



Net.Time ϕ is a versatile PTP/NTP over PRP clock that synchronizes both IEEE 61850 and legacy devices, making it the ideal solution for transitioning to modern synchronization standards while protecting existing investments.

Datasheet

Updated on 15/5/26
DS-Net-Time-Phi-v7.3.fm

Net.Time ϕ - a substation clock

Net.Time ϕ provides comprehensive synchronization for power substations. It delivers PTP/NTP for IEC 61850 IEDs while supporting IRIG-B and 1PPS for legacy devices. In addition to GNSS, it accepts multiple backup and complementary references to ensure resilient and reliable operation.

1. Mainframe Ports

Table 1. Signals and interfaces in the mainframe

	GNSS	PTP	NTP	ToD	IRIG-B	PPS	T1/E1	MHz
RJ45 (A)		out	out					
SFP (A)		out	out					
RJ45 (B)		in/out	in/out					
SFP (B)		in/out	in/out					
RJ48 (C)				in			in	in
RJ48 (D)				out			out	out
SMB (E)					out	out		
SMB (F)					in	in		
SMA (G)	in							
SMB (H)								in/out
RJ48 (I)				in/out	in/out		out	out

- RJ45 (A, B): PTP, NTP
- SFP (A, B): PTP, NTP
- RJ48 (C, D): ToD (NMEA, G.8271), 1/ 1.544/ 2.048/ 5/ 10 MHz, T1/ E1
- SMB (E): IRIG-B00X / IRIG-B1XX / IRIG-B22X, PPS
- SMB (F): IRIG-B00X / IRIG-B15X IRIG-B22X, PPS
- SMA (G): GNSS
- SMB (H): 1/ 1.544/ 2.048/ 5/ 10 MHz
- RJ48 (I): IRIG-B00X, ToD (NMEA, G.8271), 1/ 1.544/ 2.048/ 5/ 10 MHz, T1/ E1

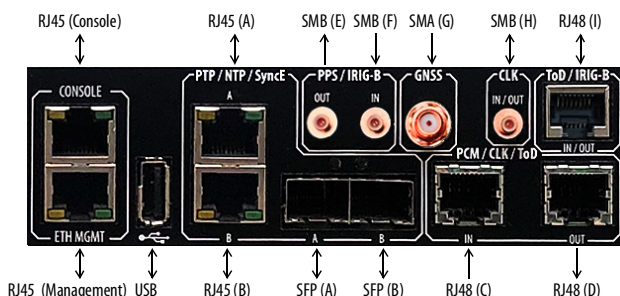


Figure 1. Mainframe connector layout

1.1 Port Specification

- Custom delay compensation for phase and time inputs and outputs
- Customizable period in PPS outputs in one-second steps
- RS-422 / ITU-T V.11 levels for PPS and IRIG-B references over RJ-48
- Square pulse shape for clock (Hz) outputs (2.4 Vpp with 50 Ω)
- Up to 25 Vpp with AC / DC coupling in IRIG-B SMB inputs
- Custom gain and impedance in IRIG-B SMB inputs
- Up to 4 Vpp with AC/DC coupling in IRIG-B1XX SMB outputs with a 50 Ω load. 2.4 Vpp in IRIG-B0XX / IRIG-B22X with a 50 Ω load.
- E1 outputs comply with ITU-T G.703 pulse mask, T1 outputs comply with ANSI T1.102-1999
- SSM generation in E1 and T1 outputs, SSM decoding in E1 and T1 inputs

2. Port Extensions

- Implemented through factory configurable and replaceable modules
- One slot for a custom port extension module

2.1 RIC-152 Module

Provides 2 x RJ48/SFP Extra Gigabit Ethernet, 4 x RJ48, 2 x BNC/ST, 2 x BNC, 1 x BNC and a 5-pin terminal block ports:

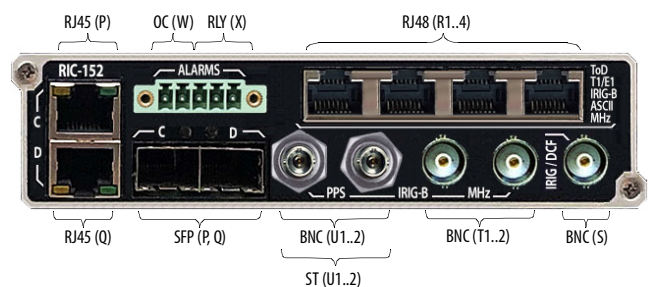


Figure 2. RIC-152 connector layout

- RJ45 (P, Q): PTP, NTP
- SFP (P, Q): PTP, NTP
- RJ48 (R1..4): IRIG-B00X, ToD (NMEA, G.8271), 1/ 1.544/ 2.048/ 5/ 10 MHz, T1/ E1, ASCII (NMEA, Meinberg)
- BNC (U1..2): IRIG-B00X, PPS
- ST (U1..2): IRIG-B00X, PPS
- BNC (T1..2): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz
- BNC (S): IRIG-B1XX, DCF77
- OC (W): PPS, Alarm (Electronic –MOSFET driver– relay)
- RLY (X): Alarm (Electro-mechanic relay)

Table 2. RIC-152 ports and interfaces

	PTP	NTP	ToD	IRIG-B	PPS	T1/E1	MHz	ASCII	DCF77	Alarm
RJ45 (P, Q)	out	out								
SFP (P, Q)	out	out								
RJ48 (R1..4)			out	out		out	out	out		
BNC (U1..2)				out	out					
ST (U1..2)				out	out					
BNC (T1..2)				out	out		out			
BNC (S)				out					out	
OC (W)										out
RLY (X)										out

2.2 RIC-50 Module

Provides a combination of 5 x BNC / ST ports (up) and 5 x BNC ports:

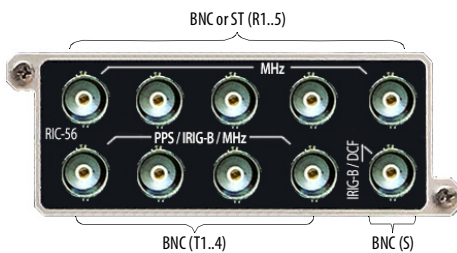


Figure 3. RIC-50 connector layout

- ST (R1..5): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz
- BNC (R1..5): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz
- BNC (T1..4): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz
- BNC (S): IRIG-B1XX, DCF77

Table 3. RIC-50 ports and interfaces

	IRIG-B	PPS	DCF77	MHz
ST (R1..5)	out	out		out
BNC (R1..5)	out	out		out
BNC (S)	out		out	
BNC (T1..4)	out	out		out

2.3 RIC-52 Module

Provides 4 x RJ48 (up) and 5 x BNC (down) ports:

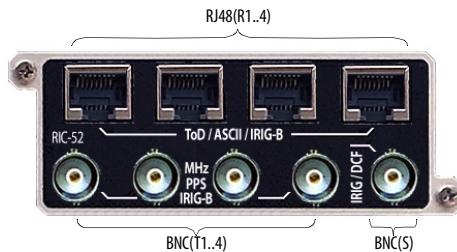


Figure 4. RIC-52 connector layout

- RJ48(R1..4): IRIG-B00X, ToD (NMEA, G.8271), ASCII (NMEA, Meinberg) with RS-232 levels
- BNC (T1..4): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz
- BNC (S): IRIG-B1XX, DCF77

Table 4. RIC-52 ports and interfaces

	ToD	IRIG-B	PPS	ASCII	DCF77	MHz
RJ48 (R1..4)	out	out		out		
BNC (S)		out			out	
BNC (T1..4)		out	out			out

2.4 RIC-54 Module

Provides 5 x BNC (up) and a 16-pin terminal block (down) ports:

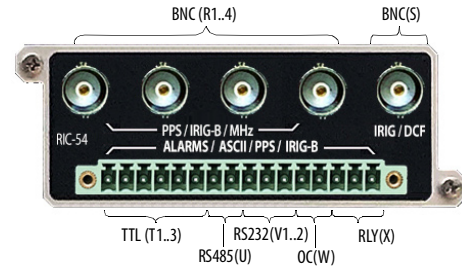


Figure 5. RIC-54 connector layout

- BNC (R1..4): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz
- BNC (S): IRIG-B1XX, DCF77
- TTL (T1..3): IRIG-B00X, PPS
- RS232 (V1..2): ASCII (NMEA, Meinberg)
- RS485 (U): IRIG-B00X, ASCII (NMEA, Meinberg), PPS
- OC (W): PPS, Alarm (Electronic - MOSFET driver- relay)
- RLY (X): Alarm (Electro-mechanic relay)

Table 5. RIC-54 ports and interfaces

	IRIG-B	PPS	ASCII	DCF77	Alarm	MHz
BNC (R1..4)	out	out				out
BNC (S)	out			out		
TTL (T1..3)	out	out				
RS485 (U)	out	out	out			
RS232 (V1..2)			out			
OC (W)		out			out	
RLY (X)					out	

2.5 RIC-56 Module

Provides a combination of 5 x BNC / SMA ports (up) and 4 x BNC / SMA ports plus 1 BNC port (down):



Figure 6. RIC-56 connector layout (BNC model and SMA model)

- BNC / SMA (R1..5): 10 MHz sine wave
- BNC / SMA (T1..4): IRIG-B00X, PPS, 1/ 1.544/ 2.048/ 5/ 10 MHz square wave
- BNC / SMA (S): IRIG-B1XX, DCF77

Table 6. RIC-56 ports and interfaces

	IRIG-B	PPS	DCF77	MHz
BNC / SMA (R1..5)				out
BNC / SMA (S)	out		out	
BNC / SMA (T1..4)	out	out		out

2.6 RIC-82 Module

Provides a combination of 5 x BNC / ST ports (up) and 16-pin term. block:

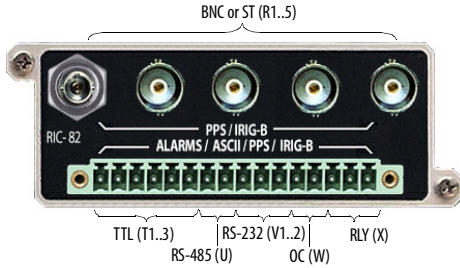


Figure 7. RIC-82 connector layout

- ST (R1..5): IRIG-B00X, PPS
- BNC (R1..5): IRIG-B00X, PPS
- TTL (T1..3): IRIG-B00X, PPS
- RS232 (V1..2): ASCII (NMEA, Meinberg)
- RS485 (U): IRIG-B00X, ASCII (NMEA, Meinberg), PPS
- OC (W): PPS, Alarm (Electronic –MOSFET driver– relay)
- RLY (X): Alarm (Electro-mechanic relay)

Table 7. RIC-82 ports and interfaces

	IRIG-B	PPS	ASCII	Alarm
ST (R1..5)	out	out		
BNC (R1..5)	out	out		
TTL (T1..3)	out	out		
RS485 (U)	out	out	out	
RS232 (V1..2)			out	
OC (W)		out		out
RLY (X)				out

2.7 RIC-84 Module

Provides a combination of 5 x BNC / ST ports (up) and 16-pin block:

- ST (R1..5): IRIG-B00X, PPS
- BNC (R1..5): IRIG-B00X, PPS
- TTL(T1..3): IRIG-B00X, PPS
- OC (U): PPS, Alarm (Electronic –MOSFET driver– relay)
- RS232(V1..2): ASCII (NMEA, Meinberg)
- OC (W): PPS, Alarm (Electronic –MOSFET driver– relay)
- RLY (X): Alarm (Electro-mechanic relay)

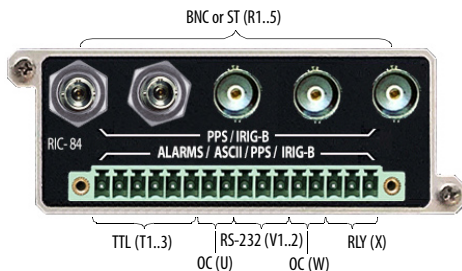


Figure 8. RIC-84 connector layout

Table 8. RIC-84 ports and interfaces

	IRIG-B	PPS	ASCII	Alarm
ST (R1..5)	out	out		
BNC (R1..5)	out	out		
TTL (T1..3)	out	out		
OC (U)		out		out
RS232 (V1..2)			out	
OC (W)		out		out
RLY (X)				out

3. Clock functions

- Hierarchical clock reference input configuration
- Automatic Reference switchover on detection of input degradation
- Custom and predefined time zones
- Unmanaged leap second adjustment and reporting

3.1 Oscillator Performance (Locked to GNSS)

Table 9. Frequency accuracy (1 day observation time)

Observation	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Single-band	$2.0e^{-12}$	$1.0e^{-12}$	$1.0e^{-12}$	$1.0e^{-12}$	$1.0e^{-12}$
Multi-band	$1.0e^{-12}$	$5.0e^{-13}$	$5.0e^{-13}$	$5.0e^{-13}$	$5.0e^{-13}$

Table 10. RMS phase error

GNSS	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Single-band	± 30 ns	± 20 ns	± 20 ns	± 15 ns	± 15 ns
Multi-band	± 15 ns	± 10 ns	± 10 ns	± 5 ns	± 5 ns

Table 11. Locking time

	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
	< 5 ns	< 10 min	< 15 min	< 4 hours	<4 hours

3.2 Oscillator Performance (Holdover mode)

Table 12. Holdover time accuracy

(± 1 °C, typical 1 sigma values. The device is powered for one month and locked to GNSS for three days before holdover)

Phase within	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
± 100 ns	15 seconds	45 minutes	3 hours	9 hours	10 hours
± 500 ns	70 seconds	3.0 hours	12 hours	1.0 days	30 hours
± 1.0 μ s	2.5 minutes	5.5 hours	24 hours	1.6 days	3.2 days
± 10.0 μ s	12 minutes	1.2 days	2.5 days	9 days	12 days

Table 13. Holdover frequency accuracy after one day

(± 1 °C, maximum values. The device is powered for one month and locked to GNSS for three days before holdover)

	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
	-	$1.0 e^{-10}$	$2.0 e^{-11}$	$1.0 e^{-11}$	$5.0e^{-12}$

3.3 Oscillator Aging

Table 14. Aging

	TCXO	OCXO	OCXO HQ	Rb	Rb HQ
Daily	$2.0e^{-8}$	$5.0e^{-10}$	$1.0e^{-10}$	$5.0e^{-12}$	$2.5e^{-11}$
Monthly	-	$1.0e^{-8}$	$3.0e^{-9}$	$5.0e^{-11}$	$5.0e^{-11}$
Yearly	$5.0e^{-7}$	$5.0e^{-8}$	$1.0e^{-8}$	$1.5e^{-9}$	$6.0e^{-10}$

4. GNSS Synchronization Inputs

- Connector: SMA (50 Ω)
- Fixed position mode for GNSS references
- Automatic setting of UTC-to-TAI offset (leap seconds) through GNSS
- 4V - 5V DC output in GNSS port to feed an external antenna
- Cable delay compensation
- Automatic antenna detection

4.1 Single-band Receiver

- 72-channel receiver
- Sensitivity: -166 dBm (tracking), -148 dBm (cold start)
- Concurrent selection of up to three satellite constellations.
- Anti-jamming technology
- Bands: (1) GPS L1, (2) GLONASS L10F, (3) Galileo E1B/C, (4) BeiDou B1

4.2 Multi-band Receiver

- 184-channel receiver
- Sensitivity: -167 dBm (tracking), -148 dBm (cold start)
- Concurrent selection of up to three satellite constellations

- Simultaneous operation in two different frequency bands
- Anti-jamming and anti-spoofing technology
- Bands: (1) GPS L1C/A, L2C, L5, (2) GLONASS L1OF, (3) Galileo E1B/C, E5b, E5a, (4) BeiDou B1I, B1C, B2a, (5) NavIC L5

5. Ethernet

- RJ45 / SFP work in combo mode, only one of each pair is active
- RJ45 interfaces: 10BASE-T, 100BASE-TX, 1000BASE-T
- SFP interfaces: 100BASE-FX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-SX
- Auto-negotiation 10 / 100 / 1000 Mb/s
- Ability to disable auto-negotiation and force line settings

6. PRP Function

- Parallel Redundancy Protocol (PRP) Link Redundancy Entity (LRE) as specified in IEC 62439-3, generation of RCT trailers on Ethernet frames
- Duplicate discard mode and PRP supervision generation / decoding
- PRP extensions for IEEE 1588-2008 / IEC 61588: 2009 defined in IEC 62439-3 Annex A connected with grandmaster clock operation

7. Protocols

- DIX and IEEE 802.1Q Ethernet frame formats
- Configuration of the VLAN VID
- User Priority if the VLAN encapsulation is enabled (IEEE 802.1Q format)
- Configuration of DSCP CoS labels
- ARP (IETF RFC 826)
- ICMP (IETF RFC 792)
- DHCP (client side) (IETF RFC 2131)
- Static IPv4 local profile configuration

8. PTP Function

- Up to 1024 unicast users (256 per port)
- IEEE 1588-2008 Annex J, Default profiles
- IEC 61850-9-3, Utility Profile
- IEEE C37.238-2011, Power Profile 2011
- IEEE C37.238-2017, Power Profile 2017
- ITU-T G.8265.1, Telecom frequency profile
- ITU-T G.8275.1, Telecom phase and time profile
- ITU-T G.8275.2, Telecom PTS / APTS profile

9. NTP Function

- Up to 500.000 transactions/s in server mode
- NTP protocol versions: NTPv3 (RFC 1305), NTPv4 (RFC 5905)
- SNTP protocol versions: SNTPv3 (RFC 1769)
- MD5 and SHA1 authenticated NTP transactions

10. Packet Services

- Packet Grandmaster: up to four independent PTP, NTP outputs
- PRP Grandmaster: up to two independent PTP and NTP outputs over PRP
- Protocol Translator: one PTP, NTP input and three independent PTP, NTP outputs.
- Hybrid Protocol Translator: one PTP, NTP, one PTP, NTP, and one PTP and NTP output over PRP

11. Statistics

- Current, max / min traffic in b/s, frames/s, % channel capacity
- Unicast, multicast, broadcast traffic in b/s, frames/s, % channel capacity
- IPv4 and IPv6 statistics in b/s, frames/s, % channel capacity
- UDP traffic in b/s, frames/s, % channel capacity
- Simultaneous per-port statistics for ports A and B

11.1 PRP LRE Statistics

- Port A / B / P / Q and aggregated inbound and outbound frames
- Port A / B / P / Q and aggregated inbound and outbound RCT frames
- Port A / B / P / Q, LAN A / B / C / D mismatches
- Port A / B / P / Q and aggregated errors
- Port A / B / P / Q unique entries
- Port A / B / P / Q single duplicated entries
- Port A / B / P / Q multiple duplicated entries

- PRP node count
- Source MAC address, time to live and node time for each entry

12. Platform

12.1 Ports

- RJ45: RS-232 console
- RJ45: Ethernet management
- USB: Storage

12.2 Management

- Web application running over HTTP or HTTPS
- Custom SSL certificates for the web application
- CLI management interface through Console interface
- SSH and Telnet remote management through ETH MGMT interface
- USB soft and firmware updates
- RFC 3164 Syslog event reporting (device role)
- Support of SNMPv2c as defined in RFC 1901
- Support of SNMPv3 as defined in RFC 3410, RFC 3411, RFC 3412
- Support of SNMP traps to report events through SNMPv2c and SNMPv3
- Ability to enable or disable management protocols separately

12.3 User Access Control

- Creation, configuration and management of user accounts
- RADIUS (Remote Authentication Dial-In User Service)
- TACACS+ (Terminal Access Controller Access-Control System Plus)
- User roles with custom access rights
- Advanced user access management policies
- Ability to grant or deny access based on user location (IP address)

12.4 Ergonomics

- Fanless operation
- Dimensions: 44 mm x 228 mm x 435 mm (equivalent to 1U in 19" rack)
- Weight: 1.9 kg / 4.2 lb
- MTBF: 150,000 hours (T/OCXO models), 140,000 hours (Rub. models)

12.5 LCD Display with Keyboard

- Display: LCD STN blue, 192 x 32 pixels
- Keyboard: Up, Down, Enter

Information displayed

- Date: Day, Time, Time scale (UTC or local time)
- Oscillator status: Free, Locked, Locking, Holdover...
- Clock reference input: GNSS, PTP, NTP...
- Position: latitude, longitude, height
- System: Serial number, Software version, MAC address
- Mngt Network: IP addr, Subnetwork mask, Gateway, DNS

12.6 Power Supply

- Redundant power supply (Single or Double)
- AC: 100 ~ 240 VAC, 50- 60 Hz (IEC 60320 C13/C14)
- DC: 18 ~ 75 VDC (2-pin 5.1 mm)
- AC/DC: 85 - 264 VAC and 100 - 370 VDC (2-pin 5.1 mm)
- Power consumption: 10 W (T/OCXO models), 14 W (Rubidium models)

12.7 LEDs

- Platform: PSU1, PSU2, System
- Application: Alarm, GNSS, Locked

12.8 USB

- Software and firmware upgrade
- Configuration, results, user files

12.9 Environmental

- Storage: -40 ~ +85°C
- Operating: -40 ~ +70°C temp. / 0 ~ 95%RH (non-condensing)
- Altitude: < 3000 m

12.10 Other

Electromechanical relay rating

- Voltage: 240 VAC, 30 VDC (MOV protected)
- Current: 3 A

Solid state (open collector) relay rating

- Max. voltage: 300 V (MOV protected)
- Max. current: 120 mA

13. Certifications

13.1 Summary

- Communications devices installed in substations: IEEE 1613, IEC 61850-3
- Electromagnetic compatibility: CISPR 22 / EN 55022, CISPR 24 / EN 55024, IEC 61000-3-2, IEC 61000-3-3, CFR 47 part 15
- Environmental: IEC 61850-3
- Safety: IEC/EN 61850-3, IEC/EN/UL/CSA 62368-1
- Other: EN 63000 (RoHS), EN 303 413 V1.1.1 (RED)

13.2 Electromagnetic Compatibility (Emission)

- Conducted Disturbance: CISPR 22 / EN 55022 (Class B), CFR 47 Part 15
- Radiated Emissions: CISPR 22 / EN 55022 (Class B), CFR 47 Part 15
- Harmonics of Current: IEC 61000-3-2 (Class A)
- Voltage Fluctuation and Flicker: IEC 61000-3-3

13.3 Electromagnetic Compatibility (Immunity)

Radiated RF Susceptibility (RS)

- IEEE C37.90.2: 80 ~ 1000 MHz, 20 V/m, 80% AM (1 kHz)
- IEC 61000-4-3: 80 ~ 3000 MHz, 10 V/m, 80% AM (1 kHz)

Conducted RF Susceptibility (CS)

- IEC 61000-4-6: 0.15 ~ 80 MHz, 10 Vrms, 80% AM (1 kHz)

Electrostatic discharge (ESD) immunity

- IEEE C37.90.3: 15 kV air discharge, 8 kV contact discharge
- IEC 61000-4-2: 2008: 8 kV air discharge, 6 kV contact discharge

Electrical fast transient / burst (EFT) immunity

- IEEE C37.90.1: 4 kV in power and telecom ports
- IEC 61000-4-4: 2 kV in power and earth ports, 4 kV in telecom ports

Damped oscillatory wave immunity

- IEEE C37.90.1
- 2.5 kV (1 MHz) in power and telecom ports
- IEC 61000-4-18
- 0.5 kV diff. / 1 kV comm, (1 MHz) in power port
- 1 kV diff. / 2.5 kV comm, (1 MHz) in telecom ports

Surge immunity

- IEC 61000-4-5
- Power port line to line 1 kV, line to ground 2 kV
- Telecom port line to line: 2 kV, line to ground: 4 kV

Power frequency immunity

- IEC 61000-4-16
- 30 V (continuous) and 300 V (1 s) in telecom port
- 10 V (continuous) and 100 V (1 s) in power port

Power frequency magnetic field immunity

- IEC 61000-4-8
- 100 A/m (continuous) and 1000 A/m (1 s)

Power supply immunity

- IEC 61000-4-11
- IEC 61000-4-17
- IEC 61000-4-29

13.4 Reliability

- Cold storage: IEC 60068-2-1, -40°C, 16 hours
- Cold operation: IEC 60068-2-1, -40°C, 16 hours
- Dry heat storage: IEC 60068-2-2, +85°C, 16 hours
- Dry heat operation: IEC 60068-2-2, +70°C, 16 hours
- Change of temperature: IEC 60068-2-14, -10 ~ + 65°C, 5 cycles
- Damp heat cyclic: IEC 60068-2-30, +25~+40°C, 55~93%RH, 6 cycles
- Damp heat steady state: IEC 60068-2-78, +40°C, 55%RH, 10 days
- Vibration response: IEC 60255-21-1 (Class 1)
- Vibration endurance: IEC 60255-21-1 (Class 1)
- Shock response: IEC 60255-21-2 (Class 1)
- Shock Withstand: IEC 60255-21-2 (Class 1)
- Bump: IEC 60255-21-2 (Class 1)
- Seismic test: IEC 60255-21-3 (Class 2)
- Degrees of protection provided by enclosures: IEC 60529 (IP30)

13.5 Safety

- Communications devices installed in power substations IEC / EN 61850-3
- Audio / Video, information and communication technology equipment IEC / EN 62368-1, UL 62368-1, CSA C22.2 No. 62368-1

14. Ordering Information

Table 15. Base configuration

Code	Description
NT.PHI.GM.ACDC	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal TCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. Web Server. USB firmware upgrade. Single AC 85 – 264 V / DC 100 – 370 V (2-pin 5.1 mm) power supply unit (PSU-ACDC).
NT.PHI.GM.AC	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal TCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. Web Server. USB firmware upgrade. Single AC 100 – 240 V, 50 – 60 Hz (IEC 60320 C13/C14) power supply unit (PSU-AC).
NT.PHI.GM.DCL	Net.Time Grandmaster Clock with built in LCD screen and keyboard. Includes dual 10 / 100 Mb/s electrical Ethernet port and dual 100 Mb/s optical Ethernet supplying synchronization as specified in IEEE 1588-2008 Annex J "Default Profiles", IEC 61850-9-3 "Utility Profile", IEEE C37.238-2011 "Power Profile 2011" and IEEE C37.238-2017 "Power Profile 2017" up to 64 slave clocks. Network Time Protocol version 3 (RFC 1305), version 4 (RFC 5905) and Simple Network Time Protocol version 3 (RFC 1769) server functionality. Internal TCXO timing source. GPS, GLONASS, BeiDou and Galileo clock reference input. 1PPS, 1PP2S and time-of-day inputs and outputs. Inter Range Instrumentation Group type B (IRIG-B) time codes input and output over balanced or unbalanced interfaces. Frame and network statistics. Console and Ethernet management ports. Simple Network Management Protocol (SNMP) management. Web Server. USB firmware upgrade. Single DC 18 – 75 V (2-pin 5.1 mm) power supply unit (PSU-DCL).

Table 16. Hardware options

Code	Description
NT.PHI.FHM.OCXO	OCXO oscillator.
NT.PHI.FHM.OCXO.HQ	OCXO HQ oscillator.
NT.PHI.FHM.RB	Rubidium oscillator.
NT.PHI.FHM.RB.HQ	Rubidium HQ internal oscillator.
NT.PHI.FHM.MB	Replaces the standard GNSS receiver by multi-band receiver. Compatible with GPS, GLONASS, Galileo, BeiDou and NavIC. Jamming and spoofing detection and mitigation.
NT.PHI.PSU.AC	Adds an additional AC 100 – 240 V, 50 – 60 Hz (IEC 60320 C13/C14) power supply unit.
NT.PHI.PSU.ACDC	Adds an additional AC/DC 85 – 264 VAC / 100 – 370 VDC (2-pin 5.1 mm) power supply unit.
NT.PHI.PSU.DCL	Adds an additional low voltage DC 18 – 75 V (2-pin 5.1 mm) power supply unit.
NT.PHI.RIC.50	Provides additional clock reference outputs. Includes PPS, IRIG-B00X and frequency references in 5 x BNC ports. Includes PPS, IRIG-B00X and frequency references in 4 x BNC ports. Includes IRIG-B1XX and DCF77 in a single BNC port.
NT.PHI.RIC.52	Provides additional clock reference outputs. Includes ToD, ASCII and IRIG-B00X references in 4 x RS-232 ports (RJ48 connector). Includes PPS, IRIG-B00X and frequency references in 4 x BNC ports. Includes IRIG-B1XX and DCF77 in a single BNC port.

Table 16. Hardware options

Code	Description
NT.PHI.RIC.54	Provides additional clock reference outputs. Includes PPS, IRIG-B00X and frequency references in 4 x BNC ports. Includes IRIG-B1XX and DCF77 in a single BNC port. Includes miscellaneous references, time codes and alarm relay functions in 3 x TTL, 1 x RS-485, 2 x RS-232, 1 x open collector and 1 x electro-mechanic relay outputs.
NT.PHI.RIC.82	Provides additional clock reference outputs. Includes PPS and IRIG-B00X references in 5 x BNC / ST factory configurable ports. Includes miscellaneous references, time codes and alarm relay functions in 3 x TTL, 1 x RS-485, 2 x RS-232, 1 x open collector and 1 x electro-mechanic relay outputs.
NT.PHI.RIC.84	Provides additional clock reference outputs. Includes PPS and IRIG-B00X references in 5 x BNC / ST factory configurable ports. Includes miscellaneous references, time codes and alarm relay functions in 3 x TTL, 2 x RS-232, 2 x open collector and mechanic relay outputs.
NT.PHI.RIC.152	Adds dual 10 / 100 / 1000 Mb/s electrical Ethernet port and dual 100 / 1000 Mb/s optical Ethernet supplying synchronization through the NTP v3 (RFC 1305), v4 (RFC 5905) and SNTP v.3 (RFC 1769). Provides additional clock reference outputs. Includes ToD / EH90, ASCII, IRIG-B00X, T1 / E1 and frequency references in 4 x RS-232 ports (RJ48 connector). Includes PPS, IRIG-B00X and frequency references in 4 x BNC / ST factory configurable ports. Includes IRIG-B1XX and DCF77 in a single BNC port. Includes 1 x open collector and relay outputs.
NT.PHI.RIC.ST	Replaces a BNC port by an ST optical port in RIC references module. One item must be ordered for each port to be replaced. The maximum number of replacement items depends on the particular module: From 0 to 5 for NT.OMG.RIC.50, NT.OMG.RIC.82 and NT.OMG.RIC.84. From 0 to 2 for NT.OMG.RIC.152.
NT.PHI.RIC.56	Provides additional clock reference outputs. Includes 10 MHz sine-wave in 5 x BNC / SMA factory configurable ports. Includes PPS, IRIG-B00X and frequency references in 4 x BNC / SMA factory configurable ports. Includes IRIG-B1XX and DCF77 in a single BNC/SMA port.
NT.PHI.RIC56.SMA	Replaces all BNC ports by SMA ports in NT.PHI.RIC.56.

Table 17. Optional Software options

Code	Description
NT.PHI.1GE	Adds support for 1 Gb/s Ethernet interfaces over electrical and optical interfaces.
NT.PHI.BC	Adds PTP profile translation functionality. Adds support for PTP to NTP protocol translation.
NT.PHI.PTP.T	ITU-T G.8265.1 "Telecom frequency profile", ITU-T G.8275.1 "Telecom phase and time profile" and ITU-T G.8275.2 "PTS / APTS profile" up to 64 slave clocks.
NT.PHI.PRPP	Parallel Redundancy Protocol following IEC 62439-3 for simultaneous transmission of information over two redundant Ethernet ports with zero seconds fail-over recovery time.
NT.PHI.FREQ	Provides support for 1544 kHz, T1, 2048 kHz, E1, 5 MHz and 10 MHz clock reference inputs and outputs.
NT.PHI.GM.USR128	Increases number of client unicast clocks per port from 64 to 128.
NT.PHI.GM.USR256	Increases number of client unicast clocks per port from 64 to 256.

Table 18. Accessories

Code	Description
NT.ANT	GNSS kit for fixed installation up to 50 m. Includes surge arrester, 3 m TNC-SMA patch cable. Cable not included.
NT.ANTC	GNSS kit for fixed installation up to 200 m. Includes antenna, surge arrester, in-line amplifier 25 dB gain, 3 m TNC-SMA patch cable, 20 cm TNC-TNC low loss coaxial cable. Cable not included.
NT.ANT.MB	GNSS antenna kit for fixed installation up to 50 m. Compatible with L1 and L5 frequency bands. Includes antenna, surge arrester, 3 m TNC-SMA patch cable and accessories. Cable not included.
NT.ANTC.MB	GNSS antenna kit for fixed installation up to 200 m. Compatible with L1 and L5 frequency bands. Includes antenna, surge arrester, in-line amplifier 25 dB gain, 3 m TNC-SMA patch cable, 20 cm TNC-TNC low loss coaxial cable and accessories. Cable not included.