KUNBUS
industrial communication

User Manual
TAP CURIOUS

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Table of Contents

1 Working safely

Intended use

The use of TAP CURIOUS described in these instructions serves to analyze Ethernet-based data flows. Using TAP CURIOUS for any alternative purpose is not envisaged and can lead to loss or damage. TAP CURIOUS must not be used for illegitimate or unlawful data espionage.

User

You are allowed to use TAP CURIOUS if you have knowledge of and authorizations for the following areas:

- assessing the safety of electrical systems and equipment,
- installing and configuring IT systems,
- measuring and analyzing electrical functions and systems,
- occupational health and safety,
- assembling and connecting-up electrical equipment,
- accident prevention and occupational safety regulations applicable at the place of use.

Avoiding hazards

NOTICE

Defect caused by excessive signal voltage

Excessive signal voltage can damage TAP CURIOUS.

Apply only signal voltage that conforms to the standard.

2 Scope of delivery

- Box
- TAP CURIOUS
- Power pack with Euro adapters
- Plug for the power supply
- Plug for the digital input and output
- Operating instructions, Wireshark plugins and web server files on USB stick (the latest version can be found at www.kunbus.de/support.html)

3 Introduction

The KUNBUS TAP CURIOUS is your network monitor for analyzing all standard industrial Ethernet solutions. Four probe ports allow you to capture up to two independent realtime Ethernet connections.

You can use filters to reduce data volumes or select specific analysis data. You can configure these filters via an integrated web server. The web server can operate in 2 different modes. "Basic" mode helps you set your filters and configure your device. "Expert" mode was developed for people with expert knowledge of frame filters. In this mode, you can filter a frame by all the aspects it contains.

The digital input and output allows you to create useful trigger conditions. These can systematically help limit sporadic effects, and identify and remedy the causes.

An internal throughput delay of 0 µs (zero delay) makes TAP CURIOUS almost transparent for the data channels to be checked.

TAP CURIOUS is connected to a PC via a standard Ethernet interface. You can operate TAP CURIOUS in 1 Gbit/s or 100 Mbit/s mode. Captured packet data is read and analyzed using network monitors such as "Wireshark", the freely available network analysis software.

4 Overview

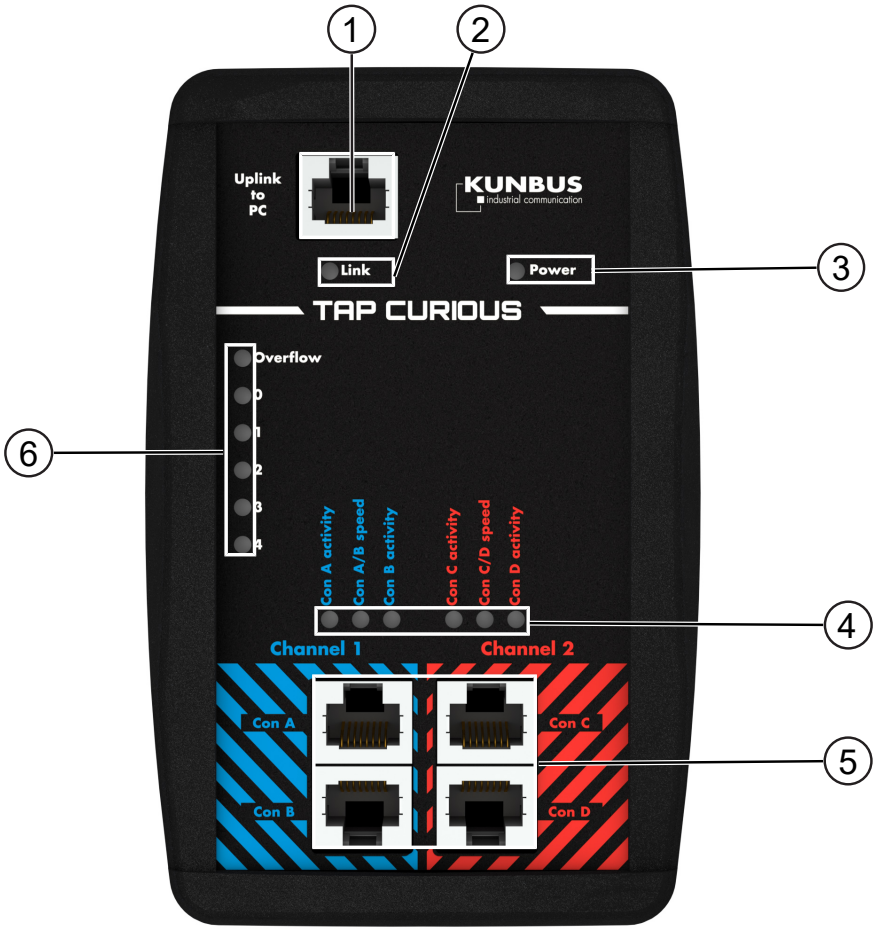


Illustration 1: Front

1	Uplink-Port	**2**	Link LED
3	Power LED	**4**	Status LEDs for the 2 communication channels (5)
5	Monitoring ports (2 communication channels)	**6**	LEDs for filter and overflow

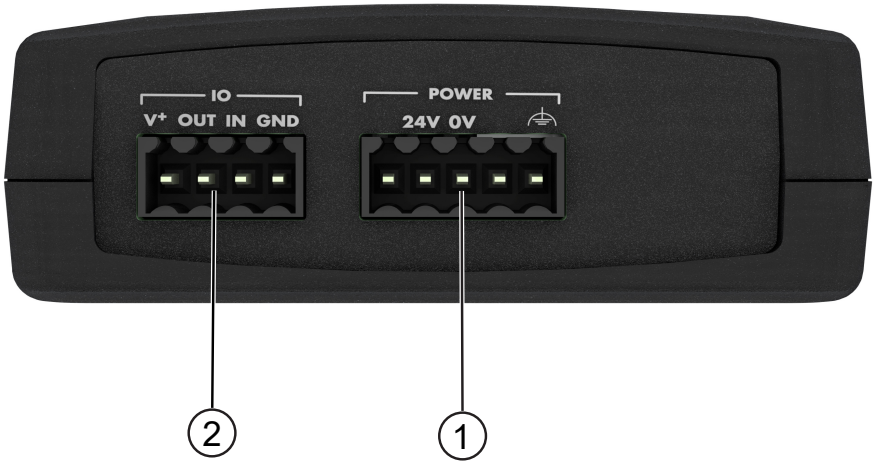


Illustration 2: Top

1	Socket for power supply	**2**	External input and output interface

The individual overview points are explained in the following sections.

4.1 Power supply

TAP CURIOUS is connected to the power supply pack via a 5-pole plug. The plug is supplied as standard.

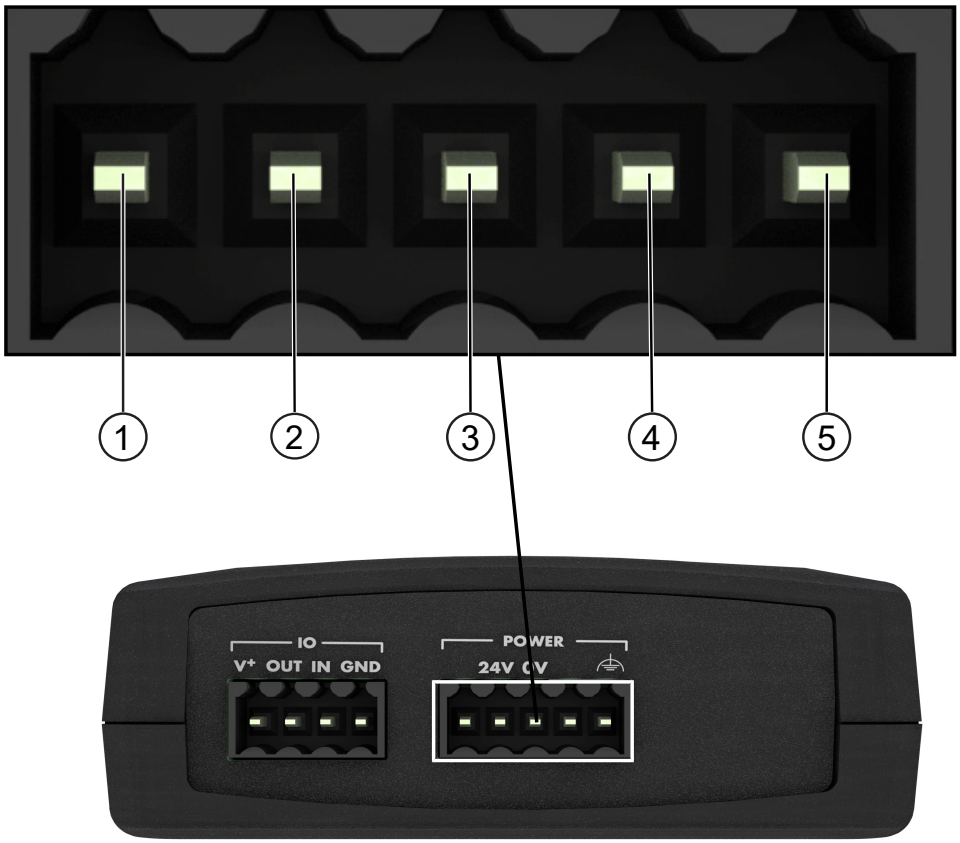
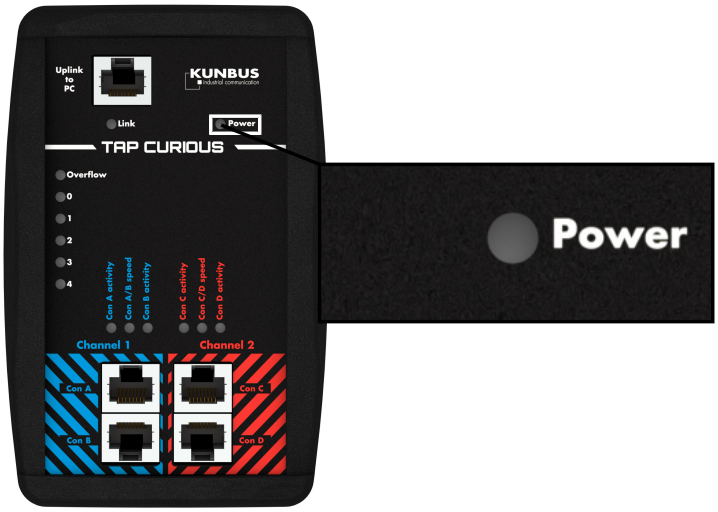


Illustration 3: Power supply

The port is assigned as follows:

Pin	Assignment
1	DNC
2	20-28 V
3	GND
4	DNC
5	PE

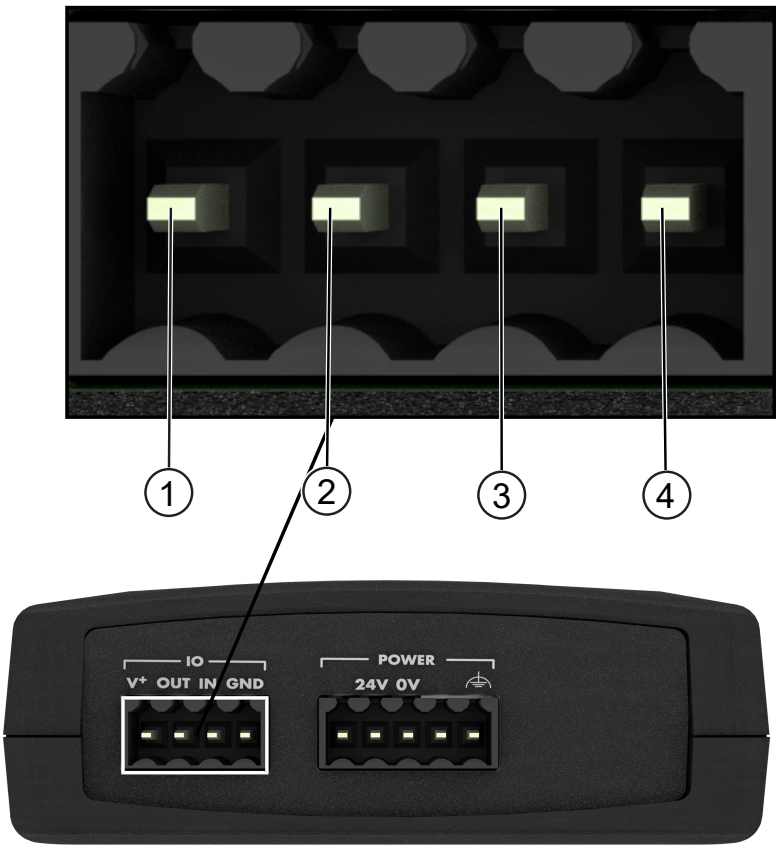
The Power LED indicates whether or not TAP CURIOUS is connected to the power supply:



LED	Display	Meaning
Power	off	TAP CURIOUS is not connected to the power supply.
	green	TAP CURIOUS is connected to the power supply.

4.2 Digital input and output

TAP CURIOUS has a digital input and output. This is protected against reverse polarity. The terminal (Weidmüller BLZF 3.50/04/180 SN BK BX) designed for the digital input and output is supplied as standard.



The port is assigned as follows:

Pin	Assignment
1	20-28 V
2	Digital output
3	Digital input
4	GND

4.3 Uplink interface

You can connect TAP CURIOUS to your PC via the uplink interface.

To do this, you need an Ethernet cable with standard RJ45 plugs.

If your PC does not have a free RJ45 port, you can use a USB adapter.

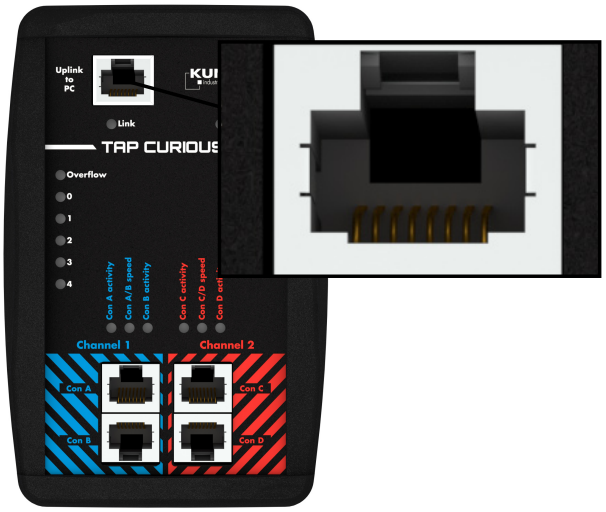


Illustration 4: Gigabit interface

The "Link" LED indicates the interface status:

LED	Display	Meaning
CC-Link	off	No connection to the remote station
	green	Successfully connected to the remote station
	yellow flash-ing	Communication running

4.4 Test inputs

TAP CURIOUS has 2 communication channels for monitoring the lines. Each of the ports Con 1 and Con 2, as well as Con 3 and Con 4, are connected directly to a communication channel.

You can connect the ports to a device via an Ethernet cable with standard RJ45 plugs.

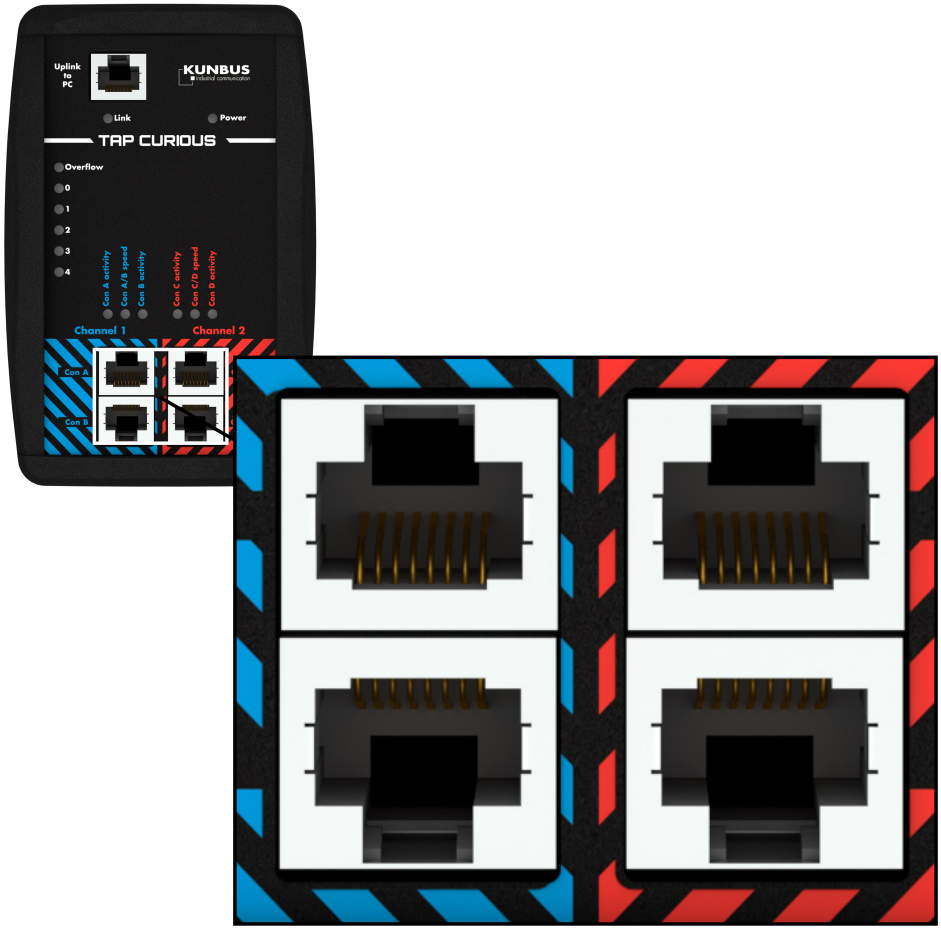
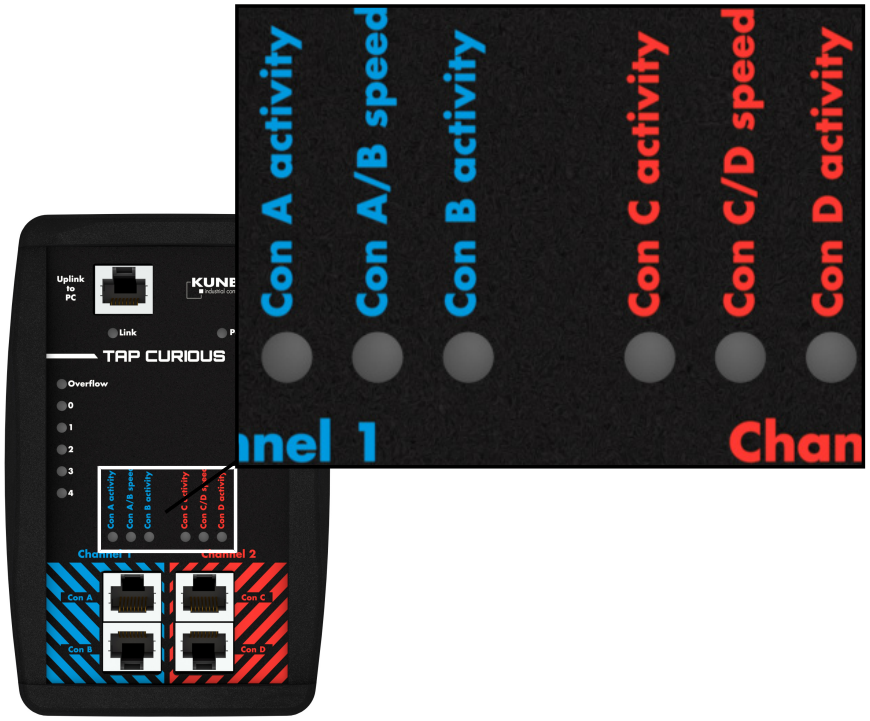


Illustration 5: Test inputs

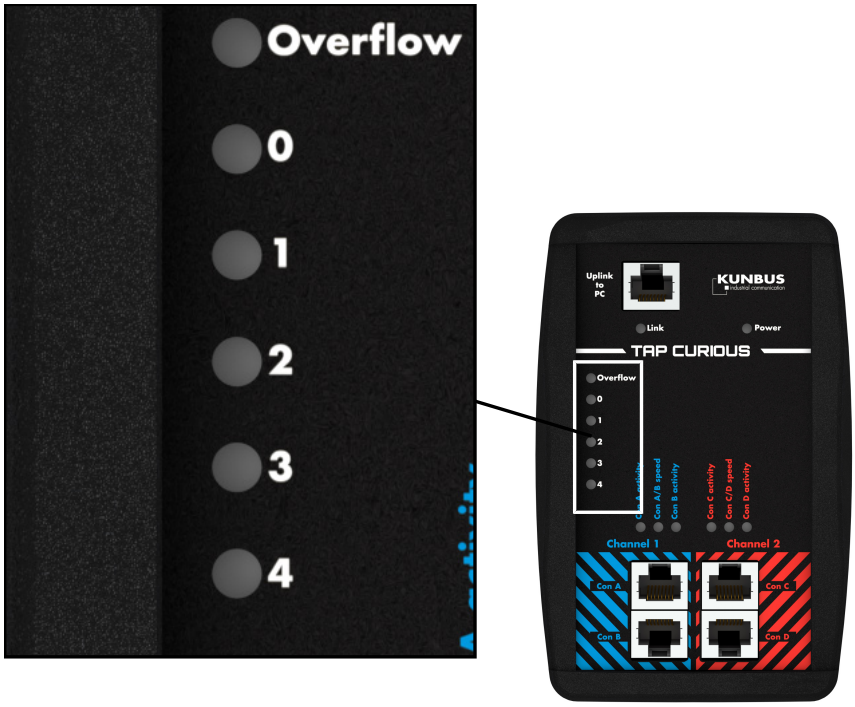
Status LEDs signal the status of the individual ports:



LED	Display	Meaning
Con (A, B ,C, D) activity	off	No communication
	green flashing	Communication running
	red	Frame has been blocked by a filter (burn time 500 ms), it is not output via the uplink
Con (A, B ,C, D) speed	green	100 Mbit/s mode
	yellow	10 Mbit/s mode

4.5 Filter and overflow LEDs

You can apply filters to the frames. The LEDs are able to show these filter results. The "Filters [} 20]" chapter explains how this works.



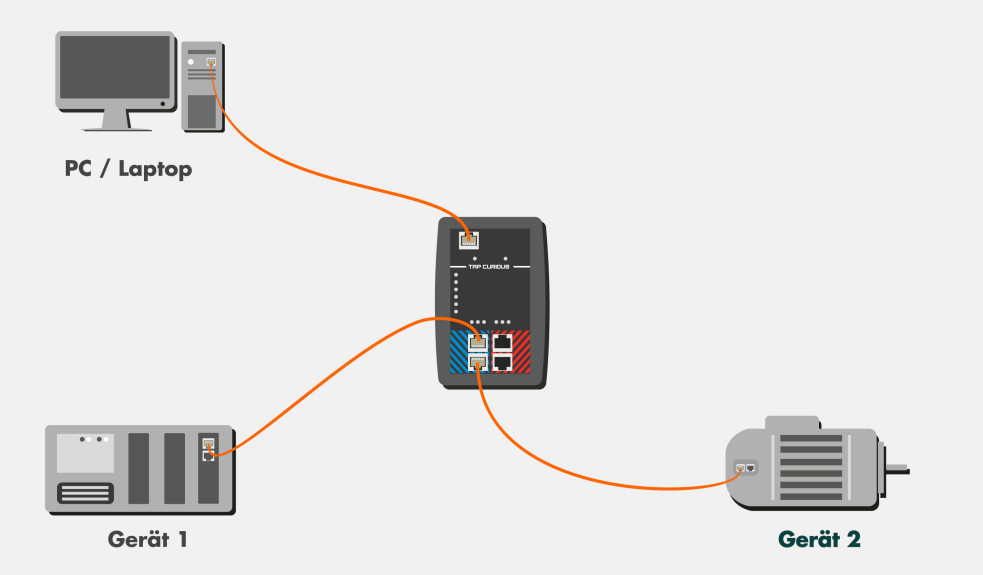
LED	Display	Meaning
Overflow	off	No overflow on uplink port
	red	Only in 100 Mbit/s mode: Overflow on uplink port (burn time 2 s)
Filter LED0	off	No filter match
	green	Filter match
Filter LED1	off	No filter match
	green	Filter match
Filter LED2	off	No filter match
	green	Filter match
Filter LED3	off	No filter match
	green	Filter match
Filter LED4	off	No filter match
	green	Filter match

5 Application examples

TAP CURIOUS is able to monitor devices in various ways. 2 examples are shown here.

Example 1:

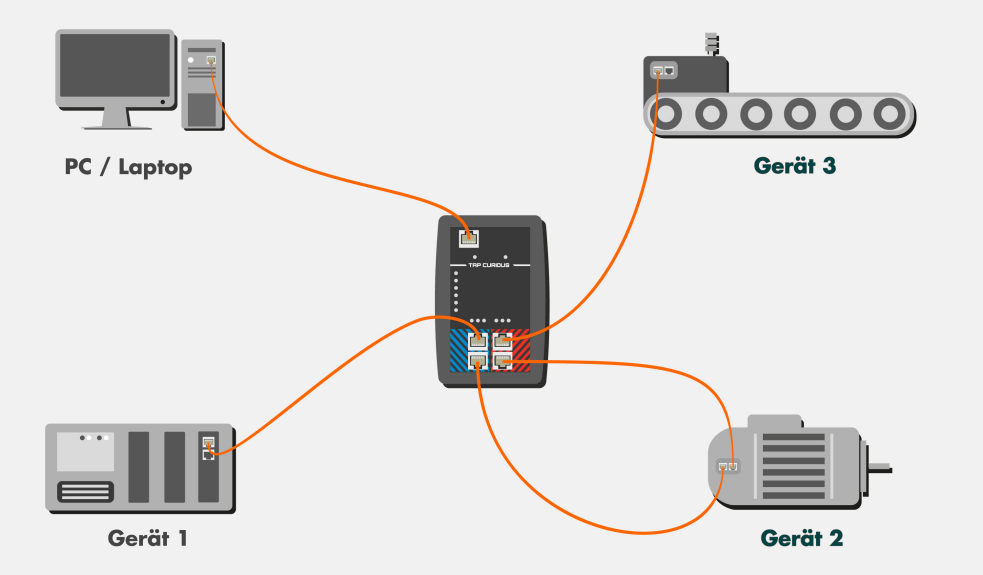
Connect your devices as shown to capture the communication between two devices. This allows you to find faulty frames on the network.



Example 2:

Connect your devices as shown to monitor the frames before and after a device throughput. In this example, device 2 is monitored. Here, you could analyze the following:

- Measure the device throughput time,
- Check whether frames have been distorted or truncated,
- Measure jitter on cyclical frames.



6 Starting TAP for the first time

- Unpack the device and make sure you have all the components listed in the scope of delivery.
- Connect the device to the power pack supplied.
  ⇨ The POWER LED lights up.
- Load the "Wireshark" network analysis software onto the PC and install it. You can download Wireshark from www.wireshark.org.
- Download the Wireshark plugin DLL from the KUNBUS website and copy the DLL file into the Wireshark plug-in directory (e.g.: C:\Programs\Wireshark\plugins\1.10.2). Starting with Whireshark version 2.6.0, the file structure has changed. The location for the DLL file is here: ...\Wireshark\plugins\2.6\epan
  Depending on whether you are using the 32- or 64-bit version of Wireshark, you will need to download the corresponding DLL file:
  - 32-bit version: tap32_1xxx.dll (Wireshark plugin WIN32)
  - 32-bit version: tap32_2xxx.dll (Wireshark-Plugin WIN32)
  - 64-Bit-Version: tap64_1xxx.dll (Wireshark-Plugin WIN64)
  - 64-Bit-Version: tap64_2xxx.dll (Wireshark-Plugin WIN64)
  xxxx represents the used version (e.g. 1.10.2)
- Connect TAP CURIOUS to an Ethernet interface on the PC using a RJ45 cable. Die "Link" LED lights up as as soon as the PC and TAP CURIOUS are connected
- Connect the line to be tested to one of the probe ports. Each of the ports "Con A" and "Con B" and ports "Con C" and "Con D" are connected directly. So communication is possible even when TAP is deactivated. The "Speed" LEDs show the connection speed set for the probe ports. When frames are being transmitted on the line, the "Activity" LED flashes green
- Start Wireshark on the PC and activate the "TAP" plugin in the menu at "Edit > Preferences > Protocols > TAP".

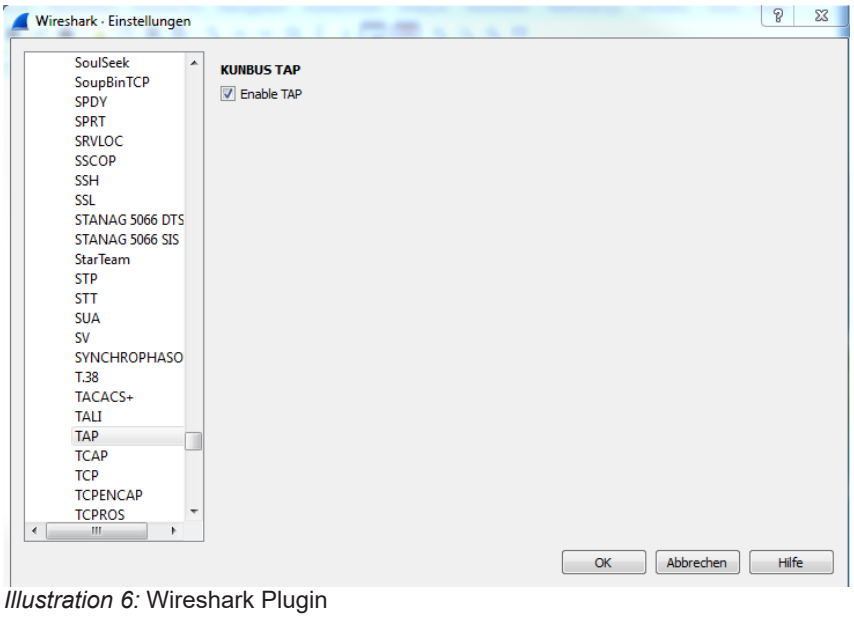


Illustration 6: Wireshark Plugin

- All available Ethernet interfaces are listed in the main window. Click on the Ethernet interface you require to select it.
- Set any filters you want via the web server. This allows you to search for specific frames and prevents your PC's main memory from becoming overloaded.

⇨ You can now use Wireshark to analyze the data.

TAP CURIOUS expands the Ethernet packets by 20 bytes of additional information. You can use TAP CURIOUS without the plugin or with a different Ethernet analysis program. But you will not be able to analyze this additional information. You might also find that the analysis program reports a data packet as faulty due to this additional information.

Information on the additional data can be found in the chapter called "Monitoring the interface [〉 58]".

7 Filters

7.1 Why do we use filters?

TAP CURIOUS records all Ethernet frames transmitted on the connected network line. TAP sends the Ethernet frames to the connected PC via the "Uplink to PC" port. Wireshark writes these frames to the main memory (RAM) on your PC.

This not only makes it more difficult for your to monitor data, it can also overload the main memory and cause your PC to crash.

To prevent this from happening, you can set various filters for each probe port. These filters check whether the incoming frame has the properties you defined in the filter settings. If the data have these properties, they will be written to the main memory on your PC. If the data do not have these properties, they will be ignored.

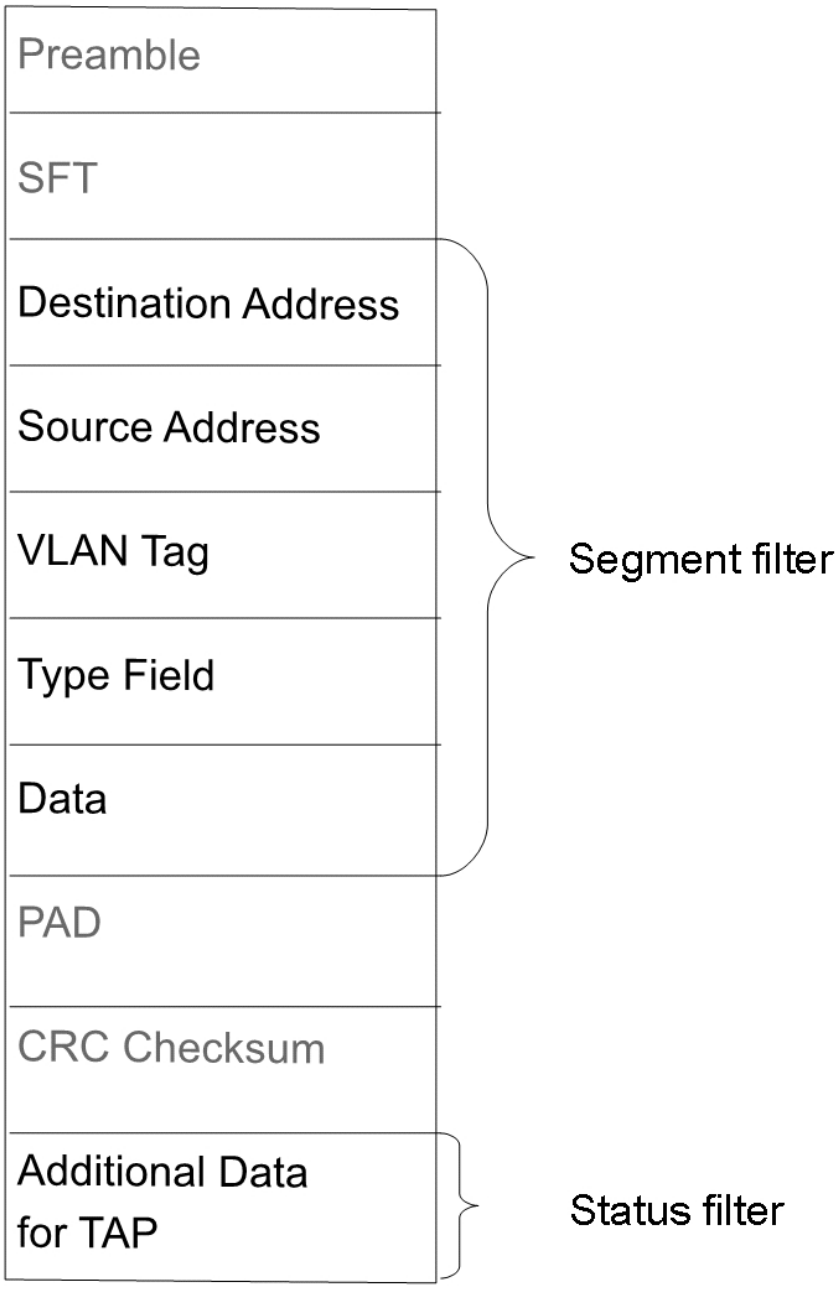
The following filter elements are available:

Status filter

The status filter enables you to filter properties such as the receiving time or the status of a frame. This filter is applied to the 20 bytes, which are additionally transmitted to the standard frame.

Segment filter

You can use the segment filter to filter data for parity or disparity within the frame. There are 16 words (4 bytes) available, and these can be checked in succession.

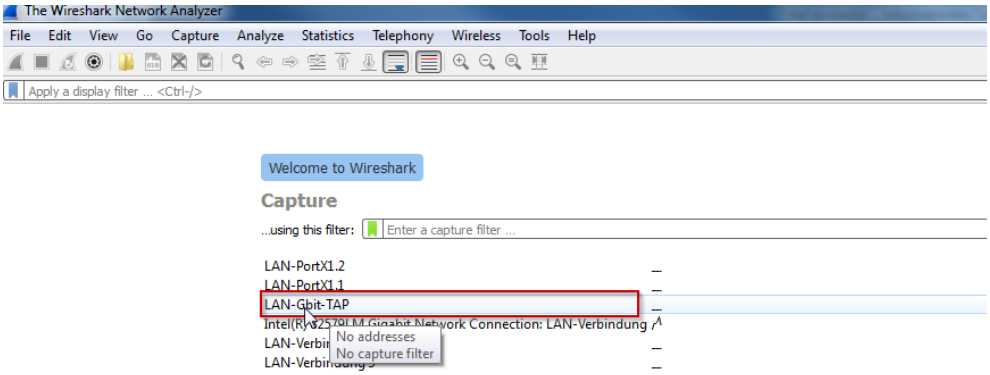


You can set a total of 5 filters per probe port.

7.2 Setting filters

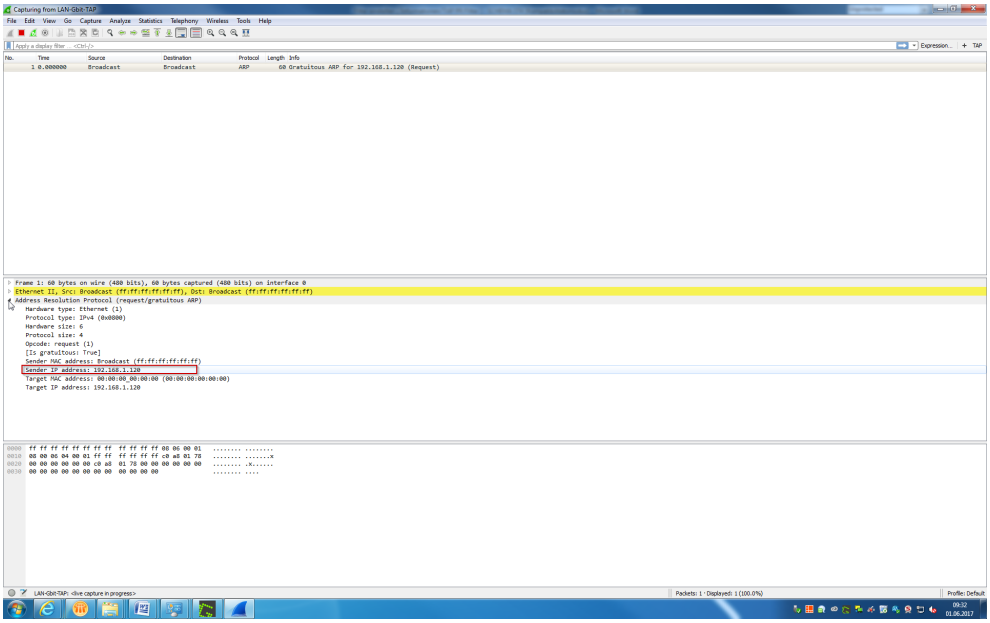
Requirements:

- ✓ Wireshark is installed on your PC.
- ✓ TAP CURIOUS is properly connected.
  - ◦ Open the Network and sharing center on your PC.
  - ◦ Click on "Change adapter settings".
  - ◦ Double-click to open the network connection for your TAP CURIOUS.
  - ◦ Click on "Properties"
  - ◦ Activate the "IPv4" protocol. You need this protocol to configure filter settings via the web server.
  - ◦ Open Wireshark
  - ◦ Select the network connection for TAP CURIOUS.



⇨ TAP CURIOUS will transmit a broadcast frame. You can determine the current IP address of TAP CURIOUS from this frame. When you start TAP CURIOUS for the first time, the default IP address is 192.168.0.10.

- ◦ Click on “Address Resolution Protocol".
- ◦ Make a note of the TAP CURIOUS IP address.



- Enter the IP address into the address line in your browser.

⇨ The web server will open.

You can now set the filters you want and configure TAP CURIOUS.

The web server has 2 modes:

"Edit Registers (Expert)" mode is the right mode for you if you are already closely familiar with the structure of an Ethernet frame.

"Filter Basic" mode is the right mode for you if you do not deal with this topic so often and feel you need a little more support.

A detailed list of the parameters for filter settings and the TAP CURIOUS configuration can be found in the chapter called "Tabulated list of filters and configuration registers [} 41]".

In the chapters that follow, we describe how to configure settings on the web server.

7.2.1 Settings in Basic mode

Basic mode is the right mode for you if you want to set filters in the easiest way possible or feel you need a little support. Filter settings you would make in multiple registers in Expert mode can be made here from just one menu option.

✓ Your TAP CURIOUS is properly installed.

✓ Your network connection for TAP CURIOUS is active.

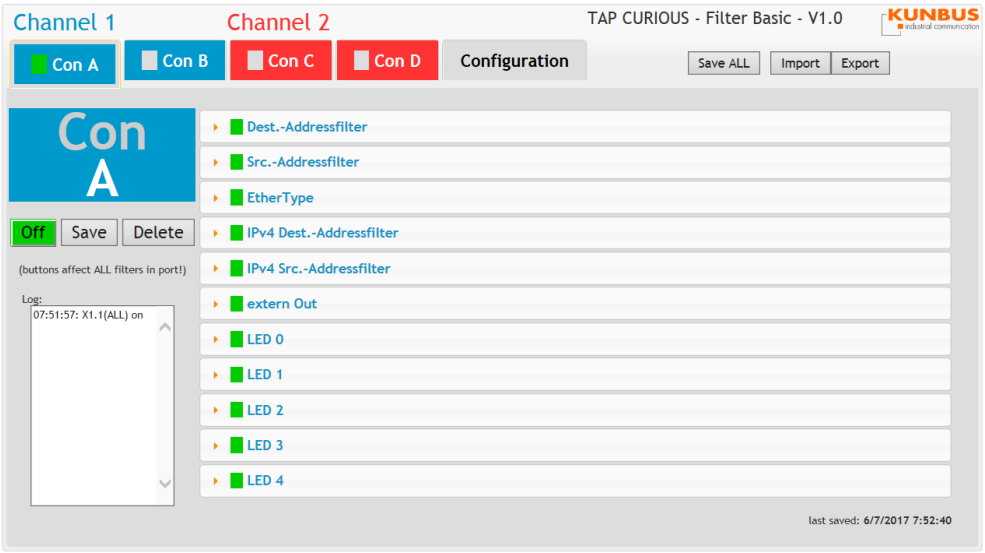
✓ You have opened the web server.

◦ Click on "Filter basic"

⇨ Basic mode will open.

Setting filters

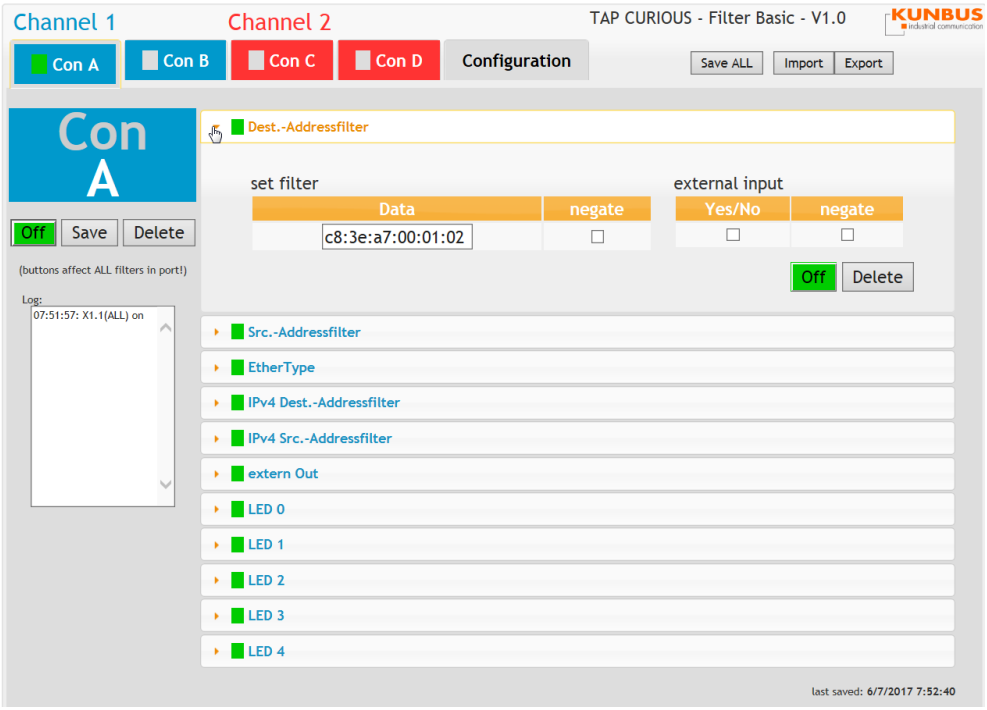
◦ Click on the register of a port on which you want to set filters (e.g. "Con A").



You can set filters for the selected port here.

◦ Click on the orange triangle in front of the filter option.

⇨ You will now see a menu in which you can set the filters.



To use any filter setting, you need to have activated the filter and saved the settings. Do this by clicking on "On" and then "Save".

You can set the following filters:

Dest. address filter

This is where you can set frames that are transmitted to a particular MAC address. Enter the MAC address you require.

Check the "Set filter > Negate" box to filter all frames that are not transmitted to this MAC address.

You can combine the filter with the external input. Do this by checking the "External input > Yes/No" box.

Check the "External input > Negate" box if the external input has to be "low".

Src. address filter

This is where you can set frames that are transmitted from a particular MAC address. Enter the MAC address you require.

Check the "Set filter > Negate" box to filter all frames that are not transmitted from this MAC address.

You can combine the filter with the external input. Do this by checking the "External input > Yes/No" box.

Check the "External input > Negate" box if the external input has to be "low".

Ethernet type

This is where you can filter by the protocol type via which a frame's useful data are transmitted. The values comply with the Ethernet specification.

We have gathered the values of a few important protocols for you here:

Type	Protocol
0x0800	IP Internet Protocol, Version 4 (IPv4)
0x0804	Address Resolution Protocol (ARP)
0x8100	VLAN Tag
0x8892	PROFINET
0x884A	EtherCAT
0x88AB	POWERLINK
0x88CD	SERCOS III

Check the "Set filter > Negate" box to filter all frames that do not match the selected Ethernet type.

You can combine the filter with the external input. Do this by checking the "External input > Yes/No" box.

Check the "External input > Negate" box if the external input has to be "low".

IPv4 Dest. address filter

This is where you can set frames that are transmitted to a particular IP address. Enter the IP address you require.

Check the "Set filter > Negate" box to filter all frames that are not transmitted to this IP address.

You can combine the filter with the external input. Do this by checking the "External input > Yes/No" box.

Check the "External input > Negate" box if the external input has to be "low".

IPv4 Src. address filter

This is where you can set frames that are transmitted from a particular IP address. Enter the IP address you require.

Check the "Set filter > Negate" box to filter all frames that are not transmitted from this IP address.

You can combine the filter with the external input. Do this by checking the "External input > Yes/No" box.

Check the "External input > Negate" box if the external input has to be "low".

Extern Out, LED 0-4

You can set what you want to do with the result of a filter here. You can show that a filter applies via the filter LEDs or the external output.

To be able to use the configuration settings, they have to be saved.

Example:

You want to filter all frames that are transmitted from the MAC address "C8 3E A7 01 23 45". LED 2 will light up when a frame has been transmitted from MAC address "C8 3E A7 01 23 45".

- In the "Dest. address filter" menu, set value "C8 3E A7 01 23 45".
- In the "Dest. address filter" checkbox in the "LED 2" menu, click "set".

For TAP CURIOUS to use your filter settings, they have to be saved.

Saving the configuration

As soon as you have set filter and configuration, you can save the settings so that they can be used at a later time.

- Click on Export.
- Enter a file name
- Click on OK

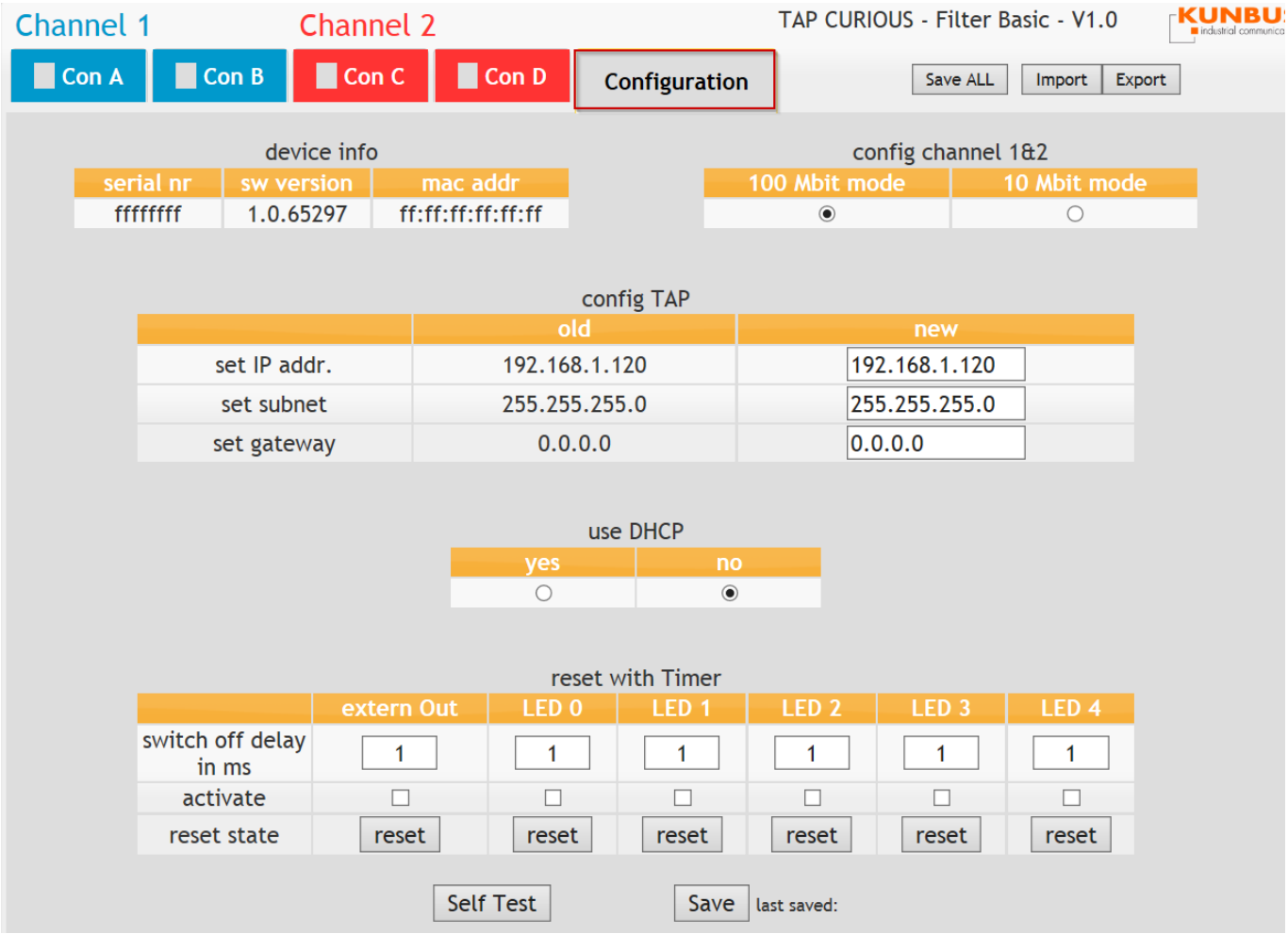
Loading an existing configuration file

If you have already saved a configuration in the web server, you can import this file to TAP CURIOUS again at any time.

- Click on "Import".
- Select the file you want.
- Click on "OK".

Configuring TAP CURIOUS

◦ Click on the "Configuration" register.



The basic settings for TAP CURIOUS will be displayed. You can also change certain values:

Device information

The following device information appears in "Device info":

– Serial number of TAP CURIOUS
– Software version
– MAC address

These data are specified by KUNBUS for this device and cannot be changed. Please have these data to hand if you report a problem to our support.

Setting the connection speed

You can select the connection speed for all ports in the "Config channel 1&2" menu. The default speed is 100 Mbit.

◦ To change the default, check the "10 Mbit mode" box.

Configuration

You can change the following communication parameters in the "Config TAP" menu:

– IP address
  The IP address ensures that TAP CURIOUS can be clearly identified within a network. When assigning a new IP address, you should therefore make sure that it is not being used by another device in the network.
  If you use DHCP, you do not need to set the IP address. In this case, TAP CURIOUS will receive the IP address from the DHCP server.
– Subnet
  This is where you can adapt the net mask. The net mask is a bit mask that indicates the bit position within the IP address that is being used to address the network section. Make sure the settings you change here match your network settings.
– Gateway address
  You can set the gateway address here.

Using DHCP

If you use a DHCP server, it can assign a free IP address to TAP CURIOUS.

Setting outputs filters

The "Reset with timer" menu allows you to reset one of the filter LEDs or the external output after a selected time.

◦ In the "Switch off delay in ms" field, enter a time after which you want the output to be reset.
◦ Check the "Activate" box

To be able to use the configuration settings, they have to be saved and TAP CURIOUS needs to be restarted.

7.2.2 Settings in Expert mode

If you are closely familiar with the structure of Ethernet frames, you can use Expert mode to configure TAP CURIOUS and set the filters.

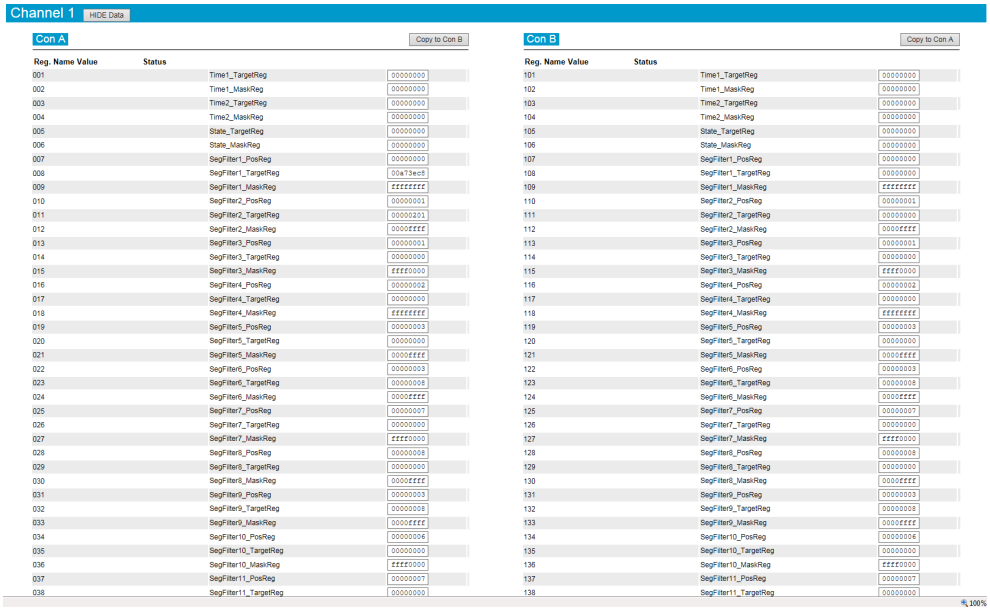
Setting filters

✓ Your TAP CURIOUS is properly installed.

✓ Your network connection for TAP CURIOUS is active.

✓ You have opened the web server.

◦ Click on the register of a port on which you want to set filters (e.g. B. "CON A").



Set your filters here. You will find the values you require in the chapter called "Tabulated list of filter registers [} 41]".

Filter examples

In the filter examples below, the x in the register number stands for the associated port.

Con A Register (0)01, Register (0)02, Register (0)03, …

Con B Register (1)01, Register (1)02, Register (1)03, …

Con C Register (2)01, Register (2)02, Register (2)03, …

Con D Register (3)01, Register (3)02, Register (3)03, …

Filtering by the destination MAC address

Input field for MAC address: 6 bytes

Example: You want to filter all frames that have been transmitted to the MAC address C8 3E A7 01 23 45.

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 00	Word offset of the MAC address
x08	01 A7 3E C8	First 4 bytes of the MAC address
x09	FF FF FF FF	Mask on all bits
SegFilter2:		
x10	00 00 00 01	Word offset of the rest of the MAC address
x11	00 00 45 23	Last 2 bytes of the MAC address
x12	00 00 FF FF	Mask on the first 2 bytes
Filter 1:		
x55	00 00 00 00	No negation of SegFilter1 and 2
x56	00 00 00 03	Filter1 consists of SegFilter1 and 2
Uplink:		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
Config reg:		
401	xx xx xx xE	Activate filter for Con A (1110)
401	xx xx xx xD	Activate filter for Con B (1101)
401	xx xx xx xB	Activate filter for Con C (1011)
401	xx xx xx x7	Activate filter for Con D (0111)

Filtering by protocol types IP4 and IP6

Example: You want to filter all registers of protocol types IPv4 and IP6. The values you require are:

- IP4= 0x0800
- IP6= 0x86DD

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 03	Word offset of protocol type
x08	00 00 00 08	IPv4 protocol type
x09	00 00 FF FF	Mask on the first 2 bytes
SegFilter2:		
x10	00 00 00 03	Word offset of protocol type
x11	00 00 DD 86	86 IPv6 Type
x12	00 00 FF FF	Mask on the first 2 bytes
Filter 1		
x55	00 00 00 00	No negation of SegFilter1
x56	00 00 00 01	Filter1 consists of SegFilter1
Filter 2		
x57	00 00 00 00	No negation of SegFilter2
x58	00 00 00 02	Filter2 consists of SegFilter2
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 03	Frame is output at the uplink port if filter 1 or 2 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON A port (1110)

Filtering by the source MAC address

Input field for Src address: 6 bytes

Example: You want to filter all frames that have been transmitted from the MAC address C8 3E A7 02 32 AB.

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 01	Word offset of the MAC address
x08	3E C8 xx xx	First 2 bytes of the MAC address
x09	FF FF 00 00	Mask on the last 2 bytes
SegFilter2:		
x10	00 00 00 02	Word offset of the rest of the MAC address
x11	AB 32 02 A7	Last 4 bytes of the MAC address
x12	FF FF FF FF	Mask on 4 bytes
Filter 1		
x55	00 00 00 00	No negation of SegFilter1 and 2
x56	00 00 00 03	Filter1 consists of SegFilter1 and 2
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON A port (1110)

Filtering by the destination or source MAC address

Input field for the destination MAC address: 6 bytes

Input field for the source MAC address: 6 bytes

Example: You want to filter all frames that are transmitted to the MAC address C8 3E A7 01 23 45 or from the MAC address C8 3E A7 02 32 AB.

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 00	Word offset of the destination MAC address
x08	01 A7 3E C8	First 4 bytes of the destination MAC address
x09	FF FF FF FF	Mask on all bits
SegFilter2:		
x10	00 00 00 01	Word offset of the rest of the destination MAC address
x11	xx xx 45 23	Last 2 bytes of the destination MAC address
x12	00 00 FF FF	Mask on 2 bytes
SegFilter3:		
x13	00 00 00 01	Word offset of the source MAC address
x14	3E C8 xx xx	First 2 bytes of the source MAC address
x15	FF FF 00 00	Mask on 2 bytes
SegFilter4:		
x16	00 00 00 02	Word offset of the rest of the source MAC address
x17	AB 32 02 A7	Last 2 bytes of the source MAC address
x18	FF FF FF FF	Mask on all bits
Filter 1		
x55	00 00 00 00	No negation of SegFilter1 and 2
x56	00 00 00 03	Filter1 consists of SegFilter1 and 2
Filter 2		
x57	00 00 00 00	No negation of SegFilter3 and 4
x58	00 00 00 0C	Filter2 consists of SegFilter3 and 4
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 03	Frame is output at the uplink port if filter 1 or 2 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON B port (1101)

Filtering by the sender IP address

(IPv4 0x0800)

Input field for sender IP address: 4 bytes

Example: You want to filter all frames that have been transmitted from the IP address 01 02 03 04.

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 03	Word offset of protocol type
x08	00 00 00 08	IPv4 protocol type
x09	00 00 FF FF	Mask on 2 bytes
SegFilter2:		
x10	00 00 00 06	Word offset of the sender IP address
x11	02 01 00 00	4 bytes of the sender IP address
x12	FF FF 00 00	Mask for all bits
SegFilter3:		
x13	00 00 00 07	Word offset of the sender IP address
x14	00 00 04 03	4 bytes of the sender IP address
x15	00 00 FF FF	Mask for all bits
Filter 1		
x55	00 00 00 00	No negation of SegFilter1 and 2
x56	00 00 00 07	Filter1 consists of SegFilter1 and 2
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON B port (1101)

Filtering by the target IP address

(IPv4 0x0800)

Input field for target IP address: 4 bytes

Example: You want to filter the target IP address "01 02 03 04".

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 03	Word offset of protocol type
x08	00 00 00 08	IPv4 protocol type
x09	00 00 FF FF	Mask on 2 bytes
SegFilter2:		
x10	00 00 00 07	Word offset of the target IP address is 10
x11	02 01 00 00	First 2 bytes of the target IP address
x12	FF FF 00 00	Mask on 2 bytes
SegFilter3:		
x13	00 00 00 08	Word offset of the rest of the target IP address is 11
x14	00 00 04 03	Last 2 bytes of the target IP address
x15	00 00 FF FF	Mask on 2 bytes
Filter 1		
x55	00 00 00 00	No negation of SegFilter1,2 and 3
x56	00 00 00 07	Filter1 consists of SegFilter1,2 and 3
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON B port (1101)

Filtering by IP4 and external input

Example: You want to filter by protocol type IPv4 and the external input.

Protocol type IPv4 corresponds to 0x0800. The external input is "high".

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 03	Word offset of protocol type
x08	00 00 00 08	IPv4 protocol type
x09	00 00 FF FF	Mask on 2 bytes
Filter 1		
x55	00 00 00 00	No negation of SegFilter1
x56	10 00 00 01	Filter1 consists of SegFilter1 and the external input
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON A port (1110)

Filtering by IP4 and setting the external output

Example: You want to filter by protocol type IPv4 and set the external output if a frame with protocol type IPv4 arrives.

Protocol type IPv4 corresponds to 0x0800.

Set the following filter registers:

Register	Parameter	Function
SegFilter1:		
x07	00 00 00 03	Word offset of protocol type
x08	00 00 00 08	IPv4 protocol type
x09	00 00 FF FF	Mask on 2 bytes
Filter 1		
x55	00 00 00 00	No negation of SegFilter1
x56	00 00 00 01	Filter1 consists of SegFilter1
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 00	Frame is output at the uplink port if filter 1 applies.
External output		
x67	00 00 00 00	No negation of ext. out
x68	00 00 00 01	Set external output if filter 1 applies
ConfigReg		
401	xx xx xx xE	Activate filter for CON A port (1110)
extOut_ConfigReg		
402	00 00 01 01	Port Con A active, reset via a timer
extOutTimerReg		
403	01 31 2D 00	Timer resets the value every 200 ms

Filtering by CRC error

Example: You want to filter all frames that report a CRC error.

Set the following filter registers:

Register	Parameter	Function
State:		
x05	08 00 00 00	CRC Error Statusbit
x06	FF 00 00 00	Mask on 1 byte
Filter 1		
x55	00 00 00 00	No negation of StateFilter
x56	80 00 00 00	Filter1 consists of state filter
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON A port (1110)

Filtering by frame length

Example: You want to filter all frames that are 1012 bytes long.

Set the following filter registers:

Register	Parameter	Function
State:		
x05	00 00 03 F4	Frame is 1012 bytes long (0x03F4)
x06	00 00 FF FF	Mask on 2 bytes
Filter 1		
x55	00 00 00 00	No negation of StateFilter
x56	80 00 00 00	Filter1 consists of state filter
Uplink		
x65	00 00 00 00	Do not invert output
x66	00 00 00 01	Frame is output at the uplink port if filter 1 applies.
ConfigReg		
401	xx xx xx xE	Activate filter for CON A port (1110)

Configuring filters

You can set what you want to do with the result of a filter in the Registers menu "401-410". You can show that a filter applies via the filter LEDs or the external output.

Information and setting values can be found in the chapter called "TAP configuration register [} 51]".

To be able to use the configuration settings, they have to be saved.

Configuring TAP CURIOUS

◦ Click on "Config settings > Show settings".

Device information

Device information is displayed in the first line:

– Serial number of TAP CURIOUS
– Software version
– MAC address

These data are specified by KUNBUS for this device and cannot be changed. Please have these data to hand if you report a problem to our support.

Connection settings

You can select the connection speed for all ports in the "Channel mode" menu. The default speed is 100 Mbit.

◦ To change the default, check the "10 Mbit mode" box.

DHCP settings

If you use a DHCP server, it can assign a free IP address to TAP CURIOUS.

◦ In the "Use DHCP" menu, click on "Yes" to use DHCP.

Configuration

You can change the following communication parameters in the "Config TAP" menu:

– IP address
  The IP address ensures that TAP CURIOUS can be clearly identified within a network. When assigning a new IP address, you should therefore make sure that it is not being used by another device in the network.
  If you use DHCP, you do not need to set the IP address. In this case, TAP CURIOUS will receive the IP address from the DHCP server.
– Subnet
  This is where you can adapt the net mask. The net mask is a bit mask that indicates the bit position within the IP address that is being used to address the network section. Make sure the settings you change here match your network settings.
– Gateway address
  You can set the gateway address here.

7.3 Tabulated list of filter registers

A tabulated overview of all filter registers can be found in this chapter.

Number	Name of the register	Name of the filter	Access
X01	Time1_TargetReg	Timestamp_1	RW 32 bit
X02	Time1_MaskReg		RW 32 bit
X03	Time2_TargetReg	Timestamp_2	RW 32 bit
X04	Time2_MaskReg		RW 32 bit
X05	State_TargetReg	Status	RW 32 bit
X06	State_MaskReg		RW 32 bit
X07	SegFilter1_PosReg	Segment filter_1	RW 16 bit
X08	SegFilter1_TargetReg		RW 32 bit
X09	SegFilter1_MaskReg		RW 32 bit
X010	SegFilter2_PosReg	Segment filter_2	RW 16 bit
X011	SegFilter2_TargetReg		RW 32 bit
X012	SegFilter2_MaskReg		RW 32 bit
X013	SegFilter3_PosReg	Segment filter_3	RW 16 bit
X014	SegFilter3_TargetReg		RW 32 bit
X015	SegFilter3_MaskReg		RW 32 bit
X016	SegFilter4_PosReg	Segment filter_4	RW 16 bit
X017	SegFilter4_TargetReg		RW 32 bit
X018	SegFilter4_MaskReg		RW 32 bit
X019	SegFilter5_PosReg	Segment filter_5	RW 16 bit
X020	SegFilter5_TargetReg		RW 32 bit
X021	SegFilter5_MaskReg		RW 32 bit
X022	SegFilter6_PosReg	Segment filter_6	RW 16 bit
X023	SegFilter6_TargetReg		RW 32 bit
X024	SegFilter6_MaskReg		RW 32 bit
X025	SegFilter7_PosReg	Segment filter_7	RW 16 bit
X026	SegFilter7_TargetReg		RW 32 bit
X027	SegFilter7_MaskReg		RW 32 bit
X028	SegFilter8_PosReg	Segment filter_8	RW 16 bit
X029	SegFilter8_TargetReg		RW 32 bit
X030	SegFilter8_MaskReg		RW 32 bit
X031	SegFilter9_PosReg	Segment filter_9	RW 16 bit
X032	SegFilter9_TargetReg		RW 32 bit
X033	SegFilter9_MaskReg		RW 32 bit
X034	SegFilter10_PosReg	Segment filter_10	RW 16 bit
X035	SegFilter10_TargetReg		RW 32 bit
X036	SegFilter10_MaskReg		RW 32 bit

Number	Name of the register	Name of the filter	Access
X037	SegFilter11_PosReg	Segment filter_11	RW 16 bit
X038	SegFilter11_TargetReg		RW 32 bit
X039	SegFilter11_MaskReg		RW 32 bit
X040	SegFilter12_PosReg	Segment filter_12	RW 16 bit
X041	SegFilter12_TargetReg		RW 32 bit
X042	SegFilter12_MaskReg		RW 32 bit
X043	SegFilter13_PosReg	Segment filter_13	RW 16 bit
X044	SegFilter13_TargetReg		RW 32 bit
X045	SegFilter13_MaskReg		RW 32 bit
X046	SegFilter14_PosReg	Segment filter_14	RW 16 bit
X047	SegFilter14_TargetReg		RW 32 bit
X048	SegFilter14_MaskReg		RW 32 bit
X049	SegFilter15_PosReg	Segment filter_15	RW 16 bit
X050	SegFilter15_TargetReg		RW 32 bit
X051	SegFilter15_MaskReg		RW 32 bit
X052	SegFilter16_PosReg	Segment filter_16	RW 16 bit
X053	SegFilter16_TargetReg		RW 32 bit
X054	SegFilter16_MaskReg		RW 32 bit
X055	Filter1_NegReg	Filter_1	RW 32 bit
X056	Filter1_MaskReg		RW 32 bit
X057	Filter2_NegReg	Filter_2	RW 32 bit
X058	Filter2_MaskReg		RW 32 bit
X059	Filter3_NegReg	Filter_3	RW 32 bit
X060	Filter3_MaskReg		RW 32 bit
X061	Filter4_NegReg	Filter_4	RW 32 bit
X062	Filter4_MaskReg		RW 32 bit
X063	Filter5_NegReg	Filter_5	RW 32 bit
X064	Filter5_MaskReg		RW 32 bit
X065	Gbit_Filter_NegReg	Gbit Upload Filter	RW 32 bit
X066	Gbit_Filter_MaskReg		RW 32 bit
X067	ExOut_Filter_NegReg	Ext Output Filter	RW 32 bit
X068	ExOut_Filter_MaskReg		RW 32 bit
X069	LED0_LED2_Filter_NegReg	LED0 - LED2 Filter	RW 32 bit
X070	LED0_LED2_Filter_MaskReg		RW 32 bit
X071	LED3_LED4_Filter_NegReg	LED3 - LED4 Filter	RW 32 bit
X072	LED3_LED4_Filter_MaskReg		

x05-State_TargetReg

Byte	Bit	Description
1	0-15	Frame length (with KUNBUS additional data 20 bytes)
2		
3	0	Port Con A
	1	Port Con B
	2	Port Con C
	3	Port Con D
	4-7	Reserved
4	0	Short Frame
	1	Long Frame
	2	Lost Frame
	3	CRC Error
	4	Alignment Error
	5	Wrong IFG
	6	Wrong Preamble

x06-State_MaskReg

Byte	Bit	Description
1	0-31	Filter mask
2		Value = 0: → Bit ignored
3		Value = 1: → Bit considered
4		

x07, x10 … x49, x52-SegFilterXX_PosReg

Byte	Bit	Description
1	0-15	Byte offset for 4 bytes in the frame
2		Offset = 0 → [01 00 5e 6e] ed c2 00 24 01 3a b6 c1 08 00 45 00
		Offset = 1 → 01 00 5e 6e [ed c2 00 24] 01 3a b6 c1 08 00 45 00
		Offset = 2 → 01 00 5e 6e ed c2 00 24 [01 3a b6 c1] 08 00 45 00
		Offset = 3 → 01 00 5e 6e ed c2 00 24 01 3a b6 c1 [08 00 45 00]

x08, x11 … x50, x53-SegFilterXX_TargetReg

Byte	Bit	Description
1	0-31	4 byte filter data for which the test is required
2		Received frame data → [c0 4a 00 01] 94 f7 c8 3e a7 00 00 95 08 06
3		
4		Frame data entries in the register → 01 00 4a c0

x09, x12 … x51, x54-SegFilterXX_MaskReg

Bit	Byte	Description
1	0-31	Filter mask
2		Value = 0: → Bit ignored
3		Value = 1: → Bit considered
4		

x55, …, x63-FilterX_NegReg

Byte	Bit	Description
1	0	Negate result of Segment filter_1
	1	Negate result of Segment filter_2
	2	Negate result of Segment filter_3
	3	Negate result of Segment filter_4
	4	Negate result of Segment filter_5
	5	Negate result of Segment filter_6
	6	Negate result of Segment filter_7
	7	Negate result of Segment filter_8
2	0	Negate result of Segment filter_9
	1	Negate result of Segment filter_10
	2	Negate result of Segment filter_11
	3	Negate result of Segment filter_12
	4	Negate result of Segment filter_13
	5	Negate result of Segment filter_14
	6	Negate result of Segment filter_15
	7	Negate result of Segment filter_16
3	0-7	Reserved
4	0	Reserved
	1	Reserved
	2	Reserved
	3	Reserved
	4	Ext. input has to be "low"
	5	Negate result of timestamp low
	6	Negate result of timestamp high
	7	Negate result of status

x56, …, x64-FilterX_MaskReg

Byte	Bit	Description
1	0	Add Segment filter_1 to the filter
	1	Add Segment filter_2 to the filter
	2	Add Segment filter_3 to the filter
	3	Add Segment filter_4 to the filter
	4	Add Segment filter_5 to the filter
	5	Add Segment filter_6 to the filter
	6	Add Segment filter_7 to the filter
	7	Add Segment filter_8 to the filter
2	0	Add Segment filter_9 to the filter
	1	Add Segment filter_10 to the filter
	2	Add Segment filter_11 to the filter
	3	Add Segment filter_12 to the filter
	4	Add Segment filter_13 to the filter
	5	Add Segment filter_14 to the filter
	6	Add Segment filter_15 to the filter
	7	Add Segment filter_16 to the filter
3	0-7	Reserved
4	0	Reserved
	1	Reserved
	2	Reserved
	3	Reserved
	4	Add ext. input to the filter
	5	Add timestamp "low" to the filter
	6	Add timestamp "high" to the filter
	7	Add status filter to the filter

x65-Gbit_Filter_NegReg

Byte	Bit	Description
1	0	Negate result of Filter 1
	1	Negate result of Filter 2
	2	Negate result of Filter 3
	3	Negate result of Filter 4
	4	Negate result of Filter 5
	5	Reserved
	6	Reserved
	7	Reserved
2	0-7	Reserved
3	0-7	Reserved
4	0-7	Reserved

x 66-Gbit_Filter_MaskReg

Byte	Bit	Description
1	0	Frame is sent if filter 1 applies
	1	Frame is sent if filter 2 applies
	2	Frame is sent if filter 3 applies
	3	Frame is sent if filter 4 applies
	4	Frame is sent if filter 5 applies
	5	Reserved
	6	Reserved
	7	Reserved
2	0-7	Reserved
3	0-7	Reserved
4	0-7	Reserved

x68-ExOut_Filter_MaskReg

Byte	Bit	Description
1	0	Set the external output if filter 1 applies
	1	Set the external output if filter 2 applies
	2	Set the external output if filter 3 applies
	3	Set the external output if filter 4 applies
	4	Set the external output if filter 5 applies
	5	Reset the external output if filter 1 applies
	6	Reset the external output if filter 2 applies
	7	Reset the external output if filter 3 applies
2	0	Reset the external output if filter 4 applies
	1	Reset the external output if filter 5 applies
	2-7	Reserved
3	0-7	Reserved
4	0-7	Reserved

x67-ExOut_Filter_NegReg

Byte	Bit	Description
1	0	Set the external output if filter 1 does not apply
	1	Set the external output if filter 2 does not apply
	2	Set the external output if filter 3 does not apply
	3	Set the external output if filter 4 does not apply
	4	Set the external output if filter 5 does not apply
	5	Reset the external output if filter 1 does not apply
	6	Reset the external output if filter 2 does not apply
	7	Reset the external output if filter 3 does not apply
2	0	Reset the external output if filter 4 does not apply
	1	Reset the external output if filter 5 does not apply
	2-7	Reserved
3	0-7	Reserved
4	0-7	Reserved

x70-LED0_LED2_Filter_MaskReg

Byte	Bit	Description
1	0	Set LED0 if filter 1 applies
	1	Set LED0 if filter 2 applies
	2	Set LED0 if filter 3 applies
	3	Set LED0 if filter 4 applies
	4	Set LED0 if filter 5 applies
	5	Set LED0 if filter 1 applies
	6	Reset LED0 if filter 2 applies
	7	Reset LED0 if filter 3 applies
2	0	Reset LED0 if filter 4 applies
	1	Reset LED0 if filter 5 applies
	2	Set LED1 if filter 1 applies
	3	Set LED1 if filter 2 applies
	4	Set LED1 if filter 3 applies
	5	Set LED1 if filter 4 applies
	6	Set LED1 if filter 5 applies
	7	Reset LED1 if filter 1 applies
3	0	Reset LED1 if filter 2 applies
	1	Reset LED1 if filter 3 applies
	2	Reset LED1 if filter 4 applies
	3	Reset LED1 if filter 5 applies
	4	Set LED2 if filter 1 applies
	5	Set LED2 if filter 2 applies
	6	Set LED2 if filter 3 applies
	7	Set LED2 if filter 4 applies

Byte	Bit	Description
4	0	Set LED2 if filter 5 applies
	1	Reset LED2 if filter 1 applies
	2	Reset LED2 if filter 2 applies
	3	Reset LED2 if filter 3 applies
	4	Reset LED2 if filter 4 applies
	5	Reset LED2 if filter 5 applies
	6	Reserved
	7	Reserved

x69-LED0_LED2_Filter_NegReg

Byte	Bit	Description
1	0	Set LED0 if filter 1 does not apply
	1	Set LED0 if filter 2 does not apply
	2	Set LED0 if filter 3 does not apply
	3	Set LED0 if filter 4 does not apply
	4	Set LED0 if filter 5 does not apply
	5	Reset LED0 if filter 1 does not apply
	6	Reset LED0 if filter 2 does not apply
	7	Reset LED0 if filter 3 does not apply
2	0	Reset LED0 if filter 4 does not apply
	1	Reset LED0 if filter 5 does not apply
	2	Set LED1 if filter 1 does not apply
	3	Set LED1 if filter 2 does not apply
	4	Set LED1 if filter 3 does not apply
	5	Set LED1 if filter 4 does not apply
	6	Set LED1 if filter 5 does not apply
	7	Reset LED1 if filter 1 does not apply
3	0	Reset LED1 if filter 2 does not apply
	1	Reset LED1 if filter 3 does not apply
	2	Reset LED1 if filter 4 does not apply
	3	Reset LED1 if filter 5 does not apply
	4	Set LED2 if filter 1 does not apply
	5	Set LED2 if filter 2 does not apply
	6	Set LED2 if filter 3 does not apply
	7	Set LED1 if filter 4 does not apply

Byte	Bit	Description
4	0	Set LED1 if filter 5 does not apply
	1	Reset LED2 if filter 1 does not apply
	2	Reset LED2 if filter 2 does not apply
	3	Reset LED2 if filter 3 does not apply
	4	Reset LED2 if filter 4 does not apply
	5	Reset LED2 if filter 5 does not apply
	6	Reserved
	7	Reserved

x72-LED3_LED4_Filter_MaskReg

Byte	Bit	Description
1	0	Set LED3 if filter 1 applies
	1	Set LED3 if filter 2 applies
	2	Set LED3 if filter 3 applies
	3	Set LED3 if filter 4 applies
	4	Set LED3 if filter 5 applies
	5	Reset LED3 if filter 1 applies
	6	Reset LED3 if filter 2 applies
	7	Reset LED3 if filter 3 applies
2	0	Reset LED3 if filter 4 applies
	1	Reset LED3 if filter 5 applies
	2	Set LED4 if filter 1 applies
	3	Set LED4 if filter 2 applies
	4	Set LED4 if filter 3 applies
	5	Set LED4 if filter 4 applies
	6	Set LED4 if filter 5 applies
	7	Reset LED4 if filter 1 applies
3	0	Reset LED4 if filter 2 applies
	1	Reset LED4 if filter 3 applies
	2	Reset LED4 if filter 4 applies
	3	Reset LED4 if filter 5 applies
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved

Byte	Bit	Description
4	0	Reserved
	1	Reserved
	2	Reserved
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved

x71-LED3_LED4_Filter_NegReg

Byte	Bit	Description
1	0	Set LED3 if filter 1 does not apply
	1	Set LED3 if filter 2 does not apply
	2	Set LED3 if filter 3 does not apply
	3	Set LED3 if filter 4 does not apply
	4	Set LED3 if filter 5 does not apply
	5	Reset LED3 if filter 1 does not apply
	6	Reset LED3 if filter 2 does not apply
	7	Reset LED3 if filter 3 does not apply
2	0	Reset LED3 if filter 4 does not apply
	1	Reset LED3 if filter 5 does not apply
	2	Set LED4 if filter 1 does not apply
	3	Set LED4 if filter 2 does not apply
	4	Set LED4 if filter 3 does not apply
	5	Set LED4 if filter 4 does not apply
	6	Set LED4 if filter 5 does not apply
	7	Reset LED4 if filter 1 does not apply
3	0	Reset LED4 if filter 2 does not apply
	1	Reset LED4 if filter 3 does not apply
	2	Reset LED4 if filter 4 does not apply
	3	Reset LED4 if filter 5 does not apply
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved

Byte	Bit	Description
4	0	Reserved
	1	Reserved
	2	Reserved
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved

TAP configuration register

401-ConfigReg

Byte	Bit	Description
1	0	Con A → all frames are transmitted, irrespective of the filtering high-active, prioritized lower than Bit 4
	1	Con B → all frames are transmitted, irrespective of the filtering high-active, prioritized lower than Bit 5
	2	Con C → all frames are transmitted, irrespective of the filtering high-active, prioritized lower than Bit 6
	3	Con D → all frames are transmitted, irrespective of the filtering high-active, prioritized lower than Bit 7
	4	Con A → no frames are transmitted, irrespective of the filtering high-active, prioritized higher than Bit 0
	5	Con B → no frames are transmitted, irrespective of the filtering high-active, prioritized higher than Bit 1
	6	Con C → no frames are transmitted, irrespective of the filtering high-active, prioritized higher than Bit 2
	7	Con D → no frames are transmitted, irrespective of the filtering high-active, prioritized higher than Bit 3
2	Reserved	
3	Reserved	
4	Reserved	

402-extOut_ConfigReg

Byte	Bit	Description
1	0-3	0001 →0x1 -> X1.1 active port for setting the ext. out 0010 →0x2 -> X1.2 active port for setting the ext. out 0100 →0x3 -> X2.1 active port for setting the ext. out 1000 →0x4 -> X2.2 active port for setting the ext. out
	4-7	0001 →0x1-> X1.1 active port for resetting the ext. out 0010 →0x2 -> X1.2 active port for resetting the ext. out 0100 →0x3 -> X2.1 active port for resetting the ext. out 1000 →0x4 -> X2.2 active port for resetting the ext. out Output reset via timer must not be activated.
2	0	Activate reset external output via timer (switch-off delay). The timer value is entered in 403-extOutTimerReg. high-active
	1	Reset external output high-active Output reset via timer must not be activated.
	2-7	Reserved
3	Reserved	
4	Reserved	

403-extOutTimerReg

Byte	Bit	Description
1-4	0-31	Delay for resetting the external output Input is in 10ns increments. For example, 0x1312D00 corresponds to 200 ms.

404-LED_ConfigReg

Byte	Bit	Description
1-4	0-5	Reset the LEDs via timer (switch-off delay), high-active (000001->LED0, 000010->LED1, 000100->LED2, 001000->LED3, 010000->LED4)
	6-11	Reset the LEDs, high-active Possible only when reset via timer is not active (000001->LED0, 000010->LED1, 000100->LED2, 001000->LED3, 010000->LED4) LED reset via timer must not be activated.
	12-15	Specify the active port for which LED0 is set. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	16-19	Specify the active port for which LED1 is set. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	20-23	Specify the active port for which LED2 is set. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	24-27	Specify the active port for which LED3 is set. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	28-31	Specify the active port for which LED4 is set. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D

405-LED_Config2Reg

Byte	Bit	Description
1-4	0-3	Specify the active port for which LED0 is reset. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	4-7	Specify the active port for which LED1 is reset. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	8-11	Specify the active port for which LED2 is reset. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	12-15	Specify the active port for which LED3 is reset. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	16-19	Specify the active port for which LED4 is reset. 0001 → Con A 0010 → Con B 0100 → Con C 1000 → Con D
	20-31	Reserved

406-LED0_TimerReg

Byte	Bit	Description
1-4	0..31	Delay until LED0 is reset. Input is in 10ns increments. For example, 0x1312D00 corresponds to 200 ms.

407-LED1_TimerReg

Byte	Bit	Description
1-4	0-31	Delay until LED1 is reset. Input is in 10ns increments. For example, 0x1312D00 corresponds to 200 ms.

408-LED2_TimerReg

Byte	Bit	Description
1-4	0-31	Delay until LED2 is reset. Input is in 10ns increments. For example, 0x1312D00 corresponds to 200 ms.

409-LED3-TimerReg

Byte	Bit	Description
1-4	0-31	Delay until LED3 is reset. Input is in 10ns increments. For example, 0x1312D00 corresponds to 200 ms.

410-LED4-TimerReg

Byte	Bit	Description
1-4	0-31	Delay until LED4 is reset Input is in 10ns increments. For example, 0x1312D00 corresponds to 200 ms.

8 Monitoring the interface

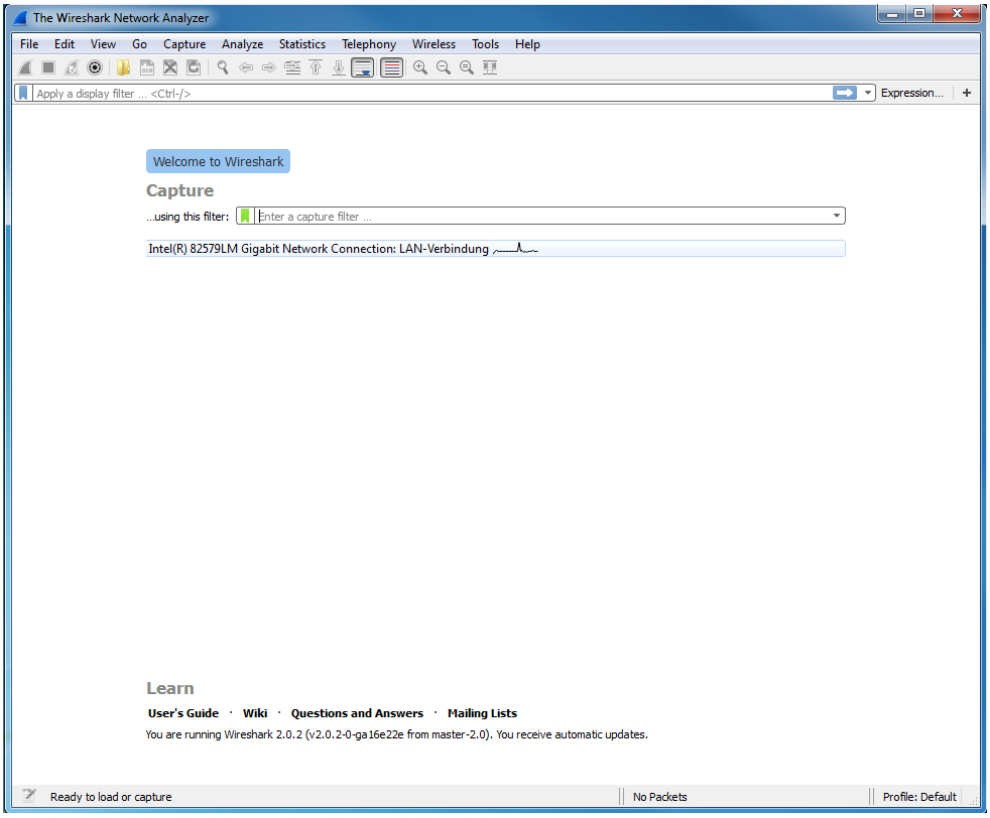
Wireshark is a free analysis program for network communication connections. It allows you to:

- Show data traffic across an Ethernet interface after or during capture in the form of data packets,
- observe individually captured data packets,
- sort data packets according to specific contents,
- extract binary contents (e.g. images),
- create and work-up data flow statistics.

The free program library "WinPcap" permits the transparent capture of data traffic under Microsoft Windows®.

You can use Wireshark on most standard systems. To analyze additional information, however, we currently offer a plugin only for Windows.

Monitoring an interface with Wireshark

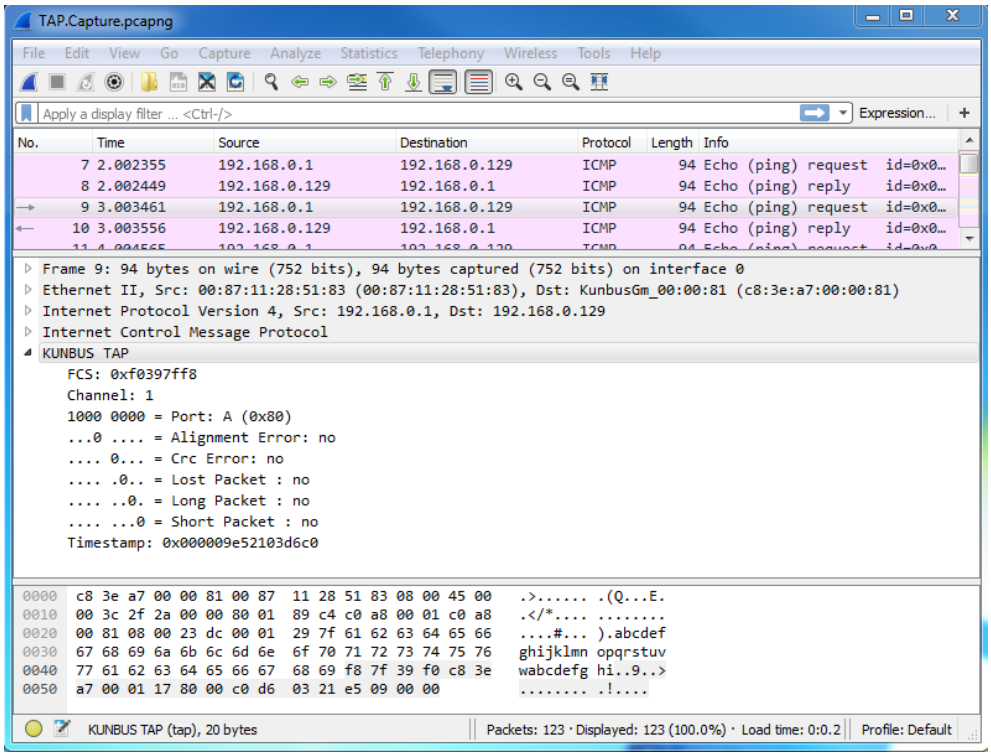


✓ You have installed Wireshark. In the main window under "Capture", you will see all identified Ethernet interfaces.

◦ Double-click to select the interface you want to monitor.

⇨ A status window opens. You will now see a recording of the data frame.

Status window



The status window consists of 3 areas:

- Packet list,
- Packet details,
- Packet raw data.

Packet list

Wireshark displays all data packets in chronological order here. As soon as the KUNBUS TAP spy plugin is activated, Wireshark will apply in the "Time" column the highly-precise time stamp from TAP CURIOUS instead of the timestamp from the operating system.

Specific values from TAP CURIOUS can be displayed in additional columns. Open the "Edit > Preferences > Columns" menu in the "Properties" section and click on the "Add" button to create a new column. Now select "Custom" from the drop-down list.

as the "Field type". You can enter "TAP.port", for example, as the "Field name". As soon as "TAP." is entered, the plugin will suggest values for selection.

To precisely analyze traces, Wireshark offers a filter function. As a result, the display and the analysis can be limited to the most informative frames for the analysis. The filter allows you to observe the inbound and outbound data traffic for your own IP address or solely ping commands. When using TAP CURIOUS, it makes sense to filter by TAP additional information. Wireshark uses the filter expression "TAP.port == a" to show, for example, only those packets that TAP CURIOUS has received at Port A.

Packet details

Once the TAP plugin is activated and Wireshark has captured the Ethernet packets via TAP CURIOUS, you can see additional information in the lowermost line in the "KUNBUS-TAP" section:

Anzahl der Bytes	Inhalt	
4 Byte	FCS (original checksum).	
6 Byte	Identifier C8 3E A7 00 01 61.	
1 Byte	Port on which the frame was received.	
1 Byte	Port	Value in Hex.
8 Byte	Con A	0x80
	Con B	0x40
	Con C	0x20
	Con D	0x10
1 Byte	Error messages	
	Bit	Error message
	Bit 7	Receive Error Signal not decoded.
	Bit 6	Wrong Preambel Preamble does not conform to standard IEEE 802.3.
	Bit 5	Wrong IFG Minimum waiting time of 96 bit times not reached.
	Bit 4	Alignment Error The total number of bits in a frame is not divisible by 8.
	Bit 3	CRC Error The received frame is faulty.
	Bit 2	Lost Frame Frame has gone astray.
	Bit 1	Long Frame The maximum length of 1518 bytes/frames has been exceeded.
	Bit 0	Short Frame Minimum length of 64 bytes/frame not reached.
8 Byte	Timestamp in ns.	

Packet raw data

This section shows the packet data in hexadecimal form and as ASCII text. The last 20 bytes in the packets contain the additional information that TAP CURIOUS has added to the data packets.

9 Refreshing the web server

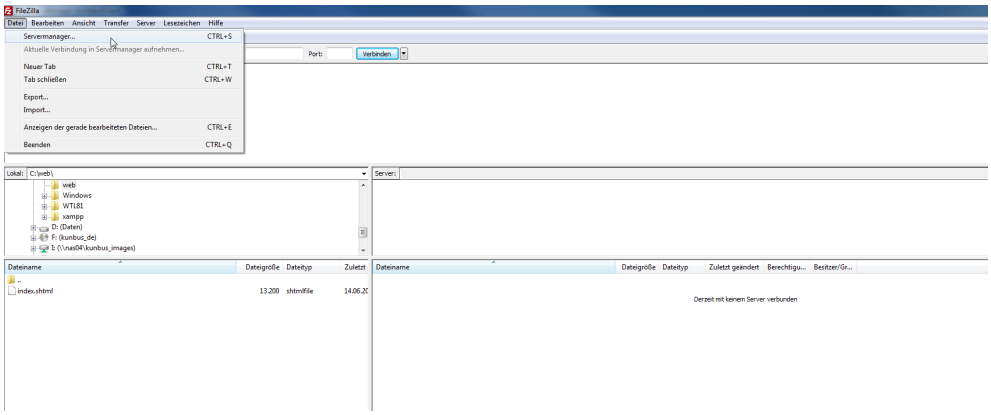
You can refresh the web server whenever an update is available.

Requirements:

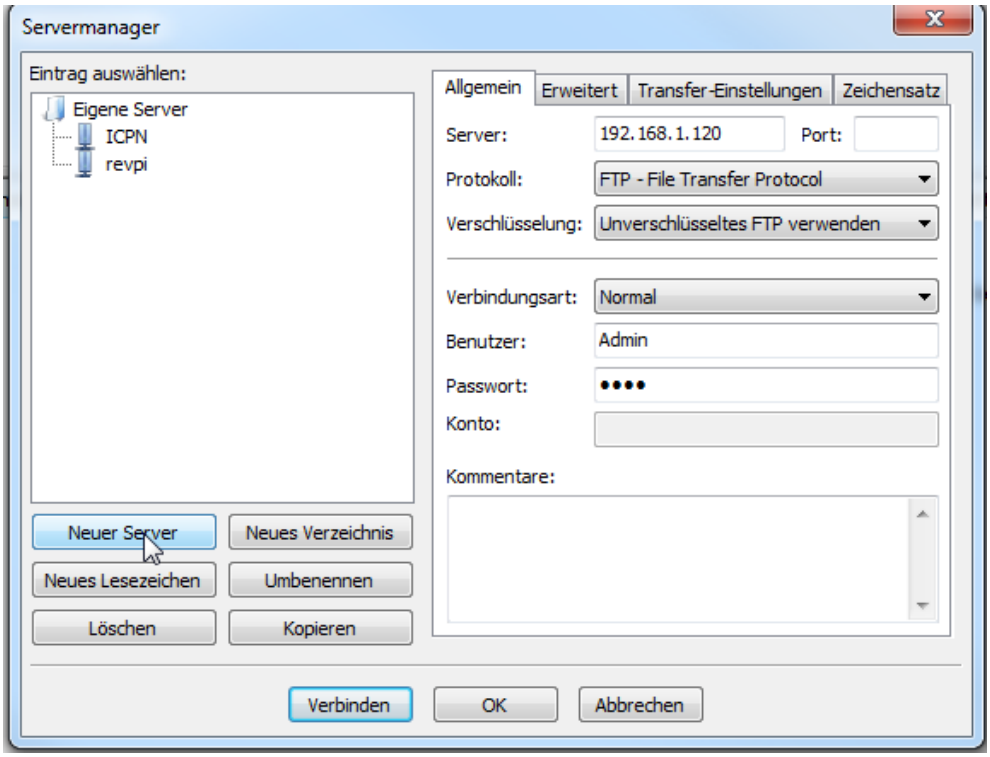
- ✓ TAP CURIOUS is connected to your PC.
- ✓ You have installed an FTP client on your PC.
- ✓ You have Internet access.
  - ◦ Download the update from our website. The latest version can always be found at: http://tap.kunbus.de.
  - ◦ Save the update files on your PC.
  - ◦ Open your FTP client.

Note! In this example, we use FileZilla. If you use a different FTP client, the steps you see may differ due to the software.

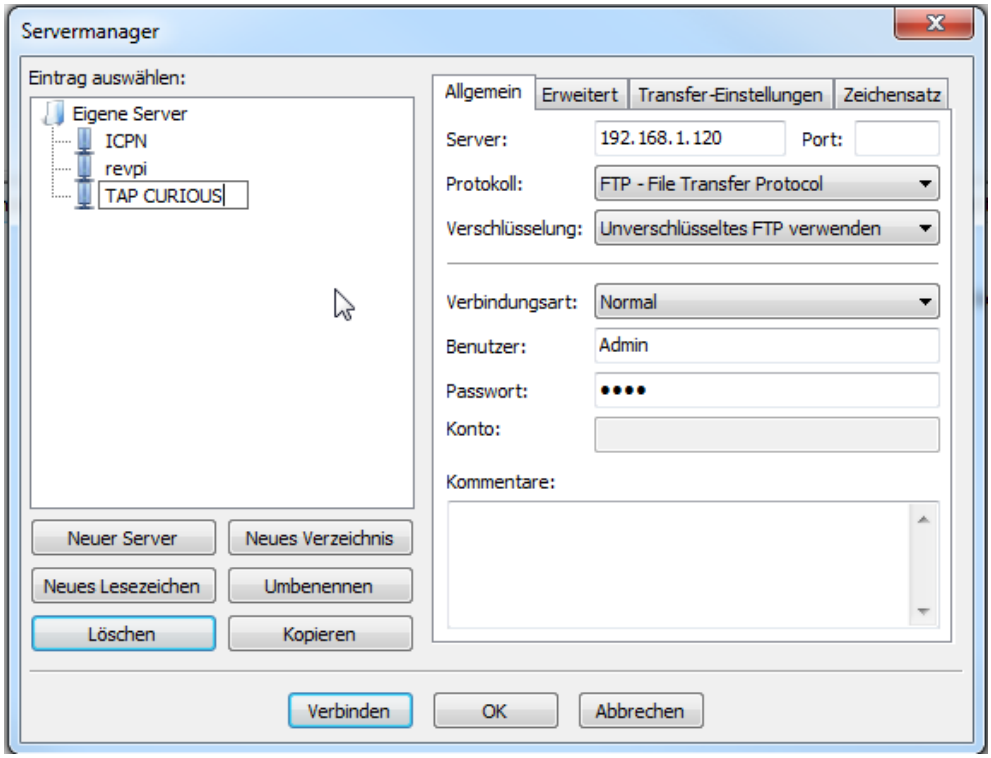
- ◦ Click on "File".
- ◦ Select "Server manager".



◦ Click on "New server".



◦ Enter a name for the server (e.g. TAP CURIOUS).



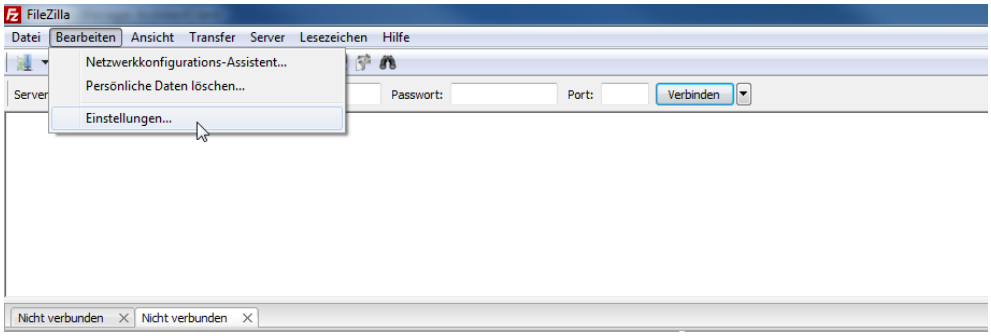
◦ Enter the following values in the "General" register:

Server	IP address of your TAP CURIOUS
Protocol	"FTP- File Transfer Protocol"
Encryption	"Use unencrypted FTP"
Connection type	"Normal"
User	Admin
Password	1701

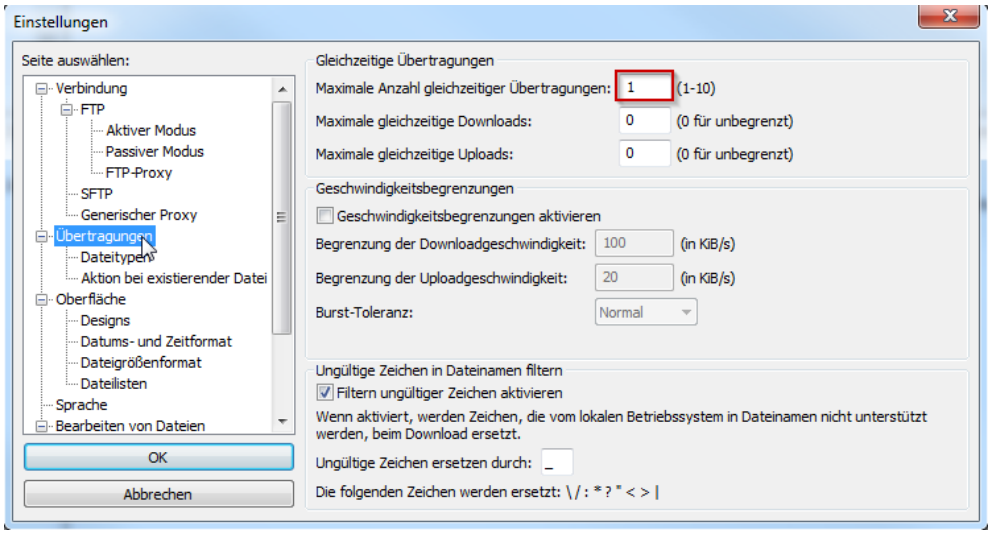
It might not be possible to establish a connection due to the proxy settings. If this is the case, click on the "Advanced" register and check the "Bypass proxy" box.

◦ Click on "Edit".

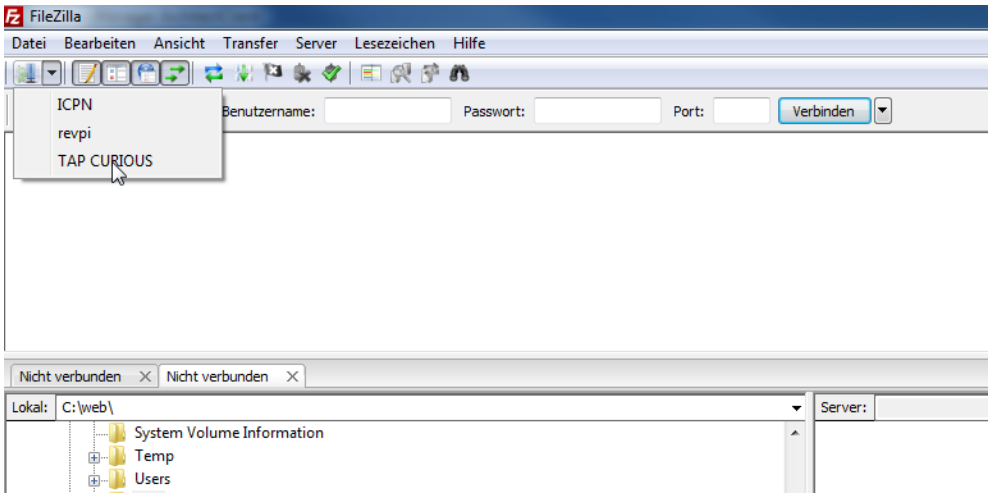
◦ Select "Settings".



- Click on "Transmit".

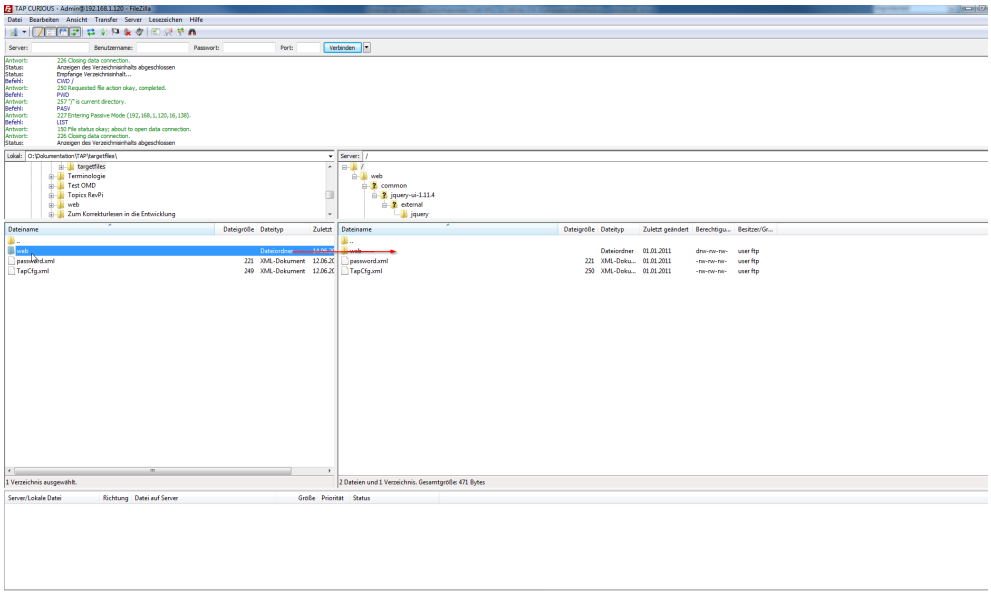


- Enter a "1" into the "Maximum number of simultaneous transmissions" box.
- Click on "OK"
- Click on the selection arrow next to the network settings.
- Select the connection for TAP.



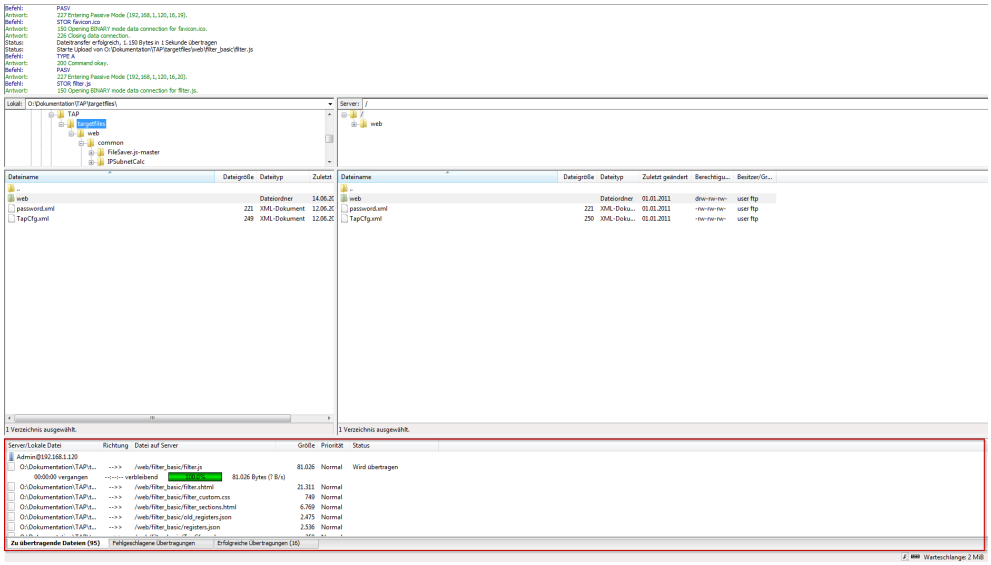
- Click on "Connect".

◦ Move the update files to TAP CURIOUS via drag&drop



⇨ The update files will now be copied to your TAP CURIOUS.

FileZilla allows you to track progress in the queue. You can also see which files have been successfully transmitted and which encountered an error.



10 Errors and problems

Problem	Solution
No link between the devices.	The TX and RX lines are interchanged between the ports (crossover). If the used devices do not have Auto-MDI-X, a crossover cable has to be used on one side
Wireshark does not show all packets.	In the "Capture & Options" configuration dialog, activate "Capture packets in promiscuous mode". Some network cards filter out certain packet types that Wireshark is unable to display. This can be solved only by using a card from a different manufacturer.
Wireshark does not show large packets.	TAP attaches 20 bytes of additional information to the packets. If large packets containing more than 1480 bytes of useful data are transmitted, the maximum packet length of 1500 bytes (1518 bytes, incl. Ethernet header and CRC) is exceeded and the packet will normally be rejected by the Ethernet card in the computer on which Wireshark is running. This can be avoided by activating "Jumbo packets" in the driver.
Wireshark shows packets as faulty.	If the TAP plugin is not activated, Wireshark (or a different analysis program without TAP plugin) might show a checksum error. This is due to the additional data that TAP CURIOUS has attached to the data packet. You can ignore this error message
Wireshark shows additional packets.	It could be that the PC on which Wireshark is running is sending additional broadcasts over the used interface. You can avoid this by deactivating all elements (Client for Microsoft networks, Internet protocol (TCP/IP), etc.) in the LAN adapter properties under Windows.
Negative time stamp.	If the network becomes overloaded, the network card may not output the frames in the correct sequence. This can be because the number of RSS queues in the network card is greater than one. To remedy the problem, the number of queues must be set to one.

Problem	Solution
Changed port number (auto crossover)	Due to the auto crossover function, the cable assignment through the listening devices is random. As a result, frames from device A (connected to Con A port) can be detected when frames have been received on Con B port.
Non-compliant Ethernet interface	You can recognize a non-compliant Ethernet interface by the error messages "Receive Error" or "Crc Error". To solve this problem, you must decouple the Ethernet interface with a switch. More information can be found in the section „Decoupling non-compliant Ethernet interfaces [} 67]“

Also see about this

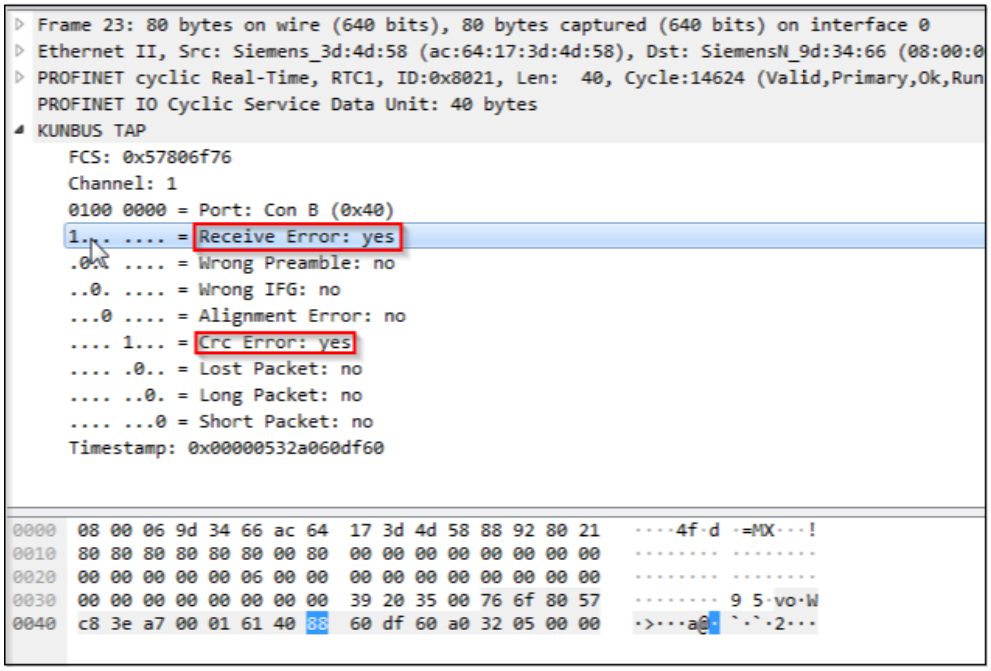
Decoupling non-compliant Ethernet interfaces [} 67]

10.1 Decoupling non-compliant Ethernet interfaces

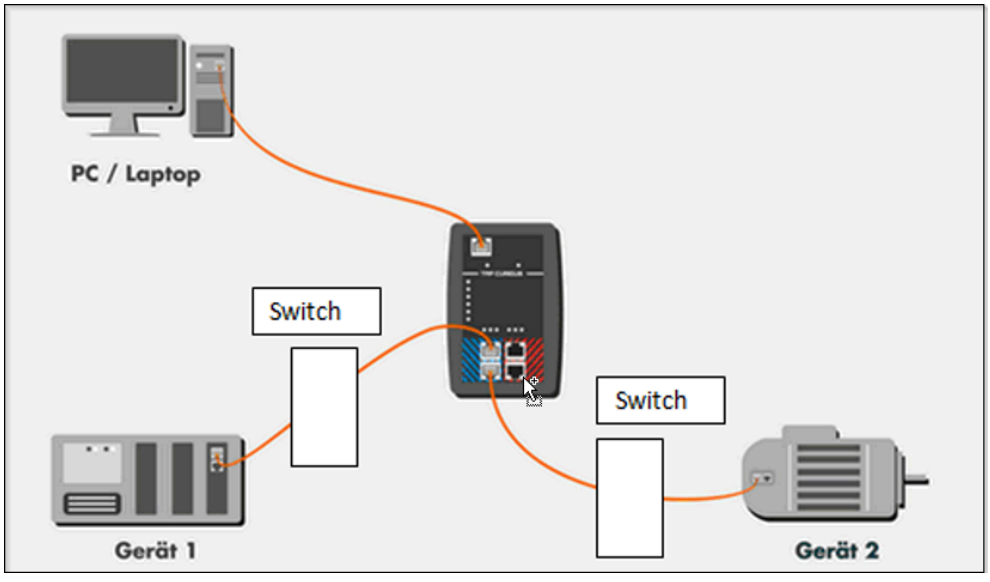
In order to measure reliably with the TAP, the Ethernet connections must meet the requirements of 100Base TX IEEE 802.3:

Differential Impendence	100Ω ±~16Ω ≤30 MHz 100Ω + 64Ω, -40Ω @ 60 MHz
Return loss at the interface	≤~ -21,5 dB ≤30MHz ≤~ -12 dB ≥60MHz

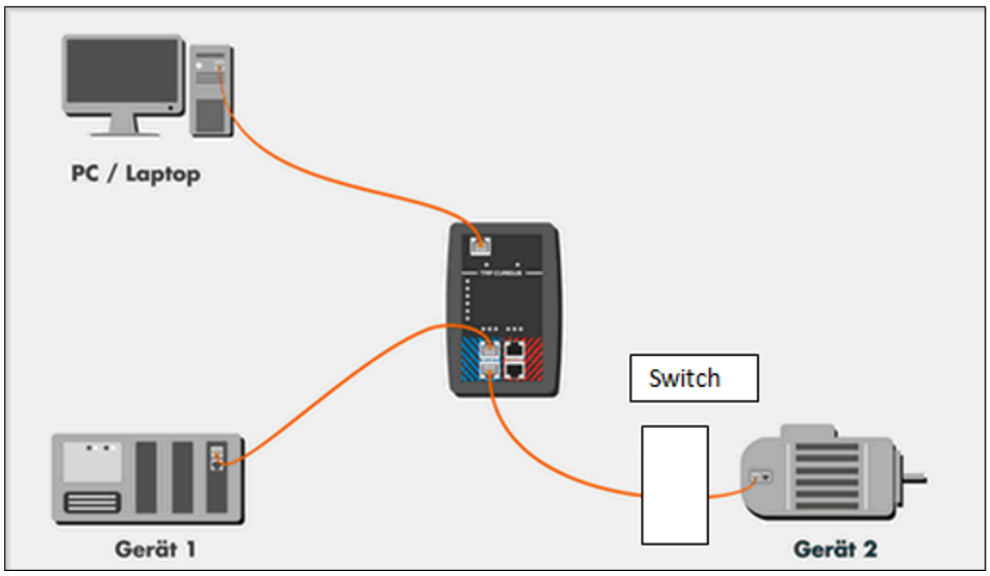
If this is not the case, it is possible that the line cannot be measured and the error message "Receive Error" or "Crc Error" is displayed:



To solve this problem, you must decouple the Ethernet interface with a switch.



If two connected devices have a non-compliant Ethernet interface, you must decouple both lines with a switch.



If a connected device has a non-compliant Ethernet interface and the differential impedance deviates more from the standard, you must decouple the relevant line with a switch.

11 Technical Data

Size/weight	
Width	91.4 mm
Height	139.7 mm
Depth	27.9 mm
Weight	approx. 150 g

Environmental conditions	
Operating temperature	0°C…+55°C
Storage temperature	-25°C…+85°C
Humidity	95%, non-condensing
Protection class	IP20

Output	
Power supply	24 V DC ± 20% or 230 V AC with mains connector
Digital input/output	External power supply 24 V DC ± 20% Maximum output current of 50 mA Pulse length of 1 ms Electrically isolated
Number of Ethernet ports	4 for recording 2 lines
Uplink port	up to 1 GBit/s (1000BASE-T Ethernet, RJ45 port)
Probe ports	up to 100 MBit/s (100BASE-TX Ethernet, RJ45 port), full and half duplex
Differential Impendence	100Ω ±~16Ω ≤30 MHz 100Ω + 64Ω, -40Ω @ 60 MHz
Return loss at the interface	≤~ -21,5 dB ≤30MHz ≤~ -12 dB ≥60MHz
Protection class	IP20
Throughput delay	~ 0 µs (zero delay)
Time stamp resolution	1 ns
Diagnosis	3 LEDs per channel 6 LEDs for filter and overflow

Tests/certificates	
CE-approved	