Optidrive Applications Support Library

Application Note	AN-ODV-2-080
Title	Motor Pre-Heating Function
Related Products	Optidrive HVAC
Level **1**	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

The Optidrive HVAC can be set to inject DC voltage into the motor on a start or stop condition, or can be set to maintain magnetising voltage across the motor whilst the speed reference to the drive is set to zero. Applying voltage to the motor creates a circulating current in the motor windings which in turn heats the motor and prevent moisture forming on the surface of the motor. Formation of moisture on the motor might be due to the motor operating in humid conditions or in low ambient temperature, or motor temperature change (specifically cool down) causing condensation to form.

Operational Overview: Setting up DC Injection braking on Start or Stop

The function uses the DC Injection parameters on either starting or stopping the motor in order to create a current and maintain an appropriate temperature within the motor prior to starting or post stopping. Parameters for configuring the DC Injection are contained in menu 6. Access to level 6 requires advanced level security access (Default P1-14=201). The level of DC Injection Voltage applied to the motor is set in parameter P6-18 (DC Injection Braking Voltage). The current can be monitored by changing the OLED display to show Amps (cycle the display to show Amps by pressing the Navigate button).

⚠️	**Caution: Always confirm the maximum acceptable current level that can be applied to the stationary motor prior to configuring the DC Injection function. It may be necessary to contact the motor manufacturer to confirm acceptable levels for operation. Check operation of the drive to ensure current levels are within the specified limited.**

The time to apply DC Injection Voltage on motor starting is set by parameter P6-11 (Speed Hold Time on Enable). The time to apply DC Injection Voltage on motor stopping is set by parameter P6-12 (Speed Hold Time on Disable). The value set in either P6-11 or P6-12 represents the time in seconds that DC Injection Braking will be applied (maximum of 250 secs). The function is then activated by the Enable / Disable input (generally configured as digital input 1 – control terminal 2) going to an enable (start) or disable (stop) condition.

The speed for the Speed Hold Time on Enable is set in Preset Speed 7 (P2-07) and the speed for the Speed Hold Time on Disable is set in Preset Speed 8 (P2-08). These parameters must be set to 0 for the DC Injection function.

Note: Preset Speed 7 (P2-07) and Preset Speed 8 (P2-08) are also used as Boost Speeds within the PID function (see section 8) and hence DC Injection cannot be used when the PID controller is enable (P1-12=3).

Ramp to Stop should be enabled (P1-05=0) and appropriate ramp rates set in P1-03 and P1-04. The timing diagram for the DC Injection function is shown below.
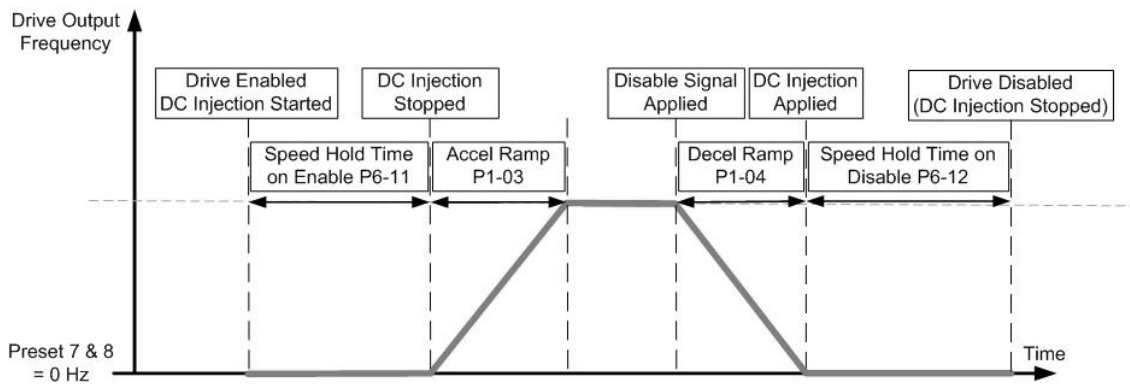
⚡ **Danger: The output from the drive to the motor will remain active whilst DC Injection braking is applied. Always disconnect power to the drive and wait 10 minutes before work is carried out to the drive or motor.**

Quick Setup Overview: Setting up DC Injection Braking on Start or Stop

- Set Basic parameters P1-01 to P1-10.
- Ensure P1-05 is set to 0, Ramp to Stop. Ensure appropriate ramp rates are set in P1-03 and P1-04.
- Set Parameter P1-14 = 201 to allow access to advanced parameters in menu 6
- Set Preset Speed 7 and 8 (P2-07 & P2-08) to 0 Hz
- Set the DC Injection Braking Time required on Start in parameter P6-11.
- Set the DC Injection Braking Time required on Stop in parameter P6-12.
- Set the DC Injection Braking Voltage to apply in P6-18.
- Monitor current levels on the drive display and motor temperature to ensure they remain within the motor manufacturers specified limits.

Operational Overview: Setting up DC Injection Braking on zero speed reference

The function uses the Boost Voltage on the drive reaching zero speed in order to create a current and maintain an appropriate temperature within the motor. The drive Standby Mode must be disabled so that the drive output is not automatically put into Standby following a period of operation with zero speed reference.

The level of DC Injection Voltage applied to the motor is set in parameter P1-11 (V/F Boost Voltage). The current can be monitored by changing the OLED display to show Amps (cycle the display to show Amps by pressing the Navigate button).

⚠ **Caution: Always confirm the maximum acceptable current level that can be applied to the stationary motor prior to configuring the voltage Boost function. It may be necessary to contact the motor manufacturer to confirm acceptable levels for operation. Check operation of the drive to ensure current levels are within the specified limited.**

The time set in the Standby Mode parameter (P2-27) must be 0. This will disable Standby Mode and ensure Boost Voltage is applied whilst the drive is enabled with zero speed reference.
Ramp to Stop should be enabled (P1-05=0) and appropriate ramp rates set in P1-03 and P1-04.
If an input is required to activate motor stop with voltage boost then a digital input can be set to Preset Speed 1 (see section 10.1) and the Preset Speed 1 value (P2-01) set to 0Hz.

Quick Setup Overview: Setting up DC Injection braking on zero speed reference

- Set Basic parameters P1-01 to P1-10.
- Ensure P1-05 is set to 0, Ramp to Stop. Ensure appropriate ramp rates are set in P1-03 and P1-04.
- Set Parameter P1-14 = 101 to allow access to advanced parameters in menu 2
- Set parameter P2-27 = 0 to disable drive Standby Mode (default)
- If a digital input is required to activate motor stop with V/F Boost Voltage then ensure P1-13 is set to 1 (default). Digital input 2 (control terminal 3) is now configured for this function. Ensure P2-01 = 0.
- Set the Boost Voltage to apply in P1-11.
- Monitor current levels on the drive display and motor temperature to ensure they remain within the motor manufacturers specified limits.

Appendix

Revision History			
Issue	Comments	Author	Date
01	Document Creation	KB	28/04/14