

Vx Spectra Procedure

Vx Spectra, Hydrostatic Pressure Test Procedure

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Vx Spectra Hydrostatic Pressure Test Procedure

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1. Introduction

1.1 Scope

The purpose of the test is to verify the structural integrity of the venturi assembly which contains all the pressure retaining parts. It applies to the Vx Spectra integrity assemblies.

The venturi assembly is designed and analyzed according to ASME section VIII division 2.

The pressure test shall be witnessed by SLB and also the Third Party if required.

A pressure test record shall be issued for each pressure test and this test shall be included in the Manufacturing Record Book (MRB). Each record shall specify the component(s) tested.

Appendix A and B consist of fill-in forms to be used during the pressure test. The appendix will be attached to the hydrostatic pressure test report as applicable.

1.2 Applicable Standards and Specifications

The specifications in this Hydrostatic Pressure Test Procedure is according to, or more stringent than, the following standards specifications on verification tests except for API 6A.

ASME VIII	Rules for construction of pressure vessels
API 6A	Specification for Wellhead and Christmas Tree Equipment (Follow most of the guidelines)
2014/68/EU	Pressure Equipment Directive

1.3 Design Requirements

Design pressure	: 345 bar (5000 psi)
Design temperature	: -46°C to +121°C (-51°F to +250 °F)
P _{TEST}	: 517 ± 10 bar (7500 ± 145 psi)
P _{WORK}	: 345 ± 3 bar (5000 ± 44 psi)

2. Abbreviations and Definitions

Vx Spectra	Multiphase Flow Meter
EUT	Equipment under test
QUEST	Is a Web-based application used in Schlumberger to collect Quality, Health, Safety, Security and Environment (QHSE) information, reporting of hazards and, undesired HSE and SPQ events.
Unit	1 bar observed at the transmitter on the display inside the control room is
Conversion	equivalent to 0 psi at the pressure test bay pressure gauge.

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3. References

<u>Title</u>	<u>Document Number</u>
1. SWI – Integrity Assembly	DMS# 101401980
2. SWI – Flanges Assembly	DMS# 101401981
3. SWI – Manufacturing Trolley	DMS# 101535304

4. Safety

Before proceeding with the test activities, all attending personnel shall be briefed of the safety information.

The employee performing the test must be pressure level 2 certified in QUEST.

Safety / Special Guidelines

- Always decrease the pressure back to 0 psi on the gauge (1 bara) before re-tightening.
- All air must be vented and the EUT completely filled with water before applying pressure.
- A clearly visible sign shall be posted to inform of ongoing activities.
- Responsible person shall ensure that only authorized personnel have access to test area.

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5. Test Equipment

The following test equipment is required and must be checked prior to starting the test.

DESCRIPTION	SIZE/RANGE	REMARKS	TEST INSTRUMENT CALIBRATION CERT REF.
Pressurising Unit.	0-527 bar (0-7644 psi)	5k design	NA
Integrity assembly, blind flanges and seal rings assembly	According to 101401980_SWI_ IntegrityAssembly and 101401981_SWI_ FlangesAssembly respectively.	5k design	NA
Fittings, Hoses, Manifold etc. for test purposes:		Range: 0-1800 bar Test equipment for connecting the blind flanges to the Pressurising Unit, Pressure Transmitter and Recorder.	NA
Test medium		Fresh water.	NA
Pressure gauges		Range: 0-23,000 psi Pressure gauges are used only as a reference.	NA
Temperature recorder	Accuracy: ± 1.6 % of calibrated range	Range: 0 -100 °C	To be attached to report
Pressure recorder	Accuracy: ± 0.5 % of full scale range	Range: 0-1600 bar Test Pressure must be inside calibrated range	To be attached to report

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6. Pressure Test Profile

The two different test profiles that can be achieved at SWTC pressure test bays dependant of the Vx Spectra meter type, are described as follows in the next two diagrams.

6.1 With isolation blocks



Figure 1 Pressure Test Profile diagram with isolation blocks

Time [min]	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	130	140	145
Pressure [bara]	1	35	1	345		1			345	1	35	1		517			1					517						1

Figure 2 Pressure Test Profile table with isolation blocks

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6.2 Without isolation blocks

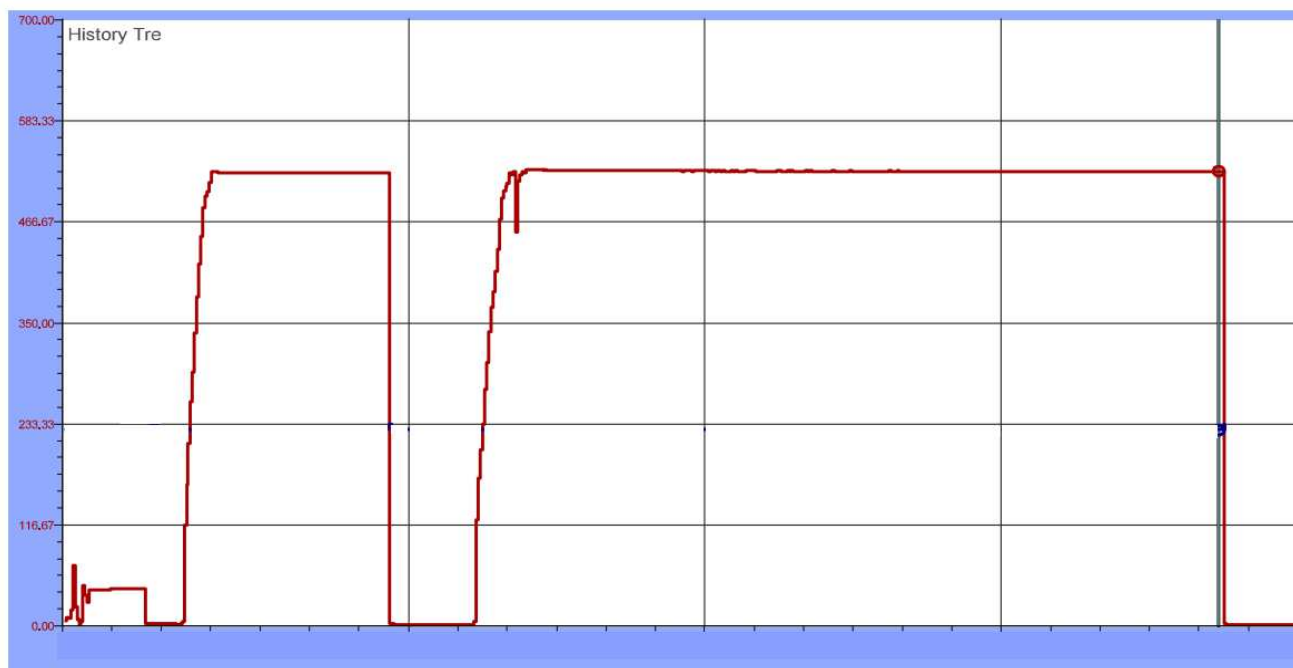


Figure 3 Pressure Test Profile diagram without isolation blocks

Time [min]	0	5	10	15	20	25	30	35	50	55	60	65	70	75	80	85	90	95	100	105	110	115
Pressure [bara]	1	35	1		517			1						517								1

Figure 4 Pressure Test Profile table without isolation blocks

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7. Additional step for xxBxxx versions

For the versions of Vx Spectra which have **no** Isolation Blocks the hydrostatic body pressure test has to be followed excluding sections 6 to 16 as per Figure 3 and figure 4. When Vx Spectra versions have Isolation Blocks option available, hydrostatic seat pressure test will be performed for all of the Pacson valves 101360615, which is attached to the Isolation Blocks. Therefore, perform additional Steps 6 to 16 in the appendix and as per Figures 1 and 2 (pressure test profile diagram and table) accordingly.



Caution

The Pacson Valve shall only be hydrostatically pressure-tested to the rated working pressure of the Pacson Valve of 345 bar.



Caution

Increase the pressure both to 345 or 517 bar step by step and, in each step to increase a maximum of 70 bar each time and, wait for stabilization.

8. APPENDIX – Fill in Sheet for Pressure Test of Integrity Assembly

A test report shall be issued as a record of this Hydrostatic Pressure Tests. The test report shall comprise a pressure test certificate and the sign-off sheets in this Appendix.

The following shall be attached to the test report:

- Pressure recorder graphs duly signed by operator according to procedure.
- Copies of valid Calibration Certificates for all test instrumentation (Pressure and temperature transmitter).

EUT serial number:

A test with a maximum pressure of: bar, was applied to the Vx Meter.

Pressure test duration: minutes.

Operator name (Print Name):

Operator signature:

Quality Inspector name (Print Name):

Quality Inspector signature:

Date for pressure test:

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A. Preceding Control Activities

Before commencing test the following has to be checked.

Step	Description	Check & Verify	Sign
1	<p>Check that valid calibration certificates are available for test instruments.</p> <p>Acceptance: Valid Pressure & Temperature Transmitters, calibration certificates</p> <p>Record the following SN for the test equipment:</p> <p>Pressure Transmitter:</p> <p>Temperature Transmitter:</p>		
2	<p>Make sure that the Barium Source is <u>not</u> installed before starting the pressure test. Ensure that all bolt marking (At isolation blocks, thermowell, detector and source side) that are specified in the integrity/window assembly are present.</p>		
3	<p>Check that all pressure integrity assembly has been completed in accordance to the Instruction-Procedure 101401980.</p>		
4	<p>Check by visual inspection that Test set-up has been completed in accordance to the Instruction-Procedure 101401981 and 101535304.</p>		

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Date: _____ Operator: _____ Signature: _____	Comments:
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B. Result Sheet

The following shall be verified and recorded as described:

Step	Description	Sign
5	<p>Start the Pressure recorder and record Pressure:</p> <p>Start the Temperature recorder and record ambient temperature:</p>	
6	<p>Increase pressure to approx. 35 bar, (35 bar \pm 10 bar). Let the pressure settle for 5 minutes, then release pressure to 0 bar (1 bara), and inspect for leaks.</p> <p>Acceptance: No leak.</p>	
7	<p>Start Pacson Valve Seat Pressure Cycle: Close the Pacson Valve (BLOCK 2) for both Isolation Blocks by tightening it to 12Nm minimally to 16Nm maximally using a 6mm hex bit socket with calibrated torque wrench. See Figure 5.</p> <p>Open the Autoclave Ports for both Isolation Blocks.</p> <p>Ensure that the Autoclave Port for both Isolation Blocks have been dried of all water droplets after the Autoclave Ports are opened.</p>	
8	<p>Increase pressure gradually in steps of approx. 70 bar each until maximum working pressure of the Pacson Valve, P_{WORK}, is reached (345 bar).</p> <p>CAUTION: Pressure should be at P_{WORK} 345 bar (345bar \pm 8 bar).</p> <p>Maintain maximum P_{WORK} until pressure is stabilised. Adjust as relevant.</p> <p>When Pressure is stabilised close pump valve to pressurising unit and maintains P_{WORK} for a total of 5 minutes.</p> <p>Record Start Time: Record Start Pressure:</p> <p>Acceptance: $P_{WORK} \pm 3$ bar.</p>	
9	<p>Check that pressure drop is within limits as specified for a period of 5 minutes.</p> <p>Record Stop Time: Record Stop Pressure:</p> <p>Acceptance: $P_{WORK} \pm 3$ bar for 5 minutes.</p>	
10	<p>Reduce pressure slowly to approximately 0 bar (1 bara). Inspect for leaks, in particular at the Autoclave Port.</p> <p>Acceptance: No leak.</p>	

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Step	Description	Sign
11	<p>Close the Pacson Valve (BLOCK 1) for both Isolation Blocks by tightening it to 12Nm minimally to 16Nm maximally using a 6mm hex bit socket with calibrated torque wrench. See Figure 5.</p> <p>Open the Pacson Valve (BLOCK 2) for both Isolation Blocks. See Figure 5.</p> <p>Ensure that the Autoclave Port for both Isolation Blocks have been dried of all water droplets after the Autoclave Ports are opened.</p>	
12	<p>Increase pressure gradually in steps of approx. 70 bar each until maximum working pressure of the Pacson Valve, P_{WORK}, is reached.</p> <p>CAUTION: Pressure should be at P_{WORK} 345 bar (345bar \pm 8 bar).</p> <p>Maintain maximum P_{WORK} until pressure is stabilised. Adjust as relevant.</p> <p>When Pressure is stabilised close pump valve to pressurising unit and maintains P_{WORK} for a total of 5 minutes.</p> <p>Record Start Time: Record Start Pressure:</p> <p>Acceptance: $P_{WORK} \pm 3$ bar.</p>	
13	<p>Check that pressure drop is within limits as specified for a period of 5 minutes.</p> <p>Record Stop Time: Record Stop Pressure:</p> <p>Acceptance: $P_{WORK} \pm 3$ bar for 5 minutes.</p>	
14	<p>Reduce pressure slowly to approximately 0 bar (1 bara). Inspect for leaks, in particular at the Autoclave Port.</p> <p>Acceptance: No leak.</p>	
15	<p>End Pacson Valve Seat Pressure Cycle: Pacson Valve Seat Pressure Cycle Passed?</p>	
16	<p>Confirm pressure is at 0 bar (1 bara).</p> <p>Close the Autoclave Ports for both Isolation Blocks by tightening them to 40.6Nm minimally using 5/8" hex socket with calibrated torque wrench.</p> <p>Open the Pacson Valve (BLOCK 1) for both Isolation Blocks. See Figure 5.</p> <p>Open the Pacson Valve (BLOCK 2) for both Isolation Blocks. See Figure 5.</p>	
17	<p>Increase pressure to approx. 35 bar, (35 bar \pm 10 bar).</p> <p>Let the pressure settle for 5 minutes, then release pressure to 0 bar (1 bara), and inspect for leaks.</p> <p>Acceptance: No leak.</p>	

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Step	Description	Sign
18	<p>Start First Pressure Cycle: Increase pressure gradually in steps of approx. 70 bar each until test pressure is reached.</p> <p>CAUTION: Pressure should be at P_{TEST} 517 bar (517bar \pm 10 bar), (refers to Section 5, Test Equipment)</p> <p>Maintain maximum P_{TEST} until pressure is stabilised. Adjust as relevant.</p> <p>When Pressure is stabilised close pump valve to pressurising unit and maintains P_{TEST} for a total of minimum 15 minutes.</p> <p>Record Start Time: Record Start Pressure:</p> <p>Acceptance: $P_{TEST} \pm 5$ bar.</p>	
19	<p>Check that pressure drop is within limits as specified for a period of 15 minutes.</p> <p>Record Stop Time: Record Stop Pressure:</p> <p>Acceptance: $P_{TEST} \pm 5$ bar for 15 minutes.</p>	
20	<p>Reduce slowly pressure to approximately 0 bar (1 bara). Inspect for leaks.</p> <p>Acceptance: No leak.</p>	
21	<p>End First Pressure Cycle: First Pressure Cycle (Step 18 to 20) Passed?</p>	
22	<p>Start Second Pressure Cycle: Increase pressure gradually in steps of approx. 70 bar each until test pressure, P_{TEST}, is reached.</p> <p>CAUTION: Pressure should be at P_{TEST} 517 bar (517bar \pm 10 bar), (refers to Section 5, Test Equipment)</p> <p>Maintain maximum P_{TEST} until pressure is stabilised. Adjust as relevant.</p> <p>When Pressure is stabilised close pump valve to pressurising unit and maintains P_{TEST} for a total of minimum 60 minutes.</p> <p>Record Start Time: Record Start Pressure:</p> <p>Acceptance: $P_{TEST} \pm 10$ bar.</p>	

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Step	Description	Sign
23	Check that pressure drop is within limits as specified for a period of 60 minutes. Record Stop Time: Record Stop Pressure: Acceptance: $P_{TEST} \pm 10$ bar for 60 minutes.	
24	Reduce pressure slowly to approximately 0 bar (1 bara). Inspect for leaks. Acceptance: No leak.	
25	End Second Pressure Cycle: Second Pressure Cycle (Step 22 to 24) Passed?	
26	After successful completion of test, reduce pressure to atmospheric, ventilate, drain and dry off all tested equipment. Please read the Caution message here below.	
27	Pressure recording chart to be signed by all attending parties and marked as follows: <ul style="list-style-type: none"> • EUT Serial Number • Date of test • Ambient temperature [°C] • Operator name and signature • Quality Inspector name and signature for witness verification 	
28	All records shall be signed and attached to the report.	
29	Certifying Authority to sign report.	

**Caution**

Ensure that the Vx Spectra inner and outer surfaces are flushed with dry compressed air. This is done to reduce/eliminate the likelihood of rusting or corrosion due to the moisture content leftover after any hydrostatic pressure test.

Date : _____ Serial number: _____ Operator Sign: _____ Quality Inspector Sign: _____ Third Party Sign: _____ Third Party Stamp: _____	Comments :
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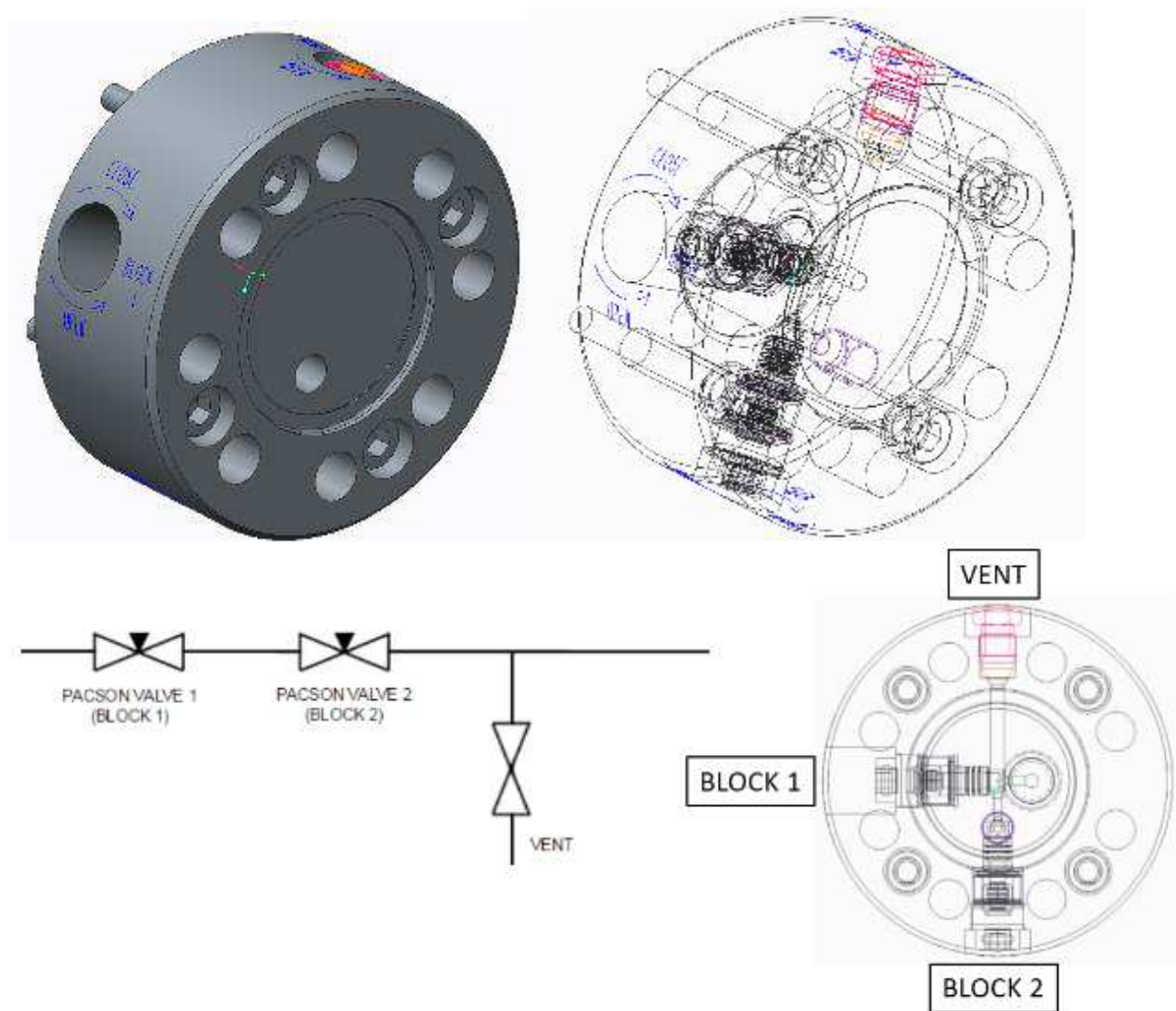


Figure 5 Location of the Pacson needle valves and autoclave bleed off plug and gland



Caution

The two Pacson needles valves and Autoclave bleed off plug and glands should be labelled BLOCK 1, BLOCK 2 and VENT. In the event that the labelling is unavailable, refer to the figure above to determine the position of each block and vent on the Isolation block.

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9. Revision Record Summary

Table 1: Document revision record summary table

Revision	Date	Remarks	Prepared By	Reviewed By	Approved By
AF	08-Apr-2016	Standardize all pressure units to bar (0 bar=1 bara). Added Quality Inspector check.	Shuqing Huang	Adalberto Fernandez	Alex Vilstrup
AG	20-July-2016	Added check for bolt markings. Updated timings, updated hold time	Htoo Aung Paing Bo	Adalberto Fernandez	Patrick Wong
AH	17-May-2018	<ul style="list-style-type: none"> - Updated PED Directive from 97/EC/23 to 2014/68/EU - Update the close of the Pacson Valve by tightening it to 12Nm minimally to maximally 16Nm using a 6mm hex bit socket with calibrated torque wrench. - Replace "90° from Autoclave Port/Vent Line" with BLOCK 1 - Replace "180° from Autoclave Port/Vent Line" with BLOCK 2 - Update the close of the Autoclave Port by tightening them to 40.6Nm minimally using a 5/8" hex socket with calibrated torque wrench. 	Gareth Chin	Shuqing Huang	Alex Vilstrup
AJ	14-Nov-2018	Update Hydrostatic Pressure Test Acceptance Criteria to +/- 1% of the test pressure when the pressure holding duration is less than 15 mins as per TS POM.	Gareth Chin	Shuqing Huang	Alex Vilstrup

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