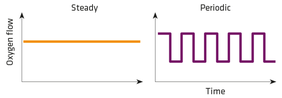
OXYGEN DEMAND PATTERNS

Where the consumption rate as a function of time is essentially constant, a PSA oxygen system is an excellent fit for a steady flow pattern. The PSA unit size can easily be matched to the measured or estimated consumption rate. Furthermore, oxygen production will be most economical if the unit operates continuously near or at its full capacity.

A PSA system is not a good fit for processes with periodic flow pattern, where flow is characterized by peaks and valleys as a function of time. An onsite generator with such variable consumption, particularly if it is sized for a peak flow, will operate at partial capacity or idle for a significant amount of time. This will results in high operating costs and operational inefficiency. However, if the duration of the valleys is short, a PSA combined with a large product buffer tank may be sufficient. A PSA system can be sized to handle most of the oxygen requirements, supplemented with liquid oxygen during peak-demand periods.



USING OF THE OXYGEN

Oxygen behaves differently to air, compressed air, nitrogen and other inert gases. Even a small increase in the oxygen level in the air – to just 24 % can create a dangerous situation. It becomes easier to start fire, which will burn hotter and more fiercely than in air.
Oxygen is also very reactive. Pure oxygen can react violently with common materials such as oil and grease. Materials such as textiles and rubber will burn vigorously in oxygen.

OXYGEN USE BY PURITY

PSA can produce oxygen at various ranges of purities. Typically purity of the oxygen produced by PSA is from 90% to 95% of the oxygen. The lower the purity, the lower is the cost of oxygen production.

Field of use	Purity of the oxygen
Metal production, welding, cutting	95 %
Glass production	95 %
Fish farms	90 % to 95 %
Healthcare, veterinary medicine	95 %
Ozone generators	90 % to 95 %
Waste water treatment plants	90 % to 95 %

Molecular sieve

High quality molecular sieve ensure long service interval. Molecular sieve is also protected from unexpected liquid intake.

Molecular sieve material is fixed in the column to prevent fast aging and inconveniently dusting. Adsorbent is also protected from unexpected liquid intake.

Controller

Robust SIEMENS PLC assures reliable and stable operation and offers variety of settings. The controller is equipped with LCD display which provides all the necessary information about the operation.

Zirconia sensors

High quality electrochemical oxygen sensor is available as an option.

High efficiency inlet and outlet filters

Standard versions of O-GEN generators are equipped with high efficiency filters. Super fine coalescing filters at the inlet prevents contamination of the adsorbent material while a dust filter at the outlet intercepts the dust generated by the process.

Air and Gas

aep COMPRESSED AIR TECHNOLOGIES

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aep COMPRESSED AIR TECHNOLOGIES

O-GEN
Oxygen generators

OXYGEN

Oxygen, is present in the air with concentration around 21%. Oxygen is at atmospheric conditions always present in gas phase with no odour, colour or taste. It is a highly reactive substance, reacting with almost all elements, except inert gases. This is why it is used in a variety of applications: aquaculture, feed gas for ozone generators, glass blowing, leaching, NOx reduction for fuel burners, oxygen lancing, welding and health care.

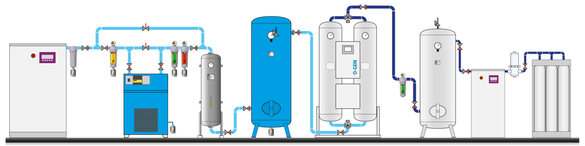
GENERATING OXYGEN GAS

Oxygen gas can be produced by either separation of gaseous air using adsorption (PSA) or fractional distillation of liquefied air using cryogenic methods.

PRESSURE SWING ADSORPTION

The first step in the PSA process is compressed air passing through a combination of filters and an activated carbon tower with the purpose of removing dust, entrained oil and water. The purified air is then directed to one of two adsorption vessels that are packed with molecular sieves (MS). The remaining impurities such as carbon dioxide and residual moisture are adsorbed by the MS at the entrance of the adsorbent bed. When the MS is at high pressure, it selectively adsorbs nitrogen, allowing oxygen to pass through it at the desired purity level. While one vessel is at high pressure to produce oxygen, the second vessel is depressurized to remove the adsorbed nitrogen, which is then vented to the atmosphere.

The automatic switching between adsorption and desorption between the two beds enables the continuous production of oxygen. By adjusting the size of the air compressor and adsorption vessels containing the MS, a large range of flow and purity combinations can be met. PSAs can economically produce oxygen gas at flowrates from less than one cubic meter per hour to greater than a few hundred cubic meter per hour at purities ranging from 90% to 95%.



Oxygen basics

Reactive,
Colourless,
Odourless,
Tasteless gas

- Reacts with with most of the chemical elements

- Necessary for most living organisms and for combustion

Processes

- Injection in water (fish farms, waste water treatment plants)
- Achieving high temperatures (glass blowing, metal cutting and production)
- Healthcare applications (hospitals, veterinary clinics)

- Source of oxygen
  LOX = Liquid oxygen
  GOX = Gaseous oxygen

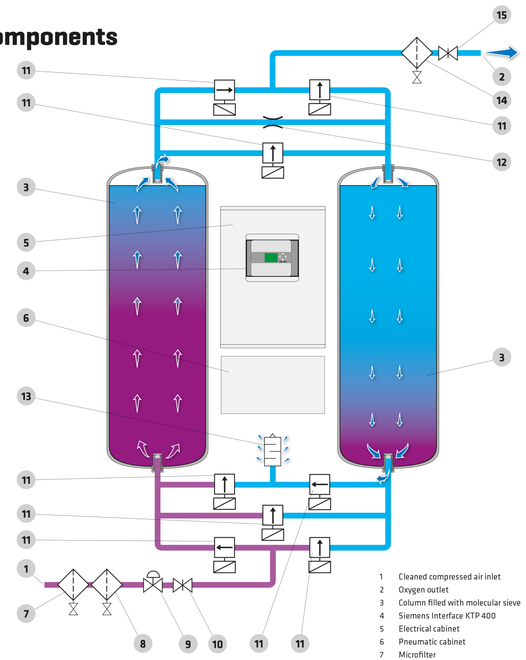
Applications

- Medical
- Pharmaceutical
- Aquaculture
- Feed gas for ozone generators
- Glass blowing
- Leaching
- NOx reduction for fuel burners
- Oxygen lancing
- Welding, brazing
- Wellness

High quality valves

Our generators are equipped with long life angled seated valves which are important due to high switch count. High flow valves have wide range of piston type actuators for maximum performance at minimum pressure.

Components



1 Cleaned compressed air inlet
2 Oxygen outlet
3 Column filled with molecular sieve
4 Siemens Interface KTP 400
5 Electrical cabinet
6 Pneumatic cabinet
7 Microfilter
8 Activated carbon filter
9 Pressure regulator
10 Compressed air flow regulator
11 Angle seated valve with pneumatic actuator
12 Purge nozzle
13 Exhaust silencer
14 Prefilter
15 Oxygen flow regulator

The O-GEN series oxygen generators extract the available oxygen in the ambient air from the other gases by applying the Pressure Swing Adsorption (PSA) technology. During the PSA process compressed, cleaned ambient air is led to a molecular sieve bed, which allows the oxygen to pass through as a product gas, but adsorbs other gases. The sieve releases the adsorbed gases to the atmosphere, when the outlet valve is closed and the bed pressure returns to ambient pressure. Subsequently the bed will be purged with oxygen before fresh compressed air will enter for a new production cycle. In order to guarantee a constant product flow, O-GEN oxygen generators use modules of two molecular sieve beds, which alternatively switch between the adsorption and the regeneration phase. Under normal operating conditions and with correct maintenance the molecular sieve beds will have an almost indefinite lifetime.

How generator works?

Generator contains two vessels with adsorbing sieve material:

1. As the high pressure air enters the first vessel, it moves through the sieve, and the nitrogen is adsorbed.
2. Oxygen is then channeled to a buffer tank.
3. Directly before the first vessel is completely saturated, the feed air is redirected to move through to the second vessel, where the same process occurs.
4. Once that process is complete, the first nitrogen generator vessel is vented out to the atmosphere, allowing the waste gas to release from the sieve.
5. Completing regeneration of the first vessel requires purging it with a small amount of process gas.

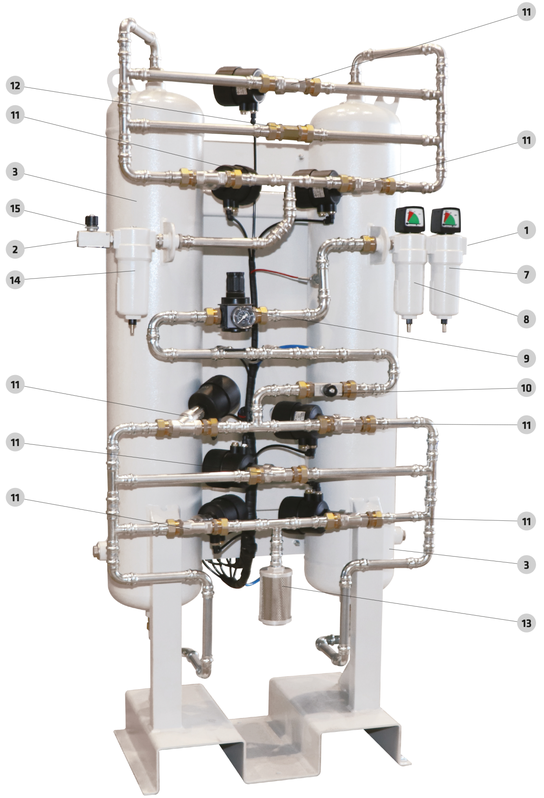
Oxygen sensors

Our oxygen generators are equipped with electrochemical sensor. Electrochemical sensors have a fast response time and accurate reading at higher oxygen concentrations. Electrochemical sensors lifespan is over eighteen thousand hours.

	90 % vol O_2	93 % vol O_2	95 % vol O_2
Electrochemical sensors	✓	✓	✓

Energy saving (stand-by)

O-GEN series generators have an option to receive a stand-by signal from the compressor or other compressed air supply. While in the stand-by the air can flow freely through both towers in direction from the inlet to the outlet of the generator. Meanwhile the generator controller is in the stand-by mode and ready to resume with the normal operation as soon as it gets the appropriate signal. The stand-by signal is relayed to the O-GEN generator through a stand-by contact on the controller by a connected switch.



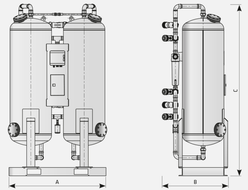
Standard equipment

- Set of external feed air filters
- Adsorber vessel in carbon steel
- Long life pneumatic valves
- Internal piping & fittings in SS316
- Exhaust mufflers
- Air and oxygen flow regulation
- Control system with SIEMENS PLC
- WebControl
- Pressure transmitter for automated idle-mode

Optional equipment

- Oxygen analyzer with zirconium-oxide sensor
- Electronic product flow meter
- Feed air / product moisture analyser
- Oxygen booster with cylinder filling system
- Feed air / product temperature transmitters
- Touch screen or semi-graphical operator interface
- Sterile filters

Dimensions



TECHNICAL DATA

Type	Connection		Dimensions [mm]			Mass
	In	Out	A	B	C	kg
O-GEN 01	1/2"	1/2"	1093	550	1.734	160
O-GEN 02	1/2"	1/2"	1.070	550	1.641	205
O-GEN 03	1/2"	1/2"	1.079	550	1.760	255
O-GEN 04	1/2"	1/2"	1.132	550	1.913	335
O-GEN 05	1/2"	1/2"	1.297	760	2.048	585
O-GEN 06	1/2"	1/2"	950	720	2.005	500
O-GEN 08	1/2"	1/2"	1.453	760	2.055	725
O-GEN 10	1/2"	1/2"	1.450	760	2.102	845
O-GEN 13	1/2"	1/2"	1.688	860	2.184	1.170
O-GEN 16	1"	1/2"	1.250	850	2.380	1.310
O-GEN 20	1"	1/2"	1.800	910	2.210	1.450
O-GEN 23	1"	1/2"	1.848	1.010	2.267	1.675
O-GEN 29	2"	1/2"	1.550	1.030	2.520	1.950
O-GEN 35	2"	1"	2.060	1.160	2.378	2.260
O-GEN 44	2"	1"	2.293	1.325	2.396	2.800
O-GEN 50	2"	1"	2.605	1.425	2.500	3.850
O-GEN 57	2"	1"	2.605	1.425	2.560	3.890
O-GEN 64	2"	1"	2.815	1.625	2.510	4.550
O-GEN 75	2"	1"	2.815	1.625	2.605	4.600
O-GEN 84	2"	1"	3.070	1.675	2.535	6.500
O-GEN 100	2"	1"	3.070	1.675	2.735	6.850

PERFORMANCE

Type		Inlet press. [barg]	Dischar. p. [barg]	Oxygen purity [%]		
				90	93[1]	95
O-GEN 01	O_2 flow [Nm³/h]	7.5	6.1	1.07	1.02	0.97
			Feed air consumption [Nm³/h]	11.6	11.4	11.3
O-GEN 02	O_2 flow [Nm³/h]	7.5	6.1	1.80	1.71	1.63
			Feed air consumption [Nm³/h]	19.6	19.3	19.0
O-GEN 03	O_2 flow [Nm³/h]	7.5	6.1	2.88	2.75	2.62
			Feed air consumption [Nm³/h]	31.4	30.9	30.4
O-GEN 04	O_2 flow [Nm³/h]	7.5	6.1	3.56	3.40	3.24
			Feed air consumption [Nm³/h]	38.8	38.2	37.6
O-GEN 05	O_2 flow [Nm³/h]	7.5	6.1	5.07	4.84	4.61
			Feed air consumption [Nm³/h]	55.2	54.4	53.6
O-GEN 06	O_2 flow [Nm³/h]	7.5	6.1	6.50	6.21	5.92
			Feed air consumption [Nm³/h]	70.9	69.8	68.7
O-GEN 08	O_2 flow [Nm³/h]	7.5	6.1	8.11	7.74	7.38
			Feed air consumption [Nm³/h]	88.4	87.1	85.7
O-GEN 10	O_2 flow [Nm³/h]	7.5	6.1	10.00	9.55	9.10
			Feed air consumption [Nm³/h]	109.0	107.4	105.7
O-GEN 13	O_2 flow [Nm³/h]	7.5	6.1	13.29	12.69	12.09
			Feed air consumption [Nm³/h]	144.8	142.7	140.5
O-GEN 16	O_2 flow [Nm³/h]	7.5	6.1	16.00	15.28	14.56
			Feed air consumption [Nm³/h]	174.4	171.8	169.2
O-GEN 20	O_2 flow [Nm³/h]	7.5	6.1	19.50	18.62	17.75
			Feed air consumption [Nm³/h]	212.6	209.4	206.2
O-GEN 23	O_2 flow [Nm³/h]	7.5	6.1	23.28	22.23	21.19
			Feed air consumption [Nm³/h]	253.8	250.0	246.1
O-GEN 29	O_2 flow [Nm³/h]	7.5	6.1	29.0	27.7	26.39
			Feed air consumption [Nm³/h]	316.1	311.4	306.6
O-GEN 35	O_2 flow [Nm³/h]	7.5	6.1	35.0	33.43	31.85
			Feed air consumption [Nm³/h]	381.5	375.8	370.1
O-GEN 44	O_2 flow [Nm³/h]	7.5	6.1	43.77	41.8	39.83
			Feed air consumption [Nm³/h]	477.0	469.9	462.7
O-GEN 50	O_2 flow [Nm³/h]	7.5	6.1	50.0	47.75	45.5
			Feed air consumption [Nm³/h]	545.0	536.8	528.7
O-GEN 57	O_2 flow [Nm³/h]	7.5	6.1	57.0	54.44	51.87
			Feed air consumption [Nm³/h]	621.3	612.0	602.7
O-GEN 64	O_2 flow [Nm³/h]	7.5	6.1	64.0	61.12	58.24
			Feed air consumption [Nm³/h]	697.6	687.1	676.7
O-GEN 75	O_2 flow [Nm³/h]	7.5	6.1	74.92	71.54	68.17
			Feed air consumption [Nm³/h]	816.6	804.3	792.1
O-GEN 84	O_2 flow [Nm³/h]	7.5	6.1	84.0	80.22	76.44
			Feed air consumption [Nm³/h]	915.6	901.9	888.1
O-GEN 100	O_2 flow [Nm³/h]	7.5	6.1	99.4	94.93	90.46
			Feed air consumption [Nm³/h]	1083.5	1067.3	1051.0