TF Group

Research and Development

Cold plasma technology and devices based on it to **improve people's quality of life**




About TF Group

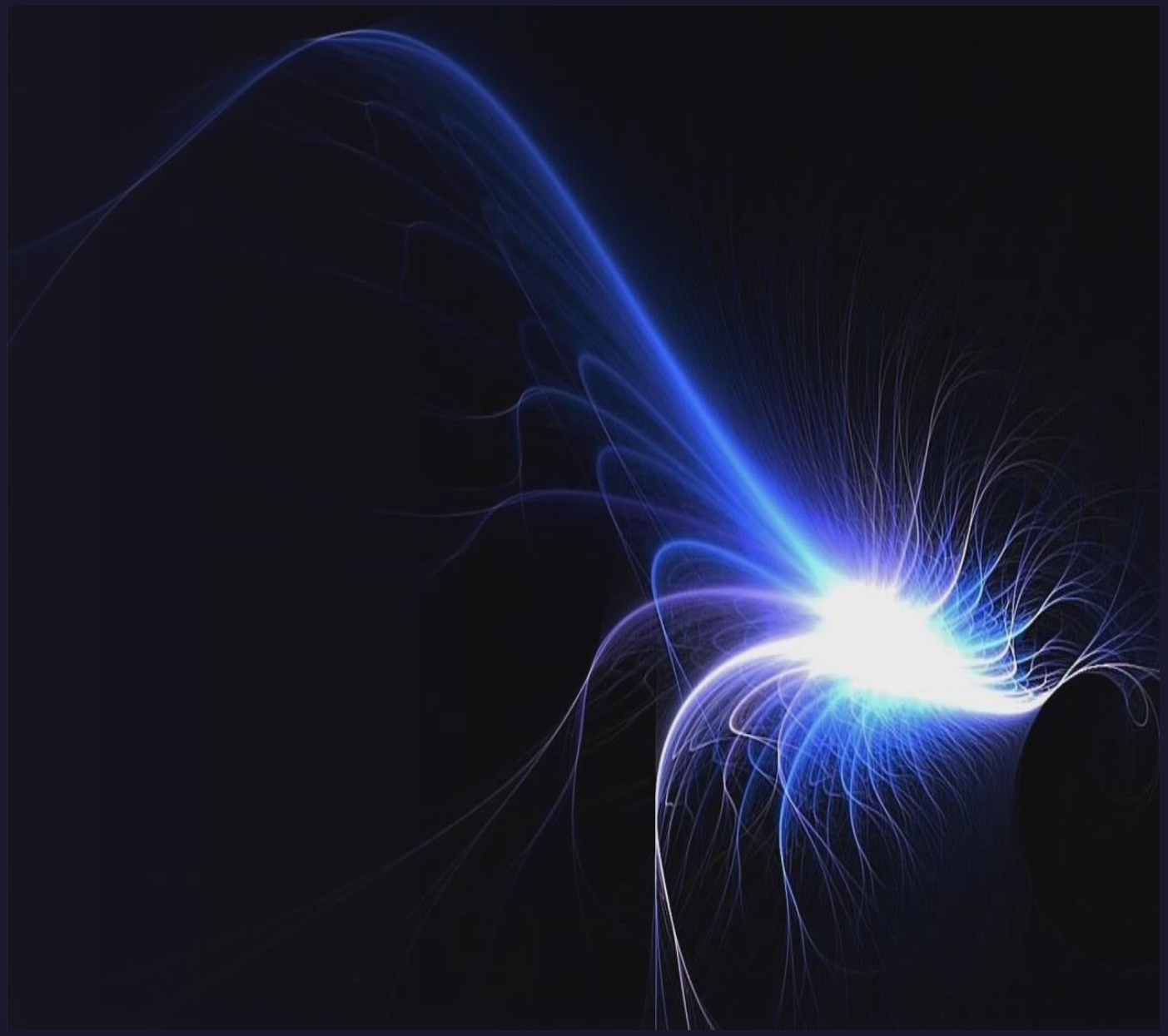
Research and Development

TF Group develops and manufactures **innovative devices** based on COLD PLASMA for water, air, food purification, COVID - 19 control and use in surgery and cosmetology. There are currently no analogues in the effectiveness and safety of cold plasma.

About plasma

From the physics course we know about three states of matter: solid, liquid and gaseous. There is also a fourth state – plasma. It can be hot as in the Sun and cold with a temperature of only 30-40 degrees Celsius.

We work specifically with cold plasma, because it has **unique properties** that we are able and can use to improve the quality of life of people in very wide areas.

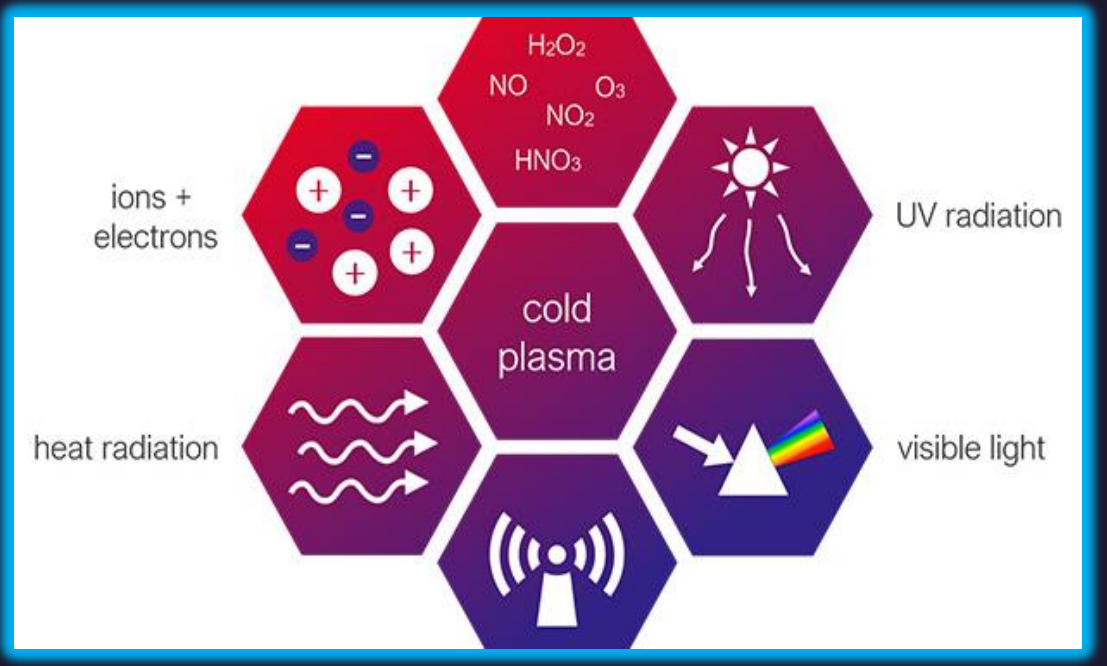


How does it work?

Low-temperature plasma is used in neon lamps and plasma televisions. Recently, low-temperature plasma has found new applications in medicine, disinfection, food industry and water purification. It turns out that a cocktail of active plasma particles has a pronounced antibacterial effect. In addition, plasma can accelerate many chemical reactions.

However, scientists and engineers faced significant difficulties here. When working with living tissues, strict temperature requirements are imposed (no more than 30-40 °C) and density (the effect is achieved only when using a sufficiently dense gas jet). It is easy to obtain low-temperature low-density plasma or dense plasma with a temperature of several hundred degrees (as in plasma welding), but it is very difficult to control both parameters simultaneously.

The company's specialists managed to **solve this most difficult engineering task** thanks to the development of unique portable nanosecond high-voltage low-temperature plasma generators (NsHV-generator), which opens up fundamentally new opportunities for the large-scale introduction of cold plasma technologies into everyday life.



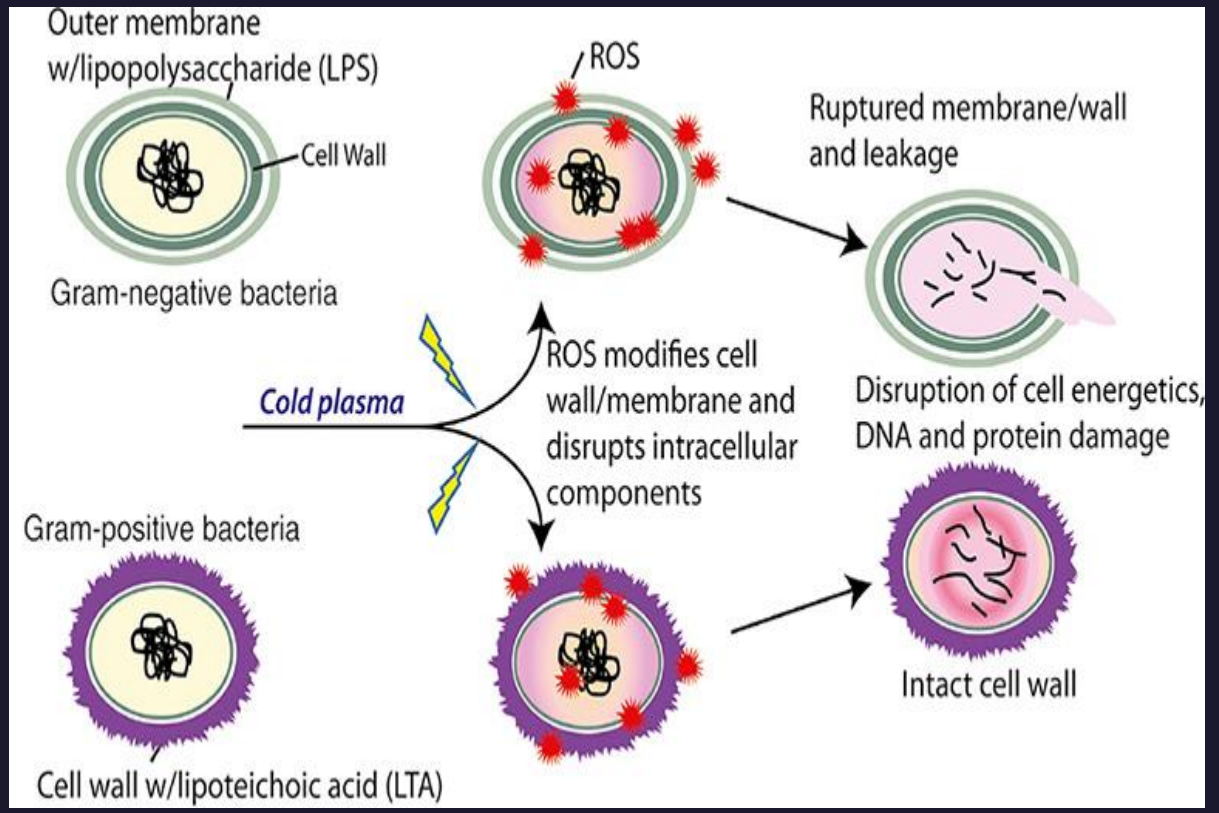
Cold plasma is a partially ionized gas consisting of electrons, ions, and neutral particles.

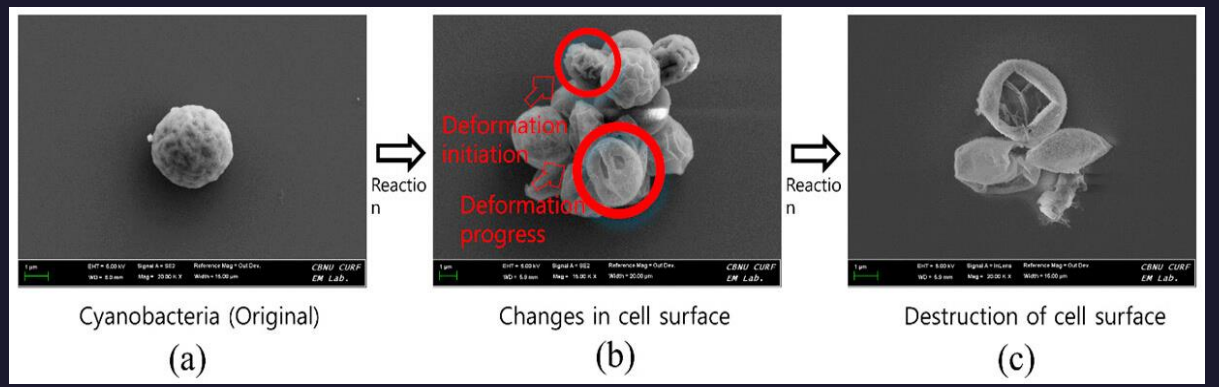
Cold plasma destroys pathogenic microorganisms

The disinfecting effect is achieved due to the action of electrons, ions, excited molecules and atoms, UV radiation and reactive substances (NO2, NO, O3, etc.) in plasma, as well as in thermal and electromagnetic fields. The efficiency of cold plasma is related to chemical and physical processes. Hydroxyl radicals, active oxidants and other charged particles formed in cold plasma destroy the shells of microorganisms, penetrating them through membranes.

For this reason, cold plasma is effective even against antibiotic-resistant pathogens. Important: plasma is absolutely safe for human and other mammalian cells, even with targeted exposure, since mammalian cells are eukaryotes, their shell is significantly stronger than prokaryotes. Low-temperature plasma disinfection is an effective alternative to existing disinfection methods.

The technology allows to destroy up to 99.9% of pathogenic microorganisms, including viruses, bacteria, fungi, and other harmful microorganisms. It is effective against multi-resistant MRSA microbes, adenoviruses, NOR viruses and coronaviruses (COVID-19), having bactericidal, fungicidal and antiviral effects.





Applications of cold plasma

The ability of plasma to destroy 99.9% of pathogenic microorganisms and accelerate the metabolism of living tissues of the human body determines its use.

Water purification in swimming pools

Drinking water purification

Sterilization of food

Air purification

Medicine and cosmetology

The use of cold plasma for disinfection increases the level of biosafety and reduces the cost of maintaining it, especially during periods of pandemics (COVID-19, etc.) We have developed the following devices:

- for disinfection of water, air and surfaces in private houses and apartments;
- for disinfection of water, air and surfaces in public places (transport, retail outlets, offices, restaurants, hotels and other institutions);
- for disinfection of air, water, surfaces and products in the food industry (pasteurization, sterilization, etc.);
- for disinfection of air, surfaces and instruments in medical institutionsin the treatment of a wide range of diseases (oncology, surgery, dermatology, dentistry, cosmetology, veterinary medicine).

Innovative, fast and safe disinfection of premises

The operation of the device is based on the technology of ionization of distilled water with cold plasma. Cold plasma activates and repeatedly enhances the disinfecting properties of distilled water, treated with a plasma discharge, it is able to completely clean the room of pathogenic microorganisms in a few minutes. The device cleans the air and surfaces from 99.9% of bacteria, fungi, microbes and viruses, including coronaviruses (COVID-19), as well as dust, microparticles, smoke and other inorganic contaminants.

High efficiency is provided by a fundamentally new design of the cold plasma reactor. Distilled water sprayed in the air passes through a discharge of cold plasma. The output is a fog with a high content of active particles. Under the action of the discharge, the molecular bonds of hydrogen and nitrogen molecules of air are broken. A mixture of active particles consisting of hydroxyl radicals OH and NO radicals is formed in the discharge. When exposed to plasma, a long-lived complex (ONOOH, ONOO) is formed, providing a long-lasting antimicrobial effect. There is no shadow effect – the device has no "blind spots", plasma penetrates into all hard-to-reach places and micro cracks of materials, tissues, etc. Hydroxyl radicals destroy pathogenic microorganisms by oxidizing proteins, carbohydrates and lipids.

100% safe - no aggressive chemicals, high temperatures or ultraviolet radiation. The mist of activated distilled water breaks down into environmentally friendly oxygen and water within 10-15 minutes. No smell, streaks or damage – no additional cleaning is needed after disinfection.

Water purification device

Conventional water filters purify it from mechanical particles. Pathogenic microflora is destroyed by ultraviolet or chemical filters, for example, based on chlorine, ozone, silver. The first option does not solve the problem of microbes, the second pollutes the environment and is not able to purify water from metals and phenols.

Our device combines the advantages of both types of filtration. After our treatment, the water becomes clean and saturated with oxygen. Organic and inorganic compounds are removed, destroying 99.9% of all viruses, bacteria, microbes and fungi.

The device has a low energy consumption, while purifying water in a natural way. There is no pollution of the environment, it does not harm human health. The treatment of food products with this water increases their shelf life and improves biosafety. It is possible to embed this module into an existing production. Cleaning of private pools by plasma method is one of the promising directions, especially in hot climates.

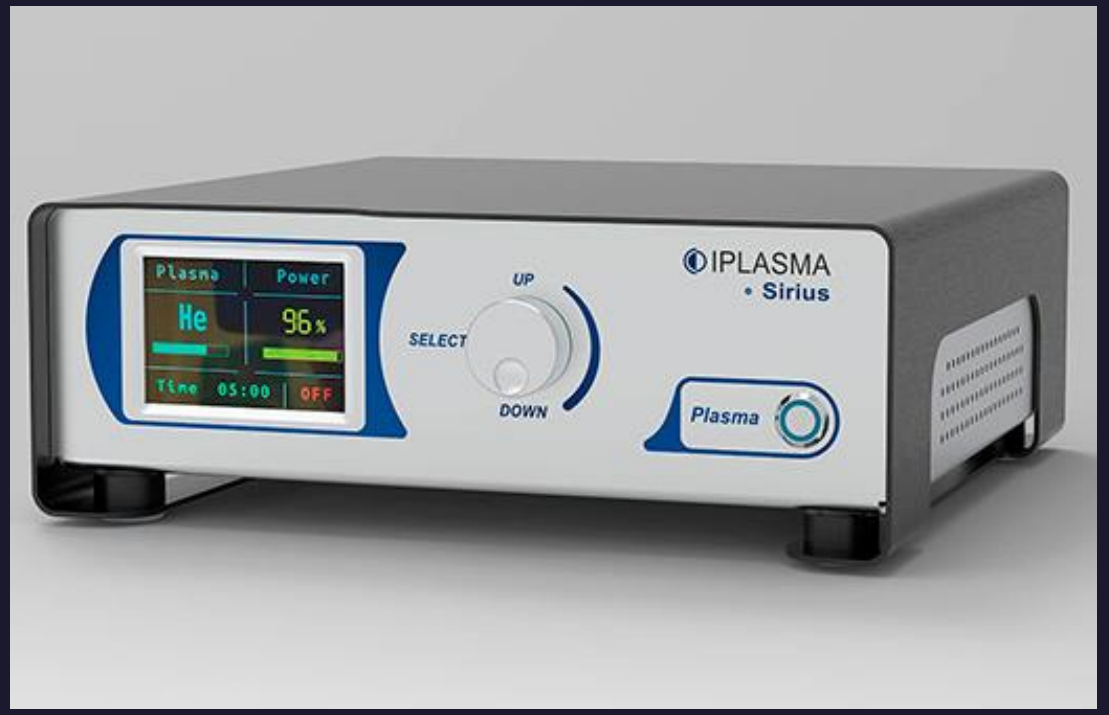
The water purification and oxygen saturation system is scaled for any task, for this it is made modular. Drinking water with oxygen improves metabolism, and pool water does not require the use of chemistry.

Medical device for the treatment of living tissues

A device designed for processing living tissues with a cold plasma stream. The device acts on tissues with nonequilibrium cold plasma produced in an inert gas environment (helium, argon, nitrogen or a mixture of these gases).

Cold plasma is generated in the ionization chamber and radiated outside the working tool. The device produces a jet of cold plasma up to 50mm long and up to 10mm in diameter. Considering the fact that the cold plasma jet of the device has a completely homogeneous and chemically active plasma, this allows it to be used with high efficiency both on biofilms and on mucous membranes. The plasma jet of the device was tested on various skin diseases. During the tests, the device showed the highest efficiency in the fight against pathogenic microorganisms and various pathogens, as well as a high rate of epithelialization of wounds.

Areas of application of the device: Dermatology: Treatment of acne, chronic ulcers, dermatitis, seborrhea, keratosis, fungal lesions, papilloma, psoriasis, herpes. Surgery: Sterilization of surgical instruments, treatment of purulent skin lesions, sterilization of wounds, stopping bleeding, healing of wounds that cannot be delayed with conventional therapy. Dentistry: Teeth whitening, sterilization of carious cavities, periodontal disease treatment. Cosmetology: Smoothing wrinkles and rejuvenation of the skin, elimination of cosmetic defects (scars, acne, etc.)



Acceleration of healing compared to antibacterial and antifungal therapy **by 2-3 times.** No effect of bacterial resistance to plasma therapy. Activation of skin regeneration and rejuvenation mechanisms. A cold plasma treatment session takes from 2 to 10 minutes. Treatment is 2-3 times cheaper than antibacterial therapy and ten times cheaper than surgical procedures. The consumable material is inexpensive and affordable technical helium, argon or nitrogen. The device is versatile and can replace several expensive devices at once.

Plasma Air Purification Filter

The principle of operation of the device is based on the interaction of several electromagnetic circuits, the constructive combination of which makes it possible to obtain: a powerful flow of free electrons; positive hydrogen ion ("positively charged" plasma) from water vapor; oxygen ion ("negatively charged" plasma) from the air; As a result of the recombination of these ions, the hydroxide ion OH is formed.

This active particle reacts with the protein of the shell of bacteria, viruses and destroys it with the formation of water. Cold plasma oxidizes microorganisms, destroying their shells and DNA – they turn into water and carbon dioxide.

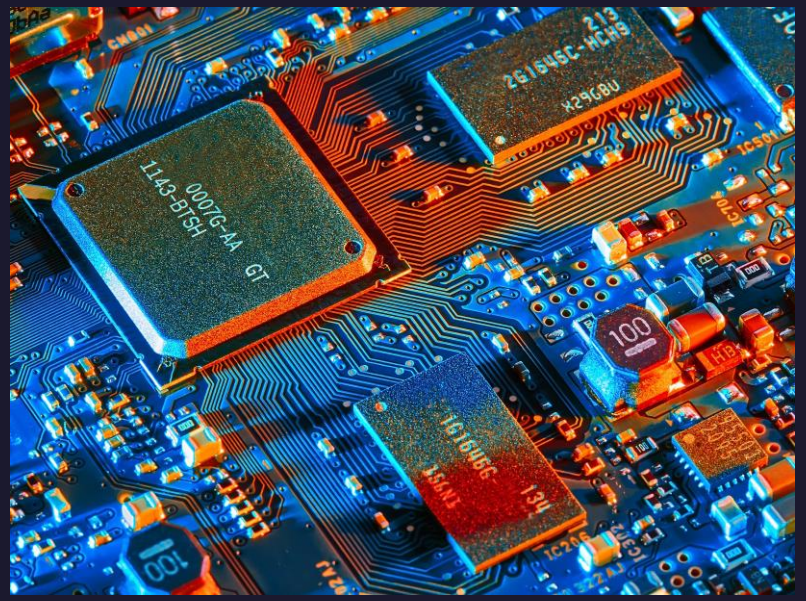
Converts all radicals into water and oxygen – no traces, stains or odor on surfaces or textiles; Cleans the air comprehensively – from microflora, dust and other contaminants, additional filtration or disinfection of the air after use is not required; Cleans and disinfects the entire volume of the room autonomously – additional ventilation is not required for this, the device does not have a shadow effect (blind spots); No chemicals, high temperatures or harmful radiation are used during cleaning – disinfection is completely safe for humans, animals, equipment, furniture, and the environment; The equipment is compact, works silently, does not overheat.

Plasma air purification filter is a universal solution for a safe microclimate in the house, office, apartment. Destroys **99.9% of harmful microorganisms**, even resistant to antiseptics and antibiotics.

LOCALIZATION of PRODUCTION and TRAINING

You can produce all our devices at home. The design documentation for the production of all our products in your country is already ready. A professionally prepared and implemented production localization plan will provide a number of important advantages for the customer enterprise:

- *Reducing production costs, increasing profits*
- *Reducing the need for transportation of parts*
- *New jobs for the population*
- *Eliminating the risk of interruptions in the supply of parts*
- *Trusting attitude in neighboring regions*
- *Participation in the state program of subsidies and discounts, preferences*



In addition to opening an office in your country, our company can arrange not only complex full-cycle assembly, but also large-node assembly **of ready-made parts (SKD),** where high qualification of employees **is not required**.

We can also train and certify specialists of any level, who will further be engaged in the maintenance of all cold plasma equipment and work directly on it.

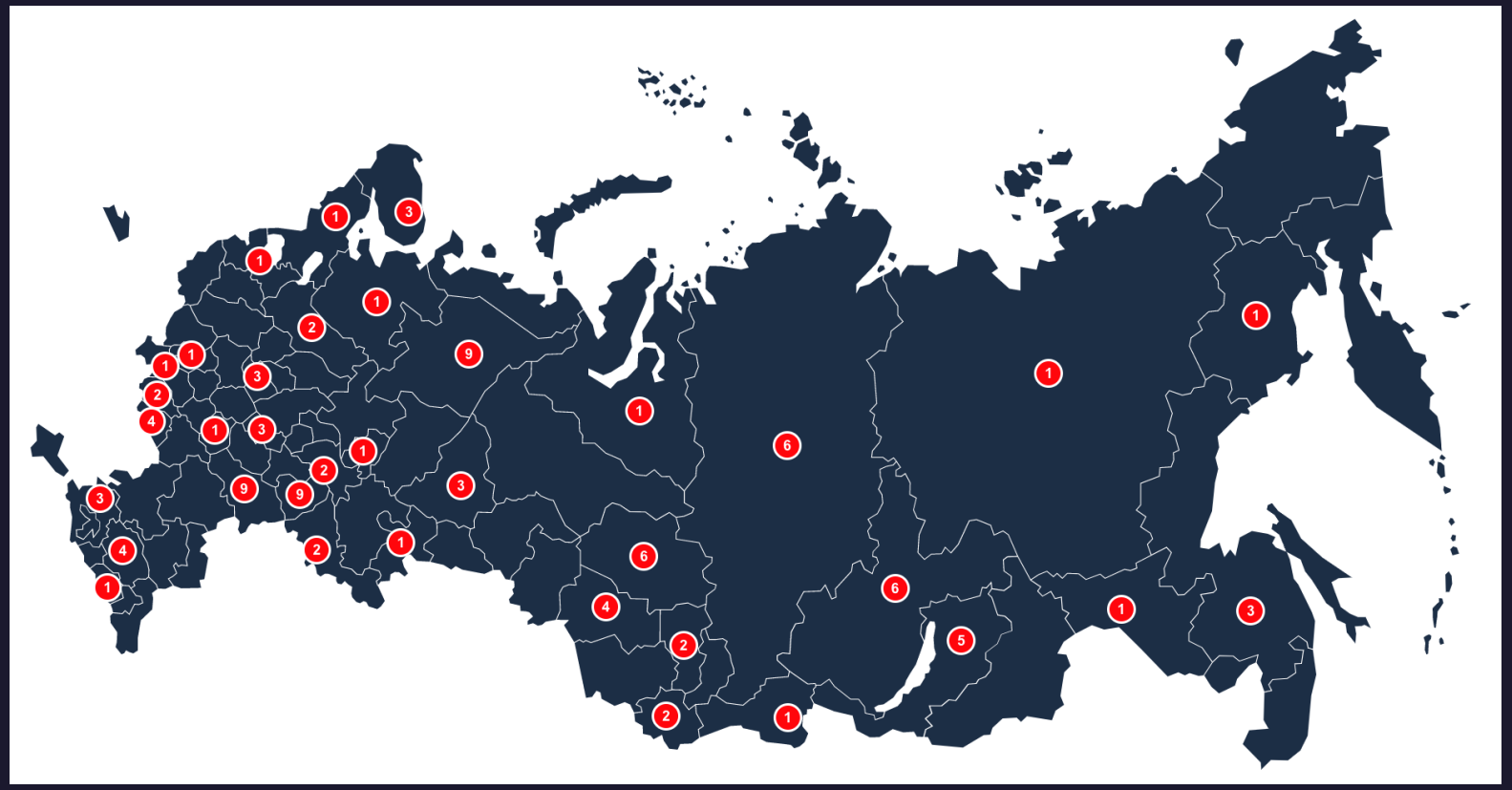
This will provide additional jobs for the citizens of the country.

OUR PARTNERS

Despite the fact that our product is innovative, our company's equipment is already working in Russian state institutions and private companies. These are hospitals, beauty salons, law enforcement agencies, companies providing disinfection services, at food production enterprises.

There are also clients in Germany, Bulgaria, USA, Denmark and China.

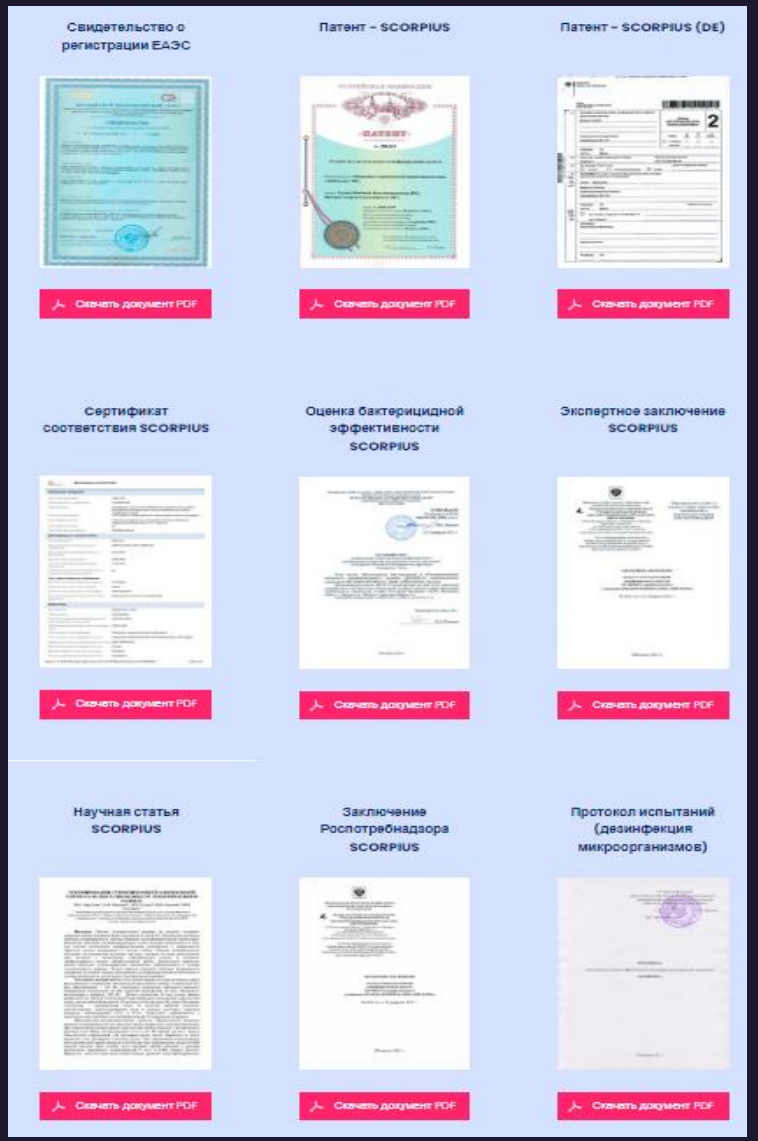
The technology has been tested not only in theory, but also in practice.



CERTIFICATES AND COMPETENCE

The company has the following resources:

- Highly qualified specialists are design engineers with many years of experience in developing unique electronic equipment.
- A medical unit working with leading research institutes and laboratories.
- Laboratory equipment (instruments, machine tools, 3D printers, CNC machines, optical equipment, etc.) for research and development of prototypes.
- Office equipment (workstations, multifunctional devices, etc.).
- Intellectual property (patents, utility models, certificates, etc.).
- Financial resources for the implementation of initiative developments.
- Clients in the private and public sector.



TF Group will be glad to cooperate

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