Gas / Liquid sampling tool
High pressure, manually operated.

VORTEX
DREDGE SYSTEMS

Version 2.2
Document name:

**VOR-GST-MAN:VER 1.0**

**VST-XX-HP**

Vortex gas sample tool manual version 1.0

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<th>SECTION</th>
<th>ISSUE DATE</th>
<th>AUTHOR</th>
<th>DESCRIPTION OF UPDATE</th>
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<td></td>
<td>21 March 2017</td>
<td>JG</td>
<td>First Edition</td>
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1. INTRODUCTION

The vortex High pressure Gas Sampling tool is designed to capture gas and liquid samples in a subsea environment and recover said samples to the surface in a high pressure state of no more than 1800psi (124bar) by means of an electro mechanical operated syringe to ingest sample then purge sample into a sample bottle after recovery to surface.

This tool is designed to be deployed from the surface with the bottle bled of air and a vacuum entrained in the system. Sample filling relies on the entrained vacuum and ambient water pressure filling the bottle when the main isolation valve is operated.

1.1 Reference Documents
See Appendix and references section at the end of this document for certificates and manufacturers data.

1.2 Abbreviations
PSI: Pounds per Square Inch
PPE: Personnel protective equipment
JHA: Job Hazard Analysis
VST: Vortex Sample Tool
HP: High Pressure

1.3 Contacts
For Technical queries, Comments and Feedback contact Vortex Dredge: goodinjoe@gmail.com
2. SAFETY

2.1 Overview
All local HSE procedures must be followed. Use of PPE should follow guidelines outlined with handling of potential sample. For example hazardous gas samples should have PPE appropriate to mitigate dangers associated with that gas. Safety glasses should be considered minimum requirement irrespective of potential sample. Your safety is your responsibility. Think and plan ahead accordingly.

2.2 Risk Assessment
Consult with local HSE and installation operators to identify best practice steps needed for safe operations. Identify if the task been done and implement lessons learned. JHA, permitting and toolbox talks should preclude all operations.

2.4 Mechanical
Ensure all fittings and fasteners are secure. Check general condition of tool against images in manual for anything which may indicate potential operational issues.

•Remember, your safety is your responsibility. Think and plan ahead accordingly. If in doubt, please ask.
3. TECHNICAL SPECIFICATIONS

3.1 Description

To “Suck” the sample into the syringe the operator will function the main isolation valve to open the circuit to ambient pressure and ‘draw’ the sample into the bottle.

To entrap the sample in the sample bottle the operator will function the main isolation valve closed to seal the circuit and entrap the sample in the sample bottle.
3. TECHNICAL SPECIFICATIONS

3.2 Description: Schematic

Exhaust relief valve set to 1800 psi (124 bar)

Sample bottle

0 to 3000 psi gauge

Sample bleed valve / vacuum pull port

Secondary isolation valve

Main isolation valve

Inlet funnel

Vortex VST-XX-HP sample tool schematic
3. TECHNICAL SPECIFICATIONS

3.3 Component particulars

- Complete tool Weight empty in air = 107 lb (40 kg)
- Complete tool Weight empty in fresh water = 61 lb (28 kg)
- Containment bottle volume = 0.264 gallon (1.0 litre)
- Main relief valve setting as of 1 May 2013 = 1800 psi (124 bar)
- Complete tool dimensions = 44 inch (1140 mm) long x 7 inch (180 mm) diameter
- Main relief valve working range = 0 to 3000 psi (206 bar)
- Main isolation valve rated to 10,000 psi (689 bar)
- Secondary isolation valve rated to 3000 psi (206 bar)
- Sample bleed off valve rated to 3000 psi (206 bar)
- Pressure gauge = 0 to 3000 psi (206 bar)
- Standard funnel diameter = - 6 inch (150 mm) Capacity = 780 ml (0.82 quart).
- Extra funnel diameter = - 10 inch (254 mm) Capacity = 6 litre (6.3 quart).
- Depth rating = 2054 mtr. 6741 foot seawater with 1800 psi rated bottles.
- Deeper rated and different sized bottles available on request.
-
4. OPERATION PROCEDURES

4.1 Pre Dive Checks tool visual check

Access sample bottles within seconds via one, heavy duty clamp.

Tool complete and ready to deploy.
4. OPERATION PROCEDURES

4.1 Pre Dive Checks tool visual check

Sample containment bottle and all valves mounted in stainless steel anti-impact safety housing

Multi orientation ROV handle

Secondary isolation valve.

Contained sample pressure.

ROV friendly Main isolation valve.

Sample bleed off valve/vacuum pull port.

Small sample intake funnel. **Remove when servicing.**

Maintenance access port.
4. OPERATION PROCEDURES

4.1 Pre Dive Checks tool visual check

Main relief valve. Vortex relief setting is 1800psi (124 bar)
It is not uncommon to see around 200 psi drop in pressure after closing main isolating valve during ascent to surface whilst main relief valve ‘resets’

10,000psi rated, ROV specific, main isolation valve and orientation.
4. OPERATION PROCEDURES

4.1 Pre Dive Checks tool visual check

This tool has **three** sample bottles in the kit. Surface with full bottle, change out bottle for dispatch to laboratory, fit new bottle, continue sample programme.

Remove these four bolts to extract main body from casing during serving.

Fit male plug to stem before transporting sample bottle.

Close this isolation valve before transporting sample bottle.
4. OPERATION PROCEDURES

4.1 Pre Dive Checks tool visual check

Standard funnel capacity:
780ml (0.82 quart).
No view ports.

Simple bolt on extra funnel capacity:
6 litre (6.3 quart).
3 view ports.
4. OPERATION PROCEDURES

4.1 Pre Dive Checks tool visual check

**Bleed off all pressure from this sample bleed off valve before serving.**

**Remove this clamp to split casing and change bottle. Ensure O-ring is in place between flanges.**

**REMOVE ALL PRESSURE FROM TOOL BEFORE SERVICING:**
4. OPERATION PROCEDURES

4.2 Pulling a vacuum

Sample bleed off valve. Connect here to draw off sample or to pull a vacuum to store in sample bottle when working in very shallow water.

Secondary isolator valve.
4. OPERATION PROCEDURES

4.3 Changing bottles

Tool has two spare bottles as standard kit to enable multiple samples whilst on location.

**ALWAYS** Fit male plug to fitting at end of isolation valve prior to shipping pressurized bottle to laboratory.

Simply fit spare bottle to continue sample programme.

**NO DOWNTIME SENDING TOOL AWAY TO LAB.**

**REMOVE ALL PRESSURE FROM TOOL BEFORE SERVICING:**
## 4. OPERATION PROCEDURES

### 4.4 Pre dive checks, in water operation

<table>
<thead>
<tr>
<th>PROCEDURE DESCRIPTION</th>
<th>CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove top section of tool to expose sample bottle location. Fit clean containment bottle. Replace top section of tool over sample bottle.</td>
<td></td>
</tr>
<tr>
<td>2. Ensure main isolation valve is CLOSED and secondary isolation valve is OPEN.</td>
<td></td>
</tr>
<tr>
<td>3. Connect vacuum pump to sample bleed valve / vacuum pull port, open this valve and draw full vacuum, note vacuum reading in dive logs then close this valve to isolate vacuum inside the circuit.</td>
<td></td>
</tr>
<tr>
<td>4. Ensure sample bleed valve is closed and capped off.</td>
<td></td>
</tr>
<tr>
<td>5. Containment bottle will now be isolated at sea level pressure with a vacuum until main isolation valve is opened and pressure differential equalizes between bottle and sea water ambient pressure.</td>
<td></td>
</tr>
<tr>
<td>6. Check 0 to 3000 psi gauge is reading 0 and full of appropriate gauge liquid.</td>
<td></td>
</tr>
<tr>
<td>7. With tool on location, invert tool to remove any residual air bubbles in the funnel, place tool with funnel facing down and place funnel over the sample location. Hold tool vertically over product until product rises and displaces water in funnel.</td>
<td></td>
</tr>
</tbody>
</table>

Remember, your safety is your responsibility. If in doubt, please ask.
## 4. OPERATION PROCEDURES

### 4.5 Pre dive checks, in water operation

<table>
<thead>
<tr>
<th>STEP</th>
<th>PROCEDURE DESCRIPTION</th>
<th>CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Open Main isolation valve to ‘suck’ product sample into tool.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Close main isolator valve.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Close secondary isolator valve if desired. This valve is only a back up to the main isolator valve.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Recover tool to deck.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>As water depth decreases during ascent, the main relief valve will limit the pressure stored in the containment bottle to a pre-set figure.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Remove top section of tool to expose sample bottle location. Close bottle isolation valve. Remove, cap and label sample bottle.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Depending on client requirements, the tool may need internally cleaning before next sample run. Invert tool, fill funnel with hot soapy water, open all valves and flush out circuit then flush circuit with fresh water then blow dry with air and close all valves.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Fit clean containment bottle, pull and isolate vacuum in circuit, replace top section of tool over sample bottle.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Continue sample program.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Please return tool to supplier for post job maintenance.</td>
<td></td>
</tr>
</tbody>
</table>

Remember, your safety is your responsibility. If in doubt, please ask
## 4. OPERATION PROCEDURES

### 4.5 Post – Dive Checks

<table>
<thead>
<tr>
<th>STEP</th>
<th>PROCEDURE DESCRIPTION</th>
<th>CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual check all over tool looking for any damage or anything unusual.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Invert tool, fill funnel with hot soapy water, open all valves and flush out circuit then flush circuit with fresh water. Connect steam cleaner to manifold block and sample bleed off valve and thoroughly clean circuit with all valves open.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Blow dry with air and close all valves.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Check mechanical connections on the tool are secure.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Check inventory of tool.</td>
<td></td>
</tr>
</tbody>
</table>
4. OPERATION PROCEDURES

4.6 Cleaning tool and bottle

**Sample bleed off valve.** Connect here to flush manifold block through with de-greaser and steam cleaner.

**Funnel inlet.** Open main isolation valve and enter here to flush through valve and plumbing with de-greaser and steam cleaner.

**Manifold block.**

**Bottle end blank fitting.** Remove to flush through with de-greaser and steam cleaner.

**Bottle connection fitting.** Remove and open valve to flush through with de-greaser and steam cleaner.

**Bottle connection fitting.** Connect here to flush manifold block through with de-greaser and steam cleaner.

To clean tool, remove sample bottle, open main isolator valve, flush through these ports with hot soapy water to remove all hydrocarbons. Roll tool full 360 degrees to flush manifold block drillings. Flush with clean water, blow dry with air.

REMOVE ALL PRESSURE FROM TOOL BEFORE SERVICING:

Vortex Dredge - Mini Gas Sampling Tool - Version 2.2
4. OPERATION PROCEDURES

4.5 Post – Dive Checks

<table>
<thead>
<tr>
<th>POST DIVE COMMENTS</th>
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<tbody>
<tr>
<td></td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>PRINT NAME</th>
<th>SIGNATURE</th>
<th>DATE</th>
</tr>
</thead>
</table>
5. MAINTENANCE & STORAGE

5.1 Standard Procedures

• Tool should be flushed with hot soapy water as per post dive checks.
• Allow to dry fully.
• Check operational condition of valves.
• Visual check of tool for anything which could prohibit future operation of the tool.

5.2 Replacement Procedures

• Contact Ashtead Technology representatives with reports of any damaged or unserviceable items
6. APPENDIX AND REFERENCES

6.1 Tool dimensions and weights

Complete tool Weight empty in air = 107 lb (40kg)
Complete tool Weight empty in fresh water = 61 lb (28 kg)
Containment bottle volume = 0.264 gallon (1.0 litre)
Complete tool dimensions = 44 inch (1140 mm) long  x 7 inch (180 mm) diameter
Extra funnel diameter =- 10 inch (254mm) Capacity = 6 litre (6.3 quart).
6. APPENDIX AND REFERENCES

6.2 Inventory

1 X sample tool complete.
1 x 11/16 crows foot spanner.
1 X multi fit ROV handle.
4 x spare funnel to main isolating valve O-rings Part number:022
2 x spare sample bottles complete. (3 bottles in total)

Consumables to be replaced at clients cost:
1000cc containment bottle replacement part number: VST-HS8HDY1000

Servicing:
Please return to supplier for servicing.
If in doubt, please ask.
6. APPENDIX AND REFERENCES

6.3 Bottle part numbers

Bottle shown is part of Vortex gas and oil sampling kit serial number VST-02
Please use these number's when ordering parts.
1 September 2014

Sample bottle number: 1
Ashtead asset number: A135970
Vortex serial number VST-01

- Manufactured and tested to DOT 3E or 3A requirements
- Cylinders are rated to 1800 psi (124bar)
- Volume: 1000 ci (16.3 l)
- All interior surfaces are sandblasted for a clean, even surface
- Thread ends per ANSI B1.20.1
- Cylinders are hydrostatically proof-tested at 3000 psig (206 BAR)
- Special High Tolerance NPT Threading
- Raw material meets NACE MR0175 requirement

WARNING: ALWAYS handle this bottle as if it contains pressure.

Bottle must be cleaned and neutralized prior to re-use.
6. APPENDIX AND REFERENCES

Appendix III
Bottle Certificates
6. APPENDIX AND REFERENCES

Appendix III
Sample Bottle Details
6. APPENDIX AND REFERENCES

Appendix III
Sample Bottle Details
6. APPENDIX AND REFERENCES

Appendix III
Sample Bottle Details

<table>
<thead>
<tr>
<th>Specification</th>
<th>DOT-3A1800 (NACE MR0175)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>1000cc (0.264 gallon)</td>
</tr>
<tr>
<td>Test date</td>
<td>March 2013</td>
</tr>
<tr>
<td>Material</td>
<td>SS 316 L</td>
</tr>
<tr>
<td>Surface coating</td>
<td>N/A. Bare 316 stainless steel</td>
</tr>
<tr>
<td>Test pressure</td>
<td>Design test pressure of 3000 psi</td>
</tr>
<tr>
<td>Working pressure</td>
<td>Marked service pressure 1800 psi</td>
</tr>
</tbody>
</table>

It is YOUR responsibility to ensure transportation of equipment containing product and or samples complies with all relevant authorities.
## 6. APPENDIX AND REFERENCES

Appendix III

### Sample Bottle Details

<table>
<thead>
<tr>
<th>Part number</th>
<th>Service pressure</th>
<th>Diameter</th>
<th>Length</th>
<th>Weight</th>
<th>Internal Volume</th>
<th>Threads</th>
<th>Specification</th>
<th>Included Accessories</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSSC3K1 5-3BA</td>
<td>207 bar</td>
<td>38 mm</td>
<td>221 mm</td>
<td>0.6 kg</td>
<td>150 ml</td>
<td>.250-18 NPT</td>
<td>DOT-3A</td>
<td>-</td>
<td>316L Stainless</td>
</tr>
<tr>
<td>HSSC3K1 5-4BA</td>
<td>207 bar</td>
<td>38 mm</td>
<td>221 mm</td>
<td>0.6 kg</td>
<td>150 ml</td>
<td>.375-18 NPT</td>
<td>DOT-3A</td>
<td>-</td>
<td>316L Stainless</td>
</tr>
<tr>
<td>HSSC30-1BA</td>
<td>207 bar</td>
<td>76 mm</td>
<td>173 mm</td>
<td>2.3 kg</td>
<td>300 ml</td>
<td>.500-14 NPT</td>
<td>DOT-3A</td>
<td>-</td>
<td>316L Stainless</td>
</tr>
<tr>
<td>HSSC30-2BA</td>
<td>207 bar</td>
<td>76 mm</td>
<td>239 mm</td>
<td>3.0 kg</td>
<td>500 ml</td>
<td>.500-14 NPT</td>
<td>DOT-3A</td>
<td>-</td>
<td>316L Stainless</td>
</tr>
<tr>
<td>HSSC30-3BA</td>
<td>207 bar</td>
<td>76 mm</td>
<td>417 mm</td>
<td>5.6 kg</td>
<td>1000 ml</td>
<td>.750-14 NPT</td>
<td>DOT-3A</td>
<td>-</td>
<td>316L Stainless</td>
</tr>
<tr>
<td>HSSC3K4 0-1BA</td>
<td>207 bar</td>
<td>102 mm</td>
<td>260 mm</td>
<td>5.2 kg</td>
<td>900 ml</td>
<td>.250-18 NPT</td>
<td>DOT-3A</td>
<td>Threaded cap &amp; collar</td>
<td>316L Stainless</td>
</tr>
<tr>
<td>HSSC3K4 0-2BA</td>
<td>207 bar</td>
<td>102 mm</td>
<td>279 mm</td>
<td>5.7 kg</td>
<td>1000 ml</td>
<td>.250-18 NPT</td>
<td>DOT-3A</td>
<td>Threaded cap &amp; collar</td>
<td>316L Stainless</td>
</tr>
</tbody>
</table>
6. APPENDIX AND REFERENCES

Appendix III
Check Valve Details

Paddle Valves
Seanic offers ROV Operable Ball valve interfaces for the many Subsea ball and Directional control valves on the market. Construction is all stainless steel, has a 20 yr design life and meets the API 17D and 17H specifications for ROV interfaces. The Paddle Valve as its often referred to eliminates the worry of an ROV manipulator damaging the valve stem causing the equipment to be returned to the surface for repair.

Material:
- Stainless Steel
- Depth Rating: Full Ocean Depth
- Weight: 11 lbs
6. Contacts

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