


## NewSpace MRO

The NewSpace MROs (Master Reference Oscillators) is an equipment that can be applied to applications, which require high stability and reliable signal. It is a part of the FGU (Frequency Generation Unit) series suitable for LEO (Low Earth Orbit) satellites and satellite constellations with a lifetime guarantee of up to 12 years.

The NewSpace MRO is specially designed for LEO broadband, GNSS and applications where precision frequency stability, ultra-low phase noise and low power consumption are crucial. It achieves highly stable long-term frequency stability  $\pm 200$  ppb over 12 years. Frequencies are available from 10 to 500 MHz with up to 2 different output frequencies.

The current baseline includes an integrated DC/DC converter. The baseline allows the clock to be powered directly from the primary satellite bus, an ON & OFF TM/TC and a single output @ 10 or 100 MHz. The key functions of synchronising to a GNSS 1 PPS signal, frequency distribution, high output power and electronic frequency control have been qualified. These fundamental features can be optionally integrated to tailor to the MRO according to application configurations. Testing and screening flows can be tailored according to customer requirements to reduce cost and lead-time.

Key Features	Baseline	Options	46 x 174 x 75 mm
<ul style="list-style-type: none"> <li>▪ Output frequency: 10 to 500 MHz</li> <li>▪ Power bus: 28 or 50/75 V</li> <li>▪ Typical phase noise @10 MHz                             <ul style="list-style-type: none"> <li>-110 dBc/Hz (@1Hz)</li> <li>-137 dBc/Hz (@10Hz)</li> <li>-147 dBc/Hz (@100Hz)</li> <li>-155 dBc/Hz (@1kHz)</li> <li>-160 dBc/Hz (@floor)</li> </ul> </li> <li>▪ Overall frequency stability: <math>\pm 200</math> ppb for 12 years</li> </ul>	<ul style="list-style-type: none"> <li>▪ Single output: 10 or 100 MHz</li> <li>▪ Primary power bus: 28 V</li> <li>▪ Integrated DC/DC converter</li> <li>▪ On &amp; Off TM/TC</li> <li>▪ Connectors                             <ul style="list-style-type: none"> <li>○ SMA: output frequency</li> <li>○ DSUB 15: Power &amp; TM/TC</li> </ul> </li> <li>▪ Output power: 0 – 2.5 dBm</li> <li>▪ Isolation entre: 2 sorties &gt; 30 dB</li> </ul>	<ul style="list-style-type: none"> <li>▪ Power bus: 50/75 V</li> <li>▪ FDU                             <ul style="list-style-type: none"> <li>○ Up to 8 outputs</li> <li>○ Up to 2 different output frequencies</li> <li>○ One single 20 dBm output power</li> </ul> </li> <li>▪ Digital electronic frequency control</li> <li>▪ Overall frequency stability: <math>\pm 20</math> ppb for 12y via sync. to the 1 PPS</li> </ul>	

## Environmental Conditions

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Operating temperature	TO <sub>p</sub>	-25	25	60	°C
Non-operating temperature	Qualification	-30		63	°C
Random vibration	Level as per MIL-STD-202, Method 214, Condition K (46.3grms)				
Sine vibration	Level as per MIL-STD-202 Method 204, Condition D (20G)				
Mechanical shock	Level as per MIL-STD-202, Method 213, Conduction F: Half sine with a peak acceleration of 1500 g for a duration of 0.5 ms				
Radiation	Total Ionizing Dose (TID) of 40 kRad, low dose rate (36 to 360 rad/h) No SEL up to LET=43 MeV/mg/cm <sup>2</sup>				
Lifetime	Up to 12 years				
Radiation	< xFIT				

## Budgets and Package

Parameter	Condition / Remarks
Mass	950 g
Package	W x L x H: 46 x 174 x 75 mm
Power	10 W

### Typical Performance Characteristics

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Nominal frequency			10		MHz
Steady state input current power	Vacuum @ +20°C			7	W
Warm up supply power	Vacuum, EOL @ -30°C			15	W
Overall frequency drift	EOL (12 years)			±0.2	ppm
Frequency variation vs. temperature				±TBC	ppb
Frequency warm up				10	mn
Output waveform	Sine				
Output power level	EOL (12 years)	0		+2.5	dBm
Harmonics level				-40	dBc
Spurious level	100 Hz to 5 GHz			-110	dBc

### Phase Noise

Parameter	Condition / Remarks	Min.	Typ.	Max.	Unit
Phase noise @ 10 MHz	1 Hz offset		-110		dBc/Hz
	10 Hz offset		-137		
	100 Hz offset		-147		
	1 kHz offset		-155		
	10 kHz offset		-160		