



VORTEX
SUBSEA SOLUTIONS

GAS / LIQUID MULTIPLE SAMPLING TOOL

HIGH PRESSURE, MANUALLY OPERATED

OPERATIONS MANUAL

VERSION 1.0 JAN 2023

VERSION	SECTION	ISSUE DATE	AUTHOR	DESCRIPTION OF UPDATE
1.0		26 Jan 2023	JG	Revised Funnel

VOR-GST-MAN:VER 1.0 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

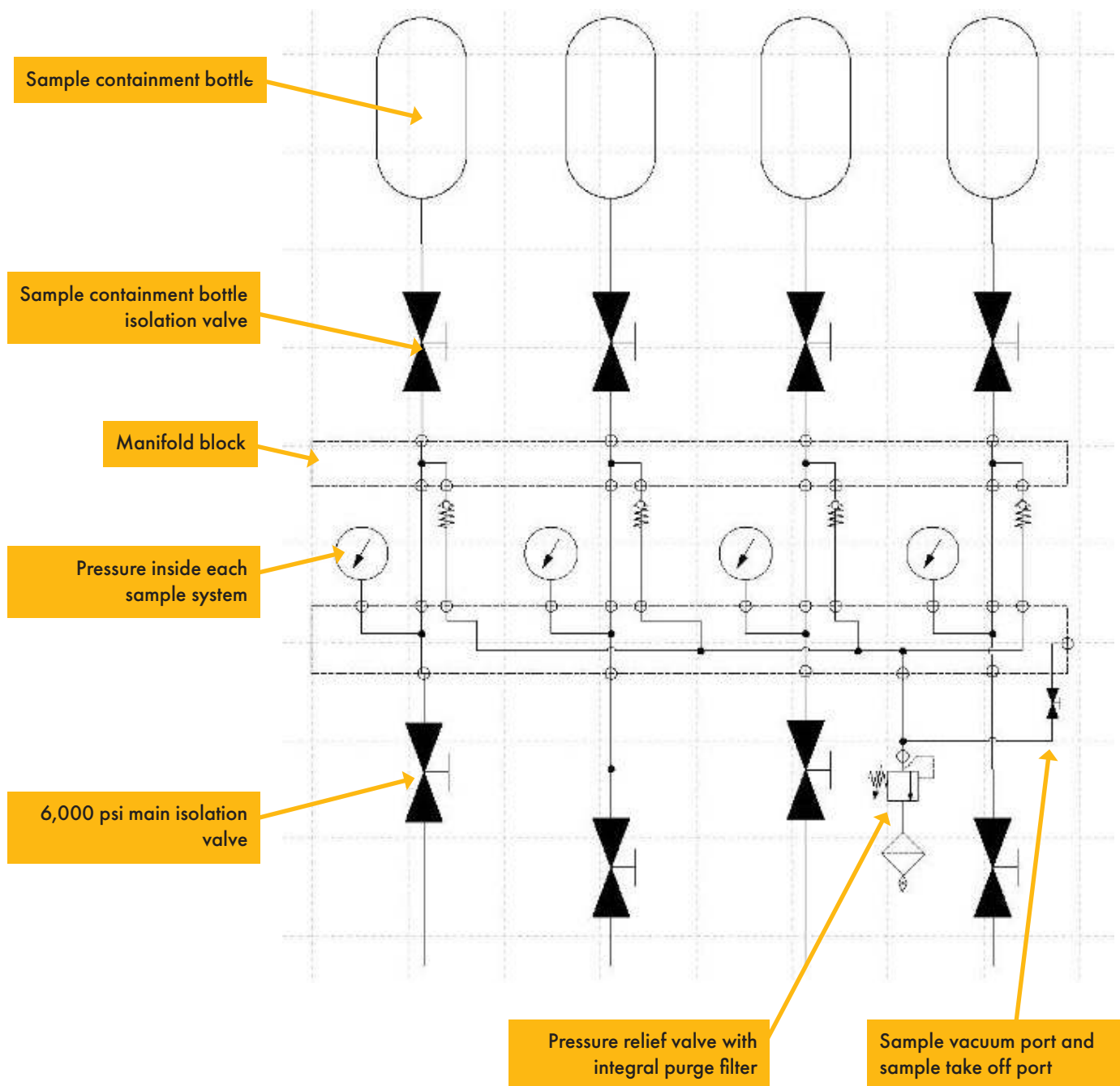
To “Suck” the sample into the syringe the operator will function the main isolation valve to open the circuit to ambient pressure and ‘draw’ the sample into the bottle.

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 lb (63kg)
- Complete tool Weight empty in fresh water = 112 lb (51 kg)
- Containment bottle volume EACH = 0.030 Cubic inch (0.5 litre)
- Main relief valve setting = 1800psi (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 (318mm) 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 x 12.5 inch (344 mm) diameter

Operation Procedures

4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



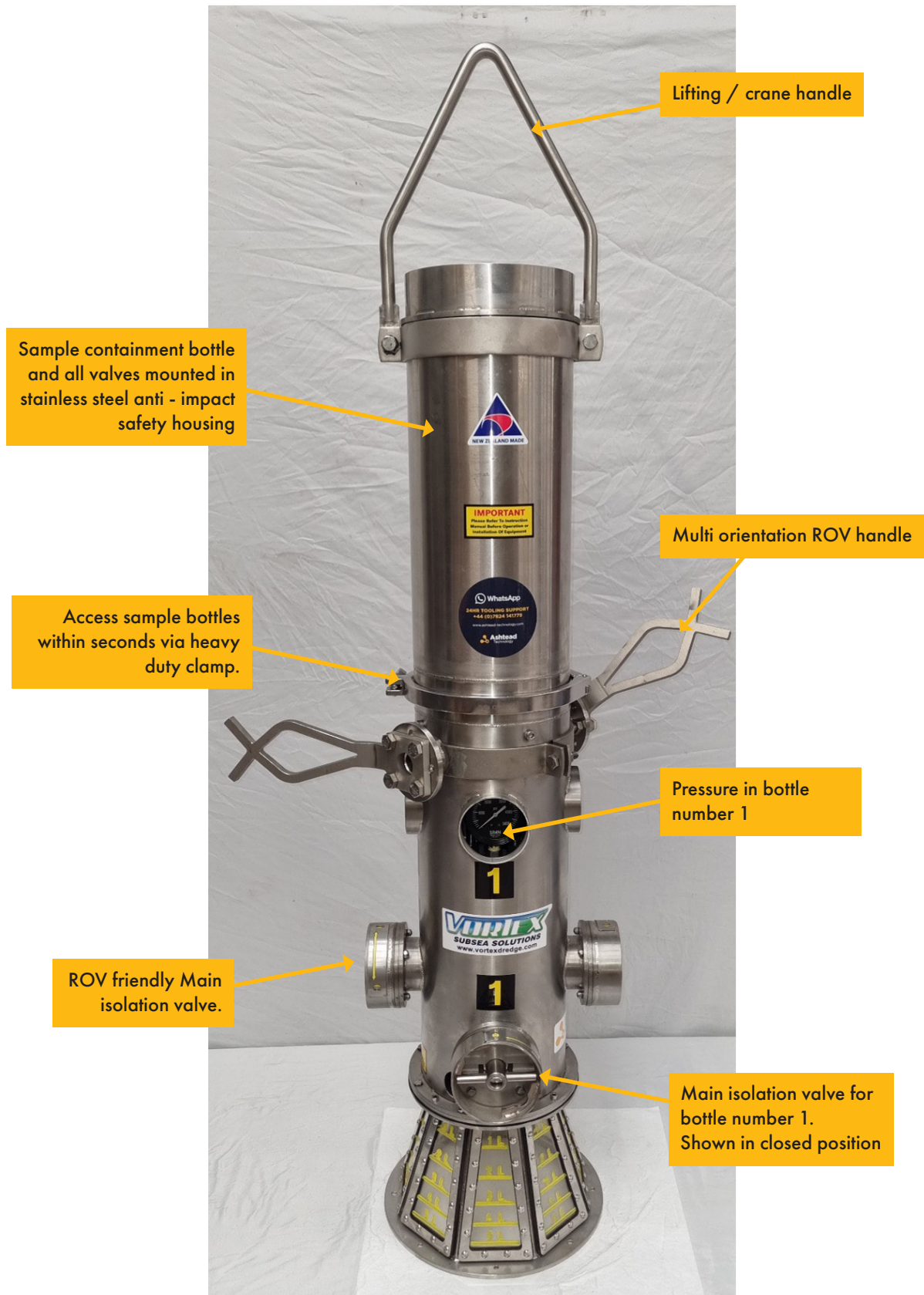
Tool as deployed



Tool ready to change sample bottles

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



This tool has sample bottles supplied in qty as per requested by the client. Surface with full bottle, change out bottle for dispatch to laboratory, fit new bottle, continue sample programme.

Remove this bottle containment ring before changing bottles

Close this isolation valve before transporting sample bottle

Fit blank to stem before transporting sample bottle

Operation Procedures

4.1 PRE DIVE CHECKS TOOL VISUAL CHECK



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



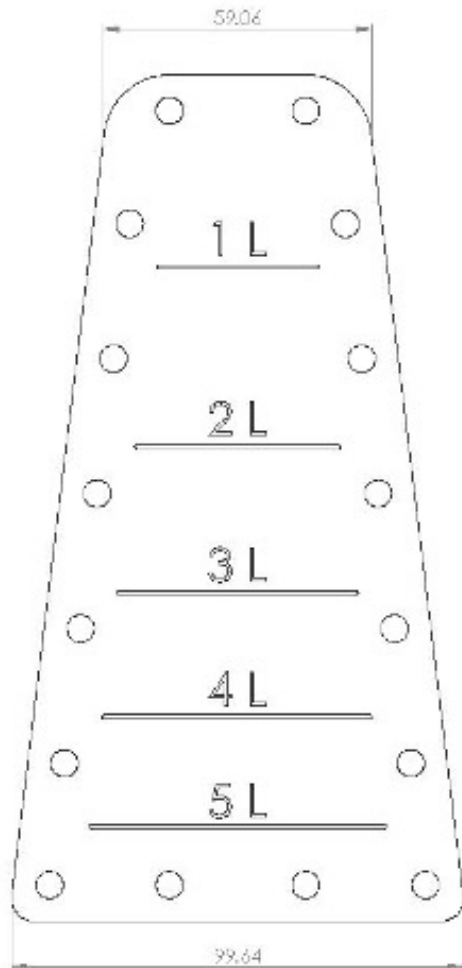
6,000 psi rated, ROV specific, main isolation valve and orientation when open



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'

Operation Procedures

4.2 FUNNEL AND FLOW MEASUREMENT



FLOW RATE CALCULATION

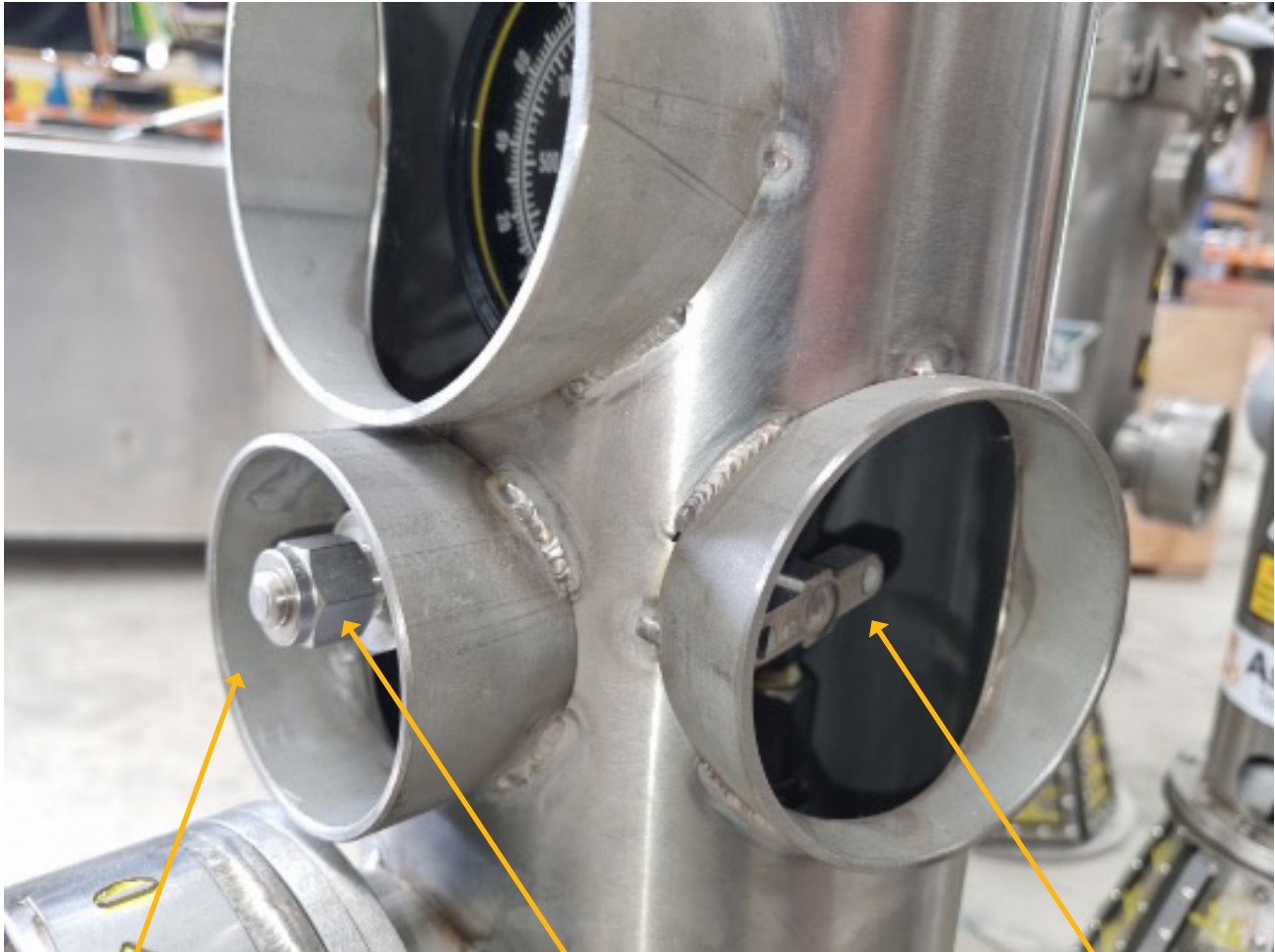
FORMULA: $Q = V / T$

**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



Sample bleed off
vacuum pull port.

Sample bleed off valve.
Connect here to draw off sample or to
pull a vacuum up to a minimum of 20
in/hg or more to store in sample bottle
when working in very shallow water.

Valve for sample
bleed off port

Operation Procedures

4.4 CHANGING BOTTLES

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



ALWAYS

Fit blank 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

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 the pressure stored in the containment bottle to a pre-set figure.	
12	Repeat sequence as sample operations as required to utilize the remaining three sample bottles.	
13	Remove top section of tool to expose sample bottle location. Close bottle isolation valves. Remove, cap bottle end and manifold end and label sample bottle.	
14	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..	
15	Fit clean containment bottles, pull and isolate vacuum in circuit, replace 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.	
2	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.	
3	Blow dry with air and close all valves.	
4	Check mechanical connections on the tool are secure.	
5	Check inventory of tool.	

Please return tool to supplier for post job maintenance.

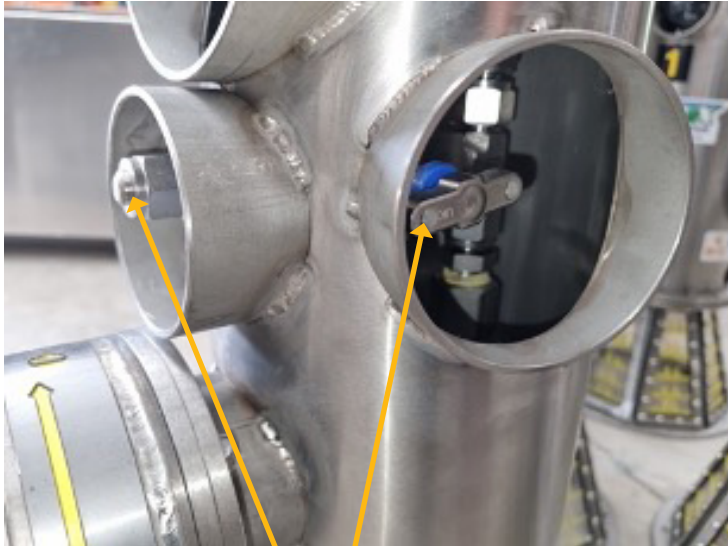
Operation Procedures

4.6 POST – DIVE CHECKS

POST DIVE COMMENTS		
Name:	Signature:	Date:

Operation Procedures

4.7 CLEANING TOOL AND BOTTLE



SAMPLE BLEED OFF VALVE

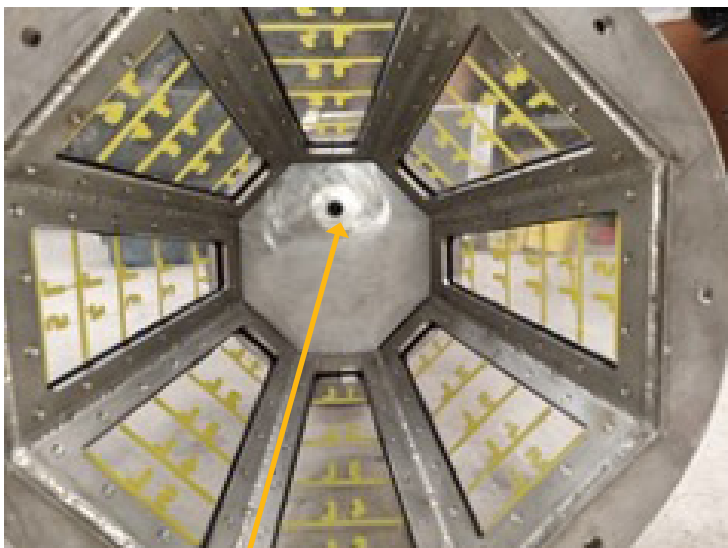
Connect here to flush manifold block through with de-greaser and steam cleaner.

MANIFOLD BLOCK



BOTTLE CONNECTION FITTING

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.

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

Maintenance & Storage

5.1 STANDARD PROCEDURES

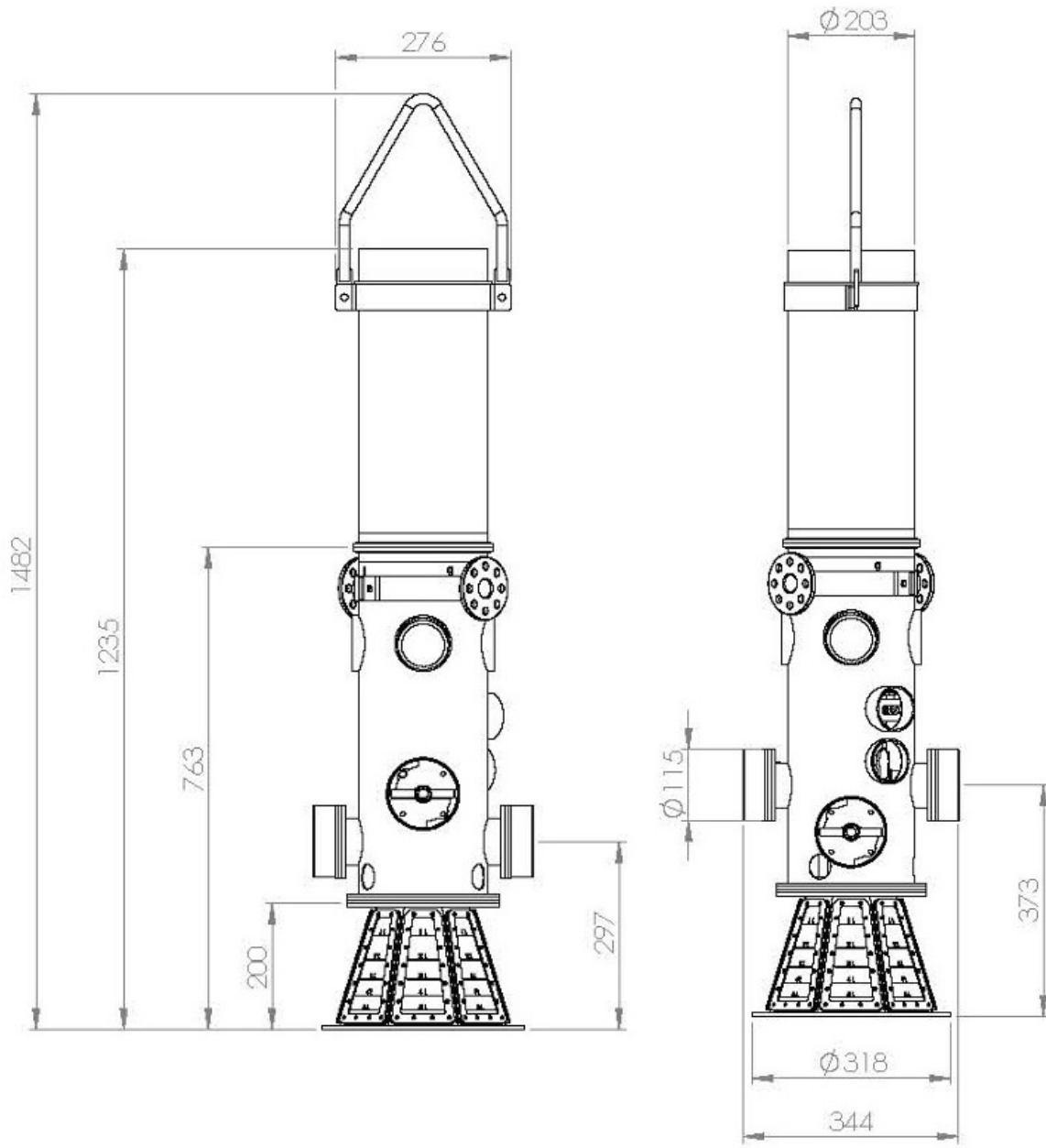
- Tool should be flushed with hot soapy water as per post dive checks.
- Allow to dry fully.
- Check operational condition of valves.
- Visual check of tool for anything which could prohibit future operation of the tool.

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 lb (63kg)
- Complete tool Weight empty in fresh water = 138 lb (51 kg)
- Containment bottle volume = 0.030 cubic inch (0.51.0 litre)
- Complete tool dimensions = 58 inch (1482 mm) long x 13.5 inch (344 mm) diameter
- Funnel diameter = 12.5 inch (318mm) 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-HS8HDY1000

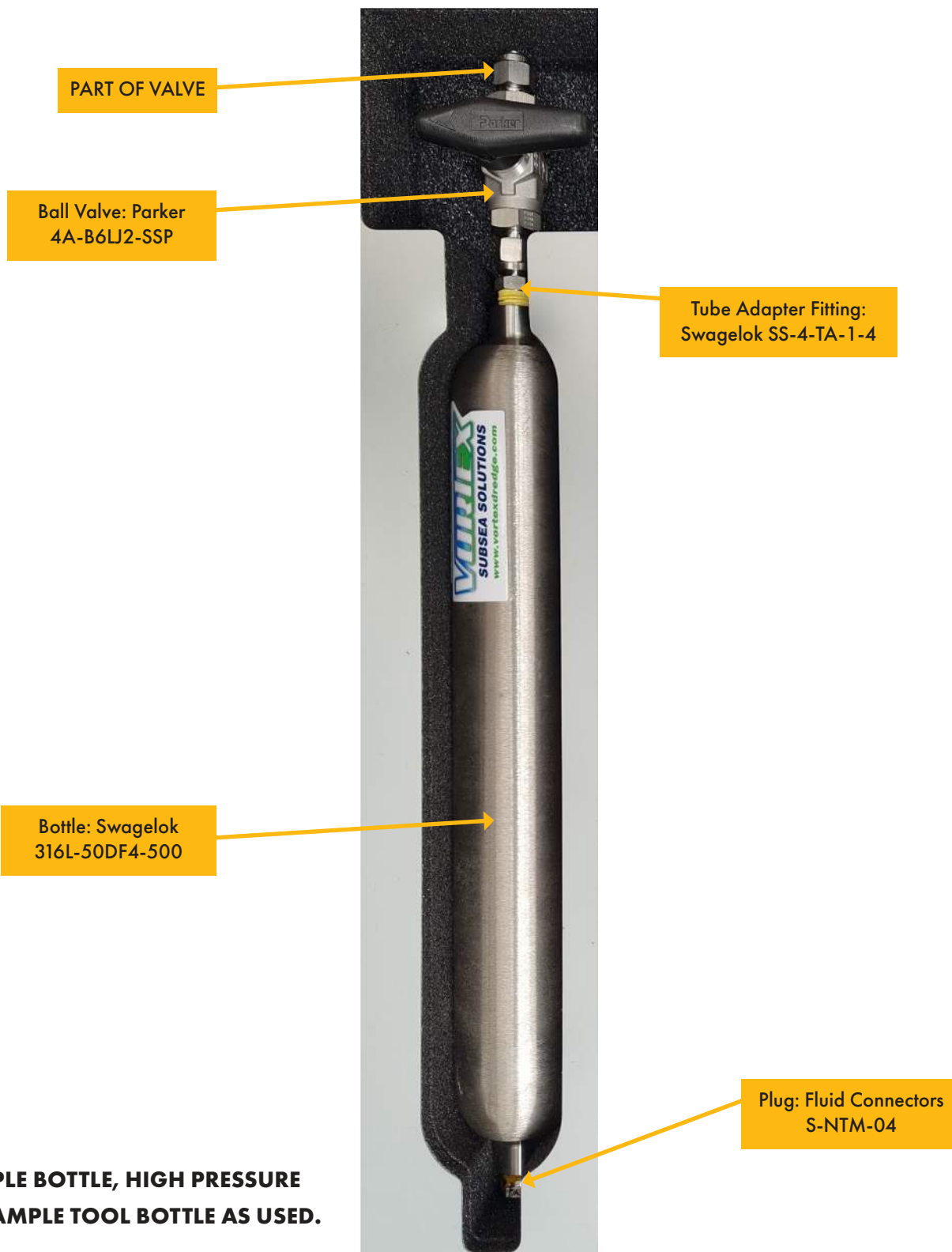
Servicing:

Please return to supplier for servicing.

If in doubt, please ask.

Appendix & References

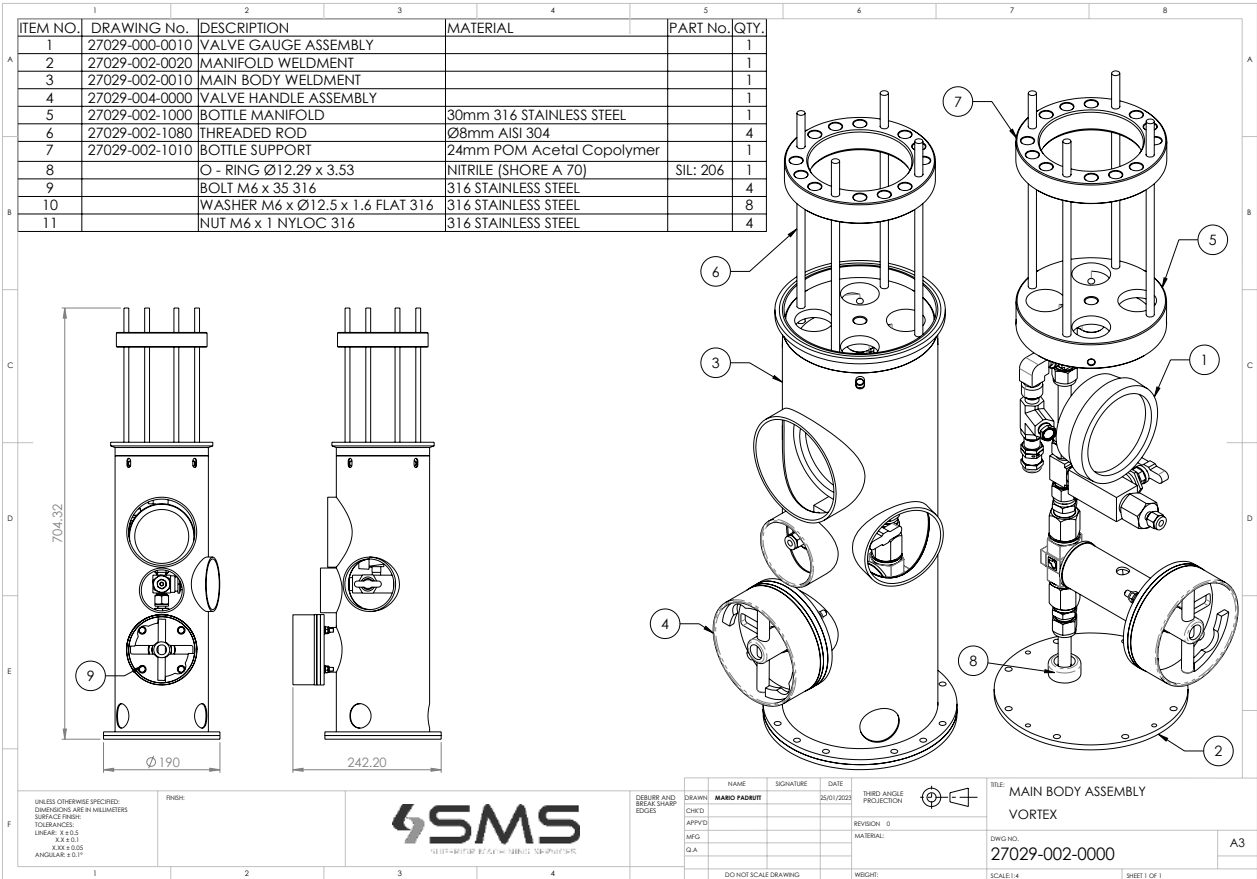
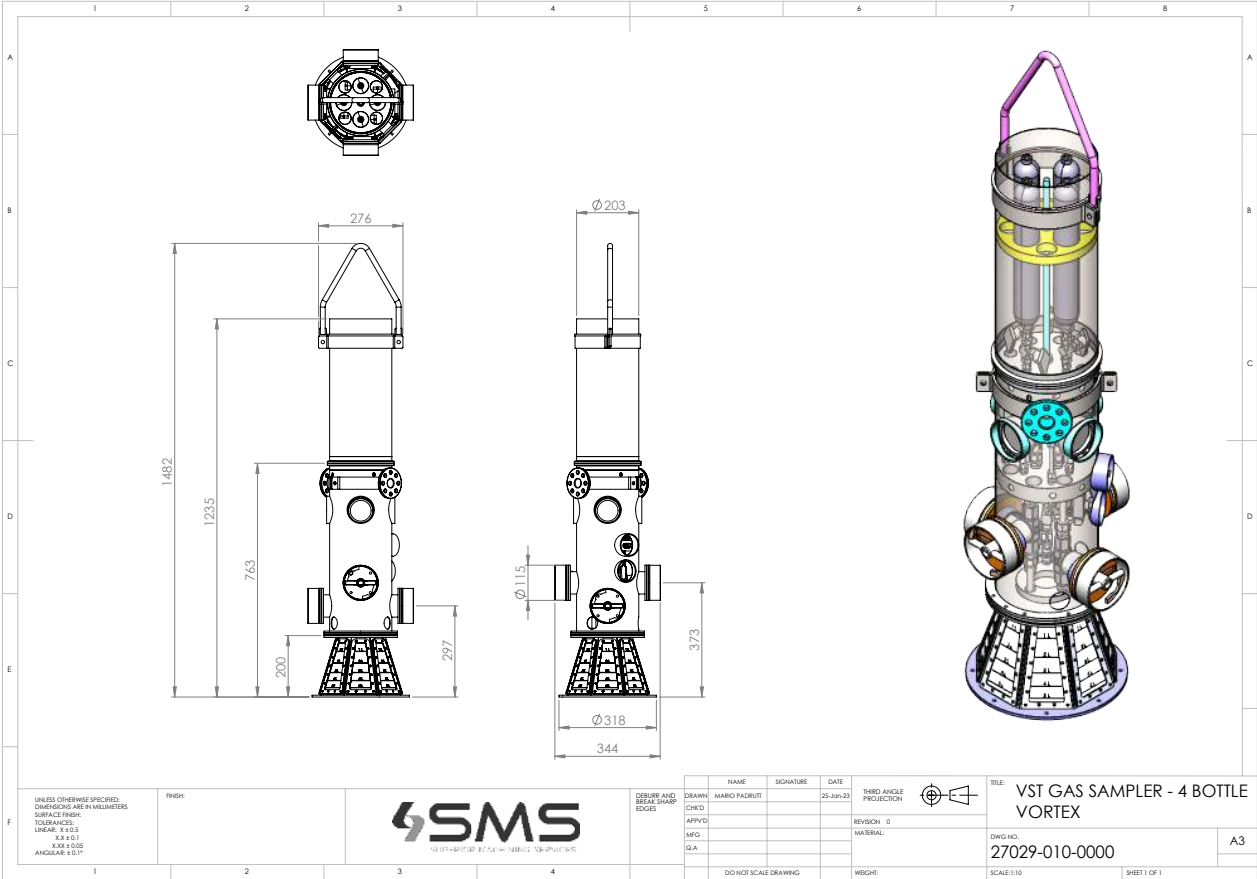
6.3 BOTTLE PART NUMBERS

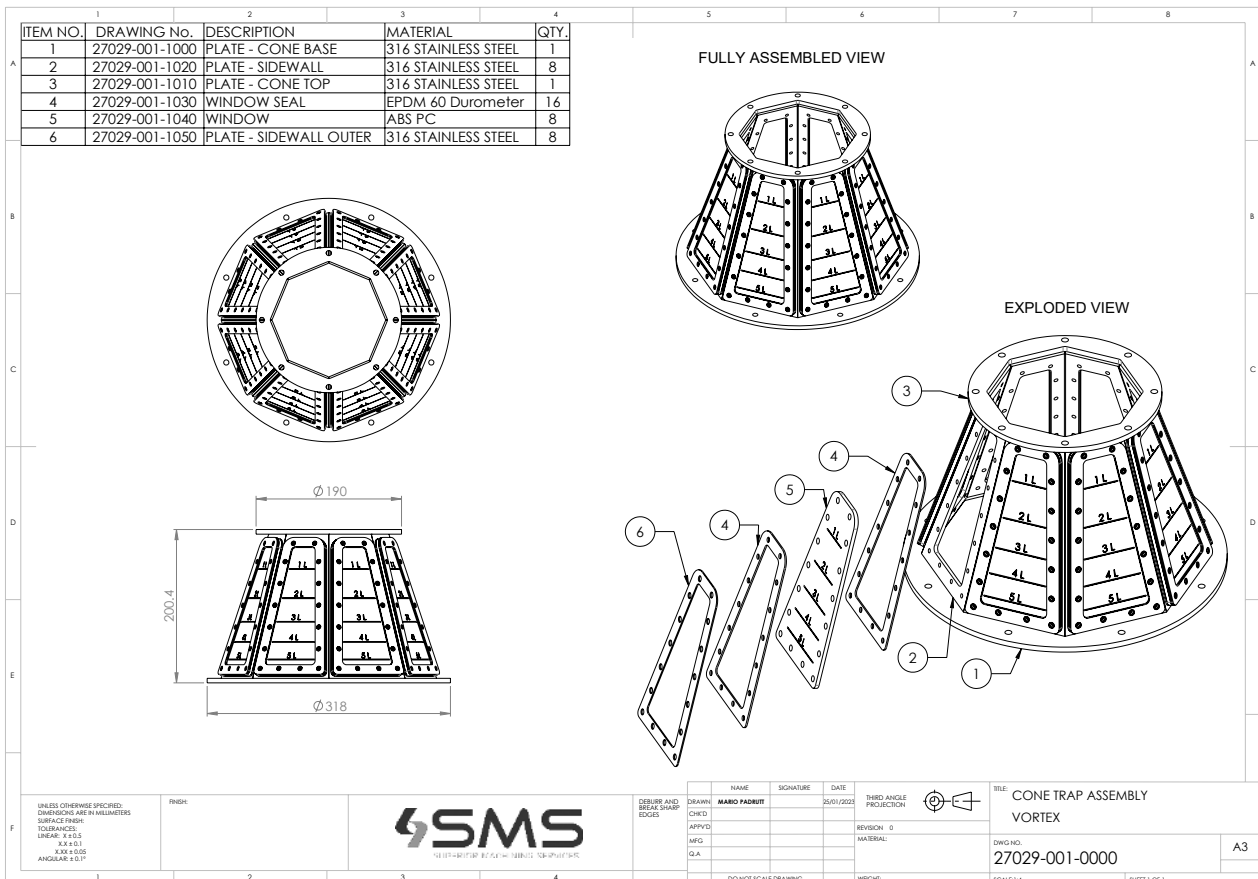
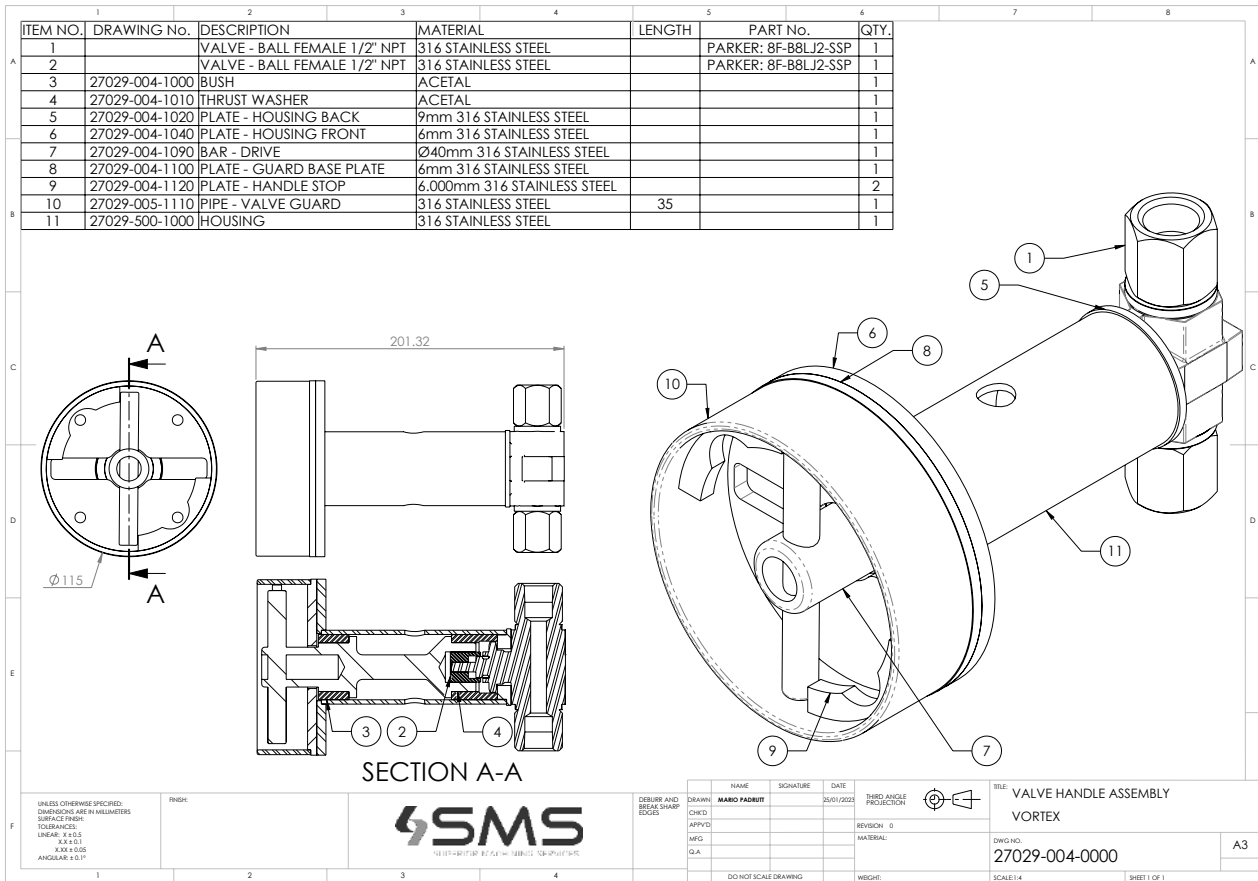


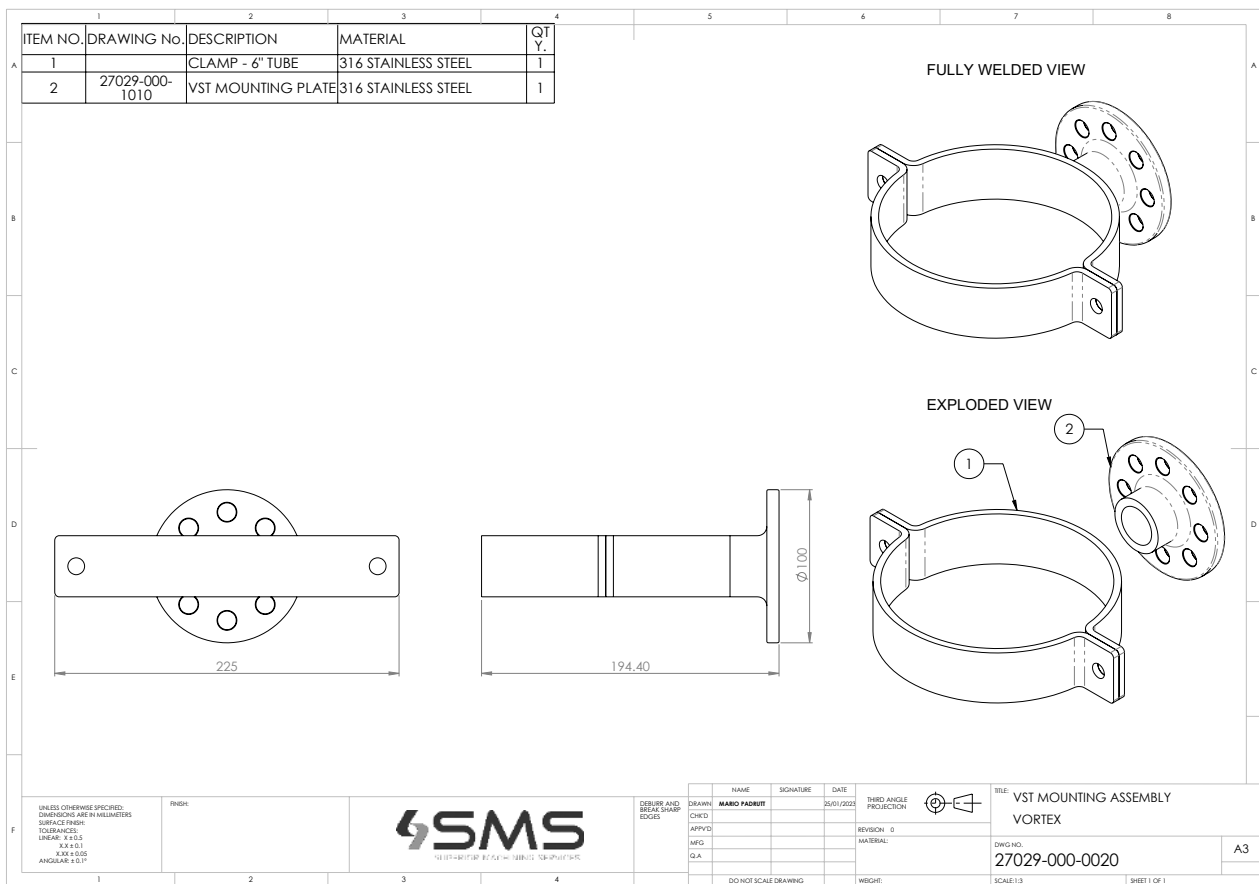
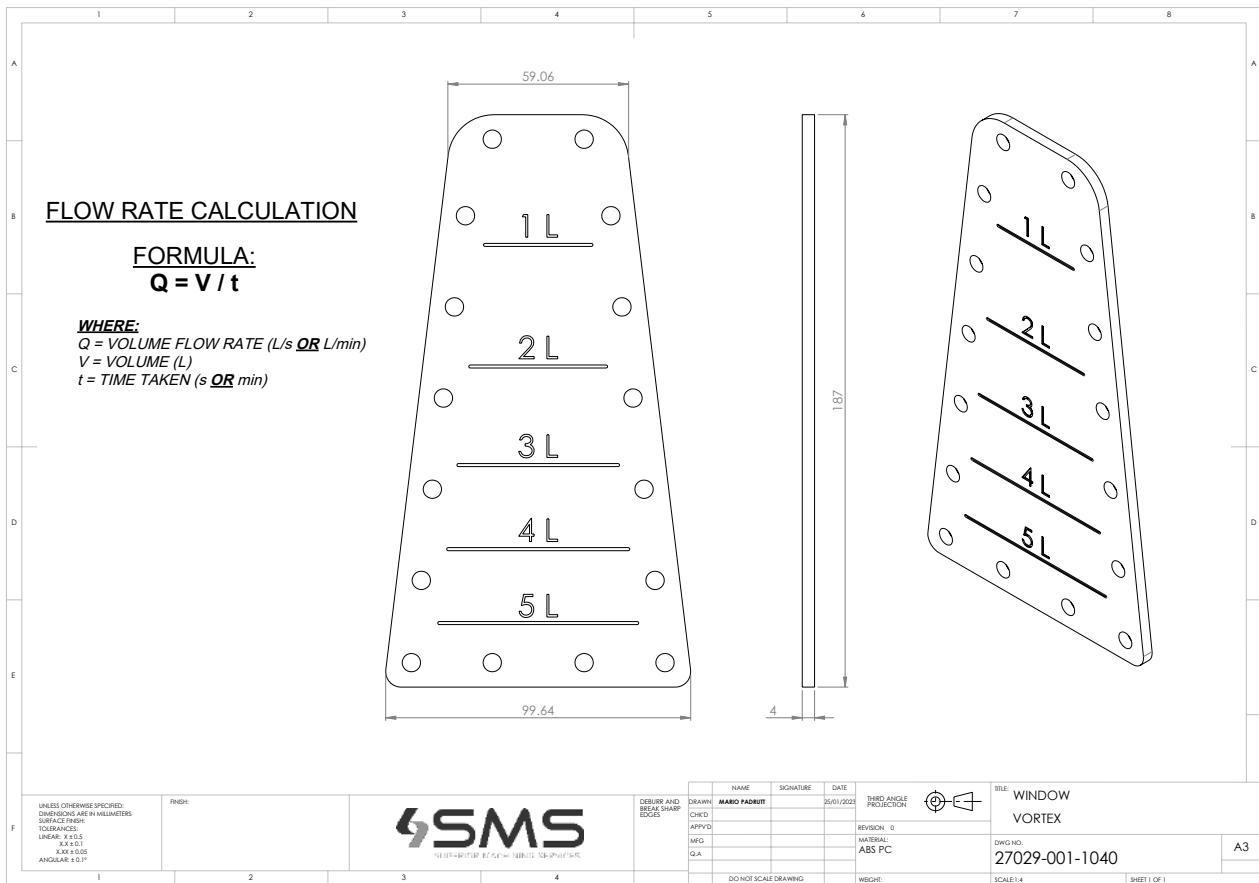
**MULTIPLE BOTTLE, HIGH PRESSURE
GAS SAMPLE TOOL BOTTLE AS USED.**

Appendix & References

APPENDIX III - SUPPLIER SPECIFICATION SHEETS







Appendix And References

APPENDIX III

SAMPLE BOTTLE DETAILS

Swagelok

7/11/2022 10:25:23 PM

www.swagelok.com

Double-Ended Cylinders



Part No.

316L-50DF4-500

Part Description

316L Stainless Steel Double Ended DOT-Compliant Sample Cylinder, 1/4 in. FNPT, 500 cm³, 5000 psig (344 bar)

Specifications

General	
Body Material	316L Stainless Steel
Connection 1 Size	1/4 in.
Connection 1 Type	Female NPT
Connection 2 Size	1/4 in.
Connection 2 Type	Female NPT
Cylinder volume/info	500 cm ³
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)	M4170
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.

⚠ 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.

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