Optidrive Applications Support Library

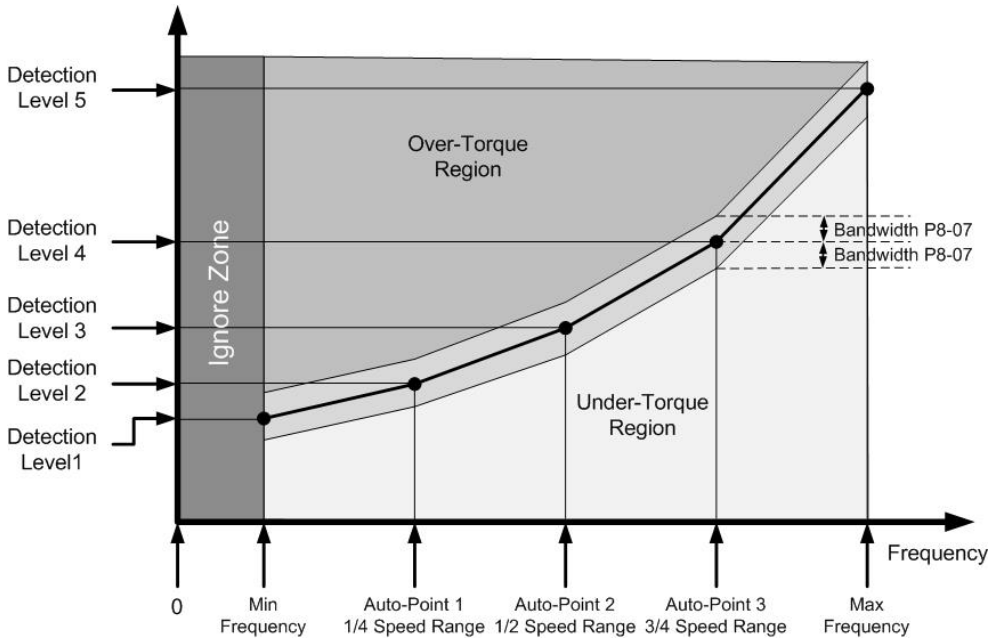
Application Note	**AN-ODV-2-075**
Title	**Load Torque Monitoring Function**
Related Products	**Optidrive HVAC**
Level **2**	1 – Fundamental - No previous experience necessary 2 – Basic – Some Basic drives knowledge recommended 3 – Advanced – Some Basic drives knowledge required 4 – Expert – Good experience in topic of subject matter recommended

Overview

The Load Profile Monitoring Function provides under and over torque protection to the driven load. Practical applications for the function might include Belt Snap detection, Motor Stall detection, Pump Blockage, or Pump Dry Run protection.

The Load Profile Monitoring Function uses a standard operating torque profile stored in memory and the drive current is continuously compared to the standard profile during operation. Should operating current / torque deviate outside of the standard profile for a specified period of time then a trip will be generated within the drive. The Optidrive HVAC uses 5 measured points on the frequency versus current operating curve in order to model normal operation.

A graphical representation of the Load Profile Monitoring Function is shown below:



Operational Overview

In order to use the Load Profile Monitoring Function the standard (normal) operating profile of the drive current versus speed must be established. Set-up of the Load Profile Monitoring Function and the standard operating profile is normally performed as the final step in commissioning the system.

The standard operating profile is established within the drive using an automatic measurement sequence. The automatic measurement sequence is activated when the Load Profile Monitoring Function is enabled (P8-06 changed from 0). When the

drive is first run, following enable of the Load Profile Monitoring Function, the drive output will be ramped to the maximum frequency setting (P1-01) with 5 evenly spaced current measurements recorded. The drive will then return to the normal set-point operating speed. In order to repeat the automatic measurement sequence the Load Profile Monitoring Function must be disabled (P8-06 = 0) and re-enabled (P8-06 <> 0).

Caution: The automatic measurement sequence over-rides the normal drive set-point speed and the drive will run the motor up to maximum frequency (P1-01). Ensure that the system is in a suitable condition to operate through the programmed speed range.

Maximum Frequency / Speed parameter (P1-01) and Minimum Frequency / Speed parameter (P1-02) can be adjusted following execution of the automatic measurement sequence without affecting the results obtained during the automatic measurement sequence. When operating outside of the maximum and minimum speed range the function is disabled.

When setting parameter P8-06 to activate the Load Profile Monitoring Function a value is set that instructions the Optidrive HVAC unit to trip on detection of under-current (P8-06=1), over-current (P8-06=2), or combination of both under-current or over-current (P8-06=3).

A detection tolerance for the Load Profile Monitoring Function is set within parameter P8-07. Parameter P8-07 (Load Profile Monitoring Function Bandwidth) is set as a current (amps) value and is then applied to the standard operating profile stored within the drive to allow for acceptable variations in the motor current measurement. The value entered is applied symmetrically to the nominal current value so totally bandwidth is 2 x P8-07. The Current values measured during the auto-tune are recorded to parameter P0-58 for reference.

In addition to a bandwidth of tolerance being applied to the standard operating profile (P8-07) a trip delay or time limit can also be specified for operation on the drive within the over torque or under torque regions. This time is set within parameter P8-08 (Load Profile Monitoring Function Trip Delay). This parameter can be set to avoid nuisance tripping whilst the load is in a temporary or transitional state.

The Optidrive HVAC will trip immediately on detecting an under / over torque condition for a time period greater than that set in P8-08 and will disable output to the motor with coast to stop. The trip will be displayed on the OLED display and can be reset by pressing the Keypad STOP key.

The Optidrive HVAC can be set to run an automatic pump cleaning function once the Load Profile Monitoring Function has detected an over-torque condition. See section 7.5, Pump Clean Function for more information.

Trip Codes: O_tor9 : Over-Torque Level Detected resulting in drive trip (Fault code 24)
U_tor9 : Under-Torque Level Detected resulting in drive trip (Fault code 25)

Quick Setup Overview

- **Read Caution note associated with this function (above)**
- Set the maximum and minimum speed limits for the drive (P1-01 & P1-02).
- Set Basic parameters P1-03 to P1-10. Energy Optimiser P1-06 must remain disabled.
- Set Parameter P1-14 = 101 to allow access to advanced parameters in menu 8
- Enable the Load Profile Monitoring Function by setting P8-06
  - 0: Disabled
  - 1: Low Load Detection Enabled (Belt Failure / Dry Pump / Broken Impeller)
  - 2: High Load Detection Enabled (Pump Blockage)
  - 3: Low and High Current Detection
- Set an acceptable tolerance bandwidth in P8-07. Set a high bandwidth initially and monitor current during normal operation to determine tighter levels if required.
- Enable the drive and allow the automatic measurement sequence to run.
- Should some nuisance tripping occur Increase the Load Profile Monitoring Function Trip Delay in P8-08. If tripping still occurs then repeat the automatic measurement sequence.

Appendix:

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