

## Hydroacoustics for drilling operations

### Introduction

The **HPR 410D** system is the drilling version of the HPR family based on the Super Short Base Line (SSBL) principle for positioning the drill-vessel relative to the well head. The system's different units and options are specially designed for the environment on-board drilling vessels.

### Rig / Vessel positioning

The system can operate up to 56 transponders, displaying all the coordinates on the display. Position data output is also available. The system positions the transponder locations at horizontal distances of up to 5-6 times the water depth, with increasingly accuracy as closer the vessel comes above the desired location. For longer horizontal positioning the transducer can even be mechanically tilted in the current direction. Vessel positions are given relative to any of the active reference transponders chosen by the operator, and all may be used with individual offsets in three dimensions.

### Underwater navigation

Tracking of underwater vehicles and positioning relative to a fixed reference is performed simultaneously using transponders, responders or a combination of these.

### Riser angle measurements

The HPR 410D system is also capable of monitoring the riser angle by using an Inclinometer Transponder. This transponder measures both the X and the Y angle of the riser, and sends this information by acoustic telemetry up to the surface vessel.

Accuracy is better than  $0.33^\circ$ . The Differential Tilt Transponder can be used to monitor the relative angle between the BOP and the riser (in the flex joint). Operator selected alarm limits for visual as well as audible alarms for BOP position and riser angle are available.

### Hull mounted transducers

Two types of transducers will cover most applications; the 60/160° and the 30/160°. The numbers indicates the beam-cone below the transducer.

Each transducer has two different beams as working area, and the system will automatically use the narrow beam, if possible, to obtain the highest accuracy. The 30° beam has an absolute position accuracy of 0.5 to 1% of the slant range, which is the best any SSBL system can perform. The relative accuracy is normally around 0.25%.

For high redundancy, the HPR 410D system can be interfaced to two transducers, and can very well be a mixture of the two mentioned above.

### Hull unit hoisting arrangements

The transducers can be installed on Kongsberg Simrad's high quality hull units. These have automatic raise and lower control from remote location (i.e. the control room). The hull units are installed with a gate valve, so that this can be closed when inspection and maintenance of the transducer is necessary.

The system can also be configured to include Acoustic (BOP) Control as **HPR 410DA**.

Please refer to the HPR 410 and HPR 410DA Product Specifications for further information.

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