2G6-FA

Modular optical platform for HFC and FTTH networks

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HUBER+SUHNER
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20 years experience in broadband technology

HUBER+SUHNER BKtel develops and produces active and passive components for modern FTTH and HFC broadband networks. Our products enable the realization of fiber optic network structures that provide future-oriented data, telephony and TV services.
With more than 20 years of experience in the research and development of fiber optic network equipment as well as production located in Hückelhoven, Germany, HUBER+SUHNER BKtel is a partner you can rely on.

2G6-FA
Compact optical transmission platform

The 2G6-FA product series provides a modular platform for analog optical transmission in state-of-the-art Hybrid Fiber Coax (HFC), Fiber to the Home (FTTH) and RF over Glass (RFoG) networks. It offers outstanding performance and high port density combined with a cost efficient and reliable design.

The platform enables a variety of applications:
- CATV-distribution over HFC networks including Targeted Services (high speed internet/voice over IP services and video on demand)
- Multiwave 1550 nm (C-band) and 1310 nm (O-band) DWDM transmission of CATV signals to be used in fiber node segmentation
- RF video overlay (CATV & SAT TV) in FTTH networks
- Access networks realized with RFoG technology

Full DOCSIS3.1 functionality

We are continuously enhancing our products, so that upcoming technical changes in HFC technology are always accommodated in time. In line with this approach 2G6 has been successfully transformed to a product series satisfying the requirements of the latest DOCSIS-standard: All transmitters and receivers are upgraded in forward path to a RF frequency of 1218 MHz and in return path to 204 MHz complying with DOCSIS 3.1.

Compact optical platform
Perfect foundation

The basis is the multifunctional chassis, which can accommodate up to 16 module components on only 4 height units. Depending on the network application, an individual combination of optical transmitters, optical amplifiers, optical receivers, optical switches, and element controllers can be arranged.

Easy insertion of the individual modules from the front: The modules slide into position on precise guide rails and are connected by pre-aligned connectors. The resulting individual and coordinated unit can be managed by the control module. Furthermore, several 2G6 combinations can be connected to each other.

Technical features:
- Forward transmission 47 (70) ... 1218 / 2800 MHz
- Return transmission 5...204 MHz, extendable to 450 MHz
- SNMP and Web browser based management
- Optical connectors: SC/APC, LC/APC, E2000
- RF connectors: F female
- Operation environmental conditions according ETS 300 019-1-3, class 3.1 (temperature controlled locations)

Modular approach
Wide variety of applications

Due to the individual composition of 2G6 active modules, virtually any network application can be supported, with only a small amount of space required. This enables the network operator to make future expansions.

Optical Transmitters
The BKtel optical transmitter product series consists of three distinct transmitter families in HFC and FTTH networks:
- 1550 nm Broadcast transmitters
- DWDM Full Band transmitters
- DWDM Narrowcast transmitters

They are covering the complete range from direct modulated standard up to high end external modulated transmitters, from 1310 nm up to O-band and C-Band wavelengths. Various models are available with a broad selection of output power levels, a wide choice of channels on the standard DWDM ITU grid. All featureing at least 1218 MHz bandwidth.

Optical Amplifier (EDFA)
Optical amplifiers are availables for two different applications:
- EDFA: Recovery of optical signal level after transmission over long fiber distances (inline amplifier)
- YEDFA: Boosting optical signal level for the final distribution to a large number of end users.
- Up to 16 output ports and power level up to 20 dBm possible

Optical Receiver
- Low noise optical receivers for forward path signals as well as quad port optical receiver modules for the return path with 1218 MHz / 204 MHz bandwidth
- Ultra-low noise receivers for RFoG applications

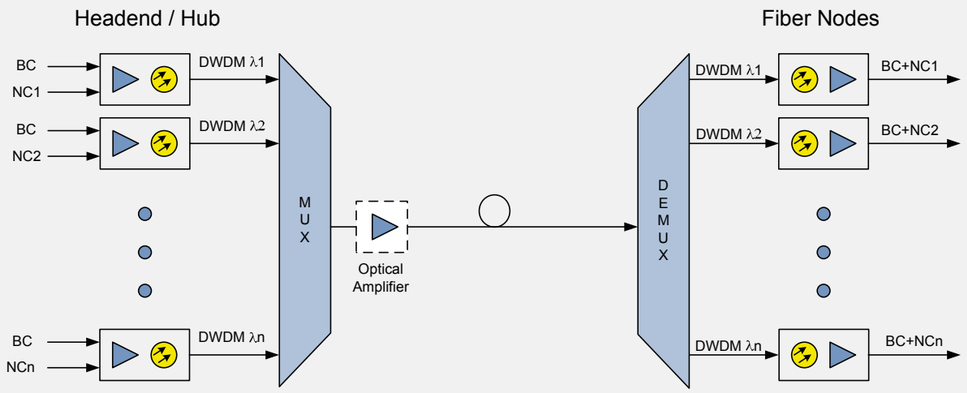
Optical Switch
- Redundancy switching between two optical inputs or outputs

Element Controller
- Ethernet interface, SNMP and Web, HMS compatible
- A single controller manages up to 60 modules

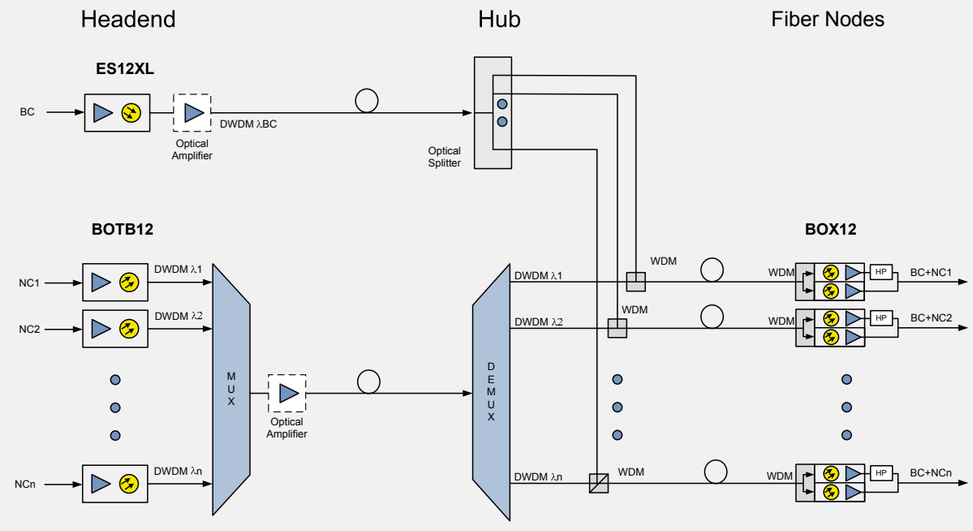
HFC transmission applications

Typical Applications

Full RF band Multiwave Transmission in fiber node segmentation

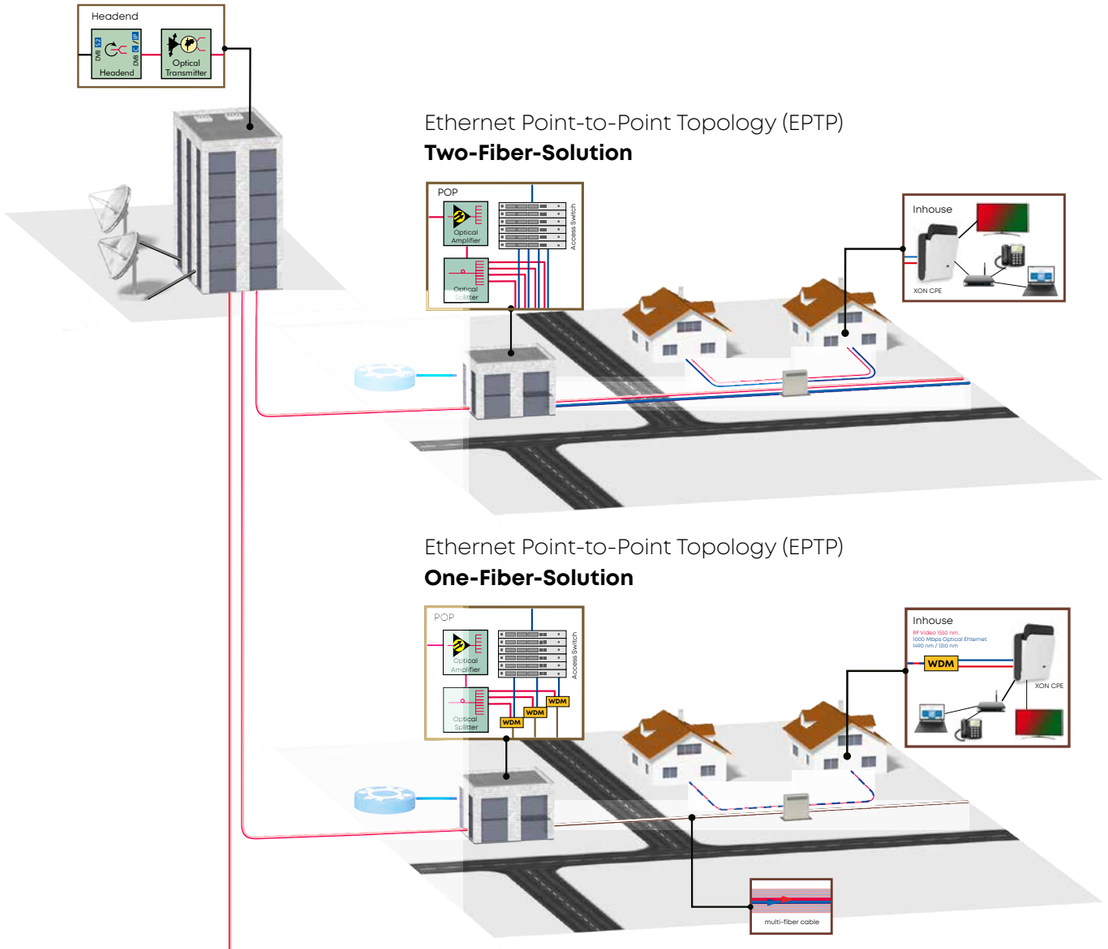


Broadcast/Narrowcast RF Split Band in high performance HFC trunking networks



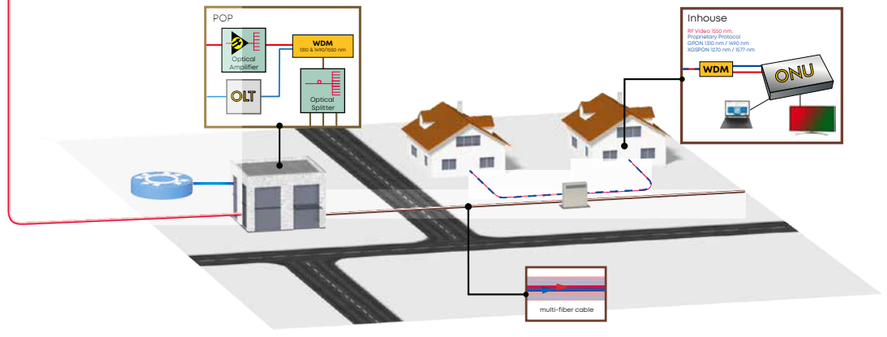
FTTH network applications

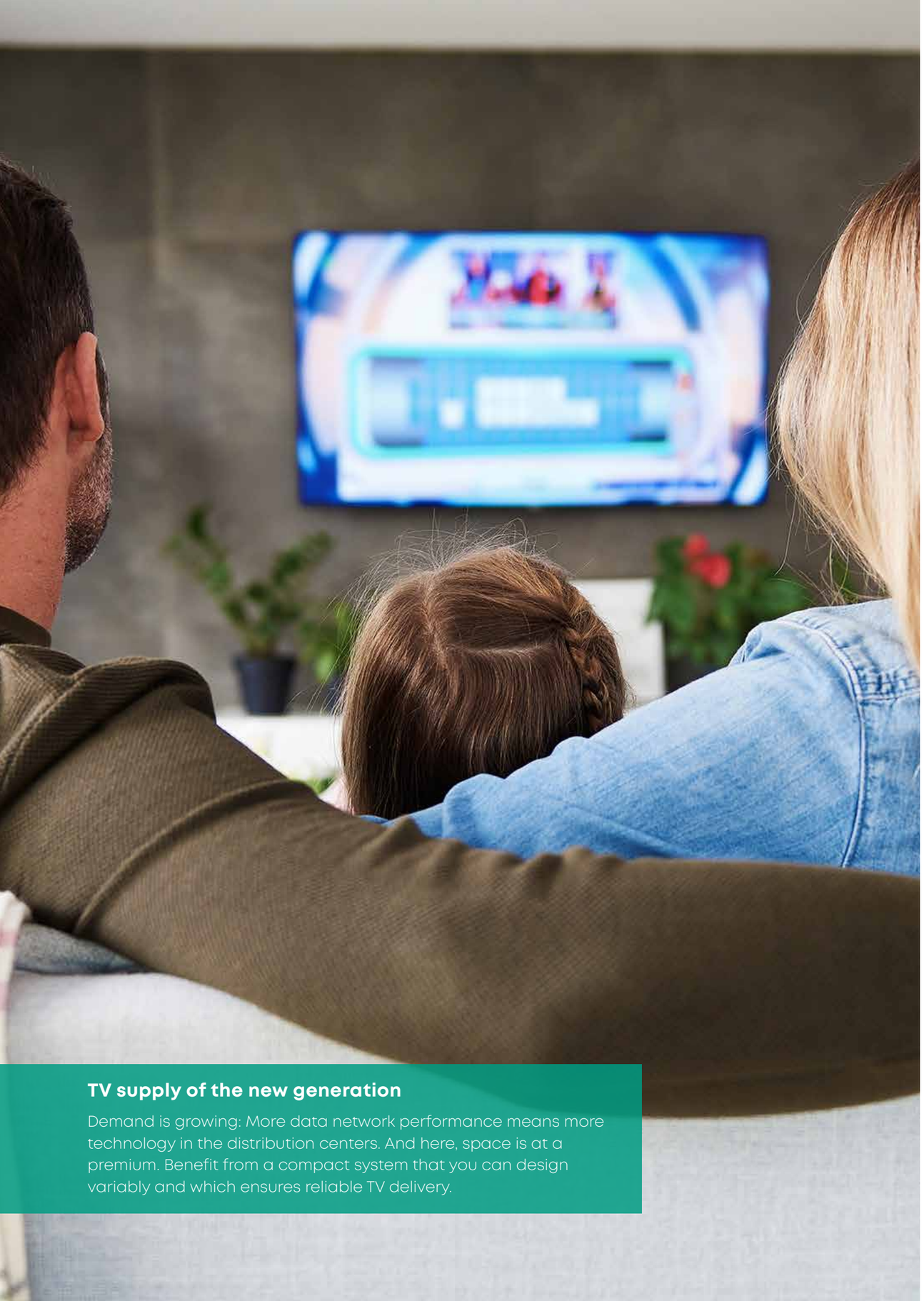
RF Video Overlay: CATV & SAT TV distribution over Fiber To The Home



PON and RF Video Overlay

Also point-to-multipoint FTTH networks such as GPON and XGSPON can integrate RF Video Overlay.





TV supply of the new generation

Demand is growing: More data network performance means more technology in the distribution centers. And here, space is at a premium. Benefit from a compact system that you can design variably and which ensures reliable TV delivery.

2G6-FA modules
Broadcast Transmitters

External Modulated 1550 nm Optical CATV Transmitter – ET12XL-FA

Electrical to optical conversion of multichannel CATV signals e.g. AM-VSB, FM and QAM signals in large scale HFC and FTTH networks

Features

- High performance Broadcast CATV transmitter
- Low phase noise, narrow linewidth cw-DFB laser
- $LiNb0_3$ modulator incorporating intensity and phase modulator
- C-Band DWDM wavelength according to ITU grid
- Wavelength adjustable +/- 100 GHz
- Bandwidth 47 ... 1218 MHz
- Two optical outputs with 8.5 or 10.0 dBm output power each
- Adjustable SBS threshold up to 19 dBm
- Enables usage of optical amplifiers (EDFAs, YEDFAs) as boosters or repeaters
- Excellent performance in optical point-to multipoint links exceeding 100 km

External Modulated 1550 nm Optical CATV and SAT-IF Transmitter – ET28XL-FA

Electrical to optical conversion of multichannel CATV signals e.g. AM-VSB, FM and QAM signals & additional SAT-IF signals for RF Video Overlay in large scale FTTH networks

Features

- High performance Broadcast CATV&SAT TV transmitter
- Low phase noise, narrow linewidth cw-DFB laser
- $LiNb0_3$ modulator incorporating intensity and phase modulator
- C-Band DWDM wavelength according to ITU grid
- Wavelength adjustable +/- 100 GHz
- Bandwidth 47 ... 870 MHz (CATV) & 950... 2800 MHz (SAT-IF)
- Two optical outputs with 8.5 or 10.0 dBm output power each
- Adjustable SBS threshold up to 19 dBm
- Enables usage of optical amplifiers (EDFAs, YEDFAs) as boosters or repeaters
- Excellent performance in optical point-to multipoint links exceeding 40 km

2G6-FA modules
Full Band DWDM Transmitters

Direct Modulated Transmitter – OTC12x-FA
Electrical to optical conversion of multichannel CATV signals e.g. AM-VSB, FM and QAM signals in HFC networks

Features
- Full Band CATV transmitter
- Cost efficient low phase noise, narrow linewidth DFB laser
- Multiple wavelength options: 1310 nm, O-band DWDM, C-band DWDM according to ITU grid
- Optical output power: +8.0 … +13.0 dBm
- Predistortion technology
- Pre-chirping technology for chromatic dispersion compensation
- Bandwidth 80 … 1218 MHz
- High quality transmission in point-to-point links up to 25 km
- Dual RF inputs: low and high level input, optionally narrowcast input with high isolation

Dual Direct Modulated Transmitter – OTC212Nx-FA
Electrical to optical conversion of multichannel CATV signals e.g. AM-VSB, FM and QAM signals in HFC networks

Features
- Dual Full Band CATV transmitter
- Cost efficient low phase noise, narrow linewidth DFB laser
- Multiple wavelength options: 1310 nm, O-band DWDM, C-band DWDM according to ITU grid
- Optical output power: +8.0 … +13.0 dBm
- Predistortion technology
- Pre-chirping technology for chromatic dispersion compensation
- Bandwidth 5 … 1218 MHz
- High quality transmission in point-to-point links up to 25 km
- Two individual Narrowcast inputs, one common Broadcast input and one testpoint

Direct Modulated Transmitter – OTB-FA
Electrical to optical conversion of multichannel Narrowcast CATV signals e.g. QAM signals in HFC networks

Features
- Narrowcast CATV transmitter with clipping mitigation
- Cost efficient low phase noise, narrow linewidth DFB laser
- C-Band DWDM wavelength according to ITU grid
- Optical output power: +10.0 dBm
- Bandwidth 470 … 1218 MHz (optional 250 … 1218 MHz)
- Very high optical modulation index due to clipping mitigation
- Predistortion technology
- Pre-chirping technology for chromatic dispersion compensation
- High quality transmission in point-to-point links up to 100 km

2G6-FA modules
Optical Amplifiers

Standard Optical Amplifier – OAnxxx-FA
Amplification of 1550 nm optical signals on single mode fibers as well as in-line or distribution boosting in HFC networks

Features
- Erbium doped fiber amplifier (EDFA)
- +13... +25 dBm optical output power per port
- Up to 8 optical output ports (internal optical splitter)
- Input signal wavelength 1540 ... 1560 nm
- Constant output power control or constant gain control
- Optional measurement unit for SBS threshold of succeeding fiberoptic links (SBS detection)

Gain-Flattened Optical Amplifier – OAnxxx-GFF-FA
Amplification of optical DWDM signals on single mode fibers (1530 ... 1561 nm) or In-line boosting in HFC networks

Features
- Erbium doped fiber amplifier (EDFA)
- Fixed gain and variable gain versions
- +13...+20 dBm optical output power per port
- Up to 2 optical output ports (internal optical splitter)
- Input signal wavelength 1530 ... 1561 nm
- Constant output power control or constant gain control
- Optional measurement unit for SBS threshold of succeeding fiberoptic links (SBS detection)
- Fixed gain version: Nominal gain optimization for 10 dB (GFF10), 15 dB (GFF15), 20 dB (GFF20) and 25 dB (GFF25)
- Variable gain version: Adjustable gain 5...20 dB (GFF)
- Gain flatness @ nominal gain ± 1dB

High Power Optical Amplifier – OAnnxxx-FA
Amplification of 1550 nm optical signals on single mode fibers as well as in-line or distribution amplifier in HFC and FTTH networks

Features
- Cladding pumped Ytterbium / Erbium doped fiber amplifier (YEDFA)
- +16.5... +21 dBm optical output power per port
- Up to 16 optical output ports (internal optical splitter)
- Input signal wavelength 1545 ... 1565 nm
- Optical preamplifier (EDFA) included
- Broad optical input power range: 5 dBm ... +10 dBm
- Constant output power control

2G6-FA modules
Optical Receivers

Optical broadcast receiver – OR12-FA
Optical to electrical conversion of Broadcast signals in HFC networks

Features
- Broadcast Receiver with two RF output ports
- Design for extremely low noise and low intermodulations
- Optical input power ranges from -8 dBm up to +4 dBm
- Bandwidth 85 ... 1218 MHz
- Automatic RF output level control using optical input level

In order to realize highest port density HUBER+SUHNER BKtel offers quadruple optical return path receivers with front side access for optical ports and rear side access for RF Ports.

Quad Optical Return Channel Receiver – OR43-300-FA
Optical to electrical conversion of Return Channel signals in HFC networks

Features
- Quad Return Channel Receiver: Four independent optical receivers
- Wide optical input power range: -16... +2 dBm
- Bandwidth 5 ... 204 MHz
- Each of the 4 receivers can be switched to the -20dB test port on front
- Optical input power controlled AGC mode to keep the RF level independent of the optical input power

Quad Optical RFoG Return Channel Receiver – OR43-204-FA
Optical to electrical conversion of Return Channel signals in RFoG and HFC networks

Features
- Quad Return Channel Receiver: Four independent optical receivers
- Wide optical input power range: -25 ... -10 dBm
- Bandwidth 5 ... 204 MHz
- 28 dB optical budget in systems with BKtel RFoG nodes due to ultra low noise optical receiver technology
- RF combination output 4:1
- Optical power level detection with LED indication for all inputs suitable for pulsed optical RFoG (TDMA) signals or continuous wave detection (HFC mode)

2G6-FA modules
Accessory modules

Forward and Return Channel RF Amplifier – CA12-FA
Amplification of forward/return RF signals

Features
- Flexible forward/return RF amplifier with high linearity for headend and hub locations
- Wide frequency range (5 ... 1218 MHz)
- Broadcast and Narrowcast input port
- RF gain and slope and software configurable
- RF power detection

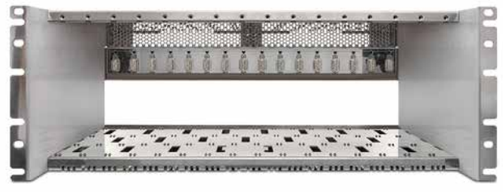
Optical Switch – OS212-FA
Redundancy switching between two optical input signals in case of missing or insufficient optical power

Features
- 1:2 Optical Switch
- Nominal input power: -25 ... +23 dBm
- Wavelength range: 1280 ... 1340; 1520 ...1625nm
- Independent optical power control of both inputs
- Sensor and LED signalling for the switch position
- Automatic, remote and manual operation

Element Controller (Ethernet) – ECE-FA
2G6 device remote supervision and controlling

Features
- Automatically detecting and polling of all active 2G6 series modules connected to the serial RS485 bus for remote supervision and control
- Webserver/Ethernet management for easy local and remote management
- SNMP/Ethernet management to connect to Network Management Systems
- Easy software updates via Ethernet interface

2G6-FA platform
Housing and cooling

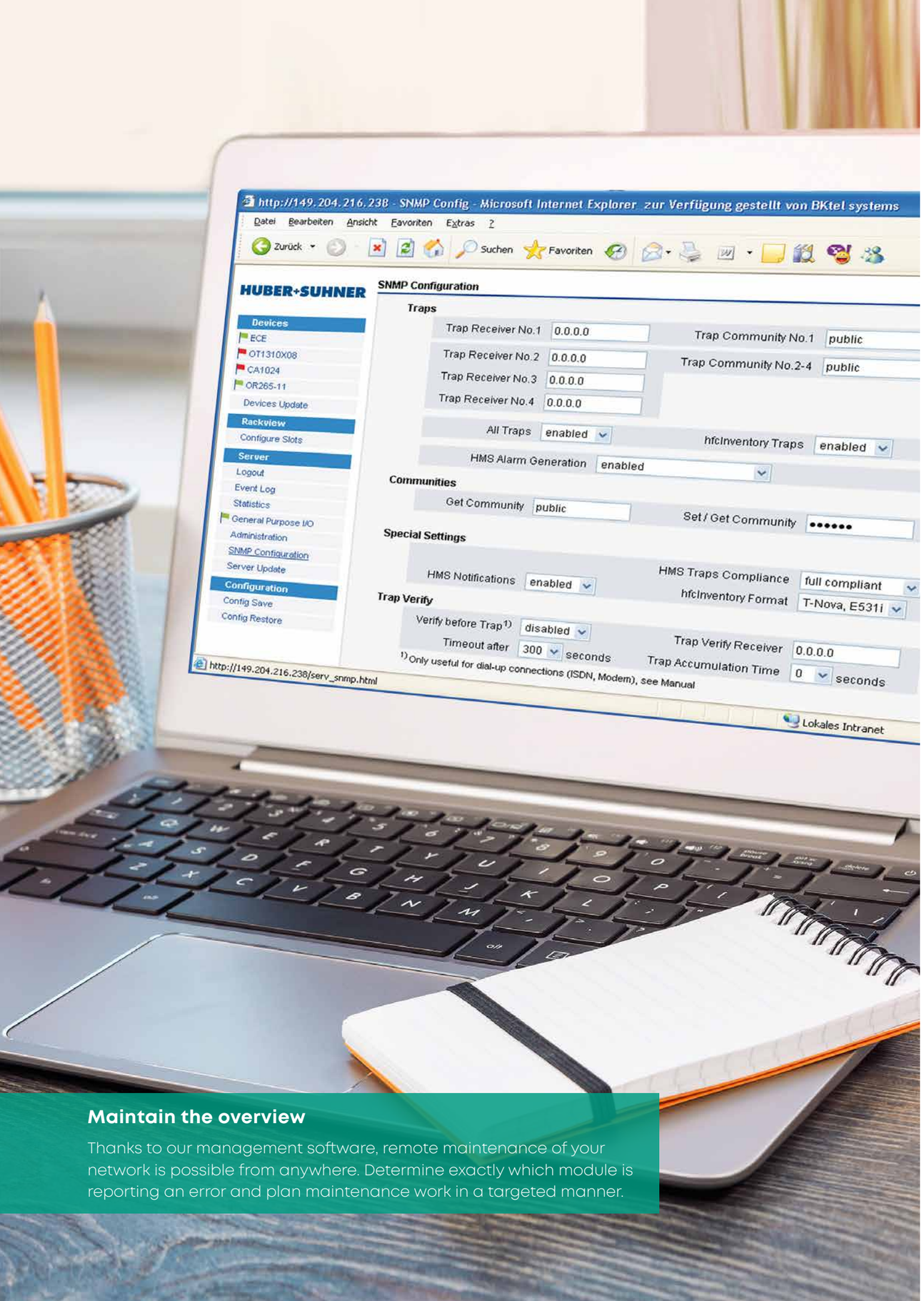


2G6 Module Chassis - SRx
Chassis for installation, powering and cooling of 2G6-modules

Features
- 19 inch / 4 RU chassis, adaptable to metric (ETSI) racks
- Extended brackets for 5 cm reverse offset mounting
- Up to 16 modules pluggable on front, together with up to two power supply and fan units mounted on the rear
- Dust safe cooling (no dust blows through the electronics of the modules)
- Redundancy option for power supply and fan unit (2 units hot pluggable),
- Automatic slot and chassis address detection of plugged modules
- Several chassis can be controlled by one ECE element controller unit
- Real time hot standby for module slots next to each other (slot 1-2, 3-4 ... 15-16)
- Maximum capacity:
  - 32 Optical transmitters (Dual transmitter in 1 slot)
  - 16 Optical amplifiers (1 slot)
  - 64 Return Channel receivers (Quad Receiver in 1 slot)

Chassis Power Modules - PMx
Power Supply for 2G6 chassis

Features
- 90 ... 264 VAC or 36 ... 60 VDC powering
- Redundancy option (2 units hot pluggable)

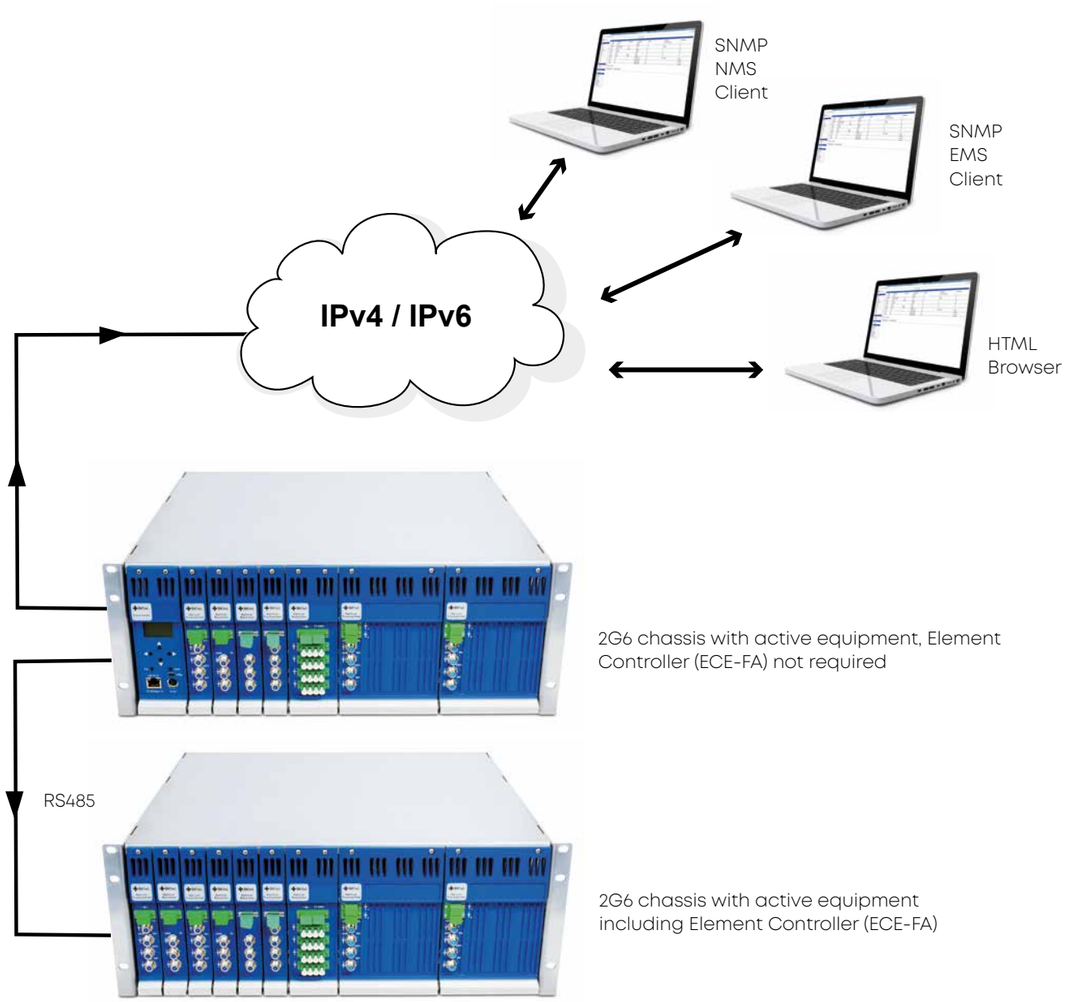


Maintain the overview

Thanks to our management software, remote maintenance of your network is possible from anywhere. Determine exactly which module is reporting an error and plan maintenance work in a targeted manner.

Network Management
Controlling via Web-Server

For monitoring, control and configuration of the active equipment, the ECE-FA controller is available. The ECE-FA is equipped with an embedded Web-Server, accessible by standardized security procedures via an Ethernet interface from any Web-Browser. The remote SNMP interface allows controlling and monitoring of all active components and provides the interface to a higher level Umbrella Management System, such as the CABLEwatch EMS. One ECE-FA can manage modules in multiple chassis.



2G6 chassis with active equipment, Element Controller (ECE-FA) not required

2G6 chassis with active equipment including Element Controller (ECE-FA)

A team of specialists

Our service offering supports you in the planning, installation and maintenance of your networks. Together with you, we plan the operations to make the work on the network as effective as possible.

Our services
From planning to training

In addition to technical advice we offer support for planning and commissioning of your network. Our comprehensive service package includes accompanying consulting as well as training in transmission technology, its handling, introduction to monitoring software, acceptance and commissioning.

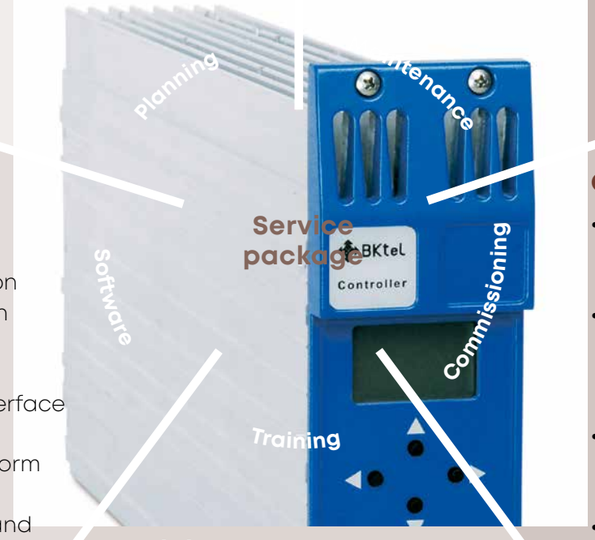
We remain available for you for optimisation or retrofitting consultation after installation or during operation.

Planning

- Determination of project objective for extension/new construction of networks
- Analysis of existing (or new) infrastructure
- Site inspection & concept planning
- Detailed network planning (headend, amplifier points, distribution points, connections)

Maintenance

- Management for remote diagnosis
- Hardware replacement service
- Coordinated maintenance windows (also during the night hours)
- Competence through our special team of engineers



Software

- Management-software **BENOS** for administration and optimization from XON CPEs with integrated Northbound-interface
- Management & monitoring platform **CABLEwatch** to administration and monitoring of active Network elements

Commissioning

- Equipment list and layout planning
- Equipment of amplifiers / distribution points
- Scheduling, Installation, Commissioning
- Certification & Approval

Training

- Basic training for FTTH and HFC network technology
- Planning of FTTH and HFC networks, interactive services in network, management
- Measurement technology and troubleshooting
- Training courses for preparation with basic knowledge of satellite, terrestrial, IPTV and CATV technology and transmission

You have questions?

Visit our website. You will find a lot of information about FTTH, Video Overlay and other network solutions as well as an overview of our product range:

Network solutions:

https://www.bktel.com/systems-solutions.htm

Our product range:

https://www.bktel.com/products.htm

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