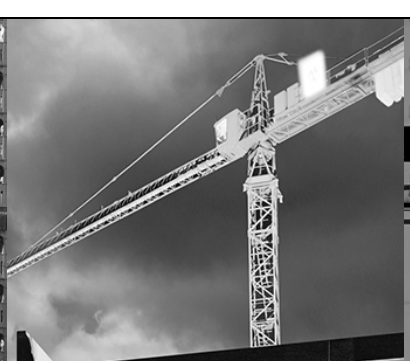
SEW EURODRIVE

Manual

Decentralized Drive and Application Controller
MOVIPRO® ADC with PROFINET Interface

Edition 04/2012

19298412 / EN

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Contents

1 General Information

1.1 Use of this documentation

The documentation is an integral part of the product and contains important information on operation and service. The documentation is written for all employees who assemble, install, start up, and service this product.

The documentation must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you 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, warnings regarding potential risks of damage to property, and other notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent danger	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 drive system or its environment
INFORMATION	Useful information or tip: Simplifies the handling of the drive system.	

1.2.2 Structure of the section-related safety notes

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

This is the formal structure of a section-related safety note:

⚠ SIGNAL WORD

Type and source of danger.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the danger.

1.2.3 Structure of the embedded safety notes

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

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD** Nature and source of hazard.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the danger.

1.3 Rights to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Read the documentation before you start working with the unit!

1.4 Exclusion of liability

You must comply with the information contained in this documentation to ensure safe operation and 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, any liability for defects is excluded.

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 General safety notes for bus systems

This communication system allows you to adapt the MOVIPRO® ADC to your application. As with all bus systems, there is a danger of modifications to the parameters that are not visible from outside (in relation to the inverter), which give rise to changes in the inverter behavior. This may result in unexpected (not uncontrolled) system behavior.

1.7 Safety functions

MOVIPRO® may not perform any safety functions unless they are described and expressly approved.

For safety applications, ensure that the information in the following publication is observed:

- MOVIPRO® ADC – Functional Safety

Use only those components in safety applications that were explicitly designed and delivered for this purpose by SEW-EURODRIVE.

1.8 Hoist applications

- Hoist applications can only be implemented with MOVIPRO® ADC under the following conditions:
  - A hoist startup must be performed.
- MOVIPRO® is not designed for use as a safety device in hoist applications.

  Use monitoring systems or mechanical protection devices as safety equipment to avoid possible damage to property or injury to people.

1.9 Copyright

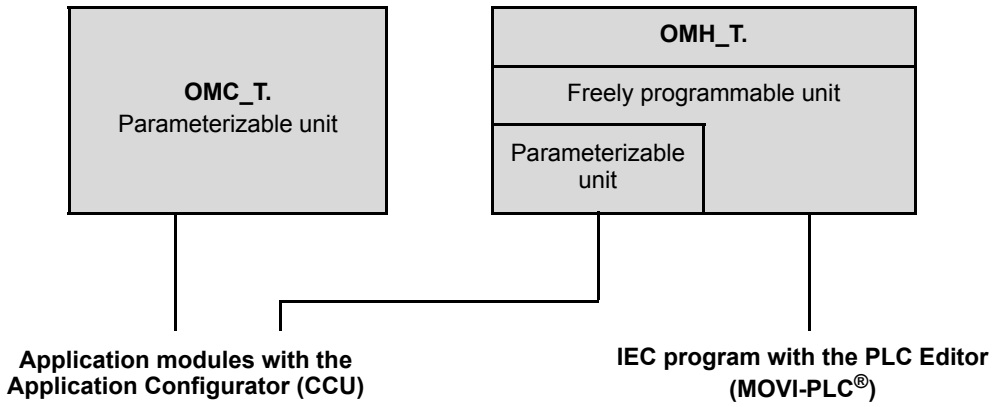
1.10 Product names and trademarks

All product names in this documentation are trademarks or registered trademarks of their respective titleholders.

2 Scope of Functions

Depending on the type of SD memory card you use with MOVIPRO®, you can use MOVIPRO® as parameterizable (CCU) and/or freely programmable unit (MOVI-PLC®).

The following figure shows the assignment of SD memory card types:



2.1 Parameterizable unit (CCU)

For more simple applications, a parameterizable variant of MOVIPRO® is available. The unit includes the Configurable Control Unit (CCU) with standardized and directly executable application modules you simply need to parameterize. You can adjust the functionality of the individual application modules to the specific application quickly and without programming knowledge. An integrated diagnostic function enables quick and simple startup.

2.1.1 Application Configurator

The Application Configurator is part of the MOVITOOLS® MotionStudio engineering software and is a simple tool for startup and diagnostics. The various applications are operated in the same easy manner independent of the drive and control component from SEW-EURODRIVE you use.

Advantages

The Application Configurator offers the following advantages:

- Parameterizable and standardized solutions for common positioning and motion sequences
- Graphically guided startup and diagnostics
- Intergrated trace function for easy troubleshooting
- The operating software visualizes the operating states of every application module so that possible faults can be rectified quickly.
- The implemented control mode supports pre-startup without a higher-level controller (PLC).
- The process data monitor visualizes the data exchange between the parameterized application modules and the master controller (PLC).
- Simple and fast engineering
- SD card for managing the data for the application module and all drive parameters

2.2 Programmable/parameterizable unit (MOVI-PLC®)

SEW-EURODRIVE offers the freely programmable motion and logic controller MOVI-PLC® for solving complex machine automation tasks in a flexible manner. Ready-made program modules make startup faster. The standard programming languages FBD, LD, IL, and structured text ensure great flexibility.

MOVI-PLC® always provides the drive functionality matching the specific application. It can be used whenever intelligent drive solutions are required, for example, when a number of drives has to perfectly interact. MOVI-PLC® controls this interaction in a simple and flexible manner.

2.2.1 Motion control with MOVI-PLC®

Advantages

Motion control with MOVI-PLC® is characterized by the following advantages:

- Simple handling
- Preconfigured function modules efficiently implement the motion functions
- Coordination of several axes
- Connection via fast, synchronous system bus
- All motion control tasks are concentrated in one MOVI-PLC®
- MOVI-PLC® takes over motion control and the control of operating sequences of sub-processes
- Automation of independent machine modules
- Relief of the central PLC
- Reduced response times
- Increased performance
- Protection of corporate know-how
- Reduced effort when changing the central automation system

2.3 Application modules for a parameterizable unit

2.3.1 Description

Drive task

Industrial drive tasks usually require more than motor speed control. The inverter often has to control complex motion sequences and take on typical PLC tasks.

Solution with MOVIPRO® ADC

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. You merely have to specify the parameters required for your application. The application module uses this information to create the control program, and then loads it onto the inverter. MOVIPRO® takes over the entire motion control. This means the application module takes load off the higher-level controller.

Benefits

The application modules offer the following benefits:

- A wide range of functions
- A user-friendly GUI
- Only the parameters necessary for the application have to be entered
- Guided parameter setting instead of complicated programming
- No programming experience required
- Quick familiarization, therefore quicker configuration and startup
- All movement functions are controlled directly in the MOVIPRO®

Scope of delivery and documentation

The application modules are included in the MOVITOOLS® MotionStudio software and can be used with all MOVIPRO® ADC units.

INFORMATION

For information on how to operate the application modules, refer to the MOVIDRIVE® B application manuals. They are available as pdf for download from the SEW homepage **www.sew-eurodrive.com**.

2.3.2 Application modules with the Application Configurator

The following application modules are available for MOVIPRO® ADC.

- Transparent
- Speed control
- Rapid/creep positioning
- Bus positioning 6 PD

"Transparent" application module

The "Transparent" application module is used when the process data from the higher-level controller (master) to the controller (MOVIPRO®) is to be forwarded to the lower-level units (integrated power section, external auxiliary axes, etc.) without being changed. The same applies to process data communication in the opposite direction. The "Transparent" application module supports all IPOS application modules running on the integrated power section "PFA-...".

"Speed control" application module

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

"Rapid/creep positioning" application module

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

Positioning takes place via two 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 four initiators.

The "Rapid/creep positioning" application module has the following functions:

- Graphical interface for startup and parameter setting
  - with a monitor for controlling and monitoring
  - with online help
- Drive functions for jog as well as rapid/creep positioning
- Suited for roller conveyors, lifting tables, and rotary tables

"6PD bus positioning" application module

The "6PD bus positioning" application module is used for variable positions in conjunction with different speeds and ramps (e.g. hoist).

Positioning is carried out via the installed motor encoder or an optional, external distance encoder. Only linear, absolute positioning is supported. You can enter various user units.

The "6PD bus positioning" application module has the following functions:

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

2.4 IPOS application modules

INFORMATION

In orer to use the IPOS application modules, you first have to configure the "Transparent" application module using the Application Configurator and then upload it into the communication and control unit "PFH-...".

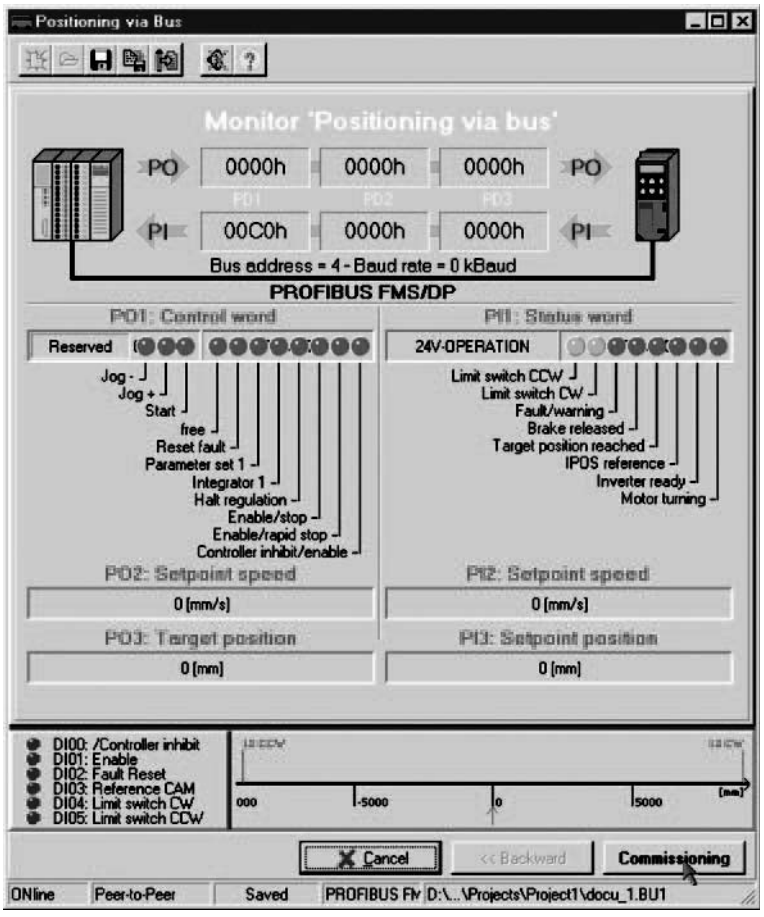
You can use all the IPOS application modules running on the internal power section "PFA-...":

- Bus positioning
- Extended positioning via bus
- Modulo positioning
- Table positioning
- Sensor based positioning via bus
- Automotive AMA0801

2.4.1 Bus positioning

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

- Variable and unlimited number of target positions
- Freely adjustable travel speed for positioning
- Maximum travel distance ± 32 700 mm



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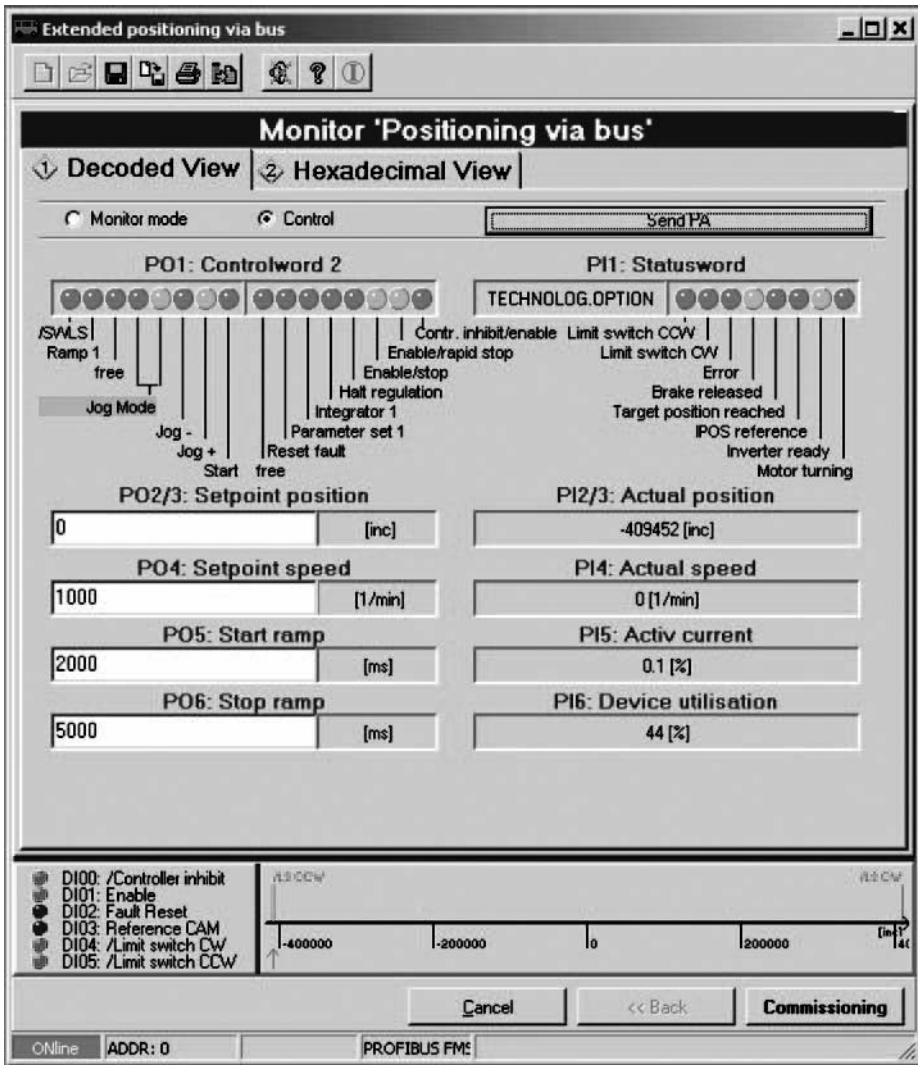
2.4.2 Extended positioning via bus

The IPOS application module "Extended positioning via bus" has 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 ± 262 100 mm
- Operation is possible with 4 instead of 6 process data words. The variable specification of the ramp type is not used in this case.



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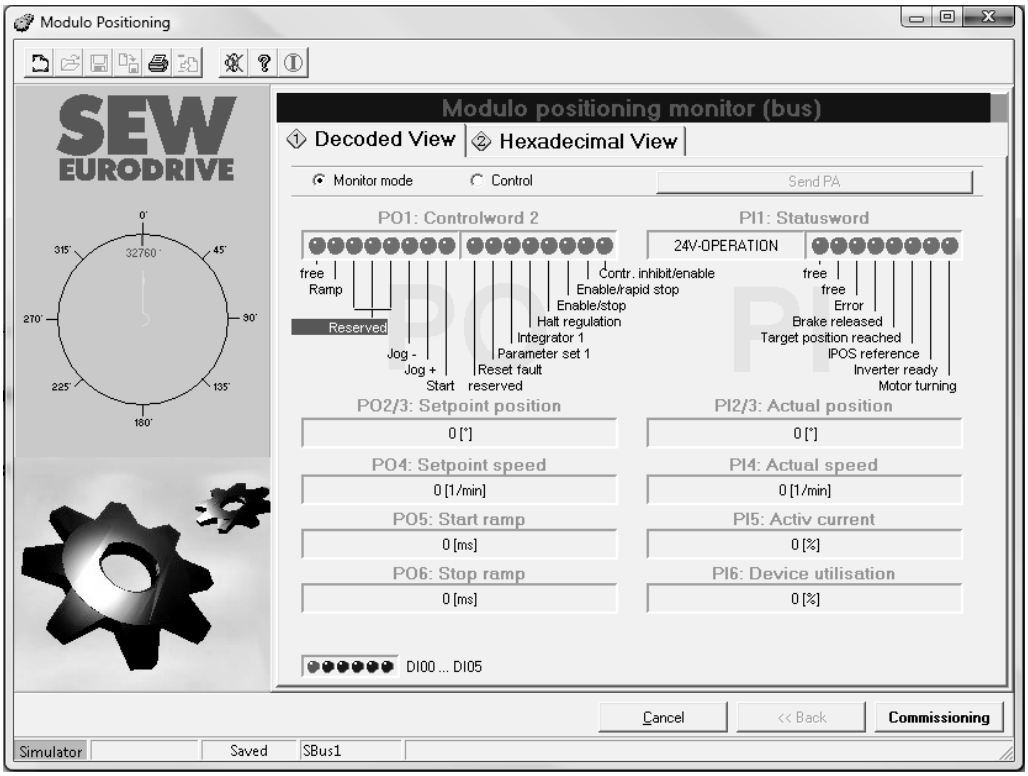
2.4.3 Modulo positioning

The IPOS application module "Modulo positioning" has the following functions:

- Fieldbuses with 4 or 6 process data words are supported
- Target position specified via 2 process data words
- Freely adjustable travel speed
- Two different ramps can be selected when 4 process data words are used for contro.
- The acceleration or deceleration ramps can be specified using process data word 5 or 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.



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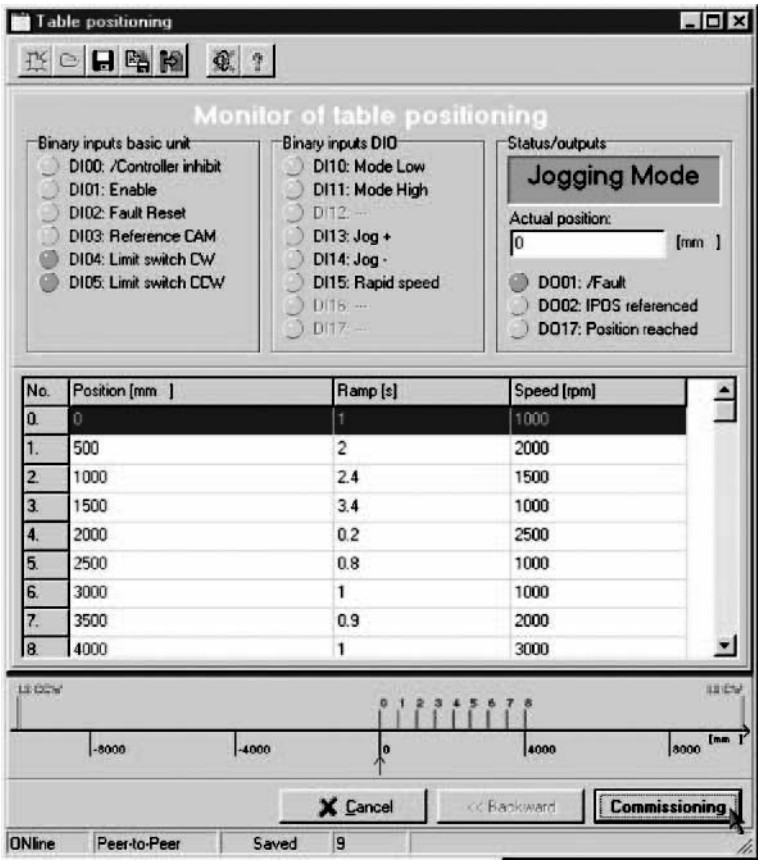
2.4.4 Table positioning

The IPOS application module "Table positioning" has the following functions:

- Control via fieldbus
- 32 table positions in inverter
- Freely adjustable travel speed



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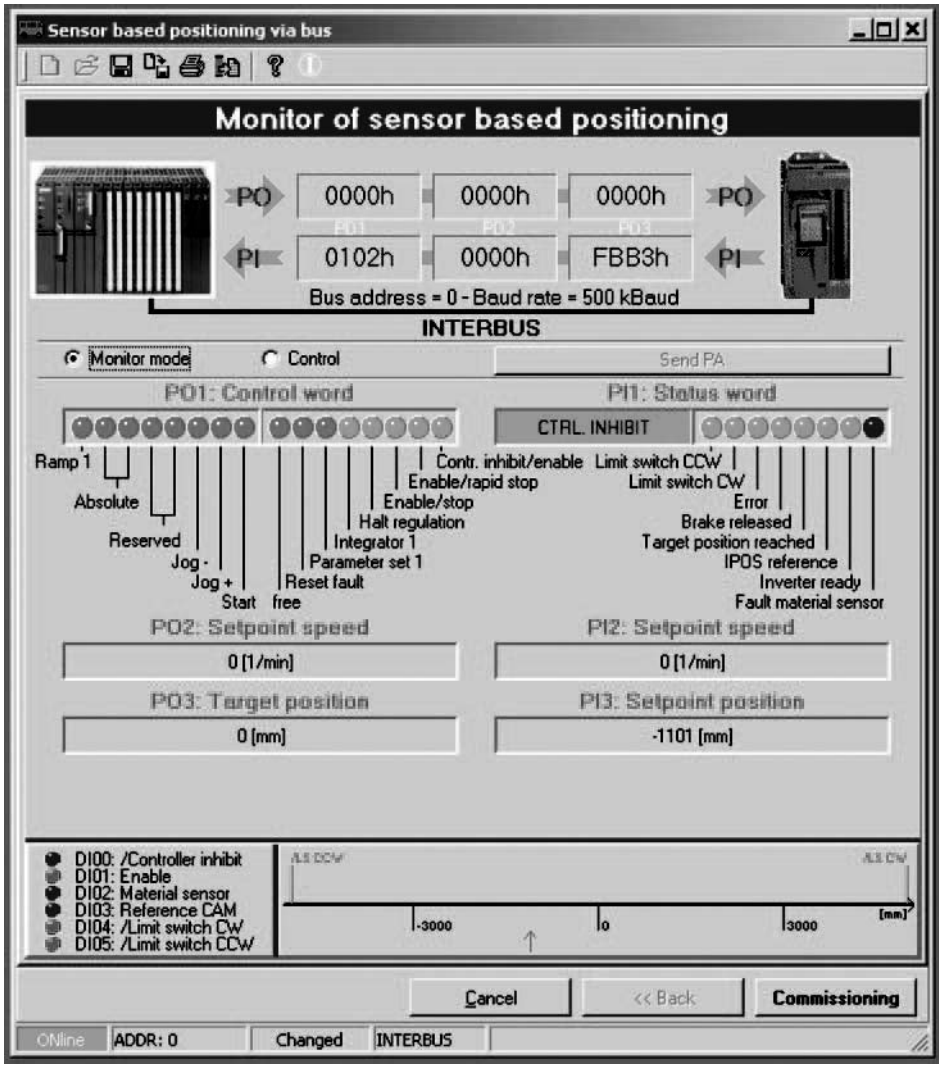
2.4.5 Sensor-based positioning

The IPOS application module "Sensor-based positioning" has the following functions:

- Variable and unlimited number of target positions
- Freely adjustable travel speed (changes can be made during travel for linear positioning ramps)
- Maximum travel distance ± 32 700 m



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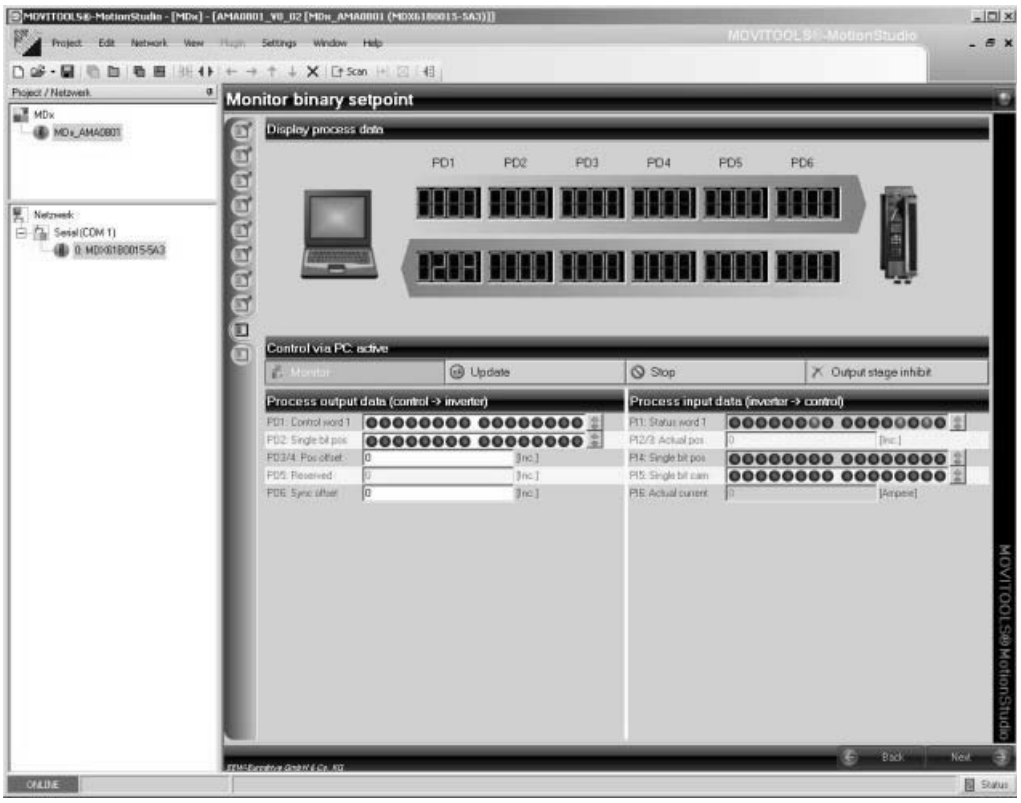
2.4.6 Automotive AMA0801

The IPOS application module "Automotive AMA0801" offers the following functions:

- The "Automotive AMA0801" application module makes it possible to implement lifting devices, conveyor systems and machinery with drives that have to move at a synchronous angle to one another occasionally or permanently.
- The "Automotive AMA0801" application module has a selectable process data interface. Setpoint specification is either variable or binary.



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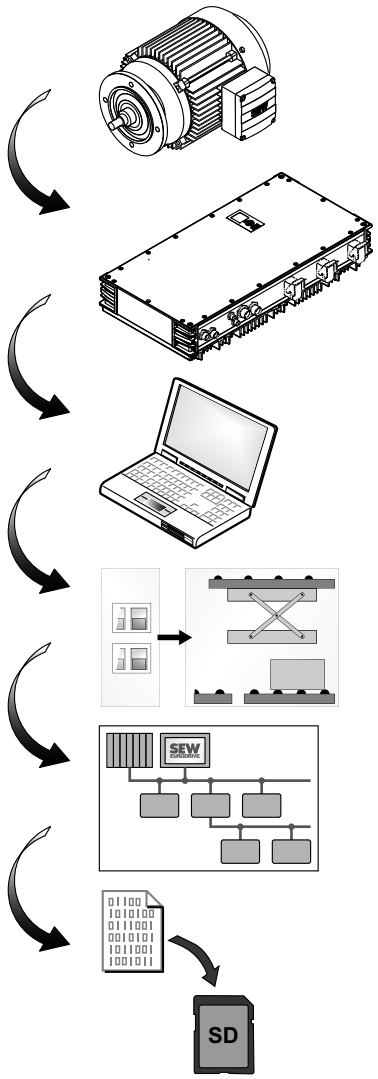
3 Startup

3.1 Checklist for startup

The following illustration gives an overview of the startup of MOVIPRO® and refers to the respective chapters and applicable documents:



[1]	Installing the motor	→ Refer to the operating instructions of the motor for information.
[2]	Installing MOVIPRO®	→ Refer to the MOVIPRO® ADC operating instructions for information.
[3]	Parameterizing MOVIPRO®	→ Refer to the chapter "Parameterization of MOVIPRO®" (page 46) for information.
[4]	Adjusting application parameters	→ Optimize the MOVIPRO®parameters according to your application.
[5]	Configuring the fieldbus	→ Refer to the subsequent chapters for information.
[6]	Saving device data on the SD memory card.	→ Refer to the chapter "Saving device data" (page 83) for information.

4 Installation Notes

INFORMATION

For information on the assembly and the installation of MOVIPRO®, refer to the "MOVIPRO® ADC" operating instructions.

4.1 General information

4.1.1 Shielding and routing bus cables

NOTICE

In case of fluctuations in the ground potential, a compensating current may flow 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.

4.1.2 TCP/IP addressing and subnets

Introduction

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

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

This chapter describes the addressing mechanisms and subdivision of IP networks into subnets to help you set the parameters correctly.

MAC address

The MAC address (Media Access Controller) is the basis for all address settings. The MAC address of an Ethernet device is a worldwide unique 6-byte value (48 bits). The MAC address of SEW Ethernet devices is 00-0F-69-xx-xx-xx. The MAC address is difficult to handle for larger networks. This is why freely assignable IP addresses are used.

IP address (IPv4)

The IP address (IPv4) is a 32-bit value that uniquely identifies a node in the network. The IP address is represented by 4 decimal numbers separated by decimal points.

Example: 192.168.10.4

Each decimal number stands for one byte (= 8 bits) of the address and can also be represented using binary code (see following table).

Byte 1		Byte 2		Byte 3		Byte 4
11000000	.	10101000	.	00001010	.	00000100

The IP address comprises a network address and a node address (see following table).

Network address	Node address
192.168.10	4

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.

Node addresses cannot consist of only zeros or ones (binary) because they represent the network itself or a broadcast address.

Network classes

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

Value range Byte 1	Network class	Complete network address (Example)	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

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

Subnet 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.

Example: 255.255.255.128

Each decimal number stands for one byte (= 8 bits) of the subnet mask and can also be represented using binary code (see following table).

Byte 1		Byte 2		Byte 3		Byte 4
11111111	.	11111111	.	11111111	.	10000000

If you compare the IP addresses with the subnet masks, you see that in the binary representation of the subnet mask all ones determine the network address and all the zeros determine the node address (see following table).

		Byte 1		Byte 2		Byte 3		Byte 4
IP address	decimal	192	.	168	.	10	.	129
	binary	11000000	.	10101000	.	00001010	.	10000001
Subnet mask	decimal	255	.	255	.	255	.	128
	binary	11111111	.	11111111	.	11111111	.	10000000

The class C network with the address 192.168.10. is further subdivided by the subnet mask 255.255.255.128. Two networks are created with the address 192.168.10.0 and 192.168.10.128.

The following node addresses are permitted in the two networks:

- 192.168.10.1 ... 192.168.10.126
- 192.168.10.129 ... 192.168.10.254

The network nodes use a logical AND operation for the IP address and the subnet mask to determine whether a communication partner is present 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.

Example: 192.168.10.1

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

4.1.3 Setting the IP address parameters

Initial startup

On delivery, all SEW controllers have the following IP address parameters:

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

Changing the IP address parameters after successful initial startup

INFORMATION

With PROFINET IO units, the IP address is assigned via the engineering system of the IO controller. In this case, it is not mandatory to set the IP address using MOVITOOLS® MotionStudio.

If the SEW controller has been started with a valid IP address, you can access the IP address parameters via the Ethernet fieldbus connection or via the Ethernet service interface.

You can change the IP address parameters of the PROFINET interface as follows:

- With the MOVITOOLS® MotionStudio software
- Using the SEW Address Editor

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

The above mentioned ways of changing the IP address parameters only come into effect once the supply voltage (including DC 24 V) has been switched off and back on again.

You can set the type of IP address assignment via the *DHCP Startup Control* parameter in the parameter tree of MOVITOOLS® MotionStudio.

- "Stored IP parameters" setting

  The stored IP address parameters are used.

- "DHCP" setting

  The IP address parameters are requested by a DHCP server.

SEW Address Editor

You can also use the SEW Address Editor to access the IP settings of the SEW controller without the Ethernet settings of the PC and SEW controller having to match.

The IP settings of all SEW units can be made and displayed in the local subnet using the Address Editor in MOVITOOLS® MotionStudio. For more information, refer to chaper "Operation of MOVITOOLS® MotionStudio".

- This allows the required settings for the PC to be determined for an installation which is in operation to enable access with the required diagnostics and engineering tools via Ethernet.
- When starting up a unit, the IP settings for the fieldbus interface of the SEW controller can be assigned without changing the network connections or the PC settings.

4.2 Fieldbus connection

4.2.1 The integrated Ethernet switch

You can use the integrated Ethernet switch to achieve line topologies known from the fieldbus technology. Other bus topologies, such as star or tree, are also possible. Ring topologies are not supported.

INFORMATION

The number of industrial Ethernet switches connected in line impacts the telegram runtime. If a telegram passes through the units, the telegram runtime is delayed by the store & 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 units 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. This means that they can use both patch and cross-over 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 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.

4.2.2 Ethernet fieldbus X4232_11 and X4232_12 (RJ45)

Use prefabricated, shielded RJ45 plug connectors compliant with IEC 11801, edition 2.0, category 5.

Function		
Ethernet fieldbus interface, 4-pole		
Connection type		
Push-pull RJ45		
Wiring diagram		
 2354433675		
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

NOTICE

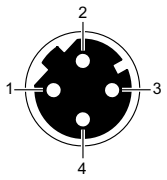
RJ45 patch cable without push-pull connector housing not snapped into place.

Damage to the push-pull RJ45 connection.

- Only use push-pull RJ45 mating connectors in accordance with IEC PAS 61076-3-117.

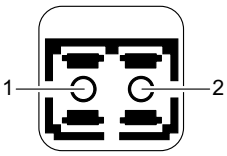
4.2.3 Ethernet fieldbus X4233_11 and X4233_12 (M12)

The following table shows information about this connection:

Function		
Ethernet fieldbus interface, 4-pole		
Connection type		
M12, 4-pole, female, D-coded		
Wiring diagram		
 2464600971		
Assignment		
No.	**Name**	**Function**
1	TX+	Sending cable (+)
2	RX+	Receiving cable (+)
3	TX-	Sending cable (-)
4	RX-	Receiving cable (-)
5	res.	Reserved

4.2.4 Ethernet fieldbus X4234_11 and X4234_12 (SCRJ)

The following table shows information about this connection:

Function		
Ethernet fieldbus interface, SCRJ / POF		
Connection type		
Push-pull SCRJ		
Wiring diagram		
 3419100299		
Assignment		
No.	**Name**	**Function**
1	Tx	Transmitting line (POF)
2	Rx	Receiving line (POF)

4.2.5 MOVIPRO® – Ethernet connection

To connect MOVIPRO® to the Ethernet, connect one of the following Ethernet interfaces to the other network stations using a category 5, class D twisted-pair cable in accordance with IEC 11801, edition 2.0:

- X4232_11 (RJ45)
- X4232_12 (RJ45)
- X4233_11 (M12)
- X4233_12 (M12)

Use suitable POF fiber-optic cables for the following POF fieldbus connections:

- X4234_11 (push-pull SCRJ)
- X4234_12 (push-pull SCRJ)

The integrated switch assists you in implementing a line topology and provides autocrossing functions.

INFORMATION

According to IEC 802.3, the maximum cable length for 10/100 MBaud Ethernet (10BaseT / 100BaseT) between two network stations, is 100 m.

5 Operation of MOVITOOLS® MotionStudio

5.1 About MOVITOOLS® MotionStudio

5.1.1 Tasks

The software package enables you to perform the following tasks:

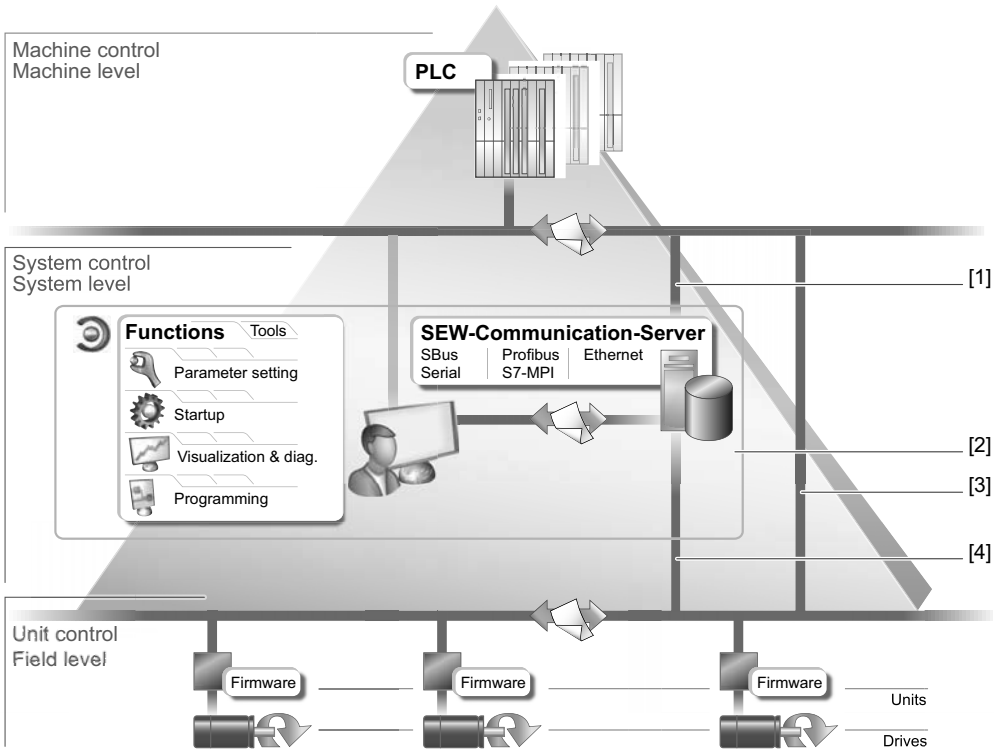
- Establishing communication with units
- Executing functions with the units

5.1.2 Functional principle

Overview

The following figure illustrates the functional principle of the MOVITOOLS® MotionStudio software package.

Note that the illustration shows only the logical communication correlation and not the hardware connections.



1194152459

[1] Communication channel for fieldbus or Industrial Ethernet
[2] MOVITOOLS® MotionStudio software package with integrated SEW Communication Server
[3] Communication between fieldbus nodes or Industrial Ethernet
[4] Communication channel via interface adapter to SBus (CAN) or serial

Engineering via interface adapters

If your unit supports the "SBus" or "Serial" communication options, you can use a suitable interface adapter for engineering.

The interface adapter is additional hardware that you can obtain from SEW-EURODRIVE. You can use it to connect your engineering PC with the respective communication option of the unit.

The type of interface adapter you require depends on the communication options of the respective unit.

Establishing communication with other units

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

The SEW Communication Server allows you to create **communication channels**. Once the channels are established, the units communicate via these communication channels using their communication options. You can operate up to four 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
- EtherCAT®
- Fieldbus (PROFIBUS DP/DP-V1)
- Tool Calling Interface

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

Executing functions of the units

The software package offers uniformity in executing the following functions:

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

The following basic components are included in the MOVITOOLS® MotionStudio software package, allowing you to use the units to execute functions:

- MotionStudio
- MOVITOOLS®

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

TCI call interface

TCI (Tool Calling Interface) is a standardized call interface based on the specification of the PROFIBUS user organization (PNO).

MOVITOOLS® MotionStudio (version 5.60 and higher) supports TCI for all units with the following communication options:

- PROFIBUS DP-V1
- PROFINET IO

These units must have been configured in the configuration software SIMATIC Manager (from the STEP 7 software package of Siemens).

You can select the configured units in the tool "HW Config" and call MOVITOOLS® MotionStudio as a so-called "device tool".

5.2 First steps

5.2.1 Starting the software and creating a project

Proceed as follows to start MOVITOOLS® MotionStudio and create a project:

1. Start the MOVITOOLS® MotionStudio from the Windows start menu via:

   [Start] / [Programs] / [SEW] / [MOVITOOLS MotionStudio] / [MOVITOOLS MotionStudio]

2. Create a project with a name and directory.

5.2.2 Establishing communication and scanning the network

Proceed as follows to establish a communication with MOVITOOLS® MotionStudio and scan your network:

1. Set up a communication channel to communicate with your units.

   For detailed information on how to configure a communication channel, refer to the section "Communication via ...".

2. Scan your network (unit scan). Press the [Start network scan] button [1] in the toolbar.

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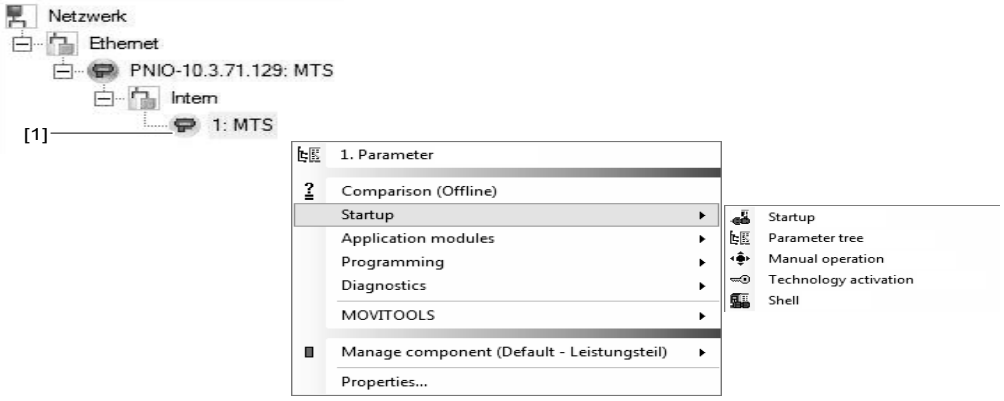
5.2.3 Configuring units

Proceed as follows to configure a unit:

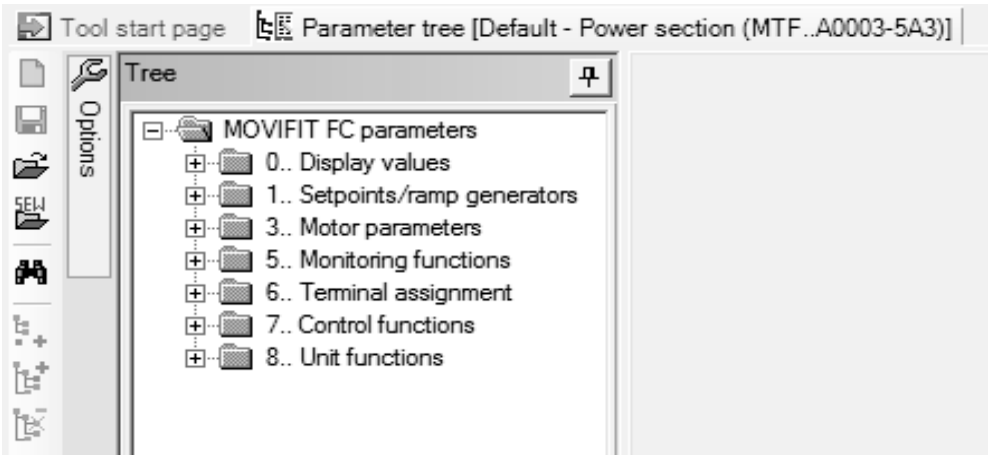
1. Select the unit (usually the power section [1]) in the network view.
2. Right-click to open the context menu and display the tools for configuring the unit.



2446350859

The example shows the context menu with the tools for a MOVIFIT® unit. The communication mode is set to "online" and the unit is scanned in the network view.

3. Select a tool (e.g. "Parameter tree") to configure the unit.



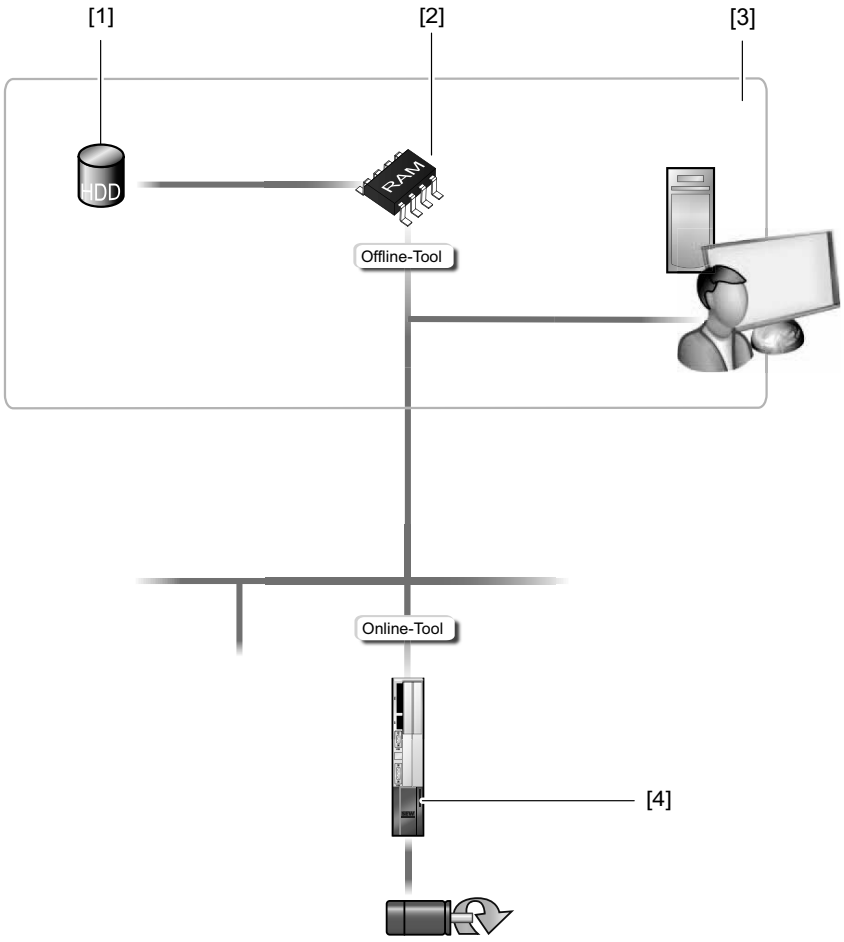
2446355211

5.3 Connection Mode

5.3.1 Overview

MOVITOOLS® MotionStudio differentiates between "online" and "offline" communication mode. You can select the communication mode yourself. Depending on the selected communication mode, you can choose offline or online tools specific to your unit.

The following figure illustrates the two types of tools:



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

Tools	Description
Offline tools	Changes made using offline tools affect **"ONLY"** the RAM [2]. • Save your project so that the changes can be stored on the hard disk [1] of your engineering PC [3]. • Perform the "Download (PC -> unit)" function if you want to transfer the changes to your unit [4] as well.
Online tools	Changes made using online tools affect **"ONLY"** the unit [4]. • Perform the "Upload (unit -> 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].

INFORMATION

- The "online" communication mode is **NOT** a response message which informs you that you are currently connected to the unit or that your unit is ready for communication. Should you require this feedback, observe section "Setting the cyclical accessibility test" in the online help (or the manual) of MOVITOOLS® MotionStudio.
- Project management commands (such as download and upload), the online unit status, and the unit scan work independent of the set communication mode.
- MOVITOOLS® MotionStudio starts up in the communication mode that you set before you closed down.

5.3.2 Selecting the communication mode (online or offline)

Proceed as follows to select the communication mode:

1. Select the communication mode:
   - "Switch to online mode" [1] for functions (online tools) that should directly influence the unit.
   - "Switch to offline mode" [2] for functions (offline tools) that should influence your project.

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[1] "Switch to online mode" symbol
[2] "Switch to offline mode" symbol

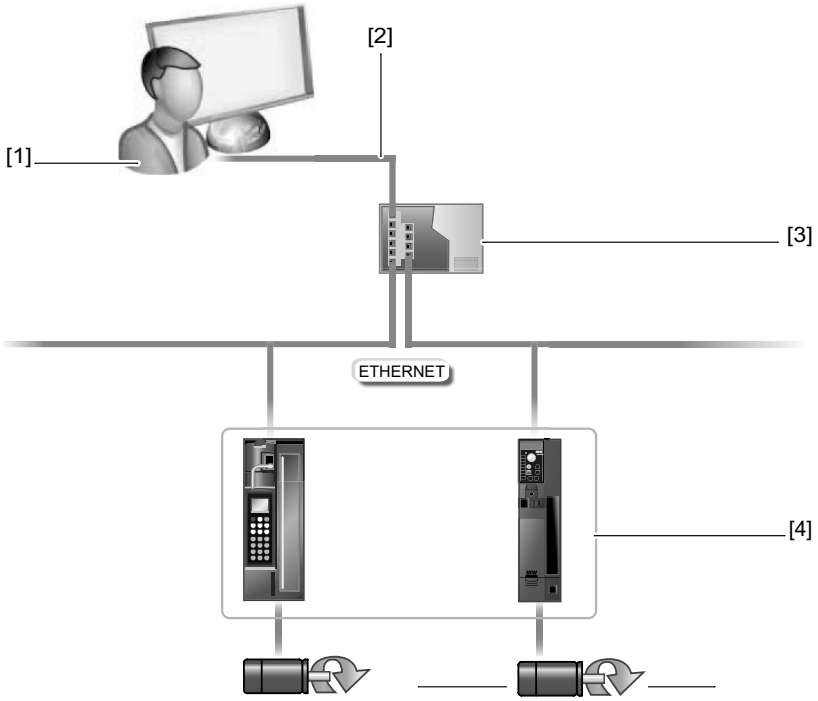
2. Select the unit node.
3. Right-click to open the context menu and display the tools for configuring the unit.

5.4 Communication via Ethernet

5.4.1 Direct communication

Overview

The figure shows the network with direct communication using Ethernet:



1193501835

[1] PC with Ethernet TCP/IP interface
[2] Ethernet TCP/IP connection
[3] Switch
[4] Units (examples) with Ethernet interfaces

Function

Parameter requests from MOVITOOLS® MotionStudio are transferred to a switch [3] via Ethernet [2] from a PC [1] using the Ethernet TCP/IP interface.

The switch [3] then directly passes on the parameter requests to the Ethernet interface of the units [4].

5.4.2 Address Editor

Overview

The Address Editor is a freeware tool by SEW-EURODRIVE GmbH & Co KG.

It is available once the "MOVITOOLS® MotionStudio" engineering software is installed. However, it is used separately.

You can use the Address Editor to establish a communication for your units via Ethernet and to address the units.

If you use a patch cable to connect the Ethernet interface of your engineering PC to the Ethernet, the Address Editor detects all Ethernet stations in the connected network segment (local network).

Unlike with "MOVITOOLS® MotionStudio", you will **not** have to adjust the IP address of the engineering PC to the local network.

This means the Address Editor is a useful addition to "MOVITOOLS® MotionStudio".

Proceed as follows if you have added other Ethernet stations to an existing network:

- Start the Address Editor
- Search for Ethernet stations

Once you have found the added Ethernet stations, you have two options:

- Adjust detected Ethernet stations to the network (address)
- Adjust the engineering PC to the network (address)

Starting the Address Editor

You can use the Address Editor once MOVITOOLS® MotionStudio has been installed.

Do the following to start the Address Editor:

1. Close MOVITOOLS® MotionStudio.
2. Start the Address Editor from the Windows start menu via:

   [Start] / [Programs] / [SEW] / [MOVITOOLS MotionStudio] / [Address Editor]

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 Ethernet interface of detected Ethernet nodes.

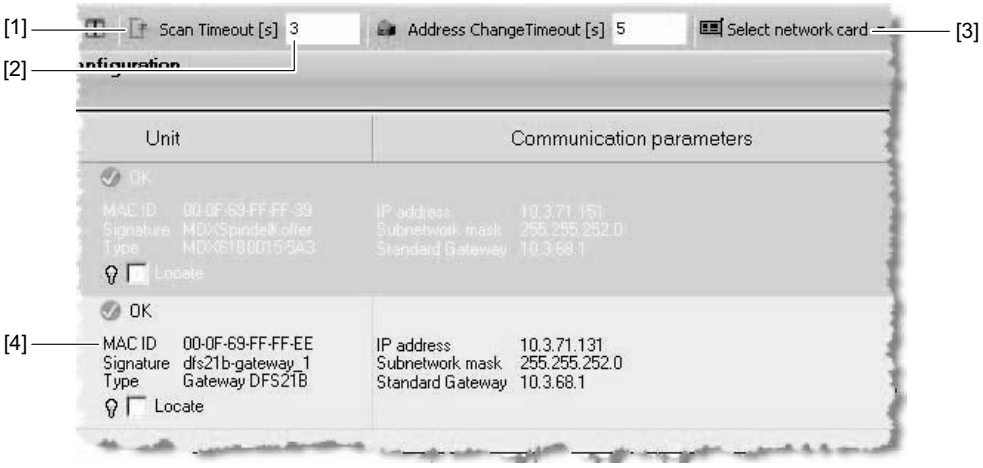
Proceed as follows to search for Ethernet nodes and localize the hardware:

1. Select "Ethernet" as the interface for PC and unit. To do so, click on the corresponding option field in the lower part of the window.
2. Click [Next] to confirm your selection and proceed to the next dialog.
3. Wait for the network scan to start **automatically**. The default setting for the waiting time (scan timeout) is 3 s [2].

   Note: If no units are detected during the network scan, the wiring might be inadequate, or you have several network cards installed (activated) in your PC.

   In this case, proceed as follows:

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



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[1] "Start network scan" icon
[2] "Scan timeout" edit box
[3] "Select network card" icon
[4] "Locate" checkbox

As a result, the current addresses of all Ethernet nodes in the connected network will be displayed.

4. Mark the "Locate" 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.

Adjusting located Ethernet stations to the network (address)

Proceed as follows to adjust (address) the localized Ethernet nodes to the network:

1. Double-click in the "Communication parameters" area of the respective unit [1].

9007200786544907

[1] "Communication parameters" window
[2] "Download" button

You can now change the following settings:

- IP address of the Ethernet node
- IP address of the subnet mask
- IP address of the standard gateway
- DHCP startup configuration (if supported by the unit)

2. Transmit the address changes to the Ethernet node. Click on [Download] [2].
3. Switch the unit off and on again in order to apply the changes.

Setting the engineering PC according to the network (address)

Do the following to adapt the engineering PC to the network setting (addressing):

1. From the Windows start menu, choose Control Panel and "Network and Internet" ("Network and Sharing Center" in the classic view).
2. Click [Manage network connection].

   A list opens with all existing network connections.
3. Select the respective network connection and choose [Properties] from the context menu.
4. Select the internet protocol "IPv4".
5. Click on the [Properties] button.
6. For the subnet mask and standard gateway, enter the same IP addresses that are used for the other Ethernet nodes in this local network.
7. For the engineering PC, enter an IP address that meets the following conditions:
   - In the blocks that define the **network**, the address segment for the engineering PC must correspond to that of the other Ethernet stations.
   - In the blocks that define the **node**, the address segment for the engineering PC must differ from the other stations.
   - The last block must not contain the values "0", "4", "127" or "255".

     NOTE: In the IP address of the subnet mask (such as 255.255.255.0), the values in the blocks have the following meaning:
     - "255", defines the address of the network where the nodes are located.
     - "0", defines the address of the actual node to distinguish it from other nodes.
8. Confirm with [OK].
9. Click [OK] again to close the dialog.

5.4.3 Configuring the communication channel via Ethernet

Do the following to configure a communication channel for Ethernet:

1. Click on "Configure communication plugs" [1] in the toolbar.

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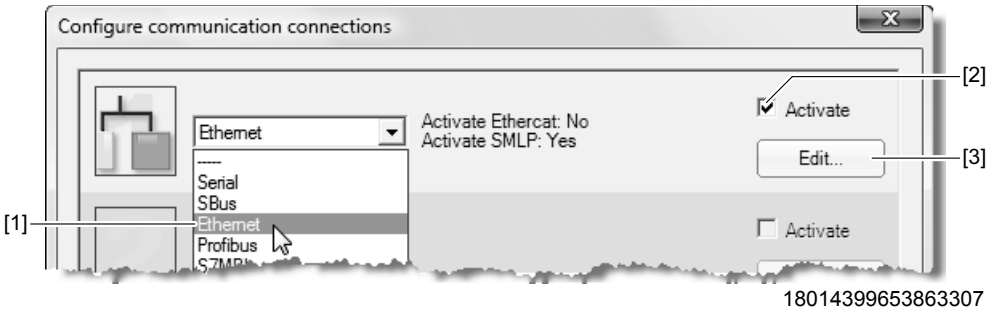
[1] "Configure communication plugs" symbol

This opens the "Configure communication plugs" window.



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[1] "Type of communication" dropdown menu
[2] "Activate" checkbox
[3] [Edit...] button

2. From the list [1], select "Ethernet" as the communication type.

   In the example, "ETHERNET" is activated as the communication type for the first communication channel [2].

3. Click [Edit] [3] in the right section of the window.

   This will display the settings for the "Ethernet" communication type.

4. Set up the SMLP protocol. To do so, select the "SMLP settings" tab.

   SMLP stands for **S**imple **M**OVI**L**INK® **P**rotocol. This is the SEW-EURODRIVE unit protocol and is transmitted directly via TCP/IP.

5. Set the parameters. Follow the instructions described in the section "Setting communication parameters for SMLP".

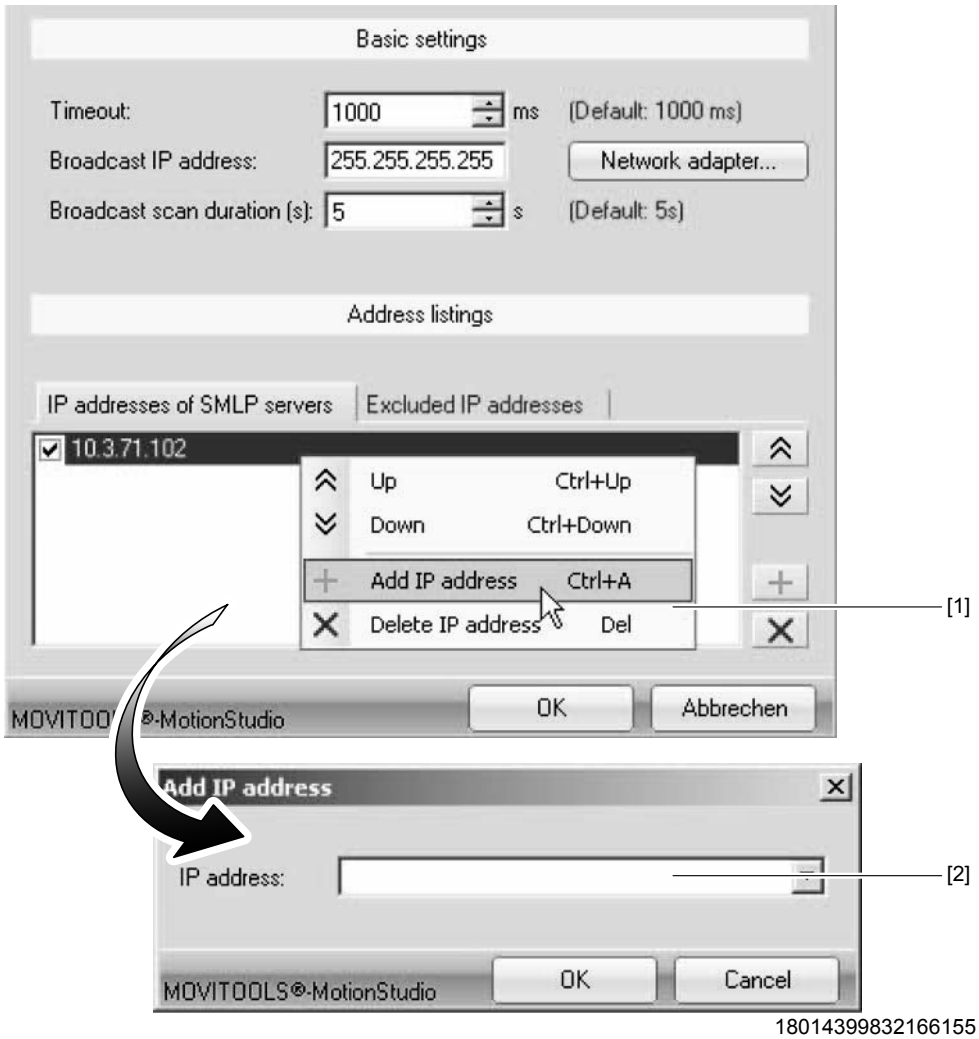
5.4.4 Setting communication parameters for SMLP

Proceed as follows to set the Ethernet communication parameters:

1. Change the set communication parameters if necessary. Refer to the detailed description of the communication parameters for SMLP.

   NOTE: During a unit scan, the system recognizes only units that are in the same (local) network segment as the PC that is running on MOVITOOLS® MotionStudio. If you have units that are outside the local network segment, add the IP addresses of these units to the list of SMLP servers.

2. Add an IP address by opening the context menu and selecting [Add IP address] [1]..



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[1] [Add IP address] button
[2] "IP address" input field

3. Enter the IP address in the input field [2] and click the [OK] button.

5.4.5 Communication parameters for SMLP

The following table describes the communication parameters for SMLP:

Communication parameters	Description	Information
Timeout	Waiting time in ms that the client waits for a response from the server after it has made a request.	• Default setting: 1000 ms • Increase the value as required if a delay in communication is causing malfunctions.
Broadcast IP address	IP address of the local network segment **within** which the unit scan is carried out.	In the default setting, the unit scan only detects units that are in the local network segment.
IP address of SMLP server	IP address of the SMLP server or of other units that are to be included in the unit scan but are **outside** the local network segment.	• Enter the IP address of units that are to be included in the unit scan but are **outside** the local network segment. • Enter the IP address of the SIMATIC S7 control, if you are operating an indirect Ethernet to PROFIBUS communication via SIMATIC S7.
Excluded IP address	IP addresses of units that should **not** be included in the unit scan.	Enter the IP address of units that should **not** be included in the unit scan. This can be units that are not ready for communication (for example because they have not been started up yet)

5.4.6 Communication ports used

The following table describes the communication ports that MOVITOOLS® MotionStudio uses:

Application	Communication port number	Description
ETH server	300 (TCP/UDP)	For the services of the SMLP (Simple-MoviLinkProtocol = MOVILINK® via Ethernet) and for using a PC as Ethernet gateway with the program "`ETH-Server.exe`"
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 (=Tool Calling Interface by Siemens)
EcEngineeringServer-RemoteControl	306 (UDP)	For direct communication (without master) with SEW EtherCAT slaves
EcEngineeringServer mailbox gateway	307 (UDP)	For direct communication (without master) with SEW EtherCAT slaves and for communication via an EtherCAT mailbox gateway (e.g. in a TwinCAT EtherCAT master)
MOVI-PLC® visualization	308 (TCP/UDP)	For communication between MOVI-PLC® and the 3D simulation of MOVITOOLS® MotionStudio

5.5 Executing functions with the units

5.5.1 Reading or changing unit parameters

Proceed as follows to read or change device parameters:

1. Switch to the required view (project view or network view).
2. Select the connection mode:
   - Click the "Switch to online mode" button [1] if you want to read or change parameters directly in the **unit**.
   - Click the "Switch to offline mode" button [2] if you want to read or change parameters in the **project**.

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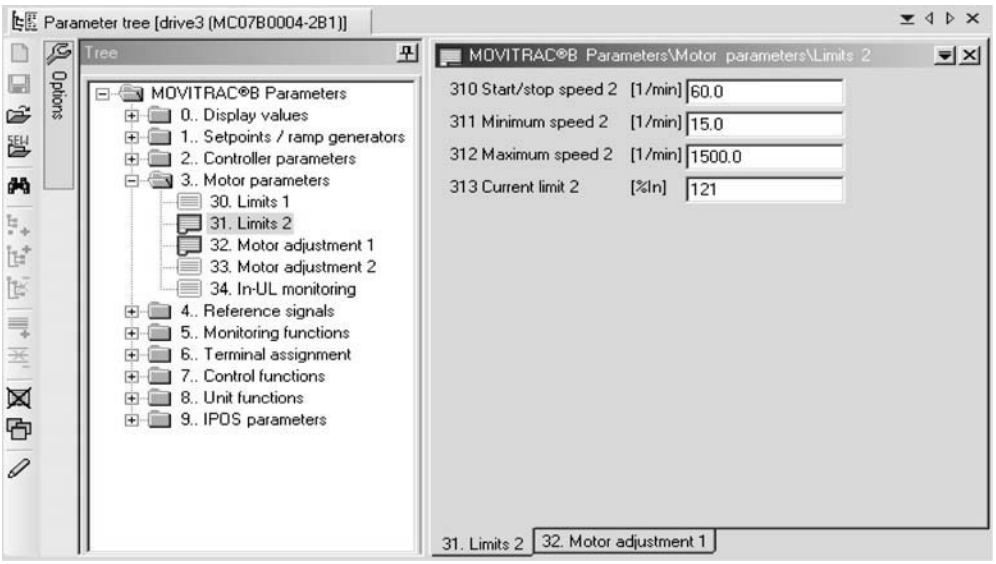
[1] "Switch to online mode" icon
[2] "Switch to offline mode" icon

3. Select the unit you want to parameterize.
4. Open the context menu and select the command [Startup] / [Parameter tree].

   Now the "Parameter tree" view opens in the right part of the monitor.
5. Expand the "Parameter tree" to the node you require.



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6. Double-click to display a particular group of unit parameters.
7. Press the enter key to finalize any changes you make to numerical values in the input fields.

INFORMATION

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

5.5.2 Starting up units (online)

Proceed as follows to start up the units (online):

1. Switch to the network view.
2. Click on "Switch to online mode" [1] in the toolbar.

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[1] "Switch to online mode" icon

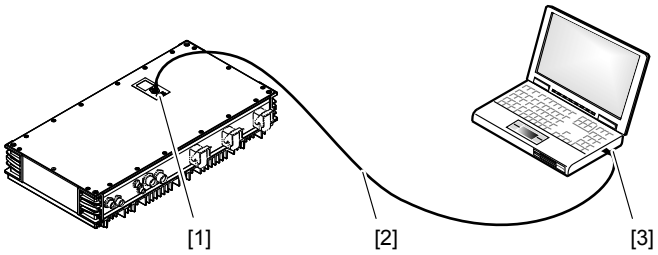
3. Select the unit you want to startup.
4. Open the context menu and select the command [Startup] / [Startup].

   The Startup wizard opens.
5. Follow the instructions of the startup wizard and then load the startup data onto your unit.

6 MOVIPRO® – Parameterization

6.1 PC/laptop connection

The following figure shows the connection between a PC/laptop and the engineering interface of MOVIPRO®:



1204936459

[1] Service interface (Ethernet RJ45) of MOVIPRO®
[2] Conventional Ethernet cable
[3] Ethernet interface of the laptop

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

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

6.2 Requirements

Ensure that the following requirements have been met:

- The latest MOVITOOLS® MotionStudio version is installed on your engineering PC.
- The latest GSDML file is installed on your engineering PC.

INFORMATION

The latest software versions are available at **www.sew-eurodrive.com** in the "Documentation / Software / CAD" section.

- A connection has been established between engineering PC and MOVIPRO® via the engineering interface.
  - Except for the lower byte, the engineering PC and the MOVIPRO® unit have the same IP address.
  - The engineering PC and the MOVIPRO® unit have identical subnet masks.
  - MOVIPRO® can be addressed via the engineering PC using the ping command.

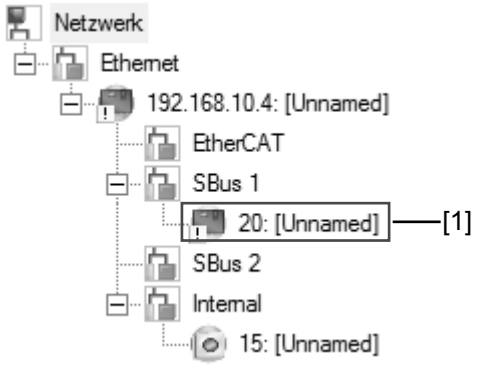
INFORMATION

For more information, refer to chaper "Operation of MOVITOOLS® MotionStudio".

6.3 Overview of how to parameterize MOVIPRO®

Proceed as follows to configure MOVIPRO®:

1. Start MOVITOOLS® MotionStudio.
2. Create a new project.
3. Set the communication properties to "Ethernet".
4. Perform a unit scan.
5. Select the power section of MOVIPRO® [1] in the network view.



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6. Right-click on it and select [Startup] / [Startup] from the context menu.
7. Configure the connected encoders (page 48).
8. Perform a motor startup.
9. Check whether the startup data are correct by moving the drive with the tool "manual mode". In order to move the drive, jumper the X5502 connection on MOVIPRO®.

   ⚠ **DANGER** No safe disconnection of the unit if the connection is jumpered.

   Severe or fatal injuries.

   – Jumper this connection only if the unit will not perform any safety functions according to DIN EN ISO 13849-1.

10. Load the respective IPOS application module into the power section (PFA-..), if necessary. To do so, right-click and select [Application modules] from the context menu.
11. If required, load your freely programmable IEC program or an Application Configurator application module into the communication and control unit (PFH-..).
12. Configure the fieldbus interface and check whether the process data exchange between the controller and MOVIPRO® is working properly.
13. After startup and after having adjusted the application parameters, save all the device data on the SD memory card (page 83).

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

INFORMATION

To being able to replace the unit quickly, you have to save the device data on the memory card after successful startup.

6.4.1 Encoder configuration

General information regarding encoder configuration

⚠ WARNING

Encoder startup aborted with an earlier version of MOVITOOLS® MotionStudio.

Severe or fatal injuries due to uncontrolled motor startup.

- Always use MOVITOOLS® MotionStudio 5.60 SP2 or a later version.

INFORMATION

The general information regarding the encoder configuration applies to the following encoder options:

- PFA-MD...B-**G20**-B...-../C../000
- PFA-MD...B-**G21**-B...-../C../000
- PFA-MD...B-**G22**-B...-../C../000

INFORMATION

For startup, you require **MOVITOOLS® MotionStudio 5.7.0.2** or a later version.

Startup with an earlier version is **not permitted**.

- Start up the drive in conjunction with MOVIPRO® as described in chapter "Motor startup". It must be possible to move the drive, e.g. via the "Manual mode PRO" plug-in".

  Make sure that the following points have been carried out properly and according to the application:

  – Wiring
  – Terminal assignment
  – Safe disconnections
- 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.

Encoder parameterization

Observe the following information when you parameterize the encoders listed here:

- **HEIDENHAIN ROQ 424 (AV1Y)**
  - The SSI version with 10 ... 30 V is supported.
  - The type designation specifies all additional conditions.
- **T&R CE 58, CE 65, LE 100 SSI, LE 200, LA 41K-SSI**
  - Make a setting of 24 data bits and program signal bits to logical 0. Im 25. Bit number 25 may either contain 0 or an error or power fail bit. Other special bits following the position will not be evaluated. The 25-bit version is not supported.
  - The output mode must be "Direct".
  - The interface must be set to "SSI".
- **T&R CE 58 CANopen**
  - The termination switch must be set to "ON".
  - The node ID must be set to "1" via the 6-fold DIP switch.
  - The number of increments per revolution must be set to the standard value 4096.
- **T&R LE200 CANopen**
  - Terminating resistor for bus termination required.
  - The node ID must be set to "1" via the 8-fold DIP switch.
- **SICK STEGMANN AG100 MSSI, AG626, ATM90, ATM60**

  Only the 24-bit version is supported.
- **SICK STEGMANN ARS60**

  Only the 15-bit version is supported.
- **SICK DME-5000-x11, DME-4000-x11**
  - The interface must be set to "SSI".
  - You have to set "24 data bits + error bit".
  - The resolution must be set to "0.1 mm" or "1 mm".
  - The plausibility must be set to "Normal".
- **SICK DME-5000-x17, DME-4000-x17**
  - The interface must be set to "Hiperface®".
  - The resolution must be set to "1 mm".
  - The plausibility must be set to "Normal".
- **SICK DME-4000-x19**
  - The interface must be set to "CANopen".
  - The node ID must be set to "1".
  - The resolution must be set to "0.1 mm" or "1 mm".
  - The plausibility must be set to "Normal".
- **Pepperl & Fuchs WCS2(A)-LS311, WCS3(A)-LS311**
  - The type designation specifies all necessary conditions.
  - The line length to the encoder must not exceed 10 m.
- **Pepperl & Fuchs WCS3B-LS410**
  - The node ID must be set to "1" (switches 1 – 6 of the 8-fold DIP switch)
  - The baud rate must be set to "250 kBd" (switches 6 – 7 of the 8-fold DIP switch)

  - The transmission mode must be set to "asynchronous 0 ms / 10 ms" (switches 1 – 3 of the 4-fold DIP switch)
  - The data protocol must be set to "data protocol 2" (switch 4 of the 4-fold DIP switch to "on")
- **Pepperl & Fuchs EDM 30/120/140 - 2347/2440**
  - All modes are supported. Recommendation: Mode 0 (DIP switches 3 and 4 in ON position) or mode 3 (DIP switches 3 and 4 in OFF position) and measuring for triple reflector (DIP switch 2 in OFF position).
- **Pepperl & Fuchs VDM 100-150**
  - The operating mode must be set to "mode 3" ([Menu] / [Parameters] / [Operating modes] / [Mode 3]).
  - The coding must be set to "Gray".
  - The resolution must be set to "0.1 mm" or "1 mm".
- **LEUZE AMS200, OMS1, OMS2, BPS37**
  - You have to set "24 data bits + error bit".
  - Set the resolution to "0.1 mm".

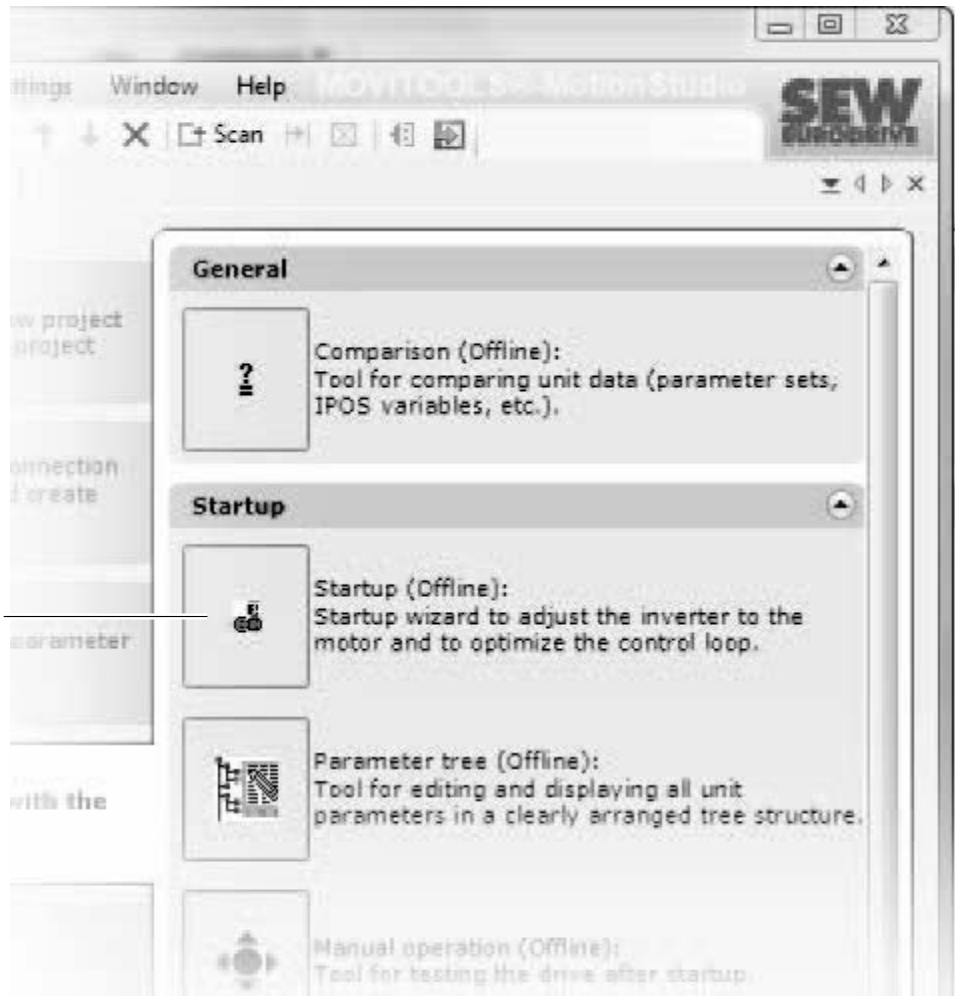
INFORMATION

The following applies to all parameterizable SSI encoders:

– The interface must be set to "SSI".
– You have to set "24 data bits + error bit" or "0 in bit 25".
– Plausibility must be set to "normal = 0" when the plausibility check is activated.
– The coding must be set to "Gray".

Encoder startup

1. Click on the [Startup] button [1] to open the startup wizard.

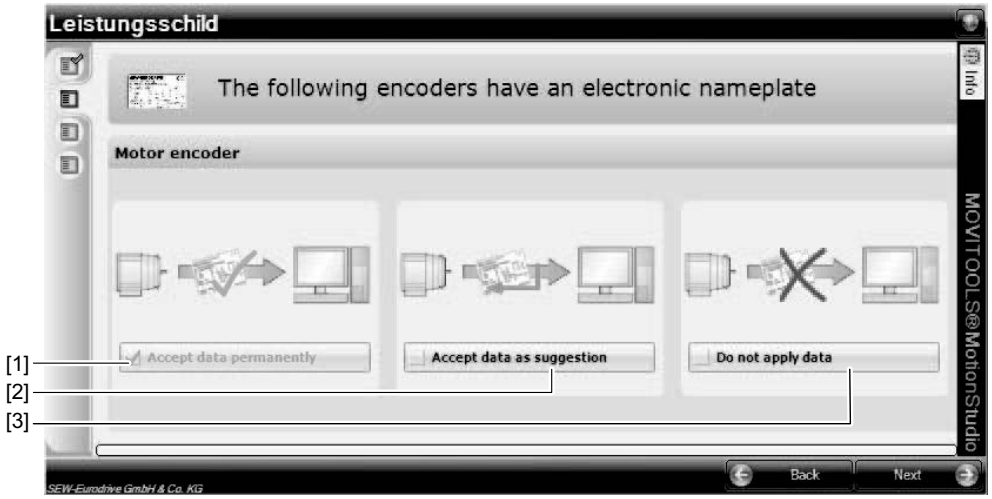


[1] [Startup] button

2. Click the [Next] button to continue with the next step. You can go back and forth in the wizard clicking the [Back] and [Next] buttons. The settings are not lost.

3024650891

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

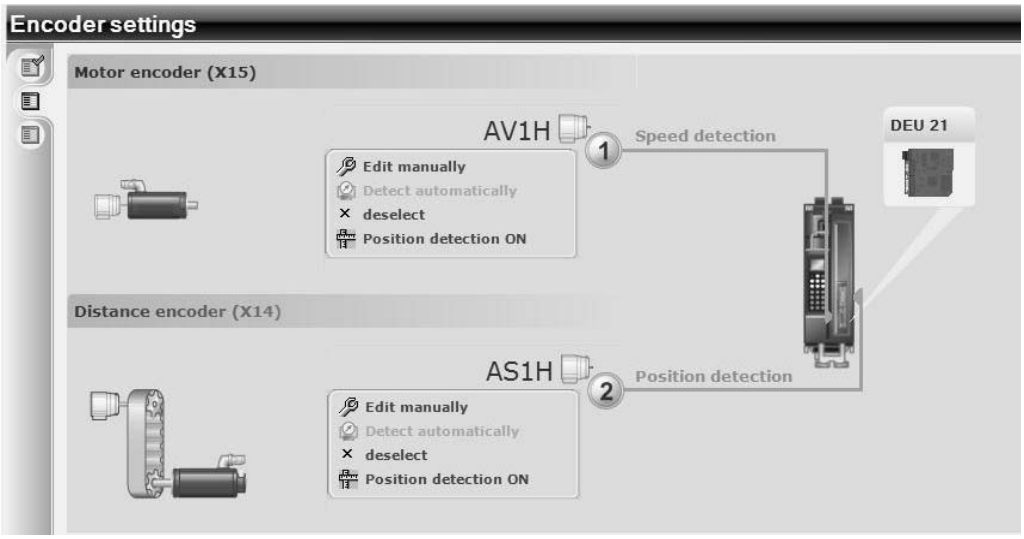


2071861387

The buttons have the following functions:

Button	Function
[Accept data permanently] [1]	Encoder data is uploaded into the startup wizard. It is not possible to edit the encoder data.
[Accept data as suggestion] [2]	Encoder data is uploaded into the startup wizard. You can edit the encoder data manually.
[Do not apply data] [3]	Encoder data is not uploaded into the startup wizard. You must edit all the encoder data manually.

4. Select the encoder settings for the motor and – if applicable – for the distance encoder:
   - "Manual editing" to select and parameterize an encoder.
   - "Automatic detection" to read out the connected encoder. This is only possible with the following SEW encoders:
     – Ex7S
     – ExxH
     – Ax7W
     – AxxH
   - "Deselect", if there is no encoder connected or if the application does not require an encoder.
   - "Position monitoring on" to determine the source of the actual values.



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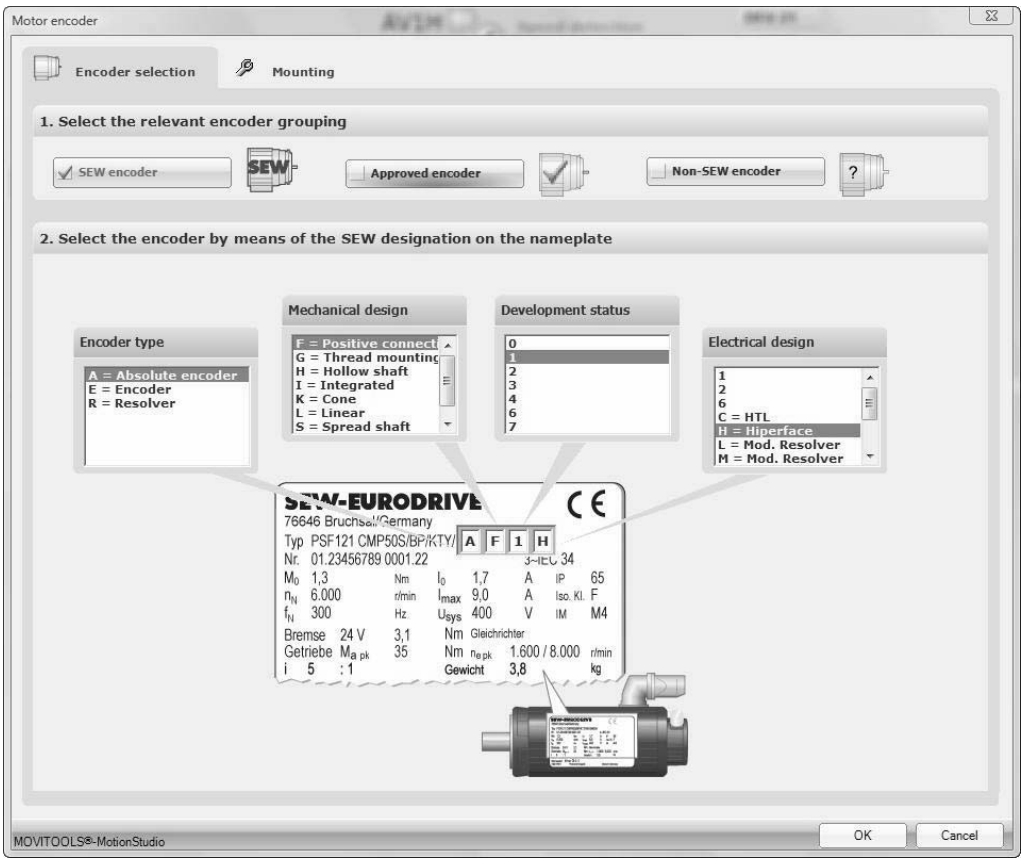
Editing SEW encoders manually

Proceed as follows to select an SEW encoder manually

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

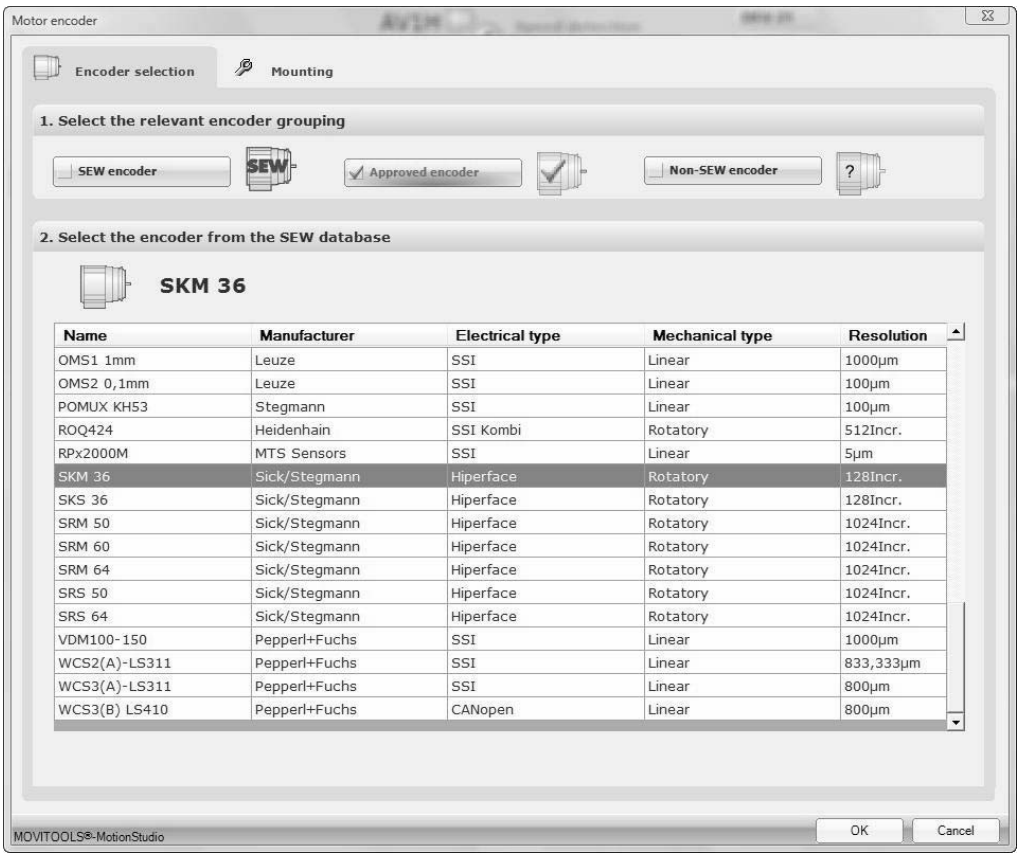


1942880907

Editing approved encoders

Proceed as follows to manually select a non-SEW encoder approved by SEW-EURODRIVE:

1. Click [Approved encoder].
2. Select the respective encoder from the SEW database



1942882827

3. Select the "Mounting" tab and define the type of mounting.

Defining the encoder mounting

Proceed as follows to define the encoder mounting:

1. Enter the counting direction of the encoder.

   The following options are possible:

   - "In direction of motor rotation"
   - "Inverse to direction of motor rotation

2. Specify the ratio between the motor and encoder.

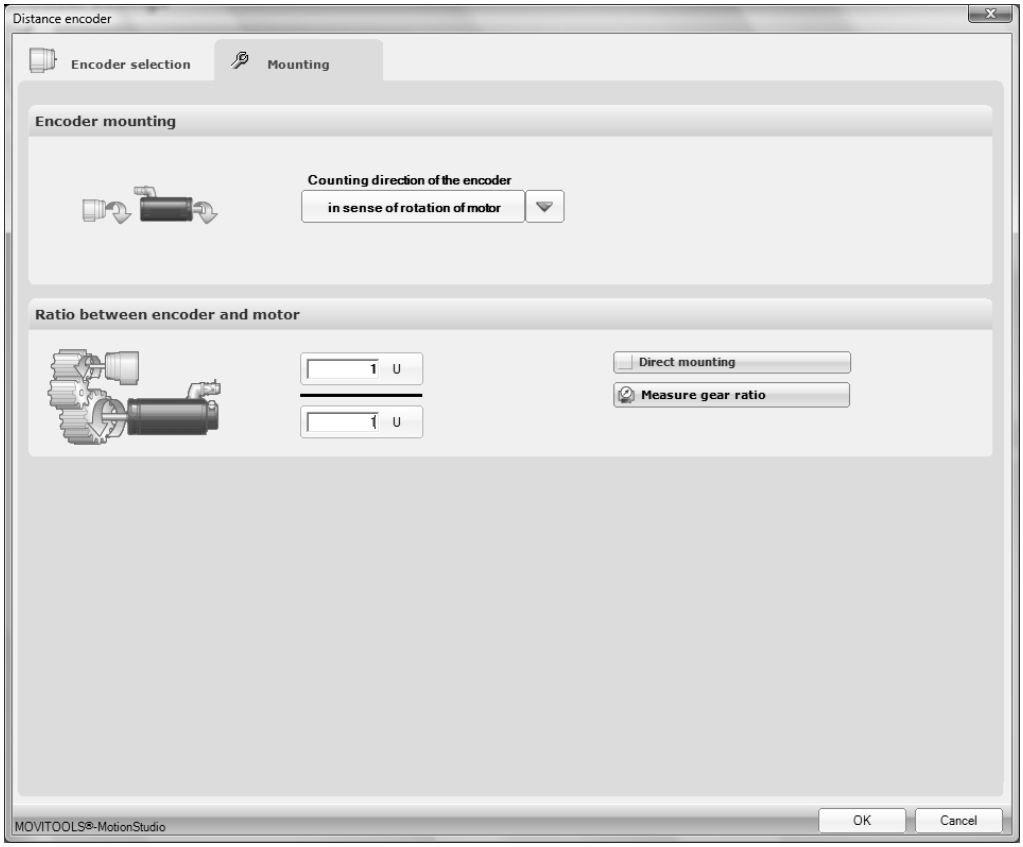
INFORMATION

You can measure the ratio with the startup software. This is only possible once the entire application has been installed.

Measuring the ratio

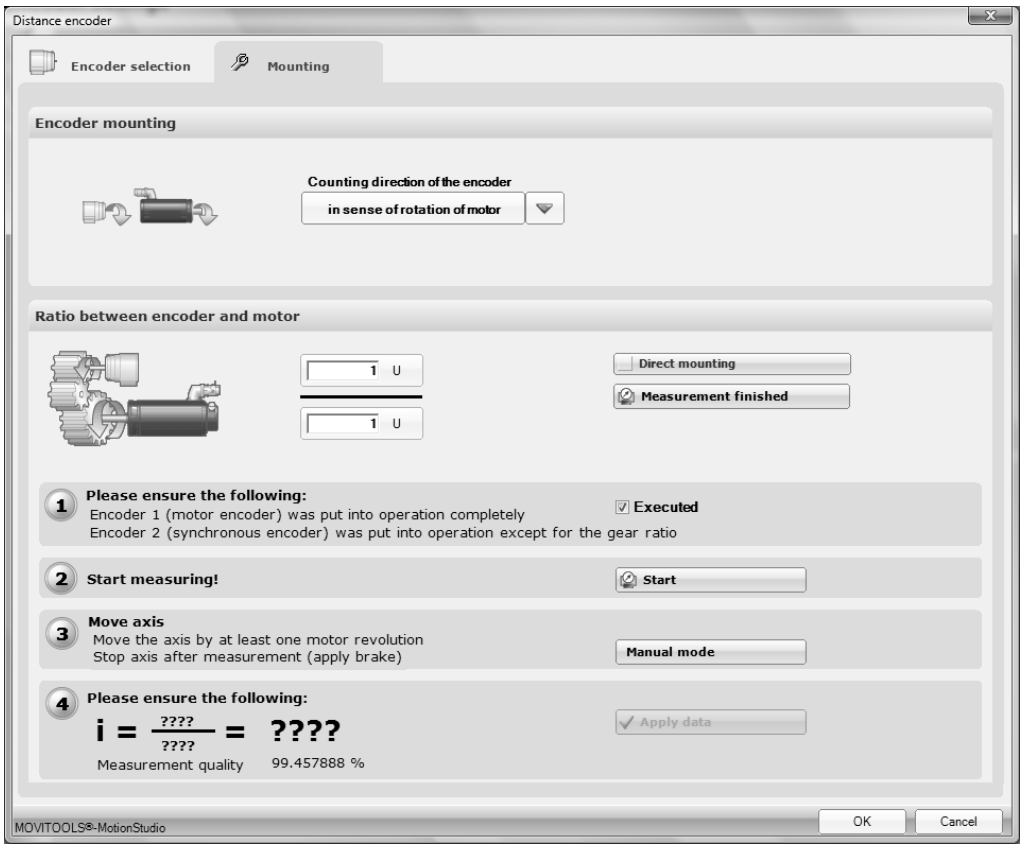
Proceed as follows to measure the ratio with the startup software:

1. Click the [Measure ratio] button.



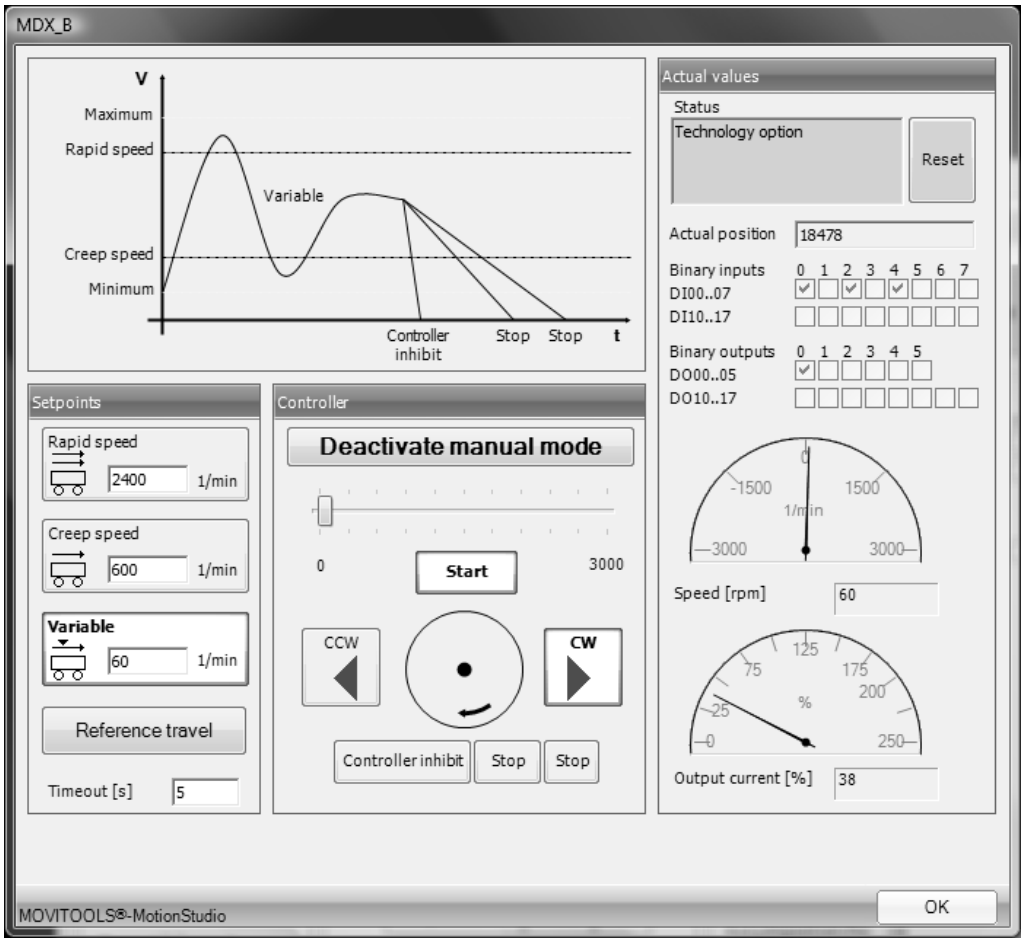
3027605515

2. Provide for the measure requested under (1) in the following figure and check the "Completed" checkbox.
3. Click [Start].
4. Click [Manual mode] to start manual mode.



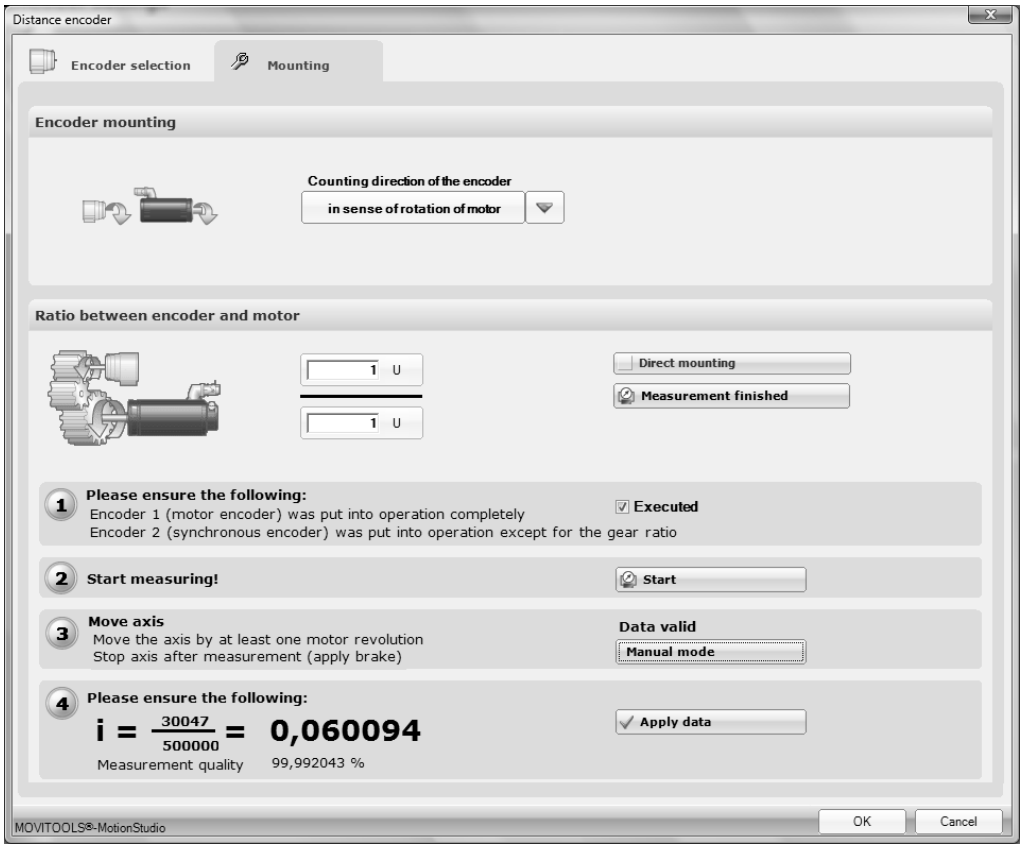
3027663755

5. Start manual mode and move the axis by at least one motor revolution. Then stop the drive (apply brake).



3027750923

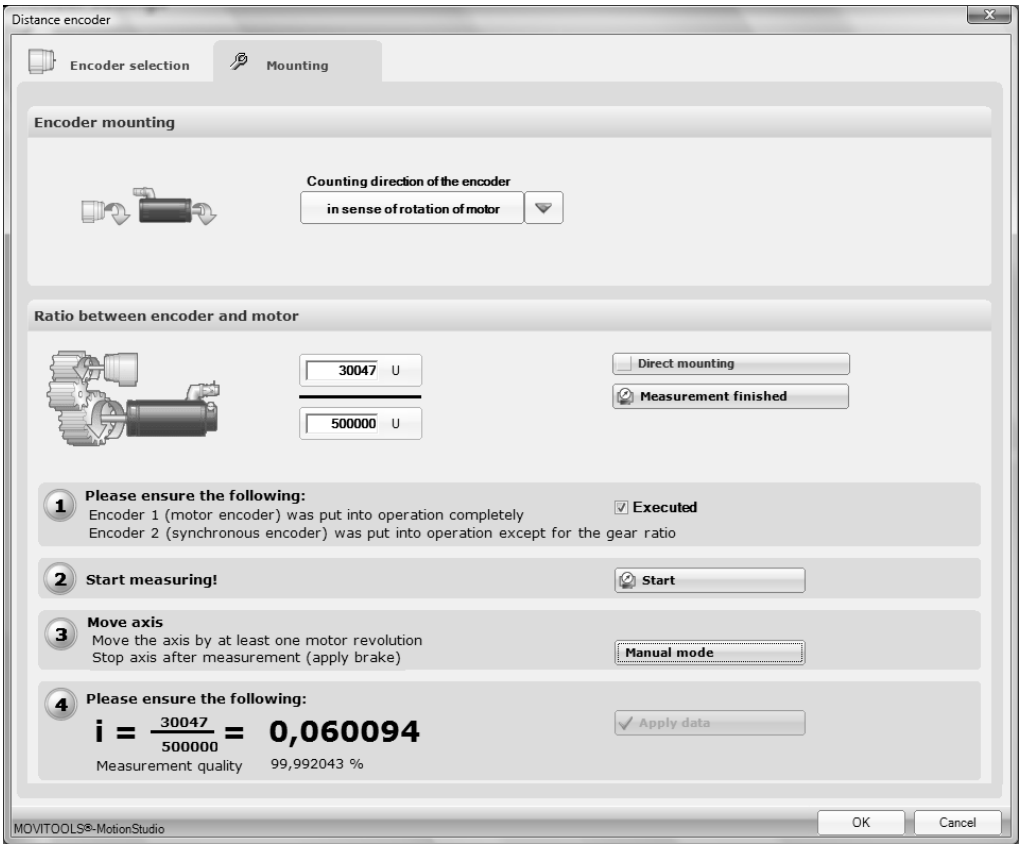
6. The determined data is displayed under 4. Further, there is information regarding the validity of the data under 3.



3027897867

7. If the data is valid, click [Quit manual mode] and [OK] to quit manual mode.

8. Click [Apply data] to apply the determined data. Now the data is entered as ratio value.



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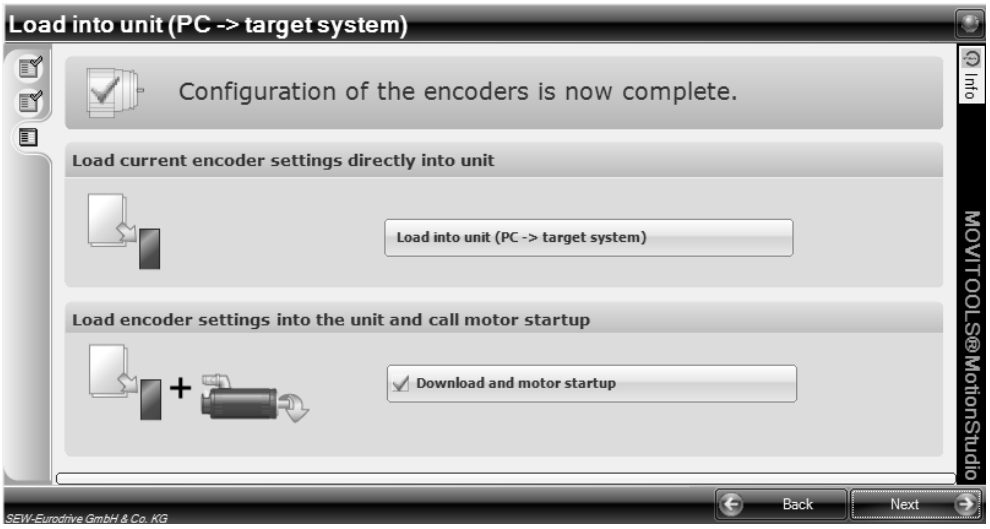
Completing encoder startup

To complete encoder startup, click on [Load into unit (PC → target system)] or on [Download and motor startup]. The buttons have the following functions:

Button	Function
[Load into unit (PC → target system)]	Transferring encoder data to MOVIPRO®
[Download and motor startup]	Transferring encoder data to MOVIPRO® and initializing motor startup



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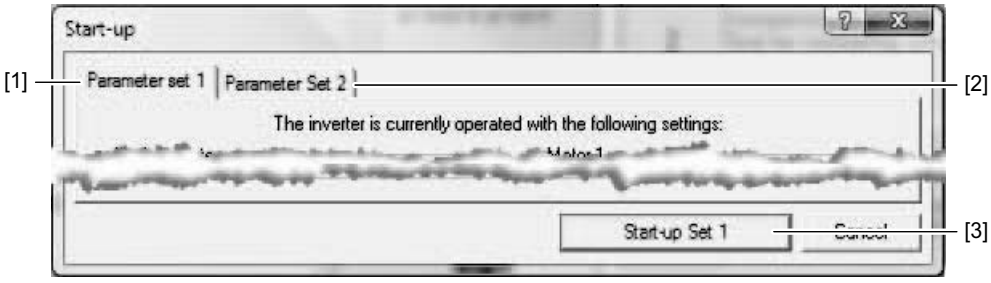
6.4.2 Motor startup

1. Perform an encoder startup (page 51) and complete it by clicking the [Download and motor startup] button.
2. To select the parameter set for startup, open the tab "Parameter set 1" [1] or "Parameter set 2" [2]. To confirm your selection, click on [Startup set 1] or [Startup set 2] [3].



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[1] "Parameter set 1" tab
[2] "Parameter set 2" tab
[3] [Startup set 1] / [Startup set 2] button

3. Select the startup type as follows:

Situation	Type of startup
• Initial startup of the motor • Extensive modifications performed (e.g. motor or encoder replacement)	Complete startup (page 62)

Situation	Type of startup
• Adapt data (e.g. changing the line or motor voltage)	Partial startup (page 65)
• Optimize a speed controller that has already been started up	Optimize a speed controller (page 65)

4. Click [Next] to continue.

Complete startup

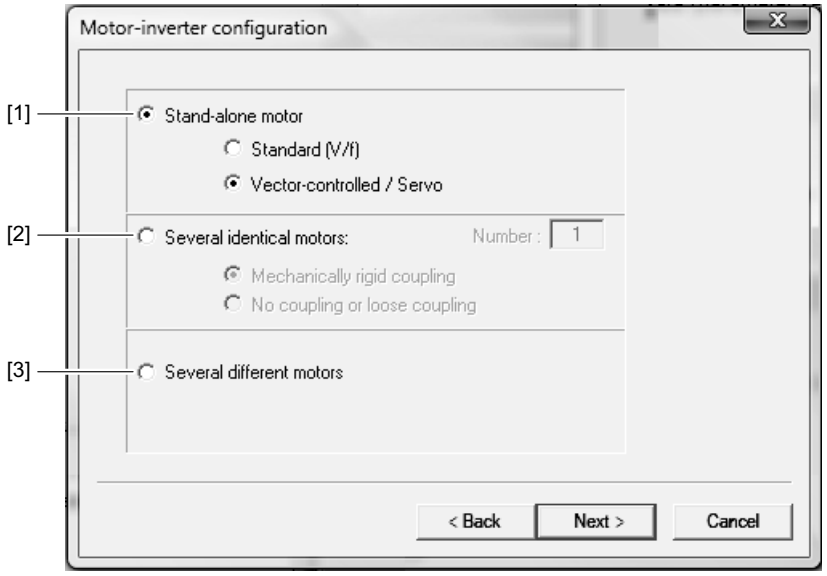
Perform a complete startup to make all the settings necessary for operating the drive.

1. Select a motor configuration:
   - **Stand-alone motor [1]**

     MOVIPRO® controls a single motor. First, select the operating mode "vector-controlled/servo". This is the best setting for operating SEW motors. If operation of a non-SEW motor with vector control does not achieve a satisfactory result, you can select the operating mode "Standard (U/f)".
   - **Several identical motors [2]**

     MOVIPRO® controls several motors of the same power rating. In this case, you have to specify whether the motor coupling is mechanically rigid or loose/non-existent.
   - **Several different motors [3]**

     MOVIPRO® controls several motors of a different power rating.



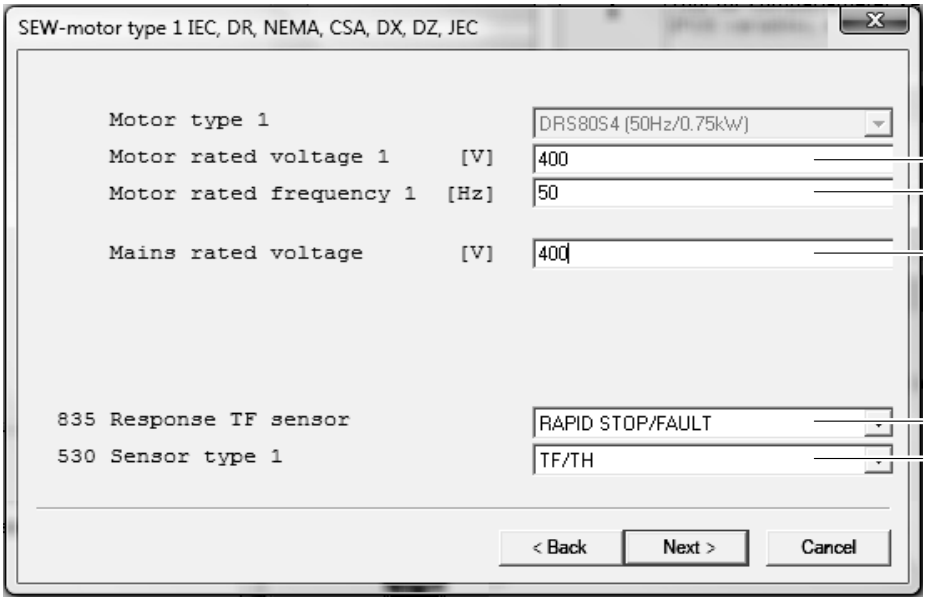
2071868683

[1] "Stand-alone motor" radio button
[2] "Several identical motors" radio button
[3] "Several different motors" radio button

2. Click [Next] to continue.
3. Check the displayed data of the motor encoder and click [Next].
4. Select the motor type and click [Next].

   Enter the following values according to the motor configuration:
   - Nominal motor voltage [1]
   - Nominal motor frequency [2]

- Nominal line voltage [3]
- Error response [4]
- Temperature sensor type [5]



2071890571

[1] "Rated motor voltage" edit box
[2] "Rated motor frequency" edit box
[3] "Rated line voltage" edit box
[4] "Error response" selection list
[5] "Temperature sensor type" selection list

5. Choose whether you want to use the encoder and click [Next].
6. Select the operating mode of the drive.

   INFORMATION Startup as a hoist is not possible in "CFC" operating mode.

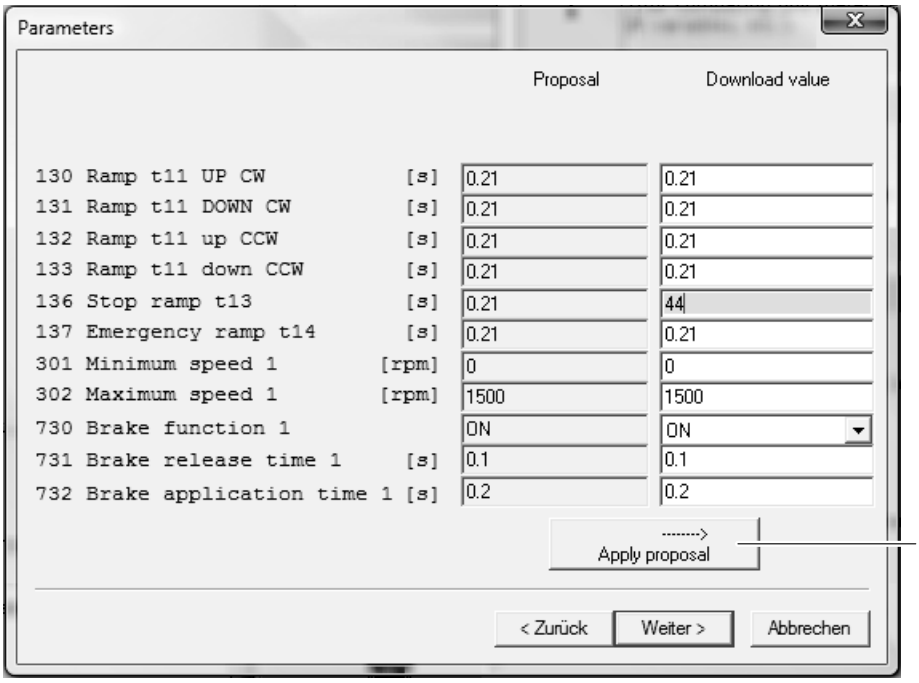
   To use the drive as a hoist, select the "Hoist" operating mode. The required parameters are now set automatically.

   To use an application module, select the "Positioning with IPOS®" operating mode. For more information about application modules, see chapter "Application modules for a parameterizable "MOVIPRO® ADC unit"

   Click [Next] to continue.
7. Select the control mode of the drive and click [Next].

8. Enter the values of the speed controller and click [Next].

   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 [Apply proposal] [1].

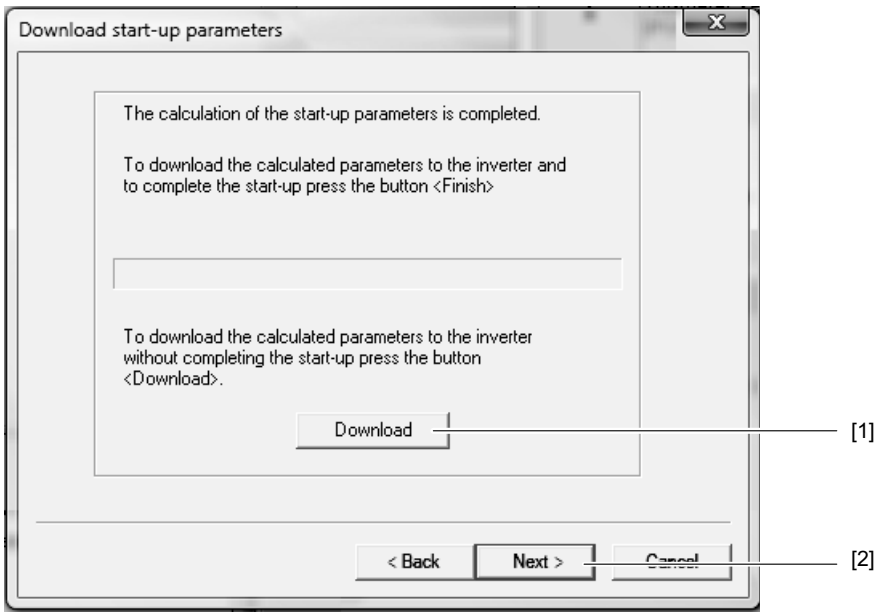


2071878411

[1] [Apply proposal] button

9. To save the startup parameters, click on [Download 1] or [Next] [2]. The buttons have the following functions:

Button	Function
[Download]	Downloading the startup parameters to MOVIPRO®
[Finish]	Downloading the startup parameters to MOVIPRO® and completing startup



2071875979

[1] [Download] button
[2] [Finish] button

Partial startup

Perform a partial startup to make the following settings:

- Rated motor voltage
- Rated motor frequency
- Rated line voltage
- Error response
- Temperature sensor type
- Download values of the drive parameters

Optimizing a speed controller

Optimize the speed controller by changing the download values of the drive parameters.

6.4.3 IPOS application modules

INFORMATION

In orer to use the IPOS application modules, you first have to configure the "Transparent" application module using the Application Configurator and then upload it into the communication and control unit "PFH-...".

You can use all the IPOS application modules running on the internal power section "PFA-...":

- Bus positioning
- Extended positioning via bus
- Modulo positioning
- Table positioning
- Sensor based positioning via bus
- Automotive AMA0801

More information

You find more information about IPOS application modules in chapter "Scope of functions", chapter "Process data description", and in the following manuals:

Manual – Applications
"MOVIDRIVE® MDX61B Extended Bus Positioning Application"
"MOVIDRIVE® Modulo Positioning"
"MOVIDRIVE® MDX61B Automotive Application Module (AMA0801)"
"MOVIDRIVE® MDX61B Table Positioning Application"
"MOVIDRIVE® Drive Inverter Bus Positioning"
"MOVIDRIVE® MDX61B Sensor-Based Positioning via Bus Application"

INFORMATION

You find the manual on the internet at **www.sew-eurodrive.com** under "MOVIDRIVE® B drive inverter" in the category "Manuals – Applications".

6.5 Parameterizing the communication and control unit "PFH-..."

INFORMATION

To being able to replace the unit quickly, you have to save the device data on the memory card after successful startup.

6.5.1 Parameterizable unit (CCU)

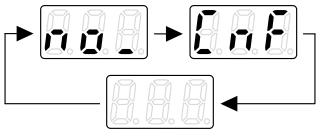
INFORMATION

For startup, you require **MOVITOOLS® MotionStudio 5.7.0.2** or a later version.

Startup with an earlier version is **not permitted**.

Initial startup

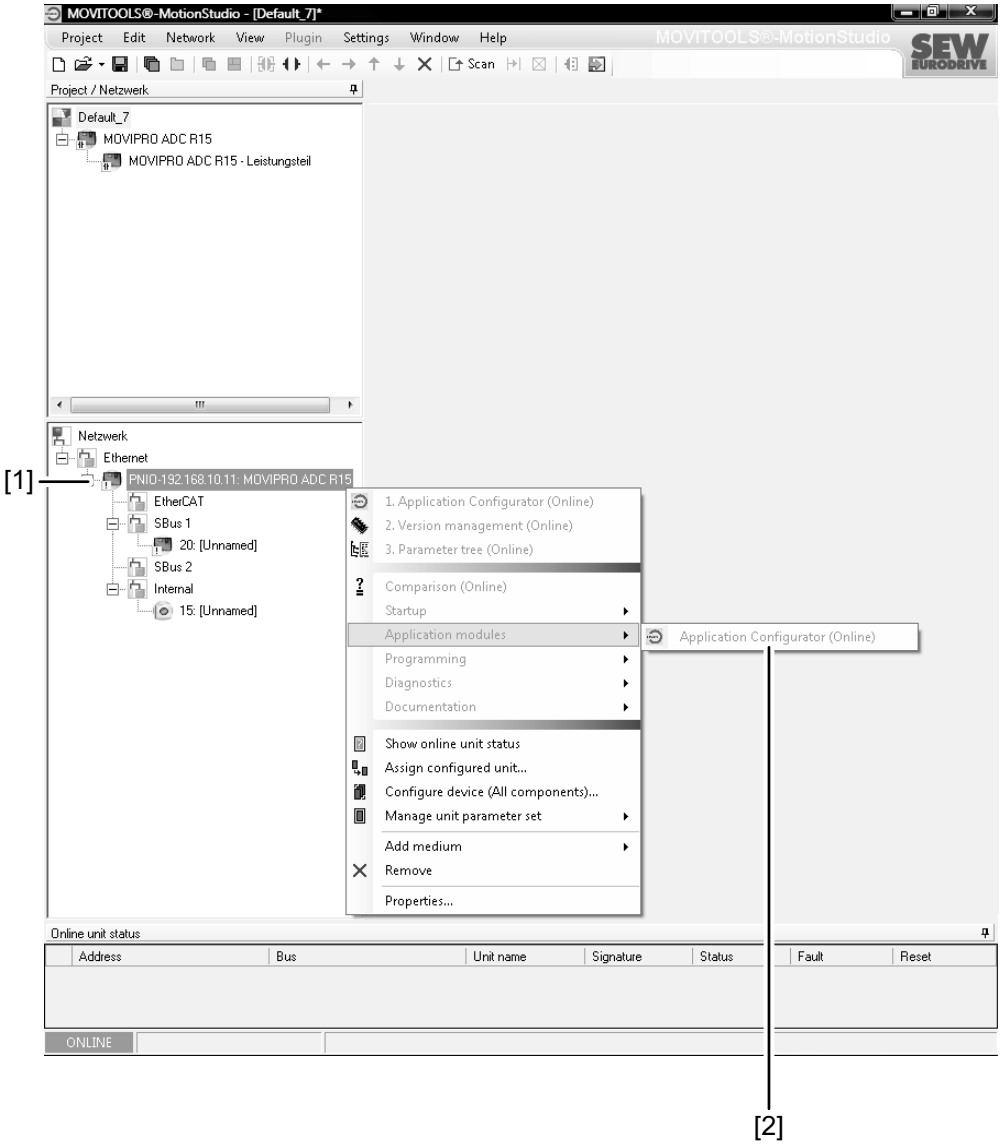
When you switch on the parameterizable MOVIPRO® ADC unit for the first time, it displays the following:

Display	Description	Remedy
 **In combination with:** **S2:** Flashing green **S3:** Lit green	No configuration has been loaded yet with the Application Configurator.	Load a configuration into MOVIPRO® using the Application Configurator.

For initial startup, perform the following steps:

1. Connect MOVIPRO® with your PC or laptop via the Ethernet service interface (X4223).
2. Start MOVITOOLS®MotionStudio and create a new project. Refer to the "MOVITOOLS® MotionStudio" manual for detailed information.
3. Perform a network scan.

4. Under "Network", right-click on your MOVIPRO® [1]. From the context menu that opens, choose [Application modules]/[Application Configurator] [2]. The Application Configurator opens.



5128533515

[1] MOVIPRO®
[2] "Application Configurator" button

5. In the Application Configurator, click [Create new configuration] [1].

5128537099

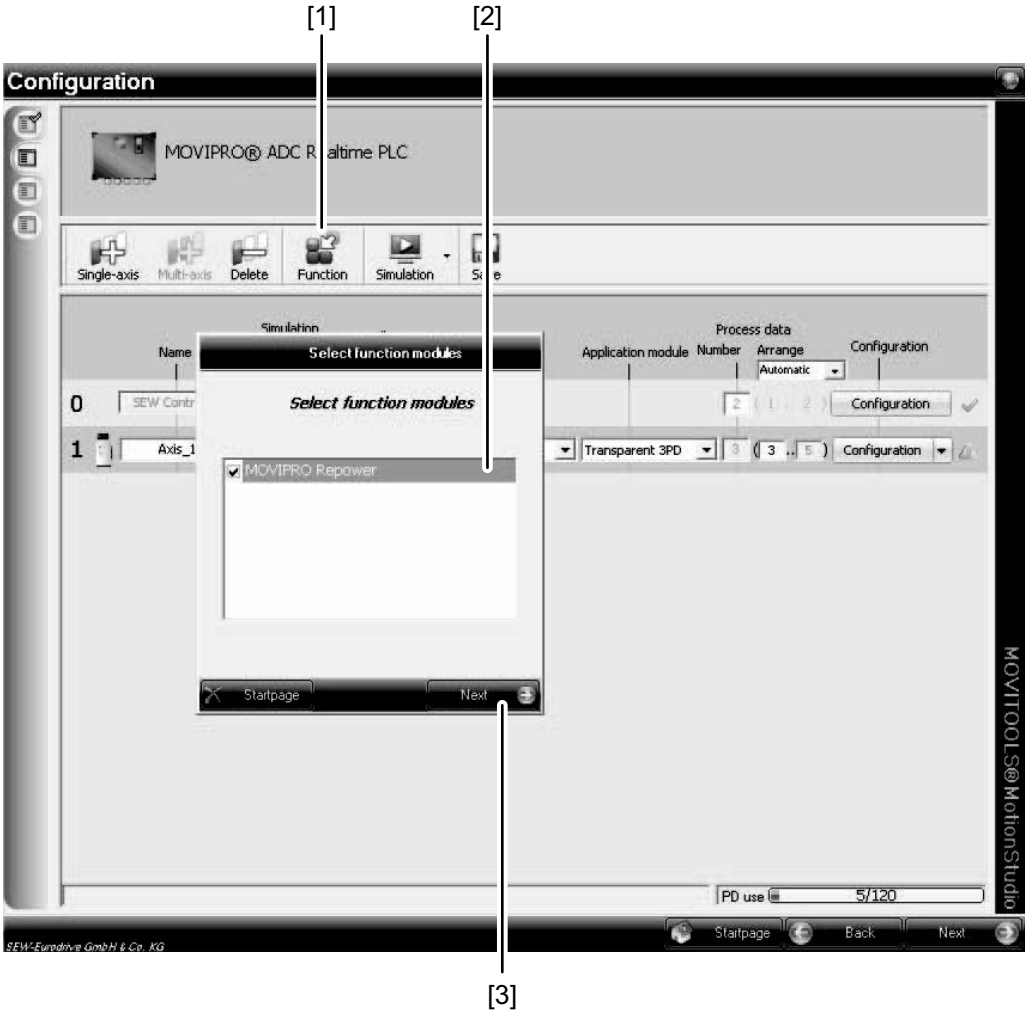
[1] [Create new configuration] button

6. **MOVIPRO® with R15 regenerative power supply**

INFORMATION

This step applies only to MOVIPRO® with R15 regenerative power supply. If your unit is not equipped with R15 regenerative power supply, continue with the next step.

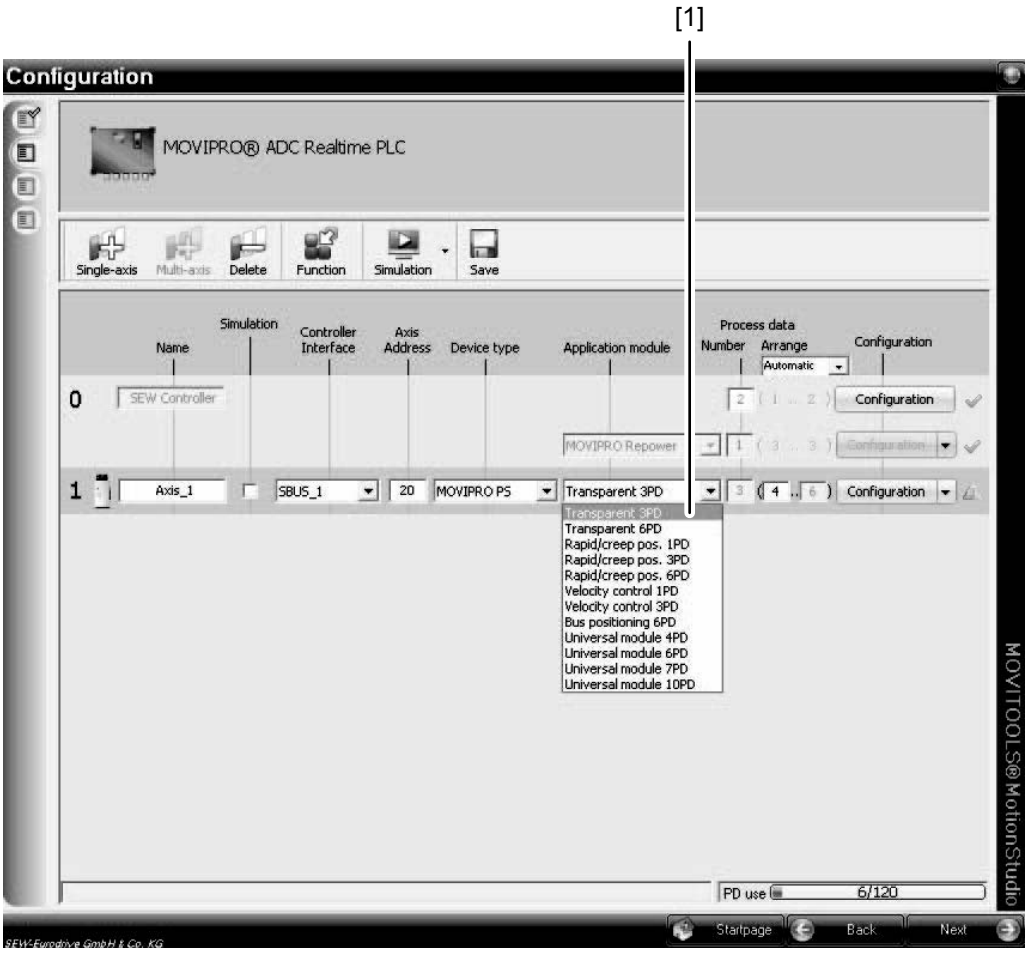
In the "Configuration" window, click on [Function] [1]. The window "Select the function modules" opens. Select [MOVIPRO Repower] [2] and confirm by clicking [Next] [3].



5128656395

[1] [Funktion] button
[2] [MOVIPRO Repower] function module
[3] [Next] button

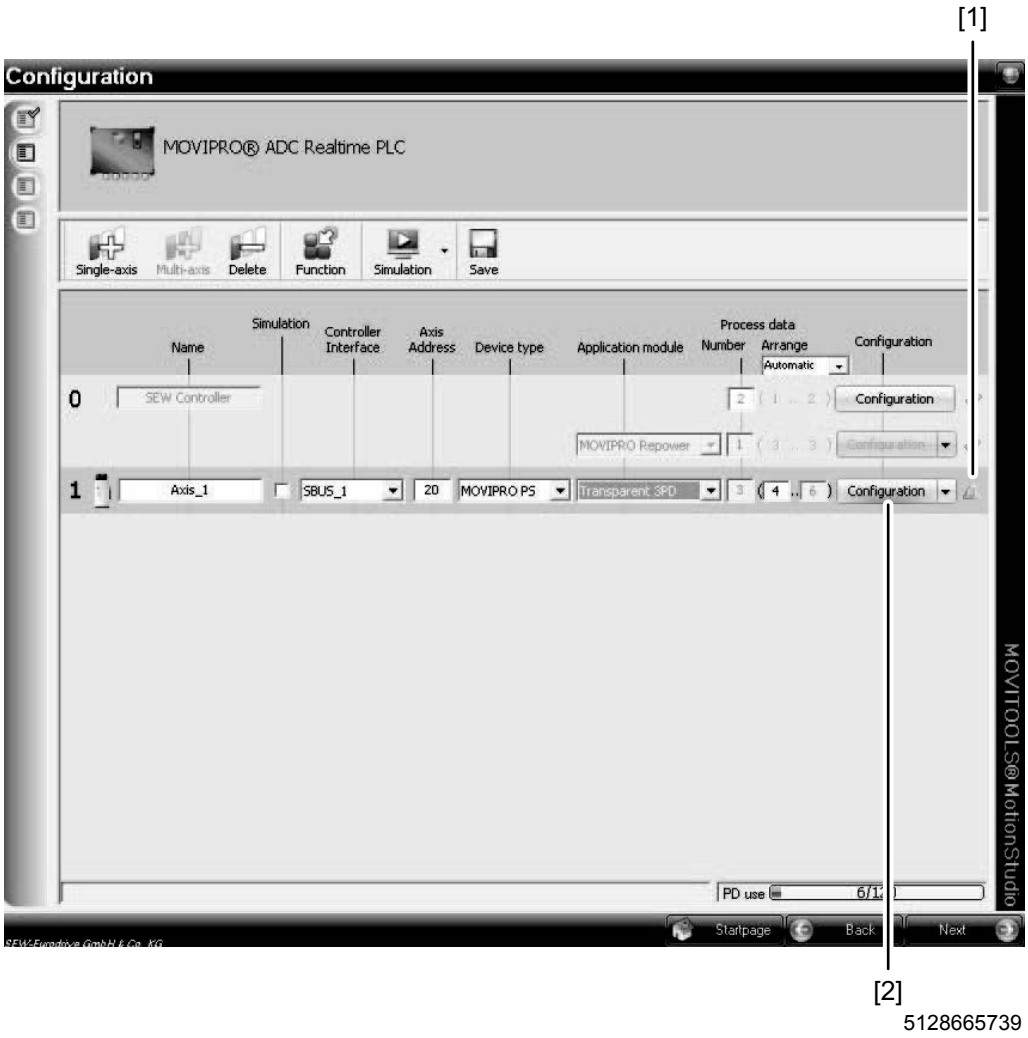
7. For speed-controlled operation (delivery condition), for example, select the [Transparent 3PD] application module [1].



5128660875

[1] [Transparent 3PD] application module

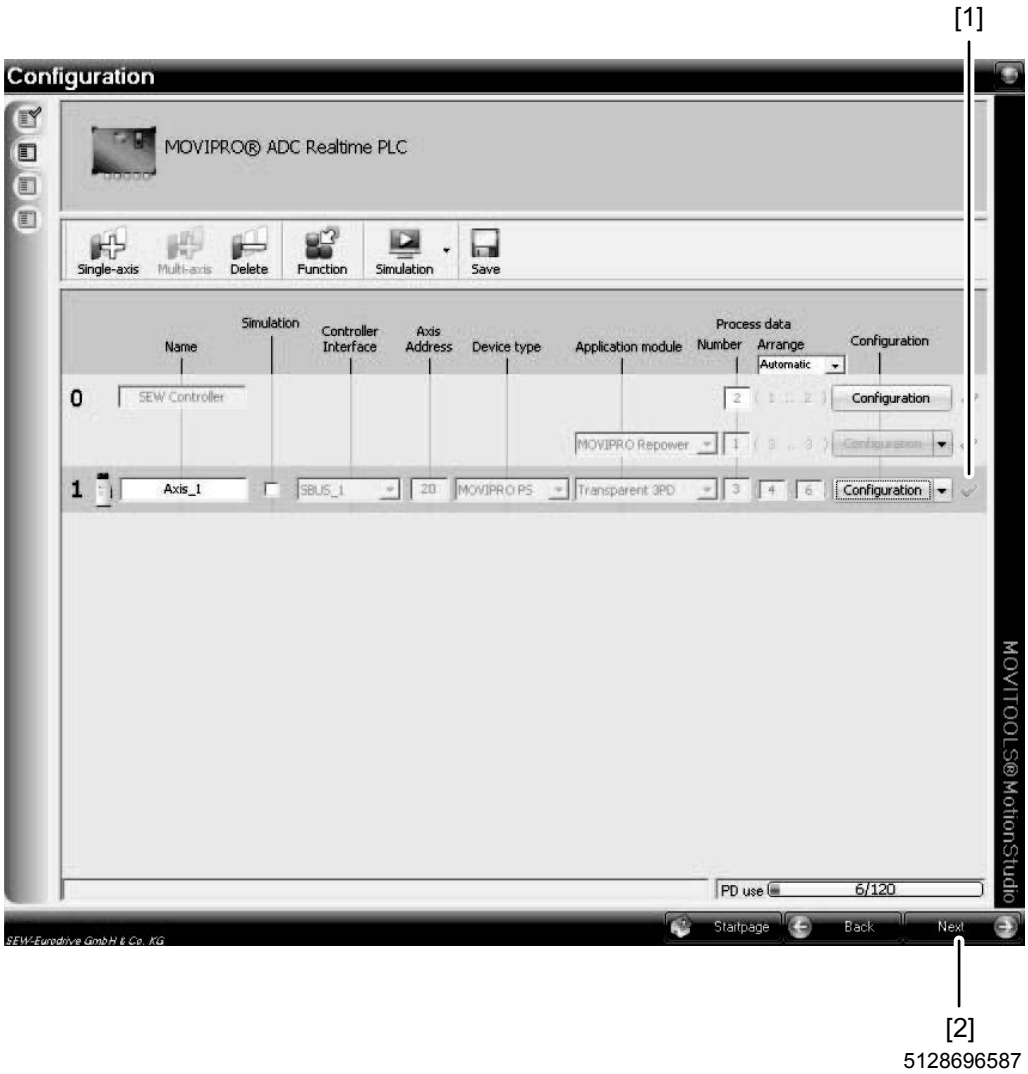
8. The yellow exclamation mark [1] indicates that configuration is not yet finished. In this case, the configuration can **not** be loaded into the power section. To finish the configuration, click [Configuration] [2].



5128665739

[1] Yellow exclamation mark = configuration not yet finished
[2] [Configuration] button

9. The green tick [1] indicates that the configuration is completed. In this case, click [Next] [2] to continue.



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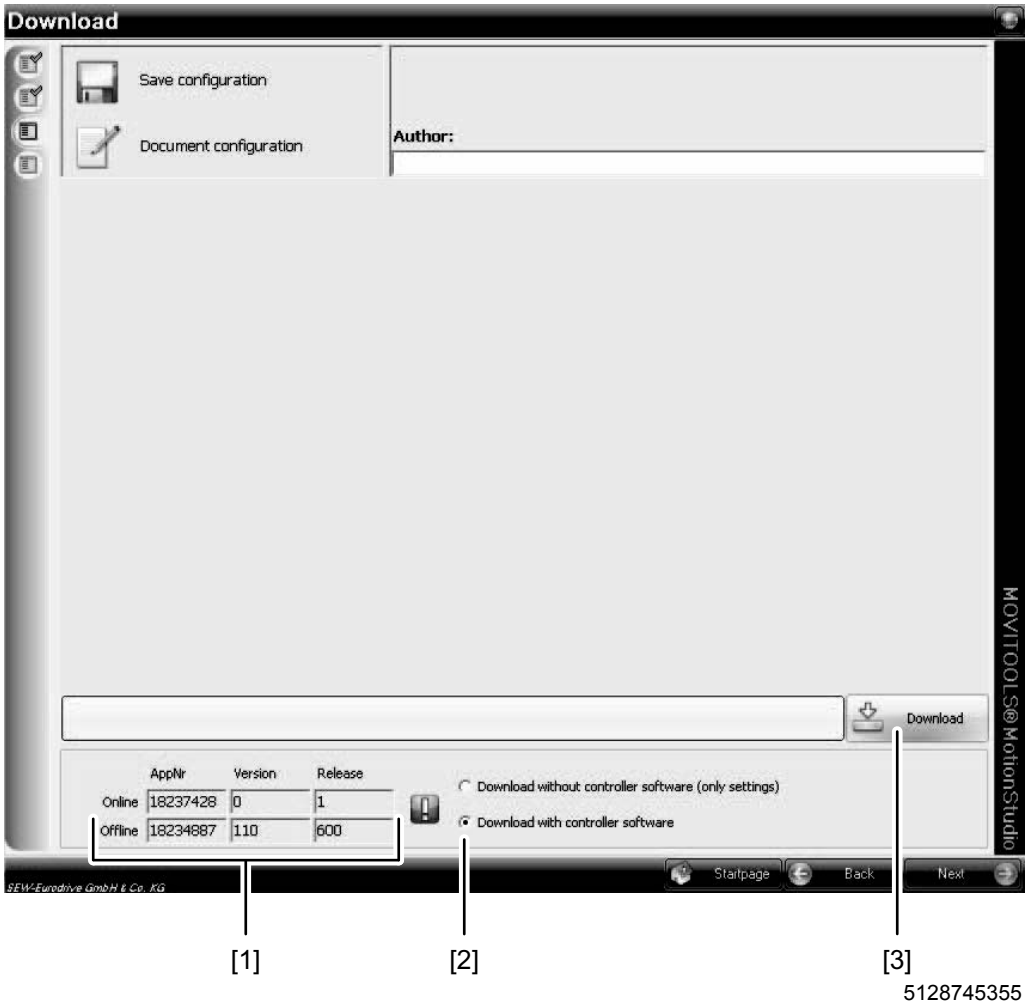
[1] Green tick = configuration completed
[2] [Next] button

10. Compare the online and offline data [1]. If they differ, enable the [Download with controller software] radio button. To load the data into MOVIPRO®, click [Download] [3].



5128745355

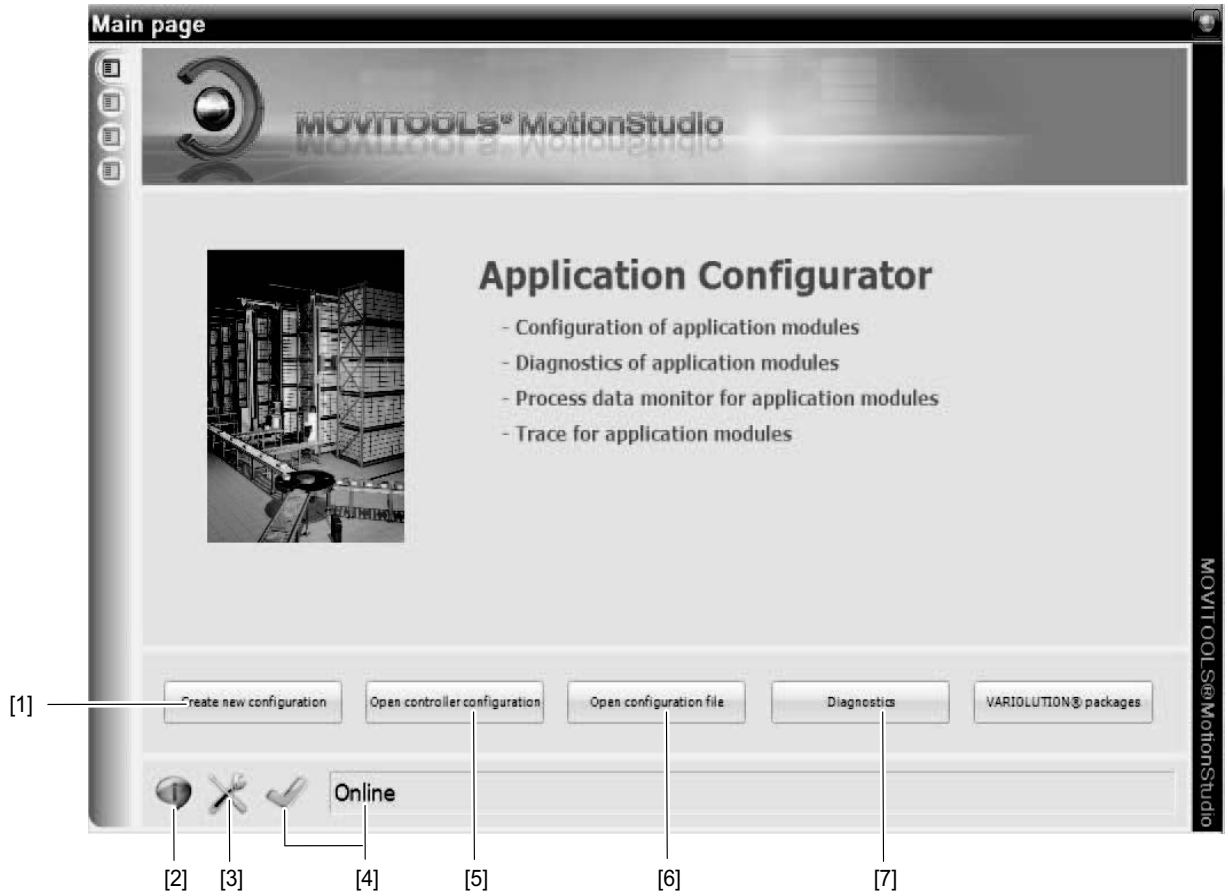
[1] Online and offline data
[2] [Download with Controller Software] radio button
[3] [Download] button

INFORMATION

The download can take some time.

Start page of the Application Configurator

Following an overview of the functions of the Application Configurator:



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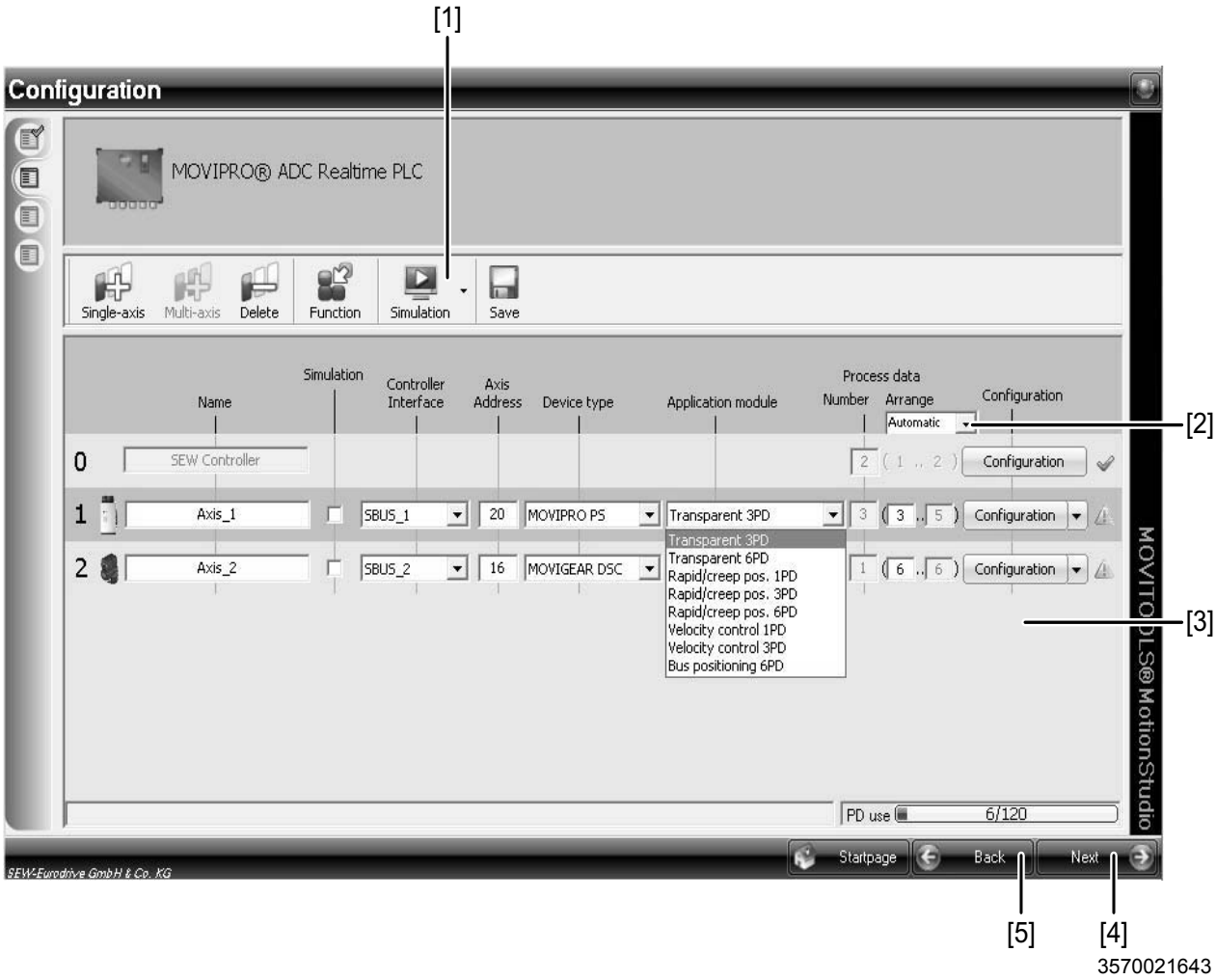
Section		Function
[1]	**[Create new configuration] button**	Click this button to open the configuration interface in order to create a new configuration and transfer it to the SD card of MOVIPRO®.
[2]	**Symbol indicating the version information**	The symbol shows the version of the Application Configurator when moving the mouse over it (tooltip).
[3]	**[Settings] button**	In the "Einstellungen" menu, you specify how MOVIPRO® should load the configuration: • **On:** The configuration is only loaded when changes were made to it • **Off:** The configuration is always loaded
[4]	**Display of the communication status of MOVIPRO®**	The communication states have the following meaning: • **Green tick and online:** The communication to MOVIPRO® has been established successfully. • **Red cross and offline:** Failure to establish a communication with MOVIPRO®.
[5]	**[Open configuration from controller] button**	Click this button to load a configuration from the SD card of MOVIPRO® to the Application Configurator.
[6]	**[Open configuration from file] button**	Click this button to open a dialog for selecting an existing configuration from a file (*.AppConfig.zip).
[7]	**[Diagnostics] button**	Click this button to open the diagnostic interface with the following functions: • Overview (state of MOVIPRO®) • PD monitor (process data monitor) • Trace record • Advanced diagnostics

"Create new configuration" window

Following an overview of the functions of the "Create new configuration" window:



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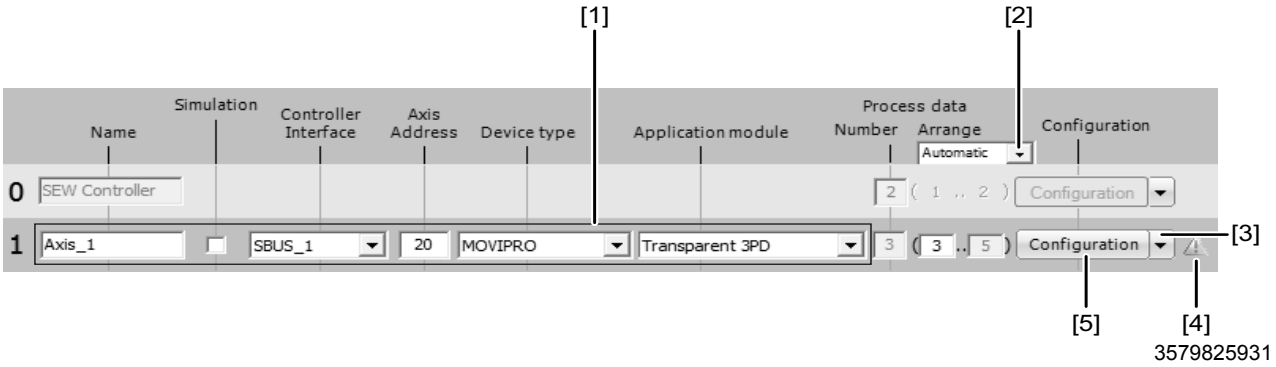
Section		Function
[1]	**Toolbar**	This is where you find the icons for the following tasks: • Add single axes • Add multi-axis applications (not available for MOVIPRO®) • Delete axes • Simulation – All axes – No axes • Save complete configuration (all axes)
[2]	**"Process data arrangement" selection list**	This is where you determine how the process data of the units are arranged: • **Automatically:** The units are addressed sequentially. • **Manually:** Here you can manually adjust the addressing of the units and in this way create gaps between the addressing (only recommended for staff with experience in the addressing of process data).
[3]	**Axis section**	This section shows the individual axes in lines.
[4]	**Process data word utilization**	This section shows the available process data words.
[5]	**Footer**	With the buttons in the footer, you can jump back and forth between the individual program sections or switch to the start page.

Adding axes

Proceed as follows to add individual axes:

1. Click the "Single axis" icon in the configuration interface. A new line appears in the axis section:



2. Configure the axis [1] according to your requirements:
   - Enter an axis name.
   - If the axis is physically not yet available but you want to perform diagnostics later, activate the "Simulation" radio button.
   - Select "SBUS_1" as the controller interface. The communication and control unit is connected with the axis via this interface.
   - Set the same axis address as for the unit (MOVIPRO® power section address 20).
   - Select "MOVIPRO LT" as the device type.
   - Select the required application module with the suitable profile, for example:
     – Application as speed-controlled drive: Transparent 3PD
     – Application module used in the power section (e.g. extended positioning via bus): Transparent 6PD
3. Click the [Configuration] button [5]. A wizard opens that lets you set the parameters for the selected application module.

INFORMATION

In some application modules, you need not make any settings because the wizard assigns the required parameters.

4. Follow the instructions of the wizard.

   Once you have configured an axis, the yellow warning symbol [4] turns into a green check. If required, you can undo this step by selecting "Resetting the configuration" from the drop-down menu [3].
5. If required, add more axes and repeat the previous steps.

INFORMATION

The process data words used are displayed for each axis and are arranged in sequential order.

6. Click [Next] to continue. The "Download" interface opens. For further information, refer to section "Download".

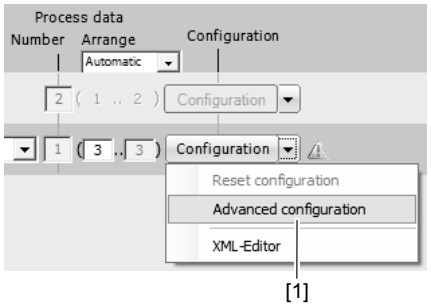
Advanced configuration

There are special settings for some application modules. This includes, for example, the update rate of the process data for the "Transparent" application module.

Specific settings for the controller are provided under "Advanced configuration".

Proceed as follows to switch to advanced configuration:

1. Open the configuration interface.
2. Open the "Configuration" selection list (e.g. in line "0" "SEW controller").
3. Click on [Advanced configuration].



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[1] [Advanced configuration] entry

4. Make the required settings in the window that now opens.
5. Finally confirm the application module configuration by clicking [Next] and the controller configuration by clicking [OK].

Advanced configuration of the controller

The advanced configuration of the controller provides the following setting options:

- Process data byte swap:
  - On: Motorola format (used in Rockwell controllers, for example)
  - Off: Intel format (used in Siemens controllers, for example)

INFORMATION

The setting applies to the complete process data range, i.e. for all axes.

- IO configuration: Assignment of the binary input and output terminals
- Parameter channel:
  - On: Activated
  - Off: Deactivated
- Toggle bit interval

MOVILINK® parameter channel

If you want to use the MOVILINK® parameter channel, you have to activate it in the "Advanced configuration settings".

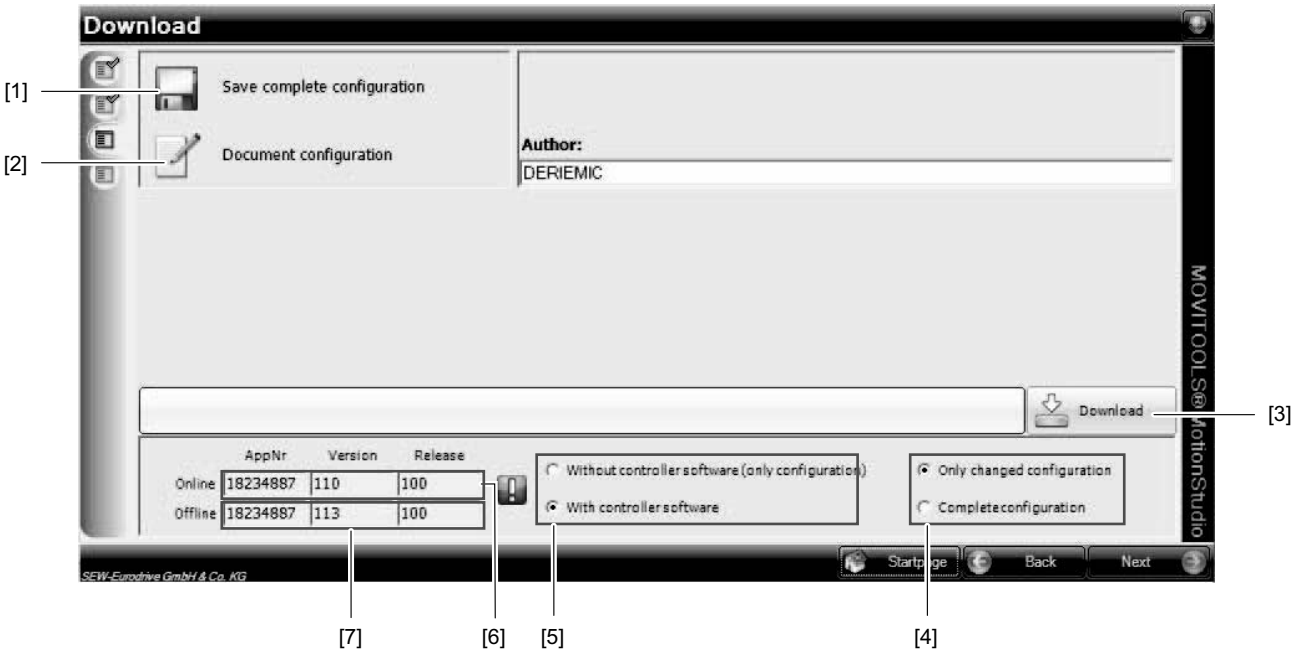
The MOVILINK® parameter channel enables access to all drive parameters of the inverter, regardless of the bus in use. Special services are available in this parameter channel to being able to read different parameter information.

INFORMATION

You find more information in the "Configuration Software Application Configurator" manual.

"Download" window

The "Download" window provides the following functions:



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Section		Function
[1]	**[Save controller configuration] button**	Click this button to save the entire configuration (all axes) in a ZIP folder on your computer.
[2]	**[Save configuration] button**	Click this button to save the configuration in PDF format.
[3]	**[Download] button**	Click this button to load the configuration with or without application program to the SD card of MOVIPRO®.
[4]	• **"Download without application (only setting)" radio button** • **"Download with application" radio button**	Use the radio buttons to choose whether to load the configuration to the SD card of MOVIPRO® **with** or **without** application program. **Note:** The program sets the correct option automatically. With "Download with application", use the engineering interface of MOVIPRO® to accelerate the process.
[5]	**"Application program online" display**	Indicates the version of the application program on MOVIPRO®.
[6]	**"Application program offline" display**	Indicates the version of the application program available in MOVITOOLS® MotionStudio (offline). If a more recent version is indicated here than under [4], SEW-EURODRIVE recommends to update the software. The program automatically sets the option "Download **with** application".

For more information, refer to the following documentation:

Documentation
"Configuration software Application Configurator for CCU" manual

6.5.2 Programmable unit (MOVI-PLC®)

INFORMATION

You can program MOVIPRO® only if you use an SD memory card of the type OMH_T.

INFORMATION

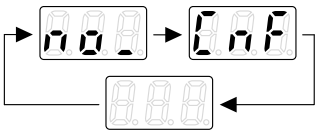
SEW-EURODRIVE provides libraries for the freely programmable MOVIPRO® unit. You find the latest library versions at **www.sew-eurodrive.com** in the "Software" section.

Use the libraries available for MOVIPRO®:

- PFH_P1D1_1_A (PROFIBUS, DeviceNet)
- PFH_E2E3_1_A (PROFINET, EtherNet/IP, Modbus/TCP)

Initial startup

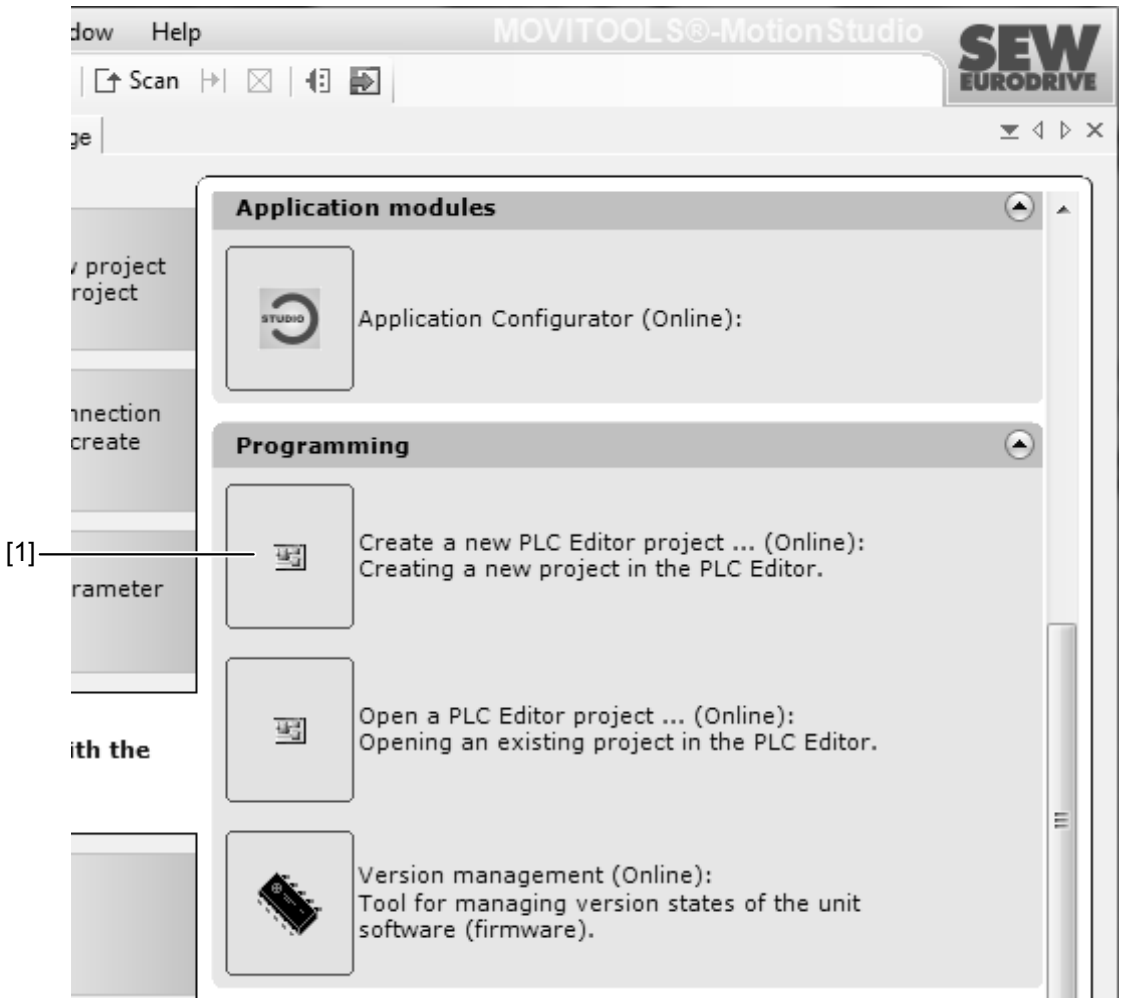
When you switch on the programmable MOVIPRO® ADC unit for the first time, it displays the following:

Display	Description	Remedy
 **In combination with:** **S2:** Flashing green **S3:** Lit green	No IEC program loaded.	Load your user program into the unit.

For initial startup, perform the following steps:

1. Start MOVITOOLS®MotionStudio and create a new project.
2. Select the communication and control unit "PFH-...".

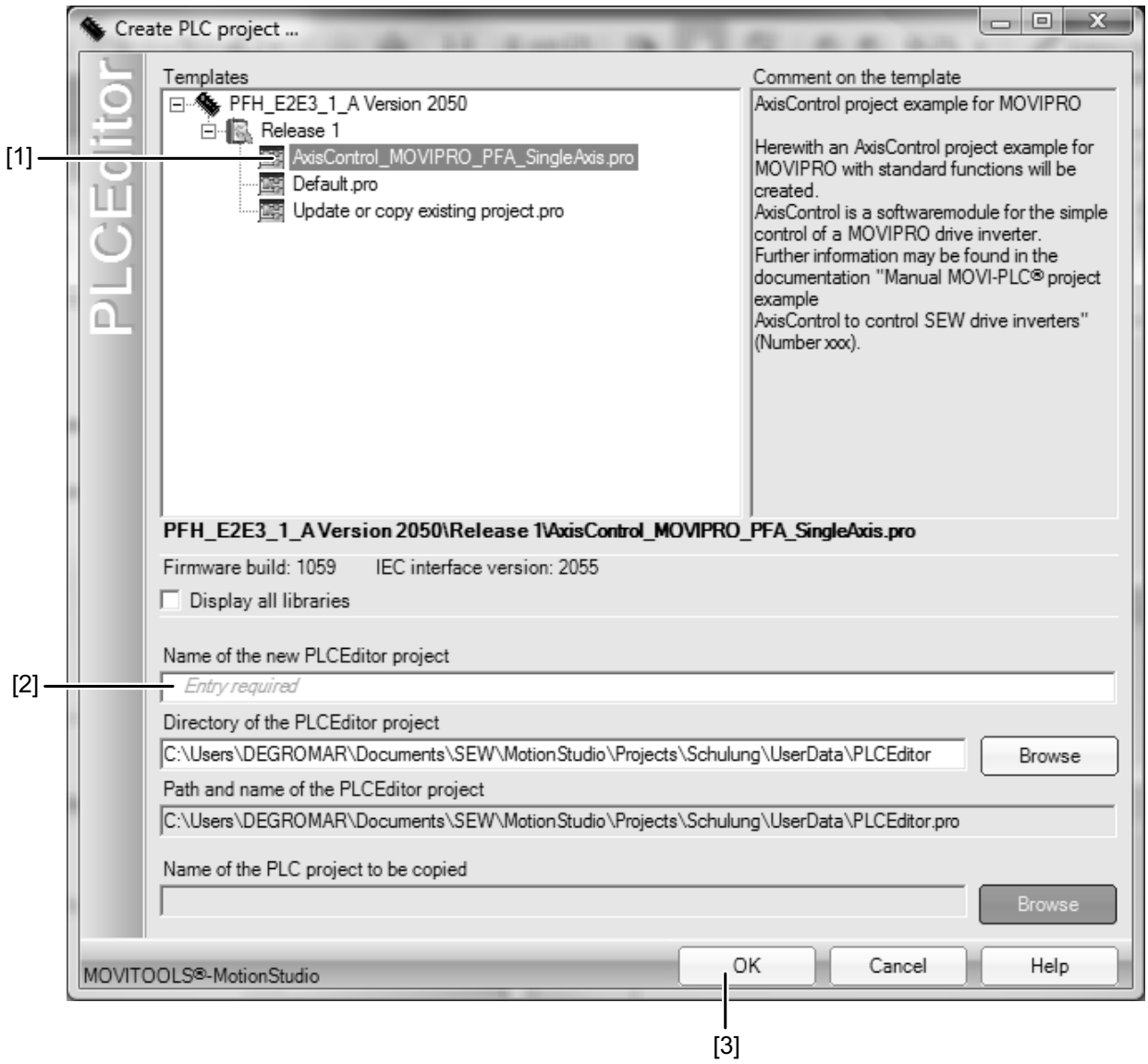
3. To start programming, click [Create new PLC Editor project] [1].



[1] [Create new PLC Editor project] button

4. Select any project template for controlling the internal power section "PFA-..." (e.g. "Axis_Control_MOVIPRO_PFA_SingleAxis.pro" [1]).

Assign a project name [2] and click [OK] [3] to confirm.



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[1] Project template selection
[2] "Project name" edit box
[3] [OK] button

5. Write your user program and load it into MOVIPRO®.

For more information, refer to the following documentation:

Documentation
"MOVI-PLC® Programming in the PLC Editor" manual
"MOVI-PLC® AxisControl Sample Project" manual

6.5.3 Configuring the fieldbus

Once you have started up encoder and motor, you have to configure the fieldbus. For detailed information, see chapter PROFINET IO configuration.

6.6 Storing unit data

The MOVIPRO® unit allows for a quick unit replacement. MOVIPRO® is equipped with a replaceable memory card on which all unit data can be stored.

If a unit has to be replaced, the plant can be started up again quickly by simply re-plugging the memory card.

INFORMATION

To being able to replace the unit quickly, you have to save the device data on the memory card after successful startup.

Proceed as follows to save the device data on the memory card:

1. Right-click on the object "MOVIPRO® Realtime" in MOVITOOLS® MotionStudio and select [Startup] / [Data management] from the context menu.

   The "Data management" tool opens.

2. To save the device data on the SD memory card, click "Upload".
3. To start data backup, click [Start upload] [3].

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Function	
[1]	Enabling this checkbox permits data backup via PLC.
[2]	Enabling the "Auto restore" [2] checkbox ensures that the data is backed up automatically when a unit replacement is detected. If the "Auto restore" checkbox [2] is not activated during upload, the data can only be restored manually via "Download".
[3]	To load the data to the SD memory card, click [Start Upload].
[4]	Enabling this checkbox means that data is automatically loaded to the SD memory card each time the data is changed after a time specified by you.

INFORMATION

Performing reference travel

- Various parameters change as soon as you perform a reference travel. This is why you should perform a data backup and save your data to the SD card **after** the reference travel.

6.7 "PFA-..." power section parameter overview

The following table shows an overview of all parameters:

- Factory settings are underlined.
- Numerical values are displayed with the complete setting range.

Parameter	Name	Value
0xx	**Display values**	
00x	Process values	
000	Speed	Display value
001	User display	Display value
002	Frequency	Display value
003	Actual position	Display value
004	Output current	Display value
005	Active current	Display value
006 / 007	Motor utilization 1/2	Display value
008	DC link voltage	Display value
009	Output current	Display value
01x	Status displays	
010	Inverter state	Display value
011	Operating state	Display value
012	Error status	Display value
013	Current parameter set	Display value
014	Heat sink temperature	Display value
015	Operating hours	Display value
016	Enable hours	Display value
017	Work	Display value
018 / 019	KTY utilization 1/2	Display value
02x	Analog setpoints	
020	Analog input AI1	Display value
03x	Binary inputs of basic unit	
030	Binary input DIØØ	Display value
032 – 035	Binary inputs DIØ2 – DIØ5	Display value
05x	Binary outputs of basic unit	
050	Binary output DBØØ	Display value
07x	Unit data	
070	Unit type	Display value
071	Rated output current	Display value
072	Encoder slot option/firmware	Display value
076	Basic unit firmware	Display value
078	Technology function	Display value
079	Unit variant	Display value
08x	Error memory	
080 – 084	Error t-0 – t-4	Display value
094 – 096	PO1 – PO3 setpoint	Display value
097 – 099	PI1 – PI3 actual value	Display value

Parameter	Name	Value
1xx	**Setpoints/ramp generators**	
13x / 14x	Speed ramps 1/2	
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 / t22 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 ramp t14 / t24	0 – 2 – 20 s
139 / 149	Ramp monitoring 1 / 2	Off
16x / 17x	Fixed setpoints 1 / 2	
160 / 170	Internal setpoint n11 / n21	-6000 – 150 – 6000 rpm
161 / 171	Internal setpoint n12 / n22	-6000 – 750 – 6000 rpm
162 / 172	Internal setpoint n13 / n23	-6000 – 1500 – 6000 rpm
2xx	**Controller parameters**	
20x	Speed control	
200	P gain n-controller	0.01 – 2 – 32
201	Time constant n-controller	0 – 10 – 3000 ms
202	Gain Acceleration precontrol	0 – 65
203	Filter acceleration precontrol	0 – 100 ms
204	Filter actual speed value	0 – 32 ms
205	Load precontrol CFC	-150 – 0 – 150%
206	Sampling time n-controller	1.0 ms / 0.5 ms
207	Load precontrol VFC	-150 – 0 – 150%
21x	Hold controller	
210	P gain hold controller	0.1 – 0.5 – 32
3xx	**Motor parameters**	
30x / 31x	Limits 1 / 2	
300 / 310	Start/stop speed 1 / 2	0 – 150 rpm
301 / 311	Minimum speed 1 / 2	0 – 15. – 6100 rpm
302 / 312	Maximum speed 1 / 2	0 – 1500 – 6100 rpm
303 / 313	Current limit 1 / 2	0 – 150% I_N
304	Torque limit	0 – 150%
32x / 33x	Motor adjustment 1/2	
320 / 330	Automatic adjustment 1/2	On
321 / 331	Boost 1 / 2	0 – 100%
322 / 332	IxR compensation 1/2	0 – 100%
323 / 333	Premagnetization time 1/2	0 – 2 s
324 / 334	Slip compensation 1/2	0 – 500 rpm
34x	Motor protection	
340 / 342	Motor protection 1/2	Off
341 / 343	Cooling type 1/2	Fan cooled
344	Motor protection interval	0.1 – 4 – 20 s

Parameter	Name	Value
345 / 346	I_N-U_L monitoring 1/2	0.1 – 500 A
35x	Direction of motor rotation	
350 / 351	Direction of rotation reversal 1/2	Off
5xx	**Monitoring functions**	
50x	Speed monitoring	
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
52x	Mains OFF monitoring	
520	Mains OFF response time	0 – 5 s
521	Mains OFF response	On
522	Phase failure monitoring	On
53x	Motor temperature protection	
530	Sensor type 1	No sensor
531	Sensor type 2	No sensor
54x	Gear unit/motor monitoring	
540	Response to vibration/warning	Display error
541	Response to vibration/error	Rapid stop/warning
542	Response oil aging/warning	Display error
543	Response to oil aging/error	Display error
544	Response to oil aging/overtemperature	Display error
545	Response to oil aging/ready	Display error
549	Response to brake wear	Display error
56x	Ex-e motor current limitation	
560	Ex-e motor current limit	Off
561	Frequency A	0 – 5 – 60
562	Current limit A	0 – 50 – 150%
563	Frequency B	0 – 10 – 104 Hz
564	Current limit B	0 – 80 – 200%
565	Frequency C	0 – 25 – 104 Hz
566	Current limit C	0 – 100 – 200%
6xx	**Terminal assignment**	
60x	Binary inputs of basic unit	
601	Binary input DIØ2	No function
602	Binary input DIØ3	No function
603	Binary input DIØ4	No function
604	Binary input DIØ5	No function
7xx	**Control functions**	
70x	Operating modes	
700 / 701	Operating mode 1/2	VFC
702	Motor category	Rotatory
71x	Standstill current	
710 / 711	Standstill current 1/2	0 – 50% I_{Mot}

Parameter	Name	Value
72x	Setpoint stop function	
720 / 723	Setpoint stop function 1/2	Off
721 / 724	Stop setpoint 1/2	0 – 30 – 500 rpm
722 / 725	Start offset 1/2	0 – 30 – 500 rpm
73x	Brake function	
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
74x	Speed skip function	
740 / 742	Skip window center 1/2	0 – 1500 – 6000 rpm
741 / 743	Skip width 1/2	0 – 300 rpm
77x	Energy-saving function	
770	Energy-saving function	Off
8xx	**Unit functions**	
80x	Setup	
802	Factory setting	No
803	Parameter lock	Off
804	Reset statistics data	No action
82x	Brake operation	
820 / 821	4-quadrant operation 1/2	On
83x	Error responses	
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
84x	Reset behavior	
840	Manual reset	No
841	Auto reset	No
842	Restart time	1 – 3 – 30 s
85x	Scaling actual speed value	
850	Scaling factor numerator	1 – 65535
851	Scaling factor denominator	1 – 65535
852	User unit	rpm
86x	Modulation	
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
87x	Process data description	
870	Setpoint description PO1	Control word 1
871	Setpoint description PO2	Setpoint speed
872	Setpoint description PO3	Ramp

Parameter	Name	Value
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
9xx	**IPOS parameters**	
90x	IPOS reference travel	
900	Reference offset	$-(2^{31}-1)$ – 0 – $(2^{31}-1)$
901	Reference speed 1	0 – 200 – 6000 rpm
902	Reference speed 2	0 – 50 – 6000 rpm
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
91x	IPOS travel parameters	
910	Gain X controller	0.1 – 0.5 – 32
911	Positioning ramp 1	0.01 – 1 – 20 s
912	Positioning ramp 2	0.01 – 1 – 20 s
913	Travel speed CW	0 – 1500 – 6000 rpm
914	Travel speed CCW	0 – 1500 – 6000 rpm
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
92x	IPOS monitoring	
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
93x	Special IPOS functions	
930	Override	Off
933	Jerk time	0.005 – 2 s
938	IPOS speed task 1	0 – 9
939	IPOS speed task 2	0 – 9
94x	IPOS encoder	
941	Actual position source	Motor encoder
948	Automatic encoder replacement detection	On
96x	IPOS modulo function	
960	Modulo function	Off
961	Modulo numerator	1 – $(2^{31}-1)$
962	Modulo denominator	1 – 2^{31}
963	Modulo encoder resolution	1 – 4096 – 65535

6.8 "PFA-..." power section parameter information

The parameters are explained below. The parameters are divided into 10 groups. The parameter names correspond to their representation in the parameter tree. The factory setting is underlined.

6.8.1 Symbols

The following symbols explain the parameters:

These parameters are switch-selectable and available in parameter sets 1 and 2.


These parameters can only be changed in inverter status "Inhibited" (= output stage at high resistance).

The startup function automatically changes this parameter.

6.8.2 P0xx display values

This parameter group contains the following information:

- Process values and states of the basic unit
- Process values and states of the installed options
- Error memory
- Fieldbus parameters

P00x process values

P000 speed Resolution: ± 0.2 rpm

In VFC or U/f mode without connected encoder, the speed results from the setpoint speed and the set slip compensation. The speed is established from the encoder or resolver signals and is displayed when there is an encoder connection.

P001 User display The user display is defined by the following parameters:

- *P850 Scaling factor numerator* (page 119)
- *P851 Scaling factor denominator* (page 119)
- *P852 User-defined unit* (page 120)

P002 frequency Output frequency of the inverter.

P003 actual position 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 rated unit current.

P005 Active current Active current in the range 0 – 200 % I_N. 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
The current thermal motor utilization of the connected motor in parameter set 1 / 2 in the range 0 – 200% is displayed. It is calculated using the motor temperature emulation in the inverter. The synchronous motor with KTY and the asynchronous motor is turned off when 110 % is reached.

P008 DC link voltage
The displayed value is the voltage measured in the DC link circuit.

P009 Output current
Apparent current, displayed in AC A.

P01x Status displays

P010 Inverter status
Status of the unit output stage ("inhibited" or "enabled").

P011 Operating status
The following operating states are possible:
- "24 V operation"
- "Controller inhibit"
- "No enable"
- "Standstill current"
- "Enable (VFC)"
- "Enable (N-control)"
- "Torque control"
- "Hold control"
- "Factory setting"
- "Limit switches"
- "Technology option"
- "Reference mode"
- "Flying start in progress"
- "Calibrating encoder"
- "Error"
- "Safe stop"

P012 error status
Error number and error in plain text.

P013 Current parameter set
Parameter set 1 or 2.

P014 Heat sink temperature
Heat sink temperature of the inverter in the range −40 – 125 °C.

P015 Operating hours
Total number of hours for which the inverter has been connected to the mains or an external DC 24 V supply. Storage cycle every 15 min.

P016 Enable hours
Total number of hours for which the inverter was in "Enabled" operating status; storage cycle every 15 min.

P017 Work
Total of the active electrical energy the motor has consumed; storage cycle every 15 min.

P018 / P019 KTY utilization 1 / 2
Display 0 %: Motor is not in operation at max. ambient temperature.
Display 110 %: Cut-off point of motor.

P02x Analog setpoints

P020 Analog input AI1
Voltage (−10 V – +10 V) at analog input AI1 (020).

P03x Binary inputs of basic unit

P030, P032 – P035 binary inputs DI00, DI02 – DI05
Displays the current status of the input terminals DI00 and DI02 – DI05 and the current function assignment. For possible terminal assignments, refer to *P601 – P604 binary inputs DIØ2 – DIØ5* (page 108).

INFORMATION
The binary input DI00 is always assigned the function “controller inhibit”.

P05x Binary outputs of basic unit

P050 Binary output DB00
Displays the current state of the binary output on the basic unit with the current function assignment.

P07x Unit data

P070 Unit type
Displays the complete designation of the unit, e.g. PFA-MD0040B-5A3.

P071 Rated output current
Displays the r.m.s. value of the rated output current.

P072 Encoder slot option/firmware
Displays the installed encoder card and its program version.

P076 Basic unit firmware
Displays the program version of the firmware used in the basic unit.

P078 Technology function
Displays the currently set technology function.
"Standard": Setting for operating the inverter with the standard functions (positioning, speed control, etc.).

P079 Unit version
Displays the unit version.
"Technology": Application modules and technology functions are available.

P08x Error memory

P080 – P084 error t-0 – t-4

There are 5 error memories (t-0 – t-4). The errors are stored in a chronological sequence with the most recent error event being stored in error memory t-0. If there are more than 5 errors, the error event of longest standing stored in t-4 is deleted.

For a list of possible error responses, refer to *P83x error responses* (page 117).

The following information is stored at the time of the error and can be displayed in the event of a error:

- Status ("0" or "1") of the binary inputs/outputs
- Operating state of the inverter
- Inverter status
- Heat sink temperature
- Speed
- Output current
- Active current
- Unit utilization
- DC link voltage
- Operating hours
- Enable hours
- Parameter set
- Motor utilization 1 and 2

P09x Bus diagnostics

P094 – P096 PO1 – PO3 setpoint

Displays the value currently transferred on the process data word in hexadecimal form.

PO setpoint	Description
P094 PO1 setpoint	*P870 Setpoint description PO1* (page 121)
P095 PO2 setpoint	*P871 Setpoint description PO2* (page 121)
P096 PO3 setpoint	*P872 Setpoint description PO3* (page 121)

P097 – P099 PI1 – PI3 actual value

Displays the value currently transferred on the process data word in hexadecimal form.

PI setpoint	Description
P097 PI1 actual value	*P873 Actual value description PI1* (page 122)
P098 PI2 actual value	*P874 Actual value description PI2* (page 122)
P099 PI3 actual value	*P875 Actual value description PI3* (page 122)

6.8.3 P1xx Setpoints/ramp generators

P13x / P14x Speed ramps 1/2

P130 – P133 / P140 – P143 ramp t11 / t21 up/down CW/CCW

1 2

P130 Ramp t11 up CW / P140 Ramp t21 up CW

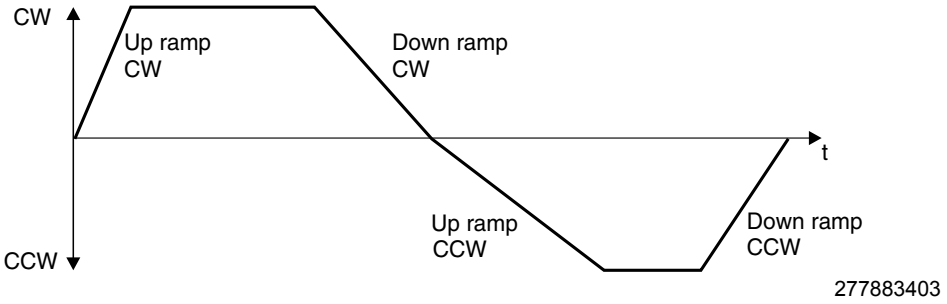
P131 Ramp t11 down CW / P141 Ramp t21 down CW

P132 Ramp t11 up CCW / P142 Ramp t21 up CCW

P133 Ramp t11 down CCW / P143 Ramp t21 down CCW

Setting range: 0 – 2 – 2000 s

The ramp times refer to a setpoint step change of Δn = 3000 rpm. The ramp takes effect when the speed setpoint is changed and the enable is revoked via the CW/CCW terminal.



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.

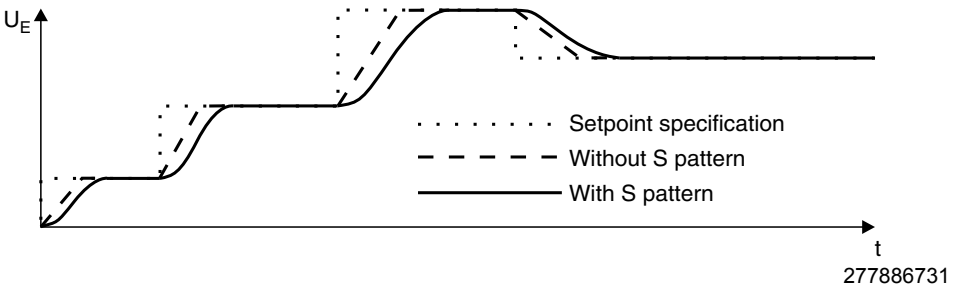
Ramps t12/t22 are activated via a binary input, which is set to the function "Ramp switchover". For information about binary input assignment, refer to *P601 – P604 Binary inputs DIØ2 – DIØ5* (page 108).

P135 / P145 S pattern t12 / t22

1 2

Setting range: 0 / 1 / 2 / 3 (0 = off, 1 = weak, 2 = medium, 3 = strong)

The 2nd ramp (t12/ t22) of parameter sets 1 and 2 can be rounded with 3 pattern grades to achieve a smoother acceleration of the drive.



A started S pattern is interrupted by the stop ramp t13 / t23 and a changeover to ramp t11 / t21. Withdrawing the setpoint or a stop using 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

The stop ramp is activated by withdrawing the ENABLE terminal or by an error. For information about possible error responses, refer to *P83x error responses* (page 117).

P137 / P147 Emergency ramp t14 / t24

1 2 AUTO

Setting range: 0 – 2 – 20 s

The emergency ramp is activated by an error. For information about possible error responses, refer to *P83x error responses* (page 117). The system 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 speed has not yet been reached.

P139 / P149 Ramp monitoring 1 / 2

1 2

Setting range: Yes/No

If you set the deceleration ramps to a value that is a lot shorter than can be physically accomplished in this system, the turning drive will be stopped after expiration of the monitoring time. Such a setting will cause an error signal and increase brake wear.

The respective ramp time also has to be increased, if the ramp timeout is definitely triggered by a preset ramp that cannot be traveled.

This parameter is an additional monitoring function for speed monitoring. This parameter only applies to the deceleration ramp. This means the parameter can be used to monitor the downwards ramp, stop ramp or emergency stop ramp if speed monitoring is not desired.

P16x / P17x Fixed setpoints 1 / 2

1 2

Setting range: −6000 – +6000 rpm

Three internal setpoints (= fixed setpoints) can be set separately for parameter sets 1 and 2. The internal setpoints are active when an input terminal programmed to n11 / n21 or n12 / n22 (*P6xx Terminal assignment*) has a "1" signal.

Setting range: 0 – 6000 rpm

Fixed setpoint	Factory setting
P160 / P170 Internal setpoint n11 / n21	n11 / n21 = 150 rpm
P161 / P171 Internal setpoint n12 / n22	n12 / n22 = 750 rpm
P162 / P172 Internal setpoint n13 / n23	n13 / n23 = 1500 rpm

Programming the input terminals:

Response	Terminal			
	n11/n21	n12/n22	Enable/stop	Parameter set 1/2
Stop with t13/t23	X	X	"0"	X
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") if an input terminal is programmed to "Fixed setpoint switchover". This changeover is possible when the unit is inhibited and enabled.

6.8.4 P2xx Controller parameters

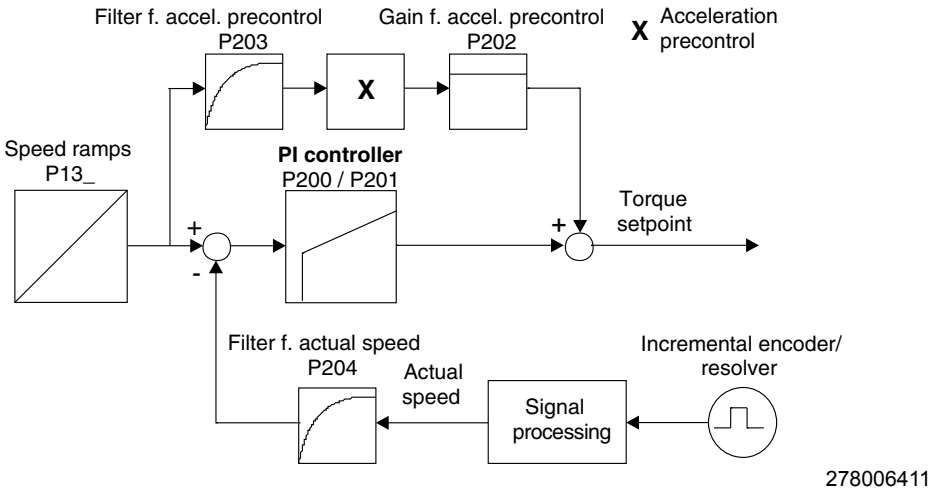
P20x Speed control

Speed control only in parameter set 1.

The speed controller of the power section is a PI-controller. It is active when the following operating modes are set:

- All operating modes with "VFC-n control".
- CFC operating modes: The speed controller is only active in "CFC & torque control" when speed limiting is active (P70x Operating modes).
- Servo operating modes: The speed controller is only active in "Servo & torque control" when speed limiting is active (P70x Operating modes).

The setting of all parameters important for speed control is supported by the startup functions of MOVITOOLS® MotionStudio. Direct alterations to individual controller parameters are reserved for optimization by specialists.



P200 P-gain n-controller

AUTO

Setting range: 0.01 – 2 – 32

Gain factor of the P-component of the speed controller.

P201 Time constant n-controller

AUTO

Setting range: 0 – 10 – 3000 ms (0 = no I-component)

Integration time constant of the speed controller The I-component reacts inversely proportionate to the time constant, i.e. a large numerical value results in a small I-component, although 0 = no I-component.

P202 Gain acceleration precontrol

AUTO

Setting range: 0 – 65

Amplification factor of acceleration precontrol. This parameter improves the control response of the speed controller.

P203 Filter acceleration precontrol

AUTO

Setting range: 0 – 100 ms

Filter time constant of acceleration precontrol. This constant influences the control response of the speed controller. The differentiator is programmed.

P204 Filter actual speed value

AUTO

Setting range: 0 – 32 ms

Filter time constant of the actual speed value filter.

P205 Load precontrol CFC

Load precontrol CFC is only effective in CFC and servo operating modes.

Setting range: –150 – 0 – 150 %

This parameter 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 setting 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 (page 90) when n = 0 is specified.

P206 Sampling time n-controller

The sampling time for n-control 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 load precontrol VFC is only effective in operating modes with VFC-n control.

Setting range: –150 – off – 150 %

This parameter determines the initial value of slip control upon enable. A setting greater than 0 % causes the slip control to be subject to pre-stressing, which means that the motor develops higher torque when it is enabled. 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.

Setting values greater than 150 % switches off the function (no pre-stressing).

In "VFC & hoist" mode and with a value greater than 150% set, pre-stressing of 0.5 x s_N is in effect.

Recommended setting: Value of the active current (page 90) at minimal speed.

P21x Hold controller

Hold control only in parameter set 1.

The hold control function is used to make sure that the drive does not drift during stand-still. It can only be activated for operating modes with speed control (encoder feedback). Hold control is active when an input terminal programmed to /HOLD CONTROL (P6xx terminal assignment) has a "0" signal. The unit 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 gain factor setting is supported in the startup function of the speed controller in MOVITOOLS® MotionStudio. The 7-segment display shows status "A1.7" when hold control is active.

P210 P gain hold controller

AUTO

Setting range: 0,1 – 0,5 – 32

The parameter corresponds to the proportional gain of a position controller and is only effective in conjunction with the activated "Hold control" function.

6.8.5 P3xx Motor parameters

This parameter group is used to adjust the inverter to the motor. The parameters can be set separately for parameter set 1 and 2. This means two different motors can be operated alternately on the same inverter without requiring a new setting.

P30x/P31x limits 1/2

P300 / P310 Start/stop speed 1/2

1 2 AUTO

Setting range: 0 – 150 rpm

During startup in the "VFC & Hoist" operating mode, the rated slip of the connected motor is set. In all other operating modes, 0.5 × the rated slip of the connected motor is set at startup.

Only effective in the VFC and V/f operating modes. The parameter is not relevant in CFC and servo operating modes. This entry defines the smallest speed request which the inverter sends to the motor when enabled. The transition to the speed determined in the setpoint selection is made using the active acceleration ramp.

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 – <u>15</u> – 6100 rpm

Speed value, the lower limit of which must not be exceeded even when zero is selected as the setpoint. The minimum speed also applies when $n_{min} < n_{start/stop}$ was set.

Important:

- If the hoist function is active, the slowest speed is 15 rpm even if n_{min} has been set to a lower value.
- To enable the drive to move clear of the limit switches even at low speeds, n_{min} is not active for the hardware limit switch with which the drive has come into contact.

P302 / P312 speed 1/2

1 2 AUTO

Setting range: 0 – <u>1500</u> – 6100 rpm

The value set here cannot be exceeded by a setpoint selection. If $n_{min} > n_{max}$ is set, then n_{max} applies. The maximum speed depends on the set operating mode (page 109).

P303 / P313 Current limit 1/2

1 2 AUTO

Setting range: 0 – 150 % 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 field weakening range, the current limit is reduced automatically above the frequency of 1.15 x f_{base} (only applies to V/f and VFC operating modes without speed control). This provides protection against the motor deviating from the optimal operating point.

The current limit effective in the field weakening range can be calculated using the following formula:

Current limit = (1.15 × f_{base} / f_{act}) × setting value of P303 / P313

f_{act} is the current speed frequency.

P304 Torque limit

1 2 AUTO

Setting range: 0 – 150 %

The parameter limits the maximum torque of the motor. The entry acts on the setpoint of the motor torque (k_T × $I_{N\_inverter}$). This function is only active in the operating modes "CFC" and "Servo" of parameter *P700/P701 Operating mode 1/2* (page 109).

INFORMATION

In the "CFC" and "Servo" operating modes, *P303 Current limit 1* must always be set ≥ *P304 Torque limit* to ensure that speed monitoring is triggered reliably.

P32x/P33x Motor adjustment 1/2

P320/P330 Automatic adjustment 1/2

1 2

Setting range: On/off

Only effective in the "VFC" and "V/f" operating modes. The function is only useful for single motor operation. The inverter sets *P322/P332 IxR adjustment 1/2* (page 100) automatically at each enable and stores the value. The inverter determines a basic setting that is adequate for a great number of drive applications. The connected motor is calibrated during the last 20 ms of the pre-magnetization time. The motor is not calibrated in the following cases:

- *P320/P330 Automatic adjustment 1/2 = "off"*
- *P700/P701 Operating mode 1/2 = "VFC & group" or "VFC & flying start"* (page 109)
- *P323/P333 Premagnetization time 1/2* (page 100) has been reduced by more than 30 ms in relation to the proposed value.
- Operating mode "VFC-n control" is selected and *P730/P733 Brake function 1/2* (page 113) = "off"

In such cases, the set I×R value is used for calculating the winding resistance.

- On: Automatic adjustment.
- Off: No automatic adjustment.

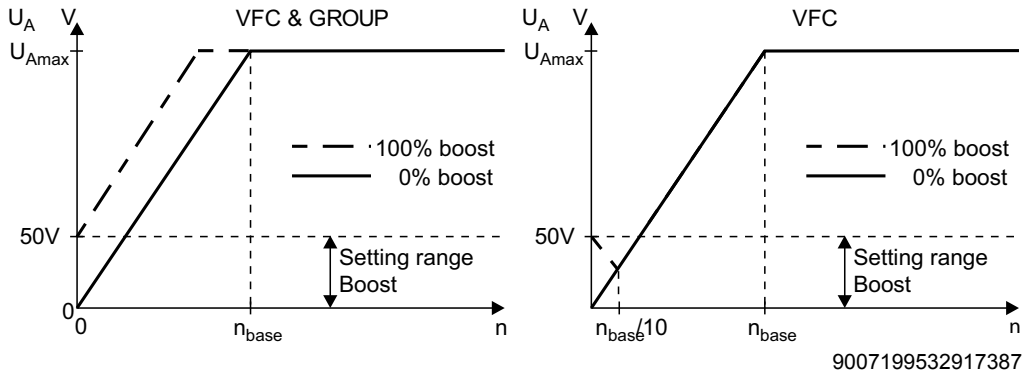
P321/P331 Boost 1/2

1 2

Setting range: 0 – 100 %

With "VFC & group": Manual setting to increase the starting torque by increasing the output voltage in the range below the base speed.

With "VFC": Manual setting is usually not required. In exceptional cases, manual setting may be necessary to increase the breakaway torque. In this case, set max. 10 %.



P322 / P332 IxR adjustment 1/2

1 2 AUTO

Setting range: 0 – 100 %

The I×R value of the matching motor is set as the factory setting.

In "VFC" operating mode, this parameter acts on the parameters of the calculated motor model which establish the torque. An automatic setting takes place with *P320/P330 Automatic adjustment 1/2* (page 99) = "on". If set to 100 %, the output voltage of the inverter is increased by 50 V when the rated current of the motor flows. Manual alterations to individual controller parameters are reserved for optimization by specialists.

P323 / P333 Premagnetization time 1/2

1 2 AUTO

Setting range: 0 – 2 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 inverter is enabled.

Premagnetization is in effect in "VFC" operating mode with encoder feedback if:

- *P730/P733 Brake function 1/2 is active* (page 113)
- *P710/P711 Standstill current 1/2 is deactivated* (page 111)

P324 / P334 Slip compensation 1/2

1 2 AUTO

Setting range: 0 – 500 rpm

The value of the matching motor is set as the factory setting.

Only effective in "VFC", "VFC-n control" and "V/f" operating modes. Slip compensation increases the speed accuracy of the motor. If values are entered manually, you will have to enter the rated slip of the connected motor. A setting range of ± 20 % of the rated slip is permitted if a value other than the rated slip is entered to compensate for fluctuations between various motors.

P34x 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.

- Off: Function not active
- ON asynchronous motor:

  When this function is activated, the power section 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) and, furthermore, 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 during startup with MOVITOOLS® MotionStudio and when the operating conditions specified for the motor are observed.

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 (page 91)	Display of the motor utilization for parameter set 1/2.
P832 Response to "Motor overload" (page 117)	Error response of the inverter when reaching *P006 / P007 Motor utilization 1/2* of 110%. Factory setting: Emergency stop/malfunction.

Set the following parameters:

Parameter	Setting/meaning
P341 Type of cooling (page 102)	Self-ventilation or forced cooling
Binary output can be programmed to: Motor utilization 1/2	Prewarning if motor utilization 1/2 exceeds a value of 100%. In this case, the programmed output is set to "0" = 0 V.

INFORMATION

Switching off the inverter (mains and 24 V external) always resets the motor utilization to zero; any motor heating existing when the motor is switched back on is not taken into account.

The motor protection function processes the utilization of the connected motors separately for both parameter sets. The motor protection function must not be used if only one motor is permanently connected to the inverter and the "parameter set changeover" function is only used for control purposes. Equally, the motor protection function must not be used with group drives because it is not possible to protect each individual motor reliably.

- ON servomotor:
  - Motor without KTY temperature sensor: The power section calculates and displays the motor utilization based on the current. The goal is to determine after only a few cycles or during startup whether the drive is going to switch off due to an overload with error "A1.F31" (TF trip). This setting is available for parameter set 1 only.

    Requirements: Motor utilization is always determined based on the rated motor current. Enter the duration of the machine cycle to receive an exact statement concerning the utilization for the motor powering the machine cycle.

    The following signal and display functions are available in conjunction with motor protection:

Parameter	Signal and display function
P006 Motor utilization 1 (page 91)	Display of the motor utilization for parameter set 1. Valid after about 10 to 20 cycles or after about 2 s and can be evaluated by a PLC.
P007 Motor utilization 2 (page 91)	In setting P340 = "One servomotor" without function
P832 Response to "Motor overload" (page 117)	In setting P340 = "One servomotor" without function

Set the following parameters:

Parameter	Meaning
P344 Motor protection interval (page 102)	Corresponds to the machine cycle of the application. Range: 0.1 s – 20 s.

INFORMATION

Activating the function does not trigger monitoring or protection of the connected motor. Protection must be guaranteed via TF/TH.

Setting a binary output to "Motor utilization_1" or "Motor utilization_2" also has no effect when P340 is set to ON SERVO.

  - SEW motor with KTY temperature sensor: Motor utilization is calculated using a motor model stored in the power section *(P006 Motor utilization 1* (page 91), *P018 KTY utilization 1* (page 92)). Once the motor dependent switch-off limit is reached, the inverter will be switched off using the response set in *P832 Response to "Motor overload"* (page 117). In this case, the settings in *P341 Type of cooling 1* (page 102) and *P344 Motor protection interval* (page 102) are not relevant.

P341/P343 Type of cooling 1/2
1 2

Setting range: Self-ventilation / Forced cooling

You need to know the cooling type of the motor to calculate the thermal load on the motor as exactly as possible, as described in *P340/P342 Motor protection 1/2* (page 101).

P344 Motor protection interval
1 2

Setting range: 0.1 – 4 – 20 s

P344 is not relevant for asynchronous motors. This parameter corresponds to the cycle time of the travel and is used for the function *P006/P007 Motor utilization 1/2* (page 91). The setting range is 100 ms – 20000 ms.

You should always set the time for roundtrip travel (back and forth).

P345 / 346 I_N / U_L monitoring 1/2
1 2 AUTO

Setting range: 0.1 – 500 A

The function cannot be deactivated. The factory setting is dependent on the rated power of the power section and is set to the rated current of the SEW motor with the same power (for units with resolver input: factory setting = 0).

At 150 % rated motor current, the inverter switches off after 5 minutes with "A1.F84".

At 500 % rated motor current, the inverter switches off after 20 seconds with "A1.F84".

P35x Motor direction of 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 SEW designation.

P350/P351 Direction of rotation reversal 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

- On: Above definition is reversed. 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. When using this parameter, it is important to carefully check that the limit switch is connected properly and the reference point and travel positions are defined correctly.

  NOTE: Altering the "Direction of rotation reversal" parameter after the system has been referenced causes the system to lose its reference point for the absolute position. The result may be undesirable movements of the axis.
- Off: The SEW definition applies.

6.8.6 P5xx Monitoring functions

The following monitoring functions have been implemented to monitor what happens to drive-specific parameters in the specific application and to be able to react in case of impermissible deviations. Some of the monitoring functions are available separately in both parameter sets. The response to the control functions can be set with *P83x error responses* (page 117).

P50x Speed monitoring

P500/P502 Speed monitoring 1/2
1 2

Setting range: Off / motor / regenerative / motor/regenerative

The speed required by the setpoint can only be achieved if there is sufficient torque available to meet the load requirements. Once *P303/P313 Current limit 1/2* (page 98) and the external current limit have been reached, the power section assumes that the torque has reached its maximum and the desired speed cannot be attained. Speed monitoring is triggered if this situation persists for the duration specified in *P501/P503 Delay time 1/2* (page 104).

Activate the speed monitoring for hoists and set the delay time to a rather small value. 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 limit can be reached briefly during acceleration, deceleration, or load peaks. You can prevent the speed monitoring from responding too sensitively by setting the delay time accordingly. The current limit must be reached permanently for the duration of the delay time before monitoring responds.

P504 Encoder monitoring motor

Setting range: Yes/No

- No: Wire break between frequency inverter and motor encoder is not detected directly. In case of a defective connection, error "A1.F08" (speed monitoring) will be issued in enabled state unless it was deactivated.
- Yes: Wire break between frequency inverter and motor encoder will be detected directly when using sin/cos encoders and TTL encoders. The error message "A1.F14" (encoder) will be issued in case of an error. This error will also be generated in inhibited state.

  NOTE: Encoder monitoring is not a safety function! If you use a HIPERFACE® encoder, encoder monitoring is always active (for the track too) irrespective of the setting in P504.

P504 Synchronous encoder monitoring

Setting range: Yes/No

- No: An open circuit between frequency inverter and synchronous encoder is not directly detected. In case of a defective connection, error "A1.F08" (speed monitoring) will be issued in enabled state unless it was deactivated.
- Yes: A wire breakage between frequency inverter and synchronous encoder will be directly detected when using sin/cos encoders and TTL encoders. The error message "A1.F14" (encoder) will be issued in case of an error. This error will also be generated in inhibited state.

P52x mains OFF monitoring

P520 mains OFF response time

Setting range: 0 – 5 s

P521 mains OFF response

Setting range: Controller inhibit/emergency stop

If the binary input is programmed to "Power on", the response set here will be triggered when the binary input receives a "0" signal.

P522 Phase failure monitoring

Setting range: Off/on

MOVIPRO® monitors the line input phases for failure of a phase. If a phase failure is detected in two phases, then the DC link will be de-energized, which corresponds to a supply system disconnection. Since the line input phases cannot be monitored directly, monitoring has to be done indirectly via the DC link ripple, which increases drastically in case of a phase failure.

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 unit.

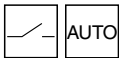
The result is the following nominal guide value for detecting a phase failure:

- 50 Hz supply system: Approx. t_{max} = 3.0 s
- 60 Hz supply system: Approx. t_{max} = 2.5 s

Once a phase failure has been detected, the output stage is inhibited and the brake is applied. The error message "A1.F06" (phase failure) is issued. The error response is "Immediate switch-off with inhibit". The error can only be remedied by executing a unit reset.

P53x Motor temperature protection

P530 Sensor type 1

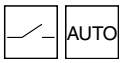


Setting range: No sensor / TF/TH / TF/TH DEU / KTY / KTY DEU (KTY only for SEW synchronous motors)

Selection of the sensor used for motor protection in parameter set 1.

- TF/TH: Set the response with *P835 Response to "TF signal"* (page 118).
- KTY: Set *P340 Motor protection 1* (page 101) to "ON servo". The motor model is now activated. Set the response using *P832 Response to "motor overload"* (page 117).

P531 Sensor type 2



Setting range: No sensor / TF/TH

Selection of the sensor used for motor protection in parameter set 2.

P54x 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 have to be set accordingly for this purpose. The error responses will also be triggered in the "controller inhibit" inverter status.

Response	Description
No response	The error is not displayed, and there is no error response. The signaled error is ignored.
Display error	The error is displayed (on the 7-segment display and in MOVITOOLS® MotionStudio). The unit performs no other error responses. The error can be reset (terminal, fieldbus, auto reset).
Immediate stop/ malfunction	The inverter switches off immediately and issues an error message. The output stage is inhibited and the brake is applied. The ready signal is revoked. A restart is only possible after an error reset has been performed during which the inverter is reinitialized.
Emergency stop/ malfunction	The drive is braked with the set emergency stop ramp t14/t24 (page 95). 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 an error reset has been performed during which the inverter is reinitialized.
Rapid stop/malfunction	The drive is braked with the set stop ramp t13/t23 (page 94). 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 an error reset has been performed during which the inverter is reinitialized.
Immediate stop/warning	The inverter switches off immediately and issues an error message. The output stage is inhibited and the brake is applied. The ready signal is not revoked. The drive restarts without unit re-initialization if the error is rectified by an internal procedure or by an error reset.

Response	Description
Emergency stop/ warning	The drive is braked with the set emergency stop ramp t14/t24 (page 95). 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 unit 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 set stop ramp t13/t23 (page 94). 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 unit 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

Once the drive vibration sensor signals a warning, the inverter will respond with the set response.

P541 Response to vibration/error

Factory setting: Rapid stop/warning

Once the drive vibration sensor signals an error, the inverter will respond with the set response.

P542 Response to oil aging/warning

Factory setting: Display error

If the oil aging sensor signals a warning, the inverter will respond with the set response.

P543 Response to oil aging/error

Factory setting: Display error

If the oil aging sensor signals an error, the inverter will respond with the set response.

P544 Oil aging/overtemperature

Factory setting: Display error

If the oil aging sensor signals overtemperature, the inverter will respond with the set response.

P545 Oil aging/ready

Factory setting: Display error

If the oil aging sensor signals ready, the inverter will respond with the set response.

P549 Response to brake wear

Factory setting: Display error

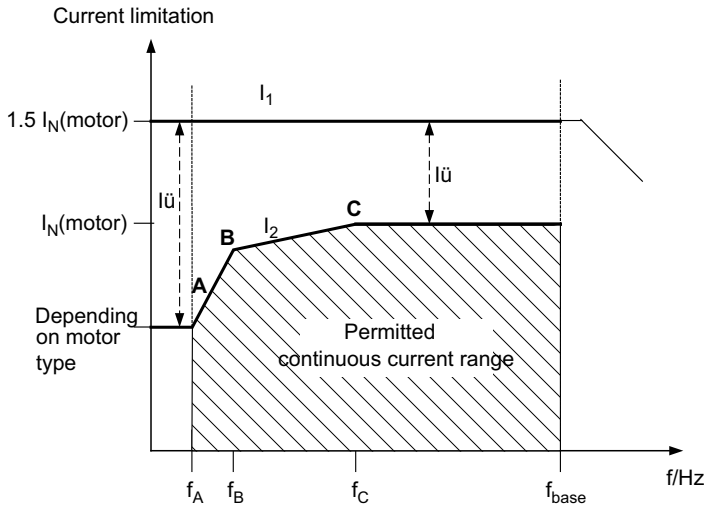
When the brake wear sensor trips, the inverter responds with the set response.

P56x Current limitation Ex-e motor

The parameter group *P56x Current limitation Ex-e motor* contains display and setting values that are specific to the "current limitation in the Ex-e motor on the inverter" function. The factory setting is indicated by underline. The factory settings apply for the delivery status.

Frequencies below frequency A are only permitted to a limited extent. Frequencies higher than the rated motor frequency are permanently illegal. Refer to the "Explosion-Proof AC Motors" operating instructions for more information. The following rules always apply:

- Frequency A < frequency B < frequency C < rated motor frequency
- Current limitation A < current limitation B < current limitation C



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P560 Current limit Ex-e motor

AUTO

Setting range: On/off

On: Current limitation for Ex-e motors active.

On startup, the current limitation for Ex-e motors is automatically activated for motors selected and approved for operation in potentially explosive areas.

P561 Frequency A

AUTO

Setting range: 0 – 5 – 60 Hz

Value for the minimum operating frequency A. The operation time with frequency A is 60 seconds, regardless of the current value. After this time, the inverter switches off and issues the "A1.F110" ("Ex e protection") error message.

P562 Current limit 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 frequency I_N.

6.8.7 P6xx Terminal assignment

P601 – P604 Binary inputs DIØ2 – DIØ5

The binary inputs can be programmed to the following functions:

Function	Effect in case of		Effective with inverter status		Factory-set to	see
	"0" signal	"1" signal	Inhibited	Enabled		
No function	–	–	–	–	DIØ2 DIØ3 DIØ4 DIØ5	
Enable/stop	Stop with t13/t23	Enable	No	Yes		P13x / P14x (page 94)
CW/stop	Stop at t11/t21 or t12/t22	Enable CW	No	Yes		
CCW/stop	Stop at t11/t21 or t12/t22	Enable CCW	No	Yes		
n11/n21 n13/n23	External setpoints only	n11/n21 n13/n23	No	Yes		P16x / P17x (page 95)
n12/n22	External setpoints only	n12/n22	No	Yes		
Fixed setpoint changeover	Fixed setpoints of the active parameter set selected	Fixed setpoints of the active parameter set selected	Yes	Yes		
Parameter set changeover[1)]	Parameter set 1	Parameter set 2	Yes	No		
Speed ramp switchover	1st ramp (t11/t21) active	2nd ramp (t12/t22) active	Yes	Yes		P13x / P14x (page 94)
/External error	External error	-	No	Yes		
Error reset	Reset on positive edge ("0" to "1")		Yes	Yes		
/Hold control	Hold control active	-	No	Yes		P210 (page 97)
/Limit switch right	Right limit switch reached	Not reached	No	Yes		
/Limit switch left	Left limit switch reached	Not reached	No	Yes		
IPOS input	Function depending on the application module					
Reference cam	Not activated	Activated	No	Yes		
Start reference travel	-	Start referencing for the application module	No	Yes		
Mains On detection	see P521 (page 104)	Ext. signal "Mains on"	Yes	Yes		P52x (page 104)

Function	Effect in case of		Effective with inverter status		Factory-set to	see
	"0" signal	"1" signal	Inhibited	Enabled		
/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 fault	Oil aging sensor signals fault	Oil aging sensor does not signal fault	Yes	Yes		
/Oil aging overtemperature	Oil aging sensor signals overtemperature	Oil aging sensor does not signal overtemperature	Yes	Yes		
Oil aging ready signal	Oil aging sensor is not ready for operation	Oil aging sensor is ready for operation	Yes	Yes		
Brake wear monitoring	Brake is worn	Brake is ok	Yes	Yes		

1) Important for operating modes with encoder feedback: The parameter set must not be changed more often than every two seconds.

6.8.8 P7xx Control functions

All settings with regard to the fundamental control properties of the inverter are defined within parameter group 7xx. These are all functions that the inverter executes automatically when activated. They affect how the inverter responds 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 positions H510 and H511. If a valid position is to be maintained after the parameter set has been changed, an absolute encoder (SSI, HIPERFACE® multi-turn) must be used.

P70x Operating modes

P700/P701 Operating mode 1/2

1 2 AUTO

This parameter is used to set the basic operating mode of the inverter for parameter sets 1 and 2. This includes in particular the definition of the motor system, encoder feedback and corresponding control functions. When the inverters are delivered, their parameters are set to the specific motor which matches the power of the inverter.

All operating modes can be set for parameter set 1. Only operating modes without encoder feedback can be set for parameter set 2 (see group 1). Without new startup, the operating mode may only be changed within a group.

Group	Parameter set 1/2 *P700 Operating mode 1* *P701 Operating mode 2*	Unit 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® ADC	DR without encoder
2	"VFC n-control" "VFC-n-control & Group" "VFC-n-control & Hoist" "VFC n-control & IPOS"	MOVIPRO® ADC + encoder option	DR with incremental encoder or HIPERFACE® encoder
3	"CFC" "CFC & torque control" "CFC & IPOS"		DR with incremental encoder or HIPERFACE® encoder
4	"Servo" "Servo & torque control" "Servo & IPOS"		CMP with HIPERFACE® encoder or resolver

P702 Motor category

AUTO

Setting range: Rotatory/Linear

This parameter is set automatically during startup. It shows the connected motor type.

P71x Standstill current

P710/P711 Standstill current 1/2

1 2

Setting range: 0 – 50% I_{Mot}

The standstill current is used for injecting an adjustable current into the motor when the motor is at a standstill and the brake is applied. The standstill current can be switched off by "/controller inhibit = 0". This allows the following functions to be carried out:

- At low ambient temperatures of the motor, it is possible to prevent the danger of condensation formation and freezing (in particular of the disk brake). Overheating the motor must be avoided when setting the current. **Recommendation:** Motor housing should be hand hot.
- It is possible to perform a rapid motor start when standstill current is activated because the motor is kept in an excited state. This means the motor can be started without having to wait for the pre-magnetizing time. **Recommendation:** Set to 45 – 50% for hoists.

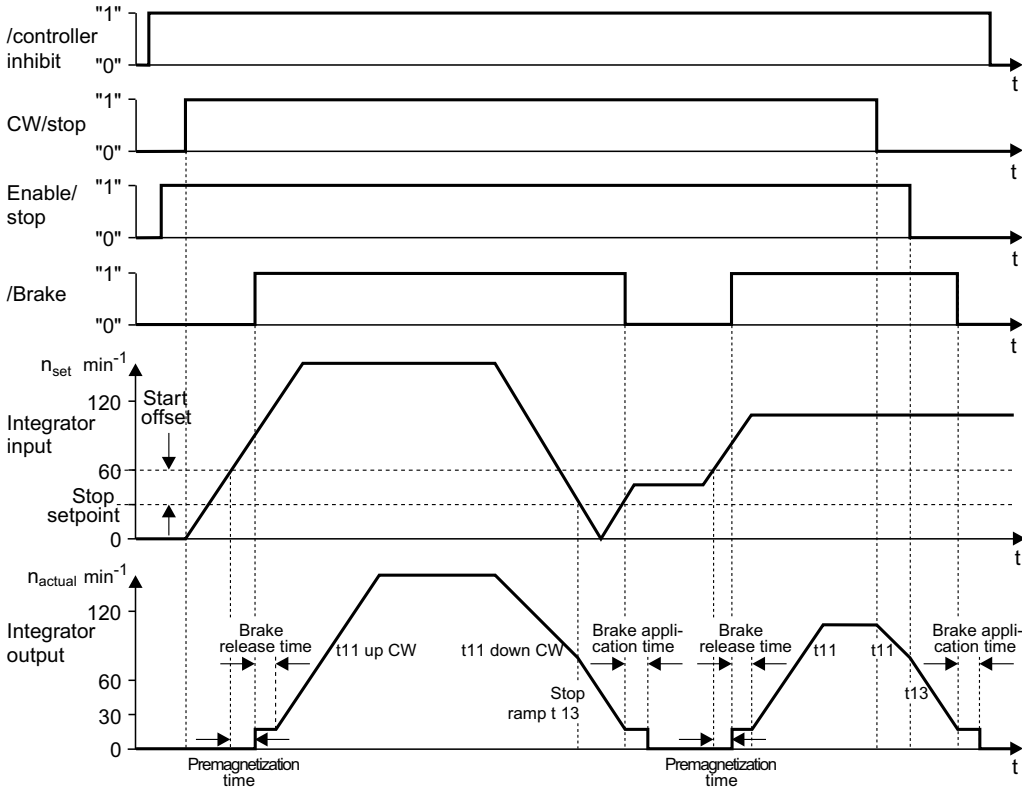
The standstill current function is deactivated when P710/P711 = 0. The setting is made as a percentage of the rated motor current. The standstill current is monitored for *P303/P313 Current limit 1/2* (page 98) in any case.

- In the "CFC" operating mode, if no other setting is made, the lowest magnetization current according to the motor model is always used. If P710/P711 is set to a higher value, this higher value applies.
- This function does not have any effect in "Servo" operating mode. No current is impressed.
- The rated magnetizing current will always be set for operating modes "VFC & Hoist", and "VFC n-control & Hoist" if P710 is active.
- In the other operating modes, a rapid start will only take place if the set standstill current is greater than or equal to the rated magnetizing current.

During the standstill current phase, the motor resistance is calibrated in the intervals of the set premagnetization time if the standstill current was constant and greater than or the same as the rated magnetizing current of the motor during the measurement interval. If a new enable takes place before expiration of the measurement interval, no new resistance value will be calculated. The existing resistance value will still be used.

P72x Setpoint stop function

The setpoint stop function allows for an enable function created automatically by the inverter depending on the main setpoint. It results in an enable process with all necessary functions, such as premagnetization, brake control, etc. It always requires an additional enable via terminals.



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P720/P723 Setpoint stop function 1/2

1 2

Setting range: On/<u>off</u>

P721/P724 Stop setpoint 1/2

1 2

Setting range: 0 – <u>30</u> – 500 rpm

In the "VFC & Hoist" operating mode, the minimum stop setpoint is internally limited to 16 rpm.

P722/P725 Start offset 1/2

1 2

Setting range: 0 – <u>30</u> – 500 rpm

There is no enable for stop setpoint + start offset (start setpoint) > n_{max}.

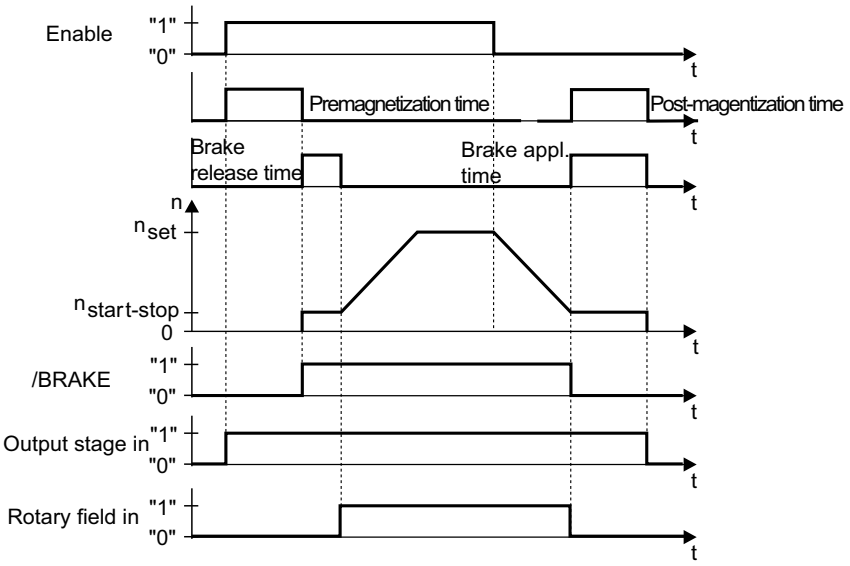
Movement with n_{min} is never possible if the stop setpoint is > n_{min}.

P73x Brake function

The power section is capable of controlling a brake installed on the motor. The brake function acts on the binary output DBØØ, which has the fixed assignment of the “/Brake” function (24 V = brake released). In drives 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

The brake is always applied when "/Controller inhibit" = 0.



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P730/P733 Brake function 1/2

1 2

Setting range: On/off

This function determines whether the brake is to be activated when the enable is withdrawn (enable = "0"). The brake is always active in controlled hoist 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.

This parameter determines how long the motor will remain at a standstill after expiration of the premagnetizing time and how much time the brake has to release.

P732 / P735 Brake application time 1/2

1 2 AUTO

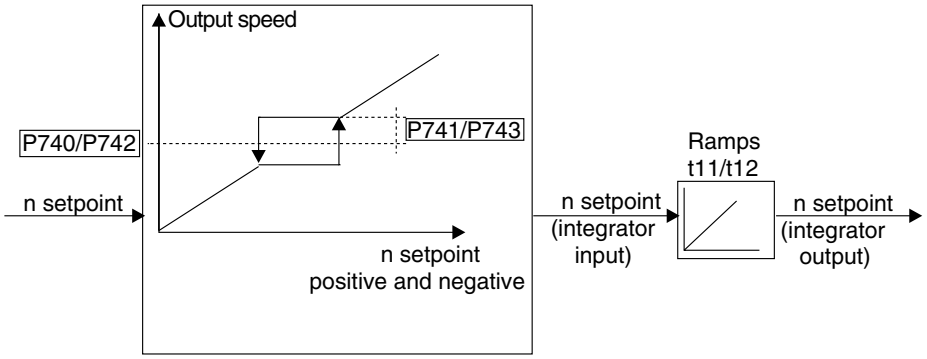
Setting range: 0 – 2 s

The brake application time of the matching motor is set as the factory setting.

Serves to set the time required for application of the mechanical brake. This parameter prevents a sagging of the drive (particularly in hoists).

P74x Speed skip

The skip window center and skip width are values and automatically have an effect on positive and negative setpoints when activated. The function is deactivated by setting the skip width to 0.



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The "Speed skip" function makes it possible to prevent the motor speed from remaining within a certain speed window. This suppresses vibration and noise, in particular in machines with pronounced mechanical resonance.

P740/P742 Skip window center 1/2

1 2

Setting range: 0 – <u>1500</u> – 600 rpm

P741 / P743 Skip width 1 / 2

1 2

Setting range: <u>0</u> – 300 rpm

6.8.9 P8xx Unit functions

P80x Setup

P802 Factory setting

Setting range: No / standard / delivery condition

You can use P802 to reset the factory settings stored in the EPROM for almost all parameters.

INFORMATION

The "Standard" setting overwrites almost all parameter values; the setting "Delivery condition" overwrites all parameter values. Save the set parameter values with MOVITOOLS® Motion-Studio before you start resetting the parameters. After resetting, it is necessary to adapt the altered parameter values and terminal assignments to meet the requirements.

- The following data are not reset when "Standard" is selected:
  - Application module
  - *P20x Speed control* (page 96)
  - *P210 P-gain hold controller* (page 97)
  - *P30x/P31x Limits 1/2* (page 98)
  - *P32x/P33x Motor compensation 1/2* (page 99)
  - *P344 Motor protection interval* (page 102)
  - *P345 / P346 I_N-/ U_L monitoring 1 / 2* (page 103)
  - *P53x Motor temperature protection* (page 105)
  - *P70x Operating modes* (page 109)
  - *P73x Brake function* (page 113)
  - *P905 Hiperface offset (motor)* (page 125)
  - *P910 Gain X controller* (page 126)
  - *P94x IPOS encoder* (page 129)
  - *Error memory*
  - *Statistical data*
- The "Delivery condition" setting also resets the data listed above.

"8.8.8" appears on the 7-segment display during the reset. The previous operating status of the inverter appears on the display after the factory settings have been restored. P802 automatically reverts to "No".

P803 Parameter lock

Setting range: On/<u>off</u>

INFORMATION

Startup is not possible when P803 is set to ON.

By setting P803 to "ON", you can prevent any modification of parameters. The parameter lock does not have any effect on the following parameters:

- *P803 Parameter lock*
- *P840 Manual reset*
- *P876 PO data enable*

This makes sense, for example, after the power section setting has been optimized. P803 must be set to "OFF" to enable changes to parameters again.

P804 Reset statistics data

Setting range: <u>No</u> / error memory / kWh counter / operating hours

P804 permits reset of the statistics data stored in the EEPROM, namely the error memory, kilowatt-hour meter and operating hours counter. This data is not affected when selecting "Standard" for P802 Factory setting.

P82x Brake operation

P820/P821 4-quadrant operation 1/2

Setting range: <u>On</u> / Off

This setting is only taken into account in operating modes without encoder feedback (VFC, V/f); 4-quadrant operation is assumed in all other operating modes. P820/P821 enables 4-quadrant operation to be switched on and off for parameter sets 1/2. 4-quadrant operation is possible if a braking resistor is connected to MOVIPRO® (CCW/CW; motor/regenerative). P820/P821 must be set to "OFF" if there is no braking resistor connected to MOVIPRO®, which means regenerative operation is not possible. In these operating modes, MOVIPRO® attempts to extend the deceleration ramp so the regenerated 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 MOVIPRO®, it is possible that the regenerated power during braking may be too great, leading to MOVIPRO® switching itself off and issuing error message F07 (DC link overvoltage). In this case you have to extend the deceleration ramps manually.

P83x error responses

The following responses can be programmed:

Response	Description
No response	The error is not displayed, and there is no error response. The signaled error is ignored.
Display error	The error is displayed (on the 7-segment display and in MOVITOOLS® MotionStudio). The unit performs no other error responses. The error can be reset (terminal, fieldbus, auto reset).
Immediate stop/ malfunction	The inverter switches off immediately and issues an error message. The output stage is inhibited and the brake is applied. The ready signal is revoked. A restart is only possible after an error reset has been performed during which the inverter is reinitialized.
Emergency stop/ malfunction	The drive is braked with the set emergency stop ramp t14/t24 (page 95). 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 an error reset has been performed during which the inverter is reinitialized.
Rapid stop/malfunction	The drive is braked with the set stop ramp t13/t23 (page 94). 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 an error reset has been performed during which the inverter is reinitialized.
Immediate stop/warning	The inverter switches off immediately and issues an error message. The output stage is inhibited and the brake is applied. The ready signal is not revoked. The drive restarts without unit 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 set emergency stop ramp t14/t24 (page 95). 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 unit 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 set stop ramp t13/t23 (page 94). 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 unit 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

The error is only triggered in the ENABLED inverter status. P830 programs the error response that is triggered by an input terminal programmed to "/EXT.ERROR".

P832 Response to "Motor overload"

Factory setting: Emergency stop/malfunction

P832 programs the error response that is triggered in the event of motor overload. Make one of the following settings to monitor motor overload:

- *P340 Motor protection 1* (page 101) to "ON asynchronous motor"
- *P340 Motor protection 1* (page 101) to "ON servomotor" and *P530 Sensor type 1* (page 105) to "KTY"

P834 Response to "Lag error"

Lag error response only with application module.

Factory setting: Emergency stop/malfunction

P834 programs the error response which is triggered via the lag error monitoring function of an application module.

P835 Response to "TF signal"

AUTO

Factory setting: No response

P835 programs the error response which is triggered by the temperature sensor monitoring of the TF or TH which may be incorporated in the motor winding.

P836 Response to "Timeout SBus 1"

Factory setting: Emergency stop/malfunction

P836 programs the error response that is triggered by system bus timeout monitoring.

P838 Response to "SW limit switch"

Factory setting: Emergency stop/malfunction

P838 programs the error response executed by the inverter if a target position for a referenced drive is outside the software limit switch. The software limit switches are set via parameters P920/P921 (page 127).

P839 Response to "Positioning interruption"

Factory setting: No response

If *P924 "Positioning interruption" detection* (page 128)' is set to "On", the response set here is triggered when a positioning sequence is interrupted.

P84x Reset behavior

P840 Manual reset

Setting range: Yes/No

- Yes: The error in the power section is reset. P840 automatically reverts to "No" after the reset. Activating manual reset does not have any effect if there is no error present.
- No: No reset.

P841 Auto reset

Setting range: On/<u>off</u>

⚠ ○DANGER

Risk of crushing if the motor starts up automatically after an auto reset.

Severe or fatal injuries.

- Do not use auto reset with drives where an automatic restart represents a danger to people or units.
- Perform a manual reset.

- On: The auto reset function is activated. In case of an error, this function automatically resets the unit after *P842 Restart time*. A maximum of five auto resets is possible during an auto reset phase. If five errors occur that are reset by an auto reset, no more auto resets are possible until:
  - a manual reset is performed using the input terminal,
  - a manual reset is performed using the serial interface (MOVITOOLS® MotionStudio, higher-level controller),
  - there is a transition to 24 V backup mode, or the inverter is switched off.

  Five automatic resets are then possible.
- <u>Off</u>: No auto reset.

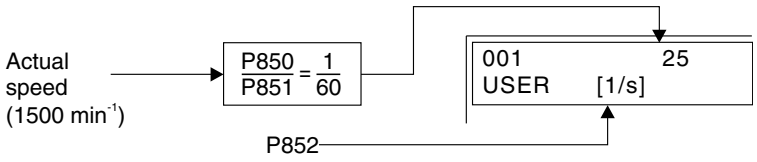
P842 Restart time

Setting range: 1 – <u>3</u> – 30 s

P842 is used to set the waiting time between the moment an error occurs and the execution of an automatic reset.

P85x Scaling actual speed value

Scaling actual speed value defines a user-specific display parameter *P001 User display* (page 90). For example, the user display is to be shown in s^{-1}. Such a setting requires a scaling factor of 1/60. This means the numerator scaling factor has to be set to 1 and the denominator scaling factor to 60. The scaling unit s^{-1} is entered in *P852 User-defined unit*.



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P850 Scaling factor numerator

Setting range: <u>1</u> – 65535

P851 Scaling factor denominator

Setting range: <u>1</u> – 65535

P852 User-defined unit

Factory setting: rpm

Up to eight ASCII characters; is displayed in *P001 User display* (page 90).

P86x Modulation

P860/P861 PWM frequency 1/2

1 2

Setting range: 4 / 8 / 12 / 16 kHz

P860/P861 can be used in VFC mode to set the switching frequency at the inverter output for parameter set 1/2. The inverter automatically switches back to lower switching frequencies when the unit utilization reaches a specific level if the clock frequency for parameter set 1/2 is not fixed to the set value using *P862/P863 PWM fixed 1/2* (page 120). 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

- On: Use P862/P863 = "ON" for parameter sets 1/2 to fix the PWM frequency set with *P860/P861 PWM frequency 1/2* when an automatic reduction of the PWM frequency is undesirable (e.g. when output filters are used).
- Off: MOVIPRO® automatically reduces the set output frequency (down to a minimum of 4 kHz) when there is a high level of thermal load on the output stage to avoid a switch-off with the "Unit utilization" error.

P864 PWM frequency CFC

Setting range: 4 / 8 / 16 kHz

P864 can be used in "CFC" and "Servo" operating mode to set the switching frequency at the inverter output for parameter set 1. The cycle frequency is set to a fixed value and is not automatically reduced with high unit utilization.

P87x Process data description

P870/P871/P872 Setpoint description PO1/PO2/PO3

P870/P871/P872 is used to define the content of the process output data words PO1/PO2/PO3. This is necessary so that the power section can allocate the appropriate setpoints.

Setpoint description	Factory setting
P870 Setpoint description PO1	Control word 1
P871 Setpoint description PO2	Setpoint speed
P872 Setpoint description PO3	Ramp

The following PO assignments are available:

Assignment	Description
No function	The content of the process output data word is ignored.
Setpoint speed	Setpoint speed in rpm
Setpoint current	Current setpoint selection (for torque control)
Setpoint position low	Setpoint position low word
Setpoint position high	Setpoint position high word
Max. speed	Maximum system speed (P302 / P312)
Max. current	Current limitation in % of I_N of the inverter (P303/P313)
Slip speed	Slip compensation (P324 / P334).
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 [%]	Selection of a speed setpoint in % of n_{max}
IPOS PO data	Specification of a 16-bit coded value for IPOS$^{plus®}$ (application module only)

See the "Fieldbus unit profile with parameter list" manual for a detailed explanation.

P873/P874/P875 Actual value description PI1/PI2/PI3

P873/P874/P875 define the content of the process input data words PI1/PI2/PI3. This is necessary so MOVIPRO®can allocate the appropriate actual values.

Actual value description	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 following PI assignments are available:

Assignment	Description	
No function	The content of the process input data word is 0000_{hex}	
Actual speed	Current speed actual value of the drive in rpm	
Output current	Present output current of the system in % of I_N.	
Active current	Present active current of the system in % of I_N: • Positive sign = positive torque • Negative sign = negative torque	
Actual position low[1)]	Current actual position low word	The actual position is read from *P941 Actual position source* (page 129).
Actual position high[1)]	Present actual position high word	
Status word 1	Status information of the inverter	
Status word 2	Status information of the inverter	
Actual speed [%]	Current actual speed value in % of n_{max}	
IPOS PI-DATA	Feedback of a 16-bit coded value for IPOS$^{plus®}$ (application modules only).	
Status word 3	Status information of the inverter	

1) Both assignments must always be set.

See the "Fieldbus unit profile with parameter list" manual for a detailed explanation.

P876 PO data enable

Setting range: On/off

- On: The process output data that was last sent from the fieldbus controller becomes effective.
- Off: The last valid process output data remain in effect.

  NOTE: If the process data assignment is changed, P876 is automatically set to "Off".

6.8.10 P9xx IPOS parameters

The IPOS$^{plus®}$ parameters can only be used in connection with an application module.

⚠ ○DANGER

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Ensure that the motor cannot start unintentionally.
- Note that modifying these parameters without knowledge of the IPOS$^{plus®}$ program, which may be active, can cause unexpected movements and place unwanted loads on the mechanical driveline. It is essential that you are familiar with the IPOS$^{plus®}$ manual to make the setting for these parameters.

P90x IPOS reference travel

The purpose of reference travel is to establish a machine zero to which all absolute positioning commands refer. It is possible to select from various reference travel strategies in *P903 Reference travel type* (page 124). These strategies define appropriate travel modes, for example to search for a reference cam. Using the reference point determined by reference travel, the machine zero point can be changed using *P900 Reference offset* (page 123) according to the following equation:

Machine zero = reference point + reference offset

The speeds of the travel movements required on the basis of the reference travel type are set using *P901 Reference speed 1* (page 123) and *P902 Reference speed 2* (page 124).

P900 Reference offset

Setting range: $-(2^{31}-1)$ – <u>0</u> – $(2^{31}-1)$

Reference offset (zero offset) is used to determine the machine zero. The following applies:

Machine zero = reference point + reference offset

The reference offset always refers to the encoder set via *P941 Source actual position* (page 129).

This encoder can be a motor encoder, an external encoder or a DIP encoder. The corresponding actual positions are indicated by IPOS$^{plus®}$ variables.

- H510 Actual position external encoder
- H511 Actual position motor encoder

The reference offset is activated again after reference travel has been completed successfully.

INFORMATION

In case of reference travel of a drive system with HIPERFACE® encoder, the value of P905 is recalculated and overwritten by the reference travel.

P901 Reference speed 1

Setting range: 0 – <u>200</u> – 6000 rpm

Reference speed 1 determines the travel speed for the first part of the reference travel. Speed change always takes place via stop ramp t13 (page 94). The search directions during reference travel are determined by the respective reference travel type. The speed is in effect until the reference cam has been reached.

P902 Reference speed 2

Setting range: 0 – 50 – 6000 rpm

Reference speed 2 determines the travel speed for the second part of the reference travel. Speed change always takes place via stop ramp t13 (page 94). The search directions during reference travel are determined by the respective reference travel type. The speed is used from the time the drive moves away from the reference cam to when it reaches the first zero pulse.

P903 Reference travel type

Setting range: 0 – 8

The reference travel type specifies the reference travel strategy that is used to establish the machine zero of a machine.

This setting also defines the search direction for the reference cam in the individual referencing phases.

Use parameter *P904 Referencing to zero pulse* (page 125) to determine if the reference travel takes place to the edge change of the reference cam or the next zero pulse of the encoder.

Prerequisite for execution of reference travel is a drive that is ready and enabled with the exception of reference travel type 8.

There are also types available that can function without a reference cam.

- Type 0: Left zero pulse
  - First search direction is CCW.
  - Reference position = Left zero pulse from current position
  - Machine zero = reference point + reference offset
- Type 1: CW end of the reference cam
  - First search direction is CCW.
  - Reference position = First zero pulse or falling edge to the left of the reference cam
  - Machine zero = reference point + reference offset
- Type 2: CW end of the reference cam
  - First search direction is CW.
  - Reference position = First zero pulse or falling edge to the right of the reference cam
  - Machine zero = reference point + reference offset
- Type 3: Limit switch right
  - First search direction is CW.
  - Reference position = First zero pulse or falling edge to the left of the right limit switch.
  - Machine zero = reference point + reference offset
  - Reference travel should take place to zero pulse.
- Type 4: Limit switch left
  - First search direction is CCW.
  - Reference position = First zero pulse or falling edge to the right of the left limit switch.
  - Machine zero = reference point + reference offset
  - Reference travel should take place to zero pulse.

- Type 5: No reference travel
  - Reference position = current position
  - Machine zero = reference offset
- Type 6: Reference cam flush with right limit switch
  - First search direction is CW.
  - Reference position = First zero pulse or falling edge to the left of the reference cam
  - Machine zero = reference point + reference offset

    INFORMATION: Reference cam and limit switches must be flush.
- Type 7: Reference cam flush with left limit switch
  - First search direction is CCW.
  - Reference position = First zero pulse or falling edge to the right of the reference cam
  - Machine zero = reference point + reference offset

    INFORMATION: Reference cam and limit switches must be flush.
- Type 8: Resetting of encoder position for drive not ready for operation

  Reference travel can take place when the drive is not enabled.
  - Reference position = current position
  - Machine zero = reference offset

P904 Reference travel to zero pulse

Setting range: Yes/No

- Yes: Reference travel takes place to the zero pulse of the selected IPOS$^{plus®}$ encoder.
- No: Reference travel takes place to the falling edge of the reference cam.

P905 Hiperface offset (motor)

Setting range: $-(2^{31}-1)$ – 0 – $(2^{31}-1)$

This parameter is used to specify the zero point of the motor encoder display.

Use this parameter to define the machine zero without reference travel. It adds or subtracts the offset from the encoder value. P905 has an effect on the actual position of the motor encoder H511:

H511 = Encoder value – P905

The actual position is determined directly after the values have been entered. A HIPERFACE® multi-turn encoder must be referenced once, a HIPERFACE® single-turn encoder must always be referenced.

INFORMATION

In case of reference travel of a drive system with HIPERFACE® encoder, the value of P905 is recalculated and overwritten by the reference travel.

The following applies:

P905 = Encoder value – P900

P906 Cam distance

The parameter contains the number of increments from the reference cam to the zero pulse of the motor encoder. The cam distance is displayed after a successful reference travel. Ideally, it is half of the encoder resolution after 4-fold evaluation. Relocate the cam if necessary.

P91x IPOS travel parameters

P910 Gain X controller

Setting range: 0.1 – 0.5 – 32

Setting value for the P controller of the position control loop in IPOS$^{plus®}$. The value from *P210 P gain hold controller* (page 97) is adopted here in the default setting.

P911/912 Positioning ramp 1/2

Setting range: 0.01 – 1 – 20 s

Value set for the ramp used during the positioning operation. The same ramp (positioning ramp 1) is always used for acceleration and deceleration when *P916 Ramp type* (page 126) is set to "Sine" or "Squared". For a "linear" ramp type, deceleration will be set depending on *P917 Ramp mode* (page 127):

- P917 = Mode 1: 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.
- P917 = Mode 2: Positioning ramp 2 is always used for deceleration if the travel speed is changed during travel. Positioning ramp 1 is used for acceleration.

P913/P914 Travel speed CW/CCW

Setting range: 0 – 1500 – 6000 rpm

Specifies the speed used for positioning. The setting must be adjusted to the maximum motor speed.

INFORMATION

P302/P312 Maximum speed 1/2 (page 98) limits P913/P914; always set P302/P312 to a value greater (about 10 %) than P913/P914 to prevent lag errors.

P915 Velocity precontrol

Setting range: –199.99 – 0 – 100 – 199.99%

When the setting is 100 %, the drive moves at an optimum speed with a linear speed 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.

INFORMATION

Parameter P915 is only in effect with the "linear" and "jerk limited" ramp types. The function has no effect for the ramp types "Sine" and "Squared".

P916 Ramp type

This parameter specifies the type of positioning ramp. This influences the speed or acceleration characteristics during positioning.

Ramp type	Positioning characteristics
Linear	Optimum time, however block-shaped acceleration characteristic
Square	Softer acceleration and higher torque demand than "linear".
Sine	Very soft acceleration profile, required torque higher than with "Squared" acceleration profile.

Ramp type	Positioning characteristics
Bus ramp	Setting for operation of drive inverter with master controller. This controller 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 external controller are interpolated linearly. For configuration, one process output data word must be set to "position high" and another one to "position low".
Jerk limitation	Jerk limitation is based on the principle of the linear ramp. For jerk limitation, the torque and, therefore, the acceleration is trapezoidal. Over time, jerk limitation builds up the torque in linear form during acceleration until the maximum value is reached. In the same way, the torque is reduced again over time in linear form to zero. This means that system vibrations can be virtually avoided. You can set a value between 0.005 s and 2 s under*P933 Jerk time* (page 128). The positioning time in comparison to the linear ramp is extended by the set jerk time. The acceleration and torque do not increase in comparison with the linear ramp.

P917 Ramp mode

Setting range: Mode 1/mode 2

This parameter determines the use of *P912 Positioning ramp 2* (page 126) with ramp type set to "linear".

- P917 = Mode 1: Deceleration for travel to target position (spot braking) takes place with Positioning ramp 2. Positioning ramp 1 is used for all other positioning operations. If position interpolation 12 bit or 16 bit is active, it runs in mode 1 without dead time compensation.
- P917 = Mode 2: Positioning ramp 2 is always used for deceleration if the travel speed is changed during travel. Positioning ramp 1 is used for acceleration. If position interpolation 12 bit or 16 bit is active, it runs in mode 1 without dead time compensation.

P918 bus setpoint source

Setting range: 0 – 499 – 1023

In conjunction with EtherCAT®, parameter P918 can be used to set the source for the setpoint in IPOS$^{plus®}$.

P92x IPOS monitoring

P920/P921 SW limit switch CW/CCW

Setting range: $-(2^{31}-1)$ – 0 – $(2^{31}-1)$

The software limit switches let the user limit the range in which travel commands are accepted. This is implemented via software. The limits of the movement range are specified using these two parameters. If *P941 Source actual position* (page 129) is set to "motor encoder" or "external encoder", then these do not take effect until after performance of a reference travel. If the software limit switches are in effect, the system checks whether the target position H492 of the current travel command is beyond the software limit switches. If the target position is beyond the range limited by the limit switches, the travel command will not be executed. The drive responds according to the error response set in *P838 error response to SW limit switch* (page 118). If P838 is set to "../warning" or ".../error", then error message "A1.F78" (IPOS SW limit switch) is generated. The software limit switches are only monitored in the "...& IPOS" operating modes.

If P838 is set to ".../error", then the drive with incremental encoder is no longer referenced after an error reset whereas a drive with absolute encoder is still referenced.

If the drive is not referenced, the software limit switches have no effect. They are only activated again after the drive has been referenced.

If P838 is set to ".../warning", the drive will remain referenced after the reset. 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.

Deactivation: Set both parameter values to 0 for endless travel so that the software limit switch function is deactivated.

P922 Position window

Setting range: 0 – 50 – 32 767 incr.

The parameter 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.

The lag error window defines a permitted difference between the setpoint and actual position value. If the permitted value is exceeded, a lag error response will be triggered. You can set the responses with *P834 Response to lag error* (page 118).

Deactivation: Set value = 0 deactivates lag error monitoring

P924 Positioning interruption detection

Setting range: On/off

This parameter determines whether the positioning process is monitored for interruptions (enable signal revoked). The response is set in *P839 Response to "Positioning interruption"* (page 118).

P93x IPOS special functions

P930 Override

Setting range: On/off

The override function makes it possible to change the travel speed for positioning operations which is programmed in the IPOS$^{plus®}$ program. The speed can be altered within the range from 0 to 150 % of the specifically programmed speed. This requires an analog input, with 0 to 150 % corresponding to 0 – 10 V at the analog input. The maximum speed value is limited by *P302/P312 Maximum speed 1/2* (page 98).

P933 Jerk time

Setting range: 0,005 – 2 s

The jerk time indicates the duration of the torque formation. The positioning time in comparison to the linear ramp is extended by the set jerk time. Make sure that *P911/P912 Positioning ramp 1/2* (page 126) is of a greater or equal value:

P933 ≤ P911

P933 ≤ P912

If this is not true, torque formation still has a trapezoidal shape with the set jerk time not being the time for the torque formation.

P938 IPOS speed task 1

Setting range: 0 – 9 additional assembler commands/ms

The standard setting for task 1 is "1". The speed can be increased by up to 9 additional assembler commands per millisecond with P938. P938 and *P939 IPOS speed task 2* (page 129) share the resources for the speed increase; that is, task 1 and task 2 together can be assigned a total of 9 additional assembler commands per millisecond. Example:

Task 1 + 2 additional assembler commands/ms = 3 assembler commands/ms

Task 2 + 7 additional assembler commands/ms = 9 assembler commands/ms

P938 IPOS speed task 2

Setting range: 0 – 9 additional assembler commands/ms

The standard setting for task 2 is "2". The speed can be increased by up to 9 additional assembler commands per millisecond with P939. P939 and *P938 IPOS speed task 1* (page 129) share the resources for the speed increase; that is, task 1 and task 2 together can be assigned a total of 9 additional assembler commands per millisecond. Example:

Task 1 + 2 additional assembler commands/ms = 3 assembler commands/ms

Task 2 + 7 additional assembler commands/ms = 9 assembler commands/ms

P94x IPOS encoder

P941 Source of actual position

Setting range: Motor encoder / Ext. Encoder

Defines the encoder to which the application module positions.

P948 Automatic encoder replacement detection

Setting range: On/off

This parameter is only effective with HIPERFACE® encoders.

- On: A replaced HIPERFACE® encoder is detected. Reference travel is required before the "IPOS referenced" bit is set.
- Off: The HIPERFACE® encoder is always referenced. The "IPOS referenced" bit is set.

  NOTE: If P948 is switched off and on again, the "IPOS referenced" bit is set to "0" once you have restarted the MOVIPRO®. Reference travel is necessary to rest the "IPOS referenced" bit to "1".

P96x IPOS modulo function

The IPOS$^{plus®}$ modulo function is used for endless positioning, for example with circular indexing tables or chain conveyors.

P960 Modulo function

Setting range: Off / Short / CW / CCW

- Off: The modulo function is deactivated.
- In 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.
- Right: 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.
- 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.

P961 Modulo numerator

Setting range: 1 – (2^{31}−1)

Simulation of the gear unit by entering the number of teeth of the gear unit and the additional gear.

Modulo numerator = Numerator gear unit i × numerator additional gear i

P962 Modulo denominator

Setting range: 1 – (2^{31}−1)

Simulation of the gear unit by entering the number of teeth of the gear unit and the additional gear.

Modulo denominator = Denominator gear unit i × denominator additional gear i

P963 Modulo encoder resolution

Setting range: 1 – 4096 – 65535

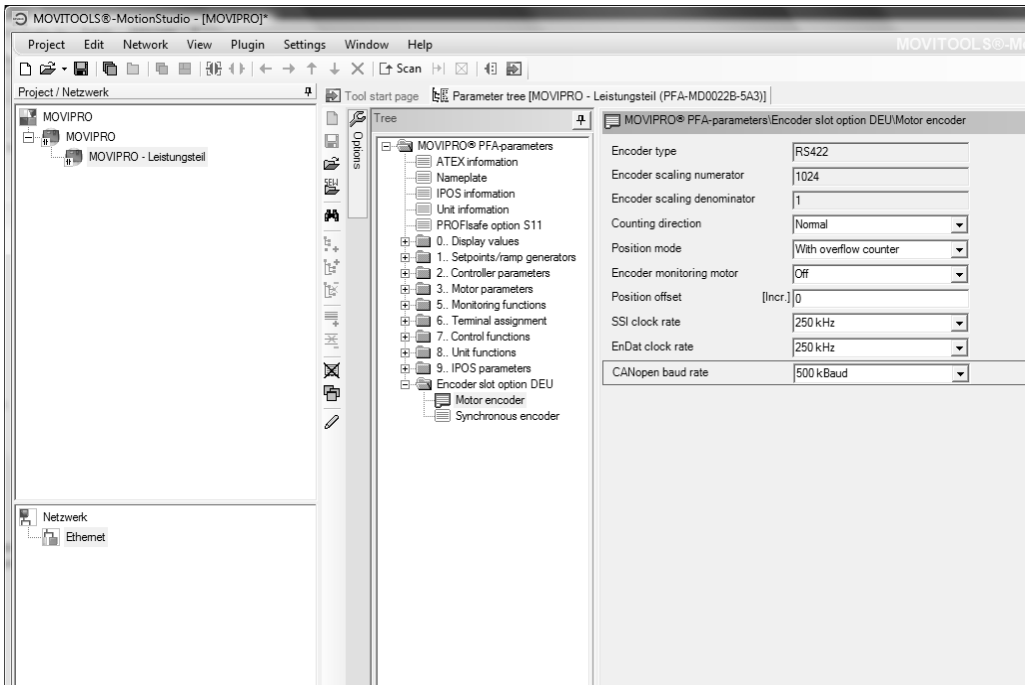
Resolution of the selected IPOS$^{plus®}$ encoder system in increments.

The IPOS$^{plus®}$ encoder resolution for positioning to the motor encoder is set to 4096 increments (prerequisite is an encoder resolution of 512 to 2048).

6.9 Parameter overview of the encoder option

The encoder option is parameterized during startup (see chapter "Encoder configuration"). You have to specify the encoder connected to MOVIPRO® and the corresponding resolution.

In addition you can make adjustments in the parameter tree, e.g. the counting direction or the clock rate.



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Parameter	Description
Encoder type	The encoder set via the startup of the MOVIPRO® is displayed
Encoder scaling numerator	The numerator of the encoder scaling set via the startup of the MOVIPRO® is displayed

Parameter	Description
Encoder scaling denominator	The denominator of the encoder scaling set via the startup of the MOVIPRO® is displayed
Counting direction	Defines the counting direction of the connected encoder. Make the settings so that the encoder counts in positive direction when the motor shaft turns clockwise.
Position mode	With overflow counter: • Encoder overflows are counted and an internal 32-bit position is generated in the inverter Single-turn absolute position: • Only via single-turn absolute encoder. The position is displayed according to the encoder information. Encoder overflows are not counted Linear operation: • The position is displayed according to the encoder information. Encoder overflows are not counted
Encoder monitoring motor	NO: • Wire breakage between frequency inverter and motor encoder is not detected directly. In case of a defective connection, error F08 speed monitoring will be issued in enabled state unless it was deactivated. YES: • Wire breakage between frequency inverter and motor encoder will be detected directly when using sin/cos encoders and TTL encoders. The error message "F14 Encoder error" will be issued in case of an error. This error will also be generated in inhibited state. **NOTE** Encoder monitoring is not a safety-relevant function. If you use a HIPERFACE® encoder, encoder monitoring is always active (for the track too) irrespective of the setting in P504 always active.
Position offset	Setting range: (-2^{31} ... 0 ... $2^{31}-1$) The position offset only has to be set on incremental encoders. For other encoders, its should be set to "0". **NOTE**The position value will be recalculated and overwritten automatically after successful completion of the reference travel.
SSI clock rate	Setting range: 125, 250, 500, 1000, 2000 kHz This parameter defines the cycle frequency at which absolute encoder information is transmitted from the encoder to the inverter.
EnDAT clock rate	Setting range: 125, 250, 500, 1000, 2000 kHz This parameter defines the cycle frequency at which absolute encoder information is transmitted from the encoder to the inverter.
CANopen baud rate	Setting range: 125, 250, 500 kBaud, 1 MBaud This parameter determines the transmission speed of the CAN bus.

7 PROFINET IO Configuration

7.1 PROFINET IO Controller – Project Planning

The following sections describe the configuration of an SEW controller with PROFINET interface. The configuration will be demonstrated using the example of the SIMATIC STEP 7 configuration software and a SIMATIC CPU 315F-2 PN/DP.

7.1.1 Installing GSDML file for MOVIPRO® ADC/SDC

INFORMATION

The latest versions of the GSD(ML) files are available for download from the SEW website (**www.sew-eurodrive.com**). You find it in the "Software" section of the respective units.

Proceed as follows to install the GSD file:

1. Start STEP 7 HW Config and select the [Install new GSD file] menu item in the [Extras] menu.

   A window is displayed.

2. Click [Browse] and select GSDML file matching the SEW controller MOVIPRO® ADC/SDC. The GSDML file can be used for the following SEW controllers:

   - MOVIPRO® SDC Realtime CCU
   - MOVIPRO® SDC Realtime PLC
   - MOVIPRO® ADC Realtime CCU
   - MOVIPRO® ADC Realtime PLC
   - MOVIPRO® ADC Realtime SNI CCU
   - MOVIPRO® ADC Realtime SNI PLC

   "yyyymmdd" in the file name stands for the date.

3. Click [OK] for confirmation.

4. You find the PROFINET IO interface for the respective controller in the hardware catalog under [PROFINET IO] / [Other field units] / [Drives] / [SEW] / [*SEW controllers*].

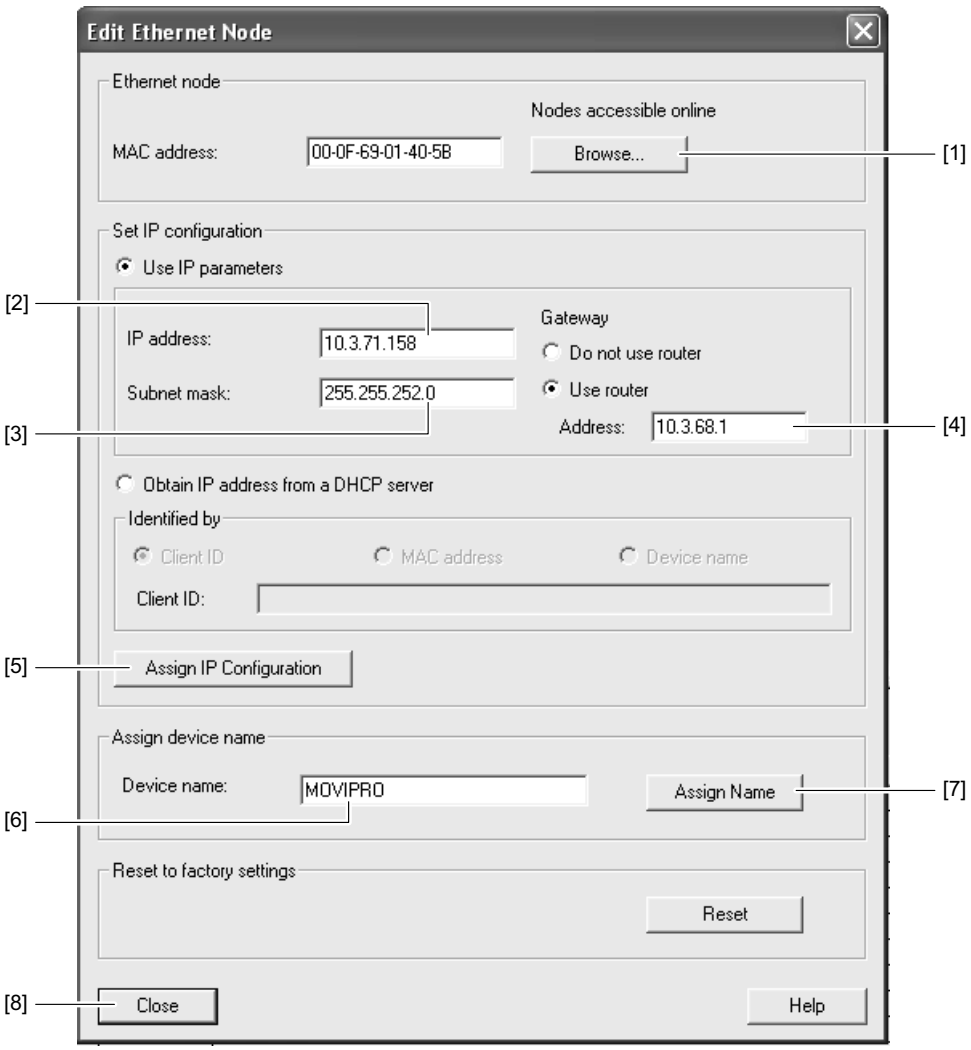
   For more information on PROFINET interface of MOVIPRO® ADC/SDC, refer to chapter "Configuring a PROFINET interface for MOVIPRO®"

7.1.2 Assigning a PROFINET device name

Proceed as follows to assign the PROFINET device name:

1. Select [Ethernet]/[Edit Ethernet station...] from the [Target system] menu in STEP 7 HW Config.

The following window opens:



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[1] [Browse...] button
[2] "IP address" edit box
[3] "Subnet mask" edit box
[4] "Address" edit box
[5] "Assign IP configuration" button
[6] "Device name" edit box
[7] "Assign name" button
[8] [Close] button

2. Click the [Browse...] [1] button in the "Ethernet stations" group. You receive an overview of all PROFINET IO stations that you can reach online with your configuration tool.

   In addition, you can use the flash test to visually locate the stations. For more information, refer to section "Status LED S1 PROFINET IO".

3. Choose the required node.

   The SEW station appears under unit type. Assign an appropriate unit name. Several SEW controllers can be differentiated by the displayed MAC addresses. The MAC address is affixed to the SEW controller.

4. Enter the device name in the "Device name" edit box [6] and click the [Assign name] button [7].

   The device name can have up to 255 characters. The device name is transferred to and saved in the station.

   You can reset the device name of the SEW controller online using the [Reset] button. You will then have to restart the SEW controller.

5. Specify an IP address [2] and a subnet mask [3] as well as a router address [4], if required.

   Click the [Assign IP configuration] button [5].

INFORMATION

The IO controller must not yet be in a cyclic data exchange with the IO devices.

6. Check whether the settings have been applied by clicking the [Browse] button [1] again.
7. Click the [Close] button [8].

7.2 Configuring PROFINET interface for a MOVIPRO® unit

7.2.1 Creating a new project

Proceed as follows to create a new project:

1. Start the SIMATIC Manager and create a new project.

   Select your control type and add the required modules. The following modules make sense:

   - **OB82 module:** This module makes sure that the controller does not trigger "STOP" in the event of so-called diagnostic alarms.
   - **OB86 module:** This module indicates the failure of decentralized peripherals.
   - **OB122 module:** This module is addressed if the controller cannot access data of a station of the decentralized periphery. This can occur when, for example, the MOVIPRO® unit is ready for operation later than the controller.

2. Start STEP 7 HW Config and select the PROFINET IO slot in the control rack.
3. Add a PROFINET IO system by right-clicking the context menu with your mouse.
4. Specify an IP address for the PROFINET IO controller when doing this.
5. Add a new PROFINET subsystem using the [Ethernet] button.
6. Open [PROFINET IO] / [Additional Field Devices] / [Drives] / [SEW] / [MOVIPRO] in the hardware catalog.

   The following entries are available:

Entry	Units
MOVIPRO V1.0	MOVIPRO® special designs (SD units)
MOVIPRO V1.0OLD	MOVIPRO® special designs (SD units) that do not support technology detection
MOVIPRO V1.1	MOVIPRO® SDC/ADC with fieldbus connection PROFINET copper (M12 or RJ45)
MOVIPRO V1.5 LWL	MOVIPRO® SDC/ADC with fieldbus connection PROFINET SCRJ (POF)

7. Move the entry matching your MOVIPRO® to the PROFINET IO system with the mouse and assign a PROFINET station name. This name must correspond to the PROFINET device name specified in the MOVIPRO® unit.

8. Enter the IO and periphery addresses in slot 2 and save the configuration.

   The slot model is used for configuration with PROFINET. Each slot is assigned to a MOVIPRO® fieldbus interface. The following structure is used:

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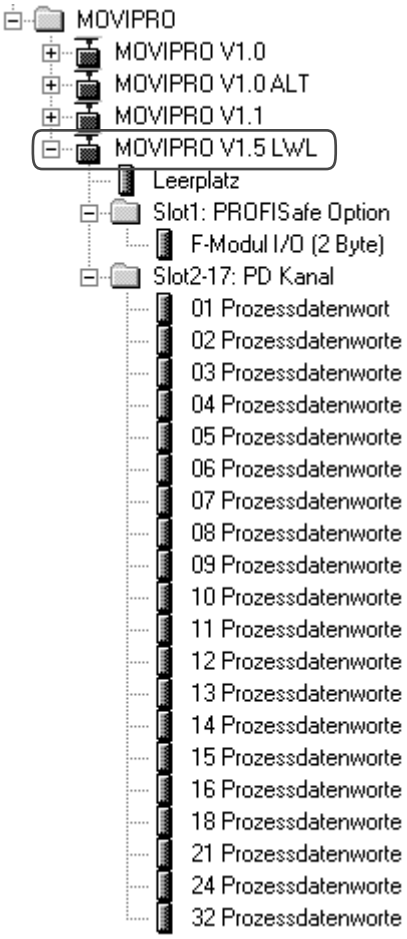


   Slot 1 is used for the PROFIsafe unit variant. Here, the F module is configured to switch the unit to the STO (Safe Torque Off) function via PROFIsafe. For detailed information, refer to the "MOVIPRO® ADC – Functional Safety" manual.

   Slots 2-17 are assigned process data channels of the drive. Slot 2 is assigned 10 process data by default.

9. Add data exchange with the new units to your user program. Process data transfer is consistent. SFC14 and SFC15 can be used to transfer process data.

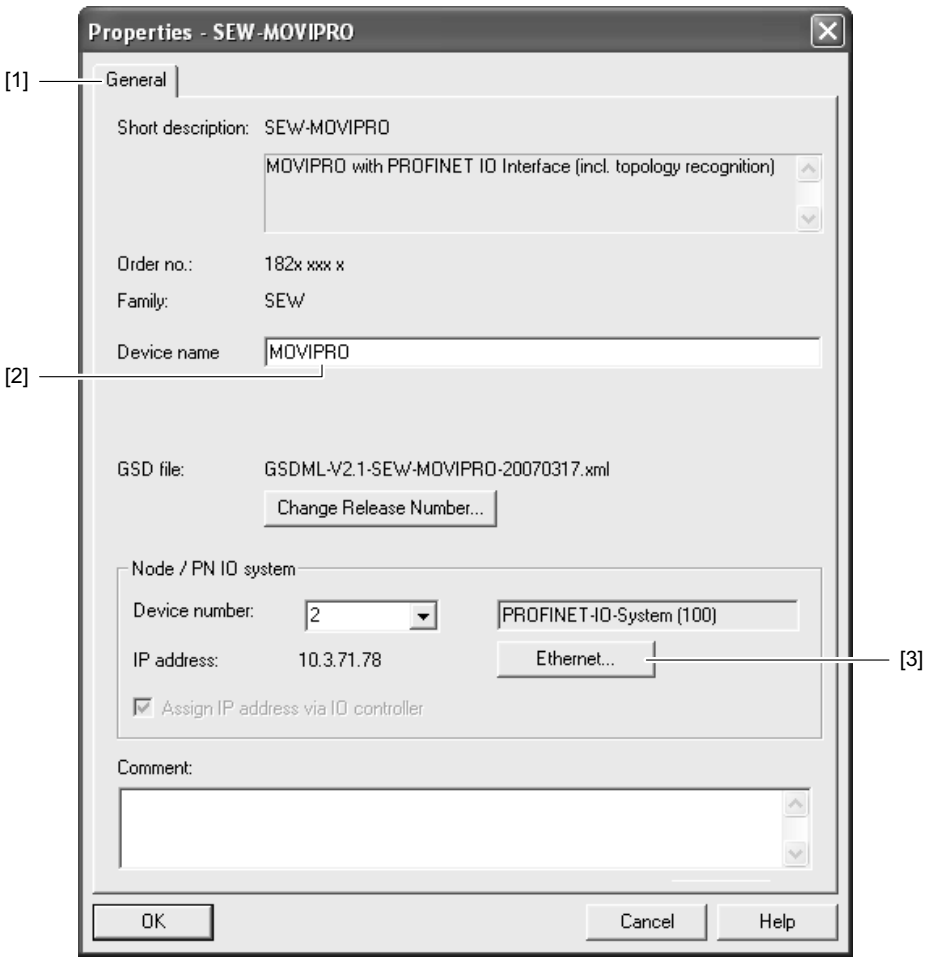
7.2.2 Configuring a station

When the individual slots are configured, the new station has to be configured with further settings.

Proceed as follows to configure a station:

1. Double-click on the device symbol of the new station.

   The following window opens:



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[1] "General" tab
[2] "Device name" edit box
[3] [ETHERNET...] button

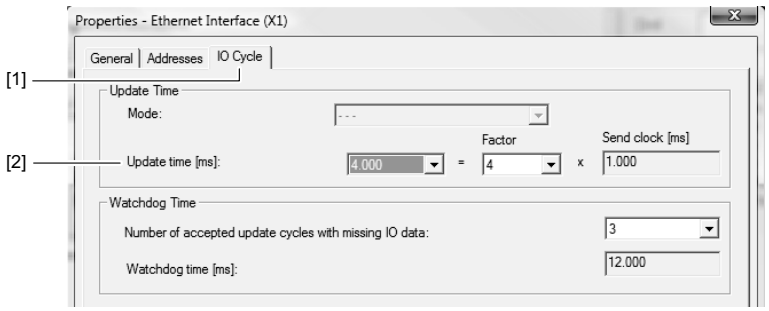
2. Enter the device name mentioned above in the "Device name" input field [2] on the "General" tab.

   Note that the name is case-sensitive.

3. Click on the [Ethernet] button [3] in the "Station/PN IO system" group to enter the previously assigned IP address.

4. Double-click on the "Ethernet interface" slot in order to set the station's update time.

The following window opens:



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[1] "IO cycle" tab
[2] "Update time" dropdown list

5. On the "IO cycle" tab [1] set the update time [2] for the station to update its process data.

   As a gateway, the MOVIPRO® unit supports a minimum update time of 4 ms.

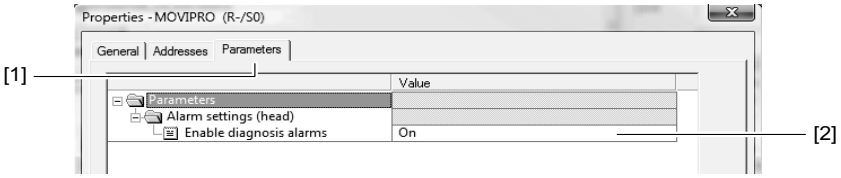
7.3 PROFINET diagnostic alarms

7.3.1 Activating diagnostic alarms

The PROFINET interface supports diagnostic alarms in the event of a unit fault. These diagnostic alarms are deactivated by default. Proceed as follows to activate diagnostic alarms in STEP 7 HW Config:

1. Select "slot 0".
2. Right-click on the slot and select "Object properties" from the context menu.

   A window is displayed.
3. Select the "Parameters" tab [1].
4. In "Activate diagnostics alarms" [2], set the alarms to "ON"



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[1] "Parameters" tab
[2] "Activate diagnostics alarms" node

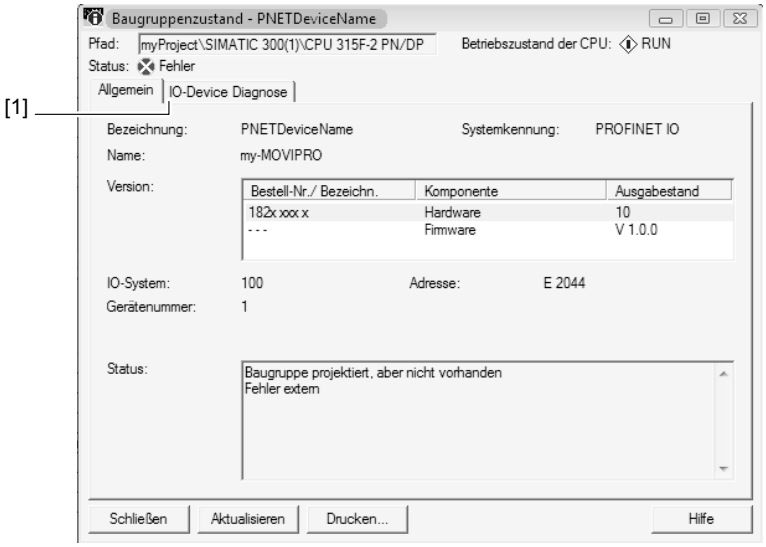
7.3.2 Determining the cause of a fault

A fault in the function unit belonging to the plug-in module causes a diagnostic alarm to be sent to the controller as an "incoming event".

Proceed as follows to determine a fault in STEP 7 HW Config:

1. Click the "ONLINE ↔ OFFLINE" symbol, to switch to "online" communication mode.
2. Mark the symbol of the SEW PROFINET interface.
3. Right-click and select "Module status" from the context menu.

   A window is displayed.



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[1] "IO device diagnostics" tab

4. Select the "IO device diagnostics" tab [1].
5. Click on [Display] to receive detailed information on the fault.

   After resetting the fault, a so-called "ongoing event" is sent to the controller. The SF LED of the CPU goes out and no more faults are displayed in the component status.

7.4 PROFINET configuration with topology detection

7.4.1 Introduction

PROFINET topology detection allows for configuring and monitoring the structure of the network with the PROFINET IO controller in addition to the PROFINET IO devices.

The so-called "Physical device (PHDEV)" is the starting point for configuration. PDEV is a model for the Ethernet interface and can be found in slot 0 in the configuration with an "Ethernet interface" subslot and one subslot for each Ethernet port.

The Ethernet ports made visible in this way can be connected to the configuration tool. The result is an image of the desired Ethernet routing for the plant. This image is stored in the PROFINET IO controller.

To determine the real plant topology, the PROFINET IO devices must support the so-called LLDP (Link Layer Discovery Protocol). The PROFINET IO devices exchange information with the neighboring PROFINET IO devices via LLDP. Via LLDP, each PROFINET IO device cyclically sends information using its own PROFINET device name and port number. The neighboring unit receives and stores this information. A PROFINET IO controller can now read the stored information from the PROFINET IO devices and determine the real plant topology.

By comparing the configured topology with the real topology, you can detect any missing or incorrectly wired PROFINET IO devices and localize them in the plant.

Apart from cabling you can still determine the transmission characteristics for the ports. For example, you can set an "Auto-negotiation" port to "100 Mbit full duplex". The settings will be monitored.

SNMP as a protocol for network diagnostics extends the topology detection by standard diagnostics mechanisms from the IT area.

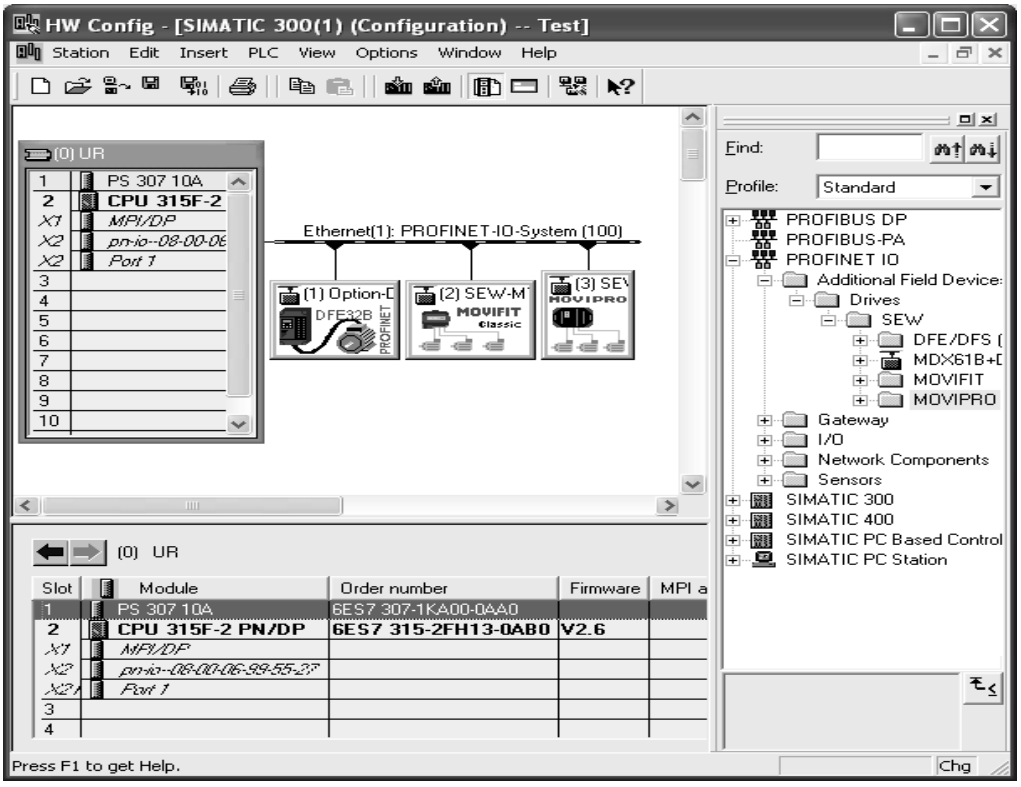
7.4.2 Creating a PROFINET IO project and starting the topology editor

The following section describes the the configuration procedure for a PROFINET topology with the SIMATIC STEP 7 topology editor. Configuration can be performed in different ways in SIMATIC STEP 7. This example will focus on one approach.

1. In STEP 7 HW Config, import the PROFINET IO devices from the hardware catalog into the PROFINET IO network as usual.

   Make sure that the PROFINET IO controller supports topology detection. The controller manufacturer provides according information.

   The hardware catalog contains several entries for each SEW interface marked as different versions. An entry marked with "OLD" does not support the PROFINET IO topology detection.



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2. Right-click on "PROFINET IO system" and select "PROFINET IO topology" from the context menu to open the topology editor.

   The "Topology editor" window is displayed.

3. Proceed according to chapter "Specifying the topology".

7.4.3 Specifying the topology and detecting faulty connections

Topology detection with topology editor

The purpose of topology detection is to compare the current topology (online topology) with the configured topology (offline topology). Any deviation suggests faulty connections in the PROFINET network.

The following section provides an introduction as to how to use the topology editor to specify PROFINET nodes and detect faulty connections to ports.

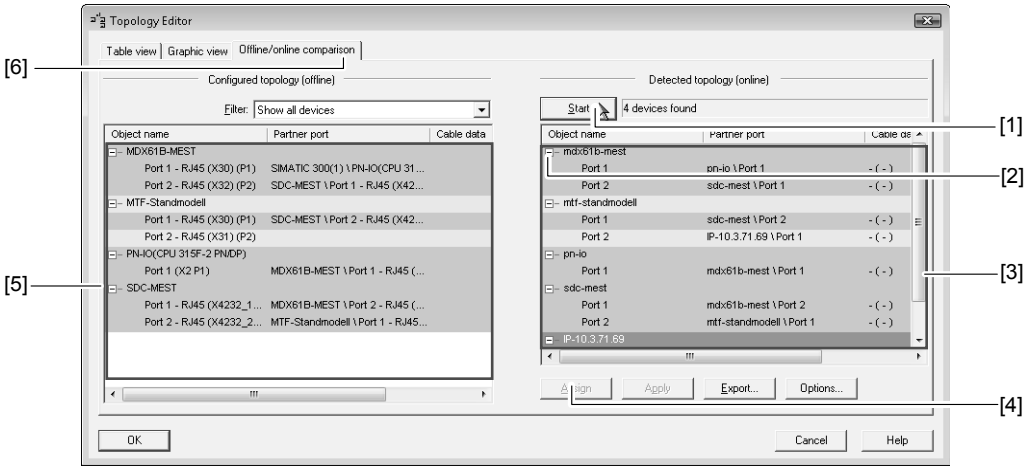
Refer to the online help for a detailed description and important additional information (e.g. the color code of the comparison results).

Click [Help] to open the online help in the open topology editor.

Specifying the topology

Proceed as follows to specify the topology of nodes in a PROFINET network:

1. Start the topology editor according to section "Creating a PROFINET project and starting the topology editor".
2. Select the "Offline/online comparison" tab [6].



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[1] [Start] button
[2] Plus symbol/minus symbol
[3] "Online topology" list
[4] [Assign] button
[5] "Offline topology" list
[6] "Offline/online comparison" tab

3. Click [Start] [1] to determine the online topology and compare it with the configured topology (offline topology).

   The left part of the window displays the "Configured topology (offline)" list [5], the right part displays the "Detected topology (online)" list [3].

   The color code (the online help) and the order of the entries provide information regarding the comparison result.

4. Make sure that the assignment corresponds to your requirements and is applied to the configuration.
   - If required, change the assignment of the devices. To do so, selecte the respective device in both lists and click [Assign] [4].
5. Make sure that the connection of the partner ports corresponds to your requirements and is applied to the configuration.
   - Click the plus sign [2] in front of the respective device in the right part of the window (online topology) [3] to display the partner ports.
   - Change the connection of the partner ports if required. To do so, select the respective port and choose [Apply port connection] from the context menu (right-click).

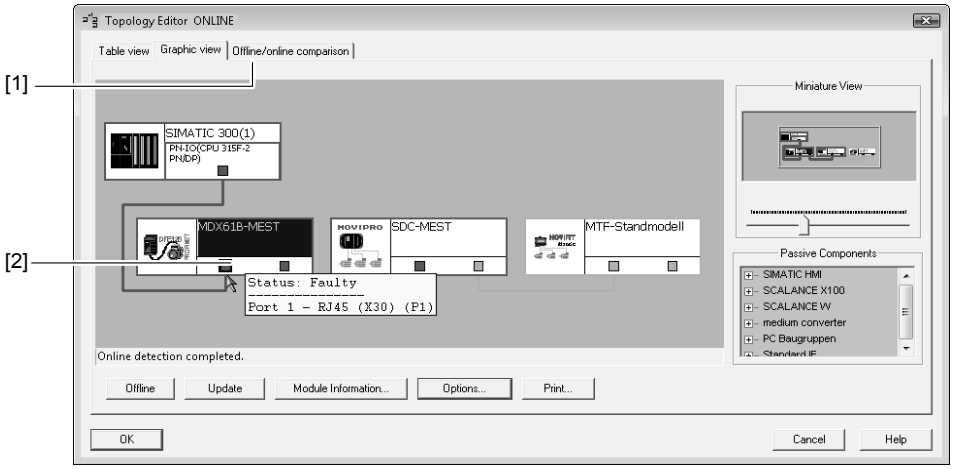
     To disconnect port connections, mark the respective port in the left part of the window and select [Interrupt port connection].
   - Repeat the procedure until all ports in the list are marked "green".

Detecting faulty connections

Faulty connections can be detected in the graphic view of the topology editor.

Proceed as follows to switch to the graphic view:

1. Start the topology editor according to section "Creating a PROFINET project and starting the topology editor".
2. Select the "graphic view" tab [1].



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[1] "Graphic view" tab
[2] Port with faulty connection

The graphic view provides a clear display of your PROFINET network (offline or online) with all devices and connected ports.

Faulty connections between ports are indicated by red lines.

3. Move the curser over the port with the faulty connection [2] to display a status message for the error.

   The example illustrates a faulty connection between the controller and "port 1" of the first device. The faulty connection is indicated by a red connection line and the status message to the port.

7.4.4 Changing port properties

The two Ethernet ports of the PROFINET interface are set to "Automatic setup" by default. Observe the following for default setup:

- Auto-negotiation and auto-crossover are activated in this setup.
- Baud rate and duplex mode are configured automatically.
- The neighboring port must also be set to "Automatic setup".
- You can use patch or crossover cables.

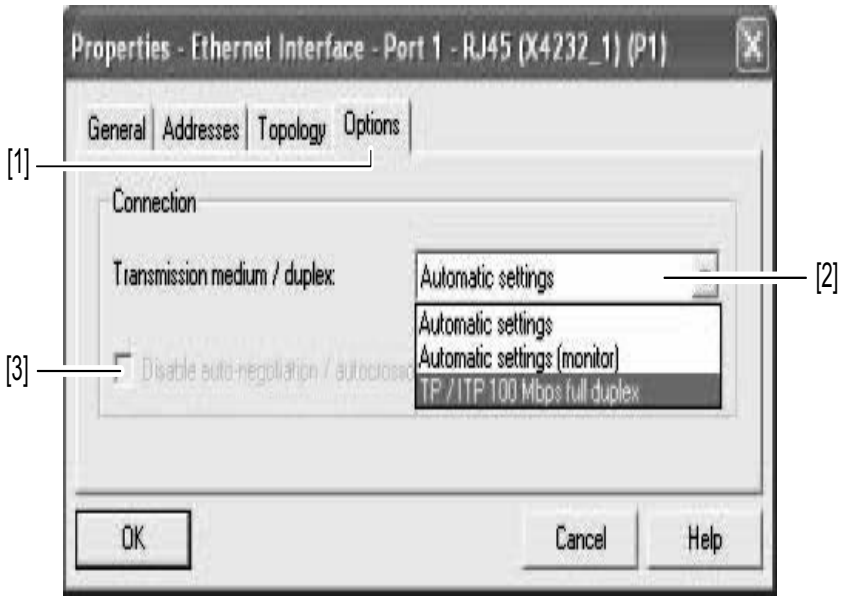
You can set a port to "100 Mbit/s full duplex". Observe the following for this setup:

- This setting must also be made for the port of the neighboring unit, otherwise it would work with 100 Mbit/s half duplex.
- If auto-crossover is deactivated, you have to use cross cables.

Proceed as follows to set a port to "100 Mbit/s full duplex":

1. Select a unit in STEP 7 HW Config.
2. Select the desired port on slot 0.
3. Right-click on the port and select "Object properties" from the context menu.

   A window is displayed.
4. Select the "Options" tab [1].



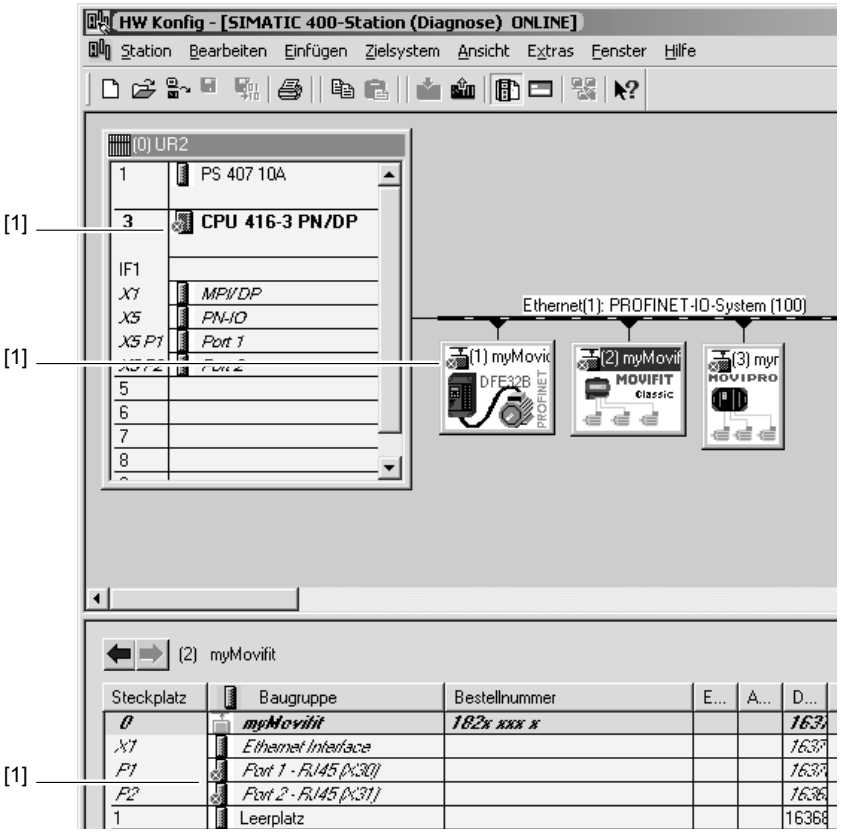
1397778187

[1] "Options" tab
[2] "Transmission medium/duplex" drop-down menu
[3] "Auto-negotiation/auto-crossover" checkbox

5. From the "Transmission medium/duplex" [2] drop-down menu select "TP/ITP with 100 Mbit/s full duplex".
6. Deactivate "Auto-negotiation/auto-crossover" checkbox [3].

7.4.5 Topology diagnostics

Topology errors are reported to the PROFINET IO controller as diagnostics alarms. In the event of an error, the EXTF-LED of the PROFINET IO controller is lit. The error is also indicated by a red cross [1] in STEP 7 HW Config.



1397776267

[1] "Red cross" – symbol for errors

Possible causes:

- Ethernet ports swapped
- Incorrectly set port properties
- Units cannot be addressed

Proceed as follows to display information about an error:

1. Select the unit or the respective slot.
2. Right-click and select "Module status" from the context menu.

   A window is displayed.
3. Select the "Communication diagnostics" tab.

7.4.6 Port statistics

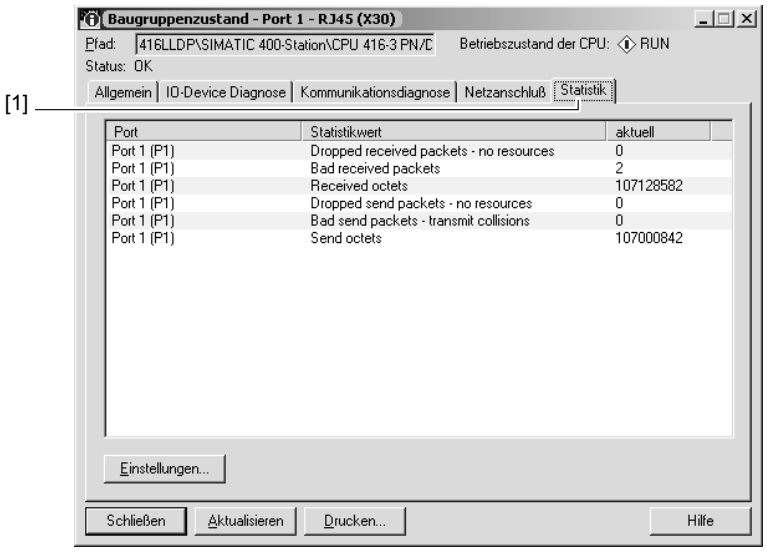
Proceed as follows to display the port statistics for an Ethernet port in STEP 7 HW Config:

1. Click the "ONLINE ↔ OFFLINE" symbol, to switch to "online" communication mode.
2. Select a unit.
3. Select the desired port on slot 0.
4. Right-click and select "Module status" from the context menu.

   A window is displayed.

   Select the "Statistics" tab [1].

   The following view is displayed:



1397780107

[1] "Statistics" tab

The following statistic values can be displayed:

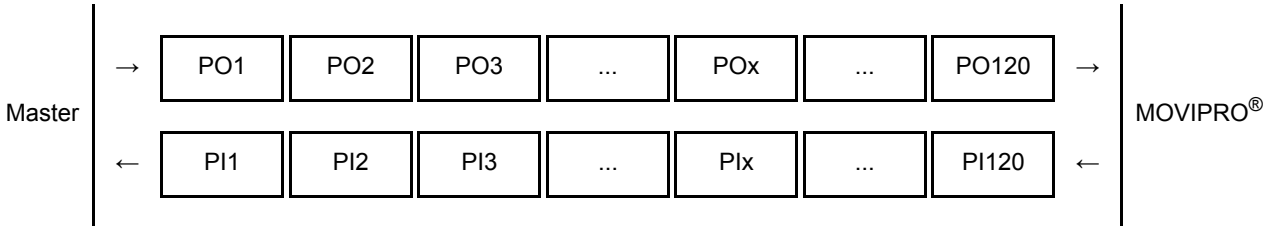
- **Dropped received packets – no resources** Shows the number of valid Ethernet packets discarded upon reception. A large number of discarded valid packets suggests a high load on the bus system. In this case, try to reduce the utilization by reducing in particular the number of broadcast and multicast telegrams and reducing the IO cycle or the number of PROFINET units in a line, if required.
- **Bad received packets** Shows the number of faulty Ethernet packets. A high number suggests a bus error. In this case, check the cabling and shielding of the network.
- **Received octets** Shows the number of received packets.
- **Dropped sent packets – no resource** Shows the number of valid Ethernet packets discarded during transmission. A large number of discarded valid packets suggests a high load on the bus system. In this case, try to reduce the utilization by reducing in particular the number of broadcast and multicast telegrams and reducing the IO cycle or the number of PROFINET units in a line, if required.

- **Bad sent packets – transmit collisions** Shows the number of discarded Ethernet packets due to collisions. There should be no collisions in a switched network.
- **Send Octets** Shows the number of transmitted packets.

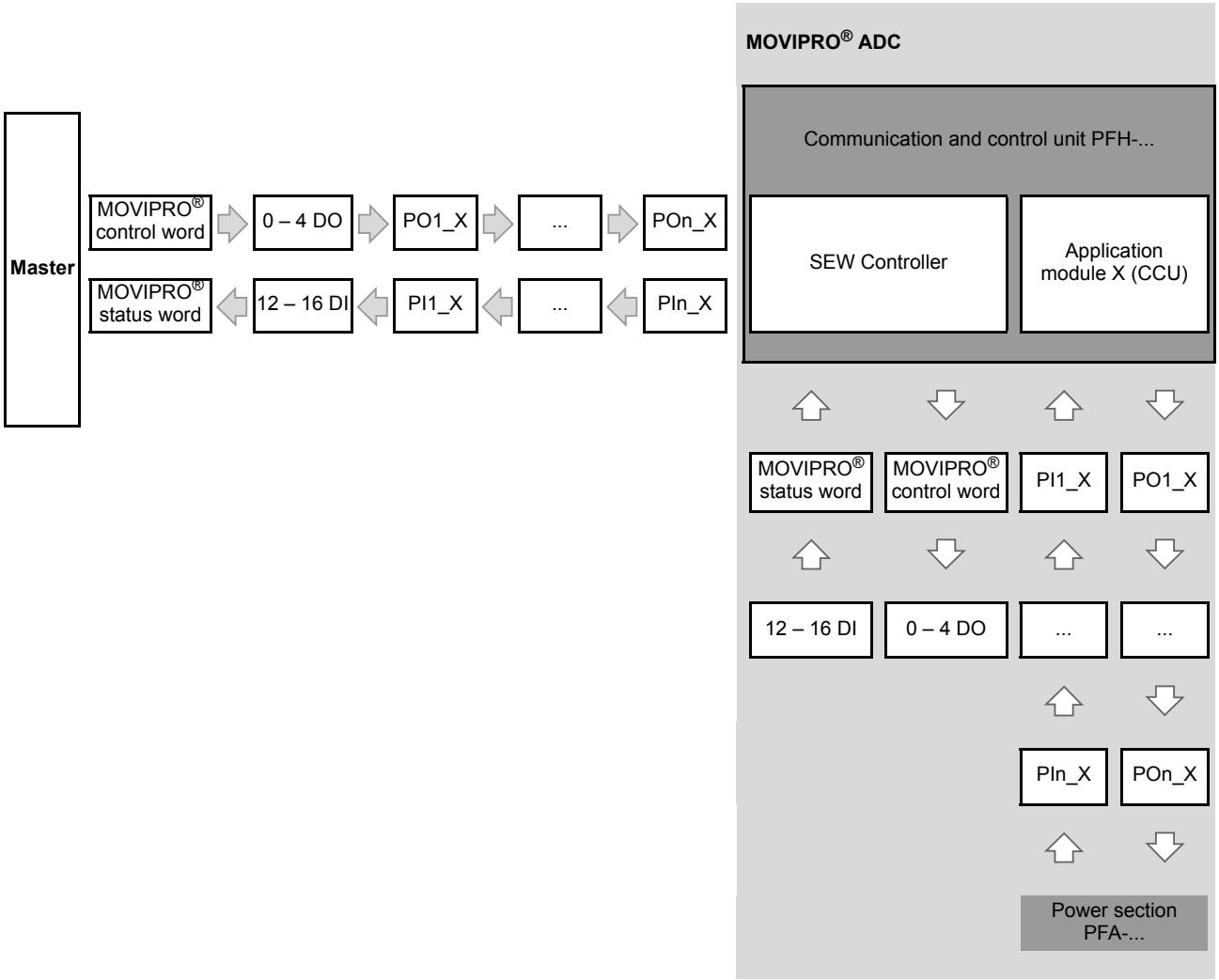
8 Process Data Description

8.1 Process data assignment – overview

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



The following figure shows the data process exchange between master and MOVIPRO®:



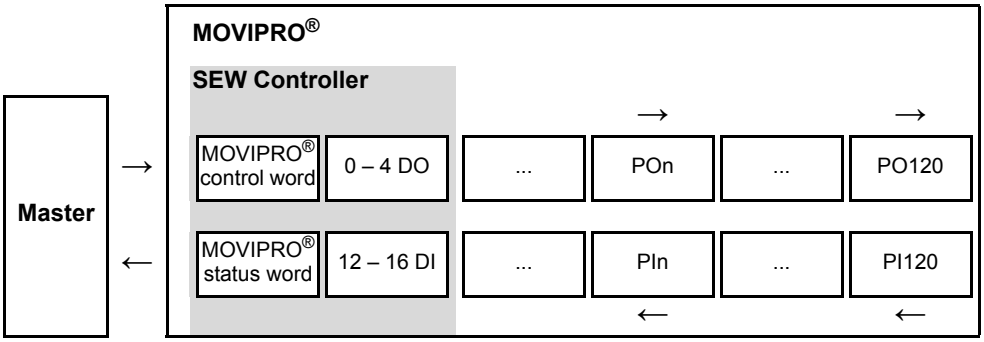
8.2 Process data in conjunction with the Application Configurator

The application modules of the Application Configurator described in the following sections are examples. For detailed information, refer to the "Configuration Software – Application Configurator for CCU" manual.

8.2.1 "SEW Controller" module

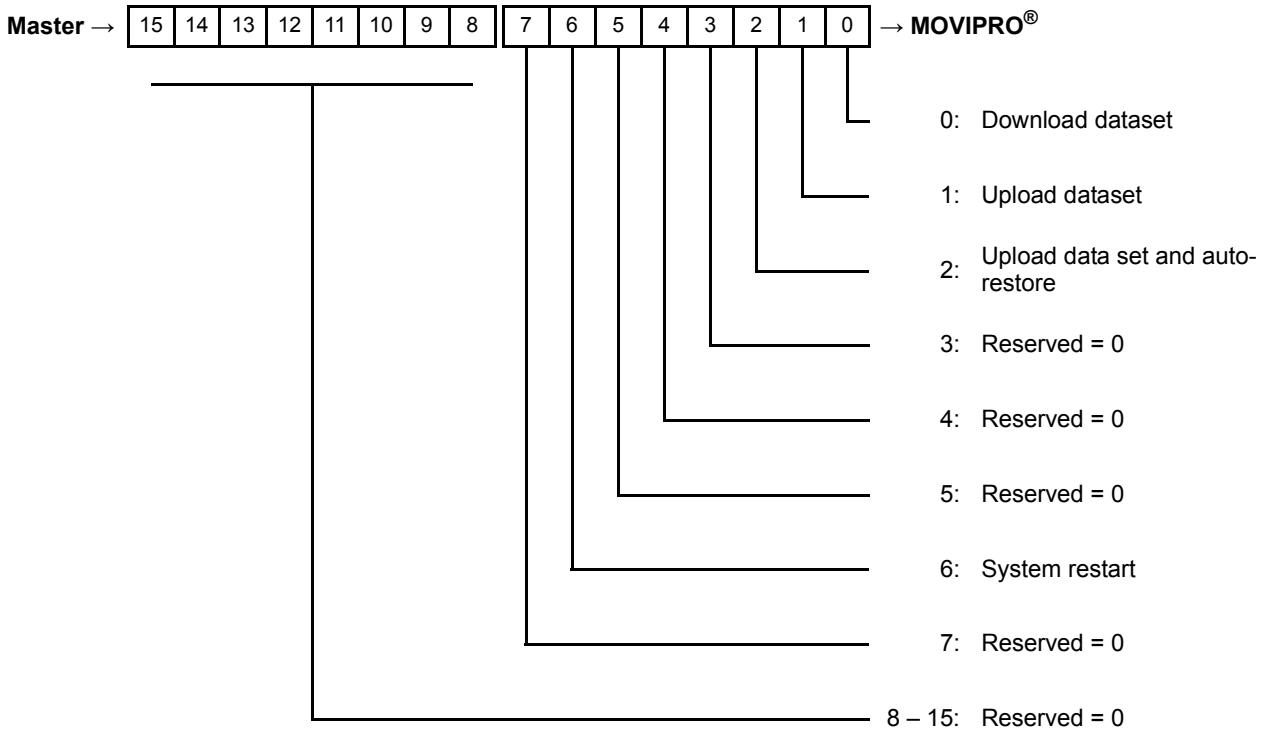
The "SEW Controller" module is always available with MOVIPRO® ADC and cannot be deleted. The module occupies two process data words and provides general device information.

The following figure gives an overview of process ouptut and input data:



MOVIPRO® control word

The following figure shows the assignment of the MOVIPRO® control word:

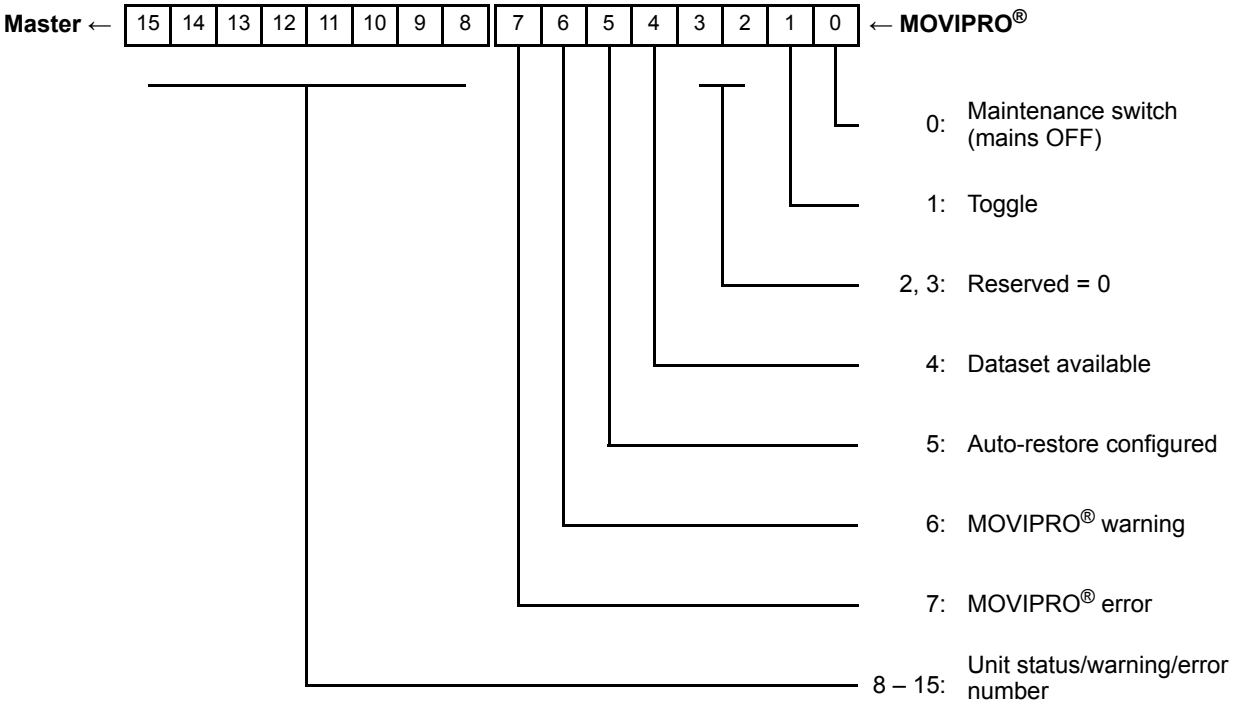


The following table shows the functions of the MOVIPRO® control word:

Bit	Meaning	Explanation
0	Download data set	The data on the SD memory card is downloaded to MOVIPRO®. **Important:** Data can only be downloaded when the power section is inhibited. (Controller inhibit or safe stop)
1	Upload data set	The data is uploaded from MOVIPRO® to the SD memory card and is saved.
2	Upload data set and auto-restore	• The data is uploaded from MOVIPRO® to the SD memory card and is saved. • In the event of a unit replacement, the saved data is automatically loaded from the SD memory card to the new MOVIPRO® unit.
3 – 5	Reserved	0 = Reserved
6	System restart	If there is an error in the "PFH.." communication and control unit, an error reset is requested by changing this bit from 0 to 1 to 0.
7 – 15	Reserved	0 = Reserved

MOVIPRO® status word

The following figure shows the assignment of the MOVIPRO® status word:



Bits 8 – 15 are assigned depending on the value of bits 6 and 7 according to the following table:

Bit 6	Bit 7	Assignment of bits 8 – 15
0	0	MOVIPRO® unit status
1	0	MOVIPRO® warning
0	1	MOVIPRO® error

The following table shows the diagnostic information of MOVIPRO® that is set up for evaluation in the higher-level PLC application. The signals are transferred to the controller via parameters and, if necessary, via the process data channel.

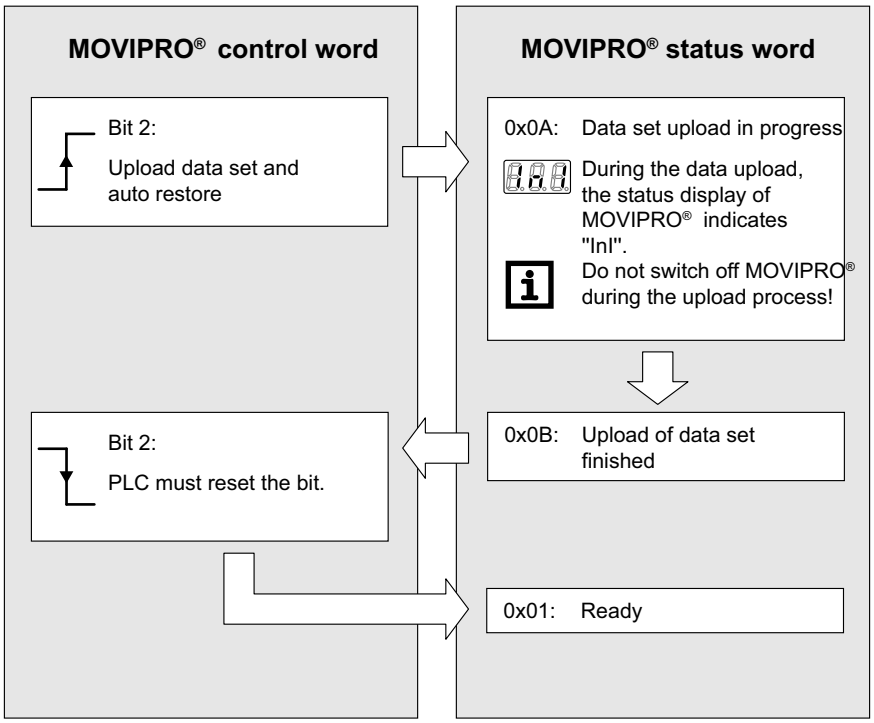
The logical communication status "0" signals the status "OK" for each signal to ensure that no asynchronous startup sequences from the bus master and the PLC can cause incorrect diagnostic messages when the systems are started up (bus startup with user data = 0).

Bit	Diagnostic name via bus	Function and coding
0	Maintenance switch (mains OFF)	Maintenance switch (mains OFF) 1 = Maintenance switch activated (mains off) 0 = OK (not activated)
1	Toggle	The toggle bit changes between "0" and "1". The default is 100 ms.
2 – 3	Reserved	0 = Reserved
4	Dataset available	Data are present on the SD memory card and they are identical with those of MOVIPRO®.
5	Auto-restore configured	Automatic unit replacement is configured. In the event of a unit replacement, the saved data is automatically downloaded from the SD memory card to the new MOVIPRO® unit. For more information, refer to chapter "Service" > "Unit replacement".
6	MOVIPRO® warning	MOVIPRO® warning 1 = MOVIPRO® warning present 0 = OK
7	MOVIPRO® error	MOVIPRO® error 1 = MOVIPRO® error present 0 = OK

Bit	Diagnostic name via bus	Function and coding
8 – 15	Unit status/ warning/error number/	Unit status (bit 6 = 0, bit 7 = 0):
		0: System startup
		1: Ready
		10: Data backup: Dataset is uploaded from the MOVIPRO® unit to the SD memory card
		11: Data backup: Dataset successfully uploaded from MOVIPRO® to SD memory card
		12: Data backup: Dataset is downloaded from the SD memory card to MOVIPRO®
		13: Data backup: Dataset successfully downloaded from SD memory card to MOVIPRO®
		Warning (bit 6 = 1, bit 7 = 0)
		Error number (bit 6 = 0, bit 7 = 1) 1: Configuration → No connection to internal power section 2: External IO error 3: Configuration → No IPOS present 4: Process data stopped to lower-level devices (GATEWAY) 10: Configuration → No configuration available 11: Configuration → Connection to configured units could not be established 20: Data backup → Upload failed 21: Data backup → Upload failed: SD memory card is write protected 22: Data backup → Download failed 23: Data backup → Safe stop necessary 99: Internal system error 110: Overload actuator voltage DO00 120: Overload sensor voltage group 1 121: Overload sensor voltage group 2

Data backup via PLC process data specification

The following figure shows data backup via PLC process data specification:



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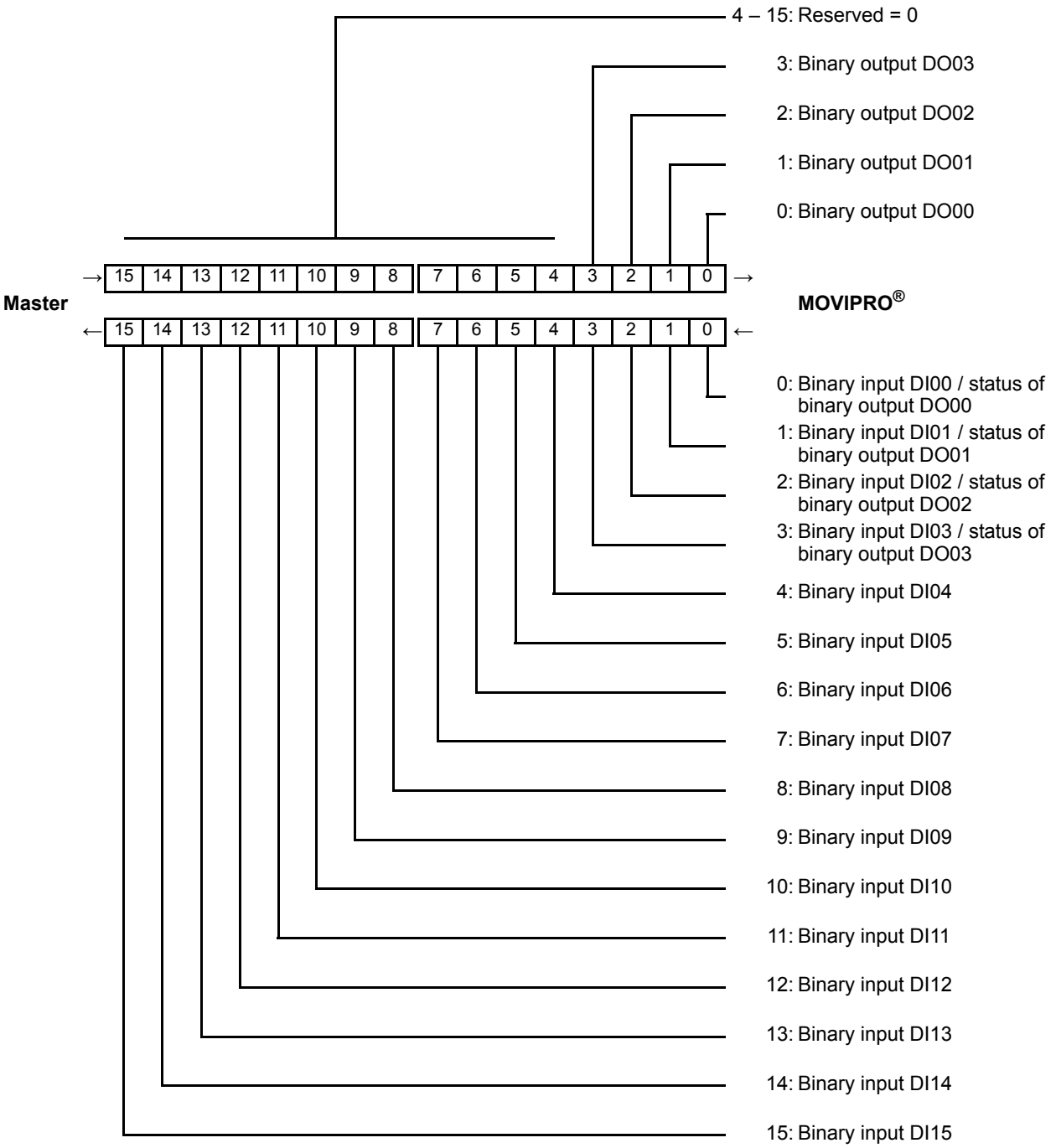
Digital inputs and outputs

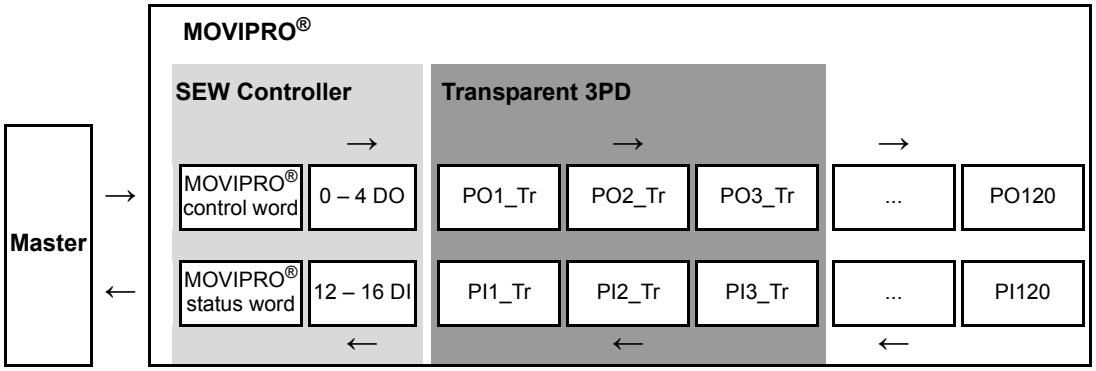
The following figure shows the assignment of the output and input data for the digital inputs/outputs (12 DI/4 DIO):



8.2.2 "Transparent 3PD" application module (CCU)

The "Transparent 3PD" application module is available with three process data words.

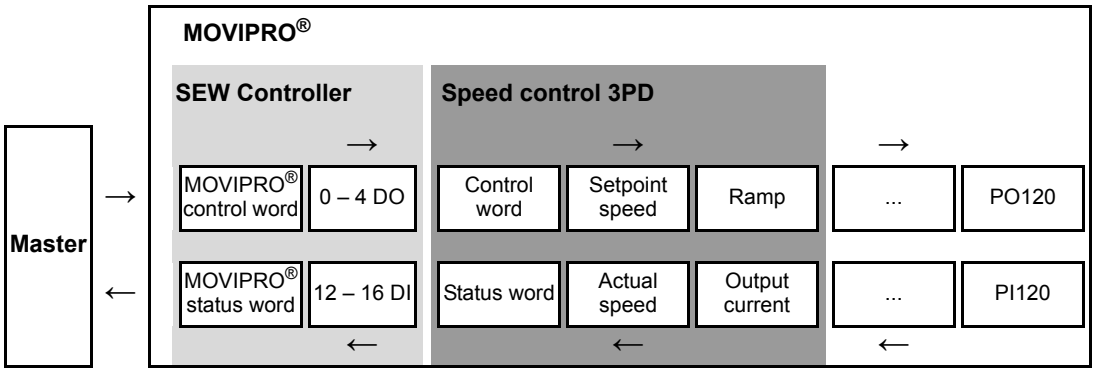
The following figure gives an overview of process output and input data:



8.2.3 "Speed control" application module (CCU)

The "Speed control" application module is available with 1 and 3 process data words.

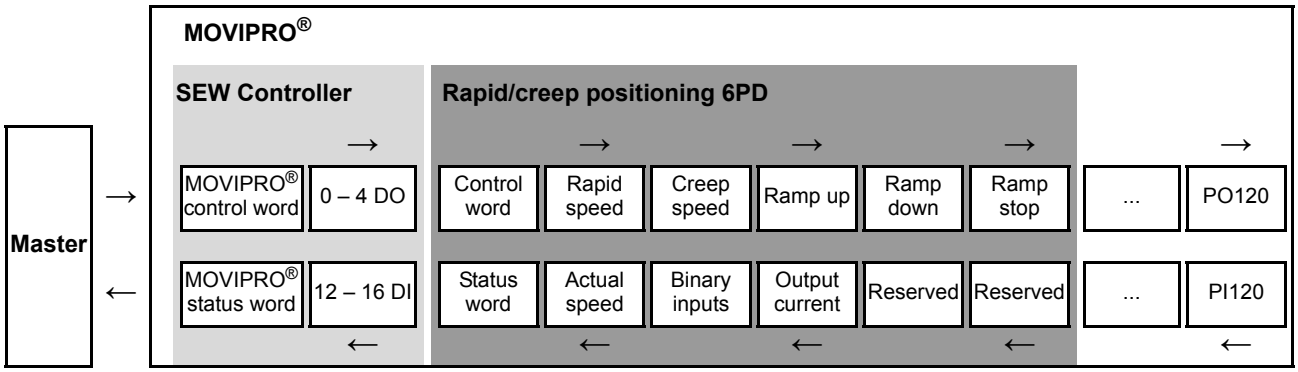
The following figure gives an overview of process output and input data (example 3 PD):



8.2.4 "Rapid/creep positioning" application module (CCU)

The "Rapid/creep positioning" application module is available with 1, 3, and 6 process data words.

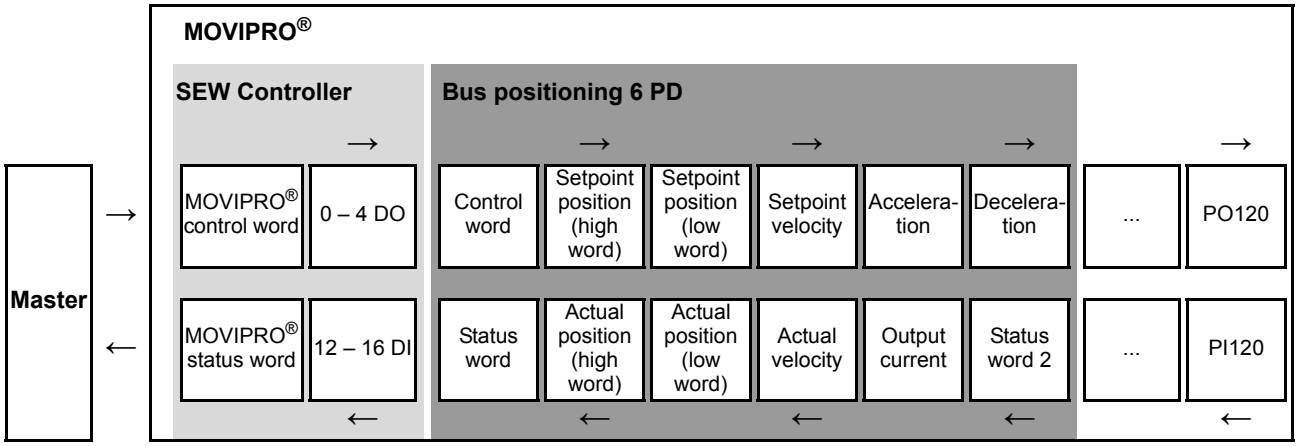
The following figure gives an overview of process output and input data (example 6 PD):



8.2.5 "6PD bus positioning" application module (CCU)

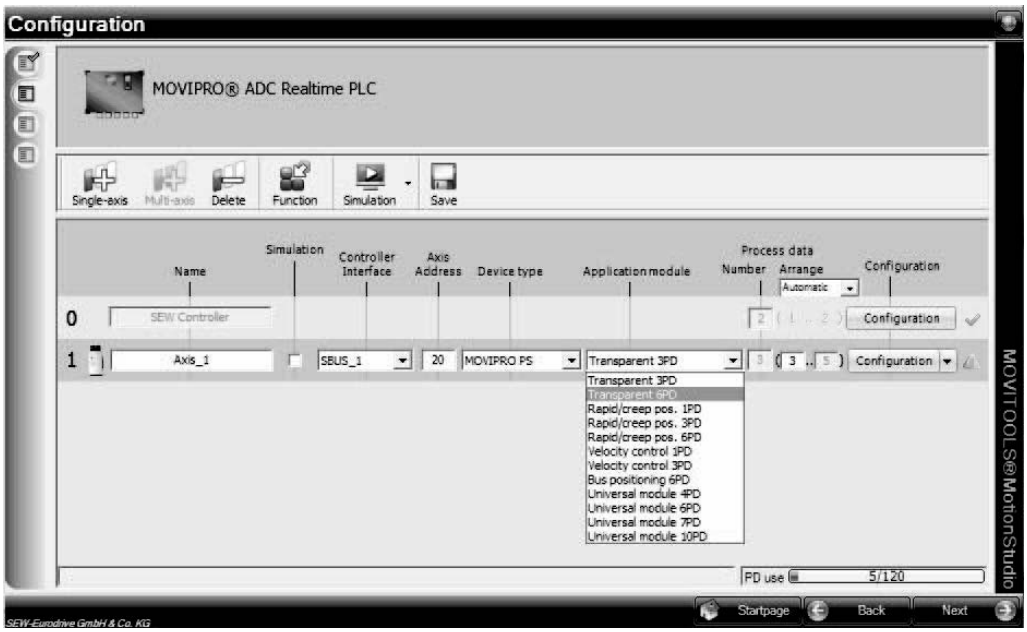
The "6PD bus positioning" application module is available with 6 process data words.

The following figure gives an overview of process output and input data:



8.3 Process data of power section "PFA-..."

To have the IPOS application modules supported that are running directly on the "PFA-..." power section, you have to load the "Transparent 6PD" (CCU) application module via the Application Configurator.



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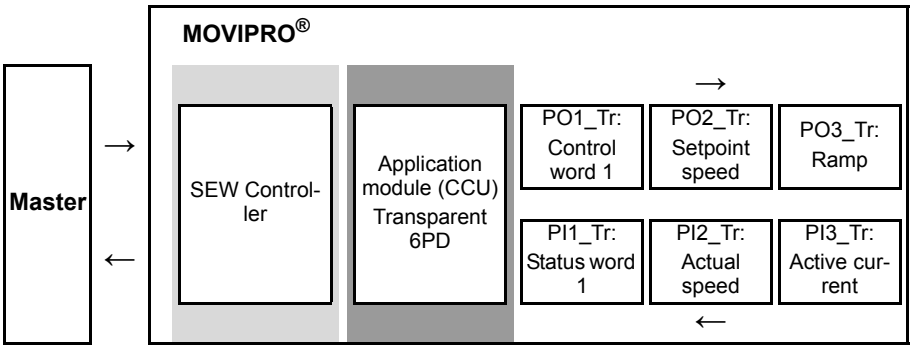
8.3.1 Delivery status / no IPOS application module loaded

In delivery condition or when no IPOS application module is loaded, MOVIPRO® contains the process output and process input data of the speed-controlled drive.

Speed-controlled drive

The process output/input data words of a speed-controlled drive (no IPOS application module loaded) are assigned as follows:

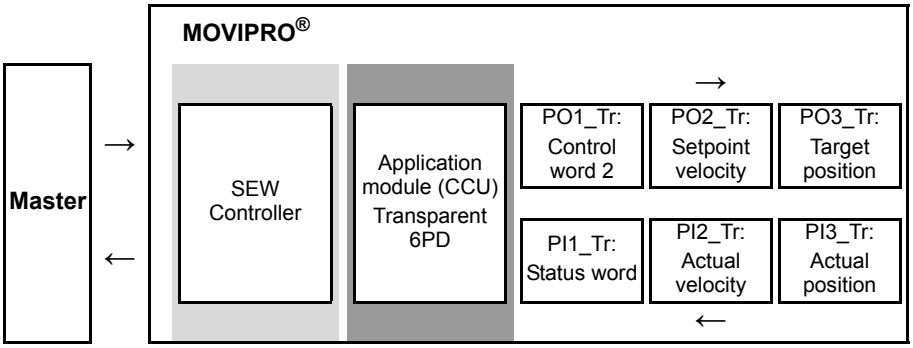


8.3.2 "Bus positioning" IPOS application module

INFORMATION

If you want to use the IPOS application module of the power section, you first have to load the "Transparent 6PD" (CCU) application module into the communication and control unit.

The process output and input data words of the "Bus positioning" IPOS application module are assigned as follows:



For further information, refer to the following documentation:

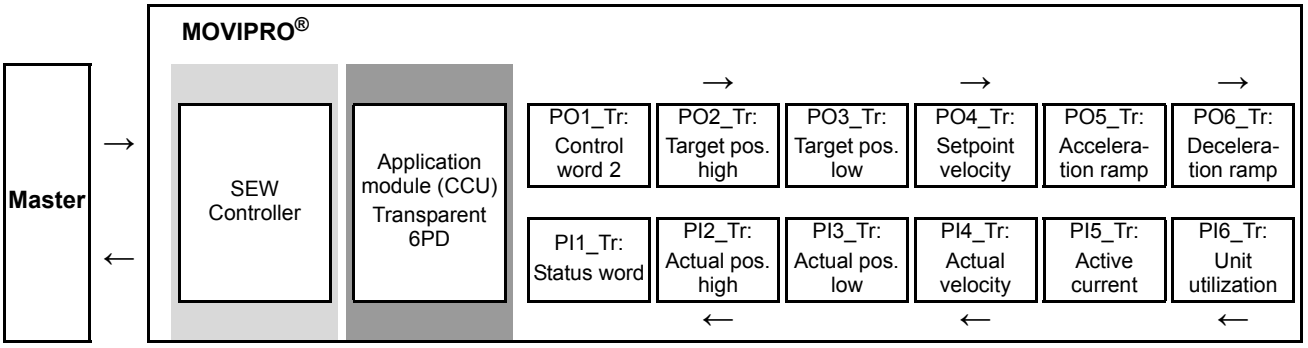
Documentation
"MOVIDRIVE® Inverter Bus Positioning" manual

8.3.3 "Extended positioning via bus" IPOS application module

INFORMATION

If you want to use the IPOS application module of the power section, you first have to load the "Transparent 6PD" (CCU) application module into the communication and control unit.

The process output and input data words of the "Extemded bus positioning" IPOS application module are assigned as follows:



For further information, refer to the following documentation:

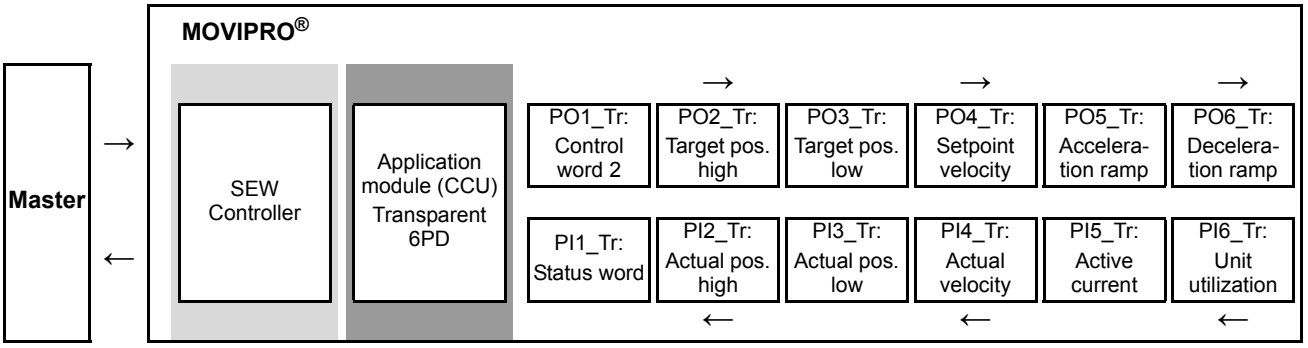
Documentation
"MOVIDRIVE® MDX61B Extended Bus Positioning Application Module" manual

8.3.4 "Modulo positioning" IPOS application module

INFORMATION

If you want to use the IPOS application module of the power section, you first have to load the "Transparent 6PD" (CCU) application module into the communication and control unit.

The process output and input data words of the "Modulo positioning" IPOS application module are assigned as follows:



For further information, refer to the following documentation:

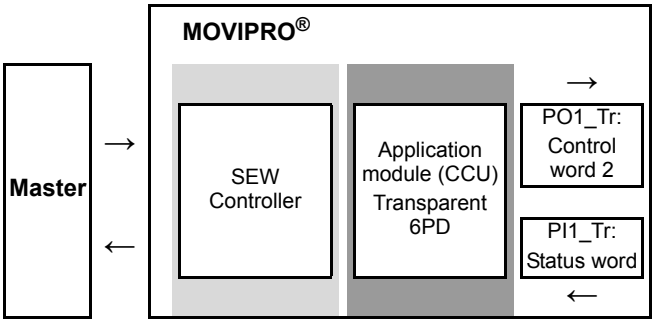
Documentation
"MOVIDRIVE® Modulo Positioning" manual

8.3.5 "Table positioning" IPOS application module

INFORMATION

If you want to use the IPOS application module of the power section, you first have to load the "Transparent 6PD" (CCU) application module into the communication and control unit.

The process output and input data words of the "Table positioning" IPOS application module are assigned as follows:



For further information, refer to the following documentation:

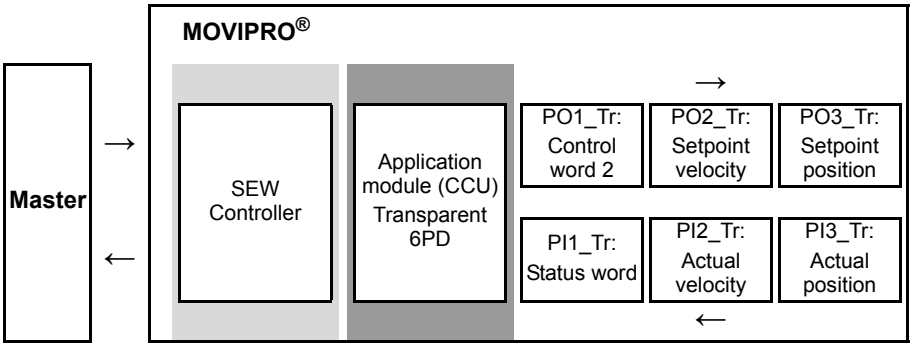
Documentation
"MOVIDRIVE® MDX61B Table Positioning Application" manual

8.3.6 "Sensor-based positioning via bus" IPOS application module

INFORMATION

If you want to use the IPOS application module of the power section, you first have to load the "Transparent 6PD" (CCU) application module into the communication and control unit.

The process output and input data words of the "Sensor-based positioning" IPOS application module are assigned as follows:



For further information, refer to the following documentation:

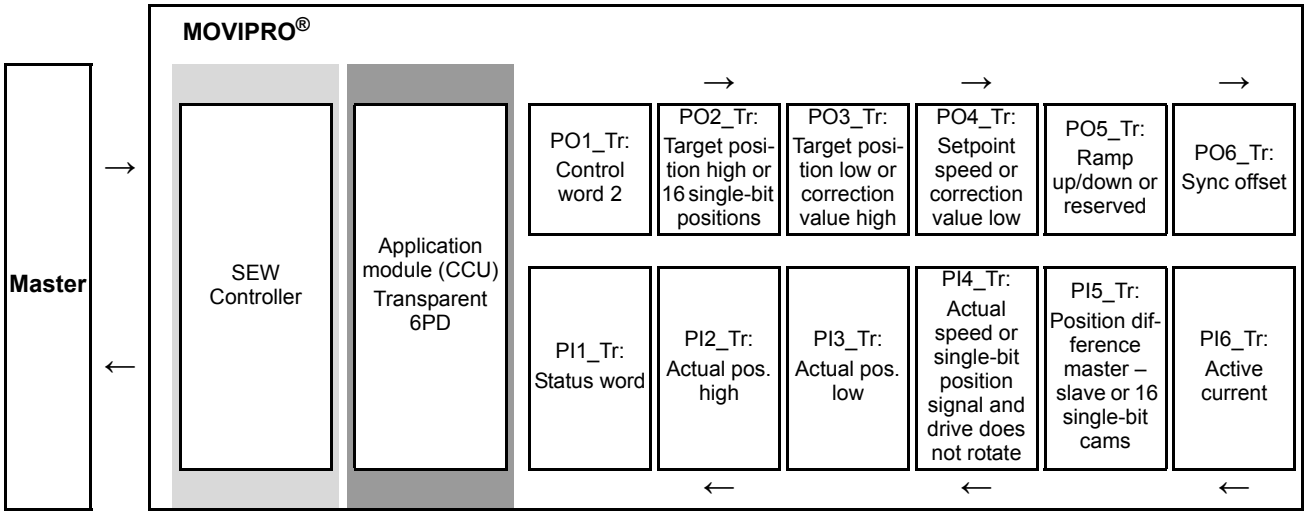
Documentation
"MOVIDRIVE MDX61B Sensor-Based Positioning Via Bus Application" manual

8.3.7 "Automotive AMA0801" IPOS application module

INFORMATION

If you want to use the IPOS application module of the power section, you first have to load the "Transparent 6PD" (CCU) application module into the communication and control unit.

Depending on the operating mode, the process output and input data words of the "Automotive AMA0801" IPOS application module are assigned as follows:

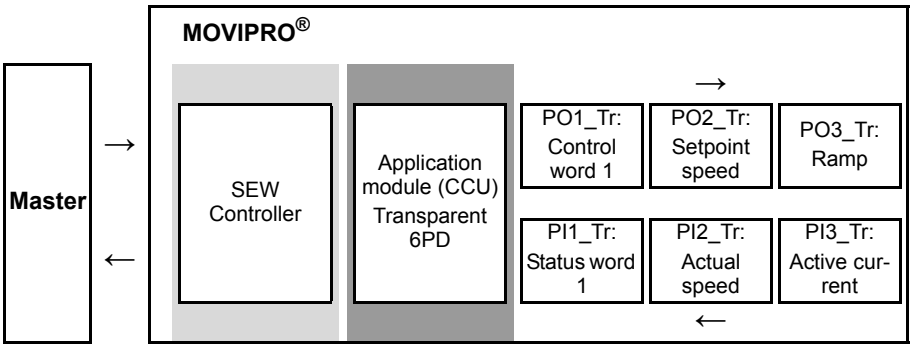


For further information, refer to the following documentation:

Documentation
"MOVIDRIVE® MDX61B AMA0801 Automotive Application Module" manual

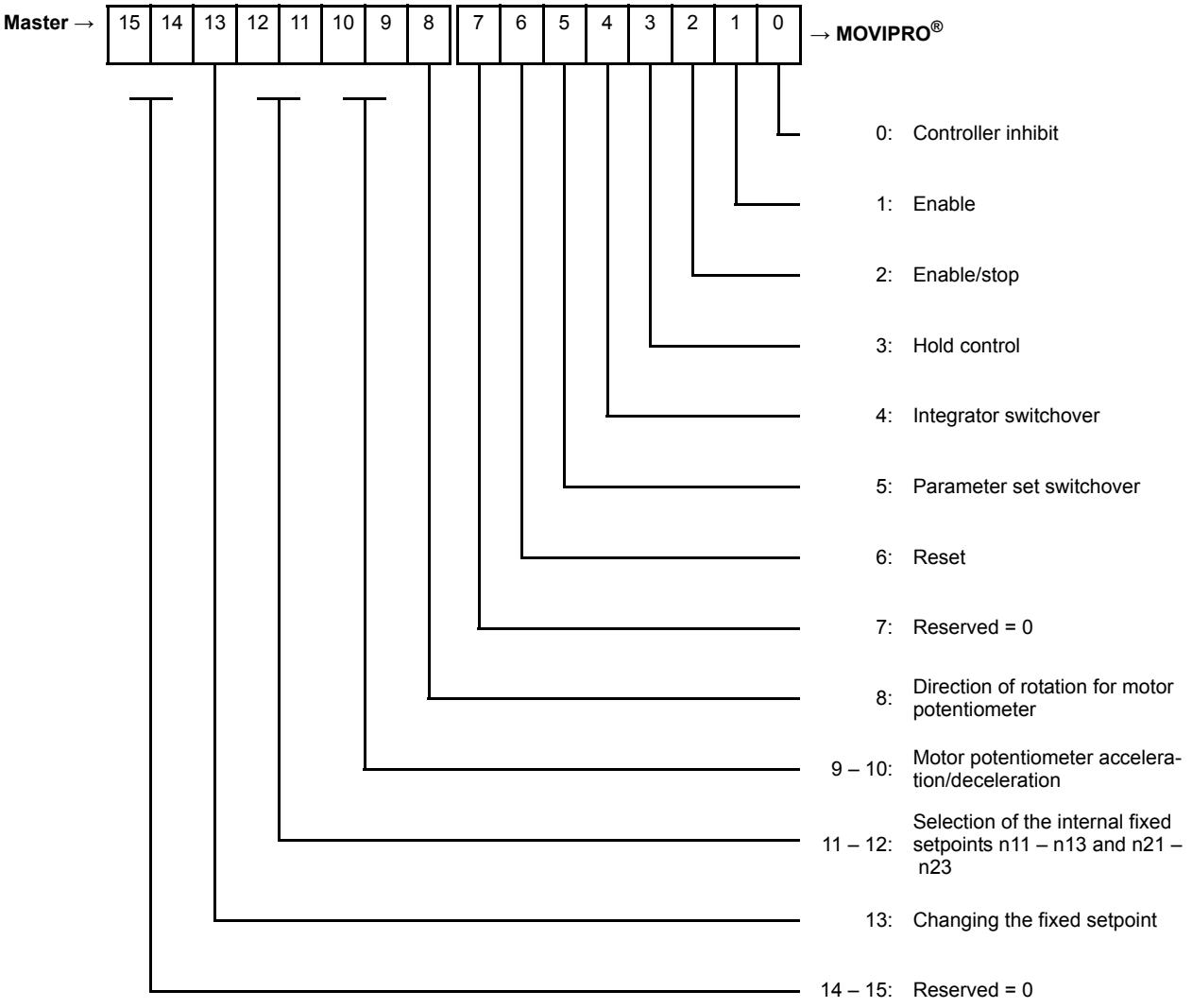
8.3.8 Speed-controlled drive

The process output/input data words of a speed-controlled drive (no IPOS application module loaded) are assigned as follows:



Control word 1

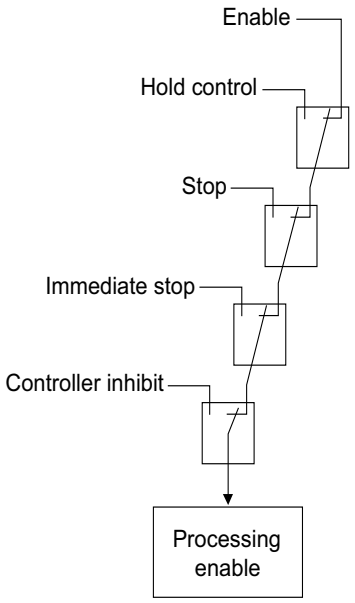
The integrated power section is controlled via control word 1. The following illustration shows the assignment of control word 1:



The following table shows the assignment of control word 1:

Bit	Meaning	Explanation
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 = Hold control not activated 1 = Hold control activated
4	**Integrator switchover**	0 = Integrator 1 1 = Integrator 2
5	**Parameter set switchover**	0 = Parameter set 1 1 = Parameter set 2
6	**Reset**	If there is an error in the inverter power section, an error reset is requested by changing this bit from 0 to 1 to 1.
7	**Reserved**	For reserved bits, the value 0 must be transferred for later use
8	**Direction of rotation for motor potentiometer**	0 = CW direction of rotation 1 = CCW direction of rotation
9 – 10	**Motor potentiometer acceleration/deceleration**	10 9 0 0 = No change 1 0 = Down 0 1 = Up 1 1 = No change
11 – 12	**Selection of the internal fixed setpoints n11 – n13 and n21 – n23**	12 11 0 0 = Speed setpoint via PO2 0 1 = Internal setpoint n11 (n21) 1 0 = Internal setpoint n12 (n22) 1 1 = 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**	For reserved bits, the value 0 must be transferred for later use

The following figure shows the prioritization for the evaluation of bits relevant for enable in control word 1:



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Setpoint speed

Set to SPEED, the power section considers the setpoint value transferred via this process data word to be the speed setpoint if the selected operating mode (*P700/P701 operating mode 1/2*) allows a speed setpoint. If there is no speed setpoint programmed although a communication interface (FIELDBUS) has been set as setpoint source, the power section will use speed setpoint = 0.

Coding: 1 digit = 0.2 rpm

Example: 1000 rpm, direction of rotation CCW

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

Ramp

Set to RAMP, the power section considers the transmitted setpoint value to be an acceleration or deceleration ramp. The determined value corresponds to a time in ms and refers to a speed change of 3000 rpm. 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

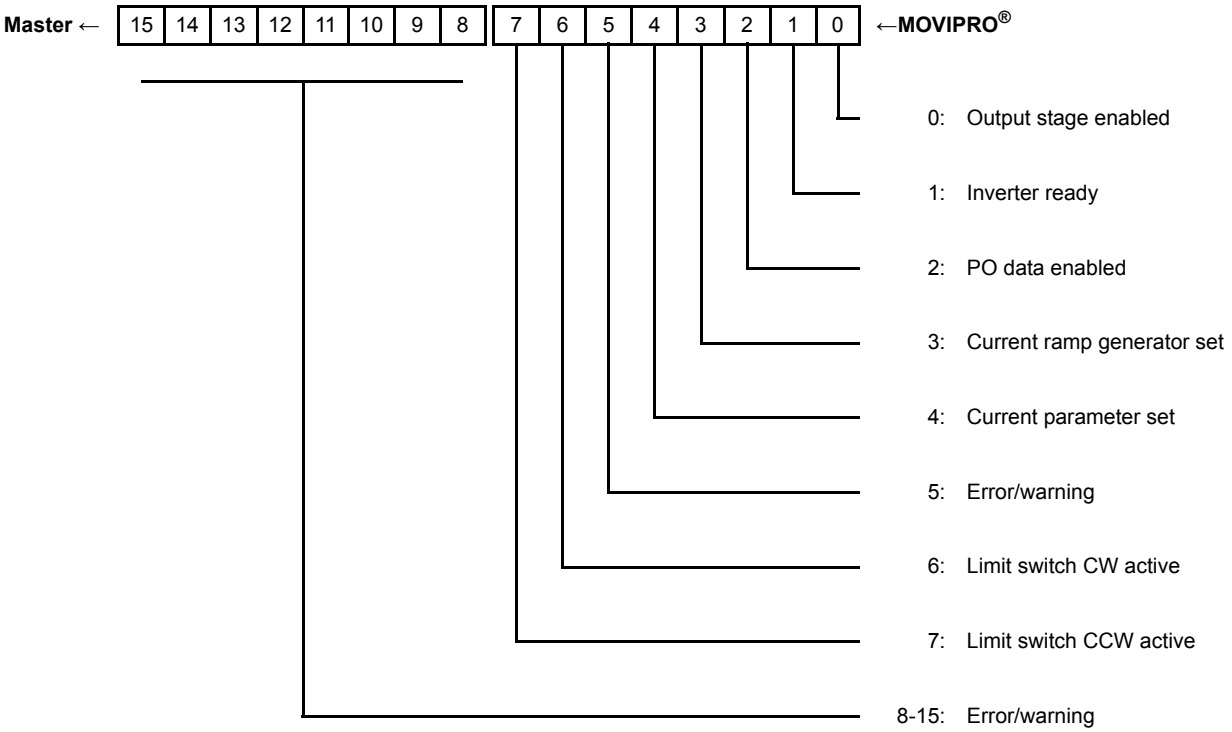
Range: 100 ms - 65 s

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

Status word 1

In addition to the most important status information in the basic status block, status word 1 alternately contains information on the "unit status" or the "error number" in the higher-level status byte. Depending on the error bit, the unit status is displayed for error bit = 0, and the error number for error bit = 1 (error). The error bit is reset by resetting the error, and the current unit status is displayed.

For the meaning of error numbers, refer to section "Error list of MOVIPRO® SDC" (page 182).



Bits 8 – 15 are assigned depending on the value of bit 5 according to the following table:

Bit 5		Assignment of bits 8 – 15	
0	No error/warning	MOVIPRO® unit status	Unit status: • 00: 24 V operation • 02: No enable
1	Error/warning present	MOVIPRO® error	Error number: • 01: Overcurrent • 02: …

Actual speed

Set to SPEED, the power section returns the current actual speed in "rpm" to the higher-level automation system. 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 solely depends on the accuracy of the slip compensation set by the user.

Coding: 1 digit = 0.2 rpm

Active current

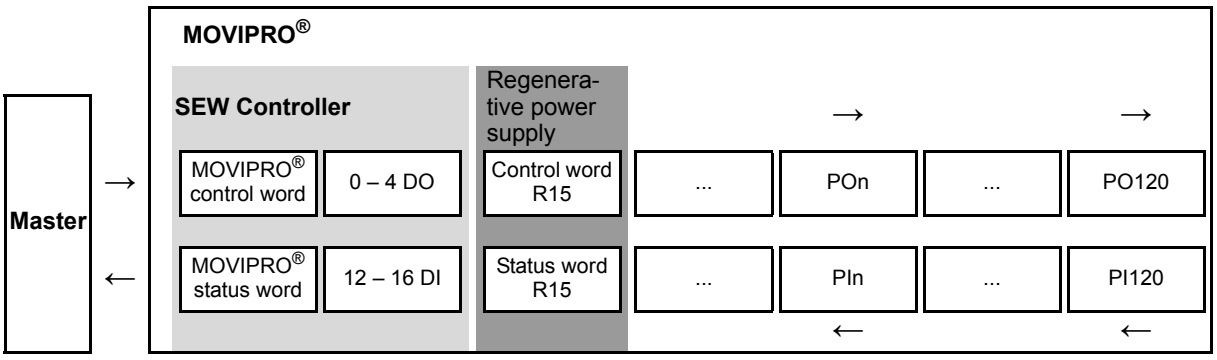
By assigning a process input word ACTIVE CURRENT, the power section provides the actual active current value in "% I_N" to the higher-level automation system.

Coding: 1 digit = 0.1 % I_N

8.4 Units with R15 regenerative power supply

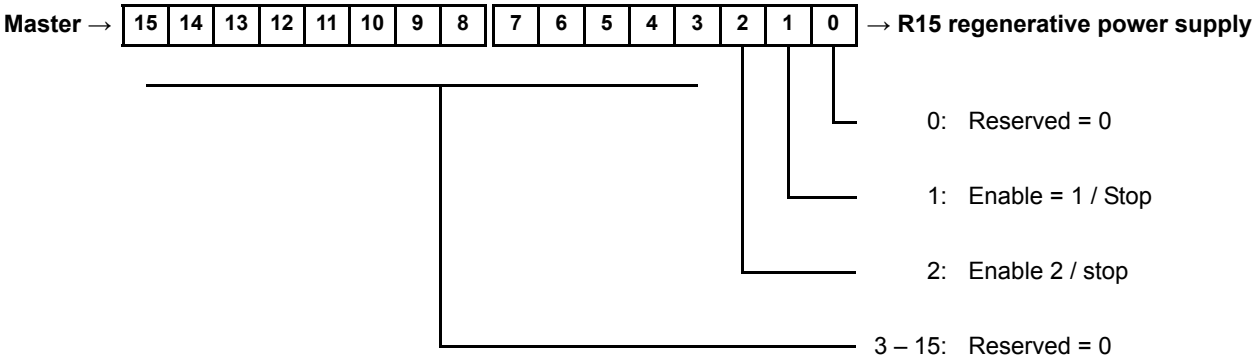
8.4.1 Sample assignment of process data

The following figure provides an overview of the assignment of the process output/input data (PO/PI) of MOVIPRO® with R15 regenerative power supply:



8.4.2 Control word of R15 regenerative power supply

The following illustration shows the assignment of the control word of the R15 regenerative power supply:



The following table shows the functions of the control word of the R15 regenerative power supply:

Bit	Meaning	Explanation
0	Reserved	0 = Reserved
1	Enable 1 / stop	0 = Stop 1 = Enable
2	Enable 2 / stop	0 = Stop 1 = Enable
3 – 15	Reserved	0 = Reserved

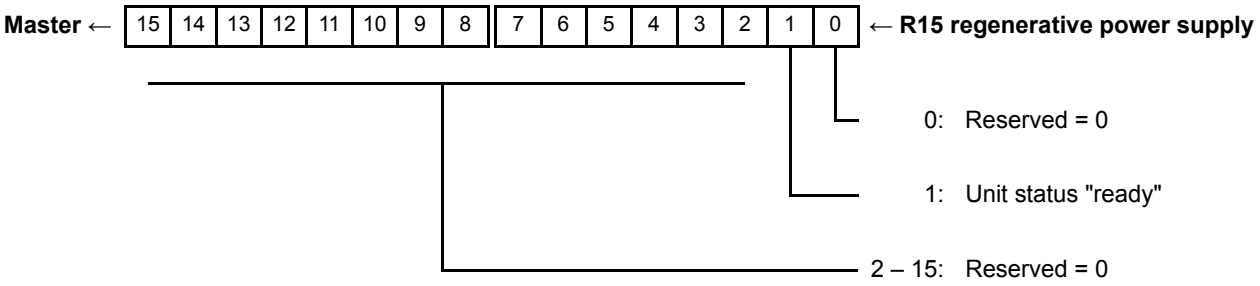
INFORMATION

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

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

8.4.3 Status word of R15 regenerative power supply

The following illustration shows the assignment of the status word of the R15 regenerative power supply:



The following table shows the functions of the control word of the R15 regenerative power supply:

Bit	Meaning	Explanation
0	Reserved	0 = Reserved
1	Unit status "ready"	As long as the regenerative power supply electronics does not signal an error and power supply is available, regenerative power supply signals unit status "Ready". **Note:** The R15 regenerative power supply signals the unit status "ready" irrespective of "enabled" or "inhibited".
2 – 15	Reserved	0 = Reserved

9 Operation

9.1 Status and error messages

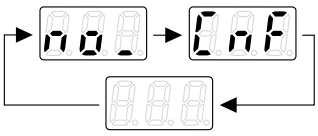
The 7-segment display informs about the status of the MOVIPRO® unit. In case of repeated malfunctions, contact SEW Service.

The display of the three-digit 7-segment display shows the current status of the unit. If several states or errors are active at the same time, the error with the highest priority is displayed.

9.1.1 Parameterizable unit (CCU)

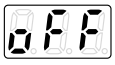
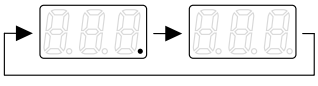
Initial startup

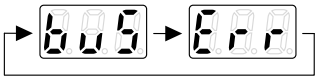
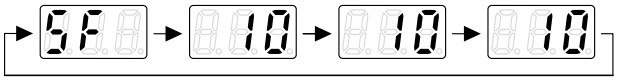
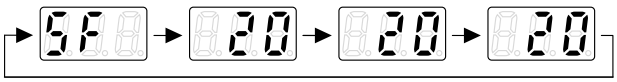
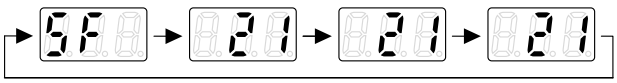
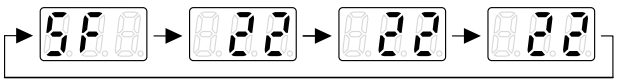
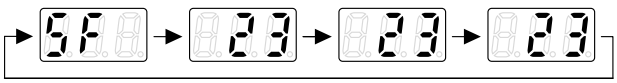
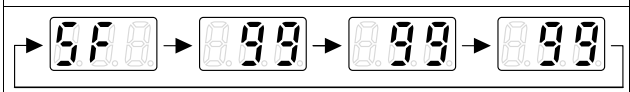
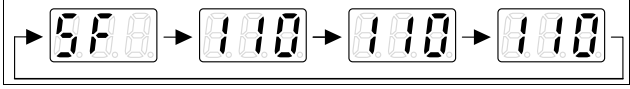
When you switch on the parameterizable MOVIPRO® ADC unit for the first time, it displays the following:

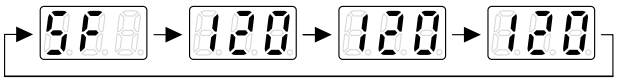
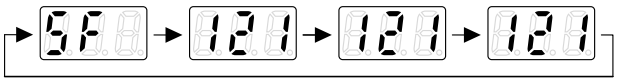
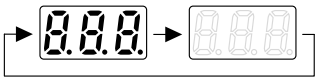
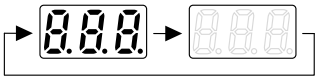
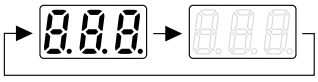
Display	Description	Remedy
 **In combination with:** **S2:** Flashing green **S3:** Lit green	No configuration has been loaded yet with the Application Configurator.	Create a configuration with the Application Configurator and load it into MOVIPRO®.

Unit status

The following unit states are possible after successful initial configuration:

Display	Description	Remedy
	Maintenance switch is turned off.	Turn on the maintenance switch. **Units without power interface:** Check the DC 24 V cabling and the cabling of switch feedback.
	Initialization: A connection is established with all internal components. This can take several minutes after a unit replacement.	–
	The connection has been established successfully. The states of the components or the application are displayed after 3 s.	–
	Blinking dot: Application module of the "PFA-..." power section is running.	–

Display	Description	Remedy
	Fieldbus error	• Check the fieldbus cabling to the higher-level controller. • Check the fieldbus parameterization of MOVIPRO® and the higher-level controller.
	Communication error with the power section	1. Disconnect MOVIPRO® for at least 30 s from the AC 400 V and DC 24 V supply voltage. 2. Restart MOVIPRO®.
	Error in external periphery	Check the cabling of the digital inputs and outputs as well as the connections of the communication package.
	Non-enabled application module loaded.	1. Set Parameter P802 "Factory setting" of the "PFA-..." power section to "Delivery status". 2. Load an enable application module to the "PFA-..." power section.
	Configuration with Application Configurator not completed.	Complete the configuration with the Application Configurator and load it into MOVIPRO®.
	Data backup on SD memory card failed, upload aborted.	Start data backup again.
	Data backup on SD memory card failed, SD memory card is write-protected.	Remove write protection from SD memory card.
	Data recovery to MOVIPRO® failed, download aborted.	Start data recovery again.
	Data recovery to MOVIPRO® failed, controller not inhibited.	Bring MOVIPRO® into one of the following conditions: • Controller inhibit (A1.1) • Safe stop (A1.u)
	Internal system error	1. Disconnect MOVIPRO® for at least 30 s from the AC 400 V and DC 24 V supply voltage. 2. Restart MOVIPRO®.
	Actuator voltage overload	Check the cabling of the digital inputs and outputs.

Display	Description	Remedy
	Overload sensor voltage group 1	Check the cabling of the digital inputs and outputs.
	Overload sensor voltage group 2	Check the cabling of the digital inputs and outputs.
	Internal communication error	**During data backup or data backup recovery:** Wait a few minutes until the display changes. **In normal operation:** 1. Disconnect MOVIPRO® for at least 30 s from the AC 400 V and DC 24 V supply voltage. 2. Restart MOVIPRO®.
 **In combination with:** **S2:** Flashing orange **S3:** Flashing green	Unit waiting for boot loader update.	Contact SEW Service.
 **In combination with:** **S2:** Flashing red **S3:** Off	Controller does not start: 1. Wrong or no SD memory card inserted 2. Defective hardware 3. Internal communication error	1. Check whether the correct SD memory card has been inserted. 2. Make sure the hardware is not defective. 3. Contact SEW Service.
 **In combination with:** **S2:** Flashing green **S3:** Off	Application module not running / not loaded	Create a configuration with the Application Configurator and load it into MOVIPRO®.

9.1.2 Programmable unit (MOVI-PLC®)

The programmable MOVIPRO® ADC unit allows for user-defined control of the 7-segment display. Use the libraries available for MOVIPRO® for this purpose:

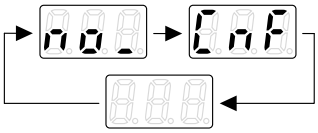
- PFH_P1D1_1_A (PROFIBUS, DeviceNet)
- PFH_E2E3_1_A (PROFINET, EtherNet/IP, Modbus/TCP)

INFORMATION

You find the latest versions of the libraries at the SEW-EURODRIVE website at **http://www.sew-eurodrive.com** in the "Software" section.

Initial startup

When you switch on the programmable MOVIPRO® ADC unit for the first time, it displays the following:

Display	Description	Remedy
 **In combination with:** **S2:** Flashing green **S3:** Lit green	No IEC program loaded.	Load your user program into the unit.

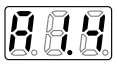
9.1.3 Inverter status

The inverter status is indicated by displaying the address/number of the axis and the corresponding status code in the form of A1.y.

INFORMATION

The unit status display takes priority over the inverter status display. If the maintenance switch is switched off of a fieldbus error occurs, no inverter status is displayed.

The following figure shows the display for the "Enable" status of axis 1:



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The following table shows the various status codes:

7-segment display	Unit status (high byte in status word 1)	Meaning
0	0_{dec}	DC 24 V operation (inverter not ready)
1	1_{dec}	Controller inhibit active
2	2_{dec}	No enable
3	3_{dec}	Standstill current
4	4_{dec}	Enable
5	5_{dec}	n-control (speed control)
6	6_{dec}	M-control (torque control)
7	7_{dec}	Hold control
8	8_{dec}	Factory setting
9	9_{dec}	Limit switch contacted
A	10_{dec}	Technology option
c	12_{dec}	IPOS$^{plus®}$ reference travel
d	13_{dec}	Flying start
E	14_{dec}	Calibrate encoder
F	Error code (page 182)	Error indicator (flashing)
U	17_{dec}	"Safe Stop" active
• (blinking dot)	–	Application module running

⚠ WARNING

Incorrect interpretation of display **U = "Safe stop" active**.

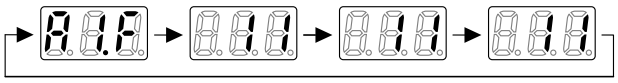
Severe or fatal injuries.

The display **U = "Safe stop" active** is not safety-related and must not be used as a safety function.

9.1.4 Inverter error

In case of an inverter error, the status display alternatively shows the address/number of the axis and 3 times the corresponding error code.

The following figure shows the display for an "Overtemperature" error of axis 1:



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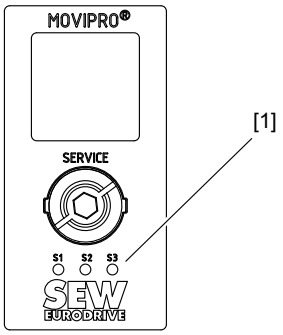
For a list of error codes, refer to section "Service" (page 182).

9.1.5 Status LED

The status LEDs are located on the service unit of MOVIPRO®. They show the fieldbus and unit status.



1954344587

[1] Status LEDs S1, S2, S3

Status LED S1
PROFINET IO

LED status	Status or cause of error	Remedy
Off	• PROFINET IO device is currently exchanging data with the PROFINET IO controller (Data Exchange).	–
Flashing green Flashing green/red	• The flashing function in the PROFINET IO controller configuration is activated to visually localize the stations.	–
Lights up red	• Connection to the PROFINET IO controller has failed. • PROFINET IO device does not detect a link. • Bus interruption • PROFINET IO controller is not in operation.	• Check the PROFINET connection of MOVIPRO®. • Check the PROFINET IO controller. • Check the cabling of your PROFINET network.
Flashing yellow Lights up yellow	• The STEP 7 hardware configuration contains a module that is not permitted.	• Switch the STEP 7 hardware configuration to ONLINE and analyze the component status of the slots in the PROFINET IO device.

Status LED S2
PLC status

LED status	Status or cause of error	Remedy
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 process is active.	–
Flashing orange	• Firmware is being updated or • Bootloader update required.	–
Flashing red	• No SD card plugged in. • File system of the SD card corrupt. • Boot process has failed.	• Switch the unit off and back on again. If the error occurs repeatedly, contact the SEW Service staff.

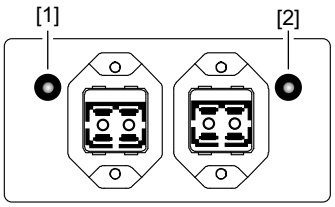
Status LED S3 IEC program status

LED status	Status or cause of error	Remedy
Lights up green	• IEC program is running.	–
Flashing green	• Program has stopped. • Bootloader update required.	• Start the IEC program.
Off	• No program is loaded.	• Load an IEC program into the communication and control unit.

Status LED FO1 and FO2 Ethernet connection push-pull SCRJ

The two LEDs "FO1" and "FO2" indicate the signal quality of the respective optical transmission line.

The following figure shows the positions of the two LEDs:



4083348491

[1] FO1
[2] FO2

LED status	Status or cause of error	Remedy
Off	The signal level is 2 dB or more. The signal quality is good.	–
Yellow light	The optical signal level has fallen below 2 dB. This can have the following reasons: • Aging effect of the polymer fiber • The plug connector is not properly connected. • The externally connected cable is faulty or damaged.	• Check whether the plug connector is properly connected. • Check the attenuation of the externally connected cable.

9.2 Units with R15 regenerative power supply

9.2.1 Notes on operation

Observe the following notes for the operation of MOVIPRO® with R15 regenerative power supply:

- To avoid reactive power in the supply system, enable the R15 regenerative power supply only when the drives connected to MOVIPRO® are active.
- While the R15 regenerative power supply is inhibited, MOVIPRO® must not be operated in regenerative mode; otherwise, error "U_Z overvoltage" is tripped.
- Wait until all drives connected to MOVIPRO® have come to a standstill before you inhibit the R15 regenerative power supply. Otherwise, the R15 regenerative power supply cannot feed back any regenerative energy to the supply system.

9.2.2 Ready signal

The ready signal is revoked when a thermal overload occurs in the R15 regenerative power supply or in case of power failure. To protect the R15 regenerative power supply from thermal overload, you must evaluate the ready signal (see chapter Evaluation of the ready signal (page 177)).

The R15 regenerative power supply detects power failures (one or more phases) within one supply system half-wave. If this is the case, the R15 regenerative power supply is inhibited automatically and the ready signal is canceled.

A restored supply system voltage is also detected within one supply system half-wave. The R15 regenerative power supply is enabled automatically after an activation delay of 200 ms, and the ready signal is set again. The supply system rectifier of the R15 regenerative power supply remains active during this time.

You must connect an additional braking resistor to MOVIPRO®, which allows for a controlled shutdown of the drives connected to MOVIPRO® in case of a power failure or power supply interruption. The braking resistor is only energized if the supply system is interrupted during regenerative operation.

The following table provides an overview:

Unit status / supply system status	Response	Ready signal
Power failure or unit malfunction → R15 not ready	• A power failure is detected within one supply system half-wave • R15 regenerative power supply inhibited • Supply system rectifier remains active	Not ready
Supply system power restored and no unit malfunction → R15 ready	• Restored power is detected within one supply system half-wave • R15 regenerative power supply is started after 200 ms	Ready after 200 ms

Evaluation of the ready signal

The ready signal of the R15 regenerative power supply of MOVIPRO® is canceled when a thermal overload occurs or in case of power failure. In this case, you must take one of the following measures **immediately**:

- Disconnect the unit from the supply system immediately.

INFORMATION

Use only line contactors in utilization category AC-3 (EN 60947-4-1).

- Switch off the inverters connected to the R15 regenerative power supply immediately in MOVIPRO®, using one of the following options, for example:
  - Cancel the enable signal
  - Set controller inhibit
  - Activate safe stop
- Stop the drives connected to MOVIPRO® in a controlled manner.

10 Service

10.1 Unit replacement

10.1.1 Notes on replacing units

The MOVIPRO® unit allows for a quick unit replacement. The MOVIPRO® unit is equipped with a replaceable memory card on which all unit data can be stored.

If a unit has to be replaced, the plant can be started up again quickly by simply re-plugging the memory card.

After the startup procedure, you have to download the unit data to the memory card.

INFORMATION

Important for programmable units (MOVI-PLC®):

- Unit replacement and consequently the 7-segment display depends on the programming.
  Requirement: The module for the data backup function (data management) must be integrated in the program.

Prerequisites for successful unit replacement

- The units that you want to swap must be identical. If the units have different configurations, a successful unit replacement cannot be guaranteed.
- You must save the data of the old unit on the SD memory card **before** you replace the unit. SEW-EURODRIVE recommends to always backup the data right after starting up a unit.

Observe the following notes when replacing a unit:

- Insert or remove the memory card only when the MOVIPRO® unit is switched off.
- After the replacement, the parameters last saved on the SD card are used.
- If an **absolute encoder** is used as motor encoder or distance encoder, you have to perform a reference travel during initial startup or after a unit or encoder replacement.
- If you are using an encoder with **HIPERFACE® interface**, a unit or encoder replacement is detected automatically and the "IPOS reference" is reset. Perform reference travel after having replaced the unit or encoder.
- If you are using an encoder with **SSI interface**, you have to adapt the encoder position to the mechanical plant conditions by carrying out another reference travel.

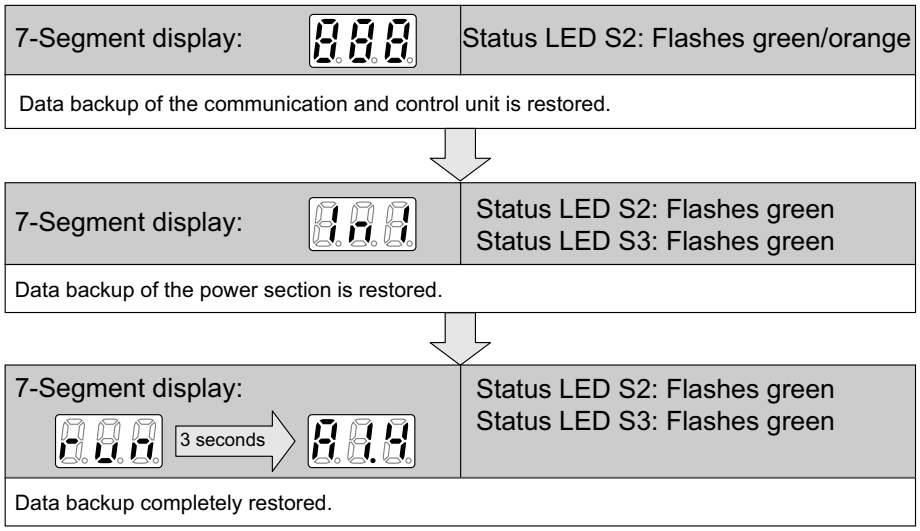
10.1.2 Performing unit replacement (CCU)

Proceed as follows to replace the parameterizable MOVIPRO® unit:

1. Perform a data backup now if you are not certain whether the current unit parameterization is stored on the SD card.
2. Disconnect the MOVIPRO® unit from the power supply and remove it from the system.
3. Remove the memory card of the unit via the service cover plate on the MOVIPRO® housing cover.
4. Insert the memory card into a new MOVIPRO® unit via the service cover plate.
5. Install the new MOVIPRO® unit in the system and connect it to the power supply.
6. Switch on the new MOVIPRO® unit.

INFORMATION

MOVIPRO® runs through several initialization steps. Do not switch off MOVIPRO® during this time!



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7. The parameters saved on the card are now available again. If you want the new MOVIPRO® unit to have a different parameter set, change the parameter set now, and save the changes on the memory card after startup.
8. For applications with motor encoder or distance encoder, you have to perform a reference travel.

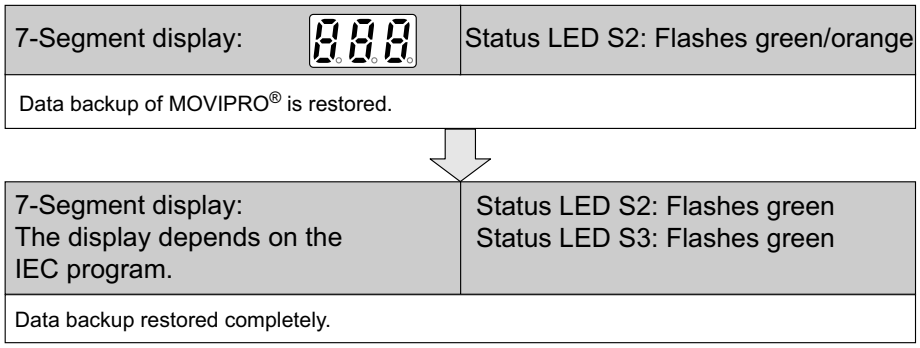
10.1.3 Performing unit replacement (MOVI-PLC®)

Proceed as follows to replace the programmable MOVIPRO® unit:

1. Perform a data backup now if you are not certain whether the current unit parameterization is stored on the SD card.
2. Disconnect the MOVIPRO® unit from the power supply and remove it from the system.
3. Remove the memory card of the unit via the service cover plate on the MOVIPRO® housing cover.
4. Insert the memory card into a new MOVIPRO® unit via the service cover plate.
5. Install the new MOVIPRO® unit in the system and connect it to the power supply.
6. Switch on the new MOVIPRO® unit.

INFORMATION

MOVIPRO® runs through several initialization steps. Do not switch off MOVIPRO® during this time!



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7. The parameters saved on the card are now available again. If you want the new MOVIPRO® unit to have a different parameter set, change the parameter set now, and save the changes on the memory card after startup.
8. For applications with motor encoder or distance encoder, you have to perform a reference travel.

10.2 Encoder replacement

10.2.1 Replacing incremental encoders

Incremental encoders for positioning always require a reference travel after startup. This is why there are no special measures required in the event of a unit or encoder (motor) replacement.

10.2.2 Replacing absolute encoders.

MOVIPRO® 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. However, this also means that you must reference the encoder in case of a unit or encoder (motor) replacement.

10.2.3 Replacing 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.

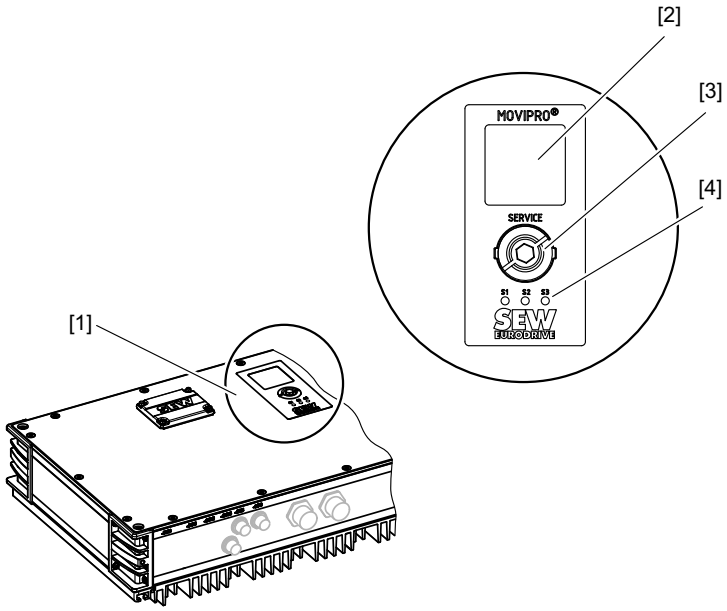
10.2.4 Replacing HIPERFACE® encoders

With HIPERFACE® encoders, you can use parameter P948 to specify whether or not a reference travel is required after an encoder replacement.

10.3 Service unit

The service unit is used for startup, diagnostics, and maintenance of the MOVIPRO® unit. It is equipped with a status display and a service interface

The following figure shows the service unit:



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[1] Service unit
[2] Status indication
[3] Ethernet service interface (Ethernet RJ45)
[4] Status LED

Status display and LED

The status display and the LED show status or error messages and allow for a quick evaluation of the current status of MOVIPRO®.

Ethernet service interface

For configuration and maintenance purposes, the unit is equipped with an Ethernet service interface that connects MOVIPRO® to an engineering PC.

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

10.4 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*.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
00	No error					
01	Overcurrent	Immediate disconnection	0	Output stage	• Short circuit at output • Motor too large • Faulty 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	• Rectify the short circuit • Connect a smaller motor • Contact SEW Service if the output stage is defective • Extend the ramp time • Check technical data of braking resistor • Check the supply cable of the braking resistor
			1	V_{CE} monitoring or undervoltage monitoring of the unit driver		
			5	Inverter remains in hardware current limit		
03	Ground fault	Immediate disconnection	0			
04	Brake chopper	Immediate disconnection	0	DC link voltage too high in 4-Q operation	• Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Brake resistance too high • Brake chopper defective	• Extend deceleration ramps • Check supply cable to braking resistor • Check technical data of braking resistor • Replace MOVIPRO® if the brake chopper is defective
			1			
06	Line phase failure	Immediate disconnection	0	DC link voltage periodically too low	Phase failure	Check the line cable
07	DC link overvoltage	Immediate switch-off	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			
08	Speed monitoring	Immediate disconnection (P)	0	Inverter in current limit 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 power system or motor. • Encoder not connected correctly or incorrect direction of rotation • n_{max} is exceeded during torque control • In operating mode VFC: Output frequency > 150 Hz • In operating mode V/f: Output frequency > 600 Hz	• Reduce load • Increase delay time setting (*P501 or P503*). • Check encoder connection, swap A/A and B/B pairs if necessary • Check encoder voltage supply • Check current limitation • 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 disconnection	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		

Error			Suberror		Possible cause	Measure
Code	Designation	Response (P)	Code	Designation		
10	IPOS-ILLOP	Emergency stop	0	Invalid IPOS$^{plus®}$ command	• Incorrect command detected during execution of the IPOS$^{plus®}$ program • Incorrect conditions during command execution	• Check the content of the program memory and, if necessary, correct. • Load the correct program into the program memory • Reload the application module
11	Excessive temperature	Emergency stop (P)	0	Heat sink temperature too high or temperature sensor defective	Thermal overload of inverter	Reduce load and/or ensure adequate cooling
			3	Overtemperature switched-mode power supply		

Error			Suberror		Possible cause	Measure
Code	Designation	Response (P)	Code	Designation		
14	Encoder	Immediate disconnection	0	Encoder not connected, defective encoder, defective encoder cable	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective	Check encoder cable and shield for correct connection, short circuit and broken wire.
			25	Motor encoder error – Speed range exceeded Encoder exceeds 6542 rpm		
			26	Motor encoder error – Card is defective. Error in 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 ext. encoder/motor encoder Increments have been lost.		
			32	HIPERFACE® motor encoder error HIPERFACE® encoder on motor encoder reports an error		
			33	HIPERFACE® external encoder error HIPERFACE® encoder on ext. encoder signals an error		
			34	Revolver motor encoder error Encoder connection or encoder is defective.		

Error			Suberror		Possible cause	Measure
Code	Designation	Response (P)	Code	Designation		
17	System error	Immediate disconnection	0	"Stack overflow" error	Inverter electronics disrupted, possibly due to effect of EMC	• Check grounding and shielding and improve, if necessary • Consult SEW service if the error occurs again
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		
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. • Consult SEW service if the error occurs again
			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	Both limit switches missing or open circuit	• 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 switch reversed		
			3	Both limit switches are active simultaneously		
29	Limit switch contacted	Emergency stop	0	Hardware limit switch hit	A limit switch has been reached in IPOS$^{plus®}$ mode (only with application module).	• Check travel range • Correct operator program
30	Emergency stop Timeout	Immediate disconnection	0	Emergency stop ramp time exceeded	• Drive overloaded • Emergency stop ramp too short	• Check configuration • Extend emergency stop ramp
31	TF/TH trip	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 • MOVIDRIVE® connection and TF/TH connection on motor interrupted	• Let motor cool off and reset error • Check connections/link between MOVIDRIVE® and TF/TH. • Set P835 to "No response"

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
32	IPOS index overflow	Emergency stop	0	IPOS$^{plus®}$ program is faulty	Programming principles violated leading to system-internal stack overflow	Reload the application module
34	Ramp Timeout	Immediate disconnection	0	Rapid stop ramp timeout	Downward ramps timeout, e.g. due to overload.	• Extend the downwards ramps • Eliminate overload
35	Operating mode	Immediate disconnection	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 disconnection	0	"System watchdog overflow" error	Error while executing system software	Consult SEW Service
38	System software	Immediate disconnection	0	"System software" error	System error	Consult SEW Service
39	Reference travel	Immediate disconnection (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 cam • Check limit switch connection • Check reference travel type setting and required parameters.
40	Boot synchronization	Immediate disconnection	0	Timeout during boot synchronization	Error during boot synchronization between inverter and option.	Consult SEW service if the error reoccurs
41	Watchdog option	Immediate disconnection	0	Watchdog timer error from/to option.	Error in communication between system software and option software	Consult SEW Service
42	Lag error	Immediate disconnection (P)	0	Lag error positioning	• Encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrect speed controller parameters • Value of lag error tolerance too small	• Check encoder connection • Extend ramps • Set P component to higher value • Reset speed controller parameters • Increase lag error tolerance • Check wiring of encoder, motor and line phase. • Check whether mechanical system components can move freely or if they are blocked
44	Unit utilization	Immediate disconnection	0	Unit utilization error	Unit 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		

Error			Suberror		Possible cause	Measure
Code	Designation	Response (P)	Code	Designation		
45	Initialization	Immediate disconnection	0	General error during initialization	No parameters set for EEPROM in power section, or parameters set incorrectly	Restore factory settings (*P802*). Consult SEW service if the error cannot be reset.
			3	Data bus error during RAM check		
			6	CPU clock error		
			7	Error in the current evaluation		
			10	Error when setting flash protection		
			11	Data bus error during RAM check		
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: Broken wire		
			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: Broken wire		
			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: Broken wire		
			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: Broken wire		
			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.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
59	Encoder communication	Rapid stop	1	HIPERFACE® encoder: Track signal error		
			2	HIPERFACE® encoder: Calibration error	Incorrect calibration of encoder	• Restore factory settings (P802) • Repeat encoder startup
			16	HIPERFACE® encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			64			
			128			
			192			
			256			
			320			
			384			
			448			
			512			
			576			
			1024	EnDat encoder: Communication error	MOVIPRO® and EnDat encoder connection interrupted	Check wiring
			1088			
			1152			
			1216			
			1280			
			1388			
			16385	HIPERFACE® distance encoder: Track signal error		
			16386	HIPERFACE® distance encoder:	Incorrect calibration of encoder	• Restore factory settings (P802) • Repeat encoder startup
59	Encoder communication	Rapid stop	16400	HIPERFACE® distance encoder: Communication error	MOVIPRO® and HIPERFACE® distance encoder connection interrupted	Check wiring
			16448			
			16512			
			16576			
			16640			
			16704			
			16768			
			16832			
			17408	EnDat distance encoder: Communication error	MOVIPRO® and EnDat distance encoder connection interrupted	Check wiring
			17472			
			17536			
			17600			
			17664			
			17772			
77	IPOS control word	No response (P)	0	Invalid control word IPOS$^{plus®}$	**Only in IPOS$^{plus®}$ 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 SW limit switch	No response (P)	0	Software limit switch reached	**Only in IPOS$^{plus®}$ mode:** Programmed target position is outside travel range delimited by software limit switches.	• Check the user program • Check position of software limit switches

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
80	RAM test	Immediate disconnection	0	"RAM test" error	Internal unit error, RAM defective.	Consult SEW Service
81	Start condition	Immediate disconnection	0	Start condition error with "VFC & hoist"	**Only in "VFC & hoist" mode:** The motor could not be supplied with the correct amount of current during the pre-magnetizing time: • Rated 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 disconnection	0	Output open with "VFC & hoist"	**Only in "VFC & hoist" mode:** • 2 or all output phases interrupted • Rated 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 emulation" error	• Motor utilization too high. • I_N-U_L monitoring 1 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 open circuit in the temperature sensor		
			3	No thermal motor model available		
			4	U_L monitoring error		
			11	Temperature sensor short circuit		
88	Flying start	Immediate disconnection	0	"Flying start" error	**Only in "VFC n-control" mode:** Actual speed > 6000 rpm when inverter enabled	Enable not unless current speed ≤ 6000 rpm
94	EEPROM checksum	Immediate disconnection	0	Power section parameters	Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send unit in for repair.
			5	Control unit data		
			6	Power section data		
			7	Invalid version of the configuration data set		
97	Copy error	Immediate disconnection	0	Parameter set upload is/was faulty	• Error during data transmission • Memory can neither be written nor read	• Repeat copying process • Restore delivery condition (P802) and repeat copying process.
			1	Parameter set download to unit cancelled		
			2	Not possible to adopt parameters		
98	CRC error	Immediate disconnection	0	"CRC via internal flash" error	Internal unit error Flash memory defective	Send unit in for repair
99	IPOS ramp calculation	Immediate disconnection	0	"Ramp calculation" error	**Only in IPOS$^{plus®}$ 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.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
100	Vibration warning	Display error (P)	0	Vibration 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 error	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately
102	Oil aging warning	Display error (P)	0	Oil aging warning	Warning 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 over-temperature	Display error (P)	0	Oil aging over-temperature	Overtemperature signal from the oil aging sensor	• Let oil cool down • Check if the gear unit cools properly
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 error	Brake lining worn	Replace brake lining (see "Motors" operating instructions)
110	"Ex-e protection" error	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
116	"Timeout" error	Rapid stop/warning	0	Internal communication timeout		• Check startup • Check wiring
122	Absolute encoder	Immediate stop	1	Plausibility check		Check the 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 error		Replace encoder
			33	HIPERFACE® encoder: Analog voltages not within tolerance		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	34	HIPERFACE® encoder: Internal encoder error		Replace encoder
			35			
			36			
			37			
			38			
			39			
			40			
			41	HIPERFACE® encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			42			
			43			
			44			
			45			
			46	HIPERFACE® encoder: internal encoder error		Replace encoder
			47			
			48			
			49			
			50			
			60	HIPERFACE® encoder: Analog voltages not within tolerance		
			61	HIPERFACE® encoder: Critical transmitter current	• Dirt • Transmitter broken	Replace encoder
			62	HIPERFACE® encoder: Critical encoder temperature		Replace encoder
			63	HIPERFACE® encoder: Position error	Speed too high, position cannot be created	Set slower speed
			64	HIPERFACE® encoder: Internal encoder error		Replace encoder
			65			
			66			
			67			
			256	SSI encoder: Voltage dip	12 V voltage supply broken	Check SSI encoder voltage supply
			257	SSI encoder: Clocking or data line interrupted		Check connection to SSI encoder
			258	SSI encoder: Change of position		
			259	SSI encoder: Insufficient clock frequency		Set a higher cycle frequency
			260	SSI encoder: Encoder signals programmable error		Check encoder parameterization
			261	SSI encoder: No high level present		• Replace encoder • Consult SEW Service
			513	EnDat encoder: Plausibility check		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	514	EnDat encoder: internal encoder error		Replace encoder
			515			
			516			
			544			
			576	EnDat encoder: internal encoder warning		Check encoder parameterization
			768	CANopen encoder: PDO timeout	No PDO data from CAN-open encoder	• Check interface • Check the configuration
			769	CANopen encoder: Encoder signals programmable error		Check encoder parameterization
			770	CANopen encoder: Change of position		
			771	CANopen encoder: Emergency signal		Check encoder
			772	CANopen encoder: Internal encoder error		Replace encoder
			773			
			774			
			16385	HIPERFACE® distance encoder: Plausibility check		
			16386	HIPERFACE® distane encoder: Unknown encoder type		
			16387	HIPERFACE® distance encoder: Corrupt encoder nameplate data		
			16417	HIPERFACE® distance encoder: Analog voltages not within tolerance		
			16418	HIPERFACE® distance encoder: Internal encoder error		Replace encoder
			16419			
			16420			
			16421			
			16422			
			16423			
			16424			
			16425	HIPERFACE® distance encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			16426			
			16427			
			16428			
			16429			
			16430	HIPERFACE® encoder: Internal encoder error		Replace encoder
			16431			
			16432			
			16433			
			16434			

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
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 encoder
			16446	HIPERFACE® distance encoder: Critical encoder temperature		Replace encoder
			16447	HIPERFACE® distance encoder: Position error	Speed too high, position cannot be created	Set slower speed
			16448	HIPERFACE® distance encoder: Internal encoder error		Replace encoder
			16449			
			16450			
			16451			
			16640	SSI distance encoder: Voltage dip	12 V voltage supply broken	Check SSI encoder voltage supply
			16641	SSI distance encoder: Interrupted clock or data line		Check connection to SSI encoder
			16642	SSI distance encoder: Change of position		
			16643	SSI distance encoder: Clock frequency too low		Set a higher cycle frequency
			16644	SSI distance encoder: Encoder signals programmable error		Check encoder parameterization
			16645	SSI distance encoder: No high level present		• Replace encoder • Consult SEW Service
			16897	EnDat distance encoder: Plausibility check		
			16898	EnDat distance encoder: internal encoder error		Replace encoder
			16899			
			16900			
			16928			
			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
			17154	CANopen distance encoder: Change of position		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	17155	CANopen distance encoder: Emergency signal		Check encoder
			17156	CANopen distance encoder: Internal encoder error		Replace encoder
			17157			
			17158			

11 Additional Information

For additional information, refer to the following documentation:

Documentation
"Configuration software Application Configurator for CCU" manual
"MOVITOOLS® MotionStudio" manual
MOVITOOLS® online help
"MOVI-PLC® Programming in the PLC Editor" system manual
"MOVIDRIVE® MD_60A Bus Positioning Application Module" manual
"MOVIDRIVE® MDX61B Extended Bus Positioning Application Module" manual
"MOVIDRIVE® MDX60B/61B Modulo Positioning Application" manual
"MOVIDRIVE® MDX61B Sensor-Based Positioning Via Bus Application" manual
"MOVIDRIVE® MDX61B Table Positioning Application" manual

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