PowerXL™

DX-NET-DEVICENET
Field bus connection DeviceNet for Variable Frequency Drives DA1

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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 DeviceNet connection DX-NET-DEVICENET for the variable frequency drives of the DA1 device series.

→ DeviceNet is an open field bus standard that is based on the CAN protocol and is specified in European standard EN 50325. The specification for the DeviceNet standard is managed and maintained by ODVA (Open DeviceNet Vendors Association).

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

Please read this manual carefully before installing and operating the DeviceNet 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.

→ 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 notes in the IL040004ZU 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

→ For more information on DeviceNet, please visit ODVA's website at: www.odva.org

0.2 Reading conventions

Symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed.

0.2.1 Hazard warnings of material damages

NOTICE

Warns about the possibility of material damage.

0.2.2 Hazard warnings of personal injury

CAUTION

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

WARNING

Warns of the possibility of hazardous situations that could result in serious injury or even death.

DANGER

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

0.2.3 Tips

Indicates useful tips.

0.3 Abbreviations and Symbols

The following abbreviations are used in this manual:

ADI	Application Data Instance
CIP	Common Industrial Protocol
COS	Change of State
CW	Control Word
LED	Light Emitting Diode (LED)
LSB	Least Significant Bit
MAC ID	Media Access Control Identifier
MSB	Most Significant Bit
ODVA	Open DeviceNet Vendor Association The user organization (www.odva.org) for DeviceNet
PC	Personal Computer
PDI	Process Data Interface
PNU	Parameter number
PD	Process Data
PLC	Programmable logic controller
SW	Status Word
UL	Underwriters Laboratories
xx_{hex}	Used to indicate hexadecimal numbers (x = 0, 1, …, 9, A, B, C, D, E, F)

0.4 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 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
Moment of 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
Weight	1 lb	pound	0.4536 kg	2.205
Flow rate	1 cfm	cubic feet per minute	1.698 m^3/n	0.5889

0.5 Data Types

This manual refers to the following data types for the DeviceNet field bus system:

Table 2: Data types in DeviceNet

Data type	Data Length [Bits]	Range Min	Range Max	Name
BOOL	1	0 (FALSE)	1 (TRUE)	Boolean
SINT	8	-128	127	Signed Short Integer
USINT	8	0	255	Unsigned Short Integer
INT	16	-32768	32767	Integer
UINT	16	0	65535	Unsigned Integer
DINT	32	-2^{31}	2^{31} -1	Signed Double Integer
UDINT	32	0	2^{32} -1	Unsigned Double Integer

1 Device series

1.1 Checking the Delivery

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

Your fieldbus connection was carefully packaged and handed over 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 DX-NET-DEVICENET fieldbus connection
- the instruction leaflet IL040004ZU.

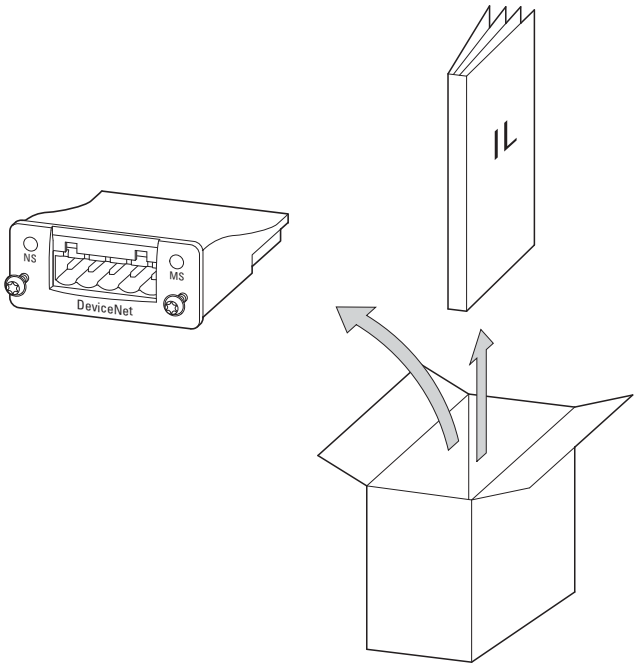


Figure 1: Equipment supplied with fieldbus connection DX-NET-DEVICENET

1.2 Key to part numbers

The catalog number selection and the part no. for the DX-NET-… field bus connection card have the following syntax:

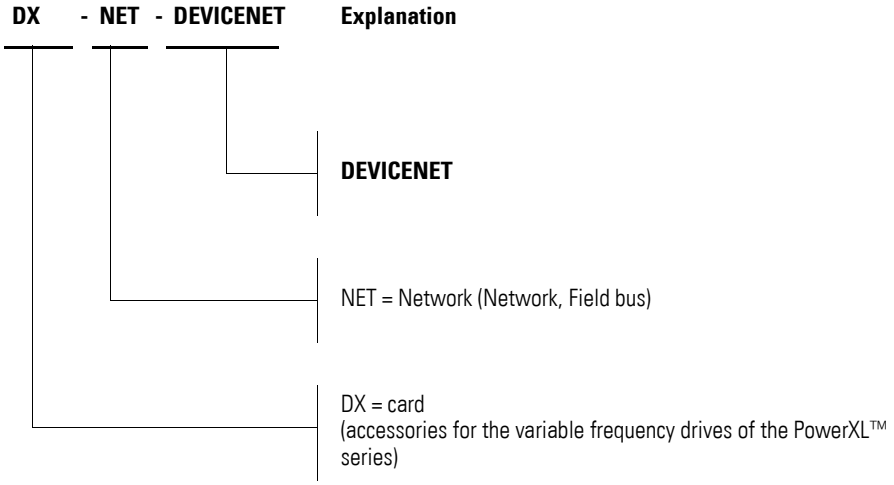


Figure 2: Catalog number selection of field bus interface card DX-NET-…

1.3 Designation at DX-NET-DEVICENET

The following drawing shows the DX-NET-DEVICENET fieldbus connection.

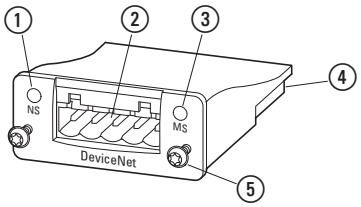


Figure 3: Designations at DX-NET-DEVICENET

① Network status LED (NS)
② DeviceNet connection sockets
③ Module status LED (MS)
④ 50-pole adapter extension
⑤ Screws for securing DA1 variable frequency drive

1.4 General rated operational data

Technical Data	Symbol	Unit	Value
General			
Standards			meets the requirements of the EN 50178 (standard for electrical safety)
Production quality			RoHS, ISO 9001
Degree of protection			IP20
Interference emissions as per EN 61000-6-4			Conducted and radiated interference as per EN 55011
Interference immunity EN 61000-6-2:			EN61000-4-2 Electrostatic discharge EN61000-4-3 Radiated, radio-frequency electromagnetic fields Fast transient electrical interference/burst as per EN 61000-4-4 Shock waves as per EN 61000-4-5 EN61000-4-6 Conducted interferences
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
DeviceNet connections			
power supply		V	3.3
interface			DeviceNet connection via 5-pin screw terminals
data transfer			Automatic baud rate detection
Communication protocol			
DeviceNet			IEEE 802.3 according to DS301; DeviceNet adapter (Slave)
Functions			Implicit and Explicit Messaging; UCMM; Change of State; Cyclic I/O, Polled I/O
Data volume		byte	256 In/Out
Baud rate		kBit/s	125 - 500

1.5 Proper use

The DX-NET-DEVICENET fieldbus connection is an electrical piece of equipment that can be used to control DA1 variable frequency drives and connect them to a standard DeviceNet field bus system. It is intended to be installed in a machine or assembled with other components into a machine or system. It makes it possible for DA1 series variable frequency drives to be integrated as slaves into DeviceNet field bus systems.

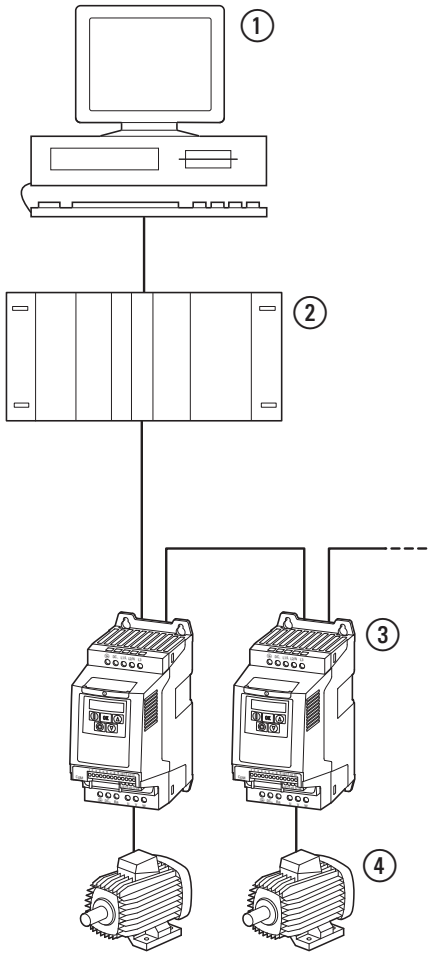


Figure 4: How the DX-NET-DEVICENET fieldbus connection can be integrated into a DeviceNet network

① PC
② Head-end controller (master) with DeviceNet interface
③ Variable frequency drive DA1 with DX-NET-DEVICENET connection
④ Motor(s)

→ The DX-NET-DEVICENET fieldbus connection is not a household appliance, but rather a component intended exclusively for use in commercial applications.

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

1.6 Maintenance and inspection

The DX-NET-DEVICENET fieldbus connection will not require any maintenance if the general rated operational data (→ Page 9), as well as all DeviceNet-specific technical data, is adhered to. However, external factors can influence the components's lifespan and function. We therefore recommend that the devices are checked regularly and the following maintenance measures are carried out at the specified intervals.

Table 3: Recommended maintenance

Maintenance measures	Maintenance interval
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-DEVICENET fieldbus connection has not been designed in such a way as to make it possible to replace or repair it. If the card is damaged by external influences, repair is not possible.

1.7 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.

1.8 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-DEVICENET),
- the date of purchase,
- a detailed description of the problem which has occurred with the DX-NET-DEVICENET fieldbus connection.

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

24-hour hotline: +49 (0) 180 5 223 822
e-mail: AfterSalesEGBonn@Eaton.com

1.9 Disposal

The DX-NET-DEVICENET 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 DeviceNet

DeviceNet was developed by Rockwell Automation and ODVA (Open DeviceNet Vendors Association) as an open field bus standard based on the CAN protocol.

DeviceNet is an object-oriented bus system and works using a producer/consumer model.

DeviceNet's application layer uses the CIP protocol (Common Industrial Protocol). CIP defines the transfer of I/O data in real time via I/O messages (I/O messaging or implicit messaging), as well as the transfer of request and response data for configuration, diagnostic, and management purposes (explicit messaging). CIP is an object-oriented protocol and is typically used to network sensors, variable frequency drives, and actuators with higher-level automation devices (PLCs).

DeviceNet devices within a DeviceNet network can function as a client (master), server (slave), or both.

DeviceNet networks can support a maximum of 64 bus nodes.
Baud rates of 125, 250, or 500 kBaud can be achieved (depending on the type of cable used).

2.2 LED indicators

The two LEDs on the module are used to indicate the module status and network status, making it possible to quickly diagnose the unit.

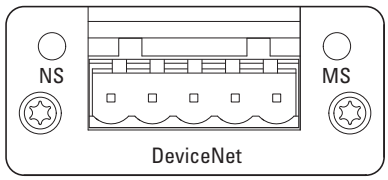


Figure 5: MS and NS LED indicators

2.2.1 LED MS

The MS LED indicates the module's status within the DeviceNet network.

LED status	Description
off	No supply voltage is applied.
green flashing	The module is in standby mode. The configuration is incorrect or incomplete, or a configuration does not exist.
green illuminating	The module is working properly.
red flashing	An error has occurred.
illuminated red	A fatal error has occurred . Module needs to be replaced.
green-red flashing	The module is running a self-test.

2.2.2 LED NS

The MS LED indicates the network communications status.

LED status	Description
off	Module is not online.
green flashing	The module is online, but a communication connection has not yet been established.
green illuminating	The module is online and a communication connection has been established
red flashing	Time-out of at least one I/O connection (time-out state).
illuminated red	A fatal network error has occurred. The module has terminated communications.
green-red flashing	The module is running a self-test.

3 Installation

3.1 Introduction

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

→ 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.

In the case of DA1 variable frequency drives, the way in which the DX-NET-DEVICENET fieldbus connection needs to be installed will depend on the corresponding variable frequency drive's size.

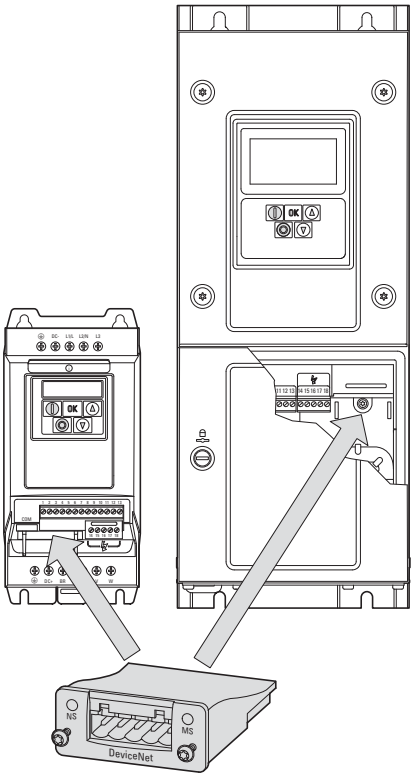


Figure 6: Flush mounting of fieldbus connection

In the case of DA1 variable frequency drives with sizes FS2 and FS3, the fieldbus connection will need to be plugged into the variable frequency drive from below. In the case of sizes FS4 and up, the fieldbus connection will need to be mounted on the right side, underneath the variable frequency drive's front enclosure cover.

3.2 Notes on the documentation

Documents containing installation instructions:

- IL4020010Z instruction leaflet for DA1 variable frequency drive in size FS2 and FS3
- IL4020011Z instruction leaflet for DA1 variable frequency drive from size FS4

These documents are also available as PDF files on the Eaton Internet website. They can be quickly located at

www.eaton.com/moeller → Support

by entering the document number as the search term.

3.3 Notes on the mechanical surface mounting

DANGER

Make sure that the equipment is fully de-energized when performing the handling and installation work required to mechanically set up and install the fieldbus connection.

When installing the DX-NET-DEVICENET fieldbus connection, it will be necessary to open the DA1 variable frequency drive's enclosure. We recommend that this mounting work be carried out before the electrical installation of the variable frequency drive.

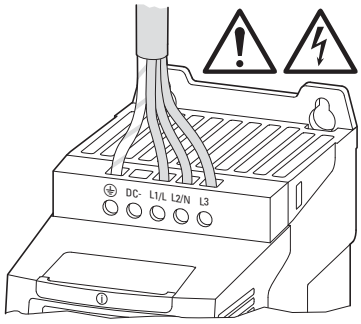


Figure 7: Make sure that the equipment is de-energized when performing installation work

3.4 Mounting for frame sizes FS2 and FS3

In the case of DA1 variable frequency drives with sizes FS2 and FS3, the DX-NET-DEVICENET fieldbus connection needs to be installed on the bottom of the variable frequency drive. To do this, use a flat-blade screwdriver to lift off the cover at the marked cutout (without forcing it) and then remove the cover by hand.

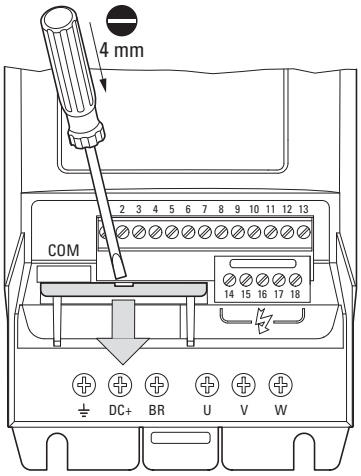


Figure 8: Opening the interface cover

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.

After doing so, you can insert the connection and secure it with the two screws.

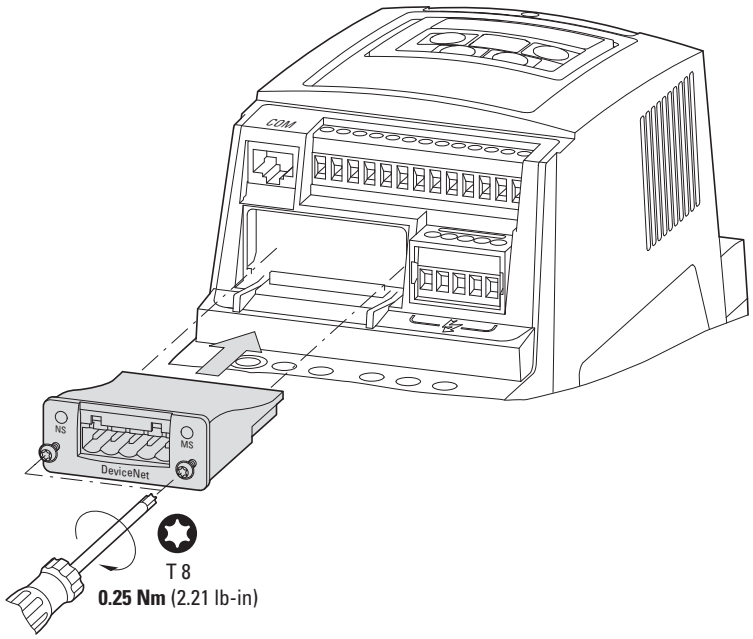


Figure 9: Inserting the fieldbus connection

3.5 Mounting from frame size FS4

When working with DA1 variable frequency drives of size FS4 or larger, the DX-NET-DEVICENET 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.

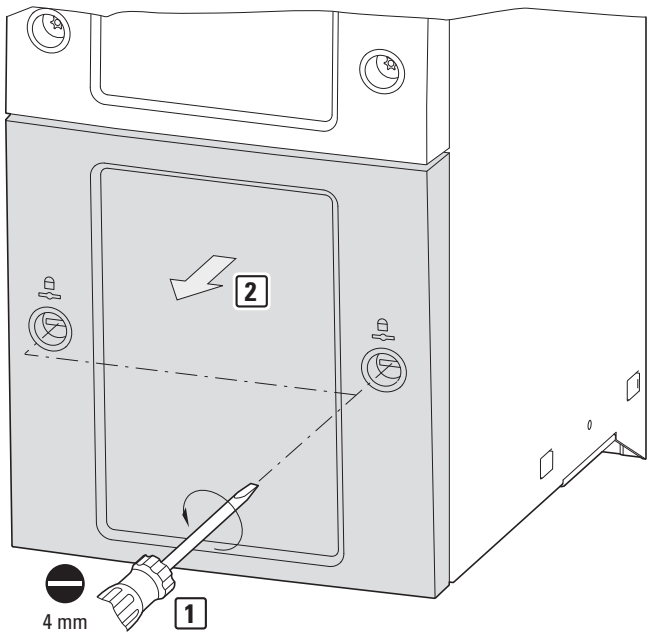


Figure 10:Opening the enclosure of DA1 variable frequency drives with size FS4 and up

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.

After doing so, you can insert the connection on the right-hand side and use the screws to secure it.

Then put the cover back on and use the two screws (turn them 90°) to secure it.

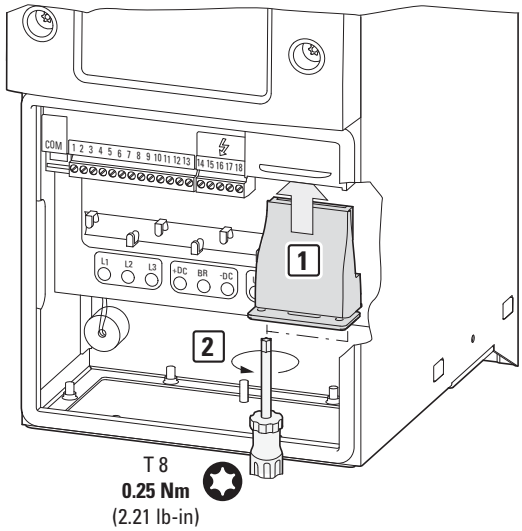
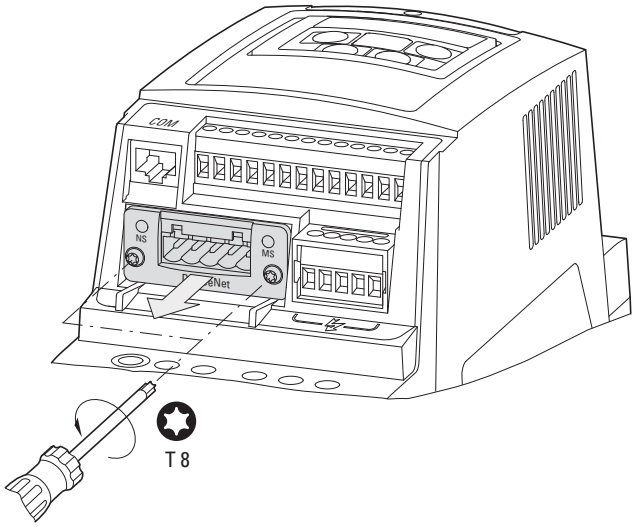


Figure 11:Inserting the fieldbus connection

3.6 Installing the fieldbus connection

To connect the variable frequency drive to the DX-NET-DEVICENET field bus module, you will need a 5-pin DeviceNet plug with an appropriate prefabricated DeviceNet cable.

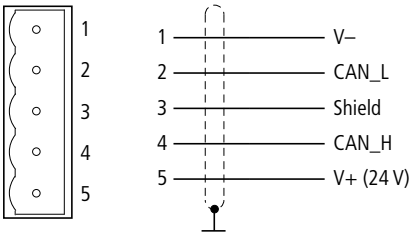


DeviceNet plugs and DeviceNet cables are specified by ODVA. Make sure to only use cables specifically approved for use with DeviceNet!

The type of cable has an influence on the maximum available length of the bus line and thus also on the Baud rate (→ Table 5).

3.6.1 Pin assignment

Table 4: DeviceNet pin assignment

Assignment	Pin	Description
	1	V-
	2	CAN_L
	3	Shield
	4	CAN_H
	5	V+ (24V)

In order to ensure that all DeviceNet field bus communications will work properly, all the plug pins need to be connected. This applies to the 24-V bus voltage as well. If there is no bus voltage present, the DX-NET-DEVICENET module will be unable to communicate. In this case, the network status LED will be in the OFF mode.

3.6.2 Bus termination resistor

The first and last modules on a DeviceNet network must be terminated with a 120 Ω bus termination resistor. This resistor needs to be connected between CAN_H and CAN_L.

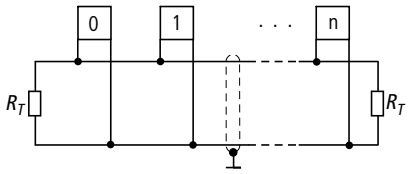


Figure 12:Bus termination resistors RT: CAN_H and CAN_L terminals

3.6.3 Max. cable lengths

The maximum bus cable length depends not only on the data rate, but also on the type of cable being used. The following cable types are permitted:

- A so-called “Thick Cable”,
- a so-called “Thin Cable”,
- a so-called “Flat Cable”,

Table 5: Maximum length for specific DeviceNet cables

Baud rate	**Maximum cable length [m]**		
[Kbit/s]	**“Thick Cable”**	**“Thin Cable”**	**“Flat Cable”**
125	500	100	420
250	250	100	200
500	100	100	100

3.7 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 V DC, etc.), as well as the field bus system's DeviceNet 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.

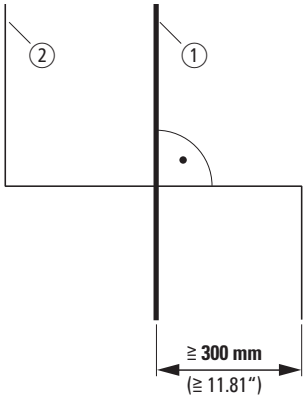


Figure 13:Routing cables for DeviceNet ② and mains/motor cables ①

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

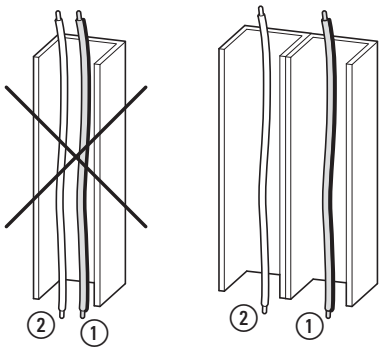


Figure 14:Separate routing in the cable duct

① Mains and motor connection cable
② DeviceNet cable

In all cases only use approved DeviceNet cables.

4 Commissioning

4.1 DA1 variable frequency drives

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

Check the settings and installations for the connection to the DeviceNet field bus 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.

For communications, parameter P12 (drive control) must be set as follows in the DA1 variable frequency drive:
P12 = 4, P5-01 = 0 - 63

For detailed information on how to configure parameters, please refer to manual MN04020005Z-EN.

4.2 EDS file

The properties of a DeviceNet module are described in what is referred to as an EDS file. In order to be able to connect a DA1 variable frequency drive to a DeviceNet network, you will need the corresponding EDS file.

The EDS file can be found on the CD-ROM and on the Internet at:

www.eaton.com/moeller → **Downloads**

4.3 Addressing

Each DeviceNet module requires its own unique address (MAC ID) within the DeviceNet network. A DeviceNet network can support up to 64 addresses (0 to 63). To set DeviceNet addresses, you will need to use the configuration software for the master controller you are using (this may require the use of an explicit message). To do so, use the corresponding service from the DeviceNet object.

The MAC address will be printed on the corresponding nameplate. The DHCP function will be enabled by default.

4.4 Engineering the module

The following instructions explain how to configure the communication module with a DA1 variable frequency drive.

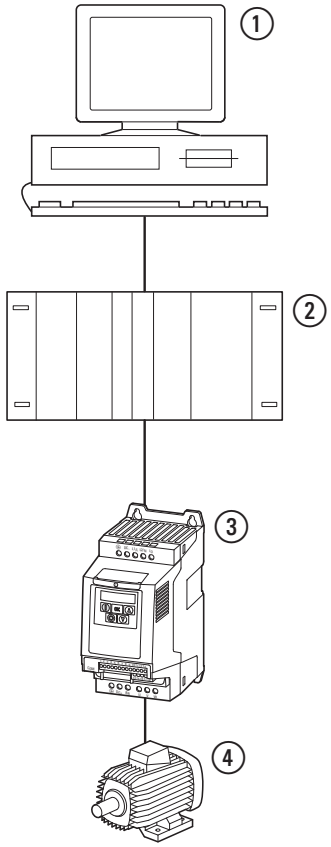


Figure 15:Engineering

① PC (with configuration tool)
② Head-end controller
③ Variable frequency drive DA1 with DX-NET-DEVICENET connection
④ Motor

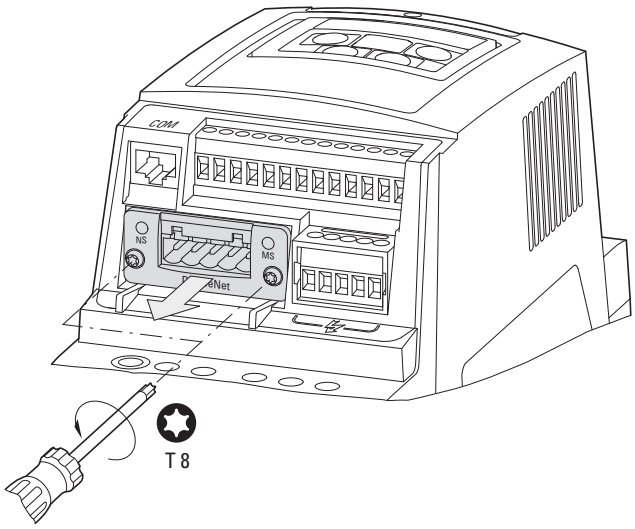
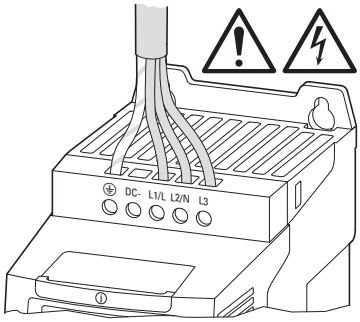
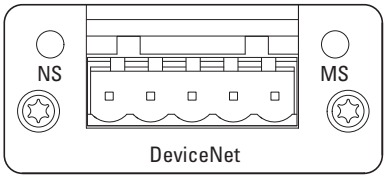


Figure 16:RJ45 plug connection

- ▶ Connect the device to the DeviceNet environment.
  You will need the following components to do so:
  - Head-end controller
  - Computer (for programming and configuration purposes)
  - Variable frequency drive DA1 with DX-NET-DEVICENET connection
- ▶ Switch the device on (switch on the power supply!).



- ▶ Now configure the project. (For information on a detailed configuration, please consult the manual provided by the PLC's manufacturer.)
- ▶ Check the LED indicators.
  The head-end controller must recognize the device address and the module must light up green (→ Section 2.2, "LED indicators").



4.5 General information about the DeviceNet field bus system

The DeviceNet field bus system is based on a connection-oriented communications model. In other words, data can only be exchanged using specific connections assigned to the devices.

4.5.1 Object model

In DeviceNet, all the devices within a DeviceNet network are described with a unique object model. Each specific device is defined with the help of objects.

The object model's objects can be subdivided into three groups:

- Management objects,
- Connection objects,
- Application-specific objects.

4.5.1.1 Management objects

Management objects define DeviceNet-specific data and functions. Every single DeviceNet device has to support these objects.

Identity Object

The Identity Object (Class Code 01_{hex}) contains all the data required to uniquely identify a node within the network, e.g., vendor ID, device type, and product code. In addition, it contains a device's current status, serial number, and product name.

Message Router Object

The Message Router Object (Class Code 02_{hex}) provides access to all of a device's classes and instances via explicit messages.

4.5.1.2 Connection Objects

Connection objects define the messages exchanged via DeviceNet.

DeviceNet Object

The DeviceNet Object (Class Code 03_{hex}) specifies the configuration of a device, as well as its physical connection to the DeviceNet network. Every single device has to support this object. More specifically, the object contains the device's MAC ID, its current configured baud rate, and other pertinent information.

Connection Object

The Connection Object (Class Code $0x05_{hex}$) is supported by every single DeviceNet device in at least one instance. This object defines the connection to data via I/O messages or explicit messages, the path and length of producer/consumer data, the CAN identifier used for the connection, the corresponding watchdog timer, and the response in the event of a fault scenario.

4.5.1.3 Application-specific objects

Application-specific objects are used to define device-specific data and functions.

Application Objects

Application objects describe simple automation applications. They are either predefined in the DeviceNet Object Library or are defined by the user.

Parameter Object

The Parameter Object (Class Code $0F_{hex}$) serves as an interface to a device's configuration data and parameters. It contains an instance for each parameter, with the instance being linked to the parameter to be configured.

Assembly Object

The Assembly Object (Class Code: 04_{hex}) provides the user with mapping options, i.e. attribute data of different instances in different classes can be grouped together to form a single attribute of an instance in an assembly object.

Acknowledge Handler Object

The Acknowledge Handler Object (Class Code $2B_{hex}$) makes it possible to establish acknowledged connections, as well as COS and cyclic I/O connections.

ADI Object

The ADI Object (Class Code $A2_{hex}$) provides access to the DA1 variable frequency drive's acyclic data.

4.6 Supported objects

The DX-NET-DEVICENET module uses the following DeviceNet object classes as defined in the "Communications Adapter Profile" device profile (as per ODVA specifications):

- Identity Object (01_{hex})
- DeviceNet Object (03_{hex})
- Connection Object (05_{hex})
- Parameter Object ($0F_{hex}$)
- Acknowledge Handler Object ($2B_{hex}$)
- ADI Object ($A2_{hex}$)

4.6.1 Identity Object (01_{hex})

The Identity Object (Class Code 01_{hex}) contains all the data required in order to uniquely identify a network node.

Attribute Id	Name	Access	Data type	Description or Value
1	Vendor ID	ro	UINT	Vendor identification number = 248_{dec} The ODVA specifies the Vendor ID. This is 248_{dec} for Eaton GmbH.
2	Device type	ro	UINT	Device type (product type) = Communications adapter
3	Product Code	ro	UINT	69123_{dec} Eaton GmbH has defined the following product code (used to identify specific vendor products) for the module: 69123_{dec}. It makes reference to the model number.
4	Revision	ro	USINT	Device version Two bytes are returned when the device version is read.
	Major Revision	ro	USINT	The low byte defines the hardware version, the high byte the operating system version.
	Minor Revision	ro	USINT	
5	status	ro	WORD	The device's status
6	Serial Number	ro	UDINT	Device serial number
7	Product Name	ro	SHORT_ STRING	DX-NET-DEVICENET

The Identity Object supports the following services:

Table 6: Services

Service code	Service name	Description
05_{hex}	Reset	Calls the module's reset function.
$0E_{hex}$	Get_Attribute_Single	This service can be used to read the value of a selected attribute from the module.
10_{hex}	Set_Attribute_Single	This service can be used to set a selected attribute in the module.

4.6.2 DeviceNet Object (03_{hex})

The DeviceNet Object can be used to configure the DX-NET-DEVICENET communications module and to define the corresponding physical environment.

Class Attributes

Attribute number	Attribute name	Access right ro | rw	Data type	Description
1	Revision	ro	UINT	Object revision

Instance attributes

Attribute Id	Name	Access	Data type	Description (Value)
1	MAC ID	ro	USINT	Network address of a network node.
2	Baud rate	ro	USINT	Baud rate during communications
3	BOI Bus-Off-Interrupt	ro/rw	BOOL	Response in the event of a bus-off event (FALSE)
4	Bus-Off Counter	ro/rw	USINT	Number (value range: 0 - 255) of bus-off events
5	Allocation Information	ro	STRUCT of BYTE, USINT	Selection bit used to assign the master MAC ID
6	MAC-ID Switch changed	ro	BOOL	The MAC ID switch settings have changed (since the last time the module was switched on)
7	Baud Rate Switch changed	ro	BOOL	
8	MAC-ID Switch Value	ro	USINT	Current Value
9	Baud Rate Switch Value	ro	USINT	Current Value

Services

Service code	Service name	Description
$0E_{hex}$	Get_Attribute_Single	This service can be used to read the value of a selected attribute from the module.
10_{hex}	Set_Attribute_Single	This service can be used to set a selected attribute in the module.
$4B_{hex}$	Allocate_Master/ Slave_Connection_Set	Requests the predefined master/slave connection set.
$4C_{hex}$	Release_Group_2 _Identifier_Set	Releases connections in the master/slave connection set.

4.6.3 ADI Object ($A2_{hex}$)

In addition to standard object classes, there are also vendor-specific classes that make it possible to access individual variable frequency drive properties. Object class A2h is used for this purpose.

Class	Property Name	Description
A2h	ADI	Variable frequency drive data for access to acyclic data

The A2h object can be used to access the DA1 variable frequency drive's acyclic data.

Classes/Instances	Attribute/Services	Value
Classes		
	Attributes	0x01, 0x02, 0x03
	Services	0xE
Instances		
	Attributes	1, 2, 3, 4, 5, 6, 7, 8
	Services	0xE

Class Attributes

Attribute Id	Attribute name	Access rights ro | rw	Data type	Description	Value
1	CLASS REVISION	ro	UINT	version	0x00 01
2	MAX OBJECT INSTANCE	ro	UINT	Maximum number of object instances	–
3	NUMBER OF INSTANCES	ro	UINT	maximum number of instances	–

Instance attributes

Attribute Id	Attribute name	Access rights ro | rw	Data type	Description
1	Name	ro	Short_String	Parameter name with length
2	Data Type	ro	USINT	Data type of the instance value
3	No. of elements	ro	USINT	Number of elements for the specified data types
4	Descriptor	ro	USINT	Access rights for the instance Bit meaning: kit 0 = Get Access 1 = Set Access
5	Value	rw	Defined by attribute 2	Instance value
6	Max Value	ro		Maximum permitted parameter value
7	Min Value	ro		Minimum permitted parameter value
8	Default Value	ro		Default parameter value (default setting)

4.6.4 Connection Object (05_{hex})

The Connection Object (Class Code 05_{hex}) is supported by every single DeviceNet device in at least one instance. This object defines the connection to data via I/O messages or explicit messages, the path and length of producer/consumer data, the CAN identifier used for the connection, the corresponding watchdog timer, and the response in the event of a fault scenario.

Class Attributes

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
1	Revision	ro	UINT	Object revision

Explicit Messages

Explicit messages are used to transmit low-priority configuration data, general management data and diagnostic data between two specific devices. They are always sent using a point-to-point connection in a client/server system, which means that a client request must always be followed by a server response.

Instance attributes

Table 7: Instance 1: Explicit message connection

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
1	State	ro	USINT	Connection status. 0: Non existent 1: Configuring 2: Waiting for connection ID 3: Established 4: Time out 5: Deferred
2	Instance Type	ro	USINT	Indicates explicit messaging.
3	Transport Class Trigger	ro	Byte	Type of connection
4	Produced Connection ID	ro	UINT	
5	Consumed Connection ID	ro	UINT	
6	Initial Communication Characteristics	ro	Byte	
7	Produced Connection Size	ro	UINT	The maximum number of bytes that will be sent (262 bytes)
8	Consumed Connection Size	ro	UINT	The maximum number of bytes that will be received (262 bytes)
9	Expected Packet Rate	ro/rw	UINT	Time behavior
12	Watchdog Timeout Action	ro/rw	USINT	Timeout Time

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
13	Produced Connection Path Length	ro	UINT	
14	Produced Connection Path	ro	EPATH	
15	Consumed Connection Path Length	ro	UINT	
16	Consumed Connection Path	ro	EPATH	
17	Production Inhibit Time	ro	UINT	Minimum time between two instances of data
18	Connection Timeout Multiplier	ro/rw	UINT	

Polled I/O connection

When a polled I/O connection is used, a conventional master/slave relationship is established between a controller and a DeviceNet device. Polled I/O connections are point-to-point connections between two nodes on the bus. When using this type of connection, the master sends a poll request to the slave, which in turn responds with a poll response.

Table 8: Instance 2: Polled I/O connection

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
1	State	ro	USINT	Connection status. 0: Non existent 1: Configuring 2: Waiting for connection ID 3: Established 4: Time out
2	Instance Type	ro	USINT	0001_{hex} (I/O Connection)
3	Transport Class Trigger	ro	Byte	Type of connection: 82_{hex}: Server, Polled Class2 80_{hex}: Server, COS/Cyclic, Class 0, No Ack.
4	Produced Connection ID	ro	UINT	FFF_{hex}: Note consuming (COS/Cyclic) Other: CAN ID for transmission
5	Consumed Connection ID	ro	UINT	
6	Initial Communication Characteristics	ro	Byte	01_{hex}: Polled $F1_{hex}$: COS/Cyclic, No Ack. 01_{hex}: COS/COS/cyclic, Ack.
7	Produced Connection Size	ro	UINT	The maximum number of bytes that will be sent 0000_{hex}: COS/Cyclic others: Size of Write Process Data (Polled)

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
8	Consumed Connection Size	ro	UINT	The maximum number of bytes that will be received
9	Expected Packet Rate	ro/rw	UINT	Time behavior
12	Watchdog Timeout Action	ro/rw	USINT	0000_{hex} (transition to the timed out state)
13	Produced Connection Path Length	ro	UINT	0000_{hex} (COS/Cyclic) 0007_{hex} (Polled)
14	Produced Connection Path	ro	EPATH	No Value (COS/Cyclic) 20 04 25 nn nn 30 03_{hex} (Polled)
15	Consumed Connection Path Length	ro	UINT	0007_{hex}
16	Consumed Connection Path	ro	EPATH	20 04 25 nn nn 30 03_{hex}
17	Production Inhibit Time	ro	UINT	0000_{hex} Minimum time between two instances of data
18	Connection Timeout Multiplier	ro/rw	UINT	0000_{hex}

Bit-Strobe I/O Connection

Bit-strobe I/O connections are connections between a DeviceNet client and an unspecified number of servers. When using this type of connection, the client broadcasts a command requiring a response from the servers.

Table 9: Instance 3: Bit-strobe I/O connection

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
1	State	ro	USINT	Connection status. 0: Non existent 1: Configuring 2: Waiting for connection ID 3: Established 4: Time out 5: Deferred
2	Instance Type	ro	USINT	0001_{hex} (I/O Connection)
3	Transport Class Trigger	ro	Byte	Type of connection: 82h: Transport Class & Trigger Server, Cyclic, Class 2
4	Produced Connection ID	ro	UINT	–
5	Consumed Connection ID	ro	UINT	–
6	Initial Communication Characteristics	ro	Byte	Produced using message group 1 and consumed using message group 2
7	Produced Connection Size	ro	UINT	The maximum number of bytes that will be sent (8 bytes)
8	Consumed Connection Size	ro	UINT	0008_{hex}
9	Expected Packet Rate	ro/rw	UINT	–
12	Watchdog Timeout Action	ro/rw	USINT	0000_{hex} (Transition to the timed out state)
13	Produced Connection Path Length	ro	UINT	0007_{hex}
14	Produced Connection Path	ro	EPATH	20 04 25 nn nn 30 03_{hex}
15	Consumed Connection Path Length	ro	UINT	0000_{hex}
16	Consumed Connection Path	ro	EPATH	20 04 25 nn nn 30 03_{hex}
17	Production Inhibit Time	ro	UINT	0000_{hex}
18	Connection Timeout Multiplier	ro/rw	UINT	0000_{hex}

COS/Cyclic I/O Connection

COS (change of state) connections are used to establish event-controlled connections. In other words, when using a connection of this type, the DeviceNet devices will automatically generate messages as soon as there is a change of state. Meanwhile, in cyclic I/O connections, messages will be triggered at a specific interval based on a timer.

Table 10: Instance 4: COS/Cyclic I/O connection

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
1	State	ro	USINT	Connection status. 0: Non existent 1: Configuring 2: Waiting for connection ID 3: Established 4: Time out 5: Deferred
2	Instance Type	ro	USINT	0001_{hex} (I/O Connection)
3	Transport Class Trigger	ro	Byte	Type of connection: 00_{hex} client, cyclic, class 0 (no acknowledge) 10_{hex} Client, COS, Class 0 (No Acknowledge) 02 Client, Cyclic, Class 2 (Acknowledge) 12_{hex} Client, COS, Class 2 (Acknowledge)
4	Produced Connection ID	ro	UINT	CAN ID
5	Consumed Connection ID	ro	UINT	$FFFF_{hex}$ Not acknowledged Other CAN ID for reception (Acknowledge)
6	Initial Communication Characteristics	ro	Byte	$0F_{hex}$ is produced using message group 1 (no acknowledge) 01_{hex} is produced using message group 1 Consumed using message group 2 (acknowledge)
7	Produced Connection Size	ro	UINT	The maximum number of bytes that will be sent (8 bytes)
8	Consumed Connection Size	ro	UINT	0008_{hex}
9	Expected Packet Rate	ro/rw	UINT	–
12	Watchdog Timeout Action	ro/rw	USINT	0000_{hex} (transition to the timed out state)
13	Produced Connection Path Length	ro	UINT	0007_{hex}
14	Produced Connection Path	ro	EPATH	20 04 25 nn nn 30 03_{hex}
15	Consumed Connection Path Length	ro	UINT	0000_{hex} (No Acknowledge) 0005_{hex} (Acknowledge)

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
16	Consumed Connection Path	ro	EPATH	No Value (No. Acknowledge) 20 2B 01 00_{hex} (Acknowledge)
17	Production Inhibit Time	ro	UINT	0000_{hex}
18	Connection Timeout Multiplier	ro/rw	UINT	0000_{hex}

4.6.4.1 Acknowledge Handler Object ($2B_{hex}$)

The Acknowledge Handler Object (Class Code $2B_{hex}$) can be used to communicate with an application object within the device.

Class Attributes

Attribute Id	Attribute name	Access right ro | rw	Data type	Value	Description
1	Revision	ro	UINT	0001h	Revision

Instance attributes

Attribute Id	Attribute name	Access right ro | rw	Data type	Value	Description
1	Acknowledged Timer	ro/rw	UINT	16 ms	Waiting time in milliseconds
2	Retry Limit	ro/rw	USINT	01h	Number of acknowledged timeout errors
3	Producing Connection Instance	ro	UINT	04h	Connection instance ID

4.6.4.2 Parameter Object ($0F_{hex}$)

The Parameter Object (Class Code $0F_{hex}$) serves as a DeviceNet interface to the DA1 variable frequency drive's configuration data and parameters. It contains an instance for each parameter, with the instance being linked to the parameter to be configured.

Class Attributes

Attribute Id	Attribute name	Access right ro | rw	Data type	Value	Description
1	Revision	ro	UINT	0001h	Revision
2	Maximal Instance	ro	UINT		Maximum number of object instances
8	Parameter Class Descriptor	ro	WORD	Default: 0000 0000 0000 01011b Bit:Contents: 0 Supports parameter instances 1 Supports full attributes 2 Must do non-volatile storage save command 3 Parameters are stored in non-volatile storage	
9	Configuration Assembly Instance	ro	UINT	0000_{hex}	Is not supported

Instance attributes

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
1	Parameter Value	ro/rw	Defined using attributes 4, 5, 6.	Parameter value It will only be possible to read this attribute if bit 4 is set to TRUE.
2	Link Path Size	ro	USINT	0007_{hex}
3	Link Path	ro	Packed EPATH	
4	Descriptor	ro	WORD	
5	Data Type	ro	EPATH	
6	Data Size	ro	USINT	
7	Parameter Name String	ro	SHORT_STRING	
8	Units String	ro	SHORT_STRING	not supported

Attribute Id	Attribute name	Access right ro | rw	Data type	Description
9	Help String	ro	SHORT_STRING	not supported
10	Minimum Value	ro		Minimum parameter value
11	Maximum Value	ro		Maximum parameter value
12	Default Value	ro		Default settings
13	Scaling Multiplier	ro	UINT	0001_{hex} (not supported in this case)
14	Scaling Divisor	ro	UINT	0001_{hex} (not supported in this case)
15	Scaling Base	ro	UINT	0001_{hex} (not supported in this case)
16	Scaling Offset	ro	INT	0000h (not supported in this case)
17	Multiplier Link	ro	UINT	0000_{hex} (not supported in this case)
18	Divisor Link	ro	UINT	0000_{hex} (not supported in this case)
19	Base Link	ro	UINT	0000_{hex} (not supported in this case)
20	Offset Link	ro	UINT	0000_{hex} (not supported in this case)
21	Decimal precision	ro	USINT	0000_{hex} (not supported in this case)

4.7 Operation

4.7.1 Cyclic data

Process data field

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

The length of each data unit is 1 word.

Description of data content

Byte	Meaning	Explanation
CW	Control word	Command
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

Command

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 run-down
4	Not used	
5	No action	Quick stop (ramp)
6	No action	Fixed frequency 1 (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	

Setpoint value

The permissible values fall within a range of P1-02 (minimum frequency) to P1-01 (maximum frequency). This value will be 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 modified during operation:

Value	Description	DS
Field bus module PDI-3 input	0 = Torque limit / reference 1 = User PID reference register 2 = User register 3	0

Process data input 4 (PDI 4)

Configured with parameter P5-13.

The following settings can also be modified during operation:

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

Status word

The status word (consisting of any error messages and the device status) provides information regarding the device status and any error messages.

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 for operation (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 input
5	–	Zero speed
6	Speed control deactivated	Speed control activated
7	Not used	Not used

Error messages

Failure code [hex]	Value shown on display	Meaning
00	no-F it	Stop, ready for operation
01	OI -b	Braking chopper overcurrent
02	OL -br	Braking resistance overload
03	O-I	• Overcurrent at variable frequency drive output • Motor overload • Overtemperature on variable frequency drive (heat sink)
04	I.t-trP	Motor, thermal overload
05	SAFE - 1	Short-circuit at safety circuit input
06	O Volts	Overvoltage (DC link)
07	U-volts	Undervoltage (DC link)
08	O-t	Overtemperature (heat sink)
09	U-t	Undertemperature (heat sink)
0A	P-dEF	Default settings, parameters have been loaded
0B	E-tr iP	External error message
0C	SC-Obs	Error, OP bus
0D	FLt-dc	Excessively large voltage waves in DC link
0E	P-LOSS	Phase failure (mains side)
0F	h O-I	Overcurrent at variable frequency drive output
10	th-Flt	Thermistor fault, built-in (heat sink)
11	dAtA-F	EEPROM checksum fault
12	4-20F	Analog input: • out-of-range value • Wire breakage (4 mA monitoring)
13	dAtA- E	Error in internal memory
14	U-dEF	User-definable factory parameters have been loaded
15	F-Ptc	Excessive overtemperature, motor PTC
16	FAn-F	Fault, internal fan
17	O-hEAt	Excessively high ambient air temperature
18	O-tor9	Maximum torque limit exceeded
19	U-tor9	Output torque too low
1A	Out-F	Fault at variable frequency drive output
1D	SAFE-2	Short-circuit at safety circuit input
1D	Enc-01	Encoder, communication lost
1F	Enc-02	Encoder, speed error
20	Enc-03	Encoder, wrong PPRs set
21	Enc-04	Encoder, channel A fault
22	Enc-05	Encoder, channel B fault
23	Enc-06	Encoder, channel A and B fault
24	Enc-07	Encoder, RS485 data channel error

Failure code [hex]	Value shown on display	Meaning
25	Enc-08	Encoder, I/O communications loss
26	Enc-09	Encoder, incorrect type
27	Enc-10	Encoder
28	AtF-01	Motor stator resistance fluctuating between phases
29	AtF-02	The motor's stator resistance is too high
2B	AtF-03	Motor inductance too low
2B	AtF-04	Motor inductance too high
2C	AtF-05	The motor parameters do not match the motor
32	SC-F01	Fault: Modbus communication loss error
33	SC-F02	Fault: CANopen communication loss error
34	SC-F03	Communications with field bus module disconnected
35	SC-F04	Loss of communications (I/O cards)
3C	OF-01	Connection to add-on card lost
3D	OF-02	Add-on card in unknown state
46	PLC-01	Unsupported PLC function
47	PLC-02	PLC program too big
48	PLC-03	Division by 0
49	PLC-04	Lower limit value is higher than upper limit value

Actual value

The variable frequency drive's actual value falls within a value range of 0 to P1-01 (maximum frequency). This value will be 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 modified 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 modified 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

4.8 Parameter

The abbreviations used in the parameter lists below 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: ro = read only rw = read and write (read and write)
Value	Setting of the parameter
DS	Default setting: (P1.1 = 1) base parameter

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

Manual

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

PC Software

PNU	Description	Value	Range	Default	Visible
①	③	②		④	

Figure 17:How the parameters are shown in the manual and in the software

PNU	ID	Access right RUN	Access right ro | rw	Designation	Value range	DS	Value that must be configured
P1-12	112	–	rw	Control level	0 = Control signal terminals (I/O) 1 = Keypad (KEYPAD FWD) 2 = Keypad (KEYPAD FWD/REV) 3 = PID control 4 = field bus system (PROFINET-2, Modbus RTU, etc.) 5 = Slave mode 6 = field bus CANopen	0	4

The Baud rate will automatically be set to match the master.

4.8.0.1 Acyclic Parameters

The module can be used to read and program parameters.

Access to the DA1 variable frequency drive's acyclic data is provided by object class A2h. The relevant ADI number can be found in → Table 11.

4.8.1 List of parameters

Table 11: Parameter Data

ADI - order	Description		Access right	ADI instance number	ADI object class
9	Variable frequency drive ID		ro	9	A2
10	Variable frequency drive part no.		ro	10	A2
11	Control section software		ro	11	A2
12	Control section checksum		ro	12	A2
13	Software power section		ro	13	A2
14	Power section checksum		ro	14	A2
15	Serial number 1		ro	15	A2
16	Serial number 2		ro	16	A2
17	Serial number 3		ro	17	A2
18	Serial number 4		ro	18	A2
21	P1-01	Maximum frequency / maximum speed	rw	101	A2
22	P1-02	Minimum frequency / minimum speed	rw	102	A2
23	P1-03	Acceleration time (acc1)	rw	103	A2
24	P1-04	Deceleration time (dec1)	rw	104	A2
25	P1-05	Stop Function	rw	105	A2
26	P1-06	Energy optimization	rw	106	A2
27	P1-07	Motor, rated operating voltage	rw	107	A2
28	P1-08	Motor, rated operational current	rw	108	A2
29	P1-09	Motor, rated frequency	rw	109	A2
30	P1-10	Motor, rated speed	rw	110	A2
31	P1-11	Output voltage at zero frequency	rw	111	A2
32	P1-12	Control level	rw	112	A2
33	P1-13	Digital input, function	rw	113	A2
34	P1-14	Parameter range access code (depends on P2-40 and P6-30)	rw	114	A2
46	P2-01	Fixed frequency FF1 / speed 1	rw	201	A2
47	P2-02	Fixed frequency FF2 / speed 2	rw	202	A2
48	P2-03	Fixed frequency FF3 / speed 3	rw	203	A2
49	P2-04	Fixed frequency FF4 / speed 4	rw	204	A2
50	P2-05	Fixed frequency FF5 / speed 5	rw	205	A2
51	P2-06	Fixed frequency FF6 / speed 6	rw	206	A2
52	P2-07	Fixed frequency FF7 / speed 7	rw	207	A2
53	P2-08	Fixed frequency FF8 / speed 8	rw	208	A2
54	P2-09	Frequency jump 1, bandwidth	rw	209	A2
55	P2-10	Frequency skip 1, center	rw	210	A2
56	P2-11	AO1 signal (Analog Output)	rw	211	A2
57	P2-12	AO1, signal range	rw	212	A2

ADI - order	Description		Access right	ADI instance number	ADI object class
58	P2-13	AO2 signal (Analog Output)	rw	213	A2
59	P2-14	AO2, signal range	rw	214	A2
60	P2-15	RO1 Signal (Relay 1 Output)	rw	215	A2
61	P2-16	AO1 / RO1 upper limit	rw	216	A2
62	P2-17	AO1 / RO1 lower limit	rw	217	A2
63	P2-18	RO2 Signal (Relay Output)	rw	218	A2
64	P2-19	AO2 / RO2 upper limit	rw	219	A2
65	P2-20	AO2 / RO2 lower limit	rw	220	A2
66	P2-21	Scaling factor for value	rw	221	A2
67	P2-22	Scaled display value	rw	222	A2
68	P2-23	Holding time for speed of zero	rw	223	A2
69	P2-24	Pulse frequency	rw	224	A2
70	P2-25	Quick stop deceleration ramp time	rw	225	A2
71	P2-26	Flying restart circuit	rw	226	A2
72	P2-27	Standby mode delay time	rw	227	A2
73	P2-28	Slave speed scaling	rw	228	A2
74	P2-29	Slave speed scaling factor	rw	229	A2
75	P2-30	AI1, Signal range	rw	230	A2
76	P2-31	AI1 scaling factor	rw	231	A2
77	P2-32	AI1 offset	rw	232	A2
78	P2-33	AI2, Signal range	rw	233	A2
79	P2-34	AI2, scaling factor	rw	234	A2
80	P2-35	AI2, Offset	rw	235	A2
81	P2-36	REAF, Start function with automatic restart, control signal terminals	rw	236	A2
82	P2-37	REAF, start function with automatic restart	rw	237	A2
83	P2-38	Response in the event of a power failure	rw	238	A2
84	P2-39	Parameter access lock	rw	239	A2
85	P2-40	Access codes - menu level 2	rw	240	A2
86	P3-01	PID controllers, P amplification	rw	301	A2
87	P3-02	PID controller, I time constant	rw	302	A2
88	P3-03	PID controller, D time constant	rw	303	A2
89	P3-04	PID controller, control deviation	rw	304	A2
90	P3-05	PID controller, setpoint source	rw	305	A2
91	P3-06	PID controller, digital reference value	rw	306	A2
92	P3-07	PID controller, actual value limiting, maximum	rw	307	A2
93	P3-08	PID controller, actual value limiting, minimum	rw	308	A2
94	P3-09	PID controller, actual value limiting	rw	309	A2

ADI - order	Description		Access right	ADI instance number	ADI object class
95	P3-10	PID controller, actual value (PV)	rw	310	A2
96	P3-11	Maximum PID error for enabling the ramps	rw	311	A2
97	P3-12	PID feedback display scaling factor	rw	312	A2
98	P3-13	PID feedback wake up level	rw	313	A2
99	P3-14	Reserved	-	314	A2
100	P3-15	Reserved	-	315	A2
101	P3-16	Reserved	-	316	A2
102	P3-17	Reserved	-	317	A2
103	P3-18	PID reset control	rw	318	A2
106	P4-01	Motor control mode selection	rw	401	A2
107	P4-02	Auto-tune enable	rw	402	A2
108	P4-03	Rotational speed controller P gain	rw	403	A2
109	P4-04	Speed controller integral time	rw	404	A2
110	P4-05	Motor Power Factor (cosφ)	rw	405	A2
111	P4-06	Torque setpoint/limit	rw	406	A2
112	P4-07	Maximum torque (motor)	rw	407	A2
113	P4-08	Minimum torque	rw	408	A2
114	P4-09	Maximum torque (generator)	rw	409	A2
115	P4-10	V/Hz characteristic curve modification voltage	rw	410	A2
116	P4-11	V/Hz characteristic curve modification frequency	rw	411	A2
126	P5-01	Inverter Slave Adress	rw	501	A2
127	P5-02	CANopen Baud rate	rw	502	A2
128	P5-03	Modbus RTU Baud rate	rw	503	A2
129	P5-04	Modbus RTU data format – Parity type	rw	504	A2
130	P5-05	Timeout at communications dropout	rw	505	A2
131	P5-06	Response in the event of a communications dropout	rw	506	A2
132	P5-07	Ramp via field bus	rw	507	A2
133	P5-08	Field bus module PDO-4 output	rw	508	A2
134	P5-09	reserved	-	509	A2
135	P5-10	reserved	-	510	A2
136	P5-11	reserved	-	511	A2
137	P5-12	Field bus module, PDO-3 output	rw	512	A2
138	P5-13	Field bus module, PDI-4 input	rw	513	A2
139	P5-14	Field bus module, PDI-3 input	rw	514	A2
146	P6-01	Firmware upgrade enable	rw	601	A2
147	P6-02	Auto temperature management	rw	602	A2
148	P6-03	Auto-reset waiting time	rw	603	A2
149	P6-04	Relay hysteresis band	rw	604	A2

ADI - order	Description		Access right	ADI instance number	ADI object class
150	P6-05	Enable incremental encoder feedback	rw	605	A2
151	P6-06	Incremental encoder scale	rw	606	A2
152	P6-07	Maximum speed error	rw	607	A2
153	P6-08	Input frequency at maximum speed	rw	608	A2
154	P6-09	Droop speed	rw	609	A2
155	P6-10	PLC function enable	rw	610	A2
156	P6-11	Speed holding time in the event of an enable signal	rw	611	A2
157	P6-12	Speed holding time in the event of a disable signal	rw	612	A2
158	P6-13	Motor brake opening time	rw	613	A2
159	P6-14	Motor brake engagement delay	rw	614	A2
160	P6-15	Minimum torque for brake opening	rw	615	A2
161	P6-16	Minimum torque time limit	rw	616	A2
162	P6-17	Maximum torque time limit	rw	617	A2
163	P6-18	Voltage for DC injection braking	rw	618	A2
164	P6-19	Brake resistor value	rw	619	A2
165	P6-20	Brake resistor power	rw	620	A2
166	P6-21	Braking chopper cycle in the event of excessively low temperature	rw	621	A2
167	P6-22	Reset fan run-time	rw	622	A2
168	P6-23	kWh meter reset	rw	623	A2
169	P6-24	Service interval	rw	624	A2
170	P6-25	Service interval reset	rw	625	A2
171	P6-26	AO1, scaling	rw	626	A2
172	P6-27	AO1, Offset	rw	627	A2
173	P6-28	Display index P0-80	rw	628	A2
174	P6-29	Save parameters as default	rw	629	A2
175	P6-30	Access code for menu level 3	rw	630	A2
176	P7-01	Motor stator resistance	rw	701	A2
177	P7-02	Rotor resistance	rw	702	A2
178	P7-03	Motor leakage inductance (d)	rw	703	A2
179	P7-04	Motor magnetizing current	rw	704	A2
180	P7-05	Motor leakage factor	rw	705	A2
181	P7-06	Motor leakage inductance (q)	rw	706	A2
182	P7-07	Advanced generator control	rw	707	A2
183	P7-08	Enable, motor parameter adaptation	rw	708	A2
184	P7-09	Overvoltage current limit	rw	709	A2
185	P7-10	Load inertia factor	rw	710	A2
186	P7-11	Minimum PWM pulse width	rw	711	A2

ADI - order	Description		Access right	ADI instance number	ADI object class
187	P7-12	Magnetizing time at the U/f method	rw	712	A2
188	P7-13	Rotational speed controller D gain	rw	713	A2
189	P7-14	Torque boost	rw	714	A2
190	P7-15	Maximum frequency limit for torque boost	rw	715	A2
191	P7-16	Enable, signal injection	rw	716	A2
192	P7-17	Signal injection level	rw	717	A2
196	P8-01	Second acceleration time (acc2)	rw	801	A2
197	P8-02	Transition frequency (acc1 - acc2)	rw	802	A2
198	P8-03	Third acceleration time (acc3)	rw	803	A2
199	P8-04	Transition frequency (acc2 - acc3)	rw	804	A2
200	P8-05	Fourth acceleration time (acc4)	rw	805	A2
201	P8-06	Transition frequency (acc3 - acc4)	rw	806	A2
202	P8-07	Fourth deceleration time (dec4)	rw	807	A2
203	P8-08	Transition frequency (dec3 - dec4)	rw	808	A2
204	P8-09	Third deceleration time (dec3)	rw	809	A2
205	P8-10	Transition frequency (dec2 - dec3)	rw	810	A2
206	P8-11	Second deceleration time (dec2)	rw	811	A2
207	P8-12	Transition frequency (dec1 - dec2)	rw	812	A2
208	P8-13	Ramp selection when there is a preset speed	rw	813	A2
216	P9-01	Control source - enable	rw	901	A2
217	P9-02	Control source - quick stop	rw	902	A2
218	P9-03	Control source - start signal 1 (FWD)	rw	903	A2
219	P9-04	Control source – start signal 2 (REV)	rw	904	A2
220	P9-05	Control source - Stay-put function	rw	905	A2
221	P9-06	Control source - enable (REV)	rw	906	A2
222	P9-07	Control source - reset	rw	907	A2
223	P9-08	Control source – external fault	rw	908	A2
224	P9-09	Control source - terminal control	rw	909	A2
225	P9-10	Source - Speed 1	rw	910	A2
226	P9-11	Source - speed 2	rw	911	A2
227	P9-12	Source - speed 3	rw	912	A2
228	P9-13	Source - speed 4	rw	913	A2
229	P9-14	Source - speed 5	rw	914	A2
230	P9-15	Source - speed 6	rw	915	A2
231	P9-16	Source - speed 7	rw	916	A2
232	P9-17	Source - speed 8	rw	917	A2
233	P9-18	Speed - input 0	rw	918	A2
234	P9-19	Speed - input 1	rw	919	A2

ADI - order	Description		Access right	ADI instance number	ADI object class
235	P9-20	Speed - input 2	rw	920	A2
236	P9-21	Fixed frequency 0	rw	921	A2
237	P9-22	Fixed frequency 1	rw	922	A2
238	P9-23	Fixed frequency 2	rw	923	A2
239	P9-24	Acceleration ramp input 0	rw	924	A2
240	P9-25	Acceleration ramp input 1	rw	925	A2
241	P9-26	Deceleration time input 0	rw	926	A2
242	P9-27	Deceleration time input 1	rw	927	A2
243	P9-28	Control source - Up-pushbutton	rw	928	A2
244	P9-29	Control source - Down-pushbutton	rw	929	A2
245	P9-30	FWD limit switch	rw	930	A2
246	P9-31	REV limit switch	rw	931	A2
247	P9-32	reserved	-	932	A2
248	P9-33	Source - analog output (AO) 1	rw	933	A2
249	P9-34	Source - analog output (AO) 2	rw	934	A2
250	P9-35	Control source - Relay 1	rw	935	A2
251	P9-36	Control source - Relay 2	rw	936	A2
252	P9-37	Control source - scaling	rw	937	A2
253	P9-38	Source - PID setpoint value	rw	938	A2
254	P9-39	Source - PID feedback	rw	939	A2
255	P9-40	Source - torque control reference	rw	940	A2
256	P9-41	Function choices - Relay output 3, 4, 5	rw	941	A2
266	DI 1 (Digital input 1)		ro	1001	A2
267	DI 2 (Digital input 2)		ro	1002	A2
268	DI 3 (Digital input 3)		ro	1003	A2
269	DI 4 (Digital input 4		ro	1004	A2
270	DI 5 (Digital input 5)		ro	1005	A2
271	DI 6 (Digital input 6)		ro	1006	A2
272	DI 7 (Digital input 7)		ro	1007	A2
273	DI 8 (Digital input 8)		ro	1008	A2
274	AO 1 (analog output 1)		ro	1009	A2
275	AO 2 (analog output 2)		ro	1010	A2
276	DO 1 (Digital output 1)		ro	1011	A2
277	DO 2 (Digital output 2)		ro	1012	A2
278	DO 3 (Digital output 3)		ro	1013	A2
279	DO 4 (Digital output 4)		ro	1014	A2
280	DO 5 (Digital output 5)		ro	1015	A2
282	User register 1		rw	1017	A2

ADI - order	Description	Access right	ADI instance number	ADI object class
283	User register 2	rw	1018	A2
284	User register 3	rw	1019	A2
285	User register 4	rw	1020	A2
286	User register 5	rw	1021	A2
287	User register 6	rw	1022	A2
288	User register 7	rw	1023	A2
289	User register 8	rw	1024	A2
290	User register 9	rw	1025	A2
291	User register 10	rw	1026	A2
292	User register 11	rw	1027	A2
293	User register 12	rw	1028	A2
294	User register 13	rw	1029	A2
295	User register 14	rw	1030	A2
296	User register 15	rw	1031	A2
297	User AO 1 (analog output 1)	rw	1032	A2
298	User AO 2 (analog output 2)	rw	1033	A2
301	User RO 1 (relay output 1)	rw	1036	A2
302	User RO 2 (relay output 2)	rw	1037	A2
303	User RO 3 (relay output 3)	rw	1038	A2
304	User RO 4 (relay output 4)	rw	1039	A2
305	User RO 5 (relay output 5)	rw	1040	A2
306	User, scaling value	rw	1041	A2
307	User, decimal scaling	rw	1042	A2
308	User, speed reference	rw	1043	A2
309	User, torque deference	rw	1044	A2
310	Field bus / User ramp	rw	1045	A2
311	Scope index 1 / 2	rw	1046	A2
312	Scope index 3 / 4	rw	1047	A2
313	24hour timer	rw	1048	A2
314	User display Ctrl	rw	1049	A2
315	User display value	rw	1050	A2
326	AI 1 (analog input 1) (Q12)	ro	1061	A2
327	AI 1 (analog input 1) (%)	ro	1062	A2
328	AI 2 (analog input 2) (Q12)	ro	1063	A2
329	AI 2 (analog input 2) (%)	ro	1064	A2
330	DI (Digital input) Status	ro	1065	A2
331	Speed reference	ro	1066	A2
332	Value, digital potentiometer	ro	1067	A2

ADI - order	Description	Access right	ADI instance number	ADI object class
333	Field bus speed reference	ro	1068	A2
334	Master speed reference	ro	1069	A2
335	Slave speed reference	ro	1070	A2
336	Frequency on speed reference input	ro	1071	A2
337	Torque reference (Q12)	ro	1072	A2
338	Torque reference (%)	ro	1073	A2
339	Master torque reference (Q12)	ro	1074	A2
340	Field bus torque reference (Q12)	ro	1075	A2
341	PID user reference (Q12)	ro	1076	A2
342	PID user return value (Q12)	ro	1077	A2
343	PID controller reference (Q12)	ro	1078	A2
344	PID controller feedback value (Q12)	ro	1079	A2
345	PID controller output (Q12)	ro	1080	A2
346	Motor, velocity	ro	1081	A2
347	Motor, current	ro	1082	A2
348	Motor, torque	ro	1083	A2
349	Motor, power	ro	1084	A2
350	PID controller starting speed	ro	1085	A2
351	DC voltage	ro	1086	A2
352	Unit Temperature	ro	1087	A2
353	PCB controle temperature	ro	1088	A2
354	Drive scaling value 1	ro	1089	A2
355	Drive scaling value 2	ro	1090	A2
356	Motor, torque (%)	ro	1091	A2
358	Expansion, IO input status	ro	1093	A2
361	ID, Plug-in module	ro	1096	A2
362	ID, field bus boards	ro	1097	A2
366	Scope channel 1 data	ro	1101	A2
367	Scope channel 2 data	ro	1102	A2
368	Scope channel 3 data	ro	1103	A2
369	Scope channel 4 data	ro	1104	A2
370	OLED language number	ro	1105	A2
371	OLED version	ro	1106	A2
372	power section	ro	1107	A2
393	Service time	ro	1128	A2
394	Fan speed	ro	1129	A2
395	User kWh meter	ro	1130	A2
396	User, MWh meter	ro	1131	A2

ADI - order	Description	Access right	ADI instance number	ADI object class
397	Complete, KWh meter	ro	1132	A2
398	Complete, MWh meter	ro	1133	A2
399	Total, operating hours meter	ro	1134	A2
400	Total, operating minutes/seconds meter	ro	1135	A2
401	User, hours-run meter	ro	1136	A2
402	User, operating minutes/seconds meter	ro	1137	A2

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