

# SmartWire-DT® Gateway EU5C-SWD-DP



*Powering Business Worldwide*

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### **Original operating manual**

The German-language edition of this document is the original operating manual.

### **Translation of the original operating manual**

All editions of this document other than those in German language are translations of the original operating manual.

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See list of revisions in chapter "About this manual"

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Subject to alteration.



## **Danger!** **Dangerous electrical voltage!**

---

### **Before commencing the installation**

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally retriggered
- Verify isolation from the supply
- Earth and short-circuit
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA/IL) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50 110-1/-2 (VDE 0105 Part 100) may work on this device/ system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalizing. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional actuation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation device.
- Ensure a reliable electrical isolation of the low voltage for the 24 V supply. Only use power supply units complying with IEC 60 364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the nominal value must not exceed the tolerance limits given in the technical data, otherwise this may cause malfunction and dangerous operation.
- Emergency switching off devices complying with IEC/EN 60 204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency switching off devices must not cause restart.
- Built-in devices for enclosures or cabinets must only be run and operated in an installed state, desk-top devices or portable devices only when the housing is closed.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency switching off devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks, etc.).



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## 0 About this Manual

This manual describes the installation, commissioning and programming of the following SmartWire-DT gateway

- EU5C-SWD-DP

The SmartWire-DT (SWD) communication system provides electromechanical switchgear and pilot devices with communication capabilities.

### Support Center

The latest version of this manual can be found in other languages on the Internet by visiting our Support Center at:

<http://www.moeller.net/en/support>

By entering the search keyword "Gateway" or "SWD" into the quick search or by entering the document designation, e.g. MN05002002Z-DE.

Basic information concerning the SmartWire-DT topic can be found in:

- "SmartWire-DT The System", MN05006002Z-EN
- "SmartWire-DT Modules", MN05006001Z-EN

You can find further information on the topics SmartWire-DT and the SmartWire-DT modules in the following documents:

- Manual "XIOC signal modules", MN05002002Z-DE
- Instructional leaflet „EU5C-SWD...“, IL05006001Z-DE

The standard GSD files can also be found in our Support Center by entering "SWD" as a search term.

### Download Center

The XSoft-CoDeSys-2 software described in this manual, as well as the SWD-Assist engineering tool, can be downloaded by visiting the Eaton Download Center at:

<http://www.eaton-automation.com>

## 0.1 List of revisions

This is a fully revised version. and replaces version 09/11 of MN05013002Z. In contrast to previous versions, which described SmartWire-DT gateways for various field buses, this version only covers one single SmartWire-DT gateway. The following table show the most important changes that have been made in terms of content:

Publication date	Page(s)	Subject	New	Modified	Omitted
01/13	67	„Online replacement" device parameter"	✓		

## 0 About this Manual

### 0.2 Target group

#### 0.2 Target group

This manual is intended for automation technicians and engineers.

Extensive knowledge of how to work with the field bus being used, as well as familiarity with the SmartWire-DT system, will make it easier to understand the contents of this manual.

A specialist knowledge of electrical engineering is needed for commissioning and programming.

#### 0.3 Exclusion of liability

All information in this operator manual was provided by us to the best of our knowledge and belief and in accordance with the current state-of-the-art. However, this does not exclude the possibility of inaccuracies so that we cannot accept any liability for the accuracy and completeness of the information. In particular, this information does not guarantee any particular properties.

The devices described here must only be set up and operated as specified in this manual and in the installation instructions provided with the device. The devices must be installed, commissioned, operated, maintained, and retrofitted by qualified people only. The devices must only be used in the recommended areas and only in conjunction with third-party devices and components that have been approved by us. Only use is technically faultless condition is permitted. Fault-free and safe operation of the system requires proper transport, storage, installation and commissioning as well as careful operation and maintenance. If the following safety instructions are not observed, particularly with regard to commissioning and maintenance of the devices by insufficiently qualified personnel and/or in the event of improper use of the devices, any hazards caused by the devices cannot be excluded. We assume no liability for any injury or damages incurred.

#### 0.4 Device designations and abbreviations

- GDS - device master data

Following designations XSoft-CoDeSys-2 are used:

- Module - SWD module
- Station - Coordinator
- Station address - Address of the field bus module



## 0.5 Reading conventions

Symbols used in this manual have the following meanings:



### **DANGER**

Warns of hazardous situations that result in serious injury or death.



### **CAUTION**

Warns of the possibility of hazardous situations that could result in slight injury or even death.

### **NOTICE**

Warns about the possibility of material damage.



Indicates useful tips.

- ▶ Indicates instructions to be followed.

For greater clarity, the name of the current chapter and the name of the current section are shown at the top of each page.

0 About this Manual  
0.5 Reading conventions

## 1 SmartWire-DT Gateway® EU5C-SWD-DP

### 1.1 Proper use

EU5C-SWD-DP SmartWire-DT gateways are used to establish a connection between a SmartWire-DT line, together with its SmartWire-DT modules, and a higher-level controller.

SmartWire-DT is not designed for transmitting safety-relevant signals and must not be used as a replacement for controllers such as burner, crane, and two-hand safety controllers.

Despite the above, SmartWire-DT can be used in applications with safety categories of up to 3, PL d as per EN ISO 13849-1 and SIL Cl2 as per EN 62061 if specific add-ons are incorporated. For more information, please consult manual "SmartWire-DT Modules", MN05006001Z-EN.

### 1.2 Overview of functions

EU5C-SWD-DP gateways are used to connect a SmartWire-DT line with PROFIBUS-DP and make it possible to access the data of up to 58 SmartWire-DT modules. These gateways can be integrated as modular field bus modules into control systems that use this type of communications. This makes it possible to access the data of every individual module from the controller.

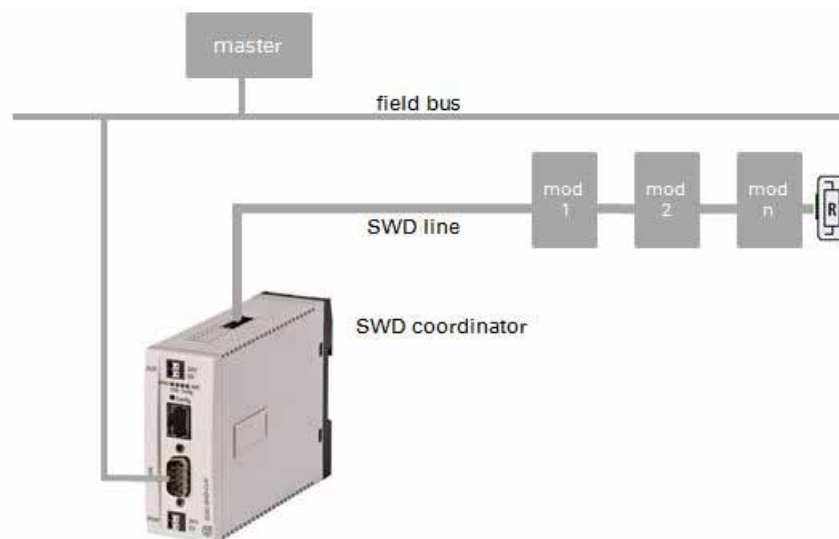


Figure 1: Connecting the field bus and SmartWire-DT with a gateway

The integrated Ethernet switch on the device is used to connect Standard 9-pin D-sub socket. The SmartWire-DT line, along with its modules, is connected to the gateway. The ribbon cable, with the SWD modules and all connection components - such as blade terminals and external device plugs - is referred to as the "SWD line."

# 1 SmartWire-DT Gateway® EU5C-SWD-DP

## 1.3 Versions

Terminals for two 24-V power supplies are available: POW for the gateway and the SmartWire-DT modules and AUX for powering the contactor coils if these are also operated via SmartWire-DT modules.

The 8-pin ribbon cable is used to run data communications, as well as the power for the SmartWire-DT modules and the contactor coils, from the gateway to the modules.

The diagnostic port is used to connect to a computer in order to run the SWD assist planning and commissioning program.

When working with an EU5C-SWD-DP gateway, this interface can be used to update the operating system by using SWD assist.

## 1.3 Versions

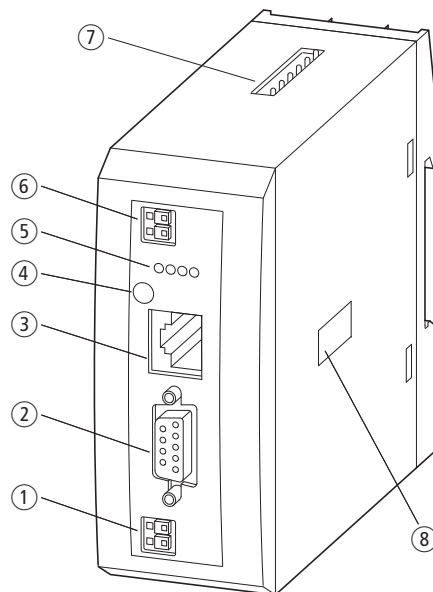


Figure 2: Front view  
EU5C-SWD-DP

- ① Power supply, 24 V DC POW
- ② Fieldbus interface
- ③ Diagnostics interface
- ④ Configuration buttons
- ⑤ LED indicators: POW, DP, Config, SWD
- ⑥ Power supply, 24 V DC AUX
- ⑦ SmartWire-DT connection
- ⑧ Dip switch for address setting

### 1.4 Important data for engineering

In connection with the SmartWire-DT modules, the gateway appears as a modular module on the relevant field bus. The following gateway can be run on the field buses specified below:

Gateway	Fieldbus
EU5C-SWD-DP	PROFIBUS-DP

Each SmartWire-DT module is presented as a separate module, with its data, to the field bus master.

The following number of SmartWire-DT modules is the maximum number that can be run on the gateway:

Gateway	Maximum number of modules at the SWD line
EU5C-SWD-DP	58

Make sure to take the maximum volume of data that can be transmitted on the field bus into account. The corresponding limit will be defined by the field bus.

Field bus-slave	Max. input data [Byte]	Max. output data [Byte]
PROFIBUS-DP	240	240



Information about the volume of input and output data of an SWD module is provided in the Appendix of the manual "SmartWire-DT Modules", MN05006001Z-EN.

The SmartWire-DT line may be extended up to 600 m.

#### 1.4.1 Field bus connection

The connection to the gateway uses a 9-pin D-sub socket. A standard PROFIBUS plug, e.g., ZB4-209-DS2, is used to connect to the field bus. This plug features an integrated bus termination resistor that can be enabled and disabled.

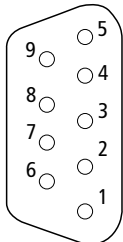
PROFIBUS-DP	SUB-D socket	Signal
	3	RxD/TxD-P
	4	CNTR-P
	5	DGND
	6	VP (+5 V DC)
	8	RxD/TxD-N

Figure 3: Pinout for the PROFIBUS-DP terminal socket on the gateway

# 1 SmartWire-DT Gateway® EU5C-SWD-DP

## 1.4 Important data for engineering

### 1.4.2 Baud rate

The gateway supports operation with the relevant field bus masters up to the following Baud rate:

Fieldbus	Maximum data baud rate in MBit/s
PROFIBUS-DP	12

The unit will adapt to the field bus master's Baud rate automatically.

### 1.4.3 Valid device field bus addresses

Data bus	Address	Address setting with dip switch	Valid address range
PROFIBUS-DP	Slave address	2 - 8	1 - 125

## 2 Installation

SWD gateways must only be installed and wired up by qualified electricians or other persons familiar with electrical engineering.

The SWD gateway is installed in the following order:

- Adjust the field bus adresse at the device.
- If the SWD gateway is the first or last module on the PROFI-BUS-DP field bus, activate a bus termination resistor.
- Mount the device.
- Connect the power supply.
- Connect the SmartWire-DT line.
- Connect the field bus.

### 2.1 Setting the gateway's field bus address

Before mounting the device, set the field bus address by using the DIP switches (DIP = Dual Inline Package). The DIP switches are located under a cover on the right side of the gateway.

**NOTICE**

Changes made to the dip switches' settings will take effect only after the power supply is turned off and back on again.

Follow the example below in order to configure an address on the gateway - 18 (decimal) is used as an example in this case:

$$18_{\text{dec}} = 16 + 2 = 1 \cdot 2^4 + 1 \cdot 2^1$$

The address is to be set at the dip switches.

for EU5C-SWD-DP the following applies:

- ▶ Use DIP switches 2–8 to set the PROFIBUS module address. For a list of valid addresses, refer to → Section “1.4.3 Valid device field bus addresses”, page 10.

DIP Switch								Description
1	2	3	4	5	6	7	8	
$2^7$	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$	
OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	Setting the gateway's field bus address to a value of $18_{\text{dec}}$

## 2 Installation

### 2.2 Activating the bus termination resistor for PROFIBUS-DP

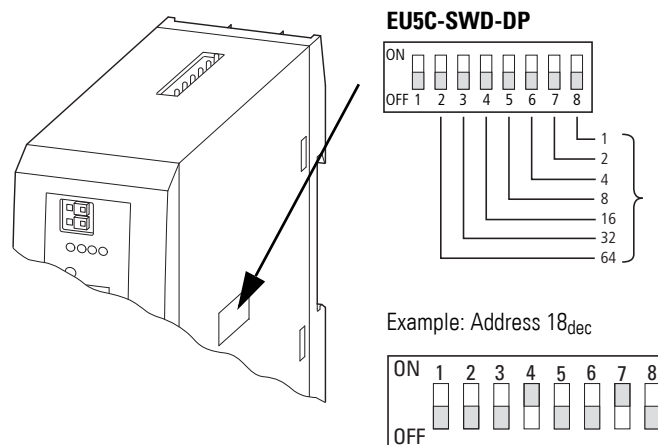


Figure 4: Setting the field bus address on an EU5C-SWD-DP gateway

### 2.2 Activating the bus termination resistor for PROFIBUS-DP

If the EU5C-SWD-DP gateway is the first or last field bus module, a bus termination resistor must be connected externally. This resistor can either be a separate bus termination resistor or a special D-sub plug with an integrated bus termination resistor, e.g., ZB4-209-DS2. This plug has an integrated bus termination resistor that can be enabled and disabled.

### 2.3 Mounting Considerations

Install the EU5C-SWD-DP gateway in a control cabinet, a panelboard, or an enclosure in such a way that the power supply and terminal connections cannot be touched accidentally during operation. Snap the device onto an IEC/EN 60715 top-hat rail or fix it in place using fixing brackets. EU5C-SWD-DP gateways can be mounted either vertically or horizontally.

For ease of wiring, leave a clearance of at least 3 cm between the device terminals and the wall or adjacent devices.

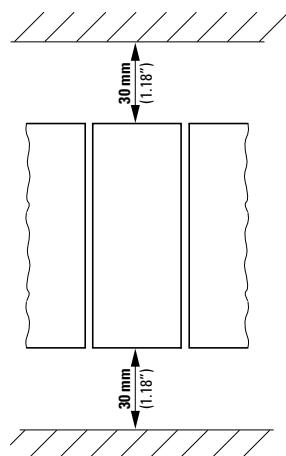


Figure 5: Vertical mounting

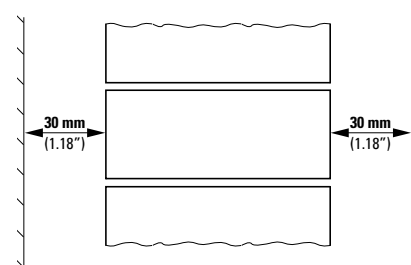


Figure 6: Horizontal mounting



### 2.3.1 Mounting the EU5C-SWD-DP gateway on a top-hat rail

Before mounting the device, make sure that you have set the device's field bus address and, if necessary, that the bus termination resistor (if any) has been activated with the corresponding DIP switch.

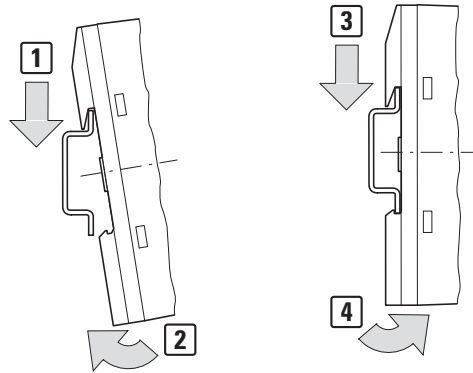


Figure 7: Mounting on top-hat rail

- ▶ Place the EU5C-SWD-DP gateway on the top-hat rail's upper edge in an inclined position. Lightly push the device down and against the top-hat rail until it snaps into place over the top-hat rail's lower edge.

The spring mechanism will make the EU5C-SWD-DP gateway automatically lock into place.

- ▶ Check that the gateway is seated firmly.

The device is mounted vertically on a top-hat rail in the same way.

### 2.3.2 Screwing the EU5C-SWD-DP gateway into place

For screw fixing, you will need two fixing brackets that can be used on the back of the EU5C-SWD-DP gateway. Fixing brackets ZB4-101-GF1 are available as accessories.

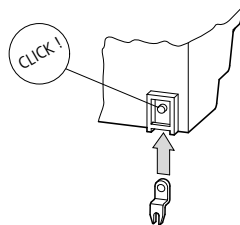


Figure 8: Inserting a fastening bracket

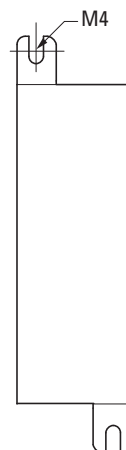


Figure 9: EU5C-SWD-DP screw fixing

## 2 Installation

### 2.4 Potential Relationship between the Components

#### **2.4 Potential Relationship between the Components**

The entire SmartWire-DT system operates on a common supply voltage. Provide a common star point for the earth wiring. In this way the various modules in the SmartWire-DT system will not be electrically isolated from one another. The field bus and the SmartWire-DT system are electrically isolated from one another.

## 2.5 Connecting the power supply



### DANGER

In safety-relevant applications the power supply providing power to the SmartWire-DT system must feature a PELV power supply unit (protective extra low voltage).



### DANGER

The gateway has protection against polarity reversal for the 24-V-DC-POW supply. If, however, the gateway is connected to a grounded device, e.g., a computer, via the diagnostic interface, the gateway may be destroyed if the polarity of the power supply is reversed!

The gateway and the SmartWire-DT modules are powered via the POW terminals. The Gateway uses the voltage at POW to generate the 15-V supply voltage for the SmartWire-DT modules with a maximum output current of 0.7 A.

If loads or contactor modules are also connected via the SWD line, the 24-VDC control voltage for the loads must be supplied in addition to the device supply voltage. The AUX terminals are used for this purpose.

Take into account the total power consumption and the voltage drop in your SWD line and, if necessary, include additional supply units, such as power feeder modules, in your design. The SWD assist software program will provide support when you are carrying out the corresponding calculations. In addition, it will automatically let you know if additional power supply modules are required for your design.

The manual "SmartWire-DT The System", MN05006002Z-EN, contains detailed calculation examples.

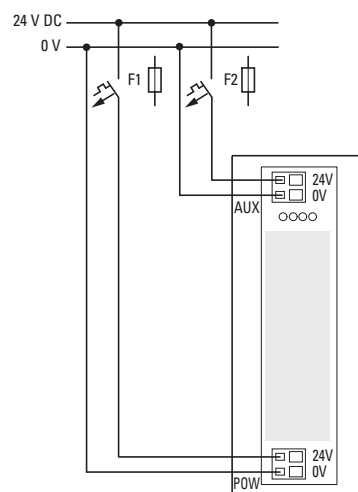


Figure 10: Connection of power supply

## 2 Installation

### 2.5 Connecting the power supply

- ▶ Connect the 24 V DC voltage to the connection terminals POW on the front side of the gateway.
- ▶ If necessary, connect the 24 VDC voltage for the contactor coils to the AUX terminals.
- ▶ Connect the POW and AUX supply voltages via separate miniature circuit-breakers or fuses.

#### **Miniature circuit-breaker F1 for POW**

- Cable protection in accordance with DIN VDE 0641 Part 11, IEC/EN 60898:
  - Miniature circuit-breaker 24 V DC rated operational current 3 A; trip type C or
  - Fuse 3 A, utilization class gL/gG
- Cable protection for cable AWG 24 in accordance with UL 508 and CSA-22.2 no. 14:
  - Miniature circuit-breaker 24 V DC rated operational current 3 A; trip type C or
  - Fuse 3 A

#### **Miniature circuit-breaker F2 for AUX**

- Cable protection in accordance with DIN VDE 0641 Part 11, IEC/EN 60898:
  - Miniature circuit-breaker 24 V DC rated operational current 3 A; trip type Z or
  - Fuse 3 A, utilization class gL/gG
- Cable protection for cable AWG 24 in accordance with UL 508 and CSA-22.2 no. 14:
  - Miniature circuit-breaker 24 V DC rated operational current 2 A; trip type B or
  - Fuse 2 A

## 2.6 Connect SmartWire-DT®

- ▶ Grab the end of the SWD line that has an arrow pointing away from the blade terminal.
- ▶ Plug this blade terminal into the gateway's SmartWire-DT connection.

To do so use the SmartWire-DT cable SWD-4-100LF8-24 and the SWD-4-8MF2 relevant blade terminal or prefabricated cables of type SWD-4-(3/5/10)F8-24-2S.



Detailed instructions explaining how to assemble a SmartWire-DT external device plug (SWD4-8SF2-5) onto an 8-pin SmartWire-DT cable can be found in "SmartWire-DT The System", MN05006002Z-EN, in the "Assembling external device plug SWD4-8SF2-5" section.

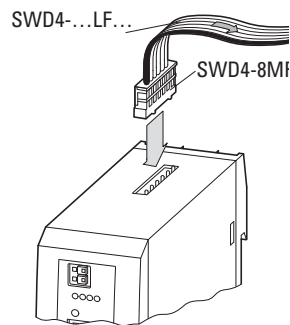


Figure 11: Connection SmartWire-DT

## 2 Installation

### 2.7 Connect field bus

#### 2.7 Connect field bus

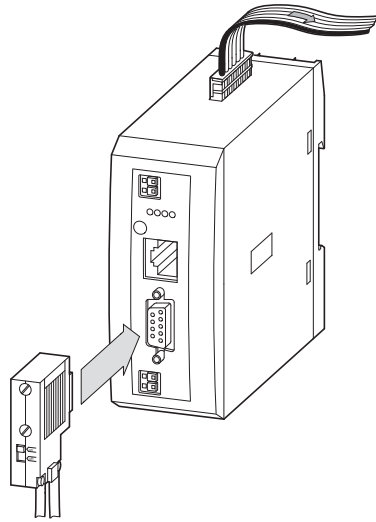


Figure 12: EtherNet/IP or Modbus-TCP  
PROFIBUS-DP

#### **PROFIBUS-DP**

To attach the PROFIBUS-DP cable, a special PROFIBUS-DP plug (e.g. ZB4-209-DS2) is needed. This has the necessary wiring for fault-free operation at up to 12 Mbit/sec.

- ▶ Connect the PROFIBUS-DP cable with the PROFIBUS-DP plug to the gateway's field bus interface.

### 2.8 Connecting the diagnostics interface

The EU5C-SWD-DP SmartWire-DT gateway features a serial interface on the front. By using a programming cable, you can connect it to a computer and do the following with the corresponding software:

- Online SmartWire-DT line diagnostics using the SWD assist program
- Generate and export a project-specific GSD file.
- Updating the operating system.

You can use any of the following programming cables:

Table 1: Programming cable for the connection to a PC

Device	Programming cable	Baud rate
EU5C-SWD-DP	EU4A-RJ45-CAB1	–
	EU4A-RJ45-USB-CAB1	38.4 kBaud

	Pin	RS232
--	-----	-------

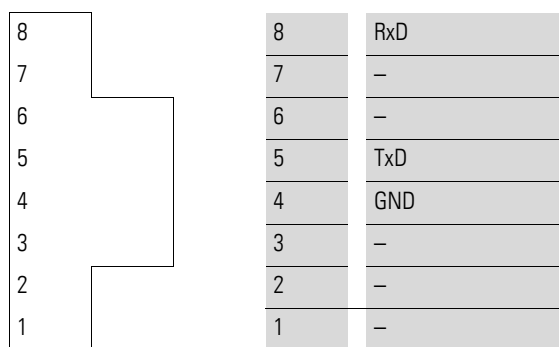


Figure 13: Configuration of the serial interface.

## 2 Installation

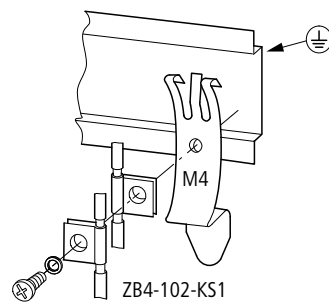
### 2.9 Wiring in accordance with EMC requirements

#### 2.9 Wiring in accordance with EMC requirements

Undesired faults can occur on the field bus due to electromagnetic interference. This can be minimized beforehand by the implementation of suitable EMC measures. These include:

- EMC-conformant system configuration,
- EMC compliant cable routing,
- Measures designed to reduce potential differences
- the correct installation of the field bus system (cable, connection of the bus connectors, etc.),
- Using shielding

for top-hat rail



for mounting plate

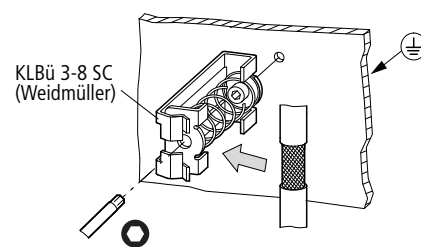
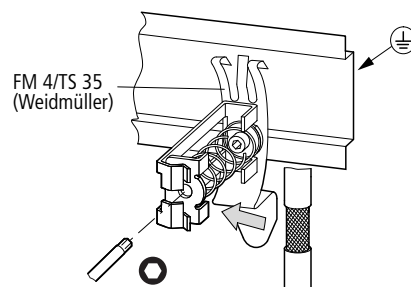
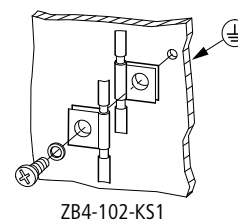


Figure 14: Field bus shielded by using a shield



## 3 Commissioning

Before switching on, check whether the power supply for the gateway is connected correctly. The configuration and installation of the SmartWire-DT line must also have been carried out correctly with all modules connected.



### DANGER

If you already have integrated devices and equipment in a system, block off any parts of the system that are connected to the working area in order to prevent access. This will ensure that no one will be injured if the system behaves unexpectedly, e.g., motors start up unexpectedly.

Commissioning takes place in several steps:

- 1 Commissioning the SmartWire-DT line
- 2 Take the field bus into operation.
- 3 Load and start the PLC program.

### Rules for successfully commissioning an EU5C-DP

Make sure to follow the rules below in order to successfully commission the gateway:

To operate the device, the target configuration must be stored. The device will only startup up error-free if the actual configuration at the start matches the target configuration.

### 3.1 Putting the SmartWire-DT® into operation

→ Chapter 7 "What you need to know about SmartWire-DT®", page 57 goes over the terms and basic knowledge related to SmartWire-DT.



### DANGER

Switch off the power supply whenever you are reconnecting modules in the SmartWire-DT system. The SmartWire-DT modules may be permanently ruined otherwise!

Before the gateway can exchange data with the PLC, the target configuration needs to be imported and stored in the gateway. The target configuration will be compared with the current actual configuration every time the gateway is started. During this process, the gateway will determine whether there are any SWD modules that cannot be reached or whether a wrong type of module is plugged into the SWD line. SmartWire-DT's response to any detected discrepancies will depend on how the device parameters for the SWD coordinator and the SWD modules have been configured → Chapter 7 "What you need to know about SmartWire-DT®", page 57.

## 3 Commissioning

### 3.1 Putting the SmartWire-DT® into operation

If a SmartWire-DT module drops out, it will be possible to continue running the SmartWire-DT line with the remaining modules. This applies even after the gateway is restarted or switched on again later. Please note that the application program can always be used to diagnose cases in which a SWD module has dropped out.



The target configuration should only be imported for SWD lines that have all the corresponding SmartWire-DT modules.

#### **NOTICE**

If you press the configuration button and a SWD module is missing or has dropped out from the SWD line, only the modules up to the device that dropped out will be assigned an address and stored. It will not be possible to use the remaining modules until the defective module is replaced and the configuration is imported again by pressing the configuration button.

Import the target configuration in the following cases:

- Initial Commissioning
- Replacement of a defective module
- Whenever the SWD module layout on the SWD line is changed

The online functions of the SWD assist software offer a wide range of options for the display and the diagnostics functions of the SmartWire-DT line even without the active PLC → Section “7.8 SWD assist”, page 74.

#### **3.1.1 Reading of target configuration**

The target configuration needs to be imported the first time the device is commissioned, whenever a module is replaced, and whenever the SWD module layout on the SWD line is changed.

Requirements that must be met in order to import the target configuration:

- All SmartWire-DT modules are connected to the SmartWire-DT line.
  - The SmartWire-DT line is connected to the gateway.
  - Voltage POW is applied to the gateway and the POW LED lights up.
  - Configured power feeder module are connected.
  - The SmartWire-DT status LEDs of the SWD modules are on or are flashing.
- ▶ Press the configuration button on the gateway for at least two seconds. The SWD-LED on the gateway begins to flash orange. The SWD-LEDs on the SmartWire-DT modules also flash.

All modules are addressed in sequence, the complete configuration is stored retentively in the gateway as target configuration. After this the SWD-LED lights green, continuous light.

- ➔ If the target configuration import process cannot be started and the SWD LED is showing an orange light, disconnect the SmartWire-DT gateway's field bus connection and try importing the target configuration again.
- ➔ If the SWD LED shows a solid red light, no addresses have been assigned to any of the SWD modules. If this happens, check the SWD line - especially the SmartWire-DT connection.

### 3.1.2 Switching on when the target configuration is stored

If a target configuration is already stored in the gateway, the system will check, every time the gateway is switched on, whether the modules that are actually on the SWD line match the target configuration in the gateway. The SWD LED on the gateway will indicate the result of this check → Section "7.7 LEDs on the device", page 73.

### 3.2 Take the field bus into operation

If you are putting the field bus into operation for the first time, you will first have to set up the PLC programming environment → Chapter 5 "Take XSoft-CoDeSys-2 into operation", page 31

Generally speaking, the following basic initial commissioning steps need to be carried out:

- 1 Add project-specific or standard GSD files to the PLC programming environment.
- 2 Open or create the project in the PLC programming environment.
- 3 Search for the field bus master in the PLC programming environment (target system) and Set the baud rate, e.g., 1.5 Mbaud.
- 4 Select the gateway as a field bus module.
- 5 If you are using the standard GSD file, select the SmartWire-DT
- 6 Configure the gateway's and the SWD modules' parameters in the PLC programming environment

## 3 Commissioning

### 3.2 Take the field bus into operation

#### 3.2.1 Creating PROFIBUS-DP field bus communication

The green SWD LED on the gateway is used to indicate that the gateway and the SmartWire-DT line are communicating successfully. This is a prerequisite for communications between the gateway and the PLC via the field bus.

- ▶ Load the program into the PLC.

The PROFIBUS field bus' configuration will be transferred to the PROFIBUS master when the program is loaded into the PLC. Once this is done, the PROFIBUS master will transfer the planned SWD configuration for the SmartWire-DT line to the gateway and check it. If the planned SWD configuration matches the target configuration stored in the gateway, the Config LED will show a solid green light. The DP LED and the Config LED will be used to indicate any errors that occur → Section "Table 9: LED SWD coordinator", page 73.

If all status displays indicate a green continuous light, commissioning has been completed successfully.

#### 3.2.2 DP-LED status display

Table 2: DP-LED at SWD coordinator

Description	DP-LED	Data exchange Gateway - PLC
Cyclic data communication runs on the PROFIBUS. Defined planned SWD configuration = target configuration.	Green continuous light	yes
Defined planned SWD configuration ≠ target configuration  The DP master does not detect a data interchange.	Flashing (green)	yes
No communication takes place on the PROFIBUS. No DP master is detected (for example, on account of a wrong module address).	off	No
Extended DP diagnostics: The input data from SmartWire-DT modules is invalid or the necessary modules are missing.	Orange	yes
The gateway is in firmware update mode when the POW LED is off. The firmware mode can be left by switching on the supply voltage again. The firmware update mode can be left by switching on the supply voltage again.	Changes from continuous orange light to red	No

### 3.2.3 POW status display

Description	POW
Device ready for operation	on
If the other three gateway LEDs are permanently red, the operating system or the hardware is faulty. If they show continuous orange light, the gateway is in Firmware Update mode. This mode can be deactivated by switching on the power supply again.	off

## 3 Commissioning

### 3.2 Take the field bus into operation

## 4 Description files for PROFIBUS-DP

In order to be able to run the SWD gateway on a PROFIBUS-DP, the SWD gateway's properties must be stored in a description file. This file follows specific standards for the corresponding field bus and can be loaded into the PLC programming environment for the field bus master being used.

The GSD file contains all the properties of a SWD gateway in its role as a field bus module. Since SWD gateways are modular field bus modules, this GSD file will also contain the properties of the potential SWD modules as inputs/outputs.

This is why new developments in SmartWire-DT, as well as the addition of new SWD modules, will result in new and different versions of gateway GSD files.



Please note that not all GSD files support all SmartWire-DT modules.

Make sure that you are working with the latest version of the standard GSD files in your PLC programming environment. Check whether there are available updates for the files at our Support Center → Page 3.

The selected GSD file must be appropriate for the SWD modules that you will be running with SmartWire-DT. In turn, this will also require you to use a specific operating system version, as well as a specific hardware device version.

For PROFIBUS-DP, make sure to use the latest GSD standard file and the latest operating system version.

### Updating the operating system

For more information on how to update the operating system, please refer to the Online Help function included in SWD-Assist version 1.10 and higher. Enter "Update operating system" under the "Search" tab.

In the case of EU5C-SWD-DP, the versions are updated via the diagnostic interface by using SWD-Assist.

## 4 Description files for PROFIBUS-DP

### 4.1 Where are the standard files?

#### 4.1 Where are the standard files?

For the PROFIBUS-DP gateway, there are two different standard GSD files available in order to make it possible to run the gateway with different types of field bus masters. Accordingly, you will get the latest available language-specific GSD files for:

- Motorola based CPU (e.g. Siemens S7)
  - Moel4dxx.gsd (English)
  - Moel4dxx.gsf (French)
  - Moel4dxx.gsg (German)
  - Moel4dxx.gsi (Italian)
  - Moel4dxx.gss (Spanish)
  - the appropriate figures KM4D13\_D.bmp and KM4D13\_N.bmp
- Intel-based CPUs (e.g. Eaton XC100/200)
  - Moe4dxx.gsd (English)
  - the corresponding KM4D14\_N.bmp figure

where xx = GSD file version. Files with xx = "13" correspond to the Profibus V0 Specification, while files with xx= "14" correspond to the Profibus V1 Specification.

To download the standard GSD file, please visit our Support Center → Page 3. To find it quickly, simply enter "SWD" or "GSD" as a search term.

- ▶ Click on "Download" to the left of "GSD file for ... Motorola ..." or "GSD file for ... Intel ...".
- ▶ Select the latest version, save it, and unzip the .zip file in a project folder of your choice.

#### 4.2 What is a project-specific GSD file

Instead of using a standard GSD file, you can also use SWD assist to generate a project-specific GSD file and use it in the PLC programming environment the same way you would a standard GSD file. The selection of SWD modules on the SWD line will already be assigned to the EU5C-SWD modular field bus module.

If you load the project-specific GSD file into the PLC programming environment, the SWD modules will be shown directly under "Selected Modules," eliminating the need to select each individual SWD module manually → Section "5.4 Select the SmartWire-DT® modules", page 33. In addition, this will prevent you from selecting the wrong SWD modules by accident.

Follow the steps below in order to generate a project-specific GSD file:

- ▶ Start SWD assist.
- ▶ Switch to the Communication view by clicking on the "View" -> "Communication View" menu option.
- ▶ Click the "Online" button.

The program will show the target configuration, but this configuration will not be in the Project view yet.



- ▶ Click on the "Device =>PC" button.

The target configuration will be loaded into the Project view.

- ▶ Click on the "Offline" button.
- ▶ Switch to the Project view by clicking on the "View" -> "Communication View" menu option.
- ▶ Click on the menu option "Project"->"save GSD file".
- ▶ Specify the project folder as the storage location and confirm with "Save."

SWD assist stores the GSD file under the name of the current project with the appropriate extension, such as "SWD\_Proj.gsd" for EU5C-SWD-DP. This can be installed in XSoft-CoDeSys-2 in the same way as the standard GSD file.



Give the GSD file a name with a maximum of eight characters. Certain PLC programming environments, such as the "HW Config" PLC programming environment, will only recognize names of up to eight characters.

### 4.3 Versions of description files

To download an overview table showing which description file has to be used in order to be able to add your SWD modules to your PLC configuration, please visit our Support Center → Section " Support Center", page 3 and enter "SWD" into the Search field.

The "SmartWire-DT Modules" manual defines the applicable device version, operating system version, and description file version requirements for each SWD module in detail.

## 4 Description files for PROFIBUS-DP

### 4.3 Versions of description files

## 5 Take XSoft-CoDeSys-2 into operation

The connection of a SWD line via the SWD gateway EU5C-SWD-DP to the controller XC200 is described in this chapter.

Please check beforehand whether you have a current XSoft-CoDeSys-2 version installed with the necessary GSD files.

Please note the list of abbreviations, as the XSoft-CoDeSys-2 PLC programming environment uses different designations from those used in this manual in certain cases

### 5.1 Installing the GSD file in XSoft-CoDeSys-2

We recommend working with the project-specific GSD file, as it already includes the assignments between the modular EU5C-SWD-DP field bus module and the SWD modules on the SWD line in order to make your work easier.

Likewise you can use the standard GSD file

- ▶ Copy the standard GSD file or the project-specific GSD file to the folder intended for storing the standard GSD file.  
In the case of the XSoft-CoDeSys-2 Eaton programming system, this folder will be found on your computer under:

C:\Program Files\Common Files\CAA-Targets\<<Version>\PLCConf

where <Version> is the installed configurator version e.g.,  
"Moeller V2.3.9."

After doing this, you will be able to use the project-specific GSD file just as you would the standard GSD file.

- ▶ Start the XSoft-CoDeSys-2.
- ▶ Install the GSD files in XSoft-CoDeSys-2 with the "Tools" -> "Select configuration file" menu option.

## 5 Take XSoft-CoDeSys-2 into operation

### 5.2 Select field bus master

#### 5.2 Select field bus master

Then please proceed as follows:

- ▶ Start XSoft-CoDeSys-2 and open a project.
- ▶ Open the "Controller configuration" in the "Resources" tab and select the Profibus bus master module XIOC-NET-DP-M. This must be positioned on the first three slots.

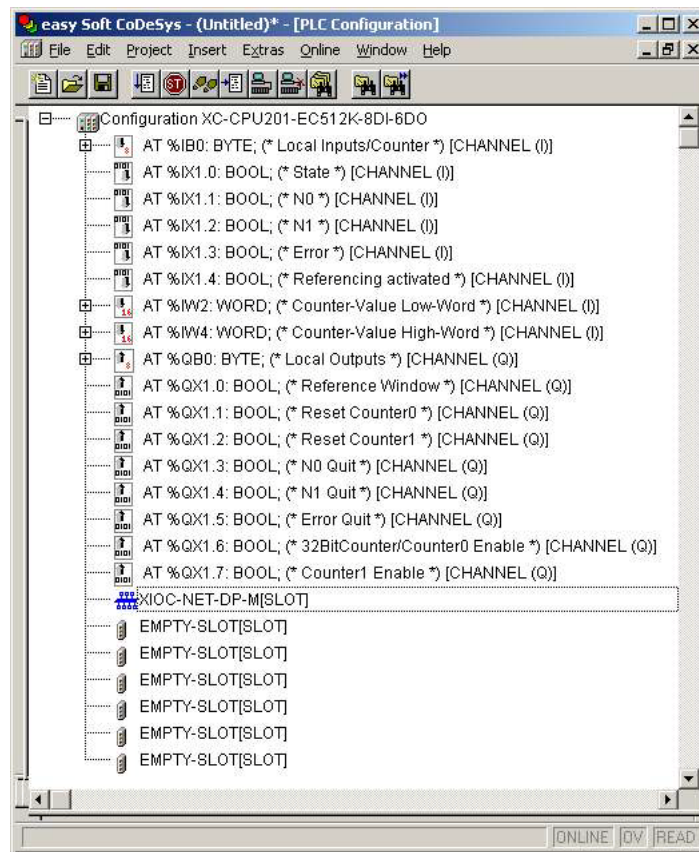


Figure 15: Selection of the DP master in XSoft-CoDeSys-2

#### 5.3 Select gateway as field bus module

- ▶ Select the field bus master and use the "Insert" -> "Attach subelement" menu option to open the selection list of field bus modules.
- ▶ Select the GSD file „EU5C-SWD-DP V1 (Int) (Moe4d14.gsd“.

## 5 Take XSoft-CoDeSys-2 into operation

### 5.4 Select the SmartWire-DT® modules

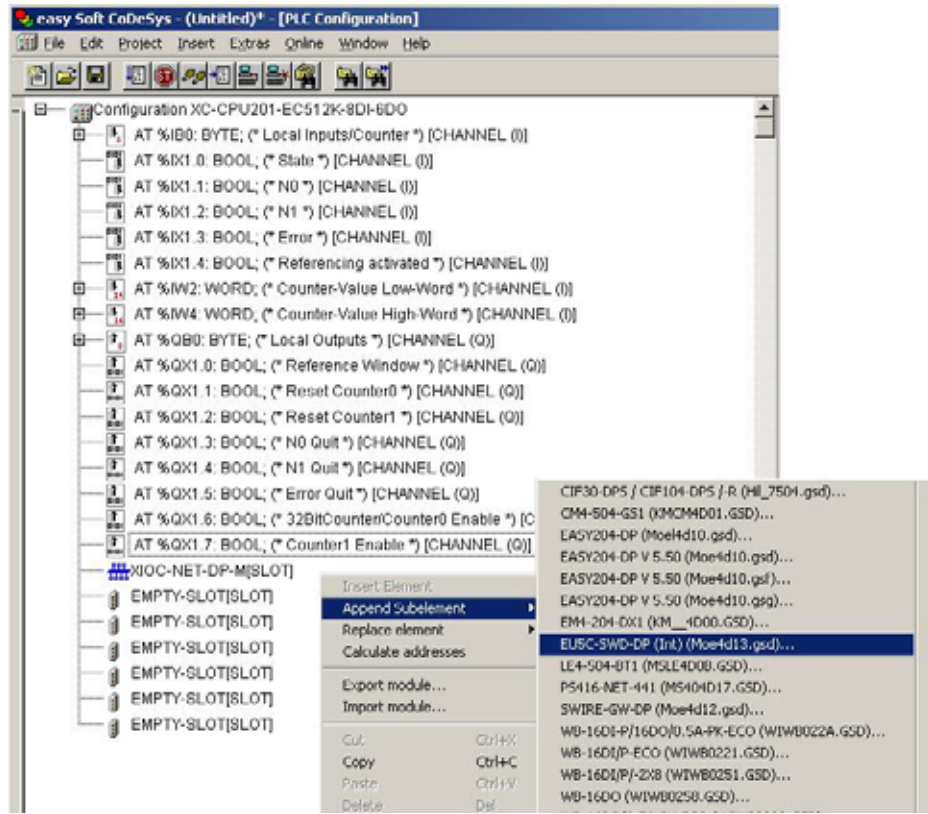


Figure 16: Select the gateway in XSoft-CoDeSys-2

### 5.4 Select the SmartWire-DT® modules

If you are using the project-specific GSD file, this step is not necessary. Skip to → Section "5.5 Change the device parameter of the gateway", page 34.

If you are using the standard GSD file, select the SWD modules as follows:

- ▶ Change over to the register "Inputs/Outputs".
- ▶ Now select the SWD modules that you need for the SWD line. Make sure to select them in the right order. The order of the SWD modules in "Selected modules" must match their physical order on the SWD line that is ready for operation. Within this context, the "first" SWD module is the one right after the gateway.

## 5 Take XSoft-CoDeSys-2 into operation

### 5.5 Change the device parameter of the gateway

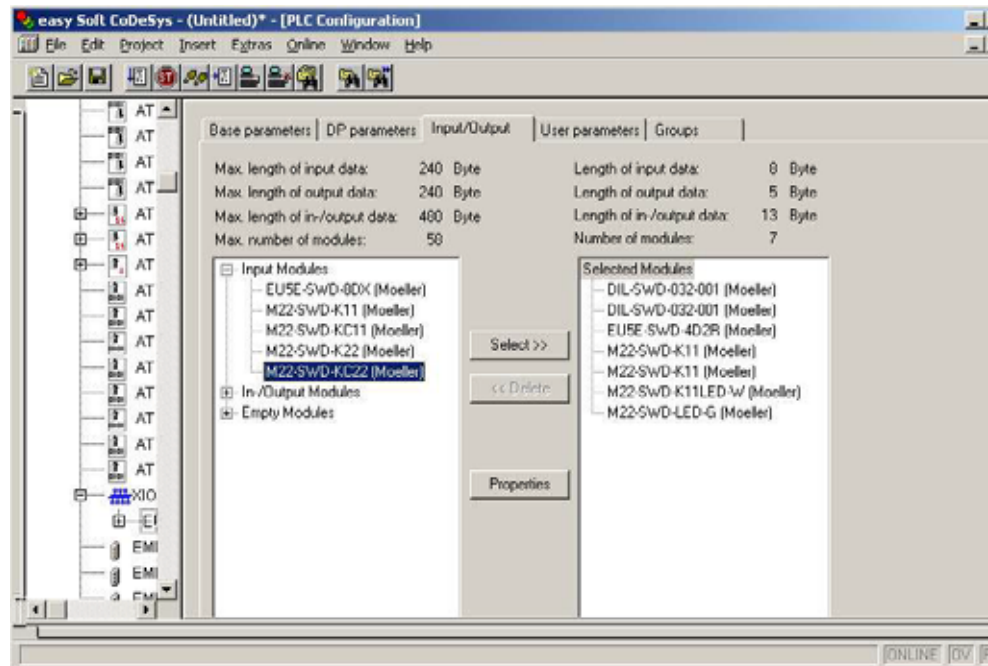


Figure 17: Selection of the modules in XSoft-CoDeSys-2

If you cannot find a specific SWD module under the "Inputs/Outputs" tab, the standard GSD file you are using may be obsolete. If this is the case, download the latest version of the standard GSD file from the Eaton Support Center → Page 3.

### 5.5 Change the device parameter of the gateway

The XSoft-CoDeSys-2 programming environment is also used to configure parameters for the communications between the gateway and the field bus master and the gateway and the SWD line, as well as the device parameters for the SWD modules and the EU5C-SWD coordinator.

These are the meanings of the individual registers.

#### “Base parameters” register

Here you can define the I/O start addresses for the mapping of the SWD modules onto the inputs and outputs of the controller map. As standard the PLC programming tool creates complete connection to the I/Os up to now. You can, however, change these values to other, unassigned areas.

#### “DP parameter” tab

The parameters that relate to communication with the field bus PROFIBUS-DP are entered under these settings. These include, for example, the address of the EU5C-SWD ("Module addresses" in XSoft-CoDeSys-2) field bus module and the monitoring time for the field bus' cyclic data communications (watchdog control).

## 5 Take XSoft-CoDeSys-2 into operation

### 5.6 Change the device parameter of the SWD module

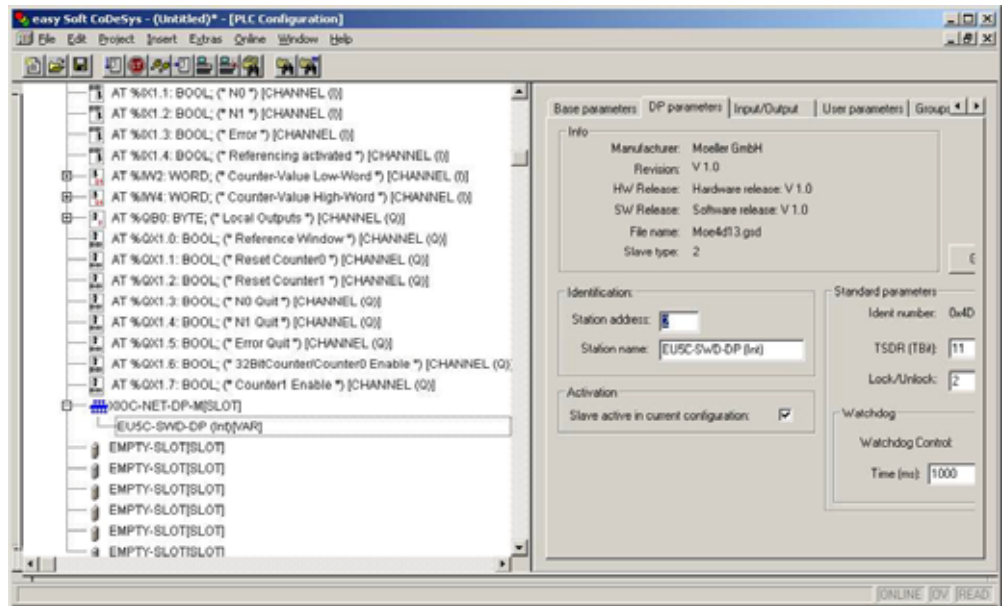


Figure 18: Adjusting the DP parameters in XSoft-CoDeSys-2

#### “User parameters” tab

This is where the device parameters for the EU5C-SWD coordinator are configured Table 7, page 68. In order to configure the "Online Replacement" device parameter, for example, follow the steps below:

- ▶ Open the "User parameters" tab in the XSoft-CoDeSys-2 PLC Configuration window.
- ▶ Click on the SWD coordinator's "Online Replacement" device parameter.

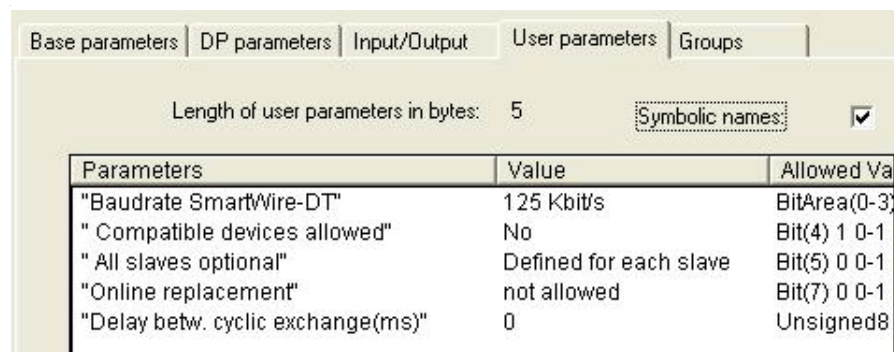


Figure 19: Device parameter of the SWD coordinator in XSoft-CoDeSys-2

### 5.6 Change the device parameter of the SWD module

You can parameterize the startup behavior for each SWD module. By doing this you define how the gateway reacts, if a module is not available. The default setting is that all modules have to be available. However, the information as to whether a module is available is also reported to the application via the diagnosis so that the failure of a module can be reacted to individually here

→ Section “6.8 Diagnostics”, page 52.

## 5 Take XSoft-CoDeSys-2 into operation

### 5.6 Change the device parameter of the SWD module

For an explanation of the SWD modules' device parameters, please refer to Table 8, page 69.

The parameter configuration here will only make sense if the SWD configurator's "All Slaves optional" parameter is set to "Defined for each slave."

In order to change the device parameter's setting, follow the steps below:

- ▶ Select the corresponding SWD module in the "Inputs/Outputs" tab in the table "Selected modules".
- ▶ Click on the "Properties" button. The dialog field "Module properties" relating to the selected SWD module is displayed.
- ▶ Double-click on "Device shall be present" in the "Value" column. The setting will change to "Device may not be present."

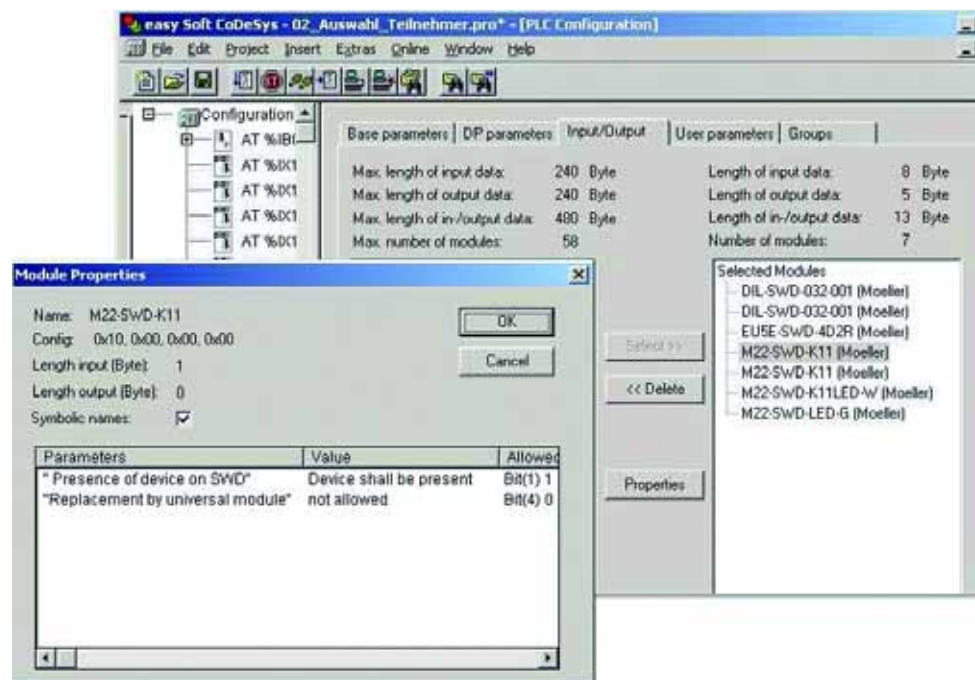


Figure 20: Parameterizing SWD modules in XSoft-CoDeSys-2

You can also define in this dialog whether the SWD module can be replaced by a universal module M22-SWD-NOP(C). In this case set the device parameter of the SWD module "Replacement by universal module" to "allowed".

For information regarding the SWD universal module, please consult the manual "SmartWire-DT Modules", MN05006001Z-EN.



## 5.7 Cyclic data communication via input/output addresses

When the SWD modules are configured in the XSoft-CoDeSys-2 PLC programming environment, the modules' input/output addresses are assigned automatically. The addresses assigned to the individual SmartWire-DT modules can be seen in the PLC programming environment.

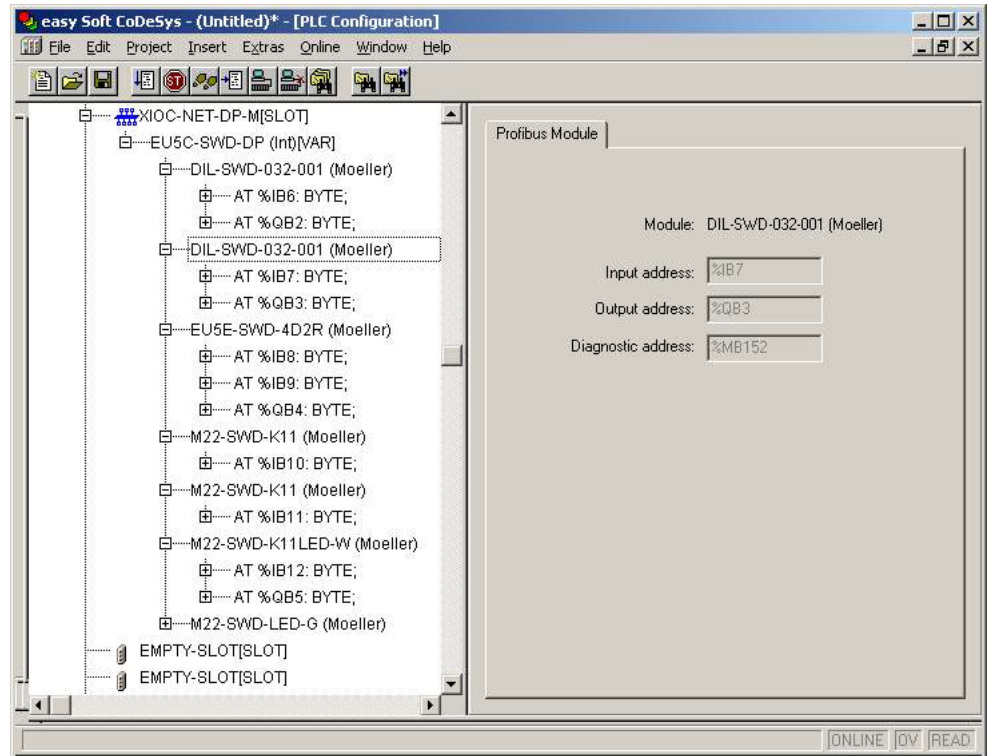


Figure 21: SWD module addresses in XSoft-CoDeSys-2

These inputs and outputs can be addressed using the PLC's I/O image table.



Please refer to the manual "SmartWire-DT Modules", MN05006001Z-EN, "Module properties" for the exact configuration and meaning of the input and output data.

## 5 Take XSoft-CoDeSys-2 into operation

### 5.8 Acyclic data communication

#### 5.8 Acyclic data communication

SWD modules such as the PKE-SWD-32 module for the electronic motor-protective circuit-breaker also supply acyclical data in addition to the cyclical data. Function blocks from the xSysNetDPMV1.lib library are used with XC100/200 controllers for reading and writing acyclical data. This library was also installed with XSoft-CoDeSys-2 and is for example to be found in the library list for XC200:

C:\Program Files (x86)\Common Files\CAA-Targets\Eaton Automation\V2.3.9 SP3\Lib\_XC-201.

The library contains the following blocks for acyclic data communications:

XDPMV1\_READ,

XDPMV1\_WRITE.

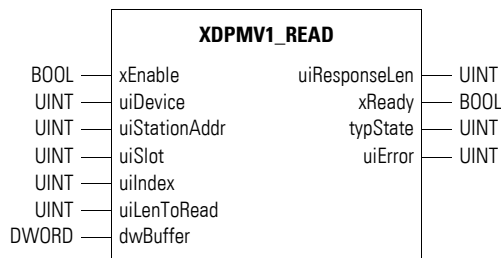


Figure 22: Prototype for the function block XDPMV1\_READ

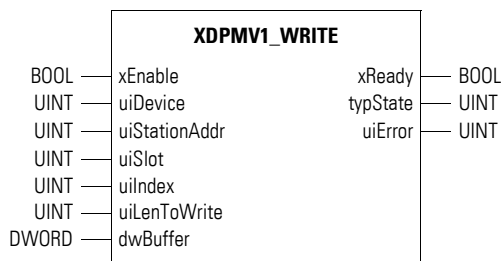


Figure 23: Prototype for the function block XDPMV1\_WRITE

#### Important information concerning designations

SWD module data that is read and/or written acyclically will hereafter be referred to as "DP-V1 objects.". The number and meaning of the available DP-V1 objects are described in the relevant documentation (e.g. "SmartWire-DT Modules", MN05006001Z-EN).

The address of a DP-V1 object is defined by the slot number (uiSlot), the index (uiIndex) and the read/write data length.

The slot number corresponds to the SWD module's address. In other words, the first module will have slot number 1, the second module will have slot number 2, etc. Meanwhile, the index is used to define the address for the DP-V1 object. Just as with the slot, the first object will be assigned number 1, the second object will be assigned number 2, etc. In the case of the PKE-SWD-32 SmartWire-DT module, DP-V1 object 1 will deliver current  $I_{rel}$ .

Please observe the following guidelines when using these function blocks:

- Do not access these blocks cyclically as it will unnecessarily load cyclic bus operation.
- Program a maximum of one block to read and one block to write for each master.
- Interlock the read and write blocks so that only one block can be active at a time!

The modules must therefore be accessed consecutively via the function blocks. DP-V1 objects of a module must also be processed consecutively.

#### **General handling guidelines for the modules**

- ▶ To start a job, apply a "1" signal (rising edge) at the "Enable" input. After the job is complete the "Ready" output will be set to the "1" state.
- ▶ Evaluate then the "typState" output. If the output value is 3 (job properly processed), the job was correct completed. If the output value is "4", this indicates an incorrectly completed job. In this case, evaluate the "uiError" output.

## 5 Take XSoft-CoDeSys-2 into operation

### 5.8 Acyclic data communication

#### What do the block parameters mean?

Operand	Meaning
xEnable	Start
uiDevice	Device number (see table below)
uiStationAddr	PROFIBUS-slave-address of the SWD-Gateway
uiSlot	SWD module address (value range 1 to 58)
uiIndex	Object Index
uiLenToRead	Length of read data in bytes (value range 0 to 240). If the read data length is unknown, enter the maximum value of "240". The actual read byte length is indicated by the "uiResponseLen" output.
uiLenToWrite	Length of write data in bytes (value range 0 to 240) If an error message appears if you do not enter the exact value.
dwBuffer	Address to a buffer
uiResponseLen	Length of data actually read (bytes)
xReady	Job process state
typState	State of module  0: not being processed 1: invalid parameter 2: started 3: job successfully completed 4: job ended with an error – check the failure code on the "uiError" output
uiError	Failure code see Tabelle 3 ("Failure code")

#### Failure code at "uiError" output

Table 3: Failure codes at "uiError" output

Failure code	Meaning
2	No resources for job processing are available in the SWD gateway (internal fault)
3	The master has not activated the DP-V1 mode for this SWD gateway. Check the PLC configuration!
9	invalid response (internal fault)
17	No response from this SWD gateway. Possible causes: <ul style="list-style-type: none"> <li>• uiStationAddr entry incorrect</li> <li>• SWD gateway or field bus not active</li> </ul>
18	General bus fault <ul style="list-style-type: none"> <li>• Check bus cables</li> <li>• Check master</li> <li>• Check the DP address or high station address of other masters in the PLC configuration</li> </ul>
25	unintelligible response, SWD module is not compliant with the DP-V1 standard
54	incorrect answer
129	DP-V1 communication has not been configured and activated or the PROFIBUS module address does not exist.
130	DP-V1 communication has been blocked, PROFIBUS module is incorrect.

Failure code	Meaning
131	A job is still active (internal FB error).
132	Parameter and data fault (internal fault)
133	Parameter fault: possible causes: "uiStationAddr", "uiSlot" or "uiIndex" are incorrect.

### Function block assignment (Device number)

Using an XC200 PLC makes it possible to use up to three DP modules XIOC-NET-DP-M. Each DP module can use one block for acyclic read operations and one function block for acyclic write operations. In other words, a maximum total of six function blocks can be used in the user program. Using device numbers will allow you to determine which function block is assigned to which DP module. These device numbers depend on the corresponding DP module's slot (see Tabelle 4). When using an XC100 PLC, the device number is generally "0," since only one single DP module can be used in this case.

Table 4: Device number for XC200

XI/OC slot	1	2	3	Notes
Card	DP-M	DP-M	DP-M	Configuration is valid
Device No.	0	1	2	
Card	DP-M	DP-M	X-module <sup>1)</sup>	Configuration is valid
Device No.	0	1	–	
Card	X-module <sup>1)</sup>	DP-M	DP-M	Configuration is valid
Device No.	–	0	1	
Card	DP-M	X-module <sup>1)</sup>	DP-M	Configuration fault: DP modules have to be placed next to each other
Device No.	0	–	2	
Card	X-module <sup>1)</sup>	X-module <sup>1)</sup>	DP-M	Configuration is valid
Device No.	–	–	0	

1) X module: Module may be any XIOC module.

## 6 Take STEP 7 into operation

### 6.1 Install the GSD files in STEP 7

## 6 Take STEP 7 into operation

This section describes how to connect an SWD line to a SIMATIC S7-300/400 controller via an EU5C-SWD-DP gateway.

### 6.1 Install the GSD files in STEP 7

You can either install the standard GSD file or a project-specific GSD file → Chapter 4 "Description files for PROFIBUS-DP", page 27. To install the GSD files, follow the steps below:

- ▶ Open the "HW Config" programming environment and check whether the SWD gateway is found in the following window:  
Hardware Catalog,  
"PROFIBUS DP" ->  
"Additional FIELD DEVICES" ->  
"Switching devices" folder or, if using a project-specific GSD file, the ->  
"SWD assist" subfolder
- ▶ In STEP 7 install all GSD files via the menu option  
"Tools" -> "Install GSD files...."

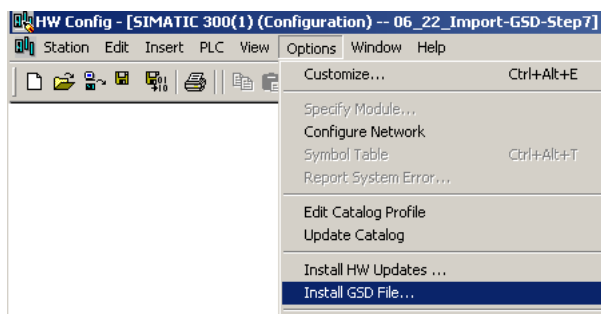


Figure 24: Starting the installation of the GSD file in HW config; Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

- ▶ In the dialog that opens choose the option "from the directory" from the "Install GSD files" list and select the appropriate directory.
- ▶ Choose the required GSD file and click the "Install" button.

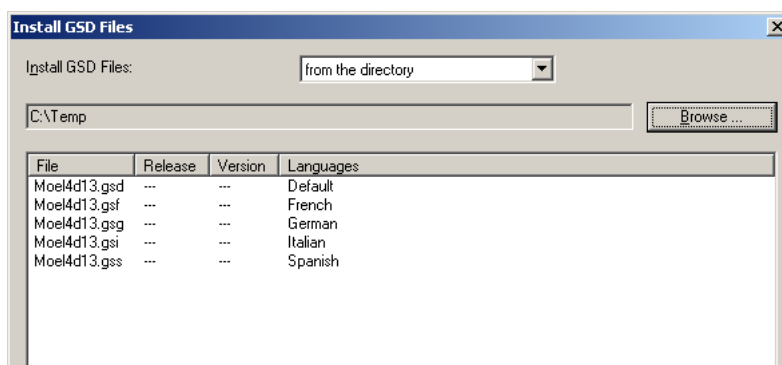


Figure 25: Installation of the GSD file - Selection in the HW config Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg



If an older GSD file is already present, this is moved to the backup directory before the installation.

The SWD gateway will be installed and shown in the following window:

- "Hardware catalog,"  
"PROFIBUS-DP"->  
"Additional FIELD DEVICES" ->  
"Switching devices" ->  
or the "SWD assist" subfolder

The SWD gateway will be shown in this window with the following designation

- "EU5C-SWD-DP (Mot)" if installed with a standard GSD file
- "EU5C-SWD-DP (<SWD assist>)" if installed with a project-specific GSD file

The EU5C-SWD-DP gateway can now be configured.

## 6.2 Select gateway as field bus module

The following description applies regardless of whether the standard GSD file or a project-specific GSD file is being used.

Prerequisite: The "HW Konfig" PLC programming environment must be running.

- 6 Take STEP 7 into operation
- 6.2 Select gateway as field bus module

### 6.2.1 Configuration with standard GSD file installed

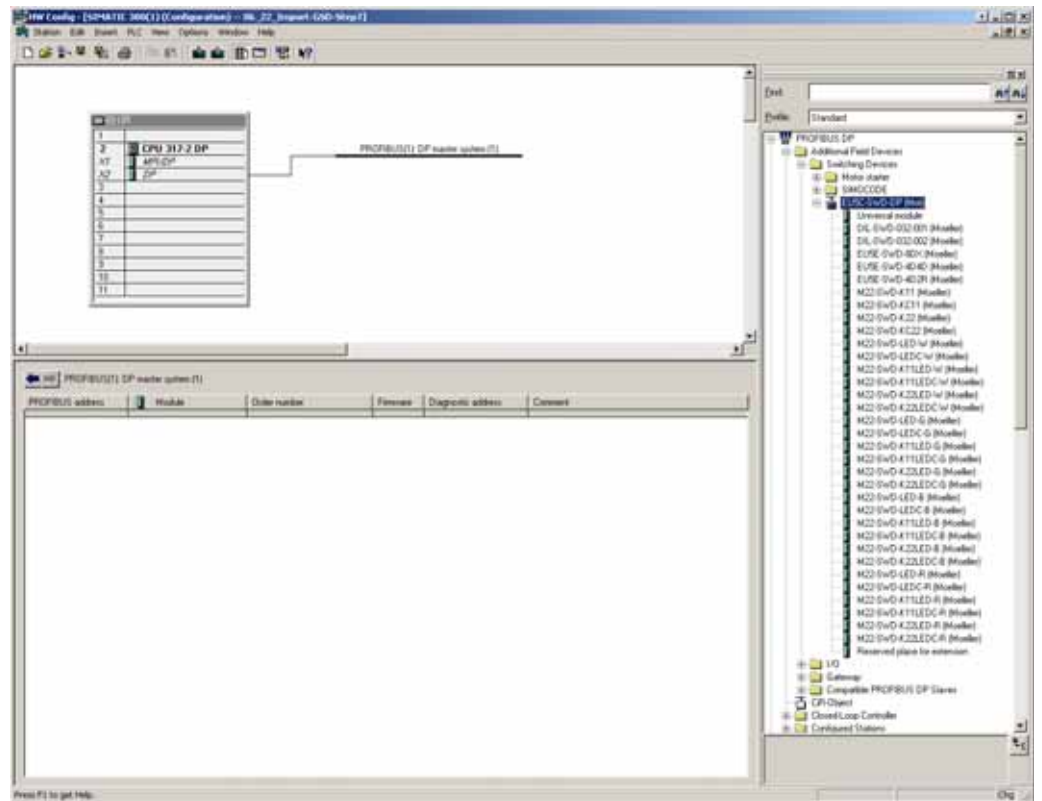


Figure 26: Configuration with standard GSD file installed in HW config  
Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

- ▶ Now add the SWD gateway with the component designation "EU5C-SWD-DP (Mot)" to the PROFIBUS line in the window for the station.



## 6.2.2 Configuration with project-specific GSD file installed

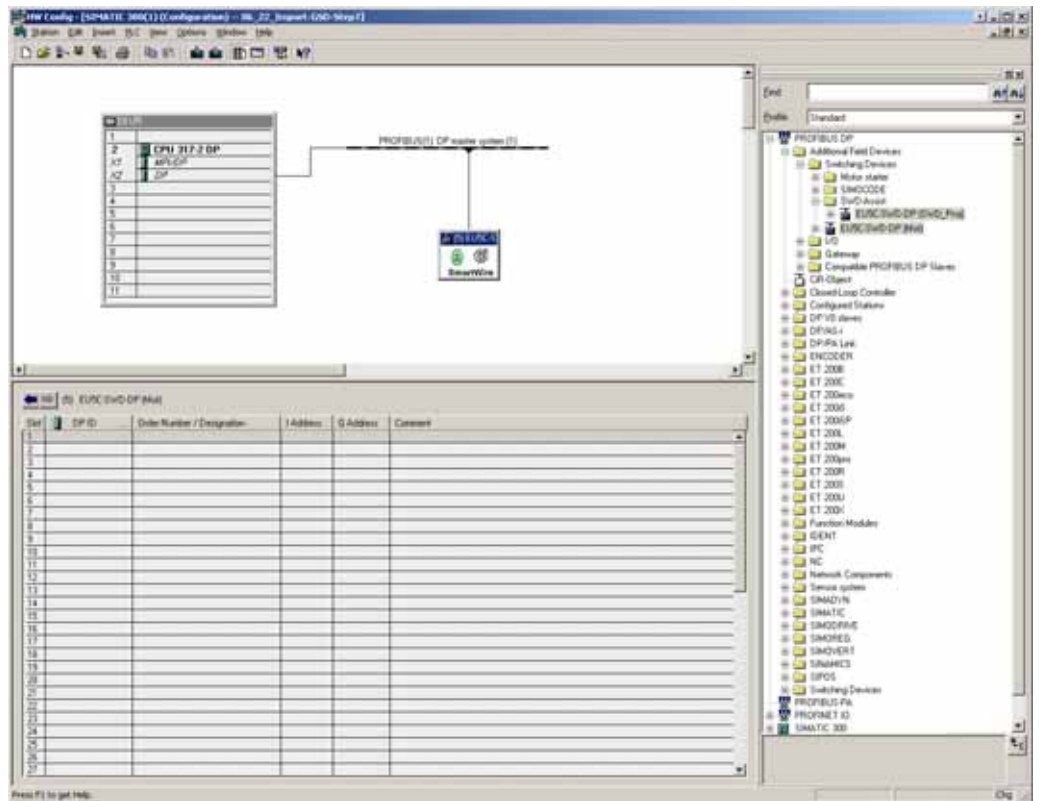


Figure 27: Configuration with project-specific GSD file installed in HW config  
 Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

- ▶ Add the SWD gateway with the component designation "EU5C-SWD-DP" (<SWD assist project name>) to the PROFIBUS line in the station window.



Once you have added this modular field bus module to your S7 project, all the configured SWD modules in the SWD line will be shown in the Station window detailed view.

The next step, → Section "6.3 Select the SmartWire-DT® modules", is unnecessary in this case.

If you want to add additional SWD modules to a project-specific PROFIBUS-DP configuration with the "HW Konfig" PLC programming environment, follow the steps in the description below, → Section "6.3 Select the SmartWire-DT® modules".

## 6.3 Select the SmartWire-DT® modules

If you want to add additional SWD modules to a project-specific PROFIBUS-DP configuration with the "HW Konfig" PLC programming environment, follow the steps in the following description, → Section "6.3 Select the SmartWire-DT® modules".

## 6 Take STEP 7 into operation

### 6.3 Select the SmartWire-DT® modules

Requirement: The SWD gateway must be present in the PROFIBUS-DP configuration.

- ▶ Move to the **Hardware Catalog** and click the plus sign in front of the standard SWD gateway EU5C-SWD-DP (Mot) under **PROFIBUS-DP -> Additional FIELD DEVICES -> Switching Devices**.

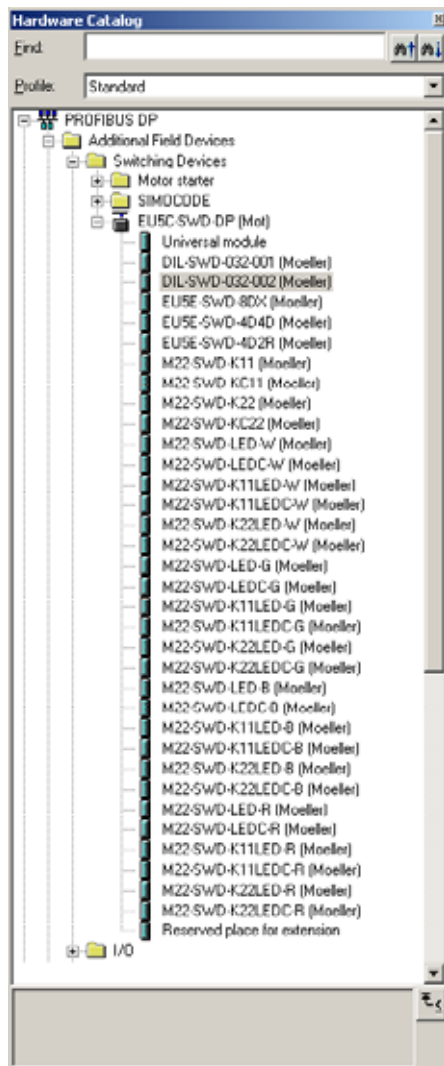


Figure 28: EU5C-SWD-DP (Mot) gateway with SWD modules in HW config  
Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

You can then select in the "Hardware catalog" the SWD modules that you require on this SWD gateway.



Observe the correct order of the SWD modules in the SWD line. These must be configured according to their arrangement in the installation.

- ▶ Double-click the required SWD modules.

## 6 Take STEP 7 into operation

### 6.4 Set device parameter of the gateway

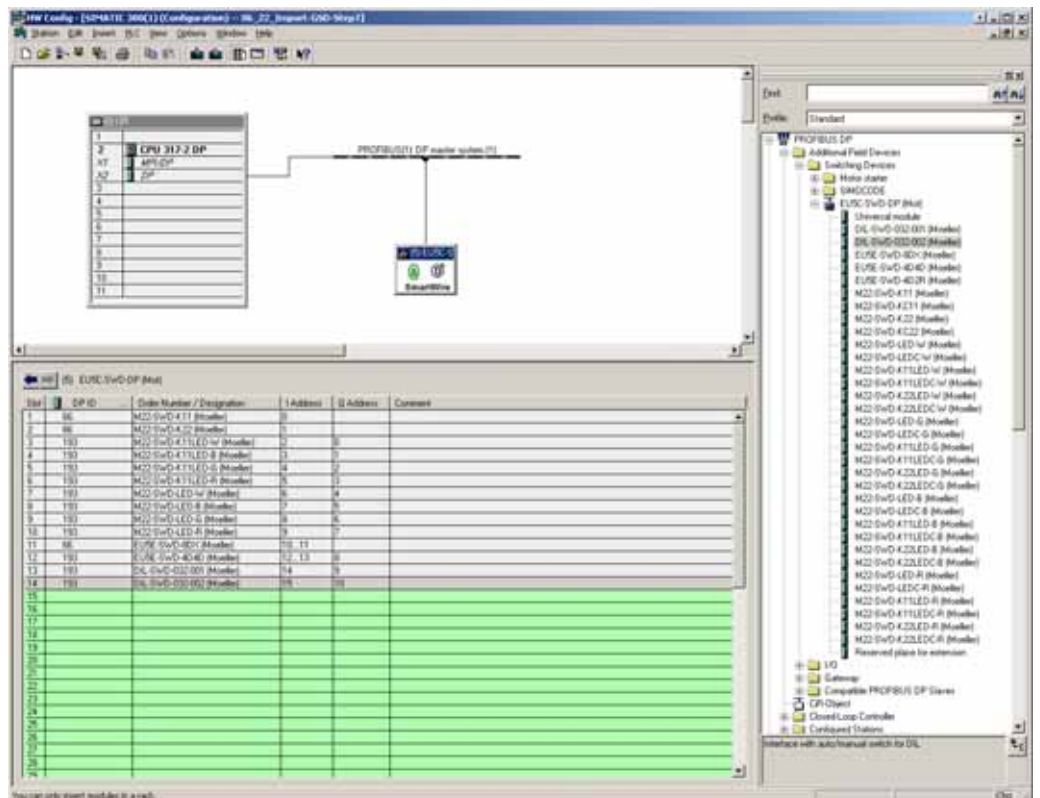


Figure 29: Selecting the SWD modules on the EU5C-SWD-DP (Mot) gateway in HW config Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

#### NOTICE

The universal module is not a valid SWD module and therefore must not be added to the project!

### 6.4 Set device parameter of the gateway

Prerequisite: The "HW Config" PLC programming environment must be open.

- ▶ When adding the SWD gateway set its DP properties, the station parameters and the DP module address.



If possible, do not use the addresses 1 and 2, which can be used for other purposes, e.g. when operating multi-CPU's.

- ▶ In the station window, double-click the SWD gateway as a newly added DP module.

In the "Properties - DP slave" dialog box that opens, start configuring the parameters in the "General" tab.

6 Take STEP 7 into operation  
 6.4 Set device parameter of the gateway

**„General“ tab**

In this tab set the relevant parameters for the PROFIBUS-DP communication

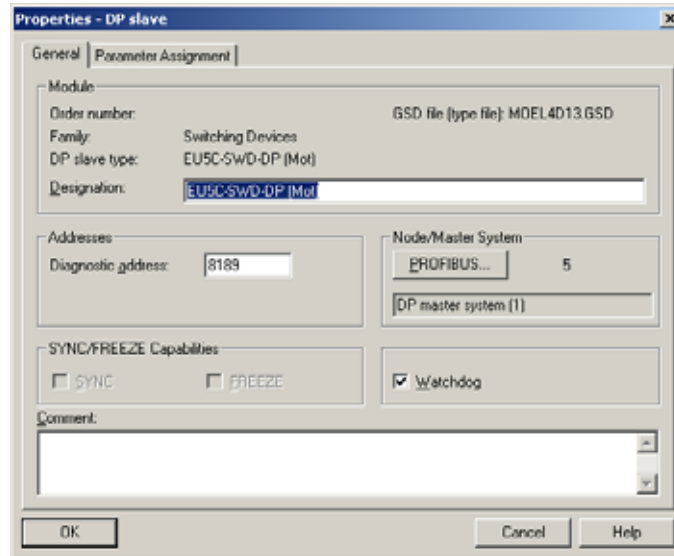


Figure 30: Setting the general properties of the DP module HW config  
 Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

- ▶ If required activate the response monitoring.
- ▶ In the "Properties - DP slave" dialog, select the "Parameter assignment" tab.

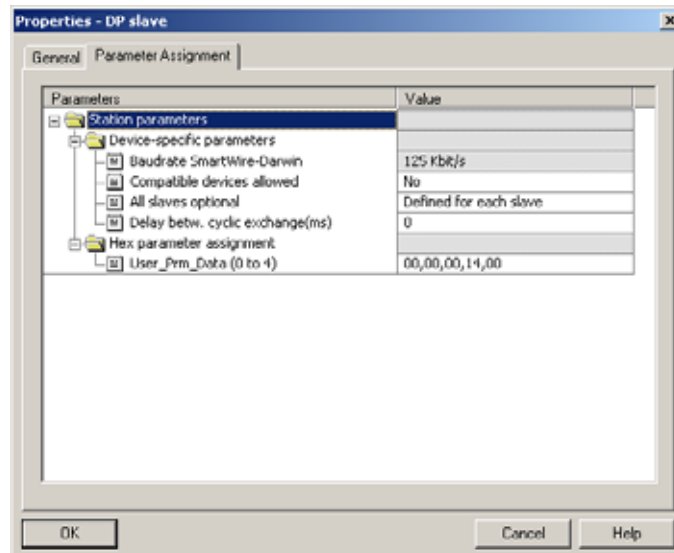


Figure 31: Station parameters of the SWD gateway in the HW config  
 Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

**„Parameter assignment“ assignment tab**

This tab is used to configure the parameters for the SWD gateway, and for the SWD line as a result, under "Stationsparameter" -> "Gerätespezifische Parameter." Table 7, page 68.

## 6.5 Set the device parameters of the SWD modules

### Input/output addresses

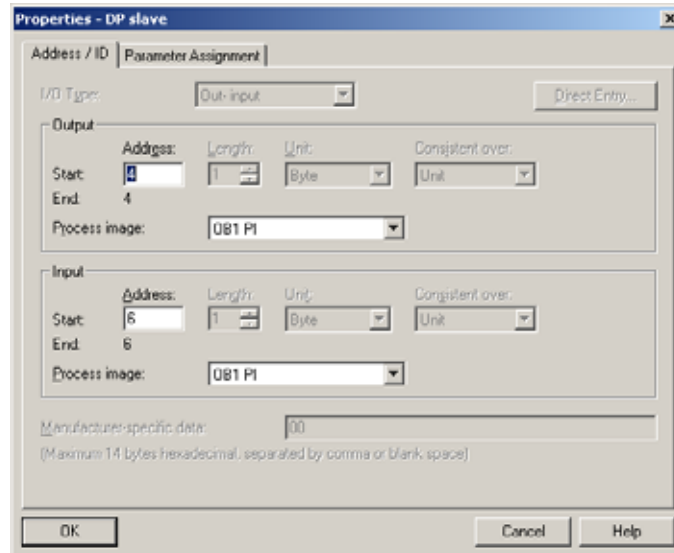


Figure 32: Input/output addresses of the SWD modules in HW config  
Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg

The address proposed by the system can be accepted directly. The preset address value ensures that the start address is within the process image of the inputs and outputs.

If required the I/O addresses can also double-clicked and modified later, providing the appropriate CPU is present.

These inputs and outputs can be addressed using the PLC's I/O image table.



Please refer to the manual "SmartWire-DT Modules", MN05006001Z-EN for the exact configuration and meaning of the input and output data.

### Adjusting specific parameters of SmartWire-DT modules

You can parameterize the startup behavior for each SWD module. This defines how the gateway is to respond if an SWD module is not present. The standard setting is that all modules have to be available.

However, the information as to whether a module is available is also reported to the application via the diagnostics function so that you can implement here a specific response to the failure of an individual module (→ Section "6.8 Diagnostics" on Page 52).

## 6 Take STEP 7 into operation

### 6.5 Set the device parameters of the SWD modules

#### Changing settings

- ▶ To change settings in the "HW config" PLC programming environment, select the SWD module you want and double-click on the corresponding line.
- ▶ In the "Properties - DP-Slave" dialog, select the "Parameter assignment" tab.

Double-click the SWD module to display the "Properties - DP-Slave" dialog field.

In the "Gerätespezifische Parameter" folder, for example, you can change the option "Device shall be present" to "Device may not be present" (does not have to be present) in the "Value" column.

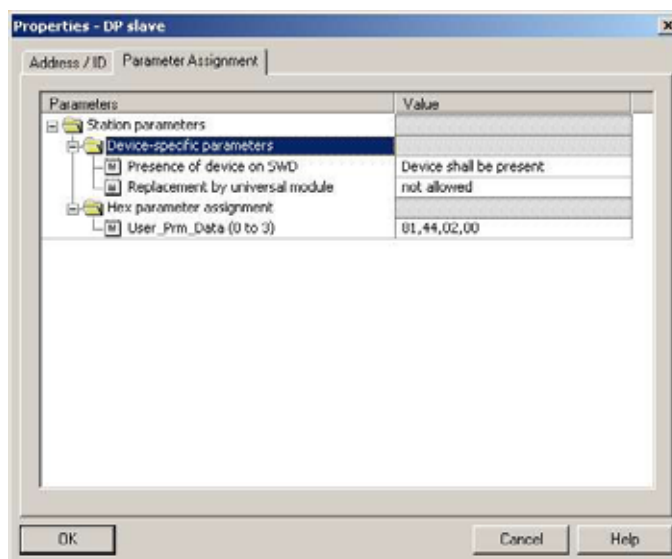


Figure 33: Specific parameter assignment of the SWD modules un HW config  
Screenshot of a STEP 7 with courtesy from SIEMENS, Nürnberg



Parameter setting at this point only makes sense if the value "Defined for each slave" is set in the application parameters (see above) for the parameter "All slaves optional".

You can also define in this dialog whether the SWD module can be replaced by a universal module M22-SWD-NOP(C). In this case set the parameter "Replacement by universal module" to "allowed".

## 6.6 Adding SmartWire-DT® modules later on

If you are not sure of the final SWD topology and may wish to add SWD modules at a later time, adding a placeholder (empty module) in the appropriate position in the SWD line is recommended. This is also useful in STEP 7 since the HW Config tool does not allow the adding of modules between occupied module locations.

- ▶ Position the permanent SWD modules in the correct order and add the placeholder (reserved place for expansion) at the required position. A wildcard reserves a SWD module address for a module to be added later.
- ▶ Save the project and then transfer it to the PLC. Then switch the PLC to RUN mode.

After the DP configuration is received from the PLC, the SWD gateway addresses the modules automatically taking the placeholder into account.

## 6.7 Acyclical data communication

SWD modules such as the PKE-SWD-32 module for the electronic motor-protective circuit-breaker also supply acyclical data in addition to the cyclical data. The function blocks SFB52 RDREC (read record) and SFB53 WRREC (write record) are used in STEP7 for reading and writing acyclical data. The reference to the required module is implemented with these function blocks via the parameters "ID" and "Index".

The input address of the SmartWire-DT module with which communication is to be established is set at the parameter "ID". The "Index" parameter addresses the V1 object. The first object is assigned number 1, the second 2 etc. On the SWD module PKE-SWD-32, the object 1 supplies the current value "I<sub>rel</sub>".



Refer to the STEP 7 documentation for further information on handling these function blocks.

## 6 Take STEP 7 into operation

### 6.8 Diagnostics

#### 6.8 Diagnostics

The system SmartWire-DT provides you with cyclic and acyclic diagnostic information.



Please refer to the documentation of the PROFIBUS-DP master XIOC-NET-DP-M in the manual MN05002002Z-DE "XIOC signal modules" for basic information on the DP diagnostics. You will find explanations there on access to the diagnostic data of a DP slave module.



When using a Simatic S7, different system components may be used to evaluate the module diagnostic function. For this refer to the relevant documentation of the CPU or CP used.

#### 6.8.1 Cyclic diagnostics information

This basic diagnostic information is coded in the normal I/O map of each SWD module. They provide information about whether the module participates in the normal data interchange via the SWD line. Furthermore, it is reported whether any current diagnostic messages are pending. These two information items are located in the first input byte in bit positions 4 and 6 for all SWD modules. They permit fast and easy assessment of the condition of the SWD module:

- The SWD module is present and integrated actively into the SWD line.
- The SWD module is operating fault-free.

#### Example

The M22-SWD-K11-LED-R function element has a red LED for illuminated pushbuttons and the two switch states 0 and 1. With cyclical input data of one byte, it contains information on switch position and diagnostic information.

#### Inputs:

Byte 0:

7	6	5	4	3	2	1	0
Diagnostic data				Input data			
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1



BIT	designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: contact not actuated
1	NO = Normally Open	0: contact not actuated 1: contact actuated
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs:

Byte 0:

7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	Q0

BIT	designation	Meaning
0	Q0	Activation LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

If the evaluation of the diagnostic bit shows that there is extended diagnostic information, details on this can be determined by evaluation of the acyclic diagnostics of the PROFIBUS-DP.

In the case of the SWD module considered here the following detailed conditions could be determined.

&Value	Meaning
0x10	The contact is longer than four seconds in the middle position.
0x11	There is a short circuit in the contact.

## 6 Take STEP 7 into operation

### 6.8 Diagnostics

#### 6.8.2 Acyclic diagnostics

As could already be seen in the configuration, the SWD coupling unit with its modules appears as a modular DP module. This also applies to the structure of the diagnostic data. Profibus DP defines for modular modules a standard access process for diagnostic information. The diagnostics consist of standard diagnostics header (DP-V0 header), of a likewise standardized module status and of optionally extended diagnostic messages in the attachment from one or several modules that report detailed diagnostics. The terms used in the standard PROFIBUS are used in the following. The designation "Module" is synonymous with a SWD module.

Diagnostic data	Description
DP-V0 header (6 byte)	Standard diagnosis header
Module status (standard)	Standard module status
first extended diagnostic alarm (optional).	device-specific detailed messages
...	
last extended diagnostic alarm (optional.)	

#### Standard diagnosis header

DP-V0 header structure

Byte:	&Value	Explanation
1		V0 Status-1
2		V0-Status-2
3		V0-Status 3
4		DP master address
5	0x4d	Eaton device identification
6	0x13	Eaton device identification

#### 6.8.3 Device-specific diagnostics

The device-specific diagnosis consists of the module status block, which provides general information about the module (SWD module) as well as, if necessary, extended information from SWD modules that are reporting diagnoses.

The module status block complies with the standard requirement of the diagnosis of a modular DP module from the structure standpoint.

### Structure of the module status block

Byte:	&Value	Description
<b>Module status header</b>		
1	Lx	Length of the module status block
2	0x82	
3	0x00	
4	0x00	
<b>Module status</b>		
5		Two status bits for SWD modules 1 - 4
...		Two status bits for SWD modules 5 - 8
Lx		Two status bits for other SWD modules

In the first byte the module status block contains the length of the complete module status block, followed by the codes 0x82, 0x00, 0x00. It is therefore compatible with the format for the status of DP-V1.

As of the fifth byte two bit status codes per module (SWD module) follow. So the status of up to four SWD modules is packed into a byte. Non-used bits are filled out with 0s in the last byte.

2-bit status code	Explanation
00	A cyclic data interchange is performed with the respective SWD module.
01	A diagnostic message from the SWD module is pending.
10	Configuration error (incompatible SWD module)
11	Failure of a SWD module

#### 6.8.4 Extended diagnosis (module related)

The extended diagnostics contain the module address of the SWD module, status information and one or several detailed specifications relating to error or diagnostic causes.



You can find the meaning of the specifications in the manual "SmartWire-DT Modules", MN05006001Z-EN.

## 6 Take STEP 7 into operation

### 6.8 Diagnostics

Table 5: Structure of the extended diagnosis

Byte:	&Value	Description
1	Ly	Length of detailed status message
2	0xA1	Status Type
3		SWD module address (1 - 58)
4	0	–
5		first detailed diagnostic alarm/status message
6		–
Ly		nth detailed diagnostic alarm/status message

#### Example

An SWD line is made up of nine SWD modules. If a short circuit is reported for an EU5E-SWD-4D4D (input/output module with overload message) SWD module that is the fifth module in the SWD line, the diagnostics will look as follows:

Absolute byte	Byte:	&Value	Description
1	1	0x8	V0-Status-1
2	2	0xC	V0-Status-2
3	3	0	V0-Status 3
4	4	1	DP master address
5	5	0x4D	Gateway ID
6	6	0x13	Gateway ID
<b>Module status header</b>			
7	1	0xC	Length of module status
8	2	0x82	–
9	3	0x00	–
10	4	0x00	–
11	5	0x0	The SWD modules 1 to 4 do not report a diagnosis.
12	6	0x01	The SWD module 5 reports a diagnosis.
13	7	0x0	The SWD module 9 does not report a diagnosis.
<b>Extended diagnostics E/A module</b>			
14	1	5	Length of detailed status message
15	2	0xA1	Status Type
16	3	0x5	SWD module address
17	4	0	–
18	5	0x13	Message: short-circuit/overload

## 7 What you need to know about SmartWire-DT®

This chapter provides a general overview of SmartWire-DT (SWD). For more detailed descriptions, please refer to the following manuals:

- "SmartWire-DT The System", MN05006002Z-EN
- "SmartWire-DT Modules", MN05006001Z-EN

With SmartWire-DT you can interconnect up to 99 modules very quickly in simple steps. Modules can consist of switchgears as well as I/O components.

The ribbon cable with the SWD modules and all components required for connecting them is called the SWD line. The SWD line starts at the blade terminal as a possible connection to the control relay and then ends at the bus termination.

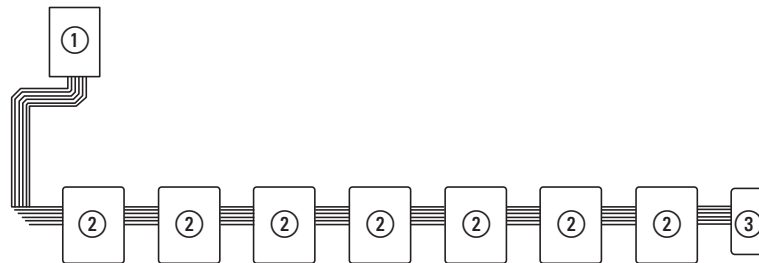


Figure 34: SWD coordinator with SWD line

- ① SWD coordinator
- ② SWD module
- ③ Bus termination

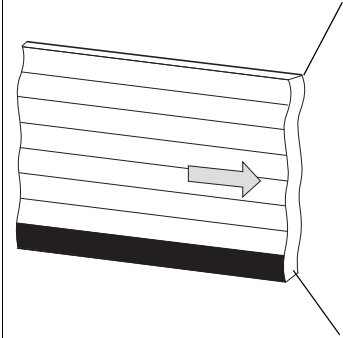
## 7 What you need to know about SmartWire-DT®

### Wiring assignment

An 8-core connecting cable is used by SWD coordinator to feed the SWD modules with power and exchange data. SmartWire-DT is self-configuring and addresses its modules at the push of a button.

Table 6: Configuration of the SmartWire-DT ribbon cable

	Meaning	
	+24 V DC	$U_{AUX}$ , Contactor control voltage
	Chassis ground	Contactor control voltage
	GND	for device supply voltage and data cable
	Data B	Data cable B
	Data A	Data cable A
	GND	for device supply voltage and data (data A, data B)
	SEL	Select cable for automatic addressing of the SmartWire-DT modules
	+15 V DC	$U_{SWD}$ , Device supply voltage



The power supply for SWD coordinator and the SWD modules is connected via the POW terminals. The 15 V power supply of the SWD modules  $U_{SWD}$  is generated from POW.

If you wish to use contactors, circuit-breakers or motor starters in the installation with SmartWire-DT, a 24 V DC voltage  $U_{AUX}$  must be fed in at AUX.

### Definition of terms: components - elements - modules

The SWD components consist of SWD modules and SWD elements.

SWD modules are all those SWD components that respond to a request from the SWD coordinator, i.e. can exchange data. They are assigned an SWD module address.

SWD elements are passive SWD components that do not exchange data but are required for operating the SmartWire-DT network. SWD elements are, for example, the power feeder modules, SWD cables, adapters etc. SWD elements are not given an SWD module address.

### SWD universal module

If functions have to be retrofitted on an installation, modifications in the hardware configuration and program extension are normally very labor-intensive. The use of a universal module enables you to initially replace the SWD modules that are required at a later time. If the installation is then extended later, the planned modules are then installed instead of the universal modules. In this way, you will be able to retain all module addresses. A detailed description on connecting the universal modules is provided in the "SmartWire-DT Modules", MN05006001Z-EN.

**Power feeder module**

The number and the types of SWD modules determine the volume of data to be transferred and the current consumption.

You can use power feed modules if your application has a higher power consumption than the device provides, or if the cable length of the SWD line causes an increased voltage drop. Calculation examples are provided in the "SmartWire-DT The System", MN05006002Z-EN.

Power feeder modules are power supply units that are connected additionally to the SmartWire-DT when there is an increased current consumption or increased voltage drop. Being a passive SWD element, a power feeder module does not have a module address.

The EU5C-SWD-PF1 power feeder module feeds the 24 V DC supply voltage for contactors on the SWD line.

The EU5C-SWD-PF2 power feeder module feeds both the 24 V DC supply voltage for contactors as well as the 15 V DC supply voltage for other SWD modules on the SWD line.

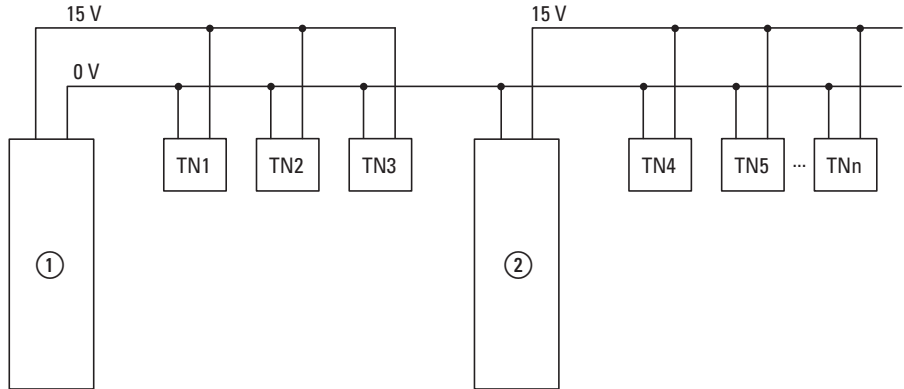


Figure 35: Schematic layout of an SWD line with the EU5C-SWD-PF2 power feeder module

- ① EU5C-SWD-DP
- ② EU5C-SWD-PF2

## 7 What you need to know about SmartWire-DT®

### 7.1 Configurations

#### 7.1 Configurations

The following different SWD configurations are possible:

- 1 Planned SWD configuration  
Before the SWD coordinator can start running, the device must know which SWD modules are present and how their parameters have been configured. This collected information is found in the planned SWD configuration.  
Depending on the field bus protocol that you will be using, you will be creating the planned SWD configuration in the PLC programming environment or in SWD assist.



Please note that the planned SWD configuration and the project configuration are not the same thing.

While the planned SWD configuration describes the parameters and the layout of the modules on the SWD line, the project configuration is the description for the controller as such.

- 2 Target configuration  
Pressing the "Config" configuration button on the device will make the system determine the actual configuration and store it as a target configuration in the SWD coordinator.
- 3 Actual configuration  
By this is meant the actual physical configuration present on the SWD line. Every time SWD coordinator is started, the actual configuration is determined and compared with the stored target configuration. Every time SWD coordinator is started, the actual configuration is determined and compared with the stored target configuration.

#### 7.2 Changing the planned SWD configuration in SWD assist

To change the configuration of the SWD line, e.g., to add a new module or replace an existing one, you will have to change the planned SmartWire-DT configuration and import the target configuration again. Proceed as described in → Section "3.1.1 Reading of target configuration", page 30.

Example: Changing or replacing a module on the SWD line

Module M22-SWD-K11LED-W has one changeover contact and one white LED. This module is to be replaced with an M22-SWD-K22LED-W module, which features two changeover contacts and one white LED. In order to change the module, you would proceed as follows:

- ▶ Switch the power supply off at the device.
- ▶ Pull the M22-SWD-K11LED-W out of the external device plug.
- ▶ Plug the M22-SWD-K22LED-W into the external device plug.
- ▶ Switch on the power supply.

The SWD LED will show a red light, indicating that, as expected, the modules on the SWD line do not match the target configuration stored on the device.



## 7 What you need to know about SmartWire-DT®

### 7.2 Changing the planned SWD configuration in SWD assist

- ▶ Press the "Config" configuration button on the front of the device.

The device will detect all the modules currently on the SWD line and store them in the device as a target configuration.

The SWD LED will show a green light, as the modules on the SWD line will match the target configuration.

The Config LED will show a red light, as the modified target configuration will no longer match the planned SWD configuration. You will now have to make them match again by using SWD assist or the PLC programming environment.

In order to modify the planned SWD configuration in SWD assist, you would proceed as follows:

- ▶ Start SWD assist.
- ▶ Open the "\*.swd" application file with File -> Open
- ▶ Switch to the Project view or turn off the Communication view by clicking on the "View" -> "Communication view" button.
- ▶ Replace the M22-SWD-K11LED-W module in the Project view. To do so, go to the device catalog and drag M22-SWD-K22LED-W to drop it where M22-SWD-K11LED-W is located on your workspace.

The SWD line will show the symbol for M22-SWD-K11LED-W instead of the original module.

- ▶ Save the changed project file „\*.swd“ in the PC.
- ▶ In order to establish a connection to the device, first switch to the Communication view by clicking on the "View" > "Communication view" buttons.
- ▶ Click on the "Connection setup" button and then on the "Online" button.

The device information in SWD assist will show that the planned SWD configuration and the target configuration in the device still do not match.

Because of this, the planned SWD configuration in SWD assist will have to be transferred to the device.

- ▶ Store the modified planned SWD configuration on the device. To do this, click the "Configurations in the device" button and then the "PC=>device" button.

The device information will show the STOP device status.

The Config LED will show a green light. This indicates that the target configuration and the planned SmartWire-DT configuration match. The device can now run.

Device 

Project.  Target config.

SWD status 

STOP

## 7 What you need to know about SmartWire-DT®

### 7.3 SWD cycle time

#### 7.3 SWD cycle time

The SWD cycle time is the time required for the cyclic exchange of data between the coordinator and all modules using a common data frame on the SWD line.

The SWD gateway is the coordinator.

The SWD cycle time does not depend on the number of modules on the SWD line as much as it does on the amount of payload data that the summation frame needs to transmit. Within this context, "payload data bytes" refers to the number of input and output bytes of a module.

There are commonplace modules, such as switches, that transmit little payload data. However, there are also modules with multiple settings and read-out values, such as motor-protective circuit-breakers.

To calculate the SWD cycle time, each byte is counted as 10 bits, since a start bit and a stop bit are required for each byte for synchronization purposes. The SWD cycle time can be calculated using the following formula:

$$\text{SWD cycle time } t_p [\text{ms}] = \frac{1}{C} \left[ n \cdot 10 \text{ bit} + 2 \text{ bit} \cdot n_{TN} + 30 \text{ bit} \cdot 10 \right]$$

$n$  = Number of user data bytes.

$C$  = Baud rate [kBit/s]

$n_{TN}$  = number of modules

#### Example:

The following values are given:

Input bytes = 13 bytes

Output bytes = 8 bytes

Modules: 9

Baud rate = 125kBit/s

$n$  = Number of user data bytes = 21

$$\text{SWD cycle time } t_p [\text{ms}] = \frac{1}{125 \text{ kBit/s}} \left[ 21 \cdot 10 \text{ bit} + 2 \text{ bit} \cdot 9 + 30 \text{ bit} \cdot 10 \right] = 4.224 \text{ ms}$$

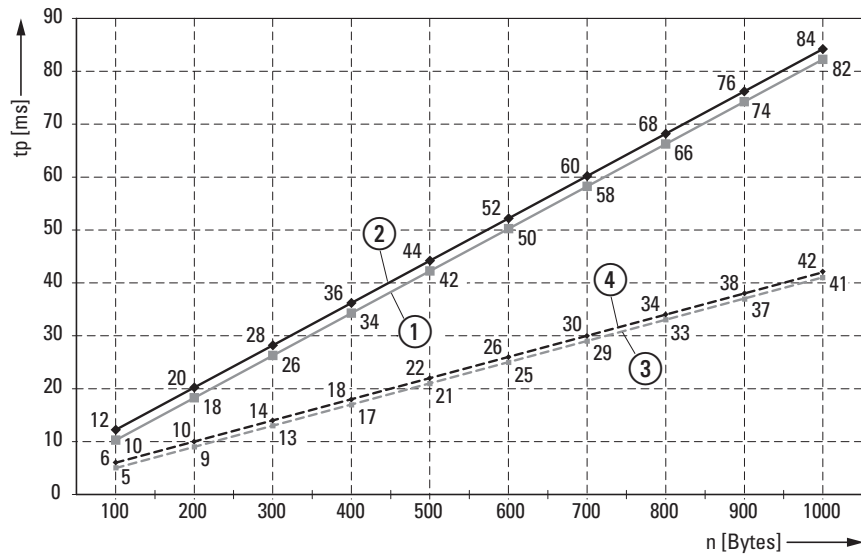


Figure 36: SWD cycle time based on the amount of transmitted payload data bytes

- ① 125 kBit/s: 1 SmartWire-DT module with n user data bytes
- ② 125 kBit/s: 99 SmartWire-DT module with n user data bytes
- ③ 250 kBit/s: 1 SmartWire-DT module with n user data bytes
- ④ 250 kBit/s: 99 SmartWire-DT module with n user data bytes

When the baud rate doubles, the SWD cycle time is cut in half. In the example above, the SWD cycle time goes from 4,224 ms at 125 kbit/s to 2.112 ms at 250 kbit/s.

## 7 What you need to know about SmartWire-DT®

### 7.4 Cyclical input and output data of the SWD modules

#### 7.4 Cyclical input and output data of the SWD modules

All the inputs and outputs of the SWD modules that are present are stored in a data storage area inside the SWD coordinator. This data storage area is referred to as the "process image." The input data can have a maximum size of 800 bytes, while the output data can have a maximum size of 642 bytes. In total, the data area must not exceed 1000 bytes. The cyclic exchange of data between the SWD coordinator and the SWD modules takes place in a common data frame. The input data can consist of several bytes, depending on the module. This input data contains information such as switch positions and diagnostic information.

The modules' input and output data is available to the PLC programming environment. To find out more about how it can be accessed, please refer to  
→ Chapter 5 "Take XSoft-CoDeSys-2 into operation", page 31 and  
→ Chapter 6 "Take STEP 7 into operation", page 42 .

#### Diagnosics possibilities

The SWD coordinator can provide the following diagnostic information:

- Cyclic diagnostic information
- Extended diagnostics information

#### Cyclic diagnostics information

SmartWire-DT provides you with cyclical diagnostic information. This information can be evaluated in the program and used for further control tasks.

This basic diagnostic information is coded in the normal process image of each SWD module. The information about whether the SWD module is exchanging data normally or whether diagnostic alarms are currently present is provided on all SWD modules in the first input byte (byte 0) at bit positions 4 and 6.



#### DANGER

Persons, systems and machines may be put at risk if an N/C contact is misinterpreted. When using N/C contacts always evaluate the PRSNT and DIAG diagnostic bits of this module.

#### Example of input and diagnostic data

The M22-SWD-K11-LED-R function element has a red LED for illuminated pushbuttons and the two switch states 0 and 1. With cyclical input data of one byte, it contains information on switch position and diagnostic information.

Byte 0:

7	6	5	4	3	2	1	0
Diagnostic data				Input data			
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1

## 7 What you need to know about SmartWire-DT®

### 7.4 Cyclical input and output data of the SWD modules

BIT	designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: contact not actuated
1	NO1 = Normally Open	0: contact not actuated 1: contact actuated
2	Not used	-
3	Not used	-
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm present
5	Not used	-
6	PRSNT	0: module not present 1: module present
7	SUBST	0: planned module is present 1: M22-SWD-NOP(C) universal module present

The diagnostic bits of the individual SWD modules can be looked up in the "SmartWire-DT Modules", MN05006001Z-EN.

#### Example for output data:

The M22-SWD-K11-LED-R function element has a red LED for illuminated pushbuttons and the two switch states 0 and 1. With cyclical output data of one byte, it contains information on switch position and diagnostic information.

Byte 0:

7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	Q0

BIT	designation	Meaning
0	Q0	Control section LED
1	Not used	-
2	Not used	-
3	Not used	-
4	Not used	-
5	Not used	-
6	Not used	-
7	Not used	-

#### Extended diagnostic services

If a SWD module is signaling "Diagnose," i.e., if bit 4 of input byte 0 is set to 1, the corresponding details can be obtained by evaluating the extended diagnostic services.

## 7 What you need to know about SmartWire-DT®

### 7.4 Cyclical input and output data of the SWD modules

If you were to determine the detailed states for an M22-SWD-K11-LED-R function element as an example of a SWD module, you would be able to get information on the following:

<b>&amp;Value</b>	<b>Meaning</b>
0x10	The contact is longer than four seconds in the middle position.
0x11	There is a short-circuit in the contact.

If there is a diagnostic alarm present for an SWD module, this means that there is a fault on this module. Using the SWD assist software you can display the extended diagnostic alarms to identify the faults more closely.

Proceed as follows for SWD assist to display the extended diagnostic alarms:

- ▶ In SWD-Assist, switch to the Communication View by clicking on the "View" -> "Communication View" menu option.
- ▶ Connect to the SWD coordinator by clicking on the "Connection establishment" button -> "Online."
- ▶ In the workspace, click on the module that you want to diagnose.
- ▶ In the Properties field choose the "Diagnostics buffer" tab.

The table in the Properties field shows you the extended diagnostic alarms. The alarms are logged and displayed with a time stamp. The time stamp is based on the system time of your PC. The code is displayed in decimal notation. Diagnostic alarms can be categorized as follows:

- Code < 1000:  
Alarm comes directly from the module; the code is the same as a fault on field bus systems. These fault messages are described in the "Smart-Wire-DT module" manual. The error codes stated there are in hexadecimal notation.
- Code  $\geq$  1000:  
Alarm was generated by SWD coordinator as the SWD module can no longer send.

The extended diagnostic alarms are not retentive in the SWD assist. If SWD coordinator is switched off, the diagnostics buffer is cleared.

Further information on extended diagnostics is provided in the Online Help of SWD assist.

For more information on how to evaluate the extended diagnostic messages in the PLC programming environment, please refer to → Chapter 5 "Take XSoft-CoDeSys-2 into operation", page 31 und → Chapter 6 "Take STEP 7 into operation", page 42

## 7.5 SWD device parameters

In the case of EU5C-SWD-DP, the device parameters can be configured in the PLC programming environment.

A "required module" is a module for which the „Presence of device on SWD“ = ""Device shall be present" so that it is enabled.

The „All slaves optional“ and „Presence of device on SWD“ device parameters define whether there is a SmartWire-DT error when the actual configuration is different from the target configuration.

The "Compatible devices allowed" and "Can be replaced with universal module" device parameters define whether there is a SmartWire-DT error when the target configuration is different from the planned configuration.

### "Online replacement" device parameter

The „Online replacement“ device parameter makes it possible to hot swap SWD modules block by block. In addition, the „All slaves optional“ parameter must be set to „Yes“ Otherwise, the entire line will be disabled if communications with one or more SmartWire-DT modules are lost.

#### **NOTICE**

Hot swapping modules on the SWD line is only allowed in conjunction with the SWD4-FFR-PF1-1 power supply module and SWD4-FFR-ST1-1 cable adapter SmartWire-DT components.

When „Online replacement“ is enabled, the SmartWire-DT coordinator will perform an automatic addressing routine if it detects any differences between the target configuration and the actual configuration when comparing them. The comparison between the planned SmartWire-DT configuration and the target configuration will continue to be performed.

#### Examples

Remember that if „All slaves optional“ is set to „Yes“ and is enabled, the SWD line will continue to run even if a module on the line drops out - regardless of whether „Online replacement“ is enabled or disabled.

When „Online replacement“ = „not allowed“ this means that the device parameter is not enabled. If the module is replaced with an identical module while the power is off, the target configuration will have to be imported again after the power is turned back on. The SWD line will not start running. In other words, the user is required to intervene.

When „Online replacement“ = „allowed“ this means that the device parameter is enabled. If the module is replaced with an identical module while the power is off, a new target configuration will be automatically imported. If this imported target configuration matches the planned SmartWire-DT configuration, the SWD line will start running. The SWD line will also start running if the new modules are compatible with the planned SmartWire-DT configuration and the "Compatible devices allowed"="Yes" is enabled.

## 7 What you need to know about SmartWire-DT®

### 7.5 SWD device parameters

#### 7.5.1 Device parameters of the SWD gateway

Table 7: Device parameter SWD coordinator

Device parameter adjustable on SWD coordinator	VALUE	Reaction SWD line
Baud rate SmartWire-DT	4=125 kBit/s 5=250 kBit/s	125 kBit/s =setpoint value  Baud rate on SWD line Setting options: <ul style="list-style-type: none"> <li>• 4 = 125 kBit/s (setpoint value)</li> <li>• 5 = 250 Kbit/s (operating system V1.10 and higher)</li> </ul>
All slaves optional (0 = No; 1 = Yes)	Defined for each slave	0=Default setting The device parameter on each SWD module is used to define whether the module is optional → Section " Presence of device on SWD", page 69.
	Yes	All SWD modules are optional. The SWD line can be run with any number of failed SWD modules. Data will be transferred to the field bus master.  The → Section " Presence of device on SWD", page 69 setting in the SWD modules will have no effect.
Compatible devices allowed (0 = No; 1 = Yes)	No	0=Default setting The planned SWD modules in the SWD configuration must comply with the SWD modules of the stored gateway target configuration. If they do not, no data will be transferred to the field bus master.
	Yes	Data will be exchanged if the SmartWire-DT modules connected to the SWD line are identical to or compatible with the SmartWire-DT modules in the planned SmartWire-DT configuration. If they do not, no data will be transferred to the field bus master. This is displayed via the status LED on the device. You will find the list of devices that are compatible with one another in → Table 30, page 106.
Delay between cyclic data exchange (0 - 255ms)		At present the value cannot be changed.
Online replacement (0 = No; 1 = Yes)	not allowed	0=Default setting; New SWD modules on the SWD line must always be assigned an address by importing the target configuration.
	allowed	This setting enables block-by-block hot swapping for SWD modules without having to explicitly reconfigure them via the device by pressing the configuration button.  In addition, the "All slaves optional" to „Yes“ Otherwise, the entire line will be disabled if communications with one or more SmartWire-DT modules are lost.



## 7.5.2 Device parameters of SWD modules

Table 8: Device parameters of SWD modules

Device parameter adjustable on SWD module	Value	Reaction SmartWire-DT
Presence of device on SWD	Device shall be present	<p>Required SWD module 1=Setpoint value The SWD module must be present when the system starts and during operation. A missing SWD module causes following:</p> <ul style="list-style-type: none"> <li>• PRSNT diagnostic bit to be set to "0"</li> <li>• DIAG diagnostic bit to be set to "1"</li> <li>• The SWD line will not start running or will be stopped, as the case may be.</li> </ul> <p><b>Note:</b></p> <p>This device parameter will only take effect if the coordinator's " „All slaves optional“ device parameter is disabled, i.e., if it has a value of „Defined for each slave“ .</p>
	Device may not be present	The SWD line will keep running even if the SWD module is missing or defective.
Replacement by universal module	not allowed	<p>0=Setpoint value The SWD module can not be replaced by a universal module M22-SWD-NOP(C).</p>
	allowed	The SWD module can be replaced by a universal module M22-SWD-NOP(C).

#### 7.5.3 Application cases for the effective use of the device parameters

##### **Compatible devices allowed enabled**

The system is already running and both the target configuration and the planned SWD configuration are stored on the SWD coordinator. The SWD coordinator is switched off in order to replace a defective module. As you don't have a replacement of the same type, you use a compatible type according to the table.

When you switch the SWD coordinator back on, the actual configuration will be determined. The automatic configuration comparison will detect the new module and signal this discrepancy by showing a solid red light on the Config LED. You will then have to press the "Config" configuration button. After this, the SWD coordinator will import the new target configuration. The SmartWire-DT coordinator will compare the target configuration with the planned SmartWire-DT configuration and detect a difference between both. The system will then check whether the "Compatible devices permissible" option has been enabled. If it has, the SWD coordinator will check whether the module in the target configuration is really compatible with the module in the planned SWD configuration. If it is, there is no SmartWire-DT error and the SWD line will start running.

##### **Can be replaced with universal module enabled**

You've designed a system and you want to first use a universal module for a specific module, as the actual specific module will be installed as part of a later upgrade. To do this, you enable the „Replacement by universal modul“ = „allowed“ device parameter.

This makes it possible for the module in the planned SmartWire-DT configuration to be replaced by a universal module in the target configuration. Once you install the universal module on the de-energized SWD line, you switch on the SWD coordinator and press the "Config" configuration button to import the target configuration. The check against the planned SWD configuration then shows that the configurations do not match. After this, the SWD coordinator checks whether the „Replacement by universal modul“ = „allowed“ device parameter is enabled for this module. If it is, the SWD line will start running.

#### 7.6 Faults on the SWD line

Different events can occur in conjunction with the SWD line, which require rectification.

##### **Missing or faulty module**

If the SWD coordinator determines that the actual configuration is missing a SWD module from the target configuration, the PRSNT diagnostic bit will be set to 0.

If the „All slaves optional“ = „Yes“, missing modules will not trigger a SmartWire-DT error. The „Presence of device on“ device parameter, which can be set individually for each SmartWire-DT module, will not be checked in this case. The Config LED and the SWD LED will show a solid green light.

If the „All slaves optional“ = „No“, the „Presence of device on“ device parameter on the individual SmartWire-DT module will be checked.

If the missing SmartWire-DT module is not a required SmartWire-DT module, the SWD line will keep running and will continue to work with the remaining SmartWire-DT modules. The Config LED and the SWD LED will show a solid green light.

If, however, the SWD module is a mandatory module, the SWD LED will show a flashing red light and the SWD line will not start running. The Config LED will show a solid green light, while the SWD LED will show a flashing red light.

If this error occurs during ongoing operation, e.g., because a module responds too late or is faulty, the SWD line will resume operation as soon as the error is fixed. A restart is not necessary.

## 7 What you need to know about SmartWire-DT®

### 7.6 Faults on the SWD line

#### **"Wrong" or faulty module**

An "incorrect" module is one that SWD coordinator finds which, when determining the actual configuration, is not expected in the target configuration.



Bear in mind that the serial number of the module is also examined for matching as well as the module type.

This means that if you replace a pushbutton actuator with one of the same type when the SWD line is switched off, it will be identified as an "incorrect" module by the SWD coordinator.

An "incorrect" SWD module on the SWD line can only be found on startup since the replacement of an SWD module is not permitted when the device is switched on. The following therefore distinguishes which cases an "incorrect" module can occur on an SWD line after startup.

If the SWD coordinator determines that an SWD module of the actual configuration does not match the target configuration, it defines it as an "wrong" module. The DIAG diagnostic bit stays at 0.

The same response also takes place if SWD coordinator finds more modules on the SWD line than is stored in the target configuration.

With a "wrong" module the SWD line does not go into operation. The Config LED is green, the continuous light; the SWD-LED is not flashing red.

You may wish to permit the "incorrect" module, because, for example, you wish to replace a faulty SWD module with a new one. Perhaps you wish to replace an SWD module with a compatible SWD module or with a universal module. In that case read further in → Section "Compatible devices permissible" enabled", page 94 and → Section "Can be replaced with universal module enabled", page 70.

In any case, you will have to press the "Config" configuration button.

## 7.7 LEDs on the device

The SWD-LED indicates whether the actual configuration of the SWD line matches the target configuration.

The Config LED is used to indicate the result of the configuration comparison between the stored target configuration and the planned configuration. This comparison takes into account all relevant device and module parameters.

Table 9: LED SWD coordinator

LED		Status	Data exchange coupling unit PLC
<b>SmartWire-DT</b>	off	no supply voltage at POW no target configuration present	No
	Green continuous light	Actual configuration = Target configuration	yes
	green flashing	The SWD modules are being addressed and the actual configuration is being determined, e.g., after switching the system on or downloading a planned SWD configuration with universal modules	No
	red flashing	actual configuration ≠ target configuration e.g., a required module is missing or one module too many	No
	Red continuous light	No SWD line present No 15 V DC device voltage present	No
<b>Config</b>	off	No planned SWD configuration is available, because e.g. <ul style="list-style-type: none"> <li>• Initial Commissioning or</li> <li>• Program in SWD coordinator was deleted</li> </ul>	No
	Green continuous light	target configuration = defined planned SWD configuration	yes
	Green flashing	A module from the planned SWD configuration has been replaced with a compatible module in the target and actual configurations	yes
	Red continuous light	Target configuration ≠ defined planned SWD configuration	No
	Changes from permanent orange to red	The gateway is in firmware update mode when the POW LED is off. The firmware update mode can be left by switching on the supply voltage again.	No

## LEDs on the module

Table 10: LEDs on the relevant module

LED		Status
<b>Module-LED</b>	off	no 15 V supply voltage
	green flashing	Waiting for addressing
	green fast flashing	Error on module and diagnostic alarm is "1"
	Green continuous light	Module matches the target configuration.

## 7 What you need to know about SmartWire-DT®

### 7.8 SWD assist

Further information is provided in the manual "SmartWire-DT The System", MN05006002Z-EN.

#### **7.8 SWD assist**

The SWD assist planning, ordering and commissioning program can be used to perform the following functions, among others:

- Selecting modules, as well as a gateway
- Entering device parameters for the SWD gateway and the SWD modules
- Entering SWD network parameters
- Status indication of the inputs/outputs
- Wiring test
- Reading of the stored actual configuration
- Importing the planned SWD configuration stored on the gateway
- Comparison of the target and actual configuration
- Display of cyclical and acyclical diagnostics messages

The Online Help function provides a detailed description of how to use SWD-Assist. In order to open it, click on the "?" icon on the SWD-Assist menu bar or press the F1 key.

## 8 Appendix

### 8.1 Dimensions

		EU5C-SWD-DP
Dimensions W × H × D	mm	35 × 90 × 126.5
	inch	1.38 × 3.54 × 4.98
Dimensions a	mm	122
	inch	4.8
Space units (SU) width		2
Weight	kg	0.16
	lb	0.35
Mounting Considerations		Top-hat rail IEC/EN 60715, 35 mm or screw fixing using fixing brackets ZB4-101-GF1 (accessories).
Mounting position		Horizontal or vertical

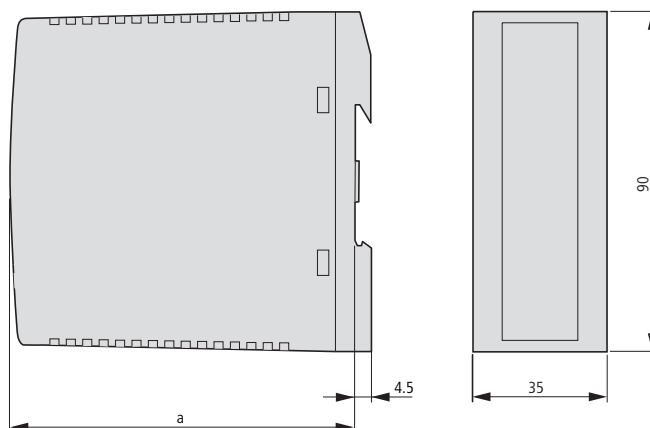


Figure 37: Dimensions EU5C-SWD-DP

## 8.2 Technical data

### 8.2.1 Standards

	EU5C-SWD-DP
Standards	EN 55011, EN 50178, EN 61131-2, IEC EN 61000-4, IEC60068-2-6, IEC60068-2-27

### 8.2.2 General ambient conditions

	EU5C-SWD-DP		
<b>Ambient mechanical conditions</b>			
Degree of protection (IEC/EN 60529, EN50178, VBG 4)	IP20		
Vibrations (IEC/EN 61131-2:2008)			
constant amplitude 0.15 mm	Hz	5 – 8.4	
constant acceleration 1 g	Hz	8.4 – 150	
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Impact resistances	9	
Drop to IEC/EN 60068-2-31	Drop height	mm	50
Free fall, packaged (IEC/EN 60068-2-32)		m	0.3
<b>Ambient climatic conditions</b>			
Operating ambient temperature (IEC 60068-2)	°C	-25 to +55	
Condensation		prevent with suitable measures	
Storage	°C	-40 to +70	
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 – 95	
<b>Electromagnetic compatibility (EMC)</b>			
Overvoltage category		II	
Pollution degree		2	
Electrostatic discharge (IEC/EN 61131-2:2008)			
Air discharge (Level 3)	kV	8	
Contact discharge (Level 2)	kV	4	
Electromagnetic fields (IEC/EN 61131-2:2008)			
80 - 1000 MHz	V/m	10	
1.4 - 2 GHz	V/m	3	
2 - 2.7 GHz	V/m	1	
Radio interference suppression (SmartWire-DT)		EN 55011 Class A	
Burst (IEC/EN 61131-2:2008, Level 3)			
Supply cables	kV	2	
Fieldbus cable	kV	1	
SmartWire-DT cables	kV	1	
Surge (IEC/EN 61131-2:2008, Level 1)			
Supply cables/Fieldbus cable	kV	supply cable: 0.5, bus cable: 1	
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	



### 8.2.3 Power supply

			EU5C-SWD-DP
<b>DC power supply AUX</b>			
Rated operational voltage		V	24 DC -15 % +20 %
Residual ripple of input voltage		%	≤ 5
Protection against polarity reversal			Yes
Maximum current	$I_{max}$	A_x	CE:3 <sup>1)</sup> UL: 2 <sup>1)</sup>
Short-circuit strength			no, external fuse CE: FAZ 3 UL: FAZ 2
Heat dissipation		W	Normally 1
Potential isolation			
from power supply POW			Yes
from serial interface			No
from SmartWire-DT			No
from fieldbus interface			Yes
Rated operating voltage of 24-V-DC modules		V	typical $U_{AUX} - 0.2$
<b>DC power supply POW</b>			
Supply voltage		V	24 DC -15 % +20 %
		%	≤ 5
			Yes
Rated operational current	$I_e$	A_x	0.7
Overload proof			yes
Inrush current and length			12.5 A/6 ms
Heat dissipation at 24 V DC		W	3.8
Potential isolation between $U_{POW}$ and 15 V SmartWire-DT supply voltage			No
Potential isolation			
from power supply POW			Yes
from serial interface			No
from SmartWire-DT			No
from fieldbus interface			Yes
Bridging voltage dips		ms	10
Repeat rate		s	1
Status display			POW-LED plain color: orange

1) When the total power consumption  $> I_{max}$ ,  
an EU5C-SWD-PF1 or EU5C-SWD-PF2 power feeder module has to be used.

### 8.2.4 SmartWire-DT®

			EU5C-SWD-DP
<b>SmartWire-DT power supply U<sub>swd</sub> (generated from the POW supply voltage)</b>			
Rated operational voltage	U <sub>e</sub>	V	14.5 ± 3 %
max. current	I <sub>max</sub>	A	0,7 <sup>1)</sup>
Short-circuit strength			Yes
Potential isolation			
from power supply POW			No
from power supply AUX			Yes
from serial interface			No
from fieldbus interface			Yes
Connection supply voltages			
Connection type			Push in terminals
solid		mm <sup>2</sup>	0.2 – 1.5 (AWG 24 – 16)
flexible with ferrule		mm <sup>2</sup>	0.25 – 1.5
<b>SmartWire-DT line</b>			
Module type			SWD configurator
Max. number of SmartWire-DT modules			58
Baud rate		kBd	125/250
Interface standard of data cable			RS485
Address setting			automatically via configuration button
Status display			Multi-color SWD-LED: orange/ green/red Dual colored Config LED: green/red
Connections			Plug, 8-pole
Plug connectors			Blade terminal SWD4-8MF2
Bus termination resistor SWD line			integrated in the device: the end of the SWD line must be terminated with SWD-RC8-10
1) When the total power consumption > I <sub>max</sub> , an EU5C-SWD-PF2 power feeder module has to be used.			

### 8.2.5 Field bus interface PROFIBUS-DP

		EU5C-SWD-DP
<b>Fieldbus interface</b>		
Function		PROFIBUS DP slave
Default port		None
Protocol		PROFIBUS-DP V 1
Input data, maximum	Byte	240
Output data, maximum	Byte	240
Baud rate	MBit	up to 12 MB
Baud rate detection		automatic
Address setting		automatic
Module address		2 – 125
Address setting with		DIP Switch
Status display interface		DP-LED two-colored: red/green
Bus termination resistor		switchable via plug
Terminal types		1 × SUB-D, 9-pole, socket
Potential isolation		
from power supply POW / AUX		Yes
from serial interface		Yes
from SmartWire-DT		Yes

### 8.2.6 Diagnostics interface

		EU5C-SWD-DP
<b>Diagnostics interface</b>		
Part no.		RS232
Terminal types		RJ45
Potential isolation		
from power supply POW / AUX		No
from SmartWire-DT		No
from fieldbus interface		Yes

## 8 Appendix

### 8.3 Compatible SWD module types

#### 8.3 Compatible SWD module types

You can find permissible SWD modules and their permissible replacement types:

Table 11: List of types that are compatible with one another

Part no.	Description	permissible replacement type 1	permissible replacement type 2
<b>RMQ function elements (front mount)</b>			
M22-SWD-K11	Function element, 2 pos. front	M22-SWD-K22	
M22-SWD-K22	Function element, 3 pos. front		
M22-SWD-LED-W	Function element, LED W front	M22-SWD-K11LED-W	M22-SWD-K22LED-W
M22-SWD-K11LED-W	Function element, 2 pos., LED W, front	M22-SWD-K22LED-W	
M22-SWD-K22LED-W	Function element, 3 pos., LED W, front		
M22-SWD-LED-R	Function element, LED R front	M22-SWD-K11LED-R	M22-SWD-K22LED-R
M22-SWD-K11LED-R	Function element, 2 pos., LED R, front	M22-SWD-K22LED-R	
M22-SWD-K22LED-R	Function element, 3 pos., LED R, front		
M22-SWD-LED-G	Function element, LED G front	M22-SWD-K11LED-G	M22-SWD-K22LED-G
M22-SWD-K11LED-G	Function element, 2 pos., LED G, front	M22-SWD-K22LED-G	
M22-SWD-K22LED-G	Function element, 3 pos., LED G, front		
M22-SWD-LED-B	Function element, LED B front	M22-SWD-K11LED-B	M22-SWD-K22LED-B
M22-SWD-K11LED-B	Function element, 2 pos., LED B, front	M22-SWD-K22LED-B	
M22-SWD-K22LED-B	Function element, 3 pos., LED B, front		

## 8 Appendix

### 8.3 Compatible SWD module types

Part no.	Description	permissible replacement type 1	permissible replacement type 2
<b>RMQ function elements (base fixing)</b>			
M22-SWD-KC11	Function element, 2 pos., base	M22-SWD-KC22	
M22-SWD-KC22	Function element, 3 pos., base		
M22-SWD-LEDC-W	Function element, LED-W, base	M22-SWD-K11LEDC-W	M22-SWD-K22LEDC-W
M22-SWD-K11LEDC-W	Function element, 2 pos., LED-W, base	M22-SWD-K22LEDC-W	
M22-SWD-K22LEDC-W	Function element, 3 pos., LED-W, base		
M22-SWD-LEDC-R	Function element, LED-R, base	M22-SWD-K11LEDC-R	M22-SWD-K22LEDC-R
M22-SWD-K11LEDC-R	Function element, 2 pos., LED-R, base	M22-SWD-K22LEDC-R	
M22-SWD-K22LEDC-R	Function element, 3 pos., LED-R, base		
M22-SWD-LEDC-G	Function element, LED-G, base	M22-SWD-K11LEDC-G	M22-SWD-K22LEDC-G
M22-SWD-K11LEDC-G	Function element, 2 pos., LED-G, base	M22-SWD-K22LEDC-G	
M22-SWD-K22LEDC-G	Function element, 3 pos., LED-G, base		
M22-SWD-LEDC-B	Function element, LED-B, base	M22-SWD-K11LEDC-B	M22-SWD-K22LEDC-B
M22-SWD-K11LEDC-B	Function element, 2 pos., LED-B, base	M22-SWD-K22LEDC-B	
M22-SWD-K22LEDC-B	Function element, 3 pos., LED-B, base		
<b>DILM/MSC function elements</b>			
DIL-SWD-32-001	DIL/MSC	DIL-SWD-32-002	
DIL-SWD-32-002	DIL/MSC, Manual/Auto		
PKE-SWD-32			
<b>I/O function elements</b>			
EU5E-SWD-4DX	Digital module, 4 inputs		
EU5E-SWD-8DX	Digital module, 8 inputs		
EU5E-SWD-4D4D	Digital module, 4 inputs, 4 outputs		
EU5E-SWD-4D2R	Digital module, 4 inputs, 2 outputs		
EU5E-SWD-X8D	Digital module, 8 outputs		
EU5E-SWD-4AX	Analog module, 4 inputs		
EU5E-SWD-2A2A	Analog module 2 inputs, 2 outputs		
EU5E-SWD-4PT	Analog module, 4 temperature inputs		
EU5E-SWD-4PT-2	Analog module, 4 temperature inputs		

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### 8.3 Compatible SWD module types

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