

RPM AC MODIFICATION INDEX

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V*S Master Motors

RPM AC Motors
1/3 - 2 HP

RPM AC Motors
2 - 1,000 HP

Large AC Motors

Small, Medium & Large DC Motors

RPM AC MODIFICATION SECTION

Frames FL180- L440/IEC FDL112-DL280)

ADAPTER RAILS

For adapting an RPM AC motor to match a larger shaft height and footprint of larger frame NEMA AC or DC motor. If rail height exceeds 4 inches, use price shown times 1.5.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Rails-Adapter	List Price	\$ 320	\$630	\$740	\$ 900	\$1,125	\$1,563	\$1,875	\$2,450

AIR PRESSURE SWITCH

Monitors pressure differential between inside and outside of motor to actuate SPDT switch when pressure drops below preset value giving an immediate indication that the air supply to the motor is reduced. Applicable to forced ventilated motors with either motor mounted blower or separately forced ventilated by customer supplied air. Since motors dependent on force ventilation will have a rapid rise in temperature after the air supply is interrupted, the customer must take immediate corrective action when the switch trips. Contacts rated 15 amps, 120-480 volts, 60 Hz AC resistive; 1/8 HP at 125 volts; 1/4 HP at 250 volts, 60Hz AC. Applicable to frames RL210 thru L400.

Switch	List Price	For All NEMA / IEC Frames
Standard		\$585
Weatherproof / Explosion Proof ⁽¹⁾		855

Note: Mounted on motor bracket at air inlet end.

(1) THE ADDITION OF THIS MODIFICATION DOES NOT PROVIDE A UL LISTED EXPLOSION PROOF MOTOR.

ALTITUDE

For machines suitable for operation at altitudes greater than the standard of 3300 feet, use the following pricing chart. Applicable to all enclosures. Frame may change. Use RPM AC Wizard to determine frame size. If frame is selected by Wizard and the list price of the larger frame at same base speed is used, no % adder, from table, is required.

High Altitude	3301 - 8800 ft	Add 10% of basic motor list for all NEMA / IEC frames.
	8801 - 15000 ft	Add 22% of basic motor list for all NEMA / IEC frames.

Note: Standard guarantees are made on the basis that the motor will operate at an altitude from sea level to 3300 feet per NEMA MG1.

AMBIENT TEMPERATURE

For motors suitable for operation in ambients greater than 40° C, use the following pricing chart. Frame size may change. Please contact Reliance Electric Motor Marketing for proper frame size or use RPM AC Motor Wizard selection tool. If frame is selected by Wizard and the list price of the larger frame at same base speed is used, no % adder, from table, is required.

High Ambient	41° C to 60° C	Add 10% of basic motor list for all NEMA / IEC frames.
	65° C	Add 22% of basic motor list for all NEMA / IEC frames.

For motors suitable for operation in ambients lower than -25° C, use the following pricing chart. Standard motor ratings are suitable for ambient temperatures down to -25° C. Note: Motor should have space heater added to prevent condensation of moisture when unenergized.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Low Ambient ⁽¹⁾	List Price	\$510	\$660	\$820	\$1,400	\$1,875	\$2,250	\$2,850	\$3,125
From -25° C to -40° C									

(1) Low temperature grease, XT or IP54 construction and high tensile strength shaft material provided as required.

BALANCE, DYNAMIC

Note: Standard Reliance motors are manufactured in accordance with the vibration limits stated in NEMA MG1, Part 7.

Use the following pricing chart for Machine Vibration Limits. For further information on Dynamic Balance, please refer to the Application Data Section for Dynamic Balance.

Special Machine Vibration Limits (NEMA Standard)			
Unfiltered Vibration / Velocity Peak (inch/sec)			
Speed, RPM	Standard	Ultra Standard	Precision
0-1200	0.15	0.08	0.04
1201-1800	0.15	0.08	0.04
1801-3600	0.15	0.1	0.06
3601-5000	0.2	0.12	0.06
5001-8000 ⁽²⁾	0.2	0.12	0.08

Special Machine Vibration Limits (IEC Standard)			
Unfiltered Vibration / Velocity Peak (mm/sec RMS)			
Speed, RPM	Grade N	Grade R	Grade S
0-1200	2.7	1.4	0.7
1201-1800	2.7	1.4	0.7
1801-3600	2.7	1.8	1.1
3601-5000	3.6	2.2	1.1
5001-8000 ⁽²⁾	3.6	2.2	1.4

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Vibration Category	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Standard / Grade "N" ⁽¹⁾		Standard For All Frame Sizes							
Ultra-Standard / Grade "R"		\$130	\$130	\$130	\$170	\$260	\$260	\$310	\$650
Precision / Grade "S"	425	425	425	800	1,605	1,605	2,300	2,500	

(1) Standard balance is normally equivalent to vibration Grade "N", according to DIN ISO 2373 (i.e. rotors are dynamically balanced with inserted key). For increased requirements on mechanical balancing, vibration Grade "R" or "S" can be achieved by the addition of the modifications shown above. Refer to the Application Section for limiting values of vibration velocity.

BEARINGS, ROLLER

Roller Bearings – Provides for roller bearings and special shaft on frames UFL180-UL440 used for belted drive. Refer to the Application Data Section for minimum sheave diameter and center-to-center distance. Details of the drive system must accompany the order. Belted drive applications not meeting the standard minimum sheave diameters, etc., require special pricing for mounting of customer's finished bore sheave.

Note: Not available with precision balance or custom high speed motors

		Frame Designation: NEMA / IEC							
		UFL180	UFL210 ⁽¹⁾⁽²⁾	UFL250 ⁽¹⁾⁽²⁾	UL280	UL320	UL360	UL400	UL440
Roller Bearing	List Price	UFDL112	UFDL132 ⁽¹⁾⁽²⁾	UFDL160 ⁽¹⁾⁽²⁾	UDL180	UDL200	UDL220	UDL250	UDL280
		\$410	\$410	\$460	\$510	\$550	\$590	\$1,870	\$2,550

(1) Includes URLand URDL frames also

(2) All FL & RL210 & 250 frames are suitable for **coupled and belted** duty in most application with **standard oversized ball bearings**. See Radial Load Capacity in Application Section

BEARING CURRENT PROTECTION

Inpro Seal with Grounding Ring - This is a bronze non-contact labyrinth bearing isolator with an integrated shaft grounding ring (SGR™) device designed to minimize shaft currents. Reliance Electric has demonstrated under laboratory conditions that this device will significantly reduce shaft voltage that can lead to shaft currents and damage to the motor bearings. This device should be used in conjunction with proper grounding procedures and **not** in lieu of proper motor grounding. Proper high frequency motor grounding back to the adjustable frequency drive is still required. For proper grounding procedures consult the AF drive instruction manual.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Horizontal - Drive End	List Price	\$460	\$460	\$460	\$480	\$500	\$580	\$700	\$760
Horizontal - Both Ends		920	920	920	960	1,000	1,160	1,400	(1)

(1) L440 frames have an insulated opposite drive end bearing as standard. Shaft grounding brush is not available on the opposite drive end of L440 frames.

Insulated Bearings – Provides for insulated bearing on O.D.E and or D.E. of the RPM AC motor. An O.D.E. insulated bearing is standard on all L440 frame sizes. Use the following pricing chart for single insulated bearing.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 ⁽¹⁾
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280 ⁽¹⁾
Insulated Bearing	List Price	\$2,000 Per Bearing For All Frame Sizes							

(1) Single Insulated Bearing is standard on O.D.E.

Current Shield Technology – Provides protection from one source of motor bearing currents by eliminating the capacitive coupling between the AC motor stator windings and the rotor core. AC motors that are powered by fast switching pulse width modulated (PWM) inverters, experience high frequency (up to several MHz transitions) voltage pulses with respect to motor ground. This high frequency voltage on the stator can cause capacitively coupled currents to flow from the stator to the rotor, with a return path through the motor bearings, to the motor ground and back and to the inverter ground. This path creates current through the motor bearing(s) and / or through the motor shaft coupling to the driven equipment bearings, possible causing premature bearing failure.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Current Shield ⁽¹⁾	List Price	\$1,150	\$1,150	\$1,950	\$1,950	\$1,950	\$2,650	\$2,650	\$4,325

(1) Not available on 575v motors.

BRAKES & BRAKE MODIFICATIONS

Disc Type AC Magnetic, Electrical Release, Spring Set

TABLE I – Opposite Drive End – For best price the solenoid actuated brake is normally specified. For all enclosures other than TEAO inline blower cooled and L400 frame TEFC, an opposite drive end brake can be used. If TEAO is required, make addition for TEAO piggyback blower – Add to TEAO inline blower cooled basic list price. **Motor mounting position, i.e., horizontal or vertical must be specified on the order.** For some combinations of brake and motor, the brake may extend below the motor feet. Special motor mounting is required to provide clearance. Refer to Reliance Electric for special brakes and for brakes of special manufacturer. Manual Release – standard on all Stearns brakes. Add space heater on brakes, when required. **For Brake Space Heater, see Space Heater Modification.**

Brakes & Encoders - For recommended encoders with opposite drive end brake, see Feedback Devices.

TABLE II – Drive End – Use when coupling a C-face motor to a C-face gear reducer. The brake is Stearns double C-face 87,700 series, mounted on the drive end. Motor mounting positions, i.e. horizontal or vertical, must be specified on the order. **Note:** Drive end mounted brakes are not suitable for belted duty or any overhung load on the brake output shaft. **Manual Release – standard on all Stearns brakes.** Add space heater on brakes, when required. For Brake Space Heater, see Space Heater Modification.

Class 1 Division 2 Brakes – Opposite drive end brakes from 6 - 105 ft-lb. are available. Contact Reliance Electric for pricing.

		TABLE I				TABLE II			
		Opposite Drive End				Drive End ⁽⁴⁾			
		Solenoid Actuated Brake		Armature Actuated Brake		Solenoid Actuated Brake			
		AC Coil ⁽⁸⁾		115, 230 or 460V 1-Phase ⁽⁵⁾		AC Coil			
Nominal Brake Torque (ft-lbs) ⁽¹⁾⁽³⁾		(230/460v 1-phase 60Hz) ⁽²⁾				(230/460v 1-phase 60Hz) ⁽²⁾			
		NEMA 2 IP23 Standard Enclosure	NEMA 4 IP54 Dust-Tight & Waterproof	NEMA 2 IP23 Standard Enclosure	NEMA 4 IP54 Dust-Tight & Waterproof ⁽⁶⁾	NEMA 2 IP23 Standard Enclosure	NEMA 4 IP54 Dust-Tight & Waterproof	NEMA 2 IP23 Standard Enclosure	NEMA 4 IP54 Dust-Tight & Waterproof
3	List Price	\$758	\$888	\$1,018	\$1,133	-	-	-	-
6		758	944	1,095	1,229	-	-	-	-
10		971	1,013	-	-	2,439	2,975	-	-
12		-	-	1,292	1,476	-	-	-	-
15		1,041	1,154	-	-	2,497	3,050	-	-
25		1,181	1,575	1,843	2,165	2,544	3,110	-	-
35		1,391	1,744	-	-	2,625	3,205	-	-
45		-	-	2,365	2,817	-	-	-	-
50		1,604	1,998	-	-	2,755	3,390	-	-
60		-	-	3,041	3,663	-	-	-	-
75		2,166	2,644	-	-	3,610	4,330	-	-
105		2,813	3,375	-	-	3,860	4,625	-	-
110		-	-	6,887	8,470	-	-	-	-
125		3,798	4,500	-	-	-	-	-	-
175		5,373	6,216	-	-	-	-	-	-
180		-	-	7,423	9,139	-	-	-	-
230		6,048	6,948	-	-	-	-	-	-
330		9,923	10,317	10,995	13,604	-	-	-	-
440		10,907	10,963	-	-	-	-	-	-
550		13,482	14,790	-	-	-	-	-	-
750	15,004	16,356	-	-	-	-	-	-	
1000	16,191	17,541	-	-	-	-	-	-	
1250 ⁽⁷⁾					\$22,500				

(1) Nominal Static Torque (ft-lbs) = (HP X 5252) / (Motor Base Speed)

(2) Add \$50 list for 115 VAC coil.

(3) Maximum Speed:

ft-lbs	3-25	35-105	125-1000
rpm	5000	4000	1800

(4) For coupled duty only.

(5) Direct Acting (Armature Actuated) Disc Brakes are common on automotive applications and are available with wide range of DC input voltages, in addition to the AC voltages shown.

(6) Internal Manual Release is standard on IP54 Armature Actuated Brakes.

(7) Contact Reliance Electric

(8) For DC coil instead of AC, rated 115V or 230V DC, add 15% to brake price shown

RPM AC Inverter Duty Motor - Modifications

BRAKE LIMIT SWITCH

Indicates condition of brake. Specify if switch is to be OPEN or CLOSED when brake coil is energized.

Switch	List Price	\$310
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BRAKE PROVISIONS

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
DPFV, TENV, TEBC ⁽¹⁾	List Price	\$325	\$550	\$650	\$935	\$1,100	\$1,420	\$1,940	\$2,350
TEFC		450	675	775	1,060	1,225	1,545	2,065	2,475

(1) For TEBC FL180/FDL112 - L400, add for TEAO Piggyback Blower.

BRAKE SPACE HEATER

Heater ⁽¹⁾	List Price	\$280
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(1) 115V or 230V Single Phase only. Not available for Division 2 classified Motors.

BRAKE WHEEL

Mounting of customer's finished bore brake wheel on motor opposite drive end shaft extension. Wheel must be finish bored, balance and keyseated for mounting on standard Reliance opposite drive end shaft extension. A Standard Opposite Drive End Shaft must be added in addition to this modification. Price does not include brake wheel, which must be received at plant, eight weeks prior to motor shipment with customer tag attached. Contact Product Marketing for price to mount larger brake wheels.

Brake Wheel Diameter (Inches)	List Price
23 or less	\$1,600

CONDUIT BOX (TERMINAL HOUSING)

Standard construction for frames FL180 through L360 provides a gasketed, stamped steel box and cover. Boxes can be rotated in 90 degree increments, and located in any quadrant as long as accessories are not in the same quadrant.

Standard construction for frames L400 through L440 are heavy gauge mill type conduit boxes which can be mounted on either side or the top of the motor as long as not in the same quadrant as the blower.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
One Size Larger C/B	List Price	\$49	\$49	\$68	\$113	\$180	\$225	N/A	N/A
Cast Iron C/B		85	135	180	245	290	540	N/A	N/A
Mill Type C/B ⁽¹⁾		N/A	270	450	630	900	1,080	Std.	Std.
Oversize Mill Type C/B		—	—	—	—	—	—	1,200	1,200
Auxiliary C/B		N/A	207	207	377	377	377	440	440
Explosion Proof C/B ⁽²⁾		N/A	850	850	1,075	1,075	1,340	1,410	1,650
C/B Location ⁽³⁾		N/A	N/C						

(1) Heavy gauge, large rectangular metal box. Standard on L400 frames and L440 frames. See Dimension Sheet 616779-001.

(2) Add to Pipe-In, Pipe-Out Separately Ventilated Motor. This modification is required to provide a motor in a Class 1 Group D, Div. I environment. Maximum size box is limited to 500 Amps. See Application Section for Div. I purged motor requirements. All accessories must be listed and labeled for same Class 1 Group as the motor.

(3) See page M-79 for standard terminal box locations. Conduit Box location may be ordered as L-1, F-2 or F-3 (top), as long as there is no accessory or blower mounted in same location. F-3 not available on FL180 DPFV. Totally Enclosed (TENV, TEBC or TEFC) FL/RL210, FL/RL250 through L400 frames come standard with top mounted conduit box. Drip Proof Force Ventilated (DPFV) FL180 - L440 frames and TEAO P/B L440 frames come standard with F-1 Mounted conduit box. Contact Reliance Electric for drive end mounted conduit box.

RPM AC Inverter Duty Motor - Modifications

V*S Master Motors

COUPLINGS

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Customer Supplied Coupling	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Finished Bore ⁽¹⁾		\$650				\$875			

(1) Finished bore coupling must be received at plant five weeks prior to shipment with customer property tag attached. Coupling to be mounted to motor shaft.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Insulated Encoder Coupling ⁽¹⁾	Net Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
		\$400 All Frames							

(1) Provides protection from motor bearing currents reflected onto the encoder.

RPM AC Motors
1/3 - 2 HP

COVERS

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Splash proof Covers ⁽¹⁾	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
		\$210	\$318	\$405	\$405	\$405	\$405	\$608	\$608

(1) For dripproof machines to meet NEMA MG1 - 1.25.2 requirements for splash proof enclosures. Provides protection against liquid drops or solid particles from entering the motor at any angle not greater than 100 degrees downward from the vertical.

RPM AC Motors
2 - 1,000 HP

DOCUMENTATION

When requested on the order, a certified dimension sheet and typical performance data will be furnished at no charge.

Certified Routine Test Report	\$ 50 Net / Motor
Certificate of Compliance	\$ 40 Net / Motor
Custom Autocad Scaled Dimension Sheet	\$300 Net

(Scaled drawings available for most stock model numbers)

DRAIN PLUGS

Automatic Breather Drain ⁽¹⁾	List Price	\$120
Corrosion-Proof "T" Drain ⁽¹⁾		30

(1) Drain Plugs are at the lowest point of the motor.

Large AC Motors

Small, Medium & Large DC Motors

ENCLOSURE MODIFICATIONS / ENHANCEMENTS

Separately Ventilated (IC17 - IC37) – For applications where ventilated air is piped into the machine from an external source, basic DPG-FV enclosures may be separately ventilated at 3, 6, 9 and 12 o'clock for the below list price deductions, (L180 ventilated at 12 o'clock only, exit atmosphere). The inlet pipe can be fastened to one end bracket, and, if required and specified, an outlet pipe can be fastened to the other end bracket. Price does not include blower or pipe. Locations of air entry and air exhaust, if used, should be specified on order. Motors must not be operated without the separate air supply. Refer to Application Data Section for separate ventilating air requirements. (To insure adequate protection of a separately ventilated motor against loss of cooling air, an over temperature device for interlocking with the controller overload protection circuit is recommended and should be added as standard practice. An air pressure differential switch is also recommended.) See pricing deduction chart below.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Encl. Mod.	List Price Deduction	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
DPG-SV		-330	-510	-729	-1,008	-1,265	-1,386	-1,665	-2,034

TEAO-Piggyback – For totally enclosed machines where blower motor must be on top or side of base motor housing, use the following pricing chart to add to TEAO inline price for Top- or Side-Mounted blower and shroud for direct cooling air over base motor frame. Includes 3-phase blower motor.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Encl. Mod.	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
TEAO Piggyback		\$320	\$320	\$450	\$600	\$800	\$950	\$1,280	\$1,470 ⁽¹⁾

(1) TEAO-P/B top mounting is standard on all L440 frames. Use this addition for F-1 or F-2 mounting of blower on L440 frames.

XT Features (IP54) – (FL210 through L440 frames) The Reliance XT motor is designed for operation in damp locations where the motor will be subjected to corrosive conditions. Typical applications are paper, chemical, petroleum, fertilizer and plastics industries. XT motors are provided in totally enclosed non-ventilated, totally enclosed fan-cooled and totally enclosed air-over construction. TEAO-BC will use an XT blower motor with longer blower housing than TEAO-BC standard. **XT Motor construction and features can be seen in the Application Data Section for Enclosure Enhancements.** The FL180 with XT features will be nameplated IP54, since frame is aluminum.

		Frame Designation: NEMA / IEC							
		FL180 ⁽³⁾	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Encl. Enh.	List Price	FDL112 ⁽³⁾	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
XT Features without XT Encoder option ⁽¹⁾		\$138	\$165	\$224	\$260	\$310	\$575	\$785	\$1,245
XT Features with XT Encoder option ⁽²⁾		472	472	531	737	787	1,052	1,325	1,785

(1) Without encoder option, or when encoder is inherently suitable for mill and chemical duty. (See Feedback Devices.)

(2) With an encoder not suitable for mill and chemical duty. To avoid exposed aluminum, MS connector is replaced with terminal block, mounted in auxiliary conduit box; H2O encoder is enclosed in sealed housing. Note: Price does not include encoder. Price does include adders for Auxiliary Conduit Box & Terminal Block for encoder leads.

(3) Finned aluminum frame with cast iron end brackets will be nameplated IP54 instead of XT.

Paper Mill Duty (IP54) – (FL/RL210 through L440 frames) The Reliance paper mill duty motor is designed for operation at the wet end of a paper mill and in other harsh environments. This modification can be provided on separately-ventilated or totally enclosed motors. For Drip Proof Force Ventilated motors in harsh environments, VPI Insulation System is recommended. **Paper Mill Duty Motor construction and features can be seen in the Application Data Section for Enclosure Enhancements.**

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Encl. Enh.	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Totally Enclosed or Drip Proof Force Vent		N/A	\$165	\$224	\$260	\$310	\$575	\$785	\$1,245

ENCLOSURE MODIFICATIONS / ENHANCEMENTS (Cont.)

Outdoor Duty/Weather Proof (IP54) – The Reliance outdoor duty motor is suitable for operation outdoors subject to direct weather conditions. Applicable enclosures are totally enclosed non-ventilated, totally enclosed fan-cooled and totally enclosed air-over. **Outdoor duty motors include space heaters to protect against condensation when the motor is not operating.** Motor accessories such as brakes must be specified and priced as suitable for outdoor use. Standard encoders are not recommended for outdoor duty. Motors operating in dirty areas with fine abrasive dust such as taconite surrounding the motor should have Dustproof / Taconite features added in to this modification. **See Application Section for feature details.**

		Frame Designation: NEMA / IEC							
		FL180 ⁽¹⁾	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		Encl. Enh. FDL112 ⁽¹⁾	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Outdoor Duty -- Weather Proof	List Price	\$429	\$456	\$515	\$551	\$601	\$866	\$1,076	\$1,536

(1) Finned Aluminum Frame

Washdown Duty (IP55) - Includes all the features of outdoor duty / weather proof with the addition of lip seals on all exposed shaft extensions. (Applicable only to Totally Enclosed Motors) Space heaters are included. **See Application Section for feature details.**

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Washdown Duty	List Price	\$564	\$591	\$650	\$686	\$736	\$1,076	\$1,286	\$1,746

Crane & Hoist Duty – (FL210 through L440 frames) The Reliance Outdoor Crane & Hoist duty motor provides severe duty features for crane duty motors such as Hoist, Gantry and Trolley motors. For Outdoor Crane & Hoist environments, make the following pricing additions to TENV, TEFC or TEBC motors. For Indoor Crane & Hoist environments, DPFV motors can be utilized with the addition of VPI Insulation System. This feature will be included in the price. **Crane & Hoist Duty Motor construction and features can be seen in the Application Section for Crane & Hoist Duty Modification.** Provides capability to 3 G's shock. Contact Reliance Electric for higher shock values.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 †
		Encl. Enh. FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
TE, Outdoor Environment	List Price	N/A	\$1,191	\$1,309	\$1,381	\$1,481	\$2,161	\$2,581	\$3,480
DPFV with VPI - Indoor Environment		N/A	2,686	2,905	3,071	3,291	3,936	4,446	2,235

† VPI is standard on all L440 frames

Class 1 Division 2 Certification

RPM AC Motors have been certified by CSA for installation in areas classified by the NEC as Class 1 Division 2 Groups A, B C or D.

As defined by the NEC, a division 2 area represents an environment which is not normally hazardous but under accidental or in unusual operating conditions can become explosive. The frame size will be selected based on the considerations of meeting total temperature (motor temperature rise plus the motor ambient) internally and externally that are required to meet the NEC temperature code for the classified Division 2 area. This may require overframing of TENV, TEBC, and DPFV motors, and a reduction in HP and/or reduced constant torque speed range on TEFC motors with shaft driven fans.

Note: it is the user responsibility to select the proper motor enclosure and to supply the correct NEC temperature code, Class, Group and Division. **Motor frame selection can only be determined after we receive the user supplied NEC temperature code.**

The minimum T-code available for Class 1 division 2 is T3A and maximum HP available will depend on the T-code and motor enclosure selected. All accessories such as space heaters, encoders, and brakes must be selected to meet the class, group, and temperature code and division 2 requirements. This will limit the availability of some accessories.

Motors will be production motors so that the proper thermostat opening temperature can be installed to comply with the NEC T-code specified.

Pricing – Contact marketing for assistance in frame selection, for T-Codes and ratings not shown on pages M-114 - M-119.

Encoders – if an encoder is required, select an explosion proof encoder from the modification section.

Space Heater –if required, select the Division 2 space heater from mod section. Brake space heaters are not available.

Thermostats – will be selected based on the NEC temperature code required. No price addition.

ENCLOSURE MODIFICATIONS / ENHANCEMENTS (Cont.)

Class 1 Division 1 – for areas defined as potentially explosive under normal conditions. The NEC requires Class 1 Division 1 motors to be either listed and labeled as explosion proof, or purged and pressurized in accordance with NFPA 70. For explosion proof motors, see the variable speed catalog section; for purged motors, RPM AC motors have been certified by CSA for purged, or pipe in/ pipe out cooling with air supplied by the user in accordance with the NEC purging requirements.

Pickle Duty – (FL210 through L440 frames) The Reliance pickle line duty motor is designed to be resistant to pickling acid environments in the steel industry. This modification can be provided on drip proof forced-ventilated, separately-ventilated or totally enclosed motors. **Pickle Duty Motor construction and features can be seen in the Application Section for Pickle Duty Feature Modification.**

Note: Frame size may increase on DPFV motors. Confirm frame size prior to quotation.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 ⁽¹⁾
Encl. Enh.	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280 ⁽¹⁾
Totally Enclosed		N/A	\$3,755	\$4,134	\$4,430	\$4,820	\$5,695	\$6,505	\$5,115
Drip Proof Force Vent		N/A	4,190	4,628	4,960	5,400	6,690	7,710	6,780

(1) All 440 frame RPM AC motors come standard with a single treatment of VPI Insulation System.

High Vibration/Press Duty – (FL180 through L440 frames) The Reliance press duty motor is suitable for applications in which the motor is exposed to higher than normal mechanical stress and high vibration. This modification increases motor mechanical endurance for applications such as an automotive stamping press line. **Press Duty Motor construction and features can be seen in the Application Section for Press Duty Modification.** Requires marketing approval for greater than 3G's.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 ⁽⁴⁾
Encl. Enh.	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280 ⁽⁴⁾
Press Duty ⁽¹⁾⁽²⁾⁽³⁾		\$1,768	\$1,990	\$2,268	\$2,470	\$2,740	\$3,500	\$4,220	\$2,490

(1) If Belted Duty required, add 5% of basic motor list price for higher tensile strength shaft (Class II Shaft Material) and add for Roller Bearing.

(2) If an Opposite Drive End Brake is required, it must be the direct acting type of brake.

(3) If feedback device is required, contact marketing for recommended selection.

(4) All 440 frame RPM AC motors come standard with a single treatment of VPI Insulation System.

END SHIELDS

NEMA C-Face, D-Flange or IEC Din Flange bracket with standard dimensions and feet. Special Seals required when oil will be around the shaft. C-Face available on frames FL180C thru L360C only. Note: Since RPM AC motors are designed for maximum horsepower per frame size, it is important to state the specific NEMA C-Face, D-Flange or IEC Din Flange and shaft diameter required for mounting, when motor will be flange mounted.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Encl. Enh.	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
NEMA C-FACE		\$108	\$108	\$162	\$250	\$418	\$526	N/A	N/A
NEMA D-FLANGE		410	460	520	865	865	1,244	1,370	1,645
IEC IM(B3/B5)		410	460	520	865	865	1,244	1,370	1,645

IMPORTANT: Motor C-Face is intended for mounting auxiliary equipment such as pumps, gears, etc. When mounted horizontally, frames L280C thru L360C & L400D thru L440D must be supported by the feet and not by the C-Face or D-Flange alone.

FEEDBACK DEVICES

ENCODERS

Standard Encoder Mounting Provisions – RPM AC Drip-Proof Force Ventilated (DPFV), Totally Enclosed Non-Ventilated (TENV) and Totally Enclosed Blower Cooled (TEBC) motors, all come with standard encoder mounting provisions which include a Machined O.D.E. Bracket and Hole Drilled & Tapped for Stub Shaft. All FL and RL frame prefix have 180T C-face as standard on ODE bracket. See Page M-181 for accessory fits on all frames. RPM AC Totally Enclosed Fan Cooled (TEFC) motors come with standard encoder mounting provisions that includes only a Hole Drilled & Tapped for Stub Shaft, for mounting of hollow shaft encoder. Note: If a machined O.D.E. bracket is needed on a TEFC RPM AC motor, for a coupled or modular encoder, please see Provisions For Mounting Only below, for proper price adder.

HOLLOWSHAFT ENCODERS

Hollowshaft Encoders – Mounts on motor stub shaft with no coupling required. A Tether-Arm (Torque Arm) mounts to the motor bracket and provides insulation from shaft currents. Standard Output is two channels, quadrature. Price includes mounting.

Brake With Encoder - All encoders listed may be mounted outboard of brake. Price shown for encoder includes mounting on the brake.

Encoder	PPR Specify	Power VDC ⁽¹⁾	Max Oper. Temp.	Max Oper. Speed	Output	List Price All Enclosures
Dynapar HS-20 ⁽²⁾	Up to 2540	5-26v	70° C	6000 rpm	Single Output	\$990
BEI HS-35 ⁽²⁾	Up to 5000	5-15v	70° C	6000 rpm	Single Output	1,100
Dynapar HS-35 ⁽²⁾	Up to 2500	5-26v	70° C	3600 rpm	Single Output Dual Output	1,100 1,750
RA HS-35M	1024 or 2048	5-24v	85C	3600 rpm	Single Output	1,200
Lakeshore HSD35	Up to 2500	5-26v	70C	3600 rpm	Single Output	1,350
Avtron HS-M3	Up to 2500	5-18v	85° C	5000 rpm	Single Output Dual Output	2,500 3,450
Lakeshore HS-56	Up to 2048	5-15v	80° C	3600 rpm	Single Output (A) Dual Output (A)	2,975 5,800
Avtron HS-M4	Up to 1200	5-18v	85° C	5000 rpm	Single Output Dual Output	3,560 5,020
Avtron M685	up to 2048	5-18v	70C	3600	Single Output (A) Dual Output (A)	5,600 7,500

Dynapar HS-20 – A Photoelectric Encoder. Enclosure meets IP65. Comes standard with a 10 Pin Mating MS Connector.

BEI HS-35 – A Photoelectric Encoder suitable for applications involving Robotics, Oil Service & Web Process Control. Enclosure meets IP65. Comes standard with a 10 Pin Mating MS Connector.

Dynapar HS-35 – A Photoelectric Encoder. Enclosure meets IP66. Comes standard with a 10 Pin Mating MS Connector.

RA HS35M - A Magneto-resistive, single output. Two Channel Quadrature (A and B) with complementary outputs with Marker pulse (Z). Enclosure meets IP65; includes extra seals for longer life. Available with 10 pin MS connector with mating connector or Epic Industrial Plug Connector.

Lakeshore HSD35– The HSD35 replaces the HS35M. It is an optical encoder suitable for applications involving Grease, Oil, Water or Dirt. Enclosure meets IP65. Comes standard with a 10 Pin Epic Style Industrial Connector.

Avtron HS-M3 – A Photoelectric Encoder suitable for Mill Duty applications. Enclosure is sealed against Dust & Water ingress. Comes standard with a 10 Pin Industrial Connector.

Lakeshore HS-56 – A Magneto-resistive Encoder suitable for applications involving Grease, Salt Water, Dust or other Common Contaminants. Enclosure is Chemical Resistant to Salt Spray, Most Solvents, Mild Acids & Bases. Comes standard with a 10 Pin Epic Style Industrial Connector.

Avtron HS-M4 – A Magneto-resistive Encoder suitable for Heavy Mill Duty applications. Enclosure is Liquid & Dust tight, and a Stainless Steel Breather Drain is supplied. Comes standard with a 10 Pin Industrial Connector.

Avtron M685 - A magneto-resistive encoder for severe duty applications

(1) Encoder output voltage will be equal to input voltage, unless otherwise specified.

(2) Not recommended for fine dust or harsh environments. Upgrade to HS-M3, HSM4, HS56, M685 or RA HS35M

(A) Requires piggyback blower for TEBC enclosure in frames FL180 - L400.

FEEDBACK DEVICES (Cont.)

COUPLED ENCODERS

Coupled Encoders – Mounts to motor with the use of a stub shaft, flexible shaft coupling & flange adapter (flower pot). Standard Output is two channels, quadrature. Price includes mounting.

Brake with Encoder - All encoders listed may be mounted outboard of brake. Price shown for encoder includes mounting on the brake.

Encoder	PPR Specify	Power VDC ⁽¹⁾	Max Oper. Temp.	Max Oper. Speed	Output	List Price	
						DPFV, TEBC & TENV	TEFC
Dynapar H20	1024 / 2048	5-15v	85 C	5000 rpm ⁽²⁾	Single Output	\$1,300	\$2,390
Allen Bradley 845H	1024 / 2048	5-15v	60 C	6000 rpm	Single Output	1,850	2,480
Avtron M3	1024 / 2048	5-18v	85 C	5000 rpm	Single Output (A)	3,100	3,940
					Dual Output (A)	4,201	5,030
Dynapar H56	1024 / 2048	5-26v	80 C	3600 rpm	Single Output (A)	3,345	3,835
					Dual Output (A)	3,800	4,290
Avtron M4	1024/2048	5-18v	85 C	5000 rpm	Single Output (A)	4,440	4,890
					Dual Output (A)	5,850	6,340
Avtron M485	512 / 1024	12-15v	70 C	3600 rpm	Single Output (A)	6,500	6,990
					Dual Output (A)	8,710	9,200

Dynapar H20 – A Photoelectric Encoder suitable for Industrial Motion applications. Enclosure meets IP66. All Dynapar encoders are CE labeled.

Allen Bradley 845H – A Photoelectric Encoder suitable for Industrial applications. Enclosure meets IP66.

Avtron M3 – A Photoelectric Encoder suitable for Mill Duty applications. Enclosure is sealed against Dust & Water ingress. Comes standard with a 10 Pin Industrial Connector.

Dynapar H56 – A direct replacement for the RD62 for mill duty applications. The H56 is a Photoelectric Encoder suitable Severe Duty Applications. Enclosure meets IP66. All Dynapar encoders are CE labeled.

Avtron M4 – A Magnetoresistive Encoder suitable for heavy mill duty applications. Enclosure is liquid and dust tight. A stainless steel breather drain is supplied. Comes standard with a 10 Pin Industrial Connector.

Avtron M485 – A Magnetoresistive Encoder suitable for Severe Duty applications. Enclosure is sealed against Dust & Water ingress. Comes standard with a 10 Pin Industrial Connector.

(1) Encoder output voltage will be equal to the input voltage, unless specified otherwise.

(2) Suitable for 10,000 RPM for PPR not exceeding 1024.

(A) Requires piggyback blower for TEBC enclosure in frames FL180 - L400

RPM AC Inverter Duty Motor - Modifications

FEEDBACK DEVICES (Cont.)

BEARINGLESS ENCODERS

Bearingless Encoders - Mounts directly to the motor end bracket without bearings or couplings. The Pulse Wheel of this type of encoder mounts directly to the motor stub shaft, which is then encased by the bracket of the encoder.

Brake and Encoder - The Northstar SL85, RIM8500 and Avtron M85 and M285 can be sandwiched between the motor and Stearns 87000 brakes up to 105 ft-lbs; all include 8.5 inch C-face. The RIM1250 can be sandwiched between the motor and larger Stearns brakes up to 550 ft-lbs. It mounts with a 12.5 inch C-face. Price includes mounting.

Encoder	PPR Specify	Power VDC(1)	Max Oper. Temp.	Max Oper. Speed	Output	List Price	
						DPFV, TEBC & TENV	TEFC
Northstar/Lakeshore RL67	1024 / 2048	5-15v	90 C	7000 rpm	Single Output(B)	\$1,600	\$2,440
Northstar/Lakeshore SL56	1024 / 2048	5-15v	90 C	7000 rpm	Single Output	1,650	2,550
					Dual Output	3,200	4,100
Avtron M85	Up to 2048	5-15v	100C	5000	Single Output (D)	1,950	2,650
					Dual Output (D)	3,900	4,610
Northstar/Lakeshore SL85	Up to 2048	5-15v	90 C	6000 rpm	Single Output (D)	1,950	2,650
					Dual Output (D)	3,900	4,610
Avtron M285	512 / 1024	12-15v	80 C	3600 rpm	Single Output	3,990	4,230
					Dual Output	5,350	5,590
Northstar/Lakeshore RIM8500	512 / 1024	5-15v	80 C	7000 rpm	Single Output (A)	4,876	5,116
					Dual Output (A)	6,250	6,490
Northstar/Lakeshore RIM1250	1024 / 2048	5-15v	80 C	7000 rpm	Single Output (A)	5,500	(C)
					Dual Output (A)	6,850	(C)

Northstar/Lakeshore RL67 – A Magneto-resistive Encoder suitable for Mill Duty applications. Enclosure allows for heavy machine vibration and accidental impacts. The RL67 adds only 1.5" to overall motor length. Comes standard with 10 Pin Epic Style Industrial Connector.

Avtron M85 - A Magneto-resistive Encoder for heavy mill duty with larger air gap for easier mounting and alignment and 10 Pin Epic Connector.

Northstar/Lakeshore SL85 – A Magneto-resistive Encoder suitable for Mill Duty applications. Enclosure allows for heavy machine vibration and accidental impacts. The SL85 adds only 1.25" to overall motor length. Comes standard with 10 Pin Epic Style Industrial Connector.

Avtron M285 – A Magneto-resistive Encoder suitable for Heavy Mill Duty applications. Enclosure is made of a Heavy Duty Cast Housing. Comes standard with 10 Pin Epic Style Industrial Connector.

Northstar/Lakeshore RIM8500 – A Magneto-resistive Encoder suitable for Rugged Mill Duty applications. Enclosure is made of Ductile Cast Iron. Comes standard with 10 Pin Epic Style Industrial Connector.

Northstar/Lakeshore RIM1250 – A Magneto-resistive Encoder suitable for Rugged Mill Duty applications. Enclosure is made of Ductile Cast Iron. Comes standard with 10 Pin Epic Style Industrial Connector.

Northstar SL56 - Magneto-resistive Encoder similar to RL67 except with 56 C-face mounting.

(1) Encoder output voltage will be equal to the input voltage, unless specified otherwise.

(A) Requires piggyback blower for TEBC enclosure in frame FL180 - L400.

(B) Cannot be used with opposite drive end brake.

(C) Contact Variable Speed Product Marketing for pricing.

(D) FL180 frame TEBC requires piggyback blower

EXPLOSION-PROOF ENCODERS

Explosion-Proof Encoders – A coupled encoder approved for National Electric Code (NEC) Class I & II, Divisions I & II, Groups C, D, E, F & G as UL Listed, Explosion Proof.

Encoder	PPR Specify	Power VDC(1)	Max Oper. Temp.	Max Oper. Speed	Output	List Price	
						DPFV, TEBC & TENV	TEFC
Dynapar X25	512 / 5000 max	5-26v	70 C	5000 rpm	Single Output ^{(A)(B)}	\$3,335	\$4,175

Dynapar X25 – A Photoelectric Encoder Suitable for Explosion Proof Applications & Environments. Enclosure meets IP56. Comes standard with terminal strip located inside encoder housing.

(1) Encoder output voltage will be equal to the input voltage, unless specified otherwise.

(A) Requires Piggyback Blower for TEBC enclosure in frames FL180 - L400. No change for DPFV and TENV, L180 - L400 frames and all L440 frames.

(B) Cannot be used with opposite drive end brake.

FEEDBACK DEVICES (Cont.)

SPECIAL ENCODER MOUNTING

MOUNTING OF CUSTOMER SUPPLIED 56 C-FACE OR OTHER ENCODER. Includes all mounting hardware and mounting. Note: May require TEAO-Piggyback blower on TEAO - In-line blower cooled designs. Contact Reliance for assistance.	List Price	\$1,929
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L2882 Frame with TEAO Piggyback Blower and Scoop Mounted Feedback Device



PROVISIONS FOR MOUNTING ONLY

Provisions Only - APPLICABLE TO TENV, TEAO-PIGGYBACK, DPV and DPSV enclosures and TEBC for those encoders that fit with in-line blower. See previous encoder page. Requires specific brand and part number with order entry.

Machined motor bracket and counter bore of opposite drive end shaft only. Standard on L180-L440 frames.	List Price	No Charge
Machined motor bracket and stub shaft with protective cover over stub shaft.		\$450
Machined motor bracket, adapter, and stub shaft for mounting 56 C-Face or other encoders.		1,075
Machined motor bracket, adapter, stub shaft and coupling for mounting of 56 C-Face or other encoders.		1,250

Provisions Only - APPLICABLE TO TEFC ENCLOSURES.

Counter bore of opposite drive end shaft.	List Price	No Charge
Stub shaft with protective cover over stub shaft. Use for Hollowshaft encoder provisions.		\$450
Adapter, stub shaft and coupling for future mounting of coupled 56 C-Face or other coupled feedback device.		1,250

RESOLVERS

Resolvers - A resolver is a shaft angle sensing transducer. Interfacing with an input module, the resolver provides position and velocity feedback information to the Control System. Three outputs are available to meet application requirements. Resolvers are provided in industrial duty and heavy duty industrial enclosures and can be face or foot mounted. Heavy duty resolvers with double shaft extensions can be supplied when a second feedback device such as an overspeed switch is required mounted in line. The table below defines the available outputs and mounting arrangements. The price includes mounting of the resolver to the motor.

Resolver 800123-2R , used with 1750 rpm motors (TS2014N) Avail. TEBC-In-Line L210-L400 Flange Mtg (AJ=2.913)	List Price	\$2,455
Resolver 800123-2S , used with motor with top speeds of 1150 rpm and less. Avail. TEBC-In-Line L210-L400 Flange Mtg (AJ=2.913)		2,741
Resolver 800123-2T , sometimes used with motors with top speeds of 500 rpm and less. Avail. TEBC-In-Line L210-L400 Flange Mtg (AJ=2.913)		2,800
Resolver 800123-R , used with 1750 rpm motors. Foot and 56 C-Face mounting. Requires Piggyback Blower for TEAO-BC designs.		2,990
Resolver 800123-S , used with motor with top speeds of 1150 rpm and less. Requires Piggyback Blower for TEAO-BC designs.		4,420
Resolver 800123-T , sometimes used with motors with top speeds of 500 rpm and less. Requires Piggyback Blower for TEAO-BC designs.		4,816

RESOLVER PART NO. 800123-	2R	2S	2T	R	S	T
1X (3600 electrical = 3600 mechanical)				X		
2X (3600 electrical = 1800 mechanical)	X	X			X	
5X (3600 electrical = 720 mechanical)			X			X
Flange Mount		X	X			
Foot Mount & C-Face	X			X	X	X
Single Shaft		X	X	X	X	X
Double Shaft	X					
General Industrial Duty		X	X			
Heavy Industrial Duty	X			X	X	X
Use with Flange Type Mounting Adapter		X	X	X	X	X
Use with Scoop Mount	X					

RPM AC Inverter Duty Motor - Modifications

FILTERS

Filter Addition for DPG-FV motor with motor mounted blower. Filter is washable type on FL180 (FL112) - L400 (DL250). All L440 DL280 have disposable filters. Recommended when filterable contaminants are present. Totally enclosed construction rather than blower motor with filter (DPG-FV) is recommended for extremely dusty, dirty environments.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Filter Addition	List Price	\$220	\$375	\$375	\$375	\$375	\$480	\$665	\$665

GEARMOTOR PROVISIONS

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Gearmotor Provisions	List Price	\$616	\$862	\$1,161	\$1,460	\$2,280	\$3,038	-	-

Includes a D-Flange, shaft lip seal, and special shaft with threads and nut for Gear Pinion Mounting & Cone Drive Mounting.

GROUNDING BRUSH - Also see Bearings, Current Protection Shaft Grounding Ring with Inpro Seal

Shaft Grounding Brush – Protects motor bearings from failure caused by circulating shaft currents.

Shaft Grounding Brush	List Price	\$593
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HIGH SPEED CAPABILITY

Depending on motor rating and mounting constraints, it may be possible, with proper motor modifications, to achieve the following maximum speeds shown for each frame. Contact Variable Speed Product Marketing for availability and pricing.

Maximum Speed with Special Construction ⁽¹⁾	
Horizontal Foot Mounted (Coupled Duty Only)	
Frame Diameter	Maximum Speed (RPM)
FL180	11,800
FL/RL210	8,000
FL/RL250	6,500
L280	6,500
L320	5,000
L360	4,500
L400	4,300
L440	3,800

(1) **Note:** Must consult Variable Speed Product Marketing for specific frame construction details and pricing.

ATTENTION: The machinery builder is responsible for ensuring that the driven machinery and all drivetrain mechanisms not supplied by Reliance Electric in addition to process line material, are capable of safe operation at the maximum speeds, as shown in the table above. Failure to do so can result in personal injury or destruction of mechanism and material.

RPM AC Inverter Duty Motor - Modifications

INSULATION SYSTEM

The standard insulation system is a full NEMA Class H insulation system, rated at 180° C with a heavy epoxy varnish. All RPM AC motors utilize an advanced insulation system that provides excellent protection against fungus and high humidity as found in tropical climates. The standard motor is suitable for operation in tropical climates without additional treatment. For a single treatment of Tropical Protection or Vacuum Pressure Impregnation (VPI), make the following List Price additions based on the following pricing chart.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 ⁽²⁾
Insulation	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280 ⁽²⁾
Tropical Protection ⁽¹⁾		Add 5% to Basic Motor List Price							
VPI Adder		\$1,465	\$1,660	\$1,820	\$1,950	\$2,120	\$2,350	\$2,650	Std.
VPI Adder Suitable for IEEE 429 Without Test		2,930	3,320	3,640	3,900	4,240	4,700	5,300	3,450

(1) For additional protection, especially during shipment and prolonged storage, this modification provides a fungicidal air dry varnish treatment per MIL-V-173C (Type I Treatment) applied over all motor windings. **Note: Motors applied in highly corrosive, moist and dirt-laden environments should have an enclosure with XT features to limit the entrance of contaminants into the motor.**

(2) All 440 frame RPM AC motors come standard with a single treatment of VPI Insulation System.

LEADS

Leads – The standard lead length is 6” for NEMA motors without terminal blocks. Leads longer than standard 6” are available on single voltage motors only. Use adders from table below for every 12” (1 Foot), or portions thereof, of added length to a maximum length of 96” (8 Feet).

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Leads	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Extra Long Leads		\$75	\$80	\$90	\$95	\$110	\$150	\$210	\$400

Lead Lugs – “YA” Crimp Type (Compression Lugs)

Burndy Hylug	List Price	
3 Lead (Single Voltage)		\$50
9 Lead (Dual Voltage)		\$140

Terminal Block / Strips For NEMA Frame Motors – Insulated stud type terminal blocks / strips may be provided for 3 lead single voltage motors. These terminal blocks / strips are designed to accept single hole lugs from the customer. (Terminal Blocks / Strips are included as standard in all IEC frame motors for main power leads and thermostats.)

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 ⁽²⁾
Main Terminal Block ⁽¹⁾	List Price	\$280	\$280	\$350	\$460	\$460	\$640	\$990	\$990
Accessory Terminal Block		\$100 For All Frame Sizes							

(1) Provides terminal block in main conduit box for connection of RPM AC motor power leads, instead of the standard leads. Thermostat leads will be connected to an auxiliary terminal block.

Note: Conduit box dimensions will change. See Conduit Box Dimension Sheet shown in Dimension Sheet Index for details.

RPM AC Inverter Duty Motor - Modifications

V*S Master Motors

LUBRICATION

Grease – Ball Bearings furnished in FL180 - L440 Frame RPM AC motors are lubricated with Chevron SRI-2 Grease. L280 - L440 RPM AC motors have Reliance Electric's exclusive "PLS" System. FL180 - FL250 Frame RPM AC motors come standard with "Lubed-For-Life" bearing system.

Fittings – Alemite fittings are provided as standard on L280 - L440 frames.

Automatic Grease Relief Fittings – Two Automatic Relief Fittings can be furnished on modified RL210 - L440 frame motors for a **List Price of \$30**.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440 ⁽²⁾
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280 ⁽²⁾
Extended Grease Drains	List Price	\$150			\$250		\$350		

RPM AC Motors
1/3 - 2 HP

NAMEPLATES

Auxiliary Nameplate	List Price	\$30
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NOISE SILENCER

Noise Silencer – (FL210/RL210 thru L440 frames) Optional Addition to DPFV or TEAO-PB for 5-7% dbA noise reduction from published levels. Further information on Noise Silencer's can be found in the Application Data Section. Silencer is standard on all DPG-FV L440 and TEAO-P/B L400 frames

Noise Silencer	List Price	\$1,425
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RPM AC Motors
2 - 1,000 HP

PACKAGING

Provides crating of motor for overseas shipping. (Does not provide for any overseas fees, documentation, etc.)

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Open Slat Crate ⁽¹⁾	Net Price	\$50			\$100				
Export Boxing ⁽²⁾		Add 5% of total motor <i>Net</i> for all frames. (Minimum \$350 Net) to Fully Modified Motor Price Including Accessories							

(1) Also known as "Hog Crating," provides additional mechanical protection for motor air shipments.

(2) Provides crating of motor for overseas shipping. (Does not provide for any overseas fees, documentation, etc.)

Large AC Motors

PAINT

Special Paint Finish – Special color or type of paint compatible with our standard air dry primer. Standard finish is Reliance Electric blue-green (Munsell Color System 8.5BG3.57/2.0) high-grade modified epoxy, air dry enamel with non-toxic rust inhibitors.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Leads	List Price								
Special Colors		\$215	\$215	\$215	\$275	\$275	\$355	\$510	\$740
OMEGA Plus		750	750	750	750	750	750	750	1200
Custom		Contact Reliance Electric for Custom Paint and Finish Requirements							

Small, Medium & Large DC Motors

SERVICE FACTOR

Standard listed motors are for 1.0 service factor on inverter power. For greater than standard service factor, use the price of the listed machine with the same enclosure and speed with a horsepower rating equal to the rated HP times the required service factor. If the HP thus calculated is not standard, use the next higher standard rating. May require oversizing inverter.

SHAFT MODIFICATIONS & SEALS

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
Shaft Modification	List Price	FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Shaft Guard ⁽¹⁾		\$59	\$59	\$68	\$68	\$80	\$80	\$80	\$102
Shaft Extension ⁽²⁾		96	96	150	244	352	420	594	676
Special Shaft Diameter – Drive End ⁽³⁾		244	244	244	340	394	486	636	892
Special Shaft Diameter – Opposite Drive End ⁽³⁾		358	358	394	584	746	906	1,230	1,568
Special Shaft Length ⁽⁴⁾		244	244	244	340	394	486	636	892
Shaft Step ⁽⁵⁾		54	54	54	100	120	140	180	260
Shaft Taper ⁽⁶⁾		298	298	298	440	494	626	806	1,152
Shaft Threads ⁽⁷⁾		54	54	54	100	120	140	180	260
Stainless Steel		\$781 List					\$1,328 List		
Class II Shaft Material	5% Basic Motor List Price								

- (1) Provides a protective cover over front end shaft extensions. **WARNING: To prevent injury, shaft guard must be specified or supplied by customer for exposed shaft extensions. Failure to observe this precaution could result in bodily injury.**
- (2) Provides Opposite Drive End extension having standard shaft dimensions per the standard dimension sheets.
- (3) Non-standard shaft having dimensions less than standard diameter or larger than standard with the maximum diameter as listed in Table below for Special Shaft Diameters.
- (4) Non-standard length for either drive end or opposite drive end shaft (use twice modification price for non-standard length on both ends). Maximum length limited to two times standard length. **CAUTION: Belted drives using smaller than standard diameter shafts and/or longer than standard shafts must be referred to Reliance Electric with complete belt drive data.**
- (5) Each step or reduced diameter from standard straight shaft. Thread modification is usually required with this Mod.
- (6) Provides standard NEMA AC shaft tapered 1-1/4 inches per foot. May be added for either drive end or opposite drive end shaft extension. Includes threads, washer and locknut. Specify "U" or "FU" required.
- (7) Class 2A right hand thread of size compatible with shaft diameter. Step modification is usually required with this Mod.

MAXIMUM ALLOWABLE SHAFT DIAMETERS

Frame	Enclosure ⁽¹⁾	Drive End		Opposite Drive End		Remarks
		U Std	U Max ⁽²⁾	FU Std	FU Max ⁽²⁾	
FL180	All	1.375	1.75	1.375	1.5	Coupled or Belted Duty ⁽³⁾
FL/RL210	All	1.875	1.875	1.625	1.75	Coupled or Belted Duty ⁽³⁾
FL/RL250	All	2.125	2.5	1.875	1.875	Coupled or Belted Duty ⁽³⁾
L280	All	2.625	2.875	2.125	2.125	Coupled or Belted Duty ⁽³⁾
UL280	All	2.625	2.875	2.125	2.125	Belted Duty Only
L320	All	2.875	3.25	2.375	2.5	Coupled or Belted Duty ⁽³⁾
UL320	All	2.875	3.25	2.375	2.5	Belted Duty Only
L360	DPFV	2.875	3.625	2.875	3.125	Coupled or Belted Duty ⁽³⁾
	All TE	2.375	2.5	2.375	2.5	
UL360	DPFV	3.25	3.625	2.875	3.125	Belted Duty Only
	All TE	3.375	3.625	2.375	3.125	
L400	DPFV	3.625	3.625	2.875	3.125	Coupled or Belted Duty ⁽³⁾
	All TE	2.375	2.5	2.375	2.5	
UL400	DPFV	4.125	4.25	2.875	3.125	Belted Duty Only
	All TE	3.875	4.25	2.375	3.5	
L440	All	4.25	4.25	4.25	4.25	Coupled or Belted Duty ⁽³⁾
UL440	All	4.5	4.625	4.25	4.25	Belted Duty Only

- (1) All bearing and shaft data is based on foot mounted, coupled motor enclosures (i.e. DPFV, TENV, TEFC & TEBC).
- (2) Maximum "FU" and "U" dimension, is the largest shaft diameter that can be supplied with a standard bearing. A price addition must be made to obtain this maximum diameter or any diameter between the standard and the maximum.
- (3) These frames are suitable for belted duty provided the Radial Load Capacity (page M-165), is not exceeded. Contact Reliance Electric for application assistance.

RPM AC Inverter Duty Motor - Modifications

SHAFT SEALS

		Frame Designation: NEMA / IEC								
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440	
Shaft Seals		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280	
Lip Seal ⁽¹⁾	List Price	\$135	\$135	\$135	\$135	\$135	\$210	\$210	\$210	
Face Seal ⁽²⁾		670	670	670	670	670	960	960	960	
Inpro Seal ⁽³⁾		Horizontal	230	230	230	240	250	290	350	535
		Vertical	680	680	715	715	765	765	850	1,085
Dust Proof / Taconite Seal ⁽⁴⁾		243	378	494	610	785	850	850	850	

(1) This modification provides a lip seal on the drive end to protect the bearing when operated with oil splashing against the shaft. Typical application is on a horizontal motor mounted to a gear case where the stationary oil level is below the motor shaft. **CAUTION: Seals operated dry for extended periods will be damaged.**

LIST PRICE IS BASED PER BEARING.

(2) This modification provides a face seal on the drive end to protect the bearing when operated with a head of oil against the shaft. Typical application is a vertical shaft-up motor connected to a gear case with oil against the motor shaft. **CAUTION: Seals operated dry for extended periods will be damaged.**

LIST PRICE IS BASED PER BEARING.

(3) This bearing isolator is a non-contact bronze compound -- labyrinth seal suitable in washdown and high dust atmospheres. **LIST PRICE IS BASED PER BEARING.**

(4) For totally enclosed machines only for protection against fine, abrasive dust such as taconite, use the following pricing chart. Provides non-magnetic labyrinth-path seal on all exposed shafts. **LIST PRICE IS BASED PER BEARING.**

INPRO SEAL WITH SHAFT GROUNDING RING

This is a bronze non-contact labyrinth bearing isolator with an integrated shaft grounding ring (SGR™) device designed to minimize shaft currents. Reliance Electric has demonstrated under laboratory conditions that this device will significantly reduce shaft voltage that can lead to shaft currents and damage to the motor bearings. This device should be used in conjunction with proper grounding procedures and **not** in lieu of proper motor grounding. Proper high frequency motor grounding back to the adjustable frequency drive is still required. For proper grounding procedures consult the AF drive instruction manual.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Horizontal - Drive End	List Price	\$460	\$460	\$460	\$480	\$500	\$580	\$700	\$760
Horizontal - Both Ends		920	920	920	960	1,000	1,160	1,400	(1)

(1) L440 frames have an insulated opposite drive end bearing as standard. Shaft grounding brush is not available on the opposite drive end of L440 frames.

SHEAVES

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Sheave ⁽¹⁾	List Price	\$1,596							

(1) Mounting of customer's finished bore sheave on motor drive end shaft extension. Maximum sheave weight not to exceed 200 pounds. Sheave must be finish bored and balanced. Sheave must be received at plant eight weeks prior to motor shipment with customer property tag attached.

SLIDE BASE

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Slide Base - Heavy Duty ⁽¹⁾	List Price	\$270	\$315	\$405	\$580	\$640	\$750	\$1,430	\$2,900

(1) **NOTE:** For adjusting belt tension. Neither bases nor rails are suitable for wall or ceiling mounting

SPACE HEATERS & MODIFICATIONS

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Space Heater ⁽¹⁾	List Price	\$291							
Space Heater Division T3 Temperature Code		2,550	600	600	600	700	800	800	900
Space Heater Aux. Conduit Box ⁽²⁾		N/A	207	207	377	377	377	440	440

(1) Mounted inside the motor. Recommended to prevent condensation of moisture for motors remaining unenergized for long periods of time. Standard heater is single phase 120, 230, or 460 volts, 50/60 Hz. Leads are terminated in motor conduit boxes. For non-classified area only.

TESTS

Tests – As standard practice, every RPM AC motor is full load tested on a dynamometer with a PWM power supply, and receives a Routine Test per IEEE 112 as modified by Reliance for inverter power supply. To obtain copy of certified routine test, make price addition shown. See page M-85 for data included in routine test report.

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Routine Test ⁽¹⁾	Net Price	\$50							
Unwitnessed		300	300	400	500	600	700	800	900
Complete Test ⁽²⁾	Unwitnessed	1,200	1,200	1,500	1,600	1,800	2,100	3,200	4,500
	Witnessed	1,800	1,800	2,400	2,500	2,700	3,200	4,900	6,500

(1) For a Certified Routine Test Report per IEEE 112 as modified by Reliance Electric for inverter power.

(2) Provides complete performance test and heat run on PWM inverter power per IEEE 112 as modified by Reliance Electric for operation on inverter.

Testing On Inverter Supplied By Customer Contact Reliance Electric for assistance and pricing.

THERMAL PROTECTION

Bearing RTD's ⁽¹⁾ per Bearing	List Price	\$2,200
Stator RTD's ⁽²⁾		2,825
Thermistors ⁽³⁾		340
KTY84 Thermistors (Siemens) - Qty 3		380
Control Module For Use With Thermistors ⁽⁴⁾		600
Thermostats ⁽⁵⁾		300

(1) This modification is available for all frames. The standard bearing RTD is a 3 lead single element design. Each RTD is provided with a conduit box and terminal block for easy connection. Resistance value (10, 100, 120 ohm) must be included on the order write up. **Note: The temperature readout device is not supplied by Reliance Electric and must be ordered separately.**

(2) Includes six (2 per phase) coil head mounted 100 ohm platinum resistance temperature detectors. Available in all frames with maximum winding voltage of 600 volts. Leads will be brought to terminal board in conduit box. For 1 RTD per phase use **List Price of \$1,413.**

(3) Consists of three PTC Thermistors imbedded in the motor windings, with leads brought into the main conduit box. **Note: Price does not include Control Module.**

(4) Reliance Electric P/N 418033-14B (S/N 115101-2) supplied in NEMA 12 enclosure for separate mounting. Requires 120 volt, 50/60Hz single-phase -- 5 ampere input. Provides two Triac outputs -- one normally energized and one normally off -- each rated 5 amperes continuous. **Note: Control Module Unmounted.**

(5) RPM AC motors include three N.C. thermostats (one per phase) as standard; leads are brought into main conduit box. **This modification includes a second set of warning thermostats (three N.C. thermostats - one per phase).**

VERTICAL LIFTING

		Frame Designation: NEMA / IEC							
		FL180	FL & RL210	FL & RL250	L280	L320	L360	L400	L440
		FDL112	FDL & RDL132	FDL & RDL160	DL180	DL200	DL220	DL250	DL280
Vertical Lift Lugs	List Price	Contact Reliance Electric For Quotation							

Notes

V*S Master Motors

RPM AC Motors
1/3 - 2 HP

RPM AC Motors
2 - 1,000 HP

Large AC Motors

Small, Medium & Large DC Motors