Passive optical network (PON)
point-to-multipoint, fiber to the premises

OPTOKON FTTH-PON SOLUTION
High quality equipment for installation of xPON passive optical networks

CZECH MADE products, produced under ELTEX license in the Czech Republic
OPTOKON FTTH NETWORK SYSTEM

CONTENT

PON – GPON:
OLT:
MA-4000-PX 9U chassis, 16x OLT cards (each with 8x OLT ports) – 8192 subscribers
LTP-8X 8x OLT ports, 1U, 1:64 splitting ratio, 512 subscribers
ONU:
NTP-2 2x 10/100/1000Base-T ports
NTP-RG-1402G-W, rev.C 4x 10/100/1000Base-T ports, 2x FXS, Wi-Fi 802.11n
NTP-2C 2x 10/100/1000Base-T ports, CATV
NTP-RG-1402GWC, rev.B 4x 10/100/1000Base-T ports, 2x FXS, Wi-Fi 802.11n, CATV

PON – Turbo GEPON:
OLT:
LTE-2x 2x OLT ports, 1U, 1:64 splitting ratio, 128 subscribers
LTE-8x 8x OLT ports, 1U, 1:64 splitting ratio, 512 subscribers
ONU:
NTE-2 2x LAN: 1x 100Base-T, 1x 10/100/1000Base-T
NTE-2C 2x LAN: 1x 100Base-T, 1x 10/100/1000Base-T, CATV
NTE-RG-1402G-W, rev.B 4x 10/100/1000Base-T, 2x FXS, Wi-Fi 802.11n
NTE-RG-1402GC-W, rev.B 4x 10/100/1000Base-T ports, 2x FXS, Wi-Fi 802.11n, CATV

PON – ONU NTU series:
NTU-2V 1x GPON/GEPON, 1x 1G, 1x 100M, 1x FXS
NTU-RG-1402-W 1x GPON/GEPON, 4x 1G, 2x FXS, Wi-Fi 802.11b/g/n, 2x USB2.0
NTU-RG-1402-Wac 1x GPON/GEPON, 4x 1G, 2x FXS, Wi-Fi 802.11ac, 2x USB2.0

HAG – Home Access Gateway:
RG-1404G 1000Base-T, 1x WAN, 4x LAN, 4x FXS
RG-1404GF 1000Base-T, 1x WAN (SFP slot), 4x LAN, 4x FXS
RG-1404G-w 1000Base-X, 1x 10G, 4x LAN, 4x FXS, Wi-Fi
RG-1404GF-W 1000Base-X, 1x 10G (SFP slot), 4x LAN, 4x FXS, Wi-Fi
RG-2404G 1000Base-T, 1x WAN, 4x LAN, 4x FXS
RG-2404G-W 1000Base-T, 1x WAN, 4x LAN, 4x FXS, Wi-Fi
RG-4404G-W 1000Base-X, 1x 10G, 4x LAN, 4x FXS, Wi-Fi
RG-4404GF-W 1000Base-X, 1x 10G (SFP slot), 4x LAN, 4x FXS, Wi-Fi

IPTV (Set Top Box):
NV-100, NV-102 Wi-Fi
NV-310-Wac Android, Wi-Fi

Switch:
Access
MES1024 24x 10/100Base-T, 2x 10/100/1000Base-T/1000Base-X (SFP), 8.8 Gbps
MES1124 24x 10/100Base-T, 4x 10/100/1000Base-T/1000Base-X (SFP), 12.4 Gbps
MES2124 24x 10/100/1000Base-T, 4x 10/100/1000Base-T/1000Base-X (SFP), 56 Gbps

Aggregation
MES3108F 4x 10/100/1000Base-X (SFP), 4x 10/100/1000Base-T/1000Base-X (SFP), 128 Gbps
MES3116F 12x 10/100/1000Base-X (SFP), 4x 10/100/1000Base-T/1000Base-X (SFP), 128 Gbps
MES3124F 24x 10/100/1000Base-X (SFP), 4x 10/100/1000Base-T/1000Base-X (SFP), 128 Gbps

Data Center
MES5248 48x 10G Base-R/1000 Base-X (SFP+), 960 Gbps, L2+ switch, rear-front ventilation

Thin Client:
TC-20: CPU 1000 MHz, DSP 750 MHz, RAM 1 GB, flash 2 GB, multimedia, videoconference
TC-50: CPU 1000 MHz, RAM 1 GB, flash 16 GB, multimedia, videoconference, web client, local applications

EMS Centralized Managing Network System
SFP Transceivers
EDFA - Erbium Doped Fiber Amplifier
PON technology is the most popular technology used for building future networks

A passive optical network (PON) is a telecommunications network that uses point-to-multipoint fiber to the premises in which unpowered optical splitters are used to enable a single optical fiber to serve multiple premises. A PON consists of an optical line terminal (OLT) at the service provider’s central office and a number of optical network units (ONUs) near the end users. A PON reduces the amount of fiber and central office equipment required compared with point-to-point architectures. A passive optical network is a type of fiber-optic access network.

- Universal transport structure to range a number of services and service
- Completely passive elements between the station and the user equipment
- High reliability (connection, disconnection or failure of the subscriber nodes does not affect the others)
- Great network scalability, cascading of splitters
- There is no limit of 100 meters from the switch to users with a copper cable
- Broad range of network units
- Convenient management provider network. One monitoring and management, and automatic configuration (ACS) for user devices

OPTOKON, a.s. offers separate devices and integrated solutions for building networks. Our solution is built on the basis of our development and ensures compatibility of components

- GPON/Turbo GEAPON
- Ethernet switches (access, aggregation, data center)
- Digital VoIP gateway
- IPTV set-top box (STB)
- Thin client
- Network Management System

Access network PON is a universal transport architecture for any kind of services

APPLICATION RANGE

INTERNET  IP Phone  FullHD IPTV, VoD, OTT

Access network in apartment buildings and residential houses

CCTV - monitoring and security networks, perimeter protection

Company access networks, government agencies
OPTOKON FFTH-PON SOLUTION

OPTOKON PON SOLUTION

OPTOKON GPON SAMPLE SOLUTION 8192 SUBSCRIBERS

16 x 512 = 8192 Subscribers

OPTOKON GEpon SAMPLE SOLUTION 512 SUBSCRIBERS
GPON MULTISERVICE ACCESS/AGGREGATION NODE

OLT MA4000-PX

The MA4000-PX is a multiservice access and aggregation node designed for building a access networks based on GPON technology. The system enables to build a scalable, fault-resistant "last mile" network to ensure the highest safety standards, both in rural and in urban areas. The access point manages subscriber units, switching traffic and connections to the transport network.

The central element of the MA4000-PX is the scalable Ethernet switch level L2+ PP4X, which works in cooperation with various types of interface modules. The peripheral units include PLC8 modules for subscriber connection via optical access devices, GPON technology.

Design features

The MA-4000PX access platform has a modular architecture; the modules are installed in standard 19" form-factor 9U. The 9U chassis has two slots for PP4X switch control modules and 16 slots for PLC8, GPON optical line terminal modules. The system can be equipped with one or two PP4X central switch modules. Installation of two modules enables to build highly reliable systems through redundancy switches and increase system capacity by distributing the data flow between modules by stacking. The interaction between the modules runs through the 10 Gbps interface.

Uplink connections:
- up to 8 ports 10G SFP+
- up to 4 ports 10/100/1000 Base-T/Base-X

Up to 16 PLC8 modules
Up to 128 GPON ports
Up to 8192 ONT on one node.
Performance of bus access node: 440 Gbps
Connection of ONTs via GPON technology

PP4X Module

Central switch module - the main element of the platform, which generally manages and diagnoses peripheral modules, switching, aggregation and communication interface modules with higher level network equipment. The modules operate in the load sharing and redundancy mode via two internal 10 Gbps interfaces.

PLC8 Module

The PLC8 module is designed to organize broadband access to the data network via GPON technology at speeds of up to 2.5 Gbps in the direction to the user. This module is designed for use on the site of the "last mile" and enables to connect up to 64 terminals ONT and supports RSSI to determine the value of the power of the optical signals received from each ONT and to measure the optical parameters of the state line.
The LTP-8X central office node terminal is designed to provide broadband access over a Passive Optical Network (PON). Access to the transport network of the provider is realized through 10 Gigabit and combo Gigabit uplink interfaces. GPON interfaces are used to connect to the Passive Optical distribution Network (PON). Up to 64 subscriber optical terminals can be connected to each interface with one fiber. The Dynamic Bandwidth Allocation (DBA) can provide a downstream rate of up to 2.5 Gbps. The LTP-8X application enables the operator to build scalable fail-safe “last mile” networks, providing a high level of safety in urban as well as rural areas. The OLT LTP-8X provides subscriber devices control, packet traffic switching and connection to transport networks.

The device has a 1U metal case available for 19” form-factor rack-mount shelf installation.

8x GPON ports (2.5 Gbps)
Uplink connection:
- 2x 10G SFP+ ports
- 4x 10/100/1000Base-T/ 1000Base-X SFP combo ports
- 4x 10/100/1000Base-T ports
Up to 512 ONT to one node
RSSI support

Main features
Support for standard device management interface through EMS, CLI, web, SNMP interfaces, RS232 console
Aggregate switch functions with the support of the following features:
- MAC address learning /aging
- MAC address quantity restriction
- Unknown MAC address processing
- Broadcasting traffic restriction
- Multiaddress traffic restriction
- Quantity of multicast groups up to 2000
- Q-in-Q support in accordance with IEEE802.1ad
- STP, RSTP, MSTP
- IGMP-proxy
- IGMP-snooping
- IGMP fast leave
- Static routing
- Port insulation, port insulation within one VLAN
- Received Signal Strength Indication (RSSI)
Interaction with internal monitoring and control devices with Telnet, SSH, SNMP protocols.
Error data gathering of device and interface modules, alarm and information messages forming for monitoring systems.
Temperature conditions and ventilation system control.
Software updating control.
Power consumption 20 W
GPON SUBSCRIBER TERMINALS

NTP-2, NTP-2C

NTP-2 and NTP-2C are high-performance subscriber terminals designed for accessing up-to-date services at high transmission speeds via GPON technology.

Available services
- High-speed access to Internet
- Video streaming / High Definition TV
- IP TV
- Video on demand (VoD)
- Video conference
- Online entertainment and educational programs

Typical application
- Connection of tenement houses and cottage settlements subscribers to broadband access services
- Corporate networking in large-scale enterprises and business centers

Main features
- 1x GPON port
- 2x 10/100/1000Base-T ports
- Max. distance to OLT:
  - NTP-2 10 km
  - NTP-2C 20 km
- Embedded Triplexer for providing CATV service (NTP-2C)
GPON SUBSCRIBER TERMINALS

NTP-RG-1402G-W

NTP-RG-1402G-W subscriber terminals are designed for connection to high speed Internet and telephony services. In addition, the RG user terminals series provide a wide range of opportunities to work in a local network.

Wireless Wi-Fi connection
Two modified subscriber terminals with 2.4 GHz transceivers enable to connect devices at rates of up to 300 Mbps.

Available services
- High-speed access to Internet
- Video streaming /High Definition TV
- IP TV
- IP telephony - VoIP
- Video on demand (VoD)
- Video conference
- Online entertainment and teaching programs

Typical application
- Connection of tenement houses and cottage settlements subscribers to broadband access services
- Corporate networking in large-scale enterprises and business centers
- Wireless Wi-Fi connection
- Built-in Wi-Fi IEEE 802.11b/g/n provides high-speed connectivity over a wireless network
- LAN network
- ONT provides a wired connection of up to 4 user devices (computers or set-top boxes). Gigabit Router 4-Port 10/100/1000 Base-T allows you to organize the high-speed connection of devices on the network.
- 2 FXS ports allow you to connect analog phones and use IP-telephony services.
- The USB port can be used to connect USB-devices (Flash-card, external HDD) or to connect a printer.

Main features
- 1x GPON port Gigabit router
- 4x 10/100/1000Base-T LAN ports
- 2x FXS ports
- Wi-Fi 802.11n, up to 300 Mbps, 2.4 GHz
- USB port
- Max. distance to OLT:
  - NTP-RG-1402G-W, rev. C 10 km
  - NTP-RG-1402GC-W, rev. B 20 km
- Embedded Triplexer for providing CATV service (for NTP-RG-1402GC-W, rev. B)
OLT LTE-2X

The OLT LTE-2X central office node terminal is designed to provide broadband access over a Passive Optical Network (PON). Access to the transport network of the provider is realized through combo Gigabit uplink interfaces. Turbo GEPON interfaces are used to connect to Passive Optical distribution Networks (PON). Up to 64 subscriber optical terminals can be connected to each interface with one fiber. The Dynamic Bandwidth Allocation (DBA) enables to provide a downstream rate up to 2.5 Gbps. The LTE-2X application enables the operator to build scalable fail-safe “last mile” networks, providing a high level of safety in urban as well as rural areas. The OLT LTE-2X provides subscriber devices with control, packet traffic switching and connection to transport networks.

The device has a 1U metal case available for 19” form-factor rack-mount shelf installation.

Uplink connection:
- 4x10/100/1000 Base-T / 1000 Base-X SFP combo ports
- 2x Turbo GEPON ports (2.5 Gbps)
- Up to 128 ONT to one node
- RSSI support
- Ideal solution for small residential areas, villages and apartment buildings

Main features

Support for standard device management interface through CLI, web, SNMP interfaces, console port RS232
Aggregate switch functions with the support of the following features:
- MAC address learning /aging
- MAC address quantity restriction
- Unknown MAC address processing
- Broadcasting traffic restriction
- Multiaddress traffic restriction
- Quantity of multicast groups up to 2000
- Q-in-Q support in accordance with IEEE802.1ad
- STP, RSTP, MSTP
- IGMP-proxy
- IGMP-snooping
- IGMP fast leave
- Static routing
- Port insulation, port insulation within one VLAN
- Received Signal Strength Indication (RSSI)

Interworking with internal monitoring and control devices by Telnet, SSH, SNMP protocols
OLT LTE-8X

The OLT LTE-8X central office node terminal is designed to provide broadband access over Passive Optical Networks (PON). Access to the transport network of the provider is realized through 10 Gigabit and combo Gigabit uplink interfaces. Turbo GEPON interfaces are used to connect to Passive Optical distribution Networks (PON). Up to 64 subscriber optical terminals can be connected to each interface by one fiber. The Dynamic Bandwidth Allocation (DBA) enables to provide a downstream rate up to 2.5 Gbps.

The LTE-8X application enables the operator to build scalable fail-safe “last mile” networks, providing a high level of safety in urban as well as rural areas. The OLT LTE-8X provides subscriber devices with control, packet traffic switching and connection to transport networks.

The device has a 1U metal case available for 19” form-factor rack-mount shelf installation.

Uplink connection:
- 2x 10G SFP+ ports
- 4x 10/100/1000Base-T/1000 Base-X SFP combo ports
- 4x 10/100/1000Base-T ports
8x Turbo GEPON ports (2.5 Gbps)
Up to 512 ONT to one node

RSSI support

Main features

Support for standard device management interface through CLI, web, SNMP interfaces, console port RS232
Aggregate switch functions with the support of the following features:
- MAC address learning /aging
- MAC address quantity restriction
- Unknown MAC address processing
- Broadcasting traffic restriction
- Multiaddress traffic restriction
- Quantity of multicast groups up to 2000
- Q-in-Q support in accordance with IEEE802.1ad
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- IGMP-snooping
- Static routing
- Port insulation, port insulation within one VLAN
- Received Signal Strength Indication (RSSI)

Interaction with internal monitoring and control devices with Telnet, SSH, SNMP protocols.

Power consumption 77 W
**TURBO GEPON SUBSCRIBER TERMINALS**

**NTE-2, NTE-2C**

NTE-2 and NTE-2C are high-performance subscriber terminals designed for accessing of up-to-date services at high transmission speeds via Turbo GEPON technology.

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**Available services**

- High-speed access to Internet
- Streaming video/High Definition TV
- IP TV
- Video on demand (VoD)
- Video conference
- Online entertainment and educational programs

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**Typical application**

- Connection of tenement houses and cottage settlement subscribers to broadband access services
- Corporate networking in large-scale enterprises and business centers.

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**Main features**

- 1x Turbo GEPON port
- 1x 100Base-T port
- 1x 10/100/1000 Base-T port
- Maximum distance to OLT:
  - NTE-2 10 km
  - NTE-2C 20 km
- Embedded Trilexer for CATV service (for NTE-2C)
NTE-RG-1402G-W/GC-W are high-performance multifunctional subscriber terminals designed for up-to-date telephone services and high-speed Internet access. The RG series subscriber terminals provide a variety of opportunities for local network operation.

**Available services**
- High-speed access to Internet
- Streaming video/High Definition TV
- IP TV
- IP telephony
- Video on demand (VoD)
- Video conference
- Online entertainment and teaching programs

**Typical application**
- Connection of tenement houses and cottage settlement subscribers to broadband access services
- Corporate networking in large-scale enterprises and business centers

**Main features**
- 1x Turbo GEPON port Gigabit router
- 4x 10/100/1000 Base-T ports
- 2x FXS ports (for NTE-RG-1402G(C)-W, NTE-RG-1402GC-W)
- Wi-Fi 802.11n, up to 300 Mbps
- USB port
- Max. distance to OLT:
  - NTE-RG-1402G-W 10 km
  - NTE-RG-1402GC-W 20 km
- Embedded Triplexer for providing CATV service (for NTE-RG-1402GC-W)
GPON/GEAPON SUBSCRIBER TERMINALS

NTU-RG-1402G-W

High-performance multi user terminals designed for access to modern telephony, IPTV, OTT and high-speed Internet. In addition, a series of NTU-RG user terminals enable operators to offer users a wide range of services and opportunities to work in a local network. NTU is a universal device that combines GPON and GEAPON technology.

- Support technologies GPON, GEAPON - one device!
- The range includes both simple devices working in "bridge" or "router" mode, including virtual and functional, combining Gigabit Router, IP-telephony, wireless connectivity via Wi-Fi and USB ports
- Option to connect to Wi-Fi 802.11ac, up to 1 Gbps

Wireless Wi-Fi connection

Subscriber ONT router NTU-RG-1402G-W allows customers to connect WiFi standard IEEE 802.11b/g/n. Subscriber ONT router NTU-RG-1402G-Wac supports 802.11ac, which provides a top speed of data transfer to 1Gbit/s and can deliver modern high-speed equipment services client wireless networks.

Available services

- High-speed access to Internet
- Video streaming/High Definition TV
- IP TV
- IP telephony - VoIP
- Video on Demand (VoD)
- Video conference
- Online entertainment and teaching programs

Typical application

- Connection of tenement houses and cottage settlement subscribers to broadband access services
- Corporate networking in large-scale enterprises and business centers
- Wireless Wi-Fi connection
  - Built-in Wi-Fi IEEE 802.11b/g/n provides high-speed connectivity over a wireless network
- LAN network
  - ONT provides a wired connection of up to 4 user devices (computers or set-top boxes). Gigabit Router 4-Port 10/100/1000 Base-T allows you to organize a high-speed connection of devices on the network.
  - 2 FXS ports allow you to connect analog phones and use IP-telephony services.
- The USB port can be used to connect USB-devices (Flash-card, external HDD) or to connect a printer.

<table>
<thead>
<tr>
<th>Name ONT</th>
<th>WAN</th>
<th>LAN</th>
<th>FXS</th>
<th>Wi-Fi</th>
<th>USB</th>
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<tbody>
<tr>
<td>NTU-2V</td>
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<td>1x1G, 1x100M</td>
<td>1xFXS</td>
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<td>NTU-RG-1402W</td>
<td>1xGPON/GEAPON</td>
<td>4x1G</td>
<td>2xFXS</td>
<td>IEEE 802.11b/g/n</td>
<td>2xUSB2.0</td>
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<td>NTU-RG-1402-Wac</td>
<td>1xGPON/GEAPON</td>
<td>4x1G</td>
<td>2xFXS</td>
<td>IEEE 802.11ac</td>
<td>2xUSB2.0</td>
</tr>
</tbody>
</table>
HOME ACCESS GATEWAY

RG-1404G-W, RG-2404G-W, RG-4402G-W

RG-series provides one location of access to Triple Play services: fast internet, high-quality telephone communications, high-definition television - all these services are available to the subscriber at the same time. RG-series is a gigabit router with support for Wi-Fi in the 5 GHz frequency band reception, two phone ports and a USB connector.

Transfer of IPTV over Wi-Fi 2.4 and 5 GHz
The device has advanced features for stable delivery of IP-TV over a wireless network, the smoothness and continuity of the video is ensured by special software functionality.

Ease of administration
The device has introduced the automation concept to the process of configuring and operating in mass subscribers units. Eltex ACS management system allows you to remove the need to set device, and provides a means to resolve issues with remote customer support. The system performed auto-configuration gateway updates the software and collects statistics.

Main features
- 4x ports FXS
- 1x port WAN 10/100/1000Base-T (cooper or SFP slot)
- 4x ports LAN 10/100/1000Base-T
- Wi-Fi 802.11n, up to 300Mbit/s
  - RG-1404-G-W (2.4 GHz)
  - RG-2404-G-W and RG-4404-G-W (2.4, 5 GHz)
- 1x port USB

HAG – Home Access Gateway:

<table>
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<th>Model</th>
<th>Interfaces</th>
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<tr>
<td>RG-1404G</td>
<td>1000Base-T, 1x WAN, 4x LAN, 4x FXS</td>
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<tr>
<td>RG-1404GF</td>
<td>1000Base-T, 1x WAN(SFP slot), 4x LAN, 4x FXS</td>
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<td>RG-1404G-W</td>
<td>1000Base-X, 1x WAN, 4x LAN, 4x FXS, Wi-Fi</td>
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<td>RG-1404GF-W</td>
<td>1000Base-X, 1x WAN(SFP slot), 4x LAN, 4x FXS, Wi-Fi</td>
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<td>RG-2404G</td>
<td>1000Base-T, 1x WAN, 4x LAN, 4x FXS</td>
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<td>RG-2404G-W</td>
<td>1000Base-T, 1x WAN, 4x LAN, 4x FXS, Wi-Fi</td>
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<td>RG-4404G-W</td>
<td>1000Base-X, 1x WAN, 4x LAN, 4x FXS, Wi-Fi</td>
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<tr>
<td>RG-4404GF-W</td>
<td>1000Base-X, 1x WAN(SFP slot), 4x LAN, 4x FXS, Wi-Fi</td>
</tr>
</tbody>
</table>
SET-TOP BOX NV-100
NV-100 - all that is needed to provide advanced interactive services:

- high image quality
- speed
- multi functionality
- accommodation
- ease of management

Hardware advantages
Powerful Sigma Designs media processor and 512 MB of RAM allow the implementation of a wide range of interactive services.

Ready solution for the operator
Integrated graphical interface allows all necessary functions to quickly provide digital TV and interactive services. Media center can function in mode "Without Middleware".

Tool for realization of your project
We provide the software development kit (SDK, API) and software adaptation to your needs.

Main features

- Chipset Sigma Designs
- Peer-to-Peer TV
- App Store
- Support for popular Middleware
- Java Script and C++ (QT) SDK

Middleware and DRM
Middleware solution on the "board" provides the full functionality of the portal, including access rights management (DRM) and allows you to quickly deploy a fully controlled and standardized infrastructure. Media Center NV-100 is compatible with leading DRM solutions and Middleware: Netris, IPTV portal, Media Alliance, Verimatrix, ARES, Secure Media.

Peer-to-peer TV
Available to you is an additional way of delivering content: streaming media files on the device protocols DC++ and Torrent. Without the use of a personal computer, without downloading files on the local disk. Illustrated bills (catalog) of the content can be arranged.
IPTV SET-TOP BOX

SET-TOP BOX NV-310-Wac

IPTV Set-top box OPTOKON NV on Android platform - this is a new level of service. This is a great tool for promoting digital TV services and the means to attract new customers.

Platform Android

Android allow to create a single universal platform access to services with a known user-interface to each. Creating your own Open platform application store and software development kit (SDK, API), for quickly creating new operator services.

Hardware advantages

Broadcom dual-core media processor supports a wide range of audio and video formats. Built-in dual-band Wi-Fi 802.11n 2,4/5 GHz 2T2R provides high-speed connectivity over a wireless network.

Main features

• Chipset Broadcom BCM7241
• 3D accelerator, support for OpenGL
• OS Android 4.2
• Peer-to-Peer TV
• App Store
• Support for popular Middleware
• Java Script API SDK

Providing personalized services based on Smart Card

NV-310-Wac – is the potential to provide a payment terminal, access to personal account, the portals of public services and e-government, as well as the use of a universal electronic card (UEC).

Peer-to-peer TV

Available to you is additional way of delivering content: streaming media files on device protocols DC++ and Torrent. Without the use of a personal computer, without downloading files on the local disk.
ACCESS SWITCH SERIES

MES1024, MES1124, MES2124

The MES1024, MES1124, MES2124 series of switches are designed for use in service provider networks as L2 access layer switches. The MES1x24 switches are equipped with 24 ports 10/100Base-T, and 2 or 4 Combo ports 1000Base-T/Base-X. The MES2124 offers 24 ports 10/100/1000Base-T, and 4 Combo ports 1000Base-T/Base-X. The switches provide connection by end users to large enterprise networks, small and medium businesses and to operator networks — ISP, Internet Service Providers via 100M/1G interfaces. The functionality of the switch provides the option of physical stacking, support of VLANs, virtual local area networks, support of multicast distribution groups and advanced security features.

Main features

- L2 switch
- High performance
- Stackable
- Multicast support
- IGMP
- IGMP snooping
- MVR

Advanced security functions:
- L2-L4 ACL
- IP source guard
- Dynamic ARP Inspection, etc.

Specifications

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<th>MES1124</th>
<th>MES2124</th>
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<td>Console</td>
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<td>ACL table</td>
<td>1K</td>
<td>1K</td>
<td>1K</td>
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<tr>
<td>Jumbo frame</td>
<td>10K</td>
<td>10K</td>
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</table>

Physical and environmental parameters

<table>
<thead>
<tr>
<th></th>
<th>MES1024</th>
<th>MES1124</th>
<th>MES2124</th>
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<tr>
<td>Noise level</td>
<td>0 dB</td>
<td>0 dB</td>
<td>0 dB</td>
</tr>
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<td>220 V, 50 Hz</td>
<td>220 V, 50 Hz</td>
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<tr>
<td>voltage consumption</td>
<td>Max 25 W</td>
<td>Max 25 W</td>
<td>Max 25 W</td>
</tr>
<tr>
<td>Dimensions</td>
<td>430 x 44 x 138 mm</td>
<td>430 x 44 x 138 mm</td>
<td>430 x 44 x 138 mm</td>
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<tr>
<td>Fans</td>
<td>passive</td>
<td>passive</td>
<td>passive</td>
</tr>
<tr>
<td>Temperature:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>-10 to +45 °C</td>
<td>-10 to +45 °C</td>
<td>-10 to +45 °C</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 to +70 °C</td>
<td>-40 to +70 °C</td>
<td>-40 to +70 °C</td>
</tr>
<tr>
<td>Humidity</td>
<td>&lt;80 %</td>
<td>&lt;80 %</td>
<td>&lt;80 %</td>
</tr>
</tbody>
</table>
MES3100 switches are designed to be used in service provider networks as aggregation layer switches or transport switches in the data centers for Top-of-Rack Switches (MES3124, MES3124F). They have a wide performance range with universal interfaces operating at speeds of 10 Gbps or 1 Gbps. The switches can be used in cooperation with OPTOKON® access switches or other manufacturers’ equipment.

Key parameters of the switch - advanced Layer 2 features, support for static IP routing, Dynamic Routing, up to 4 uplink interfaces 10 Gbps (SFP+), stackable up to 8 units, redundant power supply with hot-swappable capability.

Support for high speed EAPS (Ethernet Automatic Protection Switching) convergence protocol enables to receive time convergence of optical rings in less than 200 ms, which ensures uninterrupted delivery of services.

The switches support the use of two power supply modules with automatic switching to the redundant module, and a hot-swappable change of power modules.

**Main features**
- High performance
- Stackable
- Up to 4x 10G in basic
- Redundant power supplies, hot-swappable
- Advanced Layer 2 functions
- Support L3 functions
- Front-to-back ventilation

**Specifications**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>MES3108F</th>
<th>MES3116F</th>
<th>MES3124/3124F</th>
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<tbody>
<tr>
<td>Interface</td>
<td>4x 10/100/1000Base-X (SFP)</td>
<td>12x 100/1000Base-X (SFP)</td>
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<tr>
<td></td>
<td>4x 10/1000/1000Base-T / 1000Base-X (SFP)</td>
<td>4x 10/1000/1000Base-T / 1000Base-X (SFP)</td>
<td>24x 10/100/1000Base-T (RJ-45)</td>
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<tr>
<td></td>
<td>2x 10GBase-R/1000Base-X (SFP+/SFP)</td>
<td>2x 10GBase-R/1000Base-X (SFP+/SFP)</td>
<td>4x 10GBase-R/1000Base-X (SFP+/SFP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MES3124F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20x 100/1000Base-X (SFP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4x 10/1000/1000Base-T / 1000Base-X (SFP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4x 10GBase-R/1000Base-X (SFP+/SFP)</td>
</tr>
<tr>
<td>Console</td>
<td>RS232</td>
<td>RS232</td>
<td>RS232</td>
</tr>
<tr>
<td>Performance</td>
<td>128 Gbps</td>
<td>128 Gbps</td>
<td>128 Gbps</td>
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<tr>
<td>MAC-addresses table</td>
<td>16K</td>
<td>16K</td>
<td>16K</td>
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<tr>
<td>Dimensions</td>
<td>430 x 44 x 265 mm</td>
<td>430 x 44 x 265 mm</td>
<td>430 x 44 x 265 mm</td>
</tr>
<tr>
<td>Fans</td>
<td>4 pcs</td>
<td>4 pcs</td>
<td>4 pcs</td>
</tr>
<tr>
<td>Temperature:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>-10 to +45 °C</td>
<td>-10 to +45 °C</td>
<td>-10 to +45 °C</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 to +70 °C</td>
<td>-40 to +70 °C</td>
<td>-40 to +70 °C</td>
</tr>
<tr>
<td>Humidity</td>
<td>&lt;80 %</td>
<td>&lt;80 %</td>
<td>&lt;80 %</td>
</tr>
</tbody>
</table>
DATA CENTER SWITCH SERIES

MES5248

MES5248 are high-10G switches for use in carrier networks as devices and aggregation in data centers (DPC) as Top-of-Rack or End-of-Row switches.

All ports are designed for operation at speeds of 10Gb/s (SFP+) or 1Gb/s (SFP), which allows flexibility and gradual transition 1G-> 10G. The non-blocking switching matrix allows for the correct packet processing at maximum loads, while maintaining the minimum and predictable delays on all types of traffic. Front-to-back ventilation provides effective cooling when using the devices in modern data centers.

Main features

• High efficiency (up to 960 Gbit/s)
• Non-blocking switching matrix
• Up to 48 10G ports
• L2+ switches
• Front-to-back ventilation
• Redundant power supplies
• Stackable

Specifications

| MES5248 |
| Interface | 48 x 10G Base-X (SFP+)/48 x 1000Base-X (SFP) |
| Console | RS232 |
| Performance | 960 Gbps |
| MAC-addresses table | 32K |
| VLAN table | 4K |
| ACL table | 1K |
| Jumbo frame | 10K |

Physical and environmental parameters

| Noise level | 0 dB |
| Power supply to 2 pcs | 220 V, 50 Hz, max 300 W, 48V DC |
| Dimensions | 430 x 44 x 400 mm |
| Fans | 4 pcs |
| Temperature: Operating | -10 to +45 °C |
| Storage | -40 to +70 °C |
| Humidity | <80 % |
THIN CLIENTS

TC-20, TC-50

Hardware advantages
Key benefits of thin client TC - reliability and simplicity of the platform is achieved through a modern and economical processor architecture.

Unlimited possibilities infrastructure
Thanks to cooperation with global developers virtualization software, such as Microsoft, Citrix and VMW are TC-thin clients that allow you to create the complete solution for the implementation of your business projects to develop IT-infrastructure.

Data protection
Integration with leading manufacturers of protective equipment such as ViPNet, RuToken and eToken make indispensable for public institutions and commercial organizations and will increase the level of data protection and reduce the cost of information security.

Universal solution
Our key task in the development of thin clients build a secure, certified, flexible and well-integrated, scalable hardware and software solutions. Our thin TC solution differs from existing solutions. It is flexible, versatile and able to adapt to your needs.

Centralized management
The ACS system allows centralized management and administration of equipment through a global network necessary for complex automation of all devices and remote technical support to users, which will reduce the costs of administering and greatly reduce total cost of ownership appliances.

- Monitoring the current status of thin clients
- Editing and working with thin client with templates settings
- Adding or removing session connections
- Management sessions on thin clients
- Centralized firmware update on thin clients
- Creating tasks performed on schedule

Thin client TC-20 - effective solution for multimedia
- The processor from Texas Instruments gives the customer even greater performance
- Effective operation in mode multimedia and 3D content *
- Citrix Premium Support *

Smart Client TC-50 - unlimited opportunities to work with the information system
- Collection of high-performance system, excellent performance multimedia, fast connectivity and high energy savings
- Client terminal for virtualization system
- Standalone workstation for office work
- WEB client in cloud technologies thanks to the browser and a powerful processor
THIN CLIENTS

TC-20, TC-50

Thin clients TC have become indispensable in the corporate environment as well as in the public sector. Thin client contributes manageability, security and reliability, ensuring maximum return on your virtual infrastructure.

Main features

- High-performance chips from leading vendors Marvell, Texas Instruments, Freescale (ARM architecture)
- Access to virtual environments Citrix, Microsoft and VMWare VDI and cloud services
- Centralized management system Eltex.ACS
- Simple and intuitive interface, remote control
- Multi-functional due to the large range of physical interfaces
- Power consumption not does exceed 10W
- Certified solution ViPNet Client
- Low cost
- Flexible adaptation of the thin client by customer
- Experience with complex solutions producer

Key benefits of thin client TC - reliability and simplicity of the platform is achieved through a modern and economical processor architecture. Thin client-TC, produced in Optokon under Eltex license, has a full set of mechanisms and functional interfaces, as well as actual software.

Thin client is a diskless compact computer that provides access to the terminal server or Data-center. The usual peripheral devices - keyboard, mouse, monitor, printers, etc., thus providing a multifunctional workplace. Thin clients on LAN are connected to the server on which all system software and running applications, are stored with all the necessary data and it also performs all calculations.
AUTOMATIC CONFIGURATION SERVER

ACS

The ACS, Automatic Configuration Server is designed for automatic and easy setup of CPE (Customer Premises Equipment) using the protocol described in the standard TR-069, which enables the operator to centrally manage customer equipment through the global network. This standard defines a mechanism that secures CPE auto-configuration and integrates the functions of CPE management into one common system.

Key functions of TR-069 protocol:
- Auto-configuration and dynamic preparation of service in operation
- FW version control
- Status monitoring and performance diagnostics
- Register of accidents and events

Connection interfaces
GUI and CLI management interfaces
Both graphic and command line console management interfaces are available for comfortable operation.

Main features
- System of advance CPE fixation per subscriber, on request fixation
- Automatic detection of new devices (zero-touch configuration)
- Flexible hierarchical system of profiles and services allows to create full-featured configuration and different CPE grouping criteria
- The additional level of detachment of the subscriber’s configuration data from the equipment facilitates the setting of individual parameters and enables to change the users equipment without additional configuration services
- Automatic network monitoring, failure logging, firmware update
- Pairing of ACS with superior OSS / BSS operator
- Ability to share EMS and ACS in a one common GUI
- Integration with any CPE that supports the TR-069
- Connection of more than 100 000 devices
CENTRALIZED MANAGING NETWORK SYSTEM

EMS
The EMS introduces a centralized management system of network equipment produced by OPTOKON*. The system is based on client-server architecture. The unified access server provides a web interface that enables independent simultaneous management of various network elements.

Automation Control (Northbound Interface)
The automation control (Northbound Interface) is designed for implementation of the EMS system into a higher layer of the provider’s OSS / BSS. In particular, it offers interconnection with the billing operator system, using open standardized protocols that enable automated routine operations such as the mass disconnection of subscriber ports with outstanding services and subsequent connection, after payment, and changes the configuration devices.

The EMS system supports:

- **xPON systems:**
  - MA-4000-PX
  - LTP-8X
  - LTE-8X, LTE-2X

- **Ethernet switches:**
  - MES2124
  - MES3124
  - MES3124F

- **VoIP devices:**
  - SMG1016M
  - TAU-32M.IP, SIP
  - TAU-36.IP (SIP, MEGACO)
  - TAU-72.IP (SIP, MEGACO)

- **Power supply systems:**
  - UEP2-3
  - UEP2-5
  - UEP3-3

- **DSLAM:**
  - MXA-24
  - MXA-32
  - MXA-64

EMS configuration:
EMS server - a system for receiving, processing, interpreting, distributing, and managing data. Database – the data storage system, built on the basis of the DBMS MySQL. The database contains a list of objects for network access and individual settings for each device (SNMP - parameters). The database is also used to store user accounts, device log messages, etc.

- Web Service SOAP - a service that is part of the EMS system, which serves for connection with higher layers of provider OSS.
- Browser (Web browser) - software for communication processing, information control, located in the operator workstation.
- Client SOAP - part of the OSS provider system, which is designed for connection with the WEB Service SOAP EMS system.

Main features
- monitoring of key device parameters: time in operation, work, temperature, CPU load, fans operation, FW version, serial number
- graphically displays the status of the physical ports
- monitoring of statistics on the physical and logical interfaces
- information on optical interfaces: the module type, power of the optical emission and optical power level of receiving signal, measuring of distance
- management of SFP-modules
- information on the number of active subscribers to the PON network
- information on the established PPPoE sessions
- management of subscriber profiles
- control subscriber ports: DSLAM, PON configuration, profile assignment
- monitoring of power supply
- monitoring and statistics collection for services: Internet, VoIP, IPTV for GPON subscribers
SFP TRANSCIEVERS

GEPON SFP Transceivers
GEPON OLT transceiver GP-LP-LX-D is designed for G.984.2 Class B+ network transmission requirements. The module is contained in a SFP package with SC/UPC receptacle connector. The module consists of a 1490 nm DFB laser, InGaAs APD, Pre Amplifier and WDM filter in a high-integrated optical sub-assembly, and can transmit up to 2.5 Gbps of continuous data at 1490 nm, and receives 1.25 Gbps burst-mode data at 1310 nm. The module data links up to 20 km in 9/125 μm single mode fiber.

### Main features
- Bi-directional 1.25 Gbps Upstream/2.5 Gbps Downstream
- Complies with ITU-T G.984.2 Class B+
- SFP package with SC Receptacle
- 1490 nm continuous-mode 2.5 Gb/s DFB transmitter,
- 1310 nm burst-mode 1.25 Gb/s APD receiver
- Single +3.3 V power supply
- Rx Signal Detect

### Symbol Table

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>memo</th>
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<tr>
<td>Transmitter</td>
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<tr>
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<td>Transmitter center wavelength</td>
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<td>1490</td>
<td>1500</td>
<td>nm</td>
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<tr>
<td>Optical Return Loss Tolerance</td>
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<td>dB</td>
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<tr>
<td>Receiver</td>
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<td></td>
</tr>
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<td>Receiver sensitivity</td>
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<tr>
<td>Receiver optical wavelength</td>
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<td>1310</td>
<td>1360</td>
<td>nm</td>
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<tr>
<td>Overload</td>
<td>$P_{SAT}$</td>
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<td>dBm</td>
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<tr>
<td>Maximum distance</td>
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<td></td>
<td>20</td>
<td>km</td>
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</table>

GEPON OLT transceiver GP-LP-LX-I is designed for Gigabit Ethernet Passive Optical Network transmission. The module is contained in a SFP package with SC/UPC receptacle connector. The module consists of a 1490 nm DFB laser, InGaAs APD, Pre Amplifier and WDM filter in a high-integrated optical sub-assembly, and can transmit up to 2.5 Gbps of continuous data at 1310 nm, and receives 1.25 Gbps burst-mode data at 1310 nm. The module data links up to 20 km in 9/125 μm single mode fiber.

### Main features
- Bi-directional 1.25 Gbps Upstream/1.25 Gbps Downstream
- Complies with IEEE802.3ah 1000Base-PX20 application
- SFP package with SC Receptacle
- 1490 nm continuous-mode 1.25 Gb/s DFB transmitter, 1310 nm burst-mode 1.25Gb/s APD receiver
- Single +3.3 V power supply
- LV TTL Bias Control input and Rx Signal Detect output

### Symbol Table

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>memo</th>
</tr>
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<tr>
<td>Transmitter</td>
<td></td>
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<td>Average Launched Power</td>
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<tr>
<td>Transmitter center wavelength</td>
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<td>1490</td>
<td>1500</td>
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<tr>
<td>Optical Return Loss Tolerance</td>
<td>ORLT</td>
<td>15</td>
<td></td>
<td>dB</td>
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<tr>
<td>Receiver</td>
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<td></td>
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<td></td>
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<tr>
<td>Receiver sensitivity</td>
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<tr>
<td>Receiver optical wavelength</td>
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<td>1310</td>
<td>1360</td>
<td>nm</td>
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<tr>
<td>Overload</td>
<td>$P_{SAT}$</td>
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<td>dBm</td>
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<tr>
<td>Maximum distance</td>
<td></td>
<td></td>
<td>20</td>
<td>km</td>
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</table>
SFP TRANSCEIVERS

SFP Transceivers 1.25 Gbps
The 1.25Gbps series are hot pluggable Small-Form-Factor (SFP) duplex, bidirectional and CWDM transceiver modules expressly designed for high speed communication applications that require rates of up to 1.25 Gbps. The transceivers are manufactured with an LC receptacle that is compatible with the industry LC connector standard. All SFP transceivers have the digital diagnostic monitor feature.

SFP Transceivers 2.50 Gbps
The 2.50 Gbps series are hot pluggable Small-Form-Factor (SFP) duplex, bidirectional and CWDM and DWDM transceiver modules expressly designed for high speed communication applications that require rates of up to 2.50 Gbps. The transceivers are manufactured with an LC receptacle that is compatible with the industry LC connector standard. All SFP transceivers have the digital diagnostic monitor feature.

SFP Transceivers 4.25 Gbps
The 4.25 Gbps series are hot pluggable Small-Form-Factor (SFP) duplex, bidirectional and CWDM transceiver modules expressly designed for high speed communication applications that require rates of up to 4.25 Gbps. The transceivers have the digital diagnostic monitor feature.

SFP+ Transceivers 10 Gbps
OPTOKON transceivers are compliant with IEEE 802.3ae and the 10G MSA (Multi-Source Agreement). This upgrade, and reliability benefits by virtue of being hotpluggable, also designed for singlemode and multimode fiber with cost effective and high performance. The S10-D55, 1550 nm cooled EML laser based 10 Gigabit SFP+ transceiver is designed to transmit and receive optical data over single mode optical fiber for link length of up to 80 km.
ERBIUM DOPED FIBER AMPLIFIER

CLA - CzechLight Amplifier devices

The CLA is a family of low noise, high performance and improved reliability EDFA (Erbium Doped Fiber Amplifier), designed to support turnkey amplification solutions for fiber networks. The CLA EDFA includes 2 in 1 Pre Amp and Booster EDFA. The electronic control board enables to separately control separately the two EDFAs.

Different control modes control on each stage are available:
- AGC - automatic gain control
- APC - automatic power control
- ACC - automatic current.

Dual power supply modules can ensure uninterrupted functionality during operation.

Main features

- Low noise figure
- Low power consumption, high reliability
- Monitoring port (1% of power)
- Microcomputer control system
- RS232, Ethernet, USB interfaces
- Command line and view menu with important predefined commands
- Wide wavelength range
- Multi channel amplification (e.g. long-haul DWDM)
- Single channel amplification
- Booster / In-line / Preamp
- LED signalization
- Key lock – enable/disable EDFA output
- Display & control panel for local control

Specifications:

- Standard 2U rack case
- Up to four EDFAs (customer based) in one rack case
- Management based on Linux
- Booster, inline and preamplifiers
- EDFA modules can be selected to best fit your applications

Manufactured under licence of
CLA-CA CzechLight CATV Amplifier

The CLA is a family of low noise, high performance and improved reliability EDFA (Erbium Doped Fiber Amplifier), designed to support turnkey amplification solutions for fiber networks. The CLA-CA EDFA includes a high performance Booster EDFA module. The passive optical splitter ensures a high number of output ports with defined power level of optical signal for connection of CATV distribution network. The electronic control board enables remotely control all operation functions. Different control modes are available: AGC (automatic gain control), APC (automatic power control), ACC (automatic current control) on each stage.

Dual power supply modules can ensure uninterrupted functionality during operation.

**Main features**

- Booster CATV module, optical splitter included
- 8/16/32/64 output ports
- Low noise figure
- Monitoring port (1% of power)
- Microcomputer control system
- RS232, Ethernet, USB interfaces
- Command line and view menu with important predefined commands
- LED signalization
- Key lock – enable/disable EDFA output
- Display & control panel for local control
- Dual power supply

**Specifications:**

- Standard 2U rack case
- CA64 3U rack case
- Management based on Linux

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**Manufactured under licence of CESNET**
OPTOKON, a.s. is a leading global producer and supplier of premium active and passive fiber optic components specializing in fully tested integrated data network, FTTx and tactical military solutions. Our components and solutions can be found in applications in businesses, communities and armed forces throughout the world.

- Fiber optic technology leadership
- 25 years experience on the global fiber optic market
- NATO supplier code: 1583G
- More than 15 years experience of supplying the militaries of over 20 countries
- National Security Authority certified
- ISO and AQAP certified
- Accredited Calibration Laboratory No. 2315

OPTOKON PORTFOLIO, SERVICES & DIVISIONS

FIBER OPTIC DIVISION
- Connectors, Cable Assemblies
- Cable Management Systems
- Splitters, WDM, CWDM and DWDM
- Data Network Equipment
- Test Equipment
- Harsh Environment Optical Network

SERVICE DIVISION

CALIBRATION LABORATORY

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PRODUCTION & RESEARCH CENTER
CZECH REPUBLIC

OPTOKON, a.s.
Červený Kříž 250, Jihlava
OPTOKON Prague Office
Venušina 1149/3, Prague 10

Your local partner

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTMENT IN YOUR FUTURE