6 inch modular dredge equipment operations manual.

Worlds most powerful 3, 4 and 6-inch dredges

www.vortexdredge.com

All information correct as of 25th September 2013 and subject to change without notice
• This 6 inch dredge is a **fully modular system** designed for multiple integration options installing each component on the host ROV using the supplied brackets and frames.
• This 6-inch dredge has shown under real world conditions to provide suction performance of 54 kpa. The Vortex HURRICANE 6 inch is capable of higher suction values.

• The Vortex 6-inch is very powerful, has no depth limitations and is quick and easy to mobilize and operate, it can also be test run in air.
• The Vortex dredge equipment can be operated and maintained by the ROV crew, however it is advised Vortex personnel be involved in the initial set up and testing phase on each operation.
• Clients need to see rapid deployment of hire gear. We have included a comprehensive range of the many brackets and fixtures the ROV operator commonly has to manufacture whilst offshore.
• Optional flotation is also available.
• **Your safety is your responsibility. Please ask if you are unsure about anything.**
6 inch modular dredge. SPECIFICATIONS.

- Based on iron sand and rocks at 2.375kg per litre
- Debris removal rates (ton./hr) 60 to 80 ton plus
- Venturi inner diameter [mm] 150
- Rated maximum stone size 140 mm
- Combined water pump flow = 310 m3/hr plus
- Suction hose diameter 6 in / (150 mm)
- Exhaust hose diameter 6 in / (150 mm)
- Inlet suction hose length 4 mtr standard to custom length
- Exhaust throw length 1700 mm standard to custom length
- Hydraulic flow required Flow = 26 gpm (100 lpm) MINIMUM
- Coupling compensator NO
- Hydraulic pressure required 206 bar (3000 psi) MINIMUM
- Overrun valve std YES
- Direction run valve std YES
- Operating depths Restricted only by flotation which is 3000 mtr standard rating
- Operate pump in air YES
- Flotation - optional
- Available suction at inlet Standard is 54 kpa plus
- Optional Jetter nozzle water pressure = 45psi plus (3 Bar plus)
- There are two options for a PO check valve. See schematics.

- Your safety is your responsibility: If you don’t know, please ask.
Operating limits
The operating limit for the Vortex 6-inch, will be the responsibility of the Senior ROV person on-site. The limitation being the ability to safely deploy and recover the ROV system with the Vortex 6-inch attached. Care must be taken whilst during launch and recovery operations to prevent damage to all components of the dredge system and the ROV.

Safety
• Personal protection equipment recommended for use when working on ship/platform deck
• Hard hat
• Safety glasses
• Gloves
• Safety boots
• Overalls

Risks – Normal Operations
• All personnel involved in deck operations shall be aware of the potential risk described hereafter.
• Crane Handling (possible danger of e.g. heavy falling object)
• Launch and recovery of equipment over the side of the vessel
• Personnel working over open sea (typical personnel working with launch and recovery of equipment from vessel deck or moon pool)
• Object falling down from height (rocks following the equipment when recovering)
• Working with equipment under pressure (hydraulics or water)
• Hydraulic oil spillage

• Your safety is your responsibility: If you don’t know, please ask.
User Checklist BEFORE Dive

To prevent any damage to the equipment this checklist must be followed

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Checked</th>
<th>Comments</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ensure ROV can and does supply 100lpm and 206 bar before operating.</td>
<td></td>
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<tr>
<td>2</td>
<td>All fittings are checked for leakage</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>All hose clamps are checked</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Pumps are fastened, no loose screws</td>
<td></td>
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<tr>
<td>5</td>
<td>Suction hose is fastened</td>
<td></td>
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<tr>
<td>6</td>
<td>Dredge is fastened, no loose ends</td>
<td></td>
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<tr>
<td>7</td>
<td>All hoses are fastened and in proper condition</td>
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<tr>
<td>8</td>
<td>Filter for induction is mounted in clean water</td>
<td></td>
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<tr>
<td>9</td>
<td>No hoses are squeezed or bent</td>
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<tr>
<td>10</td>
<td>Inlet nozzle is mounted correctly</td>
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<tr>
<td>11</td>
<td>Case drain and coupling are filled with clean oil</td>
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</tbody>
</table>

Comments: .........................................................................................................................................................
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Dredge is checked by: ........................................................................ Date: ........................................
# User Checklist AFTER Dive

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<tr>
<td>1</td>
<td>Equipment used in the sea must be properly cleaned with fresh water</td>
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<td>No hoses are squeezed or bent</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Hydraulic motor and coupling is filled with clean oil</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Broken parts are reported to vortex</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**

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**Dredge is checked by:**

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**Date:**

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**Comment Form:**

**What were the positives?**

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**What were the negatives?**

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**Suggestions to make this kit better for you to use in the field:**

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6 inch modular dredge. Venturi.

- Weight of Venturi = 30 kg in air
- Weight of Venturi = 26 kg in fresh water

- 1100mm long
- 400mm high
6 inch modular dredge.

- Weight of each pump = 45 kg in air
- Weight of each pump = 29 kg in fresh water
• Modular kit packed into 1600mm x 1000 mm x 1000 mm shipping box.
• Weight of box = 250 kg
• 4000mm long inlet hose shipped by itself.
6 inch modular dredge.

- Weight of water pumps to Venturi “Y” join = 4 kg in air
- Weight of water pumps to Venturi “Y” join = 3.5 kg in fresh water
6 inch modular dredge. Component connections.

Pump mounted in frame.

Pump frame measures 700mm long x 420mm wide x 600mm high.

Case drain directly to tank.

Return directly to tank.

Direction of debris flow

4000mm long water pump to Venturi hoses are charged out consumables so cut them to length to suit your installation.

Pressure = 206 bar
Flow = 100lpm.
6 inch modular dredge. Pump mounting options.

Mount on ROV with both “pump in frame” units bolted together.

….or mount each “pump in frame” individually to ROV.

….or mount each pump on brackets for modular placement inside ROV where convenient.
Installation.

Both pumps bolted together on rear of ROV - can also be split from frames and put anywhere convenient on the ROV.

6 inch Venturi fixed to side of ROV with reversal valve in place.
Mount Venturi to inside or outside of ROV frame where most convenient using included brackets and ratchet straps.
Hydraulic connections to ROV.

-12 jic pressure hoses join to -16 male jic fitting
-6 jic case drain hoses join to -8 male jic fitting
-16 jic pressure hose to join directly to ROV tooling valve or through optional pilot to open check valve.
-8 jic case drain hose to join to ROV.
-16 jic return hose to join to ROV.
-12 jic return hoses join to -16 male jic fitting

- Fill hydraulic motors and case drains with clean oil before start up.
- Pumps can also be run in air.

Hydraulic hose fitted with clear markings to facilitate mobilization times. Pressure and return hoses have identical pressure rating to avoid chance of failure through incorrect assembly.
6 inch modular dredge. Hydraulic schematic.

PO check valve part number:
HCV 333 P16P DKHC

Pressure in from host system **AFTER** the pressure filter 100lpm at 206 bar

PO check drain directly to tank.

Return directly to tank

Case drain return directly to tank
Hydrate pilot to open check valve

Vortex 6 inch dredge hydraulic schematic for VBPS-05.

Minimum pressure for pilot line with 3000psi system pressure in = 860 psi

Pilot to open signal from ROV valve pack (on / off switch).

Pressure in from host system AFTER the pressure filter.
100lpm at 3000psi

VPBS-05 PO check valve

Over run check valve

Water pump motor

Water pump motor

Pump supply return directly to tank

Case drain return directly to tank
Hydraulic connections. Water pump.

Mechanical water/oil shaft seal rated for 40 Bar (580 psi) and has 14 psi of static mechanical pressure constantly at work.  

100 + 14 psi = 114 psi minimum keeping mechanical seal in contact and water out of system.

100 psi check valve builds up and balances pressure in case drain of motor and seal housing to increase effectiveness of water/oil seal.

Most OEM mechanical motor shaft seals designed to stop oil flow out one way only. Oil can transfer from seal housing to the hydraulic motor case via the shaft seal if pressure differential exists.
Installation – Optional inlet Nozzle Fitted with Swivel.

- Tri-clamp
- Swivel main assembly nut.
- Inlet nozzle debris cage. Remove if necessary.
- Swivel section.
- Fish tail and Multi fit ROV handle. Locate bracket to achieve most suitable position for arm.
- Painted yellow for increased visibility at depth.

This cap screw locks the swivel main assembly nut. When swivel becomes worn or loose, loosen this cap screw and wind up nut only enough to remove excess play. Lock cap screw then fit split pin into cap screw.
Optional dredge direction reversing valve.

- Hydraulically operated ball valve.
- Hose fitting has 3.5mm hole drilled. Ensure this hole is always clear to allow reversing valve to reset.
- Connect this end to exhaust of dredge Venturi.
- Fit exhaust hose to this end.
- Fit hose to water pump discharge here.

Normal dredging exhaust direction.
Optional Marine Rotary Hoe

Another option for difficult soils is using the Vortex Marine Rotary Hoe. See images (left) of Marine Rotary Hoe. Sample videos available on our website.

Tested on 100 to 150 kPa rocks and clay. Designed for difficult soil conditions.
Optional Water Jetter

Optional water jetter: Uses water taken from the water pump outlet and shown in tests not to affect dredge suction performance.

Included in kit, ‘slip-on’ jetter head goes on end of suction inlet, diverter valve, hydraulic hoses.

Water pressure available = 45psi (3 bar) plus
Optional Hydrate removal brush.

Introduction:
To be used in conjunction with Vortex reverse flow dredge or with Vortex water pump only as the motive water source. Water jets on four sides and front of Hydrate cleaning brush utilizing high volume water (62 m³/hr with Tornado pump) and up to 80 psi water pressure (with Tornado pump) generate severe turbulence to break up and disperse the hydrate build up with water pressure and flow. Mechanical action of bi-directional rotary bush serves to further break up hydrates. Soft bristles avoid damage to sensitive EFL and HFL assets.

Connect inlet hose of dredge to male cam lock of tool.
Operate dredge in blow function to eject water from end cap and sides of brush.

Hydraulic connections.
Spare Components

Spare exhaust cone. Fit to Venturi as wear becomes prevalent in original cone.
Weight = 5 kg

Spare 6-inch and 3-inch hose clamps. Use as you see fit to mount hoses. Weight = 1 kg total

Vortex pump spares kit. (two units.)
Trouble Shooting

Symptom: Water pump not operating
Remedy:

1. Ensure that the hydraulic hoses are connected as per manual drawings and match connection labels.
2. Check that 100 lpm at 206 bar can be seen directly at the Vortex water pump hydraulic motors.
3. Check any quick connect fittings you may have in the circuit as they can sometimes be faulty.
4. Are your thrusters using most of the available system flow and starving your circuit feeding the Vortex water pump?
5. Ensure the Vortex case drain is connected directly to tank. It is preferable to connect as close as possible to the reservoir and not run any hoses through quick connects.
6. Has the water pump impeller been damaged by excessive silt or other dirt ingress? If so, please repair as necessary with accordance to supplied Vortex pump servicing handbook.
7. Check that the over spin valve is operating correctly and does not have dirt ingress causing fluid to bypass the check valve. Replace with SUN valve, part number HCV 2743 as necessary.

Symptom: Debris removal slow
Remedy:

1. Check the caged nozzle of inlet hose is not blocked. Stop hydraulic flow to water pump to allow rocks and debris to be cleared.
2. Check that all cam locks are fastened and secured correctly.
3. Check all cam lock o-rings are in place and in good condition.
4. Use steady and consistent movements when plunging suction hose inlet into seabed. Try side to side and up and down movements of suction hose inlet. Differing conditions may require changing methods.
5. Check all hydraulic remedies as seen in “water pump not operating” section of trouble shooting.
6. Check inlet and exhaust hoses are not bent or blocked.
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