

TECHNICAL SHEET

TYPE 360 - D²™ Integral Bow Spring Centralizer Sub



With the energy industry's challenging and demanding performance requirements, Top-Co's Type 360 D2™ Integral Bow Spring Centralizer Sub* has been designed to withstand the most extreme deep-water down hole conditions.

Manufactured from seamless casing grade material, the D2™ Integral Centralizer Sub* is designed for ultimate performance in under-reamed holes. Additionally, Top-Co's customization capabilities allow the sub design to match the exact needs of most well and casing programs.

Primary applications:

Top-Co's Type 360 D2™ Integral Bow Spring Centralizer Sub* is designed for use in deep-water wells where under-reamed sections are encountered. The D2™ Integral Bow Spring Centralizer Sub design allows the centralizer to pass through small annular clearances and open up in the under-reamed section to provide the centralization needed to get a superior cementing job. The D2™ Integral Bow Spring Centralizer Sub* model is particularly well suited for applications that require additional protection to the bow springs, and applications with uncertain or high levels of side forces. This centralizer is also well suited for casing reciprocation.

Features:

- olid vanes machined on the OD where the D2™ Integral Centralizer Sub is placed
- Notched bow spring collar to positively index the bow spring between the vanes and provide reduced minimum OD
- Sub threads match the casing string threads
- Metallurgy and mechanical properties meet or exceed casing string specifications
- Designed to cause no damage to the sub sea casing hangar sealing surfaces (test report available)
- Customizable within API 5CT specifications to meet well specific clearance limitations
- Customized vane dimensions to increase flow byarea while maintaining standoff
- Uses pin bore ID throughout the sub rather than casing ID

Benefits

- Stays in place due to the solid vanes
- Drilling engineer do not have to worry about slippage or breakage when going through tight clearances
- Guaranteed standoff that leads to improved mud displacement and cementing



*Top-Co's Type 360 - D2™(D Squared) Bow Spring Centralizer Sub is covered by US Patent 3484803 / 7140432 & Trade-mark 72186499



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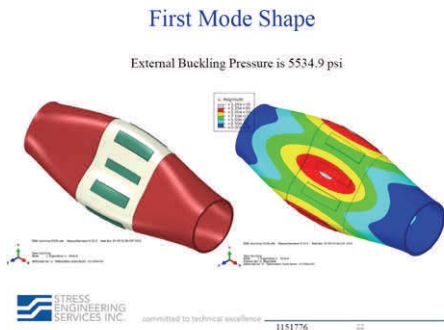


Advantages:

- Bow spring compression between the vanes ensures protection when going through dog legs and tight clearances
- Bow springs are installed to be pulled into or out of the hole
- Able to go through tighter annular clearances
- Solid vanes guarantee a minimum standoff when higher than expected side forces are encountered
- Centralizer will not slip even in flush joint applications
- Particularly well suited for reciprocation
- Stress caused by inadvertent rotation is distributed evenly around the collar instead of on the bow spring, reducing the risk for failure

Engineering Support:

- Centralization placement simulations
- Torque and drag analysis
- Pre and post installation analysis



Collapse pressures verified through Finite Element Analysis

TYPE 360 - D²™(D SQUARED) BOW SPRING CENTRALIZER SUB*

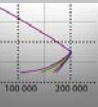


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COMPLETE INTEGRAL CENTRALIZER SUB PRODUCT LINE

The Rotobo* model has continuous machined shoulders around the sub that allow the centralizer to rotate on the sub (making casing rotation possible).

The SuperCombo* model has machined straight or spiral solid vanes above and/or below a Rotobo Centralizer* to combine the ability to rotate casing with additional protection and a guaranteed stand-off.



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