INCURSION CMR

Combined Mode Military Rebreather

O2-CCR, SCR, Switchable CCR / SCR,
Front and Back Mountable

NORTHERN DIVER

MINE WARFARE & MILITARY DIVING SPECIALISTS

A SAFE AND RELIABLE MILITARY REBREATHER, SUPPORTING ALL MISSION PROFILES.

FEATURES

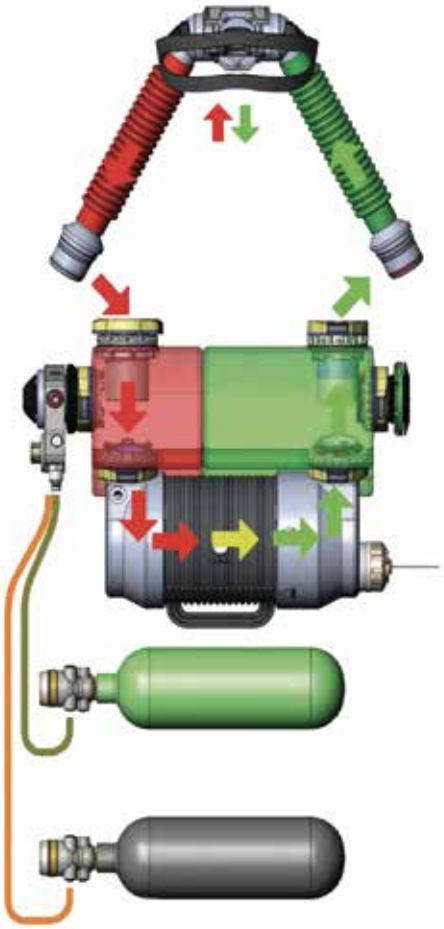
- State of the art military rebreather supporting O2-CCR and SCR operating modes, both dedicated and underwater switchable.
- Front or back-mount, with the same unit
- CE, NORSOK and NEDU standards compliant & certified.
- Functional Safety to SIL 3: audited, with full disclosure of safety case, all test data, FMECA, HAZOPs etc.
- Rugged with exceptional availability, backed by lifetime warranty on design, parts, materials and safety
- Light: 10.3kg to 17.4kg depending on configuration, ready to dive including trim weights, scrubber and gas
- Compact satchel style (35 x 41 x 16cm) including cylinder
- Internal counterlungs for high entry or scooter use
- Flood tolerant – can be recovered from a flood underwater without surfacing
- > 4 hour scrubber duration, >6 hour gas duration
- Lowest Work of Breathing in industry at
  0.35 J/L at 10m, 62.5 lpm RMV,
  0.6 J/L at 40m on air, 40 lpm RMV,
  1.44 J/L at 40msw on air, 75lpm RMV,
  0.9 J/L at 100msw Heliox, 75lpm RMV
- Fully field serviceable without tools
- Low maintenance, with all servicing and repairs able to be performed in-country: technician courses available.
- Cylinders are avionic (vacuum) tested for HALO use
- Integrates with OTS through water comms
- Low-Mag as standard and Non-Mag options (to NATO STANAG 2897 Class A, static and dynamic tests)
- Low acoustic signature to NATO STANAG 1158
- Surface Buoyancy Device available
- Clips to diveable tactical vest carrying body armour
- Proven with Naval and Special Forces around the world from arctic to tropics

BENEFITS

- Covers all mission profiles with one unit
- Low cost in capital and ownership: lifetime warranty and free upgrade policy
- Dive turn around time of minutes, using EACs and ready cleaning access
- No surprises: All test data published, audited and verified

APPLICATIONS

- Shallow Mine Counter Measures (VSWMCM)
- Deep Mine Counter Measures (MCM) Nitrox,
- Underwater intervention and rescue
- Fleet maintenance / Hull inspections



DESCRIPTION

The rebreather is supplied as a base unit, onto which a mission configuration pack is plugged in. These mission packs are:

1. O2-CCR for shallow water operations
2. SCR for deep water operations
3. O2-CCR & SCR switchable for complex mission profiles or to reduce decompression.
4. Back-mount mission pack to provide both instant bailout and gas addition direct into mouthpiece. A dedicated back mount version is also available.

The base unit is Non-Mag, and all configurations are available in both standard Low-Mag and Non-Mag (NATO STANAG 2897 NM-B and NM-A).

OPERATING PRINCIPLES

A rebreather recycles the gas exhaled by the diver, removing carbon dioxide and adding oxygen, to form a closed loop. This results no bubbles, low noise, and constant buoyancy and dive durations typically five times longer than for an equivalent weight of Open Circuit: gas consumption on a rebreather is independent of depth.

The image on the right shows the gas flow around the Incursion. Dirty gas exhaled by the diver is red. It passes though a counterlung, where the oxygen is added by an automatic diluent loop volume valve (ADV).
It then passes into the CO2 absorbent canister ("the scrubber") where the CO2 is removed. The clean gas (green) then passed into the inhale counterlung. The gas then returns to the diver's mouthpiece, clean, ready to breathe. These parts are illustrated below.

Any water is blocked by snorkel tubes and can be dumped from a water dump: even a fully flooded Incursion can be recovered without surfacing. The Micropore EAC Scrubber avoids a caustic cocktail.

In dual CCR & SCR mode, a switch allows the rebreather to be set while underwater for pure O2-CCR mode use for shallow diving, or to SCR mode for Nitrox or Trimix use. In SCR mode a constant mass of gas per minute is fed into the rebreather – the oxygen is partially metabolised by the diver and the excess is vented via the Over Pressure Valve (OPV).

UNPARALLELED SAFETY

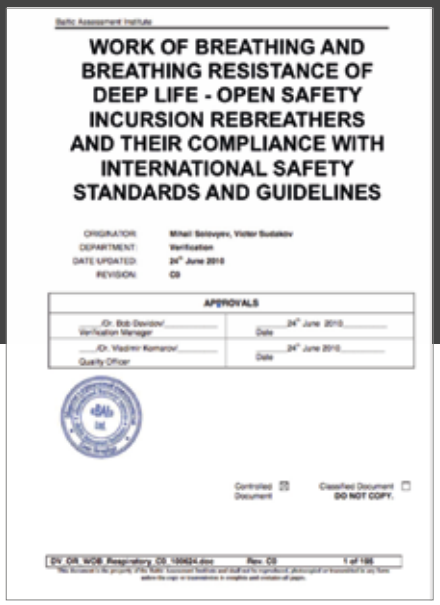
Developed out of the British and Norwegian rebreather safety initiative for commercial North Sea divers, a 200 man-year project, the Incursion CCRs are believed to be the safest rebreather that can be engineered today. The Incursion is the only military rebreather to be certified to meet any recognised Functional Safety standard: in this case, to the Gold Standard, IEC EN 61508, and at the most onerous level (SIL3) including all mechanics, electronics and software options.


SGS

Deep Life Ltd.

EC Directive 89/686/EEC

EC Type-examination


WORK OF BREATHING AND BREATHING RESISTANCE OF DEEP LIFE - OPEN SAFETY INCURSION REBREATHERS AND THEIR COMPLIANCE WITH INTERNATIONAL SAFETY STANDARDS AND GUIDELINES

APPROVALS


sira CERTIFICATION

FUNCTIONAL SAFETY CERTIFICATE

Deep Life Ltd

IEC 61508 Part 1:1998 Clause 6

Management of Functional Safety

cass

THOROUGH TESTING, WITH FULL RESULTS AVAILABLE

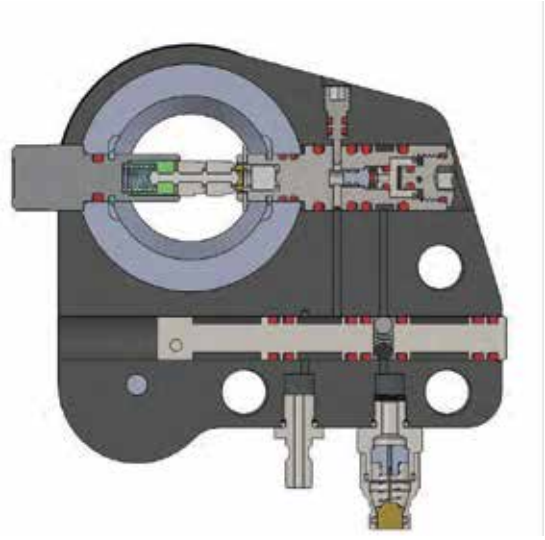
Full compliance with all applicable safety standards, with open publication of the safety case and safety documentation are cornerstones of the design.

UNIQUE FEATURES

Evaluating new rebreathers can be time consuming and labour intensive. To minimise that overhead, the Incursion family of rebreathers has been the subject of one the most stringent testing regimes ever, and the full test results, failure analysis, performance measurements and compliance matrices are audited and published for critique.

FAULT-TOLERANT AND FAIL SAFE

Fail evident, fail safe and triple redundancy of critical safety barriers are unique aspects in the Incursion CMR. A good example is in the Gas Switch, where three failures must occur simultaneously before Nitrox gas can leak into the oxygen circuit - something that requires just one failure of competitors' products. Moreover, the Incursion gas Switch uses multiple technologies to avoid any common-mode failures.



RIGHT: Cross-section of the Gas Switch showing many layers of safety. It contrasts with contemporary switches where there is no safety margin.

EAR SCRUBBER

The scrubber uses a 125mm diameter Micropore ExtendAir Cartridge (EAC): this has benefits over older granular scrubber systems of:

- flood tolerant
- no dust
- no tunnelling or bypass
- greatly reduced caustic risks,
- can be unpacked and fitted in one minute,

Scrubber housing has a viewing window to check the scrubber is fitted.
A granular adapter is available for use with Molecular Productions 797 Sodalime or similar, in emergencies, taking 2.6kg of Sofnolime.

FLOOD TOLERANT

The entire breathing loop can be flooded, water drained using the water dumps fitted to the scrubber, all underwater without surfacing, and the dive continued.

The EAC scrubber can be put in water for five minutes and then fitted without any significant loss of scrubber capacity or risk of caustic cocktail. This is a new technology that greatly enhances the overall safety.

TURN-AROUND-TIME AS LOW AS TWO MINUTES

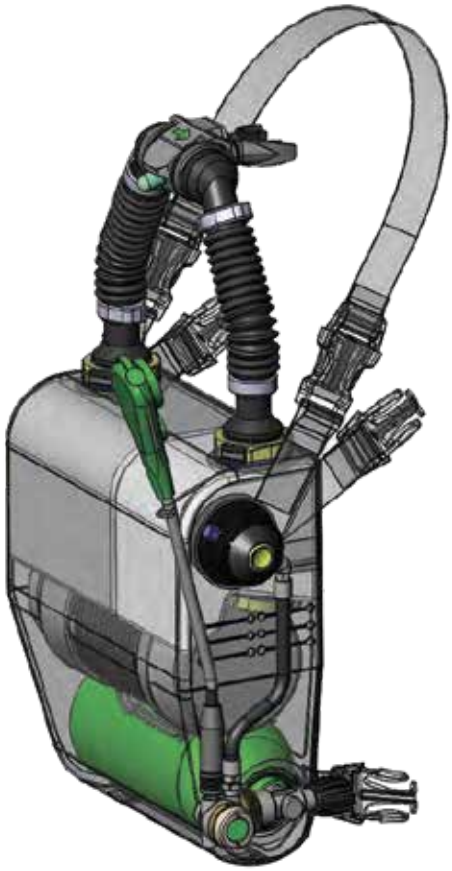
The Incursion takes just a few minutes to remove an old scrubber, rinse the breathing loop, unpack then fit a new scrubber, and commence the negative pressure test that starts the pre-dive checks. This fast turnaround time is a reflection of the clean loop design, ease of scrubber access, and the use of Micropore EAC scrubber cartridges.

ERGONOMICS

The ergonomics focus on reliable service, with fast deployment: the absolute minimum time for changeover between dives. This is coupled with a light and versatile package that can be fully dismantled, checked and reassembled even in pitch black darkness. The Incursion clips to tactical jackets in common use or can be supplied with the Incursion Special Forces Tactical Vest, with its integral support for body armour. A surface buoyancy jacket as an optional extra item, clipping directly to the Incursion SF Vest.

The diver mouthpiece assembly is one of the most comfortable in the industry, with hoses angled around the diver's face for the maximum visibility, with swivel action on the hoses to avoid fatigue, and mouthpiece retention strap.

MISSION CONFIGURATION PACKS



INCURSION CMR BASE UNIT

Includes:

- Satchel
- Inhale and Exhale Counterlungs,
- OPV
- Scrubber assembly
- Breathing hoses
- DSV with head strap, internal weight pouch, Neck strap,
- Sample EAC scrubber cartridge
- Field spares kit
- Printed Manual
- Technical Passport
- Carry case, 40 litre size, providing free air ventilation to the rebreather, and preparation mat.
- Shipping case (2 rebreathers per case): 80 litre fixed lid
- Copy of Production Checklist
- Lifetime guarantee certificates: covering workmanship, materials and all safety upgrades.
- Non-Mag units are supplied with magnetometer polar plots.

The Incursion-CMR requires at least one mission pack in order to be dived.

O2-CCR MISSION PACK

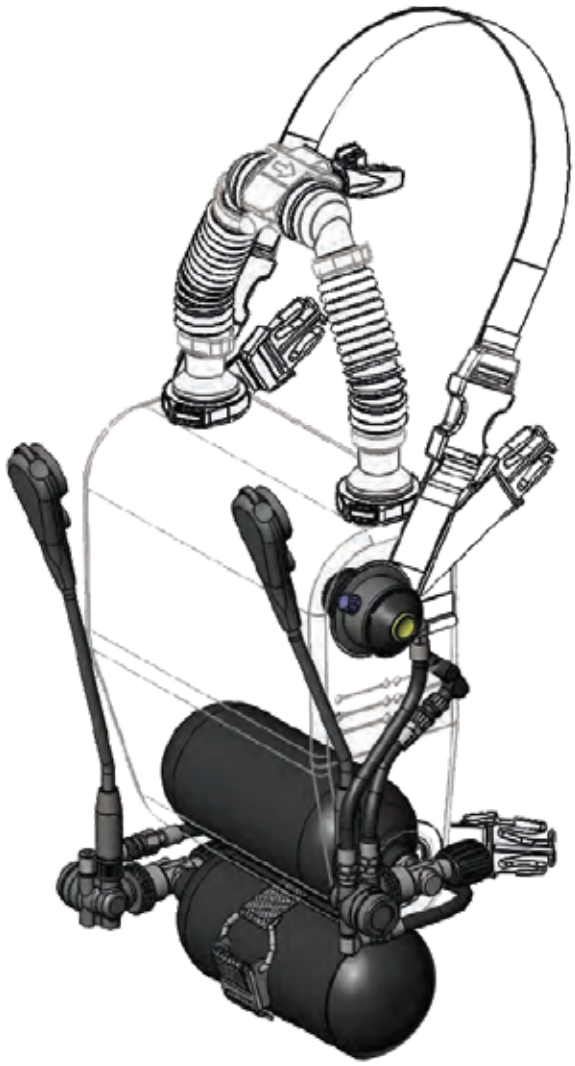
Includes:

- 2L 300 bar carbon wrapped SS904L Non-Mag cylinder
- Valve with M26 DIN outlet
- A320 1st stage regulator with M26 DIN inlet
- Auto Loop Volume Valve
- Oxygen SPG
- Pressure Relief Valve
- All gas hoses
- M26 to G5/8 fill adapter
- Technical Passport
- Certificates of Conformity
- Copy of Production Checklist
- Lifetime guarantee covering design, workmanship materials and all safety upgrades.
- Non-Mag units are supplied with magnetometer polar plots

SCR MISSION PACK

Mission pack to configure the Incursion-CMR as a dedicated Nitrox Semi-Closed Rebreather comprises:

- Two (2x) Nitrox 2L 300 bar carbon wrapped SS904L Non-Mag cylinders, each with:
  - valve with G5/8 DIN outlet,
  - A320 1st stage regulator with G5/8 DIN inlet,
  - Nitrox SPG
  - Pressure Relief Valve
- Cylinder connectors
- All gas hoses
- Swivel and zero-face connectors linking regulators and gas inputs
- Serial orifices for 60%, 50%, 40%, 32%Nitrox
- Flow Gauge with hoses
- Technical Passport
- Certificates of Conformity
- Copy of Production Checklist
- Lifetime guarantee covering design, workmanship, parts and materials, and all safety upgrades.
- Non-Mag units are supplied with magnetometer polar plots



PPO2 MONITORING PACKS

Several options are supported for PPO2 monitoring, including:
“Ironman” Head Up Display with compass, depth gauge and dive computer Wrist Mount Dive Computer, with compass and depth gauge

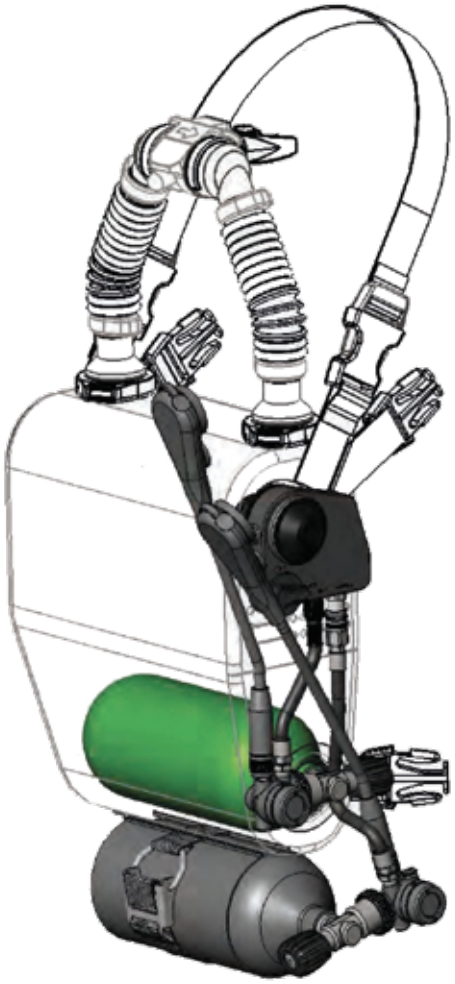
The pack comprises:

- 2L 300 bar oxygen carbon wrapped SS904L Non-Mag (green) cylinder, with:
  - valve with M26 DIN outlet
  - A320 1st stage absolute pressureregulator with M26 DIN inlet
  - Oxygen SPG
  - Pressure Relief Valve
  - M26 to G5/8 fill adapter
  - Hose with international fitting
- Nitrox 2L 300 bar carbon wrapped SS904L Non-Mag (black) cylinder, with:
  - valve with G5/8 DIN outlet
  - A320 1st stage absolute pressure regulator with G5/8 DIN inlet
  - Nitrox SPG
  - Pressure Relief Valve
  - Hose with zero-face fitting
- Cylinder connectors
- both single ended and serial orifices for pure O2 60%, 50%, 40%, 32% Nitrox for diving to 40m
- All gas hoses
- CCR-SCR switch with integrated ALV
- Technical Passport
- Certificates of Conformity
- Copy of Production Checklist
- Lifetime guarantee covering design, workmanship, parts and materials, and all safety upgrades.
- Non-Mag units are supplied with magnetometer polar plots

SWITCHED MODE MISSION PACK

The Switch Mode Mission Pack can either be supplied as a single configuration or as add on products to either the O2 CCR and SCR mission packs.

The Switchable Mode allows the diver to operate the rebreather as a Nitrox or Heliox SCR during the deep portions of the dive and switch to O2-CCR Mode underwater for shallow approach or reduced decompression time.



Mel Simm
Military Sales Director
Office: +44 (0) 1257 25 69 36
Mobile: +44 (0) 7877 693 876
Email: mel@ndiver.com

Neil Tordoff
Commercial Sales Director
Office: +44 (0) 1257 25 69 49
Mobile: +44 (0) 7972 061 533
Email: neil@ndiver.com

WWW.NDIVER-MILITARY.COM

Northern Diver International Ltd.East Quarry, Appley Lane North, Appley Bridge
Lancashire,WN6 9AE, UK