

# NITROX & Air Supply Container



Made by



**Safe and Efficient Diving**

## 1. GENERAL/DESIGN OF DIVING SYSTEM

System are designed by the following requirements:

- IMCA ( see below )
- Norsok U101 for diving equipment
- Norsok U103 for inshore diving

### 1.1. DIVING SYSTEM COMPLIANCE

The diving panel shall comply with requirements outlined below:

- Breathing gases:
  - AIR & NITROX 40%
- IMCA D. 023 Design For Surface Diving System
- IMCA D. 031 Oxygen Service
- IMCA D. 048 Surface Supplied Operations Using Nitrox
- EN 12-245 / 3 party approval of Composite cylinders
- Norsok, for dive equipment

### 1.2. OPERATIONAL DESIGN

The supply unit is designed to fulfill and exceed the requirements of:

- Surface supplied air diving, & EAN diving to 50 meter

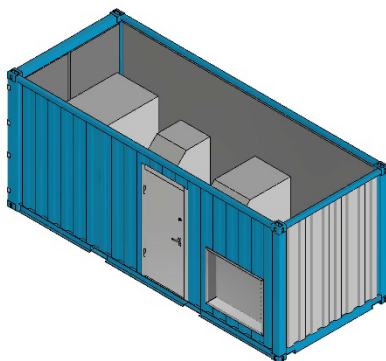
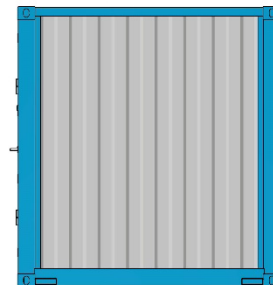
### 1.3. DOCUMENTATIONS PACKAGE

- IMCA D. 023 compliance
- Functions test certificate for diving control panel
- Pressure test certificate for diving control panel and piping systems
- Certificates for each depth gauge and all pressure gauges within the diving control panel
- Flow test certificate for each diver gas system (will be around 500L/min)
- Schematic Drawing of pipe systems for diving control panel in PDF file format
- Part list of all valves in dive panel

2. DESCRIPTION OF SUPPLY CONTAINER UNIT

Container:

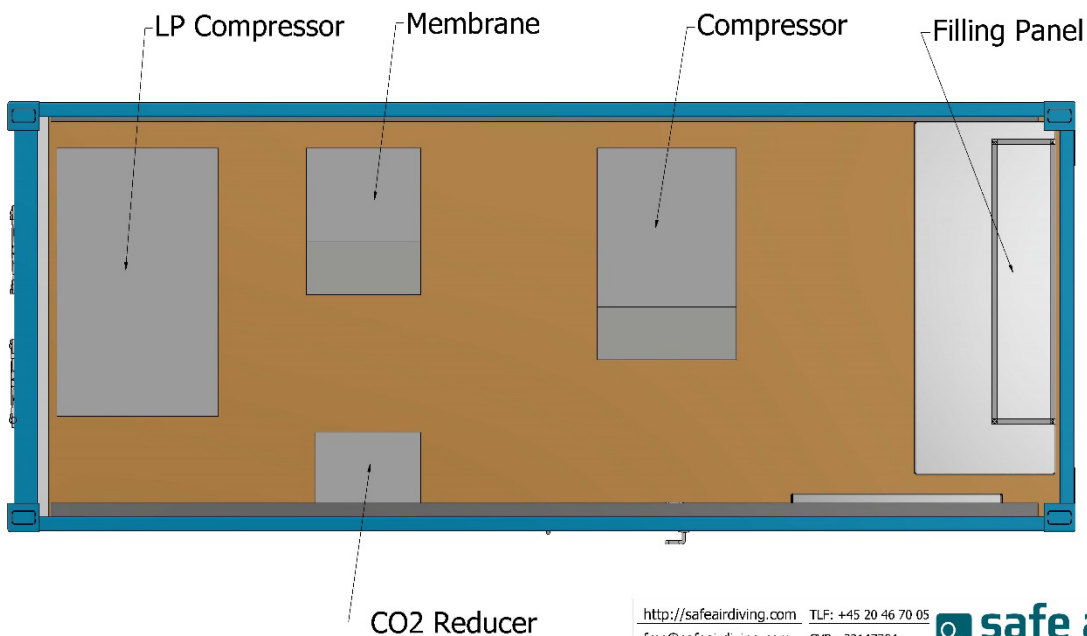
- 20 food ISO Steel container
- 50 mm. Insulation with steel board on walls and ceiling
- Steel door in the side of container, with small window
- Steel box in the side of container for pipe / hose connection to NITROX supply in / Out
- Electric 3x400Volt – 63Amp / 50 Hz power CEE connector to be placed in the inlet steel box
- Electric power cabinet inside, 400V-63Amp, with supply to all units in container
- Ventilation system Ø215mm with automatic start / Stop on temp. above 20 degrees
- Electric heating panels to hold min. temp. above 10 degrees
- 4 pcs. 240v LED flat lights units
- Oxygen room control system




|   |            |                      |      |   |                  |
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| <a href="mailto:fms@safeairdiving.com">fms@safeairdiving.com</a>  |            | CVR.: 32147704       |      | professional diving equipment   |                  |
| Designed by   | Checked by | Approved by          | Date | Date  | N/A              |
| William Schou   |            |                      |      | 25-01-2022  |                  |
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3. NITROX supply gas system:

- Screw compressor model MONSUN 15-10, delivery 2080 liter/min. – Pressure 10 bar
- KRINNER CO2 reducer, model 15P, 2500 L/min. ( Premium line closed version )
- KRINNER Membrane 450L system, ( Premium Version K02 )
- Bauer Nitrox HP compressor Model V450-OX, Premium Line 450L/min. – 225 bar with:
  - Super silent housing
  - P61 purification system, B Control / Securus monitoring
  - B-KOOL ( integrated )
  - B-Detection PLUS ( integrated ) with reading:
    - Oxygen
    - CO2
    - CO
    - VOC's oil
    - Dew point ( absolute humidity )
    - All recorded on Pc with 22" monitor
    - Ready for B-APP for remote control & monitoring



|   |            |                      |       |   |             |
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| <a href="mailto:fms@safeairdiving.com">fms@safeairdiving.com</a>  |            | CVR: 32147704        |       | professional diving equipm  |             |
| Designed by   | Checked by | Approved by          | Date: | Date:   | N/A         |
| William Schou   |            |                      |       | 25-01-2022  |             |
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|   |            |                      |       |   | Sheet 1 / 1 |

4. Filling / Reduction panel / table section consist of:

- Alu profile Table with stainless steel plate
- Bauer SECANT III-A HP filter system inline from HP compressor to filling panel
- Filling panel for 4 EAN + 1 Air pipe line to gas quads
- Reduction lines for 4 EAN + 1 Air 200 to 40 bar with Tescom reg.
- HP 225 bar Air filling line outside in Steel box, with 5/8" female connection / Bleed

5. HP Composite cylinder Quad:

- 6 pcs. of 158L composite cylinders
- Total liter volume 948L x 200 bar = 189.600L
- Working pressure 225 bar



**Description KrinnAir Premium Line NITROX Systems**

The fully automatic, internally piped and wired Nitrox compact system features a unique method of operation that was technologically impossible in the past. In particular, the combination of compressed air heating with the appropriate regulation and the previous dehydration by means of a refrigerant type drier make for more convenient handling of the system. On the one hand, extremely reliable dehydration of the compressed air is now possible. On the other, it is possible to perfectly adjust the operating points of the oxygen membranes regarding pressure and temperature.

Four high power filters are responsible for the filtration of the compressed air. Oversized filter surfaces and activated carbon filters with an activated carbon bed and integrated particle filters facilitate a service life of 500 operating hours. Filter elements are validated and certified according to the ISO 12.500-1:2007 quality standard.

KrinnAir Nitrox systems boast a universal field of application. Almost complete independence from environmental circumstances such as temperature or air humidity. A clearly defined condition of the compressed air injected into the membrane is ensured even in the event of profound fluctuations in environmental conditions. This results in increased efficiency of the device with regard to the nitrox output and durability of the compact system.

The cutting-edge regulation ensures that a strain-and-relief operation and fluctuations in the compressed air in the attached rotary screw compressor can be avoided. This increases the durability of the rotary screw compressor and reduces wear and tear to a minimum. An additional compressed air container is not required. Furthermore, the state of the art construction of the device ensures compressed air according to the ISO 8573-1 1.4.1 quality standard for reliable operation of the membrane system. Operating conditions regarding breathing air quality, temperature and pressure at the point of injection into the membrane can be regulated exactly and independently of environmental conditions.

**Technical specifications:**

| Model                  | Premium Line K01     | Premium Line K02     | Premium Line K03     |
|------------------------|----------------------|----------------------|----------------------|
| NITROX                 | 21 – 40%             | 21 – 40%             | 21 – 40%             |
| Volume delivered       | 200 – 320 litres/min | 300 – 450 litres/min | 450 – 600 litres/min |
| Operating pressure     | 7 – 10 bar           | 7 – 10 bar           | 7 – 10 bar           |
| Electrical connection  | 230V/50Hz            | 230V/50Hz            | 230V/50Hz            |
| Power consumption      | 0.9 KW               | 0.9 KW               | 2.1 KW               |
| Dimensions in mm D/W/H | 830 / 650 / 1255     | 830 / 650 / 1255     | 830 / 650 / 1255     |
| Weight: net            | 170 kg               | 170 kg               | 170 kg               |



**Connection Data:**

**Model Premium**

**K01**

**K02**

**K03**

|                          |              |            |            |            |
|--------------------------|--------------|------------|------------|------------|
| Electrical supply        | Voltage / Hz | 230 V / 50 | 230 V / 50 | 230 V / 50 |
| Total installed capacity | kW           | 1,9        | 1,9        | 2,55       |
| Power requirement        | kW           | 0,6 - 0,9  | 0,6 - 0,9  | 0,9 - 2,1  |
| Cooling air quantity     | m³/h         | 350        | 350        | 600        |
| Refrigerant type         |              | R 134A     | R 134A     | R 404A     |
| Refrigerant amount       | kg           | 0,44       | 0,44       | 0,42       |
| Sound pressure level     | dB(A)        | 68         | 68         | 69         |

**Limits compressed air inlet:**

|                          |           |             |             |             |
|--------------------------|-----------|-------------|-------------|-------------|
| Flow compressed air max. | Liter/min | 1650        | 2000        | 3300        |
| Operating pressure max.  | bar       | 7,0 to 10,0 | 7,0 to 10,0 | 7,0 to 10,0 |
| Air inlet temperature    | °C        | +10 to +46  | +10 to +46  | +10 to +46  |
| Humidity                 | 100%      | 100%        | 100%        | 100%        |
| Residual oil content     | mg/m³     | max.10 mg   | max.10 mg   | max.10 mg   |
| Ambient temperature      | °C        | +10 to +40  | +10 to +40  | +10 to +40  |

**Dimension, Weight and Connection:**

|                                    |                      |        |
|------------------------------------|----------------------|--------|
| Dimensions: depth / width / height | 830 / 650 / 1255     | mm     |
| Weight: net                        | 145                  | kg     |
| Pipe connection:                   | Compressed air inlet | G 1"   |
|                                    | Nitrox outlet        | G 1"   |
|                                    | Nitrogen outlet      | G 1/2" |
|                                    | Condensate inlet     | G 1/2" |
|                                    | Condensate outlet    | G 1/2" |

**Scope of Delivery**

- Functional and state of the art housing for an assembly not requiring foundations
- Construction in stainless steel V4A (1.4404), salt-water proof
- Stainless steel piping of compressed air and nitrox pipes
- Volume-current-regulation with overflow valve and compensation tank
- 4-level filtration with automatic condensate-drain
- Integrated refrigerate type drier with condensate-drain
- Compressed air heating with automatic temperature regulation and observation
- Oxygen membrane for nitrox gas production
- Operating pressure and nitrox regulation with pressure gauge
- Oxygen controller with sensor
- Easy to maintain housing with removable hatches
- Integrated electric control box, completely wired IP54
- Operating and malfunction notices
- Integrated condensate processing and additional connection for compressor condensate
- Optional: remote ON/OFF and compressor controls

Every system is subjected to a test run at the factory.  
Inspection certificate after successful acceptance.

The nitrox system outlined above conforms to the CE-norm and the EC machine directive 2006/42/EG.

*Engineering design and brand protection*

**Description of the KrinnAir CO<sub>2</sub> Reducer according to DIN EN 12021**

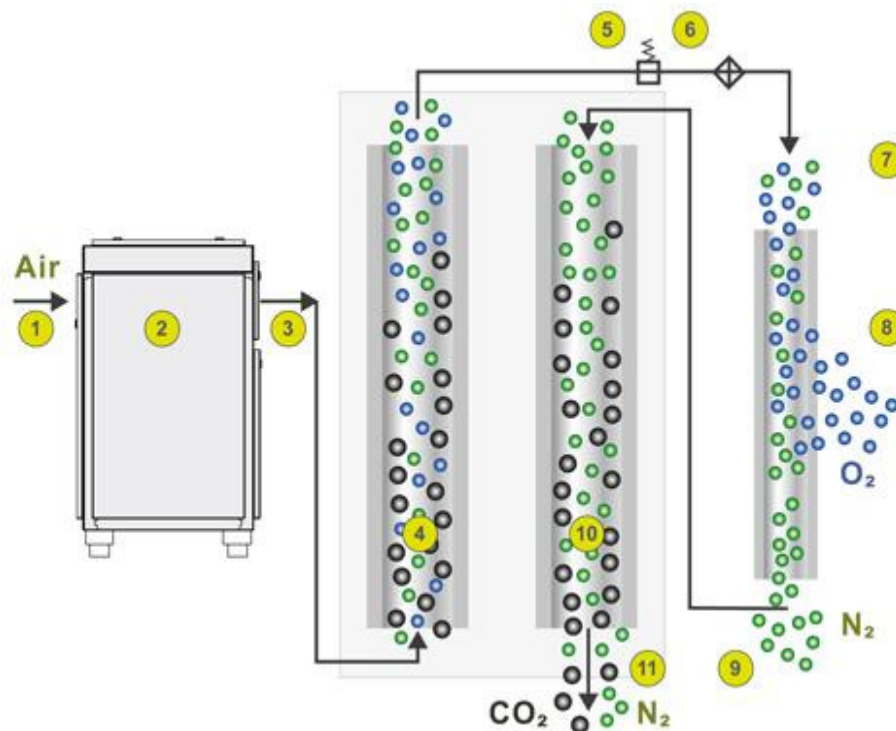
This fully automatic, internally completely piped and wired CO<sub>2</sub> compact system offers a defined mode of operation which was never before technically possible, particularly through the combination of CO<sub>2</sub> adsorption and regeneration by nitrogen which is made available as a waste product in the NITROX membrane system.

The nitrogen is heated by means of compressed air and is used in the regeneration and drying of the desiccant. KrinnAir CO<sub>2</sub> Reduction ensures extremely reliable CO<sub>2</sub> reduction and drying of compressed air – hence the increase in the overall efficiency of NITROX production, while increasing the efficiency and lifetime of the NITROX membrane.

The integrated particle filter allows a service life of 500 hours. The filter element is validated and certified according to quality standard ISO 12500-1: 2007.

With the “stand alone” version of the KrinnAir CO<sub>2</sub> Reducer, the system can be used universally, resulting in the virtually total independence of the screw compressor, membrane system and high pressure compressor. The integration is carried out by means of three flexible hoses.

**CO<sub>2</sub> Reducer Diagram**





|  |  |
|--|--|
| 1. Compressed air inlet: moist and oily              | 6. Compressed air heater                     |
| 2. Compressed air preparation: drying and filtration | 7. NITROX membrane                           |
| 3. Compressed air outlet: dry and oil-free           | 8. NITROX port CO <sub>2</sub> reduced       |
| 4. CO <sub>2</sub> filtration                        | 9. Nitrogen output                           |
| 5. Pressure reduction                                | 10. CO <sub>2</sub> regeneration             |
|  | 11. N <sub>2</sub> / CO <sub>2</sub> exhaust |

**CO<sub>2</sub> is absorbed and reclaimed with nitrogen from the membrane.**

The pre-compressed air flows under pressure of 7 to 10 bar through the compressed air inlet **(1)** into the preparation system **(2)**. The compressed air is dried and freed of oil. At the compressed air outlet **(3)**, dry, oil-free compressed air is made available for CO<sub>2</sub> processing and NITROX production.

The purified compressed air flows upwards through a container filled with desiccants **(4)**. The drying agents are sufficiently sized to bind to the CO<sub>2</sub> and thus absorb the CO<sub>2</sub> over a defined period of time. In parallel, regeneration takes place in the counter-flow of the second desiccant container **(10)**. This is done using nitrogen (about 85%) that is available as residual gas from the NITROX oxygen membrane **(9)**.

**CO<sub>2</sub> is removed before NITROX production.**

Before entering the NITROX membrane **(7)**, the pressure is reduced **(5)** and the compressed air is heated **(6)**. In the NITROX membrane, oxygen **(8)** and nitrogen **(9)** are separated within the hollow fibre membrane to a specific level in order to produce the desired NITROX breathing gas mixture according to **DIN EN 12021**.

In the final step, the residual nitrogen cleans the CO<sub>2</sub>-saturated desiccant. With a low residual pressure, the CO<sub>2</sub> is reclaimed from the desiccant and discharged through the sound-suppressed exhaust **(11)**.

The system can be integrated with any NITROX system and can be added at any time!

**Technical specifications:**

| Model Premium Line          | CO <sub>2</sub> -7,5 | CO <sub>2</sub> -11 | CO <sub>2</sub> -15 |
|-----------------------------|----------------------|---------------------|---------------------|
| Execution                   | Compact housing      |                     |                     |
| Nitrogen heater             | integrated           |                     |                     |
| Control                     | fully automatic      |                     |                     |
| CO <sub>2</sub> input max.  | 2000 ppm             |                     |                     |
| CO <sub>2</sub> output max. | 500 ppm              |                     |                     |
| Nitrox                      | 21% - 40%            | 21% - 40%           | 21% - 40%           |
| Volume flow                 | 200 – 320 Liter/min  | 300 – 450 Liter/min | 450 - 600 Liter/min |
| Volume flow max.            | 1100 litres/min      | 1650 litres/min     | 2500 litres/min     |
| Compressed air quality      | ISO 8573-1 1.4.1     | ISO 8573-1 1.4.1    | ISO 8573-1 1.4.1    |
| Operating pressure          | 7 – 10 bar           | 7 – 10 bar          | 7 – 10 bar          |
| Ambient temperature         | +5 bis +40           | +5 bis +40          | +5 bis +40          |
| Electrical connection       | 230V/50Hz            | 230V/50Hz           | 230V/50Hz           |
| Power requirement           | 0,1 -0,5 KW          | 0,1 -0,5 KW         | 0,1 -0,5 KW         |
| Dimension in mm D/W/H       | 400 / 600 / 1200     | 400 / 600 / 1200    | 400 / 600 / 2000    |
| Weight: net                 | 100 kg               | 125 kg              | 150 kg              |
| Pipe connections            | Ermeto 18L           | Ermeto 18L          | Ermeto 18L          |
| Control air                 | 6 mm                 | 6 mm                | 6 mm                |



**Equipment delivered:**

- Functional and modern casing for installation without a foundation or wall mounting
- Powder-coated model (basic Rittal control cabinet)
- Compressed air, nitrogen line piping galvanised in steel
- Integrated particle filter with manual drain
- Pressure tank protection with safety valve and manometer
- Nitrogen heating with automatic temperature control and monitoring
- Maintenance-friendly casing with removable front door
- Integrated electrical cabinet, completely wired IP54
- Optional: CO<sub>2</sub> sensor with potential-free alarm contact and audible signal

Each system is subjected to a test run at our factory.  
 A test certificate confirms the successful approval.

The KrinnAir CO<sub>2</sub> Reducer described above complies with CE norm and Machinery Directive 2006/42/EC.

*Technology, design and brand protected*