XL Systems 20 x 0.625 X80 GP-95 Viper Connector

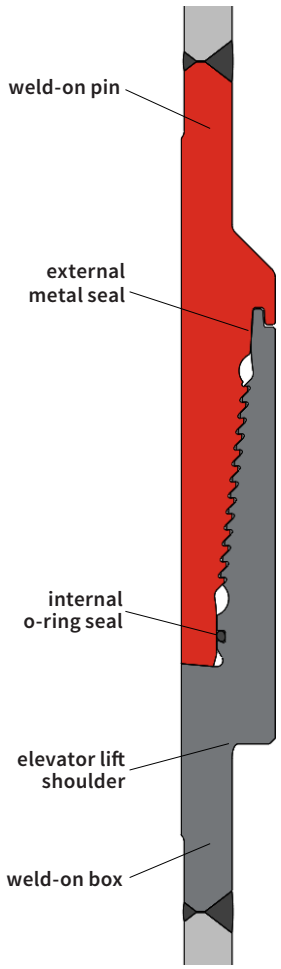
Gas Tight Surface Casing

An increasing number of deepwater casing designs are extending the intermediate strings closer to the reservoir, potentially exposing the surface casing to internal gas pressure. This means that seal performance of the surface casing connectors is extremely important to well integrity; therefore, verification of connector performance ratings through analyses and physical testing is critical to minimize risks during drilling and production.

Viper Connection

As an addition to the comprehensive liquid sealability testing already completed on the Viper connection, NOV XL Systems responded to the need for gas tight surface casing by initiating a qualification program on 20- and 22-inch sizes to ISO 13679:2011 CAL I-E (with gas) requirements. This document summarizes the successful combined load testing on the 20 x 0.625 X80 GP-95 Viper connector that confirmed gas tight sealability up to 95% of X80 grade nominal pipe body pressure ratings.

Viper maintains 100% pipe body ratings in tension, compression, and bending in most sizes, and the ViperLock anti-rotation feature effectively eliminates the risk of a dropped string. Connector performance ratings across the product line are supported by FEA, physical testing, and over ten years of service history.



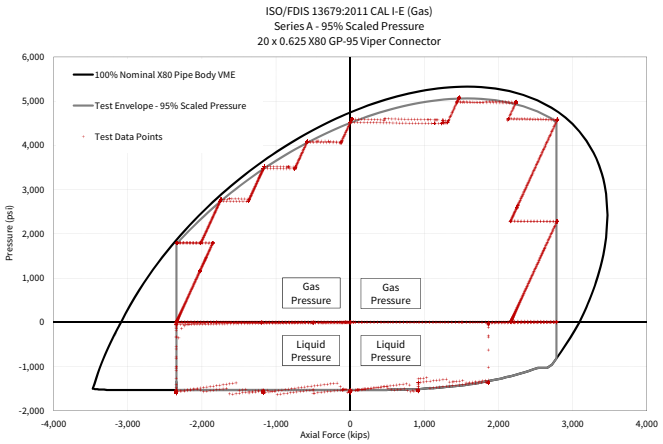
Viper unique advantages:

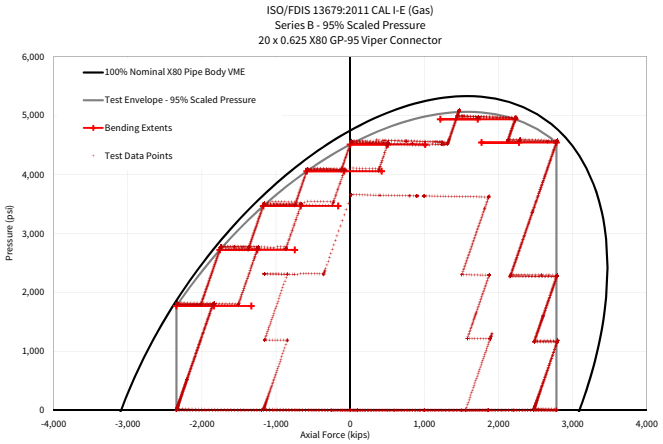
- internal o-ring seal with optimized groove and land geometry for gas tight sealability
- successfully tested with gas to the latest ISO 13679 requirements
- extensive fatigue testing and analyses support industry leading stress amplification factors
- rated to a minimum of 100% pipe body ratings in tension, compression, and bending in most sizes
- ViperLock anti-rotation feature maintains final make-up position in extreme environment conditions
- no upper torque limitations allow for higher preloads without damaging the connection

ISO 13679:2011 CAL I-E (with Gas)

Summary of Test Requirements

Testing Requirement	ISO Specimen 1	ISO Specimen 5
Objective	thread galling and sealing	galling
Made-up condition	minimum seal interference	maximum overall tightness
Specimen geometry	extreme high thread interference	high thread interference
	extreme low seal interference	high seal interference
Make-and-break	two M&B plus final make-up	three M&B
Test series B	internal gas pressure with bending	not required
Test series A	internal gas and external liquid	not required
Limit load testing	LL3 tension to failure	not required





Successfully qualified to 95% of X80 grade pipe body pressure ratings to ISO/FDIS 13679:2011 CAL I-E (with gas)

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