



# OSA 3030 EUDICS

## Digital Cesium Frequency Standard

### 3030 EUDICS (European Digital Cesium Standard) hightech compact Atomic Frequency Reference

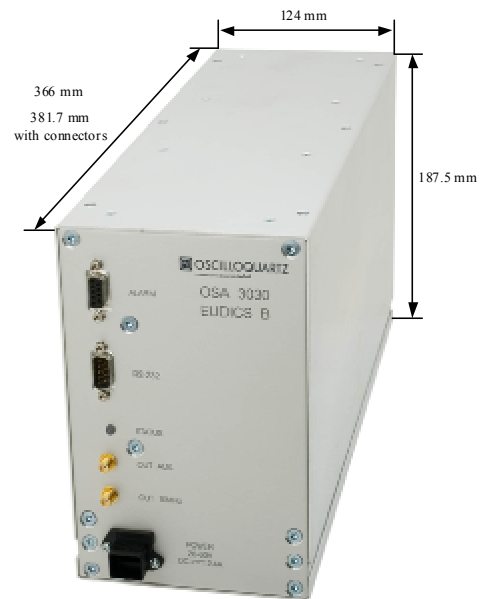
#### OVERVIEW

Atomic clocks standards are needed to generate highly accurate frequencies. These are typically used as Primary Reference in telecommunications networks, navigations systems, ground stations (LORAN C, GPS, GLONASS, GALILEO, etc...), long wave and medium wave broadcasting stations.

Atomic clocks can also be used for specific internal navigation systems where external "time reference signals" are not available or insufficiently protected regarding transmission risks.

Another field of application is for astrophysics, where very high precision atomic clocks can be used for long-baseline interferometers.

The Oscilloquartz's 3030 Eudics is specifically designed and produced with the latest technology to serve these complex applications. The OSA 3030 Eudics offers a unique set of operational features and performance, including greatly enhanced and easy integration into industrial, professional and time and frequency host systems.



#### HIGHLIGHTS

- **Excellent frequency accuracy of  $5 \times 10^{-12}$  over a large temperature range.**
- **Smallest volume/foot print in its class in rugged housing**
- **Monitoring and control available via RS232 making the 3030 extremely easy to operate.**
- **Field interchangeability of any sub-module can be achieved in minutes.**

#### APPLICATIONS

##### Primary Reference Clock for:

- **Navigation System Ground Stations (Loran C, GPS, Galileo, Glonass)**
- **Long and medium wave broadcasting stations**
- **Localization**
- **Large base Interferometry**



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### PRINCIPLE OF OPERATION

The OSA EUDICS 3030 frequency standard consists of a Quartz oscillator frequency-locked to the hyperfine resonance of free Cesium atoms. The Cesium atomic beam resonator provides an output signal which is strongly peaked around the central frequency  $f_0 = 9.192631770$  GHz, the width of the resonance being less than 500 Hz.

The stability of the resonance frequency with time and its insensitivity to environmental variations, especially to temperature, are the main reasons for the long-term stability and accuracy of the Oscilloquartz Cesium standard.

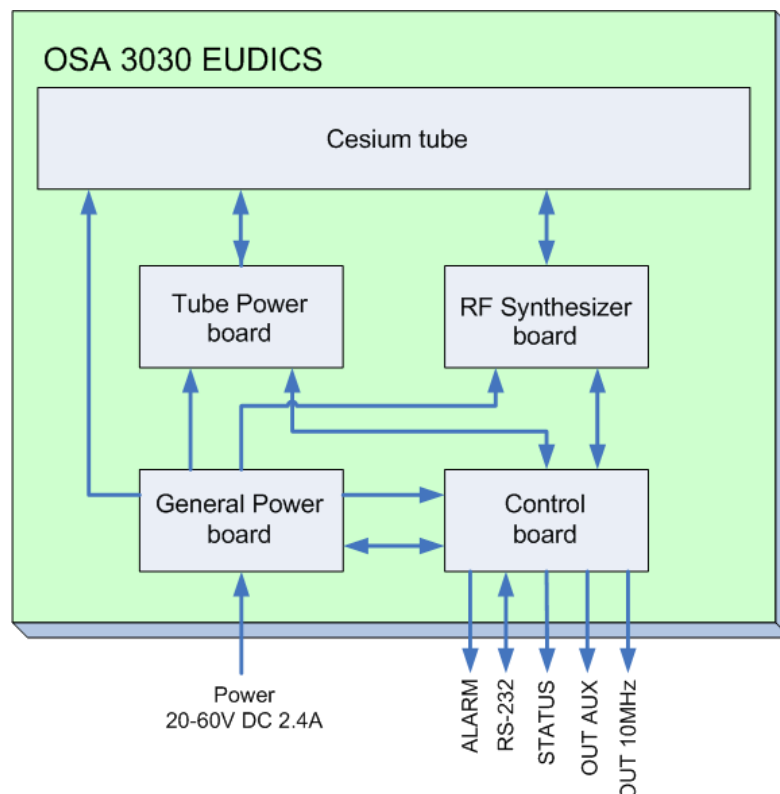
In order to lock the Quartz oscillator to the atomic resonance, an interrogating signal near  $f_0$  is derived from the output of a Quartz oscillator by multiplication and synthesis and fed to the atomic resonator. Under control of the microprocessor, the synthesized frequency is switched from one side of the atomic resonance to the other ( $f = f_i \pm 250$  Hz, square-wave frequency modulation). The output signal is processed by a digital synchronous detector to provide a correction signal to the voltage-controlled Quartz oscillator. The locked condition is reached when the two frequencies are symmetric about the resonance ( $f_i = f_0$ ).

### GENERAL STRUCTURE

The OSA 3030 EUDICS includes 5 main blocks:

- The Cesium beam tube under vacuum.
- The Control Board.  
This board is the heart of the clock. It control the main clock's functions, the power supplies monitoring and can generate the clock's alarms. It also includes the quartz oscillator.
- The RF Synthesizer board.  
This board synthesizes the micro wave electro magnetic field injected in Ramsey cavity. The RF frequency can be modulated via a DDS to scan the Cesium beam tube spectrum.
- The General Power board.  
This board generate all DC voltages used by other boards as well as "high voltage" power supplies for the Cesium tube.
- The Tube Power Board.  
This board is powering the main parts of the tube.

### GENERAL STRUCTURE

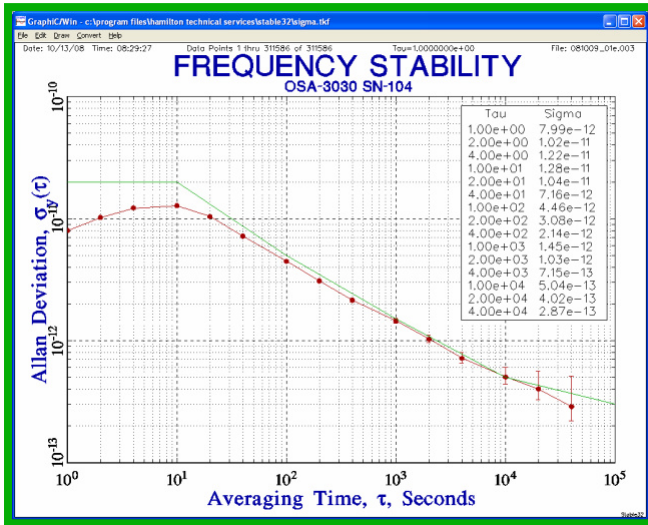




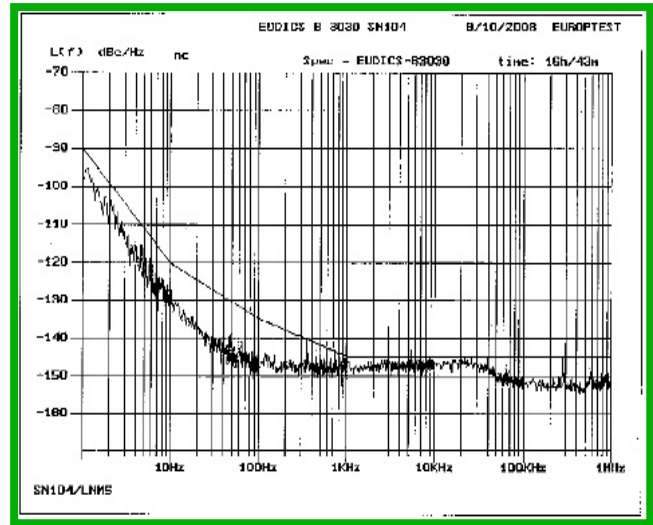
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### PERFORMANCE DATA



Short term frequency stability



Phase noise

### OUTLINE AND ELECTRICAL CONNECTIONS

POWER SUPPLY	
Input Voltage	20V to 60V (Nominal 24V / 1.5A steady state) 24V / 2A max during warm-up
Power Consumption	2.4A max Warm-Up: 48W max Steady state @25°C: 35W max
Warm-Up time @ 25°C (Cold-Start)	45 min typical
Warm-Up time to +/- 10 <sup>-11</sup>	20 min typical
ENVIRONMENTAL	
Operating Temperature Range	-5°C to 55°C
In-use Humidity	Up to 95%
Atmospheric pressure	70 kPa to 106 kPa
DC magnetic field	+/- 1Gauss maximum
MECHANICAL	
Size h x w x d mm (in.)	187.5 x 124 x 366 mm without connectors or 187.5 x 124 x 381.7 mm including connectors.
Weight	# 10Kg
Connector Access	All connectors are placed on Front Panel



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### TECHNICAL SPECIFICATION

Output signal		
	Frequency	10MHz
	Accuracy	$5 \times 10^{-12}$
	Level value	5dBm / 50Ω
Output signal Allan variance		
	1 s	$2 \times 10^{-11}$
	10 s	$1 \times 10^{-11}$
	100 s	$5 \times 10^{-12}$
	1000 s	$1.5 \times 10^{-12}$
	10 000 s	$5 \times 10^{-13}$
	100 000 s	$3 \times 10^{-13}$
	Floor	$3 \times 10^{-13}$
Relative frequency reproducibility		$3 \times 10^{-12}$
Frequency accuracy due to environment		
	Temperature -5°C + 55°C	$5 \times 10^{-12}$
	Magnetic Field	1Gauss
Frequency corrector		
	Settable resolution	$< 1 \times 10^{-14}$
	Settable range	$1 \times 10^{-10}$
Harmonic distortion		
	Harmonics	$> 30\text{dBc}$
	Spurious	$> 70\text{dBc}$
SBB phase noise spectral density (BW 1HZ)		
	1 Hz	-90/dBc
	10 Hz	-120/dBc
	100 Hz	-135/dBc
	1 kHz	-145/dBc
	10 kHz	-145/dBc
	100 kHz	-145/dBc
Programmable output		
	Frequencies	10MHz, 5MHz, 1MHz
	Level value	Square 0/5V HCMOS



Oscilloquartz SA reserves the right to change all specifications contained herein at any time without prior notice.

