

High performance sensors in depth

Measurement & sensing technology for
downhole data you can trust



Custom designed for exceptional downhole sensor performance in extreme environments



Welcome to Reuter-Stokes

Based in Twinsburg, Ohio, Reuter-Stokes, a Baker Hughes company, offers more than six decades of on-going expertise in the design, manufacture and installation of its extensive portfolio of gamma, neutron and orientation technologies. The company's portfolio has evolved across multiple industries including nuclear power, radiation monitoring, industrial and oil & gas.

Why Reuter-Stokes?

Reliability

When you need your downhole sensors to be accurate, trustworthy, and reliable, drilling service and wireline companies around the globe turn to Reuter-Stokes for the sensors that gets the job done time and again.

Investment

Reuter-Stokes continues to invest in new technology to push the industry forward. In parallel, we recently added 1,600 sq. ft of clean room production capacity to deliver quality products on time.

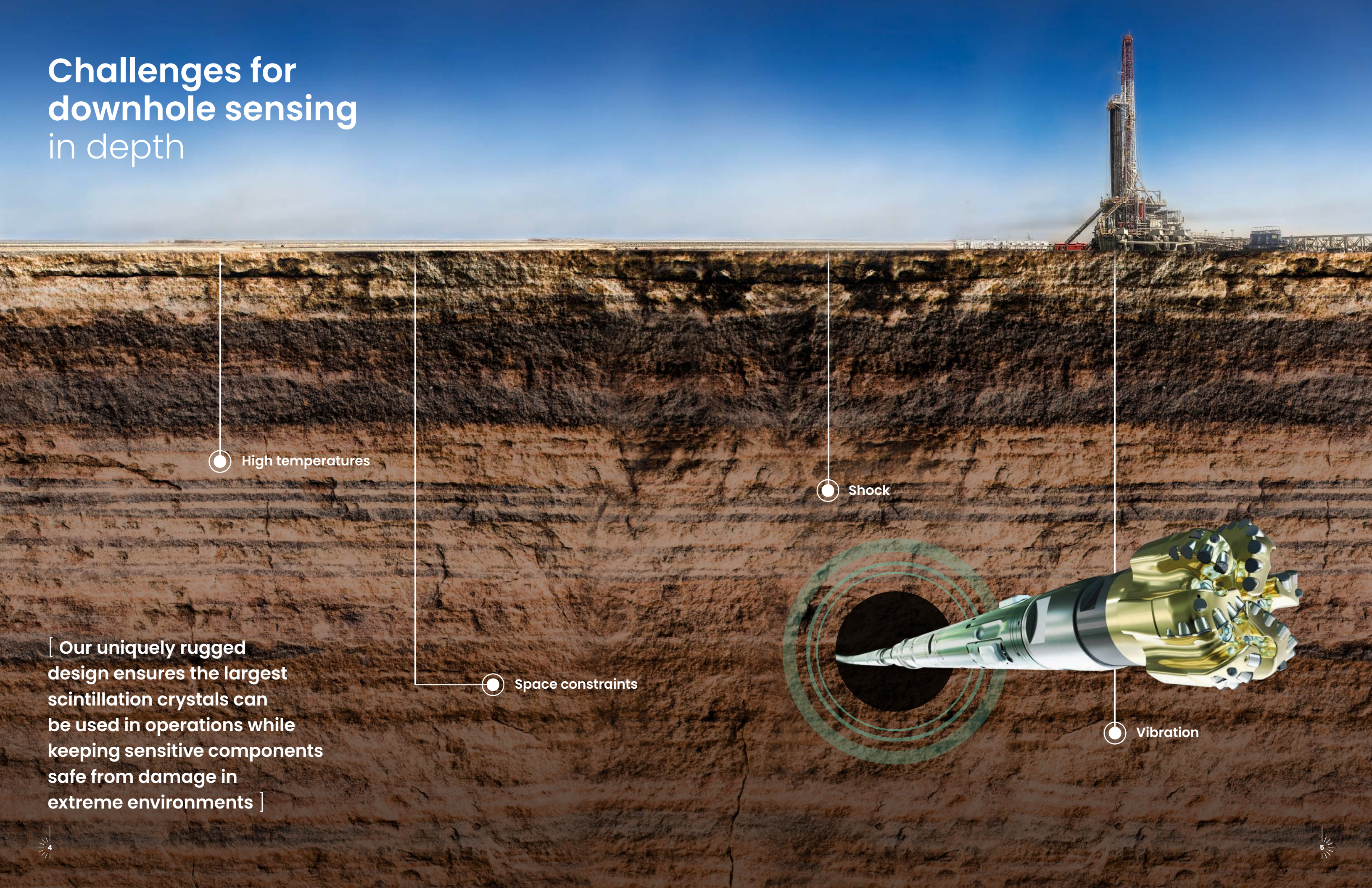
World-class service and support

You want a company that has the technical prowess to understand your measurement needs and how best to accomplish them, coupled with customer service that will make that process as seamless as possible. With over 30 years of experience in rugged downhole sensors for a variety of applications, Reuter-Stokes has the quality and expertise to see your project through to completion.

Overview

- Founded in 1956
- Over 350,000 detectors in service worldwide
- Over 60 years of service
- 156,000 sqft production capacity

Challenges for downhole sensing in depth



● High temperatures

● Shock

● Space constraints

● Vibration

[Our uniquely rugged design ensures the largest scintillation crystals can be used in operations while keeping sensitive components safe from damage in extreme environments]

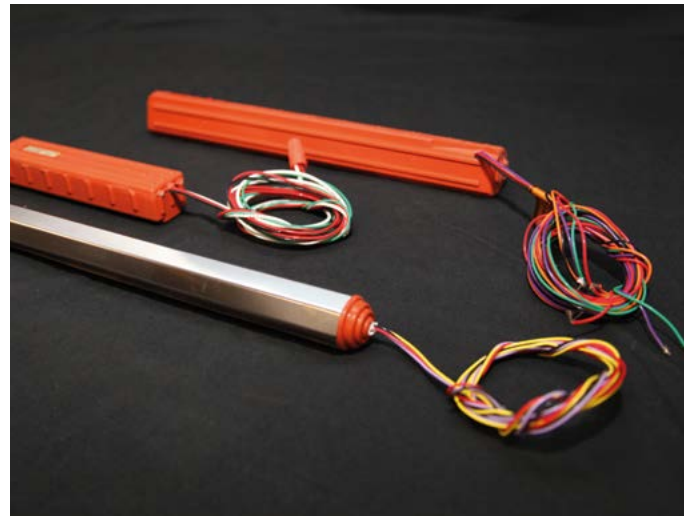
Custom design in depth

Quality, expertise and performance that will see your project through to completion.

Manufacturing excellence

Our dedicated manufacturing facilities have the advanced technologies, expertise and rigorously controlled quality needed to deliver precise and reliable downhole sensor units. Our 163,000 sqft site in Twinsburg, Ohio includes a 2,800 sqft dry room for scintillation crystal processing as well as a 2,800 sqft non-magnetic total field calibration building.

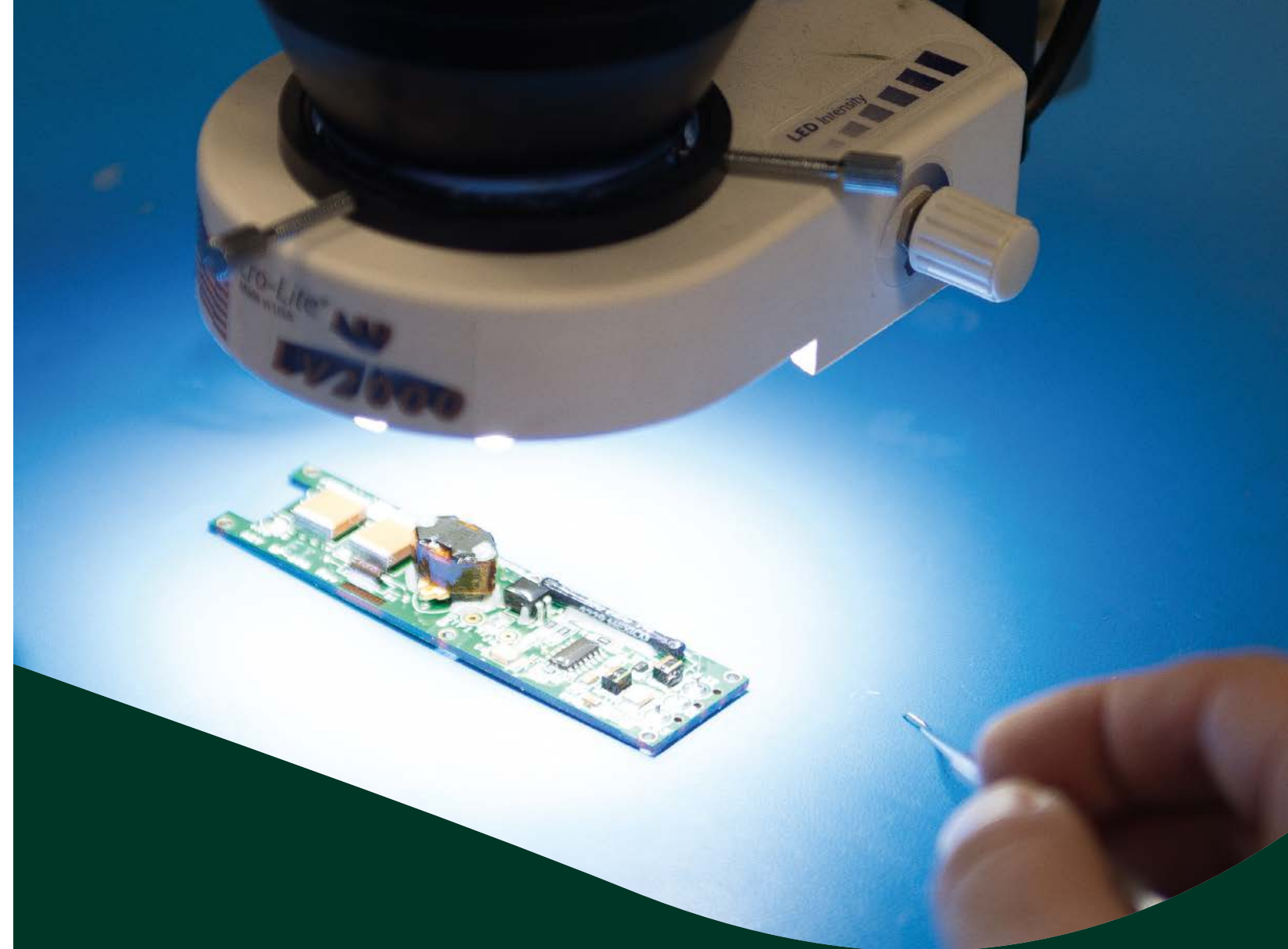
A vertically integrated manufacturing process enables complete control over every aspect of detector performance, and we employ many patented technologies to ensure your sensors will survive the most severe downhole conditions.



[From manufacturing and testing to final installation, our team's sense of purpose never falters]

Custom product opportunity

While Reuter-Stokes has a wide selection of standard products to meet most all downhole applications, most of our gamma sensors and neutron detectors start off as custom product offerings. The design of a custom product is a collaborative process with our customers to ensure the final product meets the rigors of a given application. Our objective is to deliver improvements you can measure – in efficiency, reliability, availability and performance.



Proven design expertise

Founded in 1956, Reuter Stokes' has a long heritage of excellence in radiation detection and monitoring. Today there are more than 350,000 detectors installed in a variety of applications including oil & gas, nuclear power generation, radiation monitoring and industrial sensing. For example, our neutron detectors were developed with proprietary Helium-3 purification techniques, gas mixtures, and manufacturing process controls to ensure precise matching of operating characteristics among large batches of detectors. This permits parallel operation of multiple detectors without need for separate power supplies or gain matching.

Core capabilities

- Coil winding for fluxgate manufacturing
- Scintillation crystal machining and polishing
- Low moisture/oxygen glove boxes
- Patented optical coupler technology
- Custom TIG welding equipment
- Brazing furnace for sapphire optical components and ceramics for metal brazing
- Complete radiation test capability



Harsh environment performance in depth

We have a wide range of products designed for accuracy, reliability and durability in the most extreme conditions.

Harsh environments

We have a wide range of products designed for accuracy, reliability and durability in the most extreme conditions. Validated by extreme temperature, vibration, and shock testing, our gamma scintillation packages obtain accurate measurements up to 200°C (392°F). Performance in high shock and vibration environments is ensured with technology such as the flexible dynamic sleeve and our patented spring suspension system, protecting the scintillation crystal from the dynamic environment.

Our He3 filled neutron detectors incorporate the operational experience gained from the design and manufacture of more than 67,000 units over 50 years by Reuter Stokes. This experience and the associated proprietary processing techniques that have evolved from it, have resulted in detectors that are regarded by many as the industry standard for neutron detection.

And combining robust packaging with high-temperature electronics, our orientation modules are calibrated to deliver accurate survey data over a wide operating temperature range from -20°C to 175°C (-4°F to 347°F), with downhole vibration up to 20 grms.

Quality

We employ extensive testing at every stage of design, qualification and production – and cover all possible factors affecting durability, accuracy and reliability. Rigorous calibration processes mean that our sensors meet or exceed our customers' expectations. We fully support all our products with ongoing services in advanced labs, as well as warranties that often exceed industry standards.

Key points

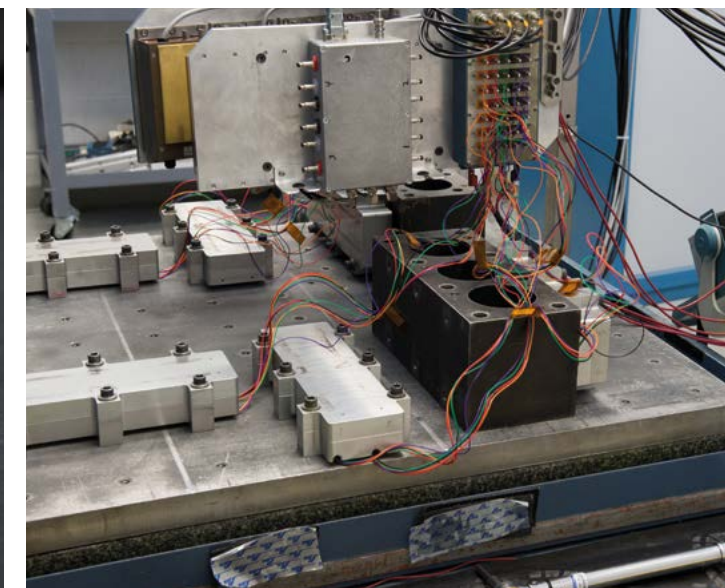
- Performance in high shock and vibration environments
- Accurate measurements up to 200°C (392°F)
- Manufactured more than 67,000 Helium-3 neutron detectors over the last 50 years



[Performance in high shock and vibration environments is ensured with our patented technology]



Integrated Gamma



Shock & Vibe

Our products in depth



Gamma sensors

Whether you need gross counting, spectral, or litho-density detectors, Reuter-Stokes has the answer. Designed to your application, we provide a broad range of configurations including crystal size, mounting and interface adaptations, as well as built-in radioactive check sources. And all crystal packages are optimized for light output, energy resolution, and sensitivity. Delivering one of the industry's highest sensitivities, our gamma sensors provide geologists and drilling contractors with the precise measurements required for accurate formation location and identification.

Features and benefits

- Operating temperatures: to 200°C (392°F)
- Shock survivability: to 1,000 g, 0.5 msec duration
- Random vibration rating: Up to 20 g RMS, 10 to 500 Hz
- Customizable
- Rigorous and extensive testing at every stage of the design, qualification, and production processes

Neutron detectors

Reuter-Stokes has been supplying neutron sensors to the oil and gas industry for almost 36 years. With over 67,000 neutron detectors sold to date and a portfolio of more than 10,000 designs, we can supply a detector to meet your application requirements. Based on the pioneering Reuter-Stokes Helium-3 proportional tube design, our latest thermal and epi-thermal detectors are renowned for their consistency and reliability regardless of temperature, pressure, shock or vibration conditions.

Features and benefits

- Plateau slope <2% per 100 V over a minimum 200 V range
- At least 100 V common plateau between room temperature and +175°C (347°F) with <2% count rate shift
- Patented anode suspension minimizes shock-induced false counts

Orientation modules

With more than 30 years of experience, Reuter-Stokes' custom-designed orientation modules provide unsurpassed measurement accuracy, reliability and calibration stability – and they've helped our customers achieve drilling records for depth, pressure and temperature. Our portfolio includes a wide range of sizes, electronics packages, and configurations. Innovative compact electronics and packaging designs result in smaller, more powerful orientation modules designed to fit into the smallest tools. And the technology has undergone extensive testing to ensure the unit's performance is accurate, stable and reliable.

Features and benefits

- Operating temperature range: from -20°C to 175°C (-4°F to 347°F) and survival temperature range from -40°C to 185°C (-40°F to 365°F)
- Customizable orientation modules including a wide range of sizes, electronics packages, and configurations
- State-of-the-art total field calibration lab with best-in-class calibration services

Specifications / applications in depth

Gamma Sensors Specifications

Crystal materials	NaI
Detector size	0.5" to 2.25" (12.7 mm to 57.2 mm) diameter and 0.5" to 12" (12.7 mm to 304.8 mm) length
Pulse height resolution	25°C PHR <9%, 150°C PHR <12.5%, 175°C PHR <15%
Operating temperature range	-32°C to 200°C (-26°F to 392°F)
Shock	Up to 1000g, 0.5 ms duration
Vibration	Up to 20 grms, 10 to 500 Hz
Check sources available	Cs-137

Neutron Detector Specifications

Fill pressures	60 to 180 psia (0.4-1 Mpa)
Detector sizes	Up to 2.25" (57.15mm) outside diameter Up to 12" (304.8mm) length
Operating temperature range	-32°C to 200°C (-26°F to 392°F)
Shock	Up to 250 g, 2 ms duration
Vibration	Up to 20 grms, 5 to 500 Hz

Orientation Module Specifications

Inclination accuracy	± 0.10 degrees
Inclination spread	< 0.20 degrees
Azimuth accuracy	± 0.50 degrees
Azimuth spread	< 1.0 degrees
Tool face accuracy	± 1.0 degrees
Total g field accuracy	± 3.0 degrees
Total magnetic accuracy	± 7.0 degrees
Module sizes	1.18 inches (29.97mm) to 1.36 inches (34.54mm) diameter 14.5 inches (368.3mm) to 22.7 (576.6mm) length
Power requirements	± 12.0 to ± 18.0 volts DC
Operating temperature range	0°C to 175°C (32°F to 347°F)
Survival temperature range	-40°C to 185°C (-40°F to 365°F)
Shock	Up to 1,000 g, 0.5 msec duration
Vibration	Up to 20 grms, 5 to 500 Hz

[Whatever your downhole
measuring and sensor challenges,
Reuter-Stokes has the answer]

We are a global technology company that designs, develops and manufactures the highest quality, most accurate and reliable customized downhole sensors for drilling and wireline applications. We leverage innovation, continuous improvement and unprecedented quality, to enable our Customers to successfully operate mission-critical assets in tough downhole environments across the world's most challenging applications.

We delight customers with tailored solutions that address their challenges; embodying our deep domain knowledge of our products with the highest standards of safety, quality and delivery.

We are Baker Hughes. We provide peace of mind in the toughest environments.

Contact us

For more information please contact your local Baker Hughes representative, or visit:

[Reuter-Stokes.com](https://reuter-stokes.com)

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