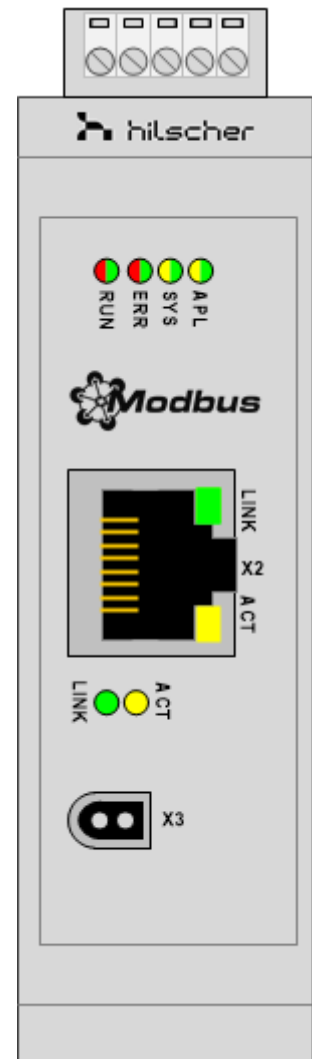


User manual
netSWITCH NS 90-RE-SPE\2I20/OMB
SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector
V1.1



Hilscher Gesellschaft für Systemautomation mbH
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1 Introduction

1.1 About the user manual

This user manual describes the hardware, installation, commissioning, and operation of the NS 90-RE-SPE\2I20/OMB SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector.

1.1.1 List of revisions

Revision	Date	Changes
1	2024-10-15	Document created.

Table 1: List of revisions

1.1.2 Obligation to read the manual



Important:

- To avoid personal injury and damage to your system and your device, you must read and understand all instructions in this manual before installing and using your device.
- First read the **Safety instructions** in chapter *Safety* [▶ page 6].
- Observe and follow all **warnings** in the manual.

1.1.3 Conventions in this manual

Notes, instructions, results of operating steps and positions in figures are marked as follows:

Notes



Important:

<important note you must follow to avoid malfunction>



Note:

<general note>



<note where to find further information>

Instructions

1. Operation purpose
2. Operation purpose
 - Instruction

Results

↗ Intermediate result

⇒ Final result

Safety messages

The labeling of safety messages is explained in the chapter Safety.

The *positions* ①, ②, ③... or ①, ②, ③... or ①, ②, ③... refer to the figure used in that section. If the numbers reference to a section outside the current section then a cross reference to that section and figure is indicated.

1.2 Reference to devices and firmware

This manual refers to device:

NS 90-RE-SPE\2120/OMB

SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector

Part number: 1794.861

This information is valid from hardware revision 4.

Firmware	Firmware version
SPE_MS_OMB	1.1.x.x

Table 2: Reference to firmware

2 Safety

2.1 General note about safety

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

2.2 Intended use

The NS 90-RE-SPE\2I20/OMB (SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector) described in this manual is a communication device and connects two communication networks. The NS 90-RE-SPE \2I20/OMB works as a switch and forwards frames from Ethernet (100BASE-TX, 10BASE-T) to Single Pair Ethernet (10BASE-T1L) and vice versa.

The SPE Media Switch is integrated in a compact housing and suitable for installation on top hat rails according to DIN EN 60715.

2.3 Personnel qualification

Only qualified expert personnel is allowed to install, configure, operate or dismantle the device. The expert personnel must have specific skills and qualifications for electrical professions in the following special fields:

- Health and safety at work
- Installing and connecting electrical equipment
- Measuring and analyzing electrical functions and systems
- Evaluating the safety of electrical systems and equipment
- Installing and configuring IT systems

2.4 Safety instructions to avoid personal injury

To avoid personal injury, you have to read, understand, and observe the following safety instructions and all warnings in this manual regarding hazards that may cause personal injury before you install and operate your device.

Risk of unsafe plant operation

To prevent personal injury, do not remove this device from a production plant without having ensured a safe operation of the plant during or after the removal of the device.

2.5 Safety instructions to avoid property damage

To avoid damage to your device, you have to read, understand, and observe the following safety instructions and all warnings in this manual regarding possible property damage before you install and operate your device.

2.5.1 Power disconnect during firmware or configuration download

If during the process of downloading a firmware or configuration

- the power supply to the device is interrupted, or
- the power supply to a PC with the software application is interrupted, or
- a reset to the device is done,

this may lead to the following consequences:

Loss of device parameters, firmware corruption

- The firmware download or the configuration download is interrupted and remains incomplete.
- The firmware or the configuration database will be corrupted and device parameters will be lost.
- Device damage may occur as the device cannot be rebooted.

Whether these consequences occur depends on when the power disconnect occurs during the download.

- During configuration download process, do not interrupt the power supply to the PC or to the device, and do not perform a reset!

Otherwise you might be forced to send in your device for repair.

Power drop during write and delete accesses in the file system

The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can damage the FAT (File Allocation Table) if the accesses cannot be completed if the power drops. Without a proper FAT, a firmware may not be found and cannot be started.

Make sure that the power supply to the device is not interrupted during write and delete accesses in the file system (firmware update, configuration download, etc.).

2.5.2 Device destruction by exceeding allowed supply voltage

Observe the following note concerning your netSWITCH SPE Media Switch described in this manual:

The operation of the netSWITCH SPE Media Switch is allowed only with the stipulated supply voltage. Make sure not to exceed the upper limit or fall below the lower limit of the tolerance range of the supply voltage. A supply voltage above the upper limit, may cause damage to the netSWITCH SPE Media Switch! A supply voltage under the lower limit, may cause malfunctions of the netSWITCH SPE Media Switch. The permitted range of the supply voltage is defined by the tolerances specified in this manual.

For information on the supply voltage prescribed for the netSWITCH SPE Media Switch, see section *Requirements for operation* [▶ page 11]. This section specifies the required and permissible supply voltage for the netSWITCH SPE Media Switch and includes the permissible tolerance range.

2.5.3 Exceeding the maximum number of allowed write/delete accesses

This device uses a serial Flash chip for storing remanent data, such as firmware, configuration, etc. This chip allows a maximum of 100 000 write/delete accesses which is sufficient for a standard device operation. Writing/deleting the chip excessively (e.g. in order to change configuration or name of station) will exceed the maximum number of allowed write/delete accesses and, thus, result in damage to the device. If, e.g., the configuration is changed every hour, the maximum number will be reached after 11.5 years. If, e.g., it is changed every minute, the maximum number will already be reached after approx. 69 days.

Avoid exceeding the maximum number of allowed write/delete accesses by excessive writing.

2.5.4 Danger of unsafe system operation

To prevent property damage, do not remove this device under runtime conditions before you can not guarantee further a safe and secure operation of the plant.

2.6 Labeling of safety messages

Signal word	Description
DANGER	Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation, which if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a property damage message.

Table 3: Signal words

2.7 References safety

References safety:

[1] ANSI Z535.6-2006 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials

[2] IEC 60950-1, Information technology equipment - Safety - Part 1: General requirements, (IEC 60950-1:2005, modified); German Edition EN 60950-1:2006

[3] EN 61340-5-1 and EN 61340-5-2 as well as IEC 61340-5-1 and IEC 61340-5-2

3 Description and requirements

3.1 Brief description

Switch function

The NS 90-RE-SPE\2I20/OMB (SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector) is a switch between standard Ethernet (100BASE-TX) and Single Pair Ethernet (10BASE-T1L). The switch forwards Ethernet frames from standard Ethernet to Single Pair Ethernet and vice versa.

The Switch supports 100BASE-TX and 10BASE-T.

Connecting devices with “Single Pair Ethernet” connector

You can use the switch to connect devices with a “Single Pair Ethernet” connector to standard Ethernet. Data frames are forwarded with the help of the MAC address of the connected devices.

Cable length up to 1000 m

Single Pair Ethernet (10BASE-T1L) allows a cable length of up to 1000 m. Standard Ethernet allows a cable length of up to 100 m. The switch can be used to transport data up to a distance of 1000 m via an SPE cable.

3.2 Name of device

The device name is:

NS 90-RE-SPE\2I20/OMB

The device name consists of the following elements:

NS	Device type netSWITCH
90	Processor type netX 90
RE	Real-Time Ethernet at connector X2
SPE	Single Pair Ethernet at connector X3
\2I20	SPE connector according to IEC 63171-2, protection class: IP20
/OMB	Protocol at connector X2: Open Modbus/TCP

3.3 Requirements for operation

SPE Media Switch must be mounted on a top hat rail.

An external power supply is required. The voltage must be in the permissible range between 18.3 V and 30 V. The power supply must provide at least 33 mA (at 24 V).

Power is supplied via connector X1.

NOTICE**Device damage**

The supply voltage must not exceed 30 V, otherwise damage to the device is possible.

The permissible temperature range must be observed for operation.

The device must have a firmware loaded. The device is delivered with a loaded firmware.

4 Device drawings and connectors

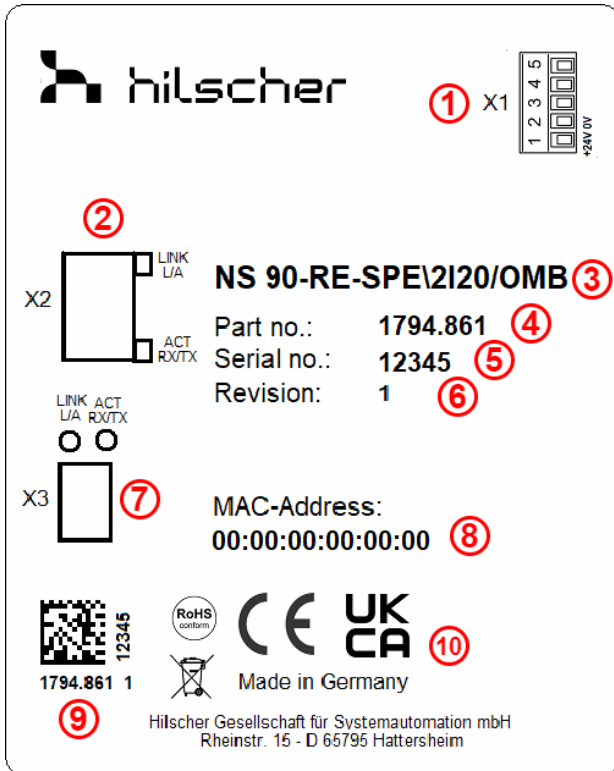
4.1 Positions of the connectors and LEDs

Device drawing	Position	Description
	(1)	Power supply (X1) [▶ page 15]
	(2)	RUN (Run) (COM0 LED)
	(3)	ERR (Error) (COM1 LED)
	(4)	SYS LED [▶ page 16]
	(5)	APL LED [▶ page 17]
	(6)	Real-Time Ethernet: Activity
	(7)	Real-Time Ethernet RJ45 socket [▶ page 15]
	(8)	Real-Time Ethernet: Link
	(9)	Single Pair Ethernet: Link
	(10)	Single Pair Ethernet: Activity
	(11)	Single Pair Ethernet interface [▶ page 16] (IEC 63171-2 connector)

Table 4: Positions of the connectors and LEDs

4.2 Device label

The type label of NS 90-RE-SPE\2I20/OMB SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector shows the following information:



- (1) Assignment of the power supply connectors (X1)
- (2) Assignment of the Ethernet interface (X2)
- (3) Name of device [▶ page 10]
- (4) Part number
- (5) Serial number
- (6) Hardware revision
- (7) Assignment of the "Single Pair Ethernet" interface (X3)
- (8) MAC address for X2 and X3
- (9) Matrix label
- (10) Conformity designations and manufacturer information

4.3 Dimensional drawings

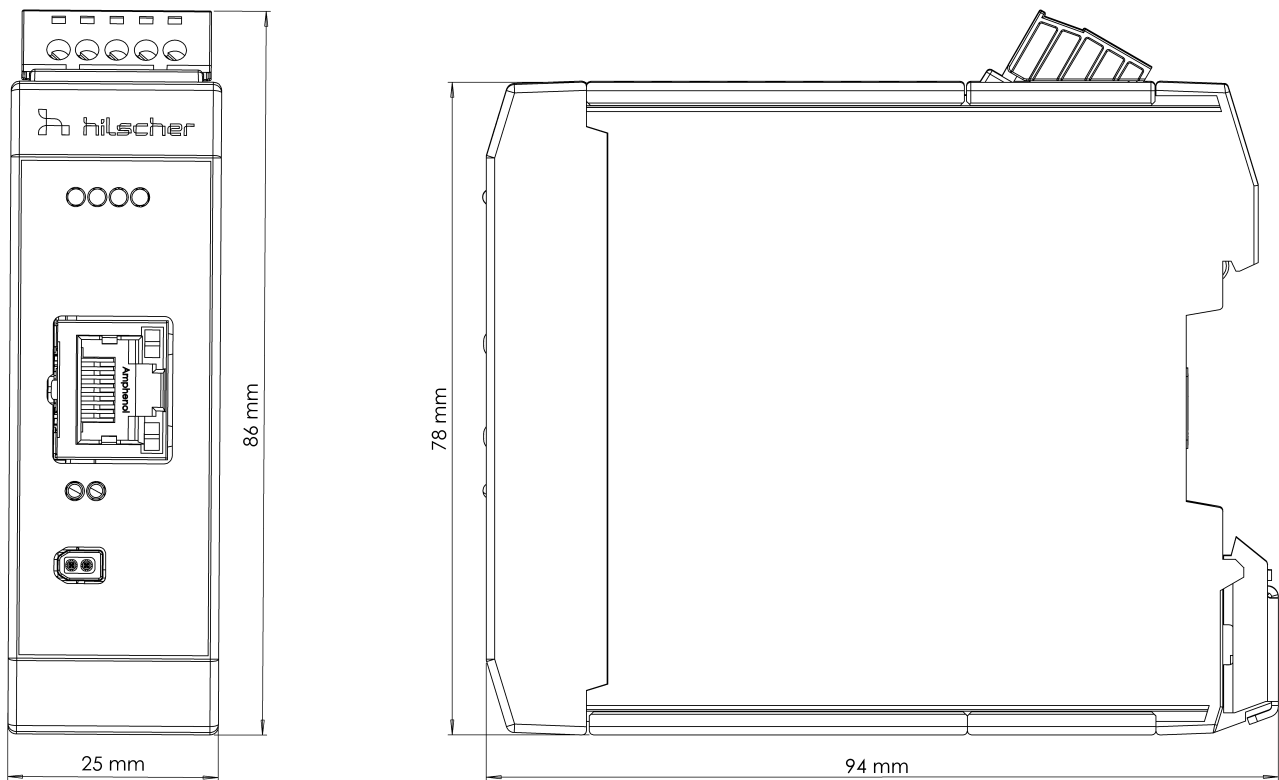


Figure 1: NS 90-RE-SPE dimensions

4.4 Connectors and interfaces

4.4.1 Power supply (X1)

The SPE Media Switch is supplied with voltage via connector X1. The connection is designed to accommodate stranded wires of a max. diameter of 1.5 mm². The supply voltage must be between 18.3 V and 30 V DC.

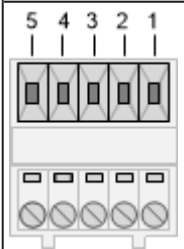
Power supply	Pin	Signal	Assignment
	1	+24 V DC	+ 24 V DC power supply
	2	0 V / GND	GND of the power supply
	3	FE	Grounding against top hat rail
	4	-	Not assigned
	5	-	Not assigned

Table 5: Power supply connector

Power over DataLine (PoDL) **not** supported at connector X2.

Power over Ethernet (PoE) **not** supported at connector X3.

4.4.2 Ethernet interface (X2)

For the Ethernet interface, use RJ45 plug and a twisted pair cable of category 5 (CAT5), or higher, which consists of 4 pairs of twisted wires with a max. baud rate of 100 MBit/s (CAT5).



Note:

The device supports the Auto Crossover function and can therefore switch RX and TX. The following figure shows the RJ45 standard pin assignment.

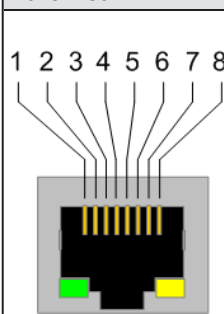
Ethernet	Pin	Signal	Description
 <p>RJ-45 socket</p>	1	TX+	Transmit data positive
	2	TX-	Transmit data negative
	3	RX+	Receive data positive
	4	-	Connected and terminated to PE via RC combination*
	5	-	Connected and terminated to PE via RC combination*
	6	RX-	Receive data negative
	7	-	Connected and terminated to PE via RC combination*
	8	-	Connected and terminated to PE via RC combination*
	-	PE	Metal shell on PE
	-	-	* Bob Smith Termination

Table 6: RJ45 Ethernet interface

4.4.3 Single Pair Ethernet interface (X3)

Connector X3 of the device is the Single Pair Ethernet interface.

Connector X3 for Single Pair Ethernet is a connector according to the IEC 63171-2. A suitable cable with a connector face based on the same standard is required to connect SPE devices.

The connector is protected against polarity reversal and has a notch to lock the connecting cable in place. The cable can only be detached from the device by pressing the corresponding lever at the end of the cable.

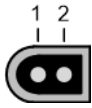
SPE (IEC 63171-2)	Pin	Signal	Description
	1	DA+	Data signal positive
	2	DA-	Data signal negative

Table 7: SPE (IEC 63171-2)

4.5 LEDs

4.5.1 System status (SYS)

This LED indicates important operating statuses even without configuring the device. To identify the SYS LED, see position (4) in section *Positions of the connectors and LEDs* [▶ page 12].








LED	Color	State	Description
SYS	Duo-LED: yellow RDY / green RUN		
	 (green)	On	The firmware is running.
	 (green)	Blinking	During the formatting of the file system
	 (yellow)	On	A system error has occurred.
	 (yellow)/ (green)	Blinking, 3x yellow, 3x green	Firmware crash, unrecoverable (an internal exception occurred that cannot be handled)
	 (yellow)/ (green)	Blinking, 1 Hz	Firmware update mode active: The firmware is idle and waiting for the update file.
	 (yellow)/ (green)	Blinking, 4 Hz	Firmware update mode active: A firmware update is being installed.
 (gray)	Off	<ul style="list-style-type: none"> No supply voltage: No supply voltage for the device or hardware defect. During a firmware reset 	

Table 8: States of the SYS-LED

4.5.2 Application status (APL)

To identify the APL LED, see position (5) in section *Positions of the connectors and LEDs* [▶ page 12].

LED	Color	State	Description
APL (5)	Duo LED red/green (orange by red and green simultaneously)		
	● (green)	On	The initialization of communication between the two networks was successful. The device works normally.
	● (orange)	On	The initialization of communication between the two networks was not successful. An error has occurred.

Table 9: Status of the APL-LED

4.5.3 LEDs Open Modbus/TCP

For identification of the RUN LED, see position (2) and for identification of the ERR LED, see position (3) in section *Positions of the connectors and LEDs* [▶ page 12].

Switch has no connection to an Open Modbus/TCP client: The switch can also be used without being connected to an Open Modbus/TCP client. In this case, the RUN LED flashes green with 1 Hz. The switch function is executed. LINK LED and ACT LED indicate the Ethernet status.

Switch has a connection to an Open Modbus/TCP client: If the switch has a connection to an Open Modbus/TCP client, the following table describes the communication status for RUN LED and ERR LED.

Communication status OpenModbusTCP

LED	Color	State	Description
RUN Position in the device overview: (2)	Duo LED red/green		
	● (green)	On	Connected: OMB task has communication. At least one TCP connection is established.
	⦿ (green)	Flashing (1 Hz)	Ready, not configured yet: OMB task is ready and not yet configured.
	⦿ (green)	Flashing (5 Hz)	Waiting for Communication: OMB task is configured.
	● (off)	Off	Not Ready: OMB task is not ready.
ERR Position in the device overview: (3)	Duo LED red/green		
	● (off)	Off	No communication error
	⦿ (red)	Flashing (2 Hz, 25% on)	System error
	● (red)	On	Communication error active

Table 10: Communication status OpenModbusTCP

LED state	Definition
Flashing (1 Hz)	The LED turns on and off with a frequency of 1 Hz: "On" for 500 ms, followed by "Off" for 500 ms.
Flashing (5 Hz)	The LED turns on and off with a frequency of 5 Hz: "On" for 100 ms, followed by "Off" for 100 ms.
Flashing (2 Hz, 25% on)	The LED turns on and off with a frequency of 2 Hz: "On" for 125 ms, followed by "Off" for 375 ms.

Table 11: Definition LED states communication status

Ethernet status OpenModbusTCP





LED	Color	State	Description
LINK X2 (8) X3 (9)	LED green		
	 (green)	On	The device is linked to the Ethernet.
	 (off)	Off	The device has no link to the Ethernet.
ACT X2 (6) X3 (10)	LED yellow		
	 (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	 (off)	Off	The device does not send/receive Ethernet frames.

Table 12: Ethernet status OpenModbusTCP

LED status	Definition
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 13: Definition of LED status of the Ethernet status

5 Mounting of device

5.1 Safety messages

Observe the following warnings:

NOTICE**Damage to the device caused by compensating currents**

Observe the grounding and shielding concept of the plant to prevent compensating currents from flowing between connected devices via signal and supply voltage lines. Otherwise, the destruction of the device cannot be excluded.

5.2 Mounting device onto Top Hat Rail

- Mount the top hat rail for the SPE Media Switch horizontally at the provided mounting point according to DIN EN 60715.
- Connect the top hat rail to the equipotential bonding conductor (FE).

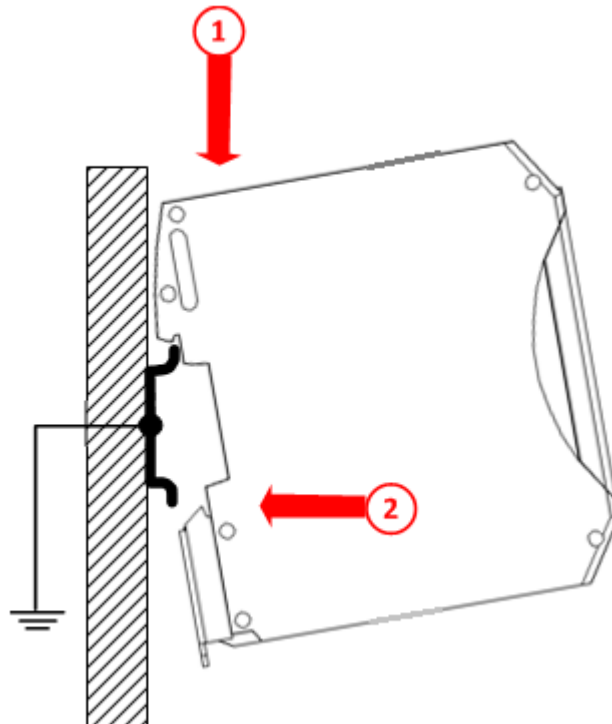


Figure 2: Mounting the SPE Media Switch on the top hat rail

- Place the device from above (1) onto the upper guiding of the top hat rail.
- Then, press the device against the top hat rail (2) until the latch of the lower holder engages.
- Thereafter, connect the 24 V supply voltage to the device.

NOTICE

Device destruction by exceeding allowed supply voltage!

The supply voltage must not exceed 30 V, otherwise damage to the device is possible.



Note:

For grounding use the grounding contact to the top hat rail on the rear of the device.

5.3 Removing device from Top Hat Rail

- To dismantle the SPE Media Switch, first remove the power supply and the data cables from the device.

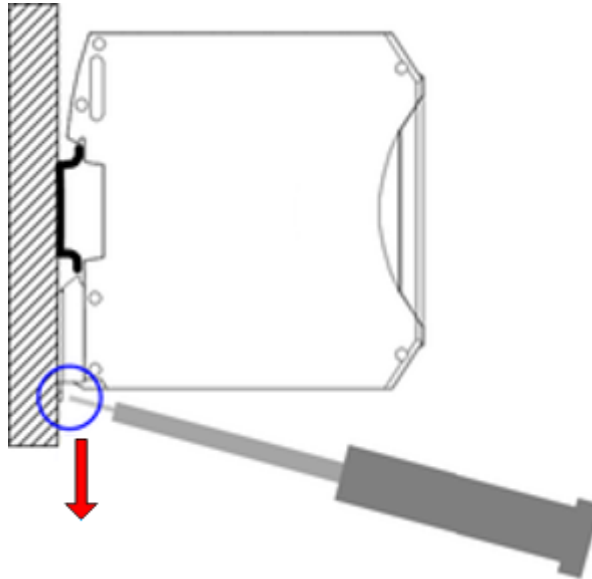


Figure 3: Removing the SPE Media Switch from the top hat rail

- At the bottom of the device, insert a screwdriver into the locking of the holder.
- Press the locking down to unlock the holder.
- Remove the device from the top hat rail thereafter.

6 Commissioning

6.1 Transparent mode and configured mode

The switch can be used in transparent mode and configured mode (optional).

Transparent mode: In the transparent mode, the switch forwards Ethernet frames from connector X2 to X3 and vice versa. This switch function is usable without any further configuration of the switch.

Configured mode: In the configured mode, the switch is included in the configuration of the Open Modbus/TCP Client and has a connection to this Open Modbus/TCP Client. In the transparent mode, the switch forwards Ethernet frames from connector X2 to X3 and vice versa.

6.2 Connecting power supply and Ethernet

Connect the +24 V DC power supply to connector X1.

Connect the Ethernet cable to connector X2. Connect the other end of the Ethernet cable to a switch or end device.

Connect the Single Pair Ethernet cable to connector X3. Connect the other end of the Single Pair Ethernet cable to a switch or end device.

As soon as all cables are connected and the switch is supplied with power, the switch starts operation automatically. Ethernet frames are forwarded automatically and require no further configuration.

Shielded cables

Always use shielded cables whose shield has a large-scale connection to the potential equalization at both ends. Lay the communication lines as far away as possible from the power lines to avoid EMC influence caused by switching operations in the power lines.

6.3 IP address

The switch has no IP address when delivered.

Transparent mode

In transparent mode, the switch requires no IP address.

Configured mode

The switch requires an IP address so that it can be addressed via the Ethernet network. The switch has no IP address when delivered. After power on of the switch, the switch sends requests to a DHCP server in order to obtain an IP address.

If there is already a DHCP server in the network, ask your network administrator for the IP address assigned to the switch. For identification of the switch, use the MAC address printed on the type plate of the switch.

Firmware update

The switch has an integrated web server to update the firmware of the switch. To reach the web server, the switch requires an IP address.

6.4 Updating the firmware

Downloading the firmware

On the overview page <https://hilscher.atlassian.net/wiki/x/ZwAKIQ>, you can see which firmware version is the current version. On the subpage , you can download the firmware for the switch as ZIP file with the name LFW-NS90-SPE-Va.b.c.d.zip (a, b, c and d are place holder for the version number).

Unpack the ZIP file into a folder of your choice. When unpacking, subfolders are created for the supported protocol variants. The folder SPE_MS_OMB contains the needed update file FWUPDATE.zip.

Requirements

- You have the firmware file FWUPDATE.zip.
- The switch is connected to a network.
- You know the IP address of the switch.

Updating the firmware

- Open a browser and navigate to:
<http://<IP address>/netx>
 (Replace <IP address> with the IP address of the switch.)
- The user interface opens and shows the tab `Diagnostics` with data about the switch.

The screenshot displays the web interface of a switch. On the left, a navigation menu includes 'Diagnostics', 'Firmware Upload', 'File Manager', and 'User Manager'. The 'Diagnostics' section shows a table of system information:

Uptime(seconds):	3914
MAC address:	00:02:a2:a1:77:4a
Manufacturer:	1
Device class:	78
Device number:	1794860
Serial number:	20004
Hardware compatibility:	0
Hardware revision:	1
Production date:	23/2024

Below the table is a 'Refresh' button. To the right, the 'Authentication' section features 'Username:' and 'Password:' input fields and a 'Login' button. The 'Event Log' section shows three entries:

- 10:45:25 AM on Diag: Diagnostics successfully retrieved.
- 10:45:25 AM on Print directory informations: Failed to get directory informations
- 10:45:25 AM on Diag: Diagnostics successfully retrieved.

Figure 4: Diagnostics

- Below **Authentication**, enter the standard login name.
 User name: `root`
 Password: `password`
- Click **Login**.
- The notification **Logged in as „root“** is displayed.
- Click **Firmware upload** in the left menu.
- Click **Choose a firmware file to upload** and select the firmware file `FWUPDATE.ZIP`.
- The name of the file is displayed above the button **Send file**.
- Click **Send file**.
- In the status information on the right, the notification **on FirmwareUpload: Upload in progress ...** is displayed and shortly afterwards **on FirmwareUpload: Upload is successful** is displayed.

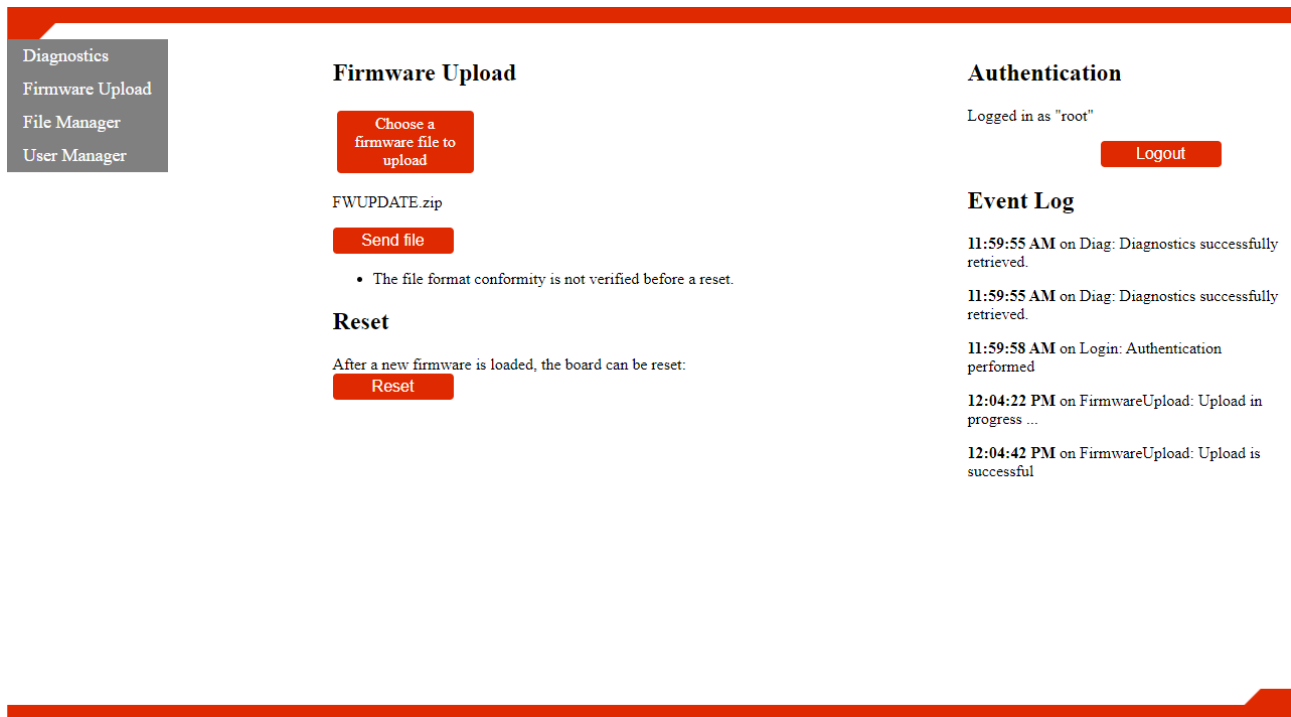


Figure 5: Firmware upload

- Click **Reset**.
- ⇒ The switch starts with the new firmware.



Note:

After the reset, the switch requires a new IP address.

6.5 Configured mode

In the configured mode (optional), the SPE Media Switch is an active Open Modbus/TCP participant and works as Open Modbus/TCP server. The SPE Media Switch is included in the configuration of the Open Modbus/TCP client. Adding the switch to the Open Modbus/TCP client configuration allows the client an active monitoring of the switch.

7 Technical data

NS 90-RE-SPE\2I20/OMB	Parameter	Value
Product	Product name	NS 90-RE-SPE\2I20/OMB
	Part number	1794.861
	Description	SPE Media Switch for Open Modbus/TCP with IEC 63171-2 connector
Communication controller	Type	netX 90
Power supply	Supply voltage	24 V DC (18,3 V ... 30 V)
	Current consumption (typical/maximum)	33 mA (at 24 V) Maximum 43 mA
	Power consumption (typical)	792 mW
	Connector	ICC25
Communication interface X2	Communication standard	Ethernet
	Interface type	10BASE-T, 100BASE-TX, isolated
	Connector	RJ45
Communication interface X3	Communication standard	Ethernet
	Interface type	10BASE-T1L
	Connector	IEC 63171-2
Displays	LED display	SYS, System status LED
		APL, Applikation status LED
		COM 0, Communication status LED 0 (Duo LED)
		COM 1, Communication status LED 1 (Duo LED)
Permissible environmental conditions	Operating temperature range	-25 °C ... +70 °C
	Storage temperature range	-40 °C ... +85 °C
	Humidity	10 % ... 95 % relative humidity, no condensation permitted
	Altitude	0 m ... 2000 m
Device	Dimensions (L x W x H)	94 mm x 25 mm x 78 mm (without connector)
		94 mm x 25 mm x 86 mm (with connector)
	Weight	76 g
	Degree of protection	IP20
	Housing material	Polyamid
Compliance	RoHS	Yes
Compliance with EMC guidelines	CE sign	Yes
	UKCA sign	Yes
	Emission	EN IEC 61000-6-4 / BS EN IEC 61000-6-4
	Immunity	EN IEC 61000-6-2 / BS EN IEC 61000-6-2

Table 14: Technical data NS 90-RE-SPE\2I20/OMB

8 Decommissioning/Disposal

8.1 Putting the device out of operation

NOTICE**Risk of unsafe plant operation**

To prevent property damage, do not remove this device from a production plant without ensuring a safe operation of the plant during or after the removal of the device.

- Remove all communication cables from the device.
- Remove the cable for operating voltage supply.
- Dismount the device from the DIN rail as described in section Removing device from Top Hat Rail.

8.2 Disposal and recycling of waste electronic equipment

Waste electronic equipment must be disposed of properly after the end of use.



Waste electronic equipment

This product must not be disposed of with household waste.

Dispose of this product in accordance with local regulations in your country.

When disposing of the product, observe the following:

- Observe national and local regulations for the disposal of waste electronic equipment and packaging.
- Delete personal data stored in the waste electronic device.
- Dispose of this product in an environmentally friendly manner at a local collection point for waste electronic equipment.
- Dispose of packaging in such a way that a high level of recycling is possible.

Alternatively, you can return our products to us for disposal. The prerequisite is that no additional foreign substances are contained. Before returning, please contact us via the Return Merchandise Authorization (RMA) form on www.hilscher.com.

In Europe, the directive 2012/19/EU waste electrical and electronic equipment applies. Different policies and laws may apply nationally.

9 Appendix

9.1 Legal notes

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- Flight control systems in aviation and aerospace;
- Nuclear fission processes in nuclear power plants;
- Medical devices used for life support and
- Vehicle control systems used in passenger transport

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- In flight safety systems, aviation and flight telecommunications systems;
- In life-support systems;
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The warranty obligation for equipment (hardware) we produce is 36 months, calculated as of the date of delivery ex works. The aforementioned provisions shall not apply if longer warranty periods are mandatory by law pursuant to Section 438 (1.2) BGB, Section 479 (1) BGB and Section 634a (1) BGB [Bürgerliches Gesetzbuch; German Civil Code] If, despite of all due care taken, the delivered product should have a defect, which already

existed at the time of the transfer of risk, it shall be at our discretion to either repair the product or to deliver a replacement product, subject to timely notification of defect.

The warranty obligation shall not apply if the notification of defect is not asserted promptly, if the purchaser or third party has tampered with the products, if the defect is the result of natural wear, was caused by unfavorable operating conditions or is due to violations against our operating regulations or against rules of good electrical engineering practice, or if our request to return the defective object is not promptly complied with.

Costs of support, maintenance, customization and product care

Please be advised that any subsequent improvement shall only be free of charge if a defect is found. Any form of technical support, maintenance and customization is not a warranty service, but instead shall be charged extra.

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