MAKING MODERN LIVING POSSIBLE

# Programming Guide

# VLT® CANopen MCA 105

## VLT® AutomationDrive FC 301/302




vlt-drives.danfoss.com

THE REAL DRIVE

# Contents



# 1 Introduction

## 1.1 Purpose of the Manual

The *VLT® CANopen MCA 105 Programming Guide* provides information about configuring the system, controlling the frequency converter, parameter access, programming, as well as troubleshooting.
The programming guide is intended for use by qualified personnel who are familiar with the VLT® frequency converter, with CANopen technology, and with the PC or PLC that is used as a master in the system.
Read the instructions before programming and follow the procedures in this manual.

VLT® is a registered trademark.

## 1.2 Additional Resources

**Resources available for the frequency converters and optional equipment:**

- The *VLT® AutomationDrive FC 301/FC 302 Operating Instructions* provide the necessary information for getting the frequency converter up and running.
- The *VLT® AutomationDrive FC 301/FC 302 Design Guide* provides detailed information about capabilities and functionality to design motor control systems.
- The *VLT® AutomationDrive FC 301/FC 302 Programming Guide* provides greater detail on working with parameters and many application examples.
- The *VLT® CANopen MCA 105 Installation Guide* provides information about installing the CANopen and troubleshooting.
- The *VLT® CANopen MCA 105 Programming Guide* provides information about configuring the system, controlling the frequency converter, parameter access, programming, troubleshooting, as well as some typical application examples.

Supplementary publications and manuals are available from Danfoss. See *vlt-drives.danfoss.com/Support/Technical-Documentation/* for listings.

## 1.3 Document and Software Version

This manual is regularly reviewed and updated. All suggestions for improvement are welcome. *Table 1.1* shows the document version and the corresponding software version.

| Edition | Remarks | Software version |
|---|---|---|
| MG92G1xx | – | – |

**Table 1.1 Document and Software Version**

## 1.4 Product Overview

This programming guide relates to the CANopen interface.
Ordering number:

- 130B1103 (uncoated)
- 130B1205 (coated)

CANopen is a low-level network that standardises communications between industrial devices (sensors, limit switches, motor controls) and high-level devices (controllers). CANopen follows the open systems interconnection (OSI) model and is based on CAN technology for media access control and physical signalling.
Configure CANopen systems to operate in a master-slave or a distributed control architecture using peer-to-peer communication. Up to 127 nodes in a multi-drop network topology are supported. By using the same cable for communication, the bus can power the communication options directly. Nodes can be removed or inserted without powering down the network.
Each node on the network has its own unique communication object identifier (COB-ID) to distinguish it on the network. The access control is based on the CSMA/CA (carrier sense multiple access/collision avoidance) principle, meaning that all nodes may have access to the network at the same time. When 2 nodes attempt to get control of the network bus simultaneously, the CAN protocol resolves the issue by arbitration. In this way, collisions on the network are avoided.
CANopen defines device profiles for devices belonging to specific classes. For other devices, define a custom class to make it CANopen compatible. All of the above enhances the interchangeability and interoperability of the network.

1

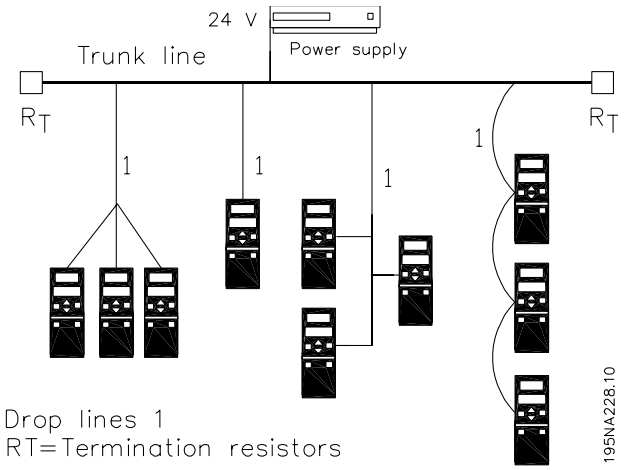



**Illustration 1.1 Topology**

VLT® CANopen MCA 105 is designed to communicate with any master abiding by the DeviceNet standard. And it is intended for use with:

- VLT® AutomationDrive FC 301.
- VLT® AutomationDrive FC 302.

## 1.5 Approvals and Certifications

More approvals and certifications are available. For more information, contact a Danfoss local partner.

## 1.6 Symbols, Abbreviations, and Conventions

| Abbreviation | Definition |
|---|---|
| CAN | Controller area network |
| CiA | CAN in automation |
| COB | Communication object |
| COB-ID | Communication object identifier |
| CTW | Control word |
| EDS | Electronic data sheet |
| EMC | Electromagnetic compatibility |
| EMCY | Emergency message |
| I/O | Input/output |
| LCP | Local control panel |
| LED | Light emitting diode |
| LSB | Least significant bit |
| MAV | Main actual value (actual output) |
| MRV | Main reference value |
| MSB | Most significant bit |
| NMT | Network management |
| N/A | Not applicable |
| OD | Object directory |
| PCD | Process data |
| PDO | Process data object |
| PLC | Programmable logic controller |
| PNU | Parameter number |
| REC | Receive error counter |
| RPDO | Receive process data object |
| RPM | Revolutions per minute; unit for the speed of a revolving motor |
| RTR | Remote transmission request frame |
| RX | Receive data |
| STW | Status word |
| SDO | Service data object |
| SYNC | Object for synchronisation of process data |
| TEC | Transmit error counter |
| TPDO | Transmit process data object |
| TX | Transmit data |

**Table 1.2 Symbols and Abbreviations**

**Conventions**

Numbered lists indicate procedures.

Bullet lists indicate other information and description of illustrations.

Italicised text indicates:

- Cross-reference.
- Link.
- Parameter name.
- Footnote.
- Parameter group.
- Parameter option.
- Alarms/warnings.

# 2 Safety



## 2.1 Safety Symbols

The following symbols are used in this manual:

**⚠WARNING**

**Indicates a potentially hazardous situation that could result in death or serious injury.**

**⚠CAUTION**

**Indicates a potentially hazardous situation that could result in minor or moderate injury. It can also be used to alert against unsafe practices.**

***NOTICE***

**Indicates important information, including situations that can result in damage to equipment or property.**

## 2.2 Qualified Personnel

Correct and reliable transport, storage, installation, operation, and maintenance are required for the trouble-free and safe operation of the frequency converter. Only qualified personnel are allowed to install and operate this equipment.

Qualified personnel are defined as trained staff, who are authorised to install, commission, and maintain equipment, systems, and circuits in accordance with pertinent laws and regulations. Additionally, the qualified personnel must be familiar with the instructions and safety measures described in these operating instructions.

## 2.3 Safety Precautions

**⚠WARNING**

**HIGH VOLTAGE**

**Frequency converters contain high voltage when connected to AC mains input, DC supply, or load sharing. Failure to perform installation, start-up, and maintenance by qualified personnel can result in death or serious injury.**

- **Only qualified personnel must perform installation, start-up, and maintenance.**

**⚠WARNING**

**UNINTENDED START**

**When the frequency converter is connected to AC mains, DC supply, or load sharing, the motor may start at any time. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage. The motor can start with an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using MCT 10 Set-up Software, or after a cleared fault condition.**
**To prevent unintended motor start:**

- **Disconnect the frequency converter from the mains.**
- **Press [Off/Reset] on the LCP before programming parameters.**
- **Completely wire and assemble the frequency converter, motor, and any driven equipment before connecting the frequency converter to AC mains, DC supply, or load sharing.**

**⚠WARNING**

**DISCHARGE TIME**

**The frequency converter contains DC-link capacitors that can remain charged even when the frequency converter is not powered. Failure to wait the specified time after power has been removed before performing service or repair work, can result in death or serious injury.**

- **Stop the motor.**
- **Disconnect the AC mains and remote DC-link supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters.**
- **Disconnect or lock the PM motor.**
- **Wait for the capacitors to discharge fully before performing any service or repair work. The duration of waiting time is specified in the relevant frequency converter operating instructions, *Chapter 2 Safety*.**

**⚠WARNING**

**LEAKAGE CURRENT HAZARD**

**Leakage currents exceed 3.5 mA. Failure to ground the frequency converter properly can result in death or serious injury.**

- **Ensure the correct grounding of the equipment by a certified electrical installer.**

2

**⚠WARNING**

**EQUIPMENT HAZARD**

**Contact with rotating shafts and electrical equipment can result in death or serious injury.**

- **Ensure that only trained and qualified personnel perform installation, start-up, and maintenance.**
- **Ensure that electrical work conforms to national and local electrical codes.**
- **Follow the procedures in this manual.**

**⚠CAUTION**

**INTERNAL FAILURE HAZARD**

**An internal failure in the frequency converter can result in serious injury, when the frequency converter is not properly closed.**

- **Ensure that all safety covers are in place and securely fastened before applying power.**

# 3 Configuration

## 3.1 Configure the CANopen Network

### 3.1.1 Object Model



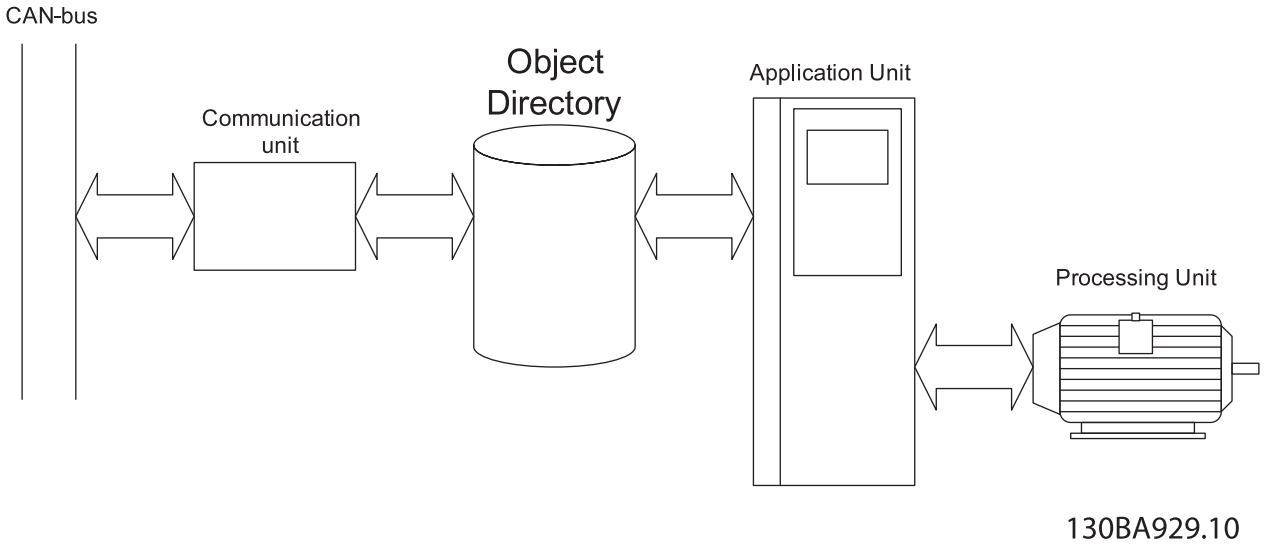



**Illustration 3.1 Functional Principle of CANopen Nodes**

All information accessible via the CAN-bus is stored in the object directory (OD).
The contents of the OD are organised in *Table 3.1*.

| Object directory index range | Object type |
|---|---|
| 0000h | Not used |
| 0001h–025Fh | Data types |
| 0260h–0FFFh | Reserved |
| 1000h–1FFFh | Communication object area |
| 2000h–5FFFh | Manufacturer-specific area |
| 6000h–9FFFh | Standardised device profile area |
| A000h–FFFFh | Reserved |

**Table 3.1 Contents of the OD**

For a complete overview of the supported objects in the OD, refer to *chapter 7 Object Directory*.

### 3.1.2 Communication in CANopen

Communication with the frequency converter in CANopen is achieved via service data objects (SDOs), process data objects (PDOs), and network management (NMT).

PDOs represent real-time process data with high priority. PDOs are only available if the node is in operational state.

SDOs represent non-time-critical data and are used to configure the frequency converter. SDOs are only available if node is in both operational and pre-operational state.

NMT functions monitor the network stability and include synchronisation, detection of faults, and emergency message transmission.

**COB-Identifiers (ID)**
Each communication object has a unique identity (COB-ID) comprising the function code and the node ID (node address), see *Illustration 3.2*.

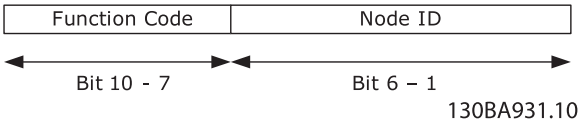



**Illustration 3.2 COB-ID**

3

| Object | Function code (binary) | Resulting COB-ID | Communication parameter in OD |
|---|---|---|---|
| NMT | 0000 | 0 | – |
| SYNC | 0001 | 125 | (1005h) |
| Time stamp | 0010 | 256 | – |
| EMERGENCY | 0001 | 129 (81h)–255 (FFh) | 1014h |
| PDO1 (tx) | 0011 | 385 (181h)–511 (1FFh) | 1800h |
| PDO1 (rx) | 0100 | 513 (201h)–639(27Fh) | 1400h |
| PDO2 (tx) | 0101 | 641 (281h)–767(2FFh) | 1801h |
| PDO2 (rx) | 0110 | 769 (301h)–895 (37Fh) | 1401h |
| PDO3 (tx) | 0111 | 897 (381h)–1023 (3FFh) | 1802h |
| PDO3 (rx) | 1000 | 1025 (401h)–1151 (47Fh) | 1402h |
| PDO4 (tx) | 1001 | 1153 (481h)–1279 (4FFh) | 1803h |
| PDO4 (rx) | 1010 | 1281 (501h)–1407 (57Fh) | 1403h |
| SDO (tx) | 1011 | 1409 (581h)–1535 (5FFh) | 1200h – ... |
| SDO (rx) | 1100 | 1537 (601h)–1663 (67Fh) | 1200h – ... |
| NMT error control (Nodeguarding) | 1110 | 1793 (701h)–1919 (77Fh) | 1016h, 1017h (100Eh) |

**Table 3.2 Communication Object**

Transmit and receive is always seen from the node's point of view:

- RX = Nodes receiving data (Controller -> node)
- TX = Nodes transmitting data (node -> controller)

**Example:**

- COB-ID 383 = PDO3 transmit, from node address 3.
- COB-ID 185 = PDO1 transmit, from node address 5.
- COB-ID 604 = SDO receive, to node address 4.

## 3.1.3 Controlling the Network

In each CANopen node, a state machine controls the different states of the node.
After power-up, the node transmits a boot-up message with the COB-ID: 700h + Node ID, and goes from initialisation to pre-operational state.
In this state, SDO communication is possible, but not PDO communication.

The node must have a start network-command from an NMT-master to enter the operational state.
In operational state, both SDO and PDO communication are possible.

The NMT-state of the node is displayed with the green NS LED:

- Flashing = Pre-operational.
- Solid on = Operational.
- Single flash = Stopped.

A reset node or reset communication-command from the NMT-master makes the node jump to initialisation state and directly on to pre-operational state.

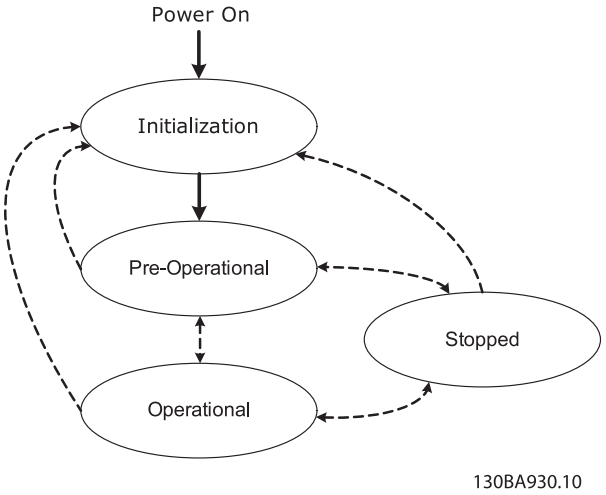



**Illustration 3.3 Controlling the Network**

## 3.1.4 Error Control

CANopen offers 2 ways of error-control: Node guarding and Heartbeat.

In node guarding, the NMT-master sends a remote-frame (RTR) cyclically: 700 + node ID.
The node replies with its actual status.
The node (frequency converter) monitors the reception of the RTR-frames, and thereby monitors the presence of the NMT-master.
Configure the monitoring of the NMT-master via:

- OD: 100C Guard time in [ms].
- OD: 100D Life time factor.

If *Guard Time x Life Time Factor* has expired, the action programmed in the *parameter 8-04 Control Word Timeout Function* is executed.

The option can also be configured as heartbeat producer via:

- OD: 1017 *Producer Heartbeat time* [ms].

The MCA 105 option continuously transmits heartbeats (RTRs with the frequency converters actual status) that can be monitored by, for example, an NMT-master.

## NOTICE

**The MCA105 option does not support the heartbeat consumer function.**

**Emergency object (EMCY)**
The emergency object is used to signal error states, and is sent automatically if an alarm in the frequency converter occurs containing the data described in the following. If the alarm is removed, another emergency telegram is sent out with the contents 0, signalling the end of the frequency converter's alarm state.

Configure the behaviour of the EMCY object via *parameter 8-07 Diagnosis Trigger*.

If *parameter 8-07 Diagnosis Trigger* is set to *[0] Disable*, the EMCY is not sent at all. If it is set to *Trigger alarms*, it is sent if an alarm occurs. If it is set to *Trigger alarms and warnings*, it is sent if an alarm or a warning occurs.

OD 1014h contains the COB-ID of the node's EMCY message. This is fixed to 80h + node ID.

The EMCY always consists of 8 bytes with the full data as described in *Table 3.3*.

| Byte 0 | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 |
|---|---|---|---|---|---|---|---|
| EMCY code* (OD: 1003 [1]) | | OD: 1001h | Vendor-specific information | | | | |

**Table 3.3 EMCY Consists of 8 Bytes with the Full Data**

*= For more information on EMCY codes, refer to *chapter 8 Troubleshooting*.

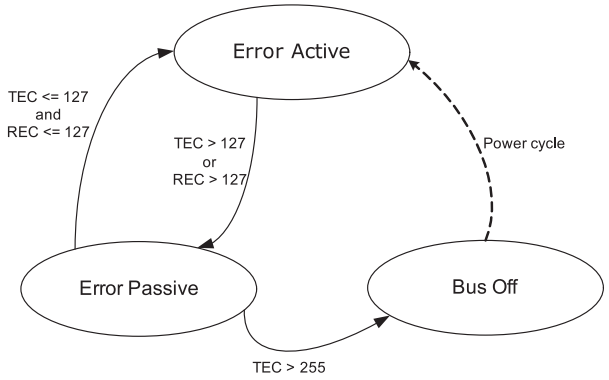
| | |
|---|---|
| Bit 0 | 1, alarm word 1 has an active alarm (parameter 16-90) |
| Bit 1 | 1, alarm word 2 has an active alarm (parameter 16-91) |
| Bit 2 | 0, Reserved |
| Bit 3 | 1, warning word 1 has an active warning (parameter 16-92) |
| Bit 4 | 1, warning word 2 has an active warning (parameter 16-93) |
| Bit 5–7 | 0, reserved |

**Table 3.4 Byte 3 Description**

**Bus error counters**
The frequency converter contains 2 CAN-bus error counters:

- *Parameter 10-05 Readout Transmit Error Counter* (TEC).
- *Parameter 10-06 Readout Receive Error Counter* (REC).

These counters determine the error-state of the CANopen node.




130BA932.10

**Illustration 3.4 Bus Error Counters**

TEC is incremented with 8 if a transmit-error occurs and decremented with 1 if a transmission is successful.
REC is incremented with 1 if a receive error is detected (8 if the transmitting node is in error active-mode) and decremented with 1 if a reception is successful.

In normal operation the node is in error active state.
If the TEC or REC exceeds the value: 127, the node enters error passive state.
In Error passive state, the error-flag is not transmitted dominantly but recessively.
This means that an error passive node, as receiver, cannot block communication from other nodes.
A node in error passive state has a lower prioritised access to the bus.

If the TEC exceeds 255 (248 + 8), the node enters bus off state.
In bus off state, the MS LED turns solid red, and a warning 34 is issued.
Power-cycle the frequency converter to leave the bus off state.

3

### 3.1.5 SDO Communication

All CANopen objects and frequency converter parameters can be accessed via SDOs (service data objects).
For a description of supported SDO abort codes, refer to *chapter 8 Troubleshooting*.

| | COB-ID | |
|---|---|---|
| Transmit SDO | 1409 (581h)–1535 (5FFh) | 580h + Node ID |
| Receive SDO | 1537 (601h)–1663 (67Fh) | 600h + Node ID |

**Table 3.5 COB-ID's for SDO Communication**

| COB-ID | CS | OD-Index | | Sub-ind. | Data | | | |
|---|---|---|---|---|---|---|---|---|
| 600+ID | See following text | 01 | 20 | 00 | 00 | 00 | 00 | 00 |

**Table 3.6 Structure of a SDO-message (Request)**

The CS-field contains the command and response specifiers. See *Table 3.7* and *Table 3.8*.

| Command | CS |
|---|---|
| Write request 4 bytes | 23h |
| Write request 2 bytes | 2Bh |
| Write request 1 byte | 2Fh |
| Read request (any) | 40h |

**Table 3.7 Command**

| Response | CS |
|---|---|
| Write response (any) | 60h |
| Read response 4 bytes | 43h |
| Read response 2 bytes | 4Bh |
| Read response 1 byte | 4Fh |
| Error response | 80h |

**Table 3.8 Response**

**Saving OD entries**
In standard configuration, all parameters + OD entries are stored in volatile (RAM) memory only. To store current network configuration in non-volatile memory, use OD index 1010h.

To save parameters, write the value 65766173 (save) to the appropriated sub-index in OD: 1010h.

| OD index | Subindex | Description |
|---|---|---|
| 1010h | 0 | Number of entries |
| | 1 | Save all parameters + OD entries |
| | 2 | Save all communication parameters + OD entries |
| | 3 | Reserved |
| | 4 | Save edit set-up (Danfoss specific) |

**Table 3.9 Saving OD Entries**

**Restoring OD entries**
To restore factory defaults, use OD index 1011h.
To restore default parameters the value "**64616F6C**" (load) must be written to the appropriated sub-index in OD: 1011h

| OD index | Subindex | Description |
|---|---|---|
| 1011h | 0 | Number of entries |
| | 1 | Restore all parameters + OD entries* |
| | 2 | Restore all communication parameters + OD entries and restart |

**Table 3.10 Restoring OD Entries**

** requires power cycle*

***NOTICE***

**Frequency converter displays Alarm 80 "Drive initialised" after restores.**

## 3.2 Configure the Master

### 3.2.1 EDS File

A large part area of the system configuration is the setting of application-related parameters. EDS (electronic data sheet) files simplify the setting up of most of the CANopen configurable parameters. The EDS file contains all supported communication-specific objects (OD 1000h + 1FFFh) and a selected number of manufacturer-specific objects (frequency converter parameters) in the OD range 2000h–5FFFh.

Danfoss provides a generic English EDS file covering all voltage and power sizes for off-line configuration.

Download the EDS file from *www.danfoss.com/BusinessAreas/DrivesSolutions/Softwaredownload/DDFieldbus_Setup_Files.htm*.

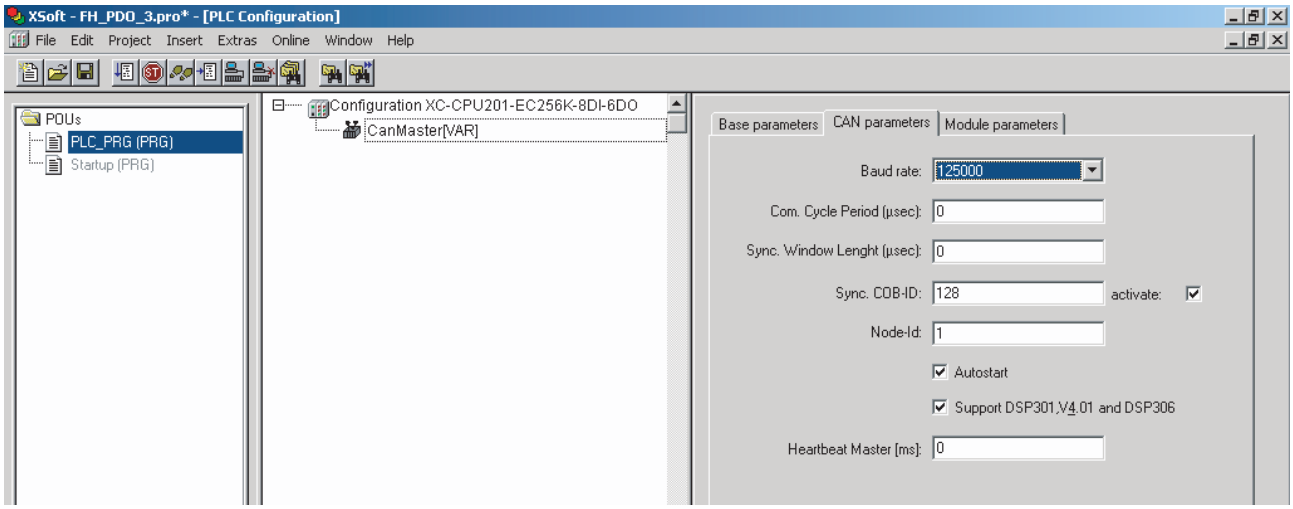
***NOTICE***

**The EDS files do not contain all parameters but a selected, limited number of parameters with generic minimum, maximum, and default values.**

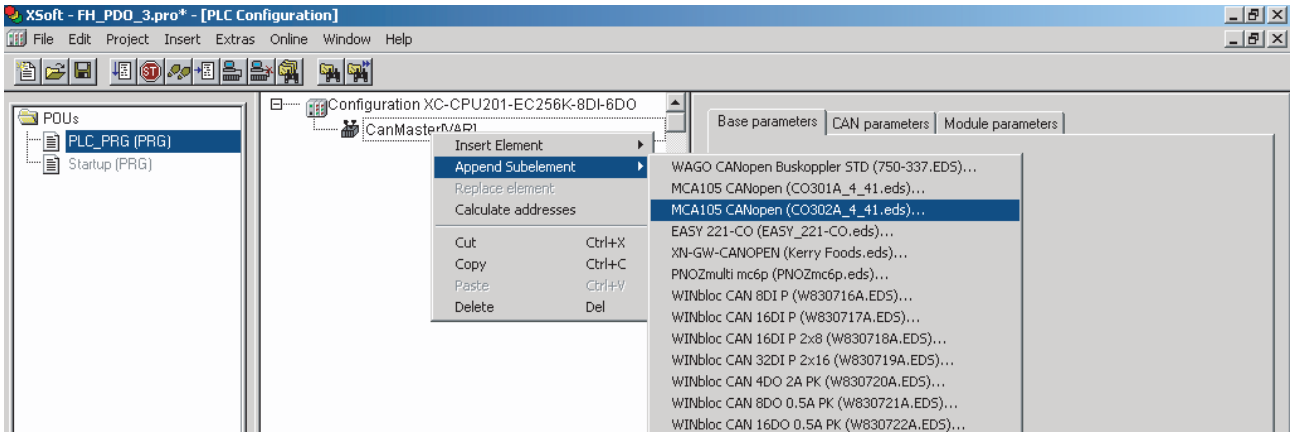
## 3.2.2 Configuring the CANopen Master

The following example shows the details in setting up the CANopen configuration on a Moeller XC-CPU201 PLC.




130BA935.10

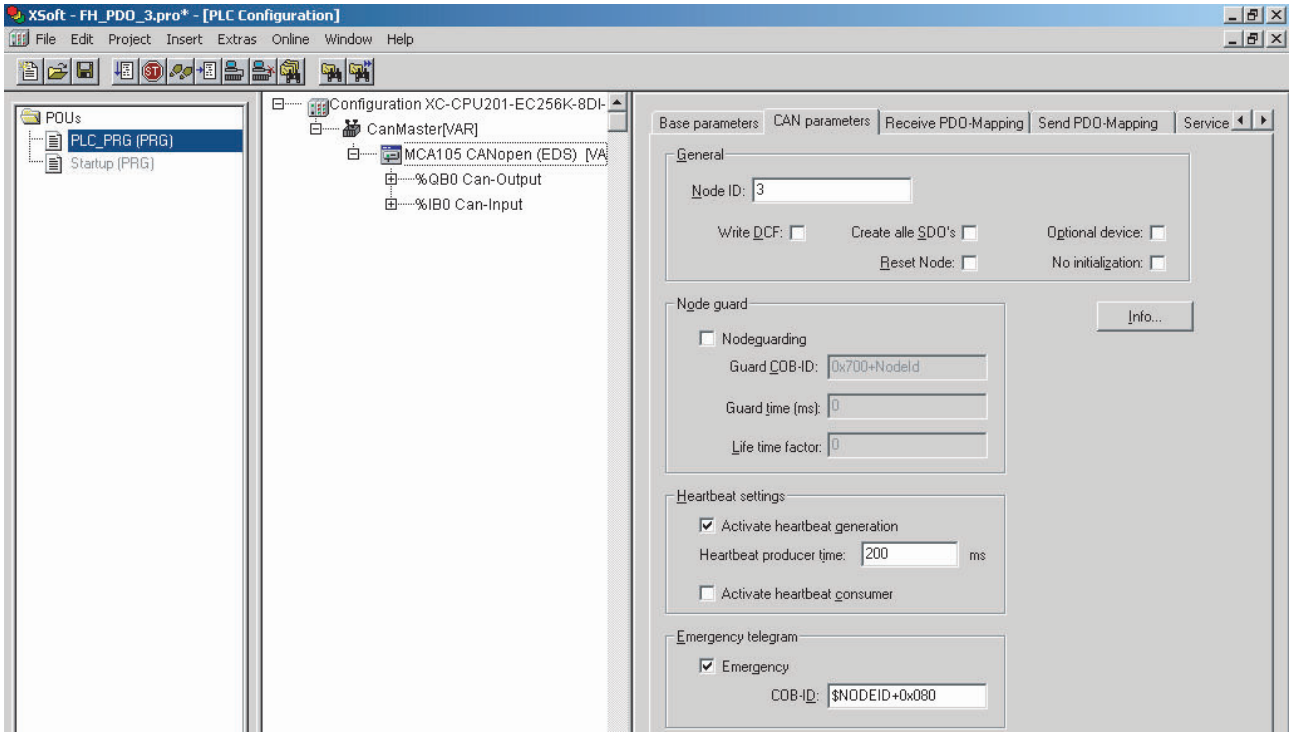
**Illustration 3.5 Setting up the Baud Rate and Node-ID on the CanMaster (CANopen Scanner)**




130BA936.10

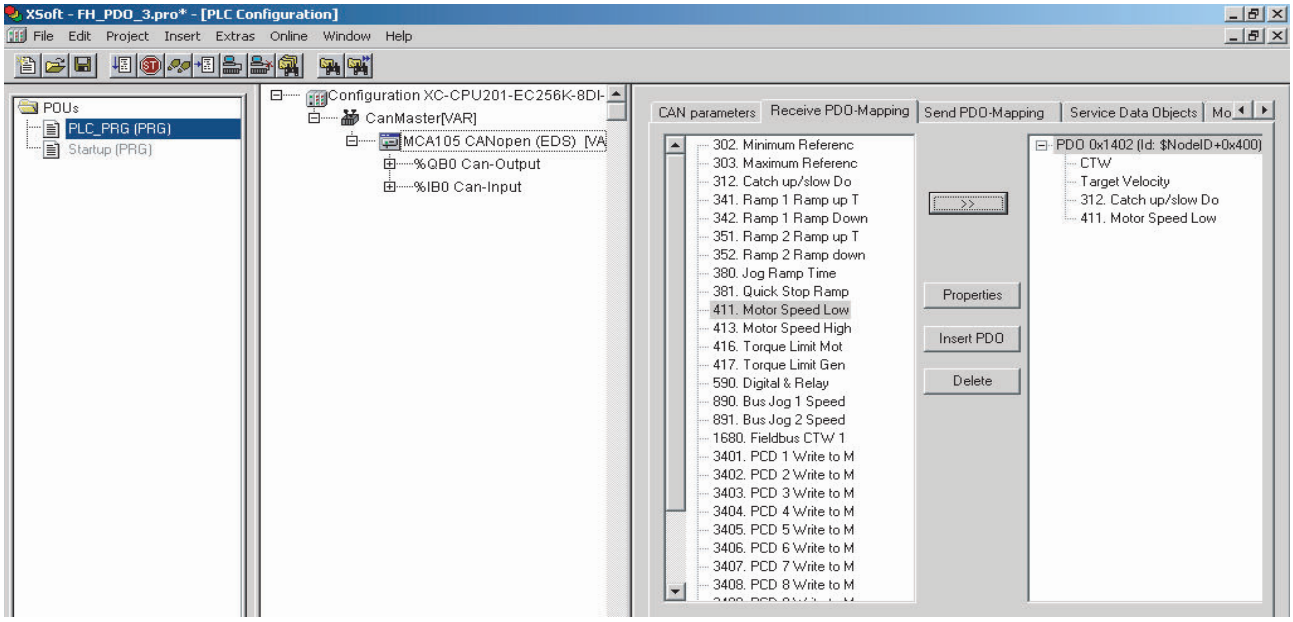
**Illustration 3.6 Appending a CANopen Node, from EDS File Library, by Rght-clicking CanMaster**




130BA937.10

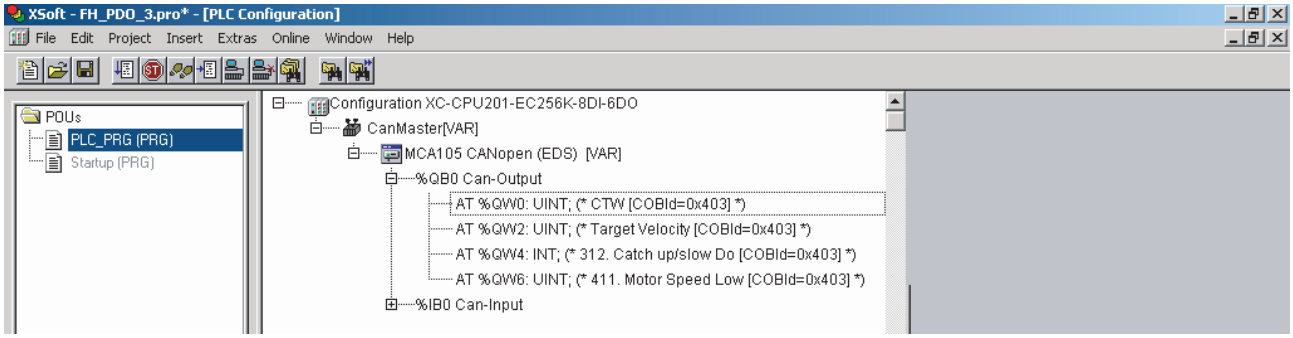
**Illustration 3.7 Configuring the CAN Parameters like Node-ID, Node-guarding, Heartbeat, and so on, on Node**




130BA938.10

**Illustration 3.8 Configuring Receive and Transmit PDO-mapping. Here PDO 1402 with *Parameter 3-12 Catch up/slow Down Value* and *Parameter 4-11 Motor Speed Low Limit [RPM]***




130BA939.10

**Illustration 3.9 PLC Memory Mapping**



## 3.3 Configure the Frequency Converter

### 3.3.1 Frequency Converter Parameters

Pay particular attention to the following parameters when configuring an VLT® AutomationDrive FC 300 with a CANopen interface. Refer to *chapter 6 Parameters* for more details about each parameter.

***Parameter 0-40 [Hand on] Key on LCP***
If the *[Hand On]* key on the frequency converter is pressed, control of the frequency converter via the CANopen interface is disabled.

***Parameter 8-02 Control Word Source***
After initial power-up, the frequency converter automatically detects whether a fieldbus option is installed in slot A, and sets *parameter 8-02 Control Word Source* to *[Option A]*. If an option is added to, changed in, or removed from an already commissioned frequency converter, it does not change *parameter 8-02 Control Word Source*.

***Parameter 8-10 Control Word Profile***
Select between the Danfoss FC Profile and the DSP 402 profile for CANopen. Refer to *chapter 4 Control*.

***Parameter 8-01 Control Site* and *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select***
Refer to *chapter 4 Control*.
Selection of how to gate the CANopen control commands with digital input command of the control card.
Set *Parameter 8-01 Control Site* to: *[2] Control word only*or *[0] Digital and ctrl. word*.

**NOTICE**

**When *parameter 8-01 Control Site* is set to *[2] Control word only*, the settings in *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select* are overruled, and all act on bus-control.**

***Parameter 8-03 Control Word Timeout Time* to *parameter 8-05 End-of-Timeout Function***
The reaction in the event of a bus timeout is set via these parameters:

- *Parameter 10-01 Baud Rate Select*
  Default is 125 kbps.
- *Parameter 10-02 MAC ID*
  Default is 127.

# 4 Control

## 4.1 PDO Communication

The real-time data transfer is performed by process data objects (PDO).
The PDOs correspond to entries in the device object dictionary and provide the interface to the application objects.



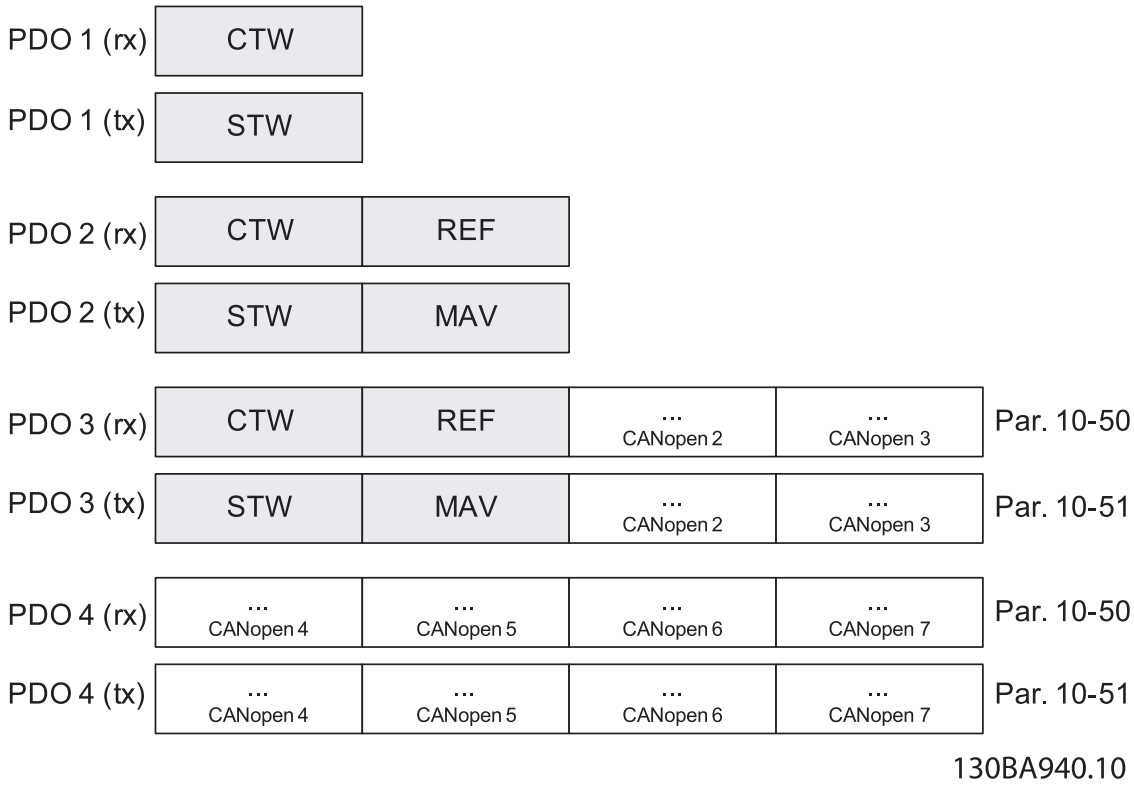



**Illustration 4.1 PDO Types**

***NOTICE***

**Control word (CTW), status word (STW), reference (REF), and Main Actual Value (MAV) are fixed in PDO type 1–3. PDO type 4 is free configurable.**

All receive and transmit PDOs can be configured via the OD.

Map process data into receive and transmit PDOs via *parameter 10-50 Process Data Config Write.* and *parameter 10-51 Process Data Config Read.* or via OD: 1600–1603 for receive PDOs and OD: 1A00–1A03 for transmit PDOs.

### 4.1.1 PDO Configuration

| Index | Name | Sub index | Description | | Value Sub index 2 | Transmission type |
|---|---|---|---|---|---|---|
| 1400h | 1st receive PDO (PDO 1) | 0 | Number of entries. | ⇒ | 1...240 | SYNC |
| 1401h | 2nd receive PDO (PDO 2) | 1 | COB ID. | ⇒ | 1...240 | SYNC |
| 1402h | 3rd receive PDO (PDO 3) | 2 | Transmission type. | ⇒ | 254...255 | COS |
| 1403h | 4th receive PDO (PDO 4) | | | ⇒ | 254...255 | COS |
| 1600h | 1st receive PDO mapping (PDO 1) COB-ID 201h–27Fh | 0 | Number of entries. | | | |
| | | 1 | 1st mapped object (60400010h control word, fixed) (*parameter 10-50 Process Data Config Write.* [0]) | | | |
| 1601h | 2nd receive PDO mapping (PDO 2) COB-ID 301h–37Fh | 0 | Number of entries | | | |
| | | 1 | 1st mapped object (60400010h control word, fixed) (*parameter 10-50 Process Data Config Write.* [0]) | | | |
| | | 2 | 2nd mapped object (60420010h target velocity, fixed) (*parameter 10-50 Process Data Config Write.* [1]) | | | |
| 1602h | 3rd receive PDO mapping (PDO 3) COB-ID 401h–47Fh | 0 | Number of entries. | | | |
| | | 1 | 1st mapped object (60400010h control word, fixed) (*parameter 10-50 Process Data Config Write.* [0]) | | | |
| | | 2 | 2nd mapped object (60420010h target velocity, fixed) (*parameter 10-50 Process Data Config Write.* [1]) | | | |
| | | 3 | 3rd mapped object (2000h + parameter number) (*parameter 10-50 Process Data Config Write.* [2]) | | | |
| | | 4 | 4th mapped object (2000h + parameter number) (*parameter 10-50 Process Data Config Write.* [3]) | | | |
| 1603h | 4th receive PDO mapping (PDO 4) COB-ID 501h–57Fh | 0 | Number of entries. | | | |
| | | 1 | 5th mapped object (2000h + parameter number) (*parameter 10-50 Process Data Config Write.* [4]) | | | |
| | | 2 | 6th mapped object (2000h + parameter number) (*parameter 10-50 Process Data Config Write.* [5]) | | | |
| | | 3 | 7th mapped object (2000h + parameter number) (*parameter 10-50 Process Data Config Write.* [6]) | | | |
| | | 4 | 8th mapped object (2000h + parameter number) (*parameter 10-50 Process Data Config Write.* [7]) | | | |

**Table 4.1 Receive PDO Configuration**

| Index | Name | Sub index | Description | | Value sub index 2 | Transmission type |
|---|---|---|---|---|---|---|
| | | 0 | Number of entries. | ⇒ | 0 | SYNC, non-cyclic |
| 1800h | 1st transmit PDO (PPO 1) | 1 | COB ID. | ⇒ | 0 | SYNC, non-cyclic |
| 1801h | 2nd transmit PDO (PPO 2) | 2 | Transmission type. | ⇒ | 1...240 | SYNC |
| 1802h | 3rd transmit PDO (PPO 3) | 3 | Inhibit time. | ⇒ | 1...240 | SYNC |
| 1803h | 4th transmit PDO (PPO 4) | 4 | Reserved. | ⇒ | 254...255 | COS |
| | | 5 | Event timer. | ⇒ | 254...255 | COS |
| 1A00h | 1st transmit PDO mapping (PDO 1) COB-ID 181h–1FFh | 0 | Number of entries. | | | |
| | | 1 | 1st mapped object (60410010h status word, fixed) (*parameter 10-51 Process Data Config Read.* [0]) | | | |
| 1A01h | 2nd transmit PDO mapping (PDO 2) COB-ID 281h–2FFh | 0 | Number of entries. | | | |
| | | 1 | 1st mapped object (60410010h status word, fixed) (*parameter 10-51 Process Data Config Read.* [0]) | | | |
| | | 2 | 2nd mapped object (60440010h control effort, fixed) (*parameter 10-51 Process Data Config Read.* [1]) | | | |
| 1A02h | 3rd transmit PDO mapping (PDO 3) COB-ID 381h–3FFh | 0 | Number of entries. | | | |
| | | 1 | 1st mapped object (60410010h status word, fixed) (*parameter 10-51 Process Data Config Read.* [0]) | | | |
| | | 2 | 2nd mapped object (60440010h control effort, fixed) (*parameter 10-51 Process Data Config Read.* [1]) | | | |
| | | 3 | 3rd mapped object (2000h + parameter number) (*parameter 10-51 Process Data Config Read.* [2]) | | | |
| | | 4 | 4th mapped object (2000h + parameter number) (*parameter 10-51 Process Data Config Read.* [3]) | | | |
| 1A03h | 4th transmit PDO mapping (PDO 4) COB-ID 481h–4FFh | 0 | Number of entries. | | | |
| | | 1 | 5th mapped object (2000h + parameter number) (*parameter 10-51 Process Data Config Read.* [4]) | | | |
| | | 2 | 6th mapped object (2000h + parameter number) (*parameter 10-51 Process Data Config Read.* [5]) | | | |
| | | 3 | 7th mapped object (2000h + parameter number) (*parameter 10-51 Process Data Config Read.* [6]) | | | |
| | | 4 | 8th mapped object (2000h + parameter number) (*parameter 10-51 Process Data Config Read.* [7]) | | | |

**Table 4.2 Transmit PDO Configuration**

### 4.1.2 PDO Mapping Syntax

Sub-index 1–4 contains the mapped objects.
Example: Object 6041 status word is fixed in PDO 1 and PDO 2 as the first transmit-word.
That is, OD 1A00h and 1A01h sub-index 1 holds the value of 60410010 (6041 = object number, 00 = sub-index, 10 = length of data = 16 bits)

Example: To map *parameter 16-14 Motor current* (32-bit data) in PDO 3, it must be mapped in 2 PDO-words.
*Parameter 16-14 Motor current* is according to manufacturer object 264E.
1A02h [3] = 264E0020 (264E = object number, 00 = sub-index, 20 = length of data = 32 bits)
1A02h [4] = 264E0020 (264E = object number, 00 = sub-index, 20 = length of data = 32 bits)

### 4.1.3 PDO Transmission Modes

Sub-index 2 contains the setting of the transmission mode.

The following PDO transmission modes are distinguished:

- Synchronous transmission.
- Asynchronous transmission.

### 4.1.4 PDO Triggering Modes

The CANopen communication profile distinguishes 2 message triggering modes:

- Event driven.
- Remotely requested.

**Event driven**
Message transmission is triggered by the occurrence of an object-specific event.
For synchronous PDOs, this is the expiration of the specified transmission period, synchronised by the reception of the SYNC object.

For acyclically transmitted synchronous PDOs and asynchronous PDO's, the triggering of a message transmission is an application-specific event specified in the device profile.

**Remotely requested**
The transmission of asynchronous PDO's may be initiated on receipt of a remote request initiated by another device.

| Transmission type | PDO transmission | | | | |
|---|---|---|---|---|---|
| | Cyclic | Acyclic | Synchronous | Asynchronous | RTR only |
| 0 | | x | x | | |
| 1–240 | x | | x | | |
| 241–251 | Reserved | | | | |
| 252 | Not supported | | | | |
| 253 | | | | | |
| 254 | | | | x | |
| 255 | | | | x | |

**Table 4.3 PDO Transmission**

### 4.1.5 Inhibit Time

Sub-index 3 contains the inhibit time.
This time defines a minimum interval for PDO transmission.
The value is defined as multiple of 0.1 ms.
Default value is 300 = 30 ms.
Minimum value is 0.
Maximum value is 32767 = 3.2 s.
Data length = 2 bytes.

### 4.1.6 Event Timer

Sub-index 5 contains the inhibit time for transmit PDOs.
If an event timer is configured for a TPDO (value not equal to 0), the elapsed timer causes the transmission of this TPDO.
The event timer can be configured as multiple of 1 ms.
Default value is 0.
Maximum value is 32767 = 32 s.
Data length = 2 bytes.

## 4.2 Control Profile

### 4.2.1 Control Word Profile 8–10

| 8–10 Control Profile | | |
|---|---|---|
| In *parameter 8-10 Control Word Profile*, it is possible to select: | | |
| **Option:** | | **Function:** |
| [0] * | FC profile | |

4

### 4.2.2 DSP 402 State Transitions

| 8–10 Control Profile | | |
|---|---|---|
| In *parameter 8-10 Control Word Profile*, it is possible to select: | | |
| **Option:** | | **Function:** |
| [5] | CANopen DSP | |

*[0] FC Profile* is the default control profile for VLT frequency converters, whereas *[5] CANopen DSP 402* is the CiA standardised control profile, featuring the special DSP 402 transition state machine.

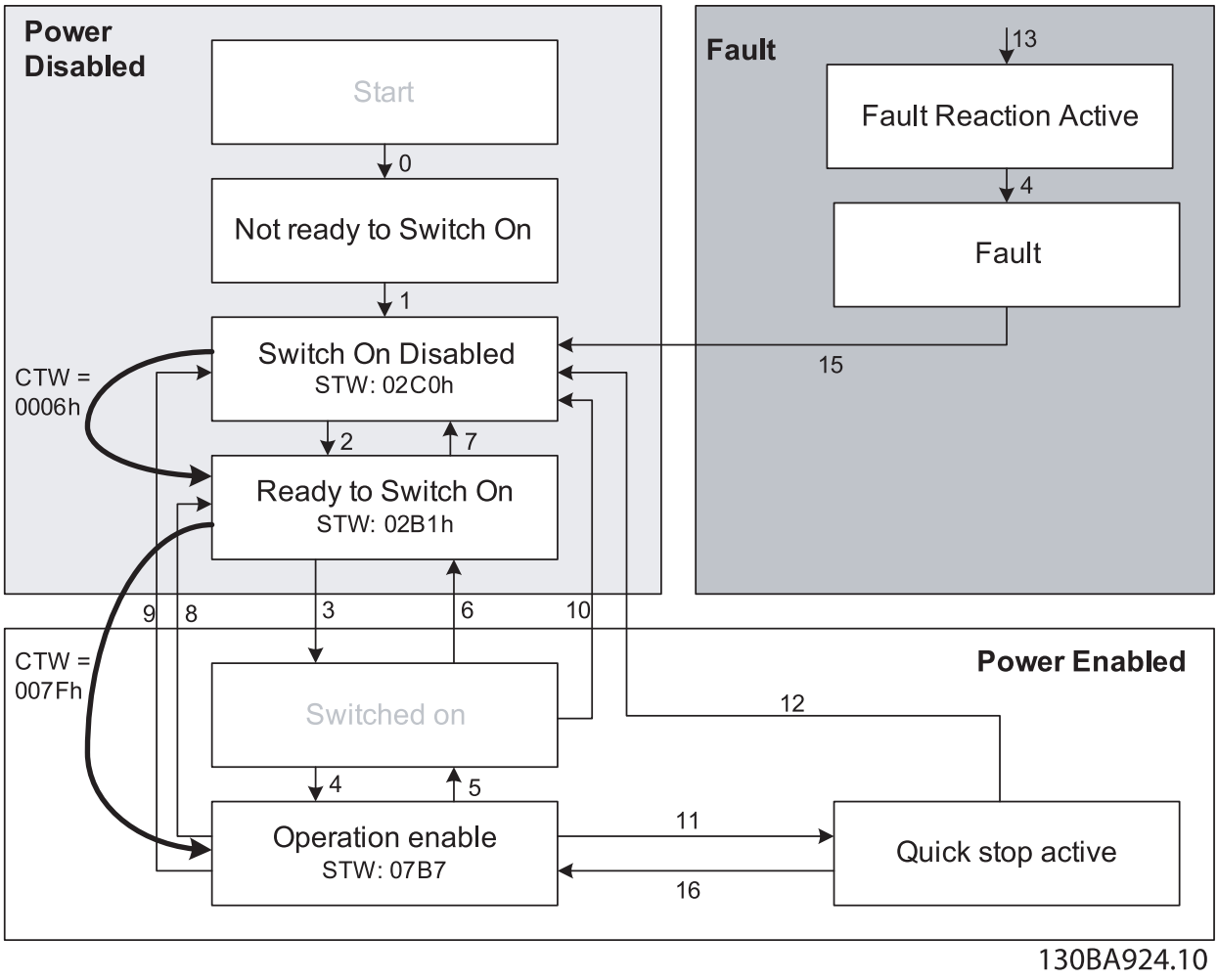



**Illustration 4.2 DSP 402 State Machine**

| Transition | State | Control word | Status word | Action |
|---|---|---|---|---|
| – | Start condition | 0000 | 0000 | |
| 0 | Start-up⇒Not ready to switch on | 0000 | 0200 | |
| 1 | Not ready to switch on⇒ Switch on disabled | 0000, 0001 | 0240 | |
| 2 | Switch on disable⇒Ready to switched on | 0006 | 0231 | |
| 3 | Ready to switch on⇒Switched on | 0007 | 0233 | |
| 4 | Switched on⇒Operation enabled | 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 | The power section is switched off immediately, and the motor is free to rotate if unbraked. |
| 9 | Operation enable⇒Switch on disable | 0001, 0000 | 0240 | The power section is switched off immediately, and the motor is free to rotate if unbraked. |
| 10 | Switched on⇒Switched on disable | 0001, 0000 | 0240 | The power section is switched off immediately, and the motor is free to rotate if unbraked. |
| 11 | Operation enabled⇒Quick stop active | 0002 | 0207 | The motor ramps to 0 RPM with programmed quick-ramp parameter. |
| 12 | Quick stop activ⇒Switch on disabled | 0001, 0000 | 0240 | The power section is switched off immediately, and the motor is free to rotate if unbraked. |
| 13 | All states⇒Fault reaction active | xxxx | 023F | |
| 14 | Fault reaction active⇒Fault | xxxx | 023F (0238 by InterBus) | |
| 15 | Fault⇒Switch on disabled | 0000 | 0240 | |
| 16 | Quick stop active⇒Operation enable (not supported) | | | |

**Table 4.4 DSP 402 State Transitions**

## 4.3 DSP 402 Control Profile

### 4.3.1 Control Word According to DSP 402 Profile (parameter 8-10 = DSP 402 profile)

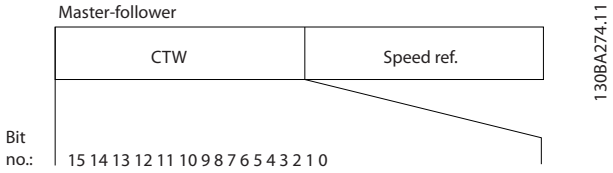



**Illustration 4.3 Control Word**

| 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 | Reserved | |
| 09 | Reserved | |
| 10 | Reserved | |
| 11 | Jog 1 OFF | Jog 1 ON |
| 12 | Reserved | |
| 13 | Setup select (LSB) | |
| 14 | Setup select (MSB) | |
| 15 | Forward | Reversing |

**Table 4.5 Control Bits**

**Explanation of the control bits**

**Bit 00, Switch off/on:**
Bit 00 = 0 executes transition 2, 6, or 8.
Bit 00 = 1 executes transition 3.

**Bit 01, Disable/enable voltage:**
Bit 01 = 0 executes transition 9, 10, or 12.
Bit 01 = 1 enables voltage.

**Bit 02, Quick stop/run:**
Bit 02 = 0 execute transition 7, 10, or 11.
Bit 02 = 1 Quick stop not active.

**Bit 03, Disable/enable operation:**
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.

**Bit 05, Freeze output frequency/run enable:**
Bit 05 = 0 means that the given output frequency is maintained even if the reference is changed.
Bit 05 = 1 means that 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 A start command to the frequency converter is given.

**Bit 07, No function/reset:**
Reset of trip.
Bit 07 = 0 means that there is no reset.
Bit 07 = 1 means that 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* (bus jog 1).
Jog 1 is only possible if bit 04 = 0, and bits 00–03 = 1.

**Bit 12:**
Danfoss reserved.

**Bits 13/14, Selection of setup:**
Bits 13 and 14 are used for selecting among the 4 menu set-ups in accordance with *Table 4.6*.

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

**Table 4.6 4 Menu Set-ups**

**Bit 15, Forward/reversing:**
Bit 15 = "0" leads to no reversing.
Bit 15 = "1" leads to reversing.

***NOTICE***

**In factory setting, reversing is set to *[0] Digital input* in *parameter 8-54 Reversing Select*.**

### 4.3.2 Status Word According to DSP 402 Profile

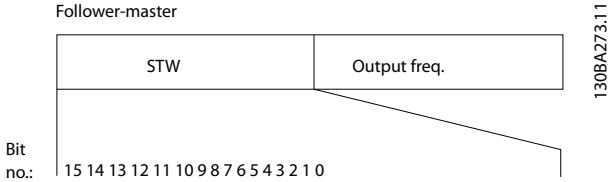



**Illustration 4.4 Status Word**

| 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 | Reserved | |
| 09 | Remote disabled | Remote enabled |
| 10 | Setpoint not reached | Setpoint reached |
| 11 | Speed limit not active | Speed limit active |
| 12 | Reserved | |
| 13 | Reserved | |
| 14 | Not running | Running |
| 15 | Reserved | |

**Table 4.7 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.

**Bit 01, Switch off/switch on:**
Bit 00 = 0 state less than switched on.
Bit 00 = 1 state at least = switched on.

**Bit 02, Operation disable/operation enable:**
Bit 00 = 0 state less than operation enable.
Bit 00 = 1 state at least = operation enable.

**Bit 03, No fault/trip:**
Bit 03 = 0 means that the frequency converter is not in a fault condition.
Bit 03 = 1 means that the frequency converter has tripped and needs a reset signal to run.

**Bit 04, Voltage disable/voltage enable:**
Bit 04 = 0 means that control word bit 01 = 1.
Bit 04 = 1 means that control word bit 01 = 0.

**Bit 05, Quick stop/run:**
Bit 05 = 0 means that control word bit 02 = 1.
Bit 05 = 1 means that control word bit 02 = 0.

**Bit 06, Start enable/start disable:**
Bit 06 = 0 state is not switch on disable.
Bit 06 = 1 state is switch on enable.

**Bit 07, No warning/warning:**
Bit 07 = 0 means that there is no warning. situation.
Bit 07 = 1 means that a warning has occurred.

**Bit 08**
Danfoss reserved.

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

**Bit 10, Setpoint not reached/setpoint reached:**
Bit 10 = 0 means that the actual motor speed is different from the speed reference set. This can be the case while the speed is ramped up/down during start/stop.
Bit 10 = 1 means that the present motor speed equals the speed reference set.

**Bit 11, Speed limit not active/speed limit active:**
Bit 11 = 0 means that the output frequency is out of the range set in *parameter 4-11 Motor Speed Low Limit [RPM]*/ *parameter 4-12 Motor Speed Low Limit [Hz]* or *parameter 4-13 Motor Speed High Limit [RPM]*/ *parameter 4-14 Motor Speed High Limit [Hz]*.
Bit 11 = 1 means that 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 means that the motor is not running.
Bit 14 = 1 means that the frequency converter has a valid start signal or that the output frequency is greater than 0 Hz.

**Bit 15**
Danfoss reserved.



## 4.4 Danfoss FC control profile

### 4.4.1 Control Word according to FC Profile (parameter 8-10 = FC profile)

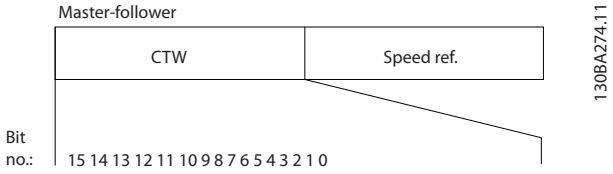



**Illustration 4.5 Control Word**

| 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 4.8 Control Bits**

**Explanation of the control bits**
**Bits 00/01**
Bits 00 and 01 are used to select between the 4 reference values, which are pre-programmed in *parameter 3-10 Preset Reference* according to *Table 4.9*.

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

**Table 4.9 Set-up**

**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 02, DC brake:**
Bit 02 = 0 leads to DC brake 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 release the motor (the output transistors are "shut off"), so that it coasts to a standstill.
Bit 03 = 1 enables the frequency converter to start the motor if the other starting conditions are 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 stop, in which the motor speed is ramped 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 then be changed only 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.

**NOTICE**

**If freeze output is active, the frequency converter can only be stopped by the following:**

- **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 are 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 signal's leading edge, for example, when changing from logic 0 to logic 1.

**Bit 08, Jog:**
Bit 08 = 1 causes the output frequency to be determined by *parameter 3-19 Jog Speed [RPM]*.

**Bit 09, Selection of ramp 1/2:**
Bit 09 = 0 means that 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 means that 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 the control word is to be used or ignored.
Bit 10 = 0 causes the control word to be ignored.
Bit 10 = 1 causes the control word to be used. This function is relevant, because the control word is always contained in the telegram, regardless of which type of telegram is used, for example, it is possible to turn off the control word if it is not to be used it with updating or reading parameters.

**Bit 11, Relay 01:**
Bit 11 = 0 Relay 01 is not activated.
Bit 11 = 1 Relay 01 activated, provided control word bit 11 is selected in *parameter 5-40 Function Relay*.

**Bit 12, Relay 04:**
Bit 12 = 0 Relay 04 is not activated.
Bit 12 = 1 Relay 04 is activated, provided control word bit 12 has been selected in *parameter 5-40 Function Relay*.

**Bit 13/14, Selection of set-up:**
Bits 13 and 14 are used to select from the four menu set-ups according to *Table 4.10*.

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

**Table 4.10 Selection of Set-up**

The function is only possible when *[9] Multi set-ups* are selected in *parameter 0-10 Active 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 causes no reversing.
Bit 15 = 1 causes reversing.

***NOTICE***

**In the factory setting reversing is set to digital in *parameter 8-54 Reversing Select*.**
**Bit 15 causes reversing only when *Ser. communication*, *Logic or*, or *Logic and* is selected.**

## 4.4.2 Status Word according to FC Profile (parameter 8-10 = FC profile)

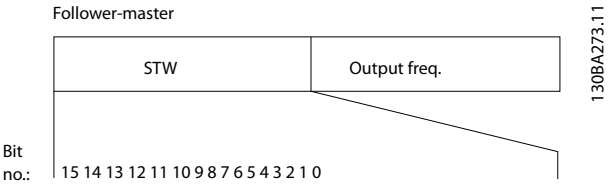



**Illustration 4.6 Status Word**

| 'Bit | Bit value = 0 | Bit value = 1 |
|---|---|---|
| 00 | Control not ready | Control ready |
| 01 | Frequency converter not ready | Frequency converter ready |
| 02 | Coasting | Enable |
| 03 | No error | Trip |
| 04 | No error | Error (no trip) |
| 05 | Reserved | - |
| 06 | No error | Trip lock |
| 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, auto start |
| 13 | Voltage ok | Voltage exceeded |
| 14 | Torque ok | Torque exceeded |
| 15 | Timer ok | Timer exceeded |

**Table 4.11 Status Bits**

4

**Explanation of the status bits**

**Bit 00, Control not ready/ready:**
Bit 00 = 0 means that the frequency converter has tripped.
Bit 00 = 1 means that the frequency converter controls are ready, but that 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 = 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 means that the frequency converter is not in fault mode.
Bit 03 = 1 means that 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 means that the frequency converter is not in fault mode.
Bit 04 = 1 means that 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 means that the frequency converter is not in fault mode.
Bit 06 = 1 means that the frequency converter is tripped, and locked.

**Bit 07, No warning/warning:**
Bit 07 = 0 means that there are no warnings.
Bit 07 = 1 means that a warning has occurred.

**Bit 08, Speed ≠ reference/speed = reference:**
Bit 08 = 0 means that the motor is running, but that the present speed is different from the preset speed reference. It might, for example, be the case while the speed is being ramped up/down during start/stop.
Bit 08 = 1 means that the present motor present speed matches the preset speed reference.

**Bit 09, Local operation/bus control:**
Bit 09 = 0 means that [STOP/RESET] is pressed 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 means that it is possible to control the frequency converter via the fieldbus/ serial communication.

**Bit 10, Out of frequency limit:**
Bit 10 = 0 if 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 means that the output frequency is within the defined limits.

**Bit 11, No operation/in operation:**
Bit 11 = 0 means that the motor is not running.
Bit 11 = 1 means that the frequency converter has a start signal or that the output frequency is greater than 0 Hz.

**Bit 12, Frequency converter OK/stopped, auto start:**
Bit 12 = 0 means that there is no temporary overtemperature on the inverter.
Bit 12 = 1 means that the inverter has stopped because of overtemperature, but that the unit has not tripped and will resume operation once the overtemperature stops.

**Bit 13, Voltage OK/limit exceeded:**
Bit 13 = 0 means that there are no voltage warnings.
Bit 13 = 1 means that the DC voltage in the frequency converter's DC link is too low or too high.

**Bit 14, Torque OK/limit exceeded:**
Bit 14 = 0 means that the motor current is lower than the torque limit selected in *parameter 4-18 Current Limit*.
Bit 14 = 1 means that the torque limit in *parameter 4-18 Current Limit* has been exceeded.

**Bit 15, Timer OK/limit exceeded:**
Bit 15 = 0 means that the timers for motor thermal protection and frequency converter thermal protection, respectively, have not exceeded 100%.
Bit 15 = 1 means that 1 of the timers has exceeded 100%.

## 4.5 Reference Handling

In both FC profile and CANopen DSP 402, the reference is scaled as a normalised relative value in percent. The value is transmitted in hexadecimal:

- 0% = 0 hex.
- 100% = 4000 hex.
- -100% = C000 hex.

Depending of the setting of *parameter 3-00 Reference Range*, the reference is scaled from – Maximum to + Maximum or from Minimum to Maximum.

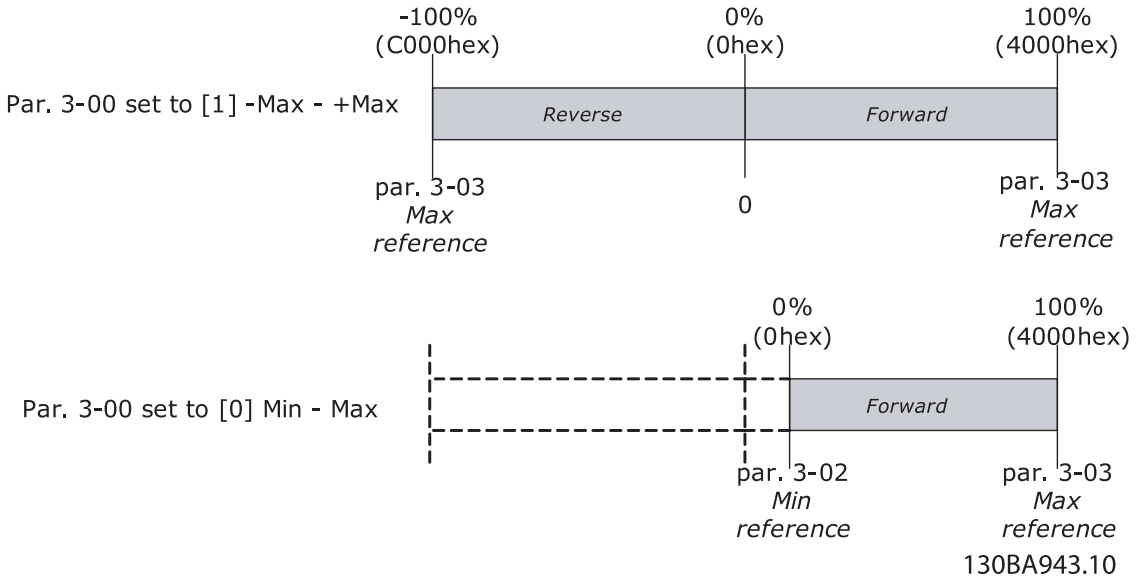



**Illustration 4.7 Reference Handling**

The actual reference [Ref. %] in the frequency converter depends on the settings in the following parameters:

- *Parameter 1-23 Motor Frequency*.
- *Parameter 1-25 Motor Nominal Speed*.
- *Parameter 3-02 Minimum Reference*.
- *Parameter 3-03 Maximum Reference*.

All references provided to the frequency converter are added to the total reference value.
If a reference is to be controlled by the fieldbus only, ensure that all other reference inputs are 0.

This means that digital and analog input terminals should not be used for reference signals.
Maintain the default setting (0%) for preset references in *parameter 3-10 Preset Reference*.

If the bus speed reference is negative, and the control word contains a run reverse signal, the frequency converter runs clockwise (- - is +).

MAV is scaled in the same way as the reference.

# 5 Parameter Access

## 5.1 Danfoss Specific Objects (2000h-5FFFh)

All frequency converter parameters are accessible as OD-entries:
**OD index = Frequency converter parameter + 2000h.**

| Frequency converter parameter | CANopen OD index |
|---|---|
| 1 | 2001h |
| 2 | 2002h |
| ... | ... |
| 0-10 | 200Ah |
| 0-11 | 200Bh |
| ... | ... |
| 1-00 | 2064h |
| 1-01 | 2065h |
| ... | ... |
| 10-00 | 23E8h |
| 10-01 | 23E9h |
| ... | ... |

**Table 5.1 Example of Converting of Frequency Converter Parameters**

Access the indexed parameters by accessing the appropriate subindex of the OD index.

# 6 Parameters



### 8-01 Control Site

| Option: | | Function: |
|---|---|---|
| | | The setting in this parameter overrides the settings in *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select*. |
| [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

| Option: | | Function: |
|---|---|---|
| | | ***NOTICE***<br>**This parameter cannot be adjusted while the motor runs.**<br><br>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*.<br>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 *parameter 8-04 Control Word Timeout Function* 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: |
|---|---|---|
| | | ***NOTICE***<br>**To change the set-up after a timeout, configure as follows:**<br>**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*.** |
| [0] | Off | Resumes control via fieldbus (fieldbus or standard), using the most recent control word. |
| [1] | Freeze output | Freezes output frequency until communication resumes. |
| [2] | Stop | Stops with auto restart when communication 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:<br>• Via the fieldbus.<br>• Via [Reset].<br>• 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 time-out function. |
| [8] | Select setup 2 | See *[7] Select set-up 1*. |
| [9] | Select setup 3 | 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: |
|---|---|---|
| [10] | Select setup 4 | See *[7] Select set-up 1*. |
| [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:<br>• *[7] Set-up 1*.<br>• *[8] Set-up 2*.<br>• *[9] Set-up 3*.<br>• *[10] Set-up 4*. |
| [0] | Hold set-up | Retains the set-up selected in *parameter 8-04 Control Timeout Function* and shows 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

| Option: | | Function: |
|---|---|---|
| | | This parameter enables and controls the frequency converter diagnosis function and permits expansion of the diagnosis data to 24 byte.<br>***NOTICE***<br>**This is only valid for Profibus.** |

### 8-07 Diagnosis Trigger

| Option: | | Function: |
|---|---|---|
| | | • *[0] Disable*: Do not send extended diagnosis data even if they appear in the frequency converter.<br>• *[1] Trigger on alarms*: Send extended diagnosis data when one or more alarms appear in alarm *parameter 16-90 Alarm Word* or *parameter 9-53 Profibus Warning Word*.<br>• *[2] Trigger alarms/warn.*: Send extended diagnosis 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*.<br>The content of the extended diagnosis frame is as follows: |

| Byte | Content | Description |
|---|---|---|
| 0 - 5 | Standard DP Diagnose Data | Standard DP Diagnose Data |
| 6 | PDU length xx | Header of extended diagnostic data |
| 7 | Status type = 0x81 | Header of extended diagnostic data |
| 8 | Slot = 0 | Header of extended diagnostic data |
| 9 | Status info = 0 | Header of extended diagnostic data |
| 10 - 13 | VLT *parameter 16-92 Warning Word* | VLT warning word |
| 14 - 17 | VLT *parameter 16-03 Status Word* | VLT status word |
| 18 - 21 | VLT *parameter 16-90 Alarm Word* | VLT alarm word |
| 22 - 23 | VLT *parameter 9-53 Profibus Warning Word* | Communication warning word (Profibus) |

**Table 6.1**

Enabling diagnosis may cause increased bus traffic. Diagnosis functions are not supported by all fieldbus types.

| | | |
|---|---|---|
| [0] * | Disable | |

### 8-07 Diagnosis Trigger

| Option: | | Function: |
|---|---|---|
| [1] | Trigger on alarms | |
| [2] | Trigger alarm/ warn. | |

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

### 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. For guidelines in selection of *[0] Frequency converter profile* and *[1] PROFIdrive profile*, refer to the *design guide* of the related product.

For more guidelines in the selection of *[1] PROFIdrive profile*, *[5] ODVA* and *[7] CANopen DSP 402*, see the *installation guide* for the installed fieldbus.

| Option: | | Function: |
|---|---|---|
| [0] * | FC profile | |
| [1] | PROFIdrive profile | |
| [5] | ODVA | |
| [7] | CANopen DSP 402 | |
| [8] | MCO | |

### 8-13 Configurable Status Word STW

| Option: | | 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*. |

### 8-13 Configurable Status Word STW

| Option: | | Function: |
|---|---|---|
| [2] | Alarm 68 Only | Only set in case of an Alarm 68. |
| [3] | Trip excl. Alarm 68 | Set in case of a trip, except if Alarm 68 executes the trip. |
| [10] | T18 DI status. | The bit indicates the status of terminal 18.<br>0 indicates that the terminal is low.<br>1 indicates that the terminal is high. |
| [11] | T19 DI status. | The bit indicates the status of terminal 19.<br>0 indicates that the terminal is low.<br>1 indicates that the terminal is high. |
| [12] | T27 DI status. | The bit indicates the status of terminal 27.<br>0 indicates that the terminal is low.<br>1 indicates that the terminal is high. |
| [13] | T29 DI status. | The bit indicates the status of terminal 29.<br>0 indicates that the terminal is low.<br>1 indicates that the terminal is high. |
| [14] | T32 DI status. | The bit indicates the status of terminal 32.<br>0 indicates that the terminal is low.<br>1 indicates that the terminal is high. |
| [15] | T33 DI status. | The bit indicates the status of terminal 33.<br>0 indicates that the terminal is low.<br>1 indicates that the terminal is high. |
| [16] | T37 DI status | The bit indicates the status of terminal 37.<br>0 indicates terminal 37 is low (Safe Torque stop).<br>1 indicates terminal 37 is high (normal). |
| [21] | Thermal warning | The thermal warning turns on when the temperature exceeds the limit in the motor, the frequency converter, the brake resistor, or the thermistor. |
| [30] | Brake fault (IGBT) | Output is logic 1 when the brake IGBT is 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. |
| [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. |

6

6

### 8-13 Configurable Status Word STW

| Option: | | Function: |
|---|---|---|
| [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 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 goes high. Otherwise, it is low. |
| [80] | SL Digital Output A | See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic 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 Output B | See *parameter 13-52 SL Controller Action*. The 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 Output C | See *parameter 13-52 SL Controller Action*. The input goes high whenever the smart logic action *[40] Set digital out C high* is executed. The input goes low whenever the smart logic action *[34] Set digital out C low* is executed. |
| [83] | SL Digital Output D | See *parameter 13-52 SL Controller Action*. The 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 Output E | See *parameter 13-52 SL Controller Action*. The 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 Output F | See *parameter 13-52 SL Controller Action*. The input goes high whenever the smart logic action *[43] Set digital out F high* is executed. |

### 8-13 Configurable Status Word STW

| Option: | | Function: |
|---|---|---|
| | | The input goes low whenever the smart logic action *[37] Set digital out F low* is executed. |

### 8-14 Configurable Control Word CTW

| Option: | | 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 *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 *parameter 1-00 Configuration Mode* is set to *[6] Surface Winder*, *[7] Extended PID Speed OL* or *[8] Extended PID Speed CL*. |
| [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 *parameter 7-50 Process PID Extended PID*. 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*. |

### 8-17 Configurable Alarm and Warningword

The configurable alarm and warning word has 16 bits (0-15). Each of those bits can be configured to any of the following options.

| Option: | | Function: |
|---|---|---|
| [0] * | Off | |
| [1] | 10 Volts low warning | |
| [2] | Live zero warning | |
| [3] | No motor warning | |
| [4] | Mains phase loss warning | |
| [5] | DC link voltage high warning | |
| [6] | DC link voltage low warning | |
| [7] | DC overvoltage warning | |

| 8-17 Configurable Alarm and Warningword | | |
|---|---|---|
| The configurable alarm and warning word has 16 bits (0-15). Each of those bits can be configured to any of the following options. | | |
| **Option:** | | **Function:** |
| [8] | DC undervoltage warning | |
| [9] | Inverter overloaded warning | |
| [10] | Motor ETR overtemp warning | |
| [11] | Motor thermistor overtemp warning | |
| [12] | Torque limit warning | |
| [13] | Over current warning | |
| [14] | Earth fault warning | |
| [17] | Controlword timeout warning | |
| [19] | Discharge temp high warning | |
| [22] | Hoist mech brake warning | |
| [23] | Internal fans warning | |
| [24] | External fans warning | |
| [25] | Brake resistor short circuit warning | |
| [26] | Brake powerlimit warning | |
| [27] | Brake chopper short circuit warning | |
| [28] | Brake check warning | |
| [29] | Heatsink temperature warning | |
| [30] | Motor phase U warning | |
| [31] | Motor phase V warning | |
| [32] | Motor phase W warning | |
| [34] | Fieldbus communication warning | |
| [36] | Mains failure warning | |
| [40] | T27 overload warning | |
| [41] | T29 overload warning | |
| [45] | Earth fault 2 warning | |
| [47] | 24V supply low warning | |
| [58] | AMA internal fault warning | |
| [59] | Current limit warning | |
| [60] | External interlock warning | |
| [61] | Feedback error warning | |
| [62] | Frequency max warning | |
| [64] | Voltage limit warning | |
| [65] | Controlboard overtemp warning | |
| [66] | Heatsink temp low warning | |
| [68] | Safe stop warning | |
| [73] | Safe stop autorestart warning | |
| [76] | Power unit setup warning | |
| [77] | Reduced powermode warning | |
| [78] | Tracking error warning | |
| [89] | Mech brake sliding warning | |
| [163] | ATEX ETR cur limit warning | |
| [165] | ATEX ETR freq limit warning | |
| [10002] | Live zero error alarm | |
| [10004] | Mains phase loss alarm | |
| [10007] | DC overvoltage alarm | |
| [10008] | DC undervoltage alarm | |
| [10009] | Inverter overload alarm | |
| [10010] | ETR overtemperature alarm | |
| [10011] | Thermistor overtemp alarm | |

| 8-17 Configurable Alarm and Warningword | | |
|---|---|---|
| The configurable alarm and warning word has 16 bits (0-15). Each of those bits can be configured to any of the following options. | | |
| **Option:** | | **Function:** |
| [10012] | Torque limit alarm | |
| [10013] | Overcurrent alarm | |
| [10014] | Earth fault alarm | |
| [10016] | Short circuit alarm | |
| [10017] | CTW timeout alarm | |
| [10022] | Hoist brake alarm | |
| [10026] | Brake powerlimit alarm | |
| [10027] | Brakechopper shortcircuit alarm | |
| [10028] | Brake check alarm | |
| [10029] | Heatsink temp alarm | |
| [10030] | Phase U missing alarm | |
| [10031] | Phase V missing alarm | |
| [10032] | Phase W missing alarm | |
| [10033] | Inrush fault alarm | |
| [10034] | Fieldbus com faul alarm | |
| [10036] | Mains failure alarm | |
| [10037] | Phase imbalance alarm | |
| [10038] | Internal fault | |
| [10039] | Heatsink sensor alarm | |
| [10045] | Earth fault 2 alarm | |
| [10046] | Powercard supply alarm | |
| [10047] | 24V supply low alarm | |
| [10048] | 1.8V supply low alarm | |
| [10049] | Speed limit alarm | |
| [10060] | Ext interlock alarm | |
| [10061] | Feedback error alarm | |
| [10063] | Mech brake low alarm | |
| [10065] | Controlboard overtemp alarm | |
| [10067] | Option config changed alarm | |
| [10068] | Safe stop alarm | |
| [10069] | Powercard temp alarm | |
| [10073] | Safestop auto restart alarm | |
| [10074] | PTC thermistor alarm | |
| [10075] | Illegal profile alarm | |
| [10078] | Tracking error alarm | |
| [10079] | Illegal PS config alarm | |
| [10081] | CSIV corrupt alarm | |
| [10082] | CSIV param error alarm | |
| [10084] | No safety option alarm | |
| [10090] | Feedback monitor alarm | |
| [10091] | AI54 settings alarm | |
| [10164] | ATEX ETR current lim alarm | |
| [10166] | ATEX ETR freq limit alarm | |



6

### 8-19 Product Code

| Range: | | Function: |
|---|---|---|
| Size related* | [0 - 2147483647] | Select 0 to read out the actual fieldbus product code according to the mounted fieldbus option. Select 1 to read out the actual vendor ID. |

### 8-46 BTM Transaction Status

| Option: | | Function: |
|---|---|---|
| [0] * | Off | |
| [1] | Transaction Started | |
| [2] | Transaction Comitting | |
| [3] | Transaction Timeout | |
| [4] | Err. Non-existing Par. | |
| [5] | Err. Par. Out of Range | |
| [6] | Transaction Failed | |

### 8-47 BTM Timeout

| Range: | | Function: |
|---|---|---|
| 60 s* | [1 - 360 s] | Select the BTM timeout after a BTM transaction has been started. |

### 8-48 BTM Maximum Errors

| Range: | | Function: |
|---|---|---|
| 21* | [0 - 21] | Selects the maximum allowed number of bulk transfer mode errors before aborting. If it is set to maximum, there is no abort. |

### 8-50 Coasting Select

| Option: | | 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 communication 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.<br>***NOTICE***<br>**When *parameter 1-10 Motor Construction* is set to *[1] PM non-salient SPM*, only selection *[0] Digital input* is available.** |
| [0] | Digital input | Activates start command via a digital input. |
| [1] | Bus | Activates start command via the serial communication port or fieldbus option. |
| [2] | Logic AND | Activates start command via the fieldbus/serial communication port, and additionally via 1 of the digital inputs. |
| [3] | Logic OR | Activates start command via the fieldbus/serial communication port, or via 1 of the digital inputs. |

### 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 input | Activates a start command via a digital input. |
| [1] | Bus | Activates a start command via the serial communication port or fieldbus option. |
| [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. |

### 8-54 Reversing Select

| Option: | | 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 input | Activates the set-up selection via a digital input. |
| [1] | Bus | Activates the set-up selection via the serial communication port or fieldbus option. |
| [2] | Logic AND | Activates the set-up selection via the fieldbus/ 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. |

### 8-56 Preset Reference Select

| Option: | | Function: |
|---|---|---|
| | | Select control of the preset reference selection via the terminals (digital input) and/or via the fieldbus. |
| [0] | Digital input | Activates preset reference selection via a digital input. |
| [1] | Bus | Activates preset reference selection via the serial communication port or fieldbus option. |
| [2] | Logic AND | Activates preset reference selection via the fieldbus/serial communication port, and via 1 of the digital inputs. |
| [3] * | Logic OR | Activates the preset reference 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 RPM] | Enter the jog speed. Activate this fixed jog speed via the serial port or fieldbus option. |

### 8-91 Bus Jog 2 Speed

| Range: | | Function: |
|---|---|---|
| 200 RPM* | [ 0 - par. 4-13 RPM] | Enter the jog speed. Activate this fixed jog speed via the serial port or fieldbus option. |

### 10-00 CAN Protocol

| Option: | | Function: |
|---|---|---|
| | | ***NOTICE*** **The options depend on installed option.** |
| [0] | CANopen | |
| [1] | DeviceNet | View the active CAN protocol. |

### 10-01 Baud Rate Select

Select the fieldbus transmission speed. The selection must correspond to the transmission speed of the master and the other fieldbus nodes.

| Option: | | Function: |
|---|---|---|
| [16] | 10 Kbps | |
| [17] | 20 Kbps | |
| [18] | 50 Kbps | |
| [19] | 100 Kbps | |
| [20] | 125 Kbps | |
| [21] | 250 Kbps | |
| [22] | 500 Kbps | |

### 10-02 MAC ID

| Range: | | Function: |
|---|---|---|
| Size related* | [ 0 - 127] | Selection of station address. Every station connected to the same network must have an unambiguous address. |

### 10-05 Readout Transmit Error Counter

| Range: | | Function: |
|---|---|---|
| 0* | [0 - 255 ] | View the number of CAN control transmission errors since the last power-up. |

### 10-06 Readout Receive Error Counter

| Range: | | Function: |
|---|---|---|
| 0* | [0 - 255 ] | View the number of CAN control receipt errors since the last power-up. |

### 10-33 Store Always

| Option: | | Function: |
|---|---|---|
| [0] * | Off | Deactivates non-volatile storage of data. |
| [1] | On | Stores parameter data received via VLT® DeviceNet MCA 104 in EEPROM non-volatile memory as default. |

### 10-50 Process Data Config. Write

Only elements [2] and [3] of this array can be selected ([0] and [1] are fixed).

| Option: | | Function: |
|---|---|---|
| [0] * | None | |
| [1] | 16-80 Fieldbus CTW 1 | |
| [2] | 16-82 Fieldbus REF 1 | |
| [3] | 3-02 Minimum Reference | |
| [4] | 3-03 Maximum Reference | |
| [5] | 3-12 Catch Up/Slow Down Value | |
| [6] | 3-41 Ramp 1 Ramp Up Time | |
| [7] | 3-42 Ramp 1 Ramp Down Time | |
| [8] | 3-51 Ramp 2 Ramp Up Time | |
| [9] | 3-52 Ramp 2 Ramp Down Time | |
| [10] | 3-80 Jog Ramp Time | |
| [11] | 3-81 Quick Stop RampTime | |
| [12] | 4-11 Motor Speed Low Limit (RPM) | |
| [13] | 4-13 Motor Speed High Limit (RPM) | |

6

### 10-50 Process Data Config. Write

Only elements [2] and [3] of this array can be selected ([0] and [1] are fixed).

| Option: | | Function: |
|---|---|---|
| [14] | 4-16 Torque Limit Motor Mode | |
| [15] | 4-17 Torque Limit Generator Mode | |
| [16] | 8-90 Bus Jog 1 Speed | |
| [17] | 8-91 Bus Jog 2 Speed | |

### 10-51 Process Data Config. Read

Only elements [2] and [3] of this array can be selected ([0] and [1] are fixed.

| | |
|---|---|
| *0 | None |
| 16-03 | Status Word |
| 16-05 | Main Actual Value (%) |
| 16-00 | Control Word |
| 16-01 | Reference (Unit) |
| 16-02 | Reference (%) |
| 16-04 | Main Actual Value (Unit) |
| 16-91 | Alarm Word 2 |
| 16-92 | Warning Word |
| 16-90 | Alarm Word |
| 16-93 | Warning Word 2 |
| 16-94 | Ext. Status Word |
| 16-95 | Ext. Status Word 2 |
| 16-10 | Power (kW) |
| 16-11 | Power (hp) |
| 16-12 | Motor Voltage |
| 16-13 | Frequency |
| 16-14 | Motor Current |
| 16-16 | Torque |
| 16-17 | Speed (RPM) |
| 16-18 | Motor Thermal |
| 16-19 | KTY Sensor Temperature |
| 16-20 | Phase Angle |
| 16-30 | DC Link Voltage |
| 16-32 | Brake Energy/s |
| 16-33 | Brake Energy/2 min |
| 16-34 | Heatsink Temp. |
| 16-35 | Inverter Thermal |
| 16-38 | SL Controller State |
| 16-39 | Control Card Temp. |
| 16-50 | External Reference |
| 16-51 | Pulse Reference |
| 16-52 | Feedback (Unit) |
| 16-53 | Digi Pot Reference |
| 16-60 | Digital Input |
| 16-61 | Terminal 53 Switch Setting |
| 16-62 | Analog Input 53 |
| 16-63 | Terminal 54 Switch Setting |
| 16-64 | Analog Input 54 |
| 16-65 | Analog Output 42 (mA) |
| 16-66 | Digital Output (bin) |
| 16-67 | Freq. Input #29 (Hz) |
| 16-68 | Freq. Input #33 (Hz) |
| 16-69 | Pulse Output #27 (Hz) |
| 16-70 | Pulse Output #29 (Hz) |
| 16-84 | Comm. Option STW |
| 16-85 | FC Port CTW 1 |
| 16-09 | Custom Readout |

**Table 6.2 Parameter List**

### 15-60 Option Mounted

| Range: | | Function: |
|---|---|---|
| 0* | [0 - 30 ] | View the installed option type. |

### 16-84 Comm. Option STW

| Range: | | Function: |
|---|---|---|
| 0* | [0 - 65535 ] | View the extended fieldbus communication option status word. For more information, refer to the relevant fieldbus manual. |

### 16-90 Alarm Word

| Range: | | Function: |
|---|---|---|
| 0* | [0 - 4294967295 ] | View the alarm word sent via the serial communication port in hex code. |

### 16-92 Warning Word

| Range: | | Function: |
|---|---|---|
| 0* | [0 - 4294967295 ] | View the warning word sent via the serial communication port in hex code. |

## 6.1 Parameter List

| Parameter number | Parameter description | Default value | Range | Conversion index | Data type |
|---|---|---|---|---|---|
| **8-0* Communication and Options** | | | | | |
| 8-01 | Control Site | Dig. and ctrl. word [0] | [0–2] | – | Unsigned 8 |
| 8-02 | Control Word Source | FC RS485 [1] | [0 –6] | – | Unsigned 8 |
| 8-03 | Control Word Timeout Time | 1.0 s | 0.1–18.000 | -1 | Unsigned 32 |
| 8-04 | Control Word Timeout Func. | Off [0] | [0–10] | – | Unsigned 8 |
| 8-05 | End-of-Timeout Function | Hold set-up [0] | [0–1] | – | Unsigned 8 |
| 8-06 | Reset Control Word Timeout | Do not reset [0] | [0–1] | – | Unsigned 8 |
| 8-07 | Diagnosis Trigger | Disable [0] | [0–3] | – | Unsigned 8 |
| 8-08 | Readout Filtering | Motor Data Std- Filt. [0] | [0–1] | – | Unsigned 8 |
| 8-10 | Control Word Profile | FC profile [0] | [0–x] | – | Unsigned 8 |
| 8-13 | Configurable Status Word STW | [0] | [83–85] | – | Unsigned 8 |
| 8-14 | Configurable Control Word CTW | None [0] | [0–6] | – | Unsigned 8 |
| 8-17 | Configurable Alarm and Warning Word | Off [0] | [0–10091] | – | Unsigned 8 |
| 8-19 | Product Code | 0 | [0–2147483647] | – | Unsigned 8 |
| 8-46 | BTM Transaction Status | Off [0] | [0–6] | – | Unsigned 8 |
| 8-47 | BTM Timeout | 1 | [1–360s] | – | Unsigned 8 |
| 8-48 | BTM Maximum Errors | 0 | [0–21] | – | Unsigned 8 |
| 8-49 | BTM Error Log | Digital input [0] | [0–3] | – | Unsigned 8 |
| 8-50 | Coasting Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-51 | Quick Stop Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-52 | DC Brake Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-53 | Start Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-54 | Reversing Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-55 | Set-up Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-56 | Preset Reference Select | Logic OR [3] | [0–3] | – | Unsigned 8 |
| 8-90 | Bus Jog 1 Speed | 100 rpm | 0–parameter 4-13 | 67 | Unsigned 16 |
| 8-91 | Bus Jog 2 Speed | 200 rpm | 0–parameter 4-13 | 67 | Unsigned 16 |
| **10-** CAN Fieldbus** | | | | | |
| 10-00 | CAN Protocol | CANopen [0] | [0] | – | Unsigned 8 |
| 10-01 | Baud Rate Select | 125 Kbps [20] | [16–22] | – | Unsigned 8 |
| 10-02 | Drive Node ID | 127 | 0–127 | – | Unsigned 8 |
| 10-05 | Transmit Error Counter | 0 | 0–255 | 0 | Unsigned 8 |
| 10-06 | Receive Error Counter | 0 | 0–255 | 0 | Unsigned 8 |
| 10-31 | Store Data Values | Off [0] | [0–2] | – | Unsigned 8 |
| 10-33 | Store Always | Off [0] | [0–1] | – | Unsigned 8 |
| 10-50 | CANopen Process Data Config. Write | None [0] | [0–17] | – | Unsigned 16 |
| 10-51 | CANopen Process Data Config. Read | None [0] | [0–48] | – | Unsigned 16 |
| **15-** Drive Information** | | | | | |
| 15-60 | Option Mounted | MCA105 CANopen | - | – | VisibleString 30 |
| **16-** Data Readouts** | | | | | |
| 16-84 | Comm. Option STW | 0 | 0–FF | | Unsigned 16 |
| 16-90 | Alarm Word | 0 | 0–FFFF | – | Unsigned 32 |
| 16-92 | Warning Word | 0 | 0–FFFF | – | Unsigned 32 |

**Table 6.3 Parameter List**

### 6.1.1 Conversion Index

This number refers to a conversion figure used when writing or reading to parameters.

| Conversion index | Conversion factor |
|---|---|
| 100 | 1 |
| 67 | 1/60 |
| 6 | 1000000 |
| 5 | 100000 |
| 4 | 10000 |
| 3 | 1000 |
| 2 | 100 |
| 1 | 10 |
| 0 | 1 |
| -1 | 0.1 |
| -2 | 0.01 |
| -3 | 0.001 |
| -4 | 0.0001 |
| -5 | 0.00001 |
| -6 | 0.00001 |

**Table 6.4 Conversion Index**

# 7 Object Directory

## 7.1 Communication Profile Area (1000h-1FFFh)

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

### 7.1.1 Communication Object Overview

| OD index (hex) | Name | Type | Access |
|---|---|---|---|
| 1000 | Device type | UNSIGNED32 | Read only |
| 1001 | Error register | UNSIGNED8 | Read only |
| 1002 | Manufacturer status register | UNSIGNED32 | Read only |
| 1003 | Pre-defined error field | UNSIGNED32 | Read only |
| 1005 | COB-ID SYNC | UNSIGNED32 | Read/write |
| 1008 | Manufacturer device name | VISIBLE_STRING | Read only |
| 1009 | Manufacturer hardware version | VISIBLE_STRING | Read only |
| 100A | Manufacturer software version | VISIBLE_STRING | Read only |
| 100C | Guard time | UNSIGNED16 | Read/write |
| 100D | Life time factor | UNSIGNED8 | Read/write |
| 1010 | Store parameters | UNSIGNED32 | Read/write |
| 1011 | Restore default parameters | UNSIGNED32 | Read/write |
| 1014 | COB-ID EMCY | UNSIGNED32 | Read only |
| 1017 | Producer heartbeat time | UNSIGNED16 | Read/write |
| 1018 | Identity Object | Identity (23h) | Read only |
| | | | |
| 1400 | 1st Receive PDO description | PDO communication parameter | Read/write |
| 1401 | 2nd Receive PDO description | PDO communication parameter | Read/write |
| 1402 | 3rd Receive PDO description | PDO communication parameter | Read/write |
| 1403 | 4th Receive PDO description | PDO communication parameter | Read/write |
| | | | |
| 1600 | 1st Receive PDO mapping | PDO Mapping | Read/write |
| 1601 | 2nd Receive PDO mapping | PDO Mapping | Read/write |
| 1602 | 3rd Receive PDO mapping | PDO Mapping | Read/write |
| 1603 | 4th Receive PDO mapping | PDO Mapping | Read/write |
| | | | |
| 1800 | 1st Transmit PDO description | PDO communication parameter | Read/write |
| 1801 | 2nd Transmit PDO description | PDO communication parameter | Read/write |
| 1802 | 3rd Transmit PDO description | PDO communication parameter | Read/write |
| 1803 | 4th Transmit PDO description | PDO communication parameter | Read/write |
| | | | |
| 1A00 | 1st Transmit PDO mapping | PDO Mapping | Read/write |
| 1A01 | 2nd Transmit PDO mapping | PDO Mapping | Read/write |
| 1A02 | 3rd Transmit PDO mapping | PDO Mapping | Read/write |
| 1A03 | 4th Transmit PDO mapping | PDO Mapping | Read/write |
| | | | |

**Table 7.1 Communication Object Overview**



### 7.1.2 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) | 402 (dec.) |

**Table 7.2 1000h Device Type**



### 7.1.3 1001h Error Register

This object is the error register of the device. The device can map internal errors in this byte. This entry is mandatory for all devices, and is a part of the emergency object. Each bit of the error register is reserved for a specified group of errors (alarms). Only bit 0 is supported. The other error information can be read with object 603Fh, error code.

| Bit | Meaning |
|---|---|
| 0 | generic error |

**Table 7.3 Content of Error Register**

### 7.1.4 1002h Manufacturer Status Register

The contents of this object are completely manufacturer-specific, and inform of the state of the frequency converter network.

| Value | Meaning |
|---|---|
| 2 | Stopped |
| 3 | Pre-operational |
| 4 | Operational |

**Table 7.4 1002h Manufacturer Status Register**

### 7.1.5 1003h Predefined Error Field

Holds errors/alarms that has occurred on the frequency converter. Setting index 0 to 0 erases the field. Disabling the diagnosis trigger (*parameter 8-07 Diagnosis Trigger*) also disables the display of values in this object.

| Sub-index | Meaning |
|---|---|
| 0 | Number of stored errors |
| 1 | Current error |
| 2 | Last error |

**Table 7.5 1003h Predefined Error Field**

| Byte 3 | Byte 2 | Byte 1 | Byte 0 |
|---|---|---|---|
| Byte 4 of EMCY object | Byte 3 of EMCY object | Byte 1of EMCY object | Byte 0 of EMCY object |

**Table 7.6 Values**

### 7.1.6 1005h COB-ID Sync Message Object

This index defines the COB-ID of the synchronisation object (SYNC). It also defines whether the device generates the SYNC.

| Bit | Value | Meaning |
|---|---|---|
| 31 (MSB) | X | Do not care |
| 30 | 0<br>1 | Device does not generate SYNC message.<br>Device generates SYNC message (not supported). |
| 29 | 0<br>1 | 11-bit ID (CAN 2.0A)<br>29-bit ID (CAN 2.0B) |
| 28 - 11 | 0<br>X | if bit 29=0<br>if bit 29=1: bits 28-11 of 29-bit COB-ID |
| 10 - 0 (LSB) | X | Bits 10-0 of COB-ID |

**Table 7.7 Structure of the SYNC COB-ID**

Bits 29 and 30 must be static (not changeable). If a device is not able to generate SYNC messages, an attempt to set bit 30 generates an abort message (abort code: 0609 0030h).
Devices supporting the standard CAN frame type only either ignore attempts to change bit 29 or respond with an abort message (abort code: 0609 0030h).
The first transmission of SYNC object starts within 1 sync cycle after setting bit 30 to 1.

### 7.1.7 1008h Manufacturer Device Name

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

### 7.1.8 1009h Manufacturer Hardware Version

This object contains the MCB 105 hardware version.

### 7.1.9 100Ah Manufacturer Software Version

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

### 7.1.10 100Ch Guard Time

This object is used in node guarding, an error control service used in addition to the heartbeat mechanism to detect failure in the CAN network.
Node guarding provides the only possible verification of the master's availability on the bus, for the frequency converter's timeout functionality.
This object contains the gap between 2 master requests in ms.

### 7.1.11 100Dh Life Time Factor

This object contains the lifetime factor used in node guarding. This factor multiply by the contents of 100Ch defines the time after which the slave has to be polled by the master's node guarding request. If this time has elapsed without the slave being polled by a guard telegram, the slave issues warning 34.

### 7.1.12 1010h Store Parameters

In the standard configuration, the contents of parameters written via fieldbus are stored in volatile memory, for example, the changed data is lost after a power cycle. This index permits non-volatile storage of all frequency converter parameters which have been changed.

| Sub-index | Meaning |
|---|---|
| 0 | Number of entries |
| 1 | Save all parameters + OD entries |
| 2 | Save all communication parameters + OD entries (All set-ups) |
| 3 | Reserved |
| 4 | Save "edit set-up" (Danfoss specific) |

**Table 7.8 1010h Store Parameters**

Writing the value "save" (0x65766c173) to subindex 1 saves all frequency converter parameters of all set-ups into non-volatile memory. Sub-index 4 does the same for the edit set-up. This is handled via *parameter 10-31 Store Data Values*.

### 7.1.13 1011h Restore Default Parameters

Use this object to set the frequency converter to factory default, by writing the value load (0x64616F6C) to subindexes.

The parameters is set to default after the next power cycle, which has to be initiated manually.

| Sub-index | Meaning |
|---|---|
| 0 | Number of entries |
| 1 | Restore all default parameters |
| 2 | Restore all default parameters + restart |

**Table 7.9 1011h Restore Default Parameters**

### 7.1.14 1014h COB ID Emergency Object

This object defines the COB-ID under which the emergency object (EMCY) is sent.

### 7.1.15 1017h Producer Heartbeat Time

The heartbeat acts as an error control service to detect a failure in the CAN network. The heartbeat mechanism for a device is established through cyclically transmitting a message by a heartbeat producer. 1 or more devices in the network are aware of this heartbeat message. If the heartbeat cycle fails for the heartbeat producer, the local application on the heartbeat consumer is informed about that event.
The producer heartbeat time defines the cycle time of the heartbeat. The producer heartbeat time remains at default 0 if it is not used.

### 7.1.16 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.

| Sub-index | Meaning |
|---|---|
| 0 | Number of entries |
| 1 | Vendor ID (200008 dec.) |
| 2 | Product code |
| 3 | Revision number (major revision number and minor revision number) |
| 4 | Serial number |

**Table 7.10 1018h Identity Object**



# 8 Troubleshooting

## 8.1 Warnings and Alarms

***NOTICE***

**Refer to the relevant *operating instructions* for an overview of warning and alarm types and for the full list of warnings and alarms.**

Alarm word, warning word, and CANopen warning word are shown on the frequency converter display in hex format. When there is more than 1 warning or alarm, the sum of all warnings or alarms is shown. Alarm word, warning word, and DeviceNet warning word can also be displayed using the serial bus in:

- *Parameter 16-90 Alarm Word*.
- *Parameter 16-91 Alarm Word 2*.
- *Parameter 16-92 Warning Word*.
- *Parameter 16-93 Warning Word 2*.

8

| Bit (Hex) | Alarm word (*parameter 16-90 Alarm Word*) |
|---|---|
| 00000001 | Brake check |
| 00000002 | Power card overtemperature |
| 00000004 | Ground fault |
| 00000008 | Ctrl. card overtemperature |
| 00000010 | Control word timeout |
| 00000020 | Overcurrent |
| 00000040 | Torque limit |
| 00000080 | Motor thermistor overtemperature |
| 00000100 | Motor ETR overtemperature |
| 00000200 | Inverter overloaded |
| 00000400 | DC link undervoltage |
| 00000800 | DC link overvoltage |
| 00001000 | Short circuit |
| 00002000 | Inrush fault |
| 00004000 | Mains phase loss |
| 00008000 | AMA not OK |
| 00010000 | Live zero error |
| 00020000 | Internal fault |
| 00040000 | Brake overload |
| 00080000 | Motor phase U is missing |
| 00100000 | Motor phase V is missing |
| 00200000 | Motor phase W is missing |
| 00400000 | Fieldbus fault |
| 00800000 | 24 V supply fault |
| 01000000 | Mains failure |
| 02000000 | 1.8 V supply fault |
| 04000000 | Brake resistor short circuit |
| 08000000 | Brake chopper fault |
| 10000000 | Option change |
| 20000000 | Frequency converter initialised |
| 40000000 | Safe torque off |
| 80000000 | Mech. brake low |

**Table 8.1** ***Parameter 16-90 Alarm Word***

| Bit (Hex) | Alarm word 2 (*parameter 16-91 Alarm Word 2*) |
|---|---|
| 00000001 | Service Trip, read/write |
| 00000002 | Reserved |
| 00000004 | Service trip, typecode/sparepart |
| 00000008 | Reserved |
| 00000010 | Reserved |
| 00000020 | Noflow |
| 00000040 | Dry pump |
| 00000080 | End of curve |
| 00000100 | Broken belt |
| 00000200 | Discharge high |
| 00000400 | Start failed |
| 00000800 | Speed limit |
| 00001000 | Reserved |
| 00002000 | Reserved |
| 00004000 | Reserved |
| 00008000 | Reserved |
| 00010000 | Reserved |
| 00020000 | KTY error |
| 00040000 | Fans error |
| 00080000 | ECB error |
| 00100000 | Reserved |
| 00200000 | Reserved |
| 00400000 | Reserved |
| 00800000 | Reserved |
| 01000000 | Reserved |
| 02000000 | Reserved |
| 04000000 | Reserved |
| 08000000 | Reserved |
| 10000000 | Reserved |
| 20000000 | Reserved |
| 40000000 | PTC thermistor |
| 80000000 | Dangerous failure |

**Table 8.2** *Parameter 16-91 Alarm Word 2*

| Bit (Hex) | Warning word (*parameter 16-92 Warning Word*) |
|---|---|
| 00000001 | Brake check |
| 00000002 | Power card overtemperature |
| 00000004 | Ground fault |
| 00000008 | Control card overtemperature |
| 00000010 | Control word timeout |
| 00000020 | Overcurrent |
| 00000040 | Torque limit |
| 00000080 | Motor thermistor overtemperature |
| 00000100 | Motor ETR overtemperature |
| 00000200 | Inverter overloaded |
| 00000400 | DC link undervoltage |
| 00000800 | DC link overvoltage |
| 00001000 | DC-link voltage low |
| 00002000 | DC-link voltage high |
| 00004000 | Mains phase loss |
| 00008000 | No motor |
| 00010000 | Live zero error |
| 00020000 | 10 V low |
| 00040000 | Brake resistor power low |
| 00080000 | Brake resistor short circuit |
| 00100000 | Brake chopper fault |
| 00200000 | Speed limit |
| 00400000 | Fieldbus comm. fault |
| 00800000 | 24 V supply fault |
| 01000000 | Mains failure |
| 02000000 | Current limit |
| 04000000 | Low temperature |
| 08000000 | Voltage limit |
| 10000000 | Encoder loss |
| 20000000 | Output frequency limit |
| 40000000 | Safe torque off |
| 80000000 | Extended status word |

**Table 8.3** *Parameter 16-92 Warning Word*



| Bit (Hex) | Warning word 2 (*parameter 16-93 Warning Word 2*) |
|---|---|
| 00000001 | Start delayed |
| 00000002 | Stop delayed |
| 00000004 | Clock failure |
| 00000008 | Fire mode was active |
| 00000010 | Reserved |
| 00000020 | No flow |
| 00000040 | Dry pump |
| 00000080 | End of curve |
| 00000100 | Broken belt |
| 00000200 | Discharge high |
| 00000400 | Reserved |
| 00000800 | Reserved |
| 00001000 | Reserved |
| 00002000 | Reserved |
| 00004000 | Reserved |
| 00008000 | Reserved |
| 00010000 | Reserved |
| 00020000 | KTY error |
| 00040000 | Fans warning |
| 00080000 | ECB error |
| 00100000 | Reserved |
| 00200000 | Reserved |
| 00400000 | Reserved |
| 00800000 | Reserved |
| 01000000 | Reserved |
| 02000000 | Reserved |
| 04000000 | Reserved |
| 08000000 | Reserved |
| 10000000 | Reserved |
| 20000000 | Reserved |
| 40000000 | PTC thermistor |
| 80000000 | Reserved |

**Table 8.4** *Parameter 16-93 Warning Word 2*



## 8.2 Troubleshooting

### 8.2.1 Check 1: LED Status

The 2 bi-colour LEDs on the CANopen card indicate the status of CANopen communication:

- The lower LED (NS) indicates the net status.
- The upper LED (MS) indicates the module status.

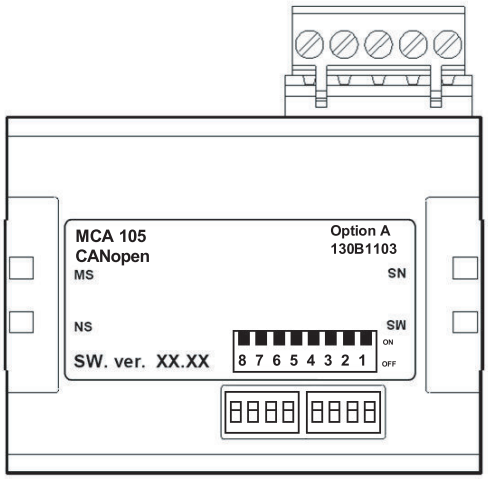



**Illustration 8.1 LED Panel CANopen MCA 105**



| State | Red LED | | Status |
|---|---|---|---|
| No error | 130BT249.10 | Off | No error. |
| Warning limit reached | 130BT250.10 | Single flash | CAN error counter has reached/ exceeded warning level. |
| Error control event | 130BT251.10 | Double flash | Node guard event has occurred. |
| Sync error | 130BT252.10 | Triple flash | Sync message has not been received within configured timeout (object 0x1006). |
| Bus Off | 130BT253.10 | On | Device in bus off-state. |

**Table 8.5 LED: Module Status (MS)**

| **State** | **Green LED** | | **Status** |
|---|---|---|---|
| Stopped | 130BT250.10 | Single flash | Device in stopped state. |
| Pre-operational | 130BT252.10 | Flashing | Device in pre-operational state. |
| Operational | 130BT253.10 | On | Device in operational state. |

**Table 8.6 LED: Network Status (NS)**

### 8.2.2 Check 2: Error Counters

Check the values of the TEC and REC in *parameter 10-05 Readout Transmit Error Counter* and *parameter 10-06 Readout Receive Error Counter*.

### 8.2.3 No Communication with the frequency converter?

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

### 8.2.4 Check 3: Is the Cabling Correct?

Check that the cables are connected to the correct terminals as shown in the diagram.

| Pin number | Terminal | Colour | Name |
|---|---|---|---|
| 1 | – | – | Reserved |
| 2 | CAN_L | Blue | CAN LOW |
| 3 | Drain | (bare) | Screen |
| 4 | CAN_H | White | CAN HIGH |
| 5 | – | – | Reserved |

**Table 8.7 Cabling**

### 8.2.5 Check 4: Is the Correct EDS File Installed?

Download the correct EDS file from *www.danfoss.com/drives* and *www.danfoss.com/BusinessAreas/DrivesSolutions/Softwaredownload/DDFieldbus_Setup_Files.htm*.

### 8.2.6 Check 5: Is the bus connection terminated at both ends?

If not, terminate the bus connection with termination resistors at the initial and final nodes. Termination is performed between terminal 2 (CAN_L) and 4 (CAN_H) with a resistor:

- 121 Ω.
- 1% metal film.
- ¼ W.

### 8.2.7 SDO Abort Codes

The abort code describes the error code when an SDO generates a failure.

| Abort code | Description |
|---|---|
| 0503 0000h | Toggle bit not alternated. |
| 0504 0000h | SDO protocol timed out. |
| 0504 0001h | Client/server command specifier not valid or unknown. |
| 0504 0002h | Invalid block size (block mode only). |
| 0504 0003h | Invalid sequence number (block mode only). |
| 0504 0004h | CRC error (block mode only). |
| 0504 0005h | Out of memory. |
| 0601 0000h | Unsupported access to an object. |
| 0601 0001h | Attempt to read a write-only object. |
| 0601 0002h | Attempt to write a read-only object. |
| 0602 0000h | Object does not exist in the object dictionary. |
| 0604 0041h | Object cannot be mapped to the PDO. |
| 0604 0042h | The number and length of the objects to be mapped would exceed PDO length. |
| 0604 0043h | General parameter incompatibility reason. |
| 0604 0047h | General internal incompatibility in the device. |
| 0606 0000h | Access failed due to a hardware error. |
| 0607 0010h | Data type does not match, length of service parameter does not match. |
| 0607 0012h | Data type does not match, length of service parameter too high. |
| 0607 0013h | Data type does not match, length of service parameter too low. |
| 0609 0011h | Subindex does not exist. |
| 0609 0030h | Value range of parameter exceeded (only for write access). |
| 0609 0031h | Value of parameter written too high. |
| 0609 0032h | Value of parameter written too low. |
| 0609 0036h | Maximum value is less than minimum value. |
| 0800 0000h | General error. |
| 0800 0020h | Data cannot be transferred or stored to the application. |
| 0800 0021h | Data cannot be transferred or stored to the application because of local control. |
| 0800 0022h | Data cannot be transferred or stored to the application because of the present device state. |
| 0800 0023h | Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of a file error). |

**Table 8.8 SDO Abort Codes**

## 8.2.8 EMCY Error Code

(OD: 1003)

| Code (hex) | Description |
|---|---|
| 0 | No fault. |
| 1000 | General fault. |
| 2130 | Short circuit. |
| 2213 | Overcurrent during start-up. |
| 2240 | Short to ground. |
| 2310 | Continuous overcurrent. |
| 2311 | Current inside the device. |
| 3100 | Mains voltage. |
| 3130 | Phase failure. |
| 3210 | Overvoltage inside the device. |
| 3220 | Undervoltage inside the device. |
| 3300 | Output voltage. |
| 4210 | Exceed device temperature. |
| 4310 | Excess frequency converter temperature. |
| 5110 | Low voltage power supply. |
| 5112 | +24 V power supply. |
| 5210 | Measurement circuit. |
| 6100 | Internal software fault. |
| 7110 | Brake chopper. |
| 8100 | Communication. |
| 8110 | CAN overrun (objects lost). |
| 8120 | CAN in error (passive mode). |
| 8130 | Life Guard error or heartbeat error. |
| 8140 | Recovered from Bus Off. |
| 8150 | Transmit COB-ID collision. |
| 8210 | PDO not processed due to length error. |
| 8220 | PDO length exceeded. |
| 8302 | Torque limiting. |
| FFxx | Vendor specific. |

**Table 8.9 EMCY Error Code**



## Index



Danfoss A/S
Ulsnaes 1
DK-6300 Graasten
vlt-drives.danfoss.com

130R0632 MG92G102 06/2015