BITSTREAM®

Leader in time synchronization and data transmission solutions

Industrial Ethernet Switch
HYPERION-500

Modular and manageable switch with Grandaster clock function ready to work in extreme conditions.

Reliable

Modular

Easy to configure

Safe

Hyperion-500 - *ideal for industry*

Modular managed industrial Ethernet switch with PTPv2 time synchronization server function and 4x 1/2.5/10G interfaces

- ✓ Industrial switch in a modular system with an enclosure: chassis for RACK 19" 1U rack with 8 slots, allowing the installation of hot swap modules ,
- ✓ The modular system allows different module configurations that can have up to 32x 10/100/1000M RJ45 or SFP 32x 100[1] /1000M and up to 4x 100M[1] /1G/2.5G/10G SFP+
- ✓ ITU-T G.8032 compliant ring operation with < 20ms reconfiguration ,
- ✓ Support for STP, RSTP and MSTP protocols ,
- ✓ DDMI - SFP module monitoring function,
- ✓ IEEE802.1x authentication, Radius, Tacacs+ - AAA,
- ✓ Support for PROFINET Conformance Class A protocol,
- ✓ Internal synchronization of the switch by GNSS signal after retrofitting the module MOD-QUAZAR-GPS,
- ✓ The following IEEE1588 v.2 (PTPv.2)-based precision time synchronization profiles are available in the HYPERION-500 switch with hardware support: default1588, G.8265.1 and G.8275.1,
- ✓ NTP protocol in server/client mode and SNTP
- ✓ Primary surge protection in MOD-TRX modules on RJ-45 ports, ITU-T K.44 4kV 10/700us ,
- ✓ Management IPv4, IPv6, WWW, telnet, SSH and local CLI console, SNMP v1/v2c/v3,
- ✓ Access security: SNMPv3, HTTPS, SSH,
- ✓ Save Energy with Energy Efficient Ethernet (EEE) Technology,
- ✓ Switch designed in accordance with requirements of IEC61850-3, IEEE1613 standards,
- ✓ Operating temperature: -40 to +85°C with appropriate conditions met,
- ✓ Modules for redundant power supply 80-350 V DC, 75-260 V AC or 36 - 60V DC,
- ✓ Load Balance function with power redundancy,

Optional features

- ✓ If retrofitted with MOD-DMC module - security is guaranteed by IEEE 802.1ae MACsec - encryption and data integrity.
- ✓ Optionally, HYPERION-500 can be retrofitted with MOD-RBX module for lossless redundancy supporting IEC62439-3 Clause 4, 5 PRP/HSR protocols, also enabling PTP over PRP synchronization redundancy.
- ✓ Optionally, the HYPERION-500 can be equipped with MOD-IRB-B module for time synchronization using PPS (Pulse Per Second) protocol in the form of IRIG 205-87 compliant with 2x IRIG-B DLCS BNC; 2x IRIG-B AM 1kHz BNC; 2x PPS FO 850nm ST interfaces.
- ✓ Optionally, HYPERION-500 can be equipped with MOD-RTR module to support L3 layer operation - supports dynamic routing protocols: RIP, OSPF, BGP and RAY - very fast routing protocol

Optional features under the license

- ✓ Extension in IEEE 1588-2008v.2 (PTPv2) with Power Profile; synchronization for real-time applications in accordance with IEEE C37.238-2011, C37.238-2017; IEC61850-9-3,
- ✓ Synchronous Ethernet G.8261 (available on optical ports)

Features of Hyperion-500

Solid

The Hyperion-500 Ethernet switch is designed to withstand operation in the harshest climatic conditions. The device is equipped with a durable IP-30 rated enclosure, allowing it to be mounted in a standard 19" 1U rack. The switch is designed in accordance with the requirements of IEC61850-3, IEEE1613 standards. Above that, the device is suitable for operation in temperatures from -40°C to +85°C under appropriate conditions.

Pew

The Hyperion-500 can be retrofitted with two independent power supplies. The redundant power supply function guarantees stable and continuous operation in case of failure of one of the power sources. The two power supply modules used in the device, provide operation with power redundancy supported by the Load Balance function.

Easy to use

BitStream's devices and software were designed to make their operation simple and intuitive. The incorporation of an HTTPS server, SSH server and SNMPv.3 agent allows secure configuration of device parameters through a standard web browser and monitoring from any management platforms equipped with SNMP protocol. With the use of SMTP protocol, it is possible to send notifications in case of failure by email.

Safe

The Hyperion-500 switch can be retrofitted with a MOD-DMC module with the IEEE 802.1ae MACSec security protocol, which has a data integrity function in addition to data encryption, making it possible, of course, to detect incidents of false data entering the network during attempts by "man in the middle" hackers. MACsec also makes it possible to provide the data integrity function itself without encryption. We can use 128 or 256 bit AES keys to encrypt transmissions.

Modular

In creating the Hyperion-500 industrial switch, we have met the requirements of our customers. The device created by us guarantees the ability to configure the device according to your own requirements. The 19-inch housing has been adapted for mounting hot-swap modules.

Guaranteeing connection redundancy

The Hyperion-500 modular switch supports ERPS (Ethernet Ring Protection Switching) technology compliant with ITU-T G.8032 standard, enabling operation with transmission path redundancy with a reconfiguration time of less than 20ms, and with support for up to 64 rings simultaneously.

Guaranteeing network synchronization

As standard, the Hyperion-500 is equipped with an on-board OCXO generator with 10 ppb stability. The switch as standard supports the IEEE 1588v.2 PTP protocol with profiles: default 1588, G.8265.1, and G.8275.1. With an additional license, it can be expanded to include the Power Profile IEEEC37.238-2011, IEEEC37.238-2017, IEC61850-9-3, which will provide precise time synchronization for applications in the power industry with high real-time operation requirements, and with the SYNCE license to enable Synchronous Ethernet, G.8261, providing precise frequency-based synchronization of internal device clocks.

Energy efficient

The HYPERION-500 supports Energy Efficient Ethernet technology (compliant with IEEE 802.3az), which enables significant reductions in power consumption by optimizing the operation of interfaces based on port traffic load, and allows an electrical port to go to sleep if a connected device is not active. The switch also features power matching on the RJ45 port depending on the length of the UTP cable.

Supported transmission standards

- ✓ IEEE 802.3 10Base-T Ethernet,
- ✓ IEEE 802.3u 100Base-TX Fast Ethernet,
- ✓ IEEE 802.3u 100Base-FX Fast Ethernet,
- ✓ IEEE 802.3ab 1000Base-T,
- ✓ IEEE 802.3z Gigabit Fiber,
- ✓ IEEE 802.3ae 10GBASE-SR/LR/ER/ZR (SFP+) 10 Gigabit Ethernet,
- ✓ IEEE 802.3x Flow Control and Back-pressure,
- ✓ IEEE 802.1p Class of Service (CoS),
- ✓ IEEE 802.1Q VLANs, up to 4095 active VLANs,
- ✓ IEEE 802.1ad QinQ,
- ✓ IEEE 802.3ad Link Aggregation Protocol (LACP),
- ✓ IEEE 802.1AB Link Layer Discovery Protocol (LLDP),
- ✓ IEEE 802.1ak Multiple Registration Protocol (MRP, GARP, GVRP),
- ✓ IEEE 802.3az Energy Efficient Ethernet.

Network redundancy

- ✓ IEEE 802.1D Spanning Tree Protocol (STP),
- ✓ IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP),
- ✓ IEEE 802.1s Multiple Spanning Tree Protocol (MSTP),
- ✓ ITU-T G.8032 v2 Ethernet Ring Protection Switching, Major Ring, Sub Ring - DHP dual homing protection,
- ✓ ITU-T G.8031 Ethernet Linear Protection Switching 1+1, 1:1,
- ✓ Each of the redundancy protocols listed above is available on all ports and on all modules except the management port on the CUS module,
- ✓ IEC 62439-3 Clause 4, 5 PRP /HSR - supported by an additional Redbox module,
- ✓ Redundancy of PTP over PRP synchronization in the network using the MOD-RBX module.

Network Security

- ✓ IEEE 802.1x Port Based Network Access Protocol, EAP, TACACS+, RADIUS - authentication, authorization and accounting functions - AAA,
- ✓ IEEE 802.1ae MAC security (MACsec) - encryption and data integrity using DMC.
- ✓ Advanced transmission security using IPSEC protocols with support for AES256 or VERNAMA algorithm, Available in the MOD-RTR module
- ✓ Virtual Private Network - VPN service support. Available in the MOD-RTR module.
- ✓ Built-in Software Firewall at Layer 3. Available in the MOD-RTR module

Layer L3 (Available in the MOD-RTR module)

- ✓ Supports dynamic routing protocols: RIP, OSPF, BGP and very fast routing protocol RAY
- ✓ Each port from the modules can operate in router mode.
- ✓ Transmission speed of 1Gbps between switch and router
- ✓ Switching to alternate route in less than 100ms.
- ✓ Multi-path concurrent routing with Load Balancing algorithm
- ✓ Lossless redundancy using VRRP and "ZEROloss" protocol.
- ✓ Virtual routing and forwarding support for up to five independent routing engines
- ✓ Dynamic Network Address Translation (NAT)
- ✓ Easy routing configuration with ZeroConfig.

Network synchronization

- ✓ NTP protocol in server/client mode and SNTP,
- ✓ IEEE 1588-2008 v2 PTP - standard support for synchronization with the 1588 profile in peer to peer, end to end and one step, two step modes,
  - Time error for Master clock mode typically 40ns ,
  - Time error for Transparent clock mode typically 50ns,
  - Time error for BC (Boundary clock) mode typically < 200ns,
  - Time error for BC (Boundary clock) with SyncE mode typically <100ns ,
  - Slave,
- ✓ Optional synchronization with Power Profile IEEEC37.238-2011, IEEEC37.238-2017 and Power Utility Profile IEC/IEEE 61850-9-3,
- ✓ Licensed support for Synchronous Ethernet, G.8261: (Timing and synchronization aspects in packet networks) on optical ports

MTBF

- ✓ Time: 410000 - 520000 hours.
- ✓ Standard: Telecordia , SR-332

Ethernet interfaces in 19" RACK 1U enclosure

- ✓ Store-and-forward mode of operation,
- ✓ Up to 32x RJ45 (10/100/1000M) or SFP (100/1000M) ports,
- ✓ Jumbo frame: 9600 B,
- ✓ Packet buffer size: 4 MB,
- ✓ Switching capacity: 160 Gbps,
- ✓ Forwarding: maximum 108 Mpps,
- ✓ Mac board: 32k,
- ✓ VLANS: 4094 VLAN entries, 802.1Q, 802.1QinQ, private VLANs, VLAN translation,
- ✓ QoS: Support for 8 physical queues,
- ✓ Storm protection: filtering for incoming traffic of Broadcast, Multicast, Unknown DA or all packets, outgoing traffic filtering for packets of all types, bandwidth limiting,
- ✓ IGMP snooping V1/V2/V3, IGMP Filtering/ Throttling, IGMP query, IGMP proxy reporting, MLD snooping V1/V2,
- ✓ Port Mirroring: copy network traffic to a specific port, monitor traffic on selected ports,
- ✓ Port Loop Protection,
- ✓ RMON, MIB II, DNS, DHCP .

Supported standards, recommendations and directives EMC, safety*

PN-EN 55035:2017-09	Electromagnetic compatibility of multimedia devices	Resistance requirements
PN-EN 55032:2015-09	Electromagnetic compatibility of multimedia devices	Emission requirements.
PN-EN IEC 62368-1:2020-11	Audio/visual, information technology and telecommunications equipment	Part 1: Safety requirements
PN-EN 55011:2016	Industrial, scientific and medical equipment	Radio frequency disturbance characteristics - Permissible levels and methods of measurement.
PN-EN 60825-1:2014-11	Safety of laser equipment Part 1: Equipment classification and requirements.	
EMC 2014/30/EU	Electromagnetic Compatibility Directive.	
LVD 2014/35/EU	Low Voltage Directive.	
IEC 61000-4-2	Electromagnetic compatibility (EMC)	Part 4-2: Test and measurement methods - Test of resistance to electrostatic discharge
IEC 61000-4-3	Electromagnetic compatibility (EMC)	Part 4-3: Test and measurement methods - RF radiated electromagnetic field immunity test
IEC 61000-4-4	Electromagnetic compatibility (EMC)	Part 4-4: Test of resistance to a series of fast electrical transients
IEC 61000-4-5	Electromagnetic compatibility (EMC)	Part 4-5: Test and measurement methods - Impact resistance testing
IEC 61000-4-6	Electromagnetic compatibility (EMC)	Part 4-6: Test and measurement methods -- Testing for immunity to conducted disturbances induced by radio frequency fields
IEC 61000-4-8	Electromagnetic compatibility (EMC)	Part 4-8: Testing for immunity to mains frequency magnetic fields
IEC 61000-4-11	Electromagnetic compatibility (EMC)	Part 4-11: Tests for resistance to voltage drops, short interruptions and voltage changes
IEC 61850-3:2014	Communication systems and networks for automation of electric power enterprises -- Part 3: General requirements	
IEEE 1613-2009	IEEE standard on environmental and test requirements for network communication equipment installed in substations	

* - The list of supported standards may change as the device evolves.

H500CH-1U8.X-X - Enclosure (chassis)
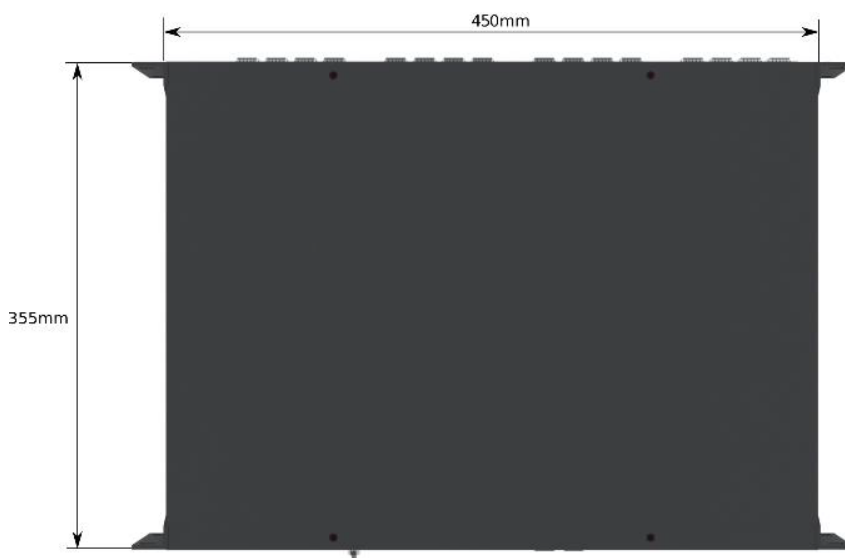
Technical specifications

- ✓ 6 slots for various types of hot-swap modules,
- ✓ 2 dedicated slots for hot-swap power modules,
- ✓ The device is equipped with an OCXO on-board generator with parameters:
    - The stability over the temperature range of -40°C to +85°C is ±10 ppb,
    - Holdover support of ±1.5 μs - at constant temperature for a minimum of 1 hour,
- ✓ Local console: RS-232 CLI for management,
- ✓ Optional - 1 NO/NC relay output maximum switching current - 0.5A 60VDC with resistive load, screw connector
- ✓ Enclosure: Non-oxidizing metal housing with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight without modules: 5 kg,
- ✓ Dimensions with modules and mounting brackets [mm]: 483 x 367 x 45,
- ✓ A 19" high 1U kit for mounting in RACK cabinets.

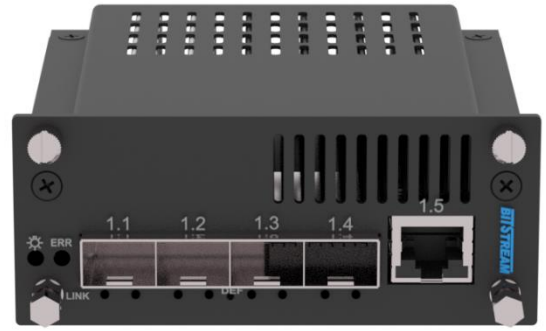## Mechanical drawing

View - side
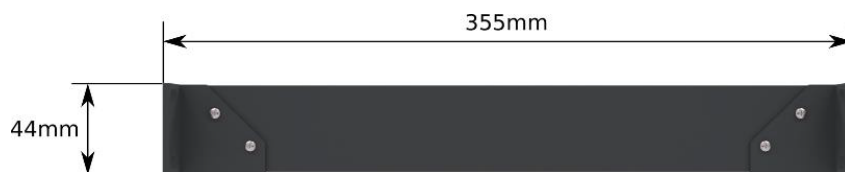
View - top

MOD-CUS - Central management module

Technical specifications

- ✓ Uplink interface: 4x SFP+ slots (1G/2.5G/10G),
- ✓ RJ45 10/100Mbps local Ethernet port for management,
- ✓ Independent management via own IPv4, IPv6, HTTP, HTTPS, Telnet, SSH and SNMP v1/v2c/v3, TRAP, Syslog,
- ✓ Support for DHCP Client, Server, Relay Option 82,
- ✓ The processor allows the creation of up to 10 interfaces with different IP addresses, separated by VLANs,
- ✓ Support for STP, RSTP and MSTP protocols,
- ✓ Ethernet Redundancy: ITU-T G.8032v2 Ethernet Ring Protection Switching, with connection reconfiguration in <20ms and ITU-T G.8031 EPS 1+1, 1:1,
- ✓ IEEE802.1x authentication, Radius, Tacacs+ - AAA,
- ✓ Synchronous Ethernet support on optical ports,
- ✓ IEEE 1588-2008 v2 PTP support,
- ✓ Support for NTP protocol in server/client mode and SNTP
- ✓ SFP DDMI: Monitoring of insert parameters for all SFP slots,
- ✓ Port Mirroring: independently copy network traffic to a specific port, monitor traffic on selected ports,
- ✓ Enclosure: Non-oxidizing metal enclosure with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight: 0.6 kg,
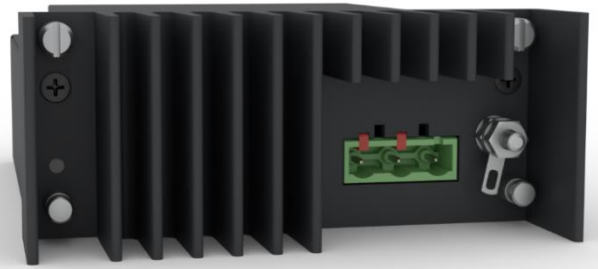- ✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing
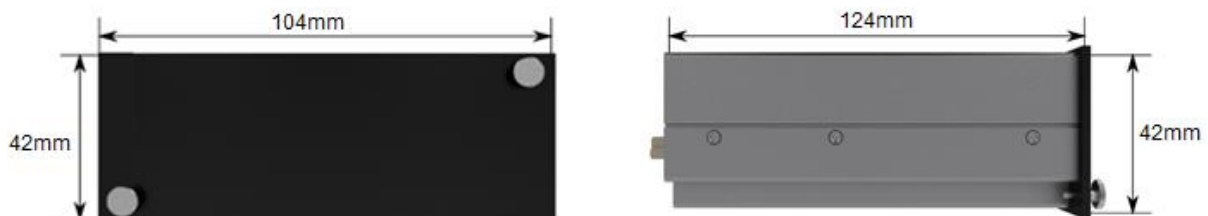
MOD-PSU - Power Supply Unit

Technical specifications

- ✓ Input voltage range: 80-350 V DC, 75-260 V AC,
- ✓ Power: 75 W,
- ✓ Input voltage range: 36-60 V DC,
- ✓ Power: 75 W,
- ✓ Connector: screw terminal - Terminal block,
- ✓ Power supply redundancy supported by Load Balance ,
- ✓ Enclosure: Non-oxidizing metal housing with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight: 0.5 kg,
- ✓ Dimensions [mm]: 132 x 107 x 44.

Mechanical drawing
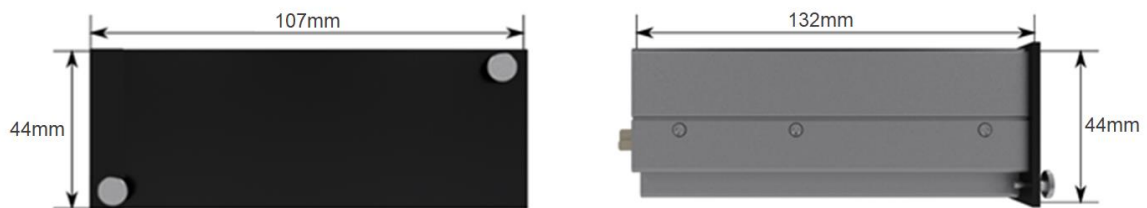
MOD-TRX - Transceiver module 8x UTP or 8xSFP

Technical specifications

- ✓ Transceiver module with 8x UTP RJ45 10/100/1000M ports,
- ✓ The transceiver module has 8x 100/1000M SFP slots for various types of optical SFP or copper modules (The 100Mbps speed on the Optical Interface only works with optical SFP inserts),
- ✓ Synchronous Ethernet support in 8xSFP optical module,
- ✓ IEEE 1588-2008 v2 PTP support,
- ✓ NTP protocol support in server/client mode and SNTP mode
- ✓ ITU K.44 - built-in primary, 4kV, 10/700us overvoltage protection in TRX.1 modules on RJ-45 ports in accordance with the requirements: Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents - Basic Recommendation,
- ✓ Reflectometer test in UTP module: Each RJ45 port can perform a reflectometric test of all pairs (4 pairs for 1000Base-T and 2 pairs for 10/100Base-Tx) for twisted-pair cable, that is, diagnostics of short circuits or breaks in pairs and the total length of the cable to the next active device,
- ✓ SFP DDMI: Monitoring of insert parameters for all SFP slots
- ✓ Signaling alarms and module status by LEDs,
- ✓ Enclosure: Non-oxidizing metal enclosure with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight: 0.5 kg,
- ✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing
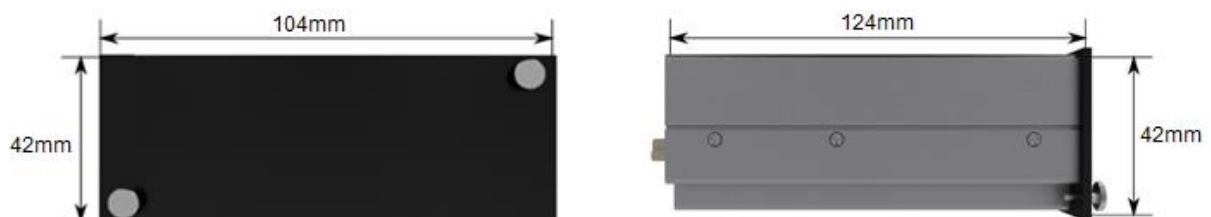
MOD-DMC Dual media converter module

Technical specifications

- ✓ The module has the following interfaces: 2x SFP 100/1000M slot and 4x UTP RJ45 10/100/1000M Ethernet port (The 100Mb/s speed on the optical interface works only with optical SFP inserts),
- ✓ Number of ports with **MacSec** encryption support: 2x SFP 100/1000M slot and 2x UTP RJ45 10/100/1000Mbit/s Ethernet port,
- ✓ Advanced transmission security with IEEE 802.1AE MAC security (MACsec) encryption and data integrity, GCM-AES-128 support, 128-bit AES keys,
- ✓ IEEE 802.1AEbn-2011 MAC security (MACsec) - encryption and data integrity support GCM-AES-256, 256-bit AES keys,
- ✓ Synchronous Ethernet support,
- ✓ IEEE 1588-2008 v2 PTP support,
- ✓ NTP protocol support in server/client mode and SNTP mode
- ✓ Independent management via its own IPv4, IPv6, HTTP, HTTPS, Telnet, SSH and SNMP v1/v2c/v3, TRAP, Syslog, as well as communication with the switch via an internal port, and the ability to block the module's communication with the HYPERION-500,
- ✓ Support for DHCP Client, Server, Relay Option 82,
- ✓ The processor has up to 10 interfaces with different IP addresses, separated by a VLAN,
- ✓ Support for STP, RSTP and MSTP protocols.
- ✓ Ethernet Redundancy: ITU-T G.8032v2 Ethernet Ring Protection Switching, with connection reconfiguration in <20ms and ITU-T G.8031 ELPS 1+1, 1:1,
- ✓ Support for IEEE 802.1x Port Based Network Access Protocol, EAP, TACACS+, RADIUS - authentication, authorization and accounting functions - AAA ,
- ✓ SFP DDMI: Monitoring of insert parameters for all SFP slots,
- ✓ Port Mirroring: independently copy network traffic to a specific port, Monitor traffic on selected ports,
- ✓ Enclosure: Non-oxidizing metal housing with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight: 0.5 kg,
- ✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing
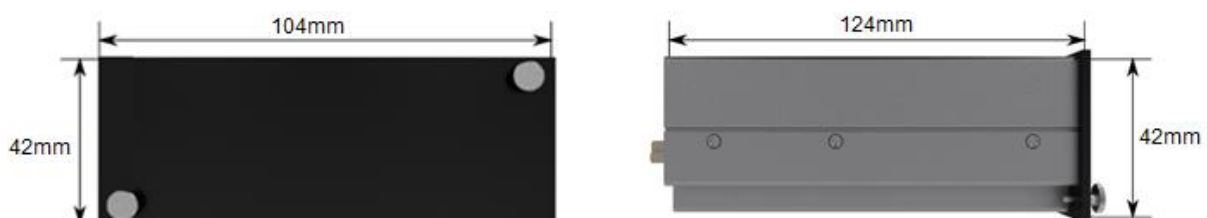
MOD-QUAZAR-GPS - GNSS receiver module for clock synchronization

Technical specifications
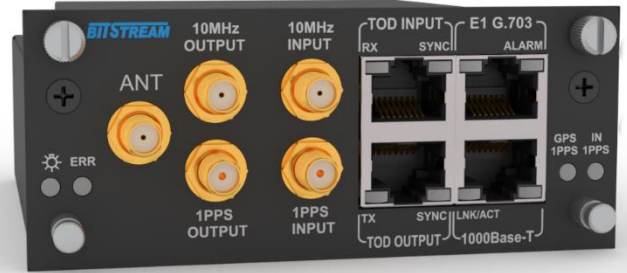
✓ Can be equipped with stable on-board generators with different parameters:
  o OCXO generator with -40 to +85°C stability of ±20 ppb and holdover time of ±1.5 µs at constant temperature for 0.5 hours,
  o OCXO generator with stability in the temperature range of -40 to +85°C of ±1 ppb and holdover time of ±1.5 µs at constant temperature for 8 hours, in the range of ±8 µs at constant temperature for 12 hours,
  o OCXO generator with stability in the temperature range -40 to +85°C at the level of ±0.1 ppb and holdover time in the range of ±1.5 µs for 48 hours, with a temperature change of 5°C, and ±1.5 µs for 24 hours, with a temperature change of 20°C,
✓ A 72-channel GNSS receiver that works with GPS, GLONASS, BeiDou, Galileo,
✓ Antenna input with SMA connector and support for active antennas,
✓ GNSS receiver sensitivity (max/min): -167dBm/-159dBm with LNA option ,
✓ GNSS PPS signal precision: ±40ns (Clear sky) ,
✓ Synchronous Ethernet support ,
✓ IEEE 1588-2008 v2 PTP support,
✓ Support for NTP in server/client mode and SNTP protocol
✓ Construction designed in accordance with the requirements of IEC61850-3, IEEE1613 standards,
✓ Enclosure: Non-oxidizing metal enclosure with IP30 rating,
✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
✓ Operating environment: Humidity (non-condensing): 5% -95%,
✓ Weight: 0.5 kg,
✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing
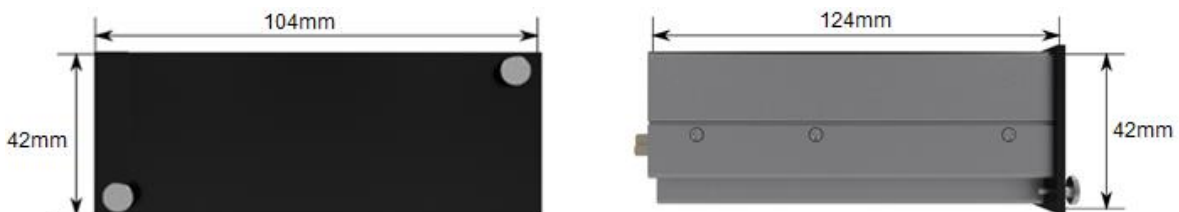
MOD-IRB-B – IRIG-B module

Technical Specifications

- ✓ Implements the functionality of providing time synchronization using PPS (Pulse Per Second) signals via the IRIG-B serial protocol in accordance with the 205-87 standard.
- ✓ Number of interfaces in the device:
    - 2x IRIG-B DCLS - unmodulated - BNC 50 Ohm connectors;
    - 2x IRIG-B AM - modulated 1kHz - BNC 600 Ohm connectors;
    - 2x PPS – HFBR transmitting transceivers; ST connector 850 nm optical fiber MM - 50/125 or 62.5/125 um
- ✓ IRIG-B DCLS interface:
    - Output voltage: 5V;
    - Output current: min. 100mA;
    - Accuracy of output relative to UTC: ± 100 ns;
- ✓ IRIG-B AM interface:
    - Output voltage: 5V;
    - Accuracy of output relative to UTC: ± 1 µs.
- ✓ Housing: Non-oxidizing metal housing with IP30 protection class,
- ✓ Working environment: Working temperature: -40 to +85°C with air flow of at least 0.4m/s,
- ✓ Working environment: Working temperature: -40 to +70°C with air flow of at least 0.0m/s,
- ✓ Working time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Working environment: Humidity (non-condensing): 5%-95%,
- ✓ Weight: 0.5 kg,
- ✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing
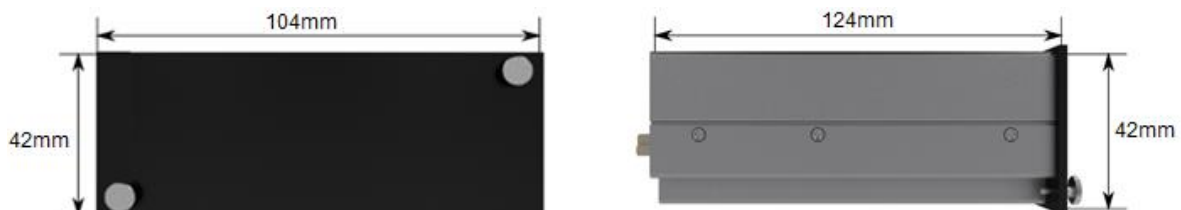
MOD-RBX - REDBOX module

Technical specifications

- ✓ A module that enables the creation of networks with lossless redundancy,
- ✓ In MOD-RBX module - 2x SFP slots (100/1000M supporting HSR (High-availability Seamless Redundancy) or PRP (Parallel Redundancy Protocol) protocols for network redundancy, Note: (100Mbps speed on Optical Interface only works with optical SFP inserts)
- ✓ 1x internal Ethernet port for communication with the switch,
- ✓ IEEE 1588-2008 PTP v2 support for PRP protocol and HSR protocol support - TC, BC modes supported,
- ✓ Construction designed in accordance with the requirements of IEC61850-3, IEEE1613 standards,
- ✓ Support for IEC 62439-3 Clause 4 standard,
- ✓ Ready for Mandatory Clause 4 2012 standard,
- ✓ Prepared for upgrade to Clause 4 2016 standard,
- ✓ Support for IEC 62439-3 Clause 5 standard,
- ✓ Prepared for upgrade to Clause 5 2016 standard,
- ✓ Enclosure: Non-oxidizing metal enclosure with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight: 0.5 kg,
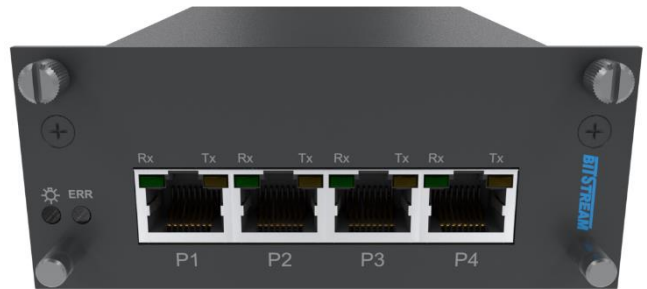- ✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing
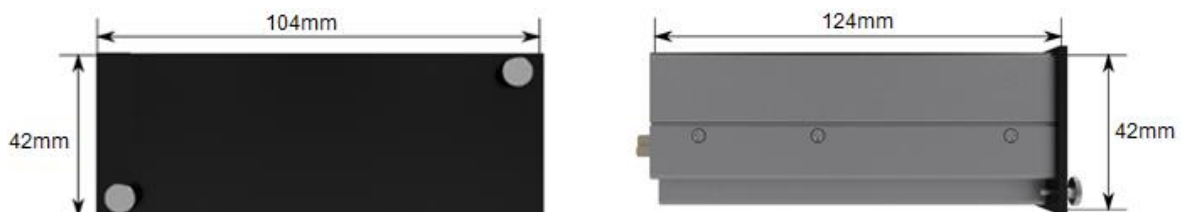
MOD-SRL - serial port server module

Technical specifications

- ✓ 4x RS485/422/232 server module with RJ45 connectors
- ✓ Available modes: SERVER, CLIENT, SSH,
- ✓ Raw socket encapsulation transmission for SERVER mode,
- ✓ Transmission speeds range from 300 to 230400 for RS232 bit/s and up to 1 Mbps on RS422/485,
- ✓ RS485 in full duplex mode (4 wires) or in half duplex mode (2 wires),
- ✓ Data bits: 5,6,7,8,
- ✓ Stop bits: 1, 1.5, 2,
- ✓ Parity bits: None, Even, Odd, Space, Mark,
- ✓ TCP and UDP protocols can operate in point-to-point or point-to-multipoint topologies,
- ✓ Sniffer mode (duplication) on each port and data stream,
- ✓ Loop function on the serial port and data transmitted in both directions,
- ✓ Independent management system using SSH, HTTPS, SNMP v.3 protocols with its own credentials,
- ✓ Enclosure: Non-oxidizing metal enclosure with IP30 rating,
- ✓ Operating environment: Operating temperature: -40 to +85°C with a minimum airflow of 0.4m/s,
- ✓ Operating environment: Operating temperature: -40 to +70°C with a minimum airflow of 0.0m/s,
- ✓ The operating time at a maximum temperature of +85°C is up to 16 hours,
- ✓ Operating environment: Humidity (non-condensing): 5% -95%,
- ✓ Weight: 0.5 kg,
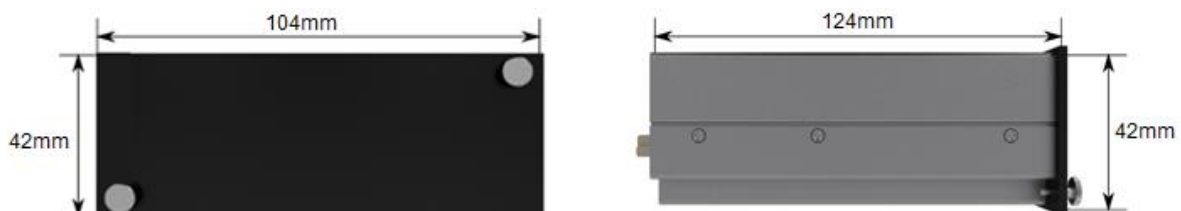- ✓ Dimensions [mm]: 124 x 104 x 42.

Mechanical drawing

MOD-RTR - Router module with full L3 layer

Technical specifications

- ✓ Module for creating and managing network elements and services with routing function.
- ✓ Supports dynamic routing protocols: RIP, OSPF, BGP and very fast RAY routing protocol
- ✓ Any port with MOD-CUS and MOD-TRX can work in router mode.
- ✓ Transmission speed of 1Gb/s between the switch and the router
- ✓ Advanced transmission security using IPSEC protocols with support for AES256 or VERNAMA algorithms,
- ✓ Virtual Private Network - VPN service support
- ✓ Built-in Software Firewall on layer 3.
- ✓ Switching to an alternative route in less than 100ms.
- ✓ Lossless redundancy with VRRP and ZEROloss protocol.
- ✓ Support for up to five independent routing engines in Virtual routing and forwarding technology
- ✓ Dynamic Network Address Translation (NAT)
- ✓ Easy routing configuration with ZeroConfig.

Mechanical drawing
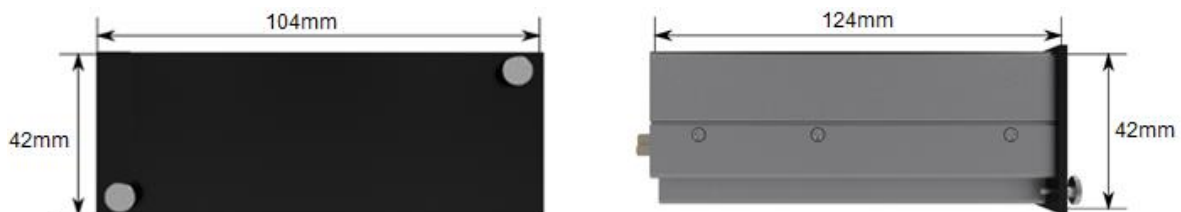
Hyperion 500 - Chassis 1U 19"

H500CH-1U8.x-X

H500CH	1U8.x	X
standard version (19" rack, 1U, 8 slots)	1U8.2	
IO version (19" rack, 1U, 8 slots, 1 relay output)	1U8.3	
On-board generator option		
OCXO generator		OCXO

Management module

MOD-CUS-Y-L

MOD	CUS	Y	L
central 10G module for switch system and module management	CUS.2		
Version			
4x SFP+ slot (1G/2.5G/10G) - **4SP** version, up to 32 Ethernet ports available in modules		4SP	
Routing option			
Standard			-
Static routing			L3

Power supply module

MOD-PSU-Z

MOD	PSU	Z
AC/DC power supply module to power the enclosure and modules	PSU.1	
DC power supply module to power the chassis and modules	PSU.2	
Version		
75W AC/DC power supply		75W
75W DC power supply		75W

SFP or UTP Transceiver Module

MOD-TRX-B-K

MOD	TRX	B	K
Transmission module with transceivers	TRX.1		
SFP version (applies to one module)			
8 x SFP (100M/1G) (100Mbps speed on Optical Interface only works with optical SFP inserts)		8S	
RJ45 version (applies to one module)			
8x RJ45 (10M/100M/1G)		8UG	
Standard function			
built-in primary 4kV 10/700µs ITU K.44 surge protection in TRX.1 modules on RJ-45 ports			K[1]

Legend:
1 - Only available in module with electrical interfaces in version 8UG

Dual media converter module

MOD-DMC-Z

MOD	DMC	Z
dual media converter with **MACSec**	DMC.1	
Version		
2x SFP (100M/1G) +4x RJ45 (10M/100M/1G) (The 100Mbps speed on the Optical Interface only works with optical SFP cartridges)		4UG2S

GNSS receiver module

MOD-QUAZAR-GPS-OCXO-X-Y

MOD-QUAZAR	GPS	OCXO	X	Y
GNSS receiver for chassis and module synchronization	GPS.1			
On-board generator version				
Type of on-board generator		OCXO		
On-board generator version				
OCXO generator with ±20 ppb stability with sustained stability for a minimum of 0.5 hours			L	
OCXO generator with ±1 ppb stability with sustained stability for a minimum of 8 hours			M	
OCXO generator with stability of ±0.1 ppb with sustain stability for a minimum of 48 hours at a temperature change of 5°C and 24 hours at a temperature change of 20°C			H	
Version				
1x GNSS signal antenna input				1A
1x GNSS signal antenna input, 1x E1 signal output G.703, G.704				1A1E

IRIG-B module

MOD-IRB-B

MOD	IRB	B
IRIG-B module	IRB.1	
Version		
IRIG-B module with interfaces 2x BNC unmodulated, 2x BNC modulated and 2x multimode optical interfaces for 850nm wave with ST connectors		4BNC2ST

REDBOX module

MOD-RBX-Y

MOD	RBX	Y
RedBox PRP/HSR module without PTP support	RBX.0	
RedBox PRP/HSR module	RBX.1	
Version		
2x SFP (100/1000Mb/s). (The 100Mbps speed on the optical interface only works with optical SFP cartridges)		2S

Serial port server module

MOD-SRL-RS

MOD	SRL	RS
serial port server module	SRL.1	
On-board generator version		
4x RS485/422/232 server module with RJ45 connectors		4MR

ROUTER module

MOD-RTR

MOD	RTR
router module	RTR.1

Overview of licenses that extend the capabilities of the HYPERION-500 switch

SYNCE LICENSE - Synchronous Ethernet G.8261 - a license to add Synchronous Ethernet G.8261 (Timing and synchronization aspects in packet networks) functionality on optical ports , providing precise synchronization of internal clocks of devices using frequencies for energy applications, among others.

PTP SYNCHRONIZATION LICENSE with POWER PROFILE - License to extend in IEEE1588 PTPv2 protocol with POWER PROFILE - IEEEC37.238-2011, IEEEC37.238-2017 and IEC61850-9-3 for precise time synchronization among other applications in the power industry

Summary of licenses that extend the capabilities of the MOD-QUAZAR-GPS module

LICENSE 1P1T - license to extend the functionality of the GNSS module with additional output signals 1x 1PPS signal input and 1x 1PPS signal output, 1x 10Mhz signal input and 1x 10Mhz signal output, 1x TOD (Time-of-Day) signal input, among others; with support for IEEE 1588 v2 Precision Time Protocol and SyncE,

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