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Safety and sanitation standard for ozone generator

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Table of Contents

Foreword

All technical content of this standard is mandatory.

The appendix A, appendix B and appendix C of this standard are normative.

This standard was put forward by and shall be under the jurisdiction of the Ministry of Health of People's Republic of China.

Drafting organizations of this standard: Huaxi School of public health of Sichuan University, Chengdu Tian Tian Medical Electrical Technology Co., Ltd.

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Safety and sanitation standard for ozone generator

1 Scope

This standard specifies the technical requirements, application scope, application methods, inspection methods, marking and packaging, transportation and storage, labels and instructions, and matters needing attention for ozone generator that is used for disinfection of water, air and object surfaces.

This standard is applicable to ozone generator that produces ozone by the physical method and is used for disinfection.

This standard is not applicable to ozone generator that produces by the chemical method.

2 Normative references

The clauses in the following documents become the provisions of this standard by reference in this standard. For dated references, subsequent amendments (excluding corrections) or revisions do not apply to this standard. However, the parties are encouraged to research and reach an agreement on whether the latest version of these documents can be used according to this standard. For undated references, the latest edition applies to this standard.

GB/T 191 Packaging. Pictorial marking for handling of goods

GB/T 1408 Test method for power frequency electrical strength of solid insulating materials

GB/T 2829 Sampling procedures and tables for periodic inspection by attributes

GB 5749 Standards for drinking water quality

GB 9706.1 Medical electrical equipment - Part 1: General requirements for safety

GB/T 14710 Environmental requirement and test methods for medical electrical equipment

GB 18466 Discharge standard of water pollutants for medical organization

Disinfection technical specification (2002 Edition), Ministry of Health

After the gas is penetrated, phenomenon of voltage decreases between the poles and the dark glow around the electrode.

3.9 Epilogue gas

An ozone-containing gas that is produced in an ozone water generator but not completely dissolved in water.

3.10 Dew point

The temperature at which the gas source starts to become dew; the lower the relative humidity of the gas, the lower the dew point temperature.

3.11 Specific consumption

The electric energy that is consumed by the ozone generator to produce a unit weight of ozone.

4 Specifications and classifications

4.1 Specifications

The specifications of the ozone generator are represented by the amount of ozone produced in a unit time (the basic unit is g/h).

4.2 Classification

4.2.1 Type

4.2.1.1 Work type is divided into ozone generator or ozone-water generator.

4.2.1.2 Placement is divided into table, standing, mobile and separate type.

4.2.2 Model marking

4.2.2.1 The structure of the ozone generation unit is divided into tube type (G) and plate type (B).

4.2.2.2 The control methods of the ozone generator are divided into common type (fixed type, P) and adjustable type [manual-adjusted (R), and program-adjusted (C)].

4.2.2.3 The working frequency of the power supply is divided into power frequency, medium frequency and high frequency.

b) The frequency of the power supply is 50Hz±1Hz, the voltage is 220V±22V, the atmospheric pressure is 86kPa~106kPa, and the relative humidity is 65%~85%, the temperature is room temperature;

c) The exit gas temperature should be < 27°C;

d) The output ozone concentration of closed type ozone generator should be ≥ 12mg/L.

When the above conditions are changed, the corresponding indicator such as discharge (corona discharge or glow discharge) per unit area of ozone yield, concentration, output and electricity consumption should be measured according to the specific conditions.

6.2.2 All kinds of electrical insulation parts of the ozone generator should meet the requirements of high voltage insulation performance and structure. The insulation parts in the environment of the glow discharge, ozone oxidation should also meet the requirements of GB 9706.1.

6.2.3 For those using water as coolant, the consumption of cooling water per kilogram of ozone should not exceed 1.5×10^3 kg.

6.2.4 The average life-span should be ≥ 20 000 h； accumulative working time without fault should be ≥ 8 000 h.

6.3 Conditions for using ozone generator

Under the condition of ambient temperature below 45°C, atmospheric pressure 86kPa~106kPa, relative humidity 65%~85%, and the cooling water temperature lower than 35°C, the ozone generator should be able to be used continuously.

6.4 Requirements for disinfection

6.4.1 Disinfection of air

6.4.1.1 Air disinfection should be carried out in a closed space with no human inside. The ozone concentration should be ≥ 20mg/m^3, the action time should be ≥ 30min.

6.4.1.2 The effect of disinfection should comply with the related requirements of the “Disinfection technical specification” (2002 Edition).

6.4.2 Disinfection of water

6.4.2.1 It can be used to disinfect medical institutions’ diagnosis-water (non-injection water), dirt-water, and the water in public places.

6.4.2.2 When it is used to disinfect the medical institutions’ diagnosis-water (non-

9.4.1 For ozone generation unit's performance spot inspection, the sampling ratio is 5%. For example, sampling unit is ozone generating unit in a single ozone generator, and the total number of ozone generation units is < 60, then, the sampling number should be ≥ 3 ozone generating units. The ozone generating unit's performance test conditions should be in accordance with 6.2.1.

9.4.2 If the data measured by performance test is 10%~20% lower than the performance requirements and the proportion is ≥ 20% of the units checked. Then, re-test can be carried out after finding the causes. If the performance requirements are still not met after re-test, then, increase the sampling proportion of the ozone generating unit to 25%. If there is no failing of the performance requirements, then spot test can be stopped. After expansion of the sampling proportion, if the proportion of failing ozone generating units exceeds 5% of the checked-number, then, the causes should be thoroughly found; and the production can only be resumed after problems are solved.

9.4.3 For new-type products or formal-products that are being manufacturing, when there are major changes in structure, material or process, or when continuous production life of one product exceeds 3 years, then, a number of ozone generation units should be randomly selected to test its performance parameters and service life.

9.5 Exit-factory inspection

9.5.1 Ozone generation unit should be accurately located in the ozone generator. Components for fastening, support and connection should be firmly installed.

9.5.2 Appearance inspection of ozone generator

Internal appearance inspection includes: parts of ozone generating unit should be clean, no oil stains, water stains, dust or other foreign objects; the anti-corrosion coating inside of the ozone generator should be smooth and clean with no peeling, chipping or other adverse conditions; The high-voltage power transmission and distribution system should be tidy and should not cause abnormal transmission and distribution.

External appearance inspection should include: the external shell surface should be smooth with no scar, bump, dent, or other defects affecting the appearance; protections and other adverse conditions (if on-site external decoration will be done according to the requirements of the buyer, this test can be carried out when appropriate). All kinds of appurtenances (parts) on the external shell should be installed at the accurate location, firmly fastened, and quality acceptable. Any part of the shell shall not obstruct installation, maintenance, cleaning etc. For ozone generators with high pressure device, the shell should be flame-retardant.

9.5.3 The interface of the ozone generator with each instrument (meter), or with

10.2.2 The package shall be suitable for water/land transportation and meet loading requirements.

10.2.3 The text and signs outside the package include the following:

a) Company name or trademark, registered address, production address, zip code, contact number;

b) Product name, model, specification;

c) Product net weight, gross weight, center of gravity, lifting mark;

d) Date of production, exit-factory number;

e) Power connection condition, input power;

f) Storage and transportation marks, such as "fragile items", "Rain fear", "limit of stacking layer", etc., shall conform to the GB/T 191 regulations.

10.2.4 Accessories, spare parts can be packaged separately.

10.2.5 In the packing boxes, there should have product packing list, accompanied spare/accessory list, product labels and instructions, performance test report, installation drawing and product qualification certificate etc.

11 Transportation and storage

11.1 Transportation

Use general transportation or in accordance with the user contractual requirements. Provide waterproof, moisture-proof, anti-impact and anti-vibration measures. Mixed package with corrosive items should be prevented.

11.2 Storage

The storage temperature after storage should not be lower than -40°C, the relative humidity should not exceed 93%±3%. Store in well ventilated indoor space with no corrosive items. The storage period is determined by the manufacturer according to the specific conditions of the product.

12 Labels and instructions

Implement according to “Management specification for label & instructions of disinfectant products” (2005 Edition).

Appendix A

(Normative)

Determination of ozone concentration

A.1 Iodimetric method

A.1.1 Purpose

To accurately determine the ozone concentration produced by the ozone generator or the ozone concentration in the ozone water produced by the ozone water generator by chemical method in the laboratory.

A.1.2 Experimental instrument

A.1.2.1 Pipettes (1mL, 5mL, 10mL, 25mL).

A.1.2.2 Burettes (2mL, 5mL, 10mL, 25mL, 50mL).

A.1.2.3 Iodine flasks (100mL, 250mL).

A.1.2.4 Volumetric flasks (50mL, 100mL, 250mL, 500mL, 1000mL).

A.1.2.5 Conical flasks (100mL, 250mL, 500mL).

A.1.2.6 Balance (sensibility: 0.1 mg).

A.1.2.7 Atmospheric sampler.

A.1.2.8 Other instruments.

A.1.3 Reagent

A.1.3.1 Prepare 3mol/L sulphuric acid, 200g/L potassium iodide and 5g/L starch.

A.1.3.2 Prepare and calibrate 0.05 mol/L sodium thiosulfate titrant.

A.1.4 Test method

A.1.4.1 Sampling: When testing the concentration of ozone water solution, draw precision sample 100.0mL~300.0mL (when the concentration is low but not lower than 10mg/L, draw 400.0mL), place in 500mL plugged conical flask, add 200g/L potassium iodide solution 20mL, mixing; add 3mol/L sulfuric acid 5mL, plug the flask, and set

In which:

I - Light intensity after the beam penetrates ozone;

I_0 - The intensity of light beam with on ozone;

L - The optical path length of the ozone sample pool;

C - Ozone concentration;

K - The absorption coefficient of ozone to the wavelength of light.

According to this formula, when K and L are known, ozone concentration can be determined by measuring I/I_0.

A.2.1.2 Determination

According to application, it can be divided into two parts: The determination of air ozone and the determination of water-soluble ozone. Operate according to the instructions of the machine. Before service, the machine should be inspected qualified by the state authorized metrological organization.

A.2.2 Electrochemical method

A.2.2.1 Principle

The electrochemical reduction of ozone in water on the electrified surface: $O_3+H_2O+2e^- \rightarrow O_2+2OH^-$

The current characteristic curve in the electrified circuit is proportional to the concentration of the molecular ozone in the solution.

The electrochemical detector is mainly used for on-line continuous detection and control of water-soluble ozone concentration.

A.2.2.2 Operation

The "membrane electrode" dissolved ozone detector is widely used in the world. The instrument should be approved by the state authorized metrological organization before it is used.

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