

1336 PLUS Specifications

GENERAL

REFERENCES

The drive is designed to meet the following specifications:

- NFPA 70 - US National Electrical Code
- NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.
- NEMA 250 - Enclosures for Electrical Equipment
- UL 508C - Underwriter's Laboratory
- CAN/CSA-C22 No. 14-M91. - Canadian Standards Association.
- IEC 146 - International Electrical Code.

REGULATORY REQUIREMENTS

The drive conforms to the following requirements:

- NFPA 70
- IEC 146
- EN Standard/CE marked for EMC directives

Emissions	Immunity
EN 50081-1	EN 50082-1
EN 50081-2	EN 50082-2
EN 55011 Class A	IEC 801-1,2,3,4,6,8
EN 55011 Class B	(per EN 50082-1,2)
- IEC 801
- C-UL marking to provide an approved listing for both United States and Canadian users.
- The Manufacturer will furnish the product as listed and classified by Underwriter's Laboratories as suitable for the purpose specified and indicated.

QUALIFICATIONS

MANUFACTURER:

Allen-Bradley entered the AC Variable speed drive market in 1980. Allen-Bradley Standard Drives Business continues to specialize in the design and manufacturing of PWM Adjustable Frequency Drives.

SUPPORT:

Allen-Bradley maintains factory trained and authorized service facilities within 100 miles of the project and has a demonstrated record of service for at least the previous three years. Full-time support personnel are employed by the Allen-Bradley Company.

CERTIFICATION:

All Allen-Bradley drive manufacturing locations are certified to the ISO-9001 Series of Quality Standards. This insures all quality and corrective action procedures are documented and implemented with a goal of Total Customer Satisfaction.

PRODUCT

RATINGS

INPUT POWER:

The drive is self adjustable to accept an input voltage range between 200-240/380-480/500-600VAC, three phase +/-10%.

Displacement power factor shall range between 1.0 and 0.95, lagging, over the entire speed range (0.80 for 0.5-5hp/0.37-3.7kW, 200-480V drives). The efficiency of the drive shall be a minimum of 97% at full load and speed.

ENVIRONMENT:

Storage ambient temperature range: -40 C to 70 C (-40 to 158 F).

Operating ambient temperature range: 0 C to 40 C (0 to 109 F) without derating. The relative humidity range is 5% to 95% non-condensing.

Operating elevation: up to 1000 Meters (3,300ft) without derating.

OUTPUT POWER:

The output voltage is adjustable from 0 to rated input voltage. The output frequency range is adjustable from 0 to 400Hz. The inverter section will produce a pulse width modulated (PWM) waveform using latest generation IGBTs.

DESIGN

HARDWARE:

The drive hardware employs the following power components

- Diode or fully gated bridge on the input.
- DC bus inductor on all ratings 7.5HP (5.5kW) or greater.
- Switching logic power supply operating from the DC bus.
- Phase to phase and phase to ground MOV protection.
- Gold plated plug-in connections on printed circuit boards.
- Microprocessor based inverter logic isolated from power circuits.
- Latest generation IGBT inverter section.
- Inverter section shall not require commutation capacitors.
- Customer Interface common for all horsepower ratings. Interface shall include an LCD digital display, programming keypad and operator keys option.
- Main Control Board common for 7.5HP (5.5kW) and up.
- Common control connection for all ratings.
- Optimized for 4kHz carrier frequency at 60HP (44kW) or less, and 2kHz at 75HP (55kW) and larger.
- Peripheral Interface to enable attaching common options.

CONTROL LOGIC:

The drive is programmable or self adjusting for operation under the following conditions.

- Operate drive with motor disconnected.
- Controlled shut down, when properly fused, with no component failure in the event of an output phase to phase or phase to ground short circuit and annunciation of the fault condition.
- Adjustable PWM carrier frequency within a range of 2-8kHz.
- Selectable Sensorless Vector or V/Hz mode.
- Selectable for variable or constant torque loads. Selection of variable torque provides 115% of rated VT current for up to one minute. Selection of constant torque provides 150% of rated CT current for up to one minute.

- Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S-curve.
- Multiple acceleration and deceleration rates.
- All adjustments to be made with the door closed.
- Adjustable output frequency up to 400Hz.

POWER CONDITIONING:

The drive is designed to operate on an AC line which may contain line notching and up to 10% harmonic distortion. An input isolation transformer shall not be required for protection from normal line transients. If line conditions dictate the use of a transformer, the **K** factor shall be 4.0 or less.

FEATURES

INTERFACE:

The drive provides a removable Human Interface Module with integral display to show drive operating conditions, adjustments and fault indications. The display is removable under power without causing a fault and is visible and operable without opening the enclosure door. The display consists of 2 lines of 16 character alphanumeric, backlit LCD with the display being configurable for simultaneously displaying two values using customized multi-lingual text and user scaled units. The module also provides LED indication of drive direction and commanded direction. The display is capable of remote mounting by means of cable connection up to 10 meters (33ft) from the drive and is capable of being used as a hand-held terminal.

CONTROL MODE:

Programming provides the ability to select sensorless vector or v/hz mode. The sensorless vector mode uses motor nameplate data plus motor operating data such as IR drop, nominal flux current and flux up time. The volts per hertz mode can be programmed for squared, cubed, straight line, pre programmed or full custom patterns.

CURRENT LIMIT:

Programmable current limit from 20% to 160% of constant torque rating. Current limit is active for all drive states; accelerating, constant speed and decelerating. The drive employs PI regulation with an adjustable gain for smooth transition in and out of current limit.

ACCELERATION/DECELERATION:

Accel/Decel settings provide separate adjustments to allow either setting to be adjusted from 0 seconds to 3600 seconds. A second set of remotely selectable Accel/Decel settings are accessible with Control Interface option. An adaptive current limit circuit can be disabled in programming for fast acceleration of low inertia loads.

SPEED REGULATION:

The programmable speed regulation modes include the following:

- Open Loop
- Slip Compensation with 0.5% speed regulation
- Droop - Negative Slip Compensation with 0.5% speed regulation
- Traverse Function
- Closed loop encoder feedback with 0.1% speed regulation
- Process PI control

SPEED PROFILES:

Programming capability allows the user to produce speed profiles with linear acceleration/deceleration or "S-Curve" profiles that provide changing accel/decel rates. S-Curve profiles shall be selectable for fixed or adjustable values.

ADJUSTMENTS:

The digital interface is used for all set-up, operation and adjustment settings. All adjustments are stored in nonvolatile memory (EEPROM). No potentiometer adjustments are used. The drive provides EEPROM memory for factory default values.

PROCESS PI CONTROL:

The internal process pi regulator has both proportional and intergral gain adjustments as well as error inversion and output clamping functions. The feedback can be configured for normal or square root functions. If the feedback indicates that the process is moving away from the setpoint, the regulator will adjust the drive output until the feedback equals the reference. Process control can be enabled or disabled with a hardwire input. Transistioning in and out of process control can be tuned for faster response by preloading the integrator. Protection is provided for a loss of feedback or reference signal.

FAULT RESET/RUN:

The drive provides up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart. The automatic mode is not applicable to a ground fault, shorted output faults and other internal microprocessor faults. The time between restarts is adjustable from 0.5 seconds to 30 seconds.

SKIP FREQUENCIES:

Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance are provided. The set points have a bandwidth adjustable from 0Hz to 15Hz.

RUN ON POWER UP:

A user programmable restart function is provided to automatically restart the equipment after restoration of power after an outage. A mintained 2-wire start input is required for this function.

LINE LOSS RESTART:

This programmable function selects the reconnect mode of the drive after recovery from a line loss condition. The reconnect modes are - Last Speed, Speed Search, Track Volts, or Use Encoder. Disabling this feature will force the drive to start from zero hertz.

FAULT MEMORY:

The last four faults as well as operating frequency, drive status and power mode are stored at the time of fault. Information is maintained in the event of a power loss.

OVERLOAD PROTECTION:

The drive will provide Class 20 motor overload protection investigated by UL to comply with N.E.C. Article 430. Overload protection is speed sensitive and adjustable for motors with speed ranges of 2:1, 4:1 and 10:1. A viewable parameter stores the overload usage in percent. An alarm bit can be used to adjust a process to eliminate an overload trip.

AUTO ECONOMIZER:

This feature automatically reduces the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage is reduced to minimize flux current in a lightly loaded motor thus reducing kW usage. If the load increases, the drive will automatically return to normal operation.

TERMINAL BLOCKS:

Separate terminal blocks are provided for control and power wiring.

FLYING START:

The drive is capable of determining the speed and direction of a spinning motor and adjusts its output to "pick-up" the motor at the rotating speed. The flying start feature is operable with or without encoder feedback.

RIDE THROUGH:

The control logic is capable of "riding through" a power outage of up to 2 seconds in duration.

ANALOG OUTPUT:

An output signal is jumper selectable for 0 - 10V DC or 0 - 20ma which is user programmable such that it is proportional to one of 13 process parameters including output frequency, output current, encoder feedback, output power and others. A programmable offset is provided to allow modification of the analog output to obtain 2 - 10V DC or 4 - 20ma. Programmable gain adjustments for both upper and lower settings allow for system calibration.

REFERENCE SIGNALS:

The drive is capable of the following input reference signals:

- Digital pulse input □ Digital MOP
- Remote potentiometer □ Serial
- 0-10V DC □ HIM (Program/Control panel)
- 4-20ma

The remote potentiometer is also programmable to be used as a trim pot for the 0-10V DC or 4-20ma signals. Programmable gain adjustments for both upper and lower settings allow for system calibration. The analog inputs are programmable for normal, inverted or square root operation.

LOSS OF REFERENCE:

In the event of loss of the 4-20ma reference signal, the drive is user programmable to the following:

- Fault and stop
- Alarm and maintain last reference within 10%
- Alarm and go to preset speed
- Alarm and go to minimum speed
- Alarm and go to maximum speed
- Active for Process PI reference or feedback

DIGITAL I/O:

Contact output ratings are 115V AC/30V DC, 5.0 Amp resistive, 2.0 Amp inductive. All four contacts provided are programmable to 17 different conditions. Factory settings are as follows:

- Form A Run contact
- Form C Fault contact
- Form C Alarm contact
- Form A At Speed contact

OPERATOR'S DEVICES:

The drive provides an option for Start, Stop, Jog, Reverse and Speed Control as an integral part of the Human Interface Module.

CONTROL INTERFACE:

All control interface cards provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable. Four additional inputs are programmed to one of 24 different Input Modes for functions such as reverse, preset speed access, jog, second accel/decel time access, process trim, speed/torque, and local control selection. Inputs are programmable to configure the drive for standard 3-wire, 2-wire, EC and serial operation requirements.

Option L6 - The control terminals are rated for 115V AC and require 10ma of power per input. Each input is optically isolated from the drive control logic. Customer supplied power is required unless a control power transformer is selected.

Option L5 - The control terminals are rated for 24V AC/DC and require 2.5ma of power per input. Each input is optically isolated from the drive control logic. Customer supplied power is required to power these circuits.

Option L4 - The control terminals are rated for 5V DC and require a contact closure only. Each input is optically isolated from the drive control logic. The external circuit must be capable of a sinking current level of 10ma per input when a contact closure is made.

Option L6E - The control terminals are rated for 115V AC and require 10ma of power per input. Each input is optically isolated from the drive control logic. Customer supplied power is required unless a control power transformer is selected. Dedicated encoder input terminals are provided with jumper selection for +5vdc or +12vdc to power the encoder circuit, power can be supplied by the drive or externally.

Option L5E - The control terminals are rated for 24V AC/DC and require 2.5ma of power per input. Each input is optically isolated from the drive control logic. Customer supplied power is required to power these circuits. Dedicated encoder input terminals are provided with jumper selection for +5vdc or +12vdc to power the encoder circuit, power can be supplied by the drive or externally.

Option L4E - The control terminals are rated for 5V DC and require a contact closure only. Each input is optically isolated from the drive control logic. The external circuit must be capable of a sinking current level of 10ma per input when a contact closure is made. Dedicated encoder input terminals are provided with jumper selection for +5vdc or +12vdc to power the encoder circuit, power can be supplied by the drive or externally.

REMOTE I/O COMMUNICATION:

This option provides a Single Point Remote I/O interface board. The board is configurable for 1/4, 1/2, 3/4, or full rack with a baud rate of 57.6, 115, or 230kbaud. The Remote I/O board may be set up by the user to control drive logic and speed reference commands and monitor drive status and process parameters.

SERIAL COMMUNICATIONS:

This option provides an RS232/422/485 serial interface board with DF1 or DH485 protocol, with multi-drop capability, for interfacing to the drive.

DEVICENET COMMUNICATIONS:

This option provides a DeviceNet interface board for interfacing the drive to the DeviceNet network.