PowerXL™

Fieldbus Connection PROFIBUS DP for Variable Frequency Drives DA1 DX-NET-PROFIBUS

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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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Production: René Wiegand
Translation: globaldocs GmbH

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 the PROFIBUS DP connection DX-NET-PROFIBUS for the variable frequency drives of the DA1 device series.

It is aimed at experienced drive specialists and automation technicians. A thorough knowledge of the PROFIBUS DP field bus and the programming of a PROFIBUS DP master is required. Knowledge of handling the DA1 variable frequency drive is also required.

Please read the manual thoroughly before you install and commission the PROFIBUS DP additional card.

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 Writing conventions

Symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed.

Indicates useful tips.

NOTICE

Warns about the possibility of material damage.

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.

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 figures 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 notes in the IL040003ZU instruction leaflet.

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

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

www.eaton.eu/powerxl

0.3 Abbreviations and Symbols

The following abbreviations are used in this manual:

ADI	Application Data Instance
CW	Control Word
DEC	decimal (number system based on 10)
DP	Decentralized periphery
EMC	Electromagnetic compatibility
FB	Field bus
FS	Frame Size
GND	Ground (0 V potential)
GSD	Electronic data sheet (electronic data sheet)
HEX	hexadecimal (number system based on 16)
Integer	Data type with integer value
LED	Light Emitting Diode (LED)
LSB	Least significant bit
MSB	Most significant bit
PC	Personal Computer
PNU	Parameter number
PD	Process Data
PROFIBUS	Process field bus
PLC	Programmable Logic Controller
SW	Status Word
UL	Underwriters Laboratories

0.4 Units

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 1: Unit conversion examples

designation	US-American value	US-American designation	SI value	Conversion value
Length	1 in ('')	inch	25.4 mm	0.0394
Power	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)	$T_F = T_C \times 9/5 + 32$
Speed	1 rpm	Revolutions per minute	1 min^{-1}	1
Weight	1 lb	pound	0.4536 kg	2.205
Flow rate	1 cfm	cubic feet per minute	1.698 m^3/n	0.5889

1 Device series

1.1 Checking the Delivery

→ Before opening the package, please check the label on it to make sure that you received the correct connection.

The field bus interface card was carefully packed for shipment. The devices should be shipped only in their original packaging with suitable transportation materials. Please observe the labels and instructions on the packaging and for handling the unpacked device.

▶ Open the packaging with adequate tools and inspect the contents immediately after receipt in order to ensure that they are complete and undamaged.

The packaging must contain the following parts:

- A fieldbus connection DX-NET-PROFIBUS,
- the instruction leaflet IL040003ZU.

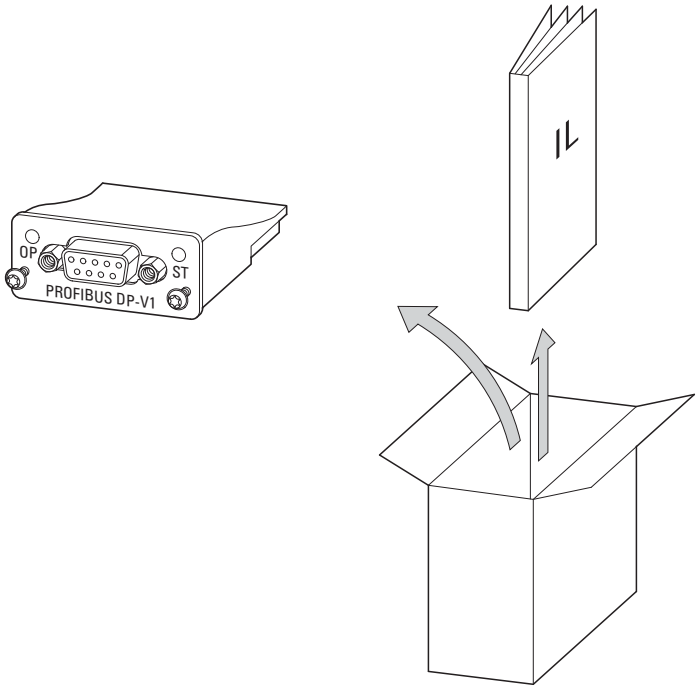

Figure 1: Equipment supplied with fieldbus connection DX-NET-PROFIBUS

1.1.1 Key to part numbers

The catalog number selection and the part no. of the DX-NET-… fieldbus connection have the following structure:

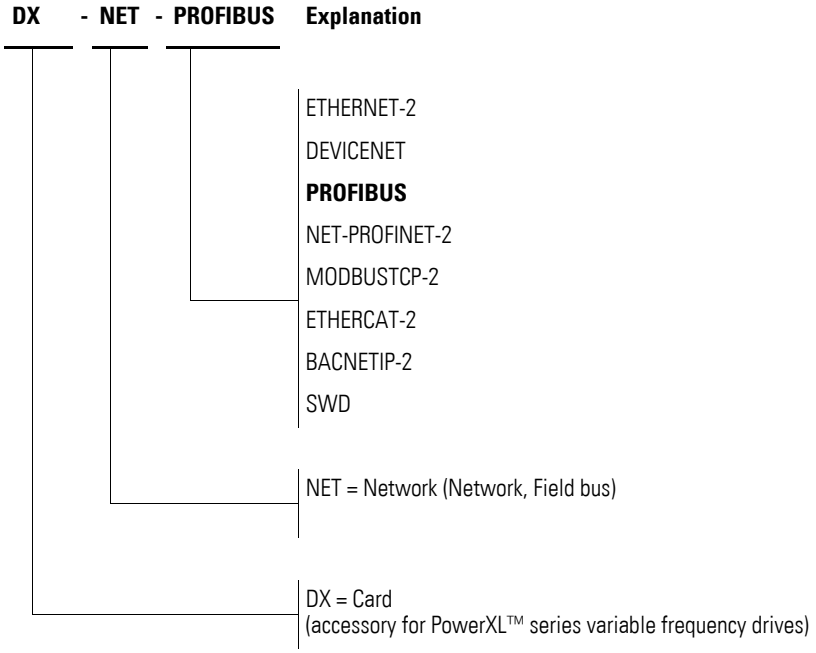

Figure 2: Catalog number selection of fieldbus interface card DX-NET-…

1.1.2 General rated operational data

Technical Data	Symbol	Unit	Value
General			
Standards			meets the requirements of the EN 50178 (standard for electrical safety)
PROFIBUS DP profile			PROFIdrive Version 4.1
Production quality			RoHS, ISO 9001
Environmental Conditions			
Operating Temperature	ϑ	°C	-40 (no hoarfrost) up to +70
Storage temperature	ϑ	°C	-40 - +85
Climatic proofing	p_w	%	< 95, relative humidity, no condensation permitted
Altitude	H	m	max. 1000
Vibration	g	m/s^2	5 – according to IEC 68-2-6; 10 - 500 Hz; 0.35 mm
PROFIBUS DP connections			
Interface			9 pole SUB-D plug
Data transfer			RS485, half duplex
Transfer cable			twisted pair (1 pair and shield)
Electrical Isolation	U	V DC	500
Communication protocol			
PROFIBUS-DP			EN 50170
Baud rate		Kbit/s	9.6 - 12000
Address			2 - 63

1.2 Designation at DX-NET-PROFIBUS

The drawing below shows the DX-NET-PROFIBUS fieldbus connection for PROFIBUS DP with a 9-pin SUB-D connector.

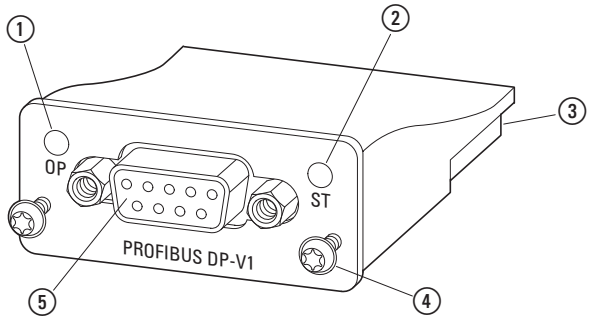

Figure 3: Designation at DX-NET-PROFIBUS

① Operating mode LED
② Status-LED
③ Adapter extension (50 pole)
④ Screws for securing DA1 variable frequency drive
⑤ SUB-D socket (9 pole)

1.3 Proper use

The DX-NET-PROFIBUS fieldbus connection is an electrical apparatus used to control DA1 variable frequency drives and connect them to PROFIBUS DP field bus systems. It is intended for installation in a machine or for assembly, together with other components, into a machine or system. It enables DA1 series variable frequency drives to be integrated as slaves into PROFIBUS DP standard field bus systems.

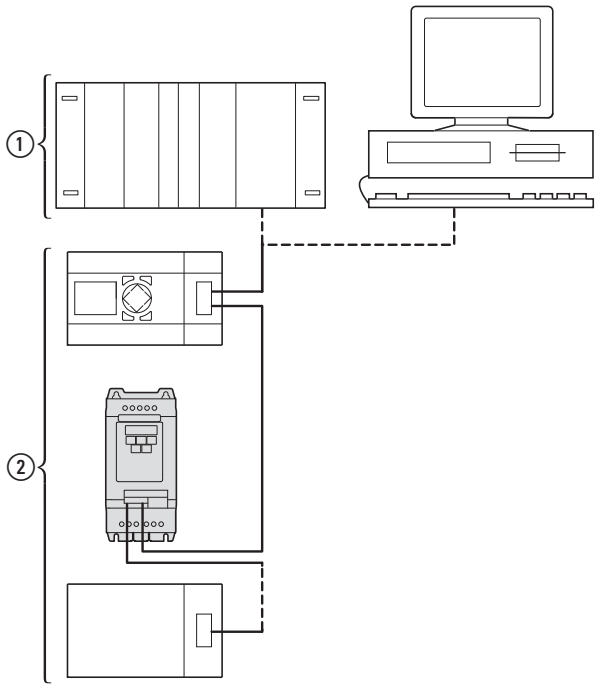

Figure 4: Integrating the DX-NET-PROFIBUS fieldbus connection into a PROFIBUS DP network

① Master area (PLC or PC)
② Station area (variable frequency drive DA1 with DX-NET-PROFIBUS connection)

→ The DX-NET-PROFIBUS fieldbus connection is not meant for household use and is exclusively intended as a component for commercial use.

→ Observe the technical data and connection requirements described in this manual.
Any other usage constitutes improper use.

1.4 Maintenance and inspection

If the general rated operational data (→ Page 9) and the PROFIBUS DP-specific technical specifications are adhered to, the DX-NET-PROFIBUS connection will not require any maintenance. However, please note that external factors may affect the connection's operation and lifespan.

We therefore recommend that the devices are checked regularly and the following maintenance measures are carried out at the specified intervals.

Table 2: Recommended maintenance

Maintenance measures	Maintenance interval
Clean cooling vents (cooling slits)	Please enquire
Check the filter in the control panel doors (see the manufacturer's specifications)	6 - 24 months (depending on the environment)
Check the tightening torques of the control signal terminals	regularly
Check connection terminals and all metallic surfaces for corrosion	6 - 24 months (depending on the environment)

The DX-NET-PROFIBUS fieldbus connection is not intended to be replaced or repaired. If the card is damaged by external influences, repair is not possible.

1.5 Storage

If the fieldbus connection is stored before use, suitable ambient conditions must be ensured at the site of storage:

- Storage temperature: -40 - +85 °C,
- Relative average air humidity: < 95 %, no condensation permitted.

1.6 Service and warranty

Contact your local sales partner if you have a problem with your Eaton fieldbus connection.

When you call, have following data ready:

- the exact part no. (= DX-NET-PROFIBUS),
- the date of purchase,
- a detailed description of the problem which has occurred with the DX-NET-PROFIBUS fieldbus connection.

Information concerning the guarantee can be found in the Terms and Conditions Eaton Industries GmbH.

24-hour hotline: +49 (0)1805 223 822

Email: AfterSalesEGBonn@Eaton.com

1.7 Disposal

The DX-NET-PROFIBUS fieldbus connection can be disposed of as electrical waste in accordance with the currently applicable national regulations. Dispose of the device according to the applicable environmental laws and provisions for the disposal of electrical or electronic devices.

2 Engineering

2.1 PROFIBUS-DP

PROFIBUS DP is designed as an open standardized field bus (EN 50170) for a wide scope of applications. It can be used to connect devices of different manufacturers and implement communication between them.

In the PROFIBUS DP version the PROFIBUS field bus system is specially designed for very fast time-critical communication between automation systems and field devices. It can replace the conventional parallel wiring with 24 V as well as the 0/4 - 20 mA and 0 - 10-V signal level.

PROFIBUS DP specifies the general technical and functional characteristics of a serial fieldbus system with which decentralized digital controllers can be interconnected and linked from the field level to the process control level. Within this fieldbus system, devices are automatically identified as master or station devices, and multi-master operation is also possible.

The master devices determine the communication on the bus. A master can always send a telegram without an external request as long as it has bus access rights (token) at this time. The master devices are also called active stations in the PROFIBUS protocol.

Station devices are peripheral devices such as input/output devices, valves, variable frequency drives etc. They also have no bus access rights of their own and can only confirm a received message or send a message to the master if this is requested. Slaves are also called "passive stations".

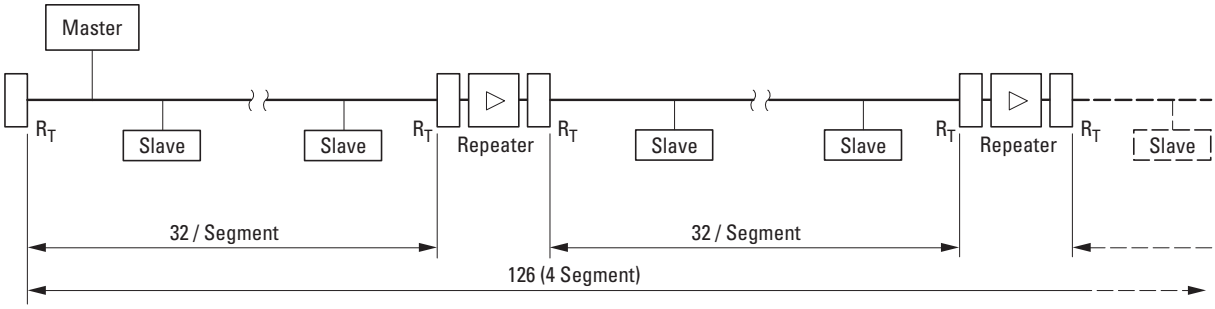

Figure 5: PROFIBUS DP line with up to 126 modules in four segments (max. 32 modules per segment).

Master = active station (head-end controller)
Station = passive station (variable frequency drive, valve, I/O device)
Repeater = amplifier
R_T = Bus termination resistor

Up to 32 modules can be connected to a field bus line (segment). A repeater can be used to connect additional segments. The maximum expansion of a PROFIBUS line is 126 modules in up to 4 segments. The use of more than three repeaters is not recommended.

The individual segments must be terminated using a bus termination resistor (R_T) at the first and last module of each segment. This bus termination resistor can be switched on in the PROFIBUS plug.

The transfer speed depends on the maximum cable length and the cable type.

Table 3: Transfer speeds for different cable lengths, without repeater

Transmission speed (baud rate) [kBit/s]	**9.6**	**19.2**	**93.75**	**187.5**	**500**	**1500**	**3000 - 12000**
Cable length for cable type A [m]	1200	1200	1200	1000	400	200	100
Cable length for cable type B [m]	1200	1200	1200	600	200	–	–

Table 4: Recommended values for cable types

Technical Data	**Type A**	**Type B**
Impedance	135 - 165 Ω	100 - 130 Ω
Frequency range	3 - 20 MHz	> 100 kHz
Capacity	< 30 pF/m	< 60 pF/m
Resistor	< 110 Ω/m	< 52 Ω/m
Clearance of the wires	> 0.64 mm	> 0.53 mm
Cross-section of the wires	> 0.34 mm^2	> 0.22 mm^2

2.2 LED indicators

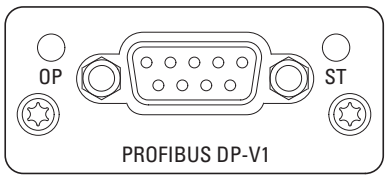

Figure 6: LED indicators OP and ST

2.2.1 ST (Status)

The status LED (ST) displays the module status.

LED status	Description
off	Card not activated
Illuminated green	Card initialized
Green flashing	Self-test (card initialized)
illuminated red	Fault

2.2.2 OP (Operation Mode)

The Power On LED (OP) displays the operating state of the module.

LED status	Description
off	Card not activated
Green illuminating	Module is online. Data exchange is taking place.
Green flashing	Network is OK. No data exchange taking place.
Red flashing	Parameter fault
red double flashing	Network error

3 Installation

3.1 Introduction

This chapter provides a description of the mounting and the electrical connection for the fieldbus connection DX-NET-PROFIBUS.

→ While installing and/or mounting the fieldbus connection, cover all ventilation slots in order to ensure that no foreign bodies can enter the device.

→ Perform all installation work with the specified tools and without the use of excessive force.

When working with DA1 series variable frequency drives, the installation method used for the DX-NET-PROFIBUS fieldbus connection will depend on the variable frequency drive's actual size.

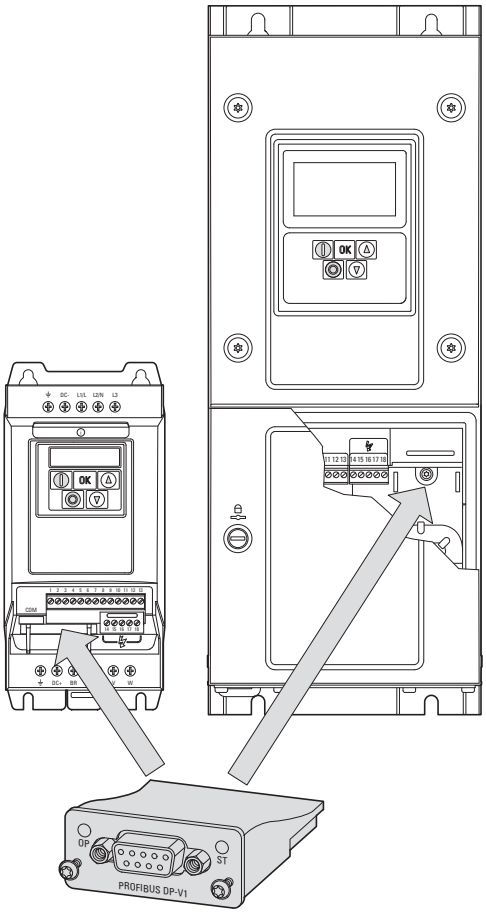

Figure 7: Flush mounting of fieldbus connection

When working with DA1 variable frequency drives of size FS2 or FS3, the card is simply plugged into the variable frequency drive from below. For sizes FS4 or larger, the card is mounted on the right-hand side underneath the variable frequency drive's front enclosure cover.

3.1.1 Notes on the documentation

Documentation for the installation:

- IL4020010Z instructional leaflet for DA1 variable frequency drive (in frame size FS2 and FS3)
- IL4020011Z instructional leaflet for DA1 variable frequency drive (from frame size FS4)

These documents are also available as PDF files on Eaton's website. They can be quickly found at

www.eaton.com/moeller → Support

by entering the document number as the search term.

3.1.2 Notes on the mechanical surface mounting

DANGER

Make sure to de-energize the system before performing the handling and installation work required to mechanically assemble and install the fieldbus connection!

In order to be able to install the DX-NET-PROFIBUS fieldbus connection, you will need to open the DA1 variable frequency drive's enclosure. We recommend performing these installation activities before proceeding to carry out the variable frequency drives's electrical installation.

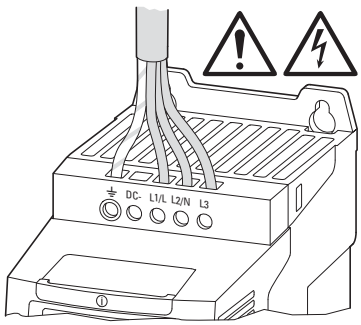

Figure 8: Perform mounting measures only in a de-energized state

3.2 Mounting for frame sizes FS2 and FS3

When working with DA1 variable frequency drives of size FS2 or FS3, the DX-NET-PROFIBUS fieldbus connection must be installed on the bottom side of the variable frequency drive. To do this, use a flat-tip screwdriver to lift the cover at the marked cutout so that the cover can be removed by hand (do not force the cover open!).

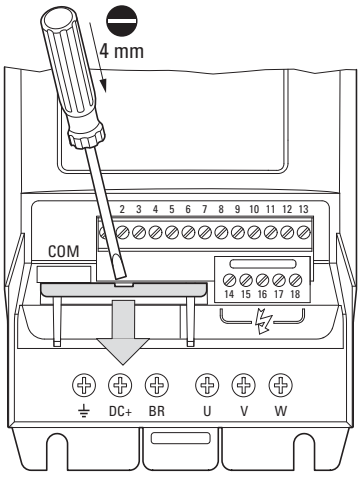

Figure 9: Opening the interface cover

NOTICE

Do not insert tools or other objects into the opened variable frequency drive. Ensure that foreign bodies do not enter the opened housing wall.

Then insert the connection and fasten it with the screws.

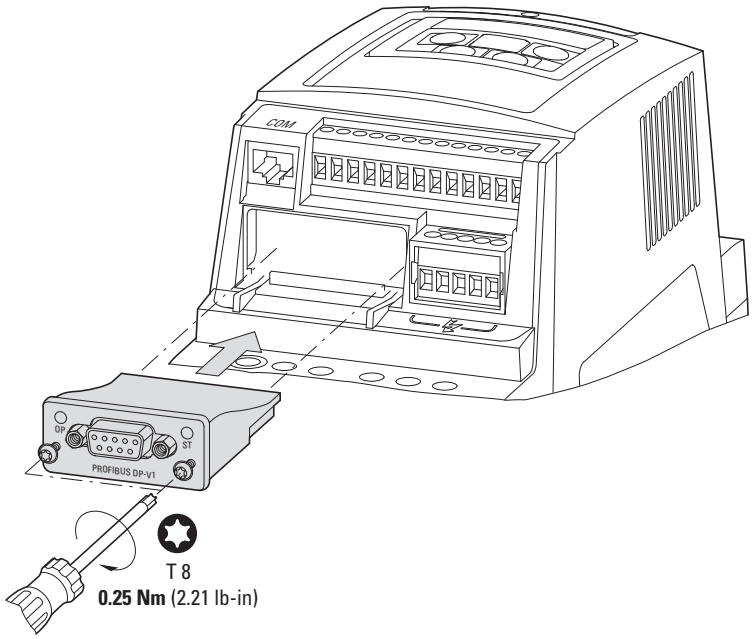

Figure 10: Inserting the fieldbus connection

3.3 Mounting from construction size FS4

When working with DA1 variable frequency drives of size FS4 or larger, the DX-NET-PROFIBUS fieldbus connection must be installed inside the variable frequency drive. To do so, use a standard screwdriver to turn the two screws on the front cover 90°. Then proceed to remove the cover.

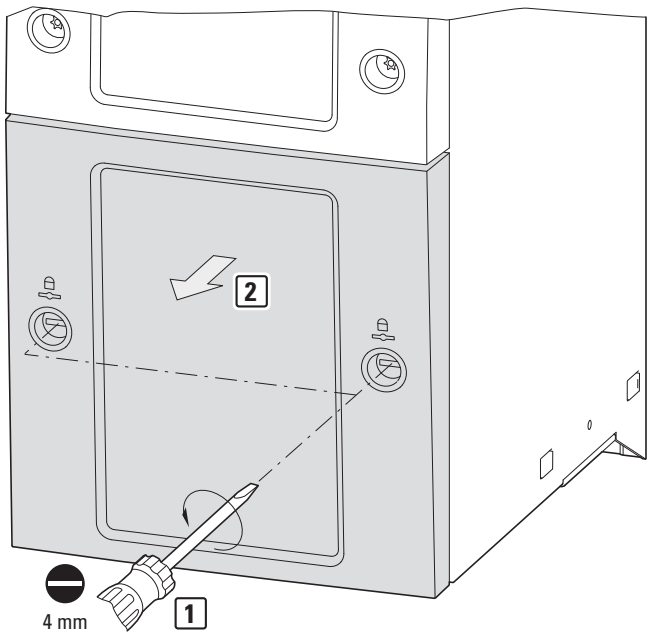

Figure 11: Opening the enclosure on a DA1 variable frequency drive of size FS4 or larger

NOTICE

Do not insert tools or other objects into the opened variable frequency drive.
Ensure that foreign bodies do not enter the opened housing wall.

Now insert the connection on the right-hand side and fasten it with the screws.

Finally, put the cover back in place and fasten it with the two screws (turn them 90°).

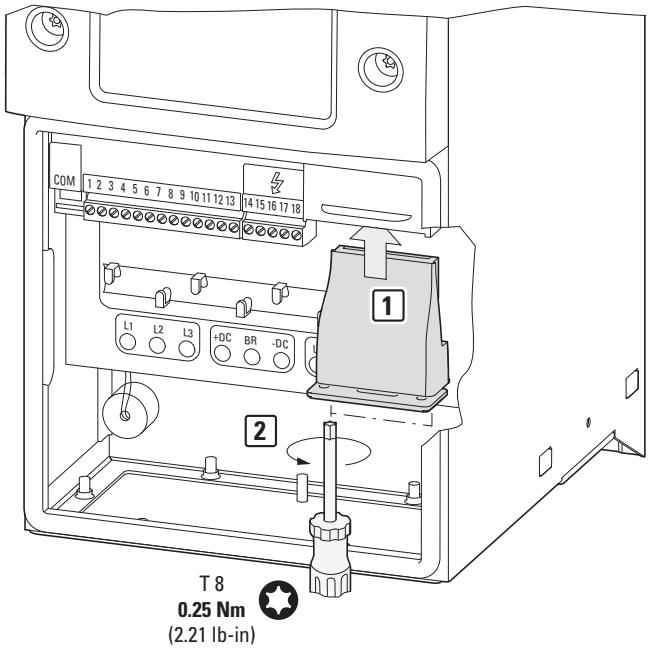

Figure 12: Inserting the fieldbus connection

3.4 Installing the fieldbus connection

A 9-pin SUB-D connector is used to establish a connection to the PROFIBUS DP field bus.

Connection cables for PROFIBUS DP with SUB-D socket connectors are generally available as standard preassembled cables. They can also be prepared individually. For this the following connections are required (pin assignment).

DX-NET-PROFIBUS

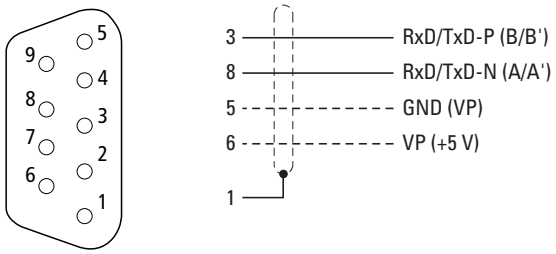

Figure 13: Pin assignment of the SUB-D socket connector

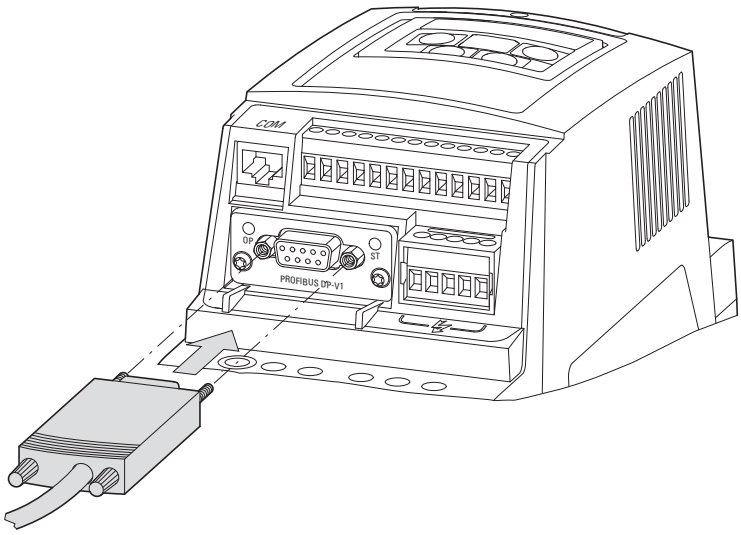

Figure 14: Connection of SUB-D socket

3.5 Install field bus

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

During the installation ensure that the control and signal cables (0 - 10 V, 4 - 20 mA, 24 V DC etc.) and the connection cables of a field bus system (PROFIBUS DP CANopen etc.) are not laid directly parallel to the energy carrying mains connection or motor connection cables.

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

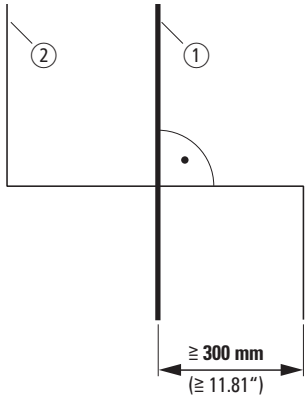

Figure 15: Cable routing for PROFIBUS DP ② and mains or motor cables ①.

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.

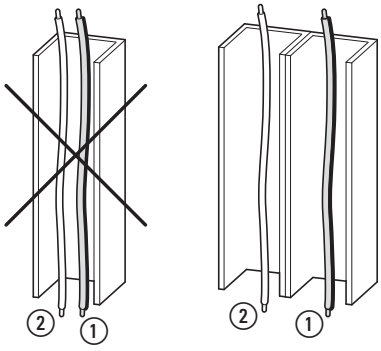

Figure 16: Separate routing in the cable duct

① Mains and motor connection cable
② PROFIBUS cable

→ In all cases only use approved PROFIBUS DP cables.

4 Commissioning

4.1 Variable frequency drives DA1

→ First of all complete all measures for commissioning the DA1 variable frequency drive as described in the respective manual MN04020005Z-EN.

→ Check the settings and installations for the connection to the PROFIBUS DP fieldbus system which are described in this manual.

NOTICE

Make sure that there is no danger in starting the motor. Disconnect the driven machine if there is a danger in an incorrect operating state.

→ The following parameter settings listed below are required for operation with PROFIBUS DP.

The abbreviations used in the parameter lists have the following meaning:

PNU	Parameter number
ID	Identification number of the parameter
RUN	Access rights to the parameters during operation (RUN): / = Modification permissible - = Modification only possible in STOP
ro/rw	Parameter read and write permissions via a fieldbus connection (BUS): ro = read only rw = read and write (read and write)
Value	Setting of the parameter
DS	Default settings: WE (P1.1 = 1) Basis parameters

→ Access rights are not shown in the drivesConnect PC software.

Manual

PNU	ID	Access right		Value	Description		DS
		RUN	ro/rw				
①				②	③		④

PC Software

PNU	Description	Value	Range	Default	Visible
①	③	②		④	

Figure 17: Layout in the manual and in the software

PNU	ID	Access right		Designation	Value range	DS	Value that must be configured
		RUN	ro/rw				
P1-12	112	–	rw	Control level	0 = Control terminals (I/O) 1 = Keypad (KEYPAD FWD) 2 = Keypad (KEYPAD FWD / REV) 3 = PID control 4 = Field bus system (Modbus RTU, PROFIBUS etc.) 5 = Slave mode 6 = Field bus (CANopen)	0	4
P1-14	114	✓	rw	Parameter range access code	0 = Parameter group 1 101 = Parameter groups P0 - P5 201 = Parameter group P0 - P9 (expert mode)	0	101
P5-01	501	✓	rw	Variable frequency drive slave address	0 -63	1	2 - 63

The baud rate will be adjusted automatically in line with the master.

4.2 Operation

Select four input words and four output words when configuring the module. Start with the output words.

During operation, a distinction is drawn between cyclic and acyclic data.

4.2.1 Cyclic data

Process data field

Master → Slave	CW	REF	PDI 3	PDI 4
Slave → Master	SW	ACT	PDO 3	PDO 4

Each data unit has a length of 1 word.

Description of data content

Byte	Meaning	Explanation
CW	Control word	Control Word
SW	Status word	Status Word
REF	Reference Value	Setpoint value
ACT	Actual Value	Actual value
PDO	Process Data Out	Process data output
PDI	Process Data In	Process data input

Controlword

PNU	Description	
	Value = 0	Value = 1
0	Stop	Operation
1	Clockwise rotating field (FWD)	Anticlockwise rotating field (REV)
2	No action	Fault Reset
3	No action	free coasting
4	Not used	
5	Not used	
6	No action	Block setpoint value (speed not variable)
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	

Setpoint value

The permissible values fall within a range of P1-02 (minimum frequency) to P1-01 (maximum frequency). The value is scaled with a factor of 0.1 in the application.

Process data input 3 (PDI 3)

Configured with parameter P5-14.

The following settings can also be changed during operation:

Value	Description	DS
Field bus module PDI-3 input	0 = Torque limit / reference 1 = User PID reference register	0

Process data input 4 (PDI 4)

Configured with parameter P5-13.

The following settings can also be changed during operation:

Value	Description	DS
Field bus module PDI-4 input	0 = Ramp control field bus 1 = User register 4	0

Statusword

Device status and error message information is provided in the status word (which is made up of the error messages and the device status).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB															LSB
Error messages								Device status							

Device status

Bit	Description	
	Value = 0	Value = 1
0	Drive not ready	READY
1	Stop	Operation (RUN)
2	Clockwise rotating field (FWD)	Anticlockwise rotating field (REV)
3	No error	Fault detected (FAULT)
4	Acceleration ramp	Frequency actual value equals setpoint value definition
5	–	Zero speed
6	Speed control deactivated	Speed control activated
7	Not used	

Error messages

To find the relevant error code, please consult the section on Modbus in the manual for your variable frequency drive.

Actual value

The variable frequency drive's actual value falls within a value range of 0 to P1-01 (maximum frequency). This value is scaled with a factor of 0.1 in the application.

Process data output 3 (PDO 3)

Configured with parameter P5-12.

The following settings can also be changed during operation:

Value	Description	DS
Field bus module PDO-3 output	0 = Output current 1 = Output power 2 = DI status 3 = AI2 signal level 4 = Heat sink temperature 5 = User register 1 6 = User register 2 7 = P0-80	0

Process data output 4 (PDO 4)

Configured with parameter P5-08.

The following settings can also be changed during operation:

Value	Description	DS
Field bus module PDO-4 output	0 = Motor torque 1 = Output power 2 = DI status 3 = AI2 signal level 4 = Heat sink temperature	0

4.2.2 acyclic data

Acyclic parameter data can be read and modified with DP-V1.

Each parameter request via DP-V1 consists of:

- a PROFIBUS DP-V1 Header,
- a parameter value.

Table 5: DP-V1 Header

Byte	Designation	Description	Allowed Values
1	Function number	PROFIBUS DP specific operation number	16#5E: for read request 16#5F: for write request Slave response: 16#DE: for faults with read request 16#DF: for faults with write request Other values are not permissible.
2	Slot number	Slot number	according to → Table 6
3	Index	Index	according to → Table 6
4	Data Length	Number of bytes in the request protocol	2

Parameter value

Each parameter has a length of 2 bytes.

Byte	Designation	Description
1	High byte	Parameter Value
2	Low byte	Parameter Value

4.3 Parameter Data

Table 6: Parameter Data

	PNU	Description	Access right	ADI number	Slot	Index
1		Variable frequency drive ID	ro	9	0	8
2		Variable frequency drive part no.	ro	10	0	9
3		Control part software	ro	11	0	10
4		Control section checksum	ro	12	0	11
5		Software power section	ro	13	0	12
6		Power section checksum	ro	14	0	13
7		Serial number 1	ro	15	0	14
8		Serial number 2	ro	16	0	15
9		Serial number 3	ro	17	0	16
10		Serial number 4	ro	18	0	17
11	P1-01	Maximum frequency / maximum speed	rw	101	0	100
12	P1-02	Minimum frequency / minimum speed	rw	102	0	101
13	P1-03	Acceleration time (acc1)	rw	103	0	102
14	P1-04	Deceleration time (dec1)	rw	104	0	103
15	P1-05	Stop Function	rw	105	0	104
16	P1-06	Energy optimization	rw	106	0	105
17	P1-07	Nominal voltage of the motor	rw	107	0	106
18	P1-08	Rated motor current	rw	108	0	107
19	P1-09	Nominal frequency of the motor	rw	109	0	108
20	P1-10	Nominal speed of the motor	rw	110	0	109
21	P1-11	Output voltage at zero frequency	rw	111	0	110
22	P1-12	Control level	rw	112	0	111
23	P1-13	Function of the digital input	rw	113	0	112
24	P1-14	Parameter range access code (depends on P2-40 and P6-30)	rw	114	0	113
25	P2-01	Fixed frequency FF1 / speed 1	rw	201	0	200
26	P2-02	Fixed frequency FF2 / speed 2	rw	202	0	201
27	P2-03	Fixed frequency FF3 / speed 3	rw	203	0	202
28	P2-04	Fixed frequency FF4 / speed 4	rw	204	0	203
29	P2-05	Fixed frequency FF5 / speed 5	rw	205	0	204
30	P2-06	Fixed frequency FF6 / speed 6	rw	206	0	205
31	P2-07	Fixed frequency FF7 / speed 7	rw	207	0	206
32	P2-08	Fixed frequency FF8 / speed 8	rw	208	0	207
33	P2-09	Frequency jump 1, bandwidth	rw	209	0	208
34	P2-10	Frequency skip 1, center	rw	210	0	209
35	P2-11	AO1 signal (Analog Output)	rw	211	0	210
36	P2-12	AO1, signal range	rw	212	0	211

	PNU	Description	Access right	ADI number	Slot	Index
37	P2-13	AO2 signal (Analog Output)	rw	213	0	212
38	P2-14	AO2, signal range	rw	214	0	213
39	P2-15	RO1 Signal (Relay 1 Output)	rw	215	0	214
40	P2-16	AO1 / RO1 upper limit	rw	216	0	215
41	P2-17	AO1 / RO1 lower limit	rw	217	0	216
42	P2-18	RO2 Signal (Relay Output)	rw	218	0	217
43	P2-19	AO2 / RO2 upper limit	rw	219	0	218
44	P2-20	AO2 / RO2 lower limit	rw	220	0	219
45	P2-21	Scaling factor for value	rw	221	0	220
46	P2-22	Scaled display value	rw	222	0	221
47	P2-23	Holding time for speed of zero	rw	223	0	222
48	P2-24	Pulse frequency	rw	224	0	223
49	P2-25	Quick stop deceleration ramp time	rw	225	0	224
50	P2-26	Motor flying restart circuit	rw	226	0	225
51	P2-27	Standby mode delay time	rw	227	0	226
52	P2-28	Slave speed scaling	rw	228	0	227
53	P2-29	Slave speed scaling factor	rw	229	0	228
54	P2-30	AI1, Signal range	rw	230	0	229
55	P2-31	AI1 scaling factor	rw	231	0	230
56	P2-32	AI1 offset	rw	232	0	231
57	P2-33	AI2, Signal range	rw	233	0	232
58	P2-34	AI2 scaling factor	rw	234	0	233
59	P2-35	AI2 offset	rw	235	0	234
60	P2-36	REAF, Start function with automatic restart, control signal terminals	rw	236	0	235
61	P2-37	REAF, start function with automatic restart	rw	237	0	236
62	P2-38	Response in the event of a power failure	rw	238	0	237
63	P2-39	Parameter access lock	rw	239	0	238
64	P2-40	Access codes - menu level 2	rw	240	0	239
65	P3-01	PID controllers, P amplification	rw	301	1	45
66	P3-02	PID controller, I time constant	rw	302	1	46
67	P3-03	PID controller, D time constant	rw	303	1	47
68	P3-04	PID controller, control deviation	rw	304	1	48
69	P3-05	PID controller, setpoint source	rw	305	1	49
70	P3-06	PID controller, digital reference value	rw	306	1	50
71	P3-07	PID controller, actual value limiting, maximum	rw	307	1	51
72	P3-08	PID controller, actual value limiting, minimum	rw	308	1	52
73	P3-09	PID controller, actual value limiting	rw	309	1	53
74	P3-10	PID controller, actual value (PV)	rw	310	1	54
75	P3-11	Maximum PID error for enabling the ramps	rw	311	1	55

	PNU	Description	Access right	ADI number	Slot	Index
76	P3-12	PID feedback display scaling factor	rw	312	1	56
77	P3-13	PID feedback wake up level	rw	313	1	57
78	P3-14	reserved	-	314	1	58
79	P3-15	reserved	-	315	1	59
80	P3-16	reserved	-	316	1	60
81	P3-17	reserved	-	317	1	61
82	P3-18	PID reset control	rw	318	1	62
85	P4-01	Motor control mode selection	rw	401	1	145
86	P4-02	Auto-tune enable	rw	402	1	146
87	P4-03	Rotational speed controller P gain	rw	403	1	147
88	P4-04	Integral time of speed controller	rw	404	1	148
89	P4-05	Motor Power Factor (cosφ)	rw	405	1	149
90	P4-06	Torque control reference / Torque control reference	rw	406	1	150
91	P4-07	Maximum torque (motor)	rw	407	1	151
92	P4-08	minimum torque	rw	408	1	152
93	P4-09	Maximum torque (generator)	rw	409	1	153
94	P4-10	V/Hz characteristic curve modification voltage	rw	410	1	154
95	P4-11	V/Hz characteristic curve modification frequency	rw	411	1	155
105	P5-01	Variable frequency drive slave address	rw	501	1	245
106	P5-02	CANopen baud rate	rw	502	1	246
107	P5-03	Modbus RTU Baud rate	rw	503	1	247
108	P5-04	Modbus RTU data format Parity type	rw	504	1	248
109	P5-05	Timeout – Communications dropout	rw	505	1	249
110	P5-06	Response in the event of a communications dropout	rw	506	1	250
111	P5-07	Ramp via field bus	rw	507	1	251
112	P5-08	Field bus module PDO-4 output	rw	508	1	252
113	P5-09	reserved	-	509	1	253
114	P5-10	reserved	-	510	1	254
115	P5-11	reserved	-	511	2	0
116	P5-12	Field bus module PDO-3 output	rw	512	2	1
117	P5-13	Field bus module PDI-4 input	rw	513	2	2
118	P5-14	Field bus module PDI-3 input	rw	514	2	3
125	P6-01	Firmware upgrade enable	rw	601	2	90
126	P6-02	Auto temperature management	rw	602	2	91
127	P6-03	Auto-reset delay	rw	603	2	92
128	P6-04	Relay hysteresis band	rw	604	2	93
129	P6-05	Enable incremental encoder feedback	rw	605	2	94
130	P6-06	Incremental encoder scale	rw	606	2	95
131	P6-07	Maximum speed error	rw	607	2	96

	PNU	Description	Access right	ADI number	Slot	Index
132	P6-08	Input frequency at maximum speed	rw	608	2	97
133	P6-09	Droop speed	rw	609	2	98
134	P6-10	PLC function enable	rw	610	2	99
135	P6-11	Speed holding time in the event of an enable signal	rw	611	2	100
136	P6-12	Speed holding time in the event of a disable signal	rw	612	2	101
137	P6-13	Motor brake opening time	rw	613	2	102
138	P6-14	Motor brake engagement delay	rw	614	2	103
139	P6-15	Minimum torque for brake opening	rw	615	2	104
140	P6-16	Time limit for minimum torque	rw	616	2	105
141	P6-17	Time limit for maximum torque	rw	617	2	106
142	P6-18	Voltage for DC injection braking	rw	618	2	107
143	P6-19	Brake resistor value	rw	619	2	108
144	P6-20	Brake resistor power	rw	620	2	109
145	P6-21	Braking chopper cycle in the event of excessively low temperature	rw	621	2	110
146	P6-22	Reset fan run-time	rw	622	2	111
147	P6-23	Reset KWh meter	rw	623	2	112
148	P6-24	Servicing interval	rw	624	2	113
149	P6-25	Reset servicing interval	rw	625	2	114
150	P6-26	AO1 - scaling	rw	626	2	115
151	P6-27	AO1 - offset	rw	627	2	116
152	P6-28	Display index P0-80	rw	628	2	117
153	P6-29	Save parameters as default	rw	629	2	118
154	P6-30	Access code for menu level 3	rw	630	2	119
155	P7-01	Motor stator resistance	rw	701	2	190
156	P7-02	Rotor resistance	rw	702	2	191
157	P7-03	Motor leakage inductance (d)	rw	703	2	192
158	P7-04	Motor magnetizing current	rw	704	2	193
159	P7-05	Motor leakage factor	rw	705	2	194
160	P7-06	Motor leakage inductance (q)	rw	706	2	195
161	P7-07	Advanced generator control	rw	707	2	196
162	P7-08	Enable, motor parameter adaptation	rw	708	2	197
163	P7-09	Overvoltage current limit	rw	709	2	198
164	P7-10	Load inertia factor	rw	710	2	199
165	P7-11	Minimum PWM pulse width	rw	711	2	200
166	P7-12	Magnetizing time at the V/f method	rw	712	2	201
167	P7-13	Rotational speed controller D gain	rw	713	2	202
168	P7-14	Torque boost	rw	714	2	203
169	P7-15	Maximum frequency limit for torque boost	rw	715	2	204
170	P7-16	Enable, signal injection	rw	716	2	205

	PNU	Description	Access right	ADI number	Slot	Index
171	P7-17	Signal injection level	rw	717	2	206
175	P8-01	Second acceleration time (acc2)	rw	801	3	35
176	P8-02	Transition frequency (acc1 - acc2)	rw	802	3	36
177	P8-03	Third acceleration time (acc3)	rw	803	3	37
178	P8-04	Transition frequency (acc2 - acc3)	rw	804	3	38
179	P8-05	Fourth acceleration time (acc4)	rw	805	3	39
180	P8-06	Transition frequency (acc3 - acc4)	rw	806	3	40
181	P8-07	Fourth deceleration time (dec4)	rw	807	3	41
182	P8-08	Transition frequency (dec3 - dec4)	rw	808	3	42
183	P8-09	Third deceleration time (dec3)	rw	809	3	43
184	P8-10	Transition frequency (dec2 - dec3)	rw	810	3	44
185	P8-11	Second deceleration time (dec2)	rw	811	3	45
186	P8-12	Transition frequency (dec1 - dec2)	rw	812	3	46
187	P8-13	Ramp selection when there is a preset speed	rw	813	3	47
195	P9-01	Control source - enable	rw	901	3	135
196	P9-02	Control source - quick stop	rw	902	3	136
197	P9-03	Control source - start signal 1 (FWD)	rw	903	3	137
198	P9-04	Control source – start signal 2 (REV)	rw	904	3	138
199	P9-05	Control source - Stay-put function	rw	905	3	139
200	P9-06	Control source - enable (REV)	rw	906	3	140
201	P9-07	Control source - reset	rw	907	3	141
202	P9-08	Control source – external fault	rw	908	3	142
203	P9-09	Control source - terminal control	rw	909	3	143
204	P9-10	Source - Speed 1	rw	910	3	144
205	P9-11	Source - speed 2	rw	911	3	145
206	P9-12	Source - speed 3	rw	912	3	146
207	P9-13	Source - speed 4	rw	913	3	147
208	P9-14	Source - speed 5	rw	914	3	148
209	P9-15	Source - speed 6	rw	915	3	149
210	P9-16	Source - speed 7	rw	916	3	150
211	P9-17	Source - speed 8	rw	917	3	151
212	P9-18	Speed - input 0	rw	918	3	152
213	P9-19	Speed - input 1	rw	919	3	153
214	P9-20	Speed - input 2	rw	920	3	154
215	P9-21	Fixed frequency 0	rw	921	3	155
216	P9-22	Fixed frequency 1	rw	922	3	156
217	P9-23	Fixed frequency 2	rw	923	3	157
218	P9-24	Acceleration ramp input 0	rw	924	3	158
219	P9-25	Acceleration ramp input 1	rw	925	3	159

	PNU	Description	Access right	ADI number	Slot	Index
220	P9-26	Deceleration time input 0	rw	926	3	160
221	P9-27	Deceleration time input 1	rw	927	3	161
222	P9-28	Control source - Up-pushbutton	rw	928	3	162
223	P9-29	Control source - Down-pushbutton	rw	929	3	163
224	P9-30	FWD limit switch	rw	930	3	164
225	P9-31	REV limit switch	rw	931	3	165
226	P9-32	Reserved	-	932	3	166
227	P9-33	Source - analog output (AO) 1	rw	933	3	167
228	P9-34	Source - analog output (AO) 2	rw	934	3	168
229	P9-35	Control source - Relay 1	rw	935	3	169
230	P9-36	Control source - Relay 2	rw	936	3	170
231	P9-37	Control source - scaling	rw	937	3	171
232	P9-38	Source - PID setpoint value	rw	938	3	172
233	P9-39	Source - PID feedbeck	rw	939	3	173
234	P9-40	Source - torque control reference	rw	940	3	174
235	P9-41	Function choices - Relay output 3, 4, 5	rw	941	3	175
245		DI1	ro	1001	3	235
246		DI2	ro	1002	3	236
247		DI3	ro	1003	3	237
248		DI4	ro	1004	3	238
249		DI5	ro	1005	3	239
250		DI6	ro	1006	3	240
251		DI7	ro	1007	3	241
252		DI8	ro	1008	3	242
253		AO1	ro	1009	3	243
254		AO2	ro	1010	3	244
255		DO1	ro	1011	3	245
256		DO2	ro	1012	3	246
257		DO3	ro	1013	3	247
258		DO4	ro	1014	3	248
259		DO5	ro	1015	3	249
260		User register 1	rw	1017	3	251
261		User register 2	rw	1018	3	252
262		User register 3	rw	1019	3	253
263		User register 4	rw	1020	3	254
264		User register 5	rw	1021	4	0
265		User register 6	rw	1022	4	1
266		User register 7	rw	1023	4	2
267		User register 8	rw	1024	4	3

	PNU	Description	Access right	ADI number	Slot	Index
268		User register 9	rw	1025	4	4
269		User register 10	rw	1026	4	5
270		User register 11	rw	1027	4	6
271		User register 12	rw	1028	4	7
272		User register 13	rw	1029	4	8
273		User register 14	rw	1030	4	9
274		User register 15	rw	1031	4	10
275		User AO 1	rw	1032	4	11
276		User AO 2	rw	1033	4	12
277		User RO 1	rw	1036	4	15
278		User RO 2	rw	1037	4	16
279		User RO 3	rw	1038	4	17
280		User RO 4	rw	1039	4	18
281		User RO 5	rw	1040	4	19
282		User, scaling value	rw	1041	4	20
283		User, decimal scaling	rw	1042	4	21
284		User, speed reference	rw	1043	4	22
285		User, torque reference	rw	1044	4	23
286		Field bus/User ramp	rw	1045	4	24
287		Scope index 1 / 2	rw	1046	4	25
288		Scope index 3 / 4	rw	1047	4	26
289		24hour timer	rw	1048	4	27
290		User display Ctrl	rw	1049	4	28
291		User display value	rw	1050	4	29
292		AI 1 (Q12)	ro	1061	4	40
293		AI 1 (%)	ro	1062	4	41
294		AI 2 (Q12)	ro	1063	4	42
295		AI 2 (%)	ro	1064	4	43
296		DI status	ro	1065	4	44
297		Speed reference	ro	1066	4	45
298		Value, digital potentiometer	ro	1067	4	46
299		Field bus speed reference	ro	1068	4	47
300		Master speed reference	ro	1069	4	48
301		Slave speed reference	ro	1070	4	49
302		Frequency, input speed reference	ro	1071	4	50
303		Torque reference (Q12)	ro	1072	4	51
304		Torque reference (%)	ro	1073	4	52
305		Master torque reference (Q12)	ro	1074	4	53
306		Field bus torque reference (Q12)	ro	1075	4	54

	PNU	Description	Access right	ADI number	Slot	Index
307		PID user reference (Q12)	ro	1076	4	55
308		PID user return value (Q12)	ro	1077	4	56
309		PID controller reference (Q12)	ro	1078	4	57
310		PID controller feedback value (Q12)	ro	1079	4	58
311		PID controller output (Q12)	ro	1080	4	59
312		Motor, velocity	ro	1081	4	60
313		Motor, current	ro	1082	4	61
314		Motor, torque	ro	1083	4	62
315		Motor, power	ro	1084	4	63
316		PID controller output speed	ro	1085	4	64
317		DC- voltage	ro	1086	4	65
318		Unit Temperature	ro	1087	4	66
319		PCB controle temperature	ro	1088	4	67
320		Drive scaling value 1	ro	1089	4	68
321		Drive scaling value 2	ro	1090	4	69
322		Motor, torque (%)	ro	1091	4	70
323		Expansion, IO input status	ro	1093	4	72
324		ID, Plug-in module	ro	1096	4	75
325		ID, field bus boards	ro	1097	4	76
326		Scope channel 1 data	ro	1101	4	80
327		Scope channel 2 data	ro	1102	4	81
328		Scope channel 3 data	ro	1103	4	82
329		Scope channel 4 data	ro	1104	4	83
330		OLED language number	ro	1105	4	84
331		OLED version	ro	1106	4	85
332		Power section	ro	1107	4	86
333		Servicing time	ro	1128	4	107
334		Fan speed	ro	1129	4	108
335		User kWh meter	ro	1130	4	109
336		User, MWh meter	ro	1131	4	110
337		Complete, KWh meter	ro	1132	4	111
338		Complete, MWh meter	ro	1133	4	112
339		Total operating hours counter	ro	1134	4	113
340		Total operating minutes/seconds counter	ro	1135	4	114
341		User, hours-run meter	ro	1136	4	115
342		User, operating minutes/seconds counter	ro	1137	4	116

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