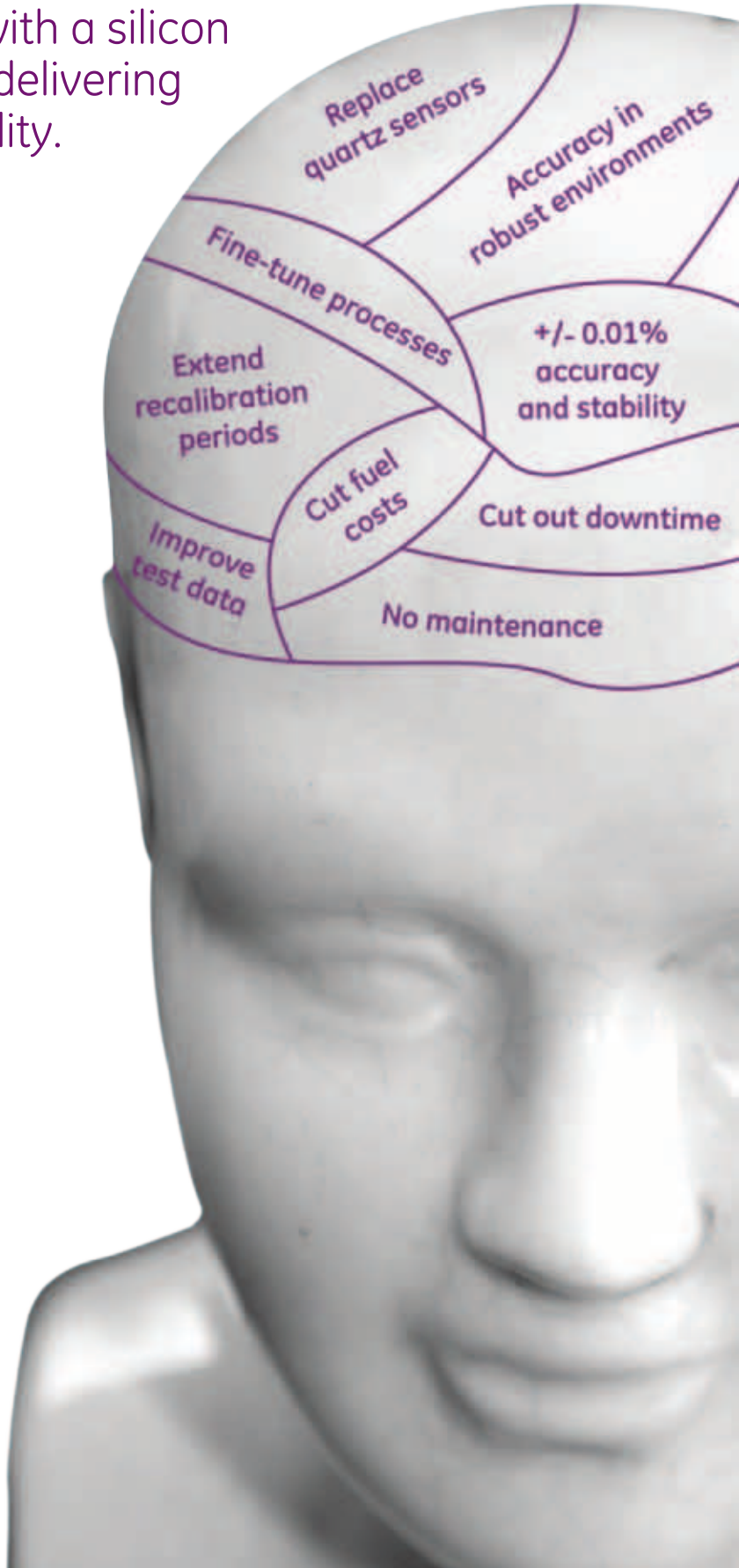
GE
Measurement & Control

TERPS

Think what you can achieve with a silicon pressure sensing technology delivering +/- 0.01% accuracy and stability.



Behind the technology

Ten times as accurate and stable as standard silicon pressure sensors

TERPS – Trench Etched Resonant Pressure Sensors – is a brand new silicon sensing technology that delivers unprecedented levels of accuracy and stability. TERPS will transform your pressure accuracy to improve safety, enhance performance and give you more sensitive solutions – even in challenging environments.

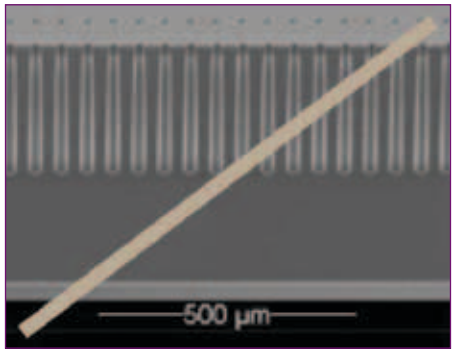
Pure silicon for improved performances

TERPS uses a resonating silicon pressure sensor, which exploits the naturally occurring perfect elasticity of the single crystalline structure. With no imperfections, performance is radically enhanced. Benefits include low hysteresis and repeatability errors, and very good long-term stability.

TERPS is dependent only on the mechanical properties of silicon allowing use over wide temperature ranges from -40 to 85 °C (-40 to 185 °F).

New frequency detection

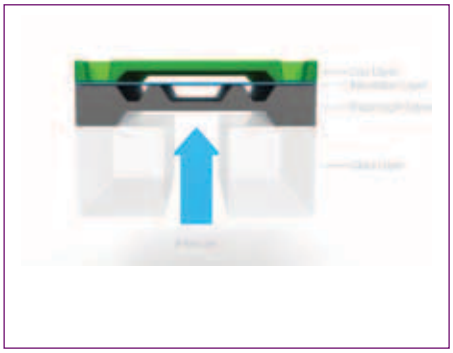
TERPS frequency detection is enhanced with a new "lever" design which produces a much higher signal from a small movement. This signal is above the ambient noise level, minimising interference and enabling the electronics to be located further from a TERPS sensor allowing it to operate in higher temperatures. The design allows a TERPS sensor to use glass-to-metal seals for applications in harsh environments.



Deep Reactive Ion Etching (DRIE) – mechanic and dynamic balance

To optimise and balance the design of resonator, we have used Deep Reactive Ion Etching (DRIE) silicon processing techniques. DRIE gives us the ability to design structures with complex and arbitrary geometries, this can be used to make the resonator in a horizontal plane unlike other types of RPT. Consequently, it can be made much more rigid and more mechanically balanced, minimizing energy losses.

- Precision of 0.01% FS (100 ppm)
- Stability of 0.01% FS per annum (100 ppm)



Silicon Fusion Bonding

TERPS sensors can operate at pressures of up to 70 bar (1015 psi) absolute thanks to Silicon Fusion Bonding (SFB). A TERPS resonator element consists of three distinct layers: the diaphragm, the resonator and the cap. Normally the resonator and the diaphragm are from the same piece of silicon. SFB allows each to be individually engineered, enabling us to create a thicker diaphragm layer for higher pressure applications.

- High accuracy: ±0.01% FS (100 ppm) over compensated temperature range
- Excellent long-term stability: ±0.01% FS per annum (100 ppm)
- Wide pressure range: 0 – 1 bar to 0 – 70 bar (0 – 15 psi to 0 – 1000 psi)
- Wide compensated temperature ranges: -40 °C to 80 °C (-40 to 185 °F)
- RS 232, RS 485, CANBus and frequency outputs
- Pressure modes absolute.

Why TERPS has revolutionised pressure sensing

Occasionally a new technology comes along that changes the parameters of what engineers consider possible. TERPS is one of those technologies.

TERPS's pressure sensor technology provides a compelling alternative to quartz sensors, giving you +/- 0.01% FS (100 ppm) accuracy and stability! TERPS can operate in harsh environments and is available at a significantly lower cost and faster delivery times.

Enhanced performance

At +/- 0.01% FS (100 ppm) accuracy and stability TERPS delivers ten times the accuracy and stability of standard sensors giving you incredibly consistent and accurate data source even in remote locations where recalibration or replacement is expensive.

TERPS vs quartz

More resilient than quartz TERPS provides quartz accuracy and stability but with the added advantage of being resilient in harsh environments and available at a fraction of the cost and the lead times of quartz.

Challenging environments

The use of glass-to-metal seals allows the sensor to be packaged for applications in challenging environments. In addition, associated electronics can be even further from a TERPS sensor which permits operation even in higher temperature environments.

Ideal for remote locations

TERPS stability means you can fit and forget while relying on high accuracy data for years.

Reliable data

Overall performance will enhance the results and performance of your operations where the quality of data is critical.

Versatility at short lead times

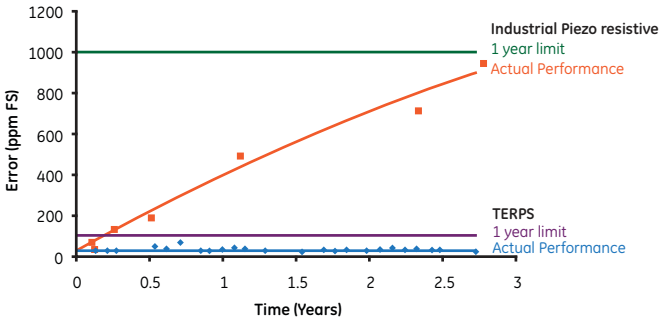
Incorporating TERPS into the sensor as a sealed unit enables TERPS to be produced with a wide range of variable features including outputs, electrical connectors and pressure ranges.

Outstanding stability

Our test data shows that TERPS delivers outstanding stability over a period of 2.5 years, giving you total confidence in critical pressure applications.

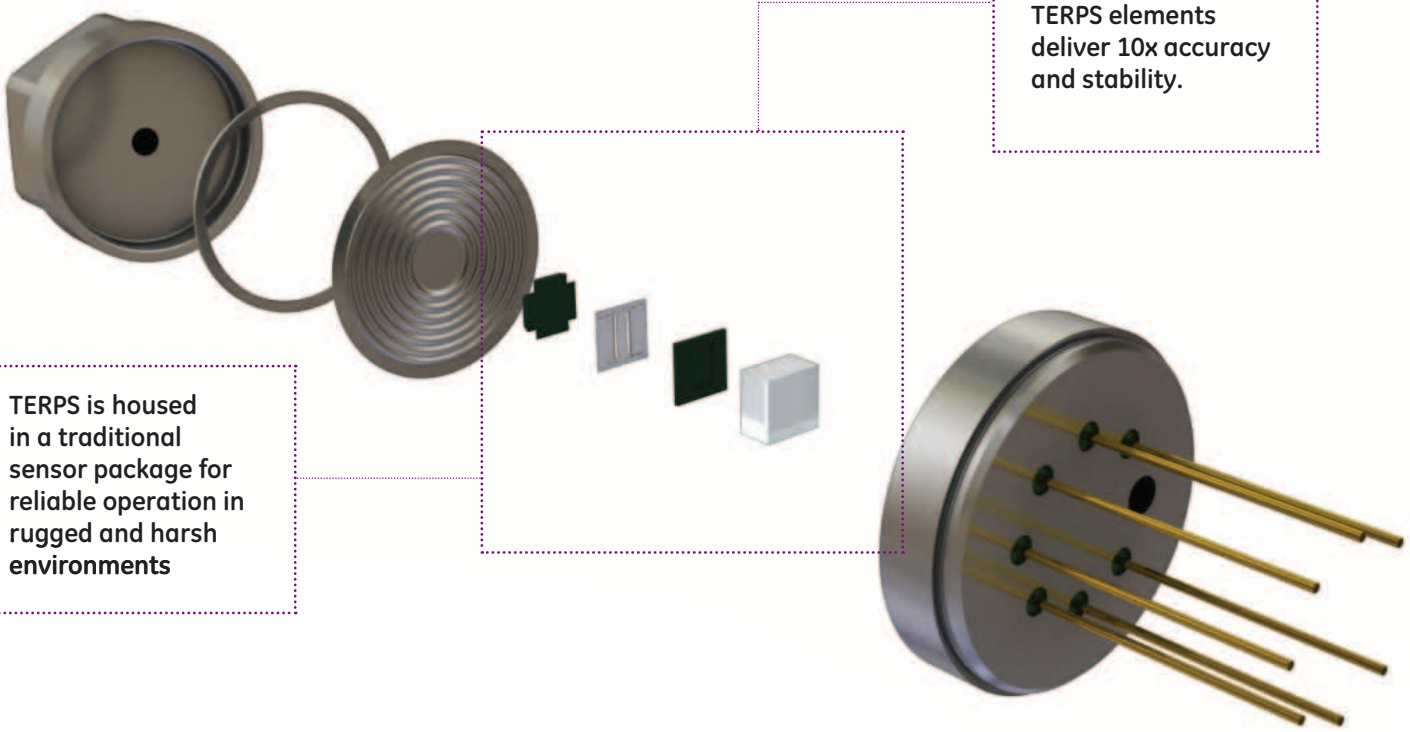
Data-collection started February 2009 with readings taken every month in the GE UKAS accredited lab in Groby Leicester Random errors overlie systematic errors. After an initial settling period, drift through 2010 and 2011 is less than 10 ppm per year.

Typical Stability Comparison



TERPS inside

TERPS elements deliver 10x accuracy and stability.



TERPS is housed in a traditional sensor package for reliable operation in rugged and harsh environments

Data talks

View TERPS sensors test data on our website and see for yourself the incredible accuracy and stability that TERPS technology delivers.

Find out more about TERPS at

www.ge-terps.com

TERPS – in action

With TERPS, you can redefine the level of accuracy, stability and reliability you can expect across a wide range of applications.

Oil and Gas seabed monitoring

When you are monitoring seabed movements in relation to oil reserves, improved accuracy can help you to understand valuable resource potential and respond to potential environmental impact faster. Hastelloy wetted parts provide long-term reliable service in the aggressive saltwater environment and on board intelligence can simplify your data gathering.

Optimising ship ballast tanks

TERPS can be used to control ballast or fuel tank levels over wide temperature ranges with extreme accuracy, providing the information you need to optimise the trim of submarines or drilling vessels, improving safety at sea and cutting fuel consumption.

Saving money on fuel control in turbine generators

High accuracy, high pressures, and fast response allow TERPS to improve fuel control on turbine generators, saving money and improving overall performance. The small size and CANBus allow you to deploy the sensor close to the measuring point, increasing speed of response and reducing installation costs.

ROV and AUV underwater operation

Remotely Operated Vehicles (ROVs) and Autonomous Underwater Vehicles (AUVs) rely on accurate data for safe operation beneath the sea. TERPS can improve accuracy, reduce cost and can be ordered and delivered to on accurate delivery schedules.

Better weather station performance with lower costs

TERPS reliability and accuracy can transform your weather station operations, helping to improve weather prediction and disaster prediction while saving money on installed costs. Dependable performance over long periods will cut your operational costs too.

Enhance tidal level monitoring

Increased accuracy in tidal level monitoring out at sea can significantly enhance your data gathering for global warming and sea defence strategies. Hastelloy wetted parts provide long-term reliable service in the aggressive saltwater environment and on board intelligence can simplify your data gathering.

Improve steam turbine efficiency

The accuracy of TERPS can help you to optimise steam turbine efficiency with more precise pressure readings. Rugged construction means reliable operation in typical steam turbine applications, from 15 to 70 bar (217 to 1015 psi), at temperatures ranging from 0 to 80 °C (32 to 176 °F).

Safety critical tsunami level monitoring

Small changes in tsunami wave heights out at sea can significantly scale as waves build towards the shore, so the improved accuracy you can achieve with TERPS can potentially save lives.

Aero-test altitude monitoring

The lightweight and rugged construction of TERPS sensors allows accurate measurement of altitude and air speed in aeronautical test environments from -55 °C to 85 °C (-67 to 185 °F) in pressure ranges from 200 to 1200 mbar (2.9 to 17 psi).

www.ge-terps.com

GE imagination at work

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