

SmartWire-DT Gateways



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Original Operating Instructions

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 German manual.

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See revision protocol in the "About this manual" chapter

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Danger! **Dangerous electrical voltage!**

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions IL (previously AWA) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-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 equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- 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 devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.

- 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-stop 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

0.1 List of revisions

As of publication date 06/10 this manual AWB2723-1612en has been renamed to MN05013002Z-EN.

The following significant amendments have been introduced since previous issues:

| Publication date | Page(s) | Key word | New | Modifi- cation | omitted |
|------------------|-----------|---|-----|-------------------|---------|
| 06/09 | 8, 46 | Maximum expansion of SmartWire-DT network | | ✓ | |
| | 8, 46 | Gateway DP and CANopen connection | | ✓ | |
| | 14 | Note on instructions (for adapting a external device plug) | ✓ | | |
| | 29 | Configuration and parameterization with SIMATIC S7, STEP 7 | ✓ | | |
| | 62 | Additional notes on node guarding and heartbeat mode | | ✓ | |
| 03/10 | 26 | Acyclical data communication | ✓ | | |
| | 145, 147 | EU5C-SWD-DP and EU5C-SWD-CAN version tables | ✓ | | |
| | 84, 84 | update of the operating system | ✓ | | |
| 06/10 | 145, 147 | EU5C-SWD-DP and EU5C-SWD-CAN version tables NZM-XSWD-704 circuit-breaker | ✓ | | |
| 03/11 | 24 | Parameterization when using a universal module M22-SWD-NOP(C) | ✓ | | |
| | 65 | Parameter "AcceptUniversalModule" | ✓ | | |
| 09/11 | Chapter 3 | New gateway type EU5C-SWD-EIP-MODTCP | ✓ | | |

0.2 Overview SmartWire-DT

The communication system SmartWire-DT makes normal electromechanical switchgears, pilot devices capable of communication. To achieve this, intelligent add-on components are added to the devices that make possible connection to the communication system SmartWire-DT. For communication various versions of 8-pole cables are used that make possible use inside and outside of the control panel.

Communication between the SmartWire-DT stations with the overriding PLC is performed via standard field bus systems. For this purpose gateways are used that map the data of the SmartWire-DT network onto the field bus.

This manual describes both systems:

- PROFIBUS Gateway EU5C-SWD-DP
- CANopen coupling unit EU5C-SWD-CAN
- EtherNet/IP / Modbus TCP Gateway EU5C-SWD-EIP-MODTCP

0.3 Further information on the device



You can find further information on the topics SmartWire-DT and the SmartWire-DT stations in the following manuals and the instructional leaflet:

- MN05006002Z-EN manual (previously AWB2723-1617en) "SmartWire-DT The System"
- MN05006001Z-EN manual (previously AWB2723-1613en) "SmartWire-DT station"
- MN05002002Z-EN manual (previously AWB2725-1452en) "XI/OC-signal modules"
- Instructional leaflet "EU5C-SWD..." IL05006001Z-EN (previously AWA2723-2478)

The documents are available for download on the Internet as PDF files.

They can be quickly located at

<http://www.eaton.com/moeller> → **Support**

by entering the document number as the search term.

0.4 Target group

This manual is intended for automation technicians and engineers.

Detailed knowledge of the field bus used is presumed. In addition you should be familiar with the handling of the SmartWire-DT system.

0.5 Writing conventions

The symbols used in this manual have the following meanings:

- ▶ indicates actions to be taken.

0.5.1 Hazard warnings of material damages

CAUTION

Warns about the possibility of material damage.
(step 1).

0.5.2 Hazard warnings of personal injury



WARNING

Warns of the possibility of hazardous situations that may possibly cause slight injury.
(step 2)



DANGER

Warns of hazardous situations that result in serious injury or death.
(step 4)

0.5.3 Tips



Indicates useful tips.

For greater clarity, the name of the current chapter and the name of the current section are shown in the page header.

0 About This Manual
0.5 Writing conventions

1 PROFIBUS Gateway EU5C-SWD-DP

1.1 Introduction

The SmartWire-DT coupling unit EU5C-SWD-DP creates a connection between the SmartWire-DT stations and an overriding PROFIBUS-DP master.

1.2 surface mounting

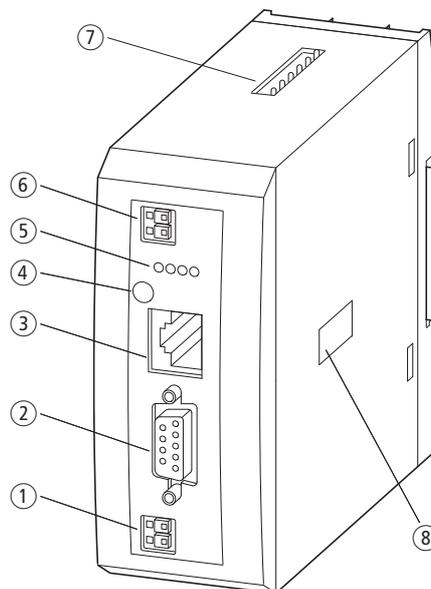


Figure 1: Front view EU5C-SWD-DP

- ① 24-V power supply POW
- ② Field bus interface
- ③ Diagnostics interface
- ④ Configuration button
- ⑤ Diagnostics displays
- ⑥ 24-V power supply AUX
- ⑦ SmartWire-DT connection
- ⑧ Address switches

The SmartWire-DT ribbon cable is connected to the stations at the gateway. Connection to the PROFIBUS field bus is effected via the standardized 9-pole PROFIBUS plug. In addition terminals for two power supplies are available, one for the SmartWire-DT stations and another 24 volts for supply of the contactor coils in case these are also operated via SmartWire-DT stations.

The power supply of the SmartWire-DT stations and the data communication are conducted via the 8-pole SmartWire-DT cable from the gateway to the stations.

1 PROFIBUS Gateway EU5C-SWD-DP

1.3 Engineering

1.3 Engineering

In connection with the SmartWire-DT stations the coupling unit appears as a modular station on the PROFIBUS. Each SmartWire-DT station is a module of its own. Up to 58 SmartWire-DT stations can be operated via a PROFIBUS coupling unit. However, take heed of the maximum data volume that can be exchanged via PROFIBUS. The maximum for a PROFIBUS station is 240 bytes of input data and 240 bytes of output data.



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

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

1.3.1 Connection

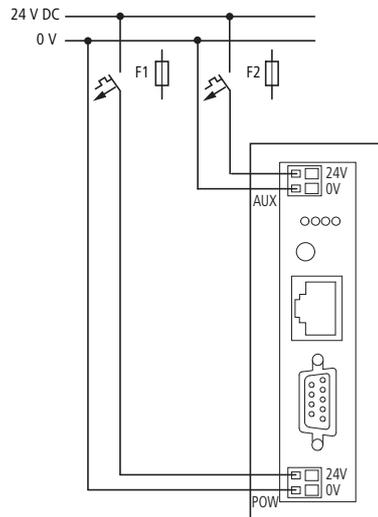


Figure 2: Connection

Power supply of the coupling unit and supply of the SmartWire-DT station electronics are performed via the terminals POW. The gateway contains an additional power feed module for the 15 V supply of the SmartWire-DT stations with an amperage of 0.7 A.

- ▶ On the SmartWire-DT gateway connect the POW and AUX supply voltages via separate miniature circuit-breakers or fuses:

Miniature circuit-breaker 24 V DC 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 types 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 24 V DC 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



Please take into consideration the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2.

For information regarding the devices' power consumption, please consult the "SmartWire-DT - System" manual (MN05006002Z-EN).



If any switchgear are also to be connected, for example, via the DIL-SWD-32-001/002 SmartWire-DT stations, the AUX supply will also be required.

If switchgear with an activation power greater than 3 A (UL: 2 A) are connected, an additional feeder module EU5C-SWD-PF1 or EU5C-SWD-PF2 must be used.



In the engineering of the SmartWire-DT network you are also supported by the software program SWD-Assist, which automatically draws your attention to the use of any necessary new feeder modules.

1 PROFIBUS Gateway EU5C-SWD-DP

1.3 Engineering

1.3.2 PROFIBUS address setting

The coupling unit requires a unique PROFIBUS-DP station address in the PROFIBUS network. This is set on the gateway via DIP switches (switches 2 - 8). The valid addresses are 1 - 125.

1.3.3 PROFIBUS connection

For connection to the field bus the standardized PROFIBUS plug is used, e.g. ZB4-209-DS2. This also includes a connectable bus termination resistor.

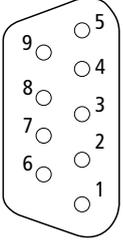
| PROFIBUS-DP | Pin | Meaning |
|---|-----|--------------|
|  | 3 | RxD/TxD-P |
| | 4 | CNTR-P |
| | 5 | DGND |
| | 6 | VP (+5 V DC) |
| | 8 | RxD/TxD-N |

Figure 3: Pin assignments

1.3.4 Baud rate

The coupling unit supports operation on PROFIBUS masters at up to 12 MB. Setting of the baud rate takes place automatically.

1.3.4.1 PROFIBUS-Version

The EU5C-SWD-DP SmartWire-DT gateway supports from operating system version 1.10 the PROFIBUS version V1 (PROFIBUS version V0 with operating system version 1.0).

1.3.5 Device master data (GSD)

A device master file (GSD file) is necessary for selection of the device and operation via the field bus PROFIBUS-DP. The GSD file contains standardized descriptions of the PROFIBUS stations.

Two different GSD files exist for the PROFIBUS gateway:

- For Motorola based CPU (e.g. for Siemens S7)
- for Intel-based CPUs (e.g. for Eaton XC100/200)

The further development of the SmartWire-DT communication system has resulted in different versions of the GSD files. The relationship between supported SmartWire-DT stations, SmartWire-DT gateways and GSD files is shown in a table in the Appendix.



As of version V.2.3.9 and service pack ecp_update_0109 these files are included in the Eaton programming system CoDeSys. You can find these files on our web site as follows:

<http://www.eaton.com/moeller> → **Support**

1.3.6 Diagnostics interface

The gateways have an online diagnostics interface with the following functions:

- Update of the operating system of the SmartWire-DT gateways
- Connection of the SWD-Assist for the online diagnostics of the SmartWire-DT network

The EU4A-RJ45-CAB1 programming cable (serial SUB-D<->RJ45) or the EU4A-RJ45-USB-CAB1 USB cable (USB<->RJ45) can be used for the connection.

| | Pin | RS232 |
|---|-----|-------|
| 8 | 8 | RxD |
| 7 | 7 | – |
| 6 | 6 | – |
| 5 | 5 | TxD |
| 4 | 4 | GND |
| 3 | 3 | – |
| 2 | 2 | – |
| 1 | 1 | – |

Figure 4: Configuration of the diagnostics interface

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 network even without the active PLC.

- Status indication of the inputs/outputs
- Wiring test
- Reading of the stored actual configuration
- Reading the SmartWire-DT configuration
- Comparison of the target and actual configuration
- Display of cyclical and acyclical diagnostics alarms

For additional details, please consult the Online Help for the SWD-Assist program.



These online functions are available from operating system version 1.10 of the gateways and version 1.10 of the SWD-Assist software.

1 PROFIBUS Gateway EU5C-SWD-DP

1.4 Installation

1.4 Installation

1.4.1 Mounting

Please proceed as follows to install the device:

- ▶ First of all set the PROFIBUS station address. This is set on the gateway via dip switches (switches 2 - 8). The dip switches are located under a cover on the right-hand side of the gateway. Valid addresses are 1 - 125.

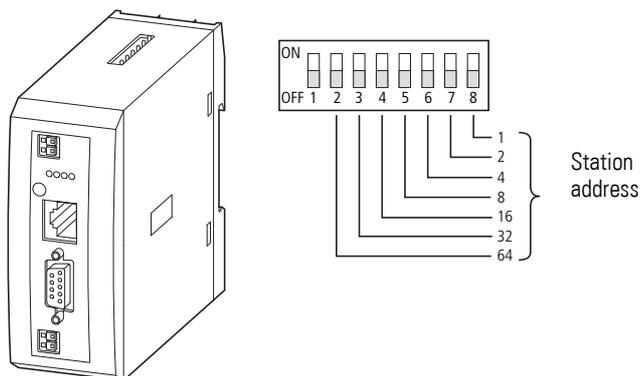


Figure 5: Setting the station address

- ▶ Mount the device on the top-hat rail.

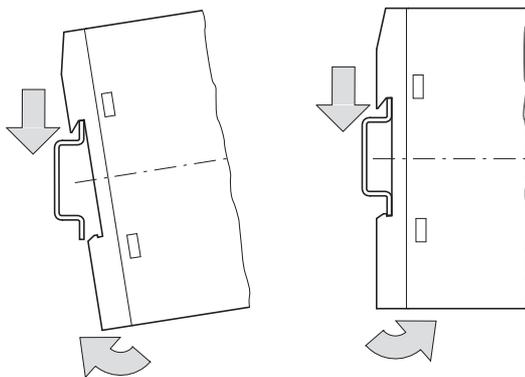


Figure 6: Mounting on top-hat rail

- ▶ Connect the 24 V DC voltage to the POW connection terminals on the front side of the gateway.
- ▶ If necessary, connect the 24 V DC voltage for the contactor coils to the connection terminals AUX.

**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).

CAUTION

You must take safety precautions (emergency switching off) in the external circuitry of the EU5C-SWD-DP and any power modules type EU5C-SWD-PF1-1 or EU5C-SWD-PF2-1 that are used. To do so, plan to switch off the power supply to the contactor coils AUX.

**DANGER**

Switch off the power supply, if you are reconnecting stations in the SmartWire-DT system or reconnecting the ribbon cable connection. Otherwise the SmartWire-DT stations can be destroyed!

1.4.1.1 Potential conditions 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 stations 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.

**DANGER**

The gateway has protection against polarity reversal for the 24-V-DC-POW supply. However, if the gateway is connected via the serial interface to an earthed device (for example to a PC), the gateway can be destroyed, if the polarity of the power supply is reversed!

1 PROFIBUS Gateway EU5C-SWD-DP

1.4 Installation

1.4.2 Connection SmartWire-DT

- ▶ Connect the SmartWire-DT network. 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 on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-DT cable are provided in chapter "Fitting external device plugs SWD4-8SF2-5" of the manual MN05006002Z-EN.

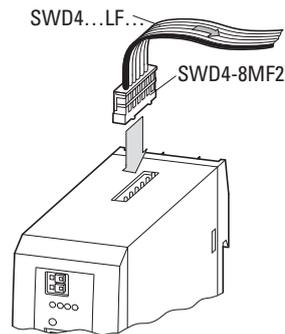


Figure 7: Connection SmartWire-DT

1.4.3 PROFIBUS-DP connection

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 by means of the PROFIBUS-DP plug to the field bus interface of the gateway.

The first and the last station of a PROFIBUS-DP field bus segment must be terminated with a switched on terminating resistor. The bus termination resistor is switched externally. It be implemented either with a separate terminating resistor or by a special SUB D connector (e.g. ZB4-209-DS2).

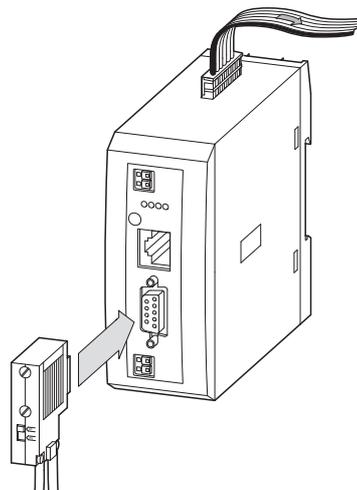


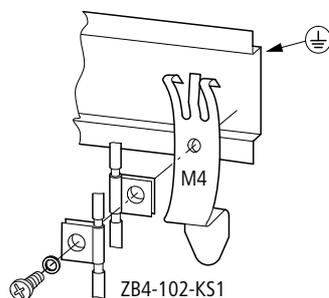
Figure 8: Connection for PROFIBUS-DP

1.4.4 EMC-conformant wiring of the network

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 that do not cause large potential differences
- correct installation of the PROFIBUS system (cable, connection of the bus connectors, etc.)
- Using shielding

for top-hat rail



for mounting plate

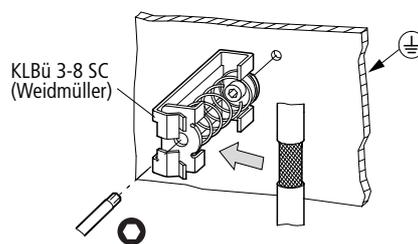
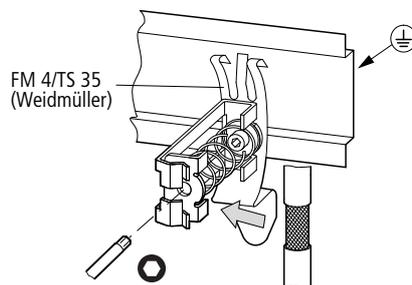
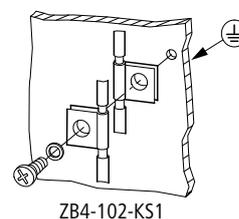


Figure 9: Network cable shielded by using a shield

1.5 Commissioning

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

If you have already integrated devices into a system, secure the operating range of any connected parts of the system against access so that nobody is endangered, for example, by motors starting up unexpectedly.

Commissioning takes place in several steps:

1. Putting the SmartWire-DT network into operation
2. Create a connection to the field bus
3. Load and start the PLC program.

1.5.1 Putting the SmartWire-DT network into operation

Before the gateway can exchange data with the PLC, a valid SmartWire-DT network configuration (a so-called gateway target configuration) has to be stored in the gateway. This is compared with the current configuration (actual configuration) each time the gateway is restarted. If the gateway ascertains in this process that a SmartWire-DT station cannot be reached or a wrong station type is determined, the SmartWire-DT network will not go into operation (to be precise this is dependent on the network configuration). Reading of the SmartWire-DT network configuration takes place by pressing the configuration button on the gateway. All SmartWire-DT stations are re-addressed in ascending order in the process.

This process may only take place in the case of:

- initial commissioning,
- the replacement of a defective station or
- a change to the configuration.



DANGER

If a SmartWire-DT station has failed, the SmartWire-DT network can still be operated with the remaining stations, depending on the configuration setting (even after a repeat power up of the gateway). The failure is reported to the application.

If there is a faulty configuration and the configuration button is pressed, only the stations up to the failed device are addressed and stored. Use of the remaining stations is not possible until the defective station has been replaced and the configuration has been read in again by actuating the configuration button.

1.5.1.1 Switching on for initial startup, a replacement or a changed SmartWire-DT configuration

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

- All SmartWire-DT stations are connected to the SmartWire-DT line.
 - The SmartWire-DT network is connected to the gateway.
 - The voltage POW is applied to the coupling unit and the power LED lights up.
 - The voltage AUX is applied (if necessary).
 - The SmartWire-DT status LEDs of the SmartWire-DT stations are on or are flashing.
 - If necessary remove the PROFIBUS field bus terminal from the SmartWire-DT gateway.
- Press the configuration button on the gateway for at least two seconds. The SmartWire status LED on the gateway begins to flash orange. The SmartWire-DT status LEDs on the SmartWire-DT stations also flash.

All stations are addressed in sequence, the complete configuration is stored retentively (coupling unit target configuration). The gateway is then restarted (see following section).

1.5.1.2 Switching on when the gateway target configuration is stored

If a configuration is stored in the gateway, each time the supply voltage is switched on it is checked whether the stations actually found on the network comply with the stored gateway target configuration. The result of the check is displayed via the SmartWire-DT status LED on the gateway:

| Description | Status SmartWire-DT LED | Data interchange between the gateway and SmartWire-DT stations |
|--|-------------------------|--|
| The current actual configuration complies with the gateway target configuration. | Green continuous light | Yes |
| A necessary SmartWire-DT station is missing or the coupling unit target configuration does not comply with the actual configuration. | Flashing (red) | no |
| Station addressing is active (after power on or the download of a planned configuration with empty modules). | Flashing (green) | no |
| Short-circuit on the 15 V power supply or no SmartWire-DT station is connected. | Red continuous light | no |

1.5.1.3 Creating field bus communication

If a data interchange is possible between the SmartWire-DT stations and the coupling unit, in principle communication between the coupling unit and the controller can also be performed via PROFIBUS.

- ▶ Connect the PROFIBUS coupling unit to the field bus.
- ▶ Load the program into the PLC.

The configuration of the PROFIBUS network is transferred to the PROFIBUS master when the program is uploaded onto the controller. The PROFIBUS master then transfers the configuration of the SmartWire-DT network to the gateway and tests it. If the planned configuration complies with the stored gateway configuration, all status LEDs indicate a green continuous light. Any errors that occur are indicated via the DP status LED and the Config status LED.

Table 1: Error Messages

| Description | PROFIBUS status LED | Data interchange between the gateway and the PLC via PROFIBUS |
|--|------------------------|---|
| Cyclic data communication runs on the PROFIBUS. The planned configuration complies with the gateway target configuration. | Green continuous light | Yes |
| The DP master does not detect a data interchange, because the planned configuration does not comply with the gateway target configuration. | Flashing (green) | Yes |
| No communication takes place on the PROFIBUS. No DP master is detected (for example, on account of a wrong station address). | Off | no |
| Extended DP diagnostics: The input data from SmartWire-DT stations is invalid or the necessary stations are missing. | orange | Yes |

So the prerequisite for data interchange is that the configuration drawn up on the PLC system (= planned configuration) complies with the configuration available on the gateway. The result of this check is signalled on the gateway via the SmartWire-DT configuration LED.

Table 2: Signals of the SmartWire-DT configuration LED

| Description | SmartWire-DT configurations LED | Data interchange between the gateway and the PLC via PROFIBUS |
|---|---------------------------------|---|
| The planned configuration complies with the gateway target configuration. | Green continuous light | Yes |
| The planned configuration does not comply with the gateway target configuration, but is compatible with it. (list of the devices that are compatible with one another → Table 22, page 140) | Flashing (green) | Yes |
| The planned configuration and the gateway target configuration are not compatible. | Red continuous light | no |

1.6 Programming

1.6.1 Introduction

The SmartWire-DT gateway is integrated into the PROFIBUS configurator of the programming system as a DP station. A device master file (GSD file) which contains a standardized description of the SmartWire-DT coupling unit is necessary for this. Depending on the PROFIBUS master used two different versions are available for this:

- For Motorola based CPU (e.g. for Siemens S7)
- for Intel-based CPUs (e.g. for Eaton XC100/200)

The further development of the SmartWire-DT communication system has resulted in different versions of the GSD files. The relationship between supported SmartWire-DT stations, SmartWire-DT gateways and GSD files is shown in a table in the Appendix.



As of version V.2.3.9 and service pack ecp_update_0109 these files are included in the Eaton programming system CoDeSys. You can also find the current version of the GSD files on the internet at:

<http://www.eaton.com/moeller> → **Support**

In this case load the relevant GSD files with the relevant bitmap files into the relevant directory of your programming system. Please refer to the documentation for your programming system for information on this.

For the Eaton programming system CoDeSys this folder is on your PC in:

C:\Program files\Common files\CAA-Targets\

The installed version for this is, for example, Moeller V2.3.9.

1.6.2 Configuration and parameterization with CoDeSys

The connection of a SmartWire-DT network via the gateway EU5C-SWD-DP to the controller XC200 is described in this section. Please check beforehand whether you have a current CoDeSys version installed with the necessary GSD files.

Then please proceed as follows:

- ▶ Start CoDeSys and open a project.
- ▶ Open the controller configuration and select the PROFIBUS master module XIOC-NET-DP-M. This must be positioned on the first three slots.

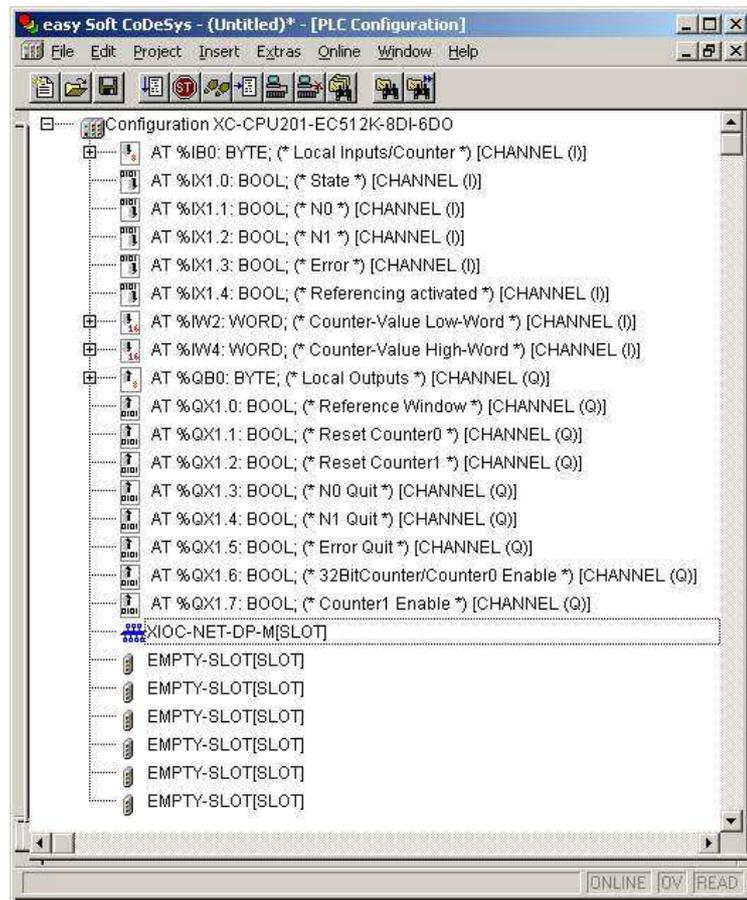


Figure 10: Selection of the DP master

- ▶ Select the DP master module and choose **Insert -> Attach sub-element** to open the selection list for the DP station modules. Select the correct version of the EU5C-SDW-DP gateway.

The relationship between supported SmartWire-DT stations and GSD files is provided in the EU5C-SWD-DP version table in the Appendix on page 145.

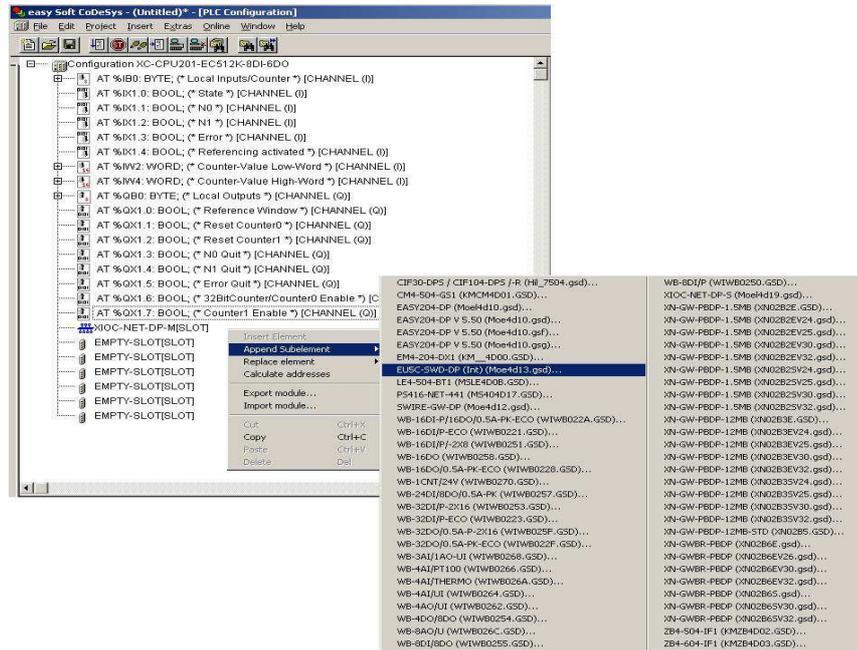


Figure 11: Selection of the gateways

Installing a project-specific GSD file

The “SWD-Assist” planning and ordering tool enables you to create a complete SmartWire-DT network. It is also possible to create a project-specific CoDeSys-compatible GSD file with the software. SWD-Assist stores the GSD file under the name of the current project with the appropriate extension, such as SWD_Proj.gsd. This can be installed in CoDeSys in the same way as the standard GSD file.

- ▶ Install the project-specific GSD file in the folder that is intended for storing the default GSD file.
If you are working with the Eaton CoDeSys programming system, this folder will be found on your computer under:

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

The installed version in the above path would be, for example, Moeller V2.3.9.

After following the above instructions, you will be able to use the project-specific GSD file the same way you would use the default GSD file.

1.6.2.1 Selecting the SmartWire-DT stations

- ▶ Change over to the **Inputs/Outputs** tab.
- ▶ Now select here the SmartWire-DT stations that you require for your SmartWire-DT network. Please heed of the correct sequence. The modules must be configured just as they will be arranged afterwards in your application.

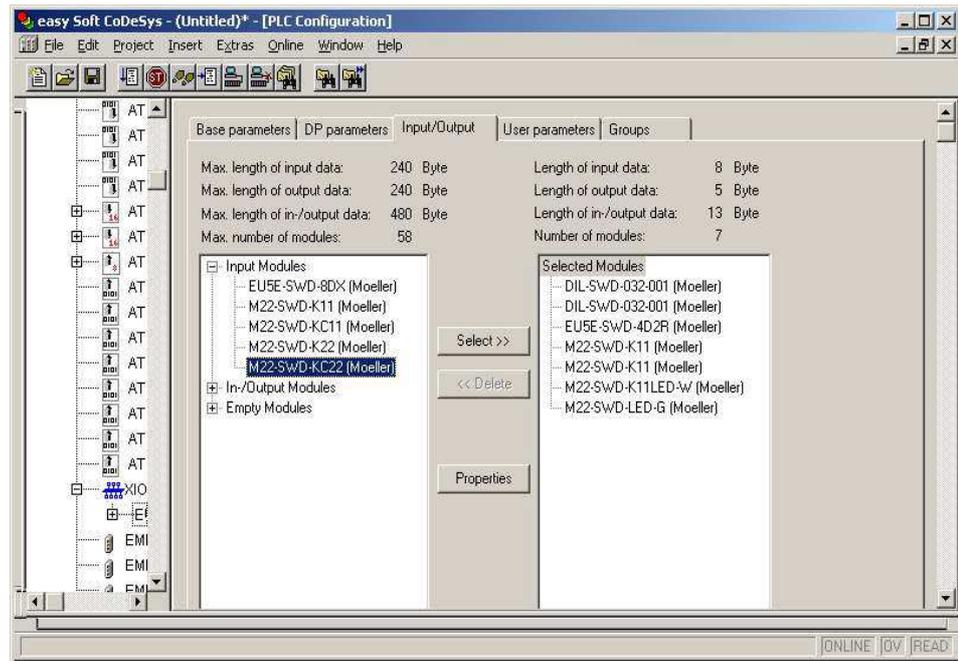


Figure 12: Selection of the stations

1.6.2.2 Parameter setting

Parameters for communication of the coupling unit with the PROFIBUS master and with the SmartWire-DT network are also defined in the controller configuration.

These are the meanings of the individual registers:

“Basic Parameters” tab

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

“DP Parameters” tab

The parameters that relate to communication with the field bus PROFIBUS-DP are entered under these settings. These include, for example, the DP-station address (node ID) or the monitoring time (watchdog control).

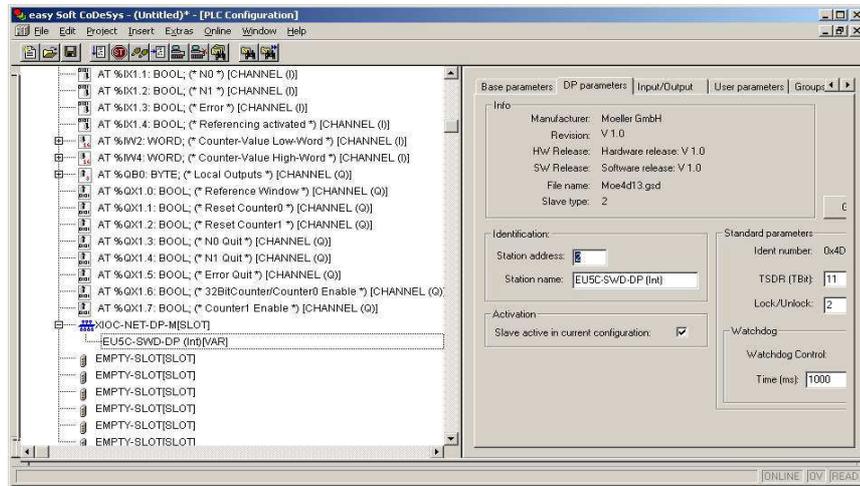


Figure 13: Setting the DP parameters

“User parameters” tab

Application parameters define the general specifications of the gateway and SmartWire-DT stations.

The following table shows the parameters, their meaning and setting facilities.

Table 3: User parameters

| Parameters | Value | Meaning |
|--|---|---|
| Baud rate SmartWire-DT | 125 Kbit/s (setpoint value) 250 Kbit/s (from operating system version V1.10) | The baud rate of the SmartWire-DT network |
| Compatible devices allowed (Compatible devices permissible) | no | The planned SmartWire-DT stations in the configuration must comply with the SmartWire-DT stations of the stored gateway target configuration. If not, no data interchange takes place with the DP master. |
| | Yes | Data exchange takes place if the connected SmartWire-DT stations are compatible with the SmartWire-DT stations in the configuration. This is indicated by the Status LED on the device. |
| All stations optional (All devices are optional) | Defined for each station (Define for each device) | Specification is performed individually for each station (→ Section “Parameters of individual SmartWire-DT stations”, page 64) |
| | Yes | Data transmission to the PROFIBUS also takes place for a random number of failed SmartWire-DT stations. The setting in the module parameters has no effect. |

1.6.2.3 Setting specific parameters of SmartWire-DT stations

You can parameterize the startup behavior for each SmartWire-DT station. By doing this you define how the gateway reacts, if a station is not available. The default setting is that all stations have to be available. However, the information as to whether a station is available is also reported to the application via the diagnosis so that the failure of a station can be reacted to individually here (→ Section “1.6.6 Diagnostics”, page 40).

1.6.2.4 Changing the setting

- ▶ Select the corresponding SmartWire-DT module in the **Inputs/Outputs** tab in the table “Selected Modules”.
- ▶ Press the pushbutton **Properties**. The dialogue field **Module Properties** relating to the selected module is displayed. By double-clicking on the entry **Device shall be present** (device must be present) in the column **Value** the setting for **Device may not be present** (device does not have to be present) changes.

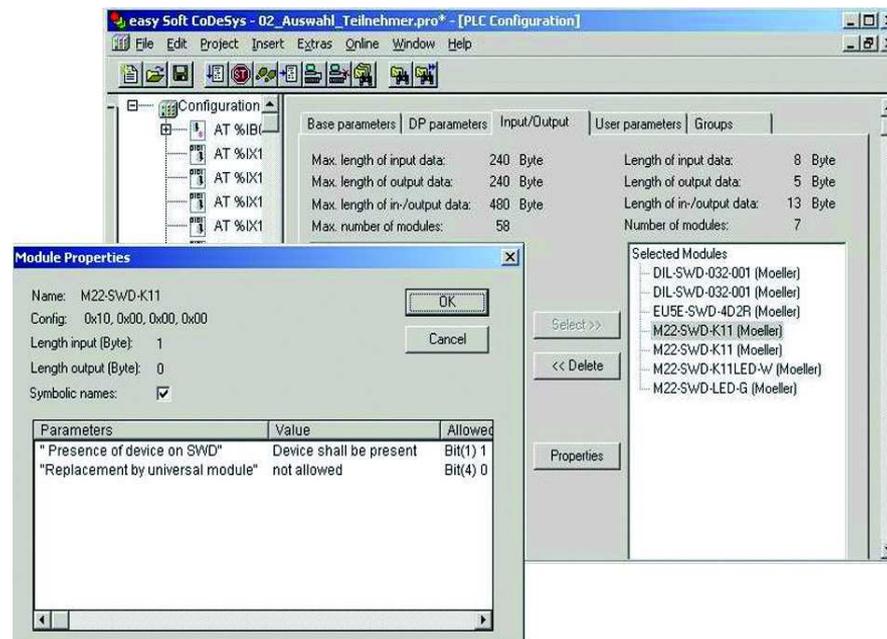


Figure 14: Parameterizing SmartWire-DT stations (= module)

Parameter setting at this point only makes sense if the value **Defined for each station** is set in the user parameters for the parameter **All Stations optional**.

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

1.6.2.5 Input/output addresses

The configuration of the SmartWire-DT stations in the controller configurator automatically causes the input/output addresses of the stations to be assigned. The assignment of the addresses to the individual SmartWire-DT stations can be viewed in the controller configuration.

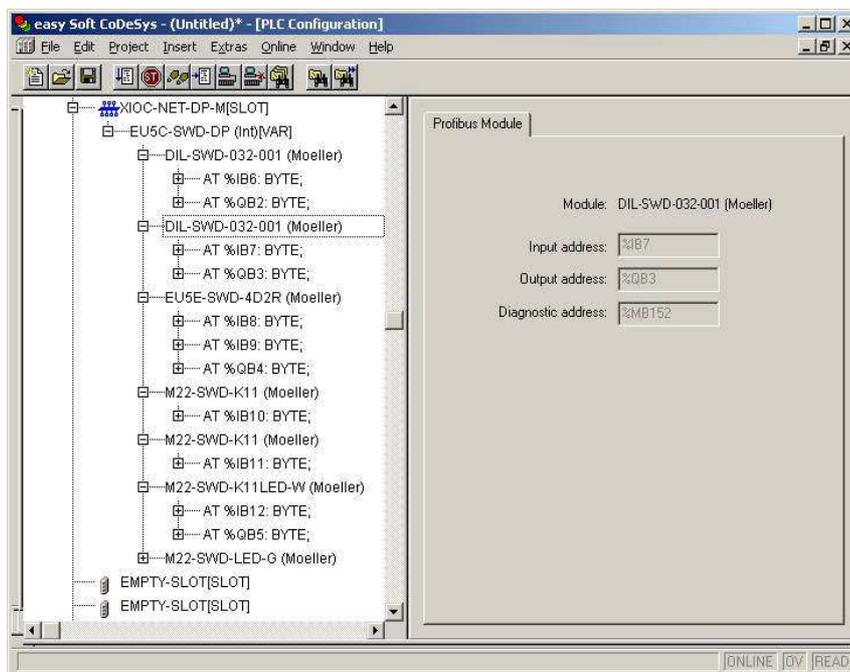


Figure 15: SmartWire-DT station addresses

The inputs and, if necessary, the outputs are used as “normal” local inputs/outputs in the application program.



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

1.6.3 Acyclic data communication

SmartWire-DT stations 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.

The library contains the function blocks

XDPMV1_READ,
XDPMV1_WRITE.

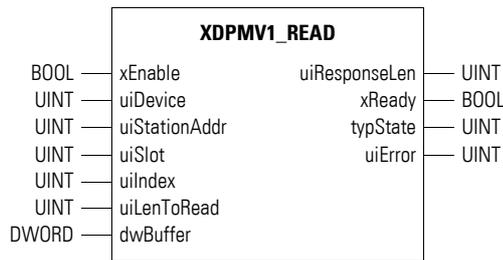


Figure 16: Prototype for the function block XDPMV1_READ

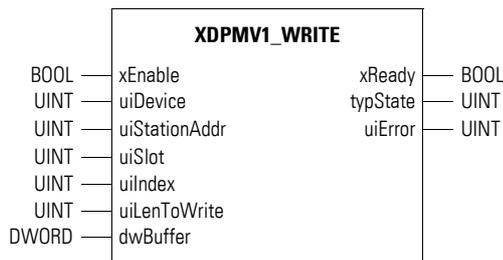


Figure 17: Prototype for the function block XDPMV1_WRITE

The data of the SmartWire-DT stations which can be read or written acyclically are described in the following as DP-V1 objects. The number and meaning of the available DP-V1 objects are described in the relevant documentation (e.g. MN05006001Z-EN "SmartWire-DT stations").

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 address of the SmartWire-DT station. The first station therefore has the slot number 1, the second 2 etc. The index addresses the V1 object. Also here, the first object is assigned the number 1, the second 2 etc. With the SmartWire-DT station PKE-SWD32, object 1 supplies the current value 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 function blocks so that only one function block can be active at a time!

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

1.6.3.1 General handling guidelines for the modules

- ▶ Apply a “1 signal” (positive/rising edge) to the “Enable” input in order to start a job. 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.

Meanings of the operands

| Operand | Meaning |
|---------------|--|
| xEnable | Start |
| uiDevice | Device number (see table below) |
| uiStationAddr | PROFIBUS-station-address of the SmartWire-DT gateway |
| uiSlot | SmartWire-DT station 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 error code on the “uiError” output |
| uiError | Error code see Table 5 („Error codes“) |

1.6.3.2 Function block assignment (Device number)

Using an XC200 PLC makes it possible to use up to three DP modules. Each DP module can use one function 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 Table 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 | Note |
|-------------------|------------------------|------------------------|------------------------|--|
| Module | DP-M | DP-M | DP-M | |
| Device No. | 0 | 1 | 2 | |
| Module | DP-M | DP-M | X-module ¹⁾ | |
| Device No. | 0 | 1 | – | |
| Module | X-module ¹⁾ | DP-M | DP-M | |
| Device No. | – | 0 | 1 | |
| Module | DP-M | X-module ¹⁾ | DP-M | Configuration fault: Gaps are invalid! |
| Device No. | 0 | – | 2 | |
| Module | X-module ¹⁾ | X-module ¹⁾ | DP-M | |
| Device No. | – | – | 0 | |

1) X-module: Module (No PROFIBUS-DP module)

1.6.3.3 Error code at "uiError" output

Table 5: Error codes at "uiError" output

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

1.6.4 Configuration and Parameterization with STEP 7

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

- ▶ In your project open the **HW Config** configurator and check whether the SmartWire-DT gateway is located in the window **Hardware Catalog**, directory **PROFIBUS-DP -> Additional FIELD DEVICES -> switch-gears**.
- ▶ If not, install the appropriate GSD file as described below.

The GSD file (device master data file) contains all the properties of an SmartWire-DT gateway as a DP station.

1.6.4.1 Installing the GSD files in STEP 7

The standard GSD file, which can be downloaded from the Internet, can be used for the installation. Alternatively, a project-specific GSD file that was created beforehand with SWD-Assist can be used

Installing the GSD standard file

- ▶ Download the standard GSD file from the Support page: <http://www.eaton.com/moeller> → **Support**
- ▶ Enter "SWD" or "GSD" in order to find the file quickly.
- ▶ Start the download via **Software -> PROFIBUS-DP Device master data (GSD)** for the SmartWire-DT gateway EU5C-SWD-DP.
- ▶ Save the packed standard GSD files with the designation **EU5C-SWD_STEP7.zip** in a suitable project folder and unpack them.

They contain the currently available GSD files for specific languages:

- 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

xx = Version of the GSD file. You will find details on this in the Appendix.

1 PROFIBUS Gateway EU5C-SWD-DP

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- ▶ In STEP 7 install all GSD files via **Options -> Install GSD File...**

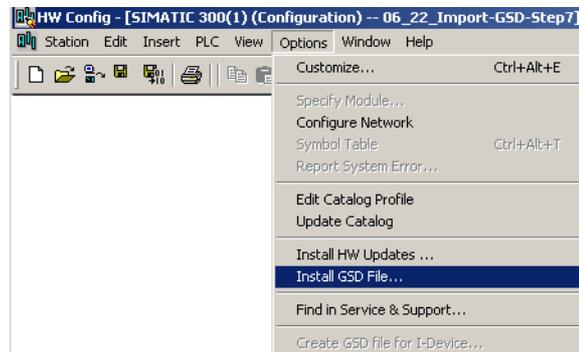


Figure 18: Starting the installation of the GSD file

- ▶ In the dialog that opens choose the option **From the directory** from the **Install GSD File** list and select the appropriate directory.

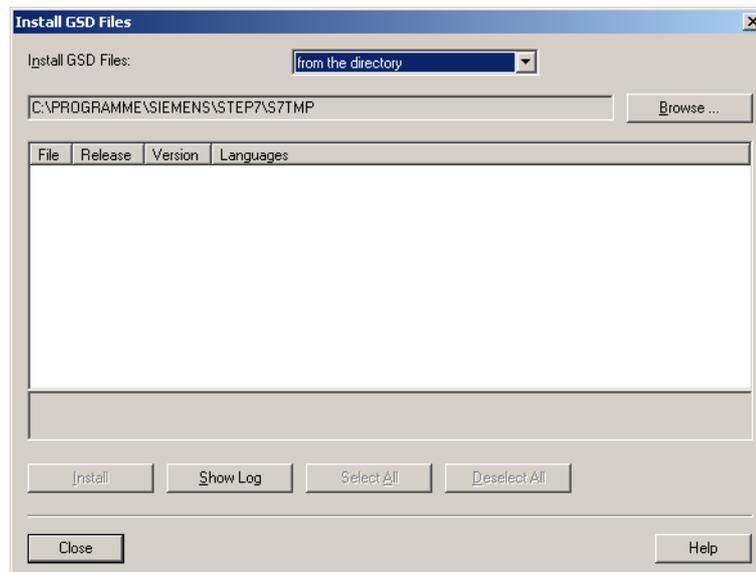


Figure 19: Installing the GSD file – Search

- ▶ Choose the required GSD file and click the **Install** button.

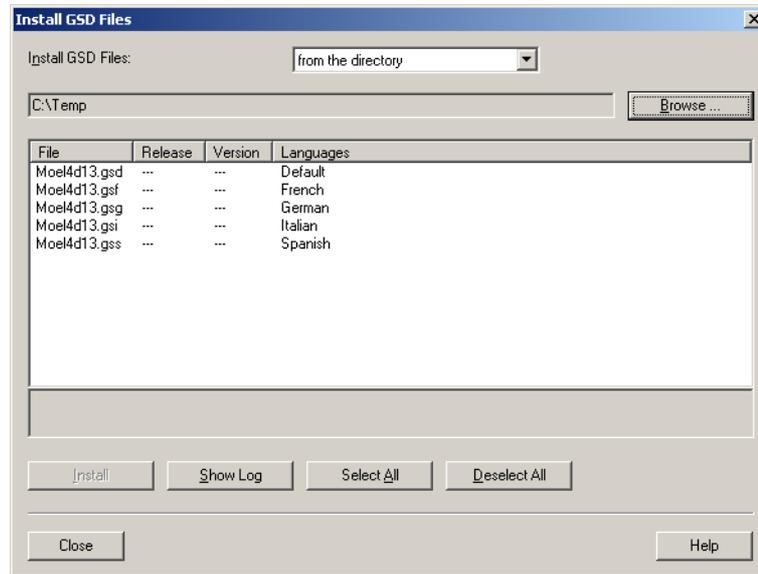


Figure 20: Installing the GSD file – Selection



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

The SmartWire-DT gateway is now available as a modular DP station in the **Hardware Catalog** window, directory **PROFIBUS-DP-> Additional FIELD DEVICES -> switchgears** under **EU5C-SWD-DP (Mot)**.

Installing a project-specific GSD file

The “SWD-Assist” planning and ordering tool enables you to create a complete SmartWire-DT network. It is also possible to create a project-specific STEP7-compatible GSD file with the software. SWD-Assist stores the GSD file under the name of the current project with the appropriate extension, such as SWD_Proj.gsd. This can be installed in STEP7 in the same way as the standard GSD file.



When naming the GSD file in SWD-Assist, ensure that it does not exceed 8 characters in length. Longer names are not recognized by the HW Config configurator.

- ▶ Install the project-specific GSD file via **Options -> Install GSD File...** as described above for the standard GSD file.
- ▶ Choose the GSD file created by SWD-Assist in the designated folder and click the **Install** button.

The SmartWire-DT gateway is now available in the **Hardware Catalog** window, directory **PROFIBUS-DP-> Additional FIELD DEVICES -> switchgears SWD-Assist** under **EU5C-SWD-DP (<SWD-Assist project name>)**. The EU5C-SWD-DP gateway can now be added.

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1.6.4.2 Configuration with a SmartWire-DT gateway

The following configuration description applies both to installed standard GSD files and project-specific GSD files.

Requirement: The **HW Config** dialog window is opened.

Configuration with standard GSD file installed

Now add the SmartWire-DT gateway with the component designation EU5C-SWD-DP and the standard suffix (Mot) to the existing PROFIBUS-DP configuration.

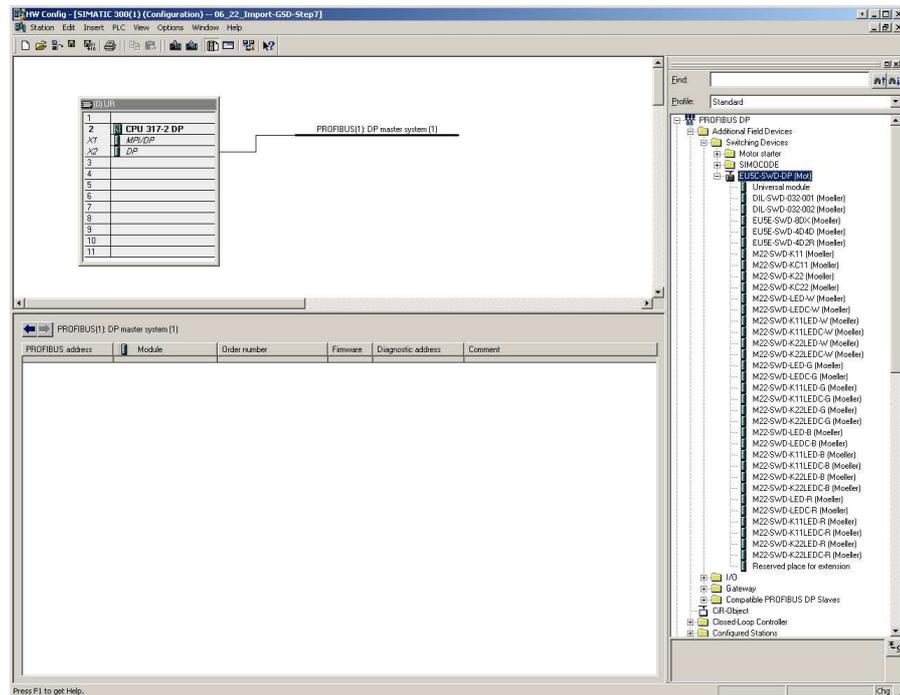


Figure 21: Configuration with standard GSD file installed

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

Configuration with project-specific GSD file installed

Add here the SmartWire-DT gateway with the component designation EU5C-SWD-DP and the project suffix in the existing PROFIBUS-DP configuration. The project-specific suffix, (e.g. SWD_Proj.gsd), is set by SWD-Assist.

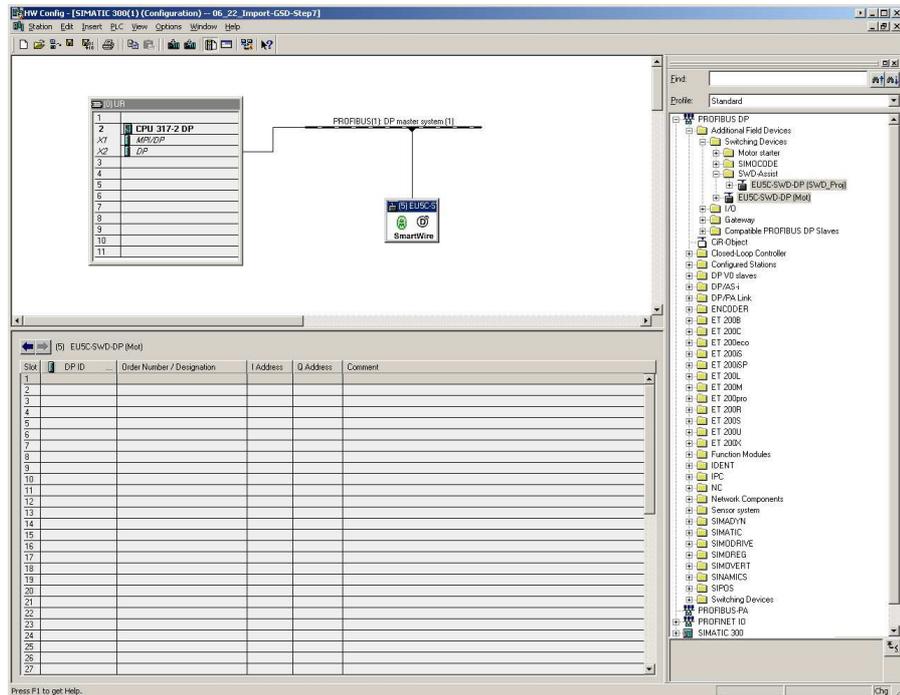


Figure 22: Configuration with project-specific GSD file installed

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



After you have transferred this modular DP station to your S7 project, all the SmartWire-DT elements set in the SmartWire-DT topology appear in the detail view of the station window.

1.6.4.3 Parameterization of the SmartWire-DT gateways as DP station

Requirement: The **HW Config** configurator is opened.

- ▶ When adding the SmartWire-DT gateway set its DP properties, the station parameters and the DP station 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 SmartWire-DT gateway as a newly added DP station.

In the dialog window that opens **Properties - DP station** start the parameter setting in the **General** tab.

General tab

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

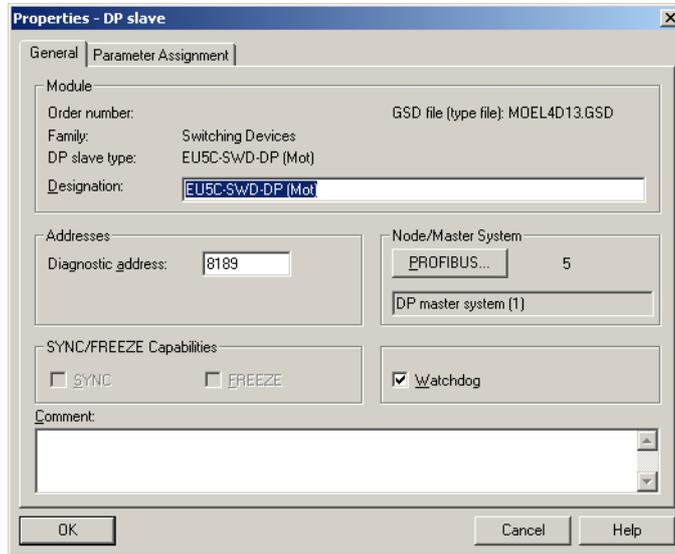


Figure 23: Setting the general properties of the DP station (SmartWire-DT gateway)

- ▶ If required activate the response monitoring.
- ▶ In the **Properties - DP station** dialog, select the **Parameter Assignment** tab.

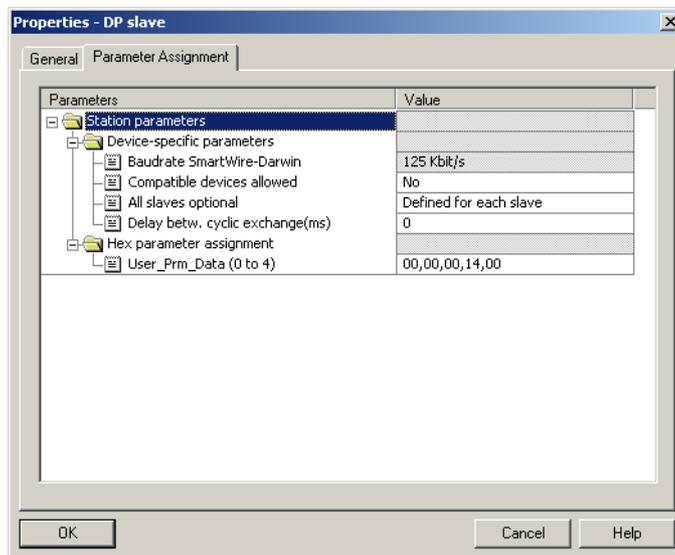


Figure 24: Station parameters of the SmartWire-DT gateway

Parameter assignment tab

In this tab set the general settings of the SmartWire-DT gateway and the SmartWire-DT network under **Station parameters -> Device-specific parameters**. The figure shows the factory set parameters. The following table shows the parameters, their meaning and possible settings.

Table 6: ApplicationParameter

| Parameters | Value | Meaning |
|---|--|--|
| Baud rate SmartWire-DT | 125 kbit/s (setpoint value) 250 kbit/s (from operating system version 1.10) | The baud rate of the SmartWire-DT network |
| Compatible devices allowed | no | The planned SmartWire-DT stations in the configuration must comply with the stations of the stored gateway target configuration. If not, no data interchange takes place with the DP master. |
| | Yes | Data exchange takes place if the connected SmartWire-DT stations are compatible with the SmartWire-DT stations in the STEP7 DP configuration. This is indicated by the Status LED on the device. |
| All stations optional (All devices are optional) | Defined for each station (Define for each device) | Specification is performed individually for each station (→ Section "Parameters of individual SmartWire-DT stations") |
| | Yes | Data transmission to the PROFIBUS also takes place for a random number of failed SmartWire-DT stations. The individual setting in the module parameters has no effect. |

1.6.4.4 Selecting the SmartWire-DT stations

Requirement:

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



This selection is unnecessary if you are using a project-specific GSD file created in SWD-Assist that already contains the required SmartWire-DT stations. The following description also applies if you wish to add additional SmartWire-DT stations in the project-specific PROFIBUS-DP configuration using the HW Config configurator.

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

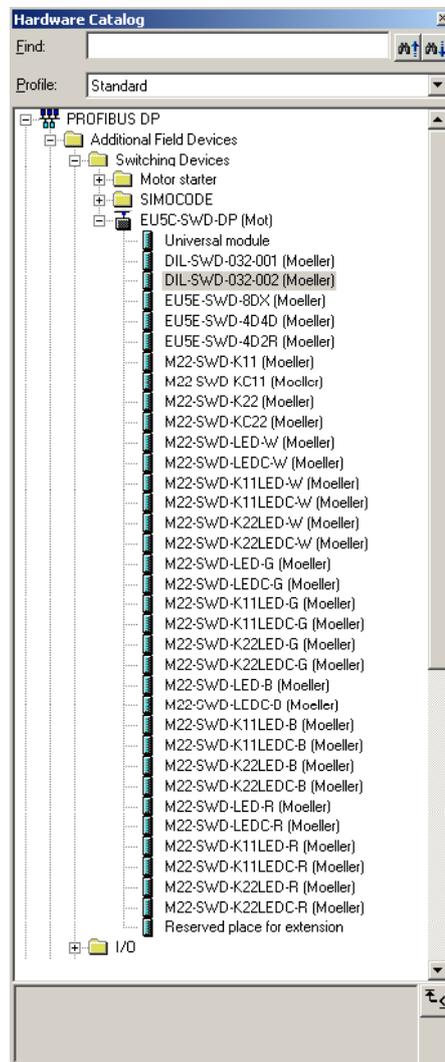


Figure 25: EU5C-SWD-DP (Mot) standard gateway with SmartWire-DT stations

You can then select in the **Hardware Catalog** the SmartWire-DT stations that you require on this SmartWire-DT gateway.



Observe the correct order of the SmartWire-DT stations in the SmartWire-DT network. The Smartwire-DT stations must be configured according to their arrangement in the installation.

- ▶ Double-click the required SmartWire-DT stations.

1 PROFIBUS Gateway EU5C-SWD-DP

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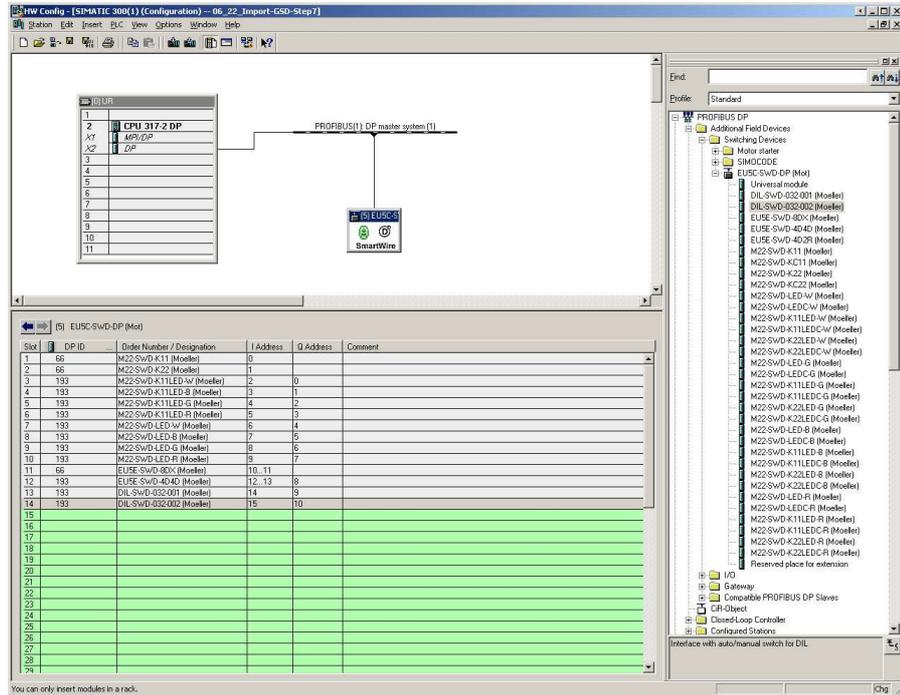


Figure 26: Selecting the SmartWire-DT stations on the EU5C-SWD-DP (Mot) gateway

CAUTION

The universal module is not a valid SmartWire-DT station and must not be added to the project.

Parameterization of the input/output addresses of an SmartWire-DT station

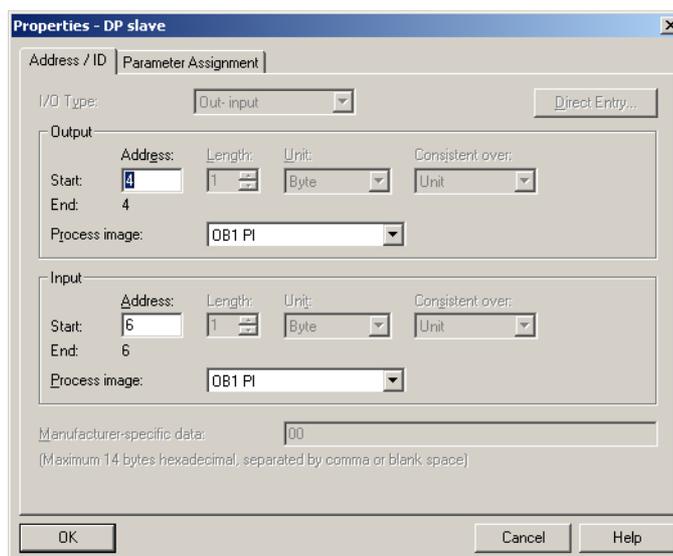


Figure 27: Input/output addresses of the SmartWire-DT stations

1 PROFIBUS Gateway EU5C-SWD-DP

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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.

The inputs and outputs are used as “normal” local inputs/outputs in the application program.



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

Setting specific parameters of SmartWire-DT stations

You can parameterize the startup behavior for each SmartWire-DT station. This defines how the gateway is to respond if an SmartWire-DT station is not present. The default setting is that all SmartWire-DT stations have to be available.

However, the information as to whether a SmartWire-DT station 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 station (→ Section “1.6.6 Diagnostics” on page 40).

Changing settings

- ▶ To change the setting in the **HW Config** configurator select the required SmartWire-DT station and double-click this line.
- ▶ In the dialog window that opens **Properties - DP Station** select the **Parameter assignment** tab.

Double-click the SmartWire-DT station to display the **Properties - DP Station** dialog field.

In the **Device-specific parameters** 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.

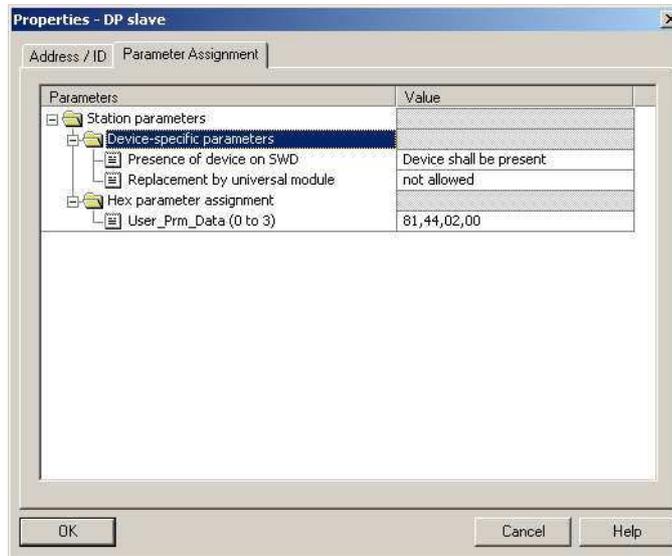


Figure 28: Specific parameter assignment of the SmartWire-DT stations



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

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

1.6.4.5 Adding SmartWire-DT stations later on

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

- ▶ Position the permanent SmartWire-DT stations in the correct order and add the wildcard (reserved place for expansion) at the required position. A wildcard reserves a SmartWire-DT station address for SmartWire-DT station 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 SmartWire-DT gateway addresses the stations automatically taking the placeholder into account.

1.6.5 Acyclical data communication

SmartWire-DT stations 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 STEP 7 for reading and writing acyclical data. The reference to the required station is implemented with these function blocks via the parameters ID and Index.

The input address of the SmartWire-DT station 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 SmartWire-DT station PKE-SWD-32, the object 1 supplies the current value I_{rel} .



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

1.6.6 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-EN, "XIOC signal modules", for basic information on the DP diagnostics. You will find explanations there on access to the diagnostic data of a DP station.



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

1.6.6.1 Cyclic diagnostic information

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

- The SmartWire-DT station is present and integrated actively into the SmartWire-DT network.
- The SmartWire-DT station is operating fault-free.

Example

M22-SmartWire-DT-K11-LED-R function element with one byte input (switch position indicator and diagnostic information)

Byte 0:

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------------|-------|---|------|-------------------|---|-----|-----|
| Diagnostics data | | | | Input data | | | |
| SUBST | PRSNT | – | DIAG | – | – | NC1 | 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: diagnostics present |
| 5 | not used | – |
| 6 | PRSNT | 0: module not present 1: module present |
| 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 | Actuation 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 SmartWire-DT station 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. |

1.6.6.2 Acyclic diagnostics

As could already be seen in the configuration, the SmartWire-DT coupling unit with its stations appears as a modular DP station. This also applies to the structure of the diagnostic data. Profibus DP defines for modular stations 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 alarms in the attachment from one or several stations that report detailed diagnostics. The terms used in the standard PROFIBUS are used in the following. The designation "module" is synonymous with a SmartWire-DT station.

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

Standard diagnostics 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 |

1.6.7 Device-specific diagnostics

The device-specific diagnosis consists of the module status block, which provides general information about the module (= SmartWire-DT station) as well as, if necessary, extended information from SmartWire-DT stations that are reporting diagnostics.

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

Structure of the module status block

| Byte | Value | Description |
|-----------------------------|-------|---|
| Module status header | | |
| 1 | Lx | Length of the station status block |
| 2 | 0x82 | |
| 3 | 0x00 | |
| 4 | 0x00 | |
| Module status | | |
| 5 | | Two status bits for SmartWire-DT stations 1 - 4 |
| ... | | Two status bits for SmartWire-DT stations 5 - 8 |
| Lx | | Two status bits for other SmartWire-DT stations |

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 (SmartWire-DT station) follow. So the status of up to four SmartWire-DT stations is packed into a byte. Non-used bits are filled out with 0 in the last byte.

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

1.6.7.1 Extended diagnosis (module related)

The extended diagnostics contain the station address of the SmartWire-DT station, 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 MN05006001Z-EN.

1 PROFIBUS Gateway EU5C-SWD-DP

1.6 Programming

Table 7: Structure of the extended diagnostics

| Byte | Value | Description |
|------|-------|--|
| 1 | Ly | Length of detailed status message |
| 2 | 0xA1 | Status type |
| 3 | | SmartWire-DT station address (1 - 58) |
| 4 | 0 | – |
| 5 | | first detailed diagnostic alarm/status message |
| 6 | | – |
| Ly | | nth detailed diagnostic alarm/status message |

Example

A SmartWire-DT network consists of nine SmartWire-DT stations. If a short circuit is reported in a SmartWire-DT station EU5E-SWD-4D4D (input/output module with overload message) that is the fifth station in the SmartWire-DT network, the diagnostics 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 |

Module status header

| | | | |
|----|---|------|---|
| 7 | 1 | 0xC | Length of module status |
| 8 | 2 | 0x82 | – |
| 9 | 3 | 0x00 | – |
| 10 | 4 | 0x00 | – |
| 11 | 5 | 0x0 | The SmartWire-DT stations 1 to 4 do not report a diagnosis. |
| 12 | 6 | 0x01 | The SmartWire-DT station 5 reports a diagnosis. |
| 13 | 7 | 0x0 | The SmartWire-DT station 9 does not report a diagnosis. |

Extended diagnostics E/A module

| | | | |
|----|---|------|-----------------------------------|
| 14 | 1 | 5 | Length of detailed status message |
| 15 | 2 | 0xA1 | Status type |
| 16 | 3 | 0x5 | SmartWire-DT station address |
| 17 | 4 | 0 | – |
| 18 | 5 | 0x13 | Message: short-circuit/overload |

2 CANOpen gateway EU5C-SWD-CAN

2.1 Introduction

The SmartWire-DT gateway EU5C-SWD-CAN creates a connection between the SmartWire-DT stations and an overriding CANopen master.

2.2 Setup

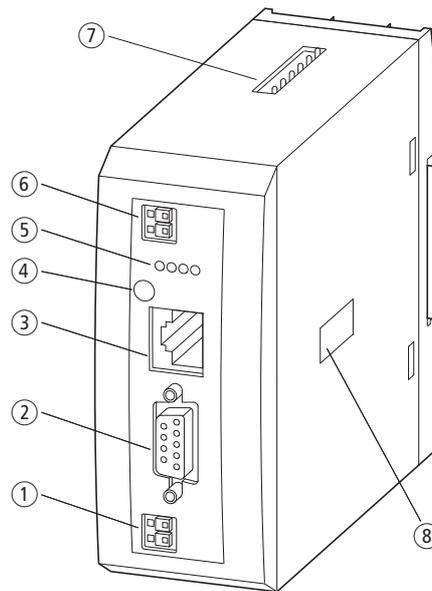


Figure 29: Front view EU5C-SWD-CAN

- ① 24-V power supply POW
- ② Field bus interface
- ③ Diagnostics interface
- ④ Configuration button
- ⑤ Diagnostics displays
- ⑥ 24-V power supply AUX
- ⑦ SmartWire-DT connection
- ⑧ Address switches

The gateway creates a connection between the stations on the SmartWire-DT network and the overriding PLC. Furthermore, it provides two power supplies, one for the SmartWire-DT stations and a 24 power supply for the contactor coils, in case this is also operated via a SmartWire-DT station. The power supply and the data communication are conducted via the 8-pole SmartWire-DT cable from the coupling unit to the stations.

2 CANOpen gateway EU5C-SWD-CAN

2.3 Engineering

2.3 Engineering

In connection with the SmartWire-DT stations the coupling unit appears as a modular station according to profile DS301.4 on the field bus CANOpen. Each SmartWire-DT station is a module of its own. Up to 99 SmartWire-DT stations can be operated via a PROFIBUS coupling unit. However, take heed of the maximum data volume that can be exchanged via CANOpen. The maximum for a Profibus station is 128 bytes of input data and 128 bytes of output data.



For information regarding the volume of input and output data corresponding to a SmartWire-DT station, please consult the appendix found in the "SmartWire-DT Stations" manual (MN05006001Z-EN).

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

2.3.1 Connection

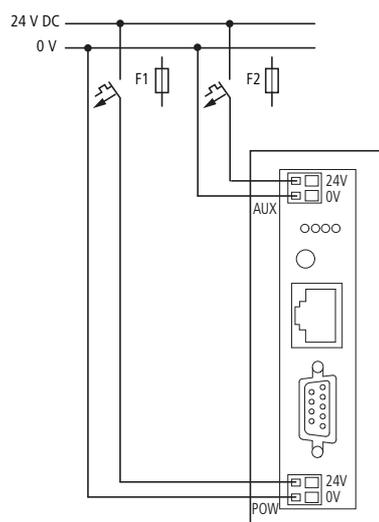


Figure 30: Connection

Power supply of the coupling unit and supply of the SmartWire-DT station electronics are performed via the terminals POW. The coupling unit contains an additional power supply unit for the 15 V supply of the SmartWire-DT stations with an amperage of 0.7 A.

- ▶ On the SmartWire-DT gateway connect the POW and AUX supply voltages via separate miniature circuit-breakers or fuses:

Miniature circuit-breaker 24 V DC 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 24 V DC 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



Please calculate the total power consumption of your SmartWire-DT network and, if necessary, install an additional EU5C-SWD-PF2 power supply module. For information regarding power consumption, please consult manual MN05006001Z-EN.



If any switching devices are also connected via the SmartWire-DT stations DIL SmartWire-DT -32-001/002, the AUX supply will also be required.

If switching devices with an activation power greater than 3 A (UL: 2 A) are connected, an additional feeder module EU5C-SWD-PF1 or EU5C-SWD-PF2 must be used.



In the planning of the SmartWire-DT network you are also supported by the software program SWD-Assist, which automatically draws your attention to the use of any necessary new feeder modules.

2 CANOpen gateway EU5C-SWD-CAN

2.3 Engineering

2.3.2 CANOpen address setting

The coupling unit requires a unique address (node ID) in the CANOpen network. This is set on the gateway via DIP switches (switches 3 - 8). Valid addresses are 1 - 32.

2.3.3 CANOpen connection

A 9-pin D-sub connector is used in order to connect to the field bus.

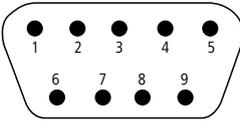
| | SUB-D plug | Signal |
|---|------------|--------|
|  | 1 | – |
| | 2 | CAN_L |
| | 3 | GND |
| | 4 | – |
| | 5 | – |
| | 6 | GND |
| | 7 | CAN_H |
| | 8 | – |
| | 9 | – |

Figure 31: Configuration of the CANOpen plug on the coupling unit

2.3.4 Baud rate

The gateway supports operation on CANOpen masters at up to 1 MB. Adaptation to the baud rate of the network master takes place automatically

2.3.5 Description file (EDS)

For selection of the device and operation via the field bus CANOpen an EDS description file (EDS = electronic data sheet) is used. This EDS file contains standardized descriptions of the CANOpen stations. For the CANOpen coupling unit EU5C-SWD-CAN this is the file EU5C-SWD-CAN.eds.

The further development of the SmartWire-DT communication system has resulted in different versions of the EDS files. The EU5C-SWD-CAN version table found on page 147 in the appendix shows how supported SmartWire-DT stations, SmartWire-DT gateways, and EDS files work together.



As of version V.2.3.9 and service pack ecp_update_0109 this file is included in the Eaton programming system CoDeSys. You can also find these files on our web site as follows:

<http://www.eaton.com/moeller> → **Support**

Please follow the links provided there.

2.3.6 Diagnostics interface

The gateways have an online diagnostics interface with the following functions:

- Update of the operating system of the SmartWire-DT gateways
- Connection of the SWD-Assist for the online diagnostics of the SmartWire-DT network

The EU4A-RJ45-CAB1 programming cable (serial SUB-D<->RJ45) or the EU4A-RJ45-USB-CAB1 USB cable (USB<->RJ45) can be used for the connection.

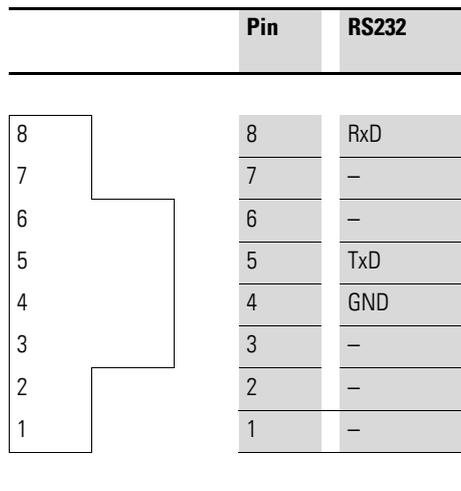


Figure 32: Configuration of the diagnostics interface

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 network even without the active PLC.

- Status indication of the inputs/outputs
- Wiring test
- Reading of the stored actual configuration
- Reading the SmartWire-DT configuration
- Comparison of the target and actual configuration
- Display of cyclical and acyclical diagnostics messages

Further details are described in the online Help of the SWD-Assist software.



These online functions are available from operating system version 1.10 of the gateways and version 1.10 of the SWD-Assist software.

2 CANOpen gateway EU5C-SWD-CAN

2.4 Installation

2.4 Installation

2.4.1 Mounting

Please proceed as follows to install the device:

- ▶ First of all set the CANOpen address (node address). This is set on the gateway via DIP switches (switches 3 - 8). The DIP switches are located under a cover on the right-hand side of the gateway. Valid addresses are 1 - 32.

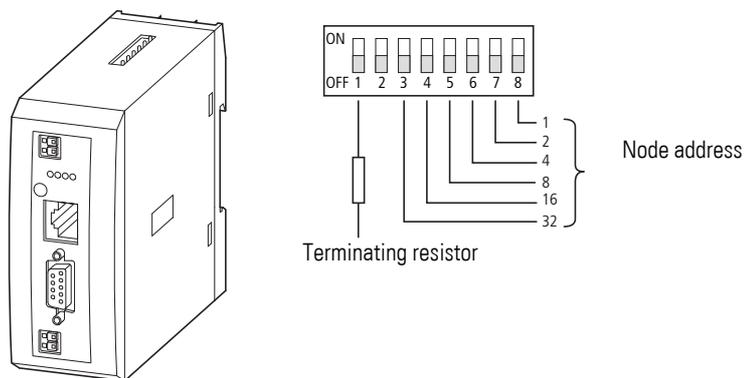


Figure 33: Setting the station address

- ▶ Mount the device on the top-hat rail.

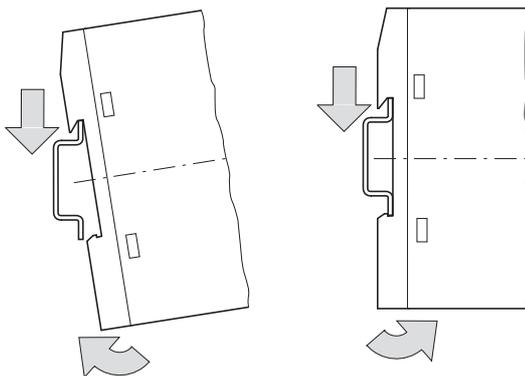


Figure 34: Mounting on top-hat rail

- ▶ Connect the 24 V DC voltage to the terminals POW on the front side of the gateway.
- ▶ If necessary, connect the 24 V DC voltage for the contactor coils to the terminals AUX.



DANGER

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

CAUTION

You must take safety precautions (emergency switching off) in the external circuitry of the EU5C-SWD-DP and any power modules type EU5C-SWD-PF1-1 or EU5C-SWD-PF2-1 that are used. To do so, plan to switch off the power supply to the contactor coils AUX.



DANGER

Switch off the power supply, if you are reconnecting stations in the SmartWire-DT system or reconnecting the ribbon cable connection. Otherwise the SmartWire-DT stations can be destroyed!

2.4.1.1 Potential conditions 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 stations 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.



DANGER

The gateway has protection against polarity reversal for the 24-V-DC-POW supply. However, if the gateway is connected via the serial interface to an earthed device (for example to a PC), the gateway can be destroyed, if the polarity of the power supply is reversed!

2 CANOpen gateway EU5C-SWD-CAN

2.4 Installation

2.4.2 Connection SmartWire-DT

- ▶ Connect the SmartWire-DT network. To do so use the SmartWire-DT cable SWD4-100LF8-24 and the relevant SWD4- 8MF2 spade connector or prefabricated cables of type SWD4-3F8-24-2S.

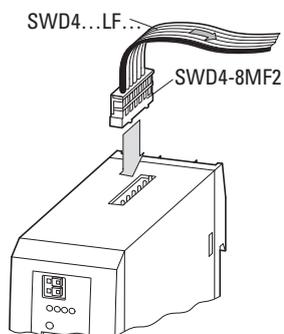


Figure 35: Connection SmartWire-DT

2.4.3 Connection CANopen

For connection to the CANopen cable you require a 9-pole SUB-D socket (e.g. PS416-ZBS-411).

- ▶ Connect the CANopen cable by means of the CANopen plug to the field bus interface of the gateway.

The first and last station in a CANopen network must terminate the field bus with a terminating resistor. The bus terminating resistor is switched externally. In the case of gateway EU5C-SWD-CAN the terminating resistor can be activated by means of DIP switch 1.

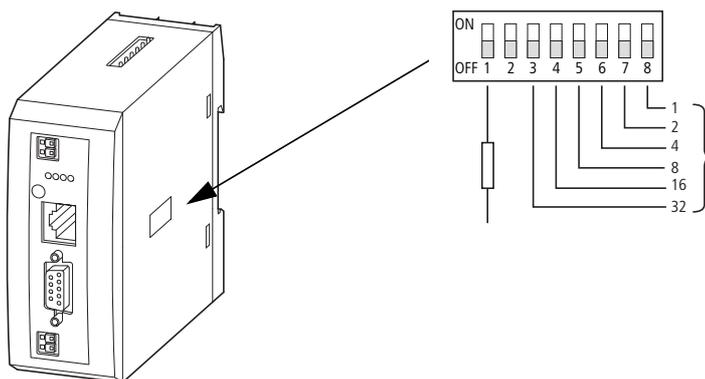


Figure 36: Activation of the terminating resistor

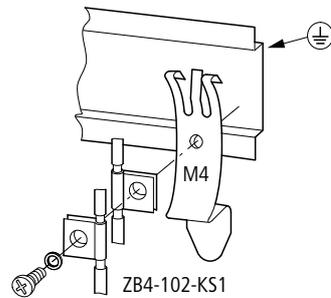
2.4.4 EMC-conformant wiring of the network

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 that do not allow the occurrence of large differences in potential and
- correct installation of the CANOpen network (cable, connection of the bus connector, etc.)

The effects of electromagnetic interference can be significantly reduced by fitting the shield. The following illustrations indicate the correct method for connecting the shield.

for top-hat rail



for mounting plate

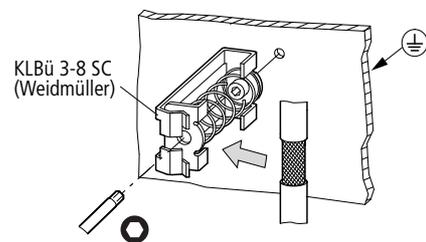
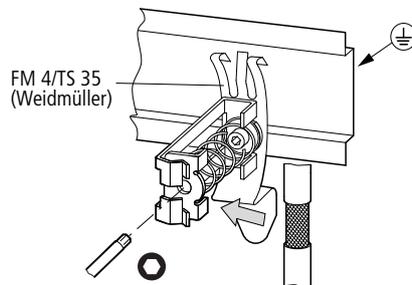
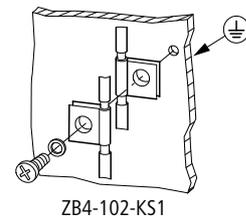


Figure 37: Shielding of network cable

2.5 Commissioning

2.5.1 Introduction

Before switching on, please check whether the power supply for the gateway is connected correctly. The configuration and installation of the Smart Wire-DT network must also have been carried out correctly (with all stations connected). If you have already integrated devices into a system, secure the operating range of any connected parts of the system against access so that nobody is endangered, for example, by motors starting up unexpectedly.

Commissioning takes place in several steps:

1. Putting the SmartWire-DT network into operation
2. Create a connection to the field bus.
3. Load and start the PLC program.

2.5.2 Putting the SmartWire-DT network into operation

Before the gateway can exchange data with the PLC, a valid SmartWire-DT network configuration (a so-called gateway target configuration) has to be stored in the gateway. This is compared with the current configuration (actual configuration) each time the gateway is restarted. If the gateway ascertains in this process that a SmartWire-DT station cannot be reached or a wrong station type is determined, the SmartWire-DT network will not go into operation (to be precise this is dependent on the network configuration). Reading of the SmartWire-DT network configuration takes place by pressing the configuration button on the gateway. All SmartWire-DT stations are re-addressed in ascending order in the process.

This process may only take place in the case of

- initial commissioning,
- the replacement of a defective station or
- a change to the configuration.



WARNING

If a SmartWire-DT station has failed, the SmartWire-DT network can still be operated with the remaining stations, depending on the configuration setting (even after a repeat power up of the gateway). If there is a faulty configuration and the configuration button is pressed, only the stations up to the failed device are addressed and stored.

If there is a faulty configuration and the configuration button is pressed, only the stations up to the failed device are addressed and stored. Use of the remaining stations is not possible until the defective station has been replaced and the configuration has been read in again by pressing the configuration button.

2.5.2.1 Switching on for initial startup, a replacement or a changed SmartWire-DT configuration

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

- All SmartWire-DT stations are connected to the SmartWire-DT line.
 - The SmartWire-DT network is connected to the gateway.
 - Voltage POW is applied to the gateway and the power LED lights up.
 - The voltage AUX is applied (if necessary).
 - The SmartWire-DT status LEDs of the SmartWire-DT stations are on or are flashing.
 - If necessary remove the CANopen fieldbus terminal from the SmartWire-DT gateway.
- ▶ Press the configuration button on the gateway for at least two seconds. The SmartWire status LED on the gateway begins to flash orange. The SmartWire-DT status LEDs on the SmartWire-DT stations also flash. All stations are addressed in sequence, the complete configuration is stored retentively (coupling unit target configuration). The coupling unit is then restarted (see next section).

2.5.2.2 Switching on when the gateway target configuration is stored

If a configuration is stored in the gateway, each time the supply voltage is switched on it is checked whether the station actually found on the network comply with the stored gateway target configuration. The result of the check is displayed via the SmartWire-DT status LED on the gateway:

| Description | Status SmartWire-DT LED | Data interchange between the gateway and SmartWire-DT stations |
|--|-------------------------|--|
| The current actual configuration complies with the gateway target configuration. | Green continuous light | Yes |
| A necessary SmartWire-DT station is missing or the coupling unit target configuration does not comply with the actual configuration. | Flashing (red) | no |
| Station addressing is active (after power on or the download of a planned configuration with empty modules). | Flashing (green) | no |
| Short-circuit on the 15 V power supply or no SmartWire-DT station is connected. | Red continuous light | no |

2.5.2.3 Creating field bus communication

If a data interchange is possible between the SmartWire-DT stations and the gateway, in principle communication between the gateway and the controller can also be performed via CANopen.

- ▶ Connect the CANopen gateway to the field bus.
- ▶ Load the program into the PLC.

The configuration of the CANopen network is transferred to the PROFIBUS master when the program is uploaded onto the controller. The CANopen master then transfers the configuration of the SmartWire-DT network to the gateway and tests it. (This only applies if you have checked Create **SDOs for module list** in the PLC configuration.) All status LEDs will be green if the configuration set matches the stored gateway configuration. Any errors that occur are indicated via the CANopen status LED and the Config status LED.

Table 8: CAN status LED

| Description | CAN status LED | Data exchange gateway via the CANopen to PLC |
|--|-----------------------------|--|
| CAN interface inactive | Off | no |
| Baud rate detection active on the CAN bus | Red strobe light | no |
| CAN baud rate detected ,waiting for a valid target configuration | orange | no |
| Communication error on the CAN bus (error warning level reached.) | Red flashing | Yes |
| Monitoring error (node guarding/heartbeat) | flickering red strobe light | only SDO |
| Communication error on the CAN bus (bus Off.) | Red | no |
| Pre-operational initialization mode - communication only possible via SDOs | Green flashing | only SDO |
| Stopped - no data exchange | Green strobe light | no |
| Operational - data exchange is possible via PDOs and SDOs | green | Yes |

So the prerequisite for data interchange is that the configuration drawn up on the PLC system (= planned configuration) complies with the configuration actually available on the gateway. The result of this check is signalled on the gateway via the SmartWire-DT configuration LED.

Table 9: Signals of the SmartWire-DT configuration LED

| Description | SmartWire-DT configurations LED | Data exchange gateway via the CANopen to PLC |
|--|---------------------------------|--|
| The planned configuration complies with the gateway target configuration. | Green continuous light | Yes |
| The planned configuration does not comply with the gateway target configuration, but is compatible with it. (list of the devices that are compatible with one another → Table 22, page 140) | Flashing (green) | Yes |
| The planned configuration and the gateway target configuration are not compatible. | Red continuous light | no |

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

2 CANOpen gateway EU5C-SWD-CAN

2.6 Programming

2.6 Programming

2.6.1 Introduction

An EDS description file (EDS = Electronic Data Sheet) is used for integration of the gateway and operation via the field bus CANopen. The EDS file contains standardized descriptions of the CANopen stations. For the CANopen gateway EU5C-SWD-CAN this is for example the file EU5C-SWD-CAN.edc.



The name of the EDS file depends on the version. The EU5C-SWD-CAN version table found on page 147 in the appendix shows how supported SmartWire-DT stations, SmartWire-DT gateways, and EDS files work together.



As of version V.2.3.9 and service pack ecp_update_0109 this EDS file is included in the Eaton programming system CoDeSys.

You can also find these files on our web site as follows:

<http://www.eaton.com/moeller> → **Support**

Please follow the links provided there.

Now please download the EDS file to the corresponding directory of your programming system. Please refer to the documentation for your programming system for information on this.

For the Eaton programming system CoDeSys this folder is in:

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

The installed version for this is, for example, Moeller V2.3.9.

2.6.2 Configuration and parameterization with CoDeSys

The connection of a SmartWire-DT network via the gateway EU5C-SWD-CAN to the controller XC200 is described in this section. Please check beforehand whether you have a current CoDeSys version installed with the necessary EDS file.

Then please proceed as follows:

- ▶ Start CoDeSys and open a project.
- ▶ Open the controller configuration and activate the CANopen master function of the CPU.

➔ Use of the CANOpen master function presumes integration of the library 3S_CANopenMaster.lib.

3S_CANopenMaster.lib is inserted into **Ressourcen/Bibliotheksverwalter**. After adding the file 3S_CANopenMaster.lib the additionally required libraries 3S_CANopenManager.lib and 3S_CanDrv.lib are also automatically loaded.

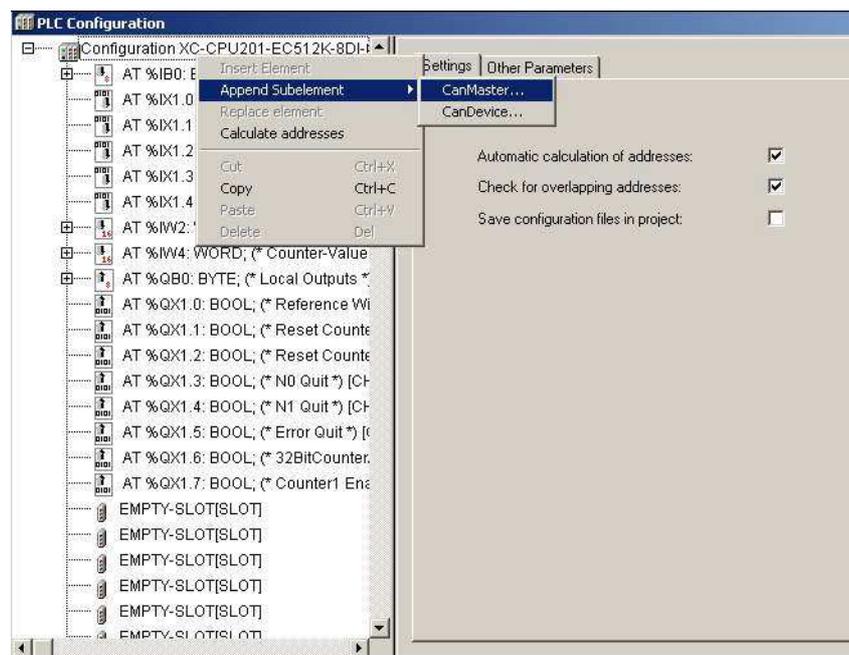


Figure 38: Select the CAN master

- ▶ Mark the CAN master and via the menu option **Insert -> Attach sub-element** or the context menu open die selection list of the CANopen station modules. Select the gateway EU5C-SDW-CAN.

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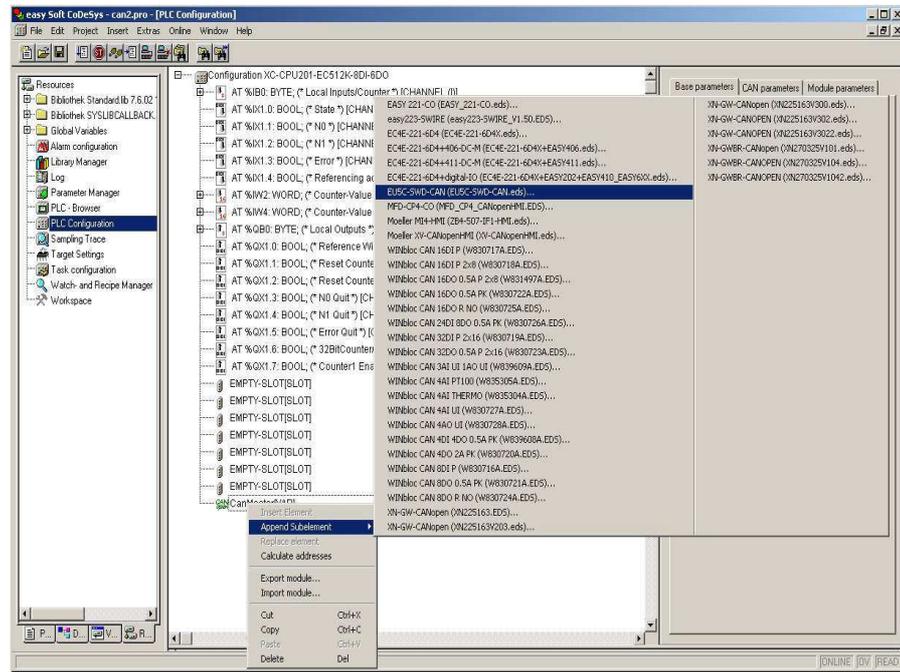


Figure 39: Selection of the gateways

2.6.2.1 Selecting the SmartWire-DT station

- ▶ Change over to the **CAN module selection** tab.
- ▶ Now select here the SmartWire-DT stations that you require for your SmartWire-DT network. Please heed of the correct sequence. The modules must be configured just as they will be arranged afterwards in your application.

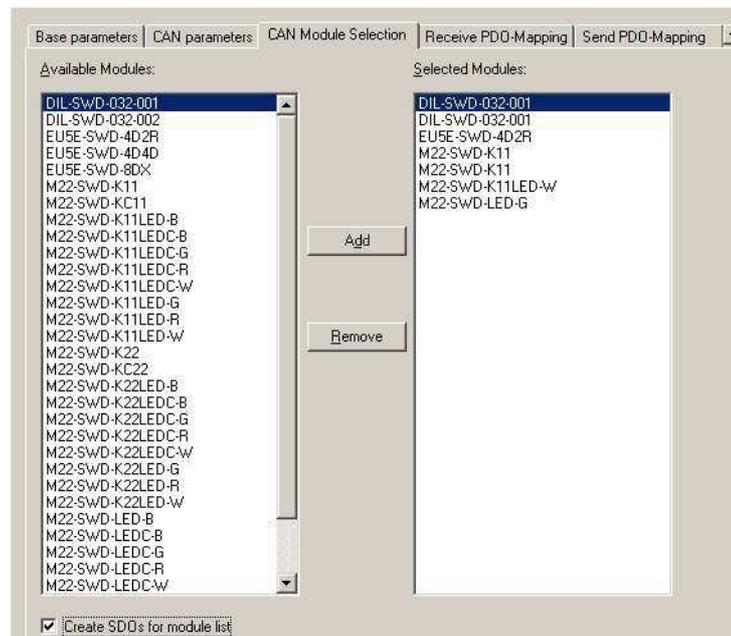


Figure 40: Selection of the stations

For downloading the configuration please select the box **Create SDOs for module list**. In this way the target configuration stored in the gateway can be compared with the one drawn up here in the programming system. If this box is not selected, you must set the parameter "Disable configuration check" in the **Service data objects** tab to True (= 1).

2.6.2.2 Parameter setting

Parameters for communication of the gateway with the CANopen master and with the SmartWire-DT network are also defined in the controller configuration.

These are the meanings of the individual tabs.

"Basic parameters" tab

This tab is used to define the I/O start addresses that are used to map the SmartWire-DT stations to the controller map's inputs/outputs. By default, the programming system will create a complete connection to the inputs/outputs used up until now. You can, however, change these values to other, unassigned areas.

"CAN parameters" tab

The parameters that relate to communication with the field bus CANopen are entered under these settings. These include, for example, the station address (node ID) or the monitoring time (watchdog control).



Only the addresses 1 to 32 may be assigned for the gateway. The gateway requires for communication four times the number of PDOs than it does for a standard CANopen station. Ensure that the COB-IDs of the activated PDOs do not collide with the other CANopen stations in the same network.

The addresses of the individual PDOs are derived as follows:

PDO 1 - PDO 4: address = NodeID + standard offset

PDO 5 - PDO 8: address = NodeID + standard offset + 64

PDO 9 - PDO 12: address = NodeID + standard offset + 96

PDO 13 - PDO 16: address = NodeID + standard offset + 32

In the case of stations with addresses higher than 32, it is necessary to ensure that no collisions will occur due to overlapping default PDO mappings. If this is the case, the mapping must be checked and, if necessary, modified.

2.6.2.3 Guarding mechanisms

Node guarding or heartbeat can be used to monitor communication between the gateway and the CAN master.

Node guarding

In node guarding the CAN master uses cyclical protocols to monitor the CAN stations.

For this the CAN master sends within the set cycle time a frame for which the CAN stations send an appropriate response. If a station does not respond, the CAN master repeats this operation. The CAN station is considered as non-existent if the number of repeat attempts exceeds the set value. The monitoring interval (Guard Time) and the number of repetition attempts can be set as required. Node guarding is deactivated by default.

Heartbeat

If the **Activate heartbeat creation** option is checked, the module emits heartbeats at the millisecond interval specified in **Heartbeat producer time**. The heartbeat function is deactivated if the entered value is 0.

Unlike in node guarding mode, the CAN stations and the CAN master each send in heartbeat mode a frame for monitoring communication. It is also possible to create dependencies in the communication processes between the CAN stations.



The node guarding mechanism cannot be operated together with the heartbeat monitoring.

The following figure shows the tab with the CAN parameters.

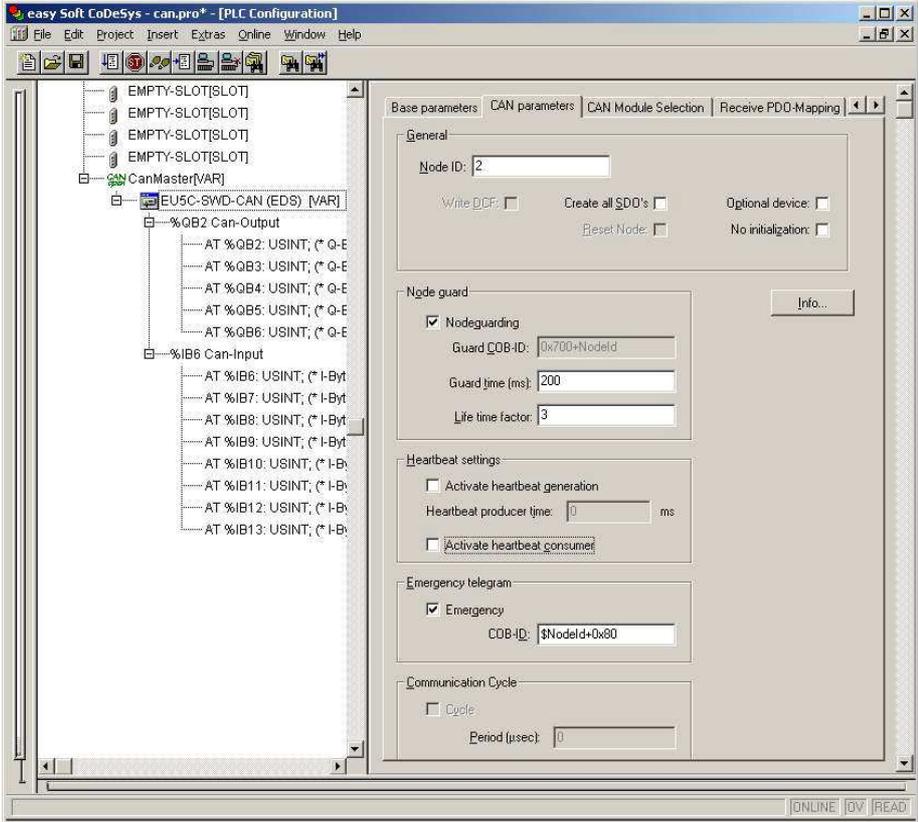


Figure 41: Setting the CAN parameters

“Service data objects” tab

In the **Service data objects** tab you can make parameter settings both for the SmartWire-DT network and for individual stations.

Parameters for the SmartWire-DT network

| Index | Name | Value | Type | Default |
|-------|---|-------|----------|---------|
| 2000 | Baudrate SmartWire Darwin (0-7) | 4 | Unsig... | 4 |
| 2001 | Compatible devices allowed (1=Yes, 0=No) | 0 | Unsig... | 0 |
| 2002 | All slaves optional (1=Yes, 0=No) | 0 | Unsig... | 0 |
| 2003 | Disable configuration check (1=Yes, 0=No) | 0 | Unsig... | 0 |
| 2010 | Delay betw. cyclic exchange(0-255ms) | 0 | Unsig... | 0 |

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Table 10: Parameters for the SmartWire-DT network

| Parameters | Value | Meaning |
|---|-------|--|
| Baud rate SmartWire-DT (0 - 7) | 4 | The baud rate of the SmartWire-DT network. Setting options: <ul style="list-style-type: none"> • 4 = 125 kBit/s (setpoint value) • 5 = 250 kBit/s (from operating system V1.10) |
| Compatible devices allowed (0 = No; 1 = Yes) | 0 | The planned stations in the CANopen configuration must comply with the stations of the stored gateway target configuration. If not, no data interchange takes place with the CAN master. |
| | 1 | Data interchange also takes place, if the SmartWire-DT stations are not identical to the CANopen configuration, but are compatible with each other. This is indicated by the Status LED on the device. (you will find the list of devices that are compatible with one another in → Table 22, page 140) |
| All stations optional (0 = No; 1 = Yes) | 0 | A data transfer to the CANopen master takes place only if all SmartWire-DT stations for which the parameter "Device presence" = 1 (obligatory station) is set are actually present in the network. Specification is performed individually for each station. |
| | 1 | A data transfer to CANopen also takes place, if there are a random number of failed SmartWire-DT stations. The setting in the module parameters has no effect. |
| Disable configuration check (0 = No; 1 = Yes) | 0 | A check is performed between the planned and stored target configuration. If not equal, no data interchange takes place. |
| | 1 | No check is performed between the planned and stored target configuration. This setting is performed for all configurators outside of Soft-CoDeSys, because only Soft-CoDeSys supports the downloading of a CAN configuration to the CANopen gateway. |
| Delay between cyclic data exchange (0 - 255ms) | 0 | At present the value cannot be changed. |

Changing settings

Select the field you want and change the value as needed.

Parameters of individual SmartWire-DT stations

Once you have selected SmartWire stations new parameters are added to the service data objects. Thus, for example, specification of the transient behavior can be performed individually. If certain stations are mandatory for operation, you can specify that the complete SmartWire-DT network will not go into operation, if one of these necessary stations is missing.

To find the parameters more easily the name of the station and the position of the SmartWire-DT station in the SmartWire-DT network are always appended to the actual settings (0 = first station, 1 = second station etc.).

The following settings are possible:

| Parameters | Value (setpoint value) | Meaning |
|---|------------------------|---|
| Device presence (0 = optional; 1 = mandatory) | (1) | The SmartWire-DT station must be present at the start or in operation. If it is not addressable, the entire SmartWire-DT network is stopped. Note: This will only happen if the "All stations optional" parameter, which is found in the general SmartWire-DT network settings, has a value of 0. |
| | 0 | The SmartWire-DT station may be missing at the start or in operation. Absence of the station is reported to the application. Communication with the other stations in the network remains unchanged. |
| AcceptUniversalModule (0 = No; 1 = Yes) | (0) | The SmartWire-DT station can not be replaced by a universal module M22-SWD-NOP(C). |
| | 1 | The SmartWire-DT station can be replaced by a universal module M22-SWD-NOP(C). |
| Q_byte... | 0 - 255 (0) | The initial value of the outputs that is output when the master starts, before the first data are sent by the PLC to the station. |

2.6.2.4 Input/output addresses

The selection of the SmartWire-DT stations in the controller configurator automatically causes the input/output addresses of the stations to be assigned. The assignment of the addresses to the individual SmartWire-DT stations can be viewed in the controller configuration.

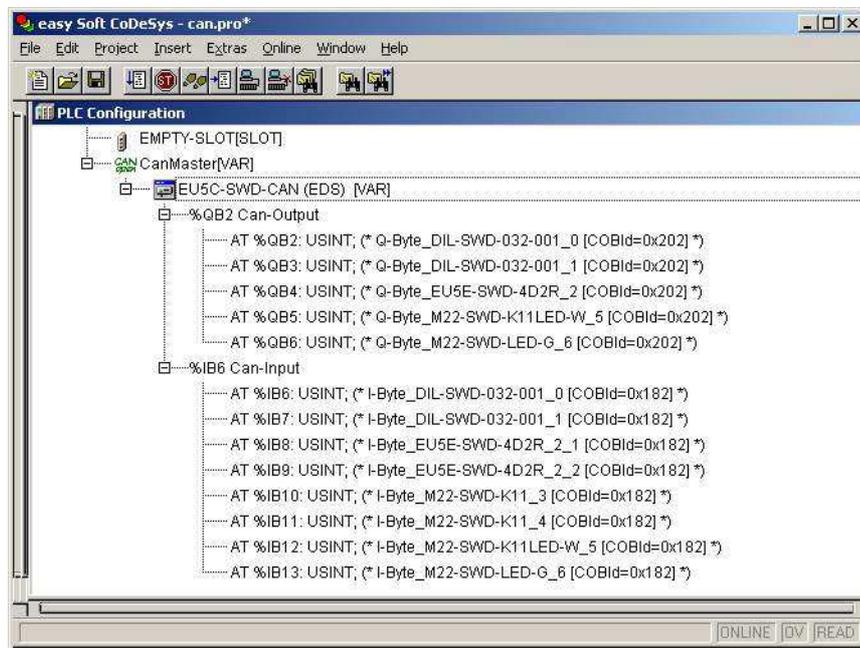


Figure 42: SmartWire-DT station addresses

The inputs and, if necessary, the outputs are used as "normal" local inputs/outputs in the application program.



Please refer to the manual MN05006001Z-EN for the configuration and meaning of the input and output data.

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2.6.3 Diagnostics

The system SmartWire-DT provides you with a basic diagnosis and extended diagnostic information via emergency telegrams.

2.6.3.1 Cyclic diagnostic information

This basic diagnostic information is coded in the normal I/O map of each SmartWire-DT station. They provide information about whether the station is participating in normal data interchange (i.e. the station is on the network and exchanging data via the SmartWire-DT network) and reporting current diagnostic messages. These two information items are located in the first input byte in bit positions 4 and 6 for all SmartWire-DT stations. They permit fast and easy assessment of the status of the SmartWire-DT station.

- The station is present and integrated actively into the network.
- The station is operating fault-free.

Example

M22-SmartWire-DT-K11-LED-R function element with one byte input (switch position indicator and diagnostic information)

Byte 0:

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

| 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: diagnostics present |
| 5 | not used | – |
| 6 | PRSNT | 0: module not present 1: module present |
| 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 | Actuation LED |
| 1 | not used | – |
| 2 | not used | – |
| 3 | not used | – |
| 4 | not used | – |
| 5 | not used | – |
| 6 | not used | – |
| 7 | not used | – |

If the SmartWire-DT station diagnosis (diagnosis bit = bit 4 is set), details on this can be determined by evaluating the extended diagnostic utilities.

In the case of the SmartWire-DT station 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. |

2.6.3.2 Extended diagnosis

An extended diagnosis is reported automatically via emergency telegrams in the event of a diagnosis. It can also be read out for each station via an SDO request. You will find details on this in Chapter “Object directory” on page 70.

2.6.3.3 PDO communication

A maximum of 16 reception PDOs and 16 transmission PDOs are supported. A maximum of 128 bytes are therefore available in each communication direction for utility data interchange.

Only the four default RX PDOs and the four default TX PDOs are active in the device's initial state (after the gateway is reset). If additional PDOs are needed for transfer purposes, PDOs 5 to 16 can be activated by the user.

Ensure that the COB-IDs of the activated PDOs do not collide with the other CANopen stations in the same network. The addresses of the individual PDOs are derived as follows:

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PDO 1 - PDO 4: address = NodeID + standard offset

PDO 5 - PDO 8: Adresse = NodeID + standard offset + 64

PDO 9 - PDO 12: Adresse = NodeID + standard offset + 96

PDO 13 - PDO 16: adress = NodeID + standard offset + 32

Accordingly only node IDs in the range 1 to 32 should be used for the gateway.

PDO assignment

As standard byte variables in PDOs 1 to 8 and word variables in PDOs 9 to 16 are mapped. Accordingly process data memory for 64 byte variables and 32 word variables at a time are available without adapting the preset mapping. The PDO mapping can be randomly changed by the user.

SDO communication

The simple SDO server connection is supported (expedited SDO server).

Error messages (emergency telegrams)

The errors that are output are governed by /DS301/. Errors are reported by means of an emergency telegram. The current status of the error register can be read out from the object list entry 0x1001/0. An error history, in which the last six errors are stored, can be read out of the object list entry 0x1003.

Structure of the emergency telegram

| Byte 0 | Byte 1 | Byte 2 | Bytes 3 - 7 |
|-----------------|-----------------|-----------|---------------------------------|
| Emcy error code | Emcy error code | Error tab | Error code (extended diagnosis) |

Emergency error code

| Error code (hex) | Meaning |
|------------------|--|
| 00xx | Error reset (no errors) |
| 01xx | general error |
| 50xx | Devices-hardware |
| 60xx | Devices-software |
| 70xx | attached modules (xx = module address) |
| FFxx | device-specific |

Extended diagnostics:

When “Emcy error code” = 0xFF01 to 0xFF63 is displayed, extended diagnostic messages are specified in bytes 3 to 7. The length of a diagnostic entry is one byte, up to five diagnostic messages being transferred in bytes 3 to 7. Non-used bytes are assigned 0x00 (= no error). The ID of the station reporting the error is located in byte 2 of the EMCY telegram.

Table 11 shows examples for Extended diagnostic messages.



You will find detailed information on this in the manual MN05006001Z-EN.

Table 11: Manufacturer-specific diagnostic alarms

| Diagnostic code | Meaning | used by |
|-----------------|------------------------------|---|
| 0x00 | No diagnostic message active | All devices that support the extended diagnosis |
| 0x10 | Contact in middle position | RMQ |
| 0x11 | Contact short-circuit | RMQ |
| 0x13 | Output overload | I/O module |

If “Emcy-Error-Code” = 0xFF00 is displayed, a 32-bit variable with error flags as shown on Table 12 will be stored in the EMCY frame’s manufacturer-specific area (bytes 4 to 7). Byte 3 of the EMCY frame has a value of 0x00.

Table 12: Failure code listing for “Emcy error code” = 0xFF00

| Byte | Bit | dwBit | Relevance | Meaning |
|------|-----|-------|-----------|--|
| 4 | 0 | 0 | Info | CANopen: not all reception word variables can be mapped in PDOs. |
| | 1 | 1 | Info | CANopen: not all reception byte variables can be mapped in PDOs. |
| | 2 | 2 | Info | CANopen: not all transmission word variables were able to be mapped in PDOs. |
| | 3 | 3 | Info | CANopen: not all transmission byte variables were able to be mapped in PDOs. |
| | 4 | 4 | Error | CANopen: no valid CAN baud rate found. |
| | 5 | 5 | Error | CANopen: no valid CANopen node ID is set (set the value 1 to 32!). |
| | 6 | 6 | - | Reserved |
| | 7 | 7 | - | Free |
| 5 | 0 | 8 | Error | CANopen: non-correctable CAN stack error. |
| | 1 | 9 | Error | CANopen: monitoring error (node guarding/heartbeat.) |
| | 2 | 10 | Info | SWD: project configuration check |
| | 3 | 11 | - | Free |
| | 4 | 12 | Info | SWD: extended diagnosis of a station is pending. |
| | 5 | 13 | Info | SWD: CFG setting of at least one SmartWire-DT station changed. |
| | 6 | 14 | - | Free |
| | 7 | 15 | - | Free |

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| Byte | Bit | dwBit | Relevance | Meaning |
|------|-----|-------|-----------|---|
| 6 | 0 | 16 | Error | SWD: necessary SmartWire-DT station missing. |
| | 1 | 17 | Warning | SWD: optional SmartWire-DT station missing. |
| | 2 | 18 | Warning | SWD: actual configuration not equal to target configuration, but compatible |
| | 3 | 19 | Warning | SWD: target configuration not equal to actual configuration, but compatible |
| | 4 | 20 | Error | SWD: no valid target configuration present |
| | 5 | 21 | Error | SWD: no valid project configuration present |
| | 6 | 22 | Error | SWD: differences between target configuration and actual configuration |
| | 7 | 23 | Error | SWD: differences between project configuration and target configuration |
| 7 | 0 | 24 | Error | SWD: short-circuit in the 15 V power supply of the SmartWire-DT bus |
| | 1 | 25 | Error | SWD: internal error of the SmartWire-DT coordinator |
| | 2 | 26 | Info | SWD: at least one SmartWire-DT station is transmitting a basic diagnosis. |
| | 3 | 27 | Error | SWD: no SmartWire-DT station found. |
| | 4 | 28 | Info | SWD: the use of compatible stations is allowed. |
| | 5 | 29 | Info | SWD: all stations are registered as "optional". |
| | 6 | 30 | Info | SWD: no comparison between target and project configuration |
| | 7 | 31 | - | Free |

General

After reception of the NMT telegram "Start Node" it is indicated by the dispatch of an EMCY-telegram that the gateway is still in the SmartWire-DT mode "Failsafe". This error message is taken back to the SWD mode "normal" after the change.

Failsafe: no initial data are transferred to the SmartWire-DT stations. The initial information of the stations is available in the PLC.

2.6.4 Object directory

The object list of the SmartWire-DT CANOpen gateway consists of static and dynamic entries.

Static entries are available in any case, dynamic entries being generated depending on the attached stations.

2.6.4.1 Static entries

CANOpen-specific entries (0x1000 - 0x1FFF)

The entries in the CANOpen specific area of the object list are created statically and are attainable via an SDO access as soon as the coupling unit participates in CAN communication.

Further information on the type and use of the listed CANOpen-specific entries in the object list can be referred to in /CiA301/.

Table 13: CANOpen-specific entries

| Index | Subindex | Data type | Setpoint value |
|---|----------|-----------------|----------------|
| Description | | | |
| 0x1000 | 0 | U32 | 0x |
| Device part no. (device profile number + additional information): | | | |
| 0x1001 | 0 | U8 | 0x0 |
| Error tab | | | |
| 0x1003 | 0 - 6 | U32 | |
| Error history | | | |
| 0x100C | 0 | U16 | 0x0 |
| Guard time (node guarding) | | | |
| 0x100D | 0 | U8 | 0 |
| Life time factor (node guarding) | | | |
| 0x1014 | 0 | U32 | 0x80+NodeID |
| COB-ID EMCY object | | | |
| 0x1016 | 0 - 4 | U16 | |
| Consumer heartbeat time | | | |
| 0x1017 | 0 | U16 | 0 |
| Producer heartbeat time | | | |
| 0x1018 | 0-4 | | |
| Identity object | | | |
| 0x1027 | 0-100 | U16,(Sub0 = U8) | |
| Module list (VendorID+DeviceID) (rw)* | | | |
| 0x1029 | 0-1 | U8 | |
| Error behavior object / communication error (rw) | | | |
| 0x1200 | 0-3 | | |
| Server-SDO-Parameters | | | |
| 0x1400 – 0x140F | 0-2 | | |
| RX-PDO communication parameters | | | |
| 0x1600 – 0x160F | 0-8 | | |
| RX-PDO mapping parameters | | | |
| 0x1800 – 0x180F | 0-2 | | |
| TX-PDO communication parameters | | | |
| 0x1A00 – 0x1A0F | 0-4 | | |
| TX-PDO mapping parameters | | | |

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User-specific entries (0x2000-0x5FFF)

| Index areas | Entries |
|-----------------|---|
| 0x2000 - 0x20FF | Configuration settings of the SmartWire-DT master |
| 0x2100 - 0x21FF | Configuration settings of the SmartWire-DT stations |
| 0x2200 - 0x22FF | Acyclic communication with SmartWire-DT stations |
| 0x2300 - 0x23FF | Extended diagnostic messages from SmartWire-DT stations |

Listing of the object entries

| Index | Subindex | Data type | Setpoint value |
|--|----------|-------------|----------------|
| Configuration settings of the SmartWire-DT master | | | |
| Description | | | |
| 0x2000 | 0 | U8 | 4(1..7) |
| Baud rate SmartWire-DT (r/w) | | | |
| 0x2001 | 0 | U8 | 0(0..1) |
| Compatibility rule for exchange (0=compatible devices allowed; 1=compatible devices not allowed) (r/w) | | | |
| 0x2002 | 0 | U8 | 0(0..1) |
| Presence of station devices (0=defined by each station; 1=all stations are optional.) (r/w) | | | |
| 0x2003 | 0 | U8 | 1(0..1) |
| Configuration comparison mandatory | | | |
| 0x2004 | 0 | U32 | -- |
| DiagFlags (Table 14.4) (ro) | | | |
| 0x2010 | 0 | U8 | 0(0..255) |
| Delay between cyclic exchange (ms) (r/w) | | | |
| Configuration settings of the SmartWire-DT stations | | | |
| 0x2100 | 0..100 | U8 | 1(0..1) |
| Presence of device on SWD (0 = device may not be present; 1 = device shall be present. (r/w) | | | |
| 0x2101 | 0..100 | U16 | |
| Device options (parameter/presence) + station address | | | |
| 0x2102 | 0..100 | U32 | |
| CFG of devices | | | |
| 0x2103 | 0..100 | | |
| Serial number of SWD device | | | |
| 0x2110 | 0..100 | U32 | |
| Parameter of devices | | | |
| Acyclic communication with SmartWire-DT stations | | | |
| 0x2200-0x22FF | 0..100 | U32 | |
| Acyclic communication with stations (r/w) | | | |
| Extended diagnostic messages from SmartWire-DT stations | | | |
| 0x2300-0x23FF | 0..10 | 1...5 bytes | |
| Extended diagnostics of the SmartWire-DT stations (ro) | | | |

Baud rate SmartWire-DT (0x2000)

- Content

SmartWire-DT baud rate

- 4 = 125 kBaud (setpoint value)
- 5 = 250 kBaud
- Read access: returns the SmartWire-DT baud rate that is currently configured. (4 stands for 125 kbaud.)
- Write access: valid value range of 0 - 7

Compatibility rule (0x2001)

- Content

General compatibility setting. This defines whether the replacement of a SmartWire-DT station by a compatible station is allowed.

- 0 = replacement allowed
- 1 = replacement not allowed (setpoint value)
- Read access: returns the current compatibility setting.
- Write access: used to set the desired compatibility behavior (0 or 1)

Presence of station devices (0x2002)

- Content

This global entry defines how the SmartWire-DT network behaves, if no station is found.

- 0 = it is individually settable for each SmartWire-DT station whether it will be treated as an "optional" or "necessary" station (default setting).
- 1 = all SmartWire-DT stations are treated as "optional" stations.
- Read access: returns the setting that is currently configured.
- Write access: used to define the desired behavior.

Configuration comparison mandatory (0x2003)

- Content

Via this entry it can be defined whether the SmartWire-DT gateway is allowed to start without the performance of a comparison between the target configuration and the project configuration.

- 1 = the SmartWire-DT gateway also starts up without comparison between the planned configuration and the target configuration. This setting is conceived for CANOpen configurators that do not support downloading of the planned module list to the gateway.

If a planned configuration is downloaded to the gateway, a comparison of the configurations takes place.

- 0 = the comparison between planned configuration and target configuration is mandatory (default setting).
- Read access: returns the setting that is currently configured.
- Write access: used to define the desired behavior.

DiagFlags (0x2004)

- Content

Via this entry the current status of the diagnostic flags in accordance with table Table 12 page 69 can be read out.

- Read access: returns the diagnostic flags' current state.
- Write access: not allowed

Delay between cyclic exchange (0x2010)

- Content

Pause time between two SmartWire-DT cycles in milliseconds (0 - 255 ms)

- Read access: pause time that is currently configured
- Write access: pause time that should be set

At present this parameter cannot be changed.

2.6.4.2 Dynamic entries

The following new entries in the object list are generated each time the gateway is started:

Module list 0x1027

Area 0x2100 to 0x22FF: properties of the SmartWire-DT modules

Area 0x6000 to 0x6FFF: utility data of the SmartWire-DT modules.

Specification of the dynamic object list entries is performed depending on the target configuration.

Input and output data of the individual SmartWire-DT stations are mapped into the PDOs in the order of the SmartWire-DT network structure.

“Input byte” entry

All input bytes of the SmartWire-DT stations are listed.

“Input word” entry

All word input data of the SmartWire-DT stations are lined up.

“Output byte” entry

All output bytes of the SmartWire-DT stations are lined up.

“Output word” entry

All word output data of the SmartWire-DT stations are lined up.

Module list (0x1027)

- Content

Subindex = 0 (U8): the subindex 0 specifies the number of SmartWire-DT stations registered in the target configuration.

Subindex = 1 (U16): module no: an entry (module ID) is generated with the order in which the SmartWire-DT stations were recorded in the target configuration. This entry is formed from the stringing together of the vendor ID and device ID.

- Read access: returns data from the stored gateway target configuration.
- Write access: used to write data to the **Planned configuration**. Writing may only be performed when in “pre-operational” status.

The list of planned modules can be transferred from the CAN master to the gateway via the entry “Module list (0x1027)”.

Presence of device (0x2100)

These local entries define how the SmartWire-DT gateway behaves, if individual stations are not found.

- Subindex = 0:
number of stations recognized on the SmartWire-DT network
- Subindex = 1 to number of SmartWire-DT stations:
This entry defines whether the corresponding station is allowed to be missing from the SmartWire-DT network ("optional"); in this case the SmartWire-DT network continues to run. Or whether the station is regarded as being necessary. If a station is missing, the SmartWire-DT network is set to failsafe mode.

Preferences:

- 0 = station is allowed to be missing from the network = "optional" station.
- 1 = the station is not allowed to be absent = "necessary" station. (Default setting)
- Read access: returns the setting that is currently configured for the specified station.
- Write access: desired setting for the specified station.



This setting can also be defined for each station in the **Service data objects** tab in the CAN-configuration of the gateway.

Module options + station address (0x2101)

- Content
 - Subindex = 0: the subindex 0 represents the number of SmartWire-DT stations registered in the target configuration.
 - Subindex = 1 to the total number of SmartWire-DT stations:
 - Byte 1 = current SmartWire-DT address of the addressed station
 - Byte 2 = bit 0: module has parameter; bit 1: module is present; bit 2 to bit 7 = fixed on 0.
- Read access: returns data from the stored gateway target configuration.
- Write access: not allowed

Module CFG (0x2102)

- Content
 - Subindex = 0:
The subindex 0 represents the number of SmartWire-DT stations registered in the target configuration.
 - Subindex = 1 to the number of SmartWire-DT stations: number and format of the input and output data made available to these stations.
- Read access: returns data from the stored gateway target configuration.
- Write access: used to write data to the **Planned configuration**. Writing may only be performed when in “pre-operational” status. The module must support the changed configuration settings.

Module serial number (0x2103)

- Content
 - Subindex = 0:
The subindex 0 represents the number of SmartWire-DT stations registered in the target configuration.
 - Subindex = 1 to the number of SmartWire-DT stations:
Serial number of the station found in the corresponding place
- Read access: returns data from the target configuration (stored gateway target configuration).
- Write access: not allowed.

Module parameter (0x2110)

- Content
 - Subindex = 0:
The subindex 0 returns the number of known parameter entries in the target configuration.
 - Subindex = 1 - 255: parameter data
- Read access: returns data from the target configuration (stored gateway target configuration).
- Write access: used to write data to the **Planned configuration**. Writing may only be performed when in “pre-operational” status. The station must support the changed parameter values.



At present this property is not supported by SmartWire-DT stations.

2.6.4.3 Acyclic station access (0x2200 - 0x22FF)

- Content

An index for the storage of extended diagnostic messages is reserved for each SmartWire-DT station registered in the target configuration.
(Index = 0x2200 + SmartWire-DT address)

Subindex = 0 - 255: module specific. Acyclic access to the station data.
The subindex is interpreted as a module index. Maximum of 120 bytes of utility data per access (subindex)

Access via acyclic data traffic to station data is allowed via SDO utilities in "operational" status only.

- Read access: station-specific
- Write access: module-specific



The number and meaning of the available object indexes are described in the relevant documentation (e.g. manual MN05006001Z-EN, "SmartWire-DT Stations").

Extended diagnosis (0x2300-0x2363)

- Content

An index for the storage of extended diagnostic messages is reserved for each SmartWire-DT station registered in the target configuration.
(Index = 0x2300 + SmartWire-DT station address).

A maximum of five diagnostic messages are stored for an SmartWire-DT station; the length of a diagnostic entry is one byte.

- Subindex 0: the number of diagnostic messages available for this SmartWire-DT station (values 0 - 5)
- Subindex: 1 - 5: diagnostic message

Access via acyclic data traffic to station data is allowed via SDO utilities in "operational" status only. The CAN coupling unit stores a maximum of 256 bytes of extended diagnostic messages.

- Read access: acyclic diagnostic alarms
- Write access: not allowed

Profile-specific entries (0x6000 - 0x7FFF) – utility data area

| Index | Subindex | Data type |
|---------|----------|-----------|
| 0x6000 | 0 - 100 | U8 |
| I-bytes | | |
| 0x6001 | 0 - 100 | U16 |
| I-words | | |
| 0x6200 | 0 - 100 | U8 |
| Q-bytes | | |
| 0x6201 | 0 - 100 | U16 |
| Q-words | | |

Input byte (0x6000)

- Content
 - Subindex = 0:
The subindex 0 returns the number of input bytes available in the stored gateway target configuration.
 - Subindex = 1 up to the number of SmartWire-DT stations:
Access to the input bytes available in the target configuration.
- Read access: returns the input byte referenced by the subindex.
- Write access: not allowed

Input word (0x6001)

- Content
 - Subindex = 0:
The subindex 0 returns the number of input words available in the target configuration.
 - Subindex = 1 up to the number of SmartWire-DT stations:
Access to the input words available in the target configuration.
- Read access: returns the input word referenced by the subindex.
- Write access: not allowed.

Output byte (0x6200)

- Content
 - Subindex = 0:
The subindex 0 returns the number of output bytes available in the target configuration.
 - Subindex = 1 up to the number of SmartWire-DT stations: access to the output bytes available in the target configuration.
- Read access: returns the output byte referenced by the subindex.
- Write access: outputs the output byte referenced by the index.

Output word (0x6201)

- Content
 - Subindex = 0:
The subindex 0 returns the number of output words available in the target configuration.
 - Subindex = 1 up to the number of SmartWire-DT stations:
Access to the output words available in the target configuration.
- Read access: returns the output word referenced by the index.
- Write access: outputs the output word referenced by the index.

2 CANOpen gateway EU5C-SWD-CAN

2.6 Programming

3 EU5C-SWD-EIP-MODTCP

3.1 Introduction

The SmartWire-DT gateway EU5C-SWD-EIP-MODTCP (EtherNet/IP / Modbus TCP Gateway) creates a connection between the SmartWire-DT stations and an overriding EtherNet/IP or Modbus TCP Master.

3.2 Setup

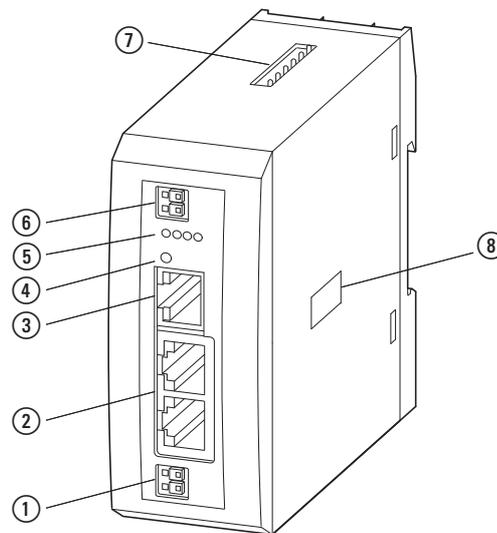


Figure 43: Front view EU5C-SWD-EIP-MODTCP

- ① 24-V power supply POW
- ② Ethernet, field bus interface
- ③ Diagnostics interface
- ④ Configuration button
- ⑤ Diagnostics displays
- ⑥ 24-V power supply AUX
- ⑦ SmartWire-DT connection
- ⑧ Switch for Ethernet address setting

The SmartWire-DT ribbon cable is connected to the stations through the gateway. The integrated Ethernet switch is used to connect to the EtherNet/IP / Modbus-TCP fieldbus. In addition, there are terminals for two power supplies: one meant for the SmartWire-DT stations and an additional 24-V supply used to power the contactor coils if these are also operated via SmartWire-DT stations. The power supply for the SmartWire-DT stations, as well as all data communications, is conducted via the 8-pin SmartWire-DT cable from the gateway to the stations. The serial diagnostic port is used to connect to a computer in order to run the SWD-Assist planning and commissioning program.

3.3 Engineering

The SmartWire-DT cable can be used to connect up to 99 SmartWire-DT stations to the gateway. However, please make sure to take the maximum volume of data that can be transmitted on the fieldbus into account.

| Data | EtherNet/IP | Modbus-TCP |
|--------------------|-------------|------------|
| Input data [Byte] | 500 | 800 |
| Output data [Byte] | 496 | 642 |

➔ The sum of all input and output data must not exceed 1000 bytes.

➔ For information regarding the volume of input and output data corresponding to a SmartWire-DT station, please consult the appendix found in the manual MN05006001Z-EN, "SmartWire-DT Stations".

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

3.3.1 Connection

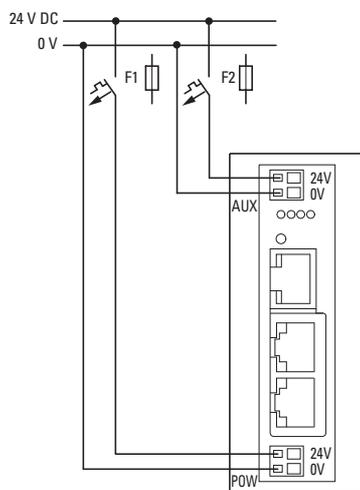


Figure 44: Connection of power supply

Power supply of the coupling unit and supply of the SmartWire-DT station electronics are performed via the terminals POW. The coupling unit contains an additional power supply unit for the 15 V supply of the SmartWire-DT stations with an amperage of 0.7 A.

- ▶ On the SmartWire-DT gateway connect the POW and AUX supply voltages via separate miniature circuit-breakers or fuses:

Miniature circuit-breaker 24 V DC 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 24 V DC 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



Please calculate the total power consumption of your SmartWire-DT network and, if the required current is > 0.7 A, install an additional EU5C-SWD-PF2 power supply module.

For information regarding the devices' power consumption, please consult the "SmartWire-DT - System" manual (MN05006002Z-EN).



If any switching devices are also to be connected, for example, via the DIL-SWD-32-001/002 SmartWire-DT stations, the AUX supply will also be required.

If switchgear with an activation power of more than 3 A (UL: 2 A) is connected, an additional EU5C-SWD-PF1 or EU5C-SWD-PF2 power supply module must be used.

The SWD-Assist software program provides support when engineering a SmartWire-DT network. If additional new power supply modules are required, it will automatically point this out.

3 EU5C-SWD-EIP-MODTCP

3.3 Engineering

3.3.2 Ethernet address setting

3.3.2.1 Default gateway settings

The EU5C-SWD-EIP-MODTCP gateway comes with the following default settings:

IP address: 192.168.1.254

Subnet screen: 255.255.255.000

Default gateway:192.168.1.001

Users can restore the gateway's default settings at any time. To do this, the address switches (DIP switches 1 to 8) and the operating mode switch (DIP switch 9) must be set to "OFF" and the gateway must be power cycled (turned off and then back on).

There are various ways to configure the Ethernet address:

- Setting directly on device
- From DHCP server on run-up
- From BOOTP server on run-up
- It can be acquired from the SWD-Assist planning program
- It can be acquired once via DHCP

To choose the method you want, adjust the DIP switches on the unit as required.

The DIP switches used to set the gateway's address and to select an operating mode and store the station configuration are located on the right-hand side of the gateway, underneath the cover.

The following figure shows the various possible configurations.

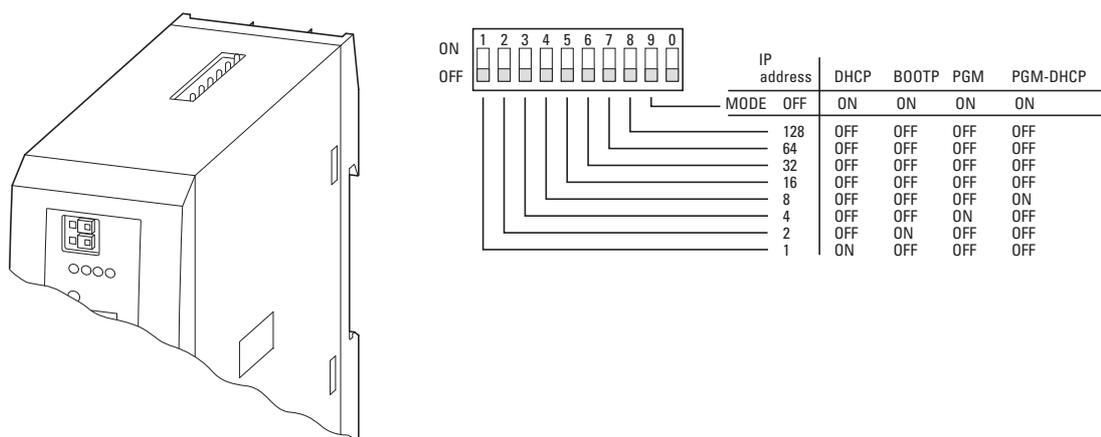


Figure 45: Configuring the fieldbus interface

Table 14: Fieldbus interface settings

| DIP switches | | | | | | | | | | Description |
|--------------|-------|-------|-------|-------|-------|-------|-------|-----|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
| OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | X | Resets the IP address setting to the default setting |
| 2^0 | 2^1 | 2^2 | 2^3 | 2^4 | 2^5 | 2^6 | 2^7 | OFF | X | Address switches used to set the last byte of the IP address (1 - 254) |
| ON | OFF | OFF | OFF | X | X | X | X | ON | X | DHCP: IP address set via DHCP server |
| OFF | ON | OFF | OFF | X | X | X | X | ON | X | BOOTP: IP address set via BOOTP server |
| OFF | OFF | ON | OFF | X | X | X | X | ON | X | PGM: IP address set via the diagnostic port with the use of the SWD-Assist planning program |
| OFF | OFF | OFF | ON | X | X | X | X | ON | X | PGM-DHCP: Address acquired once via DHCP |

CAUTION

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

3.3.2.2 IP address set with DIP switch

You can use DIP switches 1 to 8 in order to set the last byte of the IP address. In order to do so, the "MODE" operating mode switch must be set to "OFF". The valid range of addresses that can be set is 1 to 254. Addresses 0 and 255 are used for broadcast messages in the subnetwork.

Example

Say that you want to set address 18:

18 (decimal) = 0x12H (hexadecimal) = 0x01001000 (binary)

| DIP switches | | | | | | | | | | Description |
|--------------|-------|-------|-------|-------|-------|-------|-------|------|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
| 2^0 | 2^1 | 2^2 | 2^3 | 2^4 | 2^5 | 2^6 | 2^7 | MODE | | |
| OFF | ON | OFF | OFF | ON | OFF | OFF | OFF | OFF | X | Sets the last byte of the IP address to a value of 18 |

The first three bytes of the IP address are passed when the project is transferred from the SWD-Assist program (see also: the notes concerning the "PGM Address Setting" operating mode). The default gateway and subnet mask parameters are also obtained from the SWD-Assist project.

Status display "MS" LED

When the gateway is started, the "MS" LED turns red for a brief moment. Once the gateway starts without any errors, the LED will flash with a green light, indicating that the station is ready to communicate on the network.

3.3.2.3 DHCP server address setting

An address is acquired from a DHCP server on the network when the gateway is put into operation. To activate the “DHCP” operating mode, set DIP switch 9 (the “MODE” DIP switch) to “ON” and address switches 1 to 8 to address 1.

| DIP switches | | | | | | | | | | Description |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
| 2 ⁰ | 2 ¹ | 2 ² | 2 ³ | 2 ⁴ | 2 ⁵ | 2 ⁶ | 2 ⁷ | MODE | | |
| ON | OFF | OFF | OFF | X | X | X | X | ON | X | Used to set the IP address via a DHCP server |

The DHCP server will send address information for the IP address, the subnet mask, and the default gateway.

CAUTION

Addressing mode changes will only take effect after the power supply has been turned off and then back on.

DHCP supports three IP address allocation mechanisms:

- Automatic address allocation: The DHCP server assigns a permanent IP address to the client.
- Dynamic address allocation: The address assigned by the DHCP server is reserved only for a specific period of time. Once this time elapses, or if a client “explicitly” releases the address during this period, the address is re-assigned.
- Manual address allocation: A network administrator assigns the IP address. In this case, DHCP is only used to transmit the assigned address to the client.

Status display “MS” LED

When the gateway is started, the “MS” LED will flash red in order to indicate that the gateway is waiting to acquire an address via DHCP/BOOTP. As soon as an address has been acquired, the LED will flash green and the station will be ready to communicate on the network.

3.3.2.4 Address setting BOOTP server

An address is acquired from a BOOTP server on the network when the gateway is put into operation. To activate the "BOOTP-Server" operating mode, set DIP switch 9 (the "MODE" DIP switch) to "ON" and address switches 1 to 8 to address 2.

| DIP switches | | | | | | | | | | Description |
|--------------|-------|-------|-------|-------|-------|-------|-------|------|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
| 2^0 | 2^1 | 2^2 | 2^3 | 2^4 | 2^5 | 2^6 | 2^7 | MODE | | |
| OFF | ON | OFF | OFF | X | X | X | X | ON | X | Used to set the IP address via a BOOTP server |

The BOOTP server will send address information for the IP address, the subnet mask, and the default gateway.

CAUTION

Addressing mode changes will only take effect after the power supply has been turned off and then back on.

Status display "MS" LED

When the gateway is started, the "MS" LED will flash red in order to indicate that the gateway is waiting to acquire an address from the BOOTP server. As soon as an address has been acquired, the LED will flash green and the station will be ready to communicate on the network.

3.3.2.5 Address setting PGM

When the gateway is in the PGM operating mode, the IP address, the default gateway, and the subnet mask are assigned when creating the corresponding project in the SWD-Assist planning program. The values entered in the program will be transferred to the gateway via SWD-Assist when the project is transferred. The corresponding address will be applied immediately after the project is downloaded.

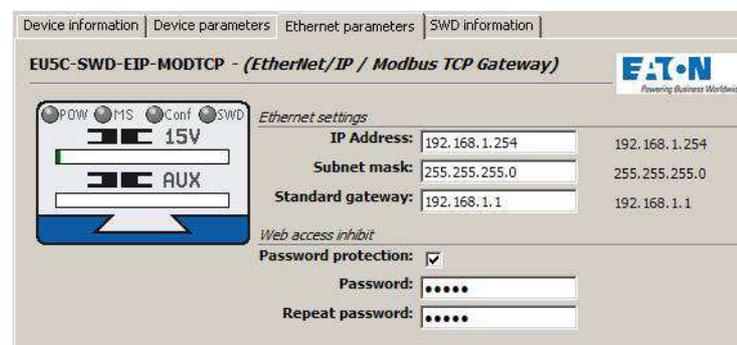


Figure 46: Setting Ethernet parameters with the SWD-Assist planning program

3 EU5C-SWD-EIP-MODTCP

3.3 Engineering

To activate the “PGM” operating mode, set DIP switch 9 (the “MODE” DIP switch) to “ON” and address switches 1 to 8 to address 4.

| DIP switches | | | | | | | | | | Description |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
| 2 ⁰ | 2 ¹ | 2 ² | 2 ³ | 2 ⁴ | 2 ⁵ | 2 ⁶ | 2 ⁷ | MODE | | |
| OFF | OFF | ON | OFF | X | X | X | X | ON | X | PGM: used to set the IP address by using the diagnostic port and the SWD-Assist planning program |

CAUTION

Addressing mode changes will only take effect after the power supply has been turned off and then back on.

3.3.2.6 Address setting DHCP server/PGM

In this case, an address is assigned once via a DHCP server on the network when the gateway is put into operation. After this, the device will switch internally to the PGM operating mode. To activate the “DHCP-PGM” operating mode, set DIP switch 9 (the “MODE” DIP switch) to “ON” and address switches 1 to 8 to address 8.

| DIP switches | | | | | | | | | | Description |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
| 2 ⁰ | 2 ¹ | 2 ² | 2 ³ | 2 ⁴ | 2 ⁵ | 2 ⁶ | 2 ⁷ | MODE | | |
| OFF | OFF | OFF | ON | X | X | X | X | ON | X | PGM-DHCP: IP address received once via DHCP |

The addresses assigned by the DHCP server for the IP address, the subnet mask, and the default gateway will be stored in the project settings of the corresponding SWD-Assist project. The next time the gateway is power cycled, this address information will be read from the project settings.

CAUTION

Addressing mode changes will only take effect after the power supply has been turned off and then back on.

If the gateway needs to acquire a new current address from the DHCP server, it must first be switched to the “PGM” operating mode and must then be restarted. After this, select the “DHCP-PGM” operating mode, which will then cause a new address request to be sent to the DHCP server.

Status display “MS” LED

The first time the gateway is started in the “DHCP-PGM” operating mode, the “MS” LED will flash red in order to indicate that the gateway is waiting to acquire an address from the DHCP server. As soon as the gateway has acquired an address, the LED will flash green and the station will be ready to communicate on the network.

3.3.3 Protocol selection

The EU5C-SWD-EIP-MODTCP gateway supports both the EtherNet/IP protocol and the Modbus-TCP protocol. The protocol that should be used is selected either through the web interface or in the corresponding project. Projects are created with the SWD-Assist planning program and are then loaded onto the gateway. The default protocol is EtherNet/IP.

3.3.4 Ethernet connection

The EU5C-SWD-EIP-MODTCP gateway features an integrated switch with two Ethernet interfaces that make it easier to set up an Ethernet bus topology. The two RJ45 sockets include diagnostic LEDs used to indicate the corresponding link and data communication statuses. The unit will switch from 10 to 100 Mbit/s and vice versa automatically.



The gateway can also be used as a non-DLR device (DLR = Device Level Ring) in Ethernet DLR topologies. When used this way, the device will continuously check whether communication requests are being sent via both Ethernet connections. These checks can result in higher communications loads.

3.3.5 Diagnostics interface

The gateway features an online diagnostic port (used to connect the gateway to a computer) with the following functions:

- Connecting the SWD-Assist program to the SmartWire-DT network’s online diagnostics

The EU4A-RJ45-CAB1 programming cable (serial D-sub<->RJ45) and the EU4ARJ45-USB-CAB1 USB cable (USB<->RJ45) can be used for the connection.

3 EU5C-SWD-EIP-MODTCP

3.3 Engineering

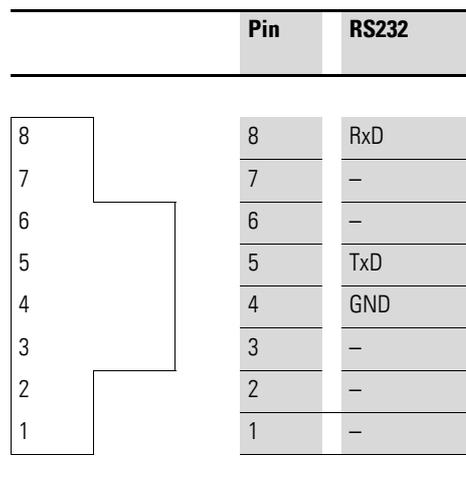


Figure 47: Configuration of the diagnostics interface

- 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 network even without the active PLC.

Following information are displayed:

- Status indication of the inputs/outputs
- Wiring test
- Reading of the stored actual configuration
- Reading the SmartWire-DT configuration
- Comparison of the target and actual configuration
- Display of cyclical and acyclical diagnostics messages
- When Ethernet communication parameters and the project configuration are transferred from the SWD-Assist planning program to the gateway

Further details are described in the online Help of the SWD-Assist software.



SWD-Assist Version 1.40 (and higher) supports the EU5C-SWD-EIP-MODTCP gateway.

3.4 Installation

3.4.1 Mounting

Proceed as follows to install the device:

- ▶ First, set the Ethernet operating mode you want. To do so, use the DIP switches (→ Section “Configuring the Ethernet address parameters”) on the gateway. The DIP switches are located under a cover on the right-hand side of the gateway.
- ▶ Mount the device on the top-hat rail.

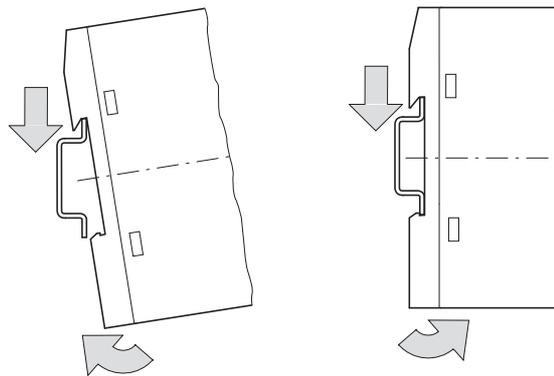


Figure 48: Mounting on top-hat rail

- ▶ Connect the 24 V DC voltage to the terminal POW on the front side of the gateway.
- ▶ If necessary, connect the 24 V DC voltage for the contactor coils to the terminals AUX.



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).

CAUTION

You must take safety precautions (emergency switching off) in the external circuitry of the gateway EU5C-SWD-DP and any power modules type EU5C-SWD-PF1-1 or EU5C-SWD-PF2-1 that are used. To do so, plan to switch off the power supply to the contactor coils AUX.



DANGER

Switch off the power supply, if you are reconnecting stations in the SmartWire-DT system or reconnecting the ribbon cable connection. Otherwise the SmartWire-DT stations can be destroyed!

3.4.2 Connection SmartWire-DT

- ▶ Connect the SmartWire-DT network. To do so use the SmartWire-DT cable SWD4-100LF8-24 and the SWD4-8MF2 relevant blade terminal or prefabricated cables of type SWD4-(3/5/10)F8-24-2S.

| | |
|---|--|
|  | DANGER The gateway has protection against polarity reversal for the 24-V-DC-POW supply. However, if the gateway is connected via the serial interface to an earthed device (for example to a PC), the gateway can be destroyed, if the polarity of the power supply is reversed! |
|---|--|



For detailed instructions on how to use the SmartWire-DT external device plug (SWD4-8SF2-5) with the 8-pin SmartWire-DT cable, please consult the "Fitting external device plug SWD4-8SF2-5" chapter found in the "SmartWire-DT - System" manual (MN05006002Z-EN).

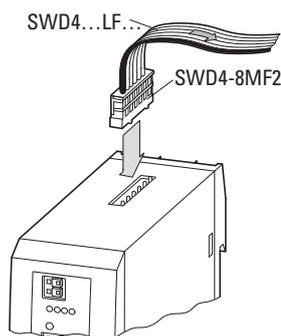


Figure 49: Connection SmartWire-DT

Potential conditions 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 stations 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.

3.4.3 Connection EtherNet/IP, Modbus TCP

The fieldbus is connected to the integrated Ethernet switch with standard Ethernet cables featuring an RJ45 connector.

3.5 Commissioning

3.5.1 Introduction

Before switching on, check whether the power supply for the gateway is connected correctly. The installation of the SmartWire-DT network must also have been carried out correctly (with all stations connected). If you have already integrated devices into a system, secure the operating range of any connected parts of the system against access so that nobody is endangered, for example, by motors starting up unexpectedly.

To put the gateway into operation, follow the steps below:

1. Putting the SmartWire-DT network into operation
2. Transfer the project configuration to the gateway
3. Set all Ethernet communication parameters and then establish a connection to the fieldbus
4. Load and start the PLC program.

3.5.2 Putting the SmartWire-DT network into operation

Before the gateway can exchange data with the PLC, a valid SmartWire-DT network configuration (a so-called gateway target configuration) has to be stored in the gateway. This configuration is compared with the current configuration (actual configuration) each time the gateway is restarted. If the gateway detects that a SmartWire-DT station cannot be reached, or if a wrong station type is determined, the SmartWire-DT network will not go into operation. (This depends on the actual SmartWire-DT network configuration.) The SmartWire-DT network configuration will be imported when the configuration button on the gateway is pressed. All SmartWire-DT stations are re-addressed in ascending order in the process. This process may only take place in the case of:

- initial commissioning,
- the replacement of a defective stations or
- a change to the configuration.



DANGER

If a SmartWire-DT station has failed, the SmartWire-DT network can still be operated with the remaining stations, depending on the configuration setting (even after a repeat power up of the gateway). If there is a faulty configuration and the configuration button is pressed, only the stations up to the failed device are addressed and stored. If there is a faulty configuration and the configuration button is pressed, only the stations up to the failed device are addressed and stored. Use of the remaining stations is not possible until the defective station has been replaced and the configuration has been read in again by pressing the configuration button.

3.5.2.1 Switching on for initial startup, a replacement or a changed SmartWire-DT configuration

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

- All SmartWire-DT stations are connected to the SmartWire-DT line.
 - The SmartWire-DT network is connected to the gateway.
 - The voltage POW is applied to the coupling unit and the power LED lights up.
 - The voltage AUX is applied (if necessary).
 - The SmartWire-DT status LEDs of the SmartWire-DT stations are on or are flashing.
 - There are no active communications between the PLC and the gateway (the "MS" LED on the gateway is flashing green). – If necessary, disconnect the Ethernet fieldbus connection on the SmartWire-DT gateway.
- ▶ Press the configuration button on the gateway for at least two seconds. The SmartWire status LED on the gateway begins to flash orange. The SmartWire-DT status LEDs on the SmartWire-DT stations also flash. All stations are addressed in sequence, the complete configuration is stored retentively (coupling unit target configuration). The gateway is then restarted (see following section).

3.5.2.2 Switching on when the gateway target configuration is stored

If a configuration is stored in the gateway, each time the supply voltage is switched on it is checked whether the station actually found on the network comply with the stored gateway target configuration. The result of the check is displayed via the SmartWire-DT status LED on the gateway:

Table 15: Status display SmartWire-DT network

| Description | Status SmartWire-DT LED | Data interchange between the gateway and SmartWire-DT stations |
|--|---|--|
| The current actual configuration complies with the gateway target configuration. | Green continuous light | yes |
| A necessary SmartWire-DT station is missing or the coupling unit target configuration does not comply with the actual configuration. | Flashing (red) | no |
| Station addressing is active (after power on or the download of a planned configuration with empty modules). | Flashing (green) | no |
| Short-circuit on the 15 V power supply or no SmartWire-DT station is connected. | Red continuous light | no |
| The gateway is in firmware update mode when the POW LED is off. The firmware mode can be left by switching on the power supply again. The firmware update mode can be left by switching on the power supply again. | Changes from continuous light orange to red | no |

3.5.3 Transferring the project configuration to the gateway

In order to initialize the SmartWire-DT stations, a project configuration is created in the SWD-Assist planning and commissioning program. This configuration includes the gateway, all SmartWire-DT stations, and the complete corresponding parameter configuration. It is also used to configure the parameters for Ethernet communications. This data is loaded onto the gateway when the project configuration is transferred via the diagnostic port with the SWD-Assist planning program. The EU4A-RJ45-CAB1 programming cable (serial D-sub<->RJ45) and the EU4ARJ45-USB-CAB1 USB cable (USB<->RJ45) can be used for the connection

If the stations defined in the SWD-Assist project match the SmartWire-DT stations connected to the gateway, the "Config" LED on the gateway will show a solid green light.



If any changes are made to the stations or to the parameters in the project, the project will have to be transferred again. If the fieldbus protocol has been changed (EtherNet/IP or Modbus-TCP), the change will only take effect after the gateway is restarted.

Table 16: Signals of the SmartWire-DT configuration LED

| Description | SmartWire-DT configurations LED | Data exchange coupling unit to PLC |
|---|---------------------------------|------------------------------------|
| The planned configuration complies with the gateway target configuration. | Green continuous light | yes |
| The planned configuration does not comply with the gateway target configuration, but is compatible with it. (list of the devices that are compatible with one another Table 22, page 140) | Flashing (green) | yes |
| The planned configuration and the gateway target configuration are not compatible. | Red continuous light | no |
| There is no planned configuration yet. | Off | no |

3.5.4 Creating field bus communication/ start PLC

In order for the gateway and the PLC to be able to communicate with each other, the gateway and the SmartWire-DT network must be able to communicate successfully. The green "SmartWire-DT LED" on the gateway is used to indicate this. In addition, the SmartWire-DT stations that are connected must match the stations in the planned configuration that has been downloaded onto the gateway with the SWD-Assist planning program. The green "Config LED" on the gateway is used to indicate this.

The settings for Ethernet communications between the PLC and the gateway are configured with the PLC manufacturer's programming system (→ Section "3.6 Programming").

3 EU5C-SWD-EIP-MODTCP

3.5 Commissioning

Please keep the IP address settings that you configured with the DIP switches in mind during this process (→ Section “3.3.2 Ethernet address setting”).

- ▶ Connect the EU5C-SWD-EIP-MODTCP gateway to the fieldbus. To do so, use the two RJ45 sockets, which are labeled ETH1 and ETH2.
- ▶ Load the program onto the PLC. To do this, use the programming system for the PLC that you are using.
- ▶ Start the PLC.

If the application is communicating with the gateway, the “MS” LED on the gateway will show a solid green light.



If a monitoring time has not been set in the Modbus-TCP operating mode and a Modbus connection was active beforehand, the “MS” LED on the gateway will continue to show a solid green light even after the Ethernet cables have been disconnected!

3.6 Programming

3.6.1 Introduction

In order to be able to create the PLC application, the SWD-Assist program must be used to create a project configuration for the SmartWire-DT network and the corresponding user program must be created with the programming software for the PLC being used. (for example: Allen-Bradley's RSLogix 5000 in conjunction with the Compact Logix controller when using the gateway in the EtherNet/IP operating mode).



SWD-Assist Version 1.40 and higher can be used to create a configuration with the EU5C-SWD-EIP-MODTCP gateway. The program can be downloaded for free at the following address:

<http://downloadcenter.moeller.net/de/software.html>

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

- Selecting stations, as well as a gateway
- Entering device parameters for the SmartWire-DT gateway and the SmartWire-DT stations
- Entering SmartWire-DT network parameters
- Creating I/O allocation lists
- Transferring a project to the gateway or from the gateway (reading the project back from the gateway)

The following sections describe the program's various functions.

3.6.2 Using SWD-Assist to configure projects and parameters

SmartWire-DT networks that use the EU5C-SWD-EIP-MODTCP gateway are created using the SWD-Assist planning and commissioning program (Version 1.40 or higher). This program enables you to select a gateway, as well as all required SmartWire-DT stations. It is also used to configure all the settings for the fieldbus, as well as the parameter settings for the individual SmartWire-DT stations, which are later loaded onto the gateway.

3.6.2.1 Configuring the SmartWire-DT network

Selection of gateway EU5C-SWD-EIP-MODTCP

Start SWD-Assist and create a new project. An EU5C-SWD-DP PROFIBUS gateway will be created by default. Select the EU5C-SWD-EIP-MODTCP gateway from the catalogue of devices and drag it to the canvas. The EU5C-SWD-DP gateway will be replaced with an SWD-EIP-MODTCP gateway.

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

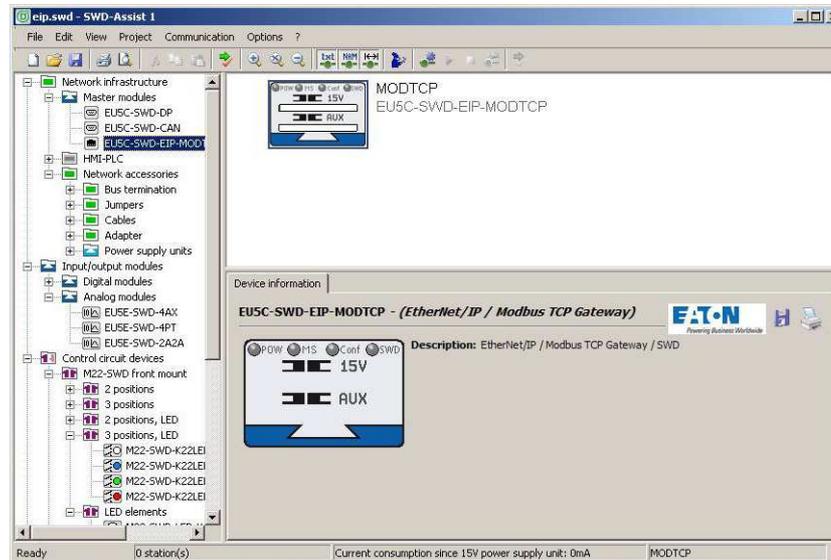


Figure 50: Selection of gateway EU5C-SWD-EIP-MODTCP

Selecting the SmartWire-DT stations

Now select the SmartWire-DT stations that you need for your SmartWire-DT network. The device catalogue will show these stations sorted according to various applications.

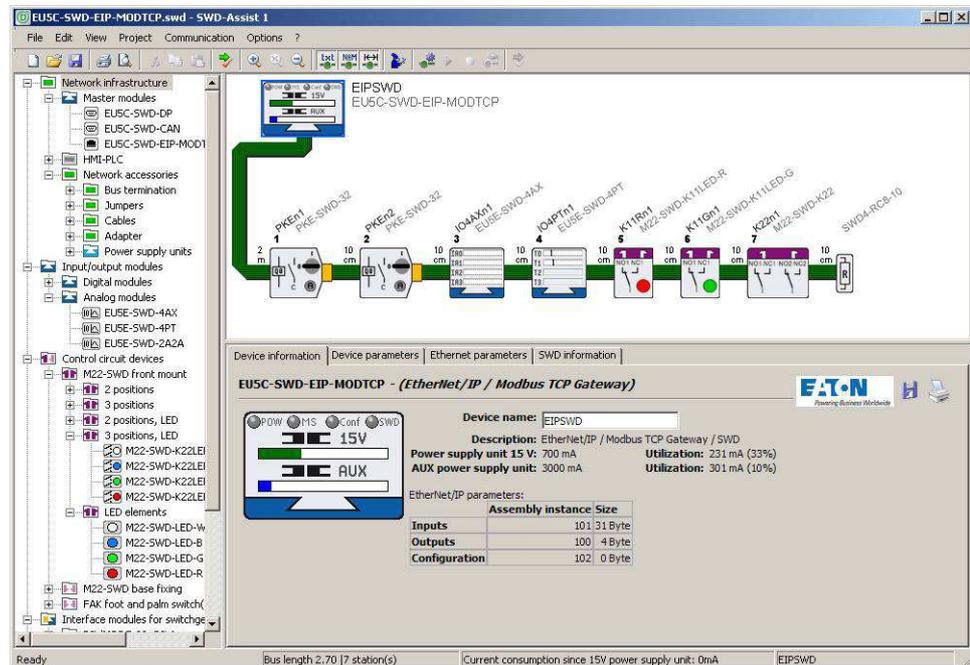


Figure 51: Selecting the SmartWire-DT stations

For more information regarding how to set up a SmartWire-DT network, please consult the online Help for the SWD-Assist program.

In order to finish configuring the network, check the configuration you have entered. To do this, open the **Project** menu item and click on the **Plausibility Check** option. Any errors—such as missing components—will be shown.

3.6.2.2 Parameter setting

There are basically two different types of parameter entries:

- Entries regarding the operating mode and communication settings, such as those used to:
 - Specify a communication protocol (EtherNet/IP or Modbus-TCP)
 - Define Ethernet address parameters
 - Enter SmartWire-DT communication parameters (baud rate, startup behavior)
- Device-specific entries used to define the way in which a SmartWire-DT station will operate, such as those used to:
 - Define how the station will behave if communications are lost
 - Replaceability through universal module M22-NOP
 - Enter station-specific parameters (e.g., select the Pt100, Pt1000, or NI1000 temperature sensor when using the EU5E-SWD-4PT temperature module)

3.6.2.3 Operating modes and communication settings

Selecting a communications protocol

The gateway can work with either the EtherNet/IP or Modbus-TCP fieldbus protocols in order to exchange data with higher-level PLCs.

Go to the **Device parameters** tab in order to select an operating mode.

The operating mode you select will affect the way I/O allocation lists are created for the programming system during the planning phase. If you have selected EtherNet/IP, the I/O addresses (tags) will be defined according to the agreements for EtherNet/IP. The format of the export file created in SWD-Assist is designed to enable you to import these I/O identifiers directly into the RSLogix 5000 programming system. If you select Modbus-TCP instead, the I/O data will be mapped to the relevant register data structure as per the specifications for Modbus-TCP. The address assignments will then be provided in an export file so that they can be edited further.

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

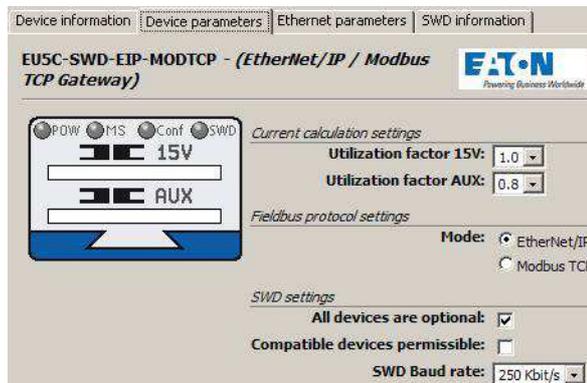


Figure 52: Selecting a communications protocol

Configuring the Ethernet address parameters

The EU5C-SWD-EIP-MODTCP gateway communicates with a higher-level PLC via the Ethernet interface. The gateway comes with the following default settings:

IP address: 192.168.1.254

Subnet screen: 255.255.255.0

Default gateway: 192.168.1.1



The DIP switches can be used to restore these default settings at any time (→ Section “3.3.2.1 Default gateway settings”).

IP addresses are assigned using one of three methods:

- The address is set directly on the device
- An address is acquired from a DHCP/BOOTP server
- An address is obtained from the SWD-Assist planning program

Depending on the operating mode that is set on the device, the settings configured in SWD-Assist will affect the Ethernet parameters differently. The operating mode is set with the DIP switches on the gateway.

Page 85 of the “Engineering” section in the “Introduction” chapter provides a detailed description of the DIP switches.

Select the EU5C-SWD-EIP-MODTCP gateway in SWD-Assist. To configure the network addresses, open the **Ethernet Parameters** tab. The default values shown above for the network addresses are also used as the default settings in SWD-Assist projects, but you can change them if necessary. After the project is transferred to the gateway, the settings and the configuration data will be saved in a retentively and will be applied immediately.

The following table shows the effect that the settings configured in an SWD-Assist project will have based on the operating mode selected with the DIP switches on the device.

| Standard gateway | Subnet Mask | IP Address | | | | Operating mode |
|------------------|--------------|--------------|--------------|--------------|--------------|---|
| | | Bytes 3 | Byte 2 | Bytes 1 | Byte 0: | |
| Project | Project | Project | Project | Project | Dip switch | Selected by means of the address switches |
| DHCP/BOOTP | DHCP/BOOTP | DHCP/BOOTP | DHCP/BOOTP | DHCP/BOOTP | DHCP/BOOTP | DHCP-/BOOTP server |
| Project | Project | Project | Project | Project | Project | PGM |
| DHCP/Project | DHCP/Project | DHCP/Project | DHCP/Project | DHCP/Project | DHCP/Project | PGM-DHCP |

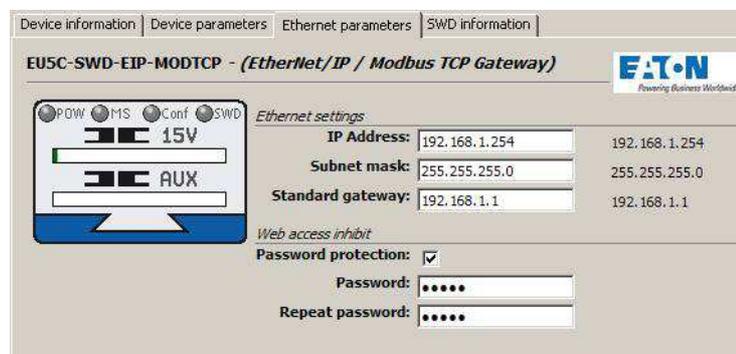


Figure 53: Configuring the Ethernet parameters for fieldbus communications

Setting of SmartWire-DT communication parameters

The **SWD Settings** section found under the **Device Parameters** tab makes it possible to configure general settings for the gateway and the SmartWire-DT stations.

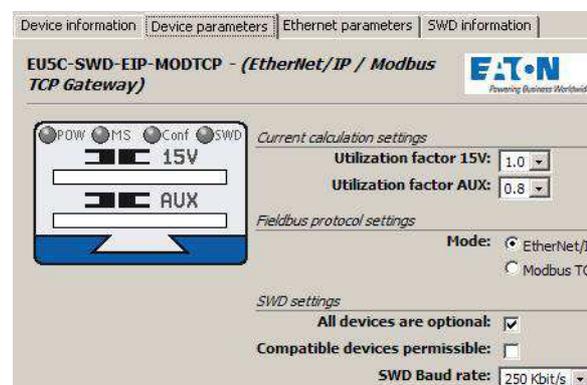


Figure 54: Configuring central SmartWire-DT parameters

The following table describes the corresponding parameters and the values that can be selected for them.

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

| Parameters | Value | Description |
|--------------------------------|---|--|
| All devices are optional | yes | Data transmission to the field bus also takes place for a random number of failed SmartWire-DT stations. The setting in the module parameters has no effect. |
| | no | Specification is performed individually for each SmartWire-DT station (→ Section “Parameter assignment of the SWD stations”) |
| Compatible devices permissible | yes | Data exchange takes place if the connected SmartWire-DT stations are compatible with the SmartWire-DT stations in the configuration. This is indicated by the Status LED on the device. For a list of devices that are compatible with each other, please consult Table 22, page 140. |
| | no | The planned SmartWire-DT stations in the configuration must comply with the SmartWire-DT stations of the stored gateway target configuration. If not, no data interchange takes place with the field bus master. |
| SWD baud rate | 125 kbit/s 250 kBit/s (setpoint value) | The baud rate of the SmartWire-DT network. |

Parameter assignment of the SWD stations

There are two different types of SmartWire-DT station configurations:

- Parameter configuration concerning the network: These parameters can be applied on every SmartWire-DT station
- Device-specific parameters: These are individual and are only optionally available.

General parameter

You can configure the parameters for each individual SmartWire-DT station. These parameters will affect the station's startup behavior and define whether it can be replaced with a SmartWire-DT universal module. For detailed information regarding the SmartWire-DT universal module, please consult the “SmartWire-DT Stations” manual (MN05006001Z-EN).

| Parameters | Value | Description |
|------------------|-------|--|
| Required station | yes | If communications cannot be established with this station, data from other stations will cease to be transferred to the fieldbus through the gateway. All input data will have a value of 0. |
| | no | If communications cannot be established with this station during operation, data from other stations will continue to be transferred to the fieldbus through the gateway. The data of the station that has dropped out will have a value of 0. The fact that the station has dropped out will be reported during diagnostics. (The PRSNT bit in the first input byte will have a value of 0). |

| Parameters | Value | |
|---------------------------------------|-------|--|
| Can be replaced with universal module | Yes | An M22-NOP(C) universal module can be installed instead of the planned station. |
| | no | The planned SmartWire-DT stations in the configuration must comply with the SmartWire-DT stations of the stored gateway target configuration. If not, no data interchange takes place with the field bus master. |

The parameters for each station are configured in SWD-Assist. To do this, simply select the station you want and modify the settings as needed.

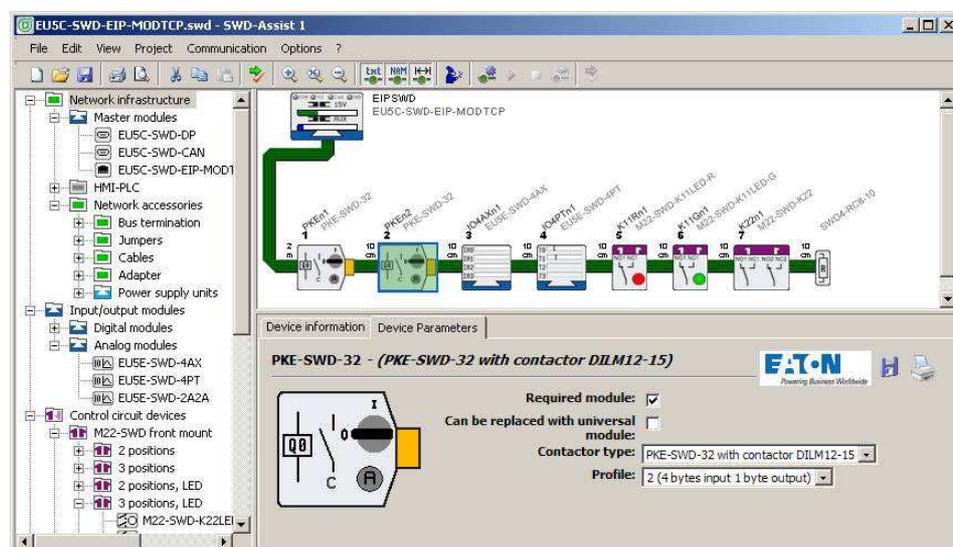


Figure 55: Entering general device-specific SmartWire-DT parameters

Device-specific parameters

Certain SmartWire-DT stations make it possible to define device-specific parameters. These parameters include, for instance, those related to selecting the analog sensor that will be connected, defining sampling times, and averaging in an analog module. Likewise, various data profiles that define the scope of the I/O data that is transmitted cyclically can also be defined (e.g. for the PKE electronic motor-protective circuit-breaker).

For information regarding the parameter configuration options available for individual SmartWire-DT stations, please consult the “SmartWire-DT Stations” manual (MN05006001Z-EN).

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

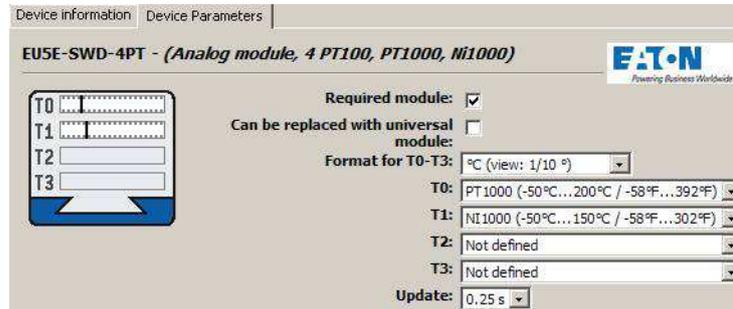


Figure 56: Dialog box used to configure the parameters for the EU5E-SWD-4PT temperature module

3.6.2.4 Exporting I/O data

The units' I/O addresses will be mapped to the corresponding field bus I/O objects based on the communications protocol that has been selected (EtherNet/IP or Modbus-TCP). The SWD-Assist planning program performs this mapping, which is shown for every SmartWire-DT station. When using the EtherNet/IP operating mode, this data can be exported as a CSV file for the RSLogix 5000 programming system and can then be imported into the RSLogix 5000 (valid from version 17.0 onward) programming system. In the case of Modbus-TCP applications, the data can be exported in a text file format.

The following sections describe the specific usage aspects involved when using the EtherNet/IP and Modbus-TCP communications protocols.

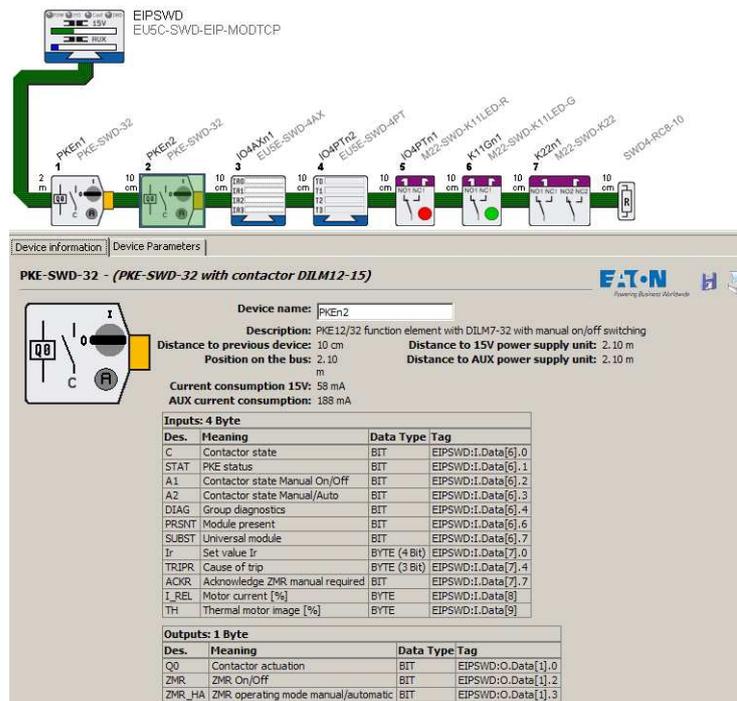


Figure 57: I/O addresses for the PKE-SWD32 SmartWire-DT station and the EtherNet/IP protocol in the SWD-Assist planning program

3.6.3 Communication protocol EtherNet/IP

This section covers the unique specific aspects involved in using the gateway with an EtherNet/IP fieldbus and the RSLogix 5000 programming system. It is subdivided into three subsections:

- Creating a SmartWire-DT network for an EtherNet/IP fieldbus using the SWD-Assist program
- Configuring the gateway in the RSLogix 5000 programming system and importing the corresponding I/O data
- Additional information on mapping the SmartWire-DT network to the EtherNet/IP fieldbus' protocol options

3.6.3.1 Creating a SmartWire-DT network with the SWD-Assist planning program

To create a SmartWire-DT network for an EtherNet/IP fieldbus using the SWD-Assist planning program, you will need to follow the steps below:

1. Select and configure the parameters of the gateway and the SmartWire-DT stations
2. Select the EtherNet/IP protocol
3. Specify the device name for the gateway
4. Specify the device names for the stations
5. Export the corresponding I/O data

The steps required in order to configure and set the parameters for the SmartWire-DT network, as well as to select a fieldbus protocol, have already been described (→ Section "3.6.2.1 Configuring the SmartWire-DT network"). After this, it is important to enter a device name for the gateway and for the individual SmartWire-DT stations, since this information will be used in order to identify the gateway in the EtherNet/IP network and when naming the I/O data corresponding to the SmartWire-DT stations in the export file.

Specifying the device name for the gateway

The SWD-Assist planning program makes it possible to assign a device name to the gateway. "EIPSWD" will be the default name used by the program. The device name will be used later on when creating the EU5C-SWD-EIP-MODTCP EtherNet/IP gateway in the programming system's device configurator, as well as when creating the symbolic names used to identify I/O data.

The device name must be unique, i.e., it cannot be in use in the application program already. The maximum permitted length is 24 characters. The name can contain letters (but not umlauts), numbers, and underscores (_).

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

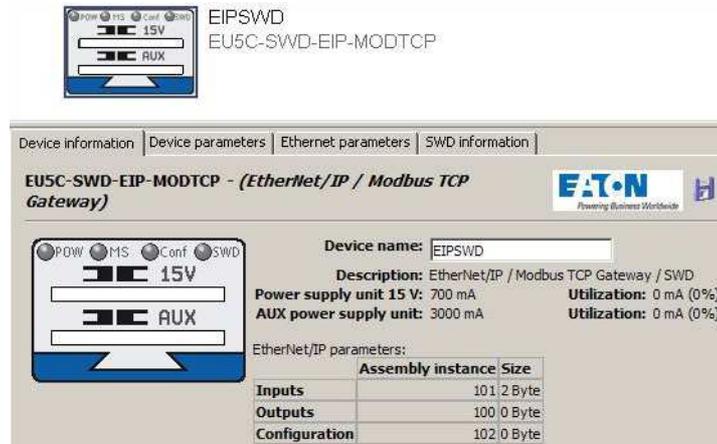


Figure 58: Specifying the device name for the gateway

Specifying the device name for the SmartWire-DT stations

Just like with the gateway, device names are also used for the SmartWire-DT stations in the SWD-Assist planning program. A device name based on the station's type and position (address) will be suggested by default. These device names are used to identify the stations and must be unique. They are used when generating symbolic names for I/O data.

The device name must be unique, i.e., it cannot be used for other SmartWire-DT stations as well. The maximum permitted length is 24 characters. The name can contain letters (but not umlauts), numbers, and underscores (_).

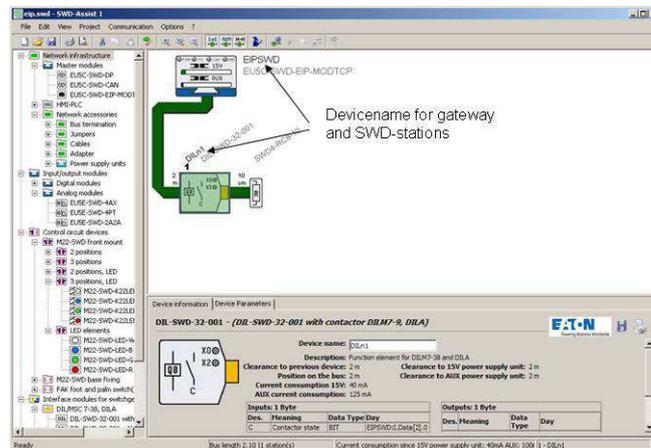


Figure 59: Specifying the device name for a SmartWire-DT station

Exporting I/O information

The process of providing access to the SmartWire-DT stations' I/O data in the RSLogix 5000 user program is made much easier by exporting this data in a file format that is compatible with RSLogix 5000. The SWD-Assist planning program has an **Export Configuration** function, found in the **Project** menu, for precisely this purpose. Using this function will store all required information in a CSV file.

The figure below shows how device names are used in I/O addresses and symbolic names in the export file.

The I/O address ("Specifier" column) is made up of:

- The device name of the EtherNet/IP fieldbus station (the EU5C-SWD-EIP-MODTCP gateway); "EIPSWD" in this particular case
- A code used to indicate whether the address is for an input (I) or an output (Q)
- The address information for the specific I/O data within the data space

The symbolic name ("Name" column) is made up of:

- The device name of the EtherNet/IP fieldbus station (the EU5C-SWD-EIP-MODTCP gateway); "EIPSWD" in this particular case
- The device name ("DILn1" in this particular case) of the station for connecting a contactor to SmartWire-DT
- A code used to indicate whether the address is for an input (I) or an output (Q)
- An individual name for the specific I/O data, e.g., "C" for the feedback signal for the contactor's position

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

| TYPE | SCOPE | NAME | DESCRIPTION | DATATYPE | SPECIFIER | ATTRIBUTES |
|-------|-------|---------------------------|-----------------------------|-------------------------------------|-------------------|-------------------|
| TAG | | EIPSWD:C | | AB:ETHERNET_MODULE.C:0 | | |
| TAG | | EIPSWD:I | | AB:ETHERNET_MODULE_SINT_31Bytes:1:0 | | |
| TAG | | EIPSWD:O | | AB:ETHERNET_MODULE_SINT_4Bytes:0:0 | | |
| ALIAS | | EIPSWD_PkEn1_I_C | Contactor state | | EIPSWD.I.Data[2]0 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_STAT | PKE status | | EIPSWD.I.Data[2]1 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_A1 | Contactor state Manual/Off | | EIPSWD.I.Data[2]2 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_A2 | Contactor state Manual/Auto | | EIPSWD.I.Data[2]3 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_DIAG | Group diagnostics | | EIPSWD.I.Data[2]4 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_PRSNT | Module present | | EIPSWD.I.Data[2]6 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_SUBST | Universal module | | EIPSWD.I.Data[2]7 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_Ir_b0b3 | Set value Ir | | EIPSWD.I.Data[3] | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_Ir_0 | Set value Ir Bit 0 | | EIPSWD.I.Data[3]0 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_Ir_1 | Set value Ir Bit 1 | | EIPSWD.I.Data[3]1 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_Ir_2 | Set value Ir Bit 2 | | EIPSWD.I.Data[3]2 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_Ir_3 | Set value Ir Bit 3 | | EIPSWD.I.Data[3]3 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_TRIPR_b4b6 | Cause of trip | | EIPSWD.I.Data[3] | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_TRIPR_4 | Cause of trip Bit 0 | | EIPSWD.I.Data[3]4 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_TRIPR_5 | Cause of trip Bit 1 | | EIPSWD.I.Data[3]5 | (RADIX = Decimal) |
| ALIAS | | EIPSWD_PkEn1_I_TRIPR_6 | Cause of trip Bit 2 | | EIPSWD.I.Data[3]6 | (RADIX = Decimal) |

Figure 60: EtherNet/IP I/O data for RSLogix 5000



You can change the device names for the gateway and the SmartWire-DT stations in SWD-Assist at any time. The corresponding I/O addresses (tags) and symbolic names will be updated immediately. You can also change these names in the programming software.

3.6.3.2 Using the gateway in the RSLogix 5000 programming system

In order to use the EU5C-SWD-EIP-MODTCP gateway in the RSLogix 5000 programming system, you will have to follow the steps below:

1. Configure and set the parameters for the EtherNet/IP EU5C-SWD-EIP-MODTCP station
2. Import the corresponding I/O data (tag list) and use it in the application program

Configuring the EU5C-SWD-EIP-MODTCP gateway

In order to be able to use an EU5C-SWC-EIP-MODTCP gateway, you will need a controller with an EtherNet/IP interface. The programming software's **Controller Organizer** pane shows the Ethernet ports under **I/O Configuration**. Select the Ethernet interface to which you want to connect the SmartWire-DT gateway.

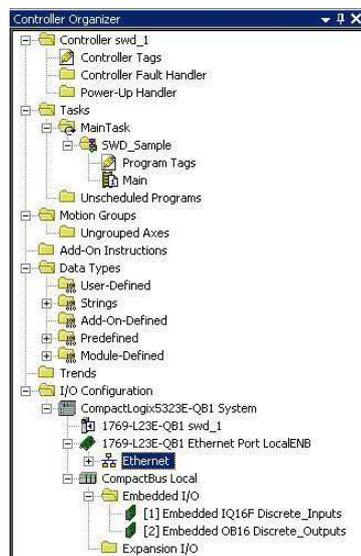


Figure 61: Ethernet interface in the controller's I/O configuration

Use the context menu (**New Modules** option) or the menu bar (**File -> New Component -> Modules**) to open the dialog box used to select Ethernet station groups. Select the **Communications** group and then the **Generic Ethernet module** device. Then confirm your selection by clicking on **OK**.

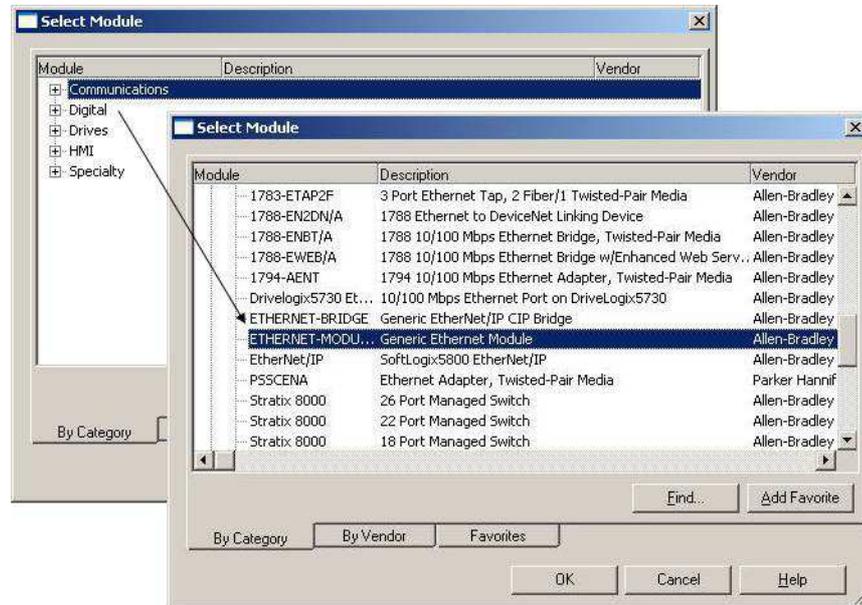


Figure 62: Selecting the gateway as a “Generic Ethernet module”

The dialog box that follows is used to configure important properties that are required in order to ensure that the controller and the gateway will be able to communicate successfully. On one hand, these include information regarding the relevant Ethernet connection parameters (such as the IP address and information regarding the type and volume of I/O data). I/O data is provided by the gateway in byte format. Accordingly, make sure to first select the “SINT” data type for the “Communication format” parameter. You will need the SmartWire-DT project that you created with the SWD-Assist planning program in order to obtain additional necessary information. To get this information, open the SmartWire-DT project and select the EU5C-SWD-EIP-MODTCP gateway. Now open the **Device information** tab.

Now copy the values for the inputs’, outputs’, and configuration data volumes found in SWD-Assist to the corresponding fields in the RSLogix 5000 parameter dialog box as shown in → Figure 63.

After doing so, open the **Ethernet Parameters** tab in SWD-Assist and do the same for the gateway’s Ethernet address. This will ensure that the gateway, together with its important communication parameters, as well as the corresponding data and configuration volumes, is known.

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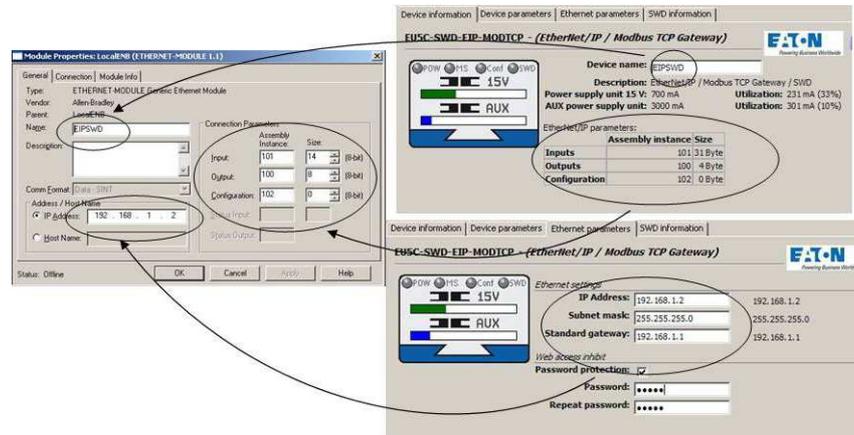


Figure 63: Entering the gateway parameters found in the SWD-Assist planning program into the RSLogix 5000 programming system



Modifying the SmartWire-DT network may affect the aforementioned data volumes. Differences between the actual network and the specified volumes will be indicated with the “Config” status display on the gateway (the “CONFIG” LED will show a red light) if, for example, the gateway detects that there are errors after performing a configuration comparison. If this happens, transfer the modified SmartWire-DT project to the gateway and update the values in the above dialog box if necessary.

Importing the I/O data

The next step after adding the EU5C-SWD-EIP-MODTCP gateway to the device configuration is to transfer the existing I/O data so that it can be used in the programming system. To do so, the CSV file previously exported in SWD-Assist needs to be imported into the RSLogix 5000 programming system. Open the **Extras** menu item, select the “Import” option, and then select “Tags and logic comments.” In the dialog box that appears, select the CSV file that you previously created with the SWD-Assist planning software and confirm your selection by clicking on **Import**.

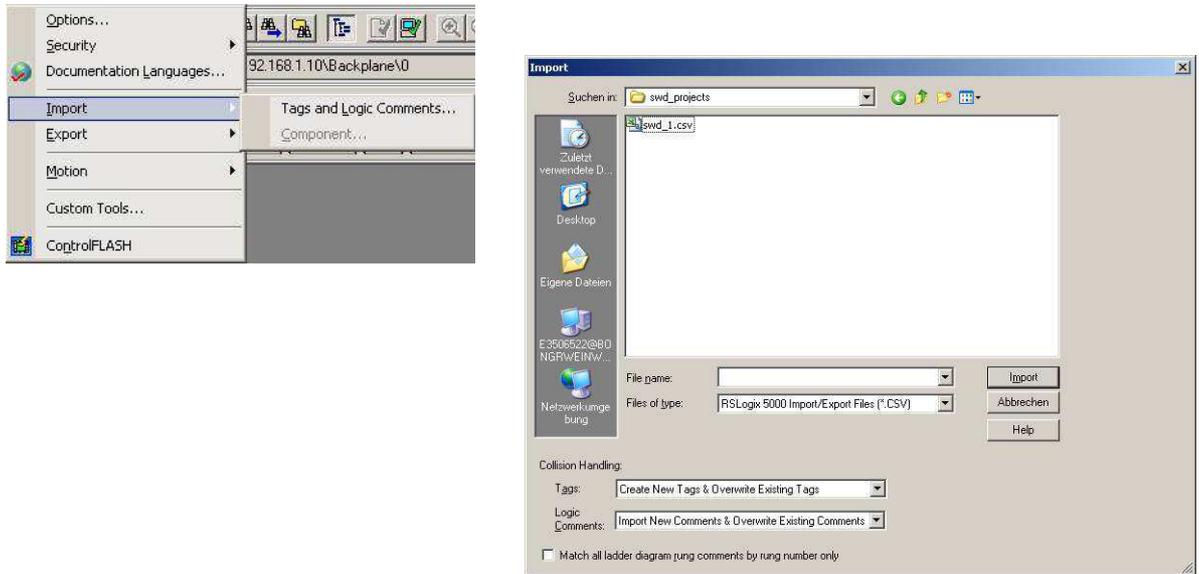


Figure 64: Importing I/O data into an RSLogix 5000 project

Once you are done with these steps, the programming system will have the I/O data and you will be able to use this data for programming as usual.

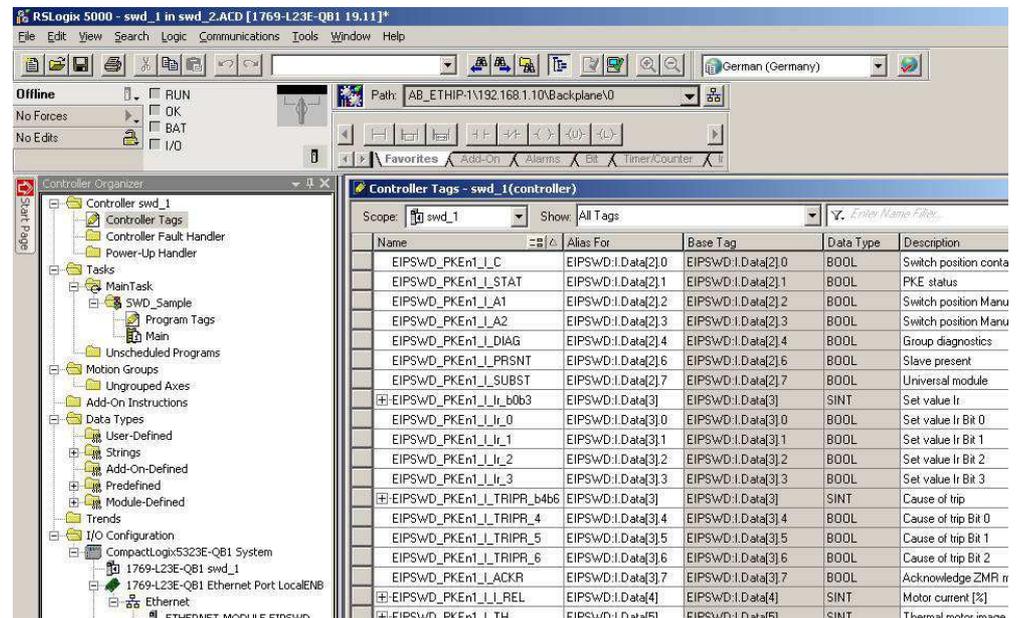


Figure 65: Tag list containing all of the SmartWire-DT network's I/O data

3.6.3.3 General information regarding the EtherNet/IP protocol

Introduction

The EtherNet/IP protocol relies on the Common Industrial Protocol (CIP) in order to transfer data. It supports the following types of communication:

- Point-to-point or multicast implicit I/O messaging
- Unconnected explicit messaging (UCMM)
- Connected explicit messaging

The EtherNet/IP protocol provides access to the gateway's data via standard services (CIP object classes) and manufacturer-specific object classes (VSC object classes, VSC = Vendor Specific Class). CIP object classes contain, for example, basic information concerning the device (device name, manufacturer, etc), as well as access to cyclic input/output data. Meanwhile, manufacturer-specific object classes contain information concerning specific properties of individual SmartWire-DT stations, including, for example, diagnostic and parameter information.

Standard CIP object classes

The following standard EtherNet/IP classes are supported in accordance with the CIP Specification:

| Class | Object name | Description |
|------------|---------------------------|---|
| 01 (0x01) | Identity object | Information about the device, such as the manufacturer, device model, etc. (→ Page 113) |
| 02 (0x02) | Message Router Object | Communication interface that can be used to generate requests for all of the device's classes and instances (→ Page 114) |
| 04 (0x04) | Assembly Object | A package of multiple data corresponding to a data object in a data field. A typical application is using them to group all cyclic input or output data. (→ Page 115) |
| 06 (0x06) | Connection Manager Object | Used to manage internal resources for I/O and explicit messaging connections |
| 244 (0xF4) | Port Object | Device port description |
| 245 (0xF5) | TCP/IP Interface Object | Information regarding the TCP/IP interface's settings |
| 246 (0xF6) | Ethernet Link Object | Status information for an Ethernet 802.3 interface |

Service Codes

The following standard EtherNet/IP service codes are used in accordance with the CIP Specification:

| Service code | Service name | Description |
|--------------|-------------------------|---|
| 1 (0x01) | Get_Attribute_All | Delivers the contents of the class or instance of the relevant object |
| 2 (0x02) | Set_Attribute_All | Modifies the contents of the instance or of the class attributes of the relevant object |
| 5 (0x05) | Reset | Resets the relevant object to its setpoint values |
| 10 (0x0A) | Multiple_Service_Packet | Grouping of a self-defined number of attributes belonging to a class or instance |
| 14 (0x0E) | Get_Attribute_Single | Delivers the contents of a single attribute |
| 16 (0x10) | Set_Attribute_Single | Modifies a single attribute |

Identity object 0x01

Identity object 0x01 delivers information via the EU5C-SWD-EIP-MODTCP SmartWire-DT gateway. This includes information regarding the device name, the device version, the serial number, and version information.

Overview of functions

| Classes/ Instances | Attributes/Services | Value |
|-----------------------|---------------------|-----------------------------------|
| Classes | | |
| | Attributes | 0x1, 0x2, 0x3, 0x6, 0x7 |
| | Services | 0x1, 0xE |
| Instances | | |
| | Attributes | 0x1, 0x2, 0x3, 0x4, 0x5, 0x6, 0x7 |
| | Services | 0x1, 0x5, 0xE |

Class attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|------------------------|---------|-----------|--|---------|
| 1 (0x01) | REVISION | G | UINT | Version | 0x00 01 |
| 2 (0x02) | MAX OBJECT INSTANCE | G | UINT | Maximum number of object instances | 0x00 01 |
| 3 (0x03) | NUMBER OF INSTANCES | G | UINT | maximum number of instances | 0x00 01 |
| 6 (0x06) | MAX CLASS IDENTIFIER | G | UINT | Highest number of the implemented class attribute | 0x00 07 |
| 7 (0x07) | MAX INSTANCE ATTRIBUTE | G | UINT | Highest number of the implemented instance attribute | 0x00 07 |

Instance attributes

| Attribute number | Attribute name | Get/Set | Data type | Description |
|------------------|----------------------------|---------|-----------------------------|--|
| 1 (0x01) | VENDOR | G | UINT | Manufacturer ID |
| 2 (0x02) | DEVICE TYPE | G | UINT | Classifies the product as a communication adapter |
| 3 (0x03) | PRODUCT CODE | G | UINT | Article No. (153163) |
| 4 (0x04) | REVISION MAJOR MINOR | G | STRUCT of USINT USINT | Device version |
| 5 (0x05) | DEVICE STATUS | G | WORD | Device status (see table below) |
| 6 (0x06) | SERIAL NUMBER | G | UINT | Device serial number |
| 7 (0x07) | PRODUCT NAME | G | SHORT STRING | Length (first byte) and product name (EU5C-SWD-EIP-MODTCP) |

Device status

| Bit | Name | Value / Description |
|--------|------------------------|---|
| 0 - 1 | Reserved | |
| 2 | Configured | 1: The gateway has a project configuration 0: The gateway does not have a project configuration |
| 3 | Reserved | |
| 4 - 7 | Extended device status | 0011: No input/output connection active 0110: At least one input/output connection in "RUN" operating mode 0111: At least one input/output connection; all in "IDLE" operating mode |
| 8 - 15 | Reserved | |

Message Router Object 0x02

This object establishes a connection to a class object or to an instance of the gateway

Overview of functions

| Classes/ Instances | Attribute/Services | Value |
|-----------------------|--------------------|-----------------------------------|
| Classes | | |
| | Attributes | 0x1, 0x2, 0x3, 0x6, 0x7, 0x8, 0x9 |
| | Services | 0x1, 0xE |
| Instances | | |
| | Attributes | 0x1, 0x2, 0x3, 0x4, 0x7 |
| | Services | 0x1, 0xE |

Class attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|--|---------|------------------------------------|--|-------------------------------|
| 1 (0x01) | REVISION | G | UINT | Version | 0x00 01 |
| 2 (0x02) | MAX OBJECT INSTANCE | G | UINT | Maximum number of object instances | 0x00 01 |
| 3 (0x03) | NUMBER OF INSTANCES | G | UINT | maximum number of instances | 0x00 01 |
| 4 (0x04) | OPTIONAL ATTRIBUTE LIST NUMBER OF Attributes OPTIONAL Attributes | G | STRUCT of UNIT ARRAY of UNIT | List of optional attributes Number of attributes | 0x00 02 0x00 01 0x00 02 |
| 5 (0x05) | OPTIONAL SERVICE LIST NUMBER SERVICES OPTIONAL SERVICES | G | STRUCT of UNIT ARRAY of UNIT | List of optional services Number of services | 0x00 01 0x00 0A |
| 6 (0x06) | MAX CLASS IDENTIFIER | G | UINT | Highest number of the implemented class attribute | 0x00 07 |
| 7 (0x07) | MAX INSTANCE ATTRIBUTE | G | UINT | Highest number of the implemented instance attribute | 0x00 02 |

Instance attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|--------------------------------------|---------|--|---|---|
| 1 (0x01) | OBJECT LIST NUMBER CLASSES | G | STRUCT of UINT ARRAY OF UINT | List of all the object class codes supported by the device Number of classes Classes supported by the gateway | 0x 00 0B 0x00 01, 0x00 02, 0x00 04,0x00 06, 0x00 F4, 0x00 F5, 0x00 F6,0x00 64, 0x00 65, 0x00 00, 0x00 00 2 (0x02) |
| 2 (0x02) | MAX NUMBER OF CONNECTIONS | G | UINT | maximum number of connections | 0x00 20 |

Assembly object 0x4

Input and output assembly objects are groups of multiple individual objects that are used in order to be able to easily read or write large data volumes with a single connection. The outputs of all the SmartWire-DT stations are grouped in instance 100, while the inputs of all the SmartWire-DT stations are grouped in instance 101. The object length varies and depends on the number of SmartWire-DT stations and their data volumes. The maximum object length is 496 bytes for each instance.

Overview of functions

| Classes/ Instances | Attribute/Services | Value |
|-----------------------|--------------------|-------------------------------|
| Classes | | |
| | Attributes | 0x1, 0x2, 0x3, 0x4, 0x6, 0x7 |
| | Services | 0xE |
| Instances | | |
| | Attributes | 0x3, 0x4 |
| | Services | 0x10 (only instance 100), 0xE |

Class attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|--|---------|------------------------------------|---|--------------------|
| 1 (0x01) | REVISION | G | UINT | Version | 0x00 02 |
| 2 (0x02) | MAX CLASS ID | G | UINT | Highest supported class number | 0x00 65 |
| 3 (0x03) | NUMBER OF INSTANCES | G | UINT | Number of instances | 0x00 02 |
| 4 (0x04) | OPTIONAL ATTRIBUTE LIST NUMBER OF Attributes OPTIONAL Attributes | G | STRUCT of UNIT ARRAY of UNIT | List of optional attributes Number of attributes | 0x00 01 0x00 04 |
| 6 (0x06) | MAX CLASS IDENTIFIER | G | UINT | Highest number of the implemented class attribute | 0x00 07 |
| 7 (0x07) | MAX INSTANCE ATTRIBUTE | G | UINT | Highest number of the implemented instance attribute | 0x00 04 |

Instance attributes

| Attribute number | Attribute name | Instance | Get/Set | Data type | Description |
|------------------|----------------|----------|---------|-------------------|-----------------------------|
| 3 (0x01) | DATA | 100 | G/S | ARRAY OF USINT | Output data |
| | | 101 | G | | Input data |
| 4 (0x04) | SIZE | 100/101 | G | UINT | Number of Input/output data |

Mapping of the data from instance 100 to the SmartWire-DT stations' outputs

All output data for the SmartWire-DT stations is stored in the data storage area for instance 100. The size of the data storage area depends on the number of configured SmartWire-DT stations, as well as on their type. When creating a SmartWire-DT network with the SWD-Assist planning program, the total size of all output data (which will then be the size of the assembly object) is specified. The SmartWire-DT stations' output data is arranged continuously within the instance's data storage area. The beginning and the length of the individual output data for each station are also specified individually in SWD-Assist.

Mapping of the SmartWire-DT stations' inputs to instance 101

The first two bytes of the data field contain the SmartWire-DT system's overall status; the remaining bytes contain all of the SmartWire-DT stations' input data, including the corresponding status information. The size of the data storage area depends on the number of configured SmartWire-DT stations and their type. When creating a SmartWire-DT network with the SWD-Assist planning program, the total size of all input data (which will then be the size of the assembly object) is specified. The SmartWire-DT stations' input data is arranged continuously within the instance's data storage area. The beginning and the length of the individual input data for each station are also specified individually in SWD-Assist.

Example

The following sample configuration will be used to show how data is stored in assembly objects 100 and 101.

- Gateway: EU5C-SWD-EIP-MODTCP
- Station 1: M22-SWD-LED-G, Indication element green
- Station 2: M22-SWD-K22LED-G, function element, 3 positions with green indication element
- Station 3: EU5E-SWD-2A2A, analog module, 2 analog inputs, 2 analog outputs

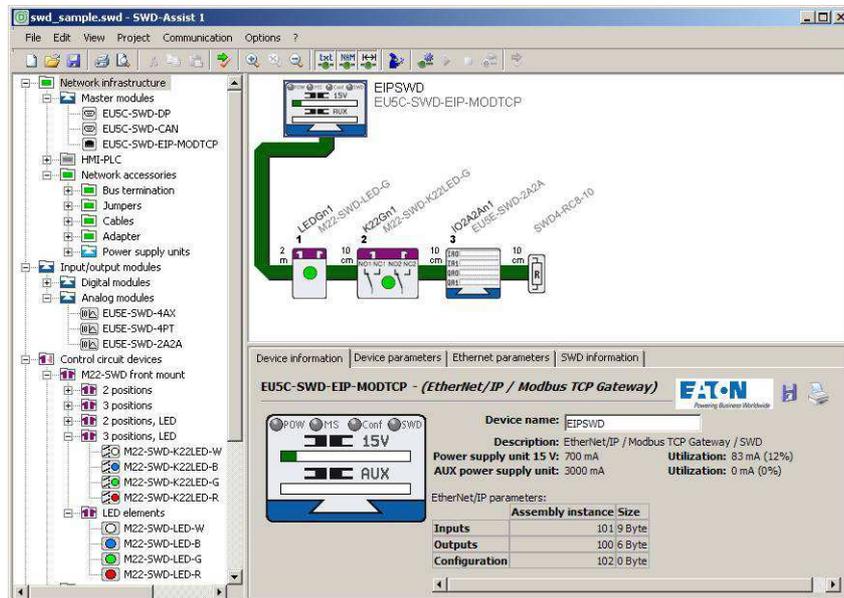


Figure 66: Sample configuration in SWD-Assist

The SWD-Assist planning program shows the length of the assembly objects for this configuration

| | Assembly instance | Length |
|---------|-------------------|--------|
| Inputs | 101 | 9 Byte |
| Outputs | 100 | 6 Byte |

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Table 17 and Table 18 show how I/O data is distributed.

Table 17: Structure of the SmartWire-DT stations' output data

| Byte 0: | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|----------------------|-------------------------|---|--|---|--|
| | | | | | High byte of analog output 2 EU5E-SWD-2A2A |
| | | | | Low Byte of analog output 2 EU5E-SWD-2A2A | |
| | | | High Byte of analog output 1 EU5E-SWD-2A2A | | |
| | | Low Byte of analog output 1 EU5E-SWD-2A2A | | | |
| | Output M22-SWD-K22LED-G | | | | |
| Output M22-SWD-LED-G | | | | | |

Table 18: Structure of the SmartWire-DT stations' input data (status information and input data)

| Byte 0: | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|-------------------------|--------------------------|----------------------|--------------------------------|----------------------|---------------------------------------|---|---------------------------------------|--|
| | | | | | | | | High Byte analog input 2 EU5E-SWD-2A2A |
| | | | | | | | Low Byte analog input 2 EU5E-SWD-2A2A | |
| | | | | | | High Byte analog input 1 EU5E EU5E-SWD-2A2A | | |
| | | | | | Low Byte analog input 1 EU5E-SWD-2A2A | | | |
| | | | | Status EU5E-SWD-2A2A | | | | |
| | | | Status inputs M22-SWD-K22LED-G | | | | | |
| | | Status M22-SWD-LED-G | | | | | | |
| | High Byte Gateway status | | | | | | | |
| Low Byte Gateway status | | | | | | | | |



The „Gateway status“ table on Page 121 contains a description of the relevant status information.

The “SmartWire-DT Stations“ manual (MN05006001Z-EN) describes the SmartWire-DT stations' input data.

Manufacturer-specific object classes

In addition to standard object classes, there are also manufacturer-specific classes (VSC classes, VSC = Vendor-Specific Class) that make it possible to access individual properties corresponding to the EtherNet/IP device and the SmartWire-DT stations. Object classes 0x64 and 0x65 are used for this purpose.

| Class | Object name | Description |
|------------|-------------|---|
| 100 (0x64) | Gateway | Data corresponding to gateway EU5C-SWD-EIP-MODTCP and the SmartWire-DT system, as well as acyclic access to the SmartWire-DT stations |
| 101 (0x65) | SWD | The SmartWire-DT stations' data and settings |

Gateway object 0x64

Gateway object 0x64 makes it possible to access the data corresponding to the EU5C-SWD-EIP-MODTCP gateway and the SmartWire-DT system. In addition, acyclic access to the SmartWire-DT stations' data is also available.

Overview of functions

| Classes/ Instances | Attribute/Services | Value |
|-----------------------|--------------------|--|
| Classes | | |
| | Attributes | 0x64, 0x65, 0x66, 0x67 |
| | Services | 0xE |
| Instances | | |
| | Attributes | 0x64, 0x65, 0x66, 0x67, 0x68, 0x69, 0x6A, 0x6B, 0x6C, 0x6D, 0x6E, 0x6F, 0x70, 0x71, 0x72, 0x73, 0x74 |
| | Services | 0x10, 0xE |

Class attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|----------------------|---------|-----------|---|---------|
| 100 (0x64) | CLASS REVISION | G | UINT | Version | 0x00 01 |
| 101 (0x65) | MAX OBJECT INSTANCE | G | UINT | Maximum number of object instances | 0x00 01 |
| 102 (0x66) | NUMBER OF INSTANCES | G | UINT | maximum number of instances | 0x00 01 |
| 103 (0x67) | MAX CLASS IDENTIFIER | G | UINT | Highest number of the implemented class attribute | 0x00 67 |

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Instance attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|--|---------|--|---|---|
| 100 (0x64) | MAX OBJECT ATTRIBUTE | G | USINT | Holds the number of the last object attribute | 0x74 |
| 101 (0x65) | STATE | G | UINT | Current Gateway Status | See the "Gateway status" table below |
| 103 (0x67) | DEVICE ID | G | UINT | Manufacturer ID | |
| 104 (0x68) | ORDER NAME | G | SHORT STRING | Length (first byte) and product name ("EU5C-SWD-EIP-MODTCP") | 13 45 55 35 43 2D 53 57 44 2D 45 49 50 2D 4D 4F 44 54 43 50 |
| 105 (0x69) | SERIAL NO. | | SHORT STRING | Device serial number | |
| 106 (0x6A) | SW REVISION | | SHORT STRING | Firmware Version of the Gateway | |
| 107 (0x6B) | PROJECT PARAMETER | | STRUCT of UNIT USINT USINT UINT | Gateway parameter SWD Baud rate (in kBit/s) Number of modules in the planned configuration CyclicExchangeDelay in ms SmartWire-DT project parameter | See the "SmartWire-DT project parameters" table below |
| 108 (0x6C) | PRODUCED DATA SIZE | G | UINT | Length of input data | |
| 109 (0x6D) | CONSUMED DATA SIZE | G | UINT | Length of output data | |
| 110 (0x6E) | FIRST CONFIGURATION ERROR (FIRST MISSING MANDATORY MODULE) | G | UINT | First station with an error (invalid type, wrong serial number, etc.) | |
| 111 (0x6F) | NODE COUNT | G | UINT | Number of modules in the target configuration | |
| 112 (0x70) | NODE IDENTS | G | ARRAY of STRUCT VENDOR USINT DEVICE USINT | Manufacturer and device IDs for all the SmartWire-DT stations in the target configuration Manufacturer Device identification: | |
| 113 (0x71) | INDEX | G/S | USINT | Object index for acyclic data | |
| 114 (0x72) | DATA | G/S | ARRAY of USINT | Data for reading / writing acyclic data | |
| 115 (0x73) | LENGTH | G/S | USINT | Length of acyclic read/write data | 1 – 120 |
| 116 (0x74) | ERROR | G | UINT | Error message | |

Gateway status

| Value | Description |
|--------|---|
| 0x0000 | No error |
| 0x0001 | FAILSAFE: no SmartWire-DT communication |
| 0x0002 | no project configuration present |
| 0x0004 | no target configuration present |
| 0x0040 | Renew Target Configuration |
| 0x007F | SmartWire-DT initialization |
| 0x0080 | Wiring test active |
| 0x0081 | Error when comparing the target configuration and the actual configuration |
| 0x0082 | Error when comparing the project configuration and the target configuration |

SmartWire-DT project parameters

| Bit | Name | Value / Description |
|--------|----------------------|---|
| 0 | SWD Compatibility | 0: Using the M22-NOP universal module is not permitted 1: The M22-NOP universal module can be used as a substitute for a planned station |
| 1 | SWD Optional Modules | 0: Defined for each specific SmartWire-DT station at the SmartWire-DT station level 1: All modules are optional (independently of the setting configured at the station level) |
| 3 - 15 | Reserved | |

3.6.3.4 Acyclic data transfer

Gateway class 0x64 is also used to acyclically access the data of individual SmartWire-DT stations. Instance attributes 0x71 to 0x74 are used for this purpose.

Instance attributes

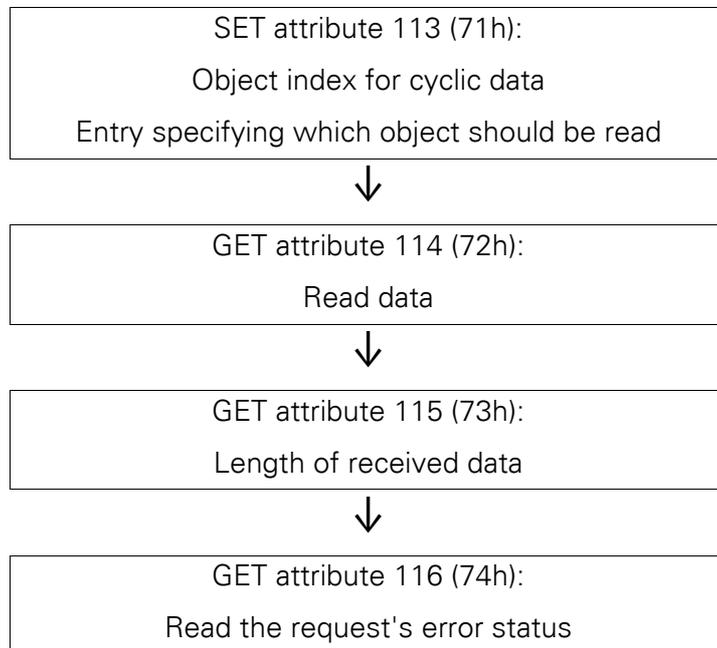
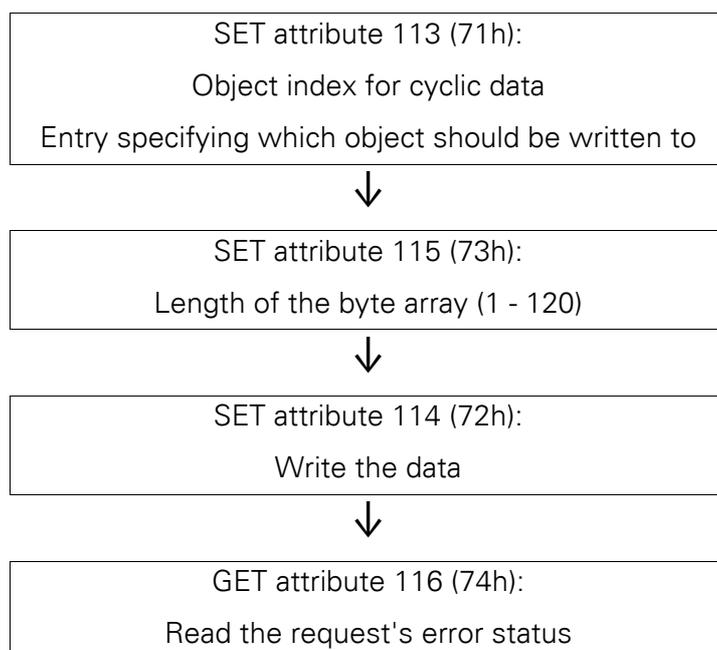
| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|----------------|---------|----------------|--|-----------------|
| 113 80x71) | INDEX | G/S | USINT | Object index for acyclic data | See note |
| 114 (0x729 | DATA | G/S | ARRAY of USINT | Data for reading or writing acyclic data | |
| 115 (0x73) | LENGTH | G/S | USINT | Length of the acyclic read/write data | |
| 116 (0x74) | ERROR | G | UINT | Error message | See table below |



Please consult the appropriate documentation in order to obtain information regarding the number and meaning of the available object indexes (e.g., “SmartWire-DT Stations” manual, MN05006001Z-EN).

Error messages for acyclic data communications

| Value | State | Description |
|--------------------|-----------------------|--|
| 0x0000 | OK | No error |
| 0x00BB | Pending | Acyclic data transfer running |
| 0xFE _{xx} | Error | 0xfe 3e : SmartWire-DT station address invalid 0xfe a0 : Read error 0xfe a1 : Write error 0xfe a2 : SmartWire-DT station error 0xfe b1 : invalid length 0xfe b2 : invalid index 0xfe b6 . Unallowed access 0xfe b7 : invalid area 0xfe b8 : invalid type |
| 0xFFFF2 | Busy | Acyclic channel is busy |
| 0xFFFF3 | Timeout | Communications monitoring time has elapsed (timeout) |
| 0xFFFF4 | Com error | Communication error |
| 0xFFFF5 | Not present | SmartWire-DT station not available |
| 0xFFFF6 | Permission denied | Access prohibited |
| 0xFFFF7 | Buffer size too small | Buffer size (attribute 0x73) is too small for data |

Acyclic read request example**Acyclic write operation example**

SWD stations object 0x65**Overview of functions**

| Classes/ Instances | Attribute/Services | Value |
|-----------------------|--------------------|--|
| Classes | | |
| | Attributes | 0x64, 0x65, 0x66, 0x67 |
| | Services | 0xE |
| Instances | | |
| | Attributes | 0x64, 0x65, 0x66, 0x67, 0x68, 0x69, 0x6A, 0x6B, 0x6C, 0x6D, 0x6E, 0x6F, 0x70, 0x71, 0x72, 0x73, 0x74 |
| | Services | 0x10, 0xE |

Class attributes

| Attribute number | Attribute name | Get/Set | Data type | Description | Value |
|------------------|----------------------|---------|-----------|---|---------|
| 100 (0x64) | CLASS REVISION | G | UINT | Version | 0x00 01 |
| 101 (0x65) | MAX OBJECT INSTANCE | G | UINT | Maximum number of object instances | 0x00 63 |
| 102 (0x66) | NUMBER OF INSTANCES | G | UINT | Maximum number of instances (= number of SmartWire-DT stations from the target configuration) | |
| 103 (0x67) | MAX CLASS IDENTIFIER | G | UINT | Highest number of the implemented class attribute | 0x00 67 |

Instance attributes for instances 1 to 99 (SmartWire-DT station address)

| Attribute number | Attribute name | Get/Set | Data type | Description |
|------------------|----------------------|---------|--------------|--|
| 100 (0x64) | MAX OBJECT ATTRIBUTE | G | USINT | Number of the highest instance attribute (= 120) |
| 101 (0x65) | STATE OF MODULE | G | UINT | Module status (see "Module status" table below) |
| 102 (0x66) | VENDOR ID | G | USINT | Manufacturer ID |
| 103 (0x67) | DEVICE ID | G | USINT | SmartWire-DT device classification |
| 104 (0x68) | ORDER NAME | G | SHORT STRING | Length and name of the SmartWire-DT station |
| 105 (0x69) | SERIAL NO. | G | SHORT STRING | Serial number |
| 106 (0x6A) | SW REVISION | G | SHORT STRING | Firmware Version |
| 107 (0x6B) | CURRENT PROFILE | G | UDWORD | Data profile |
| 108 (0x6C) | CURRENT PARAMETER | G | USINT | Parameters |

| Attribute number | Attribute name | Get/Set | Data type | Description |
|------------------|-------------------------|---------|---|---|
| 109 (0x6D) | EXTENDED DIAGNOSE | G | STRUCT of UDWORD UINT ARRAY of USINT | Extended diagnostic status Time point Diagnostic message (see "Extended SmartWire-DT module diagnostics" table below) List of currently pending diagnostic messages (maximum of 5) |
| 110 (0x6E) | EXTENDED PARAMETER SIZE | G | USINT | Size of extended parameter data |
| 111 (0x6F) | EXTENDED PARAMETER | G | ARRAY of USINT | Extended parameter data (0 - 120 bytes) |
| 112 (0x70) | | | | |
| 113 (0x71) | INDEX | G/S | USINT | Object index for cyclic data |
| 114 (0x72) | DATA | G/S | ARRAY of USINT | Data buffer for acyclic read/write data |
| 115 (0x73) | LENGTH | G/S | USINT | Length of read/write data |
| 116 (0x74) | ERROR | G | UINT | Error message |
| 117 (75h) | PRODUCED DATA SIZE | G | UINT | Size of SmartWire-DT station input data |
| 118 (76h) | PRODUCED DATA | G | ARRAY of USINT | Input data |
| 119 (77h) | CONSUMED DATA SIZE | G | UINT | Size of SmartWire-DT station output data |
| 120 (78h) | CONSUMED DATA | G | ARRAY of USINT | Output data |

Module status

| Bit | Name | Value/Description |
|--------|----------|---|
| 0 | DIAG | 0: No diagnostic alarm 1: SmartWire-DT station delivering diagnostics |
| 1 | RESERVED | Reserved |
| 2 | PRSNT | 0: SmartWire-DT station not present (input data has a value of 0) 1: Module present |
| 3 | SUBST | 0: Planned station is present 1: Universal module present instead of planned station |
| 4 - 15 | RESERVED | Reserved |

Extended SmartWire-DT module diagnostics

| Bit | Name | Description |
|--------|----------------|---|
| 0 | MODUL MISSING | 0: SmartWire-DT station not present 1: Station present |
| 1 | MODUL DIAGNOSE | 0: No diagnostic alarm 1: SmartWire-DT station delivering diagnostics |
| 2 | MODUL REPLACED | 0: Planned station is present 1: Universal module present instead of planned station |
| 3 - 15 | RESERVED | Reserved |

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The table below lists the error causes (in currently available SmartWire-DT stations) that can be queried if the diagnostics bit is set. The “SmartWire-DT Stations” manual (MN05006001Z-EN) documents the various errors for each station (in the “Diagnostics” section).

Causes of fault

| Error value | Description |
|-------------|---------------------------------------|
| 0x1 | Overtemperature |
| 0x2 | Supply voltage too low |
| 0x3 | No connection to basic device |
| 0x10 | M22 contact position undefined |
| 0x11 | M22 Contact to short-circuit |
| 0x13 | (Overload or short-circuit) |
| 0x14 | Internal error |
| 0x15 | Manual/Auto switch position undefined |
| 0x16 | S0 interface error |
| 0x17 | Value exceeds measuring range |
| 0x18 | Value falls below measuring range |

3.6.4 Communication protocol Modbus TCP

This section goes over the unique specific aspects that are involved in using the gateway with Modbus-TCP fieldbuses. It is subdivided into three subsections:

- Creating a SmartWire-DT network for a Modbus-TCP fieldbus using the SWD-Assist program
- Exporting a reference file containing the mapping of the I/O data to the Modbus register
- Additional information for mapping the SmartWire-DT network to the Modbus-TCP fieldbus' protocol options

3.6.4.1 Creating a SmartWire-DT network with the SWD-Assist planning program

In order to create a SmartWire-DT network for a Modbus-TCP fieldbus using the SWD-Assist planning program, you will have to follow the steps below:

1. Select the Modbus-TCP protocol
2. Select and configure the parameters of the gateway and the SmartWire-DT stations
3. Define the device names for the gateway and the stations
4. Export the corresponding I/O data

The steps required in order to configure and set the parameters for the SmartWire-DT network, as well as to select a fieldbus protocol, have already been described (→ Section “3.6.2.1 Configuring the SmartWire-DT network”).

Please make sure that “Modbus-TCP” is selected as the network protocol. The default protocol is “EtherNet/IP.”

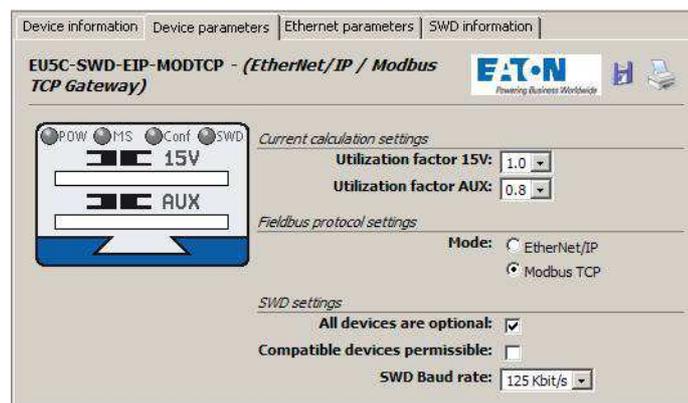


Figure 67: Selecting the Modbus-TCP protocol

As with other fieldbus connections, you can assign individual names for the gateway and for the SmartWire-DT stations in order to uniquely identify the stations. These names will be used when generating export data. This information is entered for the SmartWire-DT gateway and the SmartWire-DT stations under the **Device Information** tab.

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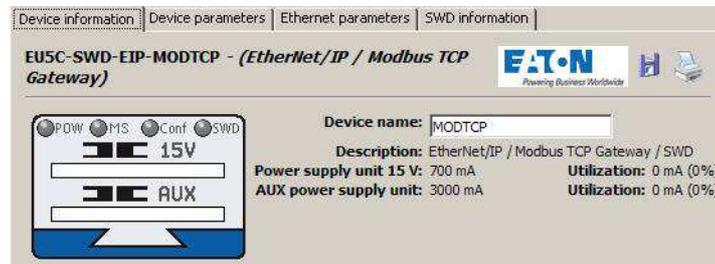


Figure 68: Assigning a device name



The device name must be unique, i.e., it must be different from all other device names. The maximum permitted length is 24 characters. The name can contain letters (but not umlauts), numbers, and underscores (_).

Exporting the I/O data

The SmartWire-DT I/O data is mapped to 16-bit Modbus registers. For more detailed information, please see → Section “3.6.4.4 General information regarding the Modbus-TCP protocol”.

In order to make it easier to identify the I/O data in the programming system for the Modbus-TCP controller being used, the SWD-Assist planning program generates an export file with all I/O data for the corresponding Modbus-TCP information. This information is saved as a table in a TXT file and can be processed further either directly or in a spreadsheet program (e.g., Microsoft Excel).

| Name | Register | Bit position | Bit number | Data type | Description |
|---------------------|----------|--------------|------------|--------------|--------------------------------|
| MODSWD_PKE1_I_C | 0 | 8 | 1 | BIT | Contactor state |
| MODSWD_PKE1_I_STAT | 0 | 9 | 1 | BIT | PKE status |
| MODSWD_PKE1_I_A1 | 0 | 10 | 1 | BIT | Contactor state Manual On/Off |
| MODSWD_PKE1_I_A2 | 0 | 11 | 1 | BIT | Contactor state Manual/Auto |
| MODSWD_PKE1_I_DIAG | 0 | 12 | 1 | BIT | Group diagnostics |
| MODSWD_PKE1_I_PRSNT | 0 | 14 | 1 | BIT | Module present |
| MODSWD_PKE1_I_SUBST | 0 | 15 | 1 | BIT | Universal module |
| MODSWD_PKE1_I_lr | 0 | 0 | 4 | BYTE (4 Bit) | Set value lr |
| MODSWD_PKE1_I_TRIPR | 0 | 4 | 3 | BYTE (3 Bit) | Cause of trip |
| MODSWD_PKE1_I_ACKR | 0 | 7 | 1 | BIT | Acknowledge ZMR manual require |
| MODSWD_PKE1_I_REL | 1 | 8 | 8 | BYTE | Motor current [%] |
| MODSWD_PKE1_I_TH | 1 | 0 | 8 | BYTE | Thermal motor image [%] |
| MODSWD_PKE1_O_Q0 | 2048 | 8 | 1 | BIT | Contactor actuation |
| MODSWD_PKE1_O_ZMR | 2048 | 10 | 1 | BIT | ZMR On/Off |

Figure 69: I/O data for Modbus-TCP

The following information is included:

- The symbolic name (“Name” column), made up of:
 - The gateway's device name (“ModTCP” in this example)
 - The station's device name; “PKE1” for the SmartWire-DT-PKE connection in this example
 - A code used to indicate whether the address is for an input (I) or an output (O)
 - An individual code for the specific I/O data, e.g., “C” for the feedback signal for the contactor position
 - The name of the input/output

- The address of the Modbus register
- The bit position within the word and the bit length of the specific input/output data
- The specific input/output data's data type
- A description of the specific input/output data



The "Export Configuration" function can be found in the **Project** menu in the SWD-Assist planning program.



You can change the device names for the gateway and the SmartWire-DT stations at any time. The input/output addresses and symbolic names will be updated immediately.

If this information is used in order to generate input/output variables, the various definition access methods of the programming system being used must be taken into account.

3.6.4.2 Using the gateway with ELC/Modicon controllers

Depending on the controller system being used, it is possible that the system will not be able to process all the data with one single Modbus request. If this is the case, please use multiple read/write requests in order to make sure that all data is processed.

3.6.4.3 Using the gateway with Eaton controllers

Eaton controllers (XC20x) and HMI displays with PLC runtime functionality can be used as Modbus-TCP servers and clients. The library required for this purpose must be imported into the XSOFTE-CoDeSys-2 programming system's library manager. Please read application note AN2700K22, "Modbus TCP Master/Station for XControl Controllers."

This application note contains not only the corresponding documentation, but also the required library.



The application note can be downloaded on the Internet at:

ftp://ftp.moeller.net/AUTOMATION/APPLICATION_NOTES/Index.html

3.6.4.4 General information regarding the Modbus-TCP protocol

Introduction

The Modbus-TCP communication system is based on the TCP/IP protocol being used. All data and parameters are entered into the TCP/IP frame's useful information data range. This data is integrated into a special MBAP (Modbus Application Header) frame that ensures that the data will be interpreted unambiguously. Special function codes are used to access the data (function codes 1 - 255).

Communications between Modbus stations are based on the client/server principle. The client (the PLC, for example) uses function codes and, if applicable, data that needs to be transmitted in order to transmit a request to the server (gateway EU5C-SWD-EIP-MODTCP in this case). The server responds to the request and returns, if applicable, the requested data to the client. If an error occurs during the communication request (e.g., because a request is not permitted), the client will receive an error message.

Data model and Modbus registers

In principle, Modbus differentiates between bit data and word data. Each of these is further subdivided into two available types:

| Data object | Data type | Access | maximum number |
|-------------|-----------|--------------|----------------|
| Bit input | Bit | Read | 65536 |
| Bit output | Bit | Read / Write | 65536 |
| | Word | Read | 65536 |
| | Word | Read / Write | 65536 |

These data structures are provided from the Modbus server side. The scope of the data access functions and the maximum number of data objects are both independent of the specific implementation being used.



The EU5C-SWD-EIP-MODTCP gateway only supports access to input and output registers.

More specifically, it supports the following functions:

| Function code | Function | Description |
|---------------|-------------------------------|--|
| 3 | Read Holding Registers | Used to read word output information |
| 4 | Read Input Registers | Used to read word input registers |
| 6 | Write Single Register | Used to write to a single word output register |
| 16 | Write Multiple Registers | Used to write to multiple word output registers |
| 23 | Read/Write Multiple Registers | Used to read from and write to multiple word registers |

The input and output register space makes it possible to access the gateway's data in a structured manner. Table 19 below lists the available registers, together with their contents and address spaces. A detailed description of the registers is provided afterwards.

Table 19: Overview of Modbus registers

| MODBUS register | Read/Write | Content | Reference to relevant section |
|---|------------|--|--|
| SmartWire-DT input/output data | | | |
| 0x0000 - 0x03FF | R | Input data (inputs and status) | → Section " SmartWire-DT input/output data", page 132 |
| 0x0800 - 0x0BFF | R/W | cyclical output data | |
| 0x1012 | R | Bit-length of the digital outputs | |
| 0x1013 | R | Bit-length of the digital inputs | |
| 0x1017 | R | Version of "mappings" register | |
| Information about the gateway (device) | | | |
| 0x1000 - 0x100B | | Name of the gateway | → Section " Device information", page 133 |
| 0x100C | | Status of the gateway | |
| Time monitoring | | | |
| 0x1020 | | Active time monitoring (in milliseconds) | → Section " Time monitoring and Modbus-TCP operating mode", page 134 |
| 0x1120 | | Defined time monitoring (in milliseconds) | |
| 0x1121 | | Time monitoring | |
| 0x1130 | | Operating mode | |
| 0x1131 | | Time monitoring | |
| 0x113C - 0x113D | | Used to restore the Modbus connection parameters | |
| 0x113E - 0x113F | | Used to save the Modbus connection parameters | |
| Acyclic SmartWire-DT data | | | |
| 0x8000 - 0x807F | | Request space for acyclic service objects | → Section " Acyclical data communication", page 136 |
| 0x8080 - 0x80FF | | Results space for acyclic service objects | |

In the case of Modbus, there are multiple addressing modes that can be used to access the data in the PLC. Table 20 below lists them, together with their limits, for the EU5C-SWD-EIP-MODTCP gateway. Their use depends on the selected PLC and the corresponding programming system. All references in this documentation are specified as hexadecimal values.

3 EU5C-SWD-EIP-MODTCP

3.6 Programming

Table 20: Addressing modes for Modbus

| hexadecimal | decimal | 5 digit | Modicon | Description |
|-----------------|-------------|---------------|-----------------|--|
| 0x0000 - 0x03FF | 0 - 1023 | 40001 - 41024 | 400001 - 401024 | Input data |
| 0x0800 - 0x0BFF | 2048 - 3071 | 42048 - 43072 | 402048 - 403072 | Output data |
| 0x1000 - 0x1006 | 4096 - 4102 | 44097 - 44103 | 404097 - 404103 | Name of the gateway |
| 0x100C | 4106 | 44107 | 404107 | Status of the gateway |
| 0x1012 | 4114 | 44115 | 404115 | Bit-length of the digital outputs |
| 0x1013 | 4115 | 44116 | 404116 | Bit-length of the digital inputs |
| 0x1017 | 4119 | 44120 | 404120 | Version of register mapping |
| 0x1020 | 4128 | 44129 | 404129 | active monitoring time (in milliseconds) |
| 0x1120 | 4384 | 44385 | 404385 | Defined monitoring time (in milliseconds) |
| 0x1121 | 4385 | 44386 | 404386 | Modbus connection monitoring (in seconds) |
| 0x1130 | 4400 | 44401 | 404401 | "Modbus connection" operating mode |
| 0x1131 | 4401 | 44402 | 404402 | Used to save Modbus parameters |
| 0x113C - 0x113D | 4412 - 4413 | 44413 - 44414 | 404413 - 404414 | Used to restore the Modbus connection parameters |
| 0x113E - 0x113F | 4414 - 4415 | 44415 - 44416 | 404415 - 404416 | Used to save the Modbus connection parameters |
| 0x0000 - 0x03FF | 0 - 1023 | 40001 - 41024 | 400001 - 401024 | Request space for acyclic service objects |
| 0x0800 - 0x0BFF | 2048 - 3071 | 42048 - 43072 | 402048 - 403072 | Results space for acyclic service objects |

SmartWire-DT input/output data

Registers 0x1012 and 0x1013 contain the length of the SmartWire-DT stations' input/output data. This length is defined in bits. Padding bytes are included. The gateway mapping version is provided via access to register 0x1017.

| MODBUS register | R/W | Data type | Value | Description |
|-----------------|-----|-----------|----------|--|
| 0x1012 | R | WORD | 0 - 5136 | Bit-length of the digital outputs |
| 0x1013 | R | WORD | 0 - 6400 | Bit-length of the digital inputs |
| 0x1017 | R | WORD | 1 | Version of "mappings" register |
| 0x0000 - 0x03FF | R | WORD | 0 - FFFF | Register space for reading the process inputs |
| 0x0800 - 0x0BFF | R/W | WORD | 0 - FFFF | Register space for reading from and writing to process outputs |

The SmartWire-DT stations' data is transferred to the Modbus registers for cyclic input/output data after the byte data. The volume and description of the input/output data depend on the specific characteristics of the SmartWire-DT stations being used. These characteristics are described in the "SmartWire-DT Stations" manual (MN05006001Z-EN).

The input data consists of status information concerning the station (e.g., status information indicating whether the data is valid), as well as other information (connector state in the case of M22 control devices, analog values, etc.) regarding the station. The SmartWire-DT stations' data (byte or word format) is allocated to Modbus registers in the SWD-Assist planning program. Based on the existing inputs/outputs, the Modbus registers will be filled with the corresponding data there. Normally, the stations' data is allocated continuously to the (word) registers. When there are byte variables, the first byte is stored in the (word) Modbus register's high byte, while the second byte is stored in the low byte.

If input data of byte type is followed by additional input data of WORD type, an additional padding byte will be inserted in certain cases in order to store word variables completely in the Modbus register.

The following rules apply:

If the first status byte is followed by input data of type WORD (16-bit value), an additional byte will be inserted before the status byte so that the word input data can be stored in a Modbus register.

Example

Input data: 1 status byte and 1 input word

| MODBUS register | High byte | Low byte |
|-----------------|--------------|-------------|
| n | Padding byte | Status byte |
| n+1 | Input word | |

A similar rule applies to output data. If a station's data storage area ends in a high byte (odd number of data bytes), a padding byte will be inserted in this case as well so that the word data of the following station will start in a new Modbus register.

Take the information in the SWD-Assist planning program into account. The information used to assign addresses to data is found in the export file.

Device information

The Modbus registers below can be used to determine the gateway's name and device status.

Register 0x1000 - 0x100B: „Gateway name“

This register holds the gateway's name.

| MODBUS register | R/W | Data type | Value | Description |
|-----------------|-----|-----------|--------------|---------------------|
| 0x1000 - 0x100B | R | STRING | EU5C-SWD-EIP | Name of the gateway |

Register 0x100C: “Gateway-Status”

This register holds information regarding the SmartWire-DT gateway's device status.

| Modbus register | R/W | Data type | Value | Description |
|-----------------|-----|-----------|--------|---|
| 0x100C | R | WORD | | Gateway status |
| | | | 0x0000 | No error |
| | | | 0x0001 | FAILSAFE: no SmartWire-DT communication |
| | | | 0x0002 | no project configuration present |
| | | | 0x0004 | no target configuration present |
| | | | 0x0040 | Renew Target Configuration |
| | | | 0x007F | SmartWire-DT initialization |
| | | | 0x0080 | Wiring test active |
| | | | 0x0081 | Error when comparing the target configuration and the actual configuration |
| | | | 0x0082 | Error when comparing the target configuration and the project configuration |

Time monitoring and Modbus-TCP operating mode

The following registers affect important Modbus-TCP communication behaviors, such as the response when a communications connection is lost, the operating mode of the Modbus connection, and saving these parameters as new default parameters for the gateway.

| Modbus register | R/W | Data type | Value | Description |
|--------------------|-----|-----------|--|---|
| 0x1020 | R | WORD | 0 - FFFF | Active time monitoring time (in milliseconds) |
| 0x1120 | R/W | WORD | 0 - FFFF Default setting: 3000 (= 3 seconds) | Defined monitoring time for Modbus communications (in milliseconds) 0 = No time monitoring |
| 0x1121 | R/W | WORD | 0 - FFFF | Time monitoring for the “Reset” register |
| 0x1130 | R/W | WORD | | “Modbus connection” operating mode |
| 0x1131 | R/W | WORD | 0 - FFFF Default setting: 0 | Time monitoring for Modbus connection (in seconds) 0 = No time monitoring |
| 0x113C - 0x113D | R/W | WORD | | Used to restore the Modbus parameters |
| 0x113E - 0x113F | R/W | WORD | | Used to save Modbus parameters |

Registers 0x1020, 0x1120, 0x1121: “Time monitoring”

These registers are used to define the behavior of the SmartWire-DT stations’ outputs when communications are lost on the Modbus connection. Register 0x1120 can be used to specify a time, in milliseconds, after which the outputs will be switched off if any of the following conditions are met:

- The controller switches from “Run” to “Stop”
- The Ethernet cable that is connected to the gateway is disconnected
- No Modbus-TCP communications between the PLC and the gateway

The setpoint value is 3000 (3000 milliseconds = 3 s). This means that the outputs will be switched off after 3 seconds in any of the above situations. If the PLC and the gateway are communicating exclusively via the user program (e.g., with the application library in the case of XControl controllers), this can lead to undesirable situations. The following scenarios must be taken into account in this case:

- Addressing between the PLC and the gateway is not cyclic, but sporadic instead (time > 3 s)
- Single-step operation during testing and commissioning

In these cases, change the value as required.

**DANGER**

Setting the timeout value in register 1120 to a value of “0” can result in dangerous situations, since set outputs will remain on even if there are no communications between the PLC and the gateway.

If time monitoring has been configured, the active time monitoring status can be read from register 0x1020. The time monitoring time is reset every time a Modbus-TCP frame is transmitted.

If there are no cyclic data transfers that will automatically reset the time monitoring time, the monitoring time can also be reset with write access to register 0x112. This can also be done with every other Modbus-TCP frame.

Registers 0x113C, 0x113D: “Restore Modbus-TCP connection parameters”

Registers 0x113C and 0x113D are used to restore the parameters in register 0x1120 to their setpoint values. To do this, a value of “0x6C6F” is first written to register 0x113C. In order to enable the reset, a value of “0x6164” (“LOAD”) is then written to register 0x113D. This must be done within 30 seconds of writing to register 0x113C.

It is also possible to write to both registers with a single operation by using function codes FC16 and FC23. The parameters will be enabled, but will not be saved in a non-volatile manner yet. To save them in a non-volatile manner, it is necessary to use the “Save Modbus-TCP connection parameters” service.

**Registers 0x113E, 0x113F:
“Save Modbus-TCP connection parameters”**

Registers 0x113E and 0x113F are used to store the Modbus-TCP connection parameters held in register 0x1120 in a non-volatile manner. To do this, a value of “0x7361” is first written to register 0x113E. However, the data is not actually stored until command “0x7665” (“SAVE”) is written to register 0x113F. This must be done within 30 seconds of writing to register 0x113E. It is also possible to write to both registers with a single operation by using function codes FC16 and FC23

Acyclical data communication

In addition to cyclic data, acyclic information can also be exchanged between a Modbus-TCP master and a SmartWire-DT station. There are specific Modbus registers and services for assigning requests and for receiving the requested data for this purpose.

| MODBUS register | Description |
|-----------------|------------------------------|
| 0x800C - 0x807F | Registers for request space |
| 0x8080 - 0x80FF | Registers for response space |

When acyclic services are used, the data is stored in these Modbus registers. The Modbus client will then wait until the request has been processed. This is indicated by means of a request acknowledgment. Once this acknowledgment is received, the response can be read. If acyclic communication requests for various stations are being processed at the same time, the PLC will manage them. The following table describes the detailed structure of these register spaces.

**Registers 8000h - 807Fh:
“Acyclic service objects, request space”**

| MODBUS register | Name | Data type | Value | Description |
|--------------------|---------------------|-----------|------------|--|
| 0x8000 | SERVICE NUMBER | UINT | 0 - 0xFFFF | This register holds a user-specific value that is deleted after the service is run. The value is copied to the SERVICE NUMBER register in the response space after the service is run. |
| 0x8001 | | | | |
| 0x8002 (Low Byte) | INDEX | USINT | 0 -0xFF | The INDEX entry is used to specify the application object. Application objects are described in the “SmartWire-DT Stations” manual (MN05006001Z-EN). |
| 0x8002 (High Byte) | SERVICE CODE | USINT | 0 - 255 | The SERVICE CODE entry is used to specify the type of access: 0x00: NO FUNCTION 0x03: READ 0x10:WRITE |
| 0x8003 (Low Byte) | DESTINATION ADDRESS | USINT | 0 - 99 | Address of the SmartWire-DT station |

| MODBUS register | Name | Data type | Value | Description |
|--------------------|-------------------------------------|-----------|------------|--------------------------------------|
| 0x8003 (High Byte) | SLOT | USINT | 0 | 0 (not a modular Modbus station) |
| 0x8004 | LENGTH | USINT | 0 - 120 | Length of data to be read or written |
| 0x8005 - 0x807F | OPTIONAL DATA (Register 0 - 122) | UINT | 0 - 0xFFFF | Object-specific data or error codes |

Registers 0x8080 - 0x80FF: “Acyclic service objects, response space”

Once an acyclic communication request has been transmitted, the SERVICE NUMBER, INDEX, SERVICE CODE, DESTINATION ADDRESS, and SLOT information will be copied to the response space.

The SERVICE NUMBER parameter is used for a simple handshake in the PLC program. The request is in progress until the SERVICE NUMBER in the response space matches the SERVICE NUMBER in the request space.

| MODBUS register | Name | Data type | Value | Description |
|--------------------|-------------------------------------|-----------|------------|--|
| 0x8080 | SERVICE NUMBER | UINT | 0 - 0xFFFF | This register holds a user-specific value that is deleted after the service is run. The value is copied to the SERVICE NUMBER register in the response space after the service is run. |
| 0x8081 | RESULT | UINT | 0 - 0xFFFF | Result of request: 0x0000: ERROR FREE EXECUTION 0xFFFF: SERVICE PARAMETERS INCORRECT 0xFFFF: SERVICE CODE UNKNOWN |
| 0x8082 (Low Byte) | INDEX | USINT | 0 - 0xFF | Used to specify the application object. |
| 0x8082 (High Byte) | SERVICE CODE | USINT | 0 - 255 | Used to specify the type of access: 0x00: NO FUNCTION 0x03: READ 0x10: WRITE |
| 0x8083 (Low Byte) | DESTINATION ADDRESS | USINT | 0 - 99 | Address of the SmartWire-DT station |
| 0x8083 (High Byte) | SLOT | USINT | 0 | 0 (not a modular Modbus station) |
| 0x8084 | LENGTH | USINT | 0 - 120 | Length of the data provided |
| 0x8085 - 0x80FF | OPTIONAL DATA (Register 0 - 122) | UINT | 0 - 0xFFFF | Requested data |

Registers 0x1300 - 0x137F: “Status of SmartWire-DT stations”

| MODBUS register | R/W | Data type | Value | Description |
|-----------------|-----|-----------|---------|---|
| 0x1300 - 0x137F | R | USINT | 0 - 0xF | The SmartWire-DT stations' status byte (0 - 99) |

The status data provides information regarding the SmartWire-DT stations' status. It is found in bits 4 to 7 of the first input byte of the cyclic data of each SmartWire-DT station:

Table 21: SmartWire-DT station status

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------------|-------|---|------|---|---|---|---|
| Diagnostics data | | | | | | | |
| SUBST | PRSNT | – | DIAG | – | – | – | – |

| Bit | Name | Description |
|-----|-------|---|
| 4 | DIAG | 0: There are currently no diagnostic messages from the station. 1: There is at least one diagnostic message. The exact cause of the diagnostic message can be read by using acyclic services. The “SmartWire-DT Stations” manual (MN05006001Z-EN) describes the various possible diagnostic alarms for each SmartWire-DT station. |
| 6 | PRSNT | 0: Communications cannot be established between the gateway (SmartWire-DT master) and the SmartWire-DT station. All input data has a value of 0. 1: The SmartWire-DT station is present and is exchanging data with the gateway (SmartWire-DT master). |
| 7 | SUBST | 0: The planned SmartWire-DT station is present 1: An M22-NOP(C) universal module is present instead of the planned SmartWire-DT station |

4 Appendix

4.1 Compatibility

The coupling unit stores the data of the devices actually connected when the configuration button is pressed (= stored gateway target configuration).

Each time the gateway starts there is a check whether this configuration has been changed. If this is the case, the data exchange between gateway and SmartWire-DT stations is not started. (In this comparison, the missing stations are not included, what is important is whether the found stations are identical.)

A project configuration is specified via the programming system by selecting the SmartWire-DT station (= planned target configuration). This is downloaded automatically to the gateway by the Eaton programming system during transfer of the program to the controller.



Information relating to the gateway EU5C-SWD-CAN

Download of the configuration is an extended utility that is not available in standard CANopen configurators. For this purpose CoDeSys offers you the option "Create SDO for module list" in the controller configuration of the CAN gateway in the Module selection tab.

If a "Planned configuration" cannot be downloaded to the gateway, the configuration comparison has to be switched off (the parameter "Disable configuration check" in the Service data objects tab must have the value 1). A configuration comparison and a resultant application of the compatibility list is therefore not possible. The user himself must check whether the configuration agrees.

4 Appendix

4.1 Compatibility

4.1.1 The planned configuration is available

Before assumption of the data communication between the coupling unit and the field bus master the consistency between the planned configuration and the stored gateway configuration is checked. If the parameter "Compatible devices allowed" is set to 0, a defective SmartWire-DT station can only be replaced by a station of the same type. However, if the parameter is set to 1, deviations are allowed. The application background to this is the facilitated replacement of defective SmartWire-DT stations by available, function-compatible, but not identical, types. For example, a green LED element with a switching function is accepted instead of a green LED element, because the more complex element also has the function "green LED".

For the comparison the SmartWire-DT stations are subdivided into various families and function classes. Stations that are compatible with each other must always belong to the same family. The replacement of an SmartWire-DT station for contactor switch-on (DIL-SWD...) is therefore fundamentally not accepted in place of a luminous pushbutton (M22-SWD-K22-LED...), although both would be compatible in terms of data mapping (one input byte, one output byte each).

You can find permissible SmartWire-DT stations and their replacement types in the following Table 22.

Tabelle 22: List of types that are compatible with one another

| Type | Description | permissible replacement type 1 | permissible replacement type 2 |
|--|--|--------------------------------|--------------------------------|
| RMQ function elements (front mount) | | | |
| 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 | | |

| Type | Description | permissible replacement type 1 | permissible replacement type 2 |
|--|--|--------------------------------|--------------------------------|
| RMQ function elements (base fixing) | | | |
| 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 | | |
| DILM/MSD function elements | | | |
| DIL-SWD-32-001 | DIL/MSD | DIL-SWD-32-002 | |
| DIL-SWD-32-002 | DIL/MSD, Manual/Auto | | |
| PKE-SWD-32 | | | |
| I/O function elements | | | |
| 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 | | |

4 Appendix

4.2 Meaning of the LED indicators

4.2 Meaning of the LED indicators

| 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 are permanently orange, the gateway is in Firmware Update mode. This mode can be deactivated by switching on the power supply again. | Off |

4.2.1 EU5C-SWD-DP-Gateway – field bus status LED “DP”

| Description | Status LED | Data exchange coupling unit to PLC |
|--|---|------------------------------------|
| Cyclic data communication runs on the PROFIBUS. The planned configuration complies with the gateway target configuration. | Green continuous light | Yes |
| The planned configuration does not comply with the gateway target configuration, but is compatible with it. | Flashing (green) | Yes |
| No communication takes place on the PROFIBUS. No DP master is detected (for example, on account of a wrong station address). | Off | no |
| Extended DP diagnostics: The input data from SmartWire-DT stations is invalid or the necessary stations 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 power supply again. The firmware update mode can be left by switching on the power supply again. | Changes from continuous light orange to red | no |

4.2.2 EU5C-SWD-CAN-Gateway – field bus status LED “CAN”

| Description | Status LED | Data exchange coupling unit to PLC |
|--|---|------------------------------------|
| CAN interface inactive. | Off | no |
| Baud rate detection active on the CAN bus | Red strobe light | no |
| CAN baud rate detected ,waiting for a valid target configuration | orange | no |
| Communication error on the CAN bus. (error warning level reached.) | Red flashing | Yes |
| Monitoring error (node guarding/heartbeat) | Red asynchronous flashing | only SDO |
| Communication error on the CAN bus. (bus Off.) | Red | no |
| Pre-operational initialization mode: communication only possible via SDOs. | Green flashing | only SDO |
| Stopped - no data exchange | Green asynchronous flashing | no |
| Operational - data exchange is possible via PDOs and SDOs | green | Yes |
| The gateway is in firmware update mode when the POW LED is off. The firmware mode can be left by switching on the power supply again. The firmware update mode can be left by switching on the power supply again. | Changes from continuous light orange to red | no |

4.2.3 EU5C-SWD-EIP-MODTCP-Gateway – field bus status LED “MS”

| Description | Status LED | Data exchange coupling unit to PLC |
|--|------------------------|------------------------------------|
| No power supply | Off | no |
| The gateway has a valid network configuration and it is ready for the establishment of an Ethernet/IP- or Modbus-TCP connection | Green flashing | no |
| Cyclic data exchange via Ethernet/IP or Modbus-TCP active. | Green continuous light | Yes |
| The gateway is reporting a communication error. An example of this is when the original connection for the cyclic exchange of data has not been terminated correctly and a timeout has occurred. | Red continuous light | no |
| The gateway is waiting for a network address to be assigned via DHCP or BOOT. As soon as the gateway is assigned an address, the LED will flash with a green light. | Red flashing | no |

4 Appendix

4.2 Meaning of the LED indicators

4.2.4 SmartWire-DT configurations LED

| Description | SmartWire-DT configurations LED | Data exchange coupling unit via field bus to PLC |
|---|--------------------------------------|--|
| The planned configuration complies with the gateway target configuration. | Green continuous light | Yes |
| The planned configuration does not comply with the gateway target configuration, but is compatible with it. (list of the devices that are compatible with one another Table 22, page 140) | Flashing (green) | Yes |
| The planned configuration and the gateway target configuration are not compatible. | Red continuous light | no |
| The gateway is in firmware update mode when the POW LED is off. The firmware mode can be left by switching on the power supply again. Firmware mode can be closed by switching on the power supply voltage. | Changes from permanent orange to red | no |

4.2.5 Status SmartWire-DT LED

| Description | Status SmartWire-DT LED | Data interchange between the gateway and SmartWire-DT stations |
|--|--------------------------------------|--|
| The current actual configuration complies with the gateway target configuration. | Green continuous light | Yes |
| A necessary SmartWire-DT station is missing or the coupling unit target configuration does not comply with the actual configuration. | Flashing (red) | no |
| Station addressing is active (after power On or the download of a planned configuration with empty modules). | Flashing (green) | no |
| Short-circuit on the 15 V power supply or no SmartWire-DT station is connected | Red continuous light | no |
| The gateway is in firmware update mode when the POW LED is off. The firmware mode can be left by switching on the power supply again. The firmware update mode can be left by switching on the power supply again. | Changes from permanent orange to red | no |

4.3 Version table EU5C-SWD-DP

| | operating system: V1.00 ¹⁾ Hardware: 01 GSD file: Motorola format (e.g. Siemens STEP7) Moel4d13.gsx Intel-format: (e.g. Moeller): Moe4d13.gsd | operating system: V1.10 ²⁾ Hardware: 01 GSD file: Motorola format (e.g. Siemens STEP7) Moel4d14.gsx Intel-format: (e.g. Moeller): Moe4d14.gsd | operating system: V1.20 ^{2),3)} Hardware: 01 GSD file: Motorola format (e.g. Siemens STEP7) Moel4d13.gsx Intel-format: (e.g. Moeller): Moe4d13.gsd |
|----------------------------|---|---|--|
| SmartWire-DT module | | | |
| I/O modules | | | |
| EU5E-SWD-8DX | X | X | X |
| EU5E-SWD-4D4D | X | X | X |
| EU5E-SWD-4D2R | X | X | X |
| EU5E-SWD-4DX | | | X |
| EU5E-SWD-X8D | | | X |
| EU5E-SWD-4AX | | | X |
| EU5E-SWD-2A2A | | | X |
| EU5E-SWD-4PT | | | X |
| DIL-/PKE-modules | | | |
| DIL-SWD-32-001 | X | X | X |
| DIL-SWD-32-001 | X | X | X |
| PKE-SWD | | | X |
| PKE-SWD-32 | | X | X |
| circuit-breakers | | | |
| NZM-XSWD-704 | | X | X |
| RMQ-modules | | | |
| M22-SWD-K11 | X | X | X |
| M22-SWD-K11LED-B | X | X | X |
| M22-SWD-K11LEDC-B | X | X | X |
| M22-SWD-K11LEDC-G | X | X | X |
| M22-SWD-K11LEDC-R | X | X | X |
| M22-SWD-K11LEDC-W | X | X | X |
| M22-SWD-K11LED-G | X | X | X |
| M22-SWD-K11LED-R | X | X | X |
| M22-SWD-K11LED-W | X | X | X |
| M22-SWD-K22 | X | X | X |
| M22-SWD-K22LED-B | X | X | X |
| M22-SWD-K22LEDC-B | X | X | X |
| M22-SWD-K22LEDC-G | X | X | X |
| M22-SWD-K22LEDC-R | X | X | X |
| M22-SWD-K22LEDC-W | X | X | X |

4 Appendix

4.3 Version table EU5C-SWD-DP

| | operating system: V1.00¹⁾ Hardware: 01 GSD file: Motorola format (e.g. Siemens STEP7) Moel4d13.gsx Intel-format: (e.g. Moeller): Moe4d13.gsd | operating system: V1.10²⁾ Hardware: 01 GSD file: Motorola format (e.g. Siemens STEP7) Moel4d14.gsx Intel-format: (e.g. Moeller): Moe4d14.gsd | operating system: V1.20^{2),3)} Hardware: 01 GSD file: Motorola format (e.g. Siemens STEP7) Moel4d13.gsx Intel-format: (e.g. Moeller): Moe4d13.gsd |
|-------------------------|--|--|---|
| M22-SWD-K22LED-G | X | X | X |
| M22-SWD-K22LED-R | X | X | X |
| M22-SWD-K22LED-W | X | X | X |
| M22-SWD-KC11 | X | X | X |
| M22-SWD-KC22 | X | X | X |
| M22-SWD-LED-B | X | X | X |
| M22-SWD-LEDC-B | X | X | X |
| M22-SWD-LEDC-G | X | X | X |
| M22-SWD-LEDC-R | X | X | X |
| M22-SWD-LEDC-W | X | X | X |
| M22-SWD-LED-G | X | X | X |
| M22-SWD-LED-R | X | X | X |
| M22-SWD-LED-W | X | X | X |
| Universal module | | | |
| M22-SWD-NOP | | | X |
| M22-SWD-NOPC | | | X |

1) Firmware version 1.0 can only be used together with GSD files moel4d13.gs* and moe4d13.gsd.

2) Firmware versions 1.10, 1.20 can only be used with versions moel4d14.gs* and moe4d14.gsd.

3) When using new modules, make sure to use the latest GSD file version. You can download the latest version on the Internet.

The version of the operating system of the gateway and the GSD file used must be identical. Downward Compatibility is not guaranteed. The identity is checked by the gateway when the configuration is loaded.



To update the operating system, choose the Update operating system in the SWD-Assist (version from 1.10) in the **Help** menu.

The necessary operating systems can be downloaded from the Internet or are provided on your PC in the folder:

Program Files\Common Files\Eaton\SWD-FW.

You can find GSD files on our web site as follows:

<http://www.eaton.com/moeller> → **Support**

4.4 Version table for EU5C-SWD-CAN

| EU5C-SWD-CAN | Operating system: V1.00 Hardware: 01 EDS file: EU5C-SWD-CAN.eds | Operating system: V1.10 ¹⁾ Hardware 01 EDS file: EU5C-SWD- CAN_V110.eds | Operating system: V1.20 ²⁾ Hardware 01 EDS file: EU5C-SWD- CAN_V120.eds |
|----------------------------|--|---|---|
| SmartWire-DT module | | | |
| I/O modules | | | |
| EU5E-SWD-8DX | X | X | X |
| EU5E-SWD-4D4D | X | X | X |
| EU5E-SWD-4D2R | X | X | X |
| EU5E-SWD-4DX | | | X |
| EU5E-SWD-X8D | | | X |
| EU5E-SWD-4AX | | | X |
| EU5E-SWD-2A2A | | | X |
| EU5E-SWD-4PT | | | X |
| DIL-/PKE-modules | | | |
| DIL-SWD-32-001 | X | X | X |
| DIL-SWD-32-001 | X | X | X |
| PKE-SWD | | | X |
| PKE-SWD-32 | | X | X |
| circuit-breakers | | | |
| NZM-XSWD-704 | | X | X |
| RMQ-modules | | | |
| M22-SWD-K11 | X | X | X |
| M22-SWD-K11LED-B | X | X | X |
| M22-SWD-K11LEDC-B | X | X | X |
| M22-SWD-K11LEDC-G | X | X | X |
| M22-SWD-K11LEDC-R | X | X | X |
| M22-SWD-K11LEDC-W | X | X | X |
| M22-SWD-K11LED-G | X | X | X |
| M22-SWD-K11LED-R | X | X | X |
| M22-SWD-K11LED-W | X | X | X |
| M22-SWD-K22 | X | X | X |
| M22-SWD-K22LED-B | X | X | X |
| M22-SWD-K22LEDC-B | X | X | X |
| M22-SWD-K22LEDC-G | X | X | X |
| M22-SWD-K22LEDC-R | X | X | X |
| M22-SWD-K22LEDC-W | X | X | X |
| M22-SWD-K22LED-G | X | X | X |
| M22-SWD-K22LED-R | X | X | X |
| M22-SWD-K22LED-W | X | X | X |

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4.4 Version table for EU5C-SWD-CAN

| EU5C-SWD-CAN | Operating system: V1.00 Hardware: 01 EDS file: EU5C-SWD-CAN.eds | Operating system: V1.10¹⁾ Hardware 01 EDS file: EU5C-SWD- CAN_V110.eds | Operating system: V1.20²⁾ Hardware 01 EDS file: EU5C-SWD- CAN_V120.eds |
|-------------------------|--|--|--|
| M22-SWD-KC11 | X | X | X |
| M22-SWD-KC22 | X | X | X |
| M22-SWD-LED-B | X | X | X |
| M22-SWD-LEDC-B | X | X | X |
| M22-SWD-LEDC-G | X | X | X |
| M22-SWD-LEDC-R | X | X | X |
| M22-SWD-LEDC-W | X | X | X |
| M22-SWD-LED-G | X | X | X |
| M22-SWD-LED-R | X | X | X |
| M22-SWD-LED-W | X | X | X |
| Universal module | | | |
| M22-SWD-NOP | | | X |
| M22-SWD-NOPC | | | X |

1) The operating system versions are backward compatible with earlier versions of the EDS file, provided no new stations are used.

2) When using new modules, make sure to use the latest EDS file version. You can download the latest version on the Internet.



If your gateway is using operating system V1.0 and you wish to use SmartWire-DT stations requiring operating system V1.0 (e.g. PKE-SWD-32), you can update the operating system of the gateway.

For this choose the Update operating system function in the **Help** menu of the SWD-Assist planning software (version from 1.10) .

The necessary operating systems can be downloaded from the Internet or are provided on your PC in the folder:

Program Files\Common Files\Eaton\SWD-FW.

You can find GSD files on our web site as follows:

<http://www.eaton.com/moeller> → **Support**

4.5 Version table EU5C-SWD-EIP-MODTCP

| EU5C-SWD-EIP-MODTCP | Operating system: V1.01 Hardware 01 |
|----------------------------|--|
| SmartWire-DT module | |
| I/O modules | |
| EU5E-SWD-8DX | X |
| EU5E-SWD-4D4D | X |
| EU5E-SWD-4D2R | X |
| EU5E-SWD-4DX | X |
| EU5E-SWD-X8D | X |
| EU5E-SWD-4AX | X |
| EU5E-SWD-2A2A | X |
| EU5E-SWD-4PT | X |
| DIL-/PKE-modules | |
| DIL-SWD-32-001 | X |
| DIL-SWD-32-001 | X |
| PKE-SWD | X |
| PKE-SWD-32 | X |
| circuit-breakers | |
| NZM-XSWD-704 | X |
| RMQ-modules | |
| M22-SWD-K11 | X |
| M22-SWD-K11LED-B | X |
| M22-SWD-K11LEDC-B | X |
| M22-SWD-K11LEDC-G | X |
| M22-SWD-K11LEDC-R | X |
| M22-SWD-K11LEDC-W | X |
| M22-SWD-K11LED-G | X |
| M22-SWD-K11LED-R | X |
| M22-SWD-K11LED-W | X |
| M22-SWD-K22 | X |
| M22-SWD-K22LED-B | X |
| M22-SWD-K22LEDC-B | X |
| M22-SWD-K22LEDC-G | X |
| M22-SWD-K22LEDC-R | X |
| M22-SWD-K22LEDC-W | X |
| M22-SWD-K22LED-G | X |
| M22-SWD-K22LED-R | X |
| M22-SWD-K22LED-W | X |

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4.5 Version table EU5C-SWD-EIP-MODTCP

| EU5C-SWD-EIP-MODTCP | Operating system: V1.01 Hardware 01 |
|----------------------------|--|
| M22-SWD-KC11 | X |
| M22-SWD-KC22 | X |
| M22-SWD-LED-B | X |
| M22-SWD-LEDC-B | X |
| M22-SWD-LEDC-G | X |
| M22-SWD-LEDC-R | X |
| M22-SWD-LEDC-W | X |
| M22-SWD-LED-G | X |
| M22-SWD-LED-R | X |
| M22-SWD-LED-W | X |
| Universal module | |
| M22-SWD-NOP | X |
| M22-SWD-NOPC | X |

4.6 Technical data

| | EU5C-SWD-DP | EU5C-SWD-CAN | EU5C-SWD-EIP-MODTCP |
|---|--------------------------------------|------------------|---------------------|
| General | | | |
| Standards | IEC/EN 61131-2, EN 50178 | | |
| Dimensions (W × H × D) | mm | 35 × 90 × 127 | |
| Weight | kg | 0.16 | 0.16 |
| Mounting | Top-hat rail IEC/EN 60715, 35 mm | | |
| Mounting position | vertical | | any |
| Ambient mechanical conditions | | | |
| Protection type (IEC/EN 60529, EN50178, VBG 4) | IP20 | IP20 | IP20 |
| Vibrations (IEC/EN 61131-2:2008) | | | |
| constant amplitude 3.5 mm | Hz | 5 - 8.4 | 5 - 8.4 |
| constant acceleration 1 g | Hz | 8.4 - 150 | 8.4 - 150 |
| Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms | Shocks | 9 | 9 |
| Drop to IEC/EN 60068-2-31 | Drop height | mm | 50 |
| Free fall, packaged (IEC/EN 60068-2-32) | m | 0.3 | 0.3 |
| Ambient climatic conditions | | | |
| Operating ambient temperature (IEC 60068-2) | °C | -25 - +55 | -25 - +55 |
| Condensation | prevent with suitable measures | | |
| Storage | °C | -40 - +70 | -40 - +70 |
| relative humidity, non-condensing (IEC/EN 60068-2-30) | % | 5 - 95 | 5 - 95 |
| Electromagnetic compatibility (EMC) | | | |
| Overvoltage category | II | II | II |
| Pollution degree | 2 | 2 | 2 |
| Electrostatic discharge (IEC/EN 61131-2:2008) | | | |
| Air discharge (Level 3) | kV | 8 | 8 |
| Contact discharge (Level 2) | kV | 4 | 4 |
| Electromagnetic fields (IEC/EN 61131-2:2008) | | | |
| 80 - 1000 MHz | V/m | 10 | 10 |
| 1.4 - 2 GHz | V/m | 3 | 3 |
| 2 - 2.7 GHz | V/m | 1 | 1 |
| Radio interference suppression (SmartWire-DT) | EN 55011 Class A | EN 55011 Class A | EN 55011 Class A |
| Burst (IEC/EN 61131-2:2008, Level 3) | | | |
| Supply cables | kV | 2 | 2 |
| Fieldbus cable | kV | 1 | 1 |
| SmartWire-DT cables | kV | 1 | 1 |
| Surge (IEC/EN 61131-2:2008, Level 1) | | | |
| Supply cables/Fieldbus cable | Supply cables 0.5 kV, bus cable 1 kV | | |
| Radiated RFI (IEC/EN 61131-2:2008, Level 3) | V | 10 | 10 |

4 Appendix

4.6 Technical data

| | | | EU5C-SWD-DP | EU5C-SWD-CAN | EU5C-SWD-EIP-MODTCP |
|---|------------------|---|--|--|--|
| Supply voltage U_{AUX} | | | | | |
| Rated operational voltage | V | | 24 DC -15 % +20 % | 24 DC -15 % +20 % | 24 DC -15 % +20 % |
| Input voltage residual ripple | % | | ≤ 5 | ≤ 5 | ≤ 5 |
| Protection against polarity reversal | | | Yes | Yes | Yes |
| Maximum current | I _{max} | A | 3 ¹⁾ | 3 ¹⁾ | CE: 3 ¹⁾ UL: 2 ¹⁾ |
| Short-circuit strength | | | no, external fuse CE: FAZ 3 ²⁾ UL: FAZ 2 ²⁾ | no, external fuse CE: FAZ 3 ²⁾ UL: FAZ 2 ²⁾ | no, external fuse CE: FAZ 3 ²⁾ UL: FAZ 2 ²⁾ |
| Heat dissipation | W | | Normally 1 | Normally 1 | Normally 1 |
| Potential isolation | | | no | no | no |
| Rated operating voltage of 24-V-DC stations | V | | typical U _{AUX} - 0.2 | typical U _{AUX} - 0.2 | typical U _{AUX} - 0.2 |
| Supply voltage U_{POW} | | | | | |
| Supply voltage | V | | 24 DC -15 % + 20 % | 24 DC -15 % + 20 % | 24 DC -15 % + 20 % |
| Input voltage residual ripple | % | | ≤ 5 | ≤ 5 | ≤ 5 |
| Protection against polarity reversal | | | Yes | Yes | Yes |
| Rated operational current | I | A | 0.7 | 0.7 | 0.7 |
| Overload proof | | | Yes | Yes | Yes |
| Inrush current and length | A | | 12.5 A/6 ms | 12.5 A/6 ms | 12.5 A/6 ms |
| Heat dissipation at 24 V DC | W | | 3.8 | 3.8 | 3.8 |
| Potential isolation between U _{POW} and 15 V SmartWire-DT supply voltage | | | no | no | no |
| Bridging voltage dips | ms | | 10 | 10 | 10 |
| Repeat rate | s | | 1 | 1 | 1 |
| Status display | LED | | Yes | Yes | Yes |
| SmartWire-DT supply voltage | | | | | |
| Rated operational voltage | U _e | V | 14.5 ±3 % | 14.5 ±3 % | 14.5 ±3 % |
| max. current | I _{max} | A | 0.7 ²⁾ | 0.7 ²⁾ | 0.7 ²⁾ |
| Short-circuit strength | | | Yes | Yes | Yes |
| Connection supply voltages | | | | | |
| Connection type | | | Push in terminals | | |
| solid | | | 0.2 - 1.5 (AWG 24 - 16) | | |
| flexible with ferrule | | | 0.25 - 1.5 | 0.25 - 1.5 | 0.25 - 1.5 |
| SmartWire-DT network | | | | | |
| Module type | | | SmartWire-DT master | | |
| Number of SmartWire-DT stations | | | 58 | 99 | 99 |
| Baud Rate | | | 125, 250 | 125, 250 | 125, 250 |
| Address setting | | | automatic | automatic | automatic |
| Status display | | | SmartWire-DT Master LED: green; Configurations LED: red | | |
| Connections | | | Plug, 8-pole | | |
| Plug connectors | | | Blade terminal SWD4-8MF2 | | |

| | | EU5C-SWD-DP | EU5C-SWD-CAN | EU5C-SWD-EIP-MODTCP |
|------------------------------|------|-------------------------------|--------------------------------|---|
| Field bus interface | | | | |
| Function | | PROFIBUS-DP module | CANopen module | CANopen module |
| Protocol | | PROFIBUS-DP V 1 | CANopen | Ethernet/IP or Modbus TCP |
| Input data, maximum | Byte | 240 | 128 | Ethernet/IP: 500 Modbus TCP: 800 |
| Output data, maximum | Byte | 240 | 128 | Ethernet/IP: 496 Modbus TCP: 642 |
| Baud Rate | MBit | up to 12 MB | to 1 MB | 10 / 100 |
| Baud rate detection | | | | automatic |
| Address setting | | automatic | automatic | automatic |
| Module address | | 2 - 125 | 2 - 32 | |
| Address setting | | DIP switches | DIP switches | Dip switch/DHCP/ BOOTP |
| Status display interface | LED | "DP" Two-colored red/green | "CAN" Two-colored red/green | "MS" Two-colored red/green Link status: yellow (10 MBit) green (100 MBit) Data transfer: yellow (10 MBit) green (100 MBit) flashing |
| Terminating resistor | | switchable via plug | DIP switches | |
| Terminal type | | 1 × SUB-D, 9-pole, socket | 1 × SUB-D plug, 9-pole | 2 × RJ45- plugs (2- channel switch) |
| potential isolation | | Yes | Yes | Yes |
| Diagnostics interface | | | | |
| Type | | RS232 | RS232 | RS232 |
| Terminal type | | RJ45 | RJ45 | RJ45 |
| potential isolation | | no | no | no |

1) If contactors with a total power consumption > 3 A are connected, a power feeder module EU5C-SWD-PF1/2 has to be used.

2) If contactors with a total current consumption > 0.7 A are connected, a power feeder module EU5C-SWD-PF2 has to be used.

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4.6 Technical data

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