



Manageable Grand Master Clock and Time Server for Ethernet synchronization and quality analyzer

- Grand Master Clock and managed analyzer for network synchronization quality with **4/8x slots SFP+ (1G/2,5G/10Gbps)**
- Master clock or qualitative analysis of up to **8 IEEE1588 PTPv2** clock domains for the profiles **G.8275.1** (telecommunication profile) and **C37.238** (Energy sector profile)
- Qualitative analysis of up to 4 synchronous Ethernet clock domains along with SSM ITU message analysis **T- G8264**.
- Built-in time server with **PTPv.2, NTP (RFC5905-09/RFC1305), SyncE, SNTP (RFC4330/RFC2030), ToD, PPS, 10MHz, G.703 / G.704**
- The accuracy of **GNSS-synchronized** reference time is better than **± 50ns**.
- Precise local **OCXO** or **Rubidium** oscillator for sustaining purposes (Holdover).
- High-performance CPU for system management.
- Built-in LCD display for the lecture of selected parameters.
- Multisystem GNSS receiver, GPS, Galileo, Glonass, Beidou.
- IEEE802.1x authentication, **RADIUS, Tacacs+, -AAA**
- Ipv4, Ipv6, WWW, telnet, SSH and local CLI management, SNMP v1/v2c/v3v.
- Operating temperature: **-5°C to +60°C**
- Redundant power supply of **80-360 V DC, 75-270 V AC** or **45 - 60V DC**

Description of the device

Functionality

QUAZAR-500 is a manageable Grand Master Clock and time server for Ethernet synchronization, and can also work as a synchronization quality analyzer, the device is equipped with a GPS module and 4/8x SFP+ (1G/2,5G/10Gbps) slots and 2x RJ45 as NMI ports, this allows simultaneous monitoring of the synchronization signals for SYNCe and for PTP. Distinguished also by the numbers of ports and speed of 10Gbps Ethernet ports, which is used in intelligent applications for energy sector and telecommunications.

Selected features

Depending on the version, the device can be equipped with 4 or 8 SFP+ 10Gbps slots, which corresponds to 4 or 8 PTPv2 transmission channels and, respectively, with 2 or 4 SyncE clock domains. QUAZAR-500 is equipped with a GNSS module with a very high precision with an OCXO or Rubidium oscillator. This provides reference signals and the ability to transmit PPS (pulse per seconds) precision signals to subsequent monitoring devices.

The device has a built-in memory for data storage, allowing a local storage measurement statistics up to 72 hours. Additionally, it is possible to present the results in the form of statistics, logs and charts in dedicated analytical software and systems.

In the basic version of the device, synchronization analyzer will offer the ability to monitoring parameters such as:

- Grand Master Clock with PRC quality
- PTPv2 IEEE 1588 with four instances
- NTP with stratum 1
- 1PPS signal output
- Holdover with very high stability
- PTP 2WAY TE (2way Time Error).
- PTP datasets (minimum login: GrandmasterID, clock class, clock accuracy, priority2, steps removed)
- Presentation of time charts in the GUI (WWW)

On the other hand, the measurements available in PTPv2 profile are:

- IEEE 1588 Custom Profile
- G.8275.1
- G.8265.1
- C37.238 (2011/2017)

Environmental requirements

QUAZAR-500 has been designed to operate in the temperature range from **-5 °C** to **+ 60 °C**. Durable metal housing IP-30 ensures operation of the device in harsh environmental conditions. The device has various housing versions enabling installation in 19" cabinets with a height of 1U for OCXO or 2U for RUBID generators, an optional redundant power supply is also available, which ensures stable and continuous operation in the event of failure of one of the power supplies.

The diagram and functionalities of the application are presented in the figures below.

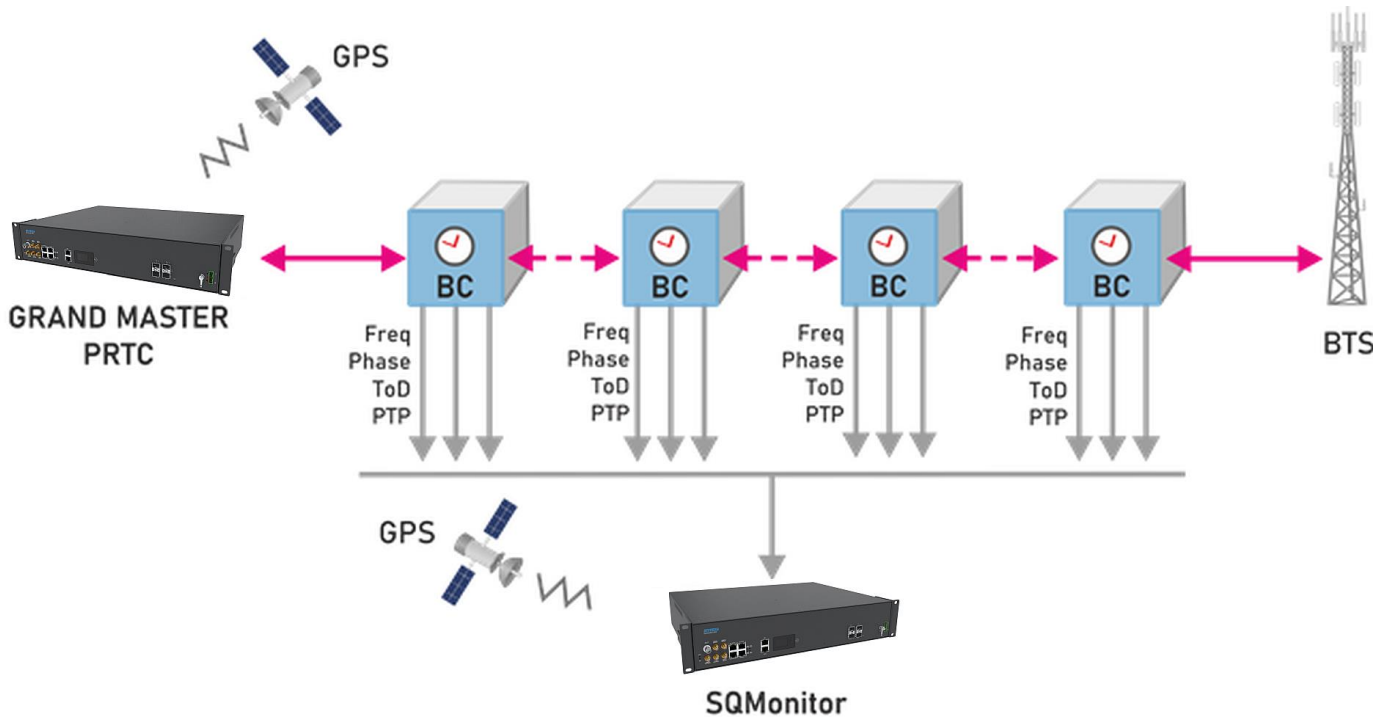


Fig. 2. The application of the usability of the device for synchronization and monitoring the quality of synchronization signals

Management

The management of the device is available through the built-in **HTTP** server, as well as **SSH** server, **RS232** console and **SNMPv.3** agent. This will allow you to configure the device parameters via a standard web browser or CLI command line and constant monitoring from any management platform. Additionally, the device

has implemented additionally authentication mechanisms such as IEEE802.1x, RADIUS, Tacacs+, -AAA. Also count with support for remote software update for the device. This will increase the functionality of the device in the future.

Technical specifications

General specifications, supported standards and protocols

- IEEE 802.3u 100Base-TX Ethernet,
- IEEE 802.3ab 1000Base-T,
- IEEE 802.3z Gigabit Fiber,
- IEEE 802.3ae 10GBASE-SR/LR/ER/ZR (SFP+) 10 Gigabit Ethernet
- IEEE 802.1Q VLAN up to 4095 active VLANs,
- IEEE 802.1ad QinQ,
- 802.1AB IEEE Link Layer Discovery Protocol (LLDP)
- IEEE 802.1w - Rapid Spanning Tree Protocol (RSTP)
- IEEE 802.1s - Multiple Spanning Tree Protocol (MSTP)

Network synchronization

- IEEE 1588-2008 v2 PTP standard support for synchronization with the profile 1588, G.8275.1, G.8265.1 or C37.238-2011/2017

⊕ **GMC** (Grand Master Clock),

⊕ **BC** (Boundary Clock)

- PPS & ToD monitoring in ITU G.827 format
- Synchronous Ethernet, G.8261, G.8282, G.8264

Security network

- IEEE 802.1x Port Based Network Access Protocol, EAP, TACACS +, RADIUS - Authentication, Authorization and Billing - AAA

Ethernet interface

- 19" RACK 1U/2U Ethernet connectors: 4 or 8 SFP+ 1/2.5/10Gbps and 1 or 2 RJ45 10/100/1000Mbps ports

GNSS module

- Antenna input with support for active antennas with BNC connector

- RS422 interface with ToD (time-of-day) signal from RJ45 connector
- 10Mhz signal from SMA connector
- Coax (PPS) interface with SMA connector
- 184 - channel receiver working with GPS, GLONASS, BeiDou, Galileo
- GNSS receiver sensitivity with LNA: -167dBm tracing, -157dBm warm start option
- High precision of the receiver: PPS: ± 50 ns
- Possibility of equipping with stable on-board generator with different parameters:
 - OCXO generator with stability of ± 20 ppb and holdover support time in the range $\pm 1.5 \mu$ s for a minimum of 0.5 hours
 - OCXO generator with stability of ± 2 ppb and holdover support time in the range $\pm 1.5 \mu$ s for a minimum of 4 hours
 - Rubidium generator with short term stability 8E-12 @ 100s, ageing/day 0.005 ppb, ageing/month 0.05 ppb.

OCXO

- Dimensions with modules [mm]: 440 x 325 x 88 with RUBID

Management

- IPv4, IPv6, ARP, ICMP, TCP, UDP, DNS,
- Configuration of permission level- read / write, independently configured for many users,
- NTP server/client,
- SSH,
- SNMP v1/v2c/v3,
- Local (Ethernet/RS-232) and remote CLI,
- System event and alarm log,
- Built-in LCD display
- DDMI – function of monitoring the SFP modules

Power supply

- Voltage range: 80-360VDC, 75-270VAC,
- Voltage range: 45-60 V DC
- Connector: screw - Terminal blok

Environmental operating requirements

- Operating temperature: -5°C to +60°C
- Standard ambient humidity during operation: 5%-95%
- Weight of device without modules: 5 kg,
- Dimensions with modules [mm]: 440 x 325 x 44 with

MTBF

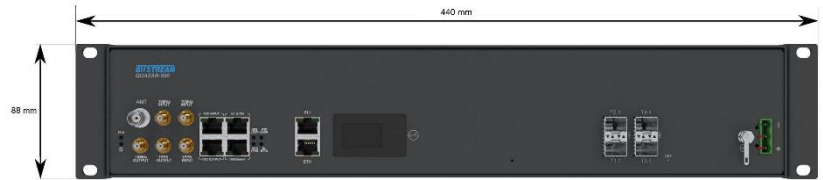
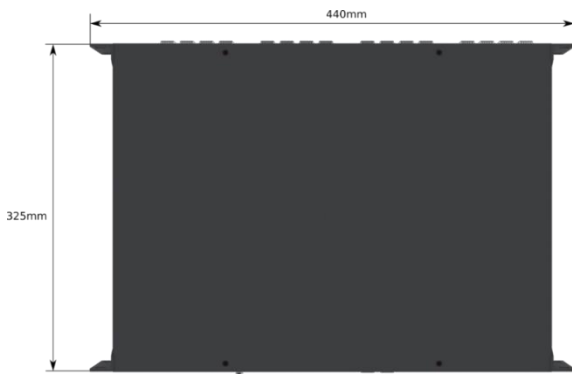
- At 30°C ambient temperature with OCXO oscillator >260.000 hours
- At 30°C ambient temperature with RUBID oscillator >245.000 hours

Supported standards, recommendations and EMC and safety directives*:

- PN-EN 55011:2012 - Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
- PN-EN 55022:2010/AC:2011 - Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- PN-EN 55024:2011/A1:2015-08 – Electromagnetic compatibility (EMC) - Information technology equipment immunity characteristics - Limits and methods of measurement
- PN-EN 60950-1:2007/A2:2014-05- Information technology equipment–Safety– Part 1: General requirements
- EMC 2004/108/WE – Electromagnetic Compatibility Directive
- LVD 2006/95/WE – Low Voltage Directive
- PN-EN 60825-1:2014-11 – Safety of laser products Part 1: Equipment classification and requirements
- IEC 61000-4-2 Electromagnetic compatibility (EMC)- Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
- IEC 61000-4-3 Electromagnetic compatibility (EMC)- Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
- IEC 61000-4-4 Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
- IEC 61000-4-5 Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
- IEC 61000-4-6 Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
- IEC 61000-4-8 Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test
- IEC 61000-4-11 Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests
- IEC 61000-4-12 Electromagnetic compatibility (EMC) – Part 4-12: Testing and measurement techniques – Ring wave immunity test
- IEC 61000-4-29 Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on DC input power port immunity tests
- IEC 61850-3 Communication networks and systems for power utility automation
- IEEE 1613-2009 - IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations

* - list of supported standards may vary with the development of the device

Mechanical drawing



Code

QUAZAR-500-X-GE-(X)-Z

Device version:

- 1 – 4x slot SFP+ 1/2,5/10G
- 2 – 8x slot SFP+ 1/2,5/10G

Generator version:

- OCXO – OCXO generator version
- RUBID – RUBIDIUM generator version

Power version:

- C – Power supply 80-360VDC, 75-270VAC
- 7 – power supply 45-60 VDC
- 77p – Redundant power supply 45-60 VDC

On-board generator version:

- No symbol – Rubidium version
- L – OCXO generator with stability ± 20 ppb supporting a minimum stability of 0.5 hour
- M – OCXO generator with stability ± 2 ppb supporting a minimum stability of 4 hours
- H – OCXO generator with stability $\pm 0,2$ ppb supporting a minimum stability of 72 hours

Licenses

List of extending capabilities of the QUAZAR-500 switch

1. **ADVANCED MONITORING LICENSE** – This is a license for additional NETWORK MONITORING functionalities

List of licenses extending the capabilities of the GNSS module

1. **STACK1P LICENSE** – This is a license to extend the functionality of the GNSS module with an additional 1PPS output signal, for stacking devices