InnerSpace Systems Corporation

An ISO9001:2000 Company

The Importance of Testing Standards

When considering which rebreather to purchase or if you considering aftermarket modifications to your re-breather it is critical to have a basic understanding of the design considerations that *should* be followed and the testing that was conducted by third party labs. Currently the most complete set of standards for rebreathers that is widely accepted is incorporated in a series of specifications that make up the Œ Standard. For the unit and breathing loop EN 14143 defines the minimum specifications and testing standards for the Œ mark. There are several standards involved with electronics, ESD and EMI are governed by EN61000 and EN55022.

InnerSpace Systems has tested the APECS™ 2.5 and 2.5a hardware configurations to these standards. All tests are conducted by impartial third party labs. Additionally any equipment that we approve and integrate has also passed these standardized tests. To date the only third party electronics that we have tested that passes both EN61000 and EN55022 is the Shearwater Pursuit™ dive computer and we have integrated the Pursuit™ into the Megalodon™ family as an approved OEM option.

Some manufacturers will make light of the Œ standards or try to confuse the situation with other tests which are not published, don't be satisfied with anything less than verifiable third party tests to a published standard. InnerSpace Systems electronics are also FCC and IC approved, Œ certification is pending and expected prior to year end.

Once the testing is complete, there should be a accepted standard for quality control during manufacture, the standard accepted world wide and required in many industries is the ISO9000 standard. InnerSpace Systems Corporation has maintained ISO9001:2000 Certification since 2004 and is audited annually to verify compliance. InnerSpace Systems is currently the ONLY rebreather manufacturer in the US to maintain this certification.

In the final analysis rebreathers are life support equipment, make certain that yours is built, tested and maintained to standards.

APECS™ 2.5 and 2.5a Test Results

Result	Standard	Description	Specified Requirement	Performance Criteria	Comments
Pass	IEC 61000-4-2	Electrostatic Discharge Immunity	EN61000-6-1	Criteria B	Tested up to 8 kv discharge and 4 kv Contact.
Pass	IEC 61000-4-3	RF Field Immunity	EN61000-6-1	Criteria A	3 V/M, 80 to 1000 MHz
Pass	IEC 61000-4-8	Magnetic Field Immunity	EN61000-6-1	Criteria A	3 A/M, 50 and 60 Hz
Pass	EN55022	Radiated Emissions	EN55022	Class B	

Electronics testing conducted by ElectroMagnetic Investigations
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Work of Breathing and Hydrostatic Imbalance

Work of Breathing (WOB) is a critical factor for any rebreather design. A number of elements effect the work of breathing of a particular unit; counter lung design, size, placement, scrubber design, hose and dsv designs can increase or decrease WOB. ISC is committed to continual refinement and improvement in the Megalodon™ system to reduce WOB to the lowest possible levels. Recent testing by the Health Safety Lab in the United Kingdom shows the Megalodon to be an industry leader in WOB. EN14143 is very specific about testing standards and criteria for evaluation.

Pitch Degrees (Roll at 0 degrees)	**Suprasternal Notch +mbar**	**-mbar**
+180	+20.0	-20.0
+90	+20.0	-20.0
+45	+20.0	-20.0
0	+20.0	-25.0
Roll Degrees (Pitch at 0 degrees)		
+90	+20.0	-20.0
+45	+23.0	-23.0
0	+20.0	-25.0
-45	+23.0	-23.0
-90	+20.0	-20

Table 1

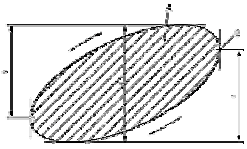

Figure 1

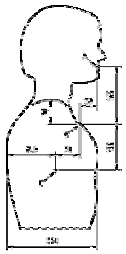

Figure 2

Figure 3

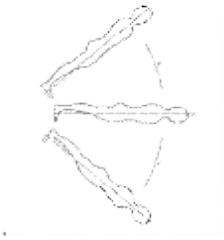

Figure 4

5.6.1.3 Respiratory Pressures— Peak to Peak Max 50mbar. Inspired and Expired pressures 25mbar.

5.6.1.4 Hydrostatic Imbalance — Table 1

Pitch Degrees	Suprasternal Notch +mbar	-mbar	Peak to Peak (Max 50 mbar)	Inspired Respiratory (Max 25 mbar)	Expired Respiratory (Max 25 mbar)
+180	9.39	-3.78	13.18	10.84	12.09
+90	7.4	-10.06	17.46	17.27	15.23
+45	3.18	-9.93	13.11	13.04	12.38
-45	9.32	-6.98	16.30	16.20	16.04
-90	9.31	-9.42	18.73	17.89	17.18
Roll Degrees					
+90	16.63	-11.97	28.60	25	25
+45	8.99	-10.72	19.71	19.61	18.80
-45	3.88	-20.75	24.62	24.35	23.53
-90	3.87	-11.16	15.02	14.67	14.50

All testing conducted by the Health Safety Laboratories in the United Kingdom. Water temp. 18.7C, Tidal Volume 2.5 liter, BR 24.93 bpm, ventilation rate 62.3 lpm.