# Torq N' Seal® HX Plug

## Hydro / Helium Test Report

**10 August 2017**


## Abstract

Torq N' Seal® high pressure tube plugs (US Patent Numbers 6883547 & 9249916) have been used across a variety of industries and heat exchanger applications for over 35 years. These plugs create a mechanical contact seal that can withstand pressures in excess of **7,000 psi** and temperatures greater than 1,750°F, or higher depending on the alloy. Torq N' Seal® high pressure tube plugs are installed by hand using a 3/8" drive torque wrench and associated HEX driver attachment, eliminating the need for costly training and installation tools that competing tube plugs require. This saves costly man-hours during critical facility downtime without sacrificing safety or efficacy in heat exchanger maintenance or capacity reduction projects.

Comprehensive testing and analysis has been completed using Torq N' Seal® plugs to verify their efficacy in sealing heat exchanger tubes. These tests included high pressure up to **10,000 psi**; pressure cycling, prolonged service, and vibration at **7,000 psi**; thermal cycling and installation effects on adjacent tubes; and **helium testing up to $10^{-10}$ std cc/s**. In addition, Torq N' Seal® tube plugs have been tested and certified by AECL's Chalk River Laboratories to permanently seal leaking tubes in Nuclear Class III and balance-of-plant (BOP) heat exchangers in CANDU power stations. Torq N' Seal® plugs have also been hydro tested by the US Naval Air Warfare Center and Ontario Hydro (the precursor to Ontario Power) to pressures in excess of **7,000 psi**. Finally, Torq N' Seal® heat exchanger tube plugs are designed and manufactured to meet or exceed ASME Section VIII, ASME Section III (Nuclear), and CAN/CSA 285.0 6.1.6 Cat H standards, among others.

# Table of Contents

## Introduction

Heat exchanger tube plugging is used to take a heat exchanger tube out of service for two main reasons, leaking/ruptured tubes or capacity reduction. There are a variety of ways to plug a heat exchanger tube, but regardless of method the goals remain the same: Create a positive seal that will endure even the harshest conditions for the life of the heat exchanger, with a simple, safe, and cost-effective implementation designed to prevent damage to adjacent tubes and tube sheet ligaments.

The Torq N' Seal® heat exchanger tube plug is a solid one-piece thimble style plug that can be inserted into the tube sheet of a leaking tube and expanded with a standard 3/8" drive torque wrench (see Appendix A.1 & A.2). The plug will expand approximately 30 mils (0.030") to provide a positive mechanical contact seal. The Torq N' Seal® heat exchanger plug can be used in high or low-pressure applications such as feedwater heaters, moisture separator re-heaters, preheaters, condensers, coolers, fin-fan coolers, or any other tubed heat exchanger.

Permanent, positive sealing in excess of **7,000 psi** is achieved without special tooling or personnel training, exceeding the needs of even super-critical heat exchangers. The plug can be inserted to any depth of the tube sheet, providing flexibility to avoid severely corroded areas on the tube sheet face. The design enables rapid implantation and fit into tight areas adjacent to the tube sheet/shell joint interface, baffle plates, and internal dividers. The one-piece design enhances sealing characteristics by eliminating second potential leak paths common to design found in two-piece plugs. Torq N' Seal®'s wide sealing area contact zone ensures a positive seal while the gradual and symmetrical torque expansion eliminates thermal and mechanical shock to the tube sheet, commonly found with welding, impact due to hammering of tapered pins, and explosive insertion methods. Additionally, the patented design allows installation of plugs at the face and back side of the tube sheet to prevent intrusion of shell side corrosives. With single plugging techniques accomplished on the face of the tube sheet, corrosives can enter the void created in the tube sheet, thereby exacerbating erosion and corrosion of the tube sheet ligaments.

The Torq N' Seal® plug is snapped onto the hex capture driver and inserted into the tube ID, ensuring that the serrated sealing area is within the tube sheet. Applying the initial torque to the driver engages the anti-spin eccentric cam, locking the plug into the tube ID, thereby providing a torsional resistive force. As additional torque (in-lb) is exerted, the drive screw threads into the plug body, pressing the tapered expansion ferrule into the reverse taper of the plug. These tapered surfaces combine to generate an enormous radial expansion force, swaging the serrated sealing area into the tube wall (see Appendix A.3 & A.4). A permanent, positive mechanical contact seal in excess of **7,000 psi** is created.

Torq N’ Seal® heat exchanger tube plugs meet or exceed all of the following manufacturing, design, and test specifications:

- ASME B31.3
- ASME Section VIII Division 1
- CSA B51
- CSA Z662
- TEMA
- Nuclear Class 3 and Balance-of-Plant Certification for CANDU power stations
- CAN/CSA 285.0 6.1.6 Cat H
- ISO-9001:2008 Standards for
    - ASME Section VIII
    - API 660
    - Alberta (ABSA) 2017-01051
    - Ontario (TSSA) CRN# OA11184.5R2
- ASME Section III Nuclear
    - 10 CFR 50 Appendix B
    - ANSI N45.2
    - Ontario (TSSA) CRN# NFA-3-4994.5ADD2

## Basis for Test Pressures

Test pressures were selected based on the ASME Section VIII Division 1 and ASME B31.3 testing requirements for high pressure vessels and piping. ASME Section VIII Division 1 requires the minimum test pressure of pressure vessels to be 1.3 times the maximum allowable working pressure (MAWP) multiplied by the lowest stress ratio (LSR) of the materials from which the pressure vessel is fabricated. The LSR is the ratio of material yield strength at test temperature to material yield strength at operating temperature. There is no time limit specified for ASME Section VIII Division 1.

ASME B31.3 specifies a test pressure not less than 1.5 times the design pressure multiplied by Rr, where Rr is the equivalent of LSR in Section VIII Division 1. Pressure must be maintained for at least 10 minutes during visual inspection for leaks. ASME B31.3 was used to determine test pressure because it was the stricter of the two regulations.

Since Torq N’ Seal® tube plugs are installed in a variety of heat exchanger applications, design pressure is a range more than a set value. As a result, the design pressure for testing was selected based on the single most demanding Torq N’ Seal® application, supercritical coal power plants. In the phase diagram of water there is a point, which occurs at 705°F/3,208 psi, called the critical point of water. Here liquid water and steam become indistinguishable. Increasing the temperature and pressure above the critical point pushes steam into the supercritical range.

Many of the large pulverized coal power plants in existence today produce supercritical steam and have an efficiency of a little more than 40 percent, such as the 600-MW John W. Turk Jr. power plant in Arkansas.

The design pressure selected for testing was 4,200 psi, as this is among the highest design pressures for ultra-supercritical coal boilers in operation today. By meeting the most demanding potential application of Torq N' Seal® plugs, this design pressure provides a safety/performance factor of several times relative to more typical installations. Multiplying by 1.5 times, in order to meet the ASME B31.3 high pressure piping test requirements, gives a test pressure of 6,300 psi. Even these relatively high pressures are so far below the yield strength of the Torq N' Seal® plug materials being tested that yield strength effects were negligible. For instance, minimum yield strength for carbon steel is greater than 50,000 psi.

**Thus, the standard test pressure was set at 7,000 psi**, used for the prolonged service, temperature cycling, pressure cycling, and vibration testing. The high-pressure test was completed at **10,000 psi.** Again, these values were specifically selected to confirm a factor of safety and performance well beyond that required by relevant codes for even the most stringent Torq N' Seal® applications.

## Testing Procedures and Results

A variety of tests have been conducted to prove the efficacy of Torq N' Seal® heat exchanger tube plugs. The test parameters were designed to demonstrate the service of Torq N' Seal® plugs to relevant code in the most demanding potential applications. These tests include: High pressure testing to 10,000 psi; Prolonged service testing at 7,000 psi for 4 days (96 hours) followed by a high-pressure test to 10,000 psi; Thermal cycling between 100°F and 600°F; Pressure cycling between 0 psi and 7,000 psi; Vibration testing at 7,000 psi; Installation effect on adjacent tubes and tube sheet ligaments; Helium testing up to $10^{-10}$ std cc/s.

Torq N' Seal® plugs were inserted into test fixtures (see Appendix A.5) of inner diameter 0.500" made from Carbon Steel and 316 Stainless Steel. The plugs were size 0.490" to 0.510" and installed based on the manufacturer's recommended installation torque using a 1/4" HEX driver coupled with a 3/8" drive torque wrench. Plug materials tested were Carbon Steel and 316 Stainless Steel. After installation, a measurement was made from the top of the plug to the beginning of the tube on the test fixture using a digital caliper accurate to 1/1000$^{th}$ of an inch. The test fixture was placed over a dry surface where leaking would be immediately apparent. Water was the medium, pressurized by a hydraulic pump (see Appendix A.6).

**High Pressure** – The test fixture was pressurized from 0 psi to 10,000 psi over the course of 1 minute (see Appendix A.7 & A.8). Observations for leakage were made continuously during pressurization. Upon reaching a pressure of 10,000 psi, the valve was closed, the pressure on the pump and hose were released, and the test fixture was left for 10 minutes. After 10 minutes, the pressure was recorded and observations for leakage were made, then the valve was opened to relieve pressure back to the reservoir. After pressure was relieved, a measurement was made of the plug location using digital calipers.

The test fixture showed no signs of leakage anywhere in the system throughout the course of the experiment. Pressure did not drop during the 10-minute observation period. The measurement of plug location showed no difference from the original measurement, indicating the plug had not moved within the test fixture.

**Prolonged Service** – The test fixture was pressurized from 0 psi to 7,000 psi over the course of 1 minute. Observations for leakage were made continuously during pressurization. Upon reaching a pressure of 7,000 psi, the valve was closed. Pressure on the pump and hose was relieved and disconnected from the test fixture. The test fixture was left under pressurization for 4 days (96 hours). Observations for leakage were made periodically over the course of the experiment. After 4 days, the pressure was recorded and final observations for leakage were made. The hose and pump were reconnected and the valve was opened, relieving pressure back to the reservoir. Then, the test fixture was pressurized again up to 10,000 psi over the course of 1 minute to verify plug efficacy after extended, high demand service. Pressure was held for 10 minutes then relieved back to the reservoir. Plug location was recorded.

The test fixture showed no signs of leakage anywhere in the system throughout the course of the experiment. Pressure did not change during the 4-day (96 hour) observation period. Plug and test fixture achieved 10,000 psi after observation period with no leakage or pressure drop. Plug location showed no change between the pre and post-test measurements, indicating the plug had not moved within the test fixture.

**Thermal Cycling** – A band heater was wrapped around the OD of the test fixture (see Appendix A.9) at the far end of the plug. The test fixture was pressurized from 0 psi to 2,500 psi over the course of 1 minute. Observation for leakage were made continuously during pressurization and the remainder of the test. Upon reaching a pressure of 2,500 psi, the valve was closed. Pressure on the pump and hose was relieved. The band heater was turned on and temperature at the seal location was measured using an IR thermometer as the test fixture was heated to a maximum temperature of 600°F, which took approximately 15 minutes. Then the band heater was turned off and the test fixture was allowed to cool to 100°F, which took approximately 11 minutes. The test fixture was heated and cooled a total of 10 times (see Appendix A.10). Then the pressure was relieved back to the reservoir and a measure of plug location was taken.

The test fixture showed no signs of leakage in the system throughout the course of the experiment. Start and finish pressures showed no change. Plug location showed no change between the pre and post-test measurements, indicating the plug had not moved within the test fixture.

**Pressure Cycling** – Observations for leakage were made throughout the course of the experiment. The test fixture was pressurized from 0 psi to 7,000 psi over the course of 1 minute. Then pressure was relieved to the reservoir (atmospheric pressure) almost immediately. The test fixture was pressurized and relieved a total of 10 times (see Appendix A.11). After the final cycle, pressure was relieved to the reservoir and a measure of plug location was taken.

The test fixture showed no signs of leakage in the system throughout the course of the experiment. Plug location showed no change between the pre and post-test measurements, indicating the plug had not moved within the test fixture.

**Vibration** – Observations for leakage were made throughout the course of the experiment. The test fixture was pressurized from 0 psi to 7,000 psi over the course of 1 minute. Upon reaching a pressure of 7,000 psi, the valve was closed. Pressure on the pump and hose was relieved and disconnected from the test fixture. The test fixture was affixed to a pneumatic vibrator rated at 60 Hz and a maximum displacement of 0.05”. The test fixture was subjected to vibration for 10 minutes. The test fixture was then removed from the pneumatic vibrator and reconnected to the hose and pump. After recording the final pressure, the valve was opened to relieve pressure back to the reservoir. A measurement of plug location was taken.

The test fixture showed no signs of leakage in the system throughout the course of the experiment. There was no pressure drop evident during the test and no change between start and end pressures. Plug location showed no change between the pre and post-test measurements, indicating the plug had not moved within the test fixture.

**Effects on Adjacent Tubes and Tube Sheet Ligaments** – A mock tube sheet made of Admiralty Brass was fabricated for this experiment. Small length copper tubes were rolled into the tube sheet. The ID of the test location and every adjacent tube were taken, as was the center-to-center distance between each adjacent tube and the test location using a digital caliper. A stainless-steel plug was selected, intended to amplify any deformation relative to a standard Torq N’ Seal® installation which would recommend an Admiralty Brass plug. The plug was installed based on the manufacturer’s recommended installation torque. The same ID and center-to-center measurements were taken.

The measurements showed negligible change after installing the plug in the test location. This indicated that the plug did not deform the tube sheet, nor did it have any impact on adjacent tubes.

**Helium Testing** – Two types of helium (He) testing were completed, for certification and further details see pages 20 and 21 after the Appendix. First, the test fixture was pressurized to 15 psi with helium tracer gas (80% He, 20% air). An STX radiodetector probe, sensitive to $10^{-4}$ std cc/s, was positioned outside the fixture at the exposed end of the tube. No helium was detected over a 3 hour period.

In the second test, the Torq N Seal® test fixture was evacuated to a near full vacuum and Helium (He) was applied to the Torq N Seal Plug end of the fixture. A Leybold Mass Spectrometer was used to detect any helium in-leakage up to a threshold of $10^{-10}$ std cc/s. There was no leakage detected throughout the course of the experiment.

## Conclusion

Torq N' Seal® heat exchanger tube plugs met all of the test requirements described in the previous section. No meaningful leakage, plug displacement, or pressure release was detected under any of the testing scenarios, as listed below:

- High pressure in excess of 10,000 psi
- Prolonged service at 7,000 psi, followed by pressurization to 10,000 psi
- Thermal cycling between 100°F and 600°F
- Pressure cycling between 0 psi and 7,000 psi
- Vibration of 100 Hz and 0.10" displacement at 7,000 psi
- No discernible deformation of adjacent tubes or tube sheet ligaments during installation
- Helium testing up to $10^{-10}$ std cc/s (300 yr detection rate) with no leakage

Torq N' Seal® heat exchanger tube plugs meet or exceed all relevant pressure vessel codes and requirements (ASME B31.3, ASME Section VIII Division 1, etc). 7,000 psi was specifically selected to meet code for the most demanding possible installations, thus demonstrating their suitability for any heat exchanger tube plugging application.

# <u>Appendix</u>

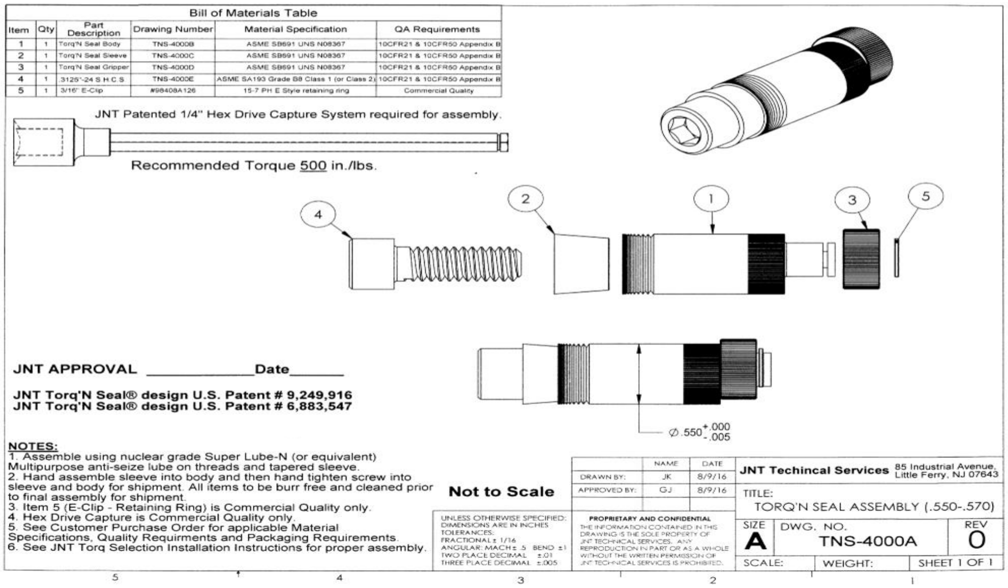


Figure A.1 – Torq N' Seal® Assembly Drawing

Figure A.2 – Assorted Torq N' Seal® Plugs and HEX Drivers

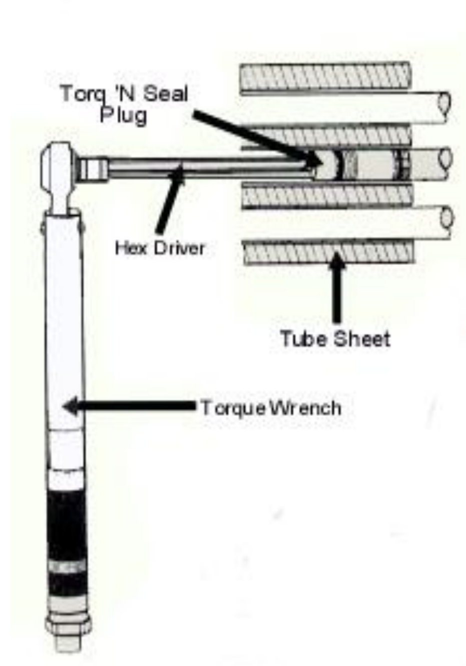


Figure A.3 – Torq N' Seal Installation Drawing

https://youtu.be/Zj3wxiCsXSg

Reference A.4 – Torq N' Seal Installation Video (link)

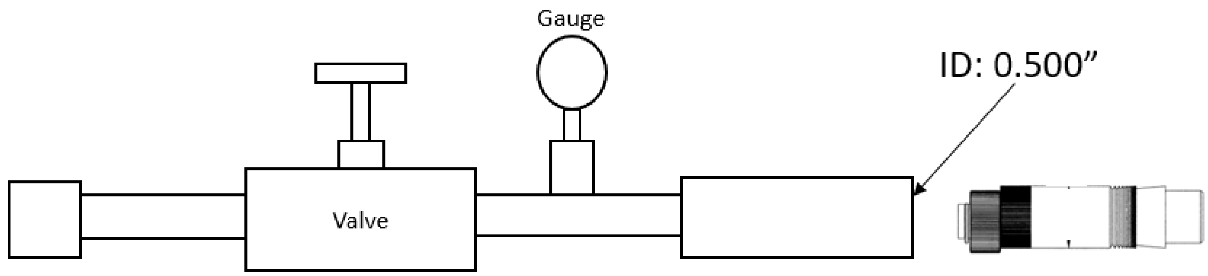


Figure A.5 – Torq N’ Seal Hydro Test Fixture Diagram

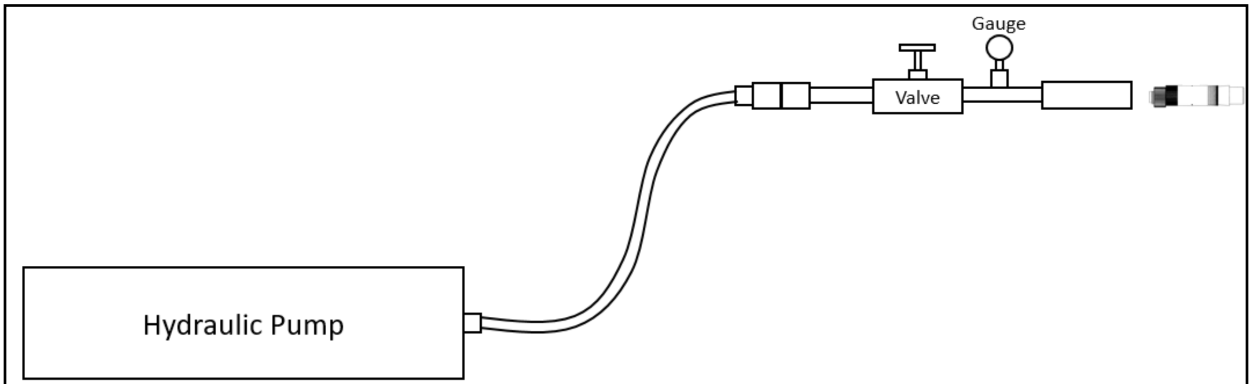


Figure A.6 – Torq N’ Seal® Hydro Test System Diagram

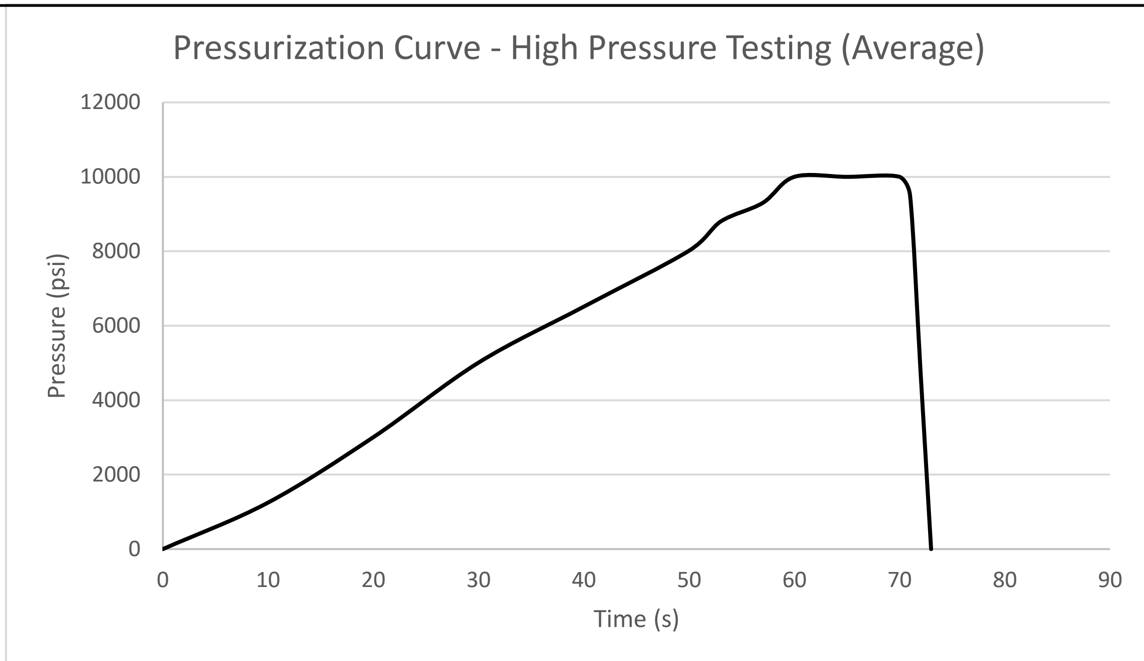


Figure A.7 – High Pressure Test Results


Figure A.8 – High Pressure Test Picture

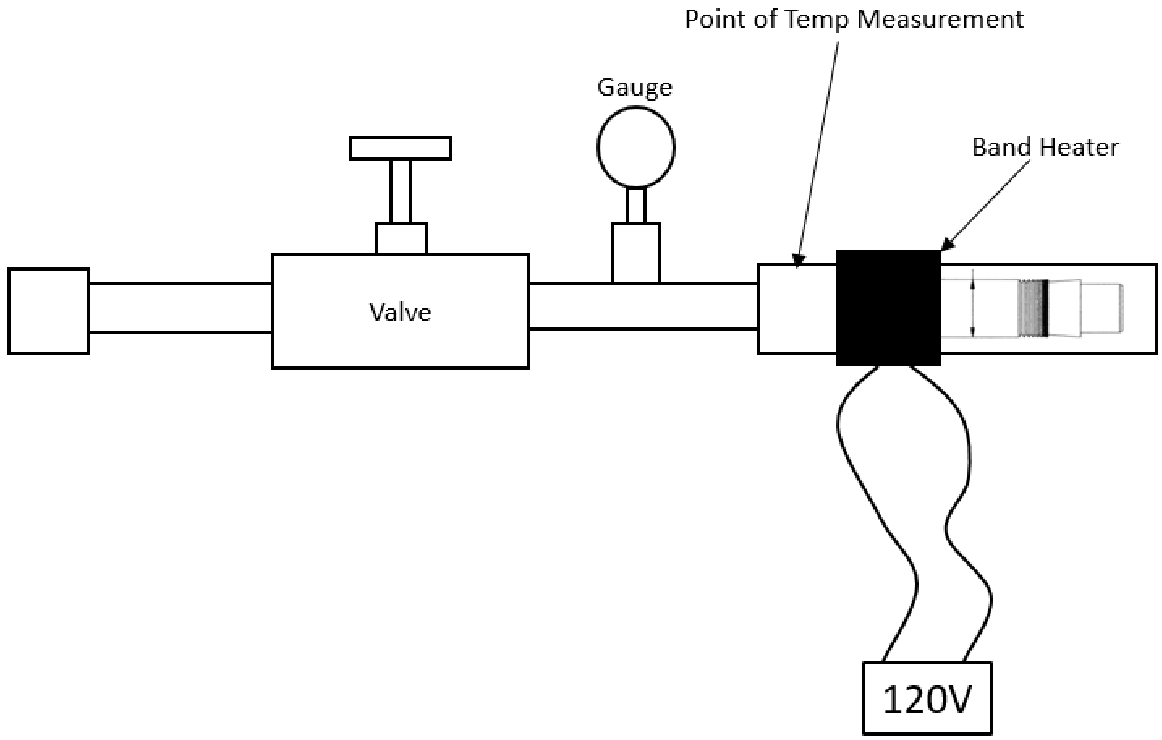


Figure A.9 – Thermal Cycling Test Fixture Diagram

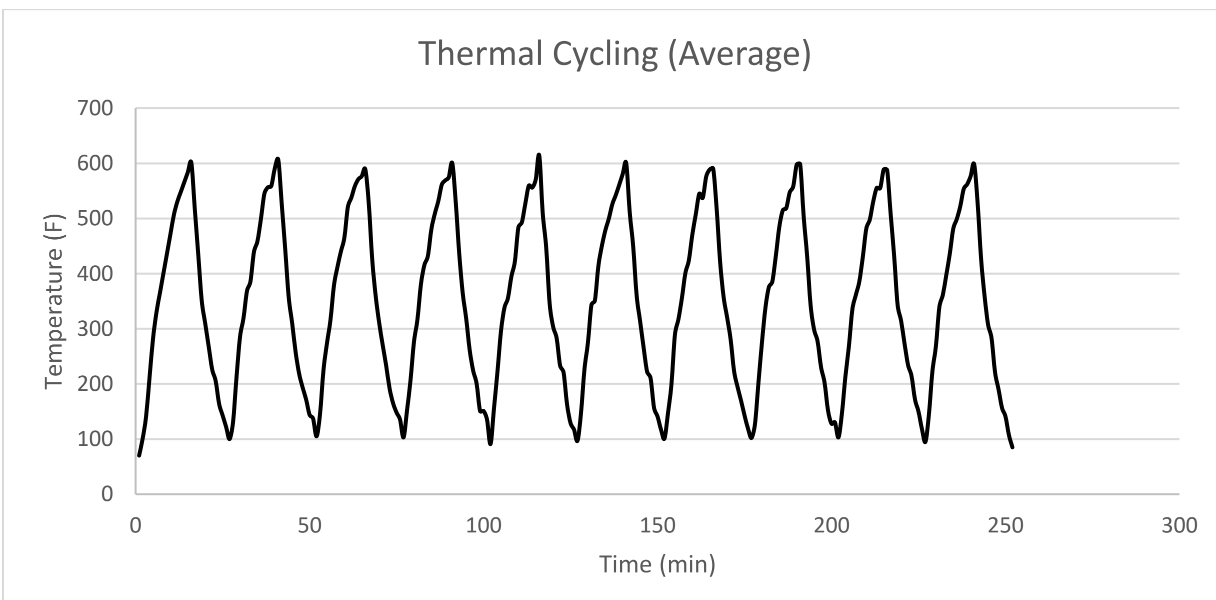


Figure A.10 – Thermal Cycling Test

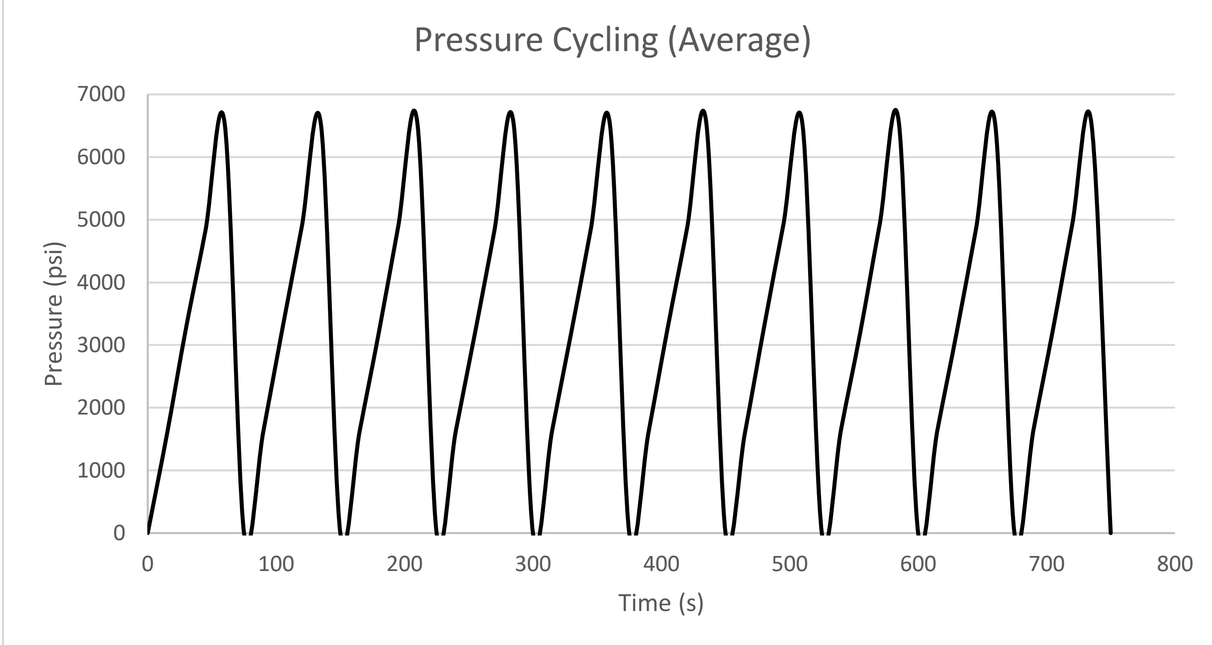


Figure A.11 – Pressure Cycling Test

Alberta Municipal Affairs

ABSA
the pressure equipment safety authority

AB-41 2016-01

## STATUTORY DECLARATION
### Registration of Fittings

In this space, show facsimile of manufacturer's logo or trademark as it will appear on the fitting.

Torq N' Seal® Plug

I, Glenn F. Jorgensen (name of applicant), President (position title) (must be in a position of authority)

of JNT Technical Services Inc. (name of manufacturer)

located at 85 Industrial Ave. Little Ferry, NJ 07643 (plant address)

do solemnly declare that the fittings listed hereunder, which are subject to the Safety Codes Act (check one)

☐ comply with the requirements of ____________ (title of recognized North American Standard) which specifies the dimensions, materials of construction, pressure/temperature ratings and identification marking of the fittings, or

☒ are not covered by the provisions of a recognized North American standard and are therefore manufactured to comply with ISO-9001:2008 for ASME VIII ~~Class 6~~ Div. 1 Vessels (title of code of construction or other applicable document) as supported by the attached data which identifies the dimensions, materials of construction, pressure/temperature ratings and the basis for such ratings, and the marking of the fittings for identification.

I further declare that the manufacture of these fittings is controlled by a quality control program which has been verified by the following authority, ISO-9001:2008 as being suitable for the manufacture of these fittings to the stated standard. The fittings covered by this declaration, for which I seek registration, are

Heat Exchanger Tube Plug (brief description of fittings)

In support of this application, the following information, calculations and/or test data are attached:

AECL Test Report

DECLARED before me at Little Ferry (city) in the State of New Jersey USA (province or state)

this 16 day of February (Month), 2017 (Year)

ELENA L. ROSE
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Aug. 13, 2019

(print) Elena Rose (a Commissioner of Oaths or Notary Public)

(sign) Elena L. Rose (a Commissioner of Oaths or Notary Public) — [signature] Pres (signature of applicant)

**For ABSA Office Use Only:**

NOTES: ____________

To the best of my knowledge and belief, the application meets the requirements of the Safety Codes Act and CSA Standard B51, Clause 4.2, and is accepted for registration in Category A

Registration Number: 0A11184.52 — [signature] (Signature of the Administrator/SCO)

Date Registered: MAR 03 2017 — Expiry Date: Feb. 3, 2026

The information you provide is necessary only for the administration of the programs as required by the Alberta Safety Codes Act and Regulations in the Pressure Equipment Discipline.

A.12 – ABSA Certification

14th Floor, Centre Tower
3300 Bloor Street West
Toronto, Ontario
Canada M8X 2X4
Tel.: 416.734.3300
Fax: 416.231.1626
Toll Free: 1.877.682.8772

www.tssa.org

February 03, 2016

GLENN JORGENSEN
JNT TECHNICAL SERVICES INC
85 INDUSTRIAL AVE
LITTLE FERRY NJ 07643, US

**Service Request Type:** BPV-Fitting Registration
**Service Request No.:** 1778364
**Your Reference No.:** GJ011516A
**Registered to:** JNT TECHNICAL SERVICES INC

Dear GLENN JORGENSEN,

Technical Standards and Safety Authority (TSSA) is pleased to inform you that your submission has been reviewed and registered as follows:

**CRN No.: 0A11184.5R2**
Main Design No.: TNS-2000 Rev.2
Expiry Date: February 3, 2026

Please be advised that a valid quality control system must be maintained for the fitting registration to remain valid until the expiry date.

Notes of registration:

1.The Owner of the CRN is JNT Technical Services which is the design and engineering company for the Torq N Seal Heat Exchanger Plugs under US patent number 5,289,851; 6,883,547 and 9,249,916. The manufacturing location are listed on the attached stamped page.
2. Design conditions: 1180psi at 500F and the plug materials as per ASME Section VIII/1 requirements.
3.The registration is supported by Bruce Power technical specification data sheet NK29-TS-40000-001 Rev.0 and -002 Rev.0, and testing as per AECL letter 1998-03-31 and AECL heat exchanger plug qualification testing dated 1997-05-16.

The stamped copy of the approved registration and the invoice are mailed separately. Should you have any questions or require further assistance, please contact a Customer Service Advisor at 1.877.682.TSSA (8772) or e-mail customerservices@tssa.org. We will be happy to assist you. When contacting TSSA regarding this file, please refer to the Service Request number provided above.

Your truly,

Liliana Constantinescu

Putting Public Safety First

A.13 – TSSA Section VIII Certification (page 1 of 2)

Boilers and Pressure Vessels Safety
3300 Bloor Street West
14th Floor, Centre Tower
Toronto, Ontario
CANADA M8X 2X4

**Torq N Seal®**
**Heat Exchanger Plug**

STATUTORY DECLARATION
Registration of Fittings

I, Glenn F. Jorgensen, President
(Name & Position, e.g. President, Plant Manager, Chief Engineer)
of JNT Technical Services Inc. Fax (201)641-2309
(Name of Manufacturer)
Located at 85 Industrial Ave. Little Ferry, NJ 07643 USA (201)641-2130
(Plant Address) (Telephone Number)

do solemnly declare that the fittings listed hereunder, which are subject to the Technical Standards and Safety Act, 2000, and Regulations for Boilers and Pressure Vessels comply with all of the requirements of

(Title of recognized North American Standard)
which specifies the dimensions, materials of construction, pressure/temperature ratings, identification marking the fittings and service;

X or are not covered by the provisions of a recognized North American standard and are therefore manufactured to comply with ASME VIII Div. 1 as supported by the attached data which identifies the dimensions, material of construction, pressure/temperature ratings and the basis for such ratings, the marking of the fitting for identification and service.

I further declare that the manufacture of these fittings is controlled by a quality system meeting the requirements of ASME VIII Div. 1 which has been verified by the following authority, ASME Sec. VIII Class 6. The items covered by this declaration, for which I seek registration, are category Cat. H type fittings. In support of this application, the following information and/or test data are attached as follows:

(drawings, calculations, test reports, etc.)

Declared before me at JNT Tech Services in the State of New Jersey
the 22nd day of December AD 20 15

Commissioner for Oaths: ELENA L. ROSE NOTARY PUBLIC OF NEW JERSEY My Commission Expires Aug. 13, 2019
Elena Rose
(Printed name)
Elena Rose President
(Signature) (Signature of Declarer)

FOR OFFICE USE ONLY

To the best of my knowledge and belief, the application meets the requirements of the Technical Standards and Safety Act, 2000, and Regulations for Boilers and Pressure Vessels and CSA Standard B51 and is accepted for registration in Category A

CRN Number Issued: OA 11184.5R2
Registered by: Adriana Constantinescu
Date Registered: Feb. 3, 2016
This registration expires on: Feb. 3, 2026

Technical Standards & Safety Authority — Boilers and Pressure Vessels Safety Program
REGISTERED
CRN OA 11184.5R2
Signed:
Date: Feb. 3, 2016

Document Name: TSSA Statutory Declaration Form Jun 17, 2007 Rev.4.doc

See attached page for notes of registr. & renewal

A.13 – TSSA Section VIII Certification (page 2 of 2)

TSSA
TECHNICAL STANDARDS & SAFETY AUTHORITY

14th Floor, Centre Tower
3300 Bloor Street West
Toronto, Ontario
Canada M8X 2X4
Tel.: 416.734.3300
Fax: 416.231.1626
Toll Free: 1.877.682.8772

www.tssa.org

February 04, 2016

GLENN JORGENSEN
JNT TECHNICAL SERVICES INC
85 INDUSTRIAL AVE
LITTLE FERRY NJ 07643
US

**Service Request Type:** BPV-Nuclear Fitting Reg
**Service Request No.:** 1778128
**Your Reference No.:** GJ011516B
**Registered to:** JNT TECHNICAL SERVICES INC

Dear GLENN JORGENSEN,

Technical Standards and Safety Authority (TSSA) is pleased to inform you that your submission has been reviewed and registered as follows:

**CRN No.: NFA-3-4994.5ADD2**
Main Design No.: TNS-2000 REV.2
Expiry Date: N/A

Please be advised that a valid quality control system must be maintained for the fitting registration to remain valid until the expiry date.

Notes of registration:

1. The scope of this registration is change in CRN ownership only. The CRN Owner is JNT Technical Services INC., which is the design and engineering company for Torq N Seal heat Exchanger Plugs under US Patent numbers: 5,289,851; 6,883,547 and 9,249,916. The manufacturing locations are listed on the attached stamped page.
2. For scope and conditions of registration see original registration package.

The stamped copy of the approved registration and the invoice are mailed separately. Should you have any questions or require further assistance, please contact a Customer Service Advisor at 1.877.682.TSSA (8772) or e-mail customerservices@tssa.org. We will be happy to assist you. When contacting TSSA regarding this file, please refer to the Service Request number provided above.

Your truly,

Liliana Constantinescu

**Putting Public Safety First**

A.14 – TSSA Section III Nuclear Certification (page 1 of 2)

TSSA

Boilers and Pressure Vessels Safety
3300 Bloor Street West
14th Floor, Centre Tower
Toronto, Ontario
CANADA M8X 2X4

**Torq N Seal®**
**Heat Exchanger Plug**

**STATUTORY DECLARATION**
**Registration of Fittings**

I, Glenn F. Jorgensen, President
(Name & Position, e.g. President, Plant Manager, Chief Engineer)
of JNT Technical Services Inc. Fax (201)641-2309
(Name of Manufacturer)
Located at 85 Industrial Ave. Little Ferry, NJ 07643 USA (201)641-2130
(Plant Address) (Telephone Number)

☐ do solemnly declare that the fittings listed hereunder, which are subject to the Technical Standards and Safety Act, 2000, and Regulations for Boilers and Pressure Vessels comply with all of the requirements of

(Title of recognized North American Standard)
which specifies the dimensions, materials of construction, pressure/temperature ratings, identification marking the fittings and service;

X or are not covered by the provisions of a recognized North American standard and are therefore manufactured to comply with ASME Sec. III Div. 1 as supported by the attached data which identifies the dimensions, material of construction, pressure/temperature ratings and the basis for such ratings, the marking of the fitting for identification and service.

I further declare that the manufacture of these fittings is controlled by a quality system meeting the requirements of ASME III Division 1 which has been verified by the following authority, ASME Nuclear Class 3. The items covered by this declaration, for which I seek registration, are category Cat. H type fittings. In support of this application, the following information and/or test data are attached as follows:
See attached cover letter.
(drawings, calculations, test reports, etc.)

Declared before me at JNT Tech Services in the State of New Jersey
the 22nd day of December AD 20 15.

Commissioner for Oaths: ELENA L. ROSE NOTARY PUBLIC OF NEW JERSEY My Commission Expires Aug. 13, 2019
Elena Rose
(Printed name)
Elena Rose
(Signature)

Jorgensen, President
(Signature of Declarer)

**FOR OFFICE USE ONLY**

To the best of my knowledge and belief, the application meets the requirements of the Technical Standards and Safety Act, 2000, and Regulations for Boilers and Pressure Vessels and CSA Standard B51 and is accepted for registration in Category A.

CRN Number Issued: NFA-3-4994.5ADD2
Registered by: Liliana Constantinescu
Date Registered: Feb. 4, 2016
This registration expires on: N/A

Boilers and Pressure Vessels Safety Program
REGISTERED
CRN NFA-3-4994.5ADD2
Signed:
Date: February 4, 2016

Document Name: TSSA Statutory Declaration Form, Jan 17, 2007 Rev.4.doc

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THIS REPORT IS FOR USE WITH **BLUEING, HYDRO-STATIC TESTING** **(EXHIBIT K,REVISION 0)**
24 HOUR NOTICE SHOULD BE GIVEN TO INSPECTOR PRIOR TO TESTING:

VESSEL NAME: N/A ITEM# Pressure Testing

CUSTOMER: JNT Technical Services, Inc PO# VISA *2279 DATE: 8/1/17

LOCATION: Shop / Field IV# 8370

DESCRIPTION: Nitrogen Bubble / Hydro-static JOB# 9901

TECHNICAL MANUAL REF: MFG Specifications PARAGRAPH REF*Customer Specification

SPECIAL INSTRUCTIONS: Hydrostatic Test at 7,000 PSI for 3 Hours

TEST PERFORMED: In Shop CSVR TAG# 9901

| JOB# | QTY | CHARACTERISTICS | TEST EQUIP. | REQUIRED | FOUND | ACCEPT. | REJECT |
|---|---|---|---|---|---|---|---|
| 9901 | (1) | 1/4" Torq n Seal Plug Test Fixture | Hydro Pump Clean Water | 0 Leak 3 Hours | 0 Leak | (x LS) | |

REMARKS: Remove test flanges, blow clean and dry with Nitrogen.
Seal flanges or shrink wrap valve inlet and outlet and prepare to ship.

INSPECTOR: [signature] TITLE: OCM DATE: 8/1/17
WITNESS: [signature] TITLE: MECH DATE: 8-1-17

**FACTORY AUTHORIZED REPAIR FACILITY**
**A.S.M.E AND NATIONAL BOARD APPROVED REPAIRS**
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**HIGH PRESSURE GATE / GLOBE / NON-RETURN VALVES**
**BOILER MAINTENANCE / HEAT EXCHANGERS**
**PIPING / FABRICATIONS**

# Torq N Seal® Plug Helium (He) Test
## 10 Aug. 2017

Testing was done in accordance with the **ASME SE-432** Specification utilizing both mass spectrophotometer and radiodetector type leak detectors for Helium (He), measuring steady-state leak rate.

Tracer gas leak testing is a simple and highly-efficient method of leak detection that provides high sensitivity as well as increased accuracy and repeatability. This method is used for testing parts with very low leak rates that are outside the range for conventional air-flow pressure decay and mass flow, or to replace bubble test methods. Tracer gas testing uses escaping tracer gas to identify micro-leaks in the range of $1x10^{-4}$ to $1x10^{-10}$ std. cc/s.

Per **ASME SE-432,** leak detection methods can be subdivided into a tracer mode and a detector probe mode. The tracer mode procedure is used when the system is evacuated and the tracer gas (He) comes from a source located outside the system. The detector probe mode is used when the system is pressurized with the tracer gas (He) and testing is done at atmospheric pressure. Usually the tracer probe technique is more rapid because the gas reaches the detector at a higher concentration, despite any streaming effects.

In general, leakage measurement procedures involve covering the whole of the suspected region with tracer gas (He), while establishing a pressure differential across the system by either pressurizing with a tracer gas or by evacuating the opposite side. The presence and concentration of the tracer gas on the lower pressure side of the system are determined and then measured.

- **Helium Pressure Test – Detector Probe Method (Shell-side Simulation)**
  The Torq N Seal® test fixture was pressurized with 15 psi. (1 Atm.) of Helium (80% He/ 20% Air) for 3 hours. An STX Radiodetector was used to detect any leakage of He.

  - **Results: No leakage @ $10^{-4}$ std. cc/s, 3 hour detection rate**
  - Interpretation: Helium pressure (15 psi.) was applied to the back side (Eccentric locking wheel side) of the Torq N Seal® Plug with no leakage being detected for 3 hours simulating a potential shell-side leak path.

- **Helium Vacuum Test - Tracer Method (Tube-side Simulation)**
  The Torq N Seal® test fixture was evacuated to a near full vacuum and Helium (He) was applied to the Torq N Seal Plug end of the fixture. A Leybold Mass Spectrometer was used to detect any leakage from an A2LA accredited and ISO 17025:2005 certified testing facility, ensuring that the strictest controlled calibration procedures were followed. These standards are provided with traceable calibration certificates, including the N.I.S.T. and ANSI/NCSL Z540.1-1994.

  - **Results: No leakage @ $10^{-10}$ std. cc/s, 300 year detection rate**
  - Interpretation: Near full vacuum was applied to the back side (Eccentric locking wheel side) of the Torq N Seal® Plug with tracer gas (He) applied to the front end (Capscrew/ Installation Side) of the Torq N Seal Plug with no leakage being detected simulating a potential tube-side leak path (UHV Test Report 11581)


**Torq N Seal® Helium Test Fixture**

# Test Report: 11581

Date: 08/10/2017

**Report Issued To:**
**JNT Technical Services Inc**
**85 Industrial Ave**
**Little Ferry, NJ 07643**
Recipient: **Glenn Jorgensen**
Email: **gfj@jnt-tech-serv.com**
Phone #: **(201)-641-2130**

## Test Information:

**Type of test:** Vacuum Method

**Description:** Connections JNT fixture

**Location of Test:** UHV Tech Services

**Quantity Submitted:** 1

**Date Received:** 08/10/2017

**Testing Period:** 08/10/2017

**Customer Requested Test Procedure:** Evacuate parts and verify helium leak tightness

**Test Procedure Used:** WI-002 Helium Leak Testing-Evacuation

**Test Specification:** $<1.0 \times 10^{-10}$ std-cc/s

**Uncertainty of Measurement:** ±8.5

**Other Comments:** None

## Overall Results: PASS

At the request of the client, the part was evaluated for compliance with the following specifications:

| CONCLUSION | SPECIFICATION |
|---|---|
| PASS | $<1.0 \times 10^{-10}$ std-cc/ |

**Tested by:** Dan Hull

**Approved by:** Scott Crabtree

### Detailed Results:

**Test Summary:** The helium leak detector was calibrated prior to the test using the NIST traceable internal leak and verified against an external NIST traceable reference. The test fittings where then attached to the JNT fixture using a NPT connection with Teflon tape. This was then connected to the XL300 leak detector's KF25 inlet port and the machine was put in the measure mode. The connections on the test fitting and JNT fixture where then sprayed with helium. To further check the leak tightness a test hood was placed over the part, filled with helium, and sealed for one minute. The part was found to be helium leak tight to less than $1 \times 10^{-10}$ std-cc/s. Once no response was verified from the helium, the part was removed and considered to have met test specifications. Proper handling is required to prevent the part from leaking or becoming damaged. This test was accomplished in accordance with the requirements of ISO 17025:2005 and ANSI/NCSL Z540.1-1994.

**Test Equipment Used:**

| Model | Model Description | Trace Number | Report No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| TL7 | NIST Traceable Internal Helium Leak | 90001224323 | 2017-4323 | May-2017 | May-2018 |
| GPP-7-He-118T | NIST Traceable External Helium Leak | 3331 | 289995-17 | June-2017 | June-2018 |
| XL300 | Leybold Helium Leak Detector | 90001085003 | N/A | Jun-2017 | N/A |