

# General Information

## Emerson's U.S. Motors® brand with Variable Frequency Drives (VFD)

Emerson's U.S. MOTORS® brand INVERTER GRADE® motors exceeded NEMA® MG 1, Parts 30 & 31 before the standards were established. We were the leader in the development of motors to withstand PWM drives' evolution from power transistors to higher switching frequency IGBTs. Today, there is an increased need for motors for light and medium duty inverter applications. Through continued research and development, including the addition of wire designed for INVERTER GRADE® motors, all three phase vertical motors are inverter compatible. However, inverter compatibility of motors is complex. Many factors must be taken into account by users to determine the suitability of types of motors. These factors include torque requirements (constant or variable), speed range, line/system voltage, cable length between drive and motor, drive switching (carrier) frequency, and the motor construction, among others. Wider speed ranges, higher voltages, higher switching frequencies and increased cable lengths all add to the severity of the application and, therefore, the potential for premature motor failure.

### Applying INVERTER GRADE® motors with variable frequency drives:

The INVERTER GRADE® motors in this catalog have inverter duty insulation. This insulation system exceeds the NEMA® MG 1 Part 31 standard and has been proved in thousands of inverter installations for reliability. Emerson extends its standard warranty to 3 years on all INVERTER GRADE® motors with up to 400 feet of cable between the motor and VFD. These are the most appropriate motors for any severe inverter application or when the factors affecting a motor's suitability are undefined (such as spares). Inverter duty motors type RUSI are typically used in 10:1 variable torque applications.

### Applying Premium, Standard & Energy Efficient motors with variable frequency drives:

Premium, Standard & Energy Efficient motors may be utilized with VFD power subject to the following limitations:

#### Applying Premium Efficient Motors on Variable Frequency Drives

Meet NEMA® MG-1, Section IV, Part 31.4.4.2. They are suitable for use with adjustable frequency drives under the following parameters: Up to 10:1 speed range on variable torque loads, standard two year warranty, per Emerson standard limited warranty set forth on page 66.

Maximum Cable Distance VFD to Motor Premium Efficiency			
Switching Frequency	460 Volt	230 Volt	380 Volt
3 kHz	196 ft	481 ft	295 ft
6 kHz	168 ft	340 ft	209 ft
9 kHz	113 ft	278 ft	170 ft
12 kHz	98 ft	241 ft	148 ft
15 kHz	88 ft	215 ft	132 ft
20 kHz	76 ft	186 ft	114 ft

#### Applying Standard & Energy Efficient Motors on Variable Frequency Drives

Meet NEMA® MG-1, Section IV, Part 30.2.2.8. They are suitable for use with adjustable frequency drives under the following parameters: Up to 10:1 speed range on variable torque loads, one year warranty, per Emerson standard limited warranty set forth on page 66.

Maximum Cable Distance VFD to Motor, Standard or Energy Efficient			
Switching Frequency	460 Volt	230 Volt	380 Volt
3 kHz	103 ft	435 ft	218 ft
6 kHz	73 ft	307 ft	154 ft
9 kHz	59 ft	251 ft	126 ft
12 kHz	51 ft	217 ft	109 ft
15 kHz	46 ft	194 ft	98 ft
20 kHz	40 ft	168 ft	86 ft

All motors have 40°C Ambient, 1.0 SF on Inverter Power, 300 Ft. Max Altitude, 460 Voltage or less line power, up to 10:1 Speed Range on Variable Torque and have Class F insulation.

† All non-Emerson Electric Co. marks shown within this document are properties of their other respective owners.