

# OSA 3300-HP

Industry-first high-performance optical pumping cesium clock



Meteorology



Science



Metrology



Research



Ground station



Time scale

## Benefits

- **Ultra-high stability and long lifetime**  
Higher frequency stability and two times longer lifetime compared to legacy magnetic cesium atomic clocks
- **Unique innovation**  
First commercial cesium atomic clock utilizing optical technology for high-performance applications
- **Compact and modern design**  
LCD touch screen and Ethernet connectivity for simplified local and remote configuration
- **Proven physics**  
Reusing and improving well established and widely deployed magnetic cesium atomic clock technology
- **Technology leadership**  
Only company with a long history of expertise in both synchronization and photonic solutions, and an innovator of optical cesium technology
- **RoHS-compliant**  
Fully compliant with the latest RoHS standard and strict EU demands

## Overview

**An ultra-stable and precise frequency source is now required in most critical applications, from metrology labs to satellite navigation, from time-keeping institutes to satellite communication.** While global navigation satellite systems (GNSS) provide excellent accuracy, they are subject to outages and cannot serve as the sole synchronization technology. Atomic clocks are the perfect complement to GNSS, combining high accuracy with outstanding availability.

Our OSA 3300-HP is the industry's first commercial optical cesium atomic clock for high-performance applications. Extending our market-leading aPNT+™ platform, it enables highly precise synchronization over an extended lifetime for very demanding applications in metrology, timekeeping labs and other applications with high accuracy requirements. Thanks to its advanced optical cesium technology, it provides a much higher level of accuracy and clock stability, longer lifetime and a more robust design than legacy magnetic cesium clocks. What's more, with its compact and portable design, our OSA 3300-HP can be used in multiple applications, even in space-constrained environments.

Combined with a highly scalable grandmaster, such as our OSA 5430, it enables a market-leading ePTC solution compliant with the most stringent synchronization requirements. Besides ensuring outstanding performance, the OSA 3300-HP reduces dependency on GNSS, giving operators control of their network synchronization.



Front view

Rear view

Oscilloquartz super aPNT+™ frequency cesium clock

# OSA 3300-HP

## High-level technical specifications

### Optical pumping benefits

- No magnetic selection; optical preparation of atoms instead
- 100 times more atoms to be measured
- 10 times higher clock stability
- Simpler mechanical design
- Higher product reliability

### Longest lifetime

- Optical cesium has much higher efficiency in utilizing cesium atoms
- Double lifetime compared with legacy magnetic cesium clocks
- No compromise between lifetime and performance

### Highest accuracy

- Superior short term and long-term stability compared to magnetic cesium clocks
- Accuracy improvement by a factor of ten by achieving a stability at  $5 \times 10^{-12} \times (\tau)^{-1/2}$  over 10 years

### Robust design

- Building on our longstanding and field-proven competence with magnetic clock and photonic technology
- Reusing unique cesium tube assembly competence
- Operating critical components outside vacuum tube

### Modular design

- 3RU 19" rack-mounting shelf
- Hot-swappable power supplies and battery modules
- Wide range of synchronization input and ultra-low noise output interfaces

### Common management

- Easy to use with automated startup and an intuitive menu with touch screen
- Remote (IP) and local (RS232) management via Windows GUI
- Simple integration with any host infrastructure

## Applications in your network

### Metrology, time keeping institutes and science labs

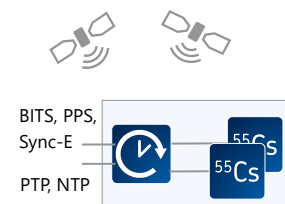
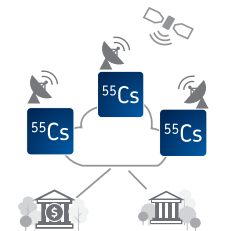
- Highly stable and low noise frequency outputs reaching  $5 \times 10^{-12} \times (\tau)^{-1/2}$  from both short and long observation times
- Ideal for contributing to national time scales for much higher accuracy and stability in applications such as GPS/GNSS-backup-as-a-service (GBaaS)

### Defense communication and space navigation

- Superior short-term stability to improve precision of navigation
- Longer holdover for frequency and time keeping thanks to superior long-term stability
- Superior short-term stability of frequency outputs with low phase noise for ultra-stable carrier frequency in communication applications
- Highly suitable for assured PNT applications

### PRC/ePRC and ePRTC for communication and cloud service providers, power utilities and enterprises

- OSA 5430 or OSA 5420 in combination with OSA 3300 solution for highly accurate and stable frequency and time source
- Fully compliant with ITU-T G.811 (PRC), G.811.1 (ePRC) and ITU-T G.8272 (ePRTC)
- Better holdover performance than ePRTC G.8272



## Product specifications

### High performance

#### Frequency accuracy

- Frequency accuracy:  $\leq \pm 5 \times 10^{-13}$
- Frequency reproducibility after powercycle:  $\leq \pm 1 \times 10^{-13}$

#### Frequency offset adjustments

- Resolution:  $\pm 1 \times 10^{-15}$
- Range:  $\pm 1 \times 10^{-9}$

#### Frequency stability versus magnetic field

- Versus  $\pm 1$  Gauss:  $\leq \pm 10^{-13}$

#### Short-term stability (frequency outputs), Allan Deviation:

Tau( $\tau$ )	HP
1s	$\leq 5 \times 10^{-12}$
10s	$\leq 3.5 \times 10^{-12}$
100s	$\leq 8.5 \times 10^{-13}$
1,000s	$\leq 2.7 \times 10^{-13}$
10,000s	$\leq 8.5 \times 10^{-14}$
100,000s	$\leq 2.7 \times 10^{-14}$
Floor (guaranteed)	$\leq 1 \times 10^{-14}$
Floor (typical)	$\leq 5 \times 10^{-15}$

- Warm-up time: 60 minutes at 25°C

#### Low noise frequency outputs

- Number of 10MHz outputs: 2
- Number of 5MHz outputs: 1
- Number of 100 MHz output: 1
- Signal format: sine wave
- Connector: SMA/F
- Load impedance: 50Ω
- Amplitude: 10dBm min., 13dBm typical
- Harmonics:  $\leq -40$ dBc
- Non-harmonics (spurious)  $\leq -80$ dBc
- Isolation between outputs:  $-110$ dB

#### Timing digital outputs

- Number of 1PPS outputs: 4
- Frequency: 1 Hz
- Connector: BNC/F
- Signal format: square LVCMOS
- Load impedance: 50Ω
- Amplitude: 2.5Vpp with 50Ω load
- Jitter  $\leq 1$ ns RMS

SBB phase noise	5MHz output	10MHz output	100MHz output
1Hz	-106dBc/Hz	-100dBc/Hz	-70dBc/Hz
10Hz	-136dBc/Hz	-130dBc/Hz	-90dBc/Hz
100Hz	-145dBc/Hz	-145dBc/Hz	-105dBc/Hz
1,000Hz	-150dBc/Hz	-150dBc/Hz	-115dBc/Hz
10,000Hz	-154dBc/Hz	-154dBc/Hz	-120dBc/Hz
Floor	-154dBc/Hz	-154dBc/Hz	-120dBc/Hz

- Rising edge  $\leq 5$ ns (10% to 90%)
- Output shape square
- Output timing signal significant slope: positive
- Pulse width: 20μs

#### Synchronization input

- Number of 1PPS input: 1
- Frequency: 1 Hz
- Connector: BNC/F
- Signal format: square LVCMOS
- Load impedance: 50Ω or 1MΩ (programmable)
- Amplitude: min. 2.5V; max. 5V
- Pulse width: 100ns-100μs
- Input timing signal significant slope: positive or negative (programmable)

#### Synchronisation function of PPS outputs

- Synchronisation range:  $\pm 500$ μs
- One shot external sync resolution  $\leq \pm 10$ ns

# OSA 3300-HP

## Power supply and battery options

- Number of power supply modules: 2
- Redundant and hot swappable
- Automatic switching
- Option 1
  - AC 110-240V, C15 connector
  - Range 88V up to 264V
  - Range 45Hz up to 65Hz
- Option 2
  - DC +24V (range 18V up to 30V)
- Option 3
  - DC-48V (accepted range -36V up to -72V)
- Power consumption steady state at 25°C  $\leq 60W$
- Power consumption at warm-up  $\leq 90W$
- Battery option: 60 minutes operation (full charge)
- Charge time from empty load: 4 hours

## Environment and compliance

- Operating temperature: 10°C to +50°C
- Non operating temperature: -40°C to +70°C
- Operating relative humidity: 10% - 90% non condensing
- Operating DC magnetic field: 0 Gauss to 2 Gauss any direction
- Vibration/Stationary - IEC 60068-2
- Basis ETSI EN 300019-2-3:2015 Stationary use Test specification T3.2 Environmental Class 3.2
- Random Vibration / Storage / Transportation / Drop
  - IEC 60068-2
  - Basis ETSI EN 300019-2 Storage Test specification T1.1 Environmental Class 1.1
  - Basis ETSI EN 300019-2 Transportation Test specification T2.2 Environmental Class 2.2
- Altitude: 0 to 15.000m
- Safety: IEC 62368-1. IEC 60825-1
- EMC and ESD:
  - EN 55032, CISPR 32, 47 CFR, Part 15, Sub part B
  - ICES - 003 Issue 7
  - EN 55035, CISPR 35,
  - EN 61326-1, IEC 61326-1
- CE & UL compliant
- RoHS 10/10
- Comply with Directive 2011/65/EU of the European Parliament and Commission Delegated Directive (EU) 2015/863

## Mechanical

- Table top
- 19" rack mountable, 19" 3RU
- Width/with rack ears: 450mm/482.6 mm
- Depth: 510mm
- Height: 132mm
- Weight: 25Kg (with battery, 20 without

## Management features

Status LED:

- 3 LEDs on front panel
- Type: Alarm, status, power

## Alarm relay

- Maximum rating: U= 50VDC, I = 250mA
- Connector: SUB-D 9/F

Graphical touch screen display

- Management functions:
  - Alarm and status
  - Monitoring
  - Parameter setting

Local management port

- Connector: SUB-D9/M
- Port configuration: 115200bps, 8bits, 1 stop bit
- Management commands: CLI
- Management software: Windows GUI

## Remote management port

- Ethernet, TCP/IP
- Connector: RJ45
- Management software: Windows GUI
- Security: user class, user ID, password

