EXTREME ENVIRONMENT | Hi-Reliability Crystals, Oscillators, VCXOs and Temperature Sensors

FREQUENCY MANAGEMENT | International

Next Generation in Frequency Control HIGH TEMPERATURE Solutions

Highest Temperature Ranges
Widest Frequency Ranges
Longest Operational Life
Highest Reliability
Smallest Packages
Lowest Current
FMI is a global leader in the design and manufacturing of high-reliability extreme environment and industrial grade—frequency control and hybrid electronic solutions. Committed to the industry’s highest level of service and total customer satisfaction, we help our customers achieve competitive advantages and strategic differentiation in their product applications.

At FMI, our foremost commitment is to complete customer satisfaction. This ideal is consistently reflected throughout our superior product performance, QA systems, prompt product delivery and effective customer assistance.

In creating a technology framework for our extreme environment specialization—FMI is uniquely situated to provide you with the most efficient solutions and response times.

Our unique and unmatched application design history (1986 to present, with a dedicated focus on the future) specifically targets the expanding systems applications for electronic frequency control solutions used in Oil & Gas Exploration, Geothermal Energy Generation, and Advanced Avionics Engine Sensor & Control.

At FMI, we continue to push the technology envelope for compelling Extreme Environment products, thereby enabling us to respond to your ever-evolving needs.

Extreme Environment Products for Oil | Gas | Geothermal

We are proactive in planning new solutions for the next generation—down-hole, geothermal, and other extreme environment system applications. FMI has delivered various extreme environment solutions to NASA and the U.S. DOE including resonators for 500ºC and crystal oscillator for 500ºC operation.

Capabilities & Features

- Targeting both New System Designs and Legacy Replacements
- Complies to Operating Conditions Beyond Industry Standards
- Solutions for New Jet Engine Controllers and Sensors at Higher Temperatures
- Smallest Available Projected Footprints
- Best Performance with the Lowest Power Consumption
- Voltage Options: 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5V

In creating a technology framework for our extreme environment specialization—FMI is uniquely situated to provide you with the most efficient solutions and response times.

Oscillators | VCXOs | Sensors

Oscillator Temperature Range: -180ºC to +325ºC, Crystals to +500ºC
High Shock and Vibration
Low Phase Jitter
Optimal Frequency Stability vs. Temperature Options
Established Reliability: Unparalleled Design, Reliability, & Customer Service
Fast Turn Around for Hi-Reliability Prototypes
Best Optimized Frequency Stability vs. Temperature Range Options
Industry Standard Packages and I/O Connections
DC to 500 MHz

Lowest Power Consumption
Proven Long Operating Life over the Entire Operating Conditions
Crystals, Oscillators, VCXOs, Temperature Sensors
High Pressure Tolerance to 7,000 PSI
Maximum Use of Established Reliability Components
Rugged Design & Construction Optimized for Severe Environments
Robust Manufacturing & Assembly Techniques
Very Rugged Crystal Design and Mechanical Assembly
Long-Term Performance & Life Test Under Extreme Conditions
Surface Mount and Thru-Hole Package Options

Hi-Temp Oscillators

Low CURRENT

Low power oscillator products are available in various packages and over a wide frequency range.

Package Style vs. Supply V vs. Frequency Range Offered

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<th>Package Style</th>
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The information provided in this brochure reflects our Extreme & High Temperature products and manufacturing capabilities. Our web site offers up-to-date product data sheets for a wide range of frequency control solutions.

www.FrequencyManagement.com

FREQUENCY MANAGEMENT | International
15302 Bolsa Chica Street
Huntington Beach, CA 92649

Sales@FrequencyManagement.com | Sales@FMI-Inc.com
1-714-373-8100 | Fax 714-373-8700
800-800-9825 (USA Only)

DC to 500 MHz
■ Low Phase Jitter
■ Optimal Frequency Stability vs. Temperature Options
■ Established Reliability: Unparalleled Design, Reliability, & Customer Service
■ Fast Turn Around for Hi-Reliability Prototypes
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**FMI Standard Hi-Temp | Hi-Rel Screening Plan**

- **Hi-Rel Screening Plan**
  - Non-Destructive Test (NDT)
  - Mechanical Testing
  - Electrical Testing

- **Hi-Temperature Testing**
  - Temperature Ranges: +200°C to +325°C
  - Test Duration: 8 hours per temperature point

**HI-TEMP SCREENING**

- **Screening**
  - Mil-Std-1285, Method 2023
  - Mil-Std-202, Method 112, Condition E
  - Mil-Std-202, Method 112, Condition D
  - Mil-Std-883, Method 2032, Class H; Method 2017, Class H
  - Mil-Std-883, Method 2023

- **Pre-Burn-in Electrical Test**
  - MIL-STD-202, Method 112, Condition E;
  - MIL-STD-202, Method 112, Condition D

**Hi-Temperature Testing**

- **Final Electrical Test**
  - MIL-STD-202, Method 112, Condition E;
  - MIL-STD-202, Method 112, Condition D

- **Marking & Serialization**
  - MIL-STD-1285, Method 2023

**Driver Solutions for Crystals, Resonators and Sensors**

- **FMI Oscillators**
  - Offers a wide range of crystal oscillator circuits for a variety of applications

**High Frequency | Tight Stability | High Temperature | Low Power**

- **Free Oscillators**
  - 5x7 mm SMD XO with High Ambient Pressure Tolerance; >7000 psi

**Hi-Temp VCXOs**

- 5x7 mm SMD Delivering Stability of ±60 ppm from 0 to +240°C (38 MHz, +3.3V)

**Extended Operating Life Crystal Oscillators, Half-DIP, >8000 Hours at +280°C**

- **Extreme Environments**
  - Lower consumption & superior performance leads to outstanding solutions at extreme temperatures.

**ALL FMI Designs have Extensive Life Testing**

- **Extended Operating Life Oscillator Product Highlights**
  - 5x7mm SMD Low-power at 32.768 MHz with 172 ppm Frequency Stability from 40 to +219°C
  - X5.7 to 12.5 MHz W/ ±10 ppm at +40°C
  - 360 MHz Speed, Half-DIP, ±50 ppm at +40°C

**Low Power Real Time Clock**

- **Supply Current (mA)** at 3.3V and 3.3V:
  - 0.0200
  - 0.0400
  - 0.0600
  - 0.0800

**Hi-Temp VCXO**

- Half-40 to 32.768 MHz VCXO Frequency Stability & Full Range temperature vs. Temperature (±10 ppm)

**Oscillators | VCXOs | Sensors**

- 32.768 MHz SMD VCXO, Pull Range (ppm) vs. Temperature (ºC) & Frequency Stability (ºC)

**Vendor Information**

- **15302 Bolsa Chica Street**
  - Huntington Beach, CA 92649
- **Sales@FrequencyManagement.com | Sales@FMI-Inc.com**
- **Tel. 714 373 8100 | Fax. 714 373 8700**
- **800 800 9825 (USA Only)**
FMI continues to set the standard and expands long term frequency drift performance solutions. Hi-Temperature Crystals (up to +235°C).

**Hi-Temp Crystals**

Highly Tunable Crystals (>2000 ppm) that facilitates any wide tuning range. Hi-Temp Crystals.

### Oscillators | VCXOs | Sensors

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<th>ppm</th>
<th>-30.0</th>
<th>-25.0</th>
<th>-20.0</th>
<th>-15.0</th>
<th>-10.0</th>
<th>-5.0</th>
<th>0.0</th>
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FMI continues to set the standard and surpass long-term frequency drift performance milestones. FMI Standard Hi-Temp | Long Term Stability

- **Hi-Temperature Long-Term Aging**
- **FREQUENCY MANAGEMENT | Huntington Beach, CA 92649**

**TO-5 CRYSTAL PACKAGE STYLE vs. FREQUENCY RANGE OFFERED**

FMI Extreme Environment MIL-Grade Product Highlights

- **Highly Tunable Crystals**
- **Hi-Temp Crystals**
- **Extremely Linear Temperature Sensor Crystals that Operate to +350°C**
- **HC-49/U Hi-Rel Package** from 1.8 MHz (lowest in the industry)
- **SMD Package Super Compliant Mounting for Very High Shock & Vibration**
- **SMD Packages, Operating Temperature Established to +240°C**

**CRYSTAL PACKAGE STYLE vs. FREQUENCY RANGE OFFERED**

- 3.2x2.5 mm
- 5x3.2 mm
- 5x7 mm
- 7x7 mm
- TO-5
- 125-1, 125-3
- HC-49/S

**Environmental Compliance**

- **Vibration – Swept**
  - **Mech Method** Method 204D
  - **Condition** A
  - **Test** 10, 20, 30 g rms, 10 to 2 kHz Random
- **Vibration – Random**
  - **Mech Method** Method 213B
  - **Condition** A
  - **Test** 10, 20, 30 g rms, 10 to 2 kHz Random
- **Shock**
  - **Mech Method** Method 213B
  - **Condition** A
  - **Test** 10, 20, 30 g rms, 10 to 2 kHz Random
- **Seal Test**
  - **Mech Method** Method 1014
  - **Condition** A
  - **Test** 10, 20, 30 g rms, 10 to 2 kHz Random

**Light PPM**

- **Low Phase Jitter**
- **Fixed, Variable, & Multiple Frequency**
- **Established Reliability**

**Compliance**

- **Manufacturer’s Data Sheets**
- **Solutions for new Jet Engine Controllers and Sensors at Higher Temperatures**
- **Complies to Operating Conditions Beyond Industry Standards**
- **Extreme Environment MIL-Grade**

**Quality Assurance Program**

Our dedication to customer satisfaction is the bedrock of our business process.

- **MIL-PRF-5510 Class B (QPL Certified)**
- **ISO 9501:2008 (Certified & Registered)**
- **MIL-STD-790 (Certified)**
- **MIL-PRF-3085 (Compliant)**
- **MIL-STD-683**
- **MIL-PRF-38554**
- **MIL-STD-202**
- **ESD: JESD22A-1**

We are committed to providing the best product performance & quality, consistent on-time delivery, and quality customer support. These are integral to our quest for total customer satisfaction.

**Space & Avionics**

**Extreme Environment Space Product Highlights**

- **Wide Frequency Range**
- **Extrem Low and High Temperature Ranges**
- **Radiation Tolerant from 10-100 TID**
- **Minimum Use of Established Reliability Components**
- **Industry Standard Package & Pin Connections**
- **Industry Standard Operating Voltages & Output Logic**
- **Industry Leading Stress Testing, Tests & Options**
- **Rugged Design & Construction Optimized for Extreme Environments**
- **Very Rugged Crystal Design and Mechanical Assembly**
- **Long Term Performance & Life Test Under Extreme Conditions**
- **Active Components: AC/DC-CMOS, HT-S0I-CMOS, & Bipolar Devices**
- **Optional MIL-Q or Swell Quartz Crystals**

FMI Extreme Environment Products

**FMI Standard Hi-Temp | Long Term Stability**

Aging measurements were done over more than 2000 hours of testing at +235°C. Despite the short term temperature fluctuations, the long term pattern clearly points to these trends. The results indicate that most of the dominant aging mechanism has been addressed. Changes in the first day of the test are due to the thermal settlement of the setup.
Welcome to the new age of Extreme Environment Electronics. FMI offers you the most rugged and advanced frequency control solutions while enhancing product performance in the most demanding environmental conditions.

FMI offers innovative and efficient solutions that have been developed exclusively for Extreme Environment applications:

- Oil & Gas Exploration Systems & Tools
  - Geothermal | Monitoring Systems
- Space Based Electronic Systems
- Aircraft Engine | Avionics
- Other Military & Industrial Subsystems
- Automotive
- Industrial Sensor Applications

World Class Manufacturing and First Class Customer Service

Located within easy reach from 3 major airports, our headquarters is located in Huntington Beach, CA with more than 16000 SF operating space for manufacturing and test equipment, clean room, and administration.

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