



OPEN SAFETY

APOCALYPSE TYPE IV LATIN FROM APO-KALUPTEN: THE UNVEIL-BIL-REVEALER

Closed Circuit Rebreathers

Datasheet for O₂-CCR Model:
A Non-instrumented Model for
Oxygen diving and OEM applications

Apocalypse Type IV O2-CCR Model

FEATURES

- **CE certified rebreather** packed with safety features ready to dive within minutes of customer receipt.
- **Rugged with low maintenance.**
- **Low Profile** of just 170.5mm, similar to a 7 litre cylinder
- **Light:** as low as 17kg ready to dive, depending on cylinder configuration.
- **Highest performance breathing loop:** achieves the lowest Work of Breathing (WOB) of any available rebreather: 0.44J/L at an RMV of 40lpm, and 1.44J/L at 75 lpm RMV – both measured at 40m depth using air.
- **Clean front and shoulders:** internal back-mounted counterlungs.
- **Flood tolerant:** even total flooding is recoverable during a dive.
- **Quick fit and safe Micropore EAC scrubber cartridges.**
- **Fast Turn-Around to next dive:** comparable with Open Circuit.
- **Constant Mass Flow valve with unique tactile feedback.**
- **Integral bail-out valve** with high performance and auto-trigger when removed from the mouth.
- **Integral Automatic Loop Volume** valve combined ALV and BOV
- **Integral Water Dumps** in counterlungs and mouthpiece.
- **CE Certified Buoyancy Compensator** providing 22.5kg of lift
- **Choice of Harnesses:** Hogarthian, Webbing and Tech Harnesses.
- **Provision for internal and external cylinders,** from 1 litre to 2x12 litres for dives that require serious bailout.
- **Top Quality Construction** from stainless steel, bronze and optimal plastics fully production engineered (moulded).
- **Full documentation set for OEMs:** all certificates and compliance data are provided, enabling OEMs to meet regulatory requirements without the huge investment of approving a complete rebreather.
- **Supplied with everything need to dive** as an oxygen rebreather except gas, mask, fins, weight, depth-timer and exposure suit. It can be dived within 10 minutes of receipt!



BENEFITS

- *Highest performance breathing loop* means **you are less stressed underwater and need less effort, so can swim further, faster and easier.**
- *Fully production engineered* to be robust with low maintenance, means it **is ready to dive when you are, every time.**
- *Functional Safety certified* means **it is safe, and it has CE approval too.**
- **Future proof:** this model is identical mechanically to the Apocalypse Type IV Nitrox and Trimix iCCR model, except it has no electronics. Divers can add the electronic package later to dive deeper than pure oxygen limits.

BLENDING DIVERS WITH THE SEA

Experienced rebreather divers have called the Apocalypse Type IV, “the first rebreather that turns a person into a fish”, meaning, for the first time, the diver is not aware the rebreather is there. The Apocalypse diver has no bubbles, no noise, and has perfect buoyancy and balance straight out of the box. The diver’s breathing is as easily as a casual walk in the park. Streamlined, with no hoses or counterlungs restricting the diver’s visibility, the Apocalypse Type IV transforms the diver into an underwater creature that blends with the environment to allow closer marine contact and a more vivid diving experience than ever before.

SAFE, CERTIFIED and COMPLIANT

A truly unique product, developed out of the 200 man-year Open Revolution™ rebreather safety initiative led by Deep Life Ltd, the Apocalypse Type IV CCR is believed to be the safest recreational SCUBA rebreather that can be engineered today. The Apocalypse Type IV is the only sport rebreather ever to

meet a recognised functional safety standard: the Apocalypse Type IV is certified to IEC EN 61508 – the Functional Safety “Gold standard”, and this has been applied to the mechanics of the Apocalypse Type IV as well as the electronics and software in the instrumented models.

The functional safety is managed through processes certified under the CASS scheme, the most rigorous available, and designated safe to SIL 3: an extremely onerous level. The rebreather is produced under ISO 9001:2008 design and production processes, that are also certified to comply with the environmental standard EN 14001 to deliver quality every time with the minimum environmental impact.

Full compliance with all applicable safety standards and open publication of the safety documentation forms a cornerstone of the design: the formal verification, test results, failure analysis, performance measurements and compliance matrices are audited and published – an openness that is truly revolutionary in rebreather safety. More test data on the Apocalypse Type IV has been published than for all other rebreathers in history added together, and in far greater detail.

The Apocalypse Type IV is packed with safety features. The tactile and audio feedback of the Constant Mass Flow gas injector, binary bail-out valve with an automatic trigger cord, and the Automatic Loop Volume valve in the mouthpiece, are just a few of over 211 safety features built in subtly to make the Apocalypse Type IV even safer than Open Circuit.

PRINCIPLES

A rebreather recycles the diver’s gas by removing carbon dioxide exhaled by the diver and adding oxygen into a closed loop. This offers reduced decompression time, eliminates bubbles and noise, to provide constant buoyancy and dive durations typically five times longer than for an equivalent weight of Open Circuit equipment. Fish sometimes touch the diver, as they are not scared off by bubble noise. Gas consumption is independent of depth, and tiny fraction of that required for an Open Circuit dive.

The Apocalypse Type IV provides a constant mass flow of oxygen to support the diver’s rest level of metabolism, with periodic injection of gas by the diver, or from the Automatic Loop Volume valve (ALV) in pure oxygen mode.

The Apocalypse Type IV in its non-instrumented format can be dived as Oxygen rebreather for shallow diving (6m depth limit) or used as the basis for OEM rebreathers for sports dives or even extreme dives (where CE certification can be achieved for up to 350m depth). It can be upgraded to the deep diver’s iCCR just by adding the iCCR electronics.

EVERY ACCESSORY!

OEM support was planned into the Apocalypse Type IV from the outset, meeting with leading rebreather accessory specialists in May 2008 to create a full range of diver accessories.

The Apocalypse Type IV non-instrumented model provides dive equipment companies with a certified breathing loop in a fully production engineered platform that is packed with safety features on which to develop their products. As a result, companies across Europe and America have developed supporting products for the Apocalypse Type IV.



Narkedat90.com oxygen cell holder for the Apocalypse Type IV O2-CCR



Narkedat90.com 3 cell pod open showing the clean design.

For example, Narkedat90 have created a three cell PPO2 holder and a diver computer interface see in the images here, specially for the Apocalypse.

Fitting a three cell PPO2 monitor to the Apocalypse Type IV CCR brings safety benefits even in its role as an oxygen rebreather: it allows the diver to check they have flushed properly, are using the right gas, and provides divers longer dive durations because the PPO2 is known.



A PPO2 monitor is also a great aid in diver training for later use of Nitrox or Trimix rebreathers

Tecme are another company that offer good quality pre-dive check kits, cleaning accessories and other items.

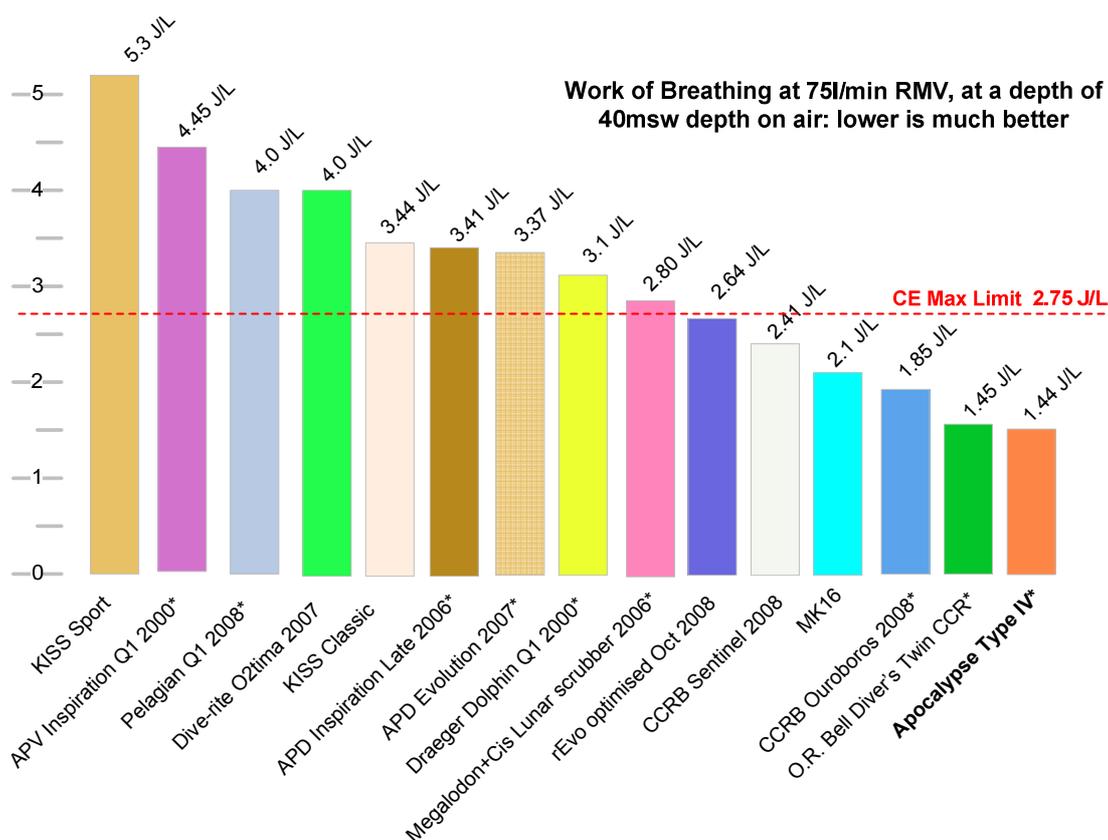
Open Safety are approving these accessories as they are tested and certified.

EASY TO LIVE WITH!

In the words of one of the independent test divers:

I especially liked the weight/trim of the unit. You can wear it, with weights, on land for a long time and not suffer. I had to walk some distance with it to reach a cave on some hills and it was easy. I cannot say the same thing about the 10L steel bailout. In water the trim feels nice. Not much need to fiddle around with the weights.
T.N., CMAS Dive Instructor and Test Diver.

Work of Breathing has been identified by the US Navy's NEDU as a primary factor affecting the diver's safety¹. Low work of breathing is important to minimise retained CO₂, with its associated health risks and effect on diver well being. The Open Revolution rebreathers achieve the lowest confirmed work of breathing that is reported for any SCUBA rebreather.



(*) are units measured by Deep Life Ltd. All others are units measured and reported by CCRB Ltd, ANSTI Ltd, NEDU or Micropore Ltd. Deep Life Ltd sweep the loop volume and take the average of ten breathing cycles with the lowest WOB, all other results are a single loop volume, and in some cases a single cycle with the lowest WOB, which tends to produce a better looking result (typically 0.2 J/L to 0.3J/L lower than that reported by Deep Life or NEDU). The Apocalypse Type IV data has been audited and repeat tests witnessed by SGS United Kingdom Ltd.

The meaning of this extremely low WOB in words of one of the independent test divers:

The unit dives very nicely and is extremely easy to breathe. I have been down to 40m with the twin scrubber unit and did not notice any increase with the breathing effort. With the single scrubber version I have been to 35-ish meters and compared WOB with my Poseidon Xstream. I must say that the rebreather was nicer to breathe. I also tried swimming around fast and did not notice any extra effort required while breathing.
T.N., CMAS Dive Instructor

WOB is just one feature of very many. The sheer build quality and stunning overall performance of the Apocalypse Type IV has put the rebreather world into a spin. OSEL's happy customers dive the Apocalypse Type IV and report great dive experiences.

¹ D. Warkander, "Comprehensive Performance Limits for Diver's Underwater Breathing Gear: Consequences of adopting diver focused limits", U.S. Navy Experimental Dive Unit TR07-02, 2007

TESTIMONIALS AND DIVE REPORTS

Here are a few of the many positive comments we received from Apocalypse Type IV divers:

I have seen a lot of rebreathers come in, and wow, nothing has ever looked anything like as professional as this. It is jaw dropping. The build quality just blows everything else away, and it is apparent as soon we started to open the box. In the water there is just nothing like it. It is the first rebreather I have dived where I am simply unaware the rebreather is there. It fits like a glove. The Apocalypse hoses are completely out of sight and there is just no perceptible work of breathing: breathing from it really was as much effort as if I was walking in the park. The performance of it is so stunning it is the closest thing to becoming a fish. When people wake up to this being available the rebreather world is going to be in different place. *Diver with Customer in USA, who dived the Apoc. Customer has reported on forum in similar terms.*

When I received the two boxes I was actually blown away. I was not expecting the unit to be so professionally packed and was getting excited at unwrapping it. There is not much that gets me excited any more so reading through all the packing labels and getting my way through the packaging was a treat. The 2 tanks supplied are beautiful and really look the part. The construction of the unit and the finish are of the highest quality and if I may say so puts most if not all the other rebreather manufactures to shame, and I hope you don't mind but I told (--REDACTED--) that the build quality was top notch.

To be honest I was not expecting this level of quality from this unit, even with the case and all the words thrown at it over the last year, it is simply just bomb proof (in fact I can try that if needed ☺). Hoses all well marked and it's taken me 10 mins to have it set up and ready. All in all I think you can see I am very impressed! *Customer in UK*

I just can't get over the engineering in this. It is just incredibly well designed and executed. I can hardly imagine the difficulty in tooling some of these items. The ALVBOV design in particular is a work of genius. *Customer in UK*

First thing I noticed besides buoyancy and trim which was spot on to start with, was that the cracking pressure of the ALVBOV is quite high in CC mode. I'm not sure if it's supposed to be like that. It's harder to activate than any rebreather I have ever used before. Swimming with the unit seems easy and doesn't require much effort.

The cylinder valves are very easy to reach, and the unit is very comfortable in the water. Initially I had some trouble locating the bailout actuator and the purge button on the ALVBOV. By the end of the dive, it was no longer an issue. At the beginning of the dive I needed two hands to get the ALVBOV from OC into CC mode, but by the end of the dive, I could do it with one hand in quite a smooth, quick motion.

I suspect I may have to adjust the length of the breathing hoses, and it took some getting used to having breathing hoses running so close to either side of your head. It's much easier to turn your body than turning your head, and - although you can turn your head if you want to - it requires effort and is a bit uncomfortable. The ALVBOV does rest nicely against your chin and I think that it would work well when scootering with a minimum of strain on your mouth.

There was a bit of gurgling in the ALVBOV and breathing hoses during the dive, and I tried the water drain and it works a treat. After the dive it turns out that there was about a cup of water in the exhalation counterlung which I think was loose lips and/or because the crown strap was too tight and became progressively more uncomfortable during the dive.

... The WOB seems great in all orientations as far as I can tell. The difference in WOB when inverted, vertical and on your side is much less pronounced than in any other unit I've owned or dived before.

OSEL were spot on in saying that apart from the 4kg trim weight I would not need anything extra. Over and above my regular weight belt, ...

Cleaning the unit at home was an absolute pleasure. Really simple and quick. In summary: I'm a very happy early adopter and I can't wait to do more dives with the unit.

Customer in South Africa, diving the Apocalypse O2 CCR for the first time, no training – straight out of the box. ALVBOV actuates easily if diver looks down: confirmed on the second dive.

Q: How do you find the prep of the Apoc, anything we could improve?

A: No, it is great as it is. Simply great. Like on Wednesday I was on a small boat with three other rebreather divers. Seeing them sweat with the prep of their units on the beach, and the weight lugging kit onto the boat in the surf brought back memories! The previous dive I arrived on site, I had the Apoc ready while even the open circuit divers are faffing about, and I could carry it all day it is so light! Trying to get a heavy rebreather on your back, with bail-out on a RHIB is not the highlight of diving. The Apoc just goes straight on, fitting like a second skin.

Q: And Underwater?

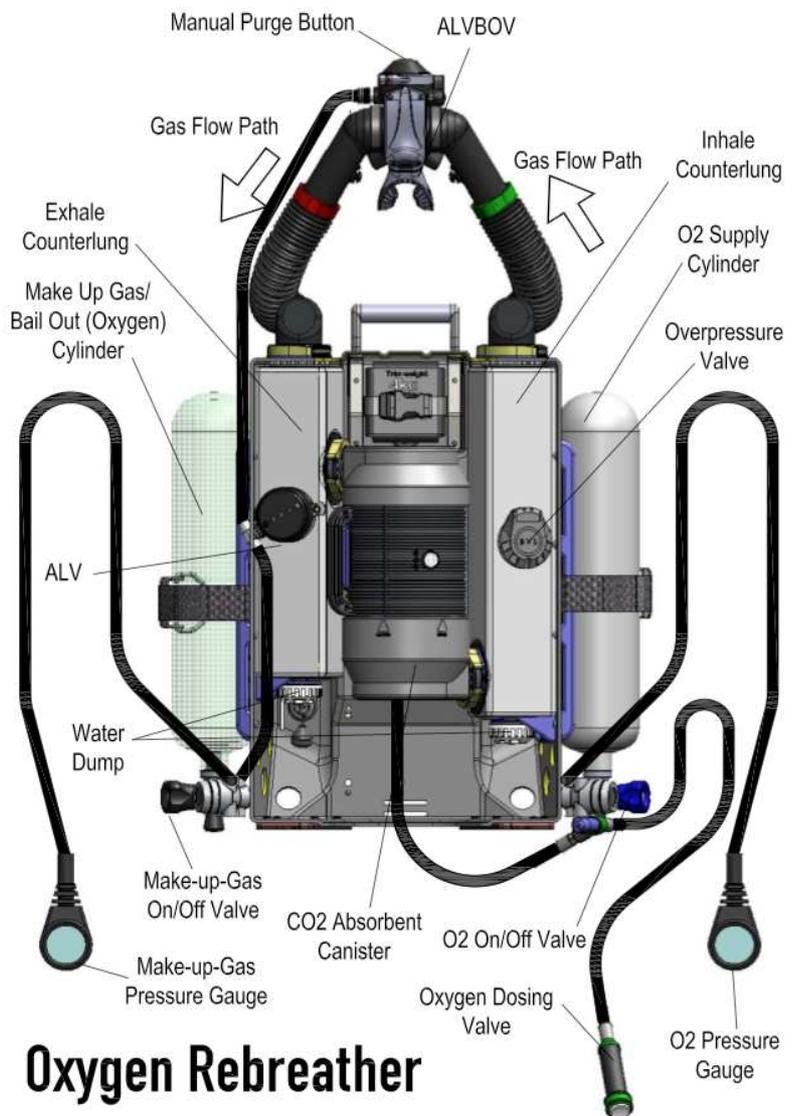
Like I said the last time you rang, it just could not be better. A second skin again. The trim was spot on from day one. With the 4kg weight recommended in the manual it is completely neutral. Breathing effort is just not noticeable ever, and when I move around it hardly changes. Manual injector is nice, the feedback is ideal, both audible and tactile. Very clean hose runs: the A320 regs are especially nice. The ALVBOV is just fantastic: one press and I am bailed out. On my old unit I should carry a wrench to bail-out. The ALVBOV gives reassurance that it will not freeflow. Obviously the hoses and counterlungs on the Apoc don't get in the way of my view out of my mask like they did on (prev rebreather): you don't know what you suffer until the suffering is gone! Everything on the Apoc is in the right place. The Apoc is a really amazing rebreather. *Customer in Europe after a few dives, answers to telephone follow up.*

WHAT YOU GET

The Apocalypse Type IV provides everything you need to dive out of the box, other than training, mask, fins, exposure suit, 4kg of weight and two oxygen gas fills.

The Apocalypse Type IV O2-CCR is supplied as standard with:

1. Case-frame with Swedish ergonomics: light, contoured to rest on the hips, with carry handle,
2. Webbing harness (50mm webbing with shoulder quick releases, D-Rings, 50mm crotch strap),
3. A quality 22.5kg lift CE Certified Tech Wing (Buoyancy Compensator),
4. Breathing Hose assembly with combined Auto Loop Volume and Bail Out Valve,
5. Inhale and exhale counterlungs, heavy duty welded construction with port reinforcing rings, stainless steel springs and 36mm dual button P-Ports,
6. Water Dumps fitted to both counterlungs allowing recovery from a full flood underwater,
7. Automatic Over-Pressure-Valve,
8. Scrubber with a longer endurance than any other with comparable weight, at any depth, under normal diving conditions, and temperatures from 4C to 34C.
9. A Micropore 5" EAC, the safest and easiest to use scrubber technology in existence,
10. Two cylinders each fitted with valves: for oxygen and Make-Up-Gas (US+TC 2.7 litre or CE 3 litre depending on the requirements of the country of delivery), with cylinder labels and inspection,
11. Top quality regulators for oxygen & make-up-gas, each fitted with over-pressure relief valves,
12. Two high quality brass bodied contents gauges,
13. Self cleaning gas injector with 0.7 lpm constant mass flow, and manual inject with tactile feedback,
14. Mouthpiece retainer,
15. Side rail tank mounts with stainless steel cam bands for cylinders,
16. Choice of colours and cylinders,
17. M26 Female to DIN G5/8 Male oxygen filling adapter,
18. Reusable shipping notices for air transport security,
19. User Manual on CD ROM, with copy of exploded drawings, safety certifications and key safety data,
20. OSEL 80L Shipping box.



An option in the webshop offers obtain a second Auto-Loop Volume valve with adjustable cracking pressure, shown in the diagram above. Everything else shown is standard and included in the price.

Consumables

The consumables are available from the Web shop and include:

1. Micropore ExtendAir scrubber cartridges, packs of eight,
2. Virkon tablets or powder for cleaning,
3. Annual Service,
4. Spares kits and wide range of components,
5. Upgrade electronics to full iCCR.

FEATURES IN DETAIL

Operating Limits

- Advised safe depth limit: 6msw using pure oxygen (CNS limit). With the iCCR electronics upgrade allowing use of gases other than pure oxygen: 30msw using air due to narcosis, and 80msw using 16% Heliox or Trimix (advisory limit for safe diving).
Note that the respiratory breathing limit is beyond 100msw using air (well beyond narcotic limits) and over 350m using Heliox (far beyond non-saturation diving limits).
- Operating temperature in air: -40C to +50C.
- Operating temperature in water: 4C to +34C.

Dimensions

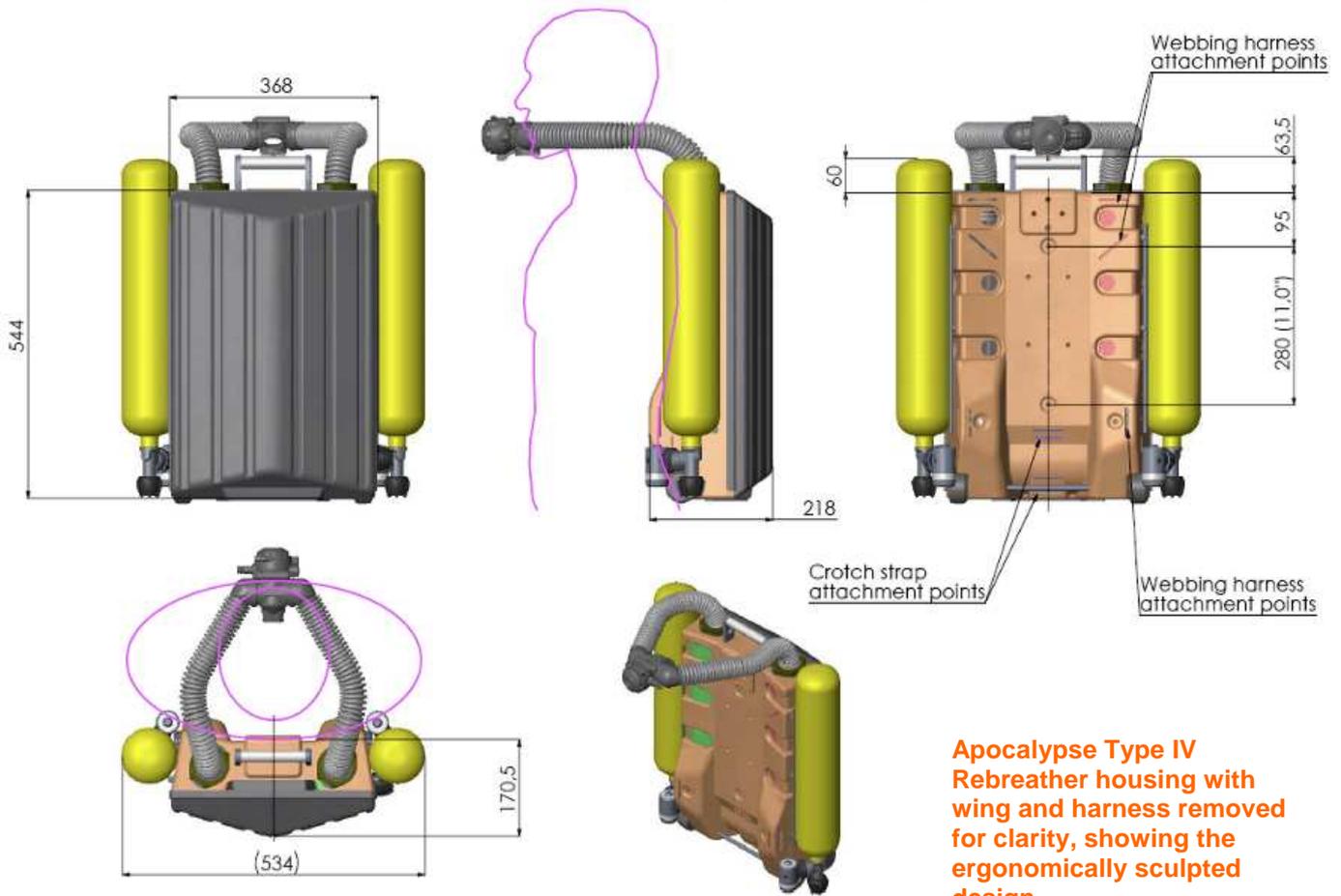
A lot of attention has been paid to the ergonomics, from reducing weight, the body sculpted form and the secure harness attachment, providing ease of access to all parts.

The rebreather is 37cm wide, which positions the valves on side-mounted cylinders just where the diver's hands fall.

The rebreather is 54cm high, plus a handle that is 6.4cm. This means the diver can sit down comfortably wearing the rebreather.

The hoses route directly to the diver's mouth: no more big breathing hose loops that reduce the diver's field of vision – the breathing hoses on the Apocalypse Type IV are out of site so they can be reached easily but do not obscure.

The rebreather profile is 17.5cm from the diver's back, and 21.8cm at its maximum point: it rests on the hips. The frame of the rebreather acts as a backplate, with webbing slots and bolts just as a backplate.



Apocalypse Type IV Rebreather housing with wing and harness removed for clarity, showing the ergonomically sculpted design.

Weight

The total weight ready-to-dive, with standard harness, a 2 litre light-weight make-up-gas cylinder, 4kg trim weight, gas & EAC is ~17kg. If it is fitted with twin external cylinders the ready to dive weight is typically 23kg to 25kg. This is around 15kg lighter than most other rebreathers ready-to-dive.

The weight is also optimal underwater: it is completely neutral and balanced with the internal trim weight (4kg), so diving in a wet suit, or a dry suit, or even just shorts does not need any buoyancy inflation or extra lead.

Preparation between dives as short as two minutes

The Apocalypse requires as little as two minutes to remove the old scrubber, wash the breathing loop, unpack and fit a new scrubber, then pressurise as the positive pressure test that starts the pre-dive checks. This fast turnaround time is a reflection of the unique two button connectors allowing fast disassembly and reassembly, the ease of scrubber and counterlung access, and the use of EAC scrubber cartridges.

Washing out the rebreather involves unclipping one port and inserting a hose: water drains from the water dumps.

Scrubber Endurance

The endurance of the EAC scrubber has been tested rigorously and the durations in the User Manual cover the full range of depths, water temperatures and breathing rates.

The endurance is believed to be better at any temperature than any other rebreather, per weight. Uniquely, it is also reasonably constant with depth.

The scrubber endurance is not affected by breaks of up to two weeks, subject to the scrubber remaining in the rebreather.

The endurance to the 2.0 kPa CO₂ limit in NORSOK U-101:1999 is 2 hours 45 minutes, at an ambient water temperature of 4C and a CO₂ injection rate of 1.6 lpm, which equates to an oxygen metabolism of 1.78 lpm. This metabolism covers 99% of divers swimming at a hard rate.

Many companies specify scrubber endurance as a “profile to 40m”, which usually means all but the first 20 minutes is at a shallow depth. For example one heavier granular scrubber claimed to have “3 hour endurance”, but in fact breaks through after just 30 minutes at 40m constant depth: a fraction of the endurance of the Apocalypse Type IV scrubber. Moreover, the Apocalypse Type IV scrubber endurance is quoted from measurements made right at the mouth as required by the standards, not at a point upstream of the mouthpiece – measuring CO₂ in the wrong place is commonly used to eliminate dead-space and hence artificially stretch durations.

Perfect trim straight out of the box

The trim is perfect straight out of the box, fitting just a 4kg weight to the weight pouch inside the unit. There is no need to strap weights to cylinders or BCDs to achieve the ideal diver attitude.

For a diver in a shortie, no extra weight should be needed other than the 4kg trim weight: for thick wet suits and dry suits, the diver should weight themselves the same as if snorkelling in that suit.

The integration with the sea is so good, it is even possible to dive it normally in the very unlikely event of a buoyancy compensator failure: a video of an Apocalypse Type IV with the BC removed is on our gallery of our webshop.

Oxygen Injector

The oxygen injector is a unique self-cleaning design, with a sapphire orifice opening up as the manual inject valve is pressed.

There is a strong tactile feedback so the diver knows immediately he touches the injector whether the gas supply is on or off. It also has a clear audible feedback when gas is injected at the higher rate.

The O₂ injector has a unique coaxial hose giving the clean lines of a single hose. The injector is mounted on the waist as standard, with a longer hose for chest mounting available as an option.

The pressure needed to operate the button is set at 1kg, to avoid cramp in the fingers in cold water.

Order options for waist mounting or longer chest mounting hoses are available in webshop on ordering or servicing.



Professional Right to Left Loop

Professional rebreathers use right to left gas flow because hoses or ports are marked in red and green for dirty and clean gas respectively, which is visible when looking at the diver. The normal maritime convention uses Red and Green for Port and Starboard, so this leads naturally to Green on the right.

Another reason for Right to Left flow is that as a general principle any oxygen rich gas should come from the right, so the oxygen cylinder is on the right side, which tends to lead the diver to think that his oxygen rich gas comes from the right.

There is one further reason for right to left: most divers' right hands are slightly stronger and more adept than their left hand, so the right hand can inject oxygen better.

Gas Regulators

The highest quality Apollo regulators have been chosen for the Apocalypse Type IV CCR, to ensure we supply a premium product with optimal hose routing. Apollo is a Japanese company that has been producing high quality regulators for decades, and are among the most expensive first stages on the market.

The M26 threaded oxygen regulator has a special label in green identifying it as an absolute pressure regulator to ensure this is not accidentally swapped with a standard regulator for safety reasons.

The Make-Up-Gas maintains the loop volume automatically, as well as providing bail-out gas: the integrated BOV allows instant access in an emergency. The Apocalypse Type IV has been designed to support all viable means of configuring bailout cylinders suitable for diving even to 100m (with the iCCR electronics upgrade).



The oxygen cylinders supplied will last between four and twelve hours, depending on the size of the diver and the amount of work being carried out – well beyond the scrubber duration. The oxygen injector has a tactile feedback so the diver can tell immediately if the oxygen is off, or when the oxygen tank is empty. The diver should always check the gas before the dive, and we also provide top quality brass cylinder contents gauges tucked into the harness to enable the diver to do comfort checks on gas during the dive. This is one area that is very different to Open Circuit: a rebreather diver should never run out of gas underwater because they use so little.

Buoyancy control

The rebreather is supplied fitted with a high quality wing that is designed specially for the Apocalypse Type IV providing 22.5kg of lift under CE test conditions.

Buoyancy swing when the Apocalypse is fully flooded is 8.5kg, assuming that both counterlungs are flooded, hoses are completely flooded and scrubber is flooded. The wings provide enough buoyancy in the event of a total loop flood to keep the diver safe, and allow the diver to flush out the water.

The Counterlungs provide 6 litres of volume: two normal breaths. The Work of Breathing - loop volume curve is so flat that buoyancy can be controlled by adjusting loop volume in the event of BCD failure.

Harness

A webbing harness is provided as standard, with shoulder pads and waist pads, as well as a crotch strap.

D-rings on the crotch strap support scooters and D-rings on the harness support additional bail out cylinders carried on the left or right of the diver.

Apocalypse Type IV in the optional yellow colour. (3rd Party PPO2 Monitor not supplied).

Dual Button 36mm P-Ports

The P-ports provide a simple connector, but again loaded with safety features:

- ◆ Two buttons that have to be pressed at the same time to disengage, to prevent accidental loop failure,
- ◆ Use of double piston EPDM O-rings to avoid dives being lost from a single O-ring failure,
- ◆ Large 36mm internal bore provides a low resistance to gas flow,
- ◆ Custom plastics formulated to prevent off-gassing,
- ◆ Main parts are screwed together for reliability,
- ◆ Tested for 100kg pulls, four times the CE requirement, as are the breathing hoses.

Water Dumps

Water dumps are provided on the bottom of each counterlung, and operate in a similar fashion to those on a BCD or a wing. To dump water, the diver fully inflates the loop when upright and pulls the toggles. A one-way valve prevents water ingress to the counterlungs while the dump is open in normal diving attitudes. A third water dump

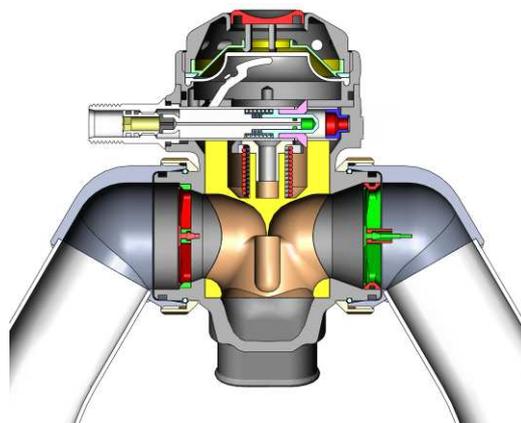
is fitted to the ALVBOV so divers can dump water without having to do contortions to move the water around hoses. The breathing hoses are spiral, so shed water more easily than normal hoses, and avoid trapping water and bacteria.

The combination of these features allows the rebreather to be completely flooded and then recovered underwater. Even the EAC scrubber material is flood tolerant for up to five minutes of flooded water immersion.

Combined Auto-Shut-Off, Auto-Loop-Volume and Bail-out-valve

The combined valve is hardly larger than many Open Circuit demand valves, but is packed with novel safety features², including:

- ◆ As well as the rebreather having the lowest claimed work of breathing of any rebreather, the mouthpiece also has the lowest work of breathing at just 0.52 J/L at 40msw with a 75 lpm RMV – the standard CE test conditions. This is the flow contouring that can be seen in the cross-section opposite.
- ◆ The valve is bi-polar: it cannot be set half open, or half closed. We did not patent this feature on purpose, to offer other manufacturers the option to improve the safety of their BOV designs.
- ◆ It ensures the bail-out-valve works when it is needed, by using the same valve for automatic-loop-volume and bail-out. The cracking pressure of the valve is adjusted automatically as it switches between closed and open circuit.
- ◆ The diaphragm is protected from free-flow using vortex balancing: in the presence of a strong current it creates a vortex of water under the purge button to counterbalance the force from the oncoming water – whether this is direct or at an angle.
- ◆ The ALVBOV has plastic elbows for robustness, and for neutral buoyancy in salt water.
- ◆ Flapper valves cannot be swapped
- ◆ Removing the valve from the mouth causes the breathing loop to shut automatically using a neck trigger cord
- ◆ It has a provision for a power drive from the iCCR, such that the diver is bailed out and the loop is shut automatically, when the loop cannot sustain life.



Counterlungs

Back mounted counterlungs are strongly preferred by divers over the more common Over-The-Shoulder (OTS) design, because they do not block the diver's vision and can provide a lower Work Of Breathing. The reason OTS designs are more common is that they can meet the hydrostatic imbalance limits in Europe easily; but the Apocalypse has a better solution: biased counterlungs.

The bias makes the counterlungs act like bellows that want to expand outwards, so there are a few millibars of breathing assistance when the diver is on his back. This counteracts the hydrostatic pressure in that position, and gives more range for adjusting the loop in other positions.



Apocalypse Type IV diver about to enter a cave, behind, with the iCCR upgrade fitted.

The counterlungs are made from a single layer of ultra-flexible material that is more resistant to knife attack than 1100 grade Cordura: it simply flows around the knife. The counterlungs are further protected from the environment by their location inside the rebreather housing.

A 36mm I.D. stainless steel spring prevents the counterlungs trapping gas. Compared to the 8mm I.D. coils normally fitted, they provide a lower resistance gas path under the worst operating conditions. Integrated snorkels allow flood tolerance in all orientations for exit from a wreck or cave on a flooding rebreather loop in closed circuit mode.

² Patents pending in PCT countries in respect of multiple features

Over-Pressure-Valve (OPV)

The OPV is on the inhale counterlung: this is the only correct place for it. There is a safety hazard on all rebreathers with OPVs on the exhale side: in a fast ascent the gas expands in the inhale counterlung and goes back through the scrubber to the exhale counterlung and then is exhausted. As it does so, it carries with it the injected oxygen. The result is that the PPO2 breathed by the diver plummets. The solution is to put the OPV on the inhale counterlung as it is on the Open Revolution rebreathers such as the Apocalypse Type IV.

Respiratory performance at different depths and work rates, using air

For diving deeper than 6m, it is absolutely essential to fit a PPO2 monitor and automatic bailout, such as the Open Safety iCCR upgrade. The information provided below is for purpose of underlining the future proofing of the Apocalypse Type IV, in being able to support all of your future diving needs with the appropriate PPO2 monitoring and bailout supplement.

Diver Vertical: Make up gas is air

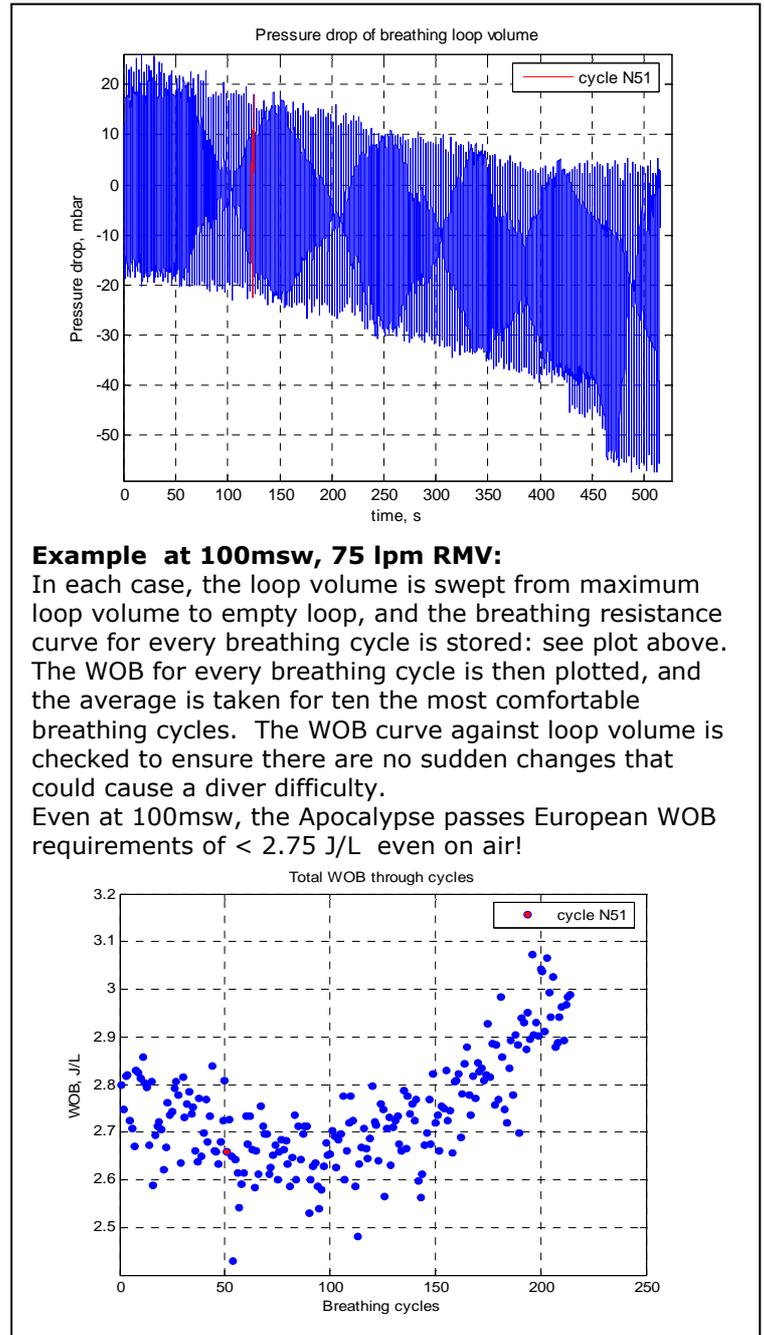
RMV	Depth msw	WOB, J/l Typical and (best case)	Inhale / exhale peak pressure, mbar
10	0	0.14	8.5 / 15.9
	40	0.18	-3.4 / 4.8
	60	0.2	-10.1 / -2.5
	100	0.23	-8.8 / -1.4
40	0	0.40	4.8 / 18.0
	40	0.41	6.4 / 19.4
	60	0.56	-7.5 / 5.6
	100	0.74	-11.0 / 2.6
75	0	0.64 (0.58)	-1.2 / 18.1
	40	1.44 (1.39)	-7.1 / 17.8
	60	1.85	-16.2 / 12.9
	80	2.2	-17.9 / 15.3
	100	2.66	-22.7 / 18.0
90	0	0.73 (0.67)	3.0 / 20.7
	40	1.96 (1.93)	-10.9 / 19.2
	60	2.46	-19.1 / 14.6
	80	2.95	-23.5 / 18.1
	100	3.55	-27.9 / 24.2

Diver Horizontal: Make up gas is air

RMV	Depth, msw	WOB, J/l Typical and (best case)	Inhale / exhale peak pressure, mbar
40	0	0.20	6.0 / 11.1
	40	0.43	3.8 / 12.1
	53	0.49	2.8 / 11.0

The role of Work of Breathing (WOB) on diver's comfort is obvious but its critical role in diver's safety has only been understood recently.

The attention given to achieving the lowest WOB in the Apocalypse Type IV rebreather is no different to the attention to each of the other safety issues. Some of these are immediately apparent, others are more subtle. The result is that the Apocalypse Type IV is a leap ahead in safe rebreather diving.



Ordering

The Apocalypse Type IV rebreather can be ordered online on www.opensafety.eu, with delivery worldwide.



Open Safety Equipment Ltd
Zetland Road, Hillington, Glasgow, Scotland

Online shop and further data:
www.opensafety.eu

Contact
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