

Introduction

Rakon is the world leader in providing innovative oscillator technology for GNSS applications. The need for extreme precision under challenging conditions and accurate location in emergency situations, is driving the demand for high performance TCXOs. Rakon has developed a portfolio of cost effective solutions which meet these performance requirements.

Rakon's TCXOs for GNSS offer less than 0.5 ppm stability, low g sensitivity, tilt compensation and best in class phase noise performance. With a wide range of frequency control products for many GNSS applications, Rakon's products have set the standard for consumer global GNSS applications. Rakon is the preferred supplier of frequency control products for GNSS.

Technology Expertise and Standards Compliant

Rakon TCXOs Enable the Highest Level of Performance for GNSS

Rakon pioneered the ± 0.5 ppm TCXO which became the world's timing reference standard for global positioning systems. Rakon has further advanced TCXO technology for GNSS, enabling reliable locking conditions – even under weak signal environments. This coupled with Rakon's unmatched engineering expertise in the design and manufacture of low phase noise, tilt-compensation to guarantee performance for life of equipment, low ageing, extended temperature from -55°C to 105°C , high stability TCXOs, leads the way for GNSS solutions requiring the highest level of performance.

Proprietary Testing Technology

Testing is critical in the frequency control product industry. The electro-mechanical nature of quartz means it's impossible to eliminate all anomalies and products must be fully tested and screened. Rakon designs and manufactures its own crystal and TCXO test and process equipment. The guaranteed temperature sensitivity and advanced testing to eliminate spurious frequencies (caused by activity dips) reduces signal lock issues and ensures enhanced GNSS experience. Rakon's high resolution testing is unique in the industry, screening out all frequency perturbations.

Low g -Sensitivity

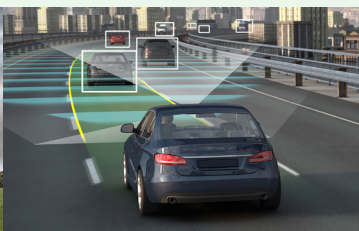
Rakon's low g sensitivity TCXO uses its proprietary Pluto+™ ASIC, and a patented dual crystal resonator design, resulting in high frequency stability over a wide temperature range, paired with a better than 0.2 ppb/ g acceleration sensitivity.

COSPAS-SARSAT Standards Compliant

The RFPT100 is the only COSPAS-SARSAT compliant TCXO available. It incorporates Rakon's Pluto™ ASIC which is a fourth-order temperature-compensation chip. The Pluto™ ASIC uses certain patented features, enabling it to achieve the critical medium term stability required, and which was previously unattainable with any TCXO. This unique performance for the first time has enabled the use of compact, low-cost TCXOs in emergency beacon applications. The Pluto™ ASIC based TCXO employs One-Time Programmable (OTP) non-volatile memory which ensures lifetime reliability under adverse conditions.


Rakon's GNSS Key Markets and Applications

- > Automotive
- > Agriculture
- > Defense and Space
- > IoT and Sport
- > Emergency Beacon (EPIRB, ELT, PLB)
- > Location Based Service
- > Personal Survival
- > Real Time Kinematic (RTK)







GNSS Positioning Solutions

TCXO Key Specifications

Parameter	High Stability TCXO	Ultra Stable TCXO	Beacons TCXO	Low g Sensitivity TCXO
Package size	3.2 x 2.5 mm 2.5 x 2.0 mm 2.0 x 1.6 mm 	7.5 x 5.0 mm 5.0 x 3.2 mm 	7.0 x 5.0 mm 5.0 x 3.2 mm 	14.7 x 9.2 mm 7.0 x 5.0 mm 
Frequency	10 to 40 MHz	1.25 to 52 MHz	10 to 20 MHz	16 to 40 MHz
Stability	±0.5 ppm (-40 to 85°C)	±0.1 ppm (-20 to 70°C) ±0.2 ppm (-40 to 85°C) ±1.0 ppm (-55 to 105°C)	±25 ppb (-20 to 70°C) ±50 ppb (-40 to 85°C)	≤ ±10 ppb (-0 to 70°C) ≤ ±50 ppb (-40 to 85°C)
Slope	±0.1 ppm/°C	0.05 ppm/°C	See Medium term stability below	± 0.02 to 0.1 ppm/°C
Phase Noise (Typical)	26 MHz: -149 dBc/Hz, ≥ 10 kHz	26 MHz: -151 dBc/Hz ≥ 10 kHz	16.367 MHz: -135 dBc/Hz ≥ 10 kHz	20 MHz: -152 dBc/Hz @ 10 kHz
Supply voltage	1.8 to 3.7 V	2.4 to 6 V	3 to 3.6 V	2.5 to 6 V
Output type	Clipped Sinewave	HCMOS, Clipped Sinewave	HCMOS, Clipped Sinewave	HCMOS, Clipped Sinewave
Application	GNSS, Fitness, PND	RTK, Differential GNSS	Emergency beacons, COSPAS SARSAT	Defense, Guidance, Avionics
Specialty features	Frequency drift: 100 ppb over first 600 seconds	Linearity: ≤1 % Extended Temperature: -55 to 105°C Tilt compensation: Yes	Medium term stability: ±0.7ppm/min (ΔT/Δt steady state) ±1.7ppm/min (ΔT/Δt during and 15 minutes after variable temperature) ±2ppm/min (Residual ΔF from slope, ΔT/Δt ≤±5°C/hour)	g-Sensitivity: ≤0.2 ppb/g

OCXO Key Specifications

Parameter	Conventional OCXO	Conventional OCXO	Mercury™ IC OCXO	Mercury+™ OCXO
Model Package Frequency	ROX2522S4 25 x 22 mm 10 to 40 MHz 	ROX2520S3 25 x 22 mm 10 to 40 MHz 	RFPO40 9.7 x 7.5 mm 5 to 50 MHz 	ROM1490 14.6 x 9.7 mm 5 to 50 MHz 
Stability	±5 ppb (-40 to 85°C)	±1 ppb (-40 to 85°C)	±10 ppb (-20 to 70°C) ±20 ppb (-40 to 85°C)	≤ ±10 ppb (-0 to 70°C) ≤ ±20 ppb (-40 to 85°C)
Frequency holdover (100 ppb)	> 24 months	> 24 months	> 1 month	> 1 month
Time holdover over (±1.5 μs @ 20°C window, 10°C /hour variation)	< 1 hour	4 hours	0.5 hours (constant temperature)	0.5 hours (constant temperature)
Phase Noise (Typical)	10 MHz: -145 dBc/Hz, @ 1kHz	10 MHz: -153 dBc/Hz, @ 10kHz	20 MHz: -152 dBc/Hz, @ 10kHz	20 MHz: -155 dBc/Hz, @ 10kHz
Aging	±0.5 ppb/day ±50 ppb/year	±0.2 ppb/day ±50 ppb/day	±1 ppb/day	±1 ppb/day
Power as steady state	1.5 W	1.5 W	400 mW	440 mW

Additional Rakon Products for Complete GNSS Positioning Design

Products Family	Product Series	Key Capabilities
VCXO	M / P / R	8 to 1500 MHz with low phase-noise and CMOS/PECL/LVDS in 7.0 x 5.0, 5.0 x 3.2 or 2.5 x 2.0 mm packages.
	X	10 to 50 MHz commercial CMOS output in 7.0 x 5.0 or 5.0 x 3.2 mm packages.
XO	M / P / R	8 to 1500 MHz with <1 ps jitter and CMOS/PECL/LVDS in 7.0 x 5.0, 5.0 x 3.2 or 2.5 x 2.0 mm packages.
	Q	8 to 1500 MHz selectable frequency, 1.0/2.0 ps jitter and CMOS/PECL/LVDS output in 2.5 x 2.0 mm package.
Crystals	X	10 to 50 MHz commercial CMOS output in 7.0 x 5.0 or 5.0 x 3.2 mm packages.
	RSX	12 to 48 MHz for Ethernet, WiFi and USB.
	RTF	32 kHz for real time clocks.

