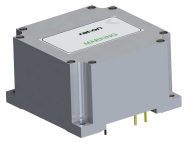
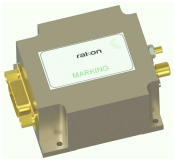
Space Oven Controlled Crystal Oscillator

RK 409 — 10^{-9} Stability class OCXO

For this product, full and detailed specifications can be delivered on request.
Specific request can be addressed to RAKON info@rakon.fr

Product Description





This stable oscillator is designed for Space Clocks, Navigation and Positioning Systems and is used in such applications as GPS receivers, digital cards, board calculators, down and up converters, synthesizers.
The AV (Allan Variance) variant of the RK409 has a short term stability of 6.10^{-13} at 1 s.
This frequency source is featured by remarkable overall frequency stability vs. temperature range up to ± 0.5 ppb under vacuum and ± 20 ppb per year.
The RK409 is available with different packages, in a small format (50x50x30mm) and is manufactured in accordance with MIL-PRF-55310 (Class 1, type 4 or type 6, level S or B).

Features

- Frequency Range: 10 MHz to 40 MHz
- Allan Variance @ 1s: 6.10^{-13}
- Supply Voltage: +12V or +15V
- Warm up consumption: 7 Watt
- Steady state consumption: 3 W under vacuum and 4W under atmospheric pressure
- Frequency stability vs. operating temperature range: ± 0.5 ppb under vacuum
- Ageing : ± 150 ppb over 15 years at 10MHz
- Output wave form: sine 50 Ohms
- Output level: from 2 to 10 dBm
- Component selected as per ECSS-Q-ST-60C
- Materials selected as per ECSS-Q-70
- Manufacturing in accordance with:
  - MIL-PRF-55310 (Class 1, type 4, level S or B)
  - ECSS-Q-ST-70-08C and ECSS-Q-ST-70-38C
- Weight:125g (GP variant)/170g (AV variant)

Applications

- Transponders
- GPS receivers
- Navigation
- Converters

Heritage

- SPACEBUS 4000
- SATCOM
- HTV
- HIMAWARI

Specifications

1. Environmental conditions

Parameters	Conditions/remarks	Min	Nom	Max	Unit
Operating Temperature	Option A	-5	25	60	°C
	Option B	-20	25	70	°C
	Option C	-40	25	70	°C
Switch-on Temperature	TSo	-40		85	°C
Non-Operating Temperature	TNOp	-55		125	°C
Random Vibration	Level as per MIL-STD-202, Method 214, condition I-J (46.30 Grms)				
Sine Vibration	Level as per MIL-STD-202, Method 214, condition D (20 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/cm²				

2. Electrical interface

Parameters	Conditions/remarks	Min	Nom	Max	Unit
Power supply	Option 12	11.4	12	12.6	V
	Option 15	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 @ 10 MHz

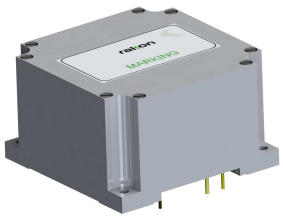
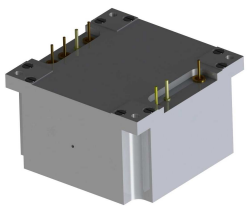
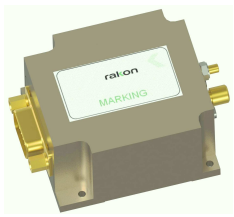
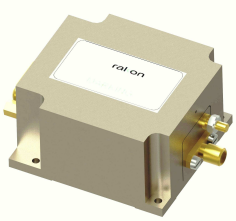
3.1. Option AV (Allan Variance)

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency		10		40	MHz
Steady state input current power	Vacuum @ -20°C			4	W
Warm up supply power				8	W
Initial frequency accuracy	Frequency pulling Option 2			± 10	ppb
Frequency adjustment	Positive slope			± 500	ppb
Frequency stability vs temperature	Option A			± 0.5	ppb
	Option B			± 1	ppb
	Option C			± 5	ppb
Frequency variation vs. supply voltage	Over Operating Temperature			± 0.1	ppb
Frequency variation vs. load	Over Operating Temperature			± 0.1	ppb
Frequency variation vs pressure				± 50	ppb
Frequency ageing (10 MHz)	Over 1 year			± 20	ppb
	Over 15 years			± 150	ppb
Allan variance	1s			6.E-13	
	10s			1.E-12	
Frequency warm up				30	mn
Output waveform		Sine			
Output level	EOL	2		10	dBm
Harmonics level and subharmonics				-30	dBc
Non harmonics level				-85	dBc
Phase noise @ 10 MHz	1 Hz			-110	dBc/Hz
	10 Hz			-135	dBc/Hz
	100 Hz			-145	dBc/Hz
	1kHz			-150	dBc/Hz
	10 kHz			-155	dBc/Hz

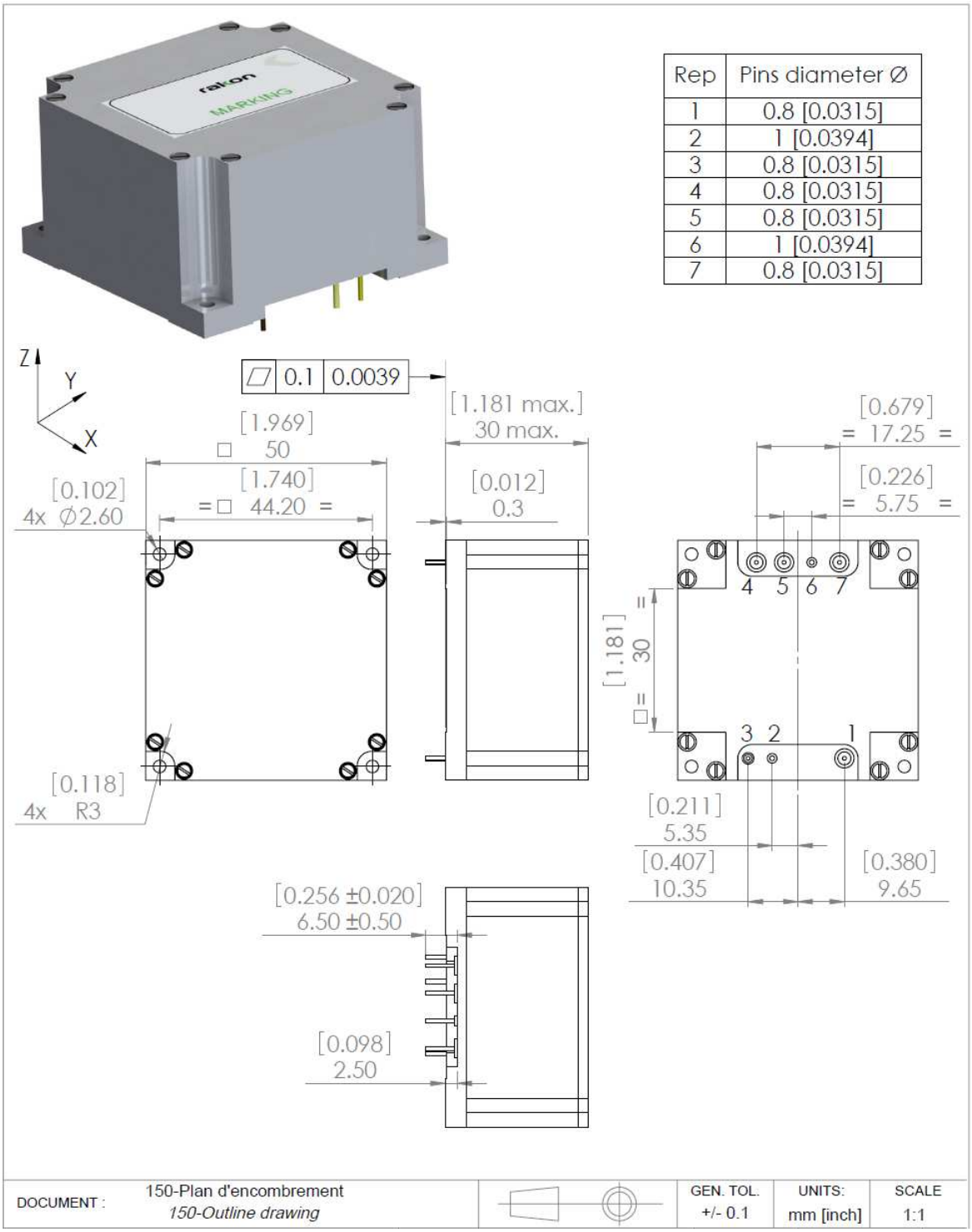
3.2. Option GP (General Purpose)

Parameters	Conditions/Remarks	Min	Typ	Max	Unit
Nominal Frequency		10		40	MHz
Steady state input current power	Vacuum @ -20°C			3	W
Warm up supply power				7	W
Initial frequency accuracy	Frequency pulling Option 2			± 10	ppb
Frequency adjustment	Positive slope			± 500	ppb
Frequency stability vs temperature	Option A			± 0.5	ppb
	Option B			± 1	ppb
	Option C			± 10	ppb
Frequency variation vs. supply voltage	Over Operating Temperature			± 0.1	ppb
Frequency variation vs. load	Over Operating Temperature			± 0.1	ppb
Frequency variation vs pressure				± 50	ppb
Frequency ageing (10 MHz)	Over 1 year			± 20	ppb
	Over 15 years			± 150	ppb
Allan variance	1s			1.E-12	
	10s			2.E-12	
Frequency warm up				30	mn
Output waveform			Sine		
Output level	EOL	2		10	dBm
Harmonics level and subharmonics				-30	dBc
Non harmonics level				-85	dBc
Phase noise	1 Hz			-105	dBc/Hz
	10 Hz			-135	dBc/Hz
	100 Hz			-145	dBc/Hz
	1kHz			-150	dBc/Hz
	10 kHz			-155	dBc/Hz

4. Mechanical features

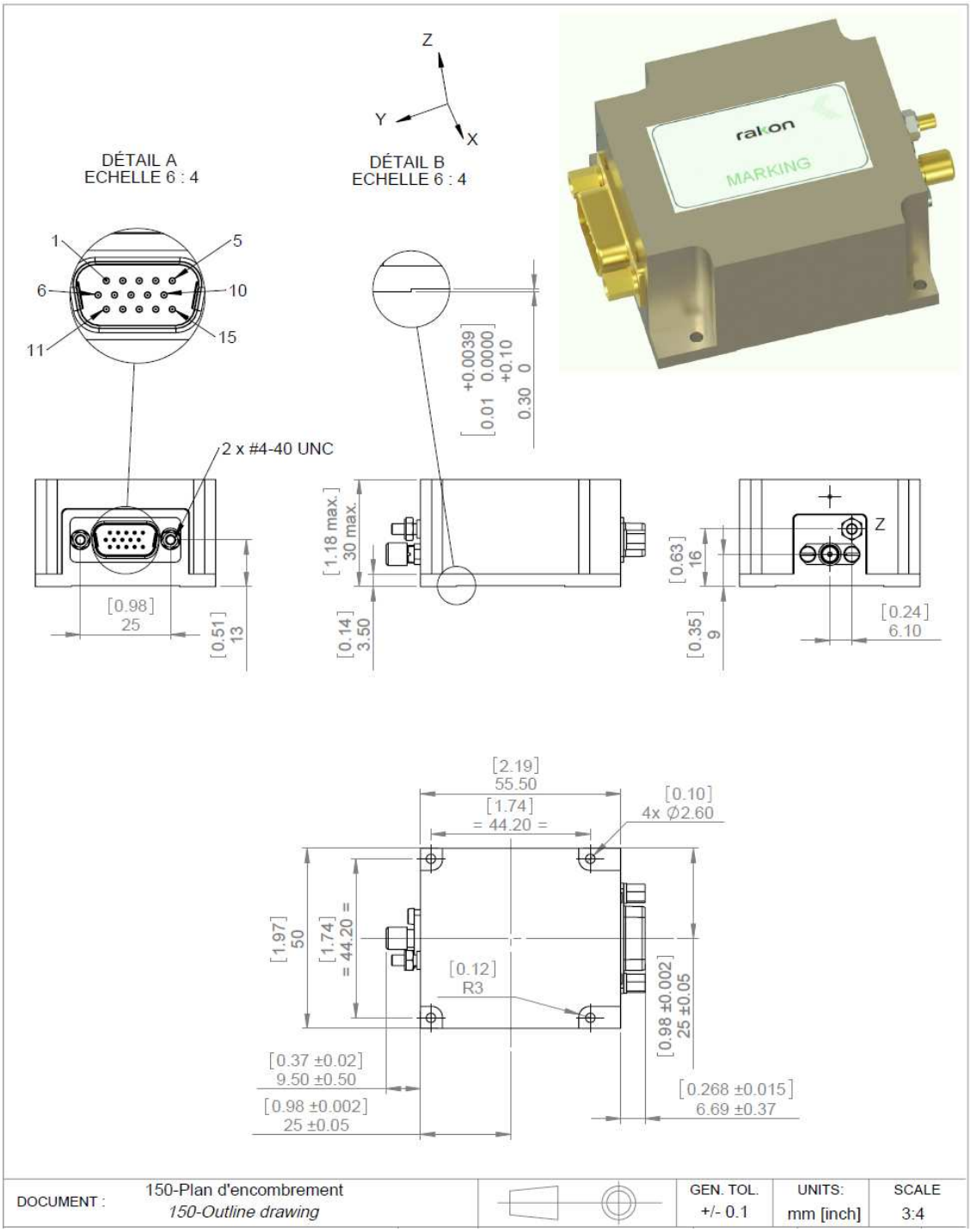
Package name	Description	Dimensions Wheight		
PT1	Pin Through Hole	50x50x30 mm		
SS1	Sub-D+SMA	50x55x30 mm		

4.1. Package PT1 (Pin Through hole)



Pin number	Name	Function
1	Alarm option 0	Not connected
	Alarm option 1	Oven alarm
2,6	GND	Ground
3	Fout	Frequency output
4	Vc	Voltage control
5	Vref	Reference voltage
7	Vcc	Power supply

4.2. Package SS1 (Sub-D+SMA)



Pin number	Name	Function
1	Vc	Voltage control
2,4,12		Not connected
3	Alarm option 0	Not connected
	Alarm option 1	Oven alarm
6,7,8,13,14,15	GND	Ground
5,9,10	Vcc	Power supply
11	Vref	Reference voltage
SMA connector	Fout	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**
Components	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
Crystal material	Swept quartz stabilized	Swept quartz stabilized	ESCC3501 Swept quartz stabilized	ESCC3501 Swept quartz stabilized	ESCC3501 Swept quartz stabilized
Mechanical interface	Flight representative in form-fit-function	Flight representative in form-fit-function	Flight design	Flight design	Flight design
Electrical interface	Flight design	Flight design	Flight design	Flight design	Flight design
Tests	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 according to 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
- 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:

RK 409 AV PT1 A 12 1 1 A 10M000000

RAKON

Series
OCXO (4xx)
10^{-9} stability class

Performance
AV = focus on Short Term stability
GP = General Purpose

Package
PT1 = 50x50x30 Pin Through
SS1 = 50x55x30 Sub-D + SMA

Temperature range/Stability
A = -5°C to +60°C, ± 0.5 ppb
B = -20°C to +70°C, ± 1 ppb
C = -40°C to +70°C, ± 5 ppb

Supply voltage
12 = 12V
15 = 15V

Frequency pulling
1 = internal calibration
2 = voltage controlled

Oven Alarm
0 = No
1 = Yes

Model
A = EM
B = EQM full environmental testing
C = EQM reduced environmental testing
D = QM
E = FM level S
F = FM level S with combined BI-aging
G = FM level B
H = FM level B with combined BI-aging
I = FM + group C

Frequency, fnom