



AQUEOS[®]

EXCELLENCE IN SUBSEA SOLUTIONS



MODULAR SATURATION DIVING SYSTEM

The Modular Saturation system is rated to 305 MSW (1,000') and provides for 12-diver occupancy in two six-man twin lock chambers. The system is designed in accordance with the DNV Class Certificate, IMCA design documents, and in compliance with IMO and SOLAS standards.

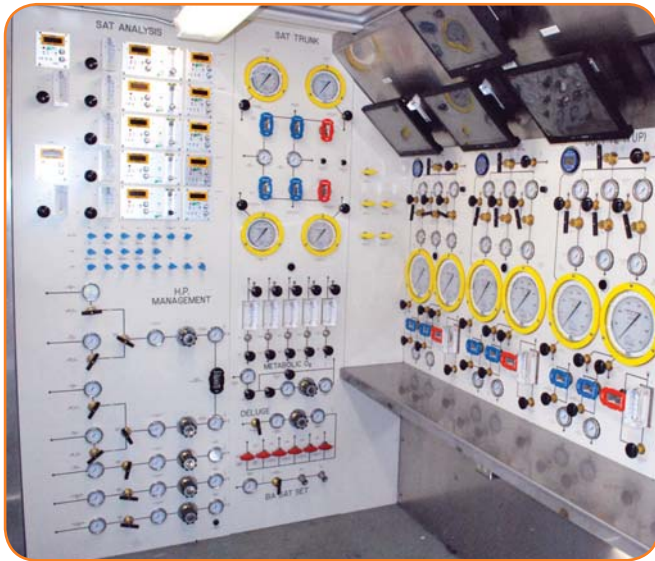
The System can also be configured with only one six-man twin lock chamber to operate with 6-divers providing maximum optimization of the space available on the deck if required.

The 12-Man Hyperbaric Rescue Chamber (HRC) can be installed on either side or at the end of the system, in either the 6-man or 12-man configuration, and is DNV approved to be utilized as a habitat for decompressing up to 4-divers if required.

SYSTEM DESCRIPTION

The System

The Modular Saturation system is rated to 305 MSW (1,000') in accordance with the DNV Class Certificate and is compliant with IMCA Design documents. The system offers standard 12-diver occupancy in two six-man twin lock chambers or can be configured with a single twin lock chamber to operate with 6 divers to optimize available deck space.



The Hyperbaric Rescue Chamber (HRC) can be installed on either side of the system, in either the 12 or configuration. The HRC is approved by DNV to be utilized for decompressing up to 4-divers, if required.

Control Panels

The Control Panels are provided with full redundancy of the pressurization, communication, fire-fighting and gas analysis systems of each lock in order to mitigate every conceivable single point of failure. The Control Panels are supplied with all the various gas mixes from the Gas Pressure Reduction Panel; each section is provided with an individual UPS as an emergency power supply system and for the stabilization of the electrical current that passes from the ship supply. The Gas Ring panels are provided with ventilation, visual monitoring and analysis for each line. All Aqueous gas panels are completely piped with Stainless &/or Tungum piping, and assembled with DNV Certified materials and components. All Control Panel pipework is cleaned to the highest standards available referenced to ASTM G93-03 and DNV-OS-E402 and OS-305.

Diving Equipment

Fully traceable records of the DNV fully-approved deliveries for all the equipment are maintained including: DNV system approval for Gas Reclaim and Environmental Control; Fire Fighting and Fire Detection System for the Chamber Complex Area; and Insulation and Thermal Balance design for the chambers and for the Diving Bell. There is extra security of the critical components (Pressure Reducers, Analyzers) in the Saturation Consoles to avoid single points of failure.

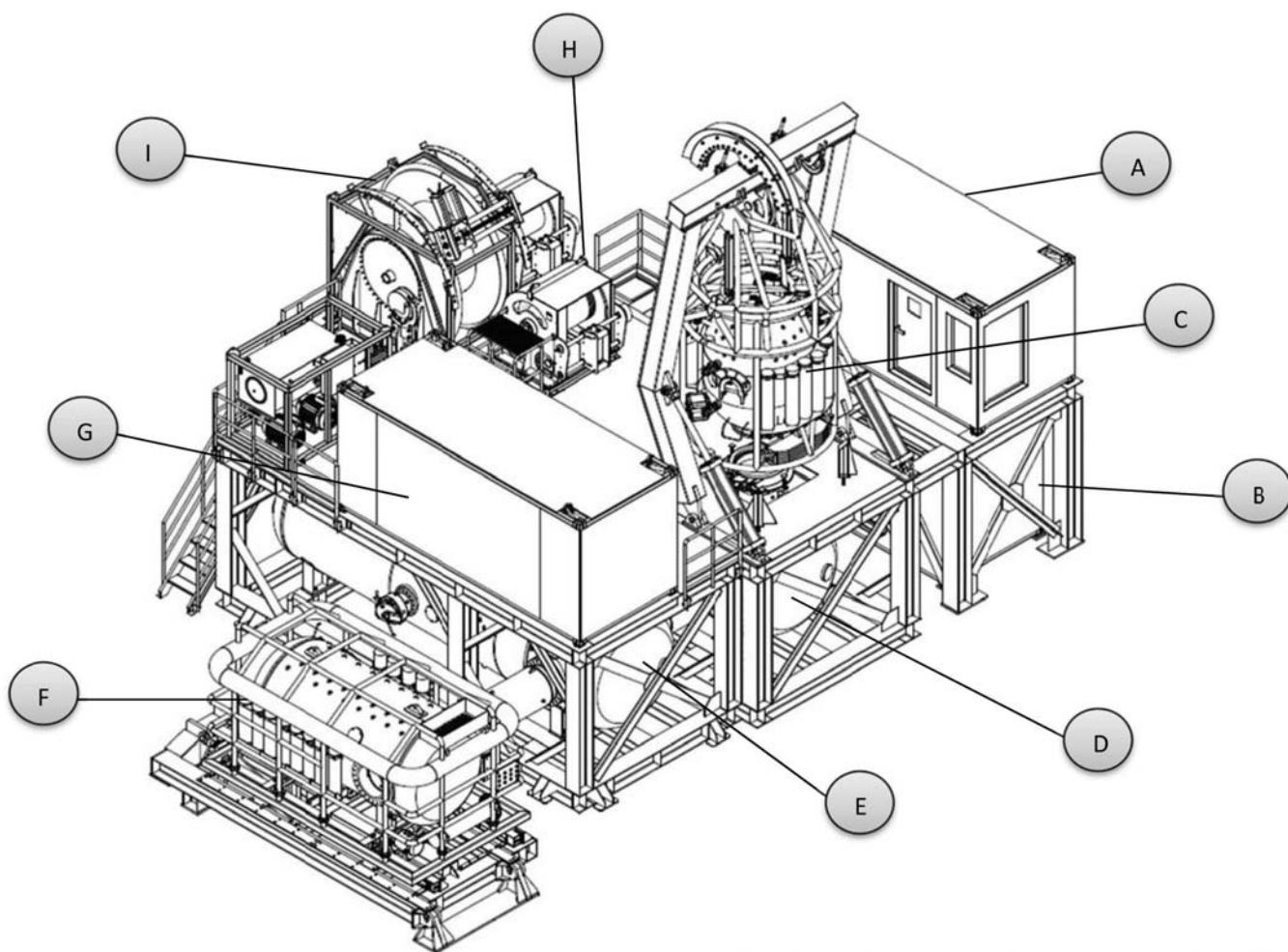
Management of the Electrical Supply includes 100% redundancy. The system provides a dedicated Life Support Container for the Hyperbaric Rescue System, made exclusively for the decompression of divers in the HRC during emergency situations. An optional Transportable Gas Storage System based on Kelly tubes (10" Kelly tubes) made exclusively for the transportable system is available.



Containers

All containers comply with DNV regulations 2.7-1, 2.7-2 & 2.7-3, the guidelines in IMO's circular MSC/Circ. 860 and also with EN 12079 points 1 and 2 respectively. All Modules defined as "Units for Transportation Offshore" are portable units with a maximum gross mass not exceeding 110,000 lbs. The modules can all be used together or separately with a primary service function, handled in open seas, to, from or between fixed and/or floating offshore installations and ships.

MODULAR SATURATION DIVING SYSTEM



EQUIPMENT DESCRIPTION

A - Bell & Saturation Control Module

The module is divided into two compartments – The Bell Control Module & the Saturation Control Module. Each Module has its own exterior entrance with an interconnecting pocket door. Both compartments have climate controlled A/C; electrical distribution boards including UPS backup; emergency lighting; external oxygen monitoring; smoke alarms; firefighting system & emergency breathing air supply with communication lines to the communications panels.

The Bell Control Module is equipped with a complete Bell Control Console and, optionally, the PLC Bell Handling console. Control of the diver reclaim system, the diver's video & communications system are included in the Bell Control Module.

The Saturation Control Module is equipped with a control panel for the two 6 man twin locks. It also controls the annexed HRC chamber for diver evacuation or for use as a 4 person decompression chamber. Video & communications panels also incorporate video & communications to strategic external locations such as medical locks & HRC launch station. The Saturation Control console also controls the automatic sanitary facility and provides two entertainment channels to each bunk which also has a 7" video monitor with wireless internet.

B - Habitat Life Support Module

The 20' Module contains:

- 2 x Environmental Control Systems
- 2 x Sea Water Pumps/Cooling Systems
- 2 x Potable water units providing hot and cold water to chambers
- Emergency (secondary) electrical distribution system (consumers/distribution board needed to safely complete a dive operation & maintain divers during decompression)

C - 3 Man Diving Bell

The Diving Bell is a 305 MSW (1000fsw) rated 3-Man 30" bottom mating/entry bell with a total internal volume of 4.9m³ (175ft³). Design pressure vessel code PVHO-ASME VIII Div 1 certified by DNV plus IMCA D 024 & D 018 compliant. The Diving Bell also has an external hatch to comply with IMCA guidelines.

In addition to gas, hot water & reclaim management systems, the following safety features are standard: Two CO₂ scrubbers; two bell heaters; hard wire, sound powered & through water communications; 360° bell external illumination; battery pack for minimum of 24 hrs emergency usage; video monitoring; medical lock; external emergency gas & water connections; DMAC bell medical kit; diver recovery harness; guide wire release system; two stage dual drop weight release system; lift wire & umbilical release systems; strobe light; passive scrubbers; survival suits; 37.5hz transponder tracking system; 3x type 1 survival suits.

Emergency Onboard Gas (OBG) cylinders are rated to 4500psi WP (oxygen exempted) and split into 3 banks of 3 to extend the capacity of emergency stored gas.



D - Dual lock 6-Man Living Habitat #1

The dual lock living habitat is designed and constructed in accordance with ASME/PVHO VIII Div 1 and DNV. It is fully IMCA compliant and has an internal diameter of 90" (2280mm) and split in two locks:

Lock I is 6 person living quarters c/w medical lock; sleeping area with individual bunk light/communication & entertainment system; sitting/eating area; medical table in accordance with DMAC 28 plus 24" Man-way door to:

Lock II a transfer lock providing washing & sanitary facilities plus access to: 24" upper man-way (bell trunk); 24" equipment lock & 24" man-way to Lock IV or HRC depending whether system is configured for a 6 or 12 person sat.

E - Dual lock 6-Man Living Habitat #2

The Dual lock living habitat is designed and constructed in accordance with ASME/PVHO VIII Div 1 and DNV. It is fully IMCA compliant and has an internal diameter of 90" (2280mm) and split in two locks:

Lock III is 6 person living quarters c/w medical lock; sleeping area with individual bunk light/communication & entertainment system; sitting/eating area plus 24" Man-way door providing access to:

Lock IV a transfer lock providing washing & sanitary facilities plus access to: 24" man-way to Lock II (bell transfer lock) & 24" man-way to the HRC.

F - Hyperbaric Rescue Chamber (HRC)

The Hyperbaric Rescue Chamber (HRC) is designed for 12 divers and is installed on a self-contained hydraulic accumulator tilt davit launching system in compliance with SOLAS rules for launching of evacuation systems. The HRC has self-sustaining gas and battery power for a minimum of 72 hours and has a EPIRB satellite tracing beacon.

The system is approved by DNV-RP-E403 and in compliance with IMO Res A692(17) & SOLAS The HRC is 84" in diameter & approved by DNV as a Habitat and can be utilized as a 4 man decompression chamber.

EQUIPMENT DESCRIPTION

G - Diving & Life Support Module

The 20' Module contains:

- CompAir 5437 heliox 300bar x 3884 ft³ p/h HP gas transfer compressor
- Divex K651 electric gas booster reclaim pump
- Divex gas reclaim reprocessing unit
- Reclaim recovery volume tank
- HP air storage cylinders (Dive/Sat control dedicated BA system supply & remote sanitary flush system)
- Main (primary) electrical distribution system (major consumers)

H - Bell Handling System – Design code DNV

The bell launch & recovery handling system comprises of the following main items of equipment:

- U Boom system in "C" configuration
- Bell catcher/stabilizer system
- Combination Main & Stand-by Hydraulic Power Units with fixed back-up winch/system controls
- Hydra/Hyflo 12 ton man-rider Bell winch c/w Lebus shells & diamond cut spooling system
- Hydra/Hyflo 7.5 ton man-rider Guide wire winch (doubles as bell secondary recovery system to recover bell through water/air interface into catcher)
- Bell guide wire/clump weight system

I - Umbilical Winch – Design code DNV

The Umbilical winch is activated & controls umbilical tension by setting enough pressure to tension or pay out umbilical as the bell is lowered or raised. The winch main items comprise of:

- Main winch drum holding 365m (1200ft) x 99mm (4") Fibron DMU 131 sheathed main bell umbilical
- Hydraulic acme thread guide system
- Focal Industries gas/water services internal slip-ring assembly (right hand side)
- Focal Industries electrical services internal slip-ring assembly (left hand side)

Not Shown - Workshop / Stores Module

The 20' x 8' Workshop / Stores module can be placed in an area convenient for access by the dedicated technicians to maintain the system & perform Planned Maintenance as required to maintain class & a safe environment. As all other modules standard fit out includes:

- Workshop facilities & major/minor spares to support the system for up to 60 days working
- Climate controlled air conditioning to ensure sensitive spares are stored within design parameters
- Thermal insulation
- Electrical distribution board
- Smoke alarms & firefighting system
- Emergency lighting

Not Shown - HRC Rescue Chamber Support Module

The HRC support module is a 10' x 8' module designed to be stored on a remote location for availability to provide full control & services to the recovered HRC after a hyperbaric evacuation of the divers. The support container has all the services & instrumentation required including a 50ft control/services umbilical to facilitate the decompression of up to 12 occupants in the HRC in a remote location. In addition to communication & gas supplies the module provides environmental cooling systems to maintain the HRC during the decompression.

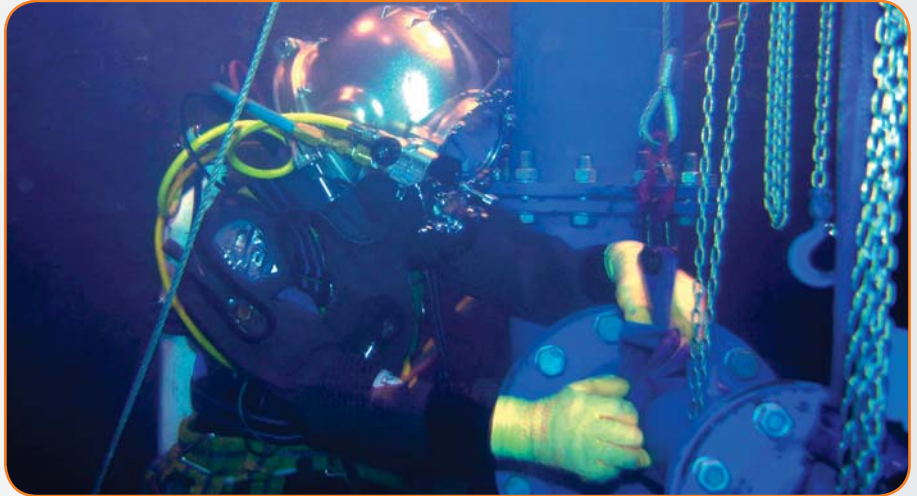
Integrated Logistic Support:

Ideally the following services will need to be supplied by the support vessel:

- 440vac/3ph primary supply from 600AMP board
- 440vac/3ph secondary supply from 300AMP board
- Fresh/potable water @ 5 GPM
- Sea water cooling @ 100 GPM
- Deck/work air supply 120 PSI (ideal) - 90 PSI (min)
- 2 x PABX telephones to interface with ship system in both Bell Dive & Saturation Control rooms
- Hard wire intercom to Dive Control to interface with DP bridge & vessel system
- Hard wire communications from Crane to Dive Control
- Hard wire communications between Dive Control & ROV (if installed)
- Interface dive system & ships fire detection systems
- Navigational supply to Dive Control & DP-status signal to interface with ships system
- Video link x 2 to ships distribution system (Divers hat camera feeds)
- Video link x 2 to/from ROV (if installed)

SYSTEM FEATURES

The Modular Series System is designed and approved by DNV. The System is equipped with a U-Boom "C" design for the deployment of the Bell over the side of the vessel or through a vessel moonpool. The System is provided with a remote control Bell Handling Console which can be used on deck by the system technician or mounted in the Dive Control Module. The System is equipped with an additional Emergency Bell Handling Console directly located on the winches. The system supports continuous saturation diving for 9 divers using both of the 6-man twin lock chambers. The decompression team can be safely decompressed in the custom HRC. The HRC is DNV approved & designed to decompress up to four divers so there would be no interference with the diving activity. For short jobs, or where deck space is at a premium the system can be mobilized with a single 6 man twin lock habitat. This configuration will support 3 x two man dive teams. In addition the HRC can still be used as a decompression chamber for team change outs.



The System is equipped with a 10' x 20' Saturation Control Module including communication and remote control systems of the life support, the firefighting and all other auxiliary equipment. A wide set of video screens is available in the Controls Rooms. The Dive Control system provides a complete communication, recording and video set. The equipment can support and interface with bridge, crane, ROV and other additional video and audio channels. The system and all of the ancillary equipment including vessel interface systems and components are fully DNV-certified and IMCA design approved. The Saturation Diving System is fully pre-approved by the Class as a complete system.

Aqueos is an active member of the International Maritime Contractor Association. Aqueos Saturation Diving System, Equipment and Components are designed and built in compliance with 2010 IMCA Recommendations.



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