NANO

Oxygen generators

OGX 110, OGX 220, OGX 330, OGX 440, OGX 550, OGX 640, OGX 850, OGX 1070

Instruction book

NANO

Oxygen generators

OGX 110, OGX 220, OGX 330, OGX 440, OGX 550, OGX 640, OGX 850, OGX 1070

Instruction book

Original instructions

This instruction book is valid for CE, non-CE as well as UKCA labelled machines. It meets the requirements for instructions specified by the applicable European directives or UK statutory instruments as identified in the Declaration of Conformity.

February 2023

No. 2920 7215 90

www.n-psi.com

Table of contents

1 Safety precautions

1.1 Safety icons

Danger: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Warning: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Notice: Indicates a potential situation which, if not avoided, might result in property damage or in an undesirable result or state.

Note: Indicates important information.

1.2 General safety precautions

Warning:

All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

1. The operator must employ safe working practices and observe all related local work safety requirements and regulations. If any of the following statements do not comply with local legislation, the stricter of the two shall apply.
2. Installation, maintenance and repair work must only be performed by authorized, trained, specialized personnel. Equipment should only be operated by the end user by use of the control panel.
3. Before carrying out any adjustment or any other non-routine checks, stop and depressurize the device by following the correct stopping procedure. In addition, the power isolating switch must be opened and locked.
4. Never operate the device below or in excess of its limit ratings.
5. No external force may be exerted on any of the pipe connections. The connected pipes must be free of strain.
6. The end user is responsible for keeping the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation, but only by authorized, trained, specialized personnel.
7. It is not allowed to walk or stand on the device or its components.
8. Do not direct an oxygen stream towards people. Clothes might get saturated with oxygen, and can catch fire in case of an ignition.

1.3 Safety precautions during installation

1. Install the equipment where the ambient air is cool and as clean as possible. See section **Reference conditions**.
2. During installation or any other intervention on the equipment or one of the connected machines, the machines must be stopped, de-energized and the isolating switch opened and locked before any maintenance or repair. As a further safeguard, persons switching on remotely

controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the start equipment.

3. Install the equipment in an area free of flammable fumes, vapours and particles, e.g. paint solvents, that can lead to internal fire or explosion.
4. The electrical connections must correspond to the applicable codes. The equipment must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the equipment.
5. For machines controlled by a central control system, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
6. In multiple compressor systems, manual valves must be installed to isolate each compressor. Non-return valves (check valves) must not be relied upon for isolating pressure systems.
7. Never remove or tamper with the safety devices.
8. If the maximum pressure of the compressor is higher than the design pressure of the connected equipment, a full flow safety valve must be installed between the compressor and the connected equipment, in order to be able to blow off the excessive pressure.

Note:

For precautions applying to the connected equipment consult the relevant instruction book.

1.4 Safety precautions during operation

Warning:

All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

1. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
2. Never operate the device in the presence of flammable or toxic fumes, vapours or particles.
3. Never operate the device below or in excess of its limit ratings.
4. Do not operate the device when there are flammable or toxic fumes, vapors or particles.
5. Keep all bodywork doors and panels closed during operation. The doors may be opened for short periods only, e.g. to carry out routine checks.
6. People staying in environments or rooms where the equipment is operated shall wear adequate personal protective measures, such as ear protection, safety goggles, etc.
7. Never modify the device in any way. Keep the equipment in original working condition.

Note:

For precautions applying to the connected equipment consult the relevant instruction book.

1.5 Specific safety precautions

Oxygen generators can be installed in the vicinity of the oxygen consuming application without the requirement for classification of the surrounding area as hazardous, provided that all necessary measures have been taken to guarantee the maximum safety.

The oxygen generating unit must be installed and used in observance of the instructions in this booklet. Failure to observe these instructions will render the guarantee null and void and release the manufacturer from all liability for direct or indirect damage or physical injury.

Hoses, pipes and connections used must be of the correct size and must be suitable for the working pressure. Never use frayed, damaged or worn hoses. Connections made to the equipment must be free of strain. For oxygen pipe lines, consult the appropriate installation proposal and guidelines. Consult the manufacturer's notes.

The exhaust of the oxygen generators contains only 10% of oxygen. Improper routing or ventilation can cause hypoxia. The exhaust opening at the top must be free of any obstructions or restrictions during use. The installed exhaust channels must remain completely open to prevent bursting of exhaust channels.

Normal oxygen concentration in air is approximately 21% by volume. In general, air containing less than 19.5% or more than 23.5% oxygen constitutes a hazardous working environment. Typical symptoms of oxygen deficient atmospheres are listed in the table below. (ref. ANSI Z88.2)

% Oxygen at sea level (Atmospheric pressure)	**Effects**
>23.5	Increased fire hazard
20.9	Normal
19.0	Some adverse physiological effects occur, but they are unnoticeable.
16.0	Increased pulse and breathing rate. Impaired thinking and attention. Reduced coordination.
14.0	Abnormal fatigue upon exertion. Emotional upset. Faulty coordination. Poor judgment.
12.5	Very poor judgment and coordination. Impaired respiration that may cause permanent heart damage. Nausea and vomiting.
<10	Inability to perform various movements. Loss of consciousness. Convulsions. Death.

Oxygen concentrations higher than 23.5% create greater fire hazards than normal air. Oxygen is not combustible, but it promotes very rapid combustion of flammable materials and some materials that are normally regarded as being relatively non-flammable.

Although a source of ignition energy is always necessary in combination with flammable materials and oxygen, control or elimination of flammables is a precautionary step.

In the direct vicinity of the generator, nitrogen enriched air (only 8 - 10 % oxygen) is vented through the muffler during the separation process. When the percentage of the vented nitrogen in the air exceeds a specific value, there is a risk of asphyxia, unconsciousness and death. Therefore, never directly inhale the vented gas, and avoid working in the immediate vicinity of the generator when it is in use.

In normally ventilated areas the nitrogen concentration decreases quickly to the normal concentration in air at short distance from the vent pipe. However, it is highly recommended to vent the blow-off from the muffler to the outdoors.

More details about the characteristics of nitrogen or oxygen can be found in the safety datasheet for nitrogen and oxygen, which are available as a separate publication. Consult your supplier.

Areas where it is possible to have an oxygen enriched or deficient atmosphere should be well ventilated. If required, warning signs should be posted and special precautions shall be taken such as installing analyzers with alarms, ensuring a minimum number of air changes per hour, implementing special entry procedures or a combination of these.

Warning:

The units described in this book are suited for industrial use.

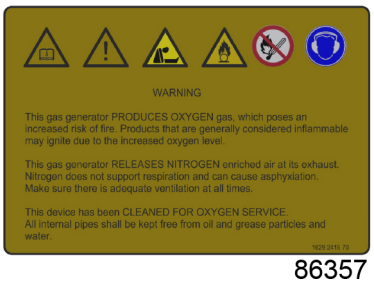
When the unit is to be used for medical purposes the installation has to comply to the locally applicable medical legislation.

Warning:

When oxygen should be vented, it has to be guided outside to atmosphere. Make sure the vent pipe is properly labelled and warning signs indicate the risks. No open flame or smoking are allowed in the vicinity of oxygen vents.

1.6 Safety labeling

The following safety label is attached to the oxygen generators:



86357

Figure 1: Safety label 1629 2415 70

Warning:

This gas generator produces oxygen gas, which poses an increased risk of fire. Products that are generally considered inflammable may ignite due to the increased oxygen level.

This gas generator releases nitrogen enriched air at its exhaust. Nitrogen does not support respiration and can cause asphyxiation. Make sure there is adequate ventilation at all times.

This device has been cleaned for oxygen service. All internal pipes shall be kept free from oil and grease particles and water.

 83489D	ISO 7000 - symbol 0419	Read instruction manual.

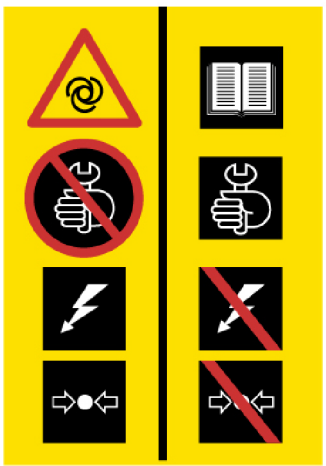
 85344D	ISO 7000 - symbol 0434b	General safety alert symbol
 83491D	ISO 7010 - symbol W028	Warning: Oxidizing substance
 83492D	ISO 7010 - symbol P003	Fire hazard: • No open flame near the generator. • Fire, open ignition source and smoking prohibited.
 83493D	-	Warning: Risk of asphyxiation
 83494D	1079 9903 48	Warning: • Generator can start automatically. • Read manual before service or repair. • Turn off power and disconnect power supply before service or repair. • Depressurize before service or repair.
 83495D	1079 9906 29	Warning: dangerous blow off
 83496D	ISO 7010 - symbol M003	Wear ear protection.

Table 1: Information on safety labels

1.7 Dismantling and disposal

The device must be disposed according to local regulations. The product is not designed for refurbishing after finished lifecycle.

Dismantling

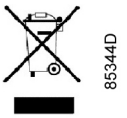
Once the end of life of the machine is reached, please follow next steps:

1. Stop the machine.

2. Check all safety precautions mentioned in the previous chapters to secure safe handling (e.g. LOTO, cool-down, depressurize, discharge, etc.).
3. Have trained personnel dismantle the installation.
4. Separate the harmful from the safe components (e.g. drain oil from parts containing oil).
5. Refer to the disposal topic below.

Disposal of electrical and electronic appliances (WEEE)

This equipment falls under the provisions of the European Directive 2012/19/EU on waste electrical and electronic appliances (WEEE) as well as under the UKCA Waste Electrical and Electronic Equipment regulations 2013 and may not be disposed as unsorted waste.



The equipment is labelled in accordance with the European Directive 2012/19/EU and the UKCA Waste Electrical and Electronic Equipment regulations 2013 with the crossed-out wheelie bin symbol.

At the end of life-time of the electric and electronic equipment (EEE) it must be taken to separate collection.

For more information check with your local waste authority, customer center or distributor.

Disposal of other used material

Used filters or any other used material (e.g. filter bags, filter media, desiccant, lubricants, cleaning rags, machine parts, etc.) must be disposed of in an environmentally friendly and safe manner, and in line with the local recommendations and environmental legislation.

2 Description

2.1 General description

OGX 110 up to OGX 1070 oxygen generators are intended to produce oxygen (O_2) for industrial purposes. They use Pressure Swing Adsorption (PSA) technology to produce oxygen by passing compressed air through an adsorber containing adsorbent material.

The adsorbents are chosen on the basis of their adsorption characteristics: the adsorbent has more affinity for non-product molecules than for the product gas (O_2). This characteristic results in most of the desired molecules (O_2) passing through the bed and remaining in the product stream, while undesired components (product impurities) are captured by the adsorbent.

The PSA process is inherently a batch process, as the adsorbent bed requires periodic desorption. Consequently, PSA systems usually contain two adsorbers to provide operational continuity. At any time, one of the adsorbers will be delivering product (O_2) by adsorbing undesired components of the air, while the other adsorber is being regenerated by depressurization to atmospheric pressure. When the adsorbing adsorber approaches saturation, a set of valves quickly switches the functions. A product tank downstream of the oxygen generator ensures continuous delivery of oxygen.

During the adsorption phase, compressed air flows through the sieve material and nitrogen molecules are caught, while oxygen molecules pass on due to the different molecular size. The sieve continues to adsorb nitrogen until a saturation point is reached. During desorption, the entering air stream is cut off and the nitrogen is able to leave the adsorber at low pressure.

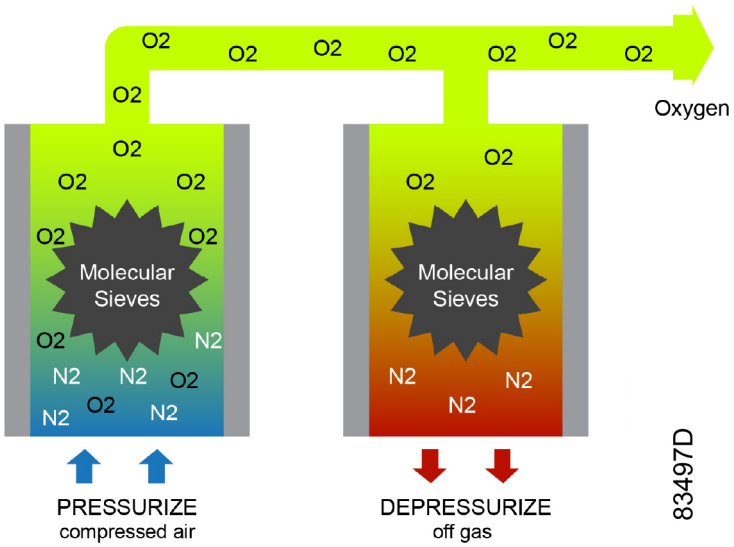


Figure 2: Operating principle of the oxygen generator

Oxygen PSA adsorbers contain Molecular Sieve (MS) material to remove nitrogen from compressed air.

The generator produces oxygen at a purity level between 90 % and 95 % according to the user requirements and the required oxygen flow and pressure.

The oxygen flow rate depends on the model and the required purity.

The oxygen pressure depends on the pressure of the compressed air at the inlet.

2.2 Detailed description

86981

Figure 3: General view

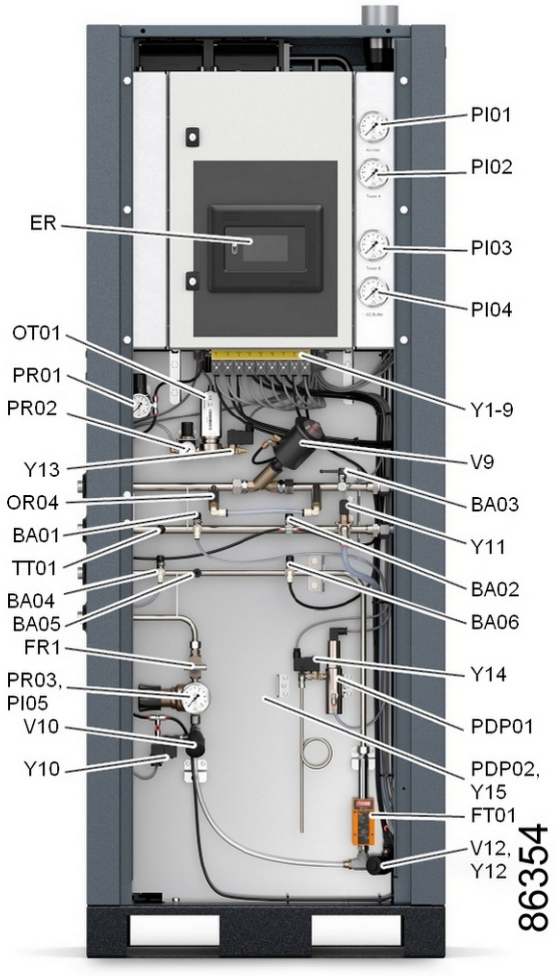


Figure 4: Front view

Reference	Description
ER	Controller
PI01	Inlet pressure gauge
PI02	Adsorber A pressure gauge
PI03	Adsorber B pressure gauge
PI04	Product tank pressure gauge
PI05	Outlet pressure gauge
OR04	Startup nozzle
PDP01	Inlet PDP transmitter
PDP02	Outlet PDP transmitter (optional)
TT01	Inlet temperature sensor
FT01	Oxygen flow sensor
Y1 - Y9	Pilot valves
Y10	Consumer valve pilot valve
Y11	Inlet flushing valve
Y12	Outlet flushing pilot valve
Y13	Oxygen sensor solenoid

Reference	Description
Y14	Inlet PDP solenoid
Y15	Outlet PDP solenoid (optional)
V9	Minimum pressure valve
V10	Consumer valve
V12	Outlet flushing valve
BA01	Pilot air ball valve
BA02	Inlet PDP- and pressure transmitter ball valve
BA03	Adsorber oxygen level sample ball valve
BA04	Oxygen sensor ball valve
BA05	Outlet PDP sensor ball valve
BA06	Outlet pressure transmitter ball valve
FR1	Manual flow regulating valve
PR01	Pilot air pressure regulator
PR02	Oxygen sensor pressure regulator
PR03	Outlet pressure regulator
OT01	Oxygen transmitter

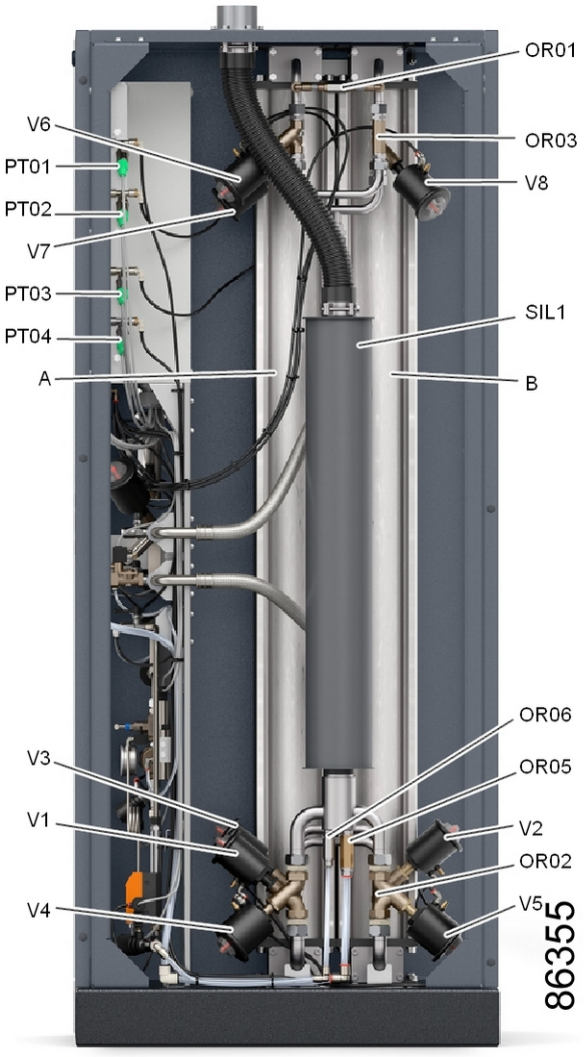
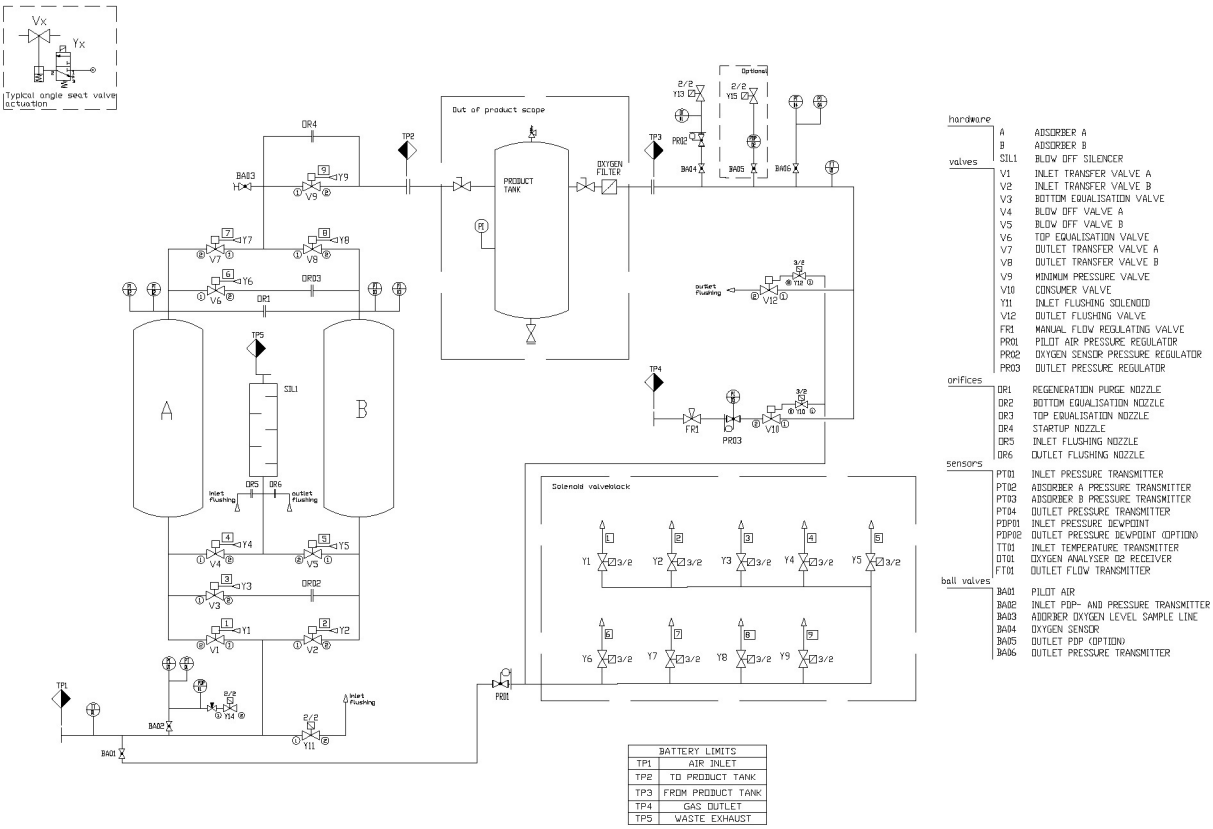


Figure 5: Side view

Reference	Description
PT01	Inlet pressure transmitter
PT02	Adsorber A pressure transmitter
PT03	Adsorber B pressure transmitter
PT04	Product tank pressure transmitter
OR01	Regeneration purge nozzle
OR02	Bottom equalization nozzle
OR03	Top equalization nozzle
OR05	Inlet flushing nozzle
OR06	Outlet flushing nozzle
V1	Inlet transfer valve, adsorber A
V2	Inlet transfer valve, adsorber B
V3	Top equalization valve
V4	Blow off valve, adsorber A
V5	Blow off valve, adsorber B

Reference	Description
V6	Bottom equalization valve
V7	Outlet transfer valve, adsorber A
V8	Outlet transfer valve, adsorber B
SIL1	Blow off silencer
A	Adsorber A
B	Adsorber B

2.3 Flow diagram



9828530064

86982

Reference	Description
A	Adsorber A
B	Adsorber B
SIL1	Blow off silencer
V1	Inlet transfer valve, adsorber A
V2	Inlet transfer valve, adsorber B
V3	Top equalization valve
V4	Blow off valve, adsorber A
V5	Blow off valve, adsorber B

Reference	Description
V6	Bottom equalization valve
V7	Outlet transfer valve, adsorber A
V8	Outlet transfer valve, adsorber B
V9	Minimum pressure valve
V10	Consumer valve
V12	Outlet flushing valve
Y1 - Y9	Pilot valves
Y10	Consumer valve pilot valve
Y11	Inlet flushing valve
Y12	Outlet flushing pilot valve
Y13	Oxygen sensor solenoid
Y14	Inlet PDP solenoid
Y15	Outlet PDP solenoid (optional)
FR1	Manual flow regulating valve
PR01	Pilot air pressure regulator
PR02	Oxygen sensor pressure regulator
PR03	Outlet pressure regulator
OR01	Regeneration purge nozzle
OR02	Bottom equalization nozzle
OR03	Top equalization nozzle
OR04	Startup nozzle
OR05	Inlet flushing nozzle
OR06	Outlet flushing nozzle
PT01	Inlet pressure transmitter
PT02	Adsorber A pressure transmitter
PT03	Adsorber B pressure transmitter
PT04	Product tank pressure transmitter
PDP01	Inlet PDP transmitter
PDP02	Outlet PDP transmitter
TT01	Inlet temperature sensor
OT01	Oxygen transmitter
FT01	Oxygen flow sensor
BA01	Pilot air ball valve
BA02	Inlet PDP and pressure transmitter ball valve
BA03	Adsorber oxygen level sample ball valve
BA04	Oxygen sensor ball valve
BA05	Outlet PDP sensor ball valve
BA06	Outlet pressure transmitter ball valve
TP1	Air inlet
TP2	To product tank
TP3	From product tank
TP4	Gas outlet
TP5	Waste exhaust

3 Installation

3.1 Dimensions

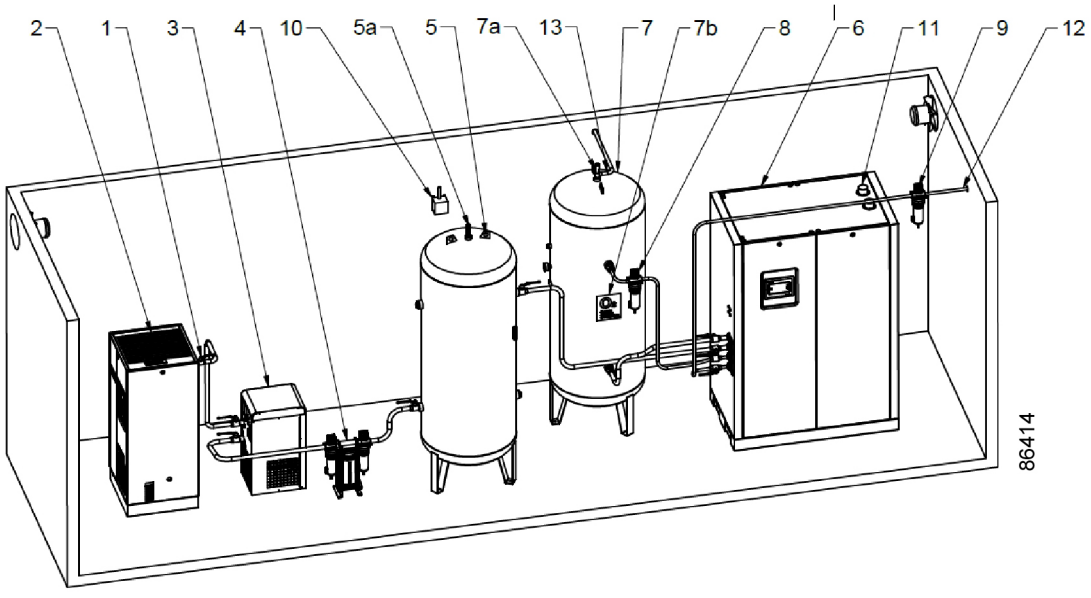
The dimension drawing can be found on the USB, supplied with the unit.

Model	Drawing number
OGX 110	9828 5300 47
OGX 220	9828 5300 48
OGX 330	9828 5300 49
OGX 440	9828 5300 50
OGX 550	9828 5300 51
OGX 640	9828 5300 52
OGX 850	9828 5300 53
OGX 1070	9828 5300 54

Dimension drawings are subject to change. Please consult your supplier to get the latest versions of the dimension drawings.

3.2 Installation

For a good functionality of the gas generator, it is paramount that the installation does not deviate from the prescribed installation proposal.



Reference	Description
1	Piping
2	Compressor
3	Dryer

Reference	Description
4	Filtration
5	Air tank
5a	Safety valve
6	Oxygen generator
7	Product tank
7a	Oxygen safety valve
7b	Oxygen tank label
8	Oxygen filter
9	Oxygen filter, anti-bacterial (optional)
10	Room oxygen sensor (optional)
11	Waste exhaust
12	Oxygen outlet to customer or storage tank
13	Oxygen safety valve exhaust pipe

Installation area requirements

- The generator is not intended for outdoor use.
- Humidity and dust: to avoid risk of damage to electronic components, install the generator in an environment subject to limited relative humidity and low concentration of dust. The generator must also be protected against water droplets, rain and wind. According to the Low Voltage requirements (EN61010), indoor use is recommended for this unit.
- Temperature: the ambient temperature in the generator installation area must be between -10 ˚C (14 ˚F) and 50 ˚C (122 ˚F). Install the generator away from heat sources. Therefore, also avoid direct exposure to sunlight.
- Positioning: when selecting the installation area for the generator, take into account minimum clearances required for operation and maintenance. A minimal free space of 600 mm around the generator is recommended. Consult the installation proposal drawings in this chapter. Install the generator on a level floor, suitable for taking its weight.

Handling and positioning of the generator

- The generator must be handled using suitable equipment such as a crane or a forklift truck.

  Only use the forklift slots for lifting the generator.
- Remove all packing material, taking care not to damage the generator.

Warning:

Keep the generator vertical at all times.

Safety valves

- Installation of safety valves on the air and product tank is obligatory.
- On the air tank, a full flow safety valve must be installed. The full flow of an installation is the maximum flow that the compressor can deliver.
- On the product tank, an oxygen approved safety valve needs to be installed and needs to have a female threaded outlet connection. This connection needs to be guided to the outside atmosphere, where it has to be properly labeled as oxygen exhaust pipe.

Inlet air quality

Note:

The properties of the compressed air at the inlet of the oxygen generator, as well as the minimum pressure and flow rate requirements, play an important role with regard to its performance and lifetime.

The compressed air used should be of a quality that meets ISO 8573-1; class 1-4-1 . Using a lower quality of compressed air will cause irreversible damage to the generator. In such case, the manufacturer denies all liability for damages and any costs for repairs will be charged to the client.

In case of any doubt with regard to the above, contact your supplier for advice on the most suitable compressed air system (compressor, dryer, filters, receiver) for the specific application.

The oxygen generators can be used with oil-injected compressors as well as with oil free compressors.

Make sure to prevent a reflux of oxygen gas from the application to the inlet suction of the compressor.

Please note however that it is of utmost importance to prevent any dust, water or oil from entering the oxygen generator, because this will damage the adsorbent material.

To achieve the forementioned air quality, the following air treatment components should be installed after the compressor.

- Compressed air dryer (depending on the inlet temperature range, a different setup is required):
  - Below 10 °C: a dessicant dryer is required to provide a PDP of -20 °C or lower.
  - From 10 °C to 29 °C: an integrated dryer maybe be used to provide a PDP of 3 °C.
  - From 30 °C and above: an oversized standalone refrigerant dryer needs to be sized at max load and max temperature conditions in order to always provide the required a PDP of 3 °C.
- Filtration:
  - A Pre-filter must be installed downstream the dryer.
  - In case an oil injected compressor is used, a carbon filter must be installed downstream the Pre-filter.
  - An After-filter must be installed upstream the compressed air tank.

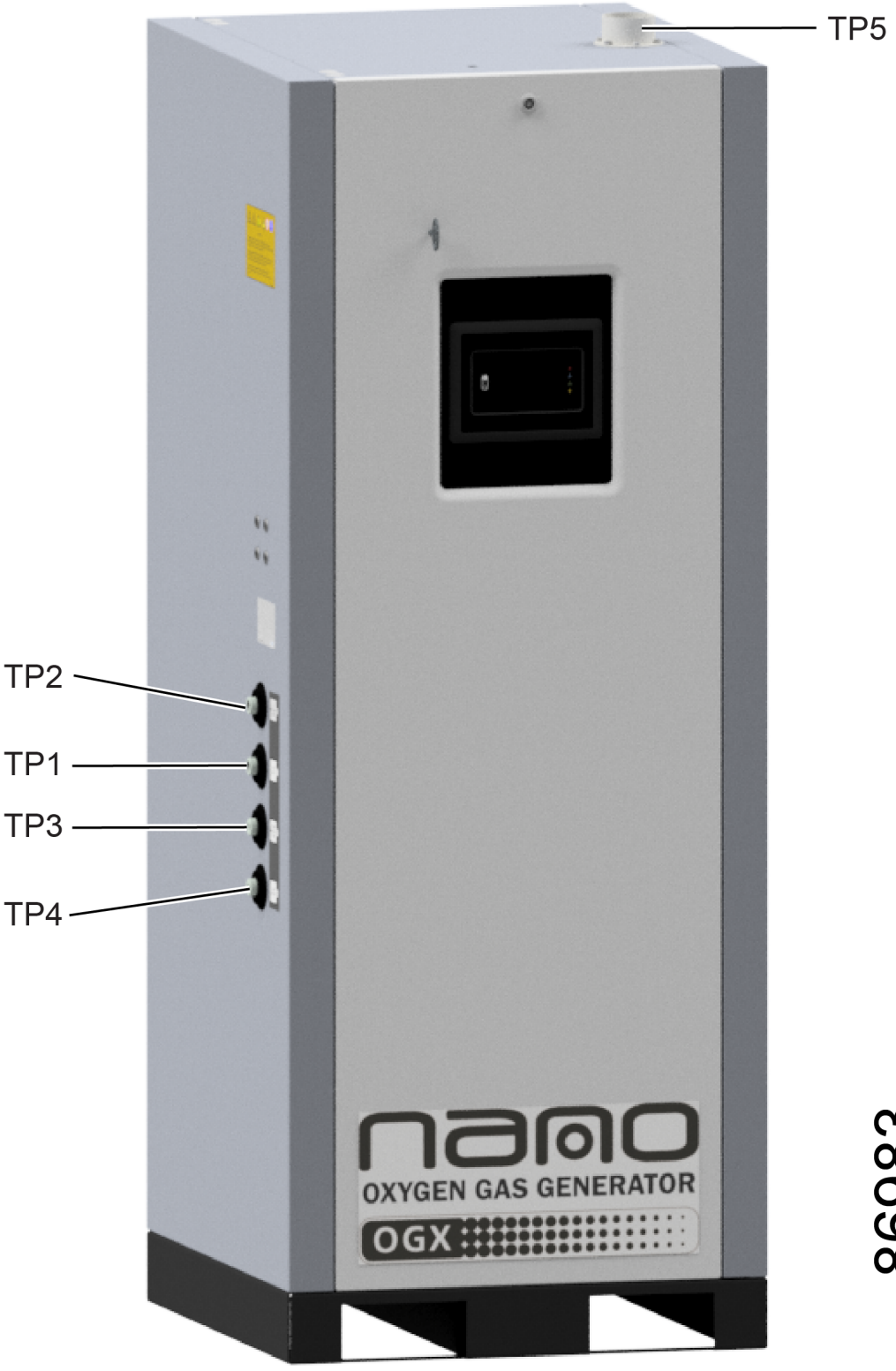
Piping connections

Warning:

Specific risks are involved in the installation of oxygen pipelines. The installation must be done by trained, authorized personnel only.

- Place the components of the installation as close to each other as possible to avoid long pipes and excessive pressure drops. Avoid distances exceeding 5 m (16.4 ft) between the various components.
- Compressed air and oxygen pipelines and connections should withstand 16 bar / 232 psi.
- For oxygen pipes: use only rigid stainless steel or copper piping.
- Use of grease or oil in oxygen nets is prohibited.
- Only install gaskets, o-rings and seals suited for oxygen such as Viton or Teflon.
- Do not use pressure gauges filled with glycerine.

- All pipes should be installed stress-free and should be adequately supported.
- The installation must be entirely leak-free in order to produce oxygen at the requested level and avoid uncontrolled oxygen leaks.
- When the exhaust is connected to the outdoors, rigid metal air ducting pipes must be used.
- When connecting the exhaust, never reduce the diameter of the pipe. Refer to mechanical connections in section *Technical data* for connection sizes. On larger generators, multiple adapters need to be connected. When combining these into a common header, use the following guideline:
  - 2x 80 mm into 1x 150 mm
  - 3x 80 mm into 1x 200 mm
- If the exhaust line exceeds a length of 5 m, the diameter must be increased to the next available size for the entire length of the pipe. Never exceed exhaust pipe lengths of more than 20 m.
- Avoid the use of short-radius bends.



86983

Reference	Description
TP1	Air inlet

Reference	Description
TP2	To product tank
TP3	From product tank
TP4	Gas outlet
TP5	Exhaust

Ventilation

The ventilation requirements in the machine room depend on if the waste gas is routed outdoors or not.

- Natural ventilation can be sufficient for one air change per hour
  - Avoid dead areas where no or limited ventilation occurs.
  - Ventilation openings shall have an area > 1/100 of the room's floor area.
  - Ventilation openings should be placed diagonally opposite to each other.
  - Ventilation openings should not be obstructed.
- Forced ventilation is required for more than two air changes per hour:
  - Contact an authorized specialist for the sizing and installation of the ventilation system.
  - A safety warning in case the ventilation unit fails is required.

It is highly recommended to install the optional room oxygen monitor. This device will produce an audible and visual alarm when the oxygen content is lower than 19.5% or higher than 22.5%. The location of the room oxygen monitoring system should be carefully chosen in line with a risk analysis of the installation.

Waste gas is not routed outdoors

When the waste gas is not routed outdoors, thorough ventilation of the room is needed to prevent build-up of nitrogen causing asphyxia. The amount of ventilation depends on the installed generator and the size of the room:

Installed generator			**OGX 110**	**OGX 220**	**OGX 330**	**OGX 440**	**OGX 550**	**OGX 640**	**OGX 850**	**OGX 1070**
blow-off volume		m^3/h	25	50	75	100	125	150	200	250
room size	small	≥ m^3	25	50	75	100	125	150	200	250
	medium	≥ m^3	50	100	150	200	250	300	400	500
	large	≥ m^3	250	500	750	1000	1250	1500	2000	2500

In a small room, at least 8 air changes/hour are required.

In a medium room, at least 4 air changes/hour are required.

In a large room, at least one air change/hour is required.

Waste gas is routed outdoors

When the waste gas is routed outdoors, good ventilation of the room is needed to prevent build-up of oxygen due to potential leaks in the installation. At least one air change per hour is required.

3.3 Electrical connections

Electric power supply

Danger:

For safety reasons, the following instructions must be observed strictly.

The electrical installation must comply with current standards, in particular regarding the earthing line.

Recommendations:

- Always connect the earthing line.
- The main socket must be located in an easily accessible position.
- Low voltage fuses on the unit and fuse installation at customer location is specified on the service diagram included in the documentation.

  Before any service intervention on the unit please make sure that the electrical power is totally disconnected. Therefore, please unplug the unit from the main power supply.

4 Controller

4.1 Controller functions

Figure 6: Vision Touch controller

Introduction

The controller has the following functions:

- Controlling the unit
- Protecting the unit
- Monitoring components subject to service
- Automatic restart after voltage failure (ARAVF)

Automatic control of the unit

The controller maintains the automatic operation of the unit based on the required purity settings. It does so by adapting the cycle or entering standby during periods without oxygen consumption.

Shutdown

Several sensors are provided on the unit. If one of the measured signals exceeds the programmed shutdown level, the unit will be stopped.

Example: If the outlet pressure exceeds the programmed shutdown level, the unit will be stopped. This will be indicated on the display of the controller.

Warning:

Before remedying, consult the safety precautions.

Before resetting a warning or shutdown message, an authorized technician should solve the problem. If a warning or alarm persists to occur, consult your supplier. Frequently resetting these messages without remedying may damage the unit.

Shutdown warning

A shutdown warning level is a programmable level below the shutdown level.

If one of the measurements exceeds the programmed shutdown warning level, a message will appear on the display and the general alarm LED will light up to warn the operator before the shutdown level is reached.

The message disappears as soon as the warning condition disappears.

When the shutdown warning is shown, press the stop button to stop the unit and wait until the unit has stopped. Consult an authorized technician to solve the problem.

Service warning

A number of service operations are grouped as a Service Plan. Each Service Plan has a programmed time interval. If the service timer exceeds a programmed value, this will be indicated on the display to warn the operator to carry out the service actions belonging to that Service Plan.

When the service warning is shown, stop the unit, switch off the voltage and carry out the required service actions.

Warning: Ignoring this service warning could severely damage your machine in the long term. The supplier is not liable for failures caused by neglecting service interval timings.

Automatic restart after voltage failure (ARAVF)

The controller has a built-in function to automatically restart the unit when the voltage is restored after voltage failure.

For units leaving the factory, this function is made inactive. If desired, the function can be activated. Consult your supplier.

Warning:

If the function is activated and the controller was in the automatic operation mode before the supply voltage was interrupted, the unit will automatically restart once the supply voltage to the unit is restored. The ARAVF label shall be attached near to the controller.

4.2 Control panel

Figure 7: Control panel

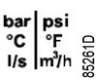
Reference	Designation	Function
1	Touch screen	Shows the unit operating condition and several icons to navigate through the menu. The screen can be operated by touch.
2	Warning sign	Flashes in case of a shut-down, is lit in case of a warning condition.
3	Service sign	Lit when service is needed.
4	Operation sign	Lit when the unit is running in automatic operation.
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	Stops the unit.
7	Start button	This button starts the unit. The operation sign lights up. The controller is operative.

4.3 Icons used

Menu icons

Menu	Icon	Menu	Icon	Menu	Icon
Data		Status			

Menu	Icon	Menu	Icon	Menu	Icon
		Inputs			
		Outputs			
		Counters			
		Auxiliary Equipment Parameters		Converters	
Service		Service		Overview	
				Service Plan	
				Service History	
		Service Functions			
		Clean Screen			
Week Timer				Week	
				Remaining Running Time	
Event History		Saved Data			
Machine Settings		Alarms			
		Regulation			
		Control Parameters			
		Auxiliary Equipment Parameters		Converters	
				Fan	
				Internal SmartBox	
		Auto Restart			

Menu	Icon	Menu	Icon	Menu	Icon
Controller Settings		Network Settings		Ethernet Settings	
				CAN Settings	
		Localisation		Language	
				Date/Time	
				Units	
		User Password			
		Help			
		Information			

Status icons

Icon	Description
	Motor Stopped
	Motor Stopped Wait
	Running Unloaded
	Manual Unload
	Running Unloaded Wait
	Running Loaded
	Failed to Load
	Running Loaded Wait
	Manual Stop

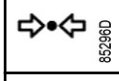
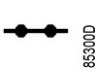
Icon	Description
	Machine Control Mode, Local
	Machine Control Mode, Remote
	Machine Control Mode, LAN
	Automatic Restart After Voltage Failure
	Week Timer Active

System icons

Icon	Description
	Basic User
	Advanced User
	Service User
	Antenna 25%
	Antenna 50%
	Antenna 75%
	Antenna 100%
	Change between screens (indication)
	Energy recovery
	Drain(s)
	Analogue Output
	Menu

Icon	Description
	Reset
	Auto Restart
	Filter(s)
	Valve(s)
	Power Meter

Input icons

Icon	Description
	Pressure
	Temperature
	Special Protection
	Open
	Closed

Note:

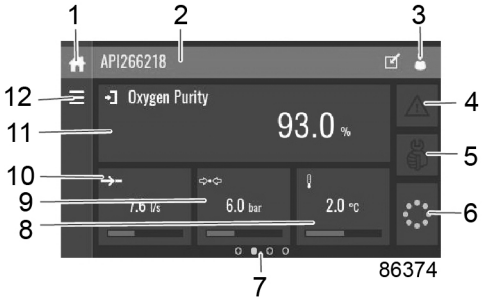
This chapter gives a general survey of available icons. Not all icons mentioned in this chapter are applicable to every machine.

4.4 Main screen

Function

The main screen is the screen that is shown automatically when the voltage is switched on. It is switched off automatically after a few minutes when there is no touch input.

Description



Reference	Designation	Function
1	Home button	The home button is always shown and can be tapped to return to the main screen.
2	Screen information	On the main screen, the screen information bar shows the serial number of the machine. When scrolling through menus, the name of the current menu is shown.
3	Access level button	The access level button is always shown and can be tapped to change the current user access level.
4	Alarm button	The alarm button can be tapped to show the current alarms. If an alarm occurs, the icon on the button will be red.
5	Service button	The service button can be tapped to show the service information.
6	Status	This icon shows the current status of the unit.
7	Page indicator	Indicates which page you currently see. The middle indication is the main screen, left is the menu screen and at the right the quick access screen. Swipe left or right to go to another screen.
8, 9, 10, 11	These fields can contain a certain value, depending on the type of the unit.	Tap the field to view the type of measurement. This will be shown in the screen information bar. Examples of values shown: • Temperature • Pressure • Purity level
12	Menu button	The menu button is always shown and can be tapped to go to the menu.

4.5 Quick access screen

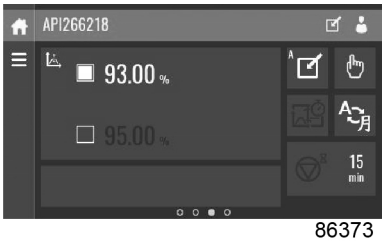
Function

The screen is used to directly access some frequently used functions.

Procedure

The quick access screen can be viewed by swiping left, starting from the main screen.

Description



86373

Through this screen, several important settings can be viewed and modified.

Reference	Function	Description
1	Setpoints	Several setpoints can be modified by tapping this icon.
2	Control mode	The control mode can be changed by tapping this icon. • Local control via start/stop buttons • Remote control via digital input(s) • LAN control via the network. When in remote or LAN control, the start/stop buttons on the controller will not work.
3	Display language	The display language of the controller can be changed by tapping this icon.
4	Operation mode	When tapped, the operation mode can be chosen between manual and automatic. When manual mode is selected, the controller will switch to automatic mode automatically after 24 hours.
5	Week timer	Week timers can be set by tapping this icon.
6	Remaining running time	The remaining running time can be set and modified by tapping this icon.
7	Internal SmartBox	The reception quality of the internal antenna can be monitored. Each bar represents 25% reception strength. If the four bars are filled, the reception strength is 100%. If only one bar is filled, the reception strength is just 25%.
8	Auto Restart	Auto restart can be activated by tapping this icon.

4.6 Graphic screen

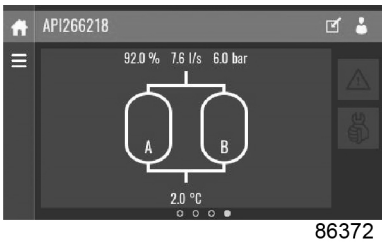
Function

The screen is used to consult the status of the adsorbers and shows the main sensor data.

Procedure

The graphic screen can be viewed by swiping left twice, starting from the main screen.

Description



86372

4.7 Menu screen

Function

This screen is used to display the different menus where settings can be viewed or changed.

Procedure

The menu screen can be viewed by tapping the menu button or by swiping right, starting from the main screen.

Description

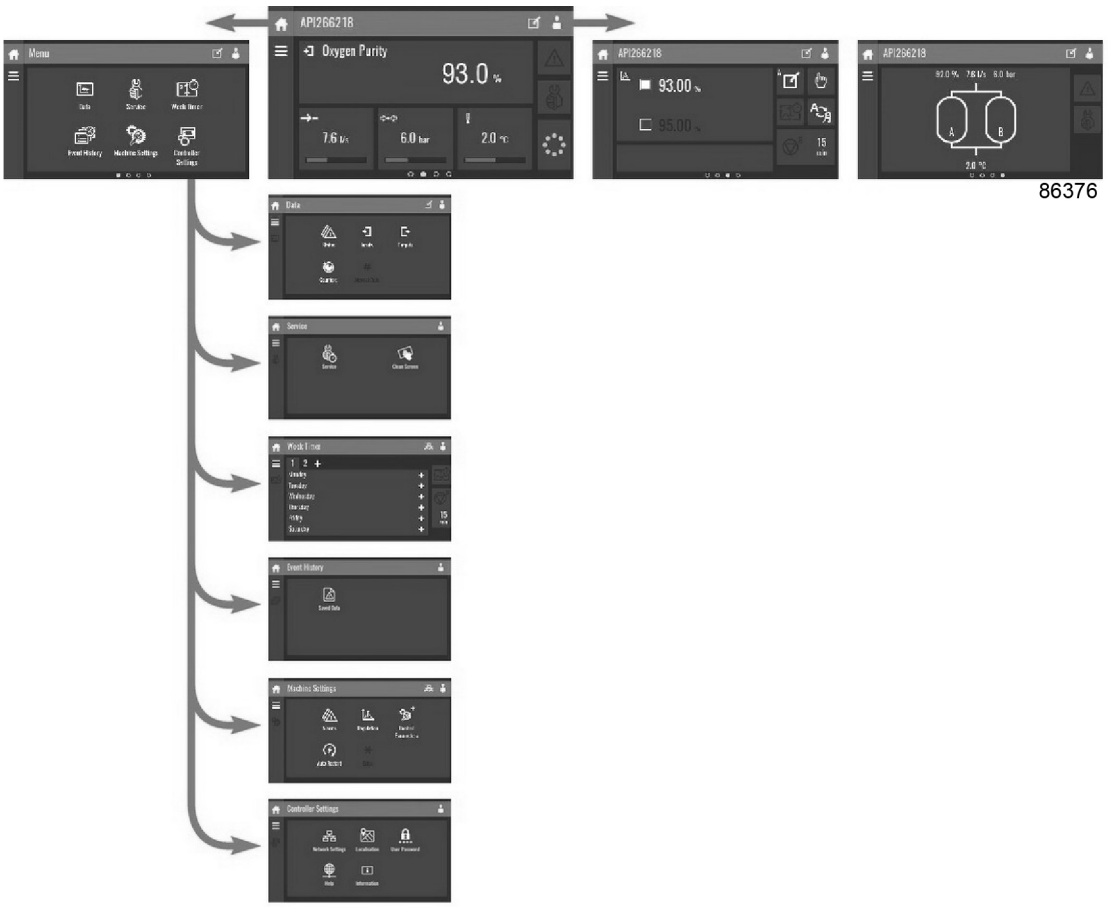
85204

Reference	Designation	Function
(1)	Data	The data menu contains the status of the unit, information about the inputs, outputs and counters. The auxiliary equipment can also be viewed through this menu.
(2)	Service	The service menu contains the service information. The "clean screen" function can be used to clean the touchscreen.
(3)	Week timer	Multiple week timers and a remaining running time can be set through this menu.
(4)	Event history	In case of an alarm, the status information of the unit is saved and can be viewed through this menu.

Reference	Designation	Function
(5)	Machine settings	Alarms settings, regulation settings and control parameters can be changed through this menu. Auxiliary equipment parameters can also be changed. The automatic restart function can be set through this menu. This function is password-protected.
(6)	Controller settings	Network settings, localisation settings and a user password can be set through this menu. There is also a help page available and the controller information can be shown.

Menu structure

Operating the controller can be done by swiping through screens and tapping icons or menu items.



This is the main structure. It can differ depending on the configuration of the unit.

4.8 Data menu

Function

This screen is used to display the following submenus:

- **Status**
- **Inputs**
- **Outputs**
- **Counters**

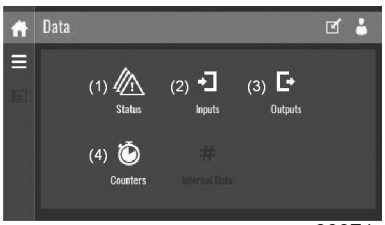
These submenus can be entered by tapping the icons.

Procedure

To enter the **Data** menu screen:

1. Tap the Menu button.
2. Tap the **Data** icon.

Description

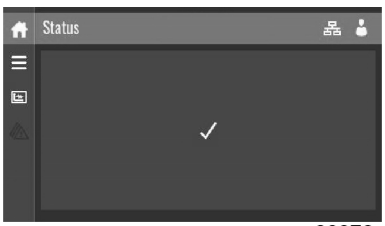


86371

Reference	Designation
(1)	**Status** menu
(2)	**Inputs** menu
(3)	**Outputs** menu
(4)	**Counters** menu

Status menu

Tap the **Status** icon to enter the **Status** menu.



86370

This menu shows the current status of the unit.

If an alarm is active, it can be viewed by tapping the alarm message. To reset an alarm, tap the reset button.

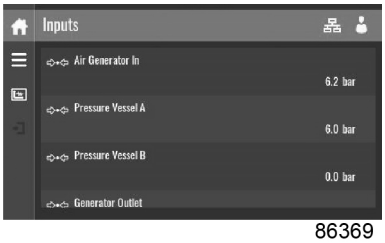
Warning:

Before remedying, consult the safety precautions.

Before resetting a warning or shutdown message, an authorized technician should solve the problem. If a warning or alarm persists to occur, consult your supplier. Frequently resetting these messages without remedying may damage the unit.

Inputs menu

Tap the **Inputs** icon to enter the **Inputs** menu.

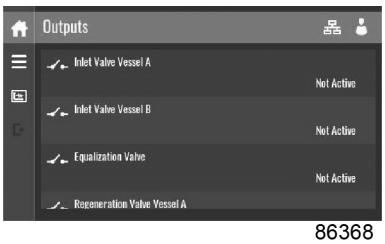


86369

This menu shows information about all the inputs.

Outputs menu

Tap the **Outputs** icon to enter the **Outputs** menu.



86368

This menu shows information about all the outputs.

Danger:

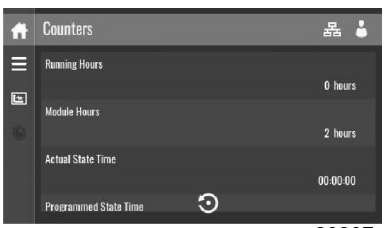
Voltage-free outputs may only be used to control or monitor functional systems. They should **NOT** be used to control, switch or interrupt safety related circuits. Check the maximum allowed load on the label.

Warning:

Stop the unit and switch off the supply before connecting external equipment. Consult the safety precautions.

Counters menu

Tap the **Counters** icon to enter the **Counters** menu.



86367

This menu shows an overview of all actual hours and counters of the unit and controller.

4.9 Service menu

Function

This screen is used to display the following submenus:

- **Service**
- **Service Functions** (visible as advanced user)

- **Clean Screen**

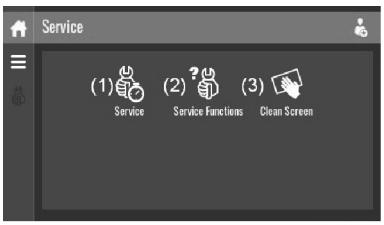
These submenus can be entered by tapping the icons.

Procedure

To enter the **Service** menu screen:

1. Tap the Menu button.
2. Tap the **Service** icon.

Description

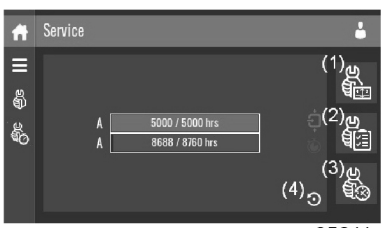


85213

Reference	Designation
(1)	**Service**
(2)	**Service Functions** (only visible as advanced user)
(3)	**Clean Screen**

Service menu

Tap the **Service** icon to enter the **Service** menu.



85211

This menu shows the remaining **Running Hours** and the remaining **Real Time Hours** until the next service. The first row (A) shows the **Running Hours** when the first service is needed (green), the second row shows the **Real Time Hours** (blue)

A service overview can be viewed by tapping icon (1).

The service plan can be viewed by tapping icon (2). Through this menu, the service plan can be modified:

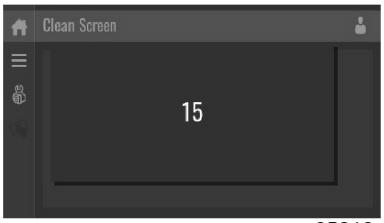
1. Tap the desired service plan. A selection screen will pop up.
2. Change the Running Hours by tapping ‘–’ or ‘+’.
3. Confirm by tapping ‘V’ or decline by tapping ‘X’.

The service history can be viewed by tapping icon (3).

When a service plan interval is reached, a message will appear on the screen. When service has been performed, the service timer can be reset by tapping the reset button (4).

Clean screen

Tap the **Clean Screen** icon to start the 15 seconds countdown to perform cleaning of the touch screen.



85212

The touch screen and the start and stop button become inactive for 15 seconds.

4.10 Week timer menu

Function

This screen is used to set up to 4 different timers with each up to 8 settings per day.

The week timers can be activated through this screen.

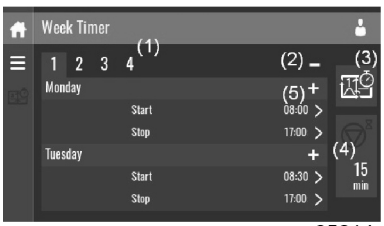
A **Remaining Running Time** can be set from 5 up to 240 minutes.

Procedure

To enter the **Week Timer** menu screen:

1. Tap the Menu button.
2. Tap the **Week Timer** icon.

Description



85214

Reference	Designation	Function
(1)	Add or select week	If less than 4 weeks are programmed, tap the '+' button to add a week.
(2)	Remove week	Tap to remove a programmed week timer.
(3)	Activate week timer	A selection screen pops up. The user can choose the correct week by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.
(4)	Remaining running time	A selection screen pops up. The user can change the remaining time by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

Reference	Designation	Function
(5)	Add setting	A selection screen pops up. The user can change the setting by swiping up or down and confirm by tapping ‘V’ or decline by tapping ‘X’.

4.11 Event history menu

Function

This screen is used to display the saved data in case of an alarm.

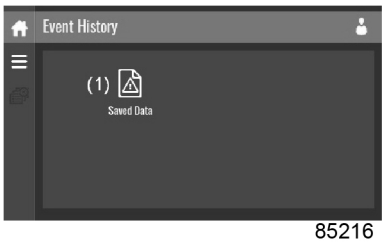
These submenus can be entered by tapping the icons.

Procedure

To enter the **Event History** menu screen:

1. Tap the Menu button.
2. Tap the **Event History** icon.

Description



85216

Reference	Designation
(1)	Saved Data

Saved data

Tap the **Saved Data** icon to enter the **Saved Data** menu.

Scroll through the items swiping up and down in this list. The event date and time is shown at the right side of the screen.

Press on one of the items in the list for more information reflecting the status of the unit when the shutdown occurred.

4.12 Machine settings menu

Function

This screen is used to display the following submenus:

- **Alarms**
  - **General**
  - **Air quality**
  - **Filters**

    - **Digital**
    - **Flow**
    - **Pressure**
- **Regulation**
    - **Purity**
    - **Regulation**
    - **Capacity control**
- **Control Parameters**
- **Auto Restart**

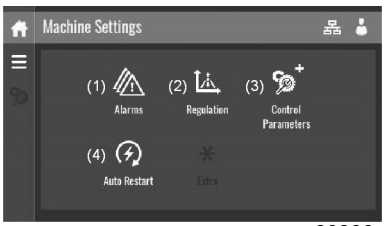
These submenus can be entered by tapping the icons.

Procedure

To enter the **Machine Settings** menu screen:

1. Tap the Menu button.
2. Tap the **Machine Settings** icon.

Description

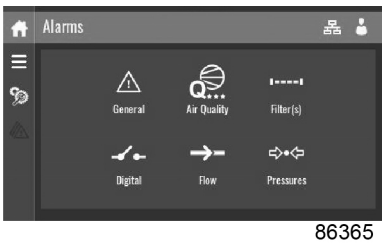


86366

Reference	Description
(1)	**Alarms** menu
(2)	**Regulation** menu
(3)	**Control Parameters** menu
(4)	**Auto Restart** menu

Alarms menu

Tap the **Alarms** icon to enter the **Alarms** menu.



86365

Alarms are grouped per type.

When pressing on one of the items in the underlying list, the warning and/or shutdown levels are shown for this alarm.

Regulation menu

Tap the **Regulation** icon to enter the **Regulation** menu.

86364

Setpoints can be modified and capacity control can be consulted through this menu.

Modify a setting

When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

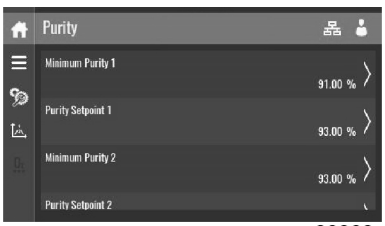
Change a selection

When tapping a list item, a selection screen pops up. The user can change the selection by swiping up or down and confirm by tapping 'V' or decline by tapping 'X'.

Purity menu

Tap the **Purity** icon to enter the **Purity** menu.

In this menu, the purity settings are entered.



86363

Minimum purity

This is the minimum purity that is allowed in the installation. Below this purity, the supply of oxygen will be cut-off and the generator will be flushing the product tank until the minimum purity has been reached.

Minimum purity

This is the minimum purity that is allowed in the installation. Below this purity, the supply of oxygen will be cut-off and the unit will be flushing the oxygen buffer vessel until the minimum purity has been reached.

Purity setpoint

This is the nominal required purity for the installation. The unit will use this setpoint to regulate the Variable Cycle Saver algorithm, in order to achieve the correct purity at the correct energy consumption in all situations.

Purity setpoint

This is the nominal required purity for the installation. The generator will use this setpoint to regulate the Variable Flow Saver algorithm, in order to achieve the correct purity at the correct energy consumption in all situations.

Capacity control

Tap the **Capacity control** icon to enter the **Capacity control** menu.

In this menu, you can view the operation of the Variable Cycle Saver.

In this menu, you can view the operation of the Variable Flow Saver.

86362

Generator capacity

The generator capacity shows the amount of flow the generator is able to produce at the current temperature, pressure and purity setpoint.

Concentrator capacity

The concentrator capacity shows the amount of flow the unit is able to produce at the current temperature, pressure and purity setpoint.

Note that in the screen above "Generator capacity" is actually "Concentrator capacity".

Consumption level

The consumption level is the relative amount of flow that is currently consumed.

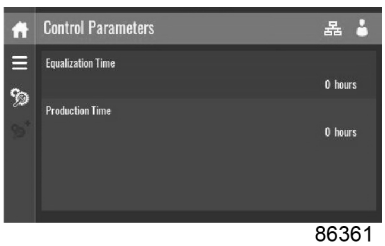
Modulation level

The modulation level is the capacity at which the unit is currently running. If the capacity is showing less than 100%, the Variable Cycle Saver is active and less energy is being consumed.

The modulation level is the capacity at which the unit is currently running. If the capacity is showing less than 100%, the Variable Flow Saver is active and less energy is being consumed.

Control parameters menu

Tap the **Control Parameters** icon to enter the **Control Parameters** menu.

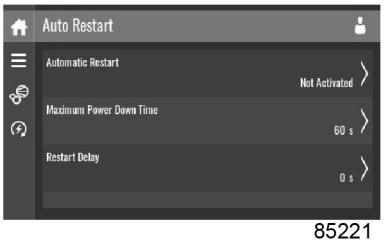


86361

This menu shows information about the cycle times.

Auto restart menu

Tap the **Auto Restart** icon to enter the **Auto Restart** menu.



85221

Through this menu, the automatic restart can be activated. The activation is password protected.

The automatic restart settings can also be changed.

Enter a password

When tapping a password protected item, a selection screen pops up. The user can enter the password by swiping up or down to select the desired number. Once the 4 digits are entered, the user can confirm by tapping ‘V’ or decline by tapping ‘X’.

Modify a setting

When tapping a list item, a selection screen pops up. The user can modify the setting by tapping ‘–’ or ‘+’ and can confirm by tapping ‘V’ or decline by tapping ‘X’.

4.13 Controller settings menu

Function

This screen is used to display the following submenus:

- **Network Settings**
- **Localisation**
- **User Password**
- **Help**
- **Information**

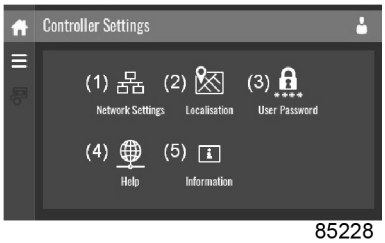
These submenus can be entered by tapping the icons.

Procedure

To enter the **Controller Settings** menu screen:

1. Tap the Menu button.
2. Tap the **Controller Settings** icon.

Description



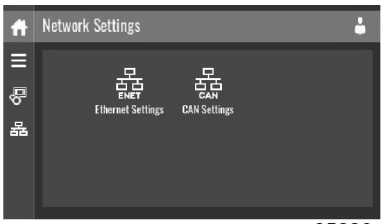
85228

Reference	Designation
(1)	**Network Settings** menu
(2)	**Localisation** menu

Reference	Designation
(3)	**User Password** menu
(4)	**Help** menu
(5)	**Information** menu

Network settings menu

Tap the **Network Settings** icon to enter the **Network Settings** menu.



85223

Ethernet Settings

The list of **Ethernet Settings** is shown. When ethernet is turned off, the settings can be modified.

CAN Settings

The list of **CAN Settings** is shown. When CAN is turned off, the settings can be modified.

Modify a setting

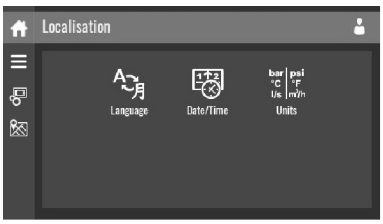
When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

Change a selection

When tapping a list item, a selection screen pops up. The user can change the selection by swiping up or down and confirm by tapping 'V' or decline by tapping 'X'.

Localisation menu

Tap the **Localisation** icon to enter the **Localisation** menu.



85224

Language

The language setting of the controller can be modified through this menu.

Date/Time

The date and time settings of the controller can be modified through this menu.

Units

The units displayed can be modified through this menu.

Modify a setting

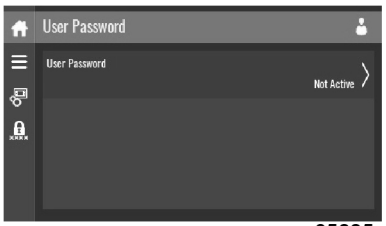
When tapping a list item, a selection screen pops up. The user can modify the setting by tapping ‘–’ or ‘+’ and can confirm by tapping ‘V’ or decline by tapping ‘X’.

Change a selection

When tapping a list item, a selection screen pops up. The user can change the selection by swiping up or down and confirm by tapping ‘V’ or decline by tapping ‘X’.

User password menu

Tap the **User Password** icon to enter the **User Password** menu.



85225

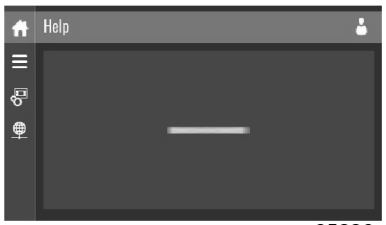
The user password can be activated or deactivated through this menu. Enter and confirm a user password to activate, repeat to deactivate.

Enter a password

When tapping a password protected item, a selection screen pops up. The user can enter the password by swiping up or down to select the desired number. Once the 4 digits are entered, the user can confirm by tapping ‘V’ or decline by tapping ‘X’.

Help menu

Tap the **Help** icon to enter the **Help** menu.

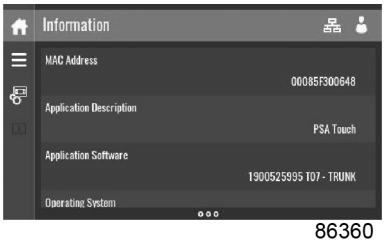


85226

This menu can show a link to the web page of your supplier, a helpdesk phone number or other helpful information.

Information menu

Tap the **Information** icon to enter the **Information** menu.



86360

This menu shows information about the controller.

4.14 Access level

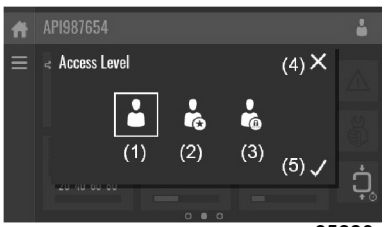
Function

Through this pop-up screen, the access level settings can be viewed or changed.

Procedure

The **Access Level** screen can be viewed or changed by tapping the **Access Level** button at the upper right corner of the screen.

Description



85229

Reference	Designation	Function
(1)	User	A basic set of parameters is visualized, no password required.
(2)	Service	A basic set of parameters can be modified, no password required.
(3)	Full	This access level is not accessible to end users.
(4)	Decline	Tap to decline the selected user level.
(5)	Confirm	Tap to confirm the selected user level.

Service access level

85230

Tap the **Service** access level icon (1) and confirm (2).

The screen information bar (1) now shows the current status of the unit instead of the machine serial number.

The Received Signal Strength Indicator (RSSI) value is now shown in the Internal SmartBox menu. See section **Quick access screen**.

In the service menu, an extra menu item is now available. See section **Service menu**.

4.15 Web server

All controllers have a built-in web server that allows direct connection to the company network or to a dedicated PC via a local area network (LAN). This allows to consult certain data and settings via a PC instead of the display of the controller.

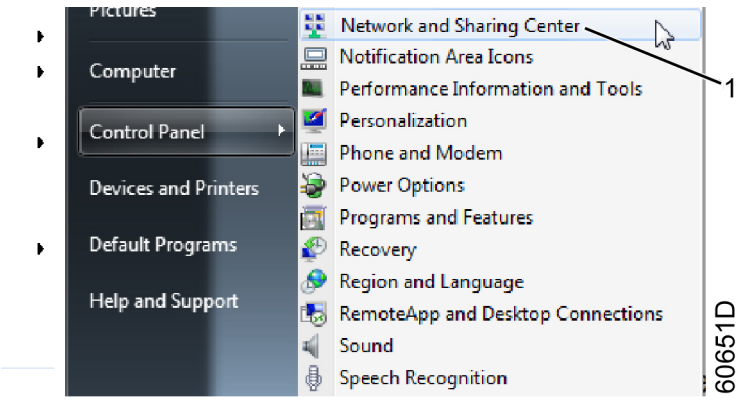
Getting started

Make sure you are logged in as administrator.

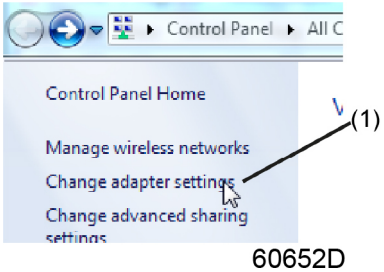
- Use the internal network card from your computer or a USB to LAN adapter.
- Use a UTP cable (CAT 5e) to connect to the controller (see picture below).

Configuration of the network card

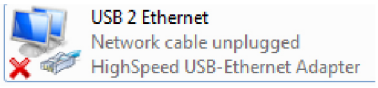
- Go to Network and Sharing Center (1).



- Click on Change adapter settings (1).

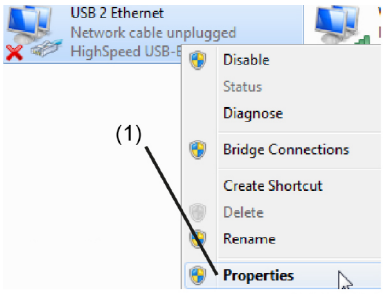


- Select the Local Area Connection, which is connected to the controller.



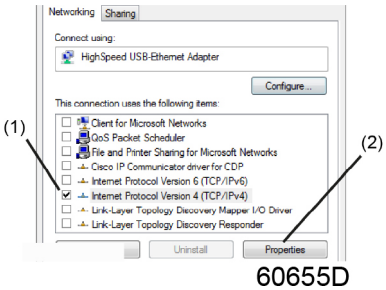
60653D

- Click with the right button and select Properties (1).



60654D

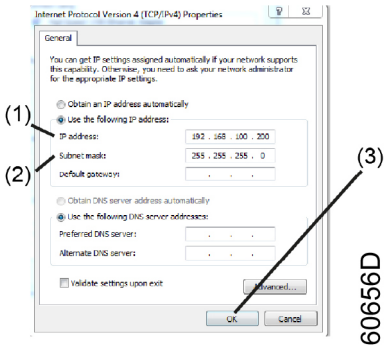
- Use the check box Internet Protocol version +4 (TCP/IPv4) (1) (see picture). To avoid conflicts, uncheck other properties if they are checked. After selecting TCP/IPv4, click on the Properties button (2) to change the settings.



60655D

- Use the following settings
  - IP Address 192.168.100.200(1)
  - Subnetmask 255.255.255.0(2)

  Click OK (3) and close network connections.



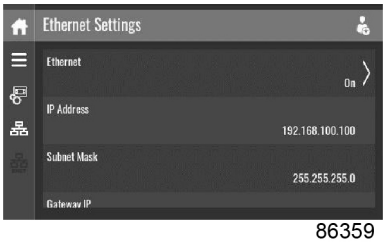
60656D

Configure a company network (LAN) connection

- Ask your IT department to generate a fixed IP address in your company's network. That IP address will be excluded from the DNS server, so it will be reserved for the controller. Also get the correct Gateway and Subnet mask settings. For example:
  - IP = 10.25.43.200
  - Gateway = 10.25.42.250
  - Subnet mask = 255.255.254.0

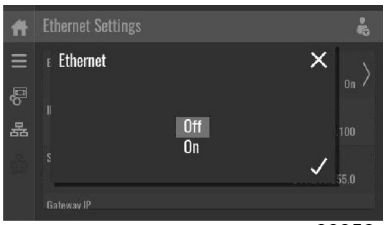
- Connect the controller to the company's network (LAN) by using a UTP cable (min. CAT 5e).

- Adapt the network settings in the controller.
  - Put the controller in advanced mode by navigating to **Menu** > **Controller settings** > **Network settings** > **Ethernet settings**.



86359

  - Switch off the ethernet communication to allow the editing of the settings.



86358

  - Adapt IP adress
  - Adapt Gateway IP
  - Adapt Subnetmask
  - Switch on the Ethernet communication
  - Wait a few minutes so the controller can be connected to the LAN network.

Configuration of the web server

The internal web server is designed and tested for Microsoft® Internet Explorer. Opera, Mozilla Firefox, Safari and Chrome should also work.

Viewing the controller data

Note:

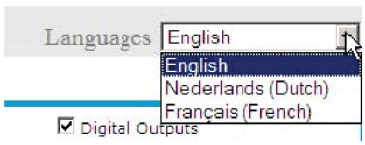
All screen shots are indicative. The number of displayed fields depends on the selected options.

- Open your browser and type the IP address of the controller you want to view in your browser (in this example http://192.168.100.100). The interface opens.

81520D

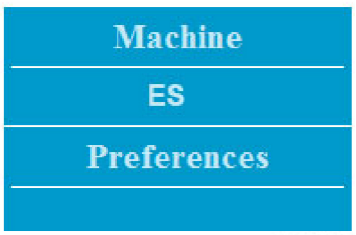
Navigation and options

- • The banner shows the unit type and the language selector. In this example, three languages are available on the controller.



81521D

- • On the left side of the interface, you can find the navigation menu. If a license for ESi is foreseen, the menu contains 3 buttons:



83810D

  - Machine: shows all generator settings.
  - ES: shows the ESi status (if a license is provided).
  - Preferences: allows to change temperature and pressure unit.

5 Operating instructions

5.1 Starting

Note:

The initial start-up after installation should always be done by trained personnel of the manufacturer or authorized distributor.

For the designation of the components, see section *Flow diagram*.

1. Make sure all ball valves between the generator and the tanks are opened and the ball valve after the compressor is closed.
2. Make sure all ball valves inside the generator are opened, except the sample purity ball valve BA03.
3. Make sure the refrigerant dryer is not running in energy efficient mode. This mode can cause an increase of outlet dew point and a shutdown of the generator as a consequence.
4. Switch on the refrigerant dryer 10 minutes in advance of the compressor (if applicable). In case of inlet temperatures below 10 °C: Switch on an adsorption dryer well before starting the generator. Make sure the PDP of the adsorption dryer is well below -20 °C before starting the generator.
5. Start the compressor.
6. Slowly open the valve after the compressor so the compressor can slowly fill the air tank so it is filled with compressed air dried down to a dew point of 3 °C (37.4 °F).
7. Enter the required oxygen purity in the controller by navigating to **Menu** > **Machine settings** > **Regulation** > **Purity**. The controller will use this setting to tune its capacity to the consumed oxygen flow (Variable Cycle Saver feature).
8. Enter the minimum required oxygen purity in the controller by navigating to **Menu** > **Machine settings** > **Regulation** > **Purity**. The generator will stop supplying oxygen to the outlet when the purity drops below this setting and will start flushing the product tank to increase the outlet purity.
9. Make sure the pilot air pressure regulator PR01 is set to a pressure between 4.5 and 6 bar(g) (65 - 90 psi).
10. Check the inlet dew point on the controller display. If this value exceeds 5 °C (41 °F), the air tank needs to be flushed until a value below 5 °C (41 °F) is reached. The flushing of the air tank will be done automatically by the generator. During this time, the generator is in standby until a dewpoint of 5 °C (41 °F) has been achieved at the inlet.
11. Start the generator by pushing the start button on the controller. The generator will now start automatically.

    During "startup" the product tank is filled through restriction orifice OR04 until the pressure difference between the air tank and product tank is less than the delta pressure setting .

    During "flushing" the oxygen tank is flushed through orifice OR06 until the purity in the vessel is equal to the **Min Purity** setting as entered in step 7.

    Flushing can take up to 2 hours. After flushing, the generator is ready for oxygen production.
12. Regulate the outlet oxygen pressure with pressure regulator PR03 to the requested oxygen pressure.

13. Make sure the outlet flow measured by FT01 does not exceed the nominal flow of the oxygen generator. Regulate the flow by controlling FR01.

    Exceeding the nominal flow will cause the purity to drop. If the purity drops below the minimum purity setting, the outlet flow is cut off to enable flushing of the product tank.

    The nominal flow is continuously calculated by the generator and can be found by navigating to **Menu** > **Machine settings** > **Regulation** > **Capacity control**.

    More flow means lower oxygen purity, less flow means higher oxygen purity. The purity in the product tank can be read on the main screen.
14. Set the time and date by navigating to **Menu** > **Controller settings** > **Localisation** > **Date/ time**.
15. Set the required warning and shutdown levels in the **Alarms** menu.
16. Set the generator in automatic operation mode on the quick-access screen. This enables standby and capacity control modes.
17. Adjust the compressor pressure if necessary: the compressor should be running continuously in order to ensure a stable inlet pressure. If the compressor enters unload during the cycle, increase the pressure setpoint, respecting the limitations for operation (maximum 10 bar(g)/145 psi).

5.2 During operation

Manual operation mode

In manual mode, the generator runs at normal timer based operation, independently from the detected flow rate.

Automatic operation mode

In automatic mode, the generator will apply Variable Cycle Saver control in 5 stages:

Oxygen consumption level compared to nominal generator capacity	Variable Cycle Saver
100 %	Normal operation
Less than 80 %	Cycle time modulation stage 1
Less than 60 %	Cycle time modulation stage 2
Less than 40 %	Cycle time modulation stage 3
Less than 1 %	Standby

Inlet PDP protection

- In combination with a refrigerant dryer:

  As standard, the unit is equipped with an inlet PDP protection feature. When the inlet air PDP exceeds 5 °C (41 °F), the PSA cycle is automatically shut down and an inlet flushing cycle is started. The inlet flushing valve (Y11) allows a small flow of air through OR05 to the silencer, which will reduce the load of the refrigerant dryer and allows the air tank to be dried until the required dewpoint is achieved.
- In combination with an adsorption dryer (low ambient option selected):

  As standard, the unit is equipped with an inlet PDP protection feature. When the inlet air PDP exceeds -20 °C (-4 °F), the PSA cycle is automatically shut down and an inlet flushing cycle is

started. The inlet flushing valve (Y11) allows a small flow of air through OR05 to the silencer, which will reduce the load of the dessicant dryer and allows the air tank to be dried until the required dewpoint is achieved.

Variable Cycle Saver

The oxygen generators are equipped with the Variable Cycle Saver (VCS) feature. This feature enables the controller to modulate the capacity (and thus the required amount of compressed air) depending on the consumed oxygen flow.

The capacity is controlled by varying the cycle times. A lower capacity means longer cycle times, a higher capacity means shorter cycle times. By doing this, the outlet purity can be maintained constant and as a consequence less compressed air will be used (energy saving up to 70%).

The feature also enables a generator which has been sized for high temperature to use less energy when it is colder than the temperature for which the generator is sized.

Overflow protection

To protect the generator from being overloaded, the adsorbers are protected by the minimum pressure valve V9. See section *Flow diagram.*

During normal operation, i.e. when the pressure difference between the air tank and product tank is less than the **Delta Pressure** setting, the minimum pressure valve is open.

If the oxygen demand would become too high, the pressure difference will increase and when it is higher than the **Delta Pressure** setting, minimum pressure valve V9 will close. At this stage, the flow is restricted by startup nozzle OR04 as long as the pressure difference between the air tank and product tank is larger than the **Delta Pressure** setting. To recover from this state, the outlet flow must be restricted to the nominal flow of the generator or less. When the pressure difference becomes smaller than the **Delta Pressure** setting, the generator will wait 10 minutes before opening minimum pressure valve V9.

Guaranteed purity

To protect the installation from low purity that could harm its process, the unit is equipped with a guaranteed purity control. The minimum purity that is allowed in the installation can be set in the controller by navigating to **Menu** > **Machine settings** > **Regulations** > **Purity**.

If the purity in the product tank becomes lower than the **Minimum purity** setting, the flow to the installation is cut off by closing consumer valve V10. At the same time, outlet flushing valve V12 is opened to flush the product tank with a flow, controlled by flushing nozzle OR06. This way, the purity in the prioduct tank is recovered as fast as possible. Once the measured purity is better than the Min Purity setting, flushing valve V12 will close and consumer valve V10 will open.

Changing the purity

Oxygen purity	Residual inert gas concentration
90 %	10 %
93 %	7 %
95 %	5 %

To change the desired outlet purity, navigate to **Menu** > **Machine settings** > **Regulations** > **Purity**. Based on this setting, the generator will adapt its capacity control and apply cycle time modulation when necessary. When changing the purity setting, the **Minimum purity** setting also needs to be

changed. Based on this setting, the generator will only allow oxygen with a better purity than the **Minimum purity** setting to be sent to the installation.

Standby mode

When the oxygen consumption stops, the generator will enter standby mode automatically. All sensors remain powered to sense any changes to the output flow, oxygen purity and pressure levels. When the sensors detect that there is a leak or the flow restarts, the generator will start producing oxygen instantaneously.

5.3 Stopping

To stop the generator for longer time periods (1 week or more), , press the stop button on the controller. The generator will finish its current cycle and vent both adsorber vessels.

If the installation is to be stopped for only a few days or a weekend, it is advised not to use this function. Instead, stop the consumption of oxygen which will turn the generator in stand-by mode automatically. This enables a start-up time of less than one minute, compared to up to one hour if the unit is completely stopped.

5.4 Checking the display

1. Check the display regularly for readings and messages.

   The main screen shows the generator inlet dew point, outlet purity, outlet flow and outlet pressure.
2. Remedy the trouble or consult the supplier if the alarm LED is alight or blinking. See section **Control panel**.

   The display will show a service message if a service plan interval has been exceeded or if a service level for a monitored component has been exceeded. Carry out the service actions of the indicated plans or replace the component and reset the relevant timer. See section **Service menu**.

5.5 Taking out of operation

Stop the generator by pressing **Stop** and close the inlet and outlet valves.

6 Maintenance

6.1 General

User maintenance is restricted to visual inspections. Do not attempt to modify or repair the apparatus. All maintenance and repairs shall be carried out by authorized trained personnel. The manufacturer offers serveral types of service contracts. Consult your supplier for more information.

6.2 Maintenance schedule

General

To maintain the generator efficiency and to reduce the risks of faults, strictly observe the recommended maintenance schedule.

The following table specifies the frequency of the recommended maintenance operations, expressed in operating hours of the generator:

Frequency	Service plan	Activity
Daily		Check the controller for information on the purity, alarms and service messages.
Every 4000 hours of operation or every 6 months (1)		• Check fitted connections in and around the unit for potential leaks. • Replacement of the activated carbon filter.
Every 8000 hours of operation or every year (1)	A	• Replacement of the inlet dew point sensor and outlet dew point sensor (optional). • Replacement of the actuators of the pneumatic valves V3 and V6.
Every 16000 hours of operation or every 2 years (1)	B	Replacement of the actuators of the pneumatic valves V1, V2, V4, V5, V7 and V8.
Every 40000 hours of operation or every 5 years	C	• Replacement of the oxygen sensor. • Replacement of the blow-off silencers. • Replacement of the solenoid valveblock.

Table 2: Programmed service interventions

(1): whichever comes first

After maintenance activities, the service counter will be reset by the service technician.

Note:

Proper and timely maintenance is extremely important to safeguard the lifetime of the adsorbent. The manufacturer cannot take any responsibility for improper functioning of the generator if maintenance is not done as prescribed. In this respect, regular maintenance of all equipment upstream of the generator, including but not limited to the compressor and the filter package used is of extreme importance.

7 Optional equipment

7.1 Outlet pressure dew point

An outlet pressure dew point sensor (PDP02) is available as an extra measure to monitor the dew point of the consumed oxygen. This feature is especially useful if the oxygen dew point is a critical parameter in the process.

Note that the outlet dew point of a oxygen generator is not stable and can make large variations depending on operating conditions. The highest outlet dew point will be -40 °C PDP, but this can drop down to -70 °C in some cases.

7.2 External oxygen analyser

An external oxygen analyser is available for the means of monitoring the oxygen level in the room where the oxygen generator is installed.

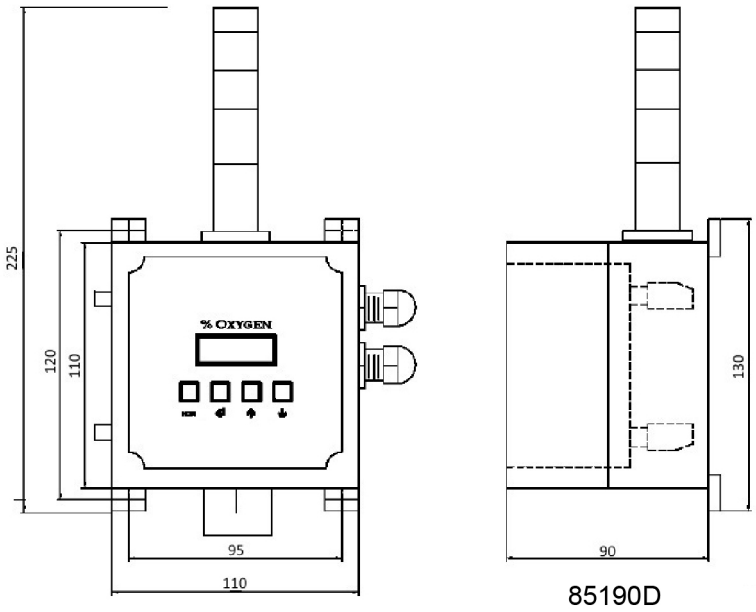


Figure 8: General arrangement

Note that adequate ventilation of the machine room is always necessary and ducting the exhaust of the generator outside is highly recommended.

7.3 Low ambient

The option low ambient is available for machine rooms where the ambient temperature can drop below 10°C. In order to guarantee longevity of the installation, the settings of the controller will be modified to allow a maximum inlet pressure dew point of -20°C (-4°F). As a consequence, a dessicant dryer needs to be installed after the compressor. By doing so, the output flow of the oxygen generator will be increased by 5%.

8 Troubleshooting

8.1 Low purity warning

When the oxygen concentration in the product tank becomes lower than the **Minimum purity** setting, the generator will start flushing the product tank and show a low purity alarm. At this point, no oxygen is available at the outlet of the generator.

1. Check that the oxygen purity ball valve BA04 is in open position.
2. Make sure that PR03 is regulated to 2 barg.
3. Make sure the generator is in running mode.
4. Variations in operating conditions, such as flow, pressure and temperature can have a large impact on the outlet purity. To check whether the generator's capacity at the current operating conditions is exceeded or not, check the **Consumption level** reading by navigating to **Menu** > **Settings** > **Generator** > **Capacity control**. When the consumption level is higher than 100%, it means that the generator has less capacity than requested. In this case, the oxygen consumption is too high and the amount of oxygen flow at the outlet needs to be reduced. If this is not an option, increasing capacity on a particular oxygen generator can be done by:
   - Decreasing the purity setting to a lower purity.
   - Decreasing the ambient temperature if the current temperature is higher than 20 °C.
   - Increasing the inlet pressure.
5. Inlet pressure should remain constant at all times. This is a direct cause of compressor sizing. If the compressor is running at full load over a complete cycle, the compressor is sized too small. If this is the case, lower the pressure setpoint of the compressor. If the compressor is oversized, then it would run in unload during one or more complete cycles. In this case, increase the pressure setting of the compressor so it's capacity is matched to that of the oxygen generator. Alternatively, a pressure regulator should be installed before the air tank in order to have a constant inlet pressure during multiple cycles.
6. If the exhaust is connected to outdoors, make sure the exhaust line is sized correctly. See section **Installation**.
7. Consult your authorized supplier.

8.2 High dryer pressure dew point

The inlet pressure dew point of an oxygen generator should be 3 °C and may not exceed 5 °C. When the low ambient option is selected, the inlet pressure dew point should not exceed -20°C. Oxygen generators are equipped as standard with an inlet dew point monitoring sensor, which monitors the dew point of the refrigerant dryer used.

If the air Tank has been filled with air that has a higher dew point than 5° C (-20°C for option low ambient), the air tank will be purged automatically by inlet flushing valve Y11. As a consequence, the dewpoint of the air tank will drop to the required level for operation.

A high dew point can be caused by an overload of the refrigerant dryer, which can occur during startup.

1. To prevent this from happening, the refrigerant dryer should be switched on before the compressor. When the compressor is switched on, the outlet flow of the compressor should be

reduced by means of choking with a ball valve. This causes the produced compressed air to have enough time to pass the dryer and fill the air tank with the correct quality of inlet air.

2. Make sure that a dedicated external dryer is used if ambient temperatures exceed 30°C.

8.3 Failed to pressurize

This alarm is triggered when adsorber A or B failed to build up pressure. In normal working conditions, the pressure inside an adsorber vessel should rise to the inlet pressure during the production state. If this does not happen, the process of producing oxygen has to be halted.

1. Make sure the inlet air pressure is higher than 4.5 bar (65 psi).
2. Make sure the pilot air pressure regulator PR01 is regulated to 6 bar (87 psi).
3. Consult your authorized supplier.

8.4 Failed to blow off vessel A (or vessel B)

This alarm is triggered when adsorber A (or B) failed to depressurize. In normal working conditions, the pressure inside an adsorber vessel should lower to the atmospheric pressure during the regeneration state. If this does not happen, the process of producing oxygen has to be halted.

1. Make sure the pilot air pressure regulator PR01 is regulated to 6 bar (87 psi).
2. Make sure the exhaust opening is not blocked.
3. Consult your authorized supplier.

8.5 High working pressure

This alarm is activated when the inlet pressure exceeds 10 bar (145 psi). This is the maximum design pressure of the generator.

Reduce the inlet pressure.

8.6 Low working pressure

This alarm is activated when the inlet pressure drops below 4.5 bar (65 psi). This is the minimum working pressure of the generator.

Increase the inlet pressure.

8.7 High inlet temperature

This alarm is activated when the inlet temperature exceeds 50 °C (122 °F). This is the maximum inlet temperature of the generator.

Make sure that the inlet temperature does not exceed 50 °C (122 °F).

8.8 Low inlet temperature

This alarm is activated when the inlet temperature drops below the allowed minimum inlet temperature. The minimum inlet temperature depends on the selected dryer: When a dessicant

dryer is installed, the minimum inlet temperature is -10°C (14°F). When a refrigerant dryer is installed, the minimum inlet temperature is +10°C (50°F).

Make sure that the inlet temperature does not go below the minimum value.

8.9 No outlet pressure

The oxygen generator features protections against overflow and regulations for guaranteed purity. Because of these features, it is able to shut off the pressure to the outlet by control valves.

If no pressure is available at the outlet, check the protection conditions of the generator.

1. Is the generator started up properly? This can be checked by comparing the pressure of the air tank to the pressure of the product tank. The difference in pressure should be less than 1 bar (14.5 psi).
2. Make sure the product tank is able to build up pressure by checking that there are no restrictions in the piping between the generator to product tank connection and the product tank. Double check that the connection diameter is corresponding to the installation proposal.
3. Check the purity of the produced oxygen. This parameter is displayed on the main screen. This parameter should be higher than the **Minimum purity** setting before pressure will be available on the outlet.

9 Technical data

9.1 Reference conditions

Air pressure at generator inlet	6 bar	87 psi
Ambient temperature (air inlet temperature)	20 °C	68 °F
Air inlet quality	Class [1-4-1] acc. ISO 8573-1:2010	

9.2 Limitations for operation

Inlet air quality	Class [1-4-1] acc. ISO 8573-1:2010	
Maximum compressed air inlet pressure	10 bar	145 psi
Minimum compressed air inlet pressure	4.5 bar	65 psi
Maximum compressed air temperature	50 °C	122 °F
Minimum compressed air temperature with refrigerant dryer	10 °C	50 °F
Minimum compressed air temperature with dessicant dryer (PDP ≤-20°C)	-10 °C	14 °F
Maximum ambient air temperature	50 °C	122 °F
Minimum ambient air temperature with refrigerant dryer	10 °C	50 °F
Minimum ambient air temperature with dessicant dryer (PDP ≤-20°C)	-10 °C	14 °F

9.3 Performance data

Outlet flow rate at reference conditions

Note that the oxygen oulet flow depends on the inlet pressure and temperature. Consult your manufacturer to calculate the performance at your specific running conditions.

	OGX 110	OGX 220	OGX 330	OGX 440	OGX 550	OGX 640	OGX 850	OGX 1070
Purity	**Oxygen flow (m^3/h)**							
90%	3.3	6.6	10.0	13.3	16.6	19.7	26.3	32.9
93%	3.0	6.0	9.4	12.5	15.7	18.1	24.1	30.2
95%	2.5	5.1	8.3	11.1	13.9	15.2	20.3	25.3

The indicated flow is the Free Oxygen Delivery (FOD), i.e. the oxygen flow referred to 20 °C, 1000 mbar and 0 % relative humidity. During testing of the units, the rejection limit is + or – 5 % of the nominal flow.

Dimensions and weight

	OGX 110	OGX 220	OGX 330	OGX 440	OGX 550	OGX 640	OGX 850	OGX 1070
Length (mm)	840.0	840.0	840.0	840.0	840.0	970.0	970.0	970.0
Width (mm)	796.0	796.0	1421.0	1421.0	1421.0	1421.0	1421.0	1421.0
Height (mm)	2015.0	2015.0	2015.0	2015.0	2015.0	2015.0	2015.0	2015.0
Mass (kg)	318	400	624	706	788	970	1134	1298
Product tank size (l)	270	270	500	500	1000	1000	1500	2000
Air tank size, variable speed unit (l)	270	270	500	500	1000	1000	1500	2000
Air tank size, fixed speed unit (l)	270	500	500	1000	1000	1500	2000	3000

Mechanical connections

	OGX 110	OGX 220	OGX 330	OGX 440	OGX 550	OGX 640	OGX 850	OGX 1070
Air inlet	G ½"	G ½"	G 1"	G 1"	G 1"	G 1 ¼"	G 1 ¼"	G 1 ¼"
To product tank	G ½"	G ½"	G 1"	G 1"	G 1"	G 1 ¼"	G 1 ¼"	G 1 ¼"
From product tank	G ¼"	G ¼"	G ½"	G ½"	G ½"	G ½"	G ½"	G ½"

	OGX 110	OGX 220	OGX 330	OGX 440	OGX 550	OGX 640	OGX 850	OGX 1070
Gas outlet	G ¼"	G ¼"	G ½"	G ½"	G ½"	G ½"	G ½"	G ½"
Waste exhaust	ø80mm	ø80mm	2x ø80mm	2x ø80mm	2x ø80mm	3x ø80mm	3x ø80mm	3x ø80mm

For CSA/UL units, NPT adapters are supplied.

10 Pressure equipment directives

Components subject to Pressure Equipment Directive

The following tables A and B contain the necessary information for the inspection of all pressure equipment of category I according Pressure Equipment Directive 2014/68/EU and Pressure Equipment (Safety) Regulations 2016 - S.I. 2016/1105.

Design criteria for pressure equipment:

Type	Medium	Number of adsorber vessels	Design pressure (bar)	Vessel diameter (mm)	Hazardous volume (l)	PED category
OGX 110	Oxygen	2	11	150	10	II
OGX 220	Oxygen	4	11	150	10	II
OGX 330	Oxygen	6	11	150	10	II
OGX 440	Oxygen	8	11	150	10	II
OGX 550	Oxygen	10	11	150	10	II
OGX 640	Oxygen	12	11	150	10	II
OGX 850	Oxygen	16	11	150	10	II
OGX 1070	Oxygen	20	11	150	10	II

Table 3: Table A

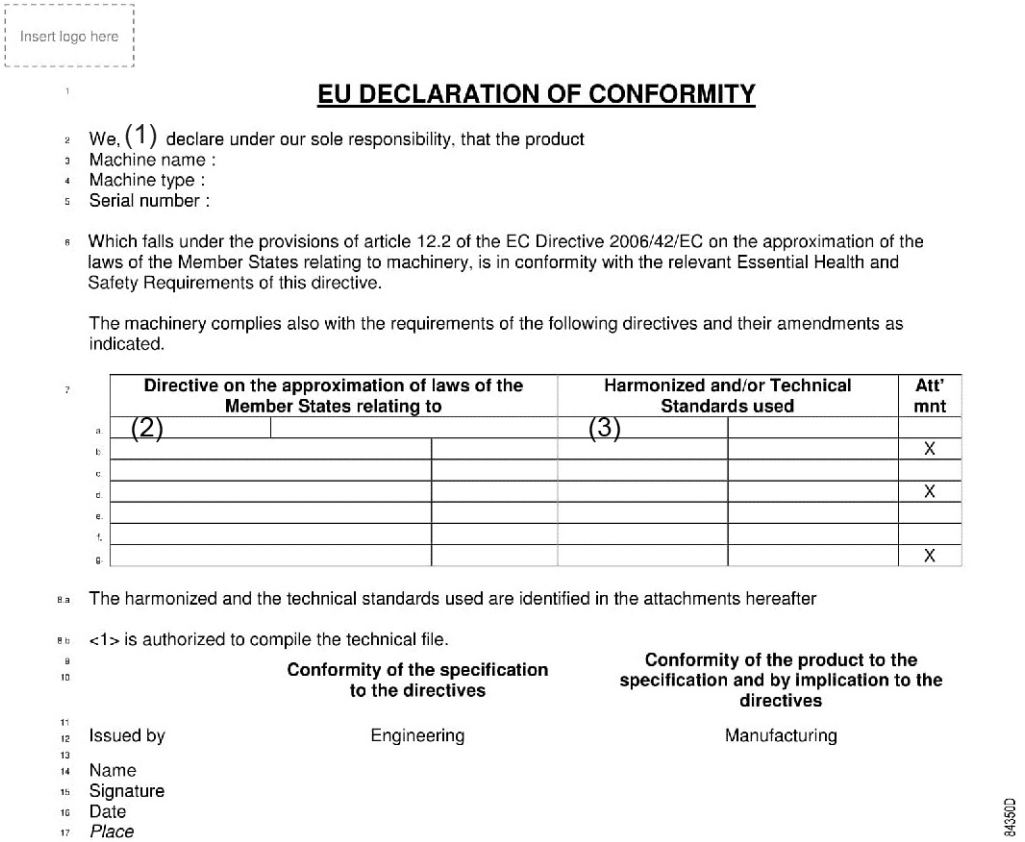
Type	Minimum design temperature (°C)	Maximum design temperature (°C)	Number of cycles	Wall thickness
OGX 110	-10	60	4730400	5
OGX 220	-10	60	4730400	5
OGX 330	-10	60	4730400	5
OGX 440	-10	60	4730400	5
OGX 550	-10	60	4730400	5
OGX 640	-10	60	4730400	5
OGX 850	-10	60	4730400	5
OGX 1070	-10	60	4730400	5

Table 4: Table B

(1): The number of cycles refers to the number of cycles from 0 bar(g) to maximum pressure

(2): The minimum wall thickness refers to the minimum required thickness according to design calculations.

11 Declaration of conformity



Insert logo here

EU DECLARATION OF CONFORMITY

We, (1) declare under our sole responsibility, that the product
Machine name :
Machine type :
Serial number :

Which falls under the provisions of article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

	Directive on the approximation of laws of the Member States relating to		Harmonized and/or Technical Standards used		Att' mnt
a.	(2)		(3)		
b.					X
c.					
d.					X
e.					
f.					
g.					X

The harmonized and the technical standards used are identified in the attachments hereafter

<1> is authorized to compile the technical file.

	Conformity of the specification to the directives	Conformity of the product to the specification and by implication to the directives
Issued by	Engineering	Manufacturing
Name		
Signature		
Date		
Place		

843500

Figure 9: Typical example of a Declaration of Conformity document

(1)	Contact address: C. ARIA C. S.R.L. Via Soastene 34 Brendola (VI) CAP 36040 Italy
(2)	Applicable directives
(3)	Standards used

On the Declaration of Conformity / Declaration by the Manufacturer, the harmonized and/or other standards that have been used for the design are shown and/or referred to.

The Declaration of Conformity / Declaration by the Manufacturer is part of the documentation that is supplied with this device.

Experience. Customer. Service.

No. 2920 7215 90 / February 2023 C. Aria C. S.R.L.

www.n-psi.com