

ASSESSMENT OF THE MAXIMUM AMBIENT PRESSURE FOR MEGASPORT DUAL SCALE MINI-INDEX PRESSURE INDICATORS

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Revision History

Revision	Date	Description
A0	11 th Dec 2009	Test performed and assessment report issued
A1	14 th Dec 2009	Drawing of fixture on request from DL

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1 PURPOSE AND SCOPE

This document reports tests on Megasport Mini-Index Oxygen and Nitrox 400 bar submersible pressure indicators model 5500P SI 664/665, having a dual scale, to determine the maximum ambient pressure the devices can withstand, and their failure mode if this pressure is exceeded.

The manufacturer provided documentation confirming the pressure indicator meets the accuracy and other requirements of EN 250, but the maximum ambient depth in the EN 250 test is 100m (hence a 50 msw rating for the pressure indicator). Deep Life Ltd wish to use the pressure indicator for commercial diving operations to 350msw, which requires the pressure indicator to withstand at least 700msw for 15 minutes.

The scope is an assessment in accord with EN 14143:2003 Section 5.9.2 for pressure indicators with regards to maximum ambient depth.

2 SAMPLE

A quantity of 260 pressure indicators was purchased in October 2009.

Ten samples were taken from the batch and inspected in detail. There was no visible difference between any pressure indicator. All indicators are in a nickel plated brass housing, marked in identical manner.

A pressure indicator was selected at random from the batch for destructive test: batch number 8546 9877 was marked on the boxes containing the pressure indicators. A second pressure indicator was selected for the repeat test.



Figure 1 Pressure indicator (front view).



Figure 2 Pressure indicator (back view).

3 EQUIPMENT USED

Equipment	Serial Number	Calibration Next Due
Digital manometer Keller ECO 1	004630	Calibration prior to each use
Digital manometer Keller LEX 1, 700 bar FSD, 0.01 bar calibrated accuracy for ECO1 calibration	002333	2 July 2012
Micro chamber, Bronze, 58mm x 110mm, WP 140bar, Test Pressure 240 bar, BP 400 bar	DLC A50	Aug 201
Dudgeon Hydrostatic test pump, Model 77 110-1. Pressure 12000psi	9348	N/A

4 TEST METHOD

A hydraulic pump connected to the chamber and water supply as shown in the figure below.

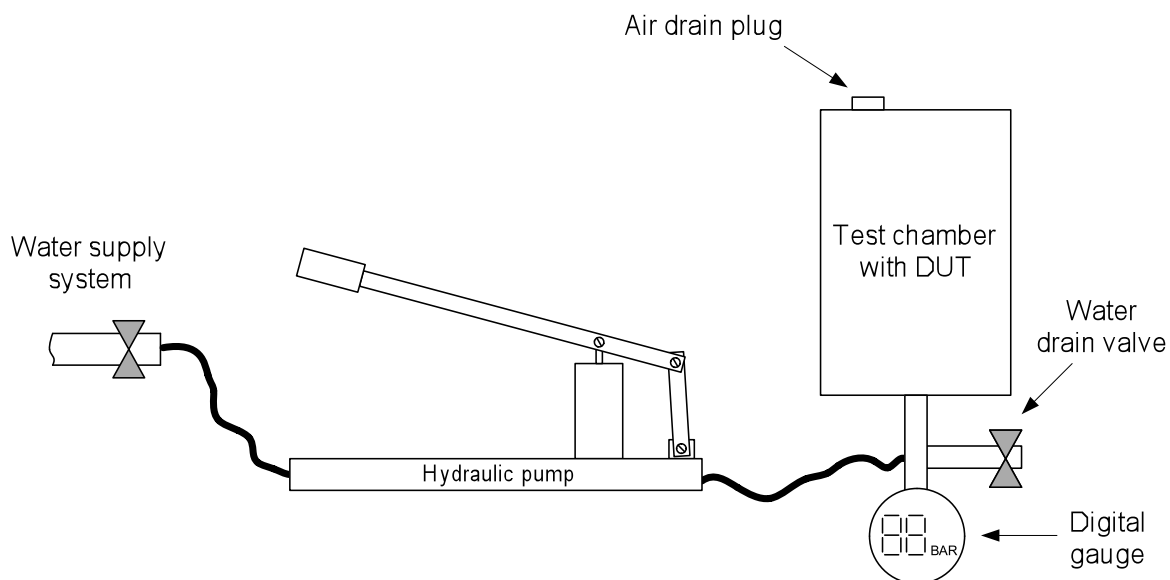


Figure 3 Test rig schematic.

The pressure indicator under test was fitted with a blanking plug.

The chamber was filled from the bottom by water via the hydraulic pump until water appeared in the gas bleed port at the top of the chamber. The gas bleed port was then closed by a plug.

The ECO 1 was calibrated against the LEX1 and confirmed to be within specification: the ECO1 is calibrated before each use because it is used for tests where sudden pressure surges can occur.

The pressure was increased until the ECO 1 showed 70 bar. The pressure indicator under test was inspected. Pressure is increased further until a sound was heard, or the pressure showed a sudden drop (which occurs when there is any sudden water ingress). The maximum pressure is recorded.

The chamber was then depressurised and the pressure indicator removed, and inspected for the damage. The damage was recorded.

The chamber was then re-pressurised with a second pressure indicator and it was confirmed that no failure occurs at 7 bar below the previous failure pressure, with the pressure maintained for 15 minutes.

The chamber was depressurised and the operation of the pressure indicator was checked by pressurising it to its full scale using water.



5 TEST RESULTS

The tests were performed on 11th Dec 2009, and witnessed by M. Soloviev, of BAI. The client Deep Life Ltd was represented by Dr. Alex Deas, who also witnessed the maximum pressure portions of the tests.

5.1 Test at 70 bars of external pressure

The chamber was pressurised to 70 bar and left for 15 minutes under this pressure. Then pressure was then dropped to ambient, and the glass of the pressure indicator was checked. No damage was found.



Figure 5 Test process at left and the pressure indicator after the test without any signs of failure.

5.2 Test to determine burst pressure

The pressure indicator was putted into the chamber again and the chamber pressurised. Pressure into the chamber was increased at a rate of around 10 bar per second.

When the pressure reached 117 bar a sound was heard from the chamber, and the hydrostatic pressure dropped by 2 bar at the same time.

Pressure was reduced to ambient and the glass of the pressure indicator was checked. It had a crack near the pressure indicator wall (see figures overleaf).



Figure 6 Pressure indicator after the test with crack on the glass (top side of the image). There was no water entry into the pressure indicator.

The glass on the front of the device did not splinter: the pressure indicator was useable to 100 bar after having been damaged by the test. There was no water ingress into the pressure indicator.

5.3 Test to validate the maximum ambient service pressure

The second pressure indicator was putted into the chamber again and the chamber pressurised to 110 bar. No failure occurred when that pressure was maintained for 15 minutes.

The maximum ambient service pressure is half the test pressure, i.e. 55 bar, which corresponds to 550m of water.



Figure 7 Test in progress. Indicator under test is being pressurised to 110 bar, where it was held for 15 minutes.

6 CONCLUSION

The ambient burst pressure of the pressure indicator was determined to be 117 bar.

A second pressure indicator withstood 110 bar for 15 minutes.

The maximum working pressure rating of the pressure indicator in accord with EN 14143:2003 Section 5.9.2 is therefore 550m of water.