



## SATURATION DIVING SYSTEMS

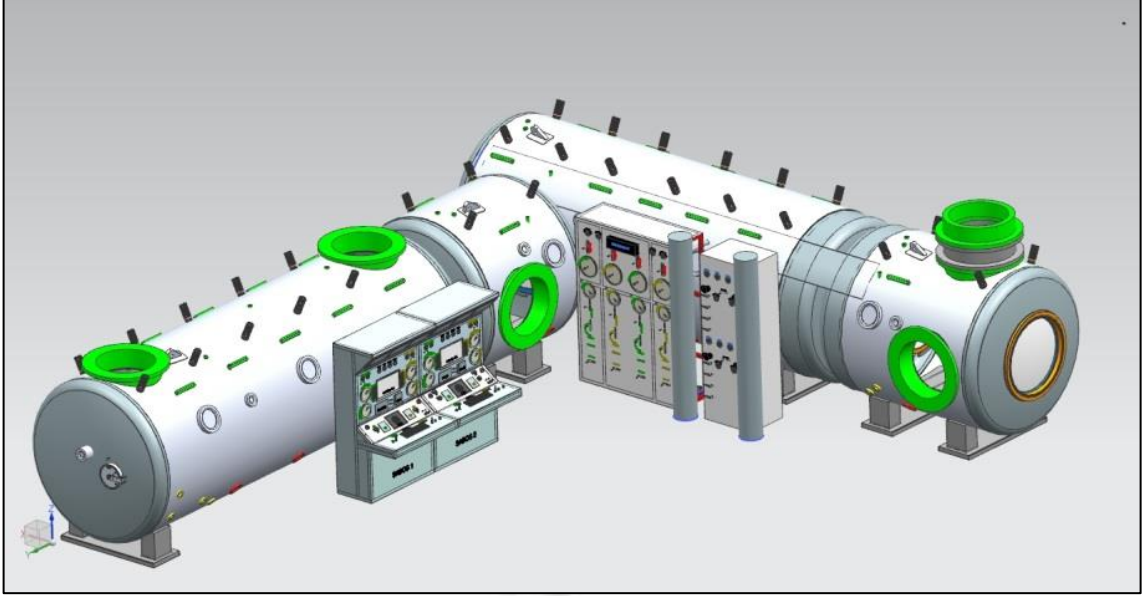
### SYSTEM DESCRIPTION



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## 1.1 SATURATION DIVING SYSTEMS



Saturation systems are the most complex hyperbaric chambers in the deep diving industry. Multiple hyperbaric wet, dry chambers and deck transfer locks linked to each other giving operational safety in the saturation and desaturation operations which is necessary in long deep diving operations. Our company can design and produce saturation systems according to the deep diving industry requirements.

The two double lock RCC chambers accommodates 6 men in main chamber at the diving depth pressure (300 msw = 30,3 bar). It is a horizontal cylinder chamber with a diameter of 2200mm-2400 mm and of length of nearly 6500 mm-to 7000mm from dished to dish end. (The ship design and the space for the equipment have to be provided for the design features. The chambers are going to be connected to each by means of a deck transfer chamber which also gives the opportunity to transfer to SDC and divers rescue boat under pressure transfer. Full computerized control could be supplied.)

It provides separate individual resting and accommodation with folded bunks and seats. There will be a telescopic table between the seats. A 700mm diameter man way provides an ease access to the TUP located on the ante chamber.

Toilet and ablution services will be inside the ante chamber. The main chamber has Ø300mm diameter medical lock, large enough to pass in consumables and medications from the outside.

The hyperbaric firefighting equipment has both a portable firefighting extinguisher and sprinkling system according to NFPA 99.

RCC complex obtain Multi gas selection during treatments and an overboard system for dumping of exhaled gases.

All main and ante chambers can be pressurized separately by means of the double door feasibility.

All important control functions can be carried out from a **OKSEA-DIVECONTROLLER** control station for the pressure chamber system. The control station is described in detail in item 2.2.4.





### 1.1.1 Functional Description

Pressure build-up / reduction

Ventilation

Oxygen / mixed-gas breathing-system

Communication

Supervision

Illumination

Supply lock

Locking of persons

Safety installations



### 1.1.1.1 Configuration of System

Pressure vessel  
Doors  
Window mouldings  
Leadthroughs, weld-on parts  
Diverse  
Main Chamber Equipment  
Observation windows  
Illuminations  
Supply lock  
Silencers  
Loudspeaker- communication system  
Sound Powered telephone system  
Oxygen & Mixed-gas breathing system  
Other equipment of main chamber  
Corrosion prevention, surface protection  
Seats  
Ante Chamber Equipment  
Observation windows  
Illuminations  
Silencers  
Communication system  
Other equipment of ante chamber  
Corrosion prevention, surface protection  
Divers entertainment system

## 1.1.2 List of Equipment

### 1.1.2.1 Pressure Vessel Equipment

- Cylindrical pressure vessel, divided in main chamber and ante chamber
- Circular flat bottom doors with double fork hinges, spring- loaded pistons
- Supply lock with closure outside, flat door inside, equipped with safety devices and pressure gauge, for one-hand operation
- Observation windows, 150mm-200 mm Ø ,
- TV-windows, 100 mm Ø
- Blind flange, free diameter 50 mm, blind leaf exchangeable formed.
- Hoisting eye bolts according to hoist standard (DIN 82024)
- Anti-slip floor in pairs (MC and AC), marine grade type and made of aluminium, easy to install and remove for cleaning
- Corrosion prevention and coat of varnish
- Several leadthroughs for pipework and cables



### 1.1.2.2 Main Chamber Equipment

- Folding seats with back rest for 6 seating persons, equipped with upholstery
- Folding Bunks for 6 lying person, equipped with upholstery
- Loudspeaker and microphone of intercom system
- Sound powered telephone (SP)
- Analog clock
- Button for emergency signal system
- Release button for spray-fog fire suppression system (**OKSEA-FIRE**)
- Caisson manometer
- 6 Observation windows
- Set of silencers for air inlet and outlet
- Safety valve
- Spray-fog fire suppression system
- UV-detectors for alarm signal in case of sensing a spark or flame
- Portable fire extinguisher
- Inner painting (non-toxic, hardly inflammable) Anti-slip floor, easy to clean
- 6 masks (BIBS) with dump valve + 1 spare
- Set of quick coupling connection (BIBS) for Scott serial masks
- Illumination units (**OKSEA-LUX**),
- CO2 Scrubber
- 3x 700 mm man ways: one to the outside, one to the TUP, one between ante and Main chamber
- 1 Medical Lock 300 mm diameter x 400 mm long, with an interlock
- CCTV system
- Drain-off system for evacuation of condensation and fluids
- Temperature & humidity regulated by environmental control system (ECU)

- Humidity & Temperature gauges
- Sound alarm if pressure exceeds 31 bars.
- Entertainment
- Telescopic table
- Control from inside optional

### 1.1.2.3 Ante-Chamber Equipment

- Loudspeaker and microphone of intercom system
- Sound powered telephone (SP)
- Analog clock
- Button for emergency signal system
- Release button for spray-fog fire suppression system (**OKSEA-FIRE**)
- Caisson manometer
- Thermometer
- Set of silencers for air inlet and outlet
- Safety valve
- Spray-fog fire suppression system
- UV-detectors for alarm signal in case of sensing a spark or flame
- Portable fire extinguisher
- Inner painting (non-toxic, hardly inflammable) Anti-slip floor, easy to clean
- Set of quick coupling connection (BIBS) for Scott serial masks
- Illumination units (**OKSEA-LUX**)
- Toilet bowl with separate exhaust lock, shower and wash basin

### 1.1.3 Functional Description

#### 1.1.3.1 Pressure Build-Up / Pressure Reduction

- The treatment chamber type **OKSEA-SAT 2400/30** can be filled with mix gas up to a maximum working pressure of 30 bar (equivalent to (300MWS)).



- As with pressure build-up, pressure reduction is effected by operational control from the control station.
- The gas is let into I let off the ante chamber and main chamber through high-effective silencers
- Ventilation
- During operation with air, oxygen supply and CO2 disposal are affected via fresh air ventilation or in mix gas conditions with mix gas collected by gas scavenging system or closed circuit according to the customers' requirements. Oxygen supply will be fed through enjector nozzles through the Co2 scrubbers.
- The quantity of ventilated air/or mix gas is separately preselected for main chamber and ante chamber
- adjusting the number of persons on the semi-automatic system
- The ventilation in here is adjusted to the number of chamber occupants and to the prevailing chamber pressure.
- The selected number of persons is indicated at the control station.

### **1.1.3.2 O2/MIXED-GAS Breathing System**

Main chamber and ante chamber are equipped with a oxygen / mixed-gas BIBS  
Improvement and acceleration of decompression

In both main and ante chamber there are couplings to connect breathing units or Scott serial breathing masks) provided for each diver.

The breathing units can be supplied with one of the following gases:

- Pure oxygen (100%)
- Air
- MixedGas (10/90 & 50/50%)
- Nitrox

### 1.1.3.3 Communication

There are two possibilities of audible communication between control station and chamber locks

- Communication in Push-to-talk-mode, loudspeaker and Microphone in one unit in the chamber, control station can hear the chamber compartments constantly (priority control).
- Sound powered telephone system with howler generator
- Emergency signal system.

### 1.1.3.4 Supervision

Direct observation of the MC occupants is achieved by 6 windows (6 cylinders shell) with a clear width of 150mm-200 mm.

For TV supervision the MC is equipped with 6 CCD colour TV cameras preferably installed outside of the chamber.

### 1.1.3.5 Illumination

The chamber rooms are illuminated by **OKSEA-LUX** special, high-effective cold-light which are mounted to the chamber ridge.

### 1.1.3.6 Supply – Lock (Oksea-Med)

Through supply lock (**OKSEA-MED**) with a clear diameter of 300 mm and an inner length of 400 mm various items (such as medicaments, food and drinks) can be locked in and out during chamber operation with the safety locks while it is under pressure.

### 1.1.3.7 Safety Installations

As soon as the maximum working pressure is exceeded the safety valve reacts. Even if the gas supply is further applied and the pressure increases up to max. 10 % above

the working pressure the valve opens. The safety valves are installed at the chamber wall.

It is equipped with an additional shut-off ball valve mounted between safety valve and pressure vessel.

This ball valve can be manually closed in order to prevent the chamber from surfacing out of control on condition that the safety valve stays open for any reason.

Fireproofness is ensured by the installed spray-fog fire suppression system, the UV-detection alarm system and the hardly inflammable interior fittings and colour coating.

#### 1.1.4 Control Station (OKSEA-DIVECONTROLLER)



##### 1.1.4.1 General

All gas manipulations and control functions are affected from the control station

The pressure chamber is operated and supervised with the **OKSEA-DIVE** controller.

Pressure control is carried out by means of the **OKSEA-DIVE** valves.

The system is equipped with a decompression chamber computer **OKSEA-DECO** for computer-controlled operation main chamber.

The **OKSEA- DIVE** controller provides all operating and control units are necessary for the operation of AC and MC.

The height of the control desk and the positioning of the control panel facilitate a comfortable handling supervision of the control devices.

The essential operating elements are arranged in a way to be clearly allocated to MC or AC operating elements have a colour marking:

- Green for main chamber
- Yellow for ante-chamber
- Grey for air
- Blue for oxygen
- Brown for mixed-gas



#### 1.1.4.2 Control Station (OKSEA-DIVECONTROLLER)

The **OKSEA-DIVE** controller is mounted directly to the chamber and divided in a vertical and a horizontal sector:

**The control desk (horizontal sector) mainly contains;**

- **OKSEA-DIVEVALVES** for air/gas inlet and outlet
- (Operational control for gas / pressure-handling)
- Switch for change-over / switching-off **OKSEA-DECO** of MC
- **OKSEA-VENT** valves for ventilation
- **OKSEA-LUX** buttons for illumination AC / MC
- Keyboard and mouse
- Video recorder
- **OKSEA-DECO** and Video monitors.
- Patient warning button and lamp

**The Control panel the vertical sector mainly contains:**

- Supply lock
- Main switch and control lamp for control station
- Main switch and control lamp for spray-fog fire suppression system
- Alarm lamps for UV-detectors (open flames)
- Analog daytime clocks
- Digital mission / daytime clock
- Breathing gas selection
- Intercom system
- Emergency signal system
- Oxygen CO2 measuring instruments
  - Digital display O2 and CO2 measuring system AC and MC
  - Digital display for temperature
  - Digital display for humidity
- Direct inlet valves for HP chamber filling MC and AC



- Ball valves quick-air outlet (MC, AC)
- Precision manometers for chamber pressure MC and AC
- Manometer HP supply air, O2 and mixed – gas
- Manometer working pressure air, O2 and mixed – gas at the left-side cover:
- Shut-off valves HP-main-supply air, O2, mixed-gas

