

PACTORQ™ BRUSHLESS DC MOTORS

Versatile Packaging

The PACTORQ Motor Line includes NEMA Totally Enclosed Non-Ventilated (TENV), and Dripproof Blower Ventilated (DPBV) enclosures. These enclosures are suitable for virtually any industrial environment. The motors are available with NEMA foot mountings, NEMA C face and IEC D flange mountings are also available.

High Efficiency

The PACTORQ brushless DC motor uses efficient neodymium-iron-boron (rare-earth) permanent magnets bonded to the rotor to produce the magnetic field. Thus, there are minimal losses in the motor due to rotor induction currents. All of the current delivered to the brushless DC motor is used to develop torque.

Dynamic Response

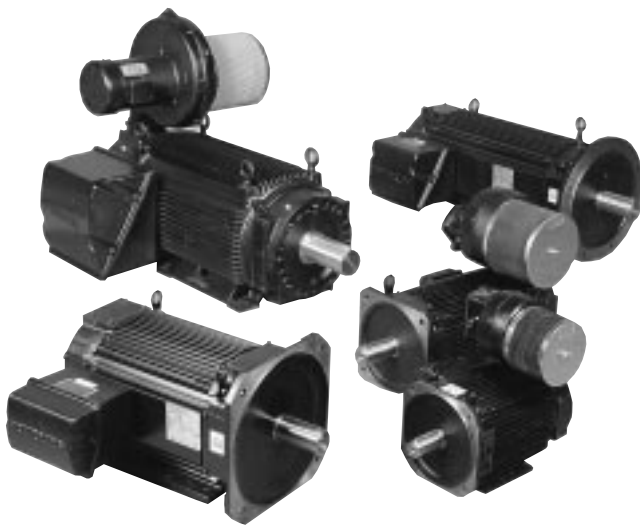
The powerful and lightweight optimized permanent magnet circuit design provides the highest power density in the industry. This high power density provides servo-like response with high starting and running torque, rapid start-stop capabilities, and smooth operation over the entire speed range.

Precision Control

The brushless DC motor is a true synchronous motor. The rotor field is always in sync with the excitation field; it does not have losses due to slip. This factor, inherent to brushless DC design, combined with various primary and secondary feedback options, allows for precise speed and torque control.

Low Maintenance

The brushless DC motor does not have any brushes to replace or a commutator to wear out. Little heat is generated in the rotor allowing the bearings to run cooler while increasing bearing life.



PACTORQ BRUSHLESS DC MOTORS
10-400 HP STANDARD

PACTORQ BRUSHLESS DC MOTORS

FEATURES

Brushless Technology

Optimized magnetic design incorporating high energy Neodymium magnets

NEMA or IEC (Metric) enclosures and mounting options

Patented double-finned, aluminum frame (US Patent No. 4, 839, 547)

Oversize bearings pressed into steel bearing insert, clamped rear bearing (NEMA 180-320 frames)

Integral through shaft encoder/resolver

Four different wiring configurations for various horsepower and speed requirements

Robust Stator
 - Concentric coil windings
 - Inverter duty insulation system
 - Proprietary trickle varnish process

Class H insulated, conservatively rated for class F operation

Flexible design incorporates many options

Near unity power factor at all speeds and loads

0% speed regulation

Standard two year warranty

BENEFITS

Reliable, high-performance motor technology - long life, virtually maintenance free, cooler running, low acoustical noise

- Highest dynamic response. Servo motor performance, rapid start-stop capability to position loads fast, quick speed changes for precise process control
- Highest power density. Extremely high torque in relatively small standard NEMA frame sizes minimizes machine size
- Highest efficiency motor technology. Significant energy savings at both base speed and much lower than base speed

Satisfies broad end-use requirements

Efficient cooling of the stator assembly
 Withstands higher shock loads than conventional cast iron enclosures

All thrust loads accommodated by rear bearing, increasing reliability and life

No coupling, yields higher feedback resolution and accuracy

Flexible and versatile
 Reduces need for large motor stock

Stator better withstands high voltage transients of PWM waveforms

Additional assurance of motor integrity over broad temperature range

Choices of mounting, terminations, feedback devices and holding brake to meet your application-specific requirements

Eliminates costly power factor correction
 Reduces power consumption for important energy savings

No slip, drift, higher throughput

Assured quality and reliability

A

MOTORS

B

DRIVES

C

PRE-ENGINEERED
DRIVE SYSTEMS

D

GENERAL
INFORMATION

PACTORQ BRUSHLESS DC MOTORS

FEATURES

- High energy Neodymium permanent magnet design
- Highest efficiency
- Highest dynamic response
- Highest HP density in industry
- Selection of Industry Standard Enclosures
- NEMA and IEC mounting options
- Patented, finned aluminum frame for highest thermal efficiency and light weight
- Class H insulation system conservatively rated for Class F operation
- Location flexibility, with no brush maintenance requirements
- Standard two year warranty

PRIMARY FEEDBACK OPTIONS

- Integral, through shaft frameless resolver (transmitter type)
- Hall Sensors (dual channel quadrature)
 - 45 ppr (180 ppr after 4x multiplication by the drive) (NEMA 180 & 210 frames)
 - 60 ppr (240 ppr after 4x multiplication by the drive) (NEMA 250, 280, & 320 frames)

SECONDARY FEEDBACK OPTIONS

- 600 or 1024 line driver encoder

OTHER OPTIONS

- 100 VDC brakes
- Encoder feedback mounting kit
- Maximum capacity ball bearings and roller bearings
- Slide base mounting
- Custom termination options
- Custom stator windings
- Custom mounting and shaft configurations
- PTC thermistor
- Special high speed designs

TYPICAL APPLICATIONS

- Test stands
- Extruders
- Electronic line shafting
- Winders
- Wire drawing
- Printing
- Forest Industry machinery
- Tube and rolling mills
- Textile machinery
- Punch presses
- Paper converting
- Cranes
- Elevators

AGENCY APPROVALS

- UL Recognized (file #E130709)
- CSA Listed (pending)
- CE Certified (pending)

GENERAL SPECIFICATIONS

Number of poles	6 (NEMA 180 & 210 frames) 8 (NEMA 250, 280, & 320 frames)
Winding	3 phase Wye or Delta, series or parallel (12 lead reconnectable)
Magnet Type	Neodymium Iron Boron
Enclosures	TENV, DPBV (others available)
Mounting	NEMA C face, foot mounting, IEC D flange
Terminations	Terminal Box: F1, F2, top mounted, and MS Connectors
Thermal Protection	NTC thermistor with resolver Normally closed thermostat with Hall Sensor Feedback
Maximum Speed	Standard PACTORQ Motor designs are limited to: – 6,000 RPM, NEMA 180 frame – 4,500 RPM, NEMA 210 frame – 4,000 RPM, NEMA 250 frame – 3,600 RPM, NEMA 280 frame – 3,000 RPM, NEMA 320 frame

NOTE: Special High Speed Designs Available

PACTORQ MOTORS MODEL NUMBER CODES



A

MOTORS

B

DRIVES

C

PRE-ENGINEERED
DRIVE SYSTEMS

D

GENERAL
INFORMATION

Standard top speeds from 3000 to 6000 RPM— high speed options available.

Patented, double-finned aluminum frame (highest thermal efficiency and lighter weight)

Rugged IGBT Class H insulation but rated conservatively for Class F for added assurance of motor integrity over broad temperature range, longer life, reduced machine down time

Totally Enclosed, Non-Ventilated (TENV) motor shown in cutaway. The addition of a blower— our standard Dripproof Blower Ventilated (DPBV) motor significantly increases torque and HP ratings. See detailed specifications on pages 56 and 58

Primary feedback devices — frameless resolver or Hall Sensors

Optional secondary feedback device— factory mounted optical encoder or encoder mounting provisions on rear end bell.

Optional integral (rear mounted) holding brake

Rugged TENV construction, sealed per IP44 and IP56

Stator connection flexibility— four separate connections provide four different power and speed ratings

Termination versatility— to terminal block in oversized terminal box or MS connectors

Long maintenance-free brushless construction— no harmonically induced bearing pitting... no brushes to replace provides location flexibility

Optimized magnetic design using neodymium rare earth permanent magnets

Standard NEMA frames

Overtemperature protection — thermistor or thermostat

NEMA or Metric mounting

Custom shafts and mounting available

Standard two year warranty

High capacity ball bearings— roller bearings optional

PACTORQ NEODYMIUM-NEMA 180 FRAME

E 18 2 E 1 J 1 N 0 2 1 0 00

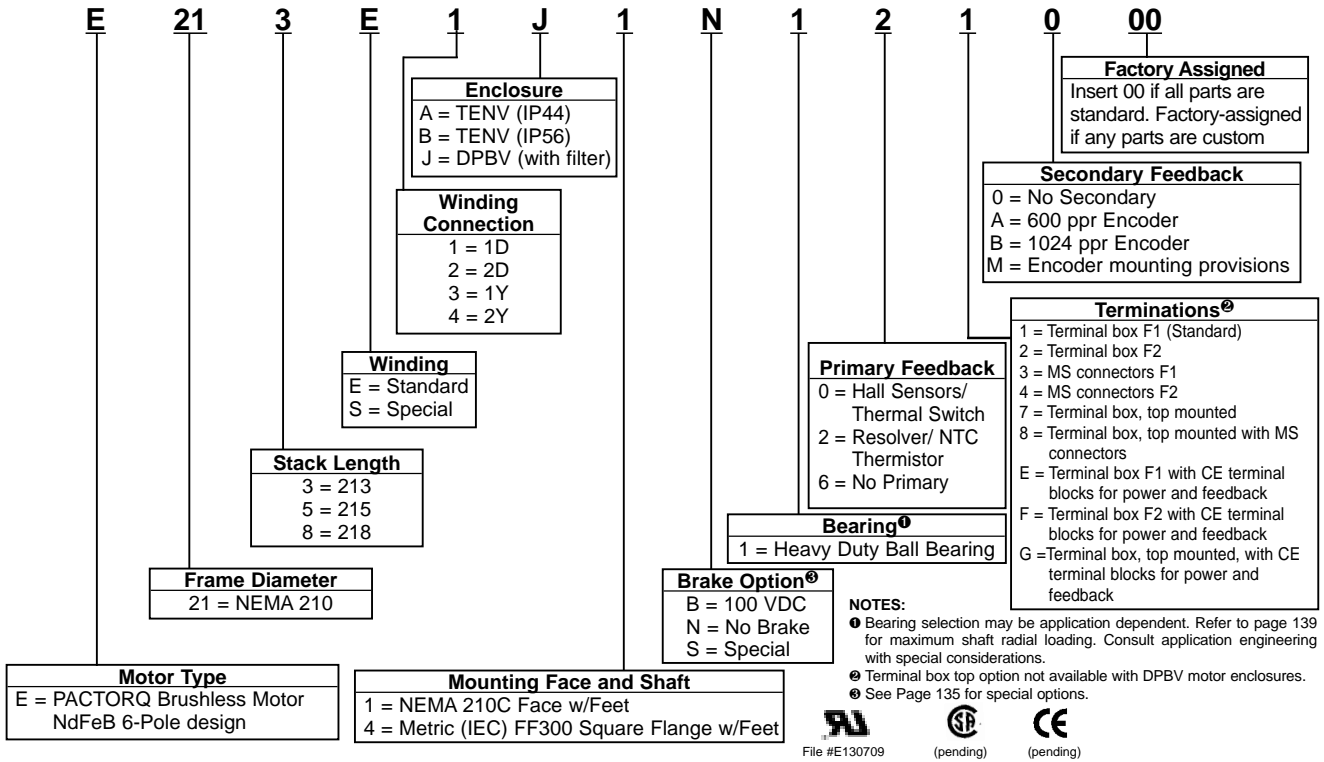
Motor Type E = PACTORQ Brushless Motor NdFeB 6-Pole design	Frame Diameter 18 = NEMA 180	Stack Length 2 = 182 3 = S184 4 = 184	Winding E = Standard S = Special	Winding Connection 1 = 1D 2 = 2D 3 = 1Y 4 = 2Y	Enclosure A = TENV (IP44) B = TENV (IP56) J = DPBV (with filter)	Brake Option[®] B = 100 VDC N = No Brake S = Special	Bearing[®] 0 = Heavy Duty Ball Bearing	Primary Feedback 0 = Hall Sensors/ Thermal Switch 2 = Resolver / NTC Thermistor 6 = No Primary	Terminations[®] 1 = Terminal box F1 (Standard) 2 = Terminal box F2 3 = MS connectors F1 4 = MS connectors F2 7 = Terminal box, top mounted 8 = Terminal box, top mounted with MS connectors E = Terminal box F1 with CE terminal blocks for power and feedback F = Terminal box F2 with CE terminal blocks for power and feedback G = Terminal box, top mounted, with CE terminal blocks for power and feedback	Secondary Feedback 0 = No Secondary A = 600 ppr Encoder B = 1024 ppr Encoder M = Encoder mounting provisions	Factory Assigned Insert 00 if all parts are standard. Factory-assigned if any parts are custom
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Mounting Face and Shaft
1 = NEMA 180C Face w/Feet
4 = Metric (IEC) FF265 Square Flange w/Feet

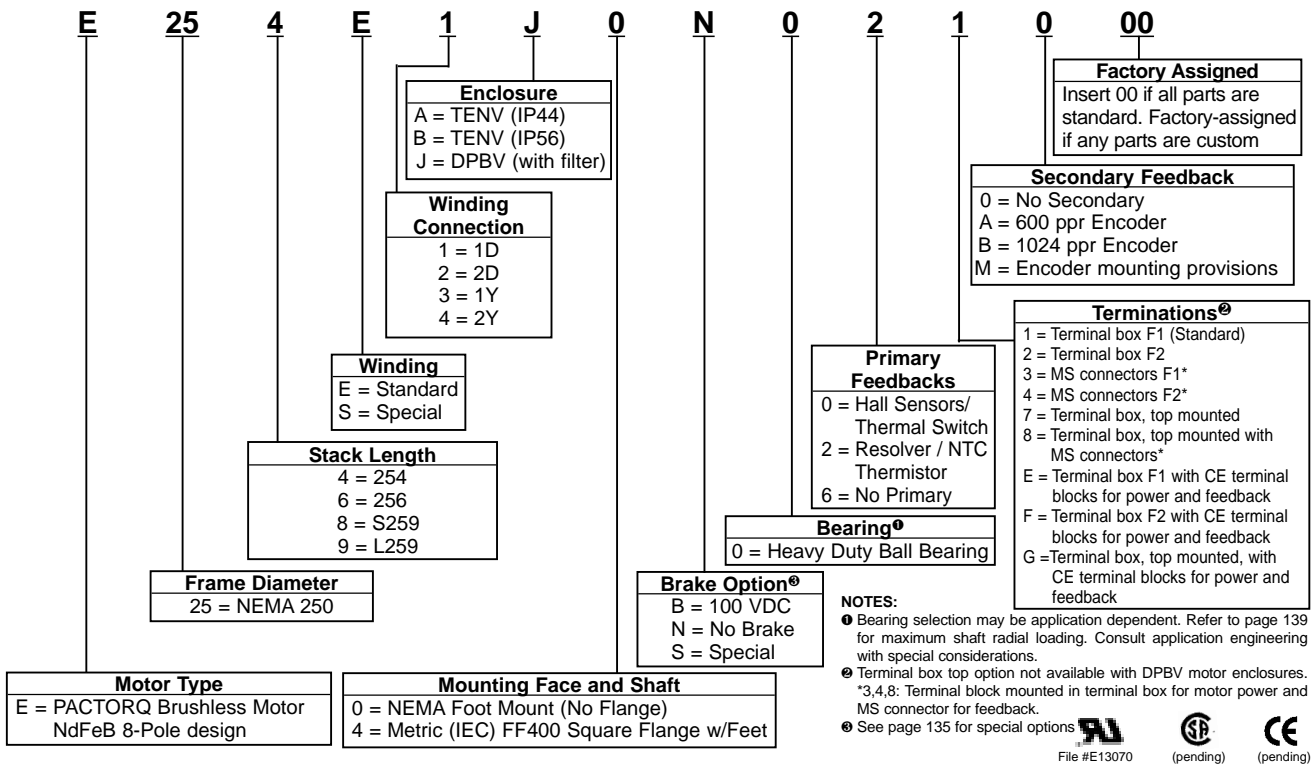
NOTES:
 ① Bearing selection may be application dependent. Refer to page 139 for maximum shaft radial loading. Consult application engineering with special considerations.
 ② Terminal box top option not available with DPBV motor enclosures.
 ③ See page 135 for special options.

PACTORQ MOTORS MODEL NUMBER CODES

PACTORQ NEODYMIUM-NEMA 210 FRAME

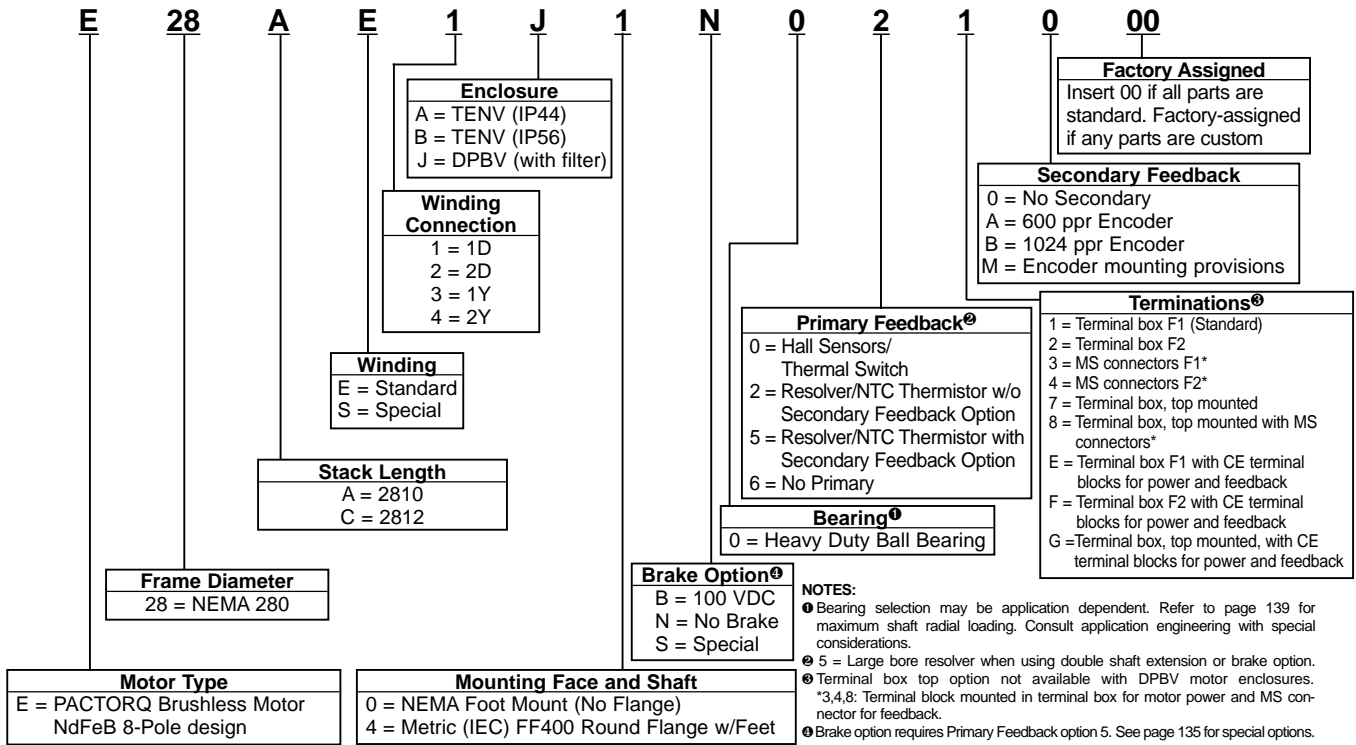


PACTORQ NEODYMIUM-NEMA 250 FRAME

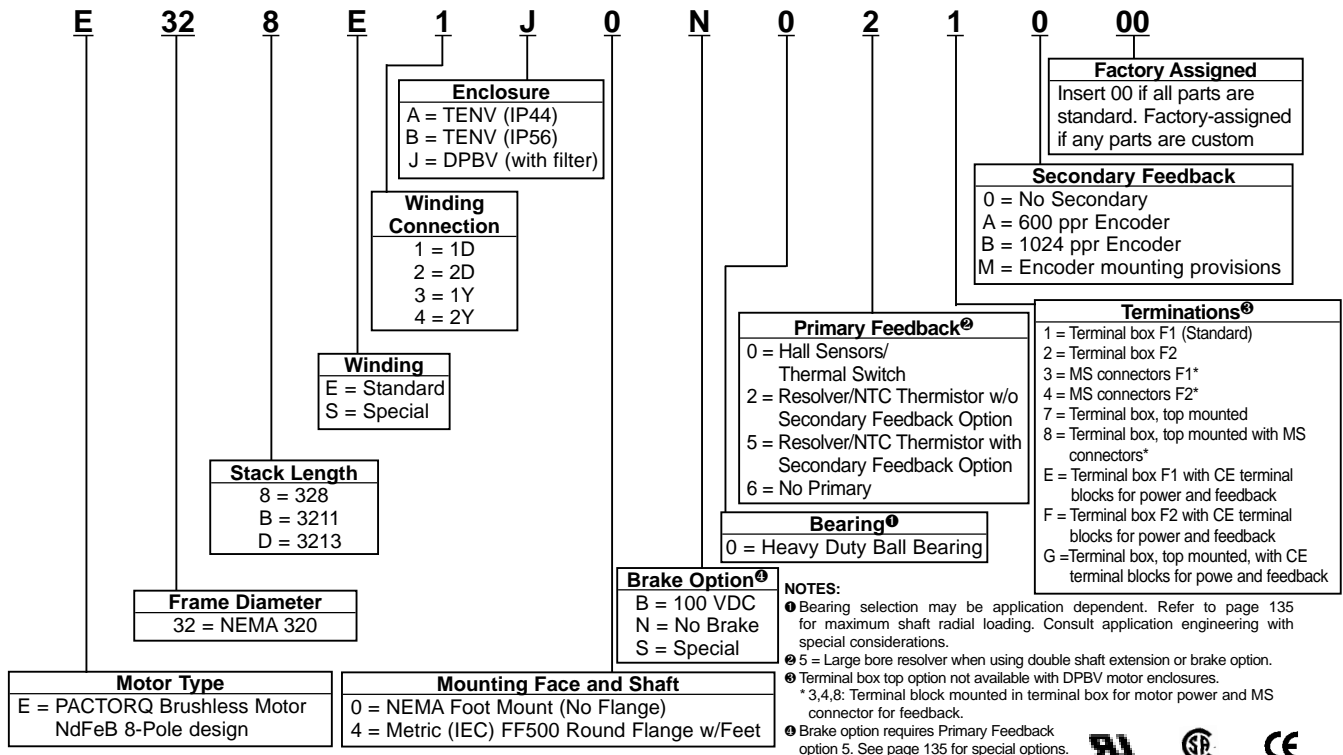


FACTORQ MOTORS MODEL NUMBER CODES

FACTORQ NEODYMIUM-NEMA 280 FRAME



FACTORQ NEODYMIUM-NEMA 320 FRAME



 File #E130709
 (pending)
 (pending)

 File #E130709
 (pending)
 (pending)

A

MOTORS

B

DRIVES

C

PRE-ENGINEERED
DRIVE SYSTEMS

D

GENERAL
INFORMATION

FACTORQ MOTORS

Totally Enclosed, Non-Ventilated (TENV)



10–75 HP Standard

FEATURES

- Optimized magnetic design utilizing Neodymium (rare earth) permanent magnets
- NEMA/IEC Totally Enclosed Non-Ventilated enclosure (IP44, IC410)
- Troublefree, brushless construction
- Very high power density
- Long life regreasable, oversize bearings
- Class H insulated, rated for class F operation
- NTC thermistor thermal protection
- NEMA or IEC mounting
- NEMA C face, foot mounting, and IEC D flange available
- Standard two year warranty

PRODUCT DESCRIPTION

FACTORQ TENV motors offer very high horsepower in a small frame size and the highest power density in the industry. From 10HP in the NEMA 210 frame to 75HP in a NEMA 320 frame, these motors are ideally suited for use in harsh industrial environments with unclean, or particle saturated air.

CONSTANT TORQUE SPEED RANGE

- 1000:1 with Millennium Drives

TYPICAL APPLICATIONS

- Test stands
- Extruders
- Electronic line shafting
- Winders
- Wire drawing
- Printing
- Forest Industry machinery
- Tube and rolling mills
- Textile machinery
- Punch presses
- Paper converting
- Cranes
- Elevators

AGENCY APPROVALS

- UL Recognized (file #E130709)
- CSA Listed (pending)
- CE Certified (pending)

RATINGS AND CHARACTERISTICS

Model Number Prefix	Efficiency @1750 RPM	Winding Connection E1 (1-Delta)		Winding Connection E3 (1-Wye)		Winding Connection E4 (2-Wye)		Rotor Inertia lb.-ft. ²	Weight lbs.	Rotor Inertia kg-m ²	Weight kg
		Rated Speed	Maximum HP	Rated Speed	Maximum HP	Rated Speed	Maximum HP				
E213	0.947	1750	15.7	1000	10.7	2000	16.5	0.825	164	0.0348	74
E215	0.951	1750	18.2	1000	13.2	2000	18.3	0.958	200	0.0404	91
E218	0.952	1750	19.9	1000	15.8	2000	18.5	1.14	250	0.0483	113
E254	0.956	1750	30.2	1000	22.5	2000	29.6	2.45	284	0.103	129
E256	0.959	1750	36.9	1000	27.9	2000	35.9	2.90	334	0.123	152
E258	0.958	1750	38.3	1000	32.8	2000	32.1	3.81	406	0.161	184
E259	NA	NA	NA	1000	36.5	NA	NA	4.72	481	0.199	218
E28A	NA	NA	NA	1000	40.1	NA	NA	8.18	630	0.345	286
E28C	NA	NA	NA	1000	53.2	NA	NA	10.8	787	0.456	357
E328	NA	NA	NA	1000	63.4	NA	NA	14.1	785	0.594	356
E32B	NA	NA	NA	1000	73.6	NA	NA	16.5	936	0.696	425
E32D	NA	NA	NA	1000	90.2	NA	NA	21.4	1170	0.901	531

RECOMMENDED TENV MOTOR / MILLENNIUM SERIES DRIVE COMBINATIONS – 1000:1 CTSR^①

PACTORQ Motors (neodymium magnets)				Motor List Price \$	Millennium Series Drive/Amperes ^② 460VAC
TENV		Base Model Number ^③ ④			
HP	RPM	Frame ^⑤	460VAC		
10	2000	E213TZ	E 213 E4A1N1210XX	7,940	M4/30
	1750	E213TZ	E 213 E1A1N1210XX	7,940	
	1000	E215TZ	E 215 E3A1N1210XX	9,070	
15	2000	E213TZ	E 213 E4A1N1210XX	7,940	M4/30
	1750	E215TZ	E 215 E1A1N1210XX	9,070	
	1000	E218TZ	E 218 E3A1N1210XX	10,200	
20	2000	E254TZ	E 254 E4A0N0210XX	10,390	M4/30
	1750	E254TZ	E 254 E1A0N0210XX	10,390	
	1000	E254TZ	E 254 E3A0N0210XX	10,390	
25	2000	E254TZ	E 254 E4A0N0210XX	10,390	M4/30
	1750	E254TZ	E 254 E1A0N0210XX	10,390	
	1000	E256TZ	E 256 E3A0N0210XX	11,490	
30	2000	E256TZ	E 256 E4A0N0210XX	11,490	M4/40
	1750	E256TZ	E 256 E1A0N0210XX	11,490	
	1000	ES259TZ	E 258 E3A0N0210XX	12,950	
40	1000	E2812TZ	E 28C E3A0N0210XX	25,140	M5/60
50	1000	E2812TZ	E 28C E3A0N0210XX	25,140	M5/75
60	1000	E328TZ	E 328 E3A0N0210XX	29,590	M5/75
75	1000	E3213TZ	E 32D E3A0N0210XX	41,070	M5/90

- ① Constant Torque Speed Range
 - ② To construct a complete motor model number see Model Number Codes beginning on page 53.
 - ③ See Millennium Series Drives, Section B, page 92.
 - ④ NEMA Frame Designation. See PACTORQ Motor Dimensions beginning on page 60.
 - ⑤ All specified PACTORQ Motors are standard.
- NOTE: PACTORQ Motors are rated for use with Millennium Drives only.

A

MOTORS

B

DRIVES

C

**PRE-ENGINEERED
DRIVE SYSTEMS**

D

**GENERAL
INFORMATION**

PACTORQ MOTORS

Dripproof, Blower Ventilated (DPBV)



10-400 HP Standard

FEATURES

- Optimized magnetic design utilizing Neodymium (rare earth) permanent magnets
- NEMA/IEC Dripproof Blower Ventilated enclosure (IP22, IC06)
- Troublefree, brushless construction
- Highest power density in the industry
- Long life regreasable, oversize bearings
- Class H insulated, conservatively rated for class F operation
- NTC thermistor thermal protection
- NEMA or IEC (Metric) mounting
- NEMA C face, foot mounting, and IEC D flange available
- Standard two year warranty

PRODUCT DESCRIPTION

PACTORQ DPBV motors offer the highest power density in the industry; from 10 HP in a NEMA 180 frame to 400 HP in a NEMA 320 frame. The motor is cooled by means of an external blower. Our patented double finned aluminum frame allows more efficient cooling of the stator assembly. Air is exhausted through finned plates in the shaft end of the motor enclosure.

These motors are protected from solid particles greater than 12mm diameter and liquids striking or entering the enclosure at an angle of not more than 15 degrees from the vertical (NEMA IP22). The cooling of the motor is in accordance with NEMA IC06.

CONSTANT TORQUE SPEED RANGE

- 1000:1 with Millennium Drives

TYPICAL APPLICATIONS

- Test stands
- Extruders
- Electronic line shafting
- Winders
- Wire drawing
- Printing
- Forest Industry machinery
- Tube and rolling mills
- Textile machinery
- Punch presses
- Paper converting
- Cranes
- Elevators

AGENCY APPROVALS

- UL Recognized (file #E130709)
- CSA Listed (pending)
- CE Certified (pending)

RATINGS AND CHARACTERISTICS

Model Number Prefix	Efficiency @1750 RPM	Winding Connection E1 (1-Delta)		Winding Connection E2 (2-Delta)		Winding Connection E3 (1-Wye)		Winding Connection E4 (2-Wye)		Rotor Inertia lb.-ft. ²	Weight lbs.	Rotor Inertia kg-m ²	Weight kg
		Rated Speed	Maximum HP	Rated Speed	Maximum HP	Rated Speed	Maximum HP	Rated Speed	Maximum HP				
E182	0.895	1750	12.8	3600	23.7	1000	7.6	2000	14.5	0.301	86	0.0127	39
E183	0.902	1750	20.8	3600	38.7	1000	12.2	2000	23.5	0.380	113	0.0160	51
E184	0.917	1750	26.9	3600	49.0	1000	15.9	2000	30.3	0.458	129	0.0193	59
E213	0.921	1750	40.2	3600	73.4	1000	21.5	2000	45.3	0.825	175	0.0348	79
E215	0.933	1750	49.2	3600	86.2	1000	29.3	2000	55.3	0.958	211	0.0404	96
E218	0.943	1750	57.0	3600	92.7	1000	34.5	2000	63.6	1.14	261	0.0483	118
E254	0.945	1750	76.4	3600	124.8	1000	46.2	2000	85.4	2.45	295	0.103	134
E256	0.953	1750	81.4	3600	116.4	1000	50.2	2000	90.1	2.91	345	0.123	156
E258	0.956	1750	101.8	3600	132.6	1000	63.4	2000	112.1	3.81	440	0.161	200
E259	0.956	1750	138.2	3600	195.9	1000	85.2	2000	152.9	4.72	515	0.199	234
E28A	0.955	1750	153.1	3600	208.7	1000	94.9	2000	169.1	8.18	630	0.345	286
E28C	0.960	1750	205.1	3600	252.9	1000	128.4	2000	225.4	10.8	787	0.456	357
E328	0.964	850	139.3	1750	263.1	500	83.9	1000	161.9	14.1	842	0.594	382
E32B	0.965	850	167.7	1750	314.5	500	101.2	1000	194.8	16.5	993	0.696	450
E32D	0.968	850	208.8	1750	384.1	500	126.6	1000	242.0	21.4	1227	0.901	557

RECOMMENDED DPBV MOTOR / MILLENNIUM SERIES DRIVE COMBINATIONS – 1000:1 CTSR¹

PACTORQ Motors (neodymium magnets)				Motor List Price \$	Millennium Series Drive/Amperes ² 460VAC
DPBV		Base Part Number ³ 460VAC			
HP	RPM	Frame ⁴			
10	3600	E182TZ	E 182 E2J1N0210XX	5,850	M4/30
	2000	E182TZ	E 182 E4J1N0210XX	5,850	
	1750	E182TZ	E 182 E1J1N0210XX	5,850	
	1000	ES184TZ	E 183 E3J1N0210XX	6,690	
15	3600	E182TZ	E 182 E2J1N0210XX	5,850	M4/30
	2000	ES184TZ	E 183 E4J1N0210XX	6,690	
	1750	ES184TZ	E 183 E1J1N0210XX	6,690	
	1000	E213TZ	E 213 E3J1N0210XX	9,200	
20	3600	E182TZ	E 182 E2J1N0210XX	5,850	M4/30
	2000	ES184TZ	E 183 E4J1N0210XX	6,690	
	1750	E184TZ	E 184 E1J1N0210XX	7,150	
	1000	E215TZ	E 215 E3J1N0210XX	10,340	
25	3600	ES184TZ	E 183 E2J1N0210XX	6,690	M4/30
	2000	E184TZ	E 184 E4J1N0210XX	7,150	
	1750	E213TZ	E 213 E1J1N0210XX	9,200	
	1000	E215TZ	E 215 E3J1N0210XX	10,340	
30	3600	ES184TZ	E 183 E2J1N0210XX	6,690	M4/40
	2000	E213TZ	E 213 E4J1N0210XX	9,200	
	1750	E213TZ	E 213 E1J1N0210XX	9,200	
	1000	E218TZ	E 218 E3J1N0210XX	11,470	
40	3600	E184TZ	E 184 E2J1N0210XX	7,150	M4/50
	2000	E215TZ	E 215 E4J1N0210XX	10,340	
	1750	E215TZ	E 215 E1J1N0210XX	10,340	
	1000	E254TZ	E 254 E3J0N0210XX	11,650	
50	3600	E213TZ	E 213 E2J1N0210XX	9,200	M5/60
	2000	E218TZ	E 218 E4J1N0210XX	11,470	
	1750	E218TZ	E 218 E1J1N0210XX	11,470	
	1000	E256TZ	E 256 E3J0N0210XX	12,820	
60	3600	E215TZ	E 215 E2J1N0210XX	10,340	M5/75
	2000	E254TZ	E 254 E4J0N0210XX	11,650	
	1750	E254TZ	E 254 E1J0N0210XX	11,650	
	1000	ES259TZ	E 258 E3J0N0210XX	14,150	
75	3600	E215TZ	E 215 E2J1N0210XX	10,340	M5/90
	2000	E256TZ	E 256 E4J0N0210XX	12,820	
	1750	E256TZ	E 256 E1J0N0210XX	12,820	
	1000	EL259TZ	E 259 E3J0N0210XX	15,820	
100	3600	E256TZ	E 256 E2J0N0210XX	12,820	M6/120
	2000	ES259TZ	E 258 E4J0N0210XX	14,150	
	1750	ES259TZ	E 258 E1J0N0210XX	14,150	
	1000	E2812TZ	E 28C E3J0N0210XX	26,150	
125	3600	ES259TZ	E 258 E2J0N0210XX	14,150	M6/150
	2000	EL259TZ	E 259 E4J0N0210XX	15,820	
	1750	EL259TZ	E 259 E1J0N0210XX	15,820	
	1000	E2812TZ	E 28C E3J0N0210XX	26,150	
150	3600	EL259TZ	E 259 E2J0N0210XX	15,820	M7/220
	2000	E2810TZ	E 28A E4J0N0210XX	22,340	M6/175
	1750	E2810TZ	E 28A E1J0N0210XX	22,340	
	1000	E328TZ	E 32B E4J0N0210XX	30,970	
200	3600	E2812TZ	E 28C E2J0N0210XX	26,150	M7/275
	2000	E2812TZ	E 28C E4J0N0210XX	26,150	
	1750	E2812TZ	E 28C E1J0N0210XX	26,150	
	1000	E3211TZ	E 32B E4J0N0210XX	34,000	
250	2000	E328TZ	E 32B E2J0N0210XX	30,970	M7/275
	1750	E328TZ	E 32B E2J0N0210XX	30,970	
300	2000	E3211TZ	E 32B E2J0N0210XX	34,000	NA
	1750	E3211TZ	E 32B E2J0N0210XX	34,000	
400	2000	E3213TZ	E 32D E2J0N0210XX	42,450	NA

¹ Constant Torque Speed Range.

² To construct a complete motor model number see Model Number Codes beginning on page 53.

³ See Millennium Series Drives, Section B, page 92.

⁴ NEMA Frame Designation. See PACTORQ Motor Dimensions beginning on page 60.

⁵ All specified PACTORQ Motors are standard.

NOTE: PACTORQ Motors are rated for use with Millennium Drives only.

A

MOTORS

B

DRIVES

C

PRE-ENGINEERED DRIVE SYSTEMS

D

GENERAL INFORMATION