

## SUBSEA SOLUTIONS

## GAS/LIQUID MULTIPLE SAMPLING TOOL HIGH PRESSURE, MANUALLY OPERATED

## OPERATIONS MANUAL

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## VOR-GST-MAN:VER 1.0 <br> VST-XX-HP

Vortex gas sample tool manual version 1.0

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## 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

## 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.

### 2.3 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.

## 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.


## Technical Specifications

### 3.2 DESCRIPTION SCHEMATICS



## Technical Specifications

### 3.3 COMPONENT PARTICULARS

- Complete tool Weight empty in air $=138 \mathrm{lb}(63 \mathrm{~kg})$
- Complete tool Weight empty in fresh water $=112 \mathrm{lb}(51 \mathrm{~kg})$
- Containment bottle volume EACH $=0.030$ Cubic inch ( 0.5 litre)
- Main relief valve setting $=1800$ psi ( 124 bar)
- Main relief valve working range $=0$ to 6000 psi ( 413 bar )
- Main isolation valve rated to 6,000 psi (413 bar)
- Sample bleed off valve rated to 6000 psi (413 bar)
- Pressure gauge $=0$ to 5000 psi (344 bar)
- Standard funnel diameter $=-12.5$ inch ( 318 mm ) Capacity $=5$ liter ( 5.28 quart).
- Depth rating $=3000$ mtr. 9842 foot seawater with standard 5000psi (344 bar) rated bottles
- Complete tool dimensions $=58$ inch ( 1482 mm ) long $\times 12.5$ inch ( 344 mm ) diameter


## Operation Procedures

### 4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



## Operation Procedures

### 4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



## Operation Procedures

### 4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



## REMOVE ALL PRESSURE FROM TOOL BEFORE SERVICING

## Operation Procedures

### 4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



## Operation Procedures

### 4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



6,000 psi rated, ROV specific, main isolation valve and orientation when closed.



## Operation Procedures

### 4.2 FUNNEL AND FLOW MEASUREMENT



FLOW RATE CALCULATION
FORMULA: $\mathbf{Q}=\mathrm{V} / \mathrm{T}$
WHERE:Q = VOLUME FLOW RATE (L/S OR L/MIN) V = VOLUME (L)T = TIME TAKEN (S OR MIN)


## Operation Procedures

### 4.3 PULLING A VACUUM



## Operation Procedures

### 4.4 CHANGING BOTTLES

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


## Operation Procedures

### 4.5 PRE DIVE CHECKS, IN WATER OPERATION

| STEP | PROCEDURE DESCRIPTION | CHECK |
| :---: | :---: | :---: |
| 1 | Remove top section of tool to expose sample bottle location. Fit clean containment bottle. Replace top section of tool over sample bottle. |  |
| 2 | Ensure main isolation valve is CLOSED |  |
| 3 | Open all sample bottle isolation valves. 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. |  |
| 4 | Ensure sample bleed valve is closed and capped off. |  |
| 5 | Containment bottles will now be isolated at sea level pressure with a vacuum until one of the four main isolation valves are opened and pressure differential equalizes between bottle and sea water ambient pressure. |  |
| 6 | Check 0 to 3000 psi gauge is reading 0 and full of appropriate gauge liquid. |  |
| 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. Hold tool vertically over product until product rises and displaces water in funnel. |  |
| 8 | Open Main isolation valve to 'suck' product sample into tool. |  |
| 9 | Close main isolator valve. Note number on tool to denote sample taken |  |
| 10 | Invert tool in clean water to disperse any residual sample in the funnel |  |

... CONTINUED OVER PAGE ...
REMEMBER, YOUR SAFETY IS YOUR RESPONSIBILITY.
THINK \& PLAN AHEAD ACCORDINGLY. IF IN DOUBT, PLEASE ASK.

## Operation Procedures

### 4.5 PRE DIVE CHECKS, IN WATER OPERATION

| STEP | PROCEDURE DESCRIPTION | CHECK |
| :---: | :--- | :--- |
| 11 | As water depth decreases during ascent, the main relief valve will limit <br> the pressure stored in the containment bottle to a pre-set figure. |  |
| 12 | Repeat sequence as sample operations as required to utilize the <br> remaining three sample bottles. |  |
| 13 | Remove top section of tool to expose sample bottle location. Close <br> bottle isolation valves. Remove, cap bottle end and manifold end and <br> label sample bottle. | Depending on client requirements, the tool may need internally cleaning <br> before next sample run. Invert tool, fill funnel with hot soapy water, open <br> all valves and flush out circuit then flush circuit with fresh water then blow <br> dry with air and close all valves.. |
| 15 | Fit clean containment bottles, pull and isolate vacuum in circuit, replace <br> top section of tool over sample bottles. |  |
| 16 | Continue sample program as required |  |

Please return tool to supplier for post job maintenance.

## REMEMBER, YOUR SAFETY IS YOUR RESPONSIBILITY. THINK \& PLAN AHEAD ACCORDINGLY. IF IN DOUBT, PLEASE ASK.

## Operation Procedures

### 4.6 POST DIVE CHECKS

| STEP | PROCEDURE DESCRIPTION | CHECK |
| :---: | :--- | :--- |
| 1 | Visual check all over tool looking for any damage or anything unusual. |  |\(\left.\quad \begin{array}{|c|l|}\hline 2 \& \begin{array}{l}Invert tool, fill funnel with hot soapy water, open all valves and flush out <br>

circuit then flush circuit with fresh water. <br>
Connect steam cleaner to manifold block and sample bleed off valve <br>
and thoroughly clean circuit with all valves open.\end{array}\end{array}\right\}\)

Please return tool to supplier for post job maintenance.

## Operation Procedures

4.6 POST - DIVE CHECKS


## Operation Procedures

### 4.7 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 degreaser and steam cleaner.

MANIFOLD BLOCK


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.

## 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.
- Sample bottles must be fully cleaned with records of being decontaminated and returned with records of pressure test post cleaning.


## Appendix \& References

### 6.1 TOOL DIMENSIONS AND WEIGHTS



- Complete tool Weight empty in air $=112 \mathrm{lb}(63 \mathrm{~kg})$
- Complete tool Weight empty in fresh water $=138 \mathrm{lb}(51 \mathrm{~kg})$
- Containment bottle volume $=0.030$ cubic inch ( 0.51 .0 litre)
- Complete tool dimensions = 58 inch ( 1482 mm ) long $\times 13.5$ inch ( 344 mm ) diameter
- Funnel diameter $=-12.5$ inch ( 318 mm ) Capacity $=5$ litre ( 5.3 quart).


## Appendix \& References

### 6.2 INVENTORY

- 1 X sample tool complete.
- 1 X multi fit ROV handle.


## Consumables to be replaced at clients cost:

1000cc containment bottle replacement part number: VST-HS8HDY 1000

## Servicing:

Please return to supplier for servicing.
If in doubt, please ask.

## Appendix \& References

### 6.3 BOTTLE PART NUMBERS



## Appendix \& References

## APPENDIX III-SUPPLIER SPECIFICATION SHEETS




|  | ' | 2 | 3 | 4 |
| :---: | :---: | :---: | :---: | :---: |
| ITEM NO. | DRAWING No. | DESCRIPTION | MATERIAL | QTY. |
| 1 | 27029-001-1000 | PLATE - CONE BASE | 316 STAINLESS STEEL | 1 |
| 2 | 27029-001-1020 | PLATE - SIDEWALL | 316 STAINLESS STEEL | 8 |
| 3 | 27029-001-1010 | PLATE - CONE TOP | 316 STAINLESS STEEL | 1 |
| 4 | 27029-001-1030 | WINDOW SEAL | EPDM 60 Durometer | 16 |
| 5 | 27029-001-1040 | WINDOW | ABS PC | 8 |
| 6 | 27029-001-1050 | PLATE - SIDEWALL OUTER | 316 STAINLESS STEEL | 8 |




| 1 |  | $2{ }^{3}$ |  |  |
| :---: | :---: | :---: | :---: | :---: |
| ITEM NO. | DRAWING No. | DESCRIPTION | MATERIAL | QT |
| 1 |  | CLAMP - 6" TUBE | 316 STAINLESS STEEL | , |
| 2 | $\begin{gathered} 27029-000- \\ 1010 \\ \hline \end{gathered}$ | VST MOUNTING PLATE | 316 STAINLESS STEEL | 1 |

FULLY WELDED VIEW


EXPLODED VIEW



## Appendix And References

## APPENDIX III

## SAMPLE BOTTLE DETAILS

## Swagelok

## Double-Ended Cylinders

Part No.
316L-50DF4-500
Part Description
316L Stainless Steel Double Ended DOT-Compliant Sample Cylinder, $1 / 4 \mathrm{in}$. FNPT, $500 \mathrm{~cm} 3,5000 \mathrm{psig}$ (344 bar)

## Specifications

| General |  |
| :--- | :--- |
| Body Material | 316 L Stainless Steel |
| Connection 1 Size | $1 / 4 \mathrm{in}$. |
| Connection 1 Type | Female NPT |
| Connection 2 Size | $1 / 4$ in. |
| Connection 2 Type | Female NPT |
| Cylinder volume/info | $500 \mathrm{cm3}$ |
| eClass (4.1) | 36030101 |
| eClass (5.1.4) | 36030101 |
| eClass (6.0) | 36030104 |
| eClass (6.1) | 36030104 |
| UNSPSC (10.0) | 24111802 |
| UNSPSC (11.0501) | 24111802 |
| UNSPSC (13.0601) | 41111636 |
| UNSPSC (15.1) | 41111636 |
| UNSPSC (17.1001) | 24111800 |
| UNSPSC (4.03) | 24111800 |
| UNSPSC (AirLiquide) | C1509-99 |
| UNSPSC (PGE) | 241118 |
| UNSPSC (SEQIRUS) | $M 4170$ |
| UNSPSC (SWG01) | 24111800 |

! The complete catalog contents must be reviewed to ensure that the system designer and user make a safe product selection. When selecting products, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.
$\triangle \square$ Warning: Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.

## Contacts

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