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Optidrive Applications Support Library

Application Note	**AN-ODP-2-015**
Title	**Modifying the Constant V-F Output characteristic**
Related Products	**Optidrive P2**
Level **3**	1 – Fundamental - No previous experience necessary 2 – Basic – Some Basic drives knowledge recommended 3 – Advanced – Some Basic drives knowledge required 4 – Expert – Good experience in topic of subject matter recommended

Overview

Optidrive P2 provides enhanced V/F (volts to Hertz) control for general purpose AC motor control applications.
In order to optimize the performance of the drive in all applications, parameters allow the V/F curve to be modified, allowing the user to increase or reduce the applied motor voltage as required to optimize the drive performance either with increased low speed torque for constant torque applications or optimal energy savings in variable torque applications. This is referred to as the V/F characteristic adjustment function.
In addition the motor start up / low speed voltage can be increased using the V/F voltage boost parameter to give improved starting / low speed torque performance. This is referred to as the V/F voltage boost function.

Note: Both the V/F characteristic adjustment function and the V/F voltage boost function apply (are active) only when the drive is operating in standard speed control mode (Enhanced V/F), when P4-01 is set to '2' (Default). Other modes of operation provide automatic adjustment of the drive output voltage to optimise performance and do not require these functions.

The V/F characteristic adjustment parameters are located in parameter group 4. In order to access these control parameters, the user should set the correct access code in P1-14. The default code is 101. The V/F voltage boost parameter is located in menu 1 and requires no security access.

V/F Voltage Boost Function

P1 - 11 V/F Voltage Boost
P1-11 allows the user to directly adjust the voltage output applied to the motor at low speeds to improve starting and low speed performance.

P1-11 defines the voltage applied to the motor at 0.0Hz, as a percentage of P1-07, Motor Rated Voltage. If P1-07 = 0, the voltage will be proportional to the incoming supply voltage. As the output frequency from the drive increases, the voltage boost is reduced linearly up to 50% of the motor rated frequency. This is shown clearly in the graph below.

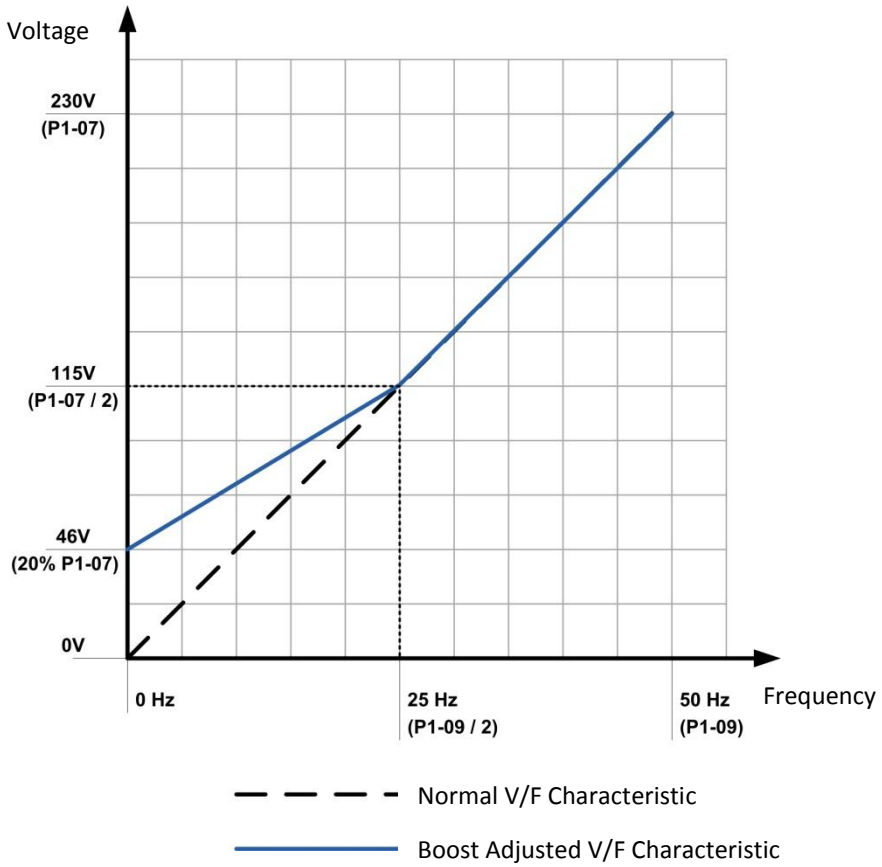
P1-11 is intended to allow the user to adjust the V/A (Volts to Amps) characteristic of the drive to compensate for the motor losses at low frequencies. If P1-11 is too low, the motor may not develop sufficient output torque at low frequency. If P1-11 is too high, the motor current will also be too high, and will likely result in the drive tripping O-I (Instantaneous Over-Current) or It.trp (Thermal Over-Current Trip). When adjusting P1-11, it is advisable to check that the output current does not exceed the motor rated current when operating at low frequencies; otherwise P1-11 should be reduced.

Example

For a typical 230V, 50Hz AC induction motor, the user should set P1-07 (Motor Rated Voltage) = 230V and P1-09 (Motor Rated Frequency) = 50Hz to give standard linear V/F operation.

If for any reason the user wishes to change this operation, e.g. to increase the voltage applied to the motor at lower speed

- Set P1-11 to an increased value.
  For example, if set to 20% the drive output will give the V/F characteristic indicated by the blue line in the graph below.



	**It is important to remember that increasing the motor voltage at any point will result in increased current and therefore increased heating of the motor, and so this function should be used with care.** **For applications where the motor may operate continuously at low speed, a force ventilated motor may be required.**

V/F Characteristic Adjustment Function

The V/F characteristic adjustment function allows an additional set-point to be specified on the standard V/F output applied to the motor. For most applications, only two of these points are required, and the V/F characteristic operates as described in the section above. In some applications, it can be advantageous to define a further point, and the following parameters allow the user to directly adjust the voltage applied to the motor at a pre-defined frequency.
These parameters are located in menu 4 and require a level 1 security code to be entered in P1-14 (default = 101).

P4-10 V/F characteristic adjustment frequency
This parameter specifies the frequency at which the voltage (set by P4-11) should be applied to the motor. The range for this parameter is from zero to motor base frequency, specified as a percentage of parameter P1-09. See the graph below for further details. The default value for this parameter is 0 (setting to 0 disables this function).

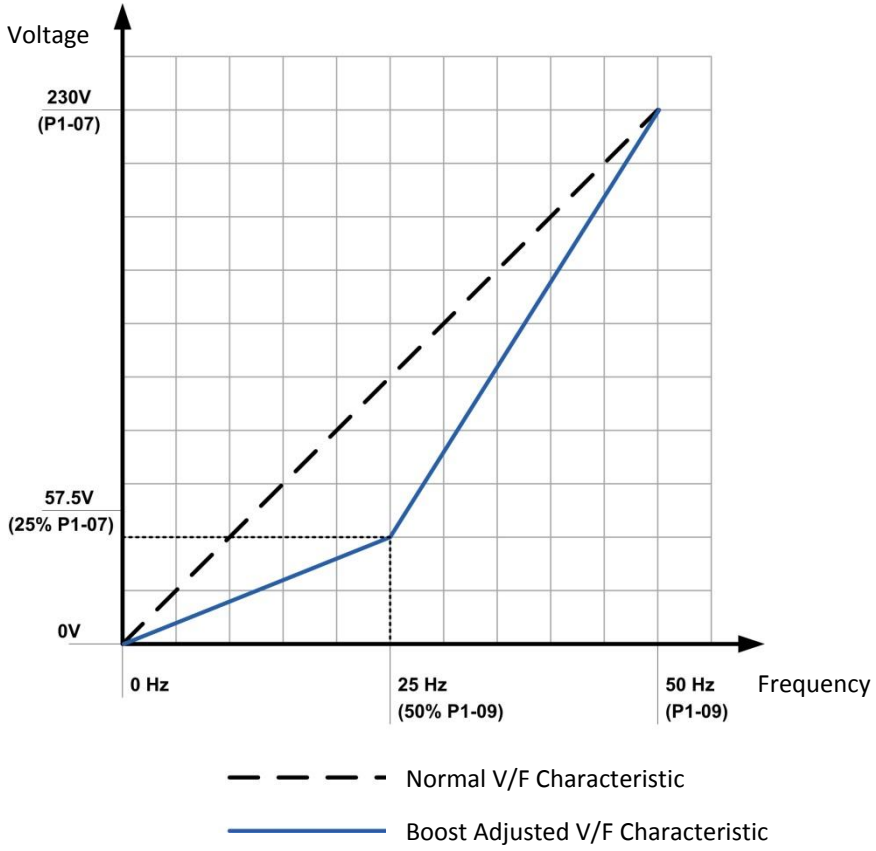
P4-11 V/F characteristic adjustment voltage
This parameter specifies the voltage to be applied to the motor at the frequency specified in P4-10. The range for this parameter is from 0 to motor rated voltage, specified as a percentage of parameter P1-07. The default value for this parameter is 0.

Example

For a typical 230V, 50Hz AC induction motor, the user should set P1-07 = 230V and P1-09 =50Hz to give standard linear V/F operation. In a centrifugal fan application, to provide the best possible energy savings, a parabolic V/F curve is desirable, reducing the voltage applied to the motor at low frequencies. This V/F curve can be approximated using the following technique.

- Set P1-14 (access code) to 101 to permit access to parameter group 4.
- Set the V/F characteristic adjustment frequency (P4-10) to 50%
  (e.g. if P1-09 = 50Hz, P4-10 = 50%, Frequency Set-point = 25Hz)
- Set the V/F characteristic adjustment voltage (P4-11) to 25% of P1-07
  (e.g. if P1-07 = 230 Volts, P4-11 = 57.5 Volts)

The resultant characteristic will be as follows



	**It is important to remember that increasing the motor voltage at any point will result in increased current and therefore increased heating of the motor, and so this function should be used with care.** **For applications where the motor may operate continuously at low speed, a force ventilated motor may be required.**

Appendix:

Revision History			
Version	Comments	Author	Date
1.00	Document Creation	JP	16/02/12