



User Manual
SmartWire-DT Gateway
EU5C-SWD-SERCOS



Hilscher Gesellschaft für Systemautomation mbH
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1 Introduction

1.1 About this document

1.1.1 Description of the contents

This manual describes the Hilscher **EU5C-SWD-SERCOS** SmartWire-DT Gateway. Here you will find information on how to install, configure and operate the gateway.

This manual is intended for automation technicians and engineers. Detailed knowledge of the **SERCOS** Real-Time Ethernet system is presumed. In addition, readers should also be familiar with the **SmartWire-DT** system.



Important:

- To avoid personal injuries or damage of electrical devices, please read this manual carefully before installing and using the EU5C-SWD-SERCOS Gateway.
 - Please first read the chapter *Safety* [▶ page 15].
-

1.1.2 List of revisions

Index	Date	Revisions
1	2017-02-16	Document created

Table 1: List of revisions

1.1.3 Conventions in this document

Notes, operation instructions and results of operation steps are marked as follows:

Notes



Important:

<important note>



Note:

<simple note>



<note, where to find further information>

Operation instructions

1. <operational step>

➤ <instruction>

➤ <instruction>

2. <operational step>

➤ <instruction>

➤ <instruction>

Results

↻ <intermediate result>

⇒ <final result>

For a description of the labeling of **Safety Messages**, see section *Labeling of safety messages* [▶ page 19].

1.2 Versions of devices, firmware, software tools and drivers

The hardware revisions and software versions functionally belong together. This means that certain revisions of the hardware of the gateway need certain versions of firmware, software and drivers, in order to function properly.

This section lists the hardware revisions and the versions of the firmware, the configuration software and the drivers which functionally belong together and to which all instructions in this manual refer.

Device and firmware

This manual refers to the following hardware revision and firmware version of the EU5C-SWD-SERCOS Gateway:

Device type name	Protocol	Part number	Hardware revision	Firmware	Firmware version
EU5C-SWD-SERCOS	Sercos slave	9233.923	1	E030J0U0.nxf	1.0.x.x

Table 2: Reference to hardware and firmware

Software tools

This manual refers to the following software versions:

Software	Manufacturer	Version
SWD-Assist	Eaton	2.xx

Table 3: Reference to software tools

Drivers

This manual refers to the following driver versions:

Driver	File name	Version
Windows USB Driver	usbser.sys	Depending on Windows version

Table 4: Reference to drivers

1.3 Software package

1.3.1 Overview

Hilscher offers the optional software package **EU5C-SWD-SW** (part number 3233.920) for SmartWire-DT Gateways. The package features the **SmartWire-DT Gateway Solutions** product DVD and a Mini-USB cable. The **SmartWire-DT Gateway Solutions** product DVD contains the **SDDML** files (SERCOS Device Description Markup Language) necessary for configuring the EU5C-SWD-SERCOS gateway and the SmartWire-DT modules within the Sercos network. If you do not need the whole package with the USB cable, you can download the contents of the product DVD separately and free of charge as ZIP file from our website www.hilscher.com under **Products > Partner Products > SmartWire-DT > EU5C-SWD-SERCOS > Downloads > Software**.

1.3.2 Contents of the product DVD

The **SmartWire-DT Gateway Solutions** product DVD contains software for all types of SmartWire-DT gateways. Depending on the gateway type you are using, you will need only certain features of the DVD.

The product DVD includes:

- Device description files
- Firmware
- Eaton SWD-Assist software
- Wizard for installing the software available on the DVD and for downloading the latest version of the SWD-Assist software from the internet
- Installation program for USB driver (USB driver is needed for connecting the gateway to a PC in order to use the Eaton SWD-Assist software)
- Installation program for the Hilscher Ethernet Device Configuration Tool
- Documentation in PDF format
- Installation program for Adobe Reader

The product DVD has the following directories:

Directory	Contents
Documentation	PDF manuals in German and English and installation program for Adobe Reader
EDS	SDDML device description files of the Gateway and of the SmartWire-DT modules in compressed <code>SDDML.zip</code> folder. After unpacking, the device description files can be imported into the <i>IndraWorks</i> engineering tool.
Firmware	Loadable gateway firmware
fscommand	Files for start screen of product DVD
Setups & Drivers	SWD-Assist software Folder: <code>SWD-Assist</code> Wizard for installing the software available on the DVD and for downloading the latest version of the SWD-Assist software from the internet Folder: <code>Setup</code> Installation program for Ethernet Device Configuration Tool Folder: <code>EnDeviceCfg</code> Installation program (<code>setup.exe</code>) and <code>.INF</code> - and <code>.CAT</code> - files for Windows USB driver. Folder: <code>USB Driver</code>

Table 5: Directory of the product DVD



Note:

You can use the wizard on the product DVD to download updates of the Eaton SWD-Assist software, or you can download SWD-Assist directly from the www.moeller.net website under **Support > Download Center**. Direct link:

<http://downloadcenter.moeller.net/en/software.a487d8b7-da91-486f-b3ba-a7ca2035db99>

1.3.3 How to use the product DVD

Insert the **SmartWire-DT Gateway Solutions** product DVD into the DVD drive of your configuration PC.

If the auto start function of your DVD drive is enabled, the start screen of the DVD automatically opens. You can also start the DVD by double-clicking the `SmartWire.exe` file in the root directory of the DVD.

In the menu of the start screen of the DVD, click **Install Planning and Configuration Tools** to open a wizard for installing the software programs stored on the DVD. The wizard also helps you to download the latest version of the Eaton planning software SWD-Assist from the internet. It automatically checks for already installed software components (which e. g. might have been installed for an earlier project), and lists the missing components accordingly. The following options might be offered:

- **USB Driver:** installs USB driver for Windows on your PC.
- **Download Center SWD-Assist (manual check):** connects your browser to a web page from which you can download the latest version of the SWD-Assist software.
- **SWD Planning Software SWD-Assist Vx.xx:** installs the SWD-Assist software version provided on the DVD.
- **Ethernet Device Scanner/Configuration Tool:** installs the Hilscher Ethernet Device Configuration Tool.
- **GSDML, EDS, SDDML, ESI files (HTML page):** opens a web page containing links to the device description files.

In the main menu of the start screen of the DVD, you can furthermore open a web page which provides an overview of all available documents (menu **Documentation**). You can also directly open the folder containing the device description files (menu **Open Electronic Device Description Files Directory**).

1.3.4 Notes on installing the USB Driver

If you intend to use the SWD-Assist software, you should first install the USB driver on your PC before you connect the gateway via USB.

To install the USB driver from the DVD, choose **Install Planning and Configuration Tools** in the DVD menu to open the installation wizard, and then select the **USB driver** option. As an alternative, you can use the Windows Explorer to open the `Setups & Drivers\USB Driver` folder on the DVD, and then double-click the `setup.exe` file. Just follow the instructions of the installation routine afterwards.

If you want to remove the USB driver from your PC, choose **Start** menu > **Control Panel** > **Uninstall a program**, then select: **Windows Driver Package – Hilscher GmbH (hilusbser) Ports** entry. Click **Uninstall/Change** button to uninstall the driver.

1.4 Documentation overview

Besides this user manual at hand (path on product DVD: `Documentation\english\2. Hardware\EU5C-SWD-SERCOS UM xx EN.pdf`), the following documents are also relevant for the user of the EU5C-SWD-SERCOS Gateway:

Title	Contents	Publisher	Document ID	Path on product DVD
<i>SmartWire-DT Modules</i>	Information on engineering, installation and programming of the individual SmartWire-DT slaves.	Eaton	MN05006001Z-EN	Documentation\english\3.SmartWire-DT\SmartWire-DT - Units\MN05006001Z_EN.pdf
<i>SmartWire-DT The System</i>	Information on function, installation, commissioning and diagnostics of the SmartWire-DT system.	Eaton	MN05006002Z-EN	Documentation\english\3.SmartWire-DT\SmartWire-DT - The System\MN05006002Z_EN.pdf
<i>SWD-Assist Online help</i>	Online help for SWD-Assist planning software	Eaton	-	Included in SWD-Assist software

Table 6: Documentation overview

1.5 Legal notes

1.5.1 Copyright

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1.5.2 Important notes

The user manual, accompanying texts and the documentation were created for the use of the products by qualified experts, however, errors cannot be ruled out. For this reason, no guarantee can be made and neither juristic responsibility for erroneous information nor any liability can be assumed. Descriptions, accompanying texts and documentation included in the user manual do not present a guarantee nor any information about proper use as stipulated in the contract or a warranted feature. It cannot be ruled out that the user manual, the accompanying texts and the documentation do not correspond exactly to the described features, standards or other data of the delivered product. No warranty or guarantee regarding the correctness or accuracy of the information is assumed.

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1.5.3 Exclusion of liability

The software was produced and tested with utmost care by Hilscher Gesellschaft für Systemautomation mbH and is made available as is. No warranty can be assumed for the performance and flawlessness of the software for all usage conditions and cases and for the results produced when utilized by the user. Liability for any damages that may result from the use of the hardware or software or related documents, is limited to cases of intent or grossly negligent violation of significant contractual obligations. Indemnity claims for the violation of significant contractual obligations are limited to damages that are foreseeable and typical for this type of contract.

It is strictly prohibited to use the software in the following areas:

- for military purposes or in weapon systems;
- for the design, construction, maintenance or operation of nuclear facilities;
- in air traffic control systems, air traffic or air traffic communication systems;
- in life support systems;
- in systems in which failures in the software could lead to personal injury or injuries leading to death.

We inform you that the software was not developed for use in dangerous environments requiring fail-proof control mechanisms. Use of the software in such an environment occurs at your own risk. No liability is assumed for damages or losses due to unauthorized use.

1.5.4 Warranty

Although the hardware and software was developed with utmost care and tested intensively, Hilscher Gesellschaft für Systemautomation mbH does not guarantee its suitability for any purpose not confirmed in writing. It cannot be guaranteed that the hardware and software will meet your requirements, that the use of the software operates without interruption and that the software is free of errors. No guarantee is made regarding infringements, violations of patents, rights of ownership or the freedom from interference by third parties. No additional guarantees or assurances are made regarding marketability, freedom of defect of title, integration or usability for certain purposes unless they are required in accordance with the law and cannot be limited. Warranty claims are limited to the right to claim rectification.

1.5.5 Export regulations

The delivered product (including the technical data) is subject to export or import laws as well as the associated regulations of different countries, in particular those of Germany and the USA. The software may not be exported to countries where this is prohibited by the United States Export Administration Act and its additional provisions. You are obligated to comply with the regulations at your personal responsibility. We wish to inform you that you may require permission from state authorities to export, re-export or import the product.

1.5.6 Registered Trademarks

Adobe Reader® is a registered trademark of Adobe Systems Incorporated.

IndraWorks® is a registered trademark of Bosch Rexroth AG.

Sercos® and Sercos® interface are registered trademarks of Sercos International e. V., Süssen, Germany.

SmartWire-DT® is a registered trademark of Eaton Corporation.

Windows® XP, Windows® 7 and Windows® 8 are registered trademarks of the Microsoft Corporation.

All other mentioned trademarks are property of their respective legal owners.

2 Safety

2.1 General note

The user manual, all accompanying texts and the documentation are written for the use of the products by educated personnel. When using the products, all safety instructions, property damage messages and all valid legal regulations have to be observed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended use

The purpose of the EU5C-SWD-SERCOS Gateway described in this user manual is to create a connection between SmartWire-DT slaves and a Sercos master in an overriding Sercos network.

2.3 Personnel qualification

The gateway must be installed, configured and removed by qualified personnel only. Job-specific technical skills for people professionally working with electricity must be present concerning the following issues:

- Safety and health at work
- Mounting and connecting of electrical equipment
- Measurement and analysis of electrical functions and systems
- Evaluation of the safety of electrical systems and equipment
- Installing and configuring IT systems

2.4 References safety

- [S1] ANSI Z535.6-2006 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials
- [S2] IEC 60950-1, Information technology equipment - Safety - Part 1: General requirements, (IEC 60950-1:2005, modified); German Edition EN 60950-1:2006
- [S3] EN 61340-5-1 and EN 61340-5-2 as well as IEC 61340-5-1 and IEC 61340-5-2

2.5 Safety instructions to avoid personal injury

To ensure your own personal safety and to avoid personal injury, you must read, understand and follow the following safety instructions in this manual and all warning messages before you install and operate the gateway.

2.5.1 Electrical shock hazard

Take care of the following safety measures before installing or uninstalling the gateway:

- First disconnect the power plug of the device.
- Make sure that the device is disconnected from the power supply.
- Cover or enclose neighboring units that are live.

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.

2.5.2 Danger of unintended starting up of machines

- Install automation devices and related operating elements in a way that they are well protected against unintentional 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.
- You must take safety precautions (emergency switching off) in the external circuitry of the gateway and any power modules type EU5C-SWD-PF1-1 or EU5C-SWDPF2-1 that are used. To do so, plan to switch off the power supply to the contactor coils AUX.
- 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.).

2.6 Safety instructions to avoid property damage

To avoid damage to your gateway or your communication system, you must read, understand and follow the following safety instructions and all safety instructions and warnings in this manual concerning property damage, before you install and operate the gateway.

2.6.1 General safety instructions concerning supply voltage

- 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).
- Switch off the power supply if you are reconnecting slaves in the SmartWire-DT system or reconnecting the ribbon cable connection. Otherwise the SmartWire-DT slaves can be destroyed!
- 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!
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalization. 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.
- 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.

2.6.2 Device destruction by exceeding allowed supply voltage

The gateway must only be operated with the specified supply voltage.

- Make sure that the limits of the allowed range for the supply voltage are not exceeded. A supply voltage above the upper limit can cause severe damage of the gateway!
- A supply voltage below the lower limit can cause malfunction of the gateway!
- 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.

The allowed range for the supply voltage is indicated in section *Technical data EU5C-SWD-SERCOS gateway* [▶ page 89].

2.6.3 Electrostatic sensitive device

The gateway is sensitive to electrostatic discharge, which can cause internal damage and affect its normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable to electrostatic discharge when you install or remove the gateway. Follow the guidelines listed hereafter when you handle the gateway:

- Touch a grounded object to discharge potential static before you handle the gateway.
- Wear an approved grounding wrist strap.
- If possible, use a static-safe workstation.
- When not in use, store the device in appropriate static-safe packaging.

2.7 Labeling of safety messages

In this document the safety instructions and property damage messages are designed according both to the internationally used safety conventions as well as to the **ANSI Z535** standard.

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly and highlighted by a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text and optionally by a specific safety sign.
- The **Integrated Safety Messages** embedded in operating instructions are highlighted by a signal word according to the degree of endangerment. In the safety message, the nature of the hazard is indicated.

Signal words and safety signs in safety messages on personal injury




Signal word	Meaning
 DANGER	Indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it is not avoided.
 WARNING	Indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it is not avoided.
 CAUTION	Indicates a minor hazard with medium risk, which could have as consequence personal injury if it is not avoided.

Table 7: Signal words in safety messages on personal injury



Safety sign	Sort of warning or principle
	Warning of lethal electrical shock
	Principle: Disconnect the power plug

Table 8: Safety signs in messages on personal injury

Signal words and safety signs in safety messages on property damage


Signal word	Meaning
 NOTICE	Indicates a property damage message

Table 9: Signal words in safety messages on property damage


Safety sign	Sort of warning or principle
	Warning of property damage by electrostatic discharge

Table 10: Safety signs in safety messages on property damage

3 Description of the EU5C-SWD-SERCOS gateway

3.1 Function

The EU5C-SWD-SERCOS gateway integrates a SmartWire-DT network into a Sercos network. The gateway creates a data connection between the participants (the slave devices) of the subordinate SmartWire-DT network and the master device or PLC of the super ordinate Sercos network.

The gateway acts as master (a.k.a. “Coordinator”) in the SmartWire-DT network on the one hand, and on the other hand as modular slave in the Sercos network. It thereby presents each connected SmartWire-DT participant as individual module to the Sercos master.

The cyclic process data is exchanged transparently between both networks. 492 bytes of process input/output data can in sum be exchanged with up to 99 SmartWire-DT participants (slaves).

The maximum amount of “Consumed Data” (including “Connection Control” and “IO Control”) as Sercos slave is 246 bytes, maximum amount of “Produced Data” (including “Connection Control” and “IO Status”) is also 246 bytes.

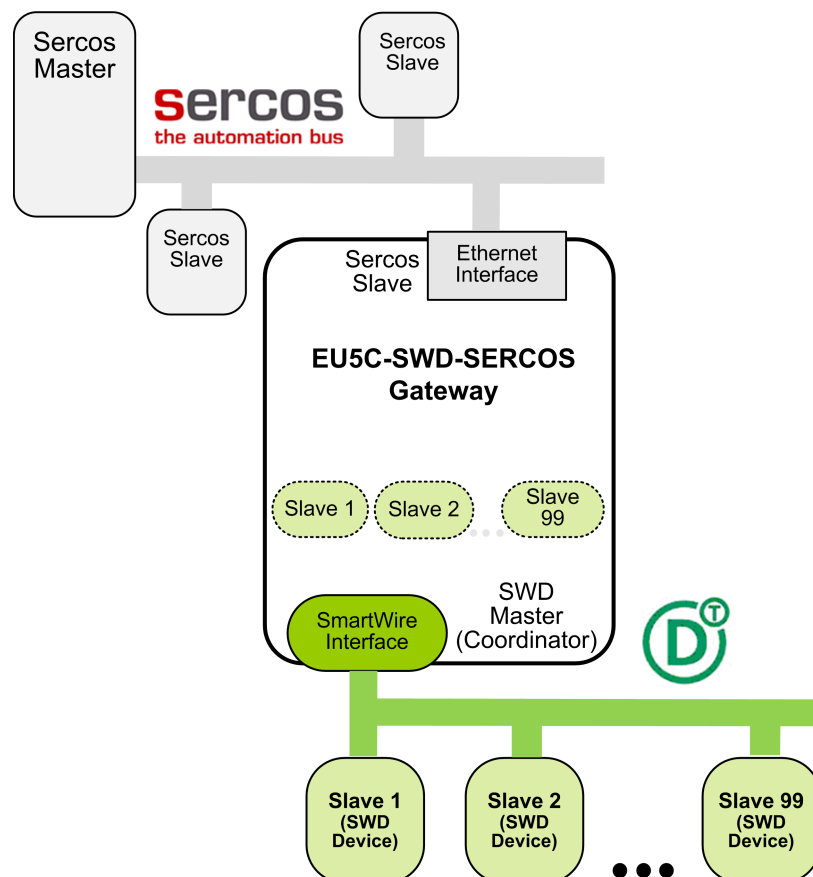


Figure 1: Data flow EU5C-SWD-SERCOS Gateway

3.2 Configuration

3.2.1 SmartWire-DT configuration

The EU5C-SWD-SERCOS Gateway is easily commissioned by an automated configuration function: On pushing the configuration button on the front of the gateway, the gateway scans the current SmartWire-DT network configuration, the so-called actual configuration. It then stores the actual configuration as target configuration zero voltage-safe in the device, thus making the target configuration available for a comparison of actual and targeted SmartWire-DT configuration, which takes place each time the gateway is being switched on.

When the gateway is switched on after a target configuration has already been stored, the gateway automatically rescans the connected actual configuration and checks it against the target configuration. If the gateway recognizes that a required SmartWire-DT slave cannot be reached or a wrong slave type is determined, it will not go into operation. If the actual configuration complies with the target configuration, the gateway gets ready for Sercos and waits for the Sercos configuration. The gateway checks the project configuration, which it receives from the Sercos master, against the target configuration. Discrepancies between target and project configuration are indicated by the **Config** LED of the gateway.

Eaton SWD-Assist planning software

Despite the fact that you can configure the SmartWire-DT network in the gateway simply by using the configuration button, it is nevertheless recommended to use the SWD-Assist software to plan, dimension and document the SmartWire-DT network.



For further information, please refer to the SWD-Assist online help.



Note:

You will find the Eaton SWD-Assist software on the product DVD, which is included in the EU5C-SWD-SW software package (order number 3233.920) available from Hilscher. You can use the wizard on the product DVD to download updates of the Eaton SWD-Assist software, or you can download SWD-Assist directly from the www.moeller.net website under **Support > Download Center**. Direct link:

<http://downloadcenter.moeller.net/en/software.a487d8b7-da91-486f-b3ba-a7ca2035db99>

3.2.2 Sercos configuration

The gateway is commissioned in Sercos by using the Sercos engineering tool *IndraWorks* and SDDML (SERCOS Device Description Markup Language) files in XML format. The device description file of the gateway and also the files of the individual SmartWire-DT participants (a.k.a. “slaves” or “modules”) must be imported into the engineering tool. They are stored in the `SDDML.zip` archive in the `EDS\EU5C-SWD-SERCOS\Vx.x.x.x` directory of the product DVD. For detailed information, see section *Configuring gateway in Sercos* [▶ page 40].

**Note:**

The `SDDML.zip` archive contains only files of SmartWire-DT slaves which were officially listed as available products when the archive was created.

3.3 Interfaces

The gateway features a SmartWire-DT interface (plug, 8-pole), a 2-port switch Ethernet interface (RJ45) for connecting Sercos, and a Mini-USB interface. Via the Mini-USB interface, the gateway can be accessed, configured and diagnosed with the SWD-Assist software.

3.4 Diagnosis

The gateway can be diagnosed by connecting the SWD-Assist software to the Mini-USB interface. For further information, please refer to the SWD-Assist online help.

3.5 Firmware and device description files

The EU5C-SWD-SERCOS gateway is shipped with its most recent firmware already loaded. Which firmware version is loaded in the gateway at the time of delivery can be inferred from the device type label (see section *Device type label* [▶ page 29]).

The integrated WebServer of the gateway allows you to update the firmware via Ethernet connection. For more details on this, please refer to chapter *Updating firmware* [▶ page 78].

In case of a missing or defective firmware, a firmware “recovery” process is also possible via HTTP. Please refer to chapter *Firmware recovery via HTTP* [▶ page 83].

Device description files (SDDML) for the gateway and the SmartWire-DT participants (SWD slaves) are included on the product DVD in the `SDDML.zip` folder in the `EDS\EU5C-SWD-SERCOS\Vx.x.x.x` directory. As an alternative, you can download latest versions of the SDDML files from our website www.hilscher.com under **Products > Partner Products > SmartWire-DT > EU5C-SWD-SERCOS > Downloads**.

4 Requirements for operation

The following prerequisites must be fulfilled to operate the EU5C-SWD-SERCOS gateway:

4.1 Network systems

- SmartWire-DT network with maximum number of up to 99 participants/stations/slaves and maximum extension of up to 600 meters.
- Sercos network with Sercos PLC (master device). Maximum cable length is 100 meters.

4.2 Power supply

⚠ WARNING**Danger of unsafe operation of the system**

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

⚠ WARNING**Danger of unsafe operation of the system**

You must take safety precautions (emergency switching off) in the external circuitry of the gateway and any power modules type EU5C-SWD-PF1-1 or EU5C-SWDPF2-1 that are used. To do so, plan to switch off the power supply to the contactor coils **AUX**.

NOTICE**Device destruction**

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.

**Important:**

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.

You can find information on the power consumption in the operating manuals of the SmartWire-DT devices.

4.2.1 POW power connection

A Power supply of 24 V DC for the coupling unit and for the Smart-Wire-DT slave electronics is needed at the connection **POW**.

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** und CSA-22.2 No. 14:
Miniature circuit-breaker 24 V DC rated operational current 3 A; Tripping characteristics **C** or Fuse 3 A

4.2.2 AUX power connection

If any switching devices are also to be connected, for example via the DIL-SWD-32-001/002 SmartWire-DT slaves, a 24 V DC supply will also be required at the **AUX** power connection. This provides the supply for activating the contactor coils. This supply must be protected by an automatic circuit-breaker (3A gG/gI or 3 A miniature circuit-breaker with a Z characteristic).

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

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 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** und CSA-22.2 No. 14:
Miniature circuit-breaker 24 V DC rated operational current 2 A; Tripping characteristics **Z** or Fuse 2 A

5 Device picture, connectors and LEDs

5.1 Device picture

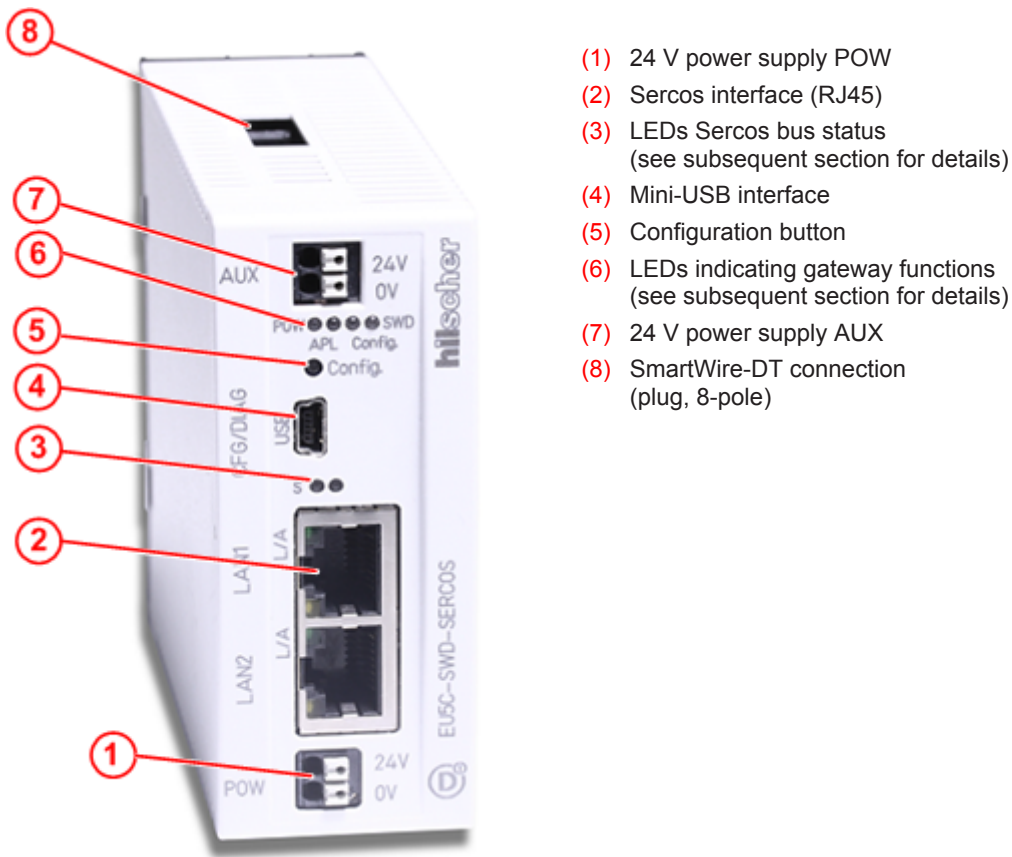


Table 11: Front view EU5C-SWD-SERCOS gateway

5.2 Positions and descriptions of the LEDs

5.2.1 Positions of the LEDs

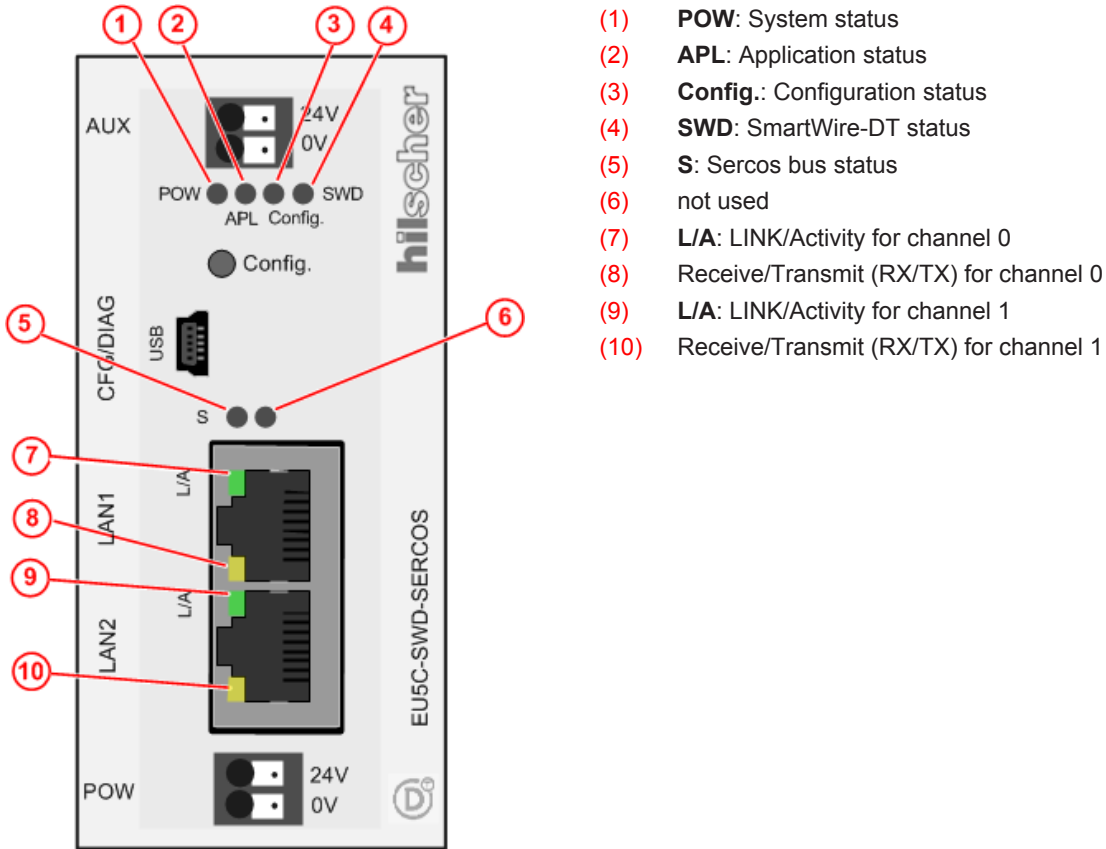


Table 12: LEDs EU5C-SWD-SERCOS Gateway

5.2.2 Description of the LEDs

Gateway function LEDs

LED	Color	State	Meaning
POW System status	Duo LED yellow/green		
Number in picture: (1)	● (yellow)	On	Operating system running, firmware has been started.
	☀ (green/yellow)	Blinking green/yellow	Second Stage Bootloader is not able to load the firmware. The device needs to be sent-in for servicing.
	● (green)	On	Backup firmware is active. The gateway needs a firmware recovery as described in chapter <i>Firmware recovery via HTTP</i> [▶ page 83].
	☀ (green)	Blinking green	ROM loader is not able to find bootable image. The device needs to be sent-in for servicing.
	● (off)	Off	Power supply for device is missing or hardware is defect.














LED	Color	State	Meaning
APL Application status Number in picture: (2)	Duo LED red/green		
	 (green)	On	Communication on Sercos and SmartWire-DT is in cyclic data exchange and the gateway function is executed.
	 (green)	Blinking 1 s off, 1 s on	Gateway is initialized, but the communication on Sercos or SmartWire-DT is not in cyclic data exchange.
	 (red)	Blinking 1 s off, 1 s on	Gateway is initialized, but the SmartWire-DT configuration is missing or in error.
	 (red)	On	Gateway has detected an error during the initialization: Missing configuration, error in configuration or internal error.
Config. Configuration status Number in picture: (3)	Duo LED red/green		
	 (green)	On	The project configuration complies with the target configuration. Data exchange between gateway and PLC via Sercos is possible.
	 (green)	Blinking	The project configuration does not comply with the target configuration, but is compatible with it. Data exchange between gateway and PLC via Sercos is possible.
	 (red)	On	The project configuration and the target configuration are not compatible. Data exchange between gateway and PLC via Sercos is not possible .
	 (off)	Off	No communication with the Sercos PLC or the gateway does not have a project configuration.
SWD SmartWire-DT status Number in picture: (4)	Duo LED red/green/orange (orange = red/green at the same time)		
	 (green)	On	The actual configuration complies with the target configuration. Data exchange between gateway and SmartWire-DT slaves takes place.
	 (red)	Blinking	The gateway misses its target configuration or a necessary SmartWire-DT slave is missing or the target configuration does not comply with the actual configuration. No data exchange between gateway and SmartWire-DT slaves.
	 (green)	Blinking	Slave addressing is active (after power-on or download of a project configuration containing empty modules). No data exchange between gateway and SmartWire-DT slaves.
	 (red)	On	Short-circuit on the 15 V power supply or no SmartWire-DT slave is connected. No data exchange between gateway and SmartWire-DT slaves.
	 (orange)	Blinking	After having pressed the configuration button: The gateway reads the actual configuration and stores it as target configuration.

Table 13: Description of the Gateway function LEDs

Sercos LEDs

















LED	Color	State	Meaning
S Number in picture: (5)	Duo-LED red/green (orange = red/green simultaneously)		
	 (green)	On	CP4: Communication phase 4: Normal operation, no error
	 (green)	Flashing (2 Hz)	Loopback: The network state has changed from „fast-forward“ to „loopback“.
	 (green/orange)	Flashing (3 x green/3s)	CP3: Communication phase 3
		(2 x green/3s)	CP2: Communication phase 2
		(1 x green/3s)	CP1: Communication phase 1
	 (orange)	On	CP0: Communication phase 0
	 (orange/green)	Flashing (2 Hz)	HP0: Hot-plug phase 0
		(1 x orange/3s)	HP1: Hot-plug mode phase 1
		(2 x orange/3s)	HP2: Hot-plug mode phase 2
	 (orange)	Flashing (2 Hz)	Identification: Corresponds to C-DEV.Bit 15 in the Slave's Device Control indicating remote address allocation or configuration errors between Master and Slaves.
	 (green/red)	Flashing (2 Hz, min. 2s)	MST losses \geq (S-0-1003/2): Depends on IDN S-0-1003.
			Corresponds to S-DEV.Bit 15 in the Device Status indicating a communication warning (Master SYNC telegrams have not been received).
 (red/orange)	Flashing (2 Hz)	Application error (C1D): See GDP & FSP Status codes class error.	
 (red)	Flashing (2 Hz)	Watchdog error: Application is not running	
 (red)	On	Communication Error (C1D): Error detected according to Sercos third generation Class 1 Diagnosis, see SCP Status codes class error.	
 (off)	Off	NRT-Mode: (Non Real-Time Mode) No Sercos Communication	
Number in picture: (6)	Duo LED red/green		
	 (off)	Off	This LED is not used.
L/A Number in picture: Ch0: (7) Ch1: (9)	LED green		
	 (green)	On	Link: The device is linked to the Ethernet, but does not send/receive Ethernet frames.
	 (green)	Flickering (load dependent)	Activity: The device is linked to the Ethernet and sends/receives Ethernet frames.
 (off)	Off	The device has no link to the Ethernet.	
Number in picture: Ch0: (8) Ch1: (10)	LED yellow		
	 (off)	Off	This LED is not used.

Table 14: LED states for the Sercos Slave protocol

5.3 Pinning of the Real-Time Ethernet interface

The following picture shows the pinning of the Sercos interface of the gateway.

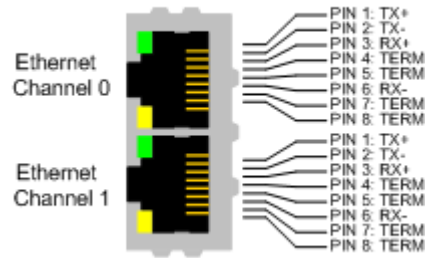


Figure 2: Pinning of the Ethernet interface (RJ45)

Pin	Signal	Description
1	TX +	Transmit Data +
2	TX –	Transmit Data –
3	RX +	Receive Data +
4	TERM	Bob Smith Termination
5	TERM	
6	RX –	Receive Data –
7	TERM	Bob Smith Termination
8	TERM	

Table 15: Ethernet interface channel 0 and channel 1 pin assignment (RJ45)

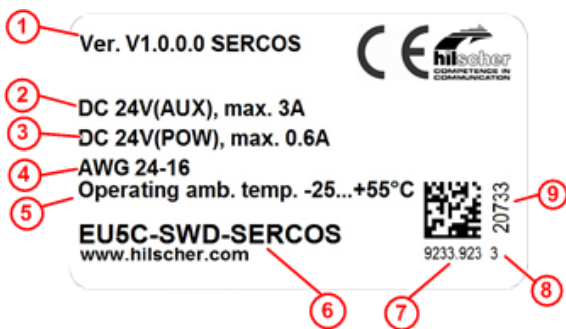


Note:

The Ethernet interface supports auto crossover.

5.4 Device type label

The EU5C-SWD-SERCOS Gateway is equipped with a device type label, which provides the following information:



- (1) Version of firmware (at time of delivery)
- (2) Information on power supply for switching devices (AUX)
- (3) Information on power supply for Gateway and Smart-Wire-DT slaves (POW)
- (4) Information on wire gauge of power supplies
- (5) Operating ambient temperature
- (6) Device type name
- (7) Part number
- (8) Hardware revision number
- (9) Serial number

Table 16: Device type label EU5C-SWD-SERCOS Gateway

6 Getting started

The following table provides an overview of the steps necessary for installing and commissioning the EU5C-SWD-SERCOS Gateway.

#	Step	For details see
1	Install gateway	Chapter <i>Installing gateway</i> [▶ page 31]
1.1	Take safety precautions	Section <i>Safety messages</i> [▶ page 31]
1.2	Mount gateway onto top hat rail	Section <i>Mounting gateway</i> [▶ page 32]
1.3	Connect gateway to power supply	Section <i>Connecting gateway to power supply</i> [▶ page 34]
1.4	Connect gateway to SmartWire-DT network	Section <i>Connecting SmartWire-DT</i> [▶ page 36]
1.5	Connect gateway to Sercos network	Section <i>Connecting Sercos</i> [▶ page 37]
2	Configure gateway	Chapter <i>Configuring gateway</i> [▶ page 38]
2.1	Configure SmartWire-DT network in gateway	Section <i>Configuring SmartWire-DT network in gateway (creating target configuration)</i> [▶ page 38]
2.2	Configure gateway in Sercos with IndraWorks	Section <i>Configuring gateway in Sercos</i> [▶ page 40]
3	Parameterize SmartWire-DT in IndraWorks	Chapter <i>Parameterization</i> [▶ page 49]
3.1	Configure gateway as SmartWire-DT Coordinator (if other than default settings are going to be used)	Section <i>Configuring EU5C-SWD-SERCOS gateway as SmartWire-DT Coordinator</i> [▶ page 49]
3.2	Configure device options and parameters of SmartWire-DT slaves (if other than default settings are to be used)	Section <i>Configuring options and parameters of SmartWire-DT devices</i> [▶ page 51]

Table 17: Getting started

7 Installing gateway

7.1 Safety messages



WARNING**Electrical shock**

Please observe the following safety messages when you install and handle the gateway:

- First disconnect the power plug of the device.
 - Make sure that the power supply is off at the device.
 - Cover or enclose neighboring units that are live.
-

**NOTICE****Electrostatic Sensitive Device**

The gateway is sensitive to electrostatic discharge, which can cause internal damage and affect its normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable to electrostatic discharge, when you install or handle the gateway:

- Do not touch the metal pins of the connectors of the gateway.
 - Touch a grounded object to discharge potential static.
 - Wear an approved grounding wrist strap.
 - If available, use a static-safe workstation.
 - When not in use, store the device in an appropriate static-safe packaging.
-

7.2 Mounting gateway

No tools are required for mounting the EU5C-SWD-ETHERCAT Gateway onto a top hat rail. The back of the gateway (1) carries a spring-fitted bolt (2) by which the gateway can be clamped to the rail (3).

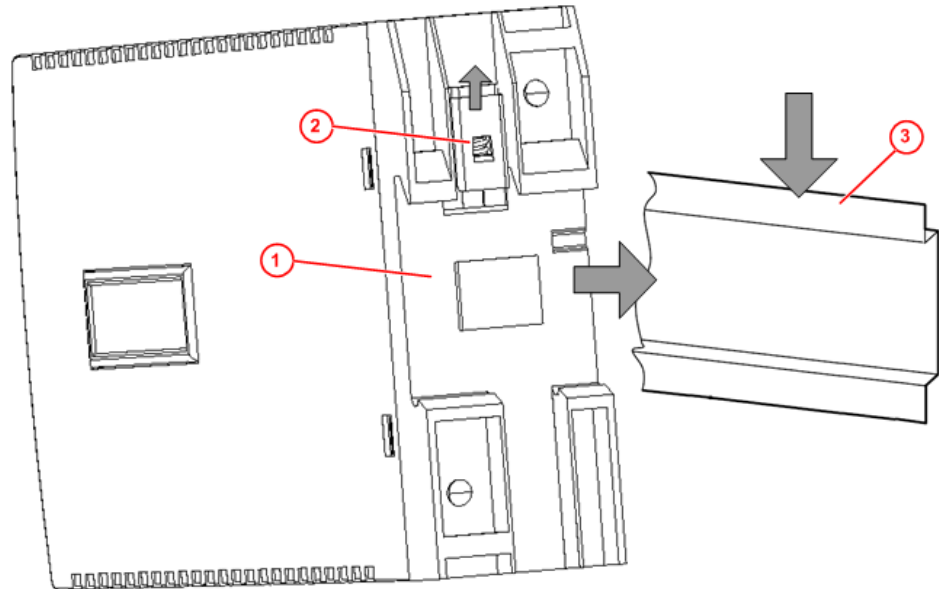


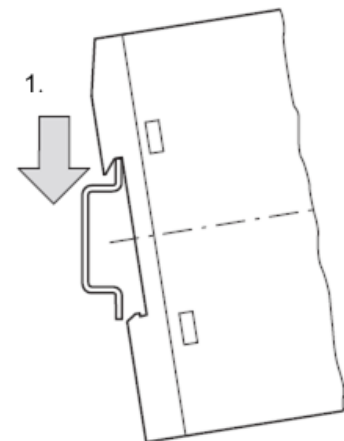
Figure 3: Mounting principle of the gateway

7.2.1 Mounting gateway onto top hat rail

To mount the gateway onto the top hat rail, proceed as follows:

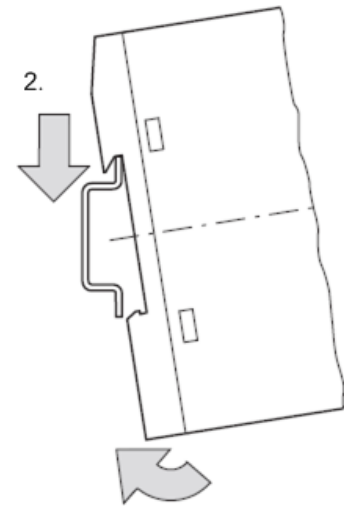
⚠ WARNING Electrical shock: Make sure that the gateway is disconnected from any power supply! Cover or enclose neighboring units that are live!

- Tilt the gateway slightly and hook it into the upper railing from above, thereby pushing down the gateway with slight force, in order to overcome the resistance of the spring in the bolt.



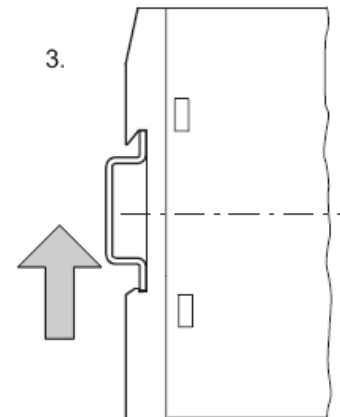
Hook gateway to upper railing

- Keep on pushing the gateway downwards and tilt it back into vertical position, thereby hooking the gateway into the lower railing.



Hook gateway to lower railing

- Let go of the gateway. The spring inside the bolt automatically pushes the gateway upwards into the railings, thereby fixing the gateway to the top hat rail.



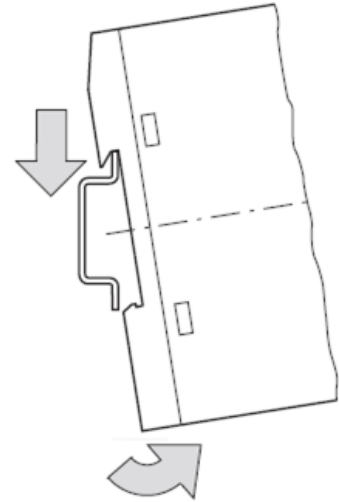
Gateway is clamped to top hat rail

7.2.2 Removing gateway from top hat rail

To remove the gateway from the top hat rail, proceed as follows:

⚠ WARNING Electrical shock: Make sure that the gateway is disconnected from any power supply! Cover or enclose neighboring units that are live!

- Push down the gateway with slight force (to overcome the resistance of the spring in the bolt), then unhook the gateway first from the lower railing and then from the upper railing.



Unhook gateway

7.3 Connecting gateway to power supply

⚠ DANGER

Danger of lethal injuries by unexpected starting up of motors or machinery!

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 by motors or machinery starting up unexpectedly.

⚠ WARNING

Danger of unsafe operation of the system

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

⚠ WARNING

Danger of unsafe operation of the system

You must take safety precautions (emergency switching off) in the external circuitry of the gateway and any power modules type EU5C-SWD-PF1-1 or EU5C-SWDPF2-1 that are used. To do so, plan to switch off the power supply to the contactor coils **AUX**.

**Important:**

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. You can find information on the power consumption in the operating manuals of the SmartWire-DT devices.

- Connect the 24 V DC voltage to the **POW** terminals on the front side of the gateway. The **POW** connection provides the voltage for the gateway itself and for the SmartWire-DT slave electronics.

**Note:**

For the 15 V supply of the SmartWire-DT slaves, the gateway contains an additional power feed module with an amperage of 0.7 A.

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

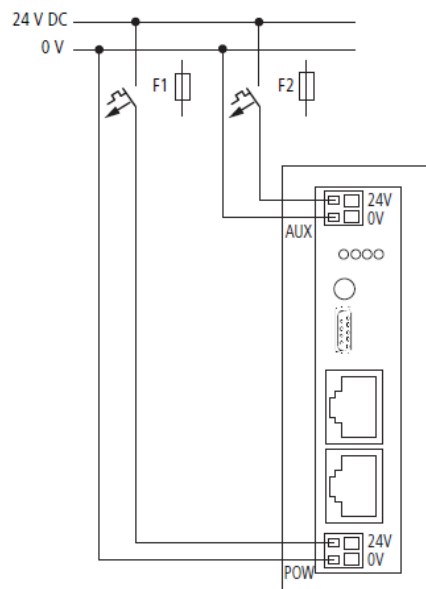


Figure 4: Gateway power supply

**Note:**

The **AUX** supply is required if any switching devices are also to be connected, for example, via the DIL-SWD-32-001/002 SmartWire-DT slaves. The **AUX** connection provides the supply for activating the contactor coils.

This supply must be protected by an automatic circuit-breaker (3A gG/gl or 3 A miniature circuit-breaker with a Z characteristic).

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

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 slaves in the SmartWire-DT system will not be electrically isolated from one another.

The Sercos network and the SmartWire-DT system are electrically isolated from one another.

7.4 Connecting SmartWire-DT

- Connect the SmartWire-DT network to the gateway. 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.

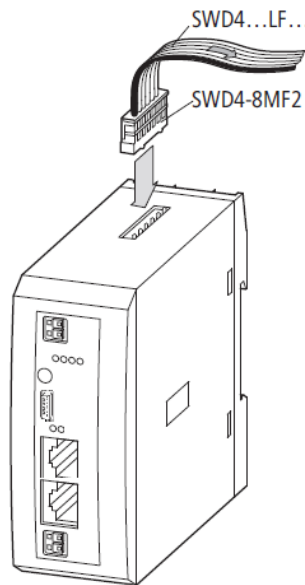


Figure 5: Connecting SmartWire-DT to gateway

NOTICE

Device destruction

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



Detailed instructions on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8 pole Smart-Wire-DT cable are provided in chapter *Fitting external device plugs SWD4-8SF2-5* of the manual *SmartWire-DT – The System*, MN05006002Z-EN (previously AWB2723-1617en).

7.5 Connecting Sercos

- Connect the RJ45 plug of the Sercos cable to one of the Ethernet connectors on the gateway.

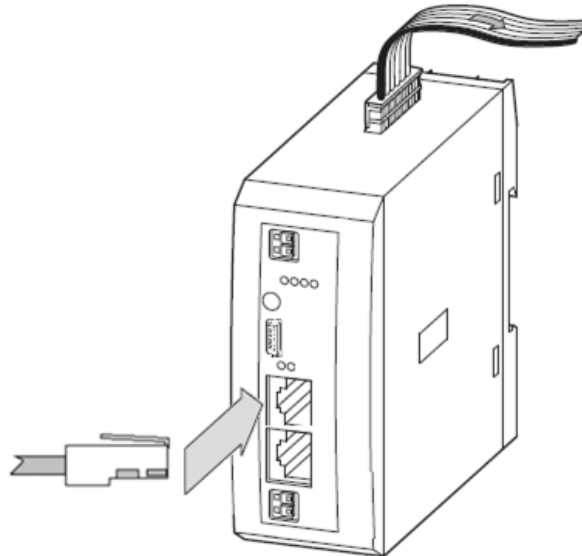


Figure 6: Connecting Sercos to gateway



Important:

Please observe the following notes on Sercos cabling :

- Use only hubs, no switches.
- Use shielded Ethernet cables that meet the requirements of at least category 5 (Cat5) according to EN 50173 or ISO/IEC 11801.
- Maximum cable length in a segment (allowed space between individual devices/hub) is 100 meters.

7.6 EMC-conformant wiring of the network

Undesired faults can occur on the 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 Sercos system (cables, connection of the bus connectors, etc.)



For more detailed information on this, please refer to the *IAONA Industrial Ethernet -Planning and Installation Guide* by IAONA e.V. Magdeburg, Germany.

8 Configuring gateway

8.1 Overview

For data exchange between the gateway and the Sercos master, the gateway needs a valid target configuration and a valid project configuration. The target configuration of the SmartWire-DT network can be created and stored in the gateway by using the configuration button on the gateway device. The project configuration must be created and transferred to the gateway by means of the Sercos engineering tool (i. e. IndraWorks®). This chapter describes how to create and store these configurations in the gateway.

8.2 Configuring SmartWire-DT network in gateway (creating target configuration)

8.2.1 Overview

When you commission the gateway, you have to read-in the actual configuration of the SmartWire-DT network (i. e. the line-up of the participants/devices connected to the SWD bus) and store it as target configuration.

Reading and storing the SmartWire-DT network configuration takes place by pressing the configuration button on the gateway (for the position of the configuration button, see figure *Device picture* [▶ page 25]). All SmartWire-DT slaves are re-addressed in ascending order by this process.

This process should only take place in the case of:

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

NOTICE

Hazard of device damage by disruption of voltage supply while creating target configuration!

Do not interrupt the voltage supply while creating the target configuration of the gateway. Power failure during a writing process within the file system can cause severe malfunctioning of the device.



Important:

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

The permanently stored target configuration is compared with the current configuration (actual configuration) each time the gateway is restarted and during bus operation. If the gateway recognizes that a required SmartWire-DT slave cannot be reached or a wrong slave type is determined, the gateway will not go into operation or stops operating. This depends in each case on the setup of the network which has been defined in the planned/project configuration. In case of error, the SmartWire-DT status LED (SWD LED) starts to blink in red (for the position of the SWD LED, see section *Positions of the LEDs* [▶ page 26]).

If a SmartWire-DT slave has failed, the SmartWire-DT network can still be operated with the remaining slaves, depending on the settings in the planned/project configuration (even after a repeated power up of the gateway). The failure is reported to the application.

8.2.2 Prerequisites

Prerequisites for reading-in the SmartWire-DT configuration are:

- All SmartWire-DT slaves are connected to the SmartWire-DT line.
- The SmartWire-DT status LEDs of the individual SmartWire-DT slaves are on or are flashing.
- The SmartWire-DT network is connected to the gateway.
- The voltage POW is applied to the gateway and the power **POW** LED is on.
- The voltage AUX is applied (if necessary).

8.2.3 Step-by-step instructions

To read-in the SmartWire-DT configuration, proceed as follows:

- Press the configuration button on the gateway for **at least two seconds** (for the position of the configuration button, see figure in section *Device picture* [▶ page 25]).



Note:

Take care to push-in the button properly. You have to feel and overcome a slight resistance at the end when pushing the button into the gateway, otherwise the button will not trigger.

- ↻ The SmartWire-DT status LED (SWD LED) on the gateway begins to flash orange. The SmartWire-DT status LEDs on the SmartWire-DT slaves also flash. All slaves are addressed in sequence, the complete configuration is stored retentively as gateway target configuration.

NOTICE

Hazard of device damage by disruption of voltage supply while creating target configuration!

Do not interrupt the voltage supply while creating the target configuration of the gateway. Power failure during a writing process within the file system can cause severe malfunctioning of the device.

- The SmartWire-DT status LED (SWD LED) on the gateway shows steady green.

**Note:**

As an alternative, you can generate and store the target configuration by using the SWD-Assist software. For this, the gateway must be connected to SWD-Assist via USB. For details, please refer to the SWD-Assist online help.

8.3 Configuring gateway in Sercos

8.3.1 Device description files

The EU5C-SWD-SERCOS Gateway is integrated as slave in the Sercos network. Configuring the gateway and the SmartWire-DT devices in the Sercos engineering tool requires SDDML device description files in XML format containing standardized descriptions of the gateway and the SmartWire devices.

You will find the device description files on the product DVD in the `SDDML.zip` folder in the `EDS\EU5C-SWD-SERCOS\Vx.x.x.x` directory. You can also download the latest versions of the files from our website www.hilscher.com under **Products > Partner Products > SmartWire-DT > EU5C-SWD-SERCOS > Downloads**.

Unpack the `SDDML.zip` folder, then import the files into the IndraWorks engineering tool as described in the following section.

**Important:**

Please note that data exchange between the gateway and the Sercos network can only take place after a SmartWire-DT network has been connected and configured in the gateway (see section *Configuring SmartWire-DT network in gateway (creating target configuration)* [▶ page 38]).

8.3.2 Configuring gateway in IndraWorks

8.3.2.1 Overview

This section describes how to create the project configuration for the EU5C-SWD-SERCOS gateway by using the IndraWorks® ML 14V10 P2 engineering tool.

8.3.2.2 Prerequisites

- PC with installed *IndraWorks* engineering tool
- You have access to the **SmartWire-DT Gateway Solutions** DVD (or you have downloaded the device description files from our website)
- You need an unpacking program like *7-Zip* to unpack the device description files from the `SDDML.zip` archive folder before importing them into *IndraWorks*

8.3.2.3 Adding gateway and SmartWire-DT devices to Sercos bus

1. Unpack ZIP folder and device description files.
 - On the product DVD, open `EDS\EU5C-SWD-SERCOS\Vx.x.x.x` directory.
 - Use an appropriate archive tool like e. g. *7-Zip* to unpack the `SDDML.zip` folder.
2. Import device description files into IndraWorks.
 - Open IndraWorks on your engineering PC.
 - In the menu bar of IndraWorks, select **Tools > Device Database...**

➤ The **Device Database** dialog window opens:

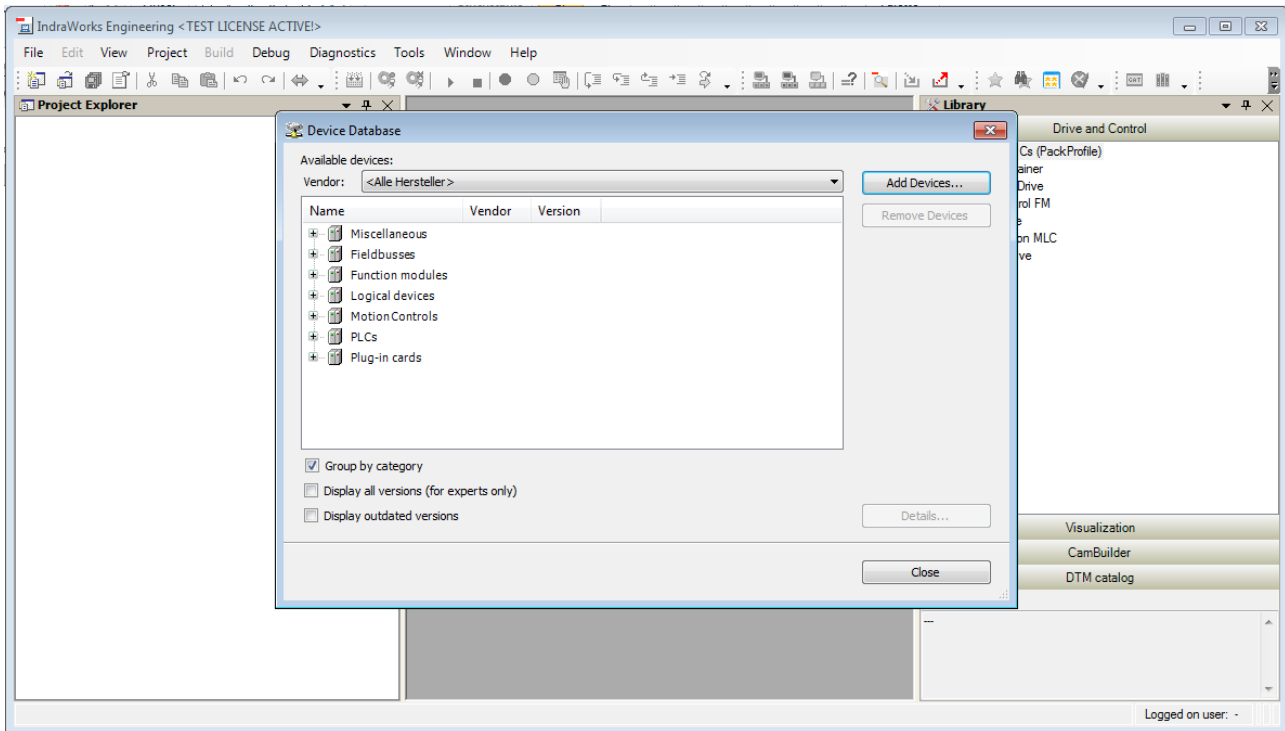


Figure 7: Device Database dialog window in IndraWorks

- Click **Add Devices...**
- The **Install Device Descriptions** window opens.
- In the **Install Device Descriptions** window, navigate to the folder containing the unpacked device description files (SDDML).
- Select all device description files, then click **Open**.



Note:

If you know exactly which SmartWire-DT devices you are using in your SmartWire-DT network (and thus which device description files you need to import), you can confine your selection to the corresponding XML files.

However, in any case make sure to import the gateway file
 SDDML#v3.1#Hilscher#EU5C-SWD-SERCOS#xxxx-xx-
 xx.xml.

- The **Install Device Descriptions** window closes and the files are being imported. The imported files and their paths are listed in the bottom field of **Device Database** dialog window:

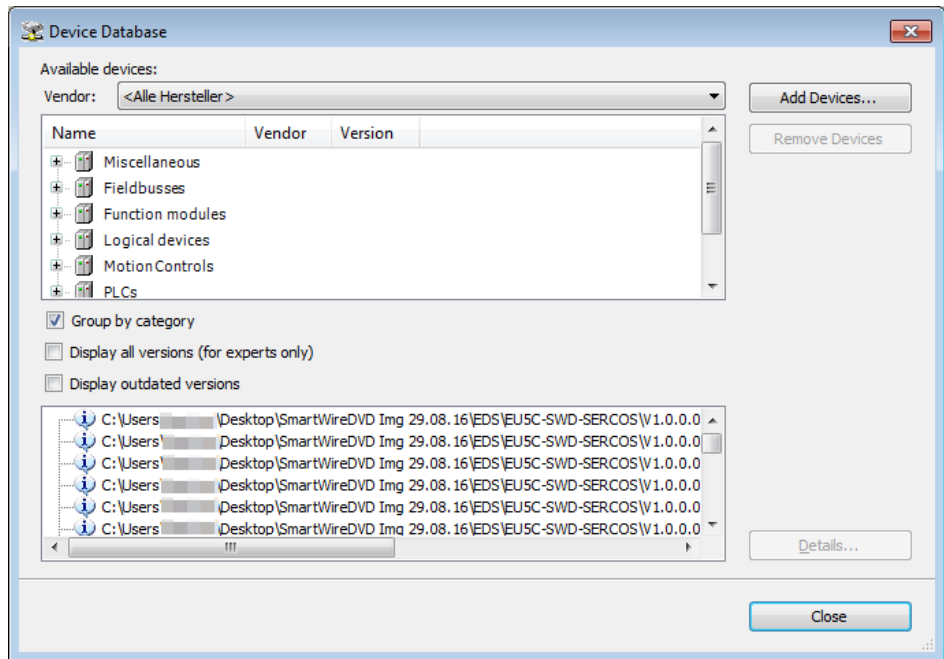


Figure 8: Imported SDDML files

- In the **Device Database** dialog window, select **Close**.
- The **Device Database** dialog window closes. You can display the imported device description files in the **Library** area of IndraWorks under **Periphery > Sercos**:

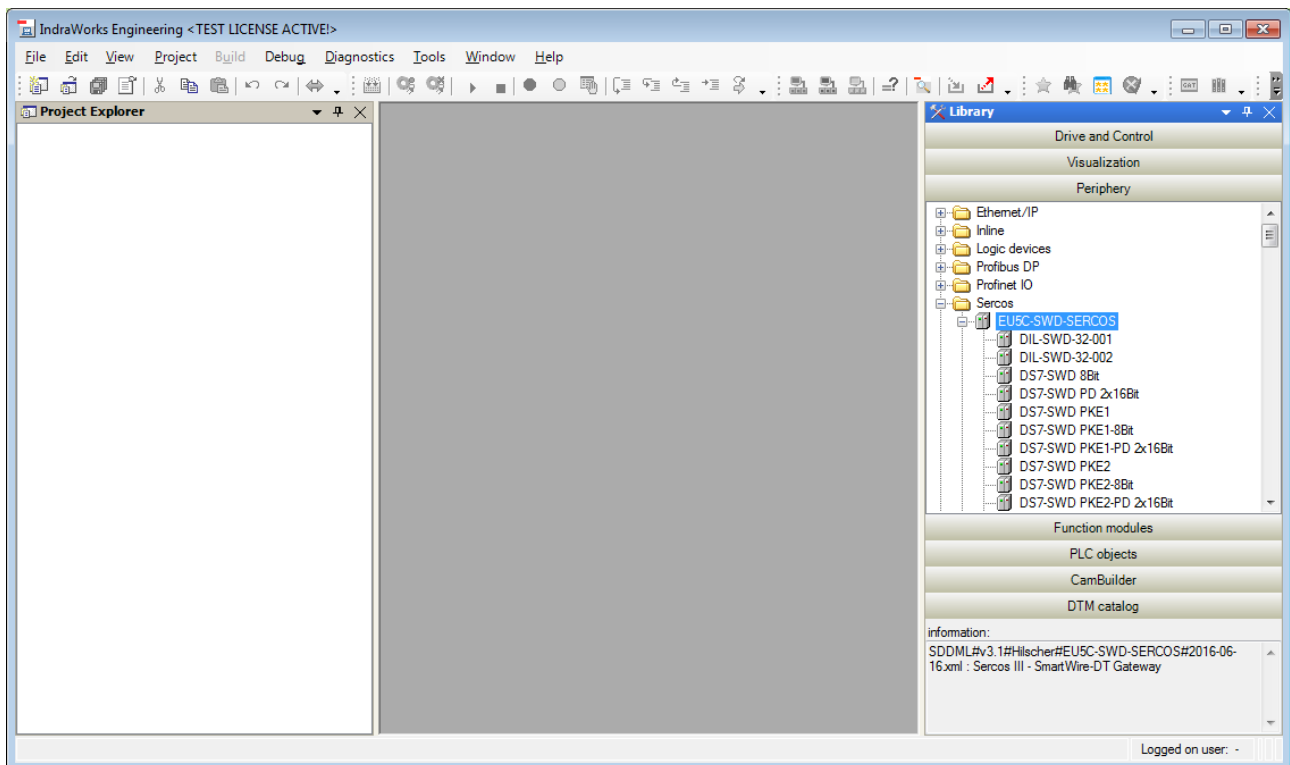


Figure 9: Imported SDDML files in Library of IndraWorks

3. Open existing project or create new project.
 - If you want to integrate the gateway into an already existing project, open this project.
 - If you want to create a new project, choose **File > New > Project...** from the menu.
 - The **Create new project** dialog window opens:

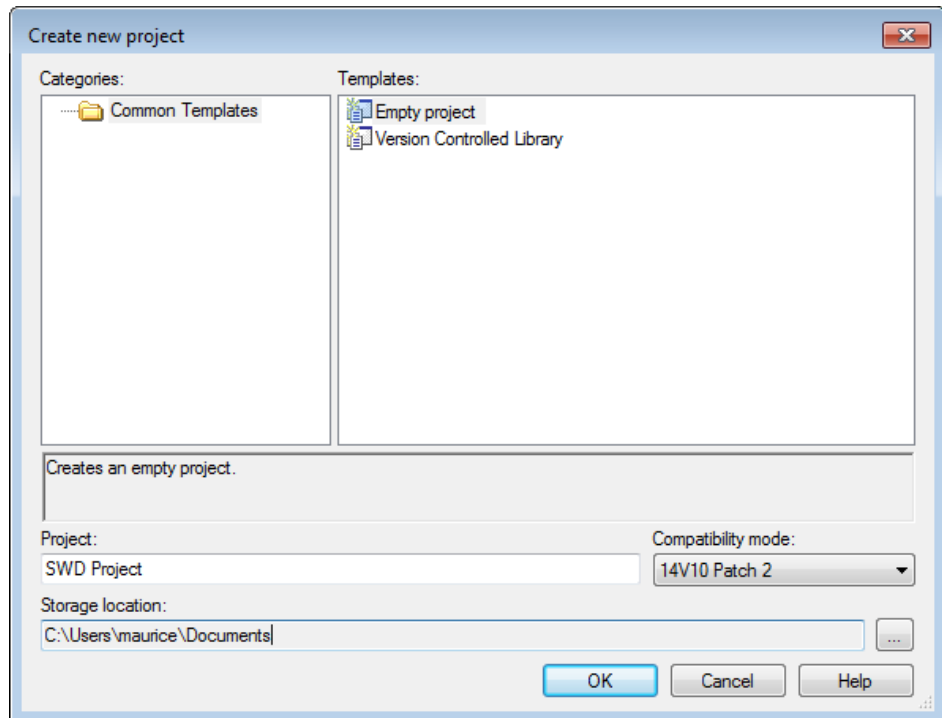


Figure 10: Create new project dialog window

- Enter the parameters of your project, then click **OK**.
- The **Create new project** dialog window closes and the new project is displayed in the **Project Explorer**.

4. Add Sercos master to project.
 - If your project does not feature a Sercos master yet, choose **Project > Add** from the menu, then select the appropriate master device, e. g. **IndraMotion MLC > IndraControl L65**.

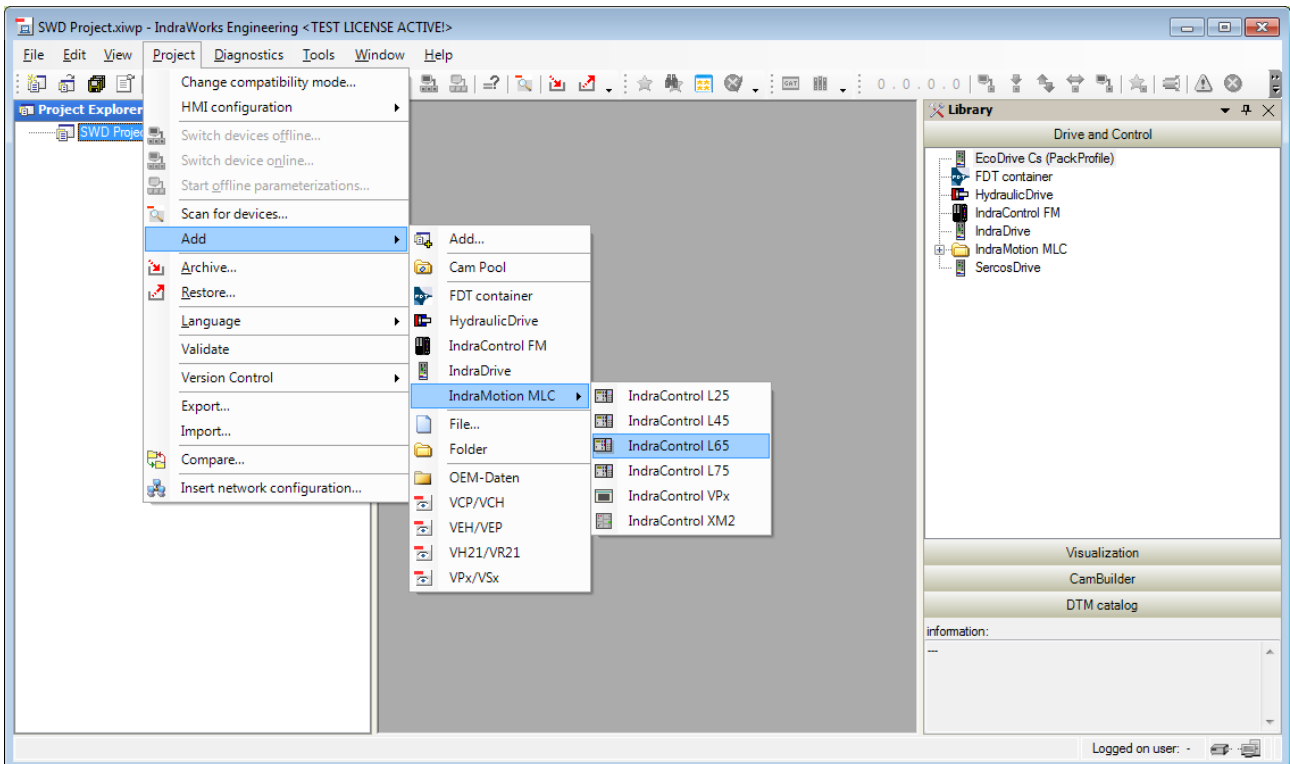


Figure 11: Add Sercos master to project

- A wizard for configuring the master/controller opens:

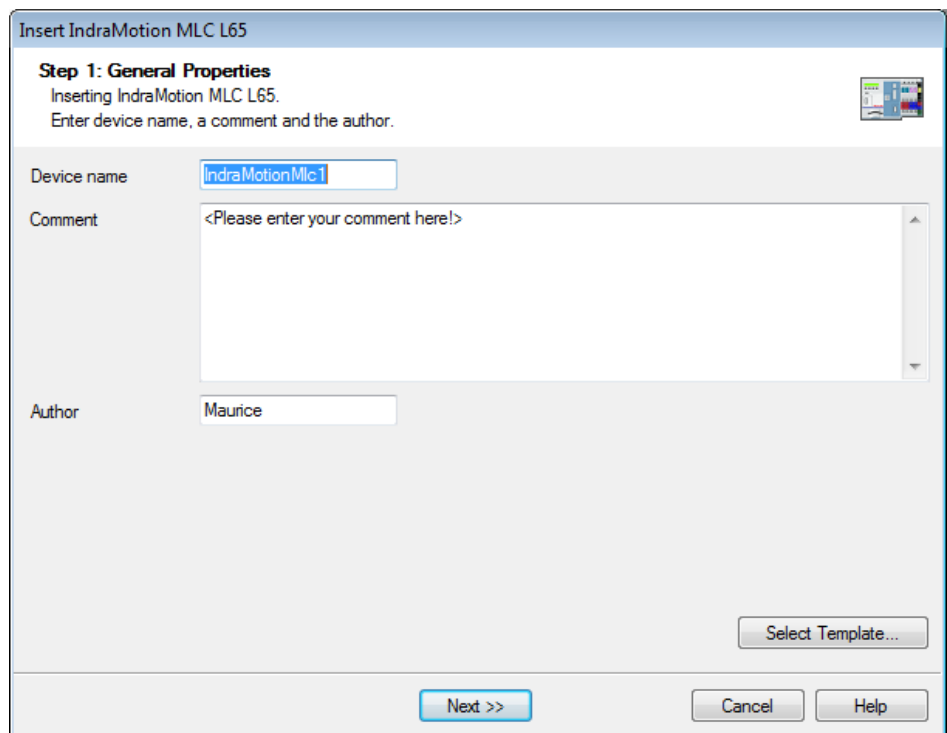


Figure 12: Wizard for configuring controller

- Use the wizard to configure the Sercos master/controller.



For further information please refer to the online help of IndraWorks.

5. Add EU5C-SWD-SERCOS gateway as Sercos slave to the project.
 - In the **Project Explorer**, select the **Sercos** object below the Sercos master (in this example the Sercos master is **IndraMotion Mlc1**), then choose **Add > EU5C-SWD-SERCOS** from the context menu:

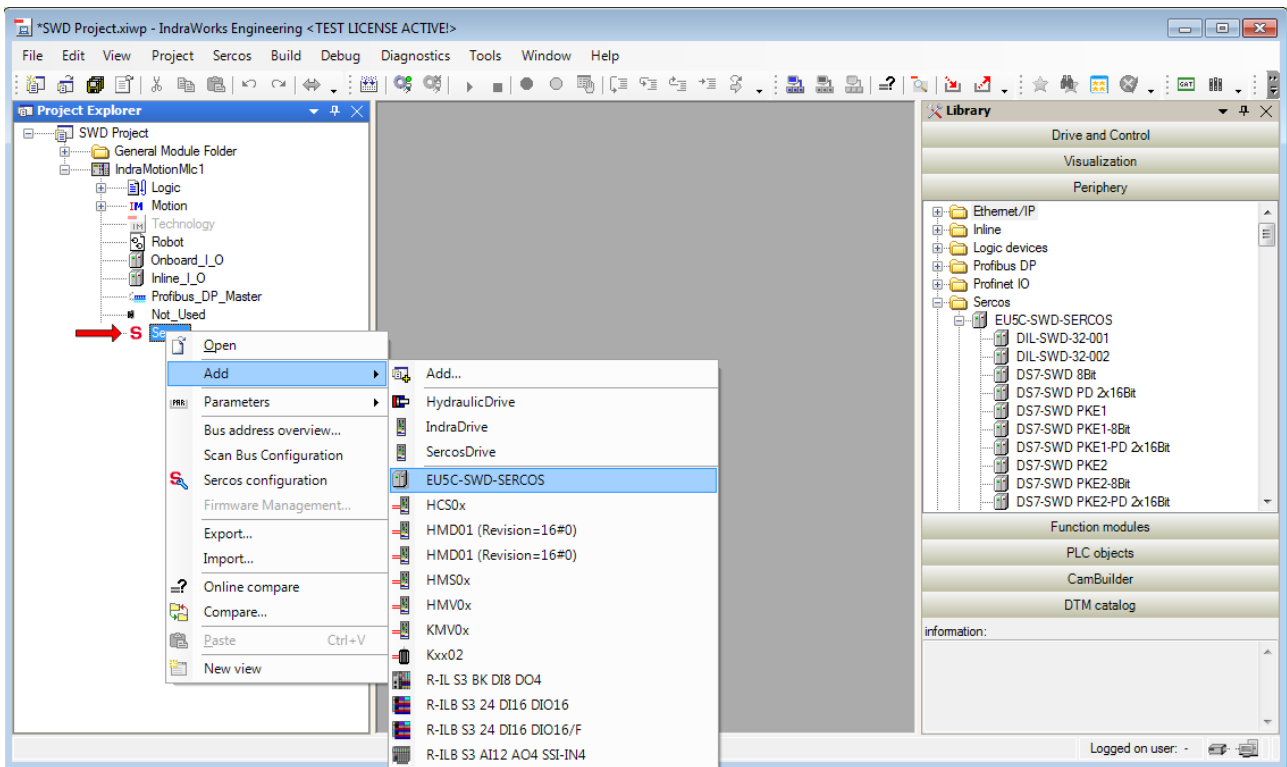


Figure 13: Add gateway to project



Note:

As an alternative, you can select the gateway in the **Library** under **Periphery > Sercos** and then drag & drop it onto the **Sercos** object in the **Project Explorer**. By using this drag & drop method, you can also place the gateway exactly between two already existing Sercos slaves.

➤ The gateway is displayed as Sercos slave (1) below the **Sercos** object in the **Project Explorer**.

Below the gateway object, a second entry (2) symbolizes the gateway as Sercos module (this is the gateway in its role as SmartWire-DT Coordinator or “head station” of the subordinate SmartWire-DT participants, see section *Configuring EU5C-SWD-SERCOS gateway as SmartWire-DT Coordinator* [▶ page 49] for more information on this).

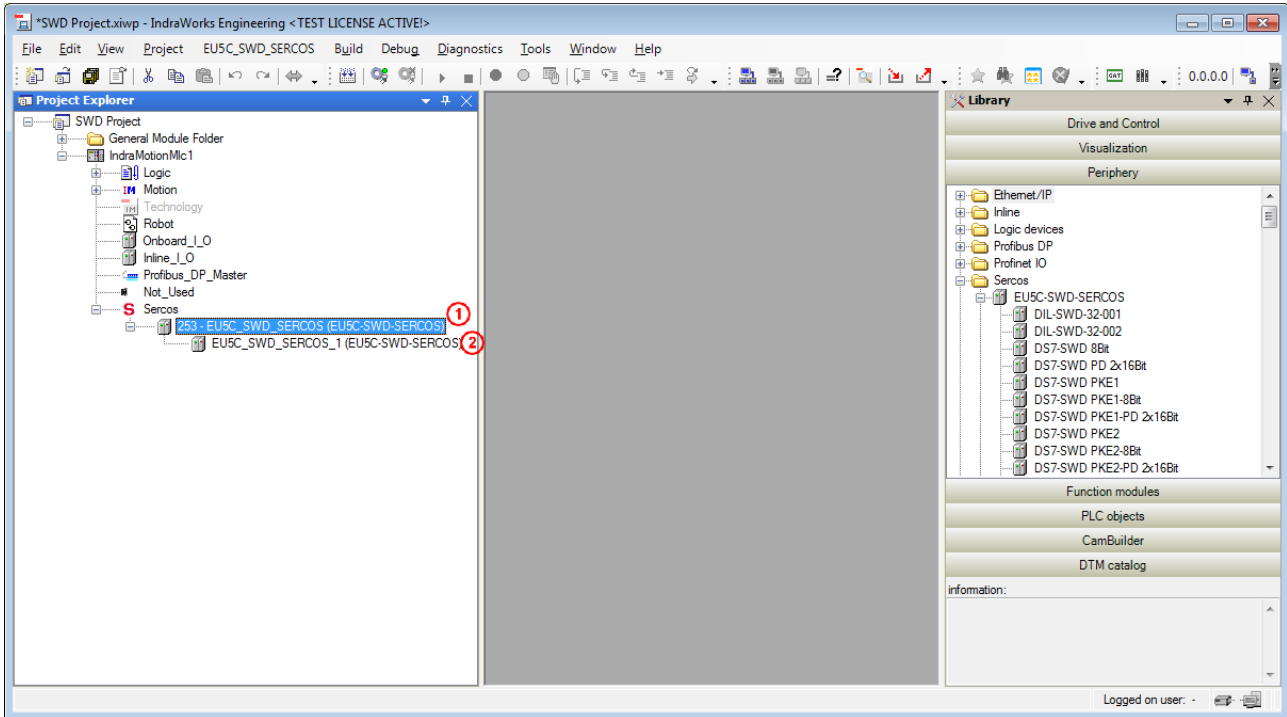


Figure 14: Gateway added as Sercos slave

6. Configure gateway as Sercos slave if necessary.

➤ In the **Project Explorer**, double-click **EU5C_SWD_SERCOS** object to open an editor in which you can configure the gateway as Sercos slave.

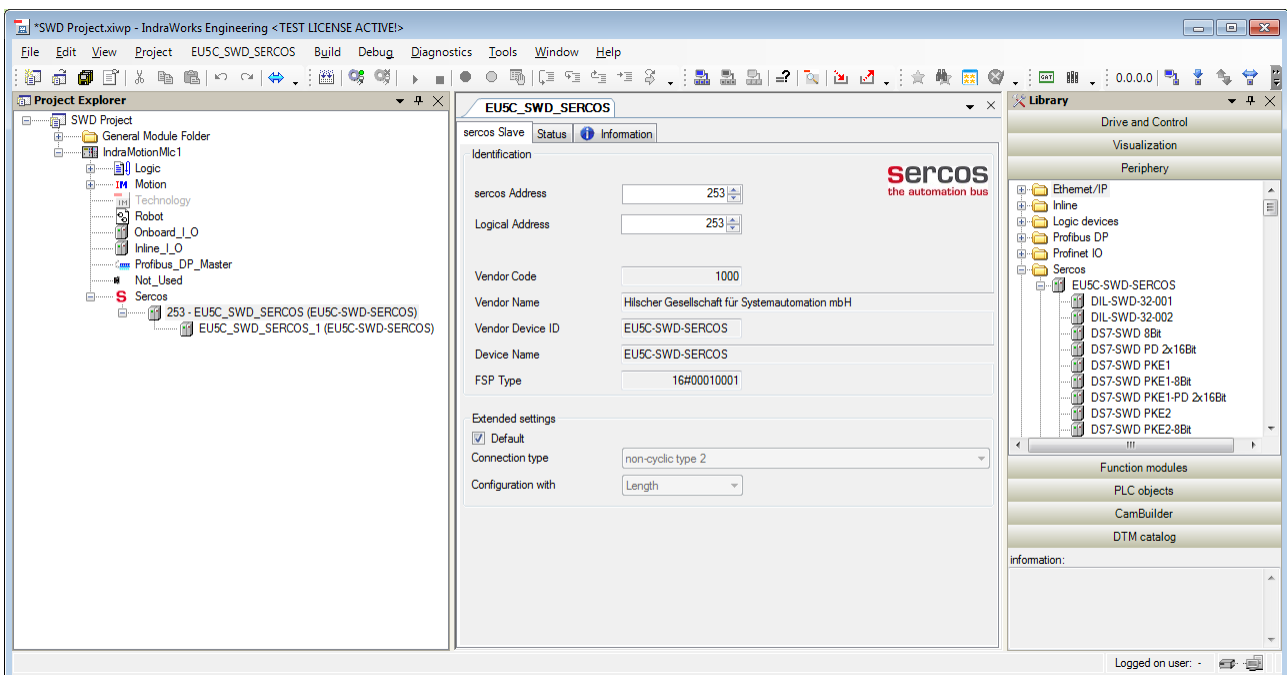


Figure 15: Sercos slave editor

7. Add SmartWire-DT participants (SWD device) to the project.

- In the **Project Explorer**, select **EU5C_SWD_SERCOS** object, then choose **Add > Module** from the context menu and select the SmartWire-DT device you want to add to the project. (As an alternative, you can select the SWD device in the **Library** under **Periphery > Sercos > EU5C-SWD-SERCOS** and then drag & drop it onto the **EU5C_SWD_SERCOS** object in the **Project Explorer**.)

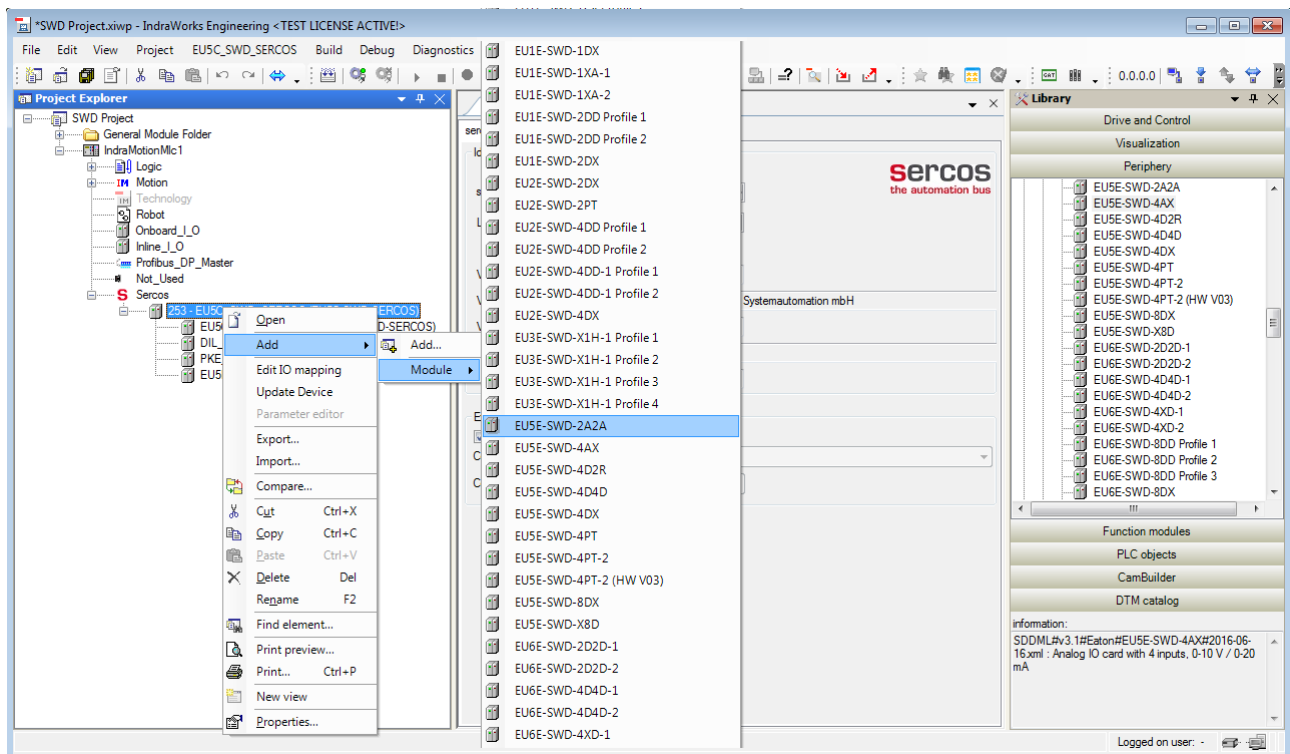


Figure 16: Add SmartWire-DT device as Sercos module to the project

- Add all SmartWire-DT devices which are part of your (secondary) SmartWire-DT network to the Sercos project in the manner described above.

9 Parameterization

9.1 Configuring EU5C-SWD-SERCOS gateway as SmartWire-DT Coordinator

Being the master device in the SmartWire-DT network, the EU5C-SWD-SERCOS gateway serves as a so-called “Coordinator” controlling the data transfer procedure within the SmartWire-DT network in accordance with the SmartWire-DT protocol. Via the Coordinator, you can configure the following properties:

- the Baud rate of the SmartWire-DT network (**Baudrate**)
- the handling of failing SmartWire-DT devices (**All Modules Optional**)
- the handling of the replacement of SmartWire-DT devices during bus operation (**Replace Mode**)

To configure the Coordinator parameters in IndraWorks® proceed as follows:

- In the **Project Explorer** double-click **EU5C_SWD_SERCOS_1 (EU5C-SWD-SERCOS)** object.

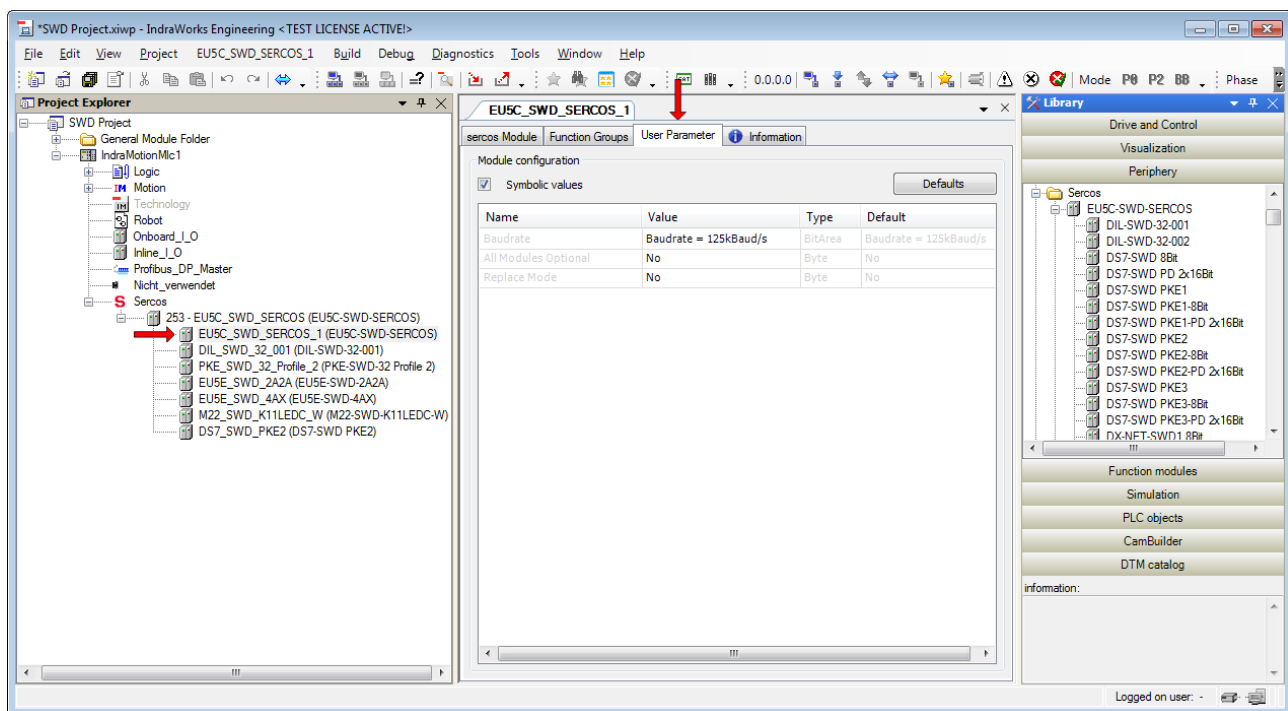


Figure 17: Configuring Coordinator parameters

- In the workspace area (middle of the window), the editor for the Sercos module opens.
- Select **User Parameter** tab.

- To change a Coordinator parameter, double-click the field you want to edit in the **Value** column, then click the small black triangle to open a drop-down list containing the optional values:

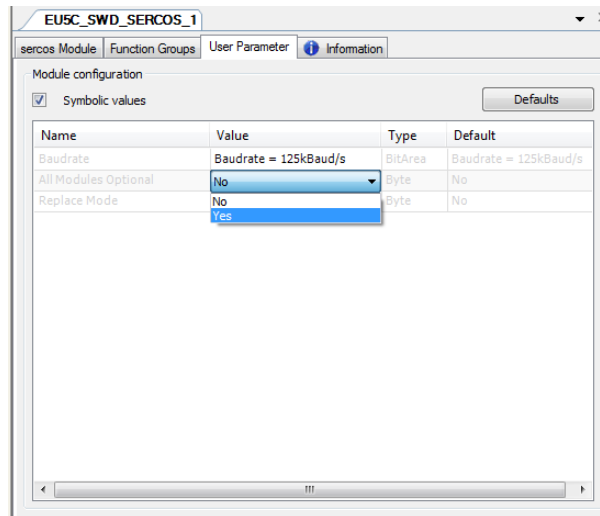


Figure 18: Changing Coordinator parameters

You can set the following parameters:

Parameter	Description	Value	Descriptions of the Values
Baudrate	SWD Baud rate	125 kBit/s (<i>Default</i>)	Baud rate of the SmartWire-DT network
		250 kBit/s	
All Modules Optional	Allows individual configuration whether a SmartWire-DT device can be missing or not	No	You can configure for each SmartWire-DT device individually in its Presence parameter, whether it is allowed to be missing or not. (<i>Default</i>) (See also section <i>Configuring options and parameters of SmartWire-DT devices</i> [▶ page 51])
		Yes	Data exchange with the Sercos master takes place even if there is a random number of missing devices in the SmartWire-DT network. The corresponding settings in the device options of the individual SmartWire-DT device thus have no effect and will be overruled.
Replace Mode	Online replacement of SmartWire-DT devices during bus operation is allowed	No	Online replacement is not allowed; new SmartWire-DT devices must always be read into the SWD configuration by pushing the configuration button. (<i>Default</i>)
		Yes	Allows online replacement of SmartWire-DT devices during bus operation <i>without</i> having to push the configuration button afterwards in order to read them into the SWD configuration.
		<p>Note: If this parameter is set to Yes, the All Modules Optional parameter must also be set to Yes, otherwise the whole SWD bus will be turned off after losing communication with one or several SWD devices.</p> <p>Please note also that online replacement during bus operation is only possible if SWD4-FFR-PF/ST.... power supply module/cable adapters are being used. Otherwise replacement must take place while power is switched off at the gateway. After return of voltage supply, the network will automatically be reconfigured (without having to push the configuration button).</p>	

Table 18: Coordinator parameters

9.2 Configuring options and parameters of SmartWire-DT devices

You can configure certain options and parameters of individual SmartWire-DT devices. For example, you can determine for each device individually whether its presence in the SmartWire-DT network is mandatory or whether it may be substituted by a universal module. For a couple of I/O modules, you can also configure typical parameters like sensor types or refresh rates.



Configurable parameters of the SmartWire-DT devices are described in the manual *SmartWire-DT Modules*, Doc ID MN05006001Z-EN, which is stored on the product DVD in the directory `Documentation\english\3. SmartWire-DT\SmartWire-DT - Units\MN05006001Z_EN.pdf`

To configure a SmartWire-DT device in IndraWorks® proceed as follows:

- In the **Project Explorer**, double-click the SmartWire-DT device you want to configure (in this example the **EU5C_SWD_2A2A** object).
- The Sercos module editor opens in the working area.
- Select **User Parameter** tab.

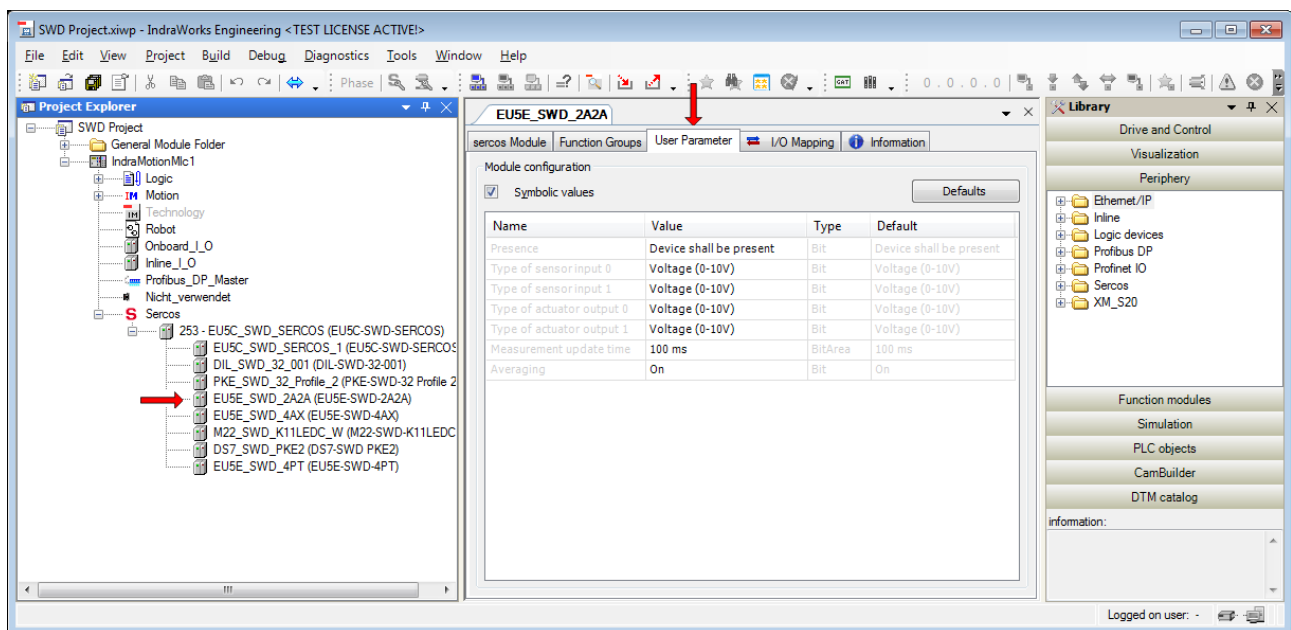


Figure 19: Configure device parameters

- To change a device parameter, double-click the field you want to edit in the **Value** column, then click the small black triangle to open a drop-down list containing the optional values:

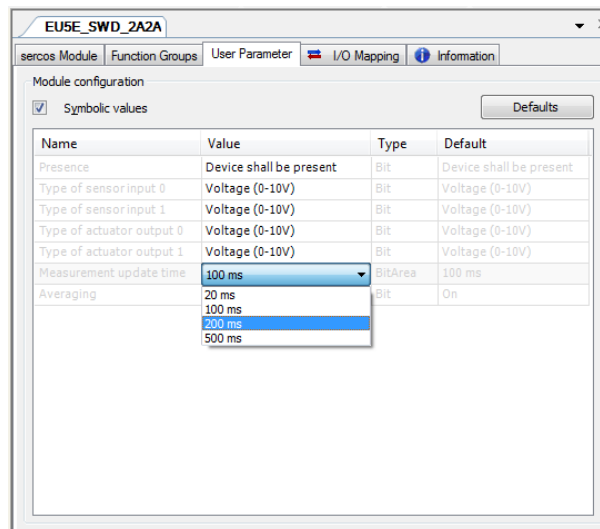


Figure 20: Change device parameter values

The following table shows the parameters of the **EU5C-SWD-2A2A** IO module. Note that the device option **Presence** is a feature of all SmartWire-DT devices; the other parameters listed here are specific to the **EU5C-SWD-2A2A** module, which means that other SmartWire-DT may have different parameters.



Individual parameters of SmartWire-DT devices are described in the manual *SmartWire-DT Modules*, Doc ID MN05006001Z-EN, which is stored on the product DVD in the directory `Documentation\english\3.SmartWire-DT\SmartWire-DT - Units\MN05006001Z_EN.pdf`

Parameter	Description	Value	Descriptions of the values
Presence	Presence in SmartWire-DT network	Device shall be present	Device must be present in current SmartWire-DT bus configuration (default)
		Device may be not present	Device may be absent in current SWD bus configuration
Type of sensor input 0	Sensor selector (signal range) input 0	Voltage (0-10V)	Voltage sensor (0-10 V) (default)
		Current (0-20mA)	Current sensor (0-20 mA)
Type of sensor input 1	Sensor selector (signal range) input 1	Voltage (0-10V)	Voltage sensor (0-10 V) (default)
		Current (0-20mA)	Current sensor (0-20 mA)
Type of actuator output 0	Actuator selector (signal range) output 0	Voltage (0-10V)	Voltage (0-10 V) (default)
		Current (0-20mA)	Current (0-20 mA)
Type of actuator output 1	Actuator selector (signal range) output 1	Voltage (0-10V)	Voltage (0-10 V) (default)
		Current (0-20mA)	Current (0-20 mA)
Measurement update time	Refresh rate of measured value	20 ms 100 ms (default) 200 ms 500 ms	Refresh rate of measured values to SmartWire-DT network in milliseconds
Averaging	Mean value function	On	Averaging function to smooth out input signal fluctuations (default)
		Off	No averaging

Table 19: Configurable device options and parameters of SWD slave (EU5C-SWD-2A2A example)

10 Acyclical communication

10.1 Overview

The Sercos master can exchange acyclic data with individual SmartWire-DT slaves via the gateway by using the following IDNs:

P-0-2000.[x].1

P-0-2000.[x].2

P-0-2000.[x].3 (Procedure Command).

[x] represents the address of the concerned SmartWire-DT slave within the SWD network.

**Note:**

For acyclic data exchange with the SmartWire-DT slaves, the gateway must be in communication phase 4 (CP4).

The subsequent section describes a typical acyclic communication process (see also diagram on the following page):

1. The Sercos master writes a task (read or write request) for a SmartWire-DT slave into the IDN P-0-2000.[x].1
2. The task is activated by the procedure command IDN P-0-2000.[x].3
3. The gateway forwards the task to the SWD slave. The SWD slave executes the requested read or write task in the specified SWD Index.
4. The answer from the SWD slave arrives at the gateway and is written to the IDN P-0-2000.[x].2.
The gateway reports successful execution of the procedure command.
5. The Sercos master can now read the response from the IDN P-0-2000.[x].2

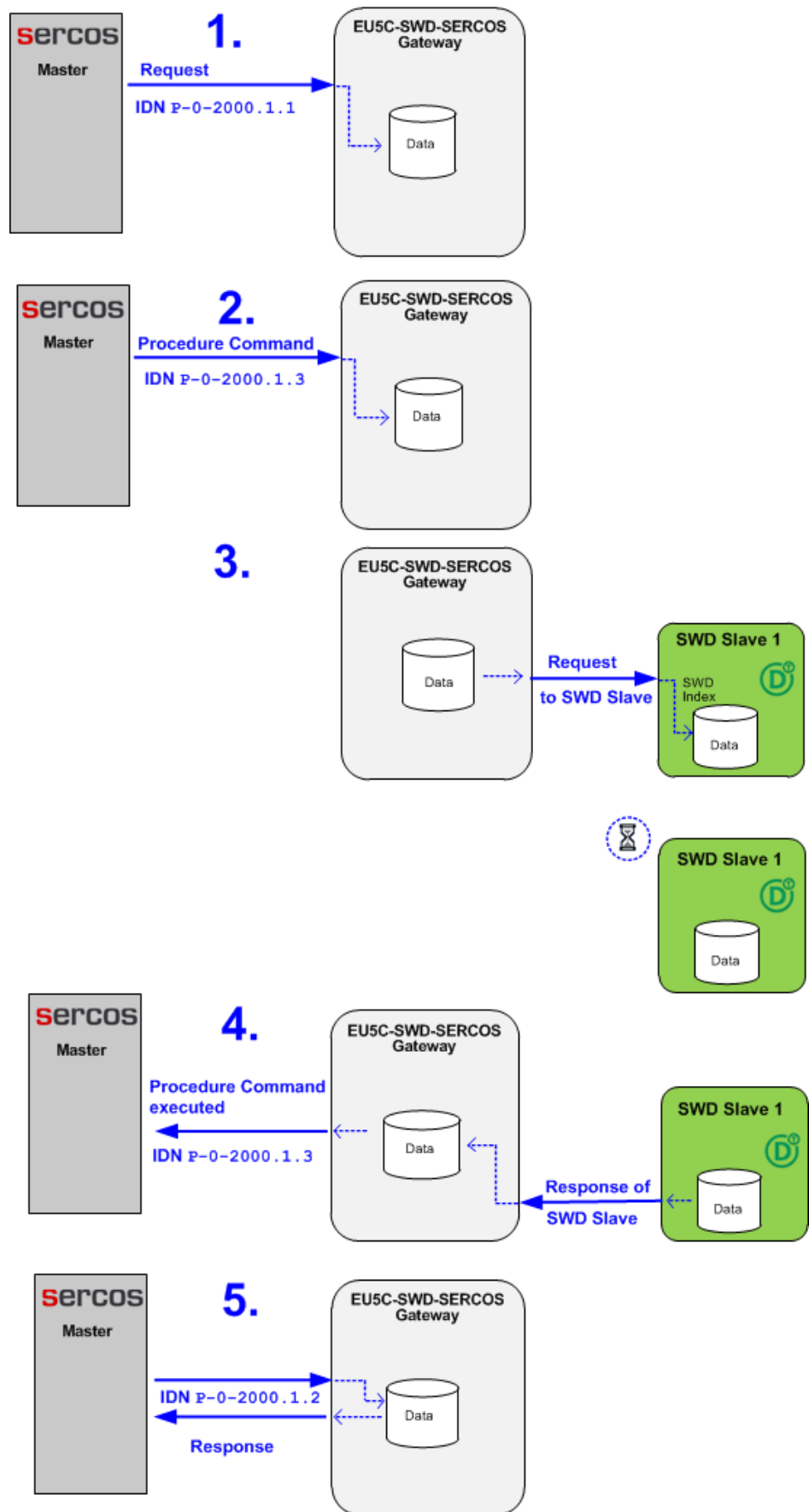


Figure 21: Acyclic communication

10.2 Read request: reading data of an SWD Slave

10.2.1 Overview: read request

Configuring read request

A reading task (read request) for a SmartWire-DT slave is written into the IDN $P-0-2000.[x].1$ by the Sercos master, whereby $[x]$ is representing the address of the concerned SWD slave.

The IDN contains the following elements:

Element	Description	Data type	Value / value range
SWD Index	SWD-specific index of the SWD slave. Determines which kind of data you want to read, e. g. error counter	uint8	0...255
Request Type	Type of request. A read request must have the value 0	uint8	0
Length	Maximum length of the expected response in bytes. Must be at least as long as the SWD object (in bytes)	uint8	1...120

Table 20: Elements of IDN $P-0-2000.x.1$ for read request

Activating read request

After having configured the read request, the Sercos master uses the procedure command IDN $P-0-2000.[x].3$ to activate the task, whereby $[x]$ is representing the address of the concerned SWD slave.

Reading response of read request

After the procedure command has been completed, the Sercos master can read the response from the IDN $P-0-2000.[x].2$, whereby $[x]$ is representing the address of the concerned SWD slave.

The IDN contains the following elements:

Element	Description	Data type	Value / value range
SWD Index	SWD index of the data which has been read, e. g. error counter	uint8	0...255
Request Type	Type of request. A read request has the value 0	uint8	0
Length	Length of the received response (payload data) in bytes	uint8	1...120
Result	State of response	uint32	0x00000000 = no error 0xC0AD0002 = JOBID_BUFFER_FULL (buffer for acyclic tasks is full) 0xC0AD0003 = JOB_DENIED (task denied) 0xC0AD0004 = NOT_AVAILABLE (SWD slave is not available)
Data	Payload data which has been read according to SWD Index, e. g. error counter	uint8 $[n-1]$ *	(...)
		* n = amount of read bytes	

Table 21: Elements of IDN $P-0-2000.x.2$

10.2.2 Read request example


The following step-by-step instructions show how to read the error counter of SmartWire-DT slave #1 by using the IndraWorks® ML 14V10 P2 engineering tool.

- SWD Index of error counter: 127 (hex: 0x7F)
- Request type for reading task: 0 (hex: 0x00)
- Maximum length of expected response in bytes: 120 (hex: 0x78)

Prerequisites

- You are connected and logged-in at the Sercos PLC/Master via IndraWorks.
- The gateway is connected to the Sercos PLC/Master and is in communication phase 4 (CP4).

Step-by-step instructions

1. Open parameter editor.
 - In the **Project Explorer**, select the gateway then click the  parameter editor symbol in the tool bar.

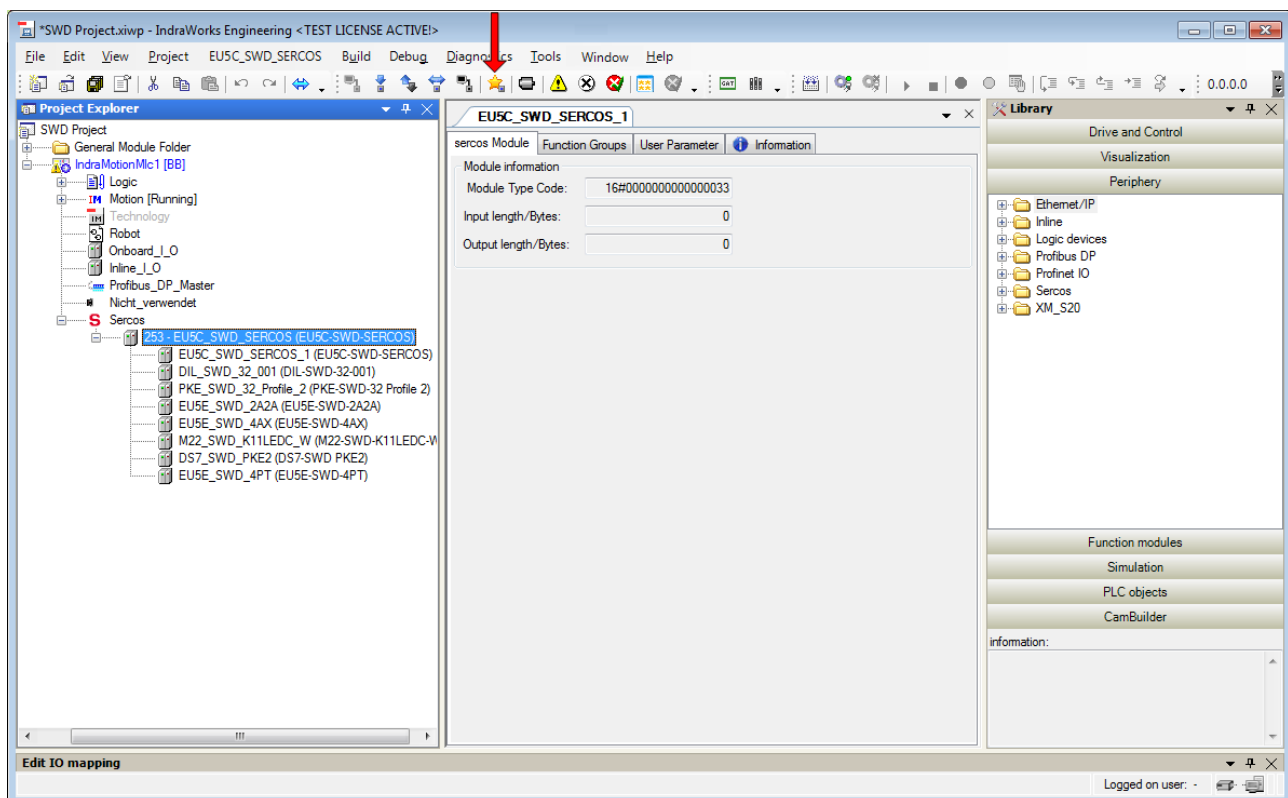


Figure 22: Open parameter editor

- The parameter editor opens.

2. Configure read request.

- In the **IDN** field, enter `s-0-2000.1.1` then press **Enter** on your keyboard.
- Enter SWD Index in field **0**, Request Type in field **1** and the length of the expected response in field **2**:

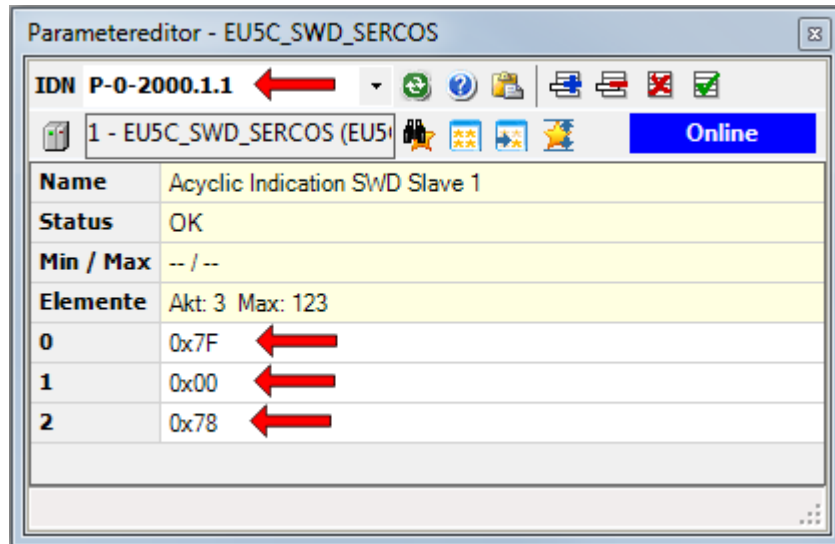


Figure 23: Configure read request

- Press **Enter** on your keyboard.
3. Activate read request.
- In the **IDN** field, enter `s-0-2000.1.3` then press **Enter** on your keyboard.
 - In the **Value** field, set the last two digits to 11.

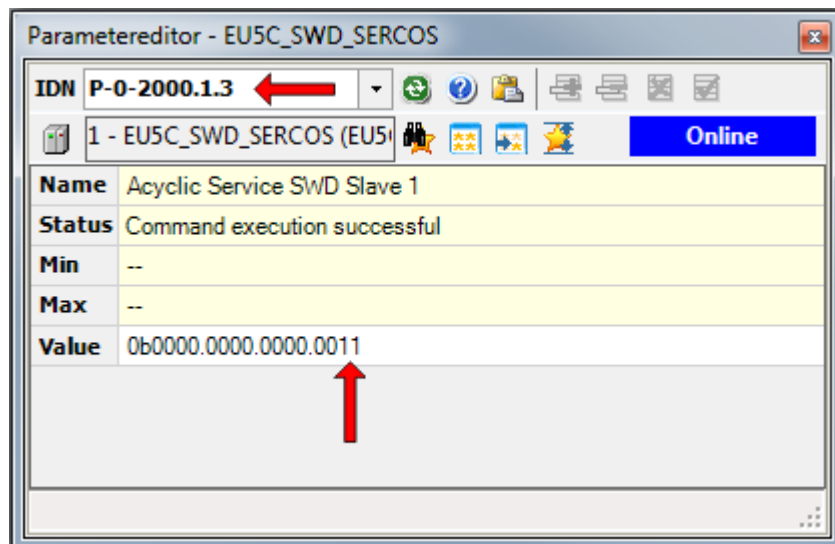


Figure 24: Activate read request

- Press **Enter** on your keyboard to issue this procedure command and thus activate the read request on the gateway.

4. View response of read request.
 - In the **IDN** field, enter `S-0-2000.1.2` then press **Enter** on your keyboard to view the response of the read request:

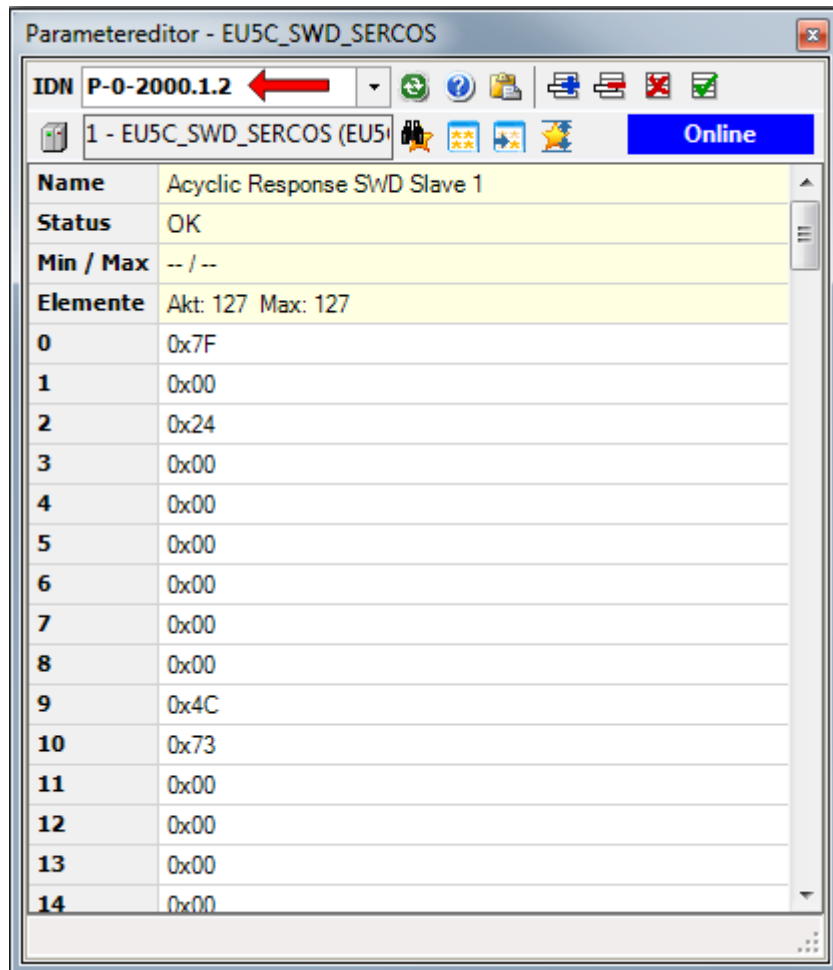


Figure 25: View response

Field **0**: SWD Index

Field **1**: Request Type

Field **2**: Length

Feld **3...6**: Result

Feld **7...n**: Data

10.3 Write request: writing data to an SWD Slave

10.3.1 Overview write request

Configuring write request

A writing task (write request) for a SmartWire-DT slave is written into the IDN $P-0-2000.[x].1$ by the Sercos master, whereby $[x]$ is representing the address of the concerned SWD slave.

The IDN contains the following elements:

Element	Description	Data type	Value / value range
SWD Index	SWD-specific index of the SWD slave. Determines where to write the data to, e. g. error counter	uint8	0...255
Request Type	Type of request. A write request must have value 1	uint8	1
Length	Length of the data (in bytes) to be written	uint8	1...120
Data	Data to be written	uint8 $[n-1]^*$	(...)
		* n = amount of bytes to be written	

Table 22: Elements of IDN $P-0-2000.[x].1$ for write request

Activating write request

After having configured the write request, the Sercos master uses the procedure command IDN $P-0-2000.[x].3$ to activate the task, whereby $[x]$ is representing the address of the concerned SWD slave.

Reading result of write request

After the procedure command has been completed, the Sercos master can read the result from the IDN $P-0-2000.[x].2$, whereby $[x]$ is representing the address of the concerned SWD slave.

The IDN contains the following elements:

Element	Description	Data type	Value / value range
SWD Index	SWD index of the data which has been written, e. g. error counter	uint8	0...255
Request Type	Type of request. A write request has value 1	uint8	1
Length	Length of the received response (payload data) in bytes. Has value 0 in a write request	uint8	0
Result	State of request	uint32	0x00000000 = no error 0xC0AD0002 = JOBID_BUFFER_FULL (buffer for acyclic tasks is full) 0xC0AD0003 = JOB_DENIED (task denied) 0xC0AD0004 = NOT_AVAILABLE (SWD slave is not available)

Table 23: Elements of IDN $P-0-2000.[x].2$ for write request

10.3.2 Write request example


The following step-by-step instructions show how to reset the error counter of SWD slave #1 to value 0 by using the IndraWorks® ML 14V10 P2 engineering tool.

- SWD Index of error counter: 127 (hex: 0x7F)
- Request type for writing task: 1 (hex: 0x01)
- Length of data to be written in bytes: 1 (hex: 0x01)
- Data (value) to be written: 0 (hex: 0x00)

Prerequisites

- You are connected and logged-in at the Sercos PLC/Master via IndraWorks.
- The gateway is connected to the Sercos PLC/Master and is in communication phase 4 (CP4).

Step-by-step instructions

1. Open parameter editor.
 - In the **Project Explorer**, select the gateway then click  parameter editor symbol in the tool bar.

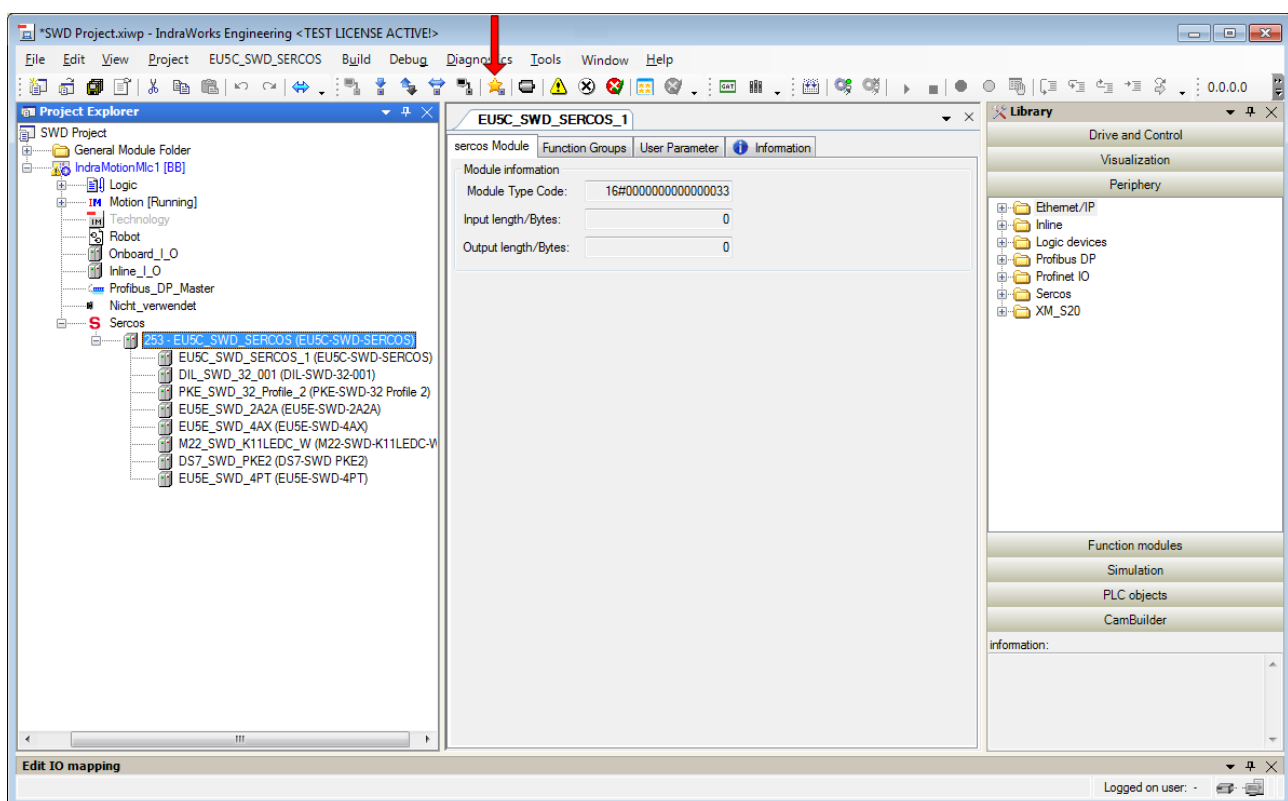


Figure 26: Open parameter editor

- The parameter editor opens.

2. Configure write request.

- In the **IDN** field, enter `S-0-2000.1.1` then press **Enter** on your keyboard.
- Enter SWD Index in field **0**, Request Type in field **1**, length in field **2** and the data to be written (the reset-value) in field **3**:

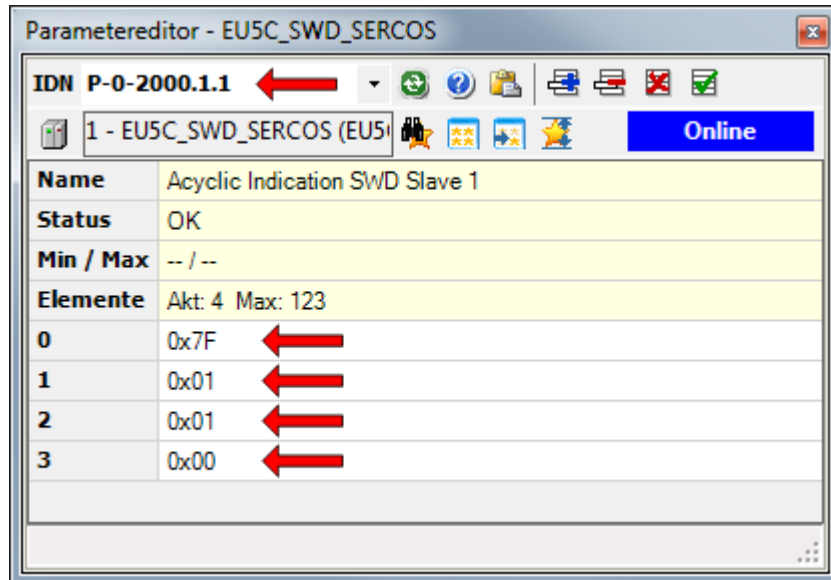


Figure 27: Configure write request

- Press **Enter** on your keyboard.
3. Activate write request.
- In the **IDN** field, enter `S-0-2000.1.3` then press **Enter** on your keyboard.
 - In the **Value** field, set the last two digits to 11.

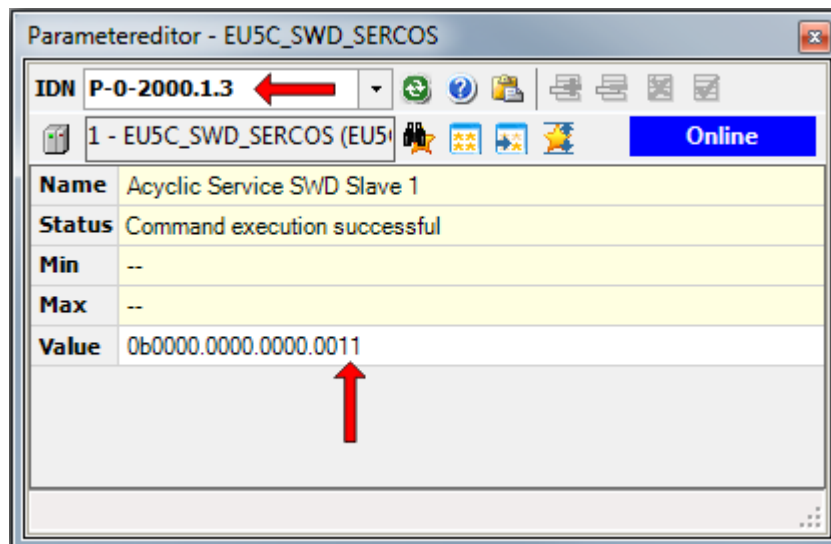


Figure 28: Activate write request

- Press **Enter** on your keyboard to issue this procedure command and thus activate the write request on the gateway.

4. View result of write request.
 - In the **IDN** field, enter `S-0-2000.1.2` then press **Enter** on your keyboard to view the result of the write request:

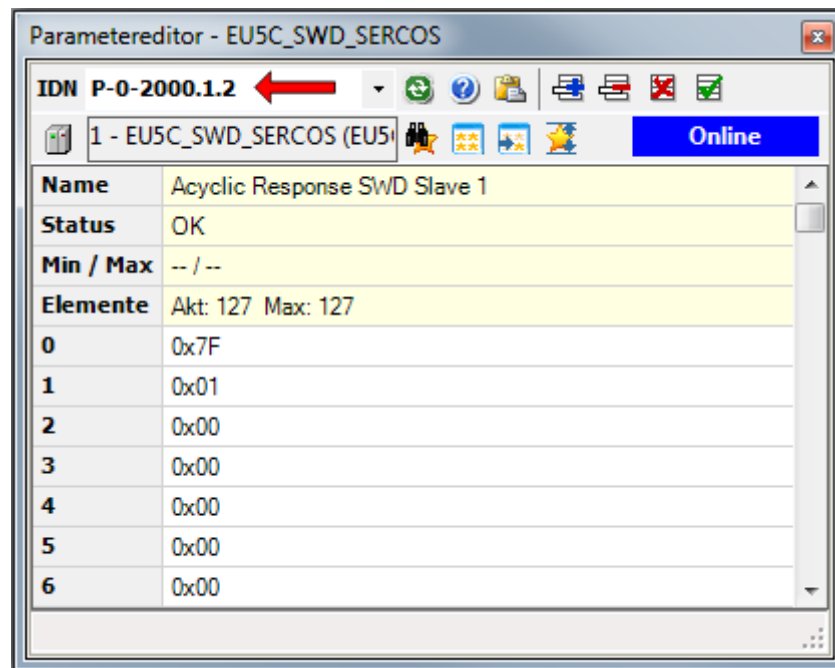


Figure 29: View result of write request

Field **0**: SWD Index

Field **1**: Request Type

Field **2**: Length

Field **3**: Result

11 Diagnosis

11.1 Overview

The gateway reports errors/warnings concerning the gateway, concerning the state of the SmartWire-DT network or concerning individual SmartWire-DT slaves by means of “standard” Sercos diagnostic IDNs:

S-0-0390.0.0 (Diagnostic Number)

S-0-0095.0.0 (Diagnostic Message)

S-0-1500.0.32 (IO Diagnostic Message)

S-0-0390.0.0 (Diagnostic Number)

This IDN contains the newest reported diagnosis. The uint32 value is coded as follows:

Bit	Element	Value / value range	Meaning
31 ... 30	Interpretation of bits 29 ... 0	0x00	Bits 29...16 (Source Type and Diagnosis Class) are defined by Sercos. Bits 15...0 (Status Code) are defined by manufacturer.
29 ... 24	Source Type	0x01	FSP IO (further details available in IO Diagnostic message)
23 ... 20	Reserved	-	-
19 ... 16	Diagnosis Class	0x0E	Warning (C2D) (see section <i>Diagnosis messages of individual SWD slaves (Diagnosis Class = Warning)</i> [▶ page 66])
		0x0F	Error (C1D) (see section <i>Diagnosis messages generated by the gateway (Diagnosis Class = Error)</i> [▶ page 70])
15 ... 0	Status Code	0x0000 ... 0xFFFF	In case of Diagnosis Class = 0x0E (warning), this is the SWD-specific Diagnosis Code of the concerned SWD device. In case of Diagnosis Class = 0x0F (error), see table <i>Diagnosis Codes of the Gateway</i> in section <i>Diagnosis messages generated by the gateway (Diagnosis Class = Error)</i> [▶ page 70].

Table 24: Coding of Diagnostic Number

S-0-0095.0.0 (Diagnostic Message)

This IDN contains a descriptive statement (e. g. Mandatory SmartWire-DT module missing) related to the diagnostic number reported in IDN S-0-0390.0.0.

S-0-1500.0.32 (IO Diagnostic Message)

This IDN contains additional information related to the diagnostic number reported in IDN S-0-0390.0.0. The uint64 value is coded as follows:

Bit	Element	Value / value range	Meaning
63	Interpretation of Status Code (bits 55 ... 40)	1	Status Code is defined by manufacturer
62 ... 60	Reserved	-	-
59 ... 56	Diagnosis Class	0x0E	Warning (C2D) (see section <i>Diagnosis messages of individual SWD slaves (Diagnosis Class = Warning)</i> [▶ page 66])
		0x0F	Error (C1D) (see section <i>Diagnosis messages generated by the gateway (Diagnosis Class = Error)</i> [▶ page 70])
55 ... 40	Status Code	0x0000 ... 0xFFFF	In case of Diagnosis Class = 0x0E (warning), this is the SWD-specific Diagnosis Code of the concerned SWD slave. In case of Diagnosis Class = 0x0F (error), see table <i>Diagnosis Codes of the Gateway</i> in section <i>Diagnosis messages generated by the gateway (Diagnosis Class = Error)</i> [▶ page 70].
39 ... 24	Number of IO Function Group	0x05E3	Complex protocol
23 ... 16	Slot Number	0x00	Gateway-specific diagnosis
		0x01 ... 0x63	Address of concerned SWD slave
15 ... 8	Sub Bus Slave Index	0	-
7 ... 0	Channel Number	0	-

Table 25: Coding of IO Diagnostic Message

11.2 Diagnosis messages of individual SWD slaves (Diagnosis Class = Warning)

11.2.1 Overview “Warning”

Diagnostic messages issued by individual SmartWire-DT devices are reported in IDN `S-0-0390.0.0` (Diagnostic Number) as **Diagnosis Class = Warning** (bits 19...16 = `0x0E`).

In this case the **Status Code** contains the corresponding SmartWire-DT diagnosis code.



The diagnosis codes of individual SmartWire-DT slaves can be looked-up in the user manual of the corresponding device (for devices manufactured by Eaton, for example, this would be the manual *SmartWire-DT modules*, MN05006001Z-EN).

In case of **Diagnosis Class = Warning**, the IDN `S-0-0095.0.0` (Diagnostic Message) always contains the standard text `SmartWire-DT specific diagnosis`.

The address of the concerned SmartWire-DT slave is indicated in the **Slot Number** (Bits 23 ... 16) of the IDN `S-0-1500.0.32` (IO Diagnostic Message).



Note:

Messages of **Diagnosis Class = Warning** do not need to be acknowledged by the Sercos master. Once the cause of the warning has been removed, the diagnosis gets cleared from the IDNs.

11.2.2 “Warning” example

The SmartWire-DT device **EU2E-SWD-4DX** at position #4 in the SmartWire-DT network transmits diagnosis No sensor connected to connector X2 (Status Code = 0x001C).

This diagnosis will be shown in IndraWorks® as follows:

- Double-click the gateway in the **Project Explorer**, then open **Status** tab.

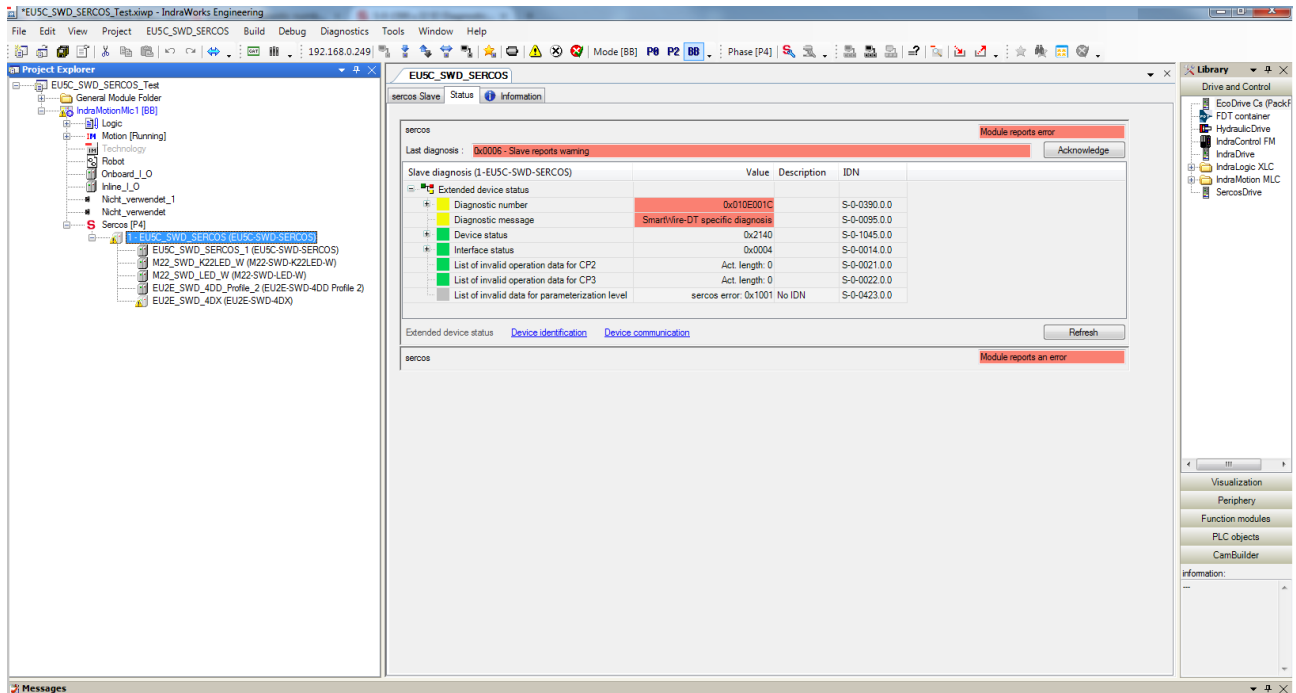


Figure 30: SmartWire-DT specific Diagnosis

S-0-0390.0.0 (Diagnostic Number)

Diagnostic number	0x010E001C	S-0-0390.0.0
Interpretation of bits 29-0	Bit 31-30	S-0-0390.0.0
Online	0x00 manufacturer specific status codes	
source type	Bit 29-24	S-0-0390.0.0
Online	0x01 FSP IO	
class	Bit 19-16	S-0-0390.0.0
Online	0x0E Warning (C2D)	
Status Code	Bit 15-0	S-0-0390.0.0
Online	0x001C manufacturer specific code	

Figure 31: Diagnostic Number for Warning

Bit	Element	Value	Meaning
31 ... 30	Interpretation of bits 29 ... 0	0x00	Bits 29...16 (Source Type and Diagnosis Class) are defined by Sercos. Bits 15...0 (Status Code) are defined by manufacturer.
29 ... 24	Source Type	0x01	FSP IO (further details available in IO Diagnostic message)
23 ... 20	Reserved	-	-
19 ... 16	Diagnosis Class	0x0E	Warning (C2D)
15 ... 0	Status Code	0x001C	SWD-specific Diagnosis Code of the concerned SWD device: „No sensor connected to connector X2“ (see manual of concerned SWD device)

Table 26: Coding of Diagnostic Number for Warning

S-0-0095.0.0 (Diagnostic Message)

Diagnostic message	SmartWire-DT specific diagnosis	S-0-0095.0.0
--------------------	---------------------------------	--------------

Figure 32: Diagnostic Message for Warning

S-0-1500.0.32 (IO Diagnostic Message)

- Open parameter editor, enter IDN S-0-1500.0.32 then press **Enter** on your keyboard.

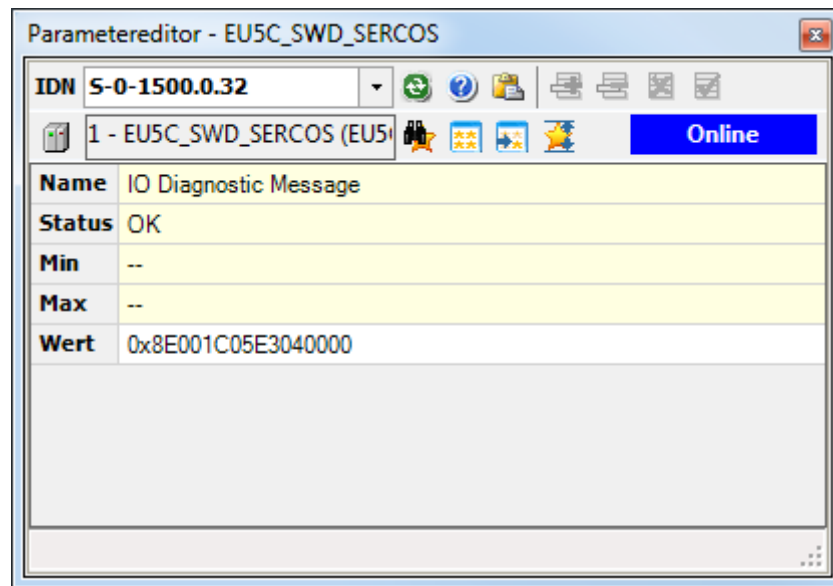


Figure 33: IO Diagnostic Message for Warning

Bit	Element	Value	Meaning
63	Interpretation of Status Code (bits 55 ... 40)	1	Status Code is defined by manufacturer
62 ... 60	Reserved	-	-
59 ... 56	Diagnosis Class	0x0E	Warning (C2D)
55 ... 40	Status Code	0x001C	SWD-specific Diagnosis Code of the concerned SWD device: „No sensor connected to connector X2“ (see manual of concerned SWD device)
39 ... 24	Number of IO Function Group	0x05E3	1507 Complex Protocol
23 ... 16	Slot Number	0x04	Address of concerned SWD device (4)
15 ... 8	Sub Bus Slave Index	0x00	-
7 ... 0	Channel Number	0x00	-

Table 27: Coding of IO Diagnostic Message for Warning

11.3 Diagnosis messages generated by the gateway (Diagnosis Class = Error)

11.3.1 Overview “Error”

All diagnostic messages related to communication issues are reported in IDN `S-0-0390.0.0` (Diagnostic Number) as **Diagnosis Class = Error** (bits 19...16 = `0x0F`).

This includes configuration errors, SmartWire-DT network errors and internal errors of the gateway.

The **Status Code** contains the relevant diagnosis code. The IDN `S-0-0095.0.0` (Diagnostic Message) contains the corresponding descriptive statement of the error cause.

In case the error is related to an individual SmartWire-DT slave (e. g. if a mandatory slave device is missing in the SWD network), the address of the concerned SWD slave is indicated in the **Slot Number** (bits 23 ... 16) of the IDN `S-0-1500.0.32` (IO Diagnostic Message).



Note:

Messages of **Diagnosis Class = Error** require an acknowledgement by the Sercos master. Once the cause of the warning has been removed, the diagnosis gets only cleared from the IDNs after acknowledgement by the master.

The following table shows the diagnosis codes of the gateway that can be conveyed in the **Status Code** elements of the IDNs `S-0-0390.0.0` and `S-0-1500.0.32` next to the corresponding descriptive text statement of the IDN `S-0-0095.0.0` (**Diagnostic Message**):

Status Code	Diagnostic Message	Meaning
0x0001	Internal error	Internal error of an SmartWire-DT slave
0x0002	Error loading target configuration	Error while loading SmartWire-DT target configuration
0x0003	Error checking target configuration	Error while checking SmartWire-DT target configuration
0x0004	Error saving target configuration	Error while saving SmartWire-DT target configuration
0x0005	Error checking project configuration	Error while checking SmartWire-DT project configuration
0x0006	No SmartWire-DT modules detected	No SmartWire-DT slaves detected
0x0007	Unsupported SmartWire-DT module detected	Unknown SmartWire-DT slave detected
0x0008	Max SmartWire-DT modules exceeded	Maximum number of SmartWire-DT slaves exceeded
0x0009	IO data timeout	SmartWire-DT IO data exchange timeout
0x000A	Error checking ASIC Watchdog	Error while checking ASIC communication Watchdog
0x000B	Mandatory SmartWire-DT module missing	Mandatory SmartWire-DT slave is missing
0x000C	Optional SmartWire-DT module missing	Optional SmartWire-DT slave is missing

Table 28: Diagnosis Codes of Gateway

11.3.2 “Error” Example

The absence of a mandatory SmartWire-DT slave (in this example the slave is expected at position #2 of the SmartWire-DT network) will be diagnosed in IndraWorks® as follows:

- Double-click the gateway in the **Project Explorer**, then open **Status** tab.

S-0-0390.0.0 (Diagnostic Number)

Diagnostic number	0x010F000B	S-0-0390.0.0
Interpretation of bits 29-0	Bit 31-30	S-0-0390.0.0
Online	0x00 manufacturer specific status codes	
source type	Bit 29-24	S-0-0390.0.0
Online	0x01 FSP IO	
class	Bit 19-16	S-0-0390.0.0
Online	0x0F Error (C1D)	
Status Code	Bit 15-0	S-0-0390.0.0
Online	0x000B manufacturer specific code	

Figure 34: Diagnostic Number for Error

Bit	Element	Value	Meaning
31 ... 30	Interpretation of bits 29 ... 0	0x00	Bits 29...16 (Source Type and Diagnosis Class) are defined by Sercos. Bits 15...0 (Status Code) are defined by manufacturer.
29 ... 24	Source Type	0x01	FSP IO (further details available in IO Diagnostic message)
23 ... 20	Reserved	-	-
19 ... 16	Diagnosis Class	0x0F	Error (C1D)
15 ... 0	Status Code	0x000B	Gateway-specific Diagnosis Code: „Mandatory SmartWire-DT module missing“ (see table <i>Diagnosis Codes of Gateway</i> in section <i>Overview “Error”</i> [page 70])

Table 29: Coding of Diagnostic Number for Error

S-0-0095.0.0 (Diagnostic Message)

Diagnostic message	Mandatory SmartWire-DT module missing	S-0-0095.0.0
--------------------	---------------------------------------	--------------

Figure 35: Diagnostic Message for Error

S-0-1500.0.32 (IO Diagnostic Message)

- Open parameter editor, enter IDN S-0-1500.0.32 then press **Enter** on your keyboard.

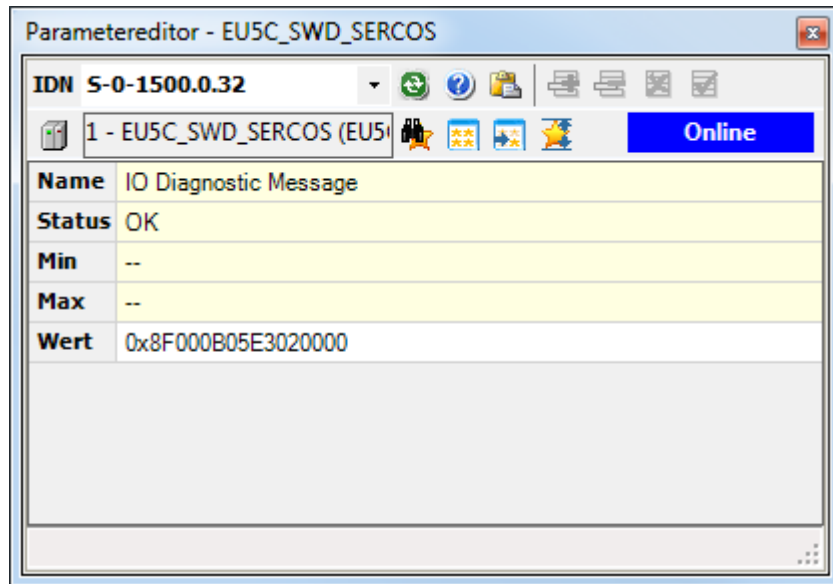


Figure 36: IO Diagnostic Message for Error

Bit	Element	Value	Meaning
63	Interpretation of Status Code (bits 55 ... 40)	1	Status Code is defined by manufacturer
62 ... 60	Reserved	-	-
59 ... 56	Diagnosis Class	0x0F	Error (C1D)
55 ... 40	Status Code	0x000B	Gateway-specific Diagnosis Code: „Mandatory SmartWire-DT module missing“ (see table <i>Diagnosis Codes of Gateway</i> in section <i>Overview "Error"</i> [▶ page 70])
39 ... 24	Number of IO Function Group	0x05E3	1507 Complex Protocol
23 ... 16	Slot Number	0x02	Address of concerned SWD slave (2)
15 ... 8	Sub Bus Slave Index	0x00	-
7 ... 0	Channel Number	0x00	-

Table 30: Coding of IO Diagnostic Message for Error

12 Changing IP address of gateway

12.1 Overview

In its state of delivery, the EU5C-SWD-SERCOS gateway has the following IP network settings:

- IP address: 192.168.0.1
- Subnet mask: 255.255.255.0
- Gateway address (standard gateway/router): 192.168.0.100

You can change the IP network settings of the gateway and adapt them to your standard company network IP settings – e. g. in order to easily update the firmware of the gateway via its web interface (for this, see also section *Updating firmware via web interface* [▶ page 79]).

To change the IP network settings, use the following Sercos standard parameter:

- Changing IP address: IDN S-0-1020.0.0
- Changing subnet mask: IDN S-0-1021.0.0
- Changing gateway address (standard gateway/router): IDN S-0-1022.0.0
- Activate new settings (“procedure command”): IDN S-0-1048.0.0

**Note:**

To change its IP settings the gateway must be in communication phase 2 (CP2).

The new settings can afterwards be checked by using the following IDNs:

- Reading IP address: IDN S-0-1020.0.1
- Reading subnet mask: IDN S-0-1021.0.1
- Reading gateway address (standard gateway/router): IDN S-0-1022.0.1


12.2 Example: Changing IP address of gateway with IndraWorks

This section shows how to change the IP network settings of the gateway by using the IndraWorks® ML 14V10 P2 Engineering Tool.

Prerequisites

- You are connected and logged-in at the Sercos PLC/Master via IndraWorks.
- The gateway is connected to the Sercos PLC/Master and is in communication phase 2 (CP2).

Step-by-step instructions

1. Open parameter editor.
 - In the **Project Explorer**, select the gateway then click  parameter editor symbol in the tool bar:

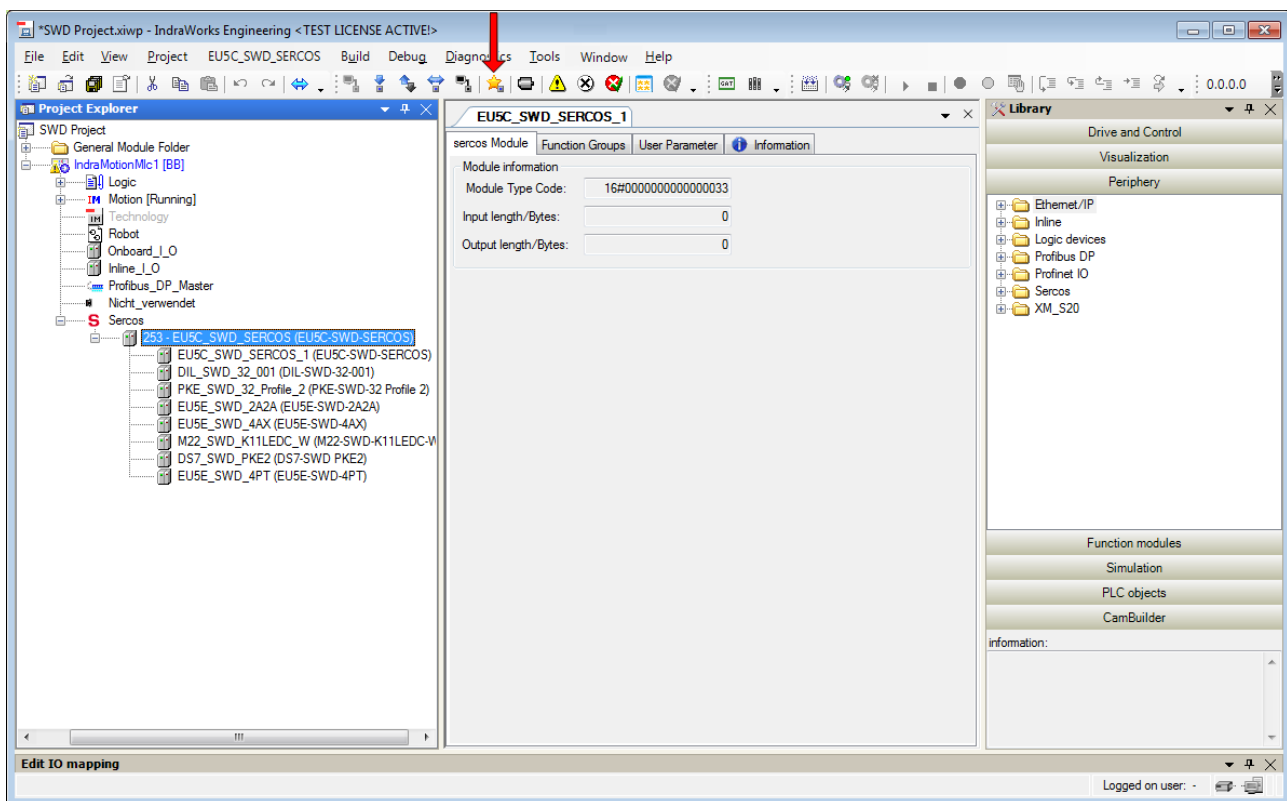


Figure 37: Open parameter editor

- The parameter editor opens.

2. Change IP address.

- In the **IDN** field, enter `S-0-1020.0.0` then press **Enter** on your keyboard.
- Enter new IP address values in fields **0** to **3** then press **Enter** on your keyboard:

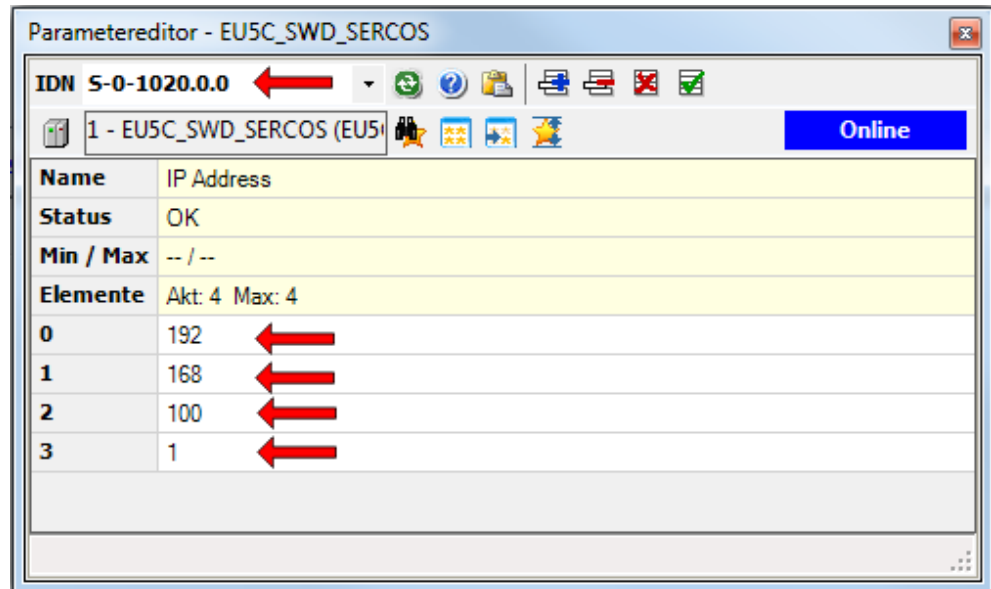


Figure 38: Changing IP address in parameter editor

3. Change subnet mask.

- In the **IDN** field, enter `S-0-1021.0.0` then press **Enter** on your keyboard.
- Enter new subnet mask values in fields **0** to **3** then press **Enter** on your keyboard:

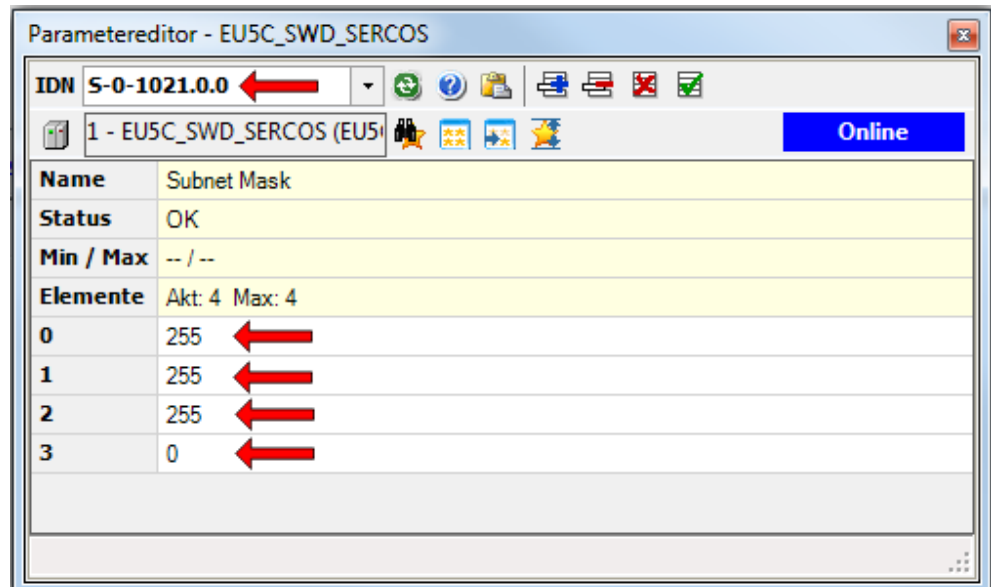


Figure 39: Changing subnet mask in parameter editor

4. Change standard gateway/router address.

- In the **IDN** field, enter `S-0-1022.0.0` then press **Enter** on your keyboard.
- Enter new gateway/router address in fields **0** to **3** then press **Enter** on your keyboard:

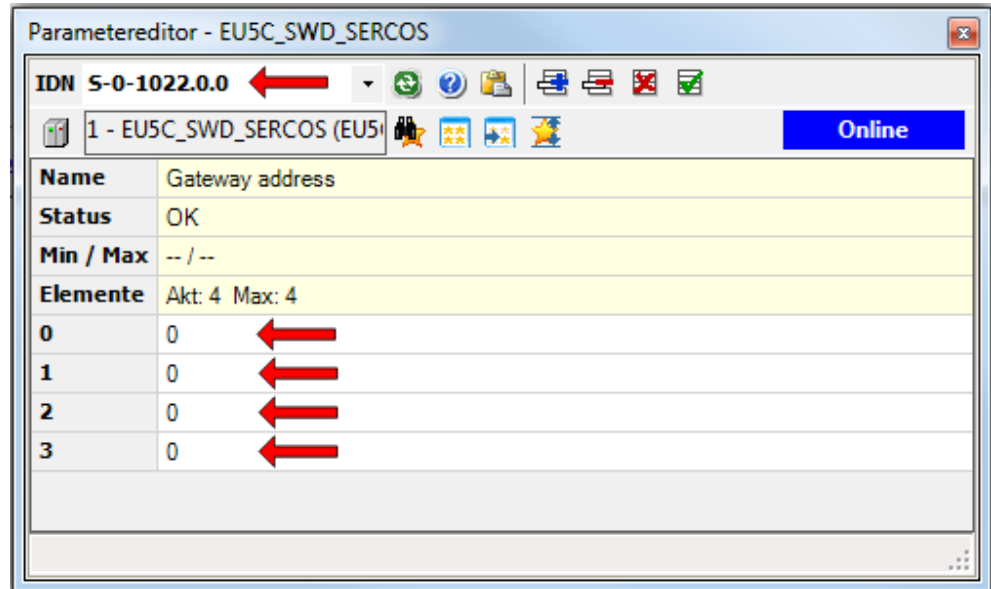


Figure 40: Changing standard gateway/router address in parameter editor

5. Activate new IP network settings.

- In the **IDN** field, enter `S-0-1048.0.0` then press **Enter** on your keyboard.
- In the **Value** field, set the last two digits to 11.
- Press **Enter** on your keyboard to issue this procedure command and to activate the new IP settings of the gateway.

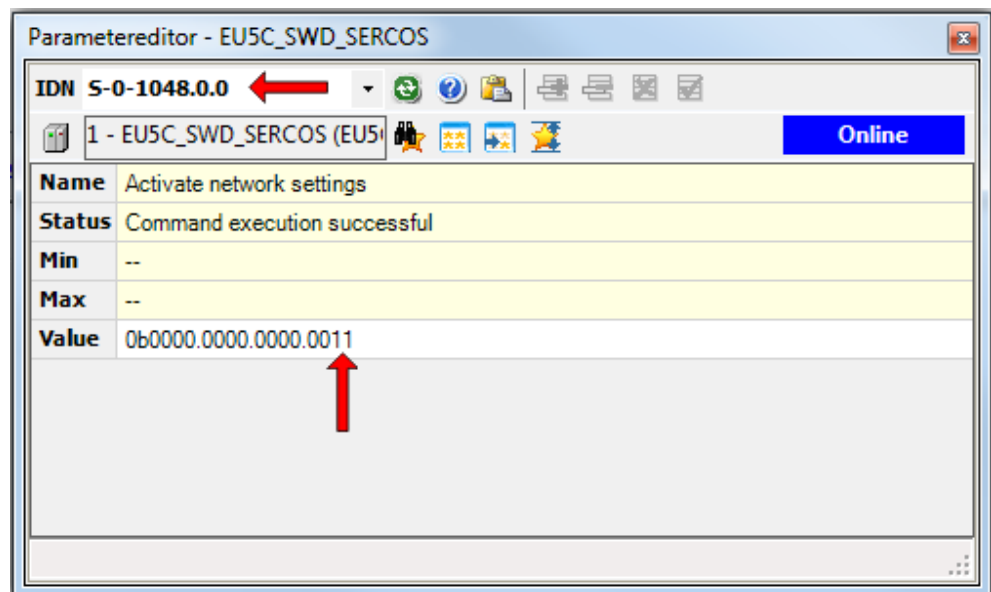


Figure 41: Activating new IP network settings

6. Check new IP network settings.

- You can read the new IP network settings by using the IDNs S-0-1020.0.1 (IP address), S-0-1021.0.1 (subnet mask) and S-0-1022.0.1 (standard gateway/router address):

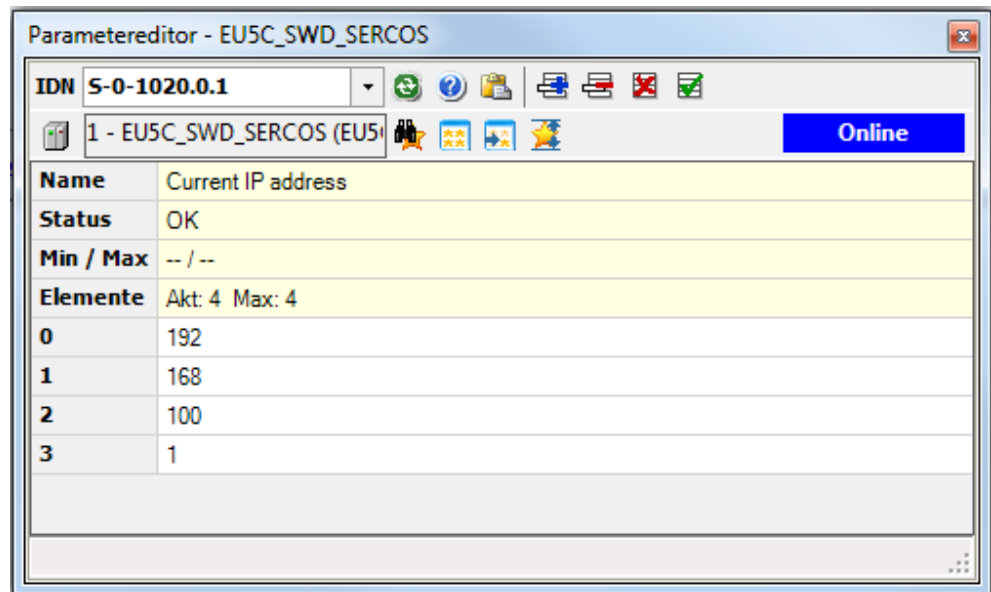


Figure 42: Checking new IP address

13 Updating firmware

13.1 Overview

The EU5C-SWD-SERCOS Gateway is shipped with its most recent firmware already loaded. The version of the loaded firmware is stated on the device type label.

The firmware can be easily updated via the Ethernet interface of the Gateway. When you perform a firmware update, the old firmware file in the gateway will automatically be overwritten. The project configuration and the target configuration in the gateway remain untouched by the firmware update.

Please note that updating firmware via Ethernet is only possible if the gateway is connected to the SmartWire-DT network and if it has a valid SmartWire-DT configuration (SWD LED of the gateway is showing steady green light), otherwise the gateway will not activate its Ethernet interfaces (PHYs).

NOTICE

Hazard of device damage by disruption of voltage supply during firmware update!

Do not interrupt the voltage supply while updating the firmware of the gateway. Power failure during a writing process in the file system can cause severe malfunctioning of the device.



Note:

In case of a missing or defective firmware (which is indicated by a green **POW** LED), the “regular” firmware update process described in this chapter is not working. In this case, proceed as described in chapter *Firmware recovery via HTTP* [▶ page 83].

There are two possible ways of updating the firmware:

Updating firmware via web interface of gateway

The integrated web server of the gateway provides a function to update the firmware of the gateway by HTTP via its Ethernet interface. All you need is a PC with an ordinary web browser connected to the gateway via Ethernet. By entering the IP address 192.168.0.1 (this is the default address of the gateway) into the address bar of your browser, you can connect to the gateway’s web interface from where you can navigate to firmware update page of the gateway.

Step-by-step instructions for this can be found in section *Updating firmware via web interface* [▶ page 79].

Instructions on how to change the IP address of the gateway can be found in section *Changing IP address of gateway* [▶ page 73].

Updating firmware via TFTP

You can also update the firmware of the gateway via Ethernet interface and TFTP (Trivial File Transfer Protocol). For this you need a PC with a TFTP client program (e. g. the open source freeware program *Tftpd64*) connected to the gateway via Ethernet.

In your TFTP client program, you need to set the following parameters for the gateway (which acts as TFTP server)

IP Address of Gateway: 192.168.0.1

TFTP-Port: 69

Local File: E030J0U0.nxf

Remote File: E030J0U0.nxf

Using the TFTP method is not described in this document, please consult the documentation of your TFTP client program for more information.

13.2 Updating firmware via web interface

Prerequisites

- The gateway is supplied with voltage.
- The gateway is connected to a SmartWire-DT network.
- The gateway contains a valid SmartWire-DT configuration. The SWD LED of the gateway shows steady green light (see position (4) in section *Positions of the LEDs* [► page 26]).
- PC with web browser connected to an IP network.
- The Ethernet interface of the gateway is connected to the same IP network as the PC.
- You have access to the SmartWire-DT Gateway Solutions DVD respectively to the firmware file which you want to download to the EU5C-SWD-SERCOS gateway (E030J0U0.nxf).

Step-by-step instructions

1. Open web page for firmware update.
 - Start the web browser on your configuration PC.
 - In the address bar of your browser, enter the URL of the gateway:
http://192.168.0.1



Note:

This is the default IP address of the gateway. Instructions on how to customize the IP address can be found in section *Changing IP address of gateway* [► page 73].

- The home page of the WebServer opens.
- In the navigation header of the web page, click **Firmware Update**.



Note:

You can also open the firmware update page by entering the IP address `http://192.168.0.1/fwupdate` in the address bar of your browser.

The following web page opens:

Firmware Identification

Channel	Name	Version	Date
0	E030J0U0.nxf	1.0.0.0	8.8.2016

Firmware Update

Choose the new firmware file (.nxf) you want to install:

Submit your file by clicking on "transfer". The transfer will take a few seconds.

WARNING: Do not interrupt power or disconnect cable from the system while the transfer is in progress!

Figure 43: Firmware update via HTTP (as depicted in Internet Explorer)

The **Firmware Identification** section displays the following parameters of the firmware currently loaded in the gateway:

- **Channel:** Location (port) of firmware
- **Name:** Name of loaded firmware
- **Version:** Version of loaded firmware
- **Date:** Date of creation of loaded firmware

The **Firmware Update** section features the following control elements:

Control element	Function
Browse...	Opens the file selection dialog
Transfer	Uploads selected firmware file to the device
Cancel	Cancels firmware update

Table 31: Controls in Firmware Update Page

2. Select new firmware file.
 - Click **Browse...** button, to open a dialog window for selecting the firmware file.
 - Navigate to the directory in which the firmware file is stored, select the file, and then click **Open**.



Note:

The name of the firmware file for the Sercos gateway is `E030J0U0.nxf`

- Path and name of the selected file are displayed in the field next to the **Browse...** button.
3. Download firmware file to gateway.

NOTICE**Hazard of device damage by disruption of voltage supply during firmware update!**

Do not interrupt the voltage supply while updating the firmware of the gateway. Power failure during a writing process in the file system can cause severe malfunctioning of the device.

- Click **Transfer** button to download the new firmware file to the gateway.
 - After you have started the upload by clicking the **Transfer** button, the validity of the firmware file is being checked by the system. If the file fails the validity check, the file will not be stored in the gateway and an error message will be displayed. If the file passes, the old firmware file in the gateway is overwritten by the new firmware. This might take a minute. Afterwards, the WebServer requests a reset, in order to start the new firmware.
4. Reset gateway.
 - To open the reset page, click **Reset** in the navigation header.

**Note:**

You can also open the reset page by entering the IP address `http://192.168.0.1/reset` in the address bar of your browser.

- The following web page opens:

Device Reset

Initiating a device reset will cause the device to reboot. A reboot will let the device **stopping all communications** immediately. Established connections will drop.

Before you initiate a reset make sure that your system is in idle state and operated under maintenance condition in order to prevent system damages.

Device parameters that have not been saved non-volatile such as a temporary IP address are getting lost during the reset.

Please confirm you want to reset the device.

Figure 44: Reset via HTTP (as depicted in Internet Explorer)

**Important:**

Please note the following consequences of a reset:

The firmware is being restarted and connections will be interrupted or timed out.

I/O bus communication is being stopped.

5. Perform reset.

- Activate the checkbox in front of **Please confirm...** to acknowledge that you want to reset the device.



Note:

You can use the **Cancel** button to uncheck the checkbox in front of **Please confirm...**

- Click **Submit** button to start the reset.
- ⇒ The device is being reset.

14 Firmware recovery via HTTP

14.1 Overview

If the **POW** system status LED of the gateway shows steady green light, the “regular” firmware of the gateway is defective or missing (for the position of the **POW** LED see section *Positions of the LEDs* [▶ page 26]).

In this case only the so-called “backup firmware” is running and the device is not able to perform its normal gateway functions. This state can be resolved by downloading a fresh (i. e. uncorrupted) firmware file into the gateway via HTTP protocol. The backup firmware (which is part of the boot strap loader running in the gateway) carries a “web server” functionality for downloading a firmware file comfortably via its Ethernet interface.

For this, you just have to connect the gateway via its Ethernet interface to an active DHCP server and a configuration PC. The purpose of the DHCP server is to assign an IP address to the gateway. This assigned IP address can then be used by the configuration PC to connect to the download function of the backup firmware running in the gateway, in order to download the new firmware file via ordinary web browser.

If you do not know the exact IP address assigned to the gateway by the DHCP server, you can use the Hilscher **Ethernet Device Configuration Tool** on your configuration PC (included on the product DVD) in order to “read out” the newly assigned IP address from the gateway. (The tool uses the netIDENT protocol to search for all Hilscher devices within the connected IP network, and then lists all found devices and their IP addresses.)

**Note:**

This chapter describes only how to download the recovery firmware. Instructions on how to configure and operate a DHCP server are not subject of this manual. For information on using a DHCP server, please consult your local network administrator.

14.2 Prerequisites

- The gateway is supplied with voltage and the backup firmware inside the device is running (this is indicated by steady green light at the **POW** LED)
- The gateway is disconnected from the Sercos network
- The gateway is connected to an active DHCP server via local Ethernet network
- The gateway is connected via local Ethernet network to a configuration PC with installed standard web browser
- You have access to the firmware file which you want to download to the gateway (the firmware is stored on the **SmartWire-DT Gateway Solutions** product DVD in the `Firmware\EU5C-SWD-SERCOS\Vx.x.x.x` folder).
- You know the IP address, which the DHCP server has assigned to the gateway. If not, install the Hilscher **Ethernet Device Configuration Tool** on your configuration PC. This tool allows you to check the current IP address of the gateway (if the configuration PC and the gateway are connected to the same local Ethernet network). An installer for this program can be found on the product DVD in the `Software\EnDeviceCfg` folder (the program can also be installed by using the menu of the product DVD.)

14.3 Step-by-step instructions

1. Use DHCP server to assign IP address to gateway.
 - Disconnect the gateway from the voltage supply.
 - Plug a cable connected to the local Ethernet network (in which a DHCP server is active) into one of the Ethernet RJ45 sockets on the front side of the gateway.
 - Reconnect the gateway to the voltage supply.



Note:

The **L/A** LINK/Activity LEDs of the Ethernet RJ45 sockets remain dark when an Ethernet cable is plugged-in while the backup firmware is running – even if a successful IP communication with an local Ethernet network has been established.

- ⇒ The backup firmware running in the device now sends a so-called *DHCPDISCOVER message broadcast* into the Ethernet network, requesting an IP address from a DHCP server. If a DHCP service is available in the network, the gateway should be receiving a valid IP address from the server within a few seconds.

2. Check IP address.

- In the Windows Start menu of your configuration PC, select **All Programs > Hilscher GmbH > Ethernet Device Configuration**, to start the *Ethernet Device Configuration Tool*.
- The **Ethernet Device Configuration** tool opens:

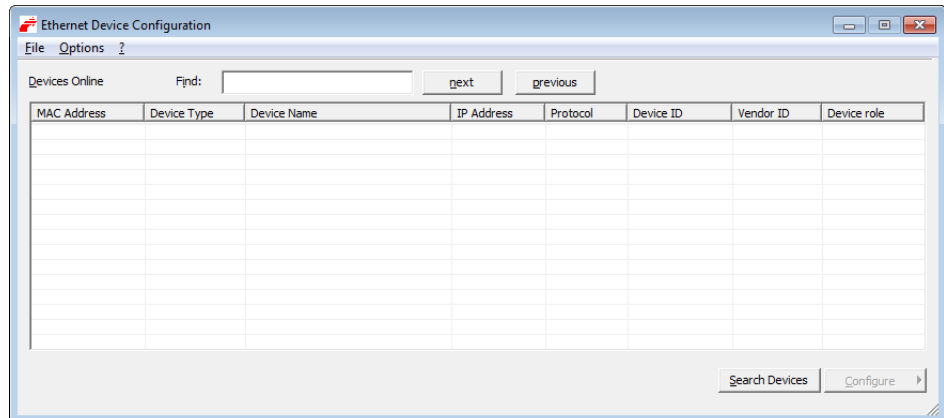


Figure 45: Ethernet Device Configuration Tool

- Click **Search Devices** button, to start searching for the gateway within the local Ethernet network.
- The tool starts scanning for devices and lists all found Hilscher devices and their IP addresses:

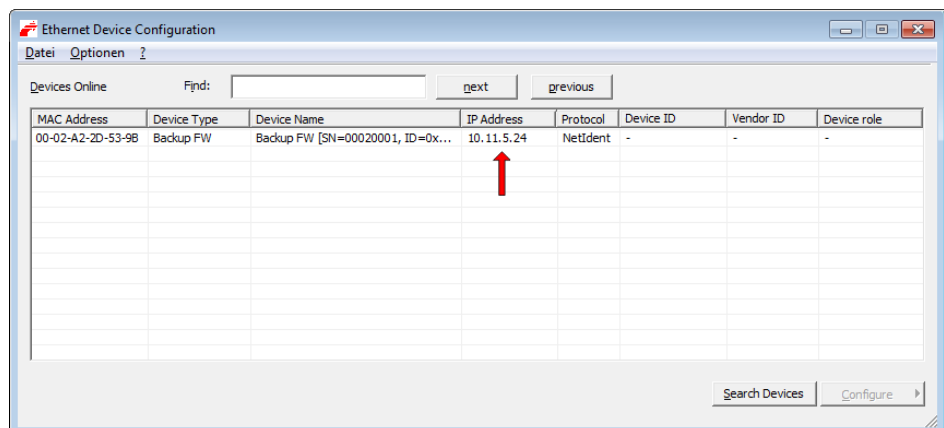


Figure 46: Found gateway in Ethernet Device Configuration Tool

- Note or write down the IP address.

**Note:**

If the default IP address 0.0.0.0 is displayed, the gateway has not yet received an IP address from a DHCP server. Make sure that the gateway is connected to a subnet with an active DHCP server. Then restart the gateway by briefly disconnecting the voltage supply while the Ethernet cable remains plugged-in. Wait a few seconds after reconnecting the voltage supply, then click the **Search Devices** button in the **Ethernet Device Configuration** Tool again.

3. Open web page for firmware download.
 - Start the web browser on your configuration PC.
 - In the address bar of your browser, enter the IP address of the gateway:
http://<IP address>
 - The **Firmware Update** page opens:

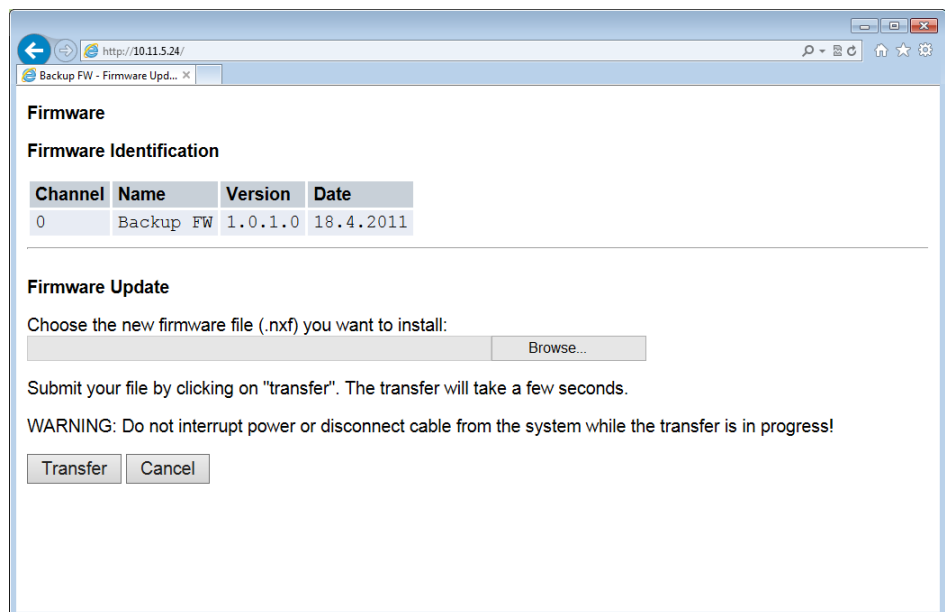


Figure 47: Firmware recovery via HTTP (as depicted in Internet Explorer)

4. Select firmware file for download.
 - Click **Browse...** button, to open a dialog window for selecting the firmware file you want to download.
 - Navigate to the directory in which the firmware file is stored, select the file, then click **Open**.

**Note:**

The name of the firmware file for the EU5C-SWD-SERCOS gateway is E030J0U0.nxf

- Path and name of the selected file are displayed in the field next to the **Browse...** button.

5. Download firmware file to gateway.

- Click **Transfer** button to download the new firmware file to the gateway.
- After you have started the download by clicking the **Transfer** button, the validity of the firmware file is being checked by the system. If the file fails the validity check, an error message will be displayed. If the file passes, the gateway requests you to perform a reset in order to start the new firmware:

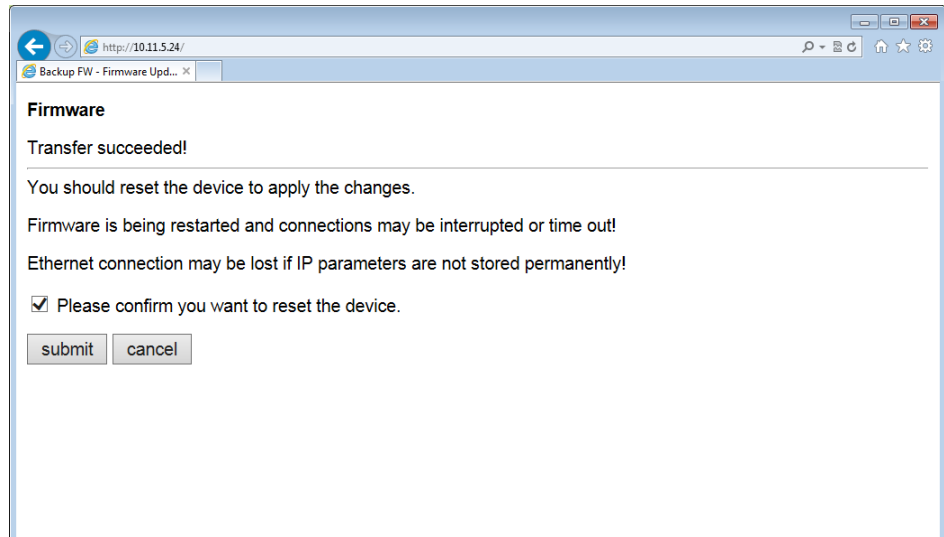


Figure 48: Reset after firmware download via HTTP (as depicted in Internet Explorer)

6. Perform reset.

- Activate the checkbox in front of **Please confirm...** to acknowledge that you want to reset the gateway.



Note:

You can use the **Cancel** button to uncheck the checkbox in front of **Please confirm...**

- Click **Submit** button to start the reset.
- After successful reset, the following message is displayed:

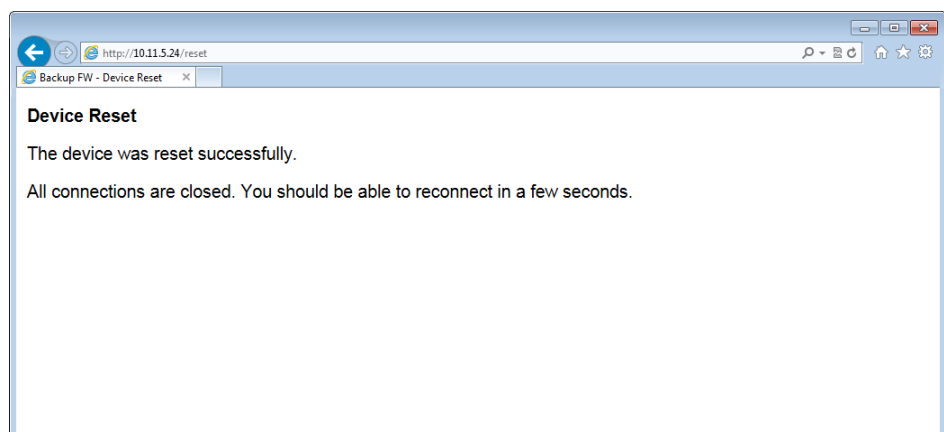


Figure 49: Successful device reset message (as depicted in Internet Explorer)

- ⇒ The **POW** system status LED at the gateway shows steady yellow light. The new firmware has been loaded and the gateway is ready for operation.

15 Technical data

15.1 Technical data EU5C-SWD-SERCOS gateway

Category	Parameter	Value
General	Part number	9233.923
	Dimensions (W x H x D)	35 x 90 x 127 mm
	Weight	160 g
	Mounting	Top hat rail 35 mm (IEC/EN 60715)
	Mounting position	Vertical
	Standards	IEC/EN 61131-2
	Communication controller	netX 50 processor
	Configuration and diagnostic interface	Mini-USB
	Integrated memory	8 MB SDRAM 4 MB serial Flash EPROM
Ambient mechanical conditions	Protection type (IEC/EN 60529, EN50178, VBG 4)	IP20
	Vibrations (IEC/EN 61131-2:2008)	Constant amplitude 3.5 mm: 5 – 9 Hz Constant acceleration 1 g: 9 – 150 Hz
	Mechanical shock resistance (IEC/EN 60068-2-27)	Semi-sinusoidal 15 g/11 ms: 9 Shocks
	Drop to (IEC/EN 60068-2-31)	Drop height: 50 mm
	Free fall, packaged (IEC/EN 60068-2-32)	Drop height: 1 m
Ambient climatic conditions	Operating ambient temperature (IEC 60068-2)	-25...+55 °C
	Condensation	Prevent by suitable measures
	Storage	-40...+70 °C
	Relative humidity, non-condensing (IEC/EN 60068-2-30)	5...95 %
Electromagnetic compatibility (EMC)	Pollution degree	2
	Electrostatic discharge (IEC/EN 61131-2:2008)	Air discharge (Level 3): 8 kV Contact discharge (Level 2): 4 kV
	Electromagnetic fields (IEC/EN 61131-2:2008)	80 – 1000 MHz: 10 V/m 1.4 – 2 GHz: 3 V/m 2 – 2.7 GHz: 1 V/m
	Radio interference suppression (SmartWire-DT)	EN 55011 Class A
	Burst (IEC/EN 61131-2:2008, Level 3)	Supply cables: 2 kV Sercos bus cable: 1 kV SmartWire-DT cables: 1 kV
	Surge (IEC/EN 61131-2:2008, Level 1)	Supply cables: 0.5 kV Sercos bus cable: 1 kV
	Radiated RFI (IEC/EN 61131-2:2008, Level 3)	0,15 – 80 MHz, 10 V, 80% AM / 1 KHz

Category	Parameter	Value
Supply voltage U_{AUX}	Rated operational voltage	24 V DC -15 % +20 %
	Input voltage residual ripple	≤ 5 %
	Protection against polarity reversal	Yes
	max. current I_{max}	3 A Note: If contactors with a total power consumption > 3 A are connected, a power feeder module EU5C-SWD-PF1/2 has to be used.
	Short-circuit strength	No, external fuse FAZ Z3
	Heat dissipation	Typ. 1 W
	Potential isolation	No
	Rated operating voltage of 24-V-DC slaves	Typ. $U_{AUX} - 0,2 V$
Supply voltage U_{POW}	Supply voltage	24 V DC -15 % +20 %
	Protection against polarity reversal	≤ 5 %
	Protection against polarity reversal	Yes
	Rated operational current I	111 mA (with two participants)
	Heat dissipation at 24 V DC	2.66 W (with two participants)
	Potential isolation between U_{POW} and 15-V-SmartWire-DT supply voltage	No
	Bridging voltage dips	10 ms
	Repeat rate	1 s
	Status display	POW LED
SmartWire-DT supply voltage	Rated operational voltage U_e	15 V ± 3 %
	max. current I_{max}	0.7 A Note: If contactors with a total power consumption > 0.7 A are connected, a power feeder module EU5C-SWD-PF2 has to be used.
	Short-circuit strength	Yes
Connection supply voltages	Connection type	Push-in terminals
	solid	0,2 – 1,5 mm ² (AWG 24 – 16)
	Flexible with ferrule	0,25 – 1,5 mm ²
SmartWire-DT network	Participant type	SmartWire-DT master
	SmartWire-DT Master ASIC	SWD-80P-RS485
	Number of SmartWire-DT slaves	99
	Baud rate	125 / 250 kBd
	Address setting	Automatic
	Status display	SmartWire-DT master: SWD LED, duo color red/ green Configuration: Config LED, duo color red/green
	Connections	Plug, 8-pole
	Plug connectors	Blade terminal SWD4-8MF2

Category	Parameter	Value
Ethernet Sercos network	Function of gateway	Sercos Slave
	Baud rate	100 MBit/s
	Interface type	100 BASE-TX
	Auto-Negotiation	Supported
	Auto-Crossover	Supported
	Address setting	By project configuration
	Status display	Sercos LED: S , duo color red/green (orange)
	Connector socket	2 x RJ45
	Connector plug	RJ45
	Potential isolation	Yes

Table 32: Technical data EU5C-SWD-SERCOS gateway

15.2 Technical data Sercos slave

Parameter	Value
Maximum number of cyclic produced data	246 bytes (including 2 bytes Connection Control and 2 bytes IO Status)
Maximum number of cyclic consumed data	246 bytes (including 2 bytes Connection Control and 2 bytes IO Control)
Sercos address	1 ... 511
Minimum cycle time	250 µs (the reachable minimum cycle time depends on the number of input and output data used)
Topology	Line and ring
Communication phases	NRT, CP0, CP1, CP2, CP3, CP4, HP0, HP1, HP2
Connections	1 Consumer Connection 1 Producer Connection
Cross Communication (CC)	Supported
Acyclic communication (Service channel)	Read, write, and standard commands
Supported Sercos version	Third generation of Sercos Communication specification version 1.1.2
Supported Sercos Communication Profiles (SCP)	SCP_FixCFG (Version 1 and 2) SCP_HP (Version 1) SCP_SysTime (Version 1) SCP_Sync (Version 1 and 2) SCP_NRTPC (Version 1) SCP_SIP (Version 1) SCP_TFTP (Version 1) SCP_Diag (Version 1) SCP_Syc (Version 1)
Supported Generic Device Profiles (GDP)	GDP_Basic (Version 1) GDP_PWD (Version 1) GDP_DiagT (Version 1) GDP_Id (Version 1) GDP_Rev (Version 1) GDP_RST (Version 1)
Supported Function Specific Profile (FSP)	FSP_IO
Reference to firmware version / stack version	V1.0.6 / V3.3

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