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Trade names

DeviceNet™ is a registered trademark of the ODVA.

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1. General information

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1. General information

1.1 Documentation

This documentation describes how to connect the field bus to the CMMP motor controller in a DeviceNet network. It describes how to activate the DeviceNet and explains the user protocol FHPP of the DeviceNet. For a detailed description of the FHPP parameters please refer to the FHPP documentation.

This manual is intended for people who are already familiar with this motor controller series and the DeviceNet protocol. The documentation contains safety instructions which must be observed.

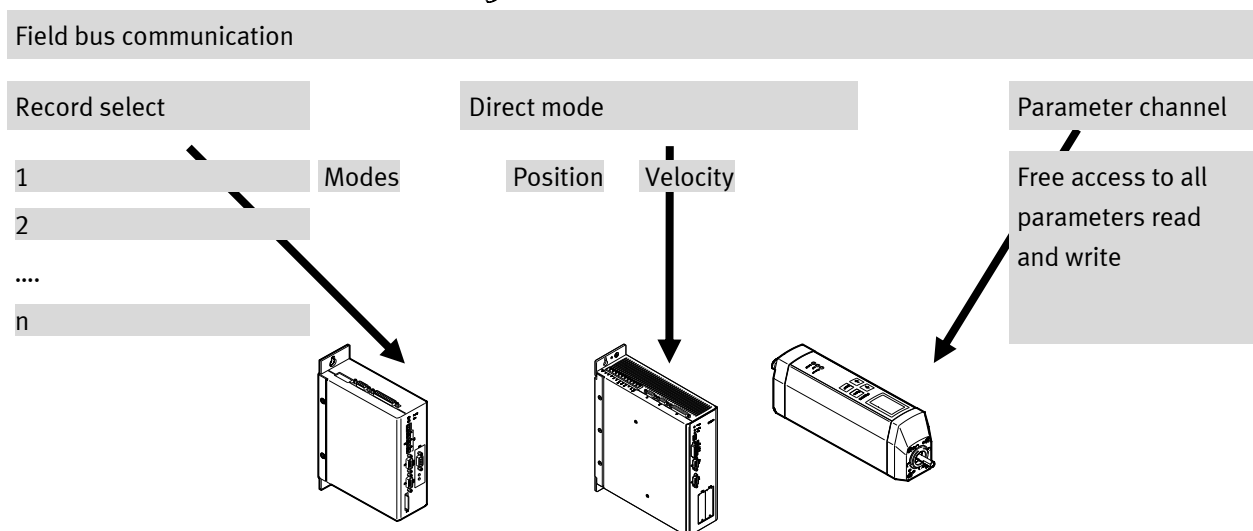
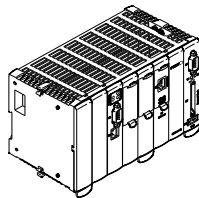
1.2 Festo Profile for Handling and Positioning (FHPP)

Festo has developed an optimised data profile, the "Festo Handling and Positioning Profile (FHPP)", tailored to the target applications for handling and positioning tasks.

The FHPP enables uniform control and programming for the various field bus systems and controllers from Festo.

In addition it defines the following for the user:

- the operating modes
- the I/O data structure
- the parameter objects
- the sequence control.

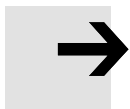


Tab. 1.1: The FHPP principle

1.3 Data exchange in the DeviceNet

DeviceNet has been developed by Rockwell Automation and the ODVA (Open DeviceNet Vendor Association) as an open field bus standard, based on the CAN protocol. DeviceNet belongs to the CIP-based networks. CIP (Common Industrial Protocol) forms the user interface of DeviceNet and defines the exchange of:

- explicit messages with low priority, e.g. for configuration or diagnosis
- I/O messages, e.g. time-critical processing data.



Note

The Open DeviceNet Vendor Association (ODVA) is the user organisation for DeviceNet. Publications on the DeviceNet/ CIP specification can be found under:

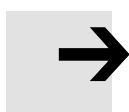
- ODVA (Open DeviceNet Vendor Association)
<http://www.odva.org>
- CI (ControlNet International) <http://www.controlnet.org>.

2. Safety instructions for electric drives and controllers

2.1 Icons used



Information
Important information



Note
Important instructions



Caution
Considerable damage to property may occur if these instructions are not observed.



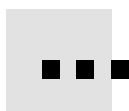
Warning
Considerable damage to property and injury to human beings may occur if these instructions are not observed.



Warning
DANGER!
Considerable damage to property and injury to human beings may occur if these instructions are not observed.



Warning
Dangerous voltage
The safety instructions contain reference to dangerous voltages which may occur.



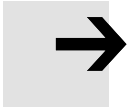
Accessories



Environment

2.2 General instructions

Festo AG & Co. KG is not liable for damage caused by failure to observe the warning instructions in these operating instructions.

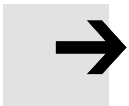


Note

- Before commissioning you must read the Safety instructions for electric drives and controllers as from page 9 and the chapter 2, “Safety instructions for electric drives and controllers”.

If the documentation is not clearly understood in this language version, please inform the supplier.

The faultless and reliable operation of the motor controller depends on its correct transport, storage, mounting and installation as well as on careful operation and maintenance.



Note

Only trained and qualified personnel should be allowed to handle the electric systems.

Trained and qualified personnel

For the purpose of this manual and the warning instructions on the product itself, technicians working with this product must be adequately familiar with the setting up, mounting, commissioning and operation of the product as well as with all warnings and precautionary measures in accordance with the operating instructions in this product manual, and must be sufficiently qualified for this task:

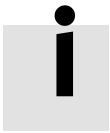
- Training and instructions on or authorization to switch on and switch off devices/ systems in accordance with technical safety standards, and to earth and mark them appropriately in accordance with the application requirements.
- Training or instructions in using and maintaining suitable safety equipment in accordance with technical safety standards.
- Training in first aid.

The following instructions must be read before the first commissioning of the system in order that bodily injuries and/or damage to property can be avoided.

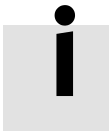


- These safety instructions must be observed at all times.

2. Safety instructions for electric drives and controllers



- Do not try to install or commission the motor controller before you have carefully read through all safety instructions for electric drives and controllers in this documentation. You must read through these safety instructions and all other user instructions before working with the motor controller.



If you do not have any user instructions for the motor controller, please contact your relevant sales representative.

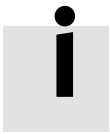
- Request that the operating instructions are sent immediately to the responsible person, in order that the motor controller can be operated correctly and safely.



- These safety instructions must also be provided if the motor controller is sold, lent and/or passed on to third parties.



For safety and guarantee reasons it is not permitted for the motor controller to be opened by the user.



The prerequisite for faultless functioning of the motor controller is skilled project planning.



Warning

DANGER!

Incorrect handling of the motor controller and failure to observe the specified warning instructions, as well as unskilled interference with the safety devices can lead to damage to property, bodily injury, electric shock or in extreme cases to death.

2.3 Dangers due to incorrect use



Warning

DANGER!

High electric voltage and high working current.

Danger of death or serious bodily injury due to electric shock!

2. Safety instructions for electric drives and controllers



Warning

DANGER!

High electric voltage due to incorrect connection.

Danger of death or bodily injury due to electric shock!



Warning

DANGER!

Surfaces of the device housing may be hot.

Danger of injury. Danger of burning.



Warning

DANGER!

Dangerous movements.

Danger of death, serious bodily injury or damage to property due to unintentional movement of the motors.

2.4 Safety instructions

2.4.1 General safety information



Warning

The motor controller complies with protection class IP20, as well as with contamination class 1.

- Ensure that the working environment also complies with this protection/contamination class.



Warning

- Use only accessories and spare parts which are approved of by the manufacturer.



Warning

- The motor controllers must be connected to the mains network in accordance with EN standards and appropriate national regulations, so that they can be disconnected with suitable uncoupling devices (e.g. main switch, fuse, circuit breaker).



The motor controller can be fused with a 300 mA all-current sensitive FI protective switch (RCD = Residual Current Protective Device).

2. Safety instructions for electric drives and controllers



Warning

- For switching the control contacts you should use gold-plated contacts or high-pressure contacts.



- Precautionary measures must be taken for preventing interference to switching systems, e.g. switching protective switches and relays with RC elements or diodes.



- You must observe the safety regulations and directives of the country in which the device is to be used.



Warning

- The environmental conditions specified in the product documentation must be observed. Safety-critical applications are not permitted if they are not explicitly approved of by the manufacturer.



Warning

- The technical specifications as well as the connection and installation conditions for the motor controller can be found in this product manual. These specifications must be observed at all times.



Warning

DANGER!

- The general installation and safety regulations for working on high-current systems (e.g. DIN, VDE, EN, IEC or other national and international regulations) must be observed here. Failure to observe these regulations can lead to bodily injury, death or considerable damage to property.



The following precautionary measures also apply without claim to completeness:

VDE 0100	Regulations for setting up high-voltage systems up to 1000 volts
EN 60204-1	Electrical equipment for machines
EN 50178	Equipping high-voltage systems with electronic operating media

2. Safety instructions for electric drives and controllers

EN ISO 12100	Safety of machines – basic concepts, general guidelines
EN 1050	Safety of machines – guidelines for risk judgment
EN 1037	Safety of machines – avoiding unintentional starting
EN 954-1	Safety-relevant parts of controllers

2.4.2 Safety instructions for assembly and maintenance

For assembling and maintaining the system, the relevant DIN, VDE, EN and IEC regulations, as well as all national and local safety and accident prevention regulations must always be observed. The system manufacturer or the user is responsible for ensuring that these regulations are observed.



Warning

The operation, maintenance and/or commissioning of the motor controller may only be carried out by trained qualified personnel and with electrical appliances suited for this work.

Avoiding accidents, bodily injury and/or material damage



Warning

- Vertical axes must be additionally secured against falling or sliding down when the motor is switched off with e.g.
 - mechanical locking of the vertical axis,
 - external braking, safety catch or clamping devices or
 - sufficient weight compensation of the axis.



Warning

The series-supplied motor holding brake or an external motor-holding brake controlled by the drive controller alone is not suitable for protecting human beings.



Warning

Switch the electrical equipment free of voltage via the main switch and make sure that it cannot be switched on again. Wait until the intermediate circuit is discharged after

- maintenance work and repairs
- cleaning
- long periods out of use.

2. Safety instructions for electric drives and controllers



Warning

Before carrying out maintenance work, make sure that the power supply is switched off and locked and that the intermediate circuit is discharged.



Warning

The external or internal braking resistance is activated and can carry a dangerous intermediate circuit voltage for up to approx. 5 minute after the motor controller has been switched off. This can cause serious bodily injury or even death if it is touched.



Warning

- Proceed carefully with mounting. Make sure during mounting as well as later during the operation of the drive that no drilling shavings, metal dust or mounting parts (screws, nuts, pieces of wire) can fall into the motor controller.



- Make sure also that the external voltage supply of the controller (24 V) is switched off.



The intermediate circuit or the mains voltage must always be switched off before the 24 V controller supply is switched off.



Warning

- Other work in the vicinity of the machine must only be carried out when the AC or DC supply is switched off and locked. Switched-off final stage or switched-off controller enable are not suitable locking conditions. In the event of a fault, this could lead to unintentional movement of the drive.

Exceptions are drives with the safety function "Safe stop" as per EN 954-1 KAT 3.



Warning

- Carry out commissioning with a free-running motor, in order to avoid mechanical damage, e.g. due to incorrect direction of rotation.

2. Safety instructions for electric drives and controllers



Warning

Electronic devices are never fail-proof.

- The user is responsible for ensuring that his system is brought into a safe state if the electric device fails.



Warning

DANGER!

The servo drive controller and in particular the braking resistance, external or internal, can become very hot. This can cause serious burning if the devices are touched.

2.4.3 Protection against touching electric components

This section concerns only devices and drive components with voltages over 50 V. It is dangerous to touch components with voltages of more than 50 V, as this can cause an electric shock. When electric devices are operated, certain components in these devices are always under dangerous tension.



Warning

High electric voltage!

Danger of death or serious bodily injury due to electric shock!

For operation the relevant DIN, VDE, EN und IEC regulations, as well as all national and local safety and accident prevention regulations must always be observed. The system manufacturer or the user is responsible for ensuring that these regulations are observed.



Warning

- Before switching the device on, fit the covers and protective screens so that the device cannot be touched.

For devices which are to be fitted in a control cabinet, make sure that a housing is fitted so that the electric components cannot be touched.

Regulations BGVA3 must be observed.



Warning

- Always connect the protective earth conductor of the electrical equipment and the devices firmly to the supply network. Due to the integrated network filter the leakage current is greater than 3.5 mA.



Warning

- Note the minimum copper cross section for the protective conductor during the complete sequence in accordance with standard EN 60617.

2. Safety instructions for electric drives and controllers



Warning

- Before commissioning, also for brief measuring and test purposes, always connect the protective conductor to all electric devices or connect to an earth cable in accordance with the connection diagram.
Otherwise, high voltages may occur on the housing. These could cause an electric shock.



Warning

- Do not touch the electrical connection points of the components when the device is switched on.



Warning

- Before touching electric components with voltages over 50 V, disconnect the device from the mains or voltage source.
- Protect the device against being switched on again.



Warning

- During installation note the amount of intermediate circuit voltage, especially with regard to insulation and protective measures.

Make sure that the earthing, the cross section size of the conductor and the corresponding short-circuit protection are correct.



Warning

The device has an intermediate fast discharge circuit in accordance with EN 60204 section 6.2.4. In certain device constellations, particularly where several motor controllers are switched parallel in the intermediate circuit or with a non-connected braking resistance, the fast discharge may not have any effect. The motor controllers can stand under dangerous tension for up to 5 minutes after being switched off (capacitor residual charge).

2.4.4 Protection by low voltage (PELV) against electric shock

Voltages from 5 to 50 V on the connections and terminals of the motor controller are protective small voltages which can be touched without danger in accordance with the following standards:

- Standards
- International: IEC 60364-4-41
 - European countries in the EU: EN 50178/1998, section 5.2.8.1

2. Safety instructions for electric drives and controllers



Warning

DANGER!

High electric voltage due to incorrect connection.

Danger of bodily injury or death due to electric shock!

Devices, electrical components and cables may only be connected to connections and terminals from 0 to 50 V, providing they have a protective low voltage (PELV = Protective Extra Low Voltage).

Connect only voltages and current circuits which have reliable separation of dangerous voltages. Such separation is achieved e.g. with isolating transformers, reliable opto-couplers or battery operation separate from the mains network.

2.4.5 Protection from dangerous movements

Dangerous movements can be caused by incorrect control of connected motors. There are various causes:

- | | |
|--------|--|
| Causes | <ul style="list-style-type: none">- Unsafe or faulty circuitry or cabling- Faults in operating the components- Faults in the measured value and signal generators- Defective or non-EMC valid components- Faults in the software in the higher-order control system. |
|--------|--|

These faults can occur immediately after the device is switched on or after a certain period of operation.

The monitoring functions in the drive components exclude to a large extent the possibility of incorrect operation of the connected drives. With regard to the protection of human beings, especially the danger of bodily injury and/or material damage, one must not rely on these circumstances alone. Until the fitted monitoring functions become effective, you must reckon with at least one incorrect drive movement, the extent of which depends on the type of control and on the operating state.



Warning

DANGER!

Dangerous movements.

Danger of injury or death, serious bodily injury or material damage.

For the above-mentioned reasons, the protection of human beings must be ensured with the aid of monitoring systems or by measures which are of higher order than the system. These measures are foreseen depending on the specific features of a danger and fault analysis by the system manufacturer. The safety regulations applicable to the system must be observed here as well. Undesired movements of the machine or other incorrect functions can occur as a result of switching off, avoiding or failing to activate safety devices.

2.4.6 Protection against touching hot components



Warning

DANGER!

Surfaces of the device housing may be hot.

Danger of injury. Danger of burning.



Warning

Danger of burning.

- Do not touch the surface of the housing in the vicinity of hot sources.
- After switching devices off, leave them for 10 minutes to cool down before touching them.

If you touch hot parts of the device such as the housing which contains the heat sink and resistors, you may burn yourself.

2.4.7 Protection when handling and assembling

Handling and assembling certain components in an unsuitable manner can under circumstances cause injury.



Warning

DANGER!

Danger of injury as a result of incorrect handling.

Bodily injury due to squashing, shearing, cutting, pushing.

The following safety measures apply here:



Warning

- Observe the general regulations on setting up and safety when handling and assembling.
- Use suitable assembly and transport devices.
- Prevent clamping and squashing (of fingers).
- Use only suitable tools. If specified, use special tools.
- Use lifting devices and tools in a correct manner.
- If necessary, use suitable protective equipment (e.g. protective glasses, safety shoes, safety gloves).
- Do not stand under hanging loads.
- Wipe up spilt liquids on the floor to avoid slipping.

3. Assembly and installation

3.1 Assembly



Caution

The motor controller must be disconnected from all current carrying cables before an additional module is fitted. After switching off the operating voltage, you must wait 1 minute before the capacitors in the motor controller are fully discharged.



Caution

Make sure that measures for ESD protection are taken when handling the additional module.

Use a suitable screwdriver to remove the front cover over module shaft Ext1 or Ext2 of the motor controller. The additional module is now placed in the open module shaft so that the printed circuit board slides into the guides on the sides of the module shaft. Push the board in as far as possible. The front plate of the additional module is then screwed to the motor controller housing with a Philips screw. Make sure that the front plate fits flush with the front in order that it has conductive contact with the housing.

3.2 Installation

- 1 Pin 5: V+
- 2 Pin 4: CAN_H
- 3 Pin 3: Drain / Shield
- 4 Pin 2: CAN_L
- 5 Pin 1: V-
- 6 MNS LED

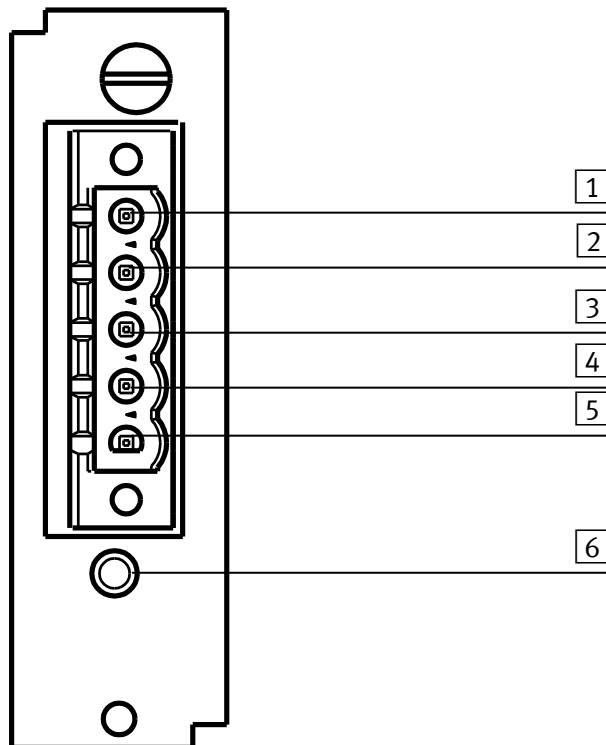


Fig. 3.1: DeviceNet module - pin assignment

3. Assembly and installation

On the CMMS-AS motor controllers the DeviceNet interface has been designed in the form of an optional additional module. An open connector with 5 connections is accessible on the front plate in accordance with the DeviceNet specification. A two-colour LED shows information about the device and the communication status. It has been designed as a combined module/network status (MSN) LED.

Next to the contacts CAN_L and CAN_H for the network connection, 24 V DC must be connected to V+ and V- in order to supply the den CAN transceiver.

The cable screening is connected with the contact Drain/Shield.

In order to connect the DeviceNet interface correctly with the network, refer to the very detailed "Planning and Installation Manual" on the ODVA homepage:

<http://www.odva.org>

The different types of network supply are represented in detail there.

For the best results we recommend that you use ready-made components.

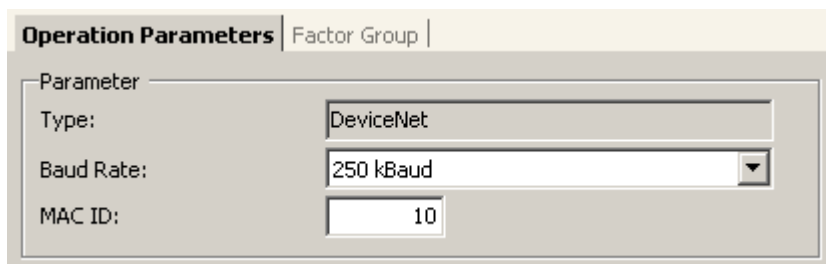
4. Activating and configuring DeviceNet

The inserted DeviceNet module will be recognized automatically when the motor controller is switched on.

A clear MAC-ID must be assigned to each device in the network.

4.1 Setting the MAC-ID

The MAC-ID is set in the FCT program in the window **Operation Parameters**:



Operation Parameters Factor Group	
Parameter	
Type:	DeviceNet
Baud Rate:	250 kBaud
MAC ID:	10

The baud rate and the MAC-ID are set in this window.



Note

If a MAC-ID greater than 63 is set, the MAC-ID 63 will be set automatically.

4.2 Setting the baud rate

The baud rate is also set in the FCT program in the window **Operation Parameters**.

The possible baud rate depends on the cable used, the cable length and the capability of the higher-order controller. If the DeviceNet is still active, the selected baud rate may differ from the baud rate actually used. The actual baud rate is therefore displayed in the commissioning tool.

When the MAC-ID and the baud rate have been set, the DeviceNet communication can be activated. Please note that the above mentioned parameters can only be modified when the protocol is deactivated. All parameters are only valid when the DeviceNet communication is deactivated and then re-activated.

Please note that the DeviceNet communication can only be activated when the parameter records have been saved and a Reset has been carried out.

5. Overview

5.1 Overview of DeviceNet

DeviceNet is a machine-orientated network which enables connections between simple industrial devices (sensors, actuators) and higher-order devices (controllers). DeviceNet is based on the CIP protocol (Common Industrial Protocol) and shares all common aspects of CIP with adaptations which enable the frame size of messages to be adapted to that of DeviceNet. Fig. 5.1 shows an example of a typical DeviceNet network.

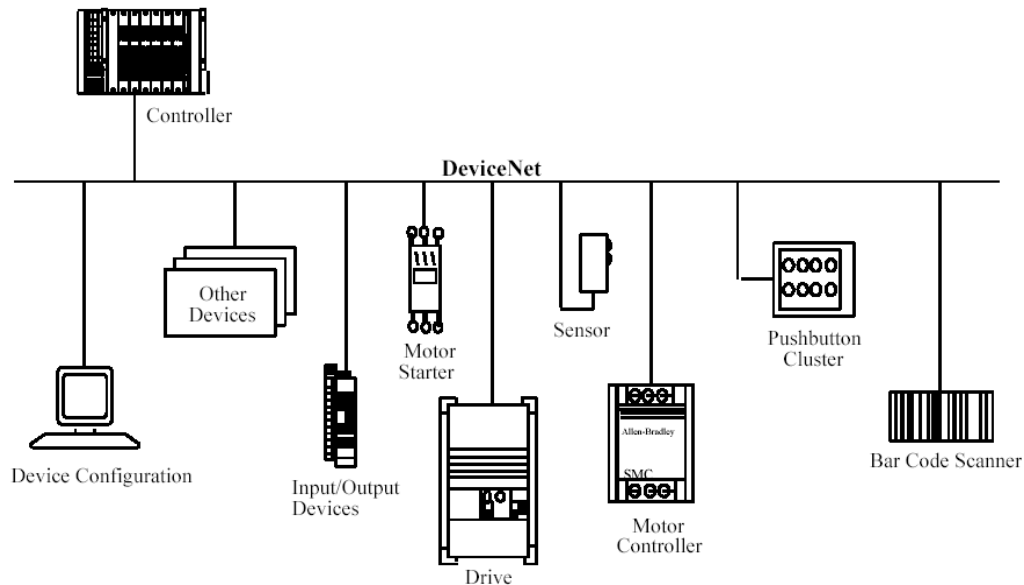


Fig. 5.1: DeviceNet network

DeviceNet offers:

- An economic solution for networks at the device level
- Access to information in devices at a lower level
- Possibility for master/slave and peer-to-peer

DeviceNet pursues two main aims:

- Transporting control-orientated information which is in connection with devices of the lower level (I/O connection).
- Transporting further information which is indirectly connected with the closed-loop system such as configuration parameters (Explicit Messaging Connection).

5.2 I/O connection

Some types of I/O connections are defined by DeviceNet™. At present only Poll Command / Response Message with 16 bytes input data and 16 bytes output data are supported. This means that the master periodically sends 16 bytes of data to the slave and the slave also replies with 16 bytes.

The meaning of the data is determined by the FHPP user protocol. Please refer to the FHPP manual for detailed information.

5.3 Explicit Messaging

The Explicit Messaging Protocol is used for transporting configuration data and for configuring a system. Explicit Messaging is also used for setting up an I/O connection. Explicit Messaging connections are always point-to-point connections. An end point sends a request, the other end point replies with an answer. The answer may be a success message or an error message.

Explicit messaging makes various services possible. The most common services are:

- opening the explicit messaging connection
- closing the explicit messaging connection
- get single attribute (read parameter)
- get single attribute (save parameter).

5.4 Electronic data sheet (EDS)

In order to make commissioning fast and simple, the abilities of the DeviceNet interface of the motor controller are described in an EDS file. By using a suitable configuration tool you can configure a device within a network. The EDS for DeviceNet is contained on the CD supplied with the product. The latest version can be downloaded from our home page (www.festo.com/fieldbus).

6. Configuration in the DeviceNet network

The way in which you configure your network depends on the configuration software used. Follow the instructions of the controller manufacturer for registering the EDS file of the motor controller.

7. Parameters

This chapter deals only with the implemented DeviceNet object model, i.e. how you can access the FHPP parameters via DeviceNet. For a detailed description of the FHPP parameters please refer to the FHPP manual.

The following data types in accordance with the DeviceNet specification are used:

Type	Signed	Unsigned
8 bits	SINT	USINT
16 bits	INT	UINT
32 bits	DINT	UDINT

Tab. 7.1: Data types

7.1 Device Data Object

This object supplies information on identifying a device.

	Name	Attribute	FHPP-PNU	Type
Version	Manufacturer hardware version	1	100,1	UINT
	Firmware version	2	101,1	UINT
	FHPP version	3	102,1	UINT
Identification	Project identifier	7	113,1	UDINT
	Serial number controller	8	114,1	UDINT
	Manufacturer device name	9	120,1	SHORT_STRING
	User device name	10	121,1	SHORT_STRING
	Drive manufacturer	11	122,1	SHORT_STRING
	http address manufacturer	12	123,1	SHORT_STRING
	Festo order number	13	124,1	SHORT_STRING
I/O Control + FCT Control	14	125,1	USINT	

Tab. 7.2: Device Data Object

7.2 Process Data Object

This object supplies demand and actual values for position, speed and torque. The digital inputs and outputs can also be controlled.

Assignment	Name	Attribute	FHPP-PNU	Type
Position	Position: Actual value	1	300,1	DINT
	Position: Setpoint	2	300,2	DINT
	Position: Actual deviation	3	300,3	DINT
Torque	Torque: Actual value	4	301,1	DINT
	Torque: Setpoint	5	301,2	DINT
	Torque: Actual deviation	6	301,3	DINT
Digital inputs/outputs	Digital Inputs: DIN 0 ... 7	10	303,1	USINT
	Digital Inputs: DIN 8 ... 11	11	303,2	USINT
	Digital Outputs: DOUT 0 ... 3	14	304,1	USINT
Speed	Velocity: Actual value	24	310,1	DINT
	Velocity: Demand value	25	310,2	DINT
	Velocity: Actual deviation	26	310,3	DINT
Record control	Demand record number	32	400,1	USINT
	Actual record number	33	400,2	USINT
	Record status byte	34	400,3	USINT
Operating time counter	Operating hour meter	35	305,3	UDINT

Tab. 7.3: Process Data Object

7.3 Project Data Object

This object supplies project information, i.e. common parameters for all devices of a machine.

Assignment	Name	Attribute	FHPP-PNU	Type
Various	Project zero point	1	500,1	DINT
	Negative position limit	2	501,1	DINT
	Positive position limit	3	501,2	DINT
	Max. speed	4	502,1	UDINT
	Max. acceleration	5	503,1	UDINT
	Max. jerkfree filter time	7	505,1	UDINT
	Teach target	20	520,1	USINT

Tab. 7.4: Project Data Object

7.4 Jog Mode Object

This object supplies information on the jog mode.

Assignment	Name	Attribute	FHPP-PNU	Type
Jog mode	Jog mode: Speed slow	30	530,1	DINT
	Jog mode: Speed fast	31	531,1	DINT
	Jog mode: Acceleration	32	532,1	UDINT
	Jog mode: Deceleration	33	533,1	UDINT
	Jog mode: Time for phase 1	33	534,1	UDINT

Tab. 7.5: Jog Mode Object

7.5 Direct Mode Position Object

This object supplies information on the project via the direct mode position control.

Assignment	Name	Attribute	FHPP-PNU	Type
Direct mode position	Direct mode pos: Base speed	40	540,1	DINT
	Direct mode pos: Acceleration	41	541,1	UDINT
	Direct mode pos: Deceleration	42	542,1	UDINT
	Direct mode pos: Jerk-free filter time	46	546,1	UDINT

Tab. 7.6: Direct Mode Position Object

7.6 Direct Mode Torque Object

This object supplies information on the project via the direct mode torque object.

Assignment	Name	Attribute	FHPP-PNU	Type
Direct mode torque	Direct mode torque Base torque ramp	32	550,1	UDINT
	Direct mode torque Force target window	34	552,1	UINT
	Direct mode torque Time window	35	553,1	UINT
	Direct mode torque speed limit	36	554,1	UDINT

Tab. 7.7: Direct Mode Torque Object

7.7 Direct Mode Speed Object

This object supplies information on the project via the direct mode speed control.

Assignment	Name	Attribute	FHPP-PNU	Type
Direct mode speed	Direct mode speed: Base speed ramp	60	560,1	UDINT
	Direct mode speed: Velocity window	61	561,1	UINT
	Direct mode speed: Velocity window time	62	562,1	UINT
	Direct mode speed: Velocity threshold	63	563,1	UINT
	Direct mode speed: Velocity threshold time	64	564,1	UINT
	Direct mode speed: Torque limit	65	565,1	UDINT

Tab. 7.8: Direct Mode Speed Object

7.8 Axis Parameter Object

This object supplies axis information, i.e. parameters for an individual device in a machine.

Assignment	Name	Attribute	FHPP-PNU	Type
Mechanical components	Polarity	1	1000,1	USINT
	Encoder resolution: Increments	2	1001,1	UDINT
	Encoder resolution: Motor revolutions	3	1001,2	UDINT
	Gear ratio: Motor revolutions	4	1002,1	UDINT
	Gear ratio: Shaft revolutions	5	1002,2	UDINT
	Feed constant: Feed	6	1003,1	UDINT
	Feed constant: Shaft revolutions	7	1003,2	UDINT
	Position factor: Numerator	8	1004,1	UDINT
	Position factor: Divisor	9	1004,2	UDINT
	Axis parameter: X2A gear numerator	11	1005,2	DINT
	Axis parameter: X2A gear divisor	12	1005,3	DINT
	Velocity encoder factor: Numerator	15	1006,1	UDINT
	Velocity encoder factor: Divisor	16	1006,2	UDINT
	Acceleration factor: Numerator	17	1007,1	UDINT
	Acceleration factor: Divisor	18	1007,2	UDINT

Tab. 7.9: Axis Parameter Object

7.9 Homing Object

This object supplies information on the project via the reference travel (homing).

Assignment	Name	Attribute	FHPP-PNU	Type
Homing	Offset axis zero point	20	1010,1	DINT
	Homing method	21	1011,1	SINT
	Homing: Speed (Search for switch)	22	1012,1	UDINT
	Homing: Speed (Search for zero)	23	1012,2	UDINT
	Homing: Acceleration	24	1013,1	UDINT
	Homing required	25	1014,1	USINT
	Homing max. torque	26	1015,1	USINT

Tab. 7.10: Homing Object

7.10 Controller Parameters Object

This object supplies information on the project via the controller.

Assignment	Name	Attribute	FHPP-PNU	Type
Controller parameters	Hold option code	30	1020,1	UINT
	Position window	32	1022,1	UDINT
	Position Window Time	33	1023,1	UINT
	Gain position controller	34	1024,18	UINT
	Gain speed controller	35	1024,19	UINT
	Time speed controller	36	1024,20	UINT
	Gain current controller	37	1024,21	UINT
	Time current controller "µs"	38	1024,22	UINT
	Save position	39	1024,32	UINT
	Festo serial number + motor serial number	44	1025,1	UDINT
	I ² t time motor	45	1025,3	UINT
	Power stage temperature	49	1026,1	UDINT
	Max, power stage temperature	50	1026,2	UDINT
	Nominal motor current	51	1026,3	UDINT
	Current limit (per mille nominal motor current)	52	1026,4	UDINT
	Controller serial number	55	1026,7	UDINT

Tab. 7.11: Controller Parameters Object

7.11 Electronic Identification Plate Object

This object supplies information on the project via the electronic type plate.

Assignment	Name	Attribute	FHPP-PNU	Type
Type plate data	Max. current	64	1034,1	UINT
	Motor rated current	65	1035,1	UDINT
	Motor rated torque	66	1036,1	UDINT
	Torque constant	67	1037,1	UDINT

Tab. 7.12: Electronic Identification Plate Object

7.12 Standstill Object

This object supplies information on the project via the standstill monitoring.

Assignment	Name	Attribute	FHPP-PNU	Type
Standstill monitoring	Position demand value	68	1040,1	DINT
	Position actual value	69	1041,1	DINT
	Following error window	70	1042,1	UDINT
	Following error timeout	71	1043,1	UINT

Tab. 7.13: Standstill Object

7.13 Fault Buffer Administration Parameters Object

This object supplies information on the project via the diagnostic memory.

Assignment	Name	Attribute	FHPP-PNU	Type
Fault	Error buffer: Incoming/outgoing error	1	204,1	USINT
	Error buffer: Resolution time stamp	2	204,2	USINT
	Error buffer: Number of entries	4	204,4	USINT
Warnings	Warning buffer: Incoming/outgoing warning	5	214,1	USINT
	Warning buffer: Resolution time stamp	6	214,2	USINT
	Warning buffer: Number of entries	8	214,4	USINT

Tab. 7.14: Fault Buffer Administration Parameters Object

7.14 Error Record List Object

This object represents the error memory. For each sub-Index (x) from 1 ... 32 an individual object group is available.

Assignment	Name	Attribute	FHPP-PNU	Type
Diagnostic memory	Diagnosis	1	200 x	USINT
	Error number	2	201 x	UINT
	Time stamp "s"	3	202 x	UDINT
	Additional information	4	203 x	UDINT

Tab. 7.15: Error Record List Object

7.15 Warning Record List Object

This object represents the warning memory. For each sub-Index (x) from 1 ... 32 an individual object group is available.

Assignment	Name	Attribute	FHPP-PNU	Type
Warning memory	Diagnosis	1	210 x	USINT
	Warning number	2	211 x	UINT
	Time stamp "s"	3	212 x	UDINT
	Additional information	4	213 x	UDINT

Tab. 7.16: Warning Record List Object

7.16 Record List Object

This object represents the data record list. Data records can be processed automatically and also linked to each other. For each sub-Index (x) from 1 ... 250 an individual object group is available.

Assignment	Name	Attribute	FHPP-PNU	Type
Record data	Record Control Byte1	1	401 x	USINT
	Record Control Byte2	2	402 x	USINT
	Setpoint	4	404 x	DINT
	Preselection value	5	405 x	DINT
	Velocity	6	406 x	UDINT
	Acceleration	7	407 x	UDINT
	Deceleration	8	408 x	UDINT
	Speed limit (in torque control)	12	412 x	UDINT
	Jerk-free filter time	13	413 x	UDINT
	Tolerance time	15	415 x	UDINT
	Following position "ms"	16	416 x	USINT

7. Parameters

Tab. 7.17: Record List Object

8. Module/network status LED

The combined module and network status LED supplies limited information on the device and the communication status.

LED is	Status	Shows:
Off	Device is not online	The device has not yet finished initialisation or has no power supply.
flashes green	Ready to operate and online, not connected or online and requires commissioning	The device works in a normal status and is online without connection
green	Ready to operate and online, connected	The device works in a normal status and is online with connections
flashes red-green	Communication failed and receives an Identify Comm Fault Request	The device has ascertained a network access error and is in the status "Communication Fault." The device has received and accepted an "Identify Communication Faulted Request." Normal behaviour during commissioning.
flashes red	Minor error or connection interrupted (Time-Out)	Correctable error and / or at least one I/O connection is in the Time Out status.
red	Critical error or critical connection error	The device has an error which cannot be corrected. The device has ascertained an error which makes communication in the network impossible (e.g. Bus Off, double MAC-ID).

Tab. 8.1: Status LED

9. DeviceNet error codes

The following faults can occur if the DeviceNet module is used:

Code	Name	Description	Activity
64-0	DeviceNet: Duplicate MAC-ID	The duplicate MAC-ID check has found two nodes with the same MAC-ID.	Change the MAC-ID of one of the nodes to a value which is not already used.
64-1	DeviceNet: Bus power lost	The DeviceNet module is not supplied with 24 V DC.	In addition to the motor controller the DeviceNet module must be connected to 24 V DC.
64-2	DeviceNet: RX queue overrun	Too many messages received within a short period.	Reduce the scan rate.
64-3	DeviceNet: TX queue overrun	Not sufficient free space on the CAN bus for sending messages.	Increase the baud rate, reduce the number of nodes or reduce the scan rate.
64-4	DeviceNet: I/O send error	Error in sending I/O data	Check that the network is connected correctly and has no faults.
64-5	DeviceNet: Bus Off	The CAN controller is BUS OFF	Check that the network is connected correctly and has no faults.
64-6	DeviceNet: CAN controller overrun	The CAN controller has an overrun.	Increase the baud rate, reduce the number of customer nodes or reduce the scan rate.
65-0	DeviceNet active, but no module	The DeviceNet communication is activated in the parameter set of the motor controller, but no module is available.	Deactivate the DeviceNet communication or connect a module.
65-1	DeviceNet: Timeout I/O connection	Interrupting an I/O connection	No I/O message received within the expected time.

Tab. 9.1: DeviceNet error codes

The following faults concern FHPP, but can also occur if the DeviceNet module is used: Please refer to the FHPP manual for detailed information.

Code	Name	Description	Activity
70-1	FHPP: Maths error	Overrun/underrun or division by zero during calculation of cyclic data.	Check the cyclic data and/or check the factor group.
70-2	FHPP: Factor Group invalid	Calculation of the factor group leads to invalid internal values.	Check the factor group.
70-3	FHPP: Operation mode change failure	Changing from the current to the desired operating mode is not permitted.	Check your application. It may be that not every change is permitted.

Tab. 9.2: FHPP error codes