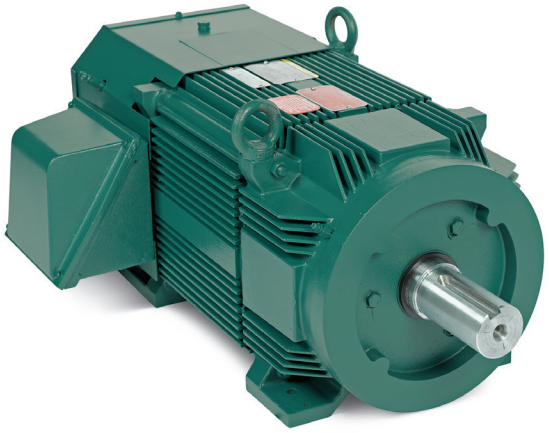
RPM XE Motors

APPLICATION GUIDE



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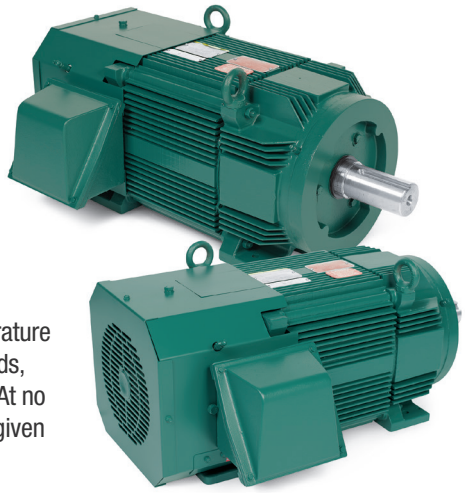
RPM XE Motors APPLICATION GUIDE

As a hybrid design, the RPM XE platform utilizes permanent magnet technology but can operate across the line, very similar to today's standard induction motor. While they offer an interchangeable design, caution should be taken to properly select and install a RPM XE motor. In this guide you will learn selection criteria, motor starting limits, and a recommended method to couple the motor with the intended load. Not limited to across the line operation, these motors can also be controlled from VFD with minimal limitations.



1. Motor Selection

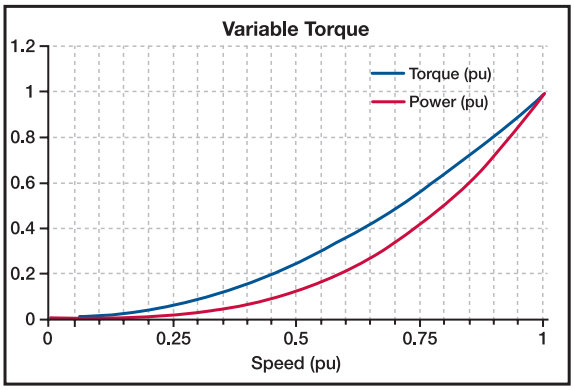
- **Duty Cycles**

  The RPM XE motor is designed for continuous operation at full load with an ambient temperature equal to or less than the value listed on the nameplate (typically 40°C). For time varying loads, it may be necessary to determine the average "or RMS" loading to properly size the motor. At no time shall the required load torque at rated speed exceed 80% of the pull out torque value given on the performance data sheet.

- **Typical Applications**

  Typical applications for the RPM XE motor include loads whereby the value of load torque varies as the square of the motor speed (i.e. variable/quadratic torque loads) as shown below in Figure 1.

Figure 1



Common variable torque loads include pumps, fans, and compressors. The value of load inertia that can successfully be synchronized varies by frame size and is typically lower than for a comparable NEMA induction motor. The inertia synchronization capability for each stock rating can be found in Table 1. For loads where the required torque exceeds the variable torque profile or the load inertia is in excess of the value listed, contact your local Baldor District office for proper sizing.

- **Number of starts**

Per NEMA guidelines, each design is capable of starting the specified load and inertia twice from cold (ambient) conditions and once from hot (rated operating temperature) conditions. Additional consecutive starts will require a wait time for the motor to cool. To take advantage of the eXtreme efficiency of the RPM XE motor, it is best applied on applications with high utilization rates. Applications that require frequent starting and stopping will not benefit as much as those with nearly continuous operation.

Motor Starting Limits are as follows:

- This is based on the Inertias from Table 1 and the load torque of Figure 1.
- These limits apply providing the applied voltage and method of starting are those for which the motor was designed and the motor coasts to rest between starts.
- 2 Start(s) with motor initially at a temperature not exceeding rated ambient temperature.
- 1 Start(s) with motor initially at a temperature not exceeding rated load operating temperature.
- Cooling time required for each additional start:
  - 45 Minutes with motor shut down before re-start
  - 15 Minutes with motor running without load before shutdown and re-start
  - 30 Minutes with motor running at rated load before shutdown and re-start
- Contact your local Baldor District Office for motor frequent starting conditions

- **Replacing Existing Induction Motor**

The RPM XE motor is a synchronous machine which means it operates at exactly synchronous speed regardless of output power requirements or operating temperature. This is in contrast to an induction motor whose operating speed (a function of slip) varies with both load and temperature. For example, an existing 50 Hp premium efficiency 4 pole motor may operate at approximately 1775 RPM, while the RPM XE motor will operate at exactly 1800 RPM. When replacing an induction motor in an existing application, any impact the (slightly) higher speed operation may have should be considered. A change of coupling may be needed as well (see section on Coupling Selection).

2. Motor Starting

- **Starting Transients**
  - The inrush current during startup is the same as that for a comparable Design B induction motor. Until the motor reaches synchronous speed, the stator field "slips" over the rotor field created by the magnets, resulting in transient torque pulsations. The magnitude of these pulsations can be greater than those typically seen during startup of an induction motor. Consult the coupling selection guide for use with RPM XE.
- **Electronic Soft Starters**
  - Due to the presence of the field created by the permanent magnets in the rotor, the use of conventional electronic soft starters is not recommended.
- **Reduced Voltage Starting**
  - Because of the permanent flux provided by the magnets, starting voltage must be high enough to overcome back-EMF generated in the windings. Motor terminal voltage should be no less than 90% of rated voltage to successfully start the motor. If further reduced voltage is required, contact your local Baldor District Office.
- **Sizing Starters per NEMA**
  - The RPM XE product line was designed to meet NEMA B requirements for locked rotor amps. Size starters the same as for a comparable induction machine.
- **Maximum Inertia**
  - Failure of the RPM XE motor to synchronize will lead to extended current draw which is several times the rated full-load value. This current will cause the motor to overheat and lead to motor failure if unmitigated. To ensure successful synchronization, the load inertia should not exceed the values in the table below. For load inertias exceeding these values, contact your Baldor District Office.

Table 1

Rating	Inertia Capability [lb-ft^2] *
10	2.6
15	4.0
20	4.6
25	10.2
30	11.1
40	16.8
50	19.0
60	28.6
75	34.5
100	36.7
125	42.2

**Inertia limit based upon 90% voltage, hot motor on fully loaded application worst case starting conditions. No inertia limitations on AF power.*

3. Coupling Selection

Due to the nature of the starting torque of an RPM XE motor operating on sine wave power, the coupling selection is critical for properly applying this motor design. The following Baldor•Dodge couplings are recommended for the stock ratings:

- Both flanged mount and split-in half style natural rubber tire couplings are designed to accept high levels of shock loading and vibration and are ideally suited for RPM XE applications.
- Mechanical soft starts are ideally suited for RPM XE applications.
- Due to the aggressive nature of applications involving RPM XE motors, couplings other than the styles specified in this guide are not recommended.
- Based on the starting Torque in Figure 1 and the Inertias from Table 1, a minimum Coupling Service Factor of 5 is recommended for use with this motor design.
- Finished bore couplings require a tight, concentric fit to the shaft. AGMA 9002 and ISO R775 Interference fits are recommended with finished bore coupling hubs.
- When a Taper Lock bushing is specified, the material of the bushing must be steel and not powdered metal or cast iron.

RPM XE Sound Levels

RPM-AC Frame	NEMA Frame	HP	RPM	WK^2 lb-ft^2	Fan Diameter (in)	Sound Pressure dBA (50 Hz / 60 Hz)	Sound Power dBA (50 Hz / 60 Hz)
FL1838	HL215T	10	1800	0.60	7.50	68 / 68	80 / 80
FL1844	HL254T	15	1800	0.73	7.50	68 / 68	80 / 80
FL1848	HL256T	20	1800	0.83	7.50	68 / 68	80 / 80
FL2158	HL284T	25	1800	1.82	7.50	60 / 63	72 / 75
FL2162	HL286T	30	1800	2.12	9.00	63 / 67	75 / 79
FL2562	HL324T	40	1800	2.96	9.00	62 / 65	74 / 78
FL2570	HL326T	50	1800	3.89	10.50	67 / 70	80 / 83
FL2873	HL364T	60	1800	7.56	10.50	66 / 70	78 / 83
FL2882	HL365T	75	1800	9.37	10.50	66 / 70	78 / 83
FL2890	HL405T	100	1800	11.10	10.50	66 / 70	78 / 83
FL2898	N/A	125	1800	12.80	11.75	70 / 75	79 / 84

Data taken at 3 feet, no load

- **Baldor•Dodge Raptor selection matrix**
  - Inertia not to exceed values listed in Table 1

Rating Hp	RPM	Motor Rated Torque (in-lbs)	Coupling Rated Torque (in-lbs)	Coupling Service Factor	Raptor Coupling Size
10	1800	350	2308	6.6	E20
15	1800	525	3651	7.0	E30
20	1800	700	3651	5.2	E30
25	1800	875	5504	6.3	E40
30	1800	1050	5504	5.2	E40
40	1800	1401	7656	5.5	E50
50	1800	1751	12505	7.1	E60
60	1800	2101	10505	5.0	E60
75	1800	2626	22132	8.4	E70
100	1800	3501	22132	6.3	E70
125	1800	4377	22132	5.1	E70

- **Baldor•Dodge Paraflex selection matrix**
  - Inertia not to exceed values listed in Table 1

Rating Hp	RPM	Motor Rated Torque (in-lbs)	Coupling Rated Torque (in-lbs)	Coupling Service Factor	Paraflex Coupling Size
10	1800	350	1800	5.1	PX60
15	1800	525	3605	6.9	PX80
20	1800	700	3605	5.1	PX80
25	1800	875	4502	5.1	PX90
30	1800	1050	5402	5.1	PX100
40	1800	1401	7750	5.5	PX110
50	1800	1751	12605	7.2	PX120
60	1800	2101	12605	6.0	PX120
75	1800	2626	27590	10.5	PX140
100	1800	3501	27590	7.9	PX140
125	1800	4377	27590	6.3	PX140

- **Baldor•Dodge Flexidyne – Mechanical Soft Start selection matrix**

Rating Hp	RPM	Motor Rated Torque (in-lbs)	Flexidyne Coupling Size
10	1800	350	75C
15	1800	525	9C
20	1800	700	9C
25	1800	875	11C
30	1800	1050	11C
40	1800	1401	11C
50	1800	1751	11C
60	1800	2101	11C
75	1800	2626	15116
100	1800	3501	15116
125	1800	4377	D151131

4. Operation on a VFD

- **System Efficiency Levels of IE3 are obtainable**
- **Sensorless (V/Hz) operation Feedback device not required**
- **No Inertia Limitations**
- **No Coupling Limitations**
- **No Limitations on maximum number of Starts**

Contact Baldor•Dodge Engineering for Technical Support: Baldor•Dodge BPTC Tech Support, 864-281-5700, BrgPtTechSupport@baldor.abb.com

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