

Safety bulletin 2009-06-25 – Poseidon Diving Systems AB

To whom it may concern.

Product: Poseidon MkVI Discovery Rebreather

Manufacturer: Poseidon Diving Systems AB

Manufactured between: 2009-01-01 – 2009-06-25

Number of incidents reported: 1

Number of reported injuries: 0

June 23rd, 2009, there was a dive incident off the coast of Gothenburg, Sweden, involving a Discovery MkVI rebreather.

After analysis of the log files we extracted from the involved unit, we advise divers using the Discovery MkVI to take the following actions:

- When pre breathing the unit, you should look for a stable PO2 value and listen for the solenoids to fire.
- When you enter the water with the Discovery MkVI rebreather, make sure that you descend to a depth of at least 0,5 m / 1,5 feet to get the unit to enter "Dive mode". The unit will remain in Dive mode as long as the wet switches on the primary display is in the water.
- This action is especially important if the diver intend to swim on the surface prior to descending.
- We recommend that you let the unit complete a pre-dive check before entering the water.

In short, the sequence of events at the incident was as follows.

- The diver did two dives of a total of 73 minutes, with a 10 minute surface interval between the dives.
- After the two dives, the diver climbed back on to the boat and took the rebreather off. The rebreather was still active but in "No Dive mode" since the unit wasn't powered down after the dives.
- After a short period of time, the diver in question decided to go back in to the water.
- He put the rebreather back on his back, and started to pre breathe the unit. He checked the display and it showed a PO2 value of 0.4.
- A few minutes after the diver started to pre breathe the unit, he got back in to the water. After entering the water, he checked the display again, and it still showed a PO2 value of 0,4.
- The diver then started to swim, on the surface, towards the bow of the boat. After only 6-7 swim strokes, he suddenly became unconscious.
- The diver was quickly pulled back on to the boat and revived.
- The diver suffered no injuries from the incident.

From the time that we (Poseidon Diving Systems AB) was informed about the incident, in the morning of June 24th, we have supported the Swedish Police, in their investigation of the incident, with

technical support to extract and interpret log files. We have also been in close contact with the diver that experienced the incident.

From our own investigation and analysis of the log files, we believe we have found the cause of the incident.

- If the PO2 value in the loop drops down below 0.35, while the unit is in “No Dive Mode”, the unit will maintain the PO2 value and add oxygen to increase the PO2 value to the desired set point.
- It is our estimate that both oxygen sensors most likely were covered with condensation, causing them to give a frozen and false reading of a 0.4 PO2 value.
- In “Dive mode”, an oxygen cell validation is performed every five (5) minutes.
- When the unit is in “No Dive Mode”, it does not perform any oxygen sensor validation, thus no flushing of the oxygen cells is performed.
- When a diver enters the water and when the unit is in “No Dive Mode”, it will enter “Dive Mode” when the depth sensor reads a pressure of 30 millibars and it will perform an oxygen sensor validation every 5 minutes, and flush the oxygen sensor of any condensation.
- Based on the log files retrieved from the unit involved in the incident, we can tell that the unit never went in to “Dive mode” when the diver re-entered the water. Most likely because he never reached a depth that would produce the required 30 millibar pressure. And since he stayed at the surface as he began to swim, the unit remained in “No Dive Mode”.
- The diver got hypoxic and unconscious because the PO2 level in the loop became too low.

Short term solution

When pre breathing the unit, you should look for a stable PO2 value and listen for the solenoids to fire.

When you enter the water with the Discovery MkVI rebreather, make sure that you descend to a depth of at least 0,5 m / 1,5 feet to get the unit to enter “Dive mode”. The unit will remain in Dive mode as long as the wet switches on the primary display is in the water.

This action is especially important if the diver intend to swim on the surface prior to descending.

We recommend that you let the unit complete a pre-dive check before entering the water.

Long term solution

We will resolve this issue in the next software release. But before we can release the next software version, we will have to go through our software test process to ensure that it works as intended.

This is the improvement we plan to implement in the next software version.

- Oxygen sensor validation will occur when the mouthpiece Closed Circuit/Open Circuit switch is set to Closed Circuit (CC) mode. This will prevent condensation build-up around the oxygen sensors.

If you have any questions about the technical analysis above, please feel free to contact us at any time.

Poseidon Diving Systems AB