Systeme Helmholz®
compatible with you

NETLink USB

USB Gateway for MPI/PROFIBUS

700-890-MPI11

User Manual

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Note:

We have checked the content of this manual for conformity with the hardware and software described. Nevertheless, because deviations cannot be ruled out, we cannot accept any liability for complete conformity. The data in this manual have been checked regularly and any necessary corrections will be included in subsequent editions. We always welcome suggestions for improvement.

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1 Safety Information

Please observe the safety information given for your own and other people's safety. The safety information indicates possible hazards and provides information about how you can avoid hazardous situations.

The following symbols are used in this manual.

! *Caution, indicates hazards and sources of error*

ℹ *gives information*

⚠ *hazard, general or specific*

⚠ *danger of **electric shock***

1.1 General

The NETLink USB is only used as part of a complete system.

! *The operator of a machine system is responsible for observing all safety and accident prevention regulations applicable to the application in question.*

⚠ *During configuration, safety and accident prevention rules specific to the application must be observed.*

⚠ *Emergency OFF facilities according to EN 60204 / IEC 204 must remain active in all modes of the machine system. The system must not enter an undefined restart.*

⚠ *Faults occurring in the machine system that can cause damage to property or injury to persons must be prevented by additional external equipment. Such equipment must also ensure entry into a safe state in the event of a fault. Such equipment includes electromechanical safety buttons, mechanical interlocks, etc. (see EN 954-1, risk estimation).*

⚠ *Never execute or initiate safety-related functions using an operator terminal.*

1.2 Restriction of access

Only authorized persons must have access to the modules!

The modules are open equipment and must only be installed in electrical equipment rooms, cabinets, or housings. Access to the electrical equipment rooms, barriers, or housings must only be possible using a tool or key and only permitted to personnel having received instruction or authorization.

1.3 Information for the user

During configuration, safety and accident prevention rules specific to the application must be observed.

This manual is addressed to anyone wishing to configure, use, or install the NETLink USB.

The manual tells the user how to operate the NETLink USB and explains the signaling functions. It provides the installing technician with all the necessary data.

The NETLink USB is exclusively for use with a S7-300/S7-400 programmable controller from Siemens.

The NETLink USB is for use within a complete system only. For that reason, the configuring engineer, user, and installing technician must observe the standards, safety and accident prevention rules applicable in the particular application. The operator of the automation system is responsible for observing these rules.

1.4 Use as intended

The NETLink USB must only be used as a communication and signaling system as described in the manual.

1.5 Avoiding use not as intended!

Make sure in the software that uncontrolled restarts cannot occur.

Safety-related functions must not be controlled via the NETLink USB alone. Make sure in the software that uncontrolled restarts cannot occur.

Before you start installation work, all system components must be disconnected from their power source.

2 Installation and Mounting

Installation and mounting must be effected in compliance with VDE 0100 / IEC 364. Because it is an IP30 module, you must install it in a cabinet.

Please ensure a maximum ambient temperature of 60 °C for reliable operation.

2.1 Mounting orientation

The NETLink USB can be installed in any orientation.

2.2 Minimum clearance

Minimum clearances must be observed because

- then it is possible to insert and remove the NETLink USB without having to remove other system components.
- there is enough space to connect existing interfaces and other contacts using standard commercial type accessories.
- there is room for any necessary cable routing.

For the NetLink USB, a minimum clearance of 60 mm should be left above and below and 10 mm at the sides.

2.3 Installing the module

A wall/DIN rail bracket is available as an accessory for mounting on flat surfaces or on DIN rails.

The available accessories are listed in Chapter 3.5 with the corresponding order numbers.

3 System Overview

3.1 Application and function description

The NETLink USB is a gateway between USB and an MPI or Profibus.

With one USB connection (12 Mbps full speed or 480 Mbps high speed), up to twelve MPI/Profibus connections (9.6 kbps to 12 Mbps) can be used simultaneously.

On both the USB and the field bus sides, the baudrate used can be determined automatically (autodetect or autobaud)

The NETLink USB can draw the necessary power supply either from the USB interface of the PC or via an external power supply.

The connecting cable used to link the NETLink USB with the programmable controller is 1.2 meters long and active. Because it is active, no spur lines are required which could interfere with the bus.

The use of drivers makes it possible to use the NETLink USB as the following on the PC side

- Programming adapter or
- Operator control and monitoring unit

The NetLink USB is connected to the PC directly or via a USB hub.

3.2 Connections

The NETLink USB has the following connections:

- USB socket (standard B socket) for connecting the unit to a commercial type PC or hub using a standard USB 2.0 cable.
- Power supply socket for 24 V DC power supply.
  This power supply option can be used, if the notebook or PC used does not provide sufficient power at the USB interface.

- Bus connector with programming unit socket, switchable terminating resistor, and 1.2 m connecting cable.
  The programming unit socket of the bus connector allows further bus nodes to be plugged in.
  The terminating resistor must be connected (ON) if the NETLink USB is at the beginning or end of a bus segment. If this is not the case, the switch position must be OFF.
  The 1.2 m connecting cable is an 'active cable'. This means there is no spur line, which avoids interference with high baud rates.

3.3 LED displays

The NETLink USB has three LEDs, including two two-color LEDs, to indicate its operating status.

LED status for operating status	Power LED (green)	Active LED (green)	Active LED (red)	Connect LED (green)	Connect LED (red)
Power ON	ON				
Active connection to the PC	ON	ON			
Active connection with a programmable controller	ON	ON		ON	
Data exchange with an programmable controller	ON	ON		BLINK	
Transferring firmware update	BLINK		BLINK		BLINK
Storing firmware update	ON		ON		ON
Exception at bus end	ON			BLINK	
Exception at PC end	ON		BLINK		

3.4 Scope of supply

The scope of supply of the NETLink USB includes:

- NETLink USB ready to run
- USB 2.0 cable with a length of three meters
- CD with NETLink-S7-NET driver, additional infos
- Manual (German/English)

3.5 Accessories

3.5.1 Manuals

Manual, German 900-881-MPI11

Manual, English 901-881-MPI11

3.5.2 Software

S7/S5 OPC server w. software license 800-880-OPC10

S7/S5 OPC server with USB dongle 800-880-OPC20

3.5.3 Other accessories

DIN mounting rail bracket 700-751-HSH01

The DIN rail bracket is for mounting the NETLink USB on a DIN standard mounting rails.

The DIN rail bracket and NETLink USB can be separated without the use of tools.

The DIN rail bracket can also be used as a wall bracket for mounting on flat surfaces.

Connector power supply unit 700-751-SNT01

Input: 100-240 V AC / 47-63 Hz / 400 mA

Output: 24 V DC / 625 mA

4 Installation of the driver software

With installation of the NETLink-S7-NET driver for the NETLink USB, it is easy to access controllers with an MPI/Profibus interface from the PC via USB.

4.1 Introduction

The NETLink-S7-NET driver is inserted in the PG/PC interface of an existing Simatic application and can then be used from most Simatic engineering tools (STEP7, ProTool, WinCC, etc.).

Access is possible to any controllers of the Simatic S7-300 or S7-400 series. The NETLink USB communication adapter is required to connect a Simatic S7-300 or S7-400 controller with USB.

4.2 System requirements

A PC with a 32-bit Windows operating system is required to operate the NETLink-S7-NET driver at the PU end. The Windows 2000 and Windows XP operating systems can be used.

A further requirement is the existence of a Simatic engineering tools, such as STEP7, Version 5.1 and higher, which ensures that the PG/PC interface is installed on the computer.

Installation under Windows 98/ME/NT is possible but is not supported by our technical support team. Please pay attention to the requirements of the STEP7 package used.

The PCs used must have a functioning USB interface. You can use normal commercial type USB cards. To maximize performance, USB interfaces should be used that are USB 2.0 compliant (high speed with 480 Mbps).
USB interfaces that only achieve full speed (12 Mbps) are also possible, but this slows down status operation.

4.3 Running the installation setup

After you have inserted the installation CD, the setup routine of the NETLink-S7-NET driver starts automatically.

If setup does not start automatically, the setup file can be launched manually in directory '*CD drive:\Driver*'.

If necessary, you can download the latest NETLink-S7-NET driver from our homepage (http://www.helmholz.de).

Administration rights are required for installation.

Please note that for installation you have to log on as an administrator under the 32-bit Windows operating systems Windows 2000 and Windows XP because the setup program has to make entries in the Windows registry.

4.3.1 Adding the interface to the PG/PC interface

After initial installation, the new interface parameter set '*NETLink-S7-NET USB*' has to be set up. Administrator rights are necessary for this.

After you have started '*Set PG/PC Interface*' in the Control Panel, click the '*Select…*' button there.

The '*Installing/Uninstalling Interfaces*' dialog box now appears.

After you have selected the entry *'NETLink-S7-NET USB'* from the left-hand list, click the *'Install'* button.

The following query then appears.

If you answer *"Yes"* to this query, the NETLink USB is immediately set as the current access path. If you respond *"No"*, the previous access path remains set and the NETLink USB is put in the selection list where you can select it later.

Now you have answered the query, *'NETLink-S7-NET USB'* will also appear in the right-hand list with the interfaces already installed.

The access path in the *'Set PG/PC Interface'* dialog box is set when this window is closed.

4.3.2 Selecting the required interface parameterization

The selection list for the interface parameter sets now contains an additional three items for the NETLink USB.

All relevant settings of the NETLink-S7-NET driver must be made in the '*Properties…*' field, as explained in Section 5.

4.4 Installation of the USB driver

If this is the first time a NETLink USB is being connected to the PC, the operating system will try to install a suitable driver. The driver is a sort of interface between the USB interface and the operating system (Windows) and has nothing to do with the actual application (NETLink-S7-NET).

This initialization can take some time and goes through the following steps:

- The operating system starts an installation wizard that performs the installation, which is largely automatic. Here it is necessary to specify that the source for the USB driver should not be ascertained automatically.

- The next step is a prompt to specify the location of the driver. It is generally enough to set a checkmark next to *'Search removable media…'* and then to click the *'Next'* button.

- The system now searches for the driver.

- If the NETLink-S7-NET CD is inserted in a local drive, installation should be started after a short time.

- After successful installation, the operation is completed by clicking the '*Finish*' button.

The NETLink USB has been successfully installed and can now be used.

If two or more NETLink USBs are to be used but the NETLink-S7-NET CD is not always at hand, it is convenient to copy the driver files of the USB driver onto the local hard disk because a separate instance of the driver is installed for each NETLink USB and the query about the driver files appears again every time.

5 Configuration

Once a NETLink USB has been selected in the '*Set PG/PC Interface*' window, it is possible to specify this access path more precisely with the '*Properties…*' button.

The properties of the access path NETLink USB(xyz) are divided into two subareas as follows:

- Bus settings
  Here it is possible to state the bus configuration (e.g. station address) with which the NETLink USB will enter the bus system.
- Options
  Here it is possible to change the language of the NETLink USB driver and to read out the version information of the driver.

5.1 Bus settings

The NETLink USB can be operated on two different bus systems: MPI and Profibus

From the NETLink USB user's viewpoint, the two bus systems differ only by the transmission rates that can be selected and the additional options for the Profibus, as explained in Chapter 5.1.2.

The bus configuration is passed to the NETLink USB during the runtime of the NETLink-S7-NET driver and is not stored in the device.

It is possible to use the NETLink USB without specifying bus-related information. The NETLink USB then automatically ascertains the bus parameters and can be operated on different programmable controllers, possible, with different transmission rates without switching over the NETLink-S7-NET driver.

Bus address 126 is not supported by the NETLink PRO

This autobaud function is supported if the '*Cyclic distribution of the bus parameters*' function is activated in the participating programmable controller.

Please note that the NETLink USB can neither have the address 126 nor communicate with address 126.

5.1.1 MPI configuration

The MPI configuration contains station and network-related settings.

The most important setting concerning bus configuration is assignment of the station address. This refers to the address the NETLink USB will have on the bus when it goes online.

The station address can have any value from '*0*' and '*125*' if the selected address is lower than or equal to the highest station address (HSA).

Example: HSA = 31

Any value between '*0*' and '*31*' can be specified for the station address if this address does not yet exist on the bus.

The local timeout of the NETLink-S7-NET driver can be parameterized in the station-related settings. If the driver does not receive a response to a request within the set timeout, a communication error is signaled to the Simatic application.

In the network-related settings, the transmission rate must be selected, as must the HAS of the programmable controller to be addressed.

To simplify configuration, the '*No baudrate detection*' function can be deselected in the station-related settings.

This causes the NETLink USB with the preset station address to ascertain the baudrate and associated bus parameters itself.

If this function is required, no manual setting of the network-related parameters is possible.

Use of the autobaud function does not impair the functionality, but initialization of a connection takes longer because the online parameters have to be ascertained.

Some older Siemens CPUs do not support the autobaud function on the MPI.

It is also possible that the autobaud function may not function reliably at transmission rates slower than or equal to 19.2 Kbps or with increased use of communication via global data exchange. In these cases, it is better to avoid automatic detection of the bus parameters.

5.1.2 Profibus configuration

Basically, the same applies to Profibus configuration as to MPI configuration. However, the network-related parameters are more extensive.

In addition to the parameters transmission rate and highest station address mentioned in Chapter 5.1.1, Profibus also has parameter field for selecting the bus profile and bus parameters:

Profile:

Under Profibus, there are usually the profiles *DP*, *Standard* und *User defined*.

The profile must be selected that is already used in the programmable controller.

Bus parameters:

Unlike the MPI bus profile, the bus parameters for Profibus are not constant and change with the type and number of Profibus stations used.

The Profibus parameters should always be set that are set in the currently used programmable controller (see STEP7 project).

To avoid these, in some cases, complicated steps, it is especially useful in the case of Profibus to use the autobaud function because it then automatically ascertains the bus parameters.

Under Profibus, please note that the autobaud function can only be used if the *'Turn on cyclic distribution of the bus parameters'* function is activated in the programmable controller used.

The following screenshot of a the hardware configuration of a randomly chosen Profibus CPU shows where to find the switch for cyclic distribution of the bus parameters.

!

Parameterization for the PPI protocol has not yet been released!

5.1.3 PPI configuration

The PPI interface is listed in the NETLink USB driver for compatibility reasons but is not currently supported.

5.2 Options of the driver

Under the options of the NETLink-S7-NET driver, it is possible to set the language of the output and help texts of the driver and read the version numbers of the driver files used.

5.2.1 Language setting of the display elements

The languages German and English are currently available.

After switching over the language, the setting window must be opened again to apply the changes.

5.2.2 Version information

The names and version number of all driver files are listed here.

If support is needed, this data is used to obtain information about the components used quickly and effectively.

6 Troubleshooting

Q: I connected the NETLink USB directly to my PC/notebook but it always seems to reboot again.

A: It is possible that the power supply from the USB interface does not provide enough power to operate the NETLink USB.
This can be remedied in one of the following ways:

1) Using a USB hub with an external power supply should resolve the problem.
2) It is also possible to user an external power supply for the NETLink USB.
3) In most cases, use of a high-quality USB 2.0 cable with the shortest length possible should resolve the problem because the voltage drop on the USB cable is then very small.

Q: Although I have already operated a NETLink USB on my PC, I am prompted to install a USB driver if I want to use another NETLink USB or another USB interface of my PC.

A: USB devices are usually equipped with a serial number. This is used to identify devices that are already known.
If you use two USB devices of the same type, two instances of the driver will be installed on your computer for this device type.
You will find the USB driver on the CD supplied in directory '*CD directory:\Driver*'. You can also download it from our homepage at www.helmholz.de.

Q: I get an error message when I access the controller.

A: Check the error message.
The problem may be the setting of the PG/PC interface (e.g. Profibus instead of MPI, address already allocated, etc.) or the NETLink USB, for example, if it is not connected or the necessary USB driver has not yet been installed.

Q: The setting dialog boxes are not appearing in the Simatic Manager:

A: Please note that after initial installation the NETLink-S7-NET driver must be added to the PG/PC interfaces.
Make sure you had administrator rights during installation.
Reboot your PC after installation if prompted to do so.
You need at least version 5.1 of the Simatic Manager.

Q: When the adapter is plugged onto the Profibus, no online connection is possible.

A: If possible, use the autobaud functionality.
If this is not possible or not desired, check the timing parameters for the Profibus in the STEP7 configuration. Enter the read values into the advanced bus parameter settings via the *'Bus parameters'*

button. If on-line access is still not possible, set a higher *'Ttr'* (target rotation time) both in the NETLink USB and on the CPU.

Q: The Starter program has problems accessing a Micromaster drive.

A: When you request a *'control priority'* for the Micromaster drive, please increase the Failure monitoring from 20ms to 200ms and the Application monitoring from 2000ms to 5000ms, so that the Starter software remains operable.

Q: Every time I execute a certain function, it fails and the red Active LED flashes.

A: It is an exception in the communication between the PC and the NETLink USB. Please contact support and describe how the error can be triggered. The support team will attempt to solve the problem as quickly as possible.

Q: Every time I execute a certain function, it fails and the red Connect LED flashes.

A: It is an exception in the communication between the programmable controller and the NETLink USB. Please contact support and describe how the error can be triggered. The support team will attempt to solve the problem as quickly as possible.

Q: Although the NETLink PRO is plugged directly into my CPU and no further nodes are connected, MPI and Profibus connections sometimes break down at high baudrates.

A: Make sure that the bus is correctly terminated.
Even if the NETLink PRO is the only device on the bus apart from the CPU, the terminating resistor must be connected. Otherwise problems may occur, especially at high baudrates.

Q: If I set the NETLink PRO to autobaud in the PG/PC interface and try to go online, the active LED lights up briefly before a message appears telling me that the bus parameters cannot be determined.

A: Either the CPU used does not support the cyclic transmission of bus parameters (disabled via parameterization or function does not exist), or the CPU is so busy with general communication tasks that the lower-priority bus parameter telegram is transmitted too infrequently and cannot be detected by the NETLink PRO. Please deactivate the autobaud functionality in the NETLink-S7-NET driver (PG/PC interface) and set the correct baudrate and the correct profile.

Q: If I open various connections via the Step 7 driver, the link sometimes breaks off or error messages appear saying that it is not possible to establish a link.

A: For communication with S7-300 modules it may be necessary to parameterize the communication resources.
The user can influence the allocation of existing *'Connection Resources'* under object properties of the CPU in the hardware configuration.

Q: Once the configured Profibus slaves have been added on my CPU, communication between NETLink PRO and Step7 becomes markedly slower.

A: The user can influence the allocation of *'Scan Cycle Load from Communication [%]'* under object properties of the CPU in the hardware configuration. The default value is 20 %.

7 Appendix

7.1 Technical data

Dimensions in mm (LxWxH)	102 x 54 x 30
Weight	Approx. 180 g
Operating voltage / current consumption	24 V DC ±25 %, 150 mA (ext.) 5 V DC, 500 mA (USB) Automatically selected
USB interface	USB 2.0 (high speed)
USB connection	USB B socket
Ethernet transmission rate	12 Mbps (full speed) and 480 Mbps (high speed)
MPI/Profibus interface	RS485, electrically isolated
MPI/Profibus transmission rate	9.6 Kbps; 19.2 Kbps 45.45 Kbps; 93.75 Kbps 187.5 Kbps; 500 Kbps 1.5 Mbps; 3 Mbps 6 Mbps; 12 Mbps
MPI/Profibus connection	SUB-D connector, 9-way with programming unit interface and terminating resistor
MPI/Profibus protocols	FDL protocol for MPI and Profibus
Displays	3 LEDs, including 2 two-color LEDs, for general status information
Degree of protection	IP 30
Operating temperature	0°C to 60°C
Storage and transportation temperature	-20° C to +90°C
Relative humidity during operation	5% to 85% at 30°C (no condensation)
Relative humidity during storage	5% to 93% at 40°C (no condensation)

7.2 Pin assignments

7.2.1 MPI/Profibus interface pin assignments

Pin	Signal	Meaning
1	-	unused
2	GND	ground (looped through)
3	RxD / TxD-P	receive / transmit data-P
4	-	unused
5	DGND	ground for bus termination (looped through)
6	DVCC	5 V DC for bus termination (looped through)
7	VCC	24 V DC (looped through)
8	RxD / TxD-N	receive / transmit data-N
9	-	unused

7.2.2 Assignment of the USB interface

Pin	Signal	Meaning
1	VCC	5 V DC
2	D-	Data -
3	D+	Data +
4	GND	Ground

The NETLink USB comes with a shielded USB 2.0 cable with a length of three meters.

The cable has a standard A and a standard B connector.

The cable length between two USB interfaces should not be longer than three meters because the voltage drop in the cable is important if the USB device draws its power supply from the interface.

If larger distances have to be covered, the use of USB hubs is recommended.

7.2.3 Power supply socket

If an external power supply is used, please make sure the polarity is correct and all technical data are complied with.

7.3 Further documentation

Internet:

http://www.helmholz.de

http://www.profibus.com

http://www.usb.org

http://www.siemens.com

Notes