SEW EURODRIVE

Manual

ECDriveS®

PROFINET IO Interface ECC-DFC

Edition 01/2019

25938274/EN

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1 General information

1.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

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

1.2 Rights to claim under limited warranty

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

1.3 Other applicable documentation

Observe the corresponding documentation for all further components.

1.4 Product names and trademarks

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

1.5 Copyright notice

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2 Safety notes

2.1 Preliminary information

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

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

2.3 Target group

Specialist for mechanical work

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

- Qualification in the mechanical area in accordance with the national regulations
- Familiarity with this documentation

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Specialist for electrotechnical work

Any electrotechnical work may only be performed by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the electrotechnical area in accordance with the national regulations
- Familiarity with this documentation

Additional qualification

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

Instructed persons

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

2.4 Designated use

The product is intended for installation in electrical plants or machines.

When installed in machines, startup (i.e. start of designated operation) is prohibited until it is determined that the machine complies with the local laws and directives. In the individual area of application, you must especially observe the Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EC.

The standards given in the declaration of conformity apply to the product.

Using these products in potentially explosive atmospheres is prohibited, unless specifically designated otherwise.

Air-cooled motors/gearmotors are designed for ambient temperatures of -10 °C to +40 °C and installation altitudes ≤ 1000 m above sea level. Observe any differing specifications on the nameplate. The ambient conditions must comply with all the specifications on the nameplate.

2.5 Functional safety technology

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

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2.6 Transport

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- Before transportation, cover the connections with the supplied protection caps.
- Only place the product on the cooling fins or on the side without connectors during transportation.
- Always use lifting eyes if available.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the information on climatic conditions in chapter "Technical data" of the documentation.

2.7 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in the documentation.

Protect the product from strong mechanical strain. The product and its mounting parts must never protrude into the path of persons or vehicles. Ensure that components are not deformed and insulation spaces are not changed, particularly during transportation and handling. Electric components must not be mechanically damaged or destroyed.

Observe the notes in chapter Mechanical installation in the documentation.

2.7.1 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- Use at an elevation of more than 4000 m above sea level

The product can be used at altitudes above 1000 m above sea level up to 4000 m above sea level under the following conditions:

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter Technical data in the documentation.
- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level limiting measures must be taken, which reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation (in accordance with EN 61800-5-1 and EN 60204-1) is required, then implement this outside the product at altitudes of more than 2000 m above sea level.

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2.8 Electrical installation

Ensure that all of the required covers are correctly attached after carrying out the electrical installation.

Make sure that preventive measures and protection devices comply with the applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

2.8.1 Required preventive measure

Make sure that the product is correctly attached to the ground connection.

2.8.2 Stationary application

Necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	• Ground connection

2.9 Startup/operation

Observe the safety notes in the chapters "Startup" (→ 🗎 19) and Operation in the documentation.

Ensure that all required covers are mounted properly before applying the supply voltage.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts, as well as hot surfaces during operation.

In the event of deviations from normal operation, switch the product off. Possible deviations are increased temperatures, noise, or vibration, for example. Determine the cause. Contact SEW-EURODRIVE if necessary.

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, first disconnect the product from the supply system and then start troubleshooting.

Risk of burns: The surface temperature of the product can exceed 60 °C during operation. Do not touch the product during operation. Let the product cool down before touching it.

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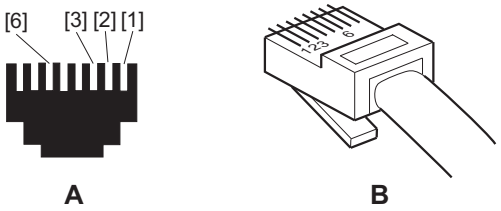
3 Assembly and installation notes

3.1 Pin assignment of the RJ45 plug connector

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



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

3.2 Installation of bus cable

INFORMATION

- According to IEC 802.3, the maximum cable length for 10/100 MBaud Ethernet (10BaseT/100BaseT), e.g. between 2 ECC-DFC fieldbus controllers, is 100 m.
- VLAN tag-prioritized Ethernet frames with the frame identification 8892_{hex} are used for the real-time data exchange with PROFINET IO. This requires switched networks. The switches must support prioritization. Hubs are not permitted. Data transmission takes place using the full duplex process with 100 MBit. Detailed information on cabling can be found in the "PROFINET Installation Guideline" publication that was issued by the PROFINET user organization.

3.2.1 Shielding and routing bus cables

NOTICE

Danger of flowing compensating currents due to the incorrect cable type, inadequate shielding, and/or the incorrect routing of bus cables.

Possible damage to property.

- In the event 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 always supply adequate equipotential bonding in accordance with the relevant IEC regulations.

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

You can take the following measures to minimize electrical interference:

- Manually tighten the mounting screws on the connectors, modules, and equipotential bonding conductors.

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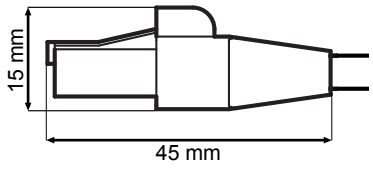
- Use only connectors with a metal housing or a metalized housing.
- Connect the shielding in the connector over a wide surface area.
- Apply the shielding of the bus cable on both ends.
- Always route the signal and bus cables spatially separated from power cables (motor leads) and, whenever possible, in separate cable ducts.
- 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.

3.2.2 Ethernet cable with suitable RJ45 connector

INFORMATION

To make it possible to mount the supplied covers of the fieldbus controller, the overmolding of the Ethernet cables must be no higher than 15 mm and no longer than 45 mm.



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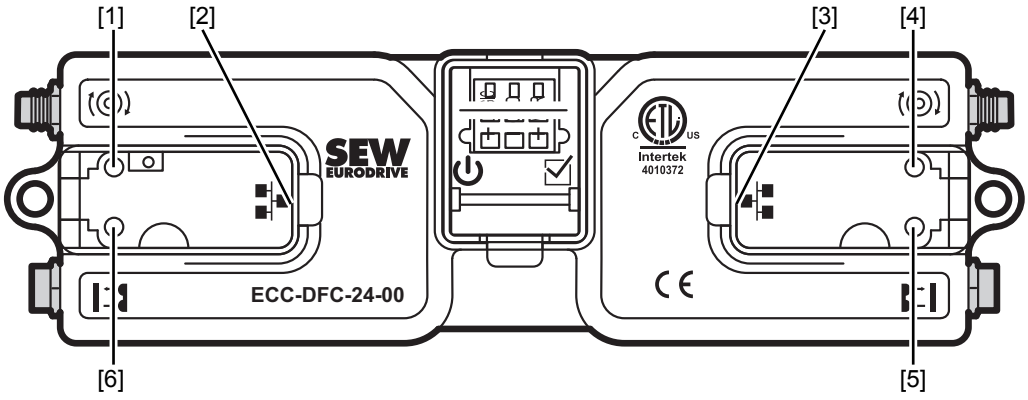
The following PROFINET-certified Ethernet cables can be used for the connection between the PROFINET master and an ECC-DFC fieldbus controller:

Manufacturer	Designation	Design	Length in m
Weidmüller	IE-C5D-S4VG0010A60A60-E	RJ45 IP 20 – RJ45 IP 20	1
	IE-C5D-S4VG0100A60A60-E	RJ45 IP 20 – RJ45 IP 20	10
	IE-C5D-S4VG0050A60XXX-E	RJ45 IP 20 – open end	5
	IE-C5D-S4VG0100A60XXX-E	RJ45 IP 20 – open end	10
	IE-C5D-S4VG0200A60XXX-E	RJ45 IP 20 – open end	20
	IE-C5D-S4VG0500A60XXX-E	RJ45 IP 20 – open end	50

Further lengths are available upon request from Weidmüller.

3.3 Operating displays for startup and operation on the PROFINET IO



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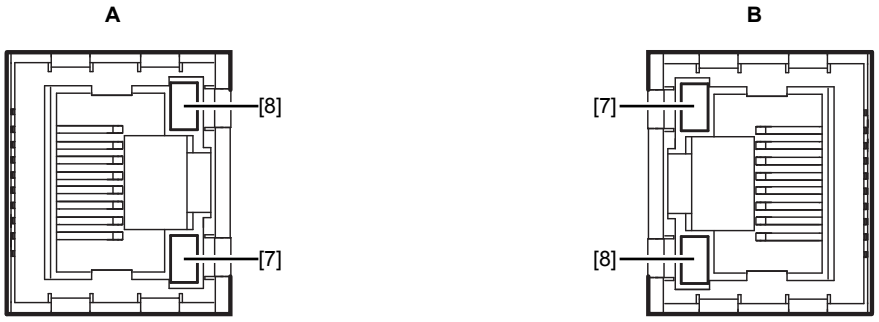
[1] "Left motor" LED – motor status indicator
[2] RJ45 socket, left
[3] RJ45 socket, right
[4] "Right motor" LED – motor status indicator
[5] Right sensor status LED indicator
[6] Left sensor status LED indicator

The 4 LEDs [1], [4], [5], [6] flash red at the same time when "Flash LED" is clicked in the engineering tool.

The LEDs "Activity" and "Link" are visible only in the top view of the RJ45 sockets [2], [3]:



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A Top view, RJ45 socket [2]
B Top view, RJ45 socket [3]
[7] Link LED
[8] Activity LED

LED	State	Meaning
Link [7]	Green	Ethernet connection available.
Link [7]	Off	No Ethernet connection available.
Activity [8]	Yellow	Data transfer via Ethernet in progress.

3.4 TCP/IP addressing and subnetworks

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

- MAC address

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- IP address
- Subnet mask
- Standard gateway

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

3.4.1 MAC address

The MAC address (Media Access Controller) is the basis for all address settings. The MAC address of an Ethernet device is a globally unique 6-byte value (48 bits).

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

3.4.2 IP address

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

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

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

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

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

3.4.3 Network class

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

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

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

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

3.4.4 Subnetwork mask

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

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

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

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

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

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

Network address	Node addresses
192.168.10.0	192.168.10.1 – 192.168.10.126
192.168.10.128	192.168.10.129 – 192.168.10.254

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

3.4.5 Standard gateway

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

Exemplary standard gateway: 192.168.10.1

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

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4 Configuration of the PROFINET IO

This chapter describes who to connect the ECC-DFC fieldbus controller to the PROFINET IO. The procedure is demonstrated using the TIA Portal configuration software as an example.

The higher-level controller (PLC) is referred to below as the IO controller (master) and the ECC-DFC fieldbus controller is referred to as the IO device (slave).

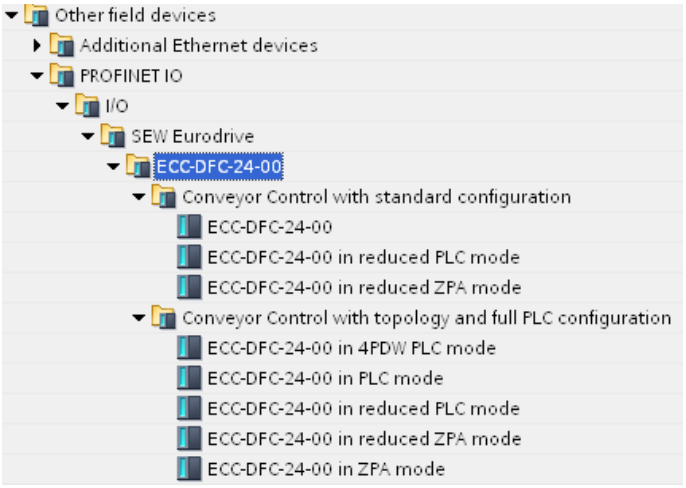
The PROFINET configuration is divided into 3 steps:

4.1 Step 1: Installing the GSD file

A device description file (GSD) is provided for the configuration of the ECC-DFC fieldbus controller. You can download the latest edition of the GSD from the SEW-EURODRIVE website (www.sew-eurodrive.com).

`GSDML-V2.31-SEWEURODRIVE-ECCJJJJMMTT.xml` ("JJJJMMTT" (YYYYMMDD) stands for the date of the file).

1. Start the TIA Portal and switch to the project view.
2. You can install the GSD under "Tools/Manage Device Description File (GSD)".
   ⇨ You will then find the IO device ECC-DFC under [Other field devices/ PROFINET IO/I/O/SEW Eurodrive/ECC-DFC-24-00].



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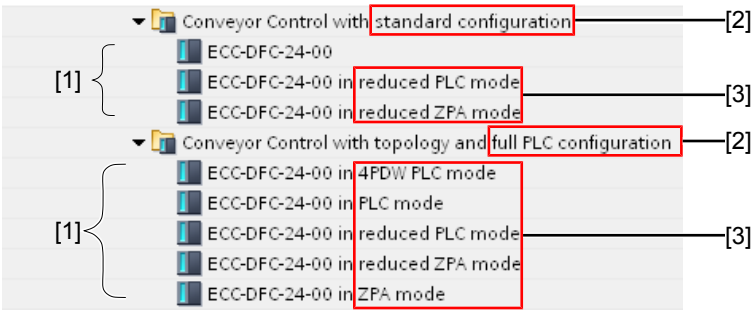
In the GSD, there are 2 folders with the names "Conveyor Control with standard configuration" and "Conveyor Control with topology and full PLC configuration". The relevant access points [1] (DAPs/Device Access Points) are listed in each of these folders.



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[1] Access points (DAPs)
[2] Configuration types
[3] Operating modes

4.2 Step 2: Selecting the configuration type

INFORMATION

At this point, you decide whether the ECC-DFC fieldbus controllers will be configured and operated in "standard configuration" or in "full PLC configuration".

Select one of the two configuration types. The properties of the configuration types are explained below.

"standard configuration":

- Simple configuration and auto configuration with the help of the ECShell engineering software
- PROFINET device names and IP addresses are defined permanently beforehand and are not freely configurable. See the chapter "Startup" (→ 🗎 19) for further information.

"full PLC configuration":

- Thanks to assembly parameters, the configuration of the ECC-DFC fieldbus controller is defined and performed entirely in the higher-level PLC. The ECShell engineering software is not necessary.
- The PROFINET device name and the IP addresses can be selected freely in accordance with the PROFINET guidelines.
- Topology detection, neighborhood detection with LLDP (Link Layer Discovery Protocol).

4.3 Step 3: Selecting the operating mode

The GSD contains several access points that are used to select the operating mode. Between 2 and 4 operating modes are available, depending on the configuration type. The two fundamental operating modes are "ZPA mode" (Zero Pressure Accumulation) and "PLC mode".

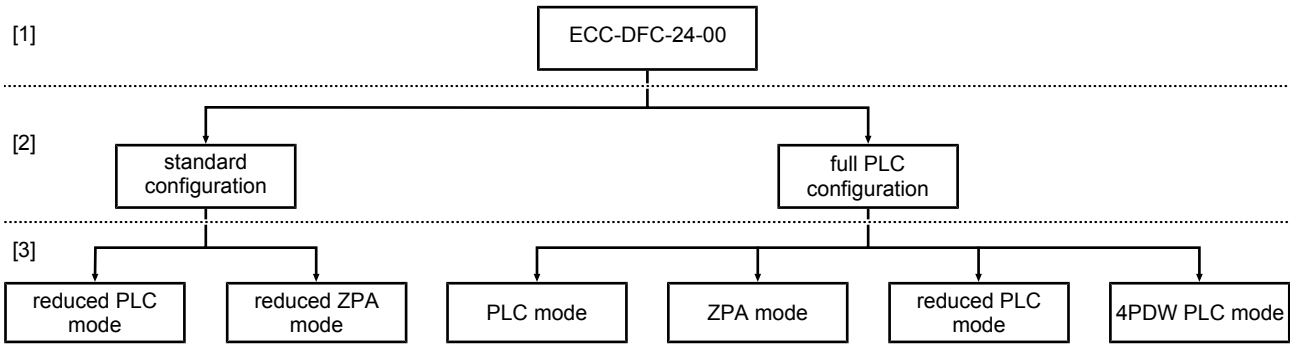
The "ZPA mode" contains a zero pressure accumulation conveying logic. In "ZPA mode", the fieldbus controllers exchange commands between themselves and regardless of the higher-level controller.

In "PLC mode", the fieldbus controllers are controlled directly by the PLC.

The access points are explained briefly in the following table. Refer to the chapter "Appendix" (→ 🗎 30) for a detailed description.

Configuration type	Access points	Description	Bytes
standard configuration	ECC-DFC-24-00	Reserved for internal use.	64
	ECC-DFC-24-00 in reduced PLC mode	This access point is optimized for an I/O length of 16 bytes.	16
	ECC-DFC-24-00 in reduced ZPA mode	This access point is optimized for an I/O length of 30 bytes.	30
full PLC configuration	ECC-DFC-24-00 in 4PDW PLC mode	This access point uses an efficient profile reduced to 4 bytes. As in PLC mode, the PLC takes full control of the ECDriveS®.	8
	ECC-DFC-24-00 in PLC mode	Full implementation of PLC mode.	64
	ECC-DFC-24-00 in reduced PLC mode	This access point is optimized for an I/O length of 16 bytes.	16
	ECC-DFC-24-00 in ZPA mode	Full implementation of ZPA mode.	64

4.3.1 Overview of configuration steps



[1] Step 1: Installing the GSD file
[2] Step 2: Selecting the configuration type
[3] Step 3: Selecting the operating mode

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5 Startup

5.1 Startup of "standard configuration"

The prerequisite for starting up ECC-DFC fieldbus controllers in "standard configuration" on the PROFINET IO is that the fieldbus controllers must have already been operated with auto-configuration. This will ensure that the IP address and the PROFINET device names have been assigned already and are no longer freely configurable.

5.1.1 Mapping the IP address and subnet mask

The network address, the subnet mask, and the PROFINET device name are defined by auto-configuration. You must configure these parameters accordingly in the higher-level PROFINET master.

The auto-configuration assigns the node address 192.168.10.20 to the furthest upstream ECC-DFC fieldbus controller. Every other fieldbus controller is then assigned a corresponding node address in ascending order (192.168.10.21, 192.168.10.22).

5.1.2 Mapping the PROFINET device name

The PROFINET device name consists of the following character sequences:

- "eccdfc"+
- "plc" or "zpa"+
- "-"+
- The value of the third byte in the IP address (192.168.**100**.47)+
- "-"+
- The value of the fourth byte in the IP address (192.168.100.**47**)

If the fieldbus controller is put into operation in "reduced ZPA mode", this results in the following PROFINET device name: eccdfczpa-100-47

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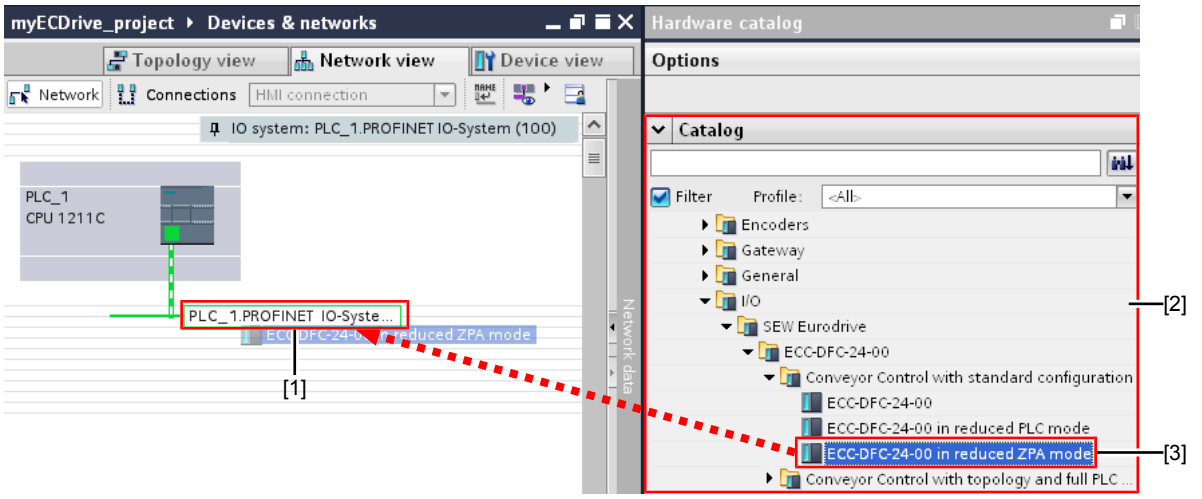
5.1.3 Configuration of a node in the TIA Portal

1. Using drag and drop, drag the desired DAP [3] from the hardware catalog [2] to the PROFINET IO system [1].



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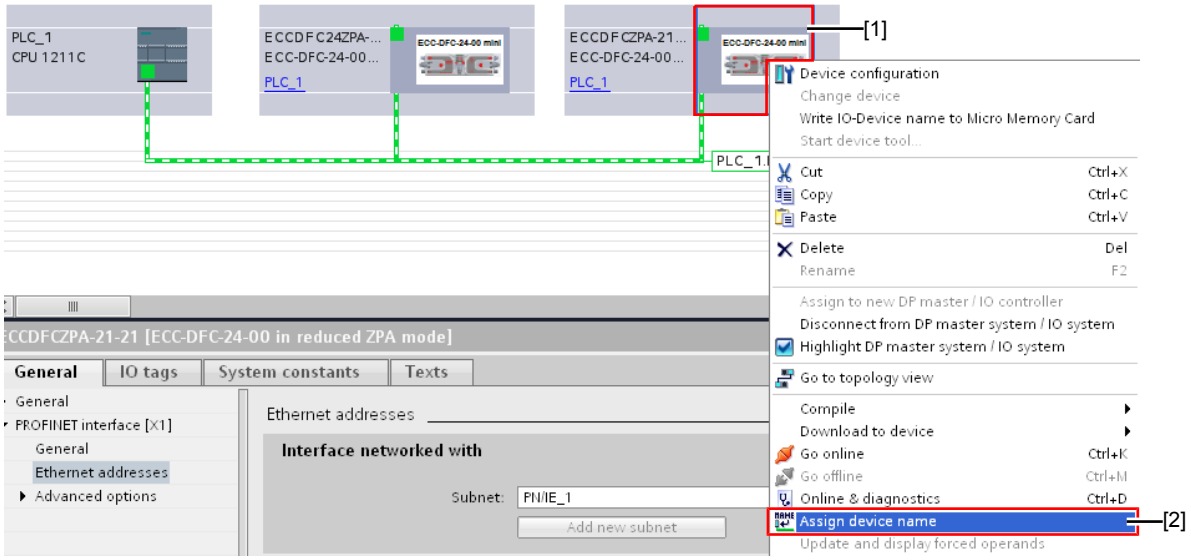
[1] PROFINET IO system
[2] Hardware catalog
[3] DAP

5.1.4 Assigning the PROFINET device name

In the TIA Portal, the PROFINET device name, the IP address, and the subnet mask are modified according to the specifications.



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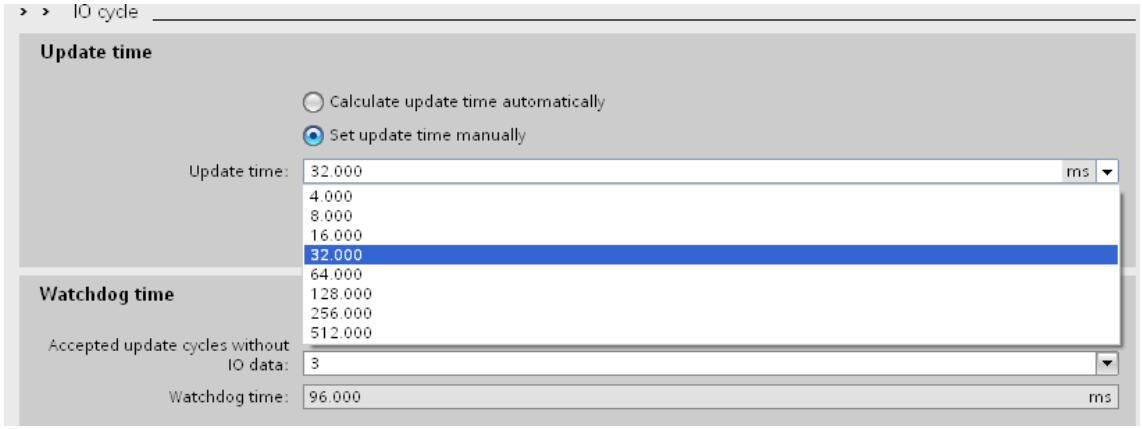
[1] Fieldbus controller
[2] Menu command [Assign device name]

1. Right-click on the relevant fieldbus controller [1] in the TIA Portal.
2. Select the [Assign device name] [2] menu command from the context menu.
   ⇨ The PROFINET device name, the IP address, and the subnet mask are assigned to the fieldbus controller.

5.1.5 Assigning the "Update time" and "Watchdog time"

In "ZPA mode", the ECC-DFC fieldbus controllers communicate with each other. In connection with short update times, this can cause network problems. Therefore select an "Update time" ≥32 ms.

The length of the "Watchdog time" is a multiple of the update time. The default value (3) is suitable for all operating modes.



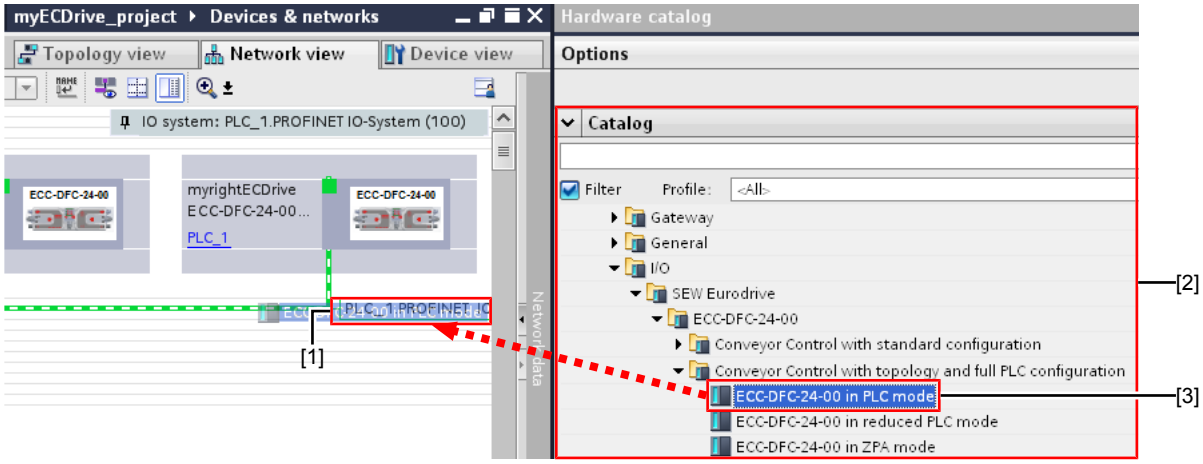
25137311371

5.2 Startup of "full PLC configuration"

In contrast to "standard configuration", the ECShell engineering software is not needed in "full PLC configuration", because all the settings are performed by the higher-level PLC.

To configure a node in "full PLC configuration" mode in the TIA Portal engineering tool, proceed as follows:

1. Using drag and drop, drag the desired DAP [3] from the hardware catalog [2] to the PROFINET IO system [1].



25149121675

[1] PROFINET IO system
[2] Hardware catalog
[3] DAP

In contrast to "standard configuration", you can freely select the PROFINET device name and the IP address in accordance with the PROFINET guidelines.

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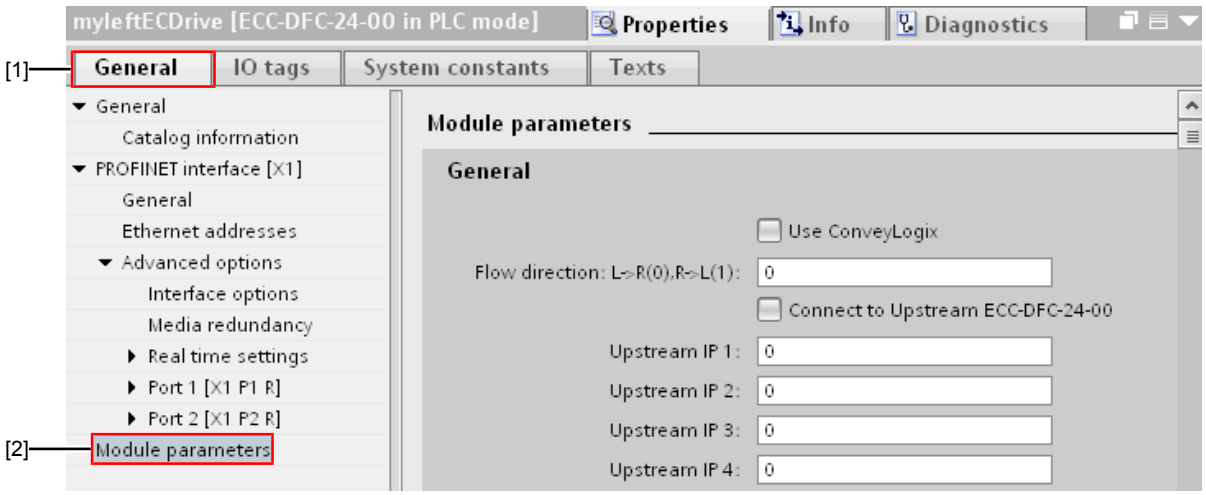
5.2.1 Setting the configuration parameters of the ECC-DFC fieldbus controller

The ECC-DFC fieldbus controllers are configured in the TIA Portal:

1. Open the "General" [1] tab in the TIA Portal.
2. Select the [Module parameters] menu command [2].
   ⇨ Here, you can configure all the settings for the ECC-DFC fieldbus controller.



25265833611

[1] "General" tab
[2] Module parameters

In contrast to the configuration with ECShell, the configuration parameters in "full PLC configuration" are written again every time the bus is started up.

5.2.2 Introduction of topology detection

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

The so-called "Physical device" (PDEV) is the starting point for the configuration. PDEV is a model for the Ethernet interface and can be found in slot0 in the configuration with an "Ethernet interface" subslot and one subslot for each Ethernet port.

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

In order to be able to determine the real plant topology, the PROFINET IO devices must support the so-called LLDP (Link Layer Discovery Protocol). The PROFINET IO devices exchange information with the neighboring PROFINET IO devices via LLDP. Each PROFINET IO device cyclically sends information about its own PROFINET device name and port number via LLDP. The neighboring device receives and stores this information. A PROFINET IO controller can then read the stored information from the PROFINET IO devices and so determine the real plant topology.

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

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

SNMP (Simple Network Management Protocol) as a protocol for network diagnostics extends the topology detection by standard diagnostics mechanisms from the IT area.

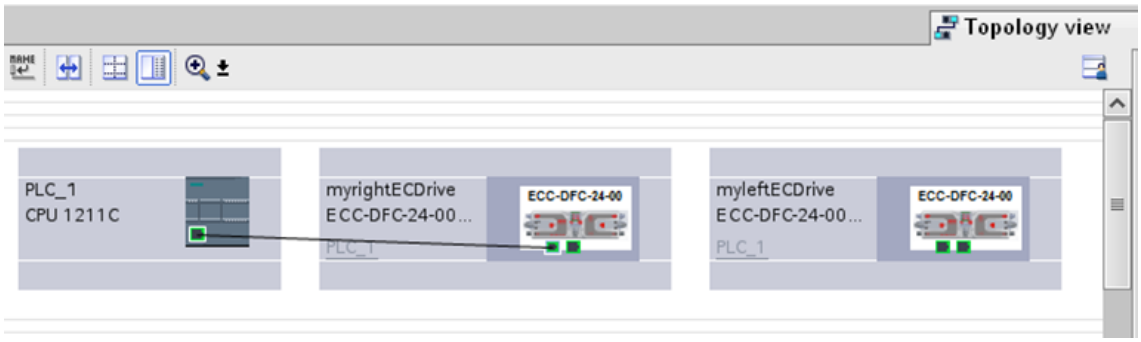
INFORMATION

If you use the ECC-DFC fieldbus controller in ZPA mode, the topology detection is required without fail.

Creating a system topology

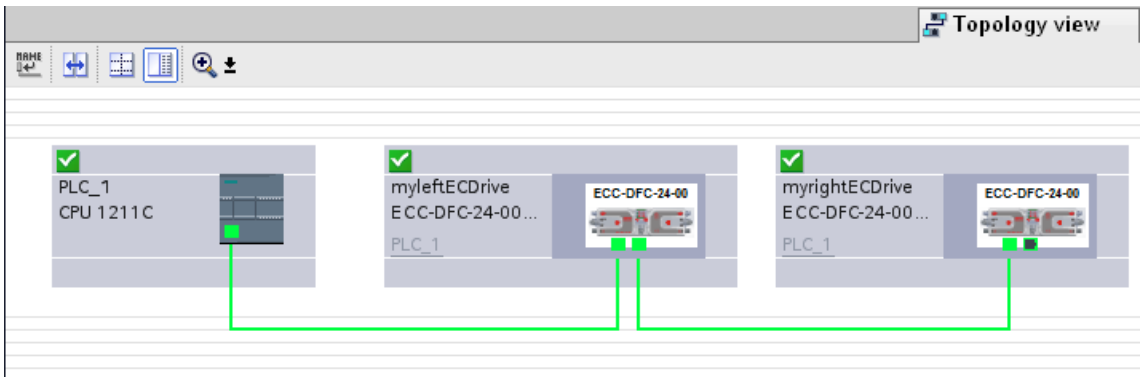
You can configure the system topology in various different ways. The offline configuration is described below.

1. To create the system topology, open the "Topology view" tab.



25272967307

2. Connect the ports by dragging and dropping and then transfer the configuration to the PLC.



25301385739

3. To check that the configured system topology matches the online topology, switch to the online view.
   - ⇨ Green: The system topology matches.
   - ⇨ Red: The system topology does not match.

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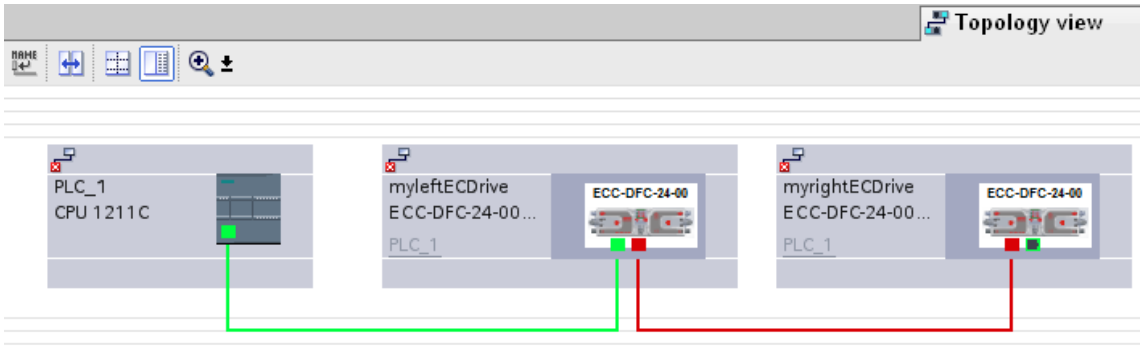


25301389835

Faults detected in the system topology are reported during the diagnostics of the PLC and are stored in the diagnostic buffer.

5.3 User-defined data types (UDTs)

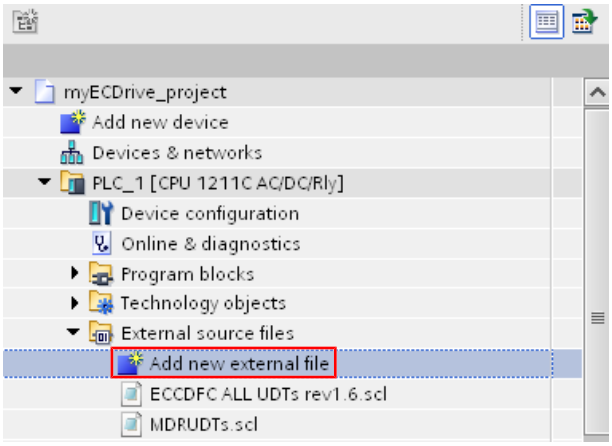
The SIMATIC offers various possibilities for defining user-defined types (UDTs) and using them in the program. These UDTs may consist of elementary or composite data types and are suitable for standardized program production.

SEW-EURODRIVE provides you with user-defined types for every access point on its website (www.sew-eurodrive.com). The provided UDTs give you simple access to the access points and so to the process data of the ECDriveS®.

5.3.1 Importing source files

The source files are imported as external sources into the TIA project. This import process is explained below using the `ECCDFC ALL UDTs rev1.6.scl` and `MDRUDTs.scl` files as an example.

1. To import source files, double-click on "Add new external file".
2. Then select the desired source file that you would like to import.
   ⇨ The imported source files are listed in the "External source files" folder.



25528686859

5.3.2 Generating UDTs

You must generate UDTs from the imported source files. You can then use the UDTs in your program.

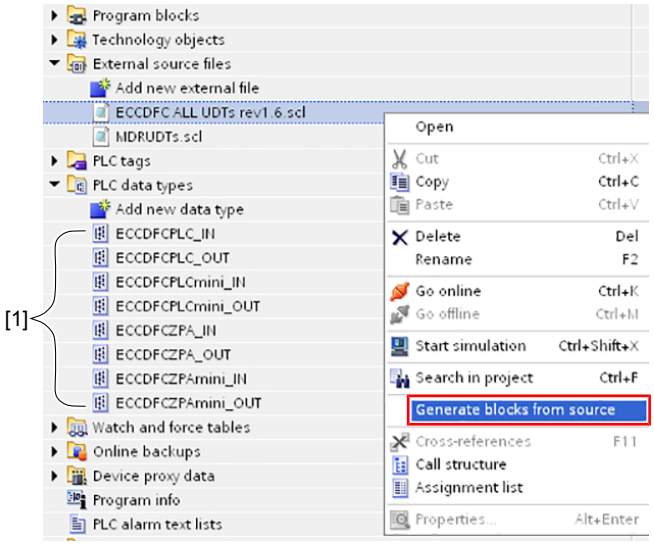
✓ The source files are imported into the TIA project.

1. Right-click on an imported source file.

   ⇨ The context menu opens.

2. To generate the UDTs, select the [Generate blocks from source] menu command in the context menu.

   ⇨ The UDTs [1] are listed in the "PLC data types" folder.

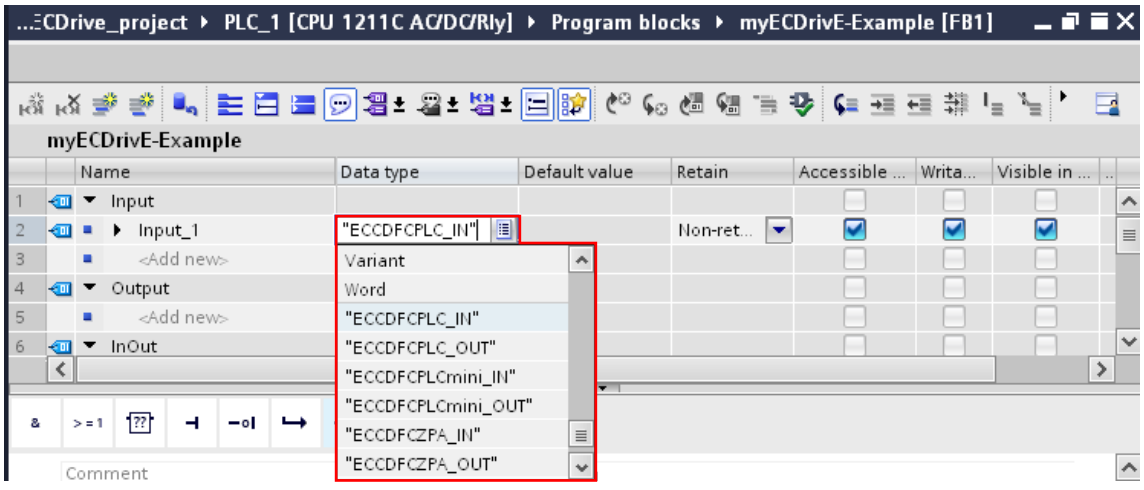


25524488331

[1] UDTs

5.3.3 Using UDTs

When you have imported the source files and generated the UDTs, the UDTs will be available in the selection field of the file types.



25608025355

5.4 TIA sample project

You can download the TIA sample project `ECDriveS_Positioning` on the SEW-EURODRIVE website (www.sew-eurodrive.com).

This example presents a positioning application of ECR roller drives or ECG gearmotors via PROFINET IO.

To implement a positioning application in full, it is necessary to preselect the operating modes for jogging +/-, referencing, and positioning.

- Setpoints from the PLC:
  - Release
  - Target position
  - Setpoint speed
  - Ramp
- Actual values to the PLC:
  - Operating state
  - Error messages
  - Actual position
  - Actual speed

To use as large a functional scope as possible with the higher-level SIMATIC, select the "PLC mode" DAP from the "full PLC configuration" configuration type.

As double word widths are used for the positional setpoints and actual values, perform the reading and writing of the process data consistently.

To ensure convenient programming and reliable execution in all conventional CPU families, create the component in structured text.

5.4.1 Integrating source files

You can download the source files from the SEW-EURODRIVE website (www.sew-eurodrive.com).

The procedure for integrating the source files into the TIA sample project is described in the chapter "User-defined data types (UDTs)" (→ 🗎 25).

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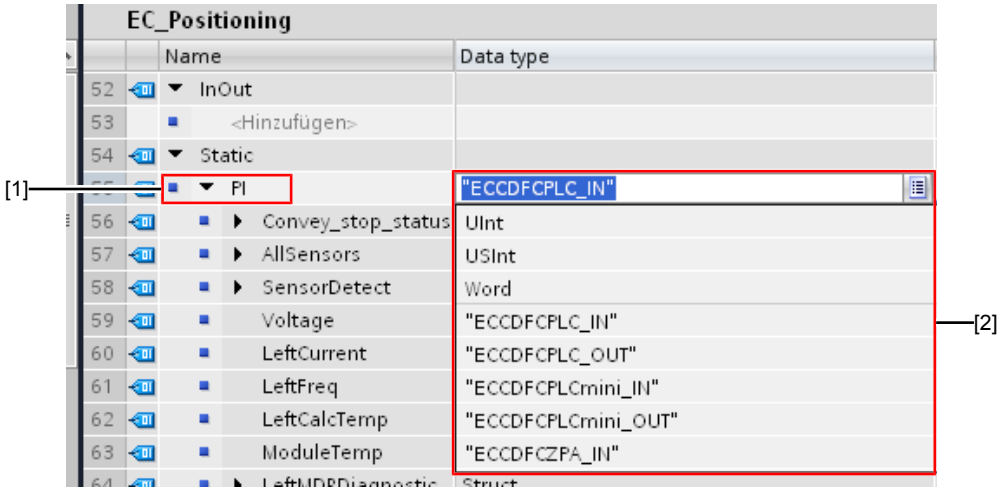
5.4.2 Implementing the sample project

Creating a "PI" receive directory

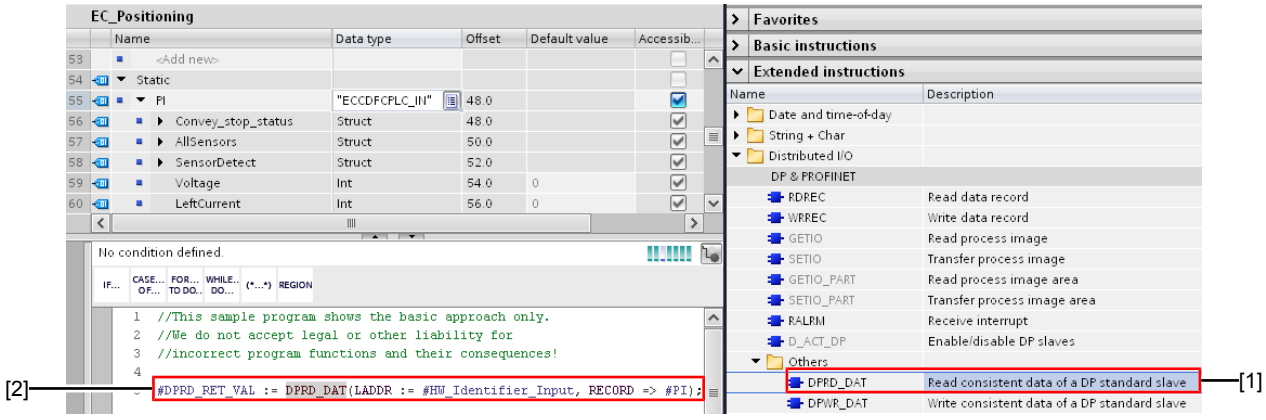
1. To create the receive directory, create a static variable `PI`.
2. Select the data type `ECCDFCPLC_IN` for the variable `PI`.



25672455947

[1] Variable `PI`
[2] Data types

3. You can then read the process input data with the instruction `DRPD_DAT` consistently and copy them to the `PI` receive directory.



25673743115

[1] Instruction `DPRD_DAT`
[2] Source code

A number of sections of the source code are explained below:

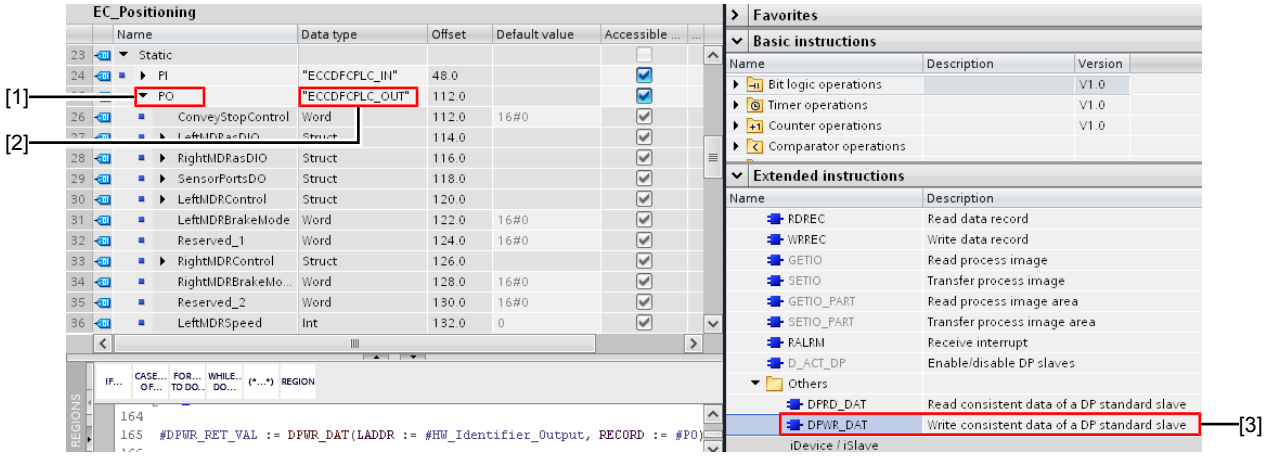
`#DPRD_RET_VAL`: Return value of the instruction `DPRD_DAT`.

`LADDR`: Hardware code of the fieldbus controller where the data will be received, which is allocated by the input `#HW_Identifier_Input`.

`RECORD`: Target area for the read useful data, in this case the variable `PI`.

Creating a "PO" send directory

1. To create the send directory, create a static variable `PO`.
2. Select the data type `ECCDFCPLC_OUT` for the variable `PO`.
3. Select the instruction `DPWR_DAT`.



25673749899

[1] Variable `PO`
[2] Data type `ECCDFCPLC_OUT`
[3] Instruction `DPWR_DAT`

Assigning control commands

You can assign the control commands via the PO structure.

Example of jog mode:

The right drive is enabled with the command `RightMDRControl.Run_MDR`.

You can select the direction of rotation with the command `RightMDRControl.MDR_Direction`:

- `#PO.RightMDRControl.Run_MDR:= true;`
- `#PO.RightMDRControl.MDR_Direction:= false;`

You can set the setpoint speed, acceleration, and deceleration with numerical values:

- `#PO.RightMDRSpeed:= xxx;`
- `#PO.RightMDRAccel:= xxx;`
- `#PO.RightMDRDeccel:= xxx;`

Processing actual values

You can retrieve the actual values from the PI structure.

With the help of the structure of the command `PI.LeftMDRDiagnostic`, you can evaluate the error bits of the left drive:

- `#PI.LeftMDRDiagnostic.Overheat;`
- `#PI.LeftMDRDiagnostic.MaxTorque;`

6 Appendix

6.1 Description of the access points

6.1.1 Input data "full PLC mode"

Process-data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Struct Bool	Convey_stop_status	0.0	0.0	Res.
	Bool		0.1	0.1	Res.
	Bool		0.2	0.2	**StopActiveCommandPLC:** Fieldbus controller was given the status Stop by the PLC
			0.3 0.7	0.3 0.7	Res.
			1.0 1.4	0.8 0.12	Res.
	Bool		1.5	0.13	**StopActiveOtherModule:** A fieldbus controller in the Stop group currently has the status Stop
	Bool		1.6	0.14	**StopActiveLostConn:** Communication connection lost. Fieldbus controller was given the status Stop
	Bool		1.7	0.15	**StopActiveLostPLC:** Missing connection to the PLC. Fieldbus controller was given the status Stop
1	Struct	AllSensors	2.0 2.6	1.0 1.6	Res.
	Bool		2.7	1.7	**Heartbeat**
	Bool		3.0	1.8	**LeftPin2:** Status of the left sensor port (Pin2)
	Bool		3.1	1.9	Res.
	Bool		3.2	1.10	**RightPin2**: Status of the right sensor port (Pin2)
	Bool		3.3	1.11	Res.
	Bool		3.4	1.12	**LeftPin4**: Status of the left sensor port (Pin4)
	Bool		3.5	1.13	Res.
	Bool		3.6	1.14	**RightPin4**: Status of the right sensor port (Pin4)
	Bool		3.7	1.15	Res.
2	Struct Bool	SensorDetect	4.0 4.7	2.0 2.7	Res.
	Bool		5.0	2.8	**RightSensorDetect**: If this bit is TRUE, a sensor was detected on the right sensor port (PIN4)
	Bool		5.1	2.9	**LeftSensorDetect**: If this bit is TRUE, a sensor was detected on the left sensor port (PIN4)
			5.2 5.7	2.10 2.15	Res.
3	Int	Voltage	6.0 6.7	3.0 3.15	Supply voltage of the fieldbus controller in mV: 24000 for 24 V. This value is averaged over a 500 ms interval
			7.0 7.7		
4	Int	LeftCurrent (LeftMDRStatus)	8.0 8.7	4.0 4.15	Left motor roller current in mA: 5000 for 5 A. This value is averaged over a 500 ms interval
			9.0 9.7		
5	Int	LeftFreq (LeftMDRStatus)	10.0 10.7	5.0 5.15	Frequency at the Hall effect sensor on the left motor roller in Hz: 500 for 500 Hz
			11.0 11.7		
6	Byte	LeftCalcTemp (LeftMDRStatus)	12.0 12.7	6.0 6.15	Calculated temperature of the left motor roller in °C
	Byte	ModuleTemp (LeftMDRStatus)	13.0 13.7		Temperature of the power section of the left drive axis, measured in °C
7	Struct Bool	LeftMDRDiagnostic (LeftMDRStatus)	14.0	7.0	**Overheat**: Overtemperature fault. The temperature of the motor roller exceeded 105 °C
	Bool		14.1	7.1	**MaxTorque**: Motor at current limit

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Process-data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Bool		14.2	7.2	**ShortCircuit**: Motor short circuit
	Bool		14.3	7.3	**MDRNotConnected:** No motor is connected to the motor port
	Bool		14.4	7.4	**Overload**: Overload detected. Speed lowered to <10% of the setpoint speed due to the overload
	Bool		14.5	7.5	**Stalled**: Motor blockade detected
	Bool		14.6	7.6	**MDRBadHall:** Hall sensor fault
	Bool		14.7	7.7	**MDRNotUsed**: Zone was not configured in ZPA
	Bool		15.0	7.8	**MDRStatus Bit1:** Description of the 2-bit coded statuses
	Bool		15.1	7.9	**MDRStatus Bit2**: Description of the 2-bit coded statuses
	Bool		15.2	7.10	**MDRinDOmode**: Motor port is connected to the digital I/O mode
			15.3 15.5	7.11 7.13	Res.
	Bool		15.6	7.14	**OverVoltage:** Overvoltage fault
	Bool		15.7	7.15	**LowVoltage**: Undervoltage fault
8	Int	RightCurrent (RightMDRStatus)	16.0 16.7	8.0 8.15	Right motor roller current
			17.0 17.7		
9	Int	RightFreq (RightMDRStatus)	18.0 18.7	9.0 9.15	Frequency at the Hall effect sensor on the right motor roller
			19.0 19.7		
10	Byte	RightCalcTemp (RightMDRStatus)	20.0 20.7	10.0 10.15	Calculated temperature of the right motor roller
	Byte	ModuleTemp_1 (RightMDRStatus)	21.0 21.7		Temperature of the power section of the right drive axis, measured in °C
11	Struct Bool	RightMDRDiagnostic (RightMDRStatus)	22.0	11.0	**Overheat**: Overtemperature fault
	Bool		22.1	11.1	**MaxTorque:** Motor at current limit
	Bool		22.2	11.2	**ShortCircuit**: Motor short circuit
	Bool		22.3	11.3	**MDRNotConnected:** No motor is connected to the motor port
	Bool		22.4	11.4	**Overload**: Overload detected
	Bool		22.5	11.5	**Stalled**: Motor blockade detected
	Bool		22.6	11.6	**MDRBadHall:** Hall sensor fault
	Bool		22.7	11.7	**MDRNotUsed**: Zone was not configured in ZPA
	Bool		23.0	11.8	**MDRStatus Bit1**: Description of the 2-bit coded statuses
	Bool		23.1	11.9	**MDRStatus Bit2**: Description of the 2-bit coded statuses
	Bool		23.2	11.10	**MDRinDOmode**: Motor port is connected to the digital I/O mode
			23.3 23.5	11.11 11.13	Res.
	Bool		23.6	11.14	**OverVoltage**: Overvoltage fault
	Bool		23.7	11.15	**LowVoltage**: Undervoltage fault
12	Struct	LeftMDR_DIOstatus	24.0 24.3	12.0 12.3	Res.
	Bool		24.4	12.4	**ShortCircuit**: Short circuit between +24 V and Pin2/3/4
			24.5 24.7	12.5 12.7	Res.
			25.0 25.7	12.8 12.15	Res.

Process-data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
13	Struct	RightMDR_DIOstatus	26.0 26.3	13.0 13.3	Res.
	Bool		26.4	13.4	**ShortCircuit**: Short circuit between +24 V and Pin2/3/4
			26.5 26.7	13.5 13.7	Res.
			27.0 27.7	13.8 13.15	Res.
14	Word	UpstreamModuleStatus	28.0 28.7	14.0 14.15	ZPA status of the upstream fieldbus controller ECC-DFC-24-00. **Lowbyte Values:** **0x01** Empty: There is no material to be conveyed in the zone and no material is arriving from the upstream zone (sensor free, motor not enabled) **0x02** Accepting: Zone is empty, but material to be conveyed is arriving from the upstream zone (sensor free, motor enabled) **0x04** Full and Running: There is material to be conveyed in the zone and it is being conveyed in the direction of the local zone (sensor occupied, motor enabled) **0x05** Full and Stopped: There is material to be conveyed in the zone and it is being accumulated there (sensor occupied, motor not enabled)
			29.0 29.7		ZPA status of the upstream fieldbus controller ECC-DFC-24-00 **Highbyte Values:** As the lowbyte values in the reverse direction of flow
15	Word	DownstreamModuleStatus	30.0 30.7	15.0 15.15	ZPA status of the downstream fieldbus controller ECC-DFC-24-00. **Lowbyte Values:** **0x01** Empty: There is no material to be conveyed in the zone and no material is arriving from the upstream zone (sensor free, motor not enabled) **0x02** Accepting: Zone is empty, but material to be conveyed is arriving from the upstream zone (sensor free, motor enabled) **0x04** Full and Running: There is material to be conveyed in the zone and it is being conveyed in the direction of the local zone (sensor occupied, motor enabled) **0x05** Full and Stopped: There is material to be conveyed in the zone and it is being accumulated there (sensor occupied, motor not enabled)
			31.0 31.7		ZPA status of the downstream fieldbus controller ECC-DFC-24-00 **Highbyte Values:** As the lowbyte values in the reverse direction of flow
16	Dword	Tracking from Upstream	32.0 32.7	16.0 16.15	ZPA tracking data of the upstream fieldbus controller ECC-DFC-24-00
			33.0 33.7		
17			34.0 34.7	17.0 17.15	
			35.0 35.7		
18		Res.	36.0 36.7	18.0 18.15	
			37.0 37.7		
19	Dint	DistanceLeft (ServoStatus)	38.0 38.7	19.0 19.15	Current motor position (incremental value) of the left motor
			39.0 39.7		
20			40.0 40.7	20.0 20.15	
			41.0 41.7		

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Process-data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
21	Dint	DistanceRight (ServoStatus)	42.0 42.7	21.0 21.15	Current motor position (incremental value) of the right motor
			43.0 43.7		
22			44.0 44.7	22.0 22.15	
			45.0 45.7		
23	Word	ServoStatusLeft (ServoStatus)	46.0 46.7	23.0 23.15	Status word for servo commands for left motor **Value 0x02**: Referencing completed, DistanceLeft = 0 **Value 0x05**: Target position was reached, DistanceLeft = setpoint position
			47.0 47.7		
24	Word	ServoStatusRight (ServoStatus)	48.0 48.7	24.0 24.15	Status word for servo commands for right motor **Value 0x02**: Referencing completed, DistanceLeft = 0 **Value 0x05**: Target position was reached, DistanceLeft = setpoint position
			49.0 49.7		
25	Word	LeftMDRRealSpeed	50.0 50.7	25.0 25.15	Measured speed/rotational speed of the left drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10 Additional limit value report, speed setpoint Bit14 **True:** Setpoint speed > maximum possible speed **False:** Setpoint speed/rotational speed OK Bit15 **True:** Setpoint speed < minimum possible speed **False:** Setpoint speed/rotational speed OK
			51.0 51.7		
26	Word	LeftMDRRealSpeed	52.0 52.7	26.0 26.15	Measured speed/rotational speed of the right drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10 Additional limit value report, speed setpoint Bit14 **True:** Setpoint speed/rotational speed > maximum possible speed **False:** Setpoint speed/rotational speed OK Bit15 **True:** Setpoint speed < minimum possible speed **False:** Setpoint speed/rotational speed OK
			53.0 53.7		

Reserved up to byte 63.

6.1.2 Output data "full PLC mode"

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Struct	ConveyStopControl	0.0 0.7	0.0 0.15	**Value 0x01:** Fieldbus controller is given the status Stop **Value 0x02:** Stop status is reset for the fieldbus controller
			1.0 1.7		
1	Struct	LeftMDRasDIO	2.0 2.6	1.0 1.6	Res.
	Bool		2.7	1.7	**SetMotDIO:** Changeover of PIN 3/4 of the motor port as a digital output **True:** Activate DIO mode **False:** Deactivate DIO mode
	Bool		3.0	1.8	Res.
	Bool		3.1	1.9	**DrivePIN4:** Set/reset digital output PIN4 **True:** Set digital output **False:** Reset digital output
	Bool		3.2	1.10	**DrivePIN3**: Set/reset digital output PIN3 **True:** Set digital output **False:** Reset digital output
			3.3 3.7	1.11 1.15	Res.

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
2	Struct	RightMDRasDIO	4.0 4.6	2.0 2.6	Res.
	Bool		4.7	2.7	**SetMotDIO**: Changeover of PIN 2/4 of the motor port as a digital output **True:** Activate DIO mode **False:** Deactivate DIO mode
	Bool		5.0	2.8	**DrivePIN2:** Set/reset motor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
	Bool		5.1	2.9	Res.
	Bool		5.2	2.10	**DrivePIN3**: Set/reset digital output PIN3 **True:** Set digital output **False:** Reset digital output
			5.3 5.7	2.11 2.15	Res.
3	Struct	SensorPortsDo	6.0 6.7	3.0 3.7	Res.
	Bool		7.0	3.8	**DriveLeftPIN2:** Set/reset left sensor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
	Bool		7.1	3.9	**DriveRightPIN2:** Set/reset right sensor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
			7.2 7.4	3.10 3.12	Res.
	Bool		7.5	3.13	**SetLeftPIN2asDO:** Changeover of the left sensor port PIN2 as a digital output **True:** PIN2 = digital output (DO) **False:** PIN2 = digital input (DI)
	Bool		7.6	3.14	**SetRightPIN2asDO:** Changeover of the right sensor port PIN2 as a digital output **True:** PIN2 = digital output (DO) **False:** PIN2 = digital input (DI)
	Bool		7.7	3.15	Res.
4	Struct Bool	LeftMDRControl	8.0	4.0	**MDR_Direction**: Changeover of direction of rotation **True:** Direction of rotation ≠ default direction of rotation **False:** Default direction of rotation
			8.1 8.7	4.1 4.7	Res.
	Bool		9.0	4.8	**Run_MDR**: Enabling of motor, left **True:** Release **False:** Stop
			9.1 9.7	4.9 4.15	Res.
5	Word	LeftBrakeMode	10.0 10.7	5.0 5.15	Deceleration behavior of left drive **Value 0x01**: Standard brake ramp **Value 0x02**: Coasting **Value 0x03**: ServoBrake
			11.0 11.7		
6	Word	Res.	12.0 12.7	6.0 6.15	
			13.0 13.7		
7	Struct Bool	RightMDRControl	14.0	7.0	**MDR_Direction**: Changeover of direction of rotation **True:** Direction of rotation ≠ default direction of rotation **False:** Default direction of rotation
			14.1 14.7	7.1 7.7	Res.
	Bool		15.0	7.8	**Run_MDR**: Enabling of motor, right **True:** Release **False:** Stop

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Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
			15.1 15.7	7.9 7.15	Res.
8	Word	RightBrakeMode	16.0 16.7	8.0 8.15	Deceleration behavior of the right drive **Value 0x01**: Standard brake ramp **Value 0x02**: Coasting **Value 0x03**: ServoBrake
			17.0 17.7		
9	Word	Res	18.0 18.7	9.0 9.15	
			19.0 19.7		
10	Int	LeftMDRSpeed	20.0 20.7	10.0 10.15	Speed/rotational speed of the left drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			21.0 21.7		
11	Int	RightMDRSpeed	22.0 22.7	11.0 11.15	Speed/rotational speed of the right drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			23.0 23.7		
12	Int	LeftMDRAccel	24.0 24.7	12.0 12.15	Acceleration of the left drive. with ECR: a(ECR) [mm] with ECG: a(ECG) [inc.][1]
			25.0 25.7		
13	Int	LeftMDRDeccel	26.0 26.7	13.0 13.15	Deceleration of the left drive. with ECR: a(ECR) [mm] with ECG: a(ECG) [inc.][1]
			27.0 27.7		
14	Int	RightMDRAccel	28.0 28.7	14.0 14.15	Acceleration of the right drive with ECR: a(ECR) [mm] with ECG: a(ECG) [inc.][1]
			29.0 29.7		
15	Int	RightMDRDeccel	30.0 30.7	15.0 15.15	Deceleration of the right drive with ECR: a(ECR) [mm] with ECG: a(ECG) [inc.][1]
			31.0 31.7		
16	Word	ClearMDRError	32.0 32.7	16.0 16.15	Fault reset **Value 0x01**: Reset[2]
			33.0 33.7		
17	Word	StatusToDownstream	34.0 34.7	17.0 17.15	Used as an interface to an adjacent fieldbus controller configured in ZPA mode on the downstream side **Value 0x04:** Wakeup for next zone **Value 0x01:** Confirmation that the material being conveyed has left the local zone
			35.0 35.7		
18	Word	StatusToUpstream	36.0 36.7	18.0 18.15	Used as an interface to an adjacent fieldbus controller configured in ZPA mode on the upstream side **Value 0x05**: Jam command for upstream zone **Value 0x01:** Cancel jam command for upstream zone
			37.0 37.7		
19	Struct	SensorPolarity	38.0 38.7	19.0 19.7	Res.
	Bool		39.0	19.8	**Left_Pin2:** Inversion of left sensor port PIN2 **True:** Invert sensor input **False:** Default polarity
			39.1	19.9	Res.
	Bool		39.2	19.10	**Right_Pin2:** Inversion of right sensor port PIN2 **True:** Invert sensor input **False:** Default polarity
			39.3	19.11	Res.
	Bool		39.4	19.12	**Left_Pin4:** Inversion of left sensor port PIN4 **True:** Invert sensor input **False:** Default polarity
			39.5	19.13	Res.

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Bool		39.6	19.14	**Right_Pin4:** Inversion of right sensor port PIN4 **True:** Invert sensor input **False:** Default polarity
			39.7	19.15	Res.
20	Dword	TrackingToDownstream	40.0 40.7	20.0 2015	You can use this DWord together with StatusToDownstream to send product tracking information to the downstream ZPA fieldbus controller
			41.0 41.7		
21			42.0 42.8	21.0 21.15	
			43.0 43.8		
22	DInt	ServoControlDistanceLeft	44.0 44.7	22.0 22.15	Target position value for left motor, absolute incremental value, 32 bit
23			45.0 45.15		
			46.0 46.7	23.0 23.15	
			47.0 47.7		
24	Word	ServoControlCommandLeft	48.0 48.7	24	Control word for positioning of left motor **Value 0x01:** Referencing, ServoDistance = set 0 **Value 0x02:** Move to setpoint position in ServoControlDistance
			49.0 49.7		
25	DInt	ServoControlDistanceLeft	50.0 50.7	25.0 25.15	Target position value for right motor, absolute incremental value, 32 bit
			51.0 51.7		
			52.0 52.7	26.0 26.15	
26			53.0 53.7		
27	Word	ServoControlCommandRight	54.0 54.7	27.0 27.15	Control word for positioning of right motor **Value 0x01:** Referencing, ServoDistance = set 0 **Value 0x02:** Move to setpoint position in ServoControlDistance
			55.0 55.7		

1) Impulses [inc]/motor revolution.

2) Flank control: The register is reset again after the reset (all bits = 0).

Reserved up to byte 63.

6.1.3 Input data "reduced PLC mode"

Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Struct	AllSensors	0.0 0.6	0.0 0.6	Res.
	Bool		0.7	0.7	**Heartbeat**
	Bool		1.0	0.8	**LeftPin2:** Status of the left sensor port (Pin2)
	Bool		1.1	0.9	Res.
	Bool		1.2	0.10	**RightPin2**: Status of the right sensor port (Pin2)
	Bool		1.3	0.11	Res.
	Bool		1.4	0.12	**LeftPin4**: Status of the left sensor port (Pin4)
	Bool		1.5	0.13	Res.
	Bool		1.6	0.14	**RightPin4**: Status of the right sensor port (Pin4)
	Bool		1.7	0.15	Res.
1	Struct	SensorDetect	2.0 2.7	1.0 1.7	Res.

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Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Bool		3.0	1.8	**RightSensorDetect**: If this bit is TRUE, a sensor was detected on the right sensor port (PIN4)
	Bool		3.1	1.9	**LeftSensorDetect**: If this bit is TRUE, a sensor was detected on the left sensor port (PIN4)
			3.2 3.7	1.10 1.15	Res.
2	Byte	LeftCalcTemp (LeftMDRStatus)	4.0 4.7	2.0 2.15	Calculated temperature of the left motor roller in °C
	Byte	ModuleTemp (LeftMDRStatus)	5.0 5.7		Temperature of the power section of the left drive axis, measured in °C
3	Struct Bool	LeftMDRDiagnostic (LeftMDRStatus)	6.0	3.0	**Overheat**: Overtemperature fault
	Bool		6.1	3.1	**MaxTorque**: Motor at current limit
	Bool		6.2	3.2	**ShortCircuit**: Motor short circuit
	Bool		6.3	3.3	**MDRNotConnected:** No motor is connected to the motor port
	Bool		6.4	3.4	**Overload**: Overload detected: Speed lowered to <10% of the setpoint speed due to the overload
	Bool		6.5	3.5	**Stalled**: Motor blockade detected
	Bool		6.6	3.6	**MDRBadHall:** Hall sensor fault
	Bool		6.7	3.7	**MDRNotUsed**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
	Bool		7.0	3.8	**MDRStatus Bit1**: Description of the 2-bit coded statuses
	Bool		7.1	3.9	**MDRStatus Bit2**: Description of the 2-bit coded statuses
	Bool		7.2	3.10	**MDRinDOmode**: Motor port is connected to the digital I/O mode
			7.3 7.5	3.11 3.13	Res.
	Bool		7.6	3.14	**OverVoltage**: Overvoltage fault
	Bool		7.7	3.15	**LowVoltage**: Undervoltage fault
4	Byte	RightCalcTemp (RightMDRStatus)	8.0 8.7	4.0 4.7	Calculated temperature of the right motor roller in °C
	Byte	ModuleTemp_1 (RightMDRStatus)	9.0 9.7	4.8 4.15	Temperature of the power section of the right drive axis in °C
5	Struct Bool	RightMDRDiagnostic (RightMDRStatus)	10.0	5.0	**Overheat**: Overtemperature fault
	Bool		10.1	5.1	**MaxTorque**: Motor at current limit
	Bool		10.2	5.2	**ShortCircuit**: Motor short circuit
	Bool		10.3	5.3	**MDRNotConnected:** No motor is connected to the motor port
	Bool		10.4	5.4	**Overload**: Overload detected
	Bool		10.5	5.5	**Stalled**: Motor blockade detected
	Bool		10.6	5.6	**MDRBadHall:** Hall sensor fault
	Bool		10.7	5.7	**MDRNotUsed**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
	Bool		11.0	5.8	**MDRStatus Bit1**: Description of the 2-bit coded statuses
	Bool		11.1	5.9	**MDRStatus Bit2**: Description of the 2-bit coded statuses
	Bool		11.2	5.10	**MDRinDOmode**: Motor port is connected to the digital I/O mode
			11.3 11.5	5.11 5.13	Res.
	Bool		11.6	5.14	**OverVoltage**: Overvoltage fault
	Bool		11.7	5.15	**LowVoltage**: Undervoltage fault

Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
6	Struct	LeftMDR_DIOstatus	12.0 12.3	6.0 6.3	Res.
	Bool		12.4	6.4	**ShortCircuit**: Short circuit between +24 V and Pin2/3/4
			12.2 12.7	6.5 6.7	Res.
			13.0 13.7	6.8 6.15	Res.
7	Struct	RightMDR_DIOstatus	14.0 14.3	7.0 7.3	Res.
	Bool		14.4	7.4	**ShortCircuit**: Short circuit between +24 V and Pin2/3/4
			14.5 14.7	7.5 7.7	Res.
			15.0 15.7	7.8 7.15	Res.

6.1.4 Output data "reduced PLC mode"

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Struct	LeftMDRasDIO	0.0 0.6	0.0 0.6	Res.
	Bool		0.7	0.7	**SetMotDIO:** Changeover of PIN 3/4 of the left motor port as a digital output **True:** Activate DIO mode **False:** Deactivate DIO mode
	Bool		1.0	0.8	Res.
	Bool		1.1	0.9	**DrivePIN4:** Set/reset digital output PIN4 **True:** Set digital output **False:** Reset digital output
	Bool		1.2	0.10	**DrivePIN3**: Set/reset digital output PIN3 **True:** Set digital output **False:** Reset digital output
			1.3 1.7	0.11 0.15	Res.
1	Struct	RightMDRasDIO	2.0 2.6	1.0 1.6	Res.
	Bool		2.7	1.7	**SetMotDIO**: Changeover of PIN 2/4 of the right motor port as a digital output **True:** Activate DIO mode **False:** Deactivate DIO mode
	Bool		3.0	1.8	**DrivePIN2:** Set/reset motor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
	Bool		3.1	1.9	Res.
	Bool		3.2	1.10	**DrivePIN3**: Set/reset digital output PIN3 **True:** Set digital output **False:** Reset digital output
			3.3 3.7	1.11 1.15	Res.
2	Struct	SensorPortsDo	4.0 4.7	2.0 2.7	Res.
	Bool		5.0	2.8	**DriveLeftPIN2:** Set/reset left sensor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
	Bool		5.1	2.9	**DriveRightPIN2:** Set/reset right sensor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
			5.2 5.4	2.10 2.12	Res.

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Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Bool		5.5	2.13	**SetLeftPIN2asDO:** Changeover of the left sensor port PIN2 as a digital output **True:** PIN2 = digital output (DO) **False:** PIN2 = digital input (DI)
	Bool		5.6	2.14	**SetRightPIN2asDO:** Changeover of the right sensor port PIN2 as a digital output **True:** PIN2 = digital output (DO) **False:** PIN2 = digital input (DI)
	Bool		5.7	2.15	Res.
3	Struct Bool	LeftMDRControl	6.0	3.0	**MDR_Direction**: Changeover of direction of rotation **True:** Direction of rotation ≠ default direction of rotation **False:** Default direction of rotation
			6.1 6.7	3.1 3.7	Res.
	Bool		7.0	3.8	**Run_MDR**: Enabling of motor, left **True:** Release **False:** Stop
			7.1 7.7	3.9 3.15	Res.
4	Struct Bool	RightMDRControl	8.0	4.0	**MDR_Direction**: Changeover of direction of rotation **True:** Direction of rotation ≠ default direction of rotation **False:** Default direction of rotation
			8.1 8.7	4.1 4.7	Res.
	Bool		9.0	4.8	**Run_MDR**: Enabling of motor, right **True:** Release **False:** Stop
			9.1 9.7	4.9 4.15	Res.
5	Int	LeftMDRSpeed	10.0 10.7	5.0 5.15	Speed/rotational speed of the left drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			11.0 11.7		
6	Int	RightMDRSpeed	12.0 12.7	6.0 6.15	Speed/rotational speed of the right drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			13.0 13.7		
7	Word	ClearMDRError	14.0 14.7	7.0 7.15	Fault reset **Value 0x01**: Reset[1)]
			15.0 15.7		

1) Flank control: The register must be reset again after the reset (all bits = 0).

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6.1.5 Input data "ZPA mode"

Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Byte	StateUpstreamZoneInverce	0.0 0.7	0.0 0.15	Status of the upstream zone of the fieldbus controller in ZPA mode with inverted direction of flow (current direction of flow ≠ configured direction of flow). Description of the transfered data corresponds to 1 byte (StateUpstreamZone)
	Byte	StateUpstreamZone	1.0 1.7		Status of the upstream zone of the fieldbus controller in ZPA mode: **Value 0x01 Empty**: There is no material to be conveyed in the zone and no material is arriving from the upstream zone (sensor free, motor not enabled) **Value 0x02 Accepting:** Zone is empty, but material to be conveyed is arriving from the upstream zone (sensor free, motor enabled) **Value 0x04**: **Full and Running**: There is material to be conveyed in the zone and it is being conveyed in the direction of the downstream zone (sensor occupied, motor enabled) **Value 0x05 Full and Stopped**: There is material to be conveyed in the zone and it is being accumulated there (sensor occupied, motor not enabled)
1	Byte	StateDownstreamZoneInverce	2.0 2.7	1.0 1.15	Status of the downstream zone of the fieldbus controller in ZPA mode with inverted direction of flow (current direction of flow ≠ configured direction of flow). Description of the transfered data corresponds to 1 byte (StateUpstreamZone)
	Byte	StateDownstreamZone	3.0 3.7		Status of the downstream zone of the fieldbus controller in ZPA mode: **Value 0x01 Empty**: There is no material to be conveyed in the zone and no material is arriving from the upstream zone (sensor free, motor not enabled) **Value 0x02 Accepting:** Zone is empty, but material to be conveyed is arriving from the upstream zone (sensor free, motor enabled) **Value 0x04 Full and Running**: There is material to be conveyed in the zone and it is being conveyed in the direction of the downstream zone (sensor occupied, motor enabled) **Value 0x05**: **Full and Stopped**: There is material to be conveyed in the zone and it is being accumulated there (sensor occupied, motor not enabled)
2	Int	ArrivalCounterUpstreamZone	4.0 4.7	2.0 2.15	This word is increased by 1 every time that material being conveyed arrives in the upstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			5.0 5.7		
3	Int	DisarrivalCounterUpstreamZone	6.0 6.7	3.0 3.15	This process data word is increased every time that material being conveyed leaves the upstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			7.0 7.7		
4	Int	ArrivalCounterDownstreamZone	8.0 8.7	4.0 4.15	This process data word is increased every time that material being conveyed arrives in the downstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			9.0 9.7		
5	Int	DisarrivalCounterDownstreamZone	10.0 10.7	5.0 5.15	This process data word is increased every time that material being conveyed leaves the downstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			11.0 11.7		

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Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
6	Struct Bool	Diagnostic	12.0	6.0	**LeftMDR_Overheat**: Overtemperature fault in left motor roller
	Bool		12.1	6.1	**LeftMDR_MaxTorque**: Motor at current limit
	Bool		12.2	6.2	**LeftMDR_Short**: Motor short circuit
	Bool		12.3	6.3	**LeftMDR_MDR_NotConn:** No motor is connected to the motor port
	Bool		12.4	6.4	**LeftMDR_Overload**: Overload detected
	Bool		12.5	6.5	**LeftMDR_Stalled**: Motor blockade detected
	Bool		12.6	6.6	**LeftMDR_BadHall:** Hall sensor fault
	Bool		12.7	6.7	**LeftMDR_NotUsed**: Zone was not configured in ZPA
	Bool		13.0	6.8	Res.
	Bool		13.1	6.9	Res.
	Bool		13.2	6.10	**OverVoltage**: Overvoltage error on left DC-AC inverter
	Bool		13.3	6.11	**LeftMDR_AnyErr**: Global error bit, left motor roller. Bits 0 – 10 indicate specific error
	Bool		13.4	6.12	**ConnectionsNotOK**: Faulty Ethernet connection
	Bool		13.5	6.13	**UpstreamJamErr:** Jam error in upstream zone
	Bool		13.6	6.14	**LeftSensLowGain:** Error in the left sensor
	Bool		13.7	6.15	**LowVoltage:** Undervoltage error (supply voltage < 18 V)
7	Struct Bool		14.0	7.0	**RightMDR_Overheat**: Overtemperature error in the right motor roller
	Bool		14.1	7.1	**RightMDR_MaxTorque**: Motor at current limit
	Bool		14.2	7.2	**RightMDR_Short**: Motor short circuit
	Bool		14.3	7.3	**RightMDR_MDR_NotConn:** No motor is connected to the motor port
	Bool		14.4	7.4	**RightMDR_Overload**: Overload detected
	Bool		14.5	7.5	**RightMDR_Stalled:** Motor blockade detected
	Bool		14.6	7.6	**RightMDR_BadHall:** Hall sensor fault
	Bool		14.7	7.7	**LeftMDR_NotUsed**: Zone was not configured in ZPA
	Bool		15.0	7.8	Res.
	Bool		15.1	7.9	Res.
	Bool		15.2	7.10	**OverVoltage**: Overvoltage error on right DC-AC inverter
	Bool		15.3	7.11	**RightMDR_AnyErr**: Global error bit, right motor roller. Bits 0 – 10 indicate specific error
	Bool		15.4	7.12	Res.
	Bool		15.5	7.13	**DownstreamJamErr:** Jam error in downstream zone
	Bool		15.6	7.14	**RightSensLowGain:** Error in the right sensor
	Bool		15.7	7.15	**LowVoltage:** Undervoltage error (supply voltage < 18 V)
8	Dword	TrackingUpstreamZone	16.0 16.7	8.0 8.15	Read ZPA tracking data of the upstream zone
			17.0 17.7		
9			18.0 18.7	9.0 9.15	
			19.0 19.7		
10	Dword	TrackingDownstreamZone	20.0 20.7	10.0 10.15	Read ZPA tracking data of the downstream zone
			21.0 21.7		
11			22.0 22.7	11.0 11.15	
			23.0 23.7		

Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
12	Int	ReleaseCounterUp-streamZone	24.0 24.7	12.0 12.15	Release of the counter of the upstream zone. Reflects the value in ReleaseControlUpstream
			25.0 25.7		
13	Int	ReleaseCounterDown-streamZone	26.0 26.7	13.0 13.15	Release of the counter of the downstream zone. Reflects the value in ReleaseControlUpstream
			27.0 27.7		
14	Dword	ModuleDischargeTracking	28.0 28.7	14.0 14.15	Read ZPA tracking data of the last zone. Tracking code of the material being transported that is currently being transfered to an adjacent section of the system (not part of the ECDriveS® conveyor line)
			29.0 29.7		
15			30.0 30.7	15.0 15.15	
			31.0 31.7		
16		ModuleDischargeTrackingIn-verse	32.0 32.7	16.0 16.15	Read ZPA tracking data of the last zone. Tracking code of the material being transported that is currently being transfered to an adjacent section of the system (not part of the ECDriveS® conveyor line) with inverted direction of flow (current direction of flow ≠ configured direction of flow)
			33.0 33.7		
17			34.0 34.7	17.0 17.15	
			35.0 35.7		
18	Struct	AllSensors	36.0 36.6	18.0 18.6	Res.
	Bool		36.7	18.7	**Heartbeat**
	Bool		37.0	18.8	**LeftPin2:** Status of the left sensor port (Pin2)
	Bool		37.1	18.9	Res.
	Bool		37.2	18.10	**RightPin2**: Status of the right sensor port (Pin2)
	Bool		37.3	18.11	Res.
	Bool		37.4	18.12	**LeftPin4**: Status of the left zone sensor port (Pin4)
	Bool		37.5	18.13	Res.
	Bool		37.6	18.14	**RightPin4**: Status of the right zone sensor port (Pin4)
	Bool		37.7	18.15	Res.
19	Word	Res.	38	19	
			39		
20	Struct Bool	Convey_stop_status	40.0	20.0	Res.
	Bool		40.1	20.1	Res.
	Bool		40.2	20.2	**StopActiveCommandPLC:** Fieldbus controller was given the status Stop by the PLC
			40.3 40.7	20.3 20.7	Res.
			41.0 41.4	20.8 20.12	Res.
	Bool		41.5	20.13	**StopActiveOtherModule:** A fieldbus controller in the Stop group currently has the status Stop. (If nec., declare as Res.)
	Bool		41.6	20.14	**StopActiveLostConn:** Communication connection lost. Fieldbus controller was given the status Stop
	Bool		41.7	20.15	**StopActiveLostPLC:** Missing connection to the PLC. Fieldbus controller was given the status Stop

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6.1.6 Output data "ZPA mode"

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Dword	InductTrackingOnUpstream	0.0 0.7	0.0 0.15	Tracking code (32 bit) for material being conveyed on upstream zone
			1.0 1.7		
1			2.0 2.7	1.0 1.15	
			3.0 3.7		
2	Dword	InductTrackingOnDownstream	4.0 4.7	2.0 2.15	Tracking code (32 bit) for material being conveyed on upstream zone
			5.0 5.7		
3			6.0 6.7	3.0 3.15	
			7.0 7.7		
4	Struct Bool	AccumulateControlUpstream	8.0	4.0	**AccumUpstreamToThisZone**: Jam material being conveyed in the upstream zone. Can be used when feeding in to hold the material being conveyed in the upstream zone during the feed-in procedure
	Bool		8.1	4.1	**FakeConfirm**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
			8.2 8.7	4.2 4.7	Res.
	Bool		9.0	4.8	**Accumulate**: Jam material being conveyed in this zone
			9.1 9.7	4.9 4.15	Res.
5	Struct Bool	AccumulateControlDown-stream	10.0	5.0	**AccumUpstreamToThisZone**: Jam material being conveyed in the upstream zone. Can be used when feeding in to hold the material being conveyed in the upstream zone during the feed-in procedure
	Bool		10.1	5.1	**FakeConfirm**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
			10.2 10.7	5.2 5.7	Res.
	Bool		11.0	5.8	**Accumulate**: Accumulate material being conveyed in this zone
			11.1 11.7	5.9 5.15	Res.
6	Int	LeftMDRSpeed	12.0 12.7	6.0 6.15	Speed/rotational speed of the left drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			13.0 13.7		
7	Int	LeftMDRSpeed	14.0 14.7	7.0 7.15	Speed/rotational speed of the right drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			15.0 15.7		

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Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
8	Int	ReleaseControlUpstream	16.0 16.7	8.0 8.15	Used to release material being conveyed that was accumulated in the upstream zone of the fieldbus controller. The Release command is dominant in relation to the Accumulate command. **Flank** Flank control. The values in this process data word can be selected freely. The control is activated as soon as a value is changed. Example: Flank 4-->5 = Release Flank 5-->6 = Release
			17.0 17.7		
9	Int	ReleaseControlDownstream	18.0 18.7	9.0 9.15	Used to release material being conveyed that was accumulated in the downstream zone of the fieldbus controller. The Release command is dominant in relation to the Accumulate command. Refer to ReleaseControlUpstream for a description
			19.0 19.7		
10	Word	InductControlState	20.0 20.7	10.0 10.15	**Upstream Wakeup:** Wakeup of the upstream zone when the material being conveyed is taken over by a system section that is not controlled with ECDriveS®. **Value 0x04**: Enabling of upstream zone **Value 0x01**: Stop of upstream zone
			21.0 21.7		
11	Word	DischargeControlState	22.0 22.7	11.0 11.15	**Downstream Lane Full:** Control of the downstream zone when the material being conveyed is taken over by a system section that is not controlled with ECDriveS®. **Value 0x05**: Jam product downstream **Value 0x01**: Release product downstream
			23.0 23.7		
12	Dword	ModuleInductTrackingOnInductSide	24.0 24.7	12.0 12.15	If material being conveyed is taken over from a system section that is not controlled with ECDriveS® by InductControlStage, the corresponding 32 bit tracking code can be written in ModuleInductTrackingOnInductSide. The tracking for this material being conveyed is started at the same time
			25.0 25.7		
13			26.0 26.7	13.0 13.15	
			27.0 27.7		
14	Dword	ModuleInductTrackingOnDischargeSide	28.0 28.7	14.0 14.15	Description corresponds to ModuleInductTrackingOnInductSide, but applies to the takeover of material being conveyed when the direction of flow is opposite to the configured direction of flow. Example: Material being conveyed was transfered by DischargeControlStage to an adjacent system section. The direction of flow is then changed and the material being conveyed is taken over by this zone
			29.0 29.7		
15			30.0 30.7	15.0 15.15	
			31.0 31.7		
16	Word	ClearMotorError	32.0 32.7	16.0 16.15	Error reset **Value 0x01**: Reset **Value 0x00**: Clear bits
			33.0 33.7		
17	Word	Res.	34.0 34.7	17.0 17.15	
			35.0 35.7		
18	Word	Res.	36.0 36.7	18.0 18.15	
			37.0 37.7		

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Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
19	Word	ConveyStopControl	38.0 38.7	19.0 19.15	**Value 0x01:** Fieldbus controller is given the status Stop **Value 0x02:** Stop status is reset for the fieldbus controller
			39.0 39.7		
20	Word	JamClearUpstream	40.0 40.7	20.0 20.15	Manual clearing of the jam error via PLC **Edge 0-->1:** Clearing of the jam error
			41.0 41.7		
21	Word	JamClearDownstream	42.0 42.7	21.0 21.15	Manual clearing of the jam error via PLC **Edge 0-->1:** Clearing of the jam error
			43.0 43.7		
22	Word	GlobalDirectionControlUpstream	44.0 44.7	22.0 22.15	Control of the change in the direction of flow and accumulation command for fieldbus controllers, upstream zone **LowByte Values** **Value 0x00**: Function deactivated **Value 0x01**: Accumulate group/individual module **Value 0x0A**: Reset to configured direction of flow **Value 0x0B**: Invert the direction of flow
			45.0 45.7		Number of fieldbus controllers whose settings are set in LowByte. **HighByte** Example: Activate accumulation for all fieldbus controllers: **0x0001** Activate accumulation for 3 fieldbus controllers: **0x0301**
23	Word	GlobalDirectionControlDownstream	46.0 46.7	23.0 23.15	Control of the change in the direction of flow and accumulation command for fieldbus controllers, downstream zone **LowByte Values** **Value 0x00**: Function deactivated **Value 0x01**: Accumulate group/individual module **Value 0x0A**: Reset to configured direction of flow **Value 0x0B**: Invert the direction of flow
			47.0 47.7		Number of fieldbus controllers whose settings are set in LowByte. **HighByte** Example: Activate accumulation for all fieldbus controllers: **0x0001** Activate accumulation for 3 fieldbus controllers: **0x0301**

Reserved up to byte 63.

6.1.7 Input data "reduced ZPA mode"

Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Byte	StateUpstreamZoneInverce	0.0 0.7	0.0 0.7	Status of the upstream zone of the fieldbus controller in ZPA mode with inverted direction of flow (current direction of flow ≠ configured direction of flow). Description of the transfered data corresponds to 1 byte (StateUpstreamZone)

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Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Byte	StateUpstreamZone	1.0 1.7	0.8 0.15	Status of the upstream zone of the fieldbus controller in ZPA mode: **Value 0x01 Empty**: There is no material to be conveyed in the zone and no material is arriving from the upstream zone (sensor free, motor not enabled) **Value 0x02 Accepting:** Zone is empty, but material to be conveyed is arriving from the upstream zone (sensor free, motor enabled) **Value 0x04 Full and Running**: There is material to be conveyed in the zone and it is being conveyed in the direction of the downstream zone (sensor occupied, motor enabled) **Value 0x05 Full and Stopped**: There is material to be conveyed in the zone and it is being accumulated there (sensor occupied, motor not enabled)
1	Byte	StateDownstreamZoneInverce	2.0 2.7	1.0 1.7	Status of the downstream zone of the fieldbus controller in ZPA mode with inverted direction of flow (current direction of flow ≠ configured direction of flow). Description of the transfered data corresponds to 1 byte (StateDownstreamZone)
	Byte	StateDownstreamZone	3.0 3.7	1.8 1.15	Status of the downstream zone of the fieldbus controller in ZPA mode: **Value 0x01 Empty** : There is no material to be conveyed in the zone and no material is arriving from the upstream zone (sensor free, motor not enabled) **Value 0x02 Accepting:** Zone is empty, but material to be conveyed is arriving from the upstream zone (sensor free, motor enabled) **Value 0x04 Full and Running**: There is material to be conveyed in the zone and it is being conveyed in the direction of the downstream zone (sensor occupied, motor enabled) **Value 0x05 Full and Stopped**: There is material to be conveyed in the zone and it is being accumulated there (sensor occupied, motor not enabled)
2	Int	ArrivalCounterUpstreamZone	4.0 4.7	2.0 2.15	This process data word is increased every time that new material being conveyed arrives in the upstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			5.0 5.7		
3	Int	DisarrivalCounterUpstreamZone	6.0 6.7	3.0 3.15	This process data word is increased every time that material being conveyed leaves the upstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			7.0 7.7		
4	Int	ArrivalCounterDownstreamZone	8.0 8.7	4.0 4.15	This process data word is increased every time that new material being conveyed arrives in the downstream zone. When the value 65535 is reached, the transfer is performed and the counter is reset to 0
			9.0 9.7		
5	Int	DisarrivalCounterDownstreamZone	10.0 10.7	5.0 5.15	This process data word is increased every time that material being conveyed leaves the downstream zone. The overflow takes place when the value 65535 is reached. The counter is reset to 0
			11.0 11.7		
6	Struct Bool	Diagnostic	12.0	6.0	**LeftMDR_Overheat**: Overtemperature fault in left motor roller
	Bool		12.1	6.1	**LeftMDR_MaxTorque**: Motor at current limit
	Bool		12.2	6.2	**LeftMDR_Short**: Motor short circuit
	Bool		12.3	6.3	**LeftMDR_MDR_NotConn**: No motor is connected to the motor port

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Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Bool		12.4	6.4	**LeftMDR_Overload**: Overload detected
	Bool		12.5	6.5	**LeftMDR_Stalled**: Motor blockade detected
	Bool		12.6	6.6	**LeftMDR_BadHall:** Hall sensor fault
	Bool		12.7	6.7	**LeftMDR_NotUsed**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
	Bool		13.0	6.8	Res.
	Bool		13.1	6.9	Res.
	Bool		13.2	6.10	**OverVoltage**: Overvoltage error, left DC-AC inverter
	Bool		13.3	6.11	**LeftMDR_AnyErr**: Global error bit, left motor roller. Bits 0 – 10 indicate specific error
	Bool		13.4	6.12	**ConnectionsNotOK**: Faulty Ethernet connection
	Bool		13.5	6.13	**UpstreamJamErr:** Jam error in upstream zone
	Bool		13.6	6.14	**LeftSensLowGain:** Error in the left sensor
	Bool		13.7	6.15	**LowVoltage:** Undervoltage error (supply voltage < 18 V)
7	Struct Bool		14.0	7.0	**RightMDR_Overheat**: Overtemperature error in the right motor roller
	Bool		14.1	7.1	**RightMDR_MaxTorque**: Motor at current limit
	Bool		14.2	7.2	**RightMDR_Short**: Motor short circuit
	Bool		14.3	7.3	**RightMDR_MDR_NotConn:** No motor is connected to the motor port
	Bool		14.4	7.4	**RightMDR_Overload**: Overload detected
	Bool		14.5	7.5	**RightMDR_Stalled**: Motor blockade detected
	Bool		14.6	7.6	**RightMDR_BadHall:** Hall sensor fault.
	Bool		14.7	7.7	**RightMDR_NotUsed**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
	Bool		15.0	7.8	Res.
	Bool		15.1	7.9	Res.
	Bool		15.2	7.10	**OverVoltage**: Overvoltage error on right DC-AC inverter
	Bool		15.3	7.11	**RightMDR_AnyErr**: Global error bit, right motor roller. Bits 0 – 10 indicate specific error
	Bool		15.4	7.12	Res.
	Bool		15.5	7.13	**DownstreamJamErr:** Jam error in downstream zone
	Bool		15.6	7.14	**RightSensLowGain:** Error in the right sensor
	Bool		15.7	7.15	**LowVoltage1:** Undervoltage error (supply voltage < 18 V)
8	Int	ReleaseCounterUp-streamZone	16.0 16.7	8.0 8.15	Release of the counter of the upstream zone. Reflects the value in ReleaseControlUpstream
			17.0 17.7		
9	Int	ReleaseCounterDown-streamZone	18.0 18.7	9.0 9.15	Release of the counter of the upstream zone. Reflects the value in ReleaseControlDownstream
			19.0 19.7		
10	Struct	AllSensors	20.0 20.6	10.0 10.6	Res.
	Bool		20.7	10.7	**Heartbeat**
	Bool		21.0	10.8	**LeftPin2:** Status of the left sensor port (Pin2)
	Bool		21.1	10.9	Res.
	Bool		21.2	10.10	**RightPin2**: Status of the right sensor port (Pin2)
	Bool		21.3	10.11	Res.
	Bool		21.4	10.12	**LeftPin4**: Status of the left zone sensor port (Pin4)
	Bool		21.5	10.13	Res.
	Bool		21.6	10.14	**RightPin4**: Status of the right zone sensor port (Pin4)
	Bool		21.7	10.15	Res.

6.1.8 Output data "reduced ZPA mode"

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0		AccumulateControlUpstream	0.0	0.0	**AccumUpstreamToThisZone**: Jam material being conveyed in the upstream zone. Can be used when feeding in to hold the material being conveyed in the upstream zone during the feed-in procedure
			0.1	0.1	**FakeConfirm**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
			0.2 0.7	0.2 0.7	
			1.0	0.8	**Accumulate**: Jam material being conveyed in this zone
			1.1 1.7	0.9 0.15	Res.
1		AccumulateControlDown-stream	2.0	1.0	**AccumUpstreamToThisZone**: Jam material being conveyed in the upstream zone. Can be used when feeding in to hold the material being conveyed in the upstream zone during the feed-in procedure
			2.1	1.1	**FakeConfirm**: Interruptflag. Used to avoid a jam error if, for example, material being conveyed is removed from a removal buffer during ongoing operation
			2.2 2.7	1.2 1.7	Res.
			3.0	1.8	**Accumulate**: Jam material being conveyed in this zone
			3.1 3.7	1.9 1.15	Res.
2	Int	LeftMDRSpeed	4.0 4.7	2.0 2.15	Speed/rotational speed of the left drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			5.0 4.7		
3	Int	LeftMDRSpeed	6.0 6.7	3.0 3.15	Speed/rotational speed of the right drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			7.0 7.7		
4	Int	ReleaseControlUpstream	8.0 8.7	4.0 4.15	Used to release material being conveyed that is accumulated in the upstream zone of the fieldbus controller. The Release command is dominant in relation to the Accumulate command. **Flank** Flank control. The values in this process data word can be selected freely. The control is activated as soon as a value is changed. Example: 4-->5 = Release 5-->6 = Release
			9.0 9.7		
5	Int	ReleaseControlDownstream	10.0 10.7	5.0 5.15	Used to release material being conveyed that is accumulated in the downstream zone of the fieldbus controller. The Release command is dominant in relation to the Accumulate command. **Flank** Flank control. The values in this process data word can be selected freely. The control is activated as soon as a value is changed. Example: 4-->5 = Release 5-->6 = Release
			11.0 11.7		

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Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
6	Word	InductControlState	12.0 12.7	6.0 6.15	Upstream Wakeup: Wakeup of the upstream zone when the material being conveyed is taken over by a system section that is not controlled with ECDriveS®. **Value 0x04**: Enabling of upstream zone **Value 0x01**: Stop of upstream zone
			13.0 13.7		
7	Word	DischargeControlState	14.0 14.7	7.0 7.15	Downstream Lane Full: Control of the downstream zone when the material being conveyed is taken over by a system section that is not controlled with ECDriveS®. **Value 0x05**: Jam product downstream **Value 0x01**: Release product downstream
			15.0 15.7		
8	Word	ClearMotorError	16.0 16.7	8.0 8.15	Error reset **Value 0x01**: Reset **Value 0x00**: Clear bits
			17.0 17.7		
9	Word	Res.	18.0 18.7	9.0 9.15	
			19.0 19.7		
10	Word	Res.	20.0 20.7	10.0 10.15	
			21.0 21.7		
11	Word	JamClearUpstream	22.0 22.7	11.0 11.15	Manual clearing of the jam error via PLC **Edge 0-->1:** Clearing of the jam error
			23.0 23.7		
12	Word	JamClearDownstream	24.0 24.7	12.0 12.15	Manual clearing of the jam error via PLC **Edge 0-->1:** Clearing of the jam error
			25.0 25.7		
13	Word	GlobalDirectionControlUp-stream	26.0 26.7	13.0 13.15	Control of the change in the direction of flow and accumulation command for fieldbus controllers in the upstream zone. **Low-Byte Values** **Value 0x00**: Function deactivated **Value 0x01**: Accumulate group/individual module **Value 0x0B**: Reset to configured direction of flow **Value 0x0A**: Invert the direction of flow
			27.0 27.7		Number of fieldbus controllers whose settings are set in LowByte. **HighByte** Example: Activate accumulation for all fieldbus controllers: **0x0001** Activate accumulation for 3 fieldbus controllers: **0x0301**
14	Word	GlobalDirectionControlDown-stream	28.0 28.7	14.0 14.15	Control of the change in the direction of flow and accumulation command for fieldbus controllers in the downstream zone. **Low-Byte Values** **Value 0x00**: Function deactivated **Value 0x01**: Accumulate group/individual module **Value 0x0B**: Reset to configured direction of flow **Value 0x0A**: Invert the direction of flow
			29.0 29.7		Number of fieldbus controllers whose settings are set in LowByte. **HighByte** Example: Activate accumulation for all fieldbus controllers: **0x0001** Activate accumulation for 3 fieldbus controllers: **0x0301**

6.1.9 Input data "4PDW PLC mode"

Process data word [PI]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Struct Bool	LeftSideStatus	0.0	0.0	**Overheat**: Overtemperature fault The temperature of the left motor roller exceeded 105 °C
	Bool		0.1	0.1	**MaxTorque**: Motor at current limit
	Bool		0.2	0.2	**ShortCircuit**: Motor short circuit. There is a short circuit in the left motor roller
	Bool		0.3	0.3	**MDRNotConnected**: No motor is connected to the left motor port
	Bool		0.4	0.4	**Overload**: Overload detected. Speed lowered to <10% of the setpoint speed due to the overload
	Bool		0.5	0.5	**Stalled**: Motor blockade detected
	Bool		0.6	0.6	**MDRBadHall**: Hall sensor fault.
	Bool		0.7	0.7	**LeftMDRAnyError**
	Bool		1.0	0.8	**MDRStatus1:** Description of the 2-bit coded statuses
	Bool		1.1	0.9	**MDRStatus2:** Description of the 2-bit coded statuses
	Bool		1.2	0.10	**Heartbeat**
	Bool		1.3	0.11	**LeftPin2**: Status of the left sensor port (Pin2)
	Bool		1.4	0.12	**LeftPin4**: Status of the right sensor port (Pin4)
	Bool		1.5	0.13	**LeftSensorDetect**: If this bit is TRUE, a sensor was detected on the left sensor port (PIN4)
	Bool		1.6	0.14	**OverVoltage**: Overvoltage fault
	Bool		1.7	0.15	**LowVoltage**: Undervoltage fault
1	Struct Bool	RightSideStatus	2.0	1.0	**Overheat**: Overtemperature fault The temperature of the right motor roller exceeded 105 °C
	Bool		2.1	1.1	**MaxTorque**: Motor at current limit
	Bool		2.2	1.2	**ShortCircuit**: Motor short circuit. There is a short circuit in the right motor roller
	Bool		2.3	1.3	**MDRNotConnected**: No motor is connected to the right motor port
	Bool		2.4	1.4	**Overload**: Overload detected. Speed lowered to <10% of the setpoint speed due to the overload
	Bool		2.5	1.5	**Stalled**: Motor blockade detected
	Bool		2.6	1.6	**MDRBadHall**: Hall sensor fault.
	Bool		2.7	1.7	**LeftMDRAnyError**
	Bool		3.0	1.8	**MDRStatus1**: Description of the 2-bit coded statuses
	Bool		3.1	1.9	**MDRStatus2:** Description of the 2-bit coded statuses
	Bool		3.2	1.10	**Heartbeat**
	Bool		3.3	1.11	**RightPin2**: Status of the left sensor port (Pin2)
	Bool		3.4	1.12	**RightPin4**: Status of the right sensor port (Pin4)
	Bool		3.5	1.13	**RightSensorDetect**: If this bit is TRUE, a sensor was detected on the left sensor port (PIN4)
	Bool		3.6	1.14	**OverVoltage**: Overvoltage fault
	Bool		3.7	1.15	**LowVoltage**: Undervoltage fault
2	Word	IW1	4	2	Input word is configurable
			5		
3	Word	IW2	6	3	Input word is configurable
			7		

6.1.10 Output data "4PDW PLC mode"

Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
0	Struct Bool	Control	0.0	0.0	**LeftMDRRun:** Enabling of motor, left **True:** Release **False:** Stop

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Process data word [PO]	Data type	Designation	Bytewise notation [byte.bit]	Wordwise notation [word.bit]	Description
	Bool		0.1	0.1	**LeftMDRDirection:** Changeover of direction of rotation **True:** Direction of rotation ≠ default direction of rotation **False:** Default direction of rotation
	Bool		0.2	0.2	**RightMDRRun:** Enabling of motor, right **True:** Release **False:** Stop
	Bool		0.3	0.3	**RightMDRDirection:** Changeover of direction of rotation **True:** Direction of rotation ≠ default direction of rotation **False:** Default direction of rotation
	Bool		0.4	0.4	**LeftPin2SetOutput:** Changeover of the left sensor port PIN2 as a digital output **True:** PIN2 = digital output (DO) **False:** PIN2 = digital input (DI)
	Bool		0.5	0.5	**LeftPin2Drive:** Set/reset left sensor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
	Bool		0.6	0.6	**RightPin2SetOutput**: Changeover of the left sensor port PIN2 as a digital output **True:** PIN2 = digital output (DO) **False:** PIN2 = digital input (DI)
	Bool		0.7	0.7	**RightPin2Drive:** Set/reset right sensor port digital output PIN2 **True:** Set digital output **False:** Reset digital output
	Bool		1.0	0.8	**ClearMDRError**: Fault reset
	Bool		1.1	0.9	**LeftPin2Polarity:** Inversion of left sensor port PIN2 **True:** Invert sensor input **False:** Standard polarity
	Bool		1.2	0.10	**RightPin2Polarity:** Inversion of right sensor port PIN2 **True:** Invert sensor input **False:** Standard polarity
	Bool		1.3	0.11	**LeftPin4Polarity:** Inversion of left sensor port PIN4 **True:** Invert sensor input **False:** Standard polarity
	Bool		1.4	0.12	**RightPin4Polarity:** Inversion of right sensor port PIN4 **True:** Invert sensor input **False:** Standard polarity
	Bool		1.5	0.13	Res.
	Bool		1.6	0.14	Res.
	Bool		1.7	0.15	Res.
1	Word	LeftMDRSpeed	2	1	Speed/rotational speed of the left drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			3		
2	Word	RightMDRSpeed	4	2	Speed/rotational speed of the right drive with ECR: v(ECR) [m/s]×1000 with ECG: v(ECG) [rpm]×10
			5		
3	Word	QW3	6	3	Output word is configurable
			7		

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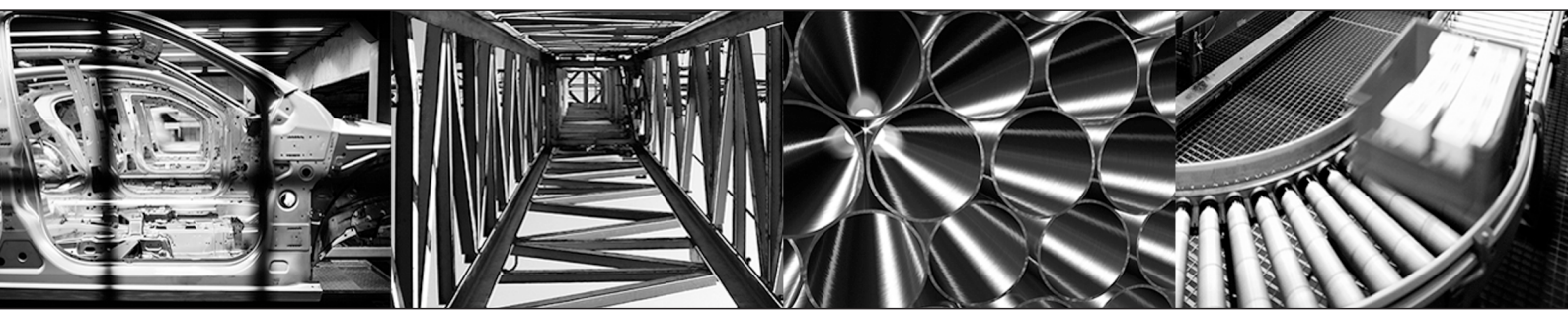

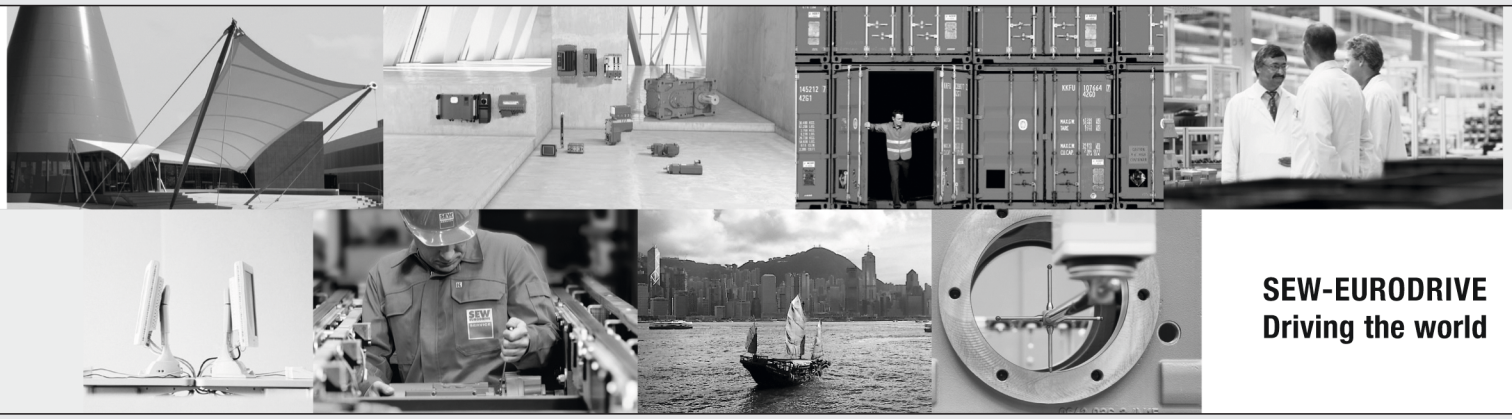

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