Light
into the Darkness

EXAL

GESO
GmbH & Co. Projekt KG

We Innovate your Future









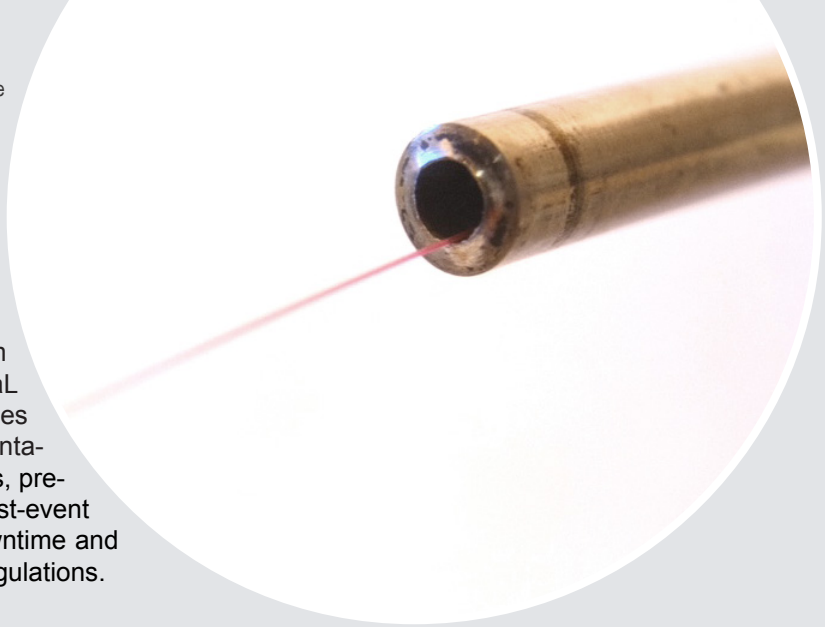






TÜV CERT
DIN EN ISO 9001:2000 / SCC**
Zertifikate Nr. 15 100 42209
Zertifikate Nr. 15 106 4030

Intelligent Boreholes



Optical fiber in a control line

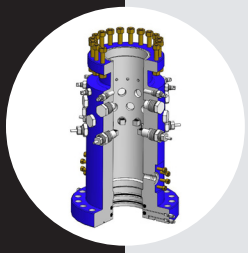
Modern energy storage and production systems require detailed monitoring to keep risks at a minimum. The intelligent borehole configuration from GESO in cooperation with EXaL combines Industry 4.0 principles with robust downhole instrumentations, used for real time analysis, predictive risk assessment and post-event diagnostics, while reducing downtime and staying compliant with safety regulations.

What is included

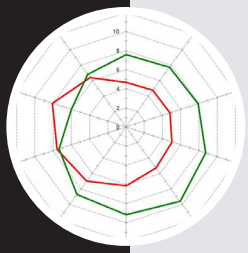
The customer gets a complete and ready to operate monitoring system (all required components are supplied and tested). The full system includes the EiWIS260t Weight Monitoring System for Production Strings, Distributed Temperature Sensing (DTS), Distributed Acoustic Sensing (DAS), software for visualization and analytics, all packaged in a reliable downhole installation via control line. All components can be easily retrofitted to existing completions with minimal interference and custom-tailored components.

Why it matters

- Identify threads before they escalate (leakages, casing failures, rock falls/rock mechanical processes, seismic events like earthquakes and induced seismicity)
- Continuous 24/7 monitoring with insights into borehole integrity and system performance without interrupting production (e.g. fluid levels, cementation and mineralization processes, leaching processes, flow rate monitoring, casing activities, reservoir monitoring, VSP)
- Fusion of multiple data streams, reducing ambiguity for improved decision-making







Measurement Systems and Components

EiWIS260t Weight Monitoring System for Production Strings

The Weight Monitoring System for Production Strings continuously measures mechanical loads on the production tubing, providing insights into wellhead and string integrity. Sensors record the load transmitted through landing bolts to the wellhead tension spool, allowing the system to track both the total axial load on the production string and the radial distribution of the load. This is especially useful to detect atypical load patterns in deflected or deviated boreholes, enabling early countermeasure.

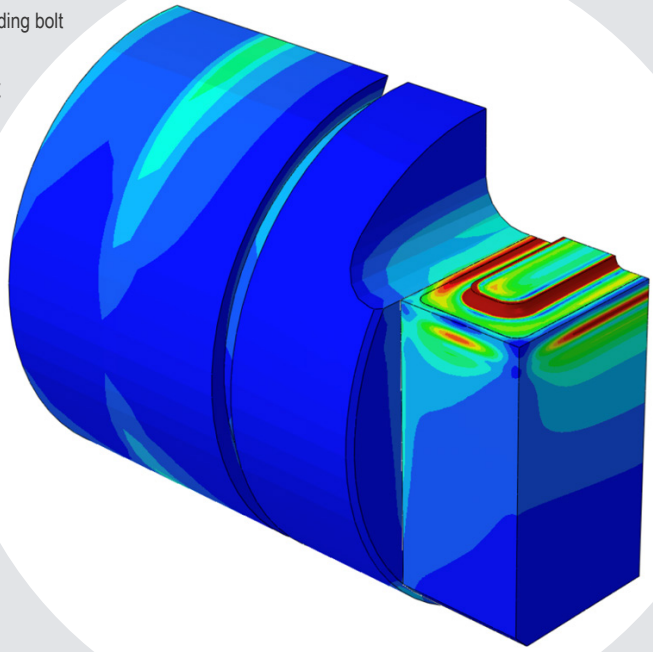
DTS / DAS

DTS and DAS are fiber optic measurement systems which work by sending a laser pulse along a fiber optic cable and analyzing backscattered light. This allows for many measurements along a single fiber, facilitating continuous temperature and seismic monitoring along the hole pipe string and well head while enabling instant leakage detection, health monitoring, and risk/damage assessments.

Fusing the sensors data leads to more detailed diagnostics. Thermal anomalies, seismic activities, fluid flow, and mechanical load changes are observed and cross-checked to reduce ambiguity.

The main benefit of a fiber optic measurement installation is the distributed character of the resulting data. A single event can be located with meter to centimeter precision along a fiber ranging multiple kilometers, thus creating an array of seismic and temperature sensors, delivering insights with an unseen level of detail. Using traditional sensors would prove as a complex and expensive undertaking as every sensor requires protec-

Computer model of a pressure-sensing landing bolt



tion against the downhole environment and continuous on-site maintenance. By contrast, fiber optic systems simplify deployment and maintenance significantly. As the cable is the sensor itself, a single measurement unit is sufficient to monitor a borehole or even a complete production site. The unit can be placed far away from hazardous environments while enabling remote maintenance of all important system components. Additionally, measurement units can be attached to multiple fibers, enabling a dynamic scaling of the system to meet current requirements.

Subsurface Measurement Equipment

The subsurface system is engineered to meet the demanded safety and operational on-site requirements.
Each element contributes to the overall integrity of the installation, ensuring long-term reliability under harsh environmental conditions and without introducing any structural weakness into the borehole or cavern completion.
For maximum system safety, the control line is tightly sealed utilizing specialized sealing elements and process feedthroughs according to the operational conditions.
Furthermore, the installation of the subsurface equipment can be seamlessly integrated into the workflow of workover procedures with minimal disturbances, providing reliable long-term and continuous measurements during the production phase.

Software

The intelligent borehole monitoring system includes a comprehensive software suite, combining the different data streams for operational monitoring. This includes automated alarms when unusual system states are detected or safety limits are reached. Clear data representations accelerate diagnosis and support evidence-based decision making.
The software is fitted to on-site requirements by our team, who will tailor alarm logics, dashboards and reporting formats to match your operational procedures and regulatory needs. Additionally, GESO will provide the startup procedures, user training and remote support to ensure the correct installation and maintained stability over the installation's lifetime.





Wellhead with pressure-sensing landing bolts

GESO mbH & Co. Projekt KG / EXaL

Technical Note

EiWIS260t Weight Monitoring System for Production Strings

- Force monitoring up to 2600 kN (with 10 pieces installed landing bolts with sensors)
- Sensor 4-20 mA
- Measuring channels MDL 4-20
- Accuracy 0.05%
- Memory 10,000 measured values
- Data transfer via dedicated line modem – radio -GMS – GPRS or LAN

DTS

- Measurement range up to 30 km in special cases over 80 km
- Up to 0.125 m spatial resolution
- Up to 0.1 °C temperature resolution

Spatial and temperature resolution are dependent on measurement range.

DAS

- Continuous measurement of axial strain or other particle velocity proxies
- Measurement range up to 50 km
- Up to 1.25 m spatial resolution
- Sampling frequency of up to 40,000 Hz

The sampling frequency and spacial resolution is dependent on the measurement range.

Subsurface Measurement Equipment

- Rugged and resistant against corrosive environments, high pressures and high temperatures
- Typical diameter around 1/4 in to 1/2 in
- Compatible with hydrogen atmospheres



Technical Notes

Don't hesitate to contact us …

GESO
GmbH & Co. Projekt KG
Loebstedter Strasse 52
D – 07749 Jena
Phone: +49-3641-31 00 350
Email: info@geso.eu

EXAL
An der Koppel 2
D – 29227 Celle
Phone: +49-151-1257-4483
Email: info@exal-technology.com

Zertifiziert durch TÜV THÜRINGEN ISO 45001 / ID:15 118 25685 www.tuev-thueringen.de

Zertifiziert durch TÜV THÜRINGEN ISO 9001 / ID:15 100 42209 www.tuev-thueringen.de