



GE Fuji drives USA

DV-300TM

DC Adjustable Speed Drive

Guide-Form Specification

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Guide-Form Specification

1.0 General

1.1 Purpose

This specification shall establish the minimum requirements for adjustable speed DC drive equipment. Drives that do not meet these requirements shall not be acceptable. The adjustable speed drive equipment shall be the DV-300 as furnished by the GE Fuji drives USA, Inc..

1.2 Driven Equipment

The drive shall be capable of operating a DC shunt wound motor with a full load current equal to or less than the continuous output range of the drive. It shall be able to operate in the constant torque range below base speed, as well as the constant horsepower range above base speed. It shall be able to operate motors with armature voltages of either 240 or 500VDC.

1.3 Drive Construction

The drive shall be of modular construction for ease of access to control and power wiring and maintenance. It shall consist of the following general components:

- 1.3.1 Full wave rectification converts supply AC to an adjustable DC voltage.
- 1.3.2 The drive shall be available in either a regenerative or non-regenerative configuration.
- 1.3.3 The drive shall be microprocessor based with an LED and LCD display to monitor operating conditions. The display section shall allow for local operation, setting of drive functions, and display of drive faults. The LED display shall offer six different display settings and the LCD shall have the capacity to display two (2) lines of information at a time.
- 1.3.4 Separate control and power terminal boards shall be provided.
- 1.3.5 The drive shall be constructed to have options for communicating, as a minimum, with recognized industry standard device level networks such as DeviceNet, Interbus-S, Profibus, and GENIUS™.
- 1.3.6 The drive shall be constructed to have the ability to upload and download drive programming data from a user PC, through a RS485 port.
- 1.3.7 The drive shall be equipped with Windows 95/Windows 98/Windows NT based software package to allow for programming. The software shall be capable of on-line trending of drive and motor parameters, including DC output voltage, motor current, and motor speed. It shall include a test generator function. The program will include complete help menus and basic start up 'wizards' to aid in programming and start-up.
- 1.3.8 The drive shall contain an integral motor field package that has the following three modes of operation:
 - Constant current - For operation from motor base speed and lower where the motor field is kept constant.
 - Weak-Field - For constant horsepower operation, where motor speeds between base and top speeds are required.
 - OFF - Capability of shutting off the motor field supply to allow field excitation from a remote source.

2.0 Operating Conditions

- 2.0.1 The drive's operating ambient temperature range shall be -10°C to 40°C , and with provisions for a maximum operating temperature of 50°C . Storage temperatures shall be between -20°C to 55°C .
- 2.0.2 The humidity range shall be 5-85% non-condensing.
- 2.0.3 The drive shall be suitable for operation at altitudes up to 3300 feet without de-rating.
- 2.0.4 The drive shall be suitable for vibration according to EN50178 class 1K4.

3.0 Standards

- 3.0.1 The drive shall be Underwriters Laboratory (UL), Canadian Underwriters Laboratory (cUL), and CE listed and labeled, indicating compliance with appropriate standards.
- 3.0.2 The drive shall be designed in accordance with applicable portions of NEMA standards.
- 3.0.3 The drive shall be compatible with the installation requirements of codes such as National Electric Code (NEC) and Occupational Safety & Health Act (OSHA).

4.0 Input Power

- 4.0.1 The drive design shall be such that it will be available for use with 208-480 VAC, 3-phase power input.
- 4.0.2 At 480 volts, the drive shall be able to withstand voltage variations of -10% to $+15\%$ and imbalance no greater than 3% without tripping or affecting drive performance.
- 4.0.3 System frequency shall be 50 or 60 Hertz with a maximum frequency variation of $\pm 5\%$.
- 4.0.4 The drive shall not require input isolation transformers.

5.0 Output Power

- 5.0.1 The drive shall be capable of horsepower ratings from 5HP through 1250 HP.
- 5.0.2 Rated output voltage shall be programmable for motor ratings from 180 to 550 volts.
- 5.0.3 The drive shall be capable of a minimum of 100% rated current in continuous operation, in accordance with the requirements of NEC.
- 5.0.4 The drive one-minute overload current rating shall be 150% of rated current.

6.0 Drive Features

- 6.0.1 The drive shall have a back-lit graphic liquid crystal display (LCD) which can be configured to display frequency, current, function code set points, or drive status and fault codes.
- 6.0.2 The drive shall also have a built in keypad that shall be extendible, by optional cable, to a remote location up to 1 meter from the drive. The keypad shall include the following devices:
 - Run/Stop keys
 - Function Code select keys
 - Programming keys
 - Drive reset key
 - Reference increment/decrement keys
 - Drive shall have six LED readouts
- 6.0.3 The keypad shall allow for three modes of operation:
 - 6.0.3.1 **Operating Mode:** While the drive/motor system is at a standstill, the following may be adjusted: Output Current, Output Voltage, Output Frequency, Speed Reference, Motor Base Speed, Torque Current References, and Line Speed (calibration adjustable from 0 to 200%.)
 - 6.0.3.2 **Programming Mode:** While the drive/motor system is at a standstill, Functions, Set Points, I/O mapping, and Control Modes may be adjusted.
 - 6.0.3.3 **Diagnostic Mode:** Faults will be displayed whenever a fault occurs.
- 6.0.4 Upon a fault condition, the LCD shall display the fault in descriptive English on the keypad. The last ten faults will be stored in memory and selectively be displayed on the LCD.
- 6.0.5 The drive shall be capable of operating as a closed-loop control system with a digital encoder, a closed-loop control system with an analog tachometer, or as an armature voltage regulator.
- 6.0.6 The drive shall accept and follow a selectable external speed reference from any of the following input types: analog (0-10 VDC, -10+10 VDC, 0-20 mA or 4-20 mA), digital, speed potentiometer, serial communications, from an encoder, or from LAN interface options.
- 6.0.7 The drive shall regulate set speed regardless of load fluctuations.
- 6.0.8 The drive shall be capable of at least 4 different acceleration rates and 4 different deceleration rates. Each acceleration and deceleration rate shall be independently adjustable from 0.1 to 6553.5 seconds.
- 6.0.9 The drive will have the capability of determining motor characteristics to optimize its operation through the use of pre-programmed motor data information or a self-tuning function. The drive will also allow manual setting of motor inductance and resistance values to optimize drive performance.
- 6.0.10 The drive shall offer two selectable acceleration/deceleration patterns: linear and S-Curve.

- 6.0.11 The drive shall display operating data, fault information, and programming prompts in English.
- 6.0.12 The drive shall have a reference filter that eliminates the effects of noise that can be present in the analog reference signal.
- 6.0.13 The drive shall be able to restart after power loss. The time from when main power is restored to the when the drive's output is reapplied to the motor shall be programmable from 0 to 10,000 seconds.
- 6.0.14 The drive shall be able to reset itself up to 99 times(adjustable) after an over-current, over-voltage, low voltage, overheating and overload faults.
- 6.0.15 The drive shall be able to restart after a voltage dip. The time to restart shall be programmable from 0 to 65535.
- 6.0.16 The drive shall have a programmable minimum speed, adjustable from 1 RPM to 200% of base speed.

7.0 Speed Control

- 7.0.1 The drive shall be capable of at least eight (8) independently programmable preset speed references, adjustable from 0 to 200% of base speed.
- 7.0.2 The drive shall be capable of motor slowdown or stop by selectable regenerative or dynamic braking while following one of the four selectable deceleration ramps.
- 7.0.3 The drive shall be equipped with a ramp "Freeze" function that maintains the current speed when activated.
- 7.0.4 In armature voltage mode the drive shall provide selectable IR compensation, which will sense output current and adjust output voltage, to improve motor speed fluctuations due to load. This will allow approximately 1% or less (depending in the slip value selected) speed regulation without the use of a speed feedback device. The Compensation setting is to be adjustable for both motoring and overhauling loads, as well as to allow for "speed droop" when a motor speed value is greater than required.

8.0 Drive Control

8.1 The drive shall provide eight optional digital inputs from external dry contacts for configurable functions, including the following:

- Run forward command
- Run reverse command
- Start command
- Multi-step frequency reference selection
- Accel/decel ramp option selection
- Stop command
- Alarm input
- Drive fault reset
- Coast Command

The digital inputs will each be capable of accepting 15-30 VDC and have an update rate of 8 milliseconds.

8.2 The drive shall provide three analog inputs with a selectable rating of -10 to $+10$ VDC, 0 to $+10$ VDC, 0 - 20 mA, or 4 - 20 mA. The resolution will be 11 bits + sign, and the update rate will be 2 milliseconds or less. The inputs shall be programmable for function control, including the following:

- Jog reference
- Ramp reference
- Speed reference
- Current references
- Speed gains adjusts
- Outer loop inputs
- Current limit adjusts
- Droop adjust
- PID adjustments
- Flux adjustments
- Speed ratio (draw)

8.4 The drive shall provide at least two digital optional programmable outputs capable of being configured to the following:

- Speed zero
- Speed threshold
- Drive ready
- Drive in overload
- Undervoltage
- Overvoltage
- External fault
- Motor overtemperature
- Speed feedback loss

8.5 The drive shall be equipped with two optional programmable analog outputs with an 11 bits + sign resolution and 2 millisecond update rate. The inputs shall be capable of being associated to the following parameters:

- Ramp reference
- Speed references
- Torque reference
- PID output
- Armature Voltage
- Armature Current
- Power output
- Motor field current
- Motor RPM

8.6 The drive shall be equipped with one normally open Fault relay for drive okay, and one normally open programmable relay rated 250 VAC, 1A, AC11.

8.7 The drive encoder shall have a minimum of 600 PPR and a maximum of 9999 PPR. The maximum frequency of a digital encoder shall be 150 kHz, the maximum for a sinusoidal encoder shall be 80 kHz. An analog tach must have a maximum voltage of 300VDC at top speed.

8.8 The drive shall facilitate the addition of the following:

- 8.8.1 The drive shall facilitate the communication over I/O serial link via a RS-485 protocol signal that will transfer information on operation commands, operating conditions, drive function code settings and fault indications.
- 8.8.2 The drive shall be compatible with the GE Fanuc GENIUS LAN, DeviceNet, PROFIBUS-DP, and INTERBUS-S and allow for communication interface either directly or via third party interface boards.

9.0 Protective and Diagnostic Features

- 9.1 When a fault occurs, the drive shall have a controlled shut down sequence. The reason for the fault condition shall be enunciated on the LED display, and the LCD graphic screen. The drive shall monitor, sense, and display the following fault conditions:
- Loss of control power
 - Undervoltage
 - Overvoltage
 - Heatsink overtemperature
 - Motor overtemperature
 - External fault
 - Field loss
 - Speed feedback loss
 - LAN bus loss
 - Enable sequence error
- 9.2 The drive shall have an adjustable Current Limiting function that will sense an overload condition and will reduce voltage and current temporarily until the load reaches acceptable levels.

10.0 Quality Assurance

- 10.1 All drives shall be 100% factory tested to ensure proper performance upon delivery.
- 10.2 The drive vendor shall provide a warranty for material and workmanship, for a period of twelve months after start up or 18 months after shipment, whichever occurs first.

11.0 Start-Up Service and Training:

Drive operational and maintenance training and/or startup service shall be offered by the drive vendor separately. The drive vendor shall have factory trained personnel at field locations convenient to the installation site, available for trouble shooting and/or startup assistance.

12.0 Documentation

An instruction manual, complete with wiring diagrams, schematics, operating, and maintenance instructions, shall be provided with the drive at the time of shipment.

13.0 Spare Parts

Spare parts shall be available locally through local stocking distributors.