

Specification	AXCS9000STD	Rev.: 2	Date: 2021-01-22
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Oscillator type: **Optically-pumped Cesium Atomic Clock  
Standard Performance Model**

## Features:

- Ultra-High Stability Primary Reference Clock (PRC)
- Standard for Time Synchronisation, Calibration and Test Labs
- Full monitoring and control features with modern user interface
- Remote access/health monitoring via Ethernet & RS-232
- Long Cesium tube life time – 10 years warranty
- No subject to U.S. export control (ITAR free)
- Compatible with popular Cesium Clocks
- Applications: 4G/5G networks, DTV, DAB, CMDA and Tetra, IPTV etc.
- Equivalent to ELECSPN TA1000A “Standard Performance”

The AXCS9000STD is a Cesium Primary Reference Clock with supreme long-term stability below  $5E-14$ . It is the first commercially available Optically-Pumped Cesium Clock. This principle has several advantages, compared to the common magnetic deflection method, like higher reliability, higher stability and lesser influence of physical factors. The guaranteed operating life time is min. 8 years. The AXCS9000STD has multiple outputs for 5 MHz, 10 MHz and 1PPS with very low phase noise and very low jitter. System synchronization is possible via 1PPS input. It also offers a state-of-the-art control & monitor interface via touch-screen or remotely via LAN or RS-232 connection.

Frequency & 1PPS pulse distribution is possible with optional distribution amplifiers AXDA9000 & AXDA9100. For further phase noise improvement and/or frequency generation the AXPLO-series of ultra-low noise “clean-up” modules are available.



**Electrical & Environmental Specification**

Parameter	min.	typ.	max.	Unit	Condition
Nominal output frequency RF1	5.000			MHz	
Nominal output frequency RF2	10.000			MHz	
Nominal output frequency RF3	1PPS				
<b>Frequency stability</b>					
Frequency accuracy			$5 \cdot 10^{-13}$		
Short- and long-term stability			$8.0 \cdot 10^{-12}$ $3.5 \cdot 10^{-12}$ $1.5 \cdot 10^{-12}$ $5.0 \cdot 10^{-13}$ $1.5 \cdot 10^{-13}$ $5.0 \cdot 10^{-14}$ $5.0 \cdot 10^{-14}$		@ $\tau = 1$ sec @ $\tau = 10$ sec @ $\tau = 100$ sec @ $\tau = 1,000$ sec @ $\tau = 10,000$ sec @ $\tau = 100,000$ sec @ Floor ( $\geq 5$ days)
Frequency reproducibility			$5 \cdot 10^{-13}$		
<b>RF output RF1</b>					
Number of output ports	2				
Signal waveform	Sine wave				
Load $R_L$	50			$\Omega$	$\pm 5\%$
Output level per port	+7	+10	+13	dBm	
Isolation between ports	100			dB	
Harmonics			-40	dBc	
Spurious			-80	dBc	
Phase noise @ 5 MHz			-105	dBc/Hz	@ 1 Hz
			-135	dBc/Hz	@ 10 Hz
			-145	dBc/Hz	@ 100 Hz
			-156	dBc/Hz	@ 1 kHz
			-158	dBc/Hz	@ $\geq 10$ kHz
<b>RF output RF2</b>					
Number of output ports	2				
Signal waveform	Sine wave				
Load $R_L$	50			$\Omega$	$\pm 5\%$
Output level per port	+7	+10	+13	dBm	
Isolation between ports	100			dB	
Harmonics			-40	dBc	
Spurious			-80	dBc	
Phase noise @ 10 MHz			-100	dBc/Hz	@ 1 Hz
			-130	dBc/Hz	@ 10 Hz
			-145	dBc/Hz	@ 100 Hz
			-150	dBc/Hz	@ 1 kHz
			-155	dBc/Hz	@ $\geq 10$ kHz
<b>RF output RF3</b>					
Number of output ports	3				
Signal waveform	Square wave / TTL				
Load $R_L$	50			$\Omega$	$\pm 5\%$
Output level	2.4			Vpp	
Rise & fall time			5	ns	
RMS Jitter			1	ns	
Pulse width	20			$\mu$ s	
Synchronization accuracy			20	ns	

Parameter	min.	typ.	max.	Unit	Condition
<b>External synchronisation input</b>					
Input frequency	1PPS				
Signal waveform	Square wave / TTL				
Number of input ports	1				
Load $R_L$	50			$\Omega$	
<b>Frequency tuning</b>					
Tuning range	$\geq \pm 1 \cdot 10^{-9}$				
Resolution	$\leq 6.5 \cdot 10^{-15}$				
<b>Lock Time</b>			60	min	@ +25°C
<b>DC Supply voltage <math>V_{S1}</math></b> (Note 1, 2)	22		75	V	
<b>AC Supply voltage <math>V_{S2}</math></b> (Note 1)	200		240	V	
<b>AC Supply input frequency</b>	50		60	Hz	
<b>Power consumption</b> (steady state)			120	W	
<b>Power consumption</b> (warm-up)			200	W	
<b>Operating temperature range</b>	0		+50	°C	
<b>Storage temperature range</b>	0		+50	°C	
<b>Relative humidity</b>	0		85	%	
<b>Enclosure (see drawing) (LxDxH)</b>	456x553x177			mm	19" rack 4 HU
<b>Weight</b>			40	kg	
<b>MTBF</b>	$\geq 100,000$			hrs	
<b>Cesium tube warranty</b>	10			years	designed for 12 years
<b>System factory warranty</b>	2			years	

**Notes:**

1. If both supply inputs AC and DC are present, then AC power supply is automatically selected.
2. The clock does not have an internal battery. It is recommended to use an UPS unit to ensure continuous power.

**Operation & Test Documents**

Title
Operation Manual
Health Monitoring Manual
Safety Mechanisms Description
Factory Acceptance Plan/Report
Site Acceptance Plan/Report

Please consult AXTAL

**Reference Documents**

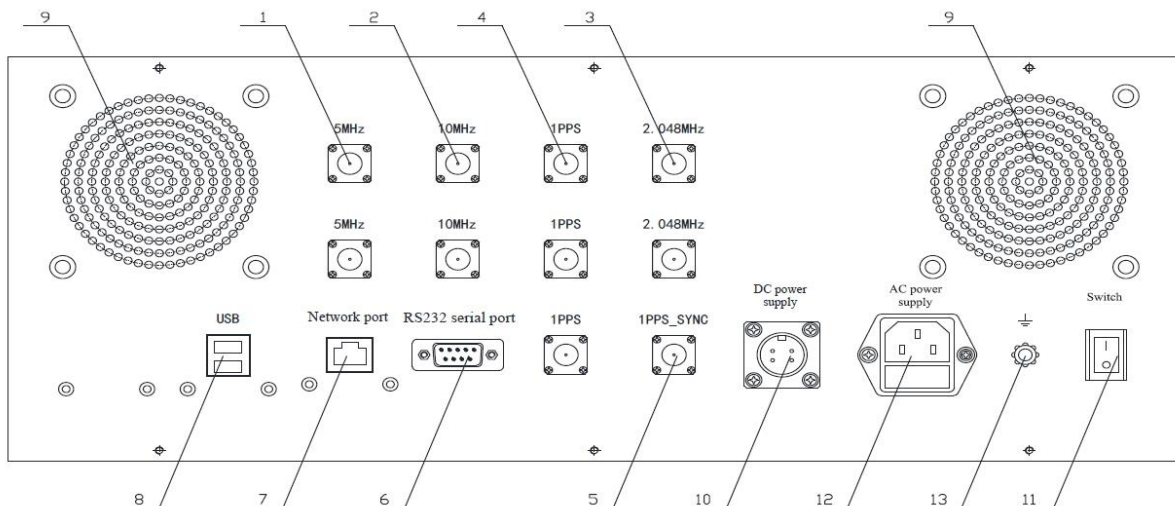
Title
Test Report National Institute of Metrology (NIM), China
Test Report National Time Service Center (NTSC), China

Please consult AXTAL

**Ordering Code**

Model	Revision	Frequency [MHz]
AXCS9000STD	Rev.2	10.000

## Backplane / Connections



#	Description	#	Description
1	5 MHz Outputs (x2)	8	USB Interface
2	10 MHz Outputs (x2)	9	Fan vents
3	<i>TA1000-M1 model only</i>	10	DC Power Supply Input
4	1PPS Outputs (x3)	11	AC Power Switch
5	1PPS Synchronization Input	12	AC Power Supply Input
6	RS-232 Interface	13	Ground connection
7	LAN Interface		

**Revision History**

Rev.	Drawing	Date [dd.mm.yyyy]	Remarks	Author	Checked
1	D0	30.07.2019	First issue – Improved Standard Model	HH	HH
1	D1	13.11.2019	Editorial changes	HH	HH
2	D0	08.01.2021	Major update – Various parameters added/updated	HH	HH
2	D1	22.01.2021	Warranty information added/updated	HH	HH