SEW EURODRIVE

Manual

MOVIDRIVE® MDX61B

Fieldbus Interface DFS12B

PROFIBUS DP-V1 with PROFIsafe

Edition 07/2009

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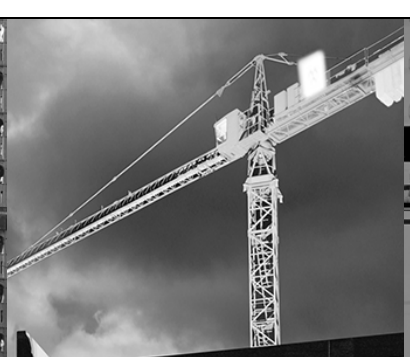


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1 General Information

1.1 How to use the 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.

1.2 Structure of the safety notes

The safety notes in this documentation are structured as follows:

Pictogram	SIGNAL WORD
	Type and source of danger. Possible consequence(s) if disregarded. • Measure(s) to prevent the danger.

Pictogram	Signal word	Meaning	Consequences if disregarded
Example:  General danger  Specific danger, e.g. electric shock	**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.	

1.3 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!

Make sure that the documentation is available to persons responsible for the system and its operation as well as to persons who work independently on the unit. You must also ensure that the documentation is legible.

1.4 Exclusion of liability

You must observe this documentation and the documentation of the connected units from SEW-EURODRIVE to ensure safe operation and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of the operating instructions. In such cases, any liability for defects is excluded.

1.5 Copyright

2 Safety Notes

2.1 Other applicable documentation

- Only electrical specialists are allowed to perform installation and startup observing relevant accident prevention regulations and the "MOVIDRIVE® MDX60B/61B" operating instructions:
- Read through this manual carefully before you commence installation and startup of the DFS12B option.
- As a prerequisite to fault-free operation and fulfillment of warranty claims, you must adhere to the information in the documentation.

2.2 General safety notes for bus systems

This communication system allows you to match the MOVIDRIVE® inverter to the specifics of your application. As with all bus systems, there is a danger of invisible, external (as far as the inverter is concerned) modifications to the parameters which give rise to changes in the unit behavior. This may result in unexpected (not uncontrolled) system behavior.

2.3 Safety functions

The MOVIDRIVE® MDX61B inverters may not perform safety functions without higher-level safety systems. Use higher-level safety systems to ensure protection of equipment and personnel.

For safety applications, refer to the information in the following publications.

- Safe disconnection for MOVIDRIVE® B

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

2.4 Hoist applications

MOVIDRIVE® MDX60B/61B 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.

2.5 Product names and trademarks

The brands and product names contained within this manual are trademarks or registered trademarks of the titleholders.

2.6 Disposal

Observe the applicable national regulations.

Dispose of the individual materials (electronics scrap, plastic, etc.) separately in accordance with the country-specific regulations in force.

3 Introduction

3.1 Content of this manual

This user manual describes how to:

- Install the DFS12B PROFIBUS DP-V1 with PROFIsafe option card in the MOVIDRIVE® MDX61B inverter.
- Start up MOVIDRIVE® with the PROFIBUS fieldbus system.
- Configure the PROFIBUS using GSD files
- Operate MOVITOOLS® MotionStudio via PROFIBUS.

3.2 Additional documentation

For information on how to easily and effectively connect MOVIDRIVE® B to the PROFIBUS DP-V1 fieldbus system, you should request the following additional publications about fieldbus technology:

- "MOVIDRIVE® MDX60B/61B Communication and Fieldbus Unit Profile" manual
- "MOVIDRIVE® B" system manual
- "MOVIDRIVE® MDX 61B Safety Module DCS21B/31B Option" manual

The MOVIDRIVE® Fieldbus Unit Profile manual and the MOVIDRIVE® B system manual provide a description of the fieldbus parameters and their coding, as well as an explanation of the various control concepts and application options in the form of brief examples.

The MOVIDRIVE® fieldbus unit profile manual provides a list of all parameters of the drive inverter that can be read and written via the different communication interfaces such as system bus, RS485 and via the field bus interface.

3.3 Characteristics

The MOVIDRIVE® MDX61B inverter enables you to use the DFS12B PROFIBUS DP-V1 option with PROFIsafe to connect to higher-level automation systems via PROFIBUS thanks to its powerful, universal fieldbus interface.

3.3.1 Access to all information

MOVIDRIVE® MDX61B offers digital access to all drive parameters and functions via the PROFIBUS interface. The drive inverter is controlled using fast, cyclic process data. You can use this process data channel to enter setpoints such as the setpoint speed, ramp generator time for acceleration/deceleration, etc. as well as trigger various drive functions such as enable, control inhibit, normal stop, rapid stop, etc. At the same time you can also use this channel to read back actual values from the drive inverter, such as actual speed, current, unit status, error number or reference signals.

3.3.2 Monitoring functions

Using a fieldbus system requires additional monitoring functions for the drive technology, for example, time monitoring of the fieldbus (fieldbus timeout) or rapid stop concepts. You can, for example, adapt the monitoring functions of MOVIDRIVE® specifically to your application. You can determine, for instance, which of the drive inverter's fault responses should be triggered in the event of a bus error. A rapid stop is meaningful for many applications, although this can also be achieved by 'freezing' the last setpoints so the drive continues operating with the most recently valid setpoints (such as with a conveyor belt). As the range of functions for the control terminals is also guaranteed in fieldbus mode, you can continue to implement rapid stop concepts using the terminals of the drive inverter, irrespective of the fieldbus used.

3.3.3 Diagnostics

The MOVIDRIVE® inverter offers numerous diagnostic options for startup and service. For example, you can use the integrated fieldbus monitor to control setpoint values sent from the higher-level controller as well as the actual values. The integrated Web server allows you to access the diagnostic values using a standard browser.

3.3.4 Fieldbus monitor

Furthermore, you are supplied with a variety of additional information about the status of the fieldbus interface. The fieldbus monitor function in conjunction with the MOVITOOLS® MotionStudio PC software offers you an easy-to-use diagnostic tool for setting all drive parameters (including the fieldbus parameters) and for displaying the fieldbus and device status information in detail.

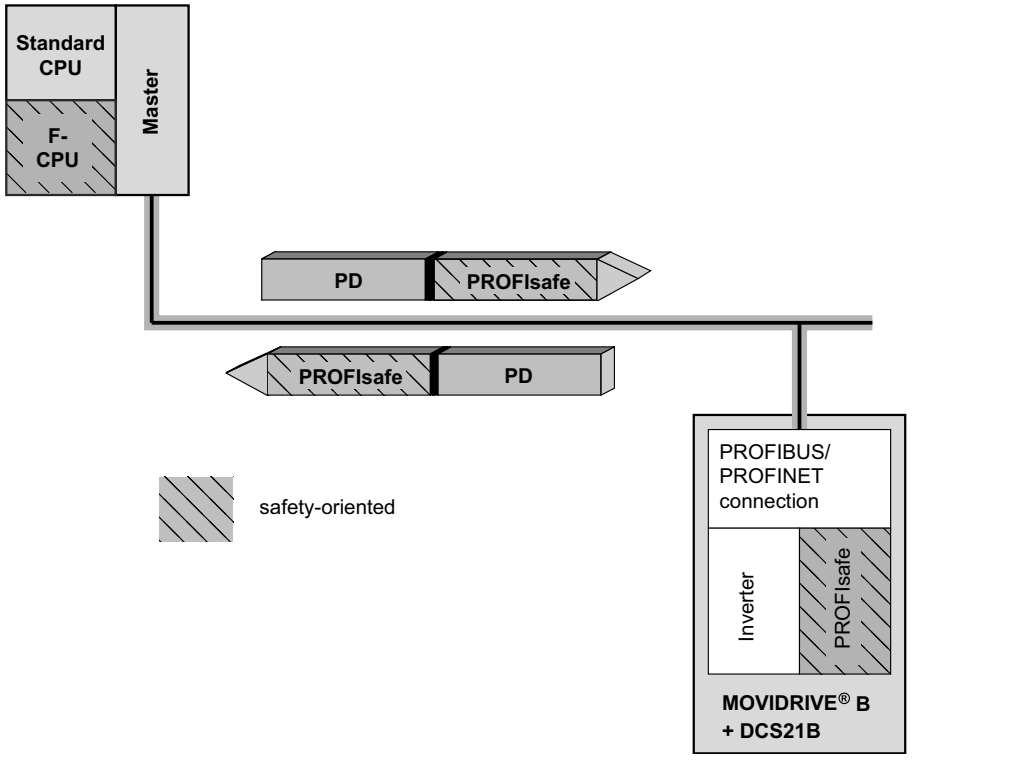
4 Integrated Safety Technology

4.1 Safety concept DFS12B in combination with DCS21B

- The PROFIsafe fieldbus interface DFS12B is equipped with an integrated CAN interface. The DFS12B option separates safe communication and sends it safely to the DCS21B option via CAN interface.
- The following requirements are fulfilled by means of a 2-channel redundant system structure of the DCS21B safety component with suitable monitoring mechanisms:
  - SIL3 according to EN 61508
  - Category 4 according to EN 954-1
  - Performance level e according to EN ISO 13849-1

  When the system detects a fault, the system responds by reverting to a safe status. This makes the safety function available in the form of failsafe inputs and outputs connected to a higher-level safety controller via PROFIsafe communication. The inputs/outputs of the DCS21B are neither evaluated locally nor processed logically. This takes place in the higher-level safety-relevant PLC.
- When using the DCS21B option, you can disable the DC 24 V input "safe stop" at X17 of the MOVIDRIVE® inverter and in this way disconnect the drive safely. In this context, observe the following safety concept of the MOVIDRIVE® inverter and all safety notes, conditions and installation regulations in this publication.

	INFORMATION
	The safety function of MOVIDRIVE® B is only permitted for applications up to category 3 according to EN 954-1 (see certificate).



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4.2 Safety concept of MOVIDRIVE® B without DCS21B option

- In case of danger, any potential risk related to a machine must be eliminated as quickly as possible. Standstill with restart prevention is generally the safe condition for preventing dangerous movements.
- The MOVIDRIVE® MDX60B/61B inverter is characterized by the optional connection of an external fail-safe, prototype examined safety relay (safety category 3 according to EN 954-1). The safety relay disconnects all active elements (disconnection of the safety-relevant 24 V power supply of the output stage control) that generate the pulse trains to the power output stage (IGBT) when a connected control device (E-STOP button with latching function) is activated.
- Disconnecting the DC 24 V at the positive and negative poles ensures that the supply voltages required for operating the inverter and consequently for generating a rotating field of pulse patterns (which allow the generation of a rotating field) are safely interrupted. Automatic restart is prevented in this way.
- Instead of galvanic separation of the drive from the power supply by means of relays or switches, the disconnection of the DC 24 V supply described here safely prevents the control of the power semiconductors in the drive inverter. This process disconnects the rotating field generation for the respective motor. The individual motor cannot develop any torque in this state even though the mains voltage is still present.
- The requirements for the safety relay are clearly defined in the following sections and must be strictly observed.

Using a suitable external circuit via a safety relay with

– **approval for at least safety category 3**

– **disconnection for at least safety category 3**

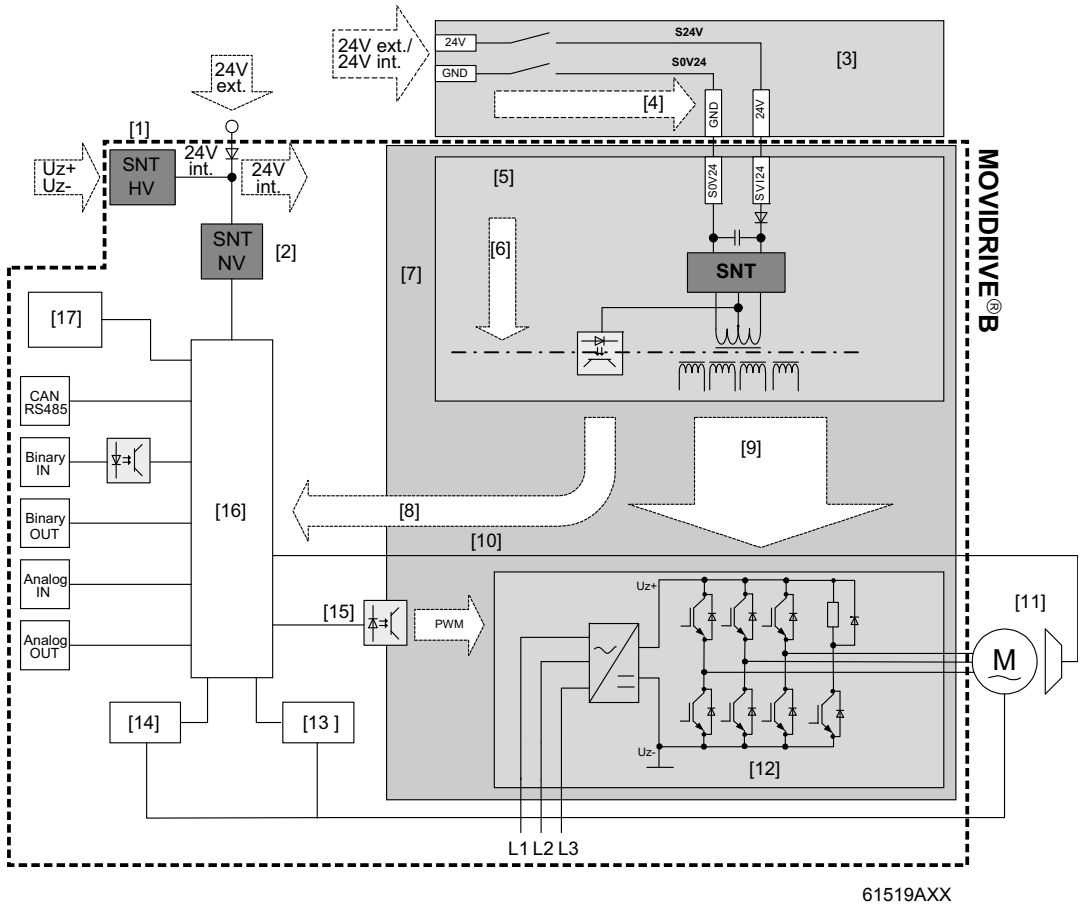
allows for operating the MOVIDRIVE® MDX60B/61B inverter with safe disconnection according to stop category 0 or 1 (to EN 60204-1) and ensures protection against restart according to safety category 3 (to EN 954-1).

4.2.1 Limitations

INFORMATION

- **If the DC 24 V link voltage is safely disconnected at the positive pole only, no test pulses must be applied to this pole in disconnected condition.**
- **Important: The safety concept is only suitable for performing mechanical work on system/machine components.**
- **Important: A system/machine-specific risk analysis must be carried out by the system/machine manufacturer and taken into account for the use of the MOVIDRIVE® B inverter.**
- **Danger of fatal injury: When the 24 V voltage supply is disconnected, mains supply voltage is still present on the drive inverter's DC link.**
- **Important: If work is carried out on the electrical section of the drive system, the supply voltage must be disconnected using an external maintenance switch.**

4.2.2 Schematic representation of the safety concept taking MOVIDRIVE® B as example



[1] High-voltage switch-mode power supply
[2] Low-voltage switch-mode power supply
[3] Safety relay (external) approved for at least category 3 according to EN 954-1
[4] Safety-relevant DC 24 V voltage supply
[5] Safety switched-mode power supply unit (SNT)
[6] Electrical isolation
[7] Safety circuit
[8] Feedback to the central processing unit: Voltage supply for output stage control OK (not in safety circuit)
[9] Voltage supply for control of power transistors
[10] DC 24 V safety switched-mode power supply disconnected / brake applied (not in safety circuit)
[11] Motor
[12] Power section
[13] Temperature detection
[14] Position detection
[15] Pulse width modulated signals for output stage
[16] Central processing unit
[17] Fieldbus interface

5 Safety Requirements

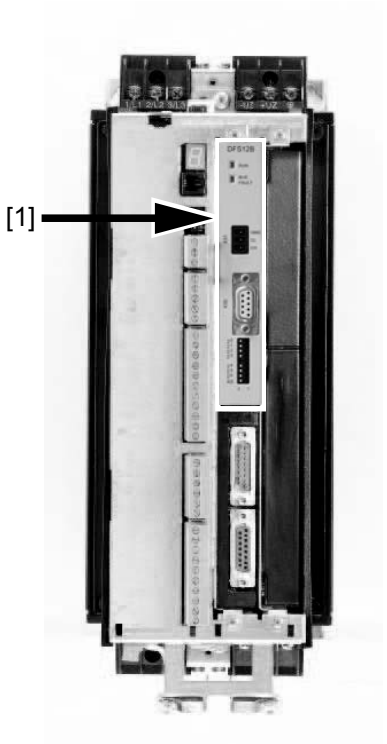
	INFORMATION
	For information on the safety-relevant conditions, refer to the following documents: • "MOVIDRIVE® MDX60B/61B Safe Disconnection - Conditions" manual • "MOVIDRIVE® MDX61B Safety Module DCS21B/31B Option" manual

6 Assembly and Installation Notes

This chapter provides information on the assembly and installation of the DFS12B PROFIBUS DP-V1 option card with PROFIsafe in MOVIDRIVE® MDX61B.

6.1 Installing the DFS12B option card in MOVIDRIVE® MDX61B

	INFORMATION
	Only SEW-EURODRIVE engineers are allowed to install or remove option cards for MOVIDRIVE® MDX61B size 0. **Users may only install or remove option cards for MOVIDRIVE® MDX61B sizes 1 to 6.** **Plug the DFS12B PROFIBUS DP-V1 option with PROFIsafe into fieldbus slot [1].** **Only use connectors and cables approved for PROFIBUS when cabling.**



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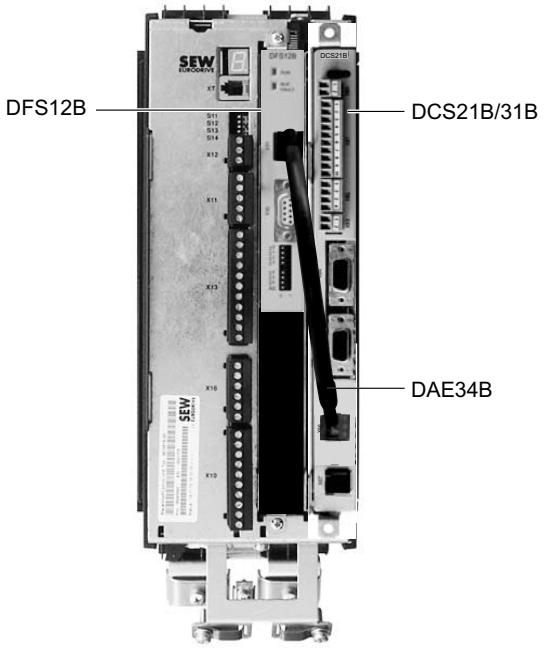
6.2 Installing DFS12B / DCS21B option cards in MOVIDRIVE® MDX61B

	INFORMATION
	• **The DCS21B option can only be used in combination with the DFS12B fieldbus interface. In this case, the DCS21B option must be plugged in the expansion slot, and the DFS12B option in the fieldbus slot.** • **The DCS21B option can only be used for MOVIDRIVE® MDX61B sizes 1 to 6 but not for size 0.** • **The prefabricated cable DAE34B (part number 1821 307 3) serves for CAN bus connection between the X86 terminal of DCS21B and X31 of option DFS12B. The scope of delivery of the DCS21B option includes the DAE34B cable.**

MOVIDRIVE® MDX61B



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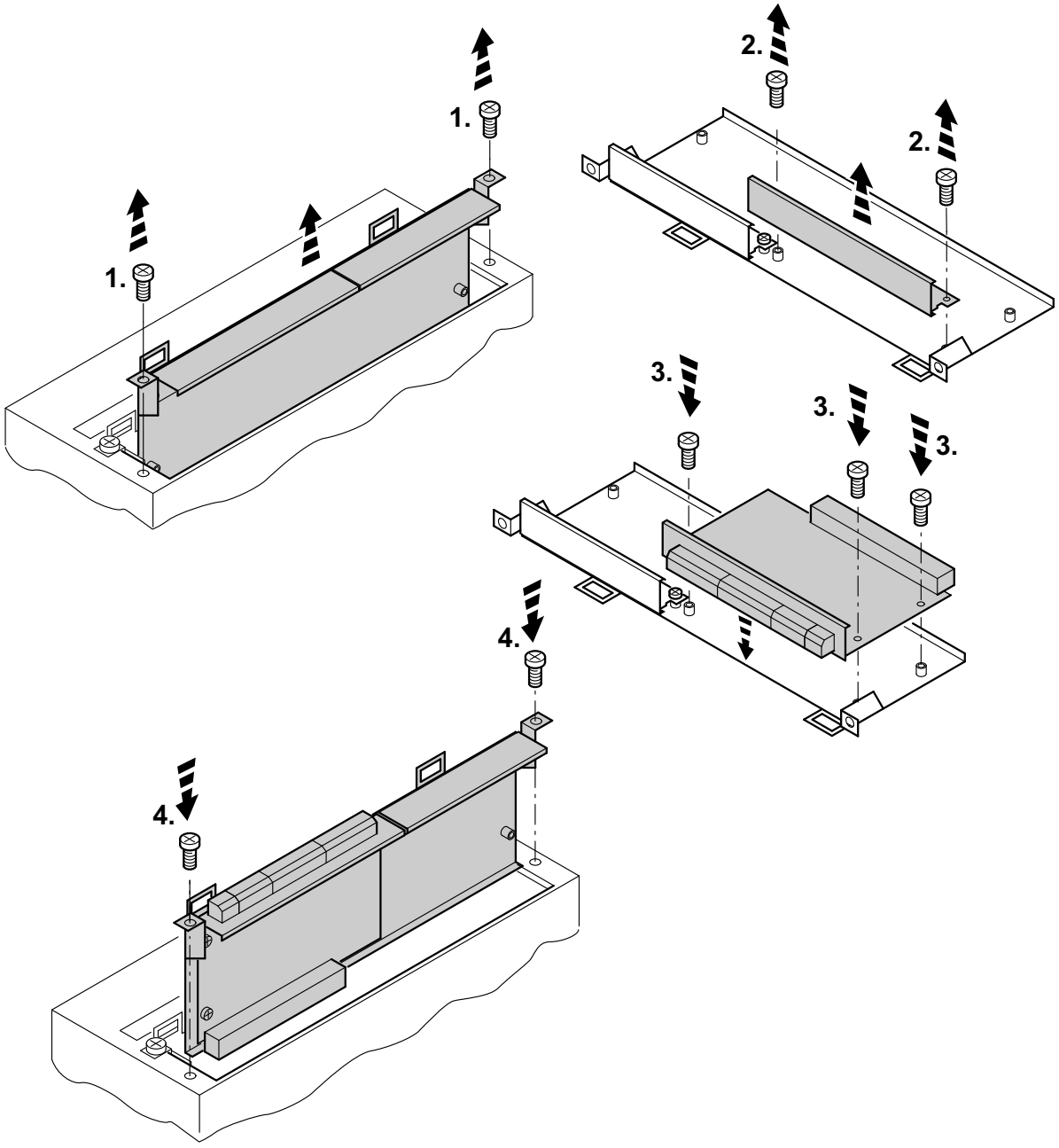
6.2.1 Before you start

Observe the following notes before installing or removing an option card:

- Disconnect the inverter from the power. Switch off the DC 24 V and the power supply voltage.
- Take appropriate measures to protect the option card from electrostatic charge (use discharge strap, conductive shoes, etc.) before touching it.
- **Before installing** the option card, remove the keypad and the front cover (see MOVIDRIVE® MDX60B/61B operating instructions, chapter "Installation").
- **After having installed** the option card, replace the keypad and the front cover (see MOVIDRIVE® MDX60B/61B operating instructions, chapter "Installation").
- Keep the option card in its original packaging until immediately before you are ready to install it.
- Hold the option card by its edges only. Do not touch any of the components.

6.2.2 Basic procedure for installing/removing an option card (MDX61B, sizes 1 - 6)



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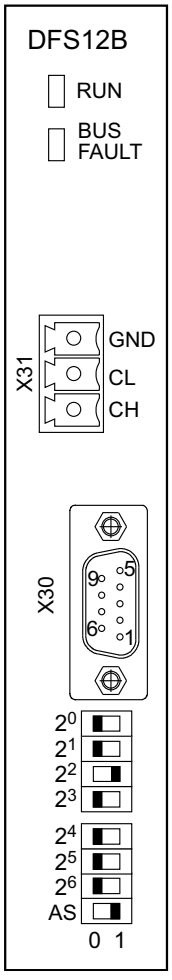
1. Remove the two retaining screws holding the card retaining bracket. Pull the card retaining bracket out evenly from the slot (do not twist!).
2. Remove the 2 retaining screws from the black cover plate on the card retaining bracket. Remove the black cover plate.
3. Position the option card onto the retaining bracket so that the three retaining screws fit into the corresponding bores on the card retaining bracket.
4. Insert the retaining bracket with the installed option card into the slot, pressing slightly so it is seated properly. Secure the card retaining bracket with the two retaining screws.
5. To remove the option card, follow the instructions in reverse order.

6.3 Connection and terminal description of the DFS12B option

Part number Fieldbus interface option DFS12B PROFIBUS with PROFIsafe: 1820 963 7

	INFORMATION
	The DFS12B option is only possible with MOVIDRIVE® MDX61B, not with MOVIDRIVE® MDX60B. • The DFS12B option must be plugged into the fieldbus slot.

Front view of DFS12B	Description	DIP switch Terminal	Function
 62967AXX	**LED RUN (red/yellow/green)** **LED BUS FAULT (red/yellow/green)**		Shows the current status of the DFS12B option. Shows the status of the PROFIBUS connection.
	X31: CAN connection	**X31:1** **X31:2** **X31:3**	CAN High CAN low DGND
	X30: PROFIBUS connection	**X30:1** **X30:2** **X30:3** **X30:4** **X30:5** **X30:6** **X30:7** **X30:8** **X30:9**	N.C. N.C. RxD/TxD-P CNTR-P DGND (M5V) VP (P5V/100 mA) N.C. RxD/TxD-N N.C.
	ADDRESS: DIP switch for setting the PROFIBUS station address	**2^0** **2^1** **2^2** **2^3** **2^4** **2^5** **2^6** **AS**	Significance: 1 Significance: 2 Significance: 4 Significance: 8 Significance: 16 Significance: 32 Significance: 64 Auto setup for gateway operation (no function)

6.4 PROFIBUS connection

Connection to the PROFIBUS network is made using a 9-pin D-sub connector according to IEC 61158. The T-bus connection must be made using a plug with the corresponding configuration.

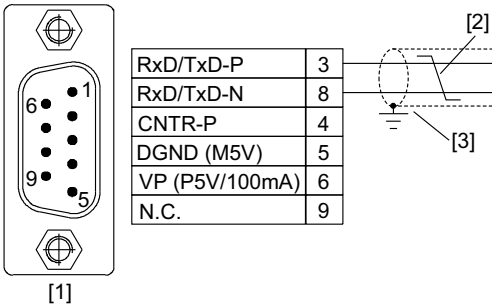


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Figure 1: Assignment of 9-pin D-sub connector to IEC 61158

[1] 9-pin D-sub connector

[2] Signal line, twisted

[3] Conductive connection over a large area is necessary between plug housing and the shield

6.4.1 Connecting MOVIDRIVE® to PROFIBUS

As a rule, the DFS12B option is connected to the PROFIBUS system using a shielded twisted-pair cable. Observe the maximum supported transmission rate when selecting the bus connector.

The twisted-pair cable is connected to the PROFIBUS connector X30 at X30: 3 (RxD/TxD-P) and X30:8 (RxD/TxD-N). Communication takes place via these two contacts. The RS485 signals RxD/TxD-P and RxD/TxD-N must all be connected to the same contacts in all PROFIBUS stations. Otherwise, no communication is possible via the bus medium.

The PROFIBUS interface sends a TTL control signal for a repeater or fiber optic adapter (reference = X30:5) via X30:4 (CNTR-P).

6.4.2 Baud rates greater than 1.5 MBaud

The DFS12B option with baud rates > 1.5 MBaud can only be operated with special 12-MBaud PROFIBUS connectors.

6.5 Shielding and routing bus cables

The PROFIBUS interface supports RS485 transmission technology and requires the cable type A to IEC 61158 specified as the physical medium for PROFIBUS. This cable must be a shielded, twisted-pair cable.

Correct shielding of the bus cable attenuates electrical interference that can occur in industrial environments. Take the following measures to optimally shield bus cables:

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

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

6.6 Bus termination

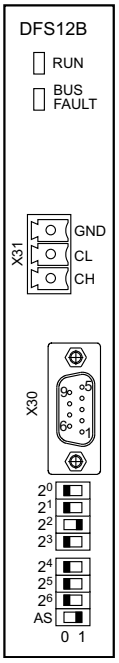
The DFS12B option is not provided with bus terminating resistors. This enables the bus system to be put into operation more easily and reduces the number of error sources.

If the DFS12B option is located at the start or end of a PROFIBUS segment and only one PROFIBUS cable is connected to the DFS12B, you have to use a connector with integrated bus terminating resistor.

Switch on the bus terminating resistors for this PROFIBUS connector.

6.7 Setting the PROFIBUS station address

Set the PROFIBUS station address using DIP switches 2^0 - 2^6 on the DFS12B option. MOVIDRIVE® supports the address range 1 to 125.



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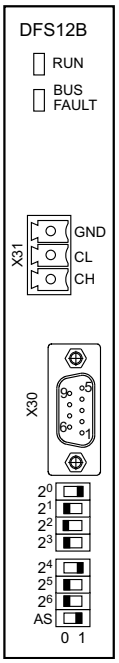
The default setting for the PROFIBUS station address is 4:

$2^0 \rightarrow$ Significance: $1 \times 0 = 0$
$2^1 \rightarrow$ Significance: $2 \times 0 = 0$
$2^2 \rightarrow$ Significance: $4 \times 1 = 4$
$2^3 \rightarrow$ Significance: $8 \times 0 = 0$
$2^4 \rightarrow$ Significance: $16 \times 0 = 0$
$2^5 \rightarrow$ Significance: $32 \times 0 = 0$
$2^6 \rightarrow$ Significance: $64 \times 0 = 0$

Any change made to the PROFIBUS station address during ongoing operation does not take effect immediately. The change only comes into effect when the inverter is switched on again (power supply + +24 V OFF / ON). The inverter displays the current station address in fieldbus monitor parameter *P093 Fieldbus address* (display with DBG60B or MOVITOOLS® MotionStudio / parameter tree).



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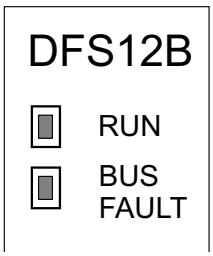
Example: Setting the PROFIBUS station address 17

$2^0 \rightarrow$ Significance: $1 \times 1 = 1$
$2^1 \rightarrow$ Significance: $2 \times 0 = 0$
$2^2 \rightarrow$ Significance: $4 \times 0 = 0$
$2^3 \rightarrow$ Significance: $8 \times 0 = 0$
$2^4 \rightarrow$ Significance: $16 \times 1 = 16$
$2^5 \rightarrow$ Significance: $32 \times 0 = 0$
$2^6 \rightarrow$ Significance: $64 \times 0 = 0$

6.8 Operation indicators of the DFS12B option

6.8.1 PROFIBUS LEDs

The PROFIBUS interface DFS12B option card has 2 LEDs that indicate the current status of the DFS12B option and the PROFIBUS system.



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RUN LED

The **RUN** LED indicates that the bus electronics are operating correctly

States of the RUN LED	Cause of error	Remedy
Green	• PROFIBUS hardware OK.	-
Orange	• The card is booting.	-
Off	• Hardware defect in the bus electronics.	• Switch the unit on again. Consult SEW service if the error occurs again.
Flashes 2 Hz	• PROFIBUS address is set higher than 125 or to 0.	• Use parameter *P093 Fieldbus address* to check the address set with the DIP switches. • Reset the inverter.
Flashes 1 Hz	• No error, only display.	• The inverter is restarting.

BUS-FAULT LED

The **BUS FAULT** LED indicates PROFIBUS-DP errors.

Status of the BUS FAULT LED	Cause of error	Remedy
Red	• Connection to the PROFIBUS DP master has failed. • Unit does not detect PROFIBUS baud rate. • Bus interruption. • PROFIBUS-DP master not in operation.	• Check the PROFIBUS DP connection on the unit. • Check the project planning of the PROFIBUS DP master. • Check all cables in your PROFIBUS DP network.
Off	• Unit is currently exchanging data with the PROFIBUS DP master (data exchange).	-
Flashes	• Unit has detected the baud rate, but is not addressed by the PROFIBUS DP master. • Unit was not configured in PROFIBUS DP master or configured incorrectly.	• Check the PROFIBUS address setting on the DFS12B and in the project planning software of the PROFIBUS DP master. • Check the configuration of the PROFIBUS DP master. • Use the GSD file **SEW_600C.GSD** with the designation *MOVIDRIVE-DFS* for configuration.

7 Project Planning and Startup

This section provides you with information on project planning for the DP master and startup of the drive inverter for fieldbus operation.

	**INFORMATION** Current versions of the GSD files for the DFS12B option are available on the SEW homepage (www.sew-eurodrive.com) under the heading "Software". Once you have downloaded and unpacked the software, you will have two directories for the operating modes PROFIBUS DP and PROFIBUS DP-V1.

7.1 Validity of the GSD file for DFS12B

PROFIBUS option DFS12B074 firmware option 1:	**MOVIDRIVE® MDX61B**
DFS12B	SEW_600C.GSD

	**INFORMATION** Do not edit or amend the entries in the GSD file. SEW-EURODRIVE assumes no liability for malfunctions of the inverter caused by a modified GSD file.

7.2 Project planning of PROFIBUS / PROFIsafe with MOVIDRIVE® GSD file

A GSD file is provided for project planning for the PROFIBUS DP master. Copy this file into a special directory of your project planning software.

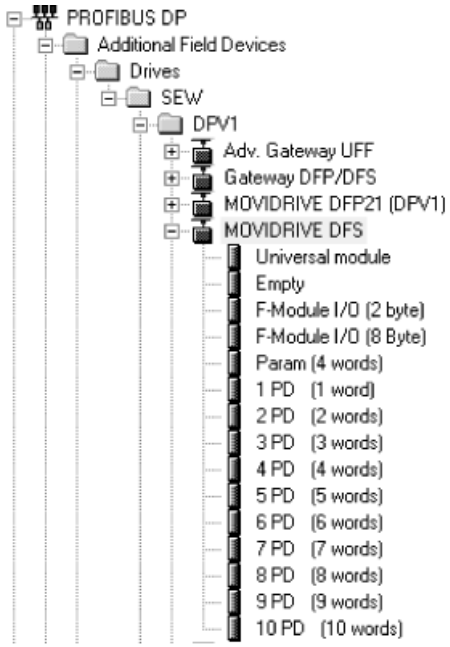
Refer to the relevant project planning software manuals for details on the procedure.

7.2.1 GSD file for PROFIBUS DP-V1

Use the **GSD fileSEW_600C.GSD** from the "DPV1" directory if you want to use the parameter setting options of PROFIBUS DP-V1 in addition to the standard PROFIBUS DP communication to control the drive inverter.

This GSD file corresponds to GSD revision 5.2.

The GSD files are assigned the name for PROFIBUS DP-V1 for easier identification and are displayed in a special subdirectory in the project planning software for the PROFIBUS DP-V1 master (see the following figure).



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7.2.2 Project planning procedure

Proceed as follows for project planning for MOVIDRIVE® with PROFIBUS DP interface:

1. Install (copy) the GSD file according to the requirements of your project planning software. Once the file has been installed properly, the device appears next to the slave stations with the designation *MOVIDRIVE+DFS12B*.
2. Add the interface module under the name *MOVIDRIVE-DFS* to the PROFIBUS structure and assign the station address.
3. Select the process data configuration required for your application (see page 25).
4. Enter the I/O or peripheral addresses for the configured data widths.

After project planning, you can start PROFIBUS DP. The red BUS FAULT LED indicates the status of the project planning (OFF = project planning OK).

7.2.3 DP configurations for MOVIDRIVE® MDX61B

The drive inverter must be given a specific DP configuration by the PROFIBUS DP master to define the type and number of input and output data used for transmission. You have the option of

- Controlling the drive using process data
- Reading and writing all drive parameters using the parameter channel
- Using a data exchange medium of your choice between IPOS$^{plus®}$ and the controllor.

MOVIDRIVE® inverters make it possible to have different DP configurations for exchanging data between the PROFIBUS DP master and the inverter. The following table provides additional information about all possible DP configurations for the MOVIDRIVE® range. The "Process data configuration" column shows the name of the configuration. The texts will also be displayed as selection list within the project planning software for the PROFIBUS DP master. The DP configurations column shows which configuration data is sent to the inverter when the PROFIBUS DP connection is being established.

Process data configuration	Meaning / notes	DP configurations		
		Slot 1 (F-module)	Slot 2 (ParamChannel)	Slot 3 (PD channel)
1 PD	MOVIDRIVE® control via 1 process data word	0x00	0x00	0xC0 0xC0 0xC0
2 PD	MOVIDRIVE® control via 2 process data words	0x00	0x00	0xC0 0xC1 0xC1
3 PD	MOVIDRIVE® control via 3 process data words	0x00	0x00	0xC0 0xC2 0xC2
4 PD	MOVIDRIVE® control via 4 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC3 0xC3
5 PD	MOVIDRIVE® control via 5 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC4 0xC4
6 PD	MOVIDRIVE® control via 6 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC5 0xC5
7 PD	MOVIDRIVE® control via 7 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC6 0xC6
8 PD	MOVIDRIVE® control via 8 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC7 0xC7
9 PD	MOVIDRIVE® control via 9 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC8 0xC8
10 PD	MOVIDRIVE® control via 10 process data words (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0x00	0xC0 0xC9 0xC9
Param + 1 PD	MOVIDRIVE® control via 1 process data word Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC0 0xC0
Param + 2 PD	MOVIDRIVE® control via 2 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC1 0xC1
Param + 3 PD	MOVIDRIVE® control via 3 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC2 0xC2
Param + 4 PD	MOVIDRIVE® control via 4 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC3 0xC3
Param + 5 PD	MOVIDRIVE® control via 5 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC4 0xC4
Param + 6 PD	MOVIDRIVE® control via 6 process data words Parameter setting via 8 byte parameter channel (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0xC0 0x87 0x87	0xC0 0xC5 0xC5
Param + 7 PD	MOVIDRIVE® control via 7 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC6 0xC6
Param + 8 PD	MOVIDRIVE® control via 8 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC7 0xC7
Param + 9 PD	MOVIDRIVE® control via 9 process data words Parameter setting via 8 byte parameter channel	0x00	0xC0 0x87 0x87	0xC0 0xC8 0xC8
Param + 10 PD	MOVIDRIVE® control via 10 process data words Parameter setting via 8 byte parameter channel (PD4-PD10 can only be used with IPOS$^{plus®}$)	0x00	0xC0 0x87 0x87	0xC0 0xC9 0xC9

	INFORMATION
	The DFS12B option does not support the "Compact identifier formats" coding. Only use the setting "Integrity over entire length" for data transmission.

Data integrity

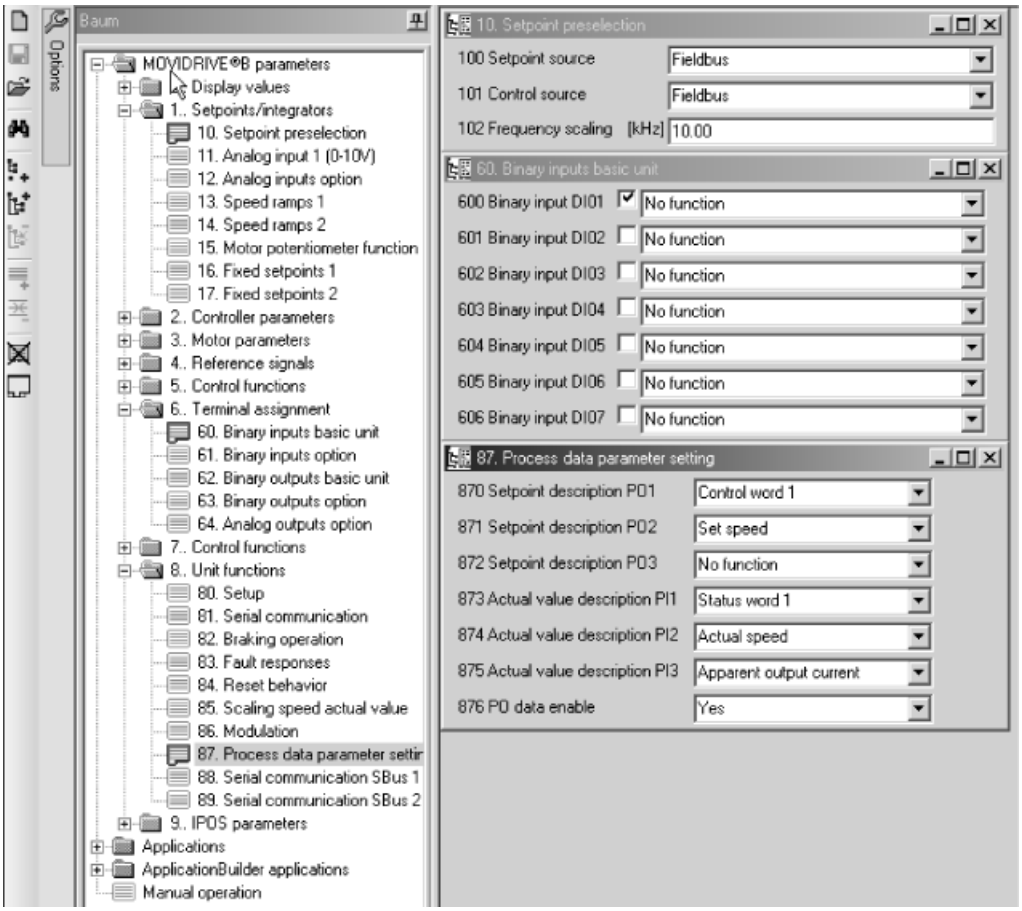
Consistent data is data that has to be transmitted between the programmable controller and the drive inverter as one block at all times and must never be transmitted separately.

Data integrity is especially important for the transmission of positioning values or complete positioning tasks. Inconsistent transmission may contain data from different program cycles of the automation device. This would lead to undefined values being transmitted to the drive inverter.

For PROFIBUS DP, data communication between the programmable controller and drive engineering devices is usually carried out with the setting "Data integrity over entire length".

7.3 Setting the MOVIDRIVE® MDX61B inverter

The following settings are required for simple fieldbus operation.



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However, to control the MOVIDRIVE® MDX61B inverter via PROFIBUS, you must first switch the drive inverter to control signal source (P101) and setpoint source (P100) = FIELDBUS. The FIELDBUS setting means the drive inverter parameters are set for control and setpoint entry via PROFIBUS. MOVIDRIVE® MDX61B then responds to the process output data transmitted from the master programmable controller.

The parameters of MOVIDRIVE® MDX61B can be set straight away via PROFIBUS without any further settings once the PROFIBUS option card has been installed. For example, all parameters can be set by the master programmable controller after being switched-on.

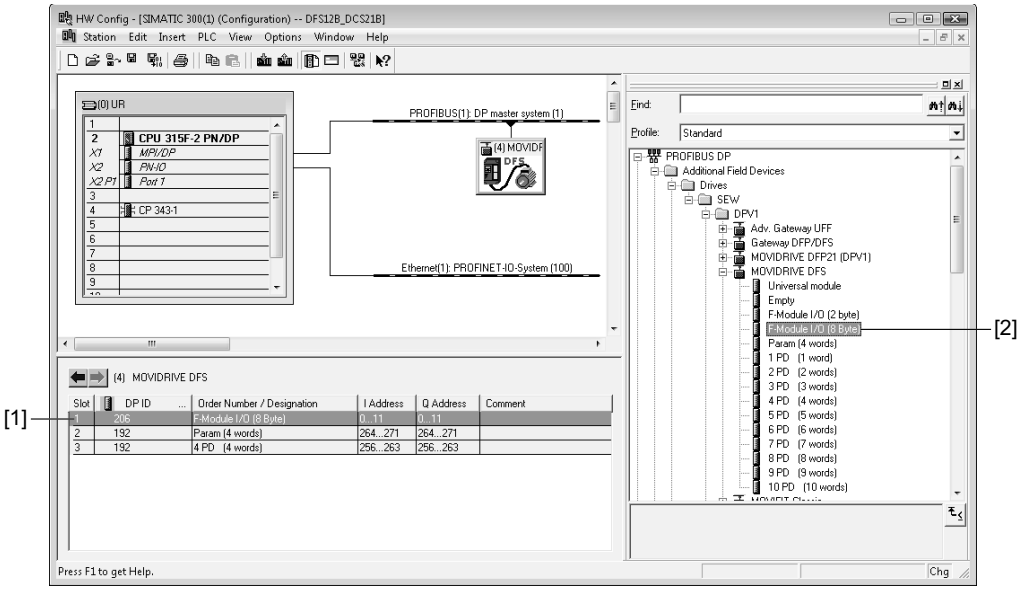
Activation of the control signal source and setpoint source FIELDBUS is signaled to the machine controller using the "Fieldbus mode active" bit in the status word.

For safety reasons, you must also enable MOVIDRIVE® MDX61B at the terminals for control via the fieldbus system. Consequently, you must wire and program the terminals in such a way that the inverter is enabled via the input terminals. The simplest way of enabling the drive inverter at the terminals is, for example, to connect the DIØØ (function /CONTROLLER INHIBIT) input terminal to a DC +24 V signal and to program input terminals DIØ1 – DIØ3 to NO FUNCTION.

7.4 Configuring PROFIsafe with STEP 7

Configuring the PROFIsafe properties

- For using the safety functions of the DFS12B/DCS21B combination, you must configure an "F-module I/O (8 byte)" in slot 1.
- Mark slot 1 and delete the entry "Slot not used". Next, move the "F-module I/O (8 byte)" entry [2] to slot 1 [1].



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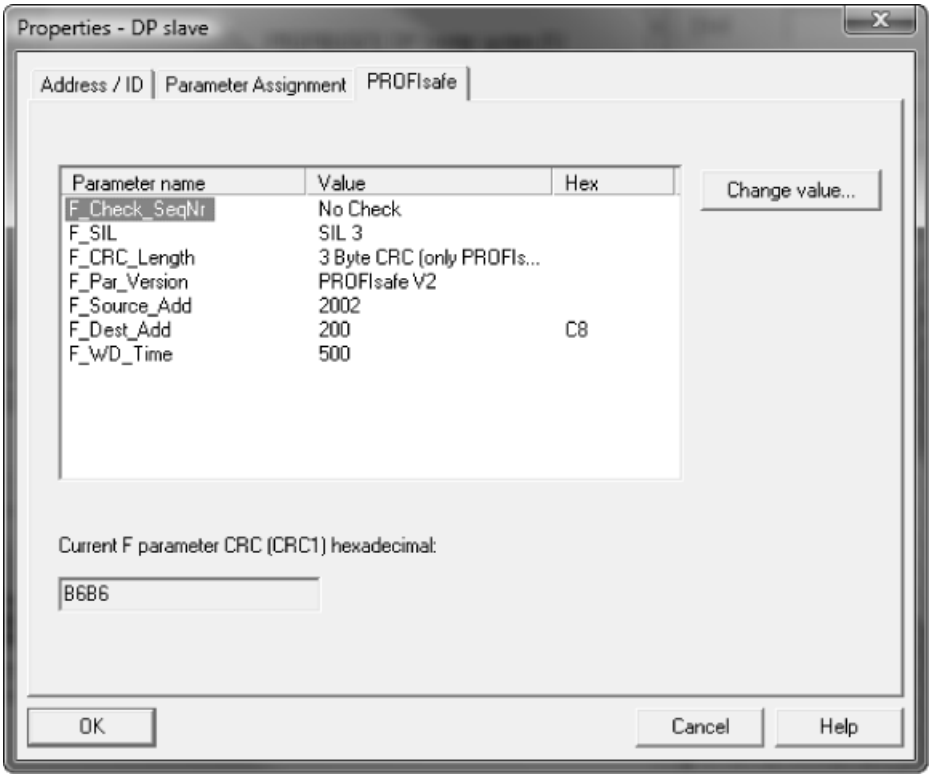
- You can set the parameters for the PROFIsafe properties (see figure below) in the hardware configuration. Make a double-click on the "F-module I/O (8 byte) module" in slot 1 [1]



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7.4.1 Description of F parameters

The DFS12B option passes the PROFIsafe protocol information to the DCS21B option (X86 terminal) via CAN bus (X31 terminal). The safety-relevant PROFIsafe protocol evaluation is performed in the DSC21B option.

	INFORMATION
	For more detailed information, refer to the "MOVIDRIVE® MDX61B Safety Module DCS21B/31B Option" manual.

When the fieldbus or network systems starts up, the bus master sends the safety-relevant parameters in an F parameter block to the PROFIsafe option DCS21B of MOVIDRIVE® B. A plausibility test then checks them in the option. The PROFIsafe option only exchanges data with bus master after positive confirmation for this F parameter block has been received. Below is a list of the safety-relevant parameters which are passed on to the PROFIsafe option DCS21B.

Depending on the bus system being used, the following parameters are available:

PROFIsafe F parameters	Bus system PROFIBUS DP-V1
F_Check_SeqNr	Not installed
F_SIL	Fix
F_CRC_Length	Fix
F_Par_Version	Fix
F_Source_Add	Fix
F_Dest_Add	Variable
F_WD_Time	Variable

"F_SIL" parameter

This parameter allows F stations to check if the safety category matches that of the F host. Depending on the risk, different safety circuits with different safety classes SIL 1 to SIL 3 (SIL = Safety Integrity Level), apply in these safety-relevant cases.

The DCS21B option supports the following setting:

- F_SIL = SIL 3

"F_CRC_Length" parameter

Depending on the length of the F user data (process values) and the PROFIsafe version, the length of the required CRC check value varies. This parameter communicates the anticipated length of the CRC2 key in the safety telegram to the F component.

The DCS21B option handles user data that is less than 12 bytes in length, so that with PROFIsafe V2, a 3 byte CRC is used.

The DCS21B option supports the following setting:

- F_CRC_Length = 3 byte CRC (only with PROFIsafe V2)

"F_Par_Version" parameter

This parameter identifies the PROFIsafe version supported by the DCS21B option. Only PROFIsafe V2 is supported when using MOVIDRIVE® B.

"F_Source_Add" parameter

The PROFIsafe addresses are used for unique identification of the source (F_Source_Add) and destination (F_Dest_Add). The combination of source and target address must be unique across the network and all stations. Depending on the master configuration, the source address F_Source_Add is automatically provided by STEP7.

Values ranging from 1 to 65534 can be entered in parameter *F_Source_Add*.

You cannot directly edit this parameter in STEP7-HW Config.

"F_Dest_Add" parameter

The PROFIsafe address of the DCS21B option that was previously set using MOVISAFE® Assist is entered in this parameter.

Values ranging from 1 to 65534 can be entered in parameter *F_Dest_Add*.

	INFORMATION
	For more detailed information, refer to the "MOVIDRIVE® MDX61B Safety Module DCS21B/31B Option" manual.

"F_WD_Time" parameter

This parameter defines a monitoring time in the DCS21B option.

A valid safety telegram must arrive from the F-CPU within this monitoring time. Otherwise the DCS21B option reverts to safe status.

Select a monitoring time of a sufficient length so that communication can tolerate telegram delays, but also sufficiently short enough for your safety application to run without restriction.

You can enter the *F_WD_Time* parameter in steps of 1 ms, ranging from 1 ms to 10 s for the DCS21B option.

7.4.2 Safety diagnostics using PROFIBUS DP-V1

The status of PROFIsafe communication and error messages of the safety module of the DFS12B option are transmitted to the PROFIBUS DP master via status PDU in accordance with the PROFIBUS DP-V1 standard.

The following figure shows how diagnostic data is organized for PROFIsafe communication via slot 1. The F module for the DFS safety module is configured in slot 1.

Byte 11 is used for transmitting diagnostic messages. These are defined in the PROFIsafe specifications.

Bytes 12 and 13 transmit the status and error status of the DFS safety module to the higher-level PROFIBUS DP master.

The figure below shows the structure of diagnostic data for PROFIBUS DP-V1:

	Status block						
Bytes 1 - 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12	Byte 13
6 bytes Standard diagnostics	**Header**	**Status Type**	**Slot Number**	**Status Specifier**	**Diag User Data 0**	**Diag User Data 1**	**Diag User Data 2**
...	0x07	0x81	0x00	0x00	PROFIsafe	F-State 1	
	↑	↑	↑	↑	↑	↑	
	7 bytes module-specific diagnostics	0x81 = Status block with status message	0x00 = Slot 1 (F-channel)	no DP-V1 specifier	PROFIsafe diagnostic information in accordance with PROFIsafe profile V2.0	Cyclical F_State of the DFS option	

Diagnostic messages of the PROFIsafe layer

The table below shows the diagnostic messages of the PROFIsafe layer:

Byte 11	Diagnostic text (German)	Diagnostic text (English)
0hex / 0dec	Kein Fehler	---
40hex / 64dec	F_Dest_Add stimmt nicht überein	Mismatch of F_Dest_Add
41hex / 65dec	F_Dest_Add ist ungültig	F_Dest_Add not valid
42hex / 66dec	F_Source_Add ist ungültig	F_Source_Add not valid
43hex / 67dec	F_WD_Time ist 0 ms	F_WD_Time is 0 ms
44hex / 68dec	F_SIL Level größer max SIL Level	F_SIL exceeds SIL f. application
45hex / 69dec	Falsche F_CRC_Length	F_CRC_Length does not match
46hex / 70dec	Falsche F-Parameter Version	F-Parameter set incorrect
47hex / 71dec	Fehler im CRC1-Wert	CRC1-Fault

INFORMATION

For more information on the meaning and remedy of error messages, refer to the manuals on the PROFIBUS master manual.

7.5 Procedure for starting up DFS12B with MOVIDRIVE® MDX61B

The following sections describe the startup procedure for MOVIDRIVE® MDX61B with the DFS12B option step-by-step.

7.5.1 Preliminary work

Step 1: Install the required software

1. FTDI driver for USB11A programming interface
   - Connect USB11A to the PC. Windows hardware detection will install the required FTDI driver.
   - You can download the FTDI driver from the software ROM 7 or from www.sew-eurodrive.com.
2. GSD file: SEW_600C.GSD
3. MOVITOOLS® MotionStudio as of version 5.50

Step 2: Install units

1. Install MOVIDRIVE® MDX61B according to the operating instructions:
   - Supply system cable
   - Motor cable
   - Braking resistance
   - DC 24 V backup voltage
   - You can download the FTDI driver from the software ROM 7 or from www.sew-eurodrive.com.
2. Install the PROFIBUS and connect the DFS12B option to the PROFIBUS. Ensure PROFIBUS termination.

7.5.2 Switching on MOVIDRIVE® MDX61B with DC 24 V or AC 400 V

Step 1: Configure MOVIDRIVE® MDX61B

1. Start MOVITOOLS® MotionStudio and create a new project.

   Enter a project name and assign the USB11A programming interface according to the serial COM interface.
   - If the USB11A programming interface is connected to the PC for the first time, Windows hardware detection will install the required FTDI driver.
   - If USB11A is not recognized, check the assignment to the COM interface. The matching COM port is marked by "USB"
2. Connect the PC with MOVIDRIVE® using the USB11A programming interface.
3. Perform a unit scan. To do so, select the unit by clicking the left mouse button. Then click the right mouse button and choose [Startup] / [Parameter tree] from the context menu.
4. Set the *P100 setpoint source* and *P101 control source* parameters to "Fieldbus".
5. For simple control via fieldbus, you can set the binary inputs to "No function" using parameters P601 to P608.

6. Check the parameter setting for the process data (P87x). The parameters for status word and control word must be set. Set the *P876 PO data enable* parameter to "Yes".

Step 2: Configure PROFIBUS

1. Start the control manufacturer's software to configure the hardware (e.g. STEP 7-HWKONFIG).
2. If the GSD file is not installed, install the GSD file SEW_600C.GSD now (see section "Preliminary work" on page 33).
3. Configure the PROFIBUS as described in this manual.
   - Assign the PROFIBUS address (DIP switch and STEP 7 configuration)
   - Configure the process data
   - Load the configuration into the controller
4. The **BUS FAULT** LED of the DFS12B option goes off when PROFIBUS is successfully configured. Process data is now being exchanged.
5. Extend the control program and establish the process data exchange with MOVIDRIVE® B.
6. Start MOVITOOLS® MotionStudio and create a new project.

   Run the MOVITOOLS® MotionStudio via serial communication with USB11A or PROFIBUS (see section 10). Connect the PC with MOVIDRIVE® B for this purpose.
7. Perform a unit scan.
8. Select MOVIDRIVE®, make a right mouse click and choose [Diagnostic] / [Bus monitor] from the context menu. Check whether process data exchange between controller and MOVIDRIVE® B is working properly.
9. Switch on the supply voltage and enable MOVIDRIVE® B at the terminals (DI00=1).

   Activate unit enable by setting control word 1 = 0x0006.

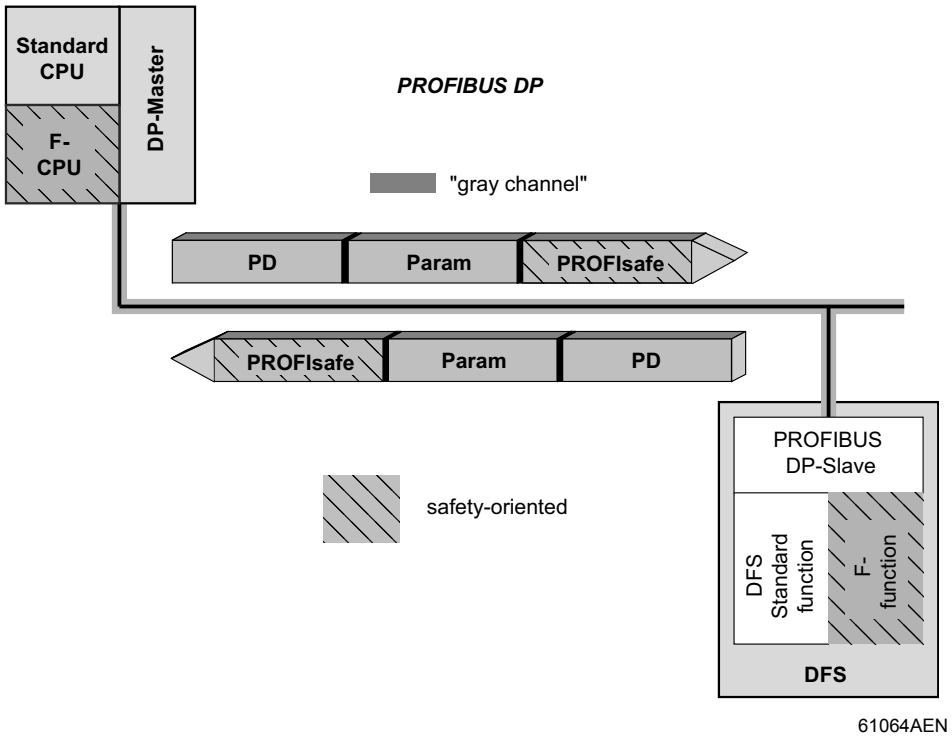
   If MOVIDRIVE® B remains in "No Enable" condition, check the terminal assignment (parameter group P60x) and apply DC 24 V to more binary inputs if required.

8 PROFIBUS DP Operating Characteristics

This section describes the basic characteristics of the drive inverter with PROFIBUS DP.

8.1 Data exchange between PROFIBUS master and DFS12B option

Data is exchanged between PROFIBUS master and DFS12B option via PROFIBUS DP, which at the same time represents the "gray channel" for the safety-relevant application. This means the transmitted DP telegrams contain standard information of conventional operation with MOVIDRIVE® B at PROFIBUS DP as well as the PROFIsafe safety telegram. Depending on the configuration, the maximum available expansion level enables the exchange of PROFIsafe safety data, the parameter channel, and the process data between PROFIBUS DP master and DFS12B as shown in the following figure.



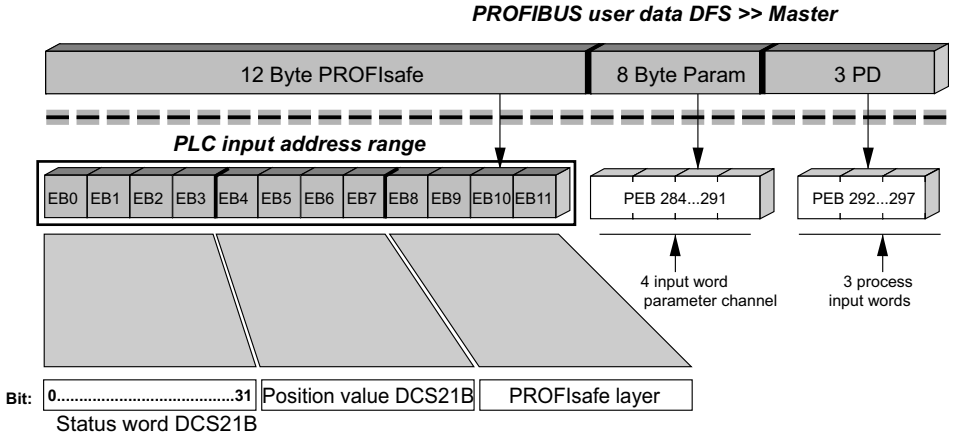
8.1.1 Mapping the DFS12B in the address range of the PLC

The user data information transmitted using PROFIBUS-DP is mapped in the input and output address range in the controller. The standard CPU uses the standard user data (process data and 8-byte parameter channel) for processing purposes. The PROFIsafe data can only be used by the F-CPU. The figures below refer to the following PROFIBUS configuration:

	E address	A address
F module I/O (8 + 4 byte)	0 - 11	0 - 11
Param (4 words)	284 - 291	284 - 291
3 PD (3 words)	292 - 297	292 - 297

For the safety-relevant function, 64 input and output bits are available in the F-CPU. 32 bits of them represent the control word and the status word of the DCS21B option. Other 32 bits represent the position values of the DCS21B option.

The following figure shows the input data in the input address range of the PLC.



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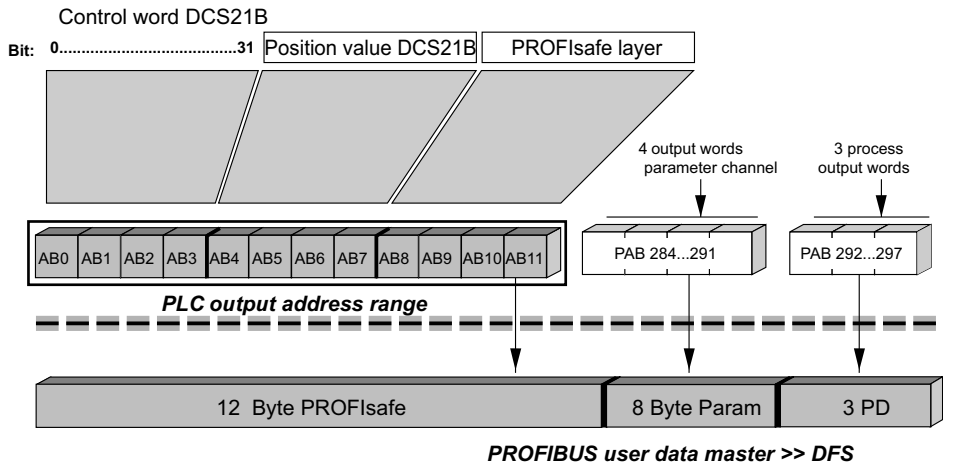
The following figure shows the data of the DCS21B option in the output address range of the PLC.



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8.1.2 F periphery DB of PROFIsafe option DFS

During compilation in the HW Config tool (HWCONFIG), the system automatically generates an F periphery DB for every PROFIsafe option DFS. The F periphery DB provides users with an interface in which they can evaluate or control variables in the safety program.

The symbolic name consists of the invariable prefix "F", the start address of the F periphery, and the name entered in the object properties during configuration for the F periphery (e.g. F00008_198).

The following table shows the F periphery DB of PROFIsafe option DFS:

	Address	Symbol	Data type	Function	Preset
User-controllable variables	DBX0.0	'F00008_198.PASS_ON'	Bool	1 = activate passivation	0
	DBX0.1	'F00008_198.ACK_NEC'	Bool	1 = acknowledgment required for reintegration with DFS	1
	DBX0.2	'F00008_198.ACK_REI'	Bool	1 = acknowledgment for reintegration	0
	DBX0.3	'F00008_198.IPAR_EN'	Bool	Variable for resetting parameters (not supported by PROFIsafe option DFS)	0
Variables that can be evaluated	DBX2.0	'F00008_198.PASS_OUT'	Bool	Run passivation	1
	DBX2.1	'F00008_198.QBAD'	Bool	1 = substitute values are output	1
	DBX2.2	'F00008_198.ACK_REQ'	Bool	1 = acknowledgment required for reintegration	0
	DBX2.3	'F00008_198.IPAR_OK '	Bool	Variable for resetting parameters (not supported by PROFIsafe option DFS)	0
	DBB3	'F00008_198.DIAG'	Byte	Service information	

PASS_ON This variable lets you activate passivation of the PROFIsafe option DFS. Provided that PASS_ON = 1, the F periphery is passivated.

ACK_NEC After a fault has been corrected, the PROFIsafe option DFS is reintegrated, depending on ACK_NEC.

- ACK_NEC = 0: automatic reintegration occurs
- ACK_NEC = 1: automatic reintegration occurs following acknowledgement by the user

CAUTION

It is only permissible to set the variable ACK_ NEC = 0 if automatic reintegration is safe for the process in question.

- Check if automatic reintegration is permissible for the process in question.

ACK_REI In order to reintegrate PROFIsafe option DFS after the fault has been corrected, user acknowledgement with positive edge of variable ACK_REI is required. Acknowledgement is only possible if variable ACK_REQ = 1.

ACK_REQ The F control system sets ACK_REQ = 1 after all faults in the data exchange with PROFIsafe option DFS have been corrected. After successful acknowledgement, the F control system sets ACK_REQ = "0".

PASS_OUT Indicates whether PROFIsafe option DFS has been passivated. Substitute values are output

QBAD Fault in the data exchange with PROFIsafe option DFS. Indicates passivation. Substitute values are output

DIAG For service information purposes, the variable DIAG supplies non-failsafe information about faults that have occurred in the F control system. For further information, refer to the relevant F control system manual.

Input and output data

	INFORMATION
	For more detailed information, refer to the "MOVIDRIVE® MDX61B Safety Module DCS21B/31B Option" manual.

8.2 Controlling the MOVIDRIVE® MDX61B inverter

The drive inverter is controlled via the process data channel which is up to 10 I/O words in length. These process data words are reproduced in the I/O and/or peripheral area of the controller, for example when a programmable logic controller is used as the PROFIBUS DP master. As a result, they can be addressed in the usual manner.

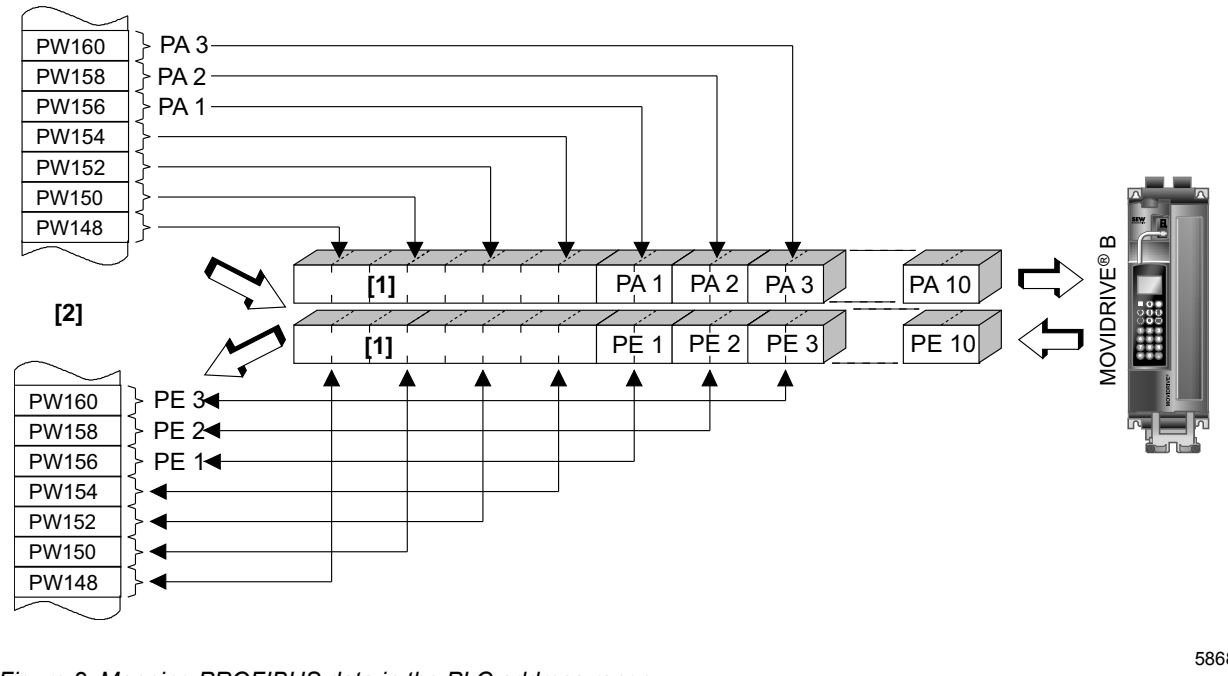


Figure 2: Mapping PROFIBUS data in the PLC address range

[1] 8 byte MOVILINK® parameter channel

[2] PLC address range

PI1 - PI10 Process input data

PO1 - PO10 Process output data

	INFORMATION
	For more information about controlling via the process data channel, in particular regarding the coding of the control and status word, refer to the Fieldbus Unit Profile manual.

8.2.1 Control example for SIMATIC S7 with MOVIDRIVE® MDX61B

The drive inverter is controlled via SIMATIC S7 depending on the selected process data configuration, either directly via load and transfer commands or via the special system functions *SFC 14 DPRD_DAT* and *SFC15 DPWR_DAT*.

In principle, S7 data lengths of 3 bytes or more than 4 bytes must be transmitted using system functions SFC14 and SFC15.

Consequently, the data in the following table applies:

Process data configuration	STEP -7 access via
1 PD	Load / transfer commands
2 PD	Load / transfer commands
3 PD	System functions SFC14/15 (6 bytes long)
6 PD	System functions SFC14/15 (12 bytes long)
10 PD	System functions SFC14/15 (20 bytes long)
Param + 1 PD	Parameter channel: System functions SFC14/15 (8 bytes long) Process data: Load / transfer commands
Param + 2 PD	Parameter channel: System functions SFC14/15 (8 bytes long) Process data: Load / transfer commands
Param + 3 PD	Parameter channel: System functions SFC14/15 (8 bytes long) Process data: System functions SFC14/15 (6 bytes long)
Param + 6 PD	Parameter channel: System functions SFC14/15 (8 bytes long) Process data: System functions SFC14/15 (12 bytes long)
Param + 10 PD	Parameter channel: System functions SFC14/15 (8 bytes long) Process data: System functions SFC14/15 (20 bytes long)

8.2.2 PROFIBUS DP timeout (MOVIDRIVE® MDX61B)

If the data transfer via PROFIBUS DP is faulty or interrupted, the response monitoring time in MOVIDRIVE® B elapses (if configured in the PROFIBUS DP master). The **BUS FAULT** LED lights up or flashes to indicate that no new user data is being received. At the same time, MOVIDRIVE® B performs the error response selected with *P831 Fieldbus timeout response*.

P819 Fieldbus timeout displays the response monitoring time specified by the PROFIBUS DP master during the PROFIBUS DP startup. The timeout can only be changed via the PROFIBUS DP master. Although modifications made using the keypad or MOVITOOLS® are displayed, they do not have any effect and are overwritten when PROFIBUS DP is next started up.

8.2.3 Fieldbus timeout response (MOVIDRIVE® MDX61B)

Parameter *P831 Fieldbus timeout response* is used to set the error response that is triggered via the fieldbus timeout monitoring function. The setting made here must correspond to the setting in the master system (S7: response monitoring).

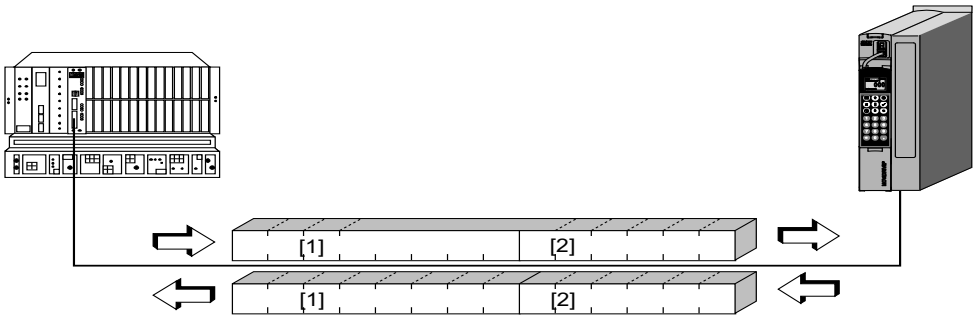
8.3 Parameter setting via PROFIBUS DP

In the PROFIBUS DP system, the parameters are accessed via the 8-byte MOVILINK® parameter channel. This parameter channel offers extra parameter services in addition to the conventional READ and WRITE services.

	INFORMATION
	Parameterization of the inverter via PROFIBUS DP parameter channel can only be used with MOVIDRIVE® MDX61B. The PROFIBUS DP parameter channel does not provide data access to the parameters of inverters that are installed on the SBus.

8.3.1 Structure of the 8 byte MOVILINK® parameter channel

PROFIBUS DP enables access to the inverter drive parameters via the "parameter process data object" (PPO). This PPO is transmitted cyclically and contains the process data channel [2] and a parameter channel [1] that can be used to exchange acyclical parameter values.



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[1] Parameter channel
[2] Process data channel

The following table shows the structure of the 8 byte MOVILINK® parameter channel.

Basic structure:

- 1 management byte
- 1 index word
- 1 reserved byte
- 4 data bytes

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Subindex (reserved)	Index high	Index low	MSB data	Data	Data	LSB data
		Parameter index		4-byte data			

Management of the 8-byte MOVILINK® parameter channel

The entire procedure for setting parameters is coordinated using management byte 0 . This byte provides important service parameters of the service performed, such as

- Service identifier
- Data length
- Design
- Status

The following table shows that bits 0, 1, 2 and 3 contain the service identifier, and define which service is performed. Bits 4 and bit 5 specify the data length in bytes for the WRITE service; it should be set to 4 bytes for all SEW drive inverters.

7 / MSB	6	5	4	3	2	1	0 / LSB
				Service identifier 0000 = No service 0001 = READ parameter 0010 = WRITE parameter 0011 = WRITE parameter volatile 0100 = READ minimum 0101 = READ maximum 0110 = READ default 0111 = READ scale 1000 = READ attribute			
		Data length 00 = 1 byte 01 = 2 bytes 10 = 3 bytes 11 = 4 bytes (must be set)					
	Handshake bit Must be changed on every new task in cyclical transmission.						
Status bit 0 = No error during execution of service 1 = Error during execution of service							

Bit 6 is used as handshake between controller and inverter. It triggers execution of the transmitted service in the inverter. In PROFIBUS DP, the parameter channel is transmitted cyclically with the process data. For this reason, the implementation of the service in the inverter must be triggered by edge control using handshake bit 6. For this purpose, the value of this bit is altered for each new service that is to be executed. The inverter uses the handshake bit to signal whether the service has been executed or not. The service was executed if the handshake bit received in the control is identical with the transmitted handshake bit. Status bit 7 indicates whether it was possible to execute the service properly or if errors occurred.

Index addressing

Byte 2: Index high and byte 3: Index low determines the parameter that is to be read or written via the fieldbus system. The parameters of an inverter are addressed with a uniform index regardless of the fieldbus system which is connected. Byte 1 should be viewed as reserved and must always be set to 0x00.

Data range

As shown in the following table, the data is contained in byte 4 through byte 7 of the parameter channel. This means up to 4 bytes of data can be transmitted per service. The data is always entered with right-justification; that is, byte 7 contains the least significant data byte (LSB data) whereas byte 4 is the most significant data byte (MSB data).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Subindex	Index high	Index low	MSB data	Data	Data	LSB data
				High byte 1	Low byte 1	High byte 2	Low byte 2
				High word		Low word	
				Double word			

Incorrect service execution

The status bit in the management byte is set to signal that a service has been executed incorrectly. If the received handshake bit is identical to the transmitted handshake bit, the inverter has executed the service. If the status bit now signals an error, the error code is entered in the data range of the parameter telegram. Bytes 4 through 7 provide the return code in a structured format (see the chapter "Return codes of parameter setting" on page 46).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Subindex	Index high	Index low	Error class	Error code	Add. code high	Add. code low
Status bit = 1: Incorrect service execution							

8.3.2 Reading a parameter via PROFIBUS DP (READ)

Due to the cyclical transfer of the parameter channel, to execute a READ service via the 8 byte MOVILINK® parameter channel, the handshake bit may only be changed if the complete parameter channel has been set up for the specific service. As a result, adhere to the following sequence when reading a parameter:

1. Enter the index of the parameter to be read in byte 2 (index high) and byte 3 (index low).
2. Enter the service identifier for the READ service in the management byte (byte 0).
3. Transfer the READ service to the inverter by changing the handshake bit.

Since this is a read service, the sent data bytes (bytes 4 to 7) and the data length (in the management byte) are ignored and do not need to be set. This means they need not be set.

The inverter now processes the READ service and sends the service confirmation back by changing the handshake bit.

7 / MSB	6	5	4	3	2	1	0 / LSB
0	0/1[1)]	X[2)]	X[2)]	0	0	0	1
				Service identifier 0001 = READ parameter			
		Data length Not relevant for READ service					
	Handshake bit Must be changed on every new task in cyclical transmission.						
Status bit 0 = No error during execution of service 1 = Error during execution of service							

1) Bit value is changed

2) Not relevant

The above table shows how a READ service is coded in the management byte. The data lenght is irrelevant. You only need to enter the service identifier for the READ service. This service is now activated in the inverter when the handshake bit changes. For example, it would be possible to activate the READ service with the management byte coding 01hex or 41hex.

8.3.3 Writing a parameter via PROFIBUS DP (WRITE)

Due to the cyclical transfer of the parameter channel, to execute a WRITE service via the 8 byte MOVILINK® parameter channel, the handshake bit may only be changed if the complete parameter channel has been set up for the specific service. Observe the following sequence when writing a parameter:

1. Enter the index of the parameter to be written in byte 2 (index high) and byte 3 (index low).
2. Enter the data to be written in bytes 4 through 7.
3. Enter the service identifier and the data length for the WRITE service in the management byte (byte 0).
4. Transfer the WRITE service to the inverter by changing the handshake bit.

The inverter now processes the WRITE service and sends the confirmation back by changing the handshake bit.

The following table shows how a WRITE service is coded in the management byte. The data length is 4 bytes for all parameters of SEW inverters. This service is now transmitted to the inverter when the handshake bit changes. Consequently, a WRITE service on the SEW inverter always has the management byte coding 32hex or 72hex.

7/MSB	6	5	4	3	2	1	0/LSB
0	0/1[1)]	1	1	0	0	1	0
				Service identifier 0010 = WRITE parameter			
		Data length 11 = 4 bytes					
	Handshake bit Must be changed on every new task in cyclical transmission.						
Status bit 0 = No error during execution of service 1 = Error during execution of service							

1) Bit value is changed

8.3.4 Parameter setting procedure with PROFIBUS DP

Using the WRITE service as an example, the following figure represents a process of setting parameters between the controller and the inverter via PROFIBUS DP. To simplify the sequence, the following figure only shows the management byte of the parameter channel.

The parameter channel is only received and returned by the inverter while the control is preparing the parameter channel for the WRITE service. The service is not activated until the moment when the handshake bit is changed (in this example, when it changes from 0 to 1). The inverter now interprets the parameter channel and processes the WRITE service, but continues to answer all telegrams with handshake bit = 0. The executed service is acknowledged with a change of the handshake bit in the response telegram of the inverter. The controller now detects that the received handshake bit is once again the same as the one which was sent. It can now prepare another parameter setting procedure.

Controller	PROFIBUS DP(V0)			Inverter (slave)
	--	0**0**110010XXX...	→	Parameter channel is received, but not evaluated
	←	0**0**110010XXX...	--	
Parameter channel is prepared for the WRITE service				
Handshake bit is changed and the service is transmitted to the inverter	--	0**1**110010XXX...	→	
	←	0**0**110010XXX...	--	
	--	0**1**110010XXX...	→	
	←	0**0**110010XXX...	--	WRITE service is performed, handshake bit is changed
Service confirmation is received as the send and receive handshake bits are the same again	←	0**1**110010XXX...	--	
	--	0**1**110010XXX...	→	Parameter channel is received, but not evaluated

8.3.5 Parameter data format

When parameters are set via the fieldbus interface, the same parameter coding is used as with the serial RS485 interfaces and/or the system bus.

The data formats and ranges of values for the individual parameters can be found in the publication "MOVIDRIVE® Fieldbus Unit Profile with Parameter List".

8.3.6 Return codes for parameter setting

Elements

In the event of an incorrect parameter setting, the inverter sends back various return codes to the master which set the parameters. These codes provide detailed information about what caused the error. Generally, these return codes are structured. The inverter distinguishes between the following elements:

- Error class
- Error code
- Additional code

These return codes are described in detail in the Fieldbus Communications Profile manual and are not included in this documentation. However, the following special cases can occur in connection with PROFIBUS:

Error class

The error class element provides a more exact classification of the error type. MOVIDRIVE® supports the following error classes defined in accordance with EN 50170(V2):

Class (hex)	Designation	Meaning
1	vfd state	Status error of the virtual field device
2	application reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error during execution of service
6	access	Access error
7	ov	Error in the object list
8	other	Other error (see section "Additional code" on page 47)

The error class is generated by the communication software of the fieldbus interface if there is an error in communication. However, this does not apply to *error class 8, Other error*. Return codes sent from the inverter system are all included in *Error class 8 = Other error*. The error can be identified more precisely using the *additional code* element.

Error code

The error code element allows for a more detailed identification of the error cause within the error class and is generated by the communications software of the fieldbus interface in the event of faulty communication. For *Error class 8 = Other error*, only *Error code = 0 (Other error code)* is defined. In this case, detailed identification is made using the *additional code*.

Additional code

The additional code contains the return codes specific to SEW dealing with incorrect parameter settings of the inverter. These codes are returned to the master under *Error class 8 = Other error*. The following table shows all possible codings for the additional code.

Add. code high (hex)	Add. code low (hex)	Meaning
00	00	No error
00	10	Illegal parameter index
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value for parameter too large
00	16	Value for parameter too small
00	17	Required option card missing for this function/parameter
00	18	Error in system software
00	19	Parameter access only via RS-485 process interface to X13
00	1A	Parameter access only via RS-485 diagnostics interface
00	1B	Parameter is access-protected
00	1C	Controller inhibit required
00	1D	Invalid value for parameter
00	1E	Factory setting was activated
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with enabled output stage

8.3.7 Special cases

Special return codes

Errors in the parameter settings that cannot be identified either automatically by the application layer of the fieldbus system or by the system software of the inverter are treated as special cases. The following is a list of errors that can occur depending on the fieldbus interface used:

- Incorrect coding of a service via parameter channel
- Incorrect length specification of a service via parameter channel
- Internal communication error

Incorrect service code in the parameter channel

Incorrect code was specified in the management byte or reserved byte during parameter setting via the parameter channel. The following table shows the return code for this special case.

	Code (dec)	Meaning
Error class:	5	Service
Error code:	5	Illegal parameter
Add. code high:	0	-
Add. code low:	0	-

Remedy

Check bits 0 and 1 in the parameter channel.

Incorrect length specification in parameter channel

A data length other than 4 data bytes was specified in a READ or WRITE service during parameter setting via the parameter channel. The following table displays the return codes.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	8	Type conflict
Add. code high:	0	-
Add. code low:	0	-

Remedy

Check bits 4 and 5 for the data length in the management byte of the parameter channel. Both bits must be set to 1.

Internal communication error

The return code listed in the following table is sent back if a communication error has occurred within the system. The parameter service transferred via the fieldbus may not have been performed and has to be repeated. If this error occurs again, switch off the inverter completely and then back on again so it is re-initialized.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	2	Hardware fault
Add. code high:	0	-
Add. code low:	0	-

Remedy

Repeat the READ or WRITE service. If the error occurs again, briefly disconnect the inverter from the power supply and switch it on again. If the error persists, consult the SEW Service.

9 Functions of PROFIBUS DP-V1

This section provides you with information about the PROFIBUS DP-V1 functions.

9.1 Introduction to PROFIBUS DP-V1

This section describes the functions and terms used for operating SEW inverters at PROFIBUS DP-V1. Refer to the PROFIBUS user organization or visit www.profibus.com for detailed technical information on PROFIBUS DP-V1.

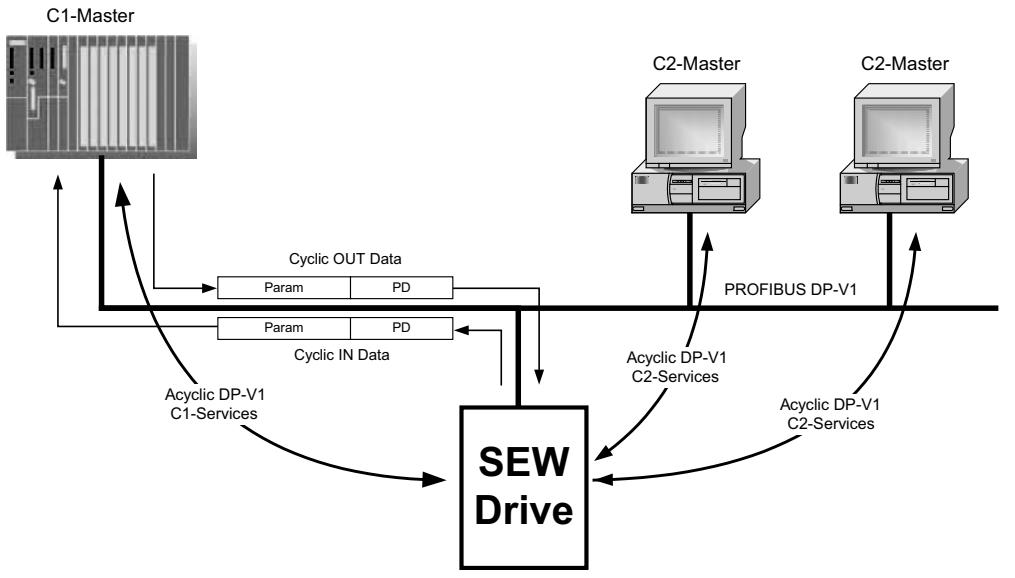
The PROFIBUS DP-V1 specification introduced new acyclical *READ / WRITE* services as part of the PROFIBUS DP-V1 expansions. These acyclical services are inserted into special telegrams during ongoing cyclical bus operation and therefore ensure compatibility between PROFIBUS DP (version 0) and PROFIBUS DP**V1** (**V**ersion **1**).

The acyclical *READ/WRITE* services can be used to exchange larger data quantities between master and slave (inverter) than it would be possible to transfer in the cyclical input or output data using the 8-byte parameter channel, for example. The advantage of the acyclical data exchange via DP-V1 lies in the minimum load on the cyclical bus operation since DP-V1 telegrams are only added to the bus cycle if required.

The DP-V1 parameter channel provides the user with 2 options:

- The higher-level controller can access all the device information of the SEW DP-V1 slaves. This means that cyclical process data and unit settings can be read, stored in the controller and modified in the slave.
- It is also possible to route the service and startup tool MOVITOOLS® MotionStudio via the DP-V1 parameter channel instead of using a proprietary RS485 connection. Once you have installed the MOVITOOLS® MotionStudio software, you can access detailed information in the folder ...\SEW\MOVITOOLS\Fieldbus.

The main features of PROFIBUS DP-V1 are explained below.



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9.1.1 Class 1 master (C1 master)

The PROFIBUS DP-V1 network differentiates between various master classes. The C1 master essentially performs the cyclical data exchange with the slaves. A typical C1 master is a control system, such as a PLC, that exchanges cyclical process data with the slave. If the DP-V1 function has been activated via the GSD file, the acyclical connection between C1 master and slave is established automatically when the cyclical connection of the PROFIBUS DP-V1 is being established. Only one C1 master can be operated in a PROFIBUS DP-V1 network.

9.1.2 Class 2 master (C2 master)

The C2 master itself does not perform cyclical data exchange with the slaves. Examples for a typical C2 master are visualization systems or temporary installed programming devices (Notebook / PC). The C2 master uses exclusively acyclic connections for communication with the slaves. The acyclic connections between C2 master and slave are established by the *Initiate* service. The connection is established once the *Initiate* service has been performed successfully. An established connection enables cyclical data exchange with the slaves using *READ* or *WRITE* services. Several C2 masters can be active in a DP-V1 network. The number of C2 connections, established simultaneously for a slave, is determined by the slave. SEW inverters support two parallel C2 connections.

9.1.3 Data sets (DS)

The user data transported via a DP-V1 service are collected in data sets. Each data set is represented uniquely by its length, a slot number and an index. The structure of data set 47 is used for DP-V1 communication with the SEW inverter. This data set is defined as the DP-V1 parameter channel for drives as of V3.1 in the PROFIdrive profile drive engineering of the PROFIBUS user organization. Different procedures for accessing parameter data in the inverter are provided via this parameter channel.

9.1.4 DP-V1 services

The DP-V1 expansions offer new services, which can be used for acyclical data exchange between master and slave. The system distinguishes between the following services:

C1 master	Connection type: MSAC1 (master/slave acyclical C1)
READ	Read data set
WRITE	Write data set

C2 master	Connection type: MSAC2 (master/slave acyclical C2)
INITIATE	Establish C2 connection
ABORT	Disconnect C2 connection
READ	Read data set
WRITE	Write data set

9.1.5 DP-V1 alarm handling

In addition to the acyclical services, the DP-V1 specification also defines extended alarm handling. Alarm handling now distinguishes between different alarm types. As a result, unit-specific diagnostics cannot be evaluated in DP-V1 operation using the "DDLM_SlaveDiag" DP-V0 service. DP-V1 alarm handling has not been defined for drive engineering as an inverter does not usually transfer its status information via cyclical process data communication.

9.2 Characteristics of SEW inverters

The SEW fieldbus interfaces to PROFIBUS DP-V1 have the same communication features for the DP-V1 interface. The drives are usually controlled via a C1 master with cyclical process data in accordance with the DP-V1 standard. This C1 master (usually a PLC) can also use an 8-byte MOVILINK® parameter channel during cyclical data exchange to perform the parameter services with DFS12B. The READ and WRITE services give the C1 master access to connected stations via the DP-V1 C1 channel.

Two additional C2 channels can be connected in parallel to these parameter channels. The first C2 master as a visualization device, for example could use these channels to read parameter data, and a second C2 master in the form of a notebook could use them to configure the drive using the MOVITOOLS® software.

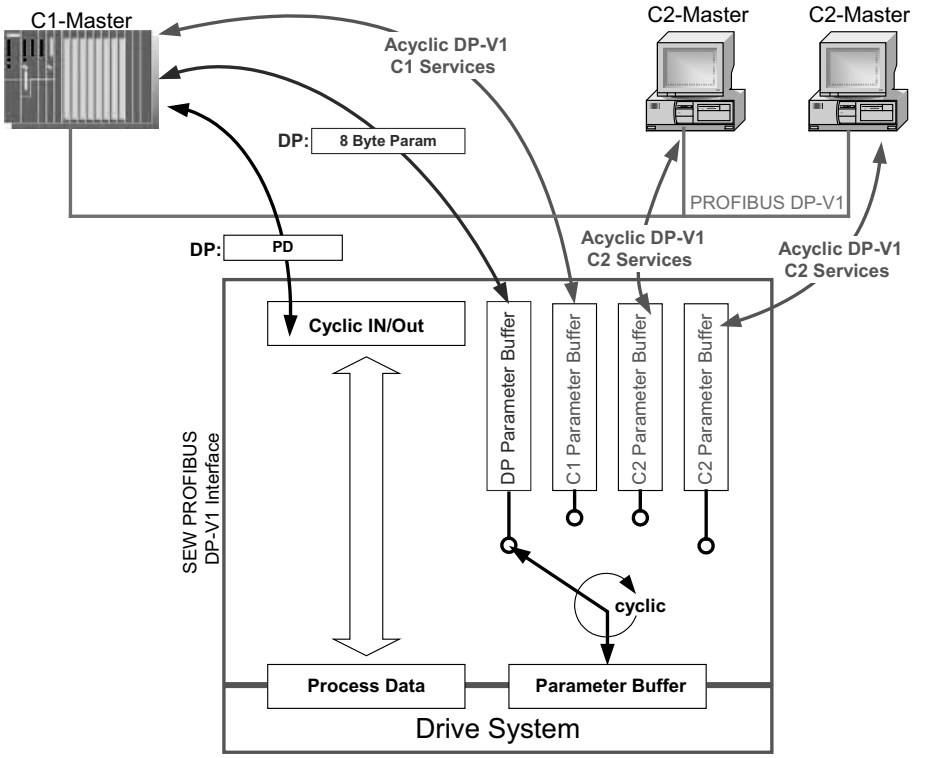

Figure 3: Parameter setting channels for PROFIBUS DP-V1

9.3 Structure of the DP-V1 parameter channel

Generally, the parameter setting of the drives to the PROFIdrive DP-V1 parameter channel of profile version 3.0 is implemented via data set 47. The *Request ID* entry is used to distinguish between parameter access based on PROFIdrive profile or via SEW-MOVILINK® services. The following table shows the possible codes of the individual elements. The data set structure is the same for PROFIdrive and MOVILINK® access.

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The following MOVILINK® services are supported:

- 8-byte MOVILINK® parameter channel with all the services supported by the inverter such as
  - READ parameter
  - WRITE parameter
  - WRITE parameter volatile
  - etc.

The following PROFIdrive services are supported:

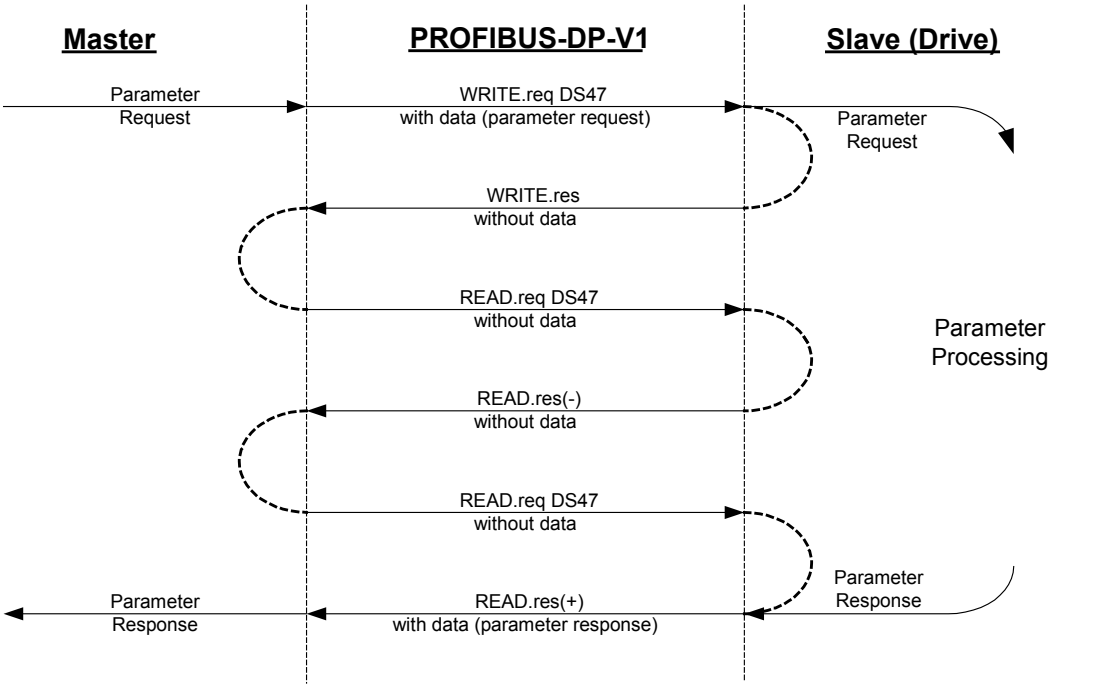
- Reading (request parameter) individual parameters of the type *double word*
- Writing (change parameter) individual parameters of the type *double word*

Field	Data type	Values
Request reference	Unsigned8	0x00 Reserved 0x01 - 0xFF
Request ID	Unsigned8	0x01 Request parameter (PROFIdrive) 0x02 Change parameter (PROFIdrive) 0x40 SEW MOVILINK® service
Response ID	Unsigned8	Response (+): 0x00 Reserved 0x01 Request parameter (+) (PROFIdrive) 0x02 Change parameter (+) (PROFIdrive) **0x40 SEW MOVILINK® service (+)** Response (-): 0x81 Request parameter (-) (PROFIdrive) 0x82 Change parameter (-) (PROFIdrive) **0xC0 SEW MOVILINK® service (-)**
Axis	Unsigned8	0x00 - 0xFF Number of axes 0 - 255
No. of parameters	Unsigned8	0x01 - 0x13 1 - 19 DWORDs (240 DP-V1 data bytes)
Attribute	Unsigned8	0x10 Value **For SEW MOVILINK® (Request ID = 0x40):** **0x00 No service** **0x10 READ parameters** **0x20 WRITE parameter** **0x30 WRITE Parameter volatile** **0x40 ... 0xF0 Reserved**
No. of elements	Unsigned8	0x00 For parameters that are not indexed 0x01 - 0x75 Quantity 1 - 117
Parameter Number	Unsigned16	0x0000 - 0xFFFF MOVILINK® parameter index
Subindex	Unsigned16	0x0000 SEW: always 0
Format	Unsigned8	0x43 Double word 0x44 Error
No. of Values	Unsigned8	0x00 - 0xEA Quantity 0 - 234
Error Value	Unsigned16	0x0000 - 0x0064 PROFIdrive error codes 0x0080 + MOVILINK® Additional Code Low **For SEW MOVILINK® 16 Bit error value**

9.3.1 Parameterization procedure via data set 47

Parameters are accessed with the combination of the DP-V1 services *WRITE* and *READ*. The parameter setting order is transferred to the slave using the *WRITE.req*, followed by slave-internal processing.

The master now sends a *READ.req* to pick up the parameter setting response. The master repeats the *READ.req* if the *READ.res* from the slave is negative. As soon as the parameter processing in the inverter is concluded, it answers with a positive response *READ.res*. The user data now contain the parameter setting response of the parameter setting order that was previously sent with *WRITE.req* (see the following figure). This mechanism applies to both a C1 and a C2 master.



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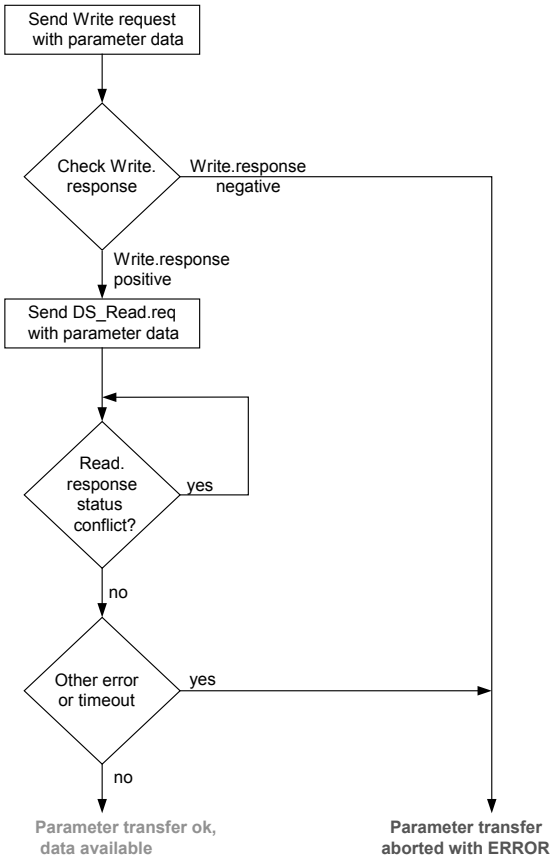
9.3.2 DP-V1 master processing sequence

If the bus cycles are very short, the request for the parameter response arrives before the inverter has concluded parameter access in the device. This means that the response data from the inverter is not yet available. In this case, the inverter sends a negative answer with the **Error_Code _1 = 0xB5 (status conflict)** to the DP-V1 level. The DP-V1 master must then repeat the request with the READ.req header until it receives a positive answer from the inverter.



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9.3.3 Addressing connected inverters

The structure of the DS47 data set defines an *axis* element. This element is used to reach multi-axis drives that are operated via one PROFIBUS interface. The *axis* element addresses one of the devices connected via the PROFIBUS interface. This mechanism can be used, for example, by the SEW MQP bus modules for MOVIMOT® or UFP for MOVITRAC® 07.

Addressing a MOVIDRIVE® B inverter at PROFIBUS DP-V1

With the setting *Axis = 0*, the parameter of the drive inverters can be accessed directly. Since there are no drive devices connected to MOVIDRIVE®, access with *Axis > 0* is returned with an error code.

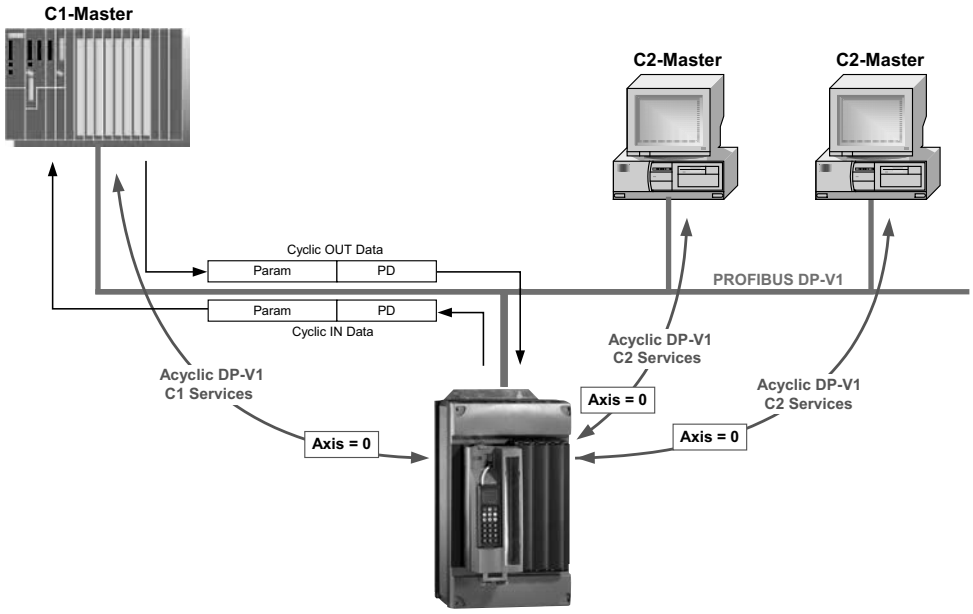

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Figure 4: Addressing a MOVIDRIVE® B inverter directly via PROFIBUS DP-V1 with Axis = 0.

9.3.4 MOVILINK® parameter requests

The MOVILINK® parameter channel of SEW inverters is directly mapped in the structure of data set 47. The Request ID 0x40 (SEW MOVILINK® service) is used for the exchange of MOVILINK® parameter setting orders. Parameter access with MOVILINK® services usually takes place according to the structure described below. The typical telegram sequence is used for data set 47.

Request ID: 0x40 SEW MOVILINK® service

The actual service is defined by the data set element *Attribute* in the MOVILINK® parameter channel. The high nibble of this element corresponds to the service nibble in the management byte of the DP parameter channel.

Example for reading a parameter via MOVILINK®

The following tables show an example of the structure of the WRITE.request and READ.res user data for reading an individual parameter via the MOVILINK® parameter channel.

Sending a parameter request

The following table shows the coding of the user data for the *WRITE.req* service specifying the DP-V1 header. The *WRITE.req* service is used to transfer the parameter setting request to the inverter. The firmware version is read.

Service:	WRITE.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	10	10 byte user data for parameter request

Byte	Field	Value	Description
0	Request reference	0x01	Individual reference number for the parameter setting request is mirrored in the parameter response.
1	Request ID	0x40	SEW MOVILINK® service
2	Axis	0x00	Axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter
4	Attribute	0x10	MOVILINK® service "READ parameter"
5	No. of elements	0x00	0 = access to direct value, no subelement
6, 7	Parameter Number	0x206C	MOVILINK® index 8300 = "Firmware version"
8, 9	Subindex	0x0000	Subindex 0

Query parameter response

The table shows the coding of the READ.req USER DATA including the DP-V1 header.

Service:	READ.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	240	Maximum length of response buffer in the DP-V1 master

Positive MOVILINK® parameter setting response

The table shows the READ.res USER DATA with the positive response data of the parameter setting request. The parameter value for index 8300 (firmware version) is returned as an example.

Service:	READ.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	10	10 byte user data in response buffer

Byte	Field	Value	Description
0	Response reference	0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x40	Positive MOVILINK® response
2	Axis	0x00	Mirrored axis number; 0 for single axis
3	No. of parameters	0x01	1 parameter
4	Format	0x43	Parameter format: Double word
5	No. of values	0x01	1 value
6, 7	Value Hi	0x311C	Higher-order part of the parameter
8, 9	Value Lo	0x7289	Lower-order part of the parameter
			Decoding: 0x 311C 7289 = 823947913 dec >> firmware version 823 947 9.13

Example for writing a parameter via MOVILINK®

The following tables show the sequence of the *WRITE* and *READ* services for volatile writing of the value 12345 to IPOS$^{plus®}$ variable H0 (parameter index 11000) as an example. The MOVILINK® service *WRITE Parameter volatile* is used for this purpose.

Send 'WRITE parameter volatile' request

Service:	WRITE.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	16	16-byte user data for order buffer

Byte	Field	Value	Description
0	Request reference	0x01	Individual reference number for the parameter setting request is mirrored in the parameter response.
1	Request ID	0x40	SEW MOVILINK® service
2	Axis	0x00	Axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter
4	Attribute	0x30	MOVILINK® service "WRITE parameter volatile"
5	No. of elements	0x00	0 = access to direct value, no subelement
6, 7	Parameter Number	0x2AF8	Parameter index 11000 = "IPOS variable H0"
8, 9	Subindex	0x0000	Subindex 0
10	Format	0x43	Double word
11	No. of values	0x01	Change 1 parameter value
12, 13	Value HiWord	0x0000	Higher-order part of the parameter value
14, 15	Value LoWord	0x0BB8	Lower-order part of the parameter value

After sending this WRITE.request, the WRITE.response is received. If there was no status conflict in processing the parameter channel, a positive WRITE.response occurs. Otherwise, the status fault is located in Error_code_1.

Query parameter response

The table shows the coding of the WRITE.req USER DATA including the DP-V1 header.

Field	Value	Description
Function_Num		READ.req
Slot_Number	X	Slot_Number not used
Index	47	Index of the data set
Length	240	Maximum length of response buffer in the DP master

Positive response to "WRITE Parameter volatile"

Service:	READ.response	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	4	4 byte user data in response buffer

Byte	Field	Value	Description
0	Response reference	0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x40	Positive MOVILINK® response
2	Axis	0x00	Mirrored axis number; 0 for single axis
3	No. of parameters	0x01	1 parameter

Negative parameter response

The following table shows the coding of a negative response of a MOVILINK® service. Bit 7 is entered in the Response ID if the response is negative.

Service:	READ.response	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	8	8 byte user data in response buffer

Byte	Field	Value	Description
0	Response reference	0x01	Mirrored reference number from the parameter setting request
1	Response ID	0xC0	Negative MOVILINK® response
2	Axis	0x00	Mirrored axis number; 0 for single axis
3	No. of parameters	0x01	1 parameter
4	Format	0x44	Error
5	No. of values	0x01	1 error code
6, 7	Error value	0x0811	MOVILINK® return code e.g. error class 0x08, Add. code 0x11 (see section "MOVILINK® configuration return codes for DP-V1" on page 61)

MOVILINK® configuration return codes for DP-V1

The following table shows the return codes that are returned by the SEW DP-V1 interface if an error occurs during DP-V1 parameter access.

MOVILINK® return code (hex)	Description
0x0810	Invalid index, parameter index does not exist in the unit
0x0811	Function/parameter not implemented
0x0812	Read access only
0x0813	Parameter lock activated
0x0814	Factory setting is active
0x0815	Value for parameter too large
0x0816	Value for parameter too small
0x0817	Required option card not installed
0x0818	Error in system software
0x0819	Parameter access only via RS-485 process interface
0x081A	Parameter access only via RS-485 diagnostics interface
0x081B	Parameter is access-protected
0x081C	Controller inhibit is required
0x081D	Invalid value for parameter
0x081E	Factory setting was activated
0x081F	Parameter was not saved in EEPROM
0x0820	Parameter cannot be changed with output stage enabled / reserved
0x0821	Reserved
0x0822	Reserved
0x0823	Parameter may only be changed at IPOS program stop
0x0824	Parameter may only be changed when auto setup is deactivated
0x0505	Incorrect coding of management and reserved byte
0x0602	Communication error between inverter system and fieldbus interface
0x0502	Timeout of secondary connection (e.g. during reset or with Sys-Fault)

9.3.5 PROFIdrive parameter requests

The PROFIdrive parameter channel of SEW inverters is directly mapped in the structure of data set 47. Parameter access with PROFIdrive services usually takes place according to the structure described below. The typical telegram sequence is used for data set 47. PROFIdrive only defines the two request IDs

Request ID:0x01request parameter (PROFIdrive)

Request ID:0x02change parameter (PROFIdrive)

This means there is restricted data access in comparison with the MOVILINK® services.

	INFORMATION
	The request ID = 0x02 = change parameter (PROFIdrive) results in remanent write access to the selected parameter. Consequently, the internal flash/EEPROM of the inverter is written with each write access. Use the MOVILINK® service "WRITE Parameter volatile" if parameters must be written cyclically at short intervals. With this service, you only alter the parameter values in the RAM of the inverter.

Example for reading a parameter via PROFIdrive

The following tables show an example of the structure of the WRITE.request and READ.res user data for reading an individual parameter via the MOVILINK® parameter channel.

Sending a parameter request

The following table shows the coding of the user data for the WRITE.req service specifying the DP-V1 header. The WRITE.req service is used to transfer the parameter setting request to the inverter.

Service:	WRITE.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	10	10 byte user data for parameter request

Service:	WRITE.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	10	10 byte user data for parameter request

Byte	Field	Value	Description
0	Request reference	0x01	Individual reference number for the parameter setting request is mirrored in the parameter response.
1	Request ID	0x01	Request parameter (PROFIdrive)
2	Axis	0x00	Axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter
4	Attribute	0x10	Access to parameter value
5	No. of elements	0x00	0 = access to direct value, no subelement
6, 7	Parameter Number	0x206C	MOVILINK® index 8300 = "Firmware version"
8, 9	Subindex	0x0000	Subindex 0

Query parameter response

The table shows the coding of the READ.req USER DATA including the DP-V1 header.

Service:	READ.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	240	Maximum length of response buffer in the DP-V1 master

Positive PROFIdrive parameter response

The table shows the READ.res user data with the positive response data of the parameter setting request. The parameter value for index 8300 (firmware version) is returned as an example.

Service:	READ.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	10	10 byte user data in response buffer

Byte	Field	Value	Description
0	Response reference	0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x01	Positive response for "Request Parameter"
2	Axis	0x00	Mirrored axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter
4	Format	0x43	Parameter format: Double word
5	No. of values	0x01	1 value
6, 7	Value Hi	0x311C	Higher-order part of the parameter
8, 9	Value Lo	0x7289	Lower-order part of the parameter
			Decoding: 0x 311C 7289 = 823947913 dec >> firmware version 823 947 9.13

Example for writing a parameter via PROFIdrive

The following tables show an example of the structure of the *WRITE* and *READ* services for the **remanent** writing of the internal setpoint n11 (see section "Example for writing a parameter via MOVILINK®", page 59). The PROFIdrive *Change parameter* service is used for this purpose.

Send "WRITE parameter" request

Service:	WRITE.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	16	16-byte user data for order buffer

Byte	Field	Value	Description
0	Request reference	0x01	Individual reference number for the parameter setting request is mirrored in the parameter response.
1	Request ID	0x02	Change parameter (PROFIdrive)
2	Axis	0x01	Axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter
4	Attribute	0x10	Access to parameter value
5	No. of elements	0x00	0 = access to direct value, no subelement
6, 7	Parameter Number	0x2129	Parameter index 8489 = P160 n11
8, 9	Subindex	0x0000	Subindex 0
10	Format	0x43	Double word
11	No. of values	0x01	Change 1 parameter value
12, 13	Value HiWord	0x0000	Higher-order part of the parameter value
14, 15	Value LoWord	0x0BB8	Lower-order part of the parameter value

After sending this WRITE.request, the WRITE.response is received. If there was no status conflict in processing the parameter channel, a positive WRITE.response occurs. Otherwise, the status fault is located in Error_code_1.

Query parameter response

The table shows the coding of the WRITE.req user data including the DP-V1 header.

Field	Value	Description
Function_Num		READ.req
Slot_Number	X	Slot_Number not used
Index	47	Index of the data set
Length	240	Maximum length of response buffer in the DP-V1 master

Positive response to "WRITE parameter"

Service:	READ.response	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	4	4 byte user data in response buffer

Byte	Field	Value	Description
0	Response reference	0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x02	Positive PROFIdrive response
2	Axis	0x01	Mirrored axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter

Negative parameter response

The following table shows the coding of a negative response of a PROFIdrive service. Bit 7 is entered in the Response ID if the response is negative.

Service:	READ.response	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data set; constant index 47
Length	8	8 byte user data in response buffer

Byte	Field	Value	Description
0	Response reference	0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x810x82	Negative response for "Request parameter", negative response for "Change Parameter"
2	Axis	0x00	Mirrored axis number; 0 = Single axis
3	No. of parameters	0x01	1 parameter
4	Format	0x44	Error
5	No. of values	0x01	1 error code
6, 7	Error value	0x0811	MOVILINK® return code e.g. error class 0x08, Add. code 0x11 (see section "MOVILINK® configuration return codes for DP-V1" on page 61)

PROFIdrive return codes for DP-V1

The following table shows the coding of the error number in the PROFIdrive DP-V1 parameter response according to PROFIdrive profile V3.1. This table applies if you use the PROFIdrive services "Request Parameter" and/or "Change Parameter".

Error no.	Meaning	Used for
0x00	Invalid parameter number.	Access to non-existent parameters
0x01	Parameter value cannot be changed	An attempt was made to change a parameter value that cannot be changed
0x02	Minimum or maximum value exceeded	An attempt was made to change a value to one that is outside of the limit values
0x03	Incorrect subindex	Access to non-existent subindex
0x04	No assignment	Access with subindex to parameter that is not indexed
0x05	Incorrect data type	An attempt was made to change a replace a value with one that does not correspond to the data type of the parameter
0x06	Setting not permitted (can only be reset)	An attempt was made to set a value to one larger than 0 where this is not permitted
0x07	Description element cannot be changed	Access to description element that cannot be changed
0x08	Reserved	(PROFIdrive Profile V2: PPO write query for IR not available)
0x09	Description does not exist	Access to description that is not accessible (parameter value exists)
0x0A	Reserved	(PROFIdrive Profile V2: incorrect access group)
0x0B	No operation priority	An attempt was made to change a parameter without change rights
0x0C	Reserved	(PROFIdrive Profile V2: incorrect password)
0x0D	Reserved	(PROFIdrive Profile V2: text cannot be read in cyclic data transfer)
0x0E	Reserved	(PROFIdrive Profile V2: name cannot be read in cyclic data transfer)
0x0F	No text assignment available	Access to text assignment that is not accessible (parameter value exists)
0x10	Reserved	(PROFIdrive Profile V2: no PPO write)
0x11	Request cannot be executed due to the operating mode	Access is currently not possible and the reason is not explained
0x12	Reserved	(PROFIdrive Profile V2: other error)
0x13	Reserved	(PROFIdrive Profile V2: data cannot be read in cyclic exchange)
0x14	Incorrect value	An attempt was made to change a value to one that is in the permitted range but is not permitted due to other long-term reasons (parameter with specified individual values)
0x15	Response is too long	The length of the current response exceeds the maximum transmittable length
0x16	Invalid parameter address	Invalid value or value that is not valid for this attribute, number of elements, parameter number, subindex or a combination of these factors.
0x17	Incorrect format	Write request: Invalid format or parameter data format that is not supported
0x18	Number of values is not consistent	Write request: Number of values of parameter data does not correspond to the number of elements in the parameter address
0x19	Axis does not exist	Access to an axis that does not exist
up to 0x64	Reserved	-
0x65 - 0xFF	Depends on the manufacturer	-

9.4 Configuring a C1 master

A special GSD file *SEW_600C.GSD* is required for configuring a DP-V1 C1 master. This file activates the DP-V1 functions of the DFS12B option. The functions of the GSD file and the DFS12B firmware must correspond with one another. When you implement the DP-V1 functions, SEW-EURODRIVE provides you with two GSD files (see page 24 for PROFIBUS DP-V1).

9.4.1 Operating mode (DP-V1 mode)

The DP-V1 operating mode can usually be activated during project planning for a C1 master. All DP slaves, which have the DP-V1 functions enabled in their GSD files and which support DP-V1, will then be operated in DP-V1 mode. Standard DP slaves will still run via PROFIBUS DP. This ensures mixed mode for DP-V1 and DP-capable modules. Depending on the master functionality, a DP-V1 capable station, that was configured using the DP-V1 GSD file, can run in the "DP" operating mode.

9.4.2 Example program for SIMATIC S7

The STEP 7 code stored in the GSD file shows how parameters are accessed via the STEP 7 system function modules SFB 52/53. You can copy the STEP 7 code and import/compile it as a STEP 7 source.

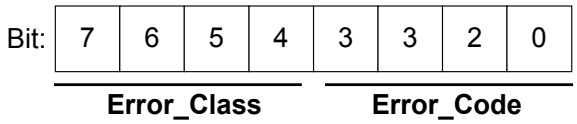
	INFORMATION
	The MOVILINK® parameter channel sample program is available from the SEW homepage (www.sew-eurodrive.de) under "Software". This example is a special and free service that demonstrates only the basic approach to generating a PLC program. SEW is not liable for the contents of the sample program.

9.4.3 Technical data DP-V1 for MOVIDRIVE® DFS12B

GSD file for DP-V1:	**SEW_600C.GSD**
Module name for project planning:	MOVIDRIVE DFS12 (DP-V1)
Number of parallel C2 connections:	2
Supported data set:	Index 47
Supported slot number:	Recommended: 0
Manufacturer code:	10A hex (SEW-EURODRIVE)
Profile ID:	0
C2 response timeout	1 s
Max. length C1 channel:	240 bytes
Max. length C2 channel:	240 bytes

9.4.4 Error codes of the DP-V1 services

This table shows possible error codes of DP-V1 services that may occur in the event of an error in the communication on DP-V1 telegram level. This table is relevant if you want to write your own parameter assignment block based on the DP-V1 services because the error codes are reported directly back on the telegram level.



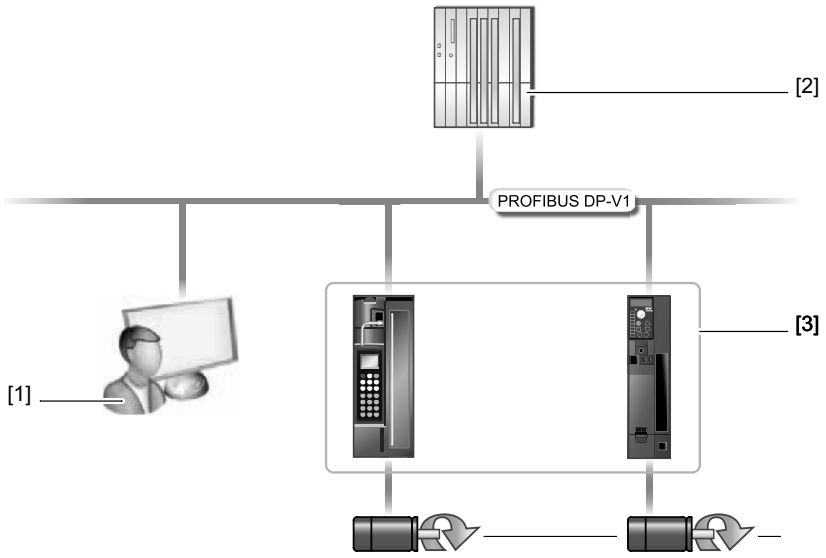
Error_Class (from DP-V1 specification)	Error_Class (from DP-V1 specification)	DP-V1 parameter channel
0x0 - 0x9 hex = reserved		
0xA = application	0x0 = read error 0x1 = write error 0x2 = module failure 0x3 to 0x7 = reserved 0x8 = version conflict 0x9 = feature not supported 0xA to 0xF = user specific	
0xB = access	0x0 = invalid index	0xB0 = No data block Index 47 (DB47); parameter requests are not supported
	0x1 = write length error 0x2 = invalid slot 0x3 = type conflict 0x4 = invalid area	
	0x5 = state conflict	0xB5 = Access to DB 47 temporarily not possible due to internal processing status
	0x6 = access denied	
	0x7 = invalid range	0xB7 = WRITE DB 47 with error in the DB 47 header
	0x8 = invalid parameter 0x9 = invalid type 0xA to 0xF = user specific	
0xC = resource	0x0 = read constraint conflict 0x1 = write constraint conflict 0x2 = resource busy 0x3 = resource unavailable 0x4 - 0x7 = reserved 0x8 - 0xF = user specific	
0xD - 0xF = user specific		

10 Operation of MOVITOOLS® MotionStudio

10.1 Communication via PROFIBUS DP/DP-V1

10.1.1 Communication via C2 master

Overview The figure shows the network with a direct PROFIBUS communication via C2 master:



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[1] C2 master (as PC with installed softnet DP driver and installed PROFIBUS master card)

[2] C1 master

[3] Units (examples) with DP-V1 capable PROFIBUS interfaces

C2 master C2 master [1] can be a PC, for example, which you can use as diagnostic and visualization PC.

For this purpose, the PC has to be equipped wtih additional hardware and software as described in the next section.

Function The C2 master [1] sends parameter requests from MOVITOOLS® MotionStudio to the PROFIBUS interfaces in the units [3] via PROFIBUS (acyclic C2 services). In this case, SIMATIC S7 [2] does not perform any routing.

Advantage The C2 master works independently of the C1 master. This means you can establish a communication with your units even when the C1 master fails.

10.1.2 Additionally required hardware and software

Requirement

	**INFORMATION** If you run and configure PROFIBUS stations in your network, you need additional hardware and software from Siemens. • Note the prerequisites regarding license rights for Siemens software products used. • Observe the documentation provided by Siemens for the hardware and software products used.

Required hardware

The following table shows the PROFIBUS master cards available from Siemens:

Designation of the PROFIBUS master card	Order number	Type of PROFIBUS master card
SIMATIC NET CP5611	6GK1561-1AA00	PCI card for PCs
SIMATIC NET CP5512	6GK1561-2AA00	PCMCIA card (32-bit card bus) for notebooks

Required software

The following table shows the software available from Siemens:

Designation of the software	Order number	Type of software
SIMATIC NET PB Softnet-DP Edition 2007	6GK1704-5DW00-3AE1	Driver package

Starting up hardware and software

Do the following to install the additionally required hardware and software:

1. Observe the documentation provided by Siemens for the hardware and software products used.
2. Install the PROFIBUS master card.
3. Install the software.

10.1.3 Parameterize C2 master with SIMATIC NET

SIMATIC NET versions and operating system

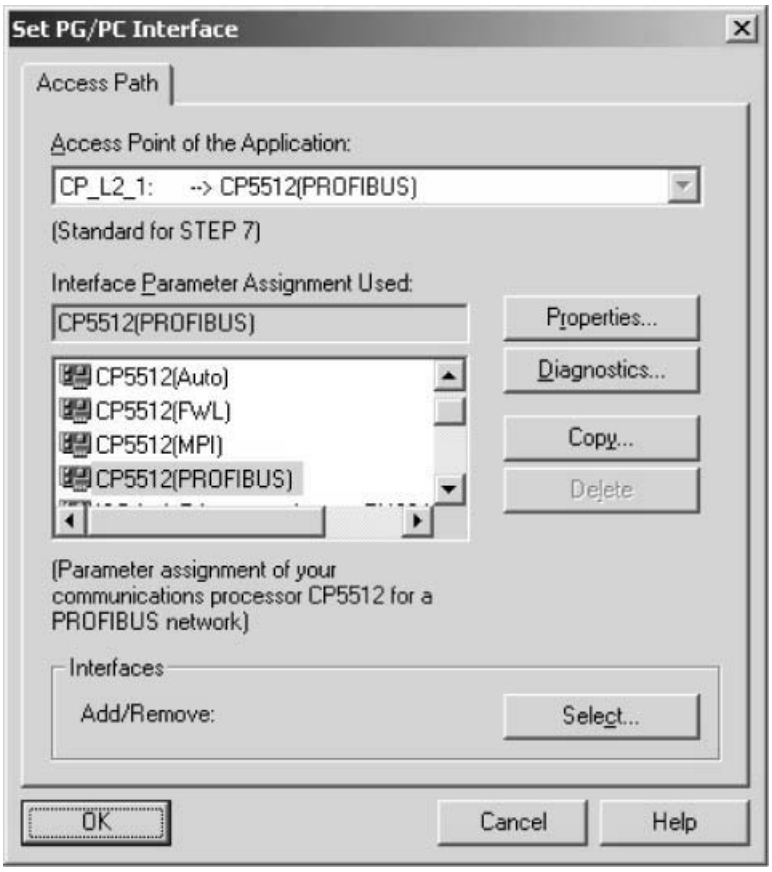
INFORMATION
The following description might deviate slightly (in part due to the language) depending on the SIMATIC NET version and the operating system in use. This concerns the display and designations in windows as well as designations in the menu path of the start menu.

Starting SIMATIC NET and setting the PG/PC interface

Do the following to start SIMATIC NET:

1. From the Start menu of Windows, start the program "Set PG/PC Interface" under the following menu item:

   The "Set PG/PC interface" window opens:



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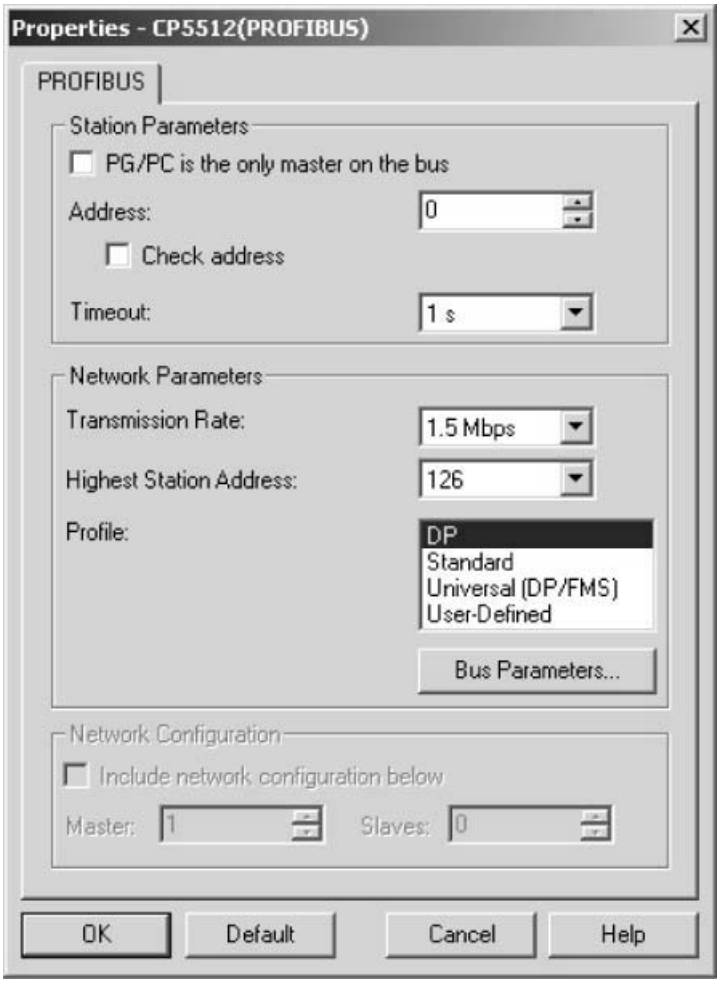
2. Set the access path of the application as shown in the figure.

INFORMATION
If you cannot set the access path because the "Access point of the the application" selection field is disabled, the reason is the following: You have opened the "Set PG/PC interface" program from SIMATIC STEP 7 and have therefore occupied the access path. • Start the "Set PG/PC Interface" program from the Windows Start menu.

Parameterizing a C2 master

Proceed as follows to configure a C2 master:

1. In the "Set PG/PC interface", click on the [Properties] button. This opens the "Properties" window.



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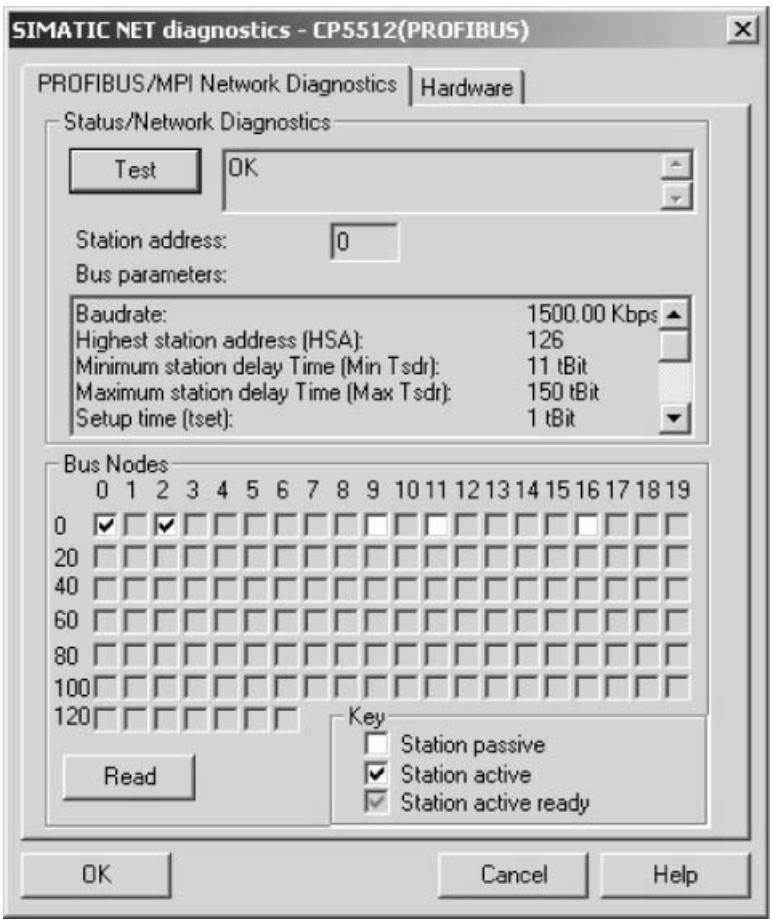
2. If a C1 master is active, disable the "PG/PC is the only master on the bus" check box.
3. Assign the PC a free address that is not yet reserved by other stations (masters or slaves).
4. Set the baud rate (transmission speed) matching your PROFIBUS network. If you operate a C1 master, set the baud rate of the C1 master.
5. Select "DP" as the profile or set the bus timing according to the existing PROFIBUS network.

Check the parameters of the PROFIBUS stations

Do the following to check the parameters of the PROFIBUS stations:

1. Close the "Properties" window to return to the "Set PG/PC interface" window.
2. Click the [Diagnostics] button.

   This opens the "SIMATIC NET diagnostics" window.



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3. Check the parameters you have set. To do so, click on [Test].

   If your parameter setting is valid, "OK" will be displayed.
4. To have all bus stations displayed, click on [Read].
5. Make sure that all bus stations were parameterized correctly.
6. Open the MOVITOOLS® MotionStudio engineering software.
7. Set the communication parameters in MOVITOOLS® MotionStudio. Refer to the next section "Configuring communication via PROFIBUS".

10.1.4 Configuring communication via PROFIBUS

Requirements

	INFORMATION
	The following steps describe only how you configure PROFIBUS communication in MOVITOOLS® MotionStudio. • **First** make all the required settings in the project planning software. Refer to the previous section "Configuring C2 master with SIMATIC NET".

Configuring a communication channel via PROFIBUS

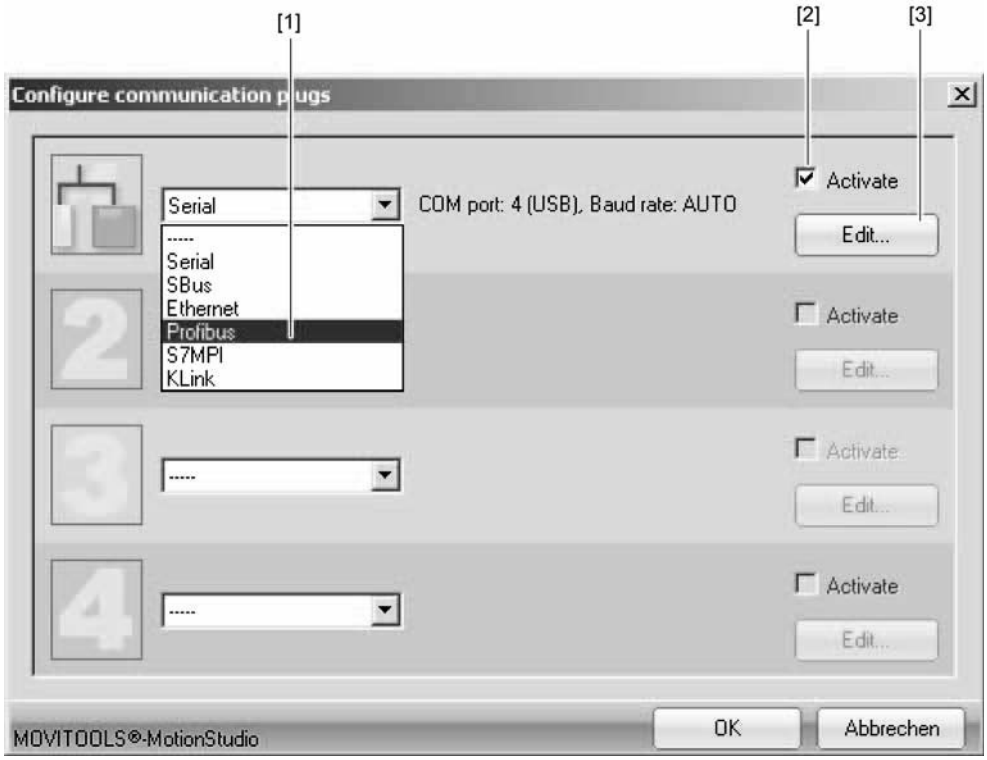
Proceed as follows to configure PROFIBUS communication:

1. Make sure that all the required settings have been made in the project planning software.
2. Start MOVITOOLS® MotionStudio and create a project following the instructions described in the section "First Steps".
3. Click on "Configure communication plugs" [1] in the toolbar.

[1] "Configure communication plugs" icon

Doing so will open the "Configure communication plugs" window.

4. From the list [1], select "PROFIBUS" as the communication type.



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[1] "Communication type" selection list

[2] "Activate" check box

[3] [Edit] button

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

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

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6. Select the "Start automatically" control field if you want to launch the PROFIBUS server every time the SEW Communication Server is started.
7. Click the [Restart server] button to start the PROFIBUS server.

   Windows displays the activated PROFIBUS server using the following ICON in the status bar:

10.1.5 Communication parameters for PROFIBUS DP/DP-V1

The following table describes the communication parameters for the PROFIBUS DP/DP-V1 communication channel:

Communication parameters	Description	Note
PROFIBUS server	Select the "Start automatically" control field if you want to launch the PROFIBUS server every time the SEW Communication Server is started.	The Windows status bar displays the active PROFIBUS server

10.2 Executing functions with the units

10.2.1 Parameterizing units in the parameter tree

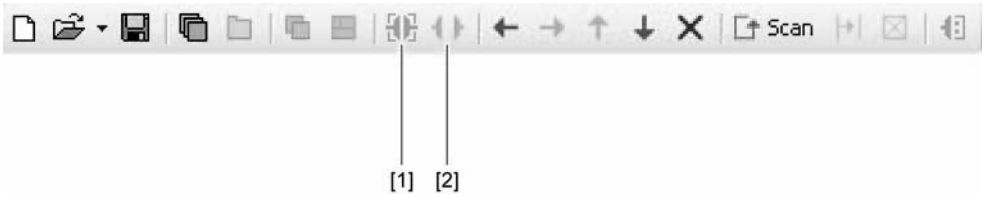
The parameter tree displays all unit parameters arranged in folders.

You can manage the unit parameters using the context menu or toolbar. The following chapter describes how to read or change unit parameters.

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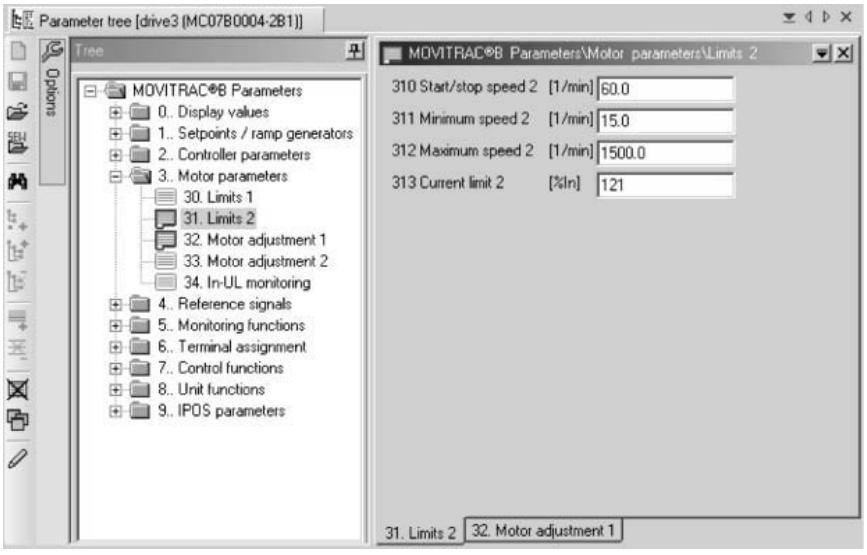
3. Select the unit you want to set parameters for.
4. Open the context menu and select the [Parameter tree] command.

   This opens the "Parameter tree" view on the right section of the screen.
5. Expand the "Parameter tree" up to the node you require.



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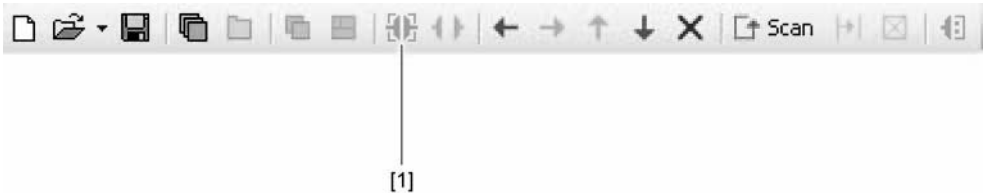
6. Double-click to display a particular group of unit parameters.
7. Press the enter key to finalize any changes you make to numerical values in the input fields.

10.2.3 Starting up units (online)

To startup units (online), proceed as follows:

1. Switch to the network view.
2. Click the [Switch to online mode] button [1].



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3. Select the unit you want to startup.
4. Open the context menu and select the command [Diagnostics] / [UFx Gateway Configurator].

   The Gateway Configurator opens.

	INFORMATION
	• For detailed information about the unit parameters, refer to parameter list for the unit. • For detailed information about how to use the startup wizard, refer to the MOVITOOLS® MotionStudio online help.

11 Error Diagnostics

11.1 Diagnostic procedures

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

- Diagnostic problem 1: Inverter does not work on PROFIBUS-DP
- Diagnostic problem 2: Inverter cannot be controlled using the PROFIBUS DP master

For more information dealing specifically with the inverter parameter settings for various fieldbus applications, refer to the *MOVIDRIVE® Communication and Fieldbus Unit Profile* manual.

Diagnostic problem 1: Inverter does not work on PROFIBUS.
Initial status:
- Inverter is connected to PROFIBUS
- Inverter configured in PROFIBUS master and bus communication active

↓

Is the bus connector plugged in? — no → **[A]**

yes ↓

Response of the **BUS FAULT** LED? — OFF → **[B]**; ON → **[C]**

FLASHES ↓

Inverter detects baud rate (P092 Baud rate fieldbus). However it was not configured, or was configured incorrectly, in the PROFIBUS master.

↓

Check the configured bus address and the one set using the DIP switches (P093 Fieldbus address)

↓

Are the bus addresses the same? — no → **[D]**

yes ↓

You may have configured an incorrect unit type or defined the configuration incorrectly.

↓

Delete the project planning for the inverter from the DP network.

↓

Perform project planning for the inverter again, choosing the unit designation "MOVIDRIVE-DFS12".
To simplify the project planning process, use a predefined configuration (for example, "Param + 3PD"). Do not change any of the preset configuration data.
Assign the address range for your control system.

↓

Load the configuration into the DP master and start the bus communication again.

[A]	Check the bus cabling.

[B]	Inverter is currently exchanging data cyclically with the PROFIBUS master. P090 PD configuration displays the configuration that the inverter is controlled with via PROFIBUS.

↓

Bus communication is functioning properly (for problems with controlling or setpoint selection via PROFIBUS DP, continue with **Diagnostic problem 2**).

[C]	Inverter does **not** detect the baud rate (P092 Baud rate fieldbus)!

↓

Check the bus cabling.

[D]	Modify the bus addresses.

Diagnostic problem 2:
Inverter cannot be controlled using the PROFIBUS DP master.
Initial status:
- Bus communication with inverter OK (**BUS FAULT** LED off)
- Inverter running with 24 V (no supply voltage)

↓

The problem is either caused by incorrect parameter settings in the inverter or a faulty control program in the PROFIBUS master.

↓

Use P094 to P097 (setpoint description PO1 to PO3) to check whether the setpoints sent by the controller are received correctly.
To do so, send a setpoint other than 0 as a test in each output word.

↓

Setpoints received? yes → **[A]**

no
↓

Check that the correct settings have been made for the following drive parameters:
- P100 SETPOINT SOURCE FIELDBUS
- P101 CONTROL SIGNAL SOURCE FIELDBUS
- P876 ENABLE PO DATA YES

↓

Settings OK? no → **[B]**

yes
↓

The problem may be caused by your control program in the DP master.

↓

Check that the address used in the program is the same as the address for project planning.
Note that the inverter requires consistent data and access must take place within the control program, if necessary, via special system functions (for example, SIMATIC S7, SFC 14 / 15).

[A]	Setpoints are transferred. Check whether the drive inverter has been enabled at the terminals.

[B]	Correct the settings.

12 Technical Data

12.1 DFS12B option for MOVIDRIVE® MDX61B

DFS12B option (MOVIDRIVE® MDX61B)	
Part number	1820 963 7
Power consumption	P = 3 W
PROFIBUS protocol options	PROFIBUS DP and DP-V1 according to IEC 61158
Automatic baud rate detection	9.6 kBaud - 12 MBaud
Connection technology	• Via 9-pin D-sub connector • Pin assignment acc. to IEC 61158
Bus termination	Not integrated, implement using suitable PROFIBUS plug with terminating resistors that can be switched on.
Station address	1 to 125, can be set using DIP switches
GSD file name	SEW_600C.GSD
DP ID number	600C = 24588_{hex}
Application-specific parameter-setting data (Set-Prm-UserData)	• Length: 9 bytes • Hex parameter settings 00,00,00,06,81,00,00,01,**01** = DP diagnostics alarm = **OFF** • Hex parameter settings 00,00,00,06,81,00,00,01,**00** = DP diagnostics alarm = **ON**
DP configurations for DDLM_Chk_Cfg	• F0hex = 1 process data word (1 I/O word) • F1hex = 2 process data words (2 I/O words) • F2hex = 3 process data words (3 I/O words) • 0hex, F5hex = 6 process data words (6 I/O words) • 0hex, F9hex = 10 process data words (10 I/O words) • F3hex, F0hex = parameter channel + 1 process data word (5 I/O words) • F3hex, F1hex = parameter channel + 2 process data words (6 I/O words) • F3hex, F2hex = parameter channel + 3 process data words (7 I/O words) • F3hex, F5hex = parameter channel + 6 process data words (10 I/O words) • F3hex, F9hex = parameter channel +10 process data words (14 I/O words)
Diagnostics data	• Max. 8 bytes • Standard diagnostics: 6 bytes
Tools for startup	• PC program MOVITOOLS® MotionStudio • DBG60B keypad
F address	See page 31
Ambient temperature	0 - 55 °C

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SEW-EURODRIVE
Driving the world

SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023
76642 Bruchsal/Germany
Phone +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com

➞ **www.sew-eurodrive.com**