



160 Series C Custom Firmware

P03 Option

Introduction

The P03 option extends the kW/HP ratings of the standard 160 drive. In addition, the following function changes have been made. Refer to the appropriate page for details.

- Custom V/Hz Curve – See Below
- Acceleration/Deceleration Selection – page 2
- Balance Detection – page 3
- Current Limits – page 4
- Relay Output Contacts – page 4
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ATTENTION: Use of this Custom Software without full understanding of the “Firmware Changes” (see below) could result in unpredictable motor operation and/or hazardous machine conditions.

Firmware Changes

Custom V/Hz Curve

V/Hz curves are programmed in the standard drive with P38 - [Boost Select]. This function has been replaced by a custom V/Hz curve. The curve can be adjusted using the parameters described in Table A.

The ramp will start at the programmed start frequency, but will ramp down to zero when stopping or reversing (if the start frequency is non-zero). The voltage will follow a straight line drawn from the start point to zero frequency and zero voltage.

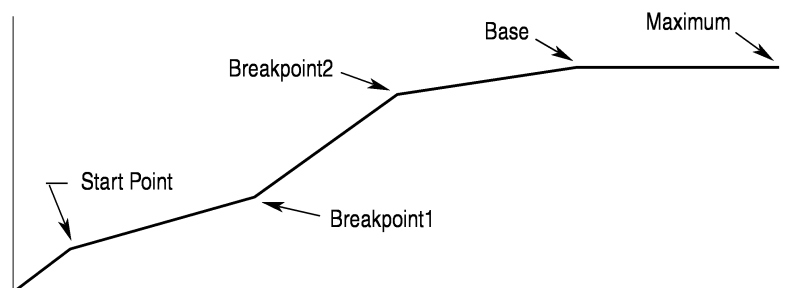


Table A
Custom V/Hz

Parameter Number	Parameter Name	Min./Max./Default	Description
P73	Start Frequency	0/120/0 Hz	Determines the starting frequency for the drive to ramp up from.
P74	Start Volts	0/230/0 Volts	Sets the voltage for the start frequency.
P75	Breakpoint1 Frequency	0/240/10 Hz	Determines the frequency point used after the Start Frequency.
P76	Breakpoint1 Volts	0/115/42 Volts for 230V Rated Units 0/230/84 Volts for 460V Rated Units	Sets the voltage for the Breakpoint1 Frequency.
P77	Breakpoint2 Frequency	0/240/15 Hz	Determines the frequency point used after the Breakpoint1 Frequency.
P78	Breakpoint2 Volts	0/230/57 Volts for 230V Rated Units 0/460/115 Volts for 460V Rated Units	Sets the voltage for the Breakpoint2 Frequency.
P35	Base Frequency	10/240/60 Hz	Determines the frequency point used after the Breakpoint2 Frequency.
P36	Base Voltage	20/460/230 Volts	Sets the voltage for the Base Frequency.
P33	Maximum Frequency	0/240/60 Hz	This will determine the frequency point used after the Base Frequency.
P37	Maximum Voltage	20/460/230 Volts	This will set the voltage for the Max. Frequency.

In the event that the frequencies or voltages are programmed incorrectly, the following will occur:

If a breakpoint or start point frequency is programmed less than the previous frequency, the V/Hz trajectory will follow its normal course to the next breakpoint (up until the out of sequence breakpoint frequency). At that point it will jump to the voltage set for that breakpoint frequency and continue on a line to the next breakpoint frequency. If P33 - [Maximum Frequency] is set less than any other frequency, it will not affect the V/Hz curve. However, it will end at the maximum frequency regardless of other set points. If a setpoint voltage is set less than the previous one, the V/Hz profile will simply connect these two points. Thus, the voltage at one breakpoint can be less than that of a previous breakpoint.

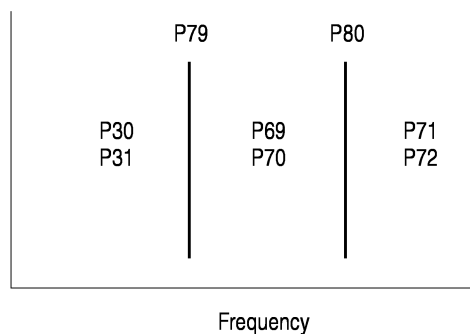
Accel/Decel Selection

In addition to the two standard accel/decel times, a third set of programmable accel/decel times has been added. None of these times will be associated with the Preset Frequency 0-7 parameters in the standard drive. Instead, two other parameters will set the frequency points where the different accel/decel times will be in affect (refer to the Table B).

Table B
Accel/Decel Parameters

Parameter Number	Parameters name	Min./Max./Default	Description
P30	Low Accel	0.0/600.0/10.0 Sec	Accel used when frequency is below first crossover point (P79).
P31	Low Decel	0.1/600.0/10.0 Sec	Decel used when frequency is below first crossover point (P79).
P69	Mid Accel	0.0/600.0/20.0 Sec	Accel used when frequency is between first & second crossover points (P79 & P80).
P70	Mid Decel	0.1/600.0/20.0 Sec	Decel used when frequency is between first & second crossover points (P79 & P80).
P71	High Accel	0.0/600.0/30.0 Sec	Accel used when frequency is above second crossover point (P80).
P72	High Decel	0.1/600.0/30.0 Sec	Decel used when frequency is above second crossover point (P80).
P79	Low to Mid Crossover	0/240/30 Hz	First frequency crossover point used to determine which accel/ decel rate will be used.
P80	Mid to High Crossover	0/240/60 Hz	Second frequency crossover point used to determine which accel/decel rate will be used.

If P80 - [Mid to High Crossover] is less than P79 - [Low to Mid Crossover], then P80 will be ignored and P69 - [Mid Accel] & P70 - [Mid Decel] will be used for all frequencies above P79. If P79 is equal to zero, P30 - [Low Accel] & P31 - [Low Decel] will not be used. See following diagram.



Balance Detection

Balance Detection uses the current phase angle information to determine if the load is within a programmable amount of variation. The algorithm requires four parameters to allow for individual machine set-up. In addition, a display parameter will be used to aid in the set-up of this feature. Refer to Table C.

Table C
Balance Detect Parameters

Parameter Number	Parameter Name	Min./Max./Default	Description
P38	Balance Angle	0/255/0 Numeric Value	Sets the threshold of angle variation in the load. Below this limit the balance detect output becomes active.
P39	Balance Delay Time	0/255/0 Sec	Number of seconds before the output relay will indicate the results of the balance test.
P40	Balance Frequency	0/240/0 Hz	The target frequency at which the drive will perform the balance test.
P41	Balance Volts	0/230/0 Volts	The voltage used when the commanded frequency equals the balance frequency, and the output frequency reaches the commanded frequency.
P16	Delta Balance	0/255/0 Numeric Value	The difference measured by the drive, which is used to compare against P38 - [Balance Angle].

Current Limits

The P03 option provides three current limits, instead of one, as in the standard drive. Each current limit has definite conditions. The secondary current limit is used to keep the motor from stalling, while accelerating toward frequencies above P35 - [Base Frequency]. For frequencies between base frequency and 150% of base frequency, the current limit is linearly decreased from P43 - [Current Limit] to P47 - [Secondary Current Limit]. See Table D.

Table D
Current Limit Parameters

Parameter Number	Parameter Name	Min./Max./Default	Description
P43	Current Limit	1/180/150 %	This limit is only in effect from zero to P35 [Base Frequency].
P47	Secondary Current Limit	1/180/150 %	This limit is only in effect above 150% of P35 [Base Frequency].
P48	DC Injection Current Limit	1/180/150 %	This limit is only in effect during DC Injection maneuver.

Relay Output Contacts

Parameters P47 - [Output Configure] and P48 - [Output Threshold] are not used with the P03 option. Instead, the relay will function to indicate a balanced condition after the balance test has been completed and to indicate the braking mode until shut-off. A switching of the relay contacts from the de-energized state will indicate a balanced condition at the balance frequency or the braking mode.

Clear Faults/Auto Restart

In addition to the standard procedures for clearing a fault and auto restart, an alternate method has been added as described below.

When P50 - [Restart Tries] is set to zero, a fault can be cleared when all of the Preset Inputs and the Start Inputs are opened.

When the P50 - [Restart Tries] is set to a non-zero value, the restart will occur only after the Preset Inputs and the Start Inputs have been opened.

The P50 - [Restart Tries] counter will be set to zero 5 minutes after the last fault. The standard drive uses the P51 - [Restart Time] to reset this counter.

Summary of Parameter Changes

The following parameter changes have been made to the standard 160 Preset Speed Drive:

Parameter Number	Standard Preset Drive Parameter Name	What Changed?
16	New parameter	Delta Balance - see "Balance Detection" on page 3
30	Accel Time 1	Changed to Low Accel, see "Accel/Decel Selection" on page 2
31	Decel Time 1	Changed to Low Decel, see "Accel/Decel Selection" on page 2
33	Maximum Frequency	Description changed, see "Custom V/Hz Curve" on page 1
35	Base Frequency	Description changed, see "Custom V/Hz Curve" on page 1
36	Base Voltage	Min./Max./Default changed, see "Custom V/Hz Curve" on page 1
37	Maximum Voltage	Min./Max./Default changed, see "Custom V/Hz Curve" on page 1
38	Boost Select	Changed to Balance Angle, see "Balance Detection" on page 3
39	Skip Frequency	Changed to Balance Delay Time, see "Balance Detection" on page 3
40	Skip Frequency Band	Changed to Balance Frequency, see "Balance Detection" on page 3
41	Motor Overload Select	Changed to Balance Volts, see "Balance Detection" on page 3
42	Motor Overload Current	Minimum value changed.
43	Current Limit	Description changed, see "Current Limits" on page 4
44	DC Hold Time	Min./Max./Default changed to 0/180/0 Seconds
47	Output Configure	Changed to Secondary Current Limit, see "Current Limits" on page 4
48	Output Threshold	Changed to DC Injection Current Limit, see "Current Limits" on page 4
69	Accel Time 2	Changed to Mid Accel, see "Accel/Decel Selection" on page 2
70	Decel Time 2	Changed to Mid Decel, see "Accel/Decel Selection" on page 2
71	IR Compensation	Changed to High Accel, see "Accel/Decel Selection" on page 2
72	Slip Compensation	Changed to High Decel, see "Accel/Decel Selection" on page 2
73	Reverse Disable	Changed to Start Frequency, see "Custom V/Hz Curve" on page 1
74	New parameter	Start Volts, see "Custom V/Hz Curve" on page 1
75	New parameter	Breakpoint1 Frequency, see "Custom V/Hz Curve" on page 1
76	New parameter	Breakpoint1 Volts, see "Custom V/Hz Curve" on page 1
77	Breakpoint2 Frequency	New parameter, see "Custom V/Hz Curve" on page 1
78	Compensation	Changed to Breakpoint2 Volts, see "Custom V/Hz Curve" on page 1
79	Software Current Trip	Changed to Low to Mid Crossover, see "Accel/Decel Selection" on page 2
80	Stall Fault Time	Changed to Mid to High Crossover, see "Accel/Decel Selection" on page 2
81	New Parameter Number	IR Compensation was P71.
82	New Parameter Number	Slip Compensation was P72.
83	New Parameter Number	Reverse Disable was P73.
84	New Parameter Number	Compensation was P78.
85	New Parameter Number	Software Current Trip was P79.
86	New Parameter Number	Stall Fault Time was P 80.

Notes

Notes

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

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