

DIVISION 26 - ELECTRICAL

SECTION 26 29 23 – VARIABLE FREQUENCY DRIVES

PART 1: GENERAL

1.01 Scope of Standard

- A. This standard provides general guidance concerning the specific preferences of Texas State University-San Marcos for Variable Frequency Drives.
- B. Texas State University-San Marcos recognizes that project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification, it is expected that these guidelines will govern the design and specifications for Texas State University-San Marcos projects.

1.02 Overview

- A. Texas State University-San Marcos maintains standard specifications and installation details for Variable Frequency Drives.
- B. The specifications list approved drive types, options and accessories.

1.03 Compatibility

- A. Due to the need for compatibility with existing VFD maintenance and inventory processes, all drives provided shall comply with current specifications.

PART 2: PRODUCTS

2.01 General Requirements

- A. Disconnect and bypass to ensure continued operation of system if VFD fails.
- B. Motor starter not integral to the VFD. Standalone starter, separate component in a self-contained enclosure.
- C. Variable torque, variable voltage/frequency type for centrifugal fan and pump applications and suitable for use with both standard and high efficiency 3-phase, squirrel cage, induction motors.
- D. Solid state with Pulse Width Modulation (PWM) output waveform. VVI, six step, and current source are not acceptable. Full wave rectifier (to prevent input line notching), AC line reactor, fuses, capacitors, and insulated bipolar transistors (IGBT's) as the output-switching device (SCR's, GTO's and Darlington transistors are not acceptable). All standard and optional features included within the VFD enclosure. Approved by the equipment manufacturer for the particular product(s) and application(s) involved.
- E. Converter and an inverter section. Converter section shall convert fixed frequency and voltage AC utility power to a DC voltage. VFD shall also include three phase input fuses. The inverter

section of the VFD shall invert the DC voltage into a quality output wave form, adjustable voltage and frequency output for stepless motor speed control.

- F. Tested to ANSI/UL standard 508. Complete system listed by a nationally recognized testing agency such as UL, ETH CUC or CSA.
- G. Power line noise limited to a voltage distortion factor and line notch depth as defined in IEEE 519-1992. Prior to installation, the VFD manufacturer shall estimate total harmonic distortion (THD) caused by the VFD. The results based on a computer aided circuit simulation of the total actual system, with information obtained from the power provider and the user.
- H. Pre-wired 3-position mechanical type Hand/Off/Auto (H-O-A) selector switch and speed potentiometer. Means to communicate hand, off, or auto position.
- I. Power on light to indicate that the VFD is being supplied line power. Fault light to indicate that the VFD has tripped on a fault condition.
- J. Plain English, backlit LCD digital display (code numbers and letters not acceptable) and keypad.
- K. Internal self-diagnostics.
- L. Speed control shall be from a 4-20mA, 0-10vdc or 3-15psi pneumatic signal.
- M. Enclosures shall be NEMA-1 for indoor applications and NEMA 3R for outdoor applications.

2.02 Warranty

- A. 12 months from the date of certified start up. Include all parts, labor, travel time and expenses.
- B. Local factory certified technicians for 24 hours, 7-day a week service. Throughout the warranty service period, response within 24 hours of initial contact for service.
- C. Guaranteed spare parts availability to the Owner for a minimum of fifteen (15) years from date of purchase. Price escalation for spare parts not to exceed 10% per year over the five (5) year duration.

2.03 Training

- A. On-site instruction included with each VFD and within 30 days of start-up. Factory trained and certified instructor. All training aids shall be provided by trainer. Content to include care, troubleshooting, servicing, and operation of the equipment and systems installed.
- B. Classroom and on-site, in-the-field instruction.

2.04 Start-Up

- A. Factory trained and certified technician shall check the installation, start the VFD's and place them into operation. Start-up within two weeks of notification.
- B. Certified start-up report.

2.05 Communications

- A. EIA-485 and EIA-232 ports as standard.
- B. Communicate with PLC's, DDC's, Metasys N2 bus, BACnet, and other communication protocols. Components included for interface with the selected Building Automation System.
- C. Serial printer to download drive parameters and fault logs.
- D. Programmable inputs and outputs.

PART 3: EXECUTION

3.01 Design Requirements

- A. The 50% Contract Document review submission shall include specifications and details for VFD's.
- B. Statement of deviations from standards. Deviations approved by Physical Plant.
- C. Incorporate Physical Plant standard VFD documents and details into project contract documents.
- D. Show VFD locations on mechanical plans. Ensure adequate mounting space and floor area including service access. VFD preferred location is adjacent to and within the same room as equipment served.

3.02 Coordination

- A. All design work shall be coordinated with electrical.
- B. VFD's shall be installed as per NEC requirements.
- C. When the AHU's, fans or pumps are being supplied as a unit with a motor installed, the mechanical contractor will supply the VFD's and starters as required by Section 26. The units will be mounted and wired by electrical contractor unless otherwise noted.

END OF SECTION 26 29 23