

Introduction

Rakon is one of the world's largest solutions providers of high reliability frequency control products. Its high reliability solutions are found in Space, Defence and Industrial applications which require the most stringent performance criteria. This is why many government and commercial programmes use Rakon oscillators across the globe, in systems where high performance is required under the most demanding conditions. Rakon continuously develops state of the art frequency control products at the cutting edge of innovative technology.

Industry contribution

- ◆ Rakon has a proven record of taking Space specifications and creating high reliability and cost effective solutions in order to meet the most demanding requirements.
- ◆ Rakon is involved in most of the scientific programmes managed by the European Space Agency (ESA), and has been supplying ESA qualified crystals since the 1980s. Rakon is now the exclusive manufacturer in the world delivering qualified Space XO's according to the ESCC standard.
- ◆ As your strategic frequency control partner, Rakon can provide standard products or customised solutions, ranging from high performance crystals, all the way through to complex sub-systems.

Space product advantages

- ◆ Rakon space grade oscillators (Flight Models) are designed to meet TID of 100 kRad, low dose rate (36 – 360 rad/h) as per ESCC22900 and latch-up free up to LET of 60 MeV/mg/cm².
- ◆ Rakon is the top worldwide supplier of Ultra Stable OCXO for Space and ground applications. The mini Space USO (Ultra Stable Oscillator) offers a guaranteed frequency stability vs. temperature of 5E-11 (-20 to +50°C) and a short-term stability (Allan Standard Deviation) below 2E-13 from 1 to 100 seconds and below 6E-14 for the ground version.

Space product range and heritage

Rakon has a long history of providing high reliability products with some customers having an association with Rakon for 30 years or more. Rakon offers a complete range of ITAR-free frequency control products based on Space grade crystal technology.

Images: ESA

Rakon products can be found in many international programmes

Alphabus, AMOS, ATV, BepiColombo, CBERS, Cryosat, Chandrayaan, DORIS, EarthCARE, EgyptSat, ELISA, ENVISAT, Galileo, Globalstar, Herschel-Planck, Himawari, HTV, Iridium, Jason, JUNO, LEOStar, KOMPSAT, Mars Express, METOP, MTG, O3B, PARASOL, PLEIADES, Rosetta, SARAL, SAR-Lupe, Syracuse, Sentinel, Spacebus, SPOT, SWARM, Spacebus, PRISMA, SATCOM, SeoSar, TānDEM-X, THEOS and Venus Express



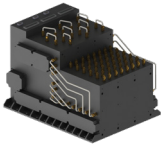
Space products

Rakon has an extensive portfolio of products with extreme capabilities. We have frequency control solutions for all types of spacecraft including: Navigation, Observation, Telecommunication Satellites, Transportation Vehicles and Exploration Probes.

MROs

The Hi-Rel Space MRO (Master Reference Oscillator) is a modular equipment that can be applied to applications which require a high stability and reliable signal. It is a part of the Equipment series suitable for different orbits but mainly GEO with a lifetime of 20 years.

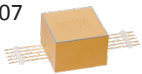
MRO



- Frequency: 4 to 400 MHz
- Overall frequency stability: ± 100 ppb for 20 years
- Frequency Distribution Unit (FDU)
- Power bus: 28 to 110 V
- Typical phase noise:
 - 105 dBc/Hz @ 10 Hz
 - 125 dBc/Hz @ 100 Hz
 - 145 dBc/Hz @ 1 kHz
 - 155 dBc/Hz @ 10 kHz

OCXOs

RK407



A wide range of Space grade OCXO with stability classes from 10^{-6} to 10^{-10} .

RK408



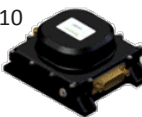
- 10^{-7} class: FvsT ± 0.25 ppm (-40 to +70°C), 25 x 25 x 17 mm, low weight 25g, low consumption 0.7 W EOL

RK409



- 10^{-8} class: FvsT ± 30 ppb (-40 to +70°C), guaranteed phase noise (for 10 MHz): -165 dBc/Hz @ 10 kHz

RK410



- 10^{-9} class: FvsT ± 1 ppb (-20 to +70°C), Allan Variance of 1×10^{-12} or better, ageing of ± 150 ppb / 15 years
- 10^{-10} class: FvsT ± 0.1 ppb (-20 to +60°C), Allan Variance of 5×10^{-13} or better, ageing of ± 100 ppb / 18 years

Crystal Filters

Custom

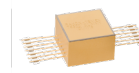


A series of custom design crystal filters.

- Fundamental mode or overtone 3 and 5
- Frequency range: 3 to 150 MHz
- Relative bandwidth: from 0.001 up to 1 %
- Insertion loss: 2 to 8 dB depending on frequency, number of poles and width

TCXOs

TE300, TE310

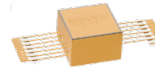


Space grade products for Transponders, GPS Receivers, Converters, Synthesizers, FGU and Digital Boards.

- Frequency: 10 to 40 MHz
- Package size: 20.6 x 20.6 x 13 mm
25.4 x 25.4 x 13 mm
- FvsT: ± 1 ppm (-20 to +70°C)
- Radiation hardness: 100 kRad
- Low weight: 20 g
- Low power consumption: 0.15 W

VCXOs

TE200

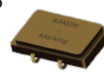


Space grade products for MEO/GEO/HEO satellites, and radiation tolerant COTS products for LEO satellites/mega-constellations.

- TE200: 10 to 40 MHz
- Package: Flat pack
- Pulling range: Up to ± 70 ppm

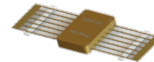
XOs

RK115



Space grade products for MEO/GEO/HEO satellites, and radiation tolerant COTS products for LEO satellites/mega-constellations.

RK135¹ (QPL)



- RK115: 10 kHz to 100 MHz. Following the guidelines of MIL-PRF-55310
- RK135: 10 kHz to 100 MHz. ESA standard
- Package: Flat pack or DIP

Crystal Resonators¹

Custom



Crystals for ultra stable TCXOs and OCXOs in harsh environments.

- Frequency up to 140 MHz
- High stability and low ageing
- Low phase noise and low *g*-sensitivity
- Sweet HQ crystal premium

¹ The RK135 and some crystals resonators are featured on the ESCC qualified parts list.

Ground applications products – High Stability OCXOs (HSOs)

Rakon's Ground USO is ideally suited for the high stability frequency requirements of calibration and metrology laboratories, as well as other applications requiring high performance reference oscillators.

HSO13

10^{-13} short term stability



- Frequency: 5 to 10 MHz
- Package size: 67 x 60 x 40 mm
- FvsT: $\pm 5 \times 10^{-11}$ (0 to 50°C)
- Allan Deviation: 2×10^{-13}
- Guaranteed phase noise @ 5 MHz: -125 dBc/Hz @ 1 Hz offset

HSO14 – State of the art

10^{-14} short term stability



- Frequency: 5 to 10 MHz
- Package size: 73 x 135 x 84 mm
- FvsT: $\pm 5 \times 10^{-11}$ (0 to 50°C)
- Allan Deviation: 6×10^{-14}
- Guaranteed phase noise @ 5 MHz: -130 dBc/Hz @ 1 Hz offset

