

CONDENSED GLOSSARY OF MOTOR AND GEARING 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 reducer — using it to increase speed rather than reduce speed. Worm gear reducers are not suitable for service as speed increasers.

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 measure at a specific radius at the output shaft.

Centre Distance - A basic measurement or size reference for worm gear reducers, measured from the centreline of the worm to the centreline of the worm wheel.

Drip-Proof - Venting in end frame and/or main frame located to prevent drops of liquid from falling into motor within 15 angle from vertical. Designed for use in areas that are reasonably dry, clean, and well ventilated (usually indoors). If installed outdoors, it is recommended that the motor be protected with a cover that does not restrict the flow of air to the motor.

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

Explosion-Proof Motors - These motors meet Underwriters Laboratories and Canadian Standards Association standards for use in hazardous (explosive) locations, as indicated by the UL label affixed to the motor. Locations are considered hazardous because the atmosphere does or may contain gas, vapor, or dust in explosive quantities.

Flanged Reducer - Usually used to refer to a reducer 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.

Gear+Motor™ - LEESON's registered trademark for a separable gear and NEMA C face motor as opposed to an integral gearmotor. Integral gearmotors suffer from lack of application and availability constraints as well as having inherent service issues when one or the other component needs replacement.

Input Horsepower - The power applied to the input shaft of a reducer. The input horsepower rating of a reducer is the maximum horsepower the reducer can safely handle.

Mechanical Rating - The maximum power or torque a reducer can transmit. LEESON reducers typically have a safety margin equal to 200% or more of its mechanical rating allowing momentary overloads during start-up or other transient overload conditions.

Motor Selection - See the technical section of LEESON's Stock Motor Catalogue 1050, request LEESON's book, Practical Motor Basics or contact LEESON's District Office for expert assistance.

Mounting Position - The relationship of the input and output shafts of a reducer relative to horizontal.

Output Horsepower - The amount of horsepower available at the output shaft of the reducer. Output horsepower is always less than the input horsepower due to the efficiency of the reducer.

Overhung Load - A force applied at right angles to a shaft beyond the shaft's outermost bearing. This shaft-bending load must be supported by the bearing. Overhung load ratings are listed for each reducer size and should not be exceeded.

Prime Mover - In industry, the prime mover is most often an electric motor. Occasionally engines, hydraulic or air motors are used. Special application 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. As a matter of safety, no LEESON reducer should be considered self-locking.

Service Factor for Gearing - A method of adjusting a reducer's load carrying characteristics to reflect the application's load characteristics. AGMA (American Gear Manufacturer's Association) has established standardized service factor information.

Service Factor for Motors - Refers to a motor's ability to handle a load greater than the motor's rated HP on a continuous basis. Most LEESON motors have a continuous duty service factor of 1.15 or higher. This ability of the motor is intended to handle momentary or transient overloads or unusual service conditions and should not be utilized when sizing motors for continuous service. For assistance in motor selection please contact your LEESON's District Office.

Thermal Rating - The power or torque a reducer can transmit continuously. This rating is based upon the reducer's ability to dissipate the heat caused by friction.

Thrust Load - Force imposed on a shaft parallel to a shaft's axis. Thrust loads are often induced by the driven machine. Take care to be sure the thrust load rating of the reducer is sufficient that its shafts and bearings can absorb the load without premature failure.

Totally Enclosed Non-Ventilated (TENV) - No vent openings, tightly enclosed to prevent the free exchange of air, but not airtight. Has no external cooling fan and relies on convection for cooling. Suitable for use where exposed to dirt or dampness, but not for hazardous (explosive) locations.

Totally Enclosed Fan Cooled (TEFC) - Same as the TENV except has external fan as an integral part of the motor, to provide cooling by blowing air around the outside frame of the motor.

WORM GEAR REDUCER SERVICE FACTORS

Proper determination of an application's service factor characteristics is critical for maximum reducer life and trouble free service. See the definition of service factor in the glossary.

All worm reducers and LEESON Gear+Motor motorized reducers are sized for applications having an AGMA defined service of 1.0, unless otherwise stated. (Alternately, 1.0 service factor is sometimes expressed as "Class I Service".) Reducers in such applications operate on a continuous duty basis, for 10 hours per day or less, and are free of recurrent shock loads. When operating characteristics are different than noted, the input horsepower and torque ratings listed must be divided by the service factor selected from the table below. This table applies to reducers with an electric or hydraulic motor input.

SPECIAL APPLICATION CONSIDERATIONS

CAUTION: Please contact LEESON for assistance in applications not listed or for applications with unusual characteristics. Including the following:

- Input speeds not listed in catalogue
- Frequent starting or repetitive shock applications
- Selection of reducers for man lifts or people moving equipment
- High energy loads, including stalling
- Starting or momentary overloads exceeding 200% of gear reducer mechanical capacity (100% overload)

SERVICE FACTOR TABLE

Duration of Service (Hours per day)	Uniform Load	Moderate Shock	Heavy Shock	Extreme Shock
Occasional 1/2 Hour	--*	--*	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
Over 10 Hours	1.25	1.50	1.75	2.00

* Unspecified service factors should be 1.00 or as agreed upon by the user and manufacturer.

When a single or multi-cylinder engine is the input power, the service factor selected from the table above should be increased by multiplying the value by the factor selected from the table below.

Service Factor Conversion Table for Engine Driven Applications.

Hydraulic or Electric Motor	Single Cylinder Engines	Multi-Cylinder Engines
1.00	1.50	1.25
1.25	1.75	1.50
1.50	2.00	1.75
1.75	2.25	2.00
2.00	2.50	2.25

On the next page, AGMA standardized service factor data is listed for a wide variety of applications operating 3 to 10 hours per day and for 10 hours or more per day.

U.L., CSA, ISO AND OTHER STANDARDS & APPROVALS – MOTORS

UNDERWRITERS LABORATORIES INC.

- All motor models listed with prefix “C” have U.L. component recognition (without thermal overload). File Number E57948, Guide Number PRGY2.
- All units have U.L. recognized Class B, F or H insulation systems unless otherwise noted. File Number E55555, Guide Number OBJY2.
- Single phase motors with a model number prefix of “A” or “M” (automatic or manual protectors) have U.L. recognized protector winding combinations and component recognition. File Number E57955, Guide Number XEWR2.
- Three phase motors with a model number prefix of “A” or “M” (automatic or manual protectors) have U.L. recognized protector winding combinations plus have capability of providing U.L. recognized primary single phasing which is included in our U.L. file E57955, Guide Number XEWR2.
- Explosion-Proof, single and three phase for 56, 143T and 145T frames: File Number E75276, Guide Number PTDR.
Explosion-Proof motors 182T and larger: File Number E12044, Guide Number PTDR.
Explosion-Proof motors DC motors 48 frame: File Number E75276, Guide Number PTDR.
- Permanent Magnet DC motors except PZ and P300 gearmotors are recognized components under File Number E57948, Guide Number PRGY2.
- PZ and P300 Permanent Magnet DC gearmotors: File number E49849 or E49747, Guide Number PRGY2.
- Speedmaster SCR Drives, Component Recognition, File E132235, Guide Number NMMS2, except catalog numbers 174902 and 174903.
- Speedmaster SCR Drives, catalog numbers 174902 and 174903. File Number E154901, Guide Number NMFT2.
- Speedmaster AC Adjustable Speed Drives, File Number E161242. Canadian UL covered by File Number E161242 also, Guide Number NMMS.

CANADIAN STANDARDS ASSOCIATION

- Motor construction for all single and three phase NEMA 42 through S254T frame, IEC/metric 63 through 90L frame, and all sub-fractional horsepower motors: Report Number L33543, Guide Number 260-0-0.
- Motor construction for all steel or cast iron three phase NEMA 182T through 447T frame and IEC/metric 100L through 250M frame motors: Report Number LR62104.
- Thermally protected single phase motors through 7½ HP, Report Number LR33543.
- All Farm Duty motors 1/3 HP through 7½ HP, Report Number LR33543
- Explosion proof single and three phase for 56, 143T and 145T frames: File Number LR47667.
Explosion-Proof motors 182T and larger: File Number LR21839 and LR47504.
Explosion-Proof DC motors 48 frame: File Number LR701080.
- Permanent Magnet DC motors are listed under File Number LR33543.
- Multi-Speed Motors, steel or cast iron, 182T through 447T frames are listed under file number LR33543.
- Speedmaster SCR Drives, catalog numbers 174902 and 174903. File Number LR75790.

MOTOR EFFICIENCY VERIFICATION

Energy Efficiency Verification - Full load efficiency ratings of three phase, single speed, NEMA/EEMAC Design A or B squirrel cage induction motors, 1 through 200 HP, 230, 460 or 575 volts, 60 Hz, in totally enclosed and open, drip-proof enclosures for non-hazardous applications, CSA Report Number EEV 78720-1. Tested to CSA 390 (IEEE 112B) Standards. The Grafton testing facility is qualified for CSA energy efficiency performance testing of polyphase induction motors. The Grafton Testing Facility is NVLAB recognized for energy efficiency testing of electric motors to EPACT requirements of the Department of Energy.

ISO QUALITY CERTIFICATION

Grafton and Saukville, Wisconsin administrative, design and manufacturing facility, ISO 9001, Certificate Number RvC #93-102. EN29001, BS5750: Part 1 and ANSI/ASQC Q91-19.

Black River Falls, Wisconsin manufacturing facility, ISO 9002, Certificate Number RvC #93-090.

Mississauga (Toronto), Ontario, administrative, distribution facility, ISO 9002, Certificate Number QMI #003027.

Hanover, Ontario, manufacturing facility, ISO 9002, Certificate Number QMI #003028.

BAKING INDUSTRY SANITATION STANDARDS COMMITTEE

WASHGUARD® II, stainless steel washdown duty motors, NEMA frames 56, 143T, 145T, 182T and 184T are certified to Standard No. 29 for Electric Motors and Accessory Equipment, authorization number 769. The WBMQ Series of gear reducers are BISSC certified to Standard No. 29 for Electric Motors and Accessory Equipment, authorization number 941.

SAUDI ARABIAN STANDARDS ORGANIZATION

SCCP Ref. No.: R-100157

The CE Mark

CE is an acronym for the French phrase “*Conformite Europeene*” and is similar to the UL or CSA marks of North America. However, unlike UL or CSA which require independent laboratory testing, the CE mark can be applied by the motor manufacturer through “self certifying” that its products are designed to the appropriate standards. The European Union has issued 24 directives related to the CE mark. Three Directives apply to electric motors.

Low Voltage Directive (73/23/EEC) This directive applies to electrical equipment operating in the voltage range of 50-1000 volts AC or 75-1500 volts DC. Virtually all LEESON motors (except low voltage DC) are included in this directive.

Based on our testing to the applicable electrical and mechanical standards EN60034 and IEC 34, LEESON certifies conformity to this directive. All three phase 50 Hz stock motors comply with the nameplate designations, lead markings and connection diagrams required. A “Declaration of Conformity” accompanies these motors and a CE label is applied.

Machinery Directive (89/3392/EEC) This directive applies to machinery that may contain certain motors. This is an issue with equipment manufacturers and requires the use of a motor meeting the Low Voltage Directive and requires a “Declaration of Incorporation” document which means that only the motor complies with the requirements of the Low Voltage Directive. A CE label is applied to the motor but it remains the responsibility of the equipment manufacturer to obtain certification for the finished product.

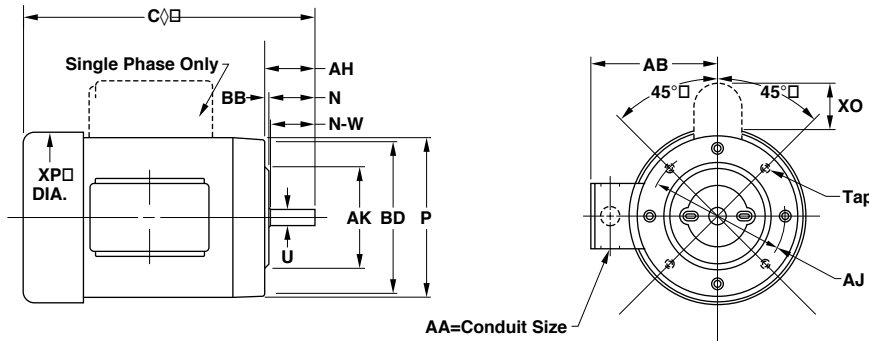
Electromagnetic Compatibility (EMC) Directive (89/336/EEC) This directive addresses the final product and is again a concern for the equipment manufacturer. Since this Directive addresses electromagnetic interference (EMI) concerns, it does not affect three phase AC motors because they do not produce EMI. DC motors, however, do produce EMI. How much of the “noise” is emitted outside the machine depends on a host of factors. LEESON’s Engineering Department can assist OEM’s in applying DC motors in machinery destined for Europe and requiring certification to the EMC Directive.



MOTOR DIMENSIONS

AC & DC MOTORS • NEMA C FACE

CRITICAL MOUNTING DIMENSIONS



The condensed dimensions shown on these pages are for general reference only and are not for construction. The “C” and “AG” dimensions for each catalog item are included in this catalog. Certified drawings of all ratings are available for construction purposes.

NEMA SHAFT AND KEYWAY DIMENSIONS ■ (Inches)

NEMA SHAFT (U)	KEYWAY DIMENSIONS (R) (S)		NEMA SHAFT (U)	KEYWAY DIMENSIONS (R) (S)	
	(R)	(S)		(R)	(S)
5/8	33/64	3/16	2-3/8	2-1/64	5/8
7/8	49/64	3/16	2-1/2	2-3/16	5/8
1-1/8	63/64	1/4	2-7/8	2-29/64	3/4
1-3/8	1-13/64	5/16	3-3/8	2-7/8	7/8
1-5/8	1-13/32	3/8	3-7/8	3-5/16	1

■ S is keyway width.
U minus R is keyway depth.

NEMA DIMENSIONS (Inches)

Frame Size ▲	N	P	U	N-W	AA	AB	AH	AJ	AK	BB	BD	XO	XP	TAP	KEY
S56	1 ¹⁵ / ₁₆	5 ¹⁹ / ₃₂	5/8	1 ⁷ / ₈	1/2	4 ⁷ / ₈	2 ¹ / ₁₆	5 ⁷ / ₈	4 ¹ / ₂	1/8	6 ¹ / ₂	2 ¹ / ₄	5 ⁷ / ₈	3/8-16	3/16
56		6 ¹⁹ / ₃₂				5 ⁵ / ₁₆							7 ⁵ / ₃₂		
143T	2 ³ / ₈	6 ¹⁹ / ₃₂	7/8	2 ¹ / ₄	3/4	5 ⁵ / ₁₆	2 ¹ / ₈	5 ⁷ / ₈	4 ¹ / ₂	1/8	6 ¹ / ₂	2 ¹ / ₄	7 ⁵ / ₃₂	3/8-16	3/16
145T						5 ⁵ / ₁₆							7 ⁵ / ₃₂		
182T	2 ⁷ / ₈	8 ¹⁵ / ₃₂	1 ¹ / ₈	2 ³ / ₄	3/4	6 ³ / ₈	2 ⁵ / ₈	7 ¹ / ₄	8 ¹ / ₂	1/4	8 ⁷ / ₈	2 ¹ / ₄	9 ³ / ₃₂	1/2-13	1/4
184T						6 ³ / ₈							9 ³ / ₃₂		
S213T	3 ¹ / ₂	8 ¹⁵ / ₃₂	1 ³ / ₈	3 ³ / ₈	3/4	6 ³ / ₈	3 ¹ / ₈	7 ¹ / ₄	8 ¹ / ₂	1/4	8 ⁷ / ₈	2 ¹ / ₄	9 ³ / ₃₂	1/2-13	5/16
213T						6 ³ / ₈					9 ³ / ₃₂				
215T	—	10 ¹³ / ₁₆	1 ³ / ₈	3 ³ / ₈	1	8 ⁵ / ₁₆	3 ¹ / ₈	7 ¹ / ₄	8 ¹ / ₂	1/4	9	2 ¹ / ₄	11 ³ / ₃₂	1/2-13	5/16
254TC	—	13 ¹ / ₄	1 ⁵ / ₈	4	1 ¹ / ₄	11 ⁵ / ₈	3 ³ / ₄	7 ¹ / ₄	8 ¹ / ₂	1/4	9 ⁵ / ₈	—	12 ⁷ / ₈	1/2-13	3/8
256TC						11 ⁵ / ₈					9 ⁵ / ₈				

▲ Blue shading denotes dimensions established by NEMA standard MG1, others are unique to LEESON, and will vary with each manufacturer.
◊ Motors on pages 154-162 for “C” dimension.

For information on **LEESON's** complete line of off-the-shelf motors, gearmotors and drives, request **Stock Catalog 1050**.