VINGTOR STENTOFON

by ZENITEL GROUP

Configuration Manual

Flowire Converter

FCDC3

About this Document

Document Scope

This document provides a detailed guide to the system setup and configuration of the FCDC3 Flowire Converter in creating IP networks using conventional telecom star-wired infrastructure (2-wire).

Relevant Products

Product Description	Item Name	Item No.
Flowire Converter, 24-48V DC	FCDC3	1008080310
Power Supply 100-240VAC 24VDC 2A	WAGO-787-1606	2990000063
Power Supply 100-240VAC 24VDC 4A	WAGO-787-1616	2990000064
Power Supply 100-240VAC 48VDC 2A	WAGO-787-1623	2990000065
Power Supply 100-240VAC 48VDC 5A	WAGO-787-1633	2990000066
Turbine Extended Ex IP Intercom	TFIX-1	1008123010
Turbine Extended Ex IP Intercom	TFIX-2	1008123020
Turbine Extended Ex IP Intercom	TFIX-3	1008123030
Turbine Extended Ex IP Intercom	TFIX-4	1008123040
Exigo Access Panel Ex	EAPFX-1	1023221511
Exigo Access Panel Ex	EAPFX-6	1023221516

Publication Log

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Related Documentation

For further information, refer to the following documentation:

Doc. number	Documentation
A100K11959	Flowire Guidelines for Exigo
A100K11957	Flowire Getting Started
A100K11960	Replacing Flowire Converter
A100K11xxx	AutoCAD Dimension Drawing
A100K11499	Exigo & Turbine Ex Installation & Maintenance

Acronyms

Acronym	Meaning
FCDC	Flowire Converter Direct Current
Flowire Star Configuration	A star configuration consisting of two or more Flowire devices, with a link to each other, and one PSU.
NMK	Network Management Key
PLC	Power Line Communication. This is the basis of the Flowire technology for transporting both power and signal on power cables or any other cable with at least two conductors.
PSU	Power Supply Unit

Contents

Figures

1   Product Description

1.1   General Description

The Flowire Converter enables Ethernet to run on the same two wires as power, providing simpler cabling and opening up for longer cable hauls. The Flowire converter is also capable of powering the Ethernet devices (Vingtor-Stentofon IP intercom stations) attached to it via spare pairs.
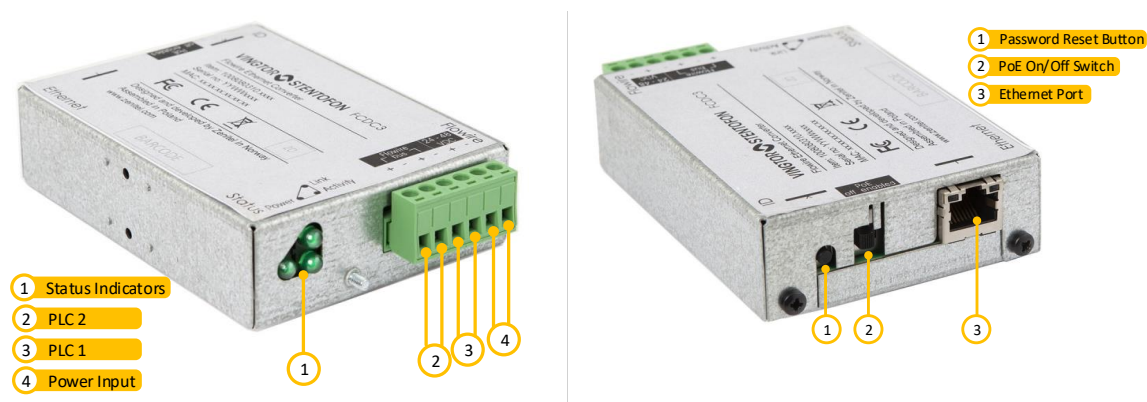

1	Status Indicators
2	PLC 2
3	PLC 1
4	Power Input

1	Password Reset Button
2	PoE On/Off Switch
3	Ethernet Port

Figure 1   FCDC3 Flowire Converter

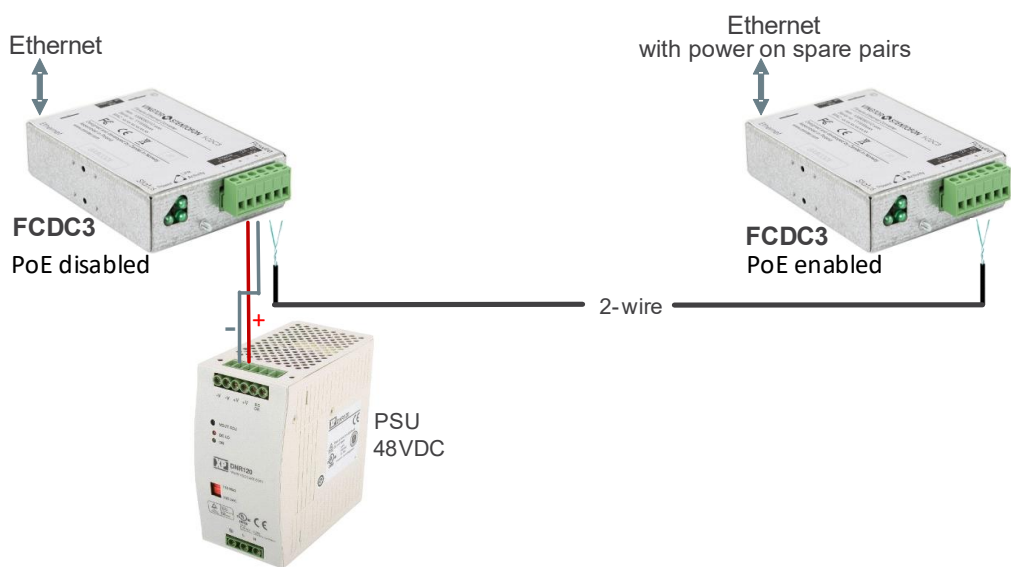| Model	Description
FCDC3	24-48 VDC Flowire Converter with power-forwarding (PoE, type 2) capabilities. Forwards 48V from the power supply to the spare pairs of the Ethernet port (not true PoE) if PoE-switch is in enable position. Does not forward 48V to the spare pairs of the Ethernet port if PoE-switch is in disable position

Figure 2   FCDC3 PoE Enabled and FCDC3 PoE Disabled

ⓘ ***It is recommended to use FCDC3 with PoE enabled only when you need to power the connected device via the spare pairs of the Ethernet port. In all other situations, use the FCDC3 with PoE disabled.***

1.2 Areas of Application

The main areas of application for the Flowire Converter are:

- Retrofitting older communication systems
- Providing Ethernet connectivity to remote locations in buildings

1.2.1 Retrofitting Older Intercom & Telephone Systems

- Analog and digital intercom systems
- Analog and digital telephone systems

The above solutions typically use a conventional star-wired telecom infrastructure with 0.5 mm^2 (20 AWG) single-pair twisted cables.

1.2.2 Remote IP Intercom Locations in New Buildings

In some new building projects, it is a challenge to provide Ethernet connectivity to remote locations (beyond 100 meters from the main equipment room) for critical communication.

By implementing Flowire Converters, it is possible to upgrade these systems with IP products without costly and time consuming re-cabling of CAT or fiber cables.

2   Upgrading Conventional Star-Wired Infrastructure

2.1 The Conventional System

A conventional star-wired infrastructure supports analog and digital intercom and telephone systems. These star-wired telecom infrastructures are typically used in both marine and onshore intercom applications.
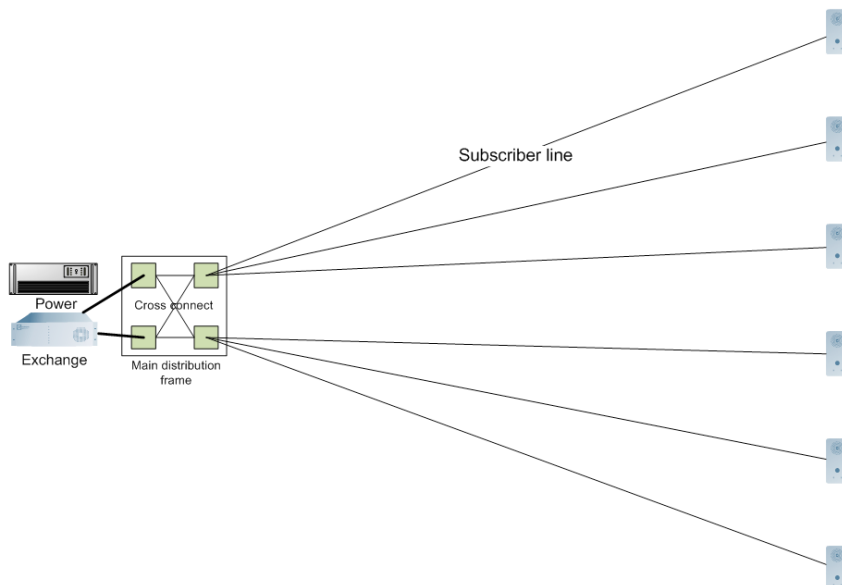

Figure 3   Conventional star-wired infrastructure

In this solution, you will have a centralized equipment rack with the following equipment:

- Telecom / Intercom Exchange
- Power Supply Unit
- Main Distribution Frame

The Main Distribution Frame connects the exchange to subscriber lines connected in a star structure.
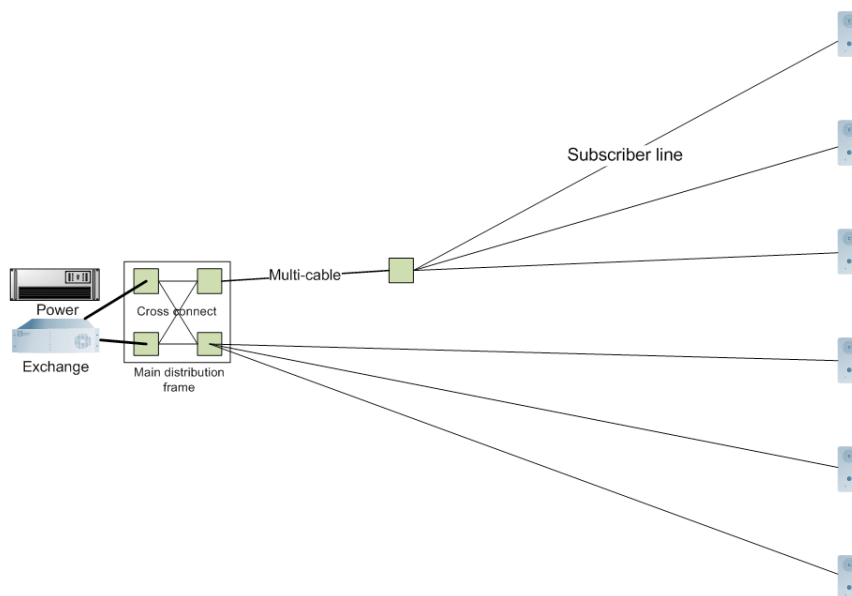

Figure 4   Conventional star infrastructure with multi-pair cables and junction boxes

In order to simplify maintenance and reduce cabling costs, it is common to use multi-pair cables and junction boxes in order to branch out to different locations.

Conventional star-wired telecom infrastructures commonly use one twisted wire pair to each telecom device. However, many systems, like AlphaCom, use two twisted pairs for each telecom device

2.2 Power on Conventional Infrastructure

In an analog and digital telecom/intercom system, it is usually a requirement to power the telephones/intercoms from the central equipment rack, thus supplying the power over the subscriber line.

Typical maximum subscriber line distances for intercom systems are:

Wire cross section	Distance
0.6 mm^2 (19 AWG)	2.0 km
0.5 mm^2 (20 AWG)	1.4 km

Table 1   AlphaCom Subscriber Line Distance

Wire cross section	Distance
0.5 mm^2 (20 AWG)	0.8 km

Table 2   AsaCom Subscriber Line Distance

2.3 Precaution & Limitations

- The cable shields must be interconnected in junction boxes and grounded in the central device only.
- Never use a cable run where the voltage drops below half of the PSU voltage.
- Do not connect more than 10 Flowire Converters on one Flowire star configuration.
- Powering of remote IP intercom stations through their Ethernet ports requires at least 40 VDC at the remote site.

2.4 Recommendations

- Use twisted-pair shielded cables
- Unless the cables are shielded, you should avoid running wires from different Flowire star configurations in the same cable ducts.
- Avoid multi-pair cables with connections to other systems.
- If you are using a multi-pair cable, but not all its pairs, connect more pairs between two Flowire Converters to reduce voltage drop and increase bandwidth.
- In a central rack with two or more Flowire Converters in close proximity, use heat shrink with grounding on unshielded areas of the cable to isolate the different Flowire star configurations and avoid cross-talk.

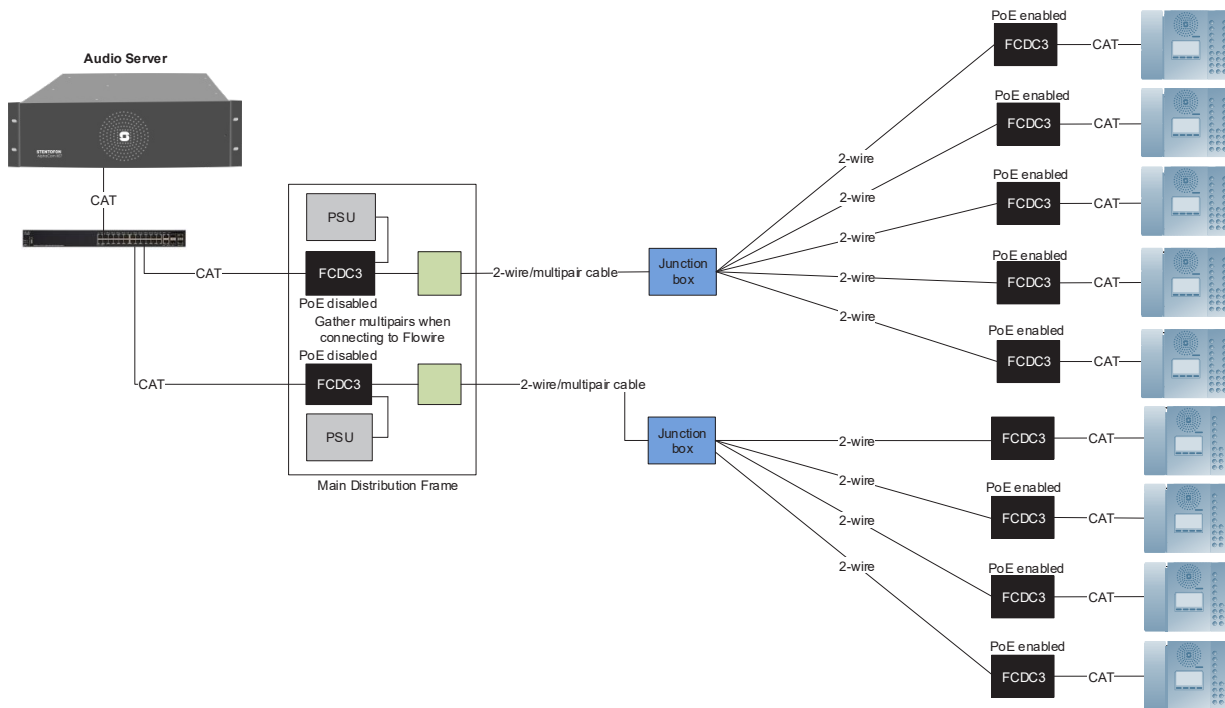## 2.5 System Configuration with Central Powering of Remote Intercoms

Figure 5   Flowire Upgraded configuration with central power distribution.

In the figure above, there are two Flowire star configurations, each with one central FCDC3 Flowire Converter with PoE disabled and one central PSU (Power Supply Unit). FCDC3 with PoE enabled is used to power the connected device via the spare pairs of its Ethernet port. There can be no cross connection between these star configurations inside the main distribution frame.

The figure above shows how the Flowire upgraded system configuration will look like when all remote IP products are powered by centrally located PSUs.

ⓘ *Only use FCDC3 with PoE disabled together with the central PSU in the main distribution frame.*

ⓘ *All multi-pair cables for one Flowire star configuration has to be gathered in the central FCDC3. This can be done directly in the FCDC3 if the plug has room for it, on connector rails or by some other means.*

ⓘ *You must never cross connect two Flowire star configurations.*

ⓘ *You must never have wires from different Flowire star configurations share the same multi-pair cable as this will lead to a very detrimental form of crosstalk.*

ⓘ *You must never ground any of the devices at the remote sites as this may draw additional current from the central PSU to the remote sites, thus reducing the power distribution performance.*

2.6 System Configuration with Local Powering of Remote Intercoms
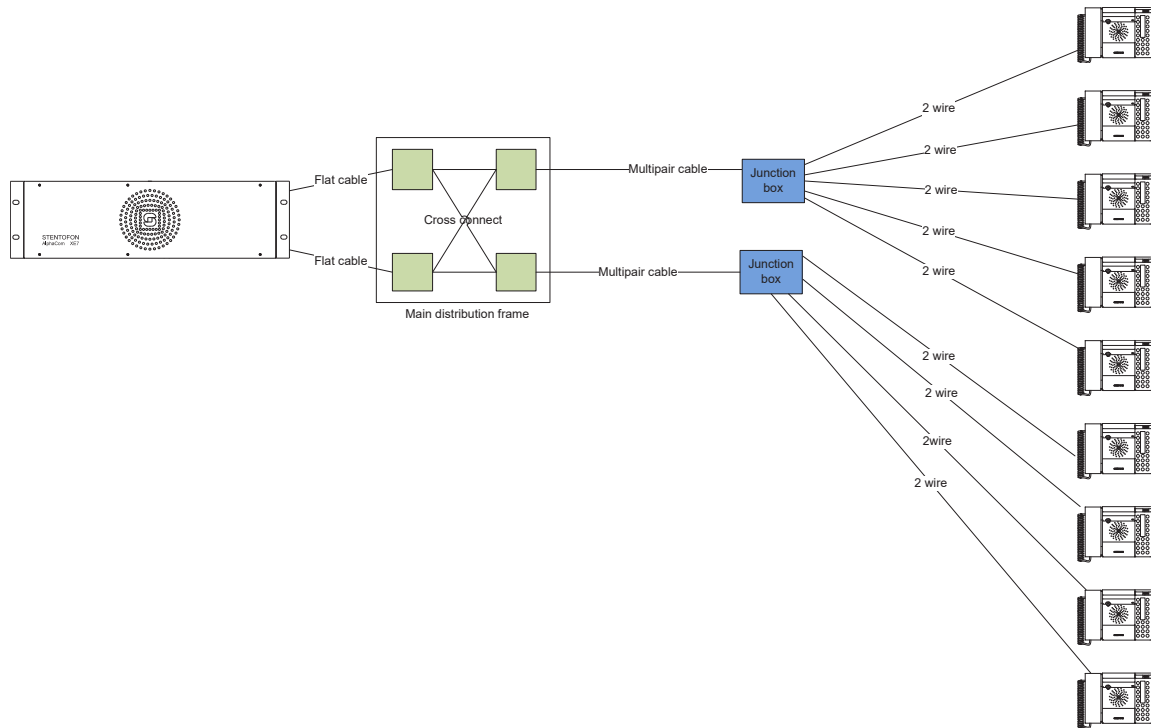

Figure 6   Conventional analog/digital system configuration
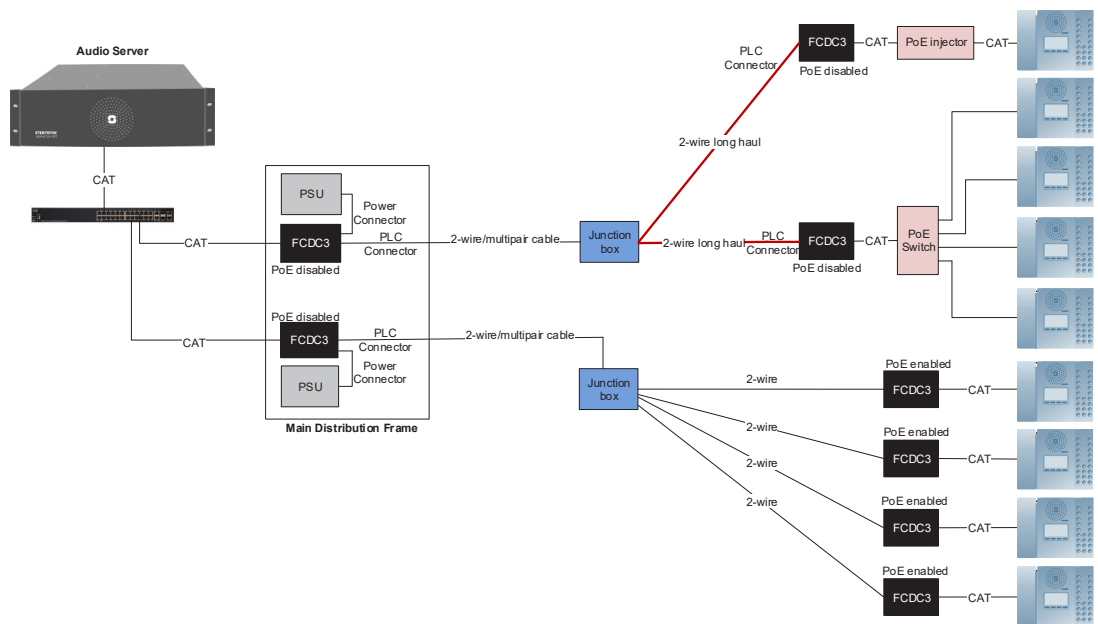

Figure 7   Flowire Upgraded configuration with local power at remote locations

Red cables indicate long hauls where local power will be necessary to maintain a stable connection to the intercoms. FCDC3 with PoE enabled is used to connect to local power for intercoms at remote locations. For single stations, a PoE injector will be ideal. For groups of intercom stations, it may be better to use a PoE switch.

ⓘ *DO NOT enable PoE on FCDC3 connected to local power for intercoms at remote locations.*

ⓘ *Maximum number of Flowire devices per star configuration is 9 (1 in main frame and 8 outside)*

ⓘ *DO NOT use Gigabit switch with FCDC3 with PoE enabled as this will damage the switch.*

ⓘ *ONLY use twisted-pair cables.*

2.7 System Configuration with Industrial & Ex Devices

The Ex device (TFIX station, EAPFX access panel) located in a hazardous zone is connected to the central equipment rack located in the safe zone using an Ex certified 2-wire shielded cable. FCDC3 is used to extend the Ethernet connection and support power distribution on the 2-wire cabling infrastructure.

Each industrial device (TFIE station, EAPII access panel) located in an outdoor area will require its own FCDC3 Flowire Converter.

To support the Flowire interface, the central equipment rack must be equipped with an FCDC3 PoE-disabled Flowire Converter.

To use an FCDC3 together with an Ex device, the device itself needs a SW upgrade. See *Appendix D* for SW upgrade of Ex devices.
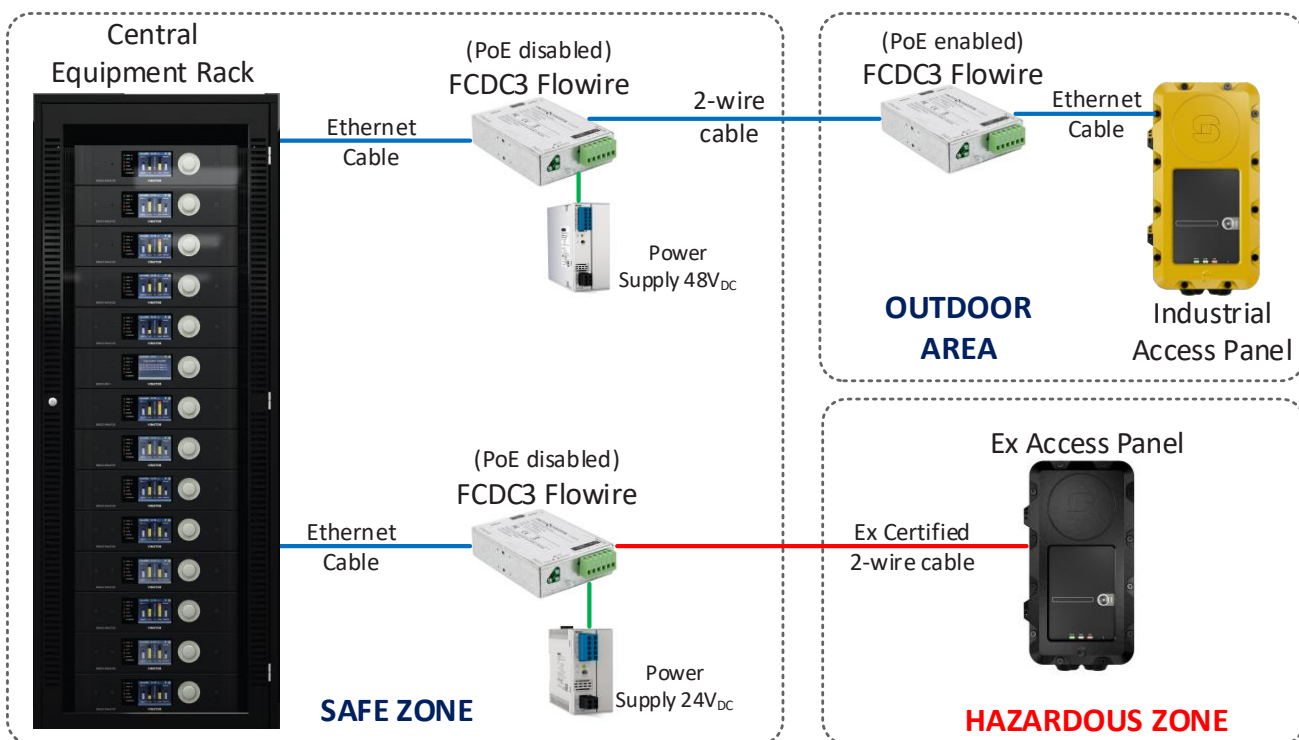

Figure 8   Cabling in Ex & Industrial Zones

ⓘ *Ex devices such as the TFIX station and EAPFX access panel MUST use 24VDC power supply for the FCDC3. The devices will be damaged if 48VDC power supply is used.*

ⓘ *Do NOT enable PoE on FCDC3 in the central equipment rack as this may damage the Ex devices.*

3 Connections & Indications

3.1 Flowire Connection

The Flowire Converter (FCDC3) must be connected to the Flowire network star configuration using twisted cabling with positive and negative DC voltage connected as shown on the label. The power supply voltage used depends on the type of devices in the star configuration.

48 VDC PSU : When using Flowire with Vingtor-Stentofon IP intercoms and access panels.

24 VDC PSU : When using Flowire with Vingtor-Stentofon Ex intercoms and access panels.

The converter is equipped with one dedicated power input connection and two connections to the other Flowire converters (PLC 1 & PLC 2).

Please note that the two connections (PLC 1 and PLC 2) are equivalent and that Power Input MUST NOT be connected to other converters.

1	Status Indicators
2	PLC 2
3	PLC 1
4	Power Input
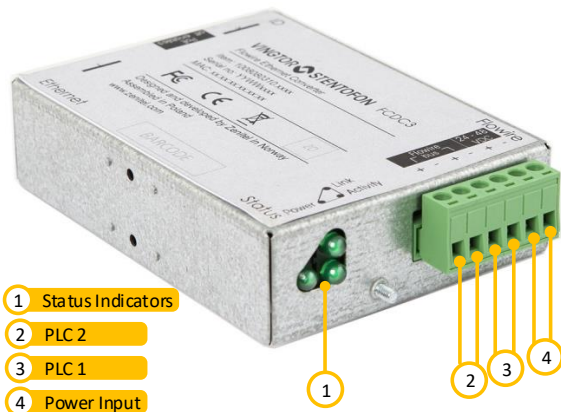
For the first converter unit on the configuration, the power input connection shall be used to connect the power supply, while the other connections can be used to connect to the actual star configuration. The power supply may be connected to the power input connection at any point on the star configuration, i.e. it can be connected to any of the Flowire Converters on the star configuration.

3.2 Ethernet Connection

Ethernet is connected via the RJ45 port. This supports 1 Gbps Ethernet (in and out) and power out over spare pairs. Use the switch next to the RJ45 port to enable/disable PoE power to the spare pairs. The power on the spare pairs is the same voltage as the one supplied to the converter. Hence, at least 40 volts must be applied to the converter in order to ensure stable operation when powering IP intercom stations directly through their Ethernet ports. If the station has a 24-volt input, the voltage can be reduced to 24 volts by separating the spare pairs from the CAT cable and connecting it to this input.

1	Password Reset Button
2	PoE On/Off Switch
3	Ethernet Port
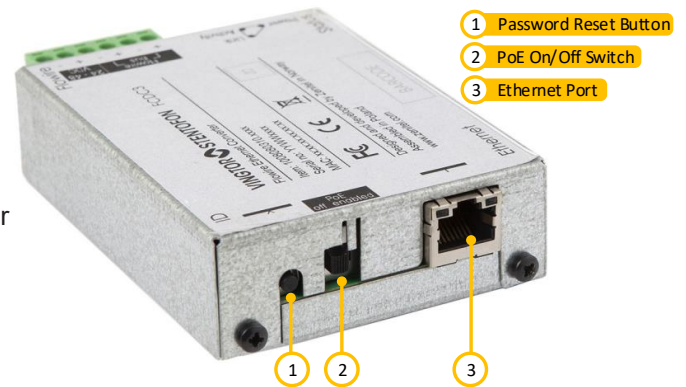
ⓘ *Do NOT power the Flowire Converter through the RJ45 Ethernet port. Trying to do so with a PoE injector will damage the converter.*

ⓘ *DO NOT use Gigabit switch with FCDC3 as this will damage the switch*

ⓘ *The RJ45 port on FCDC3 is NOT a PoE-compatible output but DC voltage on spare pairs which is always present. It must NOT be connected to any equipment that can be damaged by this voltage.*

3.3 Indicator LEDs

The Flowire Converter is equipped with three green LEDs. These indicate the status of the power, the connection/link to Flowire, and whether data is transmitted on Flowire or not.

LED1 - Power: This LED is lit when the converter is receiving enough power for powering up.
LED2 - Link: This LED is lit when the converter recognizes one or more converters on the Flowire star configuration.
LED3 - Activity: This LED flashes when data is transmitted to or from the converter.
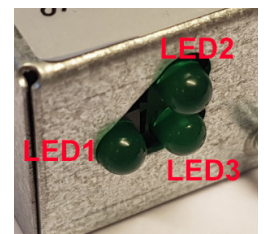
3.4 Password Reset Button

Pressing and holding this button for more than 15 seconds will reset the NMK password to the default: HomePlugAV0123

In addition to resetting the NMK password to its default, the procedure will also set the following factory defaults:

- DHCP will be turned on
- IGMP snooping querier will be turned on

4 Mounting & Recommendations

4.1 Mounting the Flowire Converter

The Flowire Converter should be mounted on-wall by using 2 x 4 mm screws or on NS35 DIN rail by using the mounting clips provided in a normal and ventilated indoor environment with a temperature of maximum 55ºC. Make sure that there is sufficient space for cables and maintenance. When using more than one Flowire Converter, try to mount them as far apart as possible.
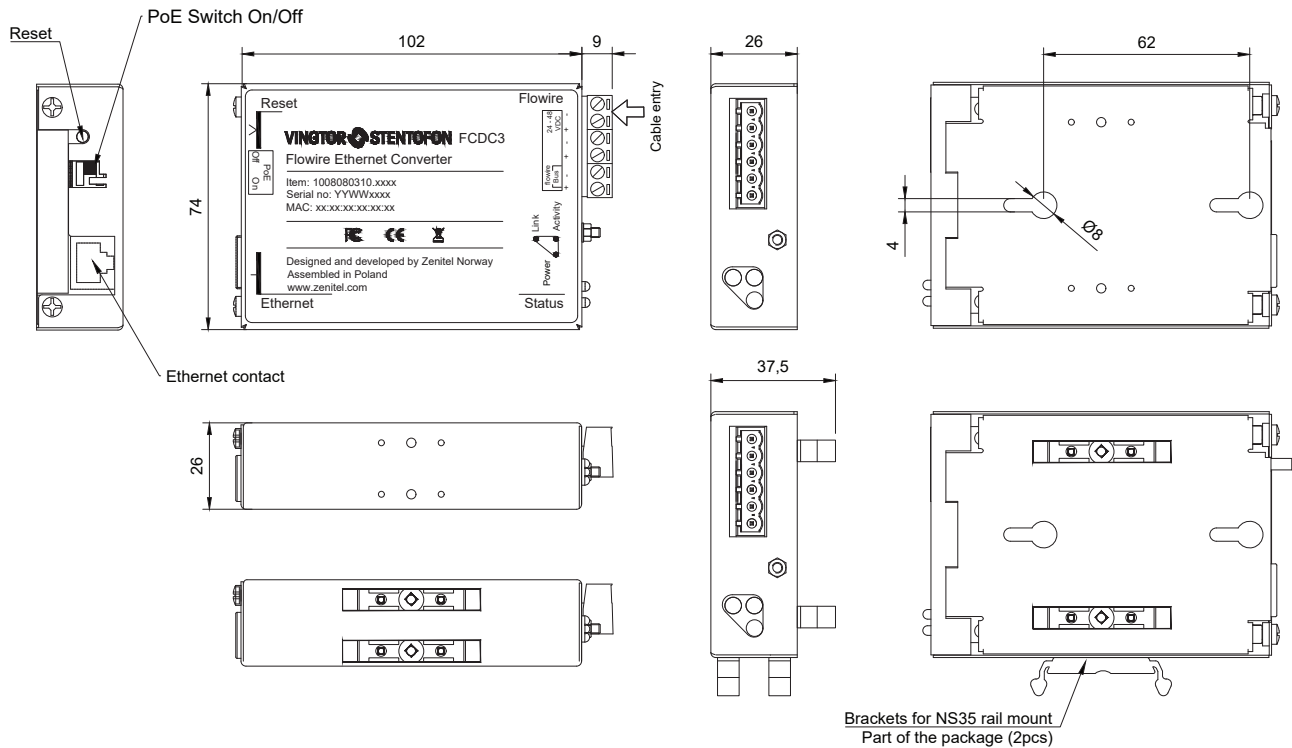
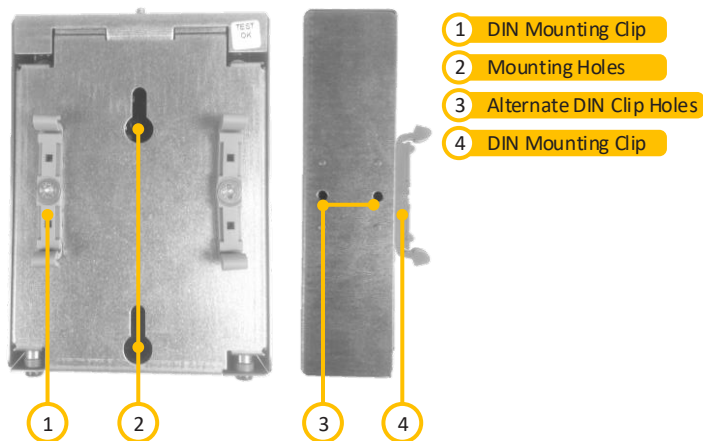

Figure 9   FCDC3 Flowire Converter Dimensions

1 DIN Mounting Clip
2 Mounting Holes
3 Alternate DIN Clip Holes
4 DIN Mounting Clip

Figure 10 DIN Mounting Clips

To mount the Flowire Converter:

● Press the Flowire Converter against the DIN rail of the rack until the mounting clips snap into place.

4.2 Power Requirements

A Flowire Converter needs at least 18V to operate, nominal voltage is 24V to 48V, and maximum voltage is 56V. The voltage at the remote Flowire Converter should never drop below half of the PSU's output voltage.

To power a Vingtor-Stentofon IP Intercom Station through its Ethernet port, we recommend at least 40V at the remote site.

For land-based installations, use XP PSU for FCDC3:

- XP 120 XP Power Supply Unit, 48V DC, 120W
  Item no. 2990101120
- XP 240 XP Power Supply Unit, 48V DC, 240W
  Item no. 2990101240

For installations with Ex equipment, use Powerbox PSU for FCDC3:

- Power Supply 100-240VAC/24VDC 2A
  Item no. 2990000063
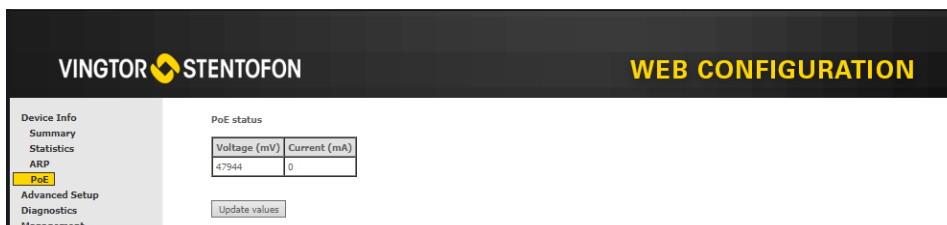- Power Supply 100-240VAC/24VDC 4A
  Item no. 2990000064

5 Troubleshooting

5.1 Power for Stable Connection at Remote Site

The minimum voltage at the remote end for PoE is 40VDC. The minimum voltage for the TFIX Ex intercoms and EAPFX Ex access panels is 18VDC.

The PoE voltage can be read on the device's web interface:

- Select **Device Info** > **PoE**

Voltage and Current values shown are out of the FCDC3.

If you are not getting sufficient voltage for a stable connection at the remote site, you can:

- Adjust the output voltage on the PSU
- Use local power supply for the connected equipment
- Route the spare pairs in the Ethernet cable to the intercom station's 24V input (available on most Vingtor-Stentofon IP intercom stations and kits except for desktop master stations)
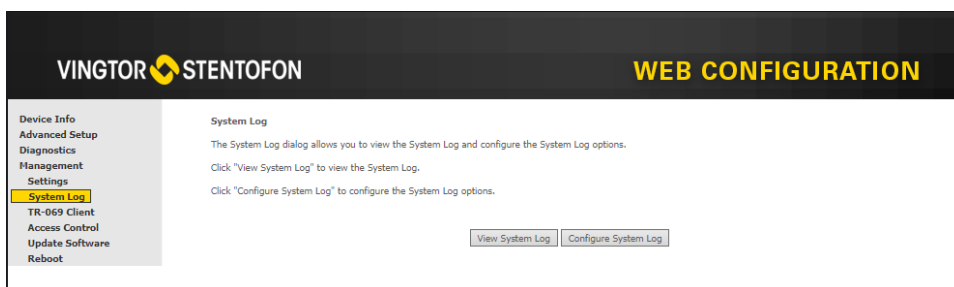
5.2 Cables & Bandwidth

- To get the best bandwidth you should use twisted-pair shielded cables.
- When using multi-pair cables, there should ideally not be any traffic on the pairs not being used for the Flowire Converter. A point-to-point connection between two Flowire Converters, however, will get better bandwidth when more wires are connected between them.
- Avoid unnecessary splicing. A continuous cable will carry the signal further.
- Regarding EMI, twisted/shielded cabling is highly recommended. When using unshielded parallel cables, try to avoid running them close to devices emitting strong fields in the 2 to 28 MHz bandwidth.
- Regarding cross-talk, there will always be some cross-talk when running unshielded cables close to each other or when using several pairs in a multi-pair cable for different devices. However, the most detrimental cross-talk can occur between different Flowire star configurations.

5.3 System Log

To enable system logging:

- Select **Management** > **System Log**

- Click **Configure System Log**

Select the log levels to log and to display. The **Mode** dropdown box selects where the log is recorded.

If **Local** is selected the log will be saved in the local memory.

If **Remote** is selected the log will be sent to the syslog server that is set up in **Server IP Address**.

If **Both** is selected the syslog will be stored locally and sent to the syslog server.

Local syslog:

System Log

Date/Time	Facility	Severity	Message
1st day 00:37:53	kern	warn	kernel: wait instruction: enabled
1st day 00:37:53	kern	info	kernel: ip_tables: (C) 2000-2006 Netfilter Core Team
1st day 00:37:53	kern	info	kernel: device eth0 entered promiscuous mode
1st day 00:37:53	kern	info	kernel: device plc0 entered promiscuous mode
1st day 00:37:53	kern	info	kernel: monitor task is initialized pid= 215
1st day 00:37:53	kern	info	kernel: br0: port 2(plc0) entered forwarding state
1st day 00:37:53	kern	info	kernel: br0: port 2(plc0) entered forwarding state
1st day 00:38:13	kern	info	kernel: Link change [eth0]. link_speed: 0, duplex: 1
1st day 00:38:13	kern	info	kernel: br0: port 1(eth0) entered disabled state
1st day 00:38:44	kern	info	kernel: Link change [eth0]. link_speed: 100000000, duplex: 1
1st day 00:38:44	kern	info	kernel: br0: port 1(eth0) entered forwarding state
1st day 00:38:44	kern	info	kernel: br0: port 1(eth0) entered forwarding state
1st day 00:38:57	kern	info	kernel: Link change [eth0]. link_speed: 0, duplex: 1
1st day 00:38:57	kern	info	kernel: br0: port 1(eth0) entered disabled state
1st day 00:39:22	kern	info	kernel: Link change [eth0]. link_speed: 100000000, duplex: 1
1st day 00:39:22	kern	info	kernel: br0: port 1(eth0) entered forwarding state
1st day 00:39:22	kern	info	kernel: br0: port 1(eth0) entered forwarding state

Refresh   Close

Log shown in a syslog server:

Since there is no real time clock in the FCDC3, the timestamp in the device is related to the start-up time of the FCDC3.

A: Power Consumption & Distances for Typical Cables

The table below shows theoretical point-to-point distances for different cable types at different levels of power consumption at the remote location. All distances are calculated for 48V output from the PSU.

Cable Type	Resistance	Intercom	Intercom	Power Consumption	40V
0.5 mm (24 AWG)	87.5 Ohm/km	Turbine Compact	Normal	10W	180m
0.5 mm (24 AWG)	87.5 Ohm/km	Turbine Compact	Max power consumption	18W	100m
0.5 mm (24 AWG)	87.5 Ohm/km	INCA	Normal	8W	220m
0.5 mm (24 AWG)	87.5 Ohm/km	INCA	Max power consumption	14W	130m
0.6 mm (22 AWG)	60.7 Ohm/km	Turbine Compact	Normal	10W	260m
0.6 mm (22 AWG)	60.7 Ohm/km	Turbine Compact	Max power consumption	18W	140m
0.6 mm (22 AWG)	60.7 Ohm/km	INCA	Normal	8W	320m
0.6 mm (22 AWG)	60.7 Ohm/km	INCA	Max power consumption	14W	180m
0.9 mm (19 AWG)	26.9 Ohm/km	Turbine Compact	Normal	10W	590m
0.9 mm (19 AWG)	26.9 Ohm/km	Turbine Compact	Max power consumption	18W	330m
0.9 mm (19 AWG)	26.9 Ohm/km	INCA	Normal	8W	740m
0.9 mm (19 AWG)	26.9 Ohm/km	INCA	Max power consumption	14W	420m

Table 3 Theoretical point-to-point distances when using a centrally located PSU to power intercom stations. Wire/ conductor thickness described as diameter and AWG.

Cable Type	Resistance	Intercom	Intercom	Power Consumption	40V
0.5 mm^2 (20 AWG)	37.8 Ohm/km	Turbine Compact	Normal	10W	420m
0.5 mm^2 (20 AWG)	37.8 Ohm/km	Turbine Compact	Max power consumption	18W	230m
0.5 mm^2 (20 AWG)	37.8 Ohm/km	INCA	Normal	8W	520m
0.5 mm^2 (20 AWG)	37.8 Ohm/km	INCA	Max power consumption	14W	300m
0.75 mm^2 (18 AWG)	25.3 Ohm/km	Turbine Compact	Normal	10W	630m
0.75 mm^2 (18 AWG)	25.3 Ohm/km	Turbine Compact	Max power consumption	18W	350m
0.75 mm^2 (18 AWG)	25.3 Ohm/km	INCA	Normal	8W	790m
0.75 mm^2 (18 AWG)	25.3 Ohm/km	INCA	Max power consumption	14W	450m
1.0 mm^2 (17 AWG)	18.9 Ohm/km	Turbine Compact	Normal	10W	840m
1.0 mm^2 (17 AWG)	18.9 Ohm/km	Turbine Compact	Max power consumption	18W	470m
1.0 mm^2 (17 AWG)	18.9 Ohm/km	INCA	Normal	8W	1000m
1.0 mm^2 (17 AWG)	18.9 Ohm/km	INCA	Max power consumption	14W	420m
1.5 mm^2 (15 AWG)	12.6 Ohm/km	Turbine Compact	Normal	10W	1200m
1.5 mm^2 (15 AWG)	12.6 Ohm/km	Turbine Compact	Max power consumption	18W	700m
1.5 mm^2 (15 AWG)	12.6 Ohm/km	INCA	Normal	8W	1500m
1.5 mm^2 (15 AWG)	12.6 Ohm/km	INCA	Max power consumption	14W	900m

Table 4 Theoretical point-to-point distances when using a centrally located PSU to power intercom stations. Wire/ conductor thickness described as cross section and AWG

ⓘ ***Note that being able to power a remote station does not guarantee sufficient bandwidth. For more about bandwidth see section "5.2 Cables & Bandwidth".***

B: Advanced Configuration

IP addresses on a Flowire device can be set either by setting a static IP address or having one assigned from a temporary DHCP server. The Flowire device has, by default, DHCP enabled on one of their networking interfaces.

B.1 Setting a Static IP Address & Disabling DHCP

By default, all Flowire devices have **169.254.1.10** as a static IP address.

In order to set a new static IP address:

1. Isolate the Flowire device by disconnecting the line to other devices (if you have more than one Flowire device with default IP configuration).


2. Access the web interface of the Flowire device via the default address 169.254.1.10.
3. Select **Advanced Setup** > **LAN**
4. Select **Disable DHCP Client**
5. Enter the new **IP address**, **Subnet Mask** and **Default Gateway**
6. Click the **Apply/Save** button

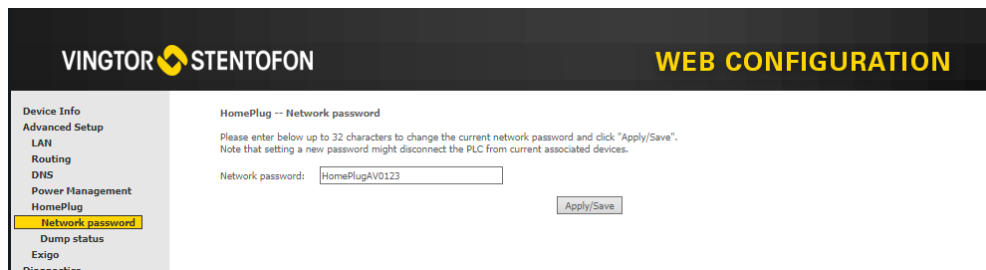The device will now use its new IP address.

B.2 Network Management Key (NMK) Configuration

To set a new NMK password:

1. Log into the Flowire device by entering its IP address in a web browser.
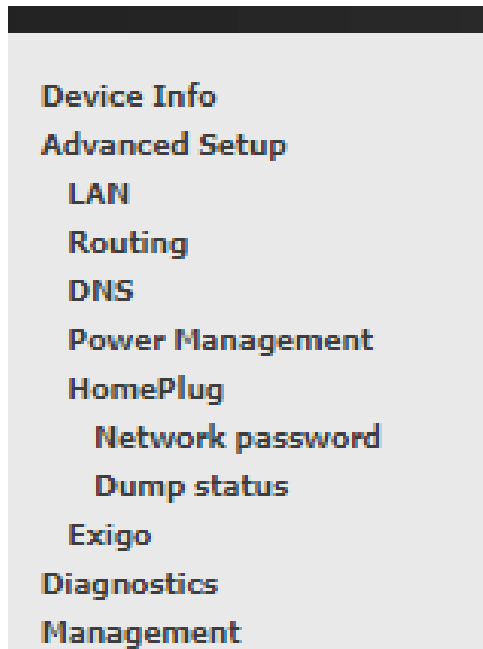
2. Select **Advanced Setup** > **HomePlug** > **Network password**

3. Enter a new password in the **Network password** field
4. Click **Apply/Save**

The NMK Password may be up to 32 characters long, and is case sensitive.

It is good practice to label the Flowire device with the new NMK.

Default NMK: **HomePlugAV0123**

B.3 CCo Settings

- Select **Advanced Setup** > **HomePlug**

In the Flowire web interface, each Flowire unit has a setting for CCo (Central Coordinator). In every Flowire network, there is always one CCo, but this is, by default, automatically selected. If the CCo should fail, another Flowire unit on the network is automatically selected to be CCo. In a star configuration, in order to optimize availability, it is recommended to always configure the FCDC3 in the rack to be CCo. Due to its location, it is least likely to suffer damage. If this Flowire unit fails, the star configuration will not function in any case, whether or not it is the CCo, as all other Flowire units are routed through it. In order for the FCDC3 in the rack to be configured as a CCo, it is necessary to set the device-side Flowire units to **not CCo**.

- For one-to-one connections, this setting can be left as **Auto/Blank**.

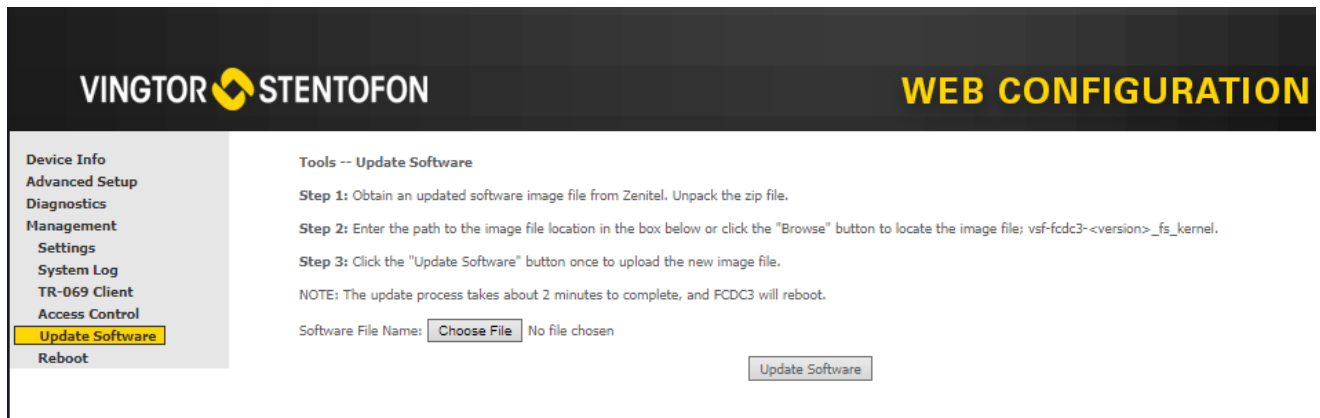ⓘ *Note: After changing CCo settings, the Flowire unit needs to be rebooted.*

For more information, see the wiki page Flowire CCo on this subject.

C: Software Upgrade

C.1 Upgrade via Web Interface on Flowire Device

To upgrade software:

1. Select **Management** > **Update Software**

2. Click the **Choose File** button and browse for the new software file
3. Click **Update Software**

The update will take about 2 minutes. When the update is complete the FCDC3 will reboot.

D: Upgrade FCDC1/FCDC2, EAPFX, TFIX to Operate with FCDC3

In order for the FCDC1, FCDC2, TFIX, or EAPFX to be able to work with the FCDC3, you need to upgrade the software in the Flowire to at least version 4.1.3.13.

The procedure is described in the wiki page [Flowire Software Upgrade Procedure](#)

⚠ **The WEEE Directive does not legislate that Zenitel, as a 'producer', shall collect 'end of life' WEEE.**

This 'end of life' WEEE should be recycled appropriately by the owner who should use proper treatment and recycling measures. It should not be disposed to landfill.

Many electrical items that we throw away can be repaired or recycled. Recycling items helps to save our natural finite resources and also reduces the environmental and health risks associated with sending electrical goods to landfill.

Under the WEEE Regulations, all new electrical goods should now be marked with the crossed-out wheeled bin symbol shown. Goods are marked with this symbol to show that they were produced after 13th August 2005, and should be disposed of separately from normal household waste so that they can be recycled.

DOC NO.

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