

CANADIAN ELECTRICAL CODE

SUBJECT: Section 28 - Motors and Generators

General

Motors Controlled by Variable Frequency Drives (VFDs)

Motors that have not been specifically tested as suitable to be operated by VFDs can cause various problems to both the customer's electrical system and the utility supply. Some of these concerns include motor overheating from reduced cooling capabilities due to a slower fan speed and from harmonic wave distortion. Harmonic wave distortion can reduce motor efficiency due to increased losses, increased heating of motors, circuit conductors and transformers and increased stress on motor insulation. Consideration should also be given to what effects harmonic distortion could have on other areas of the plant such as power quality degradation, voltage dips, premature equipment failure, and interference with telephone or computer equipment.

CSA Standard C22.2 No. 100-95, Clause 12.4 states that in addition to the normal marking requirements, inverter duty machines (motors) shall be permanently marked. It reads as follows:

12.4 Marking

12.4.1

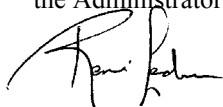
In addition to the marking requirements of Clause 5, and Clauses 7 to 9, inverter-duty machines shall be permanently marked with the following:

- (a) machine application (eg, inverter-duty motor);*
- (b) speed range over which the machine is designed to operate;*
- (c) type(s) of torque application for which the machine is designed (eg, VT (variable torque), CT (constant torque), CHp (constant horsepower) or equivalent);*
- (d) type(s) of inverter with which the machine is intended to be used (eg, VSI or VVI (6-step voltage-source), CSI (6-step current-source), VPWM (voltage-source pulse width modulated), CPWM (current-source pulse width modulated), LCI (load commutated), cycloconverter, or equivalent).*

12.4.2

Machines equipped with an integral inverter need not be marked in accordance with Clause 12.4.1(c) and (d).

Issue of this STANDATA is authorized by
the Administrator



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SAFETY CODES COUNCIL



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Considering that:

- motors intended for use with a Variable Frequency Drive should be suitable for operation by a VFD; and
- Rule 2-024 of the Code requires that electrical equipment "...be of a kind or type and rating approved for the specific purpose for which it is to be employed."; and
- CSA Standard C22.2 No. 100-95 has marking requirements for VFD rated motors,

For new installations, we should therefore ensure that motors and VFDs intended for use in a variable speed application be compatible and that motors are marked accordingly.

For existing installations, where motors are retrofitted to incorporate VFDs, owners are responsible for assessing the compatibility of the motor with the corresponding VFD. To facilitate ongoing operation and maintenance, owners are also encouraged to maintain a record of the compatibility assessment information.

Rule 28-106 Conductors, Individual Motors

Rule 28-108 Conductors, Two or More Motors

Table 27 Duty Cycle

The branch circuit conductors for an individual motor are normally sized to those values specified in Table D16 for the full load current rating of the motor. The exception is where a motor is designed and used for short-time, intermittent, periodic or varying duty, under the specific conditions as shown in Table 27. In addition, a motor application is considered one of continuous duty unless the nature of the apparatus that it drives is such that the motor will not operate continuously under load during any condition of use.

Caution is advised where Table 27 is being applied, particularly when the use of conductors rated less than 125% of the motor nameplate current rating are being considered. It would usually be necessary, in such cases, to have complete manufacturer's technical data for the motor and the apparatus driven to ensure that the operational conditions and design characteristics would be compatible with the reduced size of conductors.