

Metal-Lok™ Ultra Connector

Qualifying Test Results



ITT

Testing for Performance and Reliability

Every product at BIW Connector Systems is subjected to rigorous qualification testing to ensure that the customer receives a dependable product. The testing simulates the harshest environments where BIW products are installed.

Results of Metal Lok™ Ultra qualification test

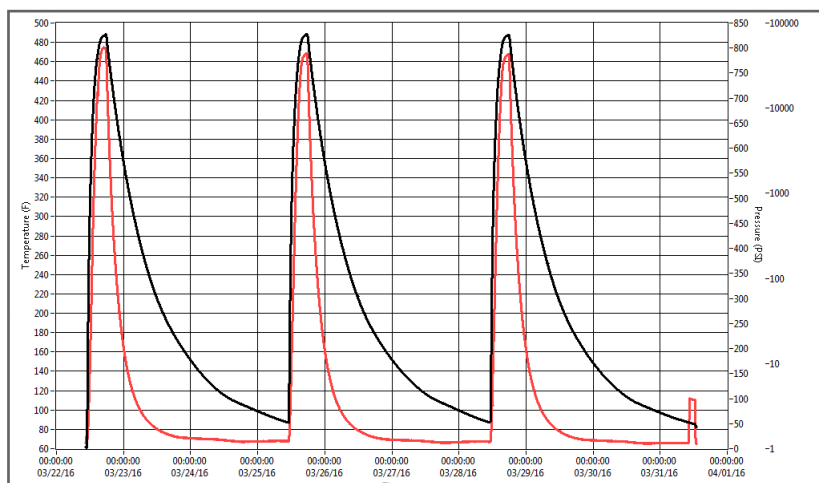
Submerged Hi-Pot Leakage @100 psi for 2 hours	Hi-Pot Voltage
0.1 micro amps	24 kV DC

Qualification Testing Parameters (Autoclave chamber)

217 hours at temperature, pressure in water/gas

3 Temperature cycles to a maximum pressure of 775 psi
Temperature cycles from 550 °F (288 °C) to 86 °F (30°)

In-situ monitoring of IR throughout qualification testing



Metal-Lok™ Ultra qualification test profile

Additional Proof
Testing:

Submerged Hi-Pot Leakage	Hi-Pot Voltage
0.1 micro amps	15 kV DC

120 hours at rated temperature and pressure in diesel/water/gas

10 pressure cycles from 3,000-1,000 psi at 50 psi/minute

Temperature hold at 500 °F (260 °C)

In-situ monitoring of IR throughout qualification testing



Metal-Lok™ Ultra system

Specification Chart

Electrical	5 kV, 140 A
Temperature	500 °F (260 °C)
Pressure	3,000 psi

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Commitment to Reliability

At BIW Connector Systems, we invest heavily in design and test to ensure our products can withstand the extreme, harsh environments of a production well.



Reliability Strategy

BIW Connector Systems' reliability and long product lifetimes are realized via a three-fold engineering strategy. The first is to test exhaustively. We test every product variation and every unique cable because our experience tells us this is necessary for world-class reliability. The second strategy is to conduct extensive forensic analysis on all field returns, to identify root cause and implement design or manufacturing improvements. Finally, we maintain an electronic Knowledge Database of every test and investigation and make this easily accessible

to our engineers so they can practice informed design.

Testing

Environmental chambers, which closely replicate the downhole conditions, are essential to proving product reliability. BIW Connector Systems has two primary chambers, capable of simultaneous 650 °F/10,000 psi and 500 °F/6,500 psi conditions, with pressure and temperature cycling. In both chambers, electrical performance of the device can be monitored throughout the test, providing us invaluable insight into its performance.

Forensic Analysis

We utilize our multi-million dollar Materials Science Laboratory, with a vast array of analytical equipment, to go beyond physical inspection to sophisticated material analysis. This information is fully documented and input into our Knowledge Database, which informs all new designs.

Informed Design

We have great designers with the best tools and technology. In addition, we invested in significant material science technology and have created a common electronic Knowledge Database which can be mined for aggregated information from past designs, tests, and forensic analysis, then applied to new products – this produces what we call informed design.



Qualification Test vessel