- **Modular device, form factor: 19" 11U eurorack**
- **2 control switches with 1+1 hot standby support**
- **Up to 16 GPON/XGS-PON modules (256 GPON/ XGS-PON ports)**
- **Up to 65536 ONTs per node in XGS-PON mode/ up to 32768 ONTs in GPON mode**
- **Node bus performance 1600 Gbps**
- **Low power consumption**
- **2 independent power inputs**



Multi-service access and aggregation node MA5160 is dedicated for access networks based on GPON/XGS-PON technologies. The system allows operators to construct scalable, fault tolerant "last mile" networks meeting high safety requirements in either urban or rural areas. MA5160 controls customer equipment, traffic switching and access to transport networks.

A core element of MA5160 is a scalable Ethernet L2+ switch MA5K-FC64, that interacts with optical access modules MA5K-LC16G, MA5K-LC16XG and MA5K-LC16C[1], to connect customer devices via GPON/XGS-PON technologies.

The modules are installed in a standard 19" 11U eurorack. The 11U case has two slots for MA5K-FC64 switch control modules and 16 slots for linear LC modules (GPON/XGS-PON).

The system may contain one or two MA5K-FC64 core switch modules. Installing two modules allows to build a highly reliable system by providing switch redundancy and increasing system bandwidth by distributing data streams between modules through stacking. The modules interact via 100 Gbps interfaces operating in load sharing and redundancy modes.

Types of modules

– MA5K-FC64: switching and control module
– Number of interface modules: up to 16
– Bus type and performance: 2 × 16 × 100GBASE-CR4 (CAUI), 1600 Gbps

Management and monitoring

– Single management interface via CLI (Telnet, SSH, Serial), SNMP
– Processing configuration data for device modules
– Support for RADIUS, TACACS+

Technical features

General features	
Chassis	up to 16 LC modules up to 2 FC64 modules
Physical specifications and environmental parameters	
Number of power supply inputs	2
Power supply voltage	36–72 V DC
Average power consumption	1480 W
Maximum power consumption	no more than 3000 W
Crate power consumption	no more than 50 W
Power consumption of FC64	no more than 250 W
Power consumption of LC16G	no more than 55 W
Power consumption of LC16XG	no more than 105 W
Power consumption of LC16C[1]	no more than 130 W
Power consumption of FM-MA5K-2800-01 fan module	no more than 400 W
Assembled chassis weight without FC/LC	32.44 kg
MA5K-FC64 weight	3.98 kg
MA5K-LC16G weight	3.04 kg
MA5K-LC16XG weight	3.08 kg
MA5K-LC16C weight[1]	3.08 kg
Weight of MA5K16-FAND deflector	2.9 kg
Weight of FM-MA5K-2800-01 fan module	6.26 kg
Weight of MA5K16-FP-FC plug	0.7 kg
Weight of MA5K16-FP-LC plug	0.58 kg
Dimensions (W× H × D)	487 × 452 × 460 mm
Operating temperature range	from -10 to +55 °C
Relative humidity	up to 80 %

[1] Under development.

Features and capabilities

Aggregation switch functions with the following capabilities:
– MAC address learning/aging
– MAC addresses limiting
– Processing of unknown MAC addresses
– Broadband traffic limiting[1]
– Multicast traffic limiting[1]
– Number of multicast groups: 1024
– Support for Q-in-Q in compliance with IEEE 802.1ad
– STP, RSTP, MSTP[1]
– Static routing[1]
– Port isolation, port isolation within the same VLAN[1]
– LAG and LACP (including interfaces of FC64 modules)
– Port mirroring, VLAN mirroring
– QoS: 802.1p, DSCP[1], WFQ
– IGMP/MLD[1] Fast Leave
– IGMP/MLD[1] Proxy
– IGMP/MLD[1] Snooping
– IGMP/MLD[1] Querier
– DHCPv4 Snooping
– IPv4 Source guard[1]
– DHCPv4/DHCPv6[1] Relay Agent (Option 82, IP helper[1])
– LLDP (802.1ab)[1]
– PPPoE Intermediate agent
– Disposal by ONT services

Standards compliance

– IEEE 802.3 10BASE-T Ethernet
– IEEE 802.3u 100BASE-T Fast Ethernet
– IEEE 802.3ab 1000BASE-T Gigabit Ethernet
– IEEE 802.3z Fiber Gigabit Ethernet
– ANSI/IEEE 802.3 NWay auto-negotiation[1]
– IEEE 802.3x Full Duplex and flow control
– IEEE 802.3ad Link aggregation
– IEEE 802.1p Protocol for Traffic Prioritization
– IEEE 802.1Q Virtual LANs
– IEEE 802.1ad Provider Bridges (QinQ)
– IEEE 802.1v VLAN Classification by Protocol and Port
– IEEE 802.3ac VLAN tagging
– IEEE 802.1d MAC bridges[1]
– IEEE 802.1w Rapid Reconfiguration of Spanning Tree[1]
– IEEE 802.1s Multiple Spanning Trees[1]
– IEEE 802.1x Port Based Network Access Control[1]
– ITU-T G.988 GPON
– ITU-T G.984x GPON

MA5K-FC64 switching and control module

The MA5K-FC64 central switch module is the main platform element performing management and diagnostics of periphery modules, switching and aggregation of traffic.

CPU

– Processor clock speed: 2000 MHz
– Number of cores: 4
– RAM: DDR4 SDRAM 16 GB 2133 MHZ
– Non-volatile memory: 30 GB SSD-SATA

Interfaces

– USB 2.0 interface

Network interfaces

– External connections:
  – 4 × 25/10/1GE (SFP28/SFP+/SFP)
  – 6 × 100/40GE (QSFP28/QSFP+)
– Interface modules connection:
  16 × 100GBASE-CR4 (CAUI-4)
– Central switch modules connection:
  8 × 100GBASE-CR4 (CAUI-4)
– Optical transceivers: 10G SFP+, 25G SFP28,
  40G QSFP+, 100G QSFP28
– OOB 10/100/1000BASE-T (RJ-45) interface
– RS-232 (RJ-45) console port

Switch

– Switch performance: 3.2 Tbps
– Support for up to 4k VLANs according to 802.1Q
– Quality of Service (QoS)
– 8 priority output queues per port
– MAC address table: 262k entries

Port modes

– Duplex mode for 25/10/1 Gbps for SFP28/SFP+/SFP ports
– Duplex mode for 100/40 Gbps for QSFP28/QSFP+ ports

Management and monitoring

– Interaction with external control and monitoring systems via Telnet, SSH, SNMP
– Access rights limiting: by password, IP address, MAC address[1], privilege level
– Support for RADIUS, TACACS+
– Collection of alarm data on interface modules and the whole device. Generation of notification and alarm messages for monitoring systems[1]
– Device temperature control, fan system management
– Software update management for all device modules

[1] Support in the future firmware versions.

PON MA5K-LC16G interface module

MA5K-LC16G modules are designed to provide broadband access to the data network via GPON technology with data rate up to 2.5 Gbps downlink.

The modules are designed for last-mile deployment and allow connecting up to 2048 optical network terminals (ONTs). RSSI support allows determining the power of optical signals received from each ONT and measuring the parameters of the optical line status.

Network interfaces

– Connection with the central switch module: 40GBASE-CR4 (CAUI-4)
– PON: 16 × 2.5/1.25 Gbps GPON (SFP)
– RS-232 (RJ-45) console port

CPU

– Processor clock speed: 2000 MHz
– Number of cores: 4
– RAM: DDR4 SDRAM 8 GB 1200 MHz

Switch

– Switch performance: 120 Gbps
– MAC address table: 64k entries
– Support for up to 4k VLANs according to 802.1Q

GPON SFP parameters[1]

– Transmission medium: SMF fiber optic cable — 9/125, G.652
– Split ratio: up to 1:128 GPON
– Received Signal Strength Indication (RSSI)

Class B+:
– Compliance with ITU-T G.984.2, FSAN Class B+, SFF-8472
– Maximum operating distance: 20 km
– Transmitter: 1490 nm POC Laser (DFB Laser)
  – Data rate: 2488 Mbps
  – Average output power: +1.5..+5 dBm
  – Spectral line width: -20 dB 1.0 nm
– Receiver: 1310 nm APD/TIA
  – Data rate: 1244 Mbps
  – Receiver sensitivity: -28 dBm
  – Receiver optical overload: -8 dBm

Class C++:
– Compliance with ITU-T G.984.2, FSAN Class C++, SFF-8472
– Maximum operating distance: 40 km
– Transmitter: 1490 nm POC Laser (DFB Laser)
  – Data rate: 2488 Mbps
  – Average output power: +7..+10 dBm
  – Spectral line width: -20 dB 1.0 nm
– Receiver: 1310 nm APD/TIA
  – Data rate: 1244 Mbps
  – Receiver sensitivity: -32 dBm
  – Receiver optical overload: -12 dBm
– Dynamic range of pulse receiver: 20 dB

PON MA5K-LC16XG interface module

MA5K-LC16XG modules are designed to provide broadband access to the data network via XGS-PON technology with data rate up to 10 Gbps downlink.

The modules are designed for last-mile deployment and allow connecting up to 4096 optical network terminals (ONTs). RSSI support allows determining the power of optical signals received from each ONT and measuring the parameters of the optical line status.

Network interfaces

– Connection with the central switch module: 100GBASE-CR4 (CAUI-4)
– PON: 16 × 10/10 Gbps XGS-PON (SFP)
– RS-232 (RJ-45) console port

CPU

– Processor clock speed: 2000 MHz
– Number of cores: 4
– RAM: DDR4 SDRAM 8 GB 1200 MHz

Switch

– Switch performance: 300 Gbps
– MAC address table: 64k entries
– Support for up to 4k VLANs according to 802.1Q

[1] Defined upon request.

XGS-PON SFP parameters[1]

– Transmission medium: SMF fiber optic cable — 9/125, G.652
– Split ratio: up to 1:128 GPON, 1:256 XGS-PON
– Received Signal Strength Indication (RSSI)
– Compliance with ITU-T G.9807.1
– Maximum operating distance: 20 km

Class N1:
– Transmitter: 1577 nm
  – Data rate: 9.953 Gbps
  – Average output power: +2..+5 dBm
– Receiver: 1270 nm
  – Data rate: 9.953 Gbps
  – Receiver sensitivity: – 26 dBm
  – Receiver optical overload: –5 dBm

Class E1:
– Transmitter: 1577 nm
  – Data rate: 9.953 Gbps
  – Average output power: +6..+9 dBm
– Receiver: 1270 nm
  – Data rate: 9.953 Gbps
  – Receiver sensitivity: –30 dBm
  – Receiver optical overload: –9 dBm

PON MA5K-LC16C interface module[1]

MA5K-LC16C modules are designed to provide broadband access to the data network via GPON/XGS-PON technologies with data rate up to 2.5/10 Gbps downlink.

The modules are designed for last-mile deployment and allow connecting up to 2048 optical network terminals (ONTs) for the GPON standard and up to 4096 for the XGS-PON standard. RSSI support allows determining the power of optical signals received from each ONT and measuring the parameters of the optical line status.

Network interfaces

– Connection with the central switch module: 100GBASE-CR4 (CAUI-4)
– Combo PON: 16 × 10/10 Gbps XGS-PON and 2.5/1.25 Gbps GPON (SFP)
– RS-232 (RJ-45) console port

CPU

– Processor clock speed: 2000 MHz
– Number of cores: 4
– RAM: DDR4 SDRAM 8 GB 1200 MHz

Switch

– Switch performance: 300 Gbps
– MAC address table: 64k entries
– Support for up to 4k VLANs according to 802.1Q

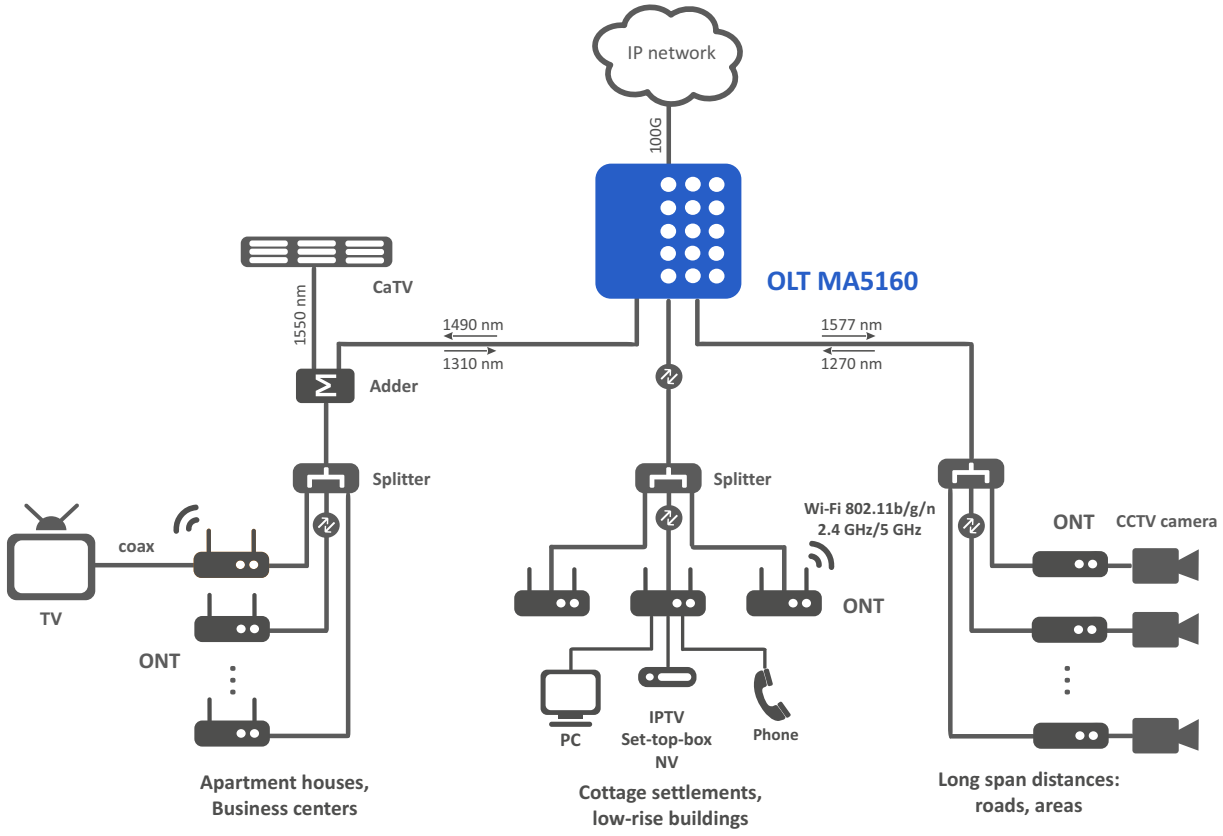
Combo PON SFP parameters[2]

– Transmission medium: SMF fiber optic cable — 9/125, G.652
– Split ratio: up to 1:256 XGS-PON and 1:128 GPON
– Received Signal Strength Indication (RSSI)
– Compliance with ITU-T G.9807.1
– Maximum operating distance: 20 km

Class N1/B+:

– Transmitter: 1577 nm POC Laser (DFB Laser):
  – Data rate: 9.953 Gbps
  – Average output power: +2..+5 dBm
  – Spectral line width: –20 dB 1.0 nm
– Receiver: 1270 nm APD/TIA:
  – Data rate: 9.953 Gbps
  – Receiver sensitivity: –26 dBm
  – Receiver optical overload: –5 dBm
– Transmitter: 1490 nm POC Laser (DFB Laser):
  – Data rate: 2.488 Gbps
  – Average output power: +2..+5 dBm
  – Spectral line width: –20 dB 1.0 nm
– Receiver: 1310 nm APD/TIA:
  – Data rate: 1.244 Gbps
  – Receiver sensitivity: –28 dBm
  – Receiver optical overload: –8 dBm

Use case



[1] Under development.
[2] Defined upon request.

Ordering information

Name	Description
Chassis	
MA5160 chassis	Chassis of the OLT MA5160 switch module with fan module installed
Switching and control modules	
MA5K-FC64	FC64 switching and control module, 4 × 25/10/1GE (SFP28/SFP+/SFP), 6 × 100/40GE (QSFP28/QSFP+), L2+
PON interface modules	
MA5K-LC16G	Optical line module OLT GPON, 16 ports GPON, RSSI
MA5K-LC16XG	Optical line module OLT XGS-PON, 16 ports XGS-PON, RSSI
MA5K-LC16C[1]	Optical line module OLT PON, 16 Combo-ports XGS-PON/GPON, RSSI
Power modules	
MA5K16-FP-FC	FC slot plug for installation in unused slots in the chassis. Installation of plugs is mandatory for proper operation of the chassis fan system
MA5K16-FP-LC	LC slot plug for installation in unused slots in the chassis. Installation of plugs is mandatory for proper operation of the chassis fan system
MA5K16-FAND	Fan panel deflector for installation on top of the chassis. Installation of the deflector is required to redirect the exhaust air flow
Related software	
EMS-MA5160	EMS-MA5160 option of Eltex.EMS system for Eltex network elements management and monitoring: 1 network element — MA5160

[1] Under development.

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About Eltex

Eltex Enterprise is a leading Russian developer and manufacturer of communication equipment with 30 years of history. Complete solutions and their seamless integrability into the Customer's infrastructure are the priority growth areas of the company.