Product Data Bulletin

ALTIVAR® 18
AC Drives Specification
Class 8805

NOTE: These specifications are for adjustable frequency drive controllers, herein referred to as AC drives. Copies of this specification are also available in 100% IBM compatible formats.

Application information directly affects the type and size of AC drives that will be quoted. Brackets are provided where such data should be included.

Please call your local Square D distributor or sales engineer for specification assistance regarding a particular application.

SECTION 16: AC DRIVES

Part 1: General

1.01 SCOPE OF WORK

A. This section provides specification requirements for AC inverter type adjustable frequency, variable speed drives, herein identified as AC drives, for use with [NEMA B, NEMA A, NEMA C, NEMA E, asynchronous] design, AC motors.

1.02 QUALITY ASSURANCE

A. **Agency Listing:**
The AC drive and all options shall be UL Listed according to UL 508C, Power Conversion Equipment Standard for Safety, and CSA certified. A UL label shall be attached inside each enclosure as verification.

B. **Standards:**
The AC drive shall be designed, constructed, and tested in accordance with NEMA, UL, CSA, NEC, VDE, and IEC standards.

C. **Service / Support:**
The AC drive manufacturer shall offer 24 hour a day product and technical assistance by factory-certified technical support personnel.

1.03 WARRANTY

A. Manufacturer's warranty shall be provided on all materials and workmanship for no less than 18 months from date of invoice from the manufacturer or its authorized channel.

Part 2: Products

2.01 ACCEPTABLE MANUFACTURERS

A. The AC drive shall be an ALTIVAR ATV 18 supplied by the Schneider North America/Square D Company or prior approved equal. No substitutions are permitted.

B. Alternate control techniques other than pulse width modulated technology (PWM) are not acceptable.

2.02 GENERAL DESCRIPTION

A. The AC drive shall convert the input AC mains power to an adjustable frequency and voltage as defined in the following sections.

B. The rectifier stage shall convert fixed voltage, fixed frequency, and AC line power to fixed DC voltage. The input power section shall use a full wave bridge design incorporating diode rectifiers. The input power section shall be insensitive to phase rotation of the AC line.

C. Input filters will be provided on the drive to suppress radio frequency interference.

D. The inverter shall change fixed DC voltage to variable frequency AC. The inverter section shall use insulated gate bipolar transistors (IGBTs).

2.03 MOTOR DATA

A. **Standard:**
The AC drive shall be sized to operate a [NEMA design B] AC motor with a nameplate rating as defined in the National Electric Code, table 430-150, for the applicable horsepower.

B. **Service factor:**
The service factor of the motor is 1.15 at the rated voltage and frequency.

2.04 APPLICATION DATA

A. **Type of load:**
The AC drive shall operate a [variable torque load, constant torque load, constant horsepower load, impact load].

B. **Speed range:**
The speed range shall be from a minimum speed of 0.5 Hz (100% break away torque at 1 Hz) to a maximum speed of 320 Hz.

C. **Maximum torque:**
Maximum torque available shall be typically 150% at 3 Hz and 100% at 1 Hz.

2.05 ENVIRONMENTAL RATINGS

A. **Operating temperature:**
The AC drive will be designed to operate in an ambient temperature from -10 °C to +40 °C (+14 °F to +104 °F). By uncovering the ventilation slots at the top of the drive, allowable ambient temperature shall be 0 °C to +50 °C (+14 °F to +122 °F).

B. **Storage temperature:**
The storage temperature range shall be -25 °C to +65 °C (-13 °F to +149 °F).

C. **Relative humidity:**
The maximum relative humidity shall be 95% at 40 °C (104 °F), non-condensing.

D. **Altitude:**
The AC drive will be rated to operate at altitudes less than or equal to 1000 m (3300 ft.). For altitudes above 1000 m, derate the AC drive by 1.2% for every 100 m (330 ft.).

E. **Ingress protection:**
AC drives 20 hp and smaller will be designed and constructed to be of finger-safe construction with the enclosure open to operator access (IP31 standard).

2.06 RATINGS

A. **Supply voltage:**
The AC drive shall be designed to operate from one of the following input voltages:
1-phase, 200 - 15% Vac to 240 +10% Vac
3-phase, 200 - 15% Vac to 240 +10% Vac
3-phase, 380 - 15% Vac to 460 +10% Vac

B. **Supply frequency:**
The AC drive shall operate from an input voltage frequency range of 57 to 63 Hz, or 47.5 to 53.5 Hz.

C. **Power factor:**
The displacement power factor shall not be less than 0.95 lagging under any speed or load condition.

D. **Efficiency:**
The efficiency of the AC drive at 100% speed and load shall not be less than 96%, except for the fractional horsepower sizes where it shall not be less than 94%.

E. **Carrier frequency:**
The output carrier frequency of the drive shall be selectable from 2.2k Hz to 12 kHz.

F. **Overtorque:**
The drive overtorque capacity will be 150% for 60 seconds.

G. **Torque at low speed:**
In sensorless flux vector mode, the drive will be able to provide typically 100% rated torque at 1 Hz and 150% rated torque at 3 Hz using a standard motor and no tachometer feedback.

2.07 PROTECTION

A. **Supply voltage:**
The AC drive design and all hardware options shall meet IP31 standards and allow for finger-safe access with the front cover open for all AC drives through 20 hp.

B. **Auto self-test:**
Upon power-up, the AC drive shall automatically test for valid operation of the drive.

C. **Self-protection:**
The drive will have self-protection capability. For example, short circuit between phases; short circuit between phase/neutral in case of drives rated above 5 hp; drives over-heating by calculating I^2t and heat sink temperature measurement; capacitor charge current limitation by built-in charge resistors; and short circuit between logic circuits.

D. **Protection against micro-interrupts:**
The AC drive will have a ride through function which will allow the logic to maintain control during a power interruption for a minimum of 16 milliseconds (one cycle) without faulting.

E. **Controlled stop:**
The deceleration mode of the AC drive shall be programmable for normal and fault conditions. Normal stop modes shall include preset ramp, fast stop, and braking (regenerative, DC injection).

Upon mains failure, it will be programmable to have the motor stop either by following a self adjusting ramp (as a function of the regenerative energy), or by coasting to a stop.

F. **Catch on the fly:**
A synchronized restart shall be provided that will catch a rotating motor by sensing the motor frequency and rotational direction.

G. **Loss of speed reference:**
Upon loss of the analog process follower reference signal, the AC drive shall fault and/or operate at a user-defined minimum speed set at software programmed low speed.

H. **Auto restart:**
Drive shall restart after disappearance of resettable fault.

I. **Motor protection:**
The AC drive shall have solid state I^2t protection that is UL Listed and meets UL 508C as a Class 10 overload protection device and meets IEC 947. The adjustment range shall be from 50% to 115% of the rated output current of the AC drive.

For self cooled motors, the operating frequency shall be taken into account to compensate for reduced self cooling effect. It shall be possible to set a time limit on low speed operation to avoid any thermal damage to the motor.

J. **Skip Frequency:**
It shall be possible to program a skip frequency with a 2 Hz bandwidth to avoid any possible mechanical system resonance.

K. **Heat sink:**
The AC drive shall use bonded fin heat sink construction for maximum heat transfer.

2.08 CONFIGURATIONS/ADJUSTMENTS

A. The AC drive shall be configurable in the following modes of operation:

1. **Sensorless flux vector mode:**
It shall offer the highest possible torque performance for severe starting conditions, typically 150% rated torque at 3 Hz.

2. **Variable torque (constant V/Hz):**
It shall be suitable for centrifugal loads (fans/pumps).

3. **Energy savings mode (nLd):**
It shall offer energy savings in case of partially loaded centrifugal loads (fans/pumps) by automatic reduction of output voltage, just enough to deliver load torque. A constant volts/Hz ratio shall be maintained.

4. **Constant torque (constant V/Hz)**:
It shall be suitable for high starting torque loads (high inertia/friction).

In case of sensorless flux vector mode, the AC drive shall be able to send a signal automatically to the connected motor and store the motor electrical data into memory. The AC drive shall automatically optimize the operating characteristics according to the stored data.

B. **Ramp time:**
The acceleration and deceleration ramp times shall be adjustable from 0.1 to 3600 seconds.

C. **V/Hz ratio:**
The volts per Hz ratios shall be user selectable to meet quadratic torque loads, normal, and high torque machine applications.

D. **Slip compensation:**
It shall be a software enabled function. It shall have an adjustable range of 0 to 5 Hz.

E. **Frequency dependent output:**
It shall be possible to program a frequency threshold logic output for integrating the on/off control of the electro-mechanical brake, when applicable. Threshold frequency shall be adjustable.

F. **Fast stop:**
It shall be possible to initiate fast stop (deceleration) of the drive through a programmable logic input. It shall scale the deceleration time down to one-fourth of the normal deceleration time. If necessary, this fast decel time shall adapt itself to eliminate any nuisance tripping of the drive feeding a high inertia load.

G. **DC Braking:**
The AC drive shall offer programmable DC injection braking that shall

brake the AC motor by injecting DC current and creating a stationary magnetic pole in the stator.

H. **Automatic DC injection braking:**
At the end of deceleration, at 0.5 Hz, DC current injection braking shall be initiated (programmable).

The level of current shall be adjustable between 25%-100% of rated current and time adjustable for 0-25 seconds or continuously.

I. **DC injection braking by external logic**:
It shall be possible to initiate DC injection braking by closing a programmable logic input. Rated current level shall be injected up to 5 seconds, after which half the rated current level shall be maintained until the logic input is not removed.

2.09 OPERATOR INTERFACE

A. **Operator interface:**
The operator interface terminal shall display and enable modification of AC drive parameters via a touch keypad. For example, operational drive parameters and input/output assignments shall be accessible.

B. **Configurable parameters:**
All of the configurable parameters shall be selectable for display, one at a time. As a minimum, the following operating parameters shall be displayable: frequency reference, motor current, output frequency, line voltage.

C. **Keys:**
Data and enter keys shall allow the user to confirm a selected menu or numeric value, or to select between multiple choices.

2.10 CONTROL

A. **Voltage:**
The control power for the logic inputs shall be 24 Vdc.

B. **Logic inputs:**
There shall be four logic inputs, at least three of which shall be software assignable. The selection of assignments shall consist of reverse operation, fast stop, DC injection, jog, and preset speeds.

C. **Logic outputs:**
One software assignable open collector logic output shall be provided, assignable to one of the following:

1. Detection of speed attained
2. Detection of frequency level attained

Additionally, safety relay contacts shall be available to indicate run/fault status of the drive.

2.11 BRAKING (Application Dependent Option)

NOTE: When braking certain types of loads, the motor converts kinematic energy into electrical energy, which is returned to the AC drive. Dynamic braking can be chosen to absorb this energy and avoid causing the AC drive to inadvertently shut down. The energy is dissipated across a resistor that is connected to the drive. A dynamic braking resistor unit shall be selectable for each drive size.

A. The dynamic braking resistor shall be connectable to existing terminals on the AC drive. The resistor shall mount externally to the AC drive enclosure. A built-in power transistor shall be provided in the AC drive to switch the excess energy to the braking resistor.

Part 3: Execution

3.01 INSPECTION

A. Upon delivery and prior to installation, the AC drive equipment and packaging shall be inspected for any signs of physical damage in transit.

3.02 PROTECTION

A. Before and during the installation, the AC drive equipment shall be protected from moisture and site contaminants.

3.03 INSTALLATION

A. Installation shall be in compliance with manufacturer's instructions, drawings, and recommendations.

END OF SECTION

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