

For this product family, a full detailed specification can also be delivered on request.  
 Specific request can be addressed to RAKON [info@rakon.fr](mailto:info@rakon.fr)

## Product Description

This Mini Ultra Stable Oscillator is designed for Master Clocks, Navigation and Positioning Systems. It is used in such applications as GPS receivers, digital cards, board calculators, down and up converters, synthesizers.

This frequency source is featured by remarkable overall frequency stability vs. temperature range up to  $\pm 0.5$  ppb under vacuum,  $\pm 20$  ppb per year, power consumption at steady state of 3W under vacuum.

The AV (Allan Variance) variant of the Mini USO has a short term stability of  $5.10^{-13}$  at 1 and 10 s.  
 This mini USO is available in a 100x94x55mm format (0.57 l) with a Sub-D 15 connector and is manufactured following the guidelines of MIL-PRF-55310 (Class 1, type 4, level S).



## Features

- 10 MHz
- Allan Variance: 5E-13
- Supply voltage: +12V or +15V
- Warm up Consumption: 10 W max
- Steady state Consumption: 3W under vacuum
- Manufactured following the guidelines of:
  - MIL-PRF-55310 (Class 1, type 4, level S)
  - ECSS-Q-ST-70-08C and ECSS-Q-ST-70-38C
- Ageing:  $\pm 50$  ppb over 15 years
- Output Wave Form: sine 50 Ohms
- Output Level: from 0 to 10 dBm
- Component selected as per ECSS-Q-ST-60C
- Materials selected as per ECSS-Q-70
- Temperature stability:  $\pm 0.5$  ppb under vacuum

## Applications

- Master clocks
- GPS receivers
- Navigation
- FGU

## Specifications

### 1. Environmental conditions

Parameters	Conditions/remarks	Min	Nom	Max	Unit
Operating Temperature	Option A	0	25	60	°C
	Option B	-20	25	60	°C
	Option C	-30	25	60	°C
Switch-on Temperature	TSo	-40		85	°C
Non-Operating Temperature	TNOp	-55		125	°C
Random Vibration	Level as per MIL-STD-202, Method 204, condition I-J (37.8 Grms)				
Sine Vibration	Level as per MIL-STD-202, Method 204, condition D (15 G)				
Shocks	Mechanical shock as per MIL-STD-202, Method 213, Condition E (half sine with a peak acceleration of 1000g for duration of 0.5 msec)				
Radiation	TID : 100 kRad, low dose rate No SEL up to LET=60 MeV/mg/cm <sup>2</sup>				

## 2. Electrical interface

Parameters	Conditions/remarks	Min	Nom	Max	Unit
Power supply	Option 1	11.4	12	12.6	V
	Option 2	14.25	15	15.75	V
Load Impedance		45	50	55	Ω
Reference voltage		6.6	6.9	7.2	V
Control voltage	Vc	0		Vref	V

## 3. Performances

### 3.1. Option AV (Allan Variance)

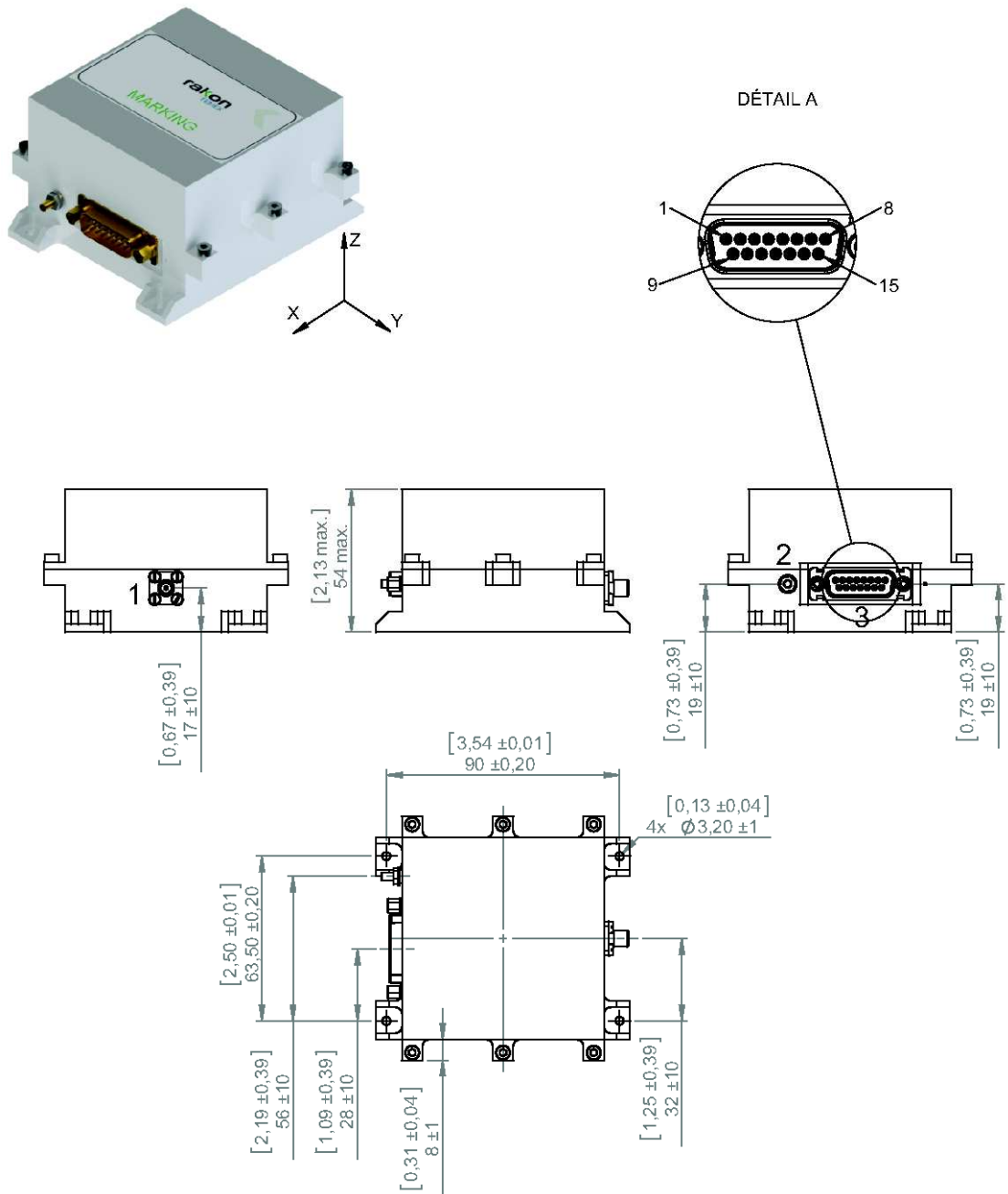
Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency			10		MHz
Steady state input current power	Vacuum @ -20°C			3	W
Warm up supply power				10	W
Initial frequency accuracy	Frequency pulling Option 2			± 5	ppb
Frequency adjustment	Positive slope	± 100			ppb
Frequency stability vs temperature	Option A			± 0.05	ppb
	Option B			± 0.1	ppb
	Option C			± 0.2	ppb
Frequency variation vs. supply voltage	Over Operating Temperature			± 0.05	ppb
Frequency variation vs. load	Over Operating Temperature			± 0.05	ppb
Frequency variation vs pressure				± 50	ppb
Frequency ageing	Over 1 year			± 10	ppb
	Over 15 years			± 50	ppb
Allan variance	1s, 10s			5.E-13	
Frequency warm up				30	mn
Output waveform		Sine			
Output level	EOL	4	5	6	dBm
Harmonics level and subharmonics				-40	dBc
Non harmonics level				-100	dBc
Phase noise	1 Hz		-120	-110	dBc/Hz
	10 Hz		-135	-120	dBc/Hz
	100 Hz		-140	-130	dBc/Hz
	1kHz		-146	-145	dBc/Hz
	10 kHz		-146	-145	dBc/Hz

**3.2. Option GP (General Purpose)**

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency			10		MHz
Steady state input current power	Vacuum @ -20°C			3	W
Warm up supply power				10	W
Initial frequency accuracy	Frequency pulling Option 2			± 5	ppb
Frequency adjustment	Positive slope	± 100			ppb
Frequency stability vs temperature	Option A			± 0.05	ppb
	Option B			± 0.1	ppb
	Option C			± 0.2	ppb
Frequency variation vs. supply voltage	Over Operating Temperature			± 0.05	ppb
Frequency variation vs. load	Over Operating Temperature			± 0.05	ppb
Frequency variation vs pressure				± 50	ppb
Frequency ageing	Over 1 year			± 20	ppb
	Over 15 years			± 100	ppb
Allan variance	1s			7.E-13	
Frequency warm up				30	mn
Output waveform		Sine			
Output level	EOL	5.5	7	8.5	dBm
Harmonics level				-45	dBc
Non harmonics level				-100	dBc
Phase noise	1 Hz		-110	-105	dBc/Hz
	10 Hz		-138	-135	dBc/Hz
	100 Hz		-153	-150	dBc/Hz
	1kHz		-157	-155	dBc/Hz
	10 kHz		-157	-155	dBc/Hz

## 4. Mechanical features

### 4.1. Package outline



DOCUMENT : 150.Plan d'encombrement  
150-Oscillator outline



GEN. TOL.  
+/- 0.1

UNITS.  
mm [inch]

SCALE  
1:1

### 4.2. Pin description

Pin number	Name	Function
2,3,4,12		Not connected
1	Vc	Voltage control
11	Vref	Reference voltage
5,9,10	Vcc	Power supply
6,7,8,13,14,15	GND	Ground
RF		Frequency output

## 5. Model philosophy

Representativeness	Engineering Model	Engineering Qualification Model	Qualification Model	Flight Model	Flight Model + Lot Acceptance test
Options	A	B, C	D	E, F, G, H	I, J
<b>Components</b>	Passive commercial parts, Active parts from the same manufacturer of HiRel parts	Mil Grade parts procured from the same manufacturer of HiRel parts	HiRel Parts	HiRel Parts	HiRel Parts
<b>Crystal material</b>	Swept quartz stabilized	Swept quartz stabilized	ESCC3501 Swept quartz stabilized	ESCC3501 Swept quartz stabilized	ESCC3501 Swept quartz stabilized
<b>Mechanical interface</b>	Flight representative in form-fit-function	Flight representative in form-fit-function	Flight design	Flight design	Flight design
<b>Electrical interface</b>	Flight design	Flight design	Flight design	Flight design	Flight design
<b>Tests</b>	Acceptance testing	Qualification testing	Qualification testing (including screening)	Acceptance testing (including screening)	Acceptance testing (including screening)+ LAT

## 6. Options for Engineering Qualification Model

- Option B: production manufacturing, qualification flow including qualification mechanical tests
- Option C: production manufacturing, electrical tests only

## 7. Flight Model Screening following the guidelines of MIL-PRF-55310

- Option E: full level S
  - Option F: level S with combined burn in aging of 480 hours
  - Option G: full level B
  - Option H: level B with combined burn in aging of 480 hours
  - Option I: level S with 1 pc/batch only
  - Option J: full level S (subgroup following the guidelines of MIL-PRF-55310)
- Lot Acceptance test could be performed on all screening options

## 8. Deliverable documentation

- Test data
- Full specification
- Certificate of Conformity (CoC)

## 9. Ordering part number definition

The part number breakdown is defined as follows:

