FreeCon Active
PROFINET-POF-Media Converter

IE-CDM-V14MRJSCP/VAPM-C

Weidmüller

Preface

The FreeCon Active PROFINET-POF-Media Converter from Weidmüller has been developed especially for usage in industrial PROFINET IRT network applications. It provides extended fiber-optic diagnostic capabilities in addition to convert FO communication towards signaling over copper cable. The FreeCon Active's tough IP65 metal housing is perfectly suited for harsh industrial applications.

Revision history

Version	Date	Changes
1.2	28.08.2018	Third Edition

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Copyright notice

Contents

1. Safety Notices

1.1 Proper and intended use

NOTE

This device is intended for use in applications as described in the operating instructions only. Any other form of usage is not permitted and can lead to accidents or destruction of the device. Using the products in non-approved applications will lead immediately to the expiration of all guarantee and warranty claims on the part of the operator against the manufacturer.

WARNING: Danger

Using the selected device for purposes other than those specified or failure to observe the operating instructions and warning notes can lead to serious malfunctions that may result in personal injury or damage to property.

1.2 Qualified staff

These operating instructions have been written for trained and qualified personnel who are familiar with the valid regulations and standards applicable to the field of application.

1.3 Accuracy of the technical documentation

These operating instructions have been written with due care and attention. Unless otherwise required by law, we do not guarantee that the data, images and drawings are accurate or complete nor do we accept liability for their contents. Weidmüller's general terms and conditions of sale apply in their respective valid form.

This document is subject to alteration without notice.

1.4 CE label

This product fulfills the guidelines issued by the European Union (EU) and is therefore entitled to carry the CE mark. The CE Declaration of Conformity is available on request from Weidmüller.

1.5 Declaration of Conformity

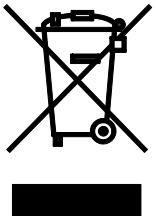
The product fulfills both the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

1.6 Recycling in accordance with WEEE

B-to-B disposal

Dear Weidmüller Customer,

Purchasing our product gives you the opportunity to return the device to Weidmüller at the end of its service life.



The EU Directive 2002/ 96 EC (WEEE) regulates the return and recycling of waste electrical and electronics equipment. In the Business to Business sector (B-to-B), manufacturers of electrical equipment are obliged as of 13/08/05 to take back and recycle free-of-charge electrical equipment sold after that date. After that date, electrical equipment must not be disposed through the "normal waste disposal channels". Electrical equipment must then be disposed of and recycled separately.

All devices that fall under the directive must feature this logo.

What we can do for you?

Weidmüller offers you the possibility of returning your old device to us at no extra charge. Weidmüller will then professionally recycle and dispose your device in accordance with the applicable laws.

What do you have to do?

Once your device has reached the end of its service life, simply return it by parcel service (in the box) to the Weidmüller subsidiary responsible for customer care - we will then initiate the necessary recycling and disposal measures.

You will incur no costs or face any inconvenience.

2. The FreeCon Active PROFINET-POF-Media Converter

The FreeCon Active PROFINET-POF-Media Converter will be used in applications, where it is needed to change a copper cable based PROFINET network towards Polymer Optic Fiber (POF) one. Additional POF line diagnostics offers physical monitoring of the POF cabling towards the connected device.

So the Media Converter serves the following important functions:

- Support of important PROFINET diagnostic functions
- Early warning messaging about maintenance need of connected POF cabling

The device is connected in-line with the power and fiber-optic cables using PushPull connectors. The extended diagnostics allow monitoring of the fiber-optic path; they also provide an early warning mechanism indicating when e.g. a robot's cabling needs to be replaced. The illustration below shows how FreeCon Active PROFINET-FO-Media Converter fits into a typical robotics application.

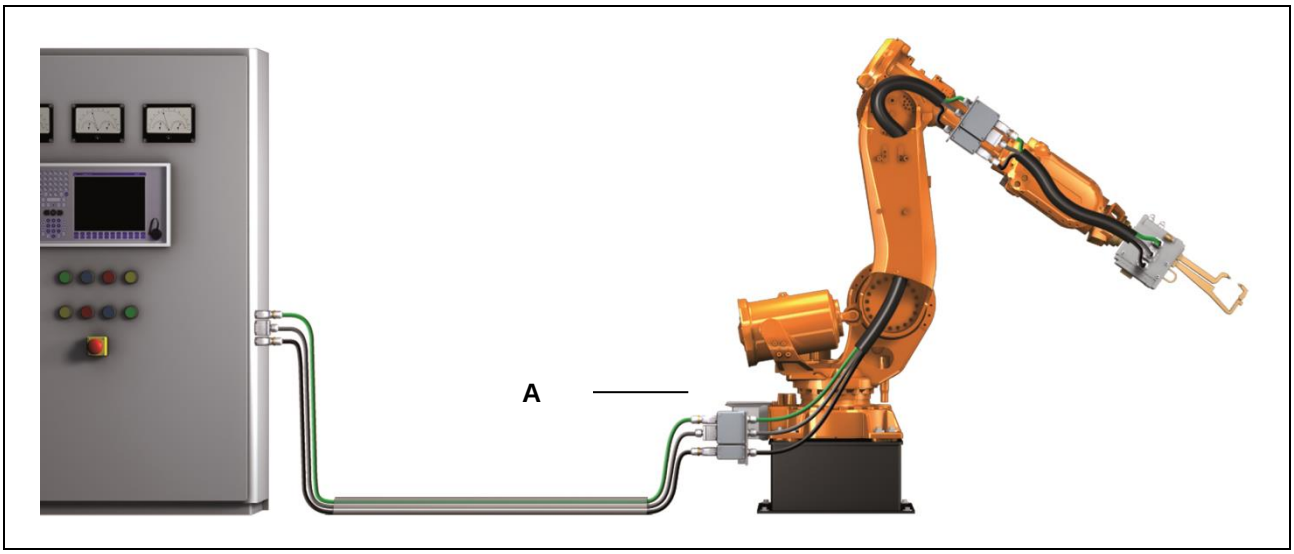


Figure 1 The FreeCon Active PROFINET-FO-Media Converter positioned in a typical robot application

A - Weidmüller FreeCon Active PROFINET-FO-Media Converter on axis 1 of the robot

2.1 Electrical Characteristics

The FreeCon Active PROFINET-POF-Media Converter´s typical current consumption is between 120 mA to 145 mA, depending of the operating voltage. The operating voltage range is between 18 to 30 VDC. The operating temperature has to be between -20 to 55°C. The maximum current on US1 or US2 shall not exceed 16A (see chapter 3.2 Power Connection).

2.2 Internal CPU

The FreeCon Active PROFINET-POF-Media Converter is equipped by an ERTEC 200 processor. It runs the VxWorks operating system and uses the PROFINET protocol stack.

2.3 Mechanical characteristics

The device measures 112 mm by 52 mm by 130 mm. It has two PushPull power ports and two PushPull network ports, as shown in the illustration below.

The FreeCon Active PROFINET-POF-Media Converter is not intended for outdoor usage.

Figure 2 FreeCon Active PROFINET-POF-Media Converter

3. Installation and Connectors

3.1 Mounting

Refer to the illustrations below for the actual mounting dimensions. Four screws must be used to mount the FreeCon Active PROFINET-POF-Media Converter to a wall. Use the device itself as a guide to mark the proper locations for the four screws. We recommend using M4x10mm screws or longer.

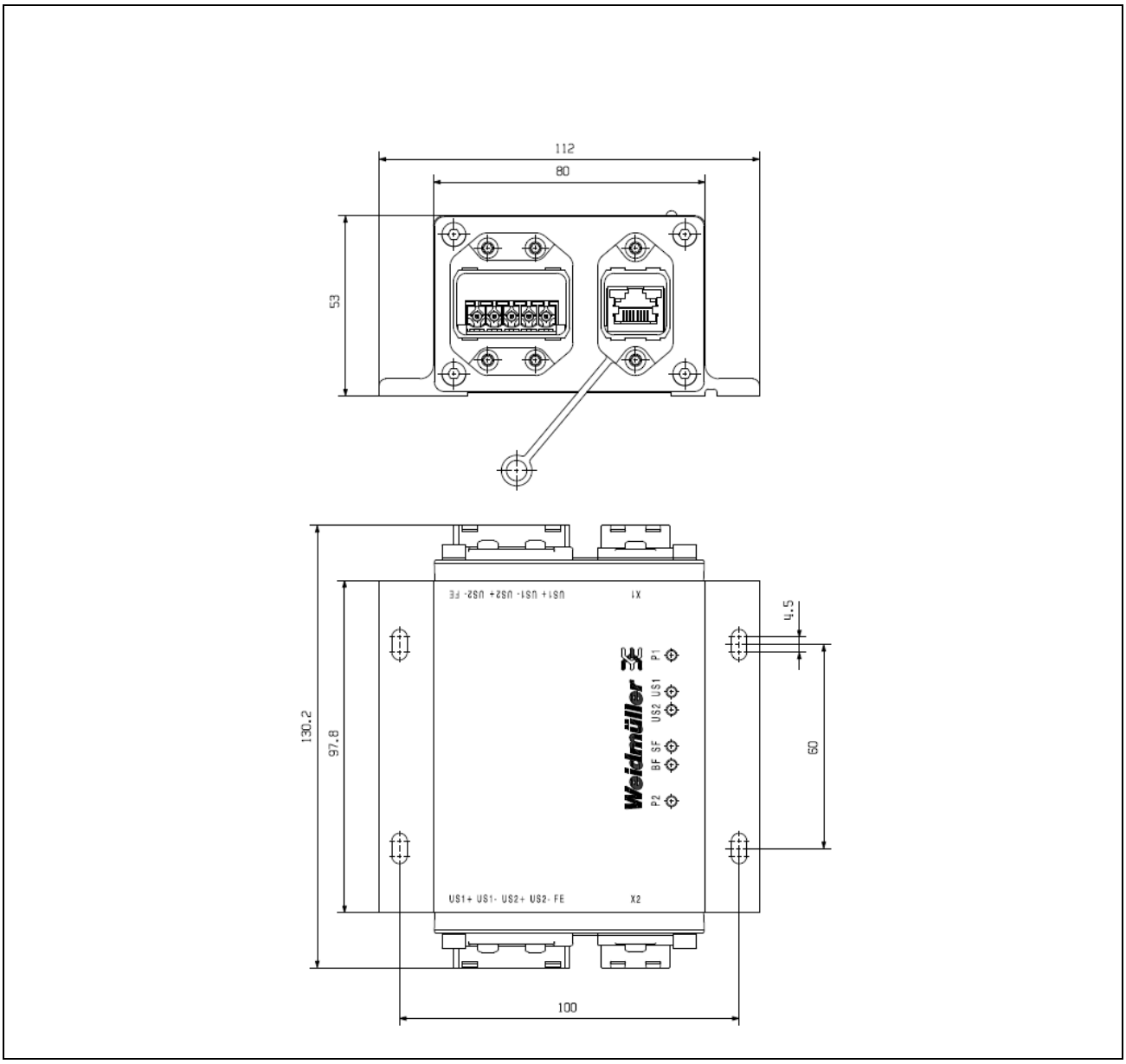


Figure 3 Mounting dimensions

3.2 Power Connection

	WARNING
	Safety First! Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

The fiber-optic signal cables for the FreeCon Active PROFINET-POF-Media Converter can be routed in a single cabling channel together with the power cabling. The cabling should be implemented in accordance with the PROFINET Installation Guideline for Cabling and Assembly („*PROFINET Cabling and Interconnection Technology*“, downloadable on www.profibus.com).

We recommend labeling the wiring to all connected devices.

Use Weidmüller’s **IE-PS-VAPM-24V** power plug (order number 1068910000) to connect to the FreeCon Active PROFINET-POF-Media Converter.

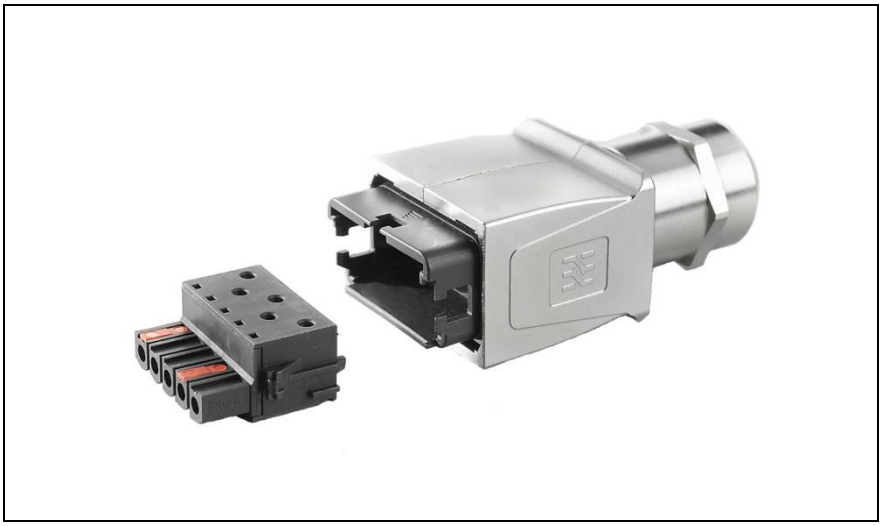


Figure 4 The IE-PS-VAPM-24V power plug 2465440000

Pin assignments for the power connector:

1: L1 24 VDC (US1+)
2: N1 0 VDC (US1-)
3: L2 24 VDC (US2+)
4: N2 0 VDC (US2-)
5: FE Functional Earth

Power is supplied to the FreeCon Active PROFINET-POF-Media Converter only via US1. US2 is forwarded through the device and only used for actuator supply.

3.3 Data connection

The FreeCon Active PROFINET-POF-Media Converter has one 100Base-FX Ethernet-Port for Polymer Optic Fiber (POF) and one 100Base-TX connection to interface a twisted Pair PROFINET copper cable based cable. Communication on both ports has been implemented with full-duplex technology.

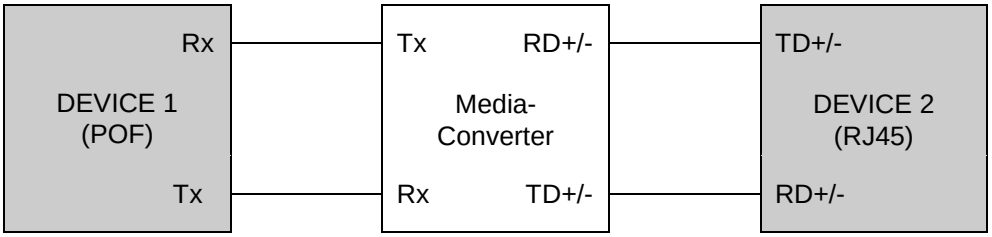


Figure 5 Rx-to-Tx-cabling between connected devices and FreeCon Active PROFINET-FO-Media Converter

Use Weidmüller's PushPull ***STEADY****TEC*® data plug: the **IE-PS-V14M-2SC-POF** (order number 1191550000) for the SCRJ fiber connection.

Figure 6 The IE-PS-V14M-2SC-POF data plug

	**WARNING**
	This is a Class 1 Laser/LED product. To avoid causing serious damage to your eyes, do not stare directly into the Laser Beam.

Use Weidmüller's PushPull ***STEADY****TEC*® data plug: the **IE-PS-V14M-RJ45-FH-P** (order number 1012170000) for the RJ45 copper connection.

Figure 7 The IE-PS-V14M-RJ45-FH-P data plug

3.4 Grounding/earthing

Proper earthing and wire routing are important in order to limit the effects of electromagnetic interference (EMI).The earthing on the FreeCon Active PROFINET-POF-Media Converter is established using the functional earth from the power plug.

4. Setup and Network Configuration

You can integrate the FreeCon Active PROFINET-POF-Media Converter by one of the following mechanisms into your system:

- Controller-Setup with GSD (GSDML-file)
- Weidmüller FreeCon CFG access

Once a proper IP address has been assigned, you can also access and configure the device using a web browser. Note that the factory default IP address is 0.0.0.0, in accordance with PROFINET specifications, and must be changed before accessing the FreeCon Active PROFINET-POF-Media Converter with a web browser.

It is essential that the FreeCon Active PROFINET-POF-Media Converter has a valid TCP/IP configuration so that it can function properly on the network. The TCP/IP settings are stored internally in the system file “\ethcfg.cfg”. These settings can be changed using one of the methods described below.

4.1 Setup with GSDML-File

The FreeCon Active PROFINET-POF-Media Converter is normally installed within a facility by integrating its GSDML file in the PLC configuration. The GSDML file and a .BMP icon of the converter are archived on the converter itself (in the compressed file Fca-pim-pof.zip). These files can be downloaded using the converter’s web interface as described in section 4.3 below.

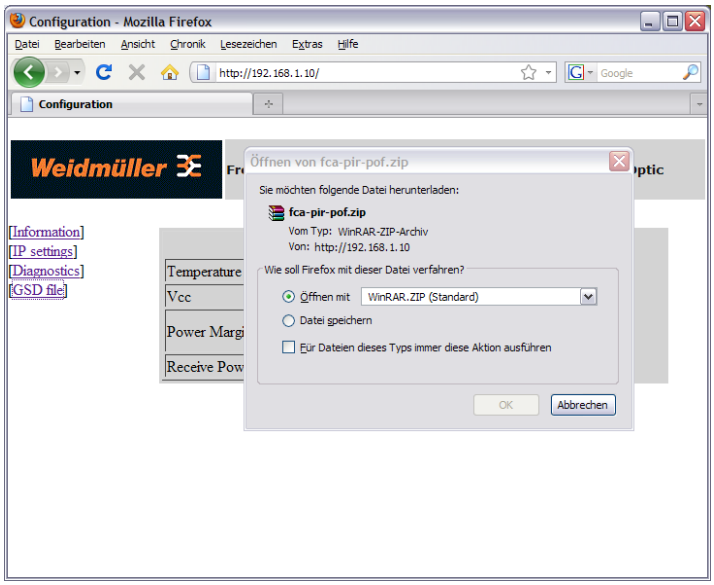


Figure 8 Downloading the GSDML-file from the FreeCon Active PROFINET-POF-Media Converter´s file system

Be sure to check that the version stored on the FreeCon Active PROFINET-POF-Media Converter is up-to-date. The latest version of the GSDML file can be downloaded from the Weidmüller website:

www.weidmueller.com → Downloads → Software → Industrial Ethernet

The GSDML file defines the parameters and configurable settings for the Media Converter. It is used by the PLC configuration software (e.g. Siemens Step 7) to configure and integrate the converter within the entire facility.

Before accessing the extended diagnostic settings, you will need to import the GSDML file and integrate it into your topology. The exact procedure varies depending on the type of PLC configuration software in use.

4.2 Setup with Weidmüller FreeCon CFG

The software utility “FreeCon CFG” can also be used to configure the FreeCon Active PROFINET-POF-Media Converter. This software – which can be downloaded free from the Weidmüller website – scans the Ethernet and displays any FreeCon Active PROFINET-POF-Media Converter that it finds. The program can access the settings of any device on the network using UDP on port 3250.

Carry out the following steps to run this utility:

1. Connect the PushPull power connector to the power port of the FreeCon Active PROFINET-POF-Media Converter.
2. Connect the PushPull data connector to the data port of the FreeCon Active PROFINET-POF-Media Converter.
3. Start the “FreeCon CFG.exe” on your PC (PC must be connected to the same network)
4. Click on the Scan button to scan for Weidmüller devices.

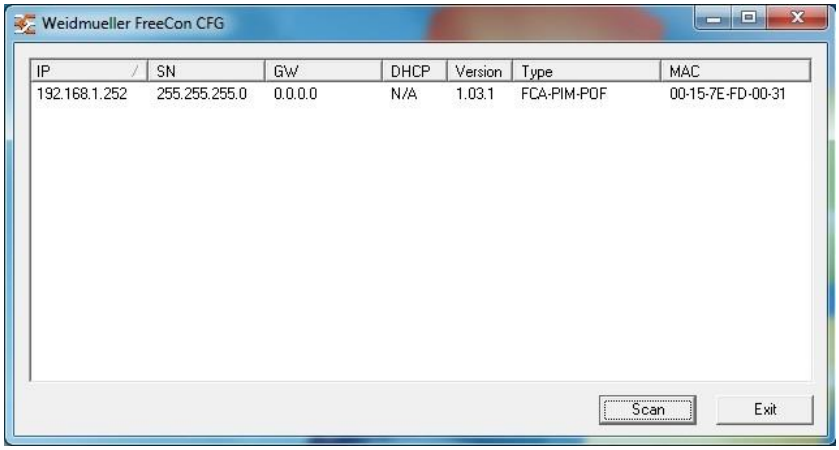


Figure 9 Scanning for Weidmüller devices in FreeCon CFG

5. The converter will show up as “FCA-PIM-POF” in the list of detected devices. Double click on the IP address to change it (may vary from IP address shown in illustration).
6. Click on the Set button to apply the new settings. The new IP address is also stored in “\ethcfg.cfg”.

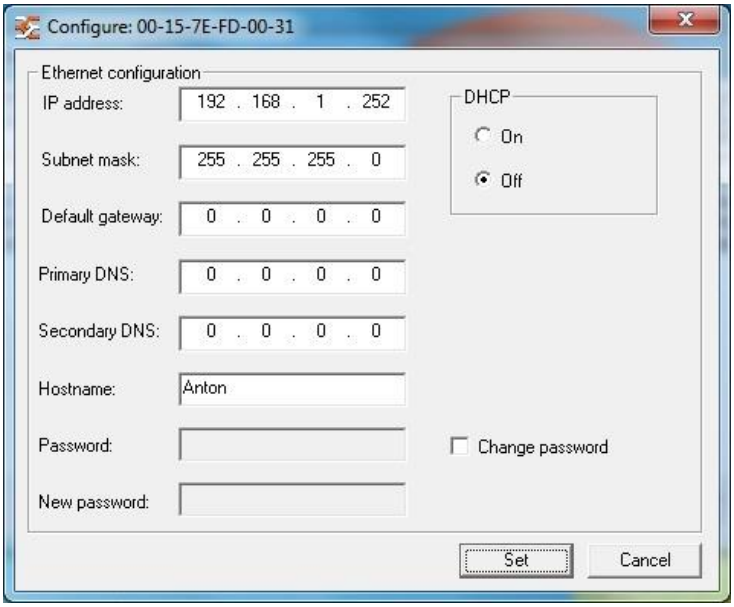


Figure 10 Configuring a new IP address in FreeCon CFG

4.3 Using a web browser to access the device

After the FreeCon Active PROFINET-POF-Media Converter has been configured using FreeCon CFG, the web server hosted on the converter can be accessed using the assigned IP address. Use a web browser installed on a PC that is on the same subnet.

The Web-interface can be used to:

- Manually display the device properties (Firmware-Version, Series Number und MAC-ID)
- Change settings (IP-address, Subnet mask or Gateway-address).

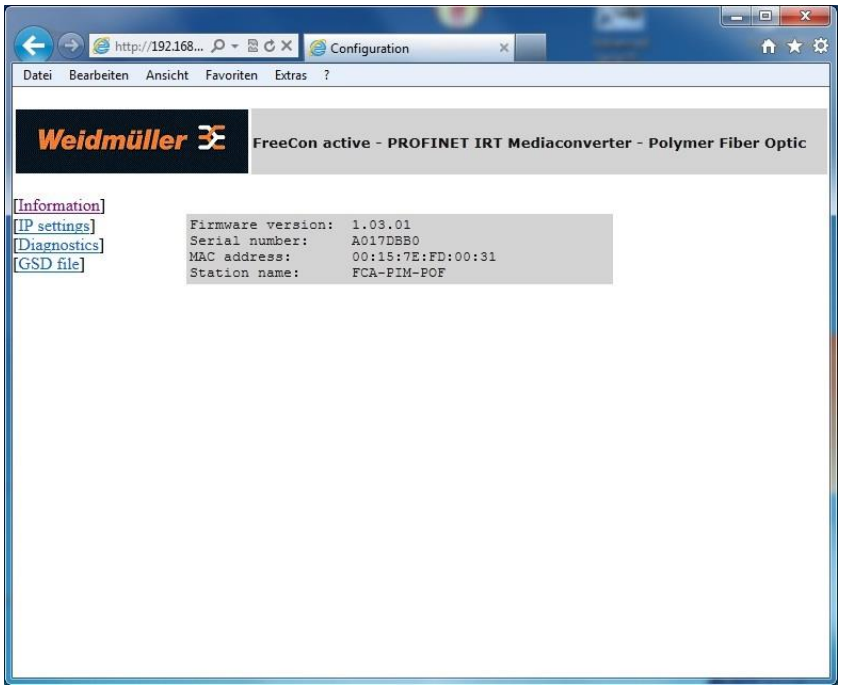


Figure 11 Properties of FreeCon Active PROFINET-POF-Media Converter, as viewed in web browser

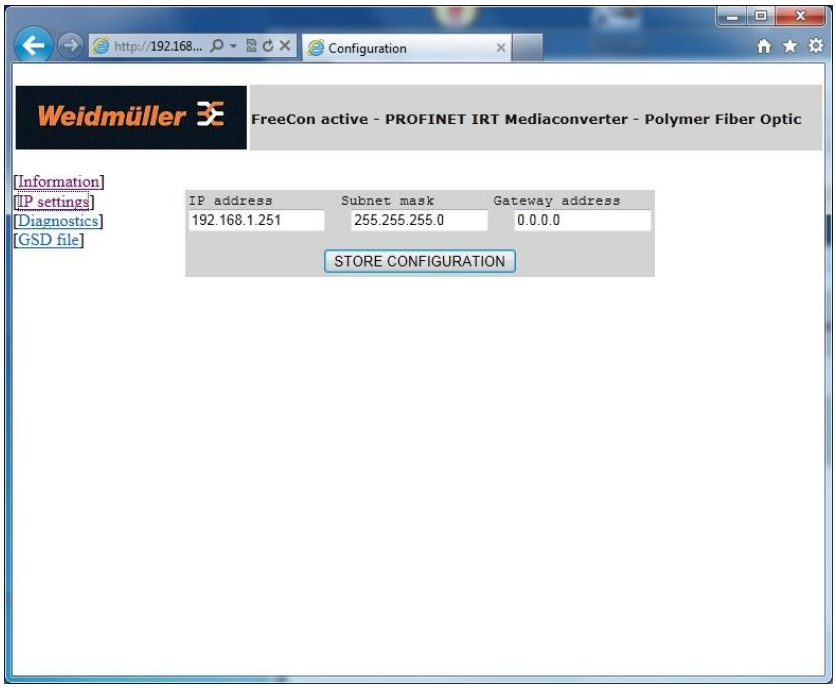


Figure 12 Using the web browser to configure the FreeCon Active PROFINET-FO-Media Converter

The FreeCon Active PROFINET-POF-Media Converter must be power cycled after clicking on the STORE CONFIGURATION button. The changes will then take effect after the reboot.

4.4 SNMP configuration

The FreeCon Active PROFINET-POF-Media Converter supports the Simple Network Management Protocol (SNMP) in compliance with the PROFINET standard and supports MIB-2. A Network Management Station can be used to remotely configure, monitor and manage the converter. A message-based communication scheme is used to retrieve data from the device's Management Information Base (MIB).

4.5 FTP configuration

The FreeCon Active PROFINET-POF-Media Converter can be configured by FTP client. Get access via FTP client to the IP-address of the FreeCon Active PROFINET-POF-Media Converter and download the file "ethcfg.cfg". You can change parameters like IP-address and subnet-mask with a standard editor and then upload the new file to the converter. This kind of configuration is usable for batch application.

4.6 Discovery and basic Configuration Protocol (DCP)

The converter provides full support for the PROFINET DCP protocol. This allows an IO controller or supervisor to discover the FreeCon Active PROFINET-FO-Media Converter and change the IP settings.

4.7 Link Layer Discovery Protocol (LLDP)

LLDP provides information about which "partner" is connected to which Ethernet port. This information is stored in the LLDP-MIB and can be read using SNMP.

5. Firmware Update

The converter's firmware can be updated by uploading a newer firmware file. Updated firmware files will be made available on the Weidmüller website.

The firmware file can be uploaded directly to the FTP server on the converter.

To establish a FTP connection to the converter, you have to set first an IP-address out of your subnet e.g. 192.168.1.252 (see chapter 4.2)

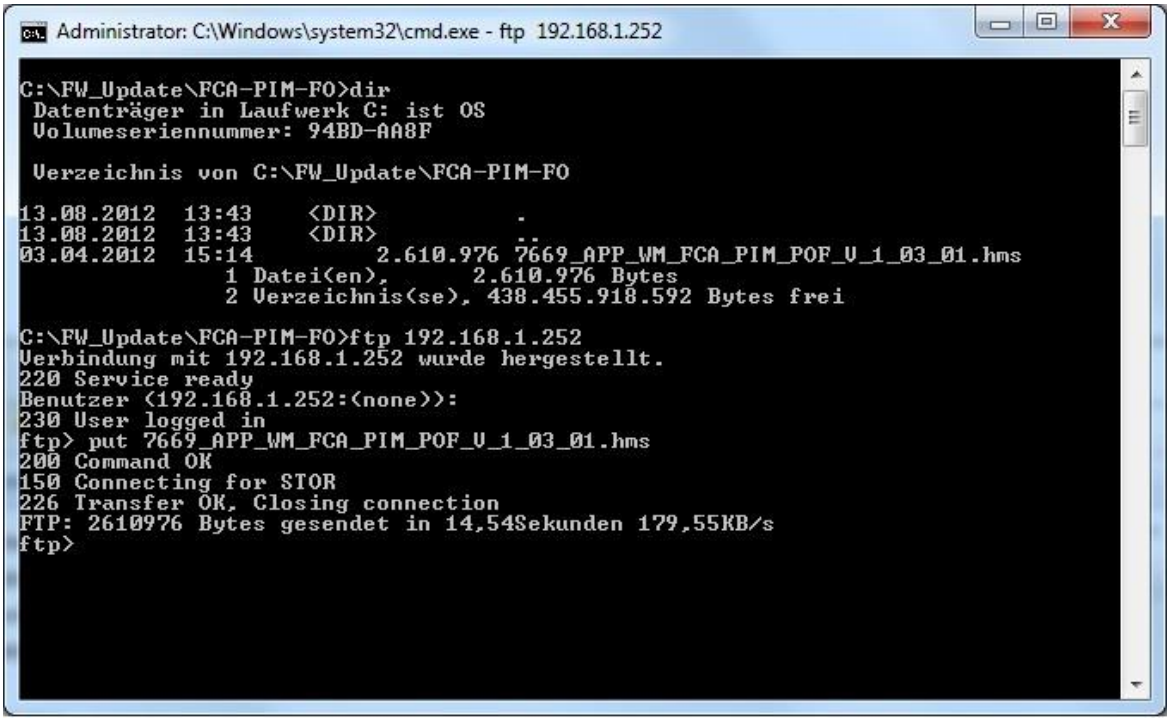


Figure 13 Transferring the firmware file via FTP

Use the command "ftp *IP-address*" to establish the FTP-connection to the converter and confirm the user login with *Enter*. The confirmation "*user logged in*" appears.

With the command "put *filename*" you can transfer the new firmware to the device.

	NOTE
	The transfer of the firmware needs only a few seconds and then follows a check and **the update of the converter, which needs up to 2 minutes.** During this update process only the LEDs US1 and US2 glow. **NEVER** interrupt the power supply during the firmware update process. After the successful update the converter will start automatically and is again reachable via the old IP-address.

Firmware Update

The GSDML-file, which is located on the converter, will also be updated with the firmware update process. Check after installation whether you have the latest version.

Detailed description of the firmware update you will find at:

www.weidmueller.com.

6. Extended Diagnostic Capabilities

The FreeCon Active PROFINET-POF-Media Converter measures and reports:

- Temperature of the fiber optic transceiver
- Supply voltage of the fiber optic transceiver
- Optical amplitude margin (OMA)
- Power budget of the fiber optic transceiver

These values are normally accessed through the controller software (e.g. Step 7). They can also be accessed directly by connecting to the FreeCon Active PROFINET-POF-Media Converter's web server.

6.1 PLC-Integration

The diagnostic information can be handled by PROFINET PLCs. The following description is exemplary for the integration of the FreeCon Active POF-Media Converter in the Siemens Step 7 configuration tool.

After creating a new project incl. PLC, add a PROFINET IO system.

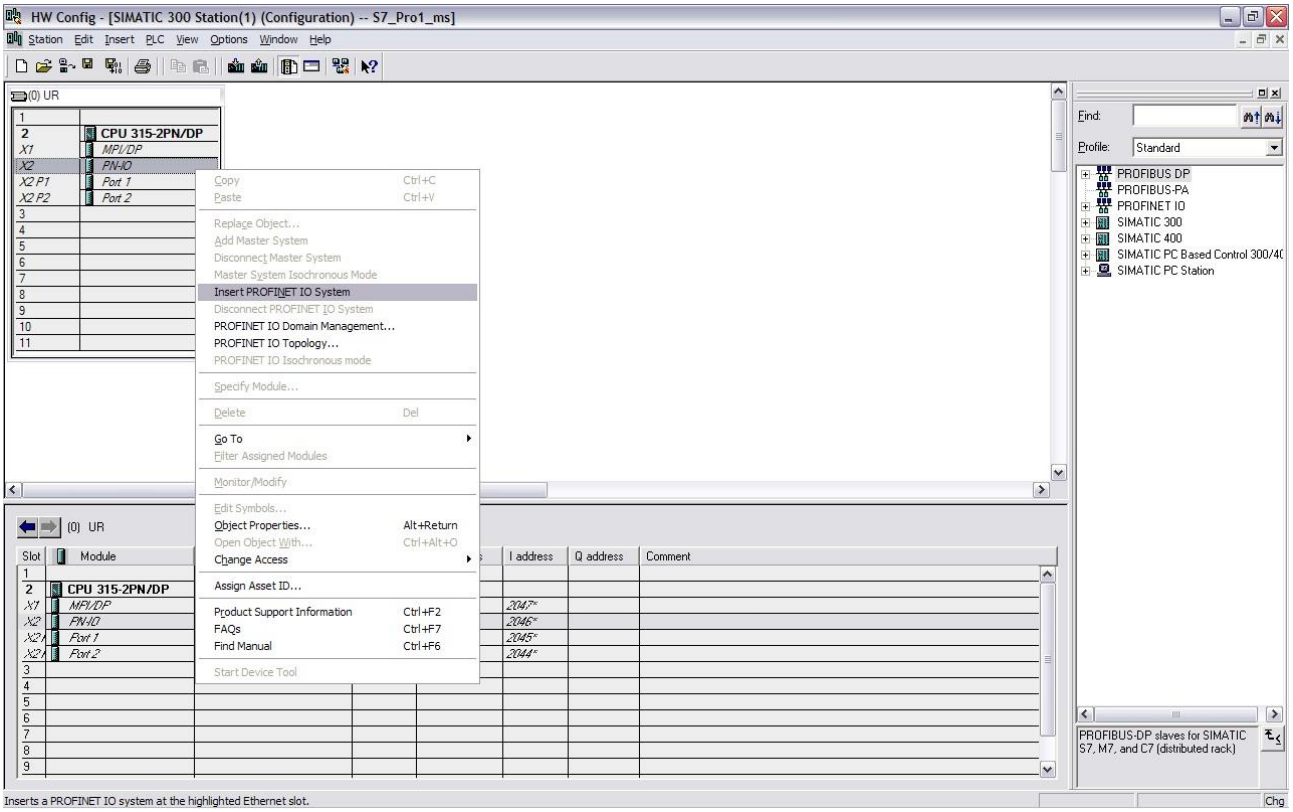


Figure 14 Step 7 – insert PROFINET IO System

Now add the converter to the Ethernet network and other devices by selection via the right mouse button and the menu point “insert object”. Optional you can use the hardware catalogue.

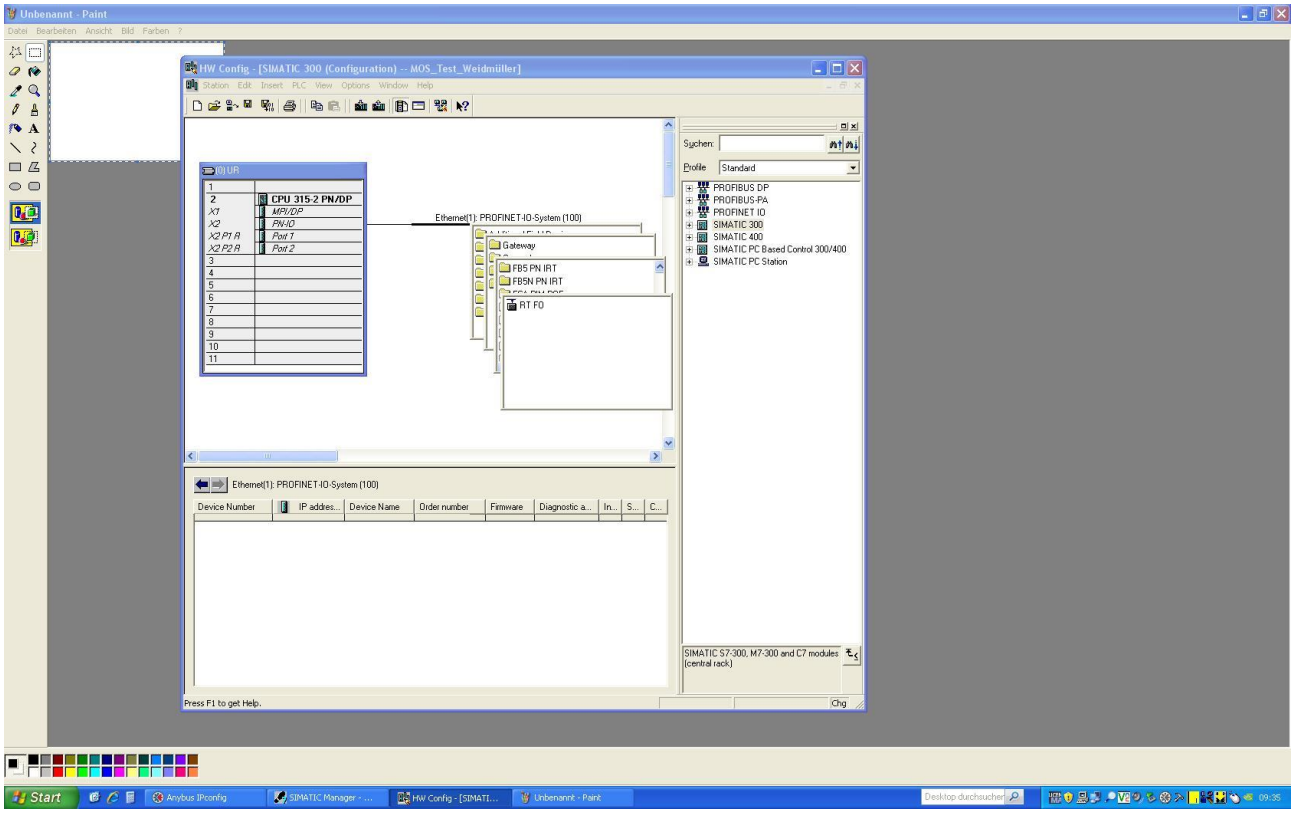


Figure 15 Insert PROFINET devices.

The next step is to set the IP-address and device names, to make them addressable in the PROFINET network.

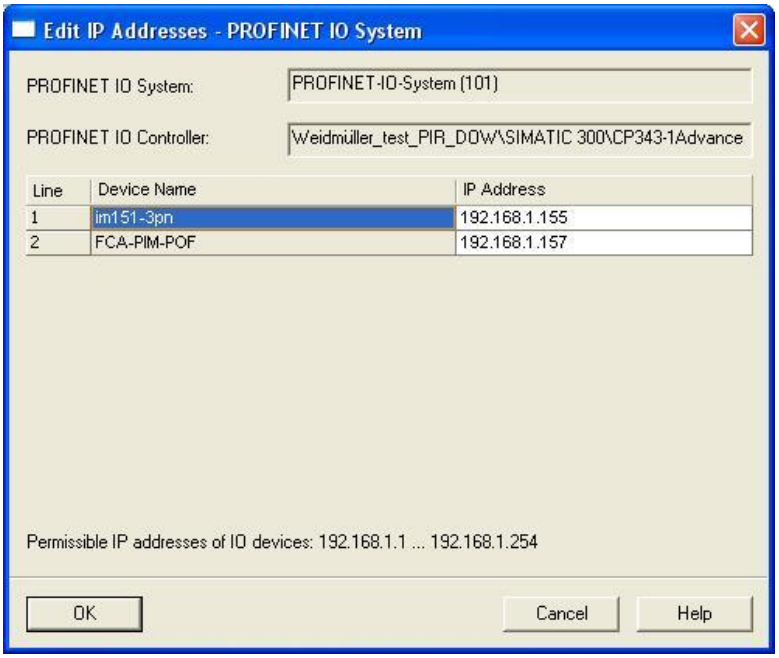


Figure 16 Edit IP-addresses

Extended Diagnostic Capabilities

Via the properties window you get to the input mask of the device name:

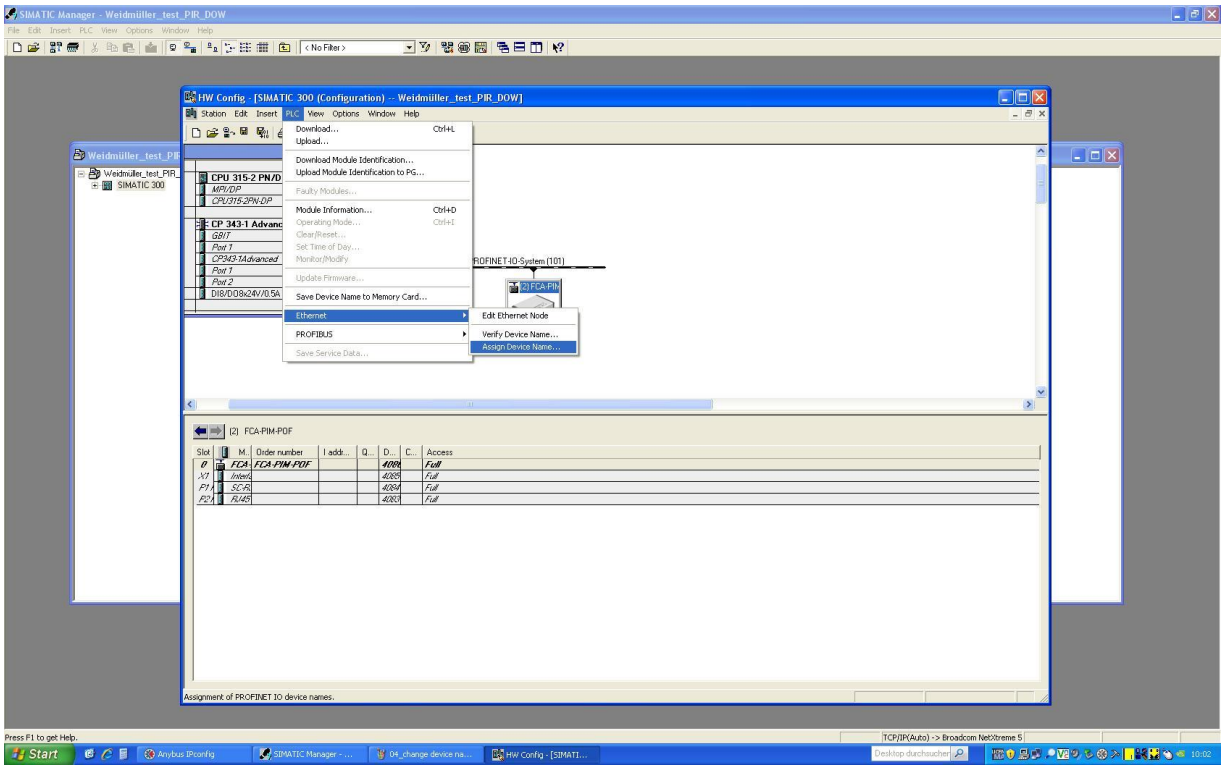


Figure 17 Properties window for adapting the device name

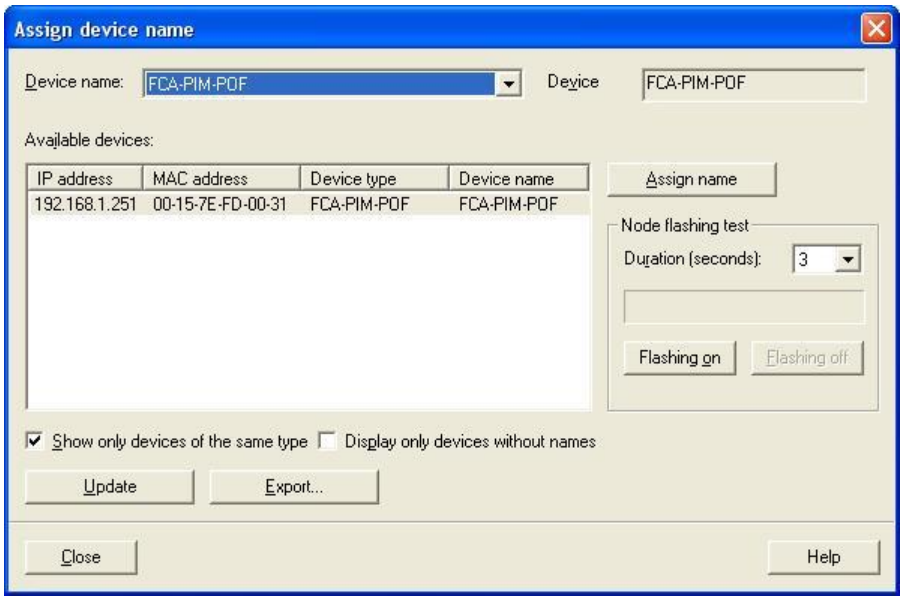


Figure 18 Assigning device name

Now load the project into the PLC and switch it to the run-mode. If the PROFINET network is well configured, the two LEDs SF and BF will be switched off.

You can see the diagnostic information of each part in the module information window (Step 7).

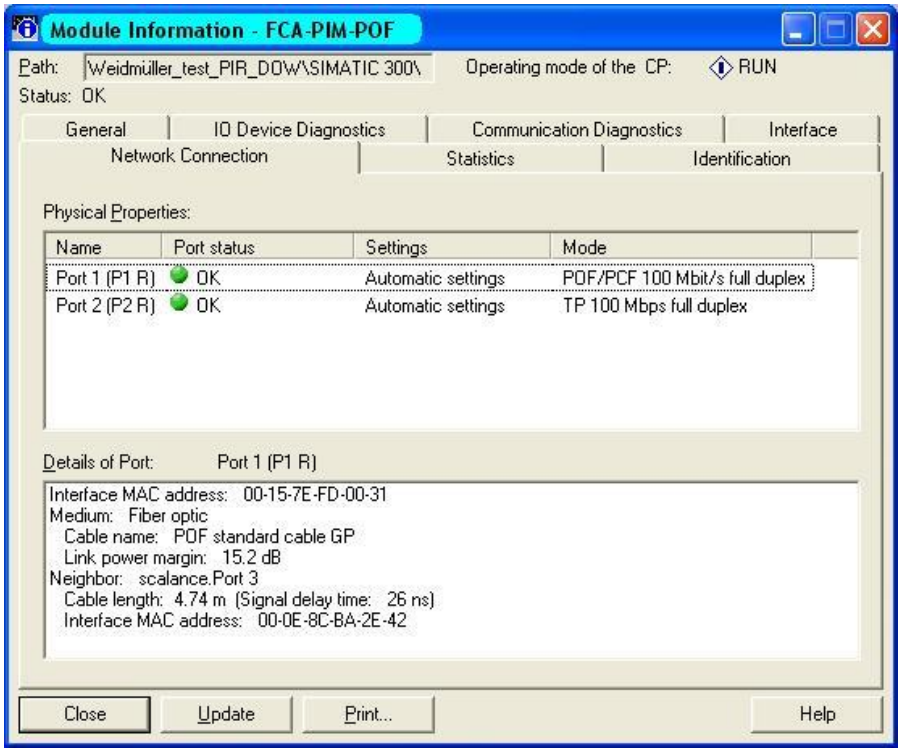


Figure 19 Step 7 device information

6.2 Web browser diagnostics

You can connect to the web server on the FreeCon Active PROFINET-POF-Media Converter to access the diagnostic measurements; simply enter the FreeCon Active PROFINET-POF-Media Converter's assigned IP address in your browser window and navigate to the diagnostics page.

The following diagnostics screen will be shown:

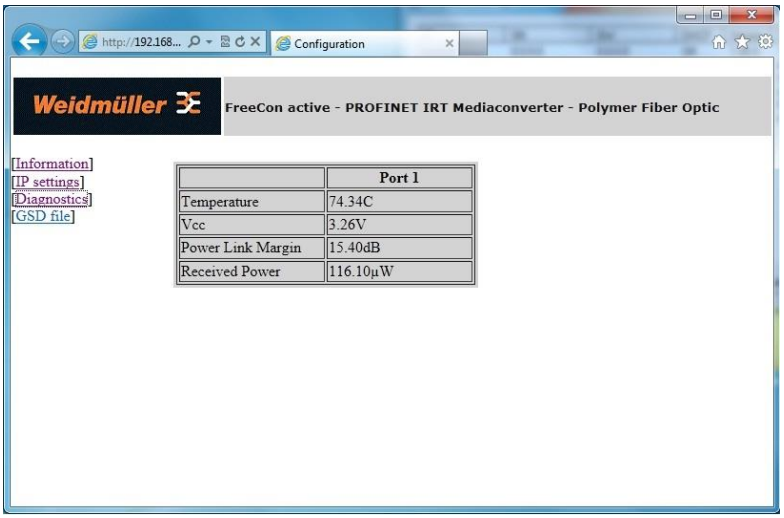


Figure 20 Browser-based diagnostics view

Temperature	Displays the current temperature of the inbuilt fiber transceiver
Vcc	Displays the supply voltage of the inbuilt fiber transceiver
Power Link Margin	The difference, in dB, between received optical power and the minimum optical power needed to overcome path losses and still satisfy the minimum input requirements of the receiver.
Received Power	optical power received

7. Status and Maintenance

7.1 LED-indicators

There are six LEDs visible on the top of the device; the function of each is described in the tables below.

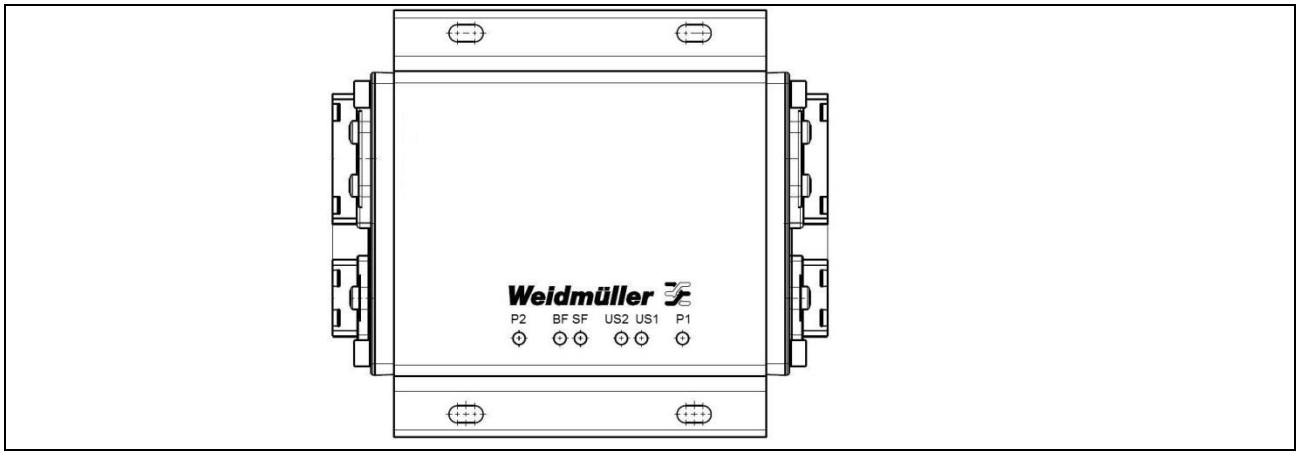


Figure 21 The six LEDs on the FreeCon Active PROFINET-FO –Media Converter

7.1.1 The P1 and P2 LEDs

These two LEDs show the port status of Port1 (P1) and Port2 (P2).

Colour	Status	Indicates
Yellow	On (solid)	100 Mbps link on TP port is active and transmission okay.
Yellow	Blinking at 1 Hz	PROFINET I/O flash/blink identification (both LEDs blink at the same time)
	Off	No link, or P1, fiber optic RX power out of range (functionality enabled by the PROFINET I/O controller).

If one of the P-LEDs is off, please check if cabling is connected correctly.

7.1.2 The US1 and US2 LEDs

These LEDs are controlled by the hardware as follows.

Colour	Status	Indicates
Green	On	Power is being supplied to the US1 (L1) or US2 (L2) power input.
	Off	Power not being supplied to the US1 (L1) or US2 (L2) power input, or voltage below 18 V.

7.1.3 The SF LED

This LED is used to indicate a system failure or error.

Colour	Status	Indicates
Red	On (solid)	One or more of the following errors: - FO-transceiver not okay, - Configuration error, - Station name has not been assigned, - IP number has not been assigned, - No connection to I/O controller, - Power margin below 2 dB.
	Off	Status okay.

If the SF LED is on, check the following:

- That fiber cable is properly attached,
- That copper cable is properly attached,
- That the station name is properly specified,
- That the proper IP Address is set (if not set by the I/O Controller),
- That the hardware configuration is correct.

7.1.4 The BF LED

This LED is used to indicate a bus failure.

Colour	Status	Indicates
Red	On (solid)	No connection to network (links down on port 1 and port 2).
Red	Blinking at 0.5 Hz	No connection to I/O controller.
	Off	Connection to I/O controller (usually the PLC) is established.

If the BF LED is on, check at least that one port is properly connected. If the BF LED is blinking, check the following:

- That the station name is properly specified,
- That the proper IP Address is set (if not set by the I/O controller),
- That the hardware configuration is correct.

8. Technical Specifications

Technology standards	100BaseFX POF Fast Ethernet, PROFINET IRT
Fiber interface	one 100BaseFX POF Port (PROFINET PushPull V14 connector, SCRJ, POF)
Copper interface	one 100BaseTP Port (PROFINET PushPull V14 connector, RJ45)

100BaseFX Optical Fiber (POF)	
Wavelength	650 nm
Max. TX	-2 dBm
Min. TX	-8,5 dBm
Min. RX sensitivity	-23 dBm
Link Budget	15 dB
Typical distance	50 m (using P980/1000 POF cable (160 dB/km))

Power	
Input voltage	18…30 VDC
Input current	0,125 A / 24 VDC
Power connection	PushPull Power connector
Reverse polarity protection	Yes
Max. Power	16 A per Port

Physical characteristics	
Housing main material	alloy profile, Cover: zinc diecast, painted
Degree of protection	IP65
Dimensions	112 mm x 53 mm x 130 mm
Weight	780 g
Installation type	Wall mounted using four M4 screws (10 mm or longer)

Ambient conditions	
Operating temperature	-20 °C...55 °C
Storage temperature	-40 °C...70 °C
Ambient relative humidity	5%...95% (non-condensing)

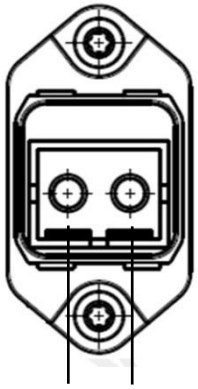
Regulatory Approvals	
Safety	UL 1863
Emissions	EN 61000-6-4 Class A
ESD	EN61000-4-2 Level 3
RF	EN61000-4-3 Level 3
Burst	EN61000-4-4 Level 3
Surge	EN61000-4-5 Level 3
CRFI	EN61000-4-6 Level 3
Shock	IEC 60068-2-27
Hammer	IEC 60068-2-75
Vibration	IEC 60068-2-6

9. Warranty

Weidmüller grants a warranty on this product in accordance with the warranty terms as described in the general conditions of sale of the Weidmüller company which has sold the products to you. Weidmüller warrants to you that such product defects of which have already existed at the time of delivery will be repaired by Weidmüller free of charge or that Weidmüller will provide a new, functionally equivalent product to replace the defective one. Save where expressly described otherwise in writing in this catalogue/product description, Weidmüller gives no warranty or guarantee as to the interoperability in specific systems or as to the fitness for any particular purpose. To the extent permitted by law, any claims for damages and reimbursement of expenses, based on whatever legal reason, including contract or tort, shall be excluded. Where not expressly stated otherwise in this warranty, the general conditions of purchase and the expressive liability commitments therein of the respective Weidmüller company which has sold the products to you shall be applicable.

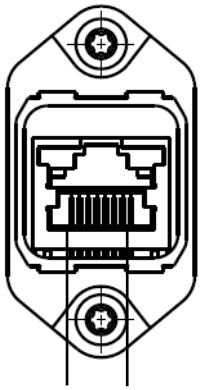
Appendix A: Pin assignments for data and power port

Data port P1, SCRJ Fiber Optic



TX RX
(transmit, receive)

Data port P2, RJ45

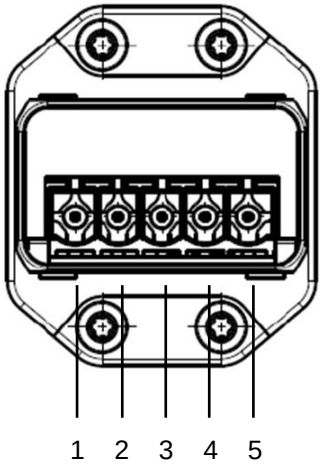


8 …. 1

Pin assignments							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
TD+	**TD-**	**RD+**	**(*)**	**(*)**	**RD-**	**(*)**	**(*)**

(*) according to PROFINET spec., these pins should be left unconnected. On the converter they are terminated by an RC network towards FE (Functional Earth).

Power port



Pin assignments				
1	**2**	**3**	**4**	**5**
L1	N1	L2	N2	FE
US1+	US1-	US2+	US2-	FE