Integrity Assembly Procedure, Vx Spectra

Testing and Process-Singapore Well Testing Centre-Vx Spectra

Introduction

This SWI consists of steps to assemble the mechanical integrity components such as MVT, isolation blocks,tubings and thermowell assembly.

This SWI is applicable to all sizes and versions.

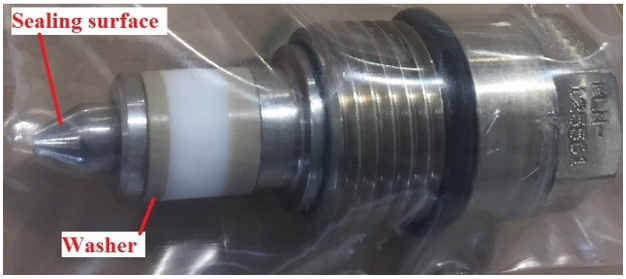
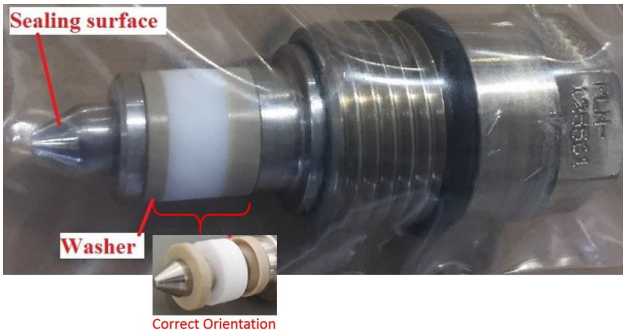
Steps

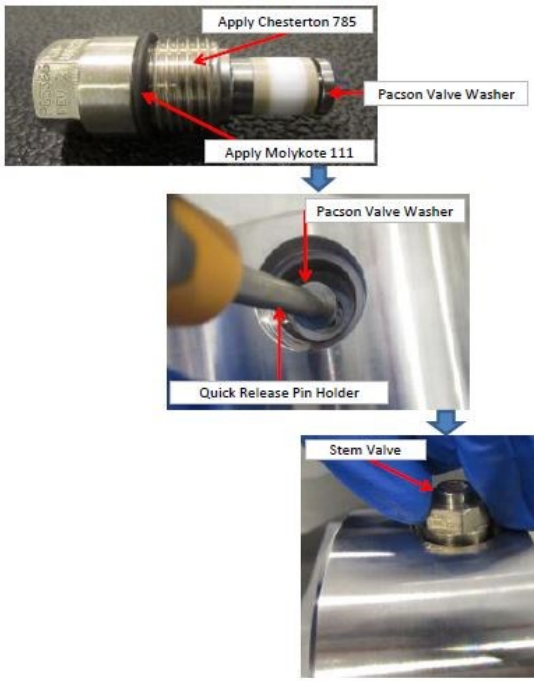
1 List of tools needed for isolation block , remote seal assembly,tubing assembly and thermowell assembly.

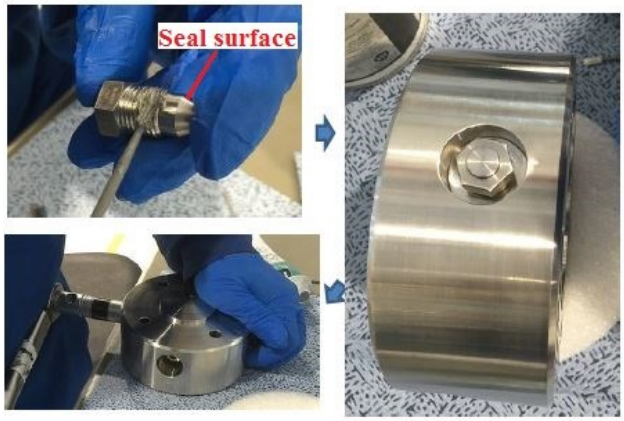
Sl No	Description
1	Torque Wrench, 60-300 Nm
2	Torque Wrench, 10-100 Nm
3	Quick release pin holder
4	8mm Allen Key Socket
5	6mm Allen Key Socket
6	17mm Hex Socket
7	24mm Hex Socket
8	22mm Hex Socket
9	16mm combination spanner
10	22mm combination spanner
11	Rachet
12	Nozzle plugged to air network
13	Chesterton 785
14	Nitrile Gloves
15	Loctite 242
16	Foam Swabs
17	Molykote 111
18	Permanent Green Marker
19	Lint Free Paper
20	Alcohol
21	1 ½ inch Hex head
22	Combination spanner 11/16 inch
23	14mm Combination spanner
24	Wrench extension Bar

Do not remove the protection on MVT remote seals unless required for inspection or cleaning or assembly. After inspection ensure protection wrap is applied until it is required for assembly to prevent damage to diaphragm.

Steps 2 to 11 are required for xxBRx version only. Skip to Step 12 for xxNRx version and Step 17 for xxNTx version respectively.

Steps			
Step 2			
	2a	Visually inspect the isolation block for scratches, dirt, metal particles. Inspect the sealing surface of the isolation block.	
	2b	Clean and wipe the sealing surface by using alcohol and lint free paper or foam swabs.	
	Make sure there are no particles in all the bore holes, no scratches on sealing surface. Wear ear muff during air flushing.		
3	Check the sealing surfaces on the pacson valve and the washer. Ensure the washers are arranged in the correct orientation.		
	If required clean and wipe the sealing surface using alcohol and lint free paper or foam swabs.		
	If non-conformance is identified, raise a TFL.		
	The stem valve should be loosened prior assembly to avoid the stem cone from being in contact with the cavity cone and getting rubbed and causing damage to surface (Stem or seat).		
Step 4			

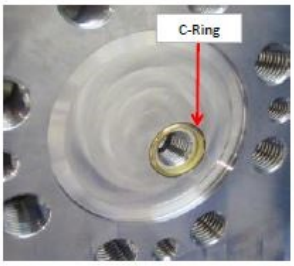
Steps			
	4a	Loosen the stem valve using a 6mm allen key.	
	4b	Install the Pacson valve washer into the isolation block with the help of the quick release pin holder.	
	4c	Apply Molykote 111 on the O-ring and Chesteron 785 on the thread.	
	4d	With the isolation block in the vertical position, push the valve with little force into the bore hole gently and screw it for a few thread using 17mm socket head.	
i	Make sure washer sits properly in the bore hole and o-ring does not come out from the bore hole while pushing the valve into the bore hole.		
Step 5			
	5a	Hand tight the packing gland with socket.	
	5b	Torque the packing gland to 54Nm by using the 17mm hex socket.	
	5c	Repeat the step 4 and 5 for another Pacson valve.	
i	NOTE: The opening/closing of the packing gland is done during pressure testing and takes 4 to 4.5 turns using a 6mm allen key.		
i	Check the packing gland is torqued with the correct torque value. Check stem travel by turning the stem in and out from the gland. It must travel freely. Leave it in the open position i.e 1 turn back towards closed.		

Steps			
Step 6			
	6a	Check seal surfaces to ensure there are no scratch or debris.	
	6b	Apply Chesterton 785 on the threads of the autoclave gland and install in the isolation block.	
	6c	Torque using a 5/8" socket with a calibrated torque wrench	
	6d	For Duplex meter - 316 material: 40 Nm	
	6e	For Inconel meter - Inconel material: 40 Nm	
i	Make sure torque wrench calibration date is not expired. Check the print on the autoclave gland and plug to make sure they are correct material.		
Step 7			
	7a	Prepare the M10 bolt by applying Chesterton 785 on the threads and under the head.	
i	Apply chesteron using brush/foam swab and coat evenly on the threads		
Step 8			
	8a	Visually inspect venturi sealing surface for scratches, dirt, metal particles.	
	8b	Blow out any foreign particles from the threads around the sealing on the venturi.	
	8c	Clean sealing area with lint free paper or foam swabs.	

Steps

i	Ensure this surface is free from dirt/particles Use ear muff during air flushing.

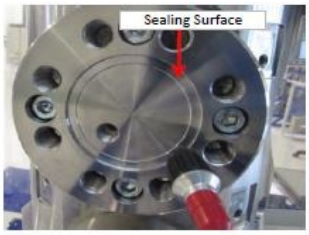
Step 9

	9a	Ensure surface is clean from dirt.	  
	9b	Place c-ring onto the sealing groove on the venturi.	
	9c	Place the isolation block over the C-ring.	
	9d	Insert the M10 bolt and tighten the isolation block onto the ventruri using a 8mm socket with calibrated torque wrench as below.	

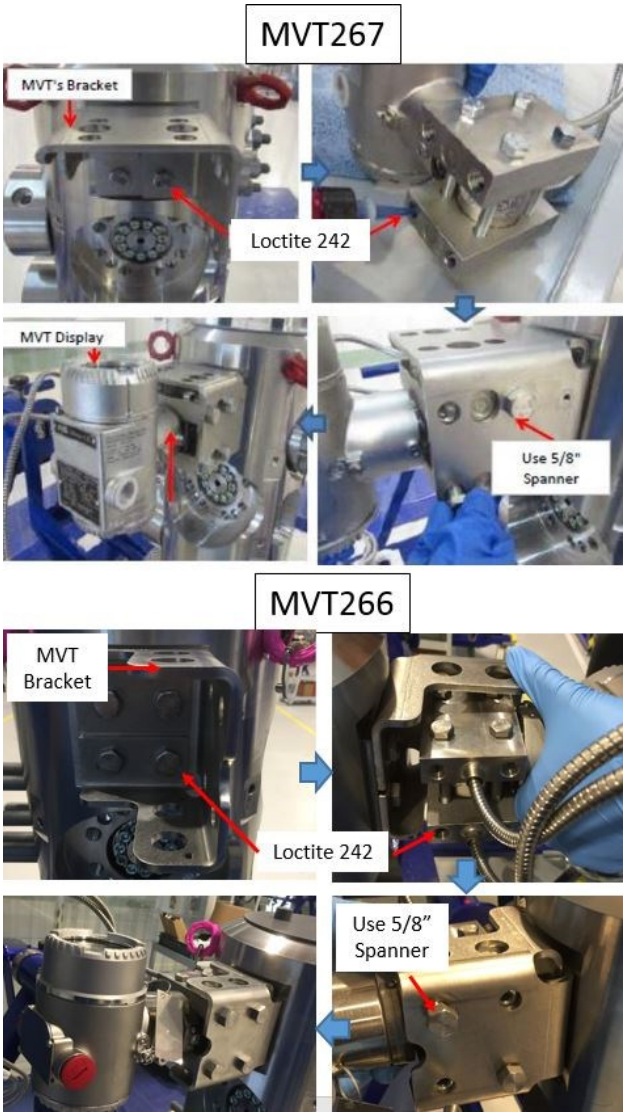
i	Be sure the outlet port on the venturi is in line with the inlet port of the isolation block.

Step 10 - Procedure to torque isolation block

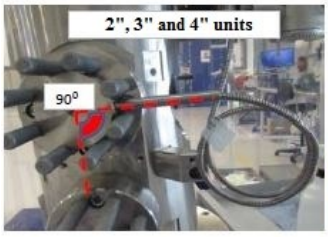
	10a	Perform torqueing in stages as per the picture.	Tighten bolts in a diagonal sequnces (Criss-cross pattern) Torque value = 35 Nm Stage 1: 30% of the torque value ≈ 10 Nm Stage 2: 60% to 70% of the torque value ≈ 20 Nm Stage 3: 100% of the torque value ≈ 35 Nm
	10b	Carry out a check in the clockwise direction on all bolts until there is no further rotations.	
	10c	Check that the gap at the flange outside diameter is closed all around the circumference of the connection.	
	10d	Mark all the nuts that have been torqued.	

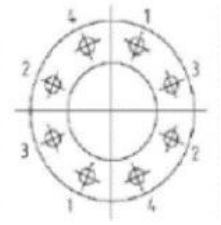
Steps			
	Ensure no damages on the bolt thread and nut bearing area. Mark all bolts using a green color marker after torque operation is complete.		
Step 11			
	11a	Visually inspect isolation block sealing surface for scratches, dirt, metal particles.	 
	11b	Blow out any foreign particles from the threads around the sealing on the isolation block.	
	11c	Clean sealing area with lint free paper or foam swabs.	
	Make sure no particles in all bore holes, no scratches on sealing surface. Use ear muff during air flushing.		
Step 12			

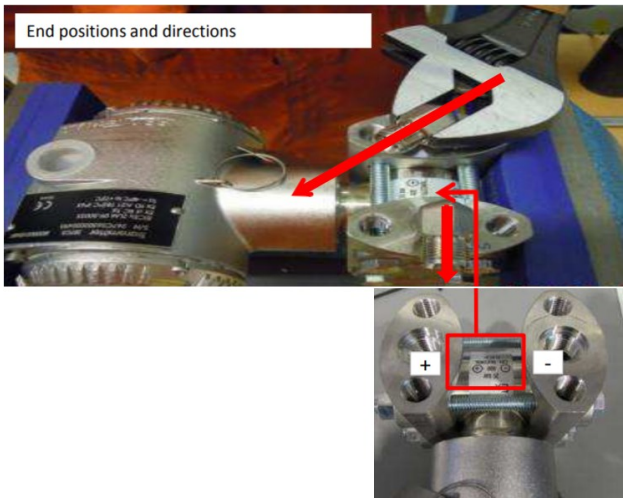
Steps			
	12a	For xxBRx version - Apply Chesterton 785 on the M16 threaded rod and screw it into the isolation block (Check the remote seal stud PN used and refer to technique below this step).	 
	12b	For xxNRx version - Apply Chesterton 785 on the M16 threaded rod and screw it into the Venturi (Check the remote seal stud PN used and refer to technique below this step).	
	12c	Repeat step 1 to 12 for the next isolation block to be mount onto the venturi.	
	12d	Make sure all studs are at the same height using a ruler (Ruler has to be perpendicular to the surface).	
	If remote seal stud is PN 101528357 - After the screw is in place, ensure the protrusion length is 70mm using a ruler		
	If remote seal stud is PN 102703255 - the stud can be screwed to the bottom		
	Proceed to Step 17 for xxNTx version.		
Step 13			

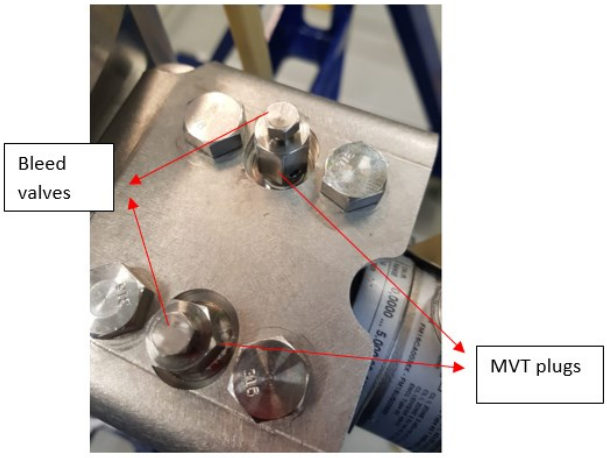
Steps			
	13a	Install MVT's bended bracket to the venturi and apply Loctite 242 to the bolts/bolt holes and attach MVT to it using a 16mm ring spanner.	
	13b	Apply loctite 242 on bolts/inside MVT's screw hole you are using to attach MVT's plate and MVT itself using 5/8" wrench.	
	13c	Make sure the display of the MVT is facing upward after mounting onto the bracket. For MVT266 bracket, the bracket is positioned different (90degree clockwise) from MVT267 bracket.	
		For MVT266, tilt the MVT slightly and engage the 2 bolts on MVT with the 2 bottom holes on the MVT bracket. Then, use the engaged bolts as pivot to position the MVT to the correct position. Alternative is a 17mm open ended spanner.	

Step 14

Steps			
	14a	For xxBRx Version - Place C-Ring onto the sealing groove on the isolation block.	   
	14b	For xxNRx Veresion - Place C-Ring onto the sealing groove on the Venturi.	
	14c	Remove protection wrap on the MVT remote seal, clean with alcohol and lint free paper, make one turn of the cable and place the remote seal over the c-ring.	
	14d	Repeat for second remote seal.	
i	Negative (-) of the remote seal to be installed on the top isolation block and Postive (+) remote seal to be installed on the bottom isolation block. The remote seal tubing should be coiled as shown in the figure.		
i	For 2", 3" and 4" units, both top and bottom tubing should be aligned in an angle of 90 deg. For 6" units, bottom tubing (only) should be aligned in an angle of 135 deg since covers 6" is not same as of 4". For 8" units, the bottom tubing (only) should be aligned at an angle of 180 deg.		
Step 15			

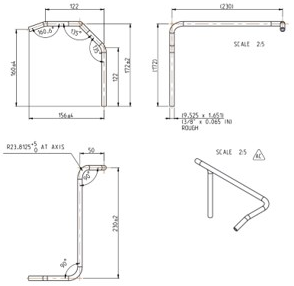
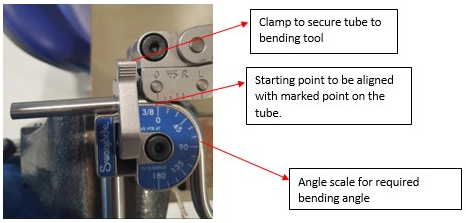
Steps			
	15a	Place the remote seal flange over the remote seal.	 
	15b	Apply Chesterton 785 on the thread of M16 bolt and under the nut surface.	
	15c	Screw the nut onto the bolt and tighten the nut.	 24 mm socket and torque wrench 
	15d	Repeat step 14 and 15 for the other remote seal.	
Step 16 - Procedure to torque remote seal flange.			
	16a	Use a 24mm socket with a calibrated torque wrench.	Tighten bolts in a diagonal sequnces (Criss-cross pattern) as illustrated in picture below.Tourque value = 165 N.m The flange shall then be torque tightened in stages up to the final torque value of 165 N.m. Stage 1: 30% of the torque value ≈ 50 N.m. Stage 2: 60% to 70% of the torque value ≈ 100 N.m. Stage 3: 100% of the torque value = 165 N.m.
	16b	Carry out a check pass in the clockwise direction on all bolts until there is no further nut rotations.	
	16c	Check that the gap at the flange outside diameter is closed all around the circumference of the connection.	
	16d	Mark all the nuts that have been torqued.	
	16e	Proceed to Step 30 for Thermowell assembly	
i	Ensure no damages on the bolt thread and nut bearing area. Mark using a green color marker.		
Step 17 For xxNTx version			

Steps			
	17a	Clamp the MVT to the vice as shown in the pic right	
	17b	Apply 1.5 rounds of theflon tape to the Tube fittings	
	17c	Insert tube fittings tp the MVT. After hand-tight, turn at least 1.5 turns with a wrench. In the end positions, they must pointing in the indicated directions shown on the picture on the right.	
i	Verify the positions against the high pressure(+) and low pressure (-) marks on the MVT.		
i	Wrap the theflon tape in the direction of the male thread spiral in a clockwise direction around the the fitting. Ensure first 2 threaded are not covered by theflon tape for proper thread engament between the threads.		
18	Install MVT's bended bracket to the venturi at the orientation shown in the picture and apply Loctite 242 to the bolts/bolt holes.		

Steps			
19	Wrap the theflon tape on the MVT breather Plugs in the direction of the male thread spiral clockwise and ensure 1 .5 turns around the fitting male thread.	  Leave the first two threads free from the tape to prevent any tape remnants from being introduced into the system.	
i	Leave the first 2 threads free from the tape to ensure proper initail engament between the threads.		
Step 20			
	20a Mount the MVT to the bracket using a 16mm ring spanner.		
	20b Ensure the MVT display is facing upwards as shown in the picture.		
21	Screw the 2 MVT plug at the MVT.Keep the bleed valves loose.		

Steps	
	Ensure there is minimum thread engagement of 5.5 turns.
22	Clamp the swagelok bending tool to the vice a shown in the picture. 
	Ensure length of tube and orientation of bend is according to drawing 103015882D before bending each bend.

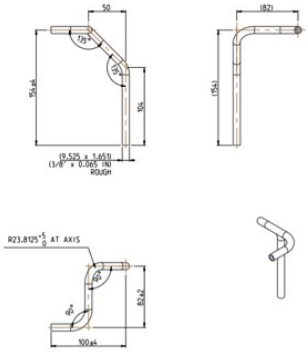
Steps

23	Prepare and bend the tube 103015882 (High Pressure side) following the steps as Shown in the picture.	**High pressure line**  Marking No/steps | Dimensions | Angle 1 | 122mm | 135 2 | 182mm | 90 3 | 401mm | 90 4 | 462mm | 160 1. Mark the tube as shown in the Table. 2. Using the Swaglog bending tool, clamp the tube to the tool and align the marked point at 122mm. 3. Bend the tube till the required angel as show in the table. 4. Re-align the tube at the starting point and repeat for the remaining marked bending points to their required angel as shown in the table.  Clamp to secure tube to bending tool Starting point to be aligned with marked point on the tube. Angle scale for required bending angle
⚠	**Ensure length of tube and orientation of bend is according to drawing 103015883D before bending each bend.**	

Steps

24 Prepare and bend the tube 103015883 (Low Pressure side) following the steps as Shown in the picture

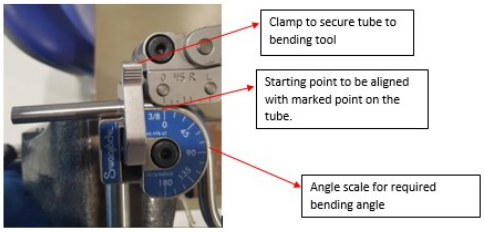
Low pressure line



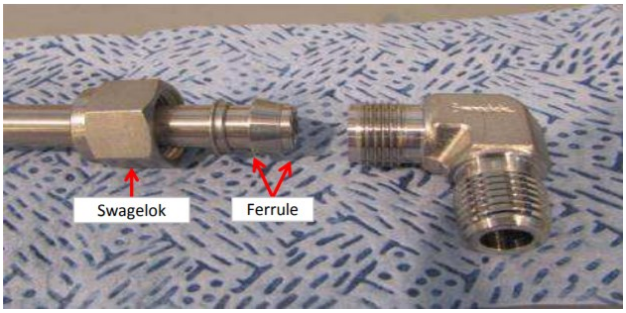
Marking

No/steps	Dimensions	Angle
1	104mm	135
2	163mm	90
3	235mm	90

1. Mark the tube as shown in the Table.
2. Using the Swagelok bending tool, clamp the tube to the tool and align the marked point at 104mm.
3. Bend the tube till the required angel as show in the table.
4. Re-align the tube at the starting point and repeat for the remaining marked bending points to their required angel as shown in the table.

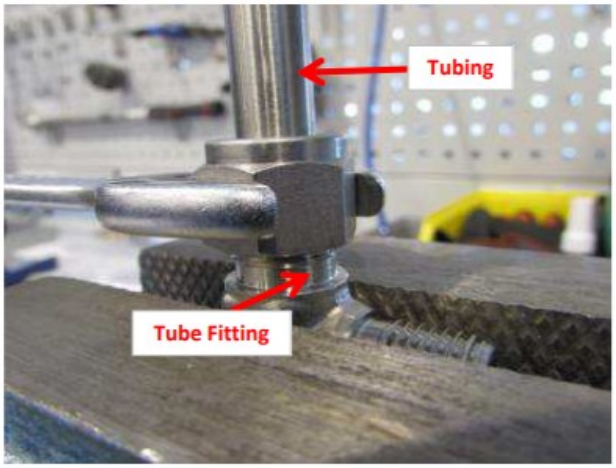


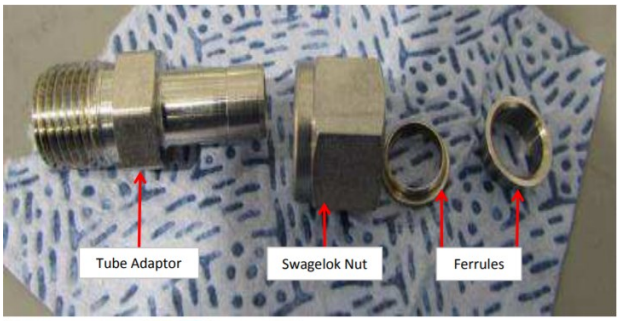
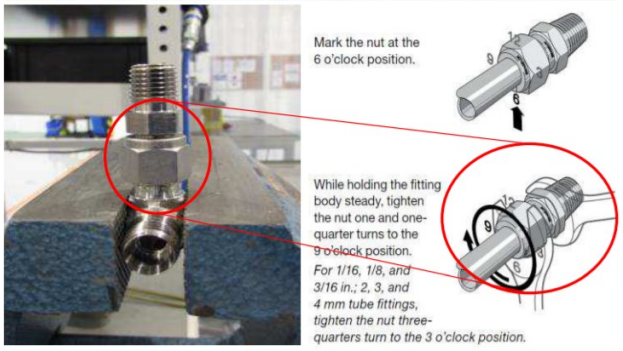
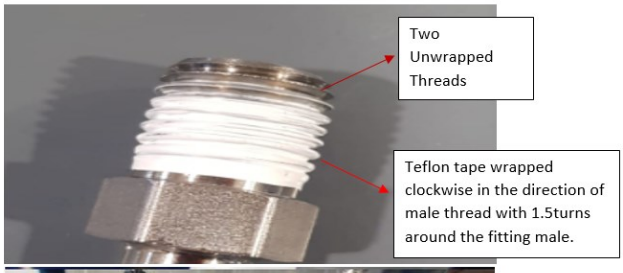
25 Install the Swagelok nut and ferrules into the tubing same as in the picture.



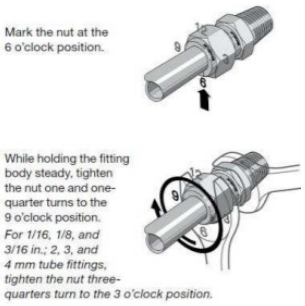
Make sure that the thread is in a perfect condition which has no damage on the thread.

Step 26

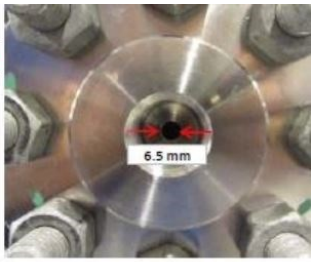
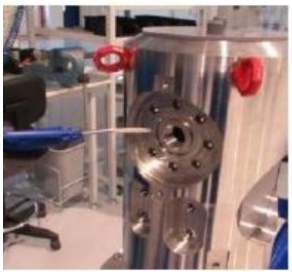
Steps			
	26a	Clamp the tube fitting into vise and assemble the tubing to the tube fitting as shown in the picture below.	
	26b	After that loosen it back and make sure the ferrule is compressed .Perform this activity at all tubing ends.	
i	Make sure that the thread is in a perfect condition which has no damage on the thread.		
i	Flush tubing with air to make sure there is now foreign particles inside the tubings.		

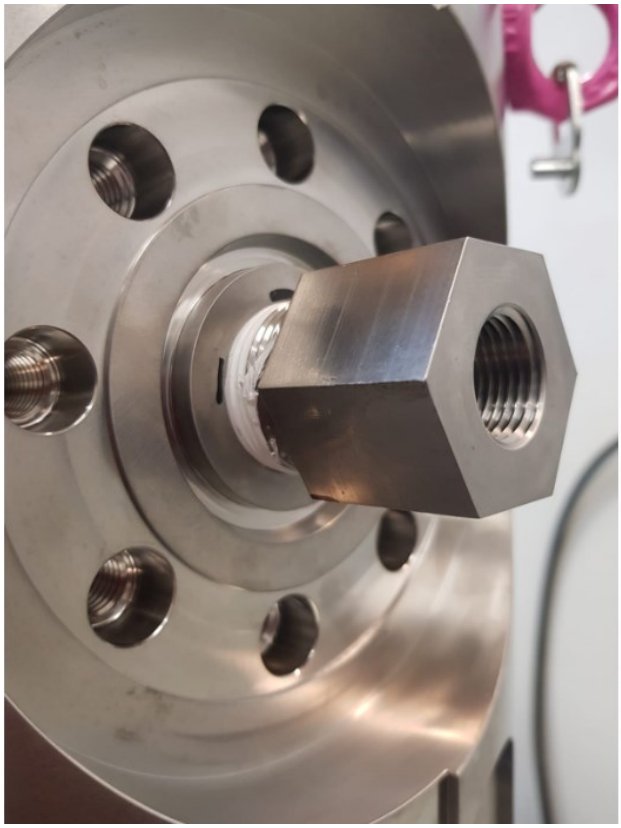
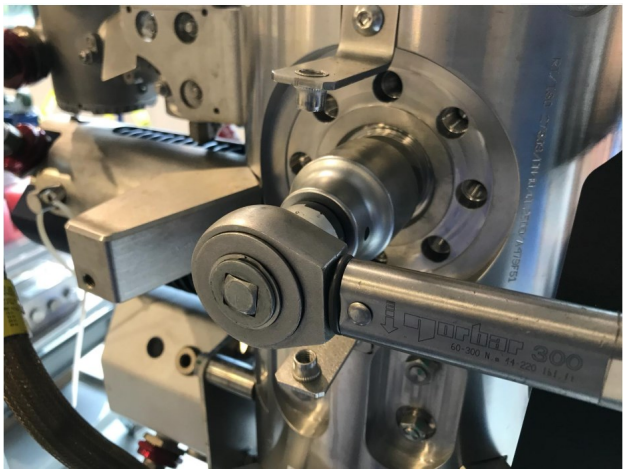
Steps		
27	Clamp the tube fitting into vise and assemble the tube adaptor into the tube fitting as shown in the picture below	 
28	Apply 1.5 round of theflon tape on the tube adaptor.Then fix the tube adaptor into the remote seal area and hand-tighten it. Then turn at least 1.5 turns with the wrench.	 
Step 29		

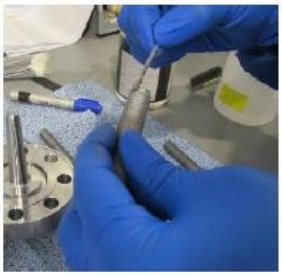
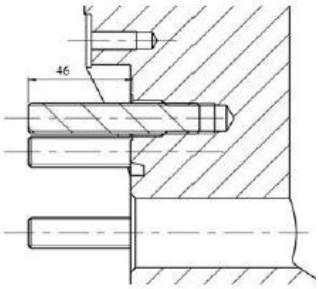
Steps			
	29a	Connect the tube fitting to the tube adaptor and don't tighten it yet.	
	29b	Insert the tubing which has been fixed with the swagelok nut and ferrule to the tube fitting.Dont tighten it first because need to adjust when doing tubing installation.	

Steps		
30	To install high pressure liner it's easier to intstall short inclined part to fitting going to MVT.Don't tight it fully for a moment and longer part to fitting going to venturi it's easier to connect in that sequence.	
31	Tighten the all the NPT fittings like describe bellow or tight it as normal if the liner was pre crimped before.	 

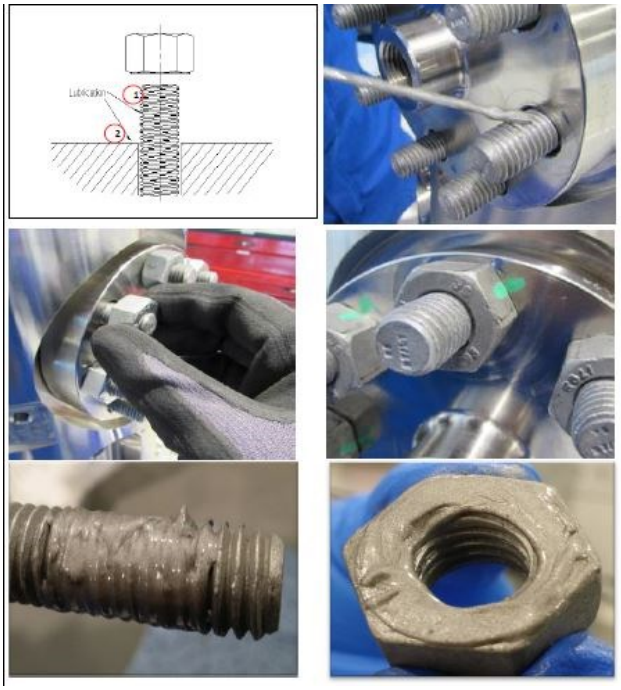
Step 32

Steps			
	32a	Visually inspect the Norsok compact flange interface on the venturi body and on the thermowell, looking for scratches, dirt, metal particles (Specifically the slanted area sealing surface),	 
	32b	For xxxxZ and OZNA version Visually inspect the treads on the Threaded thermowell and the venturi body.	 
	32c	Visually inspect, using a torch light, the 6.5mm hole in the thermowell as well to ensure there are no foreign particles or metal chips that could obstruct the temperature element.	
	32d	Proceed to step 33 for both xxxxZ and OZNA version and Step 35 for xxxxC version accordingly.	
	Blow out any foreign particles from the threads around the thermowell flange on the venturi.Clean the norsok flange, on the venturi body and on the thermowell, by using lint free paper or foam swabs. Use ear muffs when flushing with air.		
	Only assemble the Duplex Threaded Thermowell into the 1" NPT thread on the Duplex Venturi and not Inconel Venturi. Any deviation would require SWTCs approval.		
Step 33 (For Threaded thermowell)			

Steps			
	33a	Apply 3 rounds of Teflon tape from 1st complete thread.	
	33b	Apply chesterton on the first few threads/teflon tape (Best practise from OZNA)	
	33c	Ensure the first thread enters properly to avoid cross-threading.	
	33d	Achieve 3 turns by hand tigtening the thermowell into the venturi.	
i	Wrap the teflon tape in the direction of the male thread spiral in a clockwise direction around the Threaded thermowell male thread.		
Step 34 (For threaded thermowell)			
	34a	On top of the 3 turns by hand, using a 1-1/2" socket and wrench, gently and slowly tighten the thermowell to another 2 turns (minimum).	
	34b	Total number of turns can be upto 5.5 turns or until the thermowell is fully wrench tight.	

Steps	
i	Use an wrench extention Bar if required. Apply force slowly and ensure the thermowell is fully wrench tight.
i	If any signs of cross-threading is observed during the process, stop immediately and raise concern to Supervisor/ME.
35	For flanged thermowell, apply chesterton 785 to the 8 studs and insert into the threaded hole at the surrounding of norsok flanged thermowell at venturi side.    
i	Use 2 nuts (if necessary) to tighten all the studs and make sure all at the same height. The ruler has to be perpendicular to the surface.
i	Visual inspect all the thread studs to make sure all in good condition. Make sure that number on the stud surface is facing outside for any traceability process. Set the protrusion length of 46mm for the 1/2-13 UNC STUD BOLT as shown.
Step 36 (For flanged thermowell)	

Steps			
	36a	Apply Molykote 111 onto 4 non-sealing location of the IX Seal Ring as shown by the red arrows.	
	36b	Mount IX Seal Ring onto the venturi.	
	36c	Insert thermowell onto the venturi	
i	Make sure that the IX seal ring sits properly in the groove by checking that it is rocking in the groove. Make sure that the serial number/batch number is visible for traceability. Ensure there are no scratches or defects on the IX Seal Ring.		
i	Make sure the seal ring material is matching with the flange - check the PN information on the part package (between Duplex and Inconnel). In case of thermowell failure, IX seal ring can be re-used. In the case of re-use repeat this step on quality and verification.		
Step 37 (For flanged thermowell)			

Steps			
	37a	The thread surface of the bolt and nut shall be filled with lubricant and the nut bearing surface shall be liberally coated with lubricant.	
	37b	Use Chesterton 785 for lubricating system.	
	37c	Refer to the pictures in red box as guideline.	
Step 38 - Procedure to torque the flanged thermowell.			
	38a	Use a 7/8" socket with a calibrated torque wrench or auto-torque tool.	Tighten bolts using a 7/8" socket and wrench in a diagonal sequnces (Criss-cross pattern) as illustrated in picture below (Recommended is 2 tools. But we are using 1 tool). Start with the bolt where the flanges have the largest gap. Tourque value = 98 n.m The flange shall then be torque tightened in stages up to the final torque value of 98 n.m. Stage 1: 30% of the torque value ≈ 30 N.m. Stage 2: 60% to 70% of the torque value ≈ 60 N.m. Stage 3: 100% of the torque value = 98 N.m.
	38b	Torque in stages as shown in the picture.	
	38c	Carry out a check pass in the clockwise direction on all bolts until there is no further nut rotations.	
	38d	Check that the gap at the flange outside diameter is closed all around the circumference of the connection.	
	38e	Mark all the nuts that have been torqued.	

Steps	
i	Ensure no damages on the bolt thread and nut bearing area. Mark using a green color marker.
	Result: Integrity assembly has been completed on the Venturi.

END OF STANDARD WORK INSTRUCTION

This symbol means that the equipment cannot be discarded in a rubbish-bin. At its end of life, the equipment and/or its components must be treated, following Schlumberger Environmental procedures, in compliance with Schlumberger QHSE Policy and applicable laws and regulations on waste management.