PowerXL™

CANopen
Communication Manual
for Variable Frequency Drives/Variable Speed Starters
DA1, DC1, DE11

CANopen®

Powering Business Worldwide

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Original Operating Instructions
The German-language edition of this document is the original operating manual.

Translation of the original operating manual
All editions of this document other than those in German language are translations of the original German manual.

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Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit the device.
- Cover or enclose any adjacent live components.
- Follow the engineering instructions (AWA/IL) for the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE, PES) must be connected to the protective earth (PE) or the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that an open circuit on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the extra-low voltage of the 24 V supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause a restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed and with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause injury or material damage, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).
- Depending on their degree of protection, frequency inverters may contain live bright metal parts, moving or rotating components or hot surfaces during and immediately after operation.
- Removal of the required covers, improper installation or incorrect operation of motor or frequency inverter may cause the failure of the device and may lead to serious injury or damage.
- The applicable national accident prevention and safety regulations apply to all work carried on live frequency inverters.
- The electrical installation must be carried out in accordance with the relevant regulations (e. g. with regard to cable cross sections, fuses, PE).
- Transport, installation, commissioning and maintenance work must be carried out only by qualified personnel (IEC 60364, HD 384 and national occupational safety regulations).
- Installations containing frequency inverters must be provided with additional monitoring and protective devices in accordance with the applicable safety regulations. Modifications to the frequency inverters using the operating software are permitted.
- All covers and doors must be kept closed during operation.
- To reduce the hazards for people or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the drive (increased motor speed or sudden standstill of motor). These measures include:
  - Other independent devices for monitoring safety-related variables (speed, travel, end positions etc.).
  - Electrical or non-electrical system-wide measures (electrical or mechanical interlocks).
  - Never touch live parts or cable connections of the frequency inverter after it has been disconnected from the power supply. Due to the charge in the capacitors, these parts may still be live after disconnection. Fit appropriate warning signs.

Table of contents

0 About this manual

0.1 Target group

This manual describes how internal communication with the CANopen field bus system works in DA1, DC1, and DE11 variable frequency drives and variable speed starters.

It is aimed at experienced drive specialists and automation technicians. A thorough knowledge of the CANopen field bus and the programming of a CANopen master is required. Likewise, it assumes that readers are familiar with how to operate DA1/DC1 variable frequency drives and/or DE11 variable speed starters as applicable.

Please read this manual carefully before commissioning a CANopen network connection.

We assume that you have a good knowledge of engineering fundamentals, and that you are familiar with handling electrical systems and machines, as well as with reading technical drawings.

0.2 List of revisions

The following significant amendments have been introduced since previous issues:

Publication date	Page	Keyword	new	modified	deleted
09/16	19	Parameter P-12			✓
	25	„Control signal terminal configuration for DC1…E1 variable frequency drives“	✓		
	36	„Manufacturer-specific objects on DC1…E1 devices“	✓		
	38	„Fault messages“		✓	
01/16		Initial issue			

0.3 Writing conventions

Symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed.

Indicates useful tips and
More Info

0.3.1 Hazard warnings of material damages

NOTICE

Warns about the possibility of material damage.

0.3.2 Hazard warnings of personal injury

CAUTION

Warns of the possibility of hazardous situations that may possibly cause slight injury.

DANGER

Warns of hazardous situations that result in serious injury or death.

DANGER – CONTROL FAILURE

When engineering your control diagram, make sure to take all potential control path faults into account.
When it comes to critical control functions, make sure that a safe state can be reached after a control path fails. –
Critical control function examples include:

- Emergency shutdown (emergency stop),
- Overtravel stop
- Power supply failure
- Restart.

Provide separate or redundant control paths.
Make sure that system control paths include communication connections.
Take the effect of unforeseen transmission delays and connection problems into account.
Carefully and individually test every implementation of a product before putting it into operation.
Observe all general accident prevention and local safety regulations.
Information for the USA:
For more information, please refer to the latest issue of NEMA ICS 1.1, "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control," and the latest issue of NEMA ICS 7.1, "Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems."
In addition to property damage, failure to observe the above instructions may result in serious bodily injury or even death.

For greater clarity, the name of the current chapter and the name of the current section are shown in the page header.

To make it easier to understand some of the images included in this manual, the housing and other safety-relevant parts have been left out.
The components described here must be used only with a properly fitted housing and all necessary safety-relevant parts.

Please follow the installation instructions in the relevant instruction leaflets.

For **DA1** variable frequency drive:
- Instruction leaflet IL04020010Z for devices of sizes FS2 and FS3 with an IP20 degree of protection
- Instruction leaflet IL04020011Z for devices of sizes FS4 to FS7 with an IP55 degree of protection
- Instruction leaflet IL04020012Z for the control cabinet version of devices of size FS8
- Instruction leaflet IL04020015Z for devices of sizes FS2 and FS3 with an IP66 degree of protection

For **DC1** variable frequency drive:
- Instruction leaflet IL04020009Z for devices with an IP20 degree of protection
- Instruction leaflet IL04020013Z for devices with an IP66 degree of protection

For **DE1...** variable speed starter:
- Instruction leaflet IL040005ZU

These documents are available as PDF files on the Eaton Internet website:

http://www.eaton.de/EN/EatonDE/ProdukteundLoesungen/Electrical/Kundensupport/index.htm

→ Customer support → Download Center – Documentation

In the **Quick Search** box, enter the document number ("IL04020010Z", for example). Then click on **Search**.

This manual is intended as a supplement to the device manuals (installation manuals) for DA1 and DC1 variable frequency drives and DE1... variable speed starters.
- MN04020005Z-EN: "PowerXL™ DA1 Variable Frequency Drives" (Installation Manual)
- MN04020003Z-EN: "PowerXL™ DC1 Variable Frequency Drives" (Installation Manual)
- MN040011EN: "DE1… – PowerXL™ Variable speed starter DXE-EXT-SET – Configuration Module"

All the specifications in this manual refer to the hardware and software versions documented in it.

More information on the devices described here can be found on the Internet under:

www.eaton.eu/powerxl

as well as:

www.eaton.eu/documentation

Note on naming convention used throughout the program
Throughout this manual, the term “variable frequency drive” is used to refer both to DA1 and DC1 devices and to DE11 variable speed starters.

0.4 Abbreviations

The following abbreviations are used in this manual.

Table 1: Abbreviations

Abbreviation	Meaning
CAN	Controller Area Network
COB ID	Communication Object Identifier
CONST	Constant variable (read access only)
DS	Default settings
EDS	Electronic Data Sheets
EMCY	Emergency Object
HEX	Hexadecimal (base-16 numeral system)
ID	Identifier
PC	Personal Computer
PDO	Process Data Object
ro	Read Only (read access only)
ROM	Read Only Memory
rw	Read/Write (read/write access)
Rx	Receive
SDO	Service Data Object
Tx	Transmit

0.5 Units of measurement

Every physical dimension included in this manual uses international metric system units, otherwise known as SI (Système International d'Unités) units. For the purpose of the equipment's UL certification, some of these dimensions are accompanied by their equivalents in imperial units.

Table 2: Unit conversion examples

Designation	US-American value	US-American designation	SI value	Conversion value
Length	1 in ('')	inch	25.4 mm	0.0394
Performance	1 HP = 1.014 PS	horsepower	0.7457 kW	1.341
Torque	1 lbf in	pound-force inches	0.113 Nm	8.851
temperature	1 °F (T_F)	Fahrenheit	-17.222 °C (T_C)	$T_F = T_C \times 9/5 + 32$
Rotational speed	1 rpm	Revolutions per minute	1 min^{-1}	1
Weigh	1 lb	pound	0.4536 kg	2.205
Flow rate	1 cfm	cubic feet per minute	1.698 m^3/n	0.5889

1 Engineering

The variable frequency drives' CANopen slaves are integrated into a CANopen fieldbus system.

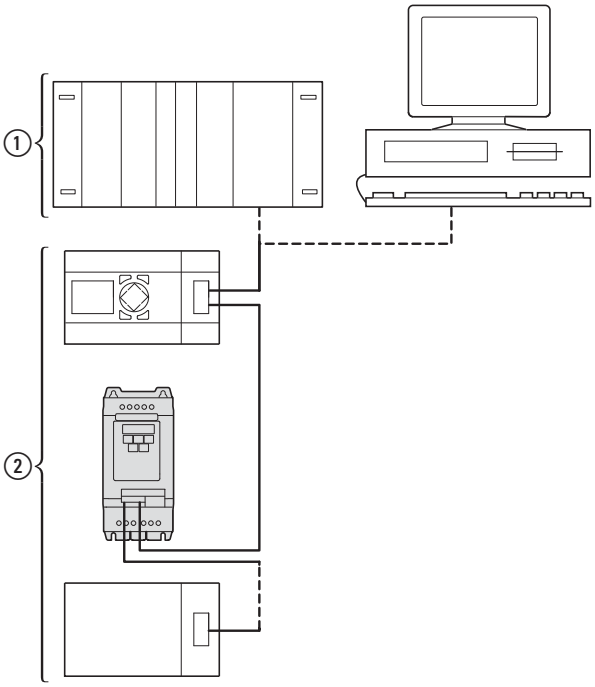


Figure 1: Integrating a DA1 variable frequency drive into a CANopen network
① Master area, PLC (e. g.: XC100, XC200) or PC with CANopen card
② Slave area: Variable frequency drives with CANopen interface

The RJ45 plug makes it possible to connect the variable frequency drives to a CANopen communication network. The CiA DS-301 CANopen communication profile documents the "How" of communications.

The CANopen communications protocol draws a distinction between process data objects (PDOs) and service data objects (SDOs).

The variable frequency drive is controlled with fast, cyclic process data (PDOs). The process data channel can be used not only to specify the speed setpoint, but also to trigger various drive functions, such as enables, operating directions, and resets.
At the same time, it can also be used to read actual values, such as the actual speed, current, and device status, from the variable frequency drive.
As a general rule, the variable frequency drive's parameters are configured using SDOs. The parameter data channel makes it possible to store all application-related drive parameters in the higher-level controller and transfer them to the variable frequency drive if necessary. All of the variable frequency drive's parameters can be transferred with CANopen by using the appropriate SDOs/PDOs.

1.1 Technical data

Table 3: Technical Specification

Size	Value
Communication profile	DS-301 V4.02
Number of bus addresses	1 - 63
Baud rate	125 kBit/s - 1 MBit/s
Total distance (depending on the baud rate / the repeater) Total distance (depending on the baud rate / the repeater)	• up to 500 m at 125 kBit/s • up to 300 m at 1 MBit/s
Transmission medium	Screened, twisted-pair cable
Bus termination resistor (EASY-NT-R)	120 Ω, suitable for separate mounting
Number of SDOs	1 server, 0 clients
Number of PDOs	2 Rx-PDO 2 Tx-PDO **Note:** Only one of each will be enabled by default.
PDO mapping	Variable
Terminal type	Plug-in RJ45 connector

1.2 References

CANopen – Application Layer and Communication Profile
CiA Draft Standard DS301, Version 4.02, February, 13, 2002

1.3 Data types

CANopen has specifications for its own data types.

The data types listed in the following table are used for the DA1 variable frequency drive's CANopen protocol handler.

Table 4: CANopen data types

Type name	Description	Context	
		Minimum	Maximum
UNSIGNED8	8-bit unsigned integer (b7 to b0)	0	255
UNSIGNED16	16-bit unsigned integer (b15 to b0)	0	65535
UNSIGNED32	32-bit unsigned integer (b31 to b0)	0	4294967295
INTEGER8	8-bit signed integer (b7 to b0)	–128	127
INTEGER16	16-bit signed integer (b15 to b0)	–32768	32767
INTEGER32	32-bit signed integer (b31 to b0)	–2147483648	2147483647
RECORD	Data structure with fixed number of any types	–	–

2 Installation

2.1 RJ 45 interface

This chapter explains how to connect DA1, DC1, and DE11 variable frequency drives to a CANopen network.

The CANopen interface is integrated into the RJ45 interface.

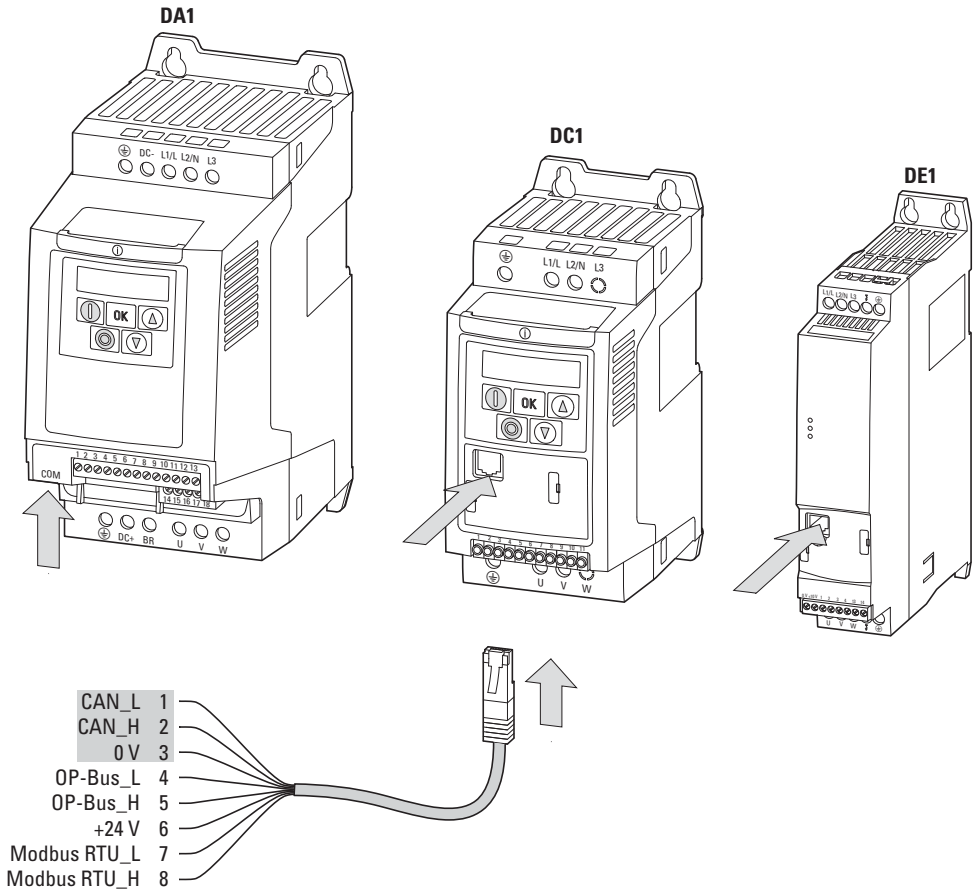


Figure 2: RJ 45 interface

The RJ45 interface's location will depend on the specific device model and the variable frequency drive's frame size.

→ For more detailed information on where the RJ45 interface is located, please refer to the instruction leaflet corresponding to the relevant variable frequency drive.

2.2 Install field bus

→ Never lay the cable of a field bus system directly parallel to the energy carrying cables.

When installing the connection, make sure that the control and signal cables (0 - 10 V, 4 - 20 mA, 24 VDC, etc.), as well as the field bus system's CANopen connection cables, are not routed directly parallel to mains connection or motor connection cables conveying power.

With parallel cable routing, the clearances between control, signal and field bus cables ② and energy-carrying mains and motor cables ① must be greater than 30 cm. Cables should always intersect at right angles.

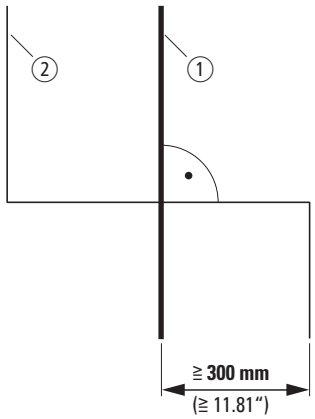


Figure 3: Routing cables for CANopen ② and mains/motor cables ①

If the system requires a parallel routing in cable ducts, a partition must be installed between the fieldbus cable ② and the mains and motor cable ①, in order to prevent electromagnetic interference on the fieldbus.

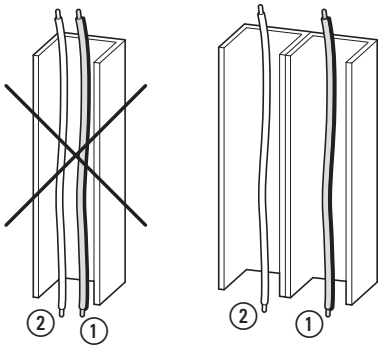


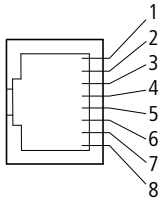
Figure 4: Separate routing in the cable duct

③ Mains and motor connection cable
④ CANopen cable

2.3 COM Port

The electrical connection between the master and the slave(s) is established with RJ45 cables. If multiple slaves are being used, they are connected in parallel by using RJ45 cables and DX-SPL-RJ45-2SL1PL splitters. Please note that the stub lines should be as short as possible.

The built-in RJ45 interface supports the CANopen protocol, making it possible to establish a direct network connection without the need for an additional interface module. A bus termination resistor with a resistance of 120 Ω needs to be connected at each physical end (last module) of the network cable in order to prevent signal reflections and the associated transfer errors.



Pin	Significance
1	**CANopen -**
2	**CANopen +**
3	**0 V**
4	RJ45 connection / external operating unit / PC connection -
5	RJ45 connection / external operating unit / PC connection +
6	24 V DC power supply
7	RS485- Modbus RTU (A)
8	RS485+ Modbus RTU (B)

Figure 5: Configuration of the RJ45 interface

→ If you are using an easy network, keep in mind that CAN- and CAN+ need to be swapped.

2.3.1 Bus termination resistor

The first and last modules on a CANopen network must be terminated with a 120 Ω bus termination resistor. This resistor needs to be connected between CAN_L and CAN_H. To do this, you can plug the EASY-NT-R bus termination resistor into the last splitter (2).

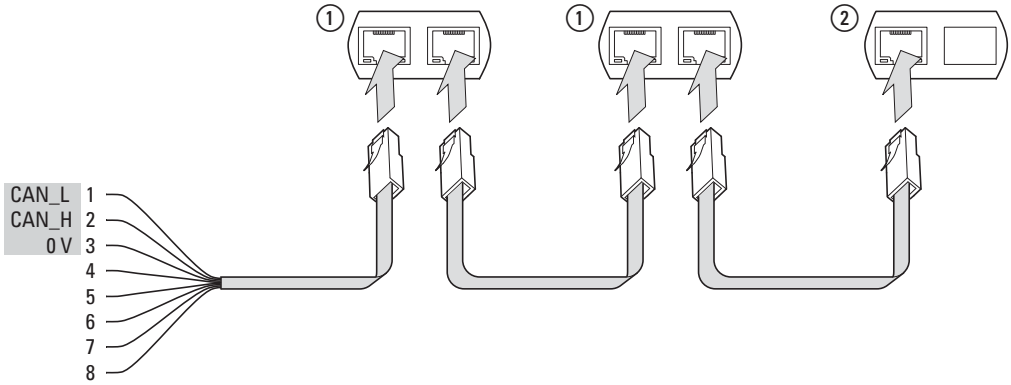


Figure 6: Example of a CANopen network layout

2.3.2 Baud rate

The baud rate must be set to the same value for all the communication modules on the CANopen bus. A value between 125 and 1000 kBit/s can be selected for the variable frequency drives' baud rate.

The maximum cable length will depend on the baud rate you use.

Table 5: Maximum cable length and baud rate

Baud rate	Maximum cable length
125 kbit/s	500 m
250 kBit/s	M 250
500 kBit/s (= default setting)	100 m
800 kBit/s	50 m
1000 kBit/s	30 m

3 Commissioning

Carry out all the commissioning work for the variable frequency drive/variable speed starter as described in manual MN04020005Z-EN (for DA1), MN04020003Z-EN (for DC1), or MN040011EN (for DE11).

Check the settings and installations for the connection to the CANopen network which are described in this manual.

NOTICE

Make sure that starting the motor will not put anyone or anything in danger. Disconnect the driven machine if there is a danger in an incorrect operating state.

3.1 Hardware enable signal

A hardware enable signal may be required depending on parameter P-15 (on DC1 and DE11 units) or P1-13 (on DA1 units).

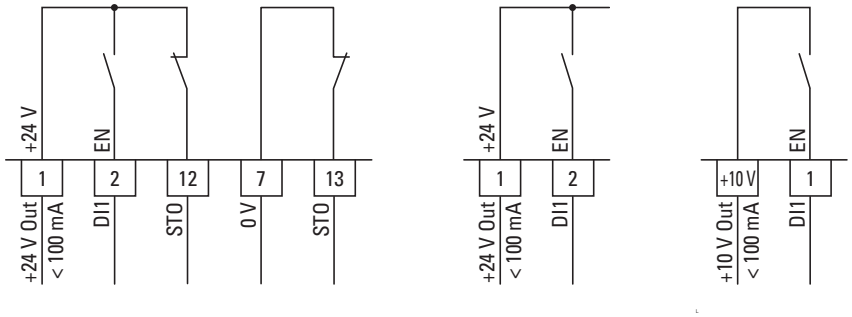


Figure 7: Hardware enable (left: DA1, center: DC1, right: DE11)

By default, DC1 variable frequency drives and DE11 variable speed starters require for an enable signal to be applied. In the case of DA1 variable frequency drives, the STO connection needs to be wired.

3 Commissioning

3.1 Hardware enable signal

4 CANopen communication settings

In order to set up communication properly, a number of parameters need to be configured on PowerXL devices.

4.1 Parameters that need to be configured on DA1 devices

Table 6: Parameters that need to be configured on DA1 variable frequency drives

Parameter	ID	Access right		Designation	Value	Description	DS
		RUN	ro/rw				
P1-12	112	–	rw	Control level	0, 1, …, 11, 13	Local Configuration of Command and Reference Sources **0**: Terminal Control. The drive responds directly to signals applied to the control terminals. **1**: Uni-directional digital reference. The drive can be controlled in the forward direction only using a digital reference (via internal or remote Keypad or terminals) **2**: Bi-directional digital reference. The drive can be controlled in the forward and reverse directions using a digital reference (via internal or remote Keypad or terminals). Pressing the keypad START button toggles between forward and reverse. **3**: PID controller. The output frequency will be controlled by the internal PID controller **4**: Fieldbus Control. Control via Modbus RTU if no fieldbus option is present, otherwise control from the fieldbus option module **5**: Slave Mode. The Variable Frequency Drive acts as a slave to a connected drive operating in Master Mode. a connected drive operating in Master Mode. **6**: CANopen Control. Control via the CANopen bus connected to the RJ45 serial interface connector. **7**: Reserved **8**: Reserved **9**: SmartWire Device Control and speed ref. **10**: SmartWire Device Control and terminal speed ref. **11**: Terminal Control and SmartWire Device speed ref. **13**: SmartWire Device Control and speed ref. Digital input sets enable.	0
P5-01	501	✓	rw	PDP-Address	0 - 63	Variable frequency drive slave address	1
P5-02	502	✓	rw	CANopen baud rate	0, 1, 2, 3	**0** = 125 kBit/s **1** = 250 kBit/s **2** = 500 kBit/s **3** = 1000 kBit/s	500
P5-07		✓		FieldbusRampControl	0, 1	Ramp control via field bus **0** = OFF. Ramps are controlled from internal drives parameters **1** = ON. Ramps are controlled by the fieldbus.	0

Difference between P5-07 = 0 and P5-07 = 1

- **P5-07 = 0**
  Both the setpoint value and the control word will be set via CANopen. The ramp times will be set with parameters P1-03 and P1-04.
- **P5-07 = 1**
  With the exception of the ramp times, the DA1 variable frequency drive will behave the same way as with P5-07 = 0. The ramp times will be transmitted cyclically.
  By default, the ramp time will be third word in the first receive PDO. The value will be scaled by a factor of 0.01.
  Example: 500 ≙ 5.00 s

4.2 Parameters that need to be configured on DC1 devices

Table 7: Parameters that need to be configured on DC1 variable frequency drives

Parameter	ID	Access right		Designation	Value	Description	DS
		RUN	ro/rw				
P-12	140	–	rw	Local ProcessData Source	0, 1, …, 11, 13	Local Configuration of Command and Reference Sources **0**: Terminal Control. The drive responds directly to signals applied to the control terminals. **1**: Uni-directional Keypad Control. The drive can be controlled in the forward direction only using an internal/external or remote Keypad. **2**: Bi-directional Keypad Control. The drive can be controlled in the forward and reverse directions using an internal/external or remote Keypad. Pressing the keypad START button toggles between forward and reverse. **3**: Modbus Control. Control via Modbus RTU communication. **4**: Modbus Control. Ramp times via Modbus. **5**: PI controller with external actual value **6**: PI controller with external actual value and totalized value of AI1 **7**: CANOpen (internal ramp times) **8**: CANOpen (CANOpen ramp times) **9**: SmartWire Device Control and speed ref. **10**: SmartWire Device Control and terminal speed ref. **11**: Terminal Control and SmartWire Device speed ref. **13**: SmartWire Device Control and speed ref. Digital input sets enable.	0
P-36	164	–	rw	PDP-Address	1 - 63	The drive's unique address on a communication network	1
				RS485-0 Baudrate	2, 3, 4, 5, 6	**2**: 9.6 kbit/s **3**: 19.2 kBit/s **4**: 38.4 kBit/s **5**: 57.6 kBit/s **6**: 115.2 kBit/s	6
				Comm Timeout Modbus RTU	0, 1, …, 8	Time between a communication loss and the resulting action. Setting "0" disables the action after communications trip. **t**: indicates the drive will trip if time exceeded **r**: indicates the drive will ramp to stop if time exceeded. **0**: no action **1**: t 30 ms **2**: t 100 ms **3**: t 1000 ms **4**: t 3000 ms **5**: r 30 ms **6**: r 100 ms **7**: r 1000 ms **8**: r 3000 ms	3000
P-50	178	–	rw	CAN0 Baudrate	0, 1, 2, 3	CANopen baud rate **0**: 125 kBit/s **1**: 250 kBit/s **2**: 500 kBit/s **3**: 1000 kBit/s	2

4.3 Parameters that need to be configured on DE11 devices

Table 8: Parameters that need to be configured on DE11 variable speed starters

Parameter	ID	Access right		Designation	Value	Description	DS
		RUN	ro/rw				
P-12	140	–	rw	Local ProcessData Source	0, 1, 3, 4, 9, 10, 11, 13	Local Configuration of Command and Reference Sources **0**: Terminal Control. The drive responds directly to signals applied to the control terminals. **1**: Uni-directional Keypad Control. The drive can be controlled in the forward direction only using an internal/external or remote Keypad. **2**: Bi-directional Keypad Control. The drive can be controlled in the forward and reverse directions using an internal/external or remote Keypad. Pressing the keypad START button toggles between forward and reverse. **3**: Modbus Control. Control via Modbus RTU communication. **4**: CANopen **5**: Reserved **6**: Reserved **7**: Reserved **8**: Reserved **9**: SmartWire Device Control and speed ref. **10**: SmartWire Device Control and terminal speed ref. **11**: Terminal Control and SmartWire Device speed ref. **13**: SmartWire-DT control + setpoint value (setpoint enable signal via terminal)	0
P-34	162	RUN	rw	PDP-Address	1 - 63	PDP-Address Unique drive address in a communication network.	1
P-35	163	RUN	rw	Modbus Baud rate	0, 1, …, 4	Modbus Baud rate 0: 960 Bit/s 1: 19.2 kbit/s 2: 38.4 kbit/s 3: 57.6 kbit/s 4: 115.2 kbit/s	4
P-36	164	RUN	rw	Modbus RTU0 COM timeout		Modbus RTU0 COM Timeout Time between a communication loss and the resulting action. Setting 0 disables the action after communications trip. t: indicates the drive will trip if time exceeded. r: indicates the drive will ramp to stop if time exceeded. • 0: no action • 1: t 30 ms • 2: t 100 ms • 3: t 1000 ms • 4: t 3000 ms • 5: r 30 ms • 6: r 100 ms • 7: r 1000 ms • 8: r 3000 ms	0
P-50	178	–	rw	CAN0 Baudrate	0, 1, 2, 3	CANopen baud rate **0**: 125 kBit/s **1**: 250 kBit/s **2**: 500 kBit/s **3**: 1000 kBit/s	2

4.4 Configuration of the control signal terminals

The following control signal terminal configuration tables use the abbreviations and acronyms listed below:

Table 9: Abbreviations and acronyms for control signal terminal configurations

Abbreviation	Significance
AI1 REF	Analog input AI1 Used as a speed setpoint input.
AI2 REF	Analog input AI2 Used as a speed setpoint input.
AI2 Torque REF	Analog input AI2 Used as a torque setpoint input.
DIR	Used to select an operating direction Used together with the START command. • Low = Forward (FWD) • High = Anticlockwise operation (REV) **Note:** If there is a wire breakage and the REV operating direction is selected, this will cause the drive to reverse! Alternative: Use configuration with FWD/REV.
DOWN	Used to reduce the speed if a digital setpoint value is selected. Used together with the UP command.
ENA	Variable frequency drive enable signal (ENA = Enable) A start signal (START, FWD, REV) is additionally required for starting. If ENA is removed, the drive will coast.
EXTFLT	Ext Fault/Warning
FWD	Used to start the drive in the forward direction (FWD = Forward)
INV	Change of rotation (INV = Inverse) The operating direction will be reversed as per the configured ramps. • High = invert • Low = Do not invert
Pulse FWD (NO) Pulse REV (NO) Pulse STOP (NC)	Pulse control
REV	Used to start the drive in the reverse direction (REV = Reverse)
Select Quick-Dec	Quick Stop
Select AI1 REF/AI2 REF	Used to select between the analog setpoint values on AI1 and AI2 • AI1 = Low • AI2 = High
Select AI1 REF/f-Fix	Used to select between analog speed reference values at analog input 1
Select AI1 REF/f-Fix1	Used to select between analog speed reference values at analog input 1
Select BUS REF/AI2 REF	Used to select between setpoint values
Select BUS REF/f-Fix	Used to select between setpoint values
Select BUS REF/f-Fix1	Used to select between setpoint values
Select DIG REF/AI2 REF	Used to select between the digital speed reference value (set with the keypad or with the UP and DOWN commands) and analog setpoint value AI2 REF
Select DIG REF/f-Fix	**DA1 only** Used to select between the digital speed reference value (set with the keypad or with the UP and DOWN commands) and a fixed frequency

<table>
<tr><th>Abbreviation</th><th>Significance</th></tr>
<tr><td>Select DIG REF/f-Fix1</td><td>DA1 only
Used to select between the digital speed reference value (set with the keypad or with the UP and DOWN commands) and fixed frequency 1 (f-Fix1) set with P2-01
• Low = digital setpoint value
• High = Preset Speed 1</td></tr>
<tr><td>Select f-Fix Bit0
Select f-Fix Bit1
Select f-Fix Bit2</td><td>Used to select a fixed frequency with digital commands
Fixed frequencies f-Fix1, …, f-Fix8 are defined with parameters P2-01, …, P2-08.
<table><tr><th>Fixed frequency</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr><tr><td>f-Fix1 (P2-01)</td><td>0</td><td>0</td><td>0</td></tr><tr><td>f-Fix2 (P2-02)</td><td>0</td><td>0</td><td>1</td></tr><tr><td>f-Fix3 (P2-03)</td><td>0</td><td>1</td><td>0</td></tr><tr><td>f-Fix4 (P2-04)</td><td>0</td><td>1</td><td>1</td></tr><tr><td>f-Fix5 (P2-05)</td><td>1</td><td>0</td><td>0</td></tr><tr><td>f-Fix6 (P2-06)</td><td>1</td><td>0</td><td>1</td></tr><tr><td>f-Fix7 (P2-07)</td><td>1</td><td>1</td><td>0</td></tr><tr><td>f-Fix8 (P2-08)</td><td>1</td><td>1</td><td>1</td></tr></table>0 = Low; 1 = High</td></tr>
<tr><td>Select PID REF/AI2 REF</td><td>DA1 only
Used to select between setpoint values
• Low = Setpoint from the PID controller's output
• High = AI2</td></tr>
<tr><td>Select PID REF/f-Fix</td><td>DA1 only
Used to select between setpoint values
• Low = Setpoint from the PID controller's output
• High = Fixed frequency
The fixed frequency itself is selected with the
Select f-Fix Bit0, Select f-Fix Bit1, Select f-Fix Bit2 commands.</td></tr>
<tr><td>Select PID REF/f-Fix1</td><td>DA1 only
Used to select between setpoint values
• Low = Setpoint from the PID controller's output
• High = f-Fix1 (set with P2-01)</td></tr>
<tr><td>Select Quick-dec</td><td>DA1 only
Used to activate a quick stop with the ramp set with P2-25
In order to activate the quick stop, there must be a high signal at both terminals</td></tr>
<tr><td>Select t-dec1/
Select t-dec2</td><td>DA1 only
Used to select between deceleration ramp 1 t-dec1 set with P1-04 and deceleration ramp 2 t-dec2 (P8-11)
• Low = Deceleration ramp 1
• High = Deceleration ramp 2</td></tr>
<tr><td>START</td><td>Used to start/stop the drive</td></tr>
<tr><td>UP</td><td>Used to increase the speed if a digital setpoint is selected
Used together with the DOWN command.</td></tr>
</table>

4.4.1 Control signal terminal configuration for DA1 variable frequency drives

Parameter P1-13 can be used to select the configuration for the control signal terminals. More specifically, you can select predefined terminal configurations by setting P1-13 to a value between 1 and 21. The setting (digital/analog) for terminals 6 and 10 will be configured automatically based on the value set for parameter P1-13. In addition to this, you have the option of configuring the terminals freely. To do this, set P1-13 to 0.
The configuration is carried out in menu 9.

P1-12 = 6: CANopen modus

Table 10: Control signal terminal configuration for DA1

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	ENA	INV	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
2	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
3	ENA	INV	Select BUS REF/f-Fix1	No function	AI2 Torque REF
4	ENA	INV	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
5	ENA	INV	Select BUS REF/AI2 REF	No function	AI2 REF
6	ENA	INV	Select BUS REF/f-Fix1	No function	EXTFLT
7	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
8	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
9	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
10	ENA	INV	No function	No function	Select BUS REF/f-Fix1
11	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
12	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
13	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	AI2 Torque REF
14	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
15	Select Quick-dec	Select Quick-dec	Select BUS REF/AI2 REF	No function	AI2 REF
16	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix 1	No function	EXTFLT
17	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
18	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
19	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
20	Select Quick-dec	Select Quick-dec	No function	No function	Select BUS REF/f-Fix1
21	Not permissible				

- **P1-13 = 1, ..., 10**:
  An enable signal is required at DI1 in order to run the drive.
  The start signal is sent via the bus.
- **P1-13 = 11, ..., 20:**
  The enable signal for the drive is issued exclusively through the bus.
  Simultaneously applying a signal at DI1 and DI2 will result in a quick stop.

4.4.2 Control signal terminal configuration for DC1 variable frequency drives

P-12 = 7, 8: CANopen

Table 11: Control signal terminal configuration for DC1

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	Not permissible			
6	START	Select BUS REF/AI1 REF	EXTFLT	AI1 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function

4.4.3 Control signal terminal configuration for DC1...E1 variable frequency drives

P-12 = 7, 8: CANopen

Table 12: Control signal terminal configuration for DE11…E1

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	Not permissible			
6	START	Select BUS REF/AI1 REF	EXTFLT	AI1 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/BUS REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/BUS REF	Select Fire Mode/Normal OP	No function
17	FWD	Select BUS REF/f-Fix4	Select Fire Mode/Normal OP	No function

4.4.4 Control signal terminal configuration for DE11 variable speed starters

P-12 = 4: CANopen

Table 13: Control signal terminal configuration for DE11

P-15	DI1	DI2	DI3	DI4
0	ENA	ENADIR	FF1	n. F.
1	ENA	ENADIR	EXTFLT	n. F.
2	ENA	ENADIR	FF2[0]	FF2[1]
3	ENA	FF1	EXTFLT	n. F.
4[1)]	ENA	**UP**	FF1	**DOWN**
5[1)]	ENA	**UP**	EXTFLT	**DOWN**
6[1)]	ENA	ENADIR	**UP**	**DOWN**
7	ENA	FF2[0]	EXTFLT	FF2[1]
8	ENA	DIR	FF1	n. F.
9	ENA	DIR	EXTFLT	n. F.

1) P-15 = 4, 5, and 6 requires an enable signal (start command) via CANopen and at DI1. Digital reference values sent via CANopen will be ignored in this case.
It will only be possible to use UP and DOWN to set a setpoint value.

n.F. = No function. When configured this way, the control terminals "n.F." will have no function whatsoever!

If CANopen is being used, there must always be an enable signal (ENA) present at DI1 control signal terminal (or DI2 = ENADIR) before the enable signal sent via CANopen will be accepted.

4.5 Object directory

4.5.1 EDS file

PowerXL devices can be integrated into a CANopen structure by using a standardized EDS (Electronic Data Sheet) file. EDS describes the functionality of a CANopen device in a machine-readable format. EDS files list all objects, the supported baud rates, the manufacturer, and other information as well.

To get the latest version of the EDS file for your device, please download it from the Eaton FTP server:
https://es-assets.eaton.com/DRIVES/POWERXL/04_CANopen/

The object dictionary contains all the objects corresponding to a CANopen module. Objects are used to map a device's functionality/parameters.

They are accessed with SDOs or PDOs. As per the corresponding specification, the object dictionary is subdivided into the following ranges:

Table 14: Object dictionary ranges

Range	Description
00 00hex…1F FFhex	Communication-specific objects (from DS-301)
20 00hex…5F FFhex	Manufacturer-specific objects (the variable frequency drive's parameters)

The object dictionary contains the entries described below.

4.5.2 Transmission Type

There are four transmission options available.

Table 15: CANopen transmission options

Transmission Type	Mode	Description
0	Acyclical – synchronous	Transmissions will only be sent if a SYNC comes and process data has changed.
1 - 240	Cyclical – synchronous	Transmissions will be sent and received after every nth SYNC.
254	Asynchronous – manufacturer-specific	The value in the default settings. Transmissions will only be sent if a value has been received and something has changed. Received data will be processed directly.
255	Asynchronous – device profile-specific	Transmissions will be sent directly if there is a change. Received data will be processed directly.

When the device is running with its default configuration, the value will be set to 254 ("asynchronous – manufacturer-specific").

4.5.3 Communication-specific objects

A detailed description of the communication parameters is provided in the CiA specification [1] Section 9.6.3.

Objects 1000_{hex}, 1001_{hex}, and 1018_{hex} are required for all CANopen devices; all other objects are optional. PowerXL devices support the objects listed in the following tables.

Index[1] [hex]	Subindex [hex]	Objectname	Significance	Access right	DS	Data type
1000	00	Device Type	Variable frequency drive – CANopen device	ro	0	UNSIGNED32
1001	00	Error Register	Error indication: 00_{hex} = No error	ro	–	UNSIGNED8
1002	00	Manufacturer Status Register	Emergency object fault log	ro	00	UNSIGNED16
1005	00	COB-ID SYNC Message	COB-ID of the SYNC object, device consumes the SYNC message	rw	80	UNSIGNED32
1008	00	Manufacturer Device Name	The variable frequency drive's device name: DA1	ro	DA1	STRING
1009	00	Manufacturer Hardware Version	Hardware version of the module	ro	1.11 (Example)	STRING
A 100	00	Manufacturer Software Version	Software version of the module	ro	1.00 (Example)	STRING
C 100	00	Guard Time	Monitoring time, in milliseconds	rw	0000_{hex} Resolution in 1 ms	UNSIGNED16
100D	00	Life Time Factor	Multiplier for the Guard Time, the result is equivalent to the maximum interval between the transfer of two Guarding message frames	rw	00_{hex}	UNSIGNED8
1014	00	COB-ID EMCY Message	CAN identifier of the emergency message	rw	00000080 + Node ID	UNSIGNED32
1018	00	Identity Object	General device information	ro	04	UNSIGNED8
	01	Vendor ID	Manufacturer: Eaton Industries GmbH	ro	000001C7	UNSIGNED32
	02	Product Code	Product Number	ro	0	UNSIGNED32
	03	Revision Number	Version	ro	1.01 (Example)	UNSIGNED32
	04	Serial Number	Serial Number	ro	00000001 (Example)	UNSIGNED32

1) Index = Identification number of the parameter

4.5.4 Server SDO Parameter

Index [hex]	Subindex [hex]	Objectname	Significance	Access right	DS	Data type
1200	00	Number of Entries	Number of inputs	ro	02	UNSIGNED8
	01	COB-ID Client → Server (rx)	COB-ID of the RxSDO. The ID is derived from the Predefined Connection Set.	ro	00000600 + Node ID	UNSIGNED32
	02	COB-ID Server → Client (tx)	COB-ID of the TxSDO. The ID is derived from the Predefined Connection Set.	ro	00000580 + Node ID	UNSIGNED32

PowerXL devices support two receive PDOs (receive PDO communication parameters 1400_{hex} and 1401_{hex}).

Objects 1600_{hex} and 1601_{hex} contain the mapping parameters for the Rx PDOs.

Index [hex]	Subindex [hex]	Objectname	Significance	Access right	DS	Data type
1400 1401		1st Receive PDO Parameter 2nd Receive PDO Parameter	Number of valid subindexes	ro	03	RECORD
	00	Number of Entries	Maximum number of entries	ro	02	UNSIGNED8
	01	PDO COB-ID	COB-ID of 1st Rx PDO COB-ID of 2nd Rx PDO	rw	40000020 0 40000030 0 + Node ID	UNSIGNED32
	02	Transmission Type	PDO transmission type: asynchronous	rw	254	UNSIGNED8
1600	00	Number of Mapped Application Objects	Highest subindex used	rw	04	UNSIGNED8
	01	1st Mapping Object		rw	20000010	UNSIGNED32
	02	2nd Mapping Object		rw	20000010	UNSIGNED32
	03	3rd Mapping Object		rw	20020010	UNSIGNED32
	04	4th Mapping Object		rw	20020010	UNSIGNED32
1601	00	Number of Mapped Application Objects	Highest subindex used	rw	4	UNSIGNED8
	01	1st Mapping Object		rw	00060010	UNSIGNED32
	02	2nd Mapping Object		rw	00060010	UNSIGNED32
	03	3rd Mapping Object		rw	00060010	UNSIGNED32
	04	4th Mapping Object		rw	00060010	UNSIGNED32

→ By default, only the first PDO will be enabled.

PowerXL devices support two transmit PDOs (transmit PDO communication parameters 1800_{hex} and 1801_{hex}).

Objects $1A00_{hex}$ and $1A01_{hex}$ contain the mapping parameters for the Tx PDOs.

Index [hex]	Subindex [hex]	Objectname	Significance	Access right	DS	Data type
1800 1801		1st Transmit PDO Parameter 2nd Transmit PDO Parameter	Number of valid subindexes	ro	04	RECORD
	00	Number of Entries	Number of entries	ro	03	UNSIGNED8
	01	PDO COB-ID	COB-ID of 1st Tx PDO COB-ID of 2nd Tx PDO	rw	40000180 40000280 + Node ID	UNSIGNED32
	02	Transmission Type	PDO transmission type: asynchronous	rw	254	UNSIGNED8
	03	Inhibit time (100 µs)		ro	0	UNSIGNED16
1A00		1st Transmit PDO Mapping	applies for Tx PDO 1			RECORD
	00	Number of Mapped Application Objects	Highest subindex used	rw	4	UNSIGNED8
	01	1st Mapping Object		rw	200A0010	UNSIGNED32
	02	2nd Mapping Object		rw	200B0010	UNSIGNED32
	03	3rd Mapping Object		rw	200D0010	UNSIGNED32
	04	4th Mapping Object		rw	200E0010	UNSIGNED32
1A01		2nd Transmit PDO Mapping	applies for Tx PDO 2			RECORD
	00	Number of Mapped Application Objects	Highest subindex used	rw	4	UNSIGNED8
	01	1st Mapping Object		rw	200F0010	UNSIGNED32
	02	2nd Mapping Object		rw	20100010	UNSIGNED32
	03	3rd Mapping Object		rw	20110010	UNSIGNED32
	04	4th Mapping Object		rw	200C0010	UNSIGNED32

→ By default, only the first PDO will be enabled.

4.5.5 Receive PDOs

Control word (Index 2000_{hex})

The "control word" object is used to control the variable frequency drive/ variable speed starter. It contains manufacturer-specific commands.

Type name	Description	
	Value = 0	**Value = 1**
0	Stop	Operational
1	Clockwise rotating field (FWD)	Anticlockwise rotating field (REV)
2	No action	Reset Fault
3	No action	free run-down
4	Not used	
5	No action	Quick stop (ramp 2)
6	No action	Fixed frequency FF1
7	No action	Overwrite setpoint value with 0
8	Not used	
9	Not used	
10	Not used	
11	Not used	
12	Not used	
13	Not used	
14	Not used	
15	Not used	

Frequency reference value (Index 2001_{hex})

The frequency reference value is specified in hertz with a single decimal place.

Example: 258_{dez} ≙ 25.8 Hz

Torque Reference (Index 2002_{hex}) – DA1 only

The Torque Reference is specified as a percentage with one decimal place.

Example: 127_{dez} ≙ 12.7 %

User ramp time (Index 2003_{hex})

The user ramp time is specified in seconds with two decimal places.

4.5.6 Transmit PDOs

Status word (Index 200A$_{hex}$)

Information regarding the variable frequency drive's device status (Bit 0 to Bit 7) and error messages (Bit 8 to Bit 15) is specified in the status word.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB															LSB
Fault messages								Status word							

Type name	Description	
	Value = 0	Value = 1
0	Operation not ready	Ready for operation (READY)
1	Stop	Running operation message (RUN)
2	Clockwise rotating field (FWD)	Anticlockwise rotating field (REV)
3	no error	Fault detected (FAULT)
4	Acceleration ramp	Frequency actual value equals setpoint input
5	–	Zero speed
6	Speed control deactivated	Speed control activated
7	–	Hardware enable signal present

4.5.7 Manufacturer-specific objects on DA1 devices

In addition to communication-specific objects, manufacturer-specific objects are also defined in the object dictionary. These objects fall within the range between index 2000_{hex} and index $23E9_{hex}$ in the DA1 variable frequency drive's object dictionary.

Table 16: Manufacturer-specific objects

Index [hex]	Object Name	Description	Access right	Data type
2000	Control command register	Command	rw	UNSIGNED16
2001	Speed reference	Frequency reference value	rw	INTEGER16
2002	Torque reference	Torque Reference	rw	Integer16
2003	User ramp reference	User ramp time	rw	UNSIGNED16
2004	Speed ref (internal)	IDL speed reference	rw	INTEGER16
200 A	Drive status register	status word	ro	UNSIGNED16
200B	Motor speed Hz	Actual value in Hertz (Hz)	ro	UNSIGNED16
200C	Motor speed (internal)	IDL actual speed	ro	UNSIGNED16
200D	Motor current	Motor Current	ro	UNSIGNED16
200E	Motor Torque	Torque	ro	INTEGER16
200F	Motor power	Power in kW	ro	UNSIGNED16
2010	Drive temperature	Variable frequency drive temperature	ro	INTEGER16
2011	DC bus value	DC Link Voltage	ro	UNSIGNED16
2012	Digital input status	State of digital inputs	ro	UNSIGNED16
2013	Analog input 1 (%)	Analog input 1 in %	ro	UNSIGNED16
2014	Analog input 2 (%)	Analog input 2 in %	ro	UNSIGNED16
2015	Analog input 1	Analog Input 1	ro	UNSIGNED16
2016	Analog input 2	Analog Input 2	ro	UNSIGNED16
2017	Relay output 1	Relay output 1	ro	UNSIGNED16
2018	Relay output 2	Relay output 2	ro	UNSIGNED16
2019	Relay output 3	Relay output 3	ro	UNSIGNED16
201 A	Relay output 4	Relay output 4	ro	UNSIGNED16
201B	Relay output 5	Relay output 5	ro	UNSIGNED16
201C	Scope channel 1	Scope channel 1	ro	UNSIGNED16
201D	Scope channel 2	Scope channel 2	ro	UNSIGNED16
201E	Scope channel 3	Scope channel 3	ro	UNSIGNED16
201F	Scope channel 4	Scope channel 4	ro	UNSIGNED16
2020	User data 1	User data 1	rw	UNSIGNED16
2021	User data 2	User data 2	rw	UNSIGNED16
2022	User data 3	User data 3	rw	UNSIGNED16
2023	User data 4	User data 4	rw	UNSIGNED16
2024	User data 5	User data 5	rw	UNSIGNED16

Index [hex]	Object Name	Description	Access right	Data type
2025	User data 6	User data 6	rw	UNSIGNED16
2026	User data 7	User data 7	rw	UNSIGNED16
2027	User data 8	User data 8	rw	UNSIGNED16
2028	User data 9	User data 9	rw	UNSIGNED16
2029	User data 10	User data 10	rw	UNSIGNED16
202 A	User data 11	User data 11	rw	UNSIGNED16
202B	User data 12	User data 12	rw	UNSIGNED16
202C	User data 13	User data 13	rw	UNSIGNED16
202D	User data 14	User data 14	rw	UNSIGNED16
202E	User data 15	User data 15	rw	UNSIGNED16
202F	User analog output 1	User, analog output 1	rw	UNSIGNED16
2030	User analog output 2	User, analog output 2	rw	UNSIGNED16
2033	User relay output 1	User, relay output 1	rw	UNSIGNED16
2034	User relay output 2	User, relay output 2	rw	UNSIGNED16
2035	User relay output 3	User, relay output 3	rw	UNSIGNED16
2036	User relay output 4	User, relay output 4	rw	UNSIGNED16
2037	User relay output 5	User, relay output 5	rw	UNSIGNED16
203 A	Kilowatt hours	Operating time in kW	ro	UNSIGNED16
203B	Megawatt hours	Operating time in MW	ro	UNSIGNED16
203C	KWh meter	Total operating time in kW	ro	UNSIGNED16
203D	MWh meter	Total operating time in MW	ro	UNSIGNED16
203E	Total run hours	Operating time in hours	ro	UNSIGNED16
203F	Total run minute/second	Operating time in minutes/seconds	ro	UNSIGNED16
2040	Current run hours	Current operating time in hours	ro	UNSIGNED16
2041	Current run minute/second	Current operating time in minutes/seconds	ro	UNSIGNED16
2042	Time to next service	Time to next service	ro	UNSIGNED16
2043	Room temperaure	Room temperature	ro	UNSIGNED16
2044	Speed controller reference		ro	UNSIGNED16
2045	Torque controller reference		ro	UNSIGNED16
2046	Digital pot speed reference		ro	UNSIGNED16

4.5.8 Manufacturer-specific objects on DC1 devices

In addition to communication-specific objects, manufacturer-specific objects are also defined in the object dictionary. These objects fall within the range between index 2000_{hex} and index 2096_{hex} in the DC1 variable frequency drive's object dictionary.

Table 17: Manufacturer-specific objects

Index [hex]	Object Name	Description	Access right	Data type
2000	Control command register	Command	rw	UNSIGNED16
2001	Speed reference	Frequency reference value	rw	Integer16
2003	User ramp reference	User ramp time	rw	UNSIGNED16
200 A	Drive status register	status word	ro	UNSIGNED16
200B	Motor speed Hz	Actual value in Hertz (Hz)	ro	UNSIGNED16
200D	Motor current	Motor Current	ro	UNSIGNED16
2010	Drive temperature	variable frequency drive temperature	ro	Integer 16
2011	DC bus value	DC Link Voltage	ro	UNSIGNED16
2012	Digital input status	State of digital inputs	ro	UNSIGNED16
2013	Analog input 1 (%)	Analog input 1 in %	ro	UNSIGNED16
2014	Analog input 2 (%)	Analog input 2 in %	ro	UNSIGNED16
2015	Analog input 1	Analog Input 1	ro	UNSIGNED16
2017	Relay output 1	Relay output 1	ro	UNSIGNED16
203E	Total run hours	Operating time in hours	ro	UNSIGNED16
203F	Total run minute/second	Operating time in minutes/seconds	ro	UNSIGNED16
2040	Current run hours	Current operating time in hours	ro	UNSIGNED16
2041	Current run minute/second	Current operating time in minutes/seconds	ro	UNSIGNED16

4.5.9 Manufacturer-specific objects on DC1…E1 devices

Table 18: Manufacturer-specific objects

Index [hex]	Object Name	Access rw/ro	Scaling	value range	Data format	description
2000	Control word	rw			U16	Command
2001	Frequency reference value	rw	500 ≙ 50.0 Hz	-5000 - 5000	S16	Frequency reference value
2002	Ramp Time	rw	500 ≙ 5.00 s	0 - 60000	U16	User ramp time
2004	High Resolution Frequency reference value	rw	3000 ≙ 50.0 Hz	-30000 - 30000	S16	Frequency reference value (high-resolution)
200 A	Error code / Drive Status	ro			U16	status word
200B	Output Frequency	ro	500 ≙ 50.0 Hz	0 - 5000	S16	Actual value in Hertz (Hz)
200D	Motor current	ro	100 = 10.0 A		U16	Motor Current
200E	Motor Torque	ro	500 ≙ 50.0 %	0 - 2000	S16	Motor Torque
200F	Motor Power	ro	100 = 1.00 kW		U16	Instance Motor Power
2015	Analog Output %	ro	500 ≙ 50.0 %	0 - 1000	U16	Analog output as a %
2017	Relay Output Status	ro	1 ≙ 1	0 - 1	U16	Relay output 1
2043	Control Board Temperature	ro	50 ≙ 50 °C	-10 - 150	S16	Control board temperature
2044	Speed Reference (Internal Format)	ro	3000 ≙ 50.0 Hz	0.00 - P-01	U16	Internal frequency reference value
2046	Digital Pot / Keypad reference	ro	3000 ≙ 50.0 Hz	0.00 - P-01	U16	Keypad frequency reference value
23E8	Scope index 12	rw				
23E9	Scope index 34	rw				

4.5.10 Manufacturer-specific objects on DE11 devices

In addition to communication-specific objects, manufacturer-specific objects are also defined in the object dictionary. These objects are located within the range between index 2000_{hex} and index 2096_{hex} in the DE11 variable speed starter's object dictionary.

Table 19: Manufacturer-specific objects

Index [hex]	Object Name	description	Access right	Data type
2000	Control command register	Command	rw	UNSIGNED16
2001	Speed reference	Frequency reference value	rw	Integer16
2003	User ramp reference	User ramp time	rw	UNSIGNED16
200A	Drive status register	Status word	ro	UNSIGNED16
200B	Motor speed Hz	Actual value in Hertz (Hz)	ro	UNSIGNED16
200D	Motor current	Motor Current	ro	UNSIGNED16
2010	Drive temperature	Variable frequency drive temperature	ro	Integer 16
2011	DC bus value	DC Link Voltage	ro	UNSIGNED16
2012	Digital input status	State of digital inputs	ro	UNSIGNED16
2013	Analog input 1 (%)	Analog input 1 in %	ro	UNSIGNED16
2014	Analog input 2 (%)	Analog input 2 in %	ro	UNSIGNED16
2015	Analog input 1	Analog Input 1	ro	UNSIGNED16
2017	Relay output 1	Relay output 1	ro	UNSIGNED16
203E	Total run hours	Operating time in hours	ro	UNSIGNED16
203F	Total run minute/second	Operating time in minutes/seconds	ro	UNSIGNED16
2040	Current run hours	Current operating time in hours	ro	UNSIGNED16
2041	Current run minute/second	Current operating time in minutes/seconds	ro	UNSIGNED16
2065	P-01	Parameters for DE11 variable speed starter	rw	
2066	P-02		rw	
…	…		…	…
2095	P-49		rw	
2096	P-50		rw	

4.6 Fault messages

Table 20: Fault messages

Error no.		Device series	Message (display on DA1, DC1)	Possible cause
dec	hex			
		DA1, DC1, DE1	STOP	There are no fault messages present. There is no drive enable signal present.
00	00	DA1, DC1, DE1	no-Flt	Shown for P0-13 if there are no messages in the error register.
01	01	DA1, DC1, DE1	OI-b	Excessively high braking current
02	02	DA1, DC1, DE1	OL-br	Thermal overload on brake resistor.
03	03	DA1, DC1, DE1	O-I	Overcurrent at variable frequency drive output
04	04	DA1, DC1, DE1	I.t-trP	Motor overload.
05	05	DA1, DC1, DE1	PS-trP	Overcurrent (Hardware)
06	06	DA1, DC1, DE1	OUolt	Overvoltage in DC link
07	07	DA1, DC1, DE1	UUolt	Undervoltage in DC link.
08	08	DA1, DC1, DE1	O-t	Overtemperature at heat sink.
09	09	DA1, DC1, DE1	U-t	Under-temperature
10	0A	DA1, DC1, DE1	P-dEF	The parameters' default settings have been loaded.
11	0B	DA1, DC1, DE1	E-tr ıP	External Fault
12	0C	DA1, DC1, DE1	SC-Obs	Communication error with an external operating unit or with a PC
13	0D	DA1, DC1, DE1	FI 1-dc	Excessively high DC link voltage ripple
14	0E	DA1, DC1, DE1	P-LOSS	Incoming power phase failure (only for devices with a three-phase power supply)
15	0F	DA1, DE1	h O-I	Overcurrent at output, DC1 motor pick-up control fault
16	0A	DA1, DC1, DE1	1h-Flt	Malfunctioning heat sink thermistor.
17	11	DA1, DC1, DE1	dAtA-F	Error in internal memory
18	12	DA1, DC1, DE1	4-20 F	The analog input's input current does not fall within the specified range.
19	12	DA1, DC1…E1	dAtA-E	Error in internal memory
20	14	DA1	U-dEF	The customer's settings for the parameters have been imported.
21	15	DA1, DC1…E1	F-Ptc	Motor PTC thermistor overtemperature
22	16	DA1, DC1…E1	FAn-F	The device's internal fan is experiencing a fault
23	17	DA1, DC1…E1	O-hEAt	The measured ambient temperature exceeds the specified value.
24	18	DA1	O-torO	Maximum permissible torque exceeded.
25	19	DA1	U-torO	Only active if brake control is enabled in hoisting gear mode (P2-18 = 8). The torque produced before the hoisting gear's mechanical brake is enabled falls below the set threshold.
26	1A	DA1, DC1…E1	OUt-F	Device output fault
29	1D	DA1	Sto-F	Internal STO circuit fault
30	1U	DA1	Enc-01	No communication between the encoder module and the variable frequency drive
31	1F	DA1	Enc-02 SP-Err	The calculated motor speed is different from the measured motor speed
32	20	DA1	Enc-03	The motor speed and the PPR value entered in P6-06 do not match.
33	21	DA1	Enc-04	Channel A fault

Error no.		Device series	Message (display on DA1, DC1)	Possible cause
dec	hex			
34	22	DA1	Enc-05	Channel B fault
35	23	DA1	Enc-06	Error on channels A and B
40	28	DA1, DC1…E1	AtF-01	Motor identification failed
41	29	DA1, DC1…E1	AtF-02	Motor identification failed: The measured stator resistance is too large.
42	2B	DA1, DC1…E1	AtF-03	Motor identification failed: The measured motor inductance is too low.
43	2B	DA1, DC1…E1	AtF-04	Motor identification failed: The measured motor inductance is too high.
44	2C	DA1, DC1…E1	AtF-05	Motor identification failed: The measured motor parameters do not match.
49	31	DA1, DC1…E1	Out-Ph	A phase in the motor cable is not connected or has a discontinuity.
50	32	DA1, DC1…E1	Sc-FD1	No valid Modbus frame was received within the time specified.
51	33	DA1, DC1…E1	Sc-FD2	No valid CANopen frame was received within the specified time.
52	34	DA1	Sc-FD3	Communications between the device and the plugged-in field bus option have dropped out.
53	35	DA1	Sc-FD4	Communications between the device and the plugged-in I/O expansion have dropped out.
60	3C	DA1	OF-01	No internal connection to an optional card
61	3D	DA1	OF-02	Optional module in abnormal state
70	46	DA1	PLC-01	Non-supported function block from function block editor
71	47	DA1	PLC-02	Program from function block editor is too big
72	48	DA1	PLC-03	Division by zero
73	49	DA1	PLC-04	Lower limit is higher than upper limit
74	4A	DA1	PLC-05	Overflow table Function block editor

4.7 Parameters

The following tables show the CANopen parameters on the variable frequency drive/variable speed starter.

The abbreviations and acronyms used in the table are defined below:

Abbreviation	Significance
CANopen Index	The parameter's identification number in CANopen (identification number)
RUN	The parameter can be accessed during operation (Run signal)
STOP	The parameter can only be accessed in STOP mode
ro/rw	Parameter read and write permissions: ro = read only rw = read and write
Designation	Name of parameter
Value	• Setting value of the parameter • value range • Display value
DS	Default setting (the parameter's value when using the device's factory settings) The values in parentheses are the default settings when using a frequency of 60 Hz.
Page	The page number in this manual containing a detailed description of the parameter.

4.7.1 Parameters on DA1 devices

Table 21: Parameters on DA1 devices

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
2065	P1-01	f-max	rw	RUN	3000 ≙ 50.0Hz	P1-02 - 5 x P1-09 (max.: 500.0 Hz / 30000 rpm)	U16
2066	P1-02	f-min	rw	RUN	3000 ≙ 50.0Hz	0.0 Hz - P1-01	U16
2067	P1-03	t-acc	rw	RUN	300 ≙ 30.0s	0.00 s - 6000 s	U16
2068	P1-04	t-dec	rw	RUN	300 ≙ 30.0s	0.00 s - 6000 s	U16
2069	P1-05	Stop Mode	rw	RUN		0 - 4	U16
206 A	P1-06	Energy Optimizer	rw	RUN		0 - 1	WORD
206B	P1-07	Motor Nom Voltage	rw	STOP	230 ≙ 230 V	0 - U_e	U16
206C	P1-08	Motor Nom Current	rw	STOP	1 ≙ 0.1A	0.1 I_e - I_e	U16
206D	P1-09	Motor Nom Frequency	rw	STOP	50 ≙ 50Hz	10 Hz - 500 Hz	U16
206E	P1-10	Motor Nom Speed	rw	RUN	1500 ≙ 1500rpm	0 / 200 rpm - 30000 rpm	U16
206F	P1-11	V-Boost	rw	STOP	-1 ≙ Auto 0 ≙ disabled 1 ≙ 0.1%	0 - Auto / 0 - 30.0 % P1-07	S16
2070	P1-12	Local ProcessData Source	rw	STOP		0 - 13	U16
2071	P1-13	DI Config Select	rw	STOP		0 - 21	U16
2072	P1-14	Password	rw	RUN		0 - 30000	U16
20C9	P2-01	f-Fix1	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20CA	P2-02	f-Fix2	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20CB	P2-03	f-Fix3	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20CC	P2-04	f-Fix4	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20CD	P2-05	f-Fix5	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20CE	P2-06	f-Fix6	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20CF	P2-07	f-Fix7	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20D0	P2-08	f-Fix8	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20D1	P2-09	f-Skip1	rw	RUN	3000 ≙ 50.0 Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20D2	P2-10	f-SkipBand1	rw	RUN	3000 ≙ 50.0Hz	P1-02 (min: 0 Hz / 0 rpm) - P1-01 (max: 500.0 Hz / 30000 rpm)	U16
20D3	P2-11	ADO1 Function & Mode	rw	RUN		0 - 11	U16
20D4	P2-12	AO1 SignalFormat	rw	RUN		0 - 5	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
20D5	P2-13	ADO2 Function & Mode	rw	RUN		0 - 11	U16
20D6	P2-14	AO2 SignalFormat	rw	RUN		0 - 5	U16
20D7	P2-15	RO1 Function	rw	RUN		0 - 13	U16
20D8	P2-16	RO1 upper limit	rw	RUN	1 ≙ 0.1 %	P2-17 - 2000	U16
20D9	P2-17	RO1 lower Limit	rw	RUN	1 ≙ 0.1 %	0.0 % - P2-16	U16
20DA	P2-18	RO2 Function	rw	RUN		0 - 13	U16
20DB	P2-19	RO2 upper Limit	rw	RUN	1 ≙ 0.1 %	P2-20 - 2000	U16
20DC	P2-20	RO2 lower Limit	rw	RUN	1 ≙ 0.1 %	0.0 % - P2-19	U16
20DD	P2-21	Display Scale	rw	RUN	1 ≙ 0.001	0.000 - -30000 - +30000	U16
20DE	P2-22	Display Source	rw	RUN		0 - 3	U16
20DF	P2-23	t-n=0 Wait	rw	RUN	1 ≙ 0.1	0.0 s - 60.0 s	U16
20E0	P2-24	Switching Frequency	rw	RUN		0 - 5	U16
20E1	P2-25	t-QuickDec	rw	RUN	S2, S3: 1 ≙ 0.01 s S4, …, S7: 1 ≙ 0.1 s	0.00 s - 240 s	U16
20E2	P2-26	Spin Start Enable	rw	RUN	1	0 - 2	WORD
20E3	P2-27	Standby Mode	rw	RUN	1 ≙ 0.01	0.0 s - 250 s	U16
20E4	P2-28	Slave SpeedScalingControl	rw	RUN		0 - 3	U16
20E5	P2-29	Slave SpeedScalingFactor	rw	RUN	1 ≙ 0.1	-500.0 % - +500.0 %	S16
20E6	P2-30	AI1 Signal Range	rw	RUN		0 - 7	U16
20E7	P2-31	AI1 Gain	rw	RUN	1 ≙ 0.1	0.0 % - 2000.0 %	U16
20E8	P2-32	AI1 Offset	rw	RUN	1 ≙ 0.1	-500.0 % - +500.0 %	S16
20E9	P2-33	AI2 Signal Range	rw	RUN		0 - 7	U16
20EA	P2-34	AI2 Gain	rw	RUN	1 ≙ 0.1	0.0 % - 2000.0 %	U16
20EB	P2-35	AI2 Offset	rw	RUN	1 ≙ 0.1	-5000 - +5000	S16
20EC	P2-36	Start Mode	rw	RUN		0 - 6	U16
20ED	P2-37	Digital Reference Reset Mode	rw	RUN		0 - 7	U16
20EE	P2-38	Action@MainsLoss	rw	RUN		0 - 3	U16
20EF	P2-39	Parameter Lock	rw	RUN		0 - 1	WORD
20F0	P2-40	Password Level2	rw	RUN		0 - 9999	U16
212D	P3-01	PID1 Kp	rw	RUN	1 ≙ 0.1	1 - 300	U16
212E	P3-02	PID1 Ti	rw	RUN	1 ≙ 0.1	0 s - 300 s	U16
212F	P3-03	PID1 Kd	rw	RUN	1 ≙ 0.01	0.00 s - 100 s	U16
2130	P3-04	PID1 Mode	rw	RUN		0 - 1	WORD
2131	P3-05	PID1 Set Point 1 Source	rw	RUN	1 ≙ 1	0 - 2	U16
2132	P3-06	PID Set Point Digital	rw	RUN	1 ≙ 0.1 %	0 - 1000	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
2133	P3-07	PID1 Output upper Limit	rw	RUN	1 ≙ 0.1 %	P3-08 - 1000	U16
2134	P3-08	PID1 Output lower Limit	rw	RUN	1 ≙ 0.1 %	0- P3-07	U16
2135	P3-09	PID1 Output LimitSelect	rw	RUN		0 - 3	U16
2136	P3-10	PID 1 Feedback 1 Source	rw	RUN		0 - 1	WORD
2137	P3-11	PID1 Error Ramp	rw	RUN	1 ≙ 0.1 %	0 - 250	U16
2138	P3-12	PID1 Feedback 1 DispScale	rw	RUN	0: disabled 1 ≙ 0.001	0.000 - 50,000	U16
2139	P3-13	PID1 WakeUpLevel	rw	RUN	1 ≙ 0.1 %	0 - 1000	U16
–	P3-14	Reserved Parameter	–	–	–	–	–
–	P3-15	Reserved Parameter	–	–	–	–	–
–	P3-16	Reserved Parameter	–	–	–	–	–
–	P3-17	Reserved Parameter	–	–	–	–	–
213E	P3-18	PID1 ResetControl	rw	RUN	1 ≙ 1	0 - 1	U16
2191	P4-01	Motor Control Mode	rw	STOP		0 - 6	U16
2192	P4-02	Motor Identification	rw	STOP		0 - 1	WORD
2193	P4-03	MSC Kp	rw	RUN	1 ≙ 0.1 %	1 - 4000	U16
2194	P4-04	MSC Ti	rw	RUN	1 ≙ 0.001 s	1 - 1000	U16
2195	P4-05	Motor PF	rw	RUN	99 ≙ 0.99	0.00 / 50 - 99	U16
2196	P4-06	M-Ref Source	rw	RUN		0 - 5	U16
2197	P4-07	M-Max Motoring	rw	RUN	2000 ≙ 200.0 %	0 - 2000	U16
2198	P4-08	M-Min Motoring	rw	RUN	1 ≙ 0.1 %	0 % - 150 %	U16
2199	P4-09	M-Max Generative	rw	RUN	1 ≙ 1 %	0 % - 200 %	U16
219A	P4-10	f-MidV/f	rw	STOP	1 ≙ 0.1 %	0.0 % - 100.0 %	U16
219B	P4-11	V-MidV/f	rw	RUN	1 ≙ 0.1 %	0.0 % - 100.0 %	U16
219C	P4-12	T-Memory Enable	rw	RUN	1≙1	0 - 1	U16
219D	P4-13	Change Phasesequence Motor	rw	STOP		0 - 1	
21F5	P5-01	PDP-Address	rw	RUN	1 ≙ 1	1-63	U16
21F6	P5-02	CAN0 Baudrate	rw	RUN	0 ≙ 125 kbps 1 ≙ 250 kbps	0 - 3	U16
21F7	P5-03	RS485-0 Baudrate	rw	RUN	0 ≙ 9.6 kbps 1 ≙ 19.2 kpbs	0 - 4	U16
21F8	P5-04	RS485-0 ParityType	rw	RUN	0 ≙ N-1 1 ≙ N-2	0 - 3	U16
21F9	P5-05	Comm Timeout Modbus RTU	rw	RUN	1 ≙ 0.1 s	0.0 - 5.0	U16
21FA	P5-06	Action@Modbus RTU Fault	rw	RUN	1 ≙ 1	0 - 3	U16
21FB	P5-07	FieldbusRampControl	rw	RUN	1 ≙ 1	0 - 1	U16
21FC	P5-08	NETSendPZD4	rw	RUN	1≙1	0 - 7	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
–	P5-09	Reserved	–	–	–	–	–
–	P5-10	Reserved	–	–	–	–	–
–	P5-11	Reserved	–	–	–	–	–
2200	P5-12	NETSendPZD3	rw	RUN		0 - 7	U16
2201	P5-13	NETReceivePZD4	rw	RUN		0 - 1	U16
2202	P5-14	NETReceivePZD3	rw	RUN		0 - 2	U16
2205	P5-17	Modbus RTU0 Response Delay	rw	RUN		0 - 16	
2259	P6-01	FirmwareUpgrade Enable	rw	STOP		0 - 3	U16
215A	P6-02	Auto Thermal Management	rw	RUN		0 - 5	WORD
215B	P6-03	Auto Reset Delay	rw	RUN		1 - 60	U16
215C	P6-04	RO1 n-Hysteresis	rw	RUN	1 ≙ 0.1 %	0 - 250	U16
215D	P6-05	Encoder Feedback Enable	rw	STOP		0 -1	WORD
215E	P6-06	Encoder PPR	rw	STOP		0 - 65535	U16
215F	P6-07	Speed Error Limit	rw	RUN	1 ≙ 0.1 %	0 - 500	U16
2160	P6-08	Freq RefMax	rw	RUN		0, 5 - 20	U16
2161	P6-09	DroopMax	rw	RUN	1 ≙ 0.1 %	0 - 250	U16
2162	P6-10	PLC Operation Enable	rw	RUN		0 -1	WORD
2163	P6-11	t-f-Fix before Start	rw	RUN	1 ≙ 0.1 s	0 - 2500	U16
2164	P6-12	t-f-Fix after Stop	rw	RUN	1 ≙ 0.1 s	0 - 2500	U16
2165	P6-13	Brake Release Delay	rw	RUN	1 ≙ 0.1 s	0 - 50	U16
2166	P6-14	Brake Apply Delay	rw	RUN	1 ≙ 0.1 s	0 - 50	U16
2167	P6-15	Brake M-Level Release	rw	RUN	1 ≙ 0.1 %	0 - 2000	U16
2168	P6-16	Brake M-Level Timeout	rw	RUN	1 ≙ 0.1 s	0 - 250	U16
2169	P6-17	Max Torque Timeout	rw	RUN	1 ≙ 0.1 s	0 - 250	U16
216A	P6-18	DC-Brake Current	rw	STOP	0 ≙ Auto 1 ≙ 0.1 %	0 : Auto 0 - 300	U16
216B	P6-19	Brake Resistor	rw	RUN	1 ≙ 1	0, RMin - 200	U16
216C	P6-20	P-Brake Resistor	rw	RUN	1 ≙ 0.01 kw	0 - 20000	U16
216D	P6-21	Brake Chopper ED Heat-Up	rw	RUN	1 ≙ 0.1 %	0 - 200	U16
216E	P6-22	Reset Fan RunTime	rw	RUN		0 -1	WORD
216F	P6-23	Reset kWh Meter	rw	RUN		0 -1	WORD
2170	P6-24	Service Interval Time	rw	RUN	1 ≙ 1	0 - 60 000 h (0 = disabled)	U16
2171	P6-25	Reset ServiceIndicator	rw	RUN	1 ≙ 1	0 -1	WORD
2172	P6-26	AO1 Scale	rw	RUN	1 ≙ 0.1	0 - 5000	U16
2173	P6-27	AO1 Offset	rw	RUN	1 ≙ 0.1 %	-5000 - 5000	S16

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
2174	P6-28	PointerToParameter	rw	RUN	–	0 - 127	U16
2175	P6-29	Save Parameters	rw	STOP	–	0 - 1	WORD
2276	P6-30	Password Level3	rw	RUN	–	0 - 9999	U16
22BD	P7-01	Motor Stator Resistance R1	rw	RUN	1 ≙ 0.001 Ω	0.000 Ω - f (I_e)	U16
22BE	P7-02	Motor Rotor Resistance R2	rw	RUN	1 ≙ 0.001 Ω	0.000 Ω- f (I_e)	U16
22BF	P7-03	Motor Stator Inductance d-Axis	rw	RUN	1 ≙ 0.0001 H	0.000 H - 6.5535 H	U16
22C0	P7-04	Magnetizing Current @M=0	rw	RUN	1 ≙ 0.1 A	0.0 A - f (I_e)	U16
22C1	P7-05	Leak Inductance Rel	rw	RUN	1 ≙ 0.001	0.000 - 0.250	U16
22C2	P7-06	Motor Stator Inductance q-Axis	rw	RUN	1 ≙ 0.0001 H	0.000 H - 6.5535 H	U16
22C3	P7-07	EnhancedGeneratorControl	rw	RUN	–	0-1	WORD
22C4	P7-08	ParameterAdaptation	rw	RUN	–	0-1	WORD
22C5	P7-09	Overvoltage Currentlimit	rw	RUN	1 ≙ 0.1%	0.0 - 100 % motor current	U16
22C6	P7-10	digRef UP Source	rw	RUN	1 ≙ 1	0 - 600	U16
22C7	P7-11	PWM lower Limit	rw	RUN	1 ≙1	0 - 500 (Time = value *16.67 ns)	U16
22C8	P7-12	t-Excitation-V/f	rw	RUN		0 - 2000	U16
22C9	P7-13	MSC Kd	rw	RUN	1 ≙ 0.1 %	0 - 4000	U16
22CA	P7-14	Torque Boost	rw	RUN	1 ≙ 0.1 %	0 - 1000	U16
22CB	P7-15	f-Torque Boost Limit	rw	RUN	1 ≙ 0.1 %	0 - 500	U16
22CC	P7-16	PM-MotorSignalIn	rw	RUN		0-3	U16
22CD	P7-17	PM-MotorSignalInLevel	rw	RUN		0 - 100	U16
2321	P8-01	t-acc2	rw	RUN	0- FS2, FS3: 1 ≙ 0.01 s FS4, …: 1 ≙ 0.1 s	0 - 60000	U16
2322	P8-02	n-accMulti1	rw	RUN	3000 ≙ 50.0 Hz	0 - 30000	U16
2323	P8-03	t-acc3	rw	RUN	FS2, FS3: 1 ≙ 0.01 s FS4, …: 1 ≙ 0.1 s	0 - 60000	U16
2324	P8-04	n-accMulti2	rw	RUN	3000 ≙ 50.0 Hz	0 - 30000	U16
2325	P8-05	t-acc4	rw	RUN	FS2, FS3: 1 ≙ 0.01 FS4, …: 1 ≙ 0.1 s	0 - 60000	U16
2326	P8-06	n-accMulti3	rw	RUN	3000 ≙ 50.0 Hz	0 - 30000	U16
2327	P8-07	t-dec4	rw	RUN	FS2, FS3: 1 ≙ 0.01 s FS4, …: 1 ≙ 0.1 s	0 - 60000	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
2328	P8-08	n-decMulti3	rw	RUN	3000 ≙ 50.0 Hz	0 - 30000	U16
2329	P8-09	t-dec3	rw	RUN	FS2, FS3: 1 ≙ 0.01 s FS4, ...: 1 ≙ 0.1 s	0 - 60000	U16
232A	P8-10	n-decMulti2	rw	RUN	3000 ≙ 50.0 Hz	0 - 30000	U16
232B	P8-11	t-dec2	rw	RUN	FS2, FS3: 1 ≙ 0.01 s FS, ...: 1 ≙ 0.1 s	0 - 60000	U16
232C	P8-12	n-decMulti1	rw	RUN	3000 ≙ 50.0 Hz	0 - 30000	U16
232D	P8-13	Ramp Mode	rw	RUN	1 ≙ 1	0 - 1	WORD
2385	P9-01	Enable Operation Source	rw	STOP	1 ≙ 1	0 - 8	U16
2386	P9-02	QuickStop Source	rw	STOP	1 ≙ 1	0 - 25	U16
2387	P9-03	FWD Source	rw	STOP	1 ≙ 1	0 - 25	U16
2388	P9-04	REV Source	rw	STOP	1 ≙ 1	0 - 25	U16
2389	P9-05	Signal Format	rw	STOP	1 ≙ 1	0 - 1	U16
238A	P9-06	Force REV Source	rw	STOP	1 ≙ 1	0 - 25	U16
238B	P9-07	FaultReset Source	rw	STOP	1 ≙ 1	0 - 25	U16
238C	P9-08	External Fault1 Source	rw	STOP	1 ≙ 1	0 - 25	U16
238D	P9-09	Power Up Local Remote Select	rw	STOP	1 ≙ 1	0 - 25	U16
238E	P9-10	SpeedSource1	rw	STOP	1 ≙ 1	0 - 16	U16
238F	P9-11	SpeedSource2	rw	STOP	1 ≙ 1	0 - 16	U16
2390	P9-12	SpeedSource3	rw	STOP	1 ≙1	0 - 16	U16
2391	P9-13	SpeedSource4	rw	STOP	1 ≙ 1	0 - 16	U16
2392	P9-14	SpeedSource5	rw	STOP	1 ≙ 1	0 - 16	U16
2393	P9-15	SpeedSource6	rw	STOP	1 ≙ 1	-	U16
2394	P9-16	SpeedSource7	rw	STOP	1 ≙ 1	0 - 16	U16
2395	P9-17	SpeedSource8	rw	STOP	1 ≙1	0 - 16	U16
2396	P9-18	Speed Select B0	rw	STOP	1 ≙ 1	0 - 25	U16
2397	P9-19	Speed Select B1	rw	STOP	1 ≙ 1	0 - 25	U16
2398	P9-20	Speed Select B2	rw	STOP	1 ≙ 1	0 - 25	U16
2399	P9-21	f-Fix Select B0	rw	STOP	1 ≙ 1	0 - 25	U16
239A	P9-22	f-Fix Select B1	rw	STOP	1 ≙ 1	0 - 25	U16
239B	P9-23	f-Fix Select B2	rw	STOP	1 ≙ 1	0 - 25	U16
239C	P9-24	t-acc Select B0	rw	STOP	1 ≙ 1	0 - 25	U16
239D	P9-25	t-acc Select B1	rw	STOP	1 ≙ 1	0 - 25	U16
239E	P9-26	t-dec Select B0	rw	STOP	1 ≙ 1	0 - 25	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
239F	P9-27	t-dec Select B1	rw	STOP	1 ≙ 1	0 - 25	U16
23A0	P9-28	Accel Pot Value	rw	STOP	1 ≙ 1	0 - 25	U16
23A1	P9-29	digRef DOWN Source	rw	STOP	1 ≙ 1	0 - 25	U16
23A2	P9-30	EnableDirFWD Source	rw	STOP	1 ≙ 1	0 - 25	U16
23A3	P9-31	EnableDirREV Source	rw	STOP	1 ≙ 1	0 - 25	U16
23A4	P9-32	Reserved	–	–	–	–	U16
23A5	P9-33	ADO1 Function & Mode Extension	rw	STOP	1 ≙ 1	0 - 2	U16
23A6	P9-34	ADO2 Function & Mode Extension	rw	STOP	1 ≙ 1	0 - 2	U16
23A7	P9-35	RO1 Function Extension	rw	STOP	1 ≙ 1	0 - 1	U16
23A8	P9-36	RO2 Function Extension	rw	STOP	1 ≙ 1	0 - 1	U16
23A9	P9-37	Display Scale Source	rw	STOP	1 ≙ 1	0 - 1	U16
23AA	P9-38	PID1 Set Point1 Source Ext	rw	STOP	1 ≙ 1	0 - 1	U16
23AB	P9-39	PID1 Feedback1 Source Ext	rw	STOP	1 ≙ 1	0 - 1	U16
23AC	P9-40	M-Ref Source Extension	rw	STOP	1 ≙ 1	0 - 1	U16
23AD	P9-41	RO5 Function Extension	rw	STOP	1 ≙1	0 - 1	U16
2013	P0-01	AI1 Value	ro	–	1000 ≙ 100.0 %	–	S16
2014	P0-02	AI2 Value	ro	–	1000 ≙ 100.0 %	–	S16
2012	P0-03	DI status	ro	–	Bit 0 ≙ Digital Input 1 Bit 1 ≙ Digital Input 2 …	–	WORD
		DI1 Status	ro	–	–	–	WORD
		DI2 Status	ro	–	–	–	WORD
		DI3 Status	ro	–	–	–	WORD
		DI4 Status	ro	–	–	–	WORD
		DI5 Status	ro	–	–	–	WORD
		DI6 Status	ro	–	–	–	WORD
		DI7 Status	ro	–	–	–	WORD
		DI8 Status	ro	–	–	–	WORD
2044	P0-04	f-PreRamp	ro	–	–	–	S16
2045	P0-05	Torque Reference	ro	–	1000 ≙ 100.0 %		U16
2046	P0-06	Motor Pot setpoint value	ro	–			U16
200E	P0-12	Motor Torque	ro	–	1000 ≙ 100.0 %		U16
2011	P0-20	DC Link Voltage	ro	–	600 ≙ 600 V		
2010	P0-21	Heat sink temperature	ro	–	40 ≙ 40 °C		

CANOpen Index [hex]	Para meter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
203A	P0-26	kWh counterR	ro	–	100 ≙ 10.0 kWh		U16
203C	P0-26	MWh counterR	ro	–	100 ≙ 100 MWh		U16
203B	P0-27	kWh meter	ro	–	–	–	U16
203D	P0-27	Total MWh Count	ro	–	–	–	U16
203E	P0-31	t-Run hours	ro	–	–	–	U16
203F	P0-31	t-Run mins/sec	ro	–	–	–	U16
2040	P0-34	t-HoursRun Enable	ro	–	–	–	U16

CANOpen Index [hex]	Parameter	Designation	Access		Scaling	Value range	Data format
			rw/ ro	RUN/ STOP			
2015		Analog Output 1	ro	–	–	–	–
2016		Analog Output 2	ro	–	–	–	–
2017		User Relay 1 output status	ro	–	–	–	–
2018		User Relay 2 output status	ro	–	–	–	–
2019		User Relay 3 output status	ro	–	–	–	–
201A		User Relay 4 output status	ro	–	–	–	–
201B		User Relay 5 output status	ro	–	–	–	–
2020		UserRegister1	rw	–	–	–	–
2021		UserRegister2	rw	–	–	–	–
2022		UserRegister3	rw	–	–	–	–
2023		UserRegister4	rw	–	–	–	–
2024		UserRegister5	rw	–	–	–	–
2025		UserRegister6	rw	–	–	–	–
2026		UserRegister7	rw	–	–	–	–
2027		UserRegister8	rw	–	–	–	–
2028		UserRegister9	rw	–	–	–	–
2029		UserRegister10	rw	–	–	–	–
202A		UserRegister11	rw	–	–	–	–
202B		UserRegister12	rw	–	–	–	–
202C		UserRegister13	rw	–	–	–	–
202D		UserRegister14	rw	–	–	–	–
202E		UserRegister15	rw	–	–	–	–
202F		User Analog Output 1	rw	–	–	–	–
2030		User Analog Output 2	rw	–	–	–	–
2033		User RO1 LogicStatus	rw	–	–	–	–
2034		User RO2 LogicStatus	rw	–	–	–	–
2035		User RO3 LogicStatus	rw	–	–	–	–
2036		User RO4 LogicStatus	rw	–	–	–	–
2037		User RO5 LogicStatus	rw	–	–	–	–

4.7.2 Parameters on DC1 devices

Table 22: Parameters on DC1 devices

CANOpen Index [hex]	Para meter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN STOP			
2065	P-01	f-max	rw	RUN	3000 ≙ 50.0 Hz	P-02 - 5 x P-09	U16
2066	P-02	f-min	rw	RUN	3000 ≙ 50.0 Hz	0 - P-01	U16
2067	P-03	t-acc	rw	RUN	300 ≙ 3.00 s	0.1 - 600s	U16
2068	P-04	t-dec	rw	RUN	300 ≙ 3.00 s	0.1 - 600s	U16
2069	P-05	Stop Mode	rw	RUN	1 ≙ 1	0 - 2	U16
206 A	P-06	Energy Optimizer	rw	RUN	1 ≙ 1	0 - 1	U16
206B	P-07	Motor Nom Voltage	rw	STOP	230 ≙ 230 V	0.20 - 230/500V	U16
206C	P-08	Motor Nom Current	rw	RUN	100 ≙ 10.0 A	Depending on device	U16
206D	P-09	Motor Nom Frequency	rw	STOP	50 ≙ 50 Hz	20-500Hz	U16
206E	P-10	Motor Nom Speed	rw	RUN	1 ≙ 1	0/250 - 30000 rpm	U16
206F	P-11	V-Boost	rw	RUN	100 ≙ 10.0 %	0.00 - 20.0 %	U16
2070	P-12	Local ProcessData Source	rw	RUN	1 ≙ 1	0 - 13	U16
2071	P-13	Last Fault1 PDP, …, Last Fault8 PDP	RO	RUN			U16
2072	P-14	Password	rw	RUN	1 ≙ 1	0 - 9999	U16
2073	P-15	DI Config Select	rw	STOP	1 ≙ 1	0-13	U16
2074	P-16	AI1 Signal Range	rw	RUN	1 ≙ 1	0 - 6	U16
2075	P-17	Switching Frequency	rw	RUN	1 ≙ 1	0 - 5	U16
2076	P-18	RO1 Function	rw	RUN	1 ≙ 1	0 - 9	U16
2077	P-19	RO1 upper limit	rw	RUN	100 ≙ 10.0 %	0 -2000	U16
2078	P-20	f-Fix1	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
2079	P-21	f-Fix2	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
207 A	P-22	f-Fix3	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
207B	P-23	f-Fix4	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
207C	P-24	t-QuickDec	rw	RUN	250 ≙ 2.50 s	0 - 2500	U16
207D	P-25	AO1 Function	rw	RUN	1 ≙ 1	0 - 11	U16
207E	P-26	f-SkipBand1	rw	RUN	3000 ≙ 50 Hz	0 - P-01	U16
207F	P-27	f-Skip1	rw	RUN	3000 ≙ 50 Hz	0 - P-01	U16
2080	P-28	V-MidV/f	rw	STOP	100 ≙ 100 V	0 - P-07	U16
2081	P-29	f-MidV/f	rw	STOP	50 ≙ 50 Hz	0 - P-09	U16
2082	P-30	Start Mode	rw	RUN	1 ≙ 1	0 - 6	U16
2083	P-31	Digital Reference Reset Mode	rw	RUN	1 ≙ 1	0 - 3	U16
2084	P-32	t-DCBrake@Stop	rw	RUN	250 ≙ 25 s	0, 0-250	U16
2085	P-33	Spin Start Enable	rw	RUN	1 ≙ 1	0 - 1	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN STOP			
2086	P-34	Brake Chopper	rw	RUN	1 ≙ 1	0 - 1	U16
2087	P-35	AI1 Gain	rw	RUN	100 ≙ 10%	0 - 5000	U16
2088	P-36	RS485-0 Address	rw	RUN	1 ≙ 1	0 - 63	U16
2088	P-36	RS485-0 Baudrate	rw	RUN	1 ≙ 1	1 - 6	U16
2088	P-36	Comm Timeout Modbus RTU	rw	RUN	1 ≙ 1	0 - 8	U16
2089	P-37	Password Level2	rw	RUN	1 ≙ 1	0 - 9999	U16
208 A	P-38	Parameter Lock	rw	RUN	1 ≙ 1	0 - 1	U16
208B	P-39	AI1 Offset	rw	RUN	300 ≙ 30 %	-5000 - +5000	U16
208C	P-40	Display Scale	rw	RUN	100 ≙ 0.100	0 - 6000	U16
208D	P-41	PID1 Control Gain	rw	RUN	10 ≙ 1.0	1 - 300	U16
208E	P-42	PID1 Ti	rw	RUN	10 ≙ 1.0s	0 - 300	U16
208F	P-43	PID1 Mode	rw	RUN	1 ≙ 1	0 - 1	U16
2090	P-44	PID1 Set Point 1 Source	rw	RUN	1 ≙ 1	0 - 1	U16
2091	P-45	PID1 Set Point Digital	rw	RUN	100 ≙ 10%	0 - 1000	U16
2092	P-46	PID 1 Feedback 1 Source	rw	RUN	1 ≙ 1	0 - 3	U16
2093	P-47	AI2 Signal Range	rw	RUN	1 ≙ 1	0 - 5	U16
2094	P-48	t-Standby	rw	RUN	10 ≙ 1.0 s	0 - 250	U16
2095	P-49	PID1 WakeUpLevel	rw	RUN	100 ≙ 10 %	0 - 1000	U16
2096	P-50	CAN0 Baudrate	rw	RUN	1 ≙ 1	0 - 3	U16
2097	P-51	T-Memory Enable	rw	RUN	1 ≙ 1	0 - 1	U16
2098	P-52	ParameterAccess	rw	RUN	1 ≙ 1	0 - 1	U16
2099	P-53	Action@Communication Loss	rw	RUN	1 ≙ 1	0 - 4	U16
209 A	P-54	RO1 Hysteresis	rw	RUN	100 ≙ 10 %	0 - 1000	U16
209B	P-55	RO1 Switch-On Delay	rw	RUN	10 ≙ 1.0 s	0 - 250	U16

4.7.3 Parameters on DC1…E1 devices

Table 23: Parameters on DC1…E1 devices

CANopen Index [hex]	Parameter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
2065	P-01	f-max	rw	RUN STOP	3000 ≙ 50.0 Hz	P-02 - 5 x P-09	U16
2066	P-02	f-min	rw	RUN	3000 ≙ 50.0 Hz	0.0 Hz - P-01	U16
2067	P-03	t-acc	rw	RUN	300 ≙ 3.00 s	0.00 s - 600 s	U16
2068	P-04	t-dec	rw	RUN	300 ≙ 3.00 s	0.00 s - 601 s	U16
2069	P-05	Stop Mode	rw	RUN	1 ≙ 1	0 - 3	U16
206A	P-06	Energy Optimizer	rw	RUN	1 ≙ 1	0 - 1	U16
206B	P-07	Motor Nom Voltage	rw	STOP	230 ≙ 230 V	0 / 20 V - U_e	U16
206C	P-08	Motor Nom Current	rw	RUN	100 ≙ 10.0 A	0.25 I_e - I_e	U16
206D	P-09	Motor Nom Frequency	rw	STOP	50 ≙ 50.0 Hz	25 Hz - 500 Hz	U16
206E	P-10	Motor Nom Speed	rw	RUN	1 ≙ 1	0 / 200 rpm - 30000 rpm	U16
206F	P-11	V-Boost	rw	RUN	100 ≙ 10.0 %	0.0 % U_e - f (FS) FS1: 25 % U_e FS2: 20 % U_e FS3: 15 % U_e FS4: 10 % U_e	U16
2070	P-12	Local ProcessData Source	rw	STOP	1 ≙ 1	0 - 13	U16
2071	P-13	Application Mode Macro	rw	RUN	1 ≙ 1	-	U16
2072	P-14	Password	rw	RUN	1 ≙ 1	0 - 65535	U16
2073	P-15	DI Config Select	rw	STOP	1 ≙ 1	0 - 17	U16
2074	P-16	AI1 Signal Range	rw	RUN	1 ≙ 1	0 - 6	U16
2075	P-17	Switching Frequency	rw	RUN	1 ≙ 1	0 - f (I_e)	U16
2076	P-18	RO1 Function	rw	RUN	1 ≙ 1	0 - 7	U16
2077	P-19	RO1 upper Limit	rw	RUN	100 ≙ 10.0 %	0 - 2	U16
2078	P-20	f-Fix1	rw	RUN	3000 ≙ 50.0 Hz	f-min - f-max	U16
2079	P-21	f-Fix2	rw	RUN	3000 ≙ 50.0 Hz	f-min - f-max	U16
207 A	P-22	f-Fix3	rw	RUN	3000 ≙ 50.0 Hz	f-min - f-max	U16
207B	P-23	f-Fix4	rw	RUN	3000 ≙ 50.0 Hz	f-min - f-max	U16
207C	P-24	t-QuickDec	rw	RUN	300 ≙ 3.00 s	0.00 s - 600.0 s	U16
207D	P-25	AO1 Function	rw	RUN	1 ≙ 1	0 - 9	U16
207E	P-26	f-SkipBand1	rw	RUN	3000 ≙ 50.0 Hz	0.0 Hz - f-max	U16
207F	P-27	f-Skip1	rw	RUN	3000 ≙ 50.0 Hz	0.0 Hz - f-max	U16
2080	P-28	V-MidV/f	rw	STOP	230 ≙ 230 V	0 V - P-07	U16
2081	P-29	f-MidV/f	rw	STOP	3000 ≙ 50.0 Hz	0 Hz - P-09	U16
2082	P-30	Start Mode	rw	RUN	1 ≙ 1	0 - 6	U16

CANopen Index [hex]	Parameter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
2083	P-31	Digital Reference Reset Mode	rw	RUN	1 ≙ 1	0 - 3	U16
2084 (Low byte)	P-32	t-DCBrake@Stop	rw	RUN	30 ≙ 3.0 s	0.0 s - 25.0 s	U16
2084 (High byte)	P-32	DCBrake	rw	RUN	1 ≙ 1	0-2	U16
2085	P-33	Spin Start Enable	rw	RUN	1 ≙ 1	0 - 1	U16
2086	P-34	Brake Chopper	rw	RUN	1 ≙ 1	0 - 2	U16
2087	P-35	AI1 Gain	rw	RUN	100 ≙ 10.0 %	0 - 20	U16
2088 (Low byte)	P-36	RS485-0 Address	rw	RUN	1 ≙ 1	1 - 63	U16
2088 (Bit 8 - Bit 11)	P-36	RS485-0 Baudrate	rw	RUN	1 ≙ 1	0 - 6	U16
2088 (Bit 12- Bit 15)	P-36	Comm Timeout Modbus RTU	rw	RUN	1 ≙ 1	0 - 8	U16
2089	P-37	Password Level2	rw	RUN	1 ≙ 1	0 - 9999	U16
208 A	P-38	Parameter Lock	rw	RUN	1 ≙ 1	0 - 1	U16
208B	P-39	AI1 Offset	rw	RUN	10 ≙ 1.0 %	-5 - 5	U16
208C (Bit 0 - Bit 13)	P-40	Display Scale	rw	RUN	10000 ≙ 10,000	0 - 6	U16
208C (Bit 14 - Bit 15)	P-40	Display Scale Source	rw	RUN	1 ≙ 1	0 - 6	U16
208D	P-41	PID1 Control Gain	rw	RUN	10 ≙ 1.0	0.1 - 30	U16
208E	P-42	PID1 Control ITime	rw	RUN	300 ≙ 3.00 s	0.0 s - 30.0 s	U16
208F	P-43	PID1 Mode	rw	RUN	1 ≙ 1	0 - 1	U16
2090	P-44	PID1 Set Point 1 Source	rw	RUN	1 ≙ 1	0 - 1	U16
2091	P-45	PID1 Set Point Digital	rw	RUN	1 ≙ 1	0 - 1	U16
2092	P-46	PID 1 Feedback 1 Source	rw	RUN	1 ≙ 1	0 - 3	U16
2093	P-47	AI2 Signal Range	rw	RUN	1 ≙ 1	0 - 6	U16
2094	P-48	t-Standby	rw	RUN	300 ≙ 3.00 s	0.0 s - 25.0 s	U16
2095	P-49	PID1 WakeUpLevel	rw	RUN	1 ≙ 1	0 - 1	U16
2096	P-50	CAN0 Baudrate	rw	RUN	1 ≙ 1	0 - 3	U16
2097	P-51	T-Memory Enable	rw	RUN	1 ≙ 1	0 - 1	U16
2098	P-52	ParameterAccess	rw	RUN	1 ≙ 1	0 - 1	U16
2099	P-53	Action@Communication Loss	rw	RUN	1 ≙ 1	0 - 4	U16
209 A	P-54	RO1 Hysteresis	rw	RUN	1 ≙ 1	0 - 1	U16

CANopen Index [hex]	Parameter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
209B	P-55	RO1 Switch-On Delay	rw	RUN	300 ≙ 3.00 s	0.0 s - 250.0 s	U16
209C	P-56	Reserved Parameter	rw	RUN	300 ≙ 3.00 s	0.0 s - 250.0 s	U16
209D	P-57	Reserved Parameter	rw	RUN	300 ≙ 3.00 s	0.0 s - 250.0 s	U16
209E	P-58	Reserved Parameter	rw	RUN	300 ≙ 3.00 s	0.0 s - 250.0 s	U16
209F	P-59	Reserved Parameter	rw	RUN	300 ≙ 3.00 s	0.0 s - 250.0 s	U16
20A0	P-60	Motor Control Mode	rw	RUN	1 ≙ 1	0 - 4	U16
20A1	P-61	Motor Identification	rw	RUN	300 ≙ 3.00 s	0.0 s - 250.0 s	U16
20A2	P-62	MSC Gain	rw	RUN	10 ≙ 1.0 %	0.0 % - 200.0 %	U16
20A3	P-63	I-CurrentLimit	rw	RUN	10 ≙ 1.0 %	0.1 % - 175 %	U16
20A4	P-64	Motor Stator Resistance R1	rw	RUN	100 ≙ 1.00 Ω	0.00 Ω - 655.35 Ω	U16
20A5	P-65	Motor Stator Inductance d-Axis	rw	RUN	100 ≙ 10.0 mH	0.0 mH - 6553.5 mH	U16
20A6	P-66	Motor Stator Inductance q-Axis	rw	RUN	100 ≙ 10.0 mH	0.0 mH - 6553.5 mH	U16
20A7	P-67	f-DCBrake@Stop	rw	RUN	3000 ≙ 50.0 Hz	0.0 Hz - P-01	U16
20A8	P-68	DC-Brake Current	rw	RUN	10 ≙ 1.0 %	0.0 % - 100.0 %	U16
2013	P00-01	Analog Input1	ro	RUN	10 ≙ 1.0 %	0 - 1000	U16
2014	P00-02	Analog Input2	ro	RUN	10 ≙ 1.0 %	0 - 1000	U16
2012	P00-04	DI1 Status	ro	RUN			U16
2049	P00-05	PID1 Output	ro	RUN	10 ≙ 1.0 %	0 - 1000	U16
2048	P00-07	Motor voltage	ro	RUN	100 ≙ 100 VAC RMS	0 - 500	U16
2011	P00-08	DC Link Voltage	ro	RUN	230 ≙ 230 V	0 - 1000	U16
203E	P00-10	t-Run hours	ro	RUN	100 ≙ 100 h		U16
203F	P00-10	t-Run seconds	ro	RUN	100 ≙ 100 s		U16
27D0	P00-11	t-Run since Trip hours	ro	RUN	100 ≙ 100 h		U16
27D1	P00-11	t-Run since Trip seconds	ro	RUN	100 ≙ 100 s		U16
27D2	P00-12	t-Run since Trip hours	ro	RUN	100 ≙ 100 h		U16
27D3	P00-12	t-Run since Trip seconds	ro	RUN	100 ≙ 100 s		U16
27D4	P00-13	Last Fault1 PDP	ro	RUN			U16
27D4	P00-13	Last Fault2 PDP	ro	RUN			U16
27D5	P00-13	Last Fault3 PDP	ro	RUN			U16
27D5	P00-13	Last Fault4 PDP	ro	RUN			U16
27D6	P00-13	Last Fault1 PDP hours	ro	RUN	100 ≙ 100 h		U16
27D7	P00-13	Last Fault1 PDP seconds	ro	RUN	100 ≙ 100 s		U16
27D8	P00-13	Last Fault2 PDP hours	ro	RUN	100 ≙ 100 h		U16
27D9	P00-13	Last Fault2 PDP seconds	ro	RUN	100 ≙ 100 s		U16
27DA	P00-13	Last Fault3 PDP hours	ro	RUN	100 ≙ 100 h		U16

CANopen Index [hex]	Parameter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
27DB	P00-13	Last Fault3 PDP seconds	ro	RUN	100 ≙ 100 s		U16
27DC	P00-13	Last Fault4 PDP hours	ro	RUN	100 ≙ 100 h		U16
27DD	P00-13	Last Fault4 PDP seconds	ro	RUN	100 ≙ 100 s		U16
2040	P00-14	t-HoursRun Enable hours	ro	RUN	100 ≙ 100 h	0h0m0s - 65535h59m59s	U16
2041		t-HoursRun Enable seconds	ro	RUN	100 ≙ 100 s	0h0m0s - 65535h59m59s	U16
27F4	P00-15	DC-Link0 Log 1	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27F5		DC-Link0 Log 2	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27F6		DC-Link0 Log 3	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27F7		DC-Link0 Log 4	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27F8		DC-Link0 Log 5	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27F9		DC-Link0 Log 6	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27FA		DC-Link0 Log 7	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27FB		DC-Link0 Log 8	ro	RUN	230 ≙ 230 V	0 - 1200	U16
27FC	P00-16	Heatsink0 Log 1	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27FD		Heatsink0 Log 2	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27FE		Heatsink0 Log 3	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27FF		Heatsink0 Log 4	ro	RUN	50 ≙ 50°C	-10 - 150	S16
2800		Heatsink0 Log 5	ro	RUN	50 ≙ 50°C	-10 - 150	S16
2801		Heatsink0 Log 6	ro	RUN	50 ≙ 50°C	-10 - 150	S16
2802		Heatsink0 Log 7	ro	RUN	50 ≙ 50°C	-10 - 150	S16
2803		Heatsink0 Log 8	ro	RUN	50 ≙ 50°C	-10 - 150	S16
2804	P00-17	MotorCurrent0 Log 1	ro	RUN	100 ≙ 10.0 A		U16
2805		MotorCurrent0 Log 2	ro	RUN	100 ≙ 10.0 A		U16
2806		MotorCurrent0 Log 3	ro	RUN	100 ≙ 10.0 A		U16
2807		MotorCurrent0 Log 4	ro	RUN	100 ≙ 10.0 A		U16
2808		MotorCurrent0 Log 5	ro	RUN	100 ≙ 10.0 A		U16
2809		MotorCurrent0 Log 6	ro	RUN	100 ≙ 10.0 A		U16
280A		MotorCurrent0 Log 7	ro	RUN	100 ≙ 10.0 A		U16
280B		MotorCurrent0 Log 8	ro	RUN	100 ≙ 10.0 A		U16
280C	P00-18	DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
280D		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
280E		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
280F		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
2810		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
2811		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
2812		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16
2813		DC-Link V-Ripple0 Log	ro	RUN	1 ≙ 1 V		U16

CANopen Index [hex]	Parameter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
27EC	P00-19	AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27ED		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27EE		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27EF		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27F0		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27F1		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27F2		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
27F3		AmbientTemp0 Log	ro	RUN	50 ≙ 50°C	-10 - 150	S16
2010	P00-20	T-Controlboard	ro	RUN	50 ≙ 50°C	-10 - 100	S16
27DE	P00-23	t-Run IGBT in OT hours	ro	RUN	100 ≙ 100 h		U16
27DF		t-Run IGBT in OT seconds	ro	RUN	100 ≙ 100 s		U16
27E0	P00-24	t-Run PCB in OT hours	ro	RUN	100 ≙ 100 h		U16
27E1		t-Run PCB in OT seconds	ro	RUN	100 ≙ 100 s		U16
2814	P00-25	Motor Speed	ro	RUN			S16
203C	P00-26	kWh Meter	ro	RUN	100 ≙ 10.0 kWh		U16
203D	P00-26	MWh Meter	ro	RUN	100 ≙ 100 MWh		U16
27E2	P00-27	Fan Runtime hours	ro	RUN	100 ≙ 100 h		U16
27E3		Fan Runtime seconds	ro	RUN	100 ≙ 100 s		U16
27E9	P00-28	System version I/O checksum	ro	RUN			U16
27EB		System version DSP checksum	ro	RUN			U16
2817	P00-31	Magnetizing current Iq	ro	RUN			U16
2816		Torque current Id	ro	RUN			U16
2815	P00-32	Switching Frequency	ro	RUN			U16
2818	P00-33	FaultCounter Overcurrent	ro	RUN			U16
2819	P00-34	FaultCounter DC-Overvoltage	ro	RUN			U16
281A	P00-35	FaultCounter DC-Undervoltage	ro	RUN			U16
281B	P00-36	FaultCounter Overtemperature Heatsink	ro	RUN			U16
281C	P00-37	FaultCounter Overcurrent Brake Chopper	ro	RUN			U16
281D	P00-38	FaultCounter Overtemperature Ambient	ro	RUN			U16
27E6	P00-43	t-PowerOn hours	ro	RUN	100 ≙ 100 h		U16
27E7		t-PowerOn seconds	ro	RUN	100 ≙ 100 s		U16
27E4	P00-47	t-FireMode Active hours	ro	RUN	100 ≙ 100 h		U16
27E5		t-FireMode Active seconds	ro	RUN	100 ≙ 100 s		U16

CANopen Index [hex]	Parameter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
201C	P00-48	ScopeChannel1	ro	RUN			S16
201D	P00-48	ScopeChannel2	ro	RUN			S16
201E	P00-49	ScopeChannel3	ro	RUN			S16
201F	P00-49	ScopeChannel4	ro	RUN			S16
27E8	P00-50	I/O processor software version	ro	RUN	300 ≙ 3.00		U16
27EA	P00-50	System Software Version	ro	RUN	300 ≙ 3.00		U16

4.7.4 Parameters on DE11 devices

Table 24: Parameters on DE11 devices

CANOpen Index [hex]	Para meter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
2065	P-01	Max Frequency	rw	RUN	3000 ≙ 50.0 Hz	P-02 - 300 Hz	U16
2066	P-02	Min Frequency	rw	RUN	3000 ≙ 50.0 Hz	0 - P-01	U16
2067	P-03	t-acc	rw	RUN	300 ≙ 3.00 s	0.1 - 300 s	U16
2068	P-04	t-dec	rw	RUN	300 ≙ 3.00 s	0.1 - 300 s	U16
2069	P-05	Stop Mode	rw	RUN	1 ≙ 1	0 - 1	U16
206A	P-06	EnergyOptimizer	rw	RUN	1 ≙ 1	0 - 1	U16
206B	P-07	Motor Nom Volt	rw	RUN STOP	230 ≙ 230 V	50 - 500 V	U16
206C	P-08	Motor Nom Current	rw	RUN	100 ≙ 10.0 A	(10 - 100%) x I_e	U16
206D	P-09	Motor Nom Freq	rw	STOP	50 ≙ 50 Hz	20 - 300 Hz	U16
206E	P-10	Motor Nom Speed	rw	RUN	1 ≙ 1	0/200 - 15000 rpm	U16
206F	P-11	Zero Frequency Volt	rw	RUN	100 ≙ 10.0 %	0.0 - 40.0 %	U16
2070	P-12	Local ProcessData Source	rw	STOP	1 ≙ 1	0 - 13	U16
2071	P-13	Last fault	RO	RUN	–	–	U16
2072	P-14	Password	rw	RUN	1 ≙ 1	0 - 65535	U16
2073	P-15	DI Config Select	rw	STOP	1 ≙ 1	0-9	U16
2074	P-16	AI1 Range	rw	RUN	1 ≙ 1	0- 3	U16
2075	P-17	AI1 Gain	rw	RUN	10 ≙ 1	0.100 - 2,500	U16
2076	P-18	AI1 Signal Invert	rw	RUN	1 ≙ 1	0/1	U16
2077	P-19	DI3 Logic	rw	RUN	1 ≙ 1	0/1	U16
2078	P-20	Preset Speed 1	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
2079	P-21	Preset Speed 2	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
207A	P-22	Preset Speed 3	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
207B	P-23	Preset Speed 4	rw	RUN	3000 ≙ 50.0 Hz	P-02 – P-01	U16
207C	P-24	Digital Reference Reset Mode	rw	RUN	1 ≙ 1	0 - 3	U16
207D	P-25	DCBrake	rw	RUN	1 ≙ 1	0 - 3	U16
207E	P-26	t-DCBrake@Stop	rw	RUN	100 ≙ 10.0 s	0 - 10s	U16
207F	P-27	DCBrakingVoltage	rw	RUN	100 ≙ 10 %	0 - P07	U16
2080	P-28	f-DCBrake@Stop	rw	RUN	3000 ≙ 50 Hz	0 - P-01	U16
2081	P-29	Switching Frequency	rw	RUN	1 ≙ 1	0 - 5	U16
2082	P-30	Start Mode	rw	RUN	1 ≙ 1	0 - 10	U16
2083	P-31	Overvoltage Control	rw	RUN	1 ≙ 1	0 - 1	U16
2084	P-32	Auto Thermal Management	rw	RUN	1 ≙ 1	0 - 1	U16
2085	P-33	T-Memory Enable	rw	RUN	1 ≙ 1	0 - 1	U16

CANOpen Index [hex]	Para meter	Designation	Access		Scale	Value range	Data format
			rw/ ro	RUN/ STOP			
2086	P-34	PDP-Address	rw	RUN	1 ≙ 1	1 - 63	U16
2087	P-35	RS485-0 Baudrate	rw	RUN	1 ≙ 1	0 - 4	U16
2088	P-36	Comm Timeout Modbus RTU	rw	RUN	1 ≙ 1	0 - 8	U16
2089	P-37	Parameter Set	rw	STOP	1 ≙ 1	0 - 1	U16
208A	P-38	Password Level2	rw	RUN	1 ≙ 1	0 - 9999	U16
208B	P-39	Parameter Lock	rw	RUN	1 ≙ 1	0 - 1	U16
208C	P-40	Action@Communication Loss	rw	STOP	1 ≙ 1	0 - 4	U16
208D	P-41	ParameterAccess	rw	RUN	1 ≙ 1	0 - 1	U16
2096	P-50	CAN0 Baudrate	rw	RUN	1 ≙ 1	0 - 3	U16
2097	P-51	RO1 Function	rw	RUN	1 ≙ 1	0 - 9	U16
2098	P-52	RO1 upper Limit	rw	RUN	100 ≙ 10.0 %	0 -2000	U16
2099	P-53	RO1 Switch-On Delay	rw	RUN	10 ≙ 1.0 s	0 - 250	U16
209A	P-54	RO1 Hysteresis	rw	RUN	100 ≙ 10 %	0 - 1000	U16

5 Application example – CANopen fieldbus connection on DA1 variable frequency drives

The application example below illustrates how to commission a DA1 variable frequency drive via CANopen when using an XV100 series EATON controller.

5.1 Setting up the PLC

Before commissioning the DA1 variable frequency drive, PLC needs to be set up correctly. The PLC will establish the connection to the DA1 variable frequency drive and handle all communications as the master.

5.2 Materials required

You will need the following software and hardware:

5.2.1 Software

- XSoft-CoDeSys-2
- Library: DA1_CANopen_V1_xx.lib
- EDS file: Eatn1000100.eds

The CODESYS V2 software is used to configure all the necessary settings.

→ The software can be downloaded at:
Eaton.de/EN/EatonDE/ProdukteundLoesungen/Electrical/Kundensupport/index.htm
→ Customer support→ Download Center – Software

▶ Under **Software**, select the **XSoft-CoDeSys-2 PLC programming software** option.
▶ Now select the **XSOFT-CODESYS** product group and the product version you want.

This application example uses CODESYS library DA1_CANopen_V1_00.lib in order to control and configure a DA1 variable frequency drive.

▶ After installing CODESYS, download the DA1_CANopen_V1_00.lib library and the Eatn1000100.eds device description file from the Eaton website. Then store these files in a folder of your choice (e.g., in the project folder).

→ To download the Eatn1000100.eds device description file, use the following link:
https://es-assets.eaton.com/DRIVES/POWERXL/04_CANopen/2_DA1/1_CONFIG_FILE/
Select the EDS_CONFIG_FILE_DA1_V1.xx.zip file.

Once you have downloaded the ZIP file, unzip it.

5.2.2 Hardware

- PLC: XV100xxx
- Variable frequency drive: PowerXL DA1
- Shielded two-conductor cable (CAN cable)
- Bus termination resistor

5.2.3 Parameter settings on DA1 device

The values for the following parameters need to be changed on the variable frequency drive:

- P1-12: Set to 7 or 8 (CANopen control mode)
- P1-14: Set to 101 (extended parameter access)
- P5-01: Set to 2
- P5-02: CANopen baud rate = 2 (≙ 500 kBit/s)

5.2.4 PLC connection

The following configuration is required in order to connect the PLC correctly:

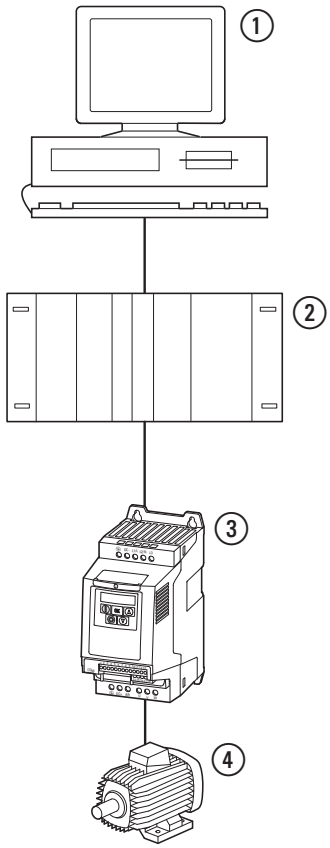


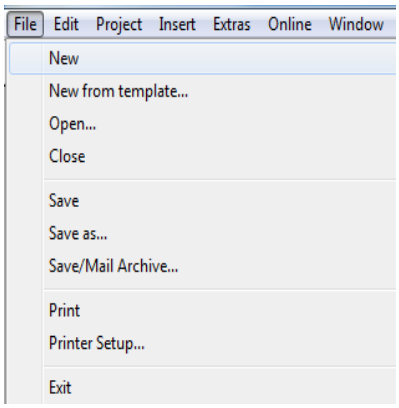
Figure 8: Engineering

⑤ PC (with xSoft CODESYS software)
⑥ PLC (XV100)
⑦ DA1 variable frequency drives
⑧ Motor

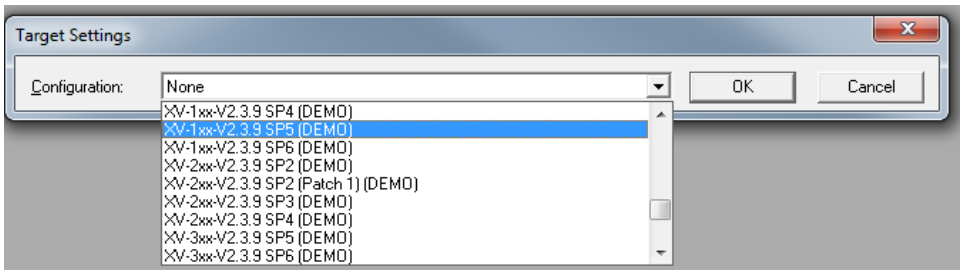
5.2.5 PLC Configuration

Once you have downloaded the CODESYS software, follow the configuration steps below in order to commission the PLC connection.

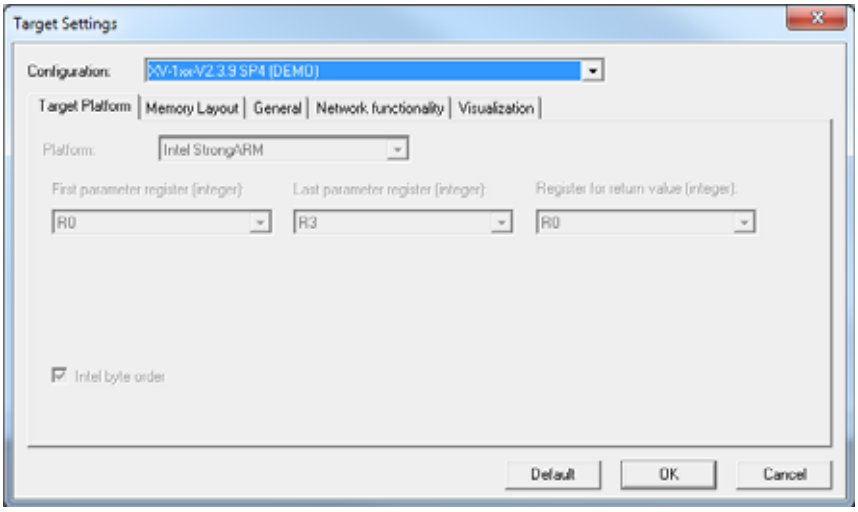
▶ Open CODESYS and select the target system by clicking on **File** ▶ **New**.



▶ The **Target Settings** dialog window will appear. Select the correct PLC model from the **Configuration** drop-down menu (in this case: XV100 – the XV-1xx-… option in this example). Then click on **OK**.

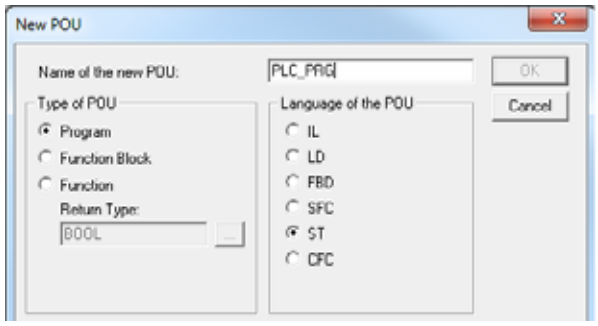


The dialog window will expand to show additional options.



▶ Click on **OK**.

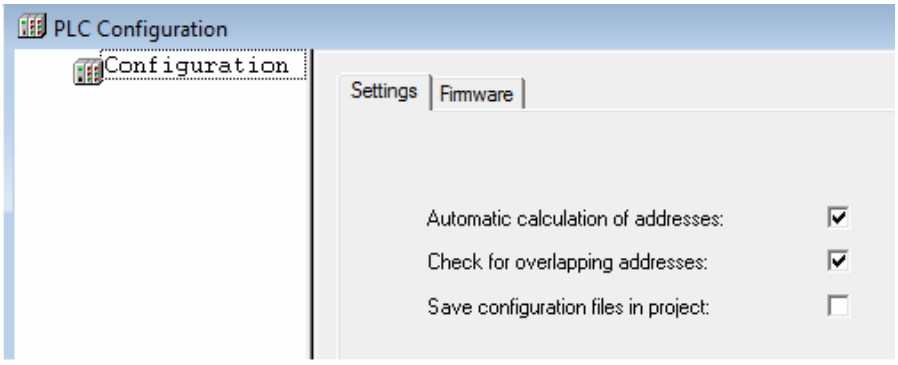
- Now, in the **New POU** dialog window, select the **Program** option under **Type of POU** and then select a language (here: ST) for the block.
- Click on **OK**.



There will be four tabs at the bottom of the left pane (the "Explorer" pane) (**POUs**, **Data types**, **Visualizations**, **Resources**) – you may need to enlarge the pane in order to be able to see the labels.

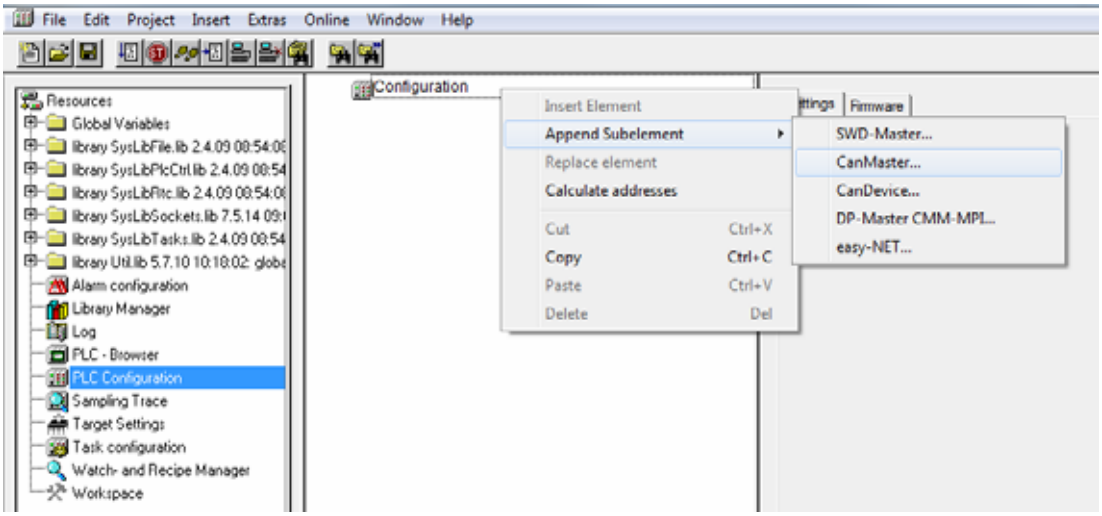
Click on the **Resources** tab.

- In the "Explorer" pane, double-click on **PLC Configuration**. A dialog window with the same name will appear.



- Right-click on the **Configuration** node on the left in order to open the context menu.

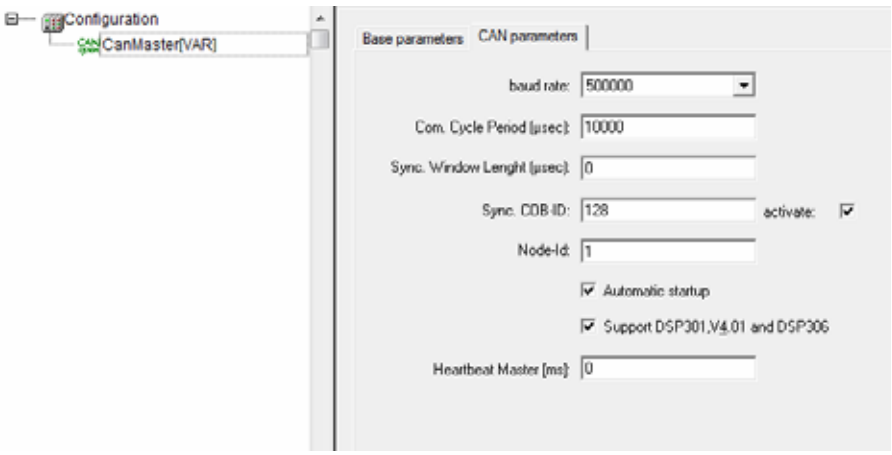
▶ In the context menu, select the **Append Subelement ▶ CanMaster**… option.



A new node called **CanMaster[VAR]** will be added under the **Configuration** node on the left.

In addition, the **Base parameters** and **CAN parameters** tabs will be shown on the right.

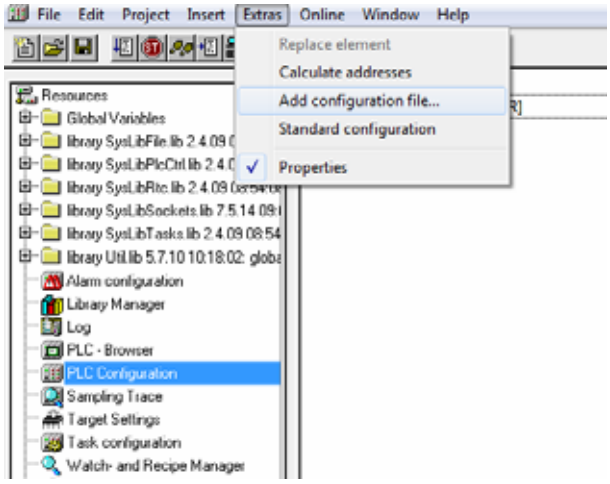
▶ Open the **CAN parameters** tab.
Set the **baud rate** to 50000 (select the option from the drop-down menu).



The CAN master's and CAN nodes' baud rate must match. Accordingly, make sure to check parameter P5-02 on the DA1 device.
Leave the default values for the other default settings alone.
If the baud rate on the CAN master is changed, you will need to disconnect the PLC from the supply voltage and then restart it – otherwise, the CAN master will not start.

Adding the EDS file

▶ Now add the EDS file you downloaded to the configuration: To do so, open the **Extras** menu and click on the **Add configuration file…** option.

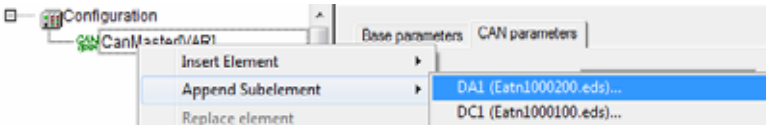


▶ Go to the folder where you stored the EDS file and open the file.

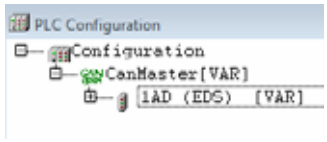
▶ Select a folder where the file should be stored.

Now "append" the DA1 variable frequency drive to the CAN master as a sub-element:

▶ In the **PLC Configuration** dialog window, right-click on the **CanMaster[Var]** node to open the context menu.
Now go to the **Append Subelement** ▶option and select **DA1(Eatn1000100.eds)…** from the list.



A new node called **DA1 (EDS) [VAR]** will be added underneath the **CanMaster[Var]** node.



Adjusting the CAN parameters

Now configure the CAN-specific parameters for the DA1 variable frequency drive:

▶ Click on the **DA1 (EDS) [VAR]** node and open the **CAN parameters** tab.

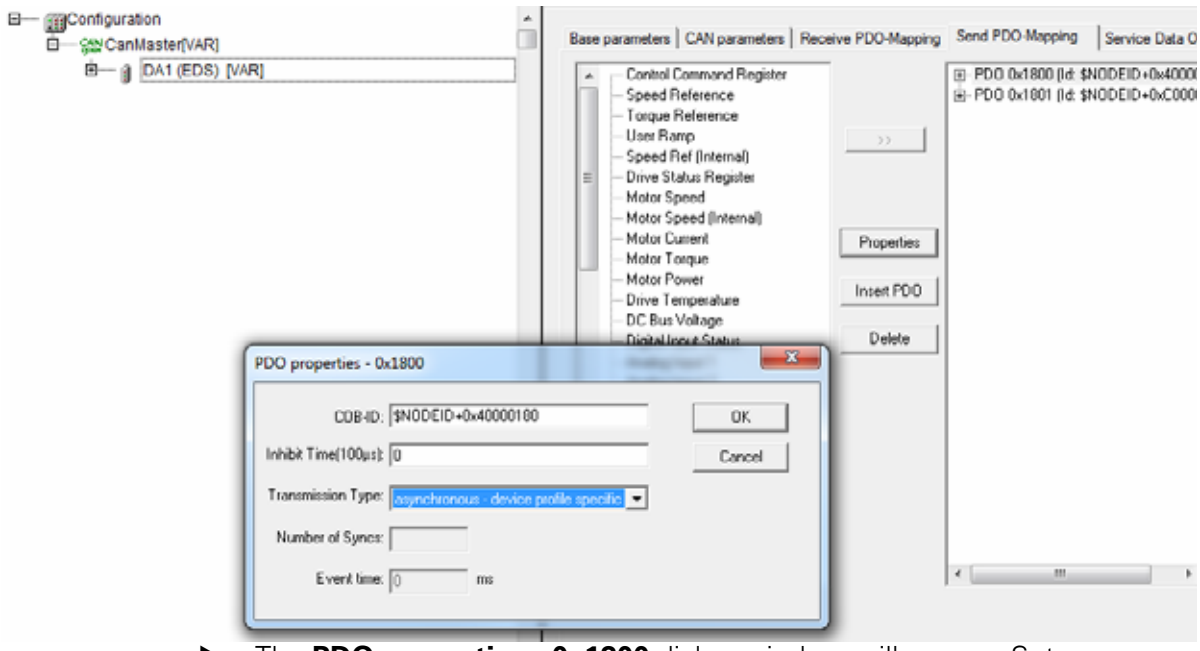
→ The **Node ID** must be identical to the DA1 variable frequency drive address set with parameter P5-01.
Nodeguarding must be enabled in order to be able to detect communication faults.

▶ Enable the **Nodeguarding** checkbox.

▶ Now open the **Send PDO-Mapping** tab.

Modify the properties for the **PDO 0x1800** and **PDO 0x1801** objects as specified below:

▶ Select the **PDO 0x1800** object on the right pane and click on the **Properties** button.

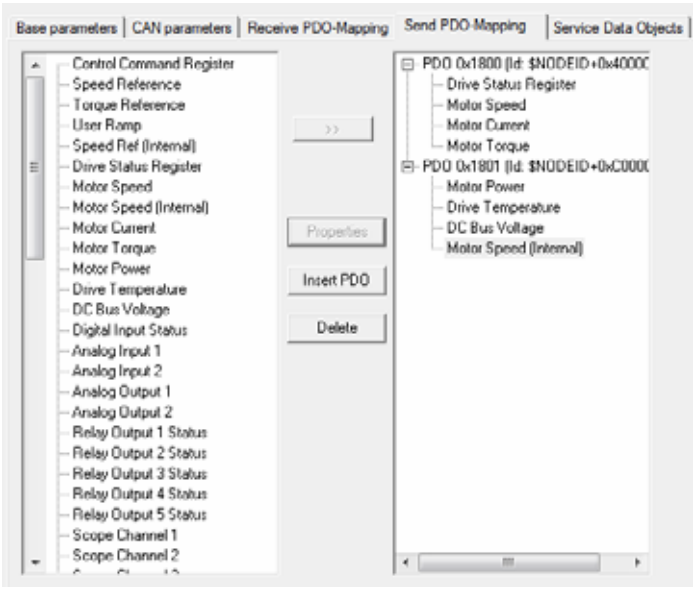


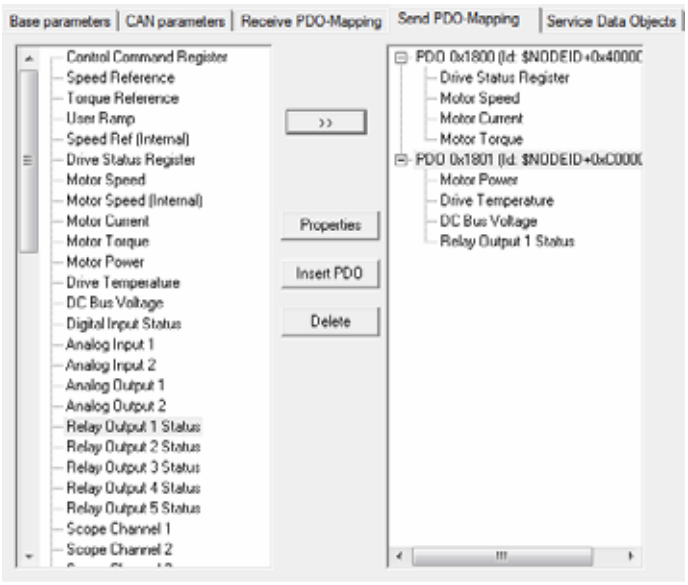
▶ The **PDO properties - 0x1800** dialog window will appear. Set **Transmission Type** to **asynchronous - device profile specific**.

→ If you do not change this setting, the actual values in the **PDO 0x1800** object will only be updated when new data is transmitted to the CAN nodes.

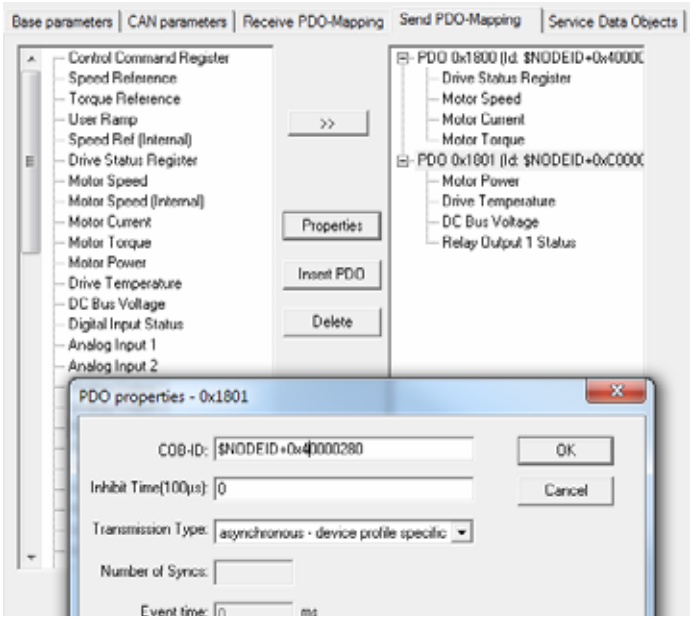
The actual values in the **PDO 0x1801** object are not used in this example.

If you need to modify the PDO mapping, you can select properties in the left pane and add them to the object by clicking on the **>>** button.
To remove objects that are not required from the PDO mapping, click on the **Delete** button.



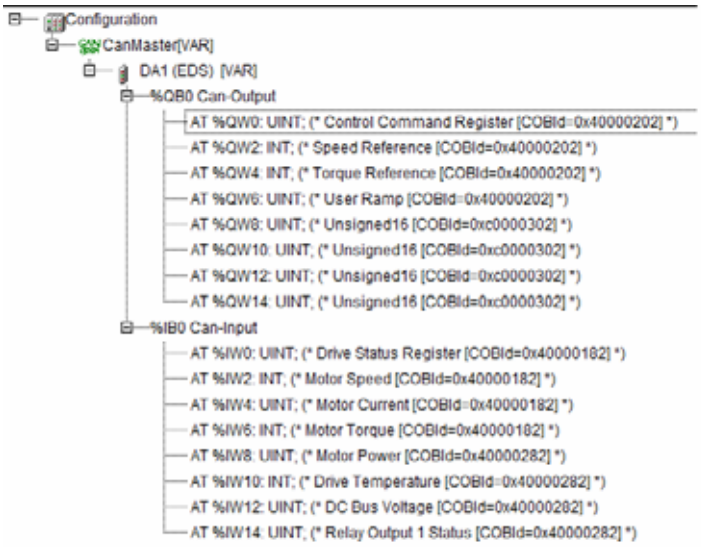


The four input words that follow are disabled in the default configuration. If they need to be polled, the COB-ID needs to be changed from $NODEID+0x**C**0000280 to $NODEID+0x**4**0000280 under **Send PDO-Mapping**.



The following input and output addresses will now be available for controlling the DA1 variable frequency drive via CANopen:

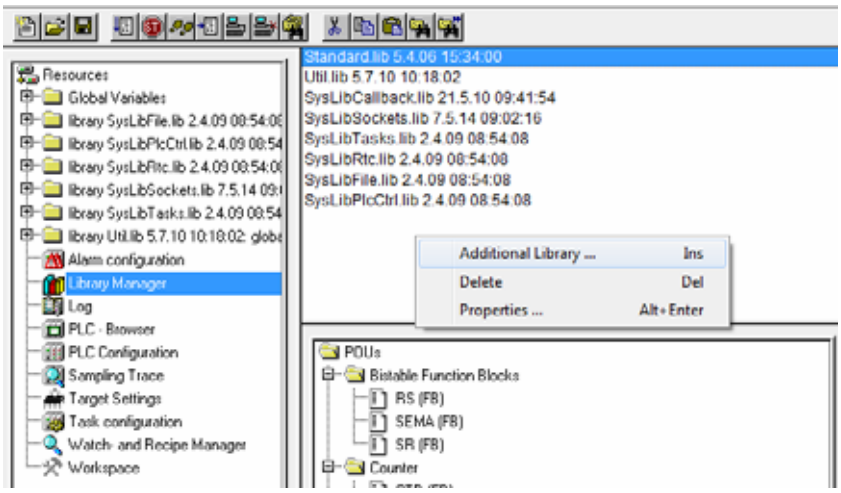
▶ Open the nodes under **DA1 (EDS) [VAR].**



Now add the DA1_CANopen_V1_xx.lib CAN library:

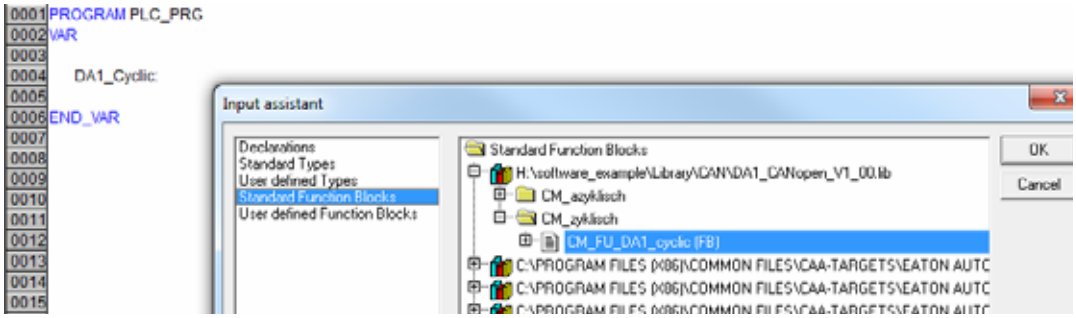
▶ Double-click on **Library Manager**, under **Resources**.

▶ Open the **Insert** menu and click on **Additional Library…**

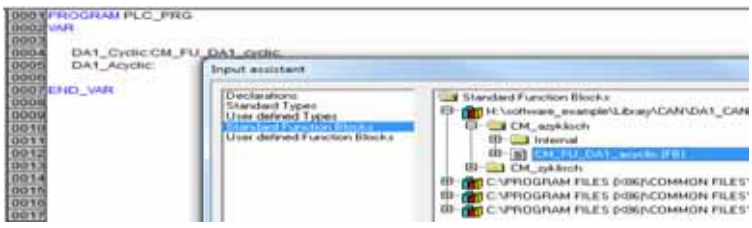


Now declare the function blocks in the PLC_PRG variables:

- ▶ Type DA1_Cyclic: -> Press function key F2.
- ▶ In the dialog window that appears, select **CM_FU_DA1_cyclic (FB)**.



- ▶ Repeat for the acyclical function block.



▶ Now insert the declared function block and assign the DA1 variable frequency drive's address to it.

```
0001 DA1_Cyclic(
0002     Hand_in_L2:=,
0003     Auto_in_L2:=,
0004     Auto_in_L1:=,
0005     x_Hand_On:=,
0006     x_Hand_Start:=,
0007     x_Anticlockwise:=,
0008     r_Hand_Setpoint:=,
0009     x_Error_Quitt_QT:=,
0010     w_Statusword:=%QW0,
0011     w_FrequencyValue:=%QW2,
0012     w_CurrentValue:=%QW4,
0013     Hand_Auto_out_L2=>,
0014     x_Drive_Ready=>,
0015     x_Start_Active=>,
0016     r_actual=>,
0017     x_Anticlockwise_Active=>,
0018     r_Current_actual=>,
0019     str_Fault_Err=>,
0020     w_Controlword=>%QW1,
0021     w_Frequencyword=> %QW2);
0022 DA1_Acyclic(
0023     x_ReadOneParameter_in:=,
0024     x_ReadAllParameter_in:=,
0025     x_WriteOneParameter_in:=,
0026     x_WriteChangedValues_in:=,
0027     b_NodeID_in:=,
0028     w_ParameterValue:=,
0029     ui_Parameterindex_in:=,
0030     b_Parametersubindex_in:=,
0031     str_ErrorMessage_AcyclicFault_out=>,
0032     x_ReadOrWrite_Activ_out=>,
0033     x_ReadOrWrite_Ready_out=>,
0034     x_Fault_out=>,
0035     x_ConnectionOk_out=> );
```

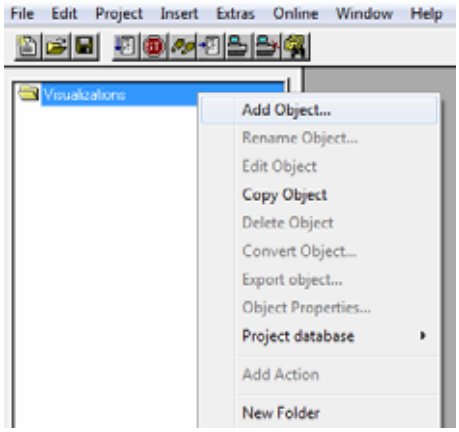
Creating visualizations

You will now be creating the visualizations.

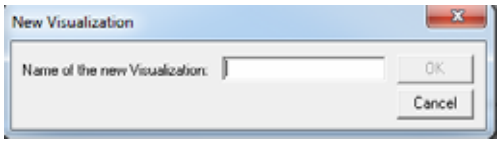
▶ Click on the bottom **Visualizations** tab.

In the object tree, you will see a folder called **Visualizations**.

▶ Right-click on the **Visualizations** folder and select the **Add Object…** option.

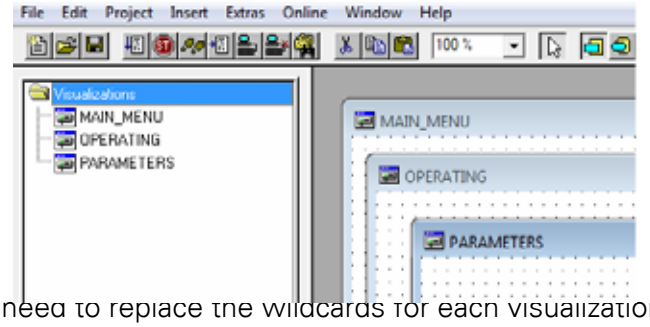


The **New Visualization** dialog window will appear:



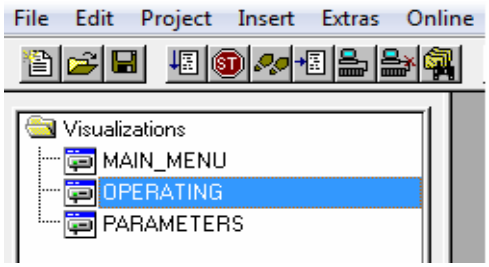
▶ Repeat the process an additional two times, making sure to assign the names below to the visualizations.
Click on **OK** after entering the name for each one.

1. MAIN_MENU
2. OPERATING
3. PARAMETERS

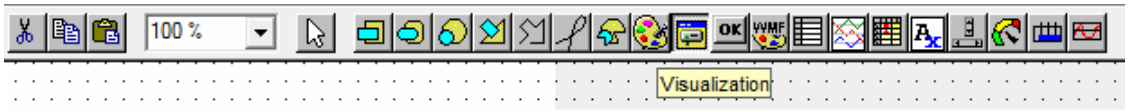


You will now need to replace the wildcards for each visualization:

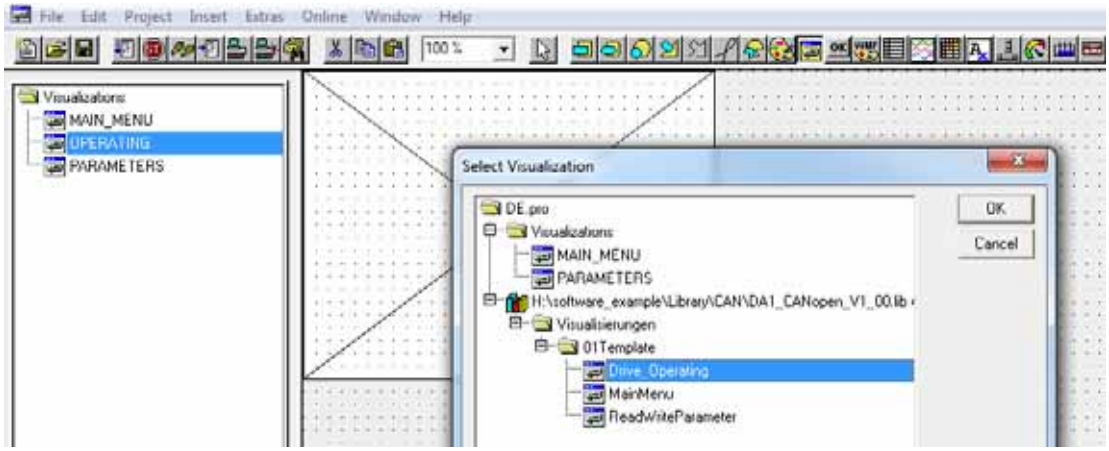
- Start by clicking on the **OPERATING** visualization.



- Now double-click on it. The toolbar at the top should expand so that the **Visualization** icon is shown.

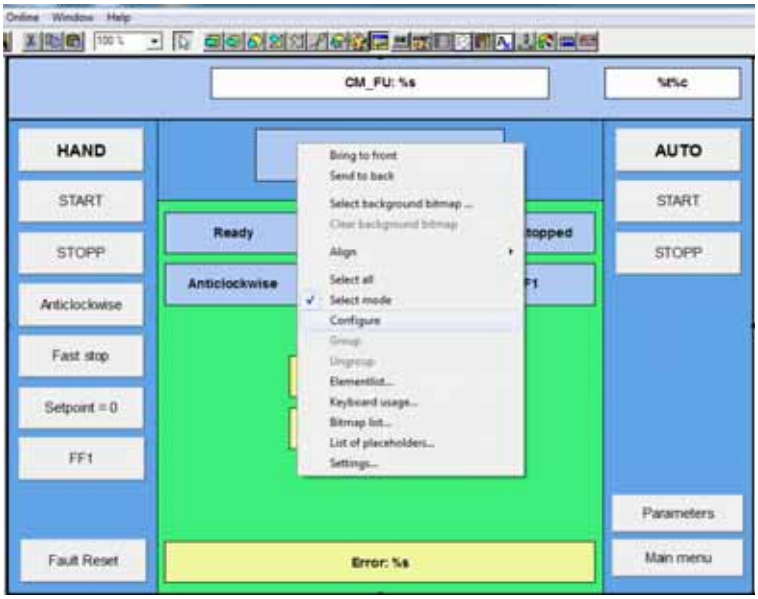


- Click on the **Visualization** icon and move the cursor to the upper left corner of the white canvas area. Hold down the left mouse button and drag it to draw a rectangle with the size you want on the white canvas area.
- A dialog window with a tree will appear. Select **Drive_Operating** under **Template**. The following window opens.

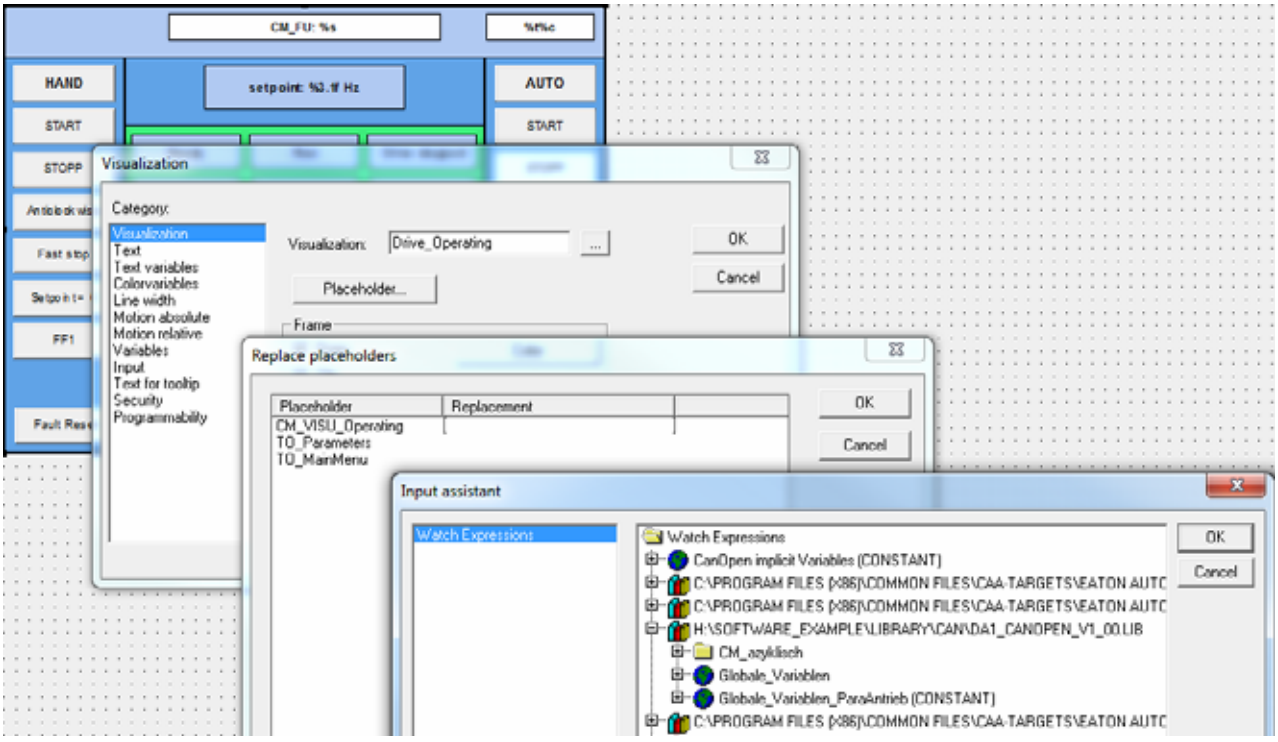


- Confirm your entry with **OK**.

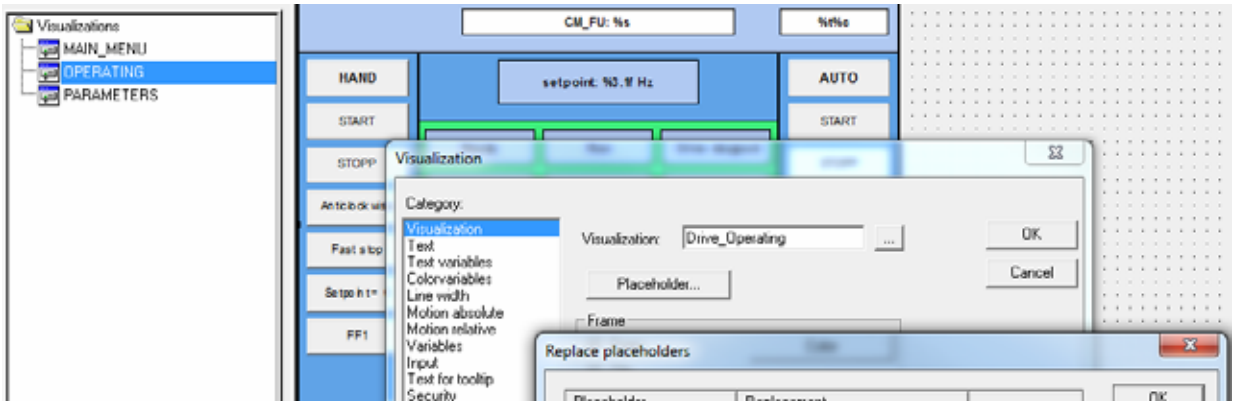
Replace the wildcards for each visualization by double-clicking on the visualization area (or right-clicking on the visualization and then clicking on **-> Configure**).



- Click on the **wildcard...** button. A dialog window called **Replace wildcards** will appear. This dialog window will contain two columns: **Wildcard** and **Replacement**.
- Click under the **Replacement** column to change the focus there and press the **F2** function key. The corresponding field will be unlocked.
- Under **PLC_PRG...**, select **CM_FU_DA1-cyclic**.
- Click on **OK**.

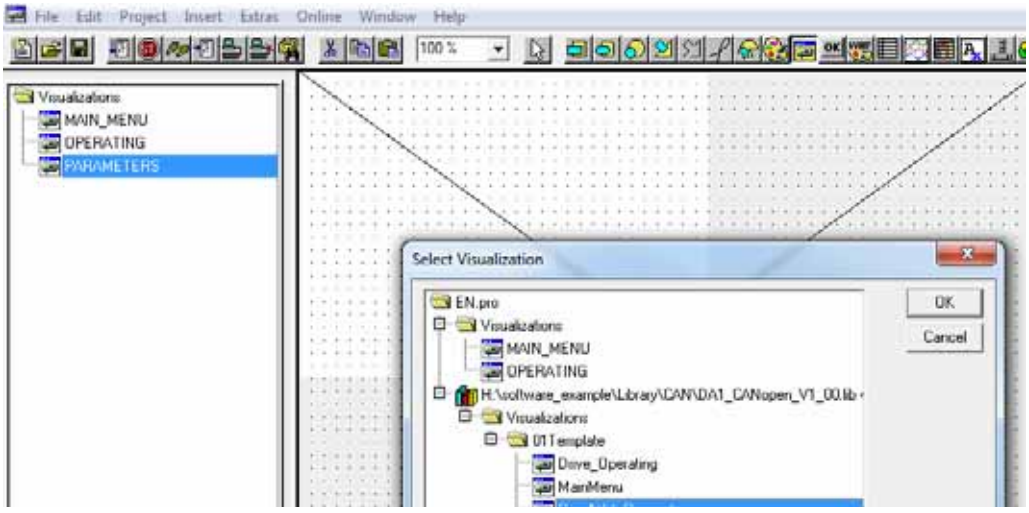


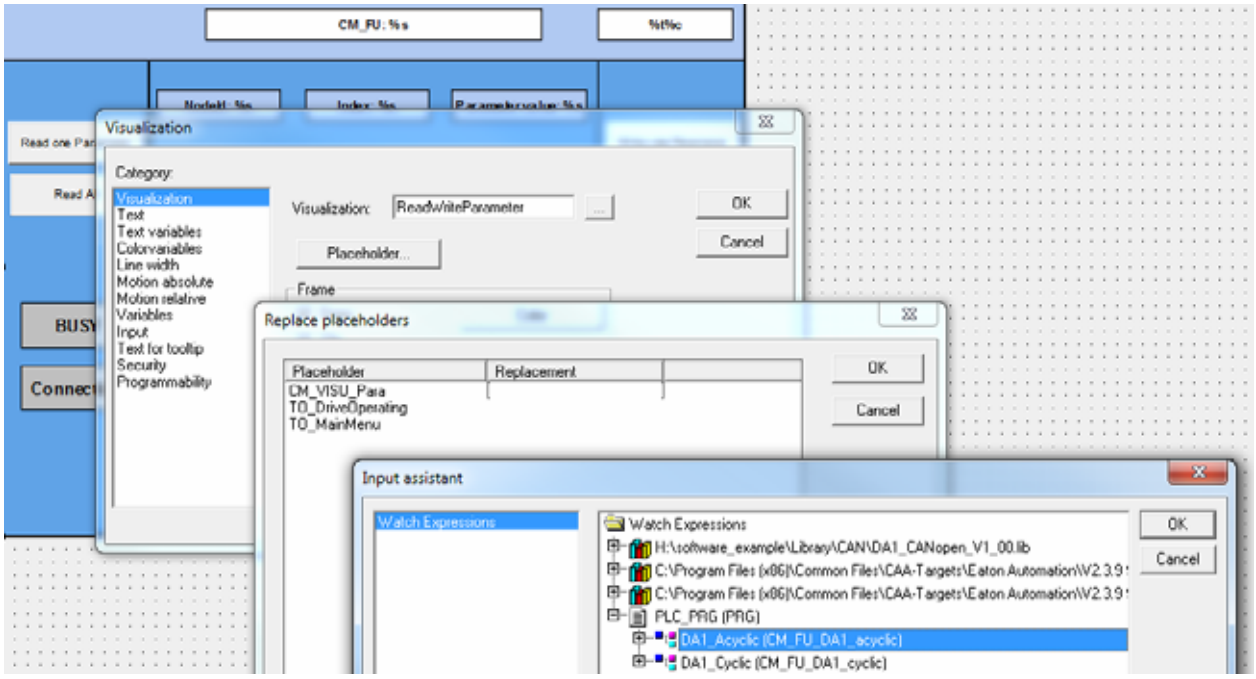
- Now follow the same steps to select the replacements for the other two placeholders.
- Click on **OK** each time.

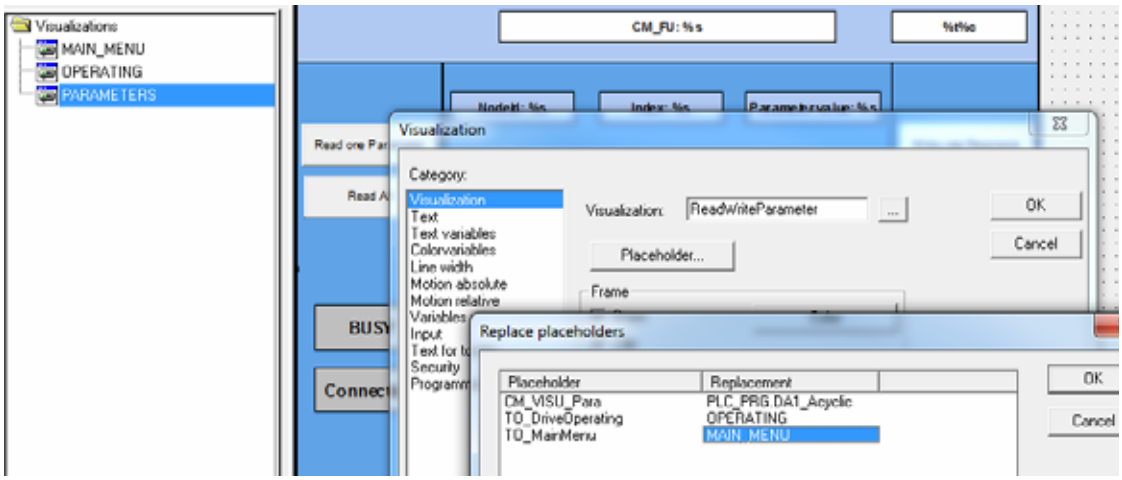


Creating the parameter visualization (replacing the wildcard)

- Under the **Visualizations** node, double-click on PARAMETERS.
- Draw a rectangle with the size you want.
- In the **Select Visualization** dialog window, select **ReadWriteParameter**.
- Confirm with **OK**.
- Double-click on the visualization.
- Select a wildcard.
- Click under **Replacement** and press **F2**; then select the corresponding option.

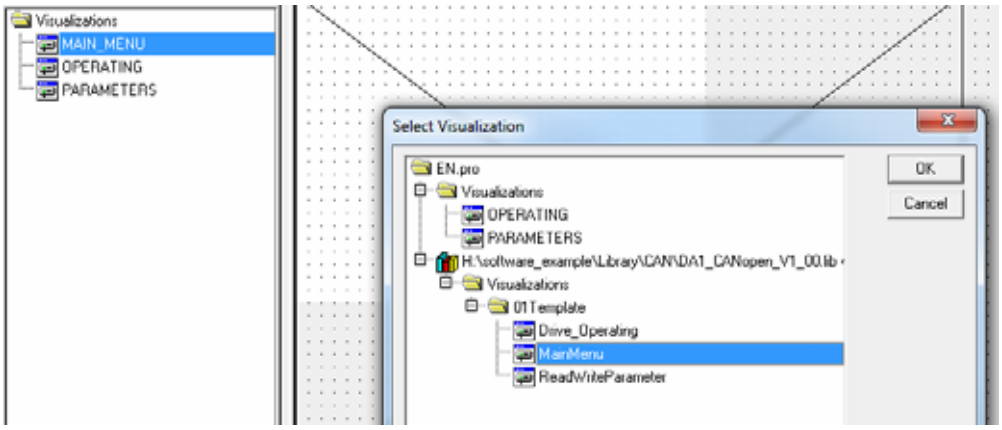


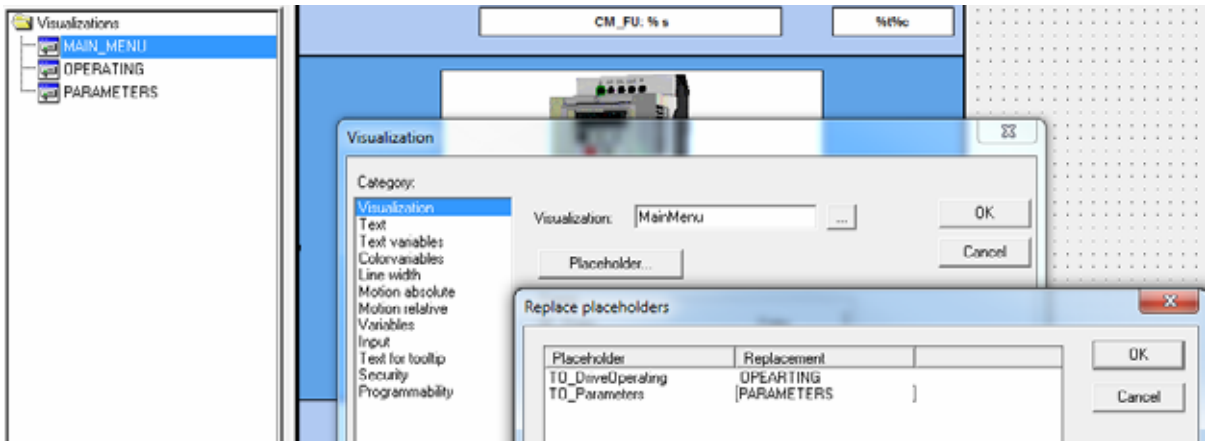

CM_FU: %s
%t%o
Visualization
Category:
Visualization
Text
Text variables
Colorvariables
Line width
Motion absolute
Motion relative
Variables
Input
Text for tooltip
Security
Programmability
Visualization:
ReadWriteParameter
OK
Cancel
Placeholder...
Frame
Replace placeholders
Placeholder
Replacement
CM_VISU_Para
TO_DriveOperating
TO_MainMenu
Input assistant
Watch Expressions
H:\software_example\Library\CAN\DA1_CANopen_V1_00.lib
C:\Program Files (x86)\Common Files\CAA-Targets\Eaton Automation\V2.3.9
PLC_PRG (PRG)
DA1_Acyclic (CM_FU_DA1_acyclic)
DA1_Cyclic (CM_FU_DA1_cyclic)
BUSY
Connect


Visualizations
MAIN_MENU
OPERATING
PARAMETERS
CM_FU: %s
%t%o
Visualization
Category:
Visualization
Text
Text variables
Colorvariables
Line width
Motion absolute
Motion relative
Variables
Input
Security
Visualization:
ReadWriteParameter
OK
Cancel
Placeholder...
Frame
Replace placeholders
Placeholder
Replacement
CM_VISU_Para
TO_DriveOperating
TO_MainMenu
PLC_PRG.DA1_Acyclic
OPERATING
MAIN_MENU
BUSY

Creating the visualization for the start page

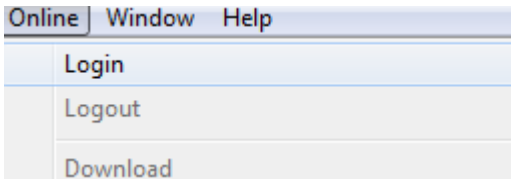
Finally, repeat the steps above for the third visualization (MAIN_MENU).





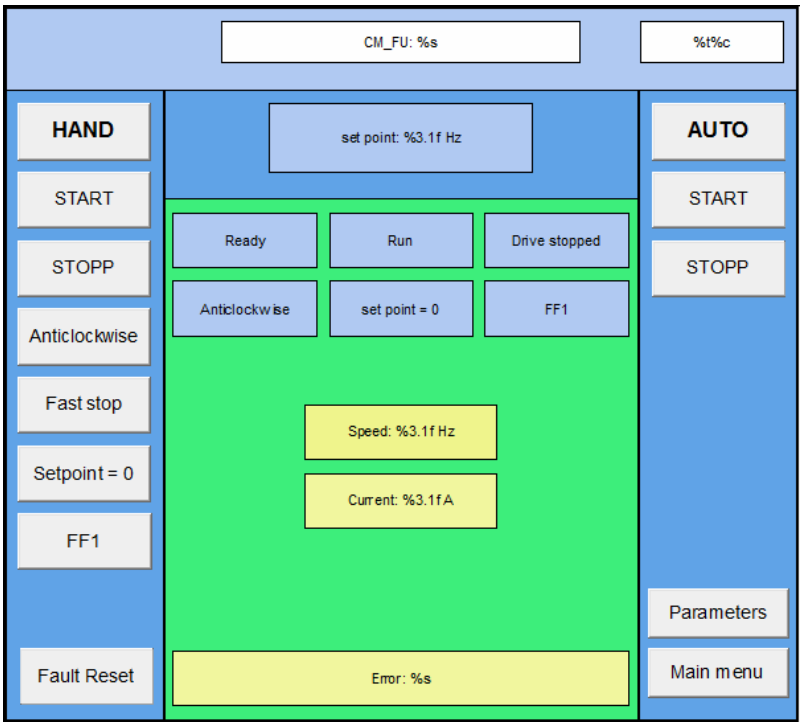
You can now connect the variable frequency drive to the PC.

- ▶ Connect the variable frequency drive and the computer to the network.
- ▶ Switch on the variable frequency drive and PLC.
- ▶ Configure the PLC's communication parameters; load your program onto the PLC.



You can now start the variable frequency drive with HAND and START (see visualization).

Visualization details



Abbreviation	Description
HAND	Manual variable frequency drive start
START	Automatic variable frequency drive start
STOP	Stops the variable frequency drive
Anticlockwise	Reverses the operating direction
Fast stop	Quick Stop
Setpoint = 0	The setpoint value will be set to 0.
FF1	Activates fixed frequency 1.
Fault Reset	Resets the current fault
Set point	Setpoint input
Ready	Variable frequency drive is ready for operations
Run	Variable frequency drive running
Drive stopped	Variable frequency drive stopped
Anticlockwise	The motor will run in reverse
Setpoint = 0	Variable frequency drive is released. The setpoint will be 0.
FF1	Fixed frequency 1 activated
Speed	Actual value
Current	Motor current
Error	Will show the current fault.
AUTOP	Not used as of this writing
START	Not used as of this writing
STOP	Not used as of this writing

Abbreviation	Description
Node Id	Enter the variable frequency drive's node ID
Index	Enter the parameter index
Read one Parameter	Reads one parameter
Real All	Read all parameters
Write one Parameter	Writes to one parameter
Write changed values	Writes changes
Parameter value	Parameter value
BUSY	Write operation in progress
Connection	Connection established
READY	Ready

Alphabetical index