SEW EURODRIVE

MOVI-PLC® *advanced* DHR41B Controller EtherNet/IP, Modbus/TCP and PROFINET IO Fieldbus Interfaces

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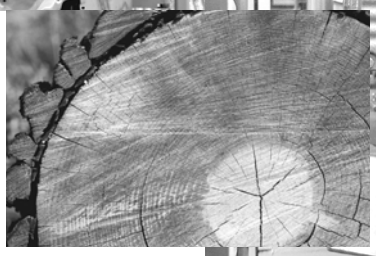
Manual



SEW EURODRIVE

1 General Notes

1.1 How to use this documentation

The documentation is an integral part of the product and contain 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 designed 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
	**TIP**	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 publication 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

Note also the following documentation:

- 'MOVI-PLC ® *advanced* DHE41B/DHF41B/DHR41B Controller' manual
- 'MOVI-PLC® Programming in the PLC Editor' manual

The following publications and documents apply to the connected units:

- Operating instructions of the units
  (Units are, for example, MOVIDRIVE® B, MOVITRAC® B, MOVIAXIS®)
- For units with functional safety technology, also the respective
  'Safe Disconnection - Conditions' manuals

2.2 Bus systems

MOVI-PLC® *advanced* DHR41B supports various bus systems. A bus system makes it is possible to adapt frequency inverters to the particulars of the machinery within wide limits. 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, though not uncontrolled, system behavior.

2.3 Safety functions

The MOVIDRIVE® MDX60B/61B and MOVITRAC® B 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, ensure that the information in the following publications is observed: 'Safe Disconnection for MOVIDRIVE® MDX60B/61B, MOVITRAC® B'.

2.4 Hoist applications

MOVIDRIVE® MDX60B/61B and MOVITRAC® B are 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 in this manual are trademarks or registered trademarks of the titleholders.

2.6 Disposal

Observe the applicable national regulations.

?Dispose of the following materials separately in accordance with the country-specific regulations in force, as:

- Electronics scrap
- Plastic
- Sheet metal
- Copper

3 Preface

3.1 Content of this manual

This user manual describes:

- The startup procedure for MOVI-PLC® *advanced* DHR41B on the fieldbus systems EtherNet/IP, Modbus/TCP and PROFINET IO.
- The configuration of the EtherNet/IP master with EDS files.
- The configuration of the Modbus/TCP master.
- The configuration of the PROFINET master using GSDML files.

The creation of IEC programs or the connection of SEW drives to the system bus interfaces of MOVI-PLC® is not described.

3.2 Characteristics

The powerful, universal fieldbus interfaces of the DHR41B option enable a connection to higher-level automation systems via EtherNet/IP, Modbus/TCP and PROFINET IO.

3.2.1 Process data exchange

The MOVI-PLC® *advanced* DHR41B controller offers digital access to a special data range via the Industrial Ethernet interface. This data range is evaluated by IEC 61131-3 as process input and output data to a higher-level controller. The meaning of the transferred data depends on the IEC program.

3.2.2 Parameter access

This parameter data exchange enables you to implement applications for which all important parameters are stored in the higher-level programmable controller, so that there is no need to set parameters manually in the MOVI-PLC® *advanced* DHR41B.

In EtherNet/IP operation, the parameters of the inverter are set by the controller solely via *explicit messages*.

In Modbus/TCP operation, the controller can access the parameters via the 8 byte MOVILINK® parameter channel.

In PROFINET operation, two parameter access options are available:

- The PROFIdrive data record 47 offers access to all unit information also in PROFINET operation
- The PROFIBUS DP-V1 parameter mechanisms offers universal access to all unit information.

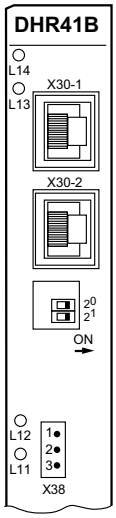
3.2.3 Monitoring functions

Using a fieldbus system requires additional monitoring functions, for example, time monitoring of the fieldbus (fieldbus timeout) or rapid stop concepts. For example, you can adapt the monitoring functions specifically to your application in the IEC program. You can determine, for instance, which fault responses should be triggered in the event of a bus error. For many applications, a rapid stop function is useful. However, you can also freeze the last setpoints so that the drive continues to operate with the most recently valid setpoints. As the range of functions for the control terminals is also available in fieldbus mode, you can continue to implement rapid stop concepts using the terminals of MOVI-PLC® *advanced* DHR41B, irrespective of the fieldbus used.

4 Assembly and Installation Notes for Ethernet

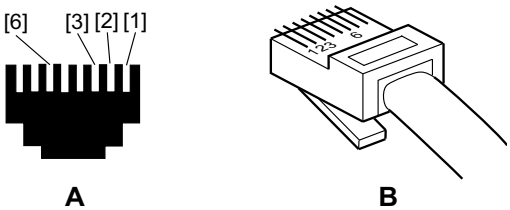
Only the connection to Ethernet networks via X30:1 and X30:2 is described in this chapter. Connection and functions via X37 (engineering) are described in the "MOVI-PLC® *advanced* DHE41B/DHF41B/DHR41B" manual.

4.1 Connecting MOVI-PLC® advanced DHR41B to an Ethernet network

Front view MOVI-PLC® *advanced* DHR41B controller	Designation	LED DIP switches Terminal	Function
 64249AXX	**LED**	**L14** **L13** **L14** **L13** **L12** **L11**	In EtherNet/IP and Modbus/TCP operation: MODULE STATUS NETWORK STATUS In PROFINET operation: RUN BUS FAULT Reserved Reserved
	X30-1: Ethernet connection LED Link (green) LED Activity (yellow)		
	X30-2: Ethernet connection LED Link (green) LED Activity (yellow)		
	DIP switches	**2^0 = ON** **2^1 = ON** **2^1 = OFF**	Resets the address parameters to their default values and deactivates DHCP • IP address: 192.168.10.4 • Subnet mask: 255.255.255.0 • Gateway: 192.168.10.4 EtherNet/IP and Modbus/TCP protocol is active PROFINET protocol is active
	X38: CAN for safety-relevant communication	**X38:1** **X38:2** **X38:3**	Reserved Reserved Reserved

4.2 Pin assignment of X30-1 and X30-2

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



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A	View from front	B	View from back
[1]	Pin 1 TX+ Transmit Plus	[2]	Pin 2 TX- Transmit Minus
[3]	Pin 3 RX+ Receive Plus	[6]	Pin 6 RX- Receive Minus

DHR41B - Ethernet connection

To connect DHR41B to the Ethernet, connect the Ethernet interface X30-1 or X30-2 (RJ45 plug connector) to the other network stations using a category 5, class D twisted-pair cable in accordance with IEC 11801 edition 2.0. The integrated switch provides support for realizing a line topology and offers auto crossing functions.

	TIPS
	• According to IEC 802.3, the maximum cable length for 10/100 MBd Ethernet (10BaseT / 100BaseT), e.g. between two network stations, is 100 m. • We recommend that you do not directly connect non-SEW end devices to the DHR41B option in order to minimize the load on the end devices in EtherNet/IP networks caused by undesired multicast data traffic. Connect non-SEW devices via a network component that supports the IGMP snooping functionality (e.g. managed switch).

4.3 Shielding and routing bus cables

Only use shielded cables and connection elements that also meet the requirements of category 5, class 2 in compliance with IEC 11801 edition 2.0.

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

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

	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 according in accordance with relevant VDE regulations in such a case.

4.4 The integrated Ethernet switch

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

	TIP
	The number of Industrial Ethernet switches connected in line impacts on the telegram run time. If a telegram passes through the units, the telegram runtime is delayed by the Store & Forward function of the Ethernet switch: • for a telegram length of 64 bytes by approximately 10 µs (at 100 Mbit/s) • for a telegram length of 1500 bytes by approximately 130 µs (at 100 Mbit/s) This means that the more units a telegram has to pass through, the higher the telegram runtime is.

Auto-crossing

The two ports leading out of the Ethernet switch have auto-crossing functionality. This means that they can use both patch and cross-over cables to connect to the next Ethernet station.

Auto-negotiation

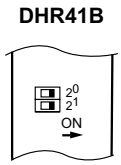
The baud rate and the duplex mode is negotiated by both Ethernet nodes when establishing the connection. For this purpose, both Ethernet ports of the EtherNet/IP connection support an auto-negotiation functionality and work with a baud rate of either 100 Mbit or 10 Mbit in full duplex or half-duplex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

Notes on multicast handling

- The integrated Ethernet switch does not provide a filter function for Ethernet multi cast telegrams. Multicast telegrams that are usually sent from the adapters (DHR41B) to the scanners (PLC) in EtherNet/IP networks are passed on to all switch ports.
- IGMP Snooping (e.g. Managed Switches) is not supported.
- SEW-EURODRIVE therefore recommends to connect the DHR41B option in EtherNet/IP networks only with network components that support IGMP snooping (e.g. managed switch) or that have safety mechanisms integrated against excess multicast load (e.g. units from SEW-EURODRIVE). Units that do not have this integrated function can fail due to high network loads.

4.5 Setting the DIP switches

	TIP
	Before each change to the DIP switches, disconnect the MOVI-PLC® *advanced* DHR41B control card from the voltage supply. The DIP switch settings are adopted during initialization only.



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2^0 (Def IP) if the switch "2^0" is set to "1" (= right = ON), the following default IP address parameters are set when the DC 24 V backup voltage is switched on.

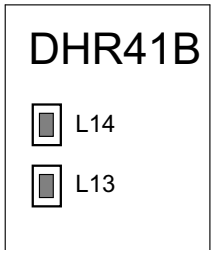
- IP address: 192.168.10.4
- Subnet mask: 255.255.255.0
- Default gateway: 192.168.10.4
- P785 DHCP / Startup configuration: Saved IP parameters (DHCP is deactivated)

2^1 (protocol) DIP switch "2^1" is used to set the protocol that is used for communication.

- 2^1 = "1" (= right = ON): The EtherNet/IP and Modbus TCP/IP fieldbus protocol is active.
- 2^1 = "0" (= left = OFF): The PROFINET fieldbus protocol is active.

4.6 Status LED of the DHR41B option

The LEDs of the DHR41B option card indicate the current status of the DHR41B option and the fieldbus system. Depending on the set protocol, the LEDs have the following meaning.



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4.6.1 Status LEDs in EtherNet/IP and Modbus/TCP operation

The status of the fieldbus interface corresponding to the LED status is shown in chapter 9.

LED L13 (NETWORK STATUS)

The LED **L13 (NETWORK STATUS)** indicates the state of the fieldbus system.

States of the NETWORK STATUS LED	Meaning
Off	The DHR41B option does not yet have any IP parameters.
Flashing green/red	The DHR41B option card performs an LED test.
Flashing green	There is no controlling IO connection.
Green	There is a controlling EtherNet/IP or Modbus/TCP connection.
Red	Conflict detected in the assigned IP addresses. Another station in the network uses the same IP address.
Flashing red	The previously established controlling IO connection is in timeout status. The status is reset by restarting communication.

LED L14 (MODULE STATUS)

LED **L14 (MODULE STATUS)** indicates that the bus electronics are operating correctly.

States of the MODULE STATUS LED	Meaning
Off	The DHR41B option card is not supplied with voltage or is defective
Flashing green	• If the NETWORK STATUS LED is off at the same time, the TCP/IP stack of the DHR41B option card will be started. If this status continues and DHCP is activated, the DHR41B option waits for data from the DHCP server. • If the NETWORK STATUS LED is flashing green at the same time, the application of the DHR41B option card is started.
Flashing green/red	The DHR41B option card performs an LED test.
Green	Indicates the standard operating state of the DHR41B option card
Red	The DHR41B option card is in fault state.
Flashing red	Conflict detected in the assigned IP addresses. Another station in the network uses the same IP address.

4.6.2 Status LEDs in PROFINET operation

LED L13 (BUS-FAULT)

The LED **L13 (BUS FAULT)** displays the status of the PROFINET.

Status of the L13 LED	Cause of error	Remedy
Off	• PROFINET IO device is currently exchanging data with the PROFINET IO controller (Data Exchange).	-
Flashing green Flashing green/red	• The flashing function in the PROFINET IO controller configuration is activated to visually localize the stations.	-
Red	• Connection to the PROFINET IO controller has failed. • PROFINET IO device does not detect a link • Bus interruption • PROFINET IO controller is not in operation	• Check the PROFINET connection of the DHR41B option • Check the PROFINET IO controller • Check the cabling of your PROFINET network
Yellow Flashing yellow	• The STEP 7 hardware configuration contains a module that is not permitted.	• Switch the STEP 7 hardware configuration to ONLINE and analyze the status of the components of the slots in the PROFINET IO device.

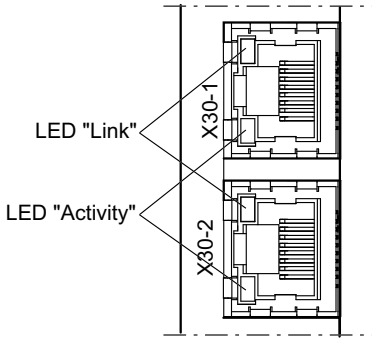
LED L14 (RUN)

LED **L14 (RUN)** indicates that the bus electronics are operating correctly.

Status of the L14 LED	Cause of error	Remedy
Green	• DHR41B hardware OK. • Proper operation	-
Off	• DHR41B is not ready for operation.	• Switch the unit on again. Consult SEW Service if the error occurs again.
Red	• Error in the DHR41B hardware	
Flashing green	• Hardware of the DHR41B does not boot up.	
Flashing yellow		• Switch the unit on again. Set default IP address parameters via DIP switch 'S1'. Consult SEW Service if the error occurs again.
Yellow		• Switch the unit on again. Consult SEW Service if the error occurs again.

4.6.3 Link/Activity LEDs

The two LEDs **Link (green)** and **Activity (yellow)**, integrated in the RJ45 plug connectors (X30-1, X30-2), display the status of the Ethernet connection.



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LED/status	Meaning
Link/green	There is an Ethernet connection.
Link/off	There is no Ethernet connection.
Link/flashes	Locating function of SEW Address Editor (see section 4.8)
Activity/ yellow	Data is currently being exchanged via Ethernet.

4.7 TCP/IP addressing and subnetworks

Preface

The settings for the address of the IP protocol are made using the following parameters:

- MAC address
- IP address
- Subnetwork mask
- Standard gateway

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

MAC address

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

IP address

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

Example: 192.168.10.4

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

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

The IP address comprises a network address and a station address (→ following table).

Network address	Station address
192.168.10	4

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

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

Network classes

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

Value range Byte 1	Network class	Complete network address (Example)	Meaning
0 ... 127	A	10.1.22.3	10 = Network address 1.22.3 = Station address
128 ... 191	B	172.16.52.4	172.16 = Network address 52.4 = Station address
192 ... 223	C	192.168.10.4	192.168.10 = Network address 4 = Station address

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

Subnet mask

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

Example: 255.255.255.128

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

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

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

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

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

The following station addresses are permitted in the two networks:

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

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

Standard gateway

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

Example: 192.168.10.1

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

If for the standard gateway, the same address is set as for the IP address, the standard gateway is deactivated. The address of the standard gateway and the IP address must be in the same subnet.

DHCP (Dynamic Host Configuration Protocol)

Instead of setting the three parameters IP address, subnetwork mask and standard gateway manually, they can be assigned in an automated manner by a DHCP server in the Ethernet network.

This means the IP address is assigned from a table, which contains the allocation of MAC address to IP address.

Parameter P785 indicates whether the DHR41B option expects the IP parameters to be assigned manually or via DHCP.

4.8 Setting the IP address parameters

Initial startup

The "DHCP" protocol (**D**ynamic **H**ost **C**onfiguration **P**rotocol) is the default setting for the DHR41B option. This means that the option card expects its IP address parameters from a DHCP server.

	TIP
	Rockwell Automation provides a DHCP server free-of-charge on their homepage. The tool is known as "BOOTP Utility" and can be downloaded from the following website: http://www.ab.com/networks/bootp.html.

Once the DHCP server has been configured and the settings have been made for the subnet mask and the standard gateway, the DHR41B option must be added to the assignment list of the DHCP server. During this process, the MAC ID of the DHR41B option is allocated a valid IP address.

	TIP
	The configured IP address parameters are permanently adopted into the parameter set if DHCP is deactivated after the IP address has been assigned.

Changing the IP address parameters after initial startup

If the DHR41B was started using a valid IP address, you can also access the IP address parameters via the Ethernet interface.

There are various ways to change the IP address parameters via Ethernet:

- Using the MOVITOOLS® MotionStudio software
- Using the EtherNet/IP TCP/IP interface object (see section 'EtherNet/IP CIP object directory')
- Using the SEW Address Editor

In addition, you can also change the IP address parameters via the other interface of DHR41B.

If the IP address parameters are assigned to the option DHR41B via a DHCP server, you can only change the parameters by adjusting the settings of the DHCP server.

The options listed above for changing the IP address parameters only come into effect once the supply voltages (DC 24 V) have been switched off and back on again.

Deactivating/activating DHCP

The type of IP address allocation is determined by the setting of the attribute *Configuration Control* of the EtherNet/IP TCP / IP interface object. The value is displayed or modified in the parameter *P785 DHCP / Startup Configuration*.

- Setting "Saved IP parameters"

  The saved IP address parameters are used.
- Setting "DHCP"

  The IP address parameters are requested by a DHCP server.

  If you use the DHCP server from Rockwell Automation, you can activate or deactivate the DHCP via a button. In this case, an EtherNet/IP telegram is sent to the TCP/IP interface object of the station that is being addressed.

Resetting the IP address parameters

If you do not know the IP address parameters and there is no other interface for reading the IP address, you can reset the IP address parameters to the default values using the DIP switch "2^0".

This action resets the DHR41B option to the following default values:

- IP address: 192.168.10.4
- Subnet mask: 255.255.255.0
- Default gateway: 192.168.10.4
- DHCP / Startup Configuration: Saved IP parameters (DHCP is deactivated)

Proceed as follows to reset the IP address parameters to the default values:

- Switch off the 24 V DC supply voltage and the mains voltage.
- Set the DIP switch "2^0" on the DHR41B option to "1".
- Switch the DC 24 V supply voltage and the line voltage back on.

SEW Address Editor

You can also use the SEW Address Editor to access the IP settings of DHR41B without the Ethernet settings of the PC and DHR41B having to match.

The IP settings of all SEW units can be made and displayed in the local subnetwork using Address Editor in MOVITOOLS® MotionStudio (see section 10).

- Thus, for a running installation, you can determine the PC settings required to provide for an access with the required diagnostics and engineering tools via Ethernet.
- When starting up a unit, the IP settings for DHR41B can be assigned without changing the network connections or PC settings.

	TIP
	• DHCP remains deactivated when you reset the DIP switch "2^0" (Def IP) to "0". You can re-activate DHCP via the EtherNet/IP TCP/IP interface object (see section 'EtherNet/IP CIP object directory'), via the parameter, or via the DHCP server from Rockwell Automation. • DHCP is activated again when the values are reset to the factory setting.

4.9 Procedure for unit replacement

- If the DIP switch "2^0" (Def IP) is set to "1" (= ON) at the DHR41B option, the DIP switch "2^0" (Def IP) of the new DHR41B must also be set to "1" (= ON). Other IP parameter settings are not required.
- If DHCP is active, the assignment list of the DHCP server must be updated when the DHR41B option is replaced. The MAC address of the DHR41B option is printed on its front panel for this purpose.
- If DHCP is not active, the IP parameters saved on the memory card of DHR41B will be used.

  If the memory card of DHR41B is not plugged into the new unit when replacing the old one, you will have to perform a complete startup of the new DHR41B (if DHCP is not active including the IP parameters). Instead, you can load a data backup created with the MOVITOOLS® MotionStudio software to the new unit.

5 Configuration and Startup (EtherNet/IP)

This section provides you with information about the configuration of the EtherNet/IP master and startup of MOVI-PLC® for fieldbus operation. Prerequisite is the correct connection and setting of the IP address parameters of DHR41B in accordance with section 'Assembly and Installation Instructions'.

5.1 Validity of the EDS file for DHR41B

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

SEW-EURODRIVE provides the following EDS file for configuring the scanner (EtherNet/IP master):

- SEW_MOVIPLC_ADVANCED_DHR41B.eds

	TIP
	Current versions of the EDS files for the DHR41B option are available on the SEW homepage (http://www.sew-eurodrive.com) under the heading "Software".

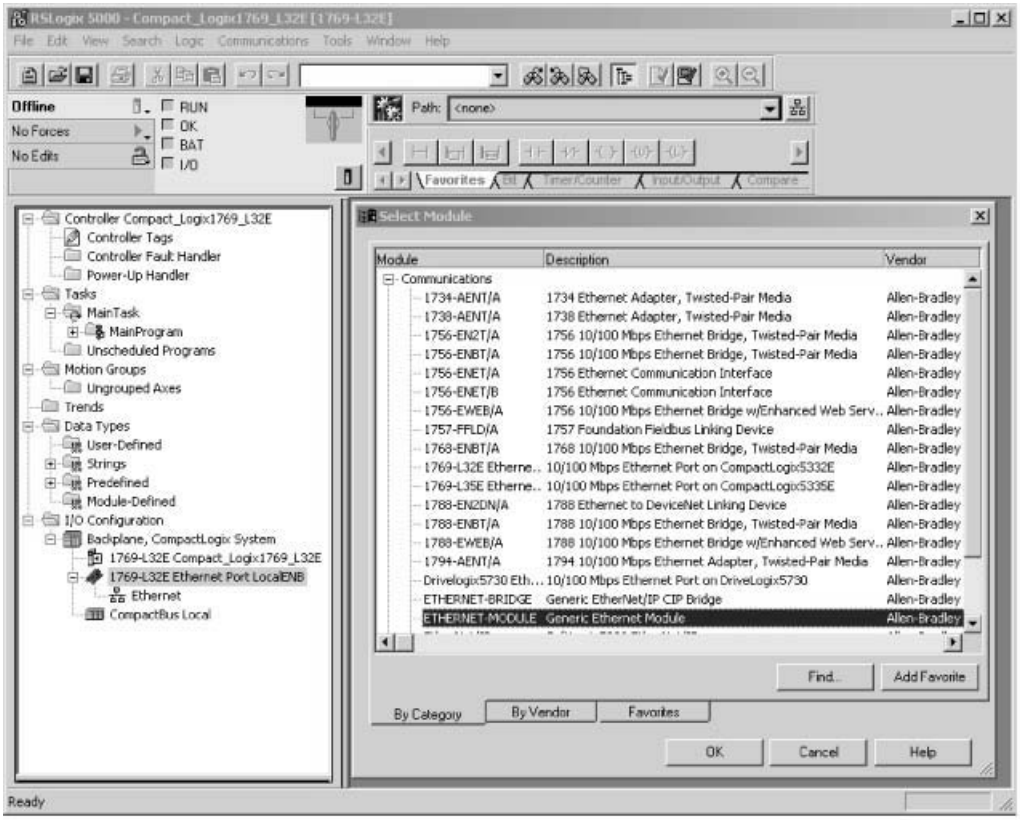
5.2 Configuring the master (EtherNet/IP scanner)

The following example refers to the configuration of the AllenBradley CompactLogix 1769-L32E controller with RSLogix 5000 programming software. The EtherNet/IP interface is already integrated in the CPU component.

	TIP
	If a CPU without an EtherNet/IP interface is used, an Ethernet communication interface must first be added to the I/O configuration.

Process data exchange

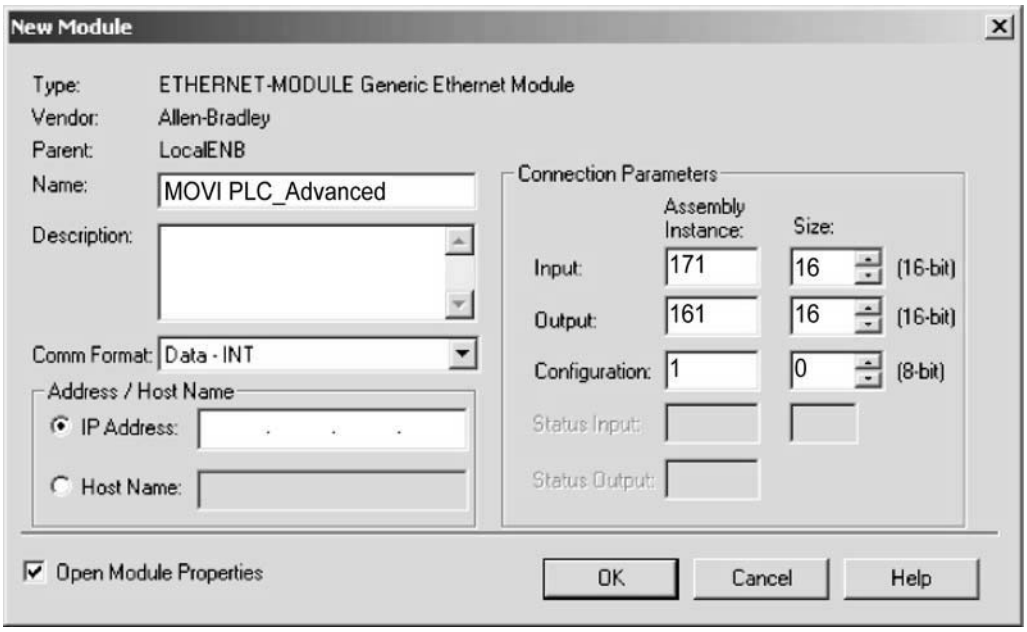
In the following configuration example, the option DHR41B is added to a project. To do so, go to the view 'Controller Organizer' in the RSLogix 5000 program as shown in the screenshot below (use the tree structure on the left side of the screen).



11709AXX

- In the "I/O Configuration" folder, select the entry "1769-L32E Ethernet Port LocalENB" as the Ethernet communication interface. Make a right mouse click to open the context menu and choose "New Module". The selection window "Select Module Type" appears.
- To add option DHR41B to the project, select the entry "ETHERNET MODULE" from the category "Communications". Confirm your selection by clicking [OK].
- The "New Module" window opens.

First enter the name under which the data is stored in the controller tags for the newly created module, and then enter the IP address.

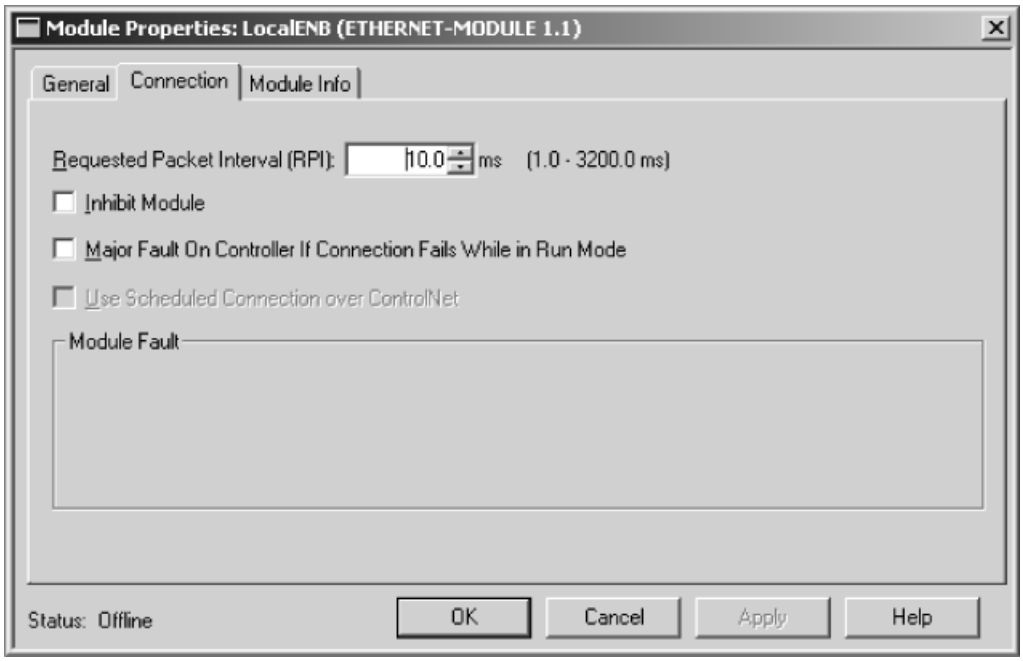


12062AXX

- **For the data format, open the dropdown menu "Comm-Format"and choose the entry "Data - INT". Process data for DHR41B always contains 16 bits (INT).**
- In the "Connection Parameters" group box, enter the value "171" in the "Input Assembly Instance" input field. The input data of the PLC must be linked to the output instance of DHR41B.
- To establish a controlling connection, in the "Connection Parameters" group box, enter the value "161" in the "Output Assembly Instance" input field. The input data of the PLC must be linked to the output instance of DHR41B.
- In the selection fields "Input Size" and "Output Size," set a maximum value of "64" (16 bit) as the data length.
- In the "Configuration Size" selection field, enter the value "0." The "Configuration Assembly Instance" input field is not used in this case.
- Click [OK] to complete the process.
- To ensure compatibility with existing DeviceNet configurations, you can also choose the data type 'SINT' in the 'Comm Format' selection field. In this case, you must ensure that an even number of bytes (2 128) is configured and that data consistency is maintained during operation when the IO data is accessed.

Additional settings

The "Connection" tab page is used to set the data rate and, if required, the error response of the controller.



11712AXX

- The DHR41B option supports a minimum data rate (input field 'Requested Packet Interval (RPI)') of 4 ms. Longer cycle times can be implemented without any problems.
- Click [OK]. You have now configured process data exchange with a DHR41B.

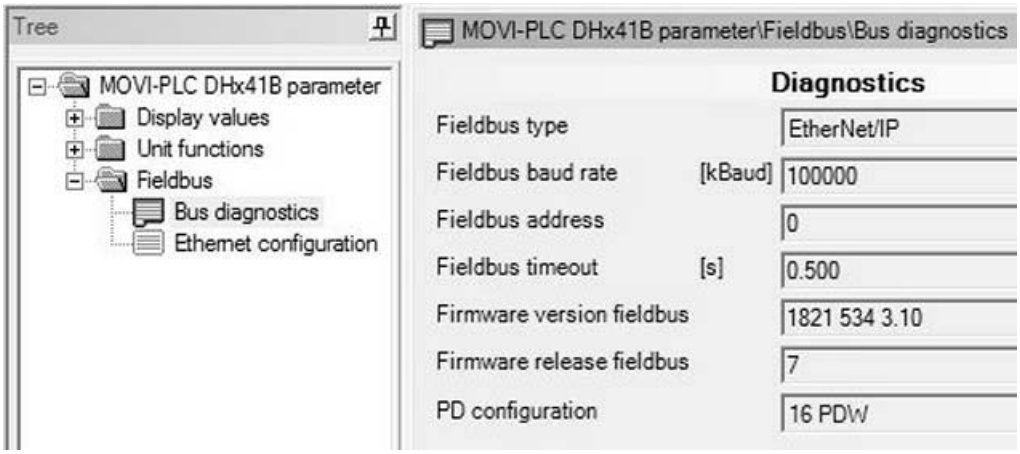
5.3 Settings in MOVI-PLC® advanced DHR41B

The creation of IEC programs is described in detail in the "MOVI-PLC®" manual. This section only describes the fieldbus-specific characteristics.

5.3.1 Process data configuration

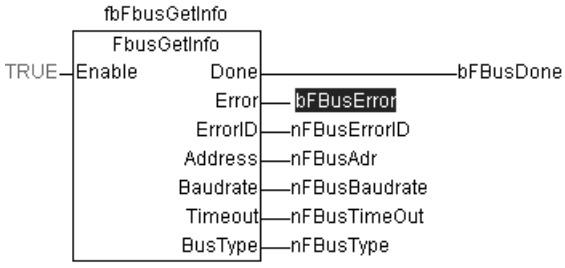
The process data interface is normally configured by the master (scanner). It sets the number of process data words and the timeout interval.

In the parameter tree of MOVITOOLS® MotionStudio (index 8451), the currently set value is displayed in the field "PD configuration" (see following figure).



12081AXX

5.3.2 Status of the fieldbus interface



12046AXX

The function module *FbusGetInfo* makes the status and some display parameters of the fieldbus interface available for the IEC program and diagnostics.

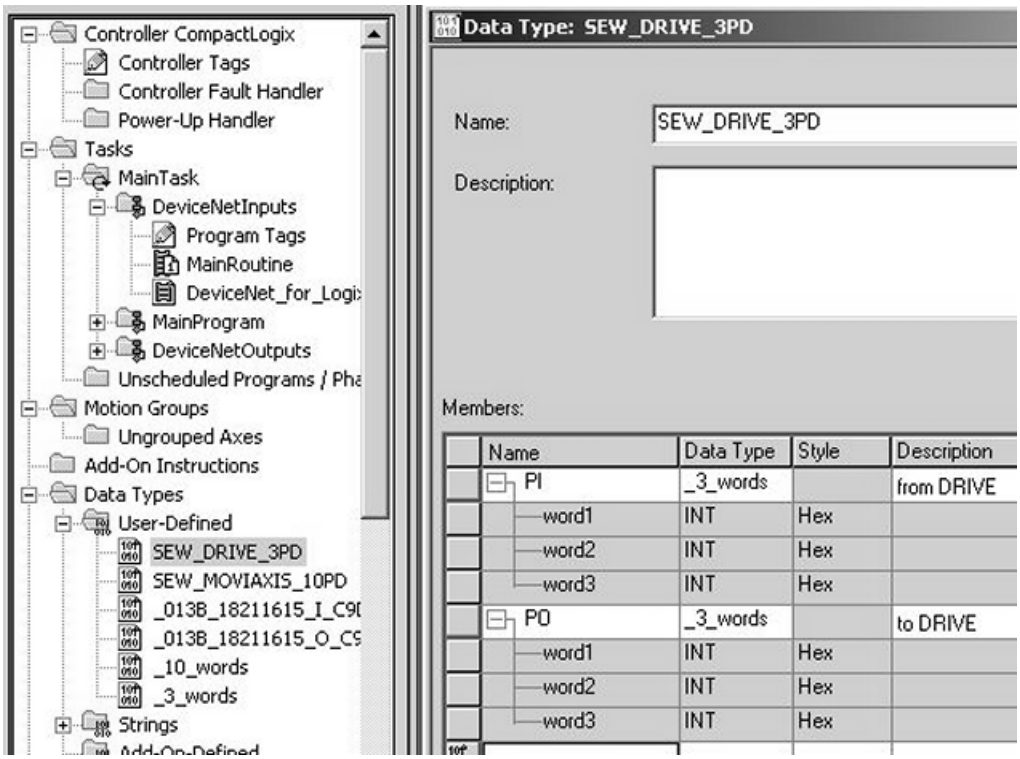
If there is no communication with the fieldbus master, the output *Error* is set to *TRUE*. During an active fieldbus connection, the output *Done* is set to *TRUE*, and the outputs *Address*, *Baud rate*, *Timeout* and *Bus type* show the respective parameters as they were set via the DIP switches of the DHR41B option or via the PLC.

5.4 Configuration examples in RSLogix 5000

5.4.1 MOVI-PLC® advanced DHR41B with 16 PD data exchange

1. Set the IP address of the DHR41B option (see section 'Setting the IP address parameters').
2. Add MOVI-PLC® *advanced* DHR41B to the EtherNet/IP configuration according to chapter 5.2.
3. You can now start integration into the RSLogix project.

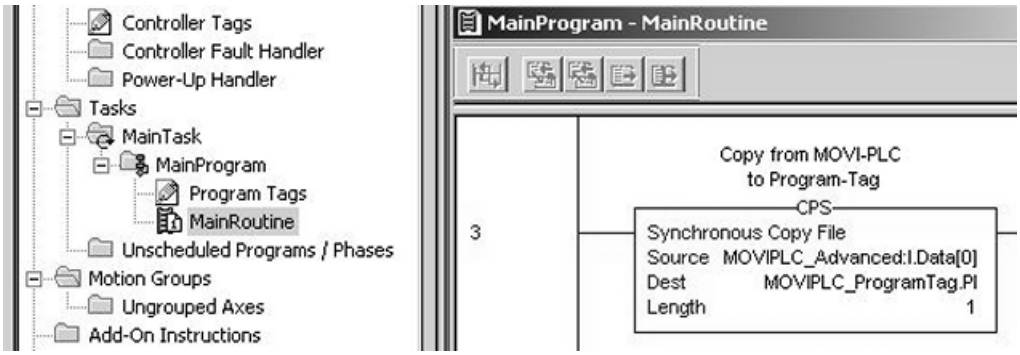
   To do so, create a controller tag with a user-defined data type to create a simple, data consistent interface to the process data of the DHR41B (see following figure).



11962AXX

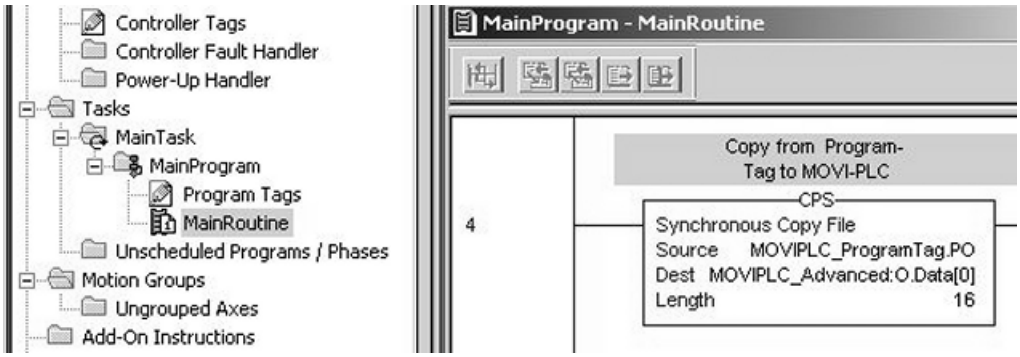
The description for process input and output data of the controller tag can be made in accordance with the definition of the process data (PD) in MOVI-PLC® *advanced* DHR41B.

4. To copy the data of MOVI-PLC® *advanced* DHR41B to the new data structure, a CPS command is added at the start of the "MainRoutine" which reads the data from the controller tag (see following figure).



12058AXX

To copy the data from the new data structure to MOVI-PLC® *advanced* DHR41B, a CPS command is added at the end of the 'MainRoutine' (see following figure).



12059AXX

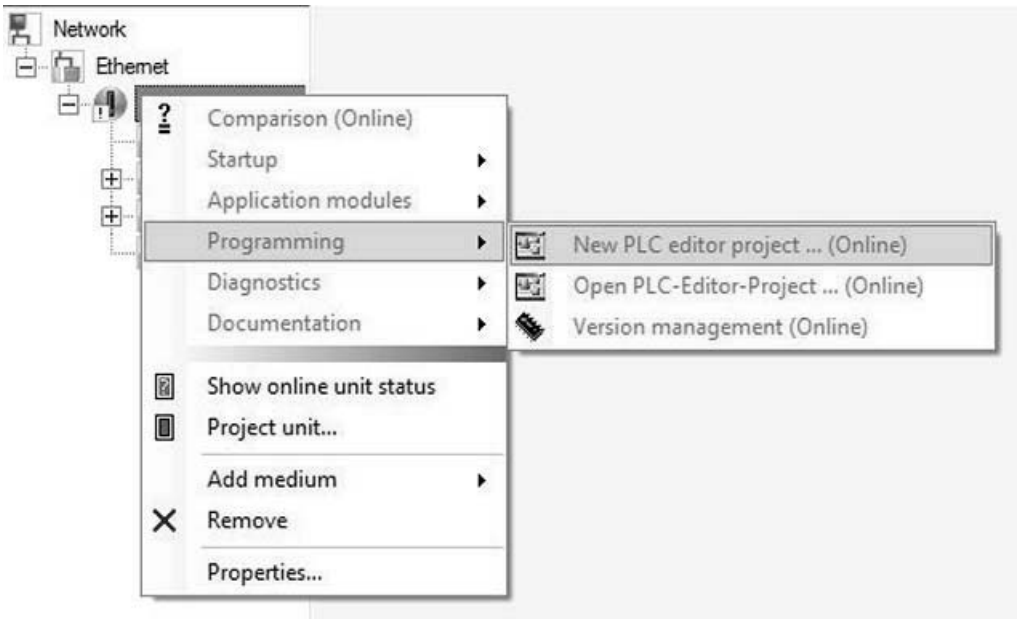
5. Now save the project and upload it to the PLC. The PLC is set to RUN mode.

   Now, the actual values can be read from MOVI-PLC® *advanced* DHR41B and set-points can be written.

   The process data should now correspond to the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio.

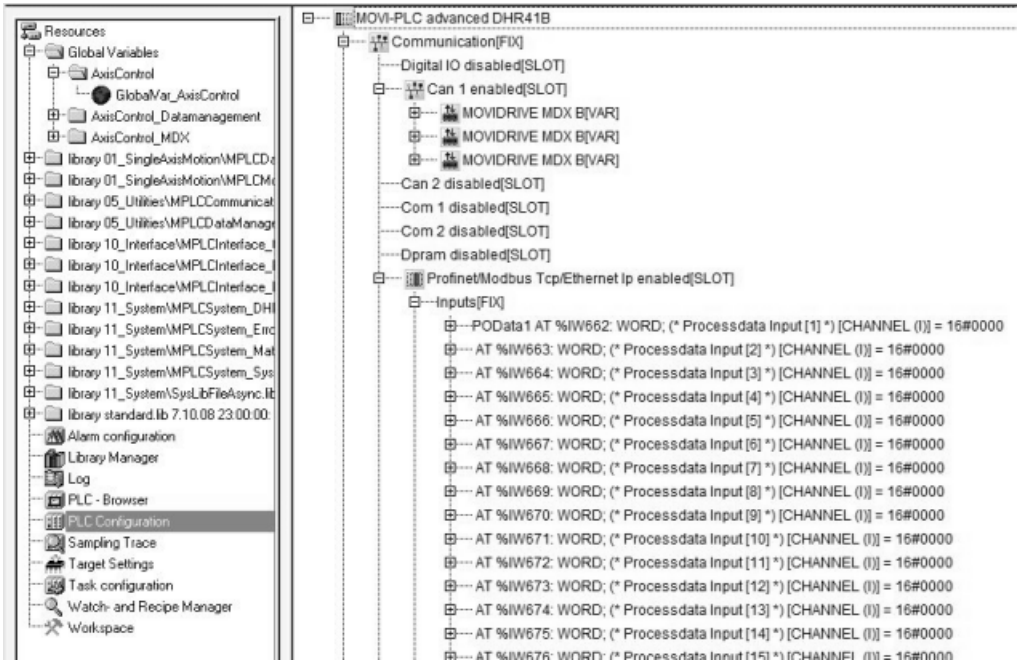
   If there is no IEC program in MOVI-PLC®, you can create one as follows:

- Open the context menu of the PLC in MOVITOOLS® MotionStudio and run the project wizard "Create new PLC Editor project" (see following figure).



12049AXX

- Use the wizard to create a new AxisControl project and upload it to MOVI-PLC® *advanced* DHR41B via the menu item "Online login"
- Start the loaded program via the menu item "Online start". You can now monitor the uploaded process data under "Resources Control configuration " (PLC configuration). (See following figure).

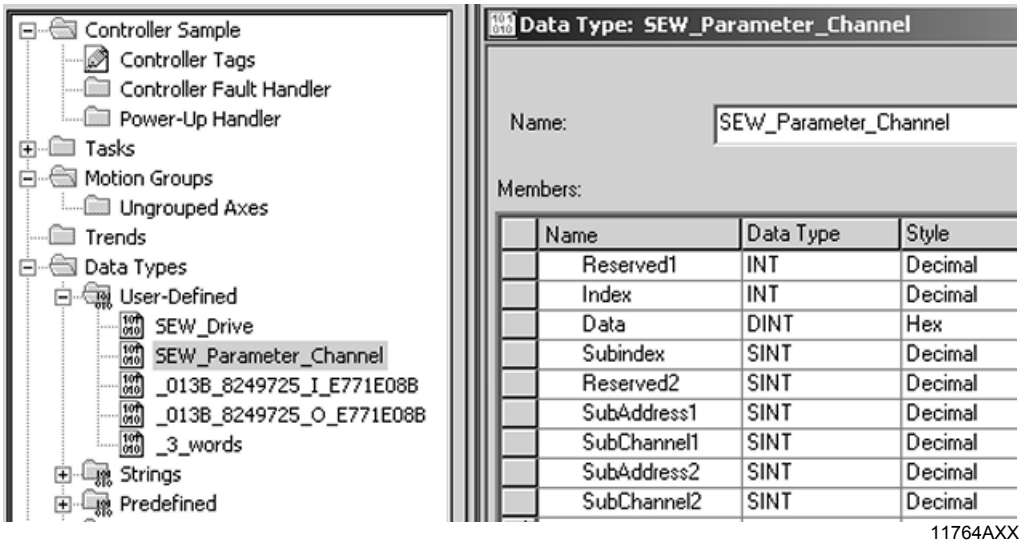


12050AXX

5.4.2 Access to the parameters of MOVI-PLC® advanced DHR41B

For easy read access to the parameters of MOVI-PLC® *advanced* DHR41B via *explicit messages* and the *register object*, proceed as follows:

1. Create a user-defined data structure "SEW_Parameter_Channel" (see following figure).



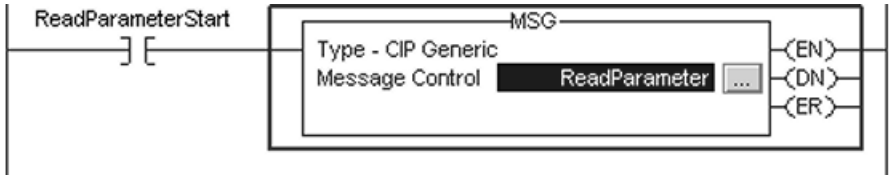
11764AXX

2. Define the following controller tags (see following figure).

Name	Data Type
ReadParameter	MESSAGE
ReadParameterRequest	SEW_Parameter_Channel
ReadParameterResponse	SEW_Parameter_Channel
ReadParameterStart	BOOL

11765AXX

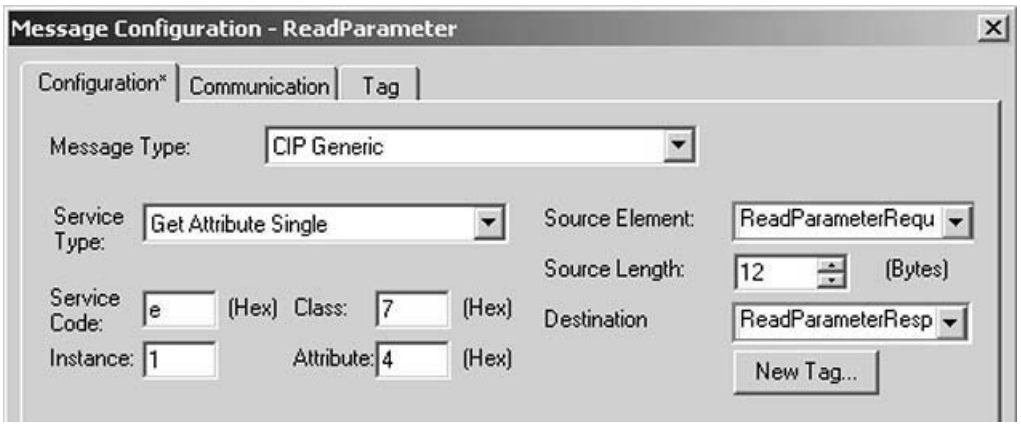
3. Create a rung for the 'ReadParameter' execution (see following figure).



11766AXX

- For contact, select the tag "ReadParameterStart"
- For the Message Control, select the tag "ReadParameter"

4. Click on [...] in the MSG command to open the 'Message Configuration' window (see following figure).



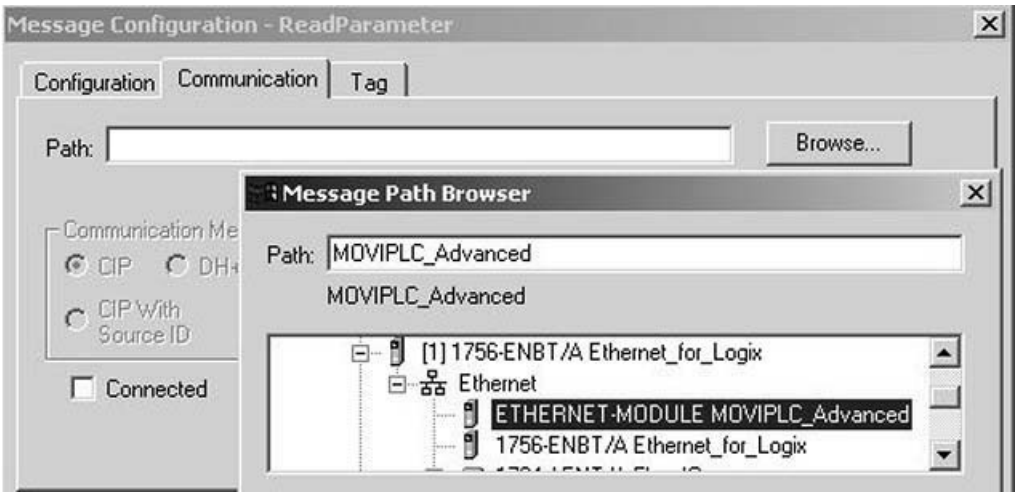
11767AXX

Select "CIP Generic" as "message type". Fill the other fields in the following order:

A Source Element = ReadParameterRequest.Index
B SourceLength = 12
C Destination = ReadParameterResponse.Index
D Class = 7_{hex}
E Instance = 1
F Attribute = 4_{hex}
G Service Code = e_{hex}

The service type is set automatically.

5. Specify the target device on the "Communication" tab. Click the [Browse] button and select the required unit from the IO configuration (under Ethernet) in the Message Path Browser (see following figure).



12060AXX

Do not select the "Connected" checkbox because both the controller and the DHR41B option permit only a limit number of connections.

6. After downloading the changes to the PLC, the index of the parameter to be read can be entered at *ReadParameterRequest.Index*. By altering *ReadParameterStart* to '1' the read request is executed once (see following figure).

Controller Tags - DeviceNet(controller)

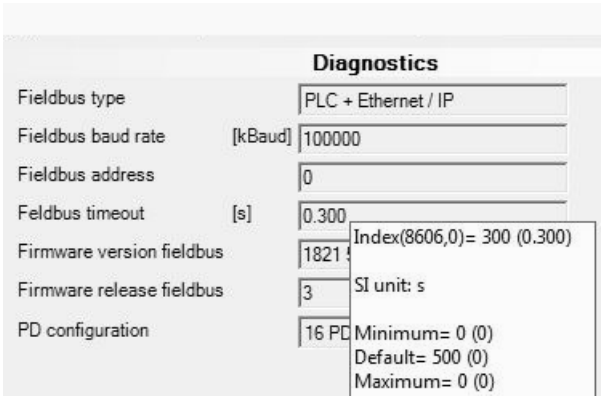
Scope: DeviceNet | Show... | SEW_Parameter_Channel, BOOL, MESSAGE

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

11966BXX

On response to the read request, *ReadParameterResponse.Index* should indicate the read index and *ReadParameterResponse.Data* should contain the read data. In this example, the timeout delay of MOVI-PLC® *advanced* DHR41B (index 8606) set by the scanner has been read (012Chex = 0.3 s).

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



12061AXX

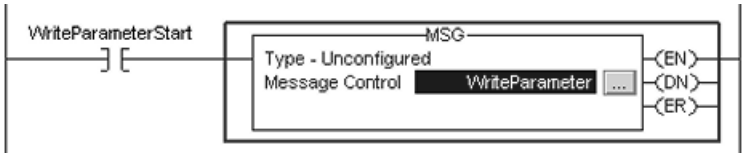
Only few changes are required for parameter write access:

- Create the controller tags (see following figure)

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

11771AXX

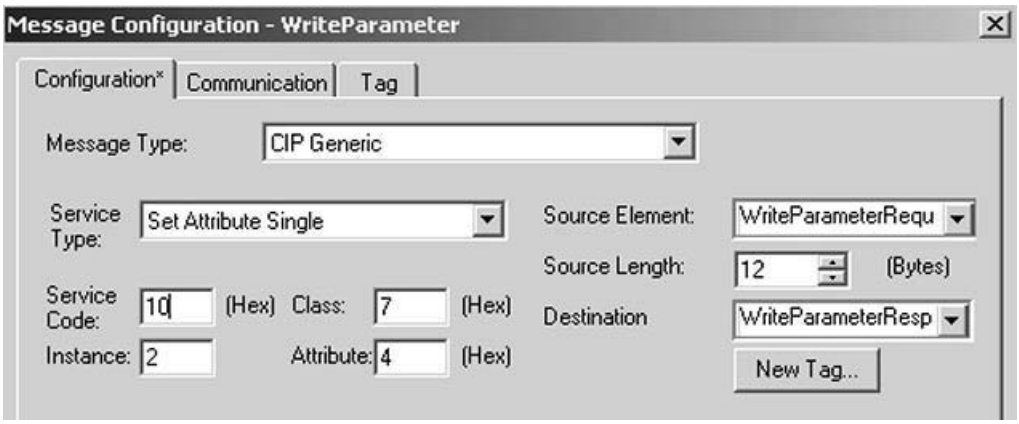
- Create a rung for executing the 'WriteParameter' command (see following figure).



11772AXX

For contact, select the tag "WriteParameterStart"
For message control, select the tag "WriteParameter"

- Click on ... in the MSG command to open the 'Message Configuration' window (see following figure).



11773AXX

Fill the other fields in the following sequence:
- Source Element = WriteParameterRequest.Index
- Source Length = 12
- Destination = WriteParameterResponse.Index
- Class = 7_{hex}
- Instance = 2
- Attribute = 4_{hex}
- Service Code = 10_{hex}

7. After downloading the changes to the PLC, index and value to be written into the parameter can be entered at *WriteParameterRequest.Index* and *WriteParameterRequest.Data.* By altering *WriteParameterStart* to "1", the write request is executed once (see following figure).

Name	Value	Style	Data Type
⊞ WriteParameter	{...}		MESSAGE
⊟ WriteParameterRequest	{...}		SEW_Parameter_C...
⊞ WriteParameterRequest.Reserved1	0	Decimal	INT
⊞ WriteParameterRequest.Index	11001	Decimal	INT
⊞ WriteParameterRequest.Data	16#0000_0021	Hex	DINT
⊞ WriteParameterRequest.Subindex	0	Decimal	SINT
⊞ WriteParameterRequest.Reserved2	0	Decimal	SINT
⊞ WriteParameterRequest.SubAddress1	0	Decimal	SINT
⊞ WriteParameterRequest.SubChannel1	0	Decimal	SINT
⊞ WriteParameterRequest.SubAddress2	0	Decimal	SINT
⊞ WriteParameterRequest.SubChannel2	0	Decimal	SINT
⊟ WriteParameterResponse	{...}		SEW_Parameter_C...
⊞ WriteParameterResponse.Reserved1	0	Decimal	INT
⊞ WriteParameterResponse.Index	11001	Decimal	INT
⊞ WriteParameterResponse.Data	16#0000_0021	Hex	DINT
⊞ WriteParameterResponse.Subindex	0	Decimal	SINT
⊞ WriteParameterResponse.Reserved2	0	Decimal	SINT
⊞ WriteParameterResponse.SubAddress1	0	Decimal	SINT
⊞ WriteParameterResponse.SubChannel1	0	Decimal	SINT
⊞ WriteParameterResponse.SubAddress2	0	Decimal	SINT
⊞ WriteParameterResponse.SubChannel2	0	Decimal	SINT
WriteParameterStart	1	Decimal	BOOL

11967BXX

On response to the write request, *WriteParameterResponse.Index* should give the written index and *WriteParameterResponse.Data* should contain the written data. In this example, 22hex (33 dec) was written to index 11001 (H1).

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

5.4.3 Access to unit parameters of downstream units

Access to the unit parameters of a MOVITRAC® B, for example, which is connected to the CAN 1 system bus of MOVI-PLC® *advanced* DHR41B is identical with the unit parameter access to MOVI-PLC® *advanced* DHR41B itself (see chapter 5.4.2)

The only difference is that **Read/WriteParameterRequest.SubChannel1**, for example, must be set to **3** and **Read/WriteParameterRequest.SubAddress1** must be set to the **SBus address** of the MOVITRAC® B connected to the DHR41B option (see following figure).

Controller Tags - Sample(controller)

Scope: Sample | Show... | Show All

Name	Value	Style	Data Type
ReadParameter	{...}		MESSAGE
ReadParameterRequest	{...}		SEW_Parameter_Channel
ReadParameterRequest.Reserved1	0	Decimal	INT
ReadParameterRequest.Index	8489	Decimal	INT
ReadParameterRequest.Data	16#0000_0000	Hex	DINT
ReadParameterRequest.Subindex	0	Decimal	SINT
ReadParameterRequest.Reserved2	0	Decimal	SINT
ReadParameterRequest.SubAddress1	7	Decimal	SINT
ReadParameterRequest.SubChannel1	3	Decimal	SINT
ReadParameterRequest.SubAddress2	0	Decimal	SINT
ReadParameterRequest.SubChannel2	0	Decimal	SINT
ReadParameterResponse	{...}		SEW_Parameter_Channel
ReadParameterResponse.Reserved1	0	Decimal	INT
ReadParameterResponse.Index	8489	Decimal	INT
ReadParameterResponse.Data	150000	Decimal	DINT
ReadParameterResponse.Subindex	0	Decimal	SINT
ReadParameterResponse.Reserved2	0	Decimal	SINT
ReadParameterResponse.SubAddress1	7	Decimal	SINT
ReadParameterResponse.SubChannel1	3	Decimal	SINT
ReadParameterResponse.SubAddress2	0	Decimal	SINT
ReadParameterResponse.SubChannel2	0	Decimal	SINT
ReadParameterStart	1	Decimal	BOOL

11775BXX

In this example, the value 150 rpm was read from the parameter *P160 Fixed setpoint n11* (index 8489) of a MOVITRAC® B connected to the CAN 1 system bus of DHR41B with SBus address 7.

For a schematic representation of the parameter access to lower-level units, refer to the chapter 'Appendix'.

6 The Ethernet Industrial Protocol (EtherNet/IP)

6.1 Introduction

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

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

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

6.2 Process data exchange

Up to 64 process data words can be exchanged with an EtherNet/IP master (scanner) depending on the use of the DHR41B unit. The EtherNet/IP master (scanner) sets the process data length when opening the connection.

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

If one controlling connection is already active via Modbus/TCP, an 'Exclusive Owner Connection' cannot be activated via EtherNet/IP without a power-on reset.

Timeout behavior

The timeout status is triggered by the DHR41B option. The timeout interval must be set by the EtherNet/IP master (scanner) when the connection is established. The EtherNet/IP specification refers to a 'Requested Packet Interval (RPI)' instead of a timeout interval.

The timeout interval displayed in the MOVITOOLS® MotionStudio parameter tree results from the Requested Packet Interval (RPI) multiplied with the 'Timeout Multiplier'.

This timeout interval is retained in the device when an 'Exclusive Owner Connection' is removed, and the device switches to timeout status after the timeout interval has elapsed. The timeout status is displayed on the front of the DHR41B option by the flashing red L13 LED.

A you can only activate the timeout delay via the bus, you must not change the value via MOVITOOLS® MotionStudio.

The timeout state causes the response programmed in the IEC program.

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

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

6.3 CIP object directory

In the Common Industrial Protocol, all unit data can be accessed via objects. The objects listed in the following table are integrated in the DHR41B option.

Class [hex]	Name
01	Identity object
02	Message Router Object
04	Assembly Object
06	Connection Manager Object
07	Register Object
0F	Parameter Object
64	Vardata Object
F5	TCP/IP Interface Object
F6	EtherNet Link Object

The meaning of the objects and a description of how to access them is given in the following section.

Identity object

- The identity object contains general information on the EtherNet/IP device.
- Class code: 01_{hex}

Class

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

Instance 1

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Vendor ID	UINT	013B	SEW-EURODRIVE GmbH & Co KG
2	Get	Device Type	UINT	0065	Manufacturer-specific type
3	Get	Product Code	UINT	0002	Product no. 2: DHR41B
4	Get	Revision	STRUCT of		Revision of the identity object, depends on firmware version
		Major Revision	USINT		
		Minor Revision	USINT		
5	Get	Status	WORD		σιεηε Table in "Coding of attribute 5 Status"
6	Get	Serial Number	UDINT		Unique serial number
7	Get	Product Name	SHORT_ STRING	SEW-MOVIPLC ADVANCED DHR41B	Product name

- Coding of attribute 5 "Status":

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

- Coding of the "extended device status " (bits 4 - 7):

Value [binary]	Description
0000	Unknown
0010	At least one faulty IO connection
0011	No IO connection established
0110	At least one IO connection active

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	X
05	Reset	-	X
0E	Get_Attribute_Single	X	X

Message router object

- The message router object provides information on the implemented objects.
- Class code: 02_{hex}

Class

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

Instance 1

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

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	-
0E	Get_Attribute_Single	X	X

Assembly object

- The assembly object is used to access the DHR41B process data. IO connections can be created for the instances of the assembly object to exchange cyclic process data.
- Class code: 04_{hex}

Class

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

Instance 161 - SEW PO data range

This instance is used to access the DHR41B process output data. MOVIDRIVE® can be controlled by only one scanner. Therefore, only one connection can be established with this instance.

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

Instance 121 - "Heartbeat"

This instance is accessed when the scanner wants to establish an input only connection. No process output data is sent with this type of connection. It is used only to read process input data.

Attribute	Access	Name	Data type	Default value [hex]	Description
3	Get	Data	Array of BYTE	-	OUTPUT assembly Data size = 0

Instance 171 - SEW PI data range

This instance is used to access the DHR41B process input data. Several multicast connections or a point-to-point connection can be established to this instance.

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

TIP

The names "INPUT assembly" and "OUTPUT assembly" refer to the processes as seen from the networkÕs point of view. "INPUT assembly" produces data on the network, an "OUTPUT assembly" consumes data from the network.

Supported services

Service code [hex]	Service Name	Class	Instance 161	Instance 121	Instance 171
0E	Get_Attribute_Single	X	X	-	X

Register object

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

Class

Attri-bute	Acces s	Name	Data type	Default value [hex]	Description
2	Get	Max Instance	UINT	0009	Maximum instance

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

As the register object is designed so that INPUT objects can only be read and OUTPUT objects can be read and written, the options listed in the following table are available for addressing the parameter channel.

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

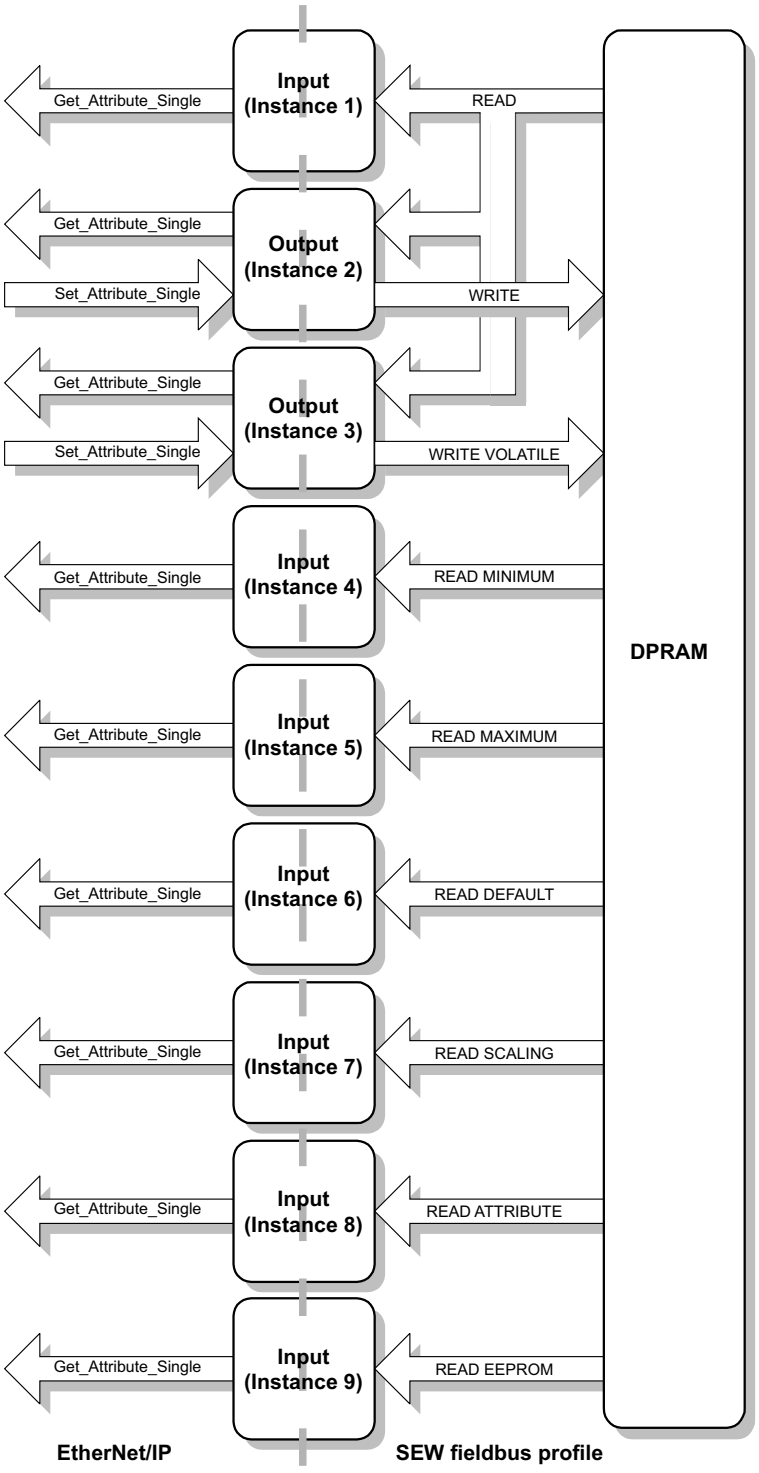


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Figure 1: Description of the parameter channel

Instance 1 - 9

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

TIPS

Explanation of the attributes:

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

Name	Data type	Description		
Index	UINT	SEW unit index		
Data	UDINT	Data (32 bit)		
Subindex	BYTE	SEW unit subindex		
Reserved	BYTE	Reserved (must be '0')		
Subaddress 1	BYTE	0 Parameter of the MOVI-PLC® itself	1 ...	e.g. SBus address of units connected to the SBus of MOVI-PLC®
Subchannel 1	BYTE	0	3	Lower-level bus system, e.g. SBus 1
Subaddress 2	BYTE	Reserved (must be '0')		
Subchannel 2	BYTE	Reserved (must be '0')		

The subchannels and subaddresses apply depending on the lower-level bus system from MOVI-PLC® *advanced* DHR41B to the drives.

For a schematic representation of the parameter access to lower-level units, refer to the chapter 'Appendix'.

Subchannel 1	Interface	Value range subaddress 1
0	MOVI-PLC® itself	0
1	Inverter via DPRAM if in MDX B	0
2	EtherCAT X36	0 - 99 (the EtherCAT address is calculated from: Sub address 1 + 1001)
3	SBus1 (X33 and X26)	1 - 63
4	SBus2 (X32)	1 - 63
5	RS485_1 (X34:1/3/5 and X24)	1 - 99
6	RS485_2 (X34:2/4/6)	1 - 99

Supported services

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

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

Parameter object

- In exceptional cases, you can also use the parameter object to access an SEW parameter channel.
- Class code: $0F_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0005	Maximum instance
8	Get	Parameter Class Descriptor	UINT	0009	Bit 0: Supports parameter instances Bit 3: Parameters are stored in a non-volatile manner
9	Get	Configuration assembly interface	UINT	0000	Configuration assembly is not supported.

The instances of the parameter object should only be used to access SEW parameters when the EtherNet/IP scanner does not support the option to attach user-defined data to the services "Get_Attribute_Single" and "Set_Attribute_Single."

When you use the parameter object, it takes a number of steps to address a parameter index.

- First, the address of the required parameter is set in instances 1 to 4.
- Next, instance 5 is used to access the parameter that is addressed in instances 1 to 4.

Access to an SEW parameter index via the parameter object is complicated and prone to errors. Consequently, this process should only be used when the EtherNet/IP scanner does not support parameterization using the mechanisms of the register object.

Instance 1 - SEW parameter index

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

Instance 2 - SEW subindex

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

Instance 3 - SEW subparameter 1

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

Instance 4 - SEW subparameter 2

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

Instance 5 - SEW read/write

Attri-bute	Access	Name	Data type	Default value [hex]	Description
1	Set	Parameter Value	UDINT		The set service executes write access to the parameters addressed in instances 1 to 4. The get service executes read access to the parameters addressed in instances 1 to 4.
2	Get	Link Path Size	USINT	00	No link is specified
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data type	EPATH	00C8	UDINT
6	Get	Data Size	USINT	04	Data length in bytes

Supported services

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

Vardata object

- This manufacturer-specific object is required to use the engineering option of some of the software tools provided by SEW-EURODRIVE.
- Class code: 64_{hex}

Class

None of the class attributes are supported.

Instance 1

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

Supported services

Service code [hex]	Service Name	Instance attribute 1	Instance attribute 2
0E	Get_Attribute_Single	X	X
32	Vardata (custom)	X	-

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

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

The following table shows the complete telegram structure.

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

TCP/IP interface object

- The TCP/IP interface object enables the IP parameters to be configured via EtherNet/IP.
- Class code: $F5_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0001	Revision 1
2	Get	Max Instance	UINT	0001	Maximum instance
3	Get	Number of Instances	UINT	0001	DHR41B has one TCP/IP interface

Instance 1

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

Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	_
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	-	X

Ethernet link object

- Information on the Ethernet communication interface is stored in the Ethernet link object.
- Class code: $F6_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0002	Revision 2
2	Get	Max Instance	UINT	0002	Maximum instance
3	Get	Number of Instances	UINT	0002	DHR41B has two Ethernet interfaces

Instance 1 Ethernet connection X30:1

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Interface Speed	UDINT	00000064	Default value = 100 → Transmission speed in Mbit/s
2	Get	Interface Flags	DWORD		• Bit 0 displays the active link • Bit 1 displays full duplex mode • Bit 2 ... bit 4 signal negotiation status • Bit 5 shows whether the manual setting has to be reset • Bit 6 indicates a local hardware fault
3	Get	Physical Address	ARRAY of 6 USINTs	00 0F 69 xx xx xx	MAC ID SEW MAC OUI: 00 0F 69

Instance 2 Ethernet connection X30:2

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Interface Speed	UDINT	00000064	Default value = 100 → Transmission speed in Mbit/s
2	Get	Interface Flags	DWORD		• Bit 0 displays the active link • Bit 1 displays full duplex mode • Bit 2 bit 4 indicate the negotiation status • Bit 5 shows whether the manual setting has to be reset • Bit 6 indicates a local hardware fault
3	Get	Physical Address	ARRAY of 6 USINTs	00 0F 69 xx xx xx xx	MAC ID SEW MAC OUI: 00 0F 69

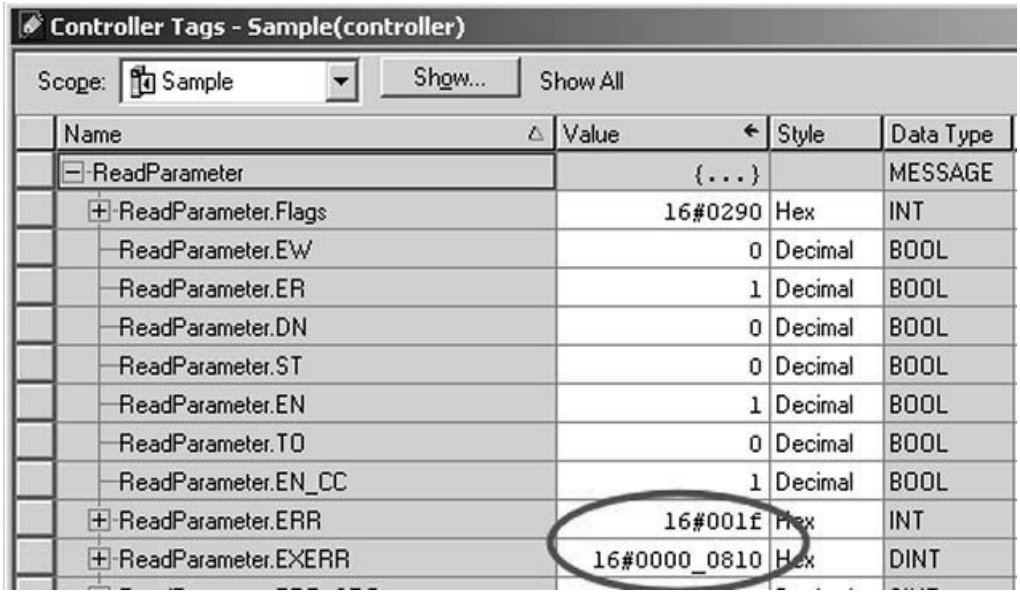
Supported services

Service code [hex]	Service Name	Class	Instance
01	Get_Attributes_All	X	_
0E	Get_Attribute_Single	X	X

6.4 Return codes for parameter setting via explicit messages

If a parameter request via explicit messages fails, a fault code can be used to determine the cause. An error can be generated either by the DHR41B option, by the EtherNet/IP system, or by a timeout.

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



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Return codes of EtherNet/IP

EtherNet/IP-specific return codes are returned in the error telegram if the data format is not maintained during the transfer or if a service is performed that has not been implemented. The coding of these return codes is described in the EtherNet/IP specification (see section "General error codes"). The General Error Code of a manufacturer-specific return code is $1F_{hex}$.

SEW-specific return codes

The return codes that the DHR41B option or lower-level units send in the event of incorrect parameterization are described in section 'MOVILINK®-specific return codes'. In conjunction with EtherNet/IP, the return codes are returned in the following format. The following table shows the data format for a parameter response message as an example

	Byte offset			
	0	**1**	**2**	**3**
Function	General error code	Additional code Length (words)	Additional code word 1 (low byte)	Additional code word 1 (high byte)
Example	$1F_{hex}$ Vendor-specific	01_{hex} only low word (word 1)	10_{hex} MOVILINK® Additional Error Code	08_{hex} MOVILINK® Error Class

In the example above, MOVILINK® error class 08 (General Error) is shown in the high byte of the additional code. The MOVILINK® additional error code 10 (invalid index) is shown in the low byte of the additional code. This information shows that the system tried to access a unit index that does not exist.

Timeout of the explicit messages

The timeout is triggered by the DHR41B option. The timeout interval must be set by the master after the connection has been established. The EtherNet/IP specification refers to an "Expected packet rate" rather than a timeout interval in this case. The expected packet rate is calculated from the timeout delay as follows:

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

It can be set using connection object class 5, instance 1, attribute 9. The range of values runs from 0 ms to 655535 ms in 5 ms steps.

If there is a timeout for the explicit messages, this connection type is automatically dropped for the explicit messages. This is the default setting for EtherNet/IP. The connection for these explicit messages must be re-established to communicate with these messages again. The timeout is **not** forwarded to the IEC program.

General error codes

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

MOVILINK®-specific return codes

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

MOVILINK®		
Error class	**Additional code**	**Description**
0x05	0x00	Unknown error
	0x01	Illegal service
	0x02	No response
	0x03	Different address
	0x04	Different type
	0x05	Different index
	0x06	Different service
	0x07	Different channel
	0x08	Different block
	0x09	No scope data
	0x0A	Illegal length
	0x0B	Illegal address
	0x0C	Illegal pointer
	0x0D	Not enough memory
	0x0E	System error
	0x0F	Communication does not exist
	0x10	Communication not initialized
	0x11	Mouse conflict
	0x12	Illegal bus
	0x13	FCS error
	0x14	PB init
	0x15	SBUS - Illegal fragment count
	0x16	SBUS - Illegal fragment type
	0x17	Access denied
		Not used

MOVILINK®		
Error class	**Additional code**	**Description**
0x08	0x00	No error
	0x10	Illegal index
	0x11	Not yet implemented
	0x12	Read only
	0x13	Parameter blocking
	0x14	Setup runs
	0x15	Value too large
	0x16	Value too small
	0x17	Required hardware does not exist
	0x18	Internal error
	0x19	Access only via RS485 (via X13)
	0x1A	Access only via RS485 (via XT)
	0x1B	Parameter protected
	0x1C	'Controller inhibit' required
	0x1D	Value invalid
	0x1E	Setup started
	0x1F	Buffer overflow
	0x20	'No enable' required
	0x21	End of file
	0x22	Communication order
	0x23	'IPOS stop' required
	0x24	Autosetup
	0x25	Encoder nameplate error
	0x29	PLC state error

7 Configuration and Startup (Modbus/TCP)

This section provides information about the configuration of the Modbus/TCP master and startup of the inverter for fieldbus operation. Prerequisite is the correct connection and setting of the IP address parameters of DHR41B in accordance with section 'Assembly and Installation Instructions'.

7.1 Unit description file for Modbus/TCP

	TIP
	There are no specific unit description files for Modbus/TCP.

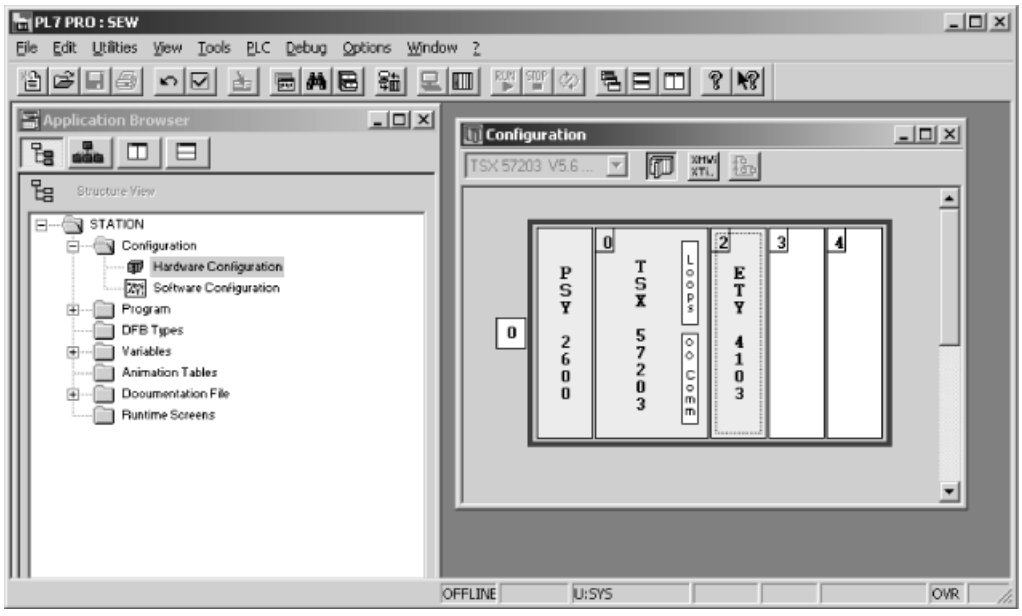
7.2 Configuration of the master (Modbus scanner)

The first example refers to the configuration and programming of a Schneider Electric control system TSX Premium P57203 using the programming software PL7 PRO. An ETY4103 is used as the Ethernet component. The information and illustrations are based on the English version of the PL7 PRO software.

	TIP
	• Enter values in PL7 PRO using the keypad. • As Ethernet bus master, use components from Schneider Electric that support I/O scanning. The Modbus/TCP interface module for SEW drives cannot be addressed via "Peer Cop". However, Ethernet bus masters that only support "Peer Cop" can access the drives from the PLC program using read and write commands.

Hardware configuration (control structure)

- Start PL7 PRO and enter the control type.
- Enter the hardware configuration for the control system in the application browser under `STATION / Configuration / Hardware configuration`.



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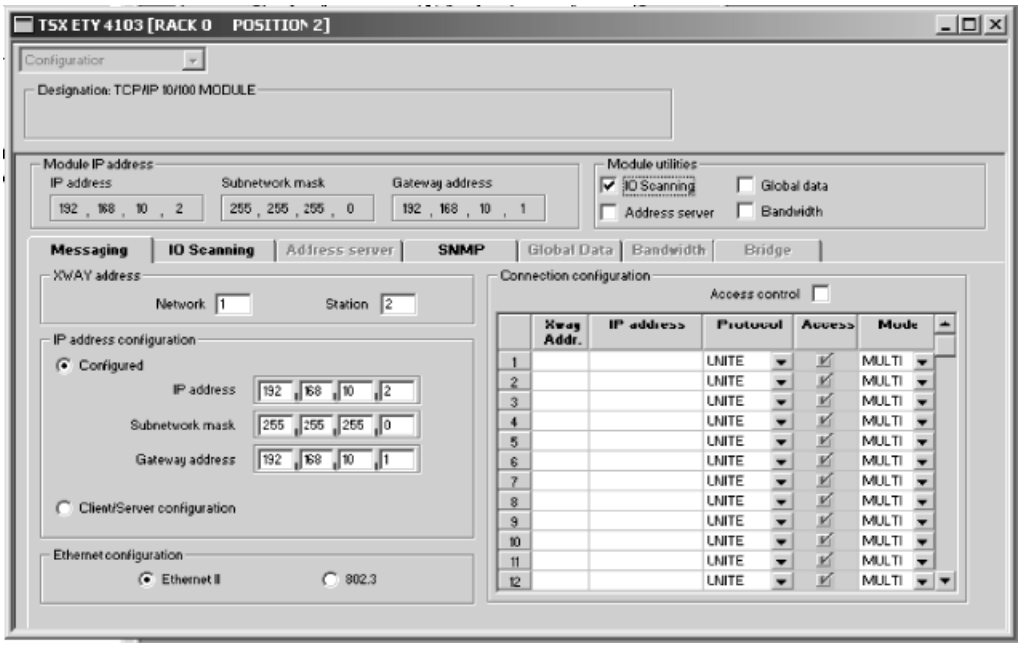
Settings for the Ethernet component

- Double-click on the Ethernet component to open the configuration window.
- If you have a non-extendable rack, enter a "1" in the "Network" input field in the "XWAY address" section.
- Enter the number of the slot that the Ethernet component is plugged into (here: 2) in the input field "Station" in the "XWAY address" section. In this case, the XWAY address is 1.2.
- In the section "IP address configuration" select the radio button "Configured". Enter the IP address and the network parameters in the input fields "IP address", "Subnetwork mask" and "Gateway address". If the control system is to receive the address parameters via a DHCP server, select the radio button "Client/Server configuration" in the section "IP address configuration".
- In the "Ethernet configuration" section, select the radio button "Ethernet II".
- In the "Module utilities" section, select the check box "IO Scanning".



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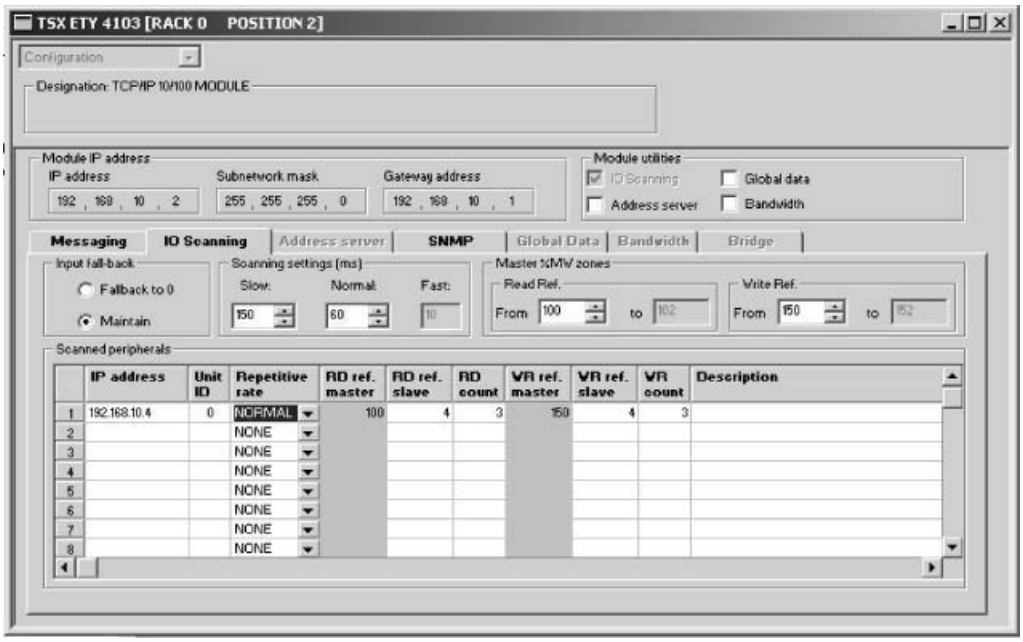
Addressing the drive using IO scanning

- Choose the "IO Scanning" tab page. In this tab page you specify which of the stations connected to the Modbus are to exchange cyclical data.
- In the section "Master %MW zones" enter the control memory areas that are to be used to exchange cyclical data with the Modbus stations. You will use the memory addresses later in your PLC program.
- Enter the following in the "Scanned peripherals" group:
  - In the "IP address" input field, enter the IP address of the SEW drive.
  - In the "Unit ID" input field, enter the value "0".
  - In the "Repetitive rate" dropdown menu, enter the cycle time that is used to address the stations.
  - Enter the value "4" in the input fields "RD ref.slave" and "WR ref. slave" as the cyclical process data are available from offset 4.
  - In the input fields "RD count" and "WR count" enter the number of words to be exchanged. The values must be the same in both fields. For the DHR41B option, you can enter between 1 and 64 words.



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- Click on the button "Confirm " to confirm the rack configuration and the global configuration.
- Once you have transferred your settings and started the program, the color of LED L13 (NETWORK/STATUS) of DHR41B changes to green (see section 'Status LEDs of the DHR41B option').

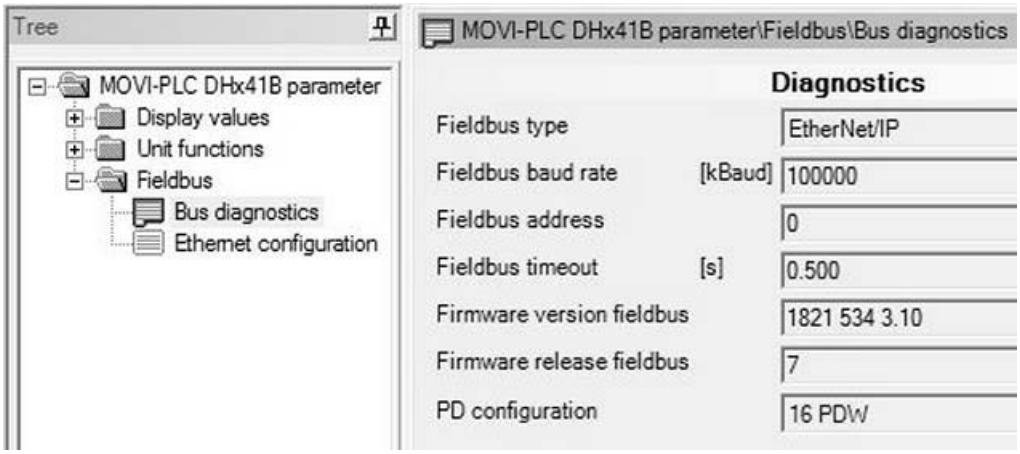
7.3 Settings in MOVI-PLC® advanced DHR41B

The creation of IEC programs is described in detail in the "MOVI-PLC®" manual. This section only describes the fieldbus-specific characteristics.

7.3.1 Process data configuration

The process data interface is normally configured by the master (scanner). The master sets the number of process data words.

In the parameter tree of MOVITOOLS® MotionStudio (index 8451), the currently set value is displayed in the field "PD configuration" (see following figure).



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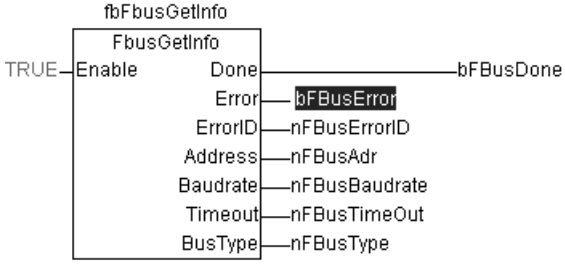
7.3.2 Status of the fieldbus interface



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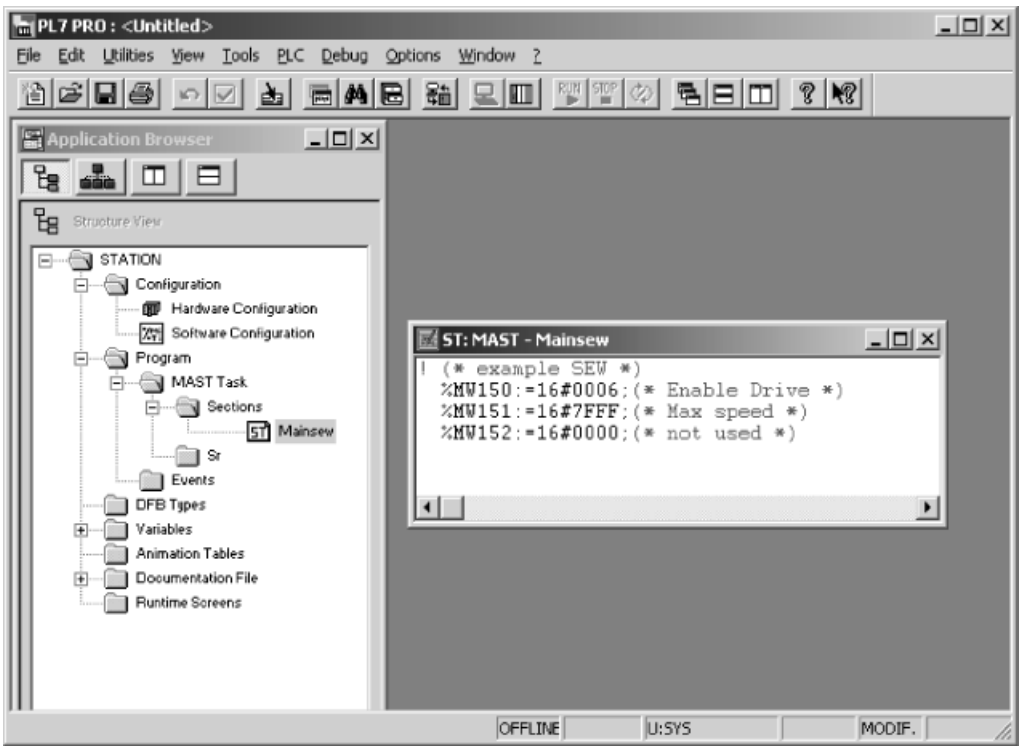
The function module *FbusGetInfo* makes the status and some display parameters of the fieldbus interface available for the IEC program and diagnostics.

If there is no communication with the fieldbus master, the output *Error* is set to *TRUE*. During an active fieldbus connection, the output *Done* is set to *TRUE*, and the outputs *Address*, *Baud rate*, *Timeout* and *Bus type* show the respective parameters as they were set via the DIP switches of the DHR41B option or via the PLC.

7.4 Configuration examples in PL7 PRO

7.4.1 MOVI-PLC® advanced DHR41B with 16 PD data exchange

1. Set the IP address of the DHR41B option (see section 'Setting the IP address parameters').
2. Integrate MOVI-PLC® *advanced* DHR41B into the configuration for I/O scanning according to section 'Configuration of the master (Modbus scanner)'.
3. Now, the integration into the PLC project can be performed.
4. Create a new section in PL7 PRO in the application browser under [`Station] / [Program] / [Mast Task] / [Sections]`.
5. In this example, the setpoints for the drive start from MW150 (see following figure).



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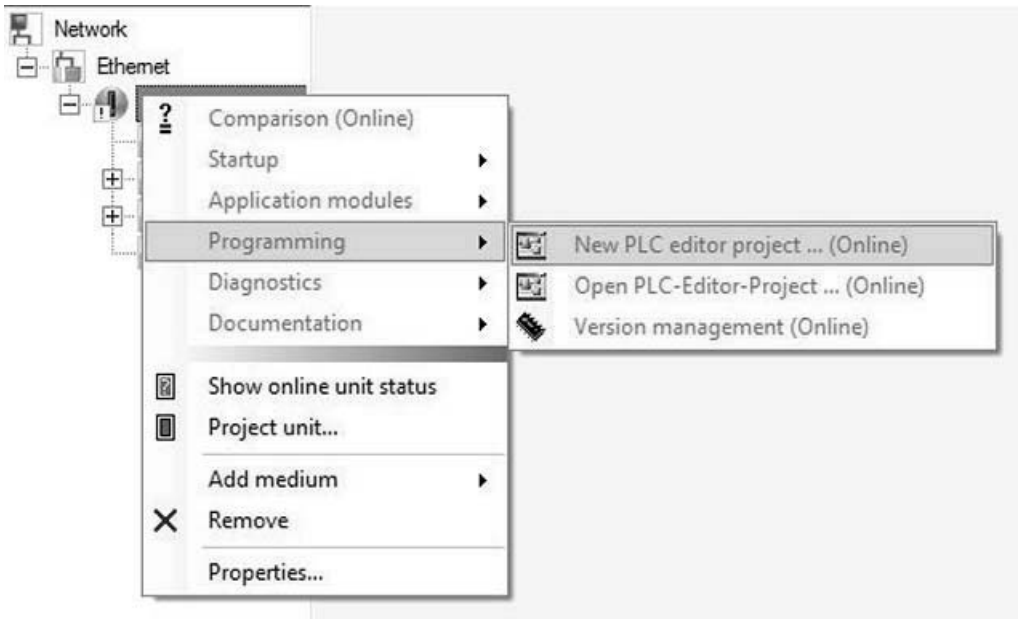
6. Now save the project and upload it to the PLC. The PLC is set to RUN mode.

   Now the actual values can be read off MOVI-PLC® *advanced* DHR41B and setpoints can be written.

   The process data should now correspond to the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio. If there is no IEC program in MOVI-PLC®, you can create one as follows:

- Open the context menu of the PLC in MOVITOOLS® MotionStudio and run the project wizard "New PLC Editor project" (see following figure).



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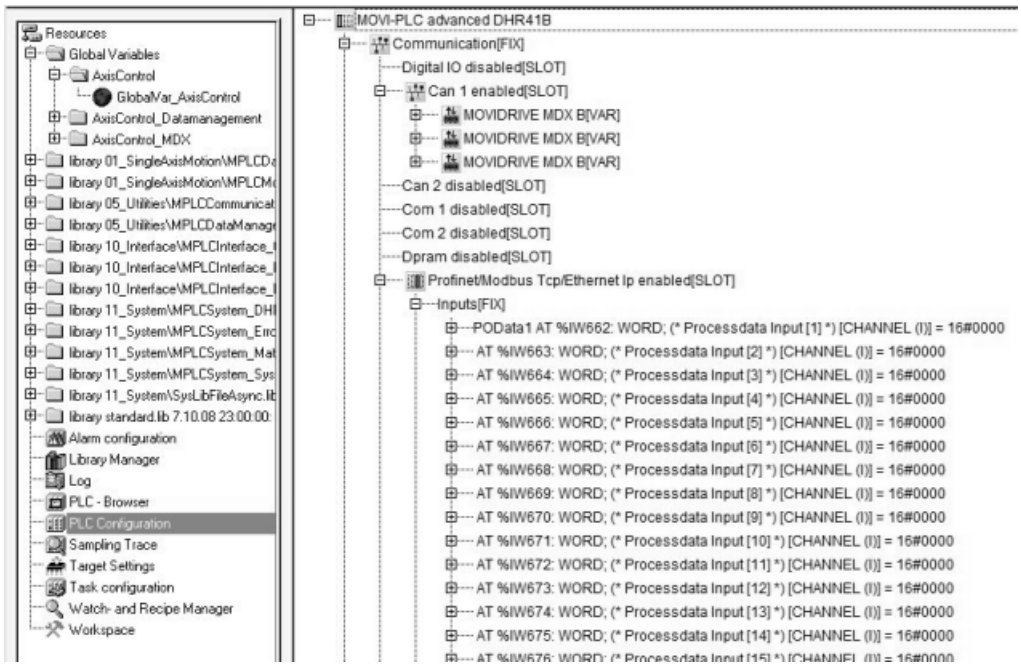
- Use the wizard to create a new AxisControl project and upload it to MOVI-PLC® *advanced* DHR41B via the menu item "Online login"
- Start the loaded program via the menu item "Online start". You can now monitor the uploaded process data under "Resources Control configuration " (PLC configuration). (See following figure).



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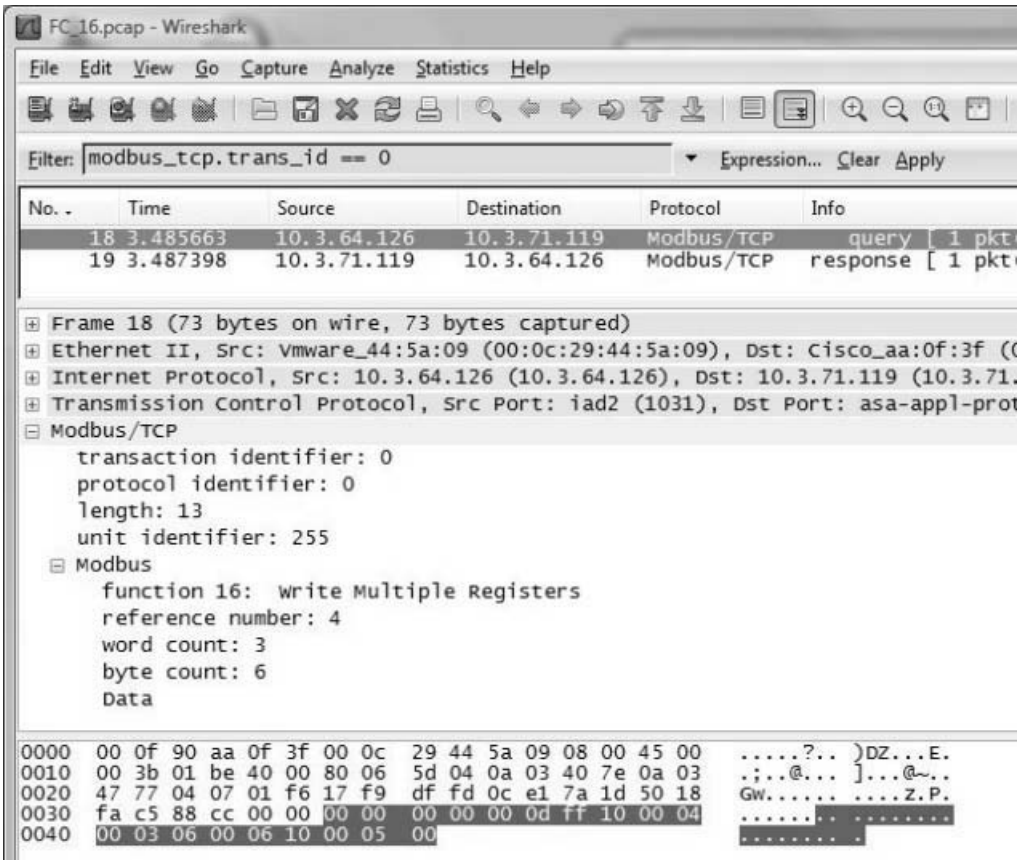
7.5 Examples for data exchange via Modbus/TCP

As there is a range of master systems and software solutions for standard PCs available for Modbus/TCP, there is no 'reference controller' which is used to create all examples. This is why this section gives detailed examples regarding the telegram structure.

You can compare the message structure in your own applications with the message structure in these examples for troubleshooting. There are simple tools for recording telegrams via the Ethernet network, e.g. Wireshark (see following figure), Packetizer etc. These freeware tools are available on the Internet.

Observe that tracing all Ethernet telegrams in a network is only possible with a tab, hub or a switch with a port mirror function. The telegrams sent from and to the PC which is also used for recording can always be recorded, of course.



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

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

7.5.1 Writing and reading process data

The process data exchange can be performed either via FC3 (read) and FC16 (write), or FC23 (read and write):

For writing 3 process data words (setpoints) to a Modbus/TCP slave via FC16, the TCP/IP telegram to port 502 is structured as illustrated above.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description, refer to Modbus/TCP specification and section 'Modbus protocol (Modbus/TCP)'
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: 3 (no. of PD) × 2 + 7 = 13	
5	0x0d			
6	0xFF	Unit identifier	Must be 0 or 255	
7	ox10	Function code	Service = FC16 (write register)	
8	0x00	Write reference number	Offset from where on the PD is located: Must always be 4	
9	0x04			
10	0x00	Write word count	Number of PDW (here 3): Must for PD 1 64	
11	0x03			
12	0x06	Write byte count	Number of PDW × 2 = 6	
13	0x00	Data	Process output data word 1	Data mapping and definition, see IEC program
14	0x11			
15	0x22		Process output data word 2	
16	0x33			
17	0x44		Process output data word 3	
18	0x55			

Only bytes 0-11 are returned in the response telegram of port 502 of the Modbus/TCP slave, where all values remain unchanged with the exception of byte 5. Byte 5 (low byte length field) is corrected to value 6.

During process data exchange via FC23, the telegram that is used to write and read 3 process data words (PD) each is structured as follows.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description, refer to Modbus/TCP specification and section 'Modbus protocol (Modbus/TCP)'
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: 3 (no. of PD) × 2 + 11 = 17	
5	0x11			
6	0xFF	Unit identifier	Must be 0 or 255	
7	0x10	Function code	Service = FC23 (read + write register)	
8	0x00	Read reference number	Offset from where the PD is located: Must always be 4	
9	0x04			
10	0x00	Read word count	Number of PDW (here 3): Must for PD 1 64	
11	0x03			
12	0x00	Write reference number	Offset from where the PD is located: Must always be 4	
13	0x04			
14	0x00	Write word count	Number of PDW (here 3): see read word count	
15	0x03			
16	0x06	Write byte count	Number of PDW × 2 = 6	
17	0x00	Data	Process output data word 1	Data mapping and definition, see IEC program
18	0x11			
19	0x22		Process output data word 2	
20	0x33			
21	0x44		Process output data word 3	
22	0x55			

The response telegram of the Modbus/TCP slave comprises the following data bytes.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description, refer to Modbus/TCP specification and section 'Modbus protocol (Modbus/TCP)'
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: 3 (no. of PD) × 2 + 3 = 9	
5	0x09			
6	0xFF	Unit identifier	Must be 0 or 255	
7	0x17	Function code	Service = FC23 (read + write register)	
8	0x06	Write byte count	Number of PDW × 2 = 6	
9	0x00	Data	Process input data word 1	Data mapping and definition, see IEC program
10	0xAA			
11	0xBB		Process input data word 2	
12	0xCC			
13	0xDD		Process input data word 3	
14	0xEE			

7.5.2 Parameter access

FC23 is suitable for the parameter access via the MOVILINK® parameter channel as it is possible to realize the request to the MOVILINK® service and the collection of the response in one Modbus/TCP service.

For read purposes, the TCP/IP telegram is structured as follows.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description, refer to Modbus/TCP specification and section 'Modbus protocol (Modbus/TCP)'
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: Must be 19 for MOVILINK®	
5	0x13			
6	0x00	Unit identifier	1)	
7	0x17	Function code	Service = FC23 (read + write register)	
8	0x02	Read reference number	Offset where the MOVILINK® parameter channel starts: Must always be 512.	
9	0x00			
10	0x00	Read word count	Must always be 4 for the MOVILINK® parameter channel.	
11	0x04			
12	0x02	Write reference number	Offset where the MOVILINK® parameter channel starts: Must always be 512.	
13	0x00			
14	0x00	Write word count	Must always be 4 for the MOVILINK® parameter channel.	
15	0x04			
16	0x08	Write byte count	8 bytes MOVILINK®	
17	0x31	Data: MOVILINK® parameter channel	Administration byte: 0x31 = read	Data mapping and definition, see IEC program and SEW unit profile
18	0x00		Parameter subindex	
19	0x20		Parameter index: 0x206c = 8300 = Firmware part number	
20	0x6C			
21	0x00		Parameter value Irrelevant for read service	
22	0x00			
23	0x00			
24	0x00			

1) The unit identifier 0 and 0xFF is used to access the parameters of DHR41B directly. For other values, the request is passed on to a lower-level unit. The assignment of the unit identifier to the downstream units on the system buses is determined via the routing table of the DHR41B control configuration. This allows parameter access for inverters that are connected via a DHR41B unit without any restrictions. See the 'Appendix' for a schematic representation of parameter access to lower-level units.

The response telegram receives the response to the MOVILINK® read service.

Byte	Value	Meaning	Interpretation	Help
0	0x00	Transaction identifier		For a detailed description, refer to Modbus/TCP specification and section 'Modbus protocol (Modbus/TCP)'
1				
2	0x00	Protocol identifier		
3				
4	0x00	Length field	Number of bytes after byte 5: Must be 11 for MOVILINK®	
5	0x11			
6	0x00	Unit identifier	1)	
7	0x17	Function code	Service = FC23 (read + write register)	
8	0x02	Read reference number	8 bytes MOVILINK®	
17	0x31	Data: MOVILINK® parameter channel	Administration byte: 0x31 = read	Data mapping and definition, see unit setting and SEW unit profile
18	0x00		Parameter subindex	
19	0x20		Parameter index: 0x206c = 8300 = Firmware part number	
20	0x6C			
21	0x00		The parameter value 0xA82e5b0d corresponds to firmware part number 28216102.53.	
22	0x00			
23	0x00			
24	0x00			

1) The unit identifier 0 and 0xFF is used to access the parameters of DHR41B directly. For other values, the request is passed on to a lower-level unit. The assignment of the unit identifier to the downstream units on the system buses is determined via the routing table of the DHR41B control configuration. This allows parameter access for inverters that are connected via a DHR41B unit without any restrictions. See the 'Appendix' for a schematic representation of parameter access to lower-level units.

8 The Modbus Protocol (Modbus/TCP)

8.1 Introduction

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

Modbus frames are exchanged via the TCP/IP port 502. Every master IP address is accepted. Modbus exclusively uses the coding 'BIG ENDIAN' (Motorola data format or high byte first).

Access via 'Peer Cop' is not possible. Make sure that the bus master supports 'IO scanning'.

Modbus/TCP is integrated into the DHR41B option as of firmware version .11.

8.1.1 Mapping and addressing

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

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

The tables can be separated or overlapping.

The DHR41B option provides the following data areas:

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

  This table starts at offset 4 and ends at offset $0FF_{hex}$. It contains the 1 64 cyclically transferred process data words.
- The process data output words from the controller are also saved in another table. It allows for one or several additional clients (e.g. visualization) to read the current setpoint values.

  This table starts at offset 104_{hex} and ends at offset $1FF_{hex}$.
- A third table is provided for the parameter access.

  This table starts at offset 200_{hex}, ends at offset $2FF_{hex}$ and contains 4 words of the MOVILINK® parameter channel (see 'Fieldbus Unit Profile' manual).
- The remaining address scope from offset 400_{hex} to $FFFF_{hex}$ is reserved and must not be addressed.

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

	TIP
	For Schneider Electric control systems: The address range often starts with 40001_{hex}, which corresponds to an offset with the value '0'.

8.1.2 Services (function codes)

For process data exchange, parameter data exchange and unit identification, the DHR41B option provides 4 FC.. services (**F**unction **C**odes).

- FC 3 Read Holding Registers
- FC16 Write Multiple Registers
- FC23 Read/Write Multiple Registers
- FC43 Read Device Identification

The FC3 and FC16 services allow reading or writing of one or more registers. FC23 allows a register block to be read and written simultaneously. FC43 can be used for a unit identification by reading out the identity parameters.

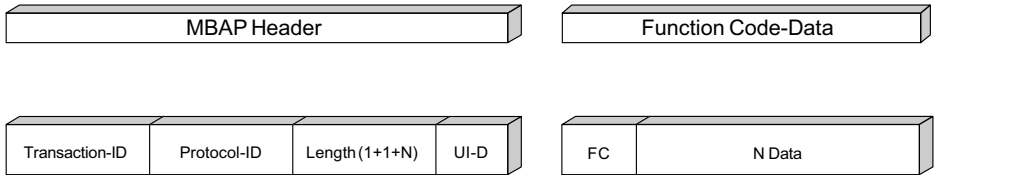
8.1.3 Access

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

	Meaning when			
Offset (hex)	**Reading**	**Writing**	**Access**	**Comment**
0 - 3	-	-	-	Reserved
4 - FF	Process input data (actual values)	Process output data (setpoint values)	FC3, FC16, FC23	0 - 64 words
100 - 103	-	-	-	Reserved
104 - 1FF	Process output data (setpoint values)	-	FC3	For reading the setpoint values by a client other than the controlling one
200 - 2FF	Result acyclical parameter channel	Request acyclical parameter channel	FC3, FC16, FC23	4 words
300 - FFFF	-	-	-	Reserved
Special case: 219E (8606_{dec})	Fieldbus timeout interval, read value	Fieldbus timeout interval, write value	FC3, FC16	Parameter P819: 16-bit value, timeout interval in ms

8.2 Protocol structure

The Modbus protocol consists of a header and function code data. The header is the same for all request/response telegrams and error messages (exceptions). Depending on the function code, a different number of data is attached to the header (see following picture).



8.2.1 Header

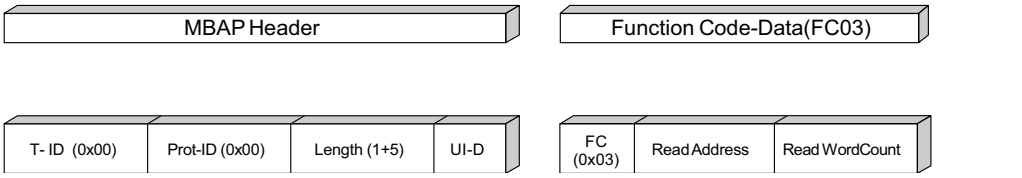
The protocol bytes of the header are described in the following table:

Byte	Designation	Meaning
0	Transaction identifier	Often 0, is simply copied by the server (slave)
1		
2	Protocol identifier	0
3		
4	Length field (upper byte)	0
5	Length field (lower byte)	Number of function codes data bytes + 1 (unit identifier)
6	Unit identifier (slave address)	This is the slave address. In order to access the DHR41B process data, it must be set to '0' (0x00) or 255 (0xFF). The following address assignments apply to the parameter channel access (Offset 200 - 203_{hex}): • 0 or 254 for parameters of the DHR41B • 1 253 for parameters of a lower-level unit connected to DHR41B. The assignment of unit identifier to the units on the system buses is determined via the routing table on the DHR41B memory card (see section '"Appendix"').
7	Function code	Requested service
8 ...	Data	Data depending on requested service

- The slave simply copies the transaction identifier (byte 0 and 1). It can help the master to identify related actions.
- The protocol identifier (byte 2 and 3) must always be '0'.
- The length bytes (byte 4 and 5) specify the number of bytes occurring in the length field. As the maximum telegram length is 255 bytes, the 'upper byte' must be '0'.
- The unit identifier (byte 6) can be used for distinguishing between several connected stations (e.g. bridges or gateways). It has the function of a subaddress that is only used for parameter access in SEW units. The process data are always mapped to the unit that is addressed via the unit identifier 0 or FF_{hex}.
- The 7 bytes of the header are followed by the function code and the data.

8.2.2 Service FC3 Read holding registers

With the service *FC3 Read holding registers*, you can read a variable number of registers (see following figure).



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Example

Request:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Requested service: 3 (Read Holding Register)
8	Reference number (high)	Offset
9	Reference number (low)	Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)

Response:

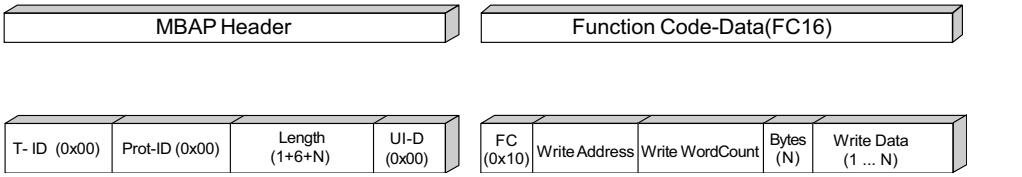
Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Service: 3 (Read Holding Register)
8	Byte count	Number of following bytes
9....	Data	2 - ... Data bytes depending on the length

Exception:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	83_{hex}
8	Exception code	Fault code

8.2.3 Service FC16 Write multiple registers

With the service *FC16 Write Multiple Registers* you can write a variable number of registers (see following figure).



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Example

Request:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Requested service: 16 (Write Multiple Registers)
8	Reference number (high)	Offset
9	Reference number (low)	Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)
12	Byte count	2* Word count
13 ...	Register values	2 - ... Data bytes depending on the length

Response:

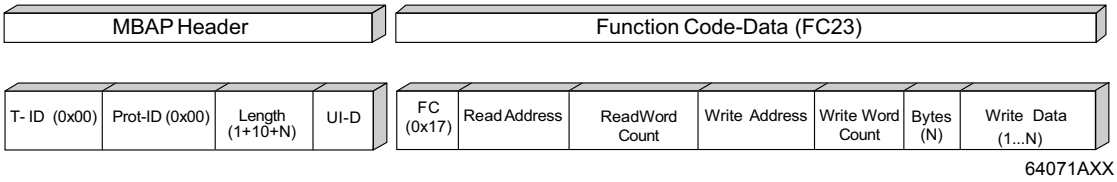
Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Service: 16 (Write Multiple Registers)
8	Reference number (high)	Offset
9	Reference number (low)	Offset
10	Word count (high)	Number of words (register)
11	Word count (low)	Number of words (register)

Exception:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	90_{hex}
8	Exception code	Fault code

8.2.4 Service FC23 Read/write multiple registers

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



Example

Request:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Requested service: 23 (Read/Write Multiple Registers)
8	Read reference number (high)	Offset
9	Read reference number (low)	Offset
10	Read word count (high)	Number of words (register) always 0
11	Read word count (low)	Number of words (register)
12	Write reference number (high)	Offset
13	Write reference number (low)	Offset
14	Write word count (high)	Number of words (register) always 0
15	Write word count (low)	Number of words (register)
16	Write byte count	2* Word count
17 ...	Write register values	2 - ... Data bytes depending on the length

Response:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Service: 23 (Read/Write Multiple Registers)
8	Byte count	Number of following bytes
9	Data	2 - ... Data bytes depending on the length

Exception:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	97_{hex}
8	Exception code	Fault code

8.2.5 Service FC43 Read device identification

The service *FC43 Read device identifications* is also referred to as MEI ('Modbus Encapsulated Interface Transport'). It can tunnel services and method calls. The service *Read Device Identification* is tunneled with the MEI-Type 0x0E. According to the Modbus specifications, there are 3 blocks (*Basic*, *Regular* and *Extended*) that can be read. The DHR41B option supports the *Basic* and *Regular* blocks (conformity level 02). The entire block is always read (streaming). This means that values 01 and 02 are permitted in the *Read device ID code*. The *Object ID* must be zero. The response is not fragmented.

Example

Request:

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

Response:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	Service: 43 (Read Device Identification)
8	MEI type	0x0E
9	Read device ID code	01 or 02
10	Conformity level	02
11	More follows	0
12	Next object ID	0
13	Number of objects	e.g. 3
14	Object ID	
15	Object length	
16	Object value	
17	....	

Exception:

Byte	Designation	Meaning/permitted values
0 - 6	MBAP header	See chapter 'Header'.
7	Function code	43_{hex}
8	Exception code	Fault code

Objects **DHR41B**

Object ID	Name	Type	M/O	Category	Value (example)
0x00	VendorName	ASCII String	Mandatory	Basic	"SEW-EURODRIVE"
0x01	ProductCode				"SEW MOVI-PLC ADVANCED DHR41B"
0x02	MajorMinorRevisions				"823 568 0.10" (example)
0x03	VendorUrl		Optional	Regular	"www.sew.de"
0x04	ProductName				"SEW MOVI-PLC ADVANCED"
0x05	ModelName				"DHR41B"

8.3 Connection management

Up to 8 simultaneous Modbus connections are possible, max. one of which has write access to the process data area (controlling connection).

Connections that are no longer used must be dropped by the master. If a ninth connection is to be established and the slave detects a connection that is no longer active, it is severed on one side by the slave because it assumes that the associated master is no longer active. If there are 8 active connections, the attempt to establish a ninth connection is cancelled (socket is closed on the server). Connections 1 - 8 operate independently of each other. There is no prioritization. Only one controlling connection that can change process data is permitted.

If a controlling connection has already been established via EtherNet/IP, you cannot establish another controlling connection via Modbus/TCP. The slave can at least buffer one frame with maximum Modbus length on receipt or transmission.

8.3.1 Sending process output data (requesting a controlling connection)

Sending process output data is only permitted if the connection already is a controlling connection or if there is no controlling connection. If the unit accepts the connection, it transfers the process output data to the process data image or transmits the process data to a lower-level station (gateway operation). As long as this connection is activated, no other master can change the process output data (PO data).

8.3.2 Dropping connections

A connection is deleted from the internal connection list if

- The 'keep alive' time has elapsed and the server no longer receives a response, or
- The socket reports a fault
- The connection to the client has been dropped

  If it was a controlling connection, another controlling connection can be established. If there are no permitted PO data sent within the timeout interval, a fieldbus timeout is triggered.

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

In the event of a cable break or a socket fault of a controlling connection, the fieldbus timeout in the unit will be displayed once the timeout interval has elapsed. Then a new controlling connection can be established.

8.3.3 Timeout monitoring

The timeout monitoring time can be set in the range of 0 to 650 s in steps of 10 ms.

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

The timeout interval can be set via:

- Register object $219E_{hex}$ (8606_{dec})
- Parameter access to index 8606 via register object 200_{hex} 203_{hex}
- Parameters in the parameter tree of MOVITOOLS® MotionStudio

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

If the timeout monitoring is deactivated by setting the timeout interval to 0 or 65000, no fieldbus timeout is detected. This also applies when the controlling connection is dropped.

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

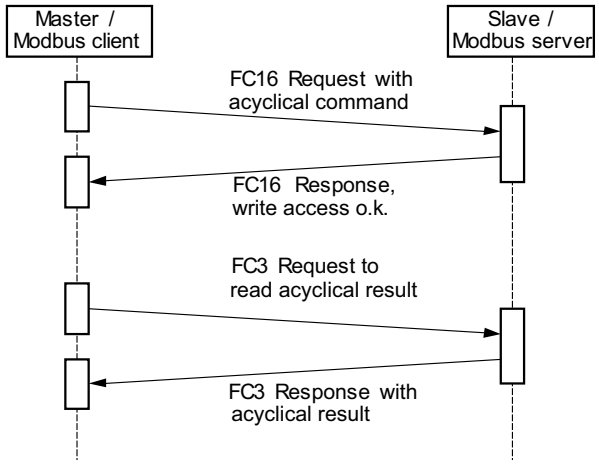
A change to the timeout interval (writing on index 8606) is activated after a re-boot.

8.4 Parameter access via Modbus/TCP

A parameter access via the MOVILINK® parameter channel in registers 200_{hex} 203_{hex} via Modbus/TCP requires the services FC3, FC16 or FC23 (write and read access). Write access is used for storing acyclic requests in the corresponding registers. Read services read the responses from the same registers.

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

8.4.1 Procedure with FC16 and FC3



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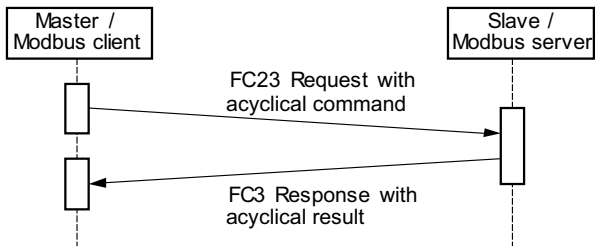
The respective error code is generated if a write access is incorrect (see section 'Error codes (exception codes)'). In this way, the write services are already processed by sending a *Write request* (FC16), and the service confirmation can be carried out by evaluating the *Write response*. Later on, the master will send a *Read Request* (FC03) in order to read out the values that have now been written into the register.

8.4.2 Procedure with FC23



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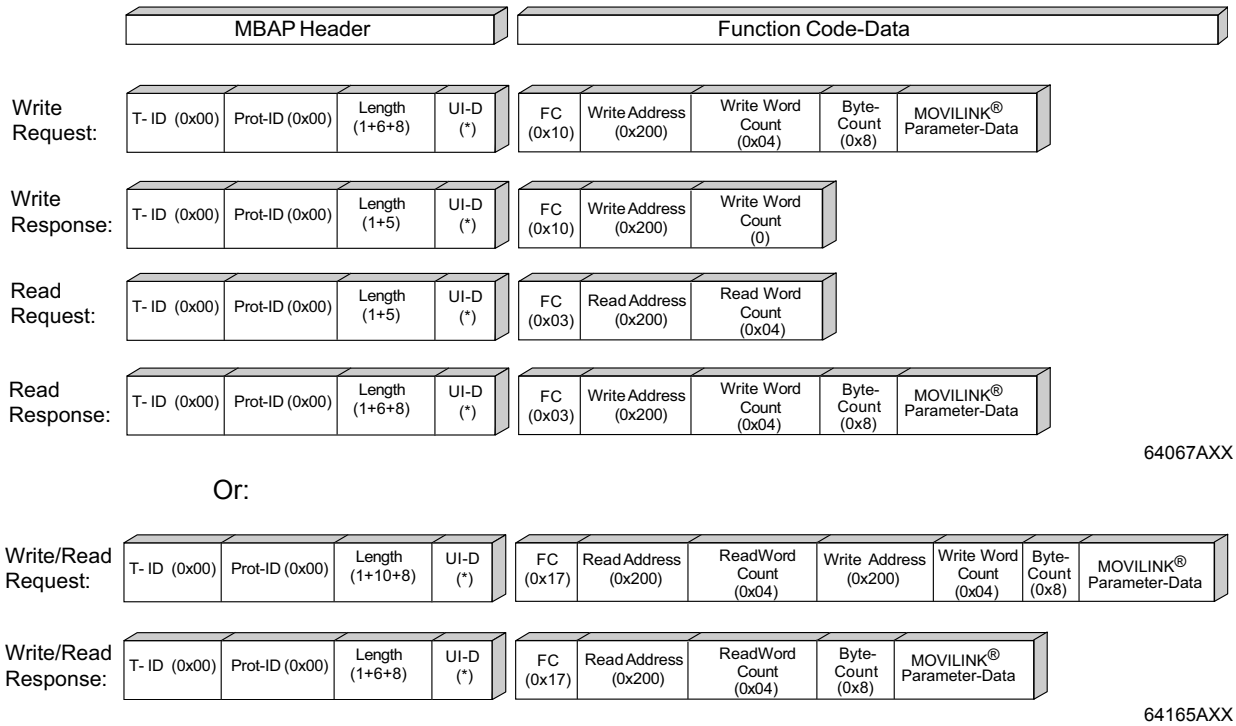
With FC23, the result is returned directly in the response.

8.4.3 Protocol structure



Or:

* The unit identifier (UI-D) is used in gateway operation to map registers 200_{hex} 203_{hex} to the lower-level stations, see section 'Header'.

The description of the MOVILINK® parameter data (8 bytes) and their mapping to registers 200_{hex} 203_{hex} is described in section 'MOVILINK® parameter channel'.

8.4.4 MOVILINK® parameter channel

The following table shows the structure of the MOVILINK® acyclic parameter channel. It contains 8 bytes.

Offset	200_{hex}	200_{hex}	201_{hex}	201_{hex}	202_{hex}	202_{hex}	203_{hex}	203_{hex}
Meaning	Administration	Subindex	Index high	Index low	MSB data	Data	Data	LSB data
Comment	Administration	Parameter index + subindex			4-byte data			
Example: Writing fieldbus timeout (index 8606)	32_{hex}	00_{hex}	21_{hex}	$9E_{hex}$	00_{hex}	00_{hex}	01_{hex}	$F4_{hex}$

You can access the parameter channel with FC3, FC16 and FC23. You can inform the parameter channel of the task in the administration byte using a write access. The task itself is a MOVILINK® service such as *Write*, *Write Volatile* or *Read*. The result can be read with a read access. Refer to the "MOVIDRIVE® Fieldbus Unit Profile and Parameter List" documentation for information on the structure of the parameter channel.

In this example, the MOVILINK® parameter channel is used to request 500 ms to be written to the fieldbus timeout interval:

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

8.5 Fault codes (exception codes)

If an error occurs when processing a function code, the Modbus client is informed in an *exception response*. The following *exception codes* can be reported by SEW devices:

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

9 Fault Diagnostics for Operation on EtherNet/IP and Modbus/TCP

9.1 Diagnostic sequence

The diagnostic procedures described in the following section demonstrate the integration of the DHR41B option into an Ethernet network and the error analysis method for the following problems:

- The MOVI-PLC® *advanced* DHR41B controller is not integrated properly in the EtherNet/IP or Modbus/TCP network
- The master (scanner) cannot specify any process data.

For detailed information about programming the DHR41B unit, refer to the "MOVI-PLC®" *advanced* DHE41B/DHF41B/DHR41B Controller" manual

For more diagnostic information, refer to the online status display in the EtherNet/IP master (scanner), in the Modbus/TCP master and the corresponding online help.

Step 1: Checking the status LEDs of DHR41B and the DIP switch settings

The possible DIP switch settings are described in chapter "Setting the DIP switches". For detailed information on the individual LED statuses, refer to chapter "Status LEDs of the DHR41B option". The following table lists the resulting unit statuses for communication via X30-1 and X30-2 and possible causes. An 'X' indicates that the state of the respective LED is not relevant.

LED		Operating status	Cause
L14 MODULE STATUS	**L13 NETWORK STATUS**		
Off	Off	Off	No voltage supply.
Red	Red	Reset	DHR41B is in reset status.
Red	X	Error	Internal DHR41B fault.
Flashing green	Off	IP-Stack starting	If DHCP is active, the DHR41B remains in this state until assigned an IP address.
Flashing red	Red	IP conflict	IP address conflict if the same IP address is used by another station in the network.
Flashing green/red	Flashing green/red	LED test	All LED conditions are briefly activated.
Flashing green	Flashing green	Application starting	All functions of the DHR41B (e. g. process data and connections to the master) are now active.
Green	Flashing green	Operational	DHR41B is active on the fieldbus but without a controlling connection to the master.
Green	Green	Connected	There is a controlling connection to a master.
Green	Flashing red	Timeout	A previously controlling connection is in timeout state.

In order to check and set the IP parameters, you can proceed according to section 'Setting IP address parameters' or use MOVITOOLS® MotionStudio.

The PING and IPCONFIG commands that you can enter via the DOS console on your PC are further tools for checking the communication via Ethernet.

Step 2: Check the status LED and the status display on the master (scanner)

To do so, use the documentation of the controller or master module.

Should there be no working EtherNet/IP or Modbus/TCP master yet, you can use an SEW master simulator for testing or starting up the DHR41B option. The latest version of the master simulator is available on the SEW website.

You can use the SEW master simulator to exchange process or parameter data with EtherNet/IP or Modbus/TCP profile with an SEW fieldbus interface.

Step 3: Fault diagnostics

If DHR41B is in the 'Connected' status, data exchange between master (scanner) and slave is active. If the data is not transferred to the IEC application of MOVI-PLC® *advanced* DHR41B via EtherNet/IP or Modbus/TCP correctly, the following steps will assist you in finding the cause for the problem.

A Are the correct values for the process data words displayed in the PLC Editor?

If yes, continue with F.

B Is the process data exchange activated in the scanner (master)?

C Is the process data written to the correct location in the scanner? Check the tags and scanner mapping.

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

E If the PLC is not sending data to the DHR41B, please refer to the documentation of the PLC manufacturer for support.

F Are the process data words being used correctly in the IEC program?

G Which status is displayed in the IEC application for the communication interface via the *FBusGetInfo* module (see chapter "Settings in MOVI-PLC® *advanced* DHR41B")?

10 PROFINET IO Configuration

10.1 Configuring the PROFINET IO controller

The following paragraphs describe the configuration of MOVI-PLC® *advanced* DHR41B with PROFINET interface. The configuration will be explained using the example of the SIMATIC STEP 7 configuration software and a SIMATIC CPU 315F-2 PN/DP.

10.1.1 Installing the GSD file

	TIP
	The latest GSD(ML) file version is also available for download on the SEW website (www.sew-eurodrive.de) in the "Software" section.

Proceed as follows to install the GSD file:

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

   A window is displayed.

2. Click on [Browse] and select the following file:

   "GSDML-V2.1-DHR41B-UFR41B-JJJJMMTT.xml" (JJJJMMTT represents the date)

3. Click on [OK] to confirm your selection.

4. You will find the PROFINET IO interface for MOVI-PLC® *advanced* DHR41B via [PROFINET IO]/[Other field units]/[Drives]/[SEW]/[DHR41B/UFR41B] in the hardware catalog.

   2 files are available for configuring the DHR41B option:

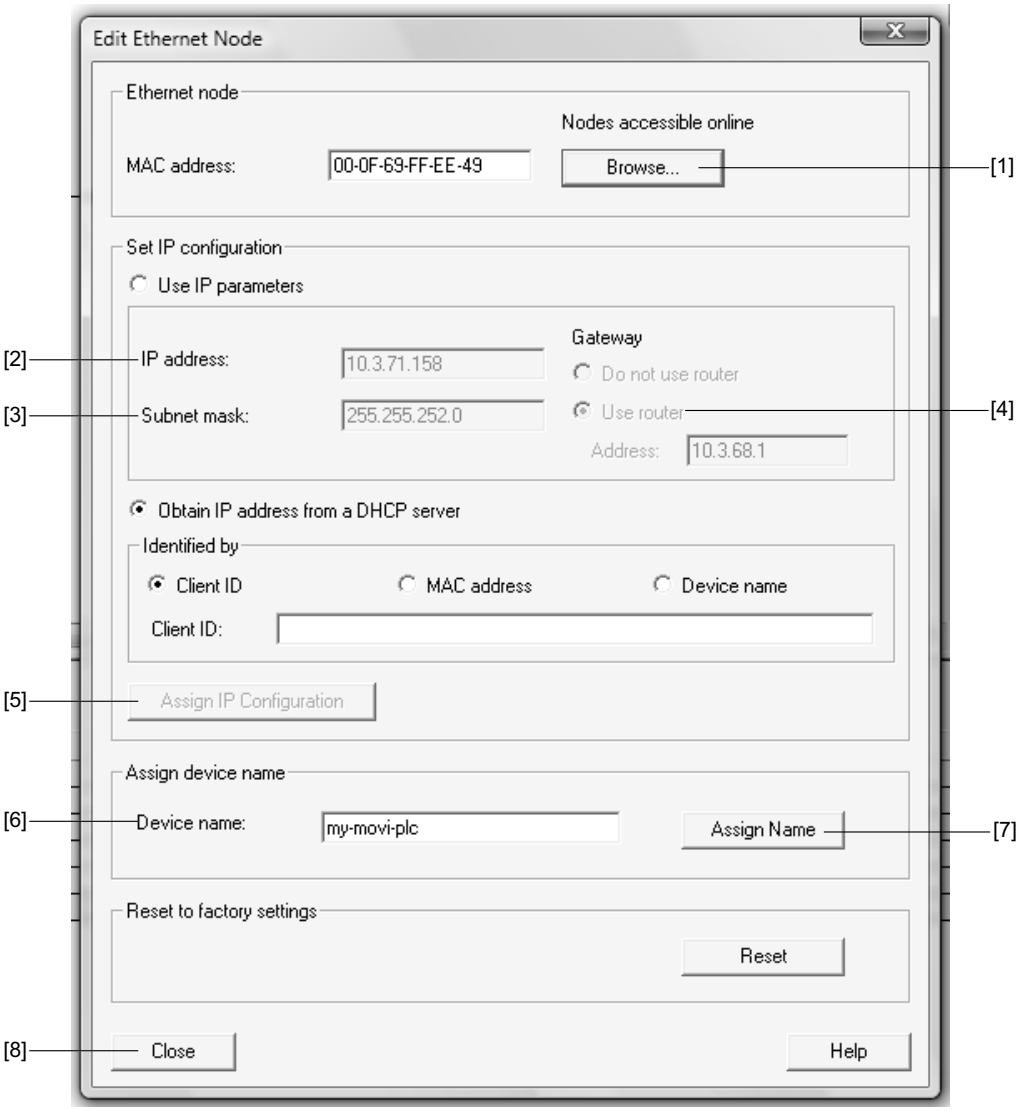
   - DHR41B V1.0
     for controllers that support the PROFINET IO topology detection
   - DHR41B V1.0 **ALT**
     for controllers that do **not** support the PROFINET IO topology detection

10.1.2 Assigning a PROFINET device name

Proceed as follows to assign the PROFINET device name:

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

   The following window opens:



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   [1] [Browse] button
   [2] " IP address" input field
   [3] "Subnet mask" input field
   [4] "Router address" input field
   [5] "Assign IP Configuration" button
   [6] "Device name" input field
   [7] "Assign name" button
   [8] [Close] button

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

3. Choose the required station.

   The SEW station appears under unit type. The default device name is 'PNETDevice-Name' and must be changed appropriately. Several MOVI-PLC® *advanced* DHR41B can be distinguished from each other by their displayed MAC address. A label with the MAC address is attached to the DHR41B option.

4. Enter the device name in the 'Device name' input field [6] and click the [Assign name] button [7].

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

   Click on [Reset] to reset the device name of MOVI-PLC® *advanced* DHR41B online. This requires a restart of DHR41B.

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

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

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

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

10.2 Configuring the PROFINET connection for MOVI-PLC® advanced DHR41B

10.2.1 Creating a new project

Proceed as follows to create a new project:

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

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

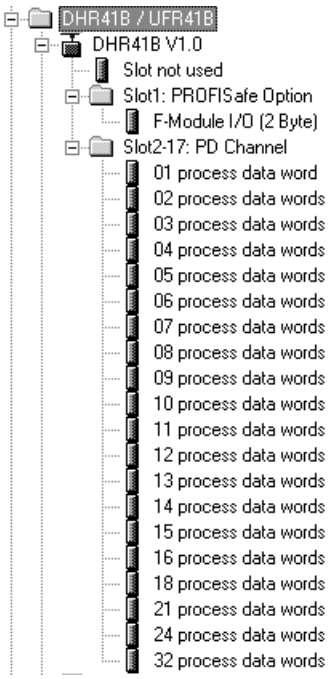
   - **OB82 module:** This module makes sure that the controller does not trigger a 'STOP' in the event of so-called diagnostic alarms.
   - **OB86 module:** This module indicates the failure of decentralized peripherals.
   - **OB122 module:**This module is addressed if the controller cannot access data of a station of the decentralized periphery. This can occur, for example, when MOVI-PLC® *advanced* DHR41B is ready for operation later than the control system.
2. Start STEP 7 HW Config and select the PROFINET IO slot in the control rack.
3. Add a PROFINET IO system by right-clicking the context menu with your mouse.
4. Specify an IP address for the PROFINET IO controller when doing this.
5. Add a new PROFINET subsystem using the [ETHERNET] button.
6. Open [PROFINET IO]/[Additional field devices]/[Drives]/[SEW]/[DHR41B/UFR41B] in the hardware catalog.

   2 entries are available for the DHR41B option:

   - DHR41B V1.0
     for controllers that support the PROFINET IO topology detection
   - DHR41B V1.0 **ALT**
     for controllers that do **not** support the PROFINET IO topology detection

7. Move the entry 'DHR41B/UFR41B' to the PROFINET IO system with the mouse and assign a PROFINET station name. This name must correspond to the PROFINET device name specified in MOVI-PLC® *advanced* DHR41B.
8. Enter the IO and periphery addresses in slot 2 and save the configuration.

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



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   The default configuration 'Slot not used' must not be modified. Slot 1 is reserved for future PROFIsafe applications.

   Slots 2 17 can be assigned process data channels. The maximum process data width is 64 words.

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

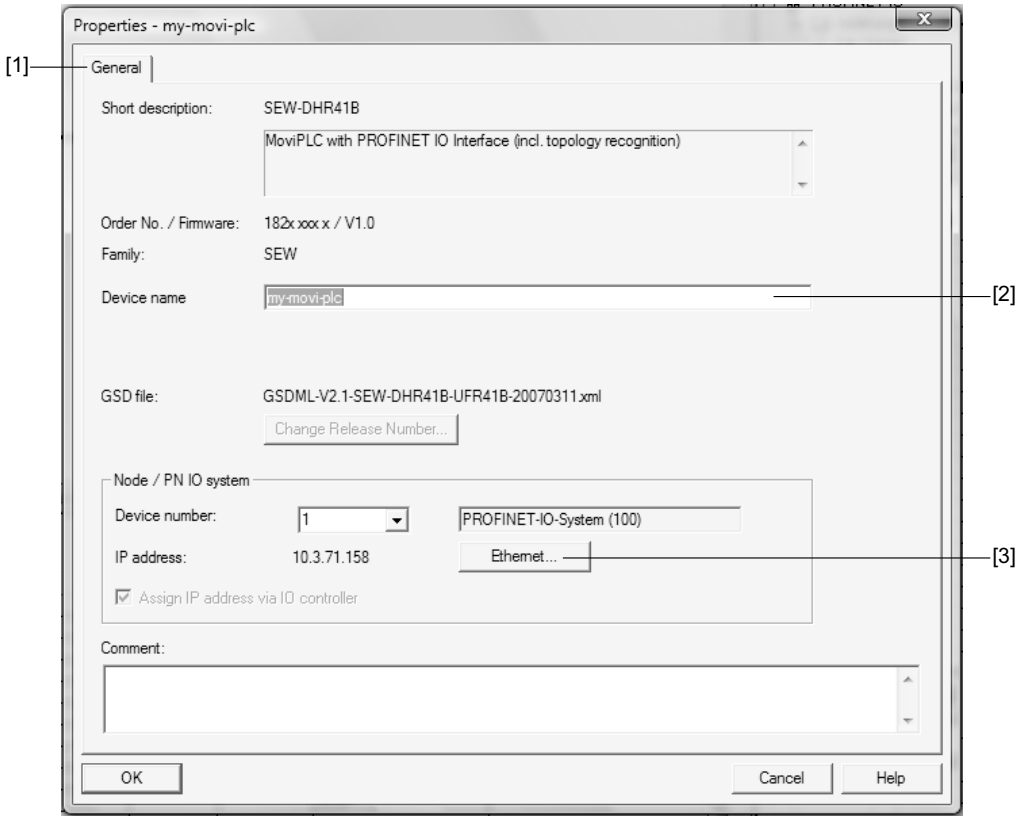
10.2.2 Configuring a station

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

Proceed as follows to configure a station:

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

   The following window opens:



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[1] "General" tab

[2] "Device name" input field

[3] [ETHERNET] button

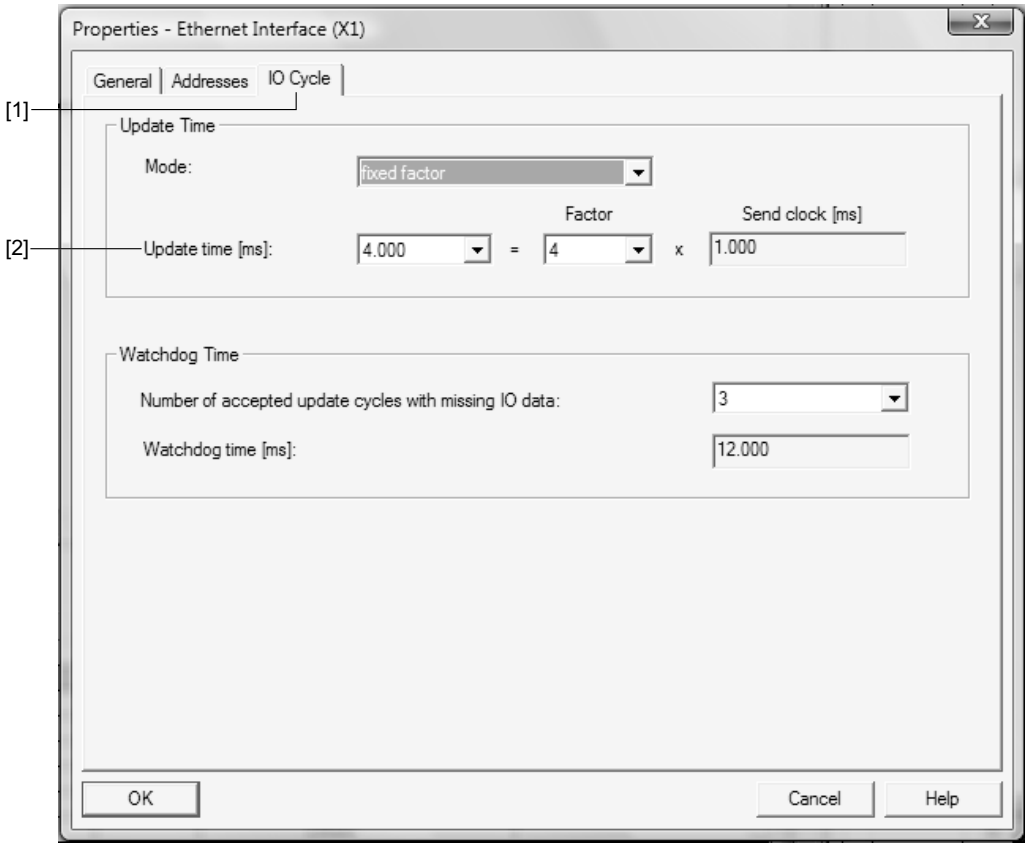
2. Enter the device name assigned before in the 'Device name' input field [2] on the 'General' tab [1].

   Note that the name is case-sensitive.

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

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

   The following window opens:



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[1] "IO Cycle" tab page

[2] "Update time" selection field

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

   As a gateway, MOVI-PLC® *advanced* DHR41B supports a minimum update time of 4 ms.

10.3 PROFINET configuration with topology detection

10.3.1 Introduction

The PROFINET technology detection allows for projecting and monitoring the structure of the network with the PROFINET IO controller in addition to the PROFINET IO devices.

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

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

In order to be able to determine the real plant topology, the PROFINET IO devices must support the so-called LLDP protocol. The PROFINET IO devices exchange information with the neighboring PROFINET IO devices via LLDP. Via LLDP, each PROFINET IO device cyclically sends information about its own PROFINET device name and port number. The neighboring unit receives and stores this information. Now a PROFINET IO controller can read the stored information from the PROFINET IO devices to determine the real plant topology.

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

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

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

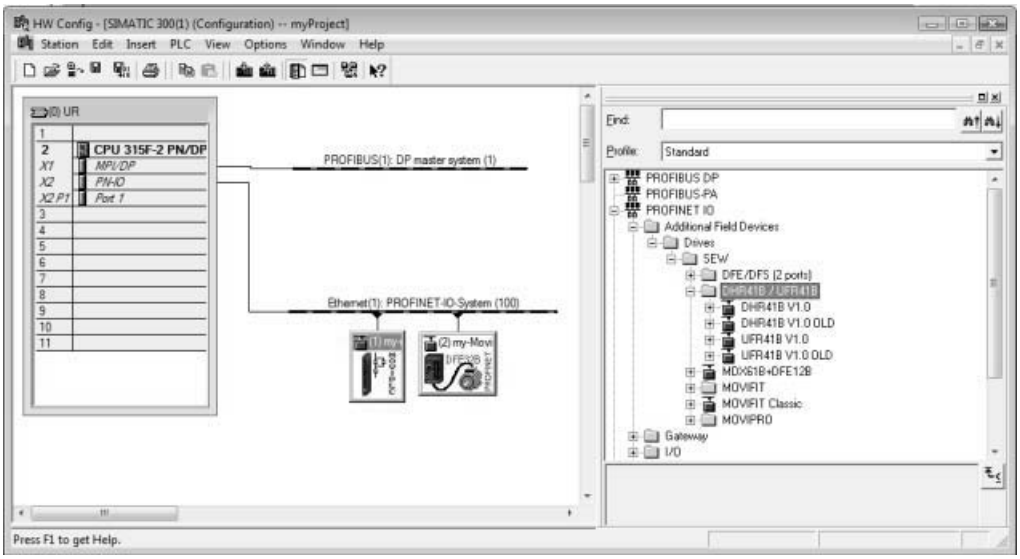
10.3.2 Configuring the PROFINET topology

The configuration procedure for a PROFINET topology will be described using the example of SIMATIC STEP 7. There are various approaches for configuration in SIMATIC STEP 7. This example will focus on one approach.

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

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

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



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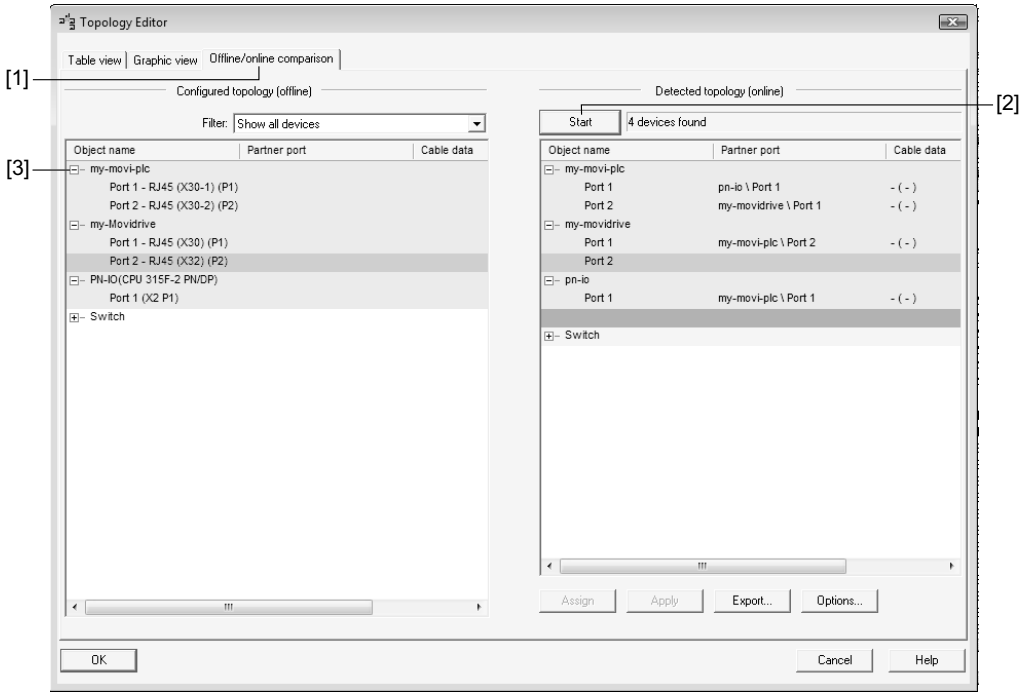
2. Right-click on the 'PROFINET IO system' and select 'PROFINET IO topology' from the context menu.

   The 'Topology editor' window is displayed.

3. Select the 'Offline/online comparison' tab [1].



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[1] 'Offline/online comparison' tab

[2] [Start] button

[3] Plus/minus symbol

4. Determine the online topology by clicking [Start] [2].
5. Make sure that the determined topology complies with your requirements by clicking on the plus symbol [3] in the online topology and checking the partner port.

   The following units are displayed in this example:

   - 2 SEW units (MOVIDRIVE®, MOVI-PLC® *advanced* DHR41B)
   - One controller
   - One switch

   The switch does not support topology and is highlighted white. The remaining PROFINET IO devices are not linked yet and are thus highlighted yellow.
6. In order to apply the determined online topology to the configuration port by port, right-click on a port. In the context menu, select 'Apply port interconnection'. Repeat this procedure for all ports of the devices until the lists are green.

10.3.3 Changing the port properties

The two ETHERNET ports of the PROFINET interface are set to 'Automatic setup' by default. Observe the following for this default setup:

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

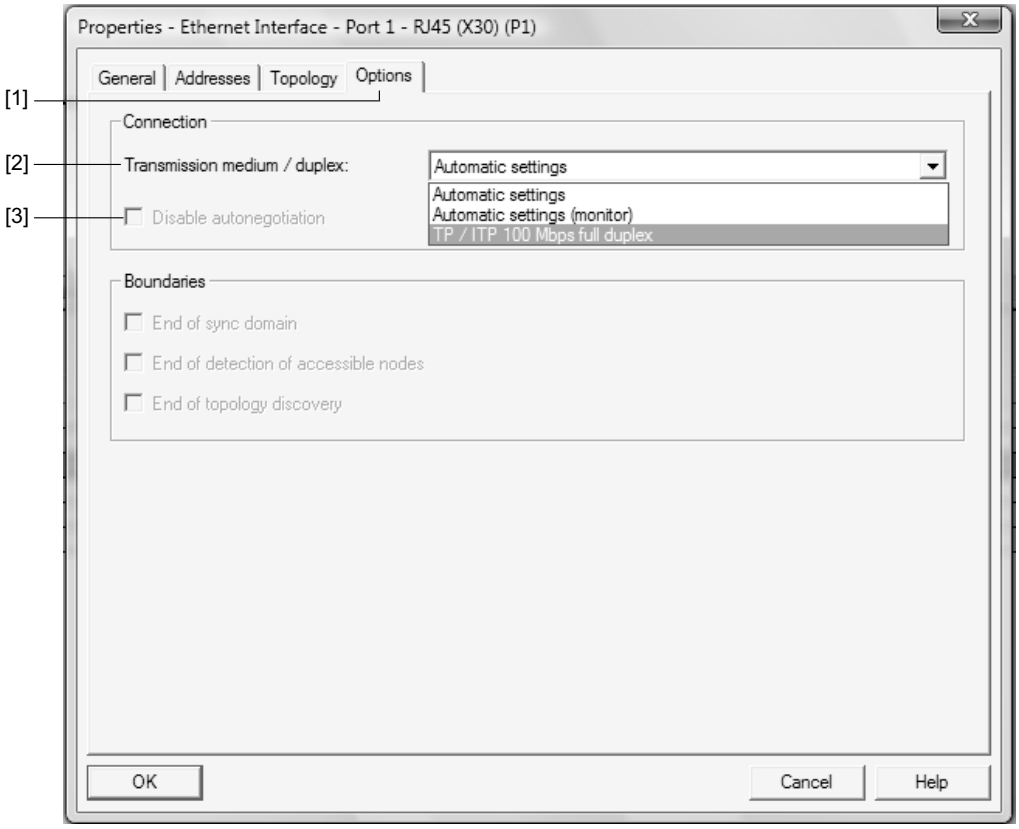
You may set a port to '100 Mbit/s full duplex'. Observe the following for this setting:

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

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

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

4. Select the 'Options' tab [1].



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[1] 'Options' tab

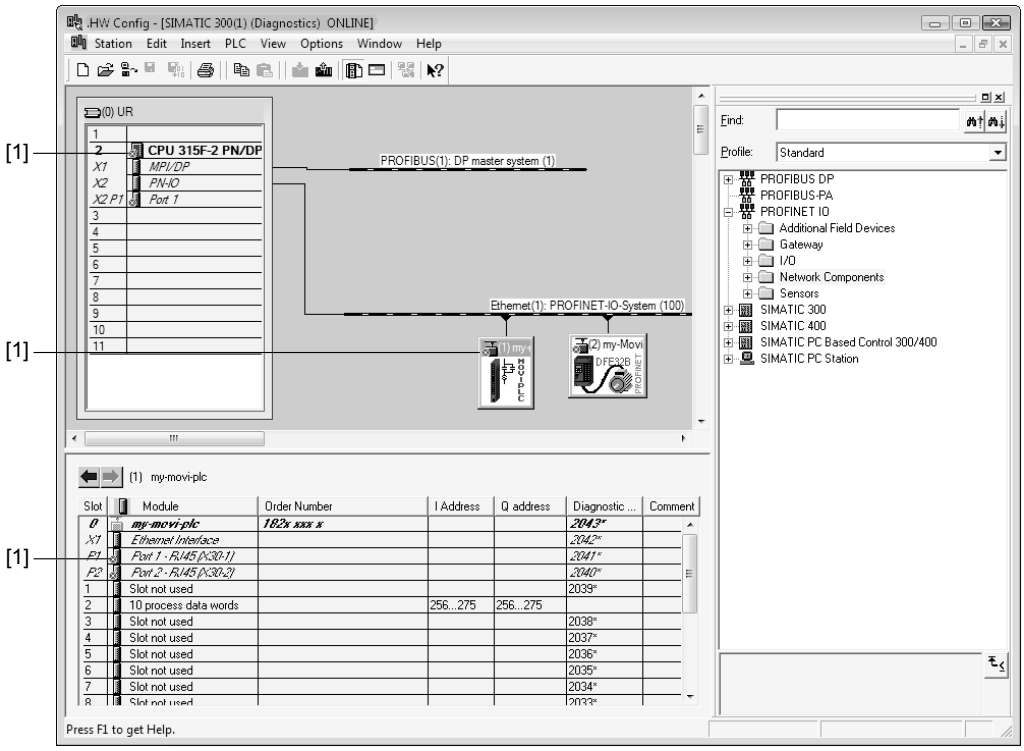
[2] 'Transmission medium/duplex' selection list

[3] 'Auto-negotiation/auto-crossover' checkbox

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

10.3.4 Topology diagnostics

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



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[1] 'Red cross' symbol for error

Possible causes:

- ETHERNET ports mixed up
- Wrong port property settings
- Units cannot be addressed

Proceed as follows to display information on an error:

1. Select the unit or the respective slot.
2. Right-click and select 'Module status' from the context menu.
   A window is displayed.
3. Select the 'Communication diagnostics' tab.

10.3.5 Port statistics

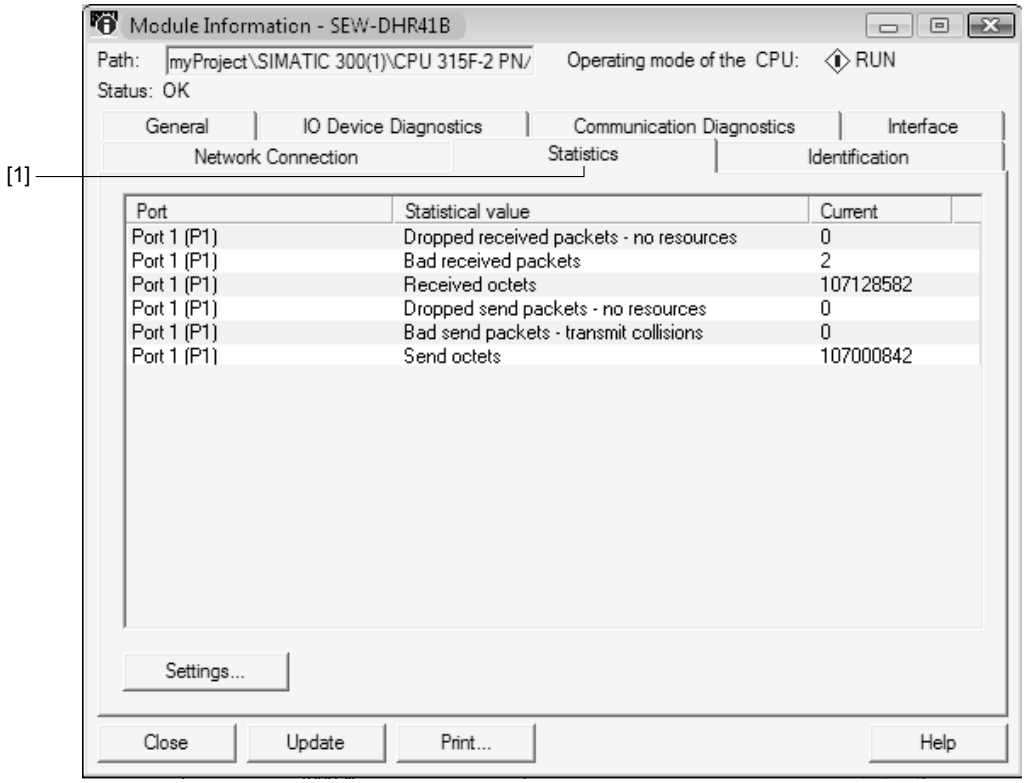
Proceed as follows to display the port statistics for an ETHERNET port in STEP 7 HW Config:

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

   A window is displayed.

   Select the 'Statistics' tab [1].

   The following view is displayed:



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[1] 'Statistics' tab

The following statistic values can be displayed:

- **Dropped received packets no resources** indicates the number of valid ETHERNET packets dropped on receipt. A large number of dropped valid packets suggests a high load on the bus system. In this case, try to reduce the utilization by especially reducing the number of broadcast and multicast telegrams and reducing the IO cycle or the number of PROFINET units in a line if required.

- **Bad received packets** indicates the number of faulty ETHERNET packets. A high number suggests a bus fault. In this case, check the cabling and shielding of the network.
- **Received octets** indicates the number of received packets.
- **Dropped sent packets – no resources** indicates the number of valid ETHERNET packets dropped on dispatch. A large number of dropped valid packets suggests a high load on the bus system. In this case, try to reduce the utilization by especially reducing the number of broadcast and multicast telegrams and reducing the IO cycle or the number of PROFINET units in a line if required.
- **Bad sent packets – transmission collisions** indicates the number of ETHERNET packets dropped due to collisions. There should be no collisions in a switched network.
- **Sent Octets** indicates the number of sent packets.

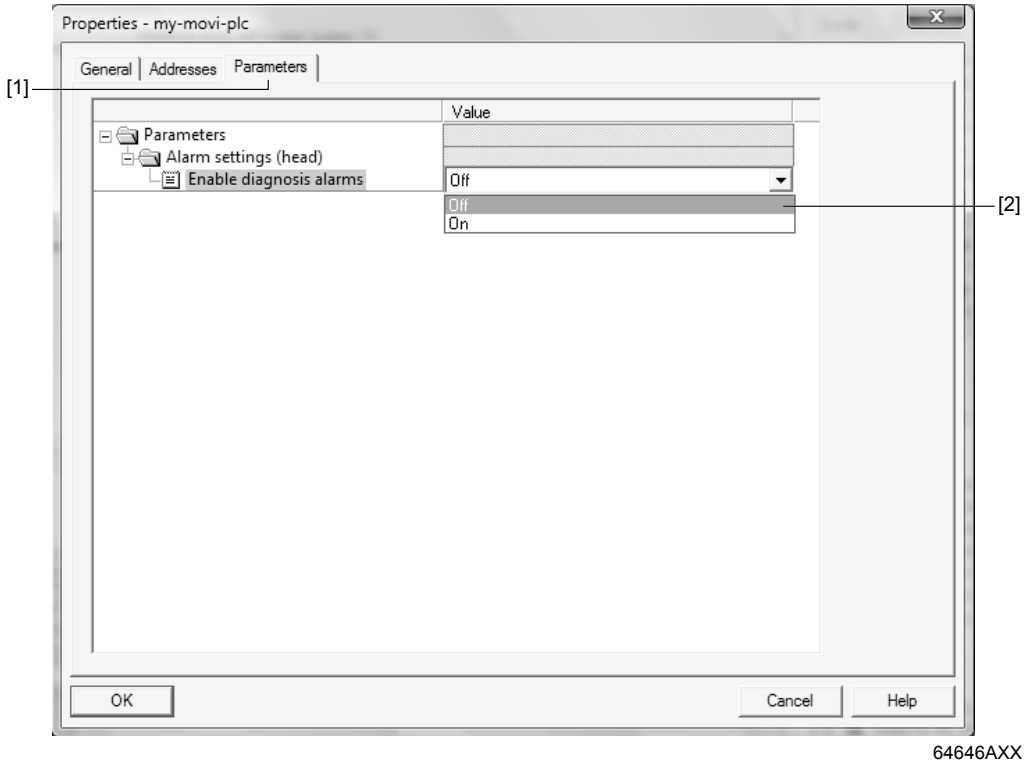
10.4 PROFINET diagnostics alarms

10.4.1 Switching on the diagnostic alarms

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

1. Highlight slot 0.
2. Right-click on it and select 'Object properties ...' from the context menu.

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



[1] "Parameters" tab

[2] 'Activate diagnostics alarms' node

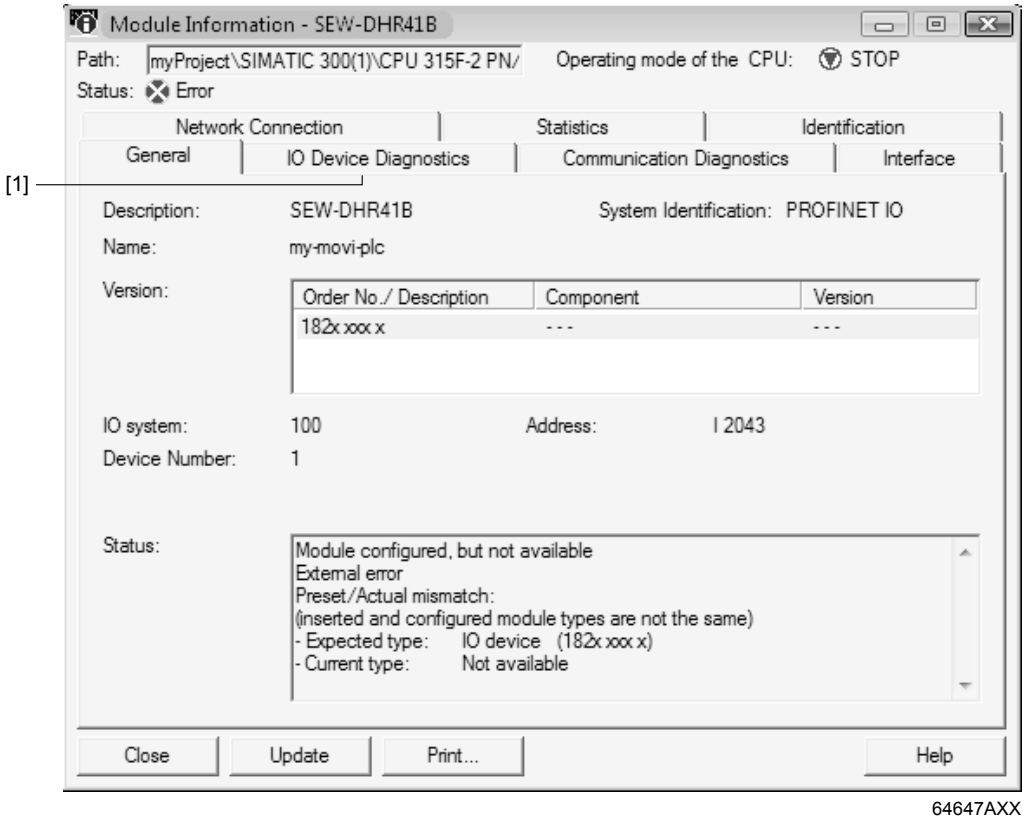
10.4.2 Determining the cause of a fault

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

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

1. Click the 'ONLINE <-> OFFLINE' symbol to switch to the 'Online' communication mode.
2. Mark the symbol of the SEW PROFINET interface.
3. Right-click on it and select 'Component status' from the context menu.

   A window is displayed.



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[1] 'IO device diagnostics' tab

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

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

11 Operating Behavior (PROFINET IO)

This section describes the basic behavior of the MOVI-PLC® *advanced* DHR41B controller when operated on the PROFIBUS system.

11.1 Process data exchange with MOVI-PLC® advanced DHR41B

MOVI-PLC® *advanced* DHR41B is controlled via the process data channel which is up to 2 × 32 I/O words in length. These process data words are mapped in the I/O or peripheral area of the MOVI-PLC® *advanced* DHR41B controller, for example, when a higher-level PLC is used as the DP master. As a result, the process data words can be addressed in the usual manner.

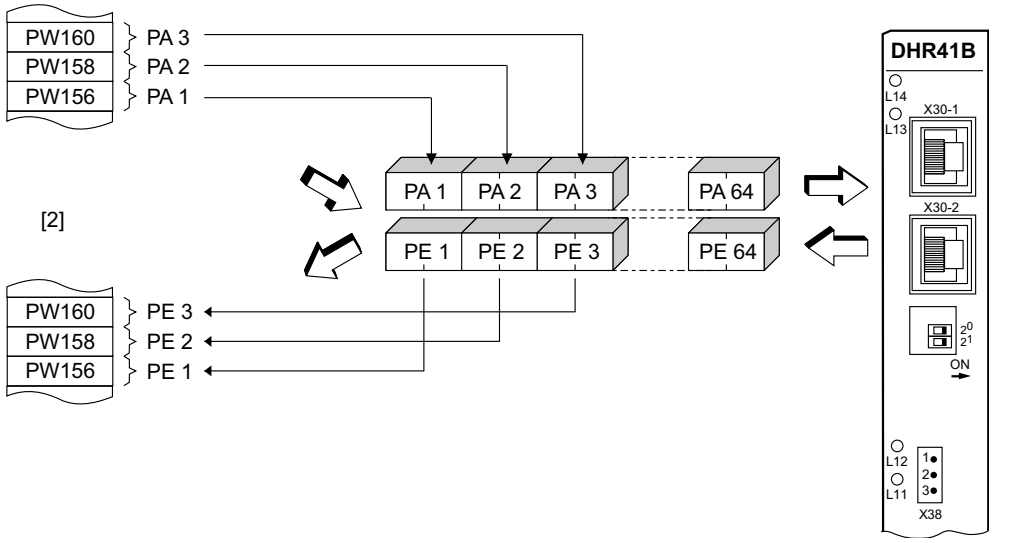


Figure 2: Mapping PROFINET data in the PLC address range

[1] Address range of the higher-level PLC

PI1 - PI64	Process input data
PO1 - PO64	Process output data

Control example for Simatic S7

Process data exchange with MOVI-PLC® *advanced* DHR41B is controlled using SIMATIC S7 in accordance with the selected process data configuration either directly using load and transfer commands or by means of special system functions, *SFC 14 DPRD_DAT* and *SFC15 DPWR_DAT*.

STEP7 sample program

In this example, the MOVI-PLC® *advanced* DHR41B controller is configured with the process data configuration *10 PD* on input addresses PEW512... and output addresses PAW512....

A data block DB3 is created with about 50 data words.

When SFC14 is called, the process input data is copied to data block DB3, data words 0 to 18. When SFC15 is called after the control program has been processed, the process output data are copied from data words 20 38 to the output address POW 512 ...

Note the length information in bytes for the *RECORD* parameter. The length information must correspond to the configured length.

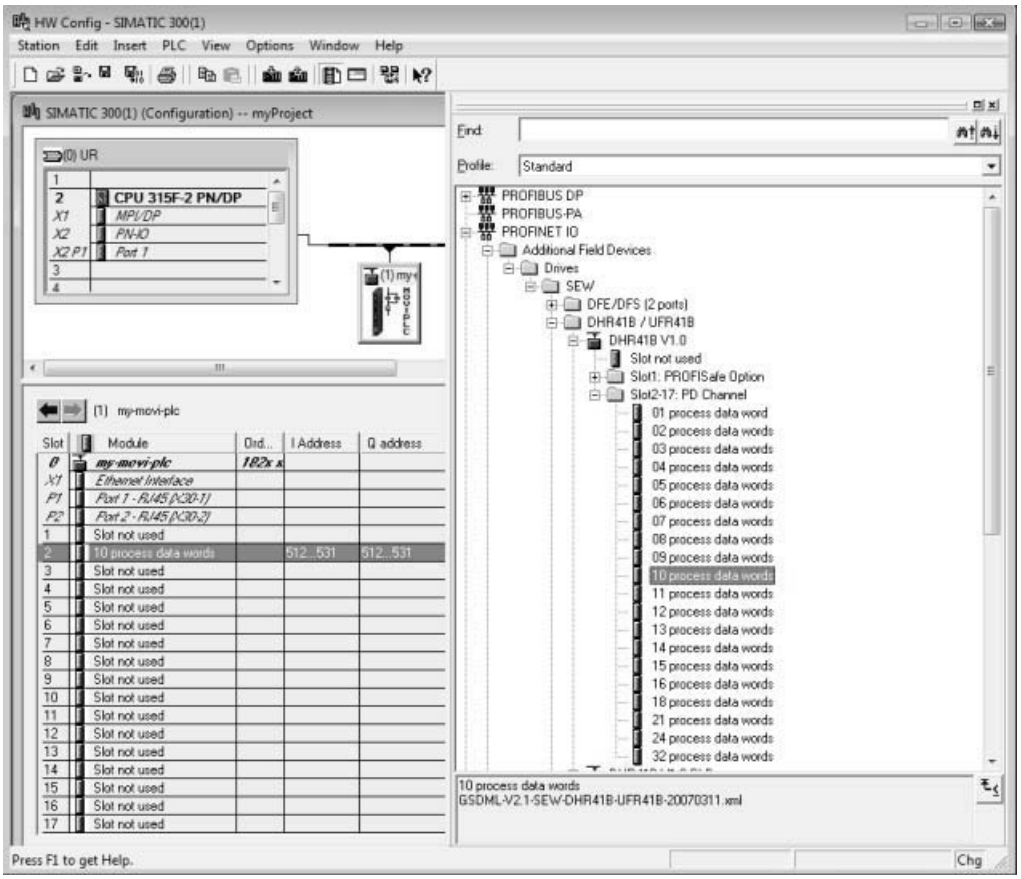
Refer to the online help for STEP7 for further information about the system functions.

```
//Start of cyclical program processing in OB1
BEGIN
NETWORK
TITLE = Copy PI data from the DHR41B control card to DB3, words 0...18
CALL SFC  14 (DPRD_DAT)    //Read DP slave record
  LADDR  := W#16#240 //Input address 512
  RET_VAL:= MW 30          //Result in flag word 30
  RECORD := P#DB3.DBX 0.0 BYTE 20 //Pointer

NETWORK
TITLE =PLC program with drive application
// PLC program uses the process data in DB3 for data exchange
// with the DHR41B control card

L  DB3.DBW 0   //Load PE1
L  DB3.DBW 2   //Load PE2
L  DB3.DBW 4   //Load PE3
// etc.

L  W#16#0006
T DB3.DBW 20   //Write 6hex to PO1
L 1500
T DB3.DBW 22   //Write 1500dec to PO2
L  W#16#0000
T DB3.DBW 24   //Write 0hex to PO3
// etc.

NETWORK
TITLE = Copy PO data from DB3, words 20...38 to the DHR41B control card
CALL SFC  15 (DPWR_DAT)             //Write DP slave record
  LADDR  := W#16#200                //Output address 512 = 200hex
  RECORD := P#DB3.DBX 20.0 BYTE 20  //Pointer to DB/DW
  RET_VAL:= MW 32                   //Result in flag word 32
```

TIP

- This program example is a special and free service that demonstrates only the basic principles of generating a PLC program as a non-binding sample. SEW is not liable for the contents of the sample program.
- You can download S7 sample projects from the SEW homepage (http://www.sew-eurodrive.de) under 'Software'.

The following figure shows the corresponding configuration for the MOVI-PLC® *advanced* DHR41B control card in the hardware configuration of STEP7.



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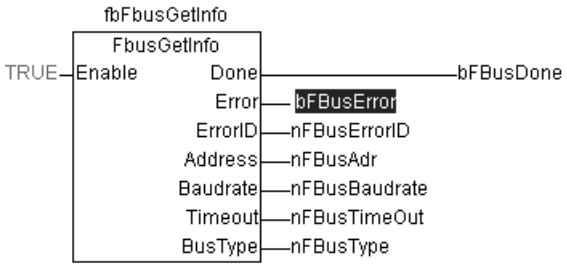
11.2 Settings in MOVI-PLC® advanced DHR41B

The creation of IEC programs is described in detail in the "MOVI-PLC®" manual. This section only describes the fieldbus-specific characteristics.

11.2.1 Status of the PROFINET fieldbus interface



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The function module *FbusGetInfo* makes the status and some display parameters of the fieldbus interface available for the IEC program and diagnostics.

If there is no communication with the fieldbus master, the output *Error* is set to *TRUE*. During an active fieldbus connection, the output *Done* is set to *TRUE*, and the outputs *Address*, *Baud rate*, *Timeout* and *Bus type* show the respective parameters as they were set via the DIP switches of the DHR41B option or via the PLC.

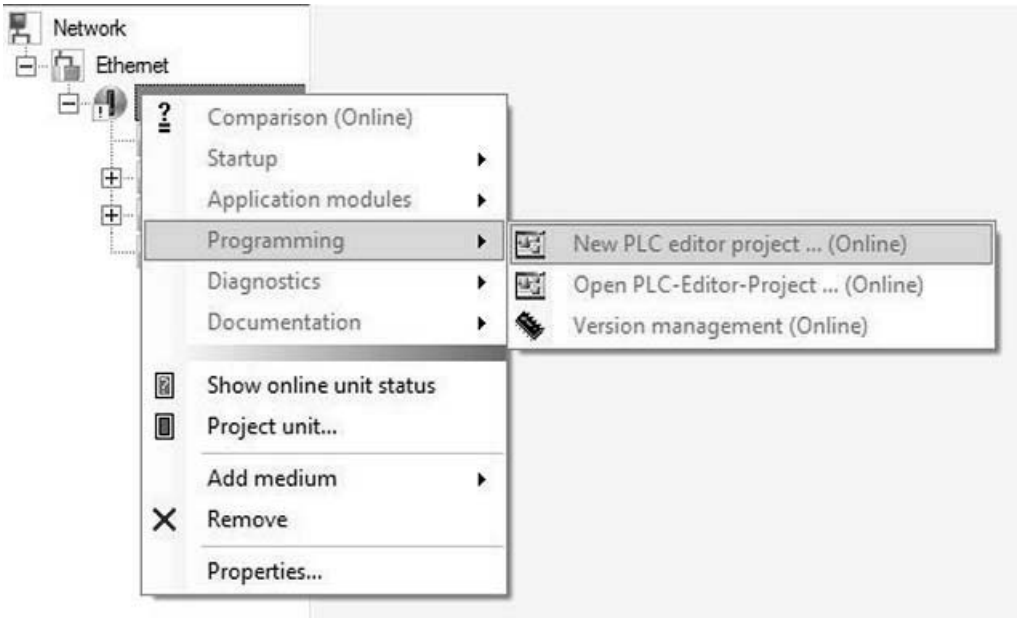
Checking the process data communication

Now the actual values can be read off MOVI-PLC® *advanced* DHR41B and setpoints can be written.

The process data should now correspond to the values displayed in the PLC Editor or in the diagnostics plug-in of the active IEC program in MOVITOOLS® MotionStudio.

If there is no IEC program in MOVI-PLC®, you can create one as follows:

- Open the context menu of the PLC in MOVITOOLS® MotionStudio and run the project wizard "New PLC Editor project" (see following figure).



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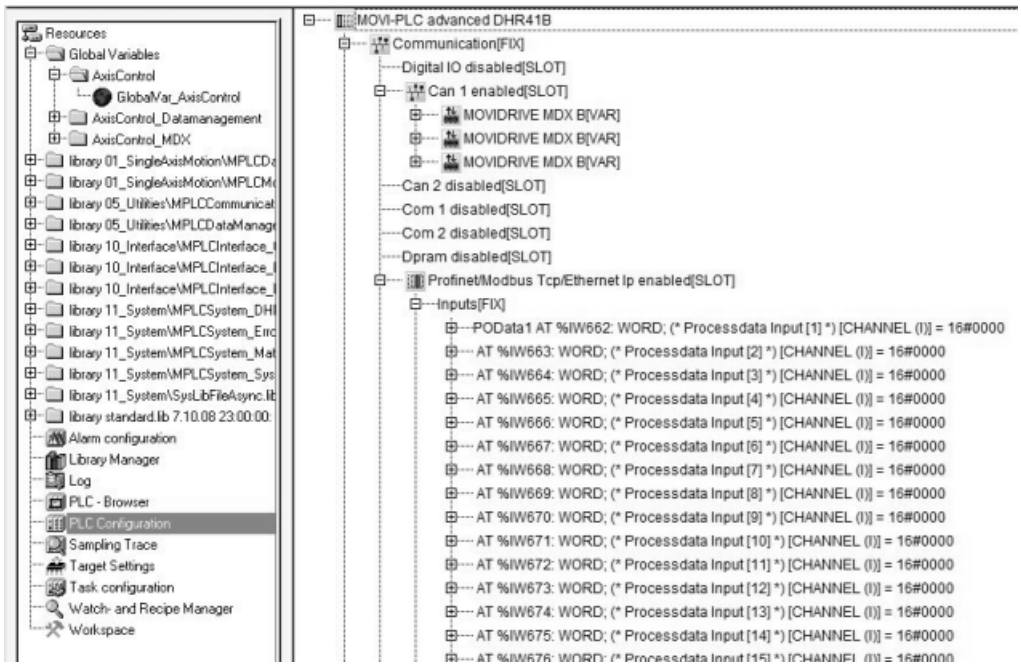
- Use the wizard to create a new AxisControl project and upload it to MOVI-PLC® *advanced* DHR41B via the menu item "Online login"

- Start the loaded program via the menu item "Online start". You can now monitor the uploaded process data under Resources Control configuration (PLC configuration). (See following figure).



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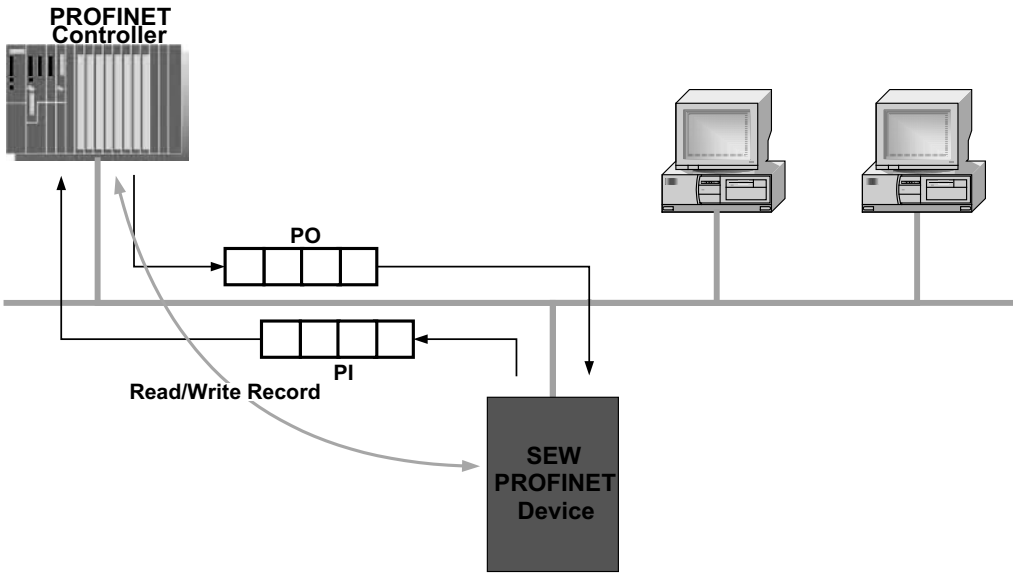
11.3 Parameterization via PROFIdrive data record 47

	TIP
	The S7 sample project "MOVILINK® parameter channel" can be used for this parameter channel. You can download it from the SEW homepage (http://www.sew-eurodrive.de) under 'Software'.

11.3.1 Introduction to PROFINET data records

With "Read Record" and "Write Record", PROFINET offers acyclic services that can be used to transfer parameter data between PROFINET controller (master) and a PROFINET device (slave). Via UDP (User Datagram Protocol), the priority of this data exchange is lower than the priority of the process data exchange.



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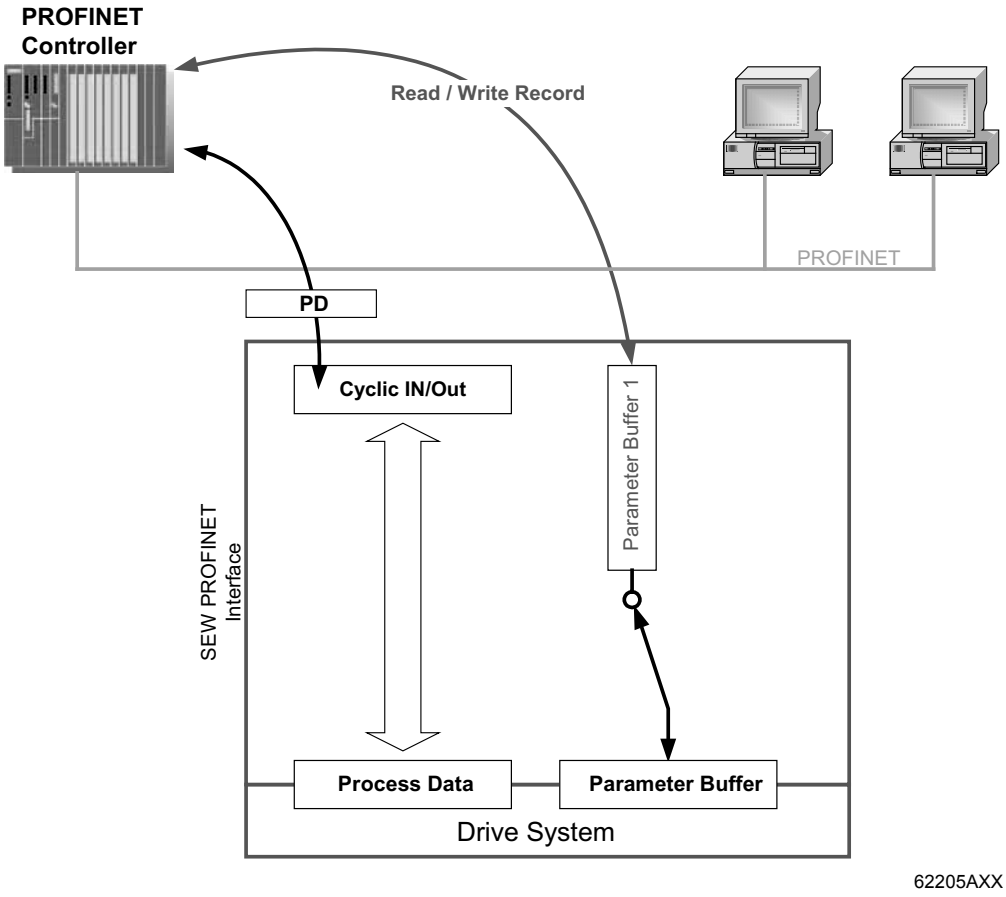
The user data transported via an acyclic PROFINET service is grouped in a dataset. Each dataset is clearly addressed by the following characteristics:

- API
- Slot number
- Subslot number
- Index

The structure of dataset 47 is used for the parameter exchange with SEW-EURODRIVE PROFINET units. The structure of data record 47 is specified in the PROFIdrive profile drive technology of the PROFIBUS user organization as of V4.0 as PROFINET parameter channel. Different procedures for accessing parameter data of the SEW-EURODRIVE PROFINET unit are provided via this parameter channel.

Characteristics of the SEW-EURODRIVE PROFINET devices

The SEW-EURODRIVE PROFINET units that support acyclic Read Record and Write Record services all have the same communication characteristics. The units are basically controlled via a PROFINET controller with cyclic process data. Additionally, this controller (usually a PLC) can set the parameters for the SEW-EURODRIVE PROFINET unit via Read Record and Write Record.



11.3.2 Structure of the PROFINET parameter channel

Generally, the parameter setting of the devices to the PROFIdrive-Base Mode Parameter Access of profile version 4.0 is implemented via data record 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 record 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 station such as
  - READ parameter
  - WRITE parameter
  - WRITE parameter volatile
  - etc.

Field	Data type	Values	
	Unsigned8	0x00 0x01 - 0xFF	Reserved
Request ID	Unsigned8	**0x40** 0x41	**SEW MOVILINK® service** SEW Data Transport
Response ID	Unsigned8	Response (+): 0x00 **0x40** 0x41 Response (-): **0xC0** 0x41	 Reserved **SEW MOVILINK® service (+)** SEW Data Transport **SEW MOVILINK® service (-)** SEW Data Transport
	Unsigned8	0x00 - 0xFF	Number of axes 0 - 255
No. of parameters	Unsigned8	0x01 - 0x13	1 - 19 DWORDs (240 DP-V1 data bytes)
Attribute	Unsigned8	**For SEW-MOVILINK® (Request ID = 0x40):** **0x00** **0x10** **0x20** **0x40** **0x50** **0x60** **0x80** **0x90** **0xA0 - 0xF0** SEW Data Transport: 0x10	 **No service** **READ Parameter** **WRITE Parameter** **Read Minimum** **Read Maximum** **Read Default** **Read Attribute** **Read EEPROM** **reserviert** Wert
No. of Elements	Unsigned8	0x00 0x01 - 0x75	For parameters that are not indexed Quantity 1 - 117
Parameter Number	Unsigned16	0x0000 - 0xFFFF	MOVILINK® parameter index
Subindex	Unsigned16	0x0000	
Format	Unsigned8	0x43 0x44	Double word Error
No. of Values	Unsigned8	0x00 - 0xEA	Quantity 0 - 234
Error Value	Unsigned16	0x0080 + MOVILINK® Additional Code Low **For SEW MOVILINK® 16 bit error value**	

11.3.3 Parameter setting procedure via data record 47

Parameter access takes place with the combination of the *WRITE RECORD* and *READ RECORD* PROFINET services. The parameter setting order is transferred to the IO device using the *WRITE.req*, Then it is processed internally.

The controller now sends a *READ.req* to pick up the parameter setting response. The device sends 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 a PROFINET controller.

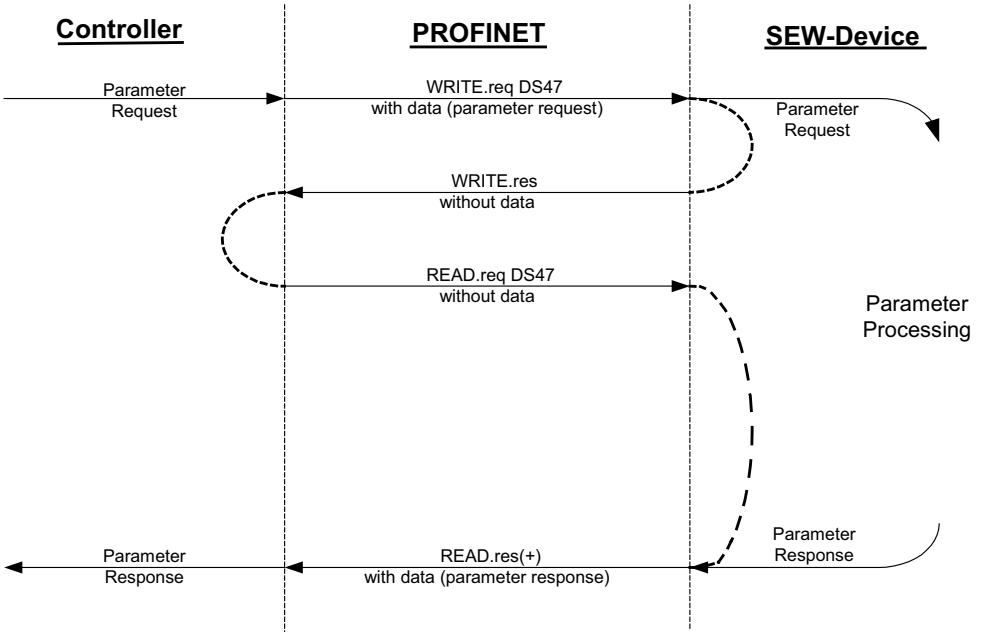
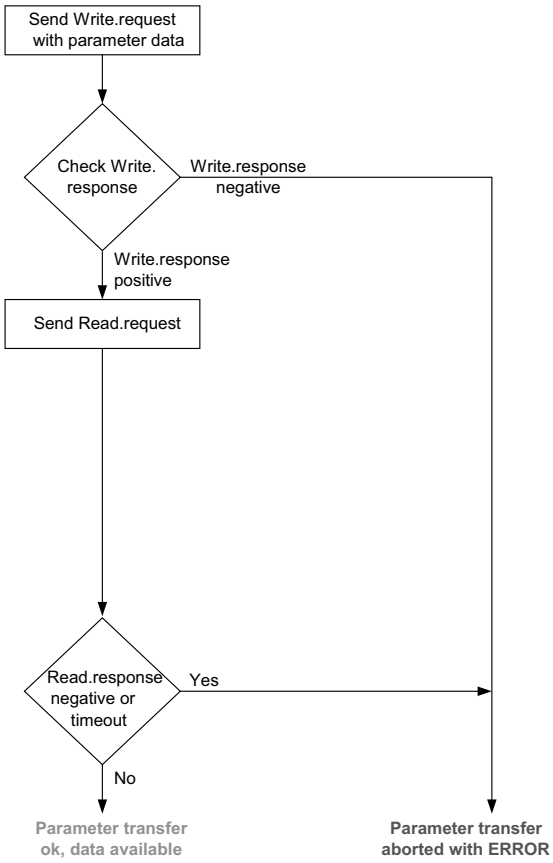


Figure 3: Telegram sequence for parameter access via Read/Write Record

11.3.4 Controller processing sequence

If the bus cycles are very short, the request for the parameter response arrives before the SEW device has concluded the parameter access in the device. This means that the response data from the SEW device is not yet available. In this state, the device delays the response to the *Read Record Request*.



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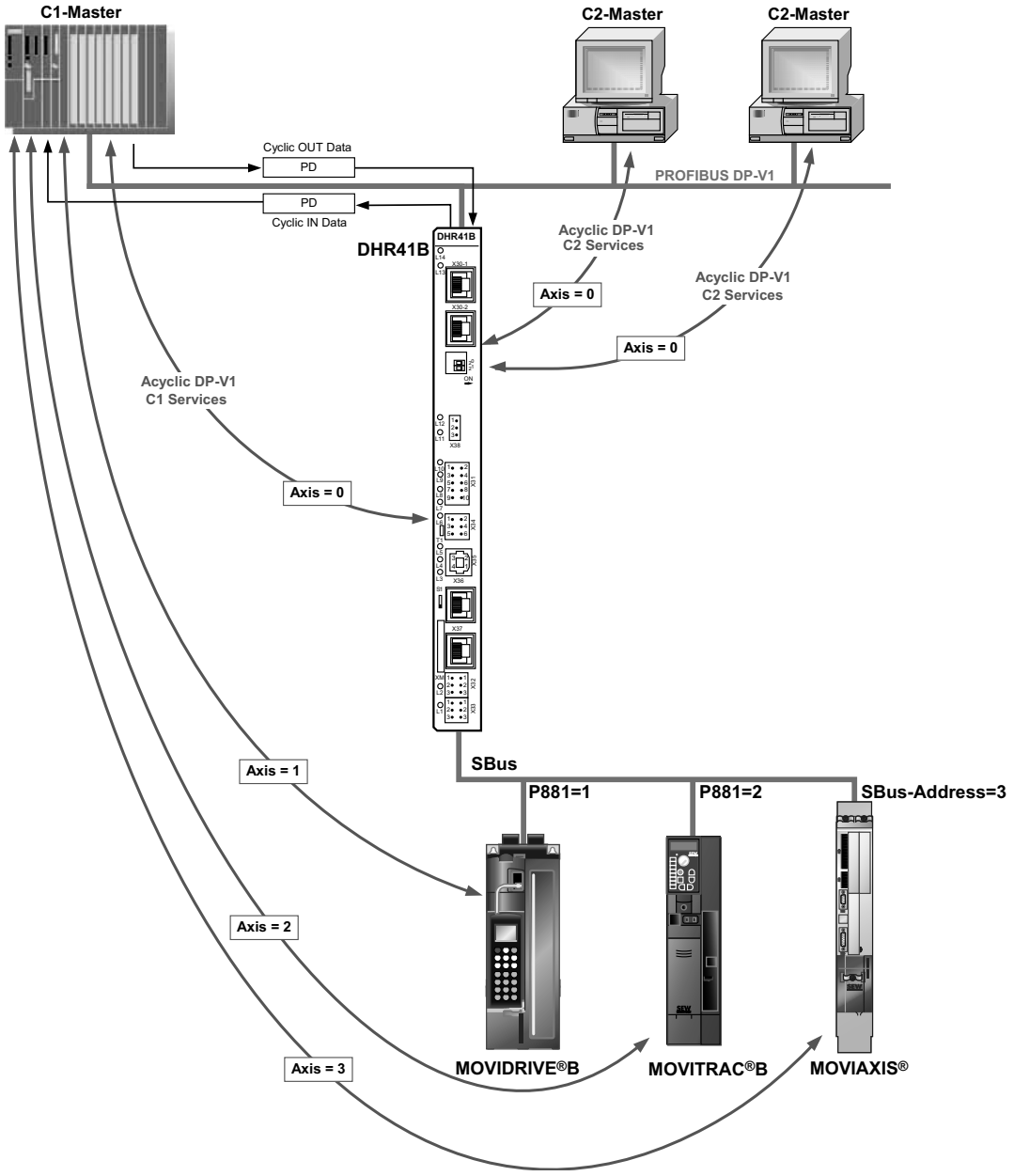
11.3.5 Addressing downstream inverters

The structure of the DS47 dataset defines an *axis* element. This element is used to reach multi-axis drives that are operated via one PROFINET interface. The *axis* element addresses one of the units connected via the PROFINET interface.

Parameter access to downstream stations

Setting *Axis = 0* enables access to the parameters of the MOVI-PLC® *advanced* DHR41B controller. The PLC Editor offers a routing table. This routing table assigns 'Axis settings' to the downstream inverters.

Example: An inverter connected to CAN 1 of MOVI-PLC® *advanced* DHR41B with SBus address 1 is addressed with *Axis =1*.



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See the 'Appendix' for a schematic representation of parameter access to lower-level units.

11.3.6 MOVILINK® parameter requests

The MOVILINK® parameter channel of the SEW inverter is directly mapped in the structure of data record 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 record 47.

Request ID: 0x40 SEW MOVILINK® **service**

The actual service is defined by the data record element *Attribute* in the MOVILINK® parameter channel. The high nibble of the element corresponds to the MOVILINK® service code.

Example for reading a parameter via MOVILINK®

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

Sending a parameter request

The table shows the coding of the user data for the *WRITE.request* PROFINET service. The *WRITE.request* service is used to transfer the parameter setting request to the inverter. The firmware version is read.

The following table shows the WRITE request header for transferring the parameter request.

Service	WRITE. request	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	10	10 byte user data for parameter request

The following table shows the WRITE.request user data for MOVILINK® "Read parameters".

Byte	Field	Value	Description
0		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 = DHR41B 1 = Access to slave unit with SBus address 1
3	No. of parameters	0x01	0 = MOVI-PLC ® or DHR41B
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 following table shows the coding of the READ.request user data including the PROFINET header.

Service	READ. request	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	240	Maximum length of response buffer in the master

Positive MOVILINK® parameter setting response

The table shows the READ.response user data with the positive response data of the parameter setting request. The parameter value for index 8300 (firmware version of DHR41B) is returned as an example.

Service	READ. request	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	10	Maximum length of response buffer in the master

Byte	Field	Value	Description
0		0x01	Reflected reference number from the parameter setting request
1	Response ID	0x40	Positive MOVILINK® response
2	Axis	0x00	0 = DHR41B
3	No. of parameters	0x01	1 parameter
4	Format	0x43	Parameter format: Double word
5	No. of values	0x01	1 value
6, 7	Value High	0x311C	Higher-order part of the parameter
8, 9	Value Low	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 an example of the structure of the *WRITE* and *READ* services for volatile writing of the value 12345 to the IPOS$^{plus®}$ variable H0 of a MOVIDRIVE® B with SBus address 1, which is connected to the CAN 1 system bus (X33) of DHR41B (parameter index 11000). The MOVILINK® service *WRITE parameter volatile* is used for this purpose.

Send 'WRITE parameter volatile' request

Service	WRITE. request	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	16	16-byte user data for order buffer

The following table shows the WRITE.request user data for MOVILINK® "Write parameters volatile.

Byte	Field	Value	Description
0		0x01	Individual reference number for the parameter setting order is reflected in the parameter response
1	Request ID	0x40	SEW MOVILINK® service
2	Axis	0x01	1 = MOVIDRIVE® B with SBus address 1
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 High word	0x0000	Higher-order part of the parameter value
14, 15	Value Low word	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 listed in *Error_code_1*.

Query parameter response

The following table shows the coding of the READ.req user data including the PROFINET- header.

Service	READ. request	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	240	Maximum length of response buffer in the master

Positive response to 'WRITE Parameter volatile'

Service	READ. response	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	4	4 byte user data in response buffer

Byte	Field	Value	Description
0		0x01	Reflected reference number from the parameter setting request
1	Response ID	0x40	Positive MOVILINK® response
2	Axis	0x01	Reflected axis number 1 = MOVIDRIVE® B with SBus address 1
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 the response ID if the response is negative.

Service	WRITE. response	Description
API	0	Fixed setting = 0
Slot_Number	0	Random (is not evaluated)
Subslot_Number	1	Fixed setting = 1
Index	47	Index of the dataset for the parameter request; constant index 47
Length	8	8 byte user data in response buffer

Byte	Field	Value	Description
0		0x01	Mirrored reference number from the parameter setting request
1	Response ID	0xC0	Negative MOVILINK® response
2	Axis	0x01	1 = MOVIDRIVE® B with SBus address 1
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® parameterization return codes for PROFINET" on page 113)

MOVILINK® configuration return codes for PROFINET

The following table shows the return codes that are returned by the SEW PROFINET interface module in case of an error in the PROFINET 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)
0x0608	Incorrect coding of the format field

11.3.7 PROFIdrive parameter requests

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

	TIP
	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.

Reading a parameter via PROFIdrive – example

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 table shows the coding of the user data for the WRITE.req service specifying the PROFINET 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 record; constant index 47
Length	10	10 byte user data for parameter request

Byte	Field	Value	Description
0		0x01	Individual reference number for the parameter setting order that is reflected in the parameter response
1	Request ID	0x01	Request parameter (PROFIdrive)
2	Axis	0x00	Axis number 0 = DHR41B
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 following table shows the coding of the READ.req user data including the PROFINET header.

Service:	READ.request	Description
Slot_Number	0	Random, (is not evaluated)
Index	47	Index of the data record; constant index 47
Length	240	Maximum length of response buffer in the PN controller

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 record; constant index 47
Length	10	10 byte user data in response buffer

Byte	Field	Value	Description
0		0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x01	Positive response for 'Request Parameter'
2	Axis	0x00	Reflected 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 of a MOVIDRIVE® B with SBus address 1 that is connected to DHR41B via the CAN 1 system bus (see section 'Example for writing a parameter via MOVILINK®' on page 111). The PROFIdrive *Change parameter* service is used for this purpose.

Send 'WRITE parameter' request

The following table shows the PROFINET header of the WRITE request with parameter request.

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

The following table shows the WRITE.req user data for the PROFINET service "Change Parameter".

Byte	Field	Value	Description
0		0x01	Individual reference number for the parameter setting order is reflected in the parameter response
1	Request ID	0x02	Change parameter (PROFIdrive)
2	Axis	0x01	Axis number 1 = MOVIDRIVE® B with SBus address 1
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 is no status conflict in processing the parameter channel, a positive WRITE.response occurs. Otherwise, the status fault is listed in Error_code_1.

Query parameter response

The following table shows the coding of the WRITE.req user data including the PROFINET header.

Field	Value	Description
Function_Num		READ.req
Slot_Number	X	Slot_Number not used
Index	47	Index of the data record
Length	240	Maximum length of response buffer in the PN controller

Positive response to 'WRITE parameter'

The following table shows the PROFINET header of the positive READ.response with parameterization response.

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

The following table shows the positive response for the PROFINET service "Change Parameter".

Byte	Field	Value	Description
0		0x01	Mirrored reference number from the parameter setting request
1	Response ID	0x02	Positive PROFIdrive response
2	Axis	0x01	1 = SBus address 1 of MOVIDRIVE® B
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 record; 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	0x01	1 = SBus address 1 of MOVIDRIVE® B
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® return codes for PROFINET" on page 113)

PROFIdrive return codes for PROFINET

The following table shows the coding of the error number in the PROFIdrive 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	-

12 Error Diagnostics on PROFINET

12.1 Diagnostic procedure

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

- MOVI-PLC® *advanced* DHR41B not working on PROFINET IO
- MOVI-PLC® *advanced* DHR41B cannot be controlled by the IO controller

For detailed information about programming the MOVI-PLC® *advanced* DHR41B controller, refer to the 'MOVI-PLC® *advanced* DHE41B/DHF41B/DHR41B' manual.

12.1.1 Diagnostics problem 1: MOVI-PLC® *advanced* DHR41B not working on PROFINET IO

Initial status:
- DHR41B option is physically connected to PROFINET IO
- DHR41B option has been configured in the IO controller and bus communication is active

↓

Ethernet bus connector X30:1, X30:2 plugged in? — No → **[A]**

Yes ↓

Response of the Link LED? — OFF → [C] — Response of the BUS FAULT LED? — Yellow → Red → **[B] [C]**

Green ↓ — Off ↓

DHR41B option has no connection to Ethernet.

↓

Check the configured and set PROFINET name.

↓

PROFINET names identical? — No → **[D]**

Yes ↓

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

↓

Delete configuration for the DHR41B option from the PROFINET IO network.

↓

Configure the DHR41B option again, selecting the unit designation "SEW-DHR41B". Assign the address range for your control system.

↓

Now load the configuration in the PROFINET IO controller and start the bus communication again.

[A]	Check the bus cabling.
[B]	The DHR41B option was not yet configured or configured incorrectly. Check the configuration, particularly the device name and the IP address.
[C]	The DHR41B option indicates that the PROFINET IO controller has not yet established communication.
	The PROFINET IO controller is switched off or has not yet been started up.
[D]	Adapt PROFINET names

12.1.2 Diagnostics problem 2: No process data exchange with the I/O controller

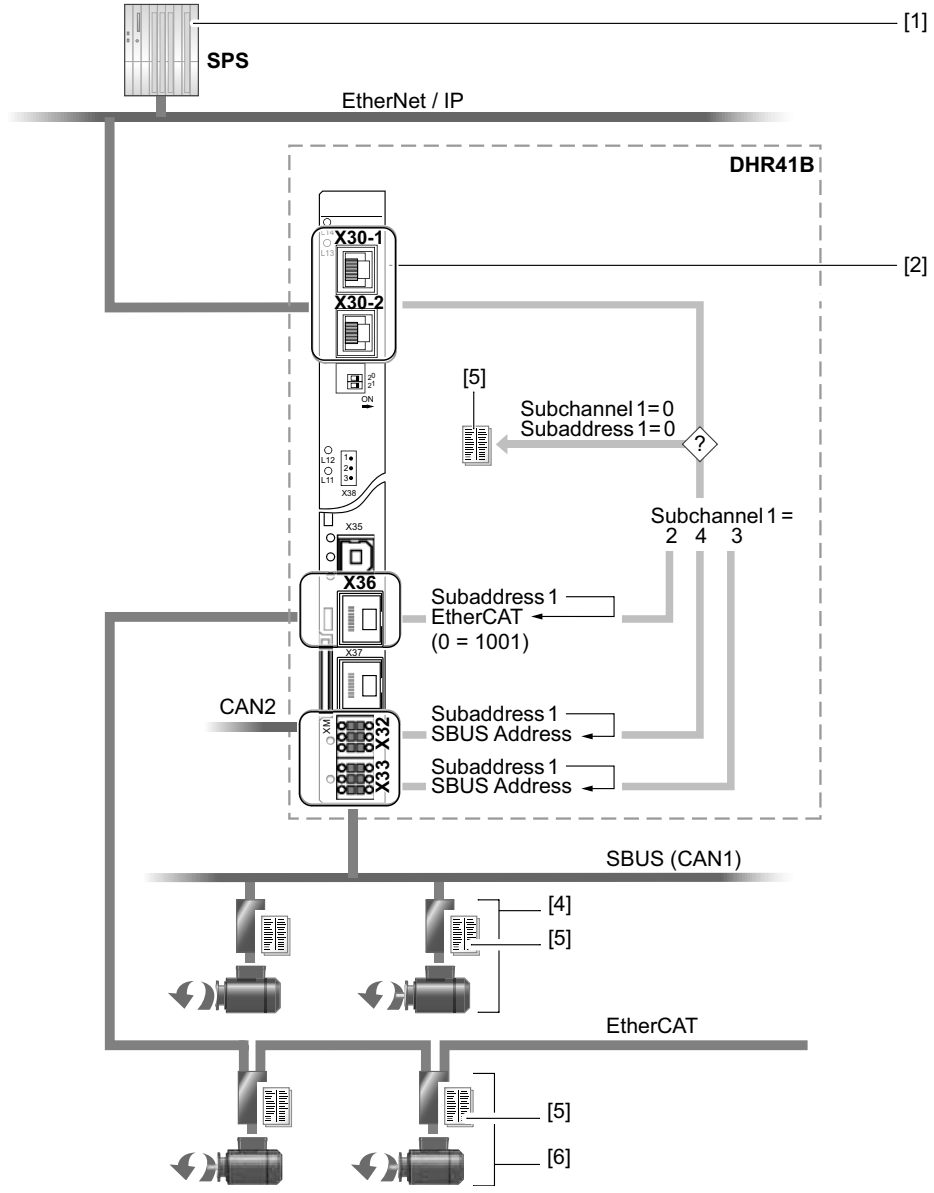
- Check the settings in the higher-level I/O controller again.

  Is the user program switched off correctly? (See sample program in chapter 'Process data exchange with the MOVI-PLC® *advanced* DHR41B" controller')

- Check the settings in MOVI-PLC® *advanced* DHR41B (see chapter "Settings in MOVI-PLC® *advanced* DHR41B")

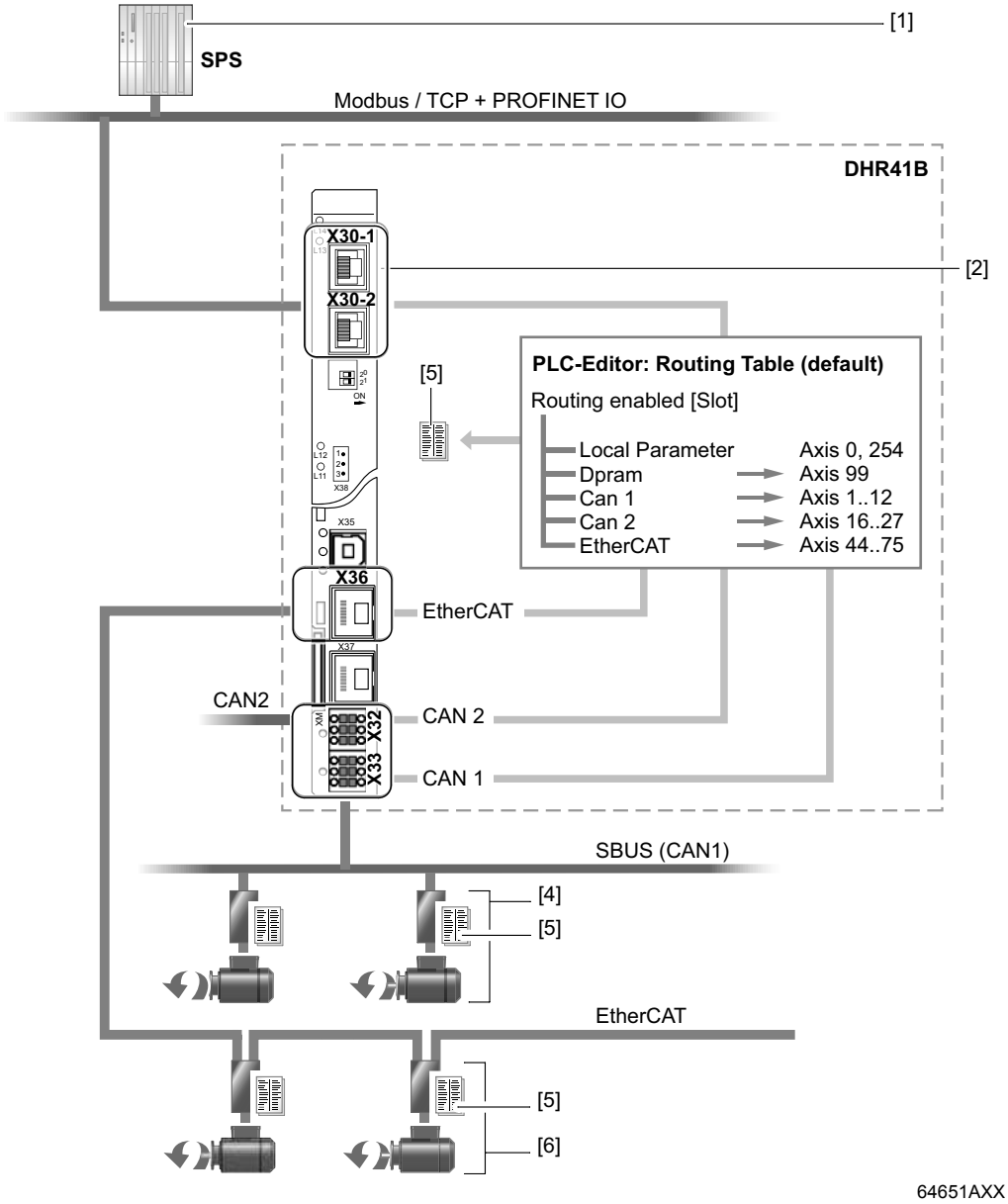
13 Appendix

13.1 Parameter access via EtherNet/IP to downstream units



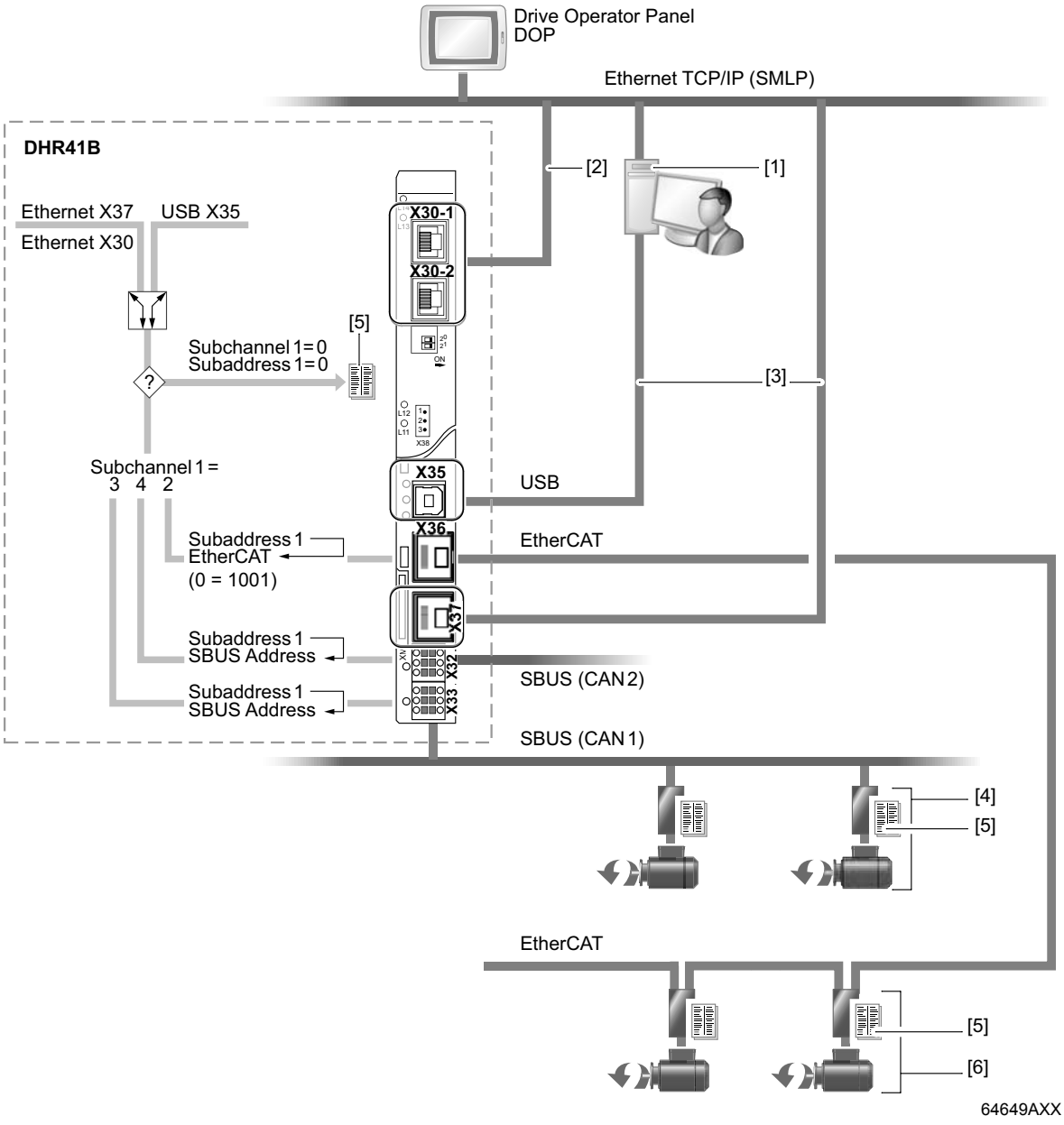
[1] PLC with EtherNet/IP scanner (master)
[2] Industrial Ethernet interface
[4] SEW inverter with SBus interface
[5] Index and parameter list of the unit
[6] SEW inverter with EtherCAT interface

13.2 Parameter access via Modbus/TCP or PROFINET to downstream units



[1] PLC with Modbus scanner
[2] Industrial Ethernet interface
[4] SEW inverter with SBus interface
[5] Index and parameter list of the unit
[6] SEW inverter with EtherCAT interface

13.3 Parameter access via engineering interface to downstream units



[1] Engineering PC
[2] Industrial Ethernet interface (for engineering)
[3] USB/Ethernet engineering interface
[4] SEW inverter with SBus interface
[5] Index and parameter list of the unit
[6] SEW inverter with EtherCAT interface

13.4 Glossary

Term	Meaning
DHCP	**D**ynamic **H**ost **C**onfiguration P**rotocol.** Allows you to allocate an IP address and additional configuration parameters for automation components in a network via a server.
TCP	**T**ransmission **C**ontrol **P**rotocol. Acknowledged connection-oriented transport protocol.
UDP	**U**ser **D**atagram **P**rotocol. Non-acknowledged, connectionless transport protocol.
IP	**I**nternet **P**rotocol. Protocol for data transport in the Internet.
IP address	An IP address consists of 32 bits divided into four so called octets containing 8 bits each for the sake of clarity. These values are displayed as four decimal numbers separated by points, for example, "192.168.1.1". An IP address is subdivided into the network section (net ID) and the node address (host ID)
Subnetwork mask	The subnetwork mask establishes which part of the IP address is used to address the network and which part is used to address a station (host). All bits set to 1 in the subnetwork mask represent the network part (net ID); all bits set to 0 represent the node address (host ID). In a class B network, for example, the subnetwork mask is 255.255.0.0; that is, the first two bytes of the IP address identify the network.
Standard gateway	IP address of the station in the subnetwork that establishes a connection to other networks.
Client	Application that uses the services from another computer. Example: A process data master uses a service from the DHR41B option for cyclical data exchange.
Server	Application on a computer that offers services to other computers. Example: The DHR41B option offers the service for cyclical process data exchange to a process data master.
Broadcast	A broadcast is a transmission to all stations within a distribution list or network.
STP	**S**hielded **T**wisted **P**air .
UTP	**U**nshielded **T**wisted **P**air .

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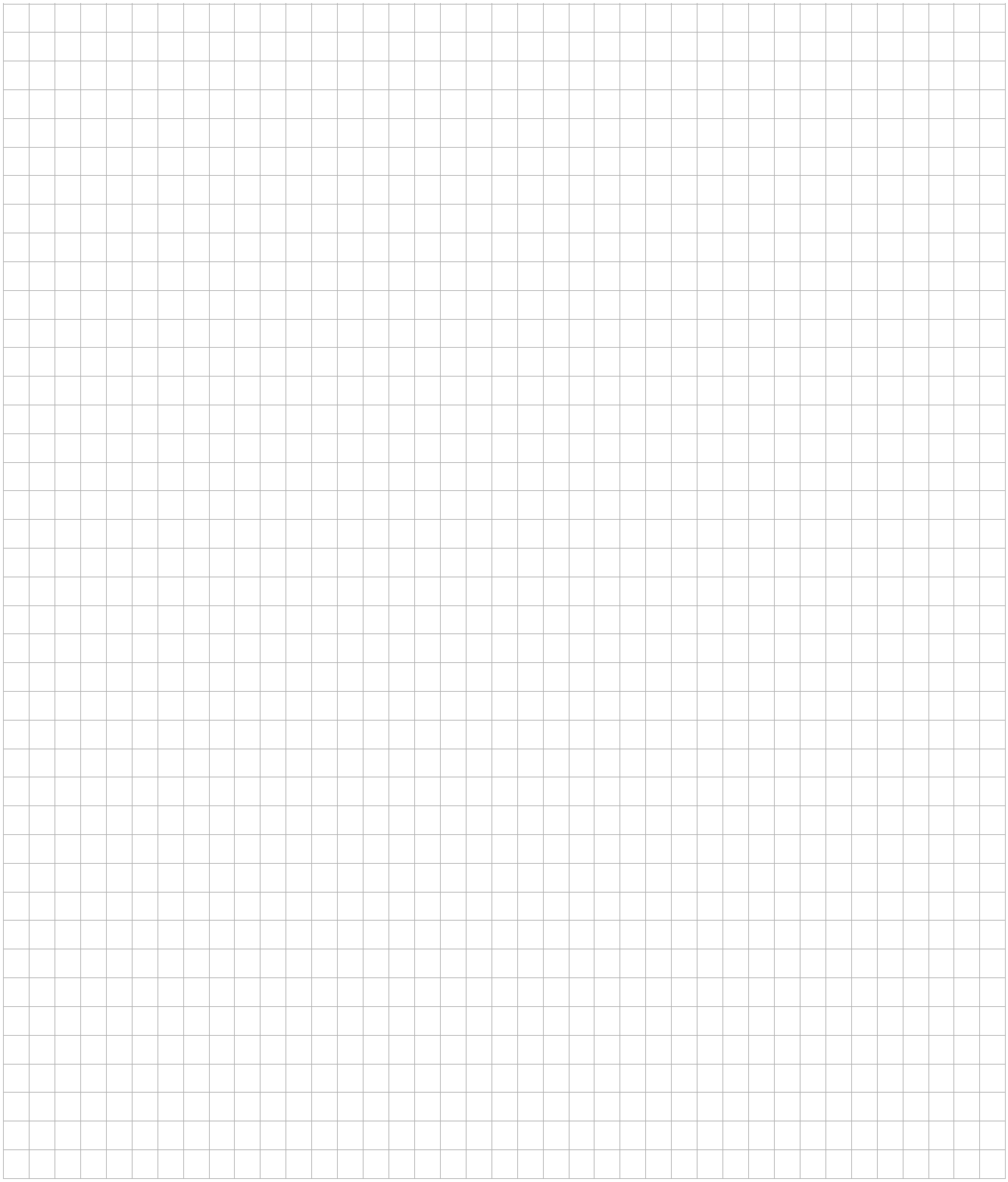

How we're driving the world

With people who think fast and develop the future with you.

With a worldwide service network that is always close at hand.

With drives and controls that automatically improve your productivity.

With comprehensive knowledge in virtually every branch of industry today.

With uncompromising quality that reduces the cost and complexity of daily operations.

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With a global presence that offers responsive and reliable solutions. Anywhere.

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