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NEMA Aluminum Worm Gearboxes

Gearbox Overview

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.

Worm gearboxes contain a worm (gear type) on the input shaft, and a mating gear on the output shaft. Worm gearboxes also change the drive direction by 90°.

IronHorse worm gearboxes are manufactured in an ISO9001 certified plant by one of the leading 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.

We also offer optional single and double output shafts, output flanges, torque arms, and output covers.
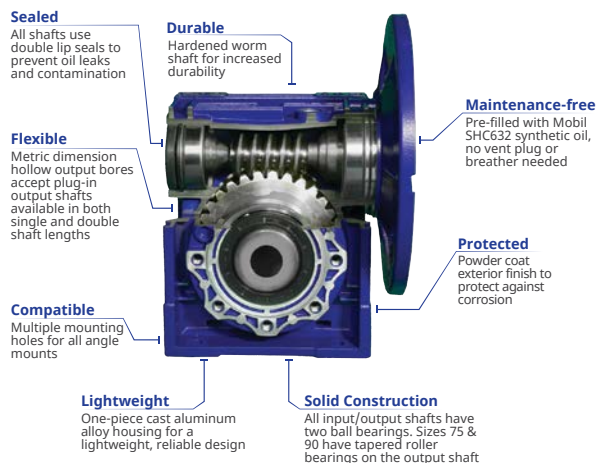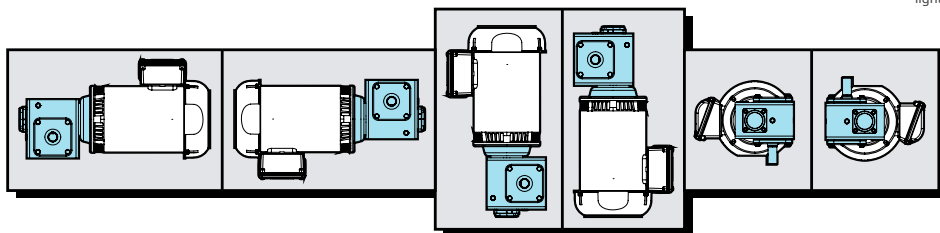
Features

- 10:1 to 100:1 ratios
- Frame sizes 30, 40, 50, 63, and 75 mm
- Compatible with NEMA motor sizes: 56C, 145TC and 182/4TC
- Cast aluminum alloy housing for lightweight design and optimal heat dissipation
- Hardened worm shaft for increased durability
- Two bearings on input and output shafts (Size 75 gearboxes have tapered roller bearings on the output shaft)
- All units filled with Mobil SHC632 synthetic oil
- No breather/vent plug needed; maintenance-free reducer
- Double lip oil seals prevent leakage
- Multiple mounting holes for any mounting orientation
- Gearbox outer finish: Powder Coat
- Hollow output bores

Applications

- Use with electric motors for reducing output speed, increasing torque, changing drive direction, or running two loads from one motor.
- Use for conveyors, packaging machines, rotary tables, etc.

Mounting Orientation

IronHorse NEMA aluminum gearboxes can be mounted in any orientation (see diagram below).

IronHorse Aluminum Worm Gearbox Accessories

Sealed
All shafts use double lip seals to prevent oil leaks and contamination

Durable
Hardened worm shaft for increased durability

Maintenance-free
Pre-filled with Mobil SHC632 synthetic oil, no vent plug or breather needed

Flexible
Metric dimension hollow output bores accept plug-in output shafts available in both single and double shaft lengths

Protected
Powder coat exterior finish to protect against corrosion

Compatible
Multiple mounting holes for all angle mounts

Lightweight
One-piece cast aluminum alloy housing for a lightweight, reliable design

Solid Construction
All input/output shafts have two ball bearings. Sizes 75 & 90 have tapered roller bearings on the output shaft

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NEMA Aluminum Worm Gearboxes

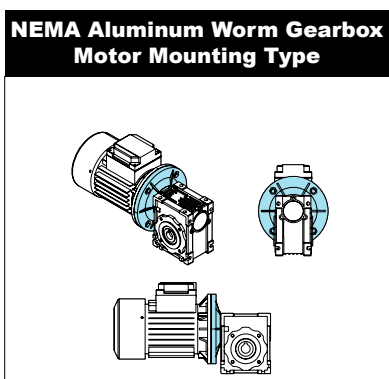## Glossary of Terms

Frame Size or Center Distance
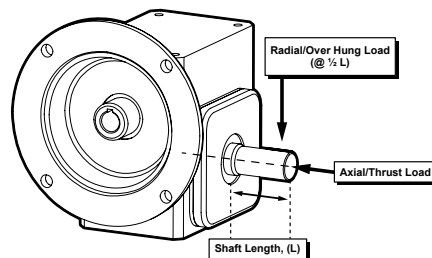Distance between the axes of rotation of the input and output shafts.
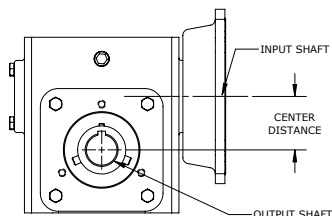
NEMA Sizes
Input Flanges sized for NEMA motor Frames:

- 56C
- 145TC
- 182/4TC

NEMA Aluminum Worm Gearbox Motor Mounting Type

Thrust and Radial Loads
Loads applied to the output shaft during operation. See Diagram below.

Nominal Motor HP
Nominal Motor HP is the highest hp, 1800rpm motor (service factor 1.0) to be used with the gearbox. Gearbox input power capacity decreases as motor speed decreases and service factor increases.

Mechanical Ratings
Maximum Mechanical Ratings are limits based on strength and durability of gearbox components; applicable when operating time is short and stopped time is greater than or equal to operating time. These ratings are applicable for 1.0 service factor loads, and may require modification depending upon characteristics of the applicable driven loads. Refer to the "Service Factors" table for more information.

Thermal Ratings
Maximum Thermal Ratings are limits for gearbox continuous use without overheating. Mechanical and Thermal Ratings are the same for Aluminum gearboxes because the aluminum housing is designed for optimal heat dissipation.

CAUTION:
1. Worm gear reducers are not to be considered fail safe or self-locking devices. If these features are required, a properly sized independent holding device should be utilized.
2. Depending upon gear geometry and operating conditions, worm gear reducers may or may not backdrive. Special consideration should be given to high inertia loads connected to the reducer output shaft.
3. Reducers driven by brake motors must be sized to accommodate motor driving, brake, and inertia loads to prevent the braking torque or inertia loads from exceeding the motor rating.

Gearbox Selection Factors

Overhung Load K Factors for Various Drive Types

Chain & Sprocket	1.00
Gear	1.25
V-belt	1.50
Flat Belt	2.50
Variable Pitch Belt	3.50

Divide gearbox Overhung Load (OHL) ratings by the applicable OHL K factors.

Service Factors for Selecting Gearboxes (when used with electric motors)

Service Continuity (per day)	Load Characteristics			
	Uniform	Moderate Shock*	Heavy Shock*	Extreme Shock*
Occasional 1/2 hour	1.00	1.00	1.00	1.25
Less than 3 hours	1.00	1.00	1.25	1.50
3-10 hours	1.00	1.25	1.50	1.75
More than 10 hours	1.25	1.50	1.75	2.00

* Shock results from sudden increases in the torque demand of the load, such as: sudden stopping, restarting, and/or reversing; significantly heavy loads dropped onto a moving conveyor; impact loads such as punch press operations.

Depending upon the load characteristics, divide the gearbox HP, Overhung Load, and Maximum Mechanical Capacity ratings by the applicable service factor.

10:1 NEMA Aluminum Worm Gearboxes

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IronHorse NEMA Aluminum Worm Gearbox Specifications									
Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-30M-010-H1	$130.00	10:1	30	NEMA 56C	NEMA 56C	0.625	0.625in	3	PDF
WGA-40M-010-H1	$163.00		40		NEMA 56C		0.75in	5	PDF
WGA-50M-010-H1	$223.00		50		NEMA 56C		1in	8	PDF
WGA-63M-010-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-63M-010-H2	$287.00			NEMA 145TC	NEMA 145TC	0.875			PDF
WGA-75M-010-H1	$418.00		75	NEMA 56C	NEMA 56C	0.625	1.25in	19	PDF
WGA-75M-010-H2	$418.00			NEMA 145TC	NEMA 145TC	1.125			PDF
WGA-75M-010-H3	$418.00			NEMA 182/4TC	NEMA 182/4TC				PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings								
Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-30M-010-H1	0.54	0.43	160	0.54	175	142	80	31	29
WGA-40M-010-H1	1.15	0.95	370	1.21		279	83	60	24
WGA-50M-010-H1	2.06	1.73	664	2.12		406	84	83	19
WGA-63M-010-H1	3.67	3.16	1108	3.52		510	86	108	17
WGA-63M-010-H2									
WGA-75M-010-H1	5.44	4.68	1656	5.2		604		128	16
WGA-75M-010-H2									
WGA-75M-010-H3									

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20:1 NEMA Aluminum Worm Gearboxes

IronHorse NEMA Aluminum Worm Gearbox Specifications

Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-30M-020-H1	$130.00	20:1	30	NEMA 56C	NEMA 56C	0.625	0.625in	3	PDF
WGA-40M-020-H1	$163.00		40		NEMA 56C		0.75in	5	PDF
WGA-50M-020-H1	$223.00		50		NEMA 56C		1in	8	PDF
WGA-63M-020-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-63M-020-H2	$287.00			NEMA 145TC	NEMA 145TC	0.875			PDF
WGA-75M-020-H1	$418.00		75	NEMA 56C	NEMA 56C	0.625	1.25in	19	PDF
WGA-75M-020-H2	$418.00			NEMA 145TC	NEMA 145TC	1.125			PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings

Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-30M-020-H1	0.3	0.22	151	0.28	88	179	72	40	28
WGA-40M-020-H1	0.61	0.48	361	0.63		350	78	76	24
WGA-50M-020-H1	1.13	0.88	656	1.14		510		104	17
WGA-63M-020-H1	2.04	1.63	1225	2.06		641	80	137	16
WGA-63M-020-H2									
WGA-75M-020-H1	3.14	2.48	1953	3.24		759	79	161	14
WGA-75M-020-H2									

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30:1 NEMA Aluminum Worm Gearboxes

IronHorse NEMA Aluminum Worm Gearbox Specifications

Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-30M-030-H1	$130.00		30		NEMA 56C		0.625in	3	PDF
WGA-40M-030-H1	$163.00		40		NEMA 56C		0.75in	5	PDF
WGA-50M-030-H1	$223.00	30:1	50	NEMA 56C	NEMA 56C	0.625	1in	8	PDF
WGA-63M-030-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-75M-030-H1	$418.00		75		NEMA 56C		1.25in	19	PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings

Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-30M-030-H1	0.25	0.16	177	0.25		205	62	45	29
WGA-40M-030-H1	0.53	0.36	403	0.53		403	68	87	24
WGA-50M-030-H1	0.95	0.67	740	0.94	58	586	70	120	19
WGA-63M-030-H1	1.76	1.28	1345	1.64		736	73	156	17
WGA-75M-030-H1	2.48	1.79	2028	2.41		873	72	185	16

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40:1 NEMA Aluminum Worm Gearboxes

IronHorse NEMA Aluminum Worm Gearbox Specifications									
Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-30M-040-H1	$130.00		30		NEMA 56C		0.625in	3	PDF
WGA-40M-040-H1	$163.00		40		NEMA 56C		0.75in	5	PDF
WGA-50M-040-H1	$223.00	40:1	50	NEMA 56C	NEMA 56C	0.625	1in	8	PDF
WGA-63M-040-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-75M-040-H1	$418.00		75		NEMA 56C		1.25in	19	PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings								
Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-30M-040-H1	0.19	0.1	160	0.19		225	55	50	28
WGA-40M-040-H1	0.39	0.25	378	0.4		441		96	24
WGA-50M-040-H1	0.7	0.46	689	0.7	44	643	65	132	17
WGA-63M-040-H1	1.26	0.88	1261	1.21		807	70	172	16
WGA-75M-040-H1	1.88	1.28	2029	1.9		957	68	203	14

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60:1 NEMA Aluminum Worm Gearboxes

IronHorse NEMA Aluminum Worm Gearbox Specifications

Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-30M-060-H1	$130.00		30		NEMA 56C		0.625in	3	PDF
WGA-40M-060-H1	$163.00		40		NEMA 56C		0.75in	5	PDF
WGA-50M-060-H1	$223.00	60:1	50	NEMA 56C	NEMA 56C	0.625	1in	8	PDF
WGA-63M-060-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-75M-060-H1	$418.00		75		NEMA 56C		1.25in	19	PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings

Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-30M-060-H1	0.12	0.06	134	0.12		259	46	54	26
WGA-40M-060-H1	0.25	0.14	319	0.25		507	56	110	22
WGA-50M-060-H1	0.46	0.26	605	0.47	29	739	57	151	16
WGA-63M-060-H1	0.86	0.51	1135	0.82		928	59	197	14
WGA-75M-060-H1	1.26	0.78	1778	1.22		1099	62	232	13

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80:1 NEMA Aluminum Worm Gearboxes

IronHorse NEMA Aluminum Worm Gearbox Specifications									
Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-40M-080-H1	$163.00	80:1	40	NEMA 56C	NEMA 56C	0.625	0.75in	5	PDF
WGA-50M-080-H1	$223.00		50		NEMA 56C		1in	8	PDF
WGA-63M-080-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-75M-080-H1	$418.00		75		NEMA 56C		1.25in	19	PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings								
Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-40M-080-H1	0.19	0.1	277	0.18	22	556	50	121	22
WGA-50M-080-H1	0.38	0.19	546	0.35		810		166	16
WGA-63M-080-H1	0.67	0.36	1027	0.6		1017	53	217	14
WGA-75M-080-H1	0.97	0.56	1632	0.91		1205	58	256	13

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100:1 NEMA Aluminum Worm Gearboxes

IronHorse NEMA Aluminum Worm Gearbox Specifications									
Part Number	Price	Nominal/ Actual Ratio	Center Distance (mm)	Input Sized for NEMA Motor Frame	NEMA Motor Face Type	Input Bore Diameter (in)	Output Bore Diameter (in)	Approx Weight (lb)	Drawing Links
WGA-40M-100-H1	$163.00	100:1	40	NEMA 56C	NEMA 56C	0.625	0.75in	5	PDF
WGA-50M-100-H1	$223.00		50		NEMA 56C		1in	8	PDF
WGA-63M-100-H1	$287.00		63		NEMA 56C		1.125in	13	PDF
WGA-75M-100-H1	$418.00		75		NEMA 56C		1.25in	19	PDF

IronHorse NEMA Aluminum Worm Gearbox Ratings								
Part Number	Maximum Ratings @ 1750 RPM Input (Mechanical/Thermal)			Nominal Motor HP @ 1800 RPM	Output RPM @ 1750 RPM Input	Overhung Load (lb)	Efficiency (%)	Thrust Load (lb)	Maximum Backlash (arc-minute)
	Input Power (hp)	Output Power (hp)	Output Torque (lb·in)						
WGA-40M-100-H1	0.15	0.07	244	0.14	17.5	595	47	130	22
WGA-50M-100-H1	0.28	0.13	462	0.26		866	46	179	16
WGA-63M-100-H1	0.57	0.27	992	0.51	18	1088	48	234	14
WGA-75M-100-H1	0.8	0.42	1517	0.74		1289	52	276	13

NEMA Aluminum Worm Gearbox Output Shaft Kits

IronHorse NEMA Aluminum Worm Gearbox Output Shaft Kits						
Part Number	Price	Fits	Output Shaft Type	Output Shaft Diameter	Typical Photo	Drawing Links
WGA-30M-ACC3	$15.50	WGA-30M NEMA series gearboxes	Single	0.625"		PDF
WGA-40M-ACC3	$17.50	WGA-40M NEMA series gearboxes		0.75"		PDF
WGA-50M-ACC3	$21.00	WGA-50M NEMA series gearboxes		1"		PDF
WGA-63M-ACC3	$27.50	WGA-63M NEMA series gearboxes		1.125"		PDF
WGA-75M-ACC3	$36.50	WGA-75M NEMA series gearboxes		1.25"		PDF
WGA-30M-ACC4	$21.00	WGA-30M NEMA series gearboxes	Double	0.625"		PDF
WGA-40M-ACC4	$24.00	WGA-40M NEMA series gearboxes		0.75"		PDF
WGA-50M-ACC4	$27.50	WGA-50M NEMA series gearboxes		1"		PDF
WGA-63M-ACC4	$37.50	WGA-63M NEMA series gearboxes		1.125"		PDF
WGA-75M-ACC4	$46.00	WGA-75M NEMA series gearboxes		1.25"		PDF

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Aluminum Worm Gearbox Accessories

IronHorse Aluminum Worm Gearbox Accessories			
Part Number	**Price**	**Description**	**Typical Photo**
WGA-30M-ACC1	$12.00	Output flange, for aluminum WGA-30M series gearboxes. Includes (4) mounting screws.	
WGA-40M-ACC1	$13.00	Output flange, for aluminum WGA-40M series gearboxes. Includes (4) mounting screws.	
WGA-50M-ACC1	$14.50	Output flange, for aluminum WGA-50M series gearboxes. Includes (4) mounting screws.	
WGA-63M-ACC1	$18.50	Output flange, for aluminum WGA-63M series gearboxes. Includes (8) mounting screws.	
WGA-75M-ACC1	$28.50	Output flange, for aluminum WGA-75M series gearboxes. Includes (8) mounting screws.	
WGA-30M-ACC2	$15.50	Torque arm, for aluminum WGA-30M series gearboxes. Includes (4) mounting screws.	
WGA-40M-ACC2	$17.50	Torque arm, for aluminum WGA-40M series gearboxes. Includes (4) mounting screws.	
WGA-50M-ACC2	$18.50	Torque arm, for aluminum WGA-50M series gearboxes. Includes (4) mounting screws.	
WGA-63M-ACC2	$29.50	Torque arm, for aluminum WGA-63M series gearboxes. Includes (8) mounting screws.	
WGA-75M-ACC2	$51.00	Torque arm, for aluminum WGA-75M series gearboxes. Includes (8) mounting screws.	
WGA-30M-ACC5	$6.50	Output cover, for aluminum WGA-30M series gearboxes. Includes (4) mounting screws.	
WGA-40M-ACC5	$6.50	Output cover, for aluminum WGA-40M series gearboxes. Includes (4) mounting screws.	
WGA-50M-ACC5	$12.00	Output cover, for aluminum WGA-50M series gearboxes. Includes (4) mounting screws.	
WGA-63M-ACC5	$12.00	Output cover, for aluminum WGA-63M series gearboxes. Includes (4) mounting screws.	
WGA-75M-ACC5	$12.00	Output cover, for aluminum WGA-75M series gearboxes. Includes (4) mounting screws.	

All accessories fit both NEMA and IEC input types.

Gearbox Selection Example (continued)
(Refer to the specifications tables for gearbox specifications, service factors, and K factors.)
Load requirements: Conveyor to run 10 hours/day; moderate shock loading; driven by V-belt @ approx 20 rpm;
                 requires 2700 in·lb of torque. Motor speed 1725 rpm (1800 rpm nominal).

7) Use the gearbox overhung load ratings from the specifications table to determine the minimum allowable pulley diameters.
    Select gearbox with **Overhung Load rating > overhung load force**:
    Gearbox required OHL rating = (gearbox real torque)(K)(SF)/(gearbox pulley diameter / 2)
    Minimum gearbox pulley diameter = (T)(K)(SF)(2)/(OHL rating)
    Conveyor pulley diameter = (gearbox pulley diameter)(pulley ratio)
    <u>For 10:1</u>, WG-175-010-x gearbox:
      Minimum gearbox pulley diameter = (312.86 in·lb)(1.5)(1.25)(2)/(650 lb) = 1.8" [use 2"]
      Conveyor pulley diameter = (2")(8.63) = ~~17.26"~~ [17.26" pulley size is prohibitively large]
      Determine pulley sizes and OHL for next larger gearbox ratio.
    <u>For 15:1</u>, WG-206-015-x gearbox:
      Minimum gearbox pulley diameter = (469.57 in·lb)(1.5)(1.25)(2)/(700 lb) = 2.5" [use 2.5"]
      Conveyor pulley diameter = (2.5")(5.75) = 14.38" [use 14.4"]
      Select **WG-206-015-x gearbox, 2.5" gearbox pulley**, and **14.4" conveyor pulley**.
    <u>For 20:1</u>, WG-206-020-x gearbox:
      N/A – larger ratio of same frame size GB is same price, yet provides lower efficiency and power characteristics
    <u>For 30:1</u>, WGA-63M-030-H1 gearbox:
      Minimum gearbox pulley diameter = (937.50 in·lb)(1.5)(1.25)(2)/(736 lb) = 4.78" [use 5"]
      Conveyor pulley diameter = (5")(2.88) = 14.40" [use 14.4"]
      N/A – WGA-63M & WG-325 gearboxes costs more than WG-206
    <u>For 40:1</u>, N/A – WG-325-xxx gearboxes cost more than WG-206 at any ratio
    <u>For 60:1</u>, N/A – WG-325-xxx gearboxes cost more than WG-206 at any ratio

8) **Check results** against original speed and torque requirements:
    a) Conveyor speed = (motor speed) / (gearbox ratio)(pulley ratio) = (1725 rpm) / (15)(14.4"/2.5") = 20 rpm
    b) Maximum real torque available at conveyor = (gearbox thermal torque)(pulley ratio) = (673 in·lb)(14.4"/2.5") = 3876 in·lb
    c) Maximum design torque available at conveyor = (gearbox mechanical torque)(pulley ratio) / (service factor)
                             = (1002 in·lb)(14.4"/2.5") / 1.25 = 4617 in·lb
    The speed is correct as required, and both maximum torque values are greater than the 2700 in·lb required by the load.

9) **Select a motor** and check torque transmitted to the load:
    From the gearbox spec tables, WG-206-015-x efficiency = 85%.
        maximum thermal input power = 1.40 hp
        maximum mechanical input power @ 1.0 SF = 2.09 hp
        maximum mechanical input power @ 1.25 SF = (rated max mechanical input power) / (SF) = 2.09 hp / 1.25 = 1.67 hp
        maximum allowable motor power = 1.40 hp; select nominal 1hp motor
    Select **1hp motor**, and check for adequate torque at the load:
        Torque = Power / Speed   **[conversion factor: (1hp) = (63,025 in·lb·rpm)]**
        Torque load = (63,025 in·lb·rpm / hp)(gearbox input hp)(gearbox efficiency) / (motor rpm / (gearbox ratio)(pulley ratio))
                 = (63,025)(1)(0.85) / (1725 / (15/1)(14.4/2.5)) = ~~2683 in·lb~~ [insufficient torque at load]
                This torque value is less than the 2700 in·lb required by the load.
    So, select and check the next larger nominal motor size, which is 1-1/2 hp.
    Since the 206 frame size 15 ratio gearboxes do not meet the 1-1/2 hp thermal rating, choose the WG-237-015-x gearbox.
    Select **1-1/2 hp motor** and **WG-237-015-x gearbox**, and check for adequate torque:
    WG-237-015-x gearbox efficiency = 84%
        maximum thermal input power = 1.55 hp
        maximum mechanical input power @ 1.25 SF = 2.64 hp / 1.25 = 2.11 hp
        maximum allowable motor power = 1.55 hp; select nominal 1-1/2 hp motor
        gearbox ratio is still 15:1, and OHL rating is increased to 900 lb, so the previous pulley calculations [step 7] remain sufficient
                [smaller pulleys can be calculated and selected for this gearbox, if desired]
        Tload = (63,025 in·lb·rpm/hp) (1.5hp) (84%) / (1725 rpm / (15/1)(14.4/2.5)) = 3977 in·lb > 2700 in·lb; sufficient torque at load

Final gearbox and motor selection: 1-1/2 hp motor   WG-237-015-x gearbox

IronHorse® Worm Gearboxes

Gearbox Selection Example (continued)
(Refer to the specifications tables for gearbox specifications, service factors, and K factors.)
[Load requirements: Conveyor to run 10 hours/day; moderate shock loading; driven by V-belt @ approx 20 rpm;
    requires 2700 in·lb of torque. Motor speed 1725 rpm (1800 rpm nominal).

7) Use the gearbox overhung load ratings from the specifications table to determine the minimum allowable pulley diameters.
 Select gearbox with **Overhung Load rating > overhung load force**:
 Gearbox required OHL rating = (gearbox real torque)(K)(SF)/(gearbox pulley diameter / 2)
 Minimum gearbox pulley diameter = (T)(K)(SF)(2)/(OHL rating)
 Conveyor pulley diameter = (gearbox pulley diameter)(pulley ratio)
 For 10:1, WG-175-010-x gearbox:
  Minimum gearbox pulley diameter = (312.86 in·lb)(1.5)(1.25)(2)/(650 lb) = 1.8" [use 2"]
  Conveyor pulley diameter = (2")(8.63) = ~~17.26"~~ [17.26" pulley size is prohibitively large]
  Determine pulley sizes and OHL for next larger gearbox ratio.
 For 15:1, WG-206-015-x gearbox:
  Minimum gearbox pulley diameter = (469.57 in·lb)(1.5)(1.25)(2)/(700 lb) = 2.5" [use 2.5"]
  Conveyor pulley diameter = (2.5")(5.75) = 14.38" [use 14.4"]
  Select **WG-206-015-x gearbox, 2.5" gearbox pulley**, and **14.4" conveyor pulley**.
 For 20:1, WG-206-020-x gearbox:
  N/A – larger ratio of same frame size GB is same price, yet provides lower efficiency and power characteristics
 For 30:1, WGA-63M-030-H1 gearbox:
  Minimum gearbox pulley diameter = (937.50 in·lb)(1.5)(1.25)(2)/(736 lb) = 4.78" [use 5"]
  Conveyor pulley diameter = (5")(2.88) = 14.40" [use 14.4"]
  N/A – WGA-63M & WG-325 gearboxes costs more than WG-206
 For 40:1, N/A – WG-325-xxx gearboxes cost more than WG-206 at any ratio
 For 60:1, N/A – WG-325-xxx gearboxes cost more than WG-206 at any ratio

8) **Check results** against original speed and torque requirements:
 a) Conveyor speed = (motor speed) / (gearbox ratio)(pulley ratio) = (1725 rpm) / (15)(14.4"/2.5") = 20 rpm
 b) Maximum real torque available at conveyor = (gearbox thermal torque)(pulley ratio) = (673 in·lb)(14.4"/2.5") = 3876 in·lb
 c) Maximum design torque available at conveyor = (gearbox mechanical torque)(pulley ratio) / (service factor)
    = (1002 in·lb)(14.4"/2.5") / 1.25 = 4617 in·lb
 The speed is correct as required, and both maximum torque values are greater than the 2700 in·lb required by the load.

9) **Select a motor** and check torque transmitted to the load:
 From the gearbox spec tables, WG-206-015-x efficiency = 85%.
   maximum thermal input power = 1.40 hp
   maximum mechanical input power @ 1.0 SF = 2.09 hp
   maximum mechanical input power @ 1.25 SF = (rated max mechanical input power) / (SF) = 2.09 hp / 1.25 = 1.67 hp
   maximum allowable motor power = 1.40 hp; select nominal 1hp motor
 Select **1hp motor**, and check for adequate torque at the load:
   Torque = Power / Speed   **[conversion factor: (1hp) = (63,025 in·lb·rpm)]**
   Torque load = (63,025 in·lb·rpm / hp)(gearbox input hp)(gearbox efficiency) / (motor rpm / (gearbox ratio)(pulley ratio))
    = (63,025)(1)(0.85) / (1725 / (15/1)(14.4/2.5)) = ~~2683 in·lb~~ [insufficient torque at load]
     This torque value is less than the 2700 in·lb required by the load.
   So, select and check the next larger nominal motor size, which is 1-1/2 hp.
   Since the 206 frame size 15 ratio gearboxes do not meet the 1-1/2 hp thermal rating, choose the WG-237-015-x gearbox.
 Select **1-1/2 hp motor** and **WG-237-015-x gearbox**, and check for adequate torque:
  WG-237-015-x gearbox efficiency = 84%
   maximum thermal input power = 1.55 hp
   maximum mechanical input power @ 1.25 SF = 2.64 hp / 1.25 = 2.11 hp
   maximum allowable motor power = 1.55 hp; select nominal 1-1/2 hp motor
   gearbox ratio is still 15:1, and OHL rating is increased to 900 lb, so the previous pulley calculations [step 7] remain sufficient
     [smaller pulleys can be calculated and selected for this gearbox, if desired]
   Tload = (63,025 in·lb·rpm/hp) (1.5hp) (84%) / (1725 rpm / (15/1)(14.4/2.5)) = 3977 in·lb > 2700 in·lb; sufficient torque at load

Final gearbox and motor selection: 1-1/2 hp motor   WG-237-015-x gearbox