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YEARS OF LEADERSHIP IN MASER CLOCK TECHNOLOGY

# iMaser 3000™

SMART ACTIVE HYDROGEN MASER CLOCK

## State-of-The-Art Performance & Features



### Swiss Quality & Technology

- Ceramic Cavity technology for lowest thermal sensitivity ( $<8 \cdot 10^{-16}/^{\circ}\text{C}$ )
- Sensitivity in temperature change technology for higher stability performance
- Durable Teflon & Bulb Coating technology for over 20 years lifetime
- Remote Distance control & monitoring for higher reliability & maintenance-free operation

### Ultra High Frequency Stability


- Allan deviation (1Hz bandwidth):
 

1 s	$6 \cdot 10^{-14}$	<i>(UST option 2020)</i>
1'000 s	$2 \cdot 10^{-15}$	
10'000 s	$1.2 \cdot 10^{-15}$	
Long term	$2 \cdot 10^{-16}$	

### Low Phase Noise (5MHz)

- $-132$  dBc/Hz @ 1Hz *(UST option 2020)*

### High Electromagnetic Compliance

-  compliance per ISO 17025,
- EN 55022 Class B, EN 55024 & EN 61326-1

### Advanced Features

- Auto cavity SmarTuning™ capability
- Distance control, monitoring & self-diagnostics

### Warranty

- 2 years, extendable to 5 or 7 years

### Lifetime

- >20 years

### Key Applications

- VLBI
- SLR
- Ground space stations
- Navigation
- Frequency reference source
- Time keeping & precision time scales
- GNSS satellite monitoring & geodesy



# iMaser™ 3000 Specifications

## FREQUENCY STABILITY

Allan Deviation				
1Hz bandwidth	Standard*	Option LN*	Option ST	Option UST*
1 s	$1.3 \cdot 10^{-13}$	$1 \cdot 10^{-13}$	$8 \cdot 10^{-14}$	$6 \cdot 10^{-14}$
10 s	$2 \cdot 10^{-14}$	$2 \cdot 10^{-14}$	$1.8 \cdot 10^{-14}$	$1.5 \cdot 10^{-14}$
100 s	$5 \cdot 10^{-15}$	$5 \cdot 10^{-15}$	$4 \cdot 10^{-15}$	$4 \cdot 10^{-15}$
1 ks	$2 \cdot 10^{-15}$	$2 \cdot 10^{-15}$	$2 \cdot 10^{-15}$	$1.5 \cdot 10^{-15}$
10 ks	$2 \cdot 10^{-15}$	$1.5 \cdot 10^{-15}$	$1.2 \cdot 10^{-15}$	$1 \cdot 10^{-15}$

## PHASE NOISE

Output Hz	5 MHz		10 MHz		100 MHz	
	Standard [dBc/Hz]	Option LN/ST/UST	Standard [dBc/Hz]	Option LN/ST/UST	Standard [dBc/Hz]	Option LN/ST/UST
1	-118	-130/-131/-132	-112	-124	-92	-102
10	-135	-142/-142/-144	-129	-136	-105	-113
100	-145	-152/-152/-153	-139	-147	-115	-125
1k	-152	-156/-156/-157	-146	-151	-125	-148
10k	-155	-156/-158/-159	-149	-153	-145	-154
100k	-155	-156/-158/-160	-149	-153	-145	-155

## ENVIRONMENTAL

	Standard	Option	[unit]	Option code
Temperature sensitivity [°C]	$<5 \cdot 10^{-15}$	$<8 \cdot 10^{-16}$	/°C	HCB
Phase sensitivity to temperature between sine outputs	$<10$	$<2$	ps/°C	HCB
Magnetic sensitivity	$<5 \cdot 10^{-14}$	$<1 \cdot 10^{-14}$	/G	MS
Frequency sensitivity to vibration	$<1 \cdot 10^{-9}$	$<5 \cdot 10^{-10}$	/g	LN/ST/UST
Power source sensitivity:	$<1 \cdot 10^{-15}$	$<1 \cdot 10^{-15}$	/V	

## OUTPUTS

	Standard	Option	Option	Option code
5 MHz	2			
10 MHz	0	2	4	O2/O4
100 MHz	2			
1 PPS	1	2	4	PPS2/PPS4

	5 / 10 / 100 MHz	[unit]	
Level (50 Ω)	+13	±1	dBm
Isolation	>	85	dB
Spectral purity	<	-45	dBc
Spurious	<	-70	dBc

1 PPS TIMING	Output	Sync Input	[unit]	Rem
Amplitude	>2.3	>2.3	V	50 Ω/TTL
Pulse width	100 μs	>100	ns	
Rise/fall time	<3 ns	<1	μs	
Jitter	<40 ps	<1	μs	Between 2 <sup>nd</sup> output
User settable		40	ns/step	

## POWER

	Nominal		[unit]	Rem
AC	110-220	85-135 176-264	V	50-60Hz
DC	24	22-30	V	3 A typical
Power	100	30-220	W	Standby-Operation Warm up
Battery	24V	0.25	hours	BATi
Battery pack	24V	15	hours	BAT1
2 <sup>nd</sup> pack	24V	32	hours	BAT2

## ADVANCED FEATURES

- Remote Ethernet monitoring: LAN HTTP, FTP, open source thru Windows, Linux or Mac (RE)
- Remote Distance Ethernet controls & distance maintenance (DC)
- Auto cavity Tuning™, Long term drift:  $2 \cdot 10^{-16}$ /day\*\* (CT)

\* Achieved with the advanced LowSensitivity™ in temperature change technology, providing an ultra-low temperature sensitivity of up to  $<8 \cdot 10^{-16}$  /°C

\*\* Typically achieved within  $\pm 0.1$  °C/day ambient temperature or with  $\pm 0.5$  °C/day the HCB ultra-low temperature sensitivity and CT SmarTuning options after a long period of continuous, undisturbed operation.

## CONTROL

- Frequency resolution 6.4·10<sup>-15</sup> 1·10<sup>-16</sup> (CT)
- Frequency tuning range  $\pm 3 \cdot 10^{-8}$

## ELECTROMAGNETIC COMPLIANCE

- CE compliance per ISO 17025,
- EN 55022 Class B, EN 55024 & EN 61326-1

## MECHANICAL

- Size (WxDxH) 60x80x91 cm  
23.7x31.5x35.9"
- Weight 100 kg / 220 lb  
40 kg / 88 lb per battery pack

## WARRANTY

- 2 years on site
- Extendable to 5 or 7 years (W5 / W7)

## LIFETIME

- >20 years

## ORDERING information

- Instructions iMaser3000 / xx / xx / xx

## Options

(xx – option codes)

LN/ST/UST

HCB

MS

O2/O4

PPS2/PPS4

BATx

CT

RE

DC

Wx

Low Noise OCXO/(Ultra) best Short Term  
Active Heater-Cooler-Box (climatic chamber)  
Extra Magnetic shield  
2/4 10MHz outputs  
2/4 x1PPS outputs  
Battery pack (IATA Approved)  
Cavity tuning  
Remote Ethernet control  
Remote Distance control & maintenance  
Extension of warranty

Examples:

iMaser3000/BAT2/O4/ST/RE/W5

