

EtherCAT Interface User Guide

Overview

This option module is specifically designed to be used with the Optidrive P2 and Optidrive HVAC range of variable speed drive products and is intended for professional incorporation into complete equipment or systems. If installed incorrectly it may present a safety hazard. Before commencing installation and commissioning, the user should ensure they are fully familiar with the Optidrive P2, and in particular have read the important safety information and warnings contained in the Optidrive P2 / Optidrive HVAC User Guide.

Note

This User Guide is intended to be used with Optidrive P2 & HVAC firmware version 1.20 or later. The firmware version of the drive can be displayed in parameter P0-28. Previous versions of firmware can be upgraded using Optitools Studio PC software. Contact your local Invertek Sales Partner for further Information.

Available Functions

The EtherCAT Interface is intended to be installed in the Optidrive option slot, and allows the Optidrive to be connected to an EtherCAT network. The interface offers the following functionality :-

- CANopen over Ethernet
- DS301 Compliant
- Fast Cyclic I/O data transfer

XML File

An EtherCat Slave Interface Identification XML file for the interface can be obtained from www.invertekdrives.com

IP Address Configuration

If it is desired to change the IP Address, an IP address configuration tool is available for download from www.invertekdrives.com

Compatibility

This Option is suitable for use on the following product ranges:

Optidrive P2 (ODP-2-.... Drives)
Optidrive HVAC (ODV-2-... Drives)

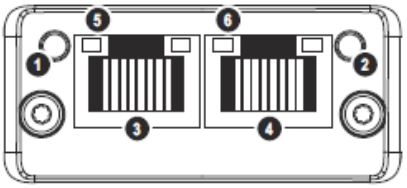
Model Code

OPT-2-ETHCAT-CC

Invertek Drives Ltd

Layout

	Item
1	RUN LED
2	ERROR LED
3	EtherCAT Port 1
4	EtherCAT Port 2
5	Port 1 Activity LED
6	Port 2 Activity LED



RUN LED

State	Indication
Off	INIT : Init State (or no power)
Green	OPERATIONAL : CoE Device in Operational State
Green Blinking	PRE-OPERATIONAL State
Green Single Flash	SAFE-OPERATIONAL State
Red	Fatal Error

ERROR LED

State	Indication
Off	No Power / Error
Red Blinking	Invalid Configuration
Red Double Flash	Application Watchdog Timeout
Red	Module Exception State

Link / Port Activity LEDs

Off	No Link
Green	Link Established, no communication
Green Flickering	Lint Established & Communicating

Installation

- Ensure the drive power is removed prior to installing the option module
- Remove the blanking cover from the option module slot
- Carefully slide the option module into the slot, ensuring that the locating tabs are correctly aligned. Do not use excessive force
- Tighten the 2 clamping screws to secure the module in place



PLC Configuration

Configuration of the PLC varies between different systems.
Refer to information on the specific PLC system in use for further guidance.

Optidrive Setup

- Set the drive to Fieldbus control mode by setting parameter P1-12 = 4
- Ensure Advanced Parameter Access is enabled on the drive by setting P1-14 = 101
- By default, the module supports DHCP, and the IP address will be automatically configured. If a fixed IP address is desired, this can be configured using the IP address configuration tool available from www.invertekdrives.com

Data Mapping

For simple control, Optidrive P2 & Optidrive HVAC support a 4 word cyclic process data exchange. The format and data contained in each of these words are detailed below.

Input Data (PDI) Telegram

This part of the memory contains the real-time drive commands sent from the network master to the Optidrive, allowing the Optidrive to be controlled. The functions of the first two data words (PDI 1 and PDI 2) are fixed, to allow basic control over the drive operation and output frequency to be achieved. The configuration of the remaining two words can be adjusted by the user.

PDI Word 1: Fixed Function : Drive Control Word

A 16 Bit control word is used to control the behaviour of the drive when P1-12 = 4. The bits function as follows :-

Bit	Name	Description
0	Drive Run	0 : Drive Stop 1 : Drive Run
1	Fast Stop Select	0 : No Function 1 : Drive Stop with Deceleration Ramp 2
2	Fault Reset	0 : No Function 1 : Rising Edge fault reset request
3	Coast Stop	0 : No Function 1 : Drive Coasts to stop. Overrides bit 0
4 - 15	Not Used	

For normal operation, Bit 3 has the highest priority, bit 0 has the lowest priority (bit 3>bit 1>bit 0). For normal run/stop control, Bit 0 only should be used. Note that the start/stop (bit 0), fast stop (bit 1) and coast stop (bit 3) can only be used to control the drive when P2-31= 0 to 3. If P2-37 > 3, the start/stop function is controlled directly by the drive control terminals. The Reset function (bit 2) will operate providing that the drive is set for Fieldbus control P1-12 = 4.

PDI Word 2: Fixed Function : Frequency Setpoint

This word is used to transfer the frequency setpoint to the Optidrive. The input data is a 16bit signed integer including one decimal place. For example, a value of 500 represents a frequency setpoint to the Optidrive of 50.0Hz, value 123 gives 12.3Hz. For a negative (reverse) speed reference, a negative value can be transferred to the drive, where the MSB of the high byte must be 1. For example, -1(0xFFFF) gives -0.1Hz. -234(0xFF16) gives -23.4Hz.

The allowed input value range is from -5000 to +5000; however the drive output speed will be limited by the maximum speed set by P1-01.

PDI Word 3 : User Defined Function

The function of this data word can be selected by the user using drive parameter P5-14. The possible setting options are shown below :-

0: Torque limit/reference (Optidrive P2 Only) – This option must be selected if the drive output torque limit / setpoint is to be controlled from the fieldbus. This also requires setting P4-06 = 3. The input data is a 16bit unsigned integer including one decimal place. For example, a value of 500 represents a torque setpoint to the Optidrive of 50.0%, value 123 gives 12.3%.

The allowed input value range is from 0 to +2000; however the drive output torque will be limited by the maximum limit set by P4-07.

1: User PID reference register – This option allows the setpoint to the PID controller to be received from the Fieldbus. In order for this option to be used, P9-38 must be set to 1, and the PID User setpoint must not be utilised within the drive PLC function.

2: User register 3 - The value received by the drive in PDI 3 is transferred to User Register 3. This option allows the function of the process data word to be defined in Parameter Group 9. In this case, User Register 3 should not be written to within any PLC function code, although the value can be read.

PDI Word 4: User Defined Function

The function of this data word can be selected by the user using drive parameter P5-13. The possible setting options are shown below :-

0: Fieldbus Ramp Control – This option must be selected if the drive acceleration and deceleration ramps are to be controlled from the fieldbus. P5-07 must also be set to 1 to enable this function.

1: User register 4 – The value received by the drive in PDI 4 is transferred to User Register 4. This option allows the function of the process data word to be defined in Parameter Group 9. In this case, User Register 3 should not be written to within any PLC function code, although the value can be read.

Output Data

This part of the memory contains the real-time drive data returned from the Optidrive to the network master. The function of the first two data words (PDO 1 and PDO 2) is fixed. The configuration of the remaining two words can be adjusted by the user.

PDO Word 1: Fixed Function : Drive Status & Error Code :

This word contains 2 bytes with information as follows :-

High byte : Gives the drive error (fault) code. (Valid when the drive is tripped)

Low byte : Gives the drive status information, 8 bits which function as follows :-

Bit	Logic 0	Logic 1	Notes
0	Drive Stopped	Drive Running	Indicates when the output to the motor is enabled
1	Drive Healthy	Drive Fault (Tripped)	Indicates when the drive has tripped. The fault code is
2	Auto Control Mode	Hand Control Mode	Optidrive HVAC Only. Indicates when Hand control is selected
3	OK	Inhibit	Indicates the status of the STO / Hardware Inhibit circuit
4	OK	Maintenance Time Reached	Indicates that the programmable System Maintenance Time Interval has expired
5 – 7	Not Used		No Function Assigned
8 - 15	Last / Current Fault Code		Indicates the last or current fault code. For further fault code information, refer to the Optidrive User Guide

PDO Word 2 : Fixed Function : Output Frequency

This word gives the real time drive output frequency information. The data is a 16bit signed integer with one decimal place. E.g. value 123 means 12.3Hz. Value -234 (0xFF16) means -23.4Hz.

PDO Word 3 : Output Current

Data to be transferred in this word can be selected by the User in drive parameter P5-12. The possible settings are as follows :-

0: Motor current – Output current to 1 decimal place, e.g. 100 = 10.0 Amps

1: Power (x.xx kW) Output power in kW to two decimal places, e.g. 400 = 4.00kW

2: Digital input status – Bit 0 indicates digital input 1 status, bit 1 indicates digital input 2 status etc.

3: Analog Input 2 Signal Level - 0 to 1000 = 0 to 100.0%

4: Drive Heatsink Temperature – 0 to 100 = 0 to 100°C

5: User register 1 – User Defined Register 1 Value

6: User register 2– User Defined Register 1 Value

7: P0-80 value – User Selected data value.

PDO Word 4 : User Defined

Data to be transferred in this word can be selected by the User in drive parameter P5-08. The possible settings are as follows :-

0 : Output Torque (Optidrive P2 Only) – 0 to 2000 = 0 to 200.0%

1 : Output Power – Output power in kW to two decimal places, e.g. 400 = 4.00kW

2 : Digital Input Status – Bit 0 indicates digital input 1 status, bit 1 indicates digital input 2 status etc.

3 : Analog Input 2 Signal Level – 0 to 1000 = 0 to 100.0%

4 : Drive Heatsink Temperature – 0 to 100 = 0 to 100°C