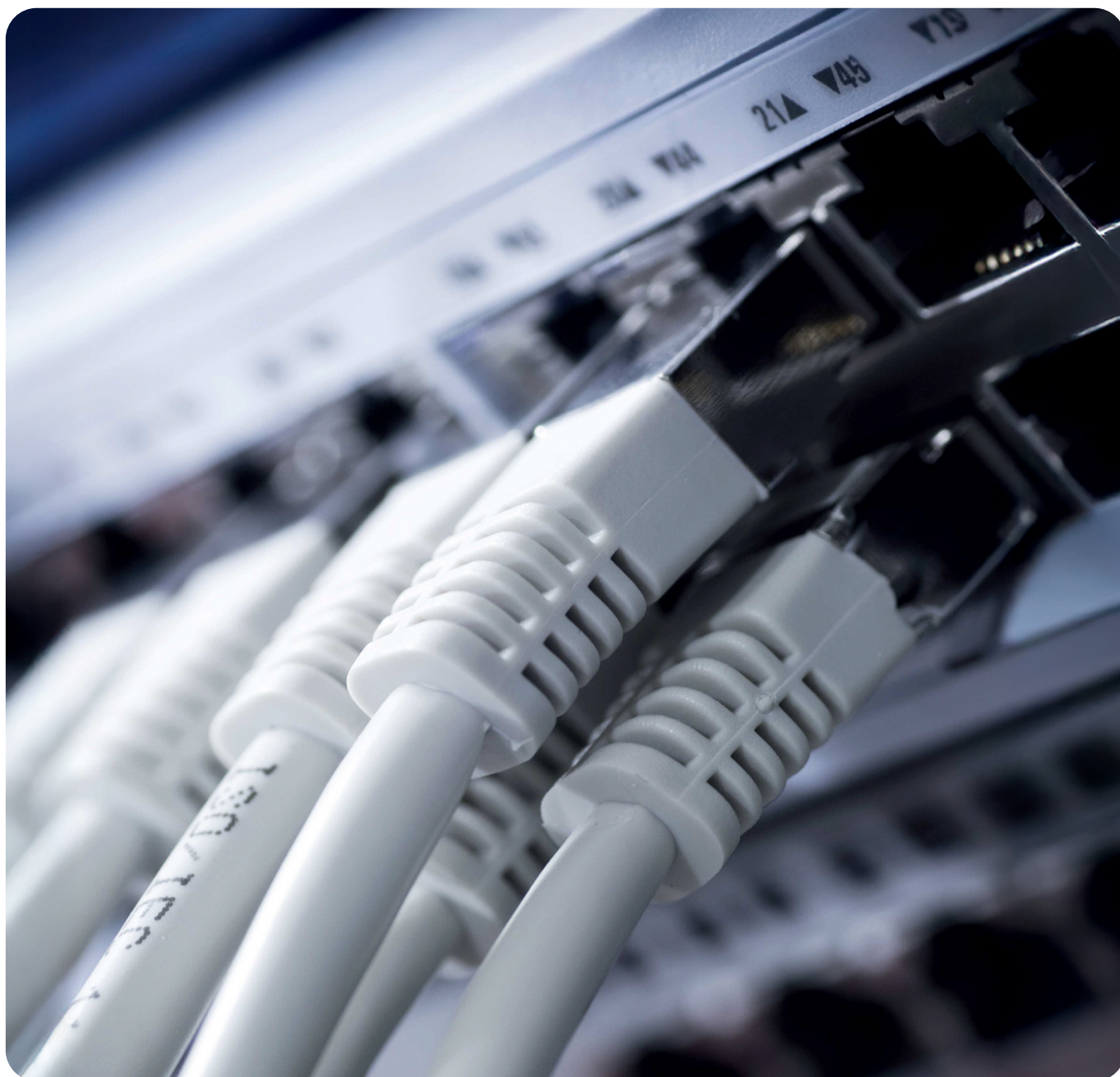




VLT® PROFINET MCA 120

VLT® FC Series FC 102, FC 103, FC 202, FC 301/FC 302, FCD 302



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1 Introduction

1.1 Purpose of the Programming Guide

This programming guide provides information about configuring the system, controlling the drive, accessing parameters, programming, and troubleshooting.

The programming guide is intended for use by qualified personnel familiar with VLT® drives, with PROFINET technology, and with the PC or PLC used as a master in the system.

Read the instructions before programming and follow the procedures in this guide.

1.2 Trademarks

VLT® is a registered trademark for Danfoss A/S.

PROFIBUS® and PROFINET® are registered trademarks of PROFIBUS and PROFINET International (PI).

1.3 Additional Resources

Resources available for the drives and for optional equipment:

- The drive-specific operating guide of the relevant drive provides the necessary information for getting the drive up and running.
- The drive-specific design guide of the relevant drive provides detailed information about capabilities and functionality to design motor control systems.
- The drive-specific programming guide of the relevant drive provides greater details on working with parameters.
- The [VLT® Ethernet Fieldbuses MCA 12X Installation Guide](#) provides information about installing and troubleshooting the PROFINET interface.
- The *VLT® PROFINET MCA 120 Programming Guide* provides information about configuring the system, programming, and troubleshooting.
- The [VLT® Motion Control Tool MCT 10 Operating Guide](#) provides information for installation and use of the software on a PC.

Supplementary publications and guides are available from Danfoss. See www.danfoss.com for listings.

1.4 Document and Software Version

This manual is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this guide is English.

Table 1: Document and Software Versions

Edition	Remarks	Software version
AU332746686169, version 0201	Editorial update.	7.0X

1.5 Intended Use

This installation guide relates to the PROFINET interface.

Code number:

- 130B1135 (uncoated)
- 130B1235 (conformal coated)

The VLT® PROFINET MCA 120 interface is designed to communicate with any system complying with the PROFINET schema version 2.2 and 2.3 standards. PROFINET provides network tools to deploy standard Ethernet technology for manufacturing applications while enabling internet and enterprise connectivity.

VLT® PROFINET MCA 120 is intended for use with:

- VLT® HVAC Drive FC 102.
- VLT® Refrigeration Drive FC 103.
- VLT® AQUA Drive FC 202.
- VLT® AutomationDrive FC 301/FC 302.
- VLT® Decentral Drive FCD 302.

1.6 Approvals and Certifications



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

1.7 Disposal



Do not dispose of equipment containing electrical components together with domestic waste.
Collect it separately in accordance with local and currently valid legislation.

2 Safety

2.1 Safety Symbols

The following symbols are used in Danfoss documentation and products.

 DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

 WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

 CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

	ISO warning symbol for general warnings
	ISO warning symbol for hot surfaces and burn hazard
	ISO warning symbol for high voltage and electric shock
	Symbol for indicating the required discharge time of the capacitors in the product.
	ISO action symbol for referring to the instructions

2.2 Qualified Personnel

To allow trouble-free and safe operation of the unit, only qualified personnel with proven skills are allowed to transport, store, assemble, install, program, commission, maintain, and decommission this equipment.

Persons with proven skills:

- Are qualified electrical engineers, or persons who have received training from qualified electrical engineers and are suitably experienced to operate devices, systems, plants, and machinery in accordance with pertinent laws and regulations.
- Are familiar with the basic regulations concerning health and safety/accident prevention.
- Have read and understood the safety guidelines given in all manuals provided with the unit, especially the instructions given in the operating guide.
- Have a good knowledge of the generic and specialist standards applicable to the specific application.
- Are cleared by the asset owner to have access to the work zone according to the security level in the zone.

2.3 Safety Precautions

WARNING

LACK OF SAFETY AWARENESS

This guide provides important information on preventing injury and damage to the equipment or the system. Ignoring this information can lead to death, serious injury, or severe damage to the equipment.

- Make sure to fully understand the dangers and safety measures present in the application.
- Before performing any electrical work on the drive, lock out and tag out all power sources to the drive.

WARNING



HAZARDOUS VOLTAGE

Drives contain hazardous voltage when connected to the AC mains or connected on the DC terminals. 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.

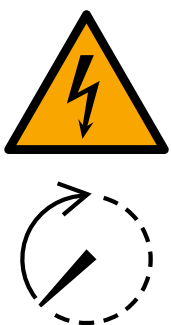
WARNING

UNINTENDED START

When the drive is connected to AC mains, DC supply, or load sharing, the motor may start at any time. The motor may start by activation of an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using VLT® Motion Control Tool MCT 10, or after a cleared fault condition. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage.

- Disconnect the drive from the mains.
- Press [Off/Reset] on the LCP before programming parameters.
- Ensure that the drive is fully wired and assembled when it is connected to AC mains, DC supply, or load sharing.

WARNING



DISCHARGE TIME

The drive contains DC-link capacitors, which can remain charged even when the drive is not powered. High voltage can be present even when the warning indicator lights are off.

Failure to wait the specified time after power has been removed before performing service or repair work could result in death or serious injury.

- Stop the motor.
- Disconnect AC mains, permanent magnet type motors, and remote DC-link supplies, including battery backups, UPS, and DC-link connections to other drives.
- Wait for the capacitors to discharge fully before performing any service or repair work. The discharge time is specified on the drive product label.
- Before performing any service or repair work, use a measuring device to make sure that capacitors are fully discharged.

 WARNING



ELECTRICAL SHOCK HAZARD - HIGH LEAKAGE CURRENT

Leakage currents exceed 3.5 mA. Failure to connect the system properly to protective earth may result in death or serious injury.

- Ensure reinforced protective earthing conductor according to IEC 60364-5-54 cl. 543.7 or according to local safety regulations for high touch current equipment. The reinforced protective earthing of the converter can be done with:
- PE conductor with a cross-section of at least 10 mm² Cu or 16 mm² Al.
- PE conductor completely enclosed within an enclosure or otherwise protected throughout its length against mechanical damage.

 WARNING



INTERNAL FAILURE HAZARD

An internal failure in the drive can result in serious injury when the drive is not properly closed.

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

3 Configuration

3.1 Configure the Controller

3.1.1 GSDML File

To configure a PROFINET controller, the configuration tool needs a GSDML file for each type of device in the network. The GSDML file is a PROFINET xml file containing the necessary communication setup data for a device. Each product in the VLT® PROFINET series has a unique GSDML file.

Download the GSDML files for the VLT® PROFINET series from <https://www.danfoss.com/en/service-and-support/downloads/dds/fieldbus-configuration-files/>. Check that the GSDML file version is compatible with the firmware version.

The following example shows how to configure the controller for VLT® PROFINET MCA 120.

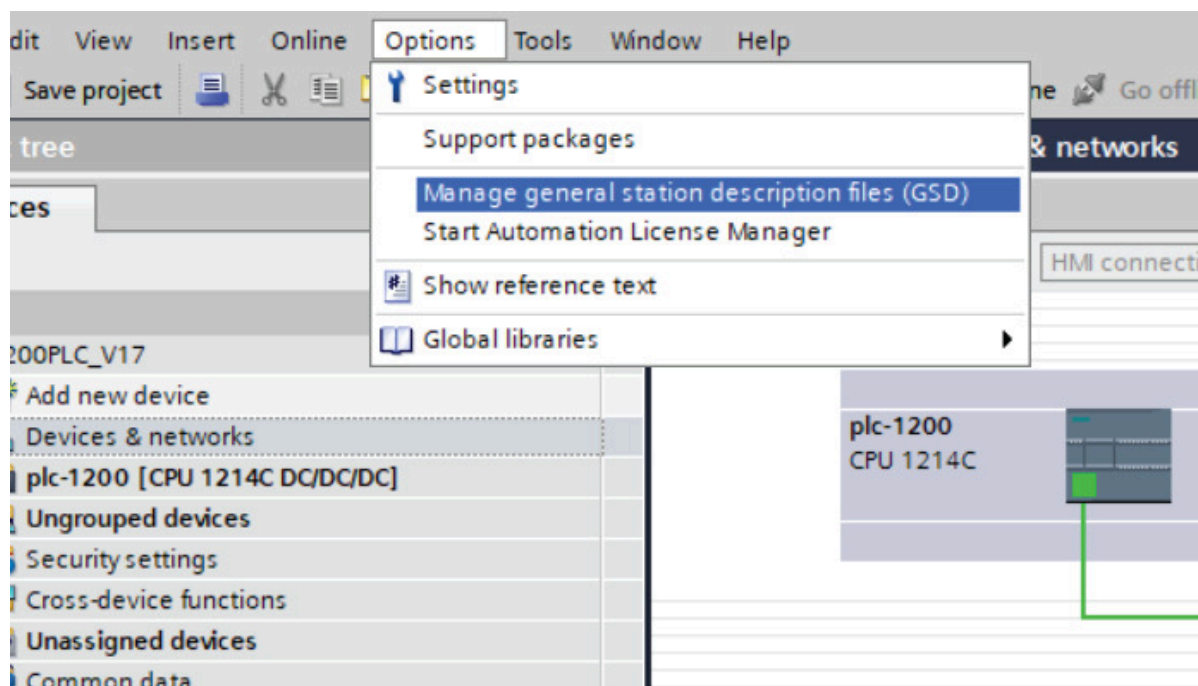
Table 2: GSDML Files

Drive series	Firmware version (parameter 15-61 Option SW Version)	GSDML file
- VLT® HVAC Drive FC 102 - VLT® Refrigeration Drive FC 103 - VLT® AQUA Drive FC 202 - VLT® AutomationDrive FC 301/FC 301	1.00–1.99	GSDML-V2.2-Danfoss-FC-20090620.xml
	2.00–2.15	GSDml-V2.3-Danfoss-FC-20131010.xml
	4.03–5.18	GSDml-V2.31-Danfoss-FC-20160616.xml
	6.11–6.21	GSDml-V2.41-Danfoss-FC-20240313.xml
	7.01–7.08	GSDml-V2.41-Danfoss-FC-20241121.xml
	7.20–7.22	GSDml-V2.45-Danfoss-FC-20260113.xml
VLT® Decentral Drive FCD 302	1.00–1.99	GSDML-V2.2-Danfoss-FCD-20090620.xml
	2.00–2.15	GSDML-V2.3-Danfoss-FCD-20131010.xml
	4.03–5.18	GSDML-V2.31-Danfoss-FCD-20160616.xml
	7.01–7.08	GSDML-V2.41-Danfoss-FCD-20241121.xml
	7.20–7.22	GSDML-V2.2-Danfoss-FCD-20260113.xml
VLT® Midi Drive FC 280	4.03–5.16	GSDML-V2.33-Danfoss-FC280-20240821.xml
	7.20–7.22	GSDML-V2.45-Danfoss-FC280-20260113.xml
VLT® AutomationDrive FC 360	4.03–5.16	GSDML-V2.3-Danfoss-FC360-20141220.xml
	7.08	GSDML-V2.41-Danfoss-FC360-20241119.xml
	7.20–7.22	GSDML-V2.45-Danfoss-FC360-20260113.xml

3.1.2 Importing the GSDML File

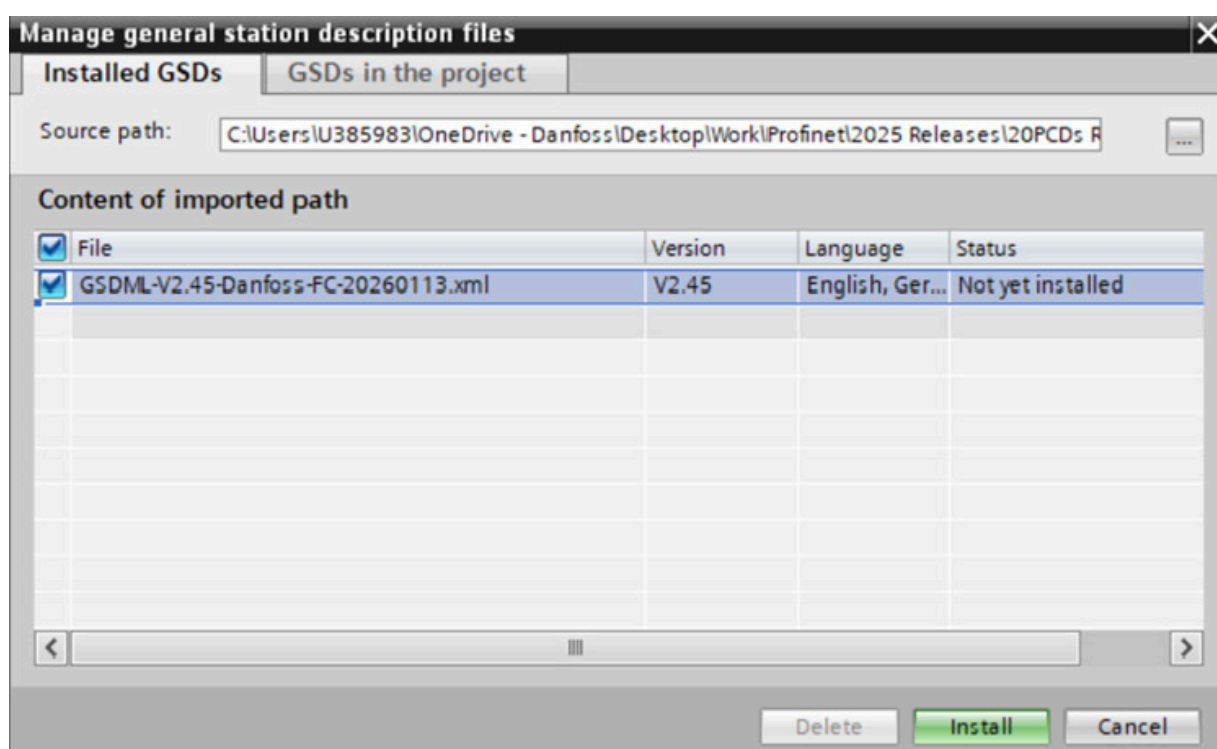
When configuring the PROFINET controller, the 1st step is to import the GSDML file in the configuration tool. The following steps show how to add a GSDML file to the TIA Portal tool. For each drive, a GSDML file is typically imported once only, following the initial installation of the software tool.

1. Open the configuration tool, select *Options*, then select *Manage general station description file*.



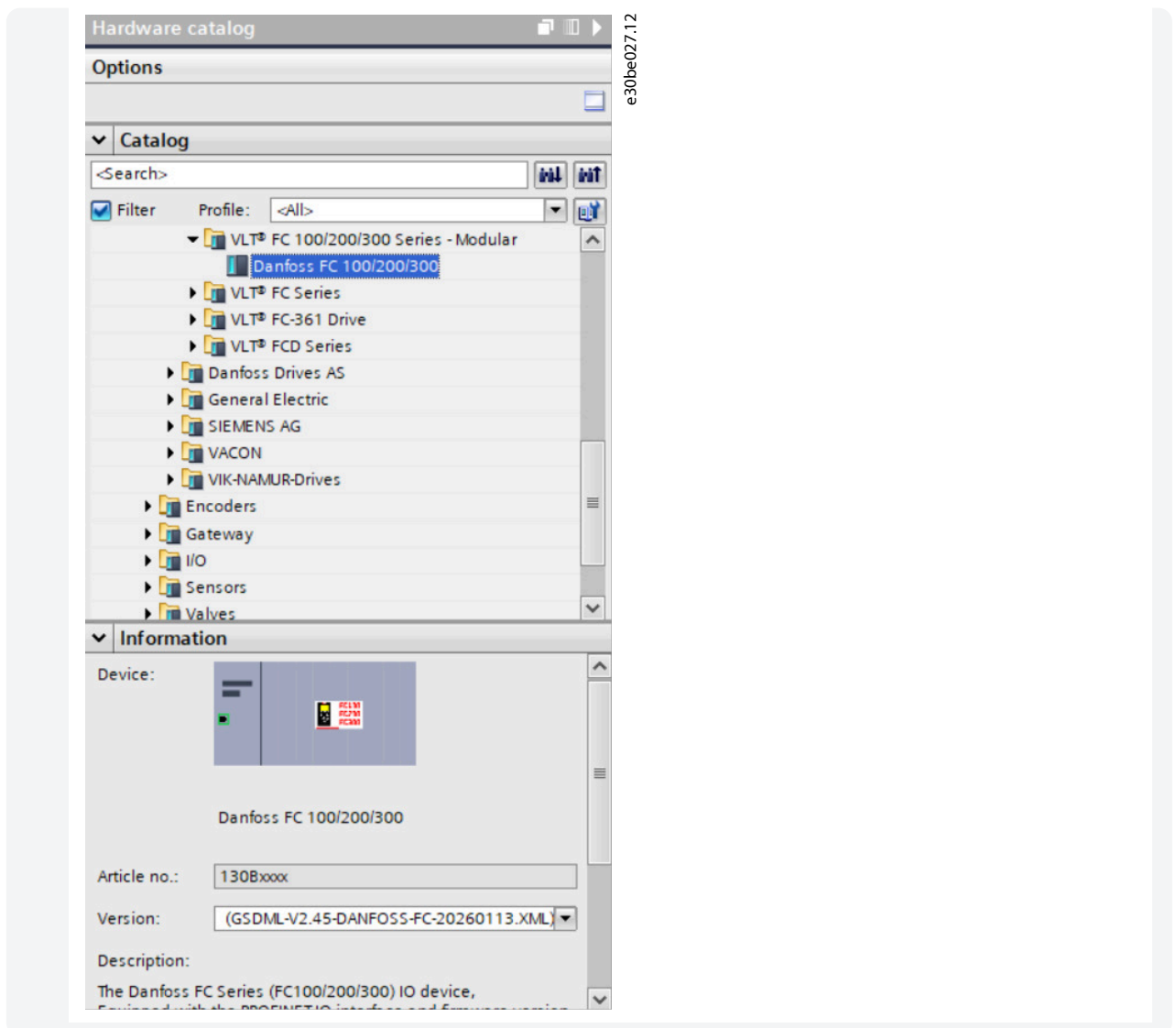
e30bn509.10

2. Select the new GSDML file.
3. Click *Install*.



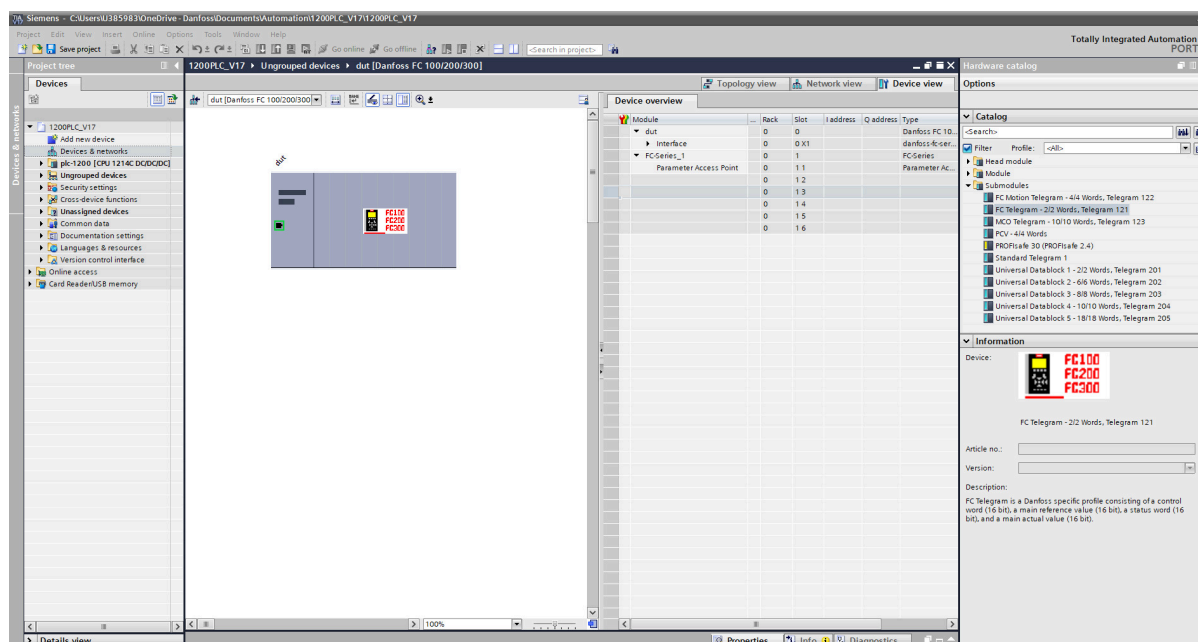
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➡ The GSDML file is now imported and is accessible in the hardware catalog.



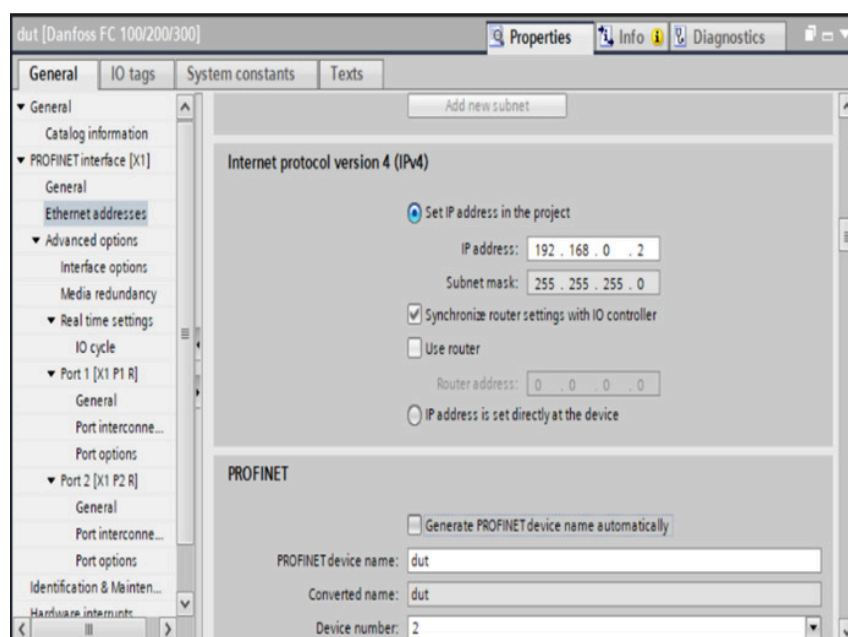
3.1.3 Setting up the Hardware and Adding a PROFINET Master System

1. Open a project.
2. Set up the hardware.
3. Add a PROFINET Master system.
4. Select Danfoss FC PN and drag and drop it onto the PROFINET I/O system.
5. Open the properties for the inserted drive.
6. Enter the device name.



e30be030.12

NOTE: The name must match the name in parameter **12-08 Host Name**. If the check mark **Assign IP address via the I/O controller** is set, the controller downloads the IP address to the I/O device with the corresponding device name. The IP address is stored in the non-volatile memory of the drive.

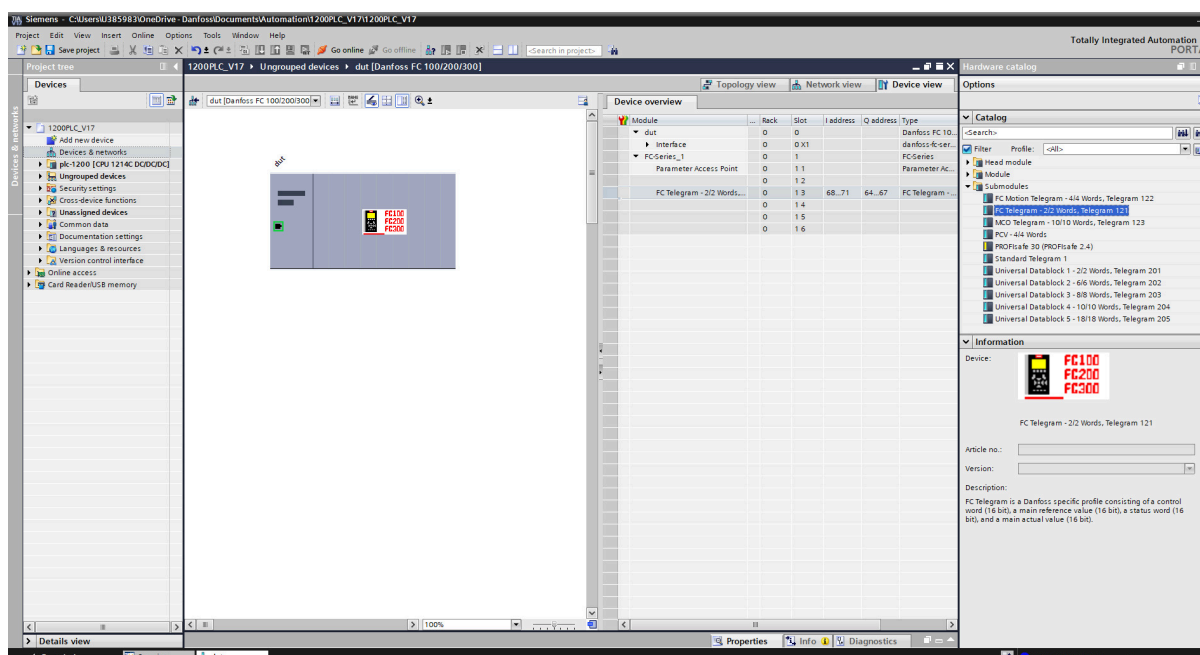


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3.1.4 Setting up the Peripheral Input and Output Data

1. Set up the peripheral input and output data.

Data set up in the peripheral area is transmitted cyclically via telegrams/PPO types. In the example below, a PPO type 6 is dragged and dropped to slot 1.



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➔ The configuration tool automatically assigns addresses in the peripheral address area. In this example, the input and output area have the following configuration:

Table 3: FC Telegram: PCD Read (Drive to PLC)

PCD word number	0	1
Input address	256–257	258–259
Setup	STW	MAV

Table 4: FC Telegram: PCD Write (PLC to Drive)

PCD word number	0	1
Output address	256–257	258–259
Setup	CTW	MRV

- Assign the PCDs via parameter **9-16 PCD Read Configuration** for inputs and parameter **9-15 PCD Write Configuration** for outputs.
- Download the configuration file to the PLC.

➔ The PROFINET system starts the data exchange when the PLC is set to Run mode.

3.2 Configure the Drive

3.2.1 PROFINET Important Parameters for PROFINET Configuration

The following parameters are important when configuring the drive with a PROFINET interface:

- Parameter **0-40 [Hand On] Key on LCOP** is activated, thus control of the drive via PROFINET is disabled.

- After an initial power-up, the drive automatically detects whether a fieldbus option is installed in slot A and sets parameter **8-02 Control Word Source** to **[3] Option A**. When an option is added, changed, or removed from an already commissioned drive, it does not change parameter **8-02 Control Word Source** but enters trip mode, and the drive shows an error.
- Parameter **8-10 Control Word Profile**. Select between the Danfoss drive profile and the PROFIdrive profile.
- Parameter **8-50 Coasting Select** to parameter **8-58 PROFIdrive OFF3 Select**. Select how to gate PROFINET control commands with the digital input command for the control card.

i NOTE: When parameter **8-01 Control Site** is set to **[2] Control word only**, the settings from parameter **8-50 Coasting Select** to parameter **8-58 PROFIdrive OFF3 Select** are overruled and only act on bus control.

4 Control

4.1 Telegram Types

The PROFIBUS profile for drives specifies several communication objects (PPOs). The PROFIBUS profile for drives is suitable for data exchange between a process controller, for example, a PLC, and a drive. All telegrams are defined for cyclic data transfer, DP-V0, so that process data (PCD) and parameters (PCA) can be transferred from the master to the follower and conversely.

Multi-telegram functionality

NOTE: The multi-telegram functionality supports software version 7.20 and newer.

Previously, the selection in the GSD file was limited to PPO type and PROFIsafe, which were modules.

The latest GSD file contains submodules holding:

- PCV channel in subslot 2
- Control word profiles in subslot 3
- Use-defined PCD (universal data blocks) in subslots 4 and 5
- PROFIsafe in subslot 6

The user-defined PCD submodules can be mixed depending on the requirements from 2/2 words to 20/20 words as shown in [Figure 1](#).

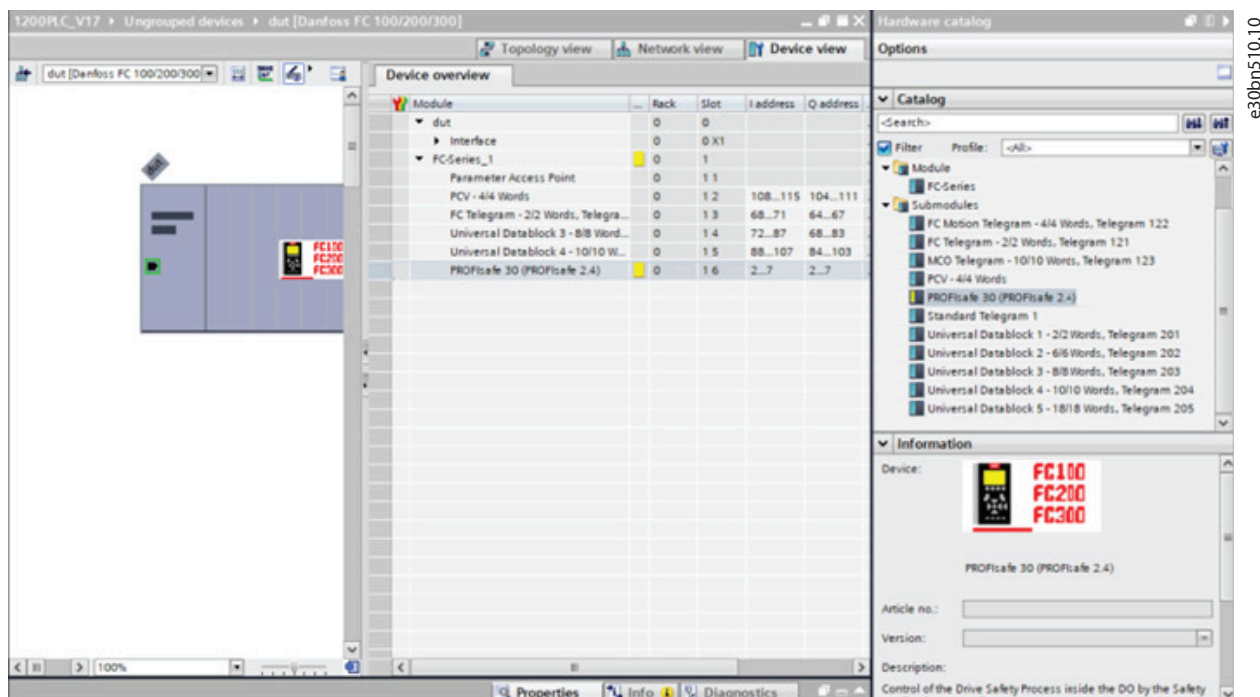
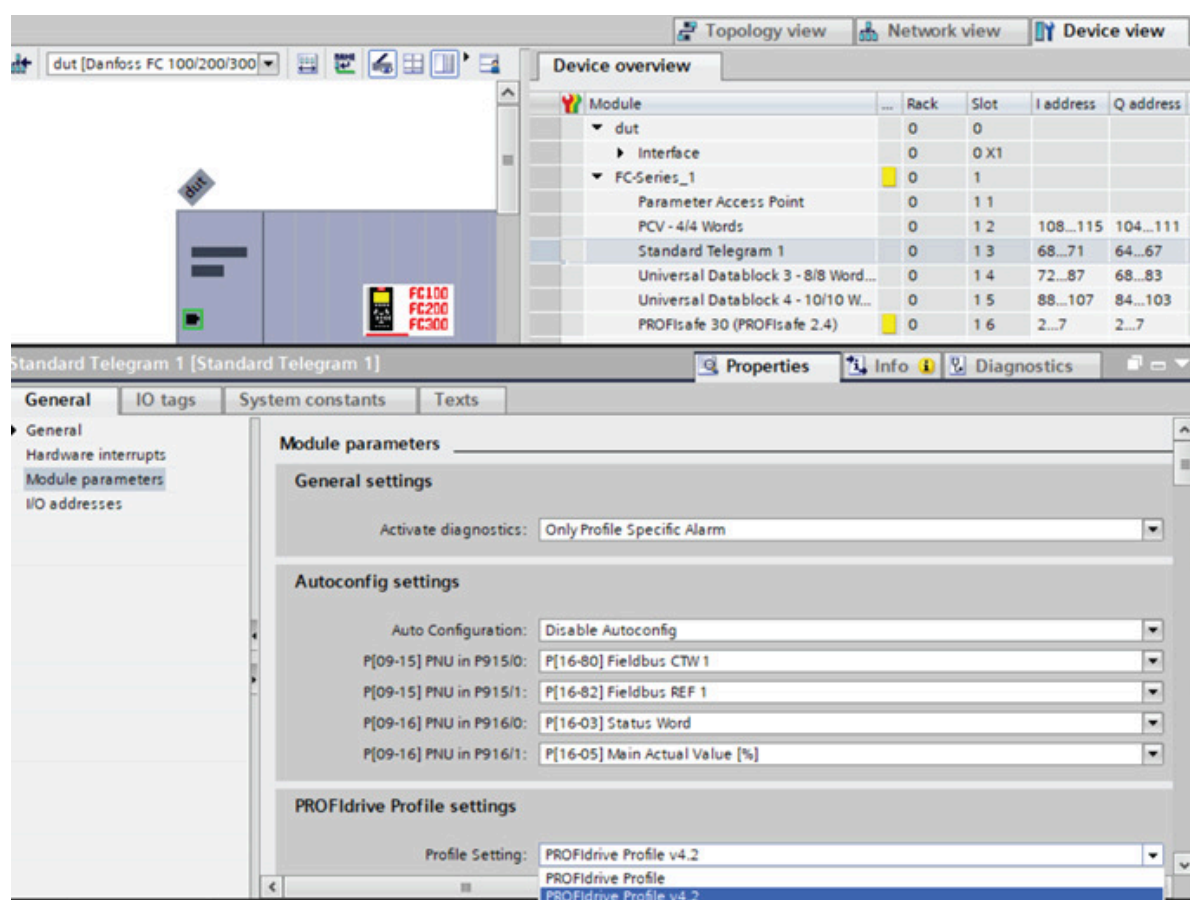


Figure 1: User-defined Submodules

This function allows setting the control word profile (parameter **8-10 Control Profile**) from the PLC configuration.

For example, if FC telegram is selected in subslot 3, the PLC sets **[0] FC profile** in parameter **8-10 Control Profile**. FC Motion telegrams and standard telegrams behave in a similar way. However, the standard telegram supports PROFIdrive and PROFIdrive v.4.2 based on the selection shown in [Figure 2](#).



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Figure 2: User Selection of Standard Telegram Support

Pure process data objects

The telegram configuration is fully customizable, and a PCV can be selected for any telegram. The PLC sends out process control data, and the drive responds with the same length, containing the process status data.

Available telegram types:

- PCD 1: The 1st 2 bytes of the process data area (PCD 1) comprise a fixed part present in all telegram types.
- PCD 2: The next 2 bytes (PCD 2) are fixed for PCD write entries (see parameter **9-15 PCD Write Configuration**, index [1]), but configurable for PCD read entries (see parameter **9-16 PCD Read Configuration**, index [1]).
- PCD 3–20: In the remaining bytes from PCD 3 and onward, the process data can be parameterized with process signals, see parameter **9-23 Parameters for Signals**.

The signals for transmission from the master to the drive (response from the drive to the master) are determined by the setting in parameter **9-16 PCD Read Configuration**.

Parameter channel

Parameter channel and process data can be added together. Use the parameter channel for reading and/or updating of parameters (successively). Alternatively, for better utilization of I/O, and thus PLC capacity, access parameters via DP-V1 by selecting a pure process data object without a PCV channel.

Select the telegram type in the master configuration. The selection is automatically recorded in the drive. No manual setting of telegram types in the drive is required. Read the current primary telegram type in parameter **9-22 Telegram Selection** and the user-defined telegrams in parameter **12-49 Ethernet Extended Status**, indices [13] and [14].

The submodule ident numbers shown as part of telegram readouts for the telegram types are as follows:

- Standard telegram - 1
- FC telegram - 121
- FC Motion telegram - 122
- MCO telegram - 123
- Universal data block 1 - 201
- Universal data block 2 - 202
- Universal data block 3 - 203
- Universal data block 4 - 204
- Universal data block 5 - 205
- PROFI-safe 30
- PCV

The ident numbers are shown in hex format, the length of each telegram readout data being 1 byte.

Example

The below GSDML configuration has telegram readout parameters as **12-49**[13] - 0xCB79 and **12-49** [14] - 0xCC1E.

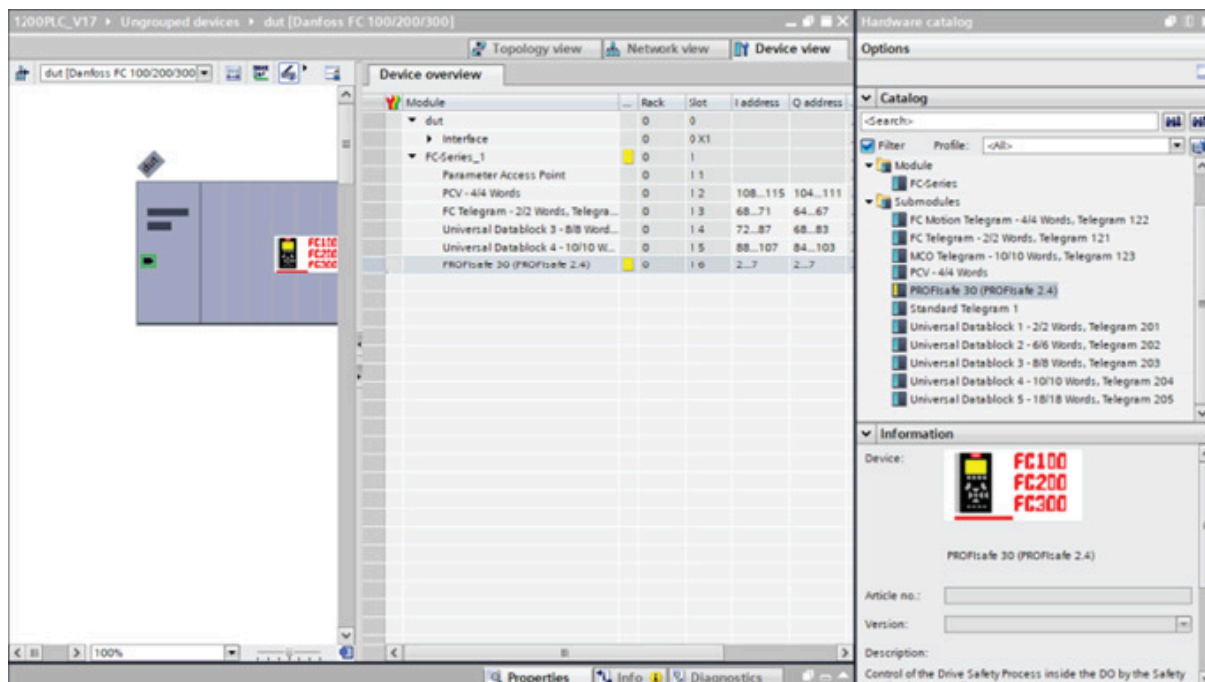


Figure 3: Example of GSDML Configuration

The process data area and parameter channel are module consistent. Module-consistent data is sent as sets of interrelated words transferred simultaneously between the PLC and the drive.

Standard telegram

1

CTW/STW	REF/MAV	(The old PPO type 3)
---------	---------	----------------------

Danfoss telegram

FC telegram

CTW/STW	REF/MAV
---------	---------

FC Motion telegram

CTW/STW	REF/MAV	POS REF/ ACT POS
---------	---------	------------------

Universal data block 1

PCD 2 Read/ Write	PCD 3 Read/ Write
-------------------------	-------------------------

Universal data block 2

PCD 2 Read/ Write	PCD 3 Read/ Write	PCD 4 Read/ Write	PCD 5 Read/ Write	PCD 6 Read/ Write	PCD 7 Read/ Write
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

Universal data block 3

PCD 2 Read/ Write	PCD 3 Read/ Write	PCD 4 Read/ Write	PCD 5 Read/ Write	PCD 6 Read/ Write	PCD 7 Read/ Write	PCD 8 Read/ Write	PCD 9 Read/ Write
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

Universal data block 4

PCD 2 Read/ Write	PCD 3 Read/ Write	PCD 4 Read/ Write	PCD 5 Read/ Write	PCD 6 Read/ Write	PCD 7 Read/ Write	PCD 8 Read/ Write	PCD 9 Read/ Write	PCD 10 Read/ Write	PCD 11 Read/ Write
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------	--------------------------

Universal data block 5

PCD 2 Read/ Write	PCD 3 Read/ Write	PCD 4 Read/ Write	PCD 5 Read/ Write	PCD 6 Read/ Write	PCD 7 Read/ Write	—	—	—	—	—	PCD 19 Read/ Write
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	---	---	---	---	---	--------------------------

Figure 4: Available Telegram Types

4.2 PCV Parameter Access

The PROFINET cyclic data exchange accesses parameters via the PCV channel. The PCV channel is part of any telegram which is described in [4.1 Telegram Types](#).

Use the PCV channel to read and write parameter values, and read the status for descriptive attributes of each parameter.

4.3 PCA Handling

The PCA can be part of any telegram type which performs several tasks. Using PCA, the master controls and supervises parameters and requests a response from the follower. The follower responds to a request from the master. *Requests-and-responses* is a handshake procedure and cannot be batched. Therefore, when the master sends out a read/write request, it must wait for the response before it sends a new request. The request or response data value is limited to maximum 4 bytes (see the RC characteristics in [Table 5](#)), which implies that the text strings are not transferable.

4.4 PCA - Parameter Characteristics

Table 5: PCA - Parameter Characteristics

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RC				SMP	PNU										

- RC: Request/response characteristics (range 0–15).
- SMP: Spontaneous message (not supported).
- PNU: Parameter number (range 1–1999).

4.5 Request/Response Handling

The RC portion of the PCA word defines:

- The requests issued from the master to the follower.
- Other portions of the PCV involved:
 - PVA: The PVA portion sends word-size parameter value in bytes 7 and 8, while long word-size values require bytes 5–8 (32 bits).
 - IND: When the response/request contains array elements, the IND carries the array sub-index. When parameter descriptions are involved, the IND holds the record sub-index of the parameter description.

4.6 RC Content

When the follower rejects a request from the master, the RC word in the PPO read indicates the rejection by assuming the value 7. Bytes 7 and 8 in the PVA element carry the fault number.

Table 6: RC Content of a Request

Request	Function
0	No request.
1	Request parameter value.
2	Change parameter value (word).
3	Change parameter value (long word).
4	Request description element.
5	Change description element.
6	Request parameter value (array).
7	Change parameter value (array word).
8	Change parameter value (array long word).
9	Request number of array elements.
10–15	Not used.

Table 7: RC Content of a Response

Response	Function
0	No response.
1	Transfer parameter value (word).
2	Transfer parameter value (long word).
3	Transfer description element.
4	Transfer parameter value (array word).
5	Transfer parameter value (long array word).
6	Transfer number of array elements.
7	Request rejected (including fault number, see Table 8).
8	Not serviceable by PCV interface.
9	Not used.
10	Not used.
11	Not used.

Table 7: RC Content of a Response - (continued)

Response	Function
12	Not used.
13–15	Not used.

Table 8: Fault Numbers

Fault number	Description
0	Illegal PNU.
1	Parameter value cannot be changed.
2	Upper or lower limit exceeded.
3	Sub-index corrupted.
4	No array.
5	Data type false.
6	Cannot be set by user (reset only).
7	Description element cannot be changed.
8	IR required PPO write not available.
9	Description data not available.
10	Access group.
11	No parameter write access.
12	Key word is missing.
13	Text in cyclic transmission not readable.
14	Name in cyclic transmission not readable.
15	Text array not available.
16	PPO write missing.
17	Request temporarily rejected.
18	Other fault.
19	Data in cyclic transmission not readable.
130	There is no bus access to the parameter called.
131	Data change is not possible because the factory setup is selected.

4.7 Example

4.7.1 Example of Using PCV

This example shows:

- How to use PCV to change the ramp-up time to 10 s in parameter **3-41 Ramp 1 Ramp Up Time**.
- How to command a start and speed reference of 50%.

Drive parameter settings:

- Parameter **8-50 Coasting Select** set to **[1] Bus**.
- Parameter **8-10 Control Word Profile** set to **[1] PROFIdrive profile**.

Refer to [4.7.2 PCV](#), [4.7.3 PCD](#), and [4.7.4 MRV](#) for more details.

4.7.2 PCV

PCA parameter characteristics

PCA part (byte 1–2).

The RC part tells what the PCV part must be used for. The functions available are listed in [4.6 RC Content](#).

When a parameter is changed, select request number 2 or 3. This example uses request number 3 as parameter **3-41 Ramp 1 Ramp Up Time** covers a long word (32 bits).

Parameter **3-41 Ramp 1 Ramp Up Time** = 155 hex: in this example, bytes 1 and 2 are set to 3155.

IND (bytes 3–4)

Used when reading/changing parameters with sub-index, for example, parameter **9-15 PCD Write Configuration**. In the example, bytes 3 and 4 are set to 00 hex.

PVA (bytes 5–8)

Change the data value of parameter **3-41 Ramp 1 Ramp Up Time** to 10.00 s. The value sent must be 1000, because the conversion index for parameter **3-41 Ramp 1 Ramp Up Time** is 2. Therefore, the value received by the drive is divided by 100, such that the drive perceives 1000 as 10.00. By 5–8 = 1000 = 03E8 hex.

4.7.3 PCD

Control word (CTW) according to PROFIdrive profile: Control words consist of 16 bits. The meaning of each bit is explained in [4.10.1 Control Word According to PROFIdrive Profile \(CTW\)](#) and [4.10.3 Status Word According to PROFIdrive Profile \(STW\)](#). The following bit pattern sets all necessary start commands:

- 0000 0100 0111 1111 = 047F hex⁽¹⁾
- 0000 0100 0111 1110 = 047E hex⁽¹⁾
- 0000 0100 0111 1111 = 047F hex

Quick stop: 0000 0100 0110 1111 = 046F hex

Stop: 0000 0100 0011 1111 = 043F hex

4.7.4 MRV

MRV is the speed reference with data format *standardized value*. 0 hex = 0% and 4000 hex = 100%. In the example, 2000 hex is used, corresponding to 50% of the maximum frequency in parameter **3-03 Maximum Reference**. See the values for bytes 11 and 12 in [Table 9](#). The whole PPO therefore has the following values in hex:

¹⁾ For restart after power-up:

- Set bits 1 and 2 of the CTW to 1.
- Toggle bit 0 0–1.

Table 9: Request Example: PCV and PCD Values in Hex

		Byte	Value
PCV	PCA	1	31
	PCA	2	55
	IND	3	00
	IND	4	00
	PVA	5	00
	PVA	6	00
	PVA	7	03
	PVA	8	E8
PCD	CTW	9	04
	CTW	10	7F
	STW	11	20
	STW	12	00

The process data within the PCD part acts immediately on the drive and can be updated from the master as quickly as possible. The PCV part is a handshake procedure, which means that the drive has to acknowledge the command before a new command can be written.

In [Table 10](#), see a positive response to the request example from [Table 9](#).

Table 10: Response Example: Positive Response

		Byte	Value
PCV	PCA	1	21
	PCA	2	55
	IND	3	00
	IND	4	00
	PVA	5	00
	PVA	6	00
	PVA	7	03
	PVA	8	E8
PCD	STW	9	0F
	STW	10	07
	MAV	11	20
	MAR	12	00

The PCD part responds according to the state and parameterization of the drive.

PCV part response:

- PCA: As the request telegram, but here the RC part is taken from [Table 7](#). In this example, RC is 2 hex, which is a confirmation that a parameter value of the type long word (32 bits) has been transferred. IND is not used in this example.
- PVA: 03E8 hex in the PVA part tells that the value of parameter **3-41 Ramp 1 Ramp Up Time** is 1000, which corresponds to 10.00.
- STW: 0F07 hex means that the motor is running and there are no warnings or faults.
- MAV: 2000 hex indicates that the output frequency is 50% of the maximum reference.

In [Table 11](#), see a negative response to the request example from [Table 9](#).

Table 11: Responses Example: Negative Response

		Byte	Value
	PCA	1	70
	PCA	2	00
	IND	3	00
	IND	4	00
	PVA	5	00
	PVA	6	00
	PVA	7	00
	PVA	8	02
PCD	STW	9	0F
	STW	10	07
	MAV	11	20
	MAR	12	00

RC is 7 hex, which means that the request has been rejected, and the fault number can be found in the PVA part. In this case, the fault number is 2, which means that the upper or lower limit of the parameter is exceeded.

4.8 Process Data

4.8.1 Process Control Data

Process control data (PCD) is the process data sent from the PLC to the drive.

Table 12: Process Control Data

Master/follower				
1	2	3		10
CTW	MRV	PCD		PCD
		PCD write		

PCD 1 contains a 16-bit control word, and each bit controls a specific function of the drive. See [4.9 Control Profile](#).

PCD 2 contains a 16-bit speed setpoint in percentage format. See [4.8.3 Reference Handling](#).

The settings in parameter **9-15 PCD Write Configuration** and parameter **9-16 PCD Read Configuration** define the content fo PCD 3–PCD 10.

4.8.2 Process Status Data

Process status data is the process data sent from the drive and contains information about the current state.

Table 13: Process Status Data

Follower/master				
1	2	3		10
STW	MAV	PCD		PCD
		PCD read		

PCD 1 contains a 16-bit status word, and each bit contains information regarding a possible state of the drive.

PCD 2 contains each default value of the drive's current speed in percentage format, see [4.8.3 Reference Handling](#). PCD 2 can be configured to contain other process signals.

The setting in parameter **9-16 PCD Read Configuration** defines the content of PCD 3–PCD 10.

4.8.3 Reference Handling

The reference handling is an advanced mechanism that sums up references from different sources as shown in [Figure 5](#).

For more information on reference handling, refer to the drive-specific design guide.

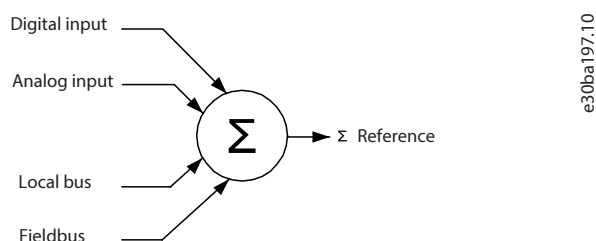


Figure 5: Reference

The reference speed or speed setpoint is sent via PROFIBUS and is always sent to the drive in percentage format as integers shown in hexadecimal (0–4000 hex).

The reference (MRV) and feedback (MAV) are always scaled equally. The setting of parameter **3-00 Reference Range** determines the scaling of the reference and feedback (MAV), see [Figure 6](#)

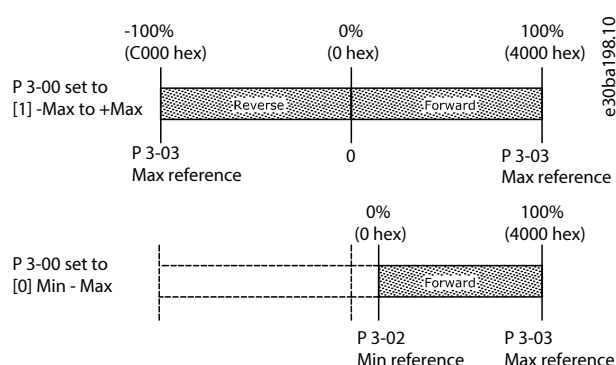


Figure 6: Reference (MRV) and Feedback (MAV), Scaled

i NOTE: When parameter **3-00 Reference Range** is set to **[0] Min - Max**, a negative reference is handled as 0%.

The actual output of the drive is limited by the speed limit parameters, parameter **4-11 Motor Speed Low Limit [RPM]** to parameter **4-14 Motor Speed High Limit [Hz]**. The final speed limit is set in parameter **4-19 Max Output Frequency**.

The reference (MRV) and the feedback (MAV) formats are listed in [Table 14](#).

Table 14: Reference/Feedback Format

MRV/MAV	Integer in hex	Integer in decimal
100%	4000	16384
75%	3000	12288
50%	2000	8192
25%	1000	4096

Table 14: Reference/Feedback Format - (continued)

MRV/MAV	Integer in hex	Integer in decimal
0%	0	0
-25%	F000	-4096
-50%	E000	-8192
-75%	D000	-12288
-100%	C000	-16384

i NOTE: Negative numbers are formed as a complement of 2.

i NOTE: The data type for MRV and MAV is an N2 16-bit standardized value, expressing a range from -200%...+200% (8001...7FFF),

Example

The following settings determine the speed as shown in [Table 15](#):

- Parameter **1-00 Configuration Mode** set to **[0] Speed open loop**.
- Parameter **3-00 Reference Range** set to **[0] Min-Max**.
- Parameter **3-02 Minimum Reference** set to 0 Hz.
- Parameter **3-03 Maximum Reference** set to 50 Hz.

Table 15: Actual Speed for MRV/MAV

MRV/MAV		Actual speed [Hz]
0%	0 hex	0
25%	1000 hex	12.5
50%	2000 hex	25
75%	3000 hex	37.5
100%	4000 hex	50

4.8.4 Process Control Operation

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

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

- MRV is the process setpoint.
- MAV expresses the actual process feedback (range $\pm 200\%$).

4.8.5 Influence of the Digital Input Terminals on FC Control Mode

In parameter **8-50 Coasting Select** to parameter **8-58 PROFIdrive OFF3 Select**, set the influence of the digital input terminals on the control of the drive.

i NOTE: The setting of parameter **8-01 Control Site** overrides the settings in parameter **8-50 Coasting Select** to parameter **8-58 PROFIdrive OFF3 Select**. The setting of terminal 37 coast stop (safe) overrules any other parameter.

Program each of the digital input signals to logic AND, logic OR, or to have no relation to the corresponding bit in the control word. In this way, the following signal sources initiate a specific control command, for example, stop/coast.

- Fieldbus only
- Fieldbus AND digital input
- Either fieldbus OR digital input.

i NOTE: To control the drive via PROFIBUS, set parameter **8-50 Coasting Select** to either [1] *Bus* or [2] *Logic AND*. Then set parameter **8-01 Control Site** to [0] *Digital and ctrl. word* or [2] *Controlword only*.

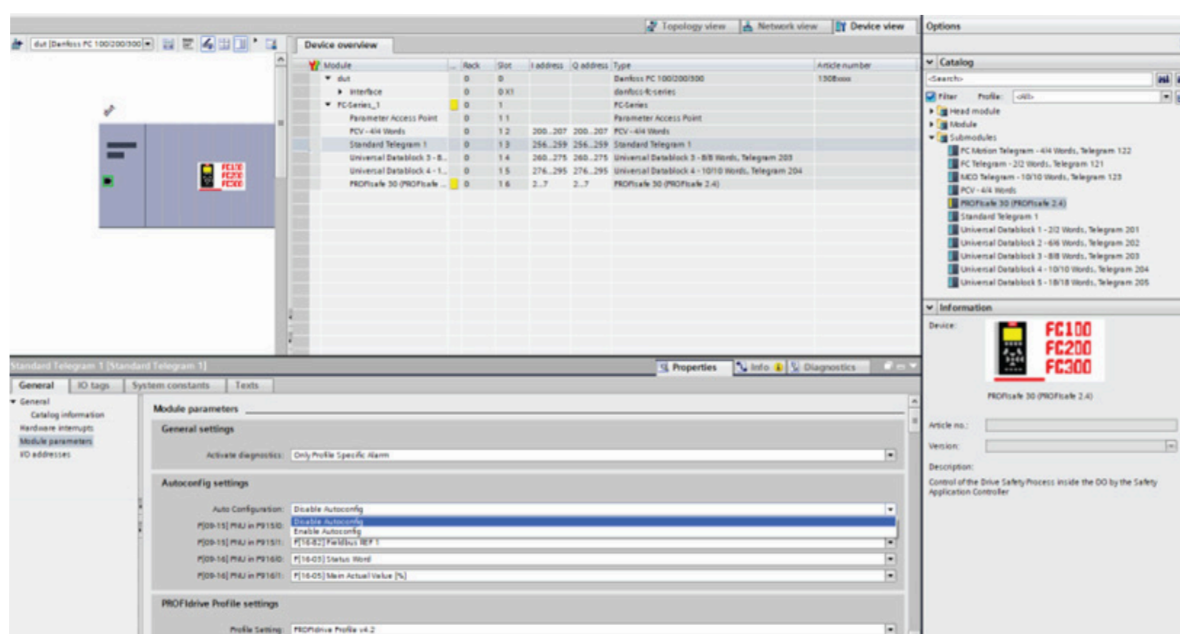
For more detailed information and examples of logical relationship options, see chapter *Troubleshooting*.

4.8.6 Auto Configuration Functionality

It is possible to configure all 20 read and write PCDs from the TIA Portal using the drive configuration.

i NOTE: If auto configuration is disabled in the drive configuration from TIA Portal, the PCD mapping can be done via VLT® Motion Control Tool MCT 10 or via the LCP.

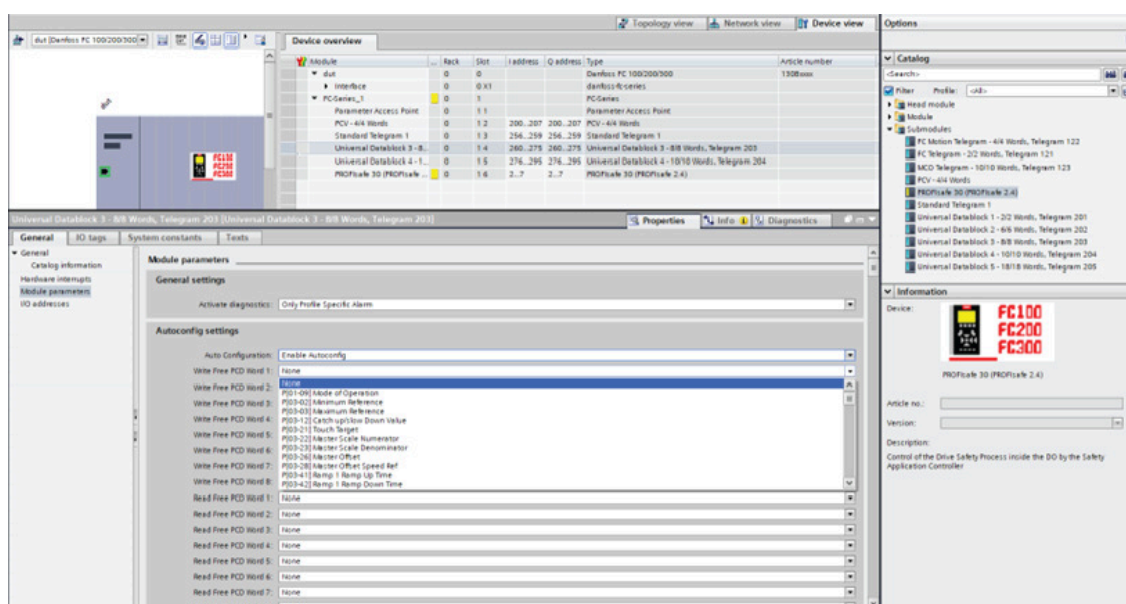
1. Click the standard telegram and open *Module parameters* from the *Properties* tab.



2. Select *Enable Auto Config* from the *Auto configuration* settings.

The read and write PCDs for the primary telegrams (FC telegram, Standard telegram, and FC Motion telegram) are available by default.

3. Enable auto configuration for the secondary telegram, such as universal data blocks 1–5.
4. Map the PCDs.



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➔ Once the PLC program is downloaded, the selected read and write PCDs are sent from the PLC to the drive.

4.9 Control Profile

Control the drive according to:

- The PROFIdrive profile, or
- The Danfoss FC control profile.

Select the control profile in parameter **8-10 Control Word Profile**. The choice of profile affects the control word and the status word only. The sections *PROFIdrive Control Profile* and *Danfoss FC Profile* provide a detailed description of control and status data.

4.10 PROFIdrive Control Profile

4.10.1 Control Word According to PROFIdrive Profile (CTW)

The control word is used to send commands from a master, for example, a PC, to a follower.

Table 16: Control Word Bits

Bit	Bit=0	Bit=1
00	OFF 1	ON 1
01	OFF 2	ON 2
02	OFF 3	ON 3
03	Coasting	No coasting
04	Quick stop	Ramp
05	Hold frequency output	Use ramp
06	Ramp stop	Start
07	No function	Reset
08	Jog 1 OFF	Jog 1 ON

Table 16: Control Word Bits - (continued)

Bit	Bit=0	Bit=1
09	Jog 2 OFF	Jog 2 ON
10	Data invalid	Data valid
11	No function	Slow down
12	No function	Catch up
13	Parameter setup	Selection lsb
14	Parameter setup	Selection msb
15	No function	Reverse

4.10.2 Explanation of the Control Word Bits

Bit 00, OFF 1/ON 1

Normal ramp stops using the ramp times of the actual selected ramp.

- Bit 00 = 0 leads to stop and activation of the output relay 1 or 2 if the output frequency is 0 Hz and if [Relay 123] has been selected in parameter **5-40 Function Relay**.
- Bit 00 = 1 means that the drive is in State 1 *Switching on inhibited*.

Bit 01, OFF 2/ON 2

Coasting stop.

- Bit 01 = 0 leads to a coasting stop and activation of the output relay 1 or 2 if the output frequency is 0 Hz and if [Relay 123] has been selected in parameter **5-40 Function Relay**.
- Bit 01 = 1 means that the drive is in State 1, *Switching on inhibited*.

Bit 02, OFF 3/ON 3

Quick stop using the ramp time of parameter **3-81 Quick Stop Ramp Time**.

- Bit 02 = 0 leads to a quick stop and activation of the output relay 1 or 2 if the output frequency is 0 Hz and if [Relay 123] has been selected in parameter **5-40 Function Relay**.
- Bit 02 = 1 means that the drive is in State 1, *Switching on inhibited*.

Bit 03, Coasting/No Coasting

- Bit 03 = 0 leads to a stop.
- Bit 03 = 1 means that the drive can start if the other start conditions are fulfilled.

i NOTE: The selection in parameter **8-50 Coasting Select** determines how bit 03 is linked with the corresponding function of the digital inputs.

Bit 04, Quick Stop/Ramp

Quick stop using the ramp time of parameter **3-81 Quick Stop Ramp Time**.

- Bit 04 = 0 leads to a quick stop.
- Bit 04 = 1 means that the drive can start if the other start conditions are fulfilled.

i NOTE: The selection in parameter **8-51 Quick Stop Select** determines how bit 04 is linked with the corresponding function of the digital inputs.

Bit 05, Hold Frequency Output/Use Ramp

- Bit 05 = 0 maintains the current output frequency even if the reference value is modified.
- Bit 05 = 1 means that the drive can perform its regulating function again. Operation occurs according to the respective reference values.

Bit 06, Ramp Stop/Start

Normal ramp stop using the ramp times of the actual ramp as selected. Additionally, activation of the output relay 1 and 4 if the output frequency is 50 Hz and if [Relay 123] has been selected in parameter **5-40 Function Relays**.

- Bit 06 = 0 leads to a stop in which the motor speed is ramped down to stop via the selected ramp-down parameter.
- Bit 06 = 1 means that the drive can start if the other start conditions are fulfilled.

i NOTE: The selection in parameter **8-53 Start Select** determines how bit 06 is linked with the corresponding functions of the digital inputs.

Bit 07, No Function/Reset

Reset after switching off. Acknowledges event in fault buffer.

- Bit 01 = 0 means that no reset occurs.
- Bit 07 = 1 means that a reset occurs after switching off.

Bit 08, Jog 1 OFF/ON

Activation of the preprogrammed speed in parameter **8-90 Bus Jog 1 Speed**. Jog 1 is only possible if bit 04=0 and bits 00–03 are set to 1.

Bit 09, Jog 2 OFF/ON

Activation of the preprogrammed speed in parameter **8-91 Bus Jog 2 Speed**. Jog 2 is only possible if bit 04=0 and bits 00–03 are set to 1.

Bit 10, Data Invalid/Valid

This bit tells the drive whether the control word should be used or ignored.

- Bit 10 = 0 ignores the control word giving the opportunity to turn off the control word when updating/reading parameters.
- Bit 10 = 1 uses the control word. This function is relevant because the control word is always contained in the telegram, regardless of the type of telegram.

Bit 11, No Function/Slow Down

This bit is used to reduce the speed reference value by the amount given in parameter **3-12 Catch Up/Slow Down Value**.

- Bit 11 = 0 means that no modification of the reference value occurs.
- Bit 11 = 1 means that the reference value is reduced.

Bit 12, No Function/Catch Up

This bit is used to increase the speed reference value by the amount given in parameter **3-12 Catch Up/Slow Down Value**.

- Bit 12 = 0 means that no modification of the reference value occurs.
- Bit 12 = 1 means that the reference value is increased.

If both slowing down and accelerating are activated (bits 11 and 12 are set to 1), slowing down has priority, meaning that the speed reference value is reduced.

Bits 13/14, Setup Selection

Bits 13 and 14 are used for selecting between the 4 parameter setups according to the table below. The function is only possible if [9] **Multi set-up** has been selected in parameter **0-10 Active Set-up**. The selection in parameter **8-55 Set-up Select** determines how bits 13 and 14 are linked with the corresponding function of the digital inputs. Changing the setup while the drive is running is only possible if the setups have been linked in parameter **0-12 This Set-up Linked to**.

Table 17: Parameter Setups

Setup	Bit 13	Bit 14
1	0	0
2	1	0
3	0	1
4	1	1

Bit 15, No Function/Reverse

- Bit 15 = 0 means no reversing.
- Bit 15 = 1 means reversing is active.

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

i NOTE: Bit 15 only activates reversing when [1] **Bus**, [2] **Logic AND**, or [3] **Logic OR** is selected.

4.10.3 Status Word According to PROFIdrive Profile (STW)

The status word is used to notify a master, for example, a PC, about the status of a follower.

Table 18: Status Word Bits

Bit	Bit=0	Bit=1
00	Control not ready	Control ready
01	Drive not ready	Drive ready
02	Coasting	Enable
03	No error	Trip
04	OFF 2	ON 2
05	OFF 3	ON 3
06	Start possible	Start not possible
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	Drive OK	Stopped, autostart

Table 18: Status Word Bits - (continued)

Bit	Bit=0	Bit=1
13	Voltage OK	Voltage exceeded
14	Torque OK	Torque exceeded
15	Timer OK	Timer exceeded

4.10.4 Explanation of the Status Word Bits

Bit 00, Control not Ready/Control Ready

- Bit 00 = 0 means that either bit 00, 01, or 02 of the control word is 0, or the drive is switched off (tripped).
- Bit 00 = 1 means that the drive control is ready, but there is not necessarily power supply to the unit present. For example, this situation could occur if 24 V external supply of the control system is used.

Bit 01, Drive not Ready/Drive Ready

Same meaning as bit 00, however, there is a supply of the power unit. The drive is ready when it receives the necessary start signals.

Bit 02, Coasting/Enable

- Bit 02 = 0 means that either bit 00, 01, or 02 of the control word is 0, or the drive is switched off (tripped).
- Bit 02 = 1 means that the drive can start the motor when a start command is given.

Bit 03, No Error/Trip

- Bit 03 = 0 means that there are no error conditions in the drive.
- Bit 03 = 1 means that the drive has tripped and requires a reset signal before it can start.

Bit 04, OFF 2/ON 2

- Bit 04 = 0 means that the control word bit 01 is 0.
- Bit 04 = 1 means that the control word bit 01 is 1.

Bit 05, OFF 3/ON 3

- Bit 05 = 0 means that control word bit 2 is 0.
- Bit 05 = 1 means that control word bit 2 is 1.

Bit 06, Start Possible/Start not Possible

If PROFIdrive has been selected in parameter **8-10 Control Word Profile**, bit 06 is 1 after a switch-off acknowledgment, after activation of OFF 2 or OFF 3, and after switching on the mains voltage. *Start not possible* is reset if control bit 00 is set to 0 and bits 01, 02, and 10 are set to 1.

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 current motor speed deviates from the set speed reference value. This situation may occur, for example, when the speed is changed during start/stop through ramp up/ramp down.
- Bit 08 = 1 means that the current motor speed corresponds to the set speed reference value.

Bit 09, Local Operation/Bus Control

- Bit 09 = 0 indicates that the drive has been stopped via the [Stop] key on the LCP, or that [0] *Linked to hand/auto* or [2] *Local* has been selected in parameter **3-13 Reference Site**.
- Bit 09 = 1 means that the drive can be controlled via fieldbus/serial communication.

Bit 10, Out of Frequency Limit/Frequency Limit OK

- Bit 10 = 0 indicates that the output frequency is outside the limits set in parameter **4-52 Warning Speed Low** and parameter **4-53 Warning Speed High**.
- Bit 10 = 1 means that the output frequency is within the indicated limits.

Bit 11, No Operation/In Operation

- Bit 11 = 0 means that the motor does not run.
- Bit 11 = 1 means that the drive has a start signal, or the output frequency is > 0 Hz.

Bit 12, Drive OK/Stopped, Autostart

- Bit 12 = 0 means that there is no temporary overloading of the inverter.
- Bit 12 = 1 means that the inverter has stopped due to overloading. However, the drive has not switched off (trip) and will start again after the overloading has ended.

Bit 13, Voltage OK/Voltage Exceeded

- Bit 13 = 0 means that the voltage limits of the drive are not exceeded.
- Bit 13 = 1 means that the direct voltage in the DC link of the drive is too low or too high.

Bit 14, Torque OK/Torque Exceeded

- Bit 14 = 0 means that the motor torque is below the limits set in parameter **4-16 Torque Limit Motor Mode** or parameter **4-17 Torque Limit Generator Mode**.
- Bit 14 = 1 means that the limit selected in parameter **4-16 Torque Limit Motor Mode** or parameter **4-17 Torque Limit Generator Mode** is exceeded. The nominal torque can be read in parameter **16-16 Torque [Nm]**.

Bit 15, Timer OK/Timer Exceeded

- Bit 15 = 0 indicates that the timers for the motor thermal protection and thermal drive protection have not exceeded 100%.
- Bit 15 = 1 indicates that 1 of the timers has exceeded 100%.

4.10.5 PROFIdrive State/Transition Diagram

In the PROFIdrive control profile, the control bits 0–3 perform the basic start-up/power-down functions, whereas the control bits 4–15 perform application-oriented control.

Refer to [Figure 7](#) to see the basic state/transition diagram where control bits 0–3 control the transitions and the corresponding status bit indicates the actual state. The black bullets indicate the priority of the control signals, where fewer bullets indicate lower priority, and more bullets indicate higher priority.

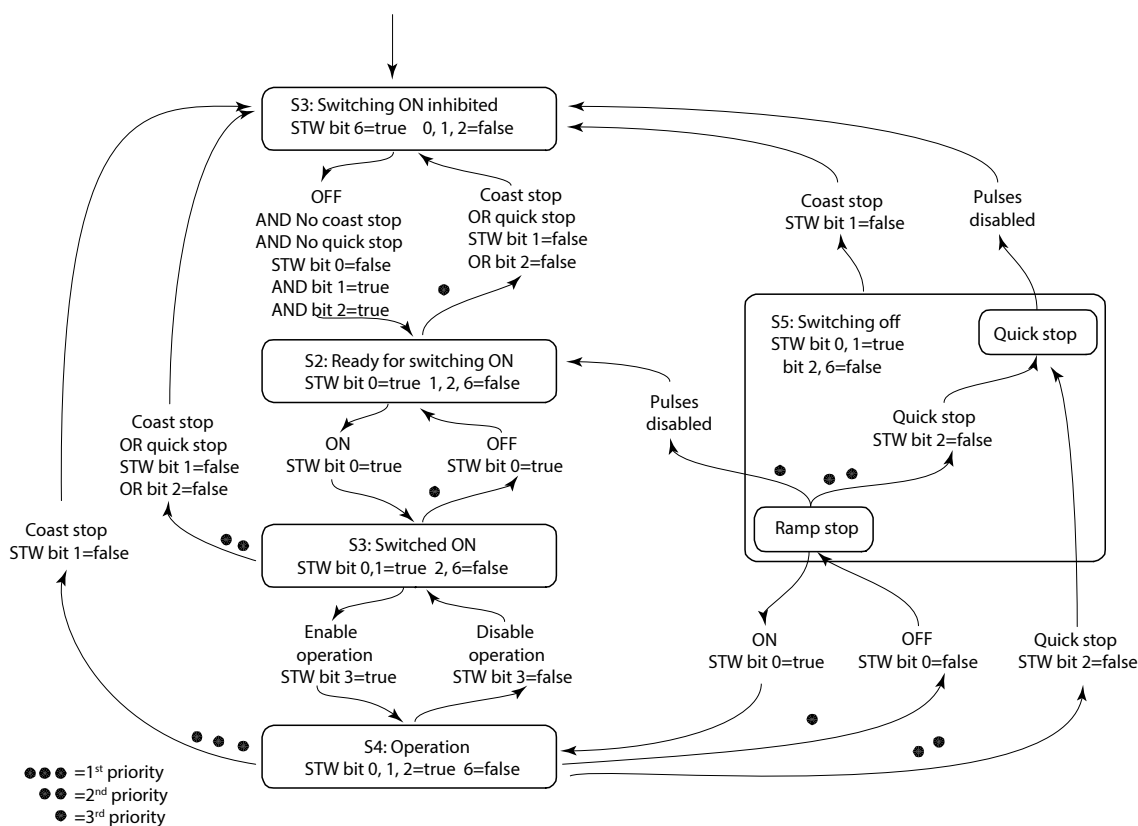


Figure 7: PROFIdrive State/Transition Diagram

4.11 Danfoss FC Control Profile

4.11.1 Control Word According to Danfoss FC Control Profile

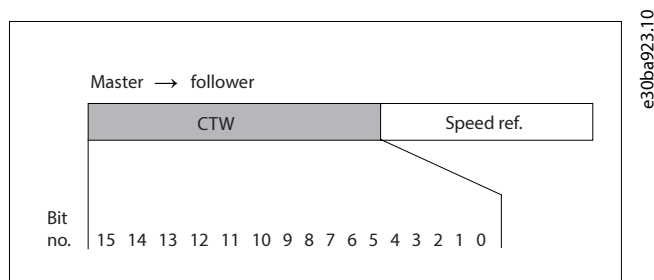


Figure 8: Parameter 8-10 Control Word Profile set to [1] FC Profile

Table 19: Control Word Bits

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

Table 19: Control Word Bits - (continued)

Bit	Bit value=0	Bit value=1
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 setup	Selection lsb
14	Parameter setup	Selection msb
15	No function	Reverse

4.11.2 Explanation of the Control Word Bits

Bits 00/01, Reference Value

Bits 00 and 01 are used for selecting between the 4 reference values, which are pre-programmed in parameter **3-10 Preset Reference** according to the following table.

Table 20: Reference Values

Programmed reference value	Parameter number	Bit 01	Bit 02
1	3-10 [0]	0	0
2	3-10 [1]	0	1
3	3-10 [2]	1	0
4	3-10 [3]	1	1

i NOTE: In parameter **8-56 Preset Reference Select**, select to define how bits 00/01 are linked with the corresponding function on the digital inputs.

Bit 02, DC Brake/Ramp

- Bit 02 = 0 leads to DC braking and stop. The 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 according to parameter **3-41 Ramp 1 Ramp Up Time**.

Bit 03, Coasting/No Coasting

- Bit 03 = 0 leads to a stop.
- Bit 03 = 1 means that the drive can start if the other start conditions are fulfilled.

i NOTE: The selection in parameter **8-50 Coasting Select** determines how bit 03 is linked with the corresponding function of the digital inputs.

Bit 04, Quick Stop/Ramp

Quick stop using the ramp time of parameter **3-81 Quick Stop Ramp Time**.

- Bit 04 = 0 leads to a quick stop.
- Bit 04 = 1 means that the drive can start if the other start conditions are fulfilled.

i NOTE: The selection in parameter **8-51 Quick Stop Select** determines how bit 04 is linked with the corresponding function of the digital inputs.

Bit 05, Hold Output Frequency/Use Ramp

- Bit 05 = 0 causes the present output frequency (in Hz) to freeze. The frozen 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 **[21] Speed up** and **[22] Speed down**.

i NOTE: If freeze output is active, the drive can only be stopped in the following ways:

- Bit 03 Coasting stop
- Bit 02 DC brake
- Digital input (parameter **5-10 Terminal 18 Digital Input** to parameter **5-15 Terminal 33 Digital Input**) programmed to **[5] DC brake inverse**, **[2] Coast inverse**, or **[3] Coast and reset inv.**

Bit 06, Ramp Stop/Start

Normal ramp stop using the ramp times of the actual ramp as selected. Additionally, activation of the output relay 1 and 4 if the output frequency is 50 Hz and if [Relay 123] has been selected in parameter **5-40 Function Relays**.

- Bit 06 = 0 leads to a stop in which the motor speed is ramped down to stop via the selected ramp-down parameter.
- Bit 06 = 1 means that the drive can start if the other start conditions are fulfilled.

i NOTE: The selection in parameter **8-53 Start Select** determines how bit 06 is linked with the corresponding functions of the digital inputs.

Bit 07, No Function/Reset

- Bit 07 = 0 means that there is no reset.
- Bit 07 = 1 resets a trip. Reset is activated when the signal changes from logic 0 to logic 1.

Bit 08, No Function/Jog

- Bit 08 = 1 means that the output frequency is as defined in parameter **3-19 Jog Speed [RPM]**.

Bit 09, Ramp 1/Ramp 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 is active (parameter **3-50 Ramp 2 Type** to parameter **3-57 Ramp 2 S-ramp Ratio at Decel. Start**).

Bit 10, Data Invalid/Valid

This bit tells the drive whether the control word should be used or ignored.

- Bit 10 = 0 ignores the control word giving the opportunity to turn off the control word when updating/reading parameters.

- Bit 10 = 1 uses the control word. This function is relevant because the control word is always contained in the telegram, regardless of the type of telegram.

Bit 11, No Function/Relay 01 Active

- Bit 11 = 0 means that the relay is not activated.
- Bit 11 = 1 means that relay 01 is activated if **[36] Control word bit 11** is selected in parameter **5-40 Function Relay**.

Bit 12, No Function/Relay 02

- Bit 12 = 0 means that the relay is not activated.
- Bit 12 = 1 means that relay 02 is activated if **[37] Control Word Bit 12** is selected in parameter **5-40 Function Relay**.

Bits 13/14, Setup Selection

Bits 13 and 14 are used for selecting between the 4 parameter setups according to the table below. The function is only possible if **[9] Multi set-up** has been selected in parameter **0-10 Active Set-up**. The selection in parameter **8-55 Set-up Select** determines how bits 13 and 14 are linked with the corresponding function of the digital inputs. Changing the setup while the drive is running is only possible if the setups have been linked in parameter **0-12 This Set-up Linked to**.

Table 21: Parameter Setups

Setup	Bit 13	Bit 14
1	0	0
2	1	0
3	0	1
4	1	1

Bit 15, No Function/Reverse

- Bit 15 = 0 means no reversing.
- Bit 15 = 1 means reversing is active.

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

i NOTE: Bit 15 only activates reversing when **[1] Bus**, **[2] Logic AND**, or **[3] Logic OR** is selected.

4.11.3 Status Word According to Danfoss FC Profile (STW)

The status word is used to notify a master, for example, a PC, about the status of the drive.

Table 22: Status Word Bits

Bit	Bit=0	Bit=1
00	Control not ready	Control ready
01	Drive not ready	Drive ready
02	Coasting	Enable
03	No error	Trip
04	No error	Error (no trip)
05	Reserved	–
06	No error	Trip lock

Table 22: Status Word Bits - (continued)

Bit	Bit=0	Bit=1
07	No warning	Warning
08	Speed $\neq$ reference	Speed = reference
09	Local operation	Bus control
10	Out of frequency limit	Frequency limit OK
11	No operation	In operation
12	Drive OK	Stopped, autostart
13	Voltage OK	Voltage exceeded
14	Torque OK	Torque exceeded
15	Thermal OK	Timer exceeded

4.11.4 Explanation of the Status Word Bits

Bit 00, Control not Ready/Control Ready

- Bit 00 = 0 means that either bit 00, 01, or 02 of the control word is 0, or the drive is switched off (tripped).
- Bit 00 = 1 means that the drive control is ready, but there is not necessarily power supply to the unit present. For example, this situation could occur if 24 V external supply of the control system is used.

Bit 01, Drive not Ready/Drive Ready

Same meaning as bit 00, however, there is a supply of the power unit. The drive is ready when it receives the necessary start signals.

Bit 02, Coasting/Enable

- Bit 02 = 0 means that either bit 00, 01, or 02 of the control word is 0, or the drive is switched off (tripped).
- Bit 02 = 1 means that the drive can start the motor when a start command is given.

Bit 03, No Error/Trip

- Bit 03 = 0 means that there are no error conditions in the drive.
- Bit 03 = 1 means that the drive has tripped and requires a reset signal before it can start.

Bit 04, No Error/Error (no Trip)

- Bit 04 = 0 means that there is no fault in the drive.
- Bit 04 = 1 means that there is a fault in the drive, but it has not tripped.

Bit 05, Reserved

- Bit 05 is not used in the status word.

Bit 06, No Error/Trip Lock

- Bit 06 = 0 means that the drive is not in fault mode.
- Bit 06 = 1 means that the drive 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 current motor speed deviates from the set speed reference value. This situation may occur, for example, when the speed is changed during start/stop through ramp up/ramp down.
- Bit 08 = 1 means that the current motor speed corresponds to the set speed reference value.

Bit 09, Local Operation/Bus Control

- Bit 09 = 0 indicates that the drive has been stopped via the [Stop] key on the LCP, or that [0] *Linked to hand/auto* or [2] *Local* has been selected in parameter **3-13 Reference Site**.
- Bit 09 = 1 means that the drive can be controlled via fieldbus/serial communication.

Bit 10, Out of Frequency Limit/Frequency Limit OK

- Bit 10 = 0 indicates that the output frequency is outside the limits set in parameter **4-52 Warning Speed Low** and parameter **4-53 Warning Speed High**.
- Bit 10 = 1 means that the output frequency is within the indicated limits.

Bit 11, No Operation/In Operation

- Bit 11 = 0 means that the motor does not run.
- Bit 11 = 1 means that the drive has a start signal, or the output frequency is > 0 Hz.

Bit 12, Drive OK/Stopped, Autostart

- Bit 12 = 0 means that there is no temporary overloading of the inverter.
- Bit 12 = 1 means that the inverter has stopped due to overloading. However, the drive has not switched off (trip) and will start again after the overloading has ended.

Bit 13, Voltage OK/Voltage Exceeded

- Bit 13 = 0 means that the voltage limits of the drive are not exceeded.
- Bit 13 = 1 means that the direct voltage in the DC link of the drive is too low or too high.

Bit 14, Torque OK/Torque Exceeded

- Bit 14 = 0 means that the motor torque is below the limits set in parameter **4-16 Torque Limit Motor Mode** or parameter **4-17 Torque Limit Generator Mode**.
- Bit 14 = 1 means that the limit selected in parameter **4-16 Torque Limit Motor Mode** or parameter **4-17 Torque Limit Generator Mode** is exceeded. The nominal torque can be read in parameter **16-16 Torque [Nm]**.

Bit 15, Thermal OK/Thermal Exceeded

- Bit 15 = 0 indicates that the timers for the motor thermal protection and thermal drive protection have not exceeded 100%.
- Bit 15 = 1 indicates that 1 of the timers has exceeded 100%.

5 Acyclic Communication (DP-V1)

5.1 PROFINET Acyclic Communication

PROFINET offers acyclic communication to enhance the cyclic data communication. This feature is possible via an I/O controller, for example, a PLC, or an I/O supervisor, for example, a PC tool.

Cyclic communication means that data transfer takes place all the time at a certain update rate. It is a common function used for quick update of I/O process data. Acyclic communication means a one-time event mainly used for read/write of parameters from process controllers PC-based tools, or monitoring systems.

5.2 Features of an I/O Controller System

- Cyclic data exchange.
- Acyclic read/write of parameters.
- The acyclic connection is fixed and cannot be changed during operation.
- In general, an I/O controller (PLC or PC-based) is used as a process controller, responsible for commands, speed reference, status of the application, and so on.
- In the I/O controller, the acyclic connection can be used for general parameter access in the followers.

5.3 Features of an I/O Supervisor System

- Initiate/abort acyclic connection.
- Acyclic read/write of parameters.
- The acyclic connection can be established dynamically (initiated) or removed (aborted) even though an I/O controller is active on the network.
- The acyclic connection is typically used for configuration or commissioning tools for easy access to each parameter in any follower in the system.

5.4 Addressing Scheme

The structure of a PROFINET I/O device is shown in [Figure 9](#).

An I/O device consists of several physical or virtual slots. Slot 0 is always present and represents the basic unit. Each slot contains some data blocks addressed by an index.

The master must address a variable in the follower as follows: /Follower address/slot #/Index #

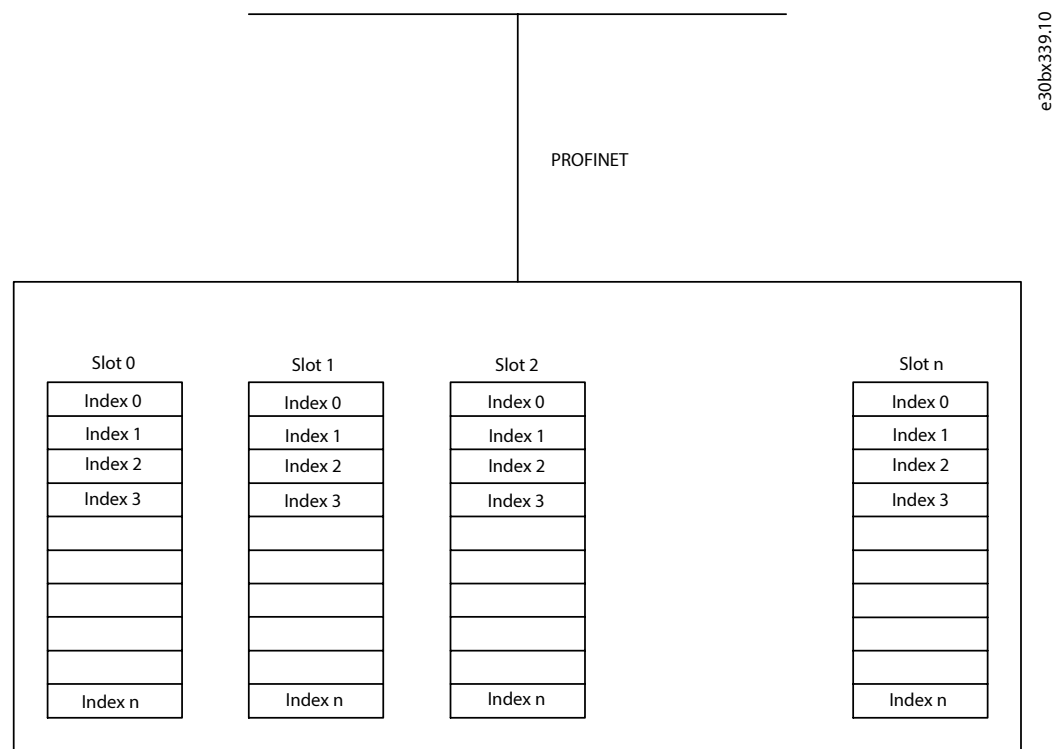


Figure 9: PROFINET I/O Device Structure

5.5 Acyclic Read/Write Request Sequence

A read or write service on a drive parameter takes place as illustrated in [Figure 10](#).

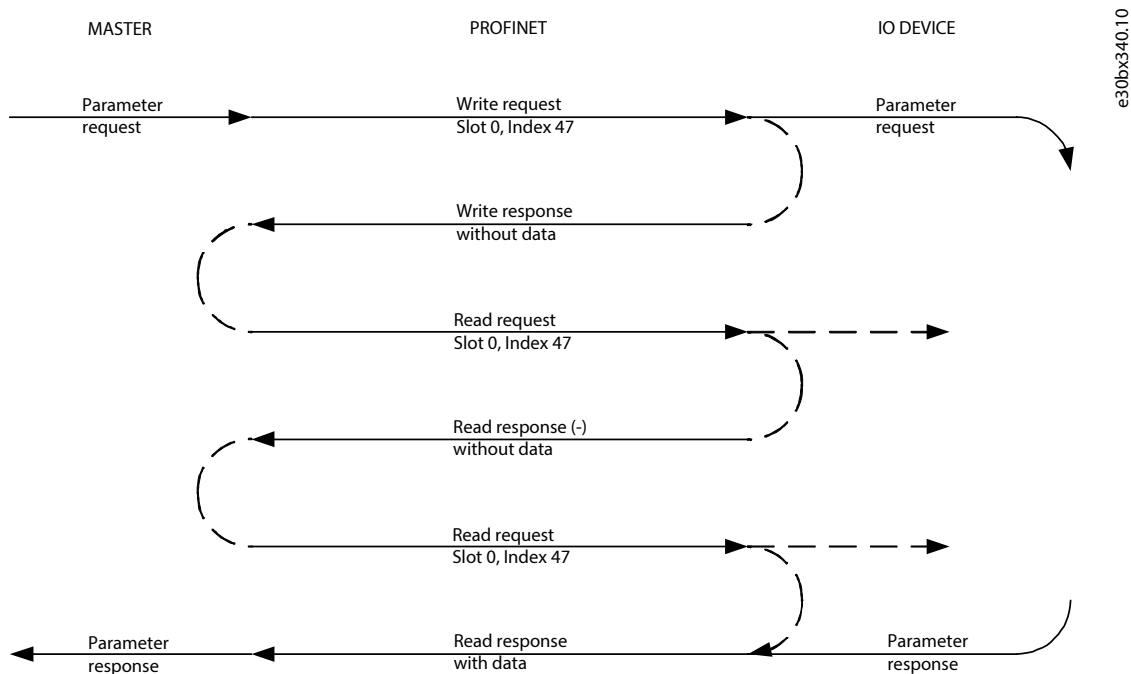


Figure 10: Acyclic Read/Write Request Sequence

Initiate a read or write on a drive parameter by an acyclic write service on slot 0, index 47. If this write request is valid, a positive write response without data is returned from the drive immediately. If not, a negative write response is returned from the drive.

The drive now interprets the PROFIdrive parameter channel part of the data unit and starts to perform this command internally in the drive.

As the next step, the master sends a read request. If the drive is still busy performing the internal parameter request, a negative response without data is returned from the drive. The master repeats this request until the drive has the response data ready for the drive parameter request.

5.6 Data Structure in the Acyclic Telegrams

The data structure for a write/read parameter consists of 3 main blocks:

- Header block
- Parameter block
- Data block

Table 23: Request Telegram

Word number		
1 header	Request #	Request ID
2 header	Axis	# parameter
3 (parameter 1)	Attribute	# elements
4 (parameter 1)	Parameter number	
5 (parameter 1)	Sub-index number	
6 (parameter 2)	Attribute	# elements
7 (parameter 2)	Parameter number	
8 (parameter 2)	Sub-index number	
9 (parameter 3)	Attribute	# elements
10 (parameter 3)	Parameter number	
11 (parameter 3)	Sub-index number	
...		
N (data parameter 1)	Format	# elements
N+1 (data parameter 1)	Data	Data
N (data parameter 2)	Format	# elements
N+1 (data parameter 2)	Data	Data
N (data parameter 3)	Format	# elements
N+1 (data parameter 3)	Data	Data
N+1 (data parameter 3)	Data	Data
N+1 (data parameter 3)	Data	Data

5.7 Header

Request number:

The master uses the request # to handle the response from the I/O device. The I/O device mirrors this number in its response.

Request ID:

- 1 = request parameter
- 2 = change parameter

Axis:

- Always leave this to 0.
- Only used in multi-axis systems.

Number of parameters:

Number of parameters to read or write.

5.8 Parameter Block

Provide the following 5 values for each parameter to read:

- Attribute to be read:
 - 10 = value.
 - 20 = description.
 - 30 = text.
- The number of elements to read when the parameter is indexed.
- Read attribute.
- The number of the parameter to read.
- Pointer to the sub-index.

5.9 Data Block

Format

The format of the information to write:

- 2: integer 8
- 3: integer 16
- 4: integer 32
- 5: unsigned 8
- 6: unsigned 16
- 7: unsigned 32
- 9: visible string
- 33: normalized value 2 bytes
- 35: bit sequence of 16 boolean variables
- 54: time difference without date

The drive-specific programming guide contains parameter descriptions, including parameter number, format, and other relevant information

Data

The data is the actual value to transfer. The amount of data has to be exactly the size requested in the parameter block. If the size differs, the request generates an error.

On a successful transmission of a request command, the master can read the response from the drive. The response looks very much like the requested command. The response only consists of 2 blocks: the header and the data block.

Table 24: Response Telegram

1 header	Request #	Request ID
2 header	Axis	# parameter
3 (data parameter 1)	Format	Error code
4 (data parameter 1)	Data	Data
5 (data parameter 2)	Format	Error code
6 (data parameter 2)	Data	Data
7 (data parameter 3)	Format	Error code
8 (data parameter 3)	Data	Data
9 (data parameter 3)	Data	Data
10 (data parameter 3)	Data	Data

Error code

If the I/O device discovers an error during the execution of the command, it sets the error code to the following values:

Table 25: Error Code

0x00	Unknown parameter.
0x01	Parameter is read-only.
0x02	Value out of range due to maximum/minimum value.
0x03	Wrong sub-index.
0x04	Parameter is not an array.
0x05	Wrong data type (wrong data length).
0x06	It is not allowed to set this parameter (only reset).
0x07	The descriptive element is read-only.
0x09	No description available (only value).
0x0b	Process control not possible.
0x0f	No text array available (only value).
0x11	Not possible in the current state.
0x14	Value out of range due to the drive state/configuration.
0x15	Reply too long (more than 240 bytes)
0x16	Wrong parameter address (unknown or unsupported value for attribute, element, parameter number, sub-index, or illegal combination).
0x17	Illegal format (for writing).
0x18	Value amount is not consistent.
0x65	Wrong axis: action not possible with this axis.
0x66	Unknown service request.
0x67	This service is not possible with multi-parameter access.
0x68	Parameter value cannot be read from bus.

6 Parameters

6.1 8-0* General Settings

8-01 Control Site

Default value:	_ ⁽¹⁾	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

1) The default value for VLT® AQUA Drive FC 202 and VLT® AutomationDrive FC 301/FC 302 is [0] Digital and ctrl. word.

The setting in this parameter overrides the settings in parameter **8-50 Coasting Select** to parameter **8-56 Preset Reference Select**.

Option	Name	Description
[0]	Digital and ctrl.word	Use both digital input and control word.
[1]	Digital only	Use digital inputs only.
[2]	Controlword only	Use control word only.

8-02 Control Word Source

Default value:	–	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select the source of the control word: 1 of 2 serial interfaces or 4 installed options. During initial power-up, the drive 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 drive detects a configuration change, sets parameter **8-02 Control Word Source** to default setting **[1] FC 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 drive trips and shows: *Alarm 67, Option Changed*. When retrofitting a bus option into a drive 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.

Option	Name	Description
[0]	None	Control via serial communication is disabled.
[1]	FC RS485	Control via RS-485 terminals 68/69 on the control card.
[2]	FC USB	Control via USB on the control card.
[3]	Option A	Control via option A.
[4]	Option B	Control via option B.
[5]	Option C0	Control via option C0.
[6]	Option C1	Control via option C1.
[30]	External Can	Internal

Option	Name	Description
[35]	Option A fast	i NOTE: This option is only available in FC 302. Same as option [3] Option A. The reference is transferred faster and without jitter, which ensures more stability and dynamic control. Moreover, all other references are ignored, which means that the drive is controlled by the A-option reference only.
[37]	Option C0 fast	i NOTE: This option is only available in FC 302. Same as option [5] Option C0. The reference is transferred faster and without jitter, which ensures more stability and dynamic control. Moreover, all other references are ignored, which means that the drive is controlled by the C-option reference only.

8-03 Control Word Timeout Time

Default value:	Size related	Parameter type:	Range, 0.1 - 18000 s ⁽¹⁾
Setup:	1 setup	Conversion index:	-1
Data type:	Uint32	Change during operation:	True

1) For VLT® HVAC Drive FC 102, the range is 0.5–18000 s. For VLT® AQUA Drive FC 202 the range is 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 serial 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

Default value:	_(1)	Parameter type:	Option
Setup:	1 setup	Conversion index:	–
Data type:	Uint8	Change during operation:	True

1) For VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202, the default value is [0] Off.

Select the timeout function. The timeout function activates when the control word is not updated within the time period specified in parameter **8-03 Control Word Timeout Time**.

i NOTE:

To change the setup after a timeout, configure as follows:

1. Set parameter **0-10 Active Set-up** to [9] **Multi setup**.
2. Select the relevant link in parameter **0-12 This Set-up Linked to**.

Option	Name	Description
[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.

Option	Name	Description
[4]	Max. speed	Runs the motor at maximum frequency until communication resumes.
[5]	Stop and trip	Stops the motor, then resets the drive to restart: • Via the fieldbus. • Via <i>[Reset]</i>. • Via a digital input.
[6]	Qstop and trip	Stops the motor with the quick stop ramp (parameter 3-81 Quick Stop Ramp Time). Perform a reset to restart the drive.
 NOTE: This option is only available in FC 302 with IMC software version 48.1X or newer.		
[7]	Select setup 1	Changes the setup after a control word timeout. If communication resumes after a timeout, parameter 8-05 End-of-Timeout Function either resumes the setup used before the timeout, or retains the setup endorsed by the timeout function.
[8]	Select setup 2	See [7] Select set-up 1 .
[9]	Select setup 3	See [7] Select set-up 1 .
[10]	Select setup 4	See [7] Select set-up 1 .
[16]	Activate emcy mode	This option automatically triggers fire mode/emergency mode on communication loss and returns to normal when communication resumes.
[20]	N2 override release	
 NOTE: This option is only available in FC 102 and FC 202.		
[26]	Trip	Only available in FC 302 with VLT® Motion Controller Option MCO 302.
[27]	Forced stop and trip	
 NOTE: This option is only available in FC 102 and FC 202.		
[30]	Warning only	
 NOTE: This option is only available in FC 102 and FC 202.		

8-05 End-of-Timeout Function

Default value:	[1] Resume set-up	Parameter type:	Option
Setup:	1 setup	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select the action after receiving a valid control word following a timeout. This parameter is active only when parameter **8-04 Control Word Timeout Function** is set to:

- **[7] Setup 1**
- **[8] Setup 2**
- **[9] Setup 3**
- **[10] Setup 4**

Option	Name	Description
[0]	Hold set-up	Retains the setup selected in parameter 8-04 Control Word Timeout Function and shows a warning until parameter 8-06 Reset Control Word Timeout toggles. Then the drive resumes its original setup.
[1]*	Resume setup	Resumes the setup that was active before the timeout.

8-06 Reset Control Word Timeout

Default value:	[0] Do not reset	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

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

Option	Name	Description
[0]*	Do not reset	Retains the setup specified in parameter 8-04 Control Word Timeout Function , following a control word timeout.
[1]	Do reset	Restores the drive to the original setup following a control word timeout. The drive resets and then immediately reverts to the [0] Do not reset setting.

8-07 Diagnosis Trigger

Default value:	[0] Disable	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

This parameter has no function for DeviceNet.

Option	Name	Description
[0]*	Disable	
[1]	Trigger on alarms	
[2]	Trigger alarm/warn.	

8-08 Readout Filtering

Default value:	–	Parameter type:	Option, Array [1]
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Use this function if the speed feedback value readouts on the fieldbus fluctuate. Select **[1] Motor Data LP-Filter** if the function is required. A power cycle is required for changes to take effect.

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

6.2 8-1* Ctrl. Word Settings

8-10 Control Word Profile

Default value:	_(1)	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

1) For VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202, the default value is [0] FC 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] FC profile** and **[1] PROFIdrive profile**, refer to the product-specific design guide. For more guidelines in the selection of **[1] PROFIdrive profile**, refer to the installation guide for the installed fieldbus.

Option	Name	Description
[0]	FC profile	
[1]	PROFIdrive profile	
[3]	FC motion profile	 NOTE: This option is only available in FC 302 with IMC software version 48.0X. Assigns motion-specific functions to various control and status word bits. This option is available when [9] Positioning or [10] Synchronization is selected in parameter 1-00 Configuration Mode .
[5]	ODVA	Available only with VLT® DeviceNet MCA 104 and VLT® EtherNet/IP MCA 121.
[7]	CANopen DSP 402	
[8]	MCO	 NOTE: Only available in FC 302 with VLT® Motion Controller Option MCO 302.
[22]	PROFIdrive v4_2 profile	

Option	Name	Description
[23]	Advanced MCO STW	<i>i</i> NOTE: Only available in FC 302 with VLT® Motion Controller Option MCO 302.
[24]	VIK-NAMUR	<i>i</i> NOTE: Only available in FC 202 and FC 302.

8-13 Configurable Status Word STW

Default value:	_(1)	Parameter type:	Option, Array [16]
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

1) For VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202, the default value is [1] Profile default.

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 more guidelines in the selection of **[1] PROFIdrive profile**, refer to the installation guide for the installed fieldbus.

Option	Name	Description
[0]	No function	The input is always low.
[1]	Profile default	Dependent on the profile set in parameter 8-10 Control Profile .
[2]	Alarm 68 Only	The input goes high whenever <i>Alarm 68 Safe Stop Activated</i> is active and goes low whenever <i>Alarm 68 Safe Stop Activated</i> is not active.
[3]	Trip excl Alarm 68	
[4]	Position error	<i>i</i> NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. The position is outside its limits set in parameter 3-06 Minimum Position and parameter 3-07 Maximum Position.
[5]	Position limit	<i>i</i> NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. The position error exceeds the value in parameter 4-71 Maximum Position for the time set in parameter 4-72 Position Error Timeout.
[6]	Touch on target	<i>i</i> NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. Target position is reached in touch probe position mode.
[7]	Touch activated	<i>i</i> NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. Touch probe positioning is active. The drive monitors the touch probe sensor input.

Option	Name	Description
[8]	Touch sensor found	i NOTE: This option is only available in FC 302 with IMC software version 48.5X or newer. The touch sensor has been detected.
[9]	Vir. master on ref	i NOTE: This option is only available in FC 302 with IMC software version 48.7X or newer. The virtual master is running on the set reference.
[10]	T18DI status	The bit indicates the status of terminal 18. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[11]	T19DI status	The bit indicates the status of terminal 19. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[12]	T27DI status	The bit indicates the status of terminal 27. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[13]	T29DI status	The bit indicates the status of terminal 29. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[14]	T32DI status	The bit indicates the status of terminal 32. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[15]	T33DI status	The bit indicates the status of terminal 33. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[16]	T37DI status	The input goes high whenever T37 has 0 V and goes low whenever T37 has 24 V.
[17]	X30/2 DI status	
[18]	X30/3 DI status	
[19]	X30/4 DI status	
[20]	CTW timeout toggle inverse	i NOTE: This option is only available in FC 202 and FC 302.
[21]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the motor, drive, brake resistor, or thermistor.
[22]	Execution distance extended	i NOTE: This option is only available in FC 302 with IMC software version 48.9X or newer. Indicates that the offset execution distance (set in parameter 17-95 Offset Execution Distance) has been extended due to speed/ramp limitation.
[29]	Protection mode	i NOTE: This option is only available in FC 302.
[30]	Brake fault (IGBT)	Output logic is 1 when the brake IGBT is short-circuited. Use this function to protect the drive if there is a fault on the brake modules. Use the output/relay to cut out the main voltage from the drive.
[40]	Out of ref range	

Option	Name	Description
[49]	Derate active	 NOTE: This option is only available in FC 102 and FC 301/FC 302.
[54]	Running	
[59]	On reference	
[60]	Comparator 0	See parameter group 13-1* Comparators . If comparator 0 is evaluated as true, the output goes high. Otherwise, it is low.
[61]	Comparator 1	See parameter group 13-1* Comparators . If comparator 1 is evaluated as true, the output goes high. Otherwise, it is low.
[62]	Comparator 2	See parameter group 13-1* Comparators . If comparator 2 is evaluated as true, the output goes high. Otherwise, it is low.
[63]	Comparator 3	See parameter group 13-1* Comparators . If comparator 3 is evaluated as true, the output goes high. Otherwise, it is low.
[64]	Comparator 4	See parameter group 13-1* Comparators . If comparator 4 is evaluated as true, the output goes high. Otherwise, it is low.
[65]	Comparator 5	See parameter group 13-1* Comparators . If comparator 5 is evaluated as true, the output goes high. Otherwise, it is low.
[66]	Comparator 6	See parameter group 13-1* Comparators . If comparator 6 is evaluated as true, the output goes high. Otherwise, it is low.
[67]	Comparator 7	See parameter group 13-1* Comparators . If comparator 7 is evaluated as true, the output goes high. Otherwise, it is low.
[68]	Comparator 8	See parameter group 13-1* Comparators . If comparator 8 is evaluated as true, the output goes high. Otherwise, it is low.
[69]	Comparator 9	See parameter group 13-1* Comparators . If comparator 9 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.
[76]	Logic rule 6	See parameter group 13-4* Logic Rules . If logic rule 6 is evaluated as true, the output goes high. Otherwise, it is low.
[77]	Logic rule 7	See parameter group 13-4* Logic Rules . If logic rule 7 is evaluated as true, the output goes high. Otherwise, it is low.
[78]	Logic rule 8	See parameter group 13-4* Logic Rules . If logic rule 8 is evaluated as true, the output goes high. Otherwise, it is low.

Option	Name	Description
[79]	Logic rule 9	See parameter group 13-4* Logic Rules . If logic rule 9 is evaluated as true, the output goes high. Otherwise, it is low.
[80]	SL digital out 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 out B	See parameter 13-52 SL Controller Action . The output goes high whenever the smart logic action [39] Set digital out B high is executed. The output goes low whenever the smart logic action [33] Set digital out B low is executed.
[82]	SL digital out C	See parameter 13-52 SL Controller Action . The output goes high whenever the smart logic action [40] Set digital out C high is executed. The output goes low whenever the smart logic action [34] Set digital out C low is executed.
[83]	SL digital out D	See parameter 13-52 SL Controller Action . The output goes high whenever the smart logic action [41] Set digital out D high is executed. The output goes low whenever the smart logic action [35] Set digital out D low is executed.
[84]	SL digital out E	See parameter 13-52 SL Controller Action . The output goes high whenever the smart logic action [42] Set digital out E high is executed. The output goes low whenever the smart logic action [36] Set digital out E low is executed.
[85]	SL digital out F	See parameter 13-52 SL Controller Action . The output goes high whenever the smart logic action [43] Set digital out F high is executed. The output goes low whenever the smart logic action [37] Set digital out F low is executed.
[86]	ATEX ETR cur. alarm	 NOTE: This option is only available in FC 302.
[87]	ATEX ETR freq. alarm	
[88]	ATEX ETR cur. warning	
[89]	ATEX ETR freq. warning	
[90]	Safe function active	
[91]	Safe opt. reset. req.	 NOTE: This option is only available in FC 302.
[92]	IGBT-cooling	 NOTE: This option is only available in FC 301/FC 302.
[96]	Reverse after ramp	 NOTE: This option is only available in FC 302 with IMC software version 48.5X or newer. Indicates if the direction of rotation should be reversed. Depends on whether the speed reference is positive or negative after the ramp specified in parameter 16-48 Speed Ref. After Ramp [RPM].
[121]	Cavitation	

Option	Name	Description
[122]	Cavitation S2	
[123]	Cavitation thld at max/min	
[181]	Prev. maintenance	
[190]	No-flow	i NOTE: This option is only available in FC 102 and FC 202.
[191]	Dry pump	i NOTE: This option is only available in FC 102 and FC 202.
[192]	End of curve	i NOTE: This option is only available in FC 102 and FC 202.
[193]	Sleep mode	i NOTE: This option is only available in FC 102 and FC 202.
[194]	Broken belt	i NOTE: This option is only available in FC 102 and FC 202.
[196]	Fire mode/Emcy mode is active	The drive is operating in emergency mode. See parameter group 24-0* Fire Mode/24-0* Emergency Mode .
[197]	Fire mode/Emcy mode was active	The drive has been operating in fire mode/emergency mode.
[198]	Fire mode/Emcy mode limits	During fire mode/emergency mode operation, 1 of the critical alarms has been activated and suppressed by fire mode/emergency mode. This may lead to reduced drive performance and expected operation lifetime before service is required.
[200]	User defined alerts	
[210]	Pos. set acknowledge	i NOTE: This option is only available in FC 302 with IMC software version 48.9X or newer. Acknowledge activation of the set target position.
[231]	In power lim. mot.	i NOTE: This option is only available in FC 302. See parameter group 4-8* Power Limit. Use this option in motor mode only.
[232]	In power lim. gen.	i NOTE: This option is only available in FC 302. See parameter group 4-8* Power Limit. Use this option in generating mode only.
[233]	In power limit	i NOTE: This option is only available in FC 302. See parameter group 4-8* Power Limit. Use this option in both motor and generating modes.
[234]	Fire m./Emcy m. OPR unexpected	Fire mode/emergency mode is not operating as expected, for example, live zero monitoring on an analog input is activated.
[254]	Testing fire mode/emcy mode	Fire mode/emergency mode was activated in a special test mode where the drive stops on all alarms.

8-14 Configurable Control Word CTW

Default value:	[1] Profile default	Parameter type:	Option, Array [16]
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

This is an array parameter with 16 elements, 1 element for each bit in range 0–15. Each of the bits can be configured to any of the following options.

Option	Name	Description
[0]	None	The drive ignores the information in this bit.
[1]*	Profile default	Dependent on the profile set in parameter 8-10 Control Profile .
[2]	CTW valid, active low	If set to 1, the drive ignores the remaining bits of the control word.
[3]	Safe option reset	i NOTE: This option is only available in FC 302. This function is only available in bits 12–15 of the control word if a safety option is mounted in the drive. The reset is executed on a 0⇒1 transition and resets the safety option as set in parameter 42-24 Restart behavior.
[4]	PID error inverse	i NOTE: This option is only available in FC 301/FC 302. 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	i NOTE: This option is only available in FC 301/FC 302. 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	i NOTE: This option is only available in FC 301/FC 302. 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.
[7]	External interlock	
[10]	Bit 10 = 0>CTW timeout	
[11]	Start homing	i NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. Starts the homing function selected in parameter 17-80 Homing Function. Must remain high until homing is done, otherwise homing is aborted.

Option	Name	Description
[12]	Activate touch	i NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. Activates monitoring of the touch sensor input.
[13]	Sync. to pos mode	i NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. Select positioning in synchronization mode.
[14]	Ramp 2	i NOTE: This option is only available in FC 302 with IMC software version 48.0X or newer. Select between ramp 1 (parameter group 3-4* Ramp 1) and ramp 2 (parameter group 3-5* Ramp 2).
[15]	Relay 1	Control relay 1.
[16]	Relay 2	Control relay 2.
[17]	Speed mode	i NOTE: This option is only available in FC 302 with IMC software version 48.1X or newer. Select the speed mode when [9] Positioning or [10] Synchronization is selected in parameter 1-00 Configuration Mode. Speed reference is set by reference resource 1 or fieldbus REF1 relative to parameter 3-03 Maximum Reference.
[18]	Enable vir. master	i NOTE: This option is only available in FC 302 with IMC software version 48.1X or newer. Enable the signal for the virtual master function. The option is applicable when [10] Synchronization is selected in parameter 1-00 Configuration Mode.
[19]	Enable mast. offset	i NOTE: This option is only available in FC 302 with IMC software version 48.1X or newer. Activates the master offset selected in parameter 3-26 Master Offset when parameter 17-93 Master Offset Selection has a selection from [1] Absolute to [5] Relative Touch Sensor.
[20]	Control word toggle command	Changes the sign of the set target position. For example, if the set target is 1000, the activation of this option changes the value to -1000.
[21]	Target inverse	i NOTE: This option is only available in FC 302 with IMC software version 48.3X or newer. Changes the sign of the set target position. For example, if the set target is 1000, the activation of this option changes the value to -1000.
[22]	Digital out 27	
[23]	Digital out 29	
[24]	Digital out X30/6	

Option	Name	Description
[25]	Digital out X30/7	
[26]	Home sensor	i NOTE: This option is only available in FC 302 with IMC software version 48.3X or newer. i NOTE: Accuracy of the home position depends on the delay in transferring the signals. The home sensor is connected via fieldbus master.
[27]	Touch sensor	i NOTE: This option is only available in FC 302 with IMC software version 48.3X or newer. i NOTE: Accuracy of the home position depends on the delay in transferring the signals. The touch sensor is connected via fieldbus master.
[28]	Position vir. master	i NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer. Activates position-controlled virtual master when [9] Positioning or [10] Synchronization is selected in parameter 1-00 Configuration Mode. When the option is selected, the following occurs: - Target position is set by Fieldbus Pos Ref or preset target is as defined in parameter 3-20 Preset Target. - Speed is set relative to parameter 3-27 Virtual Master Max Ref by the source selected in parameter 3-15 Reference Resource 1 or fieldbus REF1. - Acceleration and deceleration are set as defined in parameter group 3-6* Ramp 3.
[29]	Set master home	i NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer. Sets the actual master position as defined in parameter 17-88 Master Home Position.
[30]	Set vir. mas. pos. to actual	i NOTE: This option is only available in FC 302 with IMC software version 48.7X or newer. Bit for setting the virtual master position = the actual follower position. This is needed for setting the correct starting position for position-controlled virtual master ensuring that the virtual master ensuring that the virtual master position is aligned with the physical position of the follower.
[31]	Activate CAM table	i NOTE: This option is only available in FC 302 with IMC software version 48.7X or newer. Signal for activating a new CAM table while running with bumpless transfer.

Option	Name	Description
[32]	Halt	i NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.
[33]	Bit 10 = 0 > CTW TO always	
[34]	Activate CAM cycles	i NOTE: This option is only available with IMC software version 48.96 or newer. Activates the number of CAM cycles set in parameter 17-97 Number of CAM Cycles.
[66]	Sleep mode	i NOTE: This option is only available in FC 102 and FC 302.
[78]	Reset preventive maintenance word	
[85]	Latched pump derag	i NOTE: This option is only available in FC 202.
[86]	Flow confirmation	i NOTE: This option is only available in FC 202.
[94]	Light load detection	i NOTE: This option is only available in FC 302. Use this option to ensure drive runs in the direction which requires least energy (UPS capacity), during an emergency.
[95]	Evacuation mode	i NOTE: This option is only available in FC 302. Use this function to operate the drive at reduced DC voltage for evacuating people in case of power failure.
[189]	Fire mode/emergency mode	
[190]	Fire mode/emcy mode ref bit 0	Enables a choice between 1 of the 8 preset references.
[191]	Fire mode/emcy mode ref bit 1	Enables a choice between 1 of the 8 preset references.
[192]	Fire mode/emcy mode ref bit 2	Enables a choice between 1 of the 8 preset references.
[195]	Test fire mode/emcy mode	Fire mode/emergency mode is activated in a special test mode where the drive stops on all alarms.
[231]	Power limit mot.	i NOTE: This option is only available in FC 302. See parameter group 4-8* Power Limit. Use this option in the motor mode only.
[232]	Power limit gen.	i NOTE: This option is only available in FC 302. See parameter group 4-8* Power Limit. Use this option in the generating mode only.

Option	Name	Description
[233]	Power limit both	i NOTE: This option is only available in FC 302. See parameter group 4-8* Power Limit. Use this option in both the motor and the generating modes.
[234]	Light load+evacuation	i NOTE: This option is only available in FC 302. Use this option to ensure that the drive runs in the direction which requires least energy (UPS capacity), during an emergency and to operate the drive at reduced DC-voltage for evacuating people in case of power failure.
[235]	Setup bit 0	
[236]	Setup bit 1	

8-19 Product Code

Default value:	Size related	Parameter type:	Array [2]
Setup:	1 setup	Conversion index:	0
Data type:	Uint32	Change during operation:	True

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.

6.3 8-4* FC MC Protocol Set

8-46 BTM Transaction Status

Default value:	[0] Off	Parameter type:	Readout
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Option	Name	Description
[0]*	Off	
[1]	Transaction started	
[2]	Commit transaction	
[3]	Transaction timeout	
[4]	Err. non-existing par.	
[5]	Err. par. out of range	
[6]	Transaction failed	
[7]	SO config check	i NOTE: This option is only available in VLT® AutomationDrive FC 302.
[8]	SO config check done	i NOTE: This option is only available in VLT® AutomationDrive FC 302.

8-47 BTM Timeout

Default value:	60 s	Parameter type:	Range, 1 - 360 s
Setup:	1 setup	Conversion index:	0
Data type:	Uint16	Change during operation:	False

Select the BTM timeout after a BTM transaction has been started. Timeout is between each acyclic write of parameters.

8-48 BTM Maximum Errors

Default value:	21	Parameter type:	Range, 0 - 21
Setup:	1 setup	Conversion index:	0
Data type:	Uint8	Change during operation:	True

Select the maximum allowed number of bulk transfer mode errors before aborting. If it is set to maximum, there is no abort.

8-49 BTM Error Log

Default value:	Size related	Parameter type:	Array [22]
Setup:	1 setup	Conversion index:	-3
Data type:	Uint32	Change during operation:	True

List of parameters that failed during bulk transfer mode. The value after the decimal break is the fault code (255 stands for no error).

6.4 8-5* Digital/Bus

8-50 Coasting Select

Default value:	[3] Logic OR	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select the trigger for the coasting function.

Option	Name	Description
[0]	Digital input	A digital input triggers the coasting function.
[1]	Bus	A serial communication port or the fieldbus triggers the coasting function.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the coasting function.
[3]*	Logic OR	The fieldbus/serial communication port or a digital input triggers the coasting function.

8-51 Quick Stop Select

Default value:	_(1)	Parameter type:	Option
Setup:	All setups	Conversion index:	–

Data type: Uint8 **Change during operation:** True

1) For VLT® HVAC Drive FC 102 and VLT® AutomationDrive FC 301/FC 302, the default value is [3] Logic OR.

Select the control of the quick stop function via the terminals and/or via the bus.

Option	Name	Description
[0]	Digital input	
[1]	Bus	
[2]	Logic AND	
[3]	Logic OR	
[4]	Disabled	

i NOTE: This option is only available in FC 202.

The quick stop function is disabled.

8-52 DC Brake Select

Default value: – **Parameter type:** Option
Setup: All setups **Conversion index:** –
Data type: Uint8 **Change during operation:** True

Select control of the DC brake via the terminals (digital input) and/or via the fieldbus.

i NOTE: When parameter **1-10 Motor Construction** is set to [1] **PM non-salient SPM**, only selection [0] **Digital input** is available.

Option	Name	Description
[0]	Digital input	Activate a start command via a digital input.
[1]	Bus	Activate a start command via a serial communication port or fieldbus option.
[2]	Logic AND	Activate a start command via the fieldbus/serial communication port and also via 1 of the digital inputs.
[3]	Logic OR	Activate a start command via the fieldbus/serial communication port or via 1 of the digital inputs.

8-53 Start Select

Default value: [3] Logic OR **Parameter type:** Option
Setup: All setups **Conversion index:** –
Data type: Uint8 **Change during operation:** True

Select the trigger for the start function.

Option	Name	Description
[0]	Digital input	A digital input triggers the start function.
[1]	Bus	A serial communication port or the fieldbus triggers the start function.

Option	Name	Description
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the start function.
[3]*	Logic OR	The fieldbus/serial communication port or a digital input triggers the start function.

8-54 Reversing Select

Default value:	–	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select the trigger for the reversing function.

Option	Name	Description
[0]	Digital input	A digital input triggers the reversing function.
[1]	Bus	A serial communication port or the fieldbus triggers the reversing function.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the reversing function.
[3]	Logic OR	The fieldbus/serial communication port or a digital input triggers the reversing function.

8-55 Set-up Select

Default value:	[3] Logic OR	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select the trigger for the setup selection.

Option	Name	Description
[0]	Digital input	A digital input triggers the setup selection.
[1]	Bus	A serial communication port or the fieldbus triggers the setup selection.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the setup selection.
[3]*	Logic OR	The fieldbus/serial communication port or a digital input triggers the setup selection.

8-56 Preset Reference Select

Default value:	[3] Logic OR	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select the trigger for the preset reference selection.

Option	Name	Description
[0]	Digital input	A digital input triggers the preset reference selection.
[1]	Bus	A serial communication port or the fieldbus triggers the preset reference selection.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the preset reference selection.
[3]*	Logic OR	The fieldbus/serial communication port or a digital input triggers the preset reference selection.

6.5 8-9* Bus Jog/Feedback

8-90 Bus Jog 1 Speed

Default value:	100 RPM ⁽¹⁾	Parameter type:	Range, 0 - Par. 4-13 RPM
Setup:	All setups	Conversion index:	67
Data type:	Uint16	Change during operation:	True

1) VLT® AutomationDrive FC 301/FC 302 has not default value.

Enter the jog speed. This is a fixed jog speed activated via the serial port or fieldbus option.

8-91 Bus Jog 2 Speed

Default value:	Size related ⁽¹⁾	Parameter type:	Range, 0 - par. 4-13 RPM
Setup:	All setups	Conversion index:	67
Data type:	Uint16	Change during operation:	True

1) For VLT® HVAC Drive FC 102, the default value is 200 RPM.

Enter the jog speed. Activate this fixed jog speed via the serial port or fieldbus option.

6.6 9-** PROFIdrive

9-15 PCD Write Configuration

Default value:	–	Parameter type:	Option, Array [20]
Setup:	2 setups	Conversion index:	–
Data type:	Uint16	Change during operation:	True

Select the parameters to be assigned to PCD 3–10 of the telegrams. The number of available PCDs depends on the telegram type. Values in PCD 3–10 are written to the selected parameters as data. For standard PROFIBUS telegrams, see parameter **9-22 Telegram Selection**.

9-16 PCD Read Configuration

Default value:	–	Parameter type:	Option, Array [20]
Setup:	All setups	Conversion index:	–
Data type:	Uint16	Change during operation:	True

Select the parameters to be assigned to PCD 3–10 of the telegrams. The number of available PCDs depends on the telegram type. Values in PCD 3–10 are written to the selected parameters as data. For standard PROFIBUS telegrams, see parameter **9-22 Telegram Selection**.

9-22 Telegram Selection

Default value:	[100] None	Parameter type:	Option
Setup:	1 setup	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Select a standard PROFIBUS telegram configuration for the drive as an alternative to the freely configurable telegrams in parameter **9-15 PCD Write Configuration** and parameter **9-16 PCD Read Configuration**.

Option	Name	Description
[1]	Standard telegram 1	
[20]	Standard telegram 20 (VIK/NAMUR)	
[100]*	None	
[121]	FC telegram	
[122]	FC motion telegram	
[123]	MCO telegram	

9-23 Parameters for Signals

Default value:	[0] None	Parameter type:	Readout, Array [1000]
Setup:	All setups	Conversion index:	–
Data type:	Uint16	Change during operation:	True

This parameter contains a list of signals available for selection in parameter **9-15 PCD Write Configuration** and parameter **9-16 PCD Read Configuration**.

Option	Name	Description
[0]*	None	
[15]	Readout: actual setup	
[109]	Mode of operation	 NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.
[177]	Compressor start max speed [RPM]	
[178]	Compressor start max speed [Hz]	
[302]	Minimum reference	
[303]	Maximum reference	
[311]	Jog speed [Hz]	
[312]	Catch up/slow down value	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[319]	Jog speed [RPM]	

Option	Name	Description
[321]	Touch target	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.1X or newer.
[322]	Master scale numerator	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.1X or newer.
[323]	Master scale denominator	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.1X or newer.
[326]	Master Offset	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.0X or newer.
[328]	Master offset speed ref	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.2X or newer.
[330]	Mn. speed ramp time	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[341]	Ramp 1 ramp up time	
[342]	Ramp 1 ramp down time	
[351]	Ramp 2 ramp up time	
[352]	Ramp 2 ramp down time	
[361]	Ramp 3 ramp up time	
[362]	Ramp 3 ramp down time	
[380]	Jog/homing ramp time jog ramp time	
[381]	Quick stop ramp time	
[411]	Motor speed low limit [RPM]	
[412]	Motor speed low limit [Hz]	
[413]	Motor speed high limit [RPM]	
[414]	Motor speed high limit [Hz]	
[416]	Torque limit motor mode	
[417]	Torque limit generator mode	
[482]	Power limit motor mode	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[483]	Power limit generator mode	
[491]	Positive speed limit [RPM]	
[492]	Positive speed limit [Hz]	
[493]	Negative speed limit [RPM]	
[494]	Negative speed limit [Hz]	

Option	Name	Description
[495]	Positive torque limit	
[496]	Negative torque limit	
[553]	Term. 29 high ref./feedb. value	
[558]	Term. 33 high ref./feedb. value	
[590]	Digital & relay bus control	
[593]	Pulse out #27 bus control	
[595]	Pulse out #29 bus control	
[597]	Pulse out #30/6 bus control	
[615]	Terminal 53 high ref./feedb. value	
[625]	Terminal 54 high ref./feedb. value	
[653]	Term 42 output bus ctrl	
[663]	Terminal X30/8 bus control	
[673]	Terminal X45/1 bus control	
[683]	Terminal X45/3 bus control	
[702]	Speed PID proportional gain	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[703]	Speed PID integral time	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[708]	Speed PID feed forward factor	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[748]	PCD feed forward	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[890]	Bus jog 1 speed	
[891]	Bus jog 2 speed	
[1397]	Alert alarm word	
[1398]	Alert warning word	
[1399]	Alert status word	
[1444]	d-axis reference gain	
[1472]	Legacy alarm word	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1473]	Legacy warning word	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.

Option	Name	Description
[1474]	Leg. ext. status word	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1500]	Operating hours	
[1501]	Running hours	
[1502]	kWh counter	
[1583]	Motor Ud	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302. View the motor voltage on the d-axis. The value is a calculated value used for controlling the motor.
[1584]	Motor Uq	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302. View the motor voltage on the q-axis. The value is a calculated value used for controlling the motor.
[1585]	Motor Id	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302. View the motor d-axis current measured as a mean value, I_{RMS}.
[1586]	Motor Iq	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302. View the motor q-axis current measured as a mean value, I_{RMS}.
[1600]	Control word	
[1601]	Reference [unit]	
[1602]	Reference %	
[1603]	Status word	
[1605]	Main actual value [%]	
[1606]	Actual position	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1607]	Target position	i NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1608]	Position error	i NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1609]	Custom readout	
[1610]	Power [kW]	
[1611]	Power [hp]	
[1612]	Motor voltage	

Option	Name	Description
[1613]	Frequency	
[1614]	Motor current	
[1615]	Frequency [%]	
[1616]	Torque [Nm]	
[1617]	Speed [RPM]	
[1618]	Motor thermal	
[1619]	Thermistor sensor temperature	
[1620]	Motor angle	
[1621]	Torque [%] high res.	
[1622]	Torque [%]	
[1623]	Motor shaft power [kW]	
[1624]	Calibrated stator resistance	
[1625]	Torque [Nm] high	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1626]	Power filtered [kW]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1627]	Power filtered [hp]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1628]	Angle error	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.3X or newer.
[1630]	DC link voltage	
[1632]	Brake energy /s	
[1633]	Brake energy average	
[1634]	Heatsink temp.	
[1635]	Inverter thermal	
[1638]	SL controller state	
[1639]	Control card temp.	
[1642]	Service log counter	
[1644]	Speed error [RPM]	
[1645]	Motor phase U current	
[1646]	Motor phase V current	
[1647]	Motor phase W current	
[1648]	Speed ref. after ramp [RPM]	
[1650]	External reference	

Option	Name	Description
[1651]	Pulse reference	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1652]	Feedback[unit]	
[1653]	Digi pot reference	
[1654]	Feedback 1 [Unit]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1655]	Feedback 2 [Unit]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1656]	Feedback 3 [Unit]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1657]	Feedback [RPM]	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1660]	Digital input	
[1661]	Terminal 53 switch setting	
[1662]	Analog input 53	
[1663]	Terminal 54 switch setting	
[1664]	Analog input 54	
[1665]	Analog output 42 [mA]	
[1666]	Digital output [bin]	
[1667]	Freq. input #29 [Hz]	
[1668]	Freq. input #33 [Hz]	
[1669]	Pulse output #27 [Hz]	
[1670]	Pulse output #29 [Hz]	
[1671]	Relay output [bin]	
[1672]	Counter A	
[1673]	Counter B	
[1674]	Prec. stop counter	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.3X or newer.
[1675]	Analog in X30/11	
[1676]	Analog in X30/12	
[1677]	Analog out X30/8 [mA]	
[1678]	Analog out X45/1 [mA]	
[1679]	Analog out X45/3 [mA]	

Option	Name	Description
[1680]	Fieldbus CTW 1	
[1681]	Fieldbus sync. REF	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.3X or newer.
[1682]	Fieldbus REF 1	
[1683]	Fieldbus pos. REF	 NOTE: This option is only available in VLT® AutomationDrive FC 302 with IMC software version 48.0X or newer.
[1684]	Comm. option STW	
[1685]	FC port CTW 1	
[1686]	FC port REF 1	
[1687]	Bus readout alarm/warning	
[1688]	Fieldbus torque FF.	 NOTE: This option is only available in VLT® AutomationDrive FC 301/FC 302.
[1689]	Configurable alarm/warning word	 NOTE: This option is only available in VLT® AQUA Drive FC 202 and VLT® AutomationDrive FC 301/FC 302.
[1690]	Alarm word	
[1691]	Alarm word 2	
[1692]	Alarm word	
[1693]	Alarm word 2	
[1694]	Ext. status word	
[1695]	Ext. status word 2	
[1696]	Maintenance word	
[1697]	Alarm word 3	
[1698]	Warning word 3	
[1699]	Ext. status word 3	
[1728]	SSI status bits	 NOTE: This option is only available in VLT® AutomationDrive FC 301/FC 302.
[1740]	Fieldbus sync. delta	 NOTE: This option is only available in FC 302 with IMC software version 48.7X or newer.
[1741]	Fieldbus profile velocity	 NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.
[1742]	Fieldbus velocity FF.	 NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.

Option	Name	Description
[1743]	Fieldbus acceleration FF.	 NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.
[1744]	Fieldbus target velocity	 NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.
[1766]	SSI status	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1767]	Raw. inc. quad counter	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1768]	Raw abs. pos. low	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1769]	Raw abl. pos. high	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1782]	Home position	 NOTE: This option is only available in FC 302 with IMC software version 48.3X or newer.
[1783]	Homing speed	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1788]	Master home position	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1797]	Number of CAM cycles	 NOTE: This option is only available in FC 302 with IMC software version 48.6X or newer.
[1804]	Mech brake count	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[1820]	Commanded position	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1821]	Master position	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1823]	Virtual master pos.	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.

Option	Name	Description
[1824]	Master pos. offset	 NOTE: This option is only available in FC 302 with IMC software version 48.5X or newer.
[1825]	Latched actual pos.	 NOTE: This option is only available in FC 302 with IMC software version 48.5X or newer.
[1826]	Actual velocity [pu/s]	 NOTE: This option is only available in FC 302 with IMC software version 48.5X or newer.
[1827]	Safe opt. est. speed	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1828]	Safe opt. meas. speed	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1829]	Safe opt. speed error	 NOTE: This option is only available in FC 302 with IMC software version 48.4X or newer.
[1830]	Analog input X42/1	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1831]	Analog input X42/3	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1832]	Analog input X42/5	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1833]	Analog out X42/7 [V]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1834]	Analog out X42/9 [V]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1835]	Analog out X42/11 [V]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1836]	Analog input X48/2[mA]	
[1837]	Temp. input X48/4	
[1838]	Temp. input X48/7	
[1839]	Temp. input X48/10	
[1840]	Analog input X49/1	

Option	Name	Description
[1841]	Analog input X49/3	
[1842]	Analog input X49/5	
[1843]	Analog out X49/7	
[1844]	Analog out X49/9	
[1845]	Analog out X49/11	
[1846]	X49 Digital output [bin]	
[1847]	Last warning	
[1848]	Last warning count	
[1850]	Sensorless readout [unit]	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[1860]	Digital input 2	
[1861]	Temp. input X48 max	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1864]	Power based speed limit	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[1866]	Actual switching frequency	
[1867]	Alarm word 4	
[1868]	Warning word 4	
[1889]	Mode of operation display	 NOTE: This option is only available in FC 302 with IMC software version 48.8X or newer.
[1898]	Expected time to ramp down	 NOTE: This option is only available in FC 302 with IMC software version 48.96 or newer.
[1899]	Speed PID torque FF. [Nm]	
[2013]	Minimum reference/feedb.	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[2014]	Maximum reference/feedb.	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[2021]	Setpoint 1	 NOTE: This option is only available in VLT® AQUA Drive FC 202.
[2022]	Setpoint 2	 NOTE: This option is only available in VLT® AQUA Drive FC 202.
[2023]	Setpoint 3	 NOTE: This option is only available in VLT® AQUA Drive FC 202.

Option	Name	Description
[2470]	Min. ref. change	 NOTE: This option is only available in FC 302 with IMC software version 48.96 or newer.
[2471]	Rope length	 NOTE: This option is only available in FC 302 with IMC software version 48.96 or newer.
[2472]	Period of swing	 NOTE: This option is only available in FC 302 with IMC software version 48.96 or newer.
[2473]	Max speed change per swing	 NOTE: This option is only available in FC 302 with IMC software version 48.96 or newer.
[2623]	Terminal X42/7 Bus control	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[2653]	Terminal X42/9 Bus control	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[2663]	Terminal X42/11 Bus control	 NOTE: This option is only available in VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.
[2792]	% of total capacity	 NOTE: This option is only available in VLT® AQUA Drive FC 202.
[2795]	Advanced cascade relay output [bin]	 NOTE: This option is only available in VLT® AQUA Drive FC 202.
[2796]	Extended cascade relay output [bin]	 NOTE: This option is only available in VLT® AQUA Drive FC 202.
[2969]	Flow	 NOTE: This option is only available in VLT® AQUA Drive FC 202.
[3126]	Pressure sensor 1	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3127]	Pressure sensor 2	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3128]	Pressure sensor 3	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3129]	Pressure sensor 4	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3130]	Pressure warning W1	 NOTE: This option is only available in VLT® HVAC Drive FC 102.

Option	Name	Description
[3136]	Bus feedback pressure 1	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3137]	Bus feedback pressure 2	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3138]	Bus feedback pressure 3	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3139]	Bus feedback pressure 4	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3151]	Pressure warning W2	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3159]	Current specific fan power	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3163]	Nominal pressure sensor 1	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3164]	Nominal pressure sensor 2	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3165]	Nominal pressure sensor 3	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3166]	Nominal pressure sensor 4	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3172]	Differential energy cost	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3173]	Differential kWh counter	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3175]	Differential energy cost per day	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3178]	Energy running hours	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3180]	Filter running hours	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[3310]	Sync factor master	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3311]	Sync factor slave	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.

Option	Name	Description
[3401]	PCD 1 write to MCO	
[3402]	PCD 2 write to MCO	
[3403]	PCD 3 write to MCO	
[3404]	PCD 4 write to MCO	
[3405]	PCD 5 write to MCO	
[3406]	PCD 6 write to MCO	
[3407]	PCD 7 write to MCO	
[3408]	PCD 8 write to MCO	
[3409]	PCD 9 write to MCO	
[3410]	PCD 10 write to MCO	
[3421]	PCD 1 read from MCO	
[3422]	PCD 2 read from MCO	
[3423]	PCD 3 read from MCO	
[3424]	PCD 4 read from MCO	
[3425]	PCD 5 read from MCO	
[3426]	PCD 6 read from MCO	
[3427]	PCD 7 read from MCO	
[3428]	PCD 8 read from MCO	
[3429]	PCD 9 read from MCO	
[3430]	PCD 10 read from MCO	
[3440]	Digital inputs	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3441]	Digital outputs	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3450]	Actual position	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3451]	Commanded position	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3452]	Actual master position	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3453]	Slave index position	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.

Option	Name	Description
[3454]	Master index position	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3455]	Curve position	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3456]	Track error	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3457]	Synchronizing error	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3458]	Actual velocity	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3459]	Actual master velocity	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3460]	Synchronizing status	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[3461]	Axis status	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3462]	Program status	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3464]	MCO 302 status	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[3465]	MCO 303 control	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[3466]	SPI error counter	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[3470]	MCO alarm word 1	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3471]	MCO alarm word 2	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[3644]	Terminal X49/7 bus control	
[3654]	Terminal X49/9 bus control	

Option	Name	Description
[3664]	Terminal X49/11 bus control	
[4027]	Back EMF voltage	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4029]	B-EMF protection log readout	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4030]	Acc. delta speed	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4031]	Acc. delta time	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4032]	Dec. delta speed	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4033]	Dec. delta time	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4034]	Error code	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4035]	DS402 Qstop	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4036]	DS402 current actual	 NOTE: This option is only available in VLT® AutomationDrive FC 301/ FC 302.
[4037]	Motor current	 NOTE: This option is only available in VLT® AQUA Drive FC 202 and VLT® AutomationDrive FC 302.
[4038]	Motor power	 NOTE: This option is only available in VLT® AQUA Drive FC 202 and VLT® AutomationDrive FC 302.
[4039]	Motor torque	 NOTE: This option is only available in VLT® AQUA Drive FC 202 and VLT® AutomationDrive FC 302.
[4150]	Modbus data 0	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[4151]	Modbus data 1	 NOTE: This option is only available in VLT® HVAC Drive FC 102.

Option	Name	Description
[4152]	Modbus data 2	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[4153]	Modbus data 3	 NOTE: This option is only available in VLT® HVAC Drive FC 102.
[4280]	Safe option status	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4281]	Safe option status 2	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4282]	Safe control word	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
		 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4283]	Safe status word	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4285]	Active safe func.	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4287]	Time until manual test	 NOTE: This option is only available in VLT® AutomationDrive FC 302.
[4520]	Type	
[4521]	Status	
[4523]	Baseline failure	
[4589]	Cavitation [%]	
[4590]	Stator [%]	
[4591]	Load [%]	
[4592]	Sensor 1 [%]	
[4593]	Sensor 1 [unit]	
[4594]	Sensor 2 [%]	
[4595]	Sensor 3 [unit]	
[4596]	Sensor 3 [%]	
[4597]	Sensor 3 [unit]	
[4598]	Sensor 4 [%]	
[4599]	Sensor 4 [unit]	
[4901]	Autonomous status	
[4902]	Autonomous capacitance value	
[4911]	Baseline status	

9-27 Parameter Edit

Default value:	[1] Enabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint16	Change during operation:	False

Parameters can be edited via:

- PROFIBUS
- The standard RS-485 interface
- The LCP

Option	Name	Description
[0]	Disabled	
[1]*	Enabled	

9-28 Process Control

Default value:	[1] Enable cyclic master	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	False

Process control (setting of control word, speed reference, and process data) is possible via either PROFIBUS or standard fieldbus, but not both simultaneously. Local control is always possible via the LCP. Control via process control is possible via either terminals or fieldbus depending on the settings in parameter **8-50 Coasting Select** to parameter **8-56 Preset Reference Select**.

Option	Name	Description
[0]	Disable	
[1]*	Enable cyclic master	

9-53 PROFIBUS Warning Word

Default value:	0	Parameter type:	Readout
Setup:	All setups	Conversion index:	0
Data type:	V2	Change during operation:	True

This parameter shows PROFIBUS communication warnings.

Table 26: PROFIBUS Warning Word

Bit	Description
0	Connection with DP-master is not OK.
1	Not used.
2	FDL (fieldbus data link layer) is not OK.
3	Clear data command received.
4	Actual value is not updated.
5	Baud rate search.
6	PROFIBUS ASIC is not transmitting.

Table 26: PROFIBUS Warning Word - (continued)

Bit	Description
7	Initializing of PROFIBUS is not OK.
8	Drive is tripped.
9	Internal CAN error.
10	Wrong configuration data from PLC.
11	Wrong ID sent by PLC.
12	Internal fault occurred.
13	Not configured.
14	Timeout active.
15	Warning 34, Fieldbus Fault is active.

9-65 Profile Number

Default value:	0	Parameter type:	Readout
Setup:	All setups	Conversion index:	0
Data type:	OctStr[2]	Change during operation:	True

i NOTE: This parameter is not visible via LCP.

This parameter contains the profile identification. Byte 1 contains the profile number. Byte 2 contains the number of the profile.

9-70 Programming Set-up

Default value:	[9] Active set-up 1 ⁽¹⁾	Parameter type:	Option
Setup:	All setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

1) In VLT® AutomationDrive FC 301/FC 302, the default value is [1] Set-up 1.

Select the setup to be programmed during operation.

Option	Name	Description
[0]	Factory setup	
[1]	Set-up 1	
[2]	Set-up 2	
[3]	Set-up 3	
[4]	Set-up 4	
[9]*	Active set-up	

9-71 PROFIBUS Save Data Value

Default value:	[0] Off	Parameter type:	Option
Setup:	All setups	Conversion index:	–

Data type:	UInt8	Change during operation:	True
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Parameter values changed via RS-485 are not automatically stored in a non-volatile memory. Use this parameter to activate a function that stores parameter values in the EEPROM non-volatile memory, so changed parameter values are retained at power-down.

Option	Name	Description
[0]*	Off	
[1]	Store all setups ⁽¹⁾	
[2]	Store all setups	

1) In VLT® AQUA Drive FC 202, this is called Store edit setup.

9-72 PROFIBUSDriveReset

Default value:	[0] No action	Parameter type:	Option
Setup:	1 setup	Conversion index:	–
Data type:	UInt8	Change during operation:	False

i NOTE: Resets the VLT® PROFIBUS DP-V1 MCA 101 option only.

Option	Name	Description
[0]*	No action	
[1]	Power-on reset	
[2]	Power-on reset prep	
		i NOTE: This option is only available in VLT® AQUA Drive FC 202 and VLT® AutomationDrive FC 301/FC 302.
[3]	Comm option reset	

9-80 Defined Parameters (1)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	UInt16	Change during operation:	False

This parameter shows a list of all the defined drive parameters available for PROFIBUS.

9-81 Defined Parameters (2)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	UInt16	Change during operation:	False

This parameter shows a list of all the defined drive parameters available for PROFIBUS.

9-82 Defined Parameters (3)

Default value:	0	Parameter type:	Readout, Array [116]
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Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameter shows a list of all the defined drive parameters available for PROFIBUS.

9-83 Defined Parameters (4)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameter shows a list of all the defined drive parameters available for PROFIBUS.

9-84 Defined Parameters (5)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameter shows a list of all the defined drive parameters available for PROFIBUS.

9-90 Changed Parameters (1)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameters shows a list of all the drive parameters deviating from the default setting.

9-91 Changed Parameters (2)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameters shows a list of all the drive parameters deviating from default setting.

9-92 Changed Parameters (3)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Change during operation:	False		

This parameters shows a list of all the drive parameters deviating from default setting.

9-93 Changed Parameters (4)

Default value:	0	Parameter type:	Readout, Array [116]
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Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameters shows a list of all the drive parameters deviating from default setting.

9-94 Changed Parameters (5)

Default value:	0	Parameter type:	Readout, Array [116]
Setup:	All setups	Conversion index:	0
Data type:	Uint16	Change during operation:	False

This parameters shows a list of all the drive parameters deviating from default setting.

6.7 12-0* IP Settings

12-00 IP Address Assignment

Default value:	–	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type: Uint8	Change during operation: True		

Select the method for assigning the IP address.

Option	Name	Description
[0]	Manual	Set the IP address in parameter 12-01 IP Address .
[1]	DHCP	Assign the IP address via DHCP server.
[2]	BOOTP	Assign the IP address via BOOTP server.
[3]	Disable	

i NOTE: This option is only available in FC 102 and FC 202.

12-01 IP Address

Default value:	0	Parameter type:	Range, 0 - 4294967295
Setup:	1 setup	Conversion index:	0
Data type:	OctStr[4]	Change during operation:	True

Configure the IP address of the option. Read-only if parameter **12-00 IP Address Assignment** is set to **[1] DHCP**, **[2] BOOTP**, or via DIP switches.

12-02 Subnet Mask

Default value:	0	Parameter type:	Range, 0 - 4294967295
Setup:	1 setup	Conversion index:	0
Data type:	OctStr[4]	Change during operation:	True

Configure the IP subnet mask of the option. Read-only if parameter **12-00 IP Address Assignment** is set to **[1] DHCP** or **[2] BOOTP**.

12-03 Default Gateway

Default value:	0	Parameter type:	Range, 0 - 4294967295
Setup:	1 setup ⁽¹⁾	Conversion index:	0
Data type:	OctStr[4]	Change during operation:	True

1) VLT® AQUA Drive FC 202 has 2 setups.

Configure the IP default gateway of the option. Read-only if parameter **12-00 IP Address Assignment** set to **[1] DHCP** or **[2] BOOTP**. In a non-routed network, this address is set to the IP address of the I/O device.

12-04 DHCP Server

Default value:	0	Parameter type:	Range, 0 - 2147483647
Setup:	2 setups	Conversion index:	0
Data type:	OctStr[4]	Change during operation:	True

i NOTE: This parameter is only available for VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.

i NOTE: A power cycle is necessary after setting the IP parameters manually.

This parameter is read-only. It shows the IP address of the found DHCP or BOOTP server.

12-05 Lease Expires

Default value:	Size related	Parameter type:	Readout
Setup:	All setups	Conversion index:	0
Data type:	TimeDifferenceWithDateIndication	Change during operation:	True

i NOTE: This parameter is only available for VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202.

This parameter is read-only. It shows the lease time for the current DHCP-assigned IP address.

12-06 Name Servers

Default value:	0	Parameter type:	Array [2]
Setup:	1 setup	Conversion index:	0
Data type:	OctStr[4]	Change during operation:	True

IP addresses of the domain name servers. Can be automatically assigned when using DHCP.

12-07 Domain Name

Default value:	0	Parameter type:	Range, 0 - 48
Setup:	1 setup	Conversion index:	0
Data type:	VisStr[48]	Change during operation:	True

Domain name of the attached network. Can be automatically assigned when using DHCP network.

12-08 Host Name

Default value:	0	Parameter type:	Range, 0 - 48
Setup:	1 setup	Conversion index:	0
Data type:	VisStr[48]	Change during operation:	True

i NOTE: The display of the drive only shows the 1st 19 characters, but the remaining characters are stored in the drive.

Logical (given) name of the option.

12-09 Physical Address

Default value:	0	Parameter type:	Range, 0 - 17
Setup:	1 setup	Conversion index:	0
Data type:	VisStr[17]	Change during operation:	True

This parameter is read-only. It shows the physical (MAC) address of the option.

6.8 12-1* Ethernet Link Parameters

The following applies for the whole parameter group:

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

12-10 Link Status

Default value:	[0] No link	Parameter type:	Readout, Array [2]
Setup:	All setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

This parameter is read-only. It shows the link status of the Ethernet ports. Index [0] is used for port 1, and index [1] is used for port 2. For EtherCAT, index [0] is for the in-port, and index [1] is for the out-port.

Index	Description
[0]*	No link
[1]	Link

12-11 Link Duration

Default value:	Size related	Parameter type:	Readout, Array [2]
Setup:	All setups	Conversion index:	0
Data type:	TimeDifferenceWithDateIndication	Change during operation:	True

Shows the duration of the present link on each port in dd:hh:mm:ss.

12-12 Auto Negotiation

Default value:	[1] On ⁽¹⁾	Parameter type:	Option, Array [2]
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

1) VLT® AutomationDrive FC 301/FC 302 has no default value.

Configures auto negotiation of Ethernet link parameters, for each port: ON or OFF. Link Speed and Link Duplex can be configured in parameter **12-13 Link Speed** and parameter **12-14 Link Duplex**.

Option	Name	Description
[0]	Off	
[1]*	On	

12-13 Link Speed

Default value:	[0] None ⁽¹⁾	Parameter type:	Option, Array [2]
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

1) VLT® AutomationDrive F 301/FC 302 has not default value.

Forces the link speed for each port in 10 Mbps or 100 Mbps. If parameter **12-12 Auto Negotiation** is set to **[0] On**, this parameter is read-only and shows the actual link speed. If no link is present, **[0] None** is shown.

Option	Name	Description
[0]*	None	
[1]	10 Mbps	
[2]	100 Mbps	

12-14 Link Duplex

Default value:	[1] Full duplex ⁽¹⁾	Parameter type:	Option, Array [2]
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

1) VLT® AutomationDrive FC 301/FC 302 does not have a default value.

Forces the duplex for each port to full or half duplex. If parameter **12-12 Auto Negotiation** is set to **[1] On**, this parameter is read-only.

Option	Name	Description
[0]	Half duplex	
[1]*	Full duplex	

12-18 Supervisor MAC

Default value:	0	Parameter type:	Array [2]
Setup:	2 setups	Conversion index:	0
Data type:	OctStr[6]	Change during operation:	True

MAC addresses of currently active supervisors.

12-19 Supervisor IP Addr.

Default value:	0	Parameter type:	Array [2]
Setup:	2 setups	Conversion index:	0
Data type:	OctStr[4]	Change during operation:	True

IP addresses of currently active supervisors.

6.9 12-4* Fieldbus Extension

12-49 Ethernet Extended Status

Default value:	0hex	Parameter type:	Array [20]
Setup:	1 setup	Conversion index:	0
Data type:	Uint32	Change during operation:	True

This parameter provides extra information from Ethernet-based communication.

Table 27: Parameter Index

ID	Description
[0]	Reserved.
[1]	Reserved.
[2]	Reserved.
[3]	Reserved.
[4]	Reserved.
[5]	Reserved.
[6]	Reserved.
[7]	Reserved.
[8]	Reserved.
[9]	Reserved.
[10]	Reserved.
[11]	Reserved.
[12]	Reserved.
[13]	PROFINET telegram information.
[14]	PROFINET telegram information.
[15]	Reserved.
[16]	Reserved.
[17]	Reserved.
[18]	Reserved.
[19]	Reserved.

6.10 12-8* Other Ethernet Services

12-80 FTP Server

Default value:	[0] Disabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

Enables/disables the built-in FTP server.

Option	Name	Description
[0]*	Disabled	Disable the built-in FTP server.
[1]	Enabled	Enable the built-in FTP server.
[2]	Enabled with TLS	

i NOTE: This option is only available in FC 102 and FC 202.

12-81 HTTP Server

Default value:	[0] Disabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

Enables/disables the built-in HTTP (web) server.

Option	Name	Description
[0]*	Disabled	Disable the built-in HTTP (web) server.
[1]	Enabled	Enable the built-in HTTP (web) server.

12-82 SMTP Service

Default value:	[0] Disabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

Enables/disables the built-in SMTP (e-mail) service on the option.

Option	Name	Description
[0]*	Disabled	Disable the SMTP (e-mail) service on the option.
[1]	Enabled	Enable the SMTP (e-mail) service on the option.

12-83 SNMP Agent

Default value:	[1] Enabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

Use this parameter to either enable or disable the SNMP agent.

Option	Name	Description
[0]	Disabled	Disable the SNMP agent.
[1]*	Enabled	Enable the SNMP agent.

12-84 Address Conflict Detection

Default value:	[1] Enabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	UInt8	Change during operation:	True

Use this parameter to detect and resolve IP address conflict.

Option	Name	Description
[0]	Disabled	
[1]*	Enabled	

12-85 ACD Last Conflict

Default value:	0	Parameter type:	Range, 0 - 2147483647
Setup:	2 setups	Conversion index:	0
Data type:	OctStr[35]	Change during operation:	True

The name of the IP address causing the most recent address conflict.

12-86 NTP Host Server

Default value:	0	Parameter type:	Array [2]
Setup:	1 setup	Conversion index:	0
Data type:	VisStr[48]	Change during operation:	True

Enter the IPv4/IPv6 address, the FQDN, or the hostname of the NTP server.

12-87 SNTP Time Sync

Default value:	60 min	Parameter type:	Range, 1 - 65535 min
Setup:	1 setup	Conversion index:	0
Data type:	UInt16	Change during operation:	True

Synchronize the clock via NTP at a defined interval.

12-89 Transparent Socket Channel Port

Default value:	Size related	Parameter type:	Range, 0 - 65535
Setup:	2 setups	Conversion index:	0
Data type:	UInt16	Change during operation:	True

Configures the TCP port number for the transient socket channel. This enables FC telegrams to be sent transiently on Ethernet via TCP. 0 indicates that the function is disabled.

6.11 12-9* Advanced Ethernet Services

12-90 Cable Diagnostics

Default value:	[0] Disabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Enables/disables the advanced cable diagnosis function. If enabled, the distance to cable errors can be read out in parameter **12-93 Cable Error Length**. The parameter resumes to the default setting **[0] Disable** after the diagnostics have finished.

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

Option	Name	Description
[0]*	Disabled	
[1]	Enabled	

12-91 Auto Cross Over

Default value:	[1] Enabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

i NOTE: Disabling of the auto-crossover function requires crossed Ethernet cables for daisy-chaining the options.

Option	Name	Description
[0]	Disabled	
[1]*	Enabled	

12-92 IGMP Snooping

Default value:	[1] Enabled	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

Enabling the IGMP snooping function prevents flooding of the Ethernet protocol stack. Multicast packets are only forwarded to ports that are a member of the multicast group.

Option	Name	Description
[0]	Disabled	The IGMP snooping function is disabled.
[1]*	Enabled	The IGMP snooping function is enabled.

12-93 Cable Error Length

Default value:	0	Parameter type:	Array [2]
-----------------------	---	------------------------	-----------

Setup:	1 setup	Conversion index:	0
Data type:	Uint16	Change during operation:	True

If cable diagnostics is enabled in parameter **12-90 Cable Diagnostic**, the built-in switch is possible via time domain reflectometry (TDR). This is a measurement technique which detects common cabling problems such as open circuits, short circuits, and impedance mismatches or breaks in transmission cables. The distance from the option to the error is shown in meters with an accuracy of ± 2 m (6.6 ft). The value 0 means no errors detected.

12-94 Broadcast Storm Protection

Default value:	-1%	Parameter type:	Range, -1 - 20%
Setup:	2 setups	Conversion index:	0
Data type:	Int8	Change during operation:	True

The built-in switch is capable of protecting the switch system from receiving too many broadcast packages, which can use up network resources. The value indicates a percentage of the total bandwidth that is allowed for broadcast messages. Example: OFF means that the filter is disabled - all broadcast messages are passed through. The value 0% means that no broadcast messages are passed through. A value of 10% means that 10% of the total bandwidth is allowed for broadcast messages. If the amount of broadcast messages exceeds the 10% threshold, they are blocked.

12-95 Inactivity Timeout

Default value:	120	Parameter type:	Range, 0 - 3600
Setup:	2 setups	Conversion index:	0
Data type:	Uint16	Change during operation:	True

Applies to parameter **12-94 Broadcast Storm Protection**, if the broadcast storm protection also includes multicast telegrams.

12-96 Port Config

Default value:	_(1)	Parameter type:	Option
Setup:	2 setups	Conversion index:	–
Data type:	Uint8	Change during operation:	True

1) In VLT® HVAC Drive FC 102, the default value is [0] Normal.

Enable or disable the port-mirroring function. The function is used for troubleshooting with a network analyzer tool.

Option	Name	Description
[0]	Normal/Disable	
[1]	Mirror port 1 to 2	
[2]	Mirror port 2 to 1	
[10]	Port 1 disabled	
[11]	Port 2 disabled	

Option	Name	Description
[254]	Mirror int. port to 1	 NOTE: This option is only available in FC 202.
[255]	Mirror int. port to 2	 NOTE: This option is only available in FC 202.

12-97 QoS Priority

Default value:	Size related	Parameter type:	Array [7]
Setup:	2 setups	Conversion index:	0
Data type:	Int8	Change during operation:	True

Each index sets the DSCP value of different types of QoS prioritized messages.

Table 28: Parameter Index

Index	Value
[0]	59
[1]	47
[2]	55
[3]	47
[4]	43
[5]	31
[6]	27

12-98 Interface Counters

Default value:	4000 ⁽¹⁾	Parameter type:	Readout, Array [20]
Setup:	All setups	Conversion index:	0
Data type:	UInt32	Change during operation:	True

¹⁾ For VLT® HVAC Drive FC 102, the default value is 0.

This parameter is read-only. Advanced interface counters from a built-in switch can be used for low-level troubleshooting. The parameter shows a sum of port 1 + port 2.

Table 29: Parameter Indices

Index	Description
[0]	Octet received on the interface.
[1]	Unicast packets received on the interface.
[2]	Non-unicast packets received on the interface
[3]	Inbound packets received on the interface, but discarded.
[4]	Inbound packets that contain errors.
[5]	Inbound packets with unknown protocol.
[6]	Octet sent on the interface.

Table 29: Parameter Indices - (continued)

Index	Description
[7]	Unicast packets sent on the interface.
[8]	Non-unicast packets sent on the interface.
[9]	Outbound packets discarded.
[10]	Outbound packets that contain errors.

12-99 Media Counters

Default value:	0	Parameter type:	Readout, Array [10]
Setup:	All setups	Conversion index:	0
Data type:	Uint32	Change during operation:	True

This parameter is read-only. Advanced interface counters from a built-in switch can be used for low-level troubleshooting. The parameter shows a sum of port 1 + port 2.

Table 30: Parameter Indices

Index	Description
[0]	Alignment errors
[1]	FCS errors
[2]	Single collisions
[3]	Multiple collisions
[4]	SQE test errors
[5]	Deferred transmissions
[6]	Late collisions
[7]	Excessive collisions
[8]	MAC transmit errors
[9]	Carrier sense errors

6.12 PROFINET-specific Parameters

6.12.1 Setting Communication Parameters

Parameter group **12-0* IP Settings** contains all basic communication parameters. All parameters are set to PROFINET standard value so that only a minimum change is necessary.

- Parameter **12-00 IP Address Assignment**
- Parameter **12-01 IP Address**
- Parameter **12-02 Subnet Mask**
- Parameter **12-03 Default Gateway**
- Parameter **12-04 DHCP Server**
- Parameter **12-05 Lease Expires**
- Parameter **12-06 Name Servers**
- Parameter **12-07 Domain Name**

- Parameter **12-08 Host Name**
- Parameter **12-09 Physical Address**

The PROFINET interface offers several ways of address assignment. Typically, DCP is used and then the PLC assigns the IP address, subnet mask, and other relevant parameters when the communication is established. The following examples show the settings if the PROFINET DCP assignment is used.

Table 31: Setting up a Drive with Manually Assigned IP Address

Parameter	Value
12-00 IP Address Assignment	[10] DCP
12-01 IP Address	0.0.0.0 (from PLC)
12-02 Subnet Mask	0.0.0.0 (from PLC)
12-03 Default Gateway	0.0.0.0 (from PLC)
12-04 DHCP Server	(1)

1) The host name can be set via the LCP, through the DCP command, or by setting the DIP switches on the PROFINET interface.

Table 32: Setting up a Drive with Automatically (BOOTP/DHCP) Assigned IP Address

Parameter	Value
12-00 IP Address Assignment	[1] DHCP/[2] BOOTP
12-01 IP Address	Read only
12-02 Subnet Mask	Read only
12-03 Default Gateway	Read only

By IP address assigned by DHCP/BOOTP/DCP server, the assigned IP address and subnet mask can be read out in parameter **12-01 IP Address** and parameter **12-02 Subnet Mask**. In parameter **12-04 DHCP Server**, the IP address of the found DHCP or BOOTP server is down.

For DHCP only: The remaining lease time can be read out in parameter **12-05 Lease Expires**. If the lease time is set to 0, the time never expires.

Parameter **12-09 Physical Address** reads out the MAC address of the option, which is also printed on the label of the option.

Parameter **12-03 Default Gateway** is optional and only used in routed networks.

i NOTE: It is only possible to assign valid class A, B, and C IP addresses to the option. The valid ranges are shown in [Table 31](#).

Table 33: Valid Ranges for IP Addresses

Class	Range
A	1.0.0.1–126.255.255.254
B	128.1.0.1–191.255.255.254
C	192.0.1.1–223.255.254.254

6.12.2 Ethernet Link Parameters

The following parameters provide Ethernet link information:

- Parameter **12-10 Link Status**
- Parameter **12-11 Link Duration**
- Parameter **12-12 Auto Negotiation**

- Parameter **12-13 Link Speed**
- Parameter **12-14 Link Duplex**

i NOTE: The Ethernet link parameters are unique per port.

Parameter **12-10 Link Status** and parameter **12-11 Link Duration** show information on the link status per port. Parameter **12-10 Link Status** shows **[0] No Link** or **[1] Link** according to the status of the present port.

Parameter **12-11 Link Duration** shows the duration of the link on the present port. If the link is broken, the counter resets.

Parameter **12-12 Auto Negotiation** is a feature that enables 2 connected Ethernet devices to select a common transmission parameter, such as speed and duplex mode. In this process, the connected devices first share their capabilities for these parameters and then select the fastest transmission mode that they both support. By default, this function is enabled. Incapability between the connected devices may lead to decreased communication performance. To avoid decreased performance, disable auto negotiation.

If parameter **12-12 Auto Negotiation** is set to **[0] Off**, link speed and duplex mode can be configured manually in parameter **12-13 Link Speed** and parameter **12-14 Link Duplex**.

Parameter **12-13 Link Speed** shows/sets the link speed per port. If no link is present, none is shown.

Parameter **12-14 Link Duplex** shows/sets the duplex mode per port:

- Half duplex provides communication in both directions, but only in 1 direction at a time (not simultaneously).
- Full duplex allows communication in both directions, and unlike half duplex, it allows simultaneous communication in both directions.

6.13 Size Attribute

For further details, refer to the drive-specific programming guide.

Table 34: Size Index and Conversion Index

Physical unit	Size index	Measuring unit	Designation	Conversion index	Conversion factor
–	0	No dimension	–	–	–
Time	4	second	s	0	1
				-1	0.1
				-2	0.01
		millisecond	ms	-3	0.001
		minute	min	70	60
		hour	h	74	3600
		day	d	77	86400
Energy	8	watthour	Wh	0	1
		kilowatthour	kWh	3	1000
		megawatthour	MWh	6	10 ⁶
Power	9	milliwatt	mW	-3	0.001
		watt	W	0	1
		kilowatt	kW	3	1000
		megawatt	MW	6	10 ⁶
Rotation	11	rotation per minute	RPM	67	1

Table 34: Size Index and Conversion Index - (continued)

Physical unit	Size index	Measuring unit	Designation	Conversion index	Conversion factor
Torque	16	newton meter	Nm	0	1
		kilonewton meter	kNm	3	1000
Temperature	17	degrees Celsius	°C	0	1
Voltage	21	millivolt	mV	-3	0.001
		volt	V	0	1
		kilovolt	kV	3	1000
Current	22	milliampere	mA	-3	0.001
		ampere	A	0	1
		kiloampere	kA	3	1000
Resistance	23	milliohm	mOhm	-3	0.001
		ohm	Ohm	0	1
		kiloohm	kOhm	3	1000
Ratio	24	percent	%	0	1
Relative change	27	percnet	%	0	1
Frequency	28	hertz	Hz	0	1
		kilohertz	kHz	3	1000
		megahertz	MHz	6	10 ⁶
		gigahertz	GHz	9	10 ⁹

6.14 Supported Object and Data Types

Table 35: Supported Data Types

Data type	Short name	Description	Data type 2
3	12	Integer 16	Int16
4	14	Integer 32	Int32
5	–	Unsigned 8	UInt8
6	O2	Unsigned 16	UInt16
7	O4	Unsigned 32	UInt32
9	–	Visible string	VisStr
10	–	Byte string	–
33	N2	Standardized value (16 bit)	N2
35	V2	Bit sequence	V2
54	–	Time difference without date indication	TimD

7 Application Examples

7.1 Example: Process Data with Standard Telegram 1 and Universal Data Block 1

This example shows how to work with standard telegram 1 and universal data block 1, which consists of control word/status word and reference/main actual value. The universal data block 1 also has 2 other words, which can be programmed to monitor process signals, see [Table 36](#).

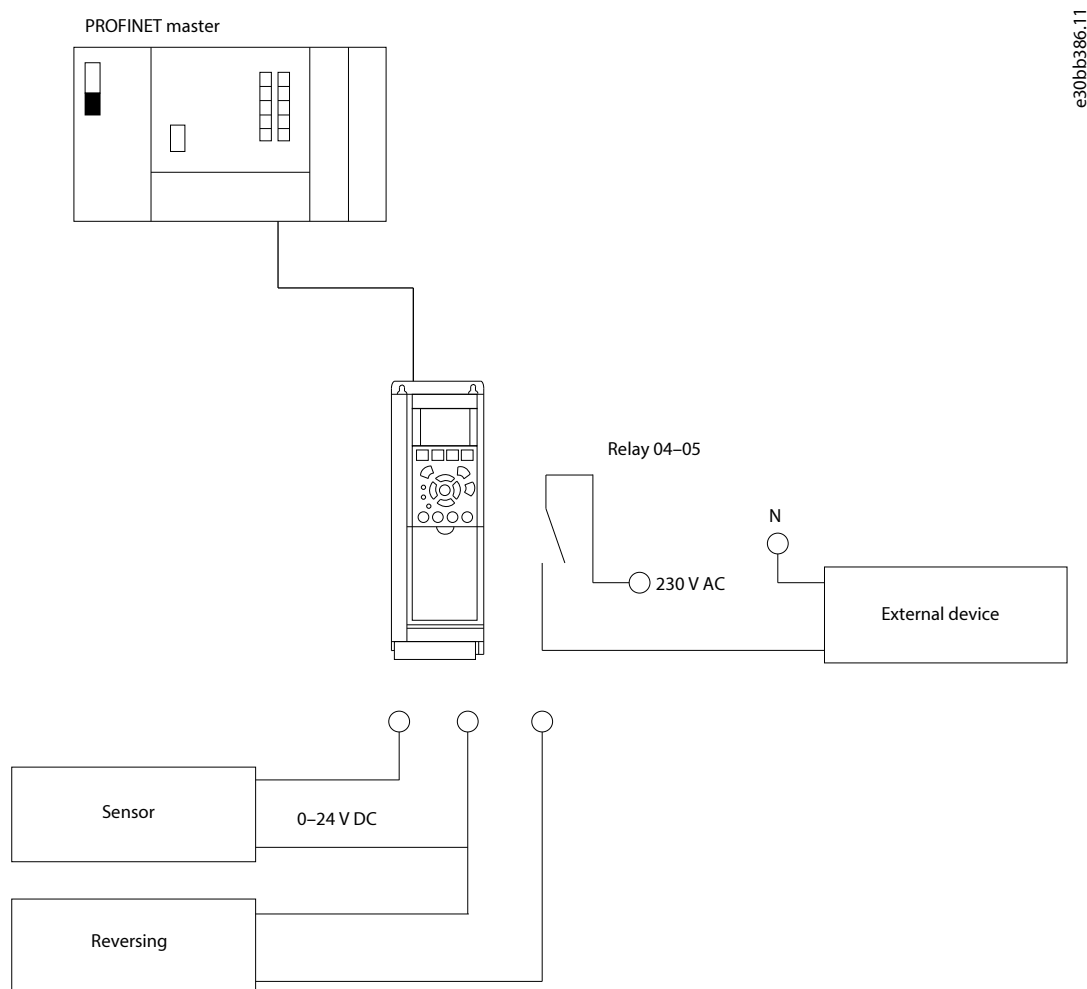
Table 36: Example: Process Data with Standard Telegram 1 and Universal Data Block 1

	0		1		2		3	
	CTW		MRV		PCD [2]		PCD [3]	
From controller	04	7C	20	00	00	00	00	00
	STW		MAV		PCD [2]		PCD [3]	
From drive	0F	07	20	00	3F	A6	00	08
Byte #	1	2	3	4	5	6	7	8

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

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

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



e30bb386.11

Figure 11: Wiring Diagram

Program the drive as shown in [Table 37](#).

Table 37: Parameter Settings

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

Table 37: Parameter Settings - (continued)

Parameter	Setting
8-55 Set-up Select	[1] Bus
8-56 Preset Reference Select	[1] Bus
9-16 PCD Read Configuration	[2] Sub-index parameter 16-16 Torque [Nm] [3] Subindex parameter 16-60 Digital Input

7.2 Example: Control Word Telegram Using Standard Telegram 1

This example shows how the control word telegram relates to the controller and the drive using the FC control profile.

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

Table 38: PCD, Bits 31–16 (MRV)

	0		1		2		3									
	CTW		MRV		PCD		PCD									
	04	7C	20	00												
PQW:	256		258		260		262									
	CTW		MRV													
Bit number:	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	0
	2				0				0				0			

Table 39: PCD, Bits 15–0 (CTW)

	0		1		2		3									
	CTW		MRV		PCD		PCD									
	04	7C	20	00												
PQW:	256		258		260		262									
	CTW		MRV													
Bit number:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
	0				4				7				C			

In this example, [Table 38](#) and [Table 39](#) show the bits contained in the control word, and how they are shown as process data in standard telegram 1, while [Table 40](#) shows the active bit functions and their corresponding bit value.

Table 40: Control Word Telegram Using Standard Telegram 1

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

7.3 Example: Status Word Telegram Using Standard Telegram 1

The status word telegram is sent from the drive to the controller. Standard telegram 1 is used in the example to demonstrate the full range of modules. All the values shown are arbitrary and are provided for demonstration purposes only.

Table 41: PCD, Bits 31–16 (MAV)

	0		1		2		3									
	STW		MAV		PCD		PCD									
	0F	07	20	00												
PIW:	256		258		260		262									
	STW		MAV													
Bit number:	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	0
	2				0				0				0			

Table 42: PCD, Bits 15–0 (STW)

	0		1		2		3									
	STW		MAV		PCD		PCD									
	0F	07	20	00												
PIW:	256		258		260		262									
	STW		MAV													
Bit number:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	0				F				0				7			

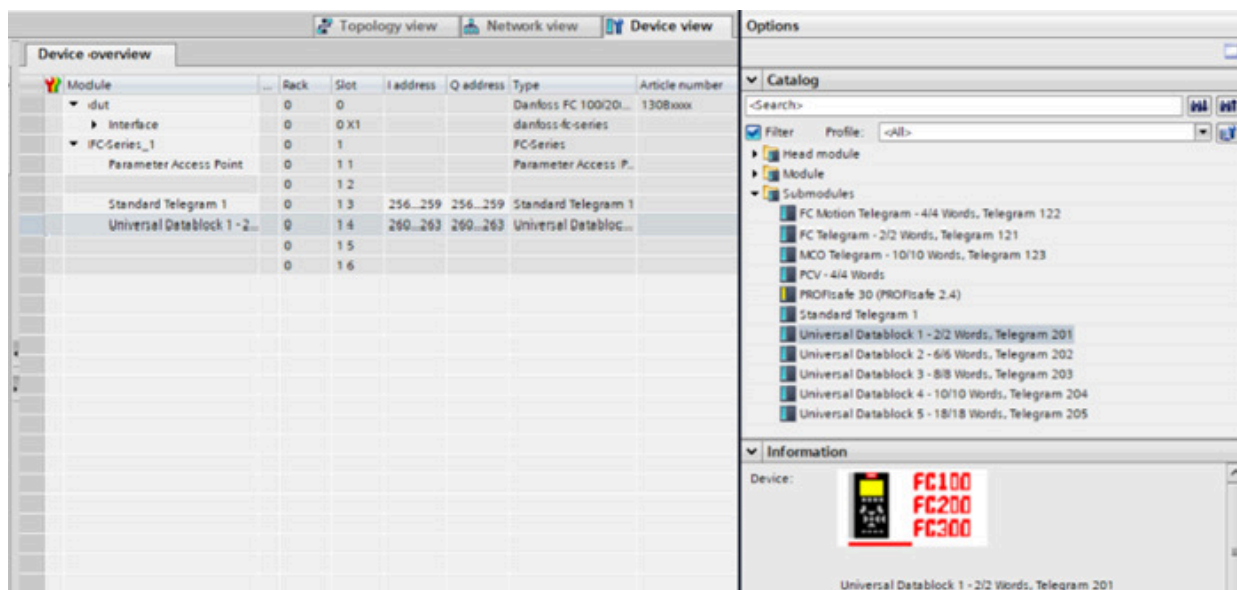
In this example, [Table 41](#) and [Table 42](#) show the bits contained in the status word and how they are shown as process data in the standard telegram, while [Table 43](#) shows the active bit functions and their corresponding bit values.

Table 43: Status Word Telegram Using Standard Telegram 1

Bit	Bit value = 0	Bit value = 1	Bit value	
00	Control not ready	Control ready	1	7
01	Drive not ready	Drive ready	1	
02	Coasting	Enable	1	
03	No error	Trip	0	
04	No error	Error (no trip)	0	0
05	Reserved	–	0	
06	No error	Trip lock	0	
07	No warning	Warning	0	
08	Speed reference	Speed≠reference	1	F
09	Local operation	Bus control	1	
10	Outside frequency range	Within frequency range	1	
11	No operation	In operation	1	
12	Drive OK	Stopped, auto start	0	0
13	Voltage OK	Voltage exceeded	0	
14	Torque OK	Torque exceeded	0	
15	Timers OK	Timers exceeded	0	
Function active		–	–	–
Function inactive		–	–	–

7.4 Example: PLC Programming

In this example, standard telegram 1 and universal data block 1 are placed in the following input/output address:



e30be933.11

Figure 12: Standard Telegram 1 and Universal Data Block 1 Placed in the Input/Output Address

Table 44: Standard Telegram and Universal Data Block 1 in Input/Output Address

Input address	256-257	258-259	260-261	262-263		Output address	256-257	258-259	260-261	262-263
Setup	Status word	MAV	Motor torque	Digital input		Setup	Control word	Reference	Not used	Not used

The network sends a start command (047C hex) and a reference (2000 hex) of 50% to the drive.

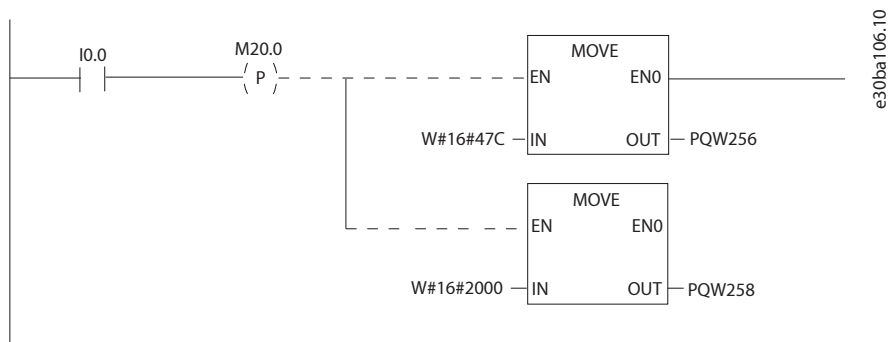


Figure 13: Network Sends Start Command and Reference

This network reads the motor torque from the drive. A new reference is sent to the drive because the motor torque (86%) is higher than the compared value.

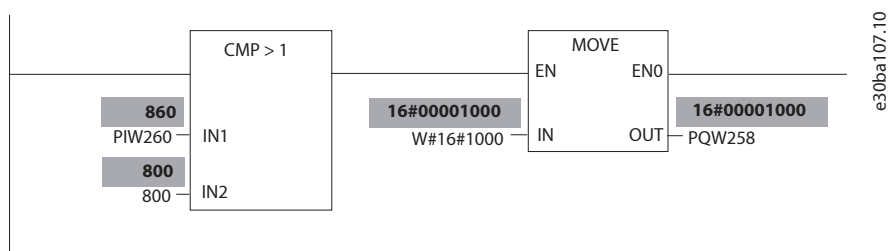


Figure 14: Network Reads the Motor Torque

This network reads the status on the digital inputs from the drive. If digital input 18 is ON, it stops the drive.

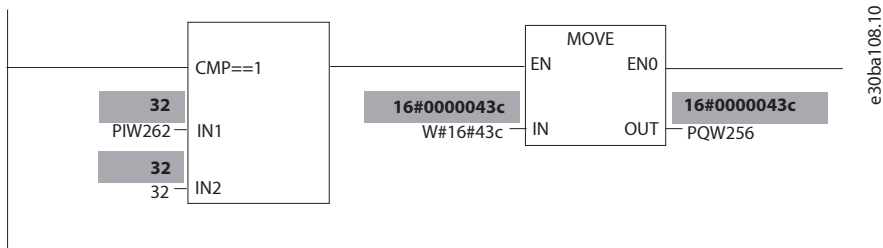


Figure 15: Network Reads the Status on the Digital Inputs

This network reverses the motor when digital input 19 is ON, because parameter **8-54 Reversing Select** is programmed to Logic AND.

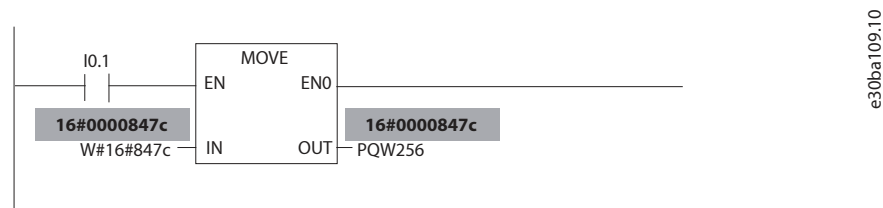


Figure 16: Network Reverses the Motor

This network activates relay 02.

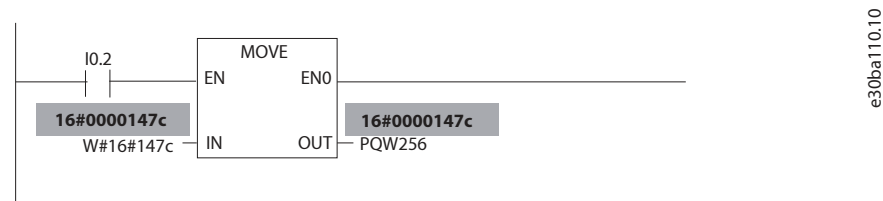


Figure 17: Network Activates Relay 02

8 Troubleshooting

8.1 No Response to Control Signals

- Is the control word correct?
 - If bit 10 = 0 in the control word, the drive does not accept the control word.
- Is the relationship between bits in the control word and the terminal I/O correct?
 - Check the logical relationship in the drive.

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

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

The following tables show the effect of a coast command on the drive for the full range of settings in parameter **8-50 Coasting Select**.

The control mode affects the functions of parameter **8-50 Coasting Select**, parameter **8-51 Quick Stop Select**, and parameter **8-52 DC Brake Select** as follows:

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

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

Table 45: [0] Digital Input

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

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

Table 46: [1] Serial Communication

Terminal	Bits 02/03/04	Function
0	0	Coast/DC brake/Q-stop
0	1	No coast/DC brake/Q-stop
1	0	Coast/DC brake/q-stop
1	1	No coast/DC brake/Q-stop

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

Table 47: [2] Logic AND

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

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

Table 48: [3] Logic OR

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

The control mode affects the functions of parameter **8-53 Start Select** and parameter **8-54 Reversing Select** as follows:

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

Table 49: [0] Digital Input

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

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

Table 50: [1] Serial Communication

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

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

Table 51: [2] Logic AND

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

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

Table 52: [3] Logic OR

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

Table 52: [3] Logic OR - (continued)

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

The control mode affects the functions of parameter **8-55 Setup Select** and parameter **8-56 Preset Reference Select** as follows:

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

Table 53: [0] Digital Input

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

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

Table 54: [1] Serial Communication

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

Table 54: [1] Serial Communication - (continued)

Terminal		Bits 00/01, 13/14		Function
1	0	0	0	1
1	0	0	1	2
1	0	1	0	3
1	0	1	1	4
1	1	0	0	1
1	1	0	1	2
1	1	1	0	3
1	1	1	1	4

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

Table 55: [2] Logic AND

Terminal		Bits 00/01, 13/14		Function
MSB	LSB	MSB	LSB	Preset ref. setup number
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	2
0	1	1	0	1
0	1	1	1	2
1	0	0	0	1
1	0	0	1	1
1	0	1	0	3
1	0	1	1	3
1	1	0	0	1
1	1	0	1	2
1	1	1	0	3
1	1	1	1	4

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

Table 56: [3] Logic OR

Terminal		Bits 00/01, 13/14		Function
Msb	Lsb	Msb	Lsb	Preset ref. setup number
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3

Table 56: [3] Logic OR - (continued)

Terminal		Bits 00/01, 13/14		Function
0	0	1	1	4
0	1	0	0	2
0	1	0	1	2
0	1	1	0	4
0	1	1	1	4
1	0	0	0	3
1	0	0	1	4
1	0	1	0	3
1	0	1	1	4
1	1	0	0	4
1	1	0	1	2
1	1	1	0	4
1	1	1	1	4

8.2 Warnings and Alarms

A warning or an alarm is signaled by the relevant indicator light on the front of the drive and indicated by a code on the display.

A warning remains active until its cause is no longer present. Under certain circumstances, operation of the motor may still be continued. Warning messages may be critical, but are not necessarily so.

In the event of an alarm, the drive trips. Reset the alarm to resume operation once the cause has been rectified.

3 ways to reset:

- Press [Reset].
- Via a digital input with the reset function.
- Via serial communication/optional fieldbus.

i NOTE: After a manual reset pressing [Reset], press [Auto On] to restart the motor.

If an alarm cannot be reset, the reason may be that its cause has not been rectified, or the alarm is trip locked.

Alarms that are trip locked offer extra protection, meaning that the mains supply must be switched off before the alarm can be reset.

After being switched back on, the drive is no longer blocked and can be reset once the cause has been rectified.

Alarms that are not trip locked can also be reset using the automatic reset function in parameter **14-20 Reset Mode** (Warning: Automatic wake up is possible.)

If a warning or alarm is marked against a code in the alarm/warning code list, this means that either a warning occurs before an alarm, or it is possible to specify whether a warning or an alarm should be shown for a given fault.

This is possible, for instance, in parameter **1-90 Motor Thermal Protection**. After an alarm or trip, the motor carries on coasting, and the alarm and warning flash. Once the problem has been rectified, only the alarm continues flashing until the drive is reset.

i NOTE: No missing motor phase detection (numbers 30-32) and no stall detection are active when parameter **1-10 Motor Construction** is set to [1] *PM non-salient SPM*.

8.3 Alarm Words and Warning Words

PROFINET alarm words and warning words are shown on the drive 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 PROFINET warning word can also be shown via the fieldbus in parameter **16-90 Alarm Word**, parameter **16-92 Warning Word**, and parameter **9-53 PROFIBUS Warning Word**.

Table 57: Parameter 16-90 Alarm Word

Bit (hex)	Unit diagnose bit	Alarm word (Parameter 16-90 Alarm Word)	Alarm number
00000001	48	Brake check	28
00000002	49	Power card overtemperature	69
00000004	50	Ground fault	14
00000008	51	Control card overtemperature	65
00000010	52	Control word timeout	18
00000020	53	Overcurrent	13
00000040	54	Torque limit	12
00000080	55	Motor thermistor overtemperature	11
00000100	40	Motor ETR overtemperature	10
00000200	41	Inverter overloaded	9
00000400	42	DC-link undervoltage	8
00000800	43	DC-link overvoltage	7
00001000	44	Short circuit	16
00004000	46	Mains phase loss	4
00008000	47	AMA not OK	52
00010000	32	Live zero error	2
00020000	33	Internal fault	38
00040000	34	Brake overload	26
00080000	35	Motor phase U is missing	30
00100000	36	Motor phase V is missing	31
00200000	37	Motor phase W is missing	32
00400000	38	Fieldbus comm. fault	34
00800000	39	24 V supply fault	47
01000000	24	Mains failure	36
04000000	26	Brake resistor short circuit	25
08000000	27	Brake chopper fault	27
10000000	28	Option change	67
20000000	29	Drive initialization	80
80000000	31	Mechanical brake low	63

Table 58: Parameter 16-92 Warning Word

Bit (hex)	Unit diagnose bit	Warning word (Parameter 16-92 Warning Word)	Alarm number
00000001	112	Brake check	28
00000002	113	Power card overtemperature	69
00000004	114	Ground fault	14
00000008	115	Control card	65
00000010	116	Control word timeout	18
00000020	117	Overcurrent	13
00000040	118	Torque limit	12
00000080	119	Motor thermistor overtempera- ture	11
00000100	104	Motor ETR overtemperature	10
00000200	105	Inverter overloaded	9
00000400	106	DC-link undervoltage	8
00000800	107	DC-link overvoltage	7
00004000	110	Mains phase loss	4
00008000	111	No motor	3
00010000	96	Live zero error	2
00040000	98	Brake overload	26
00080000	99	Brake resistor short circuit	25
00100000	100	Brake chopper fault	27
00400000	102	Fieldbus comm. fault	34
00800000	103	24 V supply fault	47
01000000	88	Mains failure	36
02000000	89	Current limit	59
10000000	92	Encoder loss	61
40000000	94	Unused	-

Table 59: Parameter 9-53 PROFIBUS Warning Word

Bit (hex)	Unit diagnose bit	PROFIBUS warning word (parameter 9-53 PROFIBUS Warning Word)
00000001	160	Connection with DP-master is not OK.
00000002	161	Unused
00000004	162	FDL (fieldbus data link layer) is not OK.
00000008	163	Clear data command received.
00000010	164	Actual value is not updated.
00000020	165	Baud rate search.
00000040	166	PROFIBUS ASIC is not transmitting.

Table 59: Parameter 9-53 PROFIBUS Warning Word - (continued)

Bit (hex)	Unit diagnose bit	PROFIBUS warning word (parameter 9-53 PROFIBUS Warning Word)
00000080	167	Initializing of PROFIBUS is not OK.
00000100	152	Drive is tripped.
00000200	153	Internal CAN error.
00000400	154	Wrong configuration data from PLC.
00000800	155	Wrong ID sent by PLC.
00001000	156	Internal fault occurred.
00002000	157	Not configured.
00004000	158	Timeout active.
00008000	159	Warning 34 active.

Table 60: Parameter 16-84 Comm. Option STW

Bit (Hex)	Comm. option STW (parameter 16-84 Comm. Option STW)
00000001	Parameterization OK
00000002	Configuration OK
00000004	Clearmode active
00000008	Baud rate search
00000010	Waiting for parameterization
00000020	Waiting for configuration
00000040	In data exchange
00000080	Not used
00000100	Not used
00000200	Not used
00000400	Not used
00000800	MCL2/1 connected
00001000	MCL2/2 connected
00002000	MCL2/3 connected
00004000	Data transport active
00008000	Not used

8.4 Descriptions of Alarms Word, Warning Word, and Extended Status Word

Table 61: Description of Alarm Word, Warning Word, and Extended Status Word

Bit	Hex	Dec	Alarm word (parameter 16-90 Alarm Word)	Alarm word 2 (parameter 16-91 Alarm Word 2)	Warning word (parameter 16-92 Warning Word)	Warning word 2 (parameter 16-93 Warning Word 2)	Extended status word (parame- ter 16-94 Ext. Status Word)
0	00000001	1	Brake check	ServiceTrip, Read/Write	Brake check	–	Ramping
1	00000002	2	Pwr. card temp	ServiceTrip, (re- served)	Pwr. card temp	–	AMA tuning
2	00000004	4	Ground fault	ServiceTrip, Typecode/Spare part	Ground fault	–	Start CW/CCW
3	00000008	8	Ctrl. card temp	ServiceTrip, (re- served)	Ctrl. card temp	–	Slow down
4	00000010	16	Ctrl. word TO	ServiceTrip, (re- served)	Ctrl. word TO	–	Catch up
5	00000020	32	Overcurrent	–	Overcurrent	–	Feedback high
6	00000040	64	Torque limit	–	Torque limit	–	Feedback low
7	00000080	128	Motor Th. over	–	Motor Th. over	–	Output current high
8	00000100	256	Motor ETR over	–	Motor ETR over	–	Output current low
9	00000200	512	Inverter overld.	–	Inverter overld.	–	Output freq. high
10	00000400	1024	DC undervolt	–	DC undervolt	–	Output freq. low
11	00000800	2048	DC overvolt	–	DC overvolt	–	Brake check OK
12	00001000	4096	Short circuit	–	DC voltage low	–	Braking max
13	00002000	8192	Inrush fault	–	DC voltage high	–	Braking
14	00004000	16384	Mains ph. loss	–	Mains ph. loss	–	Out of speed range
15	00008000	32768	AMA not OK	–	No motor	–	OVC active
16	00010000	65536	Live zero error	–	Live zero error	–	AC brake
17	00020000	131072	Internal fault	KTY error	10 V low	KTY Warn	Password time- lock
18	00040000	262144	Brake overload	Fans error	Brake overload	Fans warn	Password pro- tection
19	00080000	524288	U phase loss	ECB error	Brake resistor	ECB Warn	–
20	00100000	1048576	V phase loss	–	Brake IGBT	–	–
21	00200000	2097152	W phase loss	–	Speed limit	–	–
22	00400000	4194304	Fieldbus fault	–	Fieldbus fault	–	Unused
23	00800000	8388608	24 V supply low	–	24 V supply low	–	Unused

Table 61: Description of Alarm Word, Warning Word, and Extended Status Word - (continued)

Bit	Hex	Dec	Alarm word (parameter 16-90 Alarm Word)	Alarm word 2 (parameter 16-91 Alarm Word 2)	Warning word (parameter 16-92 Warning Word)	Warning word 2 (parameter 16-93 Warning Word 2)	Extended status word (parame- ter 16-94 Ext. Status Word)
24	01000000	16777216	Mains failure	–	Mains failure	–	Unused
25	02000000	33554432	1.8 V supply low	–	Current limit	–	Unused
26	04000000	67108864	Brake resistor	–	Low temp	–	Unused
27	08000000	134217728	Brake IGBT	–	Voltage limit	–	Unused
28	10000000	268435456	Option change	–	Encoder loss	–	Unused
29	20000000	536870912	Drive initialized	–	Output freq. lim.	–	Unused
30	40000000	1073741824	Safe stop (A68)	PTC 1 Safe stop (A71)	Safe stop (W68)	PTC 1 Safe stop (W71)	Unused
31	80000000	2147483648	Mech. brake low	Dangerous fail- ure (A72)	Extended status word	–	Unused

The alarm words, warning words and extended status words can be read out via serial bus or optional fieldbus for diagnosis. See also parameter **16-94 Ext. Status Word**.

8.5 Alarm and Warning Code List

Table 62: Alarm/Warning Code List

Number	Description	Warning	Alarm/trip	Alarm/triplock	Parameter reference
1	10 V low	X			
2	Live zero error	(X)	(X)		Parameter 6-01 Live Zero Timeout Function
3	No motor	(X)			Parameter 1-80 Function at Stop
4	Mains phase loss	(X)	(X)	(X)	Parameter 14-12 Function at Mains Imbalance
5	DC link voltage high	X			
6	DC link voltage low	X			
7	DC overvoltage	X	X		
8	DC undervoltage	X	X		
9	Inverter overloaded	X	X		
10	Motor overtempera- ture	(X)	(X)		Parameter 1-90 Motor Thermal Protection
11	Motor thermistor overtemperature	(X)	(X)		Parameter 1-90 Motor Thermal Protection

Table 62: Alarm/Warning Code List - (continued)

Number	Description	Warning	Alarm/trip	Alarm/triplock	Parameter reference
12	Torque limit	X	X		
13	Overcurrent	X	X	X	
14	Earth fault	X	X	X	
15	Hardware mismatch		X	X	
16	Short circuit		X	X	
17	Control word time-out	(X)	(X)		Parameter 8-04 Control Word Timeout Function
22	Hoist mech. brake				
23	Internal fan fault	X			
24	External fan fault	X			Parameter 14-53 Fan Monitor
25	Brake resistor short-circuited	X			
26	Brake resistor power limit	(X)	(X)		Parameter 2-13 Brake Power Monitoring
27	Brake chopper short-circuited	X	X		
28	Brake check	(X)	(X)		Parameter 2-15 Brake Check
29	Heat sink temp	X	X	X	
30	Motor phase U missing	(X)	(X)	(X)	Parameter 4-58 Missing Motor Phase Function
31	Motor phase V missing	(X)	(X)	(X)	Parameter 4-58 Missing Motor Phase Function
32	Motor phase W missing	(X)	(X)	(X)	Parameter 4-58 Missing Motor Phase Function
33	Inrush fault		X	X	
34	Fieldbus communication fault	X	X		
36	Mains failure	X	X		
38	Internal fault		X	X	
39	Heat sink sensor		X	X	

Table 62: Alarm/Warning Code List - (continued)

Number	Description	Warning	Alarm/trip	Alarm/triplock	Parameter reference
40	Overload of digital output terminal 27	(X)			Parameter 5-00 <i>Digital I/O Mode,</i> parameter 5-01 <i>Terminal 27 Mode</i>
41	Overload of digital output terminal 29	(X)			Parameter 5-00 <i>Digital I/O Mode,</i> parameter 5-02 <i>Terminal 29 Mode</i>
42	Overload of digital output on X30/6	(X)			Parameter 5-32 <i>Term X30/6 Digi Out</i> <i>(MCB 101)</i>
42	Overload of digital output on X30/7	(X)			Parameter 5-33 <i>Term X30/7 Digi Out</i> <i>(MCB 101)</i>
46	Pwr. card supply		X	X	
47	24 V supply low	X	X	X	
48	1.8 V supply low		X	X	
49	Speed limit	X			
50	AMA calibration failed		X		
51	AMA check U_{nom} and I_{nom}		X		
52	AMA low I_{nom}		X		
53	AMA motor too big		X		
54	AMA motor too small		X		
55	AMA parameter out of range		X		
56	AMA interrupted by user		X		
57	AMA timeout		X		
58	AMA internal fault	X	X		
59	Current limit	X			
61	Tracking error	(X)	(X)		Parameter 4-30 <i>Motor Feedback Loss Function</i>
62	Output frequency at maximum limit	X			
63	Mechanical brake low		(X)		Parameter 2-20 <i>Release Brake Current</i>

Table 62: Alarm/Warning Code List - (continued)

Number	Description	Warning	Alarm/trip	Alarm/triplock	Parameter reference
64	Voltage limit	X			
65	Control board overtemperature	X	X	X	
66	Heat sink temperature low	X			
67	Option configuration has changed		X		
68	Safe stop	(X)	(X) ⁽¹⁾		Parameter 5-19 Terminal 37 Safe Stop
69	Pwr. card temp		X	X	
70	Illegal FC configuration			X	
71	PTC 1 safe stop	X	X ⁽¹⁾		Parameter 5-19 Terminal 37 Safe Stop
72	Dangerous failure			X ⁽¹⁾	Parameter 5-19 Terminal 37 Safe Stop
73	Safe stop auto restart				
77	Reduced power mode	X			Parameter 14-59 Actual Number of Inverter Units
79	Illegal PS config		X	X	
80	The drive initialized to default value		X		
81	CSIV corrupt				
82	CSIV parameter error				
85	Profibus/Profisafe error				
90	Encoder loss	(X)	(X)		Parameter 17-61 Feedback Signal Monitoring
91	Analog input 54 wrong settings			X	S202
100-199	See Operating Instructions for MCO 305				
243	Brake IGBT	X	X		
244	Heat sink temp	X	X	X	

Table 62: Alarm/Warning Code List - (continued)

Number	Description	Warning	Alarm/trip	Alarm/triplock	Parameter reference
245	Heat sink sensor		X	X	
246	Pwr.card supply		X	X	
247	Pwr.card temp		X	X	
248	Illegal PS config		X	X	
250	New spare part			X	Parameter 14-23 Typecode Setting
251	New type code		X	X	

1) Cannot be auto reset via parameter 14-20 Reset Mode.

(X) Dependent on parameter.

8.6 Trip and Trip Lock

A trip occurs when an alarm has been issued. The trip coasts the motor and can be reset by pressing [Reset] or by resetting via a digital input (parameter group 5-1* **Digital I/O Mode**). The event that caused the alarm cannot damage the drive or cause dangerous conditions.

A trip lock occurs when an alarm has been issued and there is a risk of damage to the drive or the connected parts. A trip lock situation can only be reset via power cycling.

Table 63: LED Indication

Warning	Yellow
Alarm	Flashing red
Trip lock	Yellow and red

8.7 LED Status

The VLT® PROFINET MCA 120 has 3 bicolored LEDs that allow a fast and detailed diagnosis. Each LED is linked to its unique part of the interface, see [Table 64](#).

Table 64: LED Label

LED label	Description
MS	Module status, reflects the activity on the PROFINET.
NS1	Network status 1, reflects the activity on port 1.
NS2	Network status 2, reflects the activity on port 2.

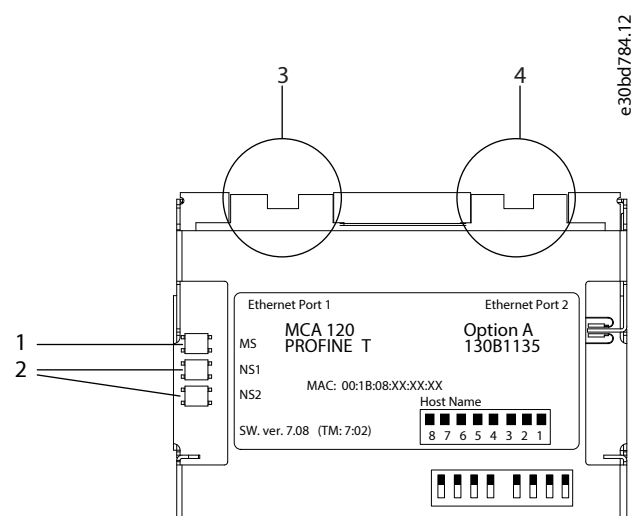


Figure 18: Overview of the VLT® PROFINET MCA 120 Option Module

Table 65: MS: Module Status

State	LED	
No IP address assigned.		Off
No communication to the PROFINET module. The module is waiting for a configuration telegram from the controller.		Green
I/O AR established		Solid green
Supervisor AR established, No I/O AR		Green
Internal error		Red
Wink		Yellow

Table 66: NS1 + NS2: Network Status (1 per Port)

State	LED		Description
Power off			No power or no link on the corresponding port.
Power on		Solid red	IP address conflict.
		Green	Waiting for configuration
Running		Green	In data exchange mode.
		Red	Wrong configuration
Data exchange		Yellow	No increment in "in Octets" counter of corresponding port in the last 60 s.

During normal operation, the MS and at least 1 NS LED shows a constant green light.

Wink command

The interface responds to a wink command from the network by flashing all 3 LEDs yellow simultaneously.

8.8 No Communication with the Drive

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

Check the link status

The status of the Ethernet link can be directly identified using the LEDs when no BACnet connection is established. Verify presence of the link in parameter **12-10 Link Status**.

Verify that the link is steadily present in parameter **12-11 Link Duration**. The parameter shows the duration of the present link and is preset to 00:00:00:00 when the link is broken.

Check the cabling

In rare cases of cabling misconfiguration, the option may show the presence of a link even if no communication is running. Exchange the cable if in doubt.

Check the IP address

Verify that the option has a valid IP address in parameter **12-01 IP Address**. If the option has identified a duplicate IP address, the NS LEDs are solid red. If the option is set up for BOOTP or DHCP, verify that a BOOTP or DHCP server is connected in parameter **12-04 DHCP Server**. If no server is connected, the parameter shows 000.000.000.000.

8.9 Warning 34, Fieldbus Fault Appears

Warning 34, Fieldbus Fault is not related to wiring. The warning appears when:

- there is no master communication for 60 s after power-up.
- the master is in stop mode.
- master communication is not established, or is configured incorrectly.
- the wiring is incorrect.

Troubleshooting:

- Check the master mode and master configuration.
- Check the wiring for correct master mode and communication.

9 Appendix

9.1 Abbreviations

Abbreviation	Definition
DCP	Discovery and configuration protocol
EMC	Electromagnetic compatibility
IP	Internet protocol
LCP	Local control panel
LED	Light-emitting diode
PC	Personal computer
PLC	Programmable logic controller

9.2 Conventions

- Numbered lists indicate procedures.
- Bulleted and dashed lists indicate listings of other information where the order of the information is not relevant.
- Bolded text indicates important information and section headings.
- Italicized text indicates the following:
 - Cross-reference.
 - Link.
 - Footnote.
 - Alarms/warnings
- Bolded and italicized text indicates the following:
 - Parameter name.
 - Parameter option.
 - Parameter group name.
- All dimensions in drawings are in metric values (imperial values in brackets).
- An asterisk (*) indicates the default setting of a parameter.



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