1000 Product Series

Fully Modular
Time Reference Systems

The 1000 product series are fully modular time reference systems that support the Global Navigation Satellite Systems (GNSS) GPS, Galileo, GLONASS, BeiDou and IRNSS/NavIC, as well as NTP, PTP and various other time sources for precise and reliable time synchronization at extremely competitive prices and are particularly well suited for critical infrastructure applications.

Key Features

- Compact modules for DIN rail mounting in automation cabinets
- Easy functionality extension with up to six modules any time on site in case of changed or additional synchronization requirements
- Extended temperature range for reliable operation between –40° and +70°C
- GPS, Galileo, GLONASS, BeiDou, IRNSS/NavIC time sources for reliable satellite synchronization
- Average accuracy of ±30 ns to UTC, peak accuracy of ±100 ns to UTC for demodulated IRIG-B and pulse outputs and ±1 µs for modulated IRIG-B output
- Synchronization of IEC 61850 compatible devices with support for highest performance class T5
- Typical NTP time stamp accuracy <30 µs
- Precision Time Protocol (PTP) option with peak time stamp accuracy ±100 ns, support for IEC 61850-9-3:2016 Power Utility Automation Profile, IEEE C37.238-2017 Power Profile
- IEC 62439-3:2016 Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR) option, feature combinable with PTP

The 1000 product series time reference systems have been designed for mission critical applications with high requirements in terms of flexibility, availability, security and the support of a wide variety of time synchronization standards commonly used in public infrastructure, railway technology, air traffic control, power utility, digital smart grid and industry automation.

The compact and modular industrial-grade system design facilitates easy spare part management and minimum mean time to repair (MTTR). The modularity of the system also ensures security of investment if the requirements for the system should increase or change in the future.

For high availability each module is powered by its own integrated power supply. All modules are available either for wide range DC input voltage 14 – 160VDC with redundant power inputs or for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input.

Up to six modules can be connected in series to form a single time reference system with time domain controller module (time signal input from time source), service provider modules (time signal output / distribution to customer application) and management controller module. The interconnection logic ensures that power failure of one module does not affect continuous operation of the remaining modules.

Resilient Timing

- Built-in by default GNSS firewall with multi-layered anti-jamming and anti-spoofing technologies and interference mitigation
- Multi redundant time sources and time source prioritization safeguard precise and resilient timing signal synchronization even with most demanding availability requirements

The 1000 product series time domain controllers facilitate evaluation of time signals from multiple time sources like GNSS satellite systems, NTP/PTP network time signals as well as various other time sources. On receiver and firmware level the time domain controllers implement consistency checks and statistical tests on features such as automatic gain control (AGC), clock error, signal quality, signal power, propagation delay and the angle of arrival in order to safeguard error-free and leap-free time signal evaluation. In case of signal loss due to antenna failure or identification of time signal mismatch due to jamming or spoofing attacks the time domain controller clock automatically switches to available redundant time sources or the integrated oscillator circuit holdover ensuring the oscillator dependent freewheeling accuracy. For unprecedented availability multi redundant time source configurations with prioritizable fall back time sources are supported.

System Configuration and Monitoring

- huma® web edition, HTTPS web interface
- Integrated event log
- Diagnostics and monitoring via SNMP v2c and v3 read operations (MIB II, ***hopf*** private enterprise MIB, NTPv4 MIB, PTPBASE MIB, IEEEC37.238 MIB, IEC-62439-3 MIB)
- Event notification using SNMP traps, email messaging and / or external SYSLOG server

Time domain controller modules with integrated management controller as well as standalone independent management controller modules allow easy configuration and monitoring using the ***hopf*** unified management application **huma® web edition** which features secure access to the system via an intuitive to use state-of-the-art web interface. All interconnected modules can be centrally configured. System configurations may be saved for the entire connected time reference system or for each individual module separately.

The management controller continuously monitors the health status of all connected modules and components. It collects diagnostic and statistical data for the integrated event log and for real time notification of critical events to external IT management systems using email messaging, SNMP traps or external SYSLOG server.

Enhanced IT/OT Security

- Separation of diagnostic and operational / productivity networks for guaranteed cyber security
- Role based access control (RBAC) with support of LDAP and RADIUS authentication according to IEC 62351-8:2020
- Built-in by default network firewall for provision of barrier against network-based intrusion attempts
- Certificate signed configuration files and firmware packages

The current demand for the convergence of Information Technologies (IT) and Operational Technologies (OT) in critical infrastructure requires to ensure cyber security and reliability in compliance with regulatory requirements. The modular system design of the 1000 product series allows complete separation of networks (e.g. process bus for power utility applications) for guaranteed cyber security while allowing complete access to diagnostic data and critical events for IT network management via integrated or standalone management controller. Role based access control according to the most up-to-date standards safeguards secure access to the management controller by authorized staff. The built-in by default network firewall feature adds even increased security against network-based intrusion attempts by limiting access to the minimum necessary network connections and services. All configuration files and firmware update packages may be signed by certificate to ensure authenticity and eligibility for application. The system fulfills security level 2 according to IEC 62443-4-2:2019.

Time Domain Controller Modules

FG1000G01	Time Domain Controller Module for product series 1000 ■ Standard precision single-band L1 GNSS receiver for concurrent evaluation of GPS, GLONASS, BeiDou and Galileo with connection via SMA connector (female) ■ TCXO oscillator (236,71 µs per day at constant temperature after 2 days of continuous operation) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1000G02	Time Domain Controller Module for product series 1000 ■ Standard precision single-band L1 GNSS receiver for concurrent evaluation of GPS, GLONASS, BeiDou and Galileo with connection via SMA connector (female) ■ OCXO oscillator for enhanced freewheeling stability (25,9 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1000G03	Time Domain Controller Module for product series 1000 ■ Standard precision single-band L1 GNSS receiver for concurrent evaluation of GPS, GLONASS, BeiDou and Galileo with connection via SMA connector (female) ■ OCXO HPFS oscillator for high precision freewheeling stability (4,32 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1001G01	Time Domain Controller Module for product series 1000 ■ Standard precision single-band L1 GNSS receiver for concurrent evaluation of GPS, GLONASS, BeiDou and Galileo with connection via SMA connector (female) ■ TCXO oscillator (236,71 µs per day at constant temperature after 2 days of continuous operation) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs

FG1001G02	Time Domain Controller Module for product series 1000 ■ Standard precision single-band L1 GNSS receiver for concurrent evaluation of GPS, GLONASS, BeiDou and Galileo with connection via SMA connector (female) ■ OCXO oscillator for enhanced freewheeling stability (25,9 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs
FG1001G03	Time Domain Controller Module for product series 1000 ■ Standard precision single-band L1 GNSS receiver for concurrent evaluation of GPS, GLONASS, BeiDou and Galileo with connection via SMA connector (female) ■ OCXO HPFS oscillator for high precision freewheeling stability (4,32 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs
FG1000G11	Time Domain Controller Module for product series 1000 ■ High precision dual-band L1/L5/E5a GNSS receiver for GPS, GLONASS, BeiDou, Galileo and IRNSS/NavIC with connection via SMA connector (female) ■ TCXO oscillator (236,71 µs per day at constant temperature after 2 days of continuous operation) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1000G12	Time Domain Controller Module for product series 1000 ■ High precision dual-band L1/L5/E5a GNSS receiver for GPS, GLONASS, BeiDou, Galileo and IRNSS/NavIC with connection via SMA connector (female) ■ OCXO oscillator for enhanced freewheeling stability (25,9 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input

FG1000G13	Time Domain Controller Module for product series 1000 ■ High precision dual-band L1/L5/E5a GNSS receiver for GPS, GLONASS, BeiDou, Galileo and IRNSS/NavIC with connection via SMA connector (female) ■ OCXO HPFS oscillator for high precision freewheeling stability (4,32 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1001G11	Time Domain Controller Module for product series 1000 ■ High precision dual-band L1/L5/E5a GNSS receiver for GPS, GLONASS, BeiDou, Galileo and IRNSS/NavIC with connection via SMA connector (female) ■ TCXO oscillator (236,71 µs per day at constant temperature after 2 days of continuous operation) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs
FG1001G12	Time Domain Controller Module for product series 1000 ■ High precision dual-band L1/L5/E5a GNSS receiver for GPS, GLONASS, BeiDou, Galileo and IRNSS/NavIC with connection via SMA connector (female) ■ OCXO oscillator for enhanced freewheeling stability (25,9 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs
FG1001G13	Time Domain Controller Module for product series 1000 ■ High precision dual-band L1/L5/E5a GNSS receiver for GPS, GLONASS, BeiDou, Galileo and IRNSS/NavIC with connection via SMA connector (female) ■ OCXO HPFS oscillator for high precision freewheeling stability (4,32 µs per day after 7 days of continuous operation (±1°C) ■ Dry contact for alarm / status output ■ Time server and integrated management controller with 2x ethernet interface 10/100/1000Base-T (RJ45) according to IEEE 802.3 for: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs

Time Service Provider Modules

FG1020N00	Time Service Provider Module for product series 1000 ■ Time server with 2x ethernet interface 10/100/1000Base-T via 2x RJ45 connector (copper) according to IEEE 802.3 for output of: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) ■ ***hopf*** product series 1000 interconnection cable KA1000B01, 20cm (7.87 inch) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1021N00	Time Service Provider Module for product series 1000 ■ Time server with 2x ethernet interface 10/100/1000Base-T via 2x RJ45 connector (copper) according to IEEE 802.3 for output of: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) ■ ***hopf*** product series 1000 interconnection cable KA1000B01, 20cm (7.87 inch) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs
FG1020N01	Time Service Provider Module for product series 1000 ■ Time server with 2x ethernet interface via 2x SFP transceiver module with LC fiber optic connector according to IEEE 802.3 for output of: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) ■ ***hopf*** product series 1000 interconnection cable KA1000B01, 20cm (7.87 inch) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input
FG1021N01	Time Service Provider Module for product series 1000 ■ Time server with 2x ethernet interface via 2x SFP transceiver module with LC fiber optic connector according to IEEE 802.3 for output of: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) ■ ***hopf*** product series 1000 interconnection cable KA1000B01, 20cm (7.87 inch) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs

Management Controller Modules

FG1000M00	Standalone independent Management Controller Module for product series 1000 ■ Dry contact for alarm / status output ■ Management controller with 2x ethernet interface 10/100/1000Base-T via 2x RJ45 connector (copper) according to IEEE 802.3 for output of: - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Time server for output of: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) ■ ***hopf*** product series 1000 interconnection cable KA1000B01, 20cm (7.87 inch) ■ Power supply for wide range AC/DC input voltages 90 – 264VAC (50Hz / 60Hz) / 125 – 250VDC with single power input

FG1001M00	Standalone independent Management Controller Module for product series 1000 ■ Dry contact for alarm / status output ■ Management controller with 2x ethernet interface 10/100/1000Base-T via 2x RJ45 connector (copper) according to IEEE 802.3 for output of: - HTTP/HTTPS, SNMP, SNMP Traps, SMTP, Syslog and huma® software (***hopf*** unified management application) ■ Time server for output of: - Network Time Protocol NTP/SNTP v4.2.x (RFC 5905) ■ ***hopf*** product series 1000 interconnection cable KA1000B01, 20cm (7.87 inch) ■ Power supply for wide range DC input voltage 14 – 160VDC with redundant power inputs

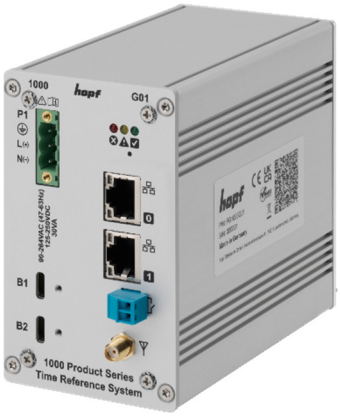
Firmware Activation Options

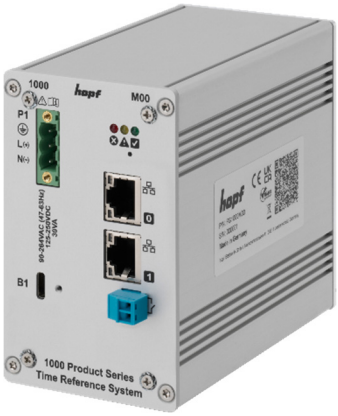
LI1000A01	Activation key for activation of the following feature for product series 1000: ■ Support for Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR) according to IEC 62439-3:2016 for use as Dual Attached Node (DAN) ■ Activation key for one (1) module
LI1000A02	Activation key for activation of the following feature for product series 1000: ■ Support for Precision Time Protocol (PTP) according to IEEE Std 1588™-2019 with support for IEEE Standard Profile for use of IEEE 1588™ Precision Time Protocol in Power System Applications (Power Profile v1) according to IEEE Std C37.238™-2011, Profile for Power Utility Automation according to IEC 61850-9-3:2016, IEEE Standard Profile for use of IEEE 1588™ Precision Time Protocol in Power System Applications (Power Profile v2) according to IEEE Std C37.238™-2017 and Telecom Profile for phase/time synchronization according to ITU-T G.8275.1 / G.8275.2 (from hardware Rev B) ■ Activation key for one (1) module
LI1000A03	Activation key for activation of the following feature for product series 1000: ■ Support for SIMATIC NET SINEC H1 Time Datagram Protocol ■ Activation key for one (1) module
LI1000A04	Activation key for activation of the following feature for product series 1000: ■ Support for Precision Time Protocol (PTP) according to IEEE Std 1588™-2019 as time source for time domain controller boards ■ Activation key for one (1) module
LI1000A05	Activation key for activation of the following feature for product series 1000: ■ Support for Network Time Protocol (NTP/SNTP) according to RFC 5905 as time source for time domain controller boards ■ Activation key for one (1) module

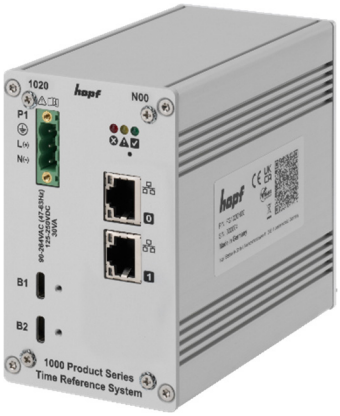
Accessories

FG9000F00	***hopf*** SFP transceiver module, 1000BASE-SX ■ Multi-mode fiber (MMF), wavelength 850nm ■ Max. cable distance: 550m@50/125µm OM2 MMF 275m@62.5/125µm OM1 MMF ■ Max. data rate: 1.25Gbps ■ Connector: LC Duplex ■ Temperature range: -40°C to +85°C (-40°F to +185°F)
FG9000F01	***hopf*** SFP transceiver module, 1000BASE-LX/LH ■ Single-mode fiber (SMF), wavelength 1310nm ■ Max. cable distance: 10km@OS1 SMF 20km@OS2 SMF ■ Max. data rate: 1.25Gbps ■ Connector: LC Duplex ■ Temperature range: -40°C to +85°C (-40°F to +185°F)
FG9000F02	***hopf*** SFP transceiver module, 100BASE-FX ■ Multi-mode fiber (MMF), wavelength 1310nm ■ Max. cable distance: 2km@50/125µm OM2 MMF 1km@62.5/125µm OM1 MMF ■ Max. data rate: 100Mbps ■ Connector: LC Duplex ■ Temperature range: -40°C to +85°C (-40°F to +185°F)
FG9000F03	***hopf*** SFP transceiver module, 1000BASE-EX ■ Single-mode fiber (SMF), wavelength 1310nm ■ Max. cable distance: 40km@OS2 SMF ■ Max. data rate: 1.25Gbps ■ Connector: LC Duplex ■ Temperature range: -40°C to +85°C (-40°F to +185°F)
KA1000B01	***hopf*** product series 1000 interconnection cable, 20cm (7.87 inch)







Applied Standards

Electromagnetic Compatibility	
IEC 61000-3-2:2018 + A1:2020 + ISH1:2021	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
IEC 61000-3-3:2013 + A1:2017 + A2:2021 + A2:2021/COR1:2022	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
IEC 61000-4-2:2008	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
IEC 61000-4-3:2020	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
IEC 61000-4-5:2014 + A1:2017	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
IEC 61000-4-6:2013	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61000-4-11:2020 + COR1:2020	Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests
IEC 61000-4-12:2017	Electromagnetic compatibility (EMC) – Part 4-12: Testing and measurement techniques – Ring wave immunity test
IEC 61000-4-17:1999 + A1:2001	Electromagnetic compatibility (EMC) - Part 4-17: Testing and measurement techniques - Ripple on d.c. input power port immunity test
IEC 61000-4-18:2019 + COR1:2019	Electromagnetic compatibility (EMC) - Part 4-18: Testing and measurement techniques - Damped oscillatory wave immunity test
IEC 61000-4-29:2000	Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques; Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests
IEC 61000-6-2:2016	Electromagnetic compatibility (EMC). Part 6-2: Generic standards – Immunity for industrial environments
IEC 61000-6-3:2020	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments

IEC 61000-6-4:2018	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
IEC 61000-6-5:2015/COR1:2017	Electromagnetic compatibility (EMC) - Part 6-5: Generic standards - Immunity for equipment used in power station and substation environment
EN 50121-4:2016	Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus
EN 55016-2-1:2014 /A1:2017 (CISPR 16-2-1:2014 +A1:2017)	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements
EN 55016-2-3:2017 /A1:2019 (CISPR 16-2-3:2016 +A1:2019)	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements
EN 55032:2015/AC:2016/ A11:2020/A1:2020 (CISPR 32:2015 + COR1:2016 + A1:2019)	Electromagnetic compatibility of multimedia equipment – Emission Requirements (150kHz – 30 MHz)
EN 55035:2017 (CISPR 35:2016, modified)	Electromagnetic compatibility of multimedia equipment – Immunity requirements

Safety

IEC 62368-1:2018	Audio/video, information and communication technology equipment – Part 1: Safety requirements
IEC 60529:1989/A1:1999 /A2:2013	Degrees of protection provided by enclosures (IP Code)

Security

IEC 62443-4-2:2019	Security for industrial automation and control systems - Part 4-2: Technical security requirements for IACS components

Radio Equipment and GNSS receivers

EN 301 489-1 V2.2.3 (2019-11)	Electromagnetic Compatibility (EMC) standard for radio equipment and services – Part 1: Common technical requirements – Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
EN 301 489-19 V2.1.1 (2019-04)	Electromagnetic Compatibility (EMC) standard for radio equipment and services – Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation and timing data – Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
EN 303 413 V1.2.1 (2021-04)	Satellite Earth Stations and Systems (SES) – Global Navigation Satellite System (GNSS) receivers – Radio equipment operating in the 1164 MHz to 1300 MHz and 1559 MHz to 1610 MHz frequency bands – Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Environmental

IEC 60068-2-1:2007	Environmental testing – Part 2-1: Tests – Test A: Cold
IEC 60068-2-2:2007	Environmental testing – Part 2-2: Tests – Test B: Dry heat
IEC 60068-2-30:2005	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)
IEC 60255-21-1:1988	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment; section 1: Vibration tests (sinusoidal)
IEC 60255-21-2:1988	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment; section 2: Shock and bump tests
IEC 60255-21-3:1993	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment; section 3: Seismic tests
IEC 60721-2-3:2013	Classification of environmental conditions - Part 2-3: Environmental conditions appearing in nature - Air pressure
IEC 61850-3:2013	Communication networks and systems for power utility automation - Part 3: General requirements
IEC 63000:2016	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

IEEE 1613-2009	Environmental and testing requirements for communications networking devices installed in electric power substations

Mechanical

IEC 60715:2017	Dimensions of low-voltage switchgear and controlgear - Standardized mounting on rails for mechanical support of switchgear, controlgear and accessories

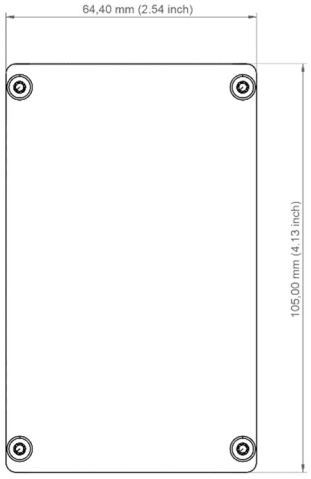
Power Industries Specific

IEC 61850-5:2013	Communication networks and systems for power utility automation - Part 5: Communication requirements for functions and device models

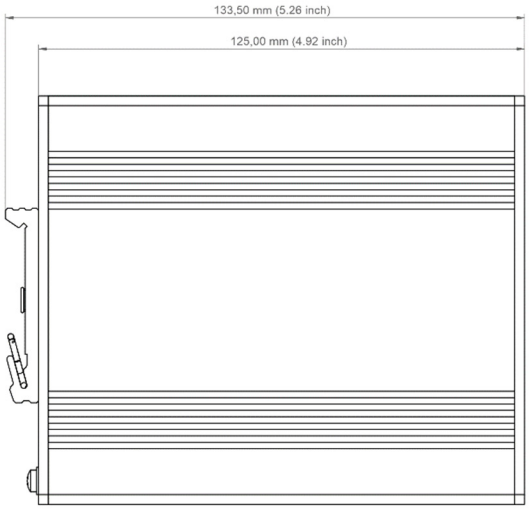
Technical Specifications

Mechanical Data

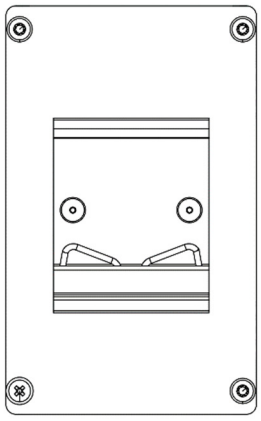
Housing	DIN rail housing with mounting clip for 35mm DIN rail according to DIN EN 60715 TH35
Dimensions	Width: 64.4 mm (2.54 inch) Height: 105.00 mm (4.13 inch) Depth: 133.5 mm (5.26 inch), without connectors on front plate
Material	anodized aluminum
Color	natural colored
Protection Class	IP50 according to IEC 60529
Weight	0.8 kg (1.76 lbs)



front view



side view



rear view

Environmental Conditions

Operating Temperature	-40 °C to +70 °C (-40 °F to +158 °F) according to IEC 61850-3 and IEEE 1613
Storage Temperature	-40 °C to +70 °C (-40 °F to +158 °F) according to IEC 61850-3 and IEEE 1613
Operating Altitude	up to 5,000 m (16,404 ft) above sea level according to IEC 61850-3
Relative Humidity	5 to 95 % (non-condensing) at 40 °C (104 °F) according to IEC 61850-3
Operating Environment	Pollution Degree: 3 Overvoltage Category: II
Reliability (MTBF)	300.000h

Environmental and Electromagnetic Compatibility Tests

Temperature	IEC 60068-2-1	Severity Level 16h at -40°C	
	IEC 60068-2-2	Severity Level 16h at +85°C storage	
		Severity Level 16h at +65°C operating	
	IEC 60068-2-14	Severity Level -20° to +55°C, 5 cycles	
	IEC 60068-2-30	Severity Level +25° to +55°C, 6 cycles, RH 95%	
	IEC 60068-2-78	Severity Level 240h at +40°C, RH 95%	
Mechanical Stress	IEC 60255-21-1	Severity Level Class 2	
	IEC 60255-21-2	Severity Level Class 2	
	IEC 60255-21-3	Severity Level Class 2	
Electromagnetic Compatibility	EN 55032 (CISPR 32)	Class B	
	IEC 61000-4-2	Severity Level 4	8kV contact / 15kV air
	IEC 61000-4-3	Severity Level 3	10V/m
	IEC 61000-4-4	Severity Level 4	4kV power connector 4kV signal connector
	IEC 61000-4-5	Severity Level 4	2kV line-to-line 4kV line-to-earth
	IEC 61000-4-6	Severity Level 3	10V
	IEC 61000-4-11	Severity Level X	30% one period 60% 50 periods 100% 5 periods 100% 50 periods
	IEC 61000-4-12	Severity Level 3	1kV line-to-line 2,5kV line-to-earth
	IEC 61000-4-17	Severity Level 3	10%
	IEC 61000-4-18	Severity Level 3	1kV line-to-line 2,5kV line-to-earth
	IEC 61000-4-29	Severity Level X	30% 0,1sec 60% 0,1sec 100% 0,05sec

Module Dependent Specifications

FG1000G01

Power Supply with single power input

Input Voltage:	90-264VAC 125-250VDC
Input Frequency:	47-63Hz for AC input voltage
Input Current:	max. 0,4A@230VAC

Ethernet

Ports	2
Data Rate	10/100/1000Mbps
Connector	RJ45

Status Output

Dry Contact	
Operating Voltage	+/-250VDC
Operating Current	max. 120mA

Boot time

typ. ≤ 40 seconds depending on the configuration

Antenna

Supply Voltage	5V±10%
Current	max. 100mA

Receiver

Receiver type	Standard precision, single-band L1	
GNSS systems	GPS, GLONASS, Beidou, Galileo	
Channels	92	
Time to first fix	Warm start:	<2s
	Cold start:	<29s
Sensitivity	Tracking:	-166dBm
	Warm start:	-159dBm
	Cold start:	-148dBm
Accuracy	RMS	30ns

Clock Accuracy

Internal PPS	±15ns (after 5 minutes GNSS reception with clear sky view, fixed position mode)
Holdover	236,71µs per day at constant temperature after 2 days of continuous operation

NTP

Timestamp Accuracy	typ. <30µs
Requests per second	25.000

PTP

Timestamp Accuracy	typ. <50ns to system internal PPS

FG1000G02

Identical to FG1000G01 except holdover

Clock Accuracy

Holdover	25,9µs per day after 7 days of continuous operation (±1°C)

FG1000G03

Identical to FG1000G01 except holdover

Clock Accuracy

Holdover	4,32µs per day after 7 days of continuous operation (±1°C)

FG1001G01	**Power Supply with redundant power inputs**		
	Input Voltage:	14-160VDC	
	Input Current:	max. 2,2A@14VDC	
	Ethernet		
	Ports	2	
	Data Rate	10/100/1000Mbps	
	Connector	RJ45	
	Status Output		
	Dry Contact		
	Operating Voltage	+/-250VDC	
	Operating Current	max. 120mA	
	Boot time		
	typ. ≤ 40 seconds depending on the configuration		
	Antenna		
	Supply Voltage	5V±10%	
	Current	max. 100mA	
	Receiver		
	Receiver type	Standard precision, single-band L1	
	GNSS systems	GPS, GLONASS, Beidou, Galileo	
	Channels	92	
	Time to first fix	Warm start:	<2s
		Cold start:	<29s
	Sensitivity	Tracking:	-166dBm
		Warm start:	-159dBm
		Cold start:	-148dBm
	Accuracy	RMS	30ns
	Clock Accuracy		
	Internal PPS	±15ns (after 5 minutes GNSS reception with clear sky view, fixed position mode)	
	Holdover	236,71µs per day at constant temperature after 2 days of continuous operation	
	NTP		
	Timestamp Accuracy	typ. <30µs	
	Requests per second	25.000	
	PTP		
	Timestamp Accuracy	typ. <50ns to system internal PPS	
FG1001G02	Identical to FG1000G01 except holdover		
	Clock Accuracy		
	Holdover	25,9µs per day after 7 days of continuous operation (±1°C)	
FG1001G03	Identical to FG1000G01 except holdover		
	Clock Accuracy		
	Holdover	4,32µs per day after 7 days of continuous operation (±1°C)	

FG1000G11 FG1000G12 FG1000G13	Identical to FG1000G01/FG1000G02/FG1000G03 except receiver and clock accuracy		
	Receiver		
	Receiver type	High precision, dual-band L1/L5/E5a	
	GNSS systems	GPS, GLONASS, Beidou, Galileo, IRNSS/NavIC	
	Time to first fix	Warm start:	<2s
		Cold start:	<29s
	Sensitivity	Tracking:	-167dBm
		Warm start:	-159dBm
		Cold start:	-148dBm
	Accuracy	1-sigma	10ns
		1-sigma jitter removed	5ns
	Clock Accuracy		
	Internal PPS	±10ns (after 5 minutes GNSS reception with clear sky view, fixed position mode)	
	Holdover	236,71µs per day at constant temperature after 2 days of continuous operation	
FG1001G11 FG1001G12 FG1001G13	Identical to FG1001G01/FG1001G02/FG1001G03 except receiver and clock accuracy		
	Receiver		
	Receiver type	High precision, dual-band L1/L5/E5a	
	GNSS systems	GPS, GLONASS, Beidou, Galileo, IRNSS/NavIC	
	Time to first fix	Warm start:	<2s
		Cold start:	<29s
	Sensitivity	Tracking:	-167dBm
		Warm start:	-159dBm
		Cold start:	-148dBm
	Accuracy	1-sigma	10ns
		1-sigma jitter removed	5ns
	Clock Accuracy		
	Internal PPS	±10ns (after 5 minutes GNSS reception with clear sky view, fixed position mode)	
	Holdover	236,71µs per day at constant temperature after 2 days of continuous operation	

FG1020N00	**Power Supply with single power input** Input Voltage: 90-264VAC 125-250VDC Input Frequency: 47-63Hz for AC input voltage Input Current: max. 0,4A@230VAC **Ethernet** Ports 2 Data Rate 10/100/1000Mbps Connector RJ45 **Boot time** typ. ≤ 40 seconds depending on the configuration **Time Accuracy** Internal time accuracy ±15ns to system internal PPS **NTP** Timestamp Accuracy typ. <30µs Requests per second 25.000 **PTP** Timestamp Accuracy typ. <50ns to system internal PPS
FG1021N00	Identical to FG1020N00 except power supply **Power Supply with redundant power inputs** Input Voltage: 14-160VDC Input Current: max. 2,2A@14VDC
FG1020N01	**Power Supply with single power input** Input Voltage: 90-264VAC 125-250VDC Input Frequency: 47-63Hz for AC input voltage Input Current: max. 0,4A@230VAC **Ethernet** Ports 2 Data Rate dependent on SFP transceiver module Connector LC **Boot time** typ. ≤ 40 seconds depending on the configuration **Time Accuracy** Internal time accuracy ±15ns to system internal PPS **NTP** Timestamp Accuracy typ. <30µs Requests per second 25.000 **PTP** Timestamp Accuracy typ. <50ns to system internal PPS
FG1021N01	Identical to FG1020N01 except power supply **Power Supply with redundant power inputs** Input Voltage: 14-160VDC Input Current: max. 2,2A@14VDC

FG1000M00	**Power Supply with single power input** Input Voltage: 90-264VAC 125-250VDC Input Frequency: 47-63Hz for AC input voltage Input Current: max. 0,4A@230VAC **Ethernet** Ports 2 Data Rate 10/100/1000Mbps Connector RJ45 **Status Output** Dry Contact Operating Voltage +/-250VDC Operating Current max. 120mA **Boot time** typ. ≤ 40 seconds depending on the configuration **Time Accuracy** Internal time accuracy ±15ns to system internal PPS **NTP** Timestamp Accuracy typ. <30µs Requests per second 25.000
FG1001M00	Identical to FG1000M00 except power supply **Power Supply with redundant power inputs** Input Voltage: 14-160VDC Input Current: max. 2,2A@14VDC

Network Standards and Protocols

General standards and protocols

- IEEE 802.1Q VLANs
- IEEE 802.3 Type 10BASE-T
- IEEE 802.3ab 1000BASE-T
- IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- IEC 62439-3:2016 Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)
- RFC 768 User Datagram Protocol (UDP)
- RFC 791 Internet Protocol, Version 4 (IPv4)
- RFC 792 Internet Control Message Protocol (ICMPv4)
- RFC 793 Transmission Control Protocol (TCP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 1035 Domain Names (client)
- RFC 1918 Address Allocation for Private Internet
- RFC 4443 Internet Control Message Protocol (ICMPv6)
- RFC 2131 Dynamic Host Configuration Protocol (DHCPv4)
- RFC 3484 Default Address Selection for Internet Protocol version 6 (IPv6)
- RFC 3596 DNS Extensions to Support IP Version 6
- RFC 8200 Internet Protocol, Version 6 (IPv6)
- RFC 8415 Dynamic Host Configuration Protocol for IPv6 (DHCPv6)

Device and Network Management

- RFC 1098 A Simple Network Management Protocol (SNMP)
- RFC 1155 Structure and Identification of Management Information for TCP/IP-based Internets
- RFC 1213 Management Information Base for Network Management of TCP/IP-based internets: MIB-II
- RFC 2578 Structure of Management Information Version 2 (SMIv2)
- RFC 2579 Textual Conventions for SMIv2
- RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks
- RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC 3413 Simple Network Management Protocol (SNMP) Applications
- RFC 3414 User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
- RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- RFC 3584 Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework
- RFC 4250/4251/5252/4253/4254 The Secure Shell (SSH) Protocol
- RFC 5321 Simple Mail Transfer Protocol
- RFC 5424 The Syslog Protocol
- RFC 7540 Hypertext Transfer Protocol Version 2 (HTTP/2)
- ***hopf*** Private Enterprise MIB

Security / Authentication

- IEC 62351-8:2020 Power systems management and associated information exchange - Data and communications security - Role-based access control
- IEC 62443-4-2:2019 Security for industrial automation and control systems - Technical security requirements for IACS components
- IEEE 1686-2013 Standard for Intelligent Electronic Devices Cyber Security Capabilities
- IEEE 802.1AE Media Access Control (MAC) Security (MACsec)
- RFC 4510/4511/4512/4513/4514/4515/4516/4517/4518/4519/4520 Lightweight Directory Access Protocol (LDAP)
- RFC 2865 Remote Authentication Dial In User Service (RADIUS)
- RFC 2866 RADIUS Accounting
- RFC 7384 Security Requirements of Time Protocols in Packet Switched Networks
- RFC 8915 Network Time Security for the Network Time Protocol

Time Synchronization

- RFC 5905 Network Time Protocol Version 4: Protocol and Algorithms Specification
- RFC 5906 Network Time Protocol Version 4: Autokey Specification
- RFC 5907 Definitions of Managed Objects for Network Time Protocol Version 4 (NTPv4)
- IEEE 1588-2019 Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems (PTP v2.1)
- IEEE C37.238-2017 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications
- IEC 61850-9-3:2016 Communication networks and systems for power utility automation - Precision time protocol profile for power utility automation
- IEEE 60255-118-1:2018-12 Measuring relays and protection equipment - Synchrophasor for power systems – Measurements
- ITU-T G.8275.1 / G.8275.2 Precision Time Protocol telecom profile for phase/time synchronization
- SIMATIC NET SINEC H1 Time Datagram

huma® web edition software

huma® web edition – ***hopf*** unified management application – is the highly flexible, versatile, secure, and easy-to-use system configuration and management software that is integral part of each system's management controller hardware. The software is accessible using the local computer's web browser and network connection.

System requirements

Web browsers	Google Chrome (Version > 89), Microsoft Edge (Version > 89), Mozilla Firefox (Version > 87), Opera (Version > 75), Brave (Version > 1.23)
Browser technology support	HTML5, CSS3, JavaScript enabled, ECMAScript 2016, Local Storage (min. 1MB)

- State-of-the-art user interface
- At-a-glance status information
- Realtime event notification
- Role-based user authentication
- Secure system configuration management and firmware update

ISO 27001:2022 No.00502/0

ISO 9001:2015 No.14218/2 | ISO 14001:2015 No.04514/2 | ISO 45001:2018 No.00143/2

Referring to the information in this product sheet: After the editorial deadline of this publication, August 16, 2024, changes may have been made to the product. Subject to changes of structural or design changes, changes to the scope and scale of discounts by the manufacturer during the delivery period as long as the changes or deviations are reasonable under consideration of the interest of the seller to the buyer. Errors and technical data are subject to change without prior notice.