Installation & Troubleshooting Manual

Form 442900

MGS® / Servo Gear Units

Speed Reducers / Precision Gearheads

Geared to a higher standard™

STÖBER

Thank you for choosing STOBER!

Thank you for your purchase of a STOBER Drives power transmission speed reducer or precision motion control gearhead!

UNSURPASSED SERVICE SUPPORT
Lower TOTAL COST of OWNERSHIP
SOLUTION DESIGN • DURABILITY

STOBER products are constructed from the highest quality, German-engineered components, and manufactured to the most stringent quality standards, making our +80 year tradition of excellence the recognized "gold standard" in the industry.

As our customer, we value your confidence and satisfaction in our product to an even higher standard. As such, we look forward to being of assistance to you in any way we can, and to the ongoing performance and success of your installation.

Peter Feil, General Manager, STOBER Drives, Inc.

These products are produced by STOBER Drives, Inc. at our Maysville, Kentucky facility, an 85,000 square feet campus including sales, service, assembly, manufacturing, and inventory warehousing space to provide 1 day shipment nationwide!

This manual covers our complete family of STOBER Servo Precision Gearheads for servo motors and MGS® Speed Reducers for AC induction motors.

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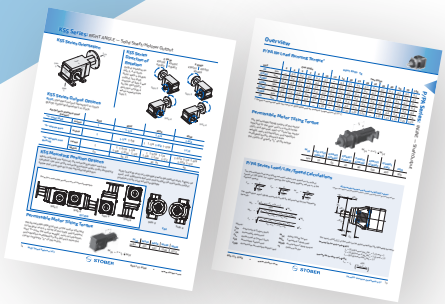


We highly recommend you download our product literature pertaining to your installation, and to keep it with this manual and other records on your MGS or Servo Gear product.

STOBER Contacts

sales@stober.com	• Send an order • Request a sales call • Ask for product information by email • Request a product drawing that is not currently available on the website
800 711-3588	Toll Free
606 759-5090	Customer service (working hours)
606 563-6035	24/7 emergency customer service hotline
Shipping Address	1781 Downing Drive, Maysville KY 41056
www.stober.com	STOBER Drives, Inc. website

MGS®/Servo Gear Units Installation and Startup Instructions

In order to obtain long life and trouble-free operation from your STOBER drive, it is essential that the proper installation and operating procedures be followed. Failure to follow these instructions will void the drive's warranty.

WARNING: SAFETY FIRST!

Safety is the most important consideration when operating any type of drive. Through proper application, safe handling methods, and wearing appropriate clothing, you can prevent accidents and injury to yourself and fellow workers.

The torque required by the application must not exceed the rated torque capacity of the drive. For safety purposes, a safety coupling should be installed between the drive and the driven load. Otherwise, overload may cause damage to the interior parts of the drive which may result in breaking the housing. As a result, persons could be injured by flying parts or splashing hot gear oil.

The shafts of STOBER drives rotate at very high speeds and can cut off or severely injure hands, fingers, and arms.

Follow all directions in the service instruction manual. Obey all federal, state and local safety regulations when operating the drive.

- Always be sure electrical power is off while making electrical connections and during installation and maintenance of the unit.

- Keep clothing, hands, and tools away from ventilation openings on motors and from all rotating parts during operation.
- Lift the drive with a double rope sling or other proper lifting equipment of adequate strength. Make sure load is secured and balanced to prevent shifting when unit is being moved. Lifting drives by hand may be dangerous and should be avoided.
- The intended use of lifting lugs is to handle the weight of the unit only. Never use a lifting lug to lift attached assemblies.
- Never operate drive at speeds higher than those shown on the nameplate, or personal injury may result. Contact STOBER Drives Inc., if there is any change of operating conditions from those for which the unit was originally sold (as stamped on the nameplate). Failure to comply could result in personal injury and or machinery damage.
- Always follow good safety practices at all times.

Each drive is tested before delivery. Before installation, however, it is advisable to examine the unit for possible damage which might have occurred during transit. If damage is discovered, it should be immediately reported to the transport agent.

If installation is delayed after receipt of the unit, the drive should be stored in a clean, dry place until put into service. Long term storage requires special procedures. If not kept in a heated, dry area, consult STOBER Drives, Inc. for storage instructions.

Important: *If it is necessary to clean drive shafts, take care to protect the oil seals.*

Caution: *Do not use any device to hammer the unit onto the output shaft during installation since the bearing races could be damaged.*

For additional information or to address other questions regarding the installation, operation, maintenance or lubrication of the unit, visit our website or call STOBER Technical Support.

MGS® Sizing & Selection Instructions

Speed Reducer Sizing/Selection Requirements

To size an MGS speed reducer for any application, the following information is required:

1. Motor speed (all MGS selection data charts assume a 1750 rpm motor)
2. Desired output speed of the reducer (rpm) to meet the application requirement (refer to selection data charts within each product section, see the following example)
3. Input HP or output torque (in.lbs.) rating requirement of the application (use calculation below)
4. Overhung load limitations of application (use calculation at right)
5. Application Service Factor requirement (use tables on the facing page)

If you have any questions or need assistance selecting the best speed reducer for your application, please contact your STOBER representative or STOBER Technical Support.

Once the appropriate MGS speed reducer has been determined use the selection data tables (see sample below), to make the appropriate model selection for the application:

① Use RPM Output (Approximate) nearest the application requirement.

②A Determine Input HP rating that is greater than or equal to the application required HP, or;

②B If selection is based on Torque instead of HP, find an Output Torque that is equal to or greater than required.

③ Confirm acceptable overhung load

④ Select Base Module and Motor Adapter part number

Complete the part number by selecting the appropriate options from the table located at the beginning of each product section.

Selection Data

1750 RPM Input			③	④ Part Number Codes		
②A Input HP	②B Output Torque (in.lbs.)	Nominal Ratio	Overhung Load Output Shaft[1] (lbs.)	Base Module	Motor Adapter Adder	Compatible NEMA C-Frame[2] with Designated Motor Adapter
① 435 RPM Output (Approximate)						
2.61	364	4.000	402	KSS102_0040	MS1R050	56C
7.00*	979	4.000	483	KSS202_0040	MS2R050	56C
					MS2R140	143/145TC
9.22*	1,289	4.000	563	KSS302_0040	MS3R050	56C
					MS3R140	143/145TC
					MS3R180	182/184TC

Calculating Input HP or Output Torque

MGS speed reducers can be selected by either HP or Output Torque. The following formulas can be used to convert horsepower to torque or torque to horsepower.

$$\text{HP} = \frac{\text{Torque (in/lbs)} \times \text{Output Speed (RPM)}}{63{,}025}$$

$$\text{Torque (in/lbs)} = \frac{\text{HP} \times 63{,}025}{\text{Output Speed (RPM)}}$$

Calculating Overhung Load

Pulling forces or overhung load of pulleys, sheaves, sprockets, etc. on the reducer input and output shaft must not exceed the allowable overhung load limits shown in the Selection Data tables within each product section.

The overhung load is measured at the center of the shaft extension. Hollow output units are not intended to support overhung loads. If an overhung load rating is required, use 50% of the published overhung load from the Selection Data. Contact STOBER Technical Support, if assistance is needed.

The following formula can be used to determine actual overhung load for a given drive:

$$\text{OHL} = \frac{126{,}000 \times \text{HP} \times \text{K}}{\text{D} \times \text{RPM}}$$

Where:

OHL	Overhung Load (lbs.)
HP	Horsepower
D	Pitch Dia. of Sprocket, Gear, Sheave, Pulley, etc.
RPM	Maximum Speed
K	1.00 Chain Drives 1.25 Gear Drives 1.25 Gearbelt Drives 1.50 V-Belt Drives 2.50 Flat Belt Drives

No overhung load is encountered when an MGS reducer is flange mounted and/or coupling connected to another unit. However, the shafts of all components must be accurately aligned and secured to prevent pre-loading of the bearings and premature bearing failure.

Determining Service Factor

Use one of the following two methods to determine the service factor of the speed reducer application.

Note: Service Factor should be determined for conditions such as non-uniform load, hours of service, and elevated ambient temperature. (For applications powered by an AC motor, a Service Factor of 2.0 is normally sufficient.)

Method 1.

Establish a Service Factor (SF) when the driven equipment and service class are known, use Table 1.

Method 2.

Establish a Service Factor (SF) when conditions are known, but the service class is NOT Known, use the information in Tables 2 – 6 below applied to the following equation:

$$SF = f_B \times f_T \times f_L \times f_V$$

Once the service factor has been determined, be sure to choose an MGS speed reducer that will meet or exceed:

HP x SF or **Torque (in/lbs) x SF**

NOTE: Do not Service Factor the motor.

Table 1. Service Class I, II, III

Operating Conditions – not all inclusive. Each application should be checked to determine if any unusual conditions are present. See also Tables 3-5.

Service Class	Service Factor	
I	1.25	**Moderate Shock** – not more than 15 minutes in 2 hours **Uniform Load** – not more than 10 hours per day.
II	1.40	**Moderate Shock** – not more than 10 hours per day. **Uniform Load** – more than 10 hours per day.
	1.50	**Heavy Shock** – not more than 15 minutes in 2 hours. **Moderate Shock** – more than 10 hours per day.
III	1.75	**Heavy Shock** – not more than 10 hours per day.
	2.00	**Heavy Shock** – more than 10 hours per day.

Type of Equipment	Hrs/Day 3-10	>10
Agitators		
Pure Liquids	I	II
Semi-Liquids, variable density	II	II
Solids	III	III
Brewing and Distilling		
Bottling Machinery	I	II
Brew Kettles (continuous duty)		II
Cookers (continuous duty)		II
Mash Tubs (continuous duty)		II
Scale Hopper (frequent starts)	II	II
Can Filling Machines	I	II
Car Dumpers	III	III
Clarifiers	I	II
Classifiers	II	II
Conveyors (uniform load and fed)		
Apron	II	II
Assembly Belt (bucket or pan)	II	II
Chain - Flight	II	II
Oven - Live Roll - Screw	I	II
Conveyors (non-uniform load and fed)		
Apron	II	III
Assembly Belt (bucket or pan)	II	II
Chain - Flight	II	II
Live Roll	*	*
Oven - Screw	II	II
Reciprocating - Shaker	III	III
Elevators		
Bucket (uniform load)	I	II
Bucket (nonuniform load - heavy duty)	II	III
Centrifugal Discharge	I	II
Freight	II	II
Gravity Discharge	I	II
Food Industry		
Slicer	II	III
Bottling, Can Filling Machines	I	II
Cereal Cooker	I	II
Mixer, Grinder	III	III
Line Shafts		
Uniform load	I	II
Nonuniform, Heavy Duty	II	III
Machine Tools		
Auxiliary Drive	I	II
Main Drive - uniform load	II	II
Main Drive - nonuniform Load	III	III
Table Conveyors (non reversing)		
Group Drives	II	III
Individual Drives	III	III
Wire Drawing, Flattening, Winding	II	III
Mixers		
Concrete - Continuous	II	III
Concrete - Intermittent	III	III
Constant Density	II	III
Semi-Liquid	III	III
Sewage Disposal Equipment		
Bar Screens	I	II
Chemical Feeders	I	II
Collectors	I	II
Dewatering Screws	II	II
Scum Breakers	II	III
Slow or Rapid Mixers	III	III
Thickeners	II	II
Vacuum Filters	II	II
Screens		
Air Washing	I	II
Rotary - Stone or Gravel	II	II
Traveling Water Intake	I	II
Skip Hoists	II	III
Slab Pushers	II	III
Stokers	II	II
Textile Industry		
Batchers or Calenders	II	II
Cards	I	II
Card Machines	III	III
Dry Cans and Dryers	II	II
Dyeing Machines	*	III
Looms	*	*
Mangles, Nappers and Pads	II	II
Soapers, Tenner Frames	II	II
Sinners, Washers, Winders	II	II
Tumbling Barrels	III	III
Windlass	II	III

* Contact STOBER Drives

Table 2. Load Factor (f_B)

Uniform Load.....1.0 Medium Shock ..1.4
Non-uniform Load ....1.25 Severe Shock 1.6

Contact STOBER Technical Support for selection assistance on applications requiring frequent starts and stops.

Table 3. Ambient Temperature Factor (f_T)

	Ambient Temperature (°F)					
	32	50	70	85	100	120
f_T	1.15	1.15	1.0	1.0	1.15	1.3

For temperatures less than 32° or greater than 120°, contact STOBER Technical Support.

Table 4. Hours of Service Factor (f_L)

	Hours of Service						
	2	4	6	8	12	16	24
f_L	0.75	0.85	0.95	1.0	1.10	1.15	1.20

Table 5. Torque Characteristics (f_V)

Use for Frequency Convertor Only

	f_V
Constant torque over entire speed variation	**1.0**
Increasing output torque from 87 – 50 Hz	**1.7**

Need Assistance? We can help!

For additional information or to address other questions regarding the appropriate sizing/selection of the unit, visit our website or call STOBER.

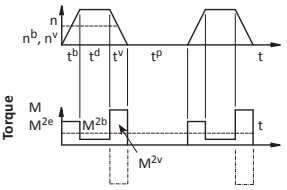
Servo Gear Units Sizing & Selection Instructions

Sizing/Selection

Use the chart on the facing page and below to determine the best series and the right size gearhead to meet your specific application requirements. In each product section of this catalog, the necessary data and a "Load/Life/Speed Calculation" section are provided to help you work through these equations..

By all means, please feel free to call or email (sales@stober.com), if you have any questions or need assistance determining the best solution for your application.

Cycle Run



$$M_{2e} = \sqrt[3]{\frac{n_{2b} \bullet t_b \bullet M_{2b}{}^3 + \ldots + n_{2n} \bullet t_n \bullet M_{2n}{}^3}{n_{2b} \bullet t_b + \ldots + n_{2n} \bullet t_n}}$$

Service Factor

Apply to Nominal Rating ONLY

Load Factor f_B	P, PA, PE PH, PHA PHV, PHVA, PHQ, PHQA, KS	PKX, PK, PHKX, PHK, PHQK, C, F, K, KSS
Operating Mode		
Continuous	1.0	1.0
Cyclic	1.0	1.25
Cyclic– Reversing	1.0	1.4

Running Time Factor f_L

≤8 hours	1.0
≤16 hours	1.15
≤24 hours	1.2

Apply to Input RPM

Temperature Factor f_T

	Without Ventilation	Fan Cooled
<20°C	1.00	0.90
<30°C	1.10	1.00
<40°C	1.25	1.15

Continuous Duty: Drive is considered continuous duty if the running time ($t^r = t^b + t^d + t^v$) is 60% of the complete cycle time ($t^b+t^d+t^v+t^p$) or longer than 20 minutes.

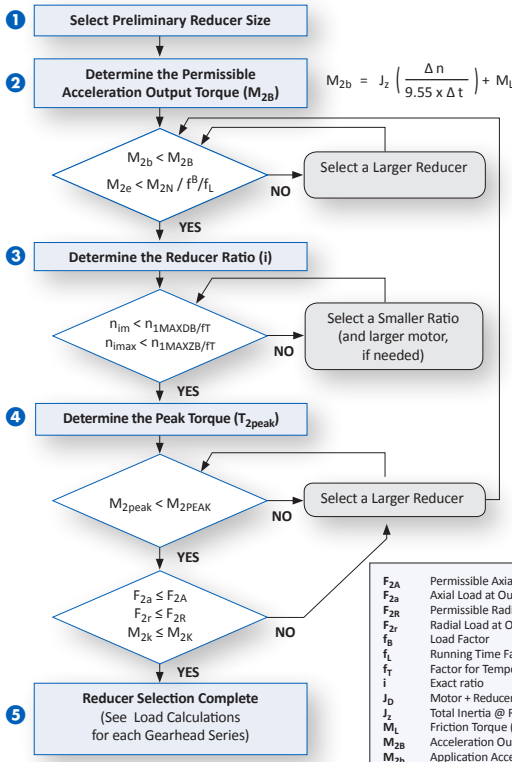
Cyclic Duty: Drive will cycle on and off.

For cyclic operation, the recommended ratio of external (application) inertia to gearhead inertia can be determined by the following equation:

$$\frac{J_Z}{i^2} = 4 \bullet J_D$$

The gearhead selected, using the following equation for inertia ratio, will result in the lowest motor torque demand and the optimum drive selection:

$$\frac{J_Z}{i^2} = J_D$$



F_{2A}	Permissible Axial Load	M_{2K}	Rated Tilting Torque
F_{2a}	Axial Load at Output Shaft	M_{2k}	Equivalent Tilting Load
F_{2R}	Permissible Radial load	M_{2N}	Nominal Output Torque
F_{2r}	Radial Load at Output Shaft	M_{2peak}	Peak Output Torque
f_B	Load Factor	n_{1db}	Maximum Continuous Input
f_L	Running Time Factor	n_{1zb}	Maximum Cyclic Input
f_T	Factor for Temperature	n_{im}	Maximum Continuous Speed
i	Exact ratio	n_{imax}	Maximum Cyclic Speed
J_D	Motor + Reducer Inertia @ Motor RPM	T_{2PEAK}	Peak Torque
J_z	Total Inertia @ Reducer RPM	t_r	Running Time
M_L	Friction Torque (Losses)	t_b	Acceleration Time
M_{2B}	Acceleration Output Torque	t_d	Duration Time
M_{2b}	Application Acceleration Torque	t_v	Deceleration Time
M_{2e}	Equivalent Torque (Avg RMS Torque)		

Need Assistance? We can help!

For additional information or to address other questions regarding the appropriate sizing/selection of the unit, visit our website or call STOBER.

ServoFit® Application-Tailored Solutions

Industry	Ideal Gearhead Applications		Recommended STOBER Gearhead
Aerospace	• Automated Guided Vehicles (AGV) • Drilling and Riveting • Machine Tool • Testing and Inspection	• Carbon Fiber Placement • Fuselage • Space Tracking Systems • Wing assembly	Inline: P, PA, PH, PHA Right Angle: KS Also: STOBER rack and pinion systems and hollow bore servo motors
Automation	• Assembly turn tables • Linear presses • Robotics auxiliary axis • Palletizing	• Custom assembly machines • Radar • Pipe and wire bending	Inline: P, PA, PE, PH, PHA Right Angle: K/KL, PKX, KS Also: STOBER rack and pinion systems, hollow bore servo motors, and servo brakes
Automotive Manufacturing	• Transfer lines • Robotic auxiliary • Machining • Tire manufacturing • Carbon fiber production	• Metal cutting and bending • Pick and place • Index tables • Electronics assembly	Inline: P, PA, PE, PH, PHA Right Angle: K/KL, PKX, KS Also: STOBER rack and pinion systems, hollow bore servo motors, and servo brakes
Converting	• Cutting • Tension Control • Web Lines	• Winding • Paper Converting	Inline: P, PA, C, PH, PHA Right Angle: K/KL Also: STOBER hollow bore servo motor, servo brakes and fans
Machine Tool	• Horizontal and vertical mills • Large gantry cranes • Carbon fiber placement • Flame, laser, water jet, and plasma cutting • Back gauging	• Grinding • X-Y tables • Indexing tables • Chip conveyors • Bending and forming • Tool changers	Inline: P, PA, PH, PHA, PHQ, PHQA Right Angle: PKX, PHKX, PHK, PHQK, KS Also: STOBER rack and pinion systems, hollow bore servo motors, and servo brakes
Material Handling	• Pick and place • Line diverter • Sorting/diverting	• Linear transfer • Palletizing	Inline: PE, C Right Angle: K/KL, F Also: STOBER hollow bore servo motors
Medical	• Imaging • Radiation • Centrifuge		Inline: P, PA, C, PH, PHA Right Angle: K/KL, F, KS Also: STOBER hollow bore servo motors
Packaging	• Continuous or intermittent filling applications		Inline: P, PA, PE, C, PH, PHA Right Angle: K/KL, F, PKX, KS Also: STOBER hollow bore servo motors
Plastics/ Composites	• Often used to replace hydraulic actuators in injection molding • Injection molding • Carbon fiber placement	• Extrusion lines • Blow molding • Thermoforming • Rubber molding	Inline: P, PA, PH, PHA, PHQ, PHQA Also: STOBER rack and pinion systems and hollow bore servo motors
Printing	• Labels • Flexographic printing	• Circuit Boards • Sheet	Inline: P, PA, PH, PHA Also: STOBER hollow bore servo motors and servo brakes
Robotics	• Delta • Pick and place • Telescoping arms	• Auxiliary axis to rotate and move robot • Positioning axis	Inline: PH, PHA, PHQ, PHQA Also: STOBER rack and pinion systems and hollow bore servo motors
Semiconductor	• Wafer polishing • Wafer handling	• Circuit web printing	Inline: P, PA, PH, PHA Also: STOBER hollow bore servo motors
Valve Control	• Ideal for handling rapid dithering positioning • Ball, gate, and globe valves	• Throttle/governor valves • Chokes • Process valves • ATEX explosion proof available	Inline: P, PA, PH, PHA Right Angle: K/KL, F, PKX, PHKX Also: STOBER hollow bore servo motors

MGS® Product Overview At-a-Glance

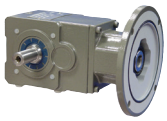
Versatility

STOBER MGS® speed reducers offer the diversity and range to meet virtually any performance and environmental challenge

If you don't see exactly what you need, call your STOBER representative or STOBER customer service for assistance.

STAINLESS STEEL

Configurations and Options		KSS
General	Input-Output Orientation	Right-Angle
	Gearing	Helical/Bevel
	Housing	Cast 304 SS
	Configurations	4 sizes; 1, 2 or 3 stages
	Envelope Size (Min/Max L" x W"x H")	6.7 x 4.2 x 5.0 12.6 x 6.8 x 7.9
Performance	Input HP (Max)	1/8 to 10
	Output Torque – lb-in (Max)	616 to 3100
	Output Speed RPM	10 to 435
NEMA C-Face Motor Compatibility (1750 RPM)	56C	•
	143/145TC	•
	182/184TC	•
	213/215TC	
	254/256TC	
	284/286TC	
	324/326TC	
	364/365TC	
Output	Solid Shaft	•
	Hollow Bore	•
	Wobble Free Bushing	•
Housing/Mounting	Round Flange	•
	Torque Arm Bracket	•
	Foot Mount	•
	Tapped Holes	•
Protection	USDA Accepted Equipment	•
	IP69K Certified	•
	IP69 Compliant	
	Housing	Totally enclosed – no breather
	Standard 3 year warranty	•
Hardware	Non-Plated	
	Plated	
	Stainless Steel	•
Paint/Coatings	Standard Gloss Gray	
	316SS Epoxy	
	Anti-Microbial Clear Coat	

IRON			
			
KL	**K**	**C**	**F**
Right-Angle	Right-Angle	Inline	Inline (Offset)
Helical/Bevel	Helical/Bevel	Concentric Helical	Offset Helical
Cast Iron	Cast Iron	Cast Iron	Cast Iron
1 size, 2 stages	10 sizes; 2, 3 or 4 stages	10 sizes; 2 or 3 stages	5 sizes; 2 or 3 stages
5.6 x 4.2 x 4.3	7.4 x 4.2 x 6.3 26.6 x 15.6 x 23.3	6.2 x 5.2 x 5.7 22.6 x 20.1 x 20.9	4.3 x 5.7 x 9.4 9.2 x 10.4 x 17.6
1/2 to 2	1/8 to 100	1/8 to 8	1/8 to 33
291 to 443	364 to 92,250	182 to 53,148	392 to 9,744
55 to 435	5* to 437	2.5* to 190	3* to 406
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• (Square)	•	• (Round or Square)	•
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•	•	•	•
•	•	•	•
Opt	Opt	Opt	Opt
Totally Enclosed – no breather	**	**	**
•	•	•	•
•	•	•	•
Opt	Opt	Opt	Opt
Opt	Opt	Opt	Opt
•	•	•	•
Opt	Opt	Opt	Opt
Opt	Opt	Opt	Opt

**If a slower speed is needed, units can be combined to match application requirements. Contact STOBER Drives Inc.*
•• Totally enclosed - no breather housing is optionally available on popular sizes.

Servo Gear Units Product Overview At-a-Glance

Versatility

STOBER Drives offers the world's largest variety of gearheads to fit virtually all servo needs.

Configurations and Options

INLINE & OFFSET INLINE GEARHEADS



		P	PA	PH	PHA	PHQ	PHQA	PE	C	F
Input	Large Input	•	•	•	•	•	•	•		
	ServoCool	•	•	•	•					
Output	Solid Shaft	•	•					•	•	•
	Hollow Bore									•
	Rotating Flange			•	•	•	•		•	•
	Shrink Ring									•
	Single Bushing									•
	Double Bushing									•
Housing	Flange								•	•
	Foot Mount								•	•
	Tapped Holes								•	•
Protection	IP65	•	•	•	•	•	•	IP64	•	•
	IP69K Washdown								Opt	Opt
	ATEX Certified	Opt	Opt	Opt	Opt	Opt	Opt		Opt	Opt
	304SS Housing									
Paint/ Coatings	Standard Black	•	•	•	•	•	•	•	•	•
	Food Duty	•							•	•
	Corrosion Resistant Duty								•	•
Added Functionality	ServoStop	•	•	•	•				•	•
	Rack and Pinion	•	•	•				•		
Performance + Good +++ Better +++++ Best	Continuous RPM	+++	+++	++	++	++	++	+++	+++	++
	Stiffness	+++	+++	++	++++	+++++	+++++	+	+	++++
	Torque Density	+++	+++	++	++++	+++++	+++++	+	+	++++
Precision	Backlash (ArcMin)	≤3 to 8	≤1 to 3	≤3 to 4	≤1 to 2	≤3 to 4	≤1 to 2	≤8 to 13	≤10 to 20	≤6 to 11
Nominal Output Torque Ranges Nm	0-50	•	•	•	•			•	•	•
	50-200	•	•	•	•			•	•	•
	200-1,000	•	•		•	•	•	•	•	•
	1,000-5,000	•	•		•	•	•	•	•	•
	5,000-10,000					•	•	•	•	•
	10,000-23,000					•	•			

RIGHT ANGLE GEARHEADS

SS304

	K	KL	PKX	PK	PHKX	PHK	PHQK	KS	KSS
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	+	+	+++	++	++++	+++	+++++	++	+
	+	+	+++	++	+++	++	++++	++	+
	≤4 to 12	≤20 to 25	≤4 to 8.5	≤3.5 to 5	≤3.5 to 6	≤3.5 to 4.5	≤3.5 to 4	≤4 to 6	≤10 to 12
	•	•	•		•		•		
	•		•		•		•	•	•
	•		•	•	•	•	•	•	•
	•		•	•	•	•	•		
	•				•		•		
	•						•		

MGS® Part Number Identification

Design Option		Part Number Code Designations by Series				
1	**Series**	**C**	**F**	**K**	**KL**	**KSS**
2	**Sizes**	0 thru 9	1 thru 4, 6	1 thru 10	2	1 thru 4
3	**Generation**	0 1	0	0 1	0	0
4	**# of Stages**	2 3	2 3	2 3 4	2	2 3
5	**Output**	—	A V W	A V W	A P W	A V W
6	**Housing**	F G N Q	F G NG	F G GD NG	F G NG	F G GD NG
7	**Bearing**	—	—	—	—	—
8	**Ratio**	0020 thru 2760	0043 thru 5520	0040 thru 3740	0040 thru 0320	0040 thru 2720
9	**Motor Adapter***	MR140 thru MR350	MR140 thru MR250	MR140 thru MR350	ML2R	MS1R MS2R MS3R MS4R
0	**NEMA Frame Size**	050 thru 360	050 thru 210	050 thru 360	050	050 thru 180
!	**Special Options**	F B	F B	F B	F B	***
@	**Mounting Position****	EL1 EL2 EL3 EL4 EL5 EL6 EL1234	EL1 EL2 EL3 EL4 EL5 EL6 EL1234	EL1 EL2 EL3 EL4 EL5 EL6 EL1256	Unrestricted	EL1256 E34

** Size dependent. Refer to product Selection Data tables in the MGS catalog for details. Optional backstop bearings also available on C, F, and K series (MRB order codes). See product information in the catalog for these alternative order code designations and further details.*
*** See mounting position section of manual for details.*
**** Inherent food & corrosion resistant duty capability*

Part Number Examples

Important: *Note that design options are not always in the same order and not always applicable for all series. Use the number balls to identify the designated design options within each part number.*

		1	2	3	4	6	8	9	0	!	@
C	*Standard duty*	C	2	0	2	N	0040	MR140/	050		EL1
	Food duty	C	2	0	2	N	0040	MR140/	050	F	EL1234

		1	2	3	4	5	6	8	9	0	!	@
F	*Standard duty*	F	2	0	2	A	NG	0043	MR140/	050		EL1
	Food duty	F	2	0	2	A	G	0043	MR140/	050	F	EL1234

		1	2	3	4	5	6	8	9	0	!	@
K	*Standard duty*	K	2	0	2	A	GD	0040	MR140/	050		EL1
	Food duty	K	2	0	2	A	F	0040	MR140/	050	F	EL1256

		1	2	3	4	5	6	8	9	0	!
KL	*Standard duty*	KL	2	0	2	A	F	0040	ML2R/	050	
	Food duty	KL	2	0	2	A	F	0040	ML2R/	050	F

	1	2	3	4	5	6	8	9	0	@
KSS	KSS	2	0	2	W	G	0040	MS1R	050	EL1256

Explanation of Part Number Codes

# of Stages	**1 thru 4**	Determined by ratio
Output	**A**	Hollow bore
	P/V	Solid shaft with key
	W	Single or double wobble-free bushing
Housing	**F**	Output flange mount
	G	Pitch Circle Diameter (PCD) tapped holes
	GD	Torque arm bracket mounting
	N/NG	Foot mounting
	Q	Square output flange

Ratio	**0020 0043 etc.**	0020 = 2:1 0120 = 12:1 1000 = 100:1 etc.
NEMA Frame Size	**050 thru 360**	050 = 56C; 140 = 143/145TC; 180 = 182/184TC; 210 = 213/215TC; 250 = 254/256TC; 280 = 284/286TC; 320 = 324/326TC; 360 = 364/365TC
Special Options	**F**	Food duty service
	B	Corrosion Resistant duty service

Servo Gear Units Part Number Identification — In-line Styles

Design Option		Part Number Code Designations by Series				
1	**Series**	C	F	P/PA	PE	PH/PHV/ PHA/PHVA PHQ/PHQA
2	**Sizes**	0 thru 9	2 thru 4, 6	2-5, 7-9	2 thru 5	3-5, 7-11
3	**Generation**	0	0	2	1	2
4	**# of Stages**	2 3	2 3	1 2	1 2	1 2 3
5	**Output**	—	A S V W	P G	P G	—
6	**Housing**	F G N Q	F G NG	S	F S	F
7	**Bearing**	—	—	D R (P only) Z (P only)	R	—
8	**Ratio**	0020 thru 2760	0043 thru 5520	0030 thru 1000	0030 thru 1000	0040 thru 6000
9	**Motor Adapter***	MT10 thru MT50	MT10 thru MT40	MT (P only) MF (PA only)	MA MAL	MT ME MF
0	**Special Options**	F B	F B	F (P only) C L	—	C L
!	**Mounting Position****	EL1 EL2 EL3 EL4 EL5 EL6	EL1 EL2 EL3 EL4 EL5 EL6	Unrestricted	Unrestricted	Unrestricted (PH,PHV, PHA & PHVA only) EL1 EL5 EL6 (PHQ & PHQA only)

** Size dependent. Refer to product Selection Data tables in Servo Gear catalog for details.*
*** See mounting position section of manual for details.*

Explanation of Part Number Codes

# of Stages	**1 thru 4**	Determined by ratio
Output	**A**	Hollow bore
	G	Solid shaft without key
	P/V	Solid shaft with key
	S	Shrink ring
	W	Single or double wobble-free bushing

Housing	**F**	Output flange mount
	G	Pitch Circle Diameter (PCD) tapped holes
	N/NG	Foot mounting
	Q	Square output flange
	S	Standard

Part Number Examples

Important: *Note that design options are not always in the same order and not always applicable for all series. Use the number balls to identify the designated design options within each part number.*

** Note that the mounting position does not appear on the unit's name plate. Review the mounting position illustrations later in this manual to confirm correct mounting position.*

C

	1	2	3	4	6	8	9	0	!*
Standard duty	C	0	0	2	F	0020	MT10		EL1
Food duty	C	0	0	2	N	0020	MT10	F	EL1

F

	1	2	3	4	5	6	8	8	0	!*
Standard duty	F	1	0	2	V	NG	0043	MT10		EL1
Food duty	F	1	0	2	A	G	0043	MT10	F	EL1

P/PA

	1	2	3	4	5	6	7	8	9	0
Standard duty	PA	4	2	1	S	P	D	0030	MF	
Food duty (P only)	P	4	2	1	S	P	R	0030	MT	F

PE

1	2	3	4	6	5	7	8	9
PE	2	1	1	S	P	R	0030	MA

PH
PHA
PHQ
PHQA

1	2	3	4	6	8	9	0	!*
PH	3	2	1	F	0040	MT	C	
PHQA	4	2	1	F	0055	ME	L	EL1

Bearing	**D**	Double row angular contact bearing
	R	Ball bearing
	Z	Cylindrical roller bearing
Ratio	**0020**	0020 = 2:1 0120 = 12:1
	0120	1000 = 100:1 etc.

Special Options	**F**	Food duty service
	B	Corrosion Reistant duty service
	C	ServoCool
	L	Large input

Servo Gear Units Part Number Identification — Right Angle Styles

Design Option		Part Number Code Designations by Series							
1	**Series**	K	KL	KS	KSS	PHK/PHQK	PK	PKX	PHKX
2	**Sizes**	1 thru 10	2	4-5, 7	1 thru 3	5, 7-11	5, 7-9	2-5, 7-9	3-5, 7-10
3	**Generation**	0 1	0	0	0	2	2	2	2
4	**# of Stages**	2 3 4	2	2 3	2	1	1 2	1 2	1 2
5	**Output**	A S V W	A G P S W	F G P S	A V W	—	P G	P G	—
6	**Housing**	F G GD NG	F G NG	F	F G NG	F	S	S	F
7	**Bearing**	—	—	—	—	—	R D Z	R D Z	—
8	**Ratio**	0040 thru 3810	0040 thru 0320	0060 thru 2000	0040 thru 0560	0160 thru 5920	0120 thru 5610	0030 thru 3000	0040 thru 3000
9	**Secondary Unit** (#) = Size (y)= # Stages	—	—	—	—	K(#)0(y)VF (#) = 1-8 (y) = 1, 2 or 3	K(#)0(y)VF (#) = 1-4 (y) = 2	KX(#)0(y)VF (#) = 3-5, 7-8 (y) =1	KX(#)0(y)VF (#) = 3-5, 7-8 (y) = 1
0	**Secondary Unit Ratio**	—	—	—	—	0040 thru 0990	0040 thru 0690	0010 thru 0030	0010 thru 0030
!	**Motor Adapter***	MT10 thru MT50	MQ	MT	MS1R MS2R MS3R	MT10 thru MT50	MT10 thru MT50	MF	MF
@	**Special Options**	F B	F B	L	—	—	F	F	—
#	**Mounting Position****	EL1 EL2 EL3 EL4 EL5 EL6	Unrestricted	EL1 EL2 EL3 EL4 EL5 EL6	E12 E34 EL5 EL6	EL1 EL2 EL3 EL4 EL5 EL6	EL1 EL2 EL3 EL4 EL5 EL6	EL1 EL2 EL3 EL4 EL5 EL6	EL1 EL2 EL3 EL4 EL5 EL6

** Size dependent. Refer to product Selection Data tables in Servo Gear catalog for details.*
*** See mounting position section of manual for details.*
**** Mounting position is unrestricted*

Explanation of Part Number Codes

# of Stages **1 thru 4** Determined by ratio

Output

A/F	Hollow bore
G	Solid shaft without key
P/V	Solid shaft with key
S	Shrink ring
W	Single or double wobble-free bushing

Housing

F	Output flange mount
G	Pitch Circle Diameter (PCD) tapped holes
GD	Torque arm bracket mounting
N/NG	Foot mounting
S	Standard

Part Number Examples

Important: Note that design options are not always in the same order and not always applicable for all series. Use the number balls to identify the designated design options within each part number.

** Note that the mounting position does not appear on the unit's name plate. Review the mounting position illustrations later in this manual to confirm correct mounting position.*

		1	2	3	4	5	6	8	!	@	#*
K	*Standard duty*	K	1	0	2	A	GD	0040	MT10		EL1
	Food duty	K	1	0	2	A	F	0040	MT10	F	EL1

		1	2	3	4	5	6	8	!	@
KL	*Standard duty*	KL	2	0	2	P	NG	0040	MQ	
	Food duty	KL	2	0	2	A	F	0040	MQ	F

	1	2	3	4	5	6	8	!	@	#*
KS	KS	4	0	2	P	F	0060	MT	L	EL1

	1	2	3	4	5	6	8	!	#*
KSS	KSS	1	0	2	V	F	0040	MS1R	E12

	1	2	3	4	6	8	9	0	!	#*
PHK **PHQK**	PH	5	2	1	F	0055	K102VF	0040	MT10	EL1

	1	2	3	4	6	5	7	8	9	0	!	#*
PK	P	5	2	1	S	P	D	0030	K102VF	0040	MT10	EL1

	1	2	3	4	6	5	7	8	9	0	!	#*
PKX	P	2	2	1	S	P	D	0040	KX301VF	0010	MF	EL1

	1	2	3	4	6	8	9	0	!	#*
PHKX	PH	3	2	1	F	0040	KX301VF	0010	MF	EL1

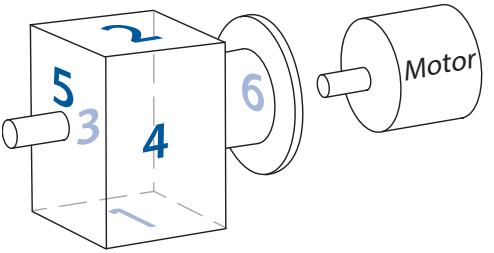
Bearing	**D**	Double row angular contact bearing
	R	Ball bearing
	Z	Cylindrical roller bearing
Ratio	**0020**	0020 = 2:1 0120 = 12:1
	0120	1000 = 100:1 etc.

Special Options	**F**	Food duty service
	B	Corrosion Resistant duty service
	L	Large input

MGS®/Servo Gear Units Orientation

In-line Styles

MGS	Servo Gear
C	C
F	F
	P/PA
	PE
	PH/PHA/ PHQ/PHQA

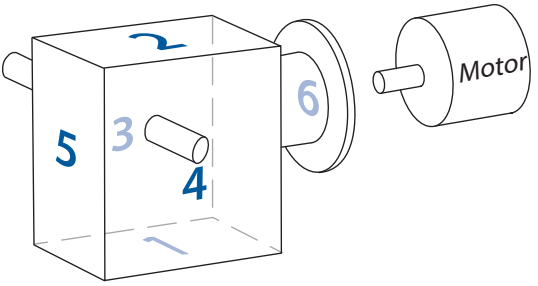


The orientation of the MGS/Servo unit in relation to the motor input (side 6) is the same for both inline and right angle units.

Note that the output for inline units is always on side 5; for right angle units, the output can be on side 3, 4 or both.

Right Angle Styles

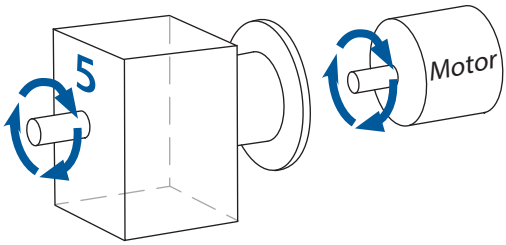
MGS	Servo Gear
K	K
KL	KL
KSS	KS
	KSS
	PK/PKX
	PHK/PHQK/PHKX



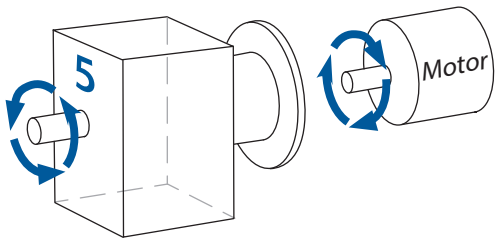
Series specific orientation information is available in the free download documents which are located under the literature tab within each product section of our website.

MGS®/Servo Gear Units Direction of Rotation — In-line Styles

Output for inline units is always on side 5.



MGS	Servo Gear
C (2 stage units)	C (2 stage units)
F (2 stage units)	F (2 stage units)
	P/PA (all units)
	PE (all units)
	PH/PHA/PHQ/PHQA (all units)

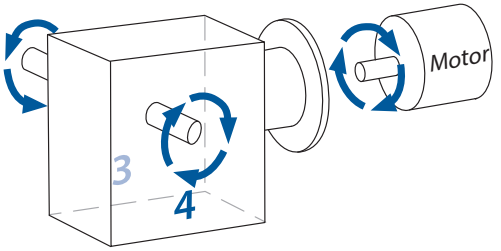


MGS	Servo Gear
C (3 stage units)	C (3 stage units)
F (3 stage units)	F (3 stage units)

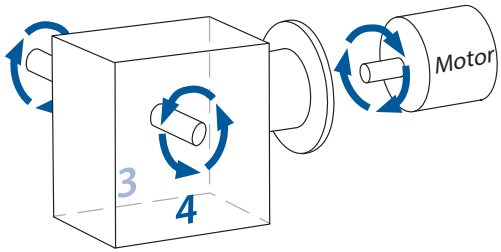
Series specific direction of rotation information is available in the free download documents which are located under the literature tab within each product section of our website.

MGS®/Servo Gear Units Direction of Rotation — Right Angle Styles

Output for right angle units can be on side 3, 4 or both.



MGS	Servo Gear
K (2 stage; 3 stage, size 5-10)	K (2 stage; 3 stage, size 5-10)
KSS (2 stage)	KSS (2 stage)
	KS (all units)
	PK (all units)
	PKX (1 stage, size PK 7-8; 2 stage, size PK 8-9)
	PHK/ PHQK (all units)
	PHKX (1 stage, size PH 7-8; 2 stage, size PH 7-10)



MGS	Servo Gear
K (3 stage, size 2-4; 4 stage)	K (3 stage, size 2-4; 4 stage)
KL (all units)	KL (all units)
KSS (3 stage)	PKX* (1 stage, size PK 2-5; 2 stage, size PK 2-5,7)
	PHKX* (1 stage, size PH 3-5; 2 stage, size PH 3-5)
	**Single output only (side 3 or 4)*

MGS®/Servo Gear Units Mounting Positions — In-line Styles

There are six possible mounting positions for most MGS and Servo Gear in-line units demonstrated by the representative illustrations on the facing page.

In order to provide the proper lubrication quantity, the appropriate mounting position order code must be specified at the time of order. ***No unit will be shipped without the mounting position specified by the customer.***

Breather vent and drain orientation, and vertical mounting which may require different seals, bearings, etc., all necessitate the need to ALWAYS mount the unit in the position for which it was assembled.

Important: *It is extremely important that the correct mounting position be specified on all units. An adjustment **CANNOT** be made in the field for incorrect mounting!*

Food & Corrosion Resistant Duty Mounting

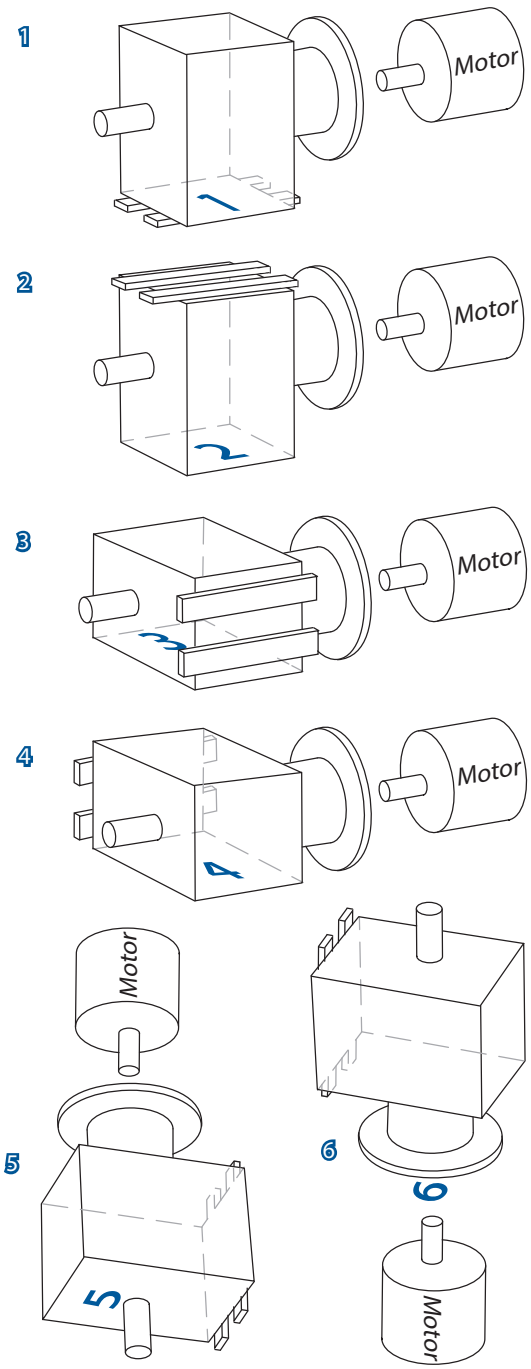
Food and Corrosion Resistant duty units are equipped with specialized seals, higher oil level, and additional features compared to standard units. These added features enable all horizontal output positions to be used interchangeably as indicated by the mounting position order codes below.

DO NOT mount horizontal Food and Corrosion Resistant duty reducers in a vertical position, or mount vertical position reducers other than specified on the order!

Series specific mounting position information is available in the free download documents which are located under the literature tab within each product section of our website.

MGS In-Line Styles		Mounting Position Order Codes 1	2	3	4	5	6
C	Standard Duty	EL1	EL2	EL3	EL4	EL5	EL6
	Food & Corrosion Resistant Duty	———	EL1234		———	EL5	EL6
F	Standard Duty	EL1	EL2	EL3	EL4	EL5	EL6
	Food & Corrosion Resistant Duty	———	EL1234		———	EL5	EL6

Servo Gear In-Line Styles						
C	EL1	EL2	EL3	EL4	EL5	EL6
F	EL1	EL2	EL3	EL4	EL5	EL6
P/PA (Mounting position unrestricted)						
PE (Mounting position unrestricted)						
PH/PHA (Mounting position unrestricted)						
PHQ/PHQA (Mounting position unrestricted on 1 and 2 stage units; order code required on 3 stage only)	———	EL1		———	EL5	EL6


1
Motor
2
Motor
3
Motor
4
Motor
Motor
5
6
6
Motor

MGS®/Servo Gear Units Mounting Positions — Right Angle Styles

There are six possible mounting positions for most MGS and Servo right angle units demonstrated by the representative illustrations on the facing page.

In order to provide the proper lubrication quantity, the appropriate mounting position order code must be specified at the time of order. ***No unit will be shipped without the mounting position specified by the customer.***

Breather vent and drain orientation, and vertical mounting which may require different seals, bearings, etc., all necessitate the need to ALWAYS mount the unit in the position for which it was assembled.

Important: *It is extremely important that the correct mounting position be specified on all units. An adjustment **CANNOT** be made in the field for incorrect mounting!*

Food & Corrosion Resistant Duty Mounting

Food and Corrosion Resistant duty units are equipped with specialized seals, higher oil level, and additional features compared to standard units. These added features enable all horizontal output positions to be used interchangeably as indicated by the mounting position order codes below.

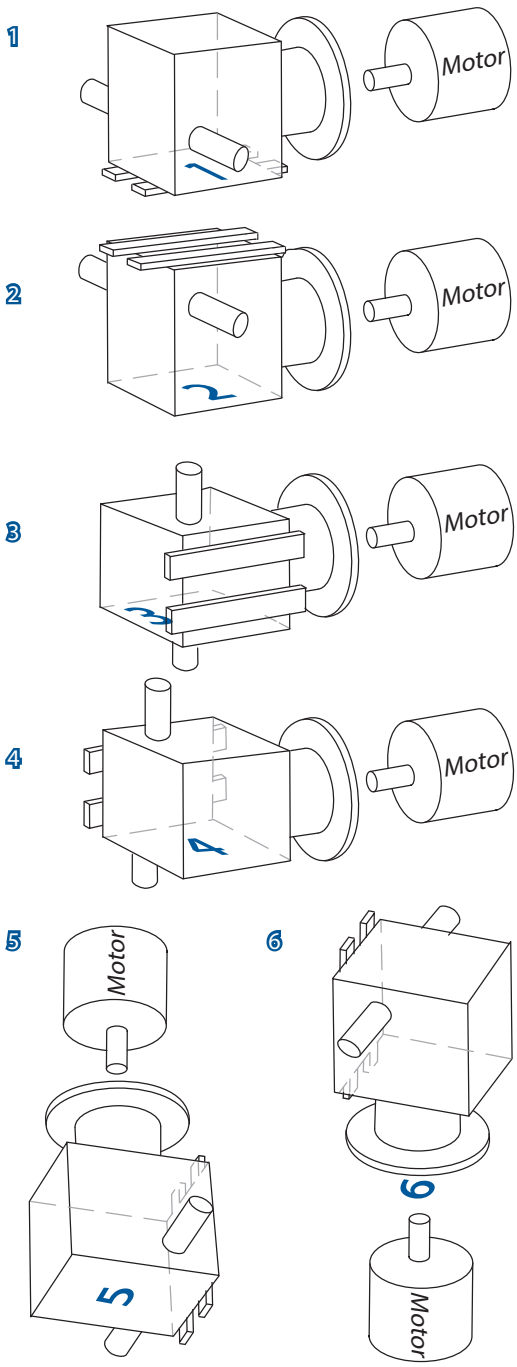
DO NOT mount horizontal Food and Corrosion Resistant duty reducers in a vertical position, or mount vertical position reducers other than specified on the order!

Series specific mounting position information is available in the free download documents which are located under the literature tab within each product section of our website.

Mounting Position Order Codes

MGS In-Line Styles		1	2	3	4	5	6
K	Standard Duty	EL1	EL2	EL3	EL4	EL5	EL6
	Food & Corrosion Resitant Duty	— EL1256 —		EL3	EL4	— EL1256 —	
KL (Mounting position unrestricted)							
KSS	All Duty Versions	— EL1256 —		— E34 —		— EL1256 —	

Servo Right Angle Styles							
K	All Duty Versions	EL1	EL2	EL3	EL4	EL5	EL6
KL (Mounting position unrestricted)							
KS	All Duty Versions	EL1	EL2	EL3	EL4	EL5	EL6
KSS	All Duty Versions	— E12 —		— E34 —		EL5	EL6
PK/PKX	All Duty Versions	EL1	EL2	EL3	EL4	EL5	EL6
PHK/PHQK/PHKX	All Duty Versions	EL1	EL2	EL3	EL4	EL5	EL6


1
Motor
2
Motor
3
Motor
4
Motor
5
Motor
5
6
6
Motor

MGS®/Servo Gear Units Lubrication

All units are shipped filled with the required amount of lubrication (Mobil XP600). If food grade or synthetic oil is requested, it will be Mobil SHC Cibus 220 Food Grade or Mobil SHC630 synthetic.

With STOBER reducers very little, or often, no maintenance is required under normal operating conditions.

Cibus® is a registered trademark of Exxon Mobil Corporation.

Units **without breathers** are lubricated for life.

For units **with breathers**, we recommend that the lubrication be changed according to the schedule below.

For all Units:

Units must be mounted according to the mounting position on the nameplate for proper lubrication!

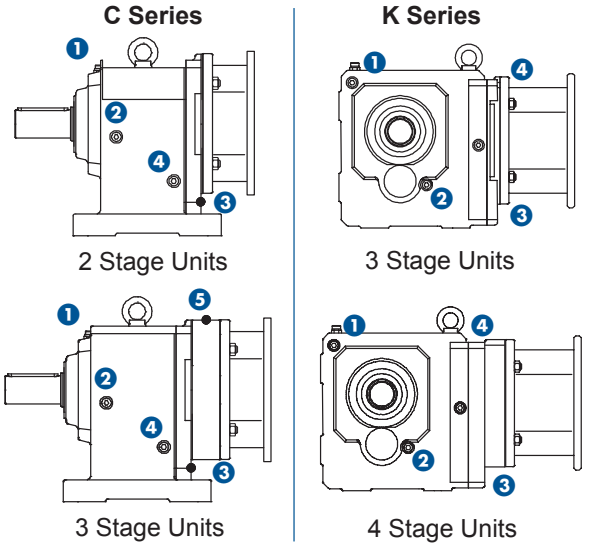
Characteristic of STOBER Standard Lubricants

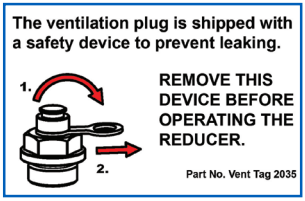
	Mobil 600 XP220	Mobil SHC Cibus® 220 Food Grade	Mobil SHC629	Mobil SHC630
Anti-Foaming Additives	X	X	Excellent	Excellent
Corrosion Protection	X	Optimum	X	Optimum
Extreme Pressure Additives	X	X	X	X
Friction and Wear Reducing Characteristics	X	Excellent	X	Superior
Oxidation Protection	X	Enhanced	X	Enhanced
Wide Temperature Range		X	X	X

Lubrication Schedule:

Normal/Dry Operating Conditions: After 10,000 Hours
Wet Operating Conditions: After 5,000 Hours

MGS®/Servo Gear Units Breather and Drain Plug Locations





Note: For units with the Food and Corrosion Resistant option, there is no breather. Contact STOBER to learn about F6, C6 or larger, and K5 or larger Food and corrosion Resistant unit.

Drain Plug and Breather Vent Locations by Mounting Position

Mtng Pos		C & K Series				
		1	2 *	2a *	3	4
EL1	All C & K	Vent			Drain	
EL2	All C & K	Drain			Vent	
EL3	All C & K		Vent	Drain		
EL4	All C & K		Drain	Vent		
EL5	C (2 stage) K (3 stage)	Drain			Vent	
	C (3 stage) K (4 stage)	Drain				Vent
EL6	C (All) K (3 stage)	Vent			Drain	
	K (4 stage)	Vent				Drain

** Position 2a is on the opposite side of 2.*

MGS®/Servo Gear Units Mounting with Torque Arm (K, KSS)

STOBER does not supply torque arms for hollow output reducers as the customer is the best source for determining the method best suited for their application footprint. However, there are recommended methods for stabilizing these reducers.

A torque arm made especially for STOBER reducers can be ordered directly from Bryant Products.

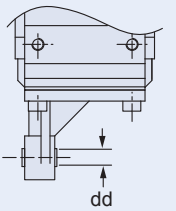
STOBER Unit	Bryant Part #
K1, K2	81617
K3, K4	81619
K5, K6	81621
K7, K8	81623
KSS1	81600-001
KSS2, KSS3	81600-002
KSS4	81600-004

BRYANT Products, Inc.

Bryant Products Inc.
W1388 Elmwood Ave.
Ixonia, WI 53036
Key Contact: Dave Roessler
Phone 920 206-6920 Ext. 1032

Torque Arm Bracket Thru Hole Diameter

Base Module	dd (in)
K1	0.47
K2	0.63
K3	0.63
K4	0.79
K5	0.79
K6	0.79
K7	0.79
K8	0.94
K9	0.94
K10	1.57



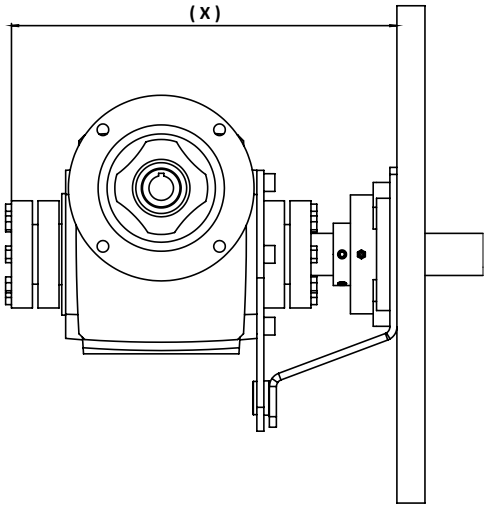
Base Module	dd (in)
KSS1 thru KSS4	0.51

Torque Arm Stabilizer Bracket Option

STOBER's Stabilizer Bracket works in conjunction with a four-bolt (205, 206, 207, or 208) Flanged Bearing and a KSS Tear Drop Torque Arm. Removing any weldment needs, the Stabilizer Bracket makes an extended shaft the only requirement to switch to STOBER if moving to wobble free bushing.

KIT PART NUMBERS

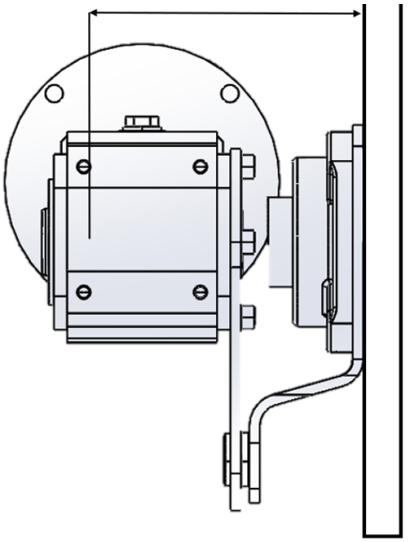
CS137450 (205/206 Flanged Bearing)
CS137367 (207/208 Flanged Bearing)
CS137561 (205/206 A-Quill Bearing)
CS137562 (207/208 A-Quill Bearing)



Required Shaft Lengths

Wobble Free Bushing Length

Unit/Flange Bearing	205/206	207/208
KSS1	10.20	-
KSS2	11.4	11.94
KSS3	10.87	12.42
KSS4	13.19	13.73



Hollow A Quill Length

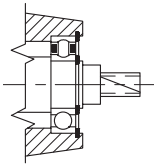
Unit/Flange Bearing	205/206	207/208
KSS1	6.63	-
KSS2	7.24	7.33
KSS3	7.69	7.78
KSS4	8.93	9.02

MGS® Optional Backstops (C, F, K)

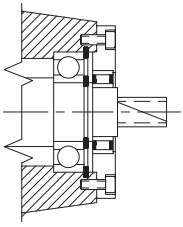
The backstop option is a bearing that is added to the motor adapter housing that prevents the gearbox from backdriving during a power off situation. Backstops are used primarily for inclined conveyor installations.

Not for use on man lifts!

To include a backstop, a "B" is added to the part number code. Gearbox output direction of rotation must be specified with order. Maximum HP limitation must not be exceeded. If the backstop is assembled for the standard rotation but rotates in the opposite direction at startup, damage to the backstop is certain.

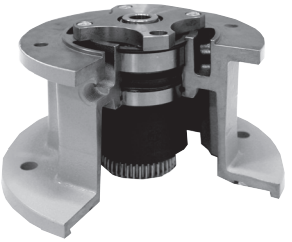


Backstop for all units using: MRB140/050, MRB160/050, MRB160/140



Backstop for MRB200/050 through MRB200/180.

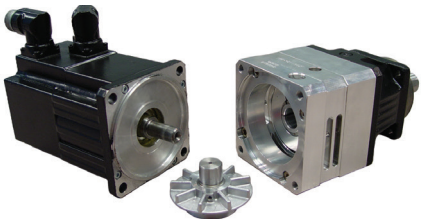
These backstops cannot be assembled in: C613, C713, C813, C913, K714, K814, K914, and K1014



Motor Adapter Sizes Available with Backstop

Adapter Part Number	NEMA Frame	Max HP* @1750 PRM
MRB160/050	56C	10.4
MRB160/140	143/145TC	
MRB200/050	56C	18.2
MRB200/140	143/145TC	
MRB200/180	182/184TC	

Servo Gear Units Optional ServoCool® Ventilation System (P/PA, PH/PHA)



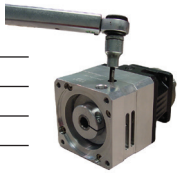
Unit and fan with adapter shaft

Step 1 Install the fan and tighten setscrew

Carefully slide the fan/adapter assembly into the gearhead with the fan hub/blades facing inward. The fan/adapter shaft will make a "hard stop" when inserted to the correct depth.

With a torque wrench, tighten the setscrew in the fan hub to hold the fan in place. Use the rating shown in Table 1.

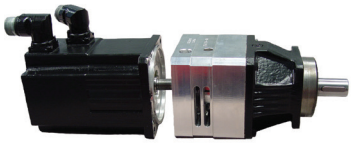
Table 1 Allen Screw Tightening Torque.



Size	Nm
2	1.5
2.5	2
3	3
4	9
5	10
6	25
8	45
10	60
14	210

Step 2 Install the motor.

Place the motor into the gearhead coupling. (If there is a keyway in the motor shaft, align the slot in the clamping hub with the keyway.) Support the gearhead while sliding it onto the motor shaft.

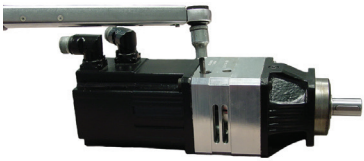


Important: *It is very important that the gearhead is not forced onto the shaft and that the motor is concentric with the gearhead coupling.*

Bolt the motor flange to the gearhead motor plate. Tighten the motor bolts to the recommended tightening torque.

Step 3 Tighten the coupling screw.

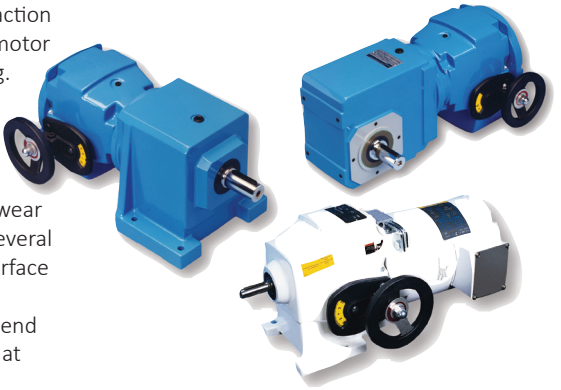
With a torque wrench, tighten the Allen screw in the coupling to the recommended torque shown in Table No. 1. A torque wrench extension is provided with each gearhead.



Step 4 Insert the plastic plugs.

MGS® ComTrac® Adjustable Speed Drive Systems (C, F, K)

The ComTrac is an adjustable speed traction drive that transfers power between a motor mounted drive cone and a traction ring.

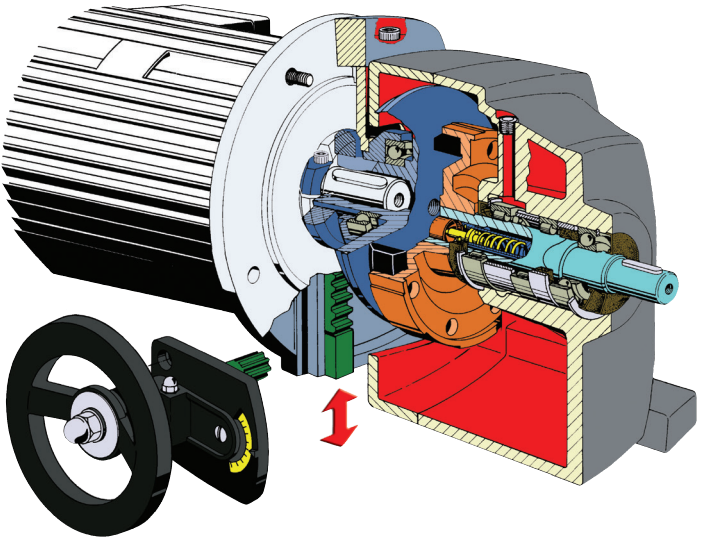


Maintenance and Repair

ComTrac Adjustable Speed Drives automatically compensate for normal wear of the traction ring. However, if after several thousand hours the annular contact surface of the traction ring becomes worn, the output shaft of the drive will slip, and tend to stop under normal load – especially at the top end of the speed range.

The condition of the traction ring can be checked after removal of the housing cover (see illustration). The traction ring must be replaced when the annular contact surface has worn down almost to the metal edge of the mounting flange.

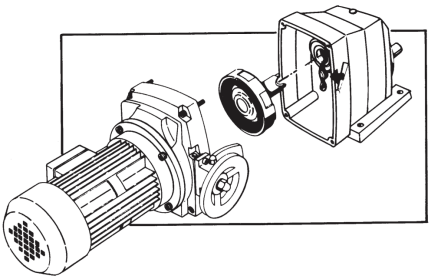
Observance of the nameplate power range for the particular ComTrac Drive in use will ensure that the traction ring will wear evenly.



Changing the Traction Ring

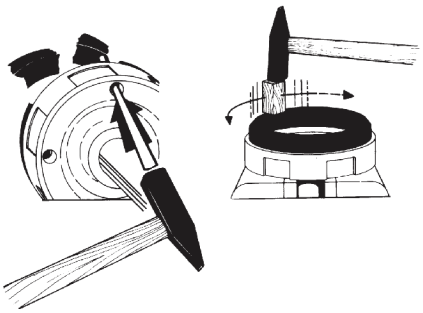
Caution: *Appropriate eye protection must be worn prior to beginning this procedure.*

1. Remove the 4 socket head cap screws and remove the housing cover.
2. Carefully pull out the traction ring complete with the flange and shaft from the bearings.

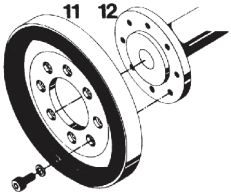


Caution: *Protect the precision ground shaft from damage.*

3. Remove the traction ring from its flange as shown below.

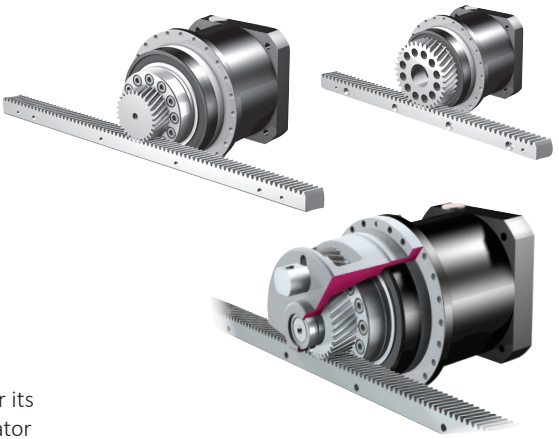


4. Press in the new traction ring by applying light hammer strokes until the ring is evenly seated. Use a block of hardwood between the hammer and the ring or use a soft mallet. Be careful not to damage the new traction ring. Clean the housing and the ring hub.
5. If desired, replace the traction ring, flange (11), and shaft assembly (12) complete (Kit C).



6. Carefully replace the traction ring and shaft taking precaution not to damage the oil seal. Rotate the ring/shaft assembly to be sure the cams are properly seated.
7. Be sure the annular contact surface of the traction ring and the drive cone surface are not damaged during assembly, and are free from grease. Wipe off any oil or grease with a dry rag, or preferably a clean paper tissue.
8. When reassembling the housing, do not use more force than is necessary to overcome the spring pressure.
9. Replace the lubricant in the bearing/cam chamber with the proper amount of lubricant. Replace the oil fill plug.
10. Grease the motor slideways by pumping small amounts of grease through the grease fittings.
11. The new traction ring requires time to run in. Therefore, avoid running the drive at full load during the first few hours of operation.

Servo Gear Units Optional Lubricator for Rack & Pinion Systems (ZV, ZR, ZTR, ZTRS Series)



STOBER offers lubrication systems for its rack and pinion offerings. The lubricator discharge period ranges from 1 to 12 months, depending on use. It is IP68 certified for use in an environment with high humidity and dust. The lubricator can handle temperature ranges of -20 to +60°C. The hose is prefilled with lubricant.

STEP 1 Adjust lubricator dial.

Use Table 1 to determine the appropriate dosage rate for the application based on the rack Mod number and the feed speed of the system. Use Table 2 to determine the appropriate setting on the Flex 125 Lubricator. Adjust the lubricator dial to the appropriate setting by inserting a flat surfaced object, such as a coin, into the slot on the dial, as illustrated below.

Table 1 Rack and Pinion Dosage Rates

Feed Speed (m/s)	Dosage Rate (ml/24h)		
	Mod 2	Mod 3	Mod 4
<1	0.25	0.25	0.25
>1 <2	0.50	0.65	0.75
>2 <3	0.75	1.00	1.25
>3 <4	1.00	1.25	1.50
>4	1.25	1.50	2.00

Table 2 Lubricator Dosage Rate Settings

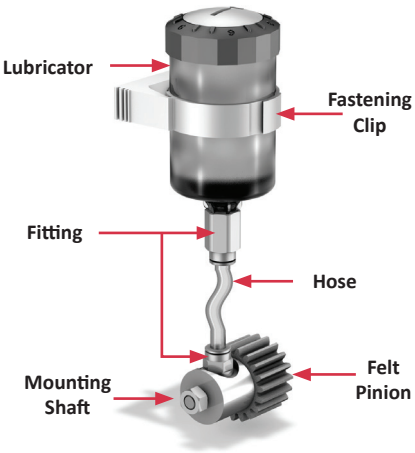
Flex 125 Lubricator Rotary Switch Position	Grease Dosage (ml/24h)
12	0.43
9	0.45
8	0.51
7	0.59
6	0.70
5	0.82
4	1.02
3	1.72
2	2.05
1	4.10

STEP 2 Attach hose fitting to the lubricator.

Remove the black plug from the bottom of the lubricator and attach the hose.

STEP 3 Mount lubricator.

To mount the lubricator, drill holes in the machine or mounting plate. Bolt the lubricator fixture to the machine.



STEP 4 Attach hose fittings to the felt gear mounting shaft port.

STEP 5 Dispose of lubricator once lubricant is depleted.

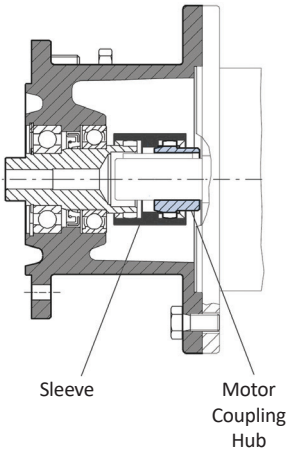
The lubricator can be disposed of once the lubrication has been depleted. The battery can be recycled.

STEP 6 Order replacement lubricator.

When a replacement lubricator is needed, please contact STOBER. The replacement kit part number is 57432.

Warning: *The lubricator enclosure is constructed from plastic. To prevent the risk of electrostatic sparking, the plastic surface should only be cleaned with a damp cloth. Appropriate measures must be taken to prevent electrostatic discharge.*

MGS® Motor Adapters



Motor coupling hub and sleeves are provided with the motor adapter. These parts, with a coupling shaft component that is part of the reducer, make a complete coupling to connect the motor to the reducer.

See page 40 for NEMA motor mounting

See page 42 for MR Adapter to NEMA motor mounting with fast, accurate, easy-to-use STOBER hub gage

Caution: *If the motor coupling is not installed correctly, the input bearing may fail due to pre-load. This will void the warranty of the reducer and possibly fail the motor.*

"MR" Motor Adapters (K, C, F, S)

Adapter	NEMA Frame	Motor Hub	Part Number	Sleeve	Part Number
MR140/050	56C	M-19 x 5/8	44308	M-19	26336
MR160/050	56C	M-24 x 5/8	44309	M-24	21741
MR160/140	143/145TC	M-24 x 7/8	44294	M-24	21741
MR200/050	56C	M-32 x 5/8	94022	M-32	20364
MR200/140	143/145TC	M-32 x 7/8	44307	M-32	20364
MR200/180	182/184TC	M-32 x 1-1/8	44295	M-32	20364
MR250/180	182/184TC	M-38 x 1-1/8	44298	M-38	21743
MR250/210	213/215TC	M-38 x 1-3/8	44299	M-38	21743
MR300/180	182/184TC	M-48 x 1-1/8	94005	M-48	21745
MR300/210	213/215TC	M-48 x 1-3/8	44302	M-48	21745
MR300/250	254/256TC	M-48 x 1-5/8	44303	M-48	21745
MR300/280	284/286TC	M-48 x 1-7/8	44304	M-48	21745
MR350/320	324/326TC	M-65 x 2-1/8	44305	M-65	21746
MR350/360	364/365TC	M-65 x 2-3/8	44306	M-65	21746

"MS_R" Motor Adapters (KSS, PSS)

Adapter	NEMA Frame	Motor Hub	Part Number	Sleeve	Part Number
MS1R050	56C	M-19 x 5/8	44308	M-19	26336
MS2R050	56C	M-24 x 5/8	44309	M-24	21741
MS2R140	143/145TC	M-24 x 7/8	44294	M-24	21741
MS3R050	56C	M-24 x 5/8	44309	M-24	21741
MS3R140	143/145TC	M-24 x 7/8	44294	M-24	21741
MS3R180	182/184TC	M-32 x 1-1/8	44295	M-32	20364
MS4R050	56C	M-24 x 5/8	44309	M-24	21741
MS4R140	143/145TC	M-24 x 7/8	44294	M-24	21741
MS4R180	182/184TC	M-32 x 1-1/8	44295	M-32	20364
MS5R050	56C	M-32 x 5/8	94022	M-32	20364
MS5R140	143/145TC	M-32 x 7/8	44307	M-32	20364
MS5R180	182/184TC	M-32 x 1-1/8	44295	M-32	20364
MS7R180	182/184TC	M-32 x 1-1/8	44295	M-32	20364

"ML" Motor Adapters (KL)

Adapter	NEMA Frame	Motor Hub	Part Number	Sleeve	Part Number
ML2R050	56C	M-19 x 5/8	44308	M-19	26336

MGS® Motor Adapter Change

The motor adapter provided for change will have the input pinion installed and the replacement gasket included. The gasket will be mounted between the motor adapter and reducer cover. The motor coupling hub and sleeve will not be replaced. It is not necessary to remove the motor hub from the motor shaft, but the coupling sleeve should be removed from the old motor adapter and used in the replacement adapter. In the event the unit is installed on an operating drive, follow all safely procedures before attempting to replace the adapter.

Replacement Procedure

Step 1 Remove the motor bolts and motor from the reducer.

Step 2 Drain oil.

When replacing the motor adapter, it is recommended to replace the oil as well. Loosen the top oil fill plug to relieve oil pressure within the reducer. Remove the oil drain plug at the lowest point on the reducer and drain oil. Caution oil may be hot. Remove the top oil fill plug to allow the oil to drain from the reducer.

Step 3 Remove the motor adapter.

Clean any gasket material that may remain on the housing cover. Failure to remove this material may lead to a future leak in this area.

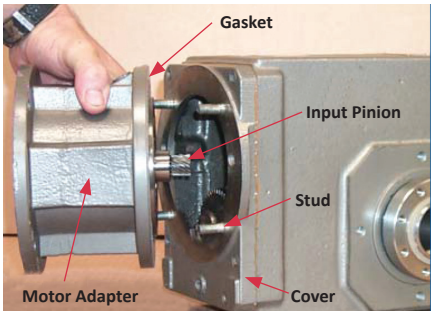
Step 4 Install replacement motor adapter.

The gasket must be mounted flat against the surface of the motor adapter and cover.

Step 5 Thread nuts onto studs in cover.

Using a torque wrench, tighten the nuts to the following values:

MR140/050B	25 Nm (220 lb-in)
MR160/050B	25 Nm (220 lb-in)
MR160/140B	25 Nm (220 lb-in)
MR200/180B	47 Nm (415 lb-in)



Step 6 Reinstall the motor.

Check the distance of the motor hub before re-installing the motor. If the unit is on an existing drive, insert the coupling sleeve into the motor adapter and reattach the motor which already has the coupling hub installed. Tighten motor bolts.

If the unit is on a new installation, follow the correct mounting procedure for installing a motor. (See page 40)

Step 7 Replace oil.

The unit must be refilled with the proper lubricant. STOBER recommends flushing the unit before replacing the oil if any gasket material or other contaminants have entered the unit during the MR replacement process. Run the unit for 20-30 minutes before draining the oil. This will pull contaminates into the oil so they can be removed.

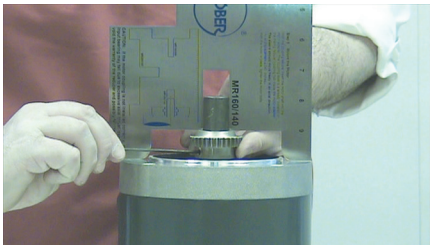
Measure and refill the oil. Check the nameplate for the correct lubrication quantity or check the STOBER web site:

http://www.stober.com/lubrication_quantity/

- Standard and Corrosion Resistant Duty Units are shipped with Mobil 600XP220.
- Food duty units are shipped with Mobil SHC CIBUS 220 food grade oil

MGS® NEMA Motor Mounting

Step 1 Place motor coupling on the motor shaft.



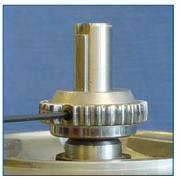
Accurate placement of the motor coupling on the shaft is vital to mounting the motor correctly. Mount the coupling with the hub projection toward the step or shoulder of the motor. The motor coupling should be located from the motor face the "XL" distance shown in Table 1.

For a fast, accurate alternative mounting method, use the STOBER Motor Hub Mounting Gage, see page 42.

Step 2 Tighten the setscrew*.

With the coupling hub located at the correct distance, tighten the setscrew in the coupling.

** Setscrews are NOT over the key in some sizes.*



Step 3 Secure the motor key.

For ease of installation, secure the motor shaft key. Staking near the end of the keyway, on the sides of the key, or a temporary adhesive works well.

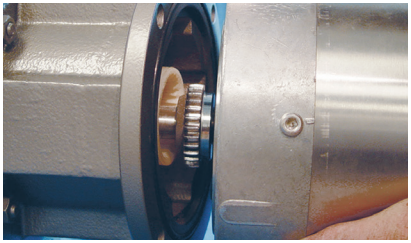
Table 1

Adapter Part Number	"XL"* mm	"XL"* inches	Set Screw Torque/Nm
Location of "MR" Motor Coupling			
MR140/050	24	0.94	2
MR160/050	30	1.18	2
MR160/140	29	1.14	2
MR200/050	40	1.57	10
MR200/140	42	1.65	10
MR200/180	36	1.42	10
MR250/180	36	1.42	10
MR250/210	33	1.30	10
MR300/180	56	2.20	10
MR300/210	53	2.09	10
MR300/250	53	2.09	10
MR300/280	53	2.09	10
MR350/320	63	2.48	17
MR350/360	63	2.48	17
Location of "MS-R" Motor Coupling			
MS1R050	24	0.94	2
MS2R050	26	1.02	2
MS2R140	29	1.14	2
MS3R050	24	0.94	2
MS3R140	29	1.14	2
MS3R180	36	1.42	10
MS4R050	24	0.94	2
MS4R140	29	1.14	2
MS4R180	36	1.42	10
Location of "ML" Motor Coupling			
ML2R050	24	0.94	2

**"XL" Tolerance = +1mm / -0mm (+0.040 / -0.000 in)*

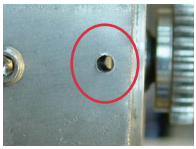
Step 4 Mount the motor.

With the coupling secure, insert the motor shaft into the motor adapter. The coupling sleeve is already installed on the mating reducer coupling hub inside the motor adapter. The sleeve should move freely in an axial direction. (Axial displacement ±0.040 inches.)



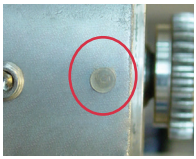
With the motor in place, install and tighten all motor bolts.

Some motor manufacturers provide a weep hole in the mounting face of washdown motors.



In some mounting positions, water or other material can enter the reducer through this hole and fail the motor adapter bearing.

Important: *Be sure the motor weep hole is plugged during washing or when the unit is in a wet environment.*



Restriction for Food Duty Speed Reducer Installations

Safety labels cannot be placed on food duty units. These labels are included with the unit and must be placed in an area visible to the equipment operator.

MGS® NEMA Motor Mounting with Hub Gage

For ease of NEMA motor coupling hub location and installation, the STOBER motor hub mounting gage is designed to fit most sizes of “MR” style motor adapters (used with C, F and K units) as well as The "MS" style adapters with the KSS series.

This simple-to-use gage makes it easy to position the motor coupling hub on the shaft quickly and accurately, insuring maximum motor/speed reducer performance and life.

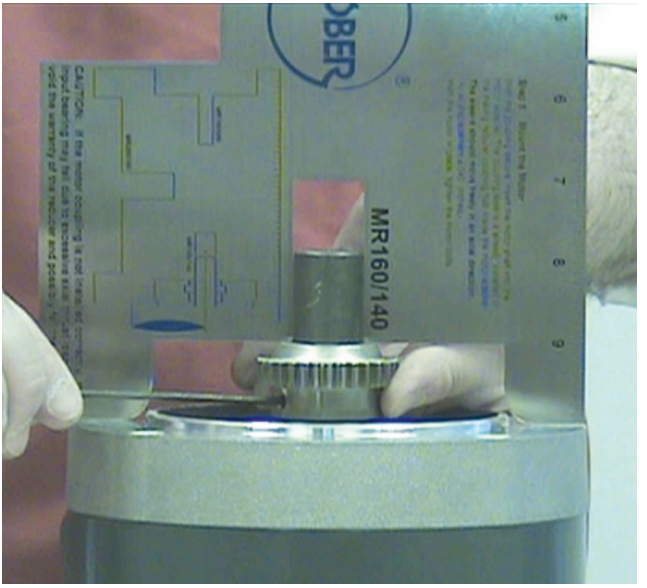
A paper motor hub mounting gage is included with each MGS speed reducer order. To order additional gages, paper or stainless steel, use the part numbers listed on the facing page. Contact STOBER to order.

Step 1 Locate the side of the gage that matches the motor adapter of the reducer. The part number on the nameplate will indicate this number.

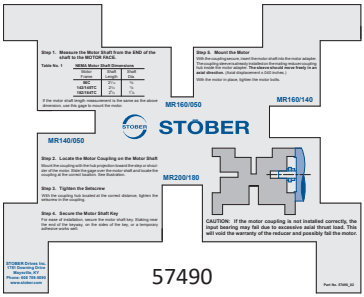
Step 2 Place the coupling hub on the motor shaft.

Step 3 Place the gage on the motor face, over the motor shaft, and hold the coupling flush with the counter-bore of the gage.

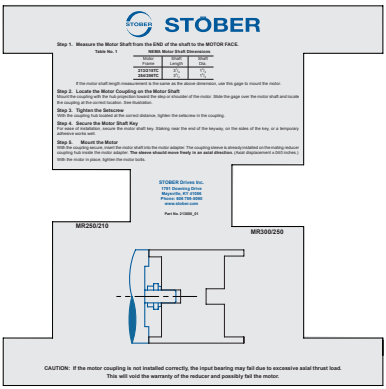
Step 4 Tighten the setscrew. Follow the motor mounting on page 40.



Paper/Stainless Steel Motor Hub Mounting Gages



57490
5000085



213000

	Part #	
Gages for C, F, K Series	**Paper**	**Stainless Steel**
Gages for use with MR140/050, MR160/050, MR160/140 and MR200/180 adapters	57490	5000070
Gage for use with MR 250/210 and MR300/250 adapters	213000	5000069
Gages for KSS Series		
Gages for use with KSS Series all MS style adapters	5000085	5000084

Servo Gear Units Motor Mounting (All units except KSS)

Servo motors are mounted to Servo gearheads using one of serveral style motor adapters (MA, MT, MQ). These patented adapters use a friction locking triple split collet to clamp on the shaft instead of using a key. A split bushing is included when the motor shaft is smaller than the input bore in the gearhead. The coupling operates free of backlash and, if installed correctly, requires no maintenance.

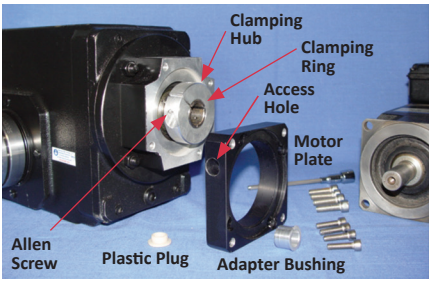
Tolerances for the motor must be ISO j6 on the pilot diameter and ISO k6 on the motor shaft, see Table 1. The motor shaft does not require a key but shaft runout, pilot concentricity and perpendicularity should meet DIN standard 42955-N when possible.

ISO metric threads are designated by the letter "M" followed by the nominal diameter and the pitch, separated by the "x" sign. Example: M6 x 0.75. (NOTE: The absence of the pitch number indicates course pitch by default.) The pitch number for tapped holes on STOBER specifications are: M5 x 0.80, M6 x 1.00, M8 x 1.25, M10 x 1.50, M12 x 1.75, and M16 x 2.00.

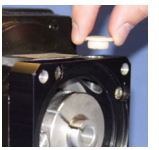
Important: *Clean the motor shaft with degreaser to remove any film of oil or grease.*

Table 1 Tolerances for Motors

k6 - Shaft Diameter	Metric (µm)
over 6 - 10	+10 / +1
over 10 - 18	+12 / +1
over 18 - 30	+15 / +2
over 30 - 50	+18 / +2
j6 - Pilot Diameter	**Metric (µm)**
over 10 - 18	+8 / -3
over 18 - 30	+9 / -4
over 30 - 50	+11 / -5
over 50 - 80	+12 / -7
over 80 - 120	+13 / -9
over 120 - 180	+14 / -11
over 180 - 250	+16 / -13
over 250 - 315	+16 / -16
over 315 - 400	+18 / -18

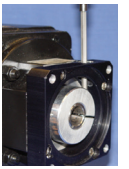


Step 1 Remove the access hole plastic plug.



Carefully remove the plastic plug from the access hole in the motor plate. For new installations, the plastic plug, wrench, instructions, and bushing, when required, are contained in a plastic bag included in the shipping carton.

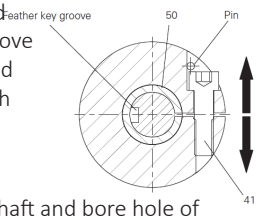
Step 2 Align screw with access hole.



Visually align the access hole with the Allen screw in the clamping ring by turning the gearhead output shaft or the input coupling. (Shown with wrench for illustration purposes.)

Step 3 Install bushing (when applicable).

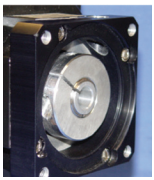
For MA units with feather keyed motor shafts, remove the feather key and align the shaft with the feather key groove as shown.



Degrease motor shaft and bore hole of the coupling hub on the motor side. If an adapter bushing is needed, degrease the bushing inside and outside.

Remove plastic plug from assembly hole of the adapter housing. Align clamping bush, if available, according to the picture. Place motor onto adapter housing. Ideally mount the motor in a vertical position to minimize unfavorable displacement.

Align the slot in the adapter bushing with the slot in the coupling hub. Slide the bushing into the input bore until the collar of the bushing touches the shaft end.



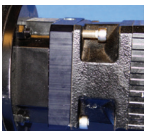
Step 4 Carefully mount the motor.

Place the gearhead (with the bushing installed where necessary) onto the motor shaft. (If there is a keyway in the motor shaft, align the slot in the clamping hub with the keyway.) Support the gearhead while sliding it onto the motor shaft.

Important: *It is critical that the gearhead is not forced onto the shaft, and that the motor is concentric with the gearhead coupling.*

Step 5 Bolt the motor flange to the gearhead motor plate.

Tighten the motor bolts to the recommended tightening torque listed below.



Motor Bolt Tightening Torque (Nm)

M4	3	M12	85	M22	580
M5	5.9	M14	135	M24	730
M6	10	M16	210	M27	1100
M8	25	M18	300	M30	1450
M10	49	M20	425	M36	2600

Step 6 Tighten the motor adapter coupling screw.

With a torque wrench, tighten the Allen screw on the coupling to the recommended tightening torque according to Table 2 below.

A torque wrench extension is provided with each gearhead. If there are two (2) screws, be sure to tighten them equally.

Step 7 Re-insert the access hole plastic plug.

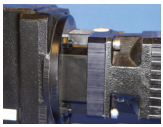


Table 2 Tightening Torques

Part Number Ends With		Screw	Allen Wrench Size	Tightening Torque (Nm)
		M4	3	3
		M5	4	5.9
MT MTL MLQ ME10 thru ME50		M6	5	10
		M8	6	25
		M10	8	49
		M12	10	85
		M16	14	210
		M20	17	435
KX	301MF	M5	4	10
	401MF	M6	5	14
	501MF	M6	5	17
	701MF	M8	6	35
	801MF	M12	10	120
		M4	3	4.5
		M5	4	9
MF MFL MA MAL ME MEI MEL		M6	5	16
		M8	6	40
		M10	8	75
		M12	10	130
		M16	14	310
		M20	17	610

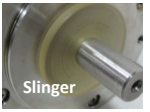
Servo Gear Units Motor Mounting (KSS only)

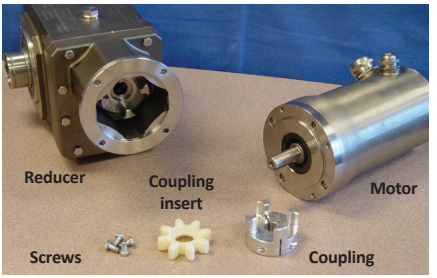
Servo motors are mounted to KSS gearheads by using a motor adapter with a Rotex® coupling. This adapter requires no key but uses a friction locking split collet to clamp the shaft. A split bushing is included when the motor shaft is smaller than the input bore in the gearhead. The coupling operates free of backlash and, if installed correctly, requires no maintenance.

Tolerances for the motor must be ISO j6 on the pilot diameter and ISO k6 on the motor shaft, see Table No. 1. The motor shaft does not require a key but shaft runout, pilot concentricity and perpendicularity should meet DIN standard 42955-N.

Important: *Clean the motor shaft with degreaser to remove any film of oil or grease.*

Important: *If the motor has a slinger, or white plastic washer on the shaft, remove it before attempting to install the motor coupling onto the motor shaft.*

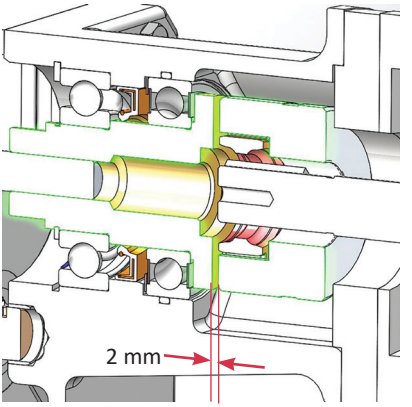




Step 1 Install the motor coupling onto the motor shaft.

Carefully slide the coupling onto the motor shaft up to the shaft shoulder. Measure the distance from the top of the reducer to the hooks (below, left) and the distance from the coupling to the flange of the adapter (below, right).

To prevent pre-load on the bearings, ensure a gap of 2 mm between the two distances.



Step 2 Tighten the screws.

Use a torque wrench to tighten the screws to the recommended torque, shown in Table 1.

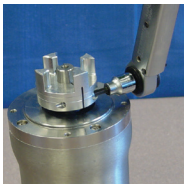
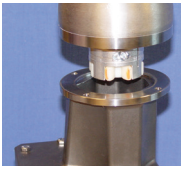


Table 1 Tightening Torque

Coupling Screw	Nm	Motor Bolt	Nm
M5	3	M8	25
M5	5.9	M10	49
M6	10	M12	85

Step 3 Install the motor.

For ease of installation, place the coupling insert onto the coupling. With the coupling and insert installed, guide the motor shaft into the gearhead. Support the gearhead during installation as some maneuvering may be required to attain correct alignment.



Step 4 Install flange bolts.

Install the motor flange bolts and tighten with a torque wrench to the recommended tightening torque.

Photo 1(left)
Photo 2 (above)

MGS®/Servo Gear Units Output Flange Installation (Hollow Bore Units)

If the STOBER reducer is supplied with an output flange, the flange side of the reducer will bolt to the equipment flange. The tolerance for the hollow bore is shown in Table 1 below. The shaft should be toleranced to fit this bore accordingly.

Table 1 Bore Tolerance (F, K, KL, KSS)

Bore Range	Tolerance dh	Tolerance uh
0.39 – 0.71	+0.0007 / -0.0000	+0.0019 -0.0000
0.71 – 1.18	+0.0008 / -0.0000	
1.18 – 1.97	+0.0010 / -0.0000	
1.97 – 3.15	+0.0012 / -0.0000	
3.15 & up	+0.0014 / -0.0000	

Since your STOBER reducer has been supplied with an output flange please discard the keeper plate. The keeper plate, inside the hollow bore, is held in place with snap rings and can be easily removed for location on either end.

Check the flange and machine mounting interface to ensure they have compatible dimensions for proper installation.

The first dimension to check is the protruding boss (dimension “b1”) of the flange (see Figure 1). This portion of the flange will be utilized for centering the gearbox on the conveyor to ensure concentricity. The tolerance of the protruding boss is shown in the Table 2. The machined bore in the mounting surface of the machine should fit this boss accordingly.

The bolt circle diameter (dimension “e1”) and mounting hole configurations are also shown in Table 2. Check the bolt circle diameter and mounting hole configuration to ensure proper alignment with the machine mounting surface.

Figure 1

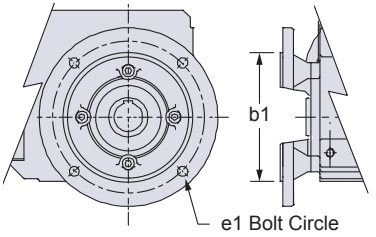


Table 2 Flange Dimensions (in)

Base Module	b1 in	e1 in	e1 Tap
KL202	3.740 +0.0005/-0.0004	5.90	M8
K1	4.331 +0.0005/-0.0004	5.12	M8
K2	5.118 +0.0006/-0.0004	6.50	M10
K3	5.118 +0.0006/-0.0004	6.50	M10
K4	7.087 +0.0006/-0.0004	8.46	M12
K5	7.087 +0.0006/-0.0004	8.46	M12
K6	9.055 +0.0006/-0.0005	10.43	M12
K7	9.842 +0.000/-0.001	11.81	M16
K8	11.811 +0.000/-0.001	13.78	M16
K9	13.780 +0.000/-0.001	15.75	M16
K10	17.716 +0.000/-0.002	19.69	M16
F1	4.331 +0.0005/-0.0004	5.12	M8
F2	5.118 +0.0006/-0.0004	6.50	M10
F3	7.087 +0.0006/-0.0004	8.46	M12
F4	7.087 +0.0006/-0.0004	8.46	M12
F6	9.055 +0.0006/-0.0005	10.43	M12

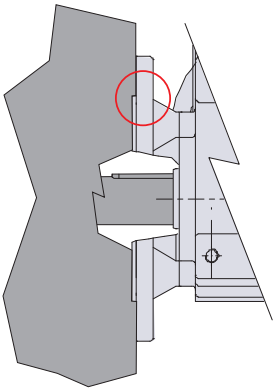
The machine/conveyor mounting surface may have a tapped hole instead of a thru hole around the bore.

If all dimensions are acceptable for interface with the STOBER flange, you are ready to install the gearbox on the machine shaft.

Installing the reducer

Before installation, brush the inside of the bore with rust inhibiting grease. Do not mount the reducer dry as removal may be impossible

Line the reducer bore up with the keyway of the machine shaft and guide the reducer onto the shaft. The flange should be facing the machine surface it will be bolted onto. Avoid hammering the gearbox onto the shaft as this may damage the bearings. Slide the gearbox onto the shaft until the flat face of the flange is flush with the mounting surface.



If the boss of the flange does not easily slide into the pilot bore of the machine surface (circled in red), do not force the flange into place. This could result in premature failure of the gearbox bearings due to misalignment. Ensure that the gearbox mounting holes are properly aligned with the mounting surface holes.

Once the flange is in proper position, install the bolts thru the reducer's flange holes into the mounting surface. If the mounting surface has tapped holes, you should then tighten the mounting bolts to the correct torque specification based on the bolt grade and size. If the mounting surface has a thru hole, you will need to place a nut and washer of the correct size onto the back side of the mounting bolt, then tighten to the correct torque specification based on the bolt grade and size. Once all bolts have been tightened to the correct torque specification, the STOBER reducer is ready for operation.

Removal

To dismantle the unit from the shaft, remove the bolts from the STOBER flange. After all flange bolts have been removed, the reducer will be ready to slide off the shaft. Removal of the reducer will be easier if the bore is greased before installation.

MGS®/Servo Gear Units Output Flange Installation (Solid Shaft Units)

If your STOBER solid shaft reducer is supplied with an output flange, the flange side of the reducer will bolt to the equipment flange.

Before mounting your STOBER flanged reducer, you will have to check the flange and machine mounting interface to ensure they have compatible dimensions for proper installation.

The first dimension to check is the protruding boss (dimension "b1") of the flange (see Figure 1). This portion of the flange will be utilized for centering the gearbox on the conveyor to ensure concentricity. The tolerance of the protruding boss is shown in the Table 1. The machined bore in the machine mounting surface should fit this boss accordingly.

The bolt circle diameter (dimension "e1") and mounting hole configurations are also shown in Table 1. Check the bolt circle diameter and mounting hole configuration to ensure proper alignment with the machine mounting surface. The machine/conveyor mounting surface may have a tapped hole instead of a thru hole around the bore.

If all dimensions are acceptable for interface with the STOBER flange, you are ready to install the gearbox into the desired location.

Figure 1

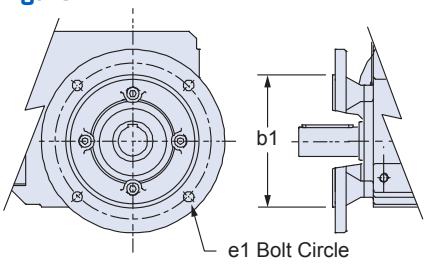


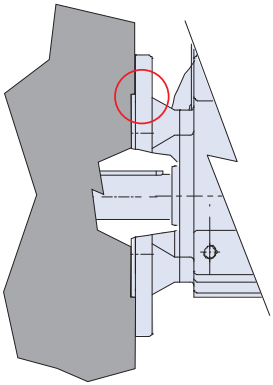
Table 1 Flange Dimensions (in)

Base Module	b1 in	e1 in	e1 Tap
KL202	3.740 +0.0005/-0.0004	5.90	M8
K1	4.331 +0.0005/-0.0004	5.12	M8
K2	5.118 +0.0006/-0.0004	6.50	M10
K3	5.118 +0.0006/-0.0004	6.50	M10
K4	7.087 +0.0006/-0.0004	8.46	M12
K5	7.087 +0.0006/-0.0004	8.46	M12
K6	9.055 +0.0006/-0.0005	10.43	M12
K7	9.842 +0.000/-0.001	11.81	M16
K8	11.811 +0.000/-0.001	13.78	M16
K9	13.780 +0.000/-0.001	15.75	M16
K10	17.716 +0.000/-0.002	19.69	M16
C0	4.331 +0.0005/-0.0004	5.12	M8
C1	5.118 +0.0006/-0.0004	6.50	M10
C2	5.118 +0.0008/-0.0004	6.50	M10
C3	7.087 +0.0006/-0.0004	8.46	M12
C4	7.087 +0.0006/-0.0005	8.46	M12
C5	9.055 +0.0006/-0.0005	10.43	M12
C6	9.055 +0.0006/-0.0005	10.43	M12
C7	9.842 +0.000/-0.001	11.81	M16
C8	11.811 +0.000/-0.001	13.78	M16
C9	13.78 +0.000/-0.001	15.75	M16
F1	4.331 +0.0005/-0.0004	5.12	M8
F2	5.118 +0.0006/-0.0004	6.50	M10
F3	7.087 +0.0006/-0.0004	8.46	M12
F4	7.087 +0.0006/-0.0004	8.46	M12
F6	9.055 +0.0006/-0.0005	10.43	M12

Installation

Before installation, brush the inside of the machine bore with rust inhibiting grease.

Align the reducer's flange side with machine mounting surface. Slide the reducer into place, ensuring the protruding boss of the STOBER flange is lined up with the bore in the machine surface.



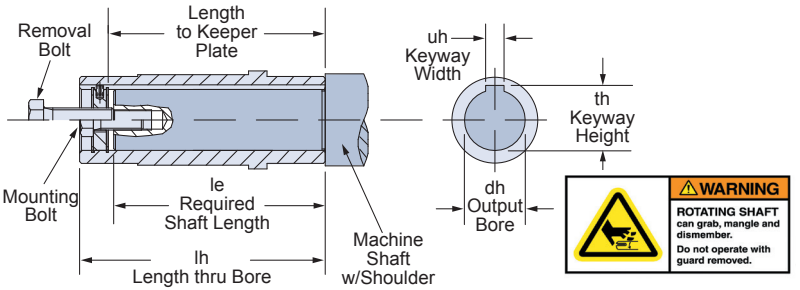
The protruding boss should extend into the bore of the mounting surface until the flat face of the flange is flush (circled in red). If the boss of the flange does not easily slide into the pilot bore of the machine surface, do not force the flange into place. This could result in premature failure of the gearbox bearings due to misalignment. Ensure that the reducer mounting holes are properly aligned with the mounting surface.

Once the flange is in proper position, install the bolts thru the reducer's flange holes into the mounting surface. If the mounting surface has tapped holes, you should then tighten the mounting bolts to the correct torque specification based on the bolt grade and size. If the mounting surface has a thru hole, you will need to place a nut and washer of the correct size onto the back side of the mounting bolt, then tighten to the correct torque specification based on the bolt grade and size. Once all bolts have been tightened to the correct torque specification, the STOBER reducer is ready for operation.

Removal

To dismantle the unit from the shaft, remove the bolts from the STOBER flange. After all flange bolts have been removed, the reducer will be ready to slide out of the bore of the mounting surface. Removal of the reducer will be easier if the bore is greased before installation.

MGS®/Servo Gear Units Hollow Output (F, K, KL, KSS)



STOBER reducers with a hollow output can be mounted to the equipment shaft from either side. Tolerances for the hollow bore are shown in Table 1. Be sure to tolerance the equipment shaft to fit accordingly.

Table 1 Bore Tolerance (F, K, KL, KSS)

Bore Range	Tolerance dh	Tolerance uh
0.39 – 0.71	+0.0007 / -0.0000	+0.0019 -0.0000
0.71 – 1.18	+0.0008 / -0.0000	
1.18 – 1.97	+0.0010 / -0.0000	
1.97 – 3.15	+0.0012 / -0.0000	
3.15 & up	+0.0014 / -0.0000	

STOBER hollow output reducers utilize a keeper plate to prevent axial movement of the unit on the equipment shaft. The keeper plate is held in place with snap rings. Each keeper plate has a spring pin to prevent it from rotating inside the bore. The keeper plate is also drilled and tapped in the center to accept the removal bolt.

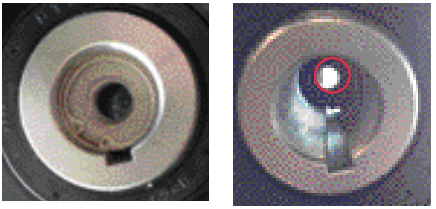
Step 1 Drill and tap equipment shaft.

STOBER recommends you drill and tap the equipment shaft a minimum one size smaller than the tap in the keeper plate. If the keeper plate is drilled for a 1/2" removal bolt, we recommend a 3/8" bolt for securing to equipment shaft.

Important: *The machine shaft length should not be longer than the "le" dimension, Table 2. A shaft length of "le minus 0.125" will allow the shaft shoulder to pull against the face of the bore of the reducer.*

Step 2 Install the keeper plate.

The keeper plate is installed on the outboard side of the unit (away from equipment shaft). Insert the first snap ring in the inner most slot. Then insert the keeper plate making sure to align the spring pin with the keyway. Insert the remaining snap ring to contain the keeper plate.



Left: Installed keeper plate with snap ring viewed from outboard side of unit; Right: Keeper plate looking through equipment shaft entry side. Note spring pin aligned in keyway. (When installed, the equipment shaft will butt up to the keeper plate.)

Important: *Before installation, brush the inside of the bore with rust inhibiting grease. Do not mount the reducer dry as removal may be impossible.*

Caution: *When mounting the unit onto the shaft, avoid hammering as this may damage the bearings.*

Step 3 Mount onto equipment shaft.

Slide reducer onto equipment shaft. Insert the mounting bolt through the keeper plate and into the threaded shaft end.

Removal of Hollow Output Reducers Using Keeper Plate

To dismantle the STOBER unit from the equipment shaft, remove the mounting bolt. In its place, thread the removal bolt into the keeper plate to press against the shaft and loosen the shaft from the unit. (Removal of the reducer will be easier if the hollow output is greased before installation.)

For parts breakdown on a specific reducer, use our website or call STOBER at 606.759.5090.

Table 2 Hollow Output Sizes*

				Imperial – Inches			Metric – mm		
Base Module	lh (in)	th (in)	uh (in)	dh	le	Removal Bolt 1	dh	le	Removal Bolt 1
F1	3.74	0.84	3/16	3/4	2.87	3/8 – 16	20H7	73	M6
F2	4.53	1.12	1/4	1	3.62	1/2 – 13	25H7	92	M12
F3	5.12	1.37	1/4	1-1/4	4.06	1/2 – 13	30H7	103	M12
F4	5.71	1.67	3/8	1-1/2	4.49	3/4 – 10	40H7	114	M20
F6	7.09	2.23	1/2	2	5.63	3/4 – 10	50H7	143	M20
K1	4.72	1.11	1/4	1	3.86	1/2 – 13	25H7	98	M12
K2	5.83	1.31	1/4	1-3/16	4.78	1/2 – 13	30H7	121.5	M12
K3	6.30	1.52	5/16	1-3/8	4.92	5/8 – 11	35H7	125	M16
K4	7.40	1.67	3/8	1-1/2	6.18	3/4 – 10	40H7	157	M20
K5	7.87	2.13	1/2	2	6.46	3/4 – 10	50H7	164	M20
K6	8.46	2.23	1/2	2	7.05	3/4 – 10	50H7	164	M20
K7	9.53	2.66	5/8	2-3/8	8.43	1 – 8	60H7	214	M24
K8	11.81	3.03	5/8	2-3/4	10.35	1 – 8	50H7	164	M20
K9	13.78	3.59	3/4	3-1/4	11.89	1 – 8	90H7	302	M30
K10	16.14	4.31	1	4	14.25	1-1/4 – 7	100H7	361	M30
KL2	4.17	0.84	0.188	3/4	3.13	3/8 – 16	—	—	—
KSS1	4.72	1.11	1/4	1	3.86	1/2 – 13	—	—	—
KSS2	5.83	1.37	1/4	1-1/4	4.78	1/2 – 13	—	—	—
KSS3	6.30	1.52	5/16	1-3/8	4.92	5/8 – 11	—	—	—
KSS4	7.40	1.67	3/8	1-1/2	6.18	3/4 – 10	—	—	—

** Most outputs available in carbon or stainless steel. KSS are stainless steel only.*

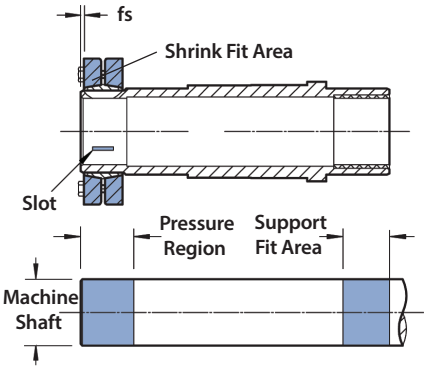
Servo Gear Units Shrink Ring Output (F, K, KL, KS)

The gear unit hollow shaft is connected to a finished machine drive shaft by frictional engagement through compression of the shrink ring on the hollow shaft. This shaft-hub connection is totally free of backlash and when installed properly will also be wear-free. Because of its self-centering property, it can transmit high torques and axial thrusts with great accuracy.

Caution: *DO NOT apply radial load to the shrink ring side.*

The hollow shaft is manufactured from heat-treated steel. Dimensions for the machine driving shaft can be found in the Servo Gear catalog.

The hollow shafts will have a compression slot on some gearbox sizes depending on the shaft size and unit size. If the hollow shaft has a slot at the shrink ring end, the machine shaft must have a tolerance of ISO h9. If the hollow shaft does not have a slot at the shrink ring end, the machine shaft must have a tolerance of ISO h6.



Assembly

Gear units supplied with a shrink ring are shipped with the ring installed on the hollow shaft end, ready for assembly. The tapered surfaces and mounting bolts of the shrink ring are greased at the factory.

Caution: *The clamping bolts on the shrink ring must NEVER be tightened before the unit is mounted on the machine shaft. Tightening these bolts prematurely will damage the inner ring and hollow shaft during assembly.*

Step 1 Prepare hollow bore and machine shaft.

- De-grease the machine shaft in the pressure region of the shrink ring.
- Remove closing and covering caps from hollow shaft and shrink ring.
- Clean shrink fit and support fit areas of the hollow shaft to remove any protective paint.

Important: *Hollow shaft bore and machine shaft must be free of grease in the region of the shrink fit!*

Step 2 Assembly sequence.

Slide the gear unit onto the machine shaft and bring into position. ***Do not force the unit or use a hammer.***

The shrink ring must be located at "fs" dimension from the end of the shaft on units with a slotted hollow shaft as listed below in Table 1.

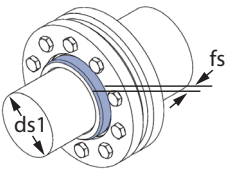


Table 1 "fs" Spacing

Shaft Ø Size –ds1	20	25	30	35	40	50
Spacing – fs	2	3	3	3	3	4

Uniformly tighten the capscrews of the shrink ring in a rotating sequence. It will take several tightening rotations to do this correctly. Tighten the screws approximately ¼ to ½ turns each rotation, until all the screws are tightened. The final tightening should be done with a torque wrench to the torque shown below in Table 2.

Table 2 Mounting Bolt Tightening Torque

Bolt Size	M5	M6	M8	M10	M12	M14
	8.8	10.9/12.9	10.9/12.9	10.9/12.9	10.9/12.9	12.9
Wrench Size [mm]	8	10	13	16	18	21
Tightening Torque [Nm] (at µ total = 0.1)	5	12/14	30/35	59/69	100/120	190

The tightening torque must correspond to the values in the table and be checked with a torque wrench.

When the tightening is completed the space between each shrink ring must be absolutely equal distance (max. 0.2 mm) from one another. Measure the distance at several locations to assure the spacing is correct.

Step 3 Install cover.

Covers or any protective devices must be installed correctly before start-up of the drive.

Disassembly

Caution: *Protect the drive and personnel against unintentional power-up by following your companies "lock-out/tag-out" procedures.*

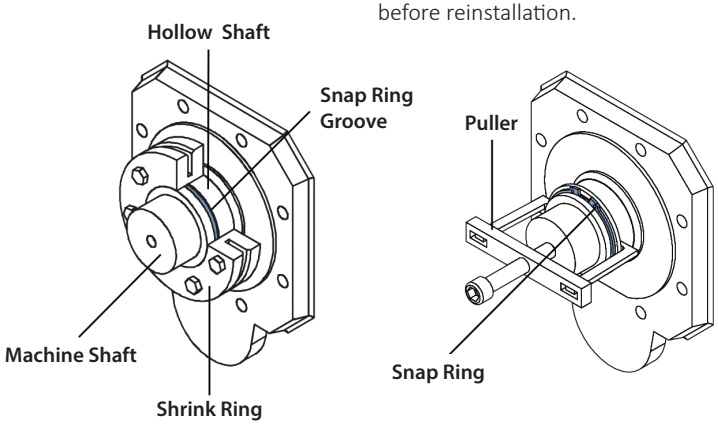
Remove the covers on the shrink ring.

Loosen the screws of the shrink ring gradually in a rotating sequence. In order to prevent misalignment and damage to the ring, it will take more than one rotation to loosen the screws.

Caution: *Do not loosen and remove the screws completely from the tapped holes. The shrink ring could spring off and cause bodily injury.*

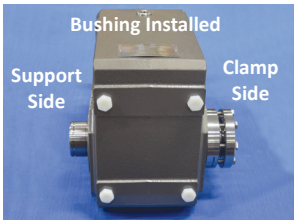
Once the screws and shrink rings have been loosened, the pressure between the hollow shaft and machine shaft should be released. If necessary, remove the shrink ring and put the snap ring into the groove to pull the drive off of the machine shaft. Refer to illustration below.

If the shrink ring has to be cleaned, the screws and tapered surfaces must be relubricated using a MoS2-based grease before reinstallation.



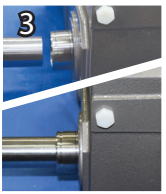
MGS®/Servo Gear Units Single Bushing Output (F, K, KL, KSS)

Important: *Refer to the chart on page 68 for recommended motor output shaft length to accommodate appropriate base model configuration.*

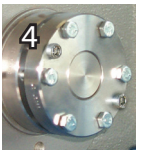


1/32 x 45° chamfer on shaft end

Clean the shaft



Guide support side bushing onto the shaft



Shaft does not protrude on clamp side

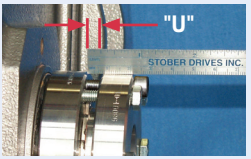
Remove the spacer bolts

Tighten clamp side first – use more than one rotating sequence – hand tighten one to two revolutions before using wrench

Use a torque wrench (See Table 1) for recommended torque

Optional step: install output covers — covers are not a standard part of the single-side wobble free configuration and must be ordered separately.

Important:



The "U" distance (between the rings) determined by the spacer bolts (see Table 1) must be maintained throughout assembly of the bushing and mounting onto the shaft.

Therefore DO NOT tighten the capscrews or remove the spacer bolts until the unit is mounted on the shaft.

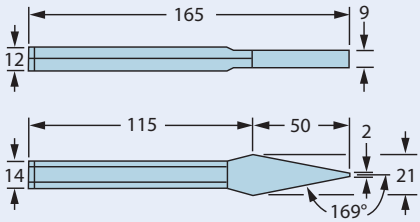
Table 1 Recommended Tightening Torque

Base Module	Capscrews Qty – Size x L (mm)	Tightening Torque Nm	Tightening Torque lb-in	U mm	U in	Spacer Bolts (mm)
F1	6 – M6×1×25	10	89	5	0.20	M6×1×20
F2	8 – M6×1×30	10	89	5	0.20	M6×1×20
F3	8 – M6×1×30	10	89	6	0.24	M6×1×20
F4	8 – M8×1.25×30	25	221	6	0.24	M8×1.25×20
F6	8 – M8×1.25×30	25	221	7	0.28	M8×1.25×25
KL2	6 – M5×0.8×25	6	53	4	0.15	M5×0.8×20
K1	6 – M6×1×25	10	89	5	0.20	M6×1×20
K2	6 – M6×1×30	10	89	5	0.20	M6×1×20
K3	8 – M6×1×30	10	89	5	0.20	M6×1×20
K4	8 – M8×1.25×30	25	221	6	0.24	M8×1.25×20
K5	8 – M8×1.25×30	25	221	7	0.28	M8×1.25×25
K6	8 – M10×1.5×35	49	434	8.5	0.33	M10×1.5×25
K7	8 – M10×1.5×40	49	434	5.5	0.22	M10×1.5×25
K8	8 – M12×1.75×40	85	752	7	0.28	M12×1.75×45
KSS1	6 – M6×1×25	10	89	5	0.20	M6×1×20
KSS2	8 – M6×1×25	10	89	5	0.20	M6×1×20
KSS3	8 – M6×1×25	10	89	5	0.20	M6×1×20
KSS4	8 – M8×1.25×30	25	221	6	0.24	M8×1.25×20

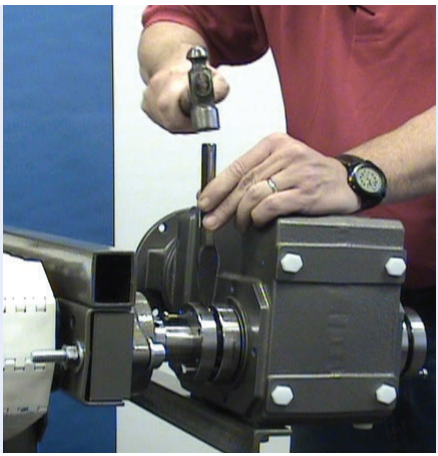
Using a torque wrench, tighten all capscrews to the torque shown in Table 1. The tightening should be done gradually in a rotating sequence and will require more than one rotation.

After two hours (minimum) running time, check capscrews and retighten, if necessary.

Clamp Ring Release Wedge

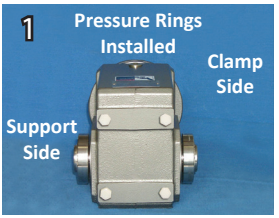


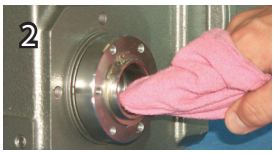
For disassembly, use a commercially-available cape chisel (approximate to the dimensions above), to assist in freeing the outer clamp ring. See page 60 for complete removal from shaft procedures.



MGS®/Servo Gear Units Double Bushing Output (F, K, KL, KSS)

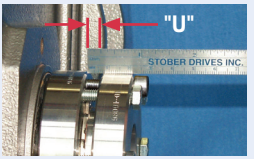
Important: *Refer to the chart on page 68 for recommended motor output shaft length to accommodate appropriate base model configuration.*





Be sure the inside of the bore is free of grease and oil before installing the tapered cones.

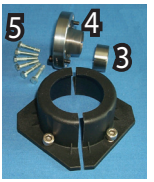
Important:



The "U" distance (between the rings) determined by the spacer bolts (see Table 1) must be maintained throughout assembly of the bushing and mounting onto the shaft. Therefore DO NOT tighten the capscrews or remove the spacer bolts until the unit is mounted on the shaft.

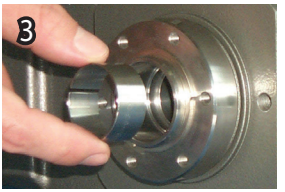
Support Side Bushing

Components

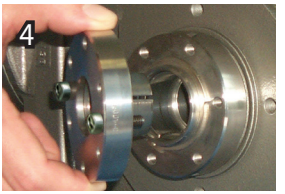


The support side is the bushing with the dark coating on the cone. It has a STOBER sticker on it. Do NOT use cleaner on the coated cone.

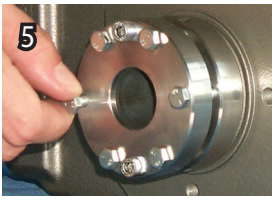
Support Side Installation



Insert tapered cone, which may have single split or double slot. If you have the split cone insert so the thinnest portion is facing outward. If you have the double slot, insert so slots are facing outward. Insure the cone is seated against the internal quill shoulder. (Note: K1/KSS1 do not have a tapered cone.)



If you have single split taper and flange cone assembly, align slots so they are 180° opposite each other. If you have double slot taper and flange cone or mixture of single and double slots, align the parts so the slots/slits are offset 90°.

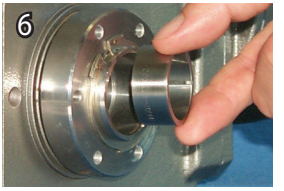


Hand tighten capscrews

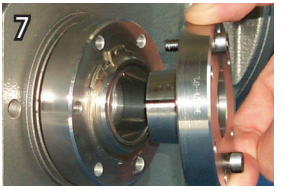
Clamp Side Bushing

Components

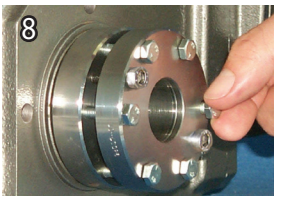
Clamp Side Installation



Insert tapered cone, which may have single split or double slot. If you have the split cone insert so the thinnest portion is facing outward. If you have the double slot, insert so slots are facing outward. Insure the cone is seated against the internal quill shoulder. (Note: K1/KSS1 do not have a tapered cone.)

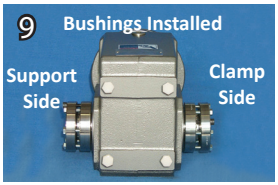


If you have single split taper and flange cone assembly, align slots so they are 180° opposite each other. If you have double slot taper and flange cone or mixture of single and double slots, align the parts so the slots/slits are offset 90°.



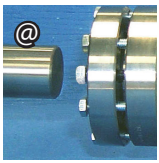
Hand tighten capscrews

Mounting onto Shaft

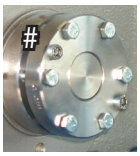


1/32 x 45° chamfer on shaft end

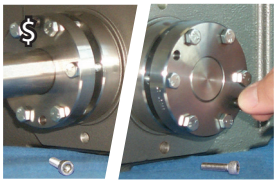
Clean the shaft



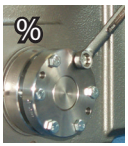
Guide support side bushing onto the shaft



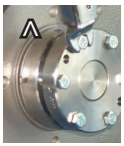
Shaft does not protrude on clamp side



Remove the spacer bolts



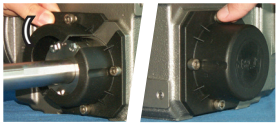
Tighten clamp side first – use more than one rotating sequence – hand tighten one to two revolutions before using wrench



Use a torque wrench (See Table 1) for recommended torque

Tighten support side capscrews – use more than one rotating sequence

Use a torque wrench (See Table 1) for recommended torque



Install split and closed covers

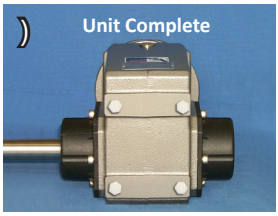


Table 1 Recommended Tightening Torque

Base Module	Capscrews Qty – Size x L (mm)	Tightening Torque Nm	Tightening Torque lb-in	U mm	U in	Spacer Bolts (mm)
F1	6 – M6×1×25	10	89	5	0.20	M6×1×20
F2	8 – M6×1×30	10	89	5	0.20	M6×1×20
F3	8 – M6×1×30	10	89	6	0.24	M6×1×20
F4	8 – M8×1.25×30	25	221	6	0.24	M8×1.25×20
F6	8 – M8×1.25×30	25	221	7	0.28	M8×1.25×25
KL2	6 – M5×0.8×25	6	53	4	0.15	M5×0.8×20
K1	6 – M6×1×25	10	89	5	0.20	M6×1×20
K2	6 – M6×1×30	10	89	5	0.20	M6×1×20
K3	8 – M6×1×30	10	89	5	0.20	M6×1×20
K4	8 – M8×1.25×30	25	221	6	0.24	M8×1.25×20
K5	8 – M8×1.25×30	25	221	7	0.28	M8×1.25×25
K6	8 – M10×1.5×35	49	434	8.5	0.33	M10×1.5×25
K7	8 – M10×1.5×40	49	434	5.5	0.22	M10×1.5×25
K8	8 – M12×1.75×40	85	752	7	0.28	M12×1.75×45
KSS1	6 – M6×1×25	10	89	5	0.20	M6×1×20
KSS2	8 – M6×1×25	10	89	5	0.20	M6×1×20
KSS3	8 – M6×1×25	10	89	5	0.20	M6×1×20
KSS4	8 – M8×1.25×30	25	221	6	0.24	M8×1.25×20

Using a torque wrench, tighten all capscrews to the torque shown in Table 1. The tightening should be done gradually in a rotating sequence and will require more than one rotation.

After two hours (minimum) running time, check capscrews and retighten, if necessary.

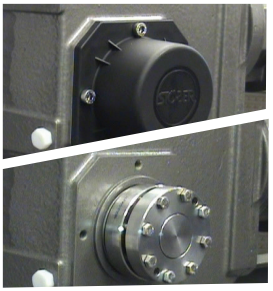
MGS®/Servo Gear Units Bushing Output Removal (F, K, KL, KSS)

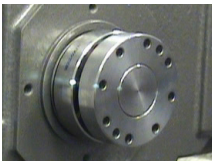
Before beginning service on your STOBER reducer, follow your companies procedures for lock out, tag out.

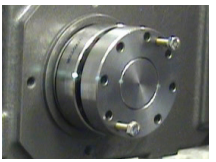
Step 1 Remove the solid cover from the clamp side bushing of the reducer.

This should be the outside bushing.

Loosen and remove all the hex head bushing bolts.



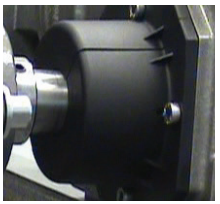


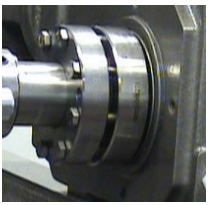


Place 2 of the hex head bolts into the back out holes and tighten slightly to apply pressure to the bushing.

Caution: ***DO NOT*** *try to use the bolts to break the bushing free. Excessive tightening can twist off the bolt head.* ***DO NOT*** *remove the bushing from the unit.*

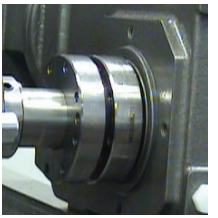
Step 2 Remove the split cover from the support side of the reducer.

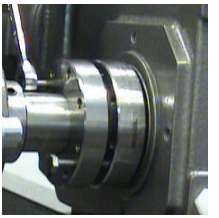




The inside bushing should be the support side, if the reducer was installed properly. This side has the Teflon coated cone and should break free easily.

Loosen and remove all of the hex head bushing bolts from the Support Side.





If there is room to do so, place two of the hex head bolts into the back out holes and tighten slightly to apply pressure to the bushing.

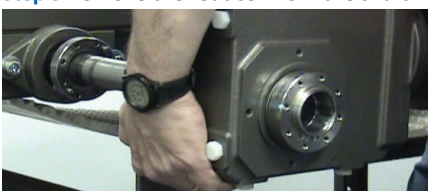
Step 3 Place a wedge between the two bushing rings on the support side, and tap with a hammer. This is done on the support side first, then on the clamp side.

(See page 57, for cape chisel info)

If the bushing does not break free, apply more pressure by tightening the bolts, and tap again. The bushing should break free. Repeat process on the clamp side.

Step 4 Remove the clamp side bushing

Step 5 Remove the reducer from the shaft.



MGS®/Servo Gear Units Technical Reference/ Troubleshooting FAQs

1. Why should I never change the mounting position of my STOBER Drives gear reducer?

STOBER gear reducers are lubricated to a specific oil level determined by the specified mounting position. Reference the mounting position pages in this manual for specifications. (In line styles, see page 24; for right angle styles, see page 26.)

Changing the mounting position of the unit will change the oil level and could result in premature failure of critical components (i.e. bearings, seals, gears etc.) for lack of lubrication.

Important: *Please contact STOBER before changing your reducers mounting position.*

MGS Food and Corrosion Resistant reducers are lubricated for mounting the unit with the output shaft in any horizontal position. If mounting a Food and Corrosion Resistant reducer with the output vertical, the mounting position must be specified when ordering.

2. What is the oil change schedule for my STOBER reducer?

Your STOBER reducer is "Lubricated for Life." There is no required maintenance of the reducer. If the reducer oil plug is removed, contaminates (dust, dirt, particulates, moisture...) will be introduced into the interior of the reducer. These contaminates could cause damage to the gears, bearings, and seals, resulting in premature failure of the reducer.

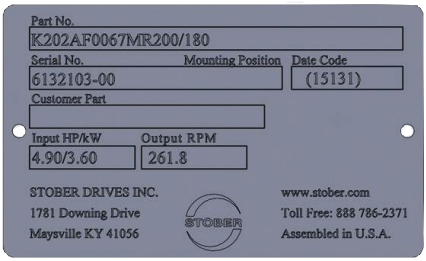
STOBER's general purpose large size gear units are supplied with a breather. These units require periodic maintenance. Reference the breather location and lubrication schedule information in this manual for specifications, see page 28.

3. Why do I need my STOBER Drives' serial number when calling STOBER to ask questions about my reducer?

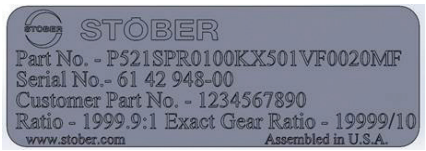
The nameplate provides valuable information such as: part number, mounting position, oil quantities, and date of manufacture (Julian calendar), but the serial number history provides information about accessories shipped with the reducer and whether there are any special requirements, such as shaft length, shaft diameter, flange, or mounted motor.

The nameplate can also be marked with Customer Information for easy cross reference. The nameplates below are typical.

MGS Nameplate



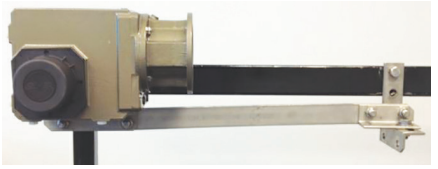
Servo Gear Nameplate



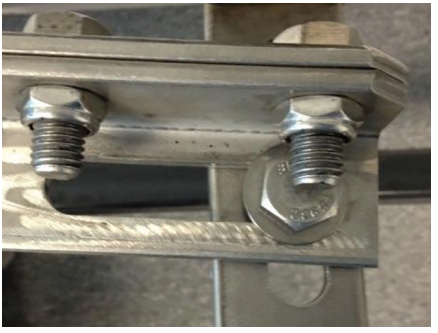
MGS®/Servo Gear Units Technical Reference/ Troubleshooting FAQs

4. My gear reducer is wobbling or shaking during operation. Do I need to stop the wobbling?

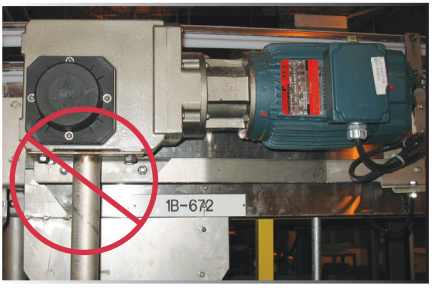
Some wobbling of the gear reducer on the output shaft is normal because of runout in the shaft. The recommended method for mounting a wobble free or hollow output gear reducer is by torque arm as shown below. See page 30 for torque arm installation instructions.



A reducer with a typical torque arm.



This picture depicts the brackets on the torque arm with a slot in each bracket to allow the torque arm to move in all directions. Also note the torque arm uses a shoulder bolt or a spacer in the slots of the brackets to prevent the torque arm from being tightened excessively.



Important: *Never rigid or pedestal mount a STOBER reducer equipped with a Single Bushing, Double Bushing or Hollow Output! Rigid mounting transfers the shaft runout to the reducer as a radial load, and can result in a premature output bearing failure.*

Do not add a rubber bushing between the brackets to dampen the movement of the reducer as that can make the mounting rigid. Rigid mounting transfers the shaft runout to the reducer bearings as radial load and will result in failure.

Reference the Torque Arm page in this manual for recommended torque arm designs.

5. What causes my reducer to wobble excessively on the conveyor shaft?

This could be caused by a several issues:

1. There is excessive runout in the conveyor shaft, the conveyor shaft is bent, or the conveyor bearings have broken down and shaft support has been compromised.
2. The wobble free bushing was not mounted to the conveyor shaft properly. The wobble free bushing must be tightened gradually in a circular pattern. If it is tightened using a star pattern the bushing will not center itself onto the shaft properly.
3. The bushing bolts were not tightened to the proper torque specified on the installation instructions. Failure to follow the instructions can result in uneven bolt torque, which will create misalignment on the conveyor shaft.

6. Why is one side of the bushing kit Teflon coated?

One bushing is Teflon coated to prevent shaft galling when the reducer is installed onto the conveyor shaft. The Teflon coat will also allow the bushing to slide across the shaft until the clamp side is fully tightened.

7. Why can't I rigid mount my STOBER gear reducer with hollow bore or wobble free output?

A hollow bore or wobble free reducer should be allowed to move with the runout coming from the shaft. If there is excessive shaft runout and the unit is rigid mounted, the reducer bearings will absorb the entire runout. The excessive load on the bearings will cause premature failure. Hollow bore and wobble free reducers should be torque arm mounted to allow the unit to float if the conveyor shaft has runout.

8. What is the maximum running temperature of a STOBER reducer?

A STOBER MGS or SMS gear reducer, should not exceed a temperature of 80°C (176° F). A planetary series gear reducers temperature should not exceed 90°C (194° F).

9. What is the ambient temperature range for a STOBER reducer?

The recommended temperature range is 0°C–40°C (32°F–104°F). If your reducer will be installed into a temperature that exceeds this range, please contact STOBER to discuss your application.

10. What chemicals can I use to wash down my STOBER reducer?

Generally, all chemicals are acceptable to wash the reducer down if they are concentrated based on the instructions for the chemical. Chemicals mixed with a strong concentration will start to break down the paint and adversely affect the reducer housings. Please contact STOBER with any questions pertaining to chemicals being used in the washdown process.

MGS®/Servo Gear Units Technical Reference/ Troubleshooting FAQs

11. What is backlash in a reducer?

Backlash is the amount of play between gears or described as gear mesh. Backlash is the value the output shaft rotates with a locked input. STOBER offers standard backlash and reduced backlash on select series reducers, see Table 1.

Backlash is measured in angular minutes or arc minutes. An angular minute is a fraction of an angular degree. One degree = 60 arc minutes and a 360 degree circle contains 21,600 arc minutes. STOBER's reduced backlash generally is <3 arc minutes and standard backlash is <20 arc minutes. See the table below for maximum backlash values per series.

Table 1 Backlash Measured in Arc Minutes*

Series	Standard	Reduced
C	< 20	
F	< 11	< 7
K	< 12	< 6
KL	< 12	< 6
KS	< 6	
KSS	< 12	
P/PA	< 8	< 3
PE	< 13	
PH/PHA	< 3	< 2
PHK	< 4.5	
PHKX	< 6	
PHQ/PHQA	< 3	< 1.5
PHQK	< 4	
PK	< 5	
PKX	< 8.5	

**Measurements taken from actual test of each series.*

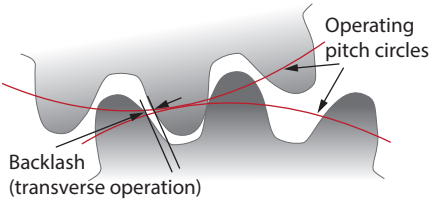


Table 2 Backlash Comparison — ArcMinute vs Linear Distance

Arc/ Minute	Degrees	Linear Distance in Inches @ 3" R	@ 12" R	@ 24" R	@ 48" R
1	0.017	0.0009	0.0035	0.0070	0.0140
2	0.033	0.0017	0.0070	0.0140	0.0279
3	0.050	0.0026	0.0105	0.0209	0.0419
4	0.067	0.0035	0.0140	0.0279	0.0558
5	0.083	0.0044	0.0175	0.0349	0.0698
6	0.100	0.0052	0.0209	0.0419	0.0838
7	0.117	0.0061	0.0244	0.0489	0.0977
8	0.133	0.0070	0.0279	0.0558	0.1117
9	0.150	0.0079	0.0314	0.0628	0.1257
10	0.167	0.0087	0.0349	0.0698	0.1396
11	0.183	0.0096	0.0384	0.0768	0.1536
12	0.200	0.0105	0.0419	0.0838	0.1675
13	0.217	0.0113	0.0454	0.0908	0.1815
14	0.233	0.0122	0.0489	0.0977	0.1955
15	0.250	0.0131	0.0524	0.1047	0.2094
16	0.267	0.0140	0.0558	0.1117	0.2234
17	0.283	0.0148	0.0593	0.1187	0.2373
18	0.300	0.0157	0.0628	0.1257	0.2513
19	0.317	0.0166	0.0663	0.1326	0.2653
20	0.333	0.0175	0.0698	0.1396	0.2792

These values can be interpolated for backlash or distances not shown in the table as follows:

$$\text{Backlash in ArcMinutes} = \left(\frac{\text{Linear Backlash (in)} \times 57.296}{\text{Radius}} \right) 60$$

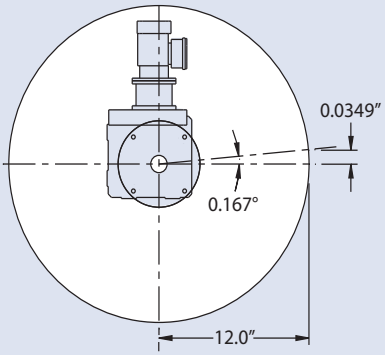
Backlash Calculation Example

Use Table 2 Backlash Comparison to determine the amount of linear movement that will be realized with a given backlash value.

Example: A vertical output shaft "K" Series gearhead is mounted under a 24" diameter turntable. The gearhead backlash is 10 arcminutes.

Reading across the table, the angular value of 10 arcminutes is 0.167 degrees.

Further determination indicates 10 arcminutes backlash will allow a linear movement of 0.0349 inches when measured at a 12 inch radius.



12. What is thermal capacity?

Thermal capacity is the point where the amount of horsepower input to a reducer produces more heat than can be dissipated.

The chart below shows input HP thermal capacity for each reducer series and size unit.

MGS® Thermal Ratings

		Series - Size			
HP	kW	KSS	K	C	F
2.95	2.2	1	1	0	1
5.36	4.0	2	2	1	2
7.38	5.5	3	3	2	3
12.34	9.2	—	4	3	4
14.75	11.0	—	5	4	5
20.12	15.0	—	6	5	6
29.50	22.0	—	7	6	—
40.23	30.0	—	8	7	—
53.64	40.0	—	9	8	—
67.05	50.0	—	10	9	—

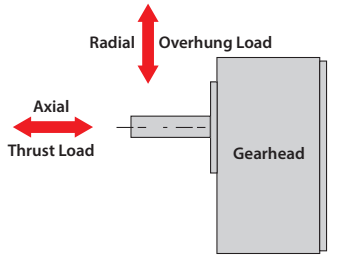
Exceeding this value can result in decreased efficiency of your STOBER reducer:

- Increased thermal capacity over time will start to break down the oil viscosity.
- Bearings will grow due to excess heat and they will lose clearance specifications determined for each bearing.
- Oil seals will start to deteriorate and lose sealing capability, causing the input and outputs to leak.

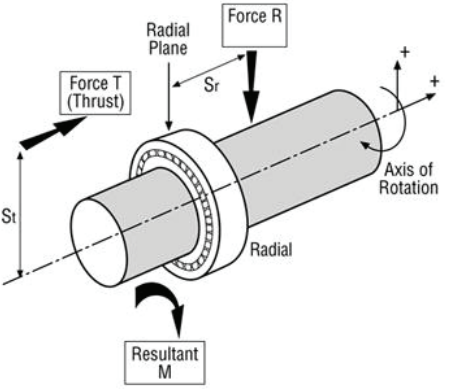
All of these factors will result in reduced life expectancy of your STOBER gear reducer.

13. What is bearing load?

There are two kinds of bearing loads: radial (overhung) and axial (thrust).

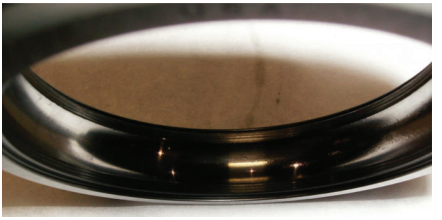


Radial Load (Overhung Load) is force applied perpendicular to the axis of the bearings. This force can be caused by pulleys, sprockets, and gears that exceed the diameter and weight recommended for a given shaft. It can also be caused by excessive tension on a belt or chain drive, incorrect mounting of a gearset, and improper location on the shaft of such components.



Too much applied radial force will cause the shaft to pull to one side and preload the bearing. This causes the bearing raceways to wear on one side resulting in premature failure.

Excessive radial load can also fatigue the output shaft and result in shaft shearing. The same effects can occur when using a STOBER reducer with a solid input (AW style) and exceeding the recommended input overhung load.

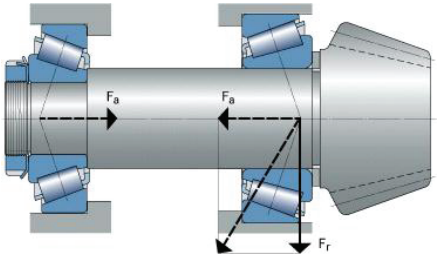


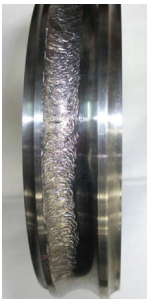
Above and left: outer and inner bearing race with radial load damage. Below: output bearing damage due to radial/overhung loads.

Axial Load (Thrust Load) is parallel force applied along the axis of rotation of a shaft. This force is created when there is a push and pull effect. A helical rack and pinion application is a typical example of this effect due to separation forces generated by the geometry of the helix angle on the gear teeth.

Axial load forces the ball bearings to one side of the race instead of running in the middle as it was designed. Axial damage is usually a result of a push or pull effect on the bearing. Helical rack and pinion can cause this due to separation forces of the teeth.

Axial load failure can occur in the STOBER reducer with the NEMA input when the motor hub is installed improperly. If the motor hub is located incorrectly it will preload the input bearing causing heat buildup and seal failure and may fail the motor as well.





Examples of an inner and outer bearing race damage from excessive axial loading.

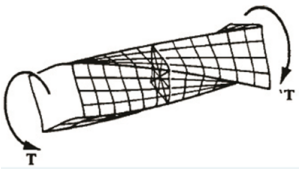
14. What is shaft failure?

Shaft failure is material fatigue due too excessive Overhung Load (OHL) or Torsional twist. No overhung load is encountered with a unit that is flange mounted and/or coupling connected to another unit. However, the shafts of all components must be accurately aligned and secured to prevent preloading of the bearings and premature bearing failure. Torsional twist results when the shaft is not strong enough to move the load and a twisting motion causes the shaft to break.

15. What causes torsional stiffness?

Torsional stiffness is a measure of wind-up or angular deflection due to applied torque. When a shaft cannot overcome applied torque and resistance of the driven mechanism material stress develops. The stress causes deformation which leads to shaft shearing. It is measured by Nm/arc-minute, Nm/Angular Degree, lb-in/arc-minute, or lb-in/Angular Degree.

Total Lost Motion is a measure of backlash plus torsional stiffness. To calculate TLM, you must determine the wind-up of the gear reducer and add that to the backlash of the unit.



This illustration shows the wind-up of the reducer shaft due to applied torque.

MGS®/Servo Gear Units FAQs

16. What fasteners are needed to install the gearhead?

Servo Gearheads are a high torque product. To insure that the specified torque ratings are attained, several series require high quality grade fasteners to attach the gear units to the machine:

Servo Gear Units Series	Grade
P, PA, PKX, PK	10.9
PH, PHA, PHK, PHKX, PHQ, PHQA, PHQK	12.9

For dynamic applications key connections should be avoided and the clearance of the key connection increases.

17. What Tightening Torques is needed for the capscrews?

When tightening capscrews in any STOBER MGS reducer, use the values in the following table. These values apply to capscrews for foot mounting, flange mounting, or torque arm mounting.

Capscrew Size	Standard Steel		Stainless Steel	
	Nm	lb-in	Nm	lb-in
M6	15	133	10	89
M8	36	318	25	221
M10	72	637	49	434
M12	125	1,106	85	z752
M16	310	2,744	210	1,858
M20	610	5,398	425	3,761
M24	1,050	9,292	730	6,460
M30	2,100	18,585	1,450	12,832
M36	3,700	32,745	2,600	23,010

MGS®/Servo Gear Units

Single and Double Bushing Recommended Shaft Length (inches)*

Series	Single Bushing		Double Bushing	
	Without Cover	With Cover	Without Covers	With Covers
F1	6.57	—	7.04	—
F2	7.51	—	8.18	—
F3	8.20	—	8.89	—
F4	9.18	—	10.03	—
F6	10.48	—	11.30	—
K1	7.06	7.97	7.73	7.97
K2	8.32	9.23	8.99	9.23
K3	8.81	9.76	9.50	9.76
K4	10.26	11.42	11.11	11.42
K5	10.80	11.84	11.61	11.89
K6	11.81	12.98	12.75	12.99
K7	13.41	14.82	14.33	14.83
K8	16.20	17.60	17.29	17.60
KL	—	—	6.81	7.03
KSS1	—	—	7.85	7.49
KSS2	—	—	9.28	9.00
KSS3	—	—	9.75	9.47
KSS4	—	—	11.38	11.04

**Important:* *A 1/32" x 45° chamfer minimum is recommended for the shaft end. The bushing will accept a shaft with a tolerance of +0.000/-0.005 in*

**Important:* *If your equipment does not have an external flange bearing, please contact STOBER to determine your recommended shaft length*

Calculating HP

To calculate the HP required for an application:

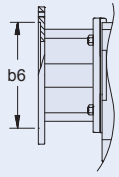
$$HP = \frac{1.732 \times Volts \times Amps \times Eff \times PF}{746}$$

Where: **Volts** = Motor Running Volts (i.e. 230V or 460V)
Amps = Measured Full Load Amps
Eff = Motor Efficiency
PF = Motor Power Factor

Specifications,Required Tolerances, Formulas and Conversions

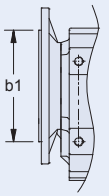
Tolerances

Motor Adapter (KSS, KL, K, C, F)



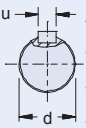
Bore (in)	Pilot Bore Diameter b6
1.96 – 3.15	+0.0007/-0.0005
3.15 – 4.72	+0.0008/-0.0006
4.72 – 7.09	+0.0010/-0.0007
7.09 – 9.84	+0.0012/-0.0008
9.84 – 12.40	+0.0014/-0.0009

Output – Flange Mount (KSS, KL, K, C, F)



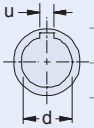
Diameter (in)	Pilot Diameter b1
>1.96 – 3.15	+0.0005/-0.0003
>3.15 – 4.72	+0.0005/-0.0004
>4.72 – 7.09	+0.0006/-0.0004
>7.09 – 9.84	+0.0006/-0.0005
>9.84 – 12.40	+0.0006/-0.0006
>12.40 – 15.74	+0.0007/-0.0007

Output – Solid Shaft (KSS, KL, K, C, F)



Diameter (in)	d	u
0.39 – 0.71	+0.0000/-0.0005	+0.0019/ -0.0000
0.71 – 1.18	+0.0000/-0.0006	
1.18 – 1.97	+0.0000/-0.0007	
1.97 – 3.15	+0.0000/-0.0008	
3.15 – Up	+0.0000/-0.0009	

Output – Hollow Bore (KSS, KL, K, C, F)



Bore (in)	d	u
0.39 – 0.71	+0.0007/-0.0000	+0.0019/ -0.0000
0.71 – 1.18	+0.0008/-0.0000	
1.18 – 1.97	+0.0010/-0.0000	
1.97 – 3.15	+0.0012/-0.0000	
3.15 – Up	+0.0014/-0.0000	

Formulas

1 HP	=	36 lb-in @ 1750 RPM
1 HP	=	54 lb-in @ 1160 RPM
HP	=	Force x FPM / 33,000
HP	=	T (lb-in) x RPM / 63,025
HP	=	T (lb-ft) x RPM / 5,252
T (lb-in)	=	63,025 x HP / RPM
T (lb-ft)	=	5,252 x HP / RPM
Ft/Minute	=	0.2618 x Dia. (in) x RPM
M/Minute	=	0.00314 x Dia. (mm) x RPM
RPM	=	Feet/Minute / 0.2618 x Dia. (in)
RPM	=	63,025 x HP / Torque
T	=	Force x Lever Arm
F	=	Torque / Radius

Conversions

Imperial to Metric

1 inch x 25.4 = mm
1 in^2 x 645.16 = mm^2
1 lb x 0.453 = kg
1 US gal x 3.785 = L
1 HP x 0.746 = kW
1 lb x 4.45 = N
1 lb in x 0.113 = Nm
1 lb ft x 1.36 = Nm
1 lb ft x .1383 = kgm
1 lb in x .0115 = kgm
1 lb in^2 x 0.00029 = kgm^2
1 PSI x 0.0689 = bar
1 PSI x 0.00689 = N/mm^2
°F = 32 + 9/5 x °C

Metric to Imperial

mm x 0.03937 = inch
1 mm^2 x 0.0015 = in^2
1 kg x 2.205 = lb
1 L x 0.264 = US gal
1 kW x 1.341 = HP
1 N x 0.225 = lb
1 Nm x 8.85 = lb-in
1 Nm x 0.737 = lb-ft
1 kgm x 7.233 = lb-ft
1 kgm x 86.798 = lb-ft
1 kgm^2 (J) x 3418.0 = lb-in^2 (WR^2)
1 bar x 14.5 = PSI
1 N/mm^2 x 145.04 = PSI
°C = 5/9 (°F-32)

Warranty

STOBER products shall be free from defects in material and workmanship for a maximum of 5- years (single shift operation or 30 months multiple shift operation) for Servo Gear products (ServoPrecision Planetary Gearheads, and Servo Geared Motors) and MGS Long Life products; 3-years (single shift operation or 18 months multiple shift operation) for other MGS products; 2-years (single shift operation or 12 months multiple shift operation) for ComTrac products, from the date of shipment to the Customer. For Servo Gear products, the motor on Servo Geared Motors, as well as all normal wear items, including oil seaals and bearings, shall be covered for a period of 2-years (single shift operation or 12 months multiple shift operation). In the event that a product proves to be defective, STOBER's sole obligation shall be, at its option, to repair or replace the product. The repaired or replacement product will be shipped F.O.B. STOBER's facilities, freight prepaid by STOBER.

No employee, agent or representative of STOBER has the authority to waive, alter, vary or add to the terms hereof without the prior written approval of an officer of STOBER. It is expressly agreed that (a) this section constitutes the final expression of the parties' understanding with respect to the warranty and (b) this section is a complete and exclusive statement of the terms of the warranty.

STOBER shall have no obligation under the warranty set forth above in the event that:

(a) The Customer fails, within the warranty period to notify STOBER in writing and provide STOBER with evidence satisfactory to STOBER of the alleged defect within five (5) days after it becomes known to the customer;

(b) After inspection of a product, STOBER determines, in its sole discretion, that it is not defective in material or workmanship;

(c) Repair or replacement of a product is required through normal wear and tear;

(d) Any part in a product or any ingredient contained in a product requires replacement or repair through routine usage or normal wear and tear;

(e A product is not maintained or used in accordance with STOBER's applicable operating and/or maintenance manuals, whether by the Customer or any third party;

(f) A product has been subject to misuse, misapplication, negligence, neglect (including, but not limited to, improper maintenance or storage), accident, catastrophe, improper installation, modification, adjustment, repair or lubrication, whether by the Customer or any third party, without the prior written consent of STOBER. Misuse shall include, but not be limited to, deterioration in a product due to chemical action and wear caused by the presence of abrasive materials;

g The system of connected rotating parts into which the product becomes incorporated is not compatible with the product, or it is not free from critical speed or torsional or other type of vibration within the specified operating range, no matter how induced; or

(h) The transmitted load and imposed torsional thrust and overhung loads are not within the published capacity limits for the unit sold.

Items manufactured by other parties but installed in or affixed to STOBER's products are not warranted by STOBER and bear only those warranties, express or implied, which are given by the manufacturer of such items, if any.

THE WARRANTY SET FORTH ABOVE IS INTENDED SOLELY FOR THE BENEFIT OF THE CUSTOMER AND DOES NOT APPLY TO ANY THIRD PARTY. ALL CLAIMS MUST BE MADE BY THE Customer AND MAY NOT BE MADE BY ANY THIRD PARTY. THIS WARRANTY MAY NOT BE TRANSFERRED OR ASSIGNED, IN WHOLE OR IN PART, BY THE Customer FOR ANY REASON WHATSOEVER. ANY SUCH ATTEMPTED TRANSFER OR ASSIGNMENT SHALL BE NULL AND VOID.

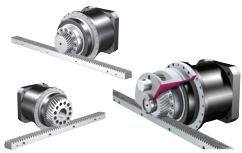
THIS WARRANTY TAKES THE PLACE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH ARE HEREBY DISCLAIMED AND EXCLUDED BY STOBER, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF USE AND ALL OBLIGATIONS OR LIABILITIES ON THE PART OF STOBER FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE, REPAIR OR PERFORMANCE OF THE PRODUCTS

ServoStop

Motor Adapter with Integrated Brake

Motor adapter integrated brake module provides redundant braking during power failures or emergency stops in hazardous situations. Available with Servo Gear P, PA, PH, PHA, PK, PHK, C, F and K Series Gearheads.

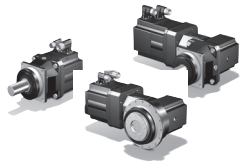
- Saves braking at EMERGENCY STOP and power cut
- Prevents accidental sliding or falling of vertical axis with gravity load absolutely reliable
- Manual hand release available
- Fits all standard servo motors
- IP54 Rated; CSA Approved
- Higher safety for vertical applications per EN ISO 13849, Category 1, 2 & 3



Rack and Pinion Systems

STOBER and Atlanta partner on ZV, ZR, ZTR, ZTRS Series high efficiency rack and pinion drives which feature an innovative pinion bearing for high linear force applications.

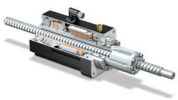
- Gear unit and rack optimally mated together as a system
- Ready to install drive solutions
- Easy selection and calculations done by STOBER for a total engineered solution
- Optimize inertia mismatch by changing the gear ratio or pinion tooth count
- Forces up to 122 kN or 27,400 lbs.
- Precision linear backlash as low as 7 µm
- Gearing size ranges from Mod. 2 – 10



Servo Gearmotors

ED and EZ Series are compact, highly-dynamic, electronically commutated, permanent magnet brushless servo motors coupled to STOBER gearheads.

- Mounting the motor directly to the gearbox eliminates a motor coupling and housing, adapter or additional input seals and bearings to reduce inertia up to 75%
- Smoother running for optimal performance; dynamic, minimal torque/speed ripple; UL/CE/CSA approved
- Options include: washdown, food coatings, spring and magnetic brakes, forced air cooling, water cooling, high dynamic performance with low inertia, encoder options, PTC or KTY winding protection, high inertia option, motor speeds up to 6000 RPM, and high torque density



Spindle Nut Direct Drive

- Axial angular contact ball bearing absorbs high axial forces from the ball screw
- Flange meets DIN 69051-5 requirements
- Liquid cooling channel available as an option for added performance

Hollow Bore Motors

- Flanged hollow shaft motor features a large internal hollow shaft (28 to 42 mm) that allows feeding of supply lines, including not only power cables, hydraulic pipes and pneumatic hoses, but also shafts and laser beams.
- 2 sizes – 5 and 7
- Extremely compact

STOBER
1781 Downing Drive
Maysville, KY 41056
(800) 711-3588
e-mail: sales@stober.com
www.stober.com

Installation & Troubleshooting Manual Form #442900 07/19

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