



**Browning**<sup>®</sup>

## HB and HSB Bevel and Spiral Bevel

1. Rugged cast iron housings, line bored for precise gear and bearing alignment.
2. Commercially available tapered roller and ball bearings provide maximum catalog load capacity.
3. Carburized alloy steel straight or spiral gears manufactured to AGMA standard for long life and quiet operation.
4. Double lip contact oil seals ride on hardened plunge ground shafts.



- 6 Sizes
- Spiral bevel and straight bevel gears
- Ratios 1:1 to 3:1 with speed up ratios available
- Torque ratings from 99 to 5,942 in.-lbs.

Bevel Red.  
Cast Iron

## Selection and Ordering Information

### Overload Service Factors

Load and operating characteristics of both driver and driven units must be considered thoroughly when selecting Browning Bevel Gear Boxes. It is essential that all gear boxes be selected for maximum load conditions to be encountered. Browning Bevel Gear Boxes will safely transmit momentary starting loads as great as 200% of the mechanical input ratings.

First determine the load classification of the driven unit from the table on page 455. Then from the table below, select an overload service factor for this classification, for duration of service to be involved and for the type of prime mover to be used.

Prime Mover	Duration of Service	Driven Machine Load Classification		
		U Uniform	M Moderate Shock	H Heavy Shock
Electric Motor	Occasional - 1/2 hour per day	0.50	0.80	1.25
	Intermittent - 3 hours per day	0.80	1.00	1.50
	Up to 10 hours per day	1.00	1.25	1.75
	24 hours per day	1.25	1.50	2.00
Multi-Cylinder Internal Combustion Engine	Occasional - 1/2 hour per day	0.80	1.00	1.50
	Intermittent - 3 hours per day	1.00	1.25	1.75
	Up to 10 hours per day	1.25	1.50	2.00
	24 hours per day	1.50	1.75	2.25
Single Cylinder Internal Combustion Engine	Occasional - 1/2 hour per day	1.00	1.25	1.75
	Intermittent - 3 hours per day	1.25	1.50	2.00
	Up to 10 hours per day	1.50	1.75	2.25
	24 hours per day	1.75	2.00	2.50

### Overhung Loads

When a gear box is driven by any belt, chain, or gear drive, or when the gear box drives a driven unit through a belt, chain or gear drive, overhung loads must not exceed those shown in the tables on pages 456 - 459. Use the following formula to calculate the overhung load.

$$OL = \frac{2TK}{D}$$

Where:

- OL = Overhung Load (pounds)
- T = Actual Shaft Torque (Inch-Pounds)
- D = P.D. of Sprocket, Sheave, Pulley or Gear
- K = 1.0 for Chain Drives
- 1.25 for Gear Drives
- 1.25 for Gearbelt Drives
- 1.50 for V-Belt Drives

No overhung loads are encountered when the gear box is coupling connected to the driver and/or driven machine. However, care should be taken in aligning the shafts to avoid pre-loading bearings by misalignment.

### Selection Example

A right angle gear box is needed for a line shaft driving processing machinery which requires 1330 inch-pounds torque and will operate about 10 hours per day. This line shaft will be coupling connected at a right angle to an existing line shaft which is driven by an 1150 rpm electric motor. Existing line shaft is 1 7/16" diameter and the new line shaft is 1 3/16" diameter.

#### 1. Determine the Load Classification of the driven unit.

From page 455, the load class for a line shaft driving processing machinery is "M".

#### 2. Determine the Overload Service Factor.

From the table on this page, the service factor for a moderate shock (M) load driven by an electric motor 10 hours per day is 1.25.

#### 3. Determine the Normal Torque (or the Normal hp).

Multiply the required torque by the service factor:

$$1330 \times 1.25 = 1662.5 \text{ Normal Torque}$$

#### 4. Select the Gear Box.

From page 457 under the 1150 RPM column, select a gear box which has a mechanical rating of 1663, or slightly greater, which in this case is 1759 and the gear box is 12HSB1-LR10. Check to see that the thermal rating (1671) exceeds the transmitted load (1330).

#### 5. Select the Couplings Required.

Note: If a chain drive or the other drive has been specified for either or both input or output shafts, the overhung loads would have to be checked from the formula above and from the table on page 457.

#### 6. List Components

- 1, 12HSB1-LR10 Spiral Bevel Gear Box

Caution: Install guards according to applicable local and national codes for rotating shafts.



## Load Classifications - Typical Applications

Application	Load Class	Application	Load Class	Application	Load Class
AGITATORS		EXTRUDERS (Plastic)-Continued		PAPER MILLS-Continued	
Pure Liquids	U	Pipe	U	Calendars-Super	H
Liquids and Solids	M	Tubing	U	Converting Machine, Except Cutters, Platers	M
Liquids - Variable Density	M	Blow Molders	M	Conveyors	U
BLOWERS		Pre-plasticizers	M	Couch	M
Centrifugal	U	FANS		Cutters-Platers	H
Lobe	M	Centrifugal	U	Cylinders	M
Vane	U	Cooling Towers-Induced Draft	★	Dryers	M
BREWING AND DISTILLING		Forced Draft	U*	Felt Stretchers	M
Bottling Machinery	U	Induced Draft	U	Felt Whippers	H
Brew Kettles, Continuous Duty	U	Large (Mine, etc.)	M	Jordons	H
Cookers, Continuous Duty	U	Large (Industrial)	M	Log Haul	H
Mash Tubs, Continuous Duty	U	Light (Small Diameter)	U	Presses	U
Scale Hopper, Frequent Starts	M	FEEDERS		Pulp Machine Reel	M
CAN FILLING MACHINES	U	Apron	M	Stock Chests	M
CANE KNIVES	M*	Belt	M	Suction Roll	U
CAR DUMPERS	H	Disc	U	Washers and Thickeners	M
CAR PULLERS	M	Reciprocating	H	Winders	U
CLARIFIERS	U	Screw	M	PRINTING PRESSES	
CLASSIFIERS	M	FOOD INDUSTRY		PULLERS	
CLAY WORKING MACHINERY		Beet Slicers	M	Barge Haul	H
Brick Press	H	Cereal Cookers	U	PUMPS	
Briquette Machine	H	Dough Mixers	M	Centrifugal	U
Clay Working Machinery	M	Meat Grinders	M	Proportioning	M
Pub Mill	M	GENERATORS - (Not Welding)	U	Reciprocating	
COMPRESSORS		HAMMER MILLS	H	Single Acting, 3 or more cylinders	M
Centrifugal	U	HOISTS		Double Acting, 2 or more cylinders	M
Lobe	M	Heavy Duty	H	Single Acting, 1 or 2 cylinders	★
Reciprocating, Multi-Cylinder	M	Medium Duty	M	Double Acting, Single cylinder	★
Reciprocating, Single Cylinder	H	Skip Hoist	M	Rotary-Gear Type	U
CONVEYORS-UNIFORMLY LOADED OR FED		LAUNDRY WASHERS		-Lobe, Vane	U
Apron	U	Reversing	M	RUBBER AND PLASTIC INDUSTRIES	
Assembly	U	LAUNDRY TUMBLERS	M	Crackers	H*
Belt	U	LINE SHAFTS		Laboratory Equipment	M
Bucket	U	Driving Processing Equipment	M	Mixing Mills	H*
Chain	U	Light	U	Refiners	M*
Flight	U	Other Line Shafts	U	Rubber Calenders	M*
Oven	U	LUMBER INDUSTRY (See Table 3, Page 5)		Rubber Mill (2 on line)	M*
Screw	U	MACHINE TOOLS		Rubber Mill (3 on line)	U*
CONVEYORS-HEAVY DUTY NOT UNIFORMLY FED		Bending Roll	M	Sheeter	M*
Apron	M	Punch Press-Gear Driven	H	Tire Building Machines	★
Assembly	M	Notching Press-Belt Driven	★	Tire and Tube Press Openers	★
Belt	M	Plate Planers	H	Tubers and Strainers	M*
Bucket	M	Tapping Machine	H	Warming Mills	M*
Chain	M	Other Machine Tools		SAND MULLER	M
Flight	M	Main Drives	M	SEWAGE DISPOSAL EQUIPMENT	
Live Roll	★	Auxiliary Drives	U	Bar Screens	U
Oven	M	METAL MILLS		Chemical Feeders	U
Reciprocating	H	Draw Bench Carriage and Main Drive	M	Collectors	U
Screw	M	Pinch, Dryer and Scrubber Rolls, Reversing	★	Dewatering Screens	M
Shaker	H	Slitters	M	Scum Breakers	M
CRANES		Table Conveyors		Slow or Rapid Mixers	M
Main Hoists	U	Non-Reversing		Thickeners	M
Bridge	★	Group Drives	M	Vacuum Filters	M
Trolley Travel	★	Individual Drives	H	SCREENS	
CRUSHER		Reversing	★	Air Washing	U
Ore	H	Wire Drawing and Flattening Machines	M	Rotary-Stone and Gravel	U
Stone	H	Wire Winding Machines	M	Traveling Water Intake	U
Sugar	M*	MILLS, ROTARY TYPE		SLAB PUSHERS	M
DREDGES		Ball	M*	STEERING GEAR	★
Cable Reels	M	Cement Kilns	M*	STOKERS	U
Conveyors	M	Dryers and Coolers	M*	SUGAR INDUSTRY	
Cutter Head Drives	H	Kilns	M	Cane Knives	M*
Jig Drives	H	Pebble	M*	Crushers	M*
Maneuvering Winches	M	Rod, Plain and Wedge Bar	M*	Mills	H*
Pumps	M	Tumbling Barrels	H	TEXTILE INDUSTRY	
Screen Drive	H	MIXERS		Batchers	M
Stackers	M	Concrete, Continuous	M	Calenders	M
Utility Winches	M	Concrete, Intermittent	M	Cards	M
ELEVATORS		Constant Density	U	Dry Cans	M
Bucket-Uniform Load	U	Variable Density	M	Dryers	M
Bucket-Heavy Load	M	OIL INDUSTRY		Dyeing Machinery	M
Bucket-Continuous	U	Chillers	M	Knitting Machines	★
Centrifugal Discharge	U	Oil Well Pumping	★	Looms	M
Escalators	U	Paraffin Filter Presses	M	Mangles	M
Freight	M	Rotary Kilns	M	Nappers	M
Gravity Discharge	U	PAPER MILLS		Range Drives	★
Man Lifts	★	Agitators (Mixers)	M	Slashers	M
Passenger	★	Barker-Auxiliaries-Hydraulic	M	Soapers	M
EXTRUDERS (Plastic)		Barker-Mechanical	M	Spinners	M
Film	U	Barking Drum	H	Tenter Frames	M
Sheet	U	Beater and Pulper	M	Washers	M
Coating	U	Bleacher	U	Winders	M
Rods	U	Calenders	M	WINDLASS	★

\* Select Service Factor for 24 hours service only.

★ Refer to Application Engineering (1 800 626 2093).

Determine Load Class from the table above. Determine Service Factor from the table on page 454.

## Speed, Horsepower, Torque and Overhung Loads

Part No.	Ratio	Gearing	Rating	Revolutions per Minute — Input Shaft**						
				1750	1150	850	690	400	300	100
3HSB1-LR10 3HSB1-SN10 3HSB1-SF10	1:1	Spiral	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	2.74	2.10	1.72	1.50	1.04	.79	.27
			Thermal Horsepower	2.74	2.10	1.72	1.50	1.04	.79	.27
			Mechanical Output Torque (In.-Lbs.)	99	115	127	137	163	166	170
			Thermal Output Torque (In.-Lbs.)	99	115	127	137	163	166	170
			Maximum Input Overhung Load (Lbs.)	100	100	100	100	101	129	166
Maximum Output Overhung Load (Lbs.)	153	153	153	153	153	153	153			
3HB1-LR10 3HB1-SN10 3HB1-SF10	1:1	Straight	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	2.48	1.65	1.24	1.05	.73	.55	.18
			Thermal Horsepower	2.48	1.65	1.24	1.05	.73	.55	.18
			Mechanical Output Torque (In.-Lbs.)	89	90	92	96	116	116	116
			Thermal Output Torque (In.-Lbs.)	89	90	92	96	116	116	116
			Maximum Input Overhung Load (Lbs.)	81	100	113	120	130	149	166
Maximum Output Overhung Load (Lbs.)	153	153	153	153	153	153	153			
3HB1-LR15 3HB1-SN15 3HB1-SF15	1.5:1	Straight	Output Speed (RPM)	1166	766	566	460	266	200	66
			Mechanical Horsepower	1.73	1.13	.88	.72	.54	.41	.14
			Thermal Horsepower	1.73	1.13	.88	.72	.54	.41	.14
			Mechanical Output Torque (In.-Lbs.)	93	93	98	99	128	128	128
			Thermal Output Torque (In.-Lbs.)	93	93	98	99	128	128	128
			Maximum Input Overhung Load (Lbs.)	74	92	101	110	113	130	158
Maximum Output Overhung Load (Lbs.)	153	153	153	153	153	153	153			
3HB1-LR20 3HB1-SN20 3HB1-SF20	2:1	Straight	Output Speed (RPM)	875	575	425	345	200	150	50
			Mechanical Horsepower	1.30	.86	.63	.51	.30	.22	.075
			Thermal Horsepower	1.30	.86	.63	.51	.30	.22	.075
			Mechanical Output Torque (In.-Lbs.)	94	94	94	94	94	94	94
			Thermal Output Torque (In.-Lbs.)	94	94	94	94	94	94	94
			Maximum Input Overhung Load (Lbs.)	77	94	108	118	144	157	158
Maximum Output Overhung Load (Lbs.)	153	153	153	153	153	153	153			
6HSB1-LR10 6HSB1-SN10 6HSB1-SF10	1:1	Spiral	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	20.3	13.7	10.4	8.52	5.08	3.85	1.33
			Thermal Horsepower	13.9*	13.7	10.4	8.52	5.08	3.85	1.33
			Mechanical Output Torque (In.-Lbs.)	731	750	771	778	800	808	838
			Thermal Output Torque (In.-Lbs.)	500	750	771	778	800	808	838
			Maximum Input Overhung Load (Lbs.)	152	152	235	308	516	580	580
Maximum Output Overhung Load (Lbs.)	500	508	508	508	508	508	508			
6HB1-LR10 6HB1-SN10 6HB1-SF10	1:1	Straight	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	21.8	14.3	10.6	8.58	4.98	3.73	1.24
			Thermal Horsepower	15.2*	14.3	10.6	8.58	4.98	3.73	1.24
			Mechanical Output Torque (In.-Lbs.)	784	784	784	784	784	784	784
			Thermal Output Torque (In.-Lbs.)	547*	784	784	784	784	784	784
			Maximum Input Overhung Load (Lbs.)	549	559	559	559	559	559	559
Maximum Output Overhung Load (Lbs.)	536	536	536	536	536	536	536			
6HB1-LR15 6HB1-SN15 6HB1-SF15	1.4615:1	Straight	Output Speed (RPM)	1197	786	581	472	273	205	68
			Mechanical Horsepower	9.37	6.16	4.55	3.70	2.14	1.61	.54
			Thermal Horsepower	8.00*	6.16	4.55	3.70	2.14	1.61	.54
			Mechanical Output Torque (In.-Lbs.)	492	492	492	492	492	492	492
			Thermal Output Torque (In.-Lbs.)	421	492	492	492	492	492	492
			Maximum Input Overhung Load (Lbs.)	559	559	559	559	559	559	559
Maximum Output Overhung Load (Lbs.)	536	536	536	536	536	536	536			
6HB1-LR18 6HB1-SN18 6HB1-SF18	1.8:1	Straight	Output Speed (RPM)	972	638	472	383	222	166	55
			Mechanical Horsepower	6.38	4.91	3.10	2.52	1.46	1.09	.36
			Thermal Horsepower	6.38	4.91	3.10	2.52	1.46	1.09	.36
			Mechanical Output Torque (In.-Lbs.)	412	412	412	412	412	412	412
			Thermal Output Torque (In.-Lbs.)	412	412	412	412	412	412	412
			Maximum Input Overhung Load (Lbs.)	559	559	559	559	559	559	559
Maximum Output Overhung Load (Lbs.)	536	536	536	536	536	536	536			
9HSB1-LR10 9HSB1-SN10 9HSB1-SF10	1:1	Spiral	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	20.3	13.7	10.4	8.52	5.08	3.85	1.33
			Thermal Horsepower	13.9*	13.7	10.4	8.52	5.08	3.85	1.33
			Mechanical Output Torque (In.-Lbs.)	731	750	771	778	800	808	838
			Thermal Output Torque (In.-Lbs.)	500*	750	771	778	800	808	838
			Maximum Input Overhung Load (Lbs.)	235	235	335	421	550	550	550
Maximum Output Overhung Load (Lbs.)	486	486	486	486	486	486	486			
9HB1-LR10 9HB1-SN10 9HB1-SF10	1:1	Straight	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	34.9	22.9	17.0	13.8	7.97	5.98	1.99
			Thermal Horsepower	12.9*	19.1*	17.0	13.8	7.97	5.98	1.99
			Mechanical Output Torque (In.-Lbs.)	1256	1256	1256	1256	1256	1256	1256
			Thermal Output Torque (In.-Lbs.)	465*	1046*	1256	1256	1256	1256	1256
			Maximum Input Overhung Load (Lbs.)	502	550	550	550	550	550	550
Maximum Output Overhung Load (Lbs.)	486	486	486	486	486	486	486			

\*\*The input shaft is the shaft at a right angle to the cross shaft.

\*Mechanical rating exceeds thermal rating; do not exceed thermal rating except for very short intermittent periods.

## Speed, Horsepower, Torque and Overhung Loads

Part No.	Ratio	Gearing	Rating	Revolutions per Minute — Input Shaft**						
				1750	1150	850	690	400	300	100
9HB1-LR15 9HB1-SN15 9HB1-SF15	1.5:1	Straight	Output Speed (RPM)	1166	766	566	460	266	200	66
			Mechanical Horsepower	10.9	7.16	5.29	4.30	2.49	1.87	.62
			Thermal Horsepower	10.9	7.16	5.29	4.30	2.49	1.87	.62
			Mechanical Output Torque (In.-Lbs.)	588	588	588	588	588	588	588
			Thermal Output Torque (In.-Lbs.)	588	588	588	588	588	588	588
			Maximum Input Overhung Load (Lbs.)	550	550	550	550	550	550	550
Maximum Output Overhung Load (Lbs.)	486	486	486	486	486	486	486			
9HB1-LR20 9HB1-SN20 9HB1-SF20	2:1	Straight	Output Speed (RPM)	875	575	425	345	200	150	50
			Mechanical Horsepower	6.62	4.35	3.22	2.61	1.51	1.14	.38
			Thermal Horsepower	6.62	4.35	3.22	2.61	1.51	1.14	.38
			Mechanical Output Torque (In.-Lbs.)	477	477	477	477	477	477	477
			Thermal Output Torque (In.-Lbs.)	477	477	477	477	477	477	477
			Maximum Input Overhung Load (Lbs.)	550	550	550	550	550	550	550
Maximum Output Overhung Load (Lbs.)	486	486	486	486	486	486	486			
12HSB1-LR10 12HSB1-SN10 12HSB1-SF10	1:1	Spiral	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	47.1	32.1	24.3	20.0	11.9	9.08	3.14
			Thermal Horsepower	30.6*	30.5*	24.3	20.0	11.9	9.08	3.14
			Mechanical Output Torque (In.-Lbs.)	1696	1759	1801	1826	1875	1907	1979
			Thermal Output Torque (In.-Lbs.)	1102*	1671*	1801	1826	1875	1907	1979
			Maximum Input Overhung Load (Lbs.)	217	217	357	470	821	900	900
Maximum Output Overhung Load (Lbs.)	697	780	780	780	780	780	780			
12HB1-LR10 12HB1-SN10 12HB1-SF10	1:1	Straight	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	52.6	34.5	25.5	20.7	12.0	9.01	3.00
			Thermal Horsepower	32.2*	29.2*	25.5	20.7	12.0	9.01	3.00
			Mechanical Output Torque (In.-Lbs.)	1891	1891	1891	1891	1891	1891	1891
			Thermal Output Torque (In.-Lbs.)	1160*	1600*	1891	1891	1891	1891	1891
			Maximum Input Overhung Load (Lbs.)	721	900	900	900	900	900	900
Maximum Output Overhung Load (Lbs.)	748	780	780	780	780	780	780			
12HB1-LR15 12HB1-SN15 12HB1-SF15	1.5:1	Straight	Output Speed (RPM)	1166	766	566	460	266	200	66
			Mechanical Horsepower	24.6	16.2	12.0	9.70	5.62	4.22	1.41
			Thermal Horsepower	24.6	16.2	12.0	9.70	5.62	4.22	1.41
			Mechanical Output Torque (In.-Lbs.)	1329	1329	1329	1329	1329	1329	1329
			Thermal Output Torque (In.-Lbs.)	1329	1329	1329	1329	1329	1329	1329
			Maximum Input Overhung Load (Lbs.)	900	900	900	900	900	900	900
Maximum Output Overhung Load (Lbs.)	780	780	780	780	780	780	780			
12HB1-LR20 12HB1-SN20 12HB1-SF20	2:1	Straight	Output Speed (RPM)	875	575	425	345	200	150	50
			Mechanical Horsepower	10.9	7.17	5.30	4.30	2.49	1.87	.62
			Thermal Horsepower	10.9	7.17	5.30	4.30	2.49	1.87	.62
			Mechanical Output Torque (In.-Lbs.)	786	786	786	786	786	786	786
			Thermal Output Torque (In.-Lbs.)	786	786	786	786	786	786	786
			Maximum Input Overhung Load (Lbs.)	900	900	900	900	900	900	900
Maximum Output Overhung Load (Lbs.)	780	780	780	780	780	780	780			
12HB1-LR15-A 12HB1-SN15-A 12HB1-SF15-A	1:1.5 Speed-Up	Straight	Output Speed (RPM)	—	1725	1275	1035	600	450	150
			Mechanical Horsepower	—	15.5	11.5	9.32	5.41	4.05	1.35
			Thermal Horsepower	—	15.5	11.5	9.32	5.41	4.05	1.35
			Mechanical Output Torque (In.-Lbs.)	—	567	567	567	567	567	567
			Thermal Output Torque (In.-Lbs.)	—	567	567	567	567	567	567
			Maximum Input Overhung Load (Lbs.)	—	900	900	900	900	900	900
Maximum Output Overhung Load (Lbs.)	—	780	780	780	780	780	780			
15HSB1-LR10 15HSB1-SN10 15HSB1-SF10	1:1	Spiral	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	93.0	63.3	48.0	39.5	23.6	18.1	6.30
			Thermal Horsepower	29.4*	38.5*	39.5*	36.8*	23.6	18.1	6.30
			Mechanical Output Torque (In.-Lbs.)	3349	3469	3559	3608	3718	3802	3970
			Thermal Output Torque (In.-Lbs.)	1058*	2110*	2928*	3361*	3718	3802	3970
			Maximum Input Overhung Load (Lbs.)	400	400	419	580	1071	1352	1860
Maximum Output Overhung Load (Lbs.)	1029	1336	1539	1620	1620	1620	1620			
15HB1-LR10 15HB1-SN10 15HB1-SF10	1:1	Straight	Output Speed (RPM)	—	1150	850	690	400	300	100
			Mechanical Horsepower	—	74.8	55.3	44.9	26.0	19.5	6.51
			Thermal Horsepower	—	33.1*	39.4*	40.7*	26.0	19.5	6.51
			Mechanical Output Torque (In.-Lbs.)	—	4101	4101	4101	4101	4101	4101
			Thermal Output Torque (In.-Lbs.)	—	1814*	2921*	3717*	4101	4101	4101
			Maximum Input Overhung Load (Lbs.)	—	1306	1494	1634	1860	1860	1860
Maximum Output Overhung Load (Lbs.)	—	1374	1604	1620	1620	1620	1620			
15HSB1-LR15 15HSB1-SN15 15HSB1-SF15	1.5:1	Spiral	Output Speed (RPM)	1166	766	566	460	266	200	66
			Mechanical Horsepower	68.3	46.4	35.1	28.9	17.3	13.1	4.55
			Thermal Horsepower	34.1*	39.4*	35.1	28.9	17.3	13.1	4.55
			Mechanical Output Torque (In.-Lbs.)	3690	3814	3904	3960	4089	4128	4301
			Thermal Output Torque (In.-Lbs.)	1842*	3239*	3904	3960	4089	4128	4301
			Maximum Input Overhung Load (Lbs.)	1061	1360	1533	1664	1860	1860	1860
Maximum Output Overhung Load (Lbs.)	1462	1620	1620	1620	1620	1620	1620			

Bevel Red.  
Cast Iron

\*\*The input shaft is the shaft at a right angle to the cross shaft.

\*Mechanical rating exceeds thermal rating; do not exceed thermal rating except for very short intermittent periods.

## Speed, Horsepower, Torque and Overhung Loads

Part No.	Ratio	Gearing	Rating	Revolutions per Minute — Input Shaft**						
				1750	1150	850	690	400	300	100
15HB1-LR15 15HB1-SN15 15HB1-SF15	1.5:1	Straight	Output Speed (RPM)	-	766	566	460	266	200	66
			Mechanical Horsepower	-	44.9	33.2	26.2	15.6	11.7	3.90
			Thermal Horsepower	-	44.9	33.2	26.2	15.6	11.7	3.90
			Mechanical Output Torque (In.-Lbs.)	-	3687	3687	3687	3687	3687	3687
			Thermal Output Torque (In.-Lbs.)	-	3687	3687	3687	3687	3687	3687
			Maximum Input Overhung Load (Lbs.)	-	1380	1568	1725	1860	1860	1860
			Maximum Output Overhung Load (Lbs.)	-	1620	1620	1620	1620	1620	1620
15HB1-LR20 15HB1-SN20 15HB1-SF20	2:1	Straight	Output Speed (RPM)	875	575	425	345	200	150	50
			Mechanical Horsepower	58.6	38.5	28.5	23.1	13.4	10.1	3.35
			Thermal Horsepower	22.8*	30.1*	28.5	23.1	13.4	10.1	3.35
			Mechanical Output Torque (In.-Lbs.)	4222	4222	4222	4222	4222	4222	4222
			Thermal Output Torque (In.-Lbs.)	1642*	3299*	4222	4222	4222	4222	4222
			Maximum Input Overhung Load (Lbs.)	1009	1294	1483	1623	1860	1860	1860
			Maximum Output Overhung Load (Lbs.)	1620	1620	1620	1620	1620	1620	1620
15HB1-LR30 15HB1-SN30 15HB1-SF30	3:1	Straight	Output Speed (RPM)	583	383	283	230	133	100	33
			Mechanical Horsepower	20.8	13.7	10.1	8.21	4.76	3.57	1.19
			Thermal Horsepower	20.8	13.7	10.1	8.21	4.76	3.57	1.19
			Mechanical Output Torque (In.-Lbs.)	2251	2251	2251	2251	2251	2251	2251
			Thermal Output Torque (In.-Lbs.)	2251	2251	2251	2251	2251	2251	2251
			Maximum Input Overhung Load (Lbs.)	1356	1614	1803	1860	1860	1860	1860
			Maximum Output Overhung Load (Lbs.)	1620	1620	1620	1620	1620	1620	1620
15HSB1-LR15-A 15HSB1-SN15-A 15HSB1-SF15-A	1:1.5 Speed-Up	Spiral	Output Speed (RPM)	-	1725	1275	1035	600	450	150
			Mechanical Horsepower	-	65.9	50.0	41.2	24.8	18.9	6.59
			Thermal Horsepower	-	39.7*	44.5*	41.2	24.8	18.9	6.59
			Mechanical Output Torque (In.-Lbs.)	-	2408	2472	2509	2605	2647	2769
			Thermal Output Torque (In.-Lbs.)	-	1452*	2200*	2509	2605	2647	2769
			Maximum Input Overhung Load (Lbs.)	-	1579	1757	1860	1860	1860	1860
			Maximum Output Overhung Load (Lbs.)	-	1306	1488	1620	1620	1620	1620
15HB1-LR15-A 15HB1-SN15-A 15HB1-SF15-A	1:1.5 Speed-Up	Straight	Output Speed (RPM)	-	-	1275	1035	600	450	150
			Mechanical Horsepower	-	-	48.6	39.5	22.9	17.2	5.72
			Thermal Horsepower	-	-	34.2*	36.1*	22.9	17.2	5.72
			Mechanical Output Torque (In.-Lbs.)	-	-	2404	2404	2404	2404	2404
			Thermal Output Torque (In.-Lbs.)	-	-	1691*	2198*	2404	2404	2404
			Maximum Input Overhung Load (Lbs.)	-	-	1768	1860	1860	1860	1860
			Maximum Output Overhung Load (Lbs.)	-	-	1514	1620	1620	1620	1620
15HB1-LR20-A 15HB1-SN20-A 15HB1-SF20-A	1:2 Speed-Up	Straight	Output Speed (RPM)	-	-	1700	1380	800	600	200
			Mechanical Horsepower	-	-	38.6	31.4	18.2	13.6	4.54
			Thermal Horsepower	-	-	20.3*	26.2*	18.2	13.6	4.54
			Mechanical Output Torque (In.-Lbs.)	-	-	1433	1433	1433	1433	1433
			Thermal Output Torque (In.-Lbs.)	-	-	753*	1197*	1433	1433	1433
			Maximum Input Overhung Load (Lbs.)	-	-	1860	1860	1860	1860	1860
			Maximum Output Overhung Load (Lbs.)	-	-	1530	1620	1620	1620	1620
18HSB1-LR10 18HSB1-SN10 18HSB1-SF10	1:1	Spiral	Output Speed (RPM)	1750	1150	850	690	400	300	100
			Mechanical Horsepower	135.0	92.3	70.0	57.7	34.6	26.4	9.23
			Thermal Horsepower	18.3*	37.4*	42.8*	44.7*	34.6	26.4	9.23
			Mechanical Output Torque (In.-Lbs.)	4862	5058	5190	5270	5451	5546	5817
			Thermal Output Torque (In.-Lbs.)	659*	2049*	3173*	4083*	5451	5546	5817
			Maximum Input Overhung Load (Lbs.)	600	600	886	1122	1841	2273	2460
			Maximum Output Overhung Load (Lbs.)	1288	1678	1941	2142	2440	2440	2440
18HB1-LR10 18HB1-SN10 18HB1-SF10	1:1	Straight	Output Speed (RPM)	-	-	-	690	400	300	100
			Mechanical Horsepower	-	-	-	65.1	37.7	28.3	9.4
			Thermal Horsepower	-	-	-	42.8*	37.7	28.3	9.4
			Mechanical Output Torque (In.-Lbs.)	-	-	-	5942	5942	5942	5942
			Thermal Output Torque (In.-Lbs.)	-	-	-	3909*	5942	5942	5942
			Maximum Input Overhung Load (Lbs.)	-	-	-	2183	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	-	2221	2440	2440	2440
18HB1-LR12 18HB1-SN12 18HB1-SF12	1.2105:1	Straight	Output Speed (RPM)	-	-	699	570	330	247	82.6
			Mechanical Horsepower	-	-	72.5	58.9	34.1	25.6	8.5
			Thermal Horsepower	-	-	28.9*	36.5*	34.1	25.6	8.5
			Mechanical Output Torque (In.-Lbs.)	-	-	6508	6508	6508	6508	6508
			Thermal Output Torque (In.-Lbs.)	-	-	2593*	4035*	6508	6508	6508
			Maximum Input Overhung Load (Lbs.)	-	-	1881	2081	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	2213	2440	2440	2440	2440

\*\*The Input Shaft is the Shaft at a Right Angle to the Cross Shaft.

\*Mechanical rating exceeds thermal rating; do not exceed thermal rating except for very short intermittent periods.

## Speed, Horsepower, Torque and Overhung Loads

Part No.	Ratio	Gearing	Rating	Revolutions per Minute — Input Shaft**						
				1750	1150	850	690	400	300	100
18HB1-LR13 18HB1-SN13 18HB1-SF13	1.3333:1	Straight	Output Speed (RPM)	-	-	637	517	300	225	75
			Mechanical Horsepower	-	-	53.1	43.1	25.0	18.8	6.25
			Thermal Horsepower	-	-	29.5*	33.2*	25.0	18.8	6.25
			Mechanical Output Torque (In.-Lbs.)	-	-	5252	5252	5252	5252	5252
			Thermal Output Torque (In.-Lbs.)	-	-	2909*	4033*	5252	5252	5252
			Maximum Input Overhung Load (Lbs.)	-	-	2121	2321	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	2440	2440	2440	2440	2440
18HSB1-LR15 18HSB1-SN15 18HSB1-SF15	1.5:1	Spiral	Output Speed (RPM)	1166	766	566	460	266	200	66.6
			Mechanical Horsepower	68.3	46.4	35.1	28.9	17.3	13.1	4.55
			Thermal Horsepower	12.3*	24.5*	30.7*	28.9	17.3	13.1	4.55
			Mechanical Output Torque (In.-Lbs.)	3690	3814	3904	3960	4089	4128	4301
			Thermal Output Torque (In.-Lbs.)	664*	2104*	3414*	3960	4089	4128	4301
			Maximum Input Overhung Load (Lbs.)	1701	2122	2375	2460	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	2157	2440	2440	2440	2440	2440	2440
18HB1-LR15 18HB1-SN15 18HB1-SF15	1.5:1	Straight	Output Speed (RPM)	-	766	566	460	266	200	66.6
			Mechanical Horsepower	-	63.5	47.0	38.1	22.1	16.6	5.52
			Thermal Horsepower	-	41.3*	47.0	38.1	22.1	16.6	5.52
			Mechanical Output Torque (In.-Lbs.)	-	5223	5223	5223	5223	5223	5223
			Thermal Output Torque (In.-Lbs.)	-	3399*	5223	5223	5223	5223	5223
			Maximum Input Overhung Load (Lbs.)	-	1874	2142	2342	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	2440	2440	2440	2440	2440	2440
18HB1-LR17 18HB1-SN17 18HB1-SF17	1.7143:1	Straight	Output Speed (RPM)	-	766	495	402	233	175	58.3
			Mechanical Horsepower	-	51.8	38.3	31.1	18.0	13.5	4.50
			Thermal Horsepower	-	19.5*	28.8*	31.1	18.0	13.5	4.50
			Mechanical Output Torque (In.-Lbs.)	-	4867	4867	4867	4867	4867	4867
			Thermal Output Torque (In.-Lbs.)	-	1832*	3660*	4867	4867	4867	4867
			Maximum Input Overhung Load (Lbs.)	-	1939	2207	2408	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	2440	2440	2440	2440	2440	2440
18HB1-LR12-A 18HB1-SN12-A 18HB1-SF12-A	1:1.2105 Speed-Up	Straight	Output Speed (RPM)	-	-	-	835	484	363	121
			Mechanical Horsepower	-	-	-	70.2	40.7	30.5	10.2
			Thermal Horsepower	-	-	-	37.5*	40.7	30.5	10.2
			Mechanical Output Torque (In.-Lbs.)	-	-	-	5298	5298	5298	5298
			Thermal Output Torque (In.-Lbs.)	-	-	-	2830*	5298	5298	5298
			Maximum Input Overhung Load (Lbs.)	-	-	-	2267	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	-	1959	2440	2440	2440
18HB1-LR13-A 18HB1-SN13-A 18HB1-SF13-A	1:1.3333 Speed-Up	Straight	Output Speed (RPM)	-	-	-	920	533	400	133
			Mechanical Horsepower	-	-	-	56.5	32.7	24.6	8.17
			Thermal Horsepower	-	-	-	44.0*	32.7	24.6	8.17
			Mechanical Output Torque (In.-Lbs.)	-	-	-	3870	3870	3870	3870
			Thermal Output Torque (In.-Lbs.)	-	-	-	3091*	3870	3870	3870
			Maximum Input Overhung Load (Lbs.)	-	-	-	2460	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	-	2126	2440	2440	2440
18HSB1-LR15-A 18HSB1-SN15-A 18HSB1-SF15-A	1:1.5 Speed-Up	Spiral	Output Speed (RPM)	-	1725	1275	1035	600	450	150
			Mechanical Horsepower	-	65.9	50.0	41.2	24.8	18.9	6.59
			Thermal Horsepower	-	20.2*	31.5*	41.2	24.8	18.9	6.59
			Mechanical Output Torque (In.-Lbs.)	-	2408	2472	2509	2605	2647	2769
			Thermal Output Torque (In.-Lbs.)	-	738*	1557*	2509	2605	2647	2769
			Maximum Input Overhung Load (Lbs.)	-	2330	2460	2460	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	1923	2163	2343	2440	2440	2440
18HB1-LR15-A 18HB1-SN15-A 18HB1-SF15-A	1:1.5 Speed-Up	Straight	Output Speed (RPM)	-	-	-	1035	600	450	150
			Mechanical Horsepower	-	-	-	55.9	32.4	24.3	8.10
			Thermal Horsepower	-	-	-	33.3*	32.4	24.3	8.10
			Mechanical Output Torque (In.-Lbs.)	-	-	-	3405	3405	3405	3405
			Thermal Output Torque (In.-Lbs.)	-	-	-	2027*	3405	3405	3405
			Maximum Input Overhung Load (Lbs.)	-	-	-	2460	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	-	2071	2440	2440	2440
18HB1-LR17-A 18HB1-SN17-A 18HB1-SF17-A	1:1.7143 Speed-Up	Straight	Output Speed (RPM)	-	-	-	1182	685	514	171
			Mechanical Horsepower	-	-	-	37.1	21.5	16.1	5.36
			Thermal Horsepower	-	-	-	36.8*	21.5	16.1	5.36
			Mechanical Output Torque (In.-Lbs.)	-	-	-	1974	1974	1974	1974
			Thermal Output Torque (In.-Lbs.)	-	-	-	1961*	1974	1974	1974
			Maximum Input Overhung Load (Lbs.)	-	-	-	2460	2460	2460	2460
			Maximum Output Overhung Load (Lbs.)	-	-	-	2322	2440	2440	2440

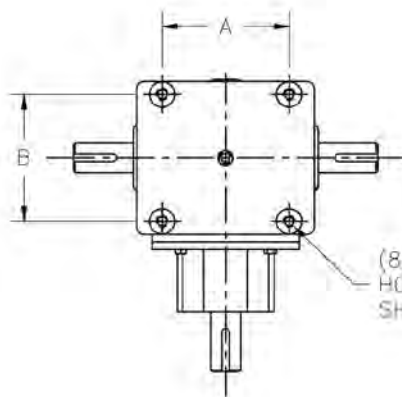
\*\*The Input Shaft is the Shaft at a Right Angle to the Cross Shaft.

\*Mechanical rating exceeds thermal rating; do not exceed thermal rating except for very short intermittent periods.

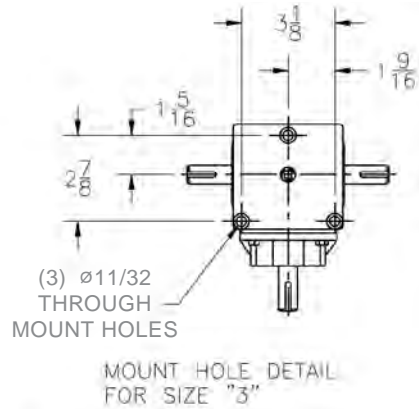




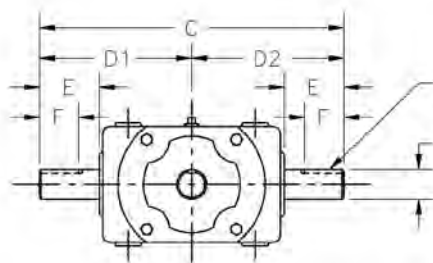
### Cast Iron Housing Hardened Gears



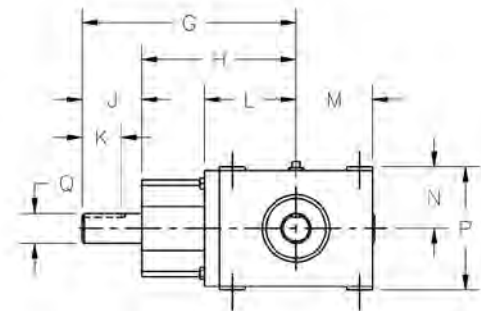
(8) "R" TAPPED MOUNT HOLES LOCATED AS SHOWN, TOP AND BOTTOM



MOUNT HOLE DETAIL FOR SIZE "3"



(3) "S" KEYWAY TYP 3 SHAFT EXT.



### Specifications

Size No.	Wt. Lbs.	Dimensions							
		A	B	C	D <sub>1</sub>	D <sub>2</sub>	E	F	G
3	10	▲	▲	7 1/2"	3 3/4"	3 3/4"	1 1/2"	7/8"	4 9/16"
6	23	4 3/8"	2 3/4"	9 3/32"	4 35/64"	4 35/64"	1 5/8"	7/8"	6 1/8"
9	28	4 1/4"	4 1/4"	10 3/16"	5 3/32"	5 3/32"	2"	1 5/16"	7 5/32"
12	48	4 1/2"	4 1/2"	12 1/4"	6 1/8"	6 1/8"	2 3/8"	1 5/8"	8 15/32"
15	105	6 1/2"	6 1/2"	15 13/16"	7 29/32"	7 29/32"	3"	2 1/8"	10 7/8"
18	125	6 1/2"	6 1/2"	16 3/32"	8 3/64"	8 3/64"	3"	2 1/8"	11 15/32"

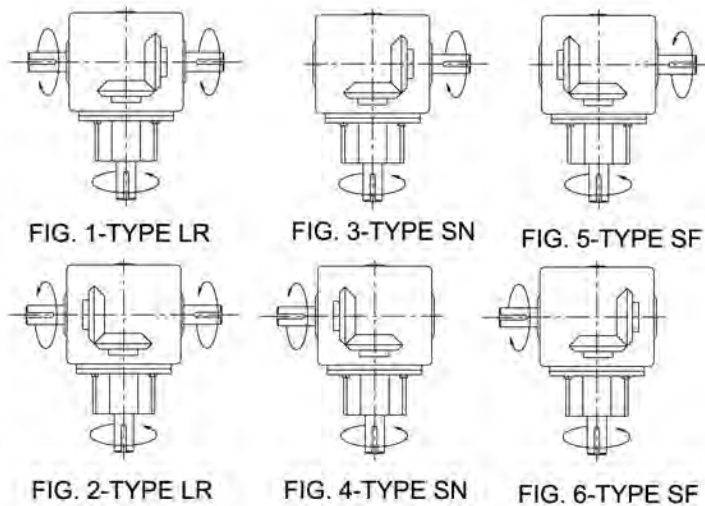
Size No.	Dimensions								Tap Size R	Tap Depth	Keyway S
	H	J	K	L	M	N	P	Q *			
3	3 1/16"	1 1/2"	7/8"	2 13/64"	1 11/16"	1 19/32"	3 3/16"	.625"	-	-	3/16" x 3/32"
6	4 3/8"	1 3/4"	1"	2 15/16"	2 1/16"	2 1/8"	4 1/4"	1.000	3/8-16NC	.56	1/4 x 1/8
9	5 5/32"	2"	1 5/16"	3 1/16"	2 9/16"	2 1/16"	4 1/8"	1.000	3/8-16NC	.56	1/4 x 1/8
12	5 31/32"	2 1/2"	1 5/8"	3 31/32"	2 7/8"	2 13/16"	5 5/8"	1.250	1/2-13NC	.88	1/4 x 1/8
15	7 7/8"	3"	2 1/8"	4 17/32"	3 27/32"	4 3/32"	8 3/16"	1.375	1/2-13NC	.88	5/16 x 5/32
18	8 15/32"	3"	2 1/8"	4 27/32"	3 27/32"	4 3/32"	8 3/16"	1.500	1/2-13NC	.88	3/8 x 3/16

▲ See Mount Hole Detail Drawing for 3HSB1.  
Select Part No. from the table and Figures 1-6 on page 461.

\* Shaft Tolerances are: +.000 to -.001".

**Note** — If gear box is to be mounted with either shaft vertical, provision must be made to lubricate the top bearings. Contact the Application Engineering (1 800 626 2093).

**Note** — In order to obtain maximum reducer life, all applications applying axial force on the input shaft of these reducers should be referred to Application Engineering.



### Ratios, Types and Part Numbers

Ratio	Fig.	Type	Part No.	Ratio	Fig.	Type	Part No.	Ratio	Fig.	Type	Part No.
<b>Size No. 3</b>				<b>Size No. 12</b>				<b>Size No. 18</b>			
1:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	3HSB1-LR10 3HSB1-SN10 3HSB1-SF10	1:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	12HSB1-LR10 12HSB1-SN10 12HSB1-SF10	1:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	18HSB1-LR10 18HSB1-SN10 18HSB1-SF10
1:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	3HB1-LR10 3HB1-SN10 3HB1-SF10	1:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	12HB1-LR10 12HB1-SN10 12HB1-SF10	1:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR10 18HB1-SN10 18HB1-SF10
1.5:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	3HB1-LR15 3HB1-SN15 3HB1-SF15	1.5:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	12HB1-LR15 12HB1-SN15 12HB1-SF15	1.2105:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR12 18HB1-SN12 18HB1-SF12
2:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	3HB1-LR20 3HB1-SN20 3HB1-SF20	2:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	12HB1-LR20 12HB1-SN20 12HB1-SF20	1.3333:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR13 18HB1-SN13 18HB1-SF13
<b>Size No. 6</b>				<b>Size No. 15</b>				<b>Size No. 18</b>			
1:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	6HSB1-LR10 6HSB1-SN10 6HSB1-SF10	1:1.5 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	12HB1-LR15-A 12HB1-SN15-A 12HB1-SF15-A	1.5:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	18HSB1-LR15 18HSB1-SN15 18HSB1-SF15
1:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	6HB1-LR10 6HB1-SN10 6HB1-SF10	1:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	15HSB1-LR10 15HSB1-SN10 15HSB1-SF10	1.5:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR15 18HB1-SN15 18HB1-SF15
1.4615:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	6HB1-LR15 6HB1-SN15 6HB1-SF15	1:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	15HB1-LR10 15HB1-SN10 15HB1-SF10	1.7131:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR17 18HB1-SN17 18HB1-SF17
1.8:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	6HB1-LR18 6HB1-SN18 6HB1-SF18	1.5:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	15HSB1-LR15 15HSB1-SN15 15HSB1-SF15	1:1.2105 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR12-A 18HB1-SN12-A 18HB1-SF12-A
<b>Size No. 9</b>				<b>Size No. 15</b>				<b>Size No. 18</b>			
1:1 Spiral	1 and 2 3 and 4 5 and 6	LR SN SF	9HSB1-LR10 9HSB1-SN10 9HSB1-SF10	1.5:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	15HB1-LR15 15HB1-SN15 15HB1-SF15	1:1.3333 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR13-A 18HB1-SN13-A 18HB1-SF13-A
1:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	9HB1-LR10 9HB1-SN10 9HB1-SF10	2:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	15HB1-LR20 15HB1-SN20 15HB1-SF20	1:1.5 Spiral (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	18HSB1-LR15-A 18HSB1-SN15-A 18HSB1-SF15-A
1.5:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	9HB1-LR15 9HB1-SN15 9HB1-SF15	3:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	15HB1-LR30 15HB1-SN30 15HB1-SF30	1:1.5 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR15-A 18HB1-SN15-A 18HB1-SF15-A
2:1 Straight	1 and 2 3 and 4 5 and 6	LR SN SF	9HB1-LR20 9HB1-SN20 9HB1-SF20	1:1.5 Spiral (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	15HSB1-LR15-A 15HSB1-SN15-A 15HSB1-SF15-A	1:1.7143 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	18HB1-LR17-A 18HB1-SN17-A 18HB1-SF17-A
				1:1.5 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	15HB1-LR15-A 15HB1-SN15-A 15HB1-SF15-A				
				1:2 Straight (Speed-Up)	1 and 2 3 and 4 5 and 6	LR SN SF	15HB1-LR20-A 15HB1-SN20-A 15HB1-SF20-A				

Bevel Red.  
Cast Iron

Determine the size reducer and ratio needed from Engineering Data on pages 456 to 459. Then from the sketches above determine the Type needed for the desired shaft extension and rotation. Then from the table above, determine the Reducer Part Number. Example: For a Size 12, 2:1 Ratio Reducer with single output left and output to rotate CCW when input rotates CW (looking at the shaft ends) note from Fig. 4 that a Type SN is needed and from the table the Part Number is 12HB1-SN20.

All sales are made on our STANDARD TERMS AND CONDITIONS OF SALE in effect at the time a customer's order is accepted. The current Terms and Conditions are set forth below:

## STANDARD TERMS AND CONDITIONS OF SALE (September 2, 2009)

These Terms and Conditions, the attendant quotation or acknowledgment and all documents incorporated by specific reference therein, will be the complete and exclusive statement of the terms of the agreement governing the sale of goods ("Goods") by Emerson Power Transmission Corporation and its divisions and subsidiaries ("Seller") to Customer ("Buyer"). Buyer's acceptance of the Goods will manifest Buyer's assent to these Terms and Conditions. If these Terms and Conditions differ in any way from the terms and conditions of Buyer's order, or other documentation, this document will be construed as a counteroffer and will not be deemed an acceptance of Buyer's terms and conditions which conflict herewith.

- 1. PRICES:** Unless otherwise specified in writing by Seller, Seller's price for the goods shall remain in effect for thirty (30) days after the date of Seller's quotation or acknowledgment of Buyer's order for the Goods, whichever occurs first, provided an unconditional, complete authorization for the immediate shipment of the Goods is received and accepted by Seller within such time period. If such authorization is not received by Seller within such thirty (30) day period, Seller shall have the right to change the price for the Good to Seller's price for the Goods at the time of shipment.
- 2. TAXES:** Any tax or governmental charge or increase in same hereafter becoming effective increasing the cost to Seller of producing, selling or delivering the Goods or of procuring material used therein, and any tax now in effect or increase in same payable by the Seller because of the manufacture, sale or delivery of the Goods, may at Seller's option, be added to the price.
- 3. TERMS OF PAYMENT:** Subject to the approval of Seller's Credit Department, terms are net thirty (30) days from date of Seller's invoice in U.S. currency. If any payment owed to Seller is not paid when due, it shall bear interest, at a rate to be determined by Seller, which shall not exceed the maximum rate permitted by law, from the date on which it is due until it is paid. Seller shall have the right, among other remedies, either to terminate the Agreement or to suspend further performance under this and/or other agreements with Buyer in the event Buyer fails to make any payment when due. Buyer shall be liable for all expenses, including attorneys' fees, relating to the collection of past due amounts.
- 4. SHIPMENT AND DELIVERY:** Shipments are made F.O.B. Seller's shipping point. Any claims for shortages or damages suffered in transit shall be submitted by the Buyer directly to the carrier. While Seller will use all reasonable commercial efforts to maintain the delivery date acknowledged or quoted by Seller, all shipping dates are approximate. Seller reserves the right to make partial shipments and to segregate "specials" and made-to-order Goods from normal stock Goods. Seller shall not be bound to tender delivery of any Goods for which Buyer has not provided shipping instructions.
- 5. QUANTITY:** Buyer agrees to accept overruns of up to ten percent (10%) of the order on "made-to-order" Goods, including parts. Any such additional items shall be priced at the price per item charged for the specific quantity ordered.
- 6. LIMITED WARRANTY:** Subject to the limitations of Section 7, Seller warrants that the Goods will be free from defects in material and workmanship under normal use, service and maintenance for a period of one year (unless otherwise specified by Seller in writing) from the date of shipment of the Goods by Seller. **THIS IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY SELLER WITH RESPECT TO THE GOODS AND IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHETHER OR NOT THE PURPOSE OR USE HAS BEEN DISCLOSED TO SELLER IN SPECIFICATIONS, DRAWINGS OR OTHERWISE, AND WHETHER OR NOT SELLER'S PRODUCTS ARE SPECIFICALLY DESIGNED AND/OR MANUFACTURED BY SELLER FOR BUYER'S USE OR PURPOSE.**

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It is expressly understood that any technical advice furnished by Seller with respect to the use of the Goods is given without charge, and Seller assumes no obligation

or liability for the advice given, or results obtained, all such advice being given and accepted at Buyer's risk.

**GOODS AND/OR SERVICES SOLD HEREUNDER ARE NOT FOR USE IN ANY NUCLEAR AND RELATED APPLICATIONS.** Buyer accepts goods and/or services with the foregoing understanding, agrees to communicate the same in writing to any subsequent purchaser or users and to defend, indemnify and hold harmless Seller from any claims, losses, suits, judgments and damages, including incidental and consequential damages, arising from such use, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability.

**8. EXCUSE OF PERFORMANCE:** Seller shall not be liable for delays in performance or for non-performance due to acts of God, acts of Buyer, war, riot, fire, flood, other severe weather, sabotage, or epidemics; strikes or labor disturbances; governmental requests, restrictions, laws, regulations, orders or actions; unavailability of or delays in transportation; default of suppliers; or unforeseen circumstances or any events or causes beyond Seller's reasonable control. Deliveries may be suspended for an appropriate period of time as a result of the foregoing. If Seller determines that its ability to supply the total demand for the Goods, or to obtain material used directly or indirectly in the manufacture of the Goods, is hindered, limited or made impracticable due to causes addressed in this Section 8, Seller may allocate its available supply of the Goods or such material (without obligation to acquire other supplies of any such Goods or material) among itself and its purchasers on such basis as Seller determines to be equitable without liability for any failure of performance which may result therefrom. Deliveries suspended or not made by reason of this section may be canceled by Seller upon notice to Buyer without liability, but the balance of the agreement shall otherwise remain unaffected.

**9. CANCELLATIONS AND DELAYS:** The Buyer may cancel orders only upon written notice and upon payment to Seller of cancellation charges which include, among other things, all costs and expenses incurred and commitments made by the Seller and a reasonable profit thereon. Any request by Buyer to extend the delivery schedule must be agreed to in writing by the Seller. If agreement cannot be reached, Seller may deliver product to the last known ship to address and invoice the Buyer upon completion of the product or prior delivery date, whichever is later.

**10. CHANGES:** Buyer may request changes or additions to the Goods consistent with Seller's specifications and criteria. In the event such changes or additions are accepted by Seller, Seller may revise the price and delivery schedule. Seller reserves the right to change designs and specifications for the Goods without prior notice to Buyer, except with respect to Goods being made-to-order for Buyer.

**11. TOOLING:** Tool, die, and pattern charges, if any, are in addition to the price of the Goods and are due and payable upon completion of the tooling. All such tools, dies and patterns shall be and remain the property of Seller. Charges for tools, dies, and patterns do not convey to Buyer, title, ownership interests in, or rights to possession or removal, nor prevent their use by Seller for other purchasers, except as otherwise expressly provided by Seller and Buyer in writing with reference to this provision.

**12. ASSIGNMENT:** Buyer shall not assign its rights or delegate its duties hereunder or any interest therein or any rights hereunder without the prior written consent of the Seller, and any such assignment, without such consent, shall be void.

**13. PATENTS AND COPYRIGHTS:** Subject to Section 7, Seller warrants that the Goods sold, except as are made specifically for Buyer according to Buyer's specifications, do not infringe any valid U.S. patent or copyright in existence as of the date of delivery. This warranty is given upon the condition that Buyer promptly notify Seller of any claim or suit involving Buyer in which such infringement is alleged, and, that Buyer cooperate fully with Seller and permit Seller to control completely the defense or compromise of any such allegation of infringement. Seller's warranty as to use only applies to infringements arising solely out of the inherent operation (i) of such Goods, or (ii) of any combination of Goods in a system designed by Seller. In the event such Goods, singularly or in combination, are held to infringe a U.S. patent or copyright in such suit, and the use of such Goods is enjoined, or in the case of a compromise by Seller, Seller shall have the right, at its option and expense, to procure for Buyer the right to continue using such Goods, or replace them with non-infringing Goods; or modify same to become non-infringing; or grant Buyer a credit for the depreciated value of such Goods and accept return of them.

**14. MISCELLANEOUS:** These terms and conditions set forth the entire understanding and agreement between Seller and Buyer, and supersede all other communications, negotiations and prior oral or written statements regarding the subject matter of these terms and conditions. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions of Sale shall be binding upon the Seller unless made in writing and signed on its behalf by an officer of the Seller. No conditions, usage or trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these Terms and Conditions shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification shall be affected by the acceptance of purchase orders or shipping instruction forms containing terms at variance with or in addition to those set forth herein. Any such modifications or additional terms are specifically rejected by Seller. No waiver by Seller with respect to any breach or default or any right or remedy and no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver be expressed in writing and signed by the party to be bound. Seller is not responsible for typographical or clerical errors made in any quotation, orders or publications. All such errors are subject to correction. The validity, performance, and all other matters relating to the interpretation and effect of this contract shall be governed by the law of the state of New York. The United Nations Convention on the International Sale of Goods shall not apply to any transaction hereunder.