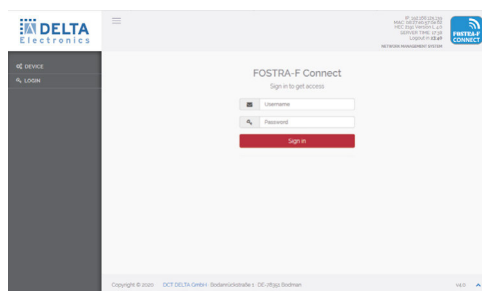


DELTANET OVERVIEW - DELTA'S SMART REMOTE CONTROL SOLUTION

- || DELTANET - the smart solution for automated data collection and creation of a topographical overview of installed network components
Remote access to FTTx and HFC components via DCT DELTA's FOSTRA-F solution. On-site configuration of DCT DELTA components via WiFi access.
- || DELTANET is based on the three applications DELTANET FOSTRA-F, DELTANET SCANAPP and DELTA CONFIGAPP, which can be used independently or in interaction with each other
 - || DELTANET FOSTRA-F: The simple and cost-effective solution for remote access, e.g. for ingress control (supported features depend on the device) with minimal energy consumption and no additional user bandwidth consumption
 - || DELTANET SCANAPP: The app (available for Android and iOS) supports during network commissioning - Register the nodes/amplifiers by scanning appropriate QR codes and get a database based topology overview of your network. Integrated tools assist the installer in avoiding mismatches. SCANAPP also supports on-site configuration via the installer's mobile device due to the integrated CONFIGAPP feature, e.g. configurations can be uploaded and downloaded to the smartphone and thus stored on the centralized DELTANET server. Uploadable recordings / photos of the installed components and configuration complete the data collection, which represents a further source of information, especially for maintenance/service tasks.
 - || DELTANET CONFIGAPP: The app (available for Android, iOS and Windows) allows to configure (via Wi-Fi) Delta Nodes/Amplifiers using a mobile device or Windows laptop. The FOSTRA-C module acts as wireless access point, inserted temporarily in the corresponding slot of the node/amplifier. Thus onsite the service staff can use the app to download and modify a configuration of connected devices. CONFIGAPP is available as a standalone version and also embedded in SCANAPP.

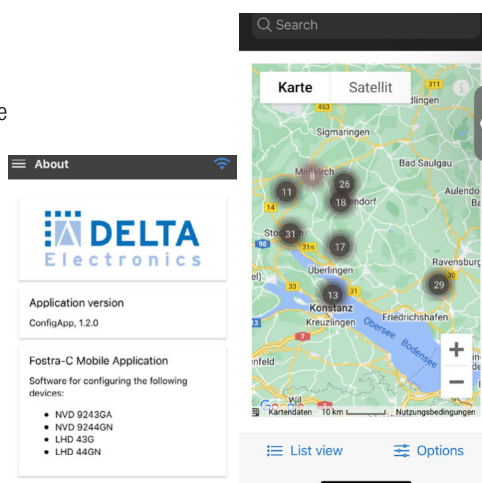
DELTANET FOSTRA-F

- || Robust remote access to configuration parameters of RFoG/HFC nodes/amplifiers
- || Access does not allocate user bandwidth
- || Efficient troubleshooting, e.g. in the event of ingress, by attenuating / switching off the return channel (as well in interaction with a higher-level management system)
- || Linux based database
- || Access via web GUI (http(s)), REST API, SNMP
- || Cost-efficient, license model allows low-cost entry



DELTANET SCANAPP

- || Client/server system. No direct dependency on server installation location, as long as there is a permanent internet connection
- || Mobile app installed on the service team's smartphones/tablets (Android or iOS). Database synchronization via the Internet
- || Simple node/amplifier registration by scanning the QR code, labeled on the devices
- || One QR code per node/amplifier, one QR code per FOSTRA-F module (if installed)
- || Integrated connection test between HEC and FOSTRA-F module (if installed)
- || Automatic inventory and location detection using GPS
- || Map or table based view of installed components
- || Uploading of photos of the on site installation or other documents (e.g. acceptance report)
- || Highlighted link from selected device towards the head end
- || Smart device based on site configuration via the CONFIGAPP feature. Device access realized via Wi-Fi hot spot (FOSTRA-C module)
- || Import/export of the node/amplifier configuration via installer's smart device



DELTANET CONFIGAPP

- || Installed on the mobile device (Android or iOS) or Windows laptop of the service staff
- || FOSTRA-C module is temporarily plugged into corresponding slot, detected and connected via Wi-Fi to the mobile device/laptop
- || Configuration of the device via the app, including import /export from/to the mobile device/laptop
- || Available as Standalone version and integrated in DELTANET SCANAPP

DELTANET FOSTRA-F



Database on HEC or dedicated database server

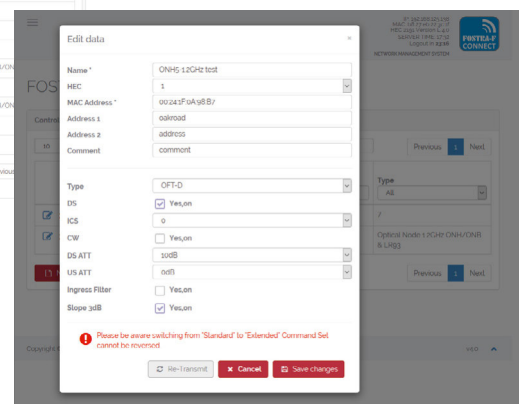
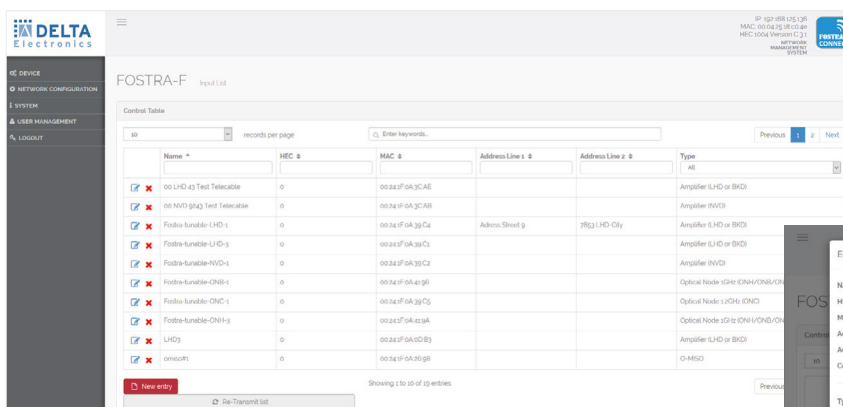


Node/Amplifier with FOSTRA-F module



Prerequisites - All you need is ...

- || DELTANET FOSTRA-F requires a platform operating the FOSTRA-F database. This might be the Headend Controller (HEC, recommended for accessing up to 500 FOSTRA-F modules) or a centralized server / VM (provided by the customer)
- || Access to device-specific information of the nodes/amplifiers, such as name, address and type.
- || Access to device-dependent parameters such as DS on/off, burst mode on/off, ECO mode on/off, DS/US path settings (for ingress management)
- || Modular license scheme, initially remote control of at least 32 FOSTRA-F modules, expandable in a stepwidth of 500. Certainly customizable on request.
- || The HEC acts as an FSK based transmitter addressing the FOSTRA-F receiver modules in the nodes/amplifiers

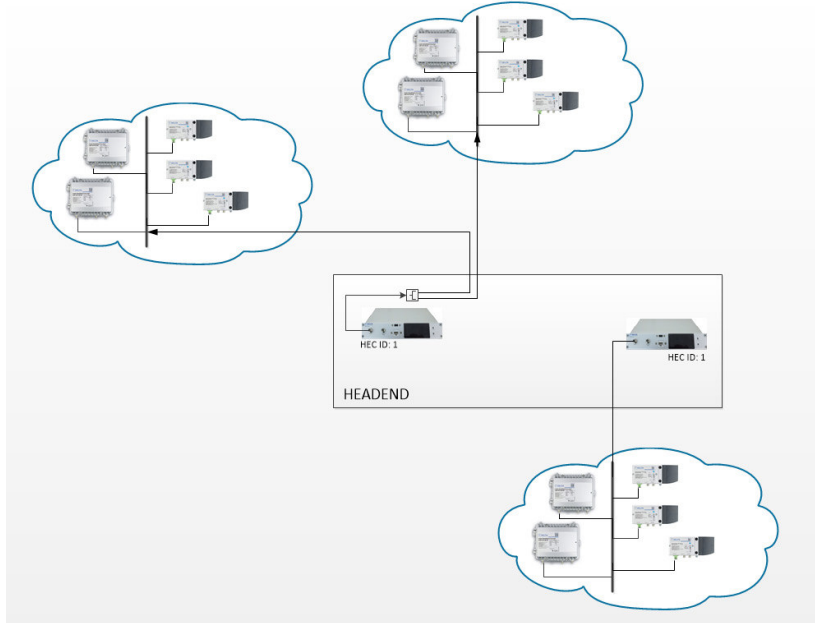


DELTANET FOSTRA-F DESIGN RECOMMENDATION

Standalone approach

Recommended for

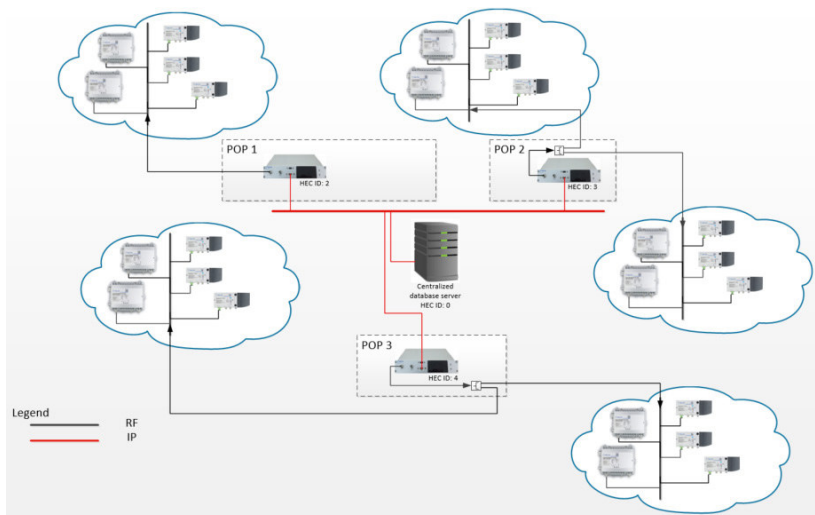
- Smaller sized networks (for up to 500 FOSTRA-F modules/HEC): HEC in standalone mode
- Database runs on HEC and HEC acts as RF single controller to attached FOSTRA-F modules



Centralized Server approach

Recommended for

- Medium / big sized networks: Centralized server for multiple HECs which hosts the database.
- HEC acts as RF gateway only



HEC3191 - HEAD END CONTROLLER FOR DELTANET FOISTRA-F



Cost-effective remote control system for HFC/RFoG nodes/amps

- || FOISTRA-F protocol implementation based on EN 60728-14
- || Compact FSK-transmitter as desktop unit, mounting kit for 1RU 19" installation included
- || Variable transmit frequency ranges in 3 specific ranges from 860.5..879.5 MHz
- || Web based GUI, running locally or centralized, Linux operated
- || 1 RF output (selectable on front or rear panel) with RF test point (-20dB)
- || Electronic level adjustment of output signal
- || 100 Base-T RJ-45 connection, USB-port for serial connection
- || Standard HEC includes basic test license for 32 FOISTRA-F modules (subscribers), expandable in steps off 500 additional FOISTRA-F modules
- || Prepared for bidirectional communication with the FOISTRA-F module (requires FOISTRA-F V3.0)



FOISTRA-F Microreceiver for Fibre Nodes and Amplifiers

- || Remote control functions: DS ON/OFF, Burst Mode ON/OFF, Ingress Detection Switch 0/6/45 dB, Eco Mode on/off, OMI adjustment upstream/downstream path settings *
- || Easy integration into smartphone application DELTANET SCANAPP
- || FSK-based, robust, no return path necessary
- || FSK signal can be configured between two SC-QAM carrier
-> no additional bandwidth consumption or other frequency block allocation.

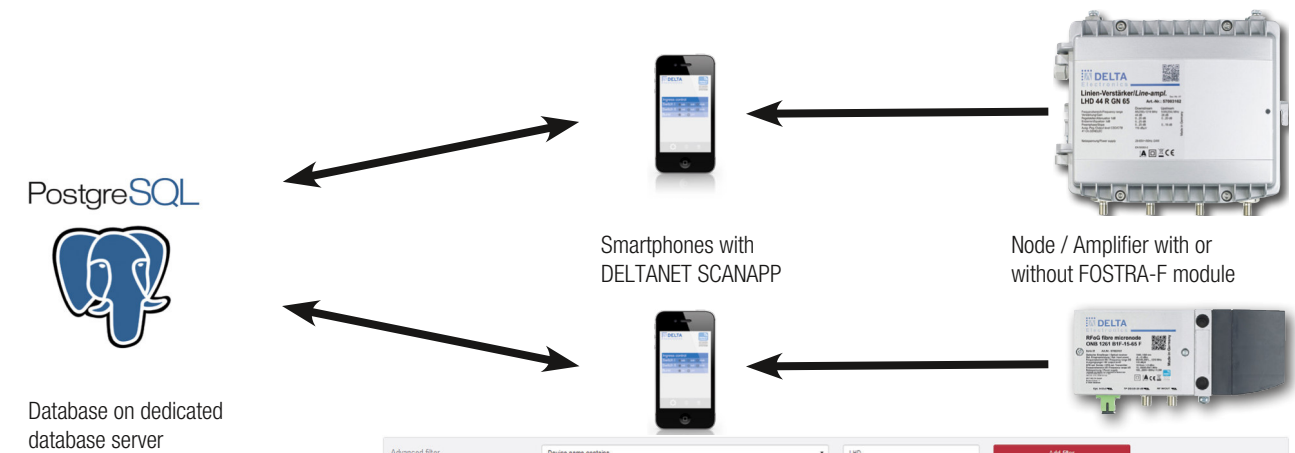


* whole functionality depending on amp/node type

Type	HEC 3191	FOISTRA-F
Application	DELTANET	ONH, ONB, BKD, LHD, NVD types
Item No.	Item number see page 9 bottom	Item number see page 9 bottom
TX-frequency	MHz 860.5-879.5 MHz (other frequencies on request)	862 / 868.3 / 870 MHz, each with a ± 300 kHz capture range (other frequencies on request)
Monitoring-Status LED	green (=Tx ON)	green: indicated current ICS settings, received command, locked / not locked to HEC
Bandwidth	kHz 120	120
Spurious	dB μ V < 10	< 10
Distortion	dB > 66	-
Dynamic-Input level	dB μ V -	30...75
Transmitting level	dB μ V 1 x 69 ... 100 (set by software)	-
RF test point	1 x -20 dB	-
Data Speed	Bps 4800	4800
Local interface	100 Base-T RJ-45 and USB (as serial port)	RS-232 (only for debugging)
Power supply	V~/W 200 - 240 AC / 5 DCV (1A) / < 5	6-24V / < 0.4W@24V / < 0.18W@12V
Dimensions	mm 220 x 140 x 1RU (chassis only) 19" x 140 x 1RU (with mounting frame)	25 x 24 x 8
Weight	kg < 1.0	0.02
IP protection class	IP 20, Indoor	

DELTANET SCANAPP

- DELATANET SCANAPP consists of a server-based application (e.g. access via web GUI) and an app, installed on the installer's smart device (supports Android and iOS.)
- Collection of relevant device data (e.g. device type, technical data, serial number, device configuration), positioning data, time of installation, installer's ID, photo(s) of installation.
- Integrated check routines, such as check for duplicated port or return path wavelengths entries, cross connection test to the assigned FOISTRA-F database.
- Automatic synchronization with the central database, resulting in real time updates of the virtual network topology.



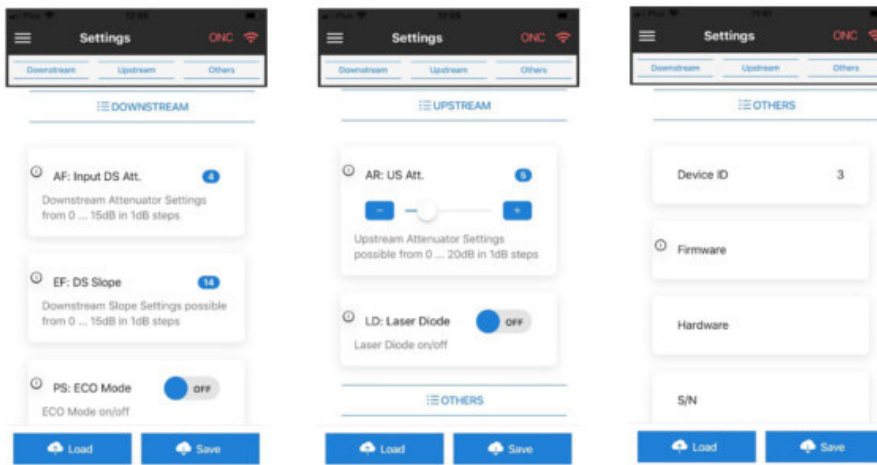
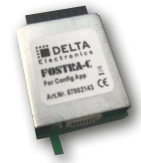
The screenshot shows the web interface of the DELATANET SCANAPP. At the top, there is a search bar for 'Device name contains' with the value 'LND'. Below this is a table of device records. The table has columns for Actions, Name, QR Barcode, MAC, Production date, Installation date, Serial, QR-Code, Address, Description, Asset number, Installer, Type, and Parent device. The table contains several rows of data for various LND devices.

Actions	Name	QR Barcode	MAC	Production date	Installation date	Serial	QR-Code	Address	Description	Asset number	Installer	Type	Parent device
	RF-LND43-Test-01	LND 43 GA	0		2017-04-14 20:05		1_2_3702010	Address	1.2GHz, 45dB, mod. Diplexer, 195-265 V-			HFC	Error
	RF-LND43-Test-02	LND 43 GA	0		2017-04-14 21:02		1_2_3702010	Umsenderort	1.2GHz, 45dB, mod. Diplexer, 195-265 V-			HFC	Error
	RF-LND43-Test-03	LND 43 GA	35754259	2007-08-21	2017-04-14 21:03	3407_2008_3702010	3407_2008_3702010	Depotstrasse	1.2GHz, 45dB, mod. Diplexer, 195-265 V-	123456	keger	HFC	Error
	RF-LND43-Test-04	LND 43 GA	0	2017-03-06	2017-04-14 21:04	1017_0302_3702010	1017_0302_3702010	Address	1.2GHz, 45dB, mod. Diplexer, 195-265 V-			HFC	Error

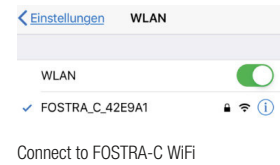
Below the table is a 'Device map' section showing a map of Köln with device locations marked. A sidebar on the left contains navigation options like 'List view', 'Map view', 'Reporting', 'Logs', 'Settings', 'My profile', 'User management', 'Device mapping', 'Android application', 'ConfigApp Template', and 'Backup'. On the right, there is a QR code with a public key for mobile phone access and a 'List registered user phones' section showing a table with columns for Actions and Name, with one entry: SM-T580 Android 7.0.

DELTANET CONFIG APP

- || CONFIGAPP enables device configuration export/import via installer's smart device.
- || Connection to the device via a Wi-Fi hotspot (FOSTRA-C module)
- || Access to all parameters that can be set via the push button menu, such as
 - || Downstream and upstream relevant parameters
 - || Device-specific settings, such as eco mode on/off, burst mode on/off
- || Display of hardware and firmware version of connected device



Application menu



DELTANET PRODUCT OVERVIEW

Type	Item No.	Description
HEC 3191	57004308	Head End Controller incl. basic 32 user license
DELTANET license extension +500	57005352	Upgrade license, to manage additional 500 FOSTRA-F modules
FOSTRA F V2.5 Tuneable HOR	57004320	For a horizontal mount FSK Receiver 861.7-862.3 MHz / 868.0-868.6 MHz / 869.7-870.3 MHz
FOSTRA F V2.5 Tuneable VER	57004321	For a vertical mount FSK Receiver 861.7-862.3 MHz / 868.0-868.6 MHz / 869.7-870.3 MHz
FOSTRA C * VER	57002143	WiFi Config Module for FOSTRA-F Connect
DELTA SCANAPP BASIS	57003559	SCANAPP Server Software incl. license for 500 subscribers
DELTA SCANAPP +500 LIC	57003560	SCANAPP license for additional 500 devices
DELTA SCANAPP +1000 LIC	57003590	SCANAPP license for additional 1000 devices
DELTA SCANAPP +5000 LIC	57003591	SCANAPP license for additional 5000 devices
DELTA SCANAPP ANDROID	57003561	SCANAPP Mobile App for Android download free in Google Play Store
DELTA SCANAPP IOS	57003562	SCANAPP Mobile App for IOS download free in Apple App Store
DELTA CONFIGAPP WINDOWS v1	57004701	DELTANET CONFIGAPP for Windows based systems v1
DELTA CONFIGAPP ANDROID v2	57004702	DELTANET CONFIGAPP for Android mobile devices v2
DELTA CONFIGAPP IOS v2	57004703	DELTANET CONFIGAPP for iOS mobile devices v2

* FOSTRA C is a service interface for temporary installation and configuration settings and must be removed from the amplifier or optical node for error-free and standard-compliant operation before it is closed.