

# Medical Oxygen *Container Solution*



Worldwide Manufacturer of PSA Generators

# Story of safe and independent source of Medical Oxygen



Oxymat is a Danish based company specialized in designing and manufacturing of on-site nitrogen and oxygen generators using Pressure Swing Adsorption (PSA) technology.

We have been manufacturing oxygen generators since 1978 and nitrogen generators since 2001 and we possess first hand knowledge of the market, developments, demands and possibilities that PSA technology holds.

We are headquartered just north of Copenhagen, Denmark and have 60 employees working in our three manufacturing locations in Denmark, Slovakia and China. Our customers are global and we have a solid distribution network, with more than 100 distributors, agents and partners based around the world.

## Industries we serve

Medical  
Food and Beverage  
Laser Cutting  
Electronics  
Aquaculture & Ozone  
Petrochemical  
Marine & Offshore  
Gold Mining

OXYMAT A/S and Air Liquide Advanced Technologies have developed Oxygen Medical Container Solution on technology share basis. History of project started in 2006 when the French army decided to launch a tender for oxygen generation module. Our solution applied and won.

Three years were required for competitive dialogue, design and manufacture. Consecutive tests in extreme temperatures (from  $-32^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ ), humidity (90% RH at  $40^{\circ}\text{C}$ ), altitude (2,000 m at the Alpe d'Huez) followed and of course other special conditions prepared by the army such as street and off-road tests.

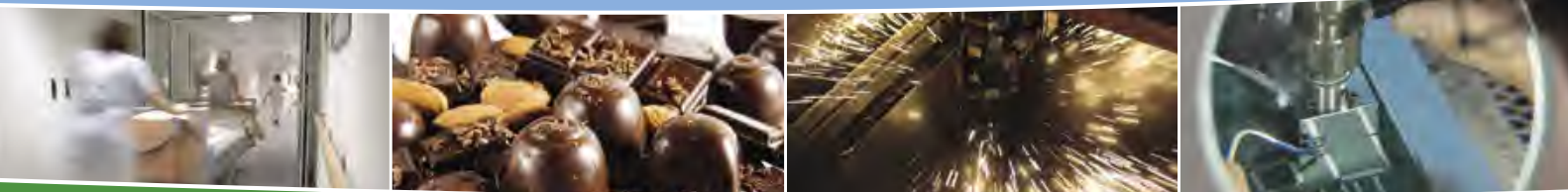
The result is an outstanding containerized oxygen producing module with features that secure trouble free operation, in accordance with most common known regulations such as ISO, PED (Pressure Equipment Directive 97/23/EC) and MDD (Medical Devices Directive 93/42/EC).

Designing a Container PSA solution to meet all the requirements and standards from a demanding customer like the French army, was indeed a big challenge for our team of engineers and project managers. In close cooperation with the project team of Air Liquide Advanced Technologies, we have succeeded with this remarkable technological challenge.

A challenge that many other applications and organisations can benefit from, since this product will also address needs of both mobile hospitals and international NGOs worldwide.

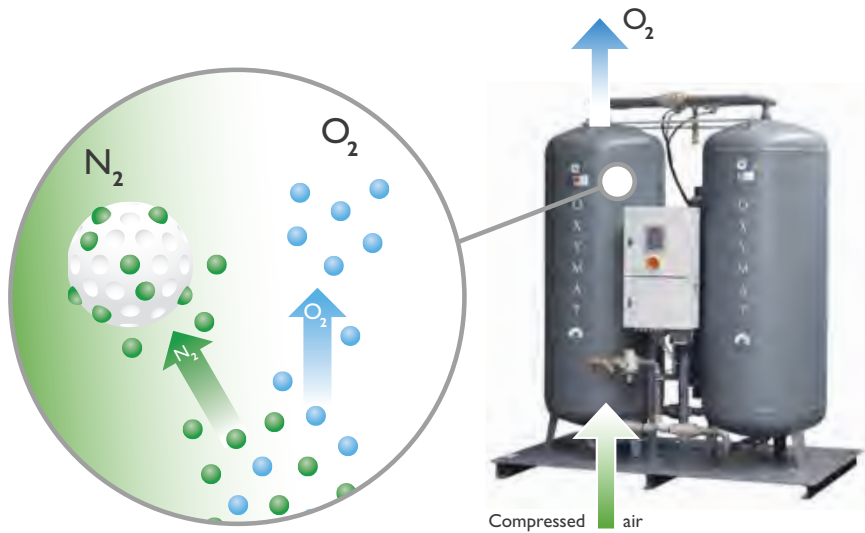
### Essential parameters:

- 93%  $\pm$  3% Oxygen Purity
- 2 x 7,5 m<sup>3</sup>/h
- 2 complete and independent lines (2x O60x2 3C)
- 4 low pressure outlets equipped with high-speed couplings
- 10 bar discharge pressure
- 4 x filling ramp with components against adiabatic compression phenomenon
- 17 high pressure outlets in total able to fill various cylinders sizes (from 2 to 50 liters)
- filling pressure calc. based on ambient temperature
- Unique automatic changeover-reducer device able to supply Oxygen in case of general failure (e.g. black-out) for hospital use from two separate back-up sources
- 15x B50 cylinders as internal back-up source (150m<sup>3</sup>)
- monitoring of ambient air inside container with low/high Oxygen level alarm
- visual / acoustic alarm
- radio alarm (featuring radio silence)
- independent purity analysis of each line
- outlet purity by paramagnetic Oxygen sensor (Servomex)
- CO / CO<sub>2</sub> / dew point monitoring
- 8" colour touch screen
- instant /cumulative consumption
- each line controlled by flow regulator

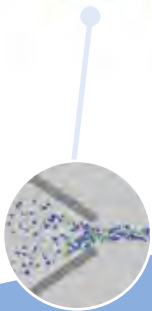


# Technology

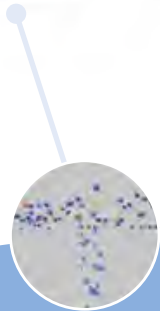
## Process description



Our generators are very easy to operate and require a minimum of maintenance and service. OxyMat uses only high quality components and our systems are designed for 24 hours, 365 days a year operation. An Oxygen generator combined with cylinder back up gives the highest level of safety. In comparison with cylinders it gives overall cost reduction up to 80%. The average oxygen production cost is 1.1kWh per cubic meter of oxygen.



**Compressor**  
increases air compression to required pressure level



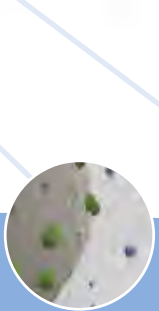
**Dryer**  
removes moisture from air (air humidity) by cooling



**Coal tower**  
adsorbs fractional impurities (oil)



**Air tank**  
accumulates necessary volume of air for PSA generator



**Zeolite**  
filling with it's ion-exchange bed traps  $N_2$  molecules and allows  $O_2$  molecules to stream through



**High Purity Oxygen**  
flows from PSA generator to product tank and is ready for use



# Standards



## Primary Oxygen Control

Downstream of PSA Oxygen stream is analysed to ensure only required Oxygen purity enters Oxygen receiver. If purity below setpoint, stream is vented to ambient air outside of container



## Special Features

- Servomex 4100C to measure O<sub>2</sub> / CO<sub>2</sub> / CO
- Heavy duty HP Oxygen boosters
- Vacuum pump



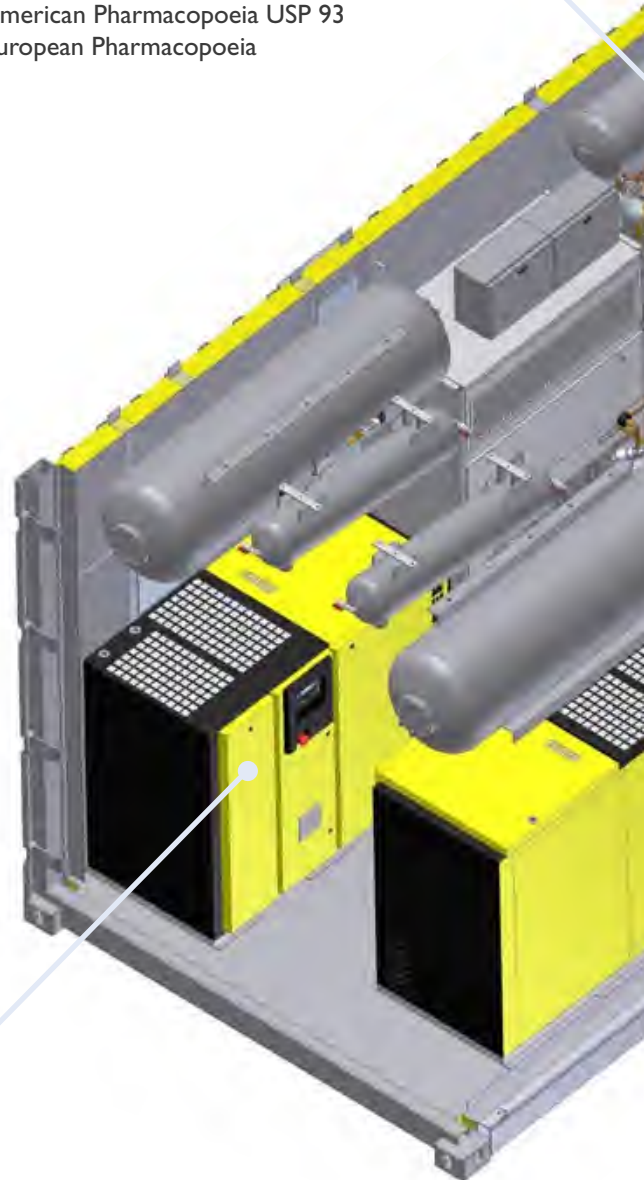
## HP Filling

17 high speed couplings mounted on 4 ramps to fit different cylinder sizes ensure fast exchange and enable 2 to 50 cylinders to be filled at the same time

## Standards



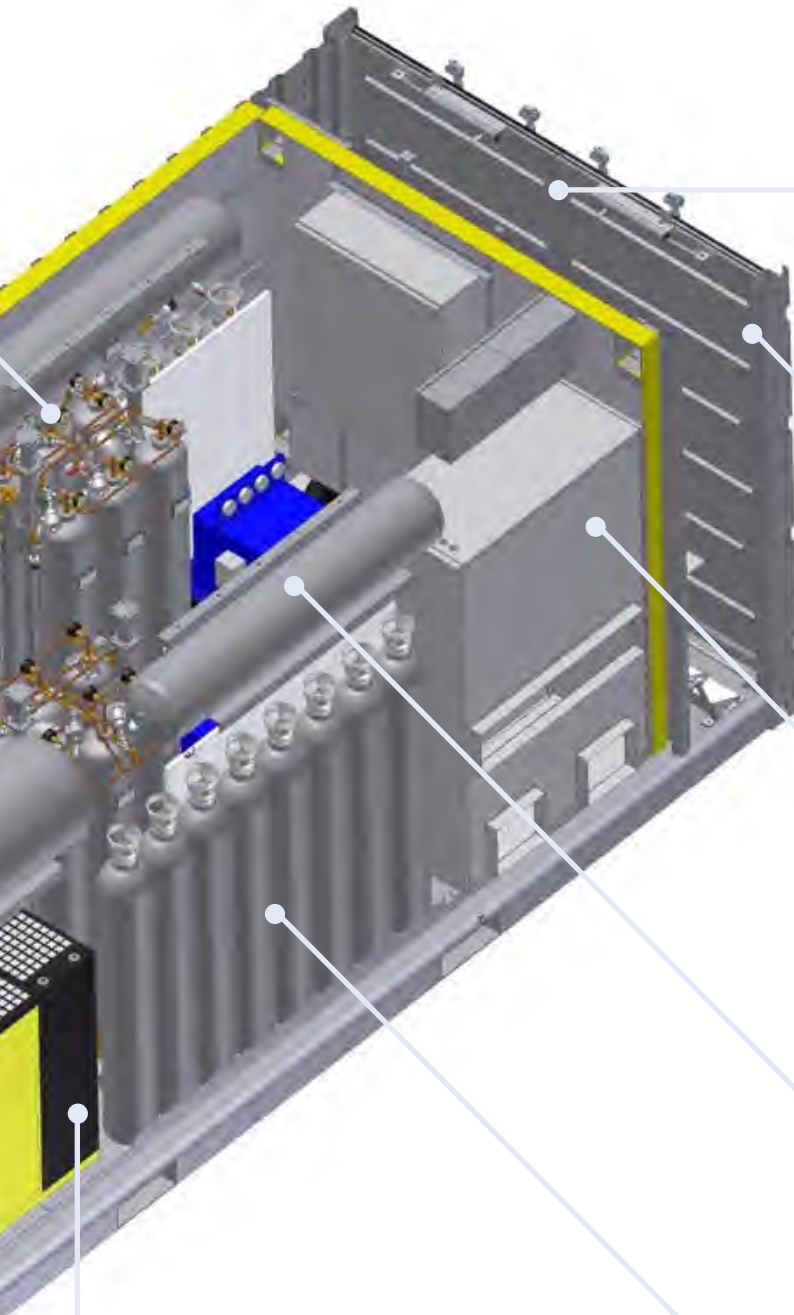
ISO 9001, ISO 13 485  
PED 97/23/EC, MDD 93/42/EC  
American Pharmacopoeia USP 93  
European Pharmacopoeia



## Defence Standards



GAM EG13: Equipment environmental tests  
STANAG 2895: Extreme Climatic Conditions and Derived Conditions for Use in Defining Design/Test Criteria for NATO Forces Material



### Shipping possibilities

- road transport
- rail transport
- sea transport
- air transport

### Container Parameters

- 20 foot long ISO container (6,1 m)
- Cargo Standards 1 TEU/teu; ISO CC, IC, ICX
- 8x ISO corners for securement and handling
- complete weight less than 10 tons

### Ambient Influence Proof Design

Protected against

- water penetration (rain/pressurized water cleaning)
- leak tight and insensitive to dust, sand and saline mist
- mechanical shocks (handling or movement)

### Environmental Conditions

- Operating temperature  $-32^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$
- Transport and Storage temperature  $-50^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Use and Store without any restrictions on its geographical conditions in accordance with STANAG 2895

### Medical Standards for Components

EN 850 (Clamp type valve outlet connections)  
ISO/FDIS 10083 (Supply systems for Oxygen concentrators)

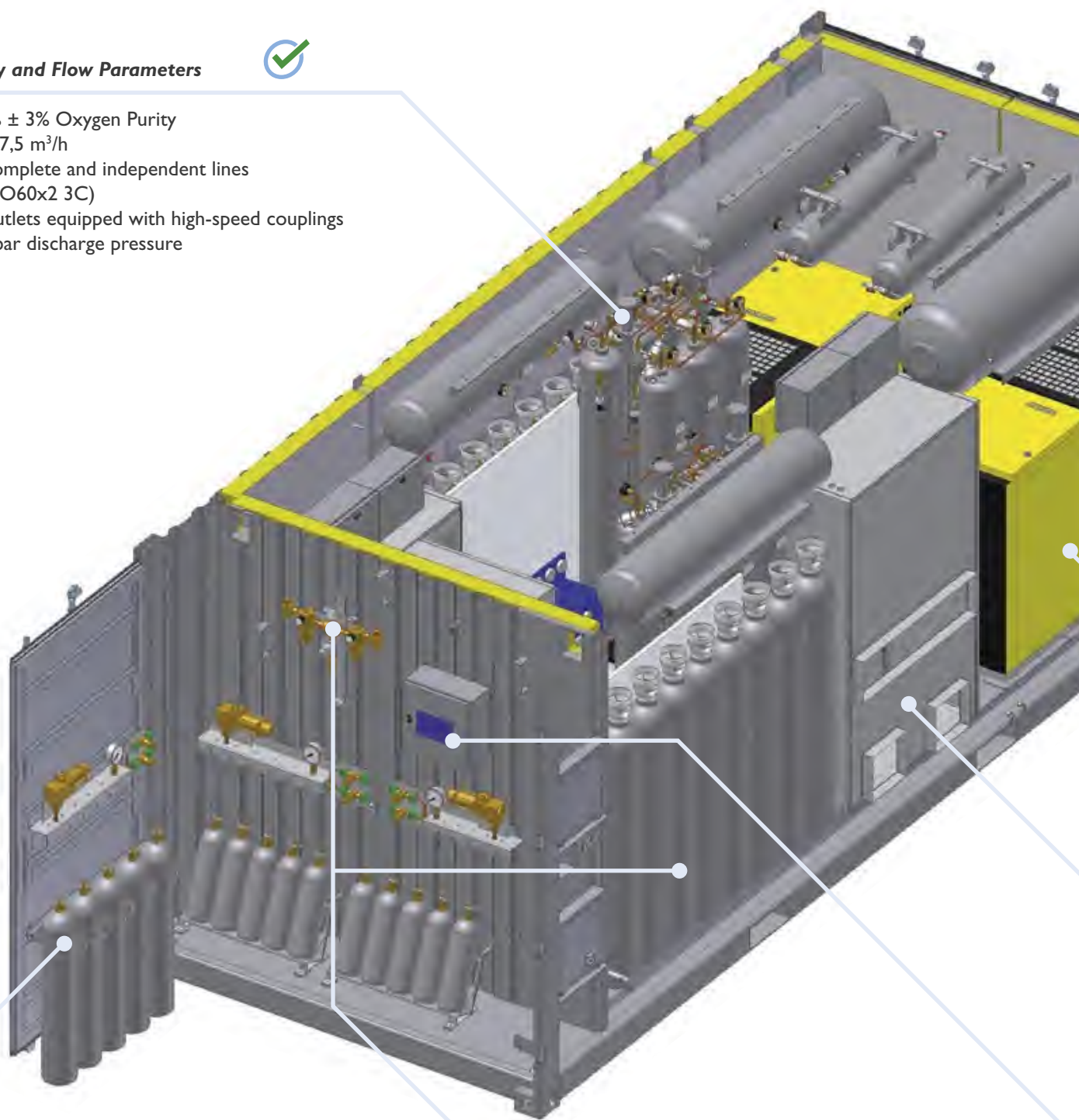
### Main Purpose of Module

Supplying oxygen in two ways

- primary: Intensive care units for medical-surgical hospitals (HMC)
- secondary: filling field medical unit oxygen cylinders

### Purity and Flow Parameters

- 93% ± 3% Oxygen Purity
- 2 x 7,5 m<sup>3</sup>/h
- 2 complete and independent lines (2x O60x2 3C)
- 4 outlets equipped with high-speed couplings
- 10 bar discharge pressure



### Filling Ramp Specification

- 4 x filling ramp with components tested against adiabatic compression ignition
- 17 outlets in total able to fill various cylinders sizes (from 2 to 50 liters)
- filling pressure calc. based on ambient temperature

### Back-up Specification

- 15x B50 cylinders as internal back-up source (150m<sup>3</sup>)
- Unique automatic changeover-reducer device able to supply Oxygene in case of general failure (e.g. black-out) for hospital use from two separate back-up sources

# Technical Parameters



## Encrypted Transmission of Operating Data



- radio - leak tight box with radio receiver and LEDs for different alarm types
- LAN - leak tight box with LAN cable connection and LEDs for different alarm types

## Energy Input Parameters



- 80 kW Total Power input (supply 400V / 50 Hz)
- 30 kW (2x AC cooling capacity - summertime)
- 6 kW (heating capacity - wintertime)

## Operational Safety



- Air monitoring for ambient Oxygen levels inside container with low/high level alarm
- visual / acoustic alarm
- radio alarm (featuring radio silence) inside container
- Ambient air monitoring with low/high Oxygen level alarm

## Product Monitoring and Measurement



- independent purity of each line by zirc sensor
- outlet purity by paramagnetic sensor
- instant /cumulative oxygene consumption
- each line controlled by flow regulator
- CO / CO<sub>2</sub> / dew point
- 8" colour touch screen



## 2 PSA lines

Complete PSA lines, independent of each other located on left and right side of the container



## Radio and Alarm

Visual alarm embedded on the outside wall, together with antenna to transmit alarms to receiver box



## Robust Construction

Technology mounted inside ISO 20' container compliant with GAM EG 13 tests and theatre of operations compliant with STANAG 2895



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### Highest level of international approval

Oxymat Medical systems are designed and manufactured according to :

- MDD(63/42EEC) Medical Devices Directive
- US Pharmacopoeia
- European Pharmacopoeia
- ISO 10083

Oxymat has long experience in design, engineering and delivery of hundreds of Oxygen systems all over the world, in accordance with international and national authorities.

Oxymat operates a QA system in accordance with EN ISO 9001:2000 and is certified by Apragaz.

- ISO 13485
- ISO 14001

