

# HIGH-PRECISION TIME SERVER, GRANDMASTER & PRTC DTS 4160.GRANDMASTER

*The DTS 4160.grandmaster is a combined time distribution and synchronization device with up to 4 network ports (IPv4/IPv6). With its high-precision and intelligent concept for redundant operation, it offers a high degree of reliability and availability.*



# HIGHLIGHTS

## PTP GRANDMASTER AND PRTC

The DTS 4160 is a primary reference time clock (PRTC) and PTP grandmaster according to IEEE 1588-2008 / PTPv2, with IEEE 1588-2019 / PTPv2.1 compability, for the synchronization of highly accurate clients. Usable for telecom (e.g. 5G), energy (e.g. smart grid), automation etc.

## HIGH-PERFORMANCE NTP SERVER

The DTS 4160 can reply to more than 10'000 NTP and SNTP requests per second (up to 600'000 clients depending on NTP client configuration).

## REDUNDANT LINK

For utmost availability, two DTS 4160 can be connected to offer redundant master-slave operation with automatic switch over in case of an error.

## GNSS RECEIVER

The DTS 4160 can receive all GNSS L1 systems (GPS+QZSS/SBAS, Galileo, GLONASS, Bei-Dou), guaranteeing utmost accuracy and availability.

## NETWORK SERVICES

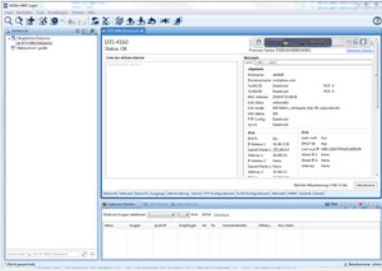
The DTS 4160 offers state-of-the-art network services such as VLAN, link aggregation, and static routing.

## OSCILLATOR OPTIONS

The DTS 4160 offers three different oscillator options (see page 3 for variants).

## LEGACY OUTPUTS

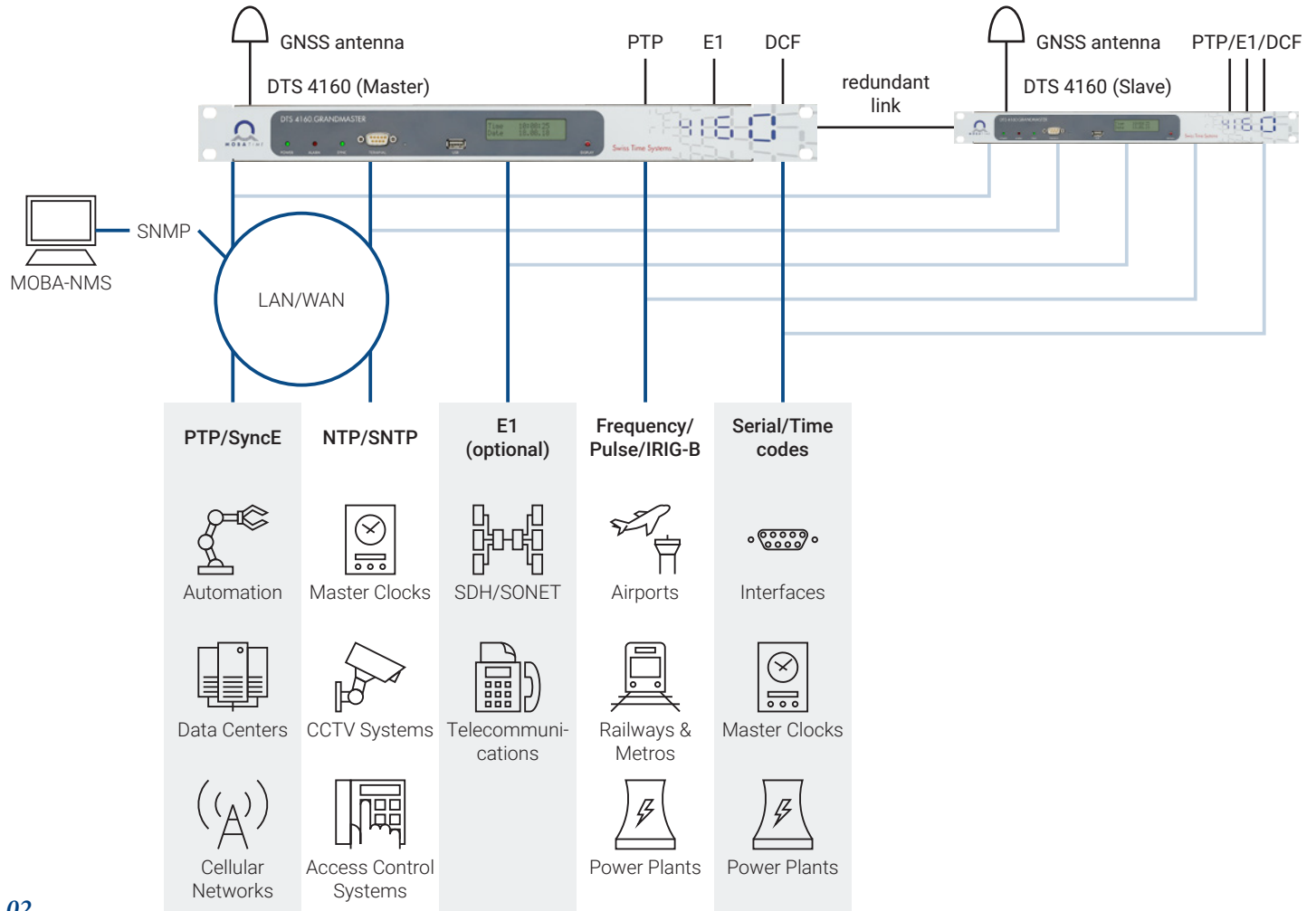
The DTS 4160 supports legacy outputs such as IRIG, E1 (optional), DCF, pulse, and frequency.



**NETWORK MANAGEMENT SYSTEM**  
**MOBA-NMS**

The DTS 4160.grandmaster can be fully monitored, configured and controlled using the Mobatime Network Management System software (MOBA-NMS).

## APPLICATIONS



# TECHNICAL DATA

## OSCILLATOR OPTIONS

### Variants

DTS 4160a	OCXO
Aging	+/- 2.0*10 <sup>-10</sup> /day +/- 2*10 <sup>-7</sup> /year
Holdover <sup>1</sup>	< +/- 5.3 µs/day
ITU-T	G.811 <sup>2</sup> , G.812 IV <sup>3</sup> , G.813
DTS 4160b	OCXO
Aging	+/- 1*10 <sup>-10</sup> /day +/- 1.5*10 <sup>-8</sup> /year
Holdover <sup>1</sup>	< +/- 3.2 µs/day
ITU-T	G.811 <sup>2</sup> , G.812 <sup>3</sup>
DTS 4160c	Rubidium
Aging	+/- 2.5*10 <sup>-11</sup> /day +/- 1*10 <sup>-9</sup> /year
Holdover <sup>1</sup>	< +/- 0.9 µs/day
ITU-T	G.811 <sup>3</sup> , G.8272 <sup>3</sup>

<sup>1</sup> After 30 days of synchronization; for more detail, see product manual  
<sup>2</sup> Typically fulfilled while GNSS synchronization is active  
<sup>3</sup> For more information, see product manual

## MECHANICAL DATA AND ENVIRONMENT

### General data

**Dimensions:** 483 x 44 x 190 mm (19", 1U)  
**Weight:** 2.3 kg  
**Housing material:** Stainless steel  
**Protection degree:** IP 20  
**Operating temperature:** 0–50 °C  
**Operating humidity:** 10–90 % relative, no condensation  
**Power supply:** 90–240 VAC or 80–240 VDC, 0.5 A; 2x 24–28 VDC, 2 A (redundant, supervised)  
 2x eDC option available for DTS4160c:  
 2 galvanically separated DC inputs  
 24–68 VDC

## STANDARDS

### Conformity

The DTS 4160.grandmaster conforms to the following agency approvals<sup>1</sup>:

CE, UKCA, CB, RoHS, WEEE  
**EMC:** EN 50121-4<sup>2</sup>, EN 61000-6-4, EN 61000-6-2  
**Safety:** IEC 62368

<sup>1</sup> For full list, see product manual  
<sup>2</sup> Not included in CB certificate

## REFERENCE SIGNAL INPUTS

- 1x GNSS RF input (for GNSS antenna) to internal GNSS receiver, 92 channels, tracking sensitivity -167 dBm
- 1x connection to second DTS 4160.grandmaster (SFP) – redundant link
- 1x PTP (from other PTP grandmaster, as PTP slave)
- 1x DCF current loop (e.g. GNSS 4500)
- 1x E1 (for holdover enhancement only)
- 1x F-IN (1 PPS, 10 MHz, 2.048 MHz) (for hold-over enhancement only)

## REFERENCE SIGNAL OUTPUTS - NETWORK

- PTP grandmaster (E2E, P2P, 1-step, 2-step, multicast, layer 2, IPv4/IPv6) (LAN 2–4)
- PTP profiles: default E2E/P2P; power utility (IEEE/IEC 61850-9-3); telecom ITU-T G.8265.1, G.8275.1, G.8275.2; gPTP IEEE 802.1AS
- SyncE master, ESMC (SSM)
- NTP server (<10'000 requests/second on all 4 ports combined)
- NTP mode: Server, Peer, Broadcast, Multicast / SNTP / MD5 and SHA1 authentication for NTP
- TIME (RFC 868), DAYTIME (RFC 867)
- IEEE/IEC 61850-9-3 (only with NTP/SNTP/PTP synchronization)

## REFERENCE SIGNAL OUTPUTS - NON-NETWORK

- 1x IRIG-B, precision output (AM/DC)
- 2x precision pulse/frequency output
- 2x serial output with configurable time telegrams, RS-232/422/485
- 1x DCF77
- Option: 1x E1/2.048 MHz (as E1 unframed), compatible with ITU-T G.811, G.812, G.813; unprotected output (1:1), SSM only quality level option I (ITU-T G.781/704)

## NETWORK INTERFACE

- 3x 100/1000BaseT (LAN 1–3)
- 1x SFP for miniGBIC module 100/1000Base-T(X) or FX (LAN 4)

## NETWORK FEATURES

- PTP grandmaster / SyncE master / NTP V4/V3 server (RFC 5905/1305) / SNTP (RFC 4330)
- IP configuration: IPv4 (DHCP, static IP), IPv6 (autoconfiguration, DHCPv6, static IP)
- Link aggregation (IEEE 802.3ad) over 2 / dedicated LAN interfaces (LAN 2 & 3)
- VLAN: prioritized (IEEE 802.1p), tagged (IEEE 802.1Q)
- Static routing
- IGMP / Multicast (RFC 3376, 1112, 4601, 3973)

## ALARMS

- Electrical output: relay contact
- Network outputs (LAN 1–3): SNMP notifications (Traps) V2c, Mail (RFC 4954, 2195)
- Alarm LED

## OSCILLATOR STABILITY

- Holdover (after 24h synchronization) at room temperature according to oscillator (see variants)

## ACCURACY (TYPICAL VALUES)

- Internal
  - GNSS to internal time: < +/- 30 ns
  - Redundant connection to internal time: < +/- 50 ns
  - PTP to internal time: < +/- 200 ns
  - DCF to internal time (with GNSS 4500): < +/- 200 ns (after compensation for fix offset)
  - E1 to internal time: < +/- 200 ns (frequency only)
  - F-In to internal time: < +/- 200 ns (frequency only)
- Time signal output
  - GNSS to NTP: < +/- 100 µs
  - GNSS to PTP: < +/- 0.25 µs
  - GNSS to DCF: < +/- 5 µs
  - GNSS to pulse: < +/- 5 µs
  - GNSS to IRIG (AM): < +/- 200 µs
  - GNSS to IRIG (DC): < +/- 1 µs
  - Pulse/frequency output, BNC & RS422: < +/- 200 ns
  - Pulse/frequency output, Current Loop: < +/- 10 µs
  - GNSS to serial output: < +/- 10 ms (Jitter <10 ms)

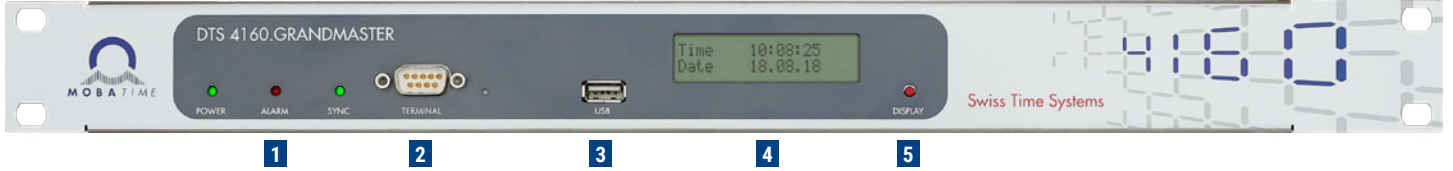
## MANAGEMENT & SUPERVISION

- MOBA-NMS; monitoring possible
- Terminal menu: Serial connector (RS-232), SSH, Telnet
- SNMP (v1/v2c/v3), SNMPv3 with authentication and encryption
- System firmware download via SCP, SFTP or FTP
- LEDs: Alarm, Power, Sync

## SECURITY

- Configuration and log files are stored on non-volatile memory in order to survive power failures
- See Mobatime security guideline (available on request)
- SNMPv3, SCP, SSH, NTP authentication
- License-based GNSS security feature (documentation available on request)

# INTERFACES



<b>1</b>	<b>Status LEDs</b>	Power (green), alarm (red), synchronization (green)	
<b>2</b>	<b>Terminal</b>	RS232 interface for local management, D-Sub 9 connector	
<b>3</b>	<b>USB</b>	USB host for USB flash drive	For firmware updates and log files
<b>4</b>	<b>Display</b>	LCD, 2 lines with up to 20 characters (with backlight)	For status, time and network configuration info
<b>5</b>	<b>Display button</b>	For display illumination and paging through information displays	
<b>6</b>	<b>Mains power supply<sup>1</sup></b>	C14 plug	90–240 VAC, 50/60 Hz or 80–240 VDC 0.5 A
<b>7</b>	<b>DC power supply (2x)<sup>1</sup></b>	2-pin terminals	24–28 VDC 2 A 2x eDC option: 24–68 VDC 2 A (galvanically separated)
<b>8</b>	<b>Alarm contact</b>	2-pin terminal	Normally closed Max. load: 30 W (30 VDC or 1 A) / 60 VA (60 VAC or 1 A)
<b>9</b>	<b>LAN 1</b>	RJ45 100/1000MBit	Management/NTP
	<b>LAN 2</b>	RJ45 100/1000MBit	Management/NTP/PTP/LAG
	<b>LAN 3</b>	RJ45 100/1000MBit	Management/NTP/PTP/LAG
	<b>LAN 4</b>	SFP	NTP/PTP/Redundant link
<b>10</b>	<b>E1 (option)</b>	2x BNC (female), 75 Ω	Tx/Rx, unbalanced, ITU-T G.703
		RJ48, 120 Ω	Tx/Rx, balanced, ITU-T G.703

<b>11</b>	<b>IRIG output<sup>2</sup></b>	BNC (female), 50 Ω	IRIG-B1xx (AM), AFNOR A/C (AM)
	<b>10MHz output</b>	BNC (female), 50 Ω	10 MHz, 2.048 MHz, 2 Hz, 1 PPS
	<b>Frequency input</b>	BNC (female), 50 Ω	10 MHz, 2.048 MHz, 1 PPS
	<b>Pulse output<sup>3</sup></b>	BNC (female), 50 Ω	10 MHz, 2.048 MHz, 2 Hz, 1 PPS
<b>12</b>	<b>Pulse Out<sup>3</sup></b>	5-pin terminal	RS-422 (10 MHz, 2.048 MHz, 2 Hz, 1 PPS) Current loop (2 Hz, 1 PPS)
<b>13</b>	<b>IRIG digital output<sup>2</sup></b>	2-pin terminal	IRIG-B00x (DC), AFNOR A/C (DC) (digital, 50 Ω, TTL)
<b>14</b>	<b>Serial output (2x)</b>	10-pin terminal	RS-232/422/485 RS-422: output only
<b>15</b>	<b>DCF In/Out</b>	6-pin terminal	DCF current loop input for the connection of a GNSS 4500 DCF output, current loop passive DC output (28 VDC, max. 100 mA), e.g. GNSS 4500 LED showing DCF signal
<b>16</b>	<b>GNSS input<sup>4</sup></b>	Type N (female), 50 Ω	GNSS antenna signal Antenna supply max. 5 V/100 mA

<sup>1</sup> Redundant, monitored

<sup>2</sup> Signal configuration is identical for analog and digital IRIG (11, 13)

<sup>3</sup> Signal configuration is identical for both pulse outputs (see manual) (11, 12)

<sup>4</sup> For available accessories, see product manual