INSTRUCTION MANUAL

Oxygen generator system

2-Column system
O10; O20; O40; O60; O70; O100; O170; O230; O330; O500; O600; O800

3-Column system
O10-3C; O20-3C; O40-3C; O60-3C; O70-3C; O100-3C; O170-3C; O230-3C; O330-3C

X-version
O-600X2; O-800X2; O-600X3; O-800X3; O-800X4; O-800X5; O-800X6

(All versions, validity from 11/2013)
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WARNINGS AND IMPORTANT INFORMATION READ BEFORE USE!

Warning: OXYMAT oxygen generator system is sold for use in industrial applications and for medical use. When PSA (pressure swing adsorption) generator is used for medical purpose it must be stated in declaration of conformity and refer to 93/42/EC MDD (medical device directive), Annex VII. & Annex V. (07/DK/1180). If you have ordered medical oxygen generator system you must follow procedures for service and maintenance of medical optional devices**. In case PSA generator is used for clinical purposes, it should be signed “exclusively for clinical investigations”.

Important: Upon receiving your OXYMAT oxygen generator system, inspect the unit thoroughly for signs of damage. Any signs of damage, either external or internal, should be noted on the delivery receipt, and also reported immediately to both the Freight Company and OXYMAT. Contact OXYMAT at Tel +45 4879 7811 / Fax +45 4879 7813 or Tel +421 32 779 0123 / Fax +421 32 779 0125

Important: The owner of the Oxymat oxygen generator system is responsible of keeping all the equipment in safe working order. Parts and units must be replaced if they are no longer in safe working condition. Installation of equipment and assembling to other equipment must be done in compliance with current local regulations and directions.

Important: The operator of the Oxymat oxygen generator system must always use safe working methods in compliance with current local safety regulations and directions. In case of difference between directions in the manual and local regulations the strictest must be followed.

Warning: Use only hoses and pipes of correct size and suitable for operating pressure and fluid. Never use hoses which are frayed, damaged or worn. Always use the correct type and size of connections. Make sure hoses are depressurized before disconnecting.

Warning: All tubes, hoses and piping used for oxygen must be compatible with oxygen and cleaned for oxygen service.

Warning: Lifting lugs on columns, if present, are only for handling of the columns if they are detached from the PSA generator unit. The PSA generator unit is not to be lifted by the lifting lugs on columns or by the pipes. The PSA generator must be lifted by the skid, with a suitable lifting device operated by a certified or trained operator. Take the necessary precautions to avoid units tipping over during handling. Anchor all parts to the concrete floor by means of anchor bolts or like.

Warning: Exhaust gas from the oxygen PSA generator contains only 8-21 % oxygen. Exhaust gas must be led by piping or ducts out of the room to outdoor atmospheric air. Failure to do this may cause serious damage, injury or death. The room where the PSA generator is located must always be well ventilated.

**see service check list
Warning: Make sure that your back-up/emergency oxygen supply is installed with an oxygen pressure regulator. The pressure must not exceed the design pressure stated in the Design Review Certificate. Check valves must be fitted at both oxygen delivery outlet from product tank and backup oxygen outlet.

Warning: Always vent oxygen to outdoor atmospheric air. While venting oxygen, make sure there is no smoking or open flame. Do not allow venting oxygen to come in contact with clothing or hydrocarbon materials.

Warning: Oxygen is a powerful oxidizing agent. It can cause fire or explosion. Observe strict cleanliness procedures when fabricating and connecting the oxygen piping. It is imperative that oxygen systems be properly cleaned and inspected to insure that no combustible materials remain in the connecting piping and fittings. Do not allow the free flow of oxygen from the oxygen PSA generator or from product tank.

Warning: The interior of the cabinet contains electrical parts that may produce electrical hazard if not handled properly. To prevent electrical shock, care must be taken when servicing this equipment. In general electrical installation and servicing is to be performed by trained or authorized personnel only.

Warning: The oxygen zirconium module and especially the heater block can get very hot. Touching these parts may cause burns. The module can still be very hot even after the module has been turned off. Always wait for at least 30 minutes before touching the module. If present the probe module is placed in the lower control cabinet.

Warning: Do not attempt to open the inspection hatch or similar unless the unit cycle pressure gauge reads zero and the rubber hose from the filter elements is disconnected to release pressure. PSA generator columns can contain hazardous substances. Handle only with proper protective clothing, gloves and eyewear and according to local environment and work environment regulations. In general mechanical and piping installation and servicing is to be performed by trained or authorized personnel only.

Caution: Improper behaviour as a result of inadequate qualification and knowledge can lead to substantial injury to person and property. Therefore don’t allow any activities to be performed by other than appropriately qualified personnel.

Warning: Tanks must be depressurized and purged thorough with air to remove all oxygen before service or inspection. Always vent oxygen to outdoor atmospheric air. Make sure there is no smoking or open flame.

Warning: When servicing control valves only use lubricant suitable for oxygen service. Use Klüber OXIGENOEX® S 4 or similar. Never use oil, grease or other lubricant not designed for oxygen. Such lubricants can self-ignite or explode in contact with oxygen.

Important: For safety, installation and operating etc. of compressor, air dryer unit or other auxiliary equipment refer to the concerned manuals of the equipment.

Warning: The compressor, air tank or other feed air supply and pressurized equipment must be fitted with adequate protective devises to protect against exceeding allowable limits of the concerned equipment e.g. safety relief valves. Feed air supply must be protected against exceeding the maximum allowable pressure P(S) 10 bar(g) for Oxymat oxygen PSA generators. For 3-column (3C) 15,2 bar version P(S) is 15 bar(g). The safety relief
valves on PSA generator columns and product tank (if supplied) are solely for the protection of these components.

**Caution:** The following will cause damage not covered under the manufacturer's warranty.
Feed air temperature T(O) above 40°C or below 5°C. Water, oil, rust, scale and/or other foreign objects carryover in the feed air due to damaged filter elements and/or plugged drains. The feed air quality must comply with specifications to ISO/EN 8573.1: 2010 class 2.4.1, unless otherwise stated.

**Caution:** OXYMAT filter elements have been selected based upon their ability to function in severe operating conditions. Use of other than original equipment manufacturer filter elements could cause damage not covered under the OXYMAT warranty.

**Caution:** The “oxygen compatible” lubricant Klüber OXIGENOEX® S 4 used in process valves is safe up to 60°C as mentioned on product sheet and MSDS (material safety data sheet) by manufacturer. In case of combustion, CO, Hydrocarbons and traces of fluorinated products will be released.

**Caution:** *** We recommend performing maintenance and greasing on equalization process valves in 2-column generator systems and all process valves on the top pipeline on 3-column generator systems every 6 months. We recommend performing maintenance and greasing once a year on all other process valves.

**Warning:** OXYMAT oxygen PSA generator cannot be disconnected from the power supply for the period longer than 6 month. It could cause damages not covered by OXYMAT warranty. This period begins to count from the date of final operation test mentioned in Design Review Certificate. This type of certificate is always part of the delivery - unique for each serial number of PSA generator.

Action in case of danger and accident:
- Store first-aid box and fire extinguishers close-at-hand
- Familiarise personnel with the inside emergency plan
- Emergency stop has to be activated
- Take first-aid measures in accordance with the inside emergency plan

*** see service check list
### Pictograms and labels on equipment

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Symbol description / Placed</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td><strong>R8-Oxidizing</strong> S9/17 Keep equipment in a well-ventilated area and gases away from combustible material <em>On front of a PSA generator</em></td>
<td>Warning: Oxidizing gas. Keep equipment in a well-ventilated area and gases away from combustible material. See WARNINGS AND IMPORTANT INFORMATION</td>
</tr>
<tr>
<td><img src="image2" alt="Symbol" /></td>
<td><strong>WARNING</strong> Equipment must be placed in a well-ventilated area. Avoid inhalation of gases <em>On exhaust silencer</em></td>
<td>Warning: Equipment must be placed in a well-ventilated area. Avoid inhalation of gases. See WARNINGS AND IMPORTANT INFORMATION concerning exhaust gases</td>
</tr>
<tr>
<td><img src="image3" alt="Symbol" /></td>
<td><strong>WARNING</strong> <strong>VOLTAGE</strong> Turn off power and disconnect before service <strong>PRESSURE</strong> Depressurize equipment before service <strong>MANUAL</strong> See manual before service <em>On skid plate</em></td>
<td>Warning: See WARNINGS AND IMPORTANT INFORMATION. Voltage - Turn off power and disconnect power supply before service or repair. Pressure - Depressurize before service or repairs. Manual - See manual before service or repair.</td>
</tr>
<tr>
<td><img src="image4" alt="Symbol" /></td>
<td><strong>INLET – FEED AIR</strong> <em>On piping near inlet</em></td>
<td>Information label, INLET - FEED AIR: Connect to feed air supply.</td>
</tr>
<tr>
<td><img src="image5" alt="Symbol" /></td>
<td><strong>OUTLET – OXYGEN</strong> <em>On piping near oxygen outlet</em></td>
<td>Information label, OUTLET – OXYGEN: On PSA generator: Connect this oxygen outlet to product tank inlet. On product tank: Connect this oxygen outlet to your consumption.</td>
</tr>
<tr>
<td>Icon</td>
<td>Warning</td>
<td>Location</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><img src="image" alt="Oxidizing" /></td>
<td><strong>S9/17</strong> Keep equipment in a well-ventilated area and gases away from combustible material.</td>
<td><strong>Warning – Oxidizing gas.</strong> Keep equipment in a well-ventilated area and gases away from combustible material. See WARNINGS AND IMPORTANT INFORMATION. On product tank near oxygen outlet</td>
</tr>
<tr>
<td><img src="image" alt="Warning" /></td>
<td><strong>WARNING</strong> Do not lift PSA generator unit by lifting lugs or by pipes.</td>
<td><strong>Warning –</strong> Do not lift PSA generator unit by the lifting lugs or by pipes. See WARNINGS AND IMPORTANT INFORMATION. On top of a PSA generator</td>
</tr>
<tr>
<td><img src="image" alt="Warning" /></td>
<td>-</td>
<td><strong>Warning: Voltage.</strong> See WARNINGS AND IMPORTANT INFORMATION. On outside of (upper) control cabinet</td>
</tr>
<tr>
<td><img src="image" alt="Warning" /></td>
<td>-</td>
<td><strong>Warning: Tip over hazard.</strong> See WARNINGS AND IMPORTANT INFORMATION. On front of a tank / column</td>
</tr>
<tr>
<td><img src="image" alt="Hot Surface" /></td>
<td><strong>HOT SURFACE</strong> Do not touch until cool</td>
<td><strong>Warning: Hot surface.</strong> Do not touch until cool. Allow for a cooling down of Zirconium probe module if present. Inside lower control cabinet on zirconium probe (if fitted)</td>
</tr>
</tbody>
</table>
Symbol used in manual:

- maintenance or control operation to be performed by adequate qualified personnel only
1 General information

Main installation parts (pre-assembled):
A. Compressor – if present in scope of supply
B. Air dryer and filters – if present in scope of supply
C. Coal tower - if present in scope of supply
D. Air tank – if present in scope of supply
E. 2-Column (or 3-Column or X-version) PSA generator c/w internal piping & electric cabinet
F. Product tank – if present in scope of supply
G. High pressure compressor – if present in scope of supply
H. Filling ramp/Backup - if present in scope of supply

1.1 Oxymat oxygen generator system

This Oxymat oxygen PSA generator is an on-site oxygen-generating machine. Coupled with your air compressor, refrigeration air dryer and filtration system (*), it takes air and separates the oxygen from other gasses. The separation is accomplished with an inert ceramic material (molecular sieve) that does not require replacement (when maintained and used according to this instruction manual). The process is completely regenerative which makes it reliable and virtually maintenance free. The delivery pressure can be set 0 to 10 bar(g) depending on version to meet the needs of your operation.

(*) It is important to note that your compressor, refrigeration air dryer and filtration system is an integral part of your total operation. It should be maintained in accordance with the manuals received with the compressor, refrigeration air dryer and filtration system to ensure safe and clean air supply. An improperly maintained compressor, refrigeration air dryer or filtration system could affect the operation of your oxygen PSA generator. For use up to 24 hours a day, OXYMAT recommends high quality screw compressors only with external or internal refrigeration air dryers and proper sized filtration systems.
**Warning:** OXYMAT oxygen PSA generators are sold for use in industrial applications only. Unless specifically modified by OXYMAT A/S, these PSA generators must not be used for any respiratory medical application. If you have ordered the oxygen PSA generator modified for medical application you must follow procedures for service and maintenance of medical optional devices.

### 1.2 Product warranty

OXYMAT A/S warrants all oxygen PSA generators to be free from defect in parts and workmanship for a period of one year duration, counting from the invoice date, or maximum 4000 operating hours of normal use and operation of the PSA generator. OXYMAT’s obligations under this warranty are limited to the repair (all parts and labour free of charge, excluding filter elements) or to replacement of the purchase price for a similar unit. Each PSA generator for which a warranty claim is asserted shall, at the request of OXYMAT A/S, be returned freight prepaid with proof of purchase date to the OXYMAT A/S factory at the expense of the purchaser.

Any replacement parts shall be warranted as stated above for the unexpired portion of the original one-year warranty. If traveling on the customer site for repair, even under warranty, freight and travel will be charged to the customer. This warranty does not extend to any PSA generator or part if a defect or malfunction occurs from misuse (at OXYMAT sole determination), any feed air malfunctions\(^1\), improper filter element maintenance\(^2\), or external causes\(^3\). The feed air quality must comply with ISO specification 8573-1:2010 class 2.4.1. The warranty shall be null, void and inoperative if the PSA generator has been repaired or altered outside the OXYMAT factory without the express written authorization of OXYMAT. The foregoing warranty is in lieu of any other warranty, expressed or implied, in fact or in law including without limitation the warranty of merchantability or the warranty of fitness for a particular purpose. It is expressly understood that purchaser’s sole and exclusive remedy for defect in parts is limited to enforcement of OXYMAT obligation as set forth above and OXYMAT shall not be liable to the purchaser or others for loss of use of the equipment or for other special, indirect, incidental or consequential damages.

Notwithstanding anything to the contrary herein, during the product warranty period as specified above, OXYMAT will return repaired PSA generators freight prepaid. After the product warranty period has expired, the customer is responsible for freight charges both ways. Said warranty shall extend and apply to the PSA generator only while the unit is owned and used exclusively by the original purchaser.

### 1.3 Limits of liability

OXYMAT A/S shall not be liable for any special, indirect, incidental or consequential damages that result from the use or malfunction of the machine.

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\(^1\)Air from your compressor must be less than 40°C before it reaches the PSA generator, T(O)-max. High feed air temperature will cause damage not covered under the OXYMAT Product Warranty.

\(^2\)Replace the filter elements every six (6) months assuming a properly maintained air compressor. Failure to replace filter elements on schedule will result in a void OXYMAT Product Warranty.

\(^3\)Locate the system in an indoor well-ventilated area that remains a temperature between 5°C and 45°C, T(S), to prevent damage not covered under the OXYMAT Product Warranty.
1.4 Conditions and procedure for returning the PSA generator for service

Follow the procedures below to return a PSA generator or component for service credit:
Contact OXYMAT A/S. Before you call for service assistance, have the following information readily available:

- The Model number of the PSA generator
- The Serial number of the PSA generator
- The invoice date
- Hours of use

Be sure merchandise is packed for a safe return. OXYMAT is not responsible for damages that occur to the PSA generator or a component because of failure to follow this procedure is the sole responsibility of the customer. Item(s) must be returned freight prepaid.
2 Product specifications

PSA generators are designed for indoor applications, temperature requirements in a range 5-45°C.

**Performance in Sm³/hour measured at 15° C (± 5 %), 981 mbar.**

- Sm³ – Standard cubic meter – reference conditions to 15°C, 981 mbar
- Nm³ – Normal cubic meter – reference conditions to 0°C, 1013 mbar

**Product Dew point** – -50°C < PDP

**Important:** All necessary information is stated in portfolio, related Order Confirmation and Oxymat web page.

<table>
<thead>
<tr>
<th>Density of O₂ and air</th>
<th>[Nm³]</th>
<th>[Sm³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density [kg/m³]</td>
<td>by 0°C</td>
<td>by 15°C</td>
</tr>
<tr>
<td>O₂ [kg/m³]</td>
<td>1,4290</td>
<td>1,3102</td>
</tr>
<tr>
<td>Air [kg/m³]</td>
<td>1,2940</td>
<td>1,1860</td>
</tr>
</tbody>
</table>

*Table 1. Density of O₂ and air*

Conversion from m³/hr. to kg/hr.:
Flow (m³/hr.) * Density (kg/m³) = Flow (kg/hr.)

Conversion from kg/hr. to m³/hr.:
Flow (kg/hr.) / Density (kg/m³) = Flow (m³/hr.)

- **bar(g)** – gauge pressure
- **bar(a)** – absolute pressure

bar(a) = bar(g) + atmospheric pressure (1,01325 bar)

**Feed air**
- Compressed feed air supply must be less than 40°C before it reaches the PSA generator.
- Pressure dew point of feed air ≤+3°C.
- The feed air quality must comply with ISO specification 8573-1:2010 class 2.4.1.

**NOTE:**

The PSA generators are designed to operate at a peak cycle pressure of 4.0 to 7.0 bar(g) and deliver 90-95% oxygen when supplied with a minimum feed air pressure of 6.0 bar(g). An increase of the cycle pressure to more than stated in the Design Review Certificate results in higher feed air consumption and lower generation efficiency.

3-column PSA generator 15,2 bar versions are designed to operate at a peak cycle pressure of 10.0 to 14.0 bar(g). Minimum feed air pressure must not be less than stated by manufacturer. An increase of the cycle pressure to more than stated in Design Review Certificate results in higher feed air consumption and lower generation efficiency.

The PSA generators can run higher peak cycle pressure, but only after special modification from OXYMAT.

For operation at lower cycle pressures and/or higher flow rates, a slight modification is required. Please contact your OXYMAT representative for assistance.
3 Oxygen generator system parts and controls

3.1 Basic process flow description of oxygen generator system

The OXYMAT Oxygen generator system 10.5 bar version is designed to accept compressed feed air at 6.0 – 10.0 bar(g) into its filter assembly. 3C 15.2 bar version accept compressed feed air at 11 – 14 bar(g). The incoming compressed air must be filtered through an air-conditioning system consisting of water drain filter, refrigeration air dryer, pre- and micro filtration units. All filtration units must be equipped with automatic drain valves for removing water and oil. The pre-filter (if present) and micro filter removes condensed water and oil, dirt, scale, etc., and the coalescing filter removes oil vapour (oil aerosols).

The normal flow of air through the PSA generator is shown in picture 2 below. After exiting the filter, the compressed feed air is regulated down to 4.0 – 6.0 bar(g). For 3C 15.2 bar versions it is regulated down to 10 – 12 bar(g) and then directed by pneumatic activated valves into one of two (2C) or three (3C) absorber columns containing molecular sieve. Molecular sieve has the unique property that it physically attracts or adsorbs nitrogen from the air, leaving the oxygen to pass through to the product tank, and can when saturated with nitrogen be regained to clean sieve again by purging with oxygen under lower pressure conditions.

The PSA generator consist of two or three absorber columns working in alternate operation, e.g. the processes always run in antiphase to one another in such way, that one absorber column with cleaned sieve delivers oxygen while the other absorber column regenerates saturated sieve. After a certain pre-set period, the processes shifts, so that the first absorber column now regenerates saturated sieve, while the second is delivering oxygen through a cleaned sieve. The oxygen from the absorber column is stored in the product tank. From the product tank the oxygen is regulated to 0 - 11.0 bar(g), depending upon model and the consumer’s specific working pressure. See picture 3 next page for more detailed information on the working process.

![Flow schematic unit of OXYMAT – 2-Column oxygen PSA generator](image)

*Picture 2. Flow - schematic unit of OXYMAT – 2-Column oxygen PSA generator*
The pressure drop $\Delta P$ on the accumulated oxygen delivery must not exceed 0.5 bar(g).

Normal process sequence:

A: Pressurization

B: Oxygen delivery

C: Pressure equalization - decreasing pressure

D: Exhaust (Pressure drop causes nitrogen release from sieve)

E: Pressure equalization and - increasing pressure
3-Column oxygen PSA generator

- is working on same procedure just with three absorber columns. 3-Column system utilizes the 2 step equalization among the 3 absorber columns as on the picture 4. Higher outlet pressures are reached while keeping molecular sieve treated in safe way avoiding fluidization.

![Picture 4. Schematic Pressure/Time diagram of Oxymat oxygen 3C PSA generator](image)

X-version oxygen PSA generator

- X-version PSA generator system consists of X-number of single PSA generators working in a counter phase. Total cycle time of single PSA generator is divided by the number of PSA generators and cycling of each unit is shifted in time proportionally.

![Picture 5. Schematic Pressure/Time diagram of Oxymat oxygen 2C PSA generators - X6 version](image)
3.2 PSA generator parts description

3.2.1 PSA generator parts, 2-Column system

1. **Absorber column**
Absorber columns contain molecular sieve that adsorbs nitrogen, and concentrates oxygen from air.

2. **Axial / angle seated valves for cycle operation, Angle seat valve for cycle operation**

These valves are controlling the pressurization and blow down sequences on the absorber columns.

3. **Feed air inlet**
Feed air from air supply system is connected to this point.

4. **Feed air pressure regulator (without or with filter)**

The feed air pressure regulator controls the inlet air pressure to 4.0 – 6.0 bar(g), and is set by the OXYMAT factory. Changing of factory set pressure can affect and harm the production capacity. The factory set pressure is stated in our Design Review Certificate.

5. **Cabinet**
The cabinet contains all sensor, PLC, HMI and electrical parts.

6. **Cycle pressure gauge**

It indicates absorber column pressure during the PSA generator cycles. The gauge is able to read from 0 to 10 bar (g). Peak cycle pressure is 4 to 6 bar(g) unless specially modified by OXYMAT to another pressure.
7. **Axial / angle seated valves for delivery of oxygen to product tank for types, Angle seat valve for delivery**

These valves open for a period of when the absorber column is pressurized to deliver oxygen to the product tank for use.

8. **Outlet to product tank**

Product tank and PSA generator are connected to this point. It is important to use the hose or pipe delivered from Oxymat A/S, as the internal dimension is an integrated part of the system.

9. **Axial / angle seated valves for equalization of pressure, Angle seat valve for equalization of pressure**

After pressurization cycle on one of the absorber columns, the purge valve will open for a period and pressure equalization between the absorber columns will take place.

10. **Safety relief valves**

These valves ensure that the pressure in column does not exceed the design pressure.
11. **Exhaust pipe - supersilencer**
Blow processed air.

![Exhaust pipe](image)

12. **Valve block**
The valve block contains all solenoid valves, that via the PLC controls the pilot air supplies to the process and drain valves.
3.2.2 PSA generator parts, 3-Column system

Function of each component is similar to the functions of the components in a 2-column PSA generator.
3.2.3 PSA generator parts, X-version system

X-version consists of X2 – X6 PSA generators connected into one inlet air manifold and one outlet oxygen manifold. X-versions 3 to 6 are built as frame.

Function of each component is similar to the functions of the components in a 2-Column PSA generator.

*Picture 8. X-version PSA generator parts*
3.3 Coal tower parts description

Air from compressor, air dryer cleaned with filters enters the coal tower through the top and leaves through the bottom.

13. Coal tower
Tower filled with active coal

14. Inlet coal tower connection

15. Outlet coal tower connection
In case PSA generator is used for medical purposes, microfilter is placed behind coal tower

Picture 9. Coal tower parts

3.4 Air tank parts description

Air from coal tower enters the air tank through the bottom of the air tank and leaves through the top.

16. Pressure gauge
   This should under normal condition read between 4.0 – 16.0 bar(g), depending on version

17. Air tank
   This stores the air for oxygen PSA generator. The air tank provides stable flow for process.

18. Inlet air tank connection

19. Outlet air tank connection

Picture 10. Air tank parts

3.5 Product tank parts description

20. **Product tank**
This stores the oxygen produced by the oxygen PSA generator. The product tank provides stable flow and purity of oxygen.

21. **Safety relief valve assembly with pressure outlet**
Safety relief valve prevents excessive pressure from building up should a malfunction occur. Pressure outlet on tee branch below the valve shall via the supplied hose be connected to the pressure transmitter on top of the control panel.

22. **Inlet product tank connection**
The oxygen PSA generator is normally connected to the product tank at the bottom through ball valve.

23. **Outlet product tank connection**
On the top of the product tank is connected outlet for the consumption through a ball valve and a regulator. In case of medical PSA generator, active coal filter and bacterial sterile filter have to be placed behind regulator.

**Spare parts**
Spare parts are delivered according customer request mentioned in OC.
3.6 Connections

3.6.1 Coal tower connections

Air form compressor, air dryer cleaned with filters enters the coal tower through the top and leaves through the bottom.

<table>
<thead>
<tr>
<th>Model type</th>
<th>Volume [l]</th>
<th>Connection [“]</th>
<th>Model type</th>
<th>Volume [l]</th>
<th>Connection [“]</th>
</tr>
</thead>
<tbody>
<tr>
<td>C010</td>
<td>10</td>
<td>¾”</td>
<td>C020</td>
<td>20</td>
<td>¾”</td>
</tr>
<tr>
<td>C040</td>
<td>40</td>
<td>1”</td>
<td>C090</td>
<td>90</td>
<td>1½”</td>
</tr>
<tr>
<td>C150</td>
<td>150</td>
<td>2”</td>
<td>C230</td>
<td>230</td>
<td>2”</td>
</tr>
<tr>
<td>C470</td>
<td>470</td>
<td>3 ½”</td>
<td>C750</td>
<td>750</td>
<td>4”</td>
</tr>
<tr>
<td>C1000</td>
<td>1000</td>
<td>6”</td>
<td>C1500</td>
<td>1500</td>
<td>6”</td>
</tr>
</tbody>
</table>

Table 2. Air inlet connections to and from coal tower

3.6.2 Air tank connections

Air from coal tower enters the air tank through the bottom of the air tank and leaves through the top.

<table>
<thead>
<tr>
<th>Model type</th>
<th>Volume [l]</th>
<th>Connection [“]</th>
<th>Model type</th>
<th>Volume [l]</th>
<th>Connection [“]</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT090</td>
<td>90</td>
<td>¾”</td>
<td>AT150</td>
<td>150</td>
<td>¾”</td>
</tr>
<tr>
<td>AT320</td>
<td>320</td>
<td>¾”</td>
<td>AT470</td>
<td>470</td>
<td>1½”</td>
</tr>
<tr>
<td>AT750</td>
<td>750</td>
<td>1 ½”</td>
<td>AT1000</td>
<td>1000</td>
<td>1½”</td>
</tr>
<tr>
<td>AT1500</td>
<td>1500</td>
<td>1 ½”</td>
<td>AT2000</td>
<td>2000</td>
<td>1 ½”</td>
</tr>
<tr>
<td>AT3000</td>
<td>3000</td>
<td>2”</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Air inlet connections to and from air tank
3.6.3 PSA generator connections

24. From pressure outlet on product tank to oxygen pressure sensor
Size of nylon tube, connecting product tank pressure outlet and pressure sensor on PSA generator control cabinet, depends on PSA generator model type.

25. Air inlet / oxygen outlet connections
Air from air tank enters PSA generator through the bottom pipe set of PSA generator and oxygen leaves through the top pipe set of PSA generator.

<table>
<thead>
<tr>
<th>Model type</th>
<th>Volume [l]</th>
<th>Connection [&quot;]</th>
<th>Model type</th>
<th>Volume [l]</th>
<th>Connection [&quot;]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxymat O10ECO</td>
<td>10</td>
<td>⅜” (a)</td>
<td>Oxymat O20ECO</td>
<td>20</td>
<td>⅜” (a)</td>
</tr>
<tr>
<td>Oxymat O40ECO</td>
<td>40</td>
<td>⅜” (a)</td>
<td>Oxymat O60ECO</td>
<td>60</td>
<td>⅜” (a)</td>
</tr>
<tr>
<td>Oxymat O70ECO</td>
<td>90</td>
<td>⅜” (a)</td>
<td>Oxymat O100ECO</td>
<td>150</td>
<td>⅜” (a)</td>
</tr>
<tr>
<td>Oxymat O170ECO</td>
<td>230</td>
<td>⅜” (a)</td>
<td>Oxymat O230ECO</td>
<td>320</td>
<td>⅜” (a)</td>
</tr>
<tr>
<td>Oxymat O330ECO</td>
<td>470</td>
<td>⅜” (c)</td>
<td>Oxymat O500ECO</td>
<td>750</td>
<td>⅜” (d)</td>
</tr>
<tr>
<td>Oxymat O600ECO</td>
<td>1000</td>
<td>⅜” (d)</td>
<td>Oxymat O800ECO</td>
<td>1500</td>
<td>⅜” (d)</td>
</tr>
</tbody>
</table>

Table 4. Air inlet connection to PSA generator and oxygen outlet from PSA generator - 2-Column

<table>
<thead>
<tr>
<th>Model type</th>
<th>Connection [&quot;]</th>
<th>Model type</th>
<th>Connection [&quot;]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxymat O10 - O60 3C</td>
<td>⅜” (a)</td>
<td>Oxymat O70 3C</td>
<td>⅜” (a)</td>
</tr>
<tr>
<td>Oxymat O100 3C</td>
<td>⅜” (a)</td>
<td>Oxymat O170 3C</td>
<td>⅜” (a)</td>
</tr>
<tr>
<td>Oxymat O230 - O330 3C</td>
<td>⅜” (c)</td>
<td>Oxymat O500ECO</td>
<td>⅜” (d)</td>
</tr>
</tbody>
</table>

Table 5. Air inlet connection to PSA generator and oxygen outlet from PSA generator – 3-Column

<table>
<thead>
<tr>
<th>Model type</th>
<th>Connection [DN]</th>
<th>Model type</th>
<th>Connection [DN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxymat O600ECOX2</td>
<td>DN50</td>
<td>Oxymat O800ECOX2</td>
<td>DN50</td>
</tr>
<tr>
<td>Oxymat O600ECOX3</td>
<td>DN80</td>
<td>Oxymat O800ECOX3</td>
<td>DN80</td>
</tr>
<tr>
<td>Oxymat O800ECOX4</td>
<td>DN100</td>
<td>Oxymat O800ECOX5</td>
<td>DN100</td>
</tr>
<tr>
<td>Oxymat O800ECOX6</td>
<td>DN150</td>
<td>Oxymat O600ECOX2 LP</td>
<td>DN65</td>
</tr>
<tr>
<td>Oxymat O800ECOX2 LP</td>
<td>DN50</td>
<td>Oxymat O600ECOX3 LP</td>
<td>DN80</td>
</tr>
<tr>
<td>Oxymat O800ECOX3 LP</td>
<td>DN80</td>
<td>Oxymat O800ECOX4 LP</td>
<td>DN100</td>
</tr>
<tr>
<td>Oxymat O800ECOX5 LP</td>
<td>DN100</td>
<td>Oxymat O800ECOX6 LP</td>
<td>DN150</td>
</tr>
</tbody>
</table>

Table 6. Air inlet connection to PSA generator and oxygen outlet from PSA generator – X-version

The feed air quality must comply with ISO specification 8573-1:2010 class 2.4.1.
NOTES (Connection from PSA generator outlet to product tank inlet):

a) For connection: supplied 10/12 ID/OD plastic tube to be used.

b) For connection: supplied 13/15 ID/OD plastic tube to be used.

c) For connection: use 20/22 ID/OD pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.

d) For connection: use 25/28 ID/OD pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.

e) For connection: use 32/35 ID/OD pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.

f) For connection: use 39/42 ID/OD pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.

g) For connection: use 50/54 ID/OD pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.

h) For connection: use DN65 pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.

i) For connection: use DN80 pipes of max 6 meters length, and material in Cu or AISI 314L, cleaned for oxygen service.
3.6.4 Product tank connections

26. Oxygen from the PSA generator enters the product tank through the bottom, then oxygen leaves product tank on top and continues to consumption (distance less than 5 meters).

<table>
<thead>
<tr>
<th>Model type</th>
<th>Inlet</th>
<th>Outlet</th>
<th>Model type</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT090</td>
<td>½&quot;</td>
<td>⅜&quot;</td>
<td>PT150</td>
<td>½&quot;</td>
<td>⅜&quot;</td>
</tr>
<tr>
<td>PT320</td>
<td>⅜&quot;</td>
<td>⅜&quot;</td>
<td>PT470</td>
<td>½&quot;</td>
<td>⅜&quot;</td>
</tr>
<tr>
<td>PT750</td>
<td>⅜&quot;</td>
<td>¼&quot;</td>
<td>PT1000</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>PT1500</td>
<td>¼&quot;</td>
<td>⅜&quot;</td>
<td>PT2000</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>PT3000</td>
<td>1½&quot;</td>
<td>1½&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Connections to / from product tank

⚠️ Warning: All tubes, hoses and piping must be compatible with oxygen and cleaned for oxygen service.

<table>
<thead>
<tr>
<th>Model type</th>
<th>PSA generator column size [l]</th>
<th>Air tank [l]</th>
<th>Product tank [l]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxymat O10ECO</td>
<td>10</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Oxymat O20ECO</td>
<td>20</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Oxymat O40ECO</td>
<td>40</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Oxymat O60ECO</td>
<td>60</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Oxymat O70ECO</td>
<td>90</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O100ECO</td>
<td>150</td>
<td>150 / 320</td>
<td>150 / 320</td>
</tr>
<tr>
<td>Oxymat O170ECO</td>
<td>230</td>
<td>320</td>
<td>320</td>
</tr>
<tr>
<td>Oxymat O230ECO</td>
<td>320</td>
<td>320</td>
<td>320</td>
</tr>
<tr>
<td>Oxymat O330ECO</td>
<td>470</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Oxymat O500ECO</td>
<td>750</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Oxymat O600ECO</td>
<td>1000</td>
<td>1500 / 2000</td>
<td>1500</td>
</tr>
<tr>
<td>Oxymat O800ECO</td>
<td>1500</td>
<td>2000 / 3000</td>
<td>2000</td>
</tr>
<tr>
<td>Oxymat O600ECOX2</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Oxymat O600ECOX3</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Oxymat O800ECOX2</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Oxymat O800ECOX3</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Oxymat O800ECOX4</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Oxymat O800ECOX5</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Oxymat O800ECOX6</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
</tbody>
</table>

Table 8. Minimum sizes of air and product tank
3.7 Control system

27. **Power/OFF**
Switch for turning the power supply ON or OFF. This is placed on the side of the cabinet.

28. **Touch screen**
Finger operated Touch Screen – see instruction manual for touch screen control system in appendix.

29. **Display control**
See instruction manual for display control system in appendix.

30. **Emergency stop button**
In case of emergency you can manually stop PSA generator.

*Picture 12. Control panel with small touch screen- IntelliControl, Display Control Panel DCP0*

Picture 13. Control panel with small touch screen- Display Control Panel DCP1 and 4”PC1


For further detailed information – see related HMI manual and wiring diagram.
4 Installation

4.1 Unpacking

You should have received the Oxymat oxygen PSA generator and the Instruction manual needed for proper installation of the unit. The product tank (if supplied) is shipped separately. Place and unpack the shipment at the pre-determined location with a hard plane and level surface, and check if the delivery is complete according to shipment and delivery lists. If any packages or parts are missing, notify the Freight Company and Oxymat A/S at once. The manufacturer is not liable in loses caused during shipment.

⚠️ Warning: Lifting lugs on tanks / columns, if present, are only for handling of the tanks / columns if they are detached from the PSA unit or by the pipes. The PSA unit is not to be lifted by the lifting lugs on columns. The oxygen PSA generator must be lifted by the skid, with a suitable lifting device operated by a certified or trained operator. Take the necessary precautions to avoid units tipping over during handling.

The PSA generator columns must be pressurized to protect the molecular sieves from ambient moisture.

⚠️ Important: Upon receiving your Oxymat oxygen PSA generator, inspect the unit thoroughly for signs of damage. Any signs of damage, either external or internal, should be noted on the delivery receipt, and also reported immediately to both the Freight Company and Oxymat. Contact Oxymat at Tel +45 4879 7811 / Fax +45 4879 7813 or Tel +421 32 779 0123 / Fax +421 32 779 0125. The manufacturer is not liable in damage caused during shipment.

4.2 Pre-installation instructions

It is necessary to consider the location, space available, air supply, and power supply prior to installing your Oxymat oxygen PSA generator.

⚠️ Important: For safe installation and operation etc. of compressor, air dryer or other equipment refer to manuals concerned for the equipment.

⚠️ Warning: Oxygen is a powerful oxidizing agent. It can cause fire or explosion. Observe strict cleanliness procedures when fabricating and connecting the oxygen piping. It is imperative that oxygen systems be properly cleaned and inspected to insure that no combustible materials remain in the connecting piping and fittings. Do not allow the free flow of oxygen from the oxygen PSA generator or from product tank.
4.2.1 Location

The PSA generator must be located in a well-ventilated indoor area which remains above 5°C and below 45°C T(S). Operating the PSA generator in an area below 5°C or above 45°C, could cause damage not covered under the manufacturer’s warranty.

Physical PSA generator characteristics (space requirements) for 2-Column system:

<table>
<thead>
<tr>
<th>Model type</th>
<th>Floor space [cmxcm]</th>
<th>Height [cm]</th>
<th>Load [kg]</th>
<th>Model type</th>
<th>Floor space [cmxcm]</th>
<th>Height [cm]</th>
<th>Load [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Column</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxymat O10ECO</td>
<td>55x45</td>
<td>145</td>
<td>75</td>
<td>Oxymat O20ECO</td>
<td>65x50</td>
<td>147</td>
<td>115</td>
</tr>
<tr>
<td>Oxymat O40ECO</td>
<td>65x50</td>
<td>146</td>
<td>145</td>
<td>Oxymat O60ECO</td>
<td>65x50</td>
<td>195</td>
<td>200</td>
</tr>
<tr>
<td>Oxymat O70ECO</td>
<td>90x80</td>
<td>183</td>
<td>250</td>
<td>Oxymat O100ECO</td>
<td>90x80</td>
<td>219</td>
<td>370</td>
</tr>
<tr>
<td>Oxymat O170ECO</td>
<td>90x80</td>
<td>213</td>
<td>500</td>
<td>Oxymat O230ECO</td>
<td>130x95</td>
<td>223</td>
<td>700</td>
</tr>
<tr>
<td>Oxymat O330ECO</td>
<td>150x95</td>
<td>227</td>
<td>1100</td>
<td>Oxymat O500ECO</td>
<td>200x125</td>
<td>239</td>
<td>1800</td>
</tr>
<tr>
<td>Oxymat O600ECO</td>
<td>200x125</td>
<td>246</td>
<td>2000</td>
<td>Oxymat O800ECO</td>
<td>200x125</td>
<td>295</td>
<td>3000</td>
</tr>
</tbody>
</table>

| 3-Column            |                     |             |           |                    |                     |             |           |
| Oxymat O10 - O60 3C| 75x60               | 195         | 293       | Oxymat O70 3C      | 105x70             | 183         | 375       |
| Oxymat O100 3C     | 75x105              | 217         | 500       | Oxymat O170 3C     | 105x70             | 183         | 750       |
| Oxymat O230 - O330 3C| 200x100           | 227         | 1650      |                    |                     |             |           |

| X-version           |                     |             |           |                    |                     |             |           |
| Oxymat O600ECOX2   | 200x250             | 246         | 4000*     | Oxymat O800ECOX2   | 200x250           | 295         | 6000*     |
| Oxymat O600ECOX3   | 455x244             | 290         | 9000*     | Oxymat O800ECOX3   | 455x244           | 290         | 9000*     |
| Oxymat O800ECOX4   | 606x244             | 290         | 12000*    | Oxymat O800ECOX5   | 606x244           | 290         | 15000*    |
| Oxymat O800ECOX6   | 606x244             | 290         | 18000*    | Oxymat O600ECOX2LP | 200x250           | 246         | 4000*     |
| Oxymat O800ECOX2LP | 200x250             | 295         | 6000*     | Oxymat O600ECOX3LP | 455x244           | 290         | 9000*     |
| Oxymat O800ECOX3LP | 455x244             | 290         | 9000*     | Oxymat O800ECOX4LP | 606x244           | 290         | 12000*    |
| Oxymat O800ECOX5LP | 606x244             | 290         | 15000*    | Oxymat O800ECOX6LP | 606x244           | 290         | 18000*    |

Table 9. PSA Generator characteristics.

* Total weight of the X-version system excludes frame weight for frame built solutions. Add 2700kg for 20ft, 1800kg for 15ft and 1400kg for 10ft frame construction.

Physical product tank characteristics (space requirements):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PT090</td>
<td>90 / 300</td>
<td>PT150</td>
<td>150 / 400</td>
</tr>
<tr>
<td>PT320</td>
<td>120 / 500</td>
<td>PT470</td>
<td>470 / 600</td>
</tr>
<tr>
<td>PT775</td>
<td>750 / 750</td>
<td>PT1000</td>
<td>1000 / 863</td>
</tr>
<tr>
<td>PT1500</td>
<td>1500 / 863</td>
<td>PT2000</td>
<td>2000 / 1100</td>
</tr>
<tr>
<td>PT3000</td>
<td>3000 / 1280</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10. Size of product tank. Please, consult Oxymat for further details.
Exhaust pipe connections in mm:

<table>
<thead>
<tr>
<th>Model type</th>
<th>Diameter Ø [mm]</th>
<th>Model type</th>
<th>Diameter Ø [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 column</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxymat O10ECO</td>
<td>150</td>
<td>Oxymat O20ECO</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O40ECO</td>
<td>150</td>
<td>Oxymat O60ECO</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O70ECO</td>
<td>150</td>
<td>Oxymat O100ECO</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O170ECO</td>
<td>150</td>
<td>Oxymat O230ECO</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O330ECO</td>
<td>150</td>
<td>Oxymat O500ECO</td>
<td>250</td>
</tr>
<tr>
<td>Oxymat O600ECO</td>
<td>250</td>
<td>Oxymat O800ECO</td>
<td>250</td>
</tr>
<tr>
<td>3 column</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxymat O10 - O60 3C</td>
<td>150</td>
<td>Oxymat O70 3C</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O100 3C</td>
<td>150</td>
<td>Oxymat O170 3C</td>
<td>150</td>
</tr>
<tr>
<td>Oxymat O230 - O330 3C</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11. Exhaust pipe connections

4.2.2 Air supply (Feed air)

Air from your compressor or feed air supply must be less than 40°C, T(O)-max, before it reaches the oxygen PSA generator. High feed air (operating) temperature will reduce the performance of the oxygen PSA generator and will cause damage not covered under the manufacturer's warranty. Low feed air (operating) temperatures may cause freezing of components and damage not covered under the manufacturer's warranty.

⚠ Warning: The compressor, product tank or other feed air supply and pressurized equipment must be fitted with adequate protective devices to protect against exceeding allowable limits of the concerned equipment e.g. safety relief valves. Feed air supply must be protected against exceeding the maximum allowable pressure P(S) for oxymat oxygen PSA generators. The safety relief valves on PSA generator columns and product tank (if supplied) are solely for the protection of these components.

The feed air quality must comply with ISO specification 8573-1:2010 class 2.4.1., e.g. maximum number of particles per m³ is as following:

<table>
<thead>
<tr>
<th>class</th>
<th>Maximum number of the particles per m³</th>
<th>Moisture</th>
<th>Residual Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Particle size, d [µm]</td>
<td>Max. pressure dew point (PDP) [°C]</td>
<td>Max. concentration [mg/ m³]</td>
</tr>
<tr>
<td></td>
<td>d ≤ 0,1</td>
<td>0,1 &lt; d ≤ 0,5</td>
<td>0,5 &lt; d ≤ 1,0</td>
</tr>
<tr>
<td>0</td>
<td>As specified by the equipment, user or supplier and more stringent than class1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Not specified</td>
<td>≤ 20 000</td>
<td>≤ 400</td>
</tr>
<tr>
<td>2</td>
<td>Not specified</td>
<td>≤ 400 000</td>
<td>≤ 6 000</td>
</tr>
<tr>
<td>3</td>
<td>Not specified</td>
<td>≤ 90 000</td>
<td>≤ 1 000</td>
</tr>
<tr>
<td>4</td>
<td>Not specified</td>
<td>Not specified</td>
<td>≤ 10 000</td>
</tr>
<tr>
<td>5</td>
<td>Not specified</td>
<td>Not specified</td>
<td>≤ 100 000</td>
</tr>
</tbody>
</table>

Table 12. Feed air quality

Dew point +3°C & residual water content max. 6 g/m³ and residual oil content max. 0,01 mg/m³.
Warning: Use only hoses and pipes of correct size and suitable for operating pressure and fluid. Never use hoses, which are frayed, damaged or worn. Always use the correct type and size of connections. Make sure hoses are depressurized before disconnecting.

Warning: All tubes, hoses and piping used for oxygen must be compatible with oxygen and cleaned for oxygen service. The connections of hoses, if used must be done with high quality connection systems, e.g. a clamp system or compression end fittings depending on the type of hose applied. It is not recommended to use ordinary hose clips.

Important: All hoses and piping must be routed out of harm’s way and secured to prevent accidental pulling of hoses piping or connections.

The hose/piping used to bring air from the compressor to the air tank and from the air tank to the oxygen PSA generator should be dimensioned to supply the needed feed air flow at a pressure between 6,0 - 10,0 bar(g). 3C 15,2 bar version: max. 15 bar (g). The dimensions must at least be:

<table>
<thead>
<tr>
<th>Model type</th>
<th>Dimensions [mm]</th>
<th>Model type</th>
<th>Dimensions [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 column</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxymat O10ECO</td>
<td>20</td>
<td>Oxymat O20ECO</td>
<td>20</td>
</tr>
<tr>
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<td>DN100</td>
<td>Oxymat O800ECOX6 LP</td>
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</table>

Table 13. Air inlet connections

With a properly dimensioned hose/piping¹, the feed air pressure must not be less than pressure specified by Oxymat. The use of an improperly size of hose/piping will result in reduced oxygen generating capacity.

It is recommended to have a shut off valve installed where the air inlet hose/piping is connected to the compressed air supply or if present on the air tank to facilitate safe depressurization of the hose/piping before removal of connections.

¹ Max length of hose: 3 meters
4.2.3 Power supply

**Warning:** The interior of the cabinet contains electrical parts that may produce electrical hazard if not handled properly. To prevent electrical shock, care must be taken when servicing this equipment. In general electrical installation and servicing is to be performed by trained or authorized personnel only.

1. 110-240V, 50-60Hz, single phase, 1.0A
   *Proper voltage must be provided to the PSA generator at all times.*
   *Maximum fuse on power supply 10A*
   *Improper voltage will cause damage not covered under the manufacturer's warranty. To protect your PLC on the PSA generator Oxymat recommend the use of electrical filters.*

2. Power should be supplied to the unit from a **grounded electrical outlet with a 3-prong plug**. It is recommended to use a circuit that will not be accidentally turned off, as this will cause the PSA unit to stop cycling. If power is off and the PSA unit is being used, the product tank will depressurize.

3. In order to prevent production stop and purity drop in case of electric power failure, a UPS (power backup) is recommended as an option.
4.3 Installation

Unpacking and handling in general:
On receipt of the aggregate, check that the individual parts correspond with those listed on the delivery note.

The packaging serves to protect the machine until it is installed and protect it from transportation damage, corrosion and other damage. Therefore, do not disturb packaging and remove it right before installation. When unloading, check immediately for possible damage to all parts, such as dents, scratches, corrosion, torn electric cables, bent pipes, or the like. In case of defects or damage, the carrier and supplier shall be informed immediately.

The aggregate shall only be lifted according to suppliers instructions, and in case of compressor/air dryer delivery, special care must be taken to the instructions noted in the compressor suppliers manual. In order to avoid squeezing of instruments, piping, etc., use a suitable lifting device.

⚠️ Warning: The PSA generator columns must be pressurized to protect the sieves from ambient moisture.

Placement of aggregate:
Place all the main parts in their final positions. Make sure that sufficient space between parts is available for maintenance and inspection. Up-line the parts to proper horizontal and vertical positions and anchor all parts to the concrete floor by means of anchor bolts or like.

⚠️ Warning: Exhaust gas from the oxygen PSA generator contains only 8-21 % oxygen. Exhaust gas must be piped out of the room to outside. Failure to do this may risk in serious damage or death. The room must always be well ventilated

- OPTIONAL - For on-line back up or surge needs, we recommend that backup oxygen is connected directly on the oxygen outlet string (through a check valve), and that the pressure on the backup oxygen is approximately 0.3 kg/cm² below the regulator setting on the oxygen PSA generator.

⚠️ Warning: Make sure that your back-up/emergency oxygen supply is installed with an oxygen pressure regulator the pressure must be set according to pressure levels stated in Design Review Certificate.

⚠️ Very important: Check all fittings for leaks using an oxygen compatible leak detecting solution.

🔍 Make all the installations and note the cautions mentioned above.

Configuration: New or existing - compressor, air dryer, coal tower with oil mist absorber, air tank; new oxygen PSA generator; new or existing product tank, high pressure compressor

1.1 For the compressor installation – follow the instructions in the compressor supplier’s manual – read this manual before installation!!!

1.2 Connect air hose/pipe from compressor outlet to air dryer inlet

1.3 Connect air hose/pipe from air dryer outlet via the pre-filter and the micro/filter (new or existing) to the inlet port at the top of the coal tower.

1.4 Connect the coal tower (oil mist absorber) equipped with a second micro-filter to the inlet of air tank. The coal tower inlet is placed on top of the tower, and the outlet is placed at the bottom of the tower.

- If the delivery includes a separate air tank, the coal tower is placed between the air dryer and air tank.
- If the air tank is an integrated part of the compressor, the coal tower location is after the air tank, and the auto drain valve is in this case placed on the side of the air tank instead of the bottom of the tank.

1.5 Connect air hose/pipe from bottom of coal tower to the bottom of the air tank.

1.6 Connect air hose/pipe from an upper port on air tank to inlet of PSA generator.

1.7 Connect product hose/pipe from PSA generator outlet valve on top of generator to the product tank bottom valve.

1.8 Also connect your oxygen application/consumption to the pressure regulator on top of the product tank. In case of medical device after product tank and pressure regulator is placed active coal filter and bacterial sterile filter.

1.9 In case we have high pressure compressor, connect oxygen hose/pipe from product tank to high pressure compressor. **Always check type of connection to high pressure compressor before installation.**

Installation connections between supplied parts and existing equipment follow sizing instructions.
Optional drain system might be available.

Picture 14. Drain system – separate air tank

Picture 15. Drain system – compressor mounted air tank
Picture 16. Instruments hose connection

Instruments hose connection – for more information follow wiring diagram.
5 Operation

5.1 Initial start-up procedure

To start the oxygen PSA generator for the first time, follow the steps below:

1. Remove transport brackets at the air dryer (if present).
2. Turn on the power supply to the air dryer (if present).
3. Allow the refrigeration air dryer temperature to stabilize at the pre-set value +3°C
4. Remove transport brackets at the compressor (if present).
5. Turn on the power supply to the compressor (if present).
6. Make sure, that all shut off valves between the plant items are open
7. Let the compressor keep running and observe that the compressor shifts to unloaded operation, when the compressor pressure has reached the pressure stop set point.
8. Carefully and gentle open for feed air supply to the PSA generator.
9. Turn on the electric power supply to the PSA generator.
10. Switch the mode selector to manual position.
11. Ensure that the drain system works properly by checking, that exhaust air appears from the drain water outlet for about 1.5 second every 5 minutes.
12. Be aware that air and condensate might be exhausted automatically from compressor and air dryer during start up – this is not a mal function.
13. Shut off the oxygen application/consumption and prepare for Leak test:
   a. Let the plant run in manual mode, until the product tank pressure reaches a minimum of 5 bar.
   b. Turn the mode selector switch to stand-by/off, and the PSA generator will stop after a little while, when the actual operation cycle is completed.
   c. Shut off the feed air supply.
   d. If fitted with purity monitoring probe close of the pressure reduction valve on probe inlet.
   e. Read and note the pressure P1 in product tank, column 1, column 2, column 3 (if available) and air tank.
   f. Let the plant stand still (rest) and isolated in pressurized condition for an hour.
   g. After an hour read and note the pressure P2 in product tank, column 1, column 2, column 3 (if available) and feed air tank.
   h. Then determine an eventually pressure drop as the difference between P1 and P2 for each component.
   i. The Leak test is right, if the pressure drop after one hour pressurized isolation is less than 0.1 bar(g). In case of leaks they must not cause more than 0.1 bar(g) pressure drop per hour.
   j. Reset the pressure reduction valve on probe inlet to 1.0 bar(g).
14. To obtain the design purity in product tank purge the tank with oxygen as follows:
   a. Check that oxygen consumption is closed off.
   b. Open up for flow from feed air supply/compressor.
   c. Start the feed air supply/compressor.
   d. Start the PSA generator and let it run for about 15 minutes.
   e. Check that pressure in product tank reaches the value stated in Design Review Certificate.
   f. Open for oxygen consumption. Adjust flow to approximately to 50 % of design flow (refer to Design Review Certificate).
   g. Let the generator run in manual mode until design purity is reached. Duration 0.5 - 8 hours
depending on purity and capacity.

h. When design purity is reached close off oxygen consumption switch PSA generator to auto mode and let the PSA generator run until it stops automatic. This should occur within 10 minutes. If the generator does not stop as described refer to section for pressure set point procedure.

15. At the end of this period, observe the feed air pressure gauge and the cycle pressure gauge on the PSA generator for at least 5 complete cycles, to make sure that the PSA generator starts and stops within the allowable limits, as follows:
   a. Observe that the feed air pressure should be no less than stated by manufacturer.
   b. Observe that the peak cycle pressure should not increase above stated by manufacturer (Design Review Certificate).

16. Now the plant is ready for normal operation.

For X-versions repeat procedure for all PSA generators separately.

**Important:** If the system is with purge system (optional), the system will automatically ensure a proper ventilation of the system. Please, read documentation supplied with the upgrade.

**Important:** When the generator is being started up for the first time, or after a long shut-down period, it is possible that the product tank is full of air. Before the PSA generator can supply oxygen of design purity, any air in the product tank must be purged.

**Warning:** Always exhaust oxygen to the outside atmospheric air. While exhausting oxygen, make sure there is no smoke, spark or open flame nearby. Do not allow exhausted oxygen to come in contact with clothing or hydrocarbon materials.

**Product purity (O<sub>2</sub>)** – indicate the purity in the product tank. The purity is controlled by purity alarm. If the purity level drops below the alarm settings, an alarm is executed. If the purity level drops below the purity stop settings, then the PSA unit will perform a controlled stop.

**Product gas quality** – please consider, that Oxymat is choosing most suitable filters to reach required product gas quality. If filters are supplied by another supplier, Oxymat cannot guarantee product gas quality.

### 5.2 Operation

🔧 The oxygen PSA generator can operate in either auto or manual mode or can be in stand-by mode. The operation mode is selected on the mode selector switch on HMI.

🗂 Refer to touch screen control manual.
5.3 Shut-down

1 Turn of oxygen application/consumption

Close off central oxygen application/consumption. This will insure that the product tank is full the next day even if oxygen discharge valve is left open.

Ensure that the mode selector switch is in the AUTO position, and wait until the PSA generator stops cycling. This allows the product tank to fill completely with oxygen for immediate use required. It also allows the unit to shut down at the proper point in the cycle.
NOTE: Failure to wait or immediate or accidental stop of operation during a cycle will result in temporary lower oxygen purity during subsequent use.

2 Turn off Power

- Turn the selector switch to stand-by position
- Turn off the compressor power switch (if present)
- Turn off the air dryer power switch (if present)
- Turn off the PSA generator power switch

5.4 Normal start-up

- Turn on the air dryer power supply (if present)
- Allow the refrigeration air dryer temperature to stabilize at the pre-set value +3°C
- Turn on the compressor power supply (if present), or open for the central compressed feed air supply
- Observe that the feed air pressure is above the minimum pressure requirements.
- Turn on the power supply to the oxygen PSA generator
- Turn the mode selector switch in manual position
- Observe that the drains are working
- Observe that the peak cycle pressure do not excess the value stated Design Review Certificate
- Turn the mode selector switch in auto position
- After a while observe that the PSA generator automatically stops, when the product tank pressure reaches pressure set point stop stated by manufacturer in Design Review Certificate
- Further observe that the PSA generator automatically re-starts after about 0.5 pressure drop unless stated otherwise by manufacturer. If the PSA generator does not start or stop like this see section for pressure set point procedure and adjustment
5.5 Extended shut-down

To shut down the Oxymat oxygen PSA generator for 24 hours or longer, complete all steps in Section 5.3 – Shutdown. In addition perform the following:

Fully close all manual valves to isolate the oxygen in the product tank, to prevent the loss of pressure in the product tank, in order to enable a normal start-up. Turn off all electric powers, e.g. on compressor, air dryer and PSA generator.

Keep columns pressurized and sealed to protect contained molecular sieve against ambient moisture.

If PSA generator is fitted with purity monitoring probe, close of the pressure reduction valve on probe inlet.

5.6 Start-up after an extended shut-down

After an extended shutdown or an unexpected shutdown, such as an electric power failure, you must purge the product tank of any low purity oxygen before the oxygen PSA generator can supply oxygen within the purity specifications.

To purge the product tank, follow step 14 in section – Initial start-up procedure.

**Important:** If the system is with purge system (optional), the system will automatically ensure a proper ventilation of the system. Please, read documentation supplied with the upgrade.
6 Maintenance

⚠️ Warning: The interior of the cabinet contains electrical parts that may produce electrical hazard if not handled properly. To prevent electrical shock, care must be taken when servicing this equipment. In general electrical installation and servicing is to be performed by trained or authorized personnel only.

Monitoring the operation of the unit on a regular schedule is the best way to insure a long life for your Oxymat oxygen PSA generator. External and internal inspection of tanks/columns and other pressurized equipment must be carried out according to local regulations.

Refer to the concerned manuals of the equipment for service instructions

6.1 Daily inspection

- Every day observe the operation of the oxygen generator system
- Check purity and product consumption
- Verify that the temperature displayed on the refrigeration air dryer is correct (+3°C). If the air tank is assembled with DEW POINT transmitter check the real dew point value.
- Make sure that the automatic drain system and air tank drain system is functioning properly (press DRAIN test button in PSA controller menu to check this function)

Observe that the filter drain port and air tank drain port is not clogged. Air should discharge from these ports for 3 seconds every 3 to 7 minutes (it depends from actual time settings) when the PSA generator is cycling.

Clogging of the drain systems will cause water/oil carry-over into the absorber columns, and will cause severe damage to the molecular sieve which is not covered under the manufacturer’s warranty.

6.2 Weekly inspection

The weekly inspection of the oxygen generator system consists of a daily inspection point, plus:

- Check oil level and operating temperature on the air compressor
- Check function of your refrigeration dryer
- Check filter elements placed after the refrigeration dryer, pressure differential gauges on the filter elements must not be in red area at any time of operation.
- Air compressor maintenance (clean procedure of air/oil after-cooler)
- Air dryer maintenance (clean procedure of cooler)
After-cooler clean procedure

- With an air jet (max. 2 bar) blowing from inside towards outside clean the cooler of air dryer and air compressor
- Repeat this operation blowing in the opposite way

!!! Be careful not to damage the aluminium fins of the cooling package.

6.3 Biannual PM– or every 4 000 working hours

- Service of air compressor according to supplier manual (filters and oil replacement, etc...)
- Service of air dryer according to supplier manual (drain and strainer cleaning, etc...)
- Replacement of pre-filter 0,1µm and micro filter element 0,01µm

6.4 Annually PM – or every 8 000 working hours

- Air package maintenance according to manufacturer manual
- Coal tower maintenance- replacement of active coal, oil indicator and micro-filter element
- Air tank - Inspection of drain system; each non-return valve has to be cleaned and checked for damage (replace if needed); axial drain valve has to be cleaned and properly re-greased
- PSA generator - whole system has to be inspected for function, damage, leakage (solenoid valve block, hose/pipe connection, safety valves, etc...); process valves has to be cleaned and properly re-greased (Klüber OXIGENOEX® S 4 or similar grease has to be used for O2 applications); inspection of strainer and main inlet pressure regulator; gas analyser maintenance / calibration; inspection of the status of molecular sieve - replacement of 2” O-ring
- Product tank – OMED upgrade filter elements (sterile and active carbon) have to be replaced
- Fan filter – if present

6.5 2 years maintenance – or every 16 000 working hours

- Replacement of top brass filters
- Replacement of process valves
- Replacement of main inlet pressure regulator
- Replacement of fan for control cabinet - if present
6.6 3 years maintenance – or every 24 000 working hours

The 3 years PM consists from the points of annual and 2 years PM, plus:

- Replacement of HDM solenoid valve block
- Replacement of gas analyser

6.7 5 years PM – or every 40 000 working hours

The 5 years PM consists from the points of annual PM, plus:

- Molecular sieve replacement is recommended
- Internal inspection of process columns

6.8 Filter element replacement

The expected life of the pre-filter elements is 6 months or 4.000 working hours with proper maintenance of air compressor.

The expected life of the micro filter elements is 6 months or 4.000 working hours with proper maintenance of air compressor and pre-filters.

It is recommended to replace active coal in coal tower, yearly. At the very latest – when the oil indicator mounted on coal tower turns red.

Improper compressed air quality could affect the operation of your oxygen PSA generator. The filter element(s) supplied with each unit have been selected by manufacturer based upon the units feed air requirements.

⚠️ **Caution:** The following will cause damage not covered under the manufacturer's warranty:
- Feed air (operating) temperature T(O) above 40°C or below 5°C.
- Water, oil, rust, scale and/or other foreign objects carryover in the feed air can damage filter elements and/or plugged drains.

⚠️ **Warning:** Oxymat filter elements have been selected based upon their ability to function in severe operating conditions. Use of other than original equipment manufacturer filters could cause damage not covered under the Oxymat warranty.

⚠️ **Warning:** Do not attempt to remove the filter bowls unless the units cycle pressure gauge reads zero and the rubber hose from the filter elements is disconnected slowly to release pressure.

Note that the first filter from the air inlet port is the pre-filter and the second filter is the micro filter.
Filter element replacement

1. Close off feed air supply to PSA generator.
2. Carefully disconnect the 4/6 mm rubber drain tube the bottom of the filter to depressurize.
3. Turn the filter element counter clockwise and remove the element.
4. Remove check valve form old filter element and install the check valve on the new filter element.
5. Install new filter element with check valve.
6. Reconnect tube to the check valve at the bottom of the filter element.
7. Perform a leak test.

Coal tower annual maintenance

1. Stop Oxymat PSA generator and air compressor
2. Close the manual ball valves behind the air dryer and front of the air tank
3. Depressurize unit (open safety relief valve slightly)
4. Disconnect hose/piping connection from the coal tower
5. Remove top filter coupling unit (turn it counter clockwise)
6. Use a suitable vacuum cleaner and suck out all the active coal
7. Perform a tower maintenance
8. Use a suitable funnel and fill the tower with new active coal (leave approx. 15cm free space on top of the tower)
9. Refit the top filter coupling unit applying a new sealing
10. Refit hose/piping connection
11. Close manual ball valve on the bottom of tower and remove micro filter element
12. Pressurize the tower from top to approx. 5 bar and after pressure is reached, totally discharge tower through manual bottom ball valve
13. Repeat this procedure until the coal dust is completely blown out from the tower
14. Install new filter element and replace oil indicator
15. Perform a leak test

6.9 Tank / column maintenance

⚠️ Warning: Tanks must be depressurized and purged thorough with air to remove all gasses before service or inspection. Always vent oxygen to outdoor atmospheric air. Make sure there is no smoking or open flame.

External and internal inspection of tanks / columns and other pressurized equipment must be carried out according to local regulations.

If molecular sieve is going to be replaced inspect columns for corrosion or other damage. Replace if needed. Refer to sieve material safety data sheet for handling and safety instructions of sieve.

Product tank should be inspected internal every 4 years or according to local regulations.
6.10 Valve maintenance

All valves should be inspected, cleaned and lubricated within period of 12 months or after 8,000 operating hours. Important notice: Upper and lower equalization valves require initial maintenance after 2,000 hours of operation. After this, it can follow the normal maintenance frequency.

Valve cleaning and lubrication

1. Stop the oxygen PSA generator.
2. Close off feed air supply to PSA generator.
3. Close and disconnect product tank.
4. Depressurize the columns by opening safety valves.
5. **NOTE! The columns must never be left unpressurized more than 2 hours.**
6. Carefully disconnect and remove the upper and lower pipe set.
7. Seal the inlets of the columns by using tape to avoid any contamination of column content by the moist.
8. Disassemble the pipe sets and disassemble the valves.
9. Remove all the particles, dirt, residual oil etc. from inside the valve.
10. Clean and lubricate the valve (Klüber OXIGENOEX® S 4 or similar grease has to be used for oxygen applications).
11. Reinstall the valve as well as the pipe sets.
12. Perform a leak test.

6.11 Safety devices

Visual inspect safety relief valves and other safety devices for dirt or damage. If there is debris in the valve seat scavenge the valve as follows: Pressurize tanks / columns and loosen the top screw one turn to. This should remove debris from the valve. Retighten the top screw.

Always wear personal protection of hearing, hands, eyes etc.

6.12 Service check list

When performing the stated monitoring/maintenance, it will be an advantage to follow and use the Service check list shown on next page.

⚠️ Warning: When servicing control valves only use lubricant suitable for oxygen service. Use Klüber OXIGENOEX® S4 or similar. Never use oil, grease or other lubricant not designed for oxygen. Such lubricants can self-ignite or explode in contact with oxygen.
## Service Check List

<table>
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<th>Type: ____________________________</th>
<th>Installation</th>
<th>every 4,000 hours</th>
<th>every 8,000 hours</th>
<th>every 16,000 hours</th>
<th>every 24,000 hours</th>
<th>every 32,000 hours</th>
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<td>Series no: ______________________</td>
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<td>1. Service compressor according to suppliers instructions</td>
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<td>2. Check of refrigeration air dryer incl. drain according to suppliers instructions</td>
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<td>3. Check of pressure in air tank, column tanks and product tank</td>
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<td>4. Check of cycle time and cycle interval</td>
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<td>5. Check of product purity</td>
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<td>6. Check of product consumption (flow)</td>
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<td>7. Check of drain system</td>
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<td>8. Replace filters (pre- and micro filter)</td>
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<td>9. **Replace micro-filter after coalescing tower</td>
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<td>10. **Replace active coal and oil indicator yearly (recommended)</td>
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<td>11. **Replace micro filter and sterile filter/bacterial filter</td>
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<td>12. Inspection of pressure regulator</td>
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<td>14. Cleaning of strainer</td>
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<td>15. ***Cleaning and inspection of process valves</td>
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<td>16. Replacement of process valves</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>17. Check level and status of molecular sieve</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>18. Replacement of molecular sieve recommended / on demand</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>19. Leak test</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>20. Check of safety valves</td>
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<td>x</td>
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<td>21. Replacement of top brass filters</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>22. Check of manometers</td>
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<td>23. Check of pipe and hose connections, cables, plugs etc.</td>
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<td>x</td>
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<tr>
<td>24. Check of solenoid valve block, leakage/function</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>25. Replacement of solenoid valve block</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>26. Check of purity analyser, Calibrate if required</td>
<td>x</td>
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<td>x</td>
<td>x</td>
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<td>27. Replacement of purity analyser</td>
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<td>28. Fan filter replacement</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>29. Fan replacement</td>
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<td>x</td>
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<tr>
<td>30. Affixing of service stoker</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>31. Hand over copy of service check list to the client</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>32. Fill in timesheet incl. spare parts list</td>
<td>x</td>
<td>x</td>
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</table>

Remarks to client:

Date: ____________________________

Service technician: ____________________________

** medical optional devices

*** equalization valve shall be greased every six month or every 4,000 wh

### Table 14. Service part list
7 Troubleshooting

Most common operation failure is insufficient oxygen purity due to inadequate flow rate (capacity) caused by too heavy leakage or other capacity problems. If a purity problem occurs, it is strongly recommended at once to uncover these eventually problems before any other initiative are taken – so follow the Route Diagram shown below:

- **Capacity Test**
  - **Corrections OK**
  - **Flow Problem**
    - **Yes**
      - **Leak Test**
        - **Leaks present**
          - **Yes**
            - **Leaks Removal**
          - **No**
            - **OK**
    - **No**
      - **Yes**
        - **Check Sensor**
          - (if present)
          - **Calibrate/replace**
          - **Purity Problem**
            - **Yes**
              - **OK**
            - **No**
              - **Continue on next page**
          - **Check quality of feed air**
            - **Yes**
              - **OK**
            - **No**
              - **Continue on next page**
          - **Corrections**
            - **Insufficient quality of feed air**
              - **Yes**
                - **OK**
              - **No**
                - **Continue on next page**
Continued from previous page

Check function of Inlet valves

Repair/replace

Malfunction of Inlet valves

Yes No

Check function of Exhaust valves

Repair/replace

Malfunction of Exhaust valves

Yes No

Check function of Equalization valves

Repair/replace

Malfunction of Equalization valves

Yes No

Continue on next page
Picture 17. Route diagram / Purity problem solving
7.1 Leak test procedure

1. Shut off the oxygen application/consumption.
2. Let the plant run in manual mode, until the product tank pressure reaches a minimum of 5 bar.
3. Turn the mode selector switch to stand-by/off, and the PSA generator will stop after a little while, when the actual operation cycle is completed.
4. Shut off the feed air supply.
5. If coal tower is installed, close of oil indication tube. If fitted with purity monitoring probe close of the pressure reduction valve on probe inlet.
6. Read and note the pressure P1 in product tank, column 1, column 2, column 3 if present and feed air tank.
7. Let the plant stand still (rest) and isolated in pressurized condition for an hour.
8. After an hour read and note the pressure P2 in product tank, column 1, column 2, column 3 if present and feed air tank.
9. Then determine an eventually pressure drop as the difference between P1 and P2 for each component.
10. The Leak test is right, if the pressure drop after one hour pressurized isolation is less than 0.1 bar. In case of leaks they must not cause more than 0.1 bar pressure drop per hour.
11. If closed open for coal tower oil indication tube and reset the pressure reduction valve on probe inlet 1.0 bar.

7.2 Air regulator adjustment procedure

1. Unlock lock on adjustment knob.
2. To increase pressure turn clockwise.
3. To decrease pressure turn counter clockwise.
4. Make small adjustments and let system cycle through one cycle before making another adjustment.
5. If readings are still incorrect, make another adjustment until you are within manufacturer's specifications stated in Design Review Certificate.

7.3 Capacity test procedure

1. Close the shut off valve between the PSA generator and the product tank.
2. Read and note the pressure in the product tank – called the starting pressure: P1 (bar).
3. Rapidly open the shut off valve between the product tank and the oxygen application/consumption and rapidly close it again after exactly one minute. This will achieve the real and exact consumption for a one minute period.
4. Now read and note the final pressure P2 (bar).
5. Determine the capacity by using the formula: \((P1 - P2) \times \text{Volume of product tank in litres} = \text{capacity in litres per minute.} \) Check the result with the stated capacity in the Design Review Certificate.
7.4 Pressure set point procedure

The pressure in the product tank controls start and stop of PSA generator in auto mode.

1. Determination of the product tank peak pressure P1:
   a. Switch PSA generator to manual mode
   b. Shut off oxygen consumption.
   c. Let the generator run for 10 minutes or more.
   d. Read and note the maximum product tank pressure during this period. This is the peak pressure P1.
2. Calculating stop set point pressure and restart hysterese set point:
   e. Calculate the stop set point pressure P2 by subtracting 0.05 bar from peak pressure
      \[
      P_2 = P_1 - 0.05.
      \]
   f. The hysterese set point (normal value 0.5 bar) controls when the generator restarts.

Example: Measured peak pressure \( P_1 = 6.50 \) bar

\[
\text{Stop set point pressure } P_2 = P_1 - 0.05 = 6.50 - 0.05 = 6.45 \text{ bar}
\]

With hysterese set to 0.5 bar the PSA generator will restart when the pressure in product tank has decreased 0.5 bar. Restart at \( P_2 - 0.50 = 6.45 - 0.50 = 5.95 \) bar

How this start and stop process is adjusted and controlled depends on PSA generator control system type.
The above mentioned product tank pressures must be read out and adjusted according to system.
For PSA generators equipped with small or large touch screen control system refer to the separate control system manuals in appendix.

7.5 Probe check and calibration

Oxymat oxygen PSA generators with control system have a probe for monitoring the purity of produced oxygen.
Procedure for checking the probe depends on the type of probe fitted.
See probe type on information label inside control panel.
If present the probe module is placed in the lower control cabinet.

Zirconium probe:

⚠️ Warning: The entire probe module and especially the heater block can get very hot. Touching these parts may cause burns. The module can still be very hot even after the module has been turned off. Always wait for at least 30 minutes before touching the module.

⚠️ Important:
- Do not touch the sensor’s ceramic probe.
- Do not blow cold air or gas onto the sensor when it is warm.
- Do not bend or tear the twisted steel pipe.
- The measuring gas must be pure and dry. Use a filter on the ingoing gas if needed.

For further detailed information – see separate Control system manual and Sensor manual as separate file.
7.6 Purging procedure

To obtain the design purity in product tank purge the tank with oxygen as follows:
1. Check that oxygen consumption is closed off.
2. Open up for flow from feed air supply/compressor.
3. Start the feed air supply/compressor.
4. Start the PSA generator and let it run for about 15 minutes.
5. Check that pressure in product tank reaches the value stated in Design Review Certificate.
6. Open for oxygen consumption. Adjust flow to approximately to 50 % of design flow (refer to Design Review Certificate).
7. Let the PSA generator run in manual mode until design purity is reached. Duration 0.5 - 8 hours depending on purity and capacity.
8. When design purity is reached close off oxygen consumption switch PSA generator to auto mode and let the PSA generator run until it stops automatic. This should occur within 10 minutes. If the PSA generator does not stop as described refer to section for pressure set point procedure.

8 Scrapping

8.1 Dismounting

By the time when the equipment is no longer in use - dismount as follows:
- Disconnect, remove and collect all wires into a wire scrap pile
- Dismount, remove and collect all electronics into an electronics scrap pile
- Disconnect, remove and collect all hoses and other plastics into a plastic scrap pile
- Empty absorber columns from the molecular sieve, and fill it into bags.
- Dismount all pipes and sort all metal parts into steel or copper scrap piles.
- Collect all organic, flammable materials into a separate scrap pile.

Dispose the different categories of waste in a via designated collection facilities appointed by the government or local authorities according to local regulations. Correct disposal and recycling will help preventing potential negative consequences to the environment and human health.

8.2 Disposal

The molecular sieve is a nontoxic organic material, which can be disposed along with the rest of sorted scrap. However the disposal must be done according to national and local laws and rules.

Refer to material safety data sheet for correct handling of molecular sieve and proper personal protection.
List of shortcuts

PSA  pressure swing adsorption
MDD  medical device directive
2C   2-column PSA generator
3C   3-column PSA generator
MSDS material safety data sheet
T(O)  operating temperature
T(S)  max. allowable temperature
PLC  programmable logic controller
HMI  human-machine interface
OC   order confirmation
ID/OD inlet diameter/outlet diameter
P(S)  max. allowable pressure

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<td>DN125</td>
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<td>DN150</td>
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*Table 15. Conversion table of dimensions DN – inch*

Conversion from bar to Pascal:

\[ 1\text{bar} = 10^5 \text{ Pa} \]
APRAGAZ certifies that the Quality System developed by:

OXYMAT A/S
&
OXYMAT – SLOVAKIA s.r.o.

for the following activities:

Design, manufacture, service and market of oxygen and nitrogen PSA generators sold for appliances such as medical appliances, aquaculture, ozone generation, marine, fire and explosion safety systems...

carried out at the following locations:

Fasanvej, 18 – 20
DK – 3200 HELSINGE
DANEMARK

Vadovce, 85
SK – 91613 KOSTOLNE
SLOVAKIA

has been assessed and found to perform to the requirements of the standard:

ISO 9001:2008

Original Certification date: 05/11/2007

Under the condition the quality system of the company is working satisfactorily, this certificate is valid for a three years period until:

03/11/2016

Date of issue: 04/11/2013

The General Manager

on behalf of the company

C.a. Lopat, Jr
### NOTIFIED BODY EC CERTIFICATE OF CONFORMITY

In accordance with Appendix II of the Medical Devices Directive 93/42/EC and the latest amendment 2007/47/EC (excluding section 4)

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### Concerned Equipment:

- **Oxygen concentrator families – (Single Module) “ECO Range”**:
  - O10/O20/O40/O60/O80/O100/O170/O230/O330/O500/O600/O800/

- **O3c: Oxygen 3 column concentrator**:
  - O10 – O60 ECO, O70 – O330 ECO.

#### Oxygen filling systems

- OFS I/OF S II/OF S III/OF S IV/OF S V (Respectively from 4 to 10 cylinders)

- Reference design technical file: 07/DK/1178

- Product Classification according to rule 11 : IIb

This is to certify that the Quality Management System of the above mentioned manufacturer has been assessed against the requirements of Annex II of the Medical Devices Directive 93/42/EC and conforms to the requirements for the equipment shown above. The approval is subject to the continued maintenance of the Quality System in accordance with the requirements of the above Directive, this shall be controlled by intermediate audits, inspections and surveys.

The manufacturer is allowed to affix the “CE” mark followed with our notified body identification number 0029 to the approved equipment in the conditions described in the Directive.

The approval is valid until 06/01/2018

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<th>Name</th>
<th>Position</th>
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<tr>
<td>07/01/2013</td>
<td>Ch. Leplat</td>
<td>General Manager</td>
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**APRAGAZ**

Belgium

Inspecting Authority

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WORLDWIDE MANUFACTURER OF PSA GENERATOR SYSTEMS

www.oxymat.com  * Service@oxymat.com  * Service Hotline +45 5050 5868
# APRAGAZ

**NOTIFIED BODY EC TYPE EXAMINATION CERTIFICATE**

In accordance with module B of the Pressure Equipment Directive 97/23/EC

<table>
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**Concerned equipment**

- **O2 : Oxygen concentrator families**:
  - O10 – O60, O70 – O330, O500 – O1000, O1200 – O5000 and O16– O60 ECO, O70 – O330 ECO, O500 – O1000 ECO, O1200 – O5000 ECO.

- **N2 : Nitrogen concentrator families**:

- **O2 3c : Oxygen 3 column concentrator families**:
  - O10 – O60, O70 – O330 and O10 – O50 ECO, O70 – O330 ECO.

The manufacturer is allowed to affix the ‘CE’ mark to approved equipment in the conditions described in the Directive, only if the requirements stated in module D are fully complied with.

The approval is valid until 11/04/2017

**Date**: 08/11/2010

Name: Ch. Leplat

Position: General Manager

**Notified body identification number**: 0029

**Notified body stamp**: APRAGAZ Belgium Inspecting Authority

**Notified body reference**: 0602/PR002/PED01 → PED01

---

**WORLDWIDE MANUFACTURER OF PSA GENERATOR SYSTEMS**

www.oxymat.com * Service@oxymat.com * Service Hotline +45 5050 5868
NOTIFIED BODY EC TYPE EXAMINATION CERTIFICATE
In accordance with module B of the Pressure Equipment Directive 97/23/EC

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Concerned equipments:

N2 PSA generators “X versions”, model Nitromat:
N3150x2 ECO, N3150x3 ECO,
N4500x2 ECO, N4500x3 ECO, N4500x4 ECO, N4500x5 ECO, N4500x6 ECO

O2 PSA generators: “X versions”, model Oxymat:
O600x2 ECO, O600x3 ECO,
O800x2 ECO, O800x3 ECO, O800x4 ECO, O800x5 ECO, O800x6 ECO

The manufacturer is allowed to affix the “CE” mark to approved equipment in the conditions described in the Directive, only if the requirements stated in module D are fully complied with.

The approval is valid until 04/08/2023

Date : 05/08/2013
Name : Ch. Leplat
Position : General Manager
Notified body identification number : 0029
Signature
Notified body stamp:
APRAGAZ
Belgium
Inspecting Authority
Notified body reference: 1211/P14967/001 & 002
Worldwide Manufacturer of PSA Generators

OXYMAT A/S
Fasanvej 18-20
DK - 3200 Helsinge
Tel. No.: +45 4879 7811, Fax:+45 4879 7813

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