IMATECH
INNOVATIVE SOLUTIONS

Torq N' Seal®
Complete User Guide

November 12, 2018

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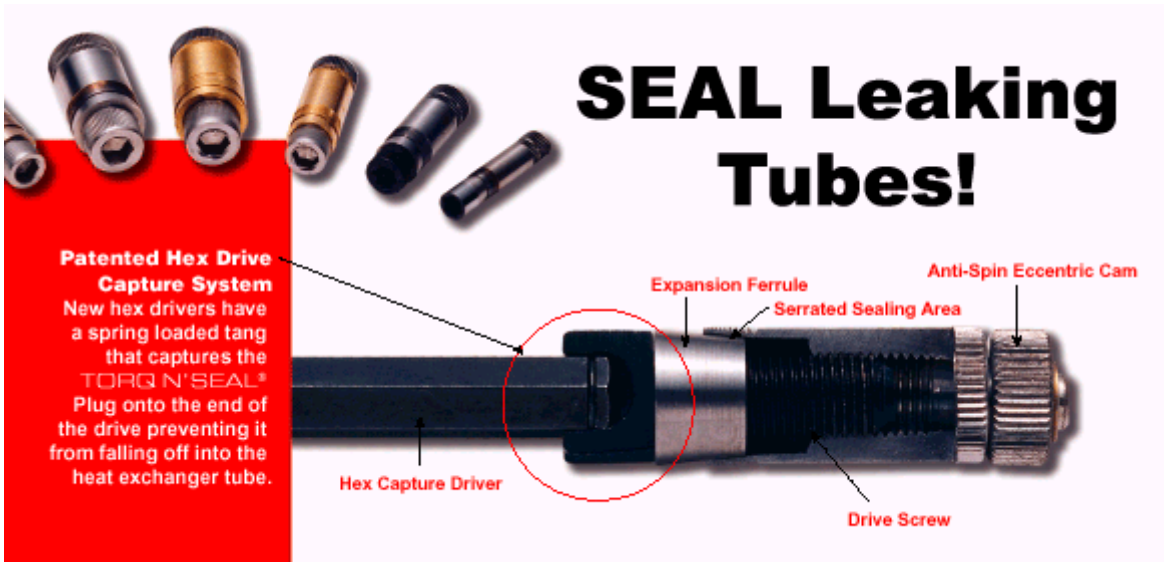


Sealing to 480 bar!

Sizes from 10 to 75mm

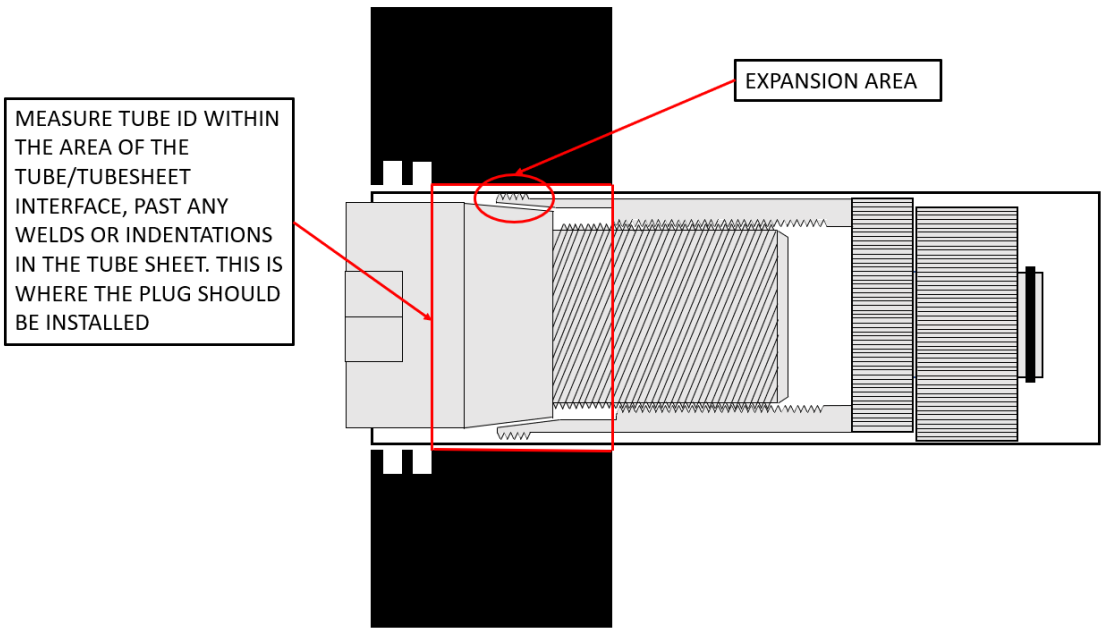
Available is Almost Any Material

Identifying the Tube Inner Diameter (ID)

An accurate Tube ID measurement is a critical first step in determining the correct Torq N' Seal® plug for your application.

Choose 1 of the 2 measurement options below:

1. Ideally, take a careful measurement of the tube ID with an inside tube micrometer or a gauging block to determine the actual bore diameter. Be sure to clean the tube of any loose scaling or corrosive oxide formation that may interfere with the measurement.
   - ***Caution**: Measure where the plug's expansion area will be when the plug is installed. If the tubes are welded to the tubesheet, be sure to measure past the weld area. In some cases where the weld overhangs the tube ID, the weld area will have to be reamed to fit the correct plug.*



Identifying Torq N' Seal® Part Number

Round your tube ID down to the nearest 10 thousandth mm and then add a material designation to **match the tube material**. Please see the example below.

Example 2: Selecting Torq N' Seal® Part Number Based on Tube ID And Material

Assume:

- *Tube ID = 17.45mm*
- *Tube Material = Carbon Steel*

Size Designation:

- *Round down: 17.450mm → 17.45mm*

Material Designation:

- *Add suffix to **MATCH YOUR TUBE MATERIAL** (Inquire for materials not listed)*
  - *BR = BRASS **(Stock Material)***
  - *CS = CARBON STEEL **(Stock Material)***
  - *316SS = 316 STAINLESS STEEL **(Stock Material)***
  - *1018CS = 1018 CARBON STEEL*
  - *F5 = A182-F5 CARBON STEEL*
  - *90CN = 90/10 COPPER NICKEL*
  - *70CN = 70/30 COPPER NICKEL*
  - *304SS = 304 STAINLESS STEEL*
  - *410SS = 410 STAINLESS STEEL*
  - *TI = TITANIUM GR 2*
  - *DP = DUPLEX 2205*
  - *SDP = SUPER DUPLEX 2507*
  - *IN825 = INCOLOY 825*
  - *MN = MONEL 400*
  - *HS = HASTELLOY 276*
  - ***Contact us for more options!***

Finalize your Torq N' Seal® Part Number:

TNS-17.45-CS

Conditions to Avoid for High Confidence Installation

This section details the 4 conditions requiring attention before and during the installation of your Torq N' Seal® plugs.

1. **Incorrect Plug Sizing**
   Follow pages 1-3 of this document to avoid any sizing issues. Plugs that are too small may not have the expansion capacity required to seal the tube, resulting in a failed installation or leakby. If the plug "slips" and begins to spin during installation, that is an indication your plugs are too small. Plugs that are too large may not fit inside the Tube ID, and thus cannot be installed.

2. **Incorrect torque is applied during installation**
   The installation torque is specifically chosen according to material and sizing based on extensive testing and experience. Applying less than the correct torque can result in an ineffective seal. Torq N' Seal® plugs are designed to handle up to 50% above the recommended torque, this makes installation less delicate and can be used to overcome some minor scaling and corrosion. Applying too much torque (2-3x greater than recommended) can cause the plug to spin inside the tube and ruin the sealing profile.

3. **Severe tube damage (cracking, pitting, eccentricity, etc.) in the sealing area**
   Tube defects that run the length of the plug will provide a leak path. Eccentricity, or ovality, will not allow the plug to seal effectively as forces will not be evenly distributed during installation. We recommend installing the plug either before or after the tube defect, where possible. If the tube defect cannot be avoided (ie: thin tubesheet), then attempt to widen the bore and smooth out the defect with a Tube Brush or De-burring tool. In extreme cases, remove or aggressively ream the tube and use a larger Torq N' Seal® plug to plug the tubesheet hole directly. Ask about the Torq N' Seal® Tubesheet Ring for these applications.

4. **Locating serrated sealing area on a roll joint or beyond the tubesheet**
   Installing a Torq N' Seal® plug with the sealing area on an uneven surface, such as a roll joint, can cause an imperfect seal. We recommend installing at a depth beyond any roll joints, but still in the tube / tubesheet interface area. Installing Torq N' Seal® plugs at a depth beyond the tubesheet's width can cause the tube to "balloon" rather than allowing the serrations to "bite" into the tube, resulting in a poor seal. Torq N' Seal® plugs are designed to complress the tube into the tubesheet, ensuring an effective seal.

Tools You Will Need

After you have identified and procured the correct Torq N' Seal® plugs, you are ready to seal the leaking tubes. Follow the 7 simple steps below to ensure a permanent, positive seal up to **480 bar!**

Tools you will need

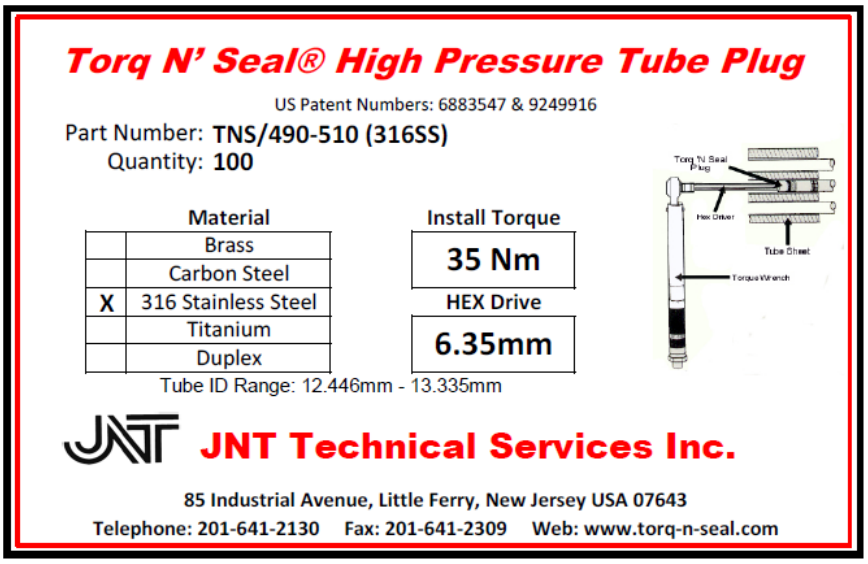
1. Torq N' Seal® Plugs *(supplied by JNT)*
2. 3/8" Square Drive Torque Wrench *(supplied by Customer)*
3. Hex Capture Driver *(comes included with all Torq N' Seal® plug purchases)*

Installing Torq N' Seal® Plugs

Step by Step Instructions

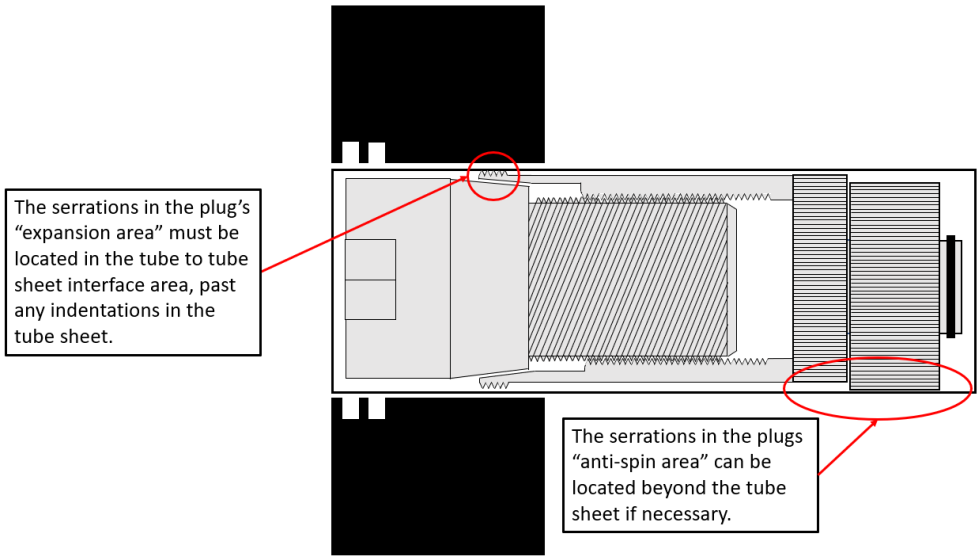
1. Inspect the tube for eccentricity (ovality) or severe tube damage (cracking, pitting, axial striations, widespread corrosion). If found, review step 3 of the "Conditions to Avoid for High Confidence Installation" Section on the previous page before proceeding.

2. Set the Torque Wrench according to the value on the Torq N' Seal® plug box. This information is also available in Appendix A.2.



3. Affix the Hex Capture Driver to a ratcheting 3/8" Drive Torque Wrench. At least 1 Hex Capture Driver is included with all Torq N' Seal® purchases. Then, place the plug on the end of the Hex Capture Driver and push until the driver fully sets into the screw head.

4. Insert the plug into the leaking tube so that the sealing area of the plug is within the tube/tubesheet interface area.



5. Slowly rotate the torque wrench clockwise until the anti-spin eccentric cam locks the plug into place. You should feel about 10 Nm of resistance at this point.

6. Continue to increase the torque slowly by rotating clockwise until you reach the recommended installation torque. Use the ratchet function of the torque wrench to provide a brief pause before each torque increase, thus reducing the stresses on the plug, tube, and tubesheet. The recommended installation torque will also be clearly displayed on the box of Torq N' Seal® plugs.

7. Remove the Hex Capture Drive from the plug with a swift pull away from the tubesheet and installation is complete. Your tube is now sealed in excess of **480 bar** by Torq N' Seal®, simple as that.

Appendix A.1: Tube ID Chart (Tube OD vs. Gauge [BWG])

Tube Outside Diameter (mm)								
B.W.G.	Wall Thickness (mm)	12.700	15.875	19.050	22.225	25.400	28.575	31.750
10	3.404	5.892	9.067	12.242	15.417	18.592	21.767	24.942
11	3.048	6.604	9.779	12.954	16.129	19.304	22.479	25.654
12	2.769	7.162	10.337	13.512	16.687	19.862	23.037	26.212
13	2.413	7.874	11.049	14.224	17.399	20.574	23.749	26.924
14	2.108	8.484	11.659	14.834	18.009	21.184	24.359	27.534
15	1.829	9.042	12.217	15.392	18.567	21.742	24.917	28.092
16	1.651	9.398	12.573	15.748	18.923	22.098	25.273	28.448
17	1.473	9.754	12.929	16.104	19.279	22.454	25.629	28.804
18	1.245	10.210	13.385	16.560	19.735	22.910	26.085	29.260
19	1.067	10.566	13.741	16.916	20.091	23.266	26.441	29.616
20	0.889	10.922	14.097	17.272	20.447	23.622	26.797	29.972
21	0.813	11.074	14.249	17.424	20.599	23.774	26.949	30.124
22	0.711	11.278	14.453	17.628	20.803	23.978	27.153	30.328

Appendix A.2: Recommended Installation Torques

Torq N' Seal® Plug – Recommended Installation Torque					
Carbon Steel		Stainless Steel / Monel		Brass / 90-10 Copper Nickel	
Plus size	Torque (Nm)	Plus size	Torque (Nm)	Plus size	Torque (Nm)
6.30-7.30mm	8.5	6.30-7.30mm	8.5	6.30-7.30mm	8.5
7.30-10.0mm	11.5	7.30-10.0mm	11.5	7.30-10.0mm	11.5
10.0-14.0mm	30	10.0-14.0mm	35	10.0-14.0mm	25
14.0-19.0mm	40	14.0-19.0mm	60	14.0-19.0mm	30
19.0-25.0mm	55	19.0-25.0mm	70	19.0-25.0mm	40
25.0-38.0mm	65	25.0-38.0mm	80	25.0-38.0mm	50
38.0-50.0mm	80	38.0-50.0mm	90	38.0-50.0mm	65