

VariForm™ centralizers

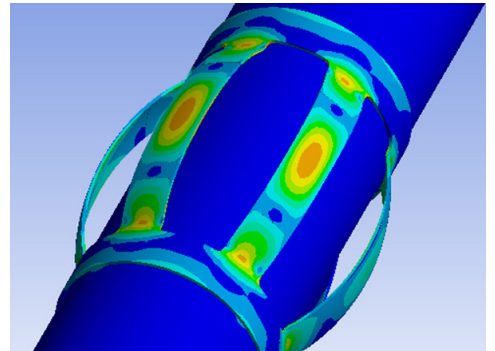
Q What makes the VariForm™ centralizer different from other centralizers?

A The VariForm centralizer is a single-piece, slip-on centralizer whose shape can be adjusted to optimize performance characteristics, including running and restoring forces for any given hole condition. The single-piece construction results in a robust centralizer that can withstand the most demanding conditions from the pipe yard to total depth. The VariForm centralizer performance is optimized using state-of-the-art precision test equipment, which results in consistent performance for every centralizer manufactured.



Q How do these shape changes affect performance?

A Centralizer performance is affected by the number of bows, bow thickness, curvature, and outer diameter. With the VariForm design process, the curvature and dimensions of each VariForm model are easily adjustable to balance requirements for size, standoff, flexibility, starting forces, running forces, and restoring forces for specific applications to optimize performance. Using finite element analysis developed from decades of testing, our engineers can predict the performance of a given shape before it is built and tested.



Q How is this one-piece centralizer built?

A VariForm centralizers are manufactured using US and European alloys and a cutting-edge process at the Weatherford manufacturing plant in Germany. Each centralizer is laser cut and shaped; then one welded seam joins the two sides of the parent material together.

The fully automated process enables extremely tight-tolerance manufacturing for low-torque rotation and precise sizing. The centralizer is then heat treated to make it metallurgically homogenous to provide superior hardness and strength.

Q Is this a standard or a custom product?

A Both. Standard sizes are available for common casing and hole size combinations that use similar weight casing in similarly inclined wellbores.

For challenging or unique applications in which standard products are difficult to use, Weatherford can provide a custom-designed VariForm centralizer that uniquely addresses a client's need.

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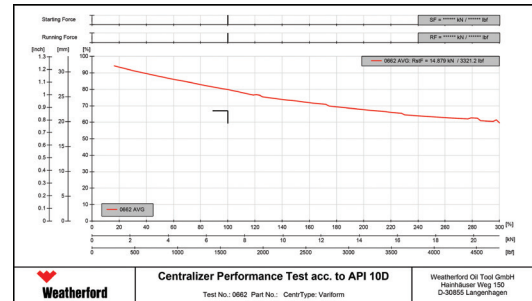
Q For which types of applications should VariForm centralizers be used?

A The VariForm centralizer provides more flow-by area than a comparable-sized rigid centralizer provides. VariForm centralizers achieve the maximum possible standoff without imparting starting and running forces, which

allows the string to get to bottom. These characteristics make the VariForm centralizer optimal for horizontal sections, under-reamed openhole sections, and close-tolerance cased-hole sections.

Q Does the VariForm centralizer meet API 10D requirements?

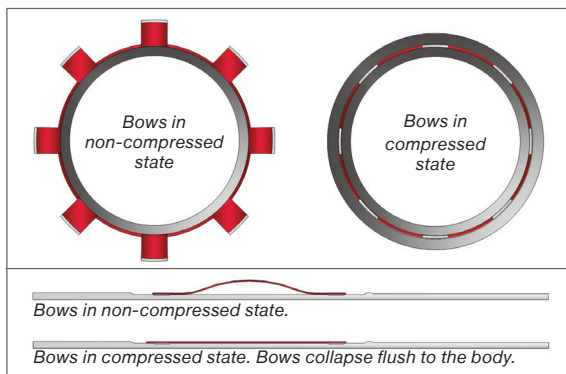
A Yes, VariForm centralizers meet or exceed all requirements. The VariForm centralizer sub is tested to simulate how a centralizer is actually run in the field: A centralizer is first run through the tightest expected restriction and then subsequently tested according to the API 10D test for open hole. This process assures operators that they have the most reliable centralizers on the market today.



Specific test and performance data are provided to clients upon request.

Q What is the difference between the VariForm centralizer, the VariForm UR centralizer, and the VariForm centralizer sub?

A All centralizers in the VariForm family are designed to pass through tight restrictions and provide high standoff. The advanced VariForm design enables customization for unique or critical applications.



- VariForm centralizer, which has little to no starting and running forces in open hole, is optimal for deviated, horizontal, and extended-reach drilling casing strings.
- VariForm UR centralizer is optimal for under-reamed offshore casing/liner strings.
- VariForm centralizer sub is installed on a casing sub body with a recessed profile for bows to collapse into when the tool comes to a restriction. It is optimal for use in ultratight-tolerance casing strings when conventional centralizers cannot be run on the casing OD.

The VariForm centralizer sub allows for full rotation with a minimum of torque. It is available in both rotating and nonrotating models.

Q Are stop collars required?

A The VariForm and VariForm UR centralizers need to be run between stop collars to provide optimal performance. The VariForm centralizer sub features a patent-pending fastening mechanism, so collars are not required.

