

Operating Instructions MCA 123 POWERLINK



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It has been assumed that all devices are sitting behind a firewall that does packet filtering and the environment has implemented restrictions on the software that can run inside the firewall. All nodes are assumed to be "trusted" nodes.

HIGH VOLTAGE

The voltage of the frequency converter is dangerous whenever connected to mains. Incorrect installation of the motor, frequency converter, or fieldbus may damage the equipment, cause serious personal injury, or death. Consequently, the instructions in this manual, as well as national and local rules and safety regulations, must be complied with.

- The frequency converter must be disconnected from mains before carrying out repair work. Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.
- 2. The off-command on the serial bus does not disconnect the equipment from mains and should not be used as a safety switch.
- Correct protective earthing or grounding of the equipment must be established. The user must be protected against supply voltage, and the motor must be protected against overload in accordance with applicable national and local regulations.
- 4. The earth leakage currents are higher than 3.5 mA.
- Do not remove the plugs for the motor and mains supply while the frequency converter is connected to mains. Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.

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- The motor can be brought to a stop with bus commands while the frequency converter is connected to mains. These stop functions do NOT provide protection against unintended starts.
- 2. While parameters are being changed, there is a risk that motor starts.
- 3. Electronic faults in the frequency converter and cease of
 - temporary overload
 - faults in supply mains, or
 - fault in the motor connection

can cause an unintended start.



ELECTRICAL HAZARD

Touching the electrical parts may be fatal - even after the equipment has been disconnected from mains.

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1 Introduction

1.1 General Information

1.1.1 About this Manual

Chapters

chapter 1 Introduction chapter 2 How to Install chapter 3 How to Configure

contain essential information for quick installation and setup.

For more detailed information, including the full range of set-up options and diagnosis tools, refer to the chapters:

chapter 4 Configure the Master chapter 5 How to Control the Frequency Converter chapter 7 Parameters chapter 8 Application Examples chapter 9 Troubleshooting

Terminology

In this manual the term Ethernet is used to describe the physical layer of the network and does not relate to the application protocol.

1.1.2 Assumptions

These Operating Instructions are under the conditions that the Danfoss POWERLINK option is used with a Danfoss VLT[®] AutomationDrive FC 301/FC 302 or FCD 302 frequency converter. The installed controller must support the interfaces described in this manual. Strictly observe all the requirements stipulated in the controller and the frequency converter, along with all limitations herein.

1.1.3 Hardware

This manual relates to the POWERLINK option MCA 123, ordering number 130B5546 (uncoated) and 130B5646 (conformal coated).

1.1.4 Background Knowledge

The Danfoss POWERLINK option card is designed to communicate with any system complying with the POWERLINK standard. Familiarity with this technology is assumed. Issues regarding hardware or software produced by other manufacturers, including commissioning tools, are beyond the scope of this manual, and not the responsibility of Danfoss.

For information regarding commissioning tools, or communication to a non-Danfoss node, consult the appropriate manuals.

1.1.5 Available Literature

- The VLT[®] AutomationDrive Operating Instructions provide the necessary information for getting the frequency converter up and running.
- The VLT[®] AutomationDrive Design Guide entails all technical information about the frequency converter design and applications including encoder, resolver, and relay options.
- The VLT[®] AutomationDrive Profibus Operating Instructions provide the information required for controlling, monitoring, and programming the frequency converter via a Profibus fieldbus.
- The VLT[®] AutomationDrive DeviceNet Operating Instructions provide the information required for controlling, monitoring, and programming the frequency converter via a DeviceNet fieldbus.
- The MCT 10 Set-up Software Operating Instructions provide information for installation and use of the software on a PC.
- The VLT[®] AutomationDrive IP21/Type 1 Instruction provides information for installing the IP21/Type 1 option.
- The VLT[®] AutomationDrive 24 V DC Back-up Instruction provides information for installing the 24 V DC Back-up option.
- The VLT[®] AutomationDrive CANOpen Operating Instructions.
- The VLT[®] AutomationDrive Modbus TCP Operating Instructions.
- The MCA 121 Ethernet/IP Operating Instructions.
- The MCA 120 PROFINET Operating Instructions.
- The MCA 124 EtherCAT Operating Instructions.
- The MCA 122 Modbus TCP Operating Instructions.

Danfoss technical literature is also available online at www.danfoss.com/BusinessAreas/DrivesSolutions/

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1.1.6 Abbreviations

Abbre-	Definition
viation	
API	Actual Packet Interval
ASnd	AsynchronousSend
СС	Control card
CTW	Control word
DCP	Discovery and Configuration Protocol
DHCP	Dynamic Host Configuration Protocol Configuration
EMC	Electromagnetic Compatibility
I/O	Input/Output
IP	Internet Protocol
PDO	Process Data Object
LCP	Local Control Panel
LED	Light Emitting Diode
LSB	Least Significant Bit
MAV	Main Actual Value (actual output)
MN	Managing Node
MSB	Most Significant Bit
MRV	Main Reference Value
N/A	Not applicable
PC	Personal Computer
PCD	Process Control Data
PLC	Programmable Logic Controller
PNU	Parameter Number
REF	Reference (=MRV)
SDO	Service Data Object
SoC	Start Of Cycle Frame
SoA	Start Of Asynchronous
STW	Status Word

Table 1.1 Overview of Abbreviations

1

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Operating Instructions

2 How to Install

2.1 Installation

2.1.1 How to Install Option in Frequency Converter

Before installing the option, make sure that the installed firmware revision supports the POWERLINK option. Following minimum versions of the frequency converter firmware are required:

POWERLINK option	Frequency converter minimum	
firmware version	firmware version	
1.01	FC 301 6.72	
1.01	FC 302 6.72	
1.12	FC 301 6.81	
	FC 302 6.81	
	FCD 302 6.81	

Table 2.1 Minimum Firmware Versions

Items required for installing the fieldbus option in the frequency converter

- Fieldbus option
- Fieldbus option adaptor frame for the FC Series. This frame is deeper than the standard frame to allow space for the fieldbus option beneath.
- Strain relief (only for A1 and A2 enclosures)

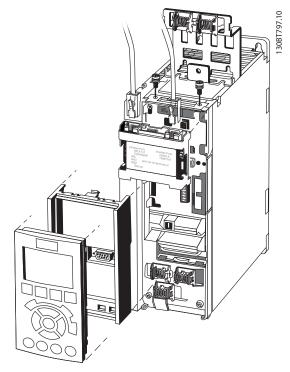


Illustration 2.1 Fieldbus Option Adaption Frame

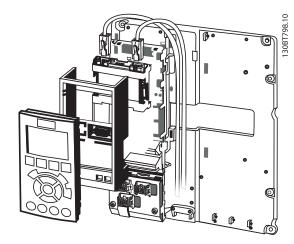


Illustration 2.2 Strain Relief for A1 and A2 Enclosures

Instructions

- 1. Remove LCP panel from the FC Series.
- 2. Remove the frame located beneath and discard it.
- Push the option into place. The Ethernet connectors must be facing upwards.
- 4. Remove knock-out on the fieldbus option adaptor frame.
- 5. Push the fieldbus option adaptor frame for the FC Series into place.
- 6. Replace the LCP and attach cable.

NOTICE

Do not strip and earth the Ethernet cable via the strain relief-plate! The earthing of screened Ethernet cable is done through the RJ-45 connector on the option.

NOTICE

After installing the MCA 123 POWERLINK option, set parameter 8-01 Control Site to: [2] Control word only or [0] Digital and ctrl. word.

parameter 8-02 Control Word Source to: [3] Option A

2.1.2 Network

It is important that the media selected for Ethernet data transmission meets the required properties. Usually CAT 5e and six cables are recommended for industrial applications. Both types are available as unscreened twisted pair and screened twisted pair. Generally, screened cables are recommended for use in industrial environments and with frequency converters.

A maximum cable-length of 100 m is allowed between network devices.

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2.1.3 POWERLINK Cables

Cable type	Specification	
Ethernet standard	Standard Ethernet (in accordance with IEEE	
	802.3), 100Base-TX (Fast Ethernet)	
Cable Type	S/FTP (screened foiled twisted pair, ISO (IEC	
	11801 or EN 50173), CAT 5e	
Damping	23.2 dB (at 100 MHz and 100 m each)	
Crosstalk	24 dB (at 100 MHz and 100 m each)	
damping		
Return loss	10 dB (100 m each)	
Surge impedance	100 Ω	

Table 2.2 Specification of POWERLINK Cables

2.1.4 LED Behaviour

The option has 3 bicolored LEDs that allow a fast and detailed diagnosis. The three LEDs are each linked to its unique part of the POWERLINK option:

LED label	Description
Status/Error	Module Status, reflects the activity on the
	POWERLINK slave.
Link/Collision	Link/Collision Port 1, reflects the activity on the
Port 1	POWERLINK port 1.
Link/Collision	Link/Collision Port 2, reflects the activity on the
Port 2	POWERLINK port 2.

Table 2.3 LEDs

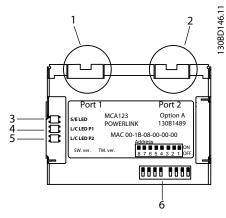


Illustration 2.3 Overview of the Option

Item #	Description
1	POWERLINK port 1
2	POWERLINK port 2
3	Status/error
4	Link/collision port 1
5	Link/collision port 2
6	Node ID dip switches

Table 2.4 Legend to Illustration 2.3

S/E LED

Illustration 2.4 S/E LED Status - Power OFF or State



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Illustration 2.6 S/E LED Status - Flickering Green

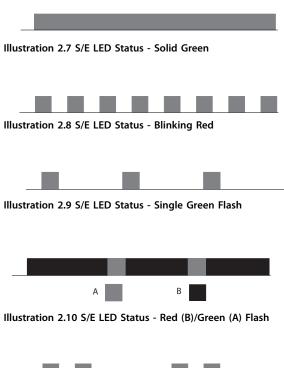








Illustration 2.13 S/E LED Status - Yellow Flash

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LED flash pattern	Powerlink option state	Description
Power OFF	NMT_GS,	No power supplied
or State	NMT_GS_INITIALISATION	to drive or
	NMT_CS_NOT_ACTIVE,	Initialising
Flickering	Basic Ethernet mode	POWERLINK
Green		interface is in basic
		Ethernet mode
Solid green		POWERLINK
		interface is on
		operational state
Blinking	NMT_CS_Stopped	PLC has stopped
greed		the Network
Single green	NMT_CS_PRE_OPERATIONAL_1	POWERLINK
flash		interface is in Pre-
		operation mode
		state 1
Red/green	NMT_CS_PRE_OPERATIONAL_1	Communication to
flash		PLC lost
Double	NMT_CS_PRE_OPERATIONAL_2	POWERLINK
green flash		interface is in Pre-
		operation mode
		state 2
Tripple	NMT_CS_READY_TO_OPERATE	POWERLINK
green flash		interface is
Yellow flash	Wink command	Node Identification
		activated from
		MCT10

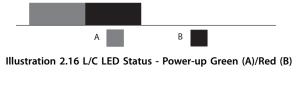




Illustration 2.17 L/C LED Status - Collision Red (B)/Green (A)

Illustration 2.18 L/C LED Status - Yellow Flash

Table 2.6 L/C LED Pattern

LED flash	Powerlink option state	Description
pattern		
Power OFF or	NMT_GS,	No power supplied to
no link	NMT_GS_INITIALISATION	drive or Initialising
	NMT_CS_NOT_ACTIVE	
Link	NMT_GS_INITIALISATION	Only shown once at
		power up
Power up	Various states	Link established
Collision		
Yellow flash	Wink command	Node Identification
		activated from MCT 10
		Set-up Software

Table 2.5 S/E LED Pattern

L/C LED

Illustration 2.14 L/C LED Status - Power OFF or No Link

Illustration 2.15 L/C LED Status - Link

2.1.5 Topology

The POWERLINK module features a built-in POWERLINK controlled node and a two-port hub. This module enables the possibility for connecting several POWERLINK options in a line topology. If more than eight frequency converters are connected in line, it requires special attention towards the timing in the network.

It is important in a POWERLINK system, that the connection is done correctly.

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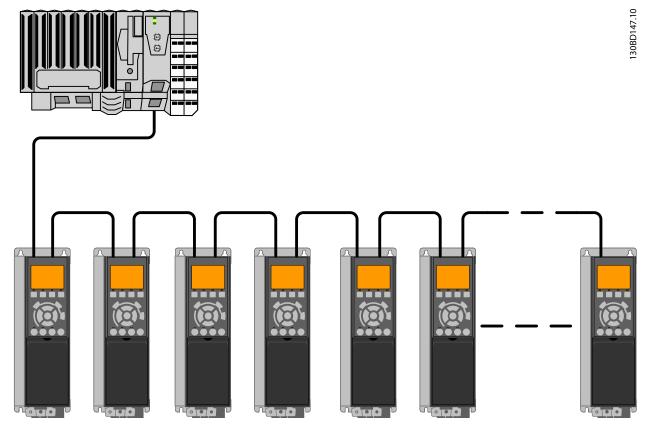


Illustration 2.19 Line Topology

Take care that following design rules are followed

- Do not connect any non-POWERLINK device (e.g. a PC) to any free port as to avoid malfunction of the complete POWERLINK network.
- 2. In a line topology, power all frequency converters either by mains or by a 24 V DC option card, for the built-in POWERLINK slave controller to work.
- 3. To achieve interference-free operation of the Ethernet, observe the following EMC precautions. The correct handling of the motor cable screen is vital for the overall performance of the system. If the rules are not followed, it leads to loss of the control and malfunction of the system. The Ethernet communication cable must be kept away from motor and brake resistor cables to avoid coupling of high frequency noise between the cables. Normally, a minimum distance of 200 mm (8 inches) is sufficient, but maintaining the greatest possible distance between the cables is recommended. Especially where cables run in parallel, over long distances, or if frequency converters with a bigger power size are installed. More information can be found in the norm IEC 61000-5-2:1997.
- 4. When crossing of cables is unavoidable, the Ethernet cable must cross motor and brake resistor cables at an angle of 90°.
- 5. Always observe relevant national and local regulations, for example regarding protective earth connection.

2.1.6 EMC Precautions

To achieve interference-free operation of the Ethernet, observe the following EMC precautions. Additional EMC information is available in the *VLT®* AutomationDrive Design Guide.

NOTICE

The correct handling of the motor cable screen is vital for the overall performance of the system. If the rules are not followed, it can lead to loss of the control and malfunction of the system.

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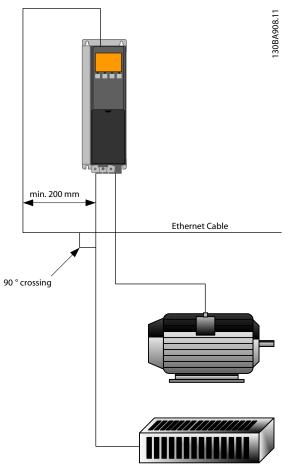


Illustration 2.20 Correct Crossing of Ethernet Cable

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3 How to Configure

3.1 Configure the Parameters

3.1.1 IP Settings

All IP-related parameters are located in parameter group 12-0* IP Settings: The parameters are all set to POWERLINK standard values, so no setting is needed. In POWERLINK, the parameter 12-00 IP Address Assignment is fixed to the option "From node ID". The IP address follows the setting in parameter 12-60 Node ID, so that the IP address is 192.168.100.xxx, where xxx is the node ID. For parameter 12-02 Subnet Mask, the IP addres is fixed to 255.255.255.0 and cannot be changed.

The POWERLINK option offers two ways of node ID assignment via parameter or DIP switch.

3.1.2 Ethernet Link Parameters

Parameter group *12-1* Ethernet Link Parameters* holds Ethernet Link information:

Parameter 12-10 Link Status Parameter 12-11 Link Duration Parameter 12-12 Auto Negotiation Parameter 12-13 Link Speed Parameter 12-14 Link Duplex

Each port has unique Ethernet link parameters.

Parameter 12-10 Link Status displays Link or No Link according to the status of the present port.

Parameter 12-11 Link Duration displays the duration of the link on the present port. If the link is broken, the counter is reset.

Parameter 12-12 Auto Negotiation is a feature that enables two connected Ethernet devices to select common transmission parameters, such as speed and duplex mode. In POWERLINK, this feature is fixed to OFF and cannot be changed.

Parameter 12-13 Link Speed - displays the link speed for each port. If no link is present, "None" is displayed. In POWERLINK, this feature is fixed to 100 MBaud and cannot be changed.

Parameter 12-14 Link Duplex - displays the duplex mode for each port.

In POWERLINK, the Link Duplex is fixed to Half Duplex, and cannot be changed.

3.2 Configure the Frequency Converter

3.2.1 VLT Parameters

Pay particular attention to the following parameters when configuring the frequency converter with a fieldbus interface.

- *Parameter 0-40 [Hand on] Key on LCP.* If the [Hand on] key on the frequency converter is activated, control of the frequency converter via the fieldbus interface is disabled.
- After an initial power-up, the frequency converter automatically detects whether a fieldbus option is installed in slot A. It then sets *parameter 8-02 Control Word Source* to [*Option A*]. Adding, changing, or removing an option from an already commissioned frequency converter does not change *parameter 8-02 Control Word Source*. However, it causes a trip mode, and the frequency converter displays an error.
- Parameter 8-10 Control Word Profile. Select between the Danfoss FC Profile and the DS 402 profile. The change of parameter 8-10 Control Word Profile is active at the next power-up.
- Parameter 8-50 Coasting Select to parameter 8-56 Preset Reference Select. Selection of how to gate fieldbus control commands with digital input command of the control card.

NOTICE

When parameter 8-01 Control Site is set to [2] Control word only, Bus-control overrules the settings in parameter 8-50 Coasting Select to parameter 8-56 Preset Reference Select.

• Parameter 8-03 Control Word Timeout Time to parameter 8-05 End-of-Timeout Function. The reaction in the event of a bus time-out is set via these parameters.

3.3 Configure the POWERLINK Network

All POWERLINK stations that are connected to the same bus network must have a unique node address. The node address of the frequency converter can be selected via:

- Hardware switches (from version 1.12)
- parameter 12-60 Node ID

Setting the NODE Address using the Hardware Switches

Using the hardware switches, it is possible to select an address range 0–239 (factory setting 1) according to Table 3.1:

How to Configure

Operating Instructions

Switch	8	7	6	5	4	3	2	1
Address value	128	+64	+32	+16	+8	+4	+2	+1
E.g. address 5	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
E.g. address 35	OFF	OFF	ON	OFF	OFF	OFF	ON	ON
E.g. address 82	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
E.g. address 157	ON	OFF	OFF	ON	ON	ON	OFF	ON

Table 3.1

NOTICE

The switches are only read during power-up. Changes are active after the next power up, and can be read in *parameter 12-60 Node ID*. Note the location and sequence of the hardware switches as illustrated in *Illustration 2.3*.

Setting the NODE Address via parameter 12-60 Node ID

Setting the address via *parameter 12-60 Node ID*, is only possible if the hardware switches are set to 0 or 255 (factory setting). The address change becomes active at the next power-up. The node address has direct influence on the IP address in *parameter 12-01 IP Address*. If the hardware switch is set to an illegal number, the frequency converter immediately issues Warning 34 in the display, and *parameter 12-69 Ethernet PowerLink Status* is set to 0 (zero).

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4 Configure the Master

4.1 Importing the XDD File

To configure a POWERLINK Master, the configuration tool needs an XDD file for each type of slave on the network. The XDD file is a text file containing the necessary communications set-up data for a slave. Download the XDD file for the FC Series frequency converters at *www.danfoss.com/BusinessAreas/DrivesSolutions/*.

parameter 15-61 Option	File
SW Version	
1.02	FC 301: 0x0200008D_FC301_01.xdd
	FC 302: 0x0200008D_FC302_01.xdd
1.12	FC 301: 0x0200008D_FC301_08.xdd
	FC 302: 0x0200008D_FC302_08.xdd
	FCD 302: FCD 302:
	0x0200008D_FCD302_08.xdd

Table 4.1 POWERLINK SW Version XDD File

The following steps show how to add a device to the Automation Studio Tool. For tools from other vendors, consult their relevant manuals.

 In the Automation Studio, select the menu [Tools] and [Import Fieldbus Device].

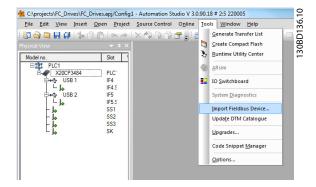


Illustration 4.1 Automation Studio

2. Select the XDD file and the Automation studio, imports it to its library. To save the new info, select the [Save All] menu or the multiple floppy disc icon.

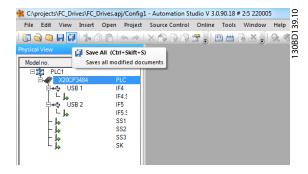


Illustration 4.2 Selecting the XDD File

4.2 Setting Up the Master

Select the POWERLINK I/O master to open the POWERLINK interface in the Automation Studio Master.

1. Right click and select [Open POWERLINK].

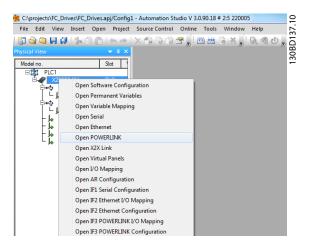


Illustration 4.3 Open POWERLINK

2. Right click the network icon, and select [Insert].

C\projects\FC_Drives\FC_Drives.apj/Config1 - Automation Studio V 3.0.90.18 # 2:5 220005					
Physical View					
Model no.	Slot 1	Slave Module	Slave Backplane	Connection	
Big: PLC1 Big: 22CF2484 Big: 22CF2484 USB 1 Lip Big: 22CF2484 USB 2 Lip Big: 22CF2484 Lip Big:	PLC IF4 IF4.5 IF5.5 SS1 SS2 SS3 SK	E	insert Delete Go To Properties	ST1	

Illustration 4.4 Physical View

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3. Select [Danfoss FC 302].

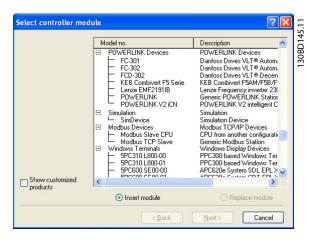


Illustration 4.5 Select Controller Module

Danfoss FC Series is inserted in the POWERLINK master system.

4. Configure the I/O configuration, right click the Danfoss Icon and select [Open I/O Configuration].

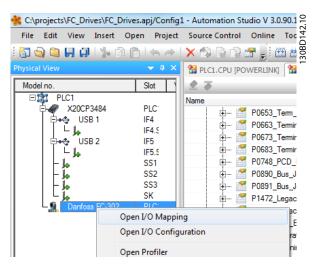


Illustration 4.6 I/O Configuration

- 5. By default the POWERLINK option does not have any process data assigned to its I/O mapping. Assign the process data by selecting the channels (FC Parameter) as read or write. Selecting the [+] sign in front of the channel menu expands the list and the parameters can be selected. In this example following has been selected:
 - Object 2690 fieldbus control word 1
 - Object 2692 fieldbus reference 1
 - Object 2643 status word
 - Object 2645 main actual value

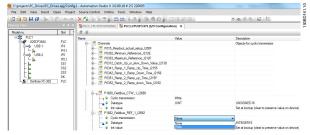


Illustration 4.7 Select Parameters

NOTICE

Make sure that maximum ten channels are selected in each direction; or the PLC enters into an endless restart of the network.

6. The POWERLINK configuration does now contain the Danfoss FC Series frequency converter as its slave and communicates with the four words. The final step is to map the I/Os to PLC variables, which is done in the I/O mapping. Select the I/O Mappings by right-clicking the [Danfoss FC 302] icon and selecting [Open I/O Mapping].

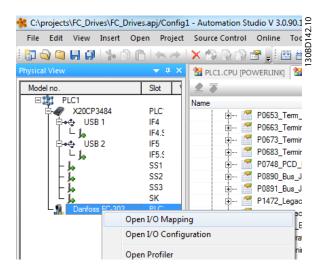


Illustration 4.8 Mapping the I/Os ot the PLC Variables

Now, the mapping can be done directly to previous defined variables.

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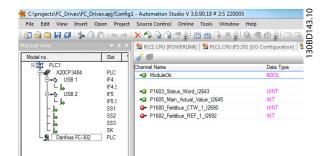


Illustration 4.9 Previous Defined Variables

Variables can also be directly declared, via selecting the Channel Name for each signal and enter the attributes directly.

Name	Туре	Local	& Reference	Constant	Retain	Value	Description	
🥏 STW	UINT							
4	11							- F

Illustration 4.10 Variables Directly Declared

This inserts the Danfoss FC 302 into the B&R system, and the frequency converter can now be controlled and supervised via the POWERLINK.

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5 How to Control the Frequency Converter

5.1 PDO Communication

The frequency converter uses the following profiles:

- Frequency converter profiles
- CANOpen DS 402 profile

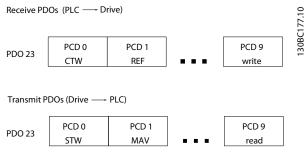
For each of the two profiles there is a set of SDO objects that is only accessible if the profile is activated in *parameter 8-10 Control Word Profile*. The change is active at the next power-up. Configure the PDO communication, where a subset of SDOs can be mapped into PDOs for cyclic communication.

PDO communication is reserved for high-speed cyclic access to parameters for control and status of the frequency converter. The PLC sends out process control data, and the frequency converter responds with a PDO containing process status data. In the Danfoss POWERLINK interface, both PDOs can be configured freely.

Select the signals for transmission from the master to the frequency converter via the PLCs configuration tool. The PLC sets *Parameter 12-21 Process Data Config Write, parameter 12-22EN-22 Process Data Config Read* and *parameter 12-23 Process Data Config Write Size,* which can be used to control that the configuration has been sent correctly from the PLC.

The POWERLINK option has only one PDO available: PDO 23. The PDO 23 is flexible in size and is adjustable to fit all needs (max. 10 PCDs). The selection is made in the master configuration and is then automatically downloaded to the frequency converter during the transition from Init to Pre-Op. No manual setting of PPO types in the frequency converter is required.

Option [1] Standard telegram 1 is equivalent to PDO 23.



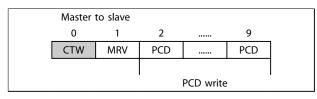


5.2 Process Data

Use the process data part of the PDO for controlling and monitoring the frequency converter via the POWERLINK.

5.2.1 Process Control Data

The example in *Table 5.1* shows control and reference sent from the PLC to the frequency converter, and status word and Main Actual Value sent from the frequency converter to the PLC.





PCD 0 contains a 16-bit control word where each bit controls a specific function of the frequency converter, see *chapter 5.3 Control Profile*. PCD 1 contains a 16-bit speed setpoint in percentage format. See *chapter 5.2.3 Reference Handling*.

The content of PCD 2 to PCD 9 is read only.

5.2.2 Process Status Data

Process data sent from the frequency converter contain information about the current state of the frequency converter.

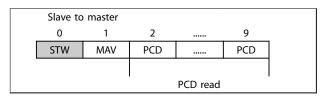


Table 5.2 Process Status Data

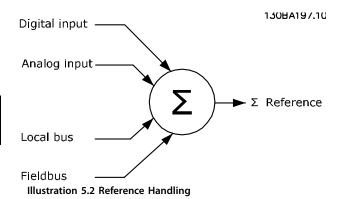
PCD 0 contains a 16-bit status word where each bit contains information regarding a possible state of the frequency converter.

PCD 1 contains per default the value of the current speed of the frequency converter in percentage format (see *chapter 5.2.3 Reference Handling*).

5.2.3 Reference Handling

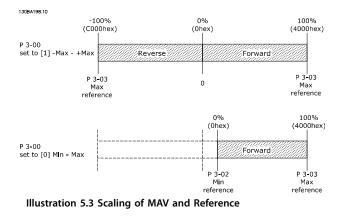
The reference handling in FC Series is an advanced mechanism that sums up references from different sources.

For more information on reference handling, refer to the *VLT®* AutomationDrive Design Guide.



The reference, or speed setpoint (MRV, sent via POWERLINK), is always transmitted to the frequency converter in percentage format as integers represented in hexadecimal (0-4000 hex).

Depending on the setting of *parameter 3-00 Reference Range* the reference and MAV are scaled accordingly:



NOTICE

If parameter 3-00 Reference Range is set to [0] Min - Max, a negative reference is handled as 0%.

The speed limit settings depend on *parameter 0-02 Motor Speed Unit* and can be set to RPM or Hz. If *parameter 0-02 Motor Speed Unit* is set to RPM, *parameter 4-11 Motor Speed Low Limit [RPM]* and *parameter 4-13 Motor Speed High Limit [RPM]* limit the actual frequency converter output. If *parameter 0-02 Motor Speed Unit* is set to Hz, *parameter 4-12 Motor Speed Low* *Limit [Hz]* and *parameter 4-14 Motor Speed High Limit [Hz]* limit the actual frequency converter output.

parameter 4-19 Max Output Frequency limits the maximum output and can also influence the maximum speed of the motor.

For reference and MAV formats, see Table 5.3.

MRV/MAV	Integer in hex	Integer in decimal
100%	4000	16.384
75%	3000	12.288
50%	2000	8.192
25%	1000	4.096
0%	0	0
-25%	F000	-4.096
-50%	E000	-8.192
-75%	D000	-12.288
-100%	C000	-16.384

Table 5.3 Reference and MAV Formats

NOTICE

Negative numbers are formed as a complement of two.

NOTICE

The data type for MRV and MAV is 16-bit standardise value, which can express a range from -200% to +200% (8001 to 7FFF).

Parameter 1-00 Configuration Mode set to [0] Speed open loop.

Parameter 3-00 Reference Range set to [0] Min - Max. Parameter 3-02 Minimum Reference set to 100 RPM. Parameter 3-03 Maximum Reference set to 3000 RPM.

	MRV/MAV	
0%	0 hex	100 RPM
25%	1000 hex	825 RPM
50%	2000 hex	1550 RPM
75%	3000 hex	2275 RPM
100%	4000 hex	3000 RPM

Table 5.4

5.2.4 Process Control Operation

In process control operation *parameter 1-00 Configuration Mode* is set to [3] *Process*.

The reference range in *parameter 3-00 Reference Range* is always [0] *Min-Max*.

- MRV represents the process setpoint.
- MAV expresses the actual process feedback (range ±200%).



5.2.5 Influence of the Digital Input Terminals upon FC Control Mode

The influence of the digital input terminals upon control of the frequency converter can be programmed in *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select*.

NOTICE

The parameter 8-01 Control Site overrules the settings in parameter 8-50 Coasting Select to parameter 8-56 Preset Reference Select, and terminal 37 Coasting Stop (safe) overrules any parameter.

Each digital input signal can be programmed to logic AND, logic OR, or to have no relation to the corresponding bit in the control word. This way, fieldbus only, fieldbus AND Digital Input, or Ether Fieldbus OR Digital input terminal can initiate a specific control command, that is stop/coast.

To control the frequency converter via POWERLINK, set parameter 8-50 Coasting Select to either [1] Bus, or to [2] Logic AND. Then set parameter 8-01 Control Site to [0] Digital and ctrl.word or [2] control word only.

5.3 Control Profile

The frequency converter can be controlled according to the DS 402 profile, or the Danfoss FC profile. Select the desired control profile in *parameter 8-10 Control Word Profile*. The choice of profile affects the control and status word only. The change of *parameter 8-10 Control Word Profile* is activated at the next power-up.

Object 6060 Modes of operation can also control the desired control profile which can be readout by object 6061 Modes of operation display. Value -1 indicates frequency converter profile. Value 2 indicates DS 402 Velocity mode. If the frequency converter is run in DS 402 profile, the DS 402 profile must be selected (for example, by *parameter 8-10 Control Word Profile* or object 6060). The four process data Control Word, Reference, Status Word and Main Actual Value will the information in according to the specification. Make sure that the profile selected is also the profile used in the PLC.

5.4 DS 402 Control Profile

5.4.1 Control Word According to DSP 402 Profile (Parameter 8-10=DSP 402 profile)

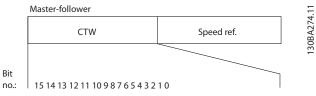


Illustration 5.4 Control Word Profile

Bit	Bit value=0	Bit value=1
00	Switch off	Switch on
01	Disable voltage	Enable voltage
02	Quick stop	Run
03	Disable operation	Enable operation
04	Disable ramp	Enable ramp
05	Freeze	Run enable
06	Ramp stop	Start
07	No function	Reset
08	Rese	rved
09	Rese	rved
10	Rese	rved
11	Jog 1 OFF	Jog 1 ON
12	Rese	rved
13	Setup se	lect (LSB)
14	Setup sel	ect (MSB)
15	Forward	Reversing

Table 5.5 Definition of Control Bits

Explanation of the control bits

Bit 00, Switch OFF/ON

Bits 00, Switch OFF/ON Bit 00="0" - executes transition 2, 6 or 8. Bit 00="1" - executes transition 3.

<u>Bit 01, Disable/Enable Voltage</u> Bit 01="0" - executes transition 9, 10 or 12. Bit 01="1" - enables voltage.

<u>Bit 02, Quick stop/Run</u> Bit 02="0" - executes transition 7, 10 or 11. Bit 02="1" - quick stop not active.

<u>Bit 03, Disable/enable Operation</u> Bit 03="0" - executes transition 5. Bit 03="1" - enables operation.

Bit 04, Quick-stop/ramp



Bit 04="0" - executes transition 7 or 11, Quick stop. Bit 04="1" - enables ramp.

<u>Bit 05, Freeze output frequency/run enable</u> Bit 05="0" - the given output frequency is maintained even if the reference is changed. Bit 05="1" - the frequency converter is again able to regulate, and the given reference is followed.

Bit 06, Ramp stop/start

Bit 06="0" - the frequency converter controls the motor down to stop. Bit 01="1" - gives a start command to the frequency converter.

Bit 07, No function/reset Reset of trip. Bit 07="0" - there is no reset. Bit 07="1" - a trip is reset.

Bit 08, 09 and 10 DSP402 reserved.

Bit 11, Jog 1 OFF/ON

Activation of pre-programmed speed in *parameter 8-90 Bus Jog 1 Speed* JOG 1 is only possible if Bit 04="0", and bit 00-03="1".

Bit 12 Danfoss reserved.

Bits 13/14, Selection of Setup

Bits 13 and 14 are used for selecting among the four menu set-ups in accordance with *Table 5.6*:

Set-up	Bit 14	Bit 13
0	0	1
0	1	2
1	0	3
1	1	4

Table 5.6 Set-up Selection Table

Bit 15, Forward/reversing Bit 15="0" - no reversing. Bit 15="1" - reversing.

NOTICE

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In factory setting reversing is set to [digital] in parameter 8-54 Reversing Select.

5.4.2 Status Word According to DS 402 Profile

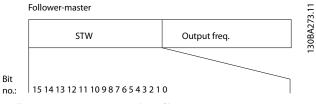


Illustration 5.5 Status Word Profile

Bit	Bit value=0	Bit value=1
00	Not ready to switch ON	Ready to switch ON
01	Switched OFF	Switched ON
02	Operation disabled	Operation enabled
03	No malfunction	Malfunction
04	Voltage disabled	Voltage enabled
05	Quick stop	Run
06	Switch on disable	Switch on enable
07	No warning	Warning
08	Not running	Running
09	Remote disabled	Remote enabled
10	Set point not reached	Set point reached
11	Speed limit not active	Speed limit active
12	Rese	rved
13	Rese	rved
14	Rese	rved
15	Rese	rved

Table 5.7 Definition of Status Bits

Explanation of the status bits

Bit 00, Not ready to switch on/Ready to switch on Bit 00="0" - state less than "Ready to switch on". Bit 00="1" - state at least = "Ready to Switch on".

<u>Bit 01, Switch off/Switch on</u> Bit 00="0" - state less than "Switched on". Bit 00="1" - state at least = "Switched on".

<u>Bit 02, Operation disable/Operation enable</u> Bit 00="0" - state less than "Operation enable". Bit 00="1" - state at least = "Operation enable".

<u>Bit 03, No fault/trip</u> Bit 03="0" - the frequency converter is not in a fault condition. Bit 03="1" - the frequency converter has tripped and needs a reset signal to run.

Bit 04, Voltage disable/Voltage enable Bit 04="0" - control word bit 01="1". Bit 04="1" - control word bit 01="0".

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Bit 05, Quick stop/Run Bit 05="0" - control word bit 02="1". Bit 05="1" - control word bit 02="0".

Bit 06, Start enable/Start disable Bit 06="0" - state is not "Switch on disable". Bit 06="1" - state = "Switch on enable".

<u>Bit 07, No warning/Warning</u> Bit 07="0" - no warning situation. Bit 07="1" - a warning has occurred.

<u>Bit 08,</u> Danfoss reserved

Bit 09, Remote disable/Remote enable Bit 09="0" - the frequency converter has been stopped with the stop key on the LCP, or [Local] has been selected in *parameter 3-13 Reference Site*. Bit 09="1" - it is possible to control the frequency

converter via the serial port.

<u>Bit 10, setpoint not reached/Set point reached</u> Bit 10="0" - the actual motor speed is different from the speed reference set. This situation can occur while the speed is ramped up/down during start/stop. Bit 10="1" - the present motor speed equals the speed reference set. Bit 11, Speed limit not active/speed limit active

Bit 11="0" - the output frequency is out of the range set in parameters 4-11/4-12 *Motor Speed low Limit RPM/Hz* or parameters 4-13/4-14 *Motor Speed high Limit RPM/Hz*. Bit 11="1" - the output frequency is within the mentioned range.

Bit 12, DSP 402 reserved

Bit 13, DSP 402 reserved

Bit 14, Running/Not running

Bit 14="0" - the motor is not running.

Bit 14="1" - the frequency converter has a valid start signal or that the output frequency is greater than 0 Hz.

Bit 15, Danfoss reserved

8-10 Control Profile		
Option:		Function:
[0] *	FC profile	
[7]	CANOpen DSP 402	

FC Profile is the default control profile for the frequency converter, whereas *CANOpen DSP 402* is the CiA standardized control profile, featuring the special DSP 402 transition state machine.

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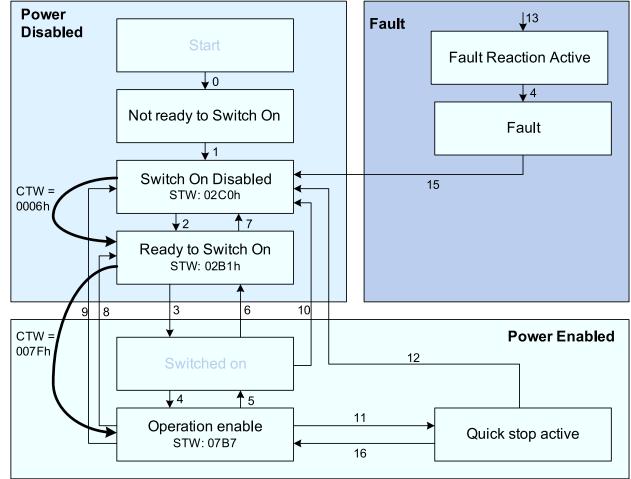


Illustration 5.6 DSP 402 State Machine

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Operating Instructions

5.4.3 DSP 402 State Transitions

Transition	State	Control	Status	Action
		word	word	
-	Start condition	0000	0000	-
0	Start-up⇒Not ready to switch on	0000	0200	-
1	Switch On Disabled⇒Switch On Disabled	0000, 0001	0240	-
2	Not Ready to Switch On⇒Switched On	0006	0231	-
3	Ready to Switch On⇒Switched On	0007	0233	-
4	Switched On⇒Ready to Switch On	000F	0237	-
5	Operation Enabled⇒Switched On	0007	0233	Motor ramps to 0 RPM with programmed ramp down
				parameter.
6	Switched On⇒Ready to Switch On	0006	0231	-
7	Ready to Switch On⇒Switch On Disable	0001, 0000	0240	-
8	Operation Enable⇒Ready to Switch On	0006	0231	If the motor is not braked, and the power section is
				switched off immediately, the motor is free to rotate.
9	Operation Enable⇒Switch On Disable	0001, 0000	0240	If the motor is not braked, and the power section is
				switched off immediately, the motor is free to rotate.
10	Switched On⇒Switched On Disable	0001, 0000	0240	If the motor is not braked, and the power section is
			_	switched off immediately, the motor is free to rotate.
11	Operation Enabled⇒Quick Stop Active	0002	0207	Motor ramps to 0 RPM with programmed quick ramp parameter.
11	Operation Enabled⇒Quick Stop Active	0003	0217	Motor ramps to 0 RPM with programmed quick ramp parameter.
12	Quick Stop Active⇒Switch On Disabled	0001, 0000	0240	If the motor is not braked, and the power section is switched off immediately, the motor is free to rotate.
13	All states⇒Fault Reaction Active	xxxx	023F	-
14	Fault Reaction Active⇒Fault	xxxx	023F	-
15	Fault⇒Switch On Disabled	0000	0240	-
16	Quick Stop Active⇒Operation Enable (not supported)	-	-	-

Table 5.8 DSP 402 State Transitions

5.5 Danfoss FC Control Profile

5.5.1 Control Word according to FC Profile (CTW)

To select Danfoss FC protocol in the control word, *parameter 8-10 Control Word Profile* must be set to [0] *frequency converter profile*. The control word is used to send commands from a master (PLC or PC) to a slave (frequency converter).

Bit	Bit value=0	Bit value=1
00	Reference value	external selection lsb
01	Reference value	external selection msb
02	DC brake	Ramp
03	Coasting	No coasting
04	Quick stop	Ramp
05	Hold output frequency	Use ramp
06	Ramp stop	Start
07	No function	Reset
08	No function	Jog
09	Ramp 1	Ramp 2
10	Data invalid	Data valid
11	No function	Relay 01 active
12	No function	Relay 04 active
13	Parameter set-up	selection lsb
14	Parameter set-up	selection msb
15	No function	Reverse

Table 5.9 Bit Values for FC Control Word

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Explanation of the control bits Bits 00/01 Reference value

Bits 00 and 01 are used to choose between the four reference values, which are pre-programmed in *parameter 3-10 Preset Reference* according to *Table 5.10*.

NOTICE

In *parameter 8-56 Preset Reference Select* a selection is made to define how Bit 00/01 gates with the corresponding function on the digital inputs.

Bit 01	Bit 00	Programmed ref. value	Parameter
		iei. value	
0	0	1	[0]
			Parameter 3-10 Preset
			Reference
0	1	2	[1]
			Parameter 3-10 Preset
			Reference
1	0	3	[2]
			Parameter 3-10 Preset
			Reference
1	1	4	[3]
			Parameter 3-10 Preset
			Reference

Table 5.10 Programmed Reference Values for Bits

Bit 02, DC brake

Bit 02="0" - leads to DC braking and stop. Braking current and duration are set in *parameter 2-01 DC Brake Current* and *parameter 2-02 DC Braking Time*. Bit 02="1" - leads to ramping.

Bit 03, Coasting

Bit 03="0" - causes the frequency converter to immediately coast the motor to a standstill.

Bit 03="1" - enables the frequency converter to start the motor if the other starting conditions have been fulfilled.

NOTICE

In *parameter 8-50 Coasting Select* a selection is made to define how Bit 03 gates with the corresponding function on a digital input.

Bit 04, Quick stop

Bit 04="0" - causes a quick stop, ramping the motor speed down to stop via *parameter 3-81 Quick Stop Ramp Time*. Bit 04="1" - the frequency converter ramps the motor speed down to stop via *parameter 3-81 Quick Stop Ramp Time*.

Bit 05, Hold output frequency

Bit 05="0" - causes the present output frequency (in Hz) to freeze. The frozen output frequency can only be changed with the digital inputs (*parameter 5-10 Terminal 18 Digital Input* to *parameter 5-15 Terminal 33 Digital Input*) programmed to *Speed up* and *Speed down*. Bit 05="1" - use ramp.

NOTICE

If *Freeze output* is active, stop the frequency converter with

- Bit 03 Coasting stop
- Bit 02 DC braking
- Digital input (parameter 5-10 Terminal 18 Digital Input to parameter 5-15 Terminal 33 Digital Input) programmed to DC braking, Coasting stop, or Reset and coasting stop.

Bit 06, Ramp stop/start

Bit 06="0" - causes a stop, in which the motor speed is ramped down to stop via the selected *ramp down* parameter.

Bit 06="1" - permits the frequency converter to start the motor, if the other starting conditions have been fulfilled.

NOTICE

In *parameter 8-53 Start Select* a selection is made to define how Bit 06 Ramp stop/start gates with the corresponding function on a digital input.

Bit 07, Reset

Bit 07="0" - does not cause a reset.

Bit 07="1" - causes the reset of a trip. Reset is activated on the signals leading edge, that is, when changing from logic "0" to logic "1".

Bit 08, Jog

Bit 08="0" - no function. Bit 08="1" - *parameter 3-19 Jog Speed* [*RPM*] determines the output frequency.

Bit 09, Selection of ramp 1/2

Bit 09="0" - ramp 1 is active (*parameter 3-40 Ramp 1 Type* to *parameter 3-47 Ramp 1 S-ramp Ratio at Decel. Start*). Bit 09="1" - ramp 2 (*parameter 3-50 Ramp 2 Type* to *parameter 3-57 Ramp 2 S-ramp Ratio at Decel. Start*) is active.

Bit 10, Data not valid/Data valid

Is used to tell the frequency converter whether it should use or ignore the control word.

Bit 10="0" - the control word is ignored.

Bit 10="1" - the control word is used. This function is relevant, because the control word is always contained in the telegram, regardless of which type of telegram is used. Thus, it is possible to turn off the control word, if it is not wished to use it when updating or reading parameters.

Bit 11, Relay 01

Bit 11="0" - relay 01 not activated.

Bit 11="1" - relay 01 activated, provided Control word bit 11 has been chosen in *parameter 5-40 Function Relay*.

Bit 12, Relay 04

Bit 12="0" - relay 04 has not been activated.

Bit 13/14, Selection of set-up

Bits 13 and 14 are used to choose from the four menu setups according to *Table 5.11*:

The function is only possible when [9] Multi-Set-up is selected in parameter 0-10 Active Set-up.

Set-up	Bit 14	Bit 13
1	0	0
2	0	1
3	1	0
4	1	1

Table 5.11 Selection of Set-up

NOTICE

In *parameter 8-55 Set-up Select* a selection is made to define how Bit 13/14 gates with the corresponding function on the digital inputs.

Bit 15 Reverse

Bit 15="0" - no reversing. Bit 15="1" - reversing.

5.5.2 Status Word according to FC Profile (STW)

The status word is used to inform the master (for example, a PC) of the operation mode of the slave (frequency converter).

Refer to *chapter 8 Application Examples* for an example of a status word telegram using PPO type 3.

Bit	Bit=0	Bit=1
00	Control not ready	Control ready
01	Frequency converter not	Frequency converter ready
	ready	
02	Coasting	Enable
03	No error	Trip
04	No error	Error (no trip)
05	Reserved	-
06	No error	Triplock
07	No warning	Warning
08	Speed reference	Speed=reference
09	Local operation	Bus control
10	Out of frequency limit	Frequency limit ok
11	No operation	In operation
12	Frequency converter OK	Stopped, autostart
13	Voltage OK	Voltage exceeded
14	Torque OK	Torque exceeded
15	Timer OK	Timer exceeded

Table 5.12 Definition of Status Bits

Explanation of the status bits Bit 00, Control not ready/ready

Bit 00="0" - the frequency converter has tripped. Bit 00="1" - the frequency converter controls are ready, but the power component is not necessarily receiving any power supply (in case of 24 V external supply to controls).

Bit 01, frequency converter ready

Bit 01="0" - the frequency converter is not ready for operation.

Bit 01="1" - the frequency converter is ready for operation, but there is an active coasting command via the digital inputs or via serial communication.

Bit 02, Coasting stop

Bit 02="0" - the frequency converter has released the motor.

Bit 02="1" - the frequency converter can start the motor when a start command is given.

Bit 03, No error/trip

Bit 03="0" - the frequency converter is not in fault mode. Bit 03="1" - the frequency converter is tripped, and that a reset signal is required to re-establish operation.

Bit 04, No error/error (no trip)

Bit 04="0" - the frequency converter is not in fault mode. Bit 04="1" - there is a frequency converter error but no trip.

Bit 05, Not used

Bit 05 is not used in the status word.

Bit 06, No error/triplock

Bit 06="0" - the frequency converter is not in fault mode. Bit 06="1" - the frequency converter is tripped, and locked.

Bit 07, No warning/warning

Bit 07="0" - there are no warnings. Bit 07="1" - a warning has occurred. Jantos

Bit 08="0" - the motor is running, but that the present speed is different from the preset speed reference. It could, for example, be the case while the speed is being ramped up/down during start/stop.

Bit 08="1" - the present motor present speed matches the preset speed reference.

Bit 09, Local operation/bus control

Bit 09="0" - [Stop/Reset] is activated on the control unit, or that *Local control* in *parameter 3-13 Reference Site* is selected. It is not possible to control the frequency converter via serial communication. Bit 09="1" - it is possible to control the frequency converter via the fieldbus/serial communication.

Bit 10, Out of frequency limit

Bit 10="0" - the output frequency has reached the value in *parameter 4-11 Motor Speed Low Limit [RPM]* or *parameter 4-13 Motor Speed High Limit [RPM]*. Bit 10="1" - the output frequency is within the defined limits.

Bit 11, No operation/in operation

Bit 11="0" - the motor is not running. Bit 11="1" - the frequency converter has a start signal or the output frequency is greater than 0 Hz.

Bit 12, frequency converter OK/stopped, auto start

Bit 12="0" - there is no temporary over temperature on the frequency converter.

Bit 12="1" - the frequency converter has stopped because of over temperature, but the unit has not tripped and resumes operation once the over temperature stops.

Bit 13, Voltage OK/limit exceeded

Bit 13="0" - there are no voltage warnings. Bit 13="1" - the DC voltage in the frequency converters intermediate circuit is too low or too high.

Bit 14, Torque OK/limit exceeded

Bit 14="0" - the motor current is lower than the torque limit selected in *parameter 4-16 Torque Limit Motor Mode* or *parameter 4-17 Torque Limit Generator Mode*.

Bit 14="1" - the torque limits in *parameter 4-16 Torque Limit Motor Mode* and *parameter 4-17 Torque Limit Generator Mode* have been exceeded.

Bit 15, Timer OK/limit exceeded

Bit 15="0" - the timers for motor thermal protection and VLT thermal protection, respectively, have not exceeded 100%.

Bit 15="1" - one of the timers has exceeded 100%.

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6 Communication Profile Area

6.1 Description - Communication Profile Area

This chapter describes the general layout of the supported POWERLINK communication area. The process data objects are defined in this area.

6.2 1000-1FFF Communication Object Area

Index [hex]	Object (symbolic name)	Name	Туре	Read/write
1000	VAR	Device type	UNSIGNED32	ro
1001	VAR	Error register	UNSIGNED8	ro
1006	VAR	Communication cycle period	UNSIGNED32	rw
1008	VAR	Manufacturer device name	VISIBLE_STRING	ro
1009	VAR	Manufacturer hardware version	VISIBLE_STRING	ro
100A	VAR	Manufacturer software version	VISIBLE_STRING	ro
1010	ARRAY	Store parameters	UNSIGNED32	rw
1011	ARRAY	Restore default parameters	UNSIGNED32	rw
0x1C14	VAR	DLL_CNLossOfSocTolerance_U32	UNSIGNED32	rw
0x1E40	RECORD	NWL_IpAddrTable_1_REC	NWL_IpAddrTable_TYPE	ro/rw
0x1E4A	RECORD	RECORD NWL_IpGroup_REC	NWL_IpGroup_TYPE	ro/rw
				10/1W
1018	RECORD	Identity object	ldentity (23h)	ro
1020	RECORD	CFM_VerifyConfiguration_REC	CFM_VerifyConfiguration_TYPE	ro
1030	RECORD	NMT_InterfaceGroup_0h_REC	NMT_InterfaceGroup_0h_TYPE	ro
1031	RECORD	NMT_InterfaceGroup_1h_REC	NMT_InterfaceGroup_0h_TYPE	ro
1300	VAR	SDO_SequLayerTimeout_U32	UNSIGNED32	rw
1400	RECORD	PDO_RxCommParam_16h_REC	UNSIGNED8	ro
1600	ARRAY	PDO_RxMappParam_00h_AU64	UNSIGNED64	rw
1800	ARRAY	PDO_TxCommParam_16h_REC	UNSIGNED8	ro
1A00	ARRAY	PDO_TxMappParam_00h_AU64	UNSIGNED64	rw
1C0A	RECORD	DLL_CNCollision_REC	UNSIGNED32	rw
1C0B	RECORD	DLL_CNLossSoC_REC	UNSIGNED32	rw
1C0F	RECORD	DLL_CNCRCError_REC	UNSIGNED32	rw
1C14	VAR	DLL_CNLossOfSocTolerance_U32	UNSIGNED32	rw
1E40	RECORD	NWL_IPAddrTable_1_REC	NWL_IpAddrTable_TYPE	ro/rw
1E4A	RECORD	RECORD NWL_IpGroup_REC	NWL_IpGroup_TYPE	ro/rw
1F81	VAR	NMT_NodeAssignment_AU32		
1F82	VAR	NMT_FeatureFlags_U32	UNSIGNED32	ro
1F83	VAR	NMT_EPLVersion_U8	UNSIGNED8	ro
1F8C	VAR	NMT_CurrNMTState_U8	UNSIGNED8	ro
1F93	RECORD	NMT_EPLNodeID_REC	UNSIGNED8	ro
1F98	VAR	NMT_CycleTiming_REC	UNSIGNED32	ro
1F99	VAR	NMT_CNBasicEthernetTimeout_U32	UNSIGNED32	rw
1F9A	VAR	NMT_HostName_VSTR	VISIBLE_STRING32	rw
1F9B	VAR	NMT_MultiplCycleAssign_AU8	UNSIGNED8	rw
1F9E	VAR	NMT_ResetCmd_U8	UNSIGNED8	rw

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Index [hex]	Object (symbolic name)	Name	Туре	Read/write
2000-5FFF		Vendor specific area	See chapter 6.3 2000-5FFF Danfoss Specific Object	
			Area	
603F	VAR	Error Code	UNSIGNED16	ro
6040	VAR	Control word	UNSIGNED16	rw
6041	VAR	Status word	UNSIGNED16	ro
6042	VAR	vl_target_velocity	SIGNED16	rw
6043	VAR	vl_velocity_demand	SIGNED16	ro
6044	VAR	vl_velocity_actual_value	SIGNED16	ro
6046	ARRAY	vl_velocity_min_max_amount	UNSIGNED32	ro
6048	RECORD	vl_velocity_acceleration	See description	ro
6049	RECORD	vl_velocity_deceleration	See description	ro
6060	VAR	Modes of operation	SIGNED8	rw
6061	VAR	Modes of operation display	SIGNED8	ro
6502	VAR	Supported drive mode	UNSIGNED32	ro
6504	VAR	Drive manufacture	VISIBLE_STRING	ro

Table 6.1 Communication Object Overview

6.2.1 1000h Device Type

This object describes the type of device and its functionality. It is composed of a 16-bit field describing the device profile used, and a second 16-bit field providing additional information about optional functionality of the device.

Additional information			Device profile number		
Mode	bits	Type bits		Bits	
31	24	23	16	15	0
0		1 (frequency converters)		0=FC Profile	
				402=DS 402	

Table 6.2 1000h Device Type

6.2.2 1001h Error Register

This object is the error register of the device. Only bit 0 and bit 5 is supported. The two bits are active (high) if an alarm is active in alarm word 1 or alarm word 2.

Bit	Meaning	
0	Generic error	
1	Current	
2	Voltage	
3	Temperature	
4	Communications error (overrun, error state)	
5	Device profile specific	
6	Reserved (always zero)	
7	Manufacturer specific	

Table 6.3 1001h Error Register

6.2.3 1006h Communication Cycle Period

This object defines the communication cycle time interval in μ s. This object is reset to its default value by object 1011h. This object is set from the MN.

6.2.4 1008h Manufacturer Device Name

This object contains the device name as defined in *parameter 15-40 FC Type*.

Index	Meaning	
1008h	for example, FC 302	

Table 6.4 1008h Manufacturer Device Name

6.2.5 1009h Manufacturer Hardware Version

This object contains the hardware version for the POWERLINK interface.

6.2.6 100Ah Manufacturer Software Version

This object contains the Danfoss software version as displayed in *parameter 15-49 SW ID Control Card*.

6.2.7 1010h Store Parameters

In the standard configuration, the contents of parameters written via fieldbus are stored in volatile memory. The changed data will be lost after a power cycle. This index permits non-volatile storage of all frequency converter parameters which have been changed. Writing to one of the indexes will set *parameter 12-28 Store Data Values*.

Operating Instructions

Index, sub-index	Meaning
1010h 0	Number sub-index supported
1010h 1	Save option parameters
1010h 2	All
1010h 3	Not supported

Table 6.5 1010h Store Parameters

Writing the value "save" (0x65766173) to sub-index 1, stores all frequency converter parameters of all set-ups into non-volatile memory, all other values are rejected.

6.2.8 1011h Restore Default Parameters

To restore factory default settings:

- 1. Write the value "load" to sub-index 1.
- 2. Initiate the next power cycle manually.

The default value is restored.

Index, sub-index	Meaning
1011h 0	Number of sub-index supported
1011h 1	Restore all default parameters and restart

Table 6.6 1011h Restore Default Parameters

Writing the value "load" (0x64616F6C) restores all frequency converter parameters of all set-ups to factory values, except the communications parameters. All other values are rejected, and abort code 0x08000020 is returned. The frequency converter has to be power cycled before the changes get active and the motor must be in the state coast or stopped.

6.2.9 1018h Identity Object

This object contains general information about the device.

The vendor ID (sub-index 1h) contains a unique value allocated to each manufacturer.

The manufacturer-specific product code (sub-index 2h) identifies a specific device version.

The manufacturer-specific revision number (sub-index 3h) consists of a major revision number and a minor revision number.

Index, sub-index	Meaning
1018h 0	Number of entries
1018h 1	Vendor ID
1018h 2	Product code
1018h 3	Revision number (major revision number and minor revision number)
1018h 4	Serial number

Table 6.7 1018h Identity Object

6.2.10 1020h CFM_VerifyConfiguration_REC

This object contains the devices local configuration date and time. The object values are set by managing node or configuration tool.

Index, sub-	Meaning	
index		
1020h 0	Number of entries	
1020h 1	ConfDate_U32, Days since January 1, 1984	
1020h 2	ConfTime_U32, milliseconds after midnight	
1020h 3	Confld_U32, assigned by the configuration tool	
1020h 4	VerifyConfInvalid_BOOL, Value False indicates	
	that configuration was not modified since last	
	storage of Confld_U32	

Table 6.8 1020h CFM_VerifyConfiguration_REC

6.2.11 1030h NMT_InterfaceGroup_0h_REC

This object is used to configure and retrieve parameters of the network interfaces (physical or virtual) via SDO.

Index, sub-index	Meaning
1030h 0	Number of entries
1030h 1	InterfaceIndex_U16
1030h 2	InterfaceDescription_VSTR t
1030h 3	InterfaceType_U8
1030h 4	InterfaceMtu_U16
1030h 5	InterfacePhysAddress_OSTR
1030h 6	InterfaceName_VSTR
1030h 7	InterfaceOperStatus_U8
1030h 8	InterfaceAdminState_U8
1030h 9	Valid_BOOL

Table 6.9 1030h NMT_InterfaceGroup_0h_REC

6.2.12 1031h NMT_InterfaceGroup_1h_REC

This object is used to configure and retrieve parameters of the network interfaces (physical or virtual) via SDO.

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Index, sub-index	Meaning
1031h 0	Number of entries
1031h 1	InterfaceIndex_U16
1031h 2	InterfaceDescription_VSTR t
1031h 3	InterfaceType_U8
1031h 4	InterfaceMtu_U16
1031h 5	InterfacePhysAddress_OSTR
1031h 6	InterfaceName_VSTR
1031h 7	InterfaceOperStatus_U8
1031h 8	InterfaceAdminState_U8
1031h 9	Valid_BOOL

Table 6.10 1031h NMT_InterfaceGroup_1h_REC

6.2.13 1300h SDO_SequLayerTimeout_U32

This object provides a timeout value in [ms] for the connection abort recognition of the SDO sequence Layer. Default value is 30000. This object is linked to *parameter 12-62 SDO Timeout*.

6.2.14 1400h PDO_RxCommParam_16h_REC

This object describes attributes of PDO Communication for RPDO. Object indices describe the Node ID and PDO Mapping Version. Mapping Version must be set by configuration tool depending on PDO mapping.

High Nibble	Low Nibble
Main version	Sub version

Table 6.11 Mapping Version Structure

PDOs differing main version will be rejected. PDOs differing sub version is accepted. Mapping version 0 indicates that no mapping version is available.

Index, sub-index	Meaning
1400h 0	Number of sub-index supported
1400h 1	NodeID_U8
1400h 2	MappingVersion_U8

Table 6.12 1400h PDO_RxCommParam_16h_REC

6.2.15 1600h PDO_RxCommParam_00h _AU64

This objects indices describe mapping of object contained in RPDO payload to object dictionary entries.

Index, sub- index	Meaning
1600h 0	Number of sub-index supported
1600h 1	parameter 12-21 Process Data Config Write, [0] Index
1600h 2	parameter 12-21 Process Data Config Write, [1] Index
1600h 3	parameter 12-21 Process Data Config Write, [2] Index
1600h 4	parameter 12-21 Process Data Config Write, [3] Index
1600h 5	parameter 12-21 Process Data Config Write, [4] Index
1600h 6	parameter 12-21 Process Data Config Write, [5] Index
1600h 7	parameter 12-21 Process Data Config Write, [6] Index
1600h 8	parameter 12-21 Process Data Config Write, [7] Index
1600h 9	parameter 12-21 Process Data Config Write, [8] Index
1600h 10	parameter 12-21 Process Data Config Write, [9] Index

Table 6.13 1600h PDO_RxCommParam_00h _AU64

For every PDO channel up to ten objects can be mapped.

The offset related to the start address of the PDO payload and the length of data is provided for every mapped object.

Octet offset	Name	Description
0-1	Index	Index of the object to be mapped
2	Sub-index	Sub-index of the object to be mapped
3	reserved	
4-5	Offset	Offset related to start of PDO payload (Bit count)
6-7	Length	Length of the mapped object (Bit count)

Table 6.14 Description of Octet Offset

	MSB			
Bits	63 48	47 32	31 24	23 16
Name	Length	Offset	Reserved	Sub-index
Encoding	UNSIGNED16	UNSIGNED16	-	UNSIGNED8
	LSB			
Bits	15 0			
Name	Index			
Encoding	UNSIGNED16			

Table 6.15 Internal Mapping of PDO Mapping Entry



6.2.16 1800h PDO_TxCommParam_16h_REC

This object describes attributes of PDO Communication for RPDO. Object indices describe the Node ID and PDO Mapping Version. Mapping Version must be set by configuration tool depending on PDO mapping. Access is read/ write. Mapping version 0 indicates that no mapping version is available.

Index, sub-index	Meaning
1400h 0	Number of sub-index supported
1400h 1	NodeID_U8
1400h 2	MappingVersion_U8

Table 6.16 1800h PDO_TxCommParam_16h_REC

6.2.17 1A00h PDO_TxMappParam_00h_AU64

This objects indices describe mapping of object contained in RPDO payload to object dictionary entries.

Index, sub- index	Meaning
1A00h0	Number of sub-index supported
1A00h1	parameter 12-22EN-22 Process Data Config Read, [0] Index
1A00h2	parameter 12-22EN-22 Process Data Config Read, [1] Index
1A00h3	parameter 12-22EN-22 Process Data Config Read, [2] Index
1A00h4	parameter 12-22EN-22 Process Data Config Read, [3] Index
1A00h5	parameter 12-22EN-22 Process Data Config Read, [4] Index
1A00h6	parameter 12-22EN-22 Process Data Config Read, [5] Index
1A00h7	parameter 12-22EN-22 Process Data Config Read, [6] Index
1A00h8	parameter 12-22EN-22 Process Data Config Read, [7] Index
1A00h9	parameter 12-22EN-22 Process Data Config Read, [8] Index
1A00h10	parameter 12-22EN-22 Process Data Config Read, [9] Index

Table 6.17 1A00h PDO_TxMappParam_00h_AU64

Map up to ten objects for every PDO channel.

The offset related to the start address of the PDO payload and the length of data is provided for every mapped object.

Octet	Name	Description
offset		
0-1	Index	Index of the object to be mapped
2	Sub-index	Sub-index of the object to be mapped
3	Reserved	
4-5	Offset	Offset related to start of PDO payload (Bit
		count)
6-7	Length	Length of the mapped object (Bit count)

Table 6.18 Description of Octet Offset

	MSB			
Bits	63 48	47 32	31 24	23 16
Name	Length	Offset	Reserved	Sub-index
Encoding	UNSIGNED16	UNSIGNED16	-	UNSIGNED8
	LSB			
	15 0			
	Index			
	UNSIGNED16			

Table 6.19 Internal Mapping of PDO Mapping Entry

6.2.18 1C0Ah DLL_CNCollision_REC

This object contains information regarding collisions on the network.

Index, sub-index	Meaning	
1C0Ah 0	Number of entries	
1C0Ah 1	CumulativeCnt_U32	
1C0Ah 2	parameter 12-68 Cumulative Counters	
1C0Ah 3	parameter 12-68 Cumulative Counters	

Table 6.20 1C0Ah DLL_CNCollision_REC

6.2.19 1C0Bh DLL_CNLossSoC_REC

This object contains information regarding loss of SoC on the network.

Index, sub-index	Meaning
1C0Bh 0	Number of entries
1C0Bh 1	CumulativeCnt_U32, [2]
	parameter 12-68 Cumulative Counters
1C0Bh 2	ThresholdCnt_U32, [2]
	parameter 12-67 Threshold Counters
1C0Bh 3	Threshold_U32, [2] parameter 12-66 Threshold

Table 6.21 1C0Bh DLL_CNLossSoC_REC

6.2.20 1C0Fh DLL_CNCRCError_REC

This object contains information regarding "CRC Errors" on the network. CumulativeCnt_U32 increases with one each time a CRC error occurs. CumulativeCnt_U32 decrements

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with one for each cycle without an error. When CumulativeCnt_U32 is equal or larger than ThresholdCnt_U32, the drive issues Warning 34 in the display.

Index, sub-index	Meaning	
1C0Fh 0	Number of entries	
1C0Fh 1	CumulativeCnt_U32, [5]	
	parameter 12-68 Cumulative Counters	
1C0Fh 2	ThresholdCnt_U32, [5]	
	parameter 12-67 Threshold Counters	
1C0Fh 3	Threshold_U32, [5] parameter 12-66 Threshold	

Table 6.22 1C0Fh DLL_CNCRCError_REC

6.2.21 1F82 NMT_FeatureFlags_U32

Feature flags indicate communication profile specific properties of the frequency converter.

Bit	Name	Remark
0	Isochronous	
1	SDO by UDP/IP	Not supported
2	SDO by ASnd	
3	SDO by PDO	Not supported
4	NMT Info Services	Not supported
5	Extended NMT State Commands	Not supported
6	Dynamic PDO Mapping	
7	NMT Service by UDP/IP	Not supported
8	Configuration Manager	Not supported
9	Multiplexed Access	
10	NodeID setup by SW	Not supported
11	MN Basic Ethernet Mode	Not supported
12	Routing Type 1 Support	Not supported
13	Routing Type 2 Support	Not supported
14	SDO Read/Write All by Index	Not supported
15	SDO Read/Write Multiple Parameter by	Not supported
	Index	
1631	Reserved	

Table 6.23 Bit Description

6.2.22 1F83h NMT_ EPLVersion_U8

The object holds the POWERLINK communication profile version that is implemented.

High nibble	Low nibble
POWERLINK Main Version	POWERLINK Sub Version

Table 6.24 Implemented Communication Profile

6.2.23 1F8C NMT_CurrNMTState_U8

This object holds the node's current NMT state.

Binary value	NMT state
0001 1100	NMT_CS_NOT_ACTIVE (Default)
0001 1101	NMT_CS_PRE_OPERATIONAL_1
0101 1101	NMT_CS_PRE_OPERATIONAL_2
0110 1101	NMT_CS_READY_TO_OPERATE
1111 1101	NMT_CS_OPERATIONAL
0100 1101	NMT_CS_STOPPED
0001 1110	NMT_CS_BASIC_ETHERNET

Table 6.25 NMS State

6.2.24 1F93h NMT_EPLNodeID_REC

This object contains the POWERLINK NodeID.

Index, sub-index	Meaning
1F93h 0	Number of entries
1F93h 1	NodeID_U8, [5] parameter 12-68 Cumulative
	Counters
1F93h 2	NodeIDByHW_BOOL, DIP switch reading

Table 6.26 1F93h NMT_EPLNodeID_REC

6.2.25 1F98h NMT_CycleTiming_REC

This object contains node-specific timing parameters which influence the POWERLINK cycle timing.

Index, sub-	Meaning	Remark	
index			
1F98h 0	Number of entries		
1F98h 1	IsochrTxMax-	Number of transmit bits,	
	Payload_U16	320=10 signals, 32 bit each	
1F98h 2	IsochrRxMax-	Number of receive bits,	
	Payload_U16	320=10 signals, 32 bit each	
1F98h 3	PResMaxLatency_U32	Latency, fixed to 10 (nS)	
1F98h 4	PReqActPayloa-	Set by MN during configu-	
	dLimit_U16	ration	
1F98h 5	PResActPayloa-	Set by MN during configu-	
	dLimit_U16	ration	
1F98h 6	ASndMaxLatency_U32	Latency, fixed to 10 (nS)	
1F98h 7	MultiplCycleCnt_U8	Set by MN during configu-	
		ration	
1F98h 8	AsyncMTU_U16	Configurable in the range	
		of 300 to 1500	

Table 6.27 Node-specific Timing Parameters

6.2.26 1F99h NMT_CNBasicEthernetTimeout_U32

This object specifies the time in μ s for which the option must wait for SoC before switching to basic Ethernet mode.

Operating Instructions

Index,	Meaning	Remark
sub-		
index		
1F99	NMT_CNBasicEthernet-	Time in microseconds before
	Timeout_U32	switching to basic Ethernet
		mode. Default 5000000 (5 s)
		Mapped to
		parameter 12-63 Basic Ethernet
		Timeout

Table 6.28 Basic Ethernet Timeout

6.2.27 1F9Ah NMT_HostName_VSTR_U32

Index, sub- index	Meaning	Meaning
1F9A	NMT_HostName_VSTR	Mapped to
		parameter 12-08 Host Name

Table 6.29 DNS Host Name

6.2.28 1F9E NMT_ResetCmd_U8

This object is used to reset the frequency converter, communication or configuration.

Hex value	NMT service
FFh	NMTInvalidService
2Bh	NMTSwReset
28h	NMTResetNode
2Ah	NMTResetConfiguration
29h	NMTResetCommunication

Table 6.30 Reset Command

6.3 2000-5FFF Danfoss Specific Object Area

6.3.1 2000h–5FFFh Vendor Specific Object Area

The area 2000h to 5FFFh holds the indexes for accessing the Danfoss frequency converter parameters. All parameters in the frequency converter are linked to indexes in this area. The first index available is index 2001h. This index is linked to the frequency converters *parameter 0-01 Language*. The rest of the POWERLINK index follows the same rule, where the frequency converters parameter number plus 2000h gives the POWERLINK index. For example, reading the running hours in *parameter 15-01 Running Hours*, is calculated by 2000h + parameter number in hex number=2000h+5DD=index 25DDh. The XDD file only contains a subset of the frequency converters parameters. This subset has the indexes that are required for setting up the PDO communication. All parameters can be read or written via SDO communication from the PLC. *Table 6.31* shows a few indexes and their mapping.

Index	Parameter
2001h	parameter 0-01 Language
2002h	parameter 0-02 Motor Speed Unit
2003h	parameter 0-03 Regional Settings
2078h	parameter 1-20 Motor Power [kW]
2079h	parameter 1-22 Motor Voltage
24B1h	parameter 12-01 IP Address
24B2h	parameter 12-02 Subnet Mask

Table 6.31 2000h-5FFFh Vendor Specific Object Area

6.4 6000-Device profile Object Area

6.4.1 6000h–9FFFh Standardised Device Profile Area

The area 6000h to 9FFFh holds the indexes specified by the IEC for various device profiles. The Danfoss POWERLINK does support three profiles, FC Profile, MCO, and the DS 402 profile, velocity mode. The profile is selected via *parameter 8-10 Control Word Profile*, Control Word Profile, or via Index 6060h Modes of operation. The profile area has up to 13 indexes depending on the selection made in *parameter 8-10 Control Word Profile*.

Table 6.32 shows the support of indexes, depending on setting of *parameter 8-10 Control Word Profile* (Index 6060h)

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Communication Profile Area

Index	Name	parameter 8-10 Control Word Profile =FC Profile	parameter 8-10 Control Word Profile= MCO	parameter 8-10 Control Word Profile= DS 402
603Fh	Error code	-	-	\checkmark
6040h	Control word	-	-	
6041h	Status word	-	-	
6042h	VI_target_velocity	-	-	
6043h	VI_velocity_demand	-	-	\checkmark
6044h	VI_velocity_actual_value	-	-	√
6046h	VI_velocity_min_max_amount	-	-	√
6048h	VI_velocity_acceleration	-	-	
6049h	VI_velocity_deceleration	-	-	\checkmark
6060h	Modes of operation	\checkmark	√	\checkmark
6061h	Modes of operation display	\checkmark	\checkmark	\checkmark
6502h	Supported frequency converter mode	\checkmark	√	\checkmark
6504h	Frequency converter manufacture	\checkmark	\checkmark	\checkmark

Table 6.32 6000h-9FFFh Standardised Device Profile Area

6.4.2 603Fh Error Code

Error signaling mechanism is used to signal alarms and events generated on the frequency converter to the MN. The error code consist of 8 byte of data, where: Byte 0 (zero) is a copy of object 1001h. Byte 1 & 2, not used. Byte 3 contains: Bit 0=1, Alarmword 1 has an active Alarm (*parameter 16-90 Alarm Word*). Bit 1=1, Alarmword 2 has an active Alarm (Future ext. *parameter 16-91 Alarm Word 2*). Bit 2=0, Reserved. Bit 3=1, Warningword 1 has an active Warning (*parameter 16-92 Warning Word*). Bit 4=1, Warningword 2 has an active Warning (Future ext. *parameter 16-93 Warning Word 2*). Bit 5-7=0, Reserved. Byte 4 and 5, Profile specific. Byte 6 and 7, reserved.

6.4.3 6040h Control Word

This object contains the control word in accordance with DS 402. The control word consists of 16 bit, these 16 bit are used for controlling the frequency converter (for example, start, stop, reset). The control word is described in *chapter 5.4 DS 402 Control Profile*.

6.4.4 6041h Status Word

This object contains the Status word in accordance to DS 402. The status word consists of 16 bit. The 16 bits show the state and status of the frequency converter (for example, running, ramping, on speed). The Status word is described in *chapter 5.4 DS 402 Control Profile*.

6.4.5 6042h vl_target_velocity

The vl_target_velocity is the required velocity of the system. The velocity is in RPM.

6.4.6 6043h vl_velocity_demand

The vl_velocity_demand is the velocity of the system after the ramp controller. The velocity is in RPM.

6.4.7 6044h vl_actual_velocity_value

The vl_actual_velocity_value is the velocity at the motor shaft. The velocity is in RPM, and is obtained from *parameter 16-17 Speed [RPM]*. The velocity is in RPM.

6.4.8 6046h vl_velocity_min_max_amount

The vl_ velocity_min_max_amount is the minimum and maximum RPM at the motor shaft. The two values are obtained from *parameter 3-02 Minimum Reference* and *parameter 3-03 Maximum Reference*. The readout values in *parameter 3-02 Minimum Reference* and *parameter 3-03 Maximum Reference* will be truncated.

Index, sub-index	Meaning	
1046h 0	Number of sub-index supported	
1046h 1	vl_velocity_min_max_amount	
1046h 2	vl_velocity_min_amount	

Table 6.33 Minimum/Maximum RPM at Motor Shaft

6.4.9 6048h vl_velocity_acceleration

The vl_ velocity_acceleration index specifies the slope of the acceleration ramp. It is generated as the quotient of the delta_speed and delta_time. The Delta time is stored in *parameter 3-41 Ramp 1 Ramp Up Time*, and the Delta speed is store locally in the options non volatile memory. After a power down the delta speed will be generated from the frequency converter *parameter 1-25 Motor Nominal Speed*.

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This can give a different readout from the frequency converter, but the slope value is maintained.

Index, sub-index	Meaning
1048h 0	Number of sub-index supported
1048h 1	Delta speed
1048h 2	Delta time

Table 6.34 6048h vl_velocity_acceleration

6.4.10 6049h vl_velocity_deceleration

The vl_ velocity_deceleration index specifies the slope of the deceleration ramp. It is generated as the quotient of the delta_speed and delta_time. The Delta time is stored in *parameter 3-42 Ramp 1 Ramp Down Time*, and the Delta speed is stored locally in the options non volatile memory. After a power down, the delta speed is generated from the frequency converter *parameter 1-25 Motor Nominal Speed*. This can give a different readout from the frequency converter, but the slope value is maintained.

Index, sub-index	Meaning
1049h 0	Number of sub-index supported
1049h 1	Delta speed
1049h 2	Delta time

Table 6.35 6049h vl_velocity_deceleration

6.4.11 6060h Modes of Operation

This index is used for selection the Danfoss FC profile, MCO profile, or the DS 402 profile. The index links directly to *parameter 8-10 Control Word Profile*. If this value is changed while in operation, the option enters the "Error PREOP" state.

Index, 6060h	Meaning
value	
-2	MCO profile (only possible if MCO305 is mounted)
-1	FC Profile
2	DS 402 profile

Table 6.36 6060h Modes of Operation

6.4.12 6061h Modes of Operation Display

This index is used to display which mode the frequency converter is in. The mode can be changed via index 6060. The values are the same as used for index 6060.

Index, 6061h	Meaning
value	
-2	MCO profile (only possible if MCO305 is
	mounted)
-1	FC Profile
2	DS 402 profile

Table 6.37 6061h Modes of Operation Display

6.4.13 6502h Supported Frequency Converter Mode

This index informs the user of which operating mode the frequency converter is capable of. Bit 1 is set, indicating that the frequency converter can run DS 402 velocity mode, bit 16 FC profile and 17 indicates MCO profile.

6.4.14 6504h Frequency Converter Manufacturer

This index does readout the name of the frequency converter manufacturer. Data is coded as a string.

Index, sub-index	Meaning	
6504Ch 0	Manufacturer "DANFOSS DRIVES"	

Table 6.38 6504h Drive Manufacturer (read only)



7 Parameters

7.1 Parameter Group 8-** Communication and Option

8-(8-01 Control Site		
Option:		Function:	
		The setting in this parameter overrides the settings in <i>parameter 8-50 Coasting Select</i> to <i>parameter 8-56 Preset Reference Select</i> .	
[0]	Digital and ctrl.word	Control by using both digital input and control word.	
[1]	Digital only	Control by using digital inputs only.	
[2]	Controlword only	Control by using control word only.	

8-02 Control Word Source		ord Source
Opt	tion:	Function:
		NOTICE
		This parameter cannot be adjusted while the motor runs.
		Select the source of the control word: 1 of 2 serial interfaces or 4 installed options. During initial power-up, the frequency converter automatically sets this parameter to [3] Option A, if it detects a valid fieldbus option installed in slot A. When the option is removed, the frequency converter detects a configuration change, sets parameter 8-02 Control Word Source to default setting RS485, and trips. If an option is installed after initial power-up, the setting of parameter 8-02 Control Word Source does not change, but the frequency converter trips and shows: Alarm 67, Option Changed. When retrofitting a bus option into a frequency converter that did not have a bus option installed earlier, change the control to bus-based. This change is required for safety reasons to avoid an unintended change.
[0]	None	
[1]	FC RS485	
[2]	FC USB	
[3]	Option A	
[4]	Option B	
[5]	Option C0	
[6]	Option C1	
[30]	External Can	

8-03 Control Word Timeout Time		
Range:		Function:
1 s*	[0.1 - 18000 s]	Enter the maximum time expected to pass between the reception of 2 consecutive telegrams. If this time is exceeded, it indicates that the telegram communication has stopped. The function selected in <i>parameter 8-04 Control</i> <i>Word Timeout Function</i> is then carried out. A valid control word triggers the timeout counter.

8-04 Control Word Timeout Function

Select the timeout function. The timeout function activates when the control word fails to be updated within the time period specified in *parameter 8-03 Control Word Timeout Time*.

Option:		Function:
[0]	Off	Resumes control via fieldbus (fieldbus or standard) using the most recent control word.
[1]	Freeze output	Freezes output frequency until communi- cation resumes.
[2]	Stop	Stops with auto restart when communi- cation resumes.
[3]	Jogging	Runs the motor at jog frequency until communication resumes.
[4]	Max. speed	Runs the motor at maximum frequency until communication resumes.
[5]	Stop and trip	Stops the motor, then resets the frequency converter to restart:
		• Via the fieldbus.
		• Via [Reset].
		• Via a digital input.
[7]	Select setup 1	Changes the set-up after reestablishment of communication following a control word timeout. If communication resumes after a timeout, parameter 8-05 End-of-Timeout Function defines whether to resume the set- up used before the timeout, or to retain the set-up endorsed by the timeout function. INOTICE To change the set-up after a timeout, configure as follows: Set parameter 0-10 Active Set-up to [9] Multi set-up and select the relevant link in parameter 0-12 This Set-up Linked to.
[8]	Select setup 2	See [7] Select set-up 1.



8-04 Control Word Timeout Function

Select the timeout function. The timeout function activates when the control word fails to be updated within the time period specified in parameter 8-03 Control Word Timeout Time.

Option:		Function:
[9]	Select setup	See [7] Select set-up 1.
	3	
[10]	Select setup	See [7] Select set-up 1.
	4	
[26]	Trip	

8-05 End-of-Timeout Function

Option:		Function:
		 Select the action after receiving a valid control word following a timeout. This parameter is active only when parameter 8-04 Control Timeout Function is set to: [7] Set-up 1. [8] Set-up 2. [9] Set-up 3. [10] Set-up 4.
[0]	Hold set- up	Retains the set-up selected in parameter 8-04 Control Timeout Function and displays a warning until parameter 8-06 Reset Control Timeout toggles. Then the frequency converter resumes its original set-up.
[1]	Resume set-up	Resumes the set-up active before the timeout.

8-06 Reset Control Word Timeout

This parameter is active only when [0] Hold set-up has been selected in parameter 8-05 End-of-Timeout Function.

Option:		Function:
[0]	Do not reset	Retains the set-up specified in
		parameter 8-04 Control Word Timeout Function,
		following a control word timeout.
[1]	Do reset	Returns the frequency converter to the original
		set-up following a control word timeout. The
		frequency converter performs the reset and
		then immediately reverts to the [0] Do not reset
		setting.

8-07 Diagnosis Trigger

This parameter enables and controls the frequency converter diagnosis/Emergency function. In Profibus, it expands the diagnosis data to 24 byte. In EtherCAT, it activates the transmission of the Emergency object. In POWERLINK, it enables the Error signaling. The Emergency/Error signaling object consists of 8 byte of data, where byte 3 indicates an active alarm or warning. Bit 0=1 Alarmword 1 has an active Alarm. Bit 1=1 Alarmword 2 has an active Alarm. Bit 2, reserved, Bit 3=1 Warningword 1 has an active warning. Bit 4=1 Warningword 2 has an active warning. Bits 5-7, reserved.

Option:		Function:
[0]	Disable	
[1]	Trigger on alarms	
[2]	Trigger alarm/warn.	

NOTICE

The following is only valid for Profibus and EtherCAT.

- [0] Disable: Do not send extended diagnosis/ emergency data even if they appear in the frequency converter.
- [1] Trigger on alarms: Send extended diagnosis/ emergency data when one or more alarms appear in alarm parameter 16-90 Alarm Word or parameter 9-53 Profibus Warning Word.
- [2] Trigger alarms/warn.: Send extended diagnosis/ emergency data if one or more alarms or warnings appear in alarm parameter 16-90 Alarm Word, parameter 9-53 Profibus Warning Word, or warning parameter 16-92 Warning Word.

Enabling diagnosis can cause increased bus traffic. Not all fieldbus types support Diagnosis functions.

8-08 Readout Filtering

If the speed feedback value readouts on fieldbus are fluctuating, this function is used. Select filtered, if the function is required. A power cycle is required for changes to take effect.

Option:		Function:
[0]	Motor Data	Normal fieldbus readouts.
	Std-Filt.	
[1]	Motor Data LP-	Filtered fieldbus readouts of the
	Filter	following parameters:
		Parameter 16-10 Power [kW].
		Parameter 16-11 Power [hp].
		Parameter 16-12 Motor Voltage.
		Parameter 16-14 Motor current.
		Parameter 16-16 Torque [Nm].
		Parameter 16-17 Speed [RPM].
		Parameter 16-22 Torque [%].
		Parameter 16-25 Torque [Nm] High.
		1

7

8-10 Control Word Profile

Select the interpretation of the control and status words corresponding to the installed fieldbus. Only the selections valid for the fieldbus installed in slot A are visible in the LCP display. If the parameter is changed while the frequency converter is in operation mode, the frequency converter goes to error state, and the control of the frequency converter is lost. This parameter should not be changed while the motor is running, since it can lead to a unknown state of the profile.

Option:		Function:
[0] *	FC Profile	
[7]	CANopen DSP 402	

8-13 Configurable Status Word STW

8-13 Configurable Status Word STW			
Opt	ion:	Function:	
		This parameter enables configuration of bits	
		12–15 in the status word.	
[0]	No function		
[1] *	Profile Default	Function corresponds to the profile default	
		selected in parameter 8-10 Control Profile.	
[2]	Alarm 68 Only	Only set in case of an Alarm 68.	
[3]	Trip excl.	Set in case of a trip, except if Alarm 68	
	Alarm 68	executes the trip.	
[10]	T18 DI status.	The bit indicates the status of terminal 18.	
		0 indicates that the terminal is low.	
		1 indicates that the terminal is high.	
[11]	T19 DI status.	The bit indicates the status of terminal 19.	
		0 indicates that the terminal is low.	
		1 indicates that the terminal is high.	
[12]	T27 DI status.	The bit indicates the status of terminal 27.	
		0 indicates that the terminal is low.	
		1 indicates that the terminal is high.	
[13]	T29 DI status.	The bit indicates the status of terminal 29.	
		0 indicates that the terminal is low.	
		1 indicates that the terminal is high.	
[14]	T32 DI status.	The bit indicates the status of terminal 32.	
		0 indicates that the terminal is low.	
		1 indicates that the terminal is high.	
[15]	T33 DI status.	The bit indicates the status of terminal 33.	
		0 indicates that the terminal is low.	
		1 indicates that the terminal is high.	
[16]	T37 DI status	The bit indicates the status of terminal 37.	
		0 indicates terminal 37 is low (Safe Torque	
		stop).	
		1 indicates terminal 37 is high (normal).	
[21]	Thermal	The thermal warning turns on when the	
	warning	temperature exceeds the limit in the motor,	
		the frequency converter, the brake resistor,	
		or the thermistor.	
[30]	Brake fault	Output is logic 1 when the brake IGBT is	
	(IGBT)	short-circuited. Use this function to protect	
		the frequency converter if there is a fault	
		on the brake modules. Use the output/relay	
		to cut out the main voltage from the	
		frequency converter.	

8-13 Configurable Status Word STW

Opt	ion:	Function:
[40]	Out of ref.	
	range	
[60]	Comparator 0	See parameter group 13-1* Comparators. If
		comparator 0 is evaluated as TRUE, the
		output goes high. Otherwise, it is low.
[61]	Comparator 1	See parameter group 13-1* Comparators. If
		comparator 1 is evaluated as TRUE, the
		output goes high. Otherwise, it is low.
[62]	Comparator 2	See parameter group 13-1* Comparators. If
		comparator 2 is evaluated as TRUE, the
		output goes high. Otherwise, it is low.
[63]	Comparator 3	See parameter group 13-1* Comparators. If
		comparator 3 is evaluated as TRUE, the
		output goes high. Otherwise, it is low.
[64]	Comparator 4	See parameter group 13-1* Comparators. If
		comparator 4 is evaluated as TRUE, the
		output goes high. Otherwise, it is low.
[65]	Comparator 5	See parameter group 13-1* Comparators. If
		comparator 5 is evaluated as TRUE, the
		output goes high. Otherwise, it is low.
[70]	Logic Rule 0	See parameter group 13-4* Logic Rules. If
		logic rule 0 is evaluated as TRUE, the output
		goes high. Otherwise, it is low.
[71]	Logic Rule 1	See parameter group 13-4* Logic Rules. If
		logic rule 1 is evaluated as TRUE, the output
		goes high. Otherwise, it is low.
[72]	Logic Rule 2	See parameter group 13-4* Logic Rules. If
		logic rule 2 is evaluated as TRUE, the output
		goes high. Otherwise, it is low.
[73]	Logic Rule 3	See parameter group 13-4* Logic Rules. If
		logic rule 3 is evaluated as TRUE, the output
		goes high. Otherwise, it is low.
[74]	Logic Rule 4	See parameter group 13-4* Logic Rules. If
		logic rule 4 is evaluated as TRUE, the output
[76]	La via Dula 5	goes high. Otherwise, it is low.
[75]	Logic Rule 5	See parameter group 13-4* Logic Rules. If
		logic rule 5 is evaluated as TRUE, the output
[80]	SL Digital	goes high. Otherwise, it is low. See <i>parameter 13-52 SL Controller Action</i> . The
[80]	Output A	output goes high whenever the smart logic
	Sulput A	action [38] Set digital out A high is executed.
		The output goes low whenever the smart
		logic action [32] Set digital out A low is
		executed.
[81]	SL Digital	See parameter 13-52 SL Controller Action. The
	Output B	input goes high whenever the smart logic
		action [39] Set digital out B high is executed.
		The input goes low whenever the smart
		logic action [33] Set digital out B low is
		executed.
[82]	SL Digital	See parameter 13-52 SL Controller Action. The
	Output C	input goes high whenever the smart logic
		action [40] Set digital out C high is executed.
		The input goes low whenever the smart

Parameters

8-13 Configurable Status word STW		
Opt	ion:	Function:
		logic action [34] Set digital out C low is
		executed.
[83]	SL Digital	See parameter 13-52 SL Controller Action. The
	Output D	input goes high whenever the smart logic
		action [41] Set digital out D high is executed.
		The input goes low whenever the smart
		logic action [35] Set digital out D low is
		executed.
[84]	SL Digital	See parameter 13-52 SL Controller Action. The
	Output E	input goes high whenever the smart logic
		action [42] Set digital out E high is executed.
		The input goes low whenever the smart
		logic action [36] Set digital out E low is
		executed.
[85]	SL Digital	See parameter 13-52 SL Controller Action. The
	Output F	input goes high whenever the smart logic
		action [43] Set digital out F high is executed.
		The input goes low whenever the smart
		logic action [37] Set digital out F low is
		executed.

8-13 Configurable Status Word STW

8-14 Configurable Control Word CTW

Op	otion:	Function:
		This parameter is not valid in software versions below 4.93.
[0]	None	The information in this bit is ignored by the frequency converter.
[1]	Profile default	The functionality of the bit is depending on the selection in parameter 8-10 Control Word Profile.
[2]	CTW Valid, active low	If set to 1, the frequency converter ignores the remaining bits of the Control Word.
[3]	Safe Option Reset	This function is only available in bits 12-15 of the control word, if a a safe option is mounted in the frequency converter. The reset is executed on a 0->1 transition, and reset the safe option as set in parameter 42-24.
[4]	PID error inverse	When enabled, it inverts the resulting error from the process PID controller. Available only if <i>parameter 1-00 Configuration Mode</i> is set to [6] <i>Surface Winder,</i> [7] <i>Extended PID Speed OL</i> or [8] <i>Extended PID Speed CL</i> .
[5]	PID reset I part	When enabled, resets the I-part of the process PID controller. Equivalent to parameter 7-40 Process PID I-part Reset. Available only if parameter 1-00 Configuration Mode is set to [6] Surface Winder, [7] Extended PID Speed OL or [8] Extended PID Speed CL.
[6]	PID enable	When enabled, enables the extended process PID controller. Equivalent to <i>parameter 7-50 Process PID Extended PID</i> . Available only if

8-14 Configurable Control Word CTW

Option:	Function:
	parameter 1-00 Configuration Mode is set to [6]
	Surface Winder, [7] Extended PID Speed OL or [8]
	Extended PID Speed CL.

8-	8-50 Coasting Select		
Op	otion:	Function:	
		Select control of the coasting function via the terminals (digital input) and/or via the bus.	
[0]	Digital input	Activates start command via a digital input.	
[1]	Bus	Activates start command via the serial communi- cation port or fieldbus option.	
[2]	Logic AND	Activates start command via the fieldbus/serial communication port, and 1 extra digital input.	
[3]	Logic OR	Activates start command via the fieldbus/serial communication port, or via 1 of the digital inputs.	

8-51 Quick Stop Select

Select control of the quick stop function via the terminals (digital input) and/or via the bus.

Option:		Function:
[0]	Digital input	
[1]	Bus	
[2]	Logic AND	
[3]	Logic OR	

8-52 DC Brake Select **Option:** Function: Select control of the DC brake via the terminals (digital input) and/or via the fieldbus. NOTICE When parameter 1-10 Motor Construction is set to [1] PM non-salient SPM, only selection [0] Digital input is available. [0] Digital Activates start command via a digital input. input 8-53 Start Select **Option: Function:** Select control of the frequency converter start function via the terminals (digital input) and/or via the fieldbus. [0] Digital Activates a start command via a digital input. input Activates a start command via the serial [1] Bus communication port or fieldbus option.

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Parameters

8-	8-53 Start Select		
Op	otion:	Function:	
[2]	Logic AND	Activates a start command via the fieldbus/serial communication port, and additionally via 1 of the digital inputs.	
[3]	Logic OR	Activates a start command via the fieldbus/serial communication port, or via 1 of the digital inputs.	

8-	8-54 Reversing Select		
Op	otion:	Function:	
[0]	Digital input	Select control of the frequency converter reverse function via the terminals (digital input) and/or via the fieldbus.	
[1]	Bus	Activates the reverse command via the serial communication port, or fieldbus option.	
[2]	Logic AND	Activates the reverse command via the fieldbus/ serial communication port, and additionally via 1 of the digital inputs.	
[3]	Logic OR	Activates the reverse command via the fieldbus/ serial communication port, or via 1 of the digital inputs.	

8-55 Set-up Select Option: Function: Select control of the frequency converter set-up selection via the terminals (digital input) and/or via the fieldbus. [0] Digital Activates the set-up selection via a digital input. input [1] Bus Activates the set-up selection via the serial communication port, or fieldbus option. [2] Logic Activates the set-up selection via the fieldbus/ AND serial communication port, and via 1 of the digital inputs. [3] Logic OR Activates the set-up selection via the fieldbus/ serial communication port, or via 1 of the digital inputs.

8-90 Bus Jog 1 Speed Range: Function: 100 RPM* [0 - par. 4-13] Enter the jog speed. Activate this

RPM]	fixed jog speed via the serial port
	or fieldbus option.

8-91 Bus Jog 2 Speed			
Range:		Function:	
200 RPM*		Enter the jog speed. Activate this fixed jog speed via the serial port or fieldbus option.	

7.2 Parameter Group 12-** Ethernet

7.2.1 12-0* IP Settings

12-00 IP Address Assignment				
Ор	tion:	Function:		
		Selects the IP Address assignment method.		
[0]	MANUAL	IP-address can be set in <i>parameter 12-01 IP Address</i> IP Address.		
[1]	DHCP	IP-address is assigned via DHCP server.		
[2]	BOOTP	IP-address is assigned via BOOTP server.		
[10]	DCP	DCP Assigned via the DCP protocol.		
[20]	From node ID	Address is set from <i>parameter 12-60 Node ID</i> only.		
12-	01 IP Addres	55		
Rai	nge:	Function:		
0 *	[0 - 2147483647]	Configure the IP address of the option. Read-only if <i>parameter 12-00 IP Address</i> <i>Assignment</i> set to DHCP or BOOTP. In POWERLINK, the IP address follows the <i>parameter 12-60 Node ID</i> last byte and the first part is fixed to 192.168.100 (node ID).		
12-	02 Subnet M	lask		
Rai	nge:	Function:		
0 *	[0 - 4244635647]	Configure the IP subnet mask of the option. Read-only if <i>parameter 12-00 IP</i> <i>Address Assignment</i> set to DHCP or BOOTP. In POWERLINK it is fixed to 255.255.255.0.		
12-	03 Default G	iateway		
Rai	nge:	Function:		
0 *	[0 - 2147483647]	Configure the IP default gateway of the option. Read-only if <i>parameter 12-00 IP</i> <i>Address Assignment</i> set to DHCP or BOOTP. In a non-routed network this address is set to the IP address of the IO Device		
12-	08 Host Nan	ne		
Range: Function:				
0 *	[0 - 2147483	647] Logical (given) name of option.		

NOTICE

The display of the frequency converter only shows the first 19 characters, but the remaining characters are stored in the frequency converter. If hardware switches are different from all ON or all OFF, the switches have priority.



12	12-09 Physical Address			
Ra	nge:	Function:		
0 *	[0 - 0]	Read-only. Displays the physical (MAC) address of the option.		

7.2.2 12-1* Ethernet Link Parameters

7.2.3 12-1* Ethernet Link Parameters

Applies for the whole parameter group.

Index [0] is used for port 1, and Index [1] is used for port 2. For EtherCAT, index [0] is for the in-port and index [1] is for the out-port.

12-10 Link Status			
Option: Function		Function	n:
		Read-only	. Displays the link status of the Ethernet
		ports.	
[0]	No Link		
[1]	Link		
12-11 Link Duration			
Ra	nge:		Function:
Size	e related*	[0-0]	Read-only. Displays the duration of the present link on each port in dd:hh:mm:ss.

12	12-12 Auto Negotiation		
Option: Function:			
		Configures auto negotiation of Ethernet link parameters, for each port: ON or OFF.	
[0]	Off	Link Speed and Link Duplex can be configured in parameter 12-13 Link Speed and parameter 12-14 Link Duplex.	

NOTICE

[1] On

In POWERLINK, this parameter is fixed to OFF setting.

12-13 Link Speed		
Op	otion:	Function:
		Forces the link speed for each port in 10 Mbps or 100 Mbps. If <i>parameter 12-12 Auto Negotiation</i> is set to: ON, this parameter is read-only and displays the actual link speed. If no link is present, <i>None</i> is displayed.
[0]	None	
[1]	10 Mbps	
[2]	100	
	Mbps	

NOTICE

In POWERLINK, this parameter is locked to 100 Mbs.

12	uplex	
Op	otion:	Function:
		Forces the duplex for each port to full or half duplex. If <i>parameter 12-12 Auto Negotiation</i> is set to: [ON], this parameter is read-only.
[0]	Half Duplex	
[1]	Full Duplex	

NOTICE

In POWERLINK this parameter is locked to half duplex.

7.2.4 12-2* Process Data

	12-20 Control Instance			
	Range:	Function:		
Γ	[None, 20,	Read-only. Displays the connection to the master.		
	21, 23, 100,	In Ethernet/IP: If no CIP connection is present,		
	101, 103]	None is displayed. In EtherCAT: If no connection		
		is active None is displayed, else it displays the		
		active PDO. In POWERLINK: If no connection is		
		active None is displayed, else it displays the		
		active PDO (23).		

12-21 Process Data Config Write

F	Range:	Function:
	[[0 - 9] PCD read 0 - 9]	Configuration of readable process
		data.

In POWERLINK, this parameter is read-only. The same applies for:

- parameter 12-22EN-22 Process Data Config Read
- parameter 12-23 Process Data Config Write Size
- parameter 12-24 Process Data Config Read Size

12-22 Process Data Config Read

Ran	ige:		Function:	
[[0 - 9] PCD	read 0 - 9]	Configuration of readable process	
			data.	
12-2	23 Proces	s Data Co	nfig Write Size	
Ran	ige:	Function	:	
16 *	[8 - 32]	frequency counts from only the le	umber of bits being sent from the converter as process data. The setting m right (LSB). The value 1 means that east significant bit of the signal is from the frequency converter.	
12-24 Process Data Config Read Size				
Range:		Function	:	
16 *	[8 - 32]	frequency counts from	umber of bits being sent to the converter as process data. The setting m right (LSB). The value 1 means that east significant bit of the signal is	

Parameters

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0-1	

12-24 Process Data Config Read Size						
Ran	Range: Function:					
transferred to the frequency converter. The preceding bits are set to zero.			•			
12-2	28 Store	Data Values				
Opt	ion:		Function:			
[0]	Off					
[1]	Store a	ll setups				
[2]	[2] Store all setups					
12-29 Store Always						

Option: Function:

		-
		Activates function that always stores received
		parameter data in non-volatile memory (EEPROM).
[0] *	Off	
[1]	On	

7.2.5 12-6* Ethernet PowerLink

12-60 Node ID Range: Function: 1 * [1 Enter the Node ID in this parameter or alternatively 239] in the hardware switch. In order to adjust the Node ID in parameter 12-60 Node ID, the hardware switch must be set to 0 or 255 (i.e. all switches set to [ON] or to [OFF]). Otherwise this parameter displays the actual setting of the switch. Setting this parameter will first be active at the next power up cycle.

12-62 SDO Timeout

Range:	Function:						
30000	[0 -	parameter 12-62 SDO Timeout is the					
ms*	2000000000 ms]	SDO Timeout in milliseconds. Value					
		of this parameter is read during					
		communication initialization into					
		Object 1300h					

12-63 Basic Ethernet Timeout

Range:		Function:		
5000.000	[0 -	Parameter 12-63 Basic Ethernet		
ms*	2000000.000	Timeout in microseconds. This		
	ms]	parameter is mapped to Object		
		1F99h. If the POWERLINK interface		
		does not receive a SoC frame within		
		the specified period of time, the		
		interface shifts to standard Ethernet		
		mode. This feature is first available		
		from version 2.00 of the POWERLINK		
		Interface.		

12-66 Threshold

Range:		Function:	
15 [0 - * 200000000]		Parameter 12-66 Threshold holds six threshold values. If one of these thresholds are exceeded, the POWERLINK Interface exits operational mode. The parameters are set to	
		optimal settings and should not be changed. The actual value of the counters can be read out via <i>parameter 12-67 Threshold Counters</i> .	

12-67 Threshold Counters

Range:		Function:	
0	[0 -	Parameter 12-67 Threshold Counters hold 6	
*	4294967295]	counters. The counter reflects the actual	
		value in the POWERLINK interface. Counters	
		increases with a count of eight at detection	
		of an error and decreases with a count of	
		one when no errors are detected. The values	
		are read only.	

12-68 Cumulative Counters

Ra	nge:	Function:					
0 * [0 - 2147483647]		Loss off SoC Cumulative. This parameter reflects the value in object 1C0Bh, subindex 1.					
12	12-69 Ethernet PowerLink Status						
Ra	Range: Function:						
0 *	[0 - 42949672	.95]					

7.2.6 12-8* Other Ethernet Services

12-8	12-80 FTP Server						
Opt	ion:		Function:				
[0]	Disabl	ed	Disables the bu	ilt-in FTP server.			
12-8	31 HT	TP Serv	/er				
Opt	ion:			Function:			
[0]	D	isabled					
12-8	32 SM	TP Ser	vice				
Opt	ion:			Function:			
[0]	D	isabled					
12-8	39 Tra	nspare	nt Socket Cha	nnel Port			
Ran	ge:		Function:				
Size [0- related* 0]			transparent s ration enable transparently value is 4000	the TCP port number for the socket channel. This configu- es FC telegrams to be sent on Ethernet via TCP. Default 0, 0 means disabled. The MCT ftware uses this port.			



7.2.7 12-9* Advanced Ethernet Settings

12	12-90 Cable Diagnostic				
Option:		Function:			
		Enables/disables advanced cable diagnosis function. If enabled, the distance to cable errors can be read out in <i>parameter 12-93 Cable Error</i> <i>Length.</i> The parameter resumes to the default setting of disable after the diagnostics have finished.			
[0]	Disabled				
[1]	Enabled				

NOTICE

The cable diagnostics function is only issued on ports where there is no link (see *parameter 12-10 Link Status*, *Link Status*)

12-	12-91 Auto Cross Over				
Option: Function:					
[0] Disabled		Disables the auto cross-over function.			
[1] Enabled Enables the auto cross-over function.					

12	12-93 Cable Error Length				
Ra	nge:	Function:			
0 *	[0 -	If cable diagnostics is enabled in			
	65535]	parameter 12-90 Cable Diagnostic, the built-in			
		switch is possible via time domain reflectometry			
		(TDR). This measurement technique detects			
		common cabling problems such as open circuits,			
		short circuits, and impedance mismatches or			
		breaks in transmission cables. The distance from			
	the option to the error is displayed in meters wi				
	an accuracy of ± 2 m. The value 0 means that r				
		errors detected.			

7.3 POWERLINK - Specific Parameter List

Parameter	Default value	Range	Conversion index	Data type
Parameter 8-01 Control Site	[0] Dig. & ctrl. word	[0-2]	-	Uint8
Parameter 8-02 Control Word Source	[0] FC RS485	[0-4]	-	Uint8
Parameter 8-03 Control Word Timeout				
Time	1	0.1-18000	-1	Uint32
Parameter 8-04 Control Word Timeout				
Function	[0] Off	[0-10]	-	Uint8
Parameter 8-05 End-of-Timeout Function	[0] Hold set-up	[0-1]	-	Uint8
Parameter 8-06 Reset Control Word				
Timeout	[0] Do not reset	[0-1]	-	Uint8
Parameter 8-07 Diagnosis Trigger	[0] Disable	[0-3]	-	Uint8
Parameter 8-10 Control Word Profile	[0] FC profile	[0-x]	-	Uint8
Parameter 8-13 Configurable Status				
Word STW				
Parameter 8-50 Coasting Select	[3] *Logic OR	[0-3]	-	Uint8
Parameter 8-51 Quick Stop Select	[3] *Logic OR	[0-3]	-	Uint8

12-96 Port Config

Enables/disables port-mirroring function. For troubleshooting with a network analyser tool.

Option: Function: No port-mirroring [0] Normal [1] Mirror Port 1 to 2 All network traffic on port 1 is mirrored to port 2. [2] Mirror Port 2 to 1 All network traffic on port 2 is mirrored to port 1. [10] Port 1 disabled [11] Port 2 disabled [254] Mirror Int. Port to 1 [255] Mirror Int. Port to 2

Parameters

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Default value	Range	Conversion index	Data type
[3] *Logic OR	[0-3]	-	Uint8
[3] *Logic OR	[0-3]	-	Uint8
[3] *Logic OR	[0-3]	-	Uint8
[3] *Logic OR	[0-3]	-	Uint8
[3] *Logic OR	[0-3]	-	Uint8
	0-parameter 4-13 Motor		
100 rpm	Speed High Limit [RPM]	67	Uint16
	0-parameter 4-13 Motor		
200 rpm	Speed High Limit [RPM]	67	Uint16
[20] *From node ID	-	-	Unsigned 8
192.168.100.xxx	-	-	Unsigned 32
255.255.255.0	-	-	Unsigned 32
0.0.0.0	-	-	Unsigned 32
	-	-	String
00:1B:08:00:00:00	-	-	Visible string 17
[0] No Link	[0-1]	-	Unsigned 8
00:00:00:00	-	-	Time diff. w/date
[1] On	[0-1]	-	Unsigned 8
[2] 100 Mbps	[0-2]	-	Unsigned 8
		-	Unsigned 8[
Application Dependent			
16		1-32	
16		1-32	
0	0-4294967295		
[0] Off			
[1]	[0-240]		Unsigned 8
30000	[0-65535]		Unsigned 16
[500000]	[0-4294967296]		Unsigned 32
[15]	[0-4294967296]		Unsigned 32
[0]	[0-4294967296]		Unsigned 32
[0]	[0-4294967296]		Unsigned 32
[0] Disable	[0-1]	-	Unsigned 8
[0] Disable	[0–1]	-	Unsigned 8
[0] Disable	[0-1]	-	Unsigned 8
[0] Disable	[0-1]	-	Unsigned 8
[0] Disable	[0-1]	-	Unsigned 8
[0] Enable	[0-1]	-	Unsigned 8
0	0-200	0	Unsigned 16
0	0-65535	-	Unsigned 16
0	0-65535	-	Unsigned 16
0	0-FFFF	0	V2
	1	1	
0	0-FFFF	0	Uint32
	[3] *Logic OR [20] rpm [20] rpm [20] *From node ID 192.168.100.xxx 255.255.255.0 0.0.00 [0] No Link 00:00:00:00 [1] On [2] 100 Mbps [0] Halfl Duplex Application Dependent Application Dependent [6] [7] [8] [9] Off [1] 30000 [5000000] [15] [0] Disable	[3] *Logic OR [0-3] [2] *Logic OR - [2] *From node ID - [2] *From node ID - [3] *Logic 00:00 - [0] No Link [0-1] [0] No Link [0-1] [0] No Link [0-1] [0] No Link [0-1] [1] On [0-1] [2] 100 Mbps [0-2] [0] Halfl Duplex [0-1] [16 - [16	[3] *Logic OR [0-3] - [20] *From node ID - - [20] *From node ID - - [21] 00 Max - - [0] No Link [0-1] - [0] No Link [0-1] - [0] Nobps [0-2] - [0] Haff Duplex [0-1] - [1] On [0-1] - [2] 100 Mbps [0-2] - [0] Haff Duplex </td

Table 7.1 Specific Parameters

Refer to the relevant Operating Instructions for a comprehensive parameter list.

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8 Application Examples

8.1 Example: Process Data with PDO 23

This example shows how to work with PDO 23, which consists of Control Word/Status Word and Reference/Main Actual Value. In the example the frequency converter is set to [0] FC profile in Parameter 8-10 Control Word Profile. The PDO contains up to ten objects, which can be programmed to monitor process signals.

					PCD		_	
		0		1		2		3
	C	TW	Ν	MRV	PC	CD[2]		PCD
From controller	04	7C	20	00	00	00	00	00
	S	TW	Ν	VAN	PC	D[2]		PCD[3]
From frequency		07		00				
converter	0F		20		3F	A6	00	08
_					-			
Byte #	1	2	3	4	5	6	7	8

Table 8.1 Example of FC Profile

The application requires monitoring of the motor torque and digital input, so PCD 2 is set up to read the current motor torque. PCD 3 is set up to monitor the state of an external sensor via the process signal digital input. The sensor is connected to digital input 18.

An external device is also controlled via control word bit 11 and the built-in relay of the frequency converter. Reversing is permitted only when the reversing bit 15 in the control word and the digital input 19 are set to high.

For safety reasons, the frequency converter stops the motor if the POWERLINK cable is broken, the master has a system failure, or the PLC is in stop mode.

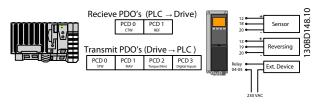


Illustration 8.1 Application Example

Application Examples

Operating Instructions

Program the frequency converter as shown in Table 8.2.

Parameter	Setting
Parameter 4-10 Motor Speed Direction	[2] Both directions
Parameter 5-10 Terminal 18 Digital Input	[0] No operation
Parameter 5-11 Terminal 19 Digital Input	[10] Reversing
Parameter 5-40 Function Relay	[36/37] Control word bit 11/12
Parameter 8-03 Control Word Timeout Time	1 s
Parameter 8-04 Control Word Timeout Function	[2] Stop
Parameter 8-10 Control Word Profile	[0] FC Profile
Parameter 8-50 Coasting Select	[1] Bus
Parameter 8-51 Quick Stop Select	[1] Bus
Parameter 8-52 DC Brake Select	[1] Bus
Parameter 8-53 Start Select	[1] Bus
Parameter 8-54 Reversing Select	[2] Logic AND
Parameter 8-55 Set-up Select	[1] Bus
Parameter 8-56 Preset Reference Select	[1] Bus

Table 8.2 Programming of Frequency Converter

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8.2 Example: Simple Control Word, Reference, Status Word and Main Actual Value

This example shows how the control word telegram relates to the controller and the frequency converter, using FC Control Profile.

The control word telegram is sent from the PLC to the frequency converter. Standard Telegram 1 is used in the example to demonstrate the full range of modules. All the values shown are arbitrary, and are provided for demonstration purposes only.

					P	CD																											
		()		1	2	2	1.1	3																								
		CT	W	M	RV	PC	D	PC	D																								
		04	7C	20	00																												
PQV	V:	256		258		260		262																									
		C1	W	M	RV																												
Bit	no.:	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
			(0			4	1			7	7			(2			2	2			()			(0			C)	
L		I		<u> </u>												-				-								<u> </u>					-

Table 8.3 Standard Telegram 1 Example

Table 8.3 indicates the bits contained within the control word, and how they are presented as process data in Standard Telegram 1 for this example.

Table 8.4 indicates which bit functions, and which corresponding bit values are active for this example.

Bit	Bit value=0	Bit value=1	Bit value	
00	Reference value	External selection lsb	0	
01	Reference value	External selection msb	0	~
02	DC brake	Ramp	1	С
03	Coasting	Enable	1	
04	Quick stop	Ramp	1	
05	Freeze output	Ramp enable	1	7
06	Ramp stop	Start	1	/
07	No function	Reset	0	
08	No function	Jog	0	
09	Ramp 1	Ramp 2	0	4
10	Data not valid	Valid	1	4
11	No function	Relay 01 active	0	
12	No function	Relay 02 active	0	
13	Parameter set-up	Selection Isb	0	0
14	Parameter set-up	Selection msb	0	0
15	No function	Reversing	0	

Table 8.4 Bit Functions

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Application Examples

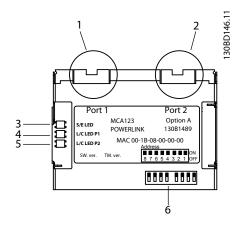
8

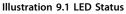
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9 Troubleshooting

9.1 LED Status





Item #	Description
1	POWERLINK port 1
2	POWERLINK port 2
3	Status/error
4	Link/collision port 1
5	Link/collision port 2
6	Node ID dip switches

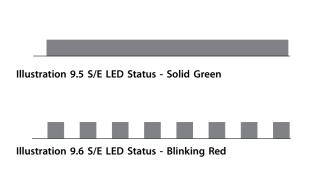
Table 9.1 Legend to Illustration 9.1





Illustration 9.3 S/E LED Status - Green (A)/Red (B) Flash

Illustration 9.4 S/E LED Status - Flickering Green



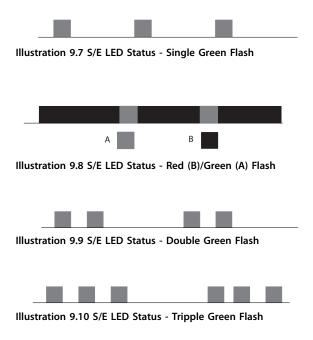


Illustration 9.11 S/E LED Status - Yellow Flash

LED flash	Powerlink option state	Description
pattern		
Power OFF	NMT_GS,	No power supplied
or init State	NMT_GS_INITIALISATION	to drive or
	NMT_CS_NOT_ACTIVE,	Initialising
Flickering	Basic Ethernet mode	POWERLINK
Green		interface is in basic
		Ethernet mode
Solid green		POWERLINK
		interface is on
		operational state
Blinking	NMT_CS_Stopped	PLC has stopped
greed		the Network
Single green	NMT_CS_PRE_OPERATIONAL_1	POWERLINK
flash		interface is in Pre-
		operation mode
		state 1
Red/green	NMT_CS_PRE_OPERATIONAL_1	Communication to
flash		PLC lost
Double	NMT_CS_PRE_OPERATIONAL_2	POWERLINK
green flash		interface is in Pre-
		operation mode
		state 2
Tripple	NMT_CS_READY_TO_OPERATE	POWERLINK
green flash		interface is

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0	

LED flash	Powerlink option state	Description
pattern		
Yellow flash	Wink command	Node Identification
		activated from
		MCT10

Table 9.2 S/E LED Pattern



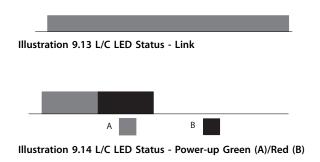




Illustration 9.15 L/C LED Status - Collision Red (B)/Green (A)



Illustration 9.16 L/C LED Status - Yellow Flash

LED flash	Powerlink option state	Description
pattern		
Power OFF or	NMT_GS,	No power supplied to
no link	NMT_GS_INITIALISATION	drive or Initialising
	NMT_CS_NOT_ACTIVE	
Link	NMT_GS_INITIALISATION	Only shown once at
		power up
Power up	Various states	Link established
Collision		
Yellow flash	Wink command	Node Identification
		activated from MCT 10
		Set-up Software

Table 9.3 L/C LED Pattern

9.2 Communication Problems

9.2.1 No Communication with the Frequency Converter

If there is no communication with the frequency converter, proceed with the following checks:

Check 1: Is the cabling correct?

Check that the cable is mounted correctly. Check if the corresponding L/C LED shows link activity.

Check 2: Does the hardware configuration match?

Check that *parameter 12-60 Node ID* is configured to the same value in the PLC. For correct function, the Node ID must be set correctly. This parameter can also be set from the DIP switches. If the DIP switches are set, they have priority over the parameter.

Check 3: Is the correct XDD file installed?

Download the correct XDD file from *www.danfoss.com/BusinessAreas/DrivesSolutions/*. Check that the process data matches the active profile in the drive.

<u>Check 4: What is the value of parameter 12-69 Ethernet</u> <u>PowerLink Status?</u>

Parameter 12-69 Ethernet PowerLink Status contains 32 bits, which each is linked to internal information. The different bits give an overview over possible errors.

Bit	Description	Value=[0]	Value=[1]	Comment
no.				
0	Initialisation		NMT_GS_INITIL	Mapped to
	State		ASATION	Object 1F8Ch
1	Not Active		NMT_CS_NOT_	Mapped to
	State		ACTIVE	Object 1F8Ch
2	Basic		NMT_CS_BASIC	Mapped to
	Ethernet		_ETHERNET	Object 1F8Ch
	State			
3	Pre-		NMT_CS_PRE_	Mapped to
	Operational 1		OPERATIONAL_	Object 1F8Ch
	State		1	
4	Pre-		NMT_CS_PRE_	Mapped to
	Operational 2		OPERATIONAL_	Object 1F8Ch
	State		2	
5	Ready to		NMT_CS_OPER	Mapped to
	Operate State		ATIONAL	Object 1F8Ch
6	Operational		NMT_CS_STOP	Mapped to
	State		PED	Object 1F8Ch
7	Stopped			Value shall be
	State			read as 0
8	Reserved			Value shall be
				read as 0
9	Reserved			Value shall be
				read as 0
10	Reserved			Value shall be
				read as 0
11	Reserved			Value shall be
				read as 0
12	Reserved			Value shall be
				read as 0
13	Reserved			Value shall be
				read as 0

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Bit Description Value=[0] Value=[1] Comment
no.	
14 Reserved	Value shall be
	read as 0
15 Reserved	Value shall be
	read as 0
16 Reserved	Value shall be
	read as 0
17 Reserved	Value shall be
	read as 0
18 Reserved	Value shall be
	read as 0
19 Reserved	Value shall be
	read as 0
20 Physical link No link Link pres	sent Mapped to
on Port 1 present on Port	1 object 1030h
on Port 1	subindex 7
21 Physical link No link Link pres	sent Mapped to
on Port 2 present on Port 2	2 object 1030h
on Port 2	subindex 7
22 Reserved	Value shall be
	read as 0
23 Reserved	Value shall be
	read as 0
24 W34 source	Mapped to
No Op State	object 178Ch
25 W34 source	Mapped to
Alarm	Alarm Word
	and Alarm
	Word 1
26 W34 source	IP address
IP Address	conflict
Conflict	detection in
	Basic Ethernet
	mode
27 W34 source	Value read
Invalid Node	from DIP
ID	switch
28 W34 source	Set on
Incorrect	incorrect Tx or
PDO	Rx PDO
mapping	mapping
29 Reserved	Value shall be
	read as 0
30 Reserved	Value shall be
	read as 0
31 Reserved	Value shall be
	read as 0

Table 9.4 POWERLINK Bits

If the master is in stop mode, Warning 34 appears. Check that the master is in run mode. If the frequency converter is not in operational state, Warning 34 will appear (60 s after power up or immediately if the frequency converter has been in operational state).

Check 1: Is the control word valid?

If bit 10=0 in the control word, the frequency converter does not accept the control word.

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Check 2: Is the relationship between bits in the control word and the terminal I/Os correct?

Check the logical relationship in the frequency converter.

Define the desired logical relationship in *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select* according to the following range of options. Select the FC control mode, digital input and/or serial communication, using *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select*.

If *parameter 8-01 Control Site* is set to digital only, the frequency converter does not react on commands sent via the control word.

Table 9.5 to Table 9.12 show a coast command's effect upon the frequency converter for the full range of *parameter 8-50 Coasting Select* settings.

The effect of control mode upon the function of *parameter 8-50 Coasting Select, parameter 8-51 Quick Stop Select,* and *parameter 8-52 DC Brake Select* is as follows:

If [0] Digital input is selected, the terminals control the coast and DC brake functions.

NOTICE

Coasting, quick stop, and DC brake functions are active for logic 0.

Terminal	Bits 02/03/04	Function
0	0	Coast/DC brake/Q-Stop
0	1	Coast/DC brake/Q-Stop
1	0	No Coast/DC brake/Q-Stop
1	1	No Coast/DC brake/Q-Stop

Table 9.5 [0] Digital Input

If [1] Serial communication is selected, commands are activated only when given via serial communication.

Terminal	Bits 02/03/04	Function
0	0	Coast/DC brake/Q-Stop
0	1	No Coast/DC brake/Q-Stop
1	0	Coast/DC brake/Q-Stop
1	1	No Coast/DC brake/Q-Stop

Table 9.6 [1] Serial Communication

If [2] Logic AND is selected, both signals must be activated to perform the function.

Terminal	Bits 02/03/04	Function
0	0	Coast/DC brake/Q-Stop
0	1	No Coast/DC brake/Q-Stop
1	0	No Coast/DC brake/Q-Stop
1	1	No Coast/DC brake/Q-Stop

Table 9.7 [2] Logic AND

If [3] Logic OR is selected, activation of one signal activates the function.

Terminal	Bits 02/03/04	Function
0	0	Coast/DC brake/Q-Stop
0	1	Coast/DC brake/Q-Stop
1	0	Coast/DC brake/Q-Stop
1	1	No Coast/DC brake/Q-Stop

Table 9.8 [3] Logic OR

The effect of control mode upon the function of *parameter 8-53 Start Select* and *parameter 8-54 Reversing Select*:

If [0] Digital input is selected, the terminals control the start and reversing functions

Terminal	Bits 06/15	Function
0	0	Stop/Counterclockwise
0	1	Stop/Counterclockwise
1	0	Start/Clockwise
1	1	Start/Clockwise

Table 9.9 [0] Digital input

If [1] Serial communication is selected, commands are activated only when given via serial communication.

Terminal	Bits 02/03/04	Function
0	0	Stop/Counterclockwise
0	1	Start/Clockwise
1	0	Stop/Counterclockwise
1	1	Start/Clockwise

Table 9.10 [1] Serial Communication

If [2] Logic AND is selected, both signals must be activated to perform the function.

Terminal	Bits 02/03/04	Function
0	0	Stop/Counterclockwise
0	1	Stop/Counterclockwise
1	0	Stop/Counterclockwise
1	1	Start/Clockwise

Table 9.11 [2] Logic AND

If [3] Logic OR is selected, activation of one signal activates the function.

Terminal	Bits 02/03/04	Function
0	0	Stop/Counterclockwise
0	1	Start/Clockwise
1	0	Start/Clockwise
1	1	Start/Clockwise

Table 9.12 [3] Logic OR

The effect of control mode upon the function of *parameter 8-55 Set-up Select* and *parameter 8-56 Preset Reference Select*:

If [0] Digital input is selected, the terminals control the setup and preset reference functions.

Terminal		Bits 00 13/14	0/01,	Function
Msb	Lsb	Msb	Lsb	Preset ref. set-up number
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	2
0	1	0	1	2
0	1	1	0	2
0	1	1	1	2
1	0	0	0	3
1	0	0	1	3
1	0	1	0	3
1	0	1	1	3
1	1	0	0	4
1	1	0	1	4
1	1	1	0	4
1	1	1	1	4

Table 9.13 [0] Digital Input

If [1] Serial communication is selected, commands are activated only when given via serial communication.

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Terminal		Bits 00/01,		Function
	13/		1	
Msb	Lsb	Msb	Lsb	Preset ref. set-up number
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	1
0	1	0	1	2
0	1	1	0	3
0	1	1	1	4
1	0	0	0	1
1	0	0	1	2
1	0	1	0	3
1	0	1	1	4
1	1	0	0	1
1	1	0	1	2
1	1	1	0	3
1	1	1	1	4

Table 9.14 [1] Serial Communication

If [2] Logic AND is selected, both signals must be activated to perform the function.

Terminal		Bits 00	0/01,	Function
Msb	Lsb	Msb	Lsb	Preset ref. set-up number
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	2
0	1	1	0	1
0	1	1	1	2
1	0	0	0	1
1	0	0	1	1
1	0	1	0	3
1	0	1	1	3
1	1	0	0	1
1	1	0	1	2
1	1	1	0	3
1	1	1	1	4

Table 9.15 [2] Logic AND

If [3] Logic OR is selected, activation of 1 signal activates the function.

Terminal		Bits 00/01,		Function
		13/14		
Msb	Lsb	Msb	Lsb	Preset ref. set-up number
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	2
0	1	0	1	2
0	1	1	0	4
0	1	1	1	4
1	0	0	0	3
1	0	0	1	4
1	0	1	0	3
1	0	1	1	4
1	1	0	0	4
1	1	0	1	4
1	1	1	0	4

Table 9.16 [3] Logic OR

9.2.2 Endless Power-down - Power-up Cycle

<u>Check 1: Is the frequency converter set to Controlled Node</u> <u>= ON in the Automation Studio?</u>

The PLC can force the frequency converter into an endless power-down - power-up cycle. Set the value to *OFF*.

Is the XDD file correct?

Check that the correct XDD file and firmware of the option are used. See *chapter 4.1 Importing the XDD File* for more information.

9.3 Warnings and Alarms

9.3.1 Alarm and Warning Words

Alarm word, Warning word, and POWERLINK Status word are shown in the display in Hex format. If there is more than one warning or alarm, a sum of all warnings or alarms is shown. Alarm word, warning word, and POWERLINK Status word can also be displayed using the serial bus in *parameter 16-90 Alarm Word*, *parameter 16-92 Warning Word*, and *parameter 12-69 Ethernet PowerLink Status*.

Troubleshooting

Operating Instructions

Bit (Hex)	Unit	Alarm word	Alarm no.
	diagnose	(parameter 16-90 Alarm	
	bit	Word)	
00000001	48	Brake check	28
00000002	49	Power card over	29
		temperature	
00000004	50	Earth fault	14
0000008	51	Control card over	65
		temperature	
00000010	52	Control word timeout	18
00000020	53	Over current	13
00000040	54	Torque limit	12
00000080	55	Motor thermistor over	11
		temp.	
00000100	40	Motor ETR over	10
		temperature	
00000200	41	Inverter overloaded	9
00000400	42	DC link under voltage	8
00000800	43	DC link over voltage	7
00001000	44	Short circuit	16
00002000	45	Inrush fault	33
00004000	46	Mains phase loss	4
0008000	47	AMA not OK	50
00010000	32	Live zero error	2
00020000	33	Internal fault	38
00040000	34	Brake overload	26
00080000	35	Motor phase U is missing	30
00100000	36	Motor phase V is missing	31
00200000	37	Motor phase W is missing	32
00400000	38	Fieldbus comm. fault	34
00800000	39	24 V supply fault	47
01000000	24	Mains failure	36
02000000	25	1.8 V supply fault	48
0400000	26	Brake resistor short circuit	25
08000000	27	Brake chopper fault	27
10000000	28	Option change	67
20000000	29	Drive initialisation	80
4000000	30	Safe stop	68
80000000	31	Mechanical brake low	63

Bit (Hex)	Unit	Warning word	Alarm no.
	diagnose	(parameter 16-92 Warning	
	bit	Word)	
00000001	112	Brake check	28
00000002	113	Power card over	29
		temperature	
00000004	114	Earth fault	14
80000008	115	Control card	65
00000010	116	Control word timeout	18
00000020	117	Over current	13
00000040	118	Torque limit	12
0000080	119	Motor thermistor over	11
		temp.	
00000100	104	Motor ETR over	10
		temperature	
00000200	105	Inverter overloaded	9
00000400	106	DC link under voltage	8
00000800	107	DC link over voltage	7
00001000	108	DC link voltage low	6
00002000	109	DC link voltage high	5
00004000	110	Mains phase loss	4
0008000	111	No motor	3
00010000	96	Live zero error	2
00020000	97	10 V low	1
00040000	98	Brake overload	26
00080000	99	Brake resistor short circuit	25
00100000	100	Brake chopper fault	27
00200000	101	Speed limit	49
00400000	102	Fieldbus comm. fault	34
0080000	103	24 V supply fault	47
01000000	88	Mains failure	36
02000000	89	Current limit	59
04000000	90	Low temperature	66
08000000	91	Voltage limit	64
10000000	92	Encoder loss	61
20000000	93	Output frequency limit	62
40000000	94	Unused	-
80000000	95	Warning word 2 (ext. stat.	-
		word)	

Table 9.17 Alarm Word Bits

Table 9.18 Warning Word Bits

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Bit (Hex)	Comm. option STW (parameter 16-84 Comm.
	Option STW)
0000001	parameterization ok
0000002	configuration ok
00000004	clearmode active
0000008	baudrate search
00000010	waiting for parameterization
0000020	waiting for configuration
00000040	in data exchange
0000080	not used
00000100	not used
00000200	not used
00000400	not used
00000800	MCL2/1 connected
00001000	MCL2/2 connected
00002000	MCL2/3 connected
00004000	data transport active
0008000	not used

Table 9.19 Status Word Bits

NOTICE

Parameter 16-84 Comm. Option STW is not part of extended diagnosis.

There is a clear distinction between alarms and warnings. An alarm make the frequency converter enter a fault condition. After the cause for the alarm has been cleared, the master will have to acknowledge the alarm message before the frequency converter can start operating again. A warning condition triggers a warning which disappears when condition returns to normal, without interfering with the process.

Warnings

A single bit within a warning word represents warnings within the frequency converter. Bit status [0] False means no warning, while bit status [1] True means warning. Any bit change in the warning word is notified by a change of bit 7 in the status word.

Alarms

Following an alarm message, the frequency converter enters fault condition. When the fault has been removed and the controller has acknowledged the alarm message by setting bit 7 in the control word, the frequency converter resumes operation. A single bit within an alarm word represents alarms within the frequency converter. Bit status [0] False means no fault, while bit status [1] True means fault. Index

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