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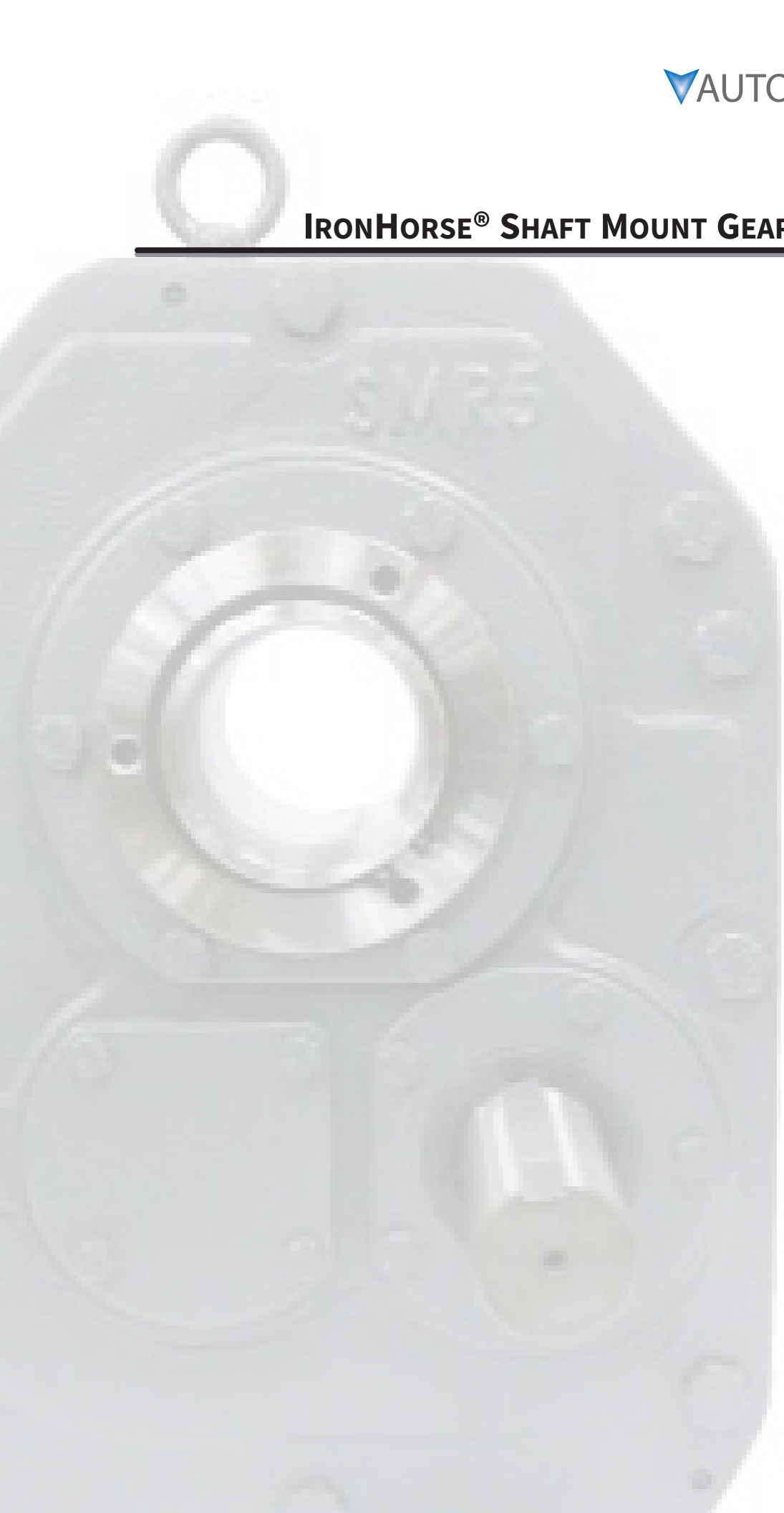
IronHorse® Shaft Mount Gearbox User Manual

IH-SMR_UMW



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IronHorse® Shaft Mount Gearbox User Manual

User Manual Revision History

Please include this Manual Number and the Manual Issue, both shown below, when communicating with AutomationDirect Technical Support regarding this publication.

Manual Number: IH-SMR_UMW
Manual Issue: First Edition, Revision A
Issue Date: 09/13/2019

Publication History		
Issue	***Date***	***Description of Changes***
First Edition	06/28/2017	Original Issue
1st Ed, Revision A	09/13/2019	Reformatted (to match other IronHorse Gearbox user manuals) Changed user manual name/number (previous name was IH-SG-UMW) Ch3: Added shaft bearing and seal information

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Getting Started

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Manual Overview

Overview of This Publication

The IronHorse® Shaft Mount Gearbox User Manual describes the installation, operation, and preventive maintenance of IronHorse Shaft Mount Gearboxes.

Who Should Read This Manual

This manual contains important information for people who will install, maintain, and/or operate any of the IronHorse Shaft Mount Gearboxes.

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CAUTION: When you see the "exclamation point" icon inside a yellow yield sign in the left-hand margin, the paragraph to its immediate right will be a caution. This information is provided to help the customer operate the equipment in a safe manner. The word "CAUTION" will mark the beginning of the text as in this example.

WARNING: When you see the "exclamation point" icon inside a red yield sign in the left-hand margin, the paragraph to its immediate right will be a warning. This information could prevent injury, loss of property, or even death (in extreme cases). Any warning in this manual should be regarded as critical information that should be read in its entirety. The word "WARNING" in boldface will mark the beginning of the text as in this example.

IronHorse® Shaft Mount Gearbox Introduction

Purpose of Shaft Mount Gearboxes

Gearboxes, also known as enclosed gear drives or speed reducers, are mechanical drive components that can control a load at a reduced fixed ratio of the motor speed. The output torque is also increased by the same ratio, while the horsepower remains the same (less efficiency losses.) For example, a 10:1 ratio gearbox outputs approximately the same motor output horsepower, motor speed divided by 10, and motor torque multiplied by 10.

IronHorse® Shaft Mount Gearboxes feature shafts and gears manufactured from the highest grade steel, case hardened and precision ground to AGMA standards for long lasting durability. Housings are 100% cast iron to provide industrial grade protection for the life of the unit. Shafts have reinforced double lip seals to protect against contamination and prevent oil from escaping. Premium ball and tapered roller bearings provide smooth operation and lower noise. Extended gear centers ensure tooth contact and provide consistent operation. Bore type is tapered with tapered bushing kits sold separately.

IronHorse® Shaft Mount Gearboxes are manufactured in an ISO9001 certified plant by one of the leading and most internationally acclaimed gearbox manufacturers in the world today. Only the highest quality materials are tested, certified, and used in the manufacturing process. Strict adherence to and compliance with the toughest international and U.S. testing standards and manufacturing procedures assure you the highest quality products.

Package Contents

After receiving the IronHorse® Shaft Gearbox, please check that you have a box of loose parts, which includes the following:

- *Torque arm with mounting brackets and hardware*
- *Brass vent plug*
- *Magnetic drain plug*

Part Number Explanation

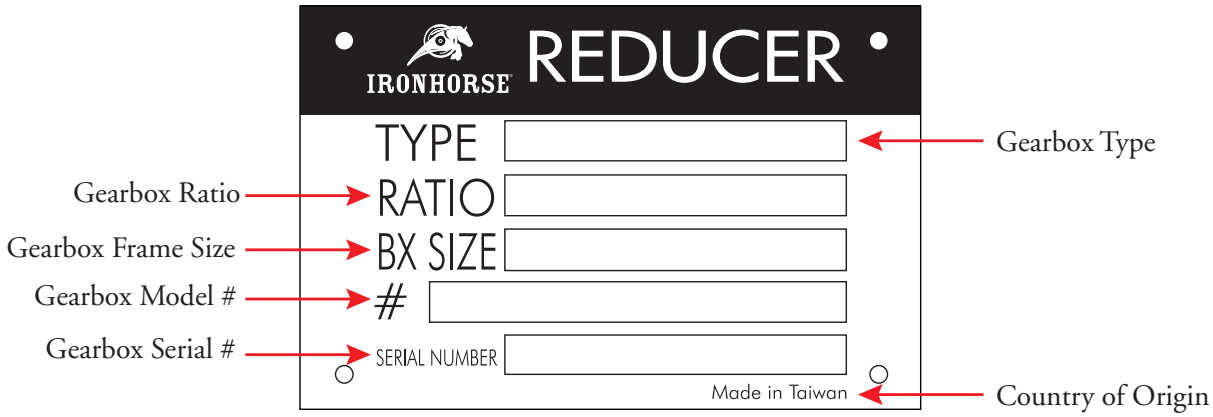
SMR 2 - 09

Ratio
Two digit input for output of 1
Example: 09 = 9:1 ratio

Frame Size
2: Size 2
3: Size 3
4: Size 4
5: Size 5

Gearbox Type Series Designation
SMR: Shaft Mount Reducer

Nameplate Information



Cast-Iron Shaft Mount Gearboxes

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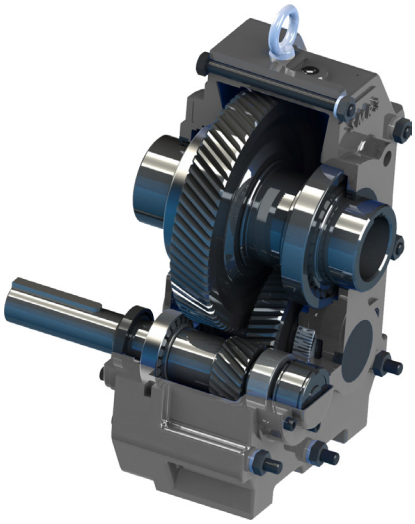
Gearbox Selection Factors

Classes of Service and Service Factors

The ratings for gear drives in this manual are based on a service factor of 1.00, for uniform load and uniform power source, up to 10 hours of operation per day. For other operating conditions, the application horsepower or torque must be multiplied by the appropriate service factor to determine the equivalent gear drive power rating. A gear drive should be selected with a rated capacity equal to or greater than the equivalent rating.



The American Gear Manufacturers Association (A.G.M.A.) bases its service factors on a uniform power source. If other power sources are used, the service factors must be converted using Table 2 below. Determine the required service factor with uniform power source. Locate that service factor in the first column and read straight across to obtain required service factor with multi-cylinder or single cylinder engines. Please refer to *page B–4* for an expanded list of classification numbers for specific industries.

- *Service factors do not need to be used with thermal ratings.*
- *Service Factor charts are for general guidelines in determining required service factors. Past experience may indicate that different service factors are required.*

Table 1 – Load Classification Numbers

Service Class	*Service Factor*	*Total Operation Per Day*		
		Up to 3 Hours	*3 to 10 Hours*	*Over 10 Hours*
I	1.0	Moderate Shock Load	Uniform Load	—
II	1.4	Heavy Shock Load	Moderate Shock Load	Uniform Load
III	2.0	—	Heavy Shock Load	Moderate Shock Load

Table 2 – Service Factor Conversion Based on Type of Power Source

Steam or Gas Turbine Hydraulic or Electric Motor	*Multi-Cylinder Engine*	*Single Cylinder Engine*
1.00	1.25	1.50
1.25	1.50	1.75
1.50	1.75	2.00
1.75	2.00	2.25
2.00	2.25	2.50
2.50	2.75	3.00
3.00	3.25	3.50

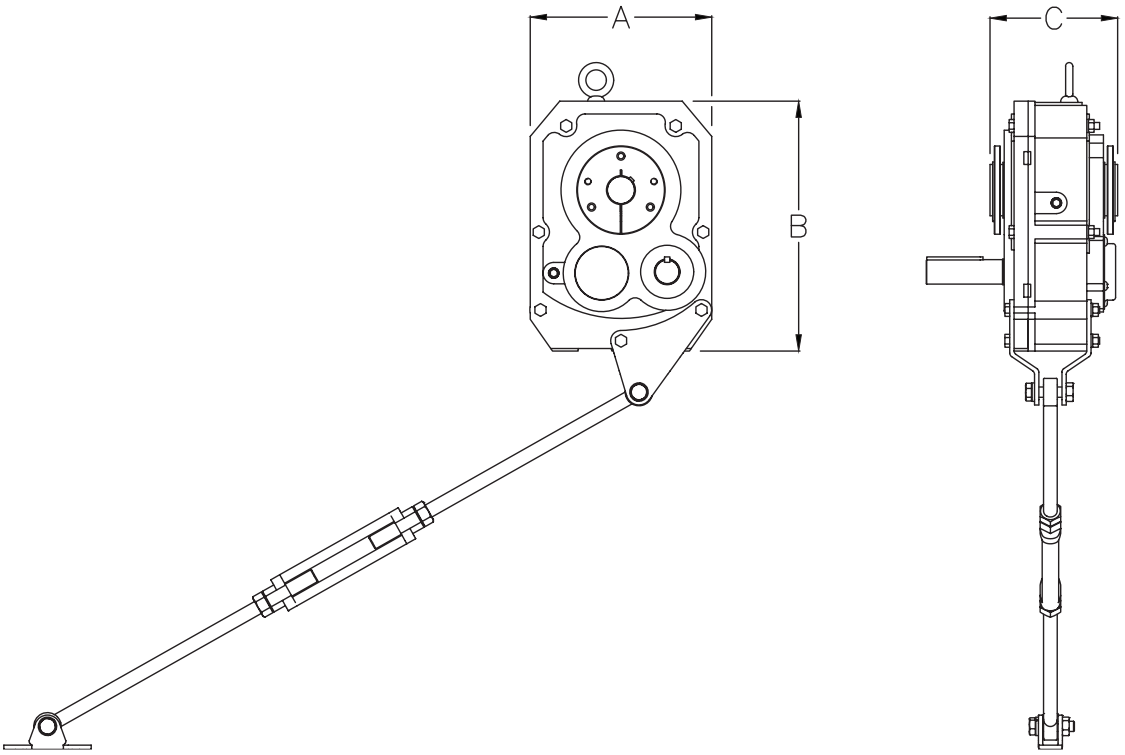
Output Shaft Overhung Load Ratings

Output Shaft Overhung Load Ratings												
Frame Size	Shaft Size	Overhung Load (lb) at Various RPMs										
		10	20	30	50	80	100	120	140	160	180	200
2	1-7/16"	2000	1510	1270	1010	840	820	720	720	710	710	700
	1-15/16"	1750	1320	1110	890	730	710	630	630	620	620	610
3	1-15/16"	5400	4250	3680	3050	2620	2440	2310	2210	2110	2040	1980
	2-3/16"	5240	4120	3570	2960	2540	2370	2240	2140	2050	1980	1920
4	2-3/16"	6520	5180	4510	3800	3230	3000	2830	2710	2600	2510	2430
	2-7/16"	6360	5060	4410	3710	3160	2930	2770	2640	2530	2450	2370
5	2-7/16"	7460	5860	5080	4280	3690	3450	3270	3110	2980	2880	2790
	2-15/16"	7060	5540	4800	4040	3490	3260	3090	2940	2820	2720	2640

Ratio to Speed

IronHorse® Cast-Iron Shaft Mount Gearbox Ratio/Speed Table						
Part Number	Nominal Ratio 9:1		Nominal Ratio 15:1		Nominal Ratio 25:1	
	Actual Ratio	Max Input Speed	Actual Ratio	Max Input Speed	Actual Ratio	Max Input Speed
SMR2-09	9.36	1872	14.04	1974	23.37	1994
SMR2-15						
SMR2-25						
SMR3-09	9.21	1842	14.87	2083	24.75	2100
SMR3-15						
SMR3-25						
SMR4-09	9.21	1842	15.13	2118	24.38	2072
SMR4-15						
SMR4-25						
SMR5-09	9.10	1820	15.4	1925	25.56	2044
SMR5-15						
SMR5-25						

Gearbox Dimensions



Dimensions						
Part Number	A		B		C	
	in	mm	in	mm	in	mm
SMR2-09	8.35	212.0	11.50	292.0	5.87	149.0
SMR2-15						
SMR2-25						
SMR3-09	9.25	235.0	12.99	330.0	7.58	192.5
SMR3-15						
SMR3-25						
SMR4-09	10.91	277.0	15.24	387.0	8.23	209.0
SMR4-15						
SMR4-25						
SMR5-09	13.15	334.0	18.23	463.0	8.78	223.0
SMR5-15						
SMR5-25						

Mechanical Ratings

IronHorse® Shaft Mount Gearbox Mechanical Ratings									
Model	Service Class I			Service Class II			Service Class III		
	Power (hp)	Output (RPM)	Output Torque (lb·in)	Power (hp)	Output (RPM)	Output Torque (lb·in)	Power (hp)	Output (RPM)	Output Torque (lb·in)
SMR2-09	7.5	78-105	5434-4037	5	78-110	3658-2594	3	58-110	2952-1556
	10	110-200	5188-2853	7.5	115-200	3722-2140	5	105-200	2717-1427
SMR2-15	2	16-24	7065-4710	1.5	18-24	4710-3532	1.5	26-34	3261-2493
	3	26-45	6521-3768	2	24-34	4710-3324	2	38-58	2975-1949
	5	46-74	6143-3819	3	38-70	4462-2422	3	58-100	2923-1695
	7.5	78-105	5434-4037	5	70-105	4037-2691	5	105-140	2691-2018
	10	105-140	5382-4037	7.5	110-140	3853-3028	—	—	—
SMR2-25	0.5	4-6	7065-4710	0.33	4-5	4663-3730	0.25	4-5	3532-2826
	0.75	6-8	7065-5298	0.5	6-8	4710-3532	0.33	6-8	3108-2331
	1	8-10	7065-5652	0.75	8-12	5298-3532	0.5	8-12	3532-2355
	1.5	12-16	7065-5298	1	12-16	4710-3532	0.75	12-16	3532-2649
	2	16-24	7065-4710	1.5	18-24	4710-3532	1	16-24	3532-2355
	3	26-45	6521-3768	2	24-34	4710-3324	1.5	26-34	3261-2493
	5	46-74	6143-3819	3	38-70	4462-2422	2	38-58	2975-1949
	7.5	78-85	5434-4987	5	70-85	4037-3324	3	58-85	2923-1995
SMR3-09	10	78-105	7246-5382	7.5	85-110	5035-3722	5	74-105	3856-2817
	15	110-140	7707-6055	10	110-150	5188-3804	7.5	110-140	3891-3057
	20	150-200	7609-5707	15	160-200	5350-4280	10	150-200	3804-2853
SMR3-15	3	28-30	6055-5652	2	16-24	7065-4710	2	24-38	4710-2975
	5	32-50	8831-5652	3	26-46	6521-3686	3	40-70	4239-2422
	7.5	52-74	8151-5728	5	50-74	5652-3819	5	74-105	3819-2691
	10	78-105	7246-5382	7.5	78-105	5434-4037	7.5	110-140	3853-3028
	15	110-140	7707-6055	10	100-140	5652-4037	—	—	—
SMR3-25	0.75	4-5	10597-8477	0.5	4-5	7065-5652	0.5	6-7	4710-4037
	1	6-7	9419-8074	0.75	6-7	7065-6055	0.75	8-10	5298-4239
	1.5	8-10	10597-8477	1	8-10	7065-5652	1	10-16	5652-3532
	2	12-16	9419-7065	1.5	12-16	7065-5298	1.5	18-24	4710-3532
	3	18-30	9419-5652	2	16-24	7065-4710	2	24-38	4710-2975
	5	32-50	8831-5652	3	26-46	6521-3686	3	40-70	4239-2422
	7.5	52-74	8151-5728	5	50-74	5652-3819	5	74-85	3819-3324
	10	78-85	7246-6649	7.5	78-85	5434-4987	—	—	—
SMR4-09	15	58-80	14616-10597	15	90-115	9511-7443	7.5	58-78	7379-5487
	20	80-110	14219-10276	20	120-140	9511-8152	10	80-115	7133-4962
	25	100-140	14129-10092	25	150-200	9511-7133	15	120-200	7133-4280
	30	120-200	14267-8560	—	—	—	—	—	—
SMR4-15	5	18-24	15699-11774	3	14-22	12111-7707	3	20-34	8477-4987
	7.5	26-34	16303-12467	5	24-34	11774-8311	5	38-54	7436-5233
	10	38-54	14873-10466	7.5	38-54	11154-7849	7.5	58-80	7308-5298
	15	58-80	14616-10597	10	54-80	10466-7065	10	80-140	765-4037
	20	80-110	14219-10276	15	85-115	9973-7372	—	—	—
	25	100-140	14129-10092	20	110-140	10276-8074	—	—	—

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IronHorse® Shaft Mount Gearbox Mechanical Ratings

Model	Service Class I			Service Class II			Service Class III		
	Power (hp)	Output (RPM)	Output Torque (lb·in)	Power (hp)	Output (RPM)	Output Torque (lb·in)	Power (hp)	Output (RPM)	Output Torque (lb·in)
SMR4-25	1	4-5	14129-11303	0.75	4-5	10597-8477	0.5	4-5	7065-5652
	1.5	5-7	16955-12111	1	5-6	11303-9419	0.75	5-6	8477-7065
	2	6-8	18839-14129	1.5	6-8	14129-10597	1	6-8	9419-7065
	3	10-14	16955-12111	2	10-12	11303-9419	1.5	10-12	8477-7065
	5	16-24	17551-11774	3	14-22	12111-7707	2	14-18	8074-6280
	7.5	26-34	16303-12467	5	24-34	11774-8311	3	20-34	8477-4987
	10	38-54	14873-10466	7.5	38-54	11154-7849	5	38-54	7436-5233
	15	58-80	14616-10597	10	54-85	10466-6649	7.5	58-85	7308-4987
	20	80-85	14129-13298	—	—	—	—	—	—
SMR5-09	25	70-95	20184-14873	20	85-115	13427-9925	15	85-115	10071-7443
	30	85-115	19947-14743	25	105-125	13587-11413	20	115-200	7443-4280
	40	110-200	20752-11413	30	125-200	13696-8560	—	—	—
SMR5-15	7.5	22-24	19267-17661	7.5	24-34	17661-12467	5	24-34	11774-8311
	10	24-34	23548-16622	10	38-54	14873-10466	7.5	38-52	11154-8151
	15	38-54	22309-15699	15	58-80	14616-10597	10	54-80	10466-7065
	20	54-78	20932-14491	20	78-110	11491-10276	15	85-110	9973-7707
	25	70-95	20184-14873	25	100-125	14129-11303	20	110-125	10276-9043
	30	85-115	19947-14743	—	—	—	—	—	—
	40	110-125	20551-18085	—	—	—	—	—	—
SMR5-25	2	4-5	28258-22606	1.5	4-5	21194-16955	1	4-5	14129-11303
	3	6-8	28258-21194	2	5-6	22606-18839	1.5	6-7	14129-12111
	5	10-14	28258-20184	3	8-14	21194-12111	2	8-12	14129-9419
	7.5	16-24	26492-17661	5	16-24	17661-11774	3	14-22	12111-7707
	10	24-34	23548-16622	7.5	24-34	17661-12467	5	24-34	11774-8311
	15	38-54	22309-15699	10	38-54	14873-10466	7.5	38-52	11154-8151
	20	54-78	20932-14491	15	58-80	14616-10597	10	54-78	10466-7246
	25	70-80	20184-17661	20	78-80	14491-14129	—	—	—

Installation, Maintenance, and Lubrication

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IronHorse® Shaft Mount Gearbox Installation

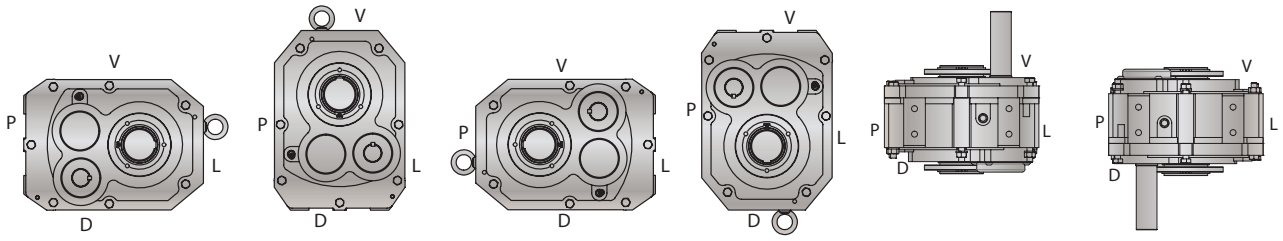
NOTE: Satisfactory performance depends on proper installation, lubrication and maintenance. Therefore, it is important that the instructions in this manual are followed carefully.

Installation Instructions

1) Use eyebolts or lifting lugs to lift reducer.
2) Determine the running positions of the reducer (see *Figure 1*). *Note*: The reducer is supplied with four plugs around the sides and one on each face for vertical installations. These plugs must be arranged relative to the horizontal running positions as follows: the bottom one is the magnetic drain plug (D). Install the brass vent plug (V) in the topmost hole. Of the three remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug (L). The running position of the reducer is not limited to the six positions shown in Figure 1. However, if running position is over 20 degrees from the position shown in sketches (B) or (D) or over 5 degrees from the position shown in sketches (A) or (C), then the oil in level plug cannot be used safely to check the oil level, unless during the checking, the torque arm is disconnected and the reducer is swung to within 20 degrees for position (B) and (D) or 5 degrees for position (A) or (C).

Figure 1 – Mounting Positions

Horizontal Applications ***Vertical Applications***



A-Position ***B-Position*** ***C-Position*** ***D-Position*** ***E-Position*** ***F-Position***

V=Vent, D=Drain, L=Level, P=Plug

NOTE: Below 15RPM output speed, oil level must be adjusted to reach the highest oil level plug (P).

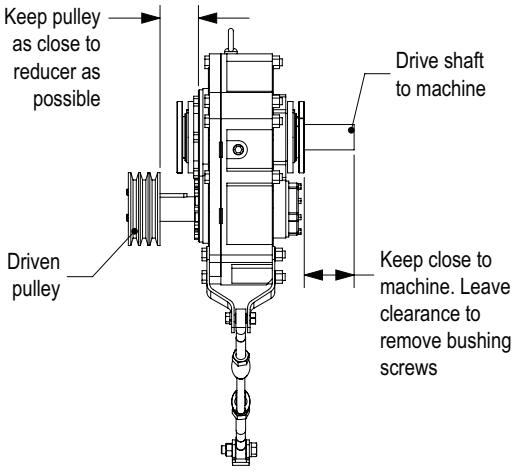
Because of the many possible positions of the reducer, it may be necessary or desirable to make special adaptations using the lubrication filling holes furnished along with other standard pipe fittings, stand pipes and oil level gauges as required.

3) Mount reducer on drive shaft as follows:

WARNING: To ensure that the motor connected to the gearbox is not unexpectedly started, turn off and lock out or tag the power source before proceeding. Remove all external loads from drive before removing or servicing reducer or accessories. Failure to observe these precautions could result in bodily injury.

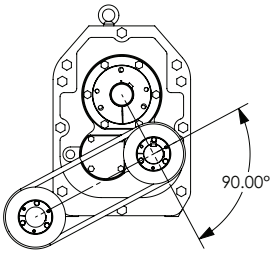
4) Install pulley on gearbox input shaft as close to the reducer as possible and mount reducer on driven shaft as close to bearing as practical (maintain minimum distance to remove tapered bushing screw) (see *Figure 2*). Failure to do this will cause excess loads on the input shaft bearings and output bearings and could cause premature failure.

Figure 2



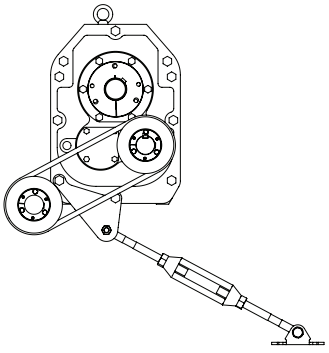
5) Install motor and wedge belt drive with the belt pulley at approximately 90° to the centerline between driven and input shafts (see *Figure 3*). This will allow tensioning of the v-belt drive with the torque arm which should preferably be in tension. If output hub runs counterclockwise, torque arm should be positioned to the right (see *Figure 4*).

Figure 3



- *Belt drive may be located in any convenient position. If the torque arm is to be used to tighten the belts, the drive should be at about 90 degrees to the line between the input and output shafts.*
- *Belt drive may be located to the right if desired.*

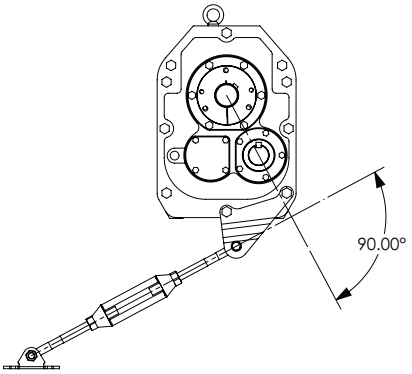
Figure 4



- *If the output hub rotates clock-wise, relocate the belt drive and torque arm in opposite direction to that shown in the illustration.*

6) Install the torque arm fulcrum on a rigid support so that the torque arm will be at approximately 90° to the centerline through the driven shaft and the torque arm case bolt (see Figure 5). If output hub rotates clockwise, belt drive and torque arm in opposite direction to that shown in the illustration.

Figure 5



- *Torque arm and belt may vary up to a take-up.*
- *Torque arm may be mounted to the right if desired.*
- *The angle shown should be a right angle, but may vary up to a maximum of 30 degrees either way.*

CAUTION: ALL IRONHORSE® SHAFT MOUNT REDUCERS ARE SHIPPED WITHOUT OIL. EVERY IRONHORSE SHAFT MOUNT REDUCER MUST BE FILLED WITH A RECOMMENDED GEAR OIL. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT. FAILURE TO LUBRICATE THE SHAFT MOUNT REDUCER WILL VOID THE MANUFACTURER'S WARRANTY.

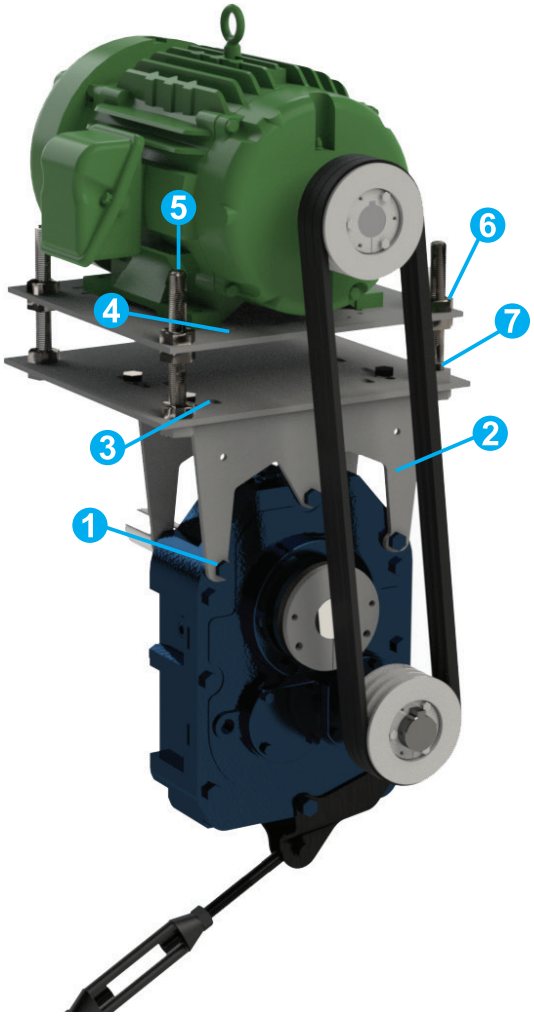
CAUTION: FAILURE TO INSTALL THE VENT PLUG MAY RESULT IN GEARBOX OVERHEATING AND WILL PREMATURELY CAUSE THE OIL SEALS TO LEAK. FAILURE TO INSTALL THE VENT PLUG IN THE SHAFT MOUNT REDUCER WILL VOID THE MANUFACTURER'S WARRANTY.

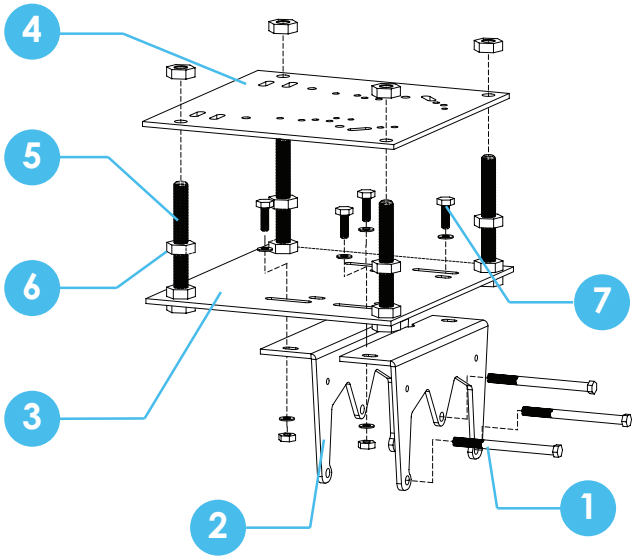
Motor Mount Installation

WARNING: To ensure that the drive is not unexpectedly started, turn off and lock out or tag the power source before proceeding. Remove all external loads from drive before removing or servicing the gearbox or accessories. Failure to observe these precautions could result in bodily injury.

Note: Refer to photo (below) for positions of all parts before installation

1) Remove the two or three bolts required for mounting the motor mount from the reducer housing. Install the front and rear supports (2) using the new reducer bolts (1) supplied with the motor mount. Make sure support flanges face output side of reducer. Tighten bolts securely.
2) Mount bottom plate (3) on supports with bolts supplied. Insert bolts (7) from top through slotted holes. Add flat washer, lock washer, and nut. Hand tighten.
3) Thread two nuts (6) on each threaded stud (5) leaving approximately 1" of stud protruding at one end. Insert threaded stud with 1" of threads through corner holed of bottom plate. Thread a hex nut (6) on the studs and tighten securely.
4) Slide top plate (4) over the threaded stud, making sure the center handling hole is positioned opposite input side of reducer. Thread a hex nut (6) on the studs and tighten securely.
5) Locate the proper position for the motor and bolt it to the top plate. Tighten bolts securely.
6) Install motor sheave and reducer sheave as close to motor and reducer housings as possible. Accurately align the motor and reducer sheave by sliding bottom plate in relation to supports. Tighten bolts (7) securely.
7) Install V-belts and tension belts by alternately adjusting nut (6) on the threaded studs (jackscrews). Make certain that all bolts are securely tightened, the V- belt drive is properly aligned and an appropriate belt guard is installed before operating the drive.





Gearbox Lubrication and Mounting Orientations

Lubricant selection is important to all gearboxes. An oil with special characteristics and a relatively high viscosity is required due to sliding action between the gear teeth where they mesh. Aside from improper gearbox selection, inadequate lubrication is the greatest factor contributing to premature gearbox failures. Improper lubrication also causes reduced gearbox performance.

Lubrication Instructions

IronHorse® Shaft Mount Gearboxes are *shipped without oil*. *Oil must be added* depending upon your mounting orientation, as shown on the following page.

Since many oils are not suitable for shaft mount gearboxes, it is very important to use the proper lubricant type. It is also very important to keep the oil free from oxidation and contamination by water or debris. For longer service life, the gearbox should be periodically drained (preferably while warm) and refilled to the proper level with a recommended gear oil. Non-synthetic oils should be changed every 6 months or 250 hours of operation under normal operating conditions. However, synthetic lubricants have increased resistance to thermal and oxidation degradation, and do not need to be changed as frequently.

For Best Results

1) Fill with recommended gear oil and operate for two weeks.
2) Drain after two weeks and flush with light oil.
3) Wipe any metal shavings from the magnetic drain plug and re-install.
4) Refill with recommended gear oil and continue.
5) Repeat every 2,500 hours to maximize unit life.

CAUTION: Every IronHorse® shaft mount reducer must be filled with a recommended gear oil. Failure to observe these precautions could result in damage or destruction of the equipment.

CAUTION: Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. More frequent oil changes are recommended when operating continuously, at high temperatures or under conditions of extreme dirt or dust.

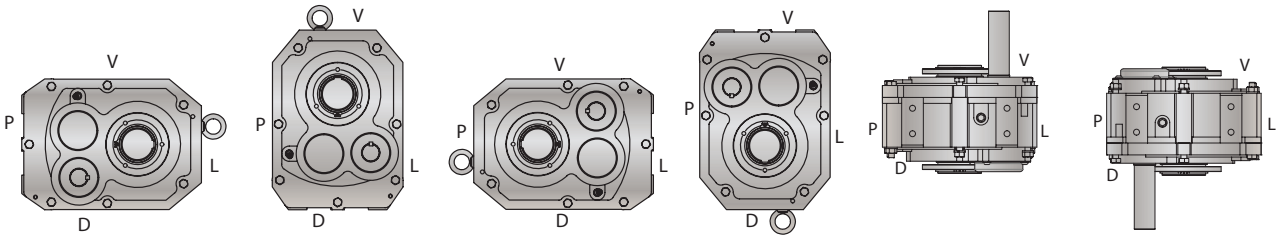
Lubrication Schedule

Lubrication Schedule				
Model Number	**15° to 60°F (-9° to 16°C)**		**50° to 125°F (10° to 50°C)**	
Mobil™	**Mobil SHC 629**	**Mobil SHC 630**	**Mobil SHC 630**	**Mobil SHC 632**
AGMA Rating	**4**	**5**	**5**	**6**
ISO Grade	**150**	**220**	**220**	**320**
SMR2-xx	N/A	1-140 RPM	N/A	1-140 RPM
SMR3-xx	N/A	1-140 RPM	N/A	1-140 RPM
SMR4-xx	126-140 RPM	1-125 RPM	126-140 RPM	1-125 RPM
SMR5-xx	101-125 RPM	1-100 RPM	101-125 RPM	1-100 RPM

Mounting Orientations

Figure 1 – Mounting Positions

Horizontal Applications ***Vertical Applications***



A-Position ***B-Position*** ***C-Position*** ***D-Position*** ***E-Position*** ***F-Position***

V=Vent, D=Drain, L=Level, P=Plug

Lubricant Capacities

WARNING: Too much oil will cause over heating, and too little oil will result in gear failure. Check oil level regularly. More frequent oil changes are recommended when operating continuously at high temperatures, or under conditions of extreme dirt or dust.

Approximate Oil Capacity – Quarts [Liters]						
Position	***A***	***B***	***C***	***D***	***E***	***F***
SMR2-xx	0.81 [0.77]	0.70 [0.66]	0.70 [0.66]	0.81 [0.77]	1.05 [0.99]	1.16 [1.10]
SMR3-xx	1.36 [1.29]	1.59 [1.50]	1.59 [1.50]	1.36 [1.29]	1.46 [1.38]	2.31 [2.19]
SMR4-xx	1.39 [1.32]	1.63 [1.54]	1.63 [1.54]	2.09 [1.98]	1.63 [1.54]	3.72 [3.52]
SMR5-xx	2.32 [2.20]	3.49 [3.30]	3.49 [3.30]	2.43 [2.30]	3.49 [3.30]	4.42 [4.18]

Bearing Sizes

IronHorse® Shaft Mount Gearbox Bearing Sizes						
Gearbox Model	***Input Shaft***		***Intermediate Shaft***		***Output Hub***	
	Input Side	***Output Side***	***Input Side***	***Output Side***	***Input Side***	***Output Side***
SMR2-xx	6206	6305	6305	6305	6013	6013
SMR3-xx	32007	33205	30305	30305	32015	32015
SMR4-xx	32208	30306	32206	32206	32017	32017
SMR5-xx	32210	30308	32208	32208	32019	32019
Note: "Input Side" refers to the side of the gearbox with the input shaft.						

Seal Sizes

IronHorse® Shaft Mount Gearbox Oil Seal Sizes		
Gearbox Model	***Input Shaft Seal (1 required) Size [mm]***	***Output Shaft Seal (2 required) Size [mm]***
SMR2-xx	62 x 30 x 8	90 x 65 x 10 & 100 x 65 x 10
SMR3-xx	52 x 35 x 8	90 x 75 x 10
SMR4-xx	62 x 38 x 7	100 x 85 x 9
SMR5-xx	75 x 50 x 12	125 x 95 x 12

Guidelines for Long Term Storage

During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service. By taking special precautions, problems such as seal leakage and reducer failure due to lack of lubrication, improper lubrication quality, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage.

Preparation

1) Drain the oil from the unit. Add a vapor phase corrosion inhibiting oil in accordance with followed table:

Quantities of Vapor Phase Oil				
Frame Size	***2***	***3***	***4***	***5***
Liters	0.1	0.1	0.2	0.3

2) Seal the unit airtight. Replace the air vent plug with a standard pipe plug and wire the vent to the unit.
3) Cover the shaft extension with a waxy rust preventative compound that will keep oxygen away from the bare metal.
4) The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside or cover the unit with a durable waterproof cover which can keep moisture away.
5) Protect reducer from dust, moisture, and other contaminants by storing the unit in a dry area.
6) In damp environments, the reducer should be packed inside a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

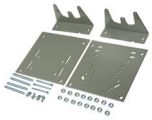
When Placing the Reducer into Service

1) Assemble the vent plug into the proper hole.
2) Clean the shaft extensions with petroleum solvents.
3) Fill the unit to the proper oil level using a recommended lubricant. (See *page 3–6* for lubrication instructions) The vapor phase corrosion inhibiting oil will not affect the new lubricant.
4) Follow the installation instructions provided in this manual.

Chapter 4: Accessories

Table of Contents

Accessories Selection

IronHorse® Shaft Mount Gearbox Accessories				
Part Number	***Description***	***Fits Frame Size***	***Includes***	***Typical Photo***
SMR2-TBK-20	1-1/4″ tapered bushing kit	2	Fastening bolts and a full length shaft key	
SMR2-TBK-23	1-7/16″ tapered bushing kit			
SMR2-TBK-24	1-1/2″ tapered bushing kit			
SMR2-TBK-31	1-15/16″ tapered bushing kit			
SMR3-TBK-27	1-11/16″ tapered bushing kit	3		
SMR3-TBK-31	1-15/16″ tapered bushing kit			
SMR3-TBK-32	2″ tapered bushing kit			
SMR3-TBK-35	2-3/16″ tapered bushing kit			
SMR4-TBK-31	1-15/16″ tapered bushing kit	4		
SMR4-TBK-32	2″ tapered bushing kit			
SMR4-TBK-35	2-3/16″ tapered bushing kit			
SMR4-TBK-39	2-7/16″ tapered bushing kit			
SMR5-TBK-35	2-3/16″ tapered bushing kit	5		
SMR5-TBK-39	2-7/16″ tapered bushing kit			
SMR5-TBK-40	2-1/2″ tapered bushing kit			
SMR5-TBK-47	2-15/16″ tapered bushing kit			
SMR2-CF	Screw conveyor flange	2	Mounting Hardware	
SMR3-CF	Screw conveyor flange	3		
SMR4-CF	Screw conveyor flange	4		
SMR5-CF	Screw conveyor flange	5		
SMR2-CDS-24	1-1/2″ screw conveyor drive shaft	2	Mounting Hardware	
SMR2-CDS-32	2″ screw conveyor drive shaft			
SMR2-CDS-39	2-7/16″ screw conveyor drive shaft			
SMR2-CDS-48	3″ screw conveyor drive shaft			
SMR3-CDS-24	1-1/2″ screw conveyor drive shaft	3		
SMR3-CDS-32	2″ screw conveyor drive shaft			
SMR3-CDS-39	2-7/16″ screw conveyor drive shaft			
SMR3-CDS-48	3″ screw conveyor drive shaft			
SMR4-CDS-24	1-1/2″ screw conveyor drive shaft	4		
SMR4-CDS-32	2″ screw conveyor drive shaft			
SMR4-CDS-39	2-7/16″ screw conveyor drive shaft			
SMR4-CDS-48	3″ screw conveyor drive shaft			
SMR5-CDS-32	2″ screw conveyor drive shaft	5		
SMR5-CDS-39	2-7/16″ screw conveyor drive shaft			
SMR5-CDS-48	3″ screw conveyor drive shaft			
SMR5-CDS-55	3-7/16″ screw conveyor drive shaft			
SMR2-BG	Belt guard	2	–	
SMR3-BG	Belt guard	3		
SMR4-BG	Belt guard	4		
SMR5-BG	Belt guard	5		
SMR2-MM	Motor mount	2	Mounting hardware	
SMR3-MM	Motor mount	3		
SMR4-MM	Motor mount	4		
SMR5-MM	Motor mount	5		
SMR2-TARM	Torque arm	2	Mounting hardware	
SMR3-TARM	Torque arm	3		
SMR4-TARM	Torque arm	4		
SMR5-TARM	Torque arm	5		
SMR2-BSK	Backstop assembly	2	–	
SMR3-BSK	Backstop assembly	3		
SMR4-BSK	Backstop assembly	4		
SMR5-BSK	Backstop assembly	5		

Backstop Installation

Backstop Installation Warnings

WARNING: Failure to install a backstop assembly correctly can result in injury to personnel and/or destruction of the backstop assembly, the speed reducer, and other property. Read all backstop installation instructions completely before installing a backstop assembly.

WARNING TO ELECTRICIANS: Before powering up equipment that contains a shaft mount reducer containing an installed backstop assembly, disconnect the V-belts from the motor sheave and confirm the rotation direction of the motor. Applying power to the motor in a reverse direction against the free wheel direction of the backstop assembly will destroy the backstop assembly and possibly destroy the shaft mount reducer as well. Failure to comply with this instruction will void the manufacturer's warranty of the speed reducer and the backstop assembly and may result in injury to personnel or property.

WARNING: Use only IronHorse® backstop assemblies in the SMR series shaft mount reducers. Do not use any other brand or style of backstop assemblies in these speed reducers. Using other brands or styles of backstop assemblies may result in backstop assembly failure and may result in injury to personnel or property. Using another manufacturer or style of backstop assembly in the SMR series shaft mount reducer will void the manufacturer's warranty of the speed reducer and the backstop assembly.

CAUTION: To avoid premature failure of the backstop or possible machine malfunction, installation of the backstop should be carried out by suitably qualified personnel and according to the following instructions:

Backstop Description

In applications where it is possible for the load to drive the gearbox in reverse when the motor is off (such as an inclined conveyor belt), a backstop should be installed to prevent the gearbox from turning in reverse.

1) The main components of **SMRx-BSK** units are: Outer race, a number of energized sprags and side plate.
2) The maximum permissible overrunning speed must not be exceeded.
3) When used in dual drive applications, the maximum driving speed must not be exceeded.
4) Backstops (cam clutches) are shaft mounted, so the shaft on which the clutch is mounted must be hardened to HRC 56-60 and 1.5 mm [0.06 in] case depth after grinding. Grind to 1.5S (16 micro-inch) finish.
   The taper of this shaft should not exceed 0.01 mm per 50mm [1.97 in].

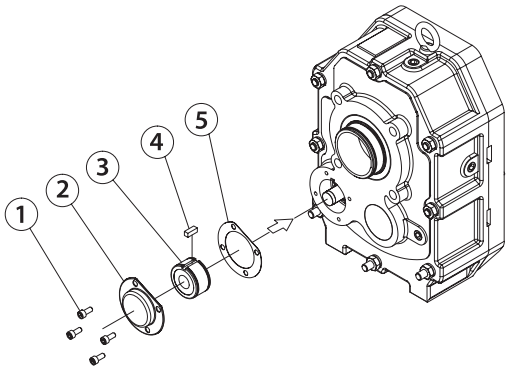
Prior to Installation

1) The units should be unpacked and installed in a clean dry working environment.
2) For units dispatched 'dry,' corrosion inhibitor should be removed using flushing oil prior to installation.
3) The mounting register for the outer race should be within the housing bore (0 to +0.03 mm) tolerance. Details for each type are shown in the dimensions tables.
4) The freewheeling direction should be checked prior to installation (*see Backstop Assembly Type and Rotation Illustrations on the next page*).
5) If reversal of the freewheeling direction is required, turn the backstop through 180 degrees.

Backstop Installation

1) The backstop (clutch) should be installed as an assembly.
2) The key should be the full length of the hub.
3) *Warning*: Drain off the oil before opening the backstop mounting compartment.
4) Refer to the illustration below for appropriate reducer size installation components.

1. Bolts
2. End cover
3. Backstop
4. Key
5. Gasket



5) Remove end cover and gasket from gearbox.
6) Determine the desired shaft rotation. IronHorse® backstops don't have an inner race. The rotation arrow is marked on the outer race, meaning the outer race's free direction; the shaft direction is opposite in other words.
7) The backstop should be mounted on the shaft by rotating it in the direction marked by the arrow shown on the backstop race. Do not apply shock to the backstop by hammering. The backstop may be tapped gently if necessary with a soft hammer (rawhide, not lead hammer).
8) Re-install the end cover and gasket.
9) Refill the gearbox with oil taking note of proper oil fill level based on gearbox mounting position.

After Installation

1) After installation, ensure smooth rotation of the units in the freewheeling direction by manually turning the input shaft of the reducer to confirm the desired direction of rotation.
2) Ensure the unit contains the correct volume of the lubricant prior to use.
3) The expected drag torque produced when freewheeling is about 1/1000 of the nominal torque.

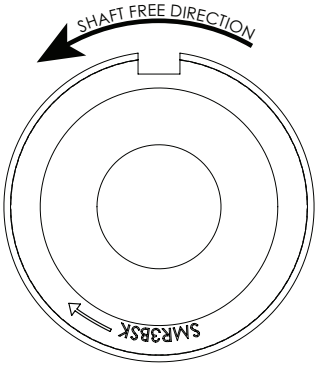
Dismantling

1) To dismantle the units, please follow the Installation section in reverse sequence.

Lubrication and Maintenance of the Backstop Assembly

1) Type **SMRx-BSK** backstops are factory lubricated with oil.
2) Operating temperature ranges from -4°F to +158° (-20°C to +70°C).
3) The backstop can operate without maintenance.
4) In harsh conditions (i.e. high temperature / dusty conditions), the backstop should be re-lubricated every 3 to 6 months.
5) Do not use slip additives such as graphite, Molykote or similar agents in the oil and grease, as they will shorten service life of the clutches.

Backstop Assembly Type and Rotation Guidelines

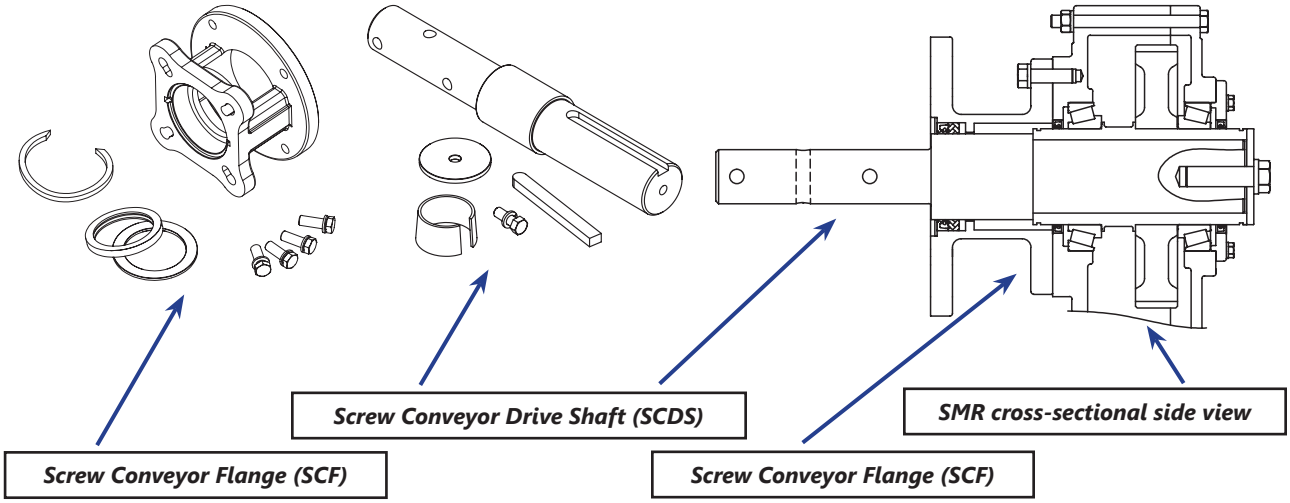


Type 1:
Backstop with outer race, the rotation arrow is marked on the outer race; shaft free direction is opposite.

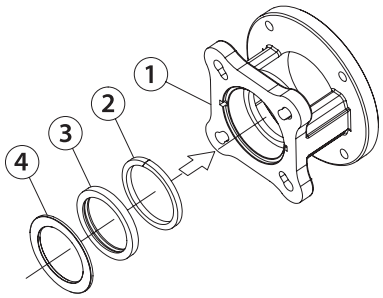
Backstop Tolerances – mm								
Model	*Housing*	*Tolerance*	*Input Shaft Ø*	*Tolerance*	*Backstop*			
					Inner Ø	*Tolerance*	*Outer Ø*	*Tolerance*
SMR2-BSK	ϕ62	+0.06 to +0.03	24.65	0 to -0.013	24.65	–	62	0 to -0.019
SMR3-BSK	ϕ47	+0.05 to +0.03	18.8	0 to -0.013	18.796	–	47	0 to -0.016
SMR4-BSK	ϕ62	+0.06 to +0.03	22.57	0 to -0.013	22.57	–	62	0 to -0.019
SMR5-BSK	ϕ80	+0.06 to +0.03	30.8	0 to -0.016	30.862	–	80	0 to -0.019
— Inner configuration with a spring, no tolerance								

Maximum Overrunning Speed		
Model	*Frame Size*	*Max Overruning Speed*
SMR2-BSK	2	1260 rpm
SMR3-BSK	3	1370 rpm
SMR4-BSK	4	1310 rpm
SMR5-BSK	5	1130 rpm

Screw Conveyor Drive Components



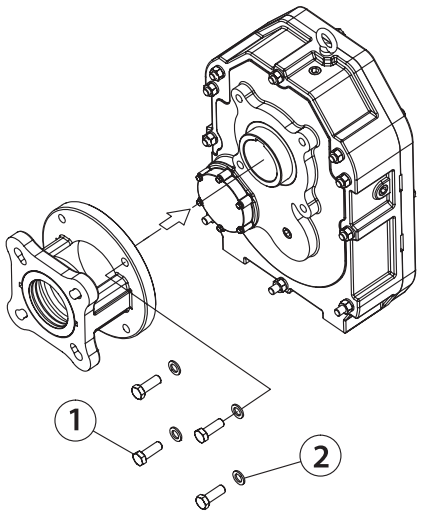
Screw Conveyor Accessories Assembly



Step 1: Adapter Assembly

1) Adapter
2) Gland Seal
3) Oil Seal
4) Seal Retainer

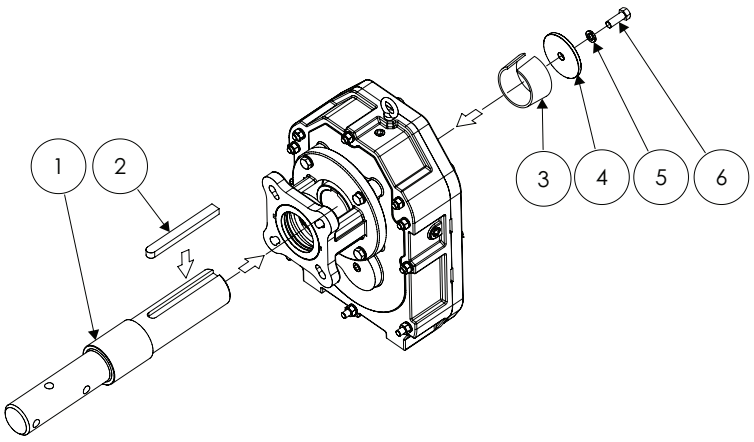
Please follow the sequence of gland seal, oil seal, and seal retainer to complete the adapter assembly.



Step 2: Reducer Assembly

1) Adapter Bolt
2) Spring Washer

Please place adapter bolts through the spring washers; then fasten the adapter kit onto the reducer.



Step 3: Drive Shaft Assembly

1) Drive Shaft
2) Drive Shaft Key
3) Bushing (sleeve)
4) Shaft Retainer
5) Spring Washer
6) Bolt

A) Insert the key onto the shaft.
B) Place the shaft through the reducer.
C) Place the bushing into the hollow shaft.
D) Place the spring washer through the bolt and shaft retainer then fasten it on to the drive shaft.

Screw Conveyor Flange Adapters

Figure 1

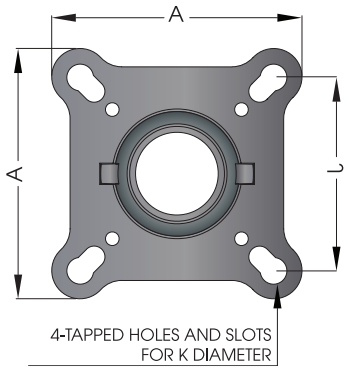
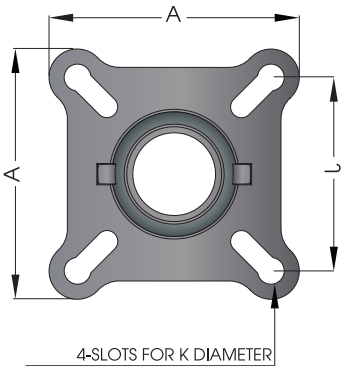
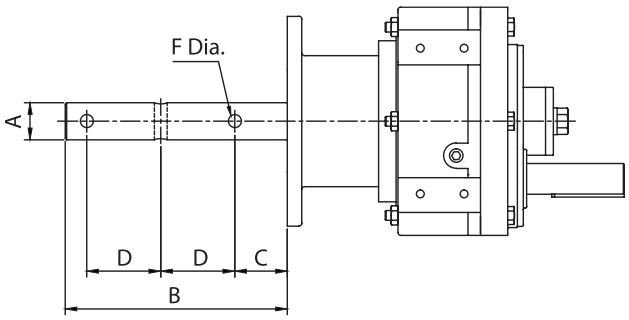


Figure 2



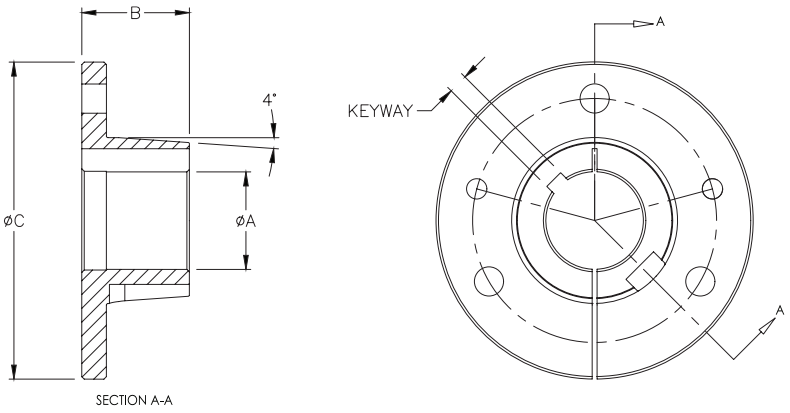
Dimensions – Inches						
Model	***Frame Size***	***Drive Shaft (Ø)***	***J***	***K***	***A***	***Figure***
SMR2-xx	2	1-1/2	4	1/2 - 13UNC	7.75	1
		2	5-1/8	5/8		
		2-7/16	5-5/8	5/8		
		3	6	3/4		
SMR3-xx	3	1-1/2	4	1/2-13UNC	8.50	
		2	5-1/8	5/8		
		2-7/16	5-5/8	5/8		
		3	6	3/4		
SMR4-xx	4	1-1/2	4	1-/2-13UNC	9.26	
		2	5-1/8	5/8		
		2-7/16	5-5/8	5/8		
		3	6	3/4		
		3-7/16	6-3/4	3/4		
SMR5-xx	5	2	5-1/8	5/8	9.26	2
		2-7/16	5-5/8	5/8		
		3	6	3/4		
		3-7/16	6-3/4	3/4		
See our website www.AutomationDirect.com for complete Engineering drawings.						

Screw Conveyor Drive Shafts



Dimensions – Inches						
Model	***Frame Size***	***Drive Shaft A (Ø)***	***B***	***C***	***D***	***F (Ø)***
SMR2-CDS-xx	2	1-1/2	9.00	2.13	3.00	0.52
		2	9.00	2.13	3.00	0.64
		2-7/16	9.69	2.75	3.00	0.64
		3	9.88	2.88	3.00	0.77
SMR3-CDS-xx	3	1-1/2	9.00	2.13	3.00	0.52
		2	9.00	2.13	3.00	0.64
		2-7/16	9.69	2.75	3.00	0.64
		3	9.88	2.88	3.00	0.77
SMR4-CDS-xx	4	1-1/2	9.00	2.13	3.00	0.52
		2	9.00	2.13	3.00	0.64
		2-7/16	9.69	2.75	3.00	0.64
		3	9.88	2.88	3.00	0.77
		3-7/16	14.13	3.88	4.00	0.89
SMR5-CDS-xx	5	2	9.00	2.13	3.00	0.64
		2-7/16	9.69	2.75	3.00	0.64
		3	9.88	2.88	3.00	0.77
		3-7/16	14.13	3.88	4.00	0.89
See our website www.AutomationDirect.com for complete Engineering drawings.						

Bushing Kits



Bushings Dimensions							
Part Number	Fits Gearbox Part Number	A (Bore)		B (Oal)		C (Flange)	
		in	mm	in	mm	in	mm
SMR2-TBK-20	SMR2-xx	1.25	31.75	1.38	35.0	4.06	103.2
SMR2-TBK-23		1.4375	36.51	1.38	35.0	4.06	103.2
SMR2-TBK-24		1.5	38.10	1.38	35.0	4.06	103.2
SMR2-TBK-31		1.9375	49.21	1.38	35.0	4.06	103.2
SMR3-TBK-27	SMR3-xx	1.6875	42.86	1.63	41.5	4.37	111.1
SMR3-TBK-31		1.9375	49.21	1.63	41.5	4.37	111.1
SMR3-TBK-32		2.0	50.80	1.63	41.5	4.37	111.1
SMR3-TBK-35		2.1875	55.56	1.63	41.5	4.37	111.1
SMR4-TBK-31	SMR4-xx	1.9375	49.21	2.13	54.0	4.81	122.2
SMR4-TBK-32		2.0	50.80	2.13	54.0	4.81	122.2
SMR4-TBK-35		2.1875	55.56	2.13	54.0	4.81	122.2
SMR4-TBK-39		2.4375	61.91	2.13	54.0	4.81	122.2
SMR5-TBK-35	SMR5-xx	2.1875	55.56	2.07	52.5	5.63	142.9
SMR5-TBK-39		2.4375	61.91	2.07	52.5	5.63	142.9
SMR5-TBK-40		2.5	63.50	2.07	52.5	5.63	142.9
SMR5-TBK-47		2.9375	74.61	2.07	52.5	5.63	142.9
See our website www.AutomationDirect.com for complete Engineering drawings.							

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Glossary of Terms

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Glossary of Terms

Axial Movement

Often called "endplay." The endwise movement of motor or gear shafts. Usually expressed in thousandths of an inch.

Back Driving

Driving the output shaft of a gearbox to increase speed rather than reduce speed. Shaft Mount gearboxes are not suitable for service to increase speed.

Backlash

Rotational movement of the output shaft clockwise and counter clockwise, while holding the input shaft stationary. Usually expressed in thousandths of an inch and measured at a specific radius at the output shaft.

Backstop

In applications where it is possible for the load to drive the gearbox in reverse when the motor is off (such as an inclined conveyor belt), a backstop should be installed to prevent the gearbox from turning in reverse.

Center Distance

A basic measurement or size reference for worm gearboxes. The distance between the centerlines of the input and output shafts.

Efficiency

A ratio of the input power compared to the output power, usually expressed as a percentage.

Flanged Reducer

Usually used to refer to a gearbox having provisions for close coupling of a motor either via a hollow (quill) shaft or flexible coupling. Most often a NEMA C-face motor is used.

Gearbox

Also called a Speed Reducer. An enclosed set of gears used in mechanical power transmission to reduce speed and increase torque.

Input Power

The power applied to the input shaft of a gearbox. There are separate ratings for Mechanical Input Power, Thermal Input Power, and Nominal Motor Horsepower.

K Factor

Also called an Overhung Load Factor. A constant used to modify the overhung load rating of a gearbox based on the type of load applied on the shaft. Use the K factor either to increase the calculated overhung load, or to reduce the gearbox overhung load rating.

Mechanical Ratings

The maximum power or torque a gearbox can transmit based on the strength and durability of its components. Some applications require the gearbox Mechanical Ratings to be reduced by a Service Factor.

Mounting Position

The relationship of the input and output shafts of a gearbox relative to horizontal.

Nominal Motor Horsepower

The highest horsepower 1800 rpm motor that can be used with the gearbox under 1.0 service factor conditions. This rating decreases as the motor speed decreases, and as the service factor increases.

Output Horsepower

The amount of horsepower available at the output shaft of a gearbox. Output horsepower is always less than the input horsepower due to the efficiency of the gearbox.

Overhung Load

A force applied at right angles to a shaft beyond its outermost bearing. This shaft-bending load must be supported by the bearing. Overhung load ratings are listed for each gearbox size, and should not be exceeded. Some applications require the gearbox Overhung Load rating to be reduced by a K Factor and/or a Service Factor.

Overhung Load Factor

K Factor.

Prime Mover

In industry, the prime mover is most often an electric motor. Occasionally engines, hydraulic or air motors are used. Special considerations are called for when other than an electric motor is the prime mover.

Self-Locking

The inability of a reducer to be driven backwards by its load. *No IronHorse gearbox should be considered self-locking*.

Service Class

The American Gear Manufacturers Association (AGMA) standard 6009 lists many applications by a service class (I, II, III) with class I being the simplest applications and class III being the most complex. These applications are directly associated with specific service factor ranges (refer to the Service Factor table on *page 2–2*).

Service Factor (for gearbox)

A constant used to modify the Mechanical Rating of a gearbox based on the duration of service and characteristics of the driven load. Use the Service Factor either as a multiplier to increase the calculated loads, or as a divisor to reduce the gearbox Mechanical and Overhung Load ratings (refer to the Service Factor table on *page 2–2*).

Service Factor (for motors)

Refers to a motor's ability to handle a load greater than the motor's rated horsepower on a continuous basis.

Speed Reducer

Gearbox.

Thermal Ratings

The power or torque a gearbox can transmit continuously. These ratings are based upon the cast-iron gearbox's ability to dissipate the heat caused by friction. (Not applicable for aluminum-frame gearboxes, due to their inherently better ability to dissipate heat.)

Thrust Load

Forces along the axis of the output shaft, usually encountered in vertical-drive applications.

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Gearbox Selection

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Shaft Mount Gearbox Selection Procedure

Follow the procedure below to select Screw Conveyor Shaft Mount Reducers (SMR) up to 40 horsepower and/or output speeds to 200 RPM, using AGMA recommended application numbers as generally described herein.

How to Select

1) **Determine Class of Service** (See "Classes of Service and Service Factors" on *page 2–2*)
To determine Load Classification for applications under normal conditions, find the type application and duty cycle that most closely matches your specific application. For a detailed list of applications and classifications numbers, see "A.G.M.A. Load Classification Numbers" on *page B–4*.

   Class I: Steady load not exceeding Motor HP rating and light shock loads during 10 hours a day. Moderate shock loads are allowable if operation is intermittent.

   Class II: Steady load not exceeding Motor HP rating for over 10 hours a day. Moderate shock loads are allowable during 10 hours a day.

   Class III: Moderate shock loads for over 10 hours a day. Heavy shock loads are allowable during 10 hours a day.

2) **Determine Reducer Size** (See "Mechanical Ratings" on *page 2–5*)
To choose the correct size SMR gearbox find the Service Class Column that accurately represents the severity of the application, and then finding the correct gearbox output speed will denote the SMR reducer case size and ratio.

3) **Select the corresponding Screw Conveyor Flange and correct Screw Conveyor Shaft Diameter** (See "Accessories Selection" on *page 4–2*)
It is necessary to select a SMR gearbox that not only matches the proper HP and Class of Service, but must also clearly accommodate the CEMA***** trough-end. Select the 3-Hole Screw Conveyor Shaft that's compatible with the schedule pipe diameter of the screw conveyor.
*****_Conveyor Equipment Manufacturer Association_

4) **Select the proper V-belt Drive Arrangement**
All SMR reducers utilizing a Motor Mount require a V-belt and Sheave combination that in conjunction with the Motor (HP & RPM) and gearbox ratio, provide the desired output speed to the driven shaft. In addition to selecting the proper sheave ratio, care must be taken in selecting the correct V-Belt cross-section and number of belts to insure an adequate Service Factor (SF). In many instances, those that specify the V-belt & pulley sizes try to pick a system that prevents nuisance failures, yet still is the Weak Link; as V-belt drives are far less expensive and quicker to replace than damaged gearboxes. If needed, please consult AutomationDirect Tech Support for proper V-belt drive selection.

5) **Select additional Accessories** (See "Accessories Selection" on *page 4–2*)
In the accessories section of the catalog a selection of Motor Mounts, Belt Guards, Bushing Kits, and Backstop clutches can be found. The part numbers are easily selected, as they share nomenclature in common with the corresponding SMR case size. Backstops are a one-way clutch that prevent the driven load of an incline or vertical load from back-driving due to gravity. Always use the same brand of backstop as the manufacturer of the SMR gearbox.

Example of SMR Gearbox Selection Procedure

A 10hp 1750rpm motor is used to drive a uniformly loaded screw conveyor moving sand at 100rpm, operating 8 hours per day. The screw conveyor pipe diameter is 2-$^{7}/_{16}$". Select the required gearbox and accessories.

1) **Determine Class of Service**
   From Table 1 on *page 2–2* locate proper Class of Service; Uniformly loaded load operating less than 10 hours per day is classified as Class I.

2) **Determine Reducer Size**
   From the table on *page 2–5* locate the correct SMR case size and ratio in accordance with Class I Service. The correct SMR selection is a SMR3-15.

3) **Select the appropriate Screw Conveyor Flange and Shaft for this SMR Gearbox**
   From the table on *page 4–2* in the accessories section we would select a Screw Conveyor Flange – Part# SMR3-CF and a 2-$^{7}/_{16}$"; Screw Conveyor Shaft – Part# SMR3-CDS-39

4) **Select correct V-belt Drive Arrangement**
   Using our 10hp, 1750rpm motor we can divide the motor RPM by out output speed of 100 RPM and conclude we require an overall reduction of 17.5:1. Since our gearbox has an actual ratio of 14.87:1 (*page 2–3*) our required V-belt drive is a 1.18:1 ratio. Your V-belt drive should be sized to handle the applied HP, and provide sufficient headroom (Service Factor) to prevent nuisance belt failures.

5) **Select additional Accessories**
   From the table on *page 4–2*, pick the appropriate accessories for a SMR3-15 as indicated.
   For example:
   Motor Mount: SMR3-MM
   Belt Guard: SMR3-BG

A.G.M.A. Load Classification Numbers

Shaft Mount Reducers with Uniform Power Source

A.G.M.A. Class Numbers for Shaft Mount Reducers			
Application	***Service Hours per Day***		
	Up to 3	***3 to 10***	***Over 10***
Agitators (mixers)			
Pure liquids	I	I	II
Liquids and solids	I	II	II
Liquids – variable density	I	II	II
Blowers			
Centrifugal	I	I	II
Lobe	I	II	II
Vane	I	II	II
Brewing and distilling			
Bottling machinery	I	I	II
Brew kettles – continuous duty	II	II	II
Cookers – continuous duty	II	II	II
Mash tubs – continuous duty	II	II	II
Scale hopper – frequent starts	II	II	II
Can filling machines	I	I	II
Car dumpers	I	III	III
Car pullers	I	II	II
Clarifiers	I	I	II
Classifiers	I	II	II
Clay working machinery			
Brick press	II	III	III
Briquette machine	II	III	III
Pug mill	I	II	II
Compactors	III	III	III
Compressors			
Centrifugal	I	I	II
Lobe	I	II	II
Reciprocating, multi-cylinder	II	II	III
Reciprocating, single-cylinder	III	III	III

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Cranes 1)			
Dry dock			
Main hoist	2.50	2.50	2.50
Auxiliary hoist	2.50	2.50	3.00
Boom hoist	2.50	2.50	3.00
Slewing drive	2.50	2.50	3.00
Traction drive	3.00	3.00	3.00
Container			
Main hoist	3.00	3.00	3.00
Boom hoist	2.00	2.00	2.00
Trolley drive – Gantry drive	3.00	3.00	3.00
Trolley drive – Traction drive	2.00	2.00	2.00
Mill duty			
Main hoist	3.50	3.50	3.50
Auxiliary	3.50	3.50	3.50
Bridge	2.50	3.00	3.00
Trolley travel	2.50	3.00	3.00
Industrial duty			
Main	2.50	2.50	3.00
Auxiliary	2.50	2.50	3.00
Bridge	2.50	3.00	3.00
Trolley travel	2.50	3.00	3.00
Crushers			
Stone or ore	III	III	III
Dredges			
Cable reels	II	II	II
Conveyors	II	II	II
Cutter head drives	III	III	III
Pumps	III	III	III
Screen drives	III	III	III
Stackers	II	II	II
Winches	II	II	II
Elevators			
Bucket	I	II	II
Centrifugal discharge	I	I	II
Escalators	I	I	II
Freight	I	II	II
Gravity discharge	I	I	II

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Extruders			
General	II	II	II
Plastics – Variable speed drive	III	III	III
Plastics – Fixed speed drive	III	III	III
Rubber – Continuous screw operation	III	III	III
Rubber – Intermittent screw operation	III	III	III
Fans			
Centrifugal	I	I	II
Cooling towers	III	III	III
Forced draft	II	II	II
Induced draft	II	II	II
Industrial & mine	II	II	II
Feeders			
Apron	I	II	II
Belt	I	II	II
Disc	I	I	II
Reciprocating	II	III	III
Screw	I	II	II
Food industry			
Cereal cooker	I	I	II
Dough mixer	II	II	II
Meat grinders	II	II	II
Slicers	I	II	II
Generators and exciters	II	II	II
Hammer mills	III	III	III
Hoists			
Heavy duty	III	III	III
Medium duty	II	II	II
Skip hoist	II	II	II
Laundry			
Tumblers	II	II	II
Washers	II	II	III

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Lumber industry			
Barkers – spindle feed	II	II	II
Main drive	III	III	III
Conveyors – burner			
Main or heavy duty	II	II	II
Main log	III	III	III
Re-saw, merry-go-round	II	II	II
Conveyors			
Slab	III	III	III
Transfer	II	II	II
Chains			
Floor	II	II	II
Green	II	II	III
Cut-off saws			
Chain	II	II	III
Drag	II	II	III
Debarking drums	III	III	III
Feeds			
Edger	II	II	II
Gang	III	III	III
Trimmer	II	II	II
Log deck	III	III	III
Log hauls – incline – well type	III	III	III
Log turning devices	III	III	III
Planer feed	II	II	II
Planer tilting hoists	II	II	II
Rolls – live-off bearing – roll cases	III	III	III
Sorting table	II	II	II
Tipple hoist	II	II	II
Transfers			
Chain	II	II	III
Craneway	II	II	III
Tray drives	II	II	II
Veneer lathe drives	II	II	II

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Metal mills			
Draw bench carriage and main drive	II	II	II
Runout table			
Non-reversing – Group drives	II	II	II
Non-reversing – Individual drives	III	III	III
Reversing	III	III	III
Slab pushers	II	II	II
Shears	III	III	III
Wire drawing	II	II	II
Wire winding machine	II	II	II
Metal strip processing machinery			
Bridles	II	II	II
Coilers & uncoilers	I	I	II
Edge trimmers	I	II	II
Flatteners	II	II	II
Loopers (accumulators)	I	I	I
Pinch rolls	II	II	II
Scrap choppers	II	II	II
Shears	III	III	III
Slitters	I	II	II
Mills, rotary type			
Spur ring gear	III	III	III
Helical ring gear	II	II	II
Direct connected	III	III	III
Cement kilns	II	II	II
Dryers & coolers	II	II	II
Mixers			
Concrete	II	II	II

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Paper mills			
Agitator (mixer)	II	II	II
Agitator for pure liquors	II	II	II
Barking drums	III	III	III
Barkers – mechanical	III	III	III
Beater	II	II	II
Breaker stack	II	II	II
Calender	II	II	II
Chipper	III	III	III
Chip feeder	II	II	II
Coating rolls	II	II	II
Conveyors			
Chip, bark, chemical	II	II	II
Log (including slab)	III	III	III
Couch rolls	II	II	II
Cutter	III	III	III
Cylinder molds	II	II	II
Dryers 2)			
Paper machine	II	II	II
Conveyor type	II	II	II
Embosser	II	II	II
Extruder	II	II	II
Fourdrinier rolls (includes lump breaker, dandy roll, wire turning, & return rolls)	II	II	II
Jordan	II	II	II
Kiln drive	II	II	II
Mt. Hope roll	II	II	II
Paper rolls	II	II	II
Platter	II	II	II
Presses – felt & suction	II	II	II
Pulper	III	III	III
Pumps – vacuum	II	II	II
Reel (surface type)	II	II	II
Screens			
Chip	II	II	II
Rotary	II	II	II
Vibrating	III	III	III
Size press	II	II	II
Super calender 3)	II	II	II
Thickener (AC motor)	II	II	II
Thickener (DC motor)	II	II	II
Washer (AC motor)	II	II	II
Washer (DC motor)	II	II	II
Wind and unwind stand	I	I	I

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Paper mills (continued)			
Winders (surface type)	II	II	II
Yankee dryers 2)	II	II	II
Plastics industry			
Primary processing			
Batch mixers	III	III	III
Continuous mixers	II	II	II
Batch drop mill – 2 smooth rolls	II	II	II
Continuous feed, holding & blend mill	II	II	II
Calenders	II	II	II
Secondary processing			
Blow molders	II	II	II
Coating	II	II	II
Film	II	II	II
Pipe	II	II	II
Pre-plasticizers	II	II	II
Rods	II	II	II
Sheet	II	II	II
Tubing	II	II	II
Pullers – barge haul	II	II	II
Pumps			
Centrifugal	I	I	II
Proportioning	II	II	II
Reciprocating			
Single acting, 3 or more cylinders	II	II	II
Double acting, 2 or more cylinders	II	II	II
Rotary			
Gear type	I	I	II
Lobe	I	I	II
Vane	I	I	II
Rubber industry			
Intensive internal mixers			
Batch mixers	III	III	III
Continuous mixers	II	II	II
Mixing mill – 2 smooth rolls	II	II	II
Mixing mill – 1 or 2 corrugated rolls	III	III	III
Batch drop mill – 2 smooth rolls	II	II	II
Cracker warmer – 2 rolls; 1 corrugated roll	III	III	III
Cracker – 2 corrugated rolls	III	III	III
Holding, feed & blend mill – 2 rolls	II	II	II
Refiner – 2 rolls	II	II	II
Calenders	II	II	II
Sand muller	II	II	II

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

(table continued next page)

A.G.M.A. Class Numbers for Shaft Mount Reducers (table continued from previous page)			
Application	**Service Hours per Day**		
	Up to 3	**3 to 10**	**Over 10**
Sewage disposal equipment			
Bar screens	II	II	II
Chemical feeders	II	II	II
Dewatering screens	II	II	II
Scum breakers	II	II	II
Slow or rapid mixers	II	II	II
Sludge collectors	II	II	II
Thickeners	II	II	II
Vacuum filters	II	II	II
Screens			
Air washing	I	I	II
Rotary – stone or gravel	II	II	II
Traveling water intake	I	I	I
Screw conveyors			
Uniformly loaded or fed	I	I	II
Heavy duty	I	II	II
Sugar industry			
Beet slicer	III	III	III
Cane knives	II	II	II
Crushers	II	II	II
Mills (low speed end)	III	III	III
Textile industry			
Batchers	II	II	II
Calenders	II	II	II
Cards	II	II	II
Dry cans	II	II	II
Dryers	II	II	II
Dyeing machinery	II	II	II
Looms	II	II	II
Mangles	II	II	II
Nappers	II	II	II
Pads	II	II	II
Slashers	II	II	II
Soapers	II	II	II
Spinners	II	II	II
Tenter frames	II	II	II
Washers	II	II	II
Winders	II	II	II

1) Crane drives are to be selected based on gear tooth bending strength, using the numeric service factors in this table. Service factor in durability shall be a minimum of 1.00.
2) Anti-friction bearings only.
3) A class number of I may be applied at base speed of a super calender operating over-speed range or part range constant horsepower, part range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A class number of II is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

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