



# Clarion™ Seismic Sensing Station and Deployment System

Weatherford's *Clarion* seismic sensing station and deployment system enables safe and easy multi-station seismic array installations on tubing or casing. For production, injection, and monitor wells, it allows ready integration of seismic sensing stations into even the most complex well completions. The unique design of the sensing station enables high-performance, multi-component, in-well seismic sensing and substantially decouples from production tubing noise, allowing a broad range of permanent in-well seismic applications.

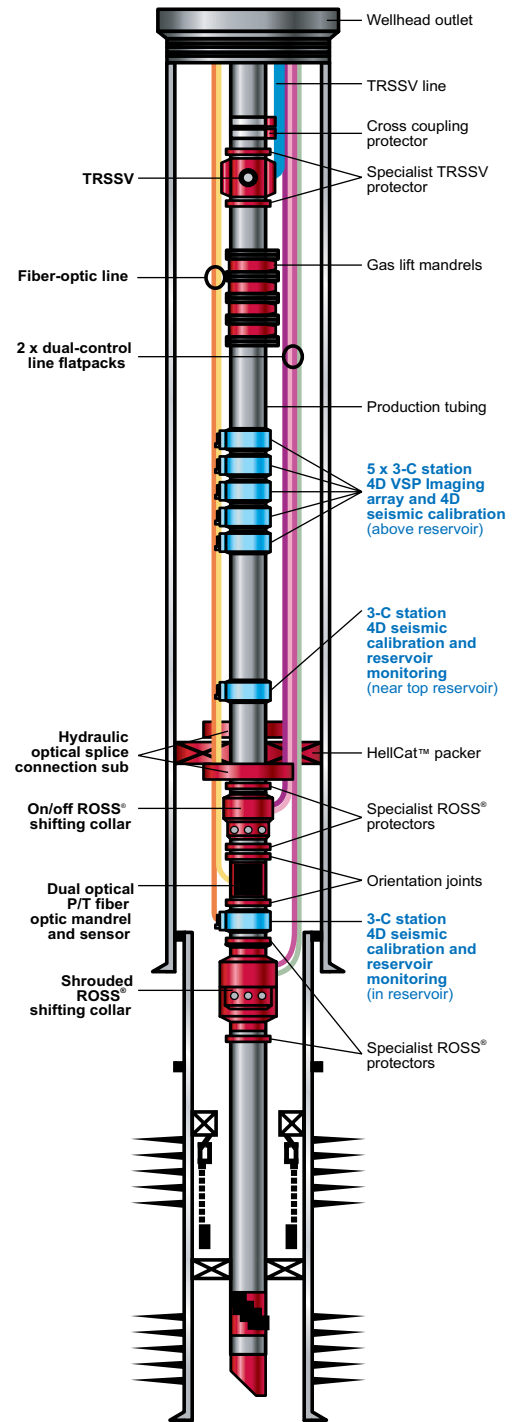
## Applications

- Permanent in-well seismic applications
- Outside-casing applications
- Production tubing-conveyed applications
- Dedicated boreholes
- Onshore or offshore wells
- Production or injection wells
- Vertical, deviated and horizontal wells

## Features, Advantages and Benefits

### Seismic Sensing Station

- Sensing station consists of a ruggedized sensor carrier, used to house and protect optical sensors, and a threaded sensor mandrel or clamp-on device for tubing or casing conveyance.
- Sensing station design supports single- and multi-component sensor configurations and multi-station arrays for permanent in-well seismic applications, allowing array customization to suit the application.



Example of a Seismic Intelligent Well



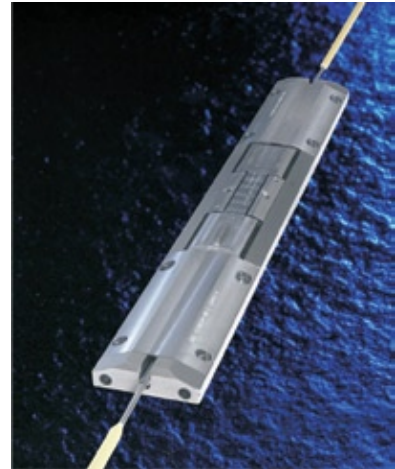
## *Clarion™ Seismic Sensing Station and Deployment System*

### *Features, Advantages and Benefits (continued)*

- Active sensor coupling mechanism provides optimal casing contact and substantially decouples from tubing noise in production and injection wells.
- Reliable release mechanism enables safe and easy installation and allows sensor coupling at desired well depth.
- Streamlined, low-profile mandrel is available in threaded or clamp-on style to suit most tubing sizes, threads, and metallurgies.
- Easy incorporation of sensing stations in the completion string reduces the risk of hang-up during deployment. Low deployment risk minimizes the effect on the completion design and architecture and facilitates integration with other intelligent well equipment.
- Sensor carrier is secured against axial and rotational movement, with no protrusions during run-in-hole, protecting the station against damage during installation.
- Sufficient room for cable and fluid bypass allows combination with other in-well control and monitoring systems.
- Adjustability for linear and rotational fit during tubing makeup provides easy, timesaving multi-station installation.

### **Seismic Array Deployment System**

- Deployment system has multi-station capability and detachable array drums to handle arrays of up to 16 stations, up to 3,281 ft (1,000 m), and of varying lengths and spacing, providing operational efficiency and flexibility.
- A minimal footprint, transport protection bars, fork and sling lift options, and lift certification (DNV 2.7-1 approved) make the deployment system transportable for simplified logistics.
- Tieback points enable the deployment system to be secured to the rig floor for controlled rotation during deployment.



Sensor Carrier



Clamp-on Sensing Station



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## Specifications

### Seismic Sensing Station

Deployment Methods	Approximate Minimum Station Spacing <sup>1</sup> (ft/m)	Tubing Diameter (in.)	Minimum Casing Diameter <sup>2</sup> (in.)
Production tubing Outside casing Dedicated boreholes	9.84 3.00	2-7/8	6-5/8
		3-1/2	7
		4-1/2	7-5/8
		5-1/2	9-5/8
		7	9-5/8

<sup>1</sup>Dependent on deployment method

<sup>2</sup>Dependent on casing weight and station spacing. Other tubing/casing combinations can be evaluated on request.



Seismic Array Deployment System

### Seismic Array Deployment System

Height (in./mm)	105.2 2,673
Width (in./mm)	53.2 1,350
Length (in./mm)	94.5 2,400
Weight (lb/kg)	3,300 1,500
Number of sensor stations per drum	1 to 16
Approximate maximum array length (ft/m)	3,281 1,000



Seismic Mandrel