

SCOPE

- I 1.1 This practice covers Variable Frequency Drives (VFDs) made to a Manufacturer's standard design. This type VFD is a complete, stand-alone converter equipment, fully specified in a printed catalog or data sheet which is current at the date of this Inquiry, and capable of speed and torque control of a three-phase squirrel-cage induction motor.
- I 1.2 Thermal capabilities, voltage, insulation and all other design aspects of the VFD, motor and cabling system shall be compatible.
- I 1.3 Standard VFDs are supplied directly, without transformer, from a low voltage power bus supply with a maximum voltage rating of 690 V rms a-c.
- I 1.4 The contents of this practice are arranged as follows:

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I 1.5 An asterisk (*) indicates that a decision or approval by the purchaser is required or that additional information is to be furnished by the purchaser.	
I 1.6 The following references are synonymous: BP and IP.	

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 The following practices shall be used with this practice.

PRACTICES	
IP 15-7-2 Protective Systems	IP 16-9-2 A-C Motors: Medium Voltage and Low Voltage over 200 HP (150 kW)
IP 16-9-1 Low Voltage A-C Motors up to 200 HP (150 kW)	IP 16-12-1 Switchgear, Control Centers and Bus Duct

- I *2.2 The following standards shall be used with this practice when specified by the purchaser.

STANDARDS	
IEC Standards 34-1 Rotating Electrical Machines-Rating and Performance Section 14: Electromagnetic Compatibility (EMC) 146-1 Semiconductor Convertors (3 Parts) 529 Classification of Degrees of Protection Provided by Enclosures 1800-3 Adjustable Speed Electrical Power Drive Systems Part 3: EMC Product Standard Including Specific Test Methods First Edition	IEEE Standards 519 Recommended Practices and Requirements for Harmonic Control in Electric Power Systems API Standard 541 Form-Wound Squirrel-Cage Induction Motors - 250 Horsepower and Larger

DOCUMENTATION

- I 3.1 Catalog data for VFD and motor shall provided with all proposals, along with a copy of the standard instructions for safe installations, commissioning, operation, and maintenance for the VFD(s) offered.

IP 16-14-1		Standard LV Variable Frequency Drives	EXXON INTERNATIONAL PRACTICE
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

- I * 3.2 **VFD data** specified in [Table 1](#), shall be furnished by the vendor with all proposals. Additionally, all other drawings and documentation specified herein shall be supplied with the proposal.
- I 3.3 **Vendor shall provide documentation showing that the equipment meets the approval requirements of the local authority.** Approval requirements may include labeling, listing, or certification by a nationally-recognized testing organization acceptable to the local authority.
- I * 3.4 When motor is included, **the vendor shall supply documentation** to confirm motor compliance with applicable national and local authority requirements for hazardous areas. If this is not available, suitable factory heat run tests shall be carried out and documented as required by the authority.

CONSTRUCTION REQUIREMENTS

MECHANICAL

- R * 4.1 Unless otherwise specified, **the VFD will be located indoors in an unclassified area** with ambient temperature range of 50-104°F (10-40°C) and below 3200 ft (1000 m) elevation. The VFD shall have a minimum ingress protection of **NEMA12 or IP21**.
- I 4.2 **The vendor shall provide drawings** to show the minimum spacing around the VFD essential to maintain proper ventilation and cooling, whether mounted alone in an enclosure, or as part of a multiple VFD installation within the same enclosure.

ELECTRICAL

- R 4.3 **The VFD shall be capable of withstanding** the thermal and mechanical forces resulting from a short circuit.
- O * 4.4 **Vendor's equipment shall comply** with installation and electrical interlocking details shown on the one-line diagram, when supplied by the purchaser.
- O * 4.5 **Vendor's equipment supply** shall include the following when needed to meet the requirements of this practice:
 - a. Output line reactors or other equipment required to ensure the motor and cable insulation systems are suitable for reliable operation with the VFD drive technology employed and comply with EMC emissions requirements.
 - b. Input filters and reactors
- I 4.6 **Vendor shall provide electrical details** on the VFD(s) offered including:
 - a. Output waveform from the VFD imposed on the motor and cable, including the maximum voltage rate of rise and peak values, and output carrier frequencies for various load conditions.
 - b. Physical sizes, installation requirements and electrical connections of any reactor or filter equipment that cannot be supplied within the VFD cubicle.
 - c. Maximum size of input fuse rating and type.

CONTROL

- O,M 4.7 **Minimum controls shall be provided** at the VFD control panel, and also be available as external hard-wired control circuit inputs as follows:
 - a. Run, forward and reverse.
 - b. Stop.
 - c. Speed reference. A smooth bump-less transfer shall be provided between the local and remote speed reference/control signals. The local speed reference shall override external signals.
 - d. Reset for any alarm or trip condition.
- I * 4.8 **Other control features that can be offered** for the proposed VFD shall be listed, including:
 - a. Hard-wired outputs for monitoring circuits
 - b. Local or hard-wired remote indications.