SEW EURODRIVE

Manual

MOVIPRO® SDC
with DeviceNet Interface

Edition 07/2010

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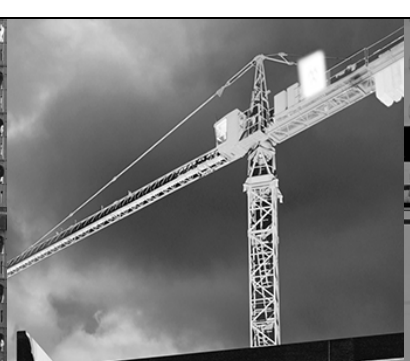

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1 General Information

1.1 How to use 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, startup, 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 the signal words

The following table shows the grading and meaning of the signal words for safety notes, notes on 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 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 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 of MOVIPRO® 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 does not replace the detailed operating instructions. Only electrical specialists are allowed to install and start up MOVIPRO® observing the applicable accident prevention regulations and the MOVIPRO® SDC operating instructions.

1.6 General safety notes for bus systems

This communication system allows you to adapt the MOVIPRO® SDC 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® SDC – 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® SDC 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

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2 Application Modules in MOVITOOLS® MotionStudio

2.1 Application modules for MOVIPRO® SDC

2.1.1 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® SDC

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

The application module has a user-friendly GUI 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 loads it into the inverter. MOVIPRO® SDC then takes over the entire motion control. Thus 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 must 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® SDC units.

INFORMATION

For information on how to operate the application modules, refer to the MOVIDRIVE® B application manuals. They are available on the SEW homepage.

2.1.2 Available application modules

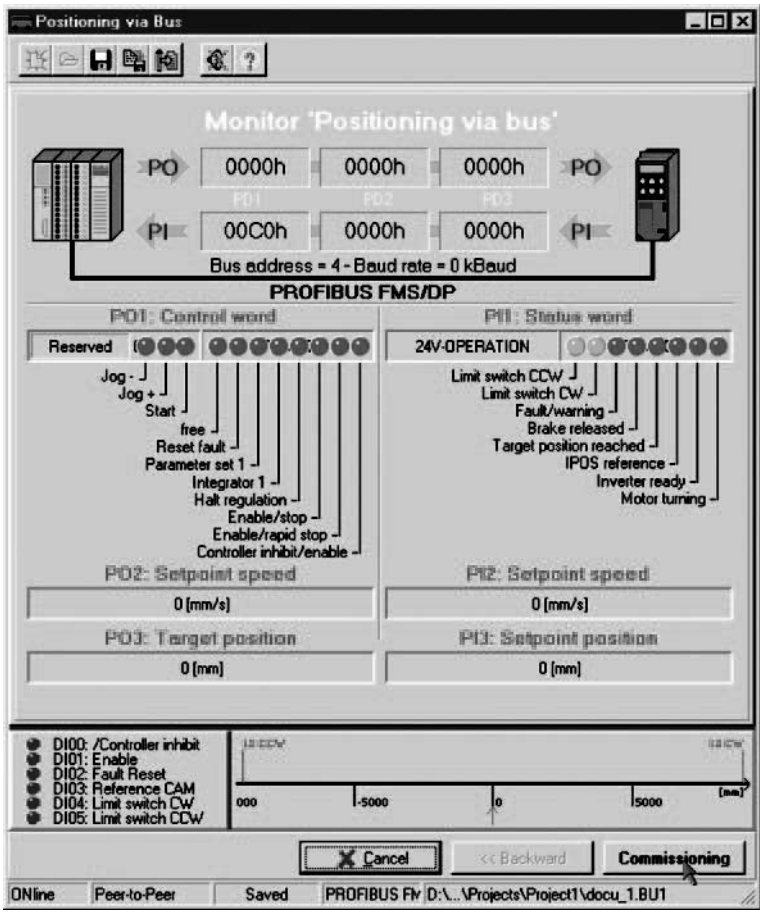
The following application modules are available for MOVIPRO® SDC.

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

Bus positioning

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

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



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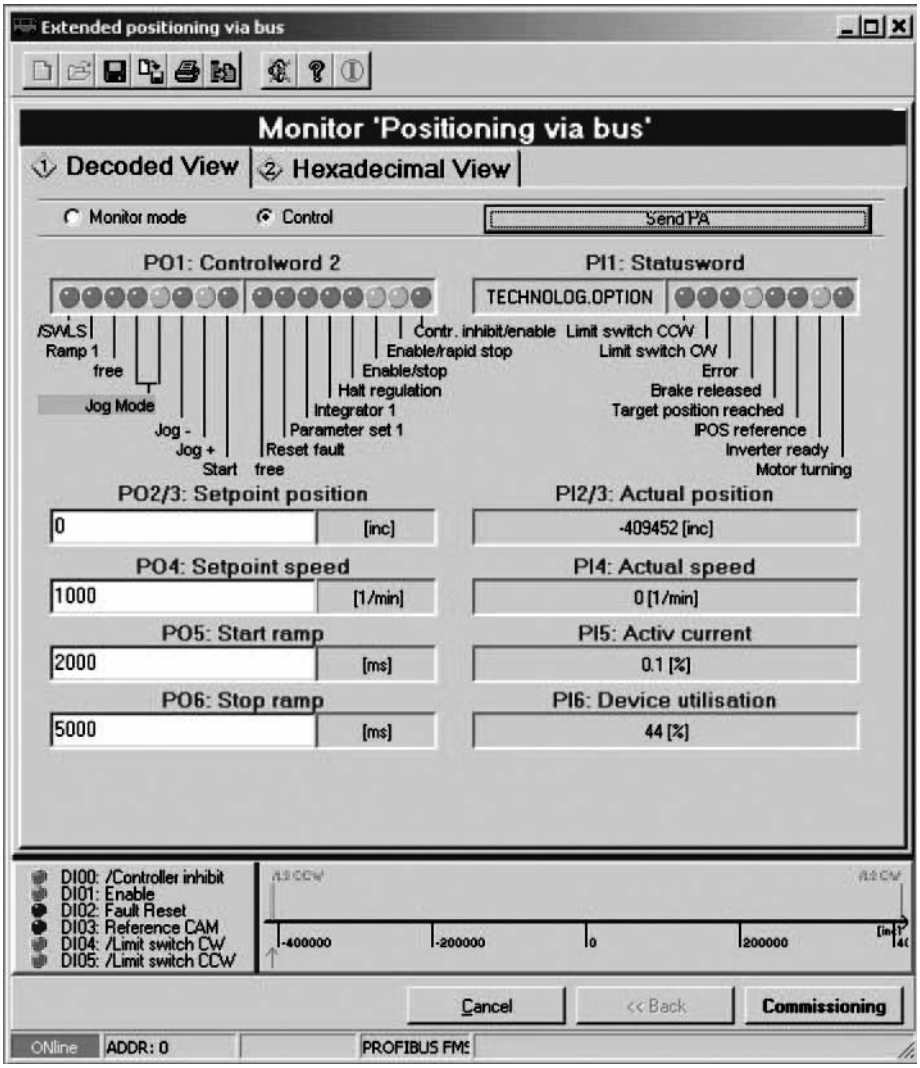
Extended bus positioning

The "Extended bus positioning" application module 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 ± 262100 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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Modulo positioning

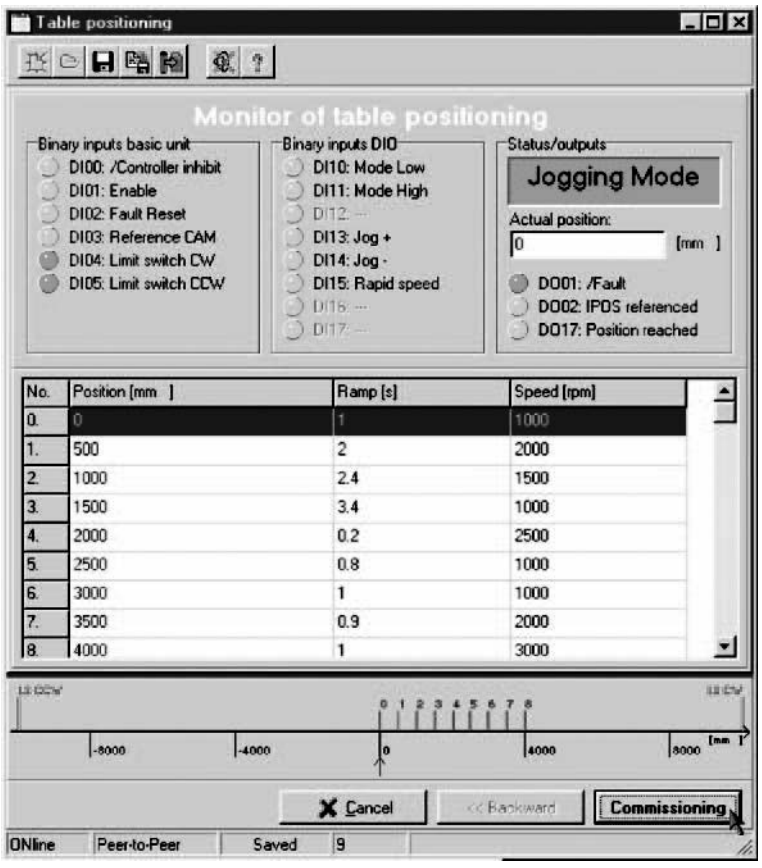
The "Modulo positioning" application module has the following functions:

- 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 control.
- 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.

Table positioning

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

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



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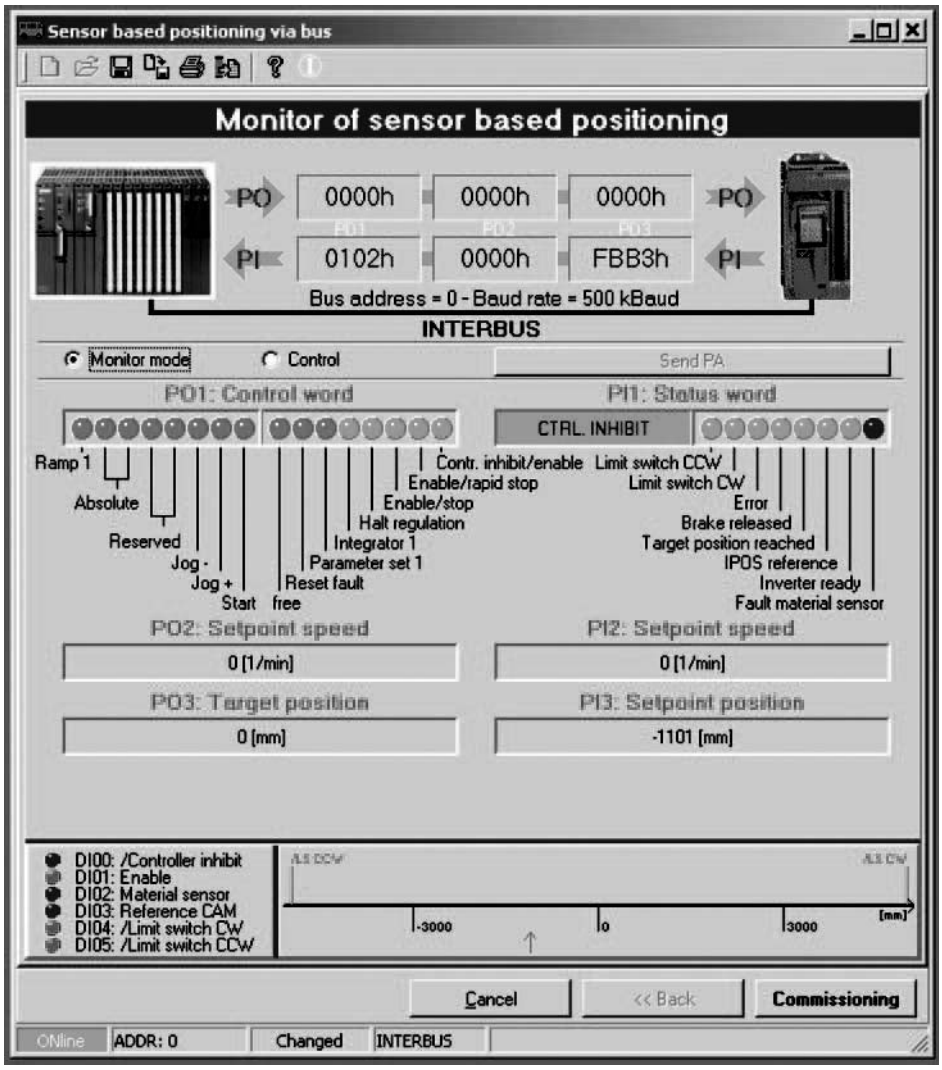
Sensor-based positioning

The "Sensor-based positioning" application module 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 ± 32700 m



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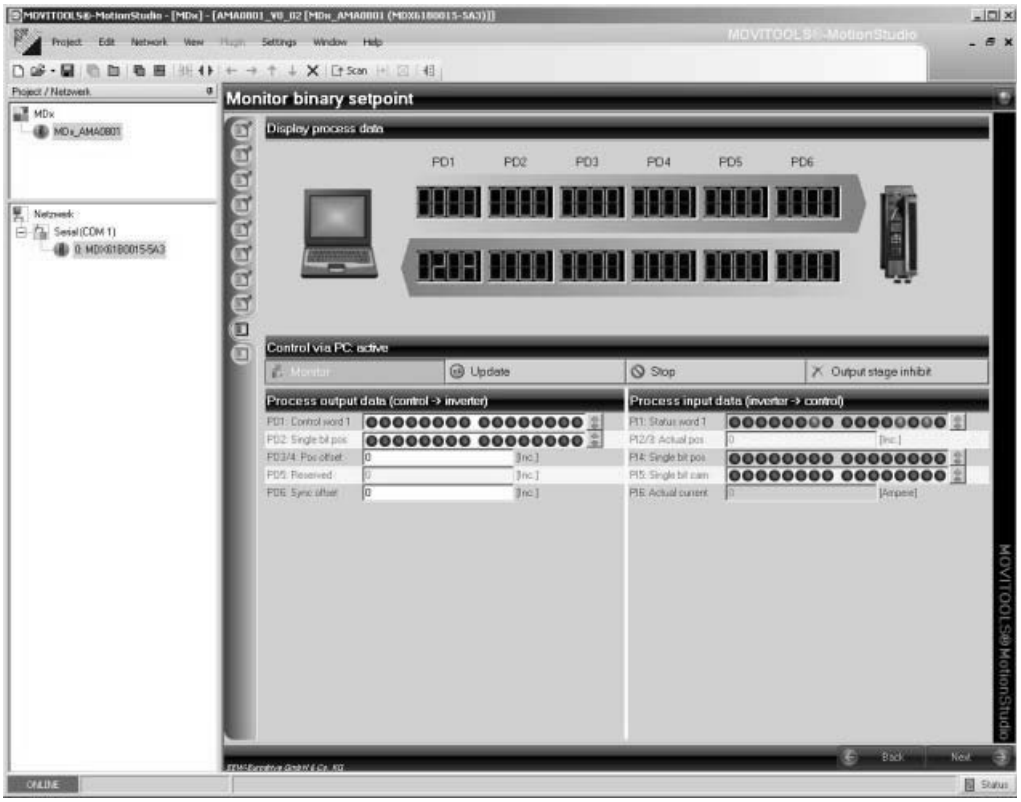
Automotive AMA0801

The "Automotive AMA0801" application module 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. Setpoints specification is either variable or binary.
- The program is used to control individual drives. In synchronous operation mode, these drives can be synchronized to a master drive.



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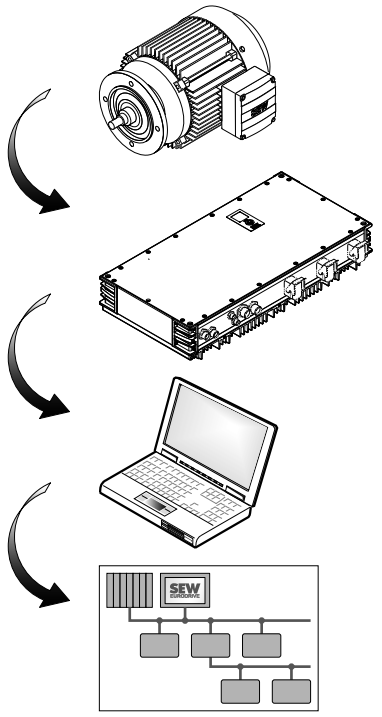
3 Startup

3.1 Startup procedure

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



[1]	Motor startup	→ Refer to the operating instructions of the motor for more information.
[2]	MOVIPRO® startup	→ For more information, refer to the "MOVIPRO® SDC" operating instructions.
[3]	Parameterization	→ For more information, see section "Parameterization of MOVIPRO®" (page 75)
[4]	Fieldbus configuration	→ Information is listed in the following sections: – "Configuration and startup on the DeviceNet fieldbus" (page 25) – "Application modules in MOVITOOLS® MotionStudio" (page 8) – "Process data description" (page 52)

3.2 Check list for startup

3.2.1 Preliminary work

Make sure that the following preliminary steps have been carried out:

- MOVITOOLS® MotionStudio version 5.60 or later is installed on the engineering PC.
- The EDS file "SEW_MOVIPRO.EDS" is available.
- The Ethernet service interface is configured. For more information, refer to section "Communication via Ethernet (page 68)".
- The MOVIPRO® unit is connected to the fieldbus.
- A connection has been established between the engineering PC and the MOVIPRO® unit.
  - Except for the lower byte, the engineering PC and the MOVIPRO® unit have the same IP address (page 68).
  - The engineering PC and the MOVIPRO® unit have identical subnet masks.
  - The MOVIPRO® can be addressed via the engineering PC using the ping command.

3.2.2 Unit installation

Perform the following steps:

1. Install the components according to the information in the MOVIPRO® operating instructions:
   - Supply system cable
   - Motor cable
   - Braking resistor
   - DC 24 V backup voltage
2. Switch on all power supplies of the MOVIPRO® unit.

3.2.3 Configuration of MOVIPRO®

INFORMATION

For information about using MOVITOOLS® MotionStudio, refer to section "Operation of MOVITOOLS® MotionStudio (page 64)".

Proceed as follows to configure the MOVIPRO®:

1. Start MOVITOOLS® MotionStudio.
2. Create a new project.
3. Set the communication properties to "Ethernet".
4. Perform a unit scan.
5. Mark the MOVIPRO® unit.
6. Right-click on it and select [Startup] / [Startup] from the context menu.
7. Perform a motor startup (page 86).
8. Load the respective application module into MOVIPRO®, if necessary.
9. Check whether the process data exchange between the controller and the MOVIPRO® is working properly.
10. Enable the MOVIPRO® unit.

4 Installation Notes

INFORMATION

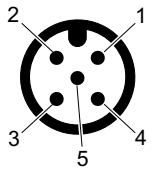
For information on the assembly and the installation of MOVIPRO®, refer to the "MOVIPRO® SDC" operating instructions.

For a simple application, this section contains information on how to install the DeviceNet.

4.1 Fieldbus connection

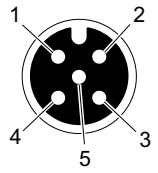
4.1.1 X4241: DeviceNet input

The following table provides information about this connection:

Function		
DeviceNet input		
Connection type		
M12, 5-pole, male, A-coded		
Wiring diagram		
 2264818187		
Assignment		
No.	**Name**	**Function**
1	Drain	Shield/equipotential bonding
2	V+	DC 24 V input
3	V-	Reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

4.1.2 X4242: DeviceNet output

The following table provides information about this connection:

Function		
DeviceNet output		
Connection type		
M12, 5-pole, female, A-coded		
Wiring diagram		
 2264816267		
Assignment		
No.	**Name**	**Function**
1	Drain	Shield/equipotential bonding
2	V+	DC 24 V output
3	V-	Reference potential
4	CAN_H	CAN data line (high)
5	CAN_L	CAN data line (low)

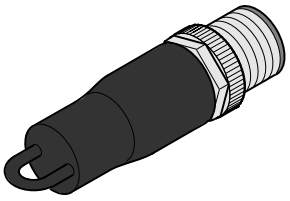
Bus termination

INFORMATION

If the unit is the last station in the bus, you must provide for a bus termination by connecting an according resistor to plug connector X4242.

Connection component

The following table shows the available component for this connection:

Connection component Resistor network	
Part number 1 328 703 6 Connection: M12	

4.1.3 MOVIPRO® – DeviceNet connection

The DeviceNet specification stipulates a line structure for the bus. The maximum permitted cable length depends on the baud rate setting:

Baud rate	Maximum cable length
125 kBaud	500 m
250 kBaud	250 m
500 kBaud	100 m

4.2 Shielding and routing the bus cables

The DeviceNet interface supports RS485 transmission technology and requires the cable type A to EN 50170 specified as the physical medium for DeviceNet. This cable must be a shielded, twisted-pair cable.

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 cables 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.

NOTICE

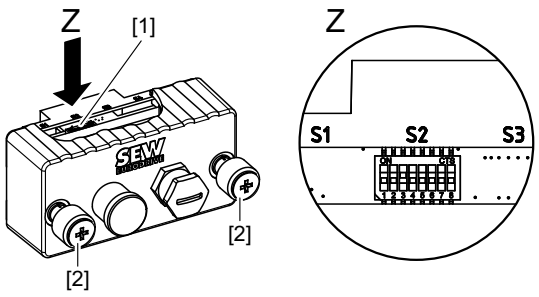
In case of fluctuations in the ground potential, a compensating current may flow via the bilaterally connected shield that is also connected to the protective earth (PE). Make sure you supply adequate equipotential bonding according in accordance with relevant VDE regulations in such a case.

4.3 Setting the station address (DeviceNet)

INFORMATION

Any changes to the station address during operation become effective after the power supply has been interrupted (DC 24 V reset).

Use the S2 DIP switch in the DeviceNet module to set the DeviceNet station address of the MOVIPRO®. The default setting for the station address is 4. The following figure shows the DIP switch S2 ant its position on the DeviceNet module:



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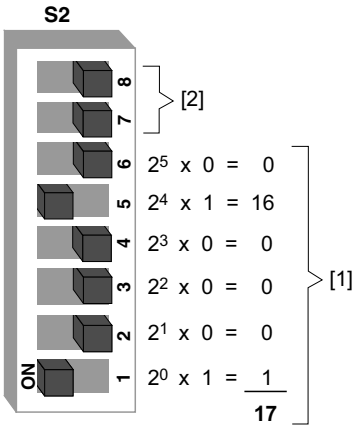
[1] DIP switch S2
[2] Knurled screw

The DIP switch S2 is located on the top of the DeviceNet module. You have to remove the DeviceNet module to reach it. This does not interrupt the DeviceNet network. Proceed as follows when removing the module:

1. Loosen the knurled screws.
2. Pull the DeviceNet module from the MOVIPRO® unit to the front.
3. Use DIP switches 1 to 6 to set the DeviceNet address. The following example shows the settings of the DIP switches for DeviceNet address 17.



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[1] Example: Address 17
[2] Switch 7, 8 = Switches for setting the baud rate
Addresses 0 to 63: valid addresses

The following table uses DeviceNet address 17 as an example to show how to determine the DIP switch settings for any bus address:

DIP switch setting	Significance
DIP 1 = ON	1
DIP 2 = OFF	2
DIP 3 = OFF	4
DIP 4 = OFF	8
DIP 5 = ON	16
DIP 6 = OFF	32

4. Connect the bus terminating resistor to the MOVIPRO® at the last bus station.
   - If MOVIPRO® is located at the end of a DeviceNet segment, the unit can only be connected to the DeviceNet network via the incoming DeviceNet line.
   - To prevent malfunctions in the bus system due to reflections, etc, the DeviceNet segment must be terminated using bus terminating resistors at the first and last physical stations.
5. Once plugged-in, secure the DeviceNet module with both knurled screws.

4.3.1 Setting the baud rate

INFORMATION

Any changes to the baud rate during operation become effective after the power supply has been interrupted (DC 24 V reset).

Use DIP switches 7 to 8 to set the baud rate:

DIP switch		Baud rate
7	8	
OFF	OFF	125 kBaud
ON	OFF	250 kBaud
OFF	ON	500 kBaud
ON	ON	Reserved

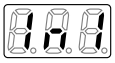
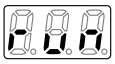
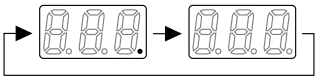
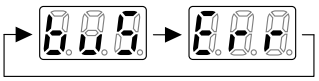
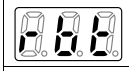
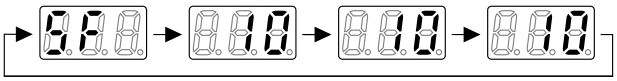
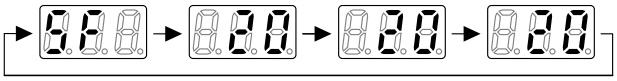
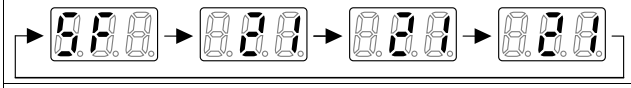
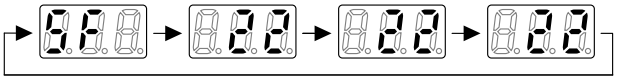
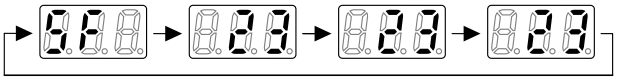
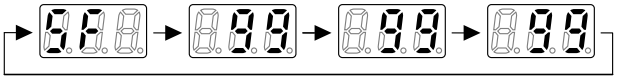
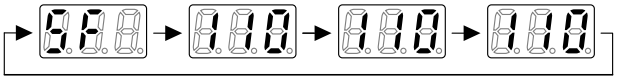
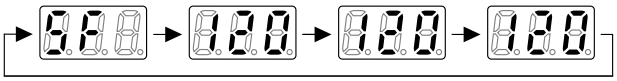
4.4 Status and error messages

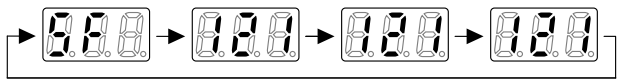
The 7-segment display informs about the status of the MOVIPRO® unit. In case of repeated malfunctions, contact the SEW Service staff.

The display of the three-digit 7-segment display shows the current status of the unit. If several statuses or errors are active at the same time, the error with the highest priority is displayed.

4.4.1 Unit status

The following unit statuses are possible:

Display	Description
	Maintenance switch is switched off
	Initialization: Trying to establish a connection to all internal components. This can take several minutes after a unit replacement.
	The connection has been established. The statuses of the components or the application are displayed after 3 s.
	Flashing dot: Application module running
	Fieldbus error
	Unit waiting for DC 24 V reset
	Communication error with the power section
	Error in external periphery
	Non-enabled application module loaded
	Configuration with Application Configurator not completed
	Data backup on SD memory card failed, upload aborted
	Data backup on SD memory card failed, SD memory card is write-protected
	Data recovery in MOVIPRO® failed, download aborted
	Data recovery in MOVIPRO® failed, controller not inhibited
	Internal system error
	Actuator voltage overload
	Overload sensor voltage group 1

Display	Description
	Overload sensor voltage group 2
	Internal communication error

4.4.2 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:

1820269707

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 139)	Error indicator (flashing)
U	17_{dec}	"Safe Stop" active
• (blinking dot)	–	Application module running

⚠ WARNING

Incorrect interpretation of display **U = "Safe stop" active**.

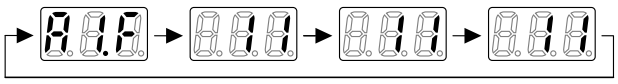
Severe or fatal injuries.

The display **U = "Safe stop" active** is not safety-related and must not be used as a safety function.

4.4.3 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:

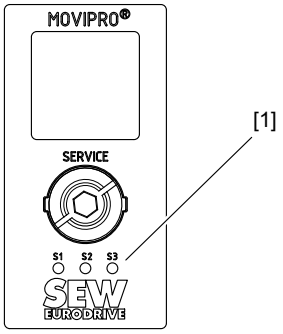


1806505867

For a list of error codes, refer to section "Service / Error list of MOVIPRO® SDC" (page 139).

4.4.4 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 DeviceNet

LED status	Status	Meaning
Off	• Not switched on / off-line	• Unit is offline. • Unit is performing DUP MAC check. • Unit is switched off.
Flashing green	• Online and in operational mode	• The unit is online and no connection has been established. • DUP-MAC check performed successfully. • A connection has not yet been established with a master. • Missing, incorrect or incomplete configuration.
Lights up green	• Online, operational mode and connected	• Online • Connection has been established with a master. • Connection is active (established state).
Flashing red	• Minor error or connection timeout	• A correctable fault has occurred. • A unit error is active. • Polled I/O and/or bit-strobe I/O connections are in timeout state.
Lights up red	• Critical error or critical link failure	• A correctable fault has occurred. • BusOff status • DUP-MAC check has detected an error.

Status LED S2

LED status	Status or cause of error	Remedy
Flashing green	• The firmware of the fieldbus gateway is running properly.	–
Flashing green/ orange	• Data backup is created/restored.	–
Lights up orange	• Boot process is active.	–
Flashing orange	• Firmware is being updated	–
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

LED status	Status or cause of error	Remedy
Lights up green	• Program is running.	–
Off	• No program is loaded.	• Replace the SD card.

5 Configuration and Startup on the DeviceNet Fieldbus

This section provides information about configuring the DeviceNet master and starting up MOVIPRO® for fieldbus operation.

INFORMATION

The latest versions of the EDS file are available for download on the SEW website (www.sew-eurodrive.de). via "Software" for the decentralized drive controller, MOVIPRO®-SDC.

5.1 Validity of the EDS files for MOVIPRO®

INFORMATION

Do not edit or amend the entries in the EDS file. SEW assumes no liability for MOVIPRO® malfunctions caused by a modified EDS file.

The current EDS file SEW_MOVIPRO.eds is available for configuring the master (DeviceNet scanner) for MOVIPRO®:

Install the following files using the RSNetWorx software to establish the DeviceNet network with MOVIPRO®:

Proceed as follows:

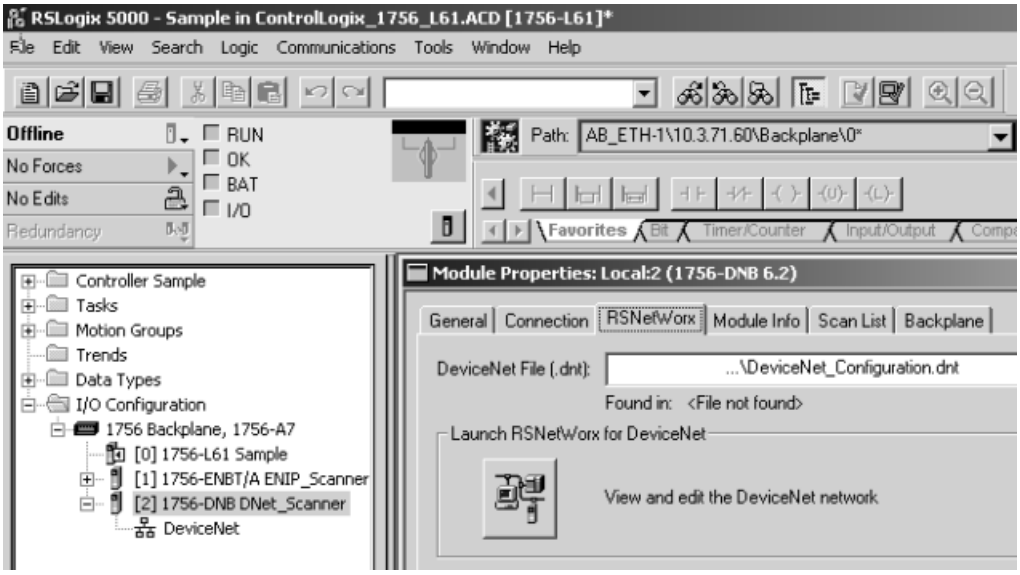
1. Select the menu item [Tools] / [EDS-Wizard] in RSNetWorx.
2. Select the EDS file and the ICON file.

   The files will be installed. For more details on how to install the EDS file, refer to the Allen Bradley documentation for RSNetWorx.
3. After installation, the device is available in the device list under the entry [Vendor] / [SEW EURODRIVE GmbH].

5.2 Configuring the PLC and master (DeviceNet scanner)

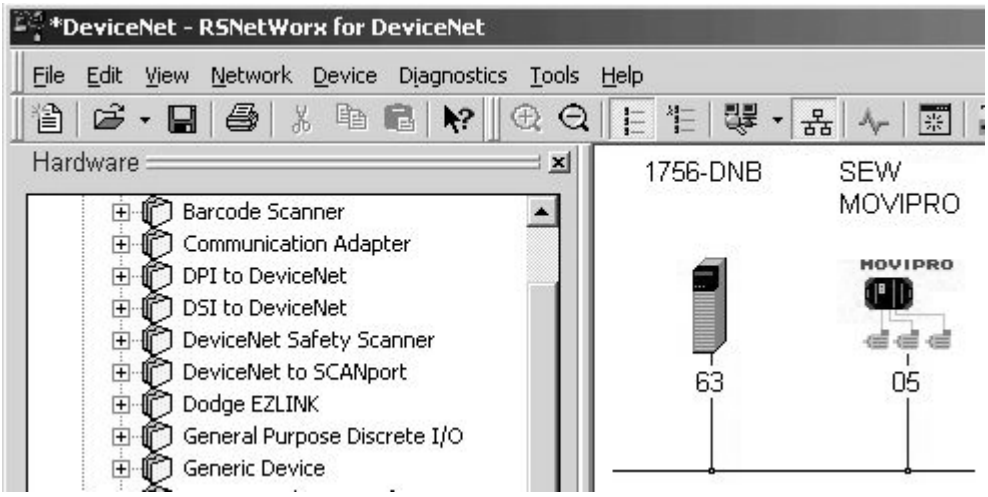
The following samples refer to the usage of an Allen-Bradley-PLC ControlLogix 1756-L61 together with the RSLogix 5000 programming software and the DeviceNet configuration software RSNetWorx for DeviceNet.

After adding the DeviceNet scanner to the I/O configuration, the DNT file containing the DeviceNet configuration is selected. To view and edit the DeviceNet configuration, RSNetWorx can be launched from this dialog:



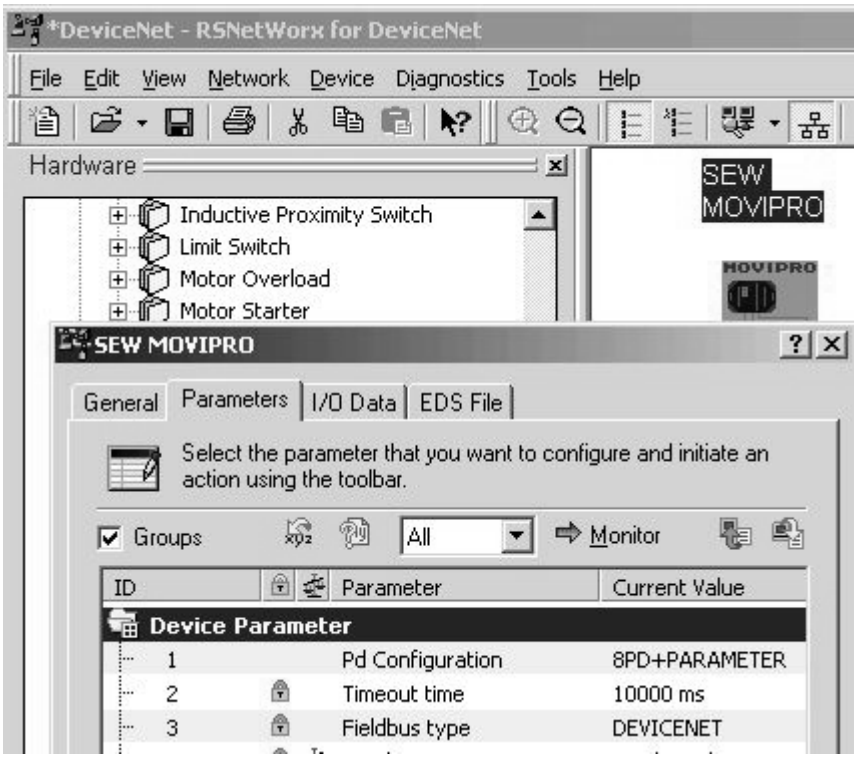
2632236171

In RSNetWorx for DeviceNet (see following figure), either perform an online scan or add the required devices to the graph by drag and drop. The address given under the icon of the device must be equal to the MAC-ID set by the DIP switches of the MOVIPRO®. If the selection list does not include the required devices, corresponding EDS files have to be registered via [Tools] / [Wizard].



2632311051

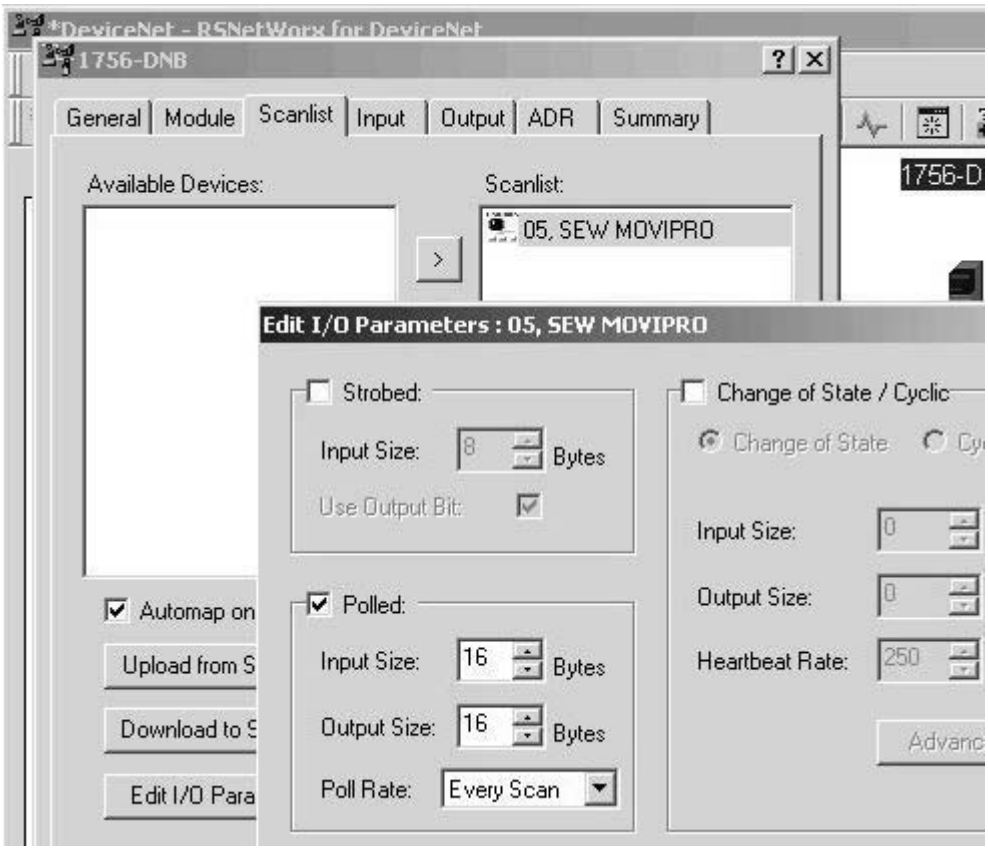
By reading the "device properties" in online mode, the process data (Pd) configuration of MOVIPRO® can be checked.



2632314635

The "Pd configuration" parameter shows the number (1 – 64) of process data words (PD) that was set via RSNetWorx and defines the I/O parameters for the DeviceNet scanner.

Changes to the PD configuration only become effective after a power on reset (DC 24 V reset).



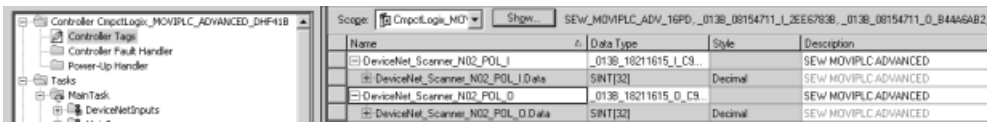
2632318219

After adding MOVIPRO® to the "scan list", the number of polled I/O bytes must be set to 2 x number of PD (e.g. PD = 8, number of polled input bytes = 16 and output bytes = 16) via "Edit I/O parameters". You can close RSNetWorx once you have saved and downloaded the DeviceNet configuration to the scanner.

Depending on the DeviceNet configuration and the mapping rules in the scanner, the data from and to DeviceNet units is packed into a DINT array that is transferred from the scanner to the local I/O tags of the Logix processor.

In order not to have to search for the data from a certain device in this array manually, the "DeviceNet Tag Generator" tool automatically generates copy commands and two controller tags (input & output as byte arrays) for each DeviceNet device.

The tag name contains the MAC-ID of the DeviceNet unit and *POL_I* for polled input data or *POL_O* for polled output data.



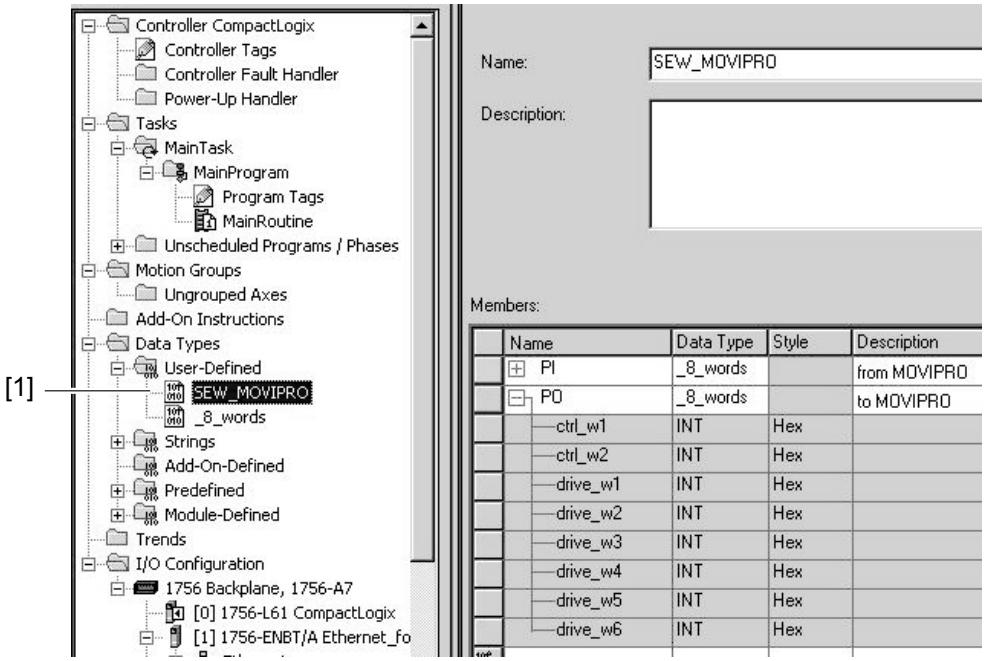
2632387595

5.3 Configuration examples in RSLogix 5000

5.3.1 MOVIPRO® with 8 process data words

1. Set the respective DIP switches on the MOVIPRO® to
   - adjust the baud rate to the DeviceNet
   - set the address (MAC-ID) to a value used by no other node
2. Add the MOVIPRO® to the DeviceNet configuration as shown in chapter "Configuring the PLC and master (DeviceNet scanner)" (page 26).
3. Set the number of process data words of MOVIPRO® to 8.
4. You can now start integration into the RSLogix project.

   Generate a controller tag with a user-defined data type [1] to get a plain interface to the inverter's process data.

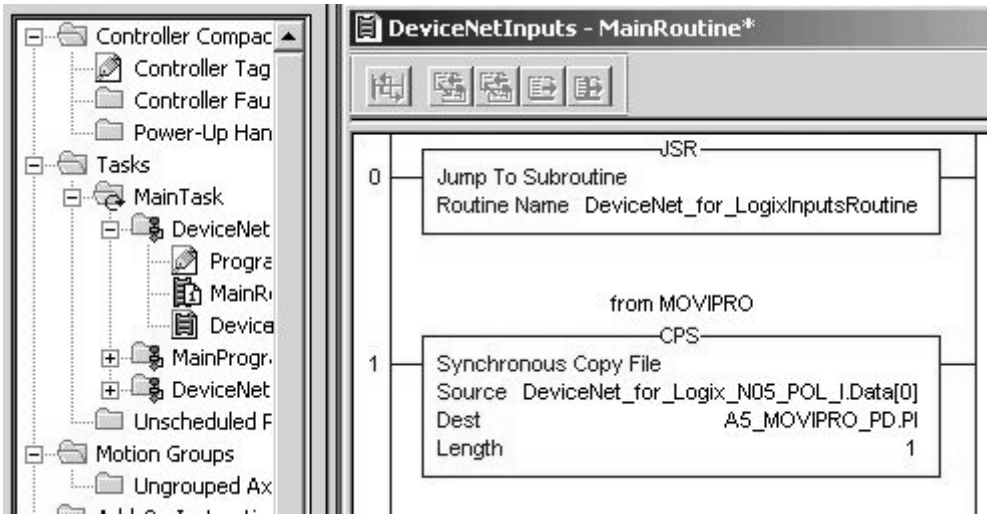


1967466379

   The description for the process input and output data of the controller tag can match the definition of the process data (PD) in MOVIPRO®.

5. In order to copy the data from MOVIPRO® to the new data structure, a CPS command is added into the "MainRoutine" that reads the data from the local I/O:

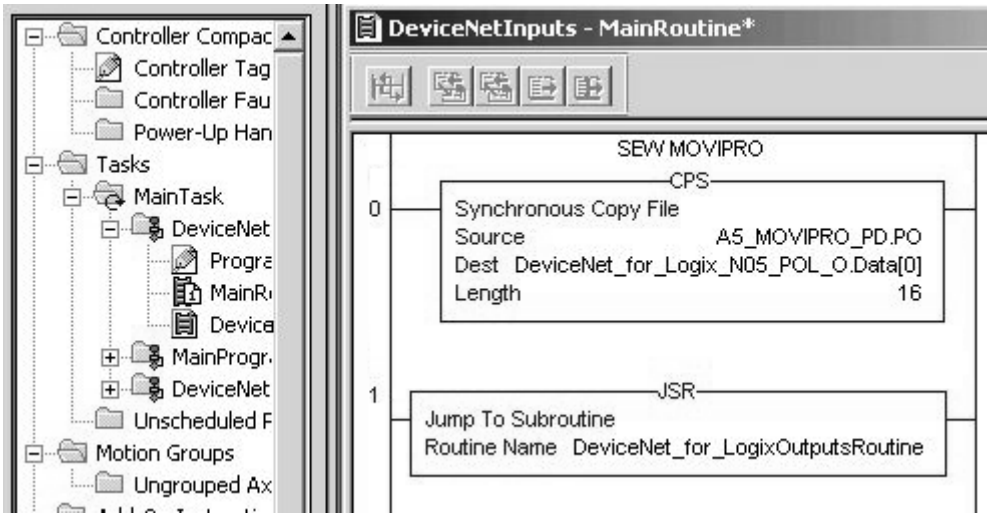
Make sure that this CPS command is executed **after** the automatically (by DeviceNet Tag Generator) generated *DNet_ScannerInputsRoutine*.



2632534027

In order to copy the data from the new data structure to MOVIPRO®, a CPS command is added into the "MainRoutine" that writes the data to the local I/O.

These CPS commands are executed **before** the automatically generated (by DeviceNet Tag Generator) *DNet_Scanner_OutputsRoutine*.



2632536459

6. Now the project is saved and uploaded to the PLC. Set the PLC to RUN mode and set the *Scanner CommandRegister.Run* to "1" to activate data exchange via DeviceNet.

Now actual values can be read from MOVIPRO® and setpoint values can be written.

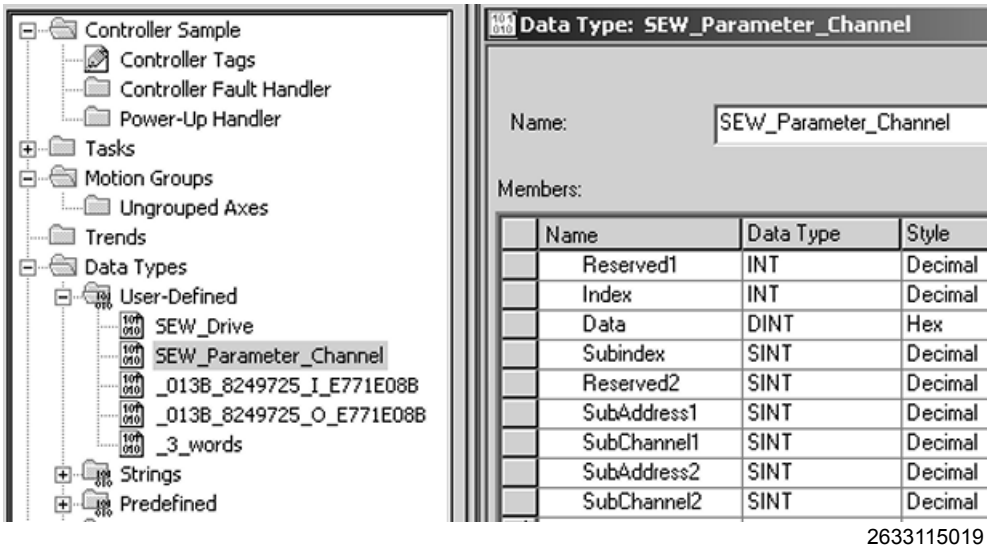
Name	Value	Style	Data Type	Description
MOVIPRO_1	{...}		SEW_MOVIPRO	
MOVIPRO_1.PI	{...}		_8_words	from MOVIPRO
MOVIPRO_1.PI.ctrl_w1	16#0000	Hex	INT	Status MOVIPRO
MOVIPRO_1.PI.ctrl_w2	16#0000	Hex	INT	12 Dig. Input
MOVIPRO_1.PI.drive_w1	16#0000	Hex	INT	PI1 from Drive
MOVIPRO_1.PI.drive_w2	16#0000	Hex	INT	PI2 from Drive
MOVIPRO_1.PI.drive_w3	16#0000	Hex	INT	PI3 from Drive
MOVIPRO_1.PI.drive_w4	16#0000	Hex	INT	PI4 from Drive
MOVIPRO_1.PI.drive_w5	16#0000	Hex	INT	PI5 from Drive
MOVIPRO_1.PI.drive_w6	16#0000	Hex	INT	PI6 from Drive
MOVIPRO_1.PO	{...}		_8_words	to MOVIPRO
MOVIPRO_1.PO.ctrl_w1	16#0000	Hex	INT	not in use
MOVIPRO_1.PO.ctrl_w2	16#0000	Hex	INT	4 Dig. Output
MOVIPRO_1.PO.drive_w1	16#0000	Hex	INT	PO1 to Drive
MOVIPRO_1.PO.drive_w2	16#0000	Hex	INT	PO2 to Drive
MOVIPRO_1.PO.drive_w3	16#0000	Hex	INT	PO3 to Drive
MOVIPRO_1.PO.drive_w4	16#0000	Hex	INT	PO4 to Drive
MOVIPRO_1.PO.drive_w5	16#0000	Hex	INT	PO5 to Drive
MOVIPRO_1.PO.drive_w6	16#0000	Hex	INT	PO6 to Drive

1968348683

5.3.2 Access to parameters of MOVIPRO®

In order to get an easy-to-use read access to parameters of the MOVIPRO® via *explicit messages* and the *register object*, follow these steps:

1. Create a user-defined data structure "SEW_Parameter_Channel":



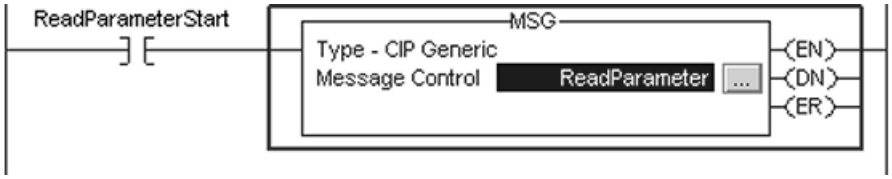
2633115019

2. Define the following controller tags:

Name	Data Type
⊞-ReadParameter	MESSAGE
⊞-ReadParameterRequest	SEW_Parameter_Channel
⊞-ReadParameterResponse	SEW_Parameter_Channel
ReadParameterStart	BOOL

2633117451

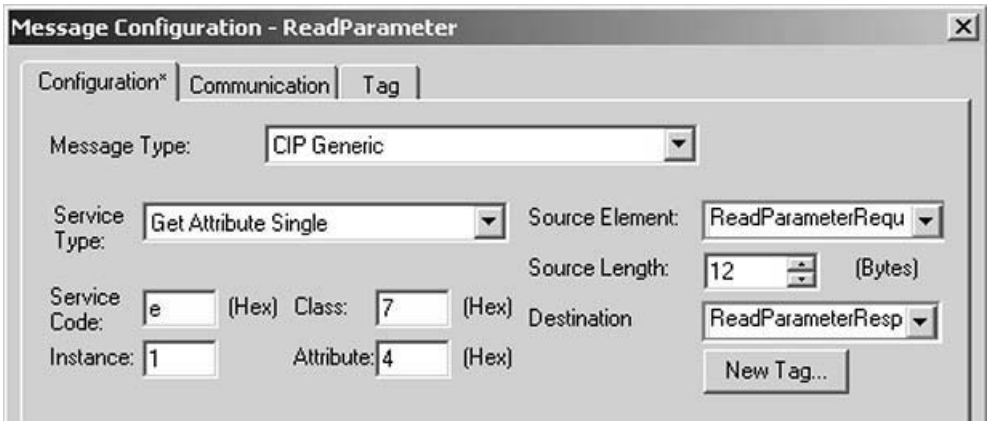
3. Create a rung to execute the "ReadParameter" command:



2633119883

- For the contact, select the "ReadParameterStart" tag
- For message control, select the "ReadParameter" tag

4. Click on in the MSG command to open the “Message Configuration” window:



2633122315

Choose “CIP Generic” as the “Message Type”. Fill the other fields in the following order:

A Source Element = ReadParameterRequest.Index

B SourceLength = 12

C Destination = ReadParameterResponse.Index

D Class = 7_{hex}

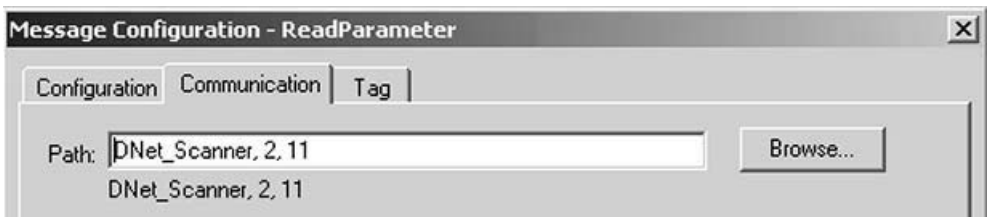
E Instance = 1

F Attribute = 4_{hex}

G Service Code = e_{hex}

The service type is set automatically.

5. Set the target unit in the "Communication" tab page:

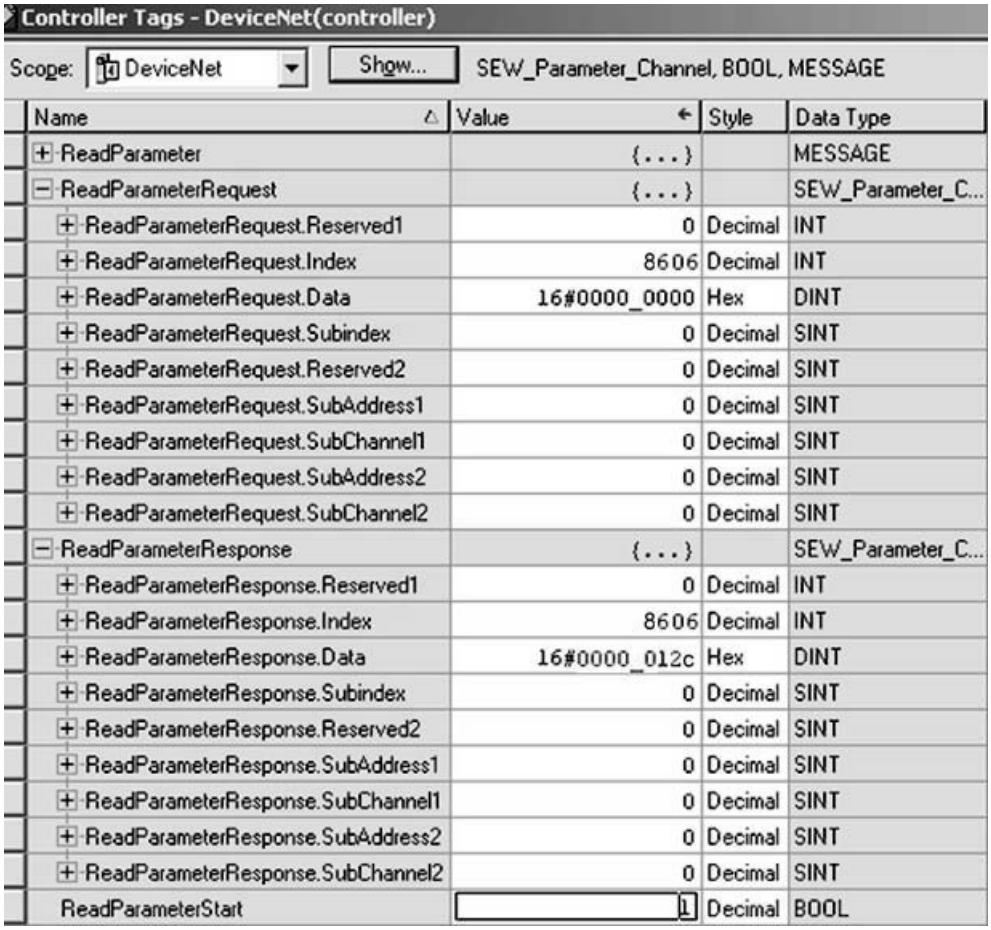


2633124747

The path consists of:

- Name of the scanner (e. g. DNet_Scanner)
- 2 (always 2)
- Slave address (e. g. 11)

6. After downloading the changes to the PLC, the index of the parameter to be read can be entered at *ReadParameterRequest.Index*. Changing the *ReadParameterStart* control bit to "1" executes the read command once:

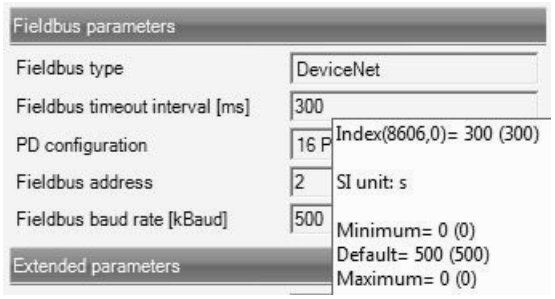


Name	Value	Style	Data Type
ReadParameter	{...}		MESSAGE
ReadParameterRequest	{...}		SEW_Parameter_C...
ReadParameterRequest.Reserved1	0	Decimal	INT
ReadParameterRequest.Index	8606	Decimal	INT
ReadParameterRequest.Data	16#0000_0000	Hex	DINT
ReadParameterRequest.Subindex	0	Decimal	SINT
ReadParameterRequest.Reserved2	0	Decimal	SINT
ReadParameterRequest.SubAddress1	0	Decimal	SINT
ReadParameterRequest.SubChannel1	0	Decimal	SINT
ReadParameterRequest.SubAddress2	0	Decimal	SINT
ReadParameterRequest.SubChannel2	0	Decimal	SINT
ReadParameterResponse	{...}		SEW_Parameter_C...
ReadParameterResponse.Reserved1	0	Decimal	INT
ReadParameterResponse.Index	8606	Decimal	INT
ReadParameterResponse.Data	16#0000_012c	Hex	DINT
ReadParameterResponse.Subindex	0	Decimal	SINT
ReadParameterResponse.Reserved2	0	Decimal	SINT
ReadParameterResponse.SubAddress1	0	Decimal	SINT
ReadParameterResponse.SubChannel1	0	Decimal	SINT
ReadParameterResponse.SubAddress2	0	Decimal	SINT
ReadParameterResponse.SubChannel2	0	Decimal	SINT
ReadParameterStart	1	Decimal	BOOL

2633126667

On response to the read request, *ReadParameterResponse.Index* should indicate the read index and *ReadParameterResponse.Data* should contain the read data. In this example, the timeout delay of the MOVIPRO® (index 8606) set by the scanner has been read ($012C_{hex}$ = 0.3 s).

You can check the value in the MOVITOOLS® MotionStudio parameter tree (see figure below). The tooltip of a parameter displays for example index, subindex, factor, etc. of the parameter.



2632606091

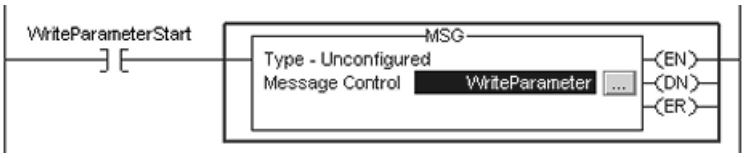
Only a few changes are required for parameter write access.

- Create the controller tags (see following figure)

Name	Data Type
⊞ WriteParameter	MESSAGE
⊞ WriteParameterRequest	SEW_Parameter_Channel
⊞ WriteParameterResponse	SEW_Parameter_Channel
WriteParameterStart	BOOL

2632608523

- Create a rung to execute the "WriteParameter" command:

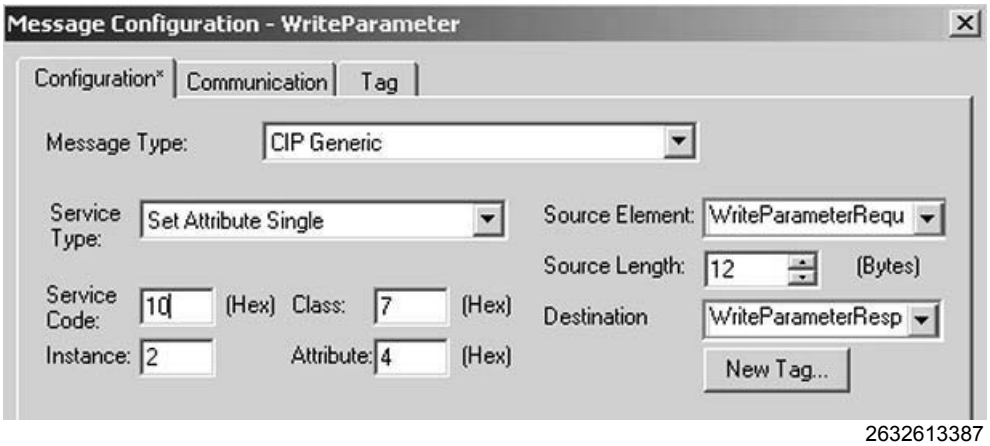


2632610955

For the contact, choose the "WriteParameterStart" tag.

For message control, choose the "WriteParameter" tag.

- Click on in the MSG command to open the “Message Configuration” window:



2632613387

Fill the other fields in the following sequence:

- Source Element = WriteParameterRequest.Index

- Source Length = 12
- Destination = WriteParameterResponse.Index
- Class = 7_{hex}
- Instance = 2
- Attribute = 4_{hex}
- Service Code = 10_{hex}

7. After downloading the changes to the PLC, index and value to be written into the parameter can be entered at *WriteParameterRequest.Index* and *WriteParameterRequest.Data*. Changing the *WriteParameterStart* control bit to "1" executes the write command once:

Name	Value	Style	Data Type
⊞ WriteParameter	{...}		MESSAGE
⊟ WriteParameterRequest	{...}		SEW_Parameter_C...
⊞ WriteParameterRequest.Reserved1	0	Decimal	INT
⊞ WriteParameterRequest.Index	10228	Decimal	INT
⊞ WriteParameterRequest.Data	16#0000_00C8	Hex	DINT
⊞ WriteParameterRequest.Subindex	3	Decimal	SINT
⊞ WriteParameterRequest.Reserved2	0	Decimal	SINT
⊞ WriteParameterRequest.SubAddress1	0	Decimal	SINT
⊞ WriteParameterRequest.SubChannel1	0	Decimal	SINT
⊞ WriteParameterRequest.SubAddress2	0	Decimal	SINT
⊞ WriteParameterRequest.SubChannel2	0	Decimal	SINT
⊟ WriteParameterResponse	{...}		SEW_Parameter_C...
⊞ WriteParameterResponse.Reserved1	0	Decimal	INT
⊞ WriteParameterResponse.Index	10228	Decimal	INT
⊞ WriteParameterResponse.Data	16#0000_00C8	Hex	DINT
⊞ WriteParameterResponse.Subindex	3	Decimal	SINT
⊞ WriteParameterResponse.Reserved2	0	Decimal	SINT
⊞ WriteParameterResponse.SubAddress1	0	Decimal	SINT
⊞ WriteParameterResponse.SubChannel1	0	Decimal	SINT
⊞ WriteParameterResponse.SubAddress2	0	Decimal	SINT
⊞ WriteParameterResponse.SubChannel2	0	Decimal	SINT
WriteParameterStart	1	Decimal	BOOL

2633165195

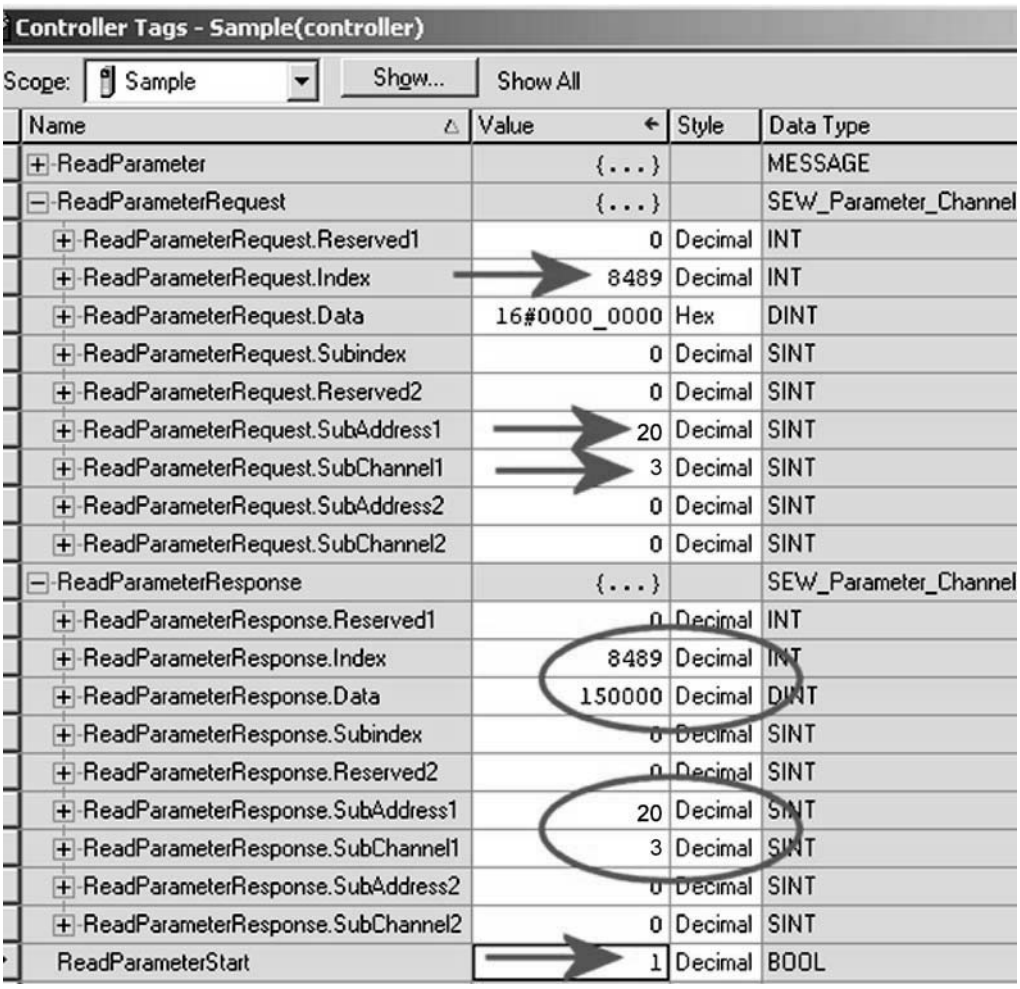
On response to the write request, *WriteParameterResponse.Index* should give the written index and *WriteParameterResponse.Data* should contain the written data. In this example, the value $C8_{hex}$ (200 dec) was written to the timeout interval RS485_1 (index 10228, subindex 3).

You can check the value in the MOVITOOLS® MotionStudio parameter tree. The tooltip of a parameter displays for example index, subindex, factor, etc. of the parameter.

5.3.3 Access to unit parameters of lower-level units

The parameters of the "PFA-..." power section that is connected to the SBus 1 of the "PFH-..." communication and control unit are accessed in the same way as the unit parameters of the "PFH-..." communication and control unit.

The only difference is that **Read/WriteParameterRequest.SubChannel1**, for example, must be set to **3** and **Read/WriteParameterRequest.SubAddress1** must be set to **SBus address 20**:



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In this example, the value 150 rpm has been read from parameter *P160 fixed setpoint n11* (Index 8489) of the "PFA-..." power section.

6 DeviceNet Operating Characteristics

6.1 Process data exchange

6.1.1 Polled I/O

The polled I/O messages correspond to the process data telegrams to MOVIPRO®. Up to 64 process data words can be exchanged between the controller and MOVIPRO® in this case. The process data length is set, for example, using the *MC_DeviceNetPDConfig* function block.

INFORMATION

The set process data length influences the process data lengths of both the polled I/O and the bit-strobe I/O messages. The process data length of the bit-strobe I/O messages is max. 4 process data words.

- If the set value for the process data length is smaller than 4, the value is adopted.
- If the set value for the process data length is larger than 4, the process data length is automatically limited to the value 4.

6.1.2 Timeout response with polled I/O

MOVIPRO® activates timeout monitoring. After a connection has been established, the master must set the timeout interval.

The DeviceNet specification refers to an "expected packet rate" rather than a timeout interval in this case. The expected packet rate is calculated on the basis of the timeout interval using the following formula:

$$t_{Timeout_inverter} = t_{Timeout_interval_polled_IO} = 4 \times t_{Expected_packet_rate_polled_IO}$$

The expected packet rate is set using the connection object class 5, instance 2, attribute 9. The range of values runs from 0 ms to 65535 ms in 5 ms steps.

The expected packet rate for the polled I/O connection is converted into the timeout interval and displayed in the device as timeout interval in index 8606 in the bus diagnostics in the parameter tree.

This timeout interval is retained in the device whenever the polled I/O connection is dropped, and the device switches to timeout status after the timeout interval has elapsed.

The timeout interval must not be altered using the PLC Editor or the IEC program because it can only be activated via the bus.

If the timeout time for the polled I/O messages has elapsed, this connection type switches to timeout status. Incoming polled I/O messages are no longer accepted.

The timeout causes a "rapid stop" of the drive.

The timeout status can be reset as follows:

- Via DeviceNet with the reset service of the connection object, class 0x05, instance 0x02, undetermined attribute,
- By interrupting the connection,
- Via reset service of the identity object, class 0x01, instance 0x01, undetermined attribute,
- Or with a restart of the MOVIPRO® unit.

6.1.3 Bit-strobe I/O

Bit-strobe I/O messages are not contained in the SEW fieldbus profile. The messages represent a DeviceNet-specific process data exchange. The master sends a broadcast message that is 8 bytes (= 64 bits) long. One bit in this message is assigned to each station in accordance with its address. The value of this bit may be "0" or "1", triggering 2 different responses in the recipient.

Bit value	Meaning
0	Sends back process input data only
1	Trigger fieldbus timeout response and send back process input data

The following table shows an example of the data range of the bit-strobe request message. This data range assigns the station address to the data bits.

Example: For example, the station with address (MAC-ID) 16 only processes bit 0 in memory byte 2.

Bit Byte	7	6	5	4	3	2	1	0
0	ID 7	ID 6	ID 5	ID 4	ID 3	ID 3	ID 1	ID 0
1	ID 15	ID 14	ID 13	ID 12	ID 11	ID 10	ID 9	ID 8
2	ID 23	ID 22	ID 21	ID 20	ID 19	ID 18	ID 17	ID 16
3	ID 31	ID 30	ID 29	ID 28	ID 27	ID 26	ID 25	ID 24
4	ID 39	ID 38	ID 37	ID 36	ID 35	ID 34	ID 33	ID 32
5	ID 47	ID 46	ID 45	ID 44	ID 43	ID 42	ID 41	ID 40
6	ID 55	ID 54	ID 53	ID 52	ID 51	ID 50	ID 49	ID 48
7	ID 63	ID 62	ID 61	ID 60	ID 59	ID 58	ID 57	ID 56

6.1.4 Timeout response with bit-strobe I/O

MOVIPRO® activates timeout monitoring. After a connection has been established, the master must set the timeout interval.

The DeviceNet specification refers to an "expected packet rate" rather than a timeout interval in this case. The expected packet rate is calculated on the basis of the timeout interval using the following formula:

$$t_{Timeout_Bit\text{-}Strobe_IO} = 4 \times t_{Expected_Packet_Rate_Bit\text{-}Strobe_IO}$$

The expected packet rate is set using the connection object class 5, instance 3, attribute 9. The range of values runs from 0 ms to 65535 ms in 5 ms steps.

If the timeout time for the bit-strobe I/O messages has elapsed, this connection type switches to timeout status. Incoming bit-strobe I/O messages are no longer accepted. The timeout is not forwarded to MOVIPRO®.

The timeout status can be reset as follows:

- Via DeviceNet with the reset service of the connection object, class 0x05, instance 0x02, undetermined attribute,
- By interrupting the connection,
- Or via reset service of the identity object, class 0x01, instance 0x01, undetermined attribute.

6.2 Common Industrial Protocol (CIP)

DeviceNet is integrated into the Common Industrial Protocol (CIP). In the Common Industrial Protocol, all unit data can be accessed via objects. The following options are integrated in MOVIPRO® with DeviceNet interface.

Class [hex]	Name
01	Identity object
03	DeviceNet object
05	Connection object
07	Register object
0F	Parameter object

6.2.1 CIP object directory

Identity object

- The identity object contains general information on the DeviceNet unit
- Class code: 01_{hex}

Class

None of the class attributes are supported.

Instance 1

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

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Vendor ID	UINT	013B	SEW-EURODRIVE GmbH & Co KG
2	Get	Device Type	UINT	0064	Manufacturer-specific type
3	Get	Product Code	UINT	0011	Product no.17: MOVIPRO®
4	Get	Revision	STRUCT of		Revision of the identity object, depends on firmware version
		Major Revision	USINT		
		Minor Revision	USINT		
5	Get	Status	WORD		See table "Coding of attribute 5 status"
6	Get	Serial number	UDINT		Unique serial number
7	Get	Product Name	SHORT_STRING	SEW MOVIPRO	Product name

"Coding of attribute 5 status" table

Bit	Name	Description
0	Owned	Controlling connection is active
1	-	Reserved
2	Configured	Configuration has been performed
3	-	Reserved
4 – 7	Extended Device Status	See "Coding of the Extended Device Status" table
8	Minor Recoverable Fault	Minor fault that can be remedied
9	Minor Unrecoverable Fault	Minor fault that cannot be remedied
10	Major Recoverable Fault	Major fault that can be remedied
11	Major Unrecoverable Fault	Major fault that cannot be remedied
12 – 15	-	Reserved

"Extended device status coding" table

Value [binary]	Description
0000	Unknown
0010	At least one faulty I/O connection
0101	No I/O connection established
0110	At least one I/O connection active

Supported services

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

Service code [hex]	Name	Instance
05	Reset	X
0E	Get_Attribute_Single	X

DeviceNet object

- The DeviceNet object provides information on the DeviceNet interface.
- Class code: 03_{hex}

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0002	Revision 2

Instance 1

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

Attribute	Access	Name	Description
1	Get	MAC ID	According to DIP switch (0 - 63)
2	Get	Baud rate	According to DIP switch (0 - 2)
3	Get	BOI	
4	Get/Set	Bus-off counter	Error counter of the physical CAN interface (0 – 255)
5	Get	Allocation information	
6	Get	MAC-ID switch changed	Information as to whether DIP switch settings vary from MAC-ID
7	Get	Baud rate switch changed	Information as to whether DIP switch settings vary from baud rate
8	Get	MAC-ID switch value	Actual DIP switch settings for MAC-ID
9	Get	Baud rate switch value	Actual DIP switch settings for baud rate

Supported services

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

Service code [hex]	Name	Class	Instance
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	–	X

Connection object

- The connection object defines the process and parameter connections.
- Class code: 05_{hex}

Class

None of the class attributes are supported.

Instance	Communication
1	Explicit message
2	Polled I/O
3	Bit-strobe I/O

Instance 1 – 3

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

Attribute	Access	Name
1	Get	State
2	Get	Instance type
3	Get	Transport class trigger
4	Get	Produce connection ID
5	Get	Consume connection ID
6	Get	Initial com characteristics
7	Get	Produced connection size
8	Get	Consumed connection size
9	Get/Set	Expected packet rate
12	Get	Watchdog timeout action
13	Get	Produced connection path len
14	Get	Produced connection path
15	Get	Consumed connection path len
16	Get	Consumed connection path
17	Get	Production inhibit time

Supported services

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

Service code [hex]	Name	Instance
0x05	Reset	X
0x0E	Get_Attribute_Single	X
0x10	Set_Attribute_Single	X

Register object

- The register object is used to access an SEW parameter index.
- Class code: 07_{hex}

Class

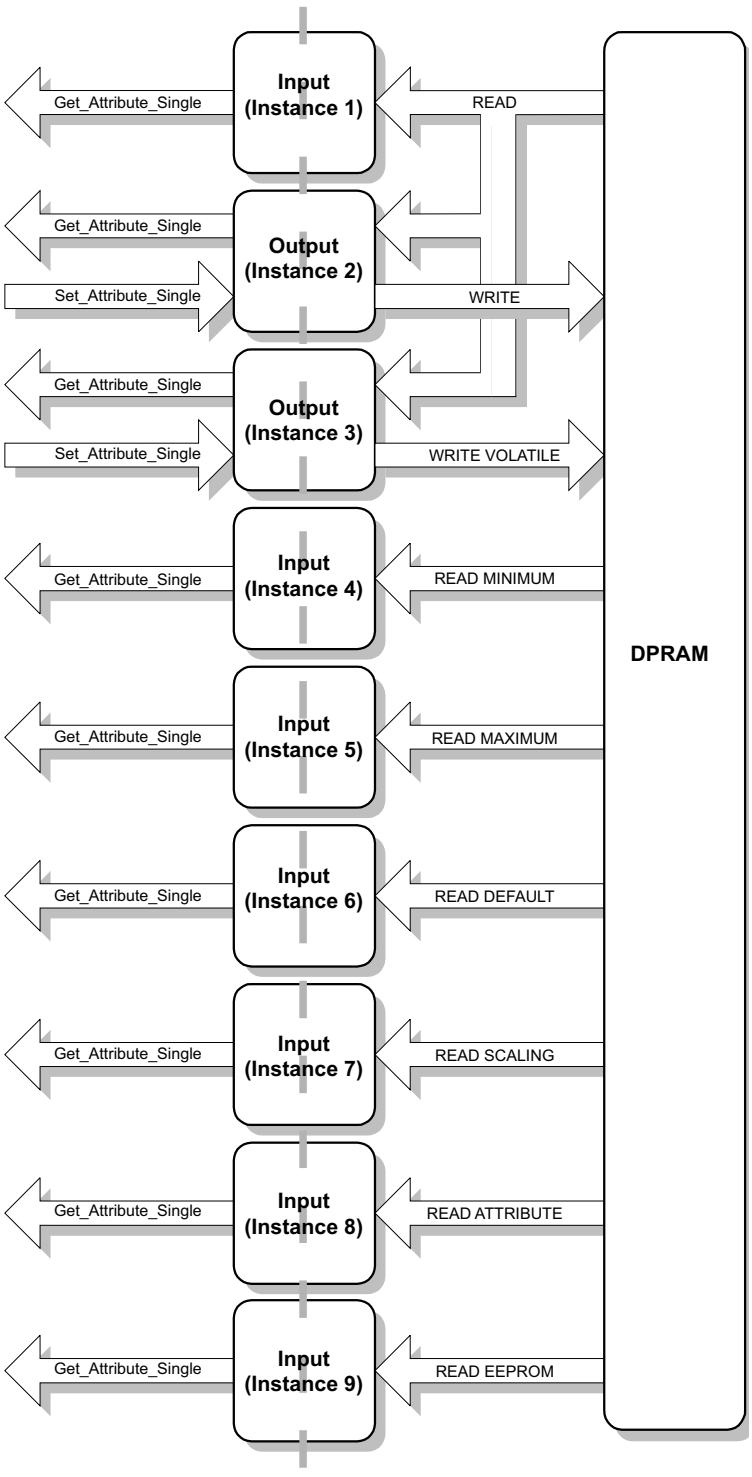
None of the class attributes are supported.

The MOVILINK® parameter services are mapped in the 9 instances of the register object. The services "Get_Attribute_Single" and "Set_Attribute_Single" are used for access.

The register object is specified so that INPUT objects can only be read, whereas OUTPUT objects can be read and written. This is why you may only access the parameter channel as follows:

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

Description of the parameter channel:



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Instance 1 – 9

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

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Bad Flag	BOOLEAN	00	0 = good 1 = bad
2	Get	Direction	BOOLEAN	00 01	00 = Input register 01 = Output register
3	Get	Size	UINT	0060	Data length in bits (96 bits = 12 bytes)
4	Get/Set	Data	ARRAY of BITS		Data in format of the SEW parameter channel

INFORMATION

Explanation of the attributes:

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

The SEW parameter channel has the following structure:

Name	Data type	Description		
Index	UINT	SEW unit index		
Data	UDINT	Data (32 bit)		
Subindex	BYTE	SEW unit subindex		
Reserved	BYTE	Reserved (must be "0")		
Subaddress 1	BYTE	0 Parameter of the MOVIPRO® control card	20	SBus address of internal "PFA-..." power section connected to the SBus 1
Subchannel 1	BYTE	0	3	Lower-level bus system, e.g. SBus 1
Subaddress 2	BYTE	Reserved (must be "0")		
Subchannel 2	BYTE	Reserved (must be "0")		

Supported services

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

Service code [hex]	Service Name	Instance
0x0E	Get_Attribute_Single	X
0x10	Set_Attribute_Single	X

Parameter object

- The fieldbus parameters of the MOVIPRO® can be addressed directly via the instance with the parameter object.
- In exceptional cases, you can also use the parameter object to access SEW parameters.
- Class code: $0F_{hex}$

INFORMATION

The data format for these instances deviates from the SEW fieldbus profile to meet the DeviceNet specification.

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
2	Get	Max Instance	UINT	0085	Maximum instance = 133
8	Get	Parameter Class Descriptor	UINT	0009	Bit 0: Supports parameter instances Bit 3: Parameters are stored in a non-volatile manner
9	Get	Configuration Assembly Interface	UINT	0000	Configuration assembly is not supported.

Instance 1 – 133

Instances 1 – 133 give access to the fieldbus parameters.

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Set/Get	Parameter	UINT	206C	Parameter to be read or written, See table "Fieldbus parameters of MOVIPRO®"
2	Get	Link Path Size	USINT	00	Not used
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C8	UDINT
6	Get	Data Size	USINT	04	Data length in bytes

Fieldbus parameters of MOVIPRO®

The following table shows the fieldbus parameters of MOVIPRO®:

Instance	Access	Group	Name	Meaning
1	Get/Set	Device parameter	PD configuration	Process data configuration
2	Get		Timeout time	Timeout interval
3	Get		Fieldbus type	DeviceNet
4	Get		Baud rate	Baud rate via DIP switches
5	Get		Station address	MAC-ID via DIP switches
6 – 69	Get	PO monitor	PO1 setpoint PO64 setpoint	Monitor of the process output data words
70 – 133	Get	PI monitor	PI1 actual value PI64 actual value	Monitor of the process input data words

Supported services

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

Service code [hex]	Service Name	Class	Instance
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	–	X

6.3 Return codes of the parameterization via explicit messages

6.3.1 SEW-specific return codes

The return codes that SEW units issue in case of incorrect parameterization are independent of the fieldbus. However, in conjunction with DeviceNet, the return codes are returned in the following format. The table shows an example of the data format for a parameter response message.

	Byte offset			
	0	1	2	3
Function	MAC ID	Service code [=94_{hex}]	General Error Code	Additional code
Example	01_{hex}	94_{hex}	$1F_{hex}$	10_{hex}

- MAC-ID is the DeviceNet address
- The *Service code* of an error telegram is always *94_{hex}*
- The *general error code* of an manufacturer-specific return code is always *$1F_{hex}$*

  The *additional code* is then defined in the SEW fieldbus unit profile

  See "Additional code" table (page 49).
- The *general error codes $D0_{hex}$* and $D1_{hex}$ indicate a MOVILINK® protocol error, e.g. incorrect address information.

  See "MOVILINK®-specific return codes" table (page 48).

The table shows the proprietary error *10_{hex} = Illegal parameter index.*

6.3.2 Return codes of DeviceNet

DeviceNet-specific return codes are sent in the error message if the data format is not maintained during the transfer or if a service is performed which has not been implemented. The coding of these return codes is described in the DeviceNet specification (see section "General Error Codes" (page 47)).

6.3.3 Timeout response of explicit messages

MOVIPRO® activates timeout monitoring. After a connection has been established, the master must set the timeout interval.

The DeviceNet specification refers to an "expected packet rate" rather than a timeout interval in this case. The expected packet rate is calculated on the basis of the timeout interval using the following formula:

$$t_{Timeout_explicit_messages} = 4 \times t_{Expected_packet_rate_explicit_messages}$$

The expected packet rate is set using the connection object class 5, instance 1, attribute 9. The range of values runs from 0 ms to 65535 ms in 5 ms steps.

If a timeout is triggered for the explicit messages, this connection type for the explicit messages is disconnected automatically providing that the polled I/O or bit-strobe con-

nections are not in the ESTABLISHED state. This is the default setting of DeviceNet. The connection for explicit messages must be re-established to communicate with these messages again. The timeout is **not** forwarded to MOVIPRO®.

6.3.4 General error codes

DeviceNet-specific error codes:

General error code [hex]	Error name	Description
00 – 01		Reserved for DeviceNet.
02	Resource unavailable	The source required for performing the service is unavailable.
03 – 07		Reserved for DeviceNet
08	Service not supported	The service is not supported for the selected class/instance.
09	Invalid attribute value	Invalid attribute data have been sent.
0A		Reserved for DeviceNet.
0B	Already in requested mode/state	The selected object is already in the requested mode/state.
0C	Object state conflict	The selected object cannot perform the service in its current status.
0D		Reserved for DeviceNet.
0E	Attribute not settable	It is not possible to access the selected object for writing.
0F	Privilege violation	Violation of access right.
10	Device state conflict	The current status of the device makes it impossible to perform the required service.
11	Reply data too large	The length of the transmitted data is longer than the size of the receive buffer.
12		Reserved for DeviceNet.
13	Not enough data	The length of the transferred data is too short for the service to be performed
14	Attribute not supported	The selected attribute is not supported.
15	Too much data	The length of the transferred data is too long for the service to be performed.
16	Object does not exist	The selected object is not implemented in the device.
17		Reserved for DeviceNet.
18	No stored attribute data	The requested data have not been stored previously.
19	Store operation failure	The data could not be stored because an error occurred while saving them.
1A – 1E		Reserved for DeviceNet.
1F	Vendor specific error	Manufacturer-specific error (see "SEW Fieldbus Unit Profile" manual).
20	Invalid parameter	Invalid parameter. This error message is used when a parameter does not satisfy the requirements of the specification and/or the requirements of the application.
21 – CF	Future extensions	Reserved by DeviceNet for additional definitions.
D0 – DF	Reserved for Object Class and service errors	Use this area if an occurring error cannot be entered in one of the error groups listed above.

6.3.5 MOVILINK®-specific return codes

The following table lists the MOVILINK® protocol-specific error messages and their coding in the DeviceNet response telegram.

General error code [hex]	Additional code [hex]	Error name	Corresponds to MOVILINK® Error code [hex]	Corresponds to MOVILINK® Additional code [hex]
0xD0	0xF0	Unknown error	0x05	0x00
	0xF1	Illegal Service		0x01
	0xF2	No Response		0x02
	0xF3	Different Address		0x03
	0xF4	Different Type		0x04
	0xF5	Different Index		0x05
	0xF6	Different Service		0x06
	0xF7	Different Channel		0x07
	0xF8	Different Block		0x08
	0xF9	No Scope Data		0x09
	0xFA	Illegal Length		0x0A
	0xFB	Illegal Address		0x0B
	0xFC	Illegal Pointer		0x0C
	0xFD	Not enough memory		0x0D
	0xFE	System Error		0x0E
0xD1	0xF0	Communication does not exist		0x0F
	0xF1	Communication not initialized		0x10
	0xF2	Mouse conflict		0x11
	0xF3	Illegal Bus		0x12
	0xF4	FCS Error		0x13
	0xF5	PB Init		0x14
	0xF6	SBUS – Illegal Fragment Count		0x15
	0xF7	SBUS – Illegal Fragment Type		0x16
	0xF8	Access denied		0x17
	0xF9 – 0xFE	Not used		

6.3.6 Additional code

The additional code contains SEW-specific return codes for incorrect parameter setting of the inverters.

General Error Code	Additional code[1)]	Meaning
0x1F	0x00	No Error
	0x10	Illegal Index
	0x11	Not yet implemented
	0x12	Read only
	0x13	Parameter Blocking
	0x14	Setup runs
	0x15	Value too large
	0x16	Value too small
	0x17	Required Hardware does not exist
	0x18	Internal Error
	0x19	Access only via RS485
	0x1A	Access only via RS485
	0x1B	Parameter protected
	0x1C	"Controller inhibit" required
	0x1D	Value invalid
	0x1E	Setup started
	0x1F	Buffer overflow
	0x20	"No enable" required
	0x21	End of File
	0x22	Communication Order
	0x23	"IPOS stop" required
	0x24	Auto setup
	0x25	Encoder Nameplate Error
	0x29	PLC State Error

1) These error codes correspond to the MOVILINK® additional codes in error class 0x08.

6.4 Definitions

Term	Description
Allocate	Provides a service for setting up a connection.
Attributes	Attribute of an object class or instance. Describes the characteristics of the object class or instance in more detail.
BIO – Bit-strobe I/O	All stations can be addressed with a broadcast message. The addressed stations respond with the process input data.
Class	DeviceNet object class
DeviceNet scanner	Plug-in module for the Allen Bradley PLC which connects the PLC fieldbus to the peripheral devices
DUP-MAC check	Duplicate MAC-ID test
Explicit message body	Includes the class no., instance no., attribute no. and the data.
Explicit message	Parameter data message; assists in addressing the DeviceNet objects
Get_Attribute_Single	Read service for a parameter.
Instance	Instance of an object class. Divides the object classes into additional subgroups.
MAC ID	Media Access Control Identifier: node address of the device.
M-File	Provides the data range between the PLC and the scanner module.
Mod/Net	Module/network
Node ID	Node address = MAC-ID
PIO – Polled I/O	Process data channel of DeviceNet; allows process output data to be sent and process input data to be received
Release	Provides a service for setting up a connection
Reset	Provides a service for resetting an error.
Rung	SLC500 program line
Service	Service performed via bus, e.g. read service, write service, etc.
Set_Attribute_Single	Write service for a parameter.

7 Error Diagnostics for Operation on the DeviceNet Fieldbus

7.1 Diagnostic procedure

The diagnostic procedures described in the following section demonstrate the fault analysis methods for the following problems:

- MOVIPRO® does not work on DeviceNet
- MOVIPRO® cannot be controlled using the DeviceNet master

7.1.1 Step 1: Check the Status LED and the Status display of the DeviceNet scanner

See documentation of the DeviceNet scanner.

7.1.2 Step 2: Check the Status LEDs of the MOVIPRO®

See chapter "Status LED" (page 23).

7.1.3 Step 3: Error diagnostics

If the MOVIPRO® status is "Connected" or "Module error" (LED S1 lights up green), the data exchange between master (scanner) and slave (MOVIPRO®) is active. If it is still not possible to transmit data to the MOVIPRO® across DeviceNet, the following steps should help you to diagnose the error.

A Are the correct values for the process data words displayed in the parameter tree?

If yes, continue with F.

B Is bit 0 in the DeviceNet control register of the PLC set to "1" to activate the exchange of process data?

C Are the process data words copied to the right offset in the Local I/O tag of the DeviceNet scanner? Check the tags and scanner mapping.

D Is the PLC in RUN mode or does active forcing overwrite the transfer of the normal process data words?

E If the PLC is not sending data to the MOVIPRO®, consult the PLC manufacturer.

F If the cycle time for exchanging process data is longer than expected, calculate the bus load.

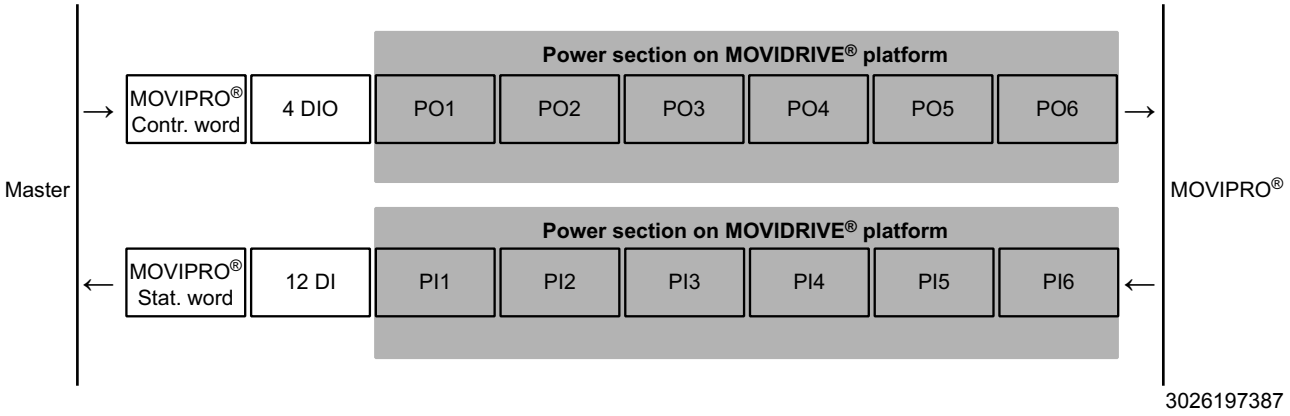
Example:

64 process data words from and to a DeviceNet slave are transmitted in ca. 11 ms at a baud rate of 500 kBaud. When operating 2 units with 64 process data words each, the shortest possible cycle time is about twice as long: ca. 22 ms. Halving the baud rate means doubling the cycle time.

8 Process Data Description

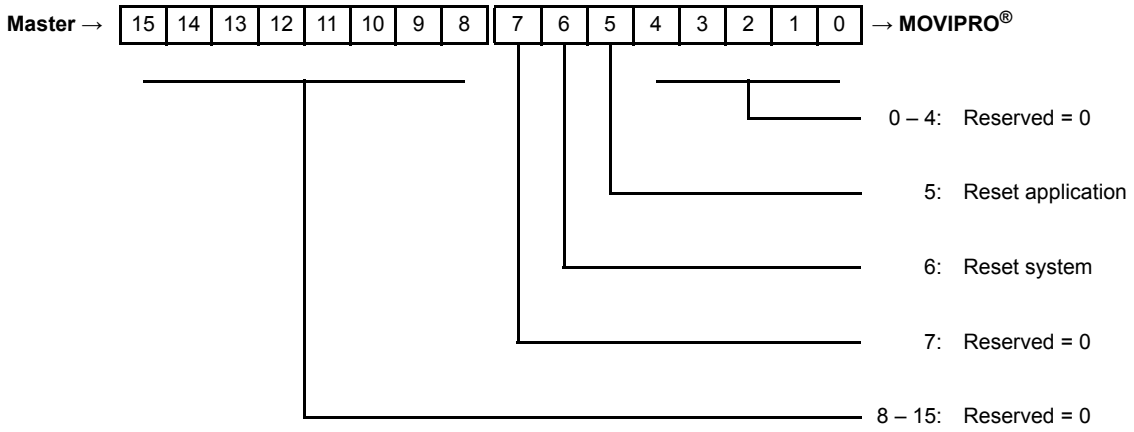
8.1 Overview of process data

The following illustration provides an overview of the assignment of the process output/ input data (PO/PI) of MOVIPRO® SDC:



8.2 MOVIPRO® control word

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

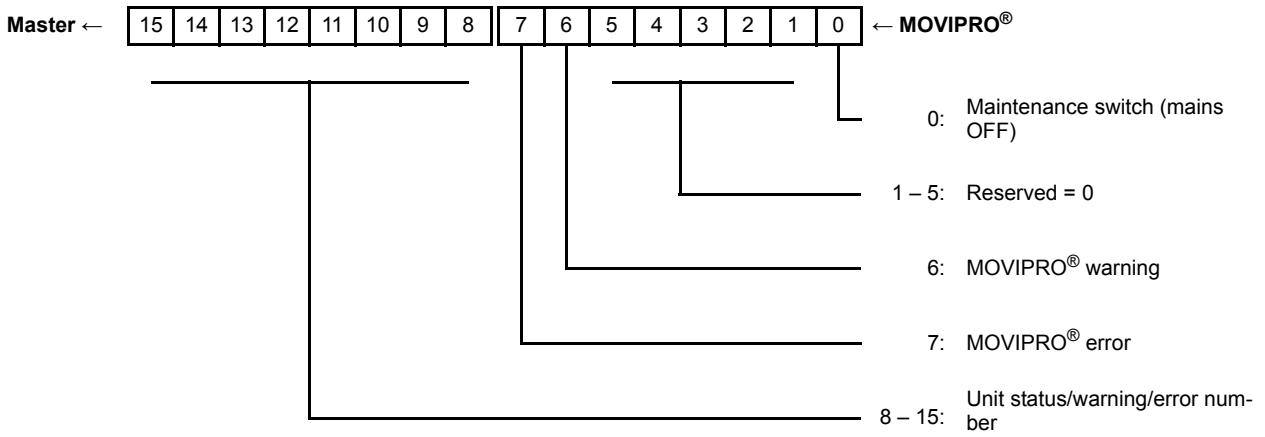


The following table shows the functions of the MOVIPRO® control word:

Bit	Meaning	Explanation
0 – 4	**Reserved**	0 = reserved
5	**Reset application**	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.
6	**Reset system**	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

8.3 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

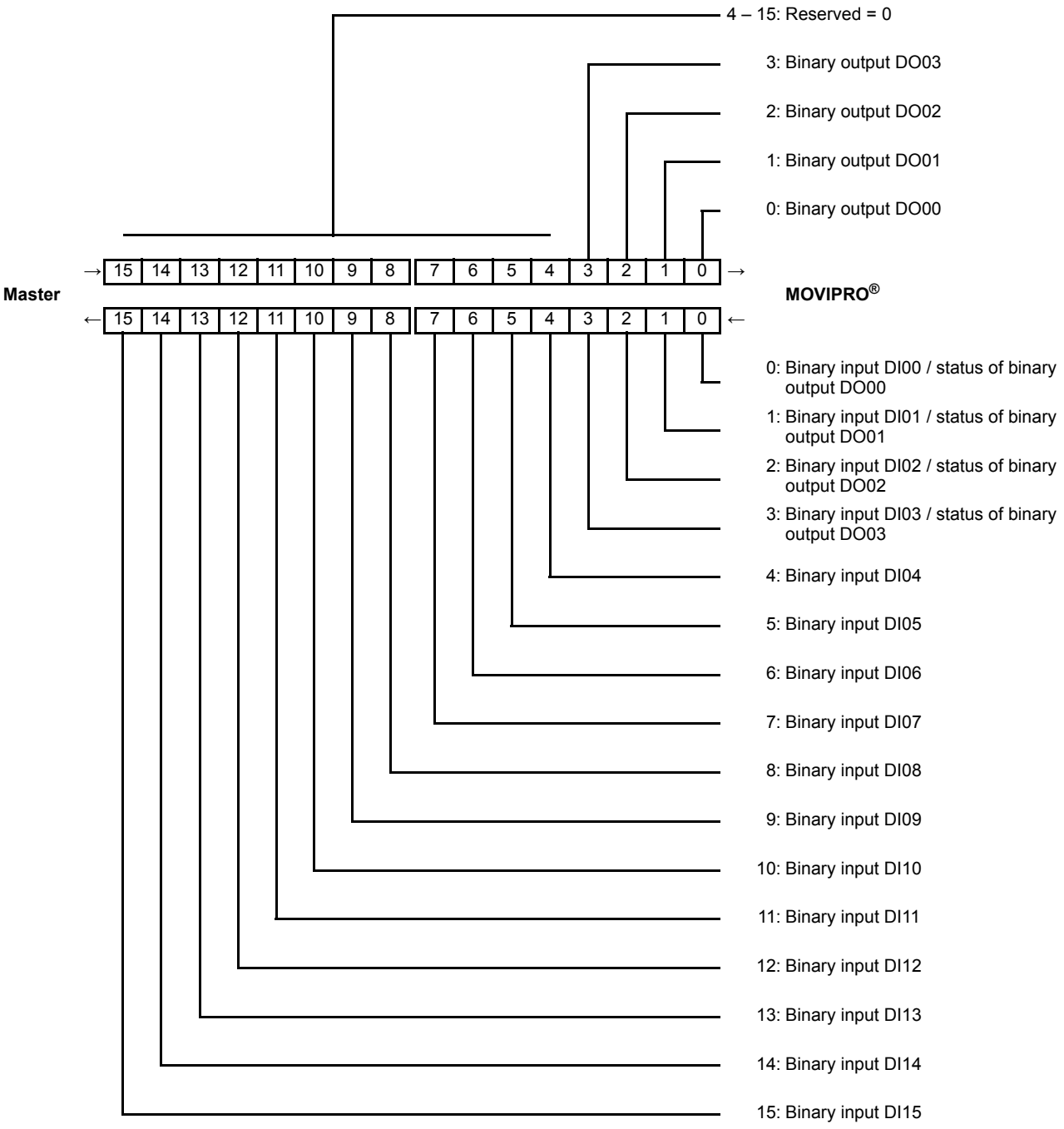
The following table shows the diagnostics information of the MOVIPRO® unit that is processed in the higher-level PLC application. The signals are transferred to the controller via parameters and, if necessary, via the process data channel.

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 – 5	**Reserved**	0 = reserved
6	**MOVIPRO® warning**	MOVIPRO® warning 1 = MOVIPRO® warning present 0 = OK
7	**MOVIPRO® error**	MOVIPRO® error 1 = MOVIPRO® error present 0 = OK
8 – 15	**Unit status/warning/error number/**	Unit status (bit 6 = 0, bit 7 = 0): • 0: System startup • 1: Ready Warning (bit 6 = 1, bit 7 = 0) Error number (bit 6 = 0, bit 7 = 1) • 1: Configuration → no configuration available • 2: Configuration → Connection to configured units could not be established • 5: Process data to lower-level units stopped • 99: Internal system error • 110: Actuator voltage overload • 120: Overload sensor voltage group 1 • 121: Overload sensor voltage group 2

8.4 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):



8.5 Process data of power section

The process data words of the integrated power section on the MOVIDRIVE® platform are assigned differently depending on the application module used. The number of process data words can vary between 1 - 6 depending on the application module.

8.5.1 Speed-controlled drive

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

PO:

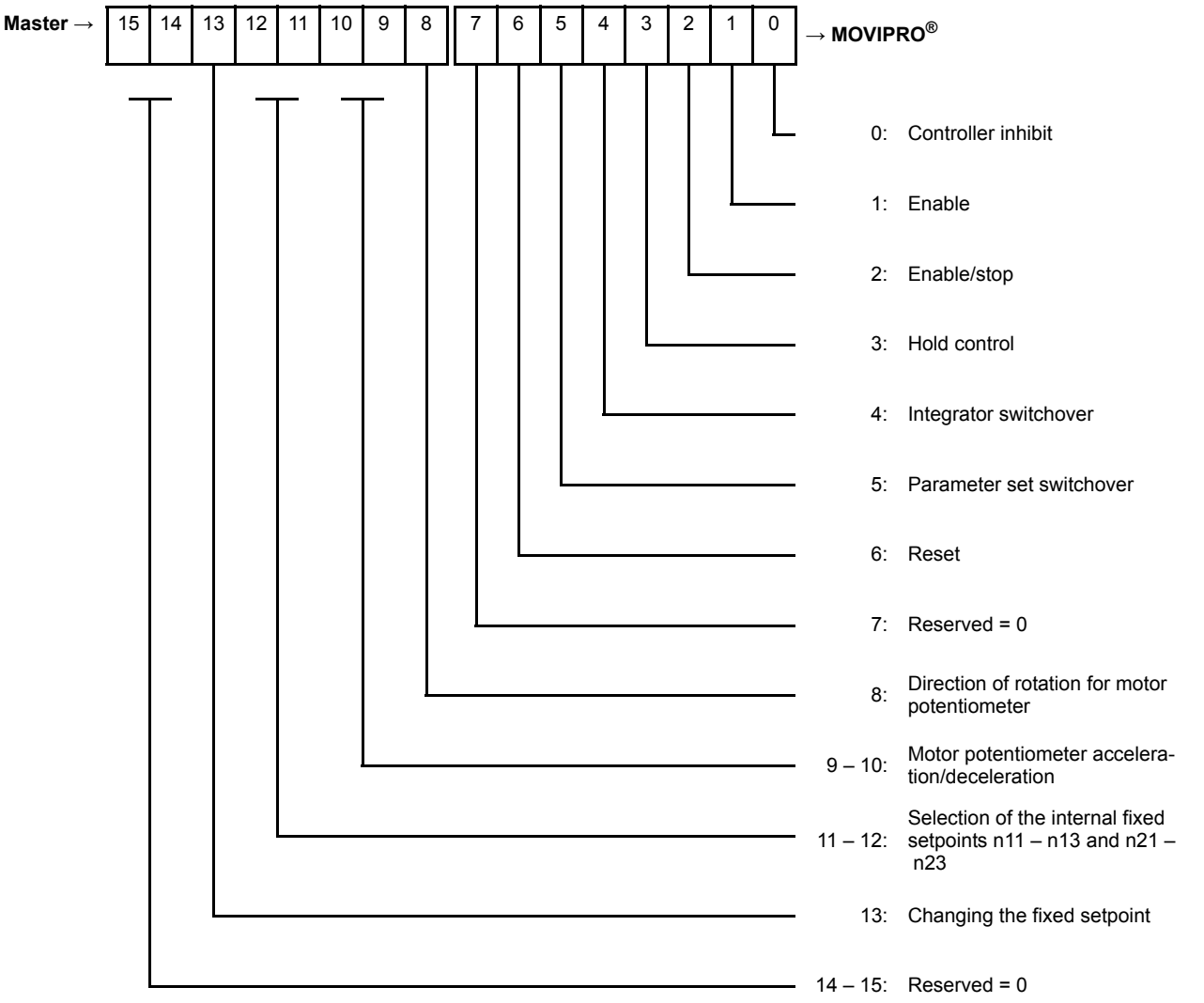
- PO1: Control word 1
- PO2: Setpoint speed
- PO3: Ramp

PI:

- PI1: Status word 1
- PI2: Actual speed
- PI3: Active current

Control word 1

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

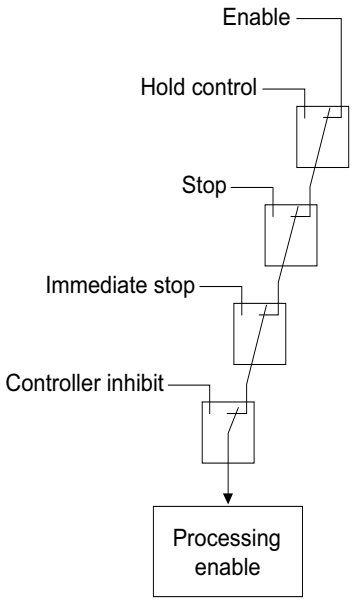


The following table shows the assignment of control word 1:

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.

Bit	Meaning	Explanation
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

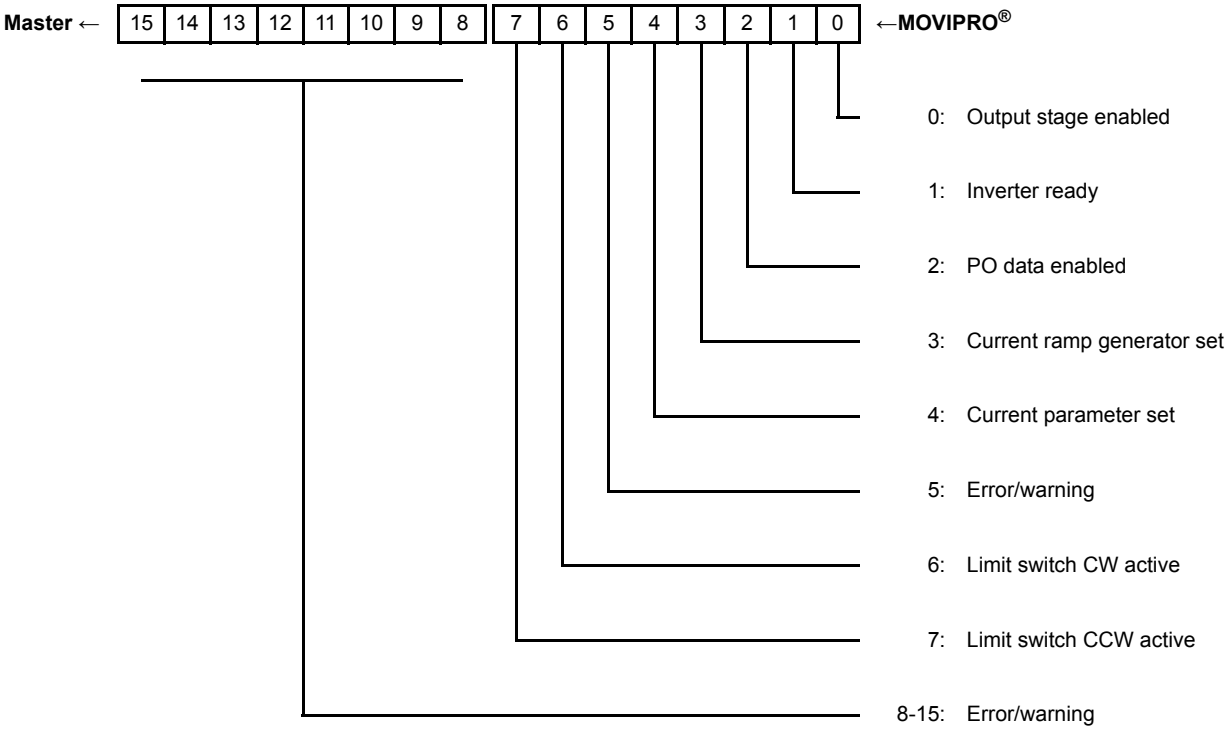
Range: 100 ms - 65 s

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 139).



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

8.5.2 "Bus positioning" application module

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

PO:

- PO1: Control word 2
- PO2: Setpoint speed
- PO3: Target position

PI:

- PI1: Status word
- PI2: Actual velocity
- PI3: Actual position

For further information, refer to the following documentation:

Documentation	Publication number
"MOVIDRIVE® MD_60A Bus Positioning Application Module" manual	0918421x/EN

8.5.3 "Extended bus positioning" application module

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

PO:

- PO1: Control word 2
- PO2: Target pos. high
- PO3: Target pos. low
- PO4: Setpoint speed
- PO5: Acceleration ramp
- PO6: Deceleration ramp

PI:

- PI1: Status word
- PI2: Actual pos. high
- PI3: Actual pos. low
- PI4: Actual velocity
- PI5: Active current
- PI6: Unit utilization

For further information, refer to the following documentation:

Documentation	Publication number
"MOVIDRIVE® MDX61B Extended Bus Positioning Application Module" manual	11335114/EN

8.5.4 "Modulo positioning" application module

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

PO:

- PO1: Control word 2
- PO2: Target pos. high
- PO3: Target pos. low
- PO4: Setpoint speed
- PO5: Acceleration ramp
- PO6: Deceleration ramp

PI:

- PI1: Status word
- PI2: Actual pos. high
- PI3: Actual pos. low
- PI4: Actual velocity
- PI5: Active current
- PI6: Unit utilization

For further information, refer to the following documentation:

Documentation	Publication number
"MOVIDRIVE® MDX60B/61B Modulo Positioning Application" manual	11349212/EN

8.5.5 "Table positioning" application module

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

PO:

- PO1: Control word 2

PI:

- PI1: Status word

For further information, refer to the following documentation:

Documentation	Publication number
"MOVIDRIVE® MDX61B Table Positioning Application" manual	11640626/EN

8.5.6 "Sensor-based positioning via bus" application module

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

PO:

- PO1: Control word 2
- PO2: Setpoint speed
- PO3: Setpoint position

PI:

- PI1: Status word
- PI2: Actual velocity
- PI3: Actual position

For further information, refer to the following documentation:

Documentation	Publication number
"MOVIDRIVE MDX61B Sensor-Based Positioning Via Bus Application" manual	11313528/EN

8.5.7 "Automotive AMA0801" application module

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

PO:

- PO1: Control word 2
- PO2: Target position high or 16 single-bit positions
- PO3: Target position low or correction value high
- PO4: Setpoint speed or correction value low
- PO5: Ramp up/down or reserved
- PO6: Sync offset

PI:

- PI1: Status word
- PI2: Actual pos. high
- PI3: Actual pos. low
- PI4: Actual speed or single-bit position signal and drive does not rotate
- PI5: Position difference master-slave or 16 single-bit cams
- PI6: Active current

For further information, refer to the following documentation:

Documentation	Publication number
"MOVIDRIVE® MDX61B AMA0801 Automotive Application Module" manual	16629612/EN

9 MOVITOOLS® MotionStudio – Operation

9.1 About MOVITOOLS® MotionStudio

9.1.1 Tasks

The software package enables you to perform the following tasks with consistency:

- Establishing communication with units
- Executing functions with the units

9.1.2 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 (RS-485) 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 units and its communication options.

9.1.3 Executing functions with the units

The software package offer uniformity in executing the following functions:

- Parameterization (for example in the parameter tree of the unit)
- Startup
- Visualization and diagnostics
- Programming

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

- MotionStudio
- MOVITOOLS®

All functions communicate using **tools**. MOVITOOLS® MotionStudio provides the right tools for every unit type.

9.2 First steps

9.2.1 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 name and storage location.

9.2.2 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, see the section regarding the relevant communication type.

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

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3. Select the unit you want to configure.
4. Right-click to open the context menu.

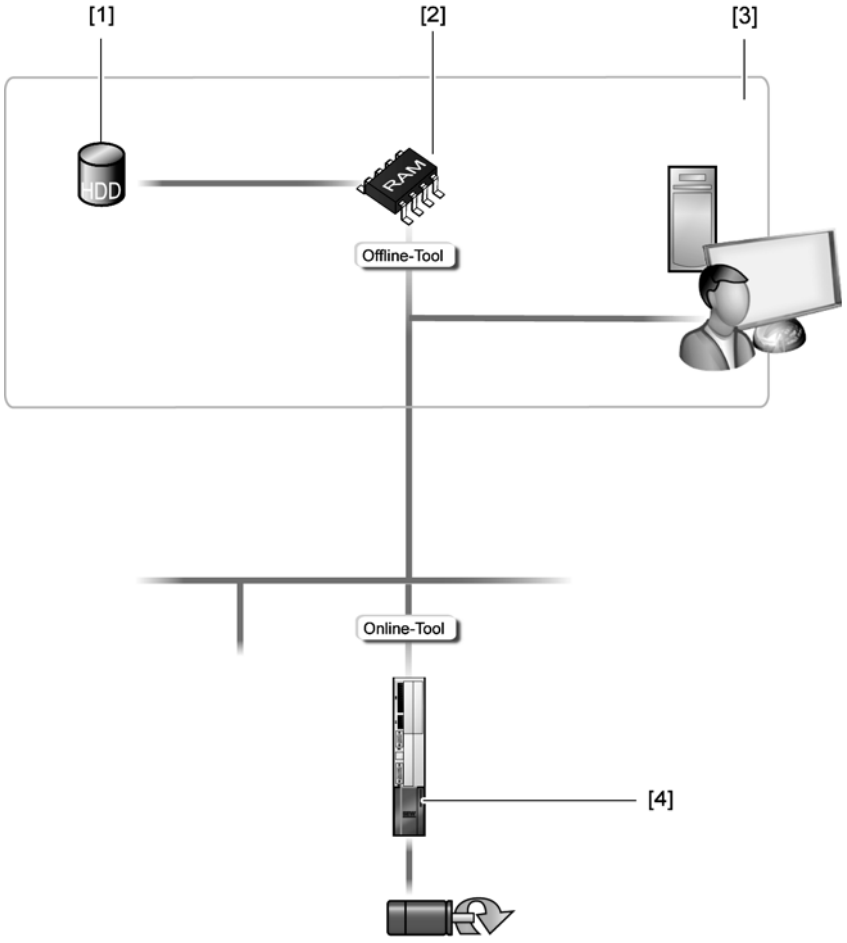
   As a result you will see a number of unit-specific tools to execute various functions with the units.

9.3 Connection mode

9.3.1 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. • 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.

9.3.2 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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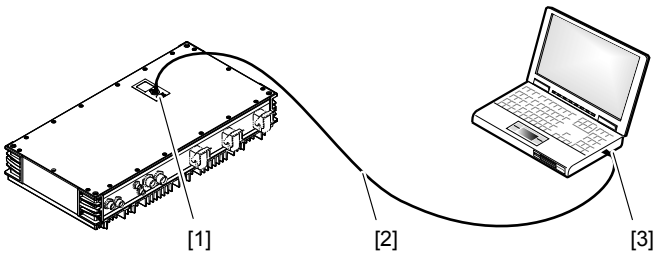
[1] "Switch to online mode" symbol
[2] "Switch to offline mode" symbol

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

9.4 Communication via Ethernet

9.4.1 Connection of PC/laptop

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



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[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 MOVIPRO®:

Standard IP address	192.168.10.4
Subnet mask	255.255.255.0

Setting the IP address of the engineering computer

Proceed as follows to set the IP address of the engineering computer:

1. Under [Start] / [Setup] / [Network connections], choose the PC interface you require and select the properties window of the PC interface from the context menu.
2. Activate the option "Use this IP address" in the property window of the "Internet protocol (TCP/IP)" entry.
3. Enter the net mask set in the MOVIPRO® (e.g. 255.255.255.0).
4. Set the IP address depending on the net mask. Apart from the sections determined by the net mask, the IP addresses of the MOVIPRO® unit and the PC interface must differ. In the area defined by the net mask, the IP addresses must be the same. The last block of the IP address must not be 0, 4, or 255.

9.4.2 Adjusting the engineering PC to the network (address)

Proceed as follows to adjust (address) the engineering PC to the network:

1. Select the following item from the Windows start menu:

   [Start] / [Setup] / [Network connections]
2. Select the corresponding PC interface.
3. Select "Properties" from the context menu.
4. Activate the checkbox with the entry "Internet protocol (TCP/IP)".
5. Click on "Properties".
6. Activate the "Use the following IP address" checkbox.

7. Enter the same IP addresses for the subnet mask and the standard gateway as for the other Ethernet stations in this local network.
8. 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 the other Ethernet stations.
   - In the blocks that define the **station**, 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 subnetwork 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 stations are located.
     – "0", defines the address of the actual station to distinguish it from other stations.

9.4.3 Configuring the communication channel via Ethernet

Proceed as follows to configure a communication channel for Ethernet:

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

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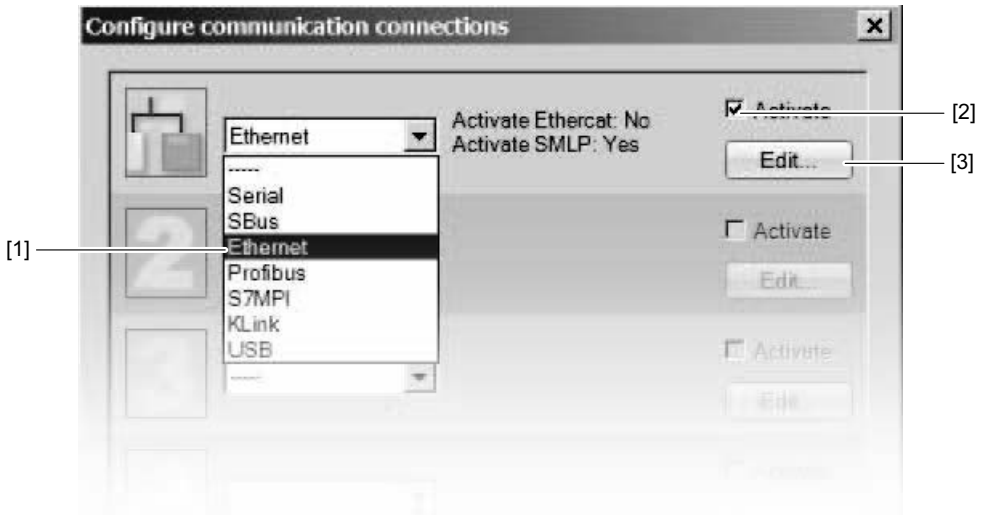
[1] "Configure communication plugs" symbol

This opens the "Configure communication plugs" window.



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[1] "Type of communication" selection list
[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. It 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".

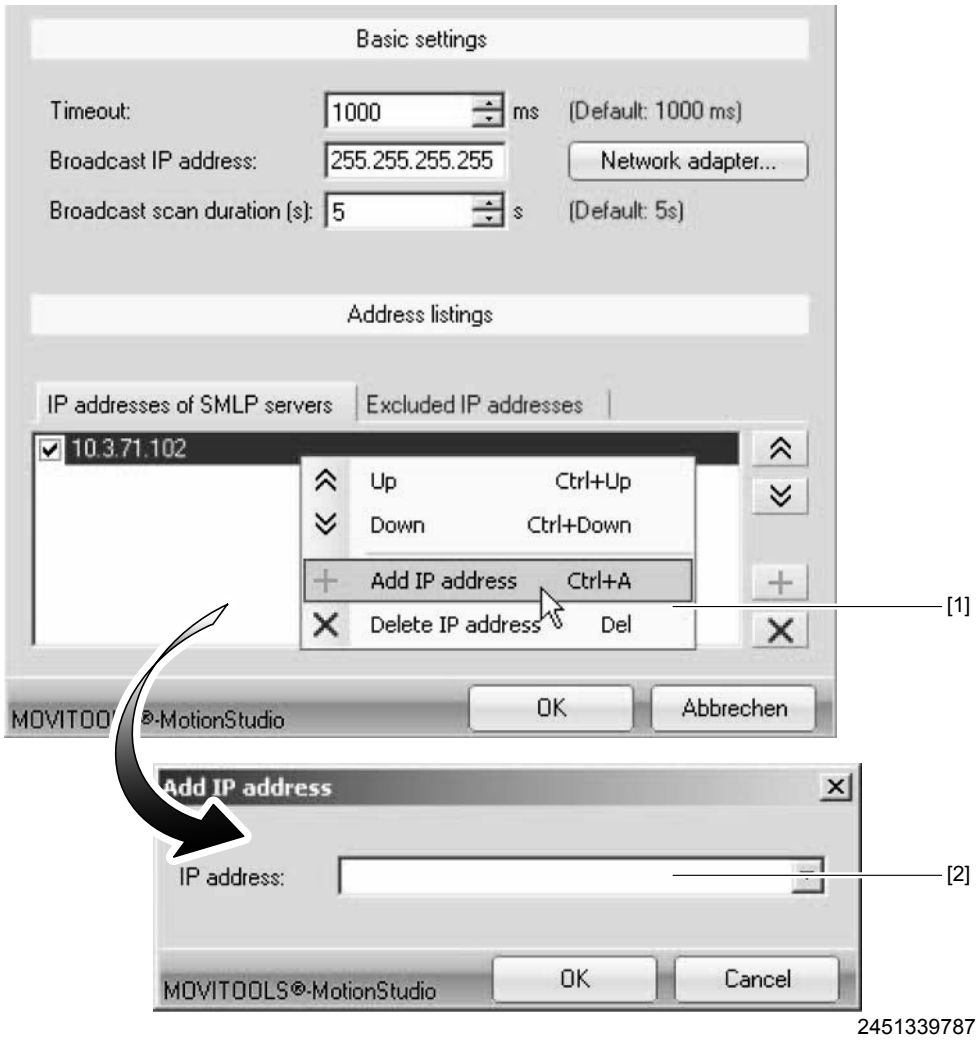
9.4.4 Setting communication parameters for SMLP

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]..



[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.

9.4.5 Communication parameters for SMLP

The following table describes the communication parameters for SMLP:

Communication parameters	Description	Note
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)

9.5 Executing functions with the units

9.5.1 Parameterizing units

Units are parameterized in the parameter tree. It displays all unit parameters, grouped into folders.

You can manage the unit parameters using the context menu and the toolbar. The following steps illustrate how to read/edit unit parameters.

9.5.2 Reading or changing unit parameters

To read or change unit parameters, proceed as follows:

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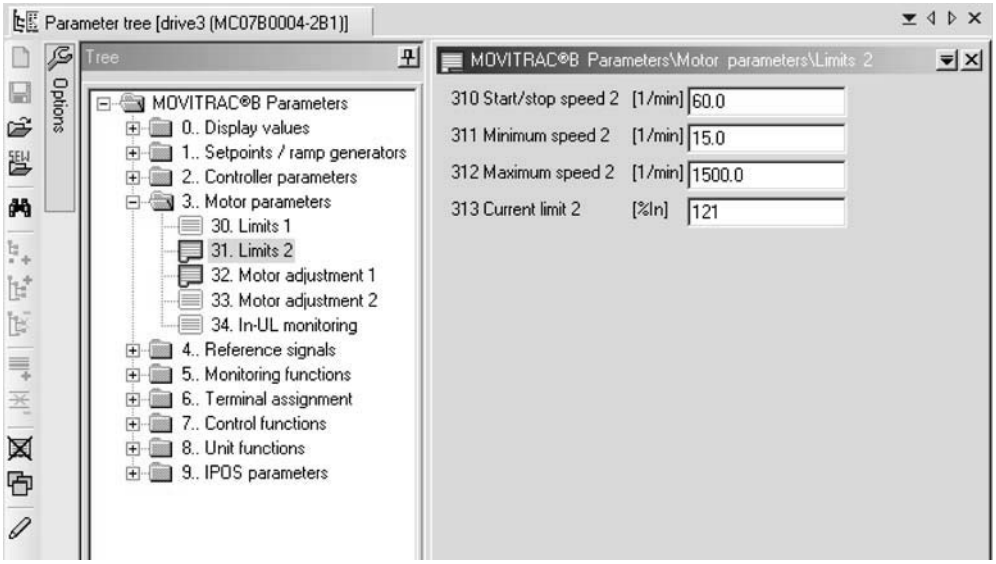
[1] "Switch to online mode" symbol
[2] "Switch to offline mode" symbol

3. Select the unit you want to set parameters for.
4. Open the context menu and select the [Parameter tree] command.

   Then, the "Parameter tree" view opens on the right section of the screen.
5. Expand the "Parameter tree" up 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

- Refer to the parameter list in the unit documentation for detailed information on the unit parameters.

9.5.3 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" symbol

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

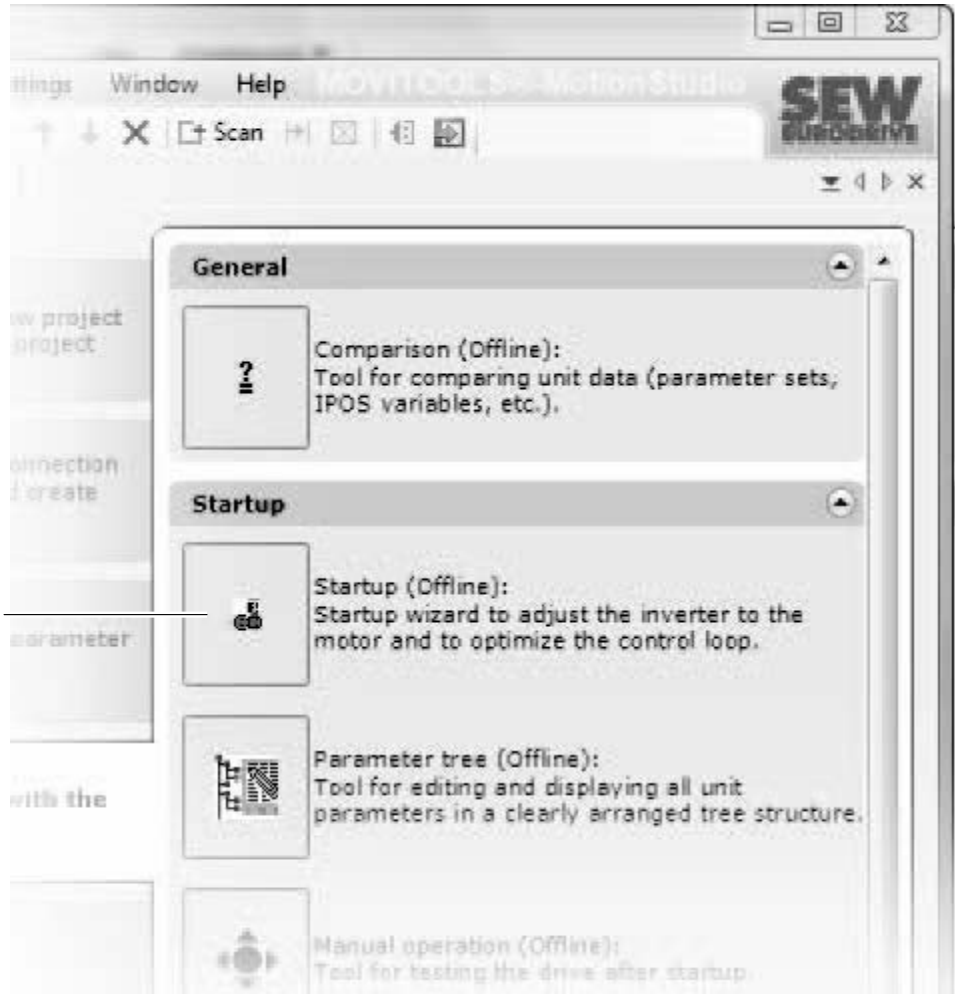
   The Startup wizard opens.
5. Follow the instructions of the startup wizard and then load the startup data onto your unit.

10 MOVIPRO® – Parameterization

10.1 Encoder configuration

10.1.1 Encoder startup

1. Start MOVITOOLS® MotionStudio and create a new project. For more information, refer to section "Operation of MOVITOOLS® MotionStudio" (page 64).
2. Click on the [Startup] button [1] to call the startup wizard.



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[1] [Startup] button

3. Click on the [Next] button [1] to go to the next step of the startup wizard. You can go back and forth in the wizard using the [Back] and [Next] buttons. The settings are not lost.

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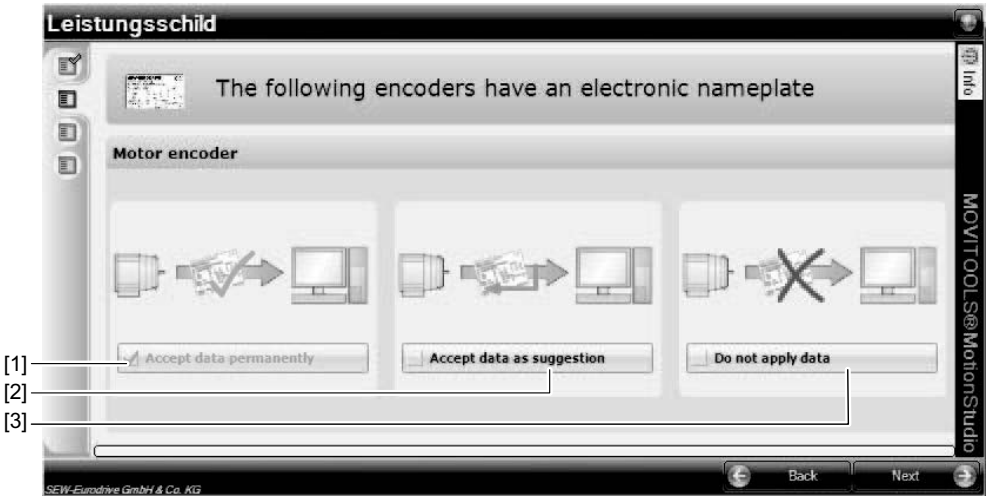
4. If the drive is equipped with an electronic nameplate, you can transfer the read-off data. The buttons have the following functions:

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 the encoder data manually.



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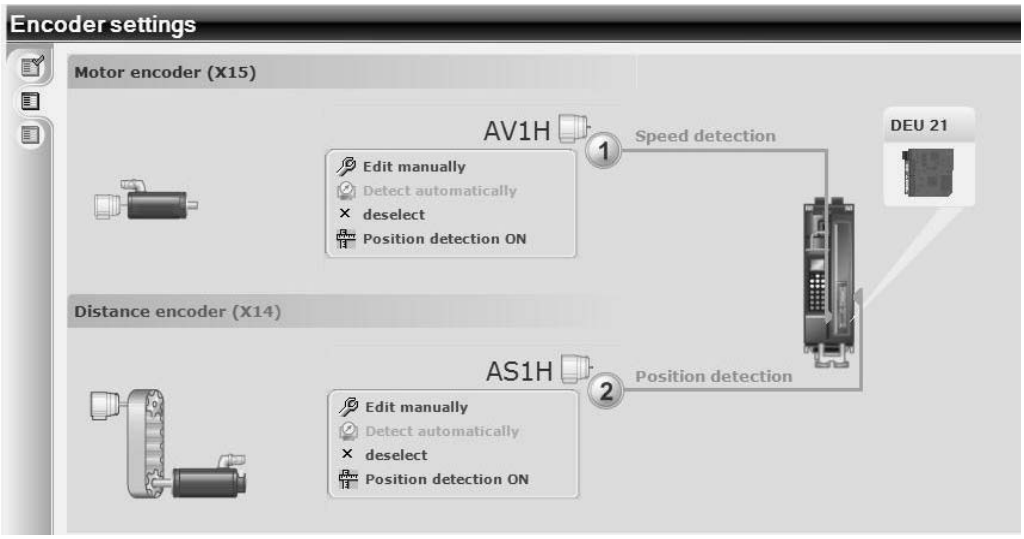
5. Select the encoder settings for the motor and – if applicable – for the distance encoder. You have the following options:
   - "Manual editing", in order to select and parameterize an encoder.
   - "Automatic detection", in order to read out the connected encoder. This is only possible with the following 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" in order to determine the source of the actual values.



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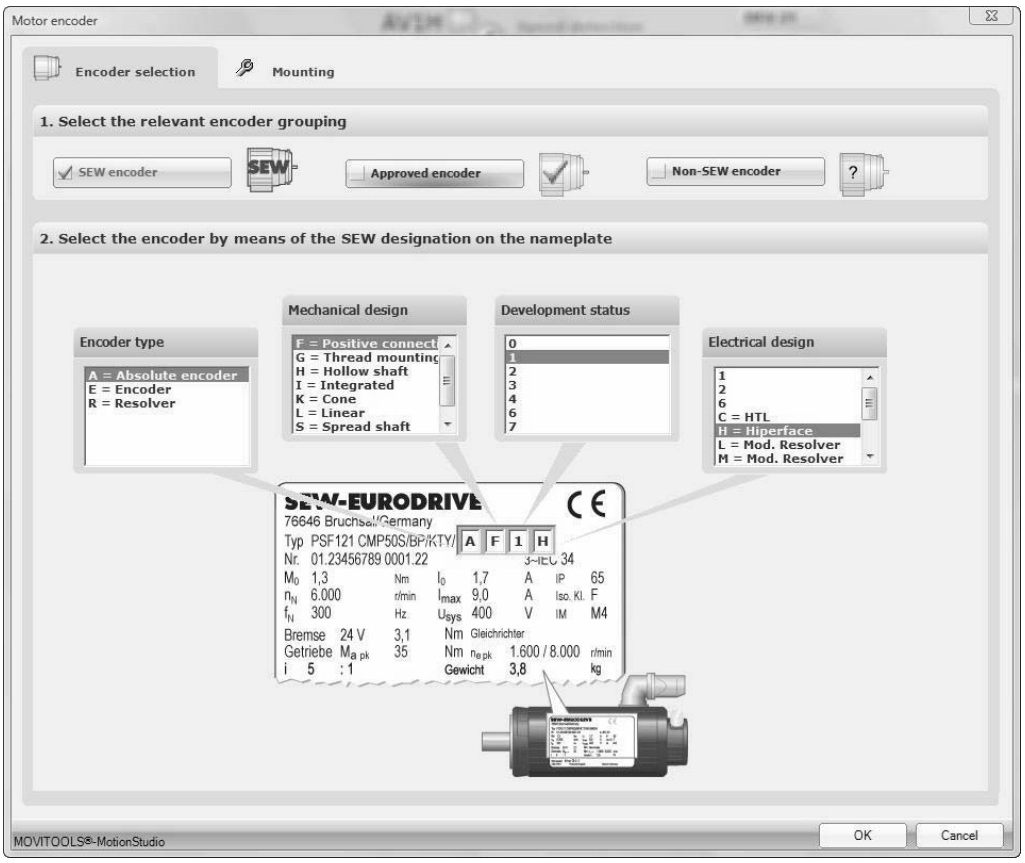
Editing SEW encoders manually

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.



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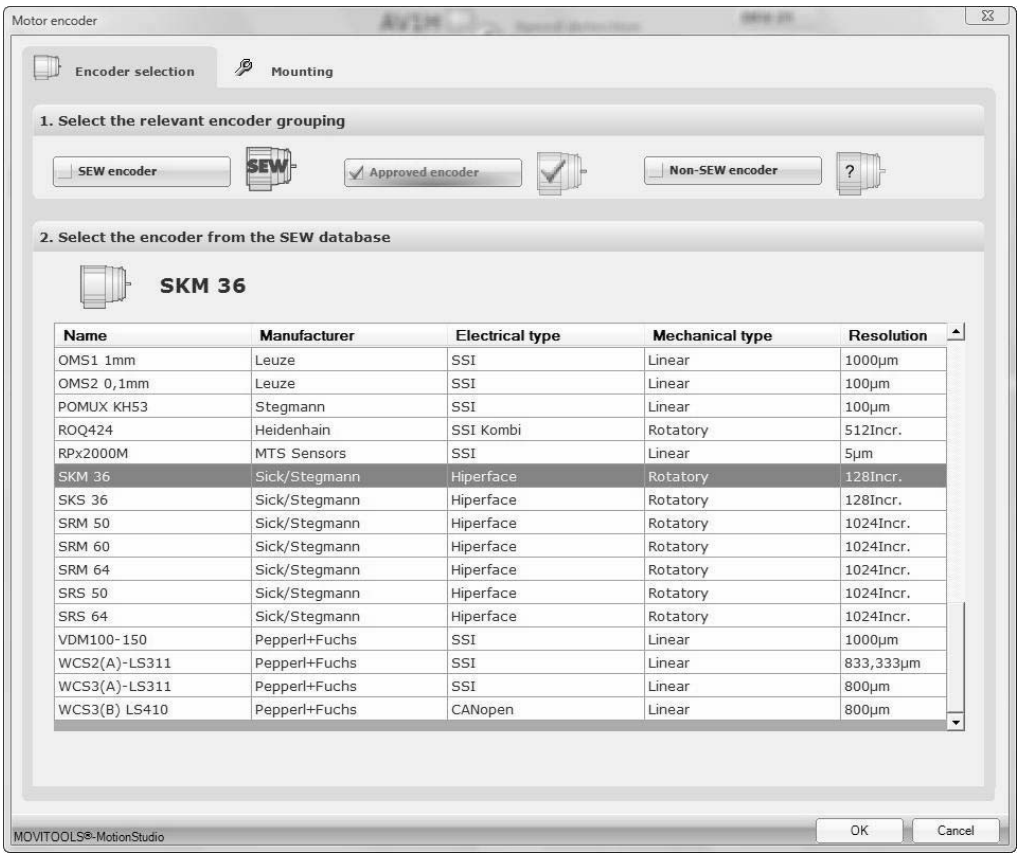
Editing approved encoders

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



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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 the encoder.

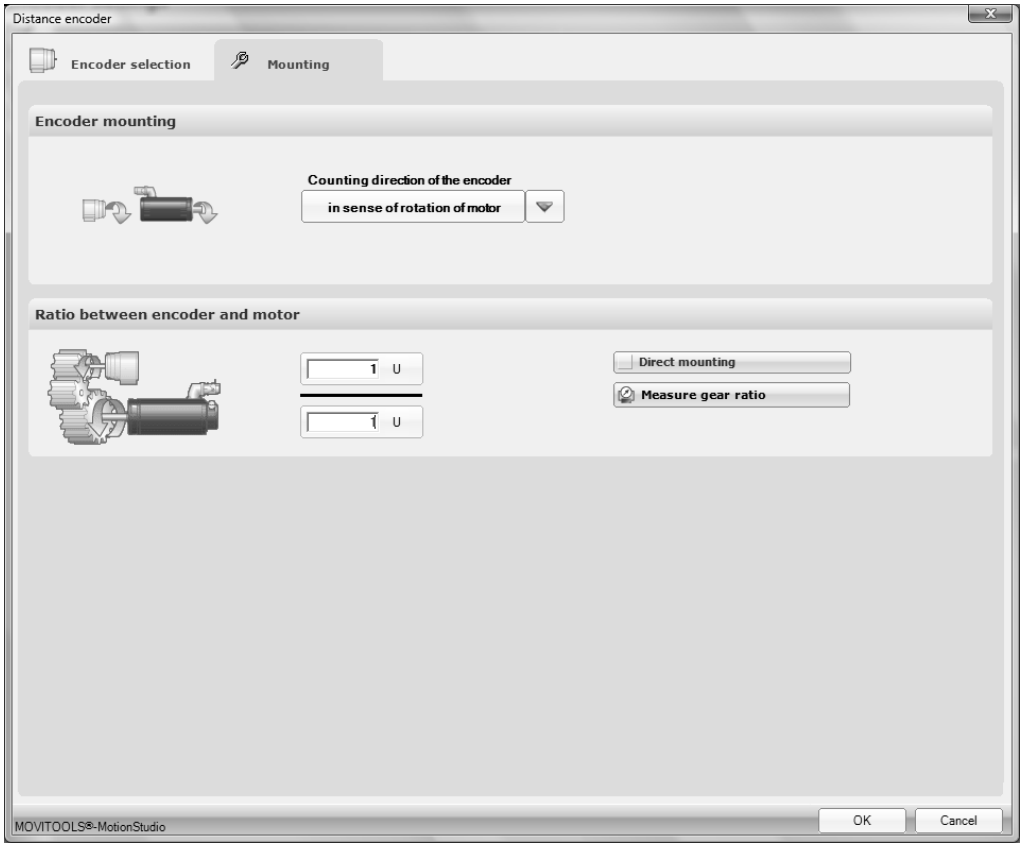
INFORMATION

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.



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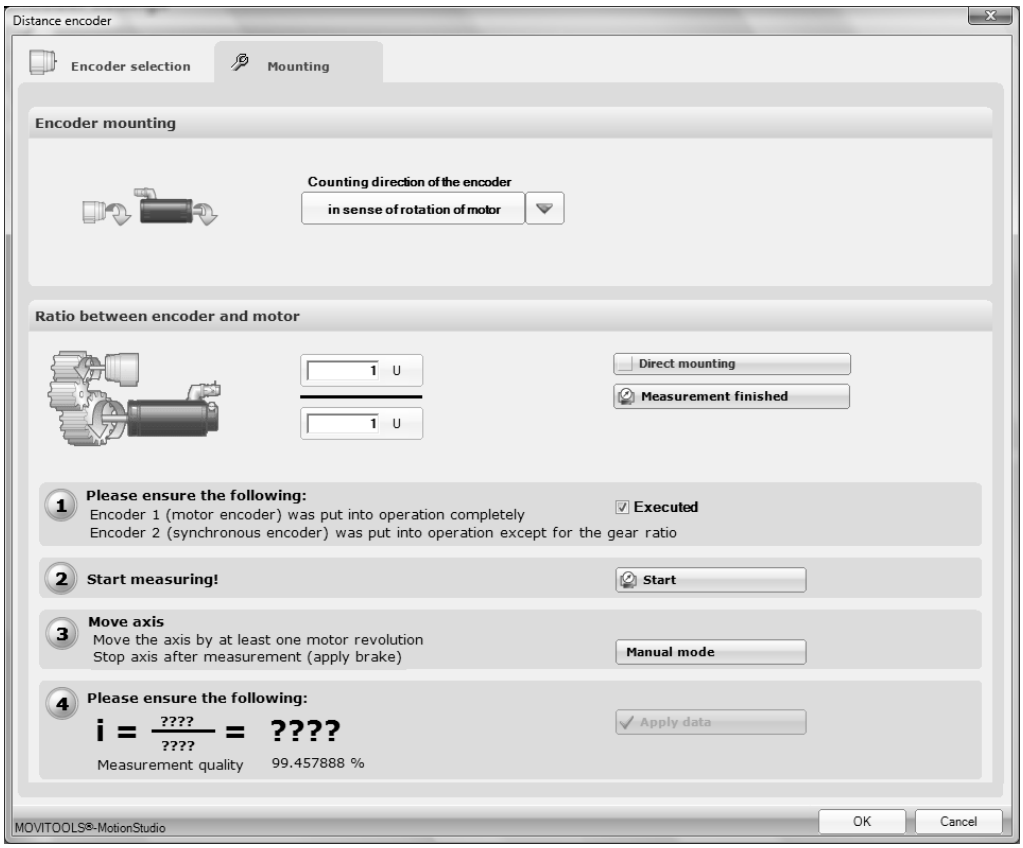
2. Provide for the measure requested under (1) in the following figure and check the "Completed" checkbox.
3. Click [Start].
4. Click [Manual mode] to start the manual mode.



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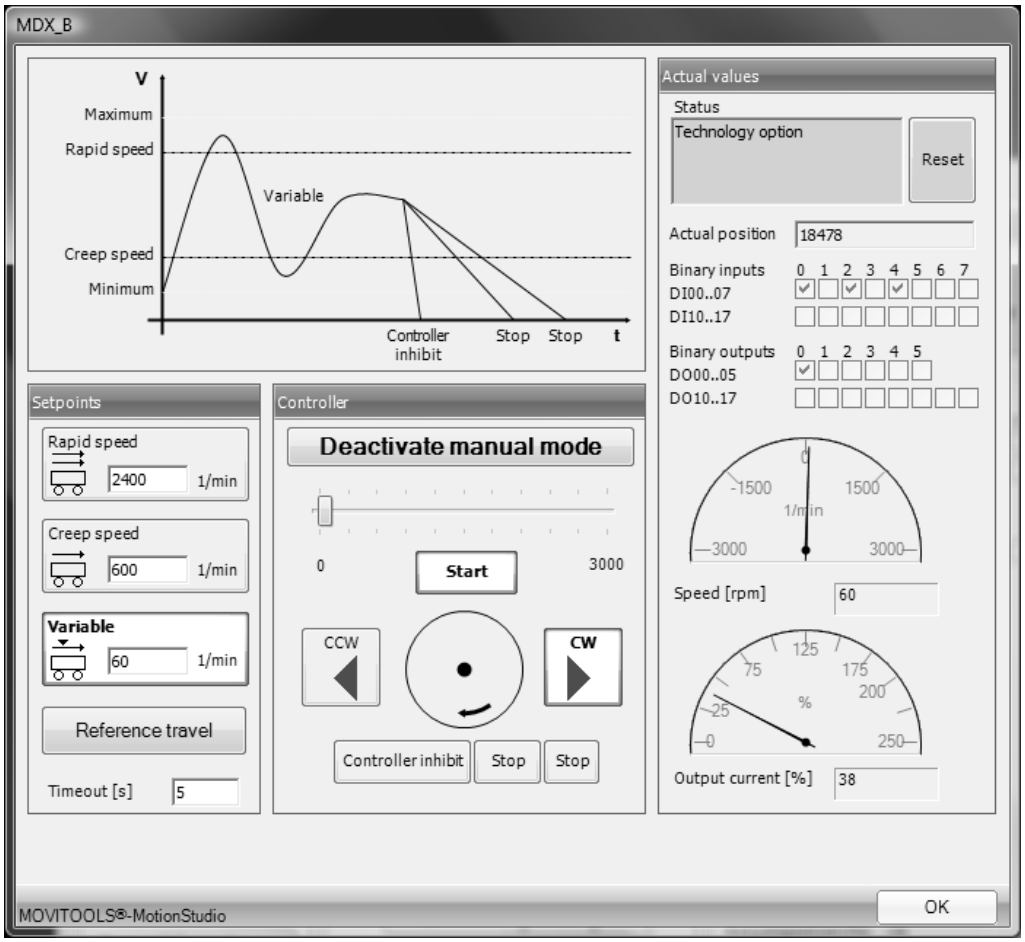
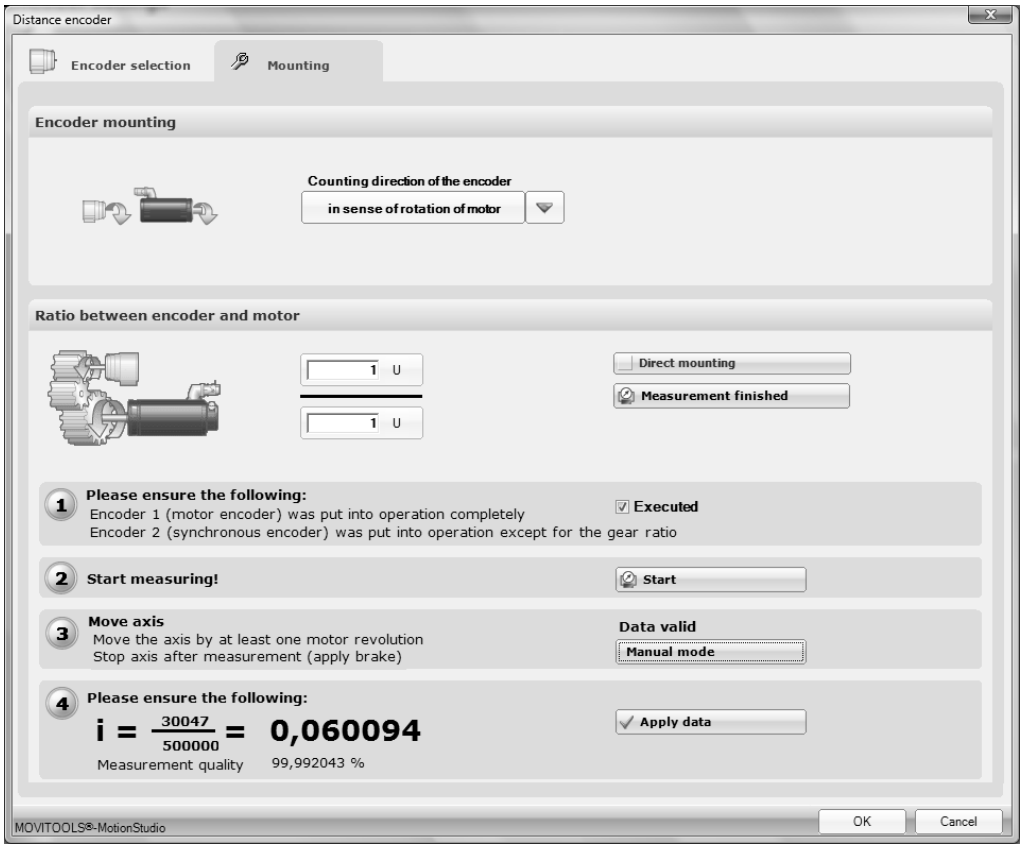
5. Start the manual mode and move the axis by at least one motor revolution. Then stop the drive (apply brake).



3027750923

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



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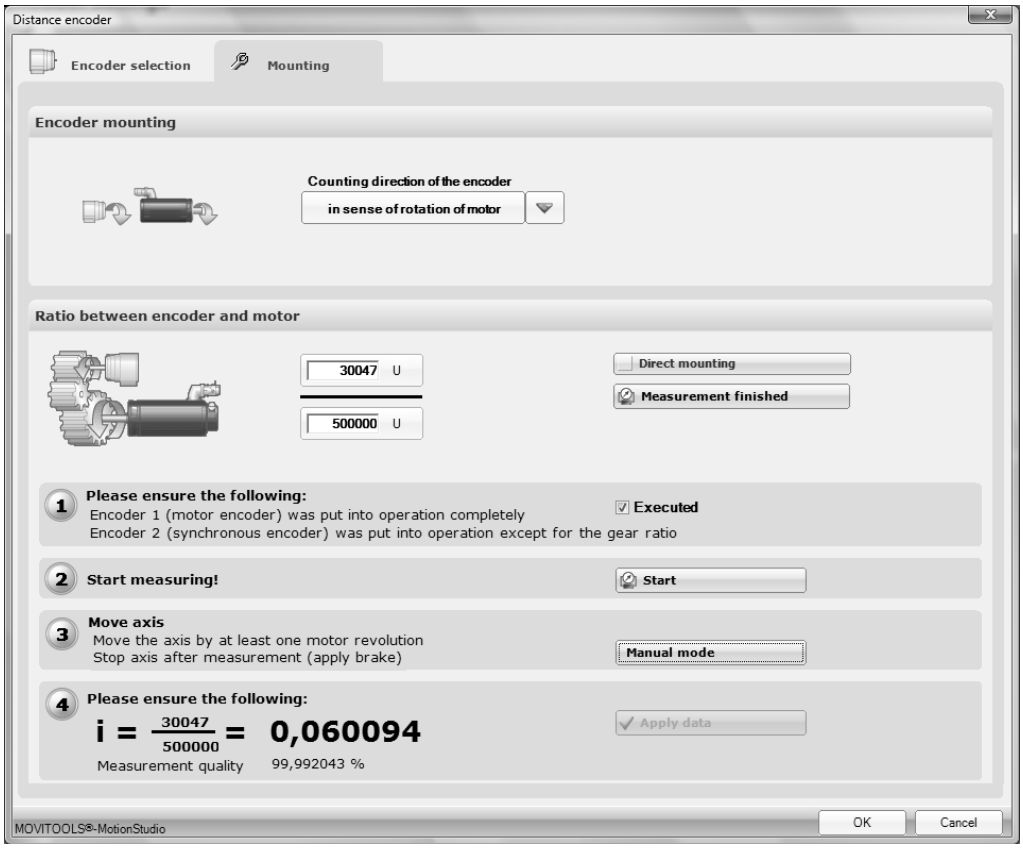
7. If the data is valid, click [Quit manual mode] and [OK] to quit the manual mode.

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

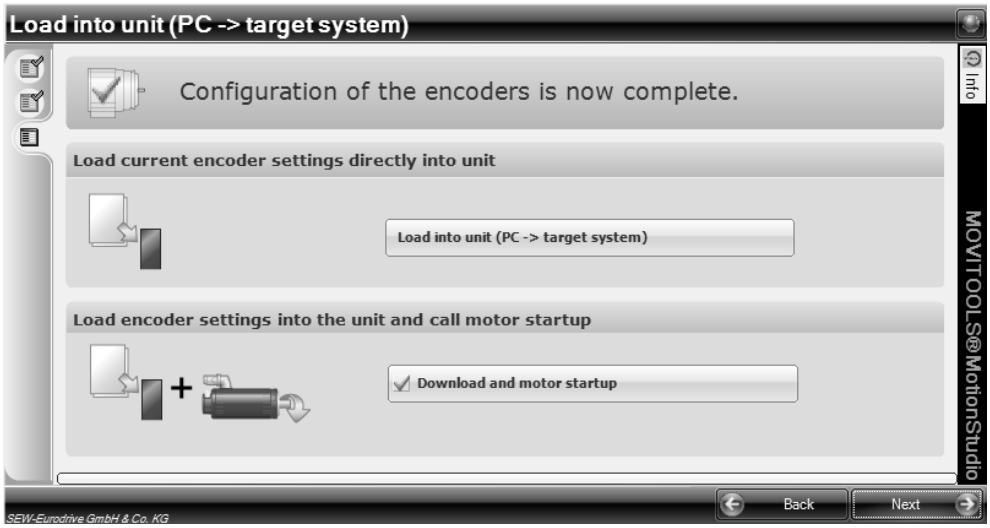


3027977611

Completing the encoder startup

To complete the 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



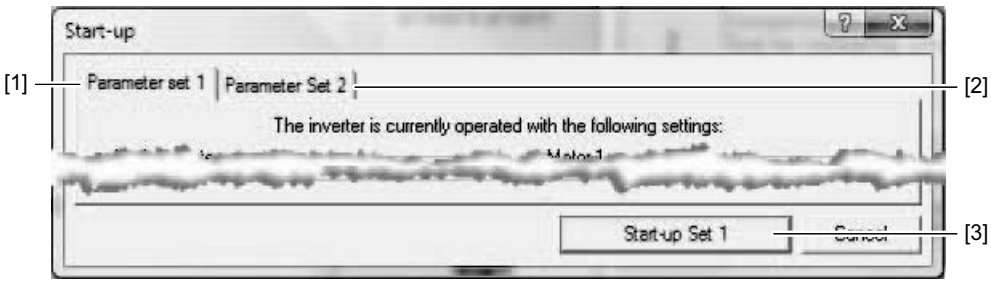
2071854091

INFORMATION

To enable quick unit replacement, you have to manually download the unit data to the memory card after startup.

10.2 Motor startup

1. Perform an encoder startup (page 75) and complete it by clicking on 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].



[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 • Performing extensive modifications [e.g. motor or encoder replacement)	Complete startup (page 86)
• Adapting data [e.g. changing the line or motor voltage)	Partial startup (page 90)
• Optimizing a speed controller that has already been started up	Optimizing a speed controller (page 90)

4. Click [Next] to continue.

INFORMATION

To enable quick unit replacement, you have to manually download the unit data to the memory card after startup.

10.2.1 Complete startup

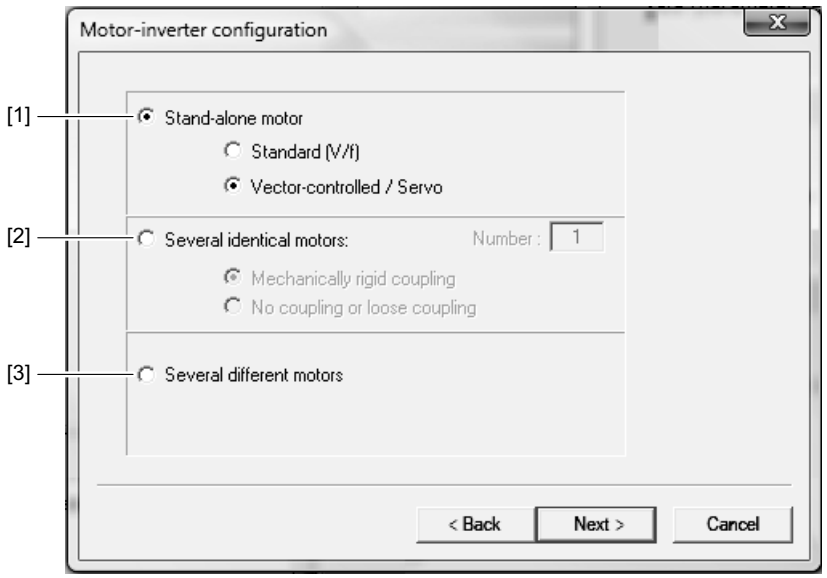
Perform a complete startup to make all the necessary settings for operation of the drive.

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 operation of 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.



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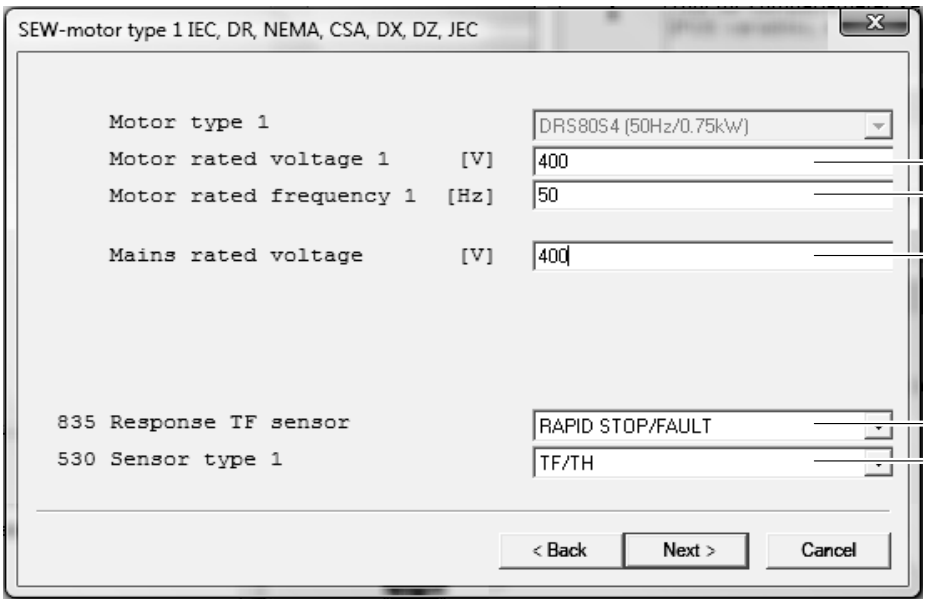
[1] "Stand-alone motor" radio button
[2] "Several identical motors" radio button
[3] "Several different motors" radio button

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.

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

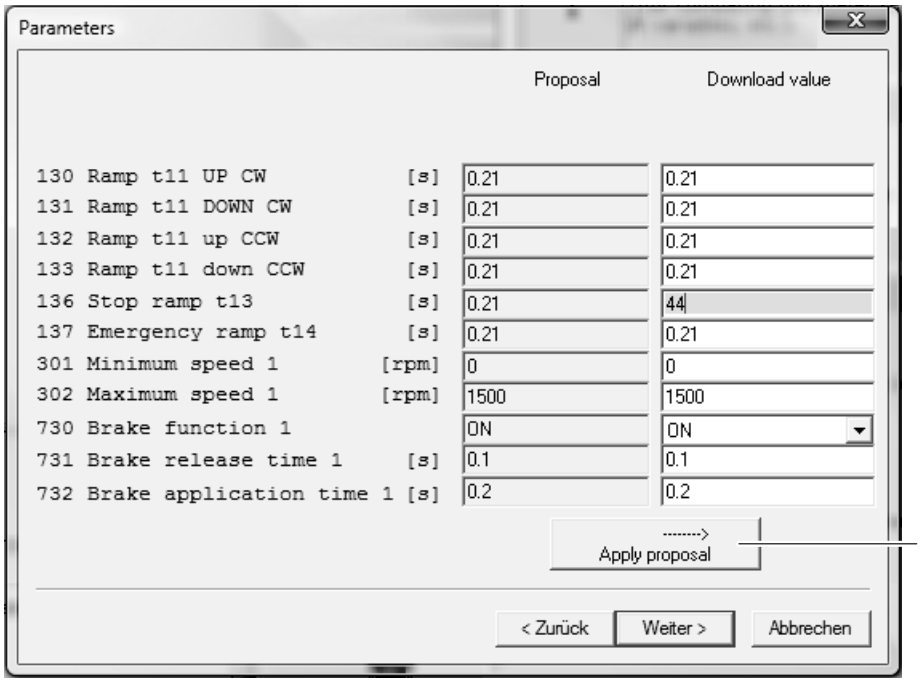
   NOTE: Startup as a hoist is not possible in "CFC" operating mode.

   To use an application module, select the "Positioning with IPOS®" operating mode. For more information about application modules, refer to section "Application modules in MOVITOOLS® MotionStudio (page 8)".

   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].



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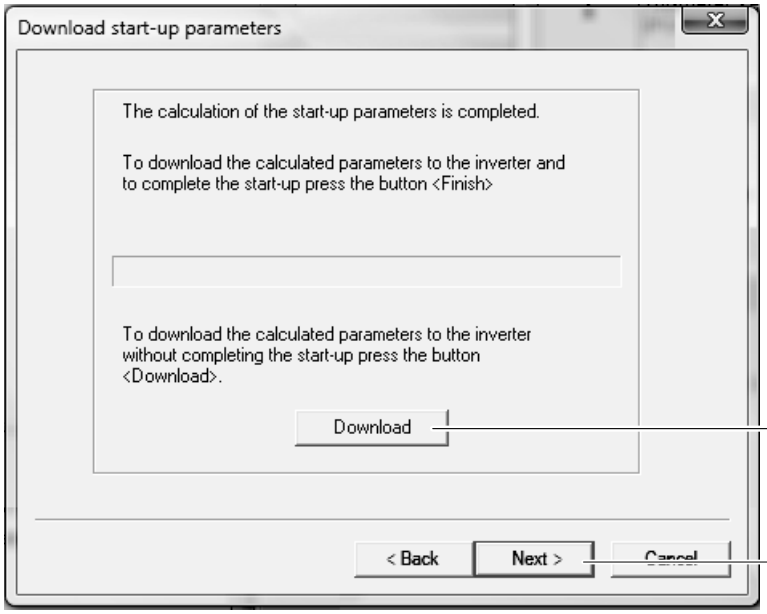
[1] [Apply proposal] button

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



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

INFORMATION

To enable quick unit replacement, you have to manually download the unit data to the memory card after startup.

10.2.2 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

10.2.3 Optimizing a speed controller

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

10.3 Storing unit data

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.

INFORMATION

To enable quick unit replacement, you have to manually download the unit data to the memory card after startup.

Proceed as follows to store the unit data on the memory card:

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

   The "Data management" tool opens.

2. Select "Upload" in order to store unit data on the memory card.
3. Activate the "Enabled" checkbox of the unit types PFA-.. (power section) [1] and PFH-.. (communication and control unit) [2].
4. Activate the "Auto restore" checkbox [4]. This ensures that the data is automatically restored when unit replacement is detected. If the "Auto restore" checkbox [4] is not activated during the upload process, the data can only be restored manually via "Download".

5. Click the [Start upload] [3] button to start data backup.

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[1] "Enable" checkbox for PFH-.. unit type
[2] "Enable" checkbox for PFA-.. unit type
[3] [Start upload] button
[4] "Auto restore" checkbox

INFORMATION

Note that each time after changing unit parameters using MOVITOOLS® MotionStudio, the changed data set must also be copied to the SD card. The data on the SD card is not automatically updated.

INFORMATION

Performing a reference travel will change several parameters. This is why you should perform a data backup and store your data on the SD card **prior** to the reference travel.

10.4 "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 status	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 type	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
1xx	**Setpoints/ramp generators**	
13x / 14x	**Speed ramps 1 / 2**	
130 / 140	Ramp t11 / t21up CW	0 – 2 – 2000 s
131 / 141	Ramp t11 / t21 down CW	0 – 2 – 2000 s
132 / 142	Ramp t11 / t21up CCW	0 – 2 – 2000 s

Parameter	Name	Value
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	Type of cooling 1/2	Fan cooled
344	Motor protection interval	0.1 – 4 – 20 s
345 / 346	I_N-U_L monitoring 1 / 2	0.1 – 500 A
35x	**Direction of rotation of the motor**	
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

Parameter	Name	Value
505	Synchronous 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 to 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	**Duty types**	
700 / 701	Operating mode 1 / 2	VFC
702	Motor category	Rotatory
71x	**Standstill current**	
710 / 711	Standstill current 1 / 2	0 – 50 % I_{Mot}
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

Parameter	Name	Value
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-defined 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
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**	

Parameter	Name	Value
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 CW	$-(2^{31}-1)$ – 0 – $(2^{31}-1)$
921	SW limit switch CCW	$-(2^{31}-1)$ – 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	IPOS Special 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

10.5 "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.

10.5.1 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.

10.5.2 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 min^{-1}

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 125)
- *P851 Scaling factor denominator* (page 125)
- *P852 User-defined unit* (page 126)

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 116).

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 123).

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 set-point

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

PO setpoint	Description
P094 PO1 setpoint	*P870 Setpoint description PO1* (page 126)
P095 PO2 setpoint	*P871 Setpoint description PO2* (page 126)
P096 PO3 setpoint	*P872 Setpoint description PO3* (page 126)

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 127)
P098 PI2 actual value	*P874 Actual value description PI2* (page 127)
P099 PI3 actual value	*P875 Actual value description PI3* (page 127)

10.5.3 P1xx Setpoints/ramp generators

P13x / P14x Speed ramps 1/2

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

P130 Ramp t11 up CW / P140 Ramp t21 up CW

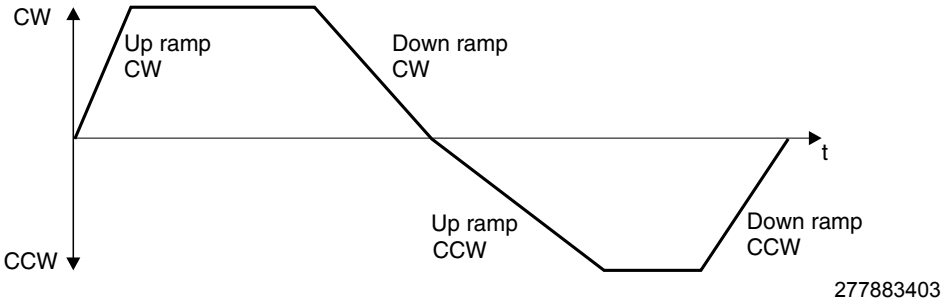
P131 Ramp t11 down CW / P141 Ramp t21 down CW

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.

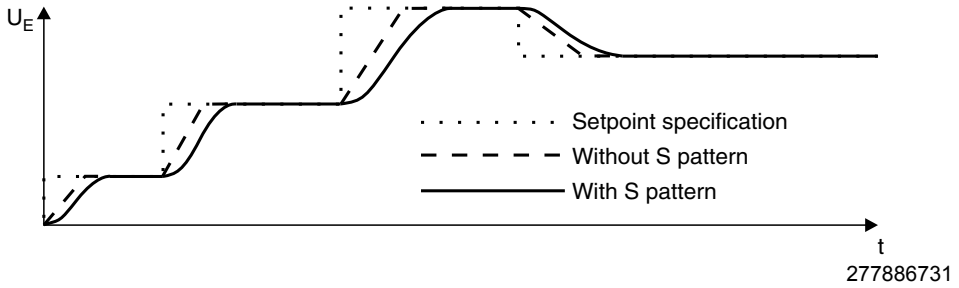
Ramps t12/t22 are activated via a binary input, which is set to the function "Ramp switchover". For information about binary input assignment, refer to *P601 – P604 Binary inputs DIØ2 – DIØ5* (page 116).

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 123).

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 123). 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 min^{-1}

3 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 min^{-1}

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.

10.5.4 P2xx Controller parameters

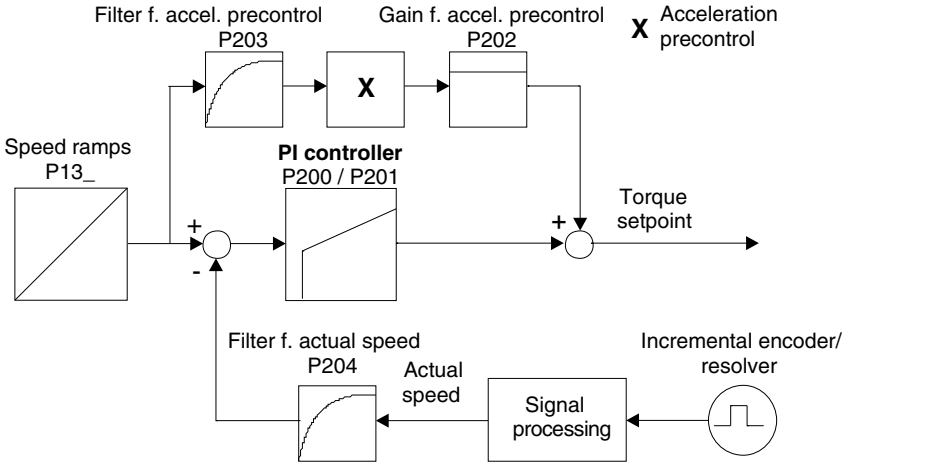
P20x Speed control

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 98) 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 98) 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 standstill. 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.

10.5.5 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 x 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 Maximum 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 117).

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 = $(1.15 \times f_{base} / f_{act}) \times$ 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 117).

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 107) 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 117)
- *P323/P333 Premagnetization time 1/2* (page 108) 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 120) = "off"

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

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

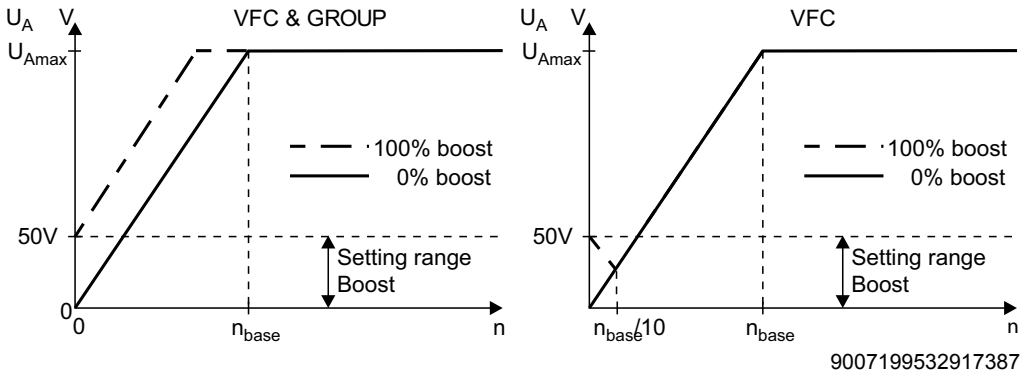
P321/P331 Boost 1/2

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 Au-*

tomatic adjustment 1/2 (page 107) = "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 120)
- *P710/P711 Standstill current 1/2 is deactivated* (page 118)

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 99)	Display of the motor utilization for parameter set 1/2.
P832 Response to "Motor overload" (page 124)	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 110)	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 99)	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 99)	In setting P340 = "One servomotor" without function
P832 Response to "Motor overload" (page 124)	In setting P340 = "One servomotor" without function

Set the following parameters:

Parameter	Meaning
P344 Motor protection interval (page 110)	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 99), *P018 KTY utilization 1* (page 100)). 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 124). In this case, the settings in *P341 Type of cooling 1* (page 110) and *P344 Motor protection interval* (page 110) 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 108).

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 99). The setting range is 100 ms – 20000 ms.

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

P345/346 In/UL 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/<u>off</u>

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 movement of the axis.

- <u>Off</u>: The SEW definition applies.

10.5.6 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 123).

P50x Speed monitoring

P500/P502 Speed monitoring 1/2

1 2

Setting range: Off / motor / regenerative / <u>motor/regenerative</u>

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 106) 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 111).

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 – <u>1</u> – 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/<u>No</u>

- <u>No</u>: 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.

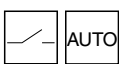
The result is the following nominal guide value for detecting a phase failure:

- 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

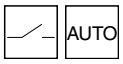


Setting range: No sensor / TF/TH / TF/TH DEU / KTY / KTY DEU (KTY only for SEW synchronous motors)

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

- TF/TH: Set the response with *P835 Response to "TF signal"* (page 124).
- KTY: Set *P340 Motor protection 1* (page 108) to "ON servo". The motor model is now activated. Set the response using *P832 Response to "motor overload"* (page 124).

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	Neither an error is displayed nor an error response is triggered. The signaled error is ignored.
Error messages	The error is displayed (in 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/error	The inverter switches off immediately and an error is signaled. 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/error	The drive is braked with the set emergency stop ramp t14/t24 (page 102). 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/error	The drive is braked with the set stop ramp t13/t23 (page 102). 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 an error is signaled. The output stage is inhibited and the brake is applied. The ready signal is not revoked. The drive restarts without a 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 102). 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 a 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 102). 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 a 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

If the brake wear sensor trips, the inverter will respond with the set response.

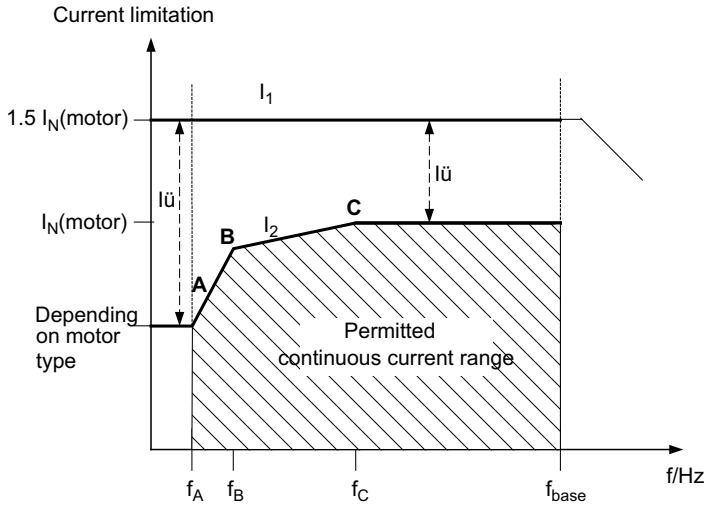
P56x Current limitation Ex-e motor

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



P560 Current limit Ex-e motor

AUTO

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

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 – <u>5</u> – 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 – <u>50</u> – 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 – <u>10</u> – 104 Hz

Value for operating frequency f_B.

P564 Current limit B

AUTO

Setting range: 0 – <u>80</u> – 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 – <u>25</u> – 104 Hz

Value for operating frequency f_C.

P566 Current limit C

AUTO

Setting range: 0 – <u>100</u> – 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.

10.5.7 P6xx Terminal assignment

P601 – P604
Binary inputs
DIØ2 – DIØ5

The binary inputs can be programmed to the following functions:

Function	Effect when		Effective with inverter status		Factory-set to	see
	"0" signal	"1" signal	Inhibited	Enabled		
No function	–	–	–	–	DIØ2 DIØ3 DIØ4 DIØ5	
Enable/stop	Stop on t13/t23	Enable	no	yes		P13x / P14x (page 101)
CW/halt	Stop on t11/t21 or t12/t22	Enable CW	no	yes		
CCW/halt	Stop on 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 103)
n12/n22	External setpoints only	n12/n22	no	yes		
Fixed setpoint switchover	Fixed setpoints of the active parameter set selected	Fixed setpoints of the active parameter set selected	yes	yes		
Parameter set switchover[1)]	Parameter set 1	Parameter set 2	yes	no		
Speed ramp switchover	1. Ramp (t11/t21) active	2. Ramp (t12/t22) active	yes	yes		P13x / P14x (page 101)
/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 105)
/Limit switch CW	Right limit switch reached	Not reached	no	yes		
/Limit switch CCW	Left limit switch reached	Not reached	no	yes		
IPOS input	Function 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 112)	Ext. signal "Mains on"	yes	yes		P52x (page 112)
/Vibration warning	Vibration sensor signals warning	Vibration sensor does not signal warning	yes	yes		
/Vibration error	Vibration sensor reports error	Vibration sensor does not report error	yes	yes		
/Oil aging warning	Oil aging sensor signals warning	Oil aging sensor does not signal warning	yes	yes		
/Oil aging error	Oil aging sensor signals error	Oil aging sensor does not signal error	yes	yes		
/Oil aging overtemperature	Oil aging sensor reports overtemperature	Oil aging sensor does not signals 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.

10.5.8 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® SDC	DR without encoder
2	"VFC n-control" "VFC-n-control & Group" "VFC-n-control & Hoist" "VFC n-control & IPOS"	MOVIPRO® SDC + 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.

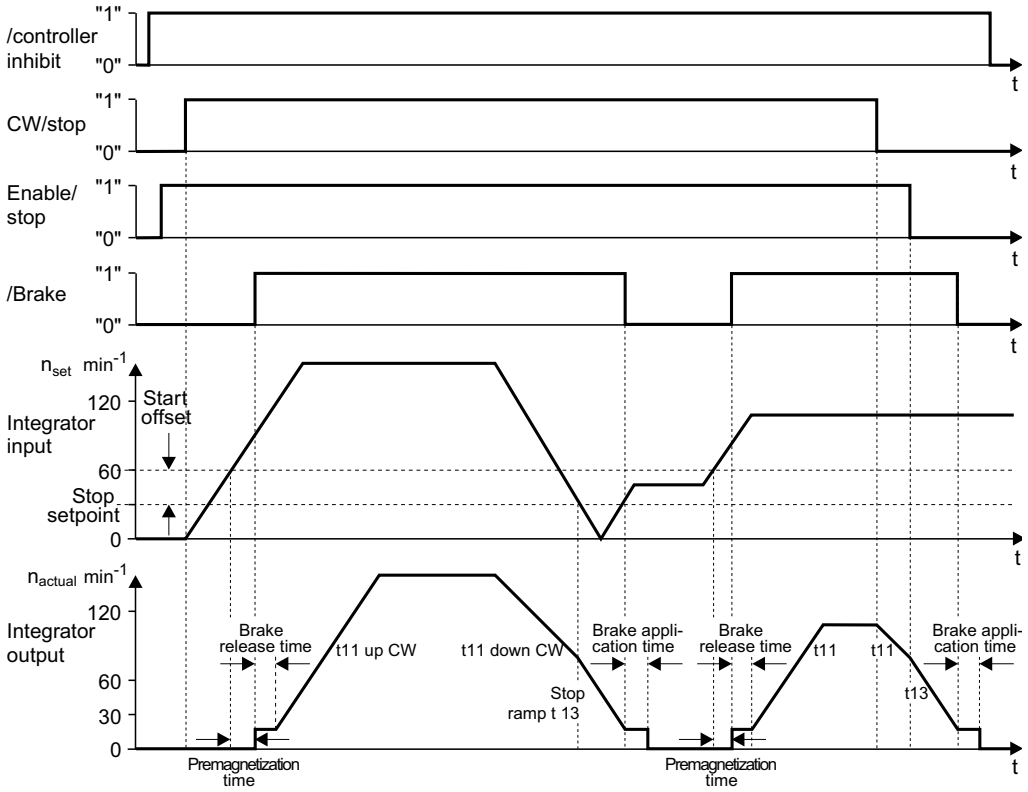
The standstill current function is deactivated by P710/P711 = 0. The setting is made in % of the rated motor current. The standstill current is monitored for *P303/P313 Current limit 1/2* (page 106) in any case.

- 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.
- Else, 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, there will be no calculation of a new resistance value. 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}.

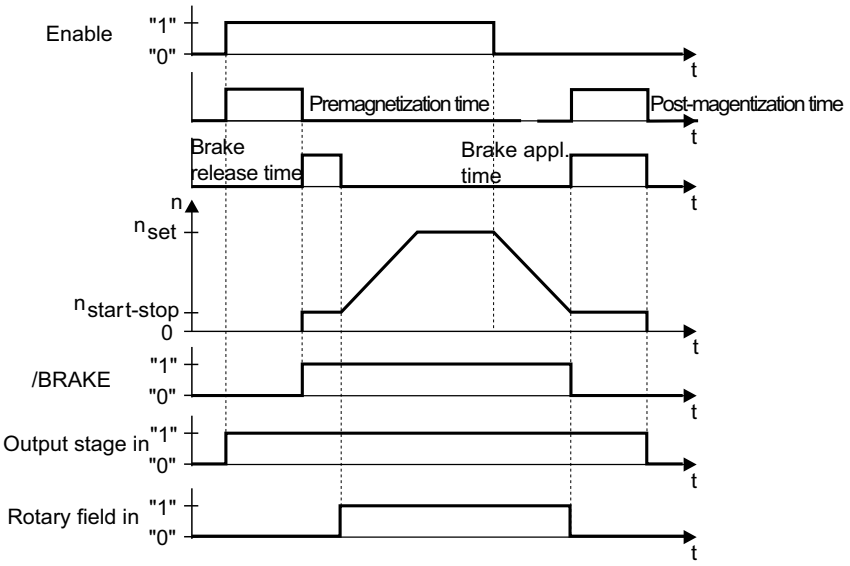
Movement with n_{min} is never possible if the stop setpoint is > n_{min}.

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

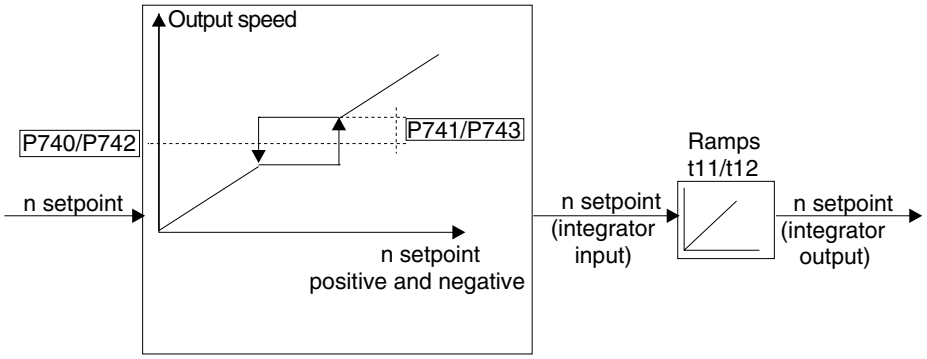
Setting range: 0 – 2 s

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

10.5.9 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 103)
  - *P210 P-gain hold controller* (page 105)
  - *P30x/P31x Limits 1/2* (page 106)
  - *P32x/P33x Motor compensation 1/2* (page 107)
  - *P344 Motor protection interval* (page 110)
  - *P345/P346 I_N-U_L monitoring 1/2* (page 110)
  - *P53x Motor temperature protection* (page 112)
  - *P70x Operating modes* (page 117)
  - *P73x Brake function* (page 120)
  - *P905 Hiperface offset (motor)* (page 130)
  - *P910 Gain X controller* (page 130)
  - *P94x IPOS encoder* (page 134)
  - *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	Neither an error is displayed nor an error response is performed. 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 an error is signaled. 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 102). 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 102). 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.

Response	Description
Immediate stop/warning	The inverter switches off immediately and an error is signaled. 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 102). 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 102). 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 108) to "ON asynchronous motor"
- *P340 Motor protection 1* (page 108) to "ON servomotor" and *P530 Sensor type 1* (page 112) 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 132).

P839 Response to "Positioning interruption"

Factory setting: No response

If *P924 "Positioning interruption" detection* (page 132)' 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/off

⚠ ○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.

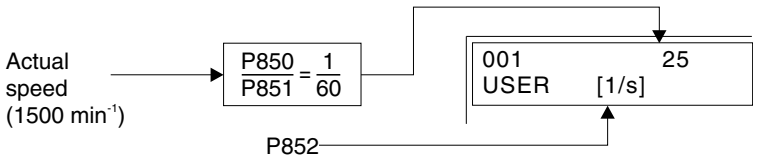
- On: The auto reset function is activated. In case of an error, this function automatically resets the unit after *P842 Restart time*. A maximum of five auto resets is possible during an auto reset phase. If five errors occur that are reset by an auto reset, no more auto resets are possible until:
  - 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.
- Off: No auto reset.

P842 Restart time Setting range: 1 – 3 – 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 98). 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: 1 – 65535

P851 Scaling factor denominator Setting range: 1 – 65535

P852 User-defined unit

Factory setting: rpm

Up to eight ASCII characters; is displayed in *P001 User display* (page 98).

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 126). 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 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
Set current	Current setpoint selection (for torque control)
Set position low	Setpoint position low word
Set 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 detailed explanations.

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 min^{-1}	
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 134).
Actual pos. 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: <u>On</u>/off

- <u>On</u>: 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".

10.5.10 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 128). 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 128) 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 128) and *P902 Reference speed 2* (page 128).

P900 Reference offset

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

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 134).

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 – 200 – 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 102). 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 102). 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 130) 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 105) 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 131) is set to "Sine" or "Squared". For a "linear" ramp type, deceleration will be set depending on *P917 Ramp mode* (page 131):

- 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 106) limits P913/P914; always set P302/P312 to a value greater (about 10 %) than P913/P914 to prevent lag errors.

P915 Velocity pre-control

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.
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 132). 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 130) 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 134) 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 124). 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 124).

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 124).

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 106).

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 130) 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 134) 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 133) 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).

11 Service

11.1 Unit replacement

11.1.1 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

Observe the following notes when replacing a unit:

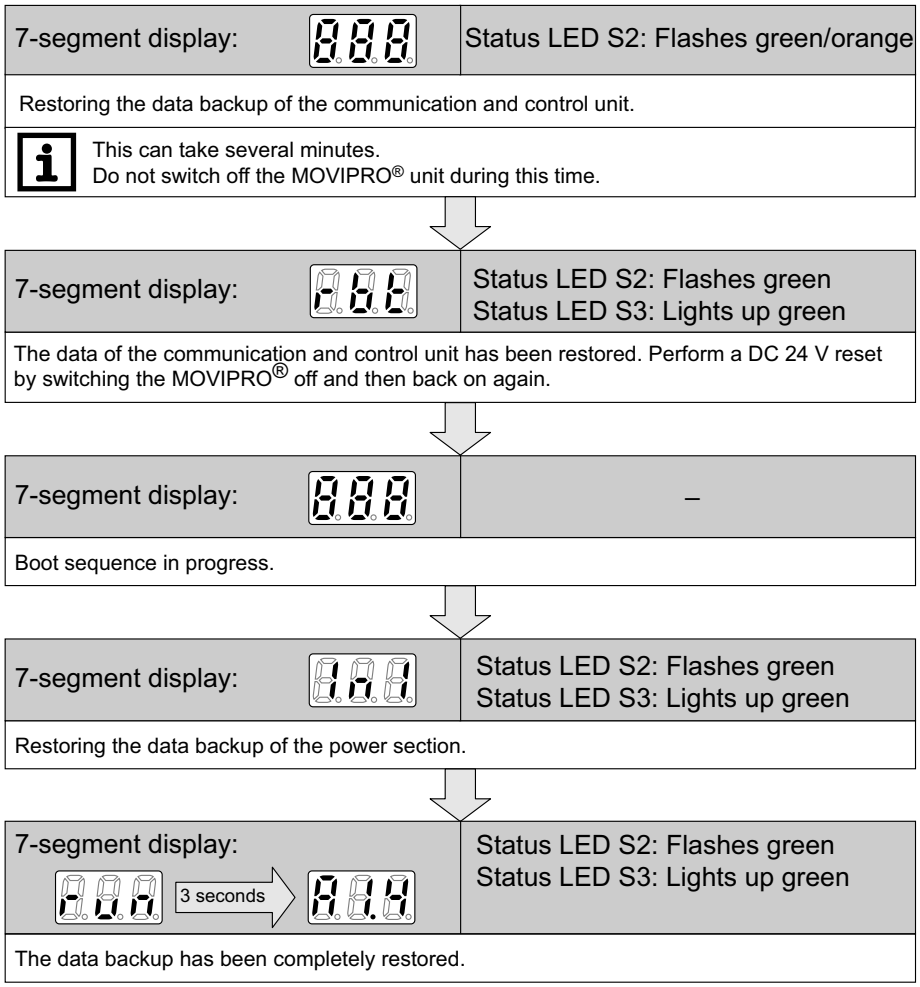
- Only insert the memory card when the MOVIPRO® unit is switched off.
- After the replacement, the parameters last saved on the SD card are used.
- If an absolute encoder is used as motor encoder or synchronous encoder, you have to perform a reference travel during initial startup or after a unit or encoder replacement.
- If you an encoder with HIPERFACE® interface, a unit or encoder replacement is detected automatically and the "IPOS reference" is reset.
- If you use an encoder with SSI interface, you have to adapt the encoder position to the mechanical plant conditions via a reference travel.

11.1.2 Replacing units

Proceed as follows to replace the MOVIPRO®:

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.



1952918283

7. Now the parameters stored on the card are available. 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 synchronous encoder, you have to perform a reference travel.

11.2 Encoder exchange

11.2.1 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.

11.2.2 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.

11.2.3 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.

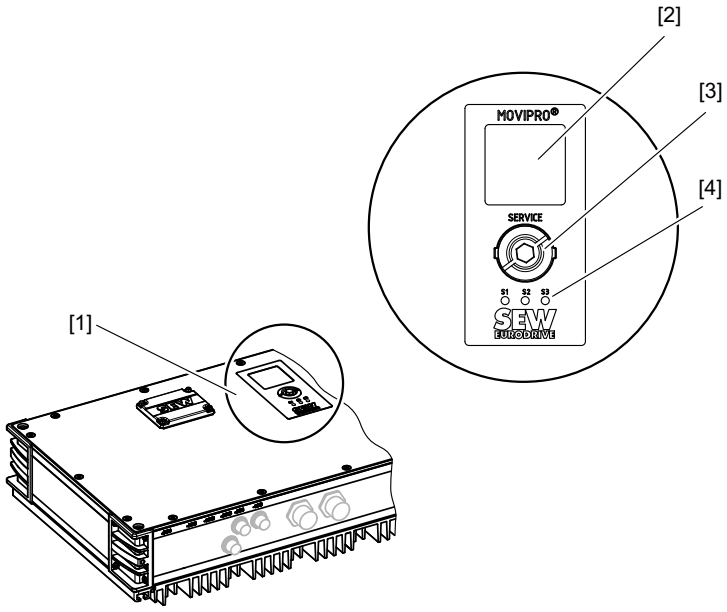
11.2.4 Replacing HIPERFACE® encoders

With HIPERFACE® encoders, you can use parameter P948 to specify whether or not a reference travel is required after an encoder replacement.

11.3 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

11.4 MOVIPRO® SDC error list

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 • Consult 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 4Q 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 disconnection	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			

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
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		
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	Overtemperature	Emergency stop (P)	0	Heat sink temperature too high or defective temperature sensor	Thermal overload of inverter	Reduce load and/or ensure adequate cooling
			3	Overtemperature switched-mode power supply		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
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 the quadrant evaluation.		
			27	Encoder error – encoder connection or encoder is defective		
			28	Encoder error – Communication error RS485 channel.		
			29	External encoder error – Communication error RS485 channel		
			30	Unknown encoder type on the external encoder/motor encoder		
			31	Plausibility error of HIPERFACE® on the external encoder/motor encoder Increments have been lost.		
			32	HIPERFACE® motor encoder error HIPERFACE® encoder on motor encoder reports an error		
			33	HIPERFACE® external encoder error HIPERFACE® encoder on external encoder reports an error		
			34	Revolver motor encoder error Encoder connection or encoder is defective.		
17	System malfunction	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		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
25	EEPROM	Rapid stop	0	Read or write error on EEPROM power section	Error while accessing EEPROM	• Restore factory settings, perform reset and reset parameters. • Consult SEW service if the error reoccurs
			11	NV memory read error Internal NVRAM		
			13	NV memory chip card System module defective		
			14	NV memory chip card Memory card defective		
			16	NV memory initialization error		
26	External terminal	Emergency stop (P)	0	External terminal	Read external error signal via programmable input	Eliminate respective cause; reprogram terminal if necessary
27	No limit switches	Emergency stop	0	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 approached	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 sensor tripped	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"
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	Wrong assignment operating mode - 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 malfunction	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	Error – Watchdog timer from/to option.	Error in communication between system software and option software	Consult SEW Service

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
42	Lag error	Immediate disconnection (P)	0	Positioning lag error	• 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		
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 synchronous encoder: Broken wire		
			16896	TTL synchronous encoder: Error in amplitude control		
			16898	TTL synchronous encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
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 synchronous encoder: Broken wire		
			16896	Sin/cos synchronous encoder: Error in amplitude control		
			16898	Sin/cos synchronous encoder: Track signal error		
			16899	Sin/cos synchronous encoder: Incorrectly set numerator/denominator values		Set the correct system numerator/denominator values.
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® synchronous encoder: Track signal error		
			16386	HIPERFACE® synchronous encoder:	Incorrect calibration of encoder	• Restore factory settings (P802) • Repeat encoder startup

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
59	Encoder communication	Rapid stop	16400	HIPERFACE® synchronous encoder: Communication error	MOVIPRO® and HIPERFACE® synchronous encoder connection interrupted	Check wiring
			16448			
			16512			
			16576			
			16640			
			16704			
			16768			
			16832			
			17408	EnDat synchronous encoder: Communication error	MOVIPRO® and EnDat synchronous 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
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

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
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 default setting (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.
100	Vibration warning	Display error (P)	0	Vibrations diagnostics warning	Vibration sensor warning (see "DUV10A" operating instructions)	• Determine cause of vibrations • Continue operation until F101 occurs
101	Vibration error	Rapid stop (P)	0	Vibration diagnostics error	Vibration sensor signals error	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately
102	Oil aging warning	Display error (P)	0	Oil aging warning	Error message from the oil aging sensor	Schedule oil change
103	Oil aging error	Display error (P)	0	Oil aging error	Error message from the oil aging sensor	SEW-EURODRIVE recommends that you change the gear unit oil immediately.
104	Oil aging overtemperature	Display error (P)	0	Oil aging overtemperature	Overtemperature signal from the oil aging sensor	• Let oil cool down • Check if the gear unit cools properly
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

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
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 the encoder
			33	HIPERFACE® encoder: Analog voltages not within tolerance		
			34	HIPERFACE® encoder: Internal encoder error		Replace the 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 the encoder
			47			
			48			
			49			
			50			
			60	HIPERFACE® encoder: Analog voltages not within tolerance		
			61	HIPERFACE® encoder: Critical transmitter current	• Dirt • Transmitter broken	Replace the encoder
			62	HIPERFACE® encoder: Critical encoder temperature		Replace the encoder
			63	HIPERFACE® encoder: Position error	Speed too high, position cannot be created	set slower speed
			64	HIPERFACE® encoder: Internal encoder error		Replace the encoder
			65			
			66			
			67			
			256	SSI encoder: Voltage dip	12 V voltage supply broken in	Check SSI encoder voltage supply
			257	SSI encoder: Clocking or data line interrupted		Check connection to SSI encoder
			258	SSI encoder: Change of position		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	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 the encoder • Consult SEW Service
			513	EnDat encoder: Plausibility check		
			514	EnDat encoder: Internal encoder error		Replace the encoder
			515			
			516			
			544			
			576	EnDat encoder: Internal encoder warning		Check encoder parameterization
			768	CANopen encoder: PDO timeout	No PDO data from CANopen 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 the encoder
			773			
			774			
			16385	HIPERFACE® synchronous encoder: Plausibility check		
			16386	HIPERFACE® synchronous encoder: Unknown encoder type		
			16387	HIPERFACE® synchronous encoder: Corrupt encoder nameplate data		
			16417	HIPERFACE® synchronous encoder: Analog voltages not within tolerance		
			16418	HIPERFACE® synchronous encoder: Internal encoder error		Replace the encoder
			16419			
			16420			
			16421			
			16422			
			16423			
			16424			
			16425	HIPERFACE® synchronous encoder: Communication error	MOVIPRO® and HIPERFACE® encoder connection interrupted	Check wiring
			16426			
			16427			
			16428			
			16429			

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	Absolute encoder	Immediate stop	16430	HIPERFACE® sync. enc.: Internal encoder error		Replace the encoder
			16431			
			16432			
			16433			
			16434			
			16444	HIPERFACE® sync. enc.: Analog voltages not within tolerance		
			16445	HIPERFACE® sync. enc.: Critical transmitter current	• Dirt • Transmitter broken	Replace the encoder
			16446	HIPERFACE® sync. enc.: Critical encoder temperature		Replace the encoder
			16447	HIPERFACE® sync. enc.: Position error	Speed too high, position cannot be created	set slower speed
			16448	HIPERFACE® sync. enc.: Internal encoder error		Replace the encoder
			16449			
			16450			
			16451			
			16640	SSI synchronous encoder: Voltage dip	12 V voltage supply broken in	Check SSI encoder voltage supply
			16641	SSI synchronous encoder: Clocking or data line interrupted		Check connection to SSI encoder
			16642	SSI synchronous encoder: Change of position		
			16643	SSI synchronous encoder: Insufficient clock frequency		Set a higher cycle frequency
			16644	SSI synchronous encoder: Encoder signals programmable error		Check encoder parameterization
			16645	SSI synchronous encoder: No high level present		• Replace the encoder • Consult SEW Service
			16897	EnDat synchronous encoder: Plausibility check		
			16898	EnDat synchronous encoder: Internal encoder error		Replace the encoder
			16899			
			16900			
			16928			
			16960	EnDat synchronous encoder: Internal encoder warning		Check encoder parameterization
			17152	CANopen synchronous encoder: PDO timeout	No PDO data from CANopen synchronous encoder	Check interface or configuration
			17153	CANopen synchronous encoder: Encoder signals programmable error		Check encoder parameterization
			17154	CANopen synchronous encoder: Change of position		
			17155	CANopen synchronous encoder: Emergency signal		Check encoder
			17156	CANopen synchronous encoder: Internal encoder error		Replace the encoder
			17157			
			17158			

12 Additional Documentation

For additional information, refer to the following documentation:

Documentation
"MOVITOOLS® MotionStudio" manual
MOVITOOLS® online help
"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
"MOVIPRO® SDC" operating instructions

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