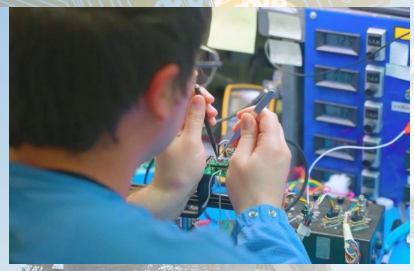

Solutions Guide

Quantic Wenzel®

Introduction

Since 1978, Quantic Wenzel has set the standard for ultra-low phase noise crystal oscillators, a portfolio complemented by a range of advanced frequency sources and integrated microwave assemblies to 30GHz and beyond. Quantic Wenzel's frequency control and timing products are designed into mission-critical military, space, and commercial applications, and perform in the most extreme environments.

Unmatched precision, low-g sensitivity and ultra-low phase noise distinguish our engineering expertise, so our customers can execute with full confidence—and without hesitation. And as a Quantic company, we're part of an extended engineering ecosystem and powerful supply chain, defining a competitive advantage that extends to every customer.

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Who We Are

At Quantic Wenzel we know that your mission-critical program needs are financially and strategically important to your organization, and we take the responsibility to help you achieve your goals very seriously. From prototype to production, we consistently provide proactive, world-class customer service in our efforts to research, design, and deliver innovative frequency control and timing products with industry-leading performance.

Our frequency control and timing products are trusted to:

- Maintain high frequency stability
- Significantly reduce phase noise
- Operate reliably in environments with intense vibration
- Withstand changes in temperature deviations

"The Quantic Wenzel oscillator is the premier standard. The oscillator provides excellent close-in and far-out phase noise performance and is ideal for the reference..."

— **Engineer**
Texas Instruments

"Whenever I'm tackling an application that has critical or frequency-stable requirements, Quantic Wenzel has been my go-to. Case in point the performance and price points of their solutions are hard to beat, and we are directly benefiting from Quantic Wenzel's leadership on that front."

— **Engineer**
University of Massachusetts Lowell

Applications & Markets Served

COMMERCIAL

Our team understands how quickly market cycles move. Our customers trust us to deliver custom crystal oscillators, advanced frequency sources, and integrated microwave assemblies that meet stringent time-to-market and budget objectives.

- 5G and Telecommunications Networks
- Test & Measurement Applications
- Radar Systems

DEFENSE

Drawing on a rich heritage in the design and manufacturing of frequency control and timing products stretching over 45 years—today, Quantic Wenzel is pushing the technological boundaries to help bring a new set of advanced capabilities for defense applications.

- Communication Systems
- Electronic Warfare Systems
- Navigation Systems

SPACE

We've amassed a storied record of achievement supporting space frequency control and timing applications. From traditional space to new space applications our team has worked with many different government contracted and commercial entities to engineer and manufacture custom crystal oscillators, advanced frequency sources, and integrated microwave assemblies.

- LEO, MEO, GEO and Deep Space Satellite Communication Systems
- Spacecraft Command and Control
- Ground-based Radar Systems

Frequency Control & Timing Products

ONYX Oscillator

Streamline Oscillator

Don't See the Part You Need?
Visit quanticwenzel.com to explore all our parts or to request a custom part for your application.

Oscillator Type	Part Number	Output Frequency	Phase Noise, Typical					Output Level	Temperature Stability	Supply Voltage	G Sensitivity	Package Configuration	Package Size	ECCN Number
			10Hz	100Hz	1KHz	10KHz	100KHz							
ONYX Oscillator Series														
Oven Controlled (OCXO)	501-22578e-01	10	-125	-150	-160	-165	-165	+10±2	±2E-8, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-22578d-03	10	-125	-150	-160	-165	-165	+10±3	±1E-7, -40° to +85°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-22578d-04	10	-135	-160	-163	-165	-165	+10±2	±2E-8, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-22578d-06	10	-135	-160	-163	-165	-165	+10±3	±1E-7, -40° to +85°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-27829-03	80	-99	-130	-155	-170	-171	+10±2	±2E-7, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-27829-04	80	-104	-135	-156	-172	-172	+10±2	±2E-7, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-24760f-01	100	-90	-120	-145	-165	-165	+10±2	±2E-7, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	EAR99, NLR
Oven Controlled (OCXO)	501-24760f-03	100	-99	-130	-155	-170	-171	+10±2	±2E-7, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1 × 1 × 0.5	3A001.b.10
Streamline Series														
Oven Controlled (OCXO)	501-27500-01	5	-135	-155	-165	-165	-165	+13±2	±2E-9, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27500-06	5	-135	-155	-165	-165	-165	+13±2	±1.5E-8, -55° to +85°C	15	N/A	Solder Pins on Base	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27500-11	5	-145	-160	-165	-165	-165	+13±2	±2E-9, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27500-16	5	-145	-160	-165	-165	-165	+13±2	±1.5E-8, -55° to +85°C	15	N/A	Solder Pins on Base	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27501-01	10	-130	-155	-165	-165	-165	+13±2	±2E-9, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27501-06	10	-130	-155	-165	-165	-165	+13±2	±1.5E-8, -55° to +85°C	15	N/A	Solder Pins on Base	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27501-11	10	-140	-160	-165	-165	-165	+13±2	±2E-9, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27501-13	10	-140	-160	-165	-165	-165	+13±2	±1.5E-8, -55° to +85°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 1	3A001.b.10

Frequency Control & Timing Products

[Continued]

Sprinter Oscillator

Local Oscillator

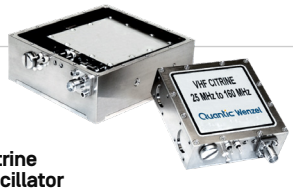
Ultra-Low Noise Oscillator

Oscillator Type	Part Number	Output Frequency	Phase Noise, Typical 10Hz	100Hz	1KHz	10KHz	100KHz	Output Level	Temperature Stability	Supply Voltage	G Sensitivity	Package Configuration	Package Size	ECCN Number
Sprinter Oscillator Series														
Oven Controlled (OCXO)	501-04516d	100	-90	-120	-150	-165	-165	+13±2	±5E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-04517d	100	-100	-130	-155	-165	-167	+13±2	±1E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27514-01	100	-90	-120	-150	-165	-165	+13±2	±2E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27514-04	100	-90	-120	-150	-165	-165	+13±2	±2E-7, 0° to +50°C	15	N/A	Solder Pins on Base	2 × 2 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27514-11	100	-100	-130	-155	-165	-167	+13±2	±2E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	2 × 2 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27514-14	100	-100	-130	-155	-165	-167	+13±2	±2E-7, 0° to +50°C	15	N/A	Solder Pins on Base	2 × 2 × 0.75	3A001.b.10
Local Oscillator Series														
Oven Controlled (OCXO)	501-27511-01	80	-100	-130	-150	-165	-165	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	Solder Pins on Base	1.5 × 1.5 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-27511-11	80	-105	-135	-155	-168	-170	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	Solder Pins on Base	1.5 × 1.5 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-27585-31	100	-105	-135	-160	-178	-180	+13±2	±2E-7, 0° to +50°C	12	5E-10, typ	Solder Pins on Base	1.5 × 1.5 × 0.5	3A001.b.10
Oven Controlled (OCXO)	501-27585-51	100	-105	-135	-160	-178	-180	+13±2	±2E-7, 0° to +50°C	15	3E-10, gtd	Solder Pins on Base	1.5 × 1.5 × 0.5	3A001.b.10
Ultra-Low Noise Oscillator Series														
Oven Controlled (OCXO)	501-27520-01	5	-145	-165	-174	-174	-174	+13±2	±2E-8, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27520-11	5	-150	-170	-176	-176	-176	+13±2	±2E-8, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27521-01	10	-137	-162	-172	-174	-174	+13±2	±2E-8, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27521-11	10	-142	-167	-175	-176	-176	+13±2	±2E-8, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27523-11	80	-106	-136	-166	-178	-180	+13±2	±2E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-23707a	80	-98	-130	-174	-174	-174	+13±2	±5E-7, -40 to +63°C	15	5E-10, typ	SMA(f) & Pins on Side	1.835 × 1.865 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27524-01	100	-100	-130	-158	-175	-176	+13±2	±2E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27524-11	100	-105	-135	-160	-178	-180	+13±2	±2E-7, 0° to +50°C	15	N/A	SMA(f) & Pins on Side	1.75 × 2.94 × 1	3A001.b.10
Oven Controlled (OCXO)	501-27555-01	100	-100	-130	-158	-175	-176	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	1.835 × 1.865 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27555-11	100	-105	-135	-160	-178	-180	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	1.835 × 1.865 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27555-21	100	-100	-130	-158	-175	-176	+13±2	±2E-7, 0° to +50°C	12	5E-10, typ	SMA(f) & Pins on Side	1.835 × 1.865 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-27555-31	100	-105	-135	-160	-178	-180	+13±2	±2E-7, 0° to +50°C	12	5E-10, typ	SMA(f) & Pins on Side	1.835 × 1.865 × 0.75	3A001.b.10
Oven Controlled (OCXO)	501-22474b	120	-97	-127	-158	-176	-176	+13±2	±2E-7, 0 to +60°C	15	3E-10. typ	SMA(f) & Pins on Side	1.835 × 1.865 × 0.75	3A001.b.10

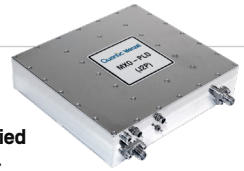
Frequency Control & Timing Products

(Continued)

Phase Locked Oscillator



Citrine Oscillator



Multiplied Crystal Oscillator

Oscillator Type	Part Number	Output Frequency	Phase Noise, Typical 10Hz	100Hz	1KHz	10KHz	100KHz	Output Level	Temperature Stability	Supply Voltage	G Sensitivity	Package Configuration	Package Size	ECCN Number
Phase Locked Oscillator Series														
Phase Lock (PLO)	501-27592-11	10	-145	-160	-172	-174	-174	+13±2	±5E-9, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27594-01	10	-140	-157	-169	-172	-172	+13±2	±5E-9, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27596-11	100	-105	-135	-160	-175	-176	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27597-01	200	-93	-123	-150	-163	-164	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27597-11	200	-98	-128	-153	-168	-169	+13±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27592-15	10, dual	-145	-160	-172	-174	-174	+10±2	±5E-9, 0° to +50°C	15	5E-10, typ	SMA(f) ×2 & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27594-15	10, dual	-145	-160	-172	-174	-174	+10±2	±5E-9, 0° to +50°C	15	5E-10, typ	SMA(f) ×2 & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Phase Lock (PLO)	501-27596-15	100, dual	-105	-135	-160	-175	-176	+10±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) ×2 & Pins on Side	2.5 × 3.5 × 0.8	3A001.b.10
Citrine Oscillator Series														
Oven Controlled (OCXO)	501-23750b	10	-135	-160	-172	-174	-174	+13±2	±2E-8, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2.25 × 2.25 × 0.8	3A001.b.3
Oven Controlled (OCXO)	501-26198	80	-105	-135	-162	-183	-188	+18±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2 × 2 × 0.7	3A001.b.8
Oven Controlled (OCXO)	501-25900b	100	-108	-138	-163	-183	-188	+18±2	±2E-7, 0° to +50°C	15	5E-10, typ	SMA(f) & Pins on Side	2 × 2 × 0.7	3A001.b.6
Phase Lock (PLO)	501-26229	100	-100	-130	-158	-175	-176	+13±2	±5E-7, 0° to +50°C	15	3E-10, typ	SMA(f) & Pins on Side	2 × 2 × 1.3	3A001.b.9
Oven Controlled (OCXO)	501-23792a	500	-85	-115	-142	-159	-160	+13±2	±5E-7, 0° to +50°C	15	3E-10, typ	SMA(f) & Pins on Side	2 × 2 × 1.3	3A001.b.4
Oven Controlled (OCXO)	501-24221	10, dual	-135	-160	-172	-172	-172	+13±2	±2E-8, 0° to +50°C	12	5E-10, typ	SMA(f) ×2 & Pins on Side	2.25 × 2.25 × 0.8	3A001.b.5
Oven Controlled (OCXO)	501-25998	500/100	-84	-114	-142	-159	-160	+13±2	±5E-7, 0° to +50°C	15	5E-10, typ	SMA(f) ×2 & Pins on Side	2 × 2 × 1.3	3A001.b.7
Multiplied Crystal Oscillator Series														
Oven Controlled (OCXO)	501-26838a	500	-91	-121	-146	-167	-170	+16±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	3.25 × 4 × 1	3A001.b.10
Oven Controlled (OCXO)	501-24145	500	-85	-115	-143	-159	-160	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	2.25 × 4 × 1	3A001.b.10
Oven Controlled (OCXO)	501-25399	4000	-66	-96	-123	-140	-141	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	4.16 × 4 × 1	3A001.b.10
Oven Controlled (OCXO)	501-25400	5000	-63	-93	-120	-137	-138	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	3.21 × 4 × 1	3A001.b.10
Oven Controlled (OCXO)	501-25412	10240	-57	-87	-112	-129	-130	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	4.16 × 4 × 1	3A001.b.10
Phase Lock (PLO)	501-23950	500	-85	-115	-143	-159	-160	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	3.45 × 4 × 1	3A001.b.10
Phase Lock (PLO)	501-24886a	4000	-66	-96	-123	-140	-141	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	5.36 × 4 × 1	3A001.b.10
Phase Lock (PLO)	501-25401	5000	-63	-93	-120	-137	-138	+13±2	±5e-7, 0° to +50°C	15	5e-10, typ	SMA(f) & Pins on Side	4.40 × 4 × 1	3A001.b.10

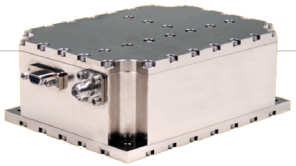
Custom Products

INTEGRATED MICROWAVE ASSEMBLIES

Our oscillator-based and frequency conversion integrated microwave assemblies are designed for use in mission-critical radar systems, communications, defense, and space applications.

INSTRUMENTATION

Our instruments combine industry leading ultra-low phase noise performance with standard rack mount configurations. A variety of standard rack source solutions are available with pre-configured output frequencies, but custom solutions are also available.



SPACE QUALIFIED

Our team has earned a reputation for engineering solutions that deliver excellent frequency stability, vibration mitigation, low-g endurance, ultra-low phase noise performance, and temperature balance.

3U/6U SOSA-ALIGNED OPENVPX

We offer SOSA-aligned card assemblies as well as custom configurations that provide one or multiple low noise frequencies.

Resources

From case studies and white papers to demonstration videos and more, we provide you with the resources that you need to expand your frequency control and timing knowledge for mission-critical radio frequency and microwave applications.

Visit **quanticwenzel.com/resources** to access the full library.

UNDERSTANDING DYNAMIC PHASE NOISE

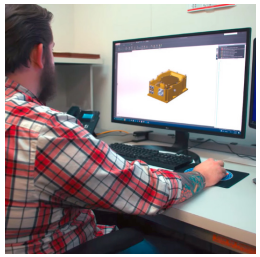
In this technical article, we delve into the concept of dynamic phase noise, explore its effects on radio frequency and microwave system performance, and discuss several techniques that engineers can employ to mitigate its impact.

IMPROVING OSCILLATOR DYNAMIC PHASE NOISE WITH PASSIVE VIBRATION ISOLATION AND ACCELEROMETER-BASED VIBRATION COMPENSATION

In this technical article, we present an accelerometer-based vibration compensation system that mitigates the effects of vibration on OCXO dynamic phase noise. We examine the use of this active compensation system as well as passive vibration isolation and discuss challenges and design considerations related to these techniques.

DYNAMIC PHASE NOISE CALCULATOR

Developed by our expert RF engineers, our calculator tools are a great resource for those involved in frequency control and timing applications.



Compliance & Quality Standards

We are committed to providing the highest quality standards and custom solutions to meet the varied and specialized technical requirements of the RF and Microwave industry. From prototype to production, we are dedicated to consistently provide proactive, personalized service in our efforts to research, design and deliver innovative world class products with industry-leading performance. Visit quanticwenzel.com/quality to view our terms and conditions of sale, export compliance information, and more.

- MIL-I-45208
- MIL-Q-9858
- MIL-STD-1686
- REACH Compliant
- RoHS Compliant (select products)
- ITAR Compliant
- ISO 9001:2015 Registered
- NASA-STD-8739
- ANSI/ESD S20.20
- ISO-10012-1 / MIL-STD-45662 / ANSI Z540 Calibration
- IPC-A-610
- J-STD-001, Class 2 and 3
- J-STD-001S

Ordering Information

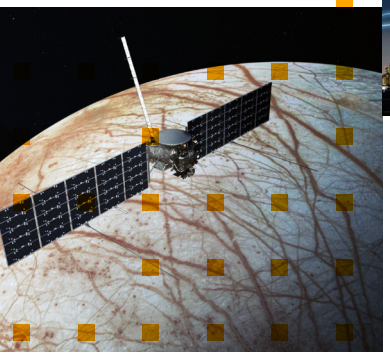
We understand that effective communication is essential in our line of work. Whether you have questions, need technical assistance, or a quote we're here to help.

Online: quanticwenzel.com/order

Phone: 512-835-2038

Mailing: 1835A Kramer Ln, Austin, TX 78758

International Sales Representatives:
quanticwenzel.com/international



Quantic Electronics Extended Ecosystem

Quantic Electronics brings together the industry's most distinguished electronics and manufacturing experts, in an elite portfolio of complementary design, engineering and manufacturing businesses. Our teams collaborate closely with customers, consulting engineer-to-engineer, on the most mission-critical applications in RF & Microwave, power, sensing and magnetics. Visit quanticnow.com to learn more.

RF & MICROWAVE

Quantic's RF & Microwave businesses produce a comprehensive portfolio, from components to integrated assemblies—all available with rapid prototyping. Key products include active and passive filters, switches and LNAs; control products; beamformers, couplers and calibration modules; crystal oscillators and frequency sources; and synthesizers and custom IMAs.

CAPACITORS

Quantic's broad array of capacitor technologies range from multilayer polymer film capacitors and multilayer ceramic capacitors and assemblies, to the industry's most power-dense, hybrid wet tantalum capacitors. Our capacitors deliver mission-critical performance in defense, aerospace and energy, where high-reliability, space, weight and power are crucial.

RESISTORS

The Quantic resistor portfolio includes thin-film technologies that give design engineers a blank slate on which to create the innovative, feature-rich circuitry that modern applications require. Our OhmegaPly® product eliminates discrete resistors for significant cost savings, while our TCR® product utilizes the very latest in advance laminate systems.

MAGNETICS

Aerospace, defense, automation and security leaders rely on Quantic ECI's high-reliability custom magnetics solutions for their most demanding applications.

SENSING

Quantic BEI's and Quantic Thistle's renowned sensing portfolios include the most advanced optical encoders and encoder-based motion-control systems, including ARA encoders, AIME-II, MKE and tracker solutions.

Quantic Wenzel®

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