

**SPECIFICATION SECTION [16260]
FOR
MEDIUM VOLTAGE ADJUSTABLE
FREQUENCY DRIVES
RATED 300 – 10,000 HP**

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RATED 300 – 10000 HP**

PART 1 GENERAL

1.01 SCOPE

- A. The purpose of this document is to provide a specification for the purchase including design, fabrication, inspection, testing and shipment of 2300 to 14,400 volt AC three-phase input, 2400 to 4160 volt output, [50, 60] Hertz, adjustable speed drives (ASDs). The ASDs are to be configured for [induction, synchronous] motors in an installation that that will result in a long design life with very low maintenance requirements.

1.02 PRODUCT INSTALLED AND NOT INCLUDED

- A. This document is for the procurement of only one component of the system and does not include requirements for the overall system design. Factors such as fault levels, torsional analysis, motor design, voltage drop, etc., also need to be included in the overall system design, but are outside the scope of this Specification. This Specification does not include the requirements for the motor. When a coordinated package is required, the Buyer shall also include an additional motor specification. More consideration will be given to a bidder that manufactures and guarantees both the motor and ASD.

1.03 REFERENCES

- A. Applicable requirements in the latest edition (or the edition indicated) of the following industry standards and industry practices shall be considered an integral part of this Specification. Short titles will be used herein when appropriate.
1. IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Converters
 2. IEEE 1100 – Powering and Grounding Sensitive Electronic Equipment (Emerald Book)
 3. NEMA ICS 6 – Industrial Control and Systems Enclosures
 4. NEMA ICS 7 – Industrial Control Systems Adjustable Speed Drives
 5. NFPA 70 – National Electrical Code (NEC)
 6. UL 347A – Medium Voltage Power Conversion Equipment
- B. Any conflicts between this specification and the Bidder's documents shall be identified in writing to Buyer for resolution.

1.04 DEFINITIONS

- A. For the purpose of this Specification, the following definitions apply:
1. **ASD Adjustable Speed Drive:** Also called variable speed drive (VSD), variable frequency drive (VFD), or adjustable frequency drive (AFD) is a device used to vary the speed of a motor.
 2. **NPC Neutral Point Clamp** is an ASD topology that has the advantage of reducing the high line to neutral voltage that can occur in other traditional drive designs that can reach 2.7 to 3.3 times normal levels.

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3. **PWM**: Pulse Width Modulation is a method of controlling power devices to convert voltage levels. PWM is a popular method of control for converting DC voltage to AC voltage.
4. **IGBT**: Insulated Gate Bipolar Transistor is a high speed electrical switching power device. It is very efficient requiring very low power for control circuits.
5. **HCT**: Hall effect Current Transformer is used for current detection of DC to high frequency without direct contact or shunts.
6. **CPT**: Control Power Transformer is typically used to power control circuits and relays for the ASD.
7. **LCD**: Liquid Crystal Display is a device used for display of alpha-numeric or graphical characters. It is used in the operator interface of the ASD.

1.05 SYSTEM DESCRIPTIONS

- A. The ASD shall consist of the following components:
 1. Incoming Disconnect (when specified on Data Sheet)
 2. Multi-secondary Isolation Transformer[s] with Rectifiers
 3. Frequency Converter/Inverter
 4. Electronic Motor Protection with selection of Class 10/20/30 protection
 5. Output filter or reactor (only if /as required to minimize reflected voltage)
 6. Output Disconnect(s) or bypass (when specified on Data Sheet)
 7. Diagnostics and Control Circuits.
- B. If specified on the data sheet, the ASD assembly shall be designed and constructed to Underwriters Laboratory (UL and/or cUL) standards.
- C. The ASD inverter shall be of the pulse width modulated (PWM) Neutral Point Clamp (NPC) type. The output devices shall be Insulated Gate Bipolar Transistors (IGBTs) with a voltage rating of at least 3300V. Use of lower rated devices is unacceptable due to the quantity of devices required in the design.
- D. This specification covers an ASD driving a single motor. When parallel operation of motors is specified, additional motor rating information shall be included on a separate attachment.
- E. All components and material shall be new and of the latest field-proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.
- F. The equipment shall be completely factory-built, assembled, wired, and tested. When it is necessary to disassemble the units for ease of transportation, adequate materials and instructions shall be provided for easy field reassembling.

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1.06 SUBMITTALS

- A. The Supplier shall furnish two (2) copies of the following documents with the quotation:
1. Descriptive bulletins to include ratings, protection, controls, diagnostics, and operation.
 2. A system harmonic statement assuring compliance with IEEE 519 at the drive terminals.
 3. Heat loss data and typical airflow data for each typical unit
 4. Drive system efficiency, including the effects of transformers, fans and other devices.
 5. Outline drawings with weights and dimensions for all components required to meet the specification.
 6. Warranty details.
- B. The Manufacturer shall submit drawings and data of the type and quantity shown in the table below.

[A] With Bid	[B] For Review	[C] Final Certified	[D] As Built	DESCRIPTION
	X	X	X	Bill of Material
	X	X	X	Outline drawings showing all dimensions, weights; and the final assembled configuration.
	X	X	X	Single-line, 3-line, and control schematic diagrams with connection diagrams for all electrical equipment supplied.
X				Harmonic statement
			X	Installation, Operation, Programming, and Maintenance Manual(s)
		X		Certified Test Reports
	X		X	Recommended priced spare parts list

[A] Bidder shall furnish these documents with proposal.

[B] Manufacturer shall furnish these documents for Buyer's review and authorization to proceed before fabrication.

[C] Manufacturer shall furnish these documents as part of the final certified document submittal.

[D] Final As-Built drawings provided within 2 weeks following shipment.

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1.07 INSPECTION AND TESTING

- A. Manufacturer's standard tests shall be performed. Minimum testing shall include:
1. Power semiconductors shall be thermally cycled prior to final assembly into the ASD.
 2. Printed circuit boards shall be tested prior to assembly into the ASD. The microprocessor [drive control] printed circuit board shall go through a burn-in at 60° C for a minimum of 24 hours.
 3. Individual power cells shall undergo a visual inspection, an electrical inspection, and a complete full load test prior to final assembly into the ASD.
 4. Mechanical operation tests shall be performed for each ASD to verify satisfactory operation. These tests shall include checking operating mechanisms and interlock devices.
 5. Electrical function tests shall be performed to ensure proper operation of all devices and components including operation of the ASD at full load conditions. Instrumentation, software, and monitoring tests shall be included.
 6. The final assembly including transformer shall be tested at full current and low voltage into a load reactor. An unloaded full voltage motor shall also be used during testing.
 7. A test record for each ASD shall be furnished as part of the final data requirements.

1.08 RELIABILITY

- A. The ASD shall be designed with an experience based calculated Mean Time Between Failure of at least 16 years.
- B. The ASD shall be designed to have a Mean Time to Repair of 15 Minutes after the capacitors have discharged to a safe value.

1.09 WARRANTY

- A. Seller shall warrant the equipment for a period of 12 months after startup, 18 months after shipment for equipment to be installed and operated in North America. For North American installations, warranty shall cover both parts and labor for required repairs.
- B. For equipment to be installed and operated outside North America, manufacturer's warranty shall extend for a minimum of 12 months after startup, 18 months after shipment, but may be parts only, and may not include repair labor.
- C. Seller must state clearly the details of warranty offered with his equipment.

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1.10 SYSTEM STARTUP AND COMMISSIONING

- A. Commissioning and Startup Services must be available from the supplier's field engineering service group. Technical support shall be available 24 hours per day, 365 days per year.
- B. The Supplier shall provide a software tool with operational, maintenance and diagnostic features. Using a Buyer supplied Windows compatible PC, this software shall permit the programming of parameters, display block diagrams, show bar graphs, report adjustment data, display trends, provide troubleshooting using first fault data/trace back data/trouble record, and contain links to system documentation and to system help. In addition, the software tool shall have the following features:
 - 1. Ethernet interface with drive
 - 2. Animated function block diagrams with real time variables
 - 3. Commissioning wizards
 - 4. Integrated trending window
- C. The ASD supplier must include one or more Remote Connectivity Interface Modules at each drive or group of drives for network or other communications of drive status. This module must also provide non-volatile storage of drive operation and fault data for analysis on site or remotely within the limits and security permissions unique to the customer facility.
- D. After commissioning is completed, the ASD supplier shall provide remote diagnostic analysis service for troubleshooting the ASD through the customer's network or other locally provided connection point. This service is to be included at no charge during the warranty period. This service shall have the capability to connect to the ASD through the included Remote Connectivity Interface Module, again within the limits and security permissions unique to the customer facility.

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PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The adjustable frequency drives shall be TMEIC Dura-Bilt5i MV, [Supplier 2, Supplier 3].
- B. The VFD supplier shall have a minimum of 15 years experience in supplying medium voltage adjustable frequency drives.

2.02 PRODUCT DESCRIPTION

A. MECHANICAL

1. ENCLOSURE CONSTRUCTION

- a. The ASD enclosure shall be suitable for installation in an indoor, unclassified area.
- b. All enclosure openings exceeding 0.25 inch (6 mm) width shall be provided with screens to prevent the entrance of snakes, rodents, etc. The maximum screen mesh opening width shall be 0.25 inch (6 mm).
- c. A “loss of cooling” fault shall be furnished. In the event of clogged filters or fan failure, the drive will produce an alarm and then in a predetermined time shutdown safely without electronic component failure. If specified on the data sheet, optional redundant fans, shall be available in the drive design as backup in the event of fan failure.
- d. Air filters shall be of a reusable type that can be easily cleaned. All doors or front panels will be fully gasketed. Air exhaust from cooling fans will be at the top of the enclosure away from personnel in front of the equipment.
- e. Fan motors shall be protected by an input circuit breaker. Metal squirrel cage ball bearing 460V three phase fan motors with 10-year design life are to be used in the drive design. Plastic muffin fans are not acceptable. Fan power will be obtained from [a remote 460V three-phase power, from a tap on the main power] transformer.
- f. The maximum noise level of the unit shall not exceed 78 dBA at a distance of 1 meter from the unit and at a height of 1.5 meters from the floor.
- g. The drive, including incoming disconnect and integral transformer should not be greater than the dimensions shown in the table at the end of this specification.
- h. Use Manufacturer’s standard finish unless otherwise shown on the Data Sheet.

2. ENCLOSURE AUXILIARY COMPONENTS

- a. If specified on the Data Sheet, enclosure space heaters shall be supplied. Space heater elements shall be rated 240 VAC and operated at 120 VAC, single-phase.
- b. The space heater circuit is to be energized from customer power when the drive is not operating.
- c. A fused switch or circuit breaker for the space heater circuit shall be provided for overload protection and as a disconnecting means.

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3. ENCLOSURE NAMEPLATES

- a. When specified by the data sheet, engraved, laminated plastic nameplates with characters 1/2 inch (12.7 mm) high, or larger, shall be provided for each ASD to identify the load it serves.
- b. Nameplates shall have black letters on a white background, unless otherwise specified on the Data Sheet.
- c. Meters, relays, switches, and other devices within the ASD shall be permanently identified using the same name as those appearing on the schematic diagrams.

B. ELECTRICAL

1. POWER REQUIREMENTS

- a. The ASD shall be capable of providing rated output for continuous input voltage deviations of $\pm 10\%$ from the nominal rating with transformer taps adjusted accordingly for continuous operation matching the average system voltage.
- b. The ASD shall be able to ride through voltage dips down to 70% of nominal, such as those experienced during motor starting.
- c. The ASD shall be able to return to normal operation without intervention following an incoming power disturbance of at least 100 ms
- d. The ASD one-minute overload current rating shall be 110-115% of rated current for variable torque applications when indicated on the Data Sheet.
- e. The ASD one-minute overload current rating shall be 150% of rated current for constant torque applications when indicated on the Data Sheet.
- f. The ASD output voltage shall be have been proven by field experience not to cause insulation stress to connected motors of nameplate rating matching the drive output.
- g. Output filters, if required, shall be integral to the drive cabinet.
- h. Any capacitors supplied shall be oil filled.
- i. The ASD shall comply with the latest revision of IEEE 519 for total harmonic current and voltage distortion measurement and calculation. Voltage distortion shall not exceed 5% and current distortion shall not exceed 3% to the utility line. Individual current harmonics shall not exceed the requirements of IEEE 519.

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2. POWER DISCONNECT DEVICES

- a. When the Buyer does not have a suitable disconnect available, the ASD Manufacturer shall include an integral main disconnect device with an interlocked and padlockable handle mechanism. The disconnecting device shall be a medium voltage vacuum contactor with a bolted pressure disconnect switch whose blades are externally visible from outside the enclosure. The disconnect device and associated fuses shall have a minimum rating of 350 MVA.
- b. The incoming line shall have distribution class lightning arrestors to protect from transient voltages. The transformer and rectifier shall be an integral part of the ASD assembly.
- c. When multiple inverter enclosure doors are supplied, all doors shall be electrically interlocked with the disconnect device. The interlocks shall include a provision to manually override for test and repair.
- d. If specified on the Data Sheet, the ASD shall include an output disconnect.
- e. If specified on the Data Sheet, the ASD shall include a bypass feature. A "maintenance bypass" shall allow servicing of the ASD components while the motor is operating at fixed speed.
- f. If specified on the Data Sheet, ASD shall provide synchronized connection of a motor on the ASD output to and removal from the power utility source.

3. INPUT POWER TRANSFORMER AND RECTIFIER

- a. The ASD shall contain an incoming dry type isolation transformer whose primary voltage shall be as specified on the Data Sheet.
- b. The transformer shall contain three-phase secondary windings that provide the proper phase shifting to feed a minimum of a 24-pulse rectification to reduce harmonic currents and voltages reflected to the primary power system. Any ASD proposed with a converter designed for less than 24 pulse shall include a harmonic study with the proposal. Additional testing at the user site to verify the study results will be required at no additional cost to Buyer.
- c. The transformer shall be copper wound and shall have a 220°C insulation system to operate at 115° C rise at full load conditions.
- d. The transformer shall have an electrostatic shield for protection from voltage transients.
- e. The rectifiers shall be protected by fuses with blown fuse indication.
- f. Soft charge of the DC bus capacitors shall be accomplished by use of an input reactor on the primary of the input transformer. A vacuum contactor rated for drive full load amps will short the reactor after charge is accomplished.
- g. The DC power supply shall be filtered by liquid filled capacitors with a design life of 20 years. Electrolytic capacitors are not permitted in the main energy storage power circuit.

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4. POWER BUS

- a. All power bus bars, when part of the standard design, and other high current carrying parts shall be tin-plated copper for corrosion resistance. Power bus bar joints shall be plated.
- b. Bus bars shall be braced to withstand short circuit currents with a minimum of 50KAIC.
- c. Input and output connections shall be either top or bottom access in the standard design.

5. INVERTER SECTION

- a. The ASD inverter section shall consist of three modular assemblies fed from series DC power supplies. Each DC supply shall be derived from a phase-shifted secondary of the input transformer that cancels reflected harmonics back to the power line.
- b. The IGBTs are designed in a bridge connection such that when used in combination with the other bridges, a multi-level output motor voltage waveform is constructed. Each cell has a minimum rating of 3300V.
- c. The IGBTs shall be cooled using a sealed cooling system utilizing modern heat plate technology.
- d. Each cell shall communicate to the controller through optical communications. No other isolation method is permitted.
- e. A high resistance ground detection circuit at the neutral point shall be included for alarm or warning in the event the load develops a ground leakage current or fault.
- f. The output of the inverter shall produce harmonic current of not more than 3% over a speed range of 50% to 100% regardless of load.

6. WIRING AND TERMINATIONS

- a. Bus bar with standard NEMA four-hole pattern shall be supplied for input and output connection of external wiring and shall be conveniently located, clearly numbered, and identified.
- b. Control wire terminal blocks for external wiring terminations shall be compression screw type, designed to accommodate stripped insulation bare wire ends, and shall accept a minimum of two No. 14 AWG wires.
- c. Connection points for inputs and outputs of different voltage levels shall be segregated to reduce possibility of electrical noise.
- d. Where wiring is run through sheet metal or any barrier, bushings, grommets or other mechanical protection around the sheet or barrier opening shall be provided.
- e. All internal wiring shall be terminated with no more than two (2) conductors per terminal point.

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- f. The ASD shall have an internal mechanical ground connection suitable for terminating a stranded copper ground conductor of the same size as the incoming phase conductors.
- g. Ground busbar connections shall be near the incoming and outgoing power cable termination points and control wiring connections.
- h. Enclosures shall be designed to accommodate power cable entry from either top or bottom.
- i. Minimum wire bending space shall meet or exceed the value shown in NEC Table 430-10(b) for termination of the power cable.

C. CONTROL

1. CONFIGURATION

- a. The ASD Supplier shall supply a software interface, called toolbox herein, to configure, monitor and troubleshoot the drive. The toolbox shall have a path to a modem for remote diagnostics. The monitor feature shall have a trending feature where the ASD signals can be displayed in real time.
- b. The toolbox shall have a multilevel privilege feature for configuration parameter settings.

2. OPERATOR PANEL, INSTRUMENTS, DISPLAYS, AND INDICATING LIGHTS

- a. A door-mounted drive backlit LCD keypad will be standard for operator interface.
- b. The operator keypad display shall:
 - 1) have configurable bar charts and intuitive icons
 - 2) contain LED's to indicate "Ready", "Run", and "Alarm/Fault"
 - 3) have drive control functions and allow local operation of the motor from the keypad
 - 4) have full access to all parameters and variables.
- c. The operator keypad shall be used to read and write parameter data, to present operational information, to produce first fault and device indication, to show alarms, and to allow metering of parameters, and provide Ethernet connectivity to the drive software programming tool on the Buyer's PC.
- d. The operator keypad shall include a level of security.
- e. The operator keypad shall have seven analog test points. Two points shall be for Current A and B, and the other five shall be configurable.
- f. Additional metering and indication shall be supplied in accordance with the Data Sheet.
- g. Meters, displays, and keypads shall be accessible and visible from the front without opening the enclosure.

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3. OPERATIONAL CONTROLS

- a. **ADJUSTMENTS** The ASD shall include the following basic operating adjustments:
 - 1) Acceleration Time
 - 2) Deceleration time
 - 3) Current Limit
 - 4) Minimum frequency or speed
 - 5) Maximum frequency or speed
 - 6) Selectable skip frequencies
 - 7) Sensor-less Vector parameter settings
 - 8) Local/Remote selection
- b. The door mounted keypad shall have a button, which when activated, shall check each IGBT and display any errors in this self diagnostic test.
- c. **PROTECTION** - The ASD shall include necessary components to protect the ASD and motor against motor overload, internal faults in either the motor or ASD and disturbances in the incoming AC line. The failure shall be annunciated on the operator panel's LCD display. The ASD to be shut down with the output voltage reduced to zero for the following conditions:
 - 1) Short circuit on the output of the ASD
 - 2) Instantaneous output overcurrent
 - 3) Motor overload - the overload protection shall have an adjustable thermal curve function that allows tailoring the drive overload for different applications.
 - 4) Undervoltage or overvoltage on the incoming AC line
 - 5) Single-phasing of the AC incoming line
 - 6) Overtemperature of the ASD power inverter electronics from a component or ventilation failure
 - 7) Gate driver power supply or control power supply undervoltage
 - 8) ASD output open circuit during operation
 - 9) Ground fault of the ASD output
 - 10) Overvoltage of the ASD output
- d. If specified on the Data Sheet, the ASD shall return the motor to operating speed upon restoration of power following a voltage interruption on the AC incoming line.
- e. If specified on the Data Sheet, the ASD shall be able to reaccelerate a rotating motor. If this feature is not specified, the Manufacturer shall ensure the ASD will not restart until the motor has slowed sufficiently.

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- f. If specified on the Data Sheet, the ASD shall have the ability to smoothly transfer the motor to and from the power line. When multiple motors are specified, this feature allows the acceleration and synchronization of a motor to line voltage and speed and then allows another motor to be run at adjustable speed.
 - g. If specified on the Data Sheet, the ASD shall have the ability provide electronic braking to slow the motor down.
 - h. The ASD and / or its software toolbox shall be equipped with an auto tune-up wizard
 - i. The ASD should include a built-in motor simulation feature. This function will allow the drive electronics and interfaces to be verified without a motor being connected.
4. CONTROL POWER TRANSFORMERS (CPT)
- a. One or more control power transformers (CPTs) shall be provided within the enclosure. Depending on the end user's needs and specified on the data sheet, the CPT primary can be furnished from a separate source of 460VAC or take power from the drive main power.
 - b. The KVA rating of the CPT shall be determined by the Manufacturer and shall have a minimum of 25% spare capacity.
 - c. The CPT secondary voltage shall be 120 VAC.
 - d. The CPT primary shall be fused with current limiting fuses with an interrupting rating no less than 100,000 amperes.
 - e. The CPT secondary shall be fused and have one terminal grounded.
5. INPUT AND OUTPUT CONTROLS
- a. Interface to external controls and signals from the Buyer shall be furnished by the Manufacturer as specified on the Data Sheet.
 - b. The ASD shall provide, as a minimum, two analog inputs at $\pm 10\text{vdc}$ or 4-20 mA.
 - c. Three configurable analog output voltage signals shall be supplied. Two outputs shall be isolated and rated 4-20 mA and the other output shall be rated $\pm 10\text{vdc}$.
 - d. The ASD shall include, as a minimum, two 24vdc – 120vac discrete inputs.
 - e. The ASD shall include, as a minimum, six 24vdc inputs.
 - f. The ASD shall include, as a minimum, five drive controlled relays with 2 NO and 2 NC contacts rated 115 VAC, at 5 amps.
 - g. The ASD source voltage for external "Start - Stop" circuit logic shall be 120 VAC, derived from either the CPT or another remote source.
 - h. If specified, a communication controller will be included to the Buyer's network shall be [DeviceNet, Modbus / Modbus IP, Profibus, ISBus, TOSLINE-S20].

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6. FAULTS AND ALARMS

- a. The latest 8 faults and alarms are logged in trace memory with 64 analog channels. The trace for each alarm is to be started 50 ms before any fault and end 100 ms after the fault. This trace data shall be uploadable to the toolbox for display/analysis in the trend window, or sent electronically for further review and analysis.
- b. The ASD shall provide one normally open contact to indicate inverter RUN status. Contacts shall be rated 5A at 230 VAC and 24 VDC.
- c. The ASD shall include a N.O. alarm contact that will be held closed during normal operation and will open on ASD fault conditions. Contacts shall be rated 5A at 230 VAC and 24 VDC. If specified on the Data Sheet, additional diagnostic contacts shall be provided. The contacts can alarm the following conditions:
 - 1) Input Contactor Failure
 - 2) Ventilation Fan Malfunction
 - 3) Control Power Loss
 - 4) CPU Failure
 - 5) DC Bus Overvoltage or Undervoltage
 - 6) Open Cabinet Door
 - 7) Gate Power Loss
 - 8) Drive Cooling Fan Failure
 - 9) Motor Overtemperature [if monitored by auxiliary relay]
 - 10) Transformer Overtemperature
 - 11) Motor Overspeed
 - 12) PCB Failure
 - 13) Data Network Failure
 - 14) Individual Cell Fault.
 - 15) Under-load / loss of load
- d. The ASD shall have the ability to be connected via a networked connection to a user supplied PC to available remote diagnostic service. See details under Startup and Commissioning.

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2.03 PRODUCT DESCRIPTION

A. EFFICIENCY

1. The efficiency of the ASD including the transformer and fans shall be greater than 96.5%, 100% load at 60 hertz output frequency.

B. POWER FACTOR

1. The true power factor of the ASD including the transformer shall be greater than 95% at loads greater than 50%.

C. SPEED CONTROL

1. Sensor-less vector control or volts/Hz control shall be supplied when required speed regulation is less than 0.5%.
2. Vector control with a tachometer or encoder shall be supplied when required speed regulation is between 0.5% and 0.01%, or when load torque requirement exceeds 150% of motor rated torque,
3. The maximum response rate of the speed regulator shall be at least 60 rad/sec.

D. TORQUE CONTROL

1. The ASD shall have less than 1% torque ripple over a 20 to 1 speed range on the motor.
2. The accuracy of the torque regulator shall be $\pm 3\%$ FS with a motor temperature sensor or $\pm 20\%$ without a motor temperature sensor.
3. The response of the torque regulator shall be at least 500 rad/sec.

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PART 3 EXECUTION

3.01 SITE PREPARATION

- A. The ASD shall be placed in an indoor, unclassified area. The maximum temperature shall not exceed the maximum ambient listed on the data sheet.

3.02 SHIPPING

- A. Unless specified otherwise, preparation for shipment shall be in accordance with Manufacturer's standards.
- B. Loose equipment shall be appropriately packaged and secured for shipment inside the enclosure or shipping container. These items shall be properly tagged for easy identification.
- C. Export packaging shall be available when indicated on the data sheet.