



HUS (Head Up Screen)

User Instruction Manual

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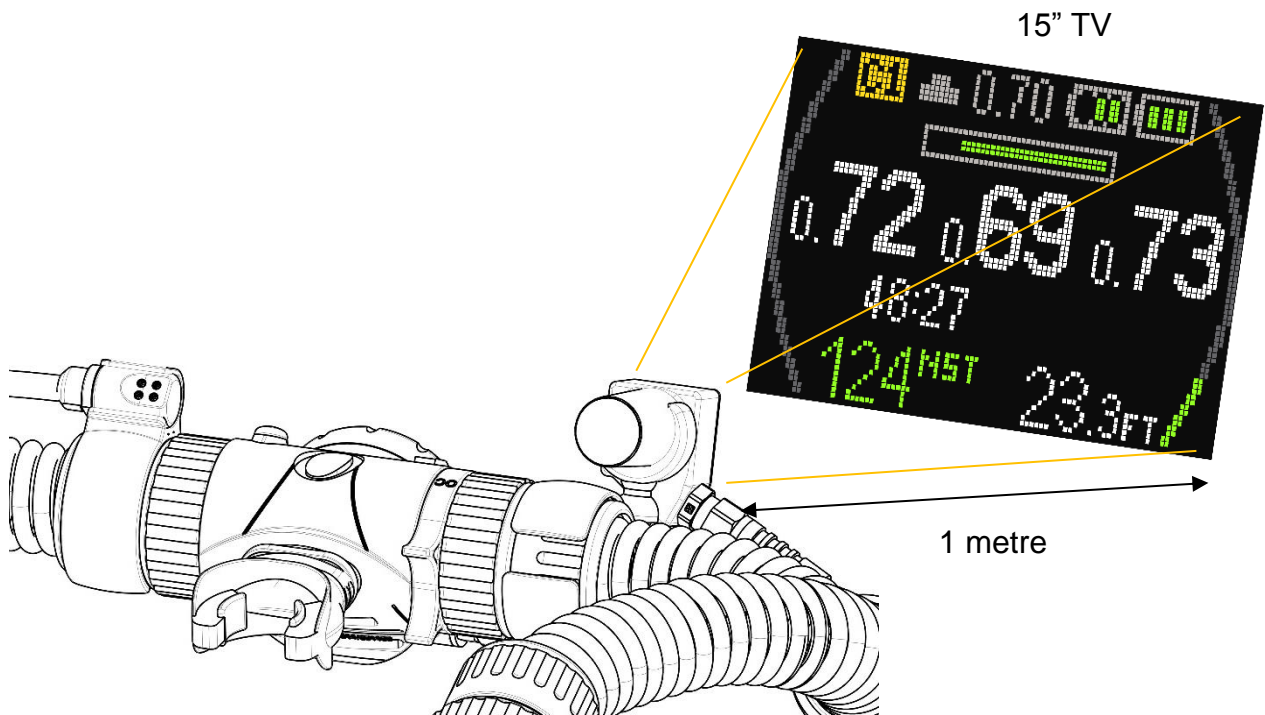
WARNING. These user instructions do not replace the AP Diving Rebreather Manual in any way and do not explain the full rebreather functionality. These instructions will detail the HUS as part of the rebreather system only.



WARNING. The HUS has optics that are designed for use underwater and as such the display is remarkably clearer underwater than on the surface. On the surface you have to focus on the display, however underwater, there is no need to focus at all, the complete display is in focus at all times.

HUS – Head Up Screen

AP Diving's HUS or Head Up Screen (RB130) is a near-eye, hands free secondary display that shows the diver real-time information directly from the rebreather's oxygen controller electronics. The clever underwater optical lens magnifies the display so it appears as if it is a 15" TV approximately 1 metre away. This gives live rebreather information in the line of sight for the complete dive, without the need to refocus. For many prescriptions normally removing the need for special masks or lenses to compensate for poor eyesight. The HUS has been specially developed for use with AP Diving's range of rebreathers, equipped with Vision electronics and is intended as an upgrade for existing customers as well as an optional item with new AP Diving rebreathers.



The HUS is mounted on the rebreather mouthpiece using an adjustable articulated mounting arm allowing bespoke positioning of the device to give the optimal view of the display without compromising the diver's vision of the diving environment. Due to the mounting being so close to the mask, the HUS can be read in very low visibility conditions where the conventional wrist mounted primary display would be more awkward to read. This style of display also allows true hands free diving whilst still monitoring the rebreather at all times. Excellent for photographers, videographers and people who require two hands to work or play underwater.

The full colour display conveys all the key rebreather information with the added benefit of conditional colouring to highlight the current status of the information provided.

The HUS is driven by a bespoke I²C channel, the same I²C connection that delivers the display information to the Handset. For this reason the HUS is provided in addition to the HUD, as the HUD is driven by raw PPO₂ values direct from the oxygen controllers and therefore can be used to fly the rebreather in the unlikely event of an I²C communication failure.

HUS Features

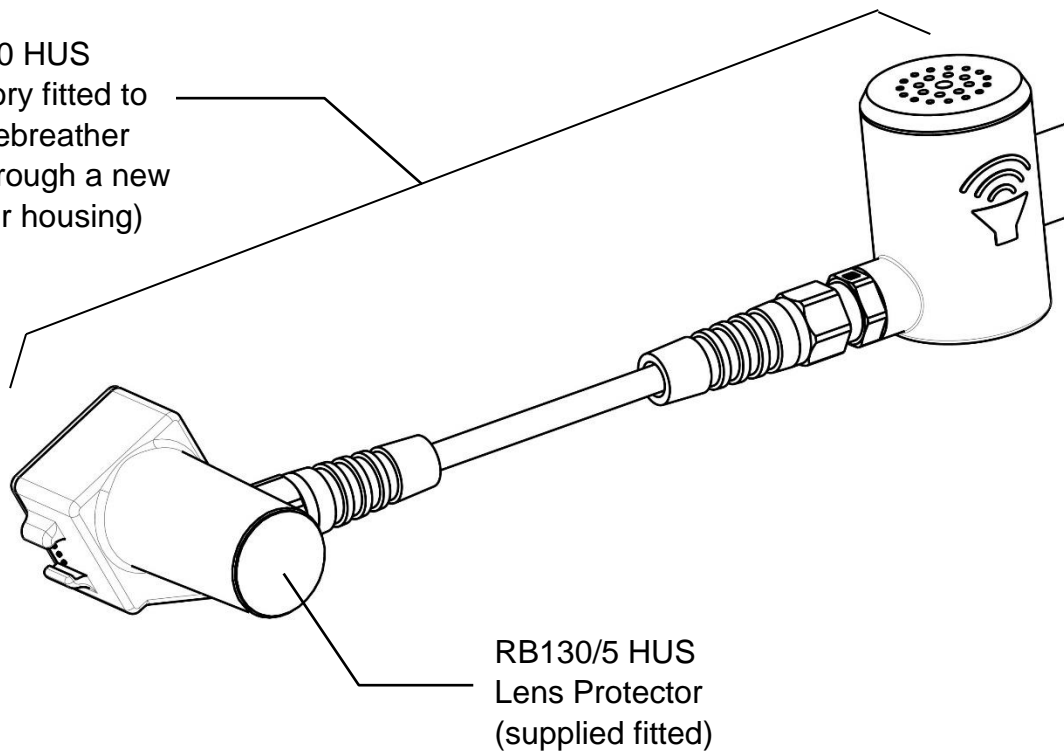
- For use with all AP Diving Rebreathers using Vision Electronics with firmware Version 06.00.00 and onwards installed
- Displays real-time information directly from the rebreather's oxygen controllers
- Displayed data includes depth, time, decompression obligation, PPO₂ values, setpoint, Setpoint switch method, battery status and more
- All rebreather warnings communicated directly to the divers eye
- Additional graphical display of ascent rate and ceiling height
- Intuitive graphical layout complements the existing rebreather handset
- Hands free rebreather monitoring in the line of sight without the need to refocus
- No need for prescription masks or lenses to compensate for poor eyesight for most prescriptions
- Excellent readability even in very poor visibility conditions
- Full colour display with conditional colouring
- Secondary display, giving extra system redundancy
- Low power consumption and powered by the Vision rebreather lid batteries guaranteeing seamless power supply
- Flexible mounting through articulated arm and therefore suitable for all types of half and full face masks
- Driven off one I²C bus arm giving appropriate isolation security from other peripherals
- Type Tested for CE approval according to the EN14143:2013 Rebreather standard (Notified Body: SGS United Kingdom Ltd)

Important Information

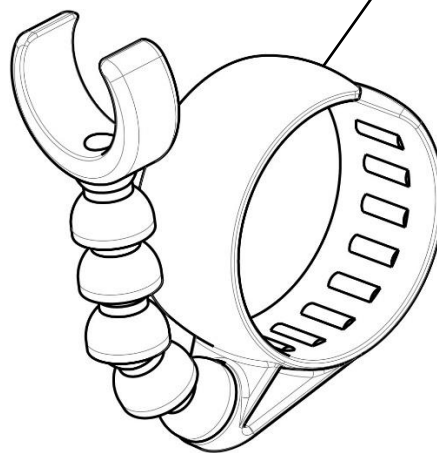
- DO:** Read the instruction manual fully before using the rebreather
- DO:** Carry out all pre-dive checks prior to each dive
- DO:** Protect the HUS against shock at all times and avoid scratches on the lens by replacing the lens protector if it starts to peel
- DO:** Make sure that the HUS is free from mechanical damage and that the lens is not impeded in any way that could affect its use
- DO:** Wash the HUS with fresh water after each dive to avoid any salt or dirt build up
- DO NOT:** Ignore warnings displayed by the HUS
- DO NOT:** Dive without sufficient battery power or enter the water until the rebreather is correctly calibrated and in surface mode
- DO NOT:** Mount the HUS in any way that obstructs the use of other rebreather functions, such as operating the mouthpiece / OCB, or the view of the handset
- DO NOT:** Attempt to open the HUS as it is designed as a sealed unit
- DO NOT:** Attempt to modify the rebreather and HUS in any way
- DO NOT:** Use chemicals to clean the HUS

Parts Supplied

RB130 HUS
(Factory fitted to
the Rebreather
Lid through a new
buzzer housing)

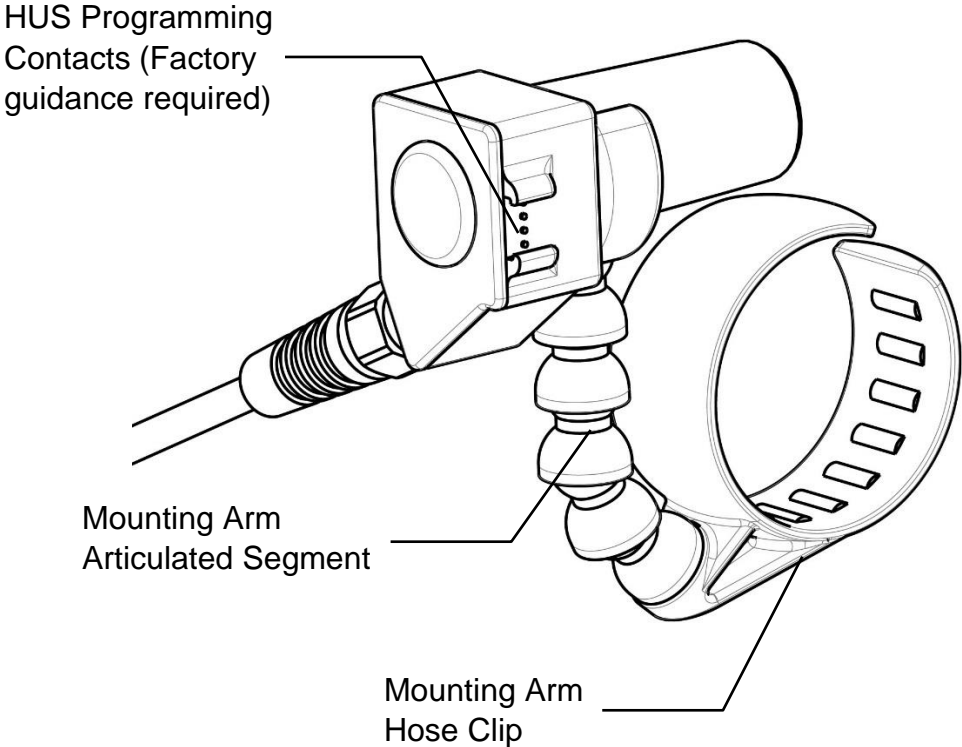
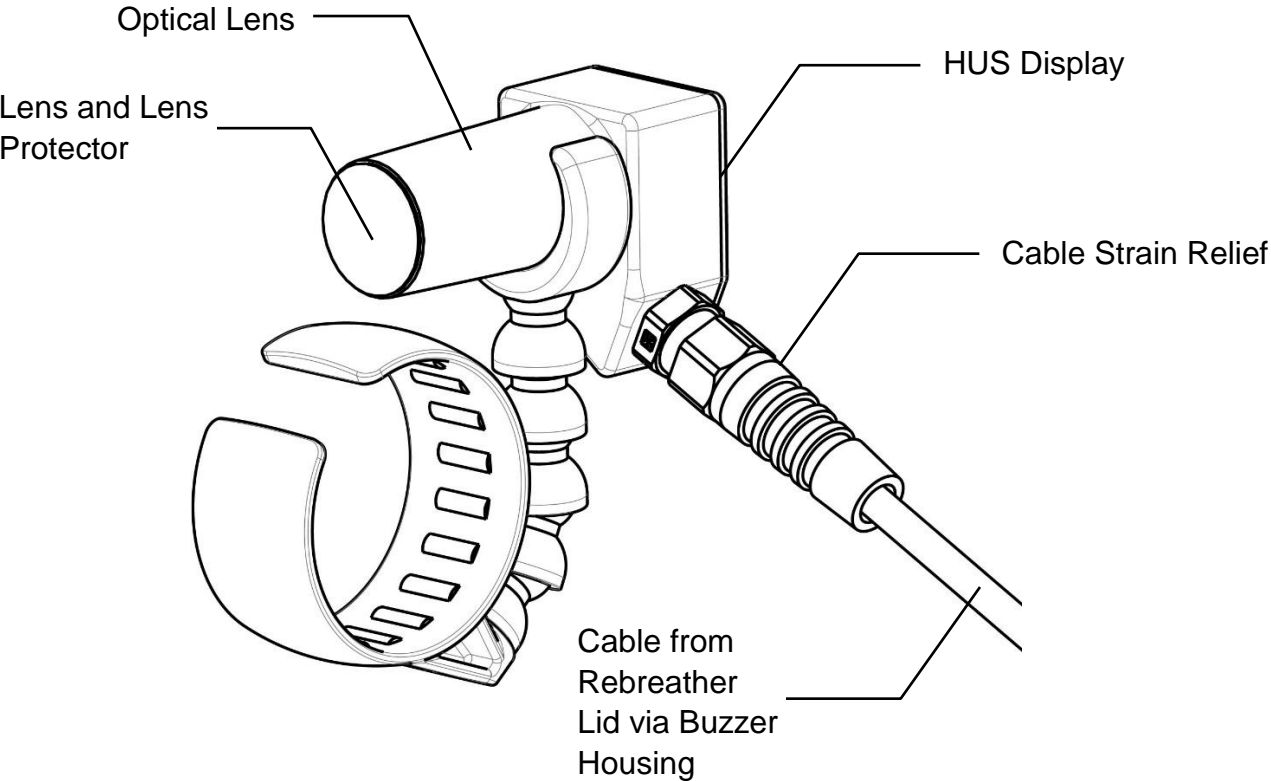


RB131 HUS
Mounting Arm



Note: The HUS is a sealed potted unit and no attempt should be made to disassemble the housing in any way. Trying to do so could cause irreversible damage to the display and electronics.

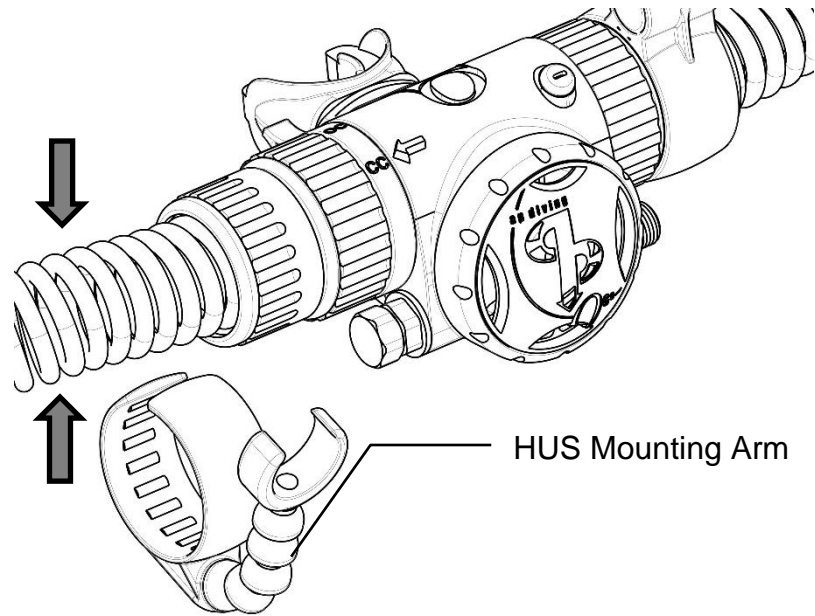
HUS Configuration



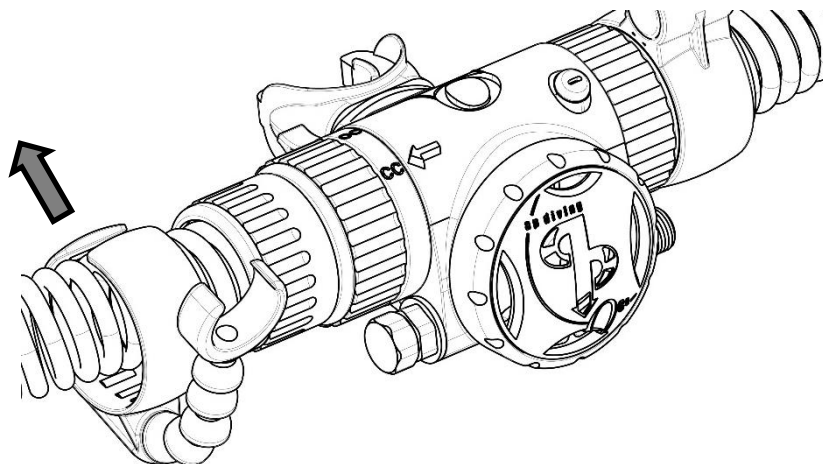
HUS Assembly / Mounting

The HUS comes factory fitted to the Rebreather Lid. It is wired into the controllers through a new buzzer housing. The rebreather firmware must be V06.00.00 or higher for the HUS to work and this will be installed as standard. We recommend that the HUS is assembled within the Rebreather using the following procedure:

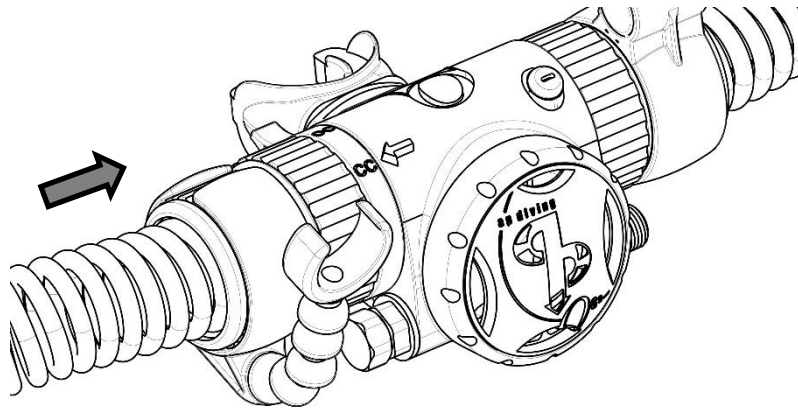
1. Compress exhale mouthpiece hose next to the mouthpiece hose fittings



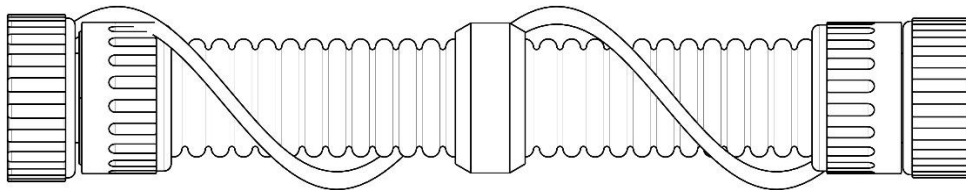
2. Whilst compressed, thread the HUS mounting arm over the hose



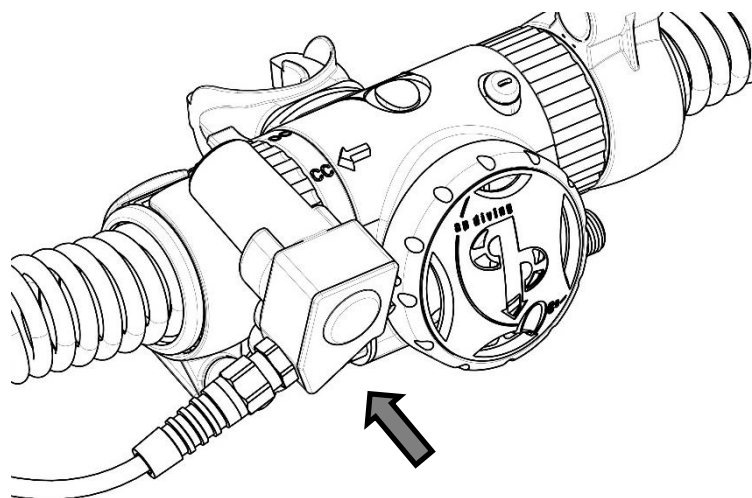
3. Slide the mounting arm onto the hose fitting where it should snap into place



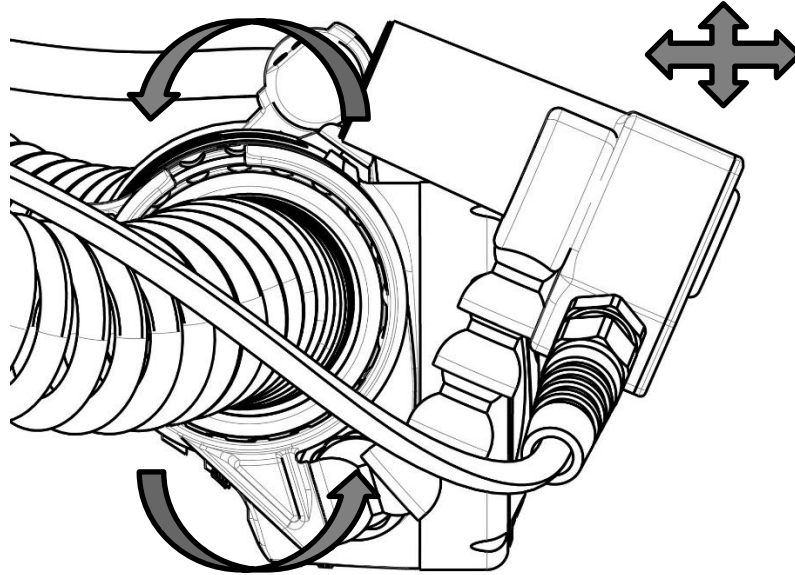
4. Prior to mounting the HUS, it is recommended that the HUS cable is wrapped around the convoluted hose to prevent the cable from becoming a snag hazard. Depending on the rebreather setup and hose lengths, it may be necessary to wrap the cable around several times to take up extra length.



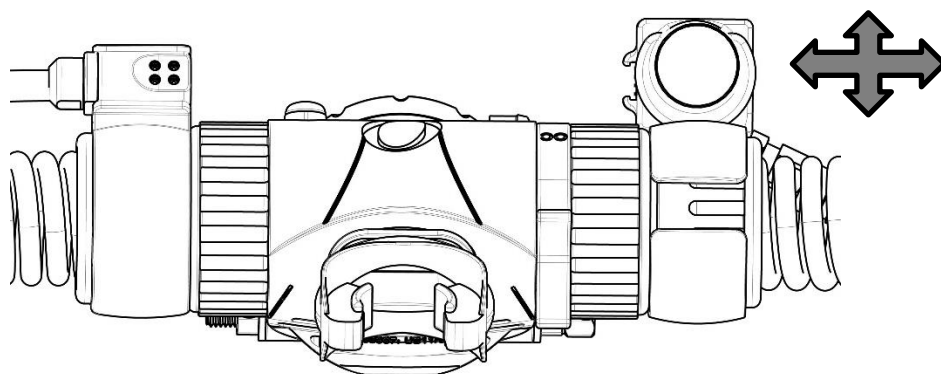
5. Slide the HUS into the mounting arm from the front until the clip is at the bottom of the HUS barrel



6. Rotate the mounting arm around the hose fitting and manipulate the articulated arm to position the HUS into an approximate position (as if it would point towards the mask)



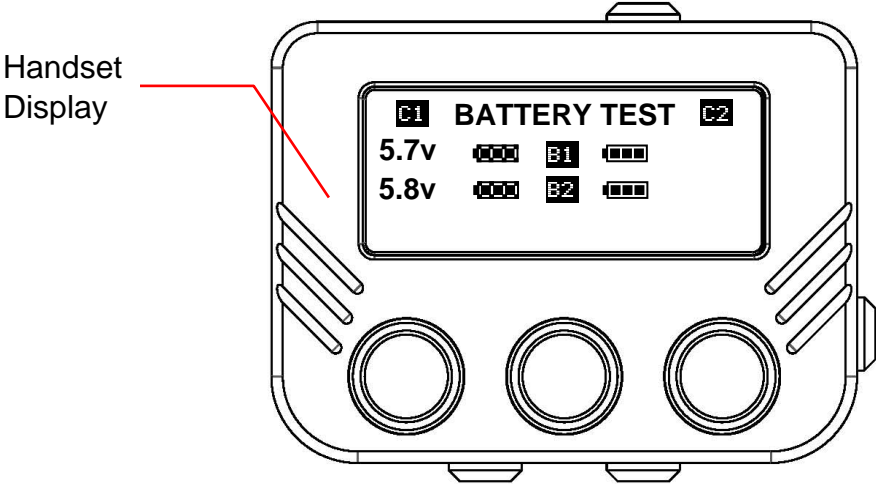
7. When wearing the unit reposition the HUS to the desired position for your particular mask and preferences.



The nature of the articulated arm means that very fine position adjustments are possible, and alterations can be made at any time prior to or during the dive. The HUS arm length can be adjusted by removing or adding push-together sections.

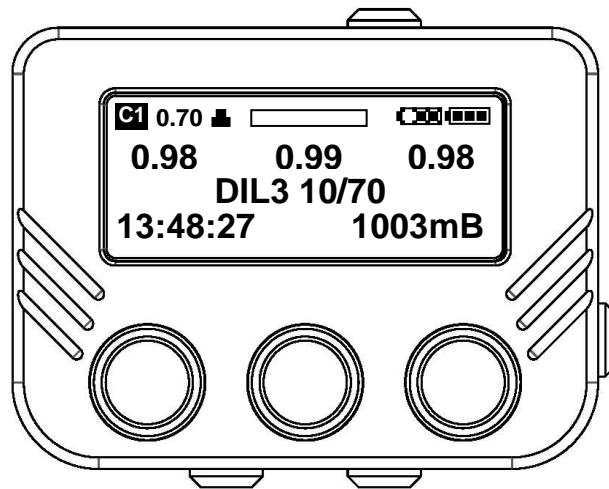
Pre-Dive / Surface Mode

Whilst the rebreather goes through its start-up process and self-tests, the HUS displays the AP Diving logo.



During this time the diver will be looking at the primary display (handset) and confirming the electronic checklist.

Following a successful calibration the HUS will display the 'Surface Mode' screen:



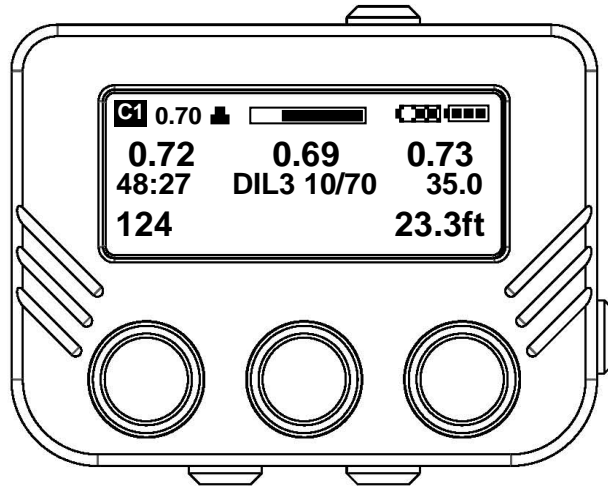
The HUS has been laid out in a very similar fashion to the handset so it is very intuitive for existing users and there is no confusion when alternating between the two displays. The HUS uses high contrast colours to help highlight important information as well as the status of the rebreather. In general terms white and green are good, red is used to highlight conditions that are important to the diver. i.e. when battery has low voltage, when they ascend too fast or have a warning of any sort. Yellow is used as an intermediate condition for decompression condition and ascent rate.

The 'Surface Mode' is identified by the time and atmospheric pressure. These will change to show dive time, depth and deco obligation once sufficient depth is reached for the rebreather to enter 'Dive Mode' i.e. 1.2m

Dive Mode

No Stop Time (NST) Display

Until sufficient depth and time causes a decompression obligation, the handset and HUS show a no stop time (NST) along with the dive time and current depth.

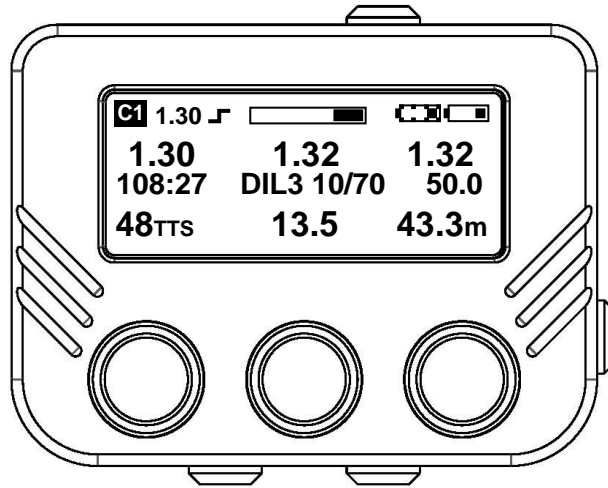


The no stop time is shown in green, meaning there is currently no decompression required. The scrubber monitor and battery status are also in green showing a good condition. All other information in this example are shown in white as they are all within the appropriate limits.

In an attempt not to crowd the HUS display, it does not display max depth, current gas, any CCR and DECO menus or functions found by pressing and holding buttons. These are however still shown on the handset.

Time To Surface (TTS) Display

When sufficient depth and time causes a decompression obligation, the handset and HUS show a time to surface (TTS) along with the dive time, current depth and a ceiling height that the diver should not exceed.

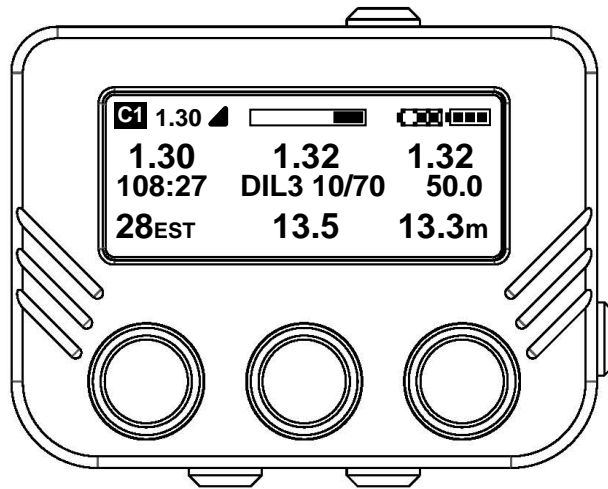


The time to surface and ceiling height are shown in yellow, highlighting the decompression obligation currently in place. The HUS also shows a graphical representation of the ceiling height in relation to the current depth. This is the curve on the left of the display and is explained later in this manual.

The scrubber monitor and B1 battery status in this example are in red showing a low battery issue and poor condition of the CO₂ scrubber.

Estimated Time To Surface (EST) Display

When the current depth has been shallower than the ceiling height for more than 2 minutes (a ceiling violation), the TTS will be replaced with an EST (estimated time to surface).

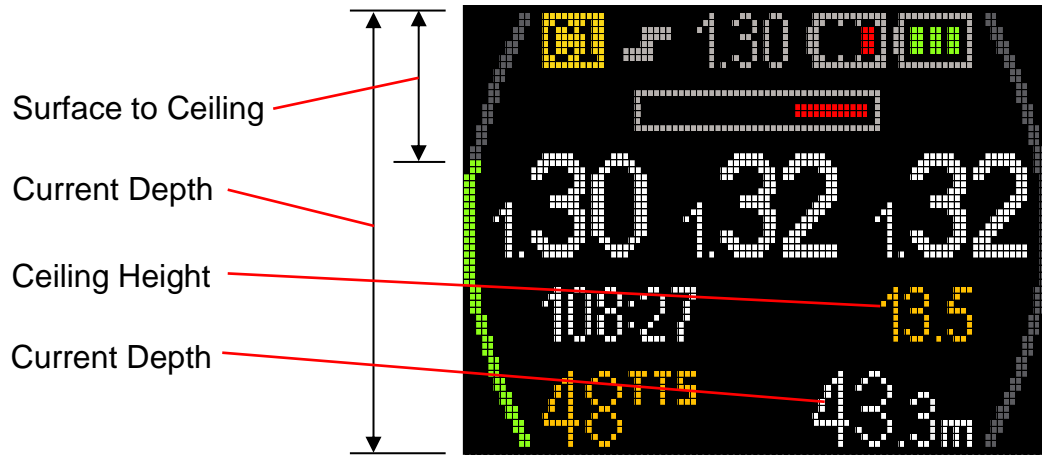


The estimated time to surface and ceiling height are shown in red, highlighting the fact that the decompression is now estimated due to the ceiling violation.

Ceiling Height and Violation

Ceiling Height

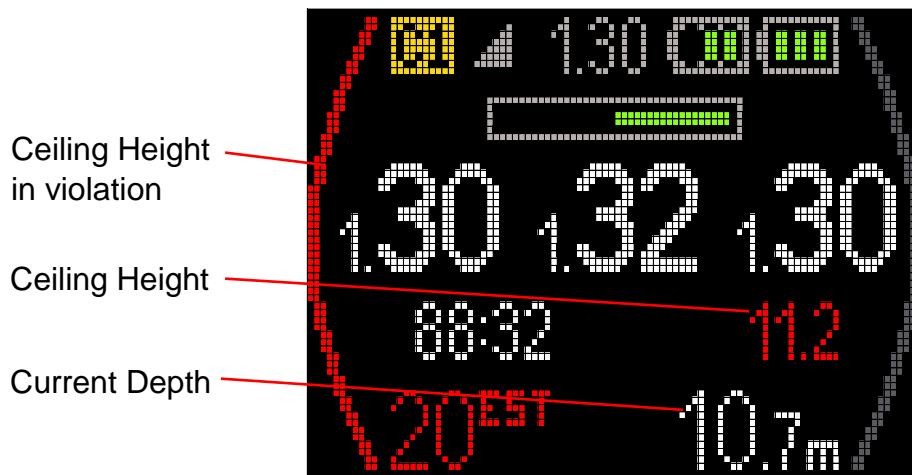
Both the HUS and rebreather handset display ceiling height as a numerical value (either in metres or feet) However, the HUS also has a graphical representation for this on the left of the display.



The green shows the 'Ceiling Height' in relation to the 'Current Depth'. This is continually updated throughout the dive once decompression is incurred and until no other stops are required, when the grey graphic will extend to the bottom of the screen.



Ceiling Violation

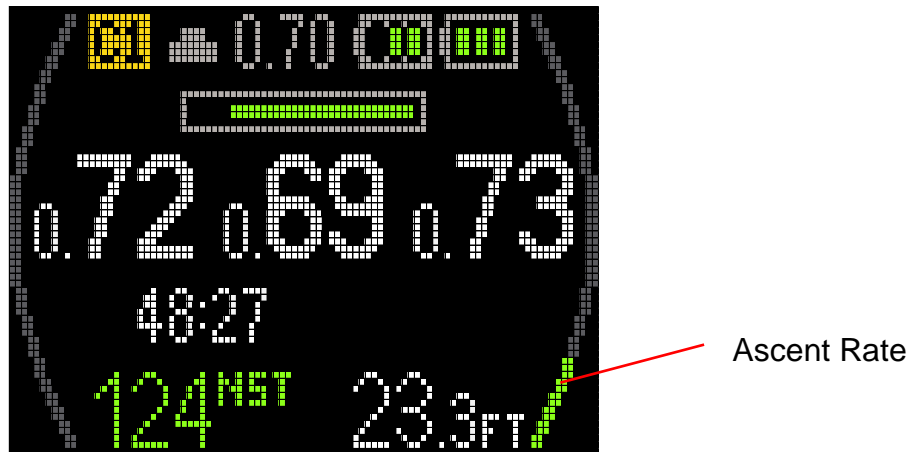


When the current depth has been shallower than the ceiling height for more than 2 minutes, the ceiling violation will be shown with a full red curve on the left as well as the normal 'Ceiling Violation' warning across the display.



Ascent Rate

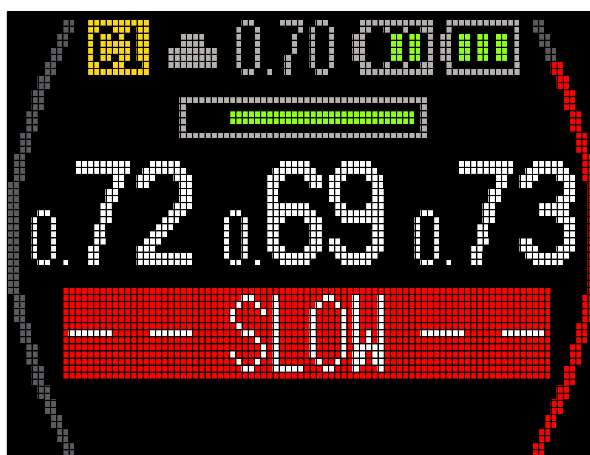
The ascent rate is represented graphically on the right of the display.



When ascending at a rate of less than 5m/min the bar graph will be green.

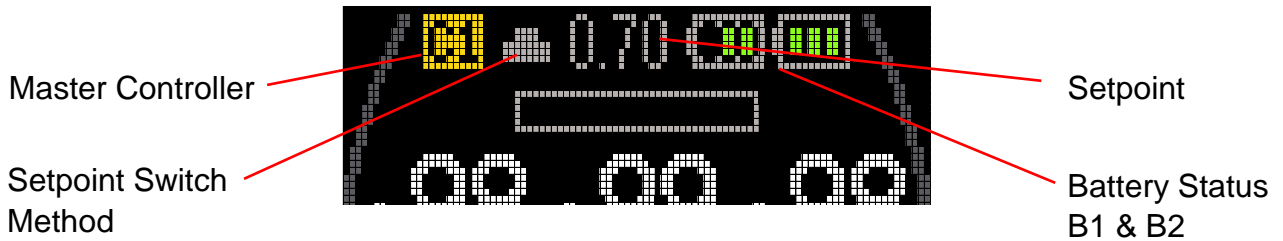


As the ascent rate increases the graphic extends higher and turns yellow when the ascent rate is between 5 and 10m/min.

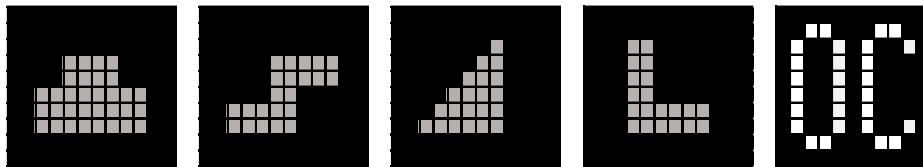


When ascending at a rate above 10m/min the bar graph will be red and you will see the ' - - SLOW - - ' warning.

Setpoint and Battery Icons

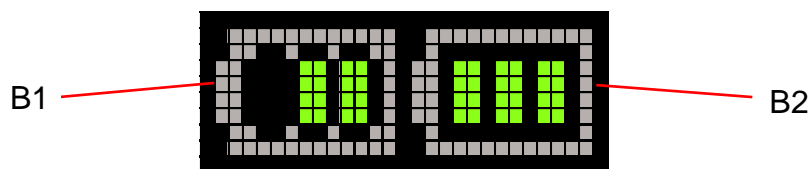


The Setpoint Switch Mode icons are shown below, manual, automatic, gradual and forced low (respectively). If the diver selects to switch to Open Circuit on the handset, the 'OC' symbol will replace the setpoint mode icon.

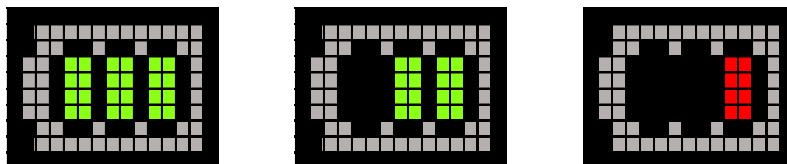


Battery Icons

The HUS incorporates the same highlighted frame to indicate which battery is the master. (providing power to the solenoid and display)



Conditional colouring is used to help highlight a low battery condition

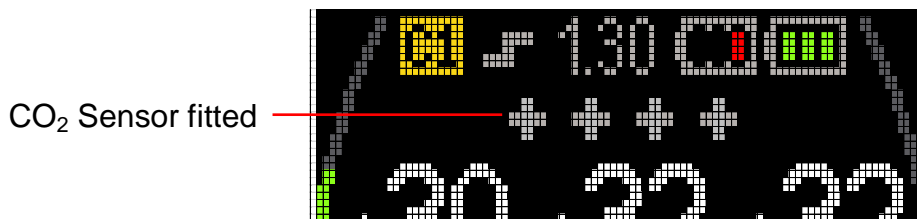


Optional Connectivity

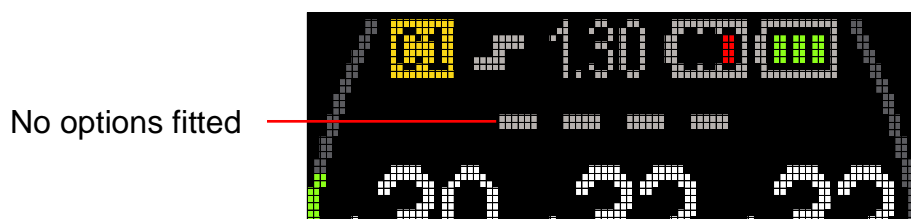
There are various options that can be used with AP diving rebreathers and these options are highlighted on the HUS as well as the handset.



The Scrubber Monitor is displayed in the same way as the handset but with the added benefit of conditional colouring. When the active area of the scrubber is becoming low the bar will change from green to red to highlight this issue.



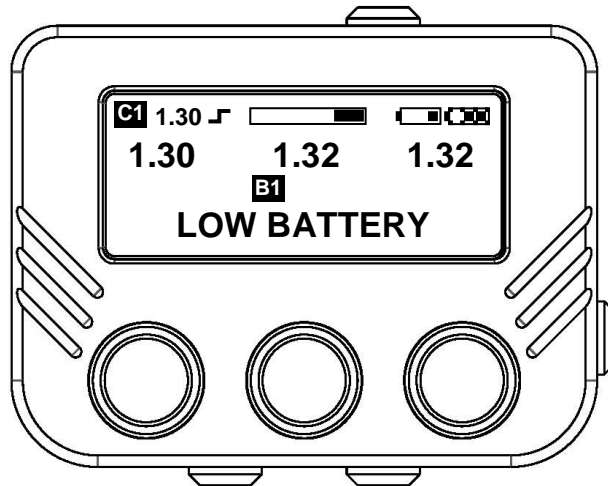
If a scrubber monitor is not fitted, but a CO₂ Sensor is present then '++++' is displayed.



If neither a scrubber monitor nor CO₂ sensor is fitted then '- - -' is displayed.

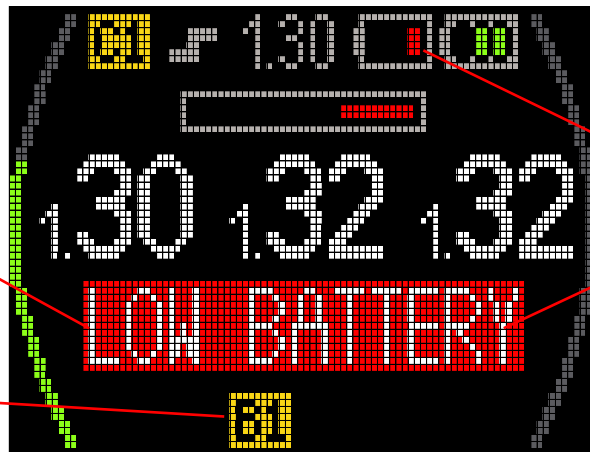
Warnings

Warnings are shown on both the handset and the HUS.



Warning Description

Battery with warning

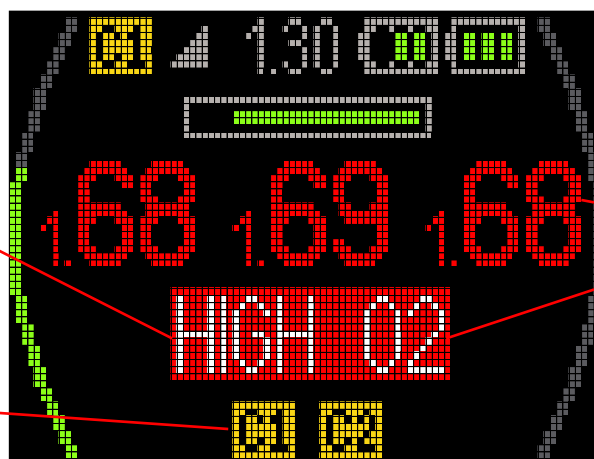


Conditional Colouring

The HUS displays which Controllers (or Batteries) are generating the warning as well as conditionally colouring the related information red – in this case the PPO₂ values.

Warning Description

Controllers with warning



Conditional Colouring

Other warnings displayed on the HUS and handset are as follows:

Warning for	Warning text displayed
High Oxygen	HIGH O2
Low Oxygen	LOW O2
Scrubber Monitor - Ascend	SCRUBBER
Scrubber Monitor - Bailout	SCRUBBER
CO2 Alarm - Ascend	CO2 ALARM
CO2 Alarm - Bailout	CO2 ALARM
Oxygen Sensor	CELL !!!
Low Battery	LOW BATTERY
PPO2	PPO2 !!!
Fast Ascent	- - SLOW - -
Ceiling Violation	↓ ↓ DOWN ↓ ↓
CNS Exposure	CNS !!!
OTU Exposure	OTU !!!
Start Error	START ERROR
Missed Decompression	MISSED DECO
Decompression Alarm	DECO ALARM
Depth Pressure Sensor Failure	DPS FAILURE

Warning Suppression

Any warnings that can be temporarily suppressed by pressing and holding the right switch for 2 secs or more will only have the HUD and buzzer warnings suppressed, leaving the handset and HUS showing the warning, alternating with dive depth/time and decompression information.

Maintenance

Post dive, always store the rebreather lid in a clean dry environment and take care not to leave the lid and HUS exposed to high temperatures. Do not expose the HUS to disinfecting regimes. The HUS should be protected against shock at all times and avoid scratches on the lens by replacing the lens protector if it starts to peel.

Do not attempt to modify the rebreather and HUS in any way.

Before each dive you should make sure that the HUS is free from mechanical damage and that the lens is not impeded in any way that could affect its use.

The HUS is a sealed potted unit and no attempt should be made to disassemble the housing in any way. Trying to do so could cause irreversible damage to the display and electronics.

It is recommended that the HUS is washed with fresh water after each dive to avoid dirt and salt build up.

The HUS should be inspected by AP Diving or one of their authorised service distributors during the rebreather lid annual service.

If 'No Data' is displayed on the HUS, you should contact AP Diving immediately as there is a connection issue that will require a repair or replacement.



WARNING – Do not attempt to dispose of the lid or HUS at the end of their life. Contact AP Diving and they will advise on disposal.

Technical Data

Temperature Range	Operation:	4°C to 32°C
	Short term air storage (hours):	-10°C to 50°C
	Long term storage:	5°C to 20°C
Atmospheric Range	650 – 1080 mbar	
Maximum Operating Depth	100m (this coincides with the maximum depth proven for all AP Diving rebreather parameters according to EN14143)	
Display	96 x 64 pixels full colour OLED	
Optics	Virtual 15" image at a 1m virtual distance	
Battery	Powered by Rebreather Lid power source	
Weight	Approx. 86g	
Dimensions	Approx. 35 x 50 x 70mm	
PPO₂ Display	Accuracy:	± 0.05 bar
	Resolution:	0.01 bar
Oxygen Setpoint Range	Low:	0.5 – 0.9 bar
	High:	0.9 – 1.5 bar
Oxygen Warning Level	Low:	0.4 bar
	High:	1.6 bar
Warranty	1 year	

EC TYPE Approval

EC Type approved by SGS United Kingdom Ltd, Unit 202b, Worle Parkway, Western-Super-Mare, Somerset, BA22 6WA. Notified Body number 0120.

The “Inspiration”, “Evolution” and “Evolution+” (complete with HUS) are CE approved to 40m using an air diluent and 100m using a Heliox or Trimix (with a max. END of 30m at 70m, reducing to an END of 24m at 100m). The EC Type Approval was granted on the APD Manufacturer’s Technical Specification and satisfactory user trials. The Technical Specification was based on the “Respiratory equipment-Self-contained re-breathing diving apparatus” standard EN14143:2013.

EC PPE Article 11B Approval

The on-going certification to allow CE marking under Article 11B Directive 89/686/EEC is granted by Lloyd’s Register Quality Assurance Ltd. CE0088.

Manufacturer

Designed and Manufactured in the UK by:



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For spares and accessories visit:
www.apdiving.com