

OZONE GENERATORS

Series: TITAN

Capacities: 1 ...20 kgO₃/hr



General:

TITAN ozone generators are compact units for ozone production capacities from 1 to 20 kgO₃/hr. All required parts and components are accommodated in a number of enclosures arranged to one compact unit. The TITAN series are modular constructed, i.e. the specified ozone generator capacity is achieved by a number of individual so-called ozone generation modules each coming with a high-voltage transformer. The complete ozone generator unit consists of ozone generator module(s), high-voltage transformer(s), one frequency inverter as power supply unit (PSU), instrumentation and monitoring devices, as well as electrical control including PLC Siemens S7-1200 with touch panel.

Ozone production

Ozone is produced from oxygen or air by means of electrical discharge, which is still known and used as the most economical method for efficient ozone generation.

Feed gas – oxygen (LOX or from a PSA oxygen concentrator), or dry air adjusted to required operation pressure and gas flow passes the ozone generator module(s) where ozone is produced by applied high-voltage from the high-voltage transformer(s) and frequency adjusted by the frequency inverter. The energy applied to discharge gaps splits O₂ oxygen molecules into O_o, or atomic oxygen. Atomic oxygen attaches to oxygen and forms three-atomic ozone molecules.

Ozone generator module

Ozone generation is an exothermal process. Hence the ozone generation modules are water-cooled for efficient heat transfer. For optimum heat transfer they are of vertical design, which offers three significant advantages:

1. Optimized cooling for stable ozone production
2. Space saving construction
3. ease of maintenance

Each TITAN ozone generation module consists of one tubular type heat-exchanger of stainless steel, carefully welded, pickled and passivated for high resistance against corrosive cooling water. Dielectric tubes of borosilicate glass are placed inside the ground electrodes in a manner that avoids mechanical stresses. The metallic high-voltage electrodes are coaxially placed inside the glass dielectrics. The high-voltage electrodes are equipped with integrated fuses. So it is ensured that in case of a glass break only the appropriated electrode is affected, while the remaining electrodes keep further in operation.

The advanced technology of double gap discharge system ensures efficient and stable ozone generation. After entering the ozone generation module the feed gas is equally distributed to all inbuilt high-voltage electrodes. After leaving the electrode tube the gas passes the first discharge gap by flowing upwards. Then the ozone/gas mixture leaves the tubular glass dielectric and passes the second discharge gap before the ozone/gas mixture leaves the ozone module. This constructional feature allows very narrow discharge gaps, which finally results in optimum conditions for efficient ozone production and heat transfer.

Electrical power supply unit

The power supply unit (PSU) for TITAN ozone generators is formed by a frequency inverter, high-voltage transformer(s) and power supply equipment. By variation of frequency and voltage the ozone production can be controlled manually or automatically versus an analogue signal 4-20mA

High-tension transformers

To each ozone generator module, one high-voltage transformer is applied. Resin-embedded high-voltage coils lead to high protection against environmental impacts. The high-voltage transformer has an built-in temperature switch to avoid overheating. The input voltage of 400V can be transformed up to max. 11,5 kV.

Frequency inverter

SEWEC uses frequency inverters, which are serial products from a leading European manufacturer. It is configured and programmed to meet the requirements for efficient power supply to the combination of high-tension transformers / ozone modules. Advanced IGBT-technology guarantees fast and energy-efficient ozone production. The integrated PID controller is applied for automatic production control.

Electrical power supply equipment

The electrical power supply unit (PSU) is completed by all components such as contactors, thermal relays, relays, etc., necessary for fully automatic and reliable long-term operation of the ozone generator.

Electrical control

TITAN ozone generator(s) are equipped with a Siemens PLC S7-1200 programmed for fully automatic control and monitoring of the ozone generator unit. For operation of the ozone

generator unit a touch panel is installed, where all operating parameters are indicated. Failure diagnosis is also included. Ethernet is provided for communication with remote main control panel.

The modular design of TITAN ozone generators allow for individual on/off of each ozone generator module. This features even allows to carry out service works on the ozone modules while the ozone generator unit remains in operation at reduced ozone production..

Instrumentation and monitoring devices

TITAN ozone generators are equipped with all monitoring and indicating devices to meet all requirements of DIN19627 and EN1278 as well as all European standards required for ozone generators as following:

- dosing valves, isolating valves and check valves for the adjustment of feed gas and cooling water flows
- pressure regulating valve for adjustment of required operating pressure
- mechanical pressure relief valve for protection of the ozone system against overpressure

The following parameters are displayed and monitored:

- Operating pressure (min./max.)
- Gas flow (min.)
- Cooling water flow (min.)
- Cooling water temperature (max.)
- Electrical parameters (voltage, current, frequency)
- Ozone concentration (optional)
- Dew point (optional)

REDUNDANCY (optional)

The advanced modular technology of TITAN ozone generators allows to equip them for 100% redundancy. This feature leads to a very cost-effective unique ozone generator unit with an integrated standby unit.

Description

100% redundancy is achieved by

- Extending the basic ozone generator unit by one ozone generator module and high-voltage transformer
- doubling electrical control, power supply unit (PSU) and all monitoring devices.

Example for a redundant 20 kg-ozone generator unit:

- Ten (10) individual ozone modules including 10 high-voltage transformers form the nominal capacity of 20kg/hr
- **one (1) additional ozone module** (2,0 kg/hr) with high-voltage transformer forms the integrated standby ozone generator module
- two (2) identical electrical controls incl. PLC (one primary, one standby)
- two (2) electrical power supply units (one primary, one standby)
- two (2) identical sets of monitoring and control devices (one primary, one standby)

This unique constructional feature allows to re-start the ozone generator after each kind of failure without repair but within shortest period and to continue operation at full capacity.

Quality management

SEWEC ozone generators meet the requirements all relevant European standards including EMC directives and EU conformity.

Core components like ozone generator module(s) - heart of SEWEC ozone generators – as well as all hydraulics are fabricated and tested in accordance with the European directives for pressure vessels.

Continuous quality control in accordance with SEWEC's internal quality system is documented accordingly and covers complete production process of the ozone generators - from the procurement through completion of fabrication and testing.