SEW EURODRIVE

Manual

MOVIPRO® with EtherNet/IP™ or Modbus/TCP Fieldbus Interface

Edition 12/2016

16998413/EN

Table of contents

1 General information ... 8
1.1 About this documentation ... 8
1.2 Structure of the safety notes ... 8
1.2.1 Meaning of signal words ... 8
1.2.2 Structure of section-related safety notes ... 8
1.2.3 Structure of embedded safety notes ... 9
1.3 Rights to claim under limited warranty ... 10
1.4 Exclusion of liability ... 10
1.5 Other applicable documentation ... 10
1.6 Additional information ... 10
1.7 Product names and trademarks ... 10
1.8 Copyright notice ... 10

2 Safety notes ... 11
2.1 Preliminary information ... 11
2.2 Target group ... 11
2.3 Bus systems ... 11
2.4 Functional safety technology ... 12
2.5 Hoist applications ... 12

3 Introduction ... 13
3.1 Content of this documentation ... 13
3.2 Short designation in the documentation ... 13
3.3 Function overview of MOVIPRO® SDC and MOVIPRO® ADC ... 13
3.4 Application modules ... 15
3.4.1 Advantages of application modules ... 15
3.4.2 Scope of delivery and documentation ... 15
3.4.3 Engineering with MOVITOOLS® MotionStudio ... 16
3.5 Application modules for MOVIPRO® SDC ... 17
3.6 Application modules for MOVIPRO® ADC ... 17
3.6.1 MOVIPRO® ADC as parameterizable device (CCU) ... 17
3.6.2 MOVIPRO® ADC as programmable device (MOVI-PLC®) ... 20
3.7 Application modules of the power section "PFA-..." ... 20
3.7.1 "Bus positioning" IPOS$^{PLUS®}$ application module ... 21
3.7.2 "Extended positioning via bus" IPOS$^{PLUS®}$ application module ... 22
3.7.3 "Modulo positioning" IPOS$^{PLUS®}$ application module ... 23
3.7.4 "Automotive AMA0801" IPOS$^{PLUS®}$ application module ... 24

4 Startup ... 25
4.1 Startup procedure ... 25

5 Installation notes ... 26
5.1 Industrial Ethernet networks ... 26
5.1.1 TCP/IP addressing and subnetworks ... 26
5.1.2 Shielding and routing bus cables ... 28
5.2 Setting the IP address parameter on the device ... 29
5.2.1 Initial startup ... 29

16998413/EN – 12/2016

5.2.2 Changing the IP address parameters after successful initial startup 29
5.2.3 Deactivating/activating the DHCP 30
5.2.4 Address Editor from SEW-EURODRIVE 30
5.3 Connection to the Ethernet network 31
5.3.1 The integrated Ethernet switch 31
5.3.2 Device connection – Ethernet network 31

6 Configuration and startup of EtherNet/IP™ 39
6.1 Device description file for EtherNet/IP™ (EDS file) 39
6.2 Configuration of the EtherNet/IP™ master 39
6.2.1 Configuration with RSLogix 5000 up to version V19 40
6.2.2 Configuration with RSLogix 5000 as of version V20 43
6.3 Device Level Ring topology 46
6.3.1 Description 46
6.3.2 Ring fault detection 46
6.3.3 Rectifying ring faults 46
6.3.4 Hardware and software configuration 47
6.4 Requirements for fieldbus operation 47
6.5 Project planning examples 48
6.5.1 MOVIPRO® as positioning drive – configuring process data exchange 48
6.5.2 MOVIPRO® as speed-controlled drive – configuring process data exchange 50
6.5.3 Access to device parameters with RSLogix 5000 52

7 Ethernet Industrial Protocol (EtherNet/IP™) 71
7.1 Description 71
7.2 Process data exchange 71
7.3 Timeout response 72
7.4 CIP object directory 72
7.4.1 Identity object 73
7.4.2 Message router object 74
7.4.3 Assembly object 75
7.4.4 Register object 76
7.4.5 Parameter object 79
7.4.6 Vardata object 82
7.4.7 TCP/IP interface object 83
7.4.8 EtherNet link object 84
7.5 Return codes for parameterization via "explicit messages" 85
7.5.1 General error codes 87
7.5.2 MOVILINK®-specific return codes 88
7.5.3 Timeout response of "explicit messages" 89
7.6 Technical data of the EtherNet/IP™ interface 89

8 Configuration and startup of Modbus/TCP 90
8.1 Device description file for Modbus/TCP 90
8.2 Configuration of the Modbus/TCP master 90
8.2.1 Configuring hardware (control structure) 91
8.2.2 Setting Ethernet component 92

16998413/EN – 12/2016

8.2.3 Addressing drive via the "IO Scanning" function ... 93
8.3 Requirements for fieldbus operation ... 94
8.4 Project planning examples ... 94
8.4.1 Configuring process data exchange ... 94
8.4.2 Data exchange via Modbus/TCP ... 95

9 Modbus protocol (Modbus/TCP) ... 101
9.1 Description ... 101
9.1.1 Mapping and addressing ... 101
9.1.2 Services (function codes) ... 102
9.1.3 Accessing services ... 102
9.2 Protocol structure ... 103
9.2.1 Header ... 103
9.2.2 Service FC3 – Read holding registers ... 104
9.2.3 Service FC16 – Write multiple registers ... 105
9.2.4 Service FC23 – Read/write multiple registers ... 106
9.2.5 Service FC43 – Read device identifications ... 107
9.3 Connection management ... 108
9.3.1 Sending process output data (request controlling connection) ... 108
9.3.2 Closing a connection ... 109
9.3.3 Timeout response ... 109
9.4 Parameter access via Modbus/TCP ... 110
9.4.1 Procedure with FC16 and FC03 ... 110
9.4.2 Procedure with FC23 ... 110
9.4.3 Protocol structure ... 111
9.4.4 MOVILINK® parameter channel ... 111
9.5 Fault codes (exception codes) ... 113
9.6 Technical data, Modbus/TCP interface ... 114

10 Error diagnostics for operation on EtherNet/IP™ and Modbus/TCP ... 115
10.1 Checking the status LEDs of the device ... 115
10.2 Checking the status LED and the status display at the fieldbus master ... 116
10.3 Checking the fault sources ... 116
10.4 Fieldbus timeout ... 117

11 Process data description ... 118
11.1 General process sequence ... 118
11.2 Process sequence MOVIPRO® SDC ... 118
11.2.1 MOVIPRO® SDC control word ... 119
11.2.2 MOVIPRO® SDC status word ... 119
11.2.3 Digital inputs and outputs ... 120
11.2.4 Example: Delivery status ... 121
11.2.5 MOVIPRO® SDC drive functions ... 121
11.3 MOVIPRO® ADC process sequence ... 122
11.3.1 MOVIPRO® ADC control word ... 123
11.3.2 MOVIPRO® ADC status word ... 123
11.3.3 Data backup via PLC process data specification ... 125
11.3.4 Digital inputs and outputs ... 125

16998413/EN – 12/2016

11.3.5 Example: Delivery status ... 126
11.3.6 MOVIPRO® ADC CCU Application modules ... 127
11.4 Process image of MOVIPRO® ADC with R15 regenerative power supply ... 131
11.4.1 Regenerative power supply control word ... 131
11.4.2 Regenerative power supply status word ... 131
11.4.3 Configuring regenerative power supply ... 132
11.5 Process image of drive functions of the power section "PFA-..." ... 133
11.5.1 Speed-controlled drive ... 133
11.5.2 "Bus positioning" IPOS$^{PLUS®}$ application module ... 136
11.5.3 "Extended positioning via bus" IPOS$^{PLUS®}$ application module ... 137
11.5.4 "Modulo positioning" IPOS$^{PLUS®}$ application module ... 137
11.5.5 "Automotive AMA0801" IPOS$^{PLUS®}$ application module ... 138

12 Operation with the MOVITOOLS® MotionStudio engineering software ... 139
12.1 About MOVITOOLS® MotionStudio ... 139
12.1.1 Tasks ... 139
12.1.2 Communication channels ... 139
12.1.3 Functions ... 139
12.2 First steps ... 140
12.2.1 Starting the software and creating a project ... 140
12.2.2 Establishing communication and scanning the network ... 140
12.2.3 Connection mode ... 141
12.2.4 Configuring devices ... 143
12.3 Communication via Ethernet ... 144
12.3.1 Connecting the device with the PC via Ethernet ... 144
12.3.2 Establishing communication with the Address Editor ... 145
12.3.3 Configuring the communication channel via Ethernet ... 148
12.4 Executing functions with the units ... 152
12.4.1 Reading or changing unit parameters ... 152
12.4.2 Starting up units (online) ... 153

13 Parameter setting ... 154
13.1 PC/laptop connection ... 154
13.2 Configuring device – checklist ... 155
13.3 Parameterizing the power section "PFA-..." ... 156
13.3.1 Encoder startup ... 156
13.3.2 Startup the motor ... 169
13.3.3 Startup IPOS$^{PLUS®}$ application modules ... 173
13.4 Parameterizing the communication and control unit "PFH-..." ... 174
13.4.1 Factory installed gateway program ... 174
13.4.2 MOVIPRO® ADC as parameterizable device (CCU) ... 174
13.4.3 MOVIPRO® ADC as programmable device (MOVI-PLC®) ... 181
13.5 Storing device data ... 183
13.6 "PFA-..." power section parameter overview ... 185
13.7 Parameter descriptions ... 191
13.7.1 Parameter group 0: Display values ... 191
13.7.2 Parameter group 1: Setpoints / ramp generators ... 196

16998413/EN – 12/2016

13.7.3 Parameter group 2: Controller parameters 199
13.7.4 Parameter group 3: Motor parameters 202
13.7.5 Parameter group 5: Monitoring functions 209
13.7.6 Parameter group 6: Terminal assignment 215
13.7.7 Parameter group 7: Control functions 216
13.7.8 Parameter group 8: Device functions 222
13.7.9 Parameter group 9: IPOS parameters 231
13.8 Parameter overview of encoder option 241

14 Service 243
14.1 Device replacement 243
14.1.1 Prerequisites for successful device replacement 243
14.1.2 Replacing the device 243
14.1.3 SD memory card as spare part 245
14.2 Reference travel after device or encoder replacement 246
14.2.1 Incremental encoder 246
14.2.2 Absolute encoder 246
14.2.3 Linear encoder systems 246
14.2.4 HIPERFACE® encoders 246
14.3 Service unit 246
14.3.1 Ethernet service interface 247
14.4 List of power section errors 248

Index 268

16998413/EN – 12/2016

1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is written for all employees who assemble, install, start up, and service this product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

16998413/EN – 12/2016

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of suspended load
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

16998413/EN – 12/2016

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.4 Exclusion of liability

Read the information in this documentation, otherwise safe operation is impossible. You must comply with the information contained in this documentation to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, SEW-EURODRIVE assumes no liability for defects.

1.5 Other applicable documentation

This document supplements the operating instructions and limits the application notes according to the following information. Use this document only together with the operating instructions.

1.6 Additional information

For additional information, refer to the following documentation:

- "MOVIPRO® SDC Decentralized Drive and Position Controller" operating instructions
- "MOVIPRO® ADC Decentralized Drive and Application Controller" operating instructions
- "MOVITOOLS® MotionStudio" manual/online help
- "Application Configurator for CCU" manual
- "MOVI-PLC® Programming in the PLC Editor" system manual
- Manuals for application modules

1.7 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.8 Copyright notice

16998413/EN – 12/2016

2 Safety notes

2.1 Preliminary information

The following general safety notes have the purpose to avoid injury and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components also observe the relevant warning and safety notes.

2.2 Target group

Specialist for mechanical work

Any mechanical work may only be performed by adequately qualified personnel. Qualified personnel in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and maintenance of the product, who possess the following qualifications:

- Qualification in the field of mechanics according to applicable national regulation.
- They are familiar with this documentation

Specialist for electrotechnical work

Any electronic work may only be performed by adequately skilled persons (electrically). Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product who possess the following qualifications:

- Qualification in the field of electrical engineering according to applicable national regulation.
- They are familiar with this documentation

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives and laws specified in this documentation. The above mentioned persons must have the authorization expressly issued by the company to operate, program, configure, label and ground devices, systems and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is that the persons are capable of performing the required tasks and work steps in a safe and correct manner.

2.3 Bus systems

A bus system makes it possible to adapt electronic drive components to the particulars of the machinery within wide limits. There is a risk that a change of parameters that cannot be detected externally may result in unexpected (but not uncontrolled) system behavior and may have a negative impact on operational safety, system availability, or data security.

Especially in Ethernet-based networked systems and with engineering interfaces, make sure that unauthorized access is prevented.

Use IT-specific safety standards to increase access protection to the ports. For a port overview, refer to the respective technical data of the used device.

16998413/EN – 12/2016

2.4 Functional safety technology

The product must not perform any safety functions without a higher-level safety system, unless explicitly allowed by the documentation.

2.5 Hoist applications

To avoid danger of fatal injury by falling hoists, observe the following points when using the product in lifting applications:

- Use mechanical protection devices.
- Perform a hoist startup.

16998413/EN – 12/2016

3 Introduction

3.1 Content of this documentation

This documentation describes the operation of the following units on the fieldbus system EtherNet/IP™ or Modbus/TCP: MOVIPRO® SDC and MOVIPRO® ADC.

3.2 Short designation in the documentation

The following short designations are used in this documentation.

Type designation	Short designation
MOVIPRO® SDC and MOVIPRO® ADC	MOVIPRO®
Higher-level controller	PLC

3.3 Function overview of MOVIPRO® SDC and MOVIPRO® ADC

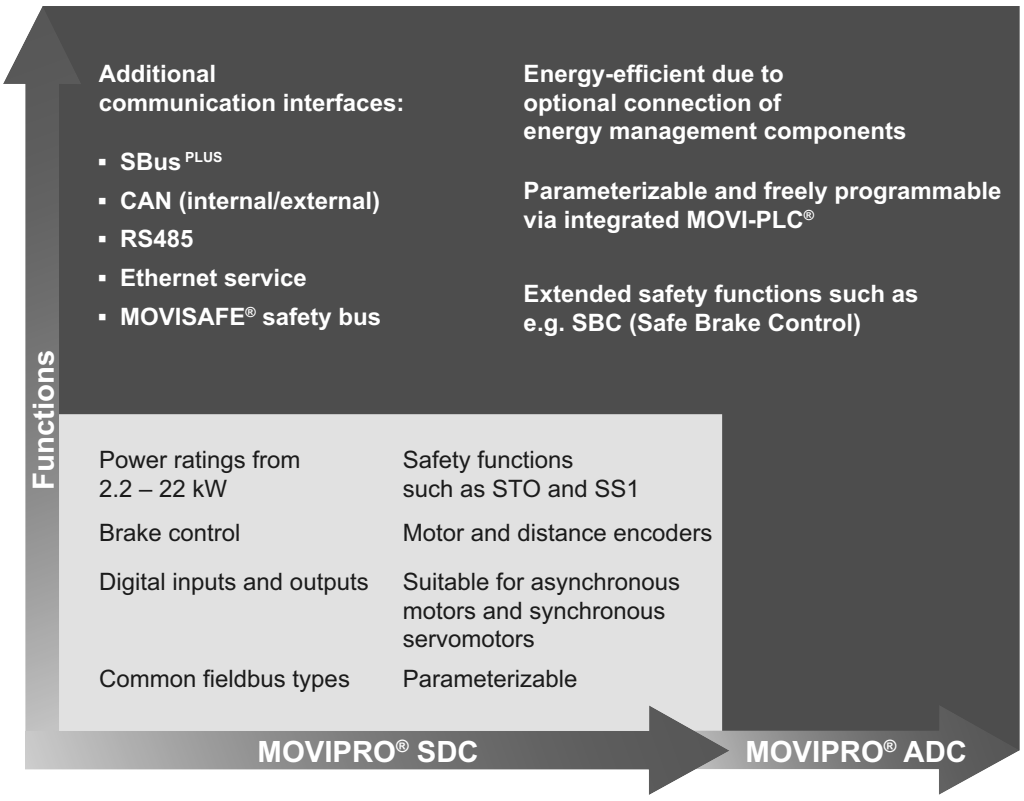
- The MOVIPRO® SDC standard inverter with positioning control is equipped with various basic functions for simple applications.

  MOVIPRO® SDC enables speed control and precise positioning via simple, free parameterization without programming and via standardized single-axis modules.
- The MOVIPRO® ADC application inverter includes these basic functions, but additionally offers even more specialized functions for more complex applications.

  Depending on the SD card type that is used, MOVIPRO® ADC can be used as a:
  - Parameterizable device (CCU)
  - Programmable device (MOVI-PLC®)

16998413/EN – 12/2016

The following figure shows an overview of the functions and options of MOVIPRO® SDC and MOVIPRO® ADC:



18014403449747467

16998413/EN – 12/2016

3.4 Application modules

In industry applications, an inverter must not only perform speed control but also control complex motion sequences and take over typical tasks of the **P**rogrammable **L**ogic **C**ontroller (PLC).

SEW-EURODRIVE offers various standardized control programs, so-called application modules, for "positioning" applications.

The application module has a user-friendly user interface to assist with parameterization. The user merely has to specify the parameters required for the application. The application module uses this information to create the control program, then loads it onto the inverter.

The device takes over the entire motion control. This means the application module takes load off the PLC.

3.4.1 Advantages of application modules

Application modules offer you the following advantages:

- A wide range of functions
- User-friendly user interface
- Only required parameters must be entered
- Guided parameter setting instead of complicated programming
- No programming experience required
- Quick training, therefore quick project planning and startup
- The entire motion control directly in the device

3.4.2 Scope of delivery and documentation

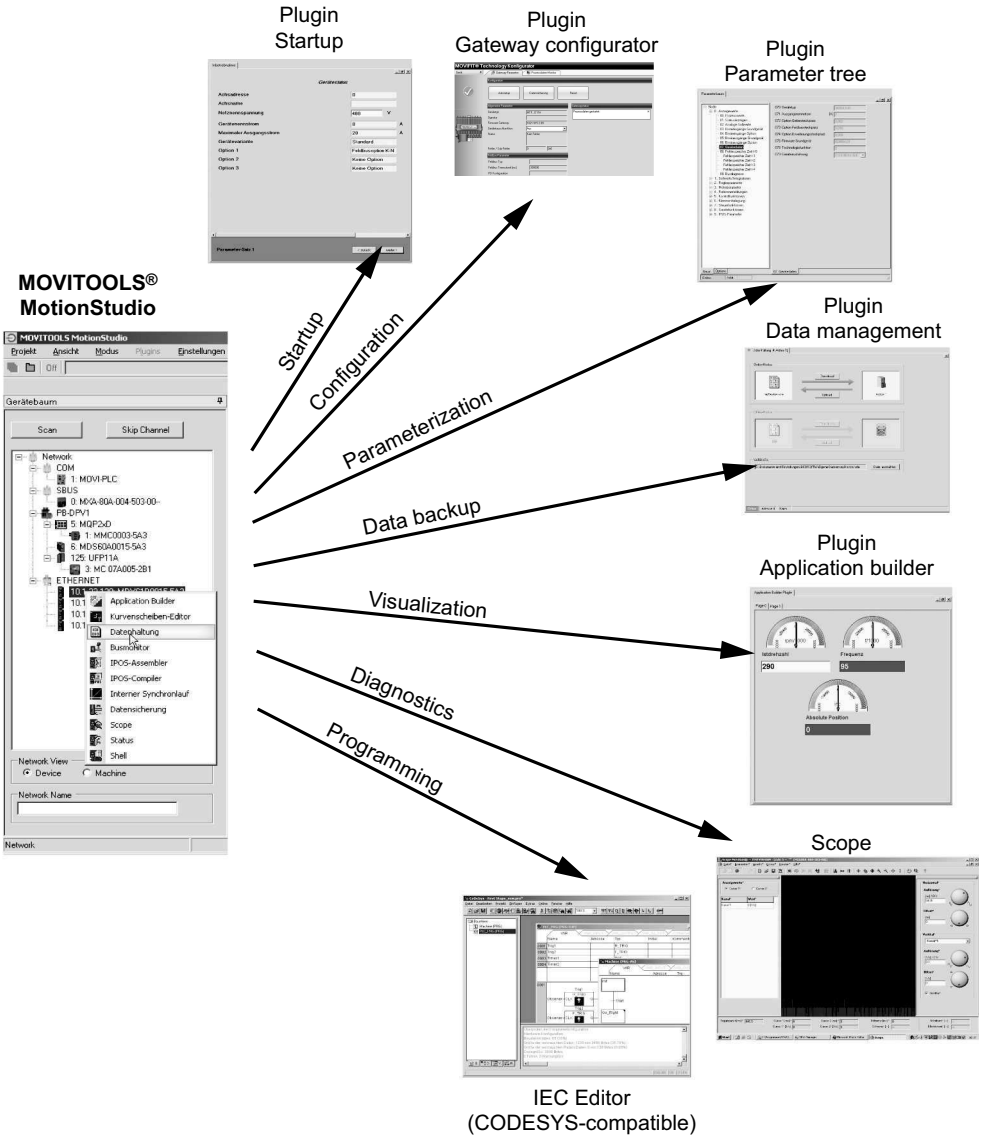
The application modules are part of the software package MOVITOOLS® MotionStudio. They can be used with the following devices: MOVIPRO®

Information on how to operate the application modules is contained in separate manuals. They can be downloaded in PDF format from the SEW-EURODRIVE website → **www.sew-eurodrive.com**.

16998413/EN – 12/2016

3.4.3 Engineering with MOVITOOLS® MotionStudio

Consistent engineering is possible with the MOVITOOLS® MotionStudio software package from SEW-EURODRIVE. This software offers all the tools necessary for automation and startup of drives:



18014399302358795

16998413/EN – 12/2016

3.5 Application modules for MOVIPRO® SDC

In MOVIPRO® SDC, the drive data of the power section "PFA-..." are transparently passed through. You only have to parameterize the desired application module of the power section to match your requirements.

For further information, refer to chapter "Application modules of the power section "PFA-...""" (→ 🗎 20).

3.6 Application modules for MOVIPRO® ADC

3.6.1 MOVIPRO® ADC as parameterizable device (CCU)

MOVIPRO® ADC includes the **C**onfigurable **C**ontrol **U**nit (CCU) with standardized and directly executable application modules you simply need to parameterize. You can adjust the functionality of the individual CCU application modules to the specific application quickly and without programming knowledge. An integrated diagnostic function helps to speed up and facilitate startup.

You can parameterize MOVIPRO® ADC with the Application Configurator controller software. The Application Configurator is part of the MOVITOOLS® MotionStudio engineering software.

Application Configurator controller software

You can use this controller software to select the suitable application module for each axis of your application (single- or multi-axis application) that runs independently of the connected drive electronics. The required parameters are entered in the assistant of the respective CCU application module. Then the entire configuration is transferred to the parameterizable device.

Application Configurator functions

The Application Configurator controller software provides the following functions:

- Startup and configuration of CCU application modules
- Diagnostics of CCU application modules

Advantages of the Application Configurator

The Application Configurator controller software provides the following advantages:

- The process data monitor visualizes the data exchange between the parameterized CCU application modules and the PLC.
- Data is saved using an SD memory card for the entire CCU application module and all drive parameters.
- The simulation mode allows for diagnostics of configurations without devices and motors connected.
- A detailed module diagnostics function allows for simple testing of the CCU application module.
- Variables (e.g. travel profiles) are recorded over the time for easy troubleshooting.
- You can simultaneously update the software of the Application Configurator on the SD memory card when you download the CCU application data.
- The CCU application modules run centrally on the parameterizable device, thus they are drive-independent.

16998413/EN – 12/2016

Available CCU application modules

The following CCU application modules are available for MOVIPRO® ADC:

- Transparent 6PD
- Velocity control
- Rapid/creep speed positioning
- Bus positioning

The CCU application modules run in the communication and control unit "PFH-...".

You can parameterize the CCU application modules in the Application Configurator controller software.

"Transparent 6PD" CCU application module

The "Transparent 6PD" CCU application module is used when the process output data from the PLC (fieldbus master) is to be forwarded unmodified to subordinate devices (internal power section "PFA-...," external auxiliary axes, etc.) via the controller (MOVIPRO® ADC). The same applies to process data communication in the opposite direction.

The "Transparent 6PD" CCU application module supports all IPOS$^{PLUS®}$ application modules running on the integrated power section. For further information, refer to chapter "Application modules of the power section "PFA-...."" (→ 🗎 20).

"Velocity control" CCU application module

The "velocity control" CCU application module is used for speed-controlled applications without positioning.

"Rapid/creep speed positioning" CCU application module

The "Rapid/creep speed positioning" CCU application module is used for simple positioning tasks in materials handling technology.

Positioning takes place via 2 initiators. The first initiator determines the switching point from rapid to creep speed. The second initiator determines the stop position. Applications that must position in two directions require 4 initiators.

The "Rapid/creep speed positioning" CCU application module offers the following functions:

- Graphical interface for startup and parameterization
  - Includes monitor for controlling and observing
  - Includes online help for support
- Drive functions for jog and rapid/creep speed positioning
- Suited for roller conveyors, lifting tables, and rotary tables

16998413/EN – 12/2016

"Bus positioning" CCU application module

The "bus positioning" CCU application module is used for variable positions in conjunction with different speeds and ramps (e.g. hoist).

The positioning is carried out via the built-in motor encoder or an optional distance encoder. Only linear, absolute positioning is supported. You can enter various user units.

The "Bus positioning" CCU application module has the following functions:

- Variable adjustments of the following values:
  - Target position
  - Speed
  - Acceleration
  - Deceleration
- Permanent feedback of:
  - Status messages
  - Actual velocity
  - Actual position
- Drive functionalities:
  - Jog
  - Referencing
  - Positioning
- Motor encoders and optional distance encoder are supported

16998413/EN – 12/2016

3.6.2 MOVIPRO® ADC as programmable device (MOVI-PLC®)

Free programming via MOVI-PLC®

SEW-EURODRIVE offers the freely programmable MOVI-PLC® motion and logic controller for solving complex machine automation tasks in a flexible manner.

Direct programming in the MOVI-PLC® development environment allows for turning application-specific requirements into drive solutions. Tasks can be programmed using the standard IEC-61131 languages (LD, FBD, IL, ST, SFC). Furthermore, function blocks from different motion libraries can be combined into one program to ensure fast startup and implement complex motion sequences.

Advantages of MOVI-PLC®

MOVI-PLC® offers you the following advantages:

- Easy to use
- Flexible programming of the application
- Standardized programming languages in accordance with IEC 61131-3
- PLCopen libraries for convenient automation
- Upon request: customized, application-specific programs
- Configuration, startup, monitoring, diagnostics and updates of all components from SEW-EURODRIVE
- Coordination of several axes
- All motion control tasks are concentrated in one MOVI-PLC®
- Relieve the PLC
- Reduced response times
- Increased performance

3.7 Application modules of the power section "PFA-..."

The following application modules are available for the power section "PFA-...":

- Bus positioning
- Extended positioning via bus
- Modulo positioning
- Automotive AMA0801

The application modules are based on IPOS$^{PLUS®}$.

INFORMATION

In MOVIPRO® ADC, the IPOS$^{PLUS®}$ application modules can only be used if a simple gateway program is installed (delivery state) in the communication and control unit "PFH-...," or the "Transparent 6PD" CCU application module is parameterized. In these cases, the process input and process output data is forwarded from the communication and control unit to the power section "PFA-..." unmodified.

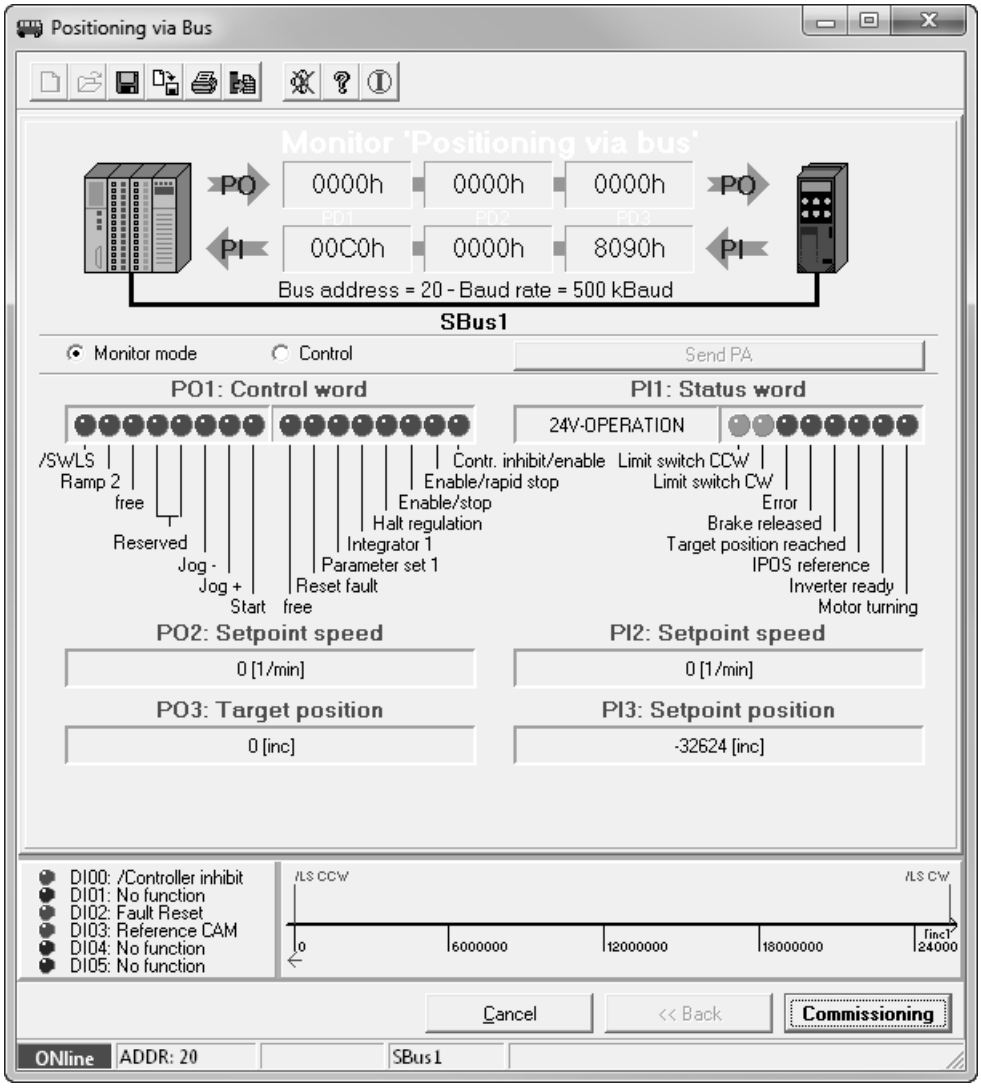
You can parameterize the IPOS$^{plus®}$ application modules in the MOVITOOLS® MotionStudio engineering software.

16998413/EN – 12/2016

3.7.1 "Bus positioning" IPOS$^{PLUS®}$ application module

The "Bus positioning" IPOS$^{PLUS®}$ application module offers the following functions:

- Variable and unlimited number of target positions
- Freely adjustable travel speed for positioning
- Maximum travel distance ± 32700 mm

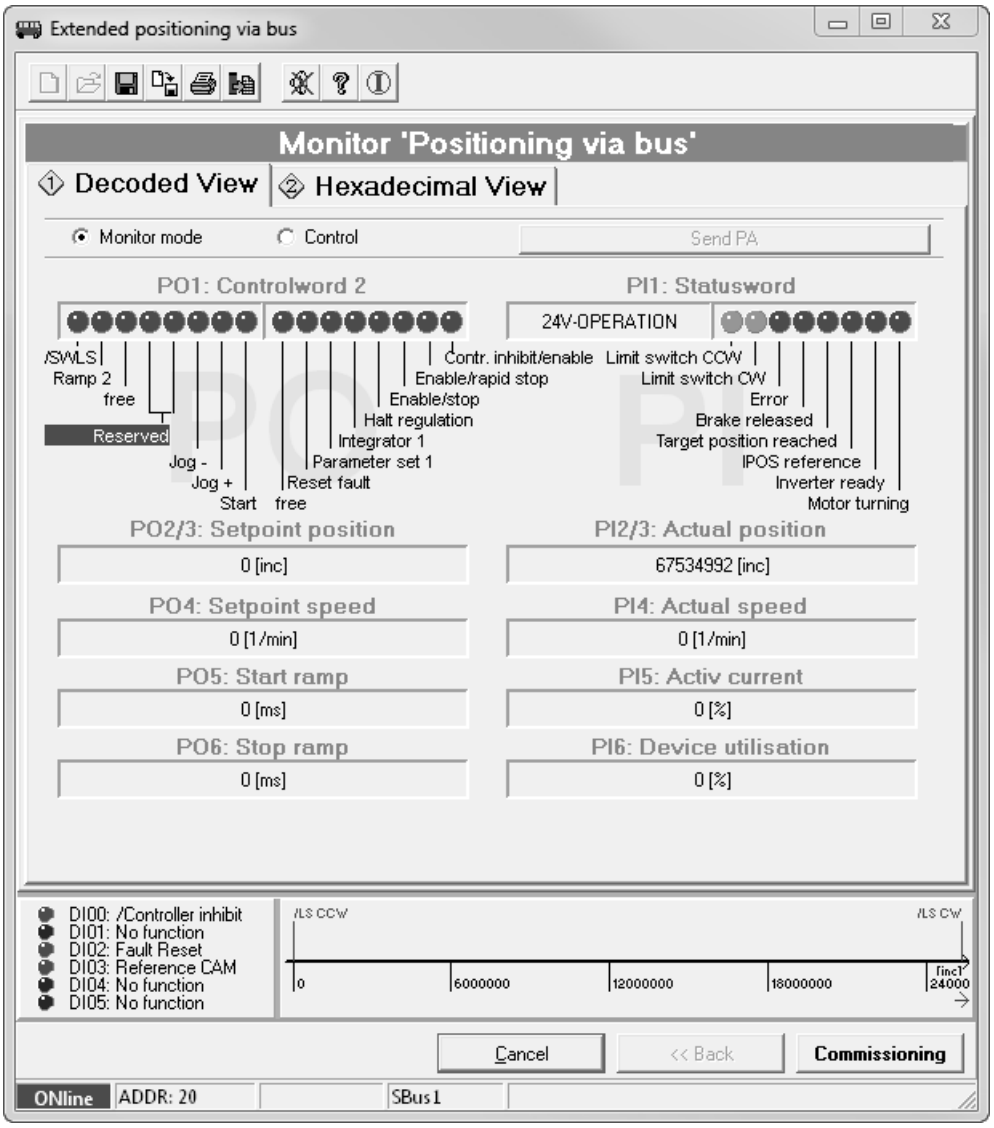


9007201239177483

3.7.2 "Extended positioning via bus" IPOS$^{PLUS®}$ application module

The "Extended positioning via bus" IPOS$^{PLUS®}$ application module offers the following functions:

- Variable number of target positions
- The travel speed for positioning and the acceleration and deceleration ramps are specified variably by the PLC.
- Maximum travel distance ± 262100 mm
- Possibility of operation with 4 process data instead of 6. In this case, the variable specification of ramp type does not apply.



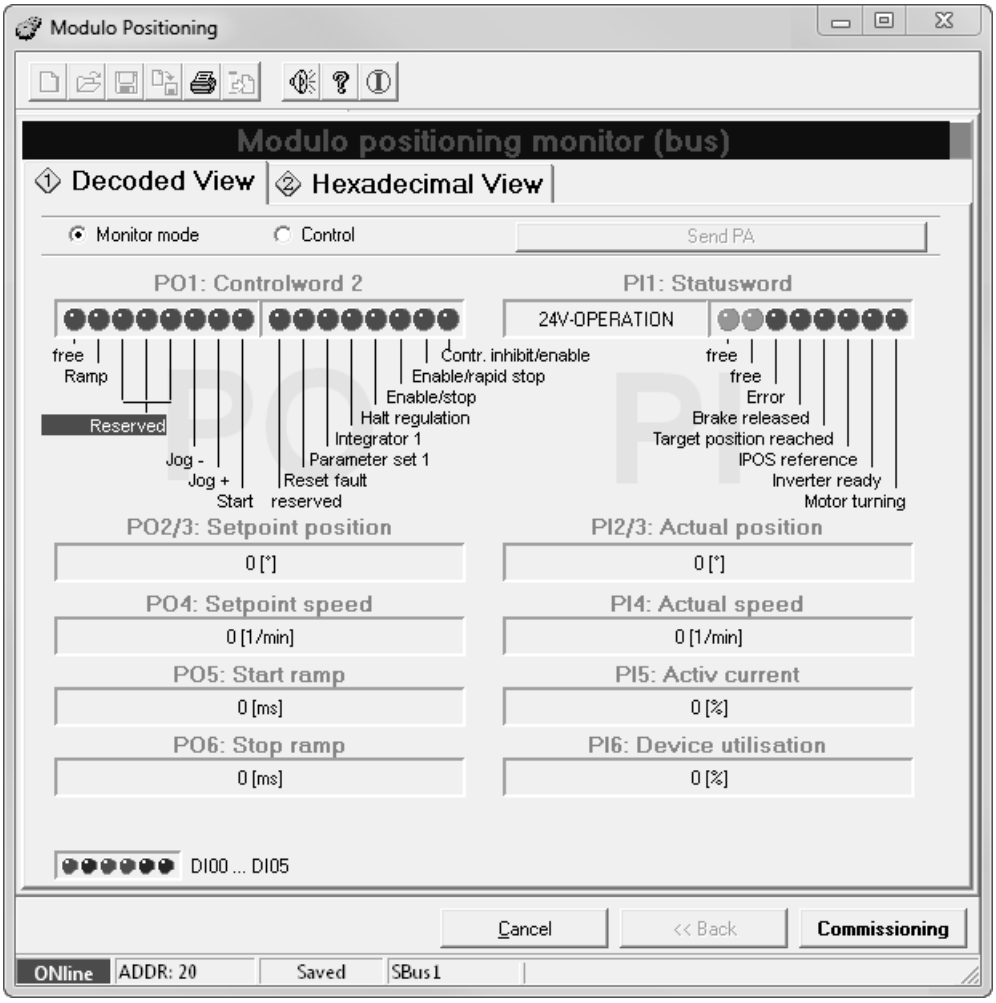
9007201239185803

16998413/EN – 12/2016

3.7.3 "Modulo positioning" IPOS$^{PLUS®}$ application module

The "Modulo positioning" IPOS$^{PLUS®}$ application module offers the following functions:

- Supports fieldbuses with 4 or 6 process data words
- Target position specified via 2 process data words
- Freely adjustable travel speed
- 2 different ramps can be selected when 4 process data words are used for control.
- The acceleration and deceleration ramps can be specified using process data word 5 and 6 for control via 6 process data words.
- For a non-positive connection (with slip) between the motor shaft and application, the distance measurement can be taken via an external incremental or absolute encoder. The encoder must be mounted to the application without slip.



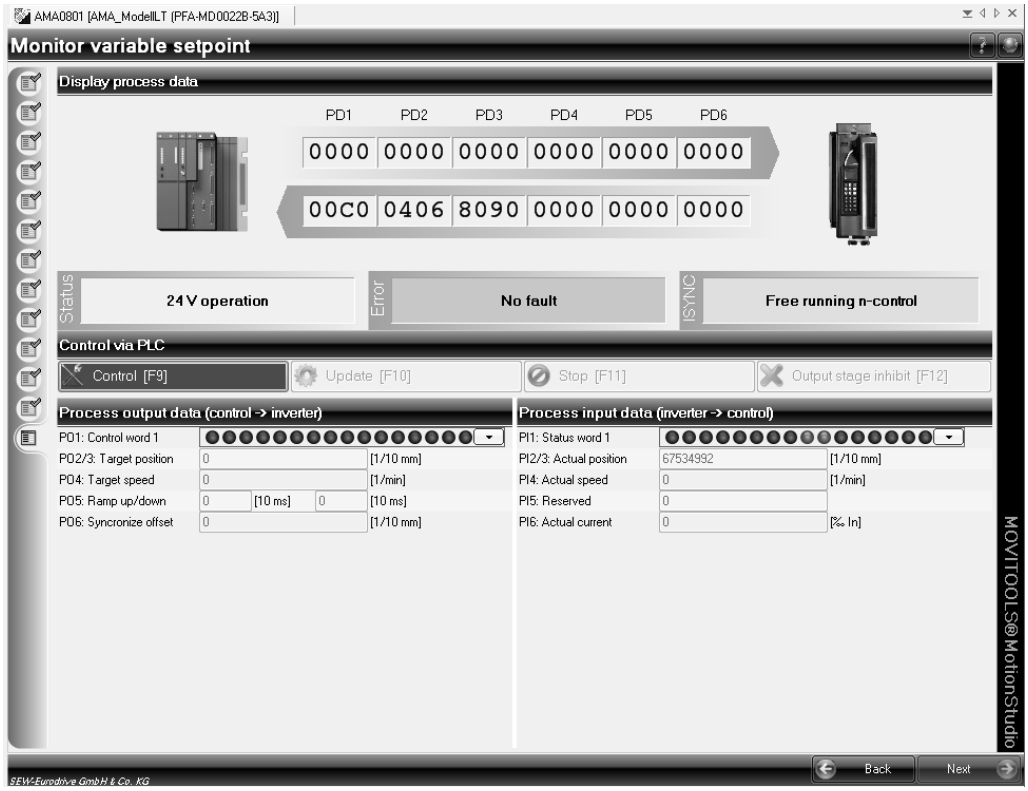
9007204510510347

16998413/EN – 12/2016

3.7.4 "Automotive AMA0801" IPOS$^{PLUS®}$ application module

The IPOS$^{PLUS®}$ application module "Automotive AMA0801" offers the following functions:

- Implementation of lifting units and conveyor systems
- Switchable process data interface. Setpoints specification is either variable or binary.
- Different operating modes for setup and automatic operation and special functions during positioning mode



9007201378601867

16998413/EN – 12/2016

4 Startup

4.1 Startup procedure

The following illustration gives an overview of the startup procedure of the device and lists other applicable documentation:

1. Device startup

   For information, refer to:

   - "MOVIPRO® SDC Decentralized Drive and Position Controller" operating instructions
   - "MOVIPRO® ADC Decentralized Drive and Application Controller" operating instructions

2. Parameterization, Programming[1] with the MOVITOOLS® MotionStudio engineering software

   For information, refer to:

   - Chapter "Parameter setting" (→ 🗎 154)
   - "MOVI-PLC® Programming in the PLC Editor" system manual

3. Fieldbus configuration

   For information, refer to:

   - The chapters "Configuration and startup of EtherNet/IP™" (→ 🗎 39) and "Configuration and startup of Modbus/TCP" (→ 🗎 90)
   - Chapter "Application modules of the power section "PFA-...."" (→ 🗎 20)
   - Chapter "Process data description" (→ 🗎 118)

4. Saving device data to the SD memory card.

   For further information, refer to chapter "Storing device data" (→ 🗎 183).

1) Programming is possible only for MOVIPRO® ADC.

16998413/EN – 12/2016

5 Installation notes

INFORMATION

The description of the assembly and installation of the device can be found in the MOVIPRO® SDC Decentralized Drive and Position Controller" and "MOVIPRO® ADC Decentralized Drive and Application Controller" operating instructions.

This chapter contains information only on how to install Ethernet.

5.1 Industrial Ethernet networks

5.1.1 TCP/IP addressing and subnetworks

The address of the TCP/IP protocol is set using the following parameters:

- MAC address
- IP address
- Subnet mask
- Standard gateway

The addressing mechanisms and subdivision of the TCP/IP networks into subnetworks are explained in this chapter to help you set the parameters correctly.

MAC address

The MAC (**M**edia **A**ccess **C**ontroller) address is the basis for all address settings. The MAC address is a worldwide unique 6-byte value (48 bits) assigned to the Ethernet device. The MAC address of Ethernet devices from SEW-EURODRIVE is 00-0F69-xx-xx-xx.

The MAC address is difficult to handle for larger networks. This is why freely assignable IP addresses are used.

IP address

The IP address is a 32-bit value that uniquely identifies a node in the network. An IP address is represented by 4 decimal numbers separated by decimal points.

Each decimal number stands for 1 byte (8 bits) of the address and can also be represented using binary code:

Exemplary IP address: 192.168.10.4		
Byte	**Decimal**	**Binary**
1	192	11000000
2	168	10101000
3	10	00001010
4	4	00000100

The IP address comprises a network address and a node address.

The part of the IP address that denotes the network and the part that identifies the node is determined by the network class and the subnet mask.

16998413/EN – 12/2016

Network class

The first byte of the IP address determines the network class and as such represents the division into network addresses and node addresses:

Range of values (Byte 1 of IP address)	Network class	Example: Complete network address	Meaning
0 – 127	A	10.1.22.3	10 = Network address 1.22.3 = Node address
128 – 191	B	172.16.52.4	172.16 = Network address 52.4 = Node address
192 – 223	C	192.168.10.4	192.168.10 = Network address 4 = Node address

Node addresses that consist only of zeros or ones are not permitted. The smallest address (all bits are zero) describes the network itself and the largest address (all bits are 1) is reserved for the broadcast.

This rough division is not sufficient for a number of networks. The networks also use an explicit, adjustable subnet mask.

Subnetwork mask

A subnet mask is used to divide the network classes into even finer sections. Like the IP address, the subnet mask is represented by 4 decimal numbers separated by decimal points.

Each decimal number stands for 1 byte (8 bits) of the subnet mask and can also be represented using binary code:

Exemplary subnet mask: 255.255.255.128		
Byte	**Decimal**	**Binary**
1	255	11111111
2	255	11111111
3	255	11111111
4	128	10000000

The binary representation of the IP address and the subnet mask shows that in the subnet mask, all bits of the network address are set to 1 and only the bits of the node addresses have the value 0:

IP address: 192.168.10.129		Subnet mask: 255.255.255.128
	Bytes 1 – 4	**Bytes 1 – 4**
Network address	11000000	11111111
	10101000	11111111
	00001010	11111111
Node address	10000001	10000000

The class C network with the network address 192.168.10 is further subdivided into the following 2 networks by the subnet mask 255.255.255.128:

Network address	Node addresses
192.168.10.0	192.168.10.1 – 192.168.10.126
192.168.10.128	92.168.10.129 – 192.168.10.254

The network nodes use a logical AND operation for the IP address and the subnet mask to determine whether there is a communication partner in the same network or in a different network. If the communication partner is in a different network, the standard gateway is addressed for passing on the data.

Standard gateway

The standard gateway is also addressed via a 32-bit address. The 32-bit address is represented by 4 decimal numbers separated by decimal points.

16998413/EN – 12/2016

Exemplary standard gateway: 192.168.10.1

The standard gateway establishes a connection to other networks. A network node that wants to address another node uses a logical AND operation of the IP address and subnet mask to determine whether the node is in the same network. If this is not the case, the network node addresses the standard gateway (router), which must be part of the actual network. The standard gateway then takes on the job of transmitting the data packages.

DHCP (Dynamic Host Configuration Protocol)

Instead of setting the 3 parameters IP address, subnet mask and standard gateway manually, they can be assigned automatically by a DHCP server in the Ethernet network.

The IP address is assigned based on a table in the DHCP server. The table contains an assignment of MAC addresses to IP addresses.

5.1.2 Shielding and routing bus cables

NOTICE

Risk of a compensating current flowing as a result of incorrect bus cable type, improper shielding and/or improperly routed bus cables.

Possible damage to property.

- In case of fluctuations in the ground potential, a compensating current may flow via the bilaterally connected shield that is also connected to the protective earth (PE). Make sure you supply adequate equipotential bonding in accordance with relevant VDE regulations in such a case.

Only use shielded cables and connection elements that meet the requirements of category 5, class D according to IEC 11801 edition 2.0.

Correct shielding of the bus cable attenuates electrical interference that can occur in industrial environments. The following measures ensure the best possible shielding:

- Manually tighten the mounting screws on the connectors, modules, and equipotential bonding conductors.
- Use only connectors with a metal housing or a metalized housing.
- Connect the shielding in the connector over a wide surface area.
- Apply the shielding of the bus cable on both ends.
- Route signal and bus cables in separate cable ducts. Do not route them parallel to power cables (motor leads).
- Use metallic, grounded cable racks in industrial environments.
- Route the signal cable and the corresponding equipotential bonding close to each other using the shortest possible route.
- Avoid using plug connectors to extend bus cables.
- Route the bus cables closely along existing grounding surfaces.

16998413/EN – 12/2016

5.2 Setting the IP address parameter on the device

5.2.1 Initial startup

The DHCP protocol is activated on the device in the factory. The IP address parameters are therefore expected from a DHCP server.

INFORMATION

There is a free DHCP server with the designation "BOOTP Utility" available on the Rockwell Automation homepage.

5.2.2 Changing the IP address parameters after successful initial startup

If the device was started using a valid IP address, you can also access the IP address parameters via the Ethernet interface.

You can change the IP address parameters via the Ethernet interface by one of the following methods:

- Using the Engineering software MOVITOOLS® MotionStudio
- Using the TCP/IP interface object from EtherNet/IP™ (→ 🗎 83)
- Using the Address Editor from SEW-EURODRIVE (→ 🗎 145)
- Other interfaces of the device

If the IP address parameters have been assigned to the unit via a DHCP server, you can only change the parameters by adjusting the settings of the DHCP server.

INFORMATION

The following applies to all other types of changing the IP address parameters: The change only becomes effective if you switch the supply voltage (including DC 24 V) off and on again.

16998413/EN – 12/2016

5.2.3 Deactivating/activating the DHCP

You can display and set the type of IP address assignment in the engineering software in the parameter tree of the unit in parameter *DHCP Startup Control*:

- "Stored IP parameters" setting

  The stored IP address parameters are used.

- "DHCP" setting

  The IP address parameters are requested by a DHCP server.

5.2.4 Address Editor from SEW-EURODRIVE

In order to access the IP settings of the fieldbus interface of the device, you can use the Address Editor from SEW-EURODRIVE.

The Address Editor is installed together with the MOVITOOLS® MotionStudio software package but is used independently. For further information, refer to the description of the MOVITOOLS® MotionStudio engineering software (→ 🗎 145).

For reliable allocation of the devices displayed in the Address Editor which are connected via X4232_11 and X4232_12 or X4233_11 and X4233_12, a label with the MAC ID of the device is attached to the housing. For further information, refer to chapter "Searching Ethernet nodes" (→ 🗎 146).

Advantages of the Address Editor

The Address Editor provides the following benefits:

- Display and specification of IP settings of all devices from SEW-EURODRIVE in one local subnetwork.
- Determination of IP settings for the engineering PC on one system during operation in order to enable the engineering software to access the device via Ethernet.
- Specification of IP settings for the fieldbus interface of the device, including without the network connections or Ethernet settings of the engineering PC having to be modified.

16998413/EN – 12/2016

5.3 Connection to the Ethernet network

5.3.1 The integrated Ethernet switch

The device is equipped with an integrated 2 port Ethernet switch for connecting the fieldbus technology. The following network topologies are supported:

- Tree topology
- Star topology
- Line topology
- Ring topologies (supported by device firmware version V19 and later)

INFORMATION

The number of industrial Ethernet switches connected in line impacts the telegram runtime. If a telegram passes through the devices, the telegram runtime is delayed by the "store-and-forward" function of the Ethernet switch:

- For a telegram length of 64 bytes by approximately 10 µs (at 100 MBit/s)
- For a telegram length of 1500 bytes by approximately 130 µs (at 100 MBit/s)

→ This means the more devices a telegram has to pass through, the higher the telegram runtime is.

Auto-crossing

The two ports leading out of the Ethernet switch have auto-crossing functionality. You can use both patch and crossover cables to connect to the next Ethernet node.

Auto-negotiation

The baud rate and duplex mode are negotiated by both Ethernet nodes when establishing the connection. For this purpose, both Ethernet ports of the EtherNet/IP™ connection support an auto-negotiation functionality and work with a baud rate of either 100 Mbit or 10 Mbit in full duplex or half-duplex mode.

Notes on multicast handling

- The integrated Ethernet switch does not provide a filter function for Ethernet Multicast telegrams. Multicast telegrams are sent from the adapters (device) to the scanners (PLC) and passed on to all switch ports.
- IGMP snooping (e.g. Managed Switches) is not supported.

INFORMATION

SEW-EURODRIVE recommends connecting the device only with the following network components:

- That support IGMP snooping (e.g. Managed Switch)
- That have protection mechanisms against high Multicast load (e.g. devices from SEW-EURODRIVE). Devices that do not have this function may be faulty due to high network load.

5.3.2 Device connection – Ethernet network

The device can be connected to the Ethernet via the following Ethernet interfaces:

- X4232_11 (RJ45 connector)

16998413/EN – 12/2016

- X4232_12 (RJ45 connector)
- X4233_11 (M12 connector)
- X4233_12 (M12 connector)

To connect the device to the Ethernet, connect one of the Ethernet interfaces to the other network node using a category 5, class D twisted-pair cable in accordance with IEC 11801, edition 2.0.

INFORMATION

According to IEEE 802.3, 200 Edition, the maximum cable length for 10 MBaud/100 MBaud Ethernet (10BaseT/100BaseT) between 2 network nodes is 100 m.

X4232_11, X4232_12: Ethernet interface

The following table provides information on this connection:

Function		
• EtherNet/IP™ interface • Modbus/TCP interface		
Connection type		
Push-pull RJ45		
Wiring diagram		
		
Assignment		
No.	**Name**	**Function**
1	TX+	Transmit line (+)
2	TX-	Transmit line (-)
3	RX+	Receive line (+)
4	Res.	Reserved
5	Res.	Reserved
6	RX-	Receive line (-)
7	Res.	Reserved
8	Res.	Reserved

16998413/EN – 12/2016

Connection cable

NOTICE

The RJ45 socket can be damaged when inserting commercially available RJ45 patch cables without push-pull connector housing.

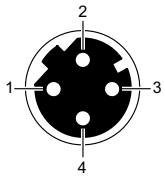
Damage to the RJ45 socket.

- Only plug suitable push-pull RJ45 mating connectors according to IEC 61076-3-117 into push-pull RJ45 sockets.
- Never use commercially available RJ45 patch cables without push-pull connector housing. These plug connectors do not snap in place when they are plugged.

Use only shielded cables for this connection.

X4233_11, X4233_12: Ethernet interface

The following table provides information on this connection:

Function		
• EtherNet/IP™ interface • Modbus/TCP interface		
Connection type		
M12, 4-pin, female, D-coded		
Wiring diagram		
		
Assignment		
No.	**Name**	**Function**
1	TX+	Transmit line (+)
2	RX+	Receive line (+)
3	TX-	Transmit line (-)
4	RX-	Receive line (-)

16998413/EN – 12/2016

Status and error messages

The status display on the device cover shows the current device status. In case of repeated malfunctions, contact the SEW-EURODRIVE Service.

If several statuses or faults are active at the same time, the status display shows the status or fault with the highest priority.

The device status display takes priority over the display of the internal "PFA-..." power section. If the maintenance switch is switched off or a fieldbus fault occurs, no power section status is displayed.

Display examples

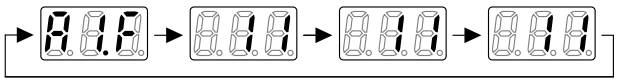
The following examples show how the device usually displays status and fault messages.

Example 1: "Enable" of power section 1

1820269707

Example 2: "Overtemperature" fault of power section 1

If the display shows "A[Power section number].F", a power section fault occurred. The display switches between the number of the power section and the fault code.



1806505867

Refer to chapter "List of power section errors" (→ 🗎 248) for an overview of power section faults.

Status messages

If you use a parameterizable device, the following status messages are possible.

Code	Meaning	Possible cause	Measure
8.8.8. **S2:** Flashing green **S3:** Off		Application module not running/not loaded	Create a configuration with the Application Configurator and load it into the device.
A1.0	DC 24 V operation, frequency inverter not ready		
A1.1	Controller inhibit active		
A1.2	No enable		
A1.3	Standstill current		
A1.4	Enable		
A1.5	n-control		
A1.6	M-control		

16998413/EN – 12/2016

Code	Meaning	Possible cause	Measure
A1.7	Position hold control		
A1.8	Factory setting		
A1.9	Limit switch reached		
A1.A	Technology option		
A1.c	IPOS$^{plus®}$ reference travel		
A1.D	Flying start		
A1.E	Calibrate encoder		
A1.F	Fault display (→ 🗎 248)		
A1.U	"Safe torque off" active **⚠ WARNING!** Risk of injury due to incorrectly interpreted display **U = "Safe Torque Off" active** – Severe or fatal injuries. The display **U = "Safe Torque Off" active** is not safety-related. Thus it must not be used safety-related.		
Flashing dot	Application module of the "PFA-..." power section is running.		
buS Err	Fieldbus error		• Check the fieldbus wiring to the higher-level controller. • Check the fieldbus parameter setting of the device and the higher-level controller.
InI	Initialization: A connection is established with all internal components. This can take several minutes after a device replacement.		
oFF	The maintenance switch is switched off.		Switch on the maintenance switch. **Devices without interface box:** Check the DC 24 V cabling and the cabling of the switch feedback.

16998413/EN – 12/2016

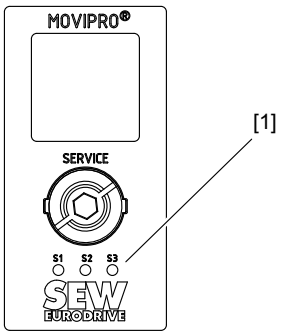
Code	Meaning	Possible cause	Measure
OFL	Internal communication error		**While backing up data or restoring a data backup:** Wait a few minutes until the display changes. **In normal operation:** • Disconnect the device from the AC 400 V supply and the DC 24 V supply voltage for at least 30 s. • Restart the device.
run	The connection has been established successfully. The statuses of the components or the application are displayed after 3 s.		
SF1	Communication error with the power section	• Parameter channel 2 not activated (*P889*) • Manual operation not finished • Parameter lock power section activated (*P803*) • Configuration in the Application Configurator not completed or not completely loaded	• Activate parameter channel 2 • Activate and deactivate manual mode • Disconnect the device from the AC 400 V supply and the DC 24 V supply voltage for at least 30 s. • Restart the device.
SF2	Error in external periphery		Check the cabling of the digital inputs and outputs as well as the connections of the communication package.
SF3	Error while loading the application module	Non-enabled application module loaded	• Set parameter P802 "Factory setting" of the "PFA-..." power section to "Delivery state". • Load an enabled application module into the "PFA-..." power section
SF10	Error during configuration with the Application Configurator	Configuration with Application Configurator not completed	Complete the configuration with the Application Configurator. Load it into the device.
SF20	Error during data backup, data backup on SD memory card failed		Start data backup again.
SF21	Error during data backup, data backup on SD memory card failed	SD memory card is write protected	Remove write protection from SD memory card.
SF22	Error during data recovery, data recovery to device failed		Start data restoring again.

16998413/EN – 12/2016

Code	Meaning	Possible cause	Measure
SF23	Error during data recovery, data recovery to device failed	Controller not inhibited	Set the device to one of the following states: • Controller inhibit (A1.1) • Safe torque off (A1.U)
SF99	Internal system error		
SF110	Actuator voltage overload error	Actuator voltage overload	Check the cabling of the digital inputs and outputs.
SF120	Error due to overload in sensor voltage of group 1	Overload sensor voltage group 1	Check the cabling of the digital inputs and outputs.
SF121	Error due to overload in sensor voltage of group 2	Overload sensor voltage group 2	Check the cabling of the digital inputs and outputs.

Status LEDs

The status LEDs are located on the service unit. They show the fieldbus and device status.



1954344587

[1] Status LEDs S1, S2, S3

Status LED S1 EtherNet/IP™ and Modbus/TCP

Status LED	Meaning
Off	The device does not yet have any IP parameters.
Flashing green/red	The device performs an LED test.
Flashing green	There is no controlling I/O connection.
Lights up green	There is a controlling EtherNet/IP™ I/O connection.
Lights up red	A conflict has been detected in the assigned IP addresses. Another node in the network uses the same IP address.
Flashing red	The previously established controlling I/O connection is in timeout state. The state is reset by restarting communication.

Status LED S2

Status LED	Possible cause	Measure
Flashing green	The firmware of the communication and control unit is running correctly.	–
Flashing green/orange	Data backup is created/restored.	–
Lights up orange	Boot is active.	–
Flashing orange	• Firmware is being updated or • Bootloader update required.	–
Flashes red	• SD memory card is not inserted. • File system on the SD memory card is corrupt. • Boot process has failed.	Switch the device off and back on again. Contact SEW-EURODRIVE service if the error reoccurs.

Status LED S3

Status LED	Possible cause	Measure
Lit green	User program is running.	–
Flashing green	• Program sequence has stopped. • Bootloader update required.	Start the user program.
Off	No program is loaded.	Load an user program into the communication and control unit.

16998413/EN – 12/2016

6 Configuration and startup of EtherNet/IP™

This chapter provides you with information on the configuration of the EtherNet/IP™ master (PLC) and startup of the device for fieldbus operation.

Requirements for correct configuration and startup are:

- Correct connection
- The correct setting of IP address parameters of the device. (→ 🗎 29).

Configuration is explained with examples. The examples are configurations carried out with the programming software RSLogix 5000 by Rockwell Automation.

6.1 Device description file for EtherNet/IP™ (EDS file)

NOTICE

Damage to the device due to malfunction due to a modified device description file.

Damages to the device.

- Do **not** change or expand entries in the device description file. SEW-EURODRIVE assumes no liability for malfunctions of the device caused by a modified device description file.

For proper operation of the device with EtherNet/IP™ interface, the following device description file is required:

- `SEW_MOVIPRO.eds`

INFORMATION

You can download the latest version of the device description file (EDS file) for MOVIPRO® with EtherNet/IP™ interface from the SEW-EURODRIVE homepage → **www.sew-eurodrive.com**.

6.2 Configuration of the EtherNet/IP™ master

The configuration procedure depends on the version of the programming software RSLogix.

- Up to and including V19, the device description file **cannot** be used directly. In this case, use the general device "GenericDevice and set the communication properties manually.
- Starting from version V20, use the device description file directly.

16998413/EN – 12/2016

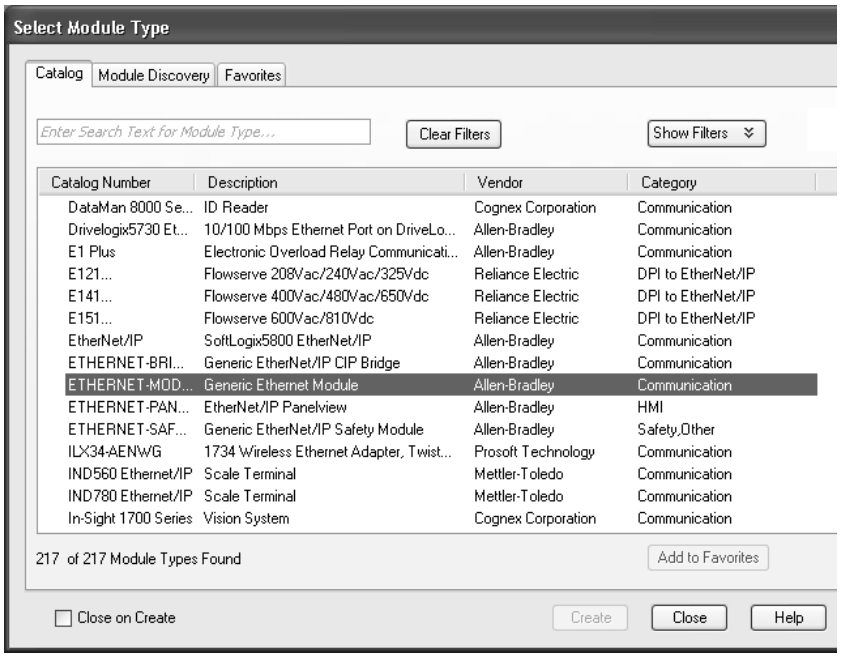
6.2.1 Configuration with RSLogix 5000 up to version V19

The following example describes configuration of the Allen Bradley control ControlLogix 1756_L61 with RSLogix 5000 Version V19.

For the Ethernet communication, a 1756-EN2TR EtherNet/IP™ interface is used.

Proceed as follows:

1. Start RSLogix 5000 and select the view "Controller Organizer" (tree structure on left part of the window).
2. Select the EtherNet/IP™ interface (1756-EN2TR in this case) in the folder "I/O configuration".
3. Select the command [New Module] from the context menu.
   ⇨ A module catalog is displayed.

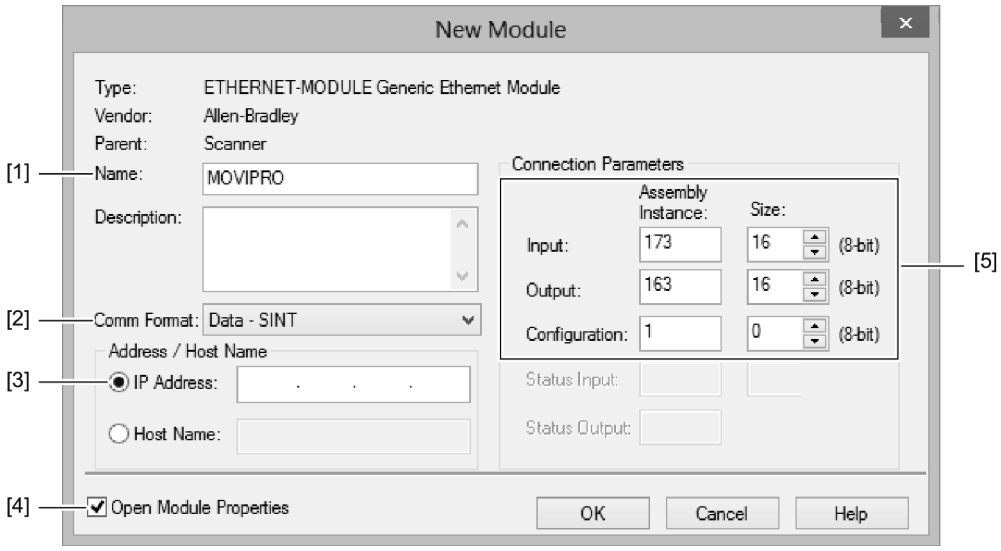


16756049803

4. Select "ETHERNET MODULE" in the "Communication" category.

16998413/EN – 12/2016

5. Click [OK].
   ⇨ The following window is displayed.



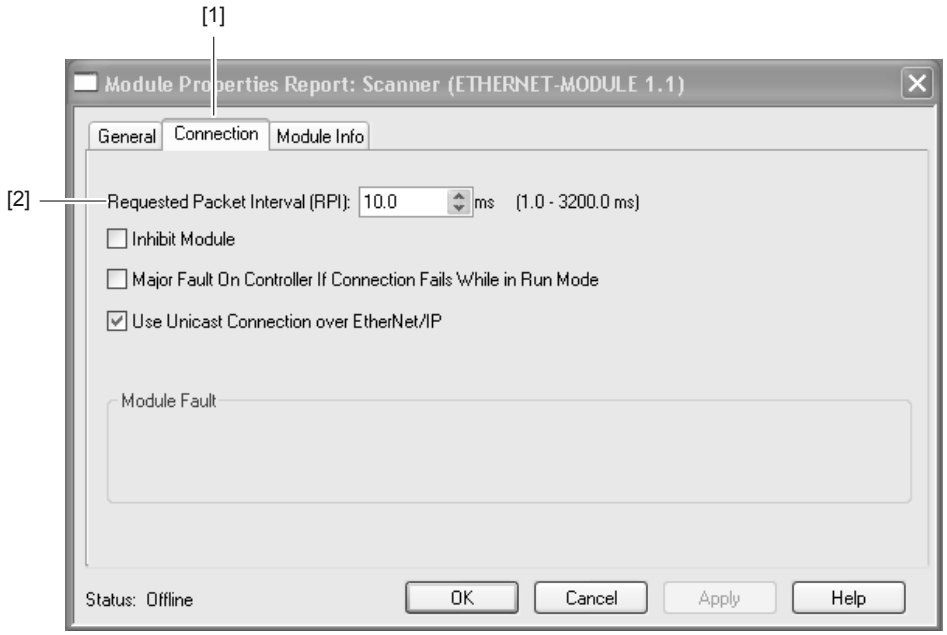
18014400474821899

6. In the edit box [1], enter the name of the EtherNet/IP™ interface with which the data are stored in the controller tags.
7. Enter the IP address of the EtherNet/IP™ interface field in the edit box [3].
8. Select data format "Data-INT" or "Data-SINT" from the drop-down list [2].
   ⇨ The process data always contains 16 bits (INT). The maximum number of process data is 120 (for "Comm format" DATA-INT) or 240 (for "Comm format" DATA-SINT).
9. Enter the following connection parameters in the section [5]:

Window element	Value
Input Assembly Instance	173
Output Assembly Instance	163
Configuration Assembly Instance	1
Input Size	16
Output Size	16
Configuration Size	0

10. Activate the check box [4].

11. Click [OK].
    ⇨ The following window is displayed.



15115056395

12. Open the tab [1].
13. Enter the cycle time (data rate) in the edit box [2]. The device supports a cycle time of a minimum of 4 ms. Longer cycle times can be implemented without any problems.
14. Click [OK].

⇨ The device is included in the project and the settings are adopted.

16998413/EN – 12/2016

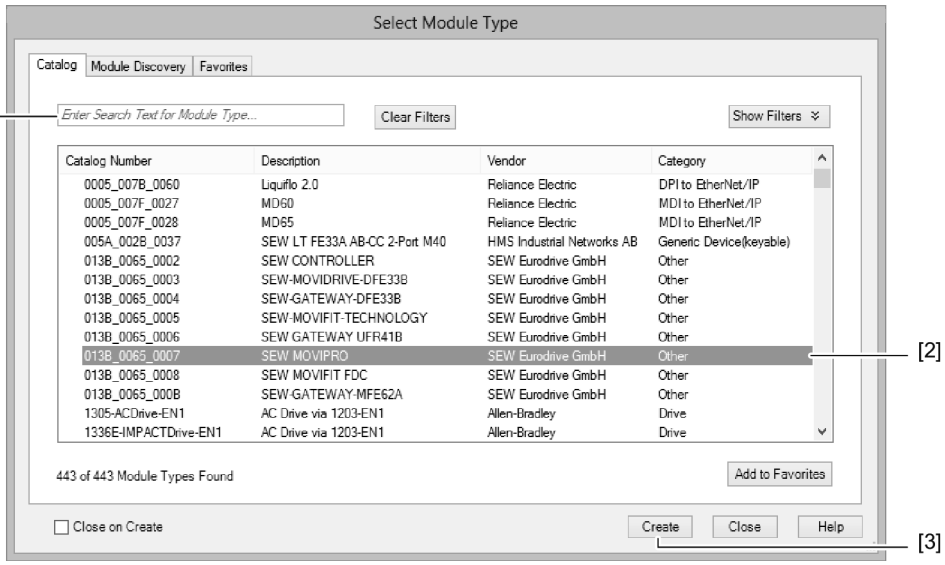
6.2.2 Configuration with RSLogix 5000 as of version V20

The following example describes configuration of the Allen Bradley controller ControlLogix 1756_L71 with Studio 5000 Logix Designer, version V24 (up to Version V20: RSLogix 5000).

For the Ethernet communication, a 1756-EN2TR EtherNet/IP™ interface is used.

Proceed as follows:

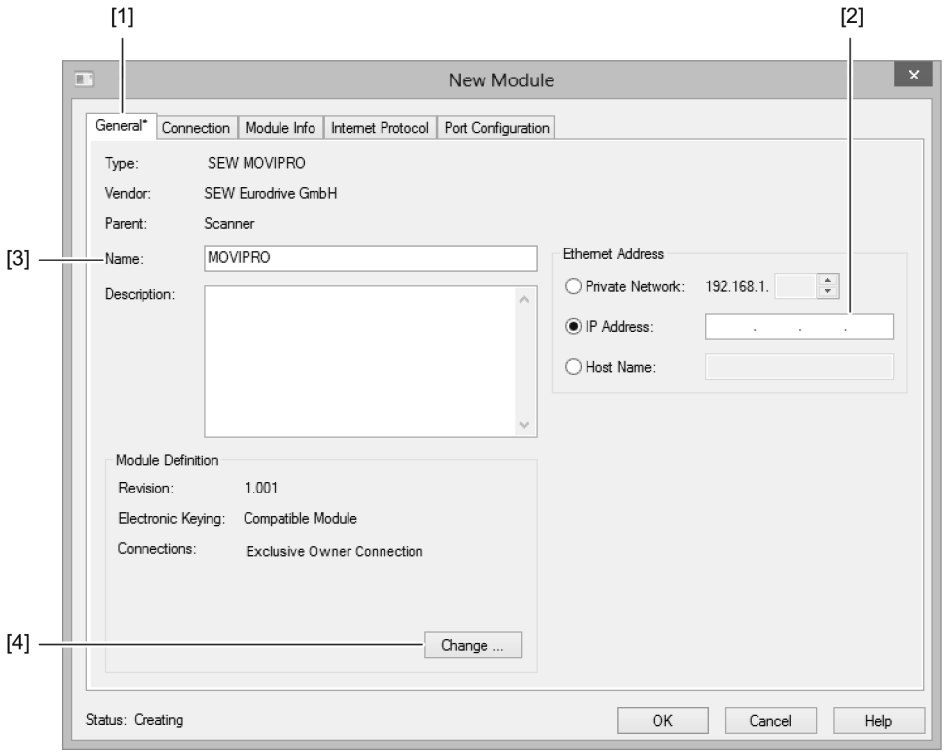
1. Start Studio 5000 Logix Designer and select the view "Controller Organizer" (tree structure on left part of the window).
2. Select the EtherNet/IP™ interface (1756-EN2TR in this case) in the folder "I/O configuration".
3. Select the command [New Module] from the context menu.
   ⇨ A module catalog is displayed.



16759271947

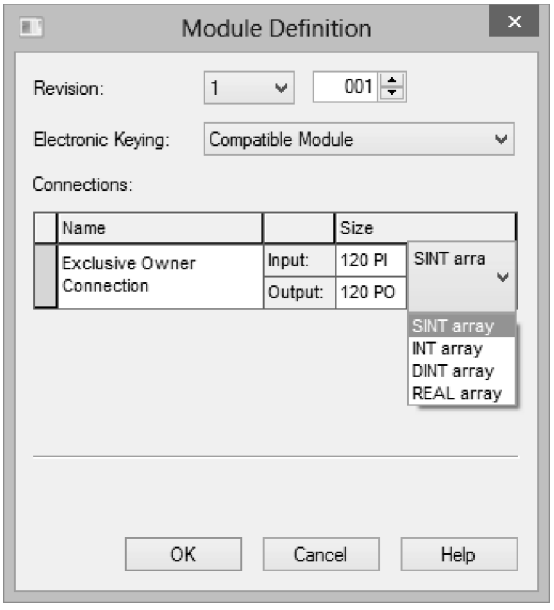
4. Enter "Movipro" in the search field [1] and press the <Enter> key.
   ⇨ If the EDS file was installed correctly, the device is displayed in the catalog.
5. Select the entry "SEW MOVIPRO" [2].

6. Click the [Create] button [3].
   ⇨ The following window is displayed.



16759276939

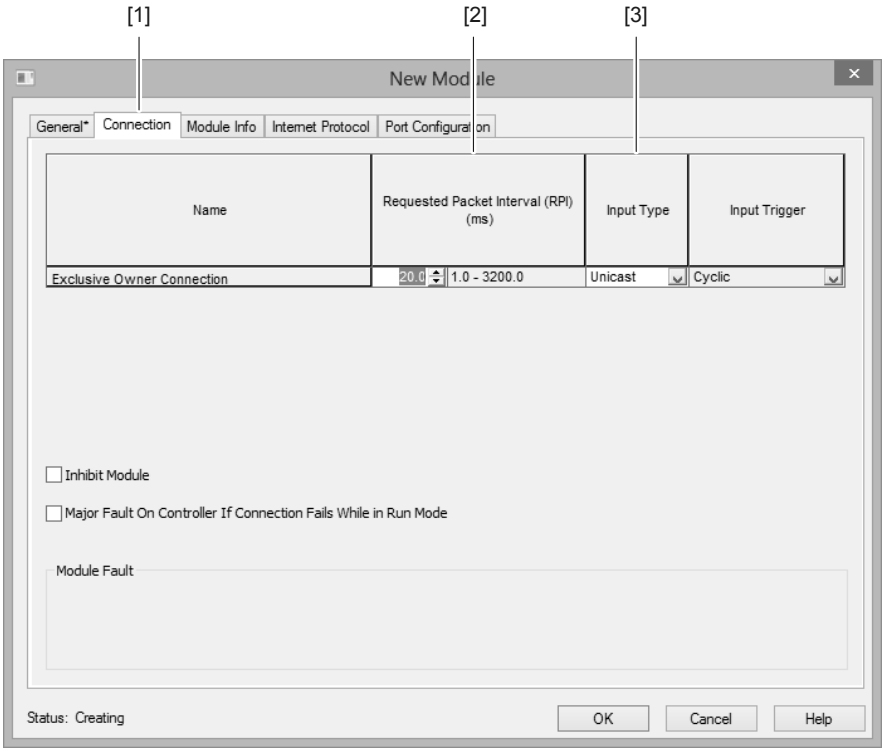
7. In the edit box [3], enter the name of the EtherNet/IP™ interface with which the data are stored in the controller tags.
8. Enter the desired IP address of the EtherNet/IP™ interface field in the edit box [2].
9. Click the button [4].
   ⇨ The following window is displayed.



16759280651

16998413/EN – 12/2016

10. Select the communication format and the process data arrangement.
    ⇨ You can select up to 120 PI/PO (process input data/process output data words) with 16 Bit respectively. The device usually uses 8 PI/PO for communication with the internal power section "PFA-..." and the PLC. By selecting the data type SINT, a data array with 16 bytes is created by the software.
11. Click [OK].
    ⇨ The previous window opens.
12. Open the tab [1].



15117198347

13. Enter the cycle time (data rate) in the edit box [2]. The device supports a cycle time of a minimum of 4 ms. Longer cycle times can be implemented without any problems.
14. Choose the input type from the drop-down list [3]. Depending on the network configuration, e.g. if a redundant fieldbus master or an HMI keypad are integrated in the network, you can either select "Unicast" or Multicast" connection.
15. Click [OK].

⇨ The device is included in the project and the settings are adopted.

6.3 Device Level Ring topology

6.3.1 Description

INFORMATION

The device supports announce telegrams only. Beacon telegrams on the fieldbus are ignored and just forwarded by the device.

If a **D**evice **L**evel **R**ing topology (DLR topology) is used, 2 new telegrams are shown on the fieldbus. Both telegrams can be used to detect single fault locations in the ring.

- **Announce telegrams** are sent cyclically every 1 s.

  No special hardware of the ring components is required to process the announce telegrams.

  The device supports announce telegrams only.
- The **beacon telegrams** are sent cyclically every 400 µs by the ring supervisor.

  A special hardware of the devices in the ring is required to process the beacon telegrams.

  The beacon telegrams are ignored and just forwarded by the device.

6.3.2 Ring fault detection

If Beacon telegrams that are sent to the first port of the ring supervisor are not received by the second port of the ring supervisor, the ring supervisor detects a ring fault.

If the telegrams do not run through the entire ring, the ring supervisor sends a non-cyclical announce telegram. This non-cyclical announce telegram leads to a status change of the EtherNet/IP™ interface. The network is automatically restored.

INFORMATION

Use less than 50 ring nodes in one DLR network. If more than 50 nodes are used in one DLR network, you have to consider the following:

- The risk of faults in the DLR network increases.
- The times for fault rectification in a faulty DLR network increase.

→ If your application requires more than 50 modes, Rockwell Automation recommends to split up the nodes in separate but linked DLR networks.[1)]

1) See user guideline by Rockwell Automation "EtherNet/IP Embedded Switch Technology – Linear and Device-level Ring Topologies", Appendix A

6.3.3 Rectifying ring faults

If a single fault location in the ring causes a fault and the rectification takes longer than the fieldbus timeout interval, you can increase the fieldbus timeout (timeout interval) by increasing the cycle time.

The timeout interval of the device is calculated as follows:

$$T_{Timeout} = RPI \times 32$$

$T_{Timeout}$ Timeout interval (fieldbus timeout) in ms

16998413/EN – 12/2016

RPI Cycle time RPI (**R**equested **P**acket **I**nterval) in ms

The device supports a cycle time of a minimum of 4 ms.

The minimum timeout interval of the fieldbus is thus 128 ms (4 × 32).

6.3.4 Hardware and software configuration

There is no need to make any special settings in the EtherNet/IP™ interface for the configuration of a DLR network. All configurations are carried out in the ring supervisor.

INFORMATION

For information on this configuration, refer to the user guideline by Rockwell Automation "EtherNet/IP™ Embedded Switch Technology – Linear and Device Level Ring Topologies" that is available on the Rockwell website.

6.4 Requirements for fieldbus operation

Correct startup of the device is prerequisite for fieldbus operation. For further information, refer to chapter "Parameter setting" (→ 🗎 154).

16998413/EN – 12/2016

6.5 Project planning examples

6.5.1 MOVIPRO® as positioning drive – configuring process data exchange

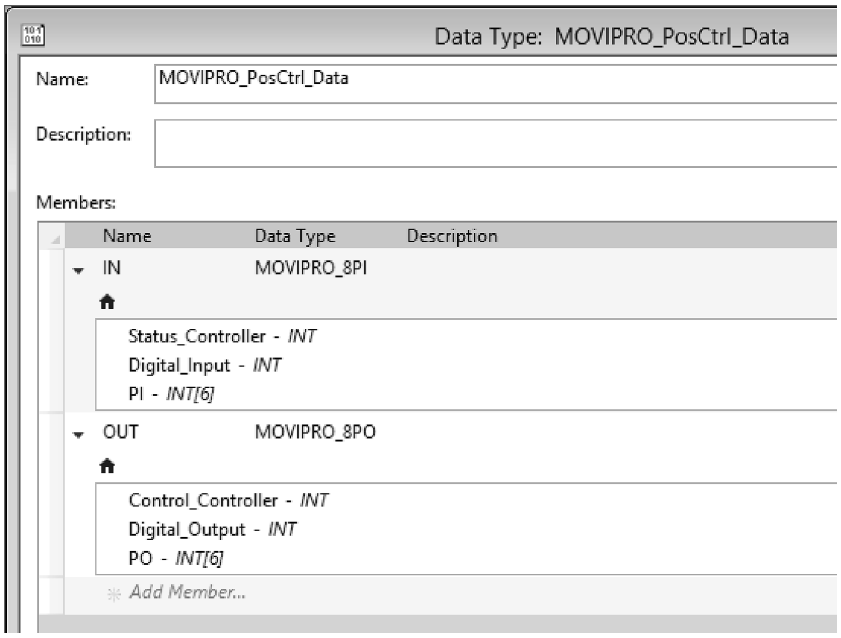
The following example describes the configuration of the process data exchange between an EtherNet/IP™ master (PLC) and MOVIPRO® as positioning drive in Studio 5000 Logix Designer.

INFORMATION

This description applies for all versions of the programming software from Rockwell Automation (RSLogix 5000, from version 20: Studio 5000 Logix Designer).

Proceed as follows:

1. Start up the device (→ 🗎 25).
2. Set the IP address parameters of the device (→ 🗎 29).
3. Include the device in the configuration for the "I/O Configuration" in Studio 5000 Logix Designer (→ 🗎 39).
4. Create a user-defined data type. It allows you to organize the process data in a structure and simplifies access to the data elements.



9007201222207371

   ⇨ In this example, a data structure with 8 process input data words (PI) and 8 process output data words (PO) is created.

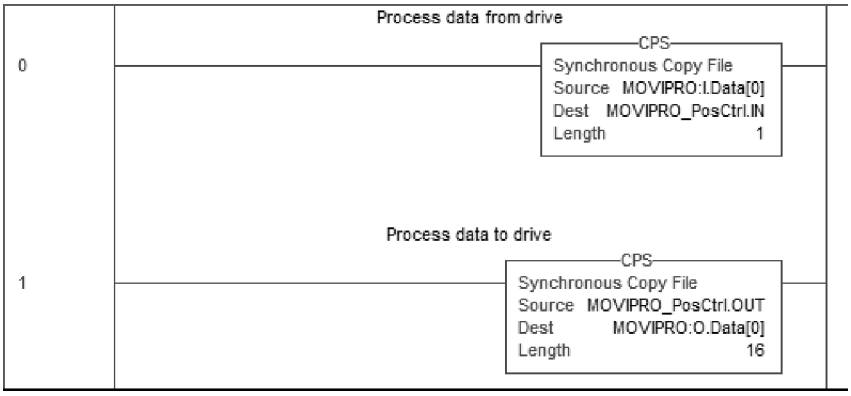
   ⇨ You can access the process data interface with explicit variable names with the created data type.

5. To enable process data exchange between the device and the PLC, insert CPS instructions at the beginning of the MainRoutine. The length designation in the CPS instructions depends on the data type of the destination.

   ⇨ During copying of the data in the user-defined data structure (from PLC to the device), the values of a structure are copied.

   ⇨ During copying of the data from the user-defined data structure to the output data (from device to PLC), 16 bytes (SINT) are copied.

16998413/EN – 12/2016



16760603787

6. Save the project and transfer it to the PLC.
7. Switch to RUN mode of the PLC.

Name	Usage	Value	Force	Style	Data Type	Description
MOVIPRO_nCtrl	Local	{...}	{...}		MOVIPRO_PosCtrl_Da	
MOVIPRO_nCtrl.IN		{...}	{...}		MOVIPRO_8PI	
MOVIPRO_nCtrl.IN.Status_Controller		16#0000		Hex	INT	Status word controller section
MOVIPRO_nCtrl.IN.Digital_Input		16#0000		Hex	INT	Digital Inputs
MOVIPRO_nCtrl.IN.PI		{...}	{...}	Hex	INT[6]	Process data from...
MOVIPRO_nCtrl.IN.PI[0]		16#0000		Hex	INT	Process data from...
MOVIPRO_nCtrl.IN.PI[1]		16#0000		Hex	INT	Process data from...
MOVIPRO_nCtrl.IN.PI[2]		16#0000		Hex	INT	Process data from...
MOVIPRO_nCtrl.IN.PI[3]		16#0000		Hex	INT	Process data from...
MOVIPRO_nCtrl.IN.PI[4]		16#0000		Hex	INT	Process data from...
MOVIPRO_nCtrl.IN.PI[5]		16#0000		Hex	INT	Process data from...
MOVIPRO_nCtrl.OUT		{...}	{...}		MOVIPRO_8PO	
MOVIPRO_nCtrl.OUT.Control_Contro		16#0000		Hex	INT	Control word controller section
MOVIPRO_nCtrl.OUT.Digital_Output		16#0000		Hex	INT	Digital outputs
MOVIPRO_nCtrl.OUT.PO		{...}	{...}	Hex	INT[6]	Process data to power section
MOVIPRO_nCtrl.OUT.PO[0]		16#0000		Hex	INT	Process data to power section
MOVIPRO_nCtrl.OUT.PO[1]		16#0000		Hex	INT	Process data to power section
MOVIPRO_nCtrl.OUT.PO[2]		16#0000		Hex	INT	Process data to power section
MOVIPRO_nCtrl.OUT.PO[3]		16#0000		Hex	INT	Process data to power section
MOVIPRO_nCtrl.OUT.PO[4]		16#0000		Hex	INT	Process data to power section
MOVIPRO_nCtrl.OUT.PO[5]		16#0000		Hex	INT	Process data to power section

18014400477830667

8. Check if the process data correspond to the values that are displayed in the parameter tree of the MOVITOOLS® MotionStudio engineering software or in the fieldbus monitor of the respective application module.

6.5.2 MOVIPRO® as speed-controlled drive – configuring process data exchange

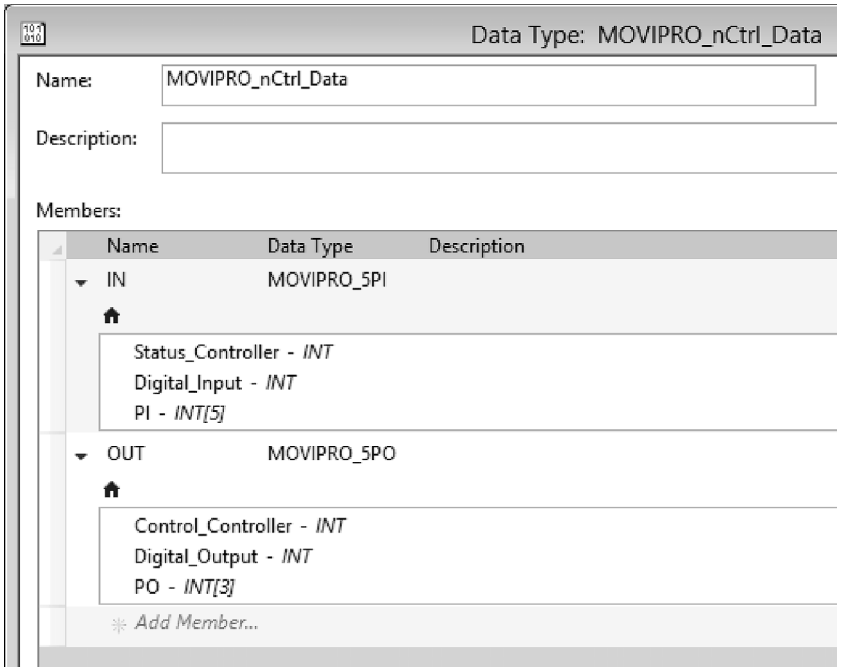
The following example describes the configuration of the process data exchange between an EtherNet/IP™ master (PLC) and MOVIPRO® as speed-controlled drive in Studio 5000 Logix Designer.

INFORMATION

This description applies for all versions of the programming software from Rockwell Automation (RSLogix 5000, from version 20: Studio 5000 Logix Designer).

Proceed as follows:

1. Start the device as a speed-controlled drive (→ 🗎 25). No application module is used in this configuration.
2. Set the IP address parameters of the device (→ 🗎 29).
3. Include the device in the configuration for the "I/O Configuration" in Studio 5000 Logix Designer with 5 process data words (→ 🗎 40).
4. Create a user-defined data type. It allows you to organize the process data in a structure and simplifies access to the data elements.

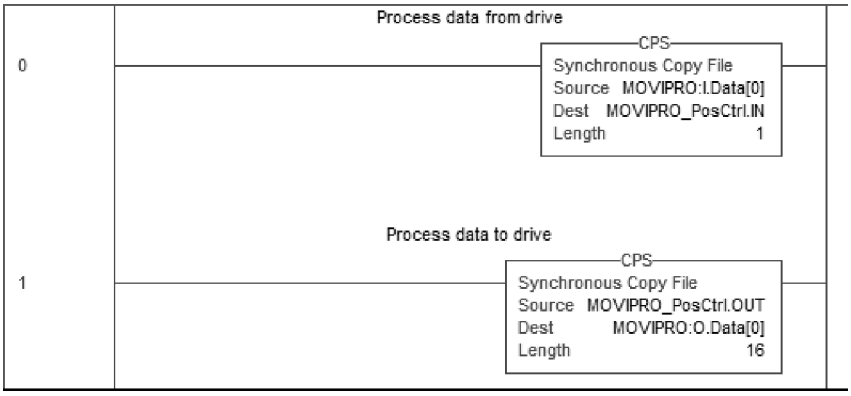


9007201224042635

5. Enter the description of the function of the device and internal power section "PFA-..." in the "Description" edit box.

16998413/EN – 12/2016

6. To enable process data exchange between the device and the PLC, insert the corresponding CPS instructions in the MainRoutine. Make sure that the CPS commands copy the entire structure rather than a single data value.



16760603787

7. Save the project and transfer it to the PLC.
8. Switch to RUN mode of the PLC.

Name	Value	Style	Data Type	Description
MOVIPRO_2	{...}		SEW_MOVIPRO_n_Ctrl	
MOVIPRO_2.PI	{...}		_5_words	from MOVIPRO
MOVIPRO_2.PI.ctrl_w1	16#0000	Hex	INT	Status MOVIPRO
MOVIPRO_2.PI.ctrl_w2	16#0000	Hex	INT	12 Dig. Input
MOVIPRO_2.PI.drive_w1	16#0507	Hex	INT	PI1 Status from Drive
MOVIPRO_2.PI.drive_w2	16#1000	Hex	INT	PI2 Speed from Drive
MOVIPRO_2.PI.drive_w3	16#0400	Hex	INT	PI3 Current from Drive
MOVIPRO_2.PO	{...}		_5_words	to MOVIPRO
MOVIPRO_2.PO.ctrl_w1	16#0000	Hex	INT	Control MOVIPRO
MOVIPRO_2.PO.ctrl_w2	16#0000	Hex	INT	4 Dig. Output
MOVIPRO_2.PO.drive_w1	16#0006	Hex	INT	PO1 Conrtolw. to Drive
MOVIPRO_2.PO.drive_w2	16#1000	Hex	INT	PO2 Speed to Drive
MOVIPRO_2.PO.drive_w3	16#0800	Hex	INT	PO3 Ramp to Drive

18014400478786059

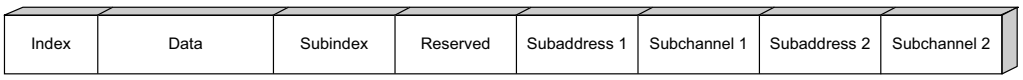
⇨ The actual values of the device can be read and the setpoints can be determined.

6.5.3 Access to device parameters with RSLogix 5000

The procedure to access device parameters depends on the version of the RSLogix 5000 programming software and the firmware version of the device (support of DLR topology).

Service	RSLogix 5000 up to version V19		RSLogix 5000 as of version V20	
	DLR support	No DLR support	DLR support	No DLR support
GetAttributeSingle SetAttributeSingle	x	x	–	x
Custom	–	–	x	–

The 12-byte MOVILINK® parameter channel enables access to all parameters, regardless of the bus in use. The 12-byte MOVILINK® parameter channel consists of the following elements:



15214071179

For MOVIPRO® with EtherNet/IP™ interface, the routing information Subaddress 1 and Subchannel 1 are used. The device parameter can only be addressed with index and subindex. The routing information Subaddress 2 and Subchannel 2 are not used.

Enter the following values for the routing information:

Routing information	Value	
	Control electronics/fieldbus	Internal power section "PFA-..."
Subaddress 1	0	20
Subchannel 1	0	3
Subaddress 2	0	0
Subchannel 2	0	0

16998413/EN – 12/2016

Access to device parameters without DLR support with RSLogix 5000 up to version V19

The following example describes the configuration of read and write access to the device parameters with RSLogix 5000, Version V19.

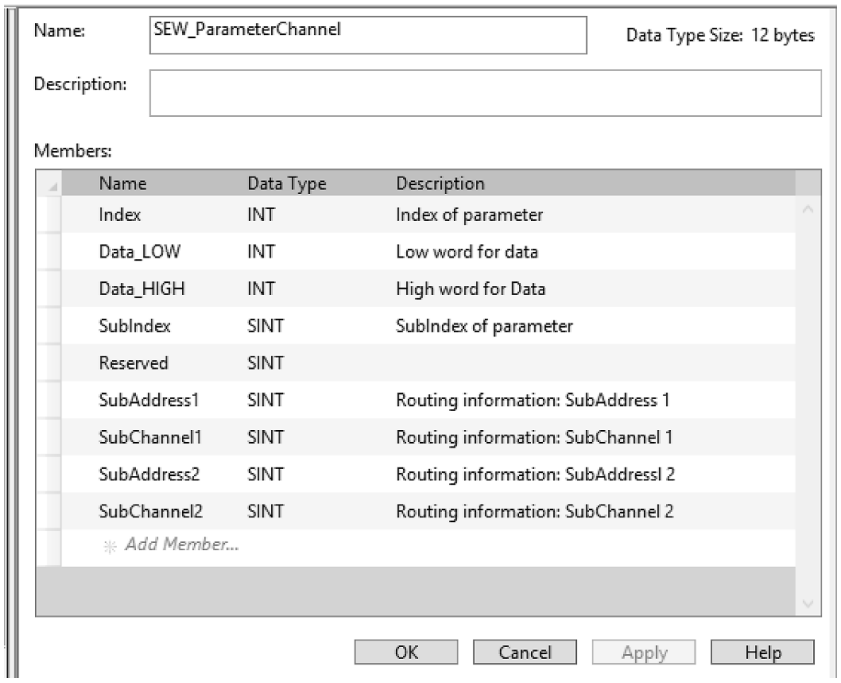
Reading parameters

Proceed as follows:

1. Create the user-defined data type "SEW_Parameter_Channel". It allows you to organize the process data in a structure and simplifies access to the data elements.

INFORMATION

To ensure proper operation of the parameter channel, you must **not** change the order of the variables. The data types must also match the figure.

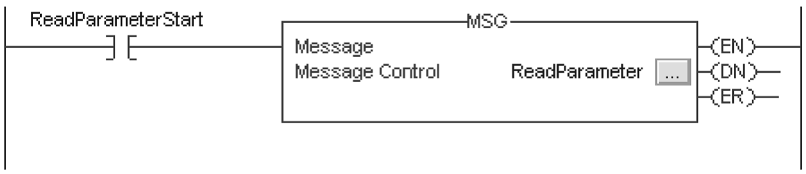


9007214912527883

2. Create the following controller tags:

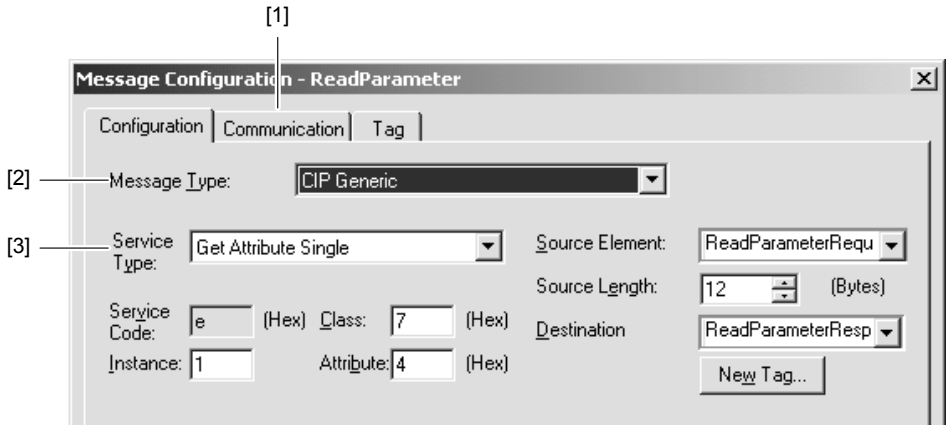
Name	Data structure
ReadParameter	MESSAGE
ReadParameterRequest	SEW_Parameter_Channel
ReadParameterResponse	SEW_Parameter_Channel
ReadParameterStart	BOOL

3. To be able to perform the read request, adapt the program of the PLC as follows:



18014399382395787

4. Click the button ... in the MSG block.
   ⇨ The following window is displayed.



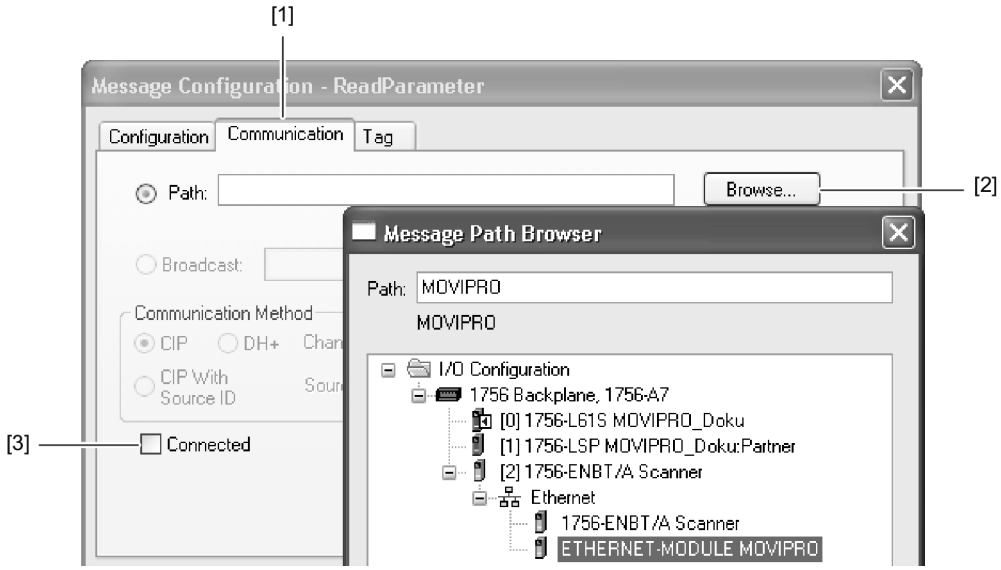
9007200127693963

5. Select the setting "CIP Generic" from the drop-down list [2].
6. Make the following settings in the specified sequence:
   ⇨ The drop-down list [3] is automatically set to "Get Attribute Single" after the entries are applied.

Window element	Setting/value
Source Element	ReadParameterRequest.Index
Source Length (Bytes)	12
Destination	ReadParameterResponse.Index
Service Code (Hex)	e
Class (Hex)	7
Instance	1
Attribute (Hex)	4

16998413/EN – 12/2016

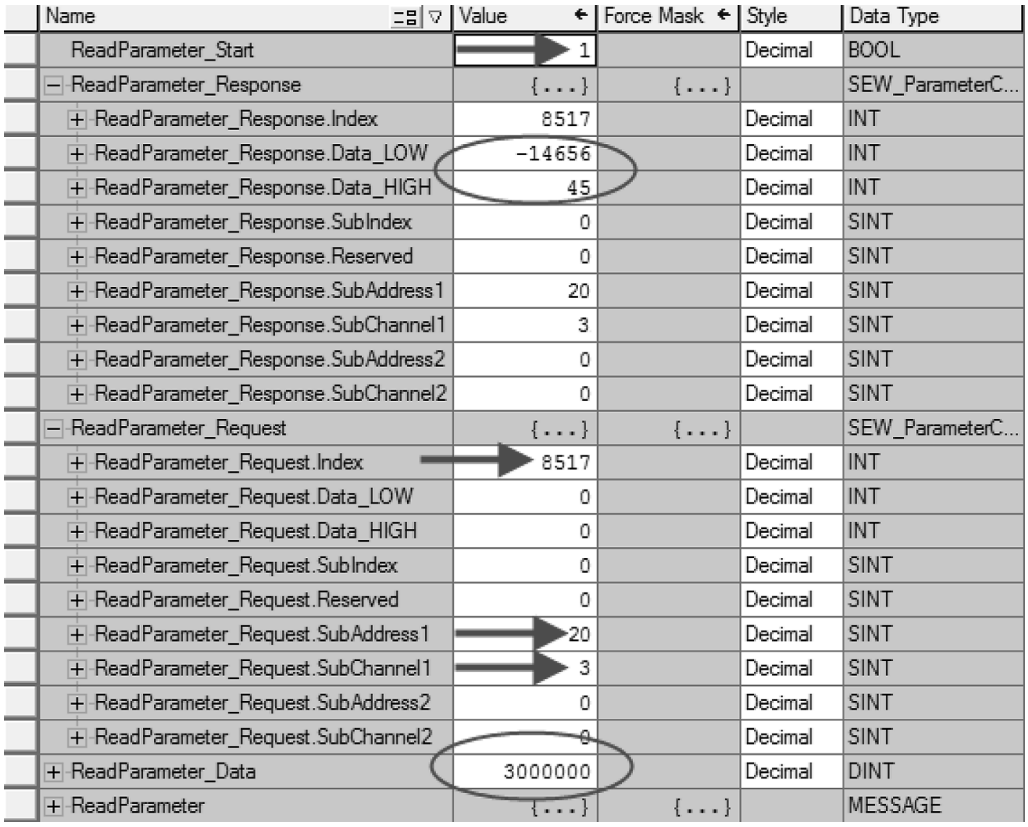
7. Open the tab [1].



18014400479917579

8. Click the button [2].
   ⇨ A module manager is displayed.
9. Via "I/O Configuration" > "Ethernet", select the target device with which you want to establish communication.
10. Do **not** activate the check box [3]. Both the PLC and the device only allow a limited number of connections.

11. Save the project and transfer it to the PLC.
12. Enter the following controller tags values:



Name	Value	Force Mask	Style	Data Type
ReadParameter_Start	1		Decimal	BOOL
ReadParameter_Response	{...}	{...}		SEW_ParameterC...
ReadParameter_Response.Index	8517		Decimal	INT
ReadParameter_Response.Data_LOW	-14656		Decimal	INT
ReadParameter_Response.Data_HIGH	45		Decimal	INT
ReadParameter_Response.SubIndex	0		Decimal	SINT
ReadParameter_Response.Reserved	0		Decimal	SINT
ReadParameter_Response.SubAddress1	20		Decimal	SINT
ReadParameter_Response.SubChannel1	3		Decimal	SINT
ReadParameter_Response.SubAddress2	0		Decimal	SINT
ReadParameter_Response.SubChannel2	0		Decimal	SINT
ReadParameter_Request	{...}	{...}		SEW_ParameterC...
ReadParameter_Request.Index	8517		Decimal	INT
ReadParameter_Request.Data_LOW	0		Decimal	INT
ReadParameter_Request.Data_HIGH	0		Decimal	INT
ReadParameter_Request.SubIndex	0		Decimal	SINT
ReadParameter_Request.Reserved	0		Decimal	SINT
ReadParameter_Request.SubAddress1	20		Decimal	SINT
ReadParameter_Request.SubChannel1	3		Decimal	SINT
ReadParameter_Request.SubAddress2	0		Decimal	SINT
ReadParameter_Request.SubChannel2	0		Decimal	SINT
ReadParameter_Data	3000000		Decimal	DINT
ReadParameter	{...}	{...}		MESSAGE

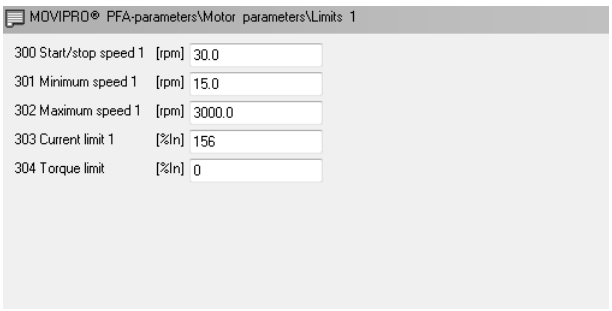
19132371595

Controller tag	Value
ReadParameterStart	1
ReadParameterRequest.Index	Index of the parameter to be read
ReadParameter_Request.SubAddress 1	20
ReadParameter_Request.SubChannel 1	3
ReadParameter_Request.SubAddress 2	0
ReadParameter_Request.SubChannel 2	0

13. Switch to RUN mode of the PLC.
    - ⇨ The read request is executed once.
    - ⇨ If the read request is answered, the controller tag "ReadParameterResponse.Index" displays the read index. The controller tag "ReadParameterResponse.Data" contains the read data.
    - ⇨ In this example, the value (3000 min^{-1}) of the parameter *P302 maximum speed* (Index *8517.0*) is read.

16998413/EN – 12/2016

14. Check if the process data correspond to the values that are displayed in the parameter tree of the engineering software MOVITOOLS® MotionStudio.



17894369291

⇨ When you move the mouse over the parameter, the tooltip shows the index, subindex, factor, etc. of the parameter.

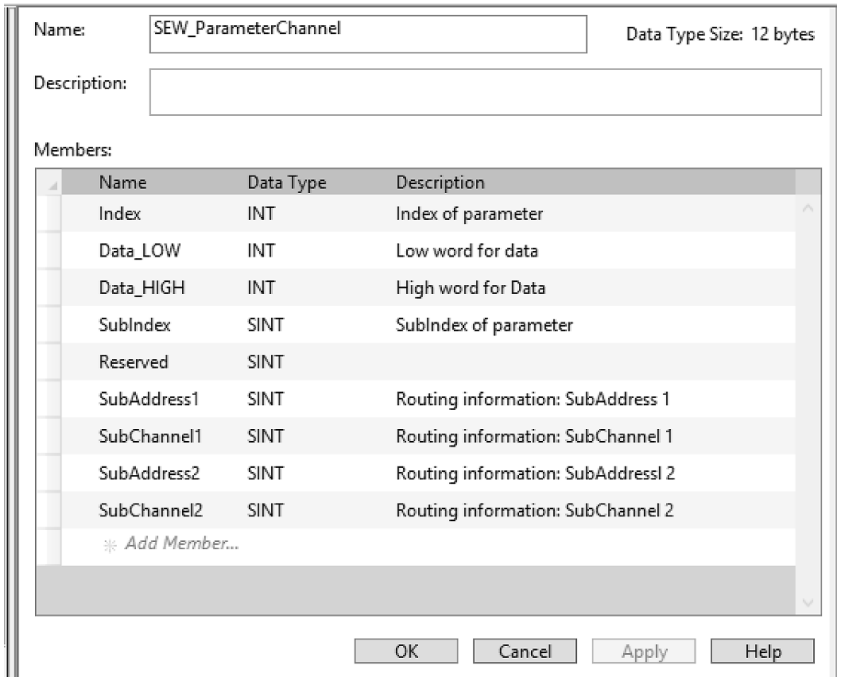
Writing parameters

Proceed as follows:

1. Create the user-defined data type "SEW_Parameter_Channel". It allows you to organize the process data in a structure and simplifies access to the data elements.

INFORMATION

To ensure proper operation of the parameter channel, do **not** change the order of the variables. The data types must also match the figure.



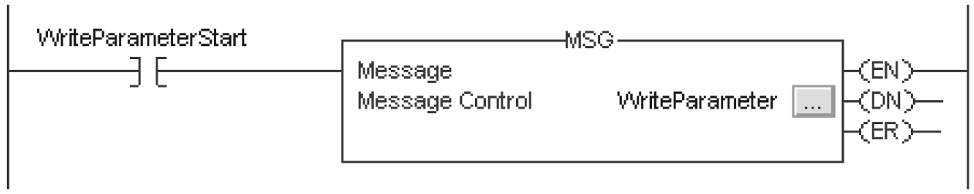
9007214912527883

2. Create the following controller tags:

Name	Data structure
WriteParameter	MESSAGE
WriteParameterRequest	SEW_Parameter_Channel

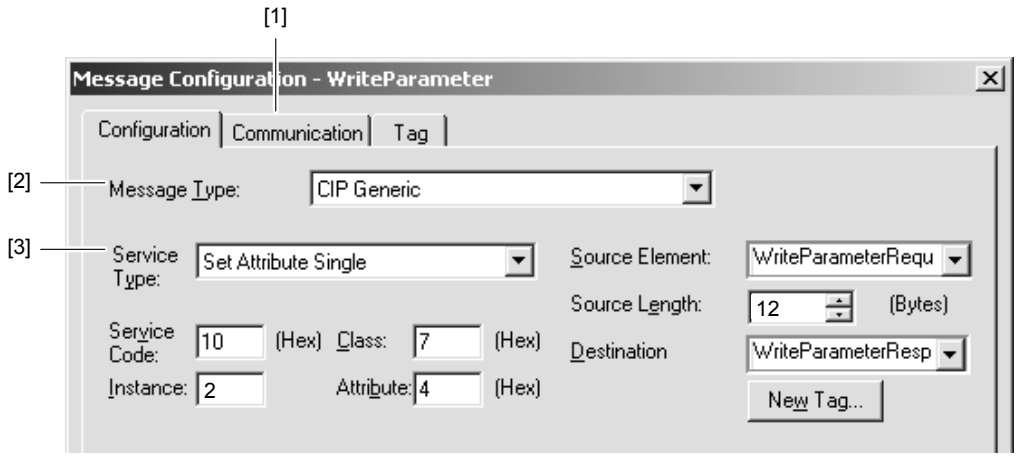
Name	Data structure
WriteParameterResponse	SEW_Parameter_Channel
WriteParameterStart	BOOL

3. To be able to perform the write request, adapt the program of the PLC as follows:



18014399382579339

4. Click the button ... in the MSG block.
   ⇨ The following window is displayed.



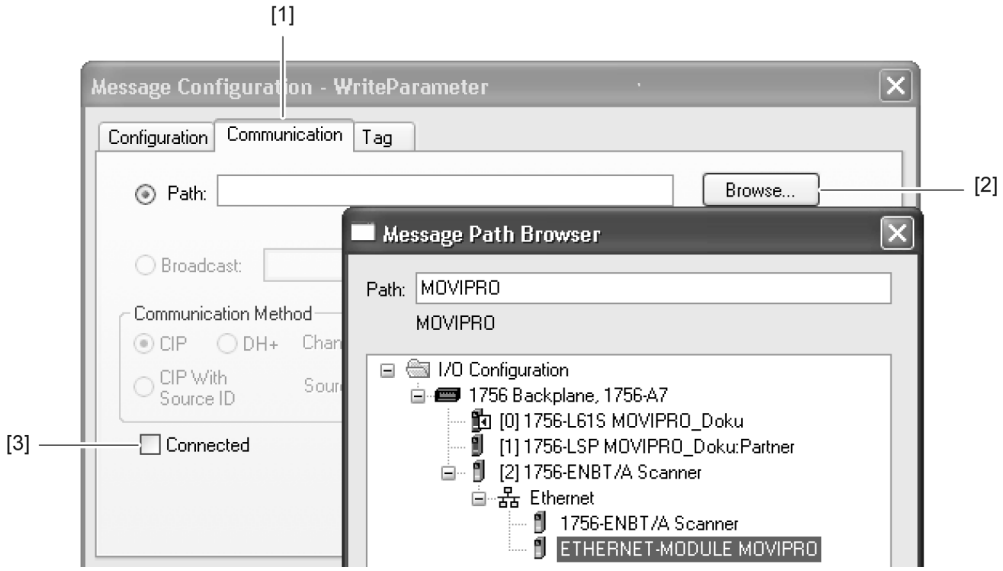
9007200845377675

5. Select the setting "CIP Generic" from the drop-down list [2].
6. Make the following settings in the specified sequence:
   ⇨ The drop-down list [3] is automatically set to "SetAttributeSingle" after the entries are applied.

Window element	Setting/value
Source Element	WriteParameterRequest.Index
Source Length (Bytes)	12
Destination	WriteParameterResponse.Index
Service Code (Hex)	10
Class (Hex)	7
Instance	2
Attribute (Hex)	4

16998413/EN – 12/2016

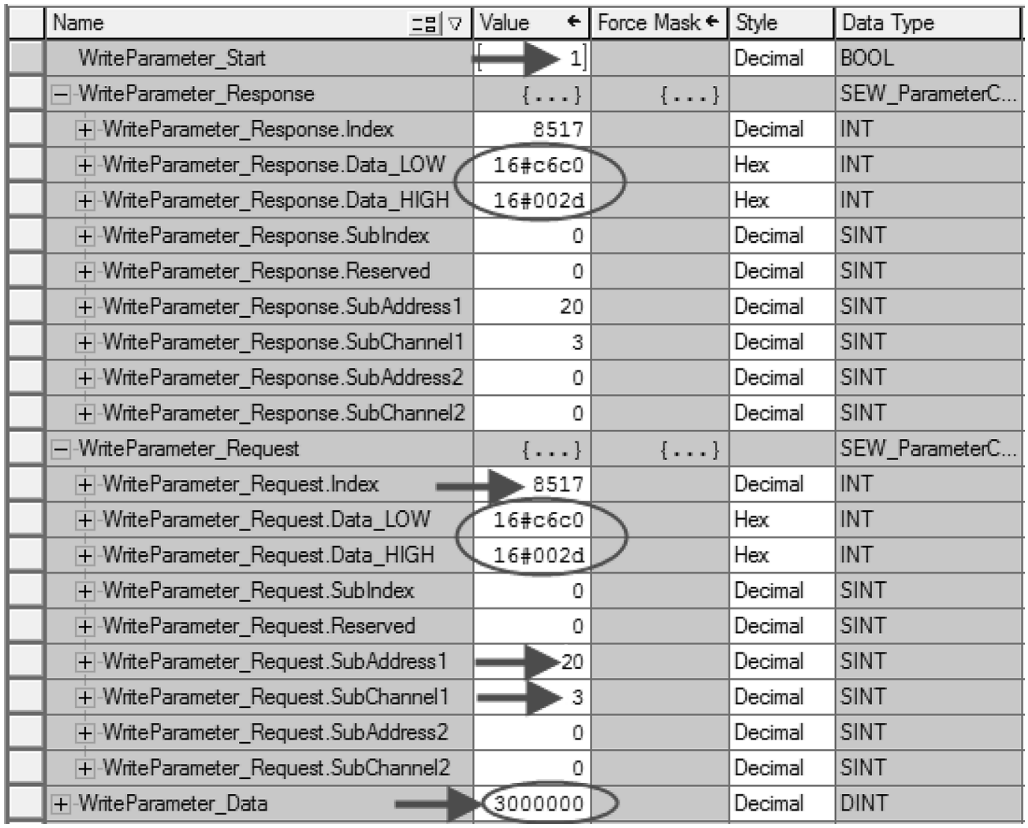
7. Open the tab [1].



16761643403

8. Click the button [2].
   ⇨ A module manager is displayed.
9. Via "I/O Configuration" > "Ethernet", select the target device with which you want to establish communication.
10. Do **not** activate the check box [3]. Both the PLC and the device only allow a limited number of connections.

11. Save the project and transfer it to the PLC.
12. Enter the following controller tags values:



Name	Value	Force Mask	Style	Data Type
WriteParameter_Start	1		Decimal	BOOL
WriteParameter_Response	{...}	{...}		SEW_ParameterC...
WriteParameter_Response.Index	8517		Decimal	INT
WriteParameter_Response.Data_LOW	16#c6c0		Hex	INT
WriteParameter_Response.Data_HIGH	16#002d		Hex	INT
WriteParameter_Response.SubIndex	0		Decimal	SINT
WriteParameter_Response.Reserved	0		Decimal	SINT
WriteParameter_Response.SubAddress1	20		Decimal	SINT
WriteParameter_Response.SubChannel1	3		Decimal	SINT
WriteParameter_Response.SubAddress2	0		Decimal	SINT
WriteParameter_Response.SubChannel2	0		Decimal	SINT
WriteParameter_Request	{...}	{...}		SEW_ParameterC...
WriteParameter_Request.Index	8517		Decimal	INT
WriteParameter_Request.Data_LOW	16#c6c0		Hex	INT
WriteParameter_Request.Data_HIGH	16#002d		Hex	INT
WriteParameter_Request.SubIndex	0		Decimal	SINT
WriteParameter_Request.Reserved	0		Decimal	SINT
WriteParameter_Request.SubAddress1	20		Decimal	SINT
WriteParameter_Request.SubChannel1	3		Decimal	SINT
WriteParameter_Request.SubAddress2	0		Decimal	SINT
WriteParameter_Request.SubChannel2	0		Decimal	SINT
WriteParameter_Data	3000000		Decimal	DINT

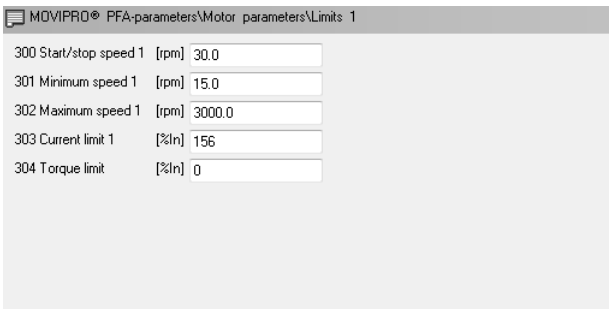
19132375179

Controller tag	Value
WriteParameterStart	1
WriteParameterRequest.Index	Index of the parameter to be described.
WriteParameterRequest.Data	Value to be written in the parameter.
WriteParameter_Request.SubAddress 1	20
WriteParameter_Request.SubChannel 1	3
WriteParameter_Request.SubAddress 2	0
WriteParameter_Request.SubChannel 2	0

13. Switch to RUN mode of the PLC.
    - ⇨ The write request is executed once.
    - ⇨ If the write request is answered, the controller tag "WriteParameterResponse.Index" displays the written index. The controller tag "WriteParameterResponse.Data" contains the written data.
    - ⇨ In this example, the parameter *P302 maximum speed* is set to 3000 min^{-1}.

16998413/EN – 12/2016

14. Check if the process data correspond to the values that are displayed in the parameter tree of the MOVITOOLS® MotionStudio engineering software.



17894369291

⇨ When you move the mouse over the parameter, the tooltip shows the index, subindex, factor, etc. of the parameter.

Access to device parameters with DLR support with RSLogix 5000 as of version V20

The following example describes the configuration of read and write access to the device parameters with Studio 5000 Logix Designer, Version V24 (up to version V20: RSLogix 5000).

You can access the device parameters as follows:

- via the 12-byte MOVILINK® parameter channel in process data
- via CIP message service

  Access is possible with all device versions.

INFORMATION

This chapter describes the access to the device parameters via the CIP message service. For information on the access via the 12-byte MOVILINK® parameter channel, refer to the "Application Configurator for CCU" manual.

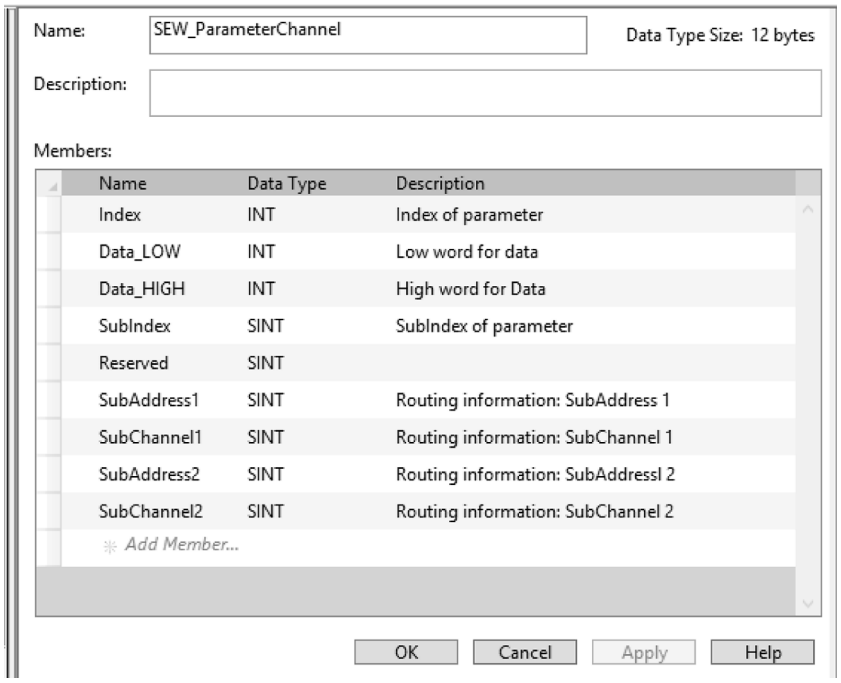
Reading parameters

Proceed as follows:

1. Create the user-defined data type "SEW_ParameterChannel". It allows you to organize the process data in a structure and simplifies access to the data elements.

INFORMATION

To ensure proper operation of the parameter channel, do **not** change the order of the variables. The data types must also match the figure.

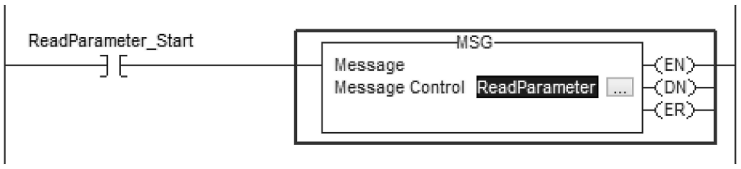


9007214470249995

2. Create the following controller tags:

Name	Data structure
ReadParameter_Start	BOOL
ReadParameter_Response	SEW_ParameterChannel
ReadParameter_Request	SEW_ParameterChannel
ReadParameter_Data	DINT
ReadParameter	MESSAGE

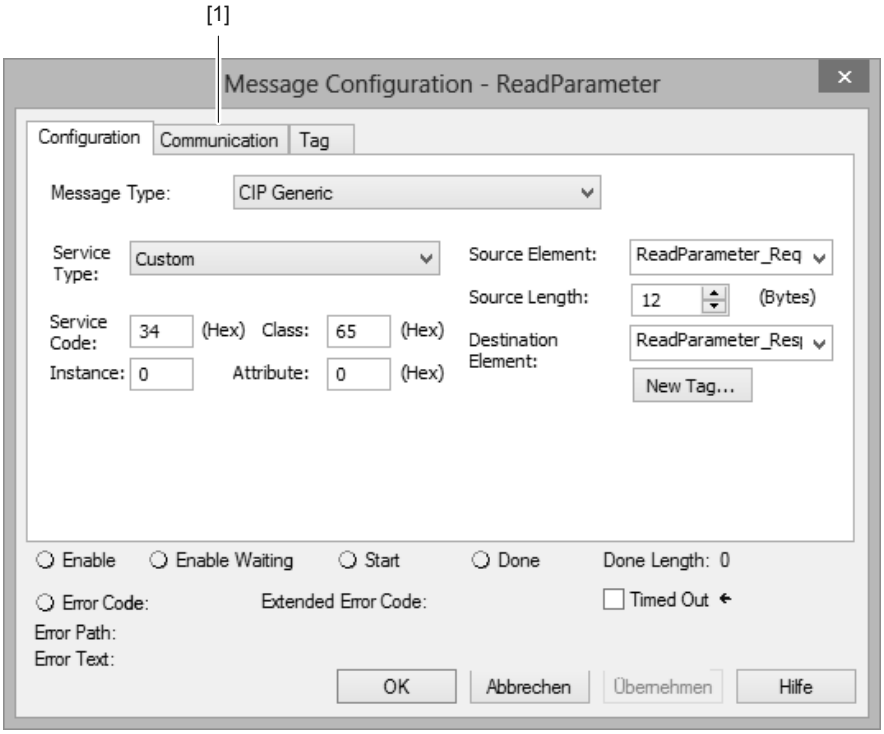
3. To be able to perform the read request, adapt the program of the PLC as follows:



9007214470308491

16998413/EN – 12/2016

4. Click the button ... in the MSG block.
   ⇨ The following window is displayed.



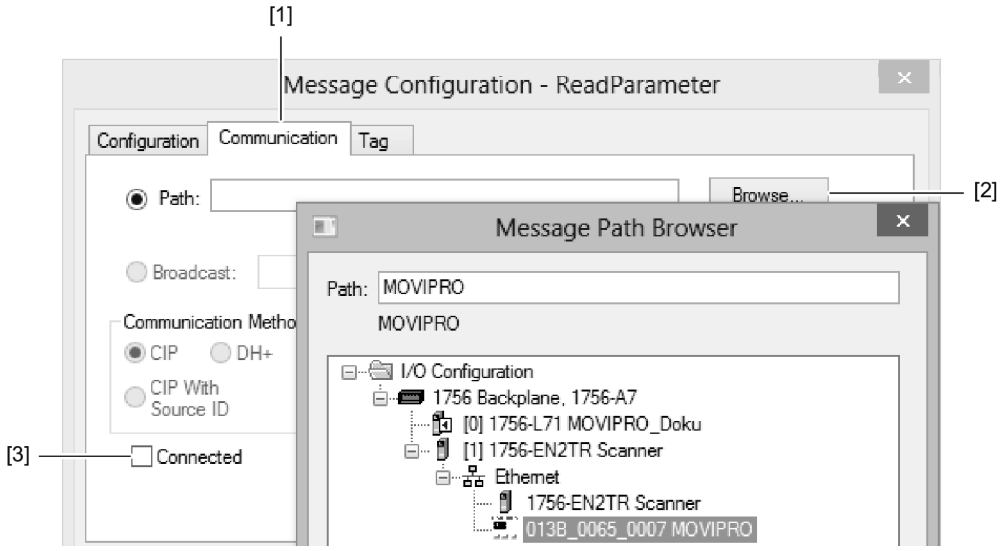
15215569931

5. Make the following settings in the specified sequence:

Window element	Setting/value
Source Element	ReadParameter_Request.Index
Source Length (Bytes)	12
Destination Element	ReadParameter_Response.Index
Service Code (Hex)	34
Class (Hex)	65
Instance	0
Attribute (Hex)	0

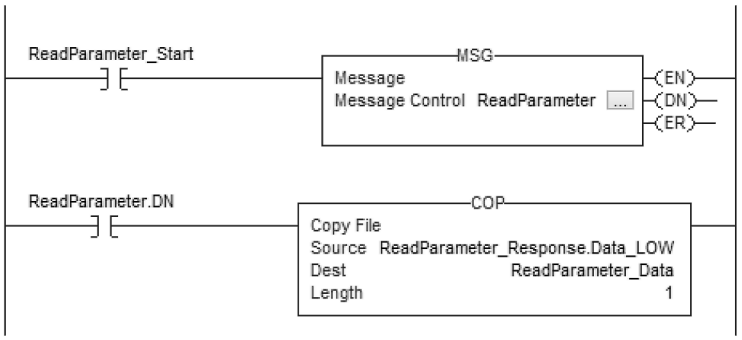
16998413/EN – 12/2016

6. Open the tab [1].



16761256459

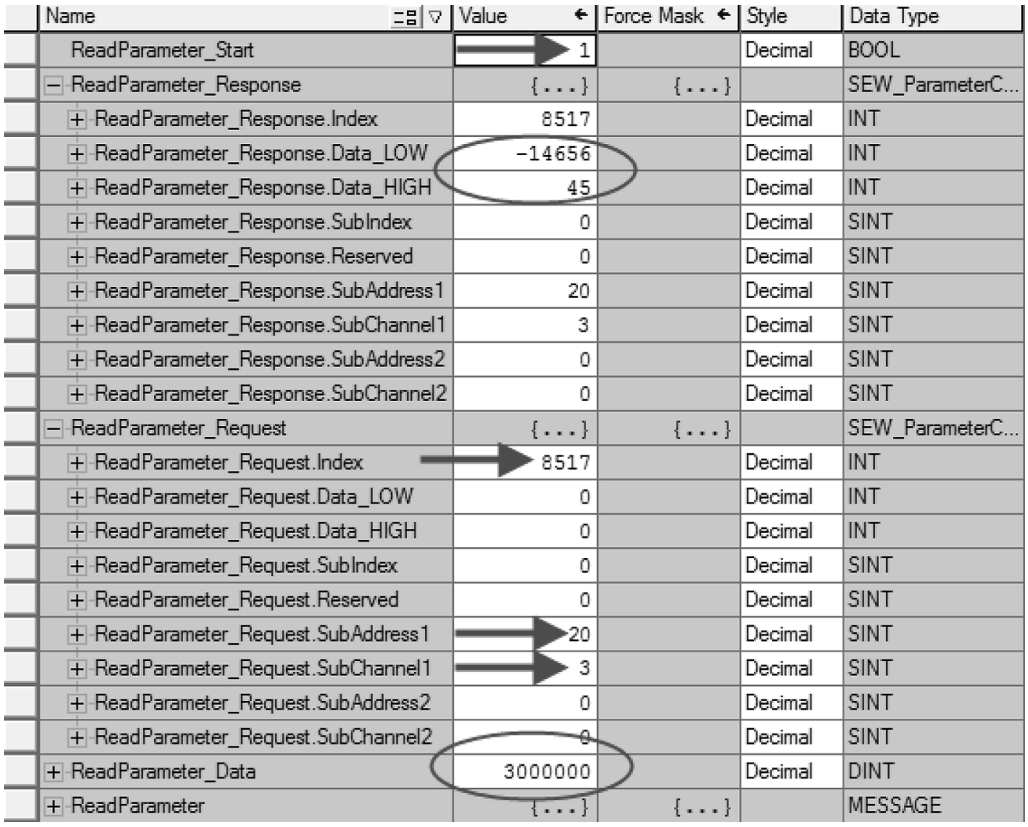
7. Click the button [2].
   ⇨ A module manager is displayed.
8. Via "I/O Configuration" > "Ethernet", select the target device with which you want to establish communication.
9. Do **not** activate the check box [3]. Both the PLC and the device allow only a limited number of connections.
10. Add the following additional "COP" command to the PLC program. The "COP" command copies both INT variables "ReadParameter_Request.Data_LOW" and "ReadParameter_Request.Data_HIGH" to a single DINT variable "ReadParameter_Data":



9007214470315787

16998413/EN – 12/2016

11. Save the project and transfer it to the PLC.
12. Enter the following controller tags values:



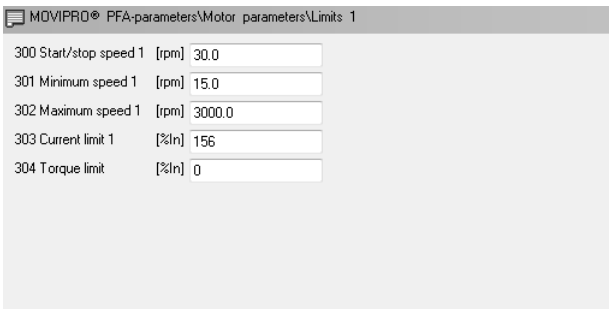
Name	Value	Force Mask	Style	Data Type
ReadParameter_Start	1		Decimal	BOOL
ReadParameter_Response	{...}	{...}		SEW_ParameterC...
ReadParameter_Response.Index	8517		Decimal	INT
ReadParameter_Response.Data_LOW	-14656		Decimal	INT
ReadParameter_Response.Data_HIGH	45		Decimal	INT
ReadParameter_Response.SubIndex	0		Decimal	SINT
ReadParameter_Response.Reserved	0		Decimal	SINT
ReadParameter_Response.SubAddress1	20		Decimal	SINT
ReadParameter_Response.SubChannel1	3		Decimal	SINT
ReadParameter_Response.SubAddress2	0		Decimal	SINT
ReadParameter_Response.SubChannel2	0		Decimal	SINT
ReadParameter_Request	{...}	{...}		SEW_ParameterC...
ReadParameter_Request.Index	8517		Decimal	INT
ReadParameter_Request.Data_LOW	0		Decimal	INT
ReadParameter_Request.Data_HIGH	0		Decimal	INT
ReadParameter_Request.SubIndex	0		Decimal	SINT
ReadParameter_Request.Reserved	0		Decimal	SINT
ReadParameter_Request.SubAddress1	20		Decimal	SINT
ReadParameter_Request.SubChannel1	3		Decimal	SINT
ReadParameter_Request.SubAddress2	0		Decimal	SINT
ReadParameter_Request.SubChannel2	0		Decimal	SINT
ReadParameter_Data	3000000		Decimal	DINT
ReadParameter	{...}	{...}		MESSAGE

19132371595

Controller tag	Value
ReadParameter_Start	1
ReadParameter_Request.Index	Index of the parameter to be read
ReadParameter_Request.SubAddress 1	20
ReadParameter_Request.SubChannel 1	3
ReadParameter_Request.SubAddress 2	0
ReadParameter_Request.SubChannel 2	0

13. Switch to RUN mode of the PLC.
    - ⇨ The read request is executed once.
    - ⇨ If the read request is answered, the controller tag "ReadParameter_Response.Index" displays the read index. The controller tags "ReadParameter_Response.Data_LOW" and "ReadParameter_Response.Data_HIGH" contain the low word and high word of the read data. The actual data is shown in the "ReadParametersResponse.Data" controller tag.
    - ⇨ In this example, the value (3000 min^{-1}) of the parameter *P302 maximum speed* (Index *8517.0*) is read.

14. Check if the process data correspond to the values that are displayed in the parameter tree of the MOVITOOLS® MotionStudio engineering software.



17894369291

⇨ When you move the mouse over the parameter, the tooltip shows the index, subindex, factor, etc. of the parameter.

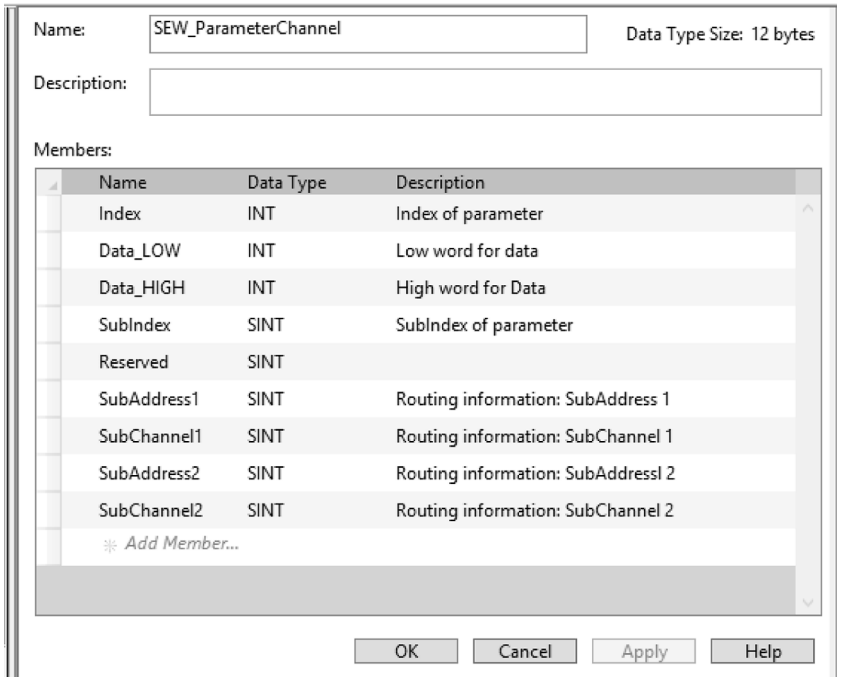
Writing parameters

Proceed as follows:

1. Create the user-defined data type "SEW_ParameterChannel". It allows you to organize the process data in a structure and simplifies access to the data elements.

INFORMATION

To ensure proper operation of the parameter channel, you must **not** change the order of the variables. The data types must also match the figure.



9007214470249995

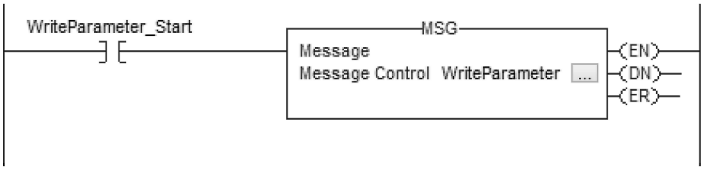
2. Create the following controller tags:

Name	Data structure
WriteParameter_Start	BOOL
WriteParameter_Response	SEW_ParameterChannel

16998413/EN – 12/2016

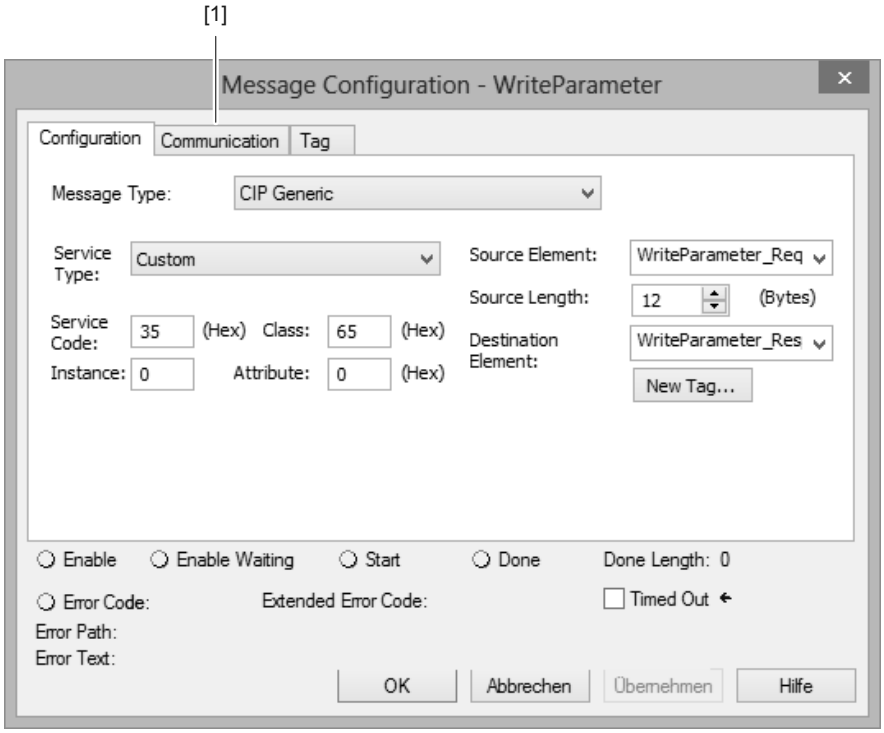
Name	Data structure
WriteParameter_Request	SEW_ParameterChannel
WriteParameter_Data	DINT
WriteParameter	MESSAGE

3. To be able to perform the write request, adapt the program of the PLC as follows:



9007214470335883

4. Click the button ... in the MSG block.
   ⇨ The following window is displayed.

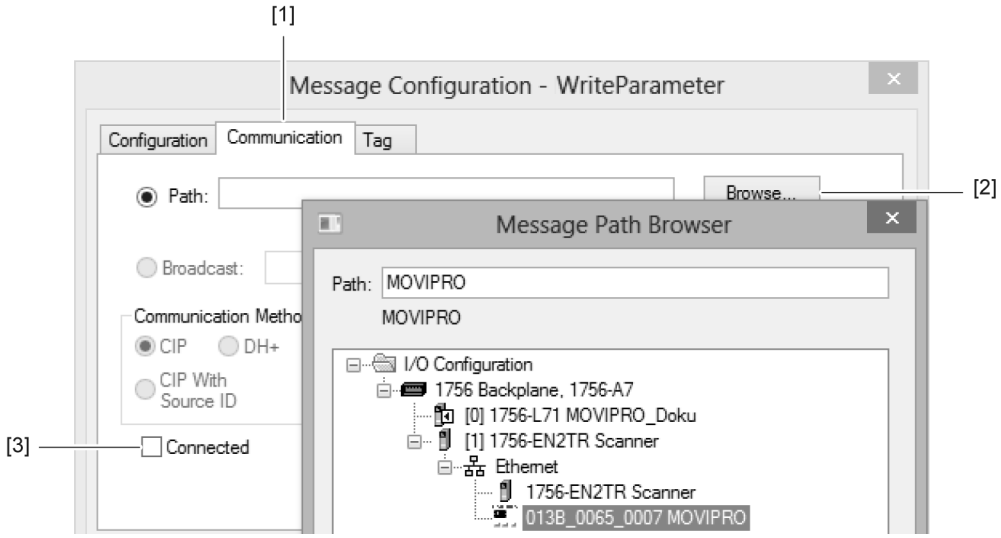


15215597323

5. Make the following settings in the specified sequence.

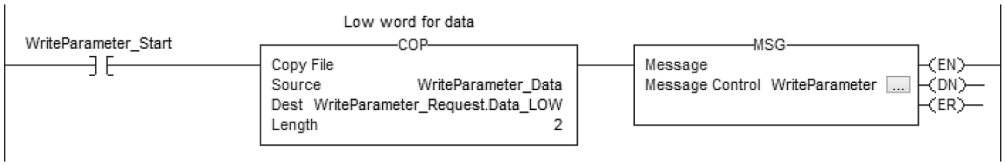
Window element	Setting/value
Source Element	WriteParameter_Request.Index
Source Length (Bytes)	12
Destination Element	WriteParameter_Response.Index
Service Code (Hex)	35
Class (Hex)	65
Instance	0
Attribute (Hex)	0

6. Open the tab [1].



16761639563

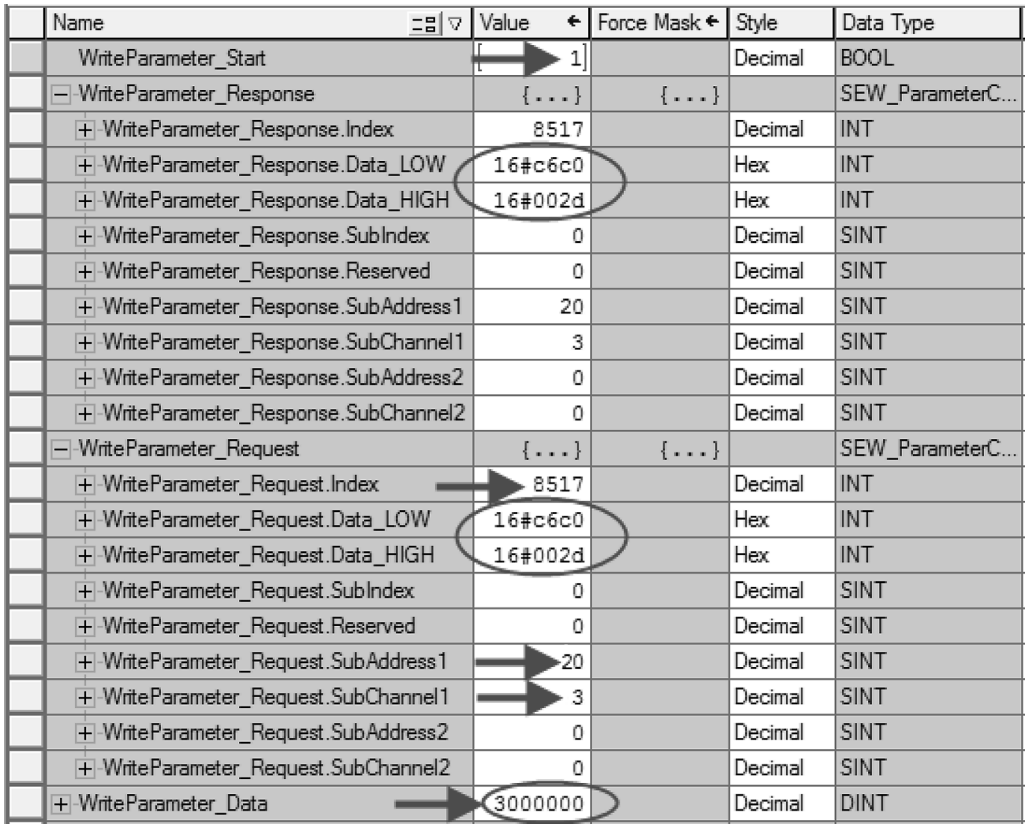
7. Click the button [2].
   ⇨ A module catalog is displayed.
8. Via "I/O Configuration" > "Ethernet", select the target device with which you want to establish communication.
9. Do **not** activate the check box [3]. Both the PLC and the device allow only a limited number of connections.
10. Add the following additional COP command to the PLC program:
    ⇨ The COP command copies the DINT variable "WriteParameter_Data" to the INT variables "WriteParameter_Request.Data_LOW" and "WriteParameter_Request.Data_HIGH".



9007214470254859

16998413/EN – 12/2016

11. Save the project and transfer it to the PLC.
12. Enter the following controller tags values:



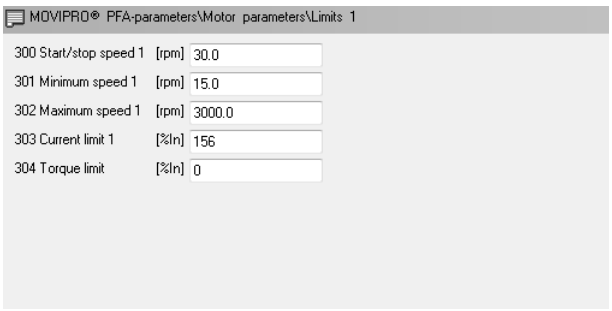
Name	Value	Force Mask	Style	Data Type
WriteParameter_Start	1		Decimal	BOOL
WriteParameter_Response	{...}	{...}		SEW_ParameterC...
WriteParameter_Response.Index	8517		Decimal	INT
WriteParameter_Response.Data_LOW	16#c6c0		Hex	INT
WriteParameter_Response.Data_HIGH	16#002d		Hex	INT
WriteParameter_Response.SubIndex	0		Decimal	SINT
WriteParameter_Response.Reserved	0		Decimal	SINT
WriteParameter_Response.SubAddress1	20		Decimal	SINT
WriteParameter_Response.SubChannel1	3		Decimal	SINT
WriteParameter_Response.SubAddress2	0		Decimal	SINT
WriteParameter_Response.SubChannel2	0		Decimal	SINT
WriteParameter_Request	{...}	{...}		SEW_ParameterC...
WriteParameter_Request.Index	8517		Decimal	INT
WriteParameter_Request.Data_LOW	16#c6c0		Hex	INT
WriteParameter_Request.Data_HIGH	16#002d		Hex	INT
WriteParameter_Request.SubIndex	0		Decimal	SINT
WriteParameter_Request.Reserved	0		Decimal	SINT
WriteParameter_Request.SubAddress1	20		Decimal	SINT
WriteParameter_Request.SubChannel1	3		Decimal	SINT
WriteParameter_Request.SubAddress2	0		Decimal	SINT
WriteParameter_Request.SubChannel2	0		Decimal	SINT
WriteParameter_Data	3000000		Decimal	DINT

19132375179

Controller tag	Value
WriteParameter_Start	1
WriteParameter_Request.Index	Index of the parameter to be described.
WriteParameter_Data	Value to be written in the parameter.
WriteParameter_Request.SubAddress 1	20
WriteParameter_Request.SubChannel 1	3
WriteParameter_Request.SubAddress 2	0
WriteParameter_Request.SubChannel 2	0

13. Switch to RUN mode of the PLC.
    - ⇨ The write request is executed once.
    - ⇨ If the write request is answered, the controller tag "WriteParameter_Response.Index" displays the written index. The controller tags "WriteParameter_Response.Data_HIGH" and "WriteParameter_Response.Data_LOW" contain the written data.
    - ⇨ In this example, the parameter *P302 maximum speed* is set to 3000 min^{-1}.

14. Check if the process data correspond to the values that are displayed in the parameter tree of the MOVITOOLS® MotionStudio engineering software.



17894369291

⇨ When you move the mouse over the parameter, the tooltip shows the index, subindex, factor, etc. of the parameter.

16998413/EN – 12/2016

7 Ethernet Industrial Protocol (EtherNet/IP™)

7.1 Description

The EtherNet Industrial Protocol (EtherNet/IP™) is an open communication standard based on the classic Ethernet protocols TCP/IP and UDP/IP.

EtherNet/IP™ was defined by the **O**pen **D**eviceNet **V**endor **A**ssociation (ODVA) and **C**ontrolNet **I**nternational (CI).

With EtherNet/IP™, Ethernet technology is expanded to include the CIP (**C**ommon **I**ndustrial **P**rotocol) application protocol. CIP is known in the field of automation engineering because it is also used for DeviceNet™ and ControlNet as an application protocol.

7.2 Process data exchange

The device can exchange the following process data words with an EtherNet/IP™ master (PLC), depending on its use:

- MOVIPRO® SDC up to 8 process data words
- MOVIPRO® ADC up to 120 process data words

The process data length sets the EtherNet/IP™ master on opening the connection.

In addition to a controlling "Exclusive Owner Connection", up to two additional "Listen Only Connections" are possible. This means the actual values of the drive can also be read out by stand-by controllers or visualization devices.

If there is already a controlling connection via Modbus/TCP, you cannot activate an "Exclusive Owner Connection" via EtherNet/IP™ before a power-on reset.

16998413/EN – 12/2016

7.3 Timeout response

The timeout state is initiated by the unit. The EtherNet/IP™ master sets the timeout interval while establishing a connection. The EtherNet/IP™ specification refers to a "**R**equested **P**acket **I**nterval (RPI)" rather than a timeout interval in this case.

The timeout interval is displayed in the parameter tree of the MOVITOOLS® MotionStudio engineering software. However, you must not change the timeout interval in the engineering software as they can only be activated via fieldbus.

The timeout interval displayed in the parameter tree is calculated by multiplying the Requested Packet Interval (RPI) with the "Timeout Multiplier".

This timeout interval is retained in the device whenever an "Exclusive Owner Connection" is dropped, and the device switches to timeout state after the timeout interval has elapsed. The timeout state is indicated by the red blinking "S1" LED on the service unit of the device.

If the application module "Transparent" is parameterized in the device, the drive is stopped immediately in the timeout state and the digital outputs are reset.

The timeout state can be reset via EtherNet/IP™ as follows:

- Via reset service of the identity object (class 0x01, instance 0x01, undetermined attribute)
- By re-establishing the connection
- Via the reset bit in the control word

7.4 CIP object directory

All device data are available via objects in the **C**ommon **I**ndustrial **P**rotocol (CIP).

The following CIP objects are integrated in the device:

Class hex	Name
01	Identity object
02	Message router object
04	Assembly object
06	Connection manager object
07	Register object
0F	Parameter object
64	Vardata object
F5	TCP/IP interface object
F6	Ethernet link object

16998413/EN – 12/2016

7.4.1 Identity object

- Contains general information on the EtherNet/IP™ device.
- Class code: 01_{hex}

Class

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0001	Maximum instance

Instance 1

The following table provides an overview via instance 1 of the identity object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Vendor ID	UINT	013B	SEW-EURODRIVE GmbH & Co KG
2	Get	Device Type	UINT	0065	Manufacturer-specific type
3	Get	Product Code	UINT	007	Product no. 7: MOVIPRO®
4	Get	Revision	STRUCT of	–	Revision of the identity object, depends on the firmware version
		Major Revision	USINT		
		Minor Revision	USINT		
5	Get	Status	WORD	–	For coding of the attribute see following table
6	Get	Serial number	UDINT	–	Unique serial number
7	Get	Product Name	SHORT_STRING	SEW-MOVIPRO	Product name

Coding of attribute 5 "Status"

Bit	Name	Description
0	Owned	Controlling connection is active.
1	–	Reserved
2	Configured	Configuration complete.
3	–	Reserved
4 – 7	Extended Device Status	• Value 0000_{bin}: Unknown • Value 0010_{bin}: At least one faulty I/O connection detected • Value 0011_{bin}: No I/O connection established • Value 0110_{bin}: At least one I/O connection active
8	Minor Recoverable Fault	Minor fault that can be remedied
9	Minor Unrecoverable Fault	Minor fault that cannot be remedied
10	Major Recoverable Fault	Major fault that can be remedied
11	Major Unrecoverable Fault	Major fault that cannot be remedied
12 – 15	–	Reserved

Supported services

The following table shows the services supported by the identity object:

Service Code hex	Service Name	Class	Instance
01	Get_Attributes_All	X	X
05	Reset	–	X
0E	Get_Attribute_Single	X	X

16998413/EN – 12/2016

7.4.2 Message router object

- Contains information on the implemented objects.
- Class code: 02_{hex}

Class

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Revision	UINT	0001	Revision 1

Instance 1

The following table provides an overview via instance 1 of the identity object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Object_List	STRUCT of	–	Object list comprising: • Number of objects • List of objects
		Number	UINT	0009	
		Classes	ARRAY of UINT	01 00 02 00 04 00 06 00 07 00 0F 00 64 00 F5 00 F6 00	
2	Get	Number Available	UINT	0009	Maximum number of connections

Supported services

The following table shows the services supported by the message router object:

Service Code hex	Service Name	Class	Instance
01	Get_Attributes_All	X	–
0E	Get_Attribute_Single	X	X

16998413/EN – 12/2016

7.4.3 Assembly object

- Accesses the process data of the device. To exchange cyclic process data, I/O connections are established to the instances of the assembly object.
- Class code: 04_{hex}

Class

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Revision	UINT	0002	Revision 2
2	Get	Max Instance	UINT	0082	Maximum instance

Instance 163 – PO data range

This instance accesses the process output data of the device. Only one single connection is established to this instance because the device can only be controlled by one single EtherNet/IP™ master.

Attribute	Access	Name	Data type	Default value hex	Description
3	Get	Data	Array of BYTE	–	OUTPUT assembly

Instance 121 – "Heartbeat"

The EtherNet/IP™ master establishes an "Input Only Connection" to this instance. No process output data is sent with this type of connection. It is used only to read process input data.

Attribute	Access	Name	Data type	Default value hex	Description
3	Get	Data	Array of BYTE	–	OUTPUT assembly Data Size 0

Instance 173 – PI data range

This instance accesses the process input data of the device. Several multi cast connections or a point-to-point connection can be established to this instance.

Attribute	Access	Name	Data type	Default value hex	Description
3	Get	Data	Array of BYTE	–	INPUT assembly

INFORMATION

The designations "INPUT assembly" and "OUTPUT assembly" refer to the processes as seen from the network's point of view. An "INPUT assembly" produces data on the network, "OUTPUT assembly" uses data from the network.

Supported services

The following table shows the services supported by the assembly object:

Service Code hex	Service Name	Class	Instance 163	Instance 121	Instance 173
0E	Get_Attribute_Single	X	X	–	X

16998413/EN – 12/2016

7.4.4 Register object

- Accesses the SEW parameter index.
- Class code: 07_{hex}

Class

Attribute	Access	Name	Data type	Default value hex	Description
2	Get	Max Instance	UINT	0009	Maximum instance

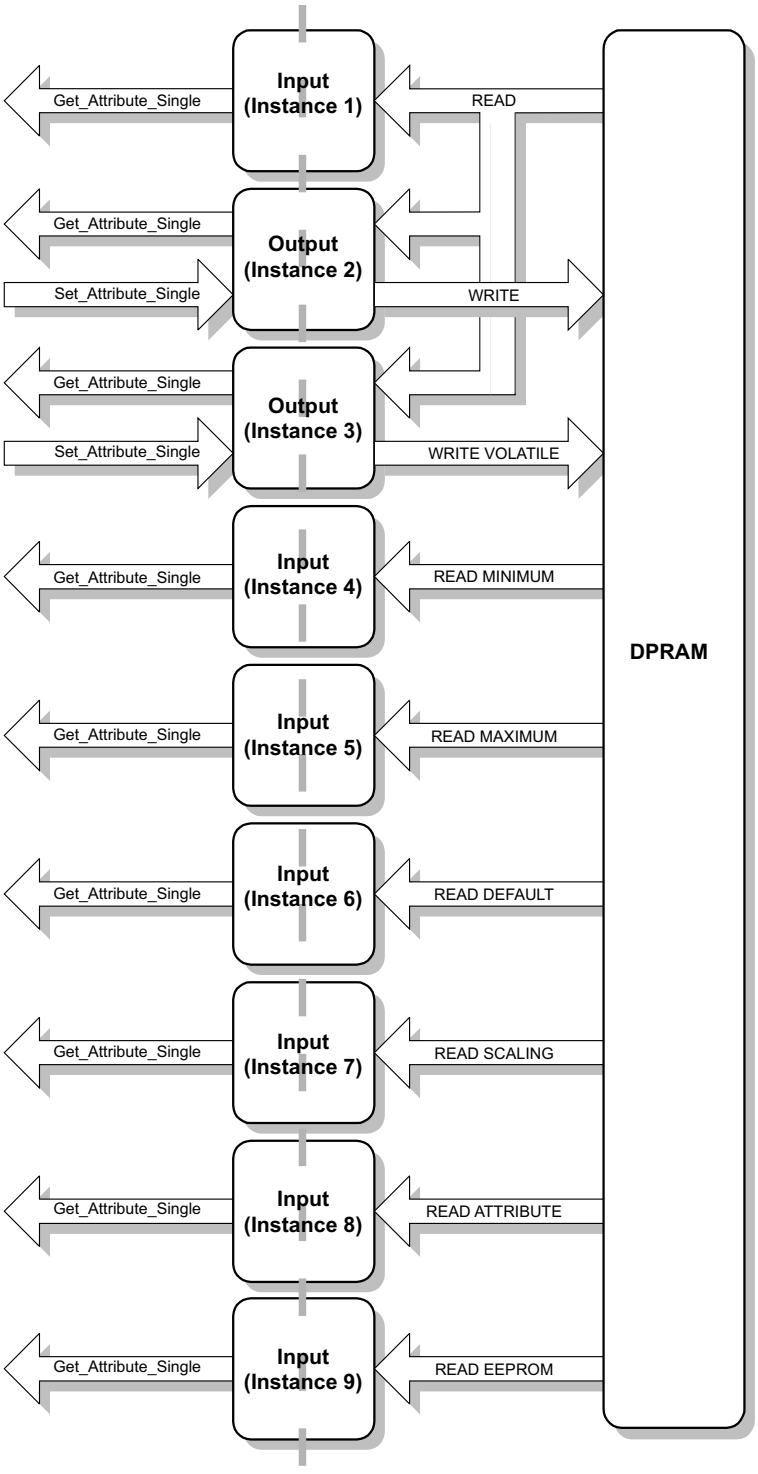
The MOVILINK® services are mapped in the 9 instances of the register object. These MOVILINK® services are accessed with the services of the register object "Get_Attribute_Single" and "Set_Attribute_Single".

The register object is specified so that INPUT objects can only be read, whereas OUTPUT objects can be read and written.

Instance	INPUT/OUTPUT	MOVILINK® service with	
		Get_Attribute_Single	Set_Attribute_Single
1	INPUT	READ parameters	Invalid
2	OUTPUT	READ	WRITE parameter
3	OUTPUT	READ	WRITE VOLATILE parameter
4	INPUT	READ MINIMUM	Invalid
5	INPUT	READ MAXIMUM	Invalid
6	INPUT	READ DEFAULT	Invalid
7	INPUT	READ SCALING	Invalid
8	INPUT	READ ATTRIBUTE	Invalid
9	INPUT	READ EEPROM	Invalid

16998413/EN – 12/2016

Description of the 12-byte MOVILINK® parameter channel:



879804555

EtherNet/IP™ **Fieldbus profile from SEW-EURODRIVE**

16998413/EN – 12/2016

Instance 1 – 9

The following table provides an overview of instances 1 – 9 of the identity object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Bad Flag	BOOL	00	• Value 0: good • Value 1: bad
2	Get	Direction	BOOL	00 01	Input register Output register
3	Get	Size	UINT	0060	Data length in bits (96 bits = 12 bytes)
4	Get/Set	Data	ARRAY of BITS	–	Data in the format of the 12-byte MOVILINK® parameter channel

The attributes have the following functions:

- Attribute 1 indicates whether an error occurred during the previous access to the data field.
- Attribute 2 indicates the direction of the instance.
- Attribute 3 indicates the data length in bits.
- Attribute 4 indicates the parameter data. When accessing attribute 4, the 12-byte MOVILINK® parameter channel must be attached to the service telegram.

The 12-byte MOVILINK® parameter channel consists of the following elements:

Name	Data type	Description
Index	UINT	SEW-Parameter index
Data	UDINT	Data (32 bit)
Subindex	BYTE	SEW-Parameter subindex
Reserved	BYTE	Reserved (must be "0")
Subaddress 1	BYTE	Different subchannels and subaddresses must be used depending on the device component to be addressed: • Subaddress 1 = 0, Subchannel 1 = 0: Parameters of communication and control unit "PFH-..." • Subaddress 1 = 20, Subchannel 1 = 3: Parameters of power section "PFA-..."
Subchannel 1	BYTE	
Subaddress 2	BYTE	Reserved (must be "0")
Subchannel 2	BYTE	Reserved (must be "0")

Supported services

The following table shows the services supported by the register object:

Service Code hex	Service Name	Instance
0x0E	Get_Attribute_Single	X
0x10	Set_Attribute_Single	X

16998413/EN – 12/2016

7.4.5 Parameter object

- Also accesses the SEW parameter index.
- Class code: $0F_{hex}$

INFORMATION

Access to an SEW parameter index via the parameter object is complicated and prone to errors.

Therefore, only use the parameter object in exceptional cases if the EtherNet/IP™ master does not support parameterization via the mechanisms of the register object.

Class

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0005	Maximum instance
8	Get	Parameter Class Descriptor	UINT	0009	• Bit 0: Supports parameter instances • Bit 3: Saves parameter permanently (non-volatile memory)
9	Get	Configuration Assembly Interface	UINT	0000	"Configuration Assembly" not supported.

The instances of the parameter object should be used only to access the SEW Parameter index when the EtherNet/IP™ master in use does not support the process of attaching own data to the services “Get_Attribute_Single” and “Set_Attribute_Single”.

Addressing a SEW parameter index with the parameter object takes place in several steps:

1. Set the address of the required parameter in the instances 1 – 4.
2. Access the parameter that is addressed in instances 1 – 4 using instance 5.

Instance 1 – SEW parameter index

The following table provides an overview of instance 1 of the parameter object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Set	Parameter value	UINT	207A	Index of the parameter
2	Get	Link Path Size	USINT	00	No link is specified
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C7	UINT
6	Get	Data Size	USINT	02	Data length in bytes

16998413/EN – 12/2016

Instance 2 – SEW parameter subindex

The following table provides an overview of instance 2 of the parameter object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Set	Parameter value	UINT	0000	Low byte contains the subindex.
2	Get	Link Path Size	USINT	00	No link is specified
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C7	UINT
6	Get	Data Size	USINT	02	Data length in bytes

Instance 3 – SEW subparameter 1

The following table provides an overview of instance 3 of the parameter object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Set	Parameter value	UINT	0000	• Low byte: Contains subaddress 1. • High byte: Contains subchannel 1.
2	Get	Link Path Size	USINT	00	No link is specified
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C7	UINT
6	Get	Data Size	USINT	02	Data length in bytes

Instance 4 – SEW subparameter 2

The following table provides an overview of instance 4 of the parameter object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Set	Parameter Value	UINT	0000	• Low byte: Contains subaddress 2. • High byte: Contains subchannel 2.
2	Get	Link Path Size	USINT	00	No link is specified
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C7	UINT
6	Get	Data Size	USINT	02	Data length in bytes

16998413/EN – 12/2016

Entity 5 – SEW read/write

The following table provides an overview of instance 5 of the parameter object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Set	Parameter Value	UDINT		• Set service: Performs write access to the parameter that is addressed in the instances 1 – 4. • Get service: Performs read access to the parameter that is addressed in the instances 1 – 4.
2	Get	Link Path Size	USINT	00	No link is specified
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C8	UDINT
6	Get	Data Size	USINT	04	Data length in bytes

Supported services

The following table shows the services supported by the parameter object:

Service Code hex	Service Name	class	Instance
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	–	X

16998413/EN – 12/2016

7.4.6 Vardata object

- This manufacturer-specific object allows for engineering with software tools from SEW-EURODRIVE.
- Class code: 64_{hex}

Class

None of the class attributes are supported.

Instance 1

The following table provides an overview of instance 1 of the Vardata object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Data	ARRAY OF SINT	–	–
2	Get	Size	UINT	00F2	Maximum data length in bytes

Supported services

The following table shows the services supported by the Vardata object:

Service Code hex	Service Name	Instance attribute 1	Instance attribute 2
0E	Get_Attribute_Single	X	X
32	Vardata (custom)	X	–

The standardized service "Get_Attribute_Single" (Service Code 0x0E) delivers a data stream with the maximum data length (attribute 2) when instance attribute 1 is accessed. The data content is filled with zeros. If a data stream is added to the request telegram ("Service Type Custom"), this data is returned in a mirrored form (Vardata test mode).

The Vardata service (service code 0x32) is manufacturer-specific. Request and response of this service have the same telegram structure. The telegram contains routing information, the data length of the Vardata user data telegram and the actual Vardata layer -7 telegram. The data length of the Vardata layer -7 telegram is variable.

The following table shows the complete telegram structure.

Name	Data type
Subaddress 1	BYTE
Subchannel 1	BYTE
Subaddress 2	BYTE
Subchannel 2	BYTE
Data Len Low	BYTE
Data Len High	BYTE
Reserved	BYTE
Reserved	BYTE
FC	BYTE
Vardata	Array of BYTE

16998413/EN – 12/2016

7.4.7 TCP/IP interface object

- Allows for configuration of the IP parameters via EtherNet/IP™.
- Class code: $F5_{hex}$

Class

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0001	Maximum instance
3	Get	Number of Instances	UINT	0001	The device has one TCP/IP interface.

Instance 1

The following table provides an overview of instance 1 of the TCP/IP interface object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Status	DWORD	00000001	Valid configuration
2	Get	Configuration Capability	DWORD	00000014	The interface configuration attribute (5) is writable. The DHCP can be used for configuration.
3	Set	Configuration Control	DWORD	00000002	• Value 0: The device uses IP parameters saved during boot-up. • Value 1: The device awaits its IP configuration via DHCP during boot-up.
4	Get	Physical Link Object	STRUCT of	–	Reference to the EtherNet link object (class code 0xF6) as sublayer.
		Path Size	UINT	0002	
		Path	Padded EPATH	20 F6 24 01	
5	Set	Interface Configuration	STRUCT of	–	–
		IP Address	UDINT	–	Current IP address
		Network Mask	UDINT	–	Current subnetwork mask
		Gateway Address	UDINT	–	Currently set standard gateway
		Name Server	UDINT	00000000	DNS is not supported.
		Name Server 2	UDINT	00000000	DNS is not supported.
		Domain Name	STRING	sew.de	–
6	Get	Host Name	STRING	–	Not used

Supported services

The following table shows the services supported by the TCP/IP interface object:

Service Code hex	Service Name	class	Instance
01	Get_Attributes_All	X	–
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	–	X

16998413/EN – 12/2016

7.4.8 EtherNet link object

- Contains information on the Ethernet communication interface.
- Class code: $F6_{hex}$

Class

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0002	Maximum instance
3	Get	Number of Instances	UINT	0002	The device has two TCP/IP interfaces.

Instance 1 – Ethernet connection X4232_1/X4233_1

The following table provides an overview via instance 1 of the identity object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Interface Speed	UDINT	00000064	Transmission speed in MBit/s Standard value = 100
2	Get	Interface Flags	DWORD	–	• Bit 0: Displays the active link. • Bit 1: Displays full duplex mode. • Bit 2 – 4: Signals negotiation state. • Bit 5: Displays whether the manual setting has to be reset. • Bit 6: Indicates a local hardware error.
3	Get	Physical Address	ARRAY of 6 USINTs	00 0F 69 xx xx xx	MAC ID SEW MAC OUI: 00 0F 69

Instance 2 – Ethernet connection X4232_2/X4233_22

The following table provides an overview via instance 2 of the identity object:

Attribute	Access	Name	Data type	Default value hex	Description
1	Get	Interface Speed	UDINT	00000064	Transmission speed in MBit/s Standard value = 100
2	Get	Interface Flags	DWORD	–	• Bit 0: Displays the active link. • Bit 1: Displays full duplex mode. • Bit 2 – 4: Signals negotiation state. • Bit 5: Displays whether the manual setting has to be reset. • Bit 6: Indicates a local hardware error.
3	Get	Physical Address	ARRAY of 6 USINTs	00 0F 69 xx xx xx	MAC ID SEW MAC OUI: 00 0F 69

Supported services

The following table shows the services supported by the Ethernet link object:

Service Code hex	Service Name	Instance attribute 1	Instance attribute 2
01	Get_Attributes_All	X	–
0E	Get_Attribute_Single	X	X

16998413/EN – 12/2016

7.5 Return codes for parameterization via "explicit messages"

If a parameter request via "explicit messages" fails, you can determine the cause via a fault code.

An error is generated as follows:

- By EtherNet/IP™ master

  EtherNet/IP™-specific return codes are returned in the error telegram if the data format is not maintained during the transfer or if a service is performed that has not been implemented.

  Coding of the EtherNet/IP™-specific return code is described in the following chapter: "General error codes" (→ 🗎 87). For further information about the EtherNet/IP™-specific return codes, refer to the EtherNet/IP™ specification.

  The "General Error Code" of a manufacturer-specific return code is $1F_{hex}$.

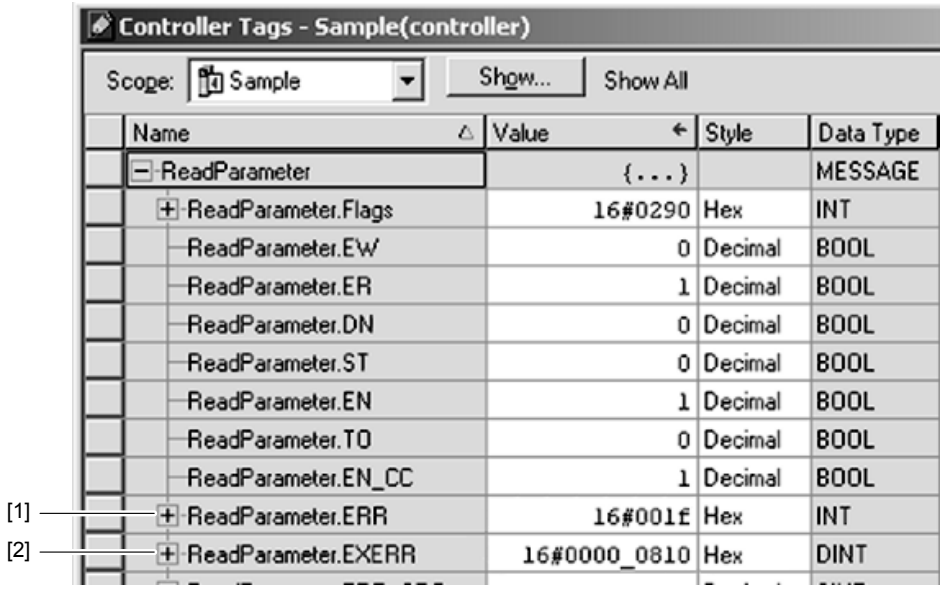
- By EtherNet/IP™ slave

  The return codes that are returned from the EtherNet/IP™ slave or lower-level devices due to faulty parameterization are described in the following chapter: "MOVILINK®-specific return codes" (→ 🗎 88).

- Due to timeout

  The timeout behavior is described in the following chapter: "Timeout response of "explicit messages"" (→ 🗎 89).

The general error code (ERR) and the additional code (EXERR) can be read out from the status registers of the message tags:



14310226443

[1] General Error Code (ERR): Value 16#001f

[2] Additional Code (EXERR): Value 16#0000_0810

The return codes are returned in the following format:

Byte offset	Function	Example: Parameter response telegram
0	General Error Codes	$1F_{hex}$ Vendor-specific
1	Additional code Length (words)	01_{hex} Only low word (word 1)
2	Additional code Word 1 (low byte)	10_{hex} MOVILINK® Additional Error Code

Byte offset	Function	Example: Parameter response telegram
3	Additional code Word 1 (high byte)	08_{hex} MOVILINK® error class

The return code `16#0000_0810` from the example has the following meaning:

- The "MOVILINK® Error Class" 08 in high byte of "Additional Codes" stands for "General Error".
- The "MOVILINK® Additional Error Class" 10 in low byte of "Additional Codes" stands for "Invalid Index"

The return thus indicates that a non-existing device index was accessed.

16998413/EN – 12/2016

7.5.1 General error codes

General Error Code hex	Designation	Description
00	Success	Successful
01	Connection failure	A connection-specific service has failed.
02	Resource unavailable	The source required for performing the service is unavailable.
03	–	Reserved
04	Path segment error	The processing node was unable to interpret the "Path Segment Identifier" or the segment syntax.
05	Path destination unknown	The "Path" refers to an object class, object instance or a structural element that is not supported by the processing node.
06 – 07	–	Reserved
08	Service not supported	The service is not supported for the selected class/instance.
09	Invalid attribute value	Invalid attribute data have been sent.
0A – 0B	–	–
0C	Object state conflict	The selected object cannot perform the service in its current status.
0D	–	Reserved
0E	Attribute not settable	It is not possible to access the selected object for writing.
10	Device state conflict	The current status of the device makes it impossible to perform the required service.
11 – 12	–	Reserved
13	Not enough data	The length of the transferred data is too short for the service to be performed.
14	Attribute not supported	The selected attribute is not supported.
15	Too much data	The length of the transferred data is too long for the service to be performed.
16	Object does not exist	The selected object is not implemented in the device.
17 – 1D	–	Reserved
1E	Embedded Service Error	Internal processing error
1F	Vendor-specific error	Manufacturer-specific error
20	Invalid parameter	Invalid parameter. This error message is used when a parameter does not satisfy the requirements of the specification and/or the requirements of the application.
21-FF	–	Reserved

16998413/EN – 12/2016

7.5.2 MOVILINK®-specific return codes

The following table shows the MOVILINK®-specific return codes (MOVILINK® "Error Class" and "Additional Code") in the event of an incorrect parameterization:

MOVILINK®		Designation
Error class	Additional code	
0x05	0x00	Unknown error
	0x01	Illegal Service
	0x02	No Response
	0x03	Different Address
	0x04	Different Type
	0x05	Different Index
	0x06	Different Service
	0x07	Different Channel
	0x08	Different Block
	0x09	No Scope Data
	0x0A	Illegal Length
	0x0B	Illegal Address
	0x0C	Illegal Pointer
	0x0D	Not enough memory
	0x0E	System Error
	0x0F	Communication does not exist
	0x10	Communication not initialized
	0x11	Mouse conflict
	0x12	Illegal Bus
	0x13	FCS Error
	0x14	PB Init
	0x15	SBus - Illegal Fragment Count
	0x16	SBus - Illegal Fragment Type
	0x17	Access denied
	–	Not used
0x08	0x00	No Error
	0x10	Illegal Index
	0x11	Not yet implemented
	0x12	Read only
	0x13	Parameter Blocking
	0x14	Setup runs
	0x15	Value too large
	0x16	Value too small
	0x17	Required Hardware does not exist
	0x18	Internal error
	0x19	Reserved
	0x1A	Reserved
	0x1B	Parameter protected
	0x1C	"Controller inhibit" required
	0x1D	Value invalid
	0x1E	Setup started
	0x1F	Buffer overflow
	0x20	"No enable" required
	0x21	End of File
	0x22	Communication Order
	0x23	"IPOS Stop" Required
	0x24	Autosetup
	0x25	Encoder Nameplate Error
	0x29	PLC State Error

16998413/EN – 12/2016

7.5.3 Timeout response of "explicit messages"

The timeout status is triggered by the EtherNet/IP™ slave. The EtherNet/IP™ master sets the timeout interval while establishing a connection. The EtherNet/IP™ specification refers to an "Expected packet rate" rather than a timeout interval in this case. The "Expected Packet Rate" is calculated from the timeout delay as follows:

$$t_{Expected\_Packet\_Rate\_ExplicitMessages} = \frac{t_{Timeout\_ExplicitMessages}}{4}$$

The "Expected Packet Rate" sets the "Forward Open Telegram" when the connection is established.

If a timeout occurs for the "explicit messages", the connection type is dropped automatically in the default setting of the EtherNet/IP™. The connection type must be re-established to communicate with "explicit messages" again. The timeout is **not** forwarded to the IEC program.

7.6 Technical data of the EtherNet/IP™ interface

EtherNet/IP™	MOVIPRO®
Automatic baud rate detection	10 MBd/100 MBd
Connection technology	M12 (D-coded)
Integrated switch	Supports auto-crossing, auto-negotiation.
Maximum line length	100 m according to IEEE Std 802.3, 200 Edition
Addressing	4 byte IP address or MAC-ID (00-0F-69-xx-xx-xx) Configurable via DHCP server or MOVITOOLS® MotionStudio with version 5.6 and higher Address default value: 192.168.10.4
Vendor ID	$013B_{hex}$
Name of EDS files	`SEW_MOVIPRO.EDS`
Name of icon files	`SEW_MOVPRO.ICO`

16998413/EN – 12/2016

8 Configuration and startup of Modbus/TCP

This chapter provides you with information on the configuration of the Modbus/TCP-Master (PLC) and startup of the device for fieldbus operation.

Requirements for correct configuration and startup are:

- Correct connection
- The correct setting of IP address parameters of the device. (→ 🗎 26).

Configuration is explained with examples. The examples are configurations carried out with the programming software PL7 PRO by Schneider Electric.

8.1 Device description file for Modbus/TCP

There are no specific device description files for Modbus/TCP.

8.2 Configuration of the Modbus/TCP master

The following example describes configuration and programming of the Modbus/TCP master in a TSX Premium P57203 control by Schneider Electric with PL7 PRO. An ETY4103 is used as the Ethernet component.

Observe the following:

- The information and illustrations in the example are based on the English version of the PL7 PRO software.
- Enter values in PL7 PRO using the keypad.
- For fieldbus master, use only those Ethernet components by Schneider Electric that support the "IO Scanning" function of Modbus/TCP communication. You cannot access drives from SEW-EURODRIVE via the "Peer Cop" function. However, fieldbus masters that only support "Peer Cop" can access the drives via the PLC program using read and write commands.

Configuration of the Modbus/TCP master takes several process steps:

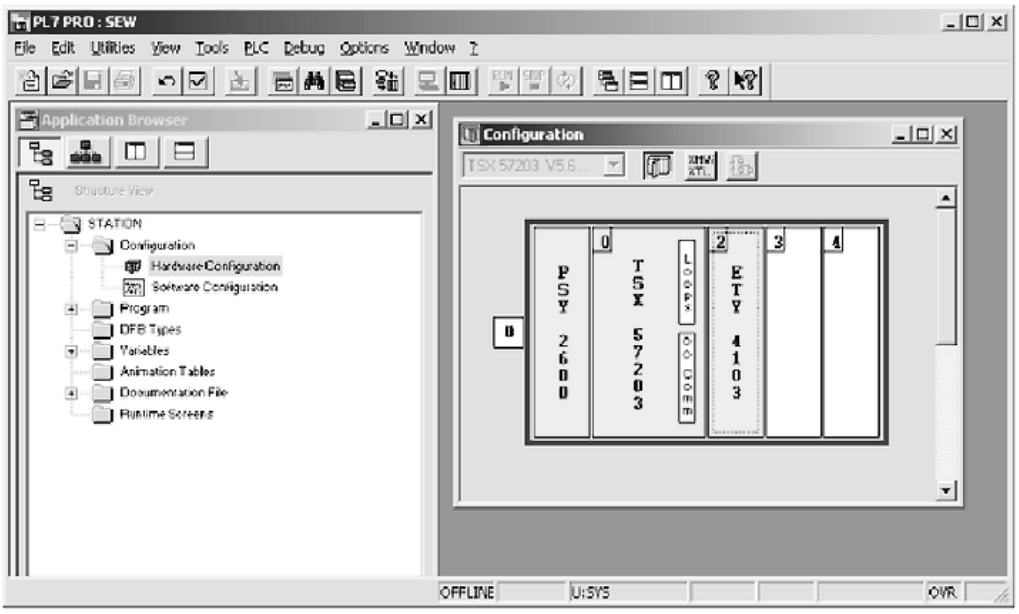
1. "Configuring hardware (control structure)" (→ 🗎 91)
2. "Setting Ethernet component" (→ 🗎 92)
3. "Addressing drive via the "IO Scanning" function" (→ 🗎 93)

16998413/EN – 12/2016

8.2.1 Configuring hardware (control structure)

Proceed as follows:

1. Start PL7 PRO and enter the PLC type.
2. Enter the hardware configuration of the PLC in the application browser under "STATION" > "Configuration" > "Hardware Configuration".

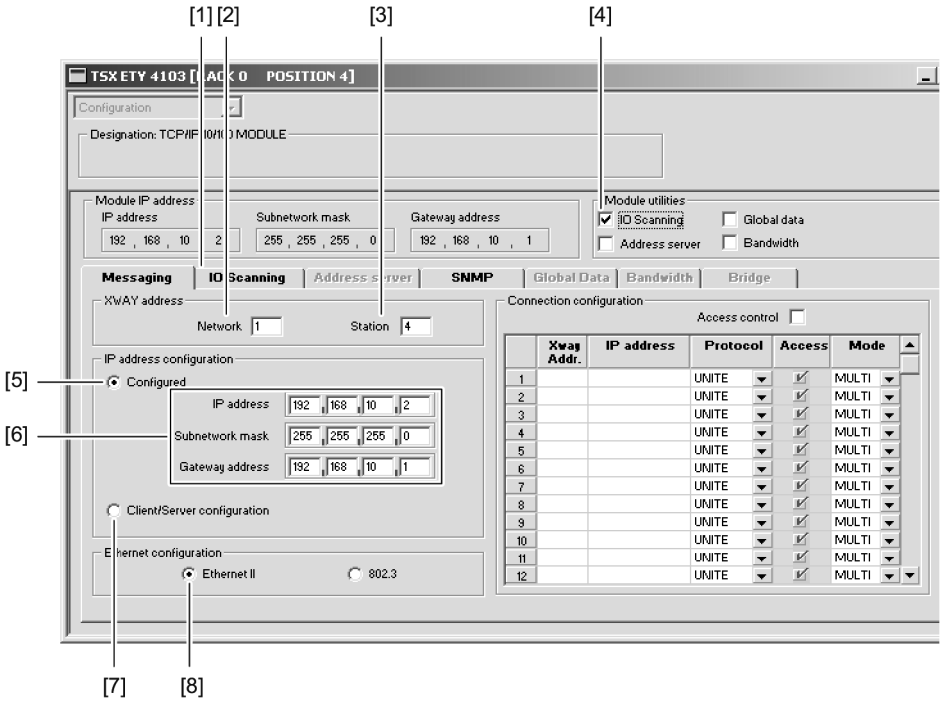


18014400140458891

8.2.2 Setting Ethernet component

Proceed as follows:

1. Open the hardware configurator in PL7 PRO.
2. Double-click on the Ethernet component (in this case: ETY4103).
   ⇨ The configuration window is displayed.



18014399339035147

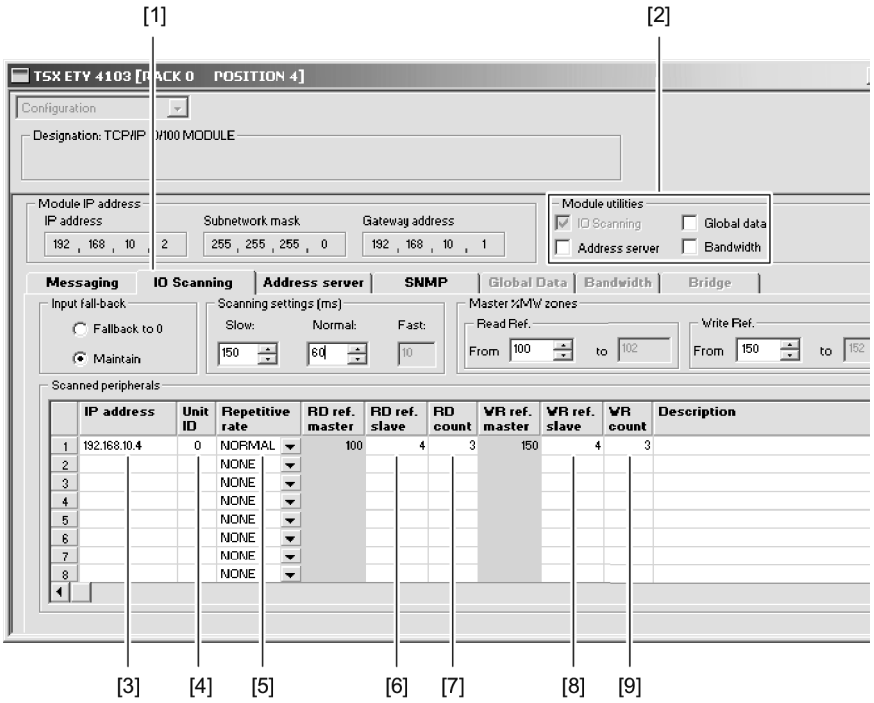
3. If you have a non-expandable rack, enter the value "1" in the edit box [2].
4. Enter the number of the slot that the Ethernet component is plugged into in edit box [3] (here: 4).
   ⇨ In this example, the XWAY address is 1.4.
5. Activate the radio button [5].
6. Enter the IP address and the network parameters into the edit boxes [6].
7. If the PLC receives the address parameters via DHCP, activate the radio button [7].
8. Activate the radio button [8].
9. Activate the check box [4].

16998413/EN – 12/2016

8.2.3 Addressing drive via the "IO Scanning" function

Proceed as follows:

1. Open the Ethernet component in the hardware configurator of PL7 PRO.
2. Open the tab [1]. In this tab, select the Modbus/TCP nodes with which cyclical data should be exchanged.



9007201560984843

3. In the section [2], enter the PLC memory areas that are to be used to exchange cyclical data with the Modbus/TCP nodes. You will use the memory addresses later in your PLC program.
4. Enter the IP address of the drive from SEW-EURODRIVE into the edit box [3].
5. Enter the value "0" in the edit box [4].
6. Select the cycle time in which the Modbus/TCP nodes are addressed in the choice box [5].
7. As the cyclical process data are located after offset 4, enter the value "4" in the edit boxes [6] and [8].
8. In the edit boxes [7] and [9] enter the number of process data words to be exchanged. The values must be the same in both fields.
   - ⇨ You can set 1 – 8 process data words for MOVIPRO® SDC and 1 – 120 process data words for MOVIPRO® ADC.
9. To confirm the rack configuration and the global configuration, click the [Confirm] button.

⇨ When you restart the program after transferring the settings, the color of the "S1" LED changes to green. For information on the LEDs, see Chapter "Status LEDs" (→ 🗎 37).

8.3 Requirements for fieldbus operation

Correct startup of the device is prerequisite for fieldbus operation. For further information, refer to chapter "Parameter setting" (→ 🗎 154).

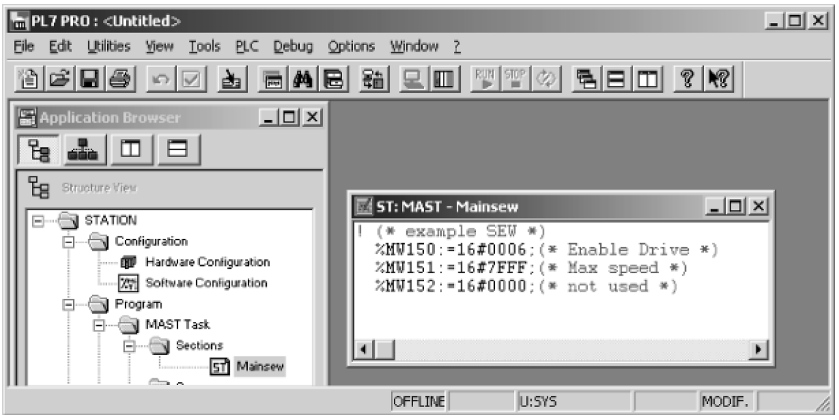
8.4 Project planning examples

8.4.1 Configuring process data exchange

The following example describes the configuration of the process data exchange between the Modbus/TCP master (PLC) and the device in PL7 PRO.

Proceed as follows:

1. Set the IP address of the device (→ 🗎 29).
2. In the Application Browser in PL7 PRO, add the device to the hardware configuration for the "IO Scanning" function (→ 🗎 90).
3. Create a new section via "STATION" > "Program" > "MAST Task" > "Sections".



27021599395294091

⇨ In the example, the setpoints for the drive start at MW150.

4. Save the project and transfer it to the PLC.
5. Switch to RUN mode of the PLC.

   ⇨ Process data exchange via Modbus/TCP is active. The actual values of the device can be read and setpoints can be written.

6. Check if the process data correspond to the values that are displayed in the parameter tree or the diagnostics plug-in for the active IEC program of the MOVITOOLS® MotionStudio engineering software.

16998413/EN – 12/2016

8.4.2 Data exchange via Modbus/TCP

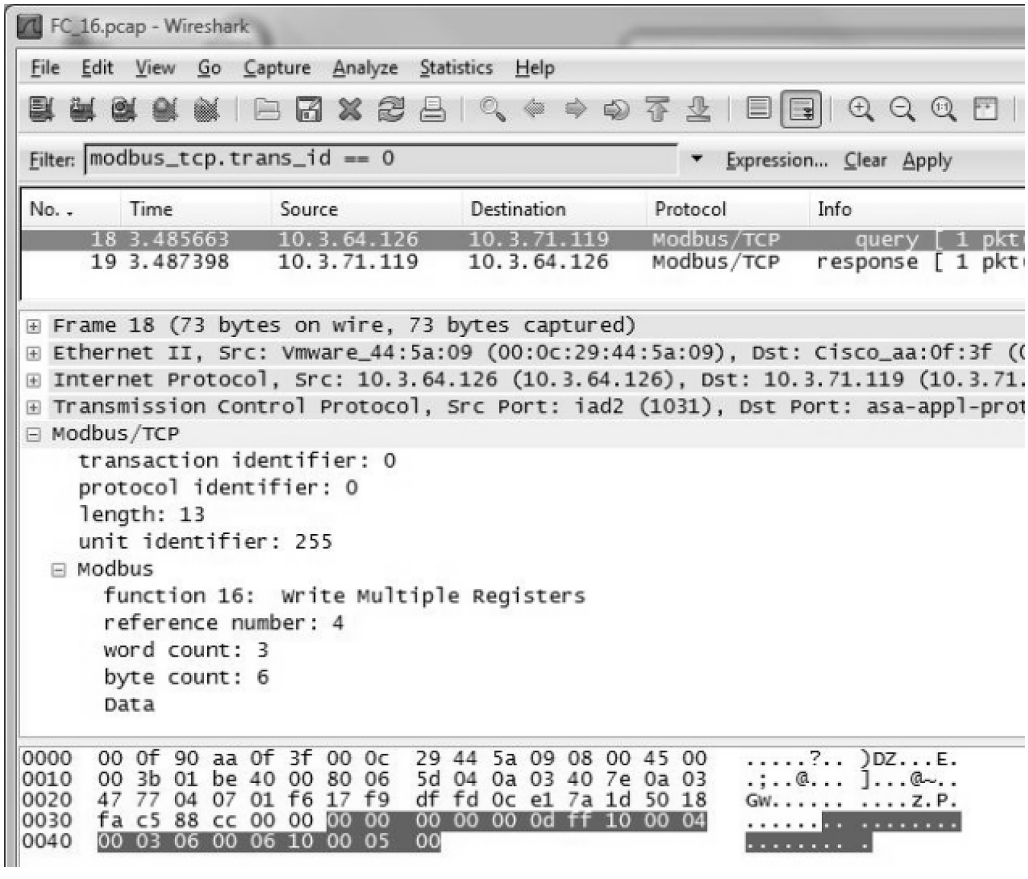
As there are many fieldbus master systems and software solutions available for Modbus/TCP for standard PCs, there is not "one reference controller" the examples are based on. This chapter gives detailed examples regarding the telegram structure.

INFORMATION

The telegram structure from the examples can be used for troubleshooting in case of errors in the telegram structure in your own applications. There are simple tools for recording telegrams via the Ethernet network, e.g. Wireshark, Packetizer etc. These freeware tools are available on the Internet.

Tracing all Ethernet telegrams in a single network is possible only with a tab, hub or a switch with a port mirror function. Telegrams that are sent from and to the recording PC can always be written.

The following figure provides an example of how setpoints are written (FC16) to the Modbus/TCP slave with IP address 10.3.71.119. The 3 process data words are located from offset 4 (reference number) and are addressed via device ID 255.



9007201560597131

All the other examples merely describe the Modbus/TCP part of the telegram. The TCP/IP part of the telegram, as well as establishing and dropping a TCP/IP connection are not explained in detail.

Process data exchange

The process data exchange is performed either via FC3 (read) and FC16 (write), or FC23 (read and write).

Process data exchange via FC16

The Modbus/TCP part for writing of 3 process data words (setpoints) each via FC16 to port 502 of a Modbus/TCP slave is structured as follows:

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier	–	For detailed description see Modbus/TCP specification and chapter "Modbus protocol (Modbus/TCP)" (→ 🗎 101).
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5 Value: Number of PD × 2 + 7 (In this case: 3 × 2 + 7 = 13)	
5	0x0d			
6	0xFF	Device identifier	Must be 0 or 255.	
7	0x10	Function code	Service: FC16 (Write Register)	
8	0x00	Write reference number	Offset where PD start. Must always be 4.	
9	0x04			
10	0x00	Write word count	Number PD[1] (In this case: 3)	
11	0x03			
12	0x06	Write byte count	Number PD × 2[2] (In this case: 3 x 2 = 6)	
13	0x00	Data	Process output data word 1	Data mapping and definition, see chapter "Process data description" (→ 🗎 118)
14	0x11			
15	0x22	Data	Process output data word 2	
16	0x33			
17	0x44	Data	Process output data word 3	
18	0x55			

1) for MOVIPRO® SDC (1 – 8) for MOVIPRO® ADC (1 – 120)

2) for MOVIPRO® SDC (2 – 16) for MOVIPRO® ADC (2 – 240)

Response telegram

Only bytes 0 – 11 are reset in the response telegram from port 502 of the Modbus/TCP slave.

Apart from byte 5, all values remain unchanged. Byte 5 (low byte in length field) is corrected to value 6.

16998413/EN – 12/2016

Process data exchange via Service FC23

During process data exchange via FC23, the Modbus/TCP part that is used to write and read 3 process data words (PD) each is structured as follows:

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier	–	For detailed description see Modbus/TCP specification and chapter "Modbus protocol (Modbus/TCP)" (→ 🗎 101).
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: Value: Number of PD × 2 + 11 (In this case: 3 × 2 + 11 = 17)	
5	0x11			
6	0xFF	Device identifier	Must be 0 or 255.	
7	0x10	Function code	Service: FC23 (read and write register)	
8	0x00	Read reference number	Offset where PD start. Must always be 4.	
9	0x04			
10	0x00	Read word count	Number PD[1] (In this case: 3)	
11	0x03			
12	0x00	Write reference number	Offset where PD start: Must always be 4.	
13	0x04			
14	0x00	Write word count	No. of PDs See read word count (In this case: 3)	
15	0x03			
16	0x06	Write byte count	Number PD × 2[2] (In this case: 3 x 2 = 6)	
17	0x00	Data	Process output data word 1	Data mapping and definition, see chapter "Process data description" (→ 🗎 118)
18	0x11			
19	0x22	Data	Process output data word 2	
20	0x33			
21	0x44	Data	Process output data word 3	
22	0x55			

1) for MOVIPRO® SDC (1 – 8) for MOVIPRO® ADC (1 – 120)

2) for MOVIPRO® SDC (2 – 16) for MOVIPRO® ADC (2 – 240)

16998413/EN – 12/2016

Response telegram

The following data bytes are returned in the response telegram of the Modbus/TCP slave:

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier	–	For detailed description see Modbus/TCP specification and chapter "Modbus protocol (Modbus/TCP)" (→ 🗎 101).
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5 Value: Number of PD × 2 + 3 (In this case: 3 × 2 + 3 = 9)	
5	0x09			
6	0xFF	Device identifier	Must be 0 or 255.	
7	0x17	Function code	Service: FC23 (read and write register)	
8	0x06	Write byte count	Number PD × 2[1)] (In this case: 3 x 2 = 6)	
9	0x00	Data	Process input data word 1	Data mapping and definition, see chapter "Process data description" (→ 🗎 118)
10	0xAA			
11	0xBB	Data	Process input data word 2	
12	0xCC			
13	0xDD	Data	Process input data word 3	
14	0xEE			

1) for MOVIPRO® SDC (2 – 16) for MOVIPRO® ADC (2 – 240)

16998413/EN – 12/2016

Parameter access

Parameter channel via the MOVILINK® parameter channel is performed via FC23 (write and read). The job to the MOVILINK® service and retrieving the response is realized in one Modbus/TCP service.

Parameter access via Service FC23

The TCP/IP telegram is structured as follows for reading a parameter:

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier	–	For detailed description see Modbus/TCP specification and chapter "Modbus protocol (Modbus/TCP)" (→ 🗎 101).
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: Must be equal to 19 for the MOVILINK® parameter channel.	
5	0x13			
6	0x00	Device identifier	• Value 0 and 0xFE: Access to parameters of communication and control unit "PFH-..." • Value 20 (0x14): Forwarding of request to the power section "PFA-..."	
7	0x17	Function code	Service = FC23 (read and write register)	
8	0x02	Read reference number	Offset from where the MOVILINK® parameter channel is located: Must always be 512.	
9	0x00			
10	0x00	Read word count	Must always be 4 for the MOVILINK® parameter channel.	
11	0x04			
12	0x02	Write reference number	Offset from where the MOVILINK® parameter channel is located: Must always be 512.	
13	0x00			
14	0x00	Write word count	Must always be 4 for the MOVILINK® parameter channel.	
15	0x04			
16	0x08	Write byte count	8 byte MOVILINK® parameter channel	
17	0x31	Data: MOVILINK® parameter channel	Management bytes: 0x31 = read	Data mapping and definition, see profile of SEW-EURODRIVE devices and chapter "Process data description" (→ 🗎 118)
18	0x00	Data: MOVILINK® parameter channel	Parameter subindex	
19	0x20	Data: MOVILINK® parameter channel	Parameter indexes: 0x206c = 8300 = firmware part number	
20	0x6C			
21	0x00	Data: MOVILINK® parameter channel	Parameter value that has no meaning during read service.	
22	0x00			
23	0x00			
24	0x00			

16998413/EN – 12/2016

Response telegram

The response telegram then contains the response to the MOVILINK® read service.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier	–	For detailed description see Modbus/TCP specification and chapter "Modbus protocol (Modbus/ TCP)" (→ 101).
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: Must be equal to 11 for the MOVILINK® parameter channel.	
5	0x11			
6	0x00	Device identifier	• Value 0 and 0xFE: Access to parameters of communication and control unit "PFH-..." • Value 20 (0x14): Forwarding of request to the power section "PFA-..."	
7	0x17	Function code	Service = FC23 (read and write register)	
8	0x02	Read reference number	8 byte MOVILINK® parameter channel	
17	0x31	Data: MOVILINK® parameter channel	Management bytes: 0x31 = read	Data mapping and definition see setting and profile of SEW-EURODRIVE devices.
18	0x00	Data: MOVILINK® parameter channel	Parameter subindex	
19	0x20	Data: MOVILINK® parameter channel	Parameter index: 0x206c = 8300 = firmware part number	
20	0x6C			
21	0x00	Data: MOVILINK® parameter channel	The parameter value 0xA82e5b0d corresponds to firmware part number 28216102.53	
22	0x00			
23	0x00			
24	0x00			

16998413/EN – 12/2016

9 Modbus protocol (Modbus/TCP)

9.1 Description

Modbus/TCP is an open protocol based on TCP/IP. It was one of the first protocol types to become standard in industrial Ethernet interfaces for process data exchange.

Modbus/TCP has the following characteristics:

- Modbus frames are exchanged via the TCP/IP port 502.
- Every fieldbus master IP address is accepted.
- Modbus exclusively uses the "Big Endian" coding (Motorola data format or high byte first).
- Access via "Peer Cop" is not possible. This is why it must be ensured that the used fieldbus master supports the "IO Scanning" function.

9.1.1 Mapping and addressing

The logic Modbus address range is 64 k words and is addressed via the reference number (offset). Four different tables can be in the address range:

- Digital inputs (RO)
- Digital outputs (RW)
- Input register (RO)
- Output register (RW)

The tables can be separated or overlapping.

The device provides the following data ranges:

- For process data transfer, there is a table that allows for write access (for setpoint values) as well as read access (for actual values).

  This table starts at offset 4 and ends at OFF_{hex}. The cyclically transferred process data words lie therein (1 – 8 for MOVIPRO® SDC and 1 – 120 for MOVIPRO® ADC).
- An additional table is created by the PLC for the process output data words. The table allows for one or several clients reading the current setpoints e.g. for visualization.

  This table starts at offset 104_{hex} and ends at Offset $1FF_{hex}$.
- A third table is created to parameter access.

  This table begins at offset 200_{hex}, ends at offset $2FF_{hex}$ and contains four words of the MOVILINK® parameter channel.
- The remaining address scope from offset 400_{hex} to $FFFF_{hex}$ is reserved and must not be addressed.

  The data word at offset 219_{hex} (8606_{dec}) is a special case, it allows for writing (and reading) the timeout monitoring time.

INFORMATION

With controllers by Schneider Electric, observe that the address range often starts at 40001_{hex}. This corresponds to the value "0" for the offset.

16998413/EN – 12/2016

9.1.2 Services (function codes)

For process data exchange, parameter data exchange and device identification, the device provides the following 4 FC (**F**unction **C**odes) services.

- FC3 – Read holding registers

  Allows for reading one or several registers.
- FC16 – Write multiple registers

  Allows for writing one or several registers.
- FC23 – Read/write multiple registers

  Allows for a register block to be read an written simultaneously.
- FC43 – Read device identification

  Allows for device identification by reading the identity object.

9.1.3 Accessing services

The implemented registers and possible services (function codes) for data exchange are summarized in the following table:

Offset hex	Meaning for		Access	Comment
	Reading	Writing		
0 – 3	–	–	–	Reserved
4 – FF	Process input data (actual values)	Process output data (setpoints)	FC03, FC16, FC23	0 – 8 process data words for MOVIPRO® SDC 0 – 120 process data words for MOVIPRO® ADC
100 – 103	–	–	–	Reserved
104 – 1FF	Process output data (setpoints)	–	FC03	For reading the setpoint values by a client other than the controlling one
200 – 2FF	Result non-cyclical parameter channel	Request non-cyclical parameter channel	FC03,FC16, FC23	4 words
300 – FFFF	–	–	–	Reserved
Special case: 219E (8606_{dec})	Fieldbus timeout interval, read value	Fieldbus timeout interval, write value	FC03, FC16	Parameter *P819*: 16-bit value, timeout interval in ms

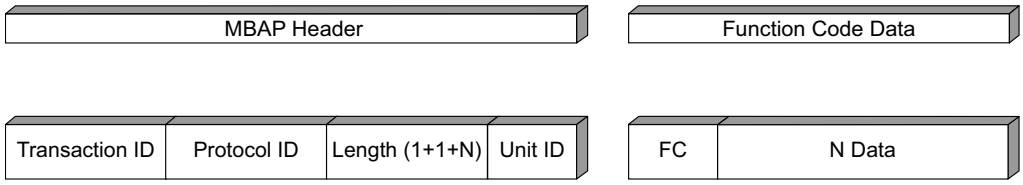
16998413/EN – 12/2016

9.2 Protocol structure

The Modbus protocol consists of a header and function code data.

The header is the same for all request and response telegrams as well as for error messages (exceptions).

Depending on the "function code", a different number of data is attached to the header.



9007200887174411

9.2.1 Header

The following table describes the protocol bytes of the header.

Byte	Designation	Meaning
0	Transaction identifier	Value: Often "0" (is simply copied by the server (slave).)
1		
2	Protocol identifier	Value: 0
3		
4	Length field (upper byte)	Value: 0
5	Length field (lower byte)	Number of function code data bytes + 1 ("Device identifier")
6	Device identifier (slave address)	Slave address. In order to access the process data of the device, it must be set to 0 (0x00) or 255 (0xFF). The following address assignments apply to the parameter channel access (Offset 200_{hex} – 203_{hex}): • 0 or 254 for parameters of the "PFH-..." communication and control unit • 20 for parameters of the integrated power section "PFA-..."
7	Function code	Requested service
8 – N	Data	Data depending on requested service

Observe the following:

- The slave simply copies the "transaction identifier" (bytes 0 and 1). It helps the fieldbus master to identify related actions.
- The "protocol identifier" (bytes 2 and 3) must always be "0".
- The length bytes (bytes 4 and 5) determine the number of the following bytes. As the maximum telegram length is 255 bytes, the "upper byte" must be "0".
- The "device identifier" (byte 6) is used for distinguishing between several connected nodes (e.g. bridges or gateways). It has the function of a subaddress that is only used for parameter access for devices from SEW-EURODRIVE. The process data are always mapped to the device that is addressed via the "device identifier" "0" or "FF_{hex}".

  The assignment of "device identifiers" to lower-level devices or the integrated power section is determined in the routing table of the controller configuration in IEC Editor. The "device identifiers" are assigned according to the following table:

Device identifier	Option/interface
0 or 255	MOVIPRO® control

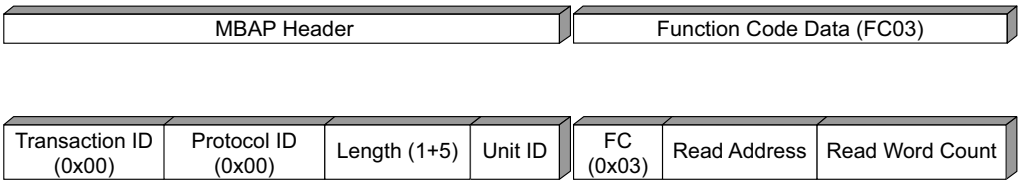
16998413/EN – 12/2016

Device identifier	Option/interface
1	MOVIPRO® power section "PFA-..."
16 – 21	MOVIPRO® slaves on the external CAN-Bus

- The 7 bytes of the header are followed by the "function code" and the data.

9.2.2 Service FC3 – Read holding registers

The service "FC03 – Read holding registers" is used to read a variable number of registers.



9007200887224075

Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Requested service Value: 03 (Read Holding Register)
8	Reference number (high)	Value: Offset
9	Reference number (low)	Value: Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)

Response:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Service Value: 03 (Read Holding Register)
8	Byte count	Number of following bytes Value: 2 x N[1)]
9 – 9+(2 x N)[1)]	Data	Content of the respective register Value: 2 – 2 x N data bytes depending on length

1) Number of registers

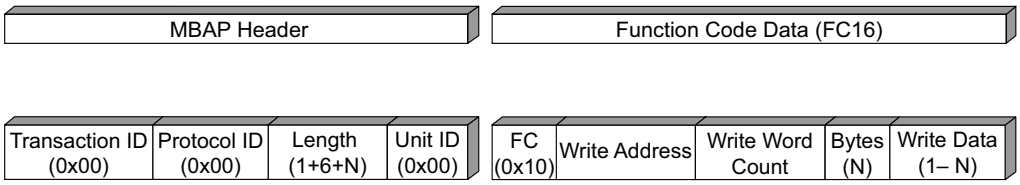
Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	83_{hex}
8	Exception Code	Error code

16998413/EN – 12/2016

9.2.3 Service FC16 – Write multiple registers

The service "FC16 – Write multiple registers" is used to write a variable number of registers.



9007200887293707

Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Requested service Value: 16 (Write Multiple Registers)
8	Reference number (high)	Value: Offset
9	Reference number (low)	Value: Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)
12	Byte count	Number of following bytes Value: 2 x N[1)]
13 – 13+(2 x N)[1)]	Register values	Value that is written in the respective register Value: 2 – 2 x N data bytes depending on length

1) Number of registers

Response:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Service Value: 16 (Write Multiple Registers)
8	Reference number (high)	Value: Offset
9	Reference number (low)	Value: Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)

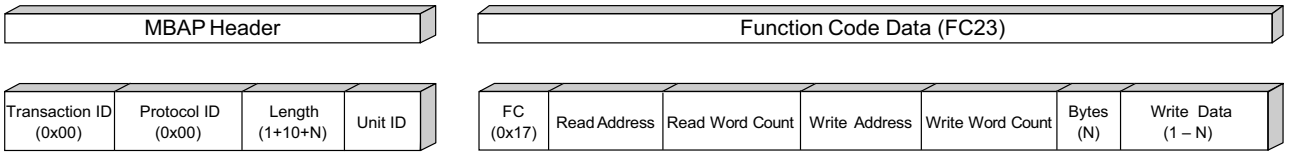
Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	90_{hex}
8	Exception Code	Error code

16998413/EN – 12/2016

9.2.4 Service FC23 – Read/write multiple registers

With the service "FC23 – Read/write multiple registers", you can simultaneously write and read a variable number of registers. The write access is carried out first. Preferably, this service is used for the process data.



9007200887389707

Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Requested service Value: 23 (Read/Write Multiple Registers)
8	Read reference number (high)	Value: Offset
9	Read reference number (low)	Value: Offset
10	Read word count (high)	Number of words (register) that are read. Value: always 0
11	Read word count (low)	Number of words (register) that are read.
12	Write reference number (high)	Value: Offset
13	Write reference number (low)	Value: Offset
14	Write word count (high)	Number of words (register) that are written. Value: always 0
15	Write word count (low)	Number of words (register) that are written.
16	Write byte count	Number of following bytes Value: 2 x N[1)]
17 – 17+(2 x N)[1)]	Write register values	Value that is written in the respective register Value: 2 – 2 x N data bytes depending on length

1) Number of registers that are written.

Response:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Service Value: 23 (Read/Write Multiple Registers)
8	Byte count	Number of following bytes Value: 2 x n[1)]
9	Data	Content of the respective register Value: 2 – 2 x n data bytes depending on length

1) Number of registers that are read.

Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	97_{hex}
8	Exception Code	Error code

16998413/EN – 12/2016

9.2.5 Service FC43 – Read device identifications

The service "FC43 – Read device identifications" is also referred to as MEI transport (**M**odbus **E**ncapsulated **I**nterface Transport). It tunnels services and method calls. The service "Read device identification" is tunneled with the MEI-Type 0x0E. In accordance with Modbus specifications, there are 3 blocks ("Basic", "Regular" and "Extended") that can be read.

The device supports "Basic" and "Regular" blocks (Conformity Level 02). The entire block is always read (streaming). This means that values "01" and "02" are permitted in the "Read device ID code". The "Object ID" must have the value "0". The response is not fragmented.

Example

Request:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Requested service Value: 43 (Read Device Identification)
8	MEI type	Value: 0x0E
9	Read device ID code	Value: 01 or 02
10	Object ID	Value: 0

Response:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	Service Value: 43 (Read Device Identification)
8	MEI type	Value: 0x0E
9	Read device ID code	Value: 01 or 02
10	Conformity level	Value: 02
11	More follows	If the identification data does not fit on one response, several request/response transactions are required. Value: 0 (no further requests)
12	Next object ID	Value: 0
13	Number of objects	Number of objects Value (example): 3
14	Object ID	ID of first object
15	Object length	Length of first object in bytes
16	Object value	Value of first object
17 – Number of objects x 2[1)]	Object ID, object length, and object value of all other objects[2)]	–

1) In the example up to 22

2) In this example, 2 more objects

Exception:

Byte	Designation	Meaning/permitted values
0 – 6	MBAP header	See chapter "Header" (→ 🗎 103)
7	Function code	43_{hex}
8	Exception code	Error code

16998413/EN – 12/2016

Objects

MOVIPRO®

Object ID	Designation	Type	M/O	Category	Value (example)
0x00	VendorName	ASCII string	Mandatory	Basic	SEW-EURODRIVE
0x01	ProductCode				SEW MOVIPRO
0x02	MajorMinorRevisons				823 568 0.10
0x03	VendorUrl		Optional	Regular	www.sew.de
0x04	ProductName				SEW MOVIPRO
0x05	ModelName				–

9.3 Connection management

8 Modbus connections are possible simultaneously. Only one of the connections can have write access to the process data range (controlling connection).

Connections that are no longer used must be disconnected by the fieldbus master. If the slave detects an inactive connection, it assumes that the associated fieldbus master is no longer active. In this case, the slave disconnects the connection that is no longer in use. It is only then that the ninth connection can be established. If there are 8 active connections, the attempt to establish a ninth connection is canceled (socket is closed on the server).

Connections 1 – 8 have the following characteristics:

- They operate independently.
- There is no prioritization.
- Only one controlling connection is permitted. This connection can change process data.

If a controlling connection has already been established via EtherNet/IP™, you cannot establish another controlling connection via Modbus/TCP.

The slave can at least buffer one frame with maximum Modbus length on receipt or transmission.

9.3.1 Sending process output data (request controlling connection)

Process data can be sent only in the following cases:

- The connection is already a controlling connection.
- No controlling connection has been established yet.

When the device accepts the connection, it takes over the process output data into the process sequence. As long as this connection is active, no other fieldbus master can change the process output data (PO data).

16998413/EN – 12/2016

9.3.2 Closing a connection

A connection is deleted from the internal connection list under the following conditions:

- The keep-alive time is over. The server does no longer receive responses afterwards.
- The socket returns a fault.
- The connection to the client has been disconnected.

  If the connection was a controlling connection, no additional controlling connection can be established. If no valid process output data has been sent within the timeout interval, a fieldbus timeout is triggered.

The default keep-alive time is 10 seconds. If there is a controlling connection with the set timeout interval > 5 s, the keep-alive time is increased to 2 times the timeout interval.

In a controlling connection, the fieldbus timeout is displayed in the unit after the set timeout interval elapses during a break in the cable or an error in the socket. Then a new controlling connection can be established.

9.3.3 Timeout response

The timeout monitoring time can be set in steps of 10 ms in a range between 0 s – 650 s.

- 0 s and 650 s mean: Timeout monitoring is deactivated.
- 10 ms – 649.09 s means: Timeout monitoring is activated.

The timeout interval can be set as follows:

- Via register object $219E_{hex}$ (8606_{dec})
- Via parameter access to index *8606* via register object 200_{hex} – 203_{hex}
- Via parameters in MOVITOOLS® MotionStudio (plug-in or in the parameter tree)

A change to the timeout interval (writing on index *8606*) is activated after a re-boot.

The timeout monitoring is triggered when a controlling connection is activated. The fieldbus driver cyclically checks whether the last process output data update was received within the timeout interval.

If the timeout interval is set to 0 s or 65000 s, time monitoring is deactivated. No fieldbus timeout is detected in this case. This also applies when the controlling connection is dropped.

In the event of a timeout, the timeout response is executed as programmed.

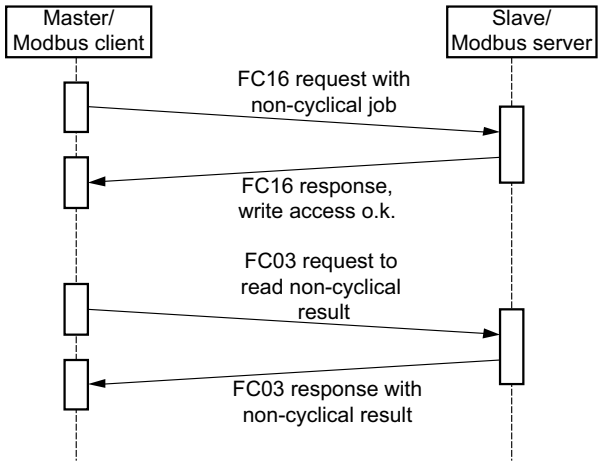
16998413/EN – 12/2016

9.4 Parameter access via Modbus/TCP

A parameter access via the MOVILINK® parameter channel in registers 200_{hex} – 203_{hex} via Modbus/TCP requires the services FC03, FC16 or FC23 (write and read access). Write access is used for storing acyclic requests in the corresponding registers. Read services read the responses from the same registers.

This method corresponds to the alternative concept according to the Modbus specifications "Network Messaging Specification for the MODBUS/TCP Protocol: Version 1.1" (Appendix A).

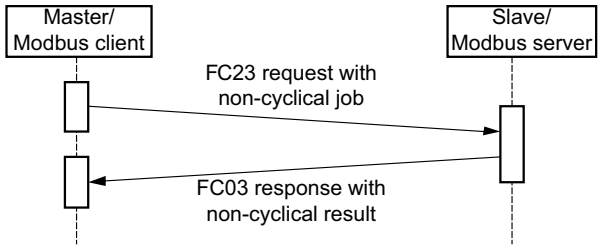
9.4.1 Procedure with FC16 and FC03



9007200887627659

An incorrect write access returns the corresponding error code. In this way the write services are already processed by sending a write request (FC16), and the service confirmation is carried out by evaluating the write response. Later on, the fieldbus master will send a read request (FC03) in order to read out the values that have now been written into the register. For more information about the error codes, see chapter "Fault codes (exception codes)" (→ 🗎 113).

9.4.2 Procedure with FC23

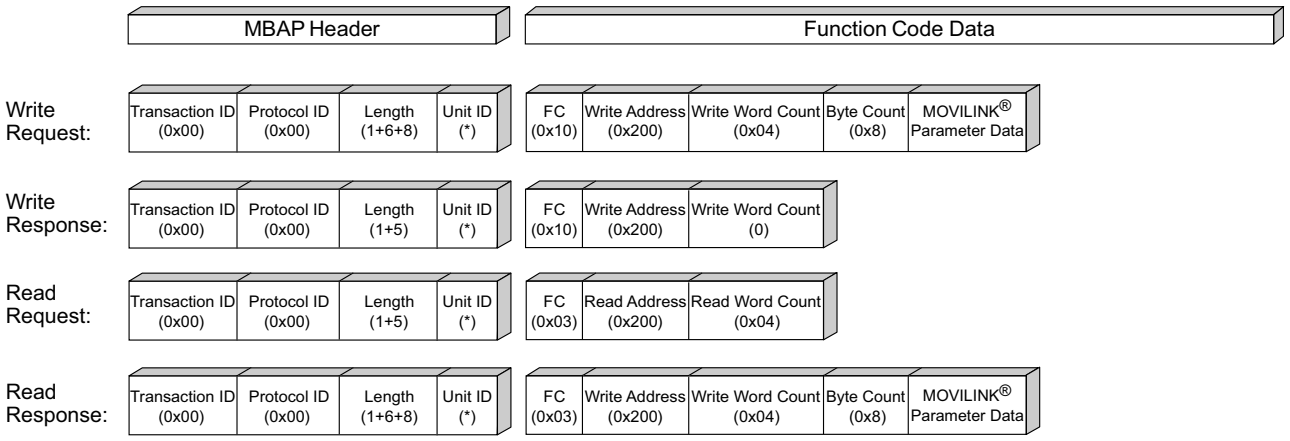


9007200887695115

With FC23 the result is returned directly in the response.

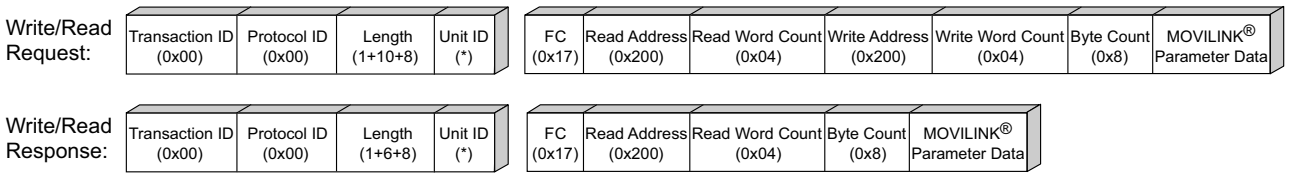
16998413/EN – 12/2016

9.4.3 Protocol structure



9007200887841291

Or:



9007200887888267

* The "unit identifier" (UI-D) is used in gateway operation to map registers 200_{hex} – 203_{hex} in lower-level nodes (see chapter Header).

Refer to chapter MOVILINK® parameter channel for a description of the MOVILINK® parameter data (8 byte) and how they are mapped in registers 200_{hex} – 203_{hex}.

9.4.4 MOVILINK® parameter channel

The following table shows the structure of the MOVILINK® non-cyclical parameter channel (8 bytes). The structure is described in detail in an example. In the example, a request is made to write 500 ms to the fieldbus timeout (Index *8606*) via the MOVILINK® parameter channel.

Offset	Meaning	Example
200_{hex}	Management	32_{hex}
200_{hex}	Subindex	00_{hex}
201_{hex}	Index high	21_{hex}
201_{hex}	Index low	$9E_{hex}$
202_{hex}	MSB data	00_{hex}
202_{hex}	Data	00_{hex}
203_{hex}	Data	01_{hex}
203_{hex}	LSB data	$F4_{hex}$

You can access the parameter channel with FC03, FC16 and FC23. You can assign a task to the parameter channel in the administration byte when using a write access. The task itself is a MOVILINK® service such as "Write", "WriteVolatile" or "Read". The result is read with a read access.

The values in the example (writing fieldbus timeout) have the following meaning:

- Offset 200_{hex} = 3200_{hex} (administration = write 4 bytes/subindex = *0*)
- Offset 201_{hex} = $219E_{hex}$ (Index = *8606*)
- Offset 202_{hex} = 0 (data high)
- Offset 203_{hex} = $01F4_{hex}$ (data low = 500)

Management byte

The management byte in the MOVILINK® parameter channel (byte 0) is defined as follows:

Management byte (1 byte)		
Bit	**Meaning**	**Coding and function**
0 (LSB)	Service identifier	0000 = No service 0001 = Read parameter 0010 = Write parameter 0011 = Write Parameter Volatile 0100 = Read minimum 0101 = Read maximum 0110 = Read default 0111 = Read scale 1000 = Read attribute
1		
2		
3		
4	Data length	00 = 1 bytes 01 = 2 bytes 10 = 3 bytes 11 = 4 bytes
5		
6	Data length	Must be changed (toggled) on every new task in cyclical transmission.
7 (MSB)	Status bit	0 = No error during execution of service 1 = Error during execution of service

The individual bits have the following functions:

- **Bits 0 – 3**

  Contain the service identification. These bits determine which service is to be executed.

- **Bit 4 and Bit 5**

  Specify the data length in byte. For inverters from SEW-EURODRIVE, this value must always be set to 4 bytes.

16998413/EN – 12/2016

- **Bit 6 (handshake bit)**

  Is used as acknowledgment bit between client and server. As the MOVILINK® parameter channel is transmitted cyclically, the service execution must be triggered by edge control via the handshake bit. For this purpose, the value of this bit is toggled for each new service to be executed. The inverter uses the handshake bit to signal whether the service has been executed or not. The service has been executed if the handshake bit received in the PLC is identical with the sent handshake bit.

- **Bit 7 (status bit)**

  Indicates whether the service was executed properly or whether errors occurred.

INFORMATION

- For the index, subindex, factor etc. of a parameter, refer to the parameter tree in the MOVITOOLS® MotionStudio engineering software.
- Refer to chapter "Parameterizing the power section "PFA-..."" (→ 🗎 156) for a detailed description of the parameters.

9.5 Fault codes (exception codes)

If a fault occurs while processing a "function code", the fault is reported to the Modbus client in an "exception response".

The following "exception codes" are returned by a unit from SEW-EURODRIVE:

Exception code hex	Designation	Meaning
01	ILLEGAL FUNCTION	The slave unit does not support the "function code" transmitted in the request.
02	ILLEGAL DATA ADDRESS	You have entered an invalid data address for the access to the Modbus slave. This can be due to the following reasons: • Invalid start address when accessing the Modbus slave registers (does not exist, or "function code" does not work with this address) • Invalid combination of start address and length • No symmetric access with "read/write" • Wrong object ID (on access via FC43)
03	ILLEGAL DATA VALUE	A part of the data field of the Modbus request contains a value invalid for the Modbus slave. This can be due to the following reasons: • The "word count" contains an invalid value (smaller than 1 or larger than 125) • The received PDU length is too short or too long (depending on the specified "word count") • Internal error when reading or writing the process data
04	SLAVE DEVICE FAILURE	Error when accessing MOVILINK® parameter (e. g. internal timeout)
06	SLAVE DEVICE BUSY	There is already a controlling connection either via another Modbus controller or another fieldbus system.
0A	GATEWAY PATH UNAVAILABLE	The data cannot be forwarded to a subsystem.

9.6 Technical data, Modbus/TCP interface

Modbus/TCP	MOVIPRO®
Automatic baud rate detection	10 MBd/100 MBd
Connection technology	M12 (D-coded) or RJ45 (push-pull)
Integrated switch	Supports auto-crossing, Auto-negotiation.
Maximum line length	100 m according to IEEE Std 802.3, 200 Edition
Addressing	4 byte IP address or MAC-ID (00-0F-69-xx-xx-xx) Configurable via DHCP server or MOVITOOLS® MotionStudio with version 5.6 and higher Address default value: 192.168.10.4
Supported services	FC03, FC16, FC23, FC43

16998413/EN – 12/2016

10 Error diagnostics for operation on EtherNet/IP™ and Modbus/TCP

The diagnostics procedures described in the following section describes the integration of the device into an Ethernet network and the error analysis method for the following problems:

- The device is not integrated properly in the EtherNet/IP™ or Modbus/TCP network.
- The device cannot be controlled using the fieldbus master (PLC).

For additional diagnostic information, refer to the online status display in the EtherNet/IP™ master, in the Modbus/TCP master and the corresponding online help.

For further information, especially on the MOVIFIT® ADC programming, refer to the "MOVI-PLC® Programming in the PLC Editor" system manual.

Diagnostics comprises several process steps:

1. "Checking the status LEDs of the device" (→ 🗎 115)
2. "Checking the status LED and the status display at the fieldbus master" (→ 🗎 116)
3. "Checking the fault sources" (→ 🗎 116)

10.1 Checking the status LEDs of the device

For detailed information on the individual LED statuses, refer to chapter "Status LEDs" (→ 🗎 37).

The following table lists the resulting device statuses and possible causes:

Status LED S1	Operating status	Possible cause
Off	IP-Stack starting	If DHCP is activated, the device remains in this status until an IP address is assigned.
Red	IP Conflict	Conflict regarding IP address. Another station in the network uses the same IP address.
Flashing red/ green	LED Test	All LED statuses are activated briefly for the LED test.
Flashing green	Operational	The device is active on the fieldbus, but there is no controlling connection to the fieldbus master.
Green	Connected	Controlling connection has been established with fieldbus master.
Flashing red	Timeout	A previously controlling connection is in timeout state.

If a conflict regarding the IP address is detected, check the IP address parameters and, if necessary, reset them. To do so, use the engineering software MOVITOOLS® MotionStudio or follow the instructions from the Chapter "Setting the IP address parameter on the device" (→ 🗎 29).

If no controlling connection with the fieldbus master is established, check the communication via Ethernet. To do so, execute the PING and IPCONFIG commands via the DOS console on your PC.

16998413/EN – 12/2016

10.2 Checking the status LED and the status display at the fieldbus master

Use the documentation of the controller or the master module for checking the status LED and the status display.

Should there be no working EtherNet/IP™ master or Modbus/TCP master yet, you can use the SEW-EURODRIVE Ethernet master simulator for test or startup purposes. The latest version of the Ethernet master simulator can be downloaded from the SEW-EURODRIVE homepage → **www.sew-eurodrive.com**. You can use the Ethernet master simulator to exchange process or parameter data with EtherNet/IP profile or Modbus/TCP profile with an SEW-EURODRIVE fieldbus interface.

10.3 Checking the fault sources

If the device status is "Connected", the data exchange between fieldbus master and device is active. If the data is not transferred to the device via EtherNet/IP™ or Modbus/TCP correctly, check the following possible fault sources:

Fault source	Measure
Are the correct values for the process data words displayed in the parameter tree or in the plug-in for the application module?	If yes, continue with line 6.
Is the process data exchange activated in the fieldbus master?	–
Is the process data written to the correct location in the fieldbus master?	Check the tags and mapping of the fieldbus master.
Is the PLC in RUN mode or does active forcing overwrite the transfer of the normal process data words to the drive?	–
Is the PLC sending data to the device?	Contact the PLC manufacturer for further assistance.
Is process data used according to the loaded application module?	–
Which status is displayed in the monitor of the application module or in the parameter tree of the engineering software MOVITOOLS® MotionStudio for the communication interface?	–

16998413/EN – 12/2016

10.4 Fieldbus timeout

⚠ WARNING

Risk of crushing if the drive keeps running unintentionally after a communication timeout or fault elimination.

Severe or fatal injuries or damage to property.

- Note that the communication timeout resets automatically as soon as communication with the lower-level device is reestablished. That is, the drives receive the current process output data from the PLC straight away after system bus communication restarts.
- Disconnect the drive controller from the power supply before rectifying a fault if automatic restart of the driven machine after fault elimination is not permitted for safety reasons.

A fieldbus timeout can occur in device when you switch off the fieldbus master or if there is a wire break in the fieldbus cabling:

- The "S1" LED indicates that no new user data is being received.
- The process data for all subordinate devices has been set to Value"0". This means that all drives connected to the device are stopped.
- The digital outputs are set to "0".

16998413/EN – 12/2016

11 Process data description

11.1 General process sequence

The process sequence that is exchanged between the fieldbus master and the device depends on the device type.

The following figures show the process sequences between fieldbus master and device. The following abbreviations are used in the figures:

Term	Abbreviation
Digital **i**nput	DI
Digital **o**utput	DO
Process **d**ata	PD
Process **i**nput data word	PI
Process **o**utput data word	PO

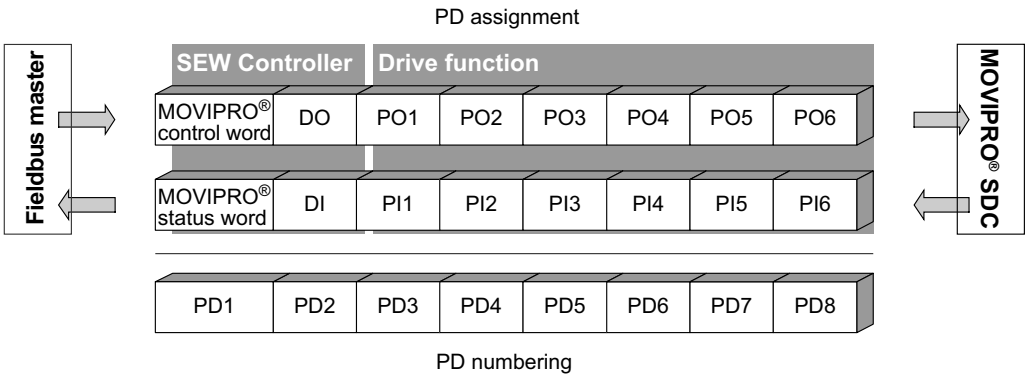
11.2 Process sequence MOVIPRO® SDC

In the case of MOVIPRO® SDC, the process data interface is already preset and specified. You only have to choose the drive function of the power section "PFA-..." to match your requirements.

A maximum of 8 process data words is permitted to be exchanged between fieldbus master and MOVIPRO® SDC.

The process sequence of MOVIPRO® SDC is essentially divided into 2 parts:

- SEW Controller (fixed):
  - MOVIPRO® control word/MOVIPRO® status word
  - Digital inputs/digital outputs (DI/DO)
- Drive function (parameterizable):
  - Control word/status word of the power section
  - Setpoints/actual values
  - Application data, such as position, speed, etc.



18015771915

16998413/EN – 12/2016

11.2.1 MOVIPRO® SDC control word

The MOVIPRO® SDC control word is defined as follows:

MOVIPRO® SDC control word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0 – 4	–	Reserved = 0
5	Restart application	If there is a fault in the communication and control unit "PFH-...," the fault can be reset with a 0-1-0 transition of this bit.
6	Reboot system	
7 – 15	–	Reserved = 0

11.2.2 MOVIPRO® SDC status word

The status word of the device contains diagnostics information of the MOVIFIT® device that is set up for evaluation in the application of the PLC. The signals are transferred to the PLC via parameters or via the process data channel.

The logical communication status "0" signals the status "OK" for each signal. Therefore, the asynchronously running start-up sequences of the PLC and the device do not output any false diagnostic messages upon start-up of the system (bus start-up with useful data = 0).

The MOVIPRO® SDC status word is defined as follows:

MOVIPRO® SDC status word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	Maintenance switch (mains OFF)	1 = maintenance switch has been actuated. Supply system is switched off. 0 = maintenance switch has not been actuated (OK).
1 – 5	–	Reserved = 0
6	Warning	1 = Warning present. 0= No warning (OK).
7	Fault	1 = Error present. 0 =no error (OK).
8 – 15	Device status/warning/error number	Bits 8 = 15 are assigned depending on the value of bits 6 and 7 (see the following table).

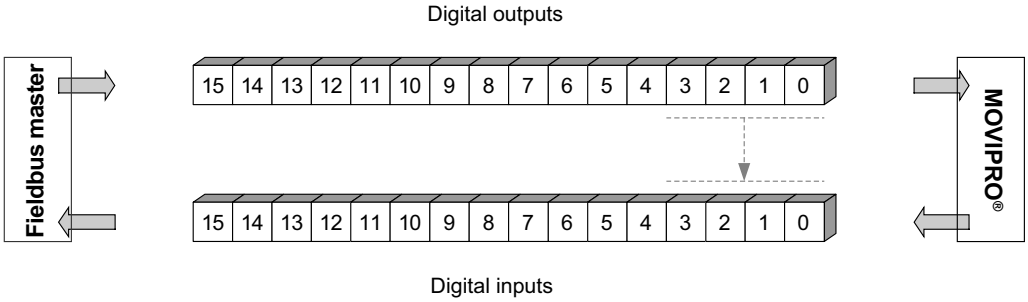
Bits 8 – 15 of the MOVIPRO® SDC status word are assigned as follows:

Bits 8 – 15 of the MOVIPRO® SDC status word			
Bit 6	**Bit 7**	**Meaning**	**Coding and function**
0	0	Device status	0 = System start-up
			1 = Ready
1	0	Warning	–
0	1	Error number	1 = Configuration No configuration available.
			2 = Configuration Unable to establish connection with configured devices.
			5 = Process data stopped to lower-level devices (gateway).
			99 = Internal system error
			110 = Overload actuator voltage
			120 = Overload sensor voltage group 1
			121 = Overload sensor voltage group 2

16998413/EN – 12/2016

11.2.3 Digital inputs and outputs

The input/output bytes of the device for 12DI/4DIO (digital inputs/digital outputs) are defined as follows:



17986358283

Digital inputs (DI)

Digital inputs (2 bytes)	
Bit	**Meaning**
0	Digital input DI00 / status digital output DO00
1	Digital input DI01 / status digital output DO01
2	Digital input DI02 / status digital output DO02
3	Digital input DI03 / status digital output DO03
4	Digital input DI04
5	Digital input DI05
6	Digital input DI06
7	Digital input DI07
8	Digital input DI08
9	Digital input DI09
10	Digital input DI10
11	Digital input DI11
12	Digital input DI12
13	Digital input DI13
14	Digital input DI14
15	Digital input DI15

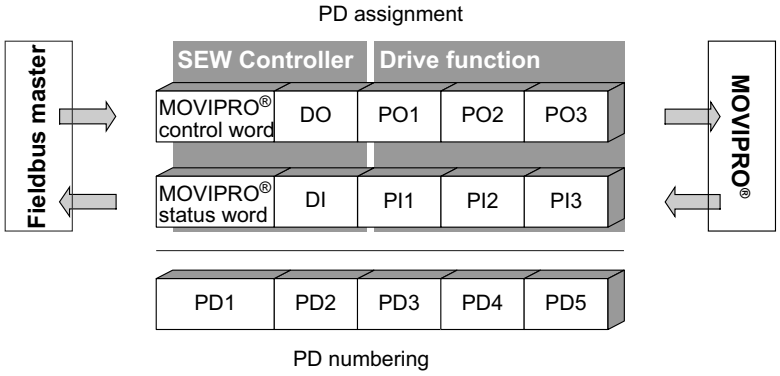
Digital outputs (DO)

Digital outputs (1 byte)	
Bit	**Meaning**
0	Digital output DO 00
1	Digital output DO 01
2	Digital output DO 02
3	Digital output DO 03
4 – 15	Reserved = 0

16998413/EN – 12/2016

11.2.4 Example: Delivery status

In the delivery state, or if no IPOS$^{PLUS®}$ application module is loaded, the device contains the process data words of the speed-controlled drive. In the case of the speed-controlled drive, the device is addressed with 3 process data words.



18095896715

11.2.5 MOVIPRO® SDC drive functions

In MOVIPRO® SDC, the drive data of the power section "PFA-..." are transparently passed through to the general process data PD03 – PD08.

The process data words of the power section are assigned differently, depending on the application module used. The number of process data words can vary between 1 and 6, depending on the application.

The following application modules are available for MOVIPRO® SDC:

- Speed-controlled drive (3 PD) – delivery state
- Bus positioning (3 PD) – IPOS$^{PLUS®}$ application module
- Expanded bus positioning (6 PD) – IPOS$^{PLUS®}$ application module
- Modulo positioning (6 PD) – IPOS$^{PLUS®}$ application module
- Automotive AMA0801 (6 PD) – IPOS$^{PLUS®}$ application module

For further information, refer to chapter "Process image of drive functions of the power section "PFA-...""" (→ 🗎 133).

16998413/EN – 12/2016

11.3 MOVIPRO® ADC process sequence

The process data interface is open in MOVIPRO® ADC. As a result, you have the following options:

- Parameterize MOVIPRO® ADC with CCU application modules

  The CCU application modules are commissioned and configured with the controller software Application Configurator.

- Freely program MOVIPRO® ADC with MOVI-PLC®

  A programmer performs the programming and parameterization of the process data interface.

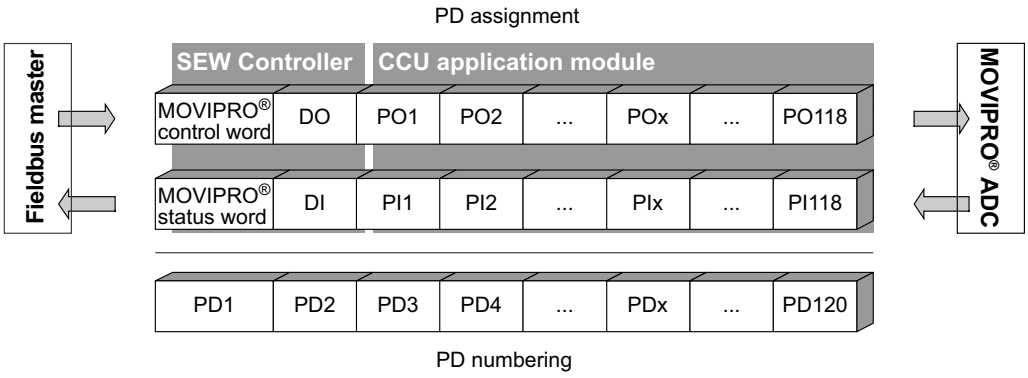
- In MOVIPRO® ADC, integrate all IPOS$^{PLUS®}$ application modules that run directly on the power section "PFA-...".

  For further information, refer to chapter "Process image of drive functions of the power section "PFA-...."" (→ 🗎 133).

A maximum of 120 process data words is permitted to be exchanged between fieldbus master and MOVIPRO® ADC. The process data assignment depends on the IEC program that is loaded or the configuration that is adjusted in the Application Configurator controller software.

The process sequence of MOVIPRO® ADC is essentially divided into 2 parts:

- SEW Controller (fixed):
  - MOVIPRO® control word/MOVIPRO®- status word
  - Digital inputs/digital outputs (DI/DO)
- CCU application module:
  - CCU control word/CCU status word
  - CCU setpoints/CCU actual values
  - CCU - Application data, such as position, speed, etc.



17958893835

16998413/EN – 12/2016

11.3.1 MOVIPRO® ADC control word

The MOVIPRO® ADC control word is defined as follows:

MOVIPRO® ADC control word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	Download dataset	The data on the SD memory card is downloaded to MOVIPRO® ADC. **NOTE** Data can only be downloaded when the power section "PFA..." (controller inhibit or activated safety function STO) is inhibited.
1	Upload dataset	The data is uploaded from MOVIPRO® ADC to the SD memory card and is saved.
2	Upload data set and auto-restore	• The data is uploaded from MOVIPRO® ADC to the SD memory card and is saved. • In case of a device replacement, the data on the SD memory card is automatically transferred to the replacement MOVIPRO® ADC.
3 – 5	–	Reserved = 0
6	System restart	Irrespective of an error or the status of the communication and control unit "PFH-...", a 0-1-0 changeover of this bit causes a system restart.
7 – 15	–	Reserved = 0

11.3.2 MOVIPRO® ADC status word

The status word of the device contains diagnostics information of the MOVIFIT® device that is set up for evaluation in the application of the PLC. The signals are transferred to the PLC via parameters or via the process data channel.

The logical communication status "0" signals the status "OK" for each signal. Therefore, the asynchronously running start-up sequences of the PLC and the device do not output any false diagnostic messages upon start-up of the system (bus start-up with useful data = 0).

The MOVIPRO® ADC status word is defined as follows:

MOVIPRO® ADC status word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	Maintenance switch (mains OFF)	1 = maintenance switch has been actuated. Supply system is switched off. 0 = maintenance switch has not been actuated (OK).
1	Toggle	The toggle bit changes between "0" and "1". The default value is 100 ms. ⚠ **WARNING!** Unpredictable behavior of the system in case of failure of the toggle bit (failure of edge change to materialize). The toggle bit shows the correct function of the internal communication and control unit "PFH-...". May result in death, severe injuries or damage to property. Deactivate the connected drive by disconnecting the drive controller from the supply system or activating the safety function STO on the device.
2 – 3	–	Reserved = 0
4	Dataset available	The data on the SD memory card is identical with the data on MOVIPRO® ADC.
5	Auto-restore configured	Automatic device replacement is configured. In case of a device replacement, the data on the SD memory card is automatically transferred to the replacement MOVIPRO® ADC. For further information, refer to chapter "Device replacement" (→ 🗎 243).
6	Warning	1 = Warning present. 0= No warning (OK).
7	Fault	1 = Error present. 0 =no error (OK).

16998413/EN – 12/2016

MOVIPRO® ADC status word (2 bytes)		
Bit	**Meaning**	**Coding and function**
8 – 15	Device status/warning/error number	Bits 8 – 15 are assigned depending on the value of bits 6 and 7 (see the following table).

Bits 8 – 15 of the MOVIPRO® ADC status word are assigned as follows:

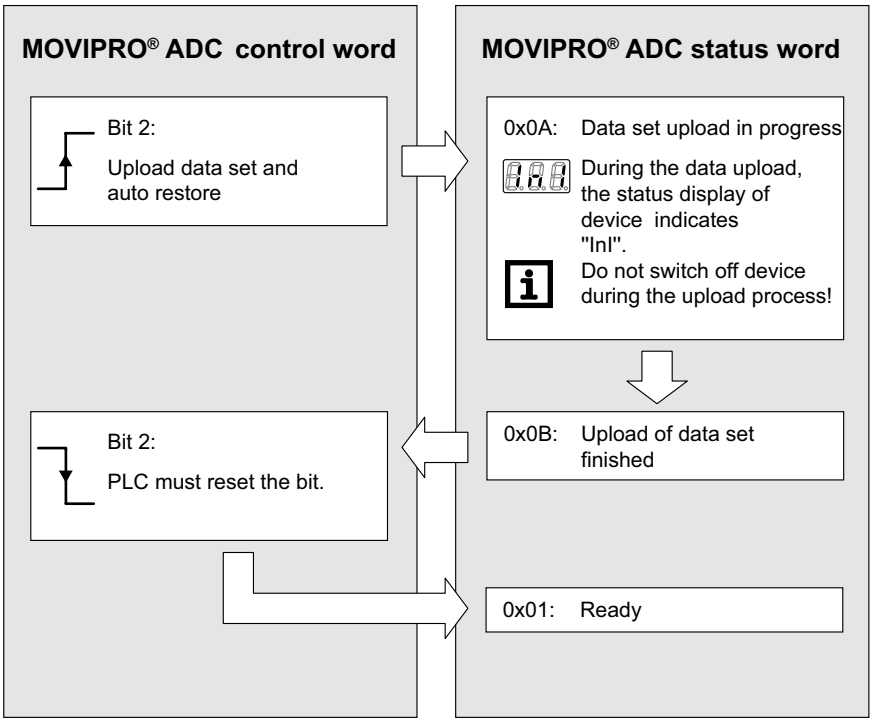
Bits 8 – 15 of the MOVIPRO® ADC status word			
Bit 6	**Bit 7**	**Meaning**	**Coding and function**
0	0	Device status	0 = System start-up
			1 = Ready
			10 = Data backup Dataset is uploaded from the MOVIPRO® ADC to the SD memory card.
			11 = Data backup Dataset successfully uploaded from MOVIPRO® ADC to SD memory card.
			12 = Data backup Dataset is downloaded from the SD memory card to MOVIPRO® ADC.
			13 = Data backup Dataset successfully downloaded from SD memory card to MOVIPRO® ADC.
1	0	Warning	–
0	1	Error number	1 = Configuration No connection to power section "PFA-...".
			2 = Error external I/O
			3 = Configuration No IPOS$^{PLUS®}$ application module available.
			4 = Process data stopped to lower-level devices (gateway).
			10 = Configuration No configuration available.
			11 = Configuration Unable to establish connection with configured devices.
			20 = Data backup Upload failed.
			21 = Data backup Upload failed because SD memory card is write-protected.
			22 = Data backup Download failed.
			23 = Data backup STO safety function required.
			99 = Internal system error
			110 = Overload actuator voltage DO00
			120 = Overload sensor voltage group 1
			121 = Overload sensor voltage group 2

16998413/EN – 12/2016

11.3.3 Data backup via PLC process data specification

The backup of device data can be controlled by the PLC via process data. Prerequisite for this is that you have enabled the data management functions in the data management tool of the engineering software MOVITOOLS® MotionStudio.

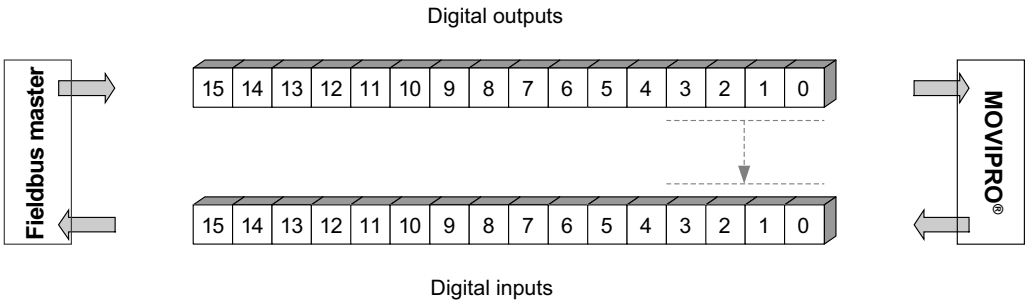
The following figure shows the process of data backup via a PLC process data specification:



9007204513749003

11.3.4 Digital inputs and outputs

The input/output bytes of the device for 12DI/4DIO (digital inputs/digital outputs) are defined as follows:



17986358283

Digital inputs (DI)

Digital inputs (2 bytes)	
Bit	**Meaning**
0	Digital input DI00 / status digital output DO00
1	Digital input DI01 / status digital output DO01
2	Digital input DI02 / status digital output DO02
3	Digital input DI03 / status digital output DO03
4	Digital input DI04

Digital inputs (2 bytes)	
Bit	**Meaning**
5	Digital input DI05
6	Digital input DI06
7	Digital input DI07
8	Digital input DI08
9	Digital input DI09
10	Digital input DI10
11	Digital input DI11
12	Digital input DI12
13	Digital input DI13
14	Digital input DI14
15	Digital input DI15

Digital outputs (DO)

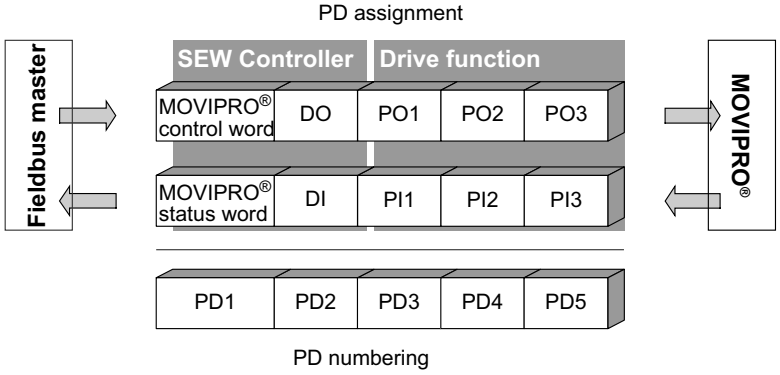
Digital outputs (1 byte)	
Bit	**Meaning**
0	Digital output DO 00
1	Digital output DO 01
2	Digital output DO 02
3	Digital output DO 03
4 – 15	Reserved = 0

11.3.5 Example: Delivery status

A simple gateway program which supports up to 6 process data for the power section "PFA-..." is already preinstalled (delivery state) in the communication and control unit "PFH-..." of MOVIPRO® ADC. This allows the drive function of the power section to be used quickly and easily without additional parameterizations having to be made with the controller software Application Configurator.

The functionality of MOVIPRO® ADC is comparable with a MOVIPRO® SDC in this case. You only have to parameterize the drive functions of the power section to match your requirements. For further information, refer to chapter "Process image of drive functions of the power section "PFA-...""" (→ 🖹 133).

In the delivery state, or if no IPOS$^{PLUS®}$ application module is loaded, the device contains the process data words of the speed-controlled drive. In the case of the speed-controlled drive, the device is addressed with 3 process data words.



18095896715

16998413/EN – 12/2016

11.3.6 MOVIPRO® ADC CCU Application modules

As a parameterizable device, MOVIPRO® ADC contains standardized and directly executable CCU application modules. The CCU application modules run in the communication and control unit "PFH-...". The application modules are configured and parameterized with the controller software Application Configurator.

The following CCU application modules are available for MOVIPRO® ADC:

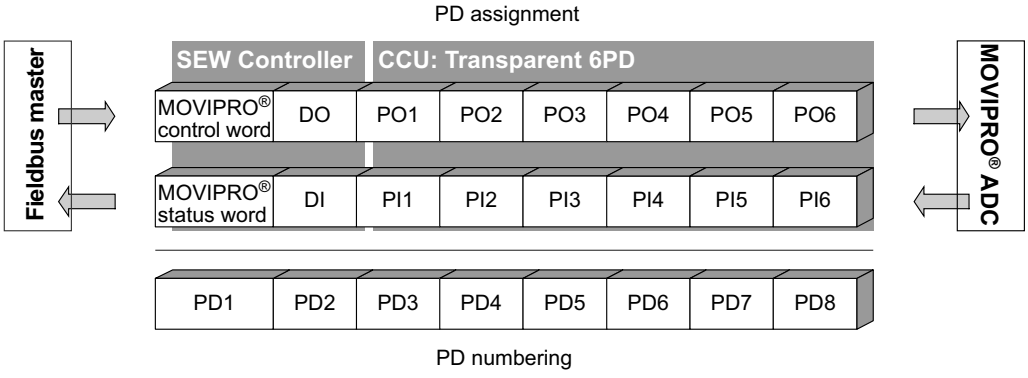
- Transparent 6PD
- Velocity control
- Rapid/creep speed positioning
- Bus positioning

For detailed information, refer to the "Application Configurator for CCU" manual.

"Transparent 6PD" CCU application module

The drive data of the power section "PFA-..." is transparently passed through to the general process data PD03 – PD08 in the "Transparent 6PD" CCU application module. MOVIPRO® ADC is addressed with 6 process data words with the "Transparent 6PD" application module.

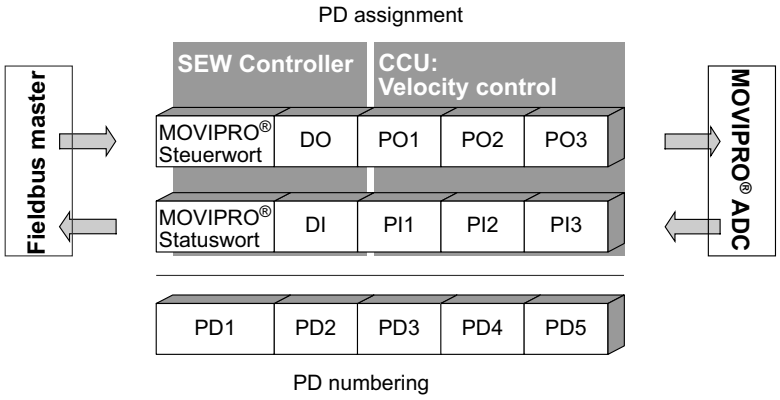
The "Transparent 6PD" CCU application module supports all IPOS$^{PLUS®}$ application modules running on the integrated power section. For further information, refer to chapter "Process image of drive functions of the power section "PFA-...""" (→ 🗎 133).



18030736523

"Velocity control" CCU application module

MOVIPRO® ADC is addressed with 3 process data words with the "velocity control" application module.

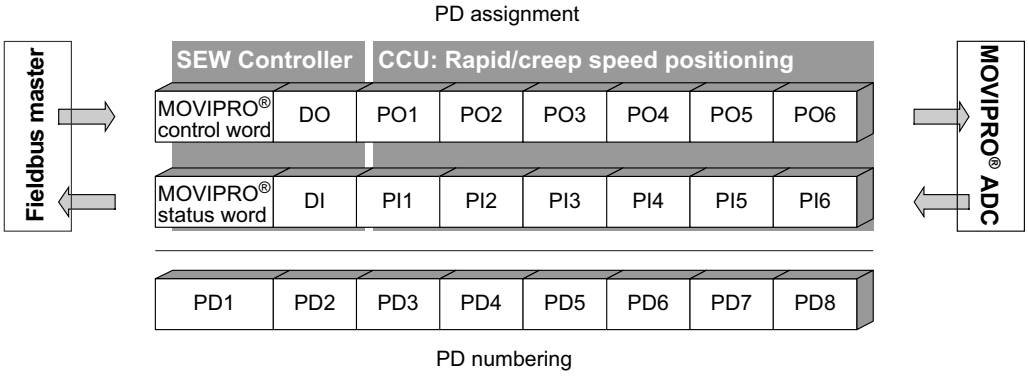


17963395595

Process data (PD) of the CCU application module	
Process output data	**Process input data**
PO1: Control word	PI1: Status word
PO2: Setpoint speed	PI2: Actual speed
PO3: Ramp	PI3: Output current

"Rapid/creep speed positioning" CCU application module

MOVIPRO® ADC is addressed with 1, 3 or 6 process data words with the "Rapid/creep speed positioning" CCU application module.



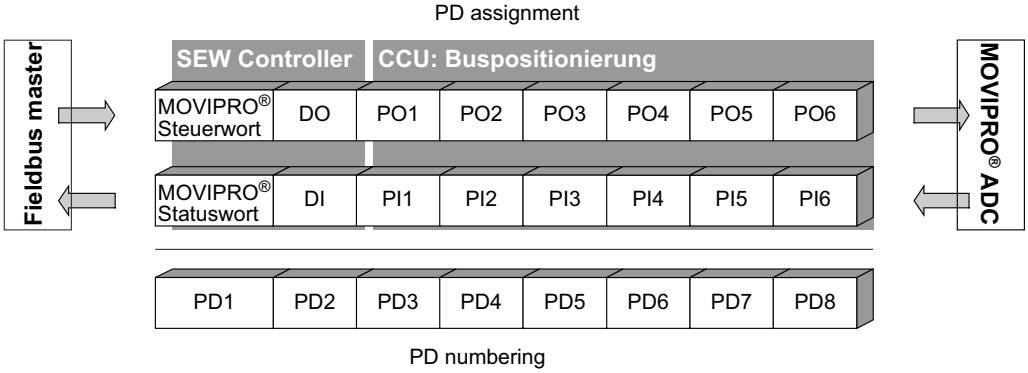
17963398923

Process data (PD) of the CCU application module	
Process output data	**Process input data**
PO1: Control word	PI1: Status word
PO2: Rapid speed	PI2: Actual speed
PO3: Creep speed	PI3: Digital inputs
PO4: Ramp up	PI4: Output current
PO5: Ramp down	PI5: Reserved
PO6: Ramp stop	PI6: Reserved

16998413/EN – 12/2016

"Bus positioning" CCU application module

MOVIPRO® ADC is addressed with 6 process data words with the "bus positioning" CCU application module.



17963388427

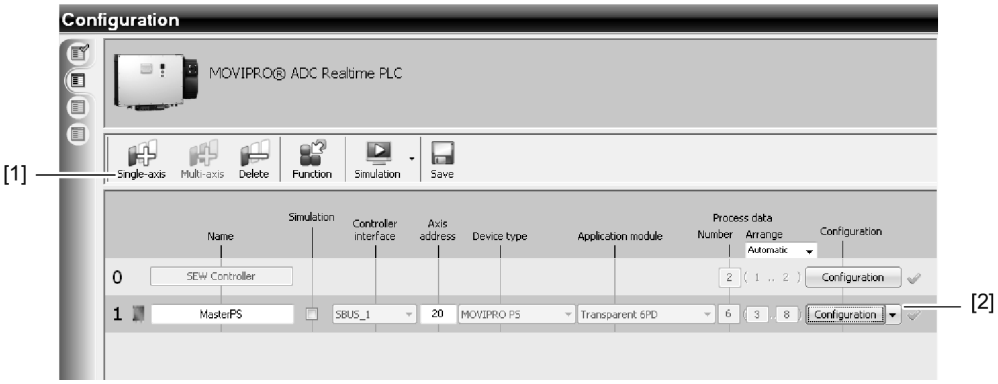
Process data (PD) of the CCU application module	
Process output data	**Process input data**
PO1: Control word	PI1: Status word
PO2: Set position (high-word)	PI2: Actual position (high-word)
PO3: Set position (low-word)	PI3: Actual position (low-word)
PO4: Setpoint velocity	PI4: Actual velocity
PO5: Acceleration	PI5: Output current
PO6: Delay	PI6: Status word 2

Configuring CCU application module

A CCU application module is commissioned as an axis in the Application Configurator controller software.

Proceed as follows:

1. Start the Application Configurator and create a new configuration.
2. Insert a single axis into the configuration. Click on the symbol [1].



18150922123

⇨ A new line is displayed in the axis area.

3. Specify the following settings for the axis:

Window element	Setting/value
Name	Name of the axis
Controller interface	SBUS_1
Axis address	20
Device type	MOVIPRO LT
Application module	Desired application module with the matching process data profile

4. Click the button [2].

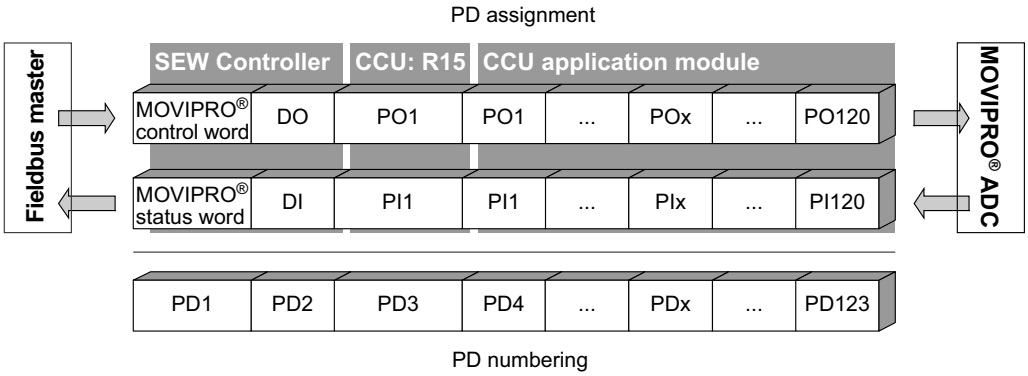
⇨ After successful configuration, a green check mark appears at the end of the line.

⇨ In this example, the "Transparent 6PD" CCU application module is configured.

16998413/EN – 12/2016

11.4 Process image of MOVIPRO® ADC with R15 regenerative power supply

Devices with R15 regenerative power supply option are a special case. The following figure shows an example of the process data assignment of MOVIPRO® ADC with R15 regenerative power supply:



18055681291

Process data (PD) of the regenerative power supply	
Process output data	**Process input data**
PO1: Control word R15	PI1: Status word R15

11.4.1 Regenerative power supply control word

The R15 regenerative power supply control word is defined as follows:

R15 regenerative power supply control word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	–	Reserved = 0
1	Enable = 1 / Stop	1 = Enable regenerative power supply. 0 = Disable regenerative power supply.
2	Enable 2/Stop	1 = Enable regenerative power supply. 2 = Disable regenerative power supply.
3 – 15	–	Reserved = 0

SEW-EURODRIVE recommends controlling the R15 regenerative power supply via the following process data:

- PO = 0x06: Enable regenerative power supply.
- PO = 0x00: Disable regenerative power supply.

11.4.2 Regenerative power supply status word

The R15 regenerative power supply status word is defined as follows:

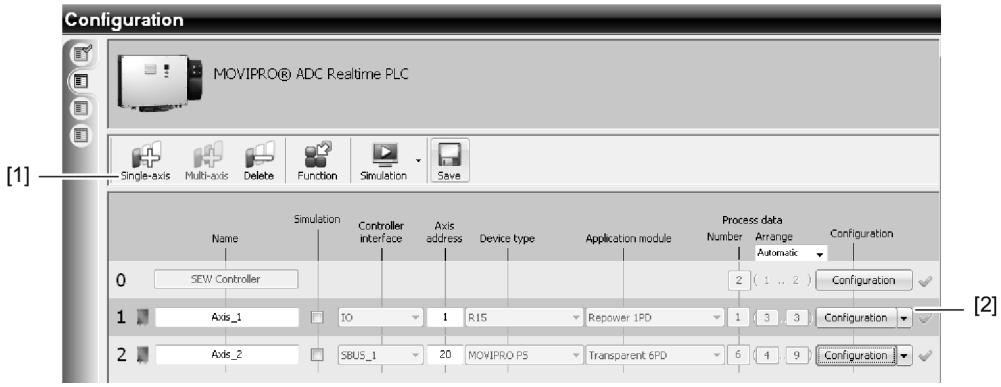
R15 regenerative power supply status word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	–	Reserved = 0
1	Device status "ready"	As long as the regenerative power supply electronics do not report an error and the supply system is available, the regenerative power supply reports the device status "ready". **Note:** The regenerative power supply reports the device status "ready" independently of the coding of the regenerative power supply control word ("enabled" or "disabled").
2 – 15	–	Reserved = 0

11.4.3 Configuring regenerative power supply

The R15 regenerative power supply is commissioned as an axis in the Application Configurator controller software.

Proceed as follows:

1. Start the Application Configurator and create a new configuration.
2. Insert a single axis into the configuration. Click on the symbol [1].



18150926859

⇨ A new line is displayed in the axis area.

3. Specify the following settings for the axis:

Window element	Setting/value
Name	Name of the axis
Controller interface	IO
Axis address	1
Device type	R15
Application module	Regenerative power supply 1PD
Number of process data	1

4. Click the button [2].

   ⇨ After successful configuration, a green check mark appears at the end of the line.

5. Then configure the desired CCU application module.

   ⇨ In this example, the "Transparent 6PD" CCU application module is configured.

16998413/EN – 12/2016

11.5 Process image of drive functions of the power section "PFA-..."

The following drive functions are available for the power section "PFA-...":

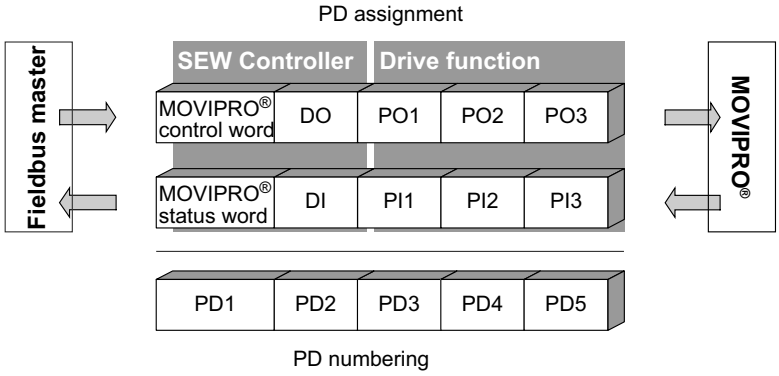
- Speed-controlled drive – delivery state
- Bus positioning (3PD) – IPOS$^{PLUS®}$ application module
- Expanded bus positioning (6PD) – IPOS$^{PLUS®}$ application module
- Modulo positioning (6PD) – IPOS$^{PLUS®}$ application module
- Automotive AMA0801 (6PD) – IPOS$^{PLUS®}$ application module

INFORMATION

In MOVIPRO® ADC, the IPOS$^{PLUS®}$ application modules can only be used if a simple gateway program is installed (delivery state) in the communication and control unit "PFH-...," or the "Transparent 6PD" CCU application module is parameterized. In these cases, the process input and process output data is forwarded from the communication and control unit to the power section "PFA-..." unmodified.

11.5.1 Speed-controlled drive

In the delivery state, or if no IPOS$^{PLUS®}$ application module is loaded, the device contains the process data words of the speed-controlled drive. In the case of the speed-controlled drive, the device is addressed with 3 process data words.



18095896715

Process data (PD) of the speed controlled drive	
Process output data	**Process input data**
PO1: Control word 1	PI1: Status word
PO2: Setpoint speed	PI2: Actual speed
PO3: Ramp	PI3: Active current

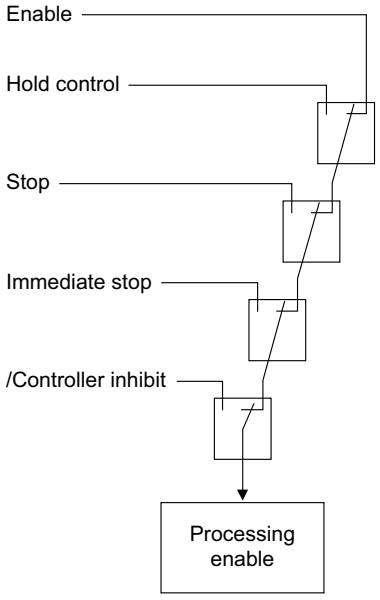
PO1: Control word

The control word of the speed-controlled drive controls the power section "PFA-...".

The control word is defined as follows:

Speed-controlled drive control word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	Controller inhibit	0 = Enable 1 = Inhibit controller, activate brake.
1	Enable/stop	0 = Stop 1 = Enable
2	Enable/stop	0 = Stop at the integrator or process ramp 1 = Enable
3	Hold control	0 = Position hold control not activated. 1 = Position hold control not activated.
4	Integrator switchover	0 = Integrator 1 1 = Integrator 2
5	Parameter set changeover	0 = Parameter set 1 1 = Parameter set 2
6	Reset	If there is a power section fault, an error reset is requested with a 0-1-0 transition of this bit.
7	–	Reserved = 0
8	Direction of rotation for motor potentiometer	0 = CW direction of rotation 1 = CCW direction of rotation
9 – 10	Motor potentiometer acceleration/deceleration	00 = no change 10 = Down 01 = Up 11 = no change
11 – 12	Selection of the internal fixed setpoints n11 – n13 and n21 – n23	00 = Speed setpoint via PA2 10 = Internal setpoint n11 (n21) 01 = Internal setpoint n12 (n22) 11 = Internal setpoint n13 (n23)
13	Changing the fixed setpoint	0 = Fixed setpoints of the active parameter set selectable via bit 11/12 1 = Fixed setpoints of the other parameter set selectable via bit 11/12
14 – 15	–	Reserved = 0

The following prioritization applies to the evaluation of bits used for the enable in the control word:



18014399878401675

16998413/EN – 12/2016

PO2: Setpoint speed

If the adjusted operating mode (*P700/P701 Operating mode 1/2*) allows a speed setpoint, the power section "PFA-..." interprets the transferred numerical value as a speed setpoint.

If no speed setpoint is programmed although a communication interface (fieldbus) has been set as setpoint source, the power section runs at speed setpoint = 0.

Coding: 1 Digit = 0.2 min^{-1}

Example: 1000 min^{-1}, CCW direction of rotation

Calculation: $-\frac{1000}{0.2} = -5000_{dec} = EC78_{hex}$

PO3: Ramp

The power section "PFA-..." interprets the transferred setpoint as a run-up or run-down ramp. The transferred time value refers to a change in speed of 3000 min^{-1}. The stop and emergency stop functions are not affected by this process ramp. When transmitting the process ramp via fieldbus system, ramps t11, t12, t21 and t22 become ineffective.

Coding: 1 digit = 1 ms

Range: 100 ms – 65 s

Example: 2.0 s = 2000 ms = 2000_{dec} = $07D0_{hex}$

PI1: Status word

The status word of the speed-controlled drive is used to display the device status and, in case of a fault, the respective fault number.

The status word is defined as follows:

Speed-controlled drive status word (2 bytes)		
Bit	**Meaning**	**Coding and function**
0	Output stage enabled	1 = Output stage enabled. 0 = Output stage not enabled.
1	Inverter ready	1 = Power section "PFA-..." is ready. 0 = Power section "PFA-..." is not ready.
2	PO data enabled	1 = Process data is enabled. The drive can be controlled via fieldbus. 0 = Process data is inhibited. The drive cannot be controlled via fieldbus.
3	Current ramp generator set	0 = Integrator set 1 1 = Integrator set 2
4	Current parameter set	0 = Parameter set 1 1 = Parameter set 2
5	Fault/warning	1 = Failure/warning present. 0 = No failure/warning present.
6	CW limit switch	1 = Limit switch CW active. 0 = Limit switch CW not active.
7	Limit switch left	1 = Limit switch CCW active. 0 = Limit switch CCW not active.
8 – 15	If no failure/warning is present (bit 5 = 0): Device state of the power section	0 = 24 V operation 2 = No enable
	If a failure/warning is present (bit 5 = 1): Error number	Error number (→ 🗎 248)

PI2: Actual speed

The power section "PFA-..." returns the current actual speed value to the PLC. The exact actual speed can only be sent back when the power section can determine the actual motor speed using speed feedback. For applications with slip compensation, the deviation from the real motor speed depends on the accuracy of the adjusted slip compensation.

Coding: 1 Digit = 0.2 min^{-1}

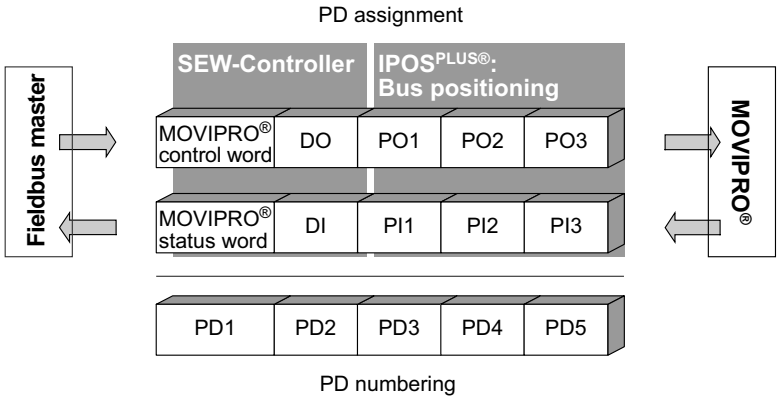
PI3: Active current

The power section "PFA-..." returns the active actual current value of the output current as a relative value in percentage to the PLC. The output current refers to the nominal device current I_N.

Coding: 1 Digit = 0.1% I_N

11.5.2 "Bus positioning" IPOS$^{PLUS®}$ application module

The device is addressed with 3 process data words with the "bus positioning" IPOS$^{PLUS®}$ application module.



18017593355

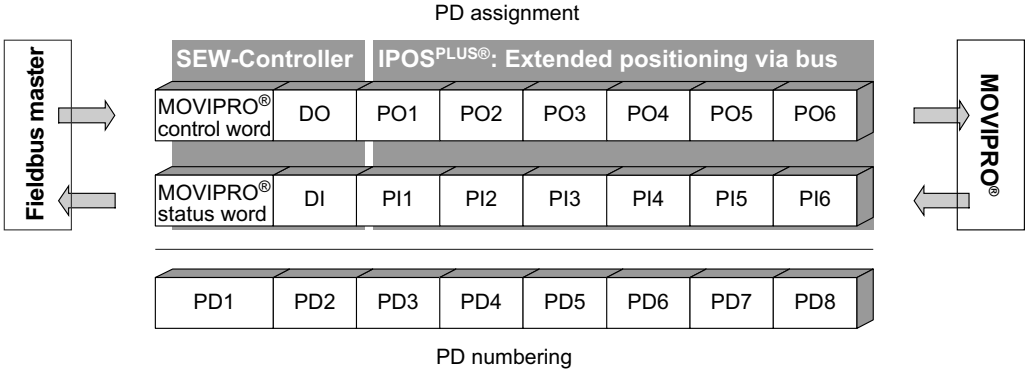
Process data (PD) of the IPOS$^{PLUS®}$ application module	
Process output data	**Process input data**
PO1: Control word 2	PI1: Status word
PO2: Setpoint velocity	PI2: Actual velocity
PO3: Target position	PI3: Actual position

For more information, refer to the "MOVIDRIVE® drive inverter bus positioning" manual.

16998413/EN – 12/2016

11.5.3 "Extended positioning via bus" IPOS$^{PLUS®}$ application module

The device is addressed with 6 process data words with the "Extended positioning via bus" IPOS$^{PLUS®}$ application module.



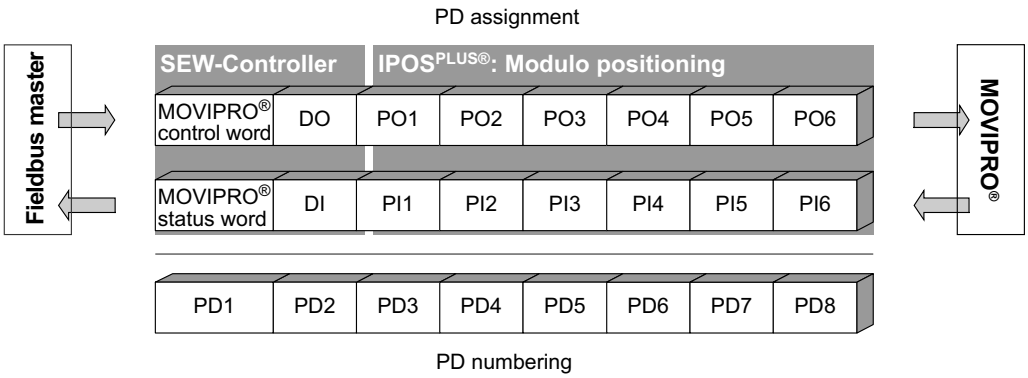
18027971467

Process data (PD) of the IPOS$^{PLUS®}$ application module	
Process output data	**Process input data**
PO1: Control word 2	PI1: Status word
PO2: Target pos. high	PI2: Actual pos. high
PO3: Target pos. low	PI3: Actual pos. low
PO4: Setpoint velocity	PI4: Actual velocity
PO5: Acceleration ramp	PI5: Active current
PO6: Deceleration ramp	PI6: Device utilization

For more information, refer to the "MOVIDRIVE® MDX61B application "Extended positioning via bus"" manual.

11.5.4 "Modulo positioning" IPOS$^{PLUS®}$ application module

The device is addressed with 6 process data words with the "Modulo positioning" IPOS$^{PLUS®}$ application module.



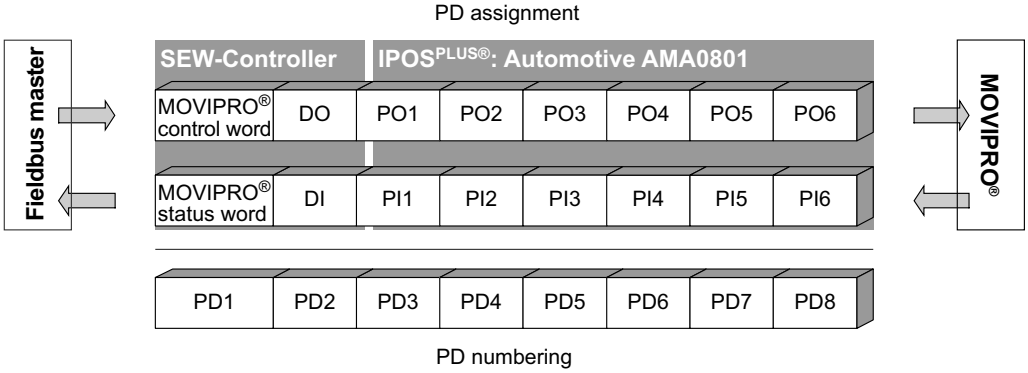
18029657483

Process data (PD) of the IPOS$^{PLUS®}$ application module	
Process output data	**Process input data**
PO1: Control word 2	PI1: Status word
PO2: Target pos. high	PI2: Actual pos. high
PO3: Target pos. low	PI3: Actual pos. low
PO4: Setpoint velocity	PI4: Actual velocity
PO5: Acceleration ramp	PI5: Active current
PO6: Deceleration ramp	PI6: Device utilization

For more information, refer to the "MOVIDRIVE® MDX60B / 61B application "Modulo positioning"" manual.

11.5.5 "Automotive AMA0801" IPOS$^{PLUS®}$ application module

The device is addressed with 6 process data words with the "Automotive AMA0801" IPOS$^{PLUS®}$ application module.



18029916683

Process data (PD) of the IPOS$^{PLUS®}$ application module	
Process output data	**Process input data**
PO1: Control word 2	PI1: Status word
PO2: Target position high or 16 single-bit positions	PI2: Actual pos. high
PO3: Target position low or correction value Target position high	PI3: Actual pos. low
PO4: Setpoint speed or correction value Target position low	PI4: Actual speed or single bit position message
PO5: Ramp up/down or reserved	PI5: Position difference master-slave or 16 single-bit cams
PO6: Sync offset	PI6: Active current

For information, refer to the "MOVIDRIVE® MDX61B and MOVIPRO® SDC/ADC application module "Automotive AMA0801"" manual.

16998413/EN – 12/2016

12 Operation with the MOVITOOLS® MotionStudio engineering software

12.1 About MOVITOOLS® MotionStudio

12.1.1 Tasks

The MOVITOOLS® MotionStudio engineering software enables you to perform the following tasks with consistency:

- Establishing communication with devices
- Executing functions with the devices

12.1.2 Communication channels

The SEW Communication Server is integrated into the engineering software MOVITOOLS® MotionStudio for establishing communication with the devices.

The SEW Communication Server allows you to create communication channels. Once the channels are established, the devices communicate via these communication channels using their communication options. You can operate up to 4 communication channels at the same time.

MOVITOOLS® MotionStudio supports the following types of communication channels:

- Serial (RS485) via interface adapters
- System bus (SBus) via interface adapters
- Ethernet TCP/IP, PROFINET IO, EtherNet/IP™, Modbus/TCP
- EtherCAT®
- Fieldbus (PROFIBUS DP-V1)
- Non-proprietary software interface Tool Calling Interface

The available channels can vary depending on the device and its communication options.

12.1.3 Functions

The MOVITOOLS® MotionStudio engineering software enables you to perform the following tasks with consistency:

- Parameterization (e. g. in the parameter tree of the device)
- Startup
- Visualization and diagnostics
- Programming

MOVITOOLS® MotionStudio provides the right tools for every device type.

16998413/EN – 12/2016

12.2 First steps

12.2.1 Starting the software and creating a project

Proceed as follows:

1. Select the following item from the Windows start menu: [Start] / [Programs] / [SEW] / [MOVITOOLS MotionStudio] / [MOVITOOLS MotionStudio]
   ⇨ MOVITOOLS® MotionStudio is started.
2. Create a project with a name and directory.

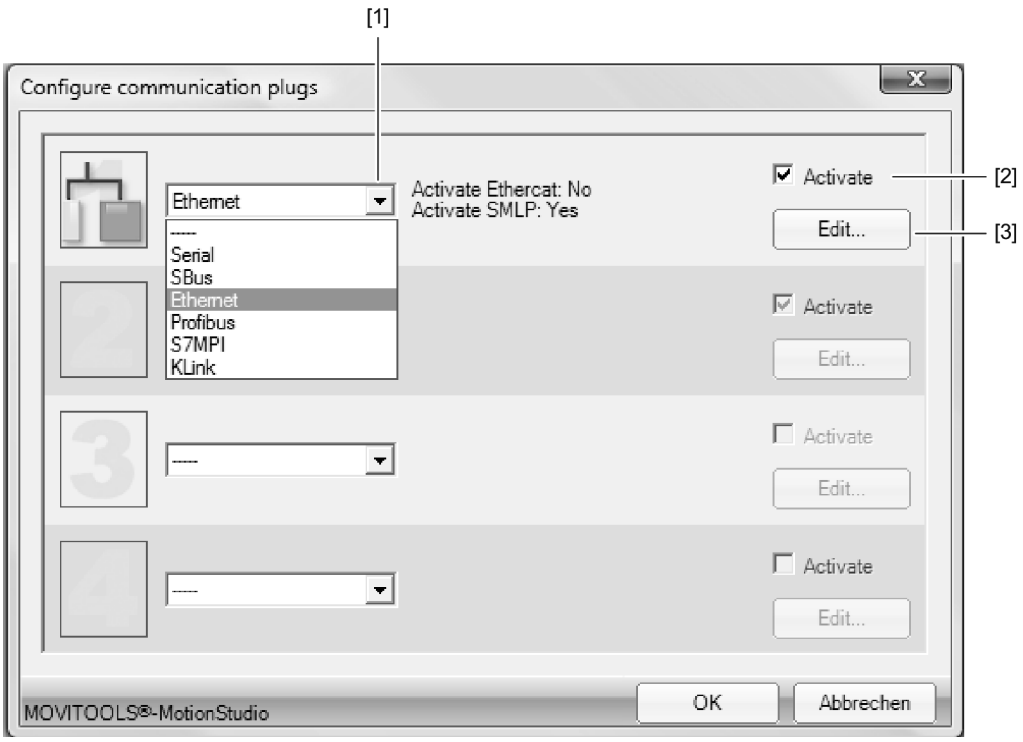
12.2.2 Establishing communication and scanning the network

Proceed as follows:

1. Click "Configure communication channels" [1] in the toolbar.

18014399642823819

   ⇨ The following window opens.



9007217492118283

2. From the drop-down list [1], select the communication type.
3. Activate the selected communication type [2].
4. To edit the settings of the selected communication type, click the button [3].

16998413/EN – 12/2016

5. If necessary, change the preset communication parameters. When doing so, refer to the detailed description of the communication channels.
6. Scan your network via the "Device scan" icon [1] in the toolbar.

27021598896943499

12.2.3 Connection mode

Overview

The MOVITOOLS® MotionStudio engineering software differentiates between "online" and "offline" connection mode. You determine the connection mode yourself. MOVITOOLS® MotionStudio starts up in the connection mode that was set before the program was closed.

INFORMATION

The "Online" connection mode is **not** a response message which informs you that you are currently connected to the device or that your device is ready for communication.

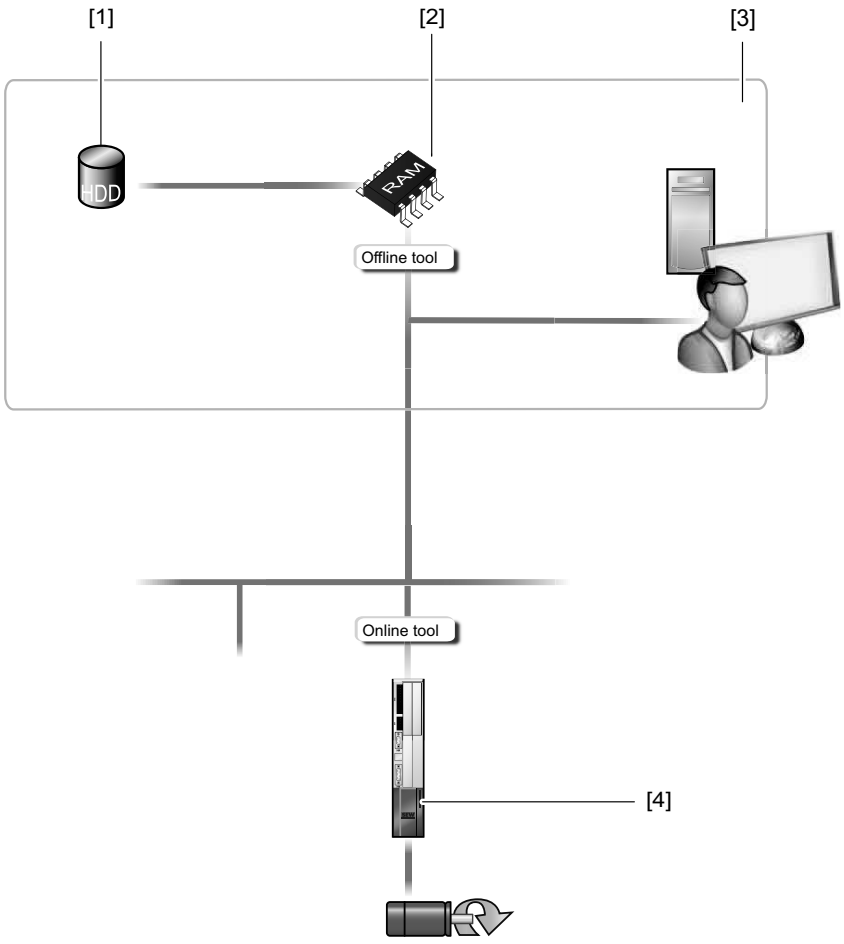
- Should you require this feedback, observe chapter "Setting the cyclical accessibility test" in the online help (or the manual) of MOVITOOLS® MotionStudio.

INFORMATION

Project management commands (such as "download" and "upload"), the online device status, and the "device scan" work independently of the set connection mode.

16998413/EN – 12/2016

Depending on the selected connection mode, you can choose offline or online tools specific to your device. The following figure illustrates the two types of tools:



18014399752675211

[1] Hard drive of the engineering PC
[2] RAM of the engineering PC
[3] Engineering PC
[4] Device

Tools	Description
Online tools	Changes made using online tools affect **only** the device [4]. • Execute the "Upload (device → PC)" function if you want to transfer the changes to your RAM [2]. • Save your project so that the changes can be stored on the hard disk [1] of your engineering PC [3].
Offline tools	Changes made using offline tools affect **only** the RAM [2] at first. • Save your project so that the changes can be stored on the hard disk [1] of your engineering PC [3]. • Execute the "Download (PC → device)" function if you want to transfer the changes to your device [4] as well. Check the parameterization afterwards.

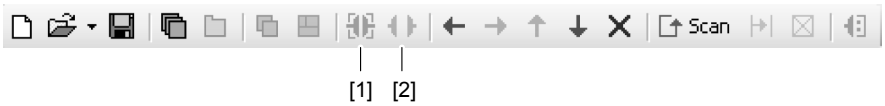
Selecting the communication mode (online or offline)

Proceed as follows:

1. Select the connection mode:

16998413/EN – 12/2016

- For functions (online tools) that should directly influence the unit, switch to online mode by using the icon [1].
- For functions (offline tools) that should directly influence the unit, switch to offline mode by using the icon [2].



18014399643939211

2. Select the unit node.
3. Select the tools for configuring the unit from the context menu.

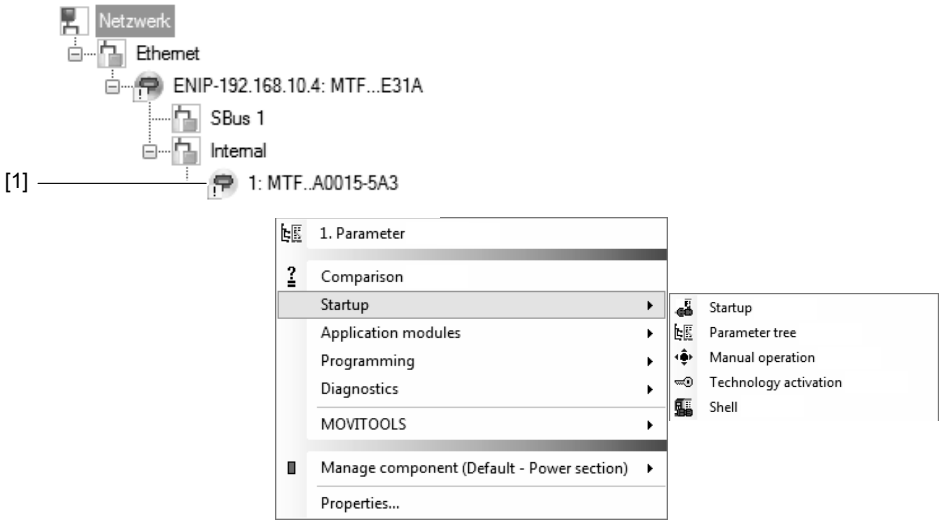
12.2.4 Configuring devices

The following example uses a MOVIFIT® device to show how to display the tools for configuring the device.

The connection mode is "online". The device has been scanned in the network view.

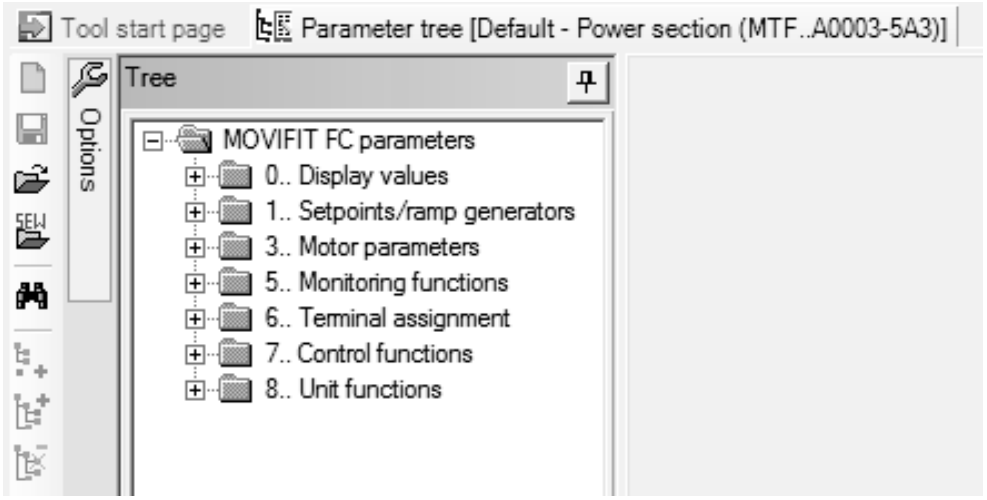
Proceed as follows:

1. Select the device (in this example the power section [1]) in the network view.
2. Right-click to open the context menu.



9007201701091851

3. Select the tool for configuring the device (in this example the command [Startup] > [Parameter tree]).

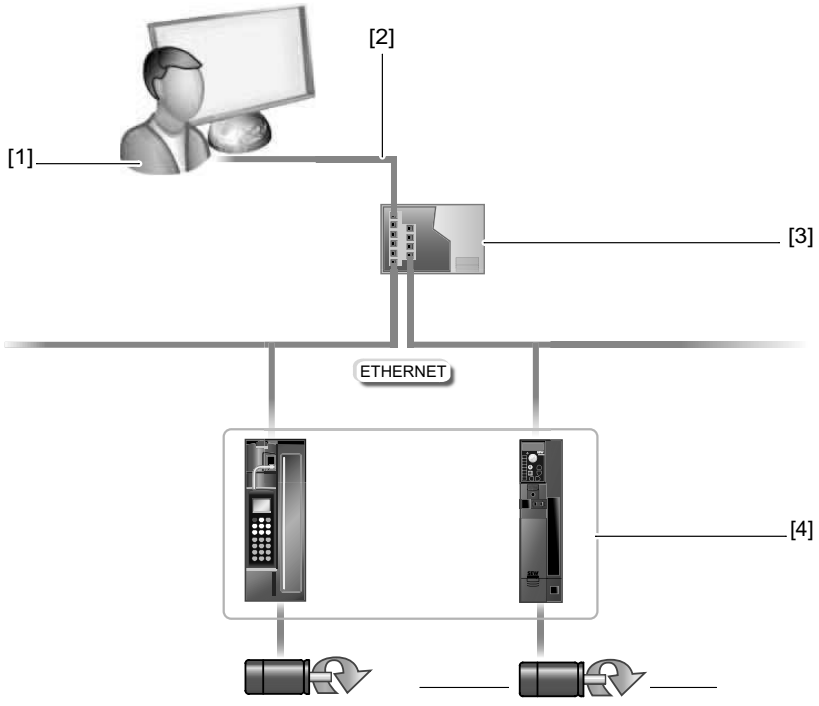


9007201701096203

12.3 Communication via Ethernet

12.3.1 Connecting the device with the PC via Ethernet

The following figure shows the network with direct communication using Ethernet:



1193501835

[1] Engineering PC with Ethernet interface
[2] Ethernet connection
[3] Switch
[4] Devices (examples) with Ethernet interfaces

16998413/EN – 12/2016

Parameter requests from the MOVITOOLS® MotionStudio engineering software are transferred to a switch [3] via Ethernet [2] from an engineering PC [1] using the Ethernet interface. The switch [3] then directly passes on the parameter requests to the Ethernet interface of the devices [4].

12.3.2 Establishing communication with the Address Editor

Address Editor is a free software tool from SEW-EURODRIVE. It is available once the MOVITOOLS® MotionStudio engineering software is installed. However, it is used separately.

The Address Editor allows to find all SEW-EURODRIVE devices connected at the local network segment (subnetwork) and to parameterize the network settings.

INFORMATION

The Address Editor only finds SEW-EURODRIVE devices. The devices have to be connected to the network via the Ethernet fieldbus interface.

In contrast to MOVITOOLS® MotionStudio, you do **not** need to set the IP address of the engineering PC to the local network segment.

Perform the following process steps to add additional Ethernet nodes to an existing network:

1. "Starting the Address Editor" (→ 🗎 145)
2. "Searching Ethernet nodes" (→ 🗎 146)
3. "Adjusting the IP address of the Ethernet nodes" (→ 🗎 147)
4. Optional: "Setting the engineering PC appropriately for the network" (→ 🗎 148)

Starting the Address Editor

You can use the Address Editor immediately after installing the MOVITOOLS® MotionStudio engineering software.

Proceed as follows:

1. Close MOVITOOLS® MotionStudio.
2. Select the following item from the Windows start menu: [Start] / [Programs] / [SEW] / [MOVITOOLS MotionStudio] / [Address Editor]

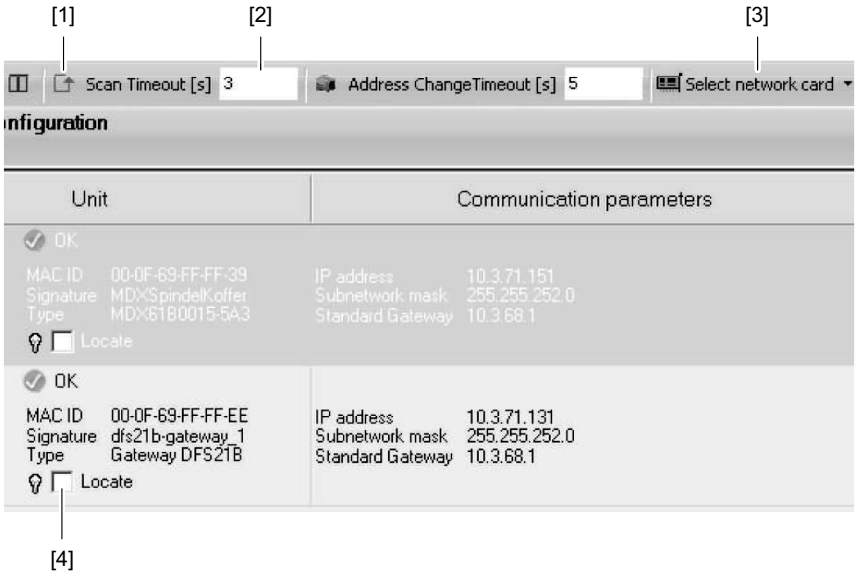
16998413/EN – 12/2016

Searching Ethernet nodes

You can use the Address Editor to find Ethernet nodes in a network. It can also be used for detecting new Ethernet nodes. The Address Editor also helps you locate the detected Ethernet nodes.

Proceed as follows:

1. Start the Address Editor.
2. Select "Ethernet" as the interface for engineering PC and device. To do so, activate the appropriate radio button.
3. Click [Next] to continue.
4. Wait until the network scan starts **automatically**. The default setting for the waiting time is 3 s (edit box [2]).



18014400023008779

⇨ The current addresses of all Ethernet nodes in the connected network will be displayed.

5. If no devices are detected during the network scan, check the wiring or if you have installed (activated) several network cards in your engineering PC.
6. Proceed as follows to search the devices with a specific network card:

- Select the required card. To do so, click the icon [3] in the toolbar.
- Start the network scan **manually**. To do so, click the icon [1] in the toolbar.

7. Activate the check box [4] to localize an Ethernet node.

⇨ The "link/act "LED of the first Ethernet interface of the respective Ethernet node will flash green.

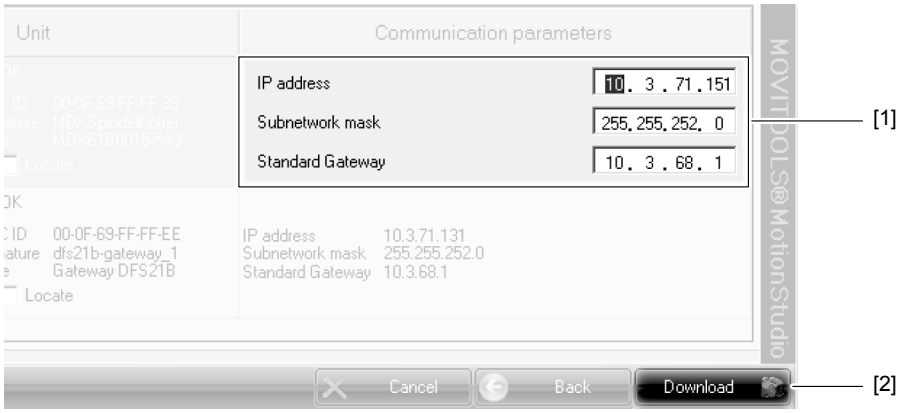
16998413/EN – 12/2016

Adjusting the IP address of the Ethernet nodes

Proceed as follows:

1. Start the Address Editor and scan the network.
2. Double-click in the area behind the setting [1] of the Ethernet node you want to change. You can change the following settings:

- IP address
- Subnet mask
- Standard gateway
- DHCP startup configuration (if supported by the device)



18014400041285899

3. Press the enter key to confirm your changes.
4. To transfer the address changes to the Ethernet node, click button [2].
5. For the changed settings to become effective, switch off the device and restart it afterwards.

Setting the engineering PC appropriately for the network

Proceed as follows:

1. Select the network settings in the Windows control panel.
2. Select the Internet protocol version 4 "TCP/IPv4" in the adapter properties.
3. Enter the IP address parameters of the engineering PC in the Internet protocol properties:

- For the subnet mask and standard gateway, enter the same IP address parameters that are used for the other network stations in this local network.
- Enter the IP address of the engineering PC depending on the subnet mask. Note that the IP address of the engineering PC is different from the IP address of all other network stations and thus is unique. The network address for all network stations must be identical and the station address must be different for all network stations.

  Example: On delivery, all SEW-EURODRIVE devices have the following IP address parameters: Standard IP address "192.168.10.4", subnet mask "255.255.255.0". In this case, the engineering PC must not have the values "0", "4", "127" or "255" in the last address block of the IP address.

4. Confirm with [OK].
5. Click [OK] again to close the window.

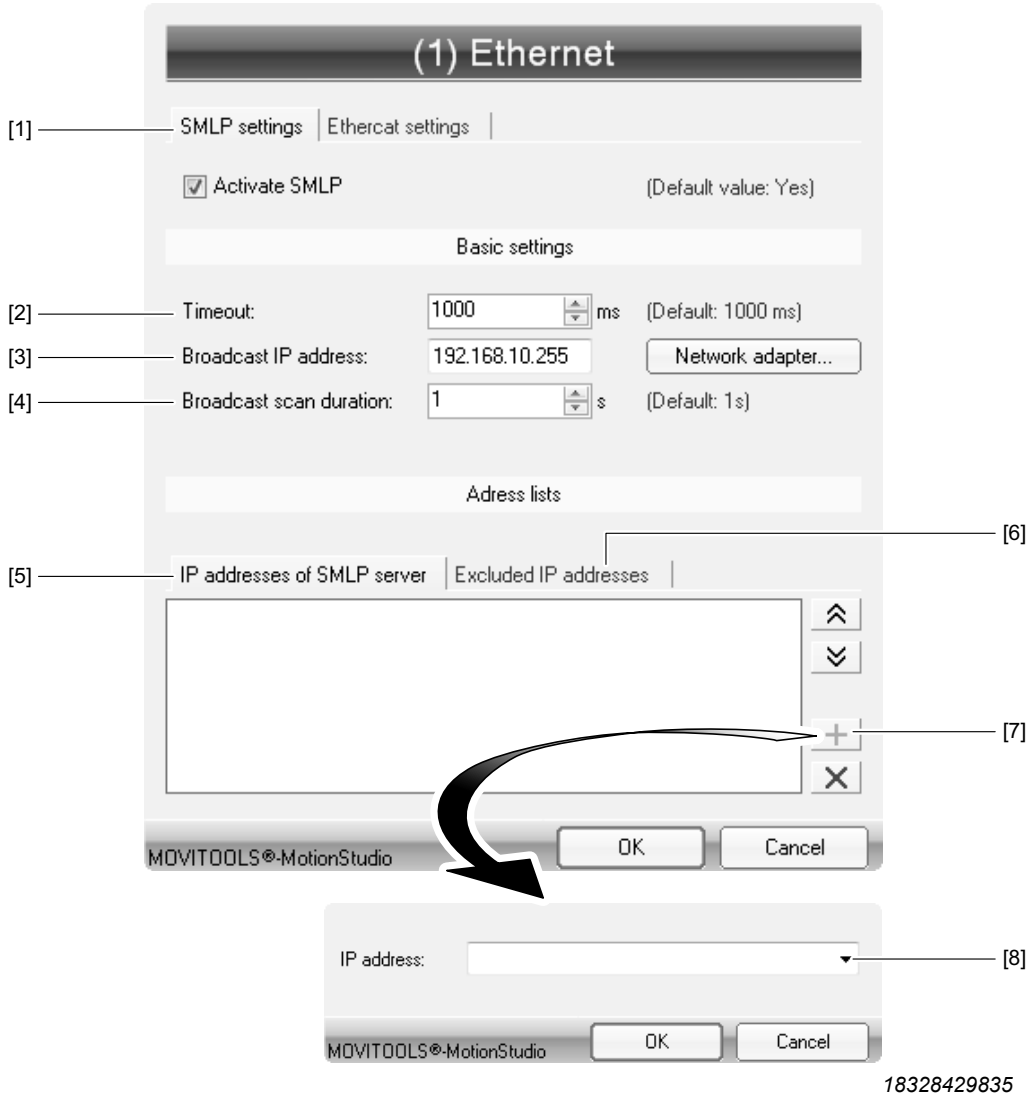
12.3.3 Configuring the communication channel via Ethernet

The devices use the device protocol from SEW-EURODRIVE **SMLP** (**S**imple **M**OVI**L**INK® **P**rotocol) that is directly transferred via TCP/IP.

Proceed as follows:

16998413/EN – 12/2016

1. Establish the communication channel via Ethernet (→ 🗎 140).
2. Set the SMLP protocol parameters in the following window in the "SMLP settings" tab [1] (→ 🗎 150).



18328429835

[1] "SMLP settings" tab
[2] Timeout
[3] Broadcast IP address
[4] Broadcast scan duration
[5] "IP addresses of SMLP server" tab
[6] "Excluded IP addresses" tab
[7] Add IP address
[8] IP address edit box

16998413/EN – 12/2016

Ethernet parameters for SMLP

The following table shows the communication parameters for SMLP:

No.	Ethernet parameter	Description	Information
[2]	Timeout	Waiting time in ms that the client waits for a reply from the server after it has made a request.	• Default setting: 1000 ms • If a delay of the communication causes failure, increase the value.
[3]	Broadcast IP address	IP address of the local network segment **within** which the device scan is carried out.	In the default setting, the device scan only retrieves devices in the local network segment.
[4]	IP address SMLP server	IP address of the SMLP server or of other devices that are to be included in the device scan but are **outside** the local network segment.	• Enter the IP address of devices that are to be included in the device scan but are **outside** the local network segment. • If you are operating an indirect communication from Ethernet to PROFIBUS, enter the IP address of the controller.
[6]	Excluded IP address	IP addresses of devices that should **not** be included in the device scan.	Enter the IP address of devices that should **not** be included in the device scan. This can be devices that are not ready for communication (e.g. because they have not been started up yet).

Adding devices to the local network segment

During a device scan, the system recognizes only devices that are in the same local network segment as the engineering PC. If you have devices that are outside the local network segment, add the IP addresses of these devices to the list of SMLP servers.

Proceed as follows:

1. Open the "SMLP settings" tab [1] (→ 🗎 148).
2. Select the address list of the SMLP server.
3. Open the "IP address of SMLP server" tab [5] (→ 🗎 148).
4. To enter the IP address, click on the plus symbol [7].
5. Enter the IP address in the edit box [8]. Click [OK].

16998413/EN – 12/2016

Communication ports used

The following table shows the communication ports that are used by the MOVITOOLS® MotionStudio engineering software:

Application	Number of the communication port	Description
ETH server	300 (TCP/UDP)	For the services of the SMLP and for using a PC as Ethernet gateway.
SEW Communication Server	301 (TCP)	For communication between MOVITOOLS® MotionStudio and the SEW Communication Server.
Offline data server	302 (TCP)	For communication of MOVITOOLS® MotionStudio in offline mode.
MOVIVISION® server	303 (TCP)	For communication with a PC with active MOVIVISION® server
Reserved	304	–
TCI server	305 (TCP)	For communication via TCI (**T**ool **C**alling **I**nterface by Siemens)
EcEngineeringServer-RemoteControl	306 (UDP)	For direct communication (without master) with the slaves
EcEngineeringServer mailbox gateway	307 (UDP)	For direct communication (without master) with the slaves and for communication via a mailbox gateway
MOVI-PLC® visualization	308 (TCP/UDP)	For communication between MOVI-PLC® and the 3D simulation of MOVITOOLS® MotionStudio

16998413/EN – 12/2016

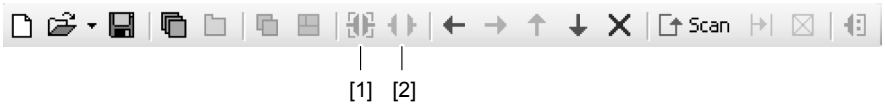
12.4 Executing functions with the units

12.4.1 Reading or changing unit parameters

Proceed as follows:

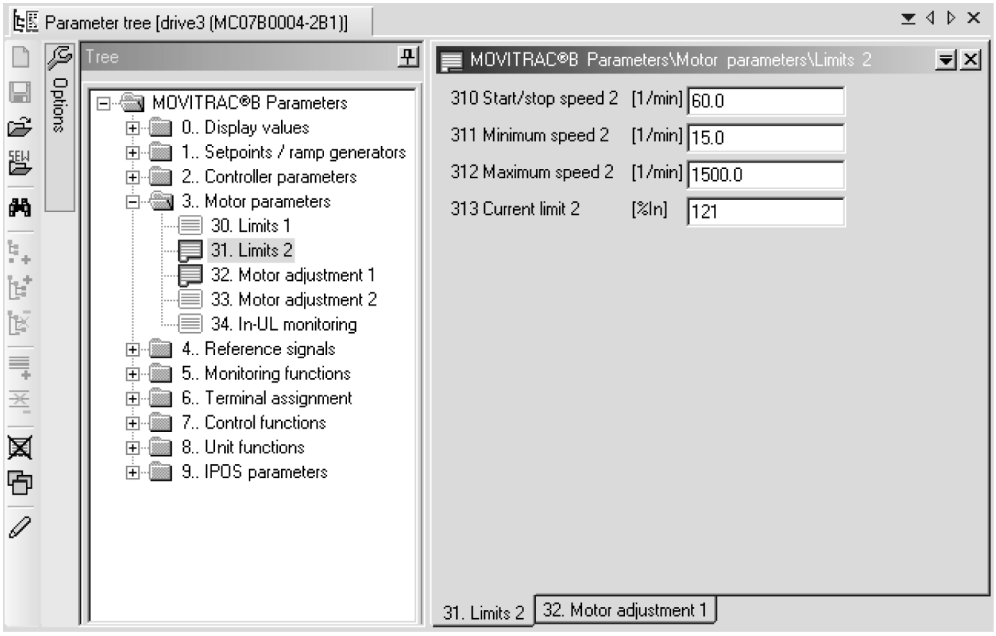
1. Switch to the required view (project view or network view).
2. Select the connection mode:

- If you want to read/change parameters directly on the **unit**, switch to online mode by using the icon [1].
- If you want to read/change parameters in the **project**, switch to offline mode by using the icon [2].



18014399643939211

3. Select the unit you want to parameterize.
4. Choose the command [Startup] > [Parameter tree] from the context menu.
   ⇨ This opens the "Parameter tree" view on the right section of the screen.
5. Expand the parameter tree to the node you require.



9007200201958155

6. To display a specific group of device parameters, double-click on the group.
7. Press the enter key to finalize any changes you make to numerical values in the input fields.

INFORMATION

For detailed information about the unit parameters, refer to the parameter list for the unit.

16998413/EN – 12/2016

12.4.2 Starting up units (online)

Proceed as follows:

1. Switch to the network view.
2. Switch to online mode by using the icon [1].

18014399693512203

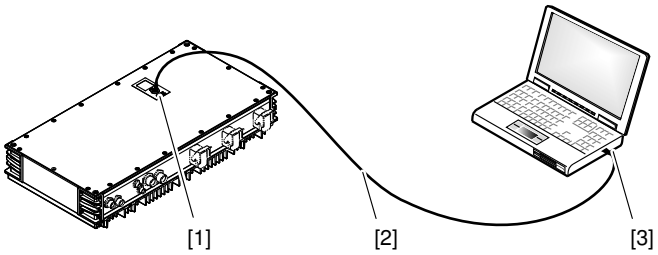
3. Select the unit you want to startup.
4. Choose the command [Startup] > [Startup] from the context menu.
   ⇨ The startup assistant is displayed.
5. Follow the instructions of the startup wizard and then load the startup data into your unit.

16998413/EN – 12/2016

13 Parameter setting

13.1 PC/laptop connection

The following figure shows the connection between a PC/laptop and the Ethernet service interface of the device:



1204936459

[1] Ethernet service interface (Ethernet RJ45) of the device
[2] Commercially available Ethernet cable
[3] Ethernet interface of the laptop

The following table shows the IP address and the subnet mask of the engineering interface of the device:

Ethernet service interface	
Standard IP address	**Subnet mask**
192.168.10.4	255.255.255.0

16998413/EN – 12/2016

13.2 Configuring device – checklist

Proceed as follows:

- ✓ You have installed the MOVITOOLS® MotionStudio engineering software on the engineering PC, V6.20 or later.
- ✓ You have already downloaded the device description file (EDS file) from SEW-EURODRIVE → **www.sew-eurodrive.com** and saved it locally to the engineering PC.
- ✓ The connection has been established between the engineering PC and device via the engineering interface. Note that the subnet masks of the two network clients are identical, but the IP addresses differ in the client addresses (lower byte of the IP address). The device can then be reached from the engineering PC with the ping command.
- ✓ The following components are installed according to the instructions in the operating instructions: Supply system cable, motor cable, braking resistor, DC-24 V backup voltage
- ✓ The voltage supply of the device is activated.

1. Start MOVITOOLS® MotionStudio and create a new project.
2. Configure a communication channel via Ethernet (→ 🗎 140).
3. Perform a device scan.
4. Configure the connected encoder (→ 🗎 140).
5. Perform a motor startup (→ 🗎 140).
6. ⚠ **DANGER!** No safe disconnection of the device if the connection is jumpered. Severe or fatal injuries. Jumper the circuit only if the device is not to perform any safety functions according to DIN EN ISO 13849-1.
   To verify whether the startup data is correct, control the drive in manual mode. To do so, you must bridge the connection X5502 (STO-IN) on the device.
7. If necessary, load an IPOS$^{PLUS®}$ application module into the power section "PFA-..." and modify the application parameters (→ 🗎 173).
8. In MOVIPRO® ADC, load a CCU application module (→ 🗎 174) or a freely programmed IEC program (→ 🗎 181) into the communication and control unit "PFH-..." as required.
9. Configure the fieldbus interface and check whether the process data exchange between the PLC and device functions (→ 🗎 39) or (→ 🗎 90).
10. Save all device data to the SD memory card (→ 🗎 183).

16998413/EN – 12/2016

13.3 Parameterizing the power section "PFA-..."

INFORMATION

To be able to replace the device quickly, save the device data to the SD memory card following successful startup (data management).

Parameterization of the power section "PFA-..." takes several process steps:

1. "Encoder startup" (→ 🗎 156)
2. "Startup the motor" (→ 🗎 169)
3. "Startup IPOSPLUS® application modules" (→ 🗎 173)

13.3.1 Encoder startup

Startup of the encoder takes several process steps:

1. "Commencing startup" (→ 🗎 159)
2. "Editing SEW-EURODRIVE encoders" (→ 🗎 162)
3. "Editing approved encoders" (→ 🗎 163)
4. "Specify encoder mounting" (→ 🗎 164)
5. "Specify translation ratio" (→ 🗎 164)
6. "Completing the encoder startup" (→ 🗎 168)

Enabled third-party encoder

Observe the following information when you execute and parameterize the third-party encoders approved by SEW-EURODIRVE.

SSI encoder

INFORMATION

The following applies for all parameterizable SSI encoders:

- The interface is parameterized to "SSI".
- 24 data bits are set. The 25th bit can either be "0" or an error bit.
- The coding is parameterized to "Gray".
- If the plausibility check is active, the plausibility is set to "Normal ".

Encoder	Condition
HEIDENHAIN ROQ 424 (AV1Y)	• The SSI version with 10 – 30 V is supported. • The type designation specifies all additional conditions.
TR-Electronic CE-58, CE-65, LE-100 SSI, LE-200, LA-41-K SSI	• 24 data bits are set. The signal bits are logically programmed to "0". The 25th bit can either be "0" or an error bit. Additional special bits are not evaluated after the position. The 25-bit version is not supported. • The output mode is set to "direct". • The interface is parameterized to "SSI".

16998413/EN – 12/2016

Encoder	Condition
SICK-STEGMANN AG 100 MSSI, AG 626, ATM90, ATM60	Only the 24-bit version is supported.
SICK-STEGMANN ARS 60	Only the 15-bit version is supported.
SICK DME5000-.11, DME4000-.11	• The interface is parameterized to "SSI". • 24 data bits and one error bit are set. • The resolution is parameterized to "0.1 mm" or "1 mm". • The plausibility is set to "Normal".
Pepperl+Fuchs WCS2A-LS311, WC- S3A-LS311	• The type designation specifies all necessary conditions. • The line length to the encoder is 10 m at maximum.
Pepperl+Fuchs EDM30/120/140-2347/2440	All modes are supported. SEW - EURODRIVE recommends mode 0 (DIP switches 3 and 4 in "ON" position) or mode 3 (DIP switches 3 and 4 in "OFF" position) and triple reflector measurement (DIP switch 2 in "OFF" position).
Pepperl+Fuchs VDM100-150	• The operating mode is set to "mode 3" in the start-up software of the encoder via the menu command [Menu] > [Parameter] > [Operating modes]. • The coding is parameterized to "Gray". • The resolution is parameterized to "0.1 mm" or "1 mm".
Leuze electronic AMS 200, OMS1, OMS2, BPS 37	• 24 data bits and one error bit are set. • The resolution is parameterized to "0.1 mm".

16998413/EN – 12/2016

CANopen encoder

Encoder	Condition
TR-Electronic CE-58 CANopen	• The termination switch is set to "ON". • The node ID is set to "1" via the 6- DIP switch. • The number of increments per revolution is programmed to the standard value, "4096".
TR-Electronic LE-200 CANopen	• A terminating resistor for bus termination is provided. • The node ID is set to "1" via the 8x DIP switch.
SICK DME4000-.19	• The interface is parameterized to "CANopen". • The node ID is set to "1". • The resolution is parameterized to "0.1 mm" or "1 mm". • The plausibility is set to "Normal."
Pepperl+Fuchs WCS3B-LS410	• The node ID is set to "1" via the 8x DIP switch 1–6. • The baud rate is set to "250 kBaud" via the 8x DIP switch 6–7. • The transmission mode is parameterized to "asynchronous 0 ms/10 ms" via the 4x DIP switch 1–3. • The data protocol is set to "data protocol 2" via the 4x DIP switch 4.

HIPERFACE® encoder

Encoder	Condition
SICK DME5000-.17, DME4000-.17	• The interface is parameterized to "HIPERFACE®". • The resolution is parameterized to "1 mm". • The plausibility is set to "Normal".

16998413/EN – 12/2016

Commencing startup

⚠ WARNING

Risk of crushing from uncontrolled start-up of the motor, if the start-up is aborted due to using an inadmissible version of the MOVITOOLS® MotionStudio engineering software.

Severe or fatal injuries.

- Always use MOVITOOLS® MotionStudio V6.20 version or later.

INFORMATION

There is no need to activate the factory settings.

If you call up a factory setting, the "PFA-..." power section parameters will be reset to the default values.

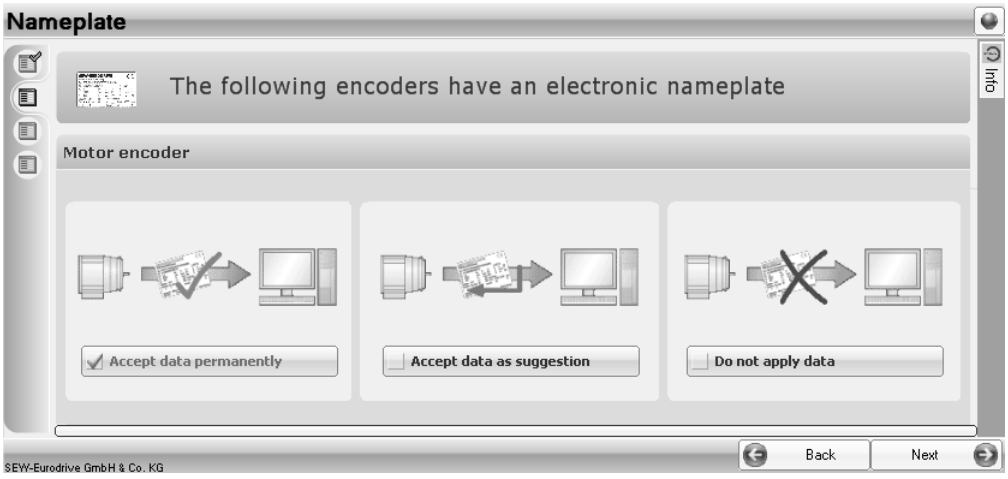
Proceed as follows:

- ✓ You have installed the MOVITOOLS® MotionStudio engineering software on the engineering PC, V6.20 or later.
- ✓ The drive can be run in order to be able to measure the translation ratio between the motor and encoder, e.g. by means of the "manual mode" plug-in.
- ✓ The following installations are correct and the application is executed accordingly: Wiring, terminal assignment, safety shutdowns

1. In the network view of MOVITOOLS® MotionStudio, select the Power section.
2. Choose the command [Startup] > [Startup] from the context menu.
   - ⇨ The startup assistant for encoder startup is displayed. Follow the instructions of the startup assistant. You can switch between the dialogs by using the [Back] and [Next] buttons.

18014401534132875

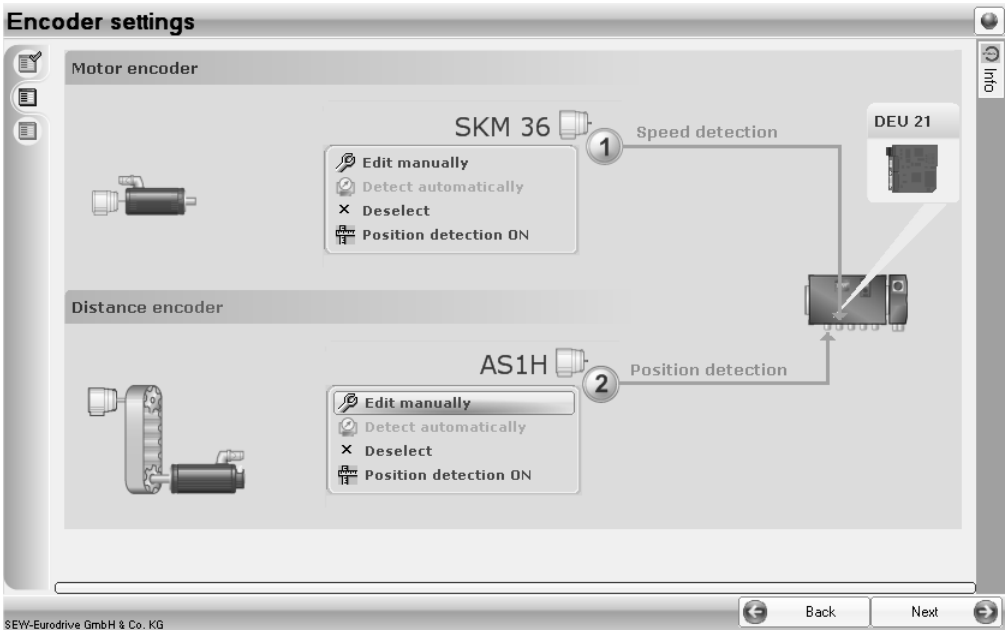
3. Startup the motor with the motor encoder.
4. If the drive is equipped with an electronic nameplate, you can transfer the read-off data.



9007201326602379

Setting	Description
Accept data permanently	Transfer of encoder data to the startup assistant. It is not possible to edit the encoder data.
Accept data as suggestion	Transfer of encoder data to the startup assistant. The encoder data can be manually edited.
Do not apply data	No transfer of encoder data to the startup assistant. All encoder data must be manually edited.

5. Select the settings for the motor encoder and – if applicable – for the distance encoder.



18570326923

16998413/EN – 12/2016

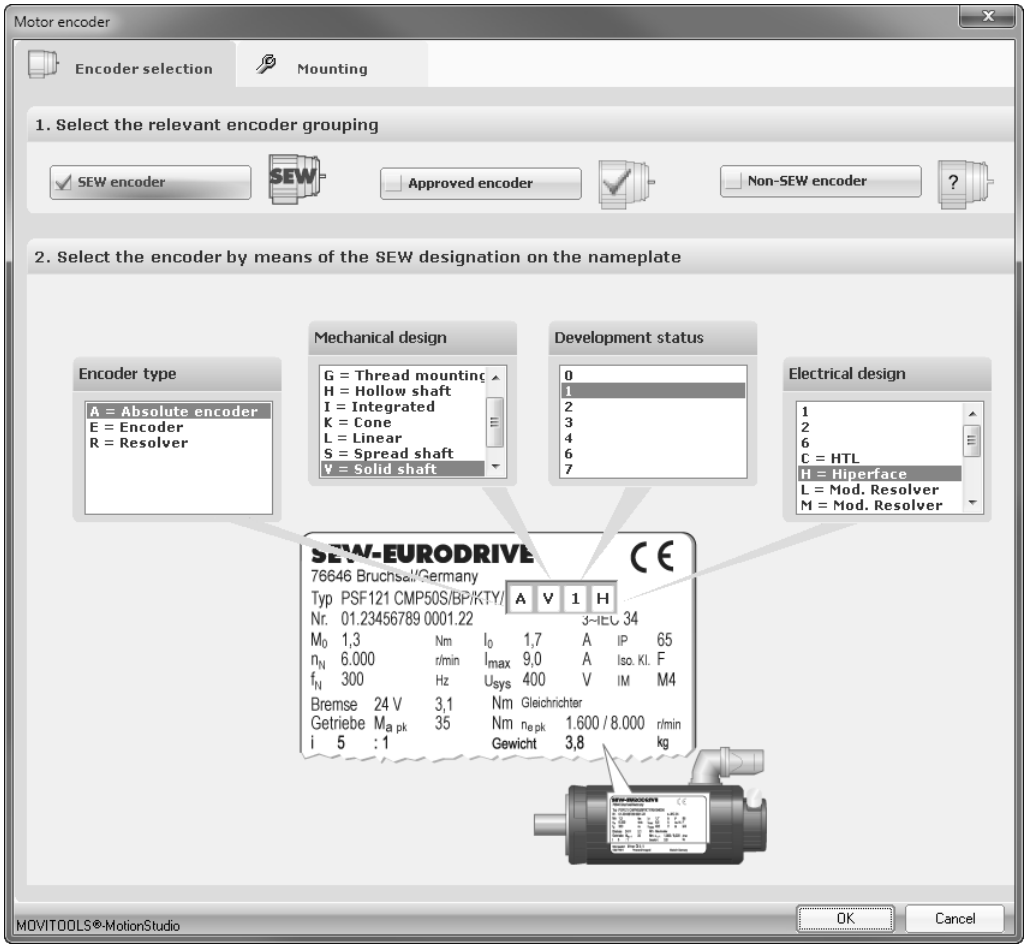
Setting	Description
Edit manually	Manual selection and configuration of the encoder.
Detect automatically	Read-out of the connected encoder. The following encoders from SEW-EURODRIVE can be read out only automatically: • E.7S • E..H • A.7W • A..H
Deselect/select	If there is no encoder connected or if the application does not require an encoder.
Position detection on/off	Specifies the source of the position controller.

16998413/EN – 12/2016

Editing SEW-EURODRIVE encoders

Proceed as follows:

1. Click on the encoder grouping [SEW encoders].
2. Enter the encoder designation in the respective fields according to the specification on the name plate.



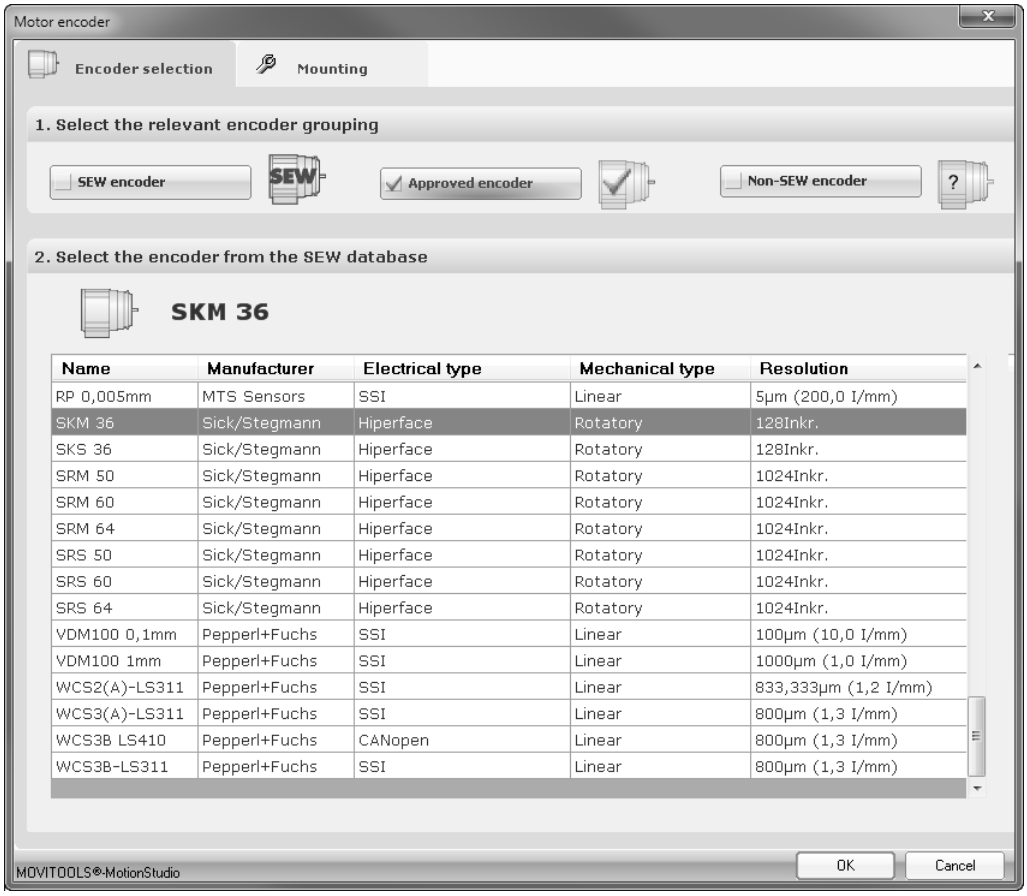
18014400452362891

Editing approved encoders

Certain third-party encoders are approved by SEW-EURODRIVE and can be operated (→ 🗎 156).

Proceed as follows:

1. Click on the encoder grouping [Approved encoders].
2. Select the encoder from the SEW-EURODRIVE database.

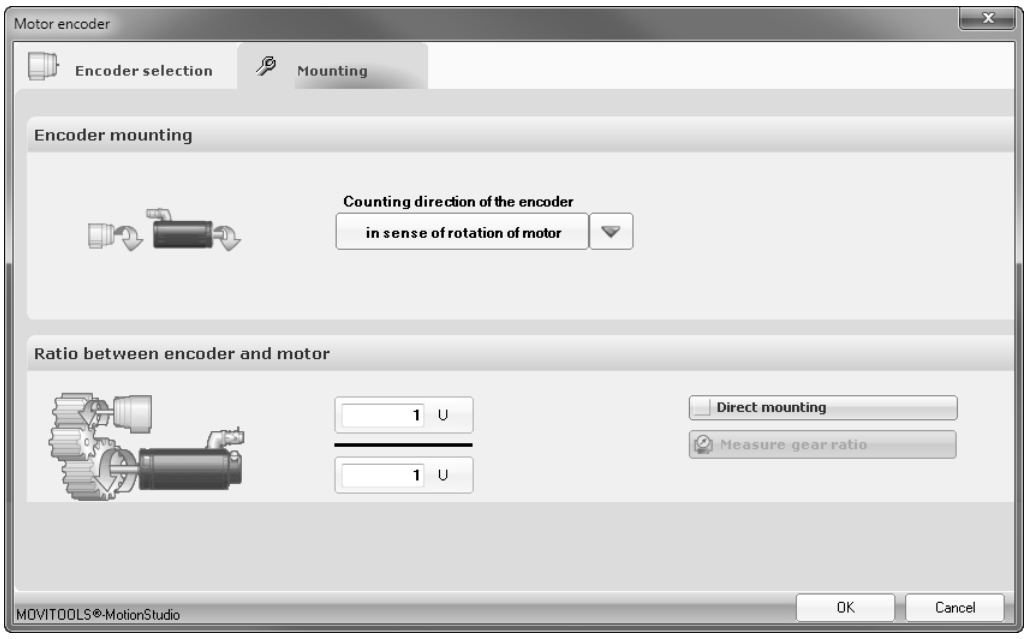


18014400452364811

Specify encoder mounting

Proceed as follows:

1. Go to the "Mounting" tab.
2. Select the counting direction of the encoder.



18565989515

Specify translation ratio

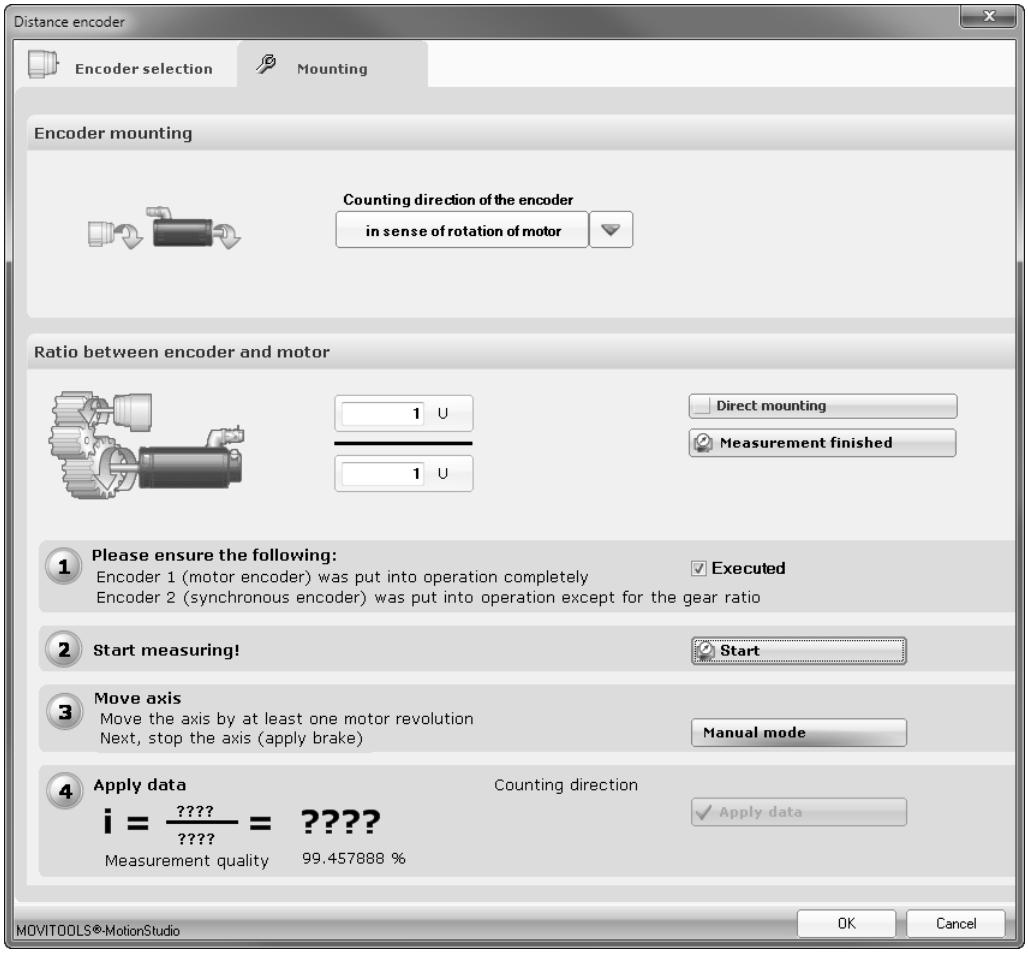
Proceed as follows:

1. If you know the translation ratio between the encoder and motor, enter it in the corresponding edit boxes.
2. If you do not know the translation ratio between the encoder and motor, click on the button [measure gear ratio].

INFORMATION

A successful installation of the entire application is prerequisite for measurement of the translation ratio with the MOVITOOLS® MotionStudio engineering software.

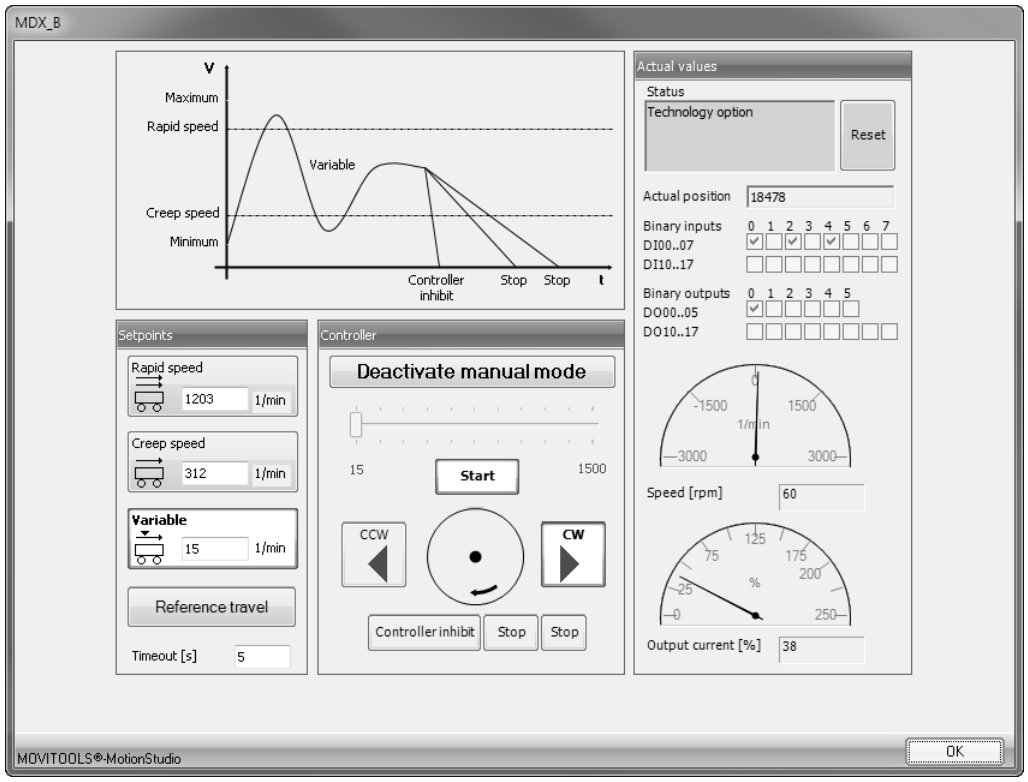
16998413/EN – 12/2016



18014401537145739

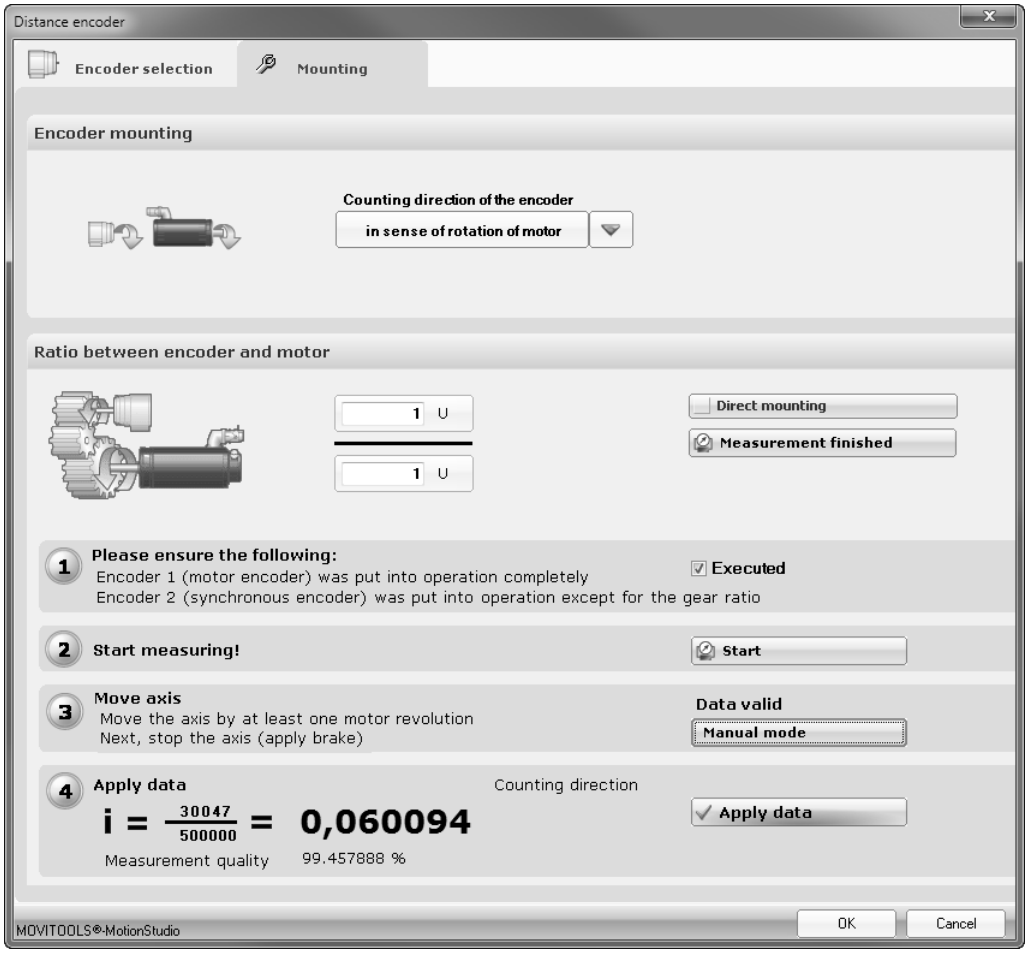
3. Carry out the steps 1 – 4.

4. Move the axis by at least one motor revolution in manual mode.



18014401537232907

⇨ The ascertained data is shown under 4, and its validity under 3.



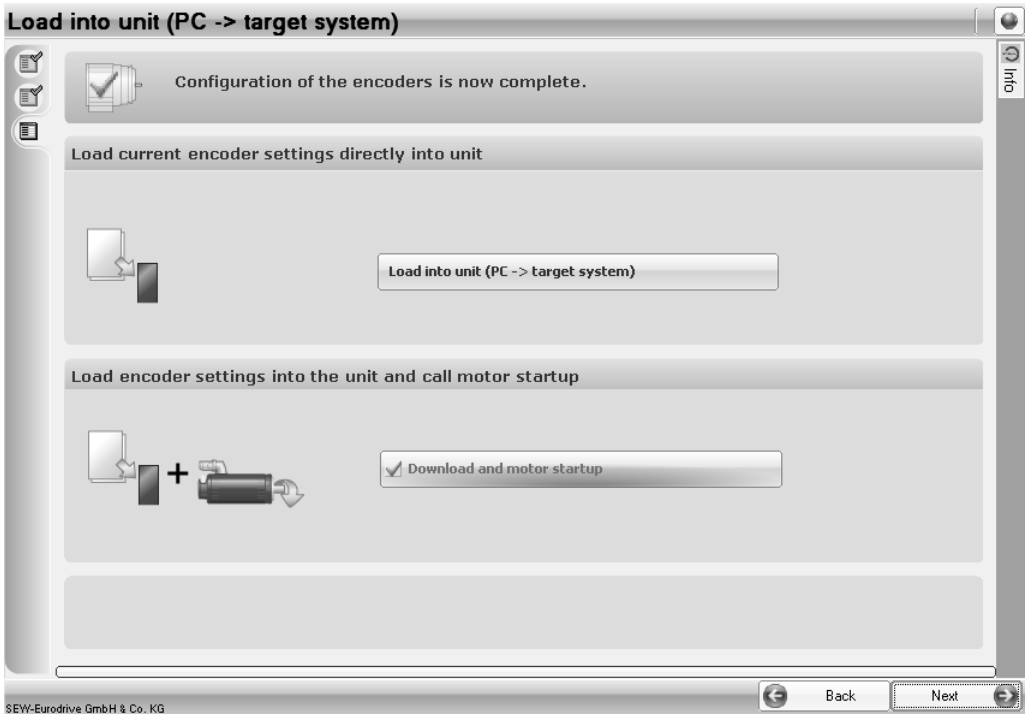
18014401537379851

5. If the data is valid, stop the drive, exit manual mode and accept the data.
   ⇨ The ascertained data is entered as ratio value.

Completing the encoder startup

Proceed as follows:

- Complete the encoder startup.



9007201326595083

Setting	Description
Load into the device (PC → target system)	Transfers the encoder data to the device.
Download and motor startup	Transfers the encoder data to the device and starts the motor startup.

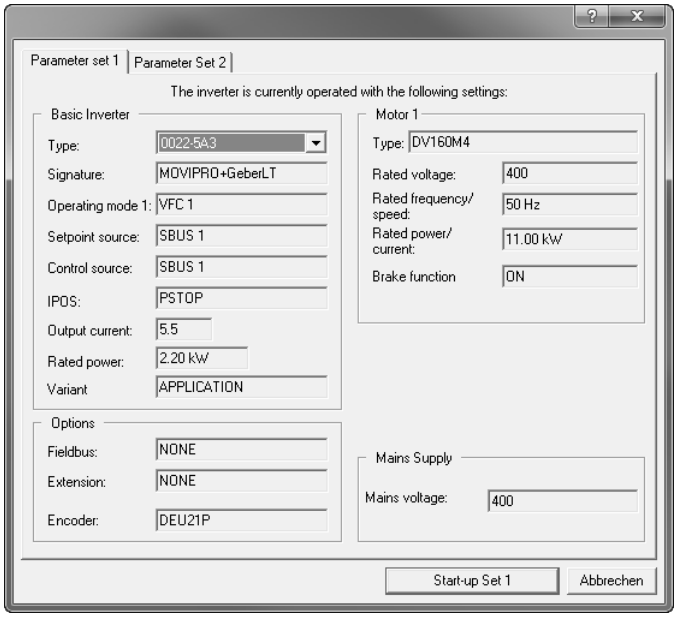
16998413/EN – 12/2016

13.3.2 Startup the motor

Proceed as follows:

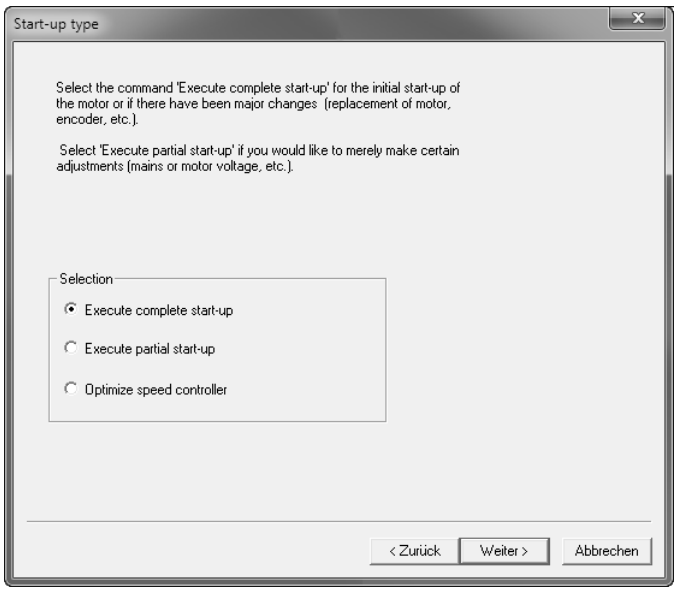
✓ The encoder startup is performed (→ 🗎 159).

1. Select the setting [Download and motor startup] in the startup assistant for encoder startup.
   ⇨ The startup assistant for motor startup is displayed. Follow the instructions of the startup assistant. You can switch between the dialogs by using the [Back] and [Next] buttons.
2. Select the parameter set with which you want to perform the startup.



27021599836096523

3. Select the type of startup:



18587719307

16998413/EN – 12/2016

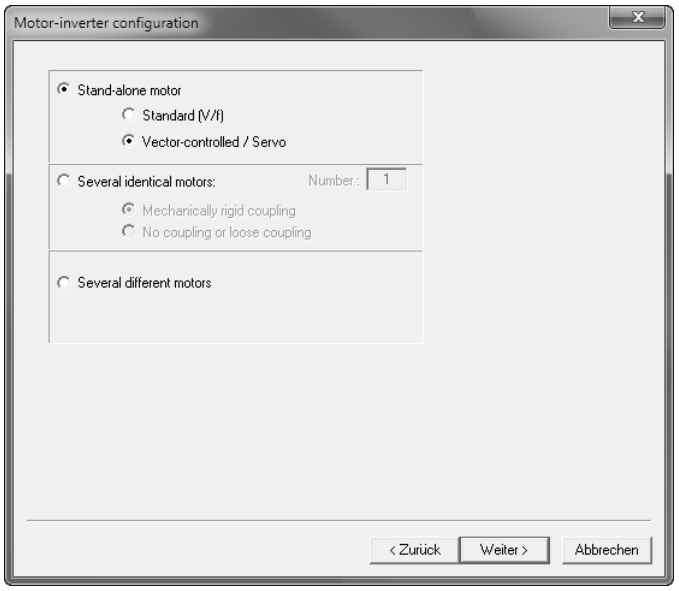
Setting	Description
Perform complete startup (→ 🗎 170)	If the following situation exists: • Initial startup of the motor • Performance of extensive changes (e.g. motor or encoder change)
Perform partial startup (→ 🗎 173)	When startup settings of the motor values (e.g. supply or motor voltage) or download values of the drive parameters are modified.
Optimizing a speed controller (→ 🗎 173)	When speed controller already in operation is optimized by changing the download values of the drive parameters.

Perform complete startup

Perform a complete startup to make all the necessary settings for operation of the drive.

Proceed as follows:

1. Select a motor configuration.



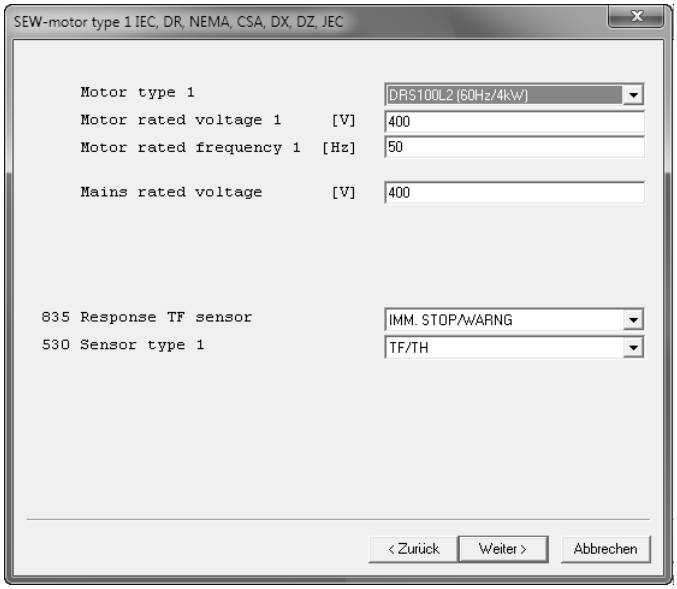
9007201326609675

Setting	Description
Single motor	The device controls a single motor. • The optimal operating mode for operating motors from SEW-EURODRIVE is "vector controlled/ servo". • If operation of a non-SEW motor with vector control does not achieve a satisfactory result, you can select the operating mode "Standard (V/f)".
Several identical motors	The device controls several motors of the same power rating. Select whether: • the motors are mechanically rigid • the motors are not/are loosely coupled

16998413/EN – 12/2016

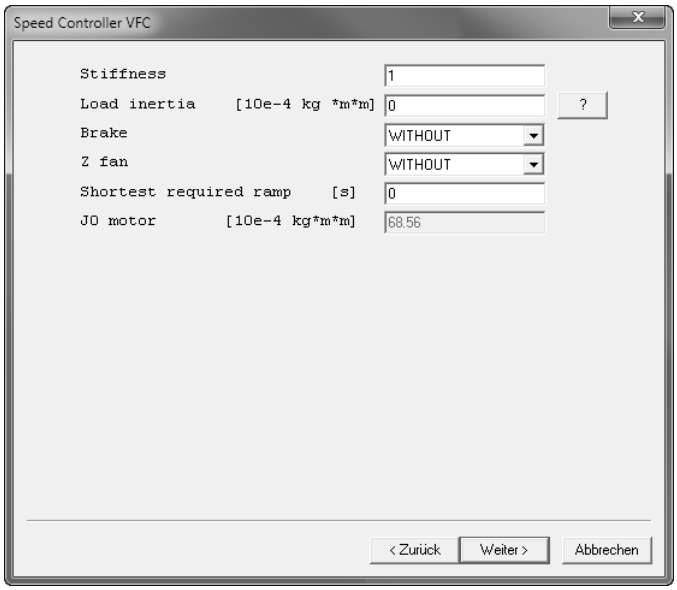
Setting	Description
Several different motors	The device controls several motors with different power rating.

2. Verify the displayed data of the motor encoder, if available.
3. Select the motor type and specify the motor values.



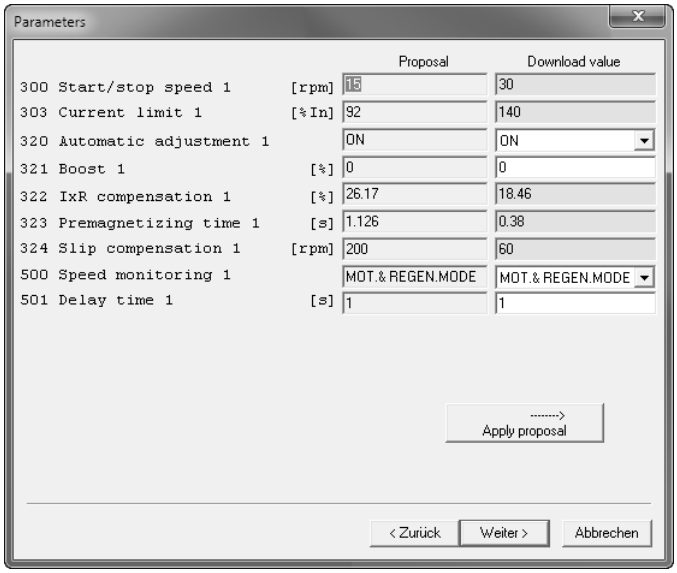
9007201326631563

4. Indicate whether you would like to use the encoder.
5. Select the operating mode of the drive:
   - ⇨ Startup as a hoist is not possible in "CFC" operating mode. The parameters required in order to use the drive as a vertical drive are set in the "Vertical drive" operating mode.
   - ⇨ To use an IPOS$^{PLUS®}$ application module, select the "Positioning with IPOS" operating mode.
6. Select the control mode of the drive and specify the values of the speed controller.



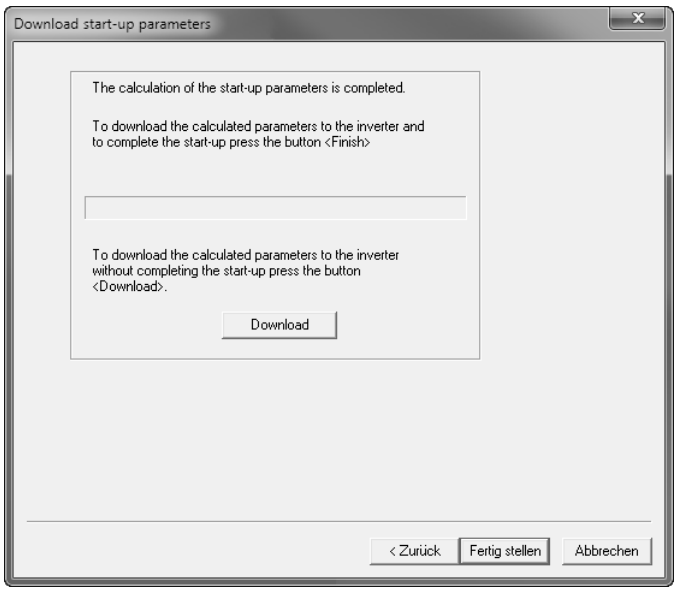
18589438603

7. Enter the download values of the drive parameters. Download values deviating from the suggested values are highlighted in yellow. To accept all suggested download values, click on the button [Apply proposal].



18589443723

8. Save the startup parameters.



9007201326616971

Setting	Description
Download	Transfers the startup parameters to the device.
Finish	Transfers the startup parameters to the device and exits the startup.

16998413/EN – 12/2016

Carrying out partial startup

During a partial startup, you specify the following settings:

- Nominal motor voltage
- Rated motor frequency
- Rated line voltage
- Error response
- Temperature sensor type
- Download values of the drive parameters

Optimizing a speed controller

During an optimization of the speed controller, you change the download values of the drive parameters.

13.3.3 Startup IPOS$^{PLUS®}$ application modules

The following application modules are available for the power section "PFA-...":

- Bus positioning
- Extended positioning via bus
- Modulo positioning
- Automotive AMA0801

INFORMATION

In MOVIPRO® ADC, the IPOS$^{PLUS®}$ application modules can only be used if a simple gateway program is installed (delivery state) in the communication and control unit "PFH-...," or the "Transparent 6PD" CCU application module is parameterized. In these cases, the process input and process output data is forwarded from the communication and control unit to the power section "PFA-..." unmodified.

Information on how to operate the application modules is contained in separate manuals. They can be downloaded in PDF format from the SEW-EURODRIVE website → **www.sew-eurodrive.com**.

The following manuals include startup of the IPOS$^{PLUS®}$ application modules:

- MOVIDRIVE® drive inverter bus positioning
- MOVIDRIVE® MDX61B application "Extended positioning via bus"
- MOVIDRIVE® MDX60B / 61B application "Modulo positioning"
- MOVIDRIVE® MDX61B and MOVIPRO® SDC/ADC application module "Automotive AMA0801"

16998413/EN – 12/2016

13.4 Parameterizing the communication and control unit "PFH-..."

INFORMATION

To be able to replace the device quickly, save the device data to the SD memory card following successful startup (data management).

13.4.1 Factory installed gateway program

In order to simplify the startup, MOVIPRO® ADC is delivered with a preinstalled gateway program. This allows MOVIPRO® ADC to be operated after startup of the encoder/motor, the IPOS$^{PLUS®}$ application modules that are used and the fieldbus. Additional parameterizations with the Application Configurator controller software are not required in this case.

If you would like to use special MOVIPRO® ADC features such as CCU application modules, R15 regenerative power supply or external slaves, however, you must carry out a CCU startup in the Application Configurator controller software.

13.4.2 MOVIPRO® ADC as parameterizable device (CCU)

You can parameterize MOVIPRO® ADC with the Application Configurator controller software. The Application Configurator is part of the MOVITOOLS® MotionStudio engineering software.

Start application configurator

⚠ WARNING

Risk of crushing from uncontrolled start-up of the motor, if the start-up is aborted due to using an inadmissible version of the MOVITOOLS® MotionStudio engineering software.

Severe or fatal injuries.

- Always use MOVITOOLS® MotionStudio V6.20 version or later.

Proceed as follows:

✓ You have installed the MOVITOOLS® MotionStudio engineering software on the engineering PC, V6.20 or later.

16998413/EN – 12/2016

1. In the network view of MOVITOOLS® MotionStudio, select the communication and control unit.
2. Select the [Application modules] > [Application Configurator] menu command in the context menu.

   ⇨ The Application Configurator is displayed.

9007202822997131

No.	Description
[1]	Click this button to open the configuration interface in order to create a new configuration and transfer it to the SD memory card of the device.
[2]	This symbol shows the version of the Application Configurator as a tooltip when moving the mouse over it .
[3]	Use this icon to open the "Settings" window. In this window, you specify responses that are triggered after certain actions in the Application Configurator (e.g. how the configuration is loaded).
[4]	The communication status is displayed here: • **Online**: The communication to the device has been established successfully (green tick). • **Offline**: The communication to the device has failed (red X). **NOTICE!** Successful communication with the device requires the connection mode in MOVITOOLS® MotionStudio being set to "online".
[5]	Use this button to load a configuration from the SD memory card of the device in order to edit it in the Application Configurator. **NOTICE!** This function is not available during initial startup.

No.	Description
[6]	Use this button to load an existing configuration from a file `*.AppConfig.zip`.
[7]	Click this button to open the diagnostics interface with the following functions: • **Overview**: Status of the device and module diagnostics • **PD-Monitor**: Process data monitor • **Trace**: Recording of variables • **Advanced diagnostics**: Current state of important data structures

Creating a new configuration

Proceed as follows:

1. In the Application Configurator, click [Create new configuration].
   ⇨ The configuration interface is displayed.

9007202824762635

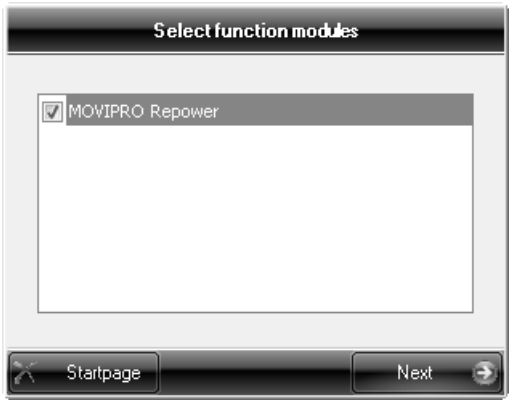
No.	Description
[1]	The device type is displayed here.

16998413/EN – 12/2016

No.	Description
[2]	The toolbar contains the icons for the following tasks: • Add single axis • Add multi-axis applications (not available for MOVIPRO® ADC) • Delete axes • Select axis-/device-independent functions (e.g. brake test) • Start simulation (all axes/no axis) • Save complete configuration (all axes)
[3]	In this drop-down list, you select how the process data of the devices is arranged: • **Automatically**: The devices are addressed sequentially. • **Manually**: You can address the devices manually, thus providing for gaps in the addressing. SEW-EURODRIVE recommends using this setting only with corresponding experience with addressing process data.
[4]	This axes section displays the added axes in individual lines.
[5]	This section displays the used/free process data words.
[6]	With the buttons in the footer, you can scroll back and forth between the individual program interfaces or switch to the start page.

2. If you are starting up a MOVIPRO® ADC with R15 regenerative power supply, click on the button [Function]. Otherwise, skip this step.

   ⇨ The following window is displayed.



18599188107

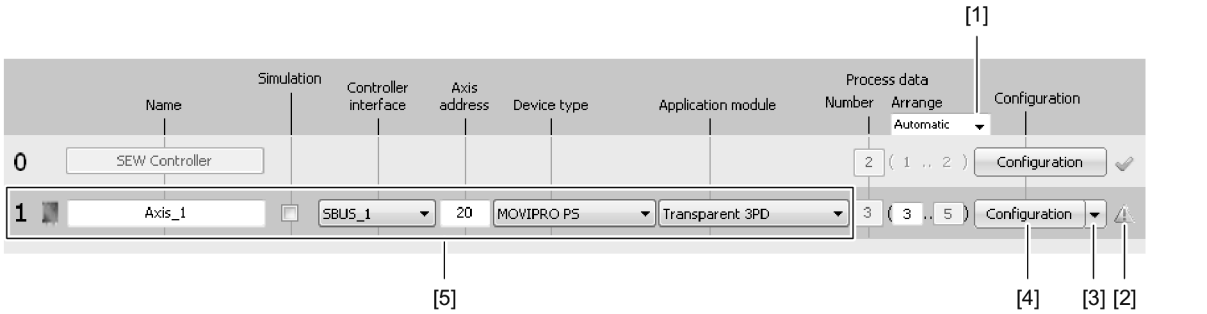
3. Activate the "MOVIPRO Repower" check box and confirm with the [Next] button.

Insert and configure axes

Only single-axis modules can be inserted for MOVIPRO® ADC.

Proceed as follows:

1. Create a new configuration (→ 🗎 176).
2. Click the [Single axis] icon in the configuration interface.
   ⇨ A new line is displayed in the axis area.



9007202834566923

3. In section [5], specify the settings for the axis according to your requirements:
   ⇨ Enter an axis name.
   ⇨ Activate the "Simulation" checkbox" if the axis is physically not available yet but you intend to perform diagnostics later nonetheless.
   ⇨ Select the "SBUS_1" interface. The communication and control unit is connected with the axis via this interface.
   ⇨ Enter the same axis address as at the device. For MOVIPRO® ADC, the axis address of the power section "PFA-..." is 20.
   ⇨ Select "MOVIPRO LT" as the device type.
   ⇨ Select the required CCU application module with the suitable profile.
4. Click the button [4] to configure the axis.
   ⇨ A wizard for setting the selected CCU application module is displayed. Some CCU application modules do not require the user to perform any settings as the wizard assigns default values to the required parameters.
5. Follow the instructions of the wizard.
   ⇨ Once you have configured an axis, the yellow warning symbol [2] turns into a green check. If required, you can undo the axis configuration by selecting "Resetting the configuration" from the drop-down menu [3].
6. Insert additional axes as required and repeat the steps in order to specify the axis settings and to configure the axis.

⇨ The used process data words are displayed for each axis and are arranged in sequential order.

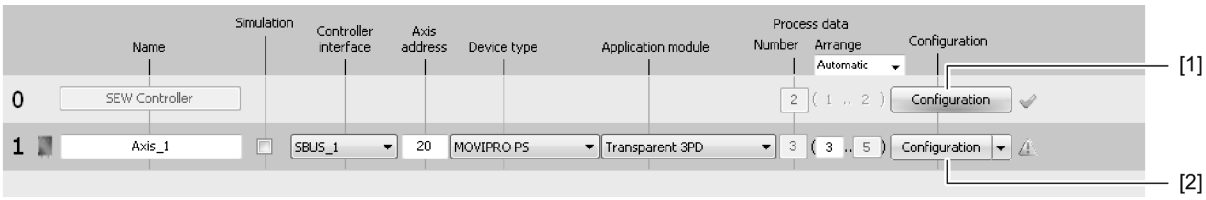
16998413/EN – 12/2016

Advanced configuration settings

For some CCU application modules, there are special settings, e.g. the interval of the toggle bit for the SEW controller (line 0).

Proceed as follows:

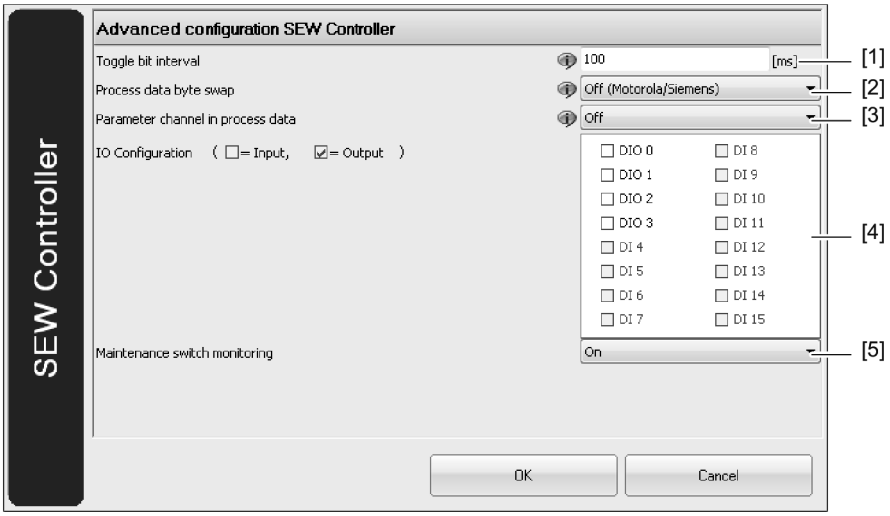
1. Open the configuration interface (→ 🗎 176).
2. If you would like to change the settings for a certain CCU application module, click on [2] at the end of the line for the associated axis.



18798219915

3. Specify the desired Settings and confirm with [Continue].
4. If you would like to change the settings for the entire process data range (all axes), click on [1] in the axis area at the end of line 0 (SEW controller).

   ⇨ The following window is displayed.



18810225931

No.	Description
[1]	Enter the toggle bit interval in ms in this edit box.
[2]	Select the byte swap of the process data from the fieldbus in this drop-down list: • **Off**: Big-Endian (Motorola processors, such as in controllers by Siemens) • **On**: Little-Endian (Intel processors, such as in controllers by Rockwell)
[3]	In this drop-down list, you activate the MOVILINK® parameter channel: • **On**: The MOVILINK® parameter channel is activated. • **Off**: The MOVILINK® parameter channel is deactivated. The MOVILINK® parameter channel enables bus-independent access to all device parameters. Special services are available in this parameter channel to be able to read different parameter information. For detailed information, refer to the "Application Configurator for CCU" manual

No.	Description
[4]	In this area, you specify the assignment of the binary input and output terminals of the device.
[5]	This setting is only for devices with maintenance switch monitoring. This section displays the used/free process data words.

5. Confirm the settings with [OK].

Load configuration into the device

⚠ WARNING

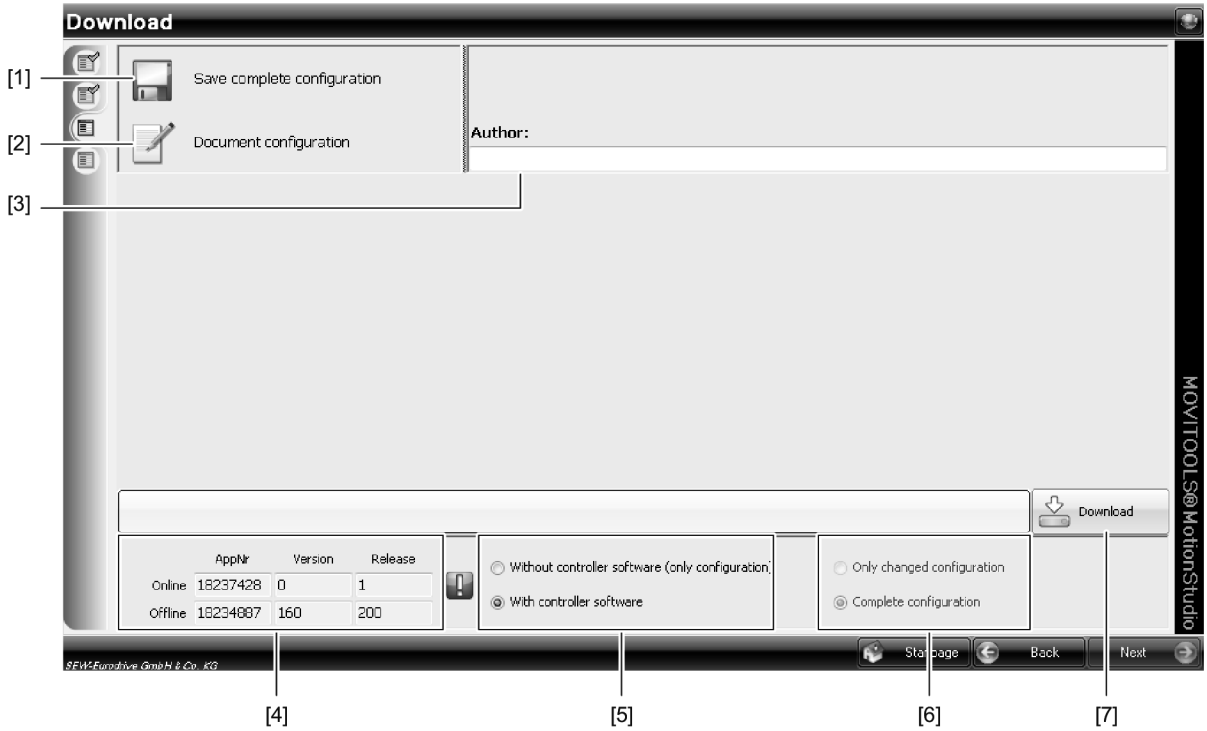
Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the motor and all connected options from the power supply before you start working.
- Secure the motor against unintended power-up.

Proceed as follows:

1. Configure the axes (→ 🗎 178).
2. Click on the [Continue] button in the configuration interface.
   ⇨ The download interface is displayed.



18696433291

No.	Description
[1]	Use this button the save the configuration to a configuration file `*.AppConfig.zip` on your PC. This way, you do not have to enter the values again for future startups with the same configuration.
[2]	Use this button to create a PDF file with a configuration report.

16998413/EN – 12/2016

No.	Description
[3]	If you enter a name in this edit box, it will be listed in the report.
[4]	This group displays the following information on the CCU application module that is installed offline on your PC and online on the device: • Part number • Design • Release
[5]	Use the radio buttons to choose if you want to download the configuration with or without controller software.
[6]	Use these radio buttons to choose if you want to load the modified or complete configuration to the SD memory card of the device.
[7]	Load the configuration onto the SD memory card of the device with this button.

3. Compare the online and offline data of the CCU application module to each other in group [4]. If the data deviate from each other, load them from your PC to the device.
4. In the group [5], select the "Download with controller software" radio button.
   ⇨ The Application Configurator replaces the previous controller software with the new controller software upon downloading (software update).
   ⇨ The software update can take several minutes. In order to shorten the process, use the local engineering interface (Ethernet or USB).
5. Click the button [7].
   ⇨ The configuration data of all axes is transferred to the SD memory card of the device.
   ⇨ The device is restarted to process the new configuration data after the download.
   ⇨ The initial screen is displayed if the download and the device restart have been successful.

For detailed information, refer to the "Application Configurator for CCU" manual.

13.4.3 MOVIPRO® ADC as programmable device (MOVI-PLC®)

INFORMATION

Only one MOVIPRO® ADC with an SD memory card OMH_T. can be freely programmed.

SEW-EURODRIVE provides libraries for the freely programmable MOVIPRO® ADC:

- PFH_P1D1_1_A (PROFIBUS, DeviceNet™)
- PFH_E2E3_1_A (PROFINET, EtherNet/IP™, Modbus/TCP)

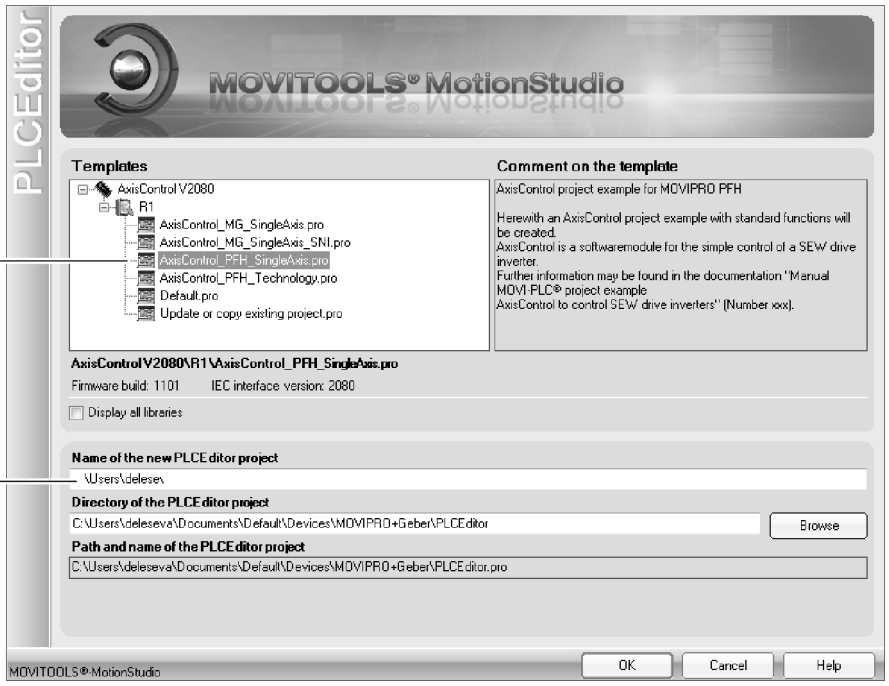
INFORMATION

You find the latest versions of the libraries at the SEW website → **www.sew-eurodrive.com** via "Online support" > "Data & documents" > "Software."

Create an IEC Project

Proceed as follows:

1. In the network view of MOVITOOLS® MotionStudio, select the communication and control unit "PFH-...".
2. In the context menu, select the [Programming] >[Create new PLC Editor project] menu command.
   ⇨ The following window is displayed.



9007202821710731

3. Select a project template for controlling the internal power section "PFA-...".
   ⇨ In this example, the project template "Axis_Control_MOVIPRO_PFA_SingleAxis.pro" [1] is selected.
4. Assign a project name [2] and click [OK] to confirm.
5. Write your IEC program and then load it into the device.

For further information, refer to the following manuals:

- MOVI-PLC® Programming with the PLC Editor
- MOVI-PLC® AxisControl Sample Project

16998413/EN – 12/2016

13.5 Storing device data

The device allows for a quick device replacement. It is equipped with a replaceable SD memory card on which all device data can be stored. If the device has to be replaced, the plant can be started up again quickly by simply exchanging the SD memory card.

INFORMATION

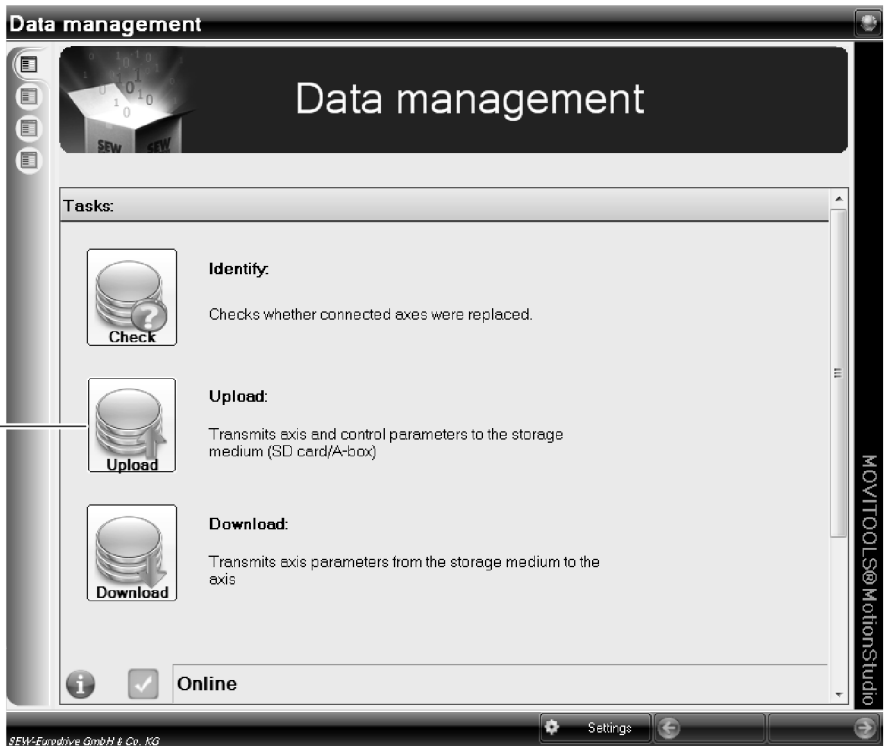
To be able to replace the device quickly, save the device data to the SD memory card following successful startup (data management).

INFORMATION

Various parameters change during a reference movement. Carry out a data backup after a reference movement so that all device data on the SD memory card is current.

Proceed as follows:

1. In the network view of MOVITOOLS® MotionStudio, select the communication and control unit.
2. Choose the menu command [Startup] > [Data management] from the context menu.
   ⇨ Data management is displayed.



[1]

18811709451

3. Click on the symbol [1].
   ⇨ The following window is displayed.

9007204387282699

5132541707

No.	Description
[1]	Enabling this check box permits data backup via PLC.
[2]	Enabling this check box ensures that the data is backed up automatically when a device replacement is detected. If the check box is not activated during upload, the data can only be restored manually via "Download".
[3]	Load the data onto the SD memory card with this button.
[4]	With this check box, you ensure that the data of the power section "PFA-..." is automatically uploaded to the SD memory card after a certain period of time, and thereby backed up.

4. To carry out the data backup to the SD memory card, click on the button [3].

16998413/EN – 12/2016

13.6 "PFA-..." power section parameter overview

The following table shows an overview of all parameters:

- Factory setting values are in bold.
- Numerical values are displayed with the complete setting range.

0.. Display values		
00. Process values		
No.	**Name**	**Range/factory setting**
000	Speed	–
001	User display	–
002	Frequency	–
003	Actual position	0 – ± (2^{31}-1) Increments
004	Output current	0 – 200% I_N
005	Active current	0 – 200% I_N
006/007	Motor utilization 1/2	0 – 200%
008	DC link voltage	–
009	Output current	–

0.. Display values		
01. Status displays		
No.	**Name**	**Range/factory setting**
010	Inverter status	–
011	Operating status	–
012	Error status	–
013	Current parameter set	–
014	Cooling air temperature	-40 – 125°C
015	Operating hours	–
016	Enable hours	–
017	Work	–
018/019	KTY utilization 1/2	–

0.. Display values		
02. Analog setpoints		
No.	**Name**	**Range/factory setting**
020	Analog input AI1	-10 – +10 V

0.. Display values		
03. Digital inputs of basic device		
No.	**Name**	**Range/factory setting**
030	Digital input DI00	–
032 – 035	Digital inputs DI02 – DI05	–

0.. Display values		
05. Digital outputs basic device		
No.	**Name**	**Range/factory setting**
050	Digital output DB00	–

0.. Display values		
07. Device data		
No.	**Name**	**Range/factory setting**
070	Device type	–
071	Nominal output current	–
072	Encoder slot option/firmware	–
076	Basic device firmware	–
078	Technology function	–
079	Device variant	–

16998413/EN – 12/2016

0.. Display values		
08. Fault memory		
No.	**Name**[1)]	**Range/factory setting**
080 – 084	Error t-0 – t-4	–
094 – 096	PO1 – PO3 setpoint	–
097 – 099	PI1 – PI3 actual value	–

1) PI = process input data word, PO = process output data word

1.. Setpoints / ramp generators		
13./14. Speed ramps 1/2		
No.	**Name**	**Range/factory setting**
130/140	Ramp t11/t21 up CW	0 – **2** – 2000 s
131/141	Ramp t11/t21 down CW	0 – **2** – 2000 s
132/142	Ramp t11/t21 up CCW	0 – **2** – 2000 s
133/143	Ramp t11/t21 down CCW	0 – **2** – 2000 s
134/144	Ramp t12/122 up = down	0 – **10** – 2000 s
135/145	S pattern t12/t22	**0** – 3
136/146	Stop ramp t13/t23	0 – **2** –20 s
137/147	Emergency stop ramp t14/24	0 – **2** –20 s
139/149	Ramp monitoring 1/2	**Off**

1.. Setpoints / ramp generators		
16./17. Fixed setpoints 1/2		
No.	**Name**	**Range/factory setting**
160/170	Internal setpoint n11/n21	-6000 – **150** – +6000 min^{-1}
161/171	Internal setpoint n12/n22	-6000 – **750** – +6000 min^{-1}
162/172	Internal setpoint n13/n23	-6000 – **1500** – +6000 min^{-1}

2.. Controller parameters		
20. Speed control		
No.	**Name**	**Range/factory setting**
200	P gain n-controller	0.01 – **2** – 32
201	Time constant n-controller	0 – **10** – 3000 ms
202	Amplification acceleration precontrol	**0** – 65
203	Filter acceleration precontrol	**0** – 100 ms
204	Filter speed actual value	**0** – 32 ms
205	Load precontrol CFC	-150 – **0** – +150 %
206	Sampling cycle n-controller	**1.0 ms**/0.5 ms
207	Load precontrol VFC	-150 – **0** – +150%

2.. Controller parameters		
21. Hold controller		
No.	**Name**	**Range/factory setting**
210	P gain hold controller	0.1 – **0.5** – 32

3.. Motor parameters		
30./31. Limits 1/2		
No.	**Name**	**Range/factory setting**
300/310	Start/stop speed 1 / 2	0 – 150 min^{-1}
301/311	Minimum speed 1 / 2	0 – **15** – 6100 min^{-1}
302/312	Maximum speed 1 / 2	0 – **1500** – 6100 min^{-1}
303/313	Current limit 1/2	0 – 150% I_N(Motor)
304	Torque limit	**0** – 150%

3.. Motor parameters		
32./33. Motor adjustment 1/2		
No.	**Name**	**Range/factory setting**
320/330	Automatic adjustment 1/2	**On**
321/331	Boost 1/2	**0** – 100%

16998413/EN – 12/2016

3.. Motor parameters		
32./33. Motor adjustment 1/2		
No.	**Name**	**Range/factory setting**
322/332	IxR adjustment 1/2	**0** – 100%
323/333	Premagnetization time 1/2	0 – 2 s
324/334	Slip compensation 1/2	0 – 500 min^{-1}

3.. Motor parameters		
34. Motor protection		
No.	**Name**	**Range/factory setting**
340/342	Motor protection 1/2	**Off**
341/343	Cooling type 1/2	**Fan cooled**
344	Motor protection interval	0.1 – **4** – 20 s
345/346	I_N-U_L monitoring 1/2	0.1 – 500 A

3.. Motor parameters		
35. Direction of motor rotation		
No.	**Name**	**Range/factory setting**
350/351	Direction of rotation reversal 1/2	**Off**

5.. Monitoring functions		
50. Speed monitoring		
No.	**Name**	**Range/factory setting**
500/502	Speed monitoring 1/2	**Motor/regenerative**
501/503	Delay time 1/2	0 – **1** – 10 s
504	Encoder monitoring motor	**Off**
505	Distance encoder monitoring	**Off**

5.. Monitoring functions		
52. Mains OFF monitoring		
No.	**Name**	**Range/factory setting**
520	Mains OFF response time	**0** – 5 s
521	Mains OFF response	**Controller inhibit**
522	Phase failure monitoring	**On**

5.. Monitoring functions		
53. Motor temperature protection		
No.	**Name**	**Range/factory setting**
530	Sensor type 1	**No sensor**
531	Sensor type 2	**No sensor**

5.. Monitoring functions		
54. Gear unit/motor monitoring		
No.	**Name**	**Range/factory setting**
540	Response to vibration/warning	**Display error**
541	Response to vibration/error	**Rapid stop/Warning**
542	Response to oil aging/warning	**Display error**
543	Response to oil aging/error	**Display error**
544	Response oil aging/over-temperature	**Display error**
545	Response oil aging/ready signal	**Display error**
549	Response to brake wear	**Display error**

5.. Monitoring functions		
56. Ex-e motor current limitation		
No.	**Name**	**Range/factory setting**
560	Ex-e motor current limit	**Off**
561	Frequency A	0 – **5** – 60 Hz
562	Current limit A	0 – **50** – 150%
563	Frequency B	0 – **10** – 104 Hz
564	Current limit B	0 – **80** – 200%

16998413/EN – 12/2016

5.. Monitoring functions		
56. Ex-e motor current limitation		
No.	**Name**	**Range/factory setting**
565	Frequency C	0 – **25** – 104 Hz
566	Current limit C	0 – **100** – 200%

6.. Terminal assignment		
60. Digital inputs of basic device		
No.	**Name**	**Range/factory setting**
601	Digital input DI02	**No function**
602	Digital input DI03	**No function**
603	Digital input DI04	**No function**
604	Digital input DI05	**No function**

7.. Control functions		
70. Operating modes		
No.	**Name**	**Range/factory setting**
700/701	Operating mode 1/2	**VFC**
702	Motor category	**Rotatory**

7.. Control functions		
71. Standstill current		
No.	**Name**	**Range/factory setting**
710/711	Standstill current 1/2	**0** – 50% I_N (Motor)

7.. Control functions		
72. Setpoint stop function		
No.	**Name**	**Range/factory setting**
720/723	Setpoint stop function 1/2	**Off**
721/724	Stop setpoint 1/2	0 – **30** – 500 min^{-1}
722/725	Start offset 1/2	0 – **30** – 500 min^{-1}

7.. Control functions		
73. Brake function		
No.	**Name**	**Range/factory setting**
730/733	Brake function 1/2	**On**
731/734	Brake release time 1/2	0 – 2 s
732/735	Brake application time 1/2	0 – 2 s

7.. Control functions		
74. Speed skip function		
No.	**Name**	**Range/factory setting**
740/742	Skip window center 1/2	0 – **1500** – 6000 min^{-1}
741/743	Skip width 1/2	**0** – 300 min^{-1}

7.. Control functions		
77. Energy-saving function		
No.	**Name**	**Range/factory setting**
770	Energy-saving function	**Off**

8.. Device functions		
80. Setup		
No.	**Name**	**Range/factory setting**
802	Factory setting	**No**
803	Parameter lock	**Off**
804	Reset of statistic data	**No action**

8.. Device functions		
82. Braking operation		
No.	**Name**	**Range/factory setting**
820/821	4-quadrant operation 1/2	**On**

16998413/EN – 12/2016

8.. Device functions		
83. Error responses		
No.	**Name**	**Range/factory setting**
830	Response to "external error"	**Emergency stop/malfunction**
832	Response to "motor overload"	**Emergency stop/malfunction**
834	Response to "lag error"	Emergency stop/malfunction
835	Response to "TF signal"	**No response**
836	Response to "timeout SBus 1"	**Emergency stop/malfunction**
838	Response to "SW limit switch"	**Emergency stop/malfunction**
839	Response to 'positioning interruption'	**No response**

8.. Device functions		
84. Reset behavior		
No.	**Name**	**Range/factory setting**
840	Manual reset	**No**
841	Auto reset	**No**
842	Restart time	1 – **3** – 30 s

8.. Device functions		
85. Scaling actual speed value		
No.	**Name**	**Range/factory setting**
850	Scaling factor numerator	**1** – 65535
851	Scaling factor denominator	**1** – 65535
852	User unit	**1/min**

8.. Device functions		
86. Modulation		
No.	**Name**	**Range/factory setting**
860/861	PWM frequency 1/2	**4**/8/12/16 kHz
862/863	PWM fix 1/2	**Off**
864	PWM frequency CFC	**4**/8/16 kHz

8.. Device functions		
87. Process data description		
No.	**Name**	**Range/factory setting**
870	Setpoint description PO1	**Control word 1**
872	Setpoint description PO2	**Setpoint speed**
872	Setpoint description PO3	**Ramp**
873	Actual value description PI1	**Status word 1**
874	Actual value description PI2	**Actual speed**
875	Actual value description PI3	**Output current**
876	PO data enable	**Yes**

9.. IPOS parameters		
90. IPOS reference travel		
No.	**Name**	**Range/factory setting**
900	Reference offset	$-(2^{31}-1)$ – **0** – $(2^{31}-1)$
901	Reference speed 1	0 – **200** – 6000 min^{-1}
902	Reference speed 2	0 – **50** – 6000 min^{-1}
903	Reference travel type	**[0] Left zero pulse**
904	Reference travel to zero pulse	**Yes**
905	Hiperface offset (motor)	**$-(2^{31}-1)$** – $(2^{31}-1)$
906	Cam distance	Display value

9.. IPOS parameters		
91. IPOS travel parameters		
No.	**Name**	**Range/factory setting**
910	Gain X controller	0.1 – **0.5** – 32
911	Positioning ramp 1	0.01 – **1** – 20 s

9.. IPOS parameters		
91. IPOS travel parameters		
No.	**Name**	**Range/factory setting**
912	Positioning ramp 2	0.01 – **1** – 20 s
913	Travel speed CW	0 – **1500** – 6000 min^{-1}
914	Travel speed CCW	0 – **1500** – 6000 min^{-1}
915	Velocity precontrol	-99.99 – 0 – **100** – 199.99%
916	Ramp type	**Linear**
917	Ramp mode	**Mode 1**
918	Bus setpoint source	0 – **499** – 1023

9.. IPOS parameters		
92. IPOS Monitoring		
No.	**Name**	**Range/factory setting**
920	SW limit switch RIGHT	$-(2^{31}-1)$ – **0** – $(2^{31}-1)$
921	SW limit switch LEFT	$-(2^{31}-1)$ – **0** – $(2^{31}-1)$
922	Position window	0 – **50** – 32767 Increments
923	Lag error window	0 – **5000** – $(2^{31}-1)$
924	'Positioning interruption' detection	**On**

9.. IPOS parameters		
93. IPOS Special functions		
No.	**Name**	**Range/factory setting**
930	Override	**Off**
933	Jerk time	**0.005** – 2 s
938	IPOS speed task 1	**0** – 9
939	IPOS speed task 2	**0** – 9

9.. IPOS parameters		
94. IPOS encoder		
No.	**Name**	**Range/factory setting**
941	Actual position source	**Motor encoder**
948	Automatic encoder replacement detection	**On**

9.. IPOS parameters		
96. IPOS modulo function		
No.	**Name**	**Range/factory setting**
960	Modulo function	**Off**
961	Modulo numerator	**1** – $(2^{31}-1)$
962	Modulo denominator	**1** – 2^{31}
963	Modulo encoder resolution	1 – **4096** – 65535

16998413/EN – 12/2016

13.7 Parameter descriptions

Observe the following:

- The parameter descriptions are divided into 10 parameter groups.
- The parameter names correspond to their representation in the parameter tree.
- The following symbols are used in the parameter descriptions:

Parameters which are switch-selectable and available in parameter sets 1 and 2.

Parameters which can be changed only in inverter status "Inhibited" (output stage at high resistance).

Parameters which are automatically changed by the startup function.

13.7.1 Parameter group 0: Display values

This parameter group contains the following information:

- Process values and states of the basic device
- Process values and states of the installed options
- Fault memory
- Fieldbus parameters

P00. Process values

P000 Speed

Resolution: ± 0.2 min^{-1}

The speed is determined by taking the setpoint speed and the set slip compensation in VFC or V/f mode without an encoder connection. The speed is established from the encoder or resolver signals and is displayed when there is an encoder connection.

P001 User display

Determined by the following parameters:

- *P850 Scaling factor numerator* (→ 🗎 228)
- *P851 Scaling factor denominator* (→ 🗎 228)
- *P852 User unit* (→ 🗎 228)

P002 Frequency

Output frequency of the device (signed)

P003 Actual position

With encoder connection, position of the drive as a value in increments observing the signs in the range 0 – ± (2^{31}-1) increments (with encoder connection. Without encoder connection, the value is zero.

P004 Output current

Apparent current in the range 0 – 200% of the nominal device current I_N

16998413/EN – 12/2016

P005 Active current

Active current in the range 0 – 200% of the nominal device current I_N (signed)

The display value is positive when torque is in positive sense of rotation; negative when torque is in negative sense of rotation.

P006/P007 Motor utilization 1/2

Current thermal motor utilization of the connected motor in the range 0 – 200%

The motor utilization is calculated using the motor temperature emulation in the device. The synchronous motor with KTY and the asynchronous motor is turned off when 110% motor utilization is reached.

P008 DC link voltage

Voltage in V measured in the DC link circuit

P009 Output current

Apparent current in AC A

P01. Status displays

P010 Inverter status

The output stage can have the following states:

- Disabled
- Enabled

P011 Operating state

The following operating states are possible:

- 24 V operation
- Controller inhibit
- No enable
- Standstill current
- Enable (VFC)
- Enab. (N-control)
- Torque control
- Position hold control
- Factory setting
- Limit switches
- Technology option
- Reference mode
- Flying start in progress
- Calibrate encoder
- Error
- Safe torque off

16998413/EN – 12/2016

P012 Error status

Error number and error in text form

P013 Current parameter set

Parameter set 1 or 2

P014 Heat sink temperature

Heat sink temperature of the device in the range −40 – 125°C

P015 Operating hours

The total of hours in which the device was connected to the supply system or an external DC 24 V supply.

Storage cycle: 15 min

P016 Enable hours

Total number of hours for which the device was in "enable".

Storage cycle: 15 min

P017 Work

Total of the active energy the motor has consumed.

Storage cycle: 15 min

P018/P019 KTY utilization 1/2

Display 0%: Motor is not in operation at max. ambient temperature.

Display 110%: Switch-off point of motor

P02. Analog setpoints

P020 Analog input AI1

Setting range: -10 – +10 V

Voltage on analog input AI1

16998413/EN – 12/2016

P03. Digital inputs of basic device

P030 – P035 Digital inputs DI00 – DI05

Current state of the input terminals DI00 – DI05 (→ 🗎 215) and the current function assignment

INFORMATION

The digital input DI00 is always assigned the function “/controller inhibit”.

P05. Digital outputs basic device

P050 Digital output DB00

Current state of the binary output and the current function assignment

P07. Device data

P070 Device type

Complete designation of the device, e.g. PFA-MD0040B-5A3

P071 Rated output current

rms value of nominal output current in A

P072 Option/firmware encoder slot

Installed encoder card and its program version

P076 Basic device firmware

Program version of the firmware used in the basic device

P078 Technology function

Current technology function setting

"Standard" setting: Operation of device with the standard functions (positioning, speed control, etc.)

P079 Device version

Device variant

"Technology" setting: Application modules and technology functions can be used.

16998413/EN – 12/2016

P08. Fault memory

P080 – P084 Faults t-0 – t-4

The device has 5 fault memories (t-0 to t4-). The faults (→ 🗎 224) are saved in chronological sequence. The last fault result is stored in the fault memory t-0. In the case of more than 5 faults, the oldest fault result is deleted from the fault memory t-4.

The following information is stored and displayed when an error occurs:

- Status ("0" or "1") of the digital inputs/outputs
- Operating status of the device
- Inverter status
- Cooling air temperature
- Speed
- Output current
- Active current
- Device utilization
- DC link voltage
- Operating hours
- Enable hours
- Parameter set
- Motor utilization 1 and 2

P09. Bus diagnostics

P094 – P096 PO1 – PO3 setpoint

Currently transferred value of the process output data words (→ 🗎 229) in hexadecimal form

P097 – P099 PI1 – PI3 actual value

Currently transferred value of the process input data words (→ 🗎 230) in hexadecimal form

16998413/EN – 12/2016

13.7.2 Parameter group 1: Setpoints / ramp generators

The following settings are defined in this parameter group:

- Speed ramps
- Fixed speed setpoints

P13./P14. Speed ramps 1/2

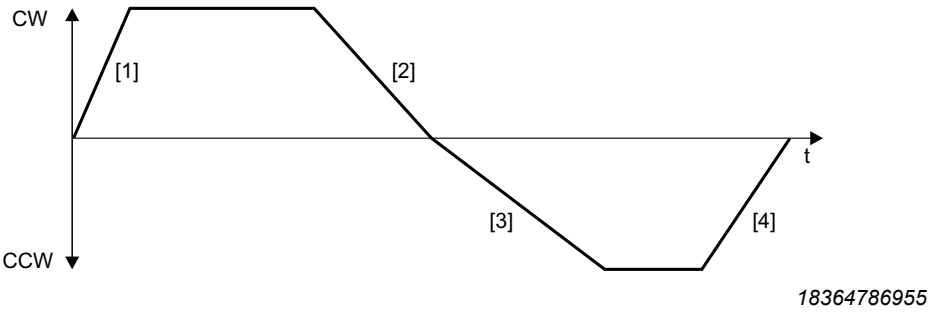
P130 – P133 / P140 – P143 ramp t11 / t21 up/down CW/CCW 1 2

Setting range: 0 – **2** – 2000 s

Specifically, the parameters are:

- *P130 Ramp t11 up CW* / *P140 Ramp t21 up CW*
- *P131 Ramp t11 down CW* / *P141 Ramp t21 down CW*
- *P132 Ramp t11 up CCW* / *P142 Ramp t21 up CCW*
- *P133 Ramp t11 down CCW* / *P143 Ramp t21 down CCW*

The ramp times refer to a setpoint step change of Δn = 3000 min^{-1}. The ramp takes effect when the speed setpoint is changed and the enable signal is revoked via the CW/CCW terminal.



18364786955

[1] Ramp up CW
[2] Ramp down CW
[3] Ramp up CCW
[4] Ramp down CCW

P134/P144 Ramp t12/t22 UP = DOWN 1 2

Setting range: 0 – **10** – 2000 s

The following applies to this ramp: UP = DOWN and CW = CCW.

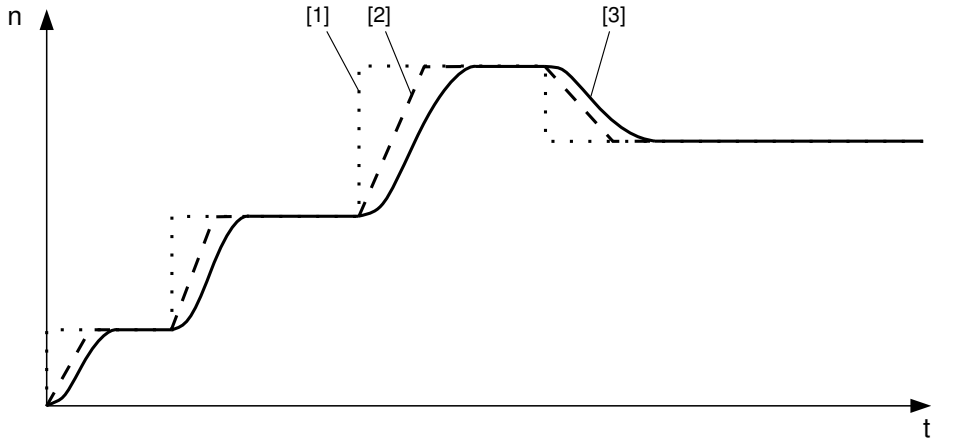
Ramps t12/t22 are activated via a digital input (→ 🗎 215), which is programmed with the function "Speed ramp switchover".

16998413/EN – 12/2016

P135/P145 S pattern t12/t22 [1][2]

Setting range: **0** – 3 (**0 = Off**, 1 = weak, 2 = medium, 3 = strong)

In order to achieve gentler drive acceleration, the 2nd ramp (t12/t22) can be rounded with 3 pattern grades.



[1] Setpoint input
[2] Speed without S pattern
[3] Speed with S pattern

A started S pattern is interrupted by the stop ramp t13/t23 and a changeover to ramp t11/t21. Revoking the setpoint or a stop via the input terminals causes the started S curve to be completed. This allows the drive to continue to accelerate despite the fact that the setpoint has been withdrawn.

P136/P146 Stop ramp t13/t23 [1][2]

Setting range: 0 – **2** – 20 s

Activated by withdrawing the "Enable" terminal or by an error (→ 🗎 224).

P137/P147 Emergency ramp t14/t24 [1][2] AUTO

Setting range: 0 – **2** – 20 s

Activated by a fault (→ 🗎 224).

The function monitors whether the drive reaches zero speed within the set time. After the set time expires, the output stage is inhibited and the brake applied even if zero drive speed has not yet been reached.

16998413/EN – 12/2016

P139/P149 Ramp monitoring 1/2 [1][2]

Setting range: On/**Off**

If you set the deceleration ramps to a value that is much shorter than can be physically achieved in the system, the turning drive will be stopped once the monitoring time has expired. In addition to the error message, this also leads to increased brake wear.

Even if the ramp timeout clearly occurs due to an impossible specification ramp, the adjustment of the respective ramp must be increased.

The parameter is an additional monitoring function for speed monitoring, but only applies for the downward ramp. It can be used to monitor the deceleration ramp, stop ramp or emergency stop ramp if speed monitoring is not desired.

16./P17. Fixed setpoints 1/2 [1][2]

Setting range: -6000 – +6000 min^{-1}

3 internal speed setpoints, so-called fixed setpoints, can be set separately for parameter sets 1 and 2. The internal setpoints are active when an input terminal (→ 🗎 215) programmed to n11/n21 or n12/n22 has a "1" signal.

In the setting range of 0 – +6000 min^{-1}, the parameters have the following factory settings:

Parameter	Factory setting
P160 170 Internal setpoint n11/n21	n11/n21 = 150 min^{-1}
P161 P171 Internal setpoint n12/n22	n12/n22 = 750 min^{-1}
P162/P172 Internal setpoint n13/n23	n13/n23 = 1500 min^{-1}

The following table shows the programming of the input terminals:

Response	Input terminal			
	n11/n21	n12/n22	Enable/stop	Parameter set 1/2
Stop with t13/t23	–	–	"0"	–
Fixed setpoint not active	"0"	"0"	"1"	"0"
n11 effective	"1"	"0"	"1"	"0"
n12 effective	"0"	"1"	"1"	"0"
n13 effective	"1"	"1"	"1"	"0"
n21 effective	"1"	"0"	"1"	"1"
n22 effective	"0"	"1"	"1"	"1"
n23 effective	"1"	"1"	"1"	"1"

The fixed setpoints of the currently inactive parameter set come into effect when this terminal is actuated ("1"-signal) if an input terminal is programmed to "Fixed setpoint switch-over".

The changeover to fixed setpoints is possible both in the inhibited and the released device state.

16998413/EN – 12/2016

13.7.3 Parameter group 2: Controller parameters

The following settings are defined in this parameter group:

- Speed control
- Hold control

P20. Speed control

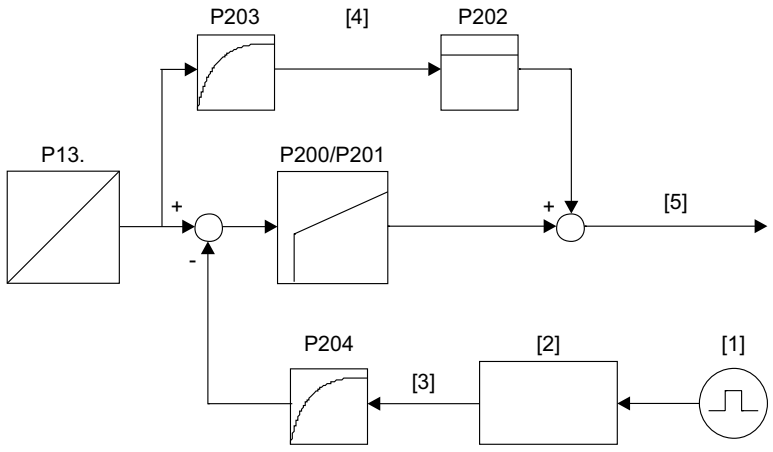
The speed control function is available only in parameter set 1.

The speed controller of the power section "PFA-..." is a PI-controller. The speed control works in the following operating modes:

- All operating modes with VFC-n control
- CFC operating modes: The speed controller is active in "CFC & Torque control" only when speed limiting is active.
- Servo operating modes: The speed controller is only active in "Servo & Torque control" when speed limiting is active.

The startup functions of the MOVITOOLS® MotionStudio engineering software support the adjustment of all relevant parameters for speed control. Direct changes to individual parameters should be made only by specialists.

The following figure shows the controller structure of the parameters for speed control:



18403733899

[1] Incremental encoder/resolver
[2] Signal processing
[3] Actual speed value
[4] Acceleration precontrol
[5] Torque setpoint
P13. Parameters of speed ramp
P200/P201 PI-controller
P203 Filter acceleration precontrol
P202 Amplification acceleration precontrol
P204 Filter speed actual value

P200 P gain speed controller AUTO

Setting range: 0.01 – **2** – 32

Gain factor of the P-component of the speed controller

P201 Time constant n-control AUTO

Setting range: 0 – **10** – 3000 ms

Integration time constant of the speed controller

The I-component reacts inversely proportionate to the time constant: A large numerical value results in a small I-component. However, a zero value means "no I component".

P202 Gain acceleration precontrol AUTO

Setting range: **0** – 65

Gain factor of acceleration precontrol which improves the guide behavior of the speed controller.

P203 Filter acceleration precontrol AUTO

Setting range: **0** – 100 ms

Filter time constant of acceleration precontrol which improves the guide behavior of the speed controller. The differentiator is programmed.

P204 Actual speed value filter AUTO

Setting range: **0** – 32 ms

Filter time constant of the actual speed value filter

P205 Load precontrol CFC

The parameter is only effective in "CFC and "Servo" operating modes.

Setting range: -150 – **0** – +150%

Determines the initial value of the torque setpoint upon enable. The parameter must be set if increased starting torque is required when the drive is enabled. For example, a parameter value greater than 0% makes it possible to prevent the unwanted sagging of hoists when the brake is released. This function should only be used in hoists without counterweight.

Recommended setting: Value of the active current (→ 🗎 192) at speed zero (n = 0)

16998413/EN – 12/2016

P206 Sampling time n-control

The parameter is only effective in "CFC and "Servo" operating modes.

Setting range: **1 ms**/0.5 ms

Setting the time to 0.5 ms improves speed control for dynamic drives with low moment of inertia.

P207 Load precontrol VFC

The parameter is effective only in the operating modes with "VFC n-control".

Setting range: -150 – **Off** – +150%

Determines the initial value of slip control upon enable.

If the parameter value is greater than 0%, the slip control is pre-stressed and the motor develops more torque upon enable. This setting can, for example, prevent the unwanted sagging of hoists when the brake is released. This function should only be used in hoists without counterweight.

Parameter values greater than 150% switch off the function (no pre-stressing). In the "VFC & Hoist" operating mode, the preload 0.5 x s_N is effective with a parameter value of greater than 150% (s_N = nominal slip of the connected motor).

Recommended setting: Value of the active current (→ 🗎 192) at minimal speed

P21. Hold controller

The position hold control function is only available in parameter set 1.

Serves for drift-free standstill control of the drive. The position hold control can only be activated in operating modes with speed control (encoder feedback).

Hold control is active when an input terminal (→ 🗎 215) programmed to /HOLD CONTROL has a "0" signal. The device then performs a stop using the "t11 up" or "t21 down" ramp. If the drive reaches speed zero, it is held in the position that is valid at this point.

The startup function of the speed controller in the MOVITOOLS® MotionStudio engineering software supports adjustment of the gain factor.

The 7-segment display of the device shows the status "A1.7" when hold control is active.

P210 P gain hold controller AUTO

Setting range: 0.1 – **0.5** – 32

Corresponds to the proportional gain of a position controller. The parameter is only effective when the position hold control function is activated.

16998413/EN – 12/2016

13.7.4 Parameter group 3: Motor parameters

This parameter group is used to adjust the device to the motor. The parameters can be set separately for parameter set 1 and 2. Thus, 2 different motors can be operated alternately on the same device without requiring a new setting.

P30./P31. Limits 1/2

P300 / P310 Start/stop speed 1/2 1 2 AUTO

The parameter is only effective in "VFC and "V/f" operating modes. The parameter has no function in "CFC" and "Servo" operating modes.

Setting range: 0 – 150 min^{-1}

Defines the smallest speed request which the device sends to the motor when enabled. The transition to the setpoint speed (determined by the setpoint selection) is made using the active acceleration ramp.

At startup without encoder, 0.5 × the nominal slip of the connected motor is set. At startup with encoder, 15 min^{-1} is set.

When a stop command is executed, this setting also determines the lowest speed at which the motor power is switched off or the post-magnetization triggered and, if applicable, the brake applied.

P301/P311 Minimum speed 1/2 1 2 AUTO

Setting range: 0 – **15** – 6100 min^{-1}

The value below which the speed may not fall, even if zero is selected as the setpoint. Even if the minimum speed is less than the start-stop speed ($n_{min} < n_{start/stop}$), the minimum speed is valid.

Important:

- With hoist function activated, the smallest speed is 15 min^{-1}, regardless of the set minimum speed value.
- To enable the drive to move clear of the limit switches even at low speeds, minimum speed is not active for the hardware limit switch with which the drive has come into contact.
- The minimum speed does not apply in the IPOS operating modes.

P302/P312 Maximum speed 1/2 1 2 AUTO

Setting range: 0 – **1500** – 6100 min^{-1}

Speed value which is not exceeded by a speed setpoint. If the minimum speed is greater than the maximum speed ($n_{min} > n_{max}$), the maximum speed is valid.

The maximum speed depends on the set operating mode (→ 🗎 216).

16998413/EN – 12/2016

P303/P313 Current limit 1/2 1 2 AUTO

Setting range: 0 – 150% of the nominal motor data I_N

The factory setting for the current limitation is set to 150% I_N of the matching motor.

The internal current limitation is based on the apparent current. In the operating modes "V/f" and "VFC" without speed control, the current limit is automatically reduced in field weakening mode above the frequency of 1.15 × f_{base}. This implements stall protection for the connected motor. The current limit effective in the field weakening range is calculated using the following formula:

$$\textit{Current limit} = (1{,}15 \times \frac{f_{base}}{f_{actual}}) \times \textit{setting value P303/P313}$$

18327565835

f_{base} Base frequency
f_{actual} Current rotational frequency

P304 Torque limit 1 2 AUTO

The parameter is only effective in "CFC and "Servo" operating modes.

Setting range: **0** – 150%

Limits the maximum torque of the motor. The entry acts on the setpoint of the motor torque (k_T × I_N(device)). In order to ensure secure triggering of the speed monitoring, the parameter value must always be less than or equal to the current limit (→ 🗎 203).

P32./P33. Motor adjustment 1/2

P320/P330 Automatic adjustment 1/2 1 2

The parameter is only effective in "VFC and "V/f" operating modes. The function is only useful for single motor operation.

Setting range: **ON**/OFF

When the parameter is activated, the device automatically adjusts the parameter *P322/P332 IxR adjustment 1/2* with every enable and saves the value. The device thereby determines a basic setting that is adequate for a great number of drive applications. The connected motor is calibrated in the last 20 ms of the premagnetization phase, except if:

- the parameter is deactivated
- the operating modes "VFC & Group" or "VFC & flying start function" are set
- the pre-magnetization time (→ 🗎 205) has been reduced by more than 30 ms in relation to the proposed value.
- in the operating mode "VFC n-control," the parameter *P730/P733 brake function 1/2* (→ 🗎 219) is deactivated.

In such cases, the set IxR value is used for calculating the winding resistance.

P321/P331 Boost 1/2 1 2

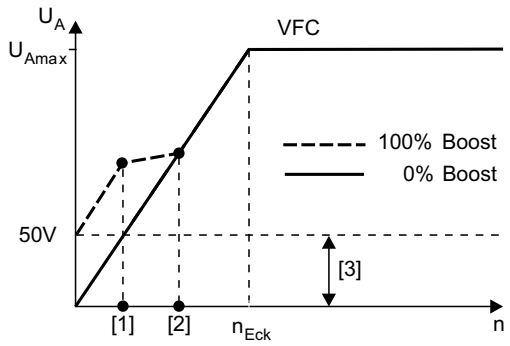
Setting range: **0** – 100%

16998413/EN – 12/2016

In operating modes "V/f" and "VFC & Group": Manual adjustment of the parameter is required in order to increase the starting torque by raising the output voltage in the range below the base speed.

In operating mode "VFC ": Manual adjustment of the parameter is normally not required. In exceptional cases, manual setting may be necessary to increase the breakaway torque. In this case, set max. 10%.

The following figure shows the phase-zero phase-to-phase voltage (not the voltage difference between the outer conductors).



36028797297140363

[1] n_{Slip}
[2] 2 x n_{Slip}
[3] Boost setting range

16998413/EN – 12/2016

P323/P333 Premagnetization time 1/2 1 2 AUTO

Setting range: 0 – 20 s

The premagnetization value of the matching motor is set as the factory setting.

Premagnetization serves to establish a high motor torque and starts when the device is enabled.

P324/P334 Slip compensation 1/2 1 2 AUTO

The parameter is only effective in "VFC," "VFC n-control" and "V/f" operating modes.

Setting range: 0 – 500 min^{-1}

The value of the matching motor is set as the factory setting.

Increases the speed accuracy of the motor. If values are entered manually, the nominal slip of the connected motor must be entered. A setting range of ± 20 % of the nominal slip is permitted if a value other than the nominal slip is entered to compensate for fluctuations between various motors.

P34. Motor protection

P340/P342 Motor protection 1/2 1 2

Setting range: **Off**/One asynchronous motor/One servomotor

Depending on the motor connected (synchronous or asynchronous motor) this function can have the following effects.

Setting: Off

The function is not active.

Setting: ON asynchronous motor

The power section "PFA-..." takes over the thermal protection of the connected motor electronically. In most cases, the motor protection function is comparable to standard thermal protection (motor protection switch) but, in addition, it takes account of speed-dependent cooling by the integrated fan. The motor utilization is calculated on the basis of:

- Inverter output current
- Type of cooling
- Motor speed
- Time

The thermal motor model is based on the motor data entered in the MOVITOOLS® MotionStudio engineering software and the operating conditions specified for the motor.

INFORMATION

If the motor also has to be protected against failure of the ventilation, blockage of air ducts, etc., it is also necessary to employ protection in the form of a TF positive temperature coefficient thermistor or TH bimetallic switch.

The following signal and display functions are available in conjunction with motor protection:

Parameter	Signal and display function
P006/P007 Motor utilization 1/2 (→ 🗎 192)	Motor utilization for parameter set 1/2
P832 Response to "Motor overload" (→ 🗎 225)	Error response of the device when the motor utilization reaches the value 110%. Factory setting: Emergency stop/malfunction.

The following parameters must be set:

Parameter	Setting/meaning
P341/P343 Type of cooling 1/2 (→ 🗎 207)	Self-cooling or external cooling
Binary output programmed to the response: "/Motor utilization 1/2"	Prewarning if motor utilization exceeds a value of 100%. In this case, the programmed binary output is set to zero (0 V).

INFORMATION

Deactivating the device (supply system and external DC 24 V supply) always sets the motor utilization to zero. After reactivation, already existing motor heating is not considered.

The motor protection function processes the utilization of the connected motors separately for both parameter sets. The motor protection function may **not** be used in the following cases:

- if only one motor is permanently connected to the device and the "parameter set changeover" function is only used for control technology purposes.
- in the case of group drives. In this case, not every individual motor can be reliably protected.

Setting: One servomotor

- Motor **without** KTY temperature sensor:

  The power section "PFA-..." calculates the motor utilization based on the nominal motor current. The aim is to determine after only a few cycles or during startup whether the drive will switch off due to an overload, with the error message "A1.F31" (TF/TH trip). In order to determine the capacity utilization at which the connected motor drives the machine cycle as precisely as possible, the duration of the machine cycle must be entered.

  This setting is only possible for parameter set 1.

The following signal and display functions are available in conjunction with motor protection:

Parameter	Signal and display function
P006 Motor utilization 1 (→ 🗎 192)	Motor utilization for parameter set 1. Valid after 10 to 20 cycles or after about 2 s and can be evaluated by a PLC.
P007 Motor utilization 2 (→ 🗎 192)	No function in this setting

16998413/EN – 12/2016

Parameter	Signal and display function
P832 Response to "Motor overload" (→ 🗎 225)	No function in this setting

The following parameters must be set:

Parameter	Meaning
P344 Interval for motor protection (→ 🗎 207)	Machine cycle of the application. Setting range: 0.1 – 20 s

INFORMATION

Activating the function does not trigger monitoring or protection of the connected motor. The programming of a binary output to "/Motor utilization 1/2" is also ineffective.

The motor protection must be guaranteed via TF/TH.

- Motor from SEW-EURODRIVE **with** KTY temperature sensor:

  The power section "PFA-..." calculates the motor utilization based on an internal motor model that uses the parameters *P006 motor utilization 1* (→ 🗎 192) and *P018 KTY utilization 1* (→ 🗎 193) as reference parameters.

  When the motor-dependent shut-down limit is reached, the device is shut down with the response set in the parameter *P832 'Motor overload' response* (→ 🗎 225). In this case, the settings in Parameters *P341 Type of cooling 1* (→ 🗎 207) and *P344 Interval for motor protection* are not relevant.

P341/P343 Type of cooling 1/2 [1] [2]

Setting range: **Self-ventilation**/Forced air cooling

Knowledge of the cooling type of the motor is required for precise calculation of the thermal load of the motor (→ 🗎 205).

P344 Interval for motor protection [1] [2]

Setting range: 0.1 – **4** – 20 s

This parameter is not effective for asynchronous motors.

Corresponds to the cycle time of the movement in the case of synchronous motors without KTY temperature sensor. The parameter is used as a reference parameter for calculating the parameter *P006/P007 motor utilization 1/2* (→ 🗎 192).

Always set the time for forward and backward movement.

16998413/EN – 12/2016

P345/P346 I_N/U_L-monitoring 1/2 1 2 AUTO

Setting range: 0.1 – 500 A

The function cannot be switched off.

The factory setting depends on the rated power of the power section "PFA-..." and is set to the rated current of the SEW EURODRIVE motor with the same rating. In devices with resolver input, the factory setting of the parameter is the value zero.

At 150% rated motor current I_N, the device switches off after 5 minutes. The error message "A1.F84" (motor protection) is displayed.

At 500% rated motor current I_N, the device switches off after 20 seconds. The error message "A1.F84" (motor protection) is displayed.

P35. Direction of motor rotation

SEW-EURODRIVE specifies the direction of rotation as seen onto the A-side of the motor. Clockwise (positive) is defined as rotation to the right and counterclockwise as rotation to the left. This definition is implemented when the motor is connected according to the description from SEW EURODRIVE.

P350/P351 Change direction of rotation 1/2 1 2 AUTO

Setting range: On/**Off**

Direction of rotation reversal	Positive setpoint (positive direction of travel)	Negative setpoint (negative direction of travel)
Off	Motor turns clockwise	Motor turns counterclockwise
On	Motor turns counterclockwise	Motor turns clockwise

- Setting "On": The definition from SEW-EURODRIVE is reversed for the motor rotation direction. The assignment of limit switches is maintained: When the motor turns in CLOCKWISE direction, the drive will be properly stopped once it hits the right limit switch.

  After changing the parameter, note the correct connection of the limit switch and the definition of the reference point and the travel positions.

INFORMATION

If the parameter is changed, the system loses its reference point for the position without withdrawal of the reference bit. The result may be undesirable movement of the axis.

Referencing is also mandatory after the parameter change (including after activation of the binary terminal).

- Setting "**Off**": the motor rotation direction corresponds to the definition from SEW-EURODRIVE.

16998413/EN – 12/2016

13.7.5 Parameter group 5: Monitoring functions

The processes of the drive-specific parameters are monitored with this parameter group in order to be able to respond to inadmissible deviations. Some of the monitoring functions are available separately in both parameter sets. Activation of a monitoring function triggers an error response (→ 🗎 224).

P50. Speed monitoring

P500/P502 Speed monitoring 1/2 [1][2]

Setting range: Off/motor/regenerative/**motor/regenerative**

The speed setpoint can only be achieved if there is sufficient torque available to meet the load requirements. If the internal current limit (→ 🗎 203) reaches the external current limit, the power section "PFA-..." assumes that the torque has reached its maximum and the desired speed cannot be attained. If this state persists for the duration of the deceleration time (→ 🗎 209), the speed monitoring trips.

In the case of a hoist, activate the speed monitoring and set the deceleration time to as small a value as possible. Speed monitoring is not that important for safety since an incorrect movement of the hoist does not necessarily mean operation in the current limitation.

P501/P503 Delay time 1/2 [1][2]

Setting range: 0 – **1** – 10 s

The set current internal limit can be reached briefly during acceleration, deceleration, or load peaks. Corresponding setting of the deceleration time can prevent unintentional, sensitive activation of the speed monitoring. The speed monitoring should only trip when the current limit is reached permanently for the duration of the set deceleration time (→ 🗎 209).

P504 Encoder monitoring motor

Setting range: On/**Off**

- Setting "On": A wire break between the device and motor encoder will be detected directly when using sin/cos encoders and TTL encoders. In the case of a defective connection, the error message "A1.F14" (encoder) is displayed. The error message is also generated in the inhibited state of the device.
- Setting "**Off**": A wire break between the device and motor encoder is not detected directly. If the speed monitoring is not deactivated, the error message "A1.F08" (speed monitoring) is displayed in the case of a defective connection. The error message is only generated in the enabled state of the device.

INFORMATION

Encoder monitoring is not a safety function. If you use a HIPERFACE® encoder, encoder monitoring is always active (including for the track) regardless of the parameter setting.

16998413/EN – 12/2016

P504 Synchronous encoder monitoring

Setting range: On/**Off**

- Setting "on:" A wire break between the device and synchronous encoder will be detected directly when using sin/cos encoders and TTL encoders. In the case of a defective connection, the error message "A1.F14" (encoder) is displayed. The error message is also generated in the inhibited state of the device.
- Setting "**Off**": A wire break between the device and synchronous encoder is not detected directly. If the speed monitoring is not deactivated, the error message "A1.F08" (speed monitoring) is displayed in the case of a defective connection. The error message is only generated in the enabled state of the device.

P52. Mains OFF monitoring

P520 Power off response time

Setting range: **0** – 5 s

Time that the power off must be present for the parameterized power off response to be triggered.

P521 Power off response

Setting range: **Controller inhibit**/emergency stop

If a binary input is programmed to "Power on," and as soon as it receives a "0" signal, the response set here is triggered.

P522 Phase failure monitoring

Setting range: Off/**On**

The device monitors the line input phases for failure of a phase. If 2 phases fail, the DC link becomes deenergized. This state corresponds to disconnection from the supply system. Since the line input phases cannot be monitored directly, monitoring has to be done indirectly via the DC link ripple. If one phase fails, the ripple increases drastically.

The DC link voltage is monitored at a time interval Δt = 1 ms for dropping below a minimum voltage level that depends on the rated supply voltage of the device.

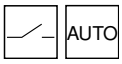
A phase failure is recognized by the following nominal guide value:

- In a 50 Hz supply system: The voltage level has been underrun approx. t_{max} = 3.0 s.
- In a 60 Hz supply system: The voltage level has been underrun approx. t_{max} = 2.5 s.

If a supply phase failure is detected, the output stage is immediately inhibited and the brake is applied. The error message "A1.F06" (line phase failure) is displayed and the error response "Immediate switch-off with interlocking" is carried out. The error can only be reset by a device reset.

16998413/EN – 12/2016

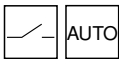
P53. Motor temperature protection

P530 Sensor type 1 

Setting range: **No Sensor** / TF/TH / TF/TH DEU / KTY / KTY DEU

Selection of the sensor used for motor protection in parameter set 1

- Setting "TF/TH": Set the response with *P835 Response 'TF-Message'* (→ 🗎 226).
- "KTY" setting: Can only be selected for synchronous motors from SEW-EURODRIVE. Activate the motor model with the setting "One servomotor" of the parameter *P340 Motor protection 1* (→ 🗎 205). Set the response with the parameter *P832 Response 'Motor overload'* (→ 🗎 225).

P531 Sensor type 2 

Setting range: **No Sensor** / TF/TH

Selection of the sensor used for motor protection in parameter set 2

P54. Gear unit/motor monitoring

These parameters are used to set the response to be triggered in the event of a motor or gear unit problem. The binary inputs must be programmed with the corresponding function. The error responses are also be triggered in the "controller inhibit" device status.

The following table shows possible error responses:

Response	Description
No response	An error is not displayed, nor is an error response performed. The signaled error is ignored.
Display error	Display of error on the 7-segment display of the device and in the MOVITOOLS® MotionStudio engineering software. The device performs no other error responses. The device can be reset by a device reset (terminal, fieldbus, auto reset).
Immediate stop/malfunction	Immediate switch-off of the device with error message. The output stage is inhibited and the brake is applied. The ready signal is revoked. A restart is only possible after a fault reset has been performed during which the device is reinitialized.
Emergency stop/malfunction	The drive is braked with the emergency stop ramp t14/t24 (→ 🗎 197). Once the stop speed is reached, the output stage is inhibited and the brake is applied. The error is signaled immediately. The ready signal is revoked. A restart is only possible after a fault reset has been performed during which the device is reinitialized.

16998413/EN – 12/2016

Response	Description
Rapid stop/malfunction	The drive is braked with the stop ramp t13/t23 (→ 🗎 197). Once the stop speed is reached, the output stage is inhibited and the brake is applied. The error is signaled immediately. The ready signal is revoked. A restart is only possible after a fault reset has been performed during which the device is reinitialized.
Immediate stop/Warning	Immediate switch-off of the device with error message. The output stage is inhibited and the brake is applied. The ready signal is not revoked. The drive restarts without device re-initialization if the error is rectified by an internal procedure or by an error reset.
Emergency stop/Warning	The drive is braked with the emergency stop ramp t14/t24 (→ 🗎 197). Once the stop speed is reached, the output stage is inhibited and the brake applied. The error is signaled immediately. The ready signal is not revoked. The drive restarts without device re-initialization if the error is rectified by an internal procedure or by an error reset.
Rapid stop/Warning	The drive is braked with the stop ramp t13/t23 (→ 🗎 197). Once the stop speed is reached, the output stage is inhibited and the brake applied. The error is signaled immediately. The ready signal is not revoked. The drive restarts without device re-initialization if the error is rectified by an internal procedure or by an error reset.

P540 Response to vibration/warning

Factory setting: **Display error**

If the drive vibration sensor signals a warning, the device carries out the set response.

P541 Response to vibration/fault

Factory setting: **Rapid stop/Warning**

If the drive vibration sensor signals an error, the device carries out the set response.

P542 Response oil aging/warning

Factory setting: **Display error**

If the oil aging sensor signals a warning, the device carries out the set response.

P543 Response oil aging/fault

Factory setting: **Display error**

16998413/EN – 12/2016

If the oil aging sensor signals an error, the device carries out the set response.

P544 Oil aging/over-temperature

Factory setting: **Display error**

If the oil aging sensor signals an over-temperature, the device carries out the set response.

P545 Oil aging/ready

Factory setting: **Display error**

If the oil aging sensor withdraws the ready signal, the device carries out the set response.

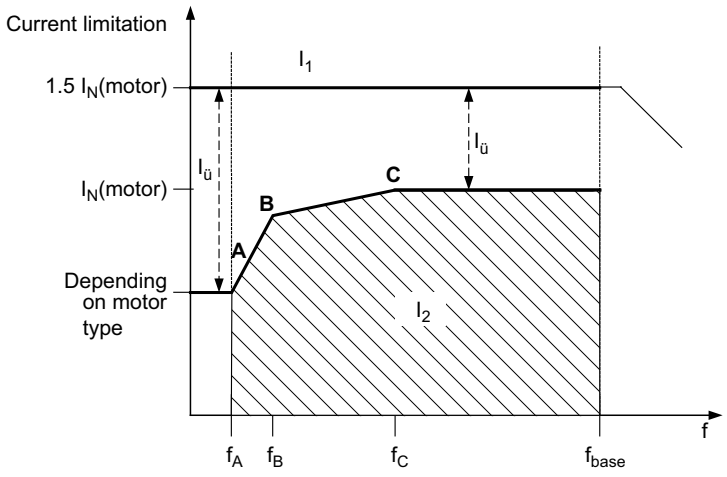
P549 Response to brake wear

Factory setting: **Display error**

If the brake wear sensor trips, the device carries out the set response.

P56. Ex-e motor current limitation

Display and setting values that are specific to the "Current limiting in the Ex-e motor on the inverter" function.



18379642507

I_N	Nominal motor current in A
I_1	Maximum permitted current in A
I_2	permitted continuous current range in A
$I_ü$	Overload current in A
f_{base}	Base frequency in Hz
A, B, C	limiting points

- Frequencies below f_A are only permitted to a limited extent.
- Frequencies higher than the rated motor frequency are not permitted.
- Frequency A < frequency B < frequency C < rated motor frequency
- Current limit A < current limit B < current limit C

Refer to the "Explosion-Proof AC Motors" operating instructions for more information.

P560 Current limit Ex-e motor AUTO

Setting range: On/**Off**

- Setting "On:" Current limitation for Ex-e motors is active. The current limiting is already activated during startup for the Ex-e operation selected and approved motors. The current limit (→ 🗎 203) can no longer be changed when the protection function is active.
- Setting "**Off**": Current limiting for Ex-e motors is not active.

P561 Frequency A AUTO

Setting range: 0 – **5** – 60 Hz

Value for minimum operating frequency f_A. The device is operated independently of the current amount for 60 s at the operating frequency f_A. After this time elapses, the device switches off and displays the error message "A1.F110" ("Ex e protection") .

P562 Current limitation A AUTO

Setting range: 0 – **50** – 150%

Current limitation that is permitted with operating frequency f_A. There is a linear gradient between current limitation A and current limitation B.

P563 Frequency B AUTO

Setting range: 0 – **10** – 104 Hz

Value for operating frequency f_B.

P564 Current limit B AUTO

Setting range: 0 – **80** – 200%

Current limitation that is permitted with operating frequency f_B. There is a linear gradient between current limit B and current limit C.

P565 Frequency C AUTO

Setting range: 0 – **25** – 104 Hz

Value for operating frequency f_C.

P566 Current limit C AUTO

Setting range: 0 – **100** – 200%

Current limit that is permitted between operating frequency f_C and rated motor frequency. The rated motor frequency is 50 Hz for star connection and 87 Hz for delta connection. After startup with an Ex-e motor, the current limit C is approximately equal to the rated motor current I_N.

16998413/EN – 12/2016

13.7.6 Parameter group 6: Terminal assignment

The binary inputs of the device are programmed with this parameter group.

P60. Digital inputs of basic device

P601 – P604 Digital inputs DI02 – DI05 

The digital inputs can be programmed to the following functions:

Function		In effect with			Effective in Device status	
		"0" signal	"1" signal		Inhibited	enabled
No function [1]		–	–		–	–
Enable/Stop[2]		Stop on t13/t23	Enable		no	yes
CW/Stop[2]		Stop at t11/t21 or t12/t22	Enable CW rotation		no	yes
CCW/Stop[2]		Stop at t11/t21 or t12/t22	Enable CCW rotation		no	yes
n11/n21[3]	n13/n23	External setpoints only	n11/n21	n13/n23	no	yes
n12/n22		External setpoints only	n12/n22		no	yes
Fixed setpoint switchover[3]		Fixed setpoints of the active parameter set	Fixed setpoints of the inactive parameter set		yes	yes
Parameter set changeover[4]		Parameter set 1	Parameter set 2		yes	no
Speed ramp switchover [2]		1. Ramp (t11/t21) active	Second Ramp (t12/t22) active		yes	yes
/External fault		External fault	–		no	yes
Fault reset		Reset on positive edge ("0" to "1")			yes	yes
/Stop control[5]		Hold control active	–		no	yes
/Limit switch CW		Right limit switch reached	Not reached		no	yes
/Limit switch CCW		Left limit switch reached	Not reached		no	yes
IPOS input		Function depends on IPOS[PLUS®] application module				
Reference cam		not actuated	Activated		no	yes
Start reference travel		–	Start referencing for the application module		no	yes
Power on detection[6]		see *P521 Power off response* (→ 🗎 201)	External message "Power on"		yes	yes
/Vibration warning		Vibration sensor signals warning.	Vibration sensor does not signal warning.		yes	yes
/Vibration fault		Vibration sensor reports fault.	Vibration sensor does not report fault.		yes	yes
/Oil aging warning		Oil aging sensor signals warning.	Oil aging sensor does not signal warning.		yes	yes
/Oil aging error		Oil aging sensor signals fault.	Oil aging sensor does not signal fault.		yes	yes
/Oil aging over-temperature		Oil aging sensor signals over-temperature.	Oil aging sensor does not signal over-temperature.		yes	yes
Oil aging ready signal		Oil aging sensor is not ready.	Oil aging sensor is ready.		yes	yes
Brake wear signal		Brake is worn.	Brake is OK.		yes	yes

1) factory to DI02, DI03, DI04, DI05
2) see parameter description P13./P14.
3) See parameter description P16./P17.
4) For operating modes with encoder feedback, parameter set changeover must not occur in cycles more frequently than every 2 seconds.
5) see parameter description P210
6) see parameter description P52.

16998413/EN – 12/2016

13.7.7 Parameter group 7: Control functions

The the fundamental control properties of the device are programmed with this parameter group. These functions are carried out automatically upon activation of the device and influence its behavior in certain operating modes.

INFORMATION

When using incremental encoders (resolver, push-pull TTL, RS422, sin/cos, HIPERFACE® single-turn), changing the parameter set invalidates the IPOS variables *H510 Actual position* and *H511 Actual position*. A position is only retained after switching over the parameter sets if an absolute encoder (SSI, HIPERFACE® Multi-Turn) is used.

P70. Operating modes

P700/P701 Operating mode 1/2 1 2 AUTO

Sets the basic operating mode of the device for parameter sets 1 and 2. The motor system, the encoder feedback and corresponding control functions are particularly specified.

In the delivery state, the devices are parameterized to the rating-matched motor. All operating modes can be set for parameter set 1. Only operating modes without encoder feedback (Group 1) can be set for parameter set 2.

INFORMATION

Without new startup, the operating mode may only be changed within a group.

The following table shows the device's possible operating modes:

Group	Operating mode	Device type and option	Motor
1	"VFC" "VFC & Group" "VFC & Hoist" "VFC & DC braking" "VFC & flying start function" "V/f characteristic curve" "V/f & DC braking"	MOVIPRO®	DR . without encoder
2	"VFC n-control" "VFC-n-control & Group" "VFC-n-control & Hoist" "VFC n-control & IPOS"	MOVIPRO® with encoder	DR.. with incremental encoder or HIPERFACE® encoder
3	"CFC" "CFC & torque control" "CFC & IPOS"	MOVIPRO® with encoder	DR.. with incremental encoder or HIPERFACE® encoder
4	"Servo" "Servo & torque control" "Servo & IPOS"	MOVIPRO® with encoder	CMP with HIPERFACE® encoder or resolver

P702 Motor category AUTO

Setting range: **Rotatory**/linear

Automatically set during startup. Displays the connected motor type.

16998413/EN – 12/2016

P71. Standstill current

P710/P711 Standstill current 1/2 [1][2]

Setting range: **0** – 50% of the nominal motor current I_N

Imprints an adjustable current (in % of the nominal motor current I_N) into the motor during motor standstill and closed brake. The standstill current can be switched off by "/controller inhibit = 0".

The standstill current fulfills the following functions:

- Prevents the risk of condensation at the motor and freezing of the brake when the ambient temperature is low (particularly to the disk brake).

  Set the current level in such a way that the motor will not overheat. SEW-EURODRIVE recommends a current level at which the motor housing is warm to the touch.
- Enables rapid start of the motor without complying with the premagnetization time.

  SEW-EURODRIVE recommends setting the standstill current to 45 – 50% of the nominal motor current I_N in hoists.

The standstill current function is deactivated at a value of 0% of the nominal motor current I_N. The standstill current is monitored for current limit in any case (→ 🗎 203).

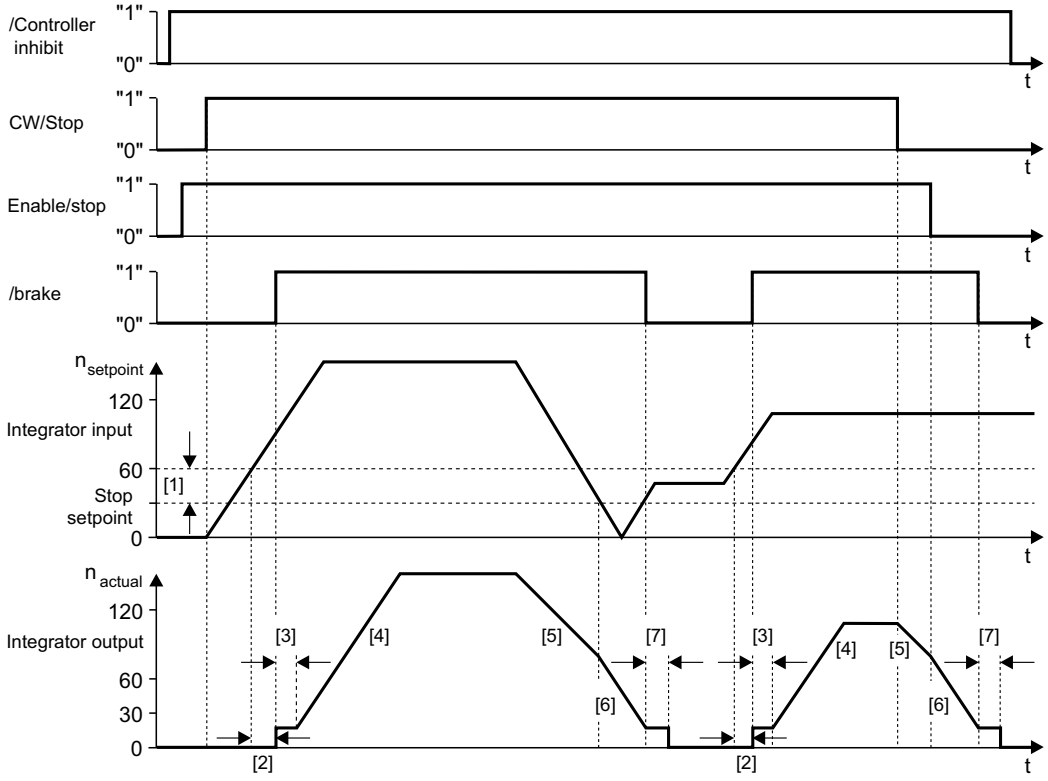
- At least the magnetizing current is always imprinted in the operating mode "CFC," which is required according to the motor model.
- No current is imprinted in the operating mode "Servo".
- The nominal magnetizing current is always imprinted in the operating modes "VFC & Hoist" and "VFC-n-control & Hoist" and activated standstill current.
- In the other operating modes, a rapid start will take place only if the set standstill current is greater than or equal to the rated magnetizing current.

If, in the standstill current phase, the set premagnetization time of the standstill current is constant and greater than or equal to the rated magnetizing current of the motor in time intervals of the set premagnetization time, the motor resistance is calibrated. If an enable is issued again during the measurement interval, the resistance value is not calculated. In this case, the existing resistance value continues to be used.

16998413/EN – 12/2016

P72. Setpoint stop function

With activated setpoint stop function, the device automatically generates an enable in dependence on the main setpoint. All required functions such as premagnetization, brake control, etc. are enabled. An additional enable via terminals must still occur in any case, however.



18382962827

[1] Start offset
[2] Pre-magnetization time
[3] Brake release time
[4] t11 up CW
[5] t11 down CW
[6] t13 Stop ramp
[7] Brake application time

P720/P723 Setpoint stop function 1/2 [1] [2]

Setting range: On/**Off**

16998413/EN – 12/2016

P721/P724 Stop setpoint 1/2 [1][2]

Setting range: 0 – **30** – 500 min^{-1}

In the "VFC & Hoist" operating mode, the minimum stop setpoint is internally limited to 16 min^{-1}.

P722/P725 Start offset 1/2 [1][2]

Setting range: 0 – **30** – 500 min^{-1}

- If the start setpoint (stop setpoint + start offset) is greater than the maximum speed, no enable occurs.
- If the stop setpoint is greater than the minimum speed, the minimum speed can never be run.

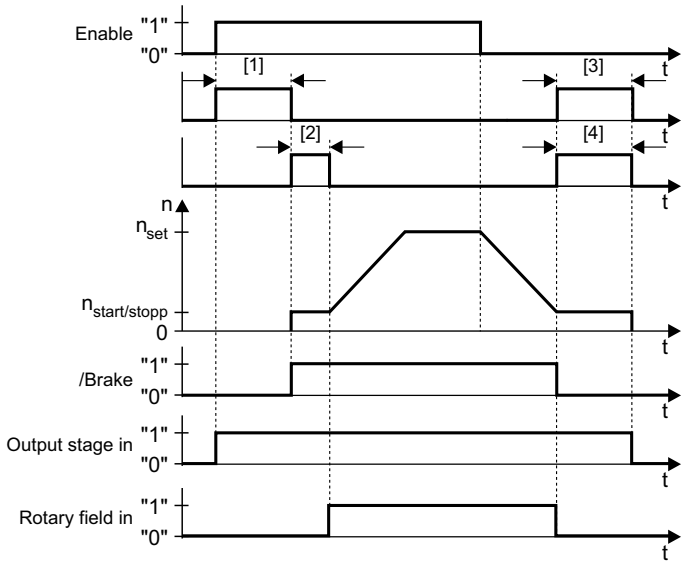
P73. Brake function

The power section "PFA-..." is capable of controlling a brake installed on the motor. The brake function takes effect on the binary output DB00, which is permanently assigned the function "/Brake" (24 V operation = brake released).

In a drive with encoder feedback (speed control), it is possible to select between electrical holding of the load and mechanical application of the brake in halt condition.

INFORMATION

With controller inhibit active (controller inhibit = "0") the brake is always applied.



18402473227

[1] Pre-magnetization time
[2] Brake release time
[3] Post-magnetization time
[4] Brake application time

P730/P733 Brake function 1/2 [1][2]

Setting range: **ON**/OFF

Determines whether the brake is activated when the enable is revoked (enable = "0"). In a hoist, the brake is always active in controlled operation.

P731/P734 Brake release time 1/2 [1][2] AUTO

Setting range: 0 – 2 s

The brake release time of the matching motor is set as the factory setting.

Specifies how long the motor will remain at a standstill after expiration of the premagnetization time and how much time the brake has to release.

P732/P735 Brake application time 1/2 [1][2] AUTO

Setting range: 0 – 2 s

The brake application time of the matching motor is set as the factory setting.

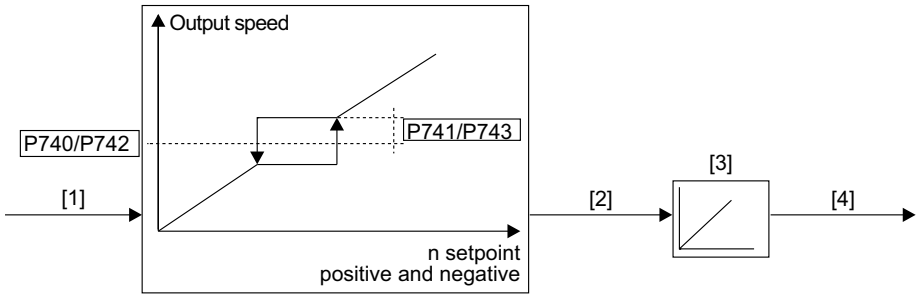
Specifies the time required for the mechanical brake to apply. This parameter prevents a sagging of the drive (particularly in hoists).

P74. Speed skip function

With these parameters, the motor speed can be prevented from persisting within a certain speed window. This suppresses vibration and noise, in particular in machines with pronounced mechanical resonance.

The parameters automatically have effect on positive and negative setpoints when activated. In the factory setting, the function is deactivated (*P741/P743 Skip width 1/2* = 0).

The following figure shows the mechanism of the parameters:



18409535883

[1] n setpoint
[2] n setpoint on the integrator input
[3] Ramps t11/t12
[4] n setpoint on the integrator output

P740/P742 Skip center 1/2 [1][2]

Setting range: 0 – **1500** – 600 min^{-1}

16998413/EN – 12/2016

P741/P743 Skip bandwidth 1/2 [1] [2]

Setting range: **0** – 300 min^{-1}

P77. Energy-saving function

Energy can be saved in the operation of pumps, fans, conveyor belts etc. In this procedure, the magnetization of the asynchronous motor is controlled depending on the load by adapting the voltage-frequency ratio; the motor is under-magnetized.

P770 Energy-saving function

Setting range: On/Off

The parameter is only effective in "VFC," "VFC & Group," "VFC & flying start function" and "V/f characteristic curve" operating modes.

During no-load operation, the power consumption of the inverter can be reduced by up to 70%. Observe the following limitations:

- The energy-saving function offers advantages only in the part-load range.
- No large step changes in load should occur during operation.

16998413/EN – 12/2016

13.7.8 Parameter group 8: Device functions

Specific device functions are defined with this parameter group.

P80. Setup

P802 Factory setting

Setting range: **No** / standard / delivery state

Reestablishes the factory setting for the parameter saved in EEPROM.

INFORMATION

Before you reset the parameter, save the set parameter values with the MOVITOOLS® MotionStudio engineering software. After the reset, you must readjust the parameter values and terminal assignments in accordance with the requirements.

- "Standard" setting: nearly all parameter values are overwritten. The following data is **not** reset:
  - Application module
  - Fault memory
  - Statistical data
  - *P20. Speed control* (→ 🗎 199)
  - *P210 P gain hold controller* (→ 🗎 201)
  - *P30./ P31. Limits 1/2* (→ 🗎 202)
  - *P32./P33. Motor compensation 1/2* (→ 🗎 203)
  - *P344 Interval for motor protection* (→ 🗎 207)
  - *P345/346 IN/UL monitoring 1/2* (→ 🗎 208)
  - *P53. Motor temperature protection* (→ 🗎 211)
  - *P70. Operating modes* (→ 🗎 216)
  - *P73. Brake function* (→ 🗎 219)
  - *P905 Hiperface offset (motor)* (→ 🗎 234)
  - *P910 Gain X controller* (→ 🗎 234)
  - *P94. IPOS encoder* (→ 🗎 239)
- Setting "Delivery state": All parameter values are overwritten.

The 7-segment display of the device shows the status "8.8.8" during the reset. When the reset is complete, the previous operating state of the device appears in the 7-segment display. The parameter automatically returns to the "no" setting.

16998413/EN – 12/2016

P803 Parameter lock

Setting range: On/**Off**

- Setting "on:" The device can **no longer** be started. Any adjustment to the parameters is prevented. The following parameters are excluded from the inhibit:
  - *P803 Parameter lock*
  - *P840 Manual reset* (→ 🗎 226)
  - *P876 PO data enable* (→ 🗎 230)

  A parameter lock is useful, for example, after an optimized setting of the power section "PFA-...".
- Setting "**Off**": Parameter adjustments are possible.

P804 Reset statistics data

Setting range: **No**/error memory/kWh counter/operating hours

Resets the statistical data, error memory, kilowatt-hour meter, and operating hours counter stored in EEPROM.

This data is not reset when selecting the "Standard" standard of the parameter *P802 Factory setting* (→ 🗎 222).

P82. Braking operation

P820/P821 4-quadrant - operation 1/2

Setting range: **ON**/OFF

The parameter is only effective in operating modes without encoder feedback (VFC and V/f). 4-quadrant operation is assumed in all other operating modes.

- If a braking resistor is connected to the device, the following 4-quadrant operating modes are possible:
  - Left/right
  - Motor/regenerative
- Parameter must be set to "OFF" if there is no braking resistor connected to device, which means regenerative operation is not possible.

  In these operating modes, the device attempts to extend the deceleration ramp so the generated power is not too great and the DC link voltage remains below the switch-off threshold.

  Despite the fact that the deceleration ramps are automatically extended by device, it is possible that the regenerated power during braking may be too great, leading to device switching itself off and issuing error message "F07 "(DC link overvoltage). In this case you have to extend the deceleration ramps manually.

16998413/EN – 12/2016

P83. Error responses

With these parameters, you set the response for occurring errors and faults.

The following table shows possible error responses:

Response	Description
No response	An error is not displayed, nor is an error response performed. The signaled error is ignored.
Display error	Display of error on the 7-segment display of the device and in the MOVITOOLS® MotionStudio engineering software. The device performs no other error responses. The device can be reset by a device reset (terminal, fieldbus, auto reset).
Immediate stop/malfunction	Immediate switch-off of the device with error message. The output stage is inhibited and the brake is applied. The ready signal is revoked. A restart is only possible after a fault reset has been performed during which the device is reinitialized.
Emergency stop/malfunction	The drive is braked with the emergency stop ramp t14/t24 (→ 🖹 197). Once the stop speed is reached, the output stage is inhibited and the brake is applied. The error is signaled immediately. The ready signal is revoked. A restart is only possible after a fault reset has been performed during which the device is reinitialized.
Rapid stop/malfunction	The drive is braked with the stop ramp t13/t23 (→ 🖹 197). Once the stop speed is reached, the output stage is inhibited and the brake is applied. The error is signaled immediately. The ready signal is revoked. A restart is only possible after a fault reset has been performed during which the device is reinitialized.
Immediate stop/Warning	Immediate switch-off of the device with error message. The output stage is inhibited and the brake is applied. The ready signal is not revoked. The drive restarts without device re-initialization if the error is rectified by an internal procedure or by an error reset.

16998413/EN – 12/2016

Response	Description
Emergency stop/Warning	The drive is braked with the emergency stop ramp t14/t24 (→ 🗎 197). Once the stop speed is reached, the output stage is inhibited and the brake applied. The error is signaled immediately. The ready signal is not revoked. The drive restarts without device re-initialization if the error is rectified by an internal procedure or by an error reset.
Rapid stop/Warning	The drive is braked with the stop ramp t13/t23 (→ 🗎 197). Once the stop speed is reached, the output stage is inhibited and the brake applied. The error is signaled immediately. The ready signal is not revoked. The drive restarts without device re-initialization if the error is rectified by an internal procedure or by an error reset.

P830 Response to 'External error'

Factory setting: **Emergency stop/malfunction**

Triggered only in the inverter status "Enabled" via an input terminal programmed to "/ External fault".

P832 Response to "Motor overload"

Factory setting: **Emergency stop/malfunction**

Triggered in case of a motor overload. Make one of the following settings to monitor the motor overload:

- In the parameter *P340 Motor protection 1* (→ 🗎 205), the setting "One asynchronous motor"
- In the parameter *P340 Motor protection 1* (→ 🗎 205), the setting "One servomotor" and in the parameter *P530 Sensor type 1* (→ 🗎 211) the setting "KTY"

P834 Response to "Lag error"

The response is possible only with one application module.

Factory setting: **Emergency stop/malfunction**

Triggered via the lag error monitoring of the application module.

16998413/EN – 12/2016

P835 Response to "TF signal" AUTO

Factory setting: **No response**

Triggered via the temperature sensor monitoring of the temperature sensor TF or TH in the motor winding, as applicable.

P836 Response 'Timeout SBus 1'

Factory setting: **Emergency stop/malfunction**

Triggered via the system bus timeout monitoring.

P838 Response 'SW limit switch'

Factory setting: **Emergency stop/malfunction**

This response is triggered if a target position outside the software limit switch is specified in the referenced drive. The software limit switches are set using parameters *P920/P921 SW limit switch CW/CCW* (→ 🗎 237).

P839 Response to "Positioning interruption"

Factory setting: **No response**

If the parameter *P924 'Position interruption' detection* (→ 🗎 238) is activated, this response is triggered upon interrupting a positioning process.

P84. Reset behavior

P840 Manual reset

Setting range: Yes/**No**

- Set to "Yes": Resets the error in the power section "PFA-...". As soon as the reset is carried out, the parameter automatically resets to the setting "**No**". Activating the manual reset does not have any effect if there is no error present.
- Set to "**No**": No reset is performed.

16998413/EN – 12/2016

P841 Auto reset

Setting range: On/**Off**

⚠ DANGER

Risk of crushing if the motor starts up automatically after an auto reset.

Fatal or severe injuries and damage to property.

- Do not use the auto-reset function with drives where an automatic restart could represent a danger to people or devices.
- Perform a manual reset.

- Setting "On": Automatically performs a device reset in case of error after an adjustable wait period. The wait period is adjusted via the parameter *P842 Restart time* (→ 🗎 227).

  A maximum of 5 auto resets are possible during an auto reset phase. If 5 errors occur that are reset by an auto-reset, no more auto-resets are possible until one of the following situations occurs:

  – A manual reset is performed using the input terminal
  – A manual reset is performed via the serial interface (with the MOVITOOLS® MotionStudio engineering software or via the PLC)
  – There is a transition to 24 V backup mode, or the device is switched off completely

  Five automatic resets are then possible again.
- Setting "**Off**": No auto reset is performed.

P842 Restart time

Setting range: 1 – **3** – 30 s

Wait time that should occur between the moment an error occurs and the execution of an automatic reset.

P85. Scaling actual speed value

Specifies a user-specific display parameter. The display parameter is shown in the parameter *P001 User display* (→ 🗎 191).

Example

A scaling factor of 1/60 is required to display the actual speed value in s^{-1}. The following settings must be specified for the display parameter:

Parameter	Setting
P850 Scaling factor numerator	1
P851 Scaling factor denominator	60
P852 User unit	s^{-1}

With these settings, an actual speed value of 1500 min^{-1} in the parameter *P001 User display* is shown as 25 s^{-1}.

16998413/EN – 12/2016

P850 Scaling factor numerator

Setting range: **1** – 65535

P851 Scaling factor denominator

Setting range: **1** – 65535

P852 User-defined unit

Factory setting: **1/min**

The user unit can comprise a maximum of 8 ASCII characters. The user unit is shown in the parameter *P001 User display* (→ 🗎 191).

P86. Modulation

P860/P861 PWM frequency 1/2 [1][2]

The parameter is only effective in the "VFC" operating mode.

Setting range: **4**/8/12/16 kHz

Sets the clock frequency on the device output for parameter set 1/2. The set clock frequency can be permanently fixed with the parameter *P862/P863 PWM fix 1/2* (→ 🗎 228).

If the clock frequency is not permanently fixed to the set value, the device automatically switches back to lower clock frequencies when the unit utilization reaches a specific level. The modulation frequency reduces switching losses in the output stage and, consequently, unit utilization.

P862/P863 PWM fix 1/2 [1][2]

Setting range: On/**Off**

- Setting "On": Fixes the set clock frequency set in the parameter *P860/P861 PWM-frequency 1/2* (→ 🗎 228) for parameter set 1/2. This prevents an automatic reduction of the clock frequency (e.g. when using output filters).
- Setting "**Off**": The device automatically reduces the set output frequency (down to minimum 4 kHz) when there is a high level of thermal load on the output stage. This is to avoid a switch-off of the device with the error message "Device utilization".

P864 PWM frequency CFC

The parameter is effective only in "CFC and "Servo" operating modes.

Setting range: **4**/8/16 kHz

Sets the clock frequency on the device output for parameter set 1. The cycle frequency is set to a fixed value and is not automatically reduced with high unit utilization.

16998413/EN – 12/2016

P87. Process data description

P870/P871/P872 Setpoint description PO1/PO2/PO3

Defines the content of the process output data words PO1/PO2/PO3. The power section "PFA-..." can only allocate the corresponding setpoints according to this specification.

Specifically, the parameters are:

Parameter	Factory setting
P870 Setpoint description PO1	Control word 1
P871 Setpoint description PO2	Setpoint speed
P872 Setpoint description PO3	Ramp

The process output data words can be allocated as follows:

Assignment	Description
No function	The content of the process output word is ignored.
Setpoint speed	Setpoint speed in min^{-1}
Set current	Current setpoint input with torque control
Set position low	Setpoint position low word
Set position high	Setpoint position high word
Max. speed	Maximum system speed (→ 🗎 202)
Max. current	Current limitation in % of I_N of the device (→ 🗎 203)
Slip speed	Slip compensation (→ 🗎 205)
Ramp	Ramp time for setpoint selection
Control word 1	Control signals for start/stop, etc.
Control word 2	Control signals for start/stop, etc.
Setpoint speed [%]	Setpoint speed specification in % of n_{max}
IPOS PO data	Specification of a 16-bit encoded value for an IPOS$^{PLUS®}$ application module

For more detailed information, refer to the "Fieldbus Device Profile with List of Parameters" manual.

16998413/EN – 12/2016

P873/P874/P875 Actual value description PI1/PI2/PI3

Defines the content of the process input data words PI1/PI2/PI3. The power section "PFA-..." can only allocate the corresponding actual values according to this specification.

Specifically, the parameters are:

Parameter	Factory setting
P873 Actual value description PI1	Status word 1
P874 Actual value description PI2	Actual speed
P875 Actual value description PI3	Output current

The process input data words can be allocated as follows:

Assignment	Description
No function	The content of the process input data word is 0000_{hex}.
Actual speed	Current actual speed value of the drive in min^{-1}
Output current	Present output current of the system in % of I_N
Active current	Present active current of the system in % of the nominal device current I_N • Positive algebraic sign corresponds to a positive torque. • Negative algebraic sign corresponds to a negative torque.
Actual position low [1]	Current actual position low word
Actual pos. high[1]	Current actual position high word
Status word 1	Status information of the device
Status word 2	Status information of the device
Actual speed [%]	Current actual speed value in % of the maximum speed n_{max}
IPOS PE data	Response of a 16-bit encoded value for an IPOS$^{PLUS®}$ application module
Status word 3	Status information of the device

1) The actual position is read in from the parameter P941 Source actual position. Both the low word and the high word must be set.

For more detailed information, refer to the "Fieldbus Device Profile with List of Parameters" manual.

P876 PO data enable

Setting range: **ON**/OFF

- Setting "**On**": The process output data that was last sent from the PLC becomes effective.
- Setting "Off": The last valid process output data remain in effect.

INFORMATION

If the process data assignment is changed, the parameter will automatically set to "Off".

16998413/EN – 12/2016

13.7.9 Parameter group 9: IPOS parameters

These parameters can only be used in connection with IPOS$^{PLUS®}$ application modules.

⚠ DANGER

Risk of crushing if the motor starts up unintentionally.

Fatal or severe injuries and damage to property.

- Ensure that the motor cannot start unintentionally.
- Note that modifying these parameters without knowledge of the IPOS$^{PLUS®}$ application module which may be active can cause unexpected movements and place unwanted loads on the mechanical drive train. It is essential that you are familiar with the "Positioning and process control with IPOS$^{PLUS®}$" manual to make the setting for these parameters.

P90. IPOS reference travel

The purpose of reference travel is to establish a machine zero to which all absolute positioning commands refer.

The parameter *P903 Reference travel type* (→ 🗎 233) specifies various reference travel strategies which define the corresponding travel modes. For example, if a reference travel is carried out with a reference cam, the machine zero is calculated as follows:

Machine zero = reference position + reference offset

The reference position is determined in the reference travel and the reference offset in the parameter *P900 Reference offset* (→ 🗎 232).

The speeds of the travel movements required on the basis of the reference travel type are set using *P901 Reference speed 1* (→ 🗎 232) and *P902 Reference speed 2* (→ 🗎 232).

16998413/EN – 12/2016

P900 Reference offset

Setting range: -(2^{31}-1) – **0** – (2^{31}-1)

Zero position correction for calculating the machine zero

All absolute positioning commands refer to the machine zero.

The machine zero is calculated as follows:

Machine zero = reference position + reference offset

The reference position is determined in the reference travel.

The reference offset always refers to the encoder. This encoder can be a motor encoder, an external encoder or a DIP encoder. Select the encoder in the parameter *P941 Source actual position* (→ 🗎 239).

The actual positions are displayed in the following IPOS$^{PLUS®}$ variables:

- The external encoder in the IPOS$^{PLUS®}$ variable *H510 Actual position*.
- The motor encoder in the IPOS$^{PLUS®}$ variable *H511 Actual position*.

Reference offset becomes active after reference travel has been completed successfully.

INFORMATION

In the case of a reference travel with HIPERFACE® encoder, the value of the parameter *P905 Hiperface-Offset (Motor)* is recalculated and overwritten as follows:

Hiperface-offset = encoder value - reference offset

P901 Reference speed 1

Setting range: 0 – **200** – 6000 min^{-1}

Specifies the travel speed for the first part of the reference travel until reaching the reference cam.

Stop ramp t13 (→ 🗎 197) is always used to change the speed. The search directions during reference travel are determined by the respective reference travel type.

P902 Reference speed 2

Setting range: 0 – **50** – 6000 min^{-1}

Specifies the travel speed for the second part of the reference travel from leaving the reference cam until reaching the first zero pulse.

Stop ramp t13 (→ 🗎 197) is always used to change the speed. The search directions during reference travel are determined by the respective reference travel type.

16998413/EN – 12/2016

P903 Reference travel type

Setting range: **0** – 8

Reference travel strategy with which the machine zero of a system is specified. This defines a travel mode for searching for a reference cam, for example.

This parameter also specifies the search direction for the reference cam in the individual referencing phases.

Use parameter *P904 Referencing to zero pulse* (→ 🗎 234) to determine if the reference travel takes place to the edge change of the reference cam or the next zero pulse of the encoder.

An operationally ready and enabled drive is prerequisite for carrying out the reference travel. The reference travel type 8 is an exception.

The following reference travel types are possible:

- Type 0: CCW zero pulse
  - First search direction: CCW
  - Reference point: CCW zero pulse from current position
  - Machine zero: Reference position + reference offset
- Type 1: CW end of the reference cam
  - First search direction: CCW
  - Reference point: First zero pulse or falling edge to the left of the reference cam
  - Machine zero: Reference position + reference offset
- Type 2: CW end of the reference cam
  - First search direction: CW
  - Reference point: First zero pulse or falling edge to the right of the reference cam
  - Machine zero: Reference position + reference offset
- Type 3: CW limit switch
  - First search direction: CW
  - Reference point: First zero pulse or falling edge to the left of the right limit switch
  - Machine zero: Reference position + reference offset
  - Reference travel should take place to zero pulse.
- Type 4: Limit switch left
  - First search direction: CCW
  - Reference point: First zero pulse or falling edge to the right of the left limit switch
  - Machine zero: Reference position + reference offset
  - Reference travel should take place to zero pulse.
- Type 5: No reference travel
  - Reference point: Current position (referencing with drive enable)
  - Machine zero: Reference offset
- Type 6: Reference cam flush with CW limit switch
  - First search direction: CW
  - Reference point: First zero pulse or falling edge to the left of the reference cam

16998413/EN – 12/2016

  - Machine zero: Reference position + reference offset
  - Reference cam and limit switches must be flush.
- Type 7: Reference cam flush with CCW limit switch
  - First search direction: CCW
  - Reference point: First zero pulse or falling edge to the right of the reference cam
  - Machine zero: Reference position + reference offset
  - Reference cam and limit switches must be flush.
- Type 8: Resetting of encoder position for drive not ready for operation
  - Reference point: Current position (referencing with drive enable)
  - Machine zero: Reference offset
  - Reference travel can take place when the drive is not enabled.

P904 Reference travel to zero pulse

Setting range: **Yes**/no

- Set to "**Yes**": Reference travel takes place to the zero pulse of the selected IPOS$^{PLUS®}$ encoder.
- Set to "No": Reference travel takes place to the falling edge of the reference cam.

P905 Hiperface offset (motor)

Setting range: -(2^{31} - 1) – **0** – (2^{31} - 1)

Specifies the zero point of the encoder display.

Use this parameter to define the machine zero without reference travel. It adds or subtracts the offset from the encoder value. The IPOS$^{PLUS®}$ variable *H511 Actual position* of the motor encoder is calculated directly after input of values as follows:

H511 = Encoder value - Hiperface-Offset

A HIPERFACE® multi-turn encoder must be referenced once, a HIPERFACE® single-turn encoder must always be referenced.

INFORMATION

In the case of a reference travel with HIPERFACE® encoder, the value of the parameter *P905 Hiperface-Offset (Motor)* is recalculated and overwritten as follows:

Hiperface-offset = encoder value - reference offset

P906 Cam distance

Contains the number of increments from leaving the reference cam to the zero pulse of the motor encoder. The parameter is displayed following successfully completed reference travel.

Ideally, the cam distance is half the encoder resolution after 4x evaluation. In order to approach the ideal case, you may have to adjust the cam.

P91. IPOS travel parameters

P910 Gain X controller

Setting range: 0.1 – **0.5** – 32

16998413/EN – 12/2016

Setting value for the P controller of the position control loop in the IPOS$^{PLUS®}$ application module

In the basic setting, the value of the parameter *P210 P-gain hold controller* (→ 🗎 201) is accepted.

P911/912 Positioning ramp 1/2

Setting range: 0.01 – **1** – 20 s

Value set for the ramp used during the positioning operation.

- The positioning ramp 1 is always used in the case of a sinusoidal or square ramp for acceleration and brake deceleration.
- In the case of a linear ramp, the brake deceleration is set depending on the ramp mode (→ 🗎 236).
  - If the ramp mode "Mode 1" is set, braking deceleration for travel to target position (spot braking) only takes place with positioning ramp 2. Positioning ramp 1 is used for all other positioning operations.
  - If the ramp mode "Mode 2" is set, positioning ramp 2 is always used during travel for brake deceleration when changing the travel speed. Positioning ramp 1 is used for acceleration.

P913/P914 Travel speed CW/CCW

Setting range: 0 – **1500** – 6000 min^{-1}

Speed used for positioning. It is limited by the maximum speed of the motor (→ 🗎 202).

INFORMATION

In order to prevent a lag error, always set the maximum speed about 10% greater than the travel speed.

P915 Velocity precontrol

Parameter is only in effect with the "linear" and "jerk limited" ramp types. The function has no effect for the ramp types "Sine" and "Squared".

Setting range: -199.99 – 0 – **100** – 199.99%

- Setting "**100%**": The drive runs optimally with regard to time using the linear velocity profile.
- If a value less than 100% is specified, a larger gap between position setpoint and actual position occurs (lag distance) during a positioning operation. This results in a "soft" run-in to the target position for the acceleration procedure.

16998413/EN – 12/2016

P916 Ramp type 

Specifies the type of positioning ramp. This influences the speed or acceleration characteristics during positioning.

The following ramp types are possible:

Ramp type	Positioning characteristics
Linear	Optimum time, however block-shaped acceleration characteristic
Squared	Softer acceleration, but higher torque demand than Ramp type "linear"
Sine	Very soft acceleration profile, but required torque higher than with "Squared" acceleration profile
Bus ramp	Setting for operation of the device with a PLC. The PLC generates a cyclical position setpoint that is written directly to the position controller. The ramp generator is deactivated. The position specifications sent cyclically by the PLC are interpolated linearly. For configuration, one process output data word must be set to "position high" and another one to "position low".
Jerk limitation	Based on the principle of the linear ramp, the torque and, therefore, the acceleration is trapezoidal. During acceleration, the torque is increased over time in linear form to the maximum value. In the same way, the torque is reduced again over time in linear form to zero. Consequently, the system experiences almost no vibration. If a jerk time is set, the positioning time extends relative to the linear ramp by the set jerk time (→ 🗎 238). The acceleration and torque do not increase in comparison with the linear ramp.

P917 Ramp mode

The parameter is only in effect with the "linear" ramp type.

Setting range: **Mode 1**/Mode 2

Determines use of the positioning ramp 2 (→ 🗎 235).

- Adjustment "**Mode 1**": Braking deceleration for travel to target position (spot braking) takes place only with positioning ramp 2. Positioning ramp 1 is used for all other positioning operations.

  If 12 bit or 16 bit position interpolation is active, it runs in mode 1 without dead time compensation.
- Adjustment "Mode 2": If the travel speed changes during travel, the positioning ramp 2 is always used for brake deceleration. Positioning ramp 1 is used for acceleration.

  If 12 bit or 16 bit position interpolation is active, it runs in mode 2 without dead time compensation.

16998413/EN – 12/2016

P918 Bus setpoint source

Setting range: 0 – **499** – 1023

Sets the source for the setpoint in the IPOS$^{PLUS®}$ application module when operating with EtherCAT®.

P92. IPOS monitoring

P920/P921 SW limit switch CW/CCW

The software limit switches are only monitored in IPOS$^{PLUS®}$ Operating modes.

Setting range: -(2^{31}-1) – **0** – (2^{31}-1)

Specifies the limits of the target range in the software in which the travel commands are still accepted.

If *P941 Source actual position* (→ 🗎 239) is set to "motor encoder" or "external encoder", then the software limit switches do not take effect until after performance of a reference travel.

If the target position *H492* of the current travel command is outside of the active software limit switch, the travel command is not executed. The drive responds accordingly to the error response set in the parameter *P838 Response 'SW limit switch'* (→ 🗎 226). If the error responses "../warning" or ".../error" are set, then error message "A1.F78" (IPOS SW limit switch) is displayed:

- Setting ".../error": After an error reset, the drive is no longer referenced with the incremental encoder. The software limit switches have no effect. They are only activated again after the drive has been referenced. A drive with absolute encoder, by contrast, remains referenced even after a fault reset.
- Setting ".../Warning": The drive remains referenced after an error reset. However, the drive can move past the target specified due to the mass moment of inertia of the machine or if the parameter settings are set incorrectly in the controller. Software limit switches cannot prevent this from happening.

For deactivation, both limit switches must be set to "0" (e.g. for continuous travel).

P922 Position window

Setting range: 0 – **50** – 32 767 incr.

Defines a distance range (position window) around the target position of a travel or stop command. The "Axis in position = Yes" condition applies if a drive is inside the position window around the current target position (*H492*). The "Axis in position" information is used as a final condition for waiting positioning commands.

P923 Lag error window

Setting range: 0 – **5000** – (2^{31}-1) incr.

Defines a permitted difference between the setpoint and actual position value. The lag error response that is set in the parameter *P834 Response to 'lag error'* (→ 🗎 225)is triggered upon exceeding.

The setting "0" deactivates the lag error monitoring.

16998413/EN – 12/2016

P924 Positioning interruption detection

Setting range: **On**/Off

Adjusts whether an interruption of the positioning process (withdrawal of enable) is monitored. The error response is set in the parameter *P839 Response to 'Positioning interruption'* (→ 🗎 226).

P93. IPOS Special functions

P930 Override

Setting range: On/**Off**

Enables the change to the travel speed of the positioning processes programmed in the IPOS$^{PLUS®}$ application module. The change occurs in the range from 0 – 150% of the respectively programmed velocity. This requires an analog input, with 0 – 150% corresponding to 0 – 10 V at the analog input. The maximum speed value is limited by the maximum speed of motor (→ 🗎 202).

P933 Jerk time

Setting range: **0.005** – 2 s

Duration of the torque build-up

If the jerk time is less than or equal to the positioning ramp 1 and 2 (→ 🗎 235), the positioning time extends relative to the linear ramp by the set jerk time. Otherwise, the torque build-up continues to be trapezoidal and the set jerk time does not correspond to the duration of the torque build-up.

P938/P939 IPOS speed task 1/task 2

Setting range: **0** – 9 additional assembler commands/ms

Increases the speed by up to 9 additional assembler commands per millisecond. The resources for the speed increase are divided between task1 and task2: Task1 and Task2 may be assigned together with 9 additional assembler commands per millisecond.

The default setting for task1 is "1" and "2" for task2. For example, a possible speed increase is:

Task 1 + 2 additional assembler commands/ms = 3 assembler commands/ms

Task 2 + 7 additional assembler commands/ms = 9 assembler commands/ms

16998413/EN – 12/2016

P94. IPOS encoder

P941 Source of actual position

Setting range: **Motor encoder**/Ext. Encoder

Defines the encoder to which the IPOS$^{PLUS®}$ application module positions.

P948 Automatic encoder replacement detection

The parameter is only effective with HIPERFACE® encoders.

Setting range: **On**/Off

- Setting "**On**:" A replaced HIPERFACE® encoder is detected. Reference travel is required before the "IPOS referenced" bit is set.
- Setting "Off": The HIPERFACE® encoder is always referenced. The "IPOS referenced" bit is set.

INFORMATION

If the parameter is switched off and on again, the "IPOS referenced" bit is set to "0" once you have restarted the device. Reference travel is necessary to reset the "IPOS referenced" bit to "1".

P96. IPOS Modulo function

These parameters serve for continuous positioning, such as in the case of rotary tables or chain conveyors. For more information, refer to the "MOVIDRIVE® MDX60B / 61B application "Modulo positioning"" manual

Note that the following prerequisite must be met:

$$\textit{Maximum target position} < \frac{2^{31}}{P963 \times P961}$$

19032235915

P960 Modulo function

Setting range: **Off**/short/CW/CCW

- Setting "**Off**": The modulo function is deactivated.
- Setting "Short": The "short travel" modulo function is active. The drive moves from the actual position to the target position taking the shortest possible route. Both directions of rotation are possible.
- Setting "CW": The "CW" modulo function is active. The drives moves from its actual position to the target position with a "CW" direction of rotation, even if this means moving a longer distance. The "CCW" direction of rotation is not possible.
- Setting "CCW": The "CCW" modulo function is active. The drives moves from its actual position to the target position with a "CCW" direction of rotation, even if this means moving a longer distance. The "CW" direction of rotation is not possible.

16998413/EN – 12/2016

P961 Modulo numerator

Setting range: **1** – (2^{31} - 1)

Simulation of the gear unit

The modulo numerator is calculated with the tooth numbers of gear unit and additional transmission as follows:

Modulo numerator = Numerator gear unit i × numerator additional transmission i

P962 Modulo denominator

Setting range: **1** – (2^{31} - 1)

Simulation of the gear unit

The modulo denominator is calculated with the tooth numbers of gear unit and additional transmission as follows:

Modulo denominator = Denominator gear unit i × denominator additional transmission i

P963 Modulo encoder resolution

Setting range: 1 – **4096** – 65535

Resolution of the selected IPOS$^{PLUS®}$ encoder system in increments

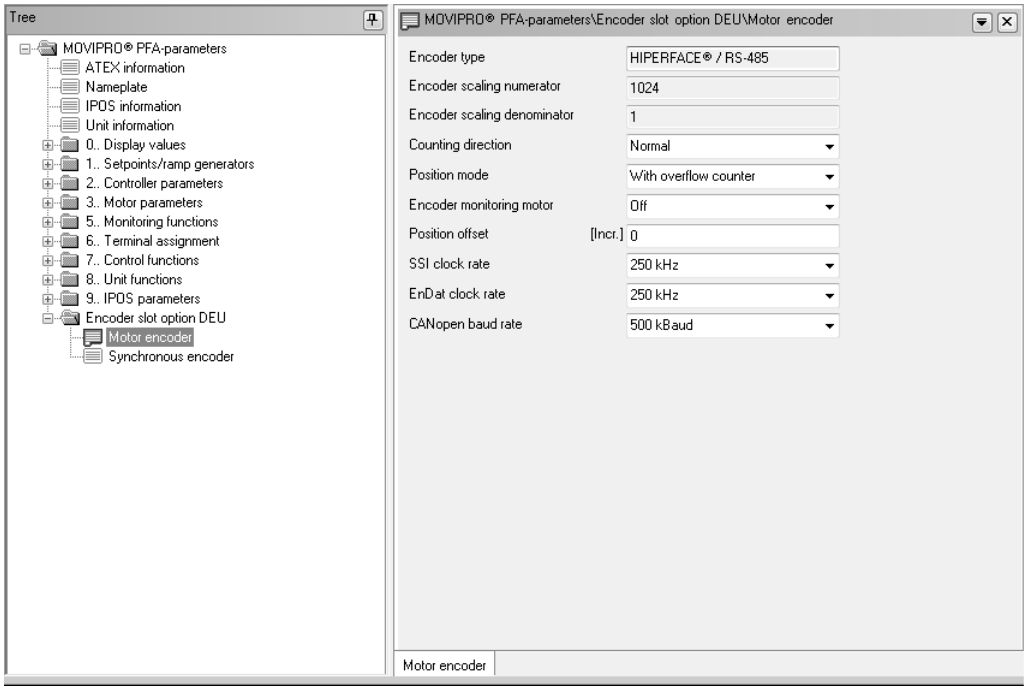
The IPOS$^{PLUS®}$ encoder resolution for positioning to the motor encoder will be set to 4096 increments (prerequisite is an encoder resolution of 512 to 2048).

16998413/EN – 12/2016

13.8 Parameter overview of encoder option

The encoder option is parameterized by the startup (→ 🗎 156). You have to specify the encoder connected to device and the corresponding resolution.

In addition, you can make adjustments in the parameter tree of the MOVITOOLS® MotionStudio engineering software, e.g. the counting direction or the clock frequency.



9007202284802059

Parameter	Description
Encoder type	Indicates the encoder set via the startup.
Encoder scaling numerator	Indicates the numerator of the encoder scaling set via the startup.
Encoder scaling denominator	Indicates the denominator of the encoder scaling set via the startup.
Counting direction	Defines the counting direction of the connected encoder. Note that the encoder must count positively when the motor shaft rotates clockwise.
Position mode	• Setting "With overflow counter": Encoder overflows are counted and an internal 32-bit position is generated in the device. • Setting "Single-turn absolute position": The position is displayed via a single-turn absolute encoder according to the encoder information. Encoder overflows are not counted. • Setting "Linear mode": The position is displayed according to the encoder information. Encoder overflows are not counted.

16998413/EN – 12/2016

Parameter	Description
Encoder monitoring motor/track	• Setting "On": A sin/cos or TTL encoder directly detects a wire break between the device and the encoder. In the case of a defective connection, the error message "A1.F14" (encoder) is displayed. The error message is also generated in the inhibited state of the device. • Setting "**Off**": A wire break between the device and encoder is not detected directly. If the speed monitoring is not deactivated, the error message "A1.F08" (speed monitoring) is displayed in the case of a defective connection. The error message is only generated in the enabled state of the device. **NOTE** If you use a HIPERFACE® encoder, encoder monitoring is always active regardless of the parameter setting.
Position offset	Setting range: -2^{31} – 0 – 2^{31}-1 The parameter has to be set only on rotary encoders. For other encoders, the parameter must be set to "0". **NOTE** In the case of a reference travel, the position value is automatically recalculated and overwritten.
SSI clock frequency	Setting range: 125, 250, 500, 1000, 2000 kHz Defines the clock frequency at which absolute encoder information is transmitted from the encoder to device.
EnDat clock frequency	Setting range: 125, 250, 500, 1000, 2000 kHz Defines the clock frequency at which absolute encoder information is transmitted from the encoder to device.
CANopen baud rate	Setting range: 125, 250, 500 kBaud, 1 MBaud Determines the transmission speed of the CAN bus.

16998413/EN – 12/2016

14 Service

14.1 Device replacement

The device allows for a quick device replacement. It is equipped with a replaceable SD memory card on which all device data is stored. If the device has to be replaced, the plant can be started up again quickly by simply exchanging the SD memory card.

14.1.1 Prerequisites for successful device replacement

Observe the following:

- The devices that you want to exchange must be identical. If the devices have different configurations, a successful device replacement cannot be guaranteed.
- You must save the data of the device to be replaced on the SD memory card **before** you replace the device. SEW-EURODRIVE recommends to always backup the data right after starting up a device.
- Insert or remove the SD memory card only when the device is switched off.
- With programmable devices, note that the status display depends on programming. The module for the data backup function (data management) must be integrated in the program.

14.1.2 Replacing the device

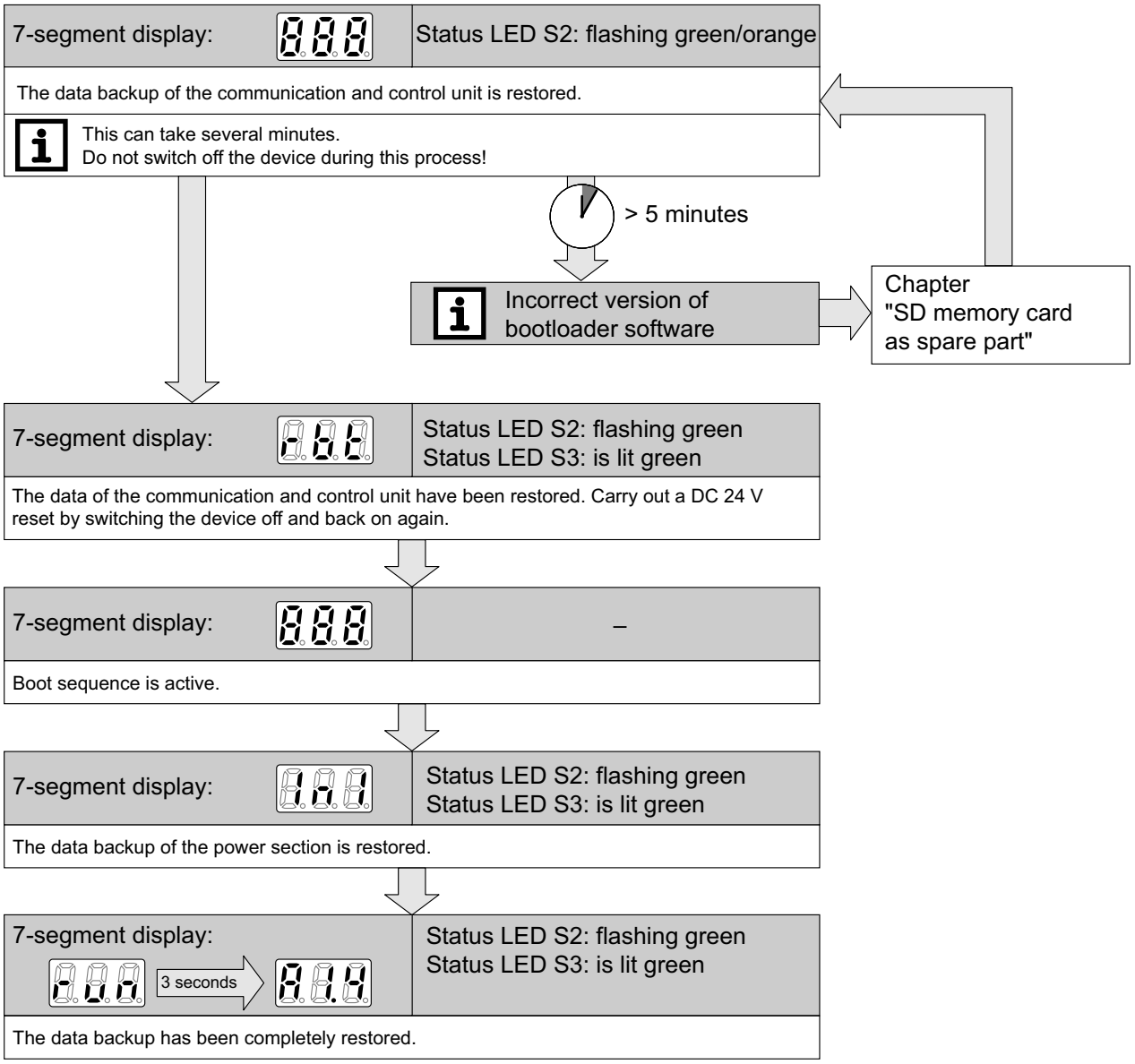
Proceed as follows:

1. Perform a data backup via MOVITOOLS® MotionStudio if you are not certain whether the current device parameterization is stored on the SD memory card.
2. Disconnect the device from the supply system.
3. Remove it from the system.
4. Remove the memory card cover from the housing cover.
5. To do so, remove the SD memory card from the device to be replaced.
6. Insert the SD memory card into the new device.
7. Install the new device in the plant. Connect it to the supply system.
8. Switch on the new device.

INFORMATION

The device performs several initialization steps. Do not switch off the device during this time.

16998413/EN – 12/2016



27021599717141259

- The parameters saved on the SD memory card are now available again. If a different parameter set is needed for the new device, change the parameter set now. Back up the changed data on the SD memory card again after startup.
- For applications with encoders, observe the chapter "Reference travel after device or encoder replacement" (→ 🗎 246).

16998413/EN – 12/2016

14.1.3 SD memory card as spare part

If you have ordered an SD card as spare part, it is possible that the versions of the bootloader software are different for the SD memory card and your device.

In this case, the device remains in the following state **for more than 5 minutes**:

7-segment display	Status LED S2
8.8.8 flashing	Flashing green/orange

Proceed as follows:

1. Disconnect the device from the supply system.
2. Unscrew the memory card cover.
3. Remove the SD memory card.
4. Connect an SD card reader to your PC.
5. Insert the SD memory card in the SD card reader. On your PC, go to [Computer] > [SD] > [System] > "BootConfig.cfg".
6. Open the file "BootConfig.cfg" with a text editor.
7. Search the file for the following expression:

   ```
   <!-- Confirm bootloader update with reset button? -->
   <ConfirmBlUpdateWithResetBtn>true</ConfirmBlUpdateWithReset-
   Btn>
   ```

8. Change the value "`true`" to the value "`false`" for the parameter.

   The expression must now be:

   ```
   <ConfirmBlUpdateWithResetBtn>false</ConfirmBlUpdateWithReset-
   Btn>
   ```

9. Save the file.
10. In the status bar, click [Safely remove hardware]. As soon as the PC confirms this, you can remove the SD memory card from the SD card reader.
11. Insert the SD memory card into the slot of the device and screw the memory card cover back on.
12. Connect the device to the supply system.
13. Observe the instructions in chapter "Device replacement" (→ 🗎 243) from step 8 onwards.

16998413/EN – 12/2016

14.2 Reference travel after device or encoder replacement

14.2.1 Incremental encoder

If incremental encoders are used for positioning, a reference travel must be performed after device startup. This way, no special measures are required.

14.2.2 Absolute encoder

The device stores the position of absolute encoders with 32 bit. This allows for representing a larger absolute area than with an encoder with typical 12 bits in the single-turn range and 12 bits in the multi-turn range.

Perform a reference travel if you replaced the encoder.

14.2.3 Linear encoder systems

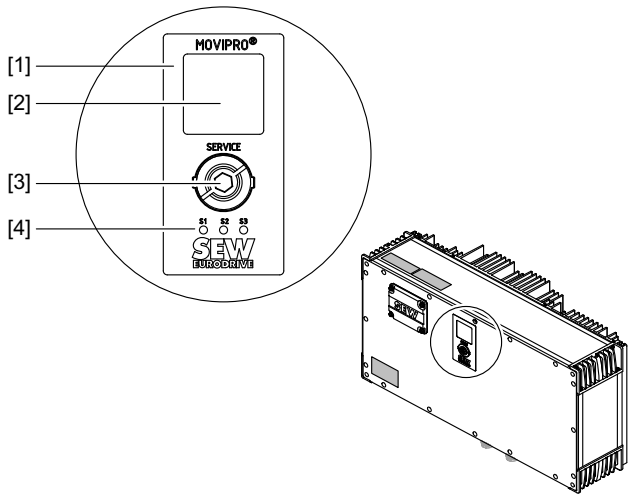
If you replace an absolute linear encoder system without encoder overflow in such a way that the encoder system provides the same values as before the replacement, a reference travel is not required.

14.2.4 HIPERFACE® encoders

With HIPERFACE® encoders, you can use parameter *P948* to specify whether or not a reference travel is required after an encoder replacement.

14.3 Service unit

The service unit is used for startup, diagnostics and maintenance of the device. It is equipped with a status display and an Ethernet service interface. The following figure shows the service unit:



27021606021937419

[1] Service unit
[2] Status display
[3] Ethernet service interface (Ethernet RJ45)
[4] Status LEDs

The status display and status LEDs display status and error messages and thus enable you to record the current state of the device.

16998413/EN – 12/2016

14.3.1 Ethernet service interface

The Ethernet service interface connects the device with an engineering PC for configuration and maintenance purposes.

Tools required

Wrench with wrench size 8

Required material

Ethernet cables with RJ45 plug connectors

Connecting the engineering PC with the Ethernet service interface

1. Remove the screw plug using the wrench.
2. Plug an RJ45 plug connector of the Ethernet cable into the Ethernet service interface.
3. Plug the other RJ45 plug connector of the Ethernet cable into the Ethernet service interface of the engineering PC.

Addresses

- Standard IP address: 192.168.10.4
- Subnet mask: 255.255.255.0

16998413/EN – 12/2016

14.4 List of power section errors

The factory set error response is listed in the "Response (P)" column. "(P)" means that the response can be set with parameter *P83_error response*.

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
00	No fault					
01	Overcurrent	Immediate stop	0	Output stage	• Short circuit at output • Motor too large • Defective output stage • Ramp limit is deactivated and set ramp time is too short • Braking resistance value too low • Short circuit in the braking resistor circuit	• Eliminate short circuit • Connect a smaller motor • Contact SEW-EURODRIVE Service if the output stage is defective • Extend the ramp time • Check technical data of braking resistor • Check braking resistor supply cable
			1	V_{CE} monitoring or undervoltage monitoring of the gate driver		
			5	Inverter remains in hardware current limit		
03	Ground fault	Immediate stop	0			
04	Brake chopper	Immediate stop	0	DC link voltage too high in 4Q operation.	• Too much regenerative power • Interruption in braking resistor circuit • Short circuit in the braking resistor circuit • Braking resistance too high • Brake chopper defective	• Extend deceleration ramps • Check supply cable to braking resistor • Check technical data of braking resistor • Replace device if the brake chopper is defective
			1			
06	Line phase failure	Immediate stop	0	DC link voltage periodically too low	Phase failure	Check the supply system cable
07	DC link overvoltage	Immediate stop	0	DC link voltage too high in 2Q operation	DC link voltage too high	• Extend deceleration ramps • Check supply cable to the braking resistor • Check technical data of braking resistor
			1			

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
08	Speed monitoring	Immediate stop (P)	0	Inverter in current limiting or in slip limit	• Speed/current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase failure in the supply system or motor • Encoder not connected correctly or incorrect direction of rotation • n_{max} is exceeded during torque control. • In VFC operating mode: Output frequency > 150 Hz • In V/f operating mode: Output frequency > 600 Hz	• Reduce load • Increase delay time setting (*P501/ P503*). • Check encoder connection, swap A/A and B/B pairs if necessary • Check the voltage supply of the encoder • Check current limiting • Extend ramps if necessary • Check motor cable and motor • Check line phases
			3	"Actual speed" system limit exceeded Speed difference between ramp setpoint and actual value for 2 × ramp time higher than expected slip		
			4	Maximum rotating field speed exceeded Maximum rotating field frequency (with VFC max 150 Hz and V/f max 600 Hz) exceeded		
09	Startup	Immediate stop	0	Startup missing	The inverter has not been started up for the selected operating mode or the encoder data has not been loaded yet.	Perform the startup for the respective operating mode or start up the encoder.
			1	Wrong operating mode selected		
			2	Wrong encoder type or defective encoder card		
10	IPOS®-IL-LOP	Emergency stop	0	Invalid IPOS$^{plus®}$ command	• Incorrect command detected during running of IPOS$^{plus®}$ program • Incorrect conditions during command execution	• Check content of program memory and correct if necessary • Load the correct program into the program memory • Reload the application module
11	Overtemperature	Emergency stop (P)	0	Heat sink temperature too high or defective temperature sensor	Thermal overload of inverter	Reduce load and/or ensure adequate cooling
			3	Overtemperature switched-mode power supply		

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
14	Encoder	Immediate stop	0	Encoder not connected, defective encoder, defective encoder cable	• Encoder cable or shield not connected correctly • Short circuit/wire break in encoder cable • Encoder defective	Check encoder cable and shield for correct connection, short circuit and wire breaks.
			25	Motor encoder error – Speed range exceeded Encoder on motor encoder exceeds 6542 min^{-1}		
			26	Motor encoder error – Card is defective Error in the quadrant evaluation		
			27	Encoder error – encoder connection or encoder is defective		
			28	Motor encoder error – Communication error RS485 channel		
			29	External encoder error – Communication error RS485 channel		
			30	Unknown encoder type on the external encoder/ motor encoder		
			31	Plausibility error of HIPERFACE® on the external encoder/motor encoder Increments have been lost.		

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
14	Encoder	Immediate stop	32	HIPERFACE® encoder on motor encoder reports an error	• Encoder cable or shield not connected correctly • Short circuit/wire break in encoder cable • Encoder defective	Check encoder cable and shield for correct connection, short circuit and wire breaks.
			33	HIPERFACE® encoder on external encoder reports an error		
			34	Encoder fault motor encoder resolver Encoder connection or encoder is defective		
17	System error	Immediate stop	0	"Stack overflow" error	Inverter electronics disrupted, possibly due to EMC influences	• Check grounding and shielding and improve, if necessary • Contact SEW-EURODRIVE Service if the error reoccurs
18			0	"Stack underflow" error		
19			0	"External NMI" error		
20			0	"Undefined opcode" error		
21			0	"Protection fault" error		
22			0	"Illegal word operand access" error		
23			0	"Illegal instruction access" error		
24			0	"Illegal external bus access" error		

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
25	EEPROM	Rapid stop	0	Read or write error on EEPROM power section	Error while accessing EEPROM	• Restore factory settings, perform reset and reset parameters • Contact SEW-EURODRIVE Service if the error reoccurs
			11	NV memory read error Internal NVRAM		
			13	NV memory chip card System module defective		
			14	NV memory chip card Memory card defective		
			16	NV memory initialization error		
26	External terminal	Emergency stop (P)	0	External terminal	Read external error signal via programmable input	Eliminate respective cause; reprogram terminal if necessary
27	No limit switches	Emergency stop	0	Limit switches missing or wire break	• Open circuit/both limit switches missing • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches • Swap limit switch connections • Reprogram terminals
			2	Limit switches reversed		
			3	Both limit switches are active simultaneously		
29	Limit switch reached	Emergency stop	0	HW limit switch reached	A limit switch has been reached in IPOS$^{plus®}$ operating mode (only with application module).	• Check travel range • Correct user program
30	Emergency stop timeout	Immediate stop	0	Timeout stop emergency stop rate	• Drive overloaded • Emergency stop ramp too short	• Check configuration • Extend emergency stop ramp

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
31	TF/TH trigger	No response (P)	0	Thermal motor protection error	• Motor too hot, TF/TH has triggered • TF/TH of the motor not connected or connected incorrectly • Device connection and TF/TH connection on motor interrupted	• Let motor cool off and reset error • Check connections/link between device and TF/TH • Set *P835* to "No response"
32	IPOS® index overflow	Emergency stop	0	IPOS$^{plus®}$ program faulty	Programming principles violated leading to system internal stack overflow	Reload the application module
34	Ramp timeout	Immediate stop	0	Timeout rapid stop ramp	Downward ramps timeout, e.g. due to overload.	• Extend the downwards ramps • Eliminate overload
35	Operating mode	Immediate stop	0	Operating mode not available	Operating mode not defined or defined incorrectly	Use *P700*/*P701* to set correct operating mode
			1	Incorrect assignment of operating mode and hardware		
37	System watchdog	Immediate stop	0	"System watchdog overflow" error	Error while executing system software	Contact SEW-EURODRIVE Service
38	System software	Immediate stop	0	"System software" error	System error	Contact SEW-EURODRIVE Service
39	Reference travel	Immediate stop (P)	0	"Reference travel" error	• The reference cam is missing or does not switch • Limit switches are connected incorrectly • Reference travel type was changed during reference travel	• Check reference cams • Check limit switch connection • Check reference travel type setting and required parameters
40	Boot synchronization	Immediate stop	0	Timeout during boot synchronization	Error during boot synchronization between inverter and option.	Contact SEW-EURODRIVE Service if the error reoccurs
41	Watchdog option	Immediate stop	0	Error – Watchdog timer from/to option.	Error in communication between system software and option software	Contact SEW-EURODRIVE Service

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
42	Lag error	Immediate stop (P)	0	Positioning lag error	• Rotary encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrectly set speed controller parameters • Value of lag error tolerance too small	• Check rotary encoder connection • Extend ramps • Set P component to higher value • Set speed controller parameters again • Increase lag error tolerance • Check wiring of encoder, motor and line phase • Make sure mechanical parts can move freely, check whether they are blocked
43	Manual mode timeout	Immediate stop (P)	0	Manual mode timeout	Manual mode not completed correctly.	a) Activate manual mode. ⇨ Manual mode was completed correctly.
44	Device utilization	Immediate stop	0	Device utilization error	Device utilization (IxT value) > 125%	• Decrease power output • Extend ramps • If suggested actions are not possible, use a larger inverter • Reduce load
			8	U_L monitoring error		
45	Initialization	Immediate stop	0	General error during initialization	No parameters set for EEPROM in power section, or parameters set incorrectly	Restore delivery state (*P802*) If error cannot be reset afterwards, contact SEW-EURODRIVE Service
			3	Data bus error during RAM check		
			6	CPU clock error		
			7	Error in the current detection		
			10	Error when setting flash protection		
			11	Data bus error during RAM check		

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
47	System bus 1 timeout	Rapid stop (P)	0	Timeout system bus CAN1	Error during communication via system bus 1.	Check system bus connection
57	TTL encoder	Immediate stop	1	TTL encoder: Wire break		
			512	TTL encoder: Error in amplitude control		
			541	TTL encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.
			16385	TTL distance encoder: Wire break		
			16896	TTL distance encoder: Error in amplitude control		
			16898	TTL distance encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.
58	Sin/cos encoder	Immediate stop	1	Sin/cos encoder: Wire break		
			512	Sin/cos encoder: Error in amplitude control		
			514	Sin/cos encoder: Track signal error		
			515	Sin/cos encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.
			16385	Sin/cos distance encoder: Wire break		
			16896	Sin/cos distance encoder: Error in amplitude control		
			16898	Sin/cos distance encoder: Track signal error		
			16899	Sin/cos distance encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
59	Encoder communication	Rapid stop	1	Hiperface® encoder: Track signal error		
			2	Hiperface® encoder: Calibration error	Incorrect calibration of encoder	• Restore delivery state (*P802*) • Repeat encoder startup
			16	Hiperface® encoder: Communication error	Device and HIPERFACE® encoder connection interrupted	Check wiring
			64			
			128			
			192			
			256			
			320			
			384			
			448			
			512			
			576			
			1024	EnDat encoder: Communication error	Device and EnDat encoder connection interrupted	Check wiring
			1088			
			1152			
			1216			
			1280			
			1388			
			16385	HIPERFACE® distance encoder: Track signal error		
			16386	HIPERFACE® distance encoder: Calibration error	Incorrect calibration of encoder	• Restore delivery state (*P802*) • Repeat encoder startup

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
59	Encoder communication	Rapid stop	16400	HIPERFACE® distance encoder: Communication error	Device and HIPERFACE® distance encoder connection interrupted	Check wiring
			16448			
			16512			
			16576			
			16640			
			16704			
			16768			
			16832			
			17408	EnDat distance encoder: Communication error	Device and Endat distance encoder connection interrupted	Check wiring
			17472			
			17536			
			17600			
			17664			
			17772			
77	IPOS® control word	No response (P)	0	Invalid IPOS$^{plus®}$ control word	**Only in IPOS$^{plus®}$ operating mode:** • An attempt was made to set an invalid automatic mode (via external controller). • "P916 = Bus ramp" is set	• Check serial connection to external controller • Check write values of external controller • Set correct value for *P916*
78	IPOS® software limit switch	No response (P)	0	Software limit switch reached	**Only in IPOS$^{plus®}$ operating mode:** Programmed target position is outside travel range delimited by software limit switches	• Check user program • Check position of software limit switches
80	RAM test	Immediate stop	0	"RAM test" error	Internal device error, memory defective	Contact SEW-EURODRIVE Service

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
81	Start condition	Immediate stop	0	Start condition error with "VFC & hoist"	**Only in "VFC & hoist" operating mode:** The motor could not be supplied with the correct amount of current during the pre-magnetization time: • Nominal motor power too small in relation to rated inverter power • Motor cable cross section too small	• Check startup data and perform new startup, if necessary • Check connection between inverter and motor • Check cross section of motor cable and increase if necessary
82	Open output	Immediate stop	0	Output open with "VFC & hoist"	**Only in "VFC & hoist" operating mode:** • 2 or all output phases interrupted • Nominal motor power too small in relation to rated inverter power	• Check connection between inverter and motor • Check startup data and perform new startup, if necessary
84	Motor protection	Emergency stop (P)	0	"Motor temperature simulation" error	• Motor utilization too high • I_N-U_L monitoring triggered • *P530* set later to "KTY"	• Reduce load • Extend ramps • Observe longer pause times • Check *P345*/*P346* • Select a larger motor
			2	Short circuit or wire break in the temperature sensor		
			3	No thermal motor model available		
			4	U_L monitoring error		
			11	Temperature sensor short circuit		
86	Power section memory	Immediate stop	0	Error during connection with the memory	• The parameter data of the power section are inconsistent. • The memory is defective.	Restore the delivery state of the device. If this does not rectify the fault, replace the device.
88	Flying start	Immediate stop	0	"Flying start" error	**Only in "VFC n-control" mode:** Actual speed > 6000 min^{-1} when inverter enabled	Enable not unless actual speed ≤ 6000 min^{-1}

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
94	EE-ROM checksum	Immediate stop	0	Power section parameters	Inverter electronics disrupted, possibly due to effect of EMC influence or a defect.	Send the device to SEW-EURODRIVE for repair.
			5	Control unit data		
			6	Power section data		
			7	Invalid version of the configuration data set		
97	Copy error	Immediate stop	0	Parameter set upload is/was faulty	• Error during data transmission • Memory can neither be written nor read	• Repeat copying process • Restore delivery state (*P802*) and repeat copying process
			1	Parameter set download to device cancelled		
			2	Not possible to adopt parameters		
98	CRC error	Immediate stop	0	"CRC via internal flash" error	Internal device fault Flash memory defective	Send the device to SEW-EURODRIVE for repair.
99	IPOS® ramp calculation	Immediate stop	0	"Ramp calculation" error	**Only in IPOS$^{plus®}$ operating mode:** Positioning ramp is sinusoidal or square and an attempt is made to change ramp times and traveling velocities with enabled inverter.	Rewrite the IPOS$^{plus®}$ program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.
100	Vibration warning	Display error (P)	0	Vibrations diagnostics warning	Vibration sensor warning (see "DUV10A" operating instructions)	• Determine cause of vibrations • Continue operation until F101 occurs
101	Vibration error	Rapid stop (P)	0	Vibration diagnostics error	Vibration sensor signals fault	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately.
102	Oil aging warning	Display error (P)	0	Oil aging warning	Warning signal from the oil aging sensor.	Schedule oil change
103	Oil aging error	Display error (P)	0	Oil aging error	Error message from the oil aging sensor.	SEW-EURODRIVE recommends that you change the gear unit oil immediately.
104	Oil aging overtemperature	Display error (P)	0	Oil aging overtemperature	Overtemperature signal from the oil aging sensor.	• Let oil cool down • Check if the gear unit cools properly

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
105	Oil aging ready signal	Display error (P)	0	Oil aging ready signal	Oil aging sensor is not ready for operation	• Check voltage supply of oil aging sensor • Check and, if necessary, replace the oil aging sensor
106	Brake wear	Display error (P)	0	Brake wear	Brake lining worn down	Replace brake lining (see operating instructions of the motor)
110	Fault "Ex-e protection"	Emergency stop	0	Duration of operation below 5 Hz exceeded	Duration of operation below 5 Hz exceeded	• Check configuration • Shorten duration of operation below 5 Hz

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
111	Internal "Timeout" error	Rapid stop/ warning	0	Communication error with the power section	Not able to establish a connection with the "PFA-..." power section (connection failed).	**When using the application module "Transparent 3PD"** • In MOVITOOLS® MotionStudio, right-click the device. • Choose [Application modules] > [Application Configurator]. • Choose [Open configuration from controller]. Check the following settings, and adjust them, if necessary: – Controller interface = SBUS_1 – Axis address = 20 – Device type = MOVIPRO LT **When using other application modules** • In MOVITOOLS® MotionStudio, right-click the power section of your device. • Choose [Technology Editor] > [Drive start-up for MOVI-PLC/ CCU] and start up the drive.
116					The existing connection to the "PFA-..." power section was interrupted.	

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
122	Absolute encoder	Immediate stop	1	Plausibility check		Check to cables of the sine tracks or replace the encoder.
			2	Hiperface® encoder: Unknown encoder type		
			3	Hiperface® encoder: Corrupt encoder nameplate data		
			32	HIPERFACE® encoder: internal encoder fault		Replace the encoder.
			33	Hiperface® encoder: Analog voltages not within tolerance		
122	Absolute encoder	Immediate stop	34	HIPERFACE® encoder: internal encoder fault		Replace the encoder.
			35			
			36			
			37			
			38			
			39			
			40			
122	Absolute encoder	Immediate stop	41	Hiperface® encoder: Communication error	Device and HIPERFACE® encoder connection interrupted	Check the wiring.
			42			
			43			
			44			
			45			
122	Absolute encoder	Immediate stop	46	HIPERFACE® encoder: internal encoder fault		Replace the encoder.
			47			
			48			
			49			
			50			

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
122	Absolute encoder	Immediate stop	60	Hiperface® encoder: Analog voltages not within tolerance		
			61	Hiperface® encoder: Critical transmitter current	• Dirt • Transmitter broken	Replace the encoder.
			62	Hiperface® encoder: Critical encoder temperature		Replace the encoder.
			63	Hiperface® encoder: Position error	Speed too high, position cannot be created	Reduce the speed.
122	Absolute encoder	Immediate stop	64	HIPERFACE® encoder: internal encoder fault		Replace the encoder.
			65			
			66			
			67			
122	Absolute encoder	Immediate stop	256	SSI encoder: Voltage dip	Drop in DC 12 V supply voltage	Check the supply voltage of the encoder.
			257	SSI encoder: Interrupted clock or data line		Check connection to encoder.
			258	SSI encoder: Change of position		
122	Absolute encoder	Immediate stop	259	SSI encoder: Insufficient clock frequency		Increase clock frequency.
			260	SSI encoder: Encoder signals programmable error		Check the encoder parameterization.
			261	SSI encoder: no high level available		• Replace the encoder. • Contact the SEW-EURODRIVE Service.

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
122	Absolute encoder	Immediate stop	513	EnDat encoder: Plausibility check		
			514	EnDat encoder: internal encoder error		Replace the encoder.
			515			
			516			
			544			
			576	EnDat encoder: internal encoder warning		Check the encoder parameterization.
122	Absolute encoder	Immediate stop	768	CANopen encoder: PDO timeout	No PDO data from CANopen encoder	• Check the interface. • Check the configuration.
			769	CANopen encoder: Encoder signals programmable error		Check the encoder parameterization.
			770	CANopen encoder: Change of position		
122	Absolute encoder	Immediate stop	771	CANopen encoder: Emergency signal		Check the encoder.
			772	CANopen encoder: internal encoder error		Replace the encoder.
			773			
			774			
122	Absolute encoder	Immediate stop	16385	HIPERFACE® distance encoder: Plausibility check		
			16386	HIPERFACE® distance encoder: Unknown encoder type		
122	Absolute encoder	Immediate stop	16387	HIPERFACE® distance encoder: Corrupt encoder nameplate data		
			16417	HIPERFACE® distance encoder: Analog voltages not within tolerance		

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
122	Absolute encoder	Immediate stop	16418	HIPERFACE® distance encoder: internal encoder fault		Replace the encoder.
			16419			
			16420			
			16421			
			16422			
			16423			
			16424			
122	Absolute encoder	Immediate stop	16425	HIPERFACE® distance encoder: Communication error	Device and HIPERFACE® encoder connection interrupted	Check the wiring.
			16426			
			16427			
			16428			
			16429			
122	Absolute encoder	Immediate stop	16430	HIPERFACE® distance encoder: internal encoder fault		Replace the encoder.
			16431			
			16432			
			16433			
			16434			
122	Absolute encoder	Immediate stop	16444	HIPERFACE® distance encoder: Analog voltages not within tolerance		
			16445	HIPERFACE® distance encoder: Critical transmitter current	• Dirt • Transmitter broken	Replace the encoder.
122	Absolute encoder	Immediate stop	16446	HIPERFACE® distance encoder: Critical encoder temperature		Replace the encoder.
			16447	HIPERFACE® distance encoder: Position error	Speed too high, position cannot be created	Reduce the speed.
122	Absolute encoder	Immediate stop	16448	HIPERFACE® distance encoder: internal encoder fault		Replace the encoder.
			16449			
			16450			
			16451			

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
122	Absolute encoder	Immediate stop	16640	SSI distance encoder: Error message of encoder, error bit of encoder set	Code tape or mirror dirty	Remove dirt.
					Code tape/mirror and encoder not aligned correctly	Check the alignment and orientation of the code tape/mirror to the encoder.
					EMC interference due to incorrect encoder installation	Check for EMC-compliant installation of the encoder.
					Supply voltage error	Check the supply voltage of the encoder.
					Incorrect mode set in the encoder	Set mode "24bit + err".
122	Absolute encoder	Immediate stop	16641	SSI distance encoder: Interrupted clock or data line		Check connection to SSI distance encoder.
			16642	SSI distance encoder: Change of position		
			16643	SSI distance encoder: Insufficient clock frequency		Increase clock frequency.
122	Absolute encoder	Immediate stop	16644	SSI distance encoder: Encoder signals programmable error		Check the encoder parameterization.
			16645	SSI distance encoder: No high level present		• Replace encoder • Contact SEW-EURODRIVE Service
			16897	EnDat distance encoder: Plausibility check		
122	Absolute encoder	Immediate stop	16898	EnDat distance encoder: internal encoder error		Replace the encoder.
			16899			
			16900			
			16928			

16998413/EN – 12/2016

Code	Meaning	Response (P)	Sub-code	Meaning	Possible cause	Measure
122	Absolute encoder	Immediate stop	16960	EnDat distance encoder: internal encoder warning		Check encoder parameterization
			17152	CANopen distance encoder: PDO timeout	No PDO data from CANopen distance encoder	Check interface or configuration
			17153	CANopen distance encoder: Encoder signals programmable error		Check encoder parameterization
122	Absolute encoder	Immediate stop	17154	CANopen distance encoder: Change of position		
			17155	CANopen distance encoder: Emergency signal		Check the encoder.
			17156	CANopen distance encoder: internal encoder error		Replace the encoder.
			17157			
			17158			
123	Positioning interruption	Emergency stop (P)	0	"Positioning/Positioning interruption" error	Interrupted positioning (e.g. unintentional bounce of enable) and thus exceeding the target position	Avoid bounce of the enable: Configure the application with a linear ramp instead of a non-linear ramp (→ *P916* Ramp type)

16998413/EN – 12/2016

Index

Icons

"Explicit messages" error code 85
- Due to timeout 89
- General error codes 87
- MOVILINK®-specific 88

Numerical

7-segment display 246

A

Access to device parameters
- Reading parameters (RSLogix 5000) 53
- Reading parameters (Studio 5000 Logix Designer) 62
- Writing parameters (RSLogix 5000) 57
- Writing parameters (Studio 5000 Logix Designer) 66

Actual speed value, parameter for scaling 227
Additional documents 10
Address Editor
- Advantages 30
- Designated use 30
- IP address Ethernet node 147
- Searching Ethernet nodes 146
- Starting 145

Address range Modbus/TCP 101
Analog setpoints, parameters 193
Application Configurator 17
- Adding axes 178
- Advantages 17
- Axis configuration 178
- Configuring CCU application module 130
- Configuring regenerative power supply 132
- Creating a new configuration 176
- Load configuration into the device 180
- Starting 174

Application modules
- Advantages 15
- Designated use 15
- For communication and control unit 18
- for power section 20
- MOVIPRO® ADC 17
- MOVIPRO® SDC 17

Auto-crossing 31
Automotive AMA0801
- IPOSPLUS® application module 24
- Process data 138

Auto-negotiation 31

B

Brake function, parameter 219
Braking operation, parameter 223
Bus diagnostics, parameter 195
Bus positioning
- CCU application module 19
- IPOSPLUS® application module 21
- Process data 129, 136

C

CCU application module
- Bus positioning 19
- Configure 130
- Process data for "Bus positioning" 129
- Process data for "Rapid/creep speed positioning" 128
- Process data for "Transparent 6PD" 127
- Process data for "Velocity control" 128
- Rapid/creep speed positioning 18
- Transparent 6PD 18
- Velocity control 18

CIP
- Assembly object 75
- Directory of objects 72
- EtherNet link object 84
- Identity object 73
- Message router object 74
- Parameter object 79
- Register object 76
- TCP/IP interface object 83
- Vardata object 82

Common Industrial Protocol, see CIP 72
Communication and control unit
- Application modules 18
- Gateway operation 20, 174
- Parameterizing 174
- Perform startup 174

Communication ports 151
Communication type
- Configuring Ethernet communication 148

16998413/EN – 12/16

Components
Service unit ... 246
Configuration
EtherNet/IP™ master ... 39
Modbus/TCP master ... 90
Configuration example EtherNet/IP™
Accessing parameters ... 52
Configuring process data exchange ... 48, 50
Reading parameters (RSLogix 5000) ... 53
Reading parameters (Studio 5000 Logix Designer) ... 62
Writing parameters (RSLogix 5000) ... 57
Writing parameters (Studio 5000 Logix Designer) ... 66
Configuration example Modbus/TCP
Accessing parameters ... 99
Configuring process data exchange ... 94
Data exchange ... 95
Exchanging process data ... 96
Configuration sequence ... 155
Configuring regenerative power supply ... 132
Connecting the device with the PC
Via Ethernet ... 144
Connection management Modbus/TCP ... 108
Control word
MOVIPRO® ADC ... 123
MOVIPRO® SDC ... 119
Copyright notice ... 10

D

Data backup
Storing device data ... 183
via PLC process data specification ... 125
Data management
Storing device data ... 183
via PLC process data specification ... 125
Device
Change of the ... 243
Fault codes ... 248
Device data
Parameter ... 194
Secure ... 183
Device description file
EtherNet/IP™ ... 39
Modbus/TCP ... 90
Device Level Ring network, see DLR network ... 46
Device replacement ... 243
Device status ... 37, 38
DHCP
Deactivate/Activate ... 30
Description ... 28
Digital inputs, parameter ... 194, 215
Direction of motor rotation, parameter ... 208
DLR grid
Rectifying ring faults ... 46
Ring fault detection ... 46
Topology ... 46
DLR network
Configuring hardware/software ... 47
Documentation, additional ... 10
Documents, additional ... 10
Dynamic Host Configuration Protocol, see DHCP ... 28

E

EDS file, see device description file ... 39
Embedded safety notes ... 9
Encoder
CANopen encoder, enabled ... 158
Change of the ... 246
HIPERFACE® encoder, enabled ... 158
Parameter ... 241
Perform startup ... 156
SSI encoder, enabled ... 156
Encoder replacement ... 246
Energy-saving function, parameter ... 221
Engineering, MOVITOOLS® MotionStudio ... 139
Error code of "explicit messages" ... 85
Due to timeout ... 89
General error codes ... 87
MOVILINK®-specific ... 88
Error codes Modbus/TCP ... 113
Error responses, parameter ... 224
Ethernet communication ... 148
Ethernet Industrial Protocol, see EtherNet/IP™ ... 71
Ethernet interface ... 246
Ethernet net
Ethernet switch ... 31
MOVIPRO® connection ... 31
Network topologies ... 31
Plug connector ... 32, 33
Shielding and routing bus cables ... 28

16998413/EN – 12/16

Ethernet nodes
Adjusting the IP address 147
Search 146
Ethernet plug connector 32, 33
Ethernet service interface 247
Ethernet switch 31
Auto-crossing 31
Auto-negotiation 31
Multicast handling 31
EtherNet/IP™
CIP objects 72
Configuration 39
Configuring master 39
Description 71
Device description file 39
DLR topology 46
EDS file 39
Process data exchange 71
Project planning examples 48, 50, 52
Return codes for parameter setting 85
Startup 39
Technical data of interface 89
Timeout behavior 72
EtherNet/IP™ master
Configuration with RSLogix 5000 40
Configuration with Studio 5000 Logix Designer .. 43
EtherNet/IP™ scanner, see EtherNet/IP™ master .. 39
Exclusion of liability 10
Ex-e motor current limitation, Parameter 213
Extended positioning via bus
IPOSPLUS® application module 22
Process data 137

F

Fault codes 248
Fault diagnostics (EtherNet/IP™, Modbus/TCP)
Checking fault sources 116
Checking status display at the master 116
Checking status LEDs 115
Diagnostic procedure 115
Fault list 248
Fault memory, parameter 195
Fault messages 34
Display examples 34
Fault responses 248
FC16 – Write multiple registers 105
FC23 – Read/write multiple registers 106
FC3 – Read holding registers 104
FC43 – Read device identifications 107
Fixed setpoints, parameter 198
Functional safety technology
Safety note 12

G

Gear unit monitoring, parameter 211

H

Hazard symbols
Meaning 9
Hold control, parameter 201

I

Inputs
binary, parameter 194, 215
Digital, process data exchange 120, 125
interface
Ethernet 246
Service 246
IP address 26
IP address parameters 26
Change after initial startup 29
Deactivate/Activate DHCP 30
Setting during initial startup 29
Setting via Address Editor 30
IPOSPLUS® application module
Automotive AMA0801 24
Bus positioning 21
Extended bus positioning 22
Modulo positioning 23
Perform startup 173
Process data for "Automotive AMA0801" 138
Process data for "Bus positioning" 136
Process data for "Extended positioning via bus". 137
Process data for "Modulo positioning" 137
IPOSPLUS® encoder, parameter 239
IPOSPLUS® Modulo function, parameter 239
IPOSPLUS® monitoring, parameter 237
IPOSPLUS® reference travel, parameter 231
IPOSPLUS® special functions, parameter 238

16998413/EN – 12/16

IPOSPLUS® travel parameters 234

L

Laptop
Addressing 148
Laptop, connect with 154
Lifting applications 12

M

MAC address 26
Mains-off monitoring, parameter 210
Memory card
Device replacement 243
Storing device data 183
Modbus protocol, see Modbus/TCP 101
Modbus/TCP
Address range 101
Closing the connection 109
Configuration 90
Connection management 108
Description 101
Device description file 90
Error codes 113
Exception codes 113
Function codes 102
Parameter access 110
Project planning examples 94, 95
Project planning, master 90
Protocol structure 103
Requesting controlling connection 108
Send process output data 108
Services 102
Startup 90
Technical data of interface 114
Timeout response 109
Modbus/TCP exception 113
Modbus/TCP function codes 102
Modbus/TCP master
Addressing drive via "IO Scanning" 93
Configuring hardware (control structure) 91
Setting the Ethernet component 92
Modbus/TCP scanner, see Modbus/TCP master 90
Modbus/TCP services 102
FC16 – Write multiple registers 105
FC23 – Read/write multiple registers 106
FC3 – Read holding registers 104
FC43 – Read device identifications 107
Modulation, parameter 228
Modulo positioning
IPOSPLUS® application module 23
Process data 137
Motor
Explosion-proof, current limiting parameter .. 213
Monitoring, parameter 211
Perform startup 169
Temperature protection, Parameter 211
Motor adjustment, parameter 203
Motor protection, parameter 205
Motor temperature protection, Parameter 211
MOVILINK®
Parameter channel 111
Return code 88
MOVI-PLC®
Advantages 20
Designated use 20
Libraries 20, 181
MOVIPRO®
Configure 155
Connection Ethernet 31
Digital inputs and outputs 120, 125
Ethernet interfaces 31
IPOSPLUS® application modules 20
Process sequence, drive functions 133
Process sequence, general 118
MOVIPRO® ADC
Control word 123
Data backup via PLC 125
Gateway operation 174
Libraries 181
Parameterizing 156, 174
Process data in the delivery state 126
Process data of the CCU application modules 127
Process data of the speed-controlled drive .. 126
Process data structure 122
Process image 122
Programming 182
Status word 123
MOVIPRO® ADC gateway operation 174
MOVIPRO® ADC with regenerative power supply
Configure 132
Control word 131

Process data structure 131
Status word 131
MOVIPRO® SDC
Control word 119
Parameterizing 156
Process data in the delivery state 121
Process data of the drive functions 121
Process data of the speed-controlled drive .. 121
Process data structure 118
Process image 118
Status word 119
MOVITOOLS® MotionStudio
Communication channels 139
Communication ports 151
Configure device 143
Creating a project 140
Designated use 139
Establishing communication 140
Functions 16, 139
Reading/changing device parameters 152
Setting the connection mode 141
Starting up unit 153
Tasks 139
Multicast handling 31

N

Network class 27
Notes
Designation in the documentation 8
Meaning of the hazard symbols 9

O

Object
Assembly 75
EtherNet link 84
Identity 73
Message router 74
Parameter 79
Register 76
TCP/IP interface 83
Vardata 82
Opening the parameter tree 152
Operating modes, parameter 216
Operation
Fault messages 34
Status LED 37
Status messages 34
Outputs
binary, parameter 194
Digital, process data exchange 120, 125
Overview of functions
MOVIPRO® ADC 13
MOVIPRO® SDC 13

P

P00. Process values 191
P01. Status displays 192
P02. Analog setpoints 193
P03. Digital inputs of basic device 194
P05. Digital outputs basic device 194
P07. Device data 194
P08. Fault memory 195
P09. Bus diagnostics 195
P13. Speed ramps 1 196
P14. Speed ramps 2 196
P16. Fixed setpoints 1 198
P17. Fixed setpoints 2 198
P20. Speed control 199
P21. Hold controller 201
P30. Limits 1 202
P31. Limits 2 202
P32. Motor adjustment 1 203
P33. Motor adjustment 2 203
P34. Motor protection 205
P35. Direction of motor rotation 208
P50. Speed monitoring 209
P52. Mains OFF monitoring 210
P53. Motor temperature protection 211
P54. Gear unit/motor monitoring 211
P56. Ex-e motor current limitation 213
P60. Digital inputs of basic device 215
P70. Operating modes 216
P71. Standstill current 217
P72. Setpoint stop function 218
P73. Brake function 219
P74. Speed skip function 220
P77. Energy-saving function 221
P80. Setup 222
P82. Braking operation 223
P83. Error responses 224
P84. Reset behavior 226
P85. Scaling actual speed value 227

16998413/EN – 12/16

P86. Modulation 228
P87. Process data description..... 229
P90. IPOS reference travel 231
P91. IPOS travel parameters 234
P92. IPOS monitoring..... 237
P93. IPOS Special functions 238
P94. IPOS encoder 239
P96. IPOS Modulo function 239
Parameter
Configuring Ethernet communication 148
Descriptions..... 191
for the encoder option 241
of the power section 185
Symbols in the descriptions..... 191
Tabular view 185
Parameter access via EtherNet/IP™
CIP objects 72
General error codes 87
MOVILINK™ return codes..... 88
Return code..... 85
Parameter access via Modbus/TCP 110
MOVILINK® parameter channel..... 111
Procedure with FC16 and FC03..... 110
Procedure with FC23..... 110
Protocol structure 111
Parameter group
P0.. Display values..... 191
P1.. Setpoints / ramp generators..... 196
P2.. Controller parameters 199
P3.. Motor parameters..... 202
P5.. Monitoring functions..... 209
P6.. Terminal assignment..... 215
P7.. Control functions 216
P8.. Device functions..... 222
P9.. IPOS parameters 231
Parameter setting
Communication and control unit..... 174
Power section..... 156
Parameterizing the unit
About MOVITOOLS® MotionStudio 152
PC
Addressing 148
PC, connect with 154
PL7 PRO, Modbus/TCP master configuration..... 90
Power section
Application modules 20
Overview of parameters 185
Parameterizing 156
Perform startup..... 156
Process sequence, drive functions..... 133
Process data
"Automotive AMA0801" IPOSPLUS® application module..... 138
"Bus positioning" CCU application module... 129
"Bus positioning" IPOSPLUS® application module..... 136
"Extended positioning via bus" IPOSPLUS® application module 137
"Modulo positioning" IPOSPLUS® application module..... 137
"Rapid/creep speed positioning" CCU application module..... 128
"Transparent 6PD" CCU application module 127
"Velocity control" CCU application module... 128
Actual current of speed-controlled drive..... 136
Actual speed of speed-controlled drive 136
Control word of speed-controlled drive..... 134
MOVIPRO® ADC 122
MOVIPRO® ADC control word..... 123
MOVIPRO® ADC status word..... 123
MOVIPRO® ADC with regenerative power supply..... 131
MOVIPRO® SDC 118
MOVIPRO® SDC control word..... 119
MOVIPRO® SDC status word..... 119
Ramp of speed-controlled drive 135
SEW Controller..... 118, 122
Speed setpoint of speed-controlled drive..... 135
Speed-controlled drive 133
Status word of speed-controlled drive..... 135
Process data description, parameter..... 229
Process data exchange
Configuration for MOVIPRO® as positioning drive..... 48
Configuration for MOVIPRO® as speed-controlled drive..... 50
with EtherNet/IP™-Master..... 71
with Modbus/TCP master..... 94
Process image
Drive functions of the power section 133
MOVIPRO® ADC 122

16998413/EN – 12/16

MOVIPRO® ADC with regenerative power supply ... 131
MOVIPRO® SDC ... 118
MOVIPRO®, general ... 118
Process values, parameters ... 191
Product names ... 10
Protocol structure Modbus/TCP ... 103, 111
Header ... 103
Service FC16 – Write multiple registers ... 105
Service FC23 – Read/write multiple registers ... 106
Service FC3 – Read holding registers ... 104
Service FC43 – Read device identifications ... 107

R

Rapid/creep speed positioning
CCU application module ... 18
Process data ... 128
Reference travel ... 246
Repairs ... 34
Reset behavior, parameter ... 226
Return code in error telegram ... 85
Due to timeout ... 89
General error codes ... 87
MOVILINK®-specific ... 88
Rights to claim under limited warranty ... 10
RSLogix 5000
Accessing device parameters ... 53
Configuring EtherNet/IP™ master ... 40
Configuring process data exchange ... 48, 50

S

Safety functions ... 12
Safety notes ... 11
Bus systems ... 11
Designation in the documentation ... 8
Meaning of the hazard symbols ... 9
Preliminary information ... 11
Structure of embedded ... 9
Structure of the section-related ... 8
SD memory card
Device replacement ... 243
Spare part ... 245
Storing device data ... 183
Section-related safety notes ... 8
Service
Device replacement ... 243
Device status ... 37, 38
Service interface ... 246
Service unit ... 246
Setpoint stop function, parameter ... 218
Setpoints
Analog, parameter ... 193
Fixed setpoints, parameter ... 198
Setup, parameter ... 222
Signal words in safety notes ... 8
SMLP server
Adding devices ... 150
Setting parameters ... 150
Speed control, parameter ... 199
Speed limitations, parameter ... 202
Speed monitoring, parameter ... 209
Speed ramps, parameter ... 196
Speed skip function, parameter ... 220
Speed-controlled drive
PI1: Status word ... 135
PI2: Actual speed ... 136
PI3: Active current ... 136
PO1: Control word ... 134
PO2: Setpoint speed ... 135
PO3: Ramp ... 135
Process data ... 121, 126, 133
Standard gateway ... 27
Standstill current, parameter ... 217
Startup ... 25
Encoder ... 156
EtherNet/IP™ ... 39
IPOSPLUS® application module ... 173
Modbus/TCP ... 90
Motor ... 169
Power section ... 156
Unit in MOVITOOLS® MotionStudio ... 153
Status display
Component description ... 246
Status displays, parameters ... 192
Status LED ... 37
Status messages ... 34
Display examples ... 34
Status word
MOVIPRO® ADC ... 123

16998413/EN – 12/16

MOVIPRO® SDC 119
Studio 5000 Logix Designer
Accessing device parameters 61
Configuring EtherNet/IP™ master 43
Configuring process data exchange 48, 50
Subnet mask 27
Switch 144

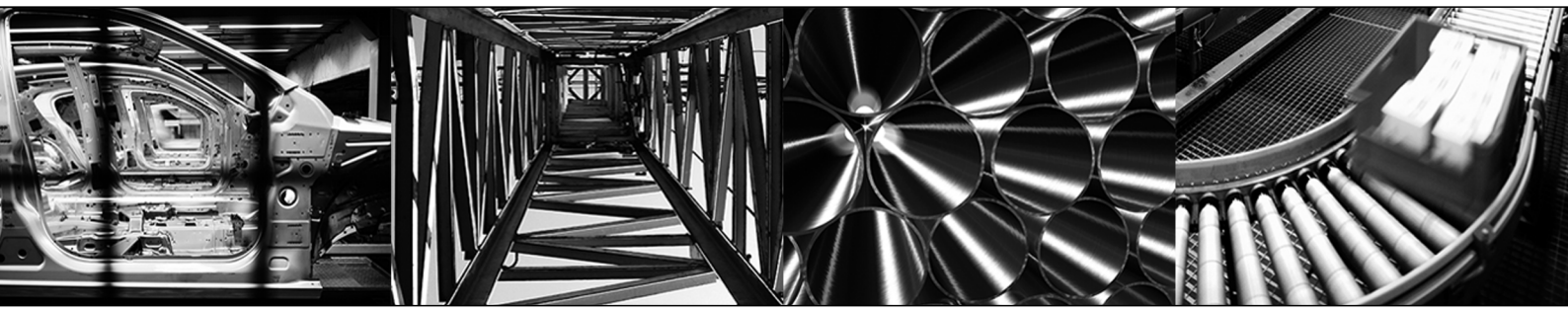
T

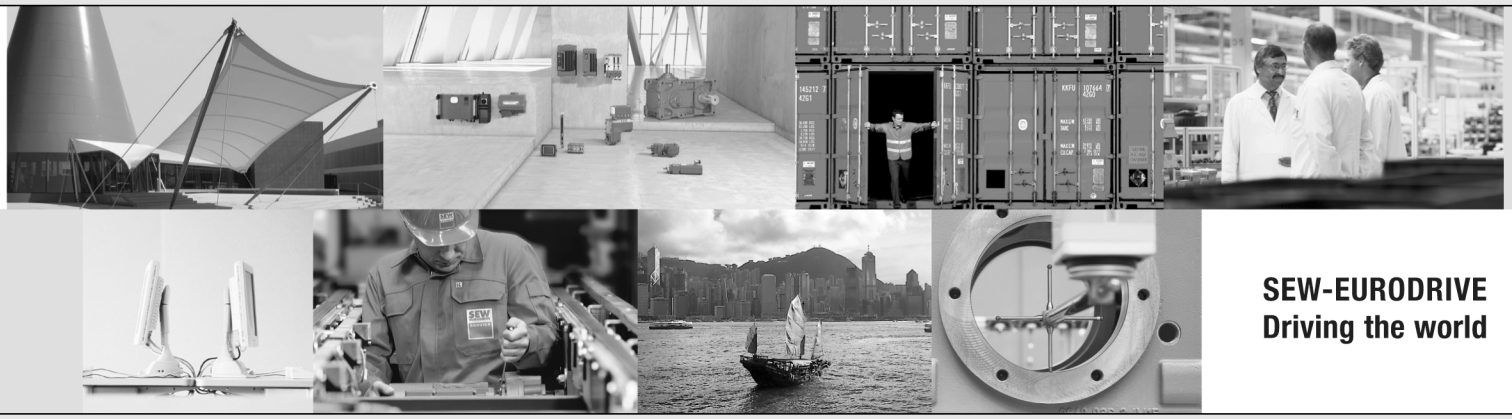
Target group 11
TCP/IP 144
TCP/IP protocol
Description 26
DHCP 28
IP address 26
MAC address 26
Network class 27
Standard gateway 27
Subnet mask 27
Technical data
EtherNet/IP™ interface 89
Modbus/TCP interface 114
Timeout behavior
EtherNet/IP™ 72
Timeout response
Modbus/TCP 109
Trademarks 10
Transparent 6PD
CCU application module 18
Process data 127

V

Velocity control
CCU application module 18
Process data 128

16998413/EN – 12/16





SEW-EURODRIVE
Driving the world

SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023
76642 BRUCHSAL
GERMANY
Phone +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com
➞ **www.sew-eurodrive.com**