DECISION

CABINET OF MINISTERS OF THE REPUBLIC OF UZBEKISTAN

ON THE APPROVAL OF THE GENERAL TECHNICAL REGULATION ON THE SAFETY OF TELECOMMUNICATION EQUIPMENT

In accordance with the Law of the Republic of Uzbekistan "On Technical Regulation", in order to establish uniform requirements for the safety of telecommunications equipment, the Cabinet of Ministers decides:

1. Approve the General Technical Regulations on the safety of telecommunications equipment in accordance with the Annex and put it into effect after six months from the date of official publication.

2. To take into consideration that in accordance with the requirements of the Law of the Republic of Uzbekistan "On technical regulation" with the introduction of technical regulations, the normative documents on standardization for the products and services specified in them are no longer mandatory and become voluntary in the established order.

3. The Agency "Uzstandard" together with the authorized bodies shall take measures on cancellation of the obligatory nature and provision of voluntariness in the application of normative documents on standardization that establish mandatory requirements for the safety of telecommunications equipment from the day the General Technical Regulation approved in this resolution is put into effect in accordance with the established procedure.

4. The Ministry for the Development of Information Technologies and Communications of the Republic of Uzbekistan, the Agency "Uzstandard" in conjunction with the National Television and Radio Company of Uzbekistan shall provide broad information to the public, state and economic authorities, business entities on the objectives, content and application of the approved General Technical Regulations .

5. The control over the execution of this resolution shall be entrusted to the Deputy Prime Minister of the Republic of Uzbekistan, U.U.Rosukulova.

Prime Minister of the Republic of Uzbekistan A. ARIPOV

Tashkent,
February 27, 2017,
No. 102

ATTACHMENT to the Resolution of the Cabinet of Ministers of February 27, 2017 No. 102

GENERAL TECHNICAL REGULATIONS

on the safety of telecommunications equipment

Chapter 1. General Provisions

§ 1. The objectives and scope of the General Technical Regulations

1. This General Technical Regulation on the Safety of Telecommunications Equipment (hereinafter - the Technical Regulations) establishes mandatory requirements for the safety of telecommunications equipment in order to:

protection of human life and health, the environment, property of legal entities, individuals and the state;

prevention of actions that mislead consumers (users, operators and telecommunications providers) regarding its purpose and safety.

removal of technical barriers to trade.

This technical regulation regulates the relations arising in the application and performance of mandatory requirements for the safety of telecommunications equipment.

2. The validity of this Technical Regulation applies to the telecommunication equipment to be put into circulation and put into service:

New, previously not in use, regardless of the country of origin;

which is in operation after modernization;

formerly in operation;

imported to the territory of the Republic of Uzbekistan.

Objects of technical regulation, which are covered by this Technical Regulation, are listed in Appendix No. 1 to this Technical Regulation.

3. This Technical Regulation does not apply to telecommunications equipment:

used in the interests of national defense, security and law and order, as well as special technical means of the system of operational-search activities;

the following transit through the border of the Republic of Uzbekistan, which is under customs control and is not operated during the entire period of stay on the territory of the Republic of Uzbekistan.

4. Requirements for ensuring the safety of telecommunications equipment are mandatory for execution by all individuals, legal entities and individual entrepreneurs.

5. This Technical Regulation, taking into account the degree of risk of harm, establishes the necessary requirements for the objects of technical regulation, which are covered by this Technical Regulations, the implementation of which provides:

a) mechanical safety;

b) electrical safety;

c) radiation safety;

d) environmental safety;

e) fire safety;

e) Explosion-proof.

6. For certain types of telecommunications equipment falling within the scope of this Technical Regulation, applied in technological networks of telecommunications or special telecommunication networks, additional mandatory requirements for ensuring security, including information security, may be established in other regulatory documents in the field technical regulation.

Other normative documents in the field of technical regulation can also establish mandatory requirements for the operation, electromagnetic and technical compatibility of telecommunications equipment, ensuring the security, integrity, interconnection and continuity of the telecommunications network.

§ 2. Terms and definitions

7. For the purposes of this Technical Regulation, the concepts established by the Law of the Republic of Uzbekistan "On Technical Regulation" are used, as well as the following terms:

security interlocks -means or systems for preventing access to dangerous parts to eliminate hazards or automatically eliminate dangerous conditions during access;

Cutting equipment - equipment designed for use without a power cord. The mains plug is an integral part of the equipment design and is used to hold equipment in a power outlet;

secondary circuit - a circuit that does not have direct connection to the primary power supply circuit and receives electricity through a transformer, converter or other equivalent device, or from a battery;

Note. The conductive parts of the connecting cables can be part of the secondary circuit.

double insulation - insulation consisting of basic and additional insulation;

decorative part - a piece of equipment that is carried outside the casing and does not perform protective functions;

additional insulation - independent insulation, applied in addition to the main insulation, reducing the risk of electric shock in the event of damage to the main insulation;

gap - the shortest distance between two conductive parts or between the conductive part and the boundary surface of the equipment, measured by air;

manufacturer - an enterprise, organization, institution or individual entrepreneur, producing telecommunications equipment for sale to the consumer;

a tool - a screwdriver or any other object that can be used to act on a screw, latch or other fixing device;

classification of fire resistance of materials - assessment of the behavior of burning materials and their ability to decay;

Notes:

1. For the requirements of this Technical Regulation, foamed materials of class HF-1 are evaluated above the same materials of class HF-2, and materials of class HF-2 are higher than materials of class HBF.

2. Similarly, other materials, including rigid foamed (technologically structured) classes of 5V or V-0, are rated higher than the same materials of class V-1, and materials of class Vl are higher than materials of class V-2, materials of class V-2 are higher than materials class HB.

terminal - clamp, nut on the screw, which serves to attach the electric wire to the copper plate;

mechanical casing - part of equipment designed to protect against mechanical and other physical hazards;
fire protection casing - part of the equipment that prevents the spread of fire or flame that has arisen inside the equipment;
electric casing - part of equipment designed to prevent access to parts that are under dangerous voltage or contain a dangerous level of energy, as well as to voltage circuits of the telecommunications network;
body - a set of all accessible conductive parts, handles, clamps, heads, etc., as well as all available surfaces of insulating materials, to which metal foil can be applied;
voltage during transients in the network - the maximum peak voltage that can occur at the input of equipment power as a result of transients in the AC power supply network;
voltage during transients in the telecommunications network - the maximum peak voltage that can occur in a telecommunications network connected to equipment as a result of transients in the external network;
a non-detachable power supply cord is a flexible cord attached to the equipment or connected to it as a single unit. Such a cord can be:

Flexible cord, easily replaceable without special preparation of the cord or without the use of a special tool;

a flexible cord specially prepared or requiring the use of special tools to replace it, or a cord that can not be replaced without damage to the equipment;

Note. The term "specially prepared" includes such concepts as providing cord protection over the entire length, the use of cable glands, the preparation of eyelets, etc., but does not mean a change in the cross-sectional shape of the conductor before it is inserted or twisted into strands to give them greater rigidity.

equipment connected by a type A connector - equipment intended for connection to the power supply of a building through household plugs and sockets or a non-industrial connector, or using both types of connections;
equipment connected by a B - type connector - equipment intended for connection to the power supply of a building through industrial plugs and sockets or a connector, or using both types of connections;
dangerous voltage - a voltage whose value exceeds 42.4 V of the amplitude value of the AC voltage or 60 V DC voltage in the circuit that does not meet the requirements imposed either on circuits with current limitation or on the voltage circuits of the telecommunications network;
operator (user) - any person not related to the service personnel;
basic insulation - insulation, providing basic protection against electric shock;
primary circuit - a circuit directly connected to the AC mains. It includes, for example, means for connecting to an AC mains supply, primary windings of transformers, electric motors and other load devices;

Note. The conductive parts of the connecting cables can be part of the primary circuit.

Movable equipment - equipment with one of the following properties:

weight not more than 18 kg, loose;

on wheels, rollers or other means of transportation by the operator in accordance with the instruction manual;

portable equipment - relocatable equipment, which, if necessary, can be transferred by the user;
the leakage path is the shortest path between two conductive parts or between the conductive part and the equipment boundary surface, measured along the insulation surface;
operating voltage is the highest voltage to which the insulation or component under consideration is subjected or may be subjected to operation under normal operating conditions;
manual equipment - moving equipment or part of equipment held in the hands during normal operation;

Note. For example, a portable personal computer, miniature computers and their accessories (printers and CD-ROM drives).

stationary equipment - equipment that is not movable;
detachable power supply cord - a flexible cord intended for connection to equipment through a suitable household connector;
thermoswitch - a temperature-sensitive control device that operates in the event of a violation of normal operating conditions and does not have the means to change the temperature mode by the operator;

Note. The thermal switch can be automatic or with manual mode setting.

the required insulation strength voltage is the maximum voltage at which the insulation under consideration withstands, without a breakdown, the effect of voltage;

reinforced insulation - a unified system of isolation, providing a degree of protection against electric shock, equivalent to double insulation, under the conditions established by this Technical Regulation;

Note. the term "insulation system" indicates that the insulation need not necessarily be uniform. It can contain several layers, which are not necessarily evaluated as primary or additional isolation.

functional isolation - isolation, which is necessary only for the proper operation of the equipment;

Note. Functional isolation, by definition, does not protect against electric shock. It reduces the likelihood of ignition or fire.

chains NTS-1 - voltage circuits of the telecommunications network, in which normal operating voltages do not exceed the limits for circuits with safety extra-low voltage operating under normal operating conditions and overvoltages from telecommunication networks are possible;

chains NTS-2 - voltage circuits of the telecommunications network, in which the voltage during normal operation exceeds the limits for circuits with safety extra-low voltage operating under normal conditions that are not subjected to overvoltages from telecommunications networks;

chains NTS-3 - voltage circuits of the telecommunications network, where the voltage during normal operation exceeds the limits for circuits with safety extra-low voltage operating under normal conditions, and overvoltages from telecommunication networks are possible;

the safety extra low voltage circuit is a secondary circuit designed and protected in such a way that under normal conditions and in case of a single fault the voltage does not exceed a safe value;

voltage circuit of the telecommunications network is a circuit in equipment for which the accessible contact area is limited and which is designed and protected so that under normal conditions and with a single fault the voltage does not exceed the maximum permissible value. The voltage circuit of the telecommunication network in this Technical Regulation is considered as a secondary circuit;

chain with current limitation - a circuit designed and protected so that the current flowing in it both under normal conditions and under conditions of single damage does not reach a dangerous value;

an extra-low voltage circuit is a secondary circuit with this voltage between any two conductors or between any one conductor and ground which, under normal operating conditions, does not exceed 42.4 V of the voltage amplitude or 60 V DC voltage that is separated from the dangerous voltage by at least, the main insulation, but does not meet all requirements for either circuits with a safety extra-low voltage, or for circuits with current limitation;

functional earthing - grounding of any point of equipment or system for reasons not related to safety;

a plug - a metal rod or plug with which a portable electrical appliance connected to them is connected to the mains;

Plug - part of the connector for connecting the consumer of electricity to the outlet.

plug-in connector is the part of the connector to which electrical energy is supplied from the source;

operational document is a design document that individually or in conjunction with other documents defines the rules for the operation of the product and / or reflects information that certifies the manufacturer's guaranteed values of the basic parameters and characteristics (properties) of the product, warranty and information on its operation for a specified period of service.

Chapter 2. Security Requirements

§ 1. Requirements for mechanical safety

8. To ensure mechanical safety, telecommunications equipment must meet the following requirements:

do not have sharp corners, edges or burrs, representing a danger to humans;

the power supply can not be replaced by a power supply not provided by the manufacturer if the telecommunications equipment is designed and constructed for power supply exclusively from power sources specified by the manufacturer;

dangerous moving parts of telecommunications equipment that can cause injuries must be located, fenced and protected in such a way as to provide the necessary protection for a person from possible injuries.

9. Telecommunication equipment must comply with the requirements of mechanical safety specified in Annex 2 to this Technical Regulation, throughout the life of the equipment, subject to the conditions of use of this equipment specified in the accompanying technical documentation.

§ 2. Safety Requirements for Emissions

10. To prevent adverse effects on the health of various types of unwanted emissions, telecommunications equipment must meet the following requirements:

the design of equipment in which radio frequency, ionizing or ultraviolet radiation is present or a laser is used, as well as the construction of equipment containing flammable liquids, gases or other sources of danger, should protect personnel from harmful effects and protect against damage to materials that provide safety;

the noise level created by the equipment during operation shall not exceed the maximum permissible values specified in clause 3 ofAppendix No. 3 of this Technical Regulation. The noise spectrum should not contain tonal components;

The electromagnetic fields created by the equipment during operation must be safe for the user.

11. The telecommunication equipment must comply with the radiation safety requirements specified in Appendix No. 3 to this Technical Regulation during its entire service life, subject to the operating conditions of this equipment specified in the accompanying technical documentation.

§ 3. Requirements for fire safety

12. In order to prevent the occurrence of fire and ensure fire safety and security of property, telecommunication equipment must meet the following requirements:

Do not represent a fire hazard in normal operating conditions and under different operating conditions;

there should be no spreading of the flame outside the ignition source in case of fire inside the equipment both under normal conditions and under conditions of overload due to malfunctioning of components, breakdown of insulation and other factors;

Do not exceed the permissible temperatures during operation of the equipment under normal conditions and in the event of a malfunction;

meet the requirements specified in clause 5 of Appendix No. 4 to this Technical Regulation, if batteries are used in the equipment;

meet the requirements specified in clause 6 of Appendix No. 4 to this Technical Regulation if the equipment contains flammable liquids;

automatically disconnect the electrical circuit from the source of electrical energy in the event of emergency operation modes due to the temperature rise of the equipment protection device until the occurrence of an outbreak;

have a protection system and ensure compliance with the requirements specified in paragraph 7 of Appendix No. 4 to this Technical Regulation, in order to avoid the occurrence of fire under conditions of overload and abnormal operating conditions of equipment;

ensure compliance with the requirements specified in clause 8 of Appendix No. 4 to this Technical Regulation, in order to exclude the occurrence of fire of cable equipment;

shall be manufactured with the use of materials, components, structures and fireproof enclosures to limit the spread of fire, to reduce the risk of ignition and the spread of fire in the equipment;

ensure compliance with the requirements of paragraph 2 of Annex 6 to this Technical Regulation, in order to prevent the heating of individual parts of the equipment to excessive temperatures.

13. Telecommunication equipment must comply with the fire safety requirements specified in this Technical Regulation, during the whole service life, provided that the operating conditions of this equipment are met, as specified in the accompanying technical documentation.

§ 4. Requirements for electrical safety

14. In order to ensure electrical safety, telecommunications equipment must meet the following requirements:

the design shall exclude the possibility of electric shock in the conditions specified in the accompanying technical documentation;

protection must be provided against electric shock from live parts;

a safe voltage must be provided in the circuits of the safety extra-low voltage both in normal operation and after a single damage, in order to exclude the possibility of touching by a person;

the risk of electric shock from accessible parts or from parts that may become available, for example, after removing the covers by a person, should be avoided;

accessible to the user metal parts of telecommunications equipment, in which there is a basic insulation and an element for connecting exposed conductive parts to the protective conductor of the electrical installation, must have a permanent and reliable ground (ground connection).At the same time, the design of telecommunications equipment should provide for the grounding of current-carrying parts accessible to a person's touch before the equipment is connected to the power supply network in the conditions specified in the accompanying technical documentation;

The insulation used (the device, the material medium used to insulate electrical wires and other conductors) must be suitable for safe use under the conditions specified in the accompanying technical documentation. Isolation of hand-held equipment in the conditions specified in the accompanying technical documentation must be resistant to sudden changes in the value of the supply voltage. The insulation material should provide sufficient electrical, thermal strength under normal operating conditions. For insulation, hygroscopic materials, as well as materials containing asbestos, natural rubber, foam polymers containing ozone-depleting substances should not be used;

The protective earth terminal must be easily accessible and must be marked with the appropriate symbol. Protective earthing of communication equipment should not be carried out through the telecommunications network;

Isolation between accessible parts or parts connected to them and dangerous parts of human life must withstand the overstress caused by transients;

insulating material, supporting parts, connected to the AC power supply, must be heat resistant;

screw connections must provide reliable electrical contact during the entire life of the equipment;

Connections such as non-detachable cords, terminals, instrumentation and cable glands shall ensure a safe and reliable connection to the AC mains and to protective earth;

the equipment must contain switches for simultaneous shutting down of all supply lines of equipment power supply when it is permanently connected to the AC mains. Also, the disconnecting device or devices must enable the equipment to be disconnected from the AC mains during maintenance;

Protection devices and switches must be applied in accordance with their nominal values;

The plugs and sockets used must prevent the possibility of incorrect connection;

The equipment must be designed and manufactured in such a way that protection against electric shock is ensured both under normal operating conditions and in conditions of malfunction;

the contact current, the current of the protective earth conductor should not pose a hazard to human life and health when exposed to humidity, temperature and other climatic factors that may be present during normal operation;

The components used, such as transformers, line filters, capacitors and other products, as well as accessories such as external flexible cords, clamps for external wires and other products, should not reduce the level of electrical safety during operation;

antenna sockets, sockets for connecting measuring circuits, as well as telecommunications network circuits should have protection against overloads in voltage and current.

15. Telecommunication equipment must meet the requirements for protection against electric shock, given in Appendix No. 5 to this Technical Regulation.

16. Telecommunication equipment must comply with the electrical safety requirements specified in this Technical Regulation throughout the life of the equipment, subject to the conditions of operation of this equipment specified in the accompanying technical documentation.

§ 5. Requirements for environmental safety

17. When operating telecommunications equipment, measures should be taken to prevent or limit the harmful effects on the environment, reduce sound pressure, vibration, electric and magnetic fields, and other harmful physical impacts.

18. Users, who generate toxic waste when operating the equipment, must ensure their timely disposal, neutralization and disposal. Storage or disposal of toxic waste in the territory of users is not allowed.

19. The order and methods of storage, neutralization and disposal of toxic waste are agreed by the user of the equipment with the relevant state supervision bodies.

20. The disposal of toxic waste is carried out by the user or organizations to which the user transfers the performance of these works under the contract.

21. Disposal of toxic wastes is carried out in the presence of a commission consisting of representatives of state authorities in the field, state supervision bodies, tax authorities and the public, followed by a document confirming the disposal of toxic waste.

22. The user of the equipment submits to the state supervision authorities a document confirming the fact of disposal of toxic waste.

23. The neutralization and burial of toxic waste is carried out in accordance with the sanitary rules in special engineering structures - landfills, taking into account the hazard class by burning, neutralizing or burial.

24. Equipment that does not meet the requirements of environmental legislation is not allowed to be used.

§ 6. Explosion-proof requirements

25. In order to ensure explosion safety, telecommunication equipment must meet the following requirements:

the possibility of contact of internal spark-forming elements with an external explosive atmosphere must be excluded;

it shall be ensured that the heating to the autoignition temperature of the explosive atmosphere is prevented;

the equipment should be equipped with materials that do not create sparks that can trigger explosion of an explosive atmosphere;

the possibility of dangerous thermal manifestations of chemical reactions and mechanical effects should be excluded;

to provide an obstacle to the emergence of an explosion that originated inside telecommunications equipment.

26. Telecommunications equipment must be explosion-proof both in the conditions specified in the accompanying documents, and in emergency operation modes, as well as in the event of improper operation. In the presence of explosive components, the equipment must have additional protection against the consequences of the explosion of such components.

27. Explosion-proof telecommunication equipment shall be marked with explosion protection in accordance with paragraphs 41 - 43 of this Technical Regulation.

28. Telecommunication equipment must comply with the requirements for explosion protection listed in Annex 6 to this Technical Regulation.

29. Telecommunication equipment must comply with the requirements of this Technical Regulation as well as other normative documents in the field of technical regulation for the whole service life in compliance with the operating conditions of this equipment specified in the accompanying technical documentation, the effect of which applies to it.

Chapter 3. Requirements for packaging, marking and operational documents

§ 1. Requirements for the packaging of telecommunications equipment

30. The package should protect telecommunications equipment from static electricity charges in accordance with regulatory documents in the field of technical regulation, as well as from external mechanical and climatic factors when stored and transported by road, rail, sea transport, in sealed aircraft compartments.

31. Telecommunication equipment in a packaged form should be resistant to transportation at an ambient temperature from minus 50 ° C to + 55 ° C and relative air humidity of 100% at a temperature of + 25 ° C by road transport covered with tarpaulin, in closed railway cars, holds river transport, in the sealed compartments of aircraft and helicopters according to the rules in force on these modes of transport.

32. The telecommunication equipment in the packed form should be stable to storage for 12 months (from the moment of equipment shipment, including the transportation time) in warehouse heated premises at temperature from + 5 ° C to + 40 ° C and average annual relative humidity of 60% at temperature + 20 ° C, the upper value of humidity can reach 80% at a temperature of + 25 ° C.

33. The requirements for the packaging of a specific object of technical regulation, its spare parts, accessories and operational documentation are regulated by the relevant regulatory documents in the field of technical regulation.

§ 2. Marking of telecommunication equipment

34. Telecommunication equipment should be equipped with a legible, easily readable and user-accessible marking that persists throughout the life of the equipment.

35. The marking that is affixed to telecommunications equipment shall contain the following information for the consumer:

name of equipment, type, model, modification, trade name, serial number;

name, trademark or trademark of the manufacturer;

name of the country of origin;

a sign of conformity;

operating voltage or voltage range;

a conventional designation of the type of current, if the nominal frequency is not specified;

the degree of protection against the ingress of solid particles and moisture provided by the containment;

symbols of safety and disposal methods for chemical sources of current;

information on the nominal consumed or useful power, or the rated current;

mass of equipment.

36. The package marking shall contain information on the name of the manufacturer and (or) its trademark, name and designation of telecommunications equipment (type, model, modification, trade name), date of manufacture, conformity mark.

37. If the information in paragraph 35 can not be applied to telecommunications equipment, they are indicated in the operating documents and on the packaging.

38. The heating parts of telecommunication equipment with temperature limits exceeding the limits are marked with a symbol in accordance with Figure 1 .

39. The marking of telecommunications equipment should also contain information on classes of protection against electric shock.

40. The marking of the explosion protection of the equipment must be carried out by relief signs in such a way that it is preserved during the entire life of the equipment under the conditions for which it is intended.

The marking of the explosion protection of Group II equipment must be carried out in the form of an integral, unsharpened designation.

The marking of the explosion protection of the equipment of Group I shall consist of two parts. The first part indicates the level of explosion protection, in the second part, located to the right of or below the first, the rest of the marking.

41. The marking of explosion protection shall include:

a) the name of the manufacturer or his registered trademark;

b) designation of the type of equipment;

c) the sign Ex, indicating that the equipment meets the standards for types of explosion protection.

The marking of equipment of group I must contain the designation of the level of explosion protection:

RP - for high reliability equipment against explosion;

RV - for explosion-proof equipment;

RO - for particularly explosion-proof equipment.

The marking of explosion protection of the equipment of group II must contain the sign of the level of explosion protection before the sign Ex:

2 - for equipment with increased reliability against explosion;

1 - for explosion-proof equipment;

0 - for highly explosion-proof equipment;

d) designation of the type of explosion protection:

o - oil filling of the shell;

p - filling or blowing the shell under excess pressure;

q - quartz filling of the shell;

d - flameproof enclosure;

e - protection of the type "e";

i_a - Intrinsically safe level circuit "i_a ";

i_b - intrinsically safe circuit of level "i_b ";

i_c - intrinsically safe circuit of level "i_c ";

m - sealing by compound;

n - protection of the type "n" (type of protection, consisting in the design of the equipment taken additional protection measures so that in normal and some abnormal modes of operation it could not become a source of arc and spark discharges, as well as heated surfaces capable of cause ignition of the surrounding explosive mixture);

s - special type of explosion protection.

e) designation of the equipment group:

I - for equipment intended for underground workings of mines and mines and their ground structures, dangerous for mine gas or dust;

II, IIA, IIB, IIC - for the equipment of internal and external installation, intended for use in places with potentially explosive gas environment, except for mines and their ground structures, dangerous for mine gas;

e) for Group II equipment, the designation of the temperature class or the maximum surface temperature, or both. If both these data are indicated in the marking, the temperature class should be indicated last, in parentheses. At the cable entries, the temperature class is not marked;

g) after the explosion protection marking, the X sign shall be placed.

42. If different types of explosion protection are used on different parts of the telecommunications equipment, each relevant part must have a designation of the type of protection adopted in it.

If several types of equipment are used in the equipment, the designation of the main type of explosion protection, and then of other types, is put on the first place.

43. When placing a replaceable battery in an area accessible to a person, a warning sign must be placed next to it, or an appropriate warning must be written in the operating and maintenance instructions.

When placing a replaceable battery anywhere in the equipment, the inscription should be placed next to the replacement battery or an appropriate warning must be written in the operating instructions.

The marking shall contain the following or similar text, as shown in the following example:

CAUTION! IMMEDIATE INSTALLATION, EXPLOSION IS POSSIBLE. REPLACE AND USE BATTERY IN ACCORDANCE WITH THE INSTRUCTION

§ 3. Operational documents for telecommunication equipment

44. Operating documents for telecommunications equipment should contain:

information specified in paragraph 35 of the Technical Regulations;

information on the appointment of telecommunications equipment;

characteristics and parameters;

rules and conditions for the installation of telecommunications equipment, its connection to the electrical network and other technical means, commissioning, regulation and commissioning, if the fulfillment of these rules and conditions is necessary to ensure the compliance of telecommunications equipment with the requirements of this Technical Regulation;

requirements for restrictions in the use of telecommunications equipment, taking into account its purpose for working in residential, commercial and industrial areas;

rules and conditions for effective and safe use;

rules and conditions for storage, transportation, sale and disposal (if necessary - requirements for them);

information on measures to be taken when a telecommunication equipment malfunction is detected;

warranty period of operation of telecommunications equipment;

manufacturer's warranty;

the period of service (validity) and information about the necessary actions of the consumer at the expiration of this period, as well as the possible consequences if the specified actions are not performed;

the location (postal address) of the manufacturer and the organizations authorized by them for accepting claims from the consumer, as well as performing repairs and maintenance;

the name and location (postal address) of the manufacturer, information for communication with him;

month and year of manufacture of telecommunications equipment and (or) information on the place of application and the method of determining the year of manufacture.

45. Operational documents are executed in the state and Russian languages.

Operational documents are carried out on paper. They can be accompanied by a set of operational documents on electronic media.Operating documents included in the set of telecommunication equipment for non-domestic use can be performed only on electronic media.

Chapter 4. Identification, Sampling and Testing of Telecommunications Equipment

§ 1. Identification

46. Identification is carried out in order to identify and establish the correspondence of telecommunication equipment to a sample (type, lot) or their description, as well as to assess the conformity of telecommunications equipment with the essential characteristics indicated in the marking.

47. Identification is carried out by the method of visual control in a way of comparing their identification characteristics in a collocative manner with the information given in the following documents:

technical documentation for telecommunications equipment;

regulatory documentation on which telecommunications equipment is manufactured;

shipping documentation (cargo customs declaration, invoice, contract, etc.).

48. The following are the general composition of identification features:

information on the type (type, model) of the equipment;

constructive characteristics;

completeness;

serial (factory) numbers;

batch size;

date of manufacture;

name of the manufacturer;

country in which the manufacturing enterprise is located.

49. The identification of telecommunications equipment in accordance with the above criteria, as well as determining its compliance with safety indicators in accordance with the requirements of this Technical Regulation:

manufacturer (seller), issuing it in circulation;

the certification body, in order to evaluate and confirm the conformity of the products;

a testing laboratory that performs testing of telecommunications equipment samples on the terms of an agreement with the conformity assessment body or with a person accepting a declaration of conformity to verify compliance within their area of accreditation;

the person accepting the declaration of conformity (when declaring conformity);

body of state control (supervision), in order to verify the compliance of products in circulation on the territory of the Republic of Uzbekistan with the requirements of this Technical Regulation.

§ 2. Sampling and testing

50. Sampling is carried out in order to determine the compliance of telecommunications equipment with the requirements of this Technical Regulation and is carried out in accordance with the current regulatory documents in the field of technical regulation.

51. Methods for conducting tests of a specific object of technical regulation on safety indicators are regulated in accordance with regulatory documents in the field of technical regulation.

Chapter 5. Transition period

52. Since the entry into force of this Technical Regulation, normative documents in the field of technical regulation operating in the territory of the Republic of Uzbekistan and establishing requirements for the safety of telecommunications equipment provided for in this Technical Regulation, prior to bringing them in line with this Technical Regulations, are applied in a part that does not contradict the present Technical Regulations.

53. Certificates of conformity received in due course for telecommunication equipment before the entry into force of this Technical Regulation continue to be valid for the following period:

certificates of conformity for serially produced telecommunication equipment - within the period established in these certificates;

certificates of conformity for individual lots of telecommunications equipment - during the term of this lot on the market.

Chapter 6. The order of state control

54. The state control over compliance with the requirements of this Technical Regulation is carried out in accordance with the Law of theRepublic of Uzbekistan "On State Control of Activities of Business Entities".

55. The state control over compliance with the requirements of this Technical Regulation is carried out by the State Inspection for Supervision in the Sphere of Communications, Informatization and Telecommunication Technologies, the Ministry of Health and the State Committee for Nature Protection and their territorial bodies, as well as other specially authorized state bodies within their competence.

Chapter 7. Responsibility for non-compliance with the requirements of the Technical Regulations

56. Persons guilty of violating the requirements of this Technical Regulation are liable in accordance with the procedure established by law.

APPENDIX № 1 to the General Technical Regulations on the Safety of Telecommunications Equipment

OBJECTS

technical regulation, which are subject to the requirements of technical regulations

1. Digital switching systems.
2. Subsystems of commutation of cellular telecommunications networks.
3. Equipment that sells network additional services.
4. Equipment of networks of the subsequent generation.
5. Terminal terminal devices with wired and wireless access.
6. Mobile communication systems.
7. Terrestrial and satellite radio, radio broadcasting and television systems.
8. Ground-based satellite navigation and positioning systems.
9. Cable television and radio broadcasting systems.
10. Radio control and telemetry devices.
11. Studio audio and video equipment.
12. Image playback devices.
13. Antennas and feeder devices
14. Equipment of digital transmission systems.
15. Data transmission equipment with wired and wireless access.
16. Network management and monitoring equipment.
17. Power supply equipment.
18. Devices and systems of climate control.
19. Communication cables and cable equipment.
20. Receiving and transmitting equipment.
21. Equipment and apparatus for radio communication.
22. Radio telephone equipment.
23. Information technology equipment.
24. Electromechanical and electronic devices and equipment intended for connection to a computer.
25. Radio-electronic and television equipment.
26. Equipment and apparatus for wire communication.
27. Radio-relay and stationary satellite communication systems.
28. Radar and radio navigation aids.
29. Accumulators and batteries, regardless of the chemical current sources used and their design.
30. Diesel generators.

APPENDIX № 2 to the General Technical Regulations on the Safety of Telecommunications Equipment

REQUIREMENTS
to mechanical safety

1. The equipment must have adequate mechanical strength and be designed so as to remain safe, if possible, by careless handling.

2. The mechanical casing must be strong enough to hold inside or direct to the side the parts which, due to malfunction or for other reasons, can be released, detached or thrown out by moving parts.

3. Parts and parts fulfilling the functions of the casing must withstand the action of a constant force (10 ± 1) N.

4. The outer shells must withstand:

Effects of constant force (250 ± 10) N;

shock loading of a smooth steel ball with a diameter of about 50 mm and a mass (500 ± 25) g, freely discharged from its rest position from a height of 1.3 m. There should be no damage that can open access to dangerous parts of the equipment.

5. Enclosures made of cast or stamped thermoplastic materials shall be designed so that any shrinkage or deformation of the material caused by internal stresses during the casting or stamping

process does not lead to the exposure of dangerous parts or to a reduction in leakage distances or gaps less than the required values.

6. Desktop equipment having a mass of not more than 5 kg intended for use in conjunction with a handset connected by a cord or other accessories that are held in use in use by an acoustic function and connected by a cord or headset shall withstand a drop from a height of 1 m.

7. The means of mounting the equipment on a wall or ceiling must be sufficient to perform its function and withstand an additional force three times the weight of the equipment.

8. The design of the equipment must be such that, in the event that any wire, screw, nut, washer, spring or other similar parts is loosened or detached, this does not result in a hazard or a reduction in the leakage distances and gaps of additional or reinforced insulation.

9. The equipment must be physically stable and should not lose balance if it deviates by an angle of 10 ° from the normal vertical position.

10. A floor unit having a mass of 25 kg or more shall not be tilted by a force equal to 20% of the weight of the block, but not exceeding 250 N, applied in any direction (but not upwards) at a height of not more than 2 m from the floor.

11. The floor unit must not be tilted by a constant force of 800 N, directed downwards and applied at the point of maximum moment to any horizontal surface with dimensions not less than 12.5 × 20 cm at a height of not more than 1 m from the floor level.

12. The equipment to be carried or parts thereof having a mass of 18 kg or more shall be provided with means for lifting and carrying it. Handles or grippers for transport, included in its design or equipment, must withstand its fourfold weight.

13. Handles, knobs, handles, levers and other controls must be securely attached to prevent their attenuation under operating conditions, if this can cause a hazard. The casting mass and similar compositions, other than self-hardening resin, shall not be used as a means against the weakening of the fastening.

14. If the form of the controls is such that the application of the axial force during operation is unlikely, then they must withstand the following axial force without removing them:

15 N - for the control of electrical components;

20 N - in other cases.

15. For controls that move along the axis, the force should be equal to:

30 N - for the management of electrical components;

50 N - in other cases.

16. If the handles, buttons and other controls are used to indicate the position of the switches or similar components, it should be excluded that they can be placed in the wrong position, if the result could be a hazard.

17. In the area accessible to maintenance personnel, protection should be provided by a design that reduces the likelihood of access to dangerous moving parts, or the placement of movable parts in a casing with mechanical or electrical safety interlocks that eliminate danger during access.

Under the area accessible to the service personnel, is understood the area in which under normal conditions the following is possible:

access without the use of tools;

Access by means specially designed for maintenance personnel;

Access of maintenance personnel to the area according to the instructions, regardless of the need to use the tool.

18. If it is not possible to fully comply with the above requirements and at the same time it is necessary to ensure the operation of the equipment, access is allowed provided that:

dangerous moving part is fenced;

The danger associated with the part is obvious to the maintenance staff;

the following additional measures were taken:

a) the instruction manual should be appropriately indicated and the equipment marked with the following or similar warning, as given in the following example:

ATTENTION! DANGEROUS MOBILE PARTS KEEP THE FINGERS OF THE HANDS AND THE OTHER PARTS OF THE BODY TO REMOVE;

b) fingers, ornaments, clothing, etc. can get inside the moving part, the person should have the means, providing the possibility of stopping the moving part.

The warning and the means provided for stopping the moving part should be visible and accessible from the place where the risk of injury is maximum.

19. Equipment equipped with a power cord that is moved during operation must be designed so that the cord is protected from excessive bending at the point of entry into the device.

20. Fastening the cord should unload the conductor from mechanical stresses, including from twisting at the place of attachment of the cord inside the device, and also to protect the insulation of the wires from abrasion.

21. It should be possible to push the cord into the equipment to avoid damage to the cord or internal parts of the equipment.

22. The compartment for connecting the supply cable or the power cord must be designed so that:

to exclude the possibility of its incorrect connection;

Before installation it was possible to check the correctness of the connection and arrangement of the conductors;

any lids could be installed without the risk of damage to the conductors or their insulation;

for portable equipment, the uninsulated end of the wire in case of falling out of the clip could not touch the accessible metal parts.

23. Equipment intended for direct connection to a wall outlet should not create a torque in the vertical plane, exert more than 0.25 Nm force. A part of the equipment's plug-in connector must meet the requirements for the corresponding plug connector.

24. The equipment must have sufficient mechanical strength and must be designed to withstand the effects that may occur during its operation.

25. Ways of laying the wires should be smooth and not have sharp edges. The wires must be protected from contact with burrs, cooling radiators, moving parts, etc., which can damage the insulation. The holes in the metal, through which the insulated conductors pass, must have smooth machined surfaces or be provided with insulating sleeves.

Contact of conductors with conductive terminals is permissible if the applied insulation system provides adequate mechanical and electrical protection or an insulation breakdown does not cause danger.

26. Internal wires must be routed, clamped or fixed in such a way as to prevent:

excessive tension of wires, including terminal clamps;

easing terminal clamps;

mechanical damage to the insulation of the wires.

27. The design of the battery should avoid the possibility of damage to the hands when working with the battery. The edges of the battery case should be free of cracks, burrs and chips (sharp edges and corners should be blunted).

28. The conventional symbols and explanations on the external surface of the battery must contain information that is minimum necessary to ensure safe handling of the battery.

If it is not possible to apply the conventional symbols directly to the battery case, this information must be included in the battery maintenance manual, as indicated in the specifications for the battery of a particular type.

29. The design of the battery should exclude the possibility of leakage or spilling out of the electrolyte in any inclinations, shocks and vibrations.

30. Batteries should have filter plugs that detain sulfuric acid hazardous substances (explosive gases), which are harmful to health, or catalytic plugs released during the charging and discharge of the battery. Information on their availability is given in regulatory documents in the field of technical regulation.

31. The batteries should be leakproof in the terminals and in the gaps between the lid and the tank and withstand the pressure increased or decreased compared to the atmospheric pressure by 20 kPa at a temperature of (25 ± 10) ° C.

32. Current-carrying parts of accumulators must withstand a short-time electric load with a current of up to 1.39 ° C_{10} A.

Note. C_{10} - battery capacity with a ten-hour discharge, which is given in the documentation for the battery and (or) marking on it.

33. The design of the batteries must prevent fire and explosion in the event of a long-term short circuit in order to avoid acid splashing and burns by service personnel.

34. The battery case should have a supporting surface that provides a stable position when installed in devices, equipment, etc.

35. The body of a battery weighing more than 20 kg must have a device or device that provides a two-handed transfer. In this case, the strength of the housing and the transfer device must ensure the safety of movement.

36. The design of the external connections of batteries connected to batteries and installed (stacked) in the same tank must be closed and protected from the possibility of a short circuit.

37. The battery case must be able to withstand without damage and with electrical characteristics a drop from a height of 20 cm to a flat wooden floor made of solid wood 10 mm thick laid on a flat concrete surface.

APPENDIX No. 3 to the General Technical Regulations on the Safety of Telecommunications Equipment

REQUIREMENTS
on radiation safety

1. The permissible levels of exposure to the radio-frequency electromagnetic field (EMF) at the user's workplace include the following requirements:

1) The EMF of radio frequencies should be estimated by the field intensity indicators generated by the energy load.

In the frequency range from 60 kHz to 300 MHz, the EMF intensity is characterized by the electric (E) and magnetic (H) fields, the energy load is the product of the square of the field strength for the time of its action (T). The energy load of the electric field (EN_E) is calculated according to formula (1), magnetic (EN_H) - according to formula (2):

In the frequency range from 300 MHz to 300 GHz, the EMF intensity is characterized by the surface energy flux density (PES), the energy load is the product of the PES field for the time of its action and is calculated by the formula:

2) the maximum permissible values of E and H in the frequency range from 60 kHz to 300 MHz in personnel workplaces should be determined based on the permissible energy load, load time and exposure time according to the formula:

where: $E_{ПД}$ and $H_{ПД}$ - maximum permissible values of electric, V / m, and magnetic, A / m, field;

T is the time of exposure, h;

$^{EN}E_{PD}$ and $^{EN}H_{PD}$ - the maximum value of the energy load during a working day, $(V / m)^2 \cdot h$ and $(A / m)^2 \cdot h$.

The maximum value of E_{PD}, H_{PD} and $^{EN}E_{PD}$, $^{EN}N_{PD}$ indicated in Table 1 № .

Table No. 1

Maximum values of field strength and energy load

Parameter	Limit values in frequency bands, MHz		
	from 0.06 to 3	over 3 to 30	over 30 to 300
E_{PD}, V / m	500	300	80
N_{PD}, A / m	50	-	-
$^{EN}E_{PD}$, $(V / m)^2 * h$	20000	7000	800
$^{EN}N_{PD}$, $(A / m)^2 * h$	200	-	-

According to the formulas and table No. 1 , the EMF intensity in the frequency range from 60 kHz to 300 MHz in the workplace of personnel during the working day must not exceed the following values of the maximum permissible level:

by electrical component, V / m:

a) 50 V / m - for frequencies from 0.06 to 3 MHz;

b) 30 V / m - for frequencies from 3 MHz to 30 MHz;

c) 10 V / m - for frequencies from 30 MHz to 300 MHz;

by magnetic component - 5 A / m for frequencies from 0.06 to 3 MHz.

Simultaneous exposure of electric and magnetic fields in the frequency range from 0.06 to 3 MHz should be considered permissible provided:

where: ЭН $_{Е}$ and EN $_{Н}$ - energy loads, characterizing the effects of electric and magnetic fields;

3) the maximum permissible values of the PES EMF in the frequency range from 300 MHz to 300 GHz should be determined on the basis of the permissible energy load and the exposure time according to the formula:

where: ППЭ $_{ПД}$ - maximum permissible values of ППЭ, W / m ^{2} (mW / cm ^{2} , μW / cm ^{2});
^{EN} PP $_{ПД}$ - maximum permissible value of the energy load, equal to 2 W · h / m ^{2} (200 μW · h / cm ^{2});

K is the coefficient of attenuation of biological efficiency, equal to:

1 - for all cases of exposure, excluding irradiation from rotating and scanning antennas;

10 - for cases of irradiation from rotating and scanning antennas with a rotation or scanning frequency of not more than 1 GHz and a duty cycle of at least 50;

T - time spent in the irradiation zone for the work shift, h.

In all cases, the maximum value of the EPRP should not exceed 10 W / m ^{2} (1000 μW / m ^{2}).

If the worker working during the working day is exposed to EMF of different intensity, the total EN is calculated by adding the EN during the corresponding periods of time, which is calculated by the following formula:

where: ППЭ $_{1}$, ППЭ $_{2}$, ППЭ $_{n}$ - values of PET, measured in separate sections;

T $_{1}$, T $_{2}$, T $_{n}$ is the residence time in them.

In cases of simultaneous or sequential irradiation of operating personnel by the electromagnetic field of the frequency range from 300 MHz to 300 GHz in continuous and intermittent mode (from rotating and / or scanning antennas), the total EN is calculated by the formula:

where: ЭН $_{ППЭсум}$ - total energy load, which should not exceed 200 μW / cm ^{2} · h;

EN $_{PPE1}$ - EN, created by continuous radiation;

EN $_{PPE2}$ - EN, generated by the radiation of rotating or scanning antennas, equal to 0.1 PPE $_{2}$ T $_{2}$.

2. The telecommunication equipment shall ensure the fulfillment of the following safety requirements for laser radiation:

laser, regardless of class, must have a protective casing (casing). A protective enclosure (casing) or parts thereof that are removed during maintenance and that open access to laser radiation and high voltage in the power supply circuits shall be protected by a safety interlock. The activation of a lock on an operating laser product or a partially discharged capacitor bank must be accompanied by a clear visual or audible alarm;

the control panel of laser products of III and IV classes should be equipped with a removable key;

Class III and IV lasers that generate radiation in the visible range, and Class IV lasers with generation in the ultraviolet and infrared ranges should be equipped with light signaling devices operating from the time of the onset of generation to its end. The warning light should be clearly visible through the goggles;

The control panel (control panel) of laser products, irrespective of the class, should be placed in such a way that irradiation of personnel by laser radiation does not occur during adjustment and operation. The design of laser products III, IV classes should provide the possibility of remote control;

lasers III, IV classes should contain dosimetric equipment;

laser products III, IV classes must have a beam interrupter or attenuator to limit the propagation of radiation;

in laser products III, IV classes, it is necessary to provide for the possibility of reducing the output power (energy) of radiation during their maintenance;

laser products of Classes III, IV, generating radiation in the invisible part of the spectrum, should have built-in lasers I, II class with visible radiation to visualize the main laser beam;

all optical observation systems (eyepieces, observation windows, screens) should provide a reduction in the energy (power) of the radiation passing through them to the maximum permissible levels;

laser products using fiber-optic transmission of radiation must be provided with a special tool for detaching the transmission systems and mechanical loosers of the laser beam on the connectors;

the panel of the protective casing (casing), when removed or displaced, a person's access to laser radiation is possible, should have a warning sign

and an explanatory sign with an inscription is shown in the following example:

ATTENTION! OPENING - LASER RADIATION

A laser product of Class I must have an explanatory sign with an inscription, as shown in the following example:

CLASS I LASER PRODUCT

A Class II laser product must have a warning sign:

and an explanatory sign with an inscription, as shown in the following example:

LASER RADIATION
DO NOT LOOK IN THE BEECH
CLASS II LASER PRODUCT

A Class III laser product must have a warning sign:

and an explanatory sign with an inscription, as shown in the example:

LASER RADIATION
AVOID EYE RADIATION
CLASS III LASER PRODUCT

A Class IV laser product must have a warning sign:

and an explanatory sign with an inscription, as shown in the following example:

LASER RADIATION
AVOID EYE AND SKIN IRRITATION
DIRECT AND DISCRETE RADIATION
CLASS IV LASER PRODUCT

Laser products of II-IV class must have an aperture through which radiation is emitted, an explanatory sign with an inscription, as shown in the following example:

LASER APERTURE

Laser products, with the exception of Class I products, should have on the explanatory sign information about the manufacturer, the maximum output energy (power) of laser radiation and the wavelength of the radiation.

3. Telecommunications equipment should ensure the following safety requirements for acoustic radiation:

1) if the equipment is a source of noise, the level of which can create a hazard, the manufacturer must measure the maximum noise level created by the equipment, except for the sound of the emergency siren, and calculate the maximum noise level. Measurement of the sound pressure level should be carried out both at the operator's workplace and at a distance of 1 m from the place on the equipment casing where the pressure level is maximum.

The noise level of 80 dBA relative to a value of 20 μPa is considered to be the minimum level that can be dangerous.

Admissible levels of sound pressure in octave bands, sound levels and equivalent sound levels created by telecommunications equipment in the workplace should be taken:

for broadband constant and non-permanent (except impulse) noise - according to Table No. 2 ;

for tonal and impulse noise - by 5 dB less than the values indicated in Table No. 2 ;

for noise generated in rooms by air conditioning, ventilation and air heating installations - 5 dB less than the actual noise levels in these rooms (measured or determined by calculation), if the latter do not exceed the values indicated in Table 2 (correction for tonal and impulse noise in this case should not be taken), in other cases - by 5 dB less than the values indicated in Table No. 2 .

Table No. 2

Admissible levels of sound pressure in octave bands, sound levels and equivalent sound levels at workplaces

Type of work activity, jobs	Sound pressure levels, dB, in octave bands with mean geometric frequencies in Hz									Sound levels and equivalent sound levels, dB
	31.5	63	125	250	500	1000	2000	4000	8000	
Enterprises, institutions and organizations										
1. Creative activity, leadership work with increased requirements, scientific activity, design and engineering, programming, teaching and learning, medical activities: workplaces in the premises of the directorate, design bureaus, calculators, computer programmers, in laboratories for theoretical work and data processing, patients in health centers	86	71	61	54	49	45	42	40	38	50
2. Highly skilled work that requires concentration, administrative and managerial activity, measuring and analytical work in the laboratory: workplaces in the premises of the shop managerial apparatus, in the office rooms of office premises, laboratories	93	79	70	63	58	55	52	50	49	60
3. Work performed with frequently received instructions and acoustic signals, work that requires constant auditory control, operator work on the exact schedule with the instruction, dispatching work: workplaces in the premises of the	96	83	74	68	63	60	57	55	54	65

dispatching service, offices and observation and remote control rooms with voice communications over the telephone, typewritten offices, on sites of exact assembly, at telephone and telegraph stations, in the premises of masters, in information processing rooms on computers										
4. Work that requires concentration, work with increased requirements for monitoring processes and remote control of production cycles: workplaces behind consoles in observation and remote control cabins without voice communication over the telephone, in laboratory rooms with noisy equipment, in rooms for placing noisy computer units	103	91	83	77	73	70	68	66	64	75
5. Performing all types of work (except for those listed in 1 - 4 of this table and the like) on permanent workplaces in production facilities and on the territory of enterprises	107	95	87	82	78	75	73	71	69	80

In the equipment installation manual, the manufacturer must specify that it is necessary to provide a level of noise from the equipment after installation on site (including the installation of any sound-attenuating screens or coatings specified by the manufacturer) that will not exceed safe limits.

2) for the terminal equipment, the protection of the person's ear from acoustic shock should be ensured. The sound pressure level developed by the end equipment in the artificial-ear chamber with electromotive force (EMF) of the test signal generator equal to 31 V must not be more than 120 dB.

For terminal equipment intended for use by people with partial hearing loss, the sound pressure level developed by the phone in the artificial-ear chamber with the EMF of the test signal generator equal to 31 V must not exceed the user-adjusted optimal level by more than 12 dB.

APPENDIX No. 4 to the General Technical Regulations on the Safety of Telecommunications Equipment

REQUIREMENTS
to fire safety

1. To determine the requirements for fire protection enclosures, materials and components used in fire safety equipment, the following criteria for the compliance of materials with fire resistance classes are used:

material of class V-0, V-1 : material that, in the fire resistance test, can ignite or incandesce, but satisfies certain time-dependent fading criteria.Ember particles or burning droplets do not ignite surgical cotton when they are ejected;

material of class V-2 : material that, in the fire resistance test, can ignite or incandesce, but satisfies certain time-dependent fading criteria.Incandescent particles or burning droplets on release can ignite surgical cotton wool;

material of class 5V, HF-1 : material that, in the fire resistance test, can ignite or incandesce, but go out for a specified period of time. Ember particles or burning droplets do not ignite surgical cotton when they are ejected;

Foam material of class HF-2 : material that, in the fire resistance test, can ignite or be heated, but extinguishes within a specified period of time.Incandescent or burning particles or burning droplets upon ejection can ignite surgical cotton wool;

foam material of class HB, HBF : material that, when tested for resistance to fire, does not exceed the set maximum combustion rate.

The criteria for the correspondence of materials to classes V-0, V-1, V-2 are given in Table No. 1 .

Table No. 1

Criteria of conformity of materials to classes V-0, V-1, V-2

Compliance Criteria	V-0	V-1	V-2
Self-combustion time for each individual sample c, not more than	10	thirty	thirty
The time of self-combustion plus the time of smoldering burning for each sample after the second application of the flame with, no more than	thirty	60	60
Does any sample burn out to the point of clamping?	No	No	No
Do burning particles or falling drops ignite surgical cotton wool?	No	No	Yes

The criteria for the conformity of materials to classes HF-1, HF-2, HBF are given in Table No. 2 .

Table No. 2

Criteria for the conformity of materials to classes HF-1, HF-2, HBF

Compliance Criteria	HF-1	HF-2	HBF
Does more than one sample burn for more than 2 seconds after removing the test flame?	No	No	Yes
Does any sample burn at least 10 seconds after removing the test flame?	No	No	Yes
Does any sample bleed for more than 30 seconds after removing the test flame?	No	No	Yes
Does any sample burn or smolder more than 60 mm away from the edge to which the flame was attached?	No	No	Yes
Do burning particles or falling drops ignite surgical cotton wool?	No	Yes	Yes
Does any sample burn at a distance of more than 120 mm from the edge to which the flame was applied, or is the burning rate above 40 mm / min?	-	-	No

The criteria for the conformity of materials to class HB are given in Table No. 3 .

Table No. 3

Criteria for the conformity of materials to class HB

Compliance Criteria	HB
Burning rate for samples 3 mm thick, mm / min, not more than	40
Burning rate for samples less than 3 mm thick, mm / min, not more than	75
Does any sample burn or smolder more than 100 mm away from the edge to which the flame was attached?	No

The criteria for the conformity of materials to class 5V are given in Table No. 4 .

Table No. 4

Criteria of conformity of materials to a class 5V

Compliance Criteria	5V
Will the sample burn completely?	No
The duration of burning or smoldering after a fivefold exposure to the flame with, no more than	60
Do burning particles or falling drops ignite surgical cotton wool?	No

2. The requirements for the use of a fire hood must include the following:

1) if the temperature of the equipment parts in the conditions of damage can be sufficient to cause a fire, then a fire protection casing should be used;

2) If all tests to simulate faults are not conducted, in which ignition, if it occurs, does not extend beyond the equipment limits, and there is no ejection of molten metal outside the equipment and inadmissible heating of the insulation, the use of a fire shield is required for the following equipment:

a) components in primary circuits, with the exception of plugs and connectors that are part of the power cord or connecting cable;

b) components in secondary circuits equipped with power supplies whose power exceeds the limit values specified in clause 9 of Appendix No. 5 to this Technical Regulation;

c) components in secondary circuits (except connectors) provided with power sources with power limitation, as specified in clause 9 ofAppendix No. 5 to this Technical Regulation, but not installed on material relating to fire resistance to Class V-1;

d) components inside the power supply or assembly having a limited output power as specified in paragraph 9 of Appendix No. 5 to this Technical Regulation, including overcurrent protection devices, impedance protection, stabilization schemes and adjustable windings until the Requirements for limiting the power at the output of the power source;

e) components with uncovered parts where electrical breakdown is possible, such as an open switch, relay contacts, switches in electrical circuits with hazardous voltages or with a dangerous energy level. "Dangerous energy level" means a level of accumulated energy of at least 20 G or an existing long time with a total power of at least 240 V · A and a potential difference of at least 2 V;

f) insulated wiring, with the exception of conductors and cables with insulation from PVC, TFE, PTFE, FEP, neoprene or polyamide.

3. Requirements for materials and components of the fire hood should include the following:

1) the design of the casing, components and other parts or materials used in their manufacture should limit the spread of fire. If desired material relating to fire resistance classes HB or HbF, it is required to test for resistance to fire via hot wire 550 C. If the temperature can not protect the components from overheating damage conditions, they must be installed on materials relating flammability to class V-1. In addition, such components should be separated from the material of a lower class of fire resistance by an air gap of at least 13 mm or a fence of rigid material relating to fire resistance to Class V-1;

2) for moving equipment with a total mass of not more than 18 kg, the fireproof casing material for the thinnest wall shall have fire resistance class V-1 or fire resistance tests shall be carried out.

For moving equipment with a total mass of more than 18 kg and all stationary equipment, the fireproof casing material for the thinnest wall shall have fire resistance class 5V or fire resistance tests to be carried out.

The material of the fire casing, separated by an air gap of less than 13 mm from parts that may be subject to electrical breakdown, for example of contacts of switching devices or a switch, must be tested for resistance to ignition from a high-current arc discharge. This requirement is applied to the equipment casings, and not to the component covers.

The material of the fireproof enclosure, separated by an air gap of less than 13 mm from the parts that can reach a temperature sufficient for the ignition of the material both under normal operation and when it is broken, must be tested for resistance to ignition from a hot wire.

Materials for components that cover the opening in the fire cover and are intended to be installed in the area of this opening, for example, fuse holders, switches, connectors and cable entries, must be fireproof to class V-1 or to withstand fire resistance tests for fireproof casings equipment weighing less than 18 kg;

3) Materials other than those noted below for components and other parts (including mechanical and electrical housings and decorative parts) located on the outer sides of the fire protection enclosures shall have a fire resistance class HB or HBF.

If a mechanical or electrical casing is also used as a fire protection casing, the requirements for fire cages are applied to it.

Connectors must be made with one of the following conditions in mind:

the material of which the connector is made must be fire resistant to class V-2;

to withstand fire resistance tests for fireproof enclosures of relocatable equipment weighing less than 18 kg;

material that is installed should be fire resistant to class V-1 and have a small size;

placed in a secondary circuit equipped with a power source, whose power under normal operating conditions and after a single damage in the equipment is limited to a maximum value of 15 VA.

For materials, components and other parts, the fire resistance requirements for class HB and HBF are not applied in one of the following cases:

for electrical components that do not pose a danger of ignition under conditions other than normal, and conduct tests in simulating faults;

for materials and components inside the casing with a volume of not more than 0.06 m^3, made entirely of metal and without ventilation openings or not containing inside a sealed section with an inert gas;

for meter housings (if otherwise suitable for installing hazardous voltage parts), meter faceplates and indicator lamps or radiators;

for components such as integrated circuit boards, optocouplers, capacitors and other small parts that are mounted on material classified as fireproof to class V-1 or powered by a power rating not exceeding 15 VA under normal operating conditions and after a single damage in equipment and installed on the material relating to the fire resistance class HB;

for wires, cables and connectors with insulation from PVC, TFE, PTFE, FEP, neoprene or polyamide;

for individual unprotected fastening parts, cover tape, twine and cable connections used with the wiring harness;

for drives, runners, belts, bearings and other small parts, including decorative parts, labels, paws, key caps, buttons, etc., transmitting heat slightly;

for power supplies, consumables, media and registration materials;

for rubber rollers, ink tubes and other parts with special properties for performing the main function;

4) internal fire-protection casings, materials for components and other parts (including mechanical and electrical enclosures located inside the fireproof enclosure) must be fire rated to class V-1 or HF-2 or to withstand fire resistance tests for fire-proof enclosures of transportable equipment of less than 18 kg.

The above requirements do not apply to any of the following:

electrical components that do not pose a fire hazard under conditions other than normal, and conduct tests in simulating faults;

materials and components inside the casing with a volume of not more than 0.06 m^3, made entirely of metal and not having ventilation holes or not containing inside a sealed section with an inert gas;

one or more layers of a thin insulating material, such as an adhesive tape, used directly on any surface within the fire cover, including the surface of the conductive parts, provided that the combination of the thin insulation material and the surface to which the material is attached meets the fire resistance requirements of class V- 2 or HF-2;

(if otherwise a suitable place for installing parts with dangerous voltage is defined), front panels of counters and indicator lamps or radiators;

components such as IC blocks, optocouplers, capacitors, and other small parts that are mounted on material classified as fireproof to class V-1;

wires, cables and connectors with insulation from PVC, TFE, PTFE, FEP, neoprene or polyamide;

individual unprotected fasteners, cover tape, twine and cable connections used with the wiring harness;

parts of telecommunications equipment separated by an air gap of at least 13 mm or a fence of rigid material relating to fire class V-1 from electrical parts (other than insulated wires and cables) that, in a damaged condition, can initiate a temperature sufficient to ignite . These include: drives, runners, belts, bearings and other small parts, including labels, attachment legs, key caps, buttons and other parts that transmit heat slightly, power supplies, supplies, media and recording materials, rubber rollers, ink tubes and other parts with special properties of the main function, containers for powders or liquids, parts of foam, if they are fire resistant to class HB or HBF;

5) air assemblies of filters should be made of a material that is fire resistant to class V-2 or HF-2.

This requirement does not apply to the following constructions:

assemblies of air filters for circulation systems, irrespective of their tightness, not intended for ventilation of fire extinguishers from outside;

assemblies of air filters placed inside or outside the fire cover, provided that the filter materials are separated by a metal shield from parts that can cause a fire;

frameworks of air filters constructed from materials that, in case of malfunctions, can initiate a temperature causing a fire and are fireproof to class HB, provided they are separated from electrical parts (other than insulated wires and cables) by an air gap of at least 13 mm or a fence made of rigid material relating to fire resistance to class V-1;

assemblies of air filters placed outside the fire cover and made of materials relating to fire resistance to class HB or HBF;

6) high-voltage components operating at voltages with a double amplitude exceeding 4 kV must meet fire resistance class V-2 or HF-2 or must withstand a fire test in which destruction is not allowed.

Internal wiring operating under AC or DC voltage exceeding 4 kV (peak) shall not contribute to the spread of fire.

4. The requirements for protecting equipment from overheating should be as follows:

1) the materials used in the equipment should be chosen so that when operating under normal load the temperature does not exceed the safe value indicated in Table No. 5 and item 15 , the list 4) of Appendix No. 5 to this Technical Regulation.

Limit values for heating equipment parts under normal conditions are given in Table No. 5 and item 15 , listing 4) of Appendix No. 5 to this Technical Regulation;

2) components operating at high temperatures should be effectively shielded or separated so as not to cause overheating of adjacent materials and components. In places where access to hot parts is unavoidable, it is required to apply the special labeling specified in paragraph 38 ofthis Technical Regulations;

Table No. 5

Limit values for heating equipment parts under normal conditions

Parts of equipment	**Maximum heating, ° C**		
	Metal	**Glass, porcelain, vitreous**	**Plastics and Rubber**

		materials	
Handles, buttons, clamps, etc., which are held in hands or touched for a short time	60	70	85
Handles, buttons, clamps, etc., permanently held in the hands during normal operation	55	65	75
External surfaces of equipment to which touch is possible	70	80	95
Parts inside equipment that can be touched	70	80	95

3) the heating elements in the earthed equipment must be protected in such a way that the failure of a fire from overheating is prevented if the earthing fails. In such equipment, heat-sensitive devices, if any, must disconnect all phase conductors of the heating elements.

Thermosensitive devices must also disconnect the neutral wire in the equipment:

Connected connector, fed through a reversible household connector or reversible plug;

A power supply from an outlet with an undefined phasing;

4) equipment designed to transmit electricity through communication cables to remote equipment must limit the output current to a value that does not cause damage to the wire communication system due to overheating under any external load conditions. The maximum value of the current from the equipment must not exceed the current limit for the minimum wire section specified in the installation manual. If the current limit value is not established, then it is assumed to be 1.3 A.

5. Equipment containing batteries should be designed to reduce the risk of fire, explosion and chemical leaks under normal operating conditions and after a single damage in the equipment, including battery damage. For batteries replaced by the user, the probability of installing them with reverse polarity should be reduced or there should be an electrical circuit that eliminates the power connection when installing batteries with reverse polarity, if this can create a hazard.

If a replaceable battery is used in the equipment and incorrect replacement may lead to an explosion, the marking specified in paragraph 43 of this Technical Regulation shall be provided .

6. If flammable liquids are used in the equipment, they must be stored in a closed container, except for the quantity necessary for the operation of the equipment. The maximum volume of the flammable liquid in the equipment in general should not exceed 5 dm^3. However, if more than 5 dm^3 liquid is required for the operation of the equipment for 8 hours , its quantity can be increased up to the volume providing the equipment operation within 8 hours.

The oil or equivalent fluid used for lubrication or in the hydraulic system must have a flash point of at least 149 $^{\circ}C$.

Replenishable fluids should have a flashpoint above 60 $^{\circ}C$ and should not be under pressure that can cause sprays.

Replenishable flammable liquids with a flash point of less than 60 $^{\circ}C$ or under pressure sufficient to cause sputtering may be used provided that there are no conditions for a fire or explosion.

7. Protection of equipment under overload conditions and abnormal conditions must meet the following requirements:

the design of the equipment should limit the risk of fire arising from electrical or mechanical overloads, failures, abnormal operation or errors in operation;

the motors must be protected or have a motor safety shut-off system, so that they do not create a danger in case of overload, temperature increase, braked rotor and other abnormal conditions;

transformers must be protected against overloads;

The leakage distances and clearances should be chosen so as to prevent the ignition of parts of equipment made of electrically insulating materials in emergency operation mode;

The design of the thermostats, temperature limiters and thermal switches built into the equipment must prevent the possibility of a significant change in the setting values due to heating and other influences during normal operation.

A thermal switch with automatic reset must automatically turn on the current after the part of the equipment controlled by it is sufficiently cooled.

8. Requirements for communication cables and cable equipment should be as follows:

communication cables intended for laying in collectors, tunnels, mines, on the inner walls of buildings and indoors should not spread combustion in a single laying;

Communication cables intended for laying in collectors, tunnels, mines, inside walls of buildings and indoors in bundles should not spread combustion while laying in beams in category A (seven liters of combustible material per 1 m of cables in a bundle);

cross equipment must be fireproof;

insulating parts of load-bearing cross-country structures and terminal cable devices must be made of non-flammable or hardly combustible and hardly flammable materials;

the activation of electrical protection in the cross-country under the influence of dangerous currents and voltages should not lead to a fire.

APPENDIX No. 5 to the General Technical Regulations on the Safety of Telecommunications Equipment

REQUIREMENTS
to electrical safety

1. The classes of equipment for protection from electric shock include:

equipment class I - equipment in which protection against electric shock is provided by the basic insulation, as well as the presence of means of connecting to the protective earthing loop of the room of those conductive parts where a dangerous voltage may appear in case of breakdown of the main insulation. Class I equipment may have parts with double or reinforced insulation;

Class II equipment is an equipment in which protection against electric shock is based not only on the use of basic insulation, but also on additional security measures such as double or reinforced insulation, and neither protective earthing nor the protection provided during installation equipment;

equipment class III - equipment in which protection against electric shock is provided by power from the safe ultra-low voltage (SELV) circuits and in which no dangerous voltage arises. For Class III equipment, there are no requirements for protection against electric shock;

equipment class 0I - equipment in which protection against electric shock is provided by the main insulation and includes a clamp for grounding, but equipped with a power cord without a grounding wire and a plug without a grounding contact.

2. The equipment must be designed in such a way that the human access zone has the necessary protection against contact with:

externally low voltage parts (CNS);

exposed parts that are under dangerous voltage;

functional or basic insulation of parts or wires of CNN chains;

functional or basic insulation of parts or wires under dangerous voltage;

ungrounded conductive parts separated only by functional or basic insulation from CHN chains or chains under dangerous voltage;

naked parts of the voltage network of the telecommunications network (NTS), except for those that are allowed to access;

exposed conductive parts located in the battery compartment;

exposed conductive parts of the NTS-1 circuits having any point connected to the protective earth terminal;

exposed conductive parts of connectors in circuits NTS - 1, separated from available ungrounded conductive parts of equipment.

Unrestricted access is allowed to circuits with current limitation.

These requirements apply to all positions of the connected equipment and operating under normal operating conditions.

3. Protection must be provided by insulation, fencing or blocking.

4. The equipment must be designed and manufactured so that manual operations such as setting the supply voltage or changing the type of power, replacing fusible inserts and indicator lighting elements, manipulating the withdrawable parts, etc., do not carry the danger of injury with an electric shock.

5. Equipment that can be regulated for different voltages of the primary power source must be designed so that manually changing the installation of different AC mains voltage would require the use of the instrument if improper installation or negligent regulation can lead to danger.

6. Bared portions under dangerous voltage shall be so placed or protected so that during unattended maintenance of other parts of the equipment unintentional contact with bare parts is excluded.

Bare parts under dangerous voltage must be placed in such a way or protected so as to exclude the possibility of accidental closure with SELV chains or with HTS circuits, for example, tools or test probes used by maintenance personnel.

7. Requirements for circuits SELV:

1) in the SELV circuits, the voltage must be safe to touch both in normal operation and after a single fault.

Under normal operating conditions in a separate SELV circuit or in mutually connected SELV circuits, the voltage between any two wires of the SELV chain or circuits and between any one such wire and ground must not exceed 42.4 V of the AC voltage amplitude or 60 VDC.

For a single fault, the voltage between any two wires of the SELV chain or circuits and between any one such wire and ground must not exceed 42.4 V of the AC voltage amplitude or 60 VDC after 0.2 s. In addition, an excess of 71 V of the amplitude of the AC voltage or 120 VDC is not permissible.

To meet this requirement, one of the following methods can be used:

separation with double or reinforced insulation (method 1);

separation by a grounded shield (method 2);

protection by grounding of the SELV circuit (method 3);

2) in a separate circuit of the NTS or in interconnected HTS circuits, the voltage between any two conductors of the circuit or circuits of the NTS, as well as between any wire of the circuit or NTS circuits and ground must correspond to the following:

a) NTS circuits - 1. The voltages must not exceed the following values:

tolerances for SELV circuits under normal operating conditions;

the tolerances shown in Figure 1 , measured with a resistor of 5000 Ω ± 2%, in the case of a single insulation fault inside the equipment;

b) chains NTS - 2 and NTS - 3. In this case, the values of the voltages exceed the tolerances for the SELV chain, but no more than the following:

voltage values of signals that must meet the requirements for a ringing telephone signal;

in the absence of a ringing telephone signal;

the combination of AC and DC voltages in normal operating conditions must satisfy the condition:

U_{ac} is the amplitude value of the AC voltage at any frequency, V;

U_{dc} is the value of the DC voltage, V.

Notes:

1. If the value of the voltage U_{dc} is zero, then the voltage value U_{ac} can not be more than 70.7 V of the amplitude value.

2. When the voltage value U_{ac} is zero, the voltage value U_{dc} can not be more than 120 V.

The tolerances in figure 1 are measured with a resistor of 5000 Ω ± 2% in the case of a single insulation fault inside the equipment.

The tolerances for the NTS-2 and NTS-3 circuits with single insulation failures, separated from the SELV circuits, NTS-1 and available conductive parts, must not exceed the corresponding tolerances for the SELV, NTS-1 circuits and available conductive parts.

The connection of the SELV and STS circuits to other circuits is allowed provided that these circuits are separated by a basic insulation from the primary circuit, including neutral.

8. The requirements for a current limited circuit should be as follows:

1) Current-limiting circuits shall be designed so that permissible limits are not exceeded when operating under normal conditions and in the event of a single damage in the equipment;

2) requirements for the values of permissible limits for circuits with current limitation:

for frequencies not exceeding 1 kHz, the value of the steady-state current passing through the non-inductive resistance resistor of 2000 Ω ± 10% included between any two parts of the current-limiting circuit or between any such part and ground shall not exceed 0.7 mA for the amplitude of the variable or 2 mA of direct current;

for frequencies above 1 kHz, the 0.7 mA value is multiplied by the frequency value in the kHz, but it should not be more than 70 mA of the AC amplitude.

For parts under voltage not exceeding 450 V of the amplitude value for a variable or the same DC value, the circuit capacitance shall not exceed 0.1 μF.

For parts where the voltage *U* is within the range of 0.45 to 15 kV of the amplitude of a variable or the same DC value, the capacitance of the circuit (C), nF, shall not exceed the value calculated by the formula:

U is the voltage, kV.

Note: The 45 / U value corresponds to an allowable accumulated charge of 45 μC.

For parts where the voltage *U* exceeds 15 kV of the amplitude value of a variable or the same value of direct current, the capacitance of the circuit (C), nF, shall not exceed the value calculated by the formula:

U is the voltage, kV.

Note. A value of 700 / U 2 corresponds to an allowable energy of 350 mJ.

9. Requirements for limited power network power supplies should be as follows:

1) A limited-power AC power source operating from AC power or a battery limited power source that, when the load is powered, is charged from AC power, must have an isolating transformer;

2) the power supply with power limitation must meet one of the following conditions:

to the output parameters, restrictions are imposed according to Table No. 1 ;

the total output resistance must satisfy the requirements of Table No. 1 ;

the overcurrent protection device is used, and the output parameters are limited according to Table No. 2 ;

the network control limits the output parameters according to Table No. 1 both under normal operating conditions and after a single fault;

the network regulation limits the output parameters according to Table No. 1 both under normal operating conditions and after a single fault in the control network (open or short circuit of the circuit);

the network regulation limits the output parameters in accordance with Table No. 1 when operating in normal mode, and the overcurrent protection device limits the output parameters according to Table No. 2 after a single fault in the control network (open or short circuit).

When using the overcurrent protection device, it is necessary to use a fuse or an electromechanical device without adjustment and auto-return.

Table No. 1

Limit values for power supplies containing limiting devices

The output voltage $U_{x.x}$ [1], V		**Output current $I_{к.з}$ [2], A**	**Valid power S [3], V × A**
alternating current	**direct current**		
≤ 20	≤ 20	≤ 8.0	≤ 5 x U_{xx}
20 < $U_{x.x}$ ≤ 30	20 < $U_{x.x}$ ≤ 30	≤ 8.0	≤ 100
-	30 < $U_{x.x}$ ≤ 60	≤ 150 / $U_{x.x}$	≤ 100

[1] $U_{x.x}$ - output voltage measured with all disconnected load circuits. Voltages are given for sinusoidal alternating current and direct current, without pulsations. For non-sinusoidal

alternating current and direct current with amplitude ripple values of more than 10%, the amplitude values of the voltages should not exceed 42.4 V;

[2] $I_{к.з}$ - maximum output current after 60 s of operation in the absence of capacitive load, including short-circuited circuits;

[3] S - maximum total output power at any load. Exceeding the boundary value for transients upon start-up with a duration of less than 100 ms is allowed.

Table No. 2

Limit values for power supplies that do not contain a limitation device (only overcurrent protection devices are required)

The output voltage $U_{x.x}$ [1], V		Output current $I_{к.з}$ [2], A	The real power S [3], B · A	Nominal value of the current of the protection device [4], A
alternating current	direct current			
≤ 20	≤ 20	≤ 1000 / $U_{x.x}$	≤ 250	≤5,0
20 <$U_{x.x}$ ≤30	20 <$U_{x.x}$ ≤ 30			≤ 100 / $U_{x.x}$
-	30 <$U_{x.x}$ ≤ 60			≤ 100 / $U_{x.x}$

[1] $U_{x.x}$ - output voltage, measured with all disconnected load circuits. Voltages are given for sinusoidal alternating current and direct current, without pulsations. For non-sinusoidal

alternating current and direct current with amplitude ripple values of more than 10%, the amplitude values of the voltages should not exceed 42.4 V;

[2] $I_{к.з}$ - maximum output current after 60 s of operation in the absence of capacitive load, including short-circuited circuits, without taking into account current protection devices. Current limited by impedance

equipment, flows in the circuit during measurements of the overcurrent protection device;

[3] S - maximum total output power at any load and without current protection devices. From consideration, transient processes are excluded when starting with a duration of less than 100 ms;

Note: The basis for excluding measurements with overcurrent protection devices is the total energy that is the cause of possible excessive overheating during the operation of overcurrent protection devices.

[4] The rated current value for protection devices such as fuses and circuit breakers is determined on the assumption that they are triggered when a current of 210%

from the nominal value given in this table.

10. Requirements for protective earthing should be as follows:

1) parts of telecommunications equipment that are subject to fault currents when overcurrent protection devices are triggered, as well as conductive other currents should be securely connected to the main protective earth terminal of the equipment.

The parts that lead to fault currents when overcurrent protection devices are triggered include:

accessible conductive parts that can carry a dangerous voltage in the event of a single damage;

parts that must be grounded to maintain the integrity of the SELV chain;

parts that must be grounded to maintain the integrity of the circuit of the NTS;

SELV circuits, HTS circuits and accessible conductive parts, which must be grounded if the power supply is not a telecommunications network.

The parts that conduct other currents include:

circuits SELV, NTS and available conductive parts, which must necessarily be grounded, if the power supply is a telecommunications network;

transformer screens and components (such as lightning protection) that do not have to take the dangerous voltage in case of a single fault, but must be grounded to reduce transients that can operate in isolation;

the SELV circuits and HTS circuits, which must necessarily be grounded to reduce or eliminate the contact current in the telecommunications network;

2) in the area accessible for maintenance, conductive parts, such as the motor housing, electronic circuitry, etc., where a hazardous voltage may occur in case of a single insulation fault, must either be connected to the protective earth terminal, or, if this impossible or difficult to implement, be provided with a special inscription warning the maintenance personnel that these parts are not grounded and before touching them, it is necessary to check the absence of dangerous voltage;

Note: The requirement does not apply to accessible conductive parts that are separated from parts under hazardous voltage, grounded metal parts or solid insulation, air gap or a combination thereof that satisfy the requirements for double or reinforced insulation. In this case, these parts must be fixed and rigid enough that during the entire life of the product the specified minimum distances are kept.

3) the resistance of the protective conductor must not be more than 0.1 Ohm.

11. If functional earthing of accessible or other conductive parts is required, the following requirements apply to functional earthing circuits:

1) The functional ground circuit shall be separated from dangerous voltage parts in equipment with double or reinforced insulation, as well as a protective earthing screen or other part of conductive protective earth, separated from the parts under dangerous voltage, at least by basic insulation;

2) it is permissible to connect the functional ground circuit to the protective earth terminal or to the conductor of the protective connection;

3) terminals used only for functional earthing shall not be marked with a symbol or with the exception of places where a conductive clip is provided on the component (for example, terminal block or assembly where the symbol is allowed);

4) for the internal functional grounding do not use wires with green-yellow insulation, except for complex enlarged parts (for example, multi-wire cables or EMC filters);

5) conductors with green-yellow insulation, located in the power cable, are used only for connection to the functional earth;

6) equipment must not be marked with a symbol

7) if there are no other requirements, it is necessary that the functional ground wire terminates in the equipment.

12. The requirements for conductors and protective earth terminals must be as follows:

1) the main protective earth terminal for equipment connected permanently must:

a) To be located so that it is easily accessible during power connection;

b) be provided with the support clamps, pins, screws, bolts and / or similar terminals provided during manufacture, together with the necessary fasteners, if a protective earth conductor of more than 7 mm ^{2} (diameter 3 mm or more) is used;

c) be marked with a symbol or

2) for protective earth conductors, protective conductor conductors and for functional ground conductors, the limiting current must be adequate to the actual current under normal operating conditions, i.e. they must remove the fault currents to the ground.

The minimum dimensions of the conductors of the protective connection must meet the requirements given in Table No. 3 .

Table No. 3

Minimum size of protective connection conductors

Rated current of the circuit in question, A	**Minimum cross-sectional area of conductor, mm ^{2}**
Up to 16 inclusive	-
Holy 16 to 25 inclusive	1.5
from 25 to 32	2.5
from 32 to 40	4.0
from 40 to 63	6.0
63 to 80	10
from 80 to 100	16.0
from 100 to 125	25.0
from 125 to 160	35.0
from 160 to 190	50.0
from 190 to 230	70.0
from 230 to 260	95.0

from 260 to 300	120.0
from 300 to 340	150.0
from 340 to 400	185.0
from 400 to 460	240.0

The rated current of the circuit used in Table No. 3 depends on the condition and location of the overcurrent protection devices and must be equal to the smallest value from:

the rated current of the equipment;

the rated value of the current of the overload protection device specified in the installation instruction for the equipment to be provided in the building electrical wiring;

the rated current of the overload protection device built into the equipment and protecting the circuit or part requiring grounding;

3) the insulation color of the protective earth conductor in the power cable supplied with the equipment must be green-yellow. If the conductor of the protective connection is insulated, the insulation must be green-yellow except in the following cases:

For earthing braiding the insulation must be green-yellow or transparent;

for the conductor of the protective connection in such units as ribbon cables, feeders, printed mounting, etc. allow any color, if the wrong interpretation of the use of the wire is excluded;

4) the terminals must meet the following requirements:

Equipment in which protective earthing is required must have a main protective ground terminal. For equipment with a detachable power supply cord, the ground terminal of the input to the device is considered the main protective ground terminal;

If the equipment is equipped with more than one power connection (for example, when powered by different voltages or frequencies, or from a backup power source), it is allowed to have a main protective ground terminal combined with such a power connection. In this case, the clamps must be commensurate with the corresponding nominal power inputs;

The design of the terminals should prevent unintentional attenuation of the wires. In general, the design for current-carrying terminals is used, other than the reference type terminals, providing sufficient resiliency in accordance with this requirement. For other designs, special support should be used, for example the use of suitable elastic parts, which can not be accidentally forgotten during installation;

all terminals of protective earthing and connections of supporting, pin and screw types must have dimensions, proceeding from the current flowing;

5) requirements for separation of the protective earth conductor from the conductors of the protective connection:

separate terminals must be provided for connection (in case of location on one bus) separately for each protective earth conductor and separately for each conductor of the protective connection;

as an exception, it is allowed to have one screw-type or pin-type terminal for permanently connected equipment with a non-detachable power supply cord or for equipment connected by a type A or B connector having a special non-detachable power supply cord, the protective ground wire at the same terminal be separated by a nut from the wire of the protective connection. The procedure for connecting the protective earth conductor and the wires of the protective connection to the terminal is not established;

it is also possible to supply equipment with an instrument input to a separate terminal;

6) the integrity of the protective earth must meet the following requirements:

a) for equipment integrated into the system, provision of protective earthing shall be guaranteed for all equipment in accordance with the requirements for connecting the protective earth, without regard to the location of equipment in the system;

b) equipment that contains a conductor of the protective connection to maintain continuity of the protective earthing circuit in other equipment in the system shall not be marked with a symbol

c) the protective earth conductors and the conductors of the protective connection must not contain switches or overcurrent protection devices;

d) the protective earth connections must be such that disconnection at one point or system does not disrupt the protective earth connections in other parts or blocks of the system if a possible danger is not excluded at this time;

e) the connection of the protective earth must occur before the moment of power connection and break after its deactivation for each of the following structures:

connectors of parts that can be removed by service personnel;

power supply cord plug;

connection device with household appliances;

e) the protective grounding must be made in such a way that when removing the serviced part, it is not violated for other parts, if a possible danger is not excluded at this time;

g) the conductive parts at the connection point to the protective earth terminal shall not be subjected to significant corrosion due to electrochemical processes during operation, storage or transport under the conditions specified in the manufacturer's instructions. Corrosion resistance can be additionally provided with a suitable coating;

h) self-tapping (thread-cutting and thread-forming) and spatially threaded screws (of sheet metal) are allowed to provide protective connections, if this is not related to the need for disruption of connections during maintenance.

In any case, the thickness of the metal part at the place of application of the internal thread must be at least twice the depth of the screw thread. It is allowed to use the local pressing of the metal part to increase the effective thickness.

At least two threads should be used for each connection. In addition, single self-tapping screws are allowed provided that the thickness of the metal part at the thread cutting site must be at least 0.9 mm for thread-forming screws and 1.6 mm for thread-cutting screws;

i) protective earthing should not be carried out through the telecommunications network.

13. Requirements for overcurrent and earth-fault protection in primary circuits include:

1) requirements for protection in primary circuits:

a) protection in primary circuits from the current of overload, short circuit, earth fault must either be part of the equipment, or be an integral part of the building network;

b) if the protection of equipment connected by a Type B connector or permanently connected equipment is provided by the safety devices of the wiring in the building, the assembly instructions for the equipment shall establish and precisely determine the protection requirements against short circuit or overcurrent, or, if necessary, for both cases;

c) the protective devices must have the necessary breaking capacity and interrupt the maximum possible current caused by the malfunction (including the short-circuit current);

d) for permanently connected equipment or for equipment connected by a Type B connector, a redundant short circuit protection is allowed in the building's power system;

e) for equipment connected by a type A connector, the installation of a protective device in the power system of the building is considered sufficient to protect against short circuit;

Note. If fuses are used in primary circuits, they should have a high breaking capacity (1500 A) if the expected short-circuit current exceeds 35 A or 10 times the rated fuse current, however large it may be.

e) the number and arrangement of protective systems or devices in the primary circuit must be such as to detect and interrupt the overload currents that have occurred in any current circuit (for example between phases, between phase and neutral, between phase and protective earth conductor or between phase and conductor protective compounds listed in Tables 4 and 5);

g) do not apply protection against ground damage in the equipment in each of the following cases:

there is no ground connection;

there is a double or reinforced insulation between the primary circuit and all parts connected to the ground;

Note: If double or reinforced insulation is used, a short to ground fault should be considered as double damage.

h) when connecting the power supply to a load using more than one phase conductor, if the protective device breaks the neutral wire, it must simultaneously break all other power wires. Therefore, in such cases, single-pole protective devices are not used;

Table No. 4

Examples of protective devices in single-phase equipment or subsystems

Sources supplying equipment	Protection	Minimum number of fuses or poles of the circuit breaker	Installation location
Example A Equipment connected to the ENERGY SYSTEM with easily identifiable grounded neutral, except as given in Example C	from earth fault	1	Phase wire
	from the overload current	1	One of the two wires
Example B Equipment that can be connected to any power source, including IT ENERGY SYSTEM and power supply with reversible plug connection, except as given in Example C	from earth fault	2	Both wires
	from the overload current	1	One of the two wires
Example C Equipment connected to a three-wire power supply system with an easily grounded neutral	from earth fault	2	Each phase conductor
	from the overload current	2	Each phase conductor

Table No. 5

Examples of protective devices of three-phase equipment

Power system	Number of feed wires	Protection	Minimum number of fuses or poles of the circuit breaker	Installation location
Three-phase without neutral	3	from earth fault	3	All three wires
		from the overload current	2	Any two wires
With grounded neutral (TN or TT)	4	from earth fault	3	Each phase conductor
		from the overload current	3	Each wire line
With an ungrounded neutral	4	from earth fault	4	All four wires
		from the overload current	3	Each phase conductor

2) if the protection devices are used in more than one power pole for the load in question, these devices are placed together. It is allowed to combine two or more security devices into a single device;

3) prevention requirements for maintenance personnel include the following:

a) the relevant marking shall be provided on the equipment or the requirements shall be given in the operating instructions in order to alert the operating personnel of a possible hazard in the following cases:

if in the neutral of single-phase equipment of Class I either permanently connected or equipped with a plug with oriented pins, fuses are installed;

if, after the protective device has been triggered, parts of the equipment that remain under voltage may present a hazard during maintenance;

b) it is possible to apply the following (or similar) warning, as shown in the example:

ATTENTION! ***ATTENTION!***
DOUBLE-POLE FUSE FUSE ***FUSION FUSE IN NEUTRAL***

14. Requirements for security interlocks should be as follows:

1) security locks are installed where access of maintenance personnel is permitted to the area that is dangerous under normal conditions;

2) the design of the safety interlocks must eliminate the danger before the lid, door and other opening parts of the equipment are in a position that makes it possible to contact dangerous parts;

3) protection against electric shock and energy hazard when moving the cover, opening or removing the cover, the door and other opening parts of the equipment must inevitably be accompanied by a preliminary power failure of such parts or automatically cause a power failure of such parts and reduce the voltage to 42, 4 V voltage amplitudes or 60 VDC or less, and the energy level lowered to less than 20 F;

4) for a moving part, inertially retaining its motion and continuing to present a mechanical hazard with a closed door or lid, which are shifted, opened or removed, it is necessary:

mandatory prior reduction of movement to a safe acceptable level;

automatically ensure a reduction in movement to a safe acceptable level;

5) the design of protective locks should exclude the possibility of unintentional occurrence of danger with unclosed lids, fences, doors;

6) the safety interlocks should be selected taking into account mechanical shocks and vibrations arising during normal operation, so that they do not cause unintended operation, which leads to dangerous consequences;

7) the safety lock system must be designed so that there is no damage to the locking system during the normal service life of the equipment, and if it does not create an extreme danger that requires protection;

8) moving parts in mechanical and electromechanical locking systems must have adequate strength;

9) if it becomes necessary for maintenance personnel to disable the safety interlocks, the following should be provided:

perform special actions to shutdown;

automatic return to the state of normal operation after the end of maintenance or prohibition of normal operation, until the maintenance staff completes the repair;

there is no possibility of bypassing the safety interlocks in case of extreme danger, if other means of protection do not provide safety in this case. The equipment must be designed so that the blockage can not be ruled out unless other means of protection are installed and do not start working;

10) if the interlock contacts break the primary circuit, then the clearance between them must be at least 3 mm. If the contacts break apart other than the primary circuit, then the gap between them must be at least the minimum gap value in accordance with the requirements for the main insulation in the secondary circuit;

11) if the safety of the moving part is provided by the mechanical locking system, measures must be taken to protect the moving part from overloading. If this requirement is not met due to the construction of the component parts, the movement of the actuator beyond the operating position must be limited to 50% of the maximum, for example, during installation or placement or by adjustment.

15. Insulation categories must meet the following requirements:

1) isolation is considered as functional, basic, additional, reinforced or double.

Examples of insulation applications are shown in Table 6 and shown in Figure 2 .

Table No. 6

Application of insulation

Degree of isolation	Insulation location		Explanations to Figure 2
	between	and	
1	2	3	4
1 Functional	an ungrounded SELV circuit or a conductor, insulated double insulation	grounded conductive part	F1
		conductive part, insulated double insulation	F2
		ungrounded SELV chain	F2
		grounded by SELV chain	F1
		grounded by NTS-1 circuit	F10
	grounded by SELV chain	grounded by SELV chain	F11
		grounded conductive part	F11
		ungrounded NTS-1 circuit	F12
		grounded by NTS-1 circuit	F13
1	2	3	4
1 Functional	SNN chain or conductive part, insulated main insulation	grounded conductive part	F3
		grounded by SELV chain	F3
		conductive part, insulated main insulation	F4
		CNN chain	F4
	grounded secondary circuit under dangerous voltage	grounded secondary circuit under dangerous voltage	F5
	NTS-1 chain	NTS-1 chain	F7
	NTS-2 chain	NTS-2 chain	F8
	NTS-3 chain	NTS-3 chain	F9
	layers of transformer windings		F6
2 Basic	Primary Chain	grounded or ungrounded secondary circuit under hazardous voltage	B1
		grounded conductive part	B2
		grounded by SELV chain	B2
		conductive part, insulated main insulation	B3
		CNN chain	B3
	grounded or ungrounded secondary circuit under hazardous voltage	Ungrounded secondary circuit under hazardous voltage	B4

		grounded conductive part	B5
		grounded by SELV chain	B5
		conductive part, insulated main insulation	B6
		CNN chain	B6
	an ungrounded SELV circuit or a conductor, insulated double insulation	ungrounded NTS-1 circuit	B7
		NTS-2 chain	B8
		NTS-3 chain	B9
	grounded by SELV chain	NTS-2 chain	B10
		NTS-3 chain	B11
	NTS-2 chain	ungrounded NTS-1 circuit	B12
		grounded by NTS-1 circuit	B13
		NTS-3 chain	B14
	NTS-3 chain	ungrounded NTS-1 circuit	B12
		grounded by NTS-1 circuit	B13
3 Optional	conductive part, isolated main insulation or CNN chain	conductive part, insulated double insulation	S1 [1)]
		ungrounded SELV chain	S1 [1)]
	NTS chain	conductive part, insulated main insulation	S2
		CNN chain	S2
4 Additional or reinforced	Ungrounded secondary circuit under hazardous voltage	conductive part, insulated double insulation	S / R1 [2)]
		ungrounded SELV chain	S / R1 [2)]
		NTS chain	S / R2 [2)]
5 Reinforced	primary chain	conductive part, insulated double insulation	R1
		ungrounded SELV chain	R1
		NTS chain	R2
	grounded secondary circuit under dangerous voltage	conductive part, insulated double insulation	R3
		ungrounded SELV chain	R3
		NTS chain	R4

[1)] The operating voltage for additional insulation between the CHN circuits or the conductive part with the main insulation and the ungrounded accessible conductive part is equal to the most unfavorable

working voltage for basic insulation. The most unfavorable operating voltage may be the result of a primary or secondary network and, in accordance with this, a requirement for isolation is established.

[2)] The insulation between an ungrounded secondary circuit with a hazardous voltage and an ungrounded conductive accessible part or circuit (S / R in Figure 2) must satisfy the following unfavorable requirements:

reinforced insulation, the operating voltage of which is equal to the dangerous voltage;

additional insulation, the operating voltage of which is equal to the voltage between the secondary circuit with dangerous voltage;

another secondary circuit with dangerous voltage or primary circuit.

These examples apply if:

Only the basic insulation between the secondary and primary circuits is used;

Only the basic insulation between the secondary circuit and ground is used.

Note. The term "conductive part" refers to an electrically conductive part that:

a) is normally not under voltage;

b) is not connected to any of the following circuits:

chain under dangerous voltage;

chain CNS;

chain NTS;

chain SELV;

circuit with current limitation.

Figure 2 - Examples of the use of insulation.

Examples of such a conductive part are equipment housings, transformer cores and, in some cases, conductive screens in transformers.

If such a conductive part is protected from a part under dangerous voltage by:

double or reinforced insulation, it is defined as "a conductive part with double insulation";

basic insulation plus protective earth, it is defined as "grounded conductive part";

the main insulation, but without grounding, i.e., it does not have a second level of protection, it is defined as a "conductive part with a basic insulation".

The term "grounded" refers to a circuit or conductive part if they are connected to a protective earth terminal. Otherwise, the chains or conductive parts are defined by the term "ungrounded".

When choosing and using insulating materials, it is necessary to take into account the requirements for electrical, thermal and mechanical strength, working voltage frequency, and also to the environmental conditions (temperature, pressure, humidity and contamination);

2) hygroscopic materials and materials containing asbestos and natural rubber are not used for insulation;

3) the insulation of the equipment must meet the requirements:

by heating;

requirements for electrical strength;

requirements for the distance of leakage on the surface and clearance;

4) the insulation used in the equipment must be chosen so that when operating under normal load the temperature does not exceed the safe value in accordance with Table No. 7 .

Table No. 7

Limit values of heating

Parts of equipment	**Maximum heating, K**
Insulation, including insulation of windings:	
material of class A	75
material of class E	90
material of class B	95
material of class F	115
material of class H	140

Insulation of synthetic rubber or PVC inner and outer wires, including power cables: without a temperature T with the temperature T	50 T-25
Other thermoplastic insulation Terminals, including ground terminals for external grounding conductors of fixed equipment, with the exception of a non-removable power supply cord	[1] 60
[1] Due to the large range, it is not possible to set all permissible heating limits for thermoplastic materials, therefore, in each specific case, the thermoplasticity of the insulation material is determined.	

5) the insulation used in the equipment must have sufficient electrical strength and withstand the test voltage specified in Tables 8 and 9 .

Table No. 8

Voltage value for the electric strength test

Type of Isolation	**Application points (if necessary)**						
	primary circuit - housing primary circuit - secondary circuit between parts in the primary chain					**secondary circuit - housing between independent secondary circuits**	
	Operating voltage, V (peak or DC)					Operating voltage, V	
	U ≤ 184 [1]	184 <U ≤ 354 [2]	354 <U ≤1410	1.410 <U <10000 [3]	(10 <U ≤ 50) kV	U ≤42,4 peak or 60 direct current [4] .	U ≤ 42,4 peak or 60 direct current <U ≤ 10 kV peak or 60 direct current [4]
	Test voltage, V, rms value [5]						
Functional	1000	1500	See In [a] (table 11)	See In [a] (table 11)	1.5 U	500	See In [a] (table 11)
Primary, additional						Without testing	
Reinforced	2000	3000	3000	See In [b] (table 11)			

[1] This graph is used for a DC mains voltage of up to 130 V, which is affected by the transient line voltage.

[2] This graph is used for the DC voltage of the DC. 130 to 250 V, which is subjected to the transient line voltage.

[3] This graph is used for the DC voltage of the DC. 250 V, which is subjected to the transient line voltage.

[4] This graph is used for the DC voltage received from an AC or DC power source built into the equipment.

[5] For operating voltages in the secondary circuits of St. 10 kV (peak value or direct current) use the same values as for primary circuits.

6) insulation in thin sheet materials is permissible, regardless of its thickness, provided that it is used inside the equipment casing, is not subjected to mechanical impact or abrasion during maintenance by the operator and is applied under one of the following conditions:

additional insulation consists of not less than two layers of material, each of which withstands the tests for electrical strength, both for additional insulation;

additional insulation consists of three layers of material, all combinations of two layers of which together must withstand the tests for electrical strength, both for additional insulation;

reinforced insulation consists of not less than two layers of material, each of which withstands tests for electrical strength, both for reinforced insulation;

The reinforced insulation consists of three layers of insulating material, all combinations of two layers of which together withstand the tests for electrical strength, both for reinforced insulation.

7) for multilayer insulation it is not necessary that all layers are made of the same insulating material;

8) coatings based on soluble enamels are not considered as insulation in thin sheet material.

Table No. 9

STRESSES

for electric strength testing

Voltage U Peak value or direct current	Test voltage (rms)		Voltage U Peak value or direct current	Test voltage (rms)		Voltage U Peak value or direct current	Test voltage (rms)	
	In a	In b		In a	In b		In a	In b
1	2	3	4	5	6th	7th	8	9
34	500	800	250	1 261	2 018	1 750	3 257	3 257
35	507	811	260	1 285	2 055	1 800	3,320	3,320
36	513	821	270	1 307	2 092	1 900	3 444	3 444
38	526	842	280	1 330	2 127	2,000	3 566	3 566
40	539	863	290	1 351	2 162	2 100	3 685	3 685
42	551	882	300	1 373	2 196	2 200	3,803	3,803
44	564	902	310	1 394	2 230	2 300	3,920	3,920
46	575	920	320	1 414	2 263	2 400	4 034	4 034
48	587	939	330	1,435	2 296	2 500	4 147	4 147
50	598	957	340	1455	2 328	2 600	4,259	4,259
52	609	974	350	1 474	2 359	2 700	4,369	4,369
54	620	991	360	1 494	2,390	2 800	4,478	4,478
56	630	1,008	380	1,532	2 451	2 900	4,586	4,586
58	641	1 025	400	1,569	2 510	3,000	4,693	4,693
60	651	1 041	420	1 605	2 567	3 100	4,798	4,798
62	661	1 057	440	1 640	2 623	3 200	4,902	4,902
64	670	1 073	460	1 674	2,678	3 300	5,006	5,006
66	680	1,088	480	1 707	2 731	3 400	5 108	5 108
68	690	1 103	500	1 740	2 784	3 500	5,209	5,209
70	699	1 118	520	1 772	2 835	3 600	5,309	5,309
72	708	1 133	540	1,803	2 885	3 800	5,507	5,507
74	717	1 147	560	1 834	2 934	4,000	5,702	5,702

76	726	1 162	580	1 864	2 982	4 200	5,894	5,894
78	735	1 176	588	1 875	3,000	4 400	6,082	6,082
80	744	1 190	600	1 893	3,000	4 600	6,268	6,268
85	765	1 224	620	1 922	3,000	4 800	6,452	6,452
90	785	1 257	640	1 951	3,000	5,000	6 633	6 633
95	805	1 288	660	1 979	3,000	5,200	6,811	6,811
100	825	1 319	680	2,006	3,000	5 400	6,987	6,987
105	844	1 350	700	2 034	3,000	5 600	7 162	7 162
110	862	1 379	720	2 060	3,000	5 800	7,334	7,334
115	880	1 408	740	2 087	3,000	6,000	7,504	7,504
120	897	1,436	760	2 113	3,000	6 200	7 673	7 673
125	915	1 463	780	2 138	3,000	6 400	7,840	7,840
130	931	1 490	800	2 164	3,000	6 600	8,005	8,005
135	948	1517	850	2 225	3,000	6 800	8 168	8 168
140	964	1,542	900	2 285	3,000	7,000	8,330	8,330
145	980	1,568	950	2 343	3,000	7,200	8,491	8,491
150	995	1 593	1,000	2 399	3,000	7 400	8 650	8 650
152	1,000	1 600	1 050	2 454	3,000	7,600	8,807	8,807
155 [1)]	1,000	1 617	1 100	2 508	3,000	7,800	8,964	8,964
160 [1)]	1,000	1 641	1 150	2 560	3,000	8,000	9 119	9 119
165 [1)]	1,000	1 664	1 200	2 611	3,000	8 200	9 273	9 273
170 [1)]	1,000	1 688	1 250	2 661	3,000	8 400	9,425	9,425
175 [1)]	1,000	1 711	1,300	2 710	3,000	8,600	9,577	9,577
180 [1)]	1,000	1 733	1 350	2 758	3,000	8 800	9,727	9,727
184 [1)]	1,000	1 751	1 400	2,805	3,000	9,000	9,876	9,876
185	1, 097	1 755	1 410	2 814	3,000	9 200	10,024	10,024
190	1 111	1 777	1 450	2,868	3,000	9 400	10 171	10 171
200	1 137	1 820	1 500	2 934	3,000	9 600	10 317	10 317
210	1 163	1 861	1 550	3,000	3,000	9 800	10 463	10 463
220	1 189	1,902	1 600	3,065	3,065	10,000	10,607	10,607
230	1 214	1 942	1 650	3 130	3 130			
240	1 238	1 980	1 700	3 194	3 194			

[1)] For these voltages, the values of $B_{b\,are}$ determined by the total curve $B_b = 155.86\ U^{0.4638}$, and not $1.6\ V_a$. Linear interpolation between adjacent points in the table is resolved.

16. Requirements for manual controls should be as follows:

1) current-carrying handles, handles, levers, control buttons and other similar controls must not contact parts that are under dangerous voltage or SNN and NTS circuits;

2) Handles, handles, levers, control buttons and other similar parts made of electrically conductive material, normally operated manually and grounded only through a shaft or bearing, must satisfy one of the following requirements:

be separated from the parts under dangerous voltage by double or reinforced insulation;

have accessible parts covered with additional insulation.

17. The insulation requirements for overvoltage caused by transients should be as follows:

1) for equipment powered from an alternating current network, the value of the voltage of the transient process depends on the category of overvoltage and the nominal value of the AC supply voltage. In general, the gaps in the equipment circuits powered by the AC mains must correspond to the values for the transient voltage of the overvoltage category II network;

2) equipment that can be subjected to transient overvoltages exceeding the specified values for overvoltage category II should be rated for surge category III or IV, unless external equipment provides additional protection. In this case, the instructions for installing the equipment should indicate the need for such external protection.

The corresponding value of the voltage of the transient network process should be selected depending on the category of overvoltage and the rated voltage of the AC mains using Table No. 10 .

Table No. 10

Voltage transient in the network

Rated mains voltage, taking into account the phase-neutral voltage, rms value	**Voltage transient network, peak value**			
	Overvoltage category			
	I	**II**	**III**	**IV**
50	330	500	800	1 500
100	500	800	1 500	2 500
150 [1)]	800	1 500	2500	4,000
300 [2)]	1 500	2 500	4,000	6,000
600 [3)]	2 500	4,000	6,000	8,000

[1)] Including 120/208 or 120/240 V.
[2)] Including 230/400 or 277/480 V.
[3)] Including 400/690 V.

If the voltage of the transient process of the telecommunication network is unknown for this telecommunications network, it is considered equal:

1 500 V_{peak}, if the circuit is connected to NTS-1 or NTS-3 by telecommunications network circuits;

800 V_{peak}, if the circuit is connected to the SELV or NTS-2 circuits of the telecommunications network.

18. Thermoplastic insulating parts, holding elements under dangerous voltage, must be resistant to heat in conditions of abnormal operation and single damage.

19. Requirements for gaps should be as follows:

1) the dimensions of the gaps should be such that stress surges from transients that may affect the equipment and the peak voltage value that can be generated in the equipment do not lead to breakdown of the gap;

2) the values of the minimum gaps and creepage distances for different degrees of contamination:

a) the degree of contamination 1 is applicable to components and blocks that are sealed to prevent the ingress of dust and moisture;

b) the degree of pollution 2 is applicable in general to equipment falling within the scope of this Technical Regulation;

c) the degree of pollution 3 is applicable if the local environment inside the equipment is exposed to conductive contamination or dry non-conductive contamination, which can become conductive due to possible condensation;

3) the gaps in the primary circuits must correspond to the minimum dimensions given in Table No. 11 .

Table No. 11 applies to equipment that will not be subjected to transient processes exceeding category II for overvoltages. The corresponding transient network voltages are given in parentheses in each graph of the nominal AC supply voltage. If higher transient values are expected, additional protection may be needed in the power supply circuits of equipment or insulation;

4) for all AC power systems, the AC mains voltage shown in Tables 11 , 12 and 13 is the voltage between phase and neutral;

Table No. 11

Minimum clearances for insulation in primary circuits and between primary and secondary circuits

Clearances in millimeters

Working voltage, V		**Rated AC mains voltage up to 150 V (transient supply voltage 1500 V)**						**Rated AC mains voltage SV 150 to 300 V (transient supply voltage 2500 V)**						**Rated AC mains voltage 300 V to 600 V (transient supply voltage 4 000 B)**		
Maximum voltage value or DC voltage value	The root-mean-square value of the voltage (sinusoidal)	Degrees pollution 1 and 2			Power pollution 3			Degrees pollution 1 and 2			Power pollution 3			Degrees pollution 13		
		F	B / S	R	F	B / S	R	F	B / S	R	F	B / S	R	F	B / S	R
71	50	0.4	1.0 (0.5)	2.0 (1.0)	0.8	1.3 (0.8)	2.6 (1.6)	1.0	2.0 (1.5)	4.0 (3.0)	1.3	2.0 (1.5)	4.0 (3.0)	2.0	3.2 (3.0)	6.4 (6.0)
210	150	0.5	1.0 (0.5)	2.0 (1.0)	0.8	1.3 (0.8)	2.6 (1.6)	1.4	2.0 (1.5)	4.0 (3.0)	1.5	2.0 (1.5)	4.0 (3.0)	2.0	3.2 (3.0)	6.4 (6.0)
420	300	F 1.5; B / S 2.0 (1.5); R 4.0 (3.0)												2.5	3.2 (3.0)	6.4 (6.0)
840	600	F 3.0; B / S 3.2 (3.0); R 6.4 (6.0)														
1400	1000	F / B / S 4.2; R 6.4														
2 800	2,000	F / B / S / R 8.4														
7,000	5,000	F / B / S / R 17.5														
9 800	7,000	F / B / S / R 25														

14,000	10,000	F / B / S / R 37
28 000	20,000	F / B / S / R 80
42 000	30 000	F / B / S / R 130

Notes:

1. The values in the table are applied to the functional (F), main (B), supplementary (S) and reinforced (R) insulation.

2. The values in parentheses apply to basic, additional and reinforced insulation in the event that a quality management program is carried out in production. In particular, double and reinforced insulation must be subjected to periodic tests for electrical strength.

3. For operating voltages from 2800 to 42000 V peak AC or DC values, linear interpolation between the nearest two points is allowed, calculated on the basis of rounding up to the nearest largest value, taking into account increments of 0.1 mm.

Table No. 12

Additional clearances for insulation in primary circuits in which the maximum operating voltages exceed the amplitude value of the rated AC mains voltage

Rated AC mains voltage, V up to 150				**Rated AC mains voltage, V 150 <U_{nom} ≤ £ 300**		**Additional clearance, mm**	
Maximum amplitude value of the operating voltage, V						**functional, basic or additional insulation**	**reinforced insulation**
210	(210)	210	(210)	420	(420)	0	0
298	(288)	294	(293)	493	(497)	0.1	0.2
386	(366)	379	(376)	567	(575)	0.2	0.4
474	(444)	463	(459)	640	(652)	0.3	0.6
562	(522)	547	(541)	713	(729)	0.4	0.8
650	(600)	632	(624)	787	(807)	0.5	1.0
738	(678)	715	(707)	860	(884)	0.6	1.2
826	(756)	800	(790)	933	(961)	0.7	1.4
914	(839)	-	-	1,006	(1,039)	0.8	1.6
1,002	(912)	-	-	1 080	(1 116)	0.9	1.8
1 090	(990)	-	-	1 153	(1,193)	1.0	2.0
-	-	-	-	1 226	(1,271)	1.1	2.2
-	-	-	-	1,300	(1 348)	1.2	2.4
-	-	-	-	-	(1,425)	1.3	2.6

Note: the values in parentheses are used: when the values in brackets in table 18 are applied; for functional isolation.

5) in the secondary circuits apply gaps not less than those indicated in Table No. 13 ;

6) for the operating voltages to be used in determining the gaps for the secondary circuit, take the values given in Table No. 13 :

for the DC voltages, the amplitude values of any superimposed pulsations must be included;

for non-sinusoidal oscillations it is necessary to use amplitude values of the quantities;

7) secondary circuits, as a rule, must correspond to the I category of overvoltages, if the primary circuit has the II category of overvoltages. The maximum values of the transient processes for various voltages of the AC power supply network of category I overvoltages are given in Table No. 13 . However, an unloaded secondary circuit must satisfy the requirements for the primary circuit in Tables 11 and 12 if it is used in equipment with a protective earth terminal and corresponds to one of the following cases:

is separated from the primary circuit by a grounded metal shield;

the secondary circuit transients are below the permissible maximum value for category I overvoltages, (for example, due to attenuation by connected components, such as a capacitor between the secondary circuit and ground).

Table No. 13

Minimum clearances in secondary circuits

Clearances in millimeters

Operating voltage, V		**Rated AC mains voltage $U_{nom} \leq 150$ V (The value of the transient voltage for the secondary UP TO 800 V) [5]**			**Rated AC mains voltage 150 V $< U_{nom} \leq 300$ V (The value of the transient voltage for the secondary circuit is up to 1500 V) [5]**						**Rated AC mains voltage 300 V $< U_{nom} \leq$ 600 V (The value of the transient voltage for the secondary circuit is up to 2500 V) [5]**			**Chains not subject to transient voltage [4]**		
Amplitude value of voltage or value of direct current voltage, V	**The root-mean-square value of the voltage (sinusoidal), V**	**Degrees pollution 1 and 2**			**Power pollution 3**			**Degrees pollution 1 and 2**			**Power pollution 3**			**Degrees pollution 13**			**Degrees pollution 1 and 2**		
		F	**B / S**	**R**	**F**	**B / S**	**R**	**F**	**B / S**	**R**	**F**	**B / S**	**R**	**F**	**B / S**	**R**	**F**	**B / S**	**R**
71	50	0.4	0.7	1.4	1.0	1.3	2.6	0.7	1.0	2.0	1.0	1.3	2.6	1.7	2.0	4.0	0.4	0.4	0.8
(0.2)	(0.2)	(0.4)	(0.8)	(0.8)	(1.6)	(0.5)	(0.5)	(1.0)	(0.8)	(0.8)	(1.6)	(1.5)	(1.5)	(3.0)	(0.2)	(0.2)	(0.4)		
140	100	0.6	0.7	1.4	1.0	1.3	2.6	0.7	1.0	2.0	1.0	1.3	2.6	1.7	2.0	4.0	0.6	0.7	1.4
(0.2)	(0.2)	(0.4)	(0.8)	(0.8)	(1.6)	(0.5)	(0.5)	(1.0)	(0.8)	(0.8)	(1.6)	(1.5)	(1.5)	(3.0)	(0.2)	(0.2)	(0.4)		

210	150	0.6	0.9	1.8	1.0	1.3	2.6	0.7	1.0	2.0	1.0	1.3	2.6	1.7	2.0	4.0	0.6	0.7	1.4
(0.2)	(0.2)	(0.4)	(0.8)	(0.8)	(1.6)	(0.5)	(0.5)	(1.0)	(0.8)	(0.8)	(1.6)	(1.5)	(1.5)	(3.0)	(0.2)	(0.2)	(0.4)		
280	200	F1.1 (0.8) B / S 1.4 (0.8) R 2.8 (1.6)												1.7	2.0	4.0	1.1	1.1	2.2
(1.5)	(1.5)	(3.0)	(0.2)	(0.2)	(0.4)														
420	300	F 1.6 (1.0) B / S 1.9 (1.0) R 3.8 (2.0)												1.7	2.0	4.0	1.4	1.4	2.8
(1.5)	(1.5)	(3.0)	(0.2)	(0.2)	(0.4)														
700	500	F / B / S 2.5 R 5.0																	
840	600	F / B / S 3.2 R 5.0																	
1 400	1,000	F / B / S 4.2 R 5.0																	
2 800	2,000	F / B / S / R 8.4 [6]																	
7,000	5,000	F / B / S / R 17.5 [6]																	
9 800	7,000	F / B / S / R 25 [6]																	
14,000	10,000	F / B / S / R 37 [6]																	
28 000	20,000	F / B / S / R 80 [6]																	
42 000	30 000	F / B / S / R 130 [6]																	

[1] The values in the table are applied to the functional (F), main (B), supplementary (S) and reinforced (R) insulation.

[2] Values in parentheses apply to basic, additional or reinforced insulation in the event that a quality management program is carried out in production. In particular, double and reinforced insulation must be subjected to periodic tests for electrical strength.

[3] For operating voltages from 2800 to 42000 V peak values of AC or DC, linear interpolation between the nearest two points is allowed, calculated on the basis of rounding up to the nearest largest value, taking into account increments

0.1 mm.

[4] The values are applied to secondary DC circuits that are securely connected to the ground and have capacitive filtering, which limits the double pulsation amplitude to 10% of the DC voltage value.

[5] If the transients in the equipment exceed these values, use the corresponding maximum clearances.

[6] A gap of 8.4 mm or more is not required if it passes:

completely by air;

completely or partially on the surface of the insulating material belonging to group I, and the insulation withstands the tests for electrical strength:

an AC test voltage whose rms value is equivalent to 1.06 times the maximum operating voltage or a DC test voltage equivalent to the amplitude value prescribed above.

If the gap partially extends along the surface of the material other than Group I, then the electric strength test is performed only for the air gap.

The

20. Requirements for leakage paths should be as follows:

1) the dimensions of the leakage paths must be such that there is no spark overlap for the given operating voltage and pollution degree or there is no violation (tracking) of the insulation;

2) the values of the leakage paths shall not be less than the values specified in Table No. 14 for the corresponding values of operating voltages, pollution degree and group of materials;

3) for reinforced insulation, the values of the leakage paths should be twice the values given in Table No. 14 for basic insulation;

4) if the value of the leakage paths according to Table No. 14 is less than the corresponding clearance in Tables 11 , 12 or 13 , then the value of this gap must be accepted as the minimum value of the leakage paths;

5) minimum values of leakage paths equal to the values of the applied gaps are applied for glass, mica, ceramics and similar materials used as insulating materials;

6) for operating voltages that are used to determine the leakage paths:

a) apply the effective rms value or DC voltage value;

b) do not take into account:

any superimposed ripple at constant current;

short-term processes (for example, ringing signals in the circuits of the NTS);

short-term interference (eg, transients);

7) Depending on the relative index of tracking resistance (SIT), the materials are classified into the following groups:

I ..... 600 ≤ SIT;

II ..... 400 ≤ SIT <600 ;

III a ..... 175 ≤ SIT <400 ;

III b ..... 100 ≤ SIT <175 .

The belonging of materials to a certain group is confirmed by the data of testing of these materials using 50 drops of a 0.1% solution of ammonium chloride.

If there is no data on the material belonging to a particular group, it is considered that the material belongs to group III b;

8) If a SIT of 175 or more is required and the data is not available, the material group can be determined in tests for the control index oftracking resistance (CIT). The material corresponds to the group if its KIT, established by these tests, is equal to or greater than the minimum value of the SIT required for the group.

Table No. 14

Minimum leakage paths (leakage path values are given in mm)

Operating voltage AT	**Working, basic and additional insulation**						
	pollution degree 1	**degree of pollution 2**			**degree of pollution 3**		
(RMS value or DC voltage value)	**material group**	**material group**			**material group**		
	I, II, IIIa or IIIb	**I**	**II**	**I, IIa or IIIb**	**I**	**II**	**I, IIa or IIIb**
≤ 50		0.6	0.9	1.2	1.5	1.7	1.9
100		0.7	1.0	1.4	1.8	2.0	2.2
125		0.8	1.1	1.5	1.9	2.1	2.4
150		0.8	1.1	1.6	2.0	2.2	2.5

200	Use	1.0	1.4	2.0	2.5	2.8	3.2
250	gaps in	1.3	1.8	2.5	3.2	3.6	4.0
300	the relevant	1.6	2.2	3.2	4.0	4,5	5.0
400	tables	2.0	2.8	4.0	5.0	5.6	6.3
600		3.2	4,5	6.3.	8.0	9.6	10.0
800		4.0	5.6	8.0	10.0	11.0	12.5
1000		5.0	7.1	10.0	12.5	14.0	16.0
Note: Linear interpolation between two nearby points is allowed, calculated on the basis of rounding up to the nearest largest value, taking into account increments of 0.1 mm.							

21. Requirements for conductors should be as follows:

1) the cross-sectional area of the internal wires and connecting cables must correspond to the current flowing through these wires when the equipment is operating under normal load conditions. Do not exceed the maximum permissible conductor temperature;

2) all internal wiring (including buses) and connecting cables intended for distribution of power through the primary circuit must be protected against overcurrent and short-circuit currents by protective devices of the appropriate rating;

3) wiring that does not directly participate in the distribution of power supplies, does not need protection if it is reliable from the point of view of safety (for example, the indication circuit);

Notes:

1. Devices protecting components from the overload current can also provide protection for all the electrical wiring.

2. For internal circuits connected to the AC power supply network, individual protection may be required in case of using a wire of reduced cross-section, and also taking into account the length of the conductors.

4) The AC power cord must be used with the following conditions in mind:

rubber insulation should be made of synthetic rubber and be not softer than a conventional elastic flexible cord with a rubber sheath;

polyvinyl chloride insulation should be:

a) for equipment with a non-detachable power supply cord and a mass not exceeding 3 kg - not softer than a flexible cord with a lightweight PVC jacket;

b) for equipment with a non-detachable power supply cord and a mass exceeding 3 kg - it is not softer than a conventional flexible cord with PVC insulation;

c) for equipment with a non-removable power supply cord - not softer than a protected flexible cord with PVC insulation. The mass of equipment intended for use with a detachable power supply cord is not standardized;

equipment requiring protective earthing must contain a protective earth conductor with yellow-green insulation.

The conductor of protective earthing in the power cord of the equipment shall have the dimensions of the cross-sectional area not less than those specified in Table No. 15 .

Table No. 15

Cross-sectional area dimensions of conductors

Rated current of equipment, A				**Nominal cross-sectional area, mm ^{2}**	
Before		6th	incl.	0.75 [1)]	
Over	6th	to 10	incl.	1.00	(0.75) [2)]
«	10	" 13	«	1.25	(1.0) [3)]
«	13	" 16	«	1.5	(1.0) [3)]
«	16	«25	«	2.5	

«	25	«32	«	4
«	32	«40	«	6th
«	40	«63	«	10
«	63	«80	«	16
«	80	" 100	«	25
«	100	«125	«	35
«	125	«160	«	50
«	160	"190	«	70
«	190	«230	«	95
«	230	«260	«	120
«	260	«300	«	150
«	300	«340	«	185
«	340	«400	«	240
«	400	«460	«	300

[1)] For rated current up to 3 A, a nominal conductor cross-section of 0.5 mm [2] is allowed with a cord length of not more than 2 m.
[2)] The value in parentheses refers to the detachable power supply cords with connectors for a rated current of 10 A , provided that the length of the cord does not exceed 2 m.
[3)] The values in parentheses refer to the detachable power supply cords with connectors for a rated current of 16 A , provided that the length of the cord does not exceed 2 m.

22. Requirements for the protection of conductors should be as follows:

1) the ways of laying the wires must be smooth and have no sharp edges. The wires must be protected from contact with burrs, cooling radiators, moving parts, etc., which can damage the insulation. Holes in the metal, through which the insulated conductors pass, must have smooth machined surfaces or be provided with bushings;

2) the internal wires must be laid, clamped or fixed in such a way as to prevent:

a) excessive tension of wires, including terminal clamps;

b) loosening of terminal clamps;

c) damage to the insulation of the wires;

3) power cords should not be exposed to sharp corners or edges inside or on the surface of equipment, as well as in holes and cable entry bushings;

4) the outer sheath of the non-detachable power cord must pass through the input bush or cable entry into the equipment and extend beyond the clamping jig by at least half the diameter of the cord.

When using input bushings they are:

must be securely fixed;

Do not remove without the use of tools;

5) the input in the non-metallic casing must be made of an insulating material;

6) the inlet sleeve or cable entry installed on a conductive part not protected by grounding shall comply with the requirements for additional insulation;

7) a cable entry must be provided at the opening for the insertion of an integral power supply cord for hand equipment or equipment that is intended to be moved during operation .

The cable entry must meet the following requirements:

have a design that prevents excessive bending of the cord at the entrance to the equipment of at least ten external cable diameters;

made of insulating material;

securely fixed;

protrude from the insertion hole beyond the outer surface of the equipment for a length equal to at least five outside diameters, or for flat cords, equal to the fivefold largest cross-sectional dimension of the cord.

23. Requirements for screw connections should be as follows:

1) if the screw provides electrical contact, then it must be screwed into the metal plate, nut or bushing by at least two complete turns;

2) screws made of insulating material are not used for electrical connections, including grounding, and also in cases where their replacement with metal screws can lead to damage to additional or reinforced insulation;

3) if the screws made of insulating material provide other types of safety, they must be screwed into at least two complete turns;

4) screws (on sheet metal) are not used for connecting current - carrying parts, unless they provide direct contact between these parts and are not provided with interlocking devices that prevent unscrewing;

5) self-tapping (thread-cutting and thread-forming) screws are not used for electrical connections, unless they create full-fledged (corresponding to the standard) thread turns. Also, do not use these screws if the user or the person performing the installation and installation is to work with them, except when the thread is made by stamping;

6) the screws and nuts clamping the conductors of the external power supply must have threads that coincide in pitch and mechanical strength. They should not be used to fix other elements, but they can fix the internal wires, if they are located so that when the power conductors are secured their displacement is excluded.

24. The power connection requirements should be as follows:

1) for safe and reliable connection to the AC mains, the equipment must be equipped with one of the following means:

terminals for permanent connection to the power supply;

a non-removable power cord for permanent connection to a power source or a cord with a plug for this purpose;

a device plug for connecting a detachable power cord;

a mains plug that is part of the cutting equipment;

2) if the equipment provides more than one (multi-plug) connection to the power network (for example, with different voltages or frequencies, or to a backup power source), the following conditions must be satisfied in the design:

for different circuits provide for separate means of connection;

plugs for connecting to power supplies should not be interchangeable if their incorrect connection can create a danger;

when one or more connectors are disconnected, the operator should not be able to touch bare parts, SNN circuits or parts under dangerous voltage, for example plug contacts;

3) permanently connected equipment must be equipped with a set of terminals or an all-in-one power cord.

On permanently connected equipment with a set of terminals there should be provided:

the possibility of connecting the power wires after fixing the equipment on site;

cable glands, cable ducts, installation boxes or bushings that allow you to connect the required types of cables or lines.

For equipment with a rated current not exceeding 16 A, cable entries must be designed for the external diameter of cables and lines;

4) for equipment with a non-detachable power cord, the cord must be rigidly fixed to:

Do not allow tension of the cord conductors at the connection points;

Protect the outer shell from mechanical friction damage.

Non-detachable power cords should be protected from abrasion and sharp bends at the point where the cord enters the equipment in one of the following ways:

using a bushing insulating sleeve with a hole, the radius of the curvature of the walls of which is not less than 1.5 times larger than the diameter of the cord with the largest cross-sectional area;

using an insulated sleeve on the cord that protrudes beyond the outlet for at least five cord diameters with the largest cross-sectional area.For flat cords, the diameter is considered to be the larger lateral dimension of the cord.

The possibility of pushing the power cord into the equipment should be excluded if the cord or its veins can create a danger or lead to a displacement of the internal parts of the equipment.

In non-detachable power cords containing a protective earth conductor, the design must be such that when the cord is tensioned at the connection point, the protective earth conductor is pulled last.

The rigid fastening of the cord should either be made of an insulating material or be provided with a shell of insulating material that meets the requirements for additional insulation. However, this requirement is not applied if the rigid mount is a bushing that includes an electrical connection with the braid of a shielded power cord. The design of the hard fastening of the cord should be such that:

the replacement of the cord did not reduce the safety of the equipment;

for the usual replacement cord, the way to protect it from tension was obvious;

The cord was not clamped by a screw directly acting on it; if the fastening of the cord includes a screw made of insulating material, then the size of the screw must correspond to the diameter of the cord to be fixed;

It was not allowed to tie a cord into a knot or tie a cord;

It is not allowed to rotate the cord relative to the equipment body, which can lead to tension in the places of electrical connections.

25. Requirements for disconnecting devices should be as follows:

1) function breakers can be used as tripping devices, provided that they meet all the requirements for switching devices. These requirements do not apply to functional switches, where other means of isolation are used;

2) the following types of breaking devices shall be used:

Power cord plug;

a mains plug that is part of the cutting equipment;

household connector;

isolation switch;

disconnector;

any similar device;

3) Disconnecting devices must have a gap between contacts of at least 3 mm. When installing a disconnect device inside the equipment, it should be located as close as possible to the power input;

4) for permanently connected equipment, the isolating device must be installed in the equipment, unless it is specified in the installation manual that the corresponding device should be part of the building network;

5) parts of the disconnecting device in the equipment on the power supply side, which remain energized after the shutdown device is switched off, must be protected in such a way as to avoid accidental contact of maintenance personnel with them;

6) in single-phase equipment, the disconnecting device must disconnect both poles at the same time, unless a single-pole tripping device can be used to disconnect the phase conductor if it is possible to reliably determine the neutral of the AC power supply;

7) for equipment equipped with a single-pole tripping device, an additional two-pole tripping device shall be provided in the installation instruction if it is not possible to determine the neutral in the AC power supply;

8) in three-phase equipment, the disconnecting device must disconnect all the phase wires of the AC mains at the same time;

9) if the tripping device breaks the neutral wire, it must simultaneously break all the phase wires;

10) if the breaking device is a switch built into the equipment, its "on" and "off" positions shall be indicated.

26. Forks and sockets of the manufacturer, completed by the manufacturer, used by the user or service personnel, must exclude the possibility of improper mating. Connectors used to connect to AC power must not be used for SELV or STS circuits.

Compliance with this requirement is ensured by using a key in the connection, appropriate placement, and for connectors that are only accessible to maintenance personnel - by applying a distinct marking.

27. Protection against electric shock should be provided in the event of malfunctions:

short circuit or breakage of semiconductor devices and capacitors;

malfunction caused by long-term power dissipation in resistors intended for short-term operation;

internal faults in integrated circuits causing excessive power dissipation;

damage to the main insulation between live parts of the primary circuit and:

a) accessible conductive parts;

b) grounded conductive screens;

c) chains of SELV;

d) parts of circuits with current limitation.

28. The equipment must be designed so that the leakage current does not create a hazard. The leakage current value should not exceed the following values:

for Class II equipment - 0.25 mA;

for Class I portable equipment - 0.75 mA;

for moving and permanently connected equipment to the electric current network - 3.5 mA.

29. To ensure safety, the components of the equipment must meet the safety requirements of this Technical Regulation, which defines the electrical safety requirements for the component used.

30. Requirements for isolation of antenna leads and circuits of telecommunication networks should be as follows:

1) the equipment must provide the necessary electrical separation between circuits such as NTS - 1 or NTS - 2 and the following parts of the equipment:

a) ungrounded conductive parts and non-conductive parts of equipment intended to be held or touched during normal use;

b) parts and chains to which you can touch;

c) chains that are intended for connection to other equipment;

2) the insulation providing electrical separation must withstand 10 pulses of 10/700 μs of variable polarity. The interval between pulse sequences is 60 s, the initial voltage Uc is:

for a) - 2.5 kV ;

for b), c) - 1.5 kV ;

3) isolation, which provides electrical separation of antenna leads and parts under dangerous voltage, must withstand the impact of 50 pulses with a voltage of 10 kV.

31. The safety of the equipment should not be disturbed by exposure to moisture, which may appear during operation. The insulation resistance should not decrease and be not less than:

between the poles of parts directly connected to the network - 2 MΩ;

between the parts separated by the main and additional insulation - 2 MΩ;

between the parts separated by reinforced insulation - 4 megaohm.

32. The requirements for the construction of equipment for protection against electric shock should be as follows:

1) in circuits for which, under normal use or under conditions of one fault, the values of electrical quantities exceed the allowed values:

the reliability of the connections of wires that are subject to mechanical stress should not depend solely on soldering;

the screws securing the removable casings must be non-falling if their length defines the gap or the path of leakage between available conductive and dangerous parts;

accidental loosening or loosening of wires, screws, etc. It should not make available parts dangerous;

2) equipment in which double or reinforced insulation is used to protect against electric shock, should have shells covering all metal parts. Enclosures or parts of casings made of insulating material must satisfy the requirements for double and reinforced insulation.

Protection of casings or parts of casings made of metal must be provided in one of the following ways:

the presence of an insulating coating or fencing on the inner surface of the casing. It should surround all metal parts and all places where the movement of dangerous parts can lead to their contact with the metal parts of the casing;

means that, with the possible movement of parts or wires, do not alter the gaps and creepage distances between the casing and the hazardous parts;

3) equipment with protective connection must meet the following requirements:

if part of the equipment can be removed by the operator, then the protective connection of the remaining part should not be violated;

movable current-carrying connections, for example, hinges, sliders, should not be the only protective joint, unless they are specifically designed for electrical connection;

the metal braid of the cables, even if connected to a protective earth terminal, should not be considered a protective connection;

if the energy from the power source is transmitted through one equipment to power another, a protective conductor must be routed through the first to protect the second;

Protective earth conductors can be uninsulated or insulated. The insulation must be two-color: green and yellow, except:

a) at the earthing braids the insulation can be either green (yellow) or transparent;

b) internal insulation conductors in various assemblies (cables with rubber insulation, busbars, flexible printed conductors, etc.) can be insulated with any color provided that the danger due to the lack of identification of the protective conductor is eliminated.

33. The safety requirements for diesel generators are as follows:

1) The design of diesel generators should ensure the safety of maintenance personnel from electric shock, from injury to rotating and moving parts and to burns from parts heated to high temperatures.

The design of diesel generators bonneted and container designs must meet the requirements of degree of protection IP23, and the design of mobile generating sets cabover performance and stationary diesel generators - the degree of protection IP2X;

2) the circuit wiring three-phase alternating current diesel generators has to be isolated neutral (at connecting generator windings of the electric plant according to the "star" or power derived from the zero point). In diesel generators of alternating three-phase current with a voltage of 230 V, the zero of the generator is output to the power take-off panel only at the request of the customer.

It is not allowed to use any devices that create an electrical connection of phase wires or neutral with a housing or ground, either directly or through an artificial zero point (except for a device for suppressing interference to radio reception);

3) mobile diesel generators with a voltage of 230 and 400 V must have devices for permanent monitoring of insulation. To operate in conjunction with the electric grid of the public power system in mobile diesel generators, an automatic protective shutdown device must be provided.

Do not use permanent insulation monitoring devices that operate on the principle of voltage asymmetry.

At the request of the customer, permanent insulation monitoring devices must have a light or sound signaling about a reduction in the insulation resistance below the permissible value;

4) all metallic non-conductive parts of electrical equipment that may be under dangerous voltage due to insulation damage, must have an electrical connection to the diesel generator housing, and also to the grounded frame of the vehicle;

5) diesel generators must have earthing clamps for connection of protective and working grounding and grounding marks;

6) the resistance of the electrical insulation of separate disconnected power circuits between themselves and with respect to the body shall not be lower than indicated in Table No. 16 ;

7) electrical isolation of current-carrying parts of diesel generators must withstand without damage within 1 minute a sinusoidal test voltage of 50 Hz, indicated in Table No. 17 (with capacitors and semiconductors switched off);

Table No. 16

Resistance of electrical insulation of separate disconnected power circuits to each other and to the case

Values of climatic factors of the environment	**Insulation resistance, MOh, for electrical circuits with rated voltage, V**		
	230 and 400	**6300**	**10500**
Normal climatic test conditions	-	-	-
Cold state of insulation	3.0	32.0	40.0

Hot insulation condition (after operation in the steady-state nominal mode)	1.0	8.0	10.0
Relative humidity of air 98% (100%) * at 298 K (25 ° C) and lower temperatures without condensation of moisture	0.5	1.5	2.0
Relative humidity of air 98% (100%) * at 308 K (35 ° C) (tropical version)	0.5	1.5	2.0
* Installed at the request of the customer (100% with condensation of moisture). At the same time, the minimum permissible insulation resistance for electrical circuits with rated voltage 230 and 400 V in the cold state before switching on the load should be not lower than 0.015 MΩ.			

Table No. 17

Rated voltage, V	Test voltage, V
230	1500
400	1800
6300	18,000
10500	24000

APPENDIX No. 6 to the General Technical Regulations on the Safety of Telecommunications Equipment

Requirements for explosion-proof equipment

1. Classification of explosion-proof equipment is as follows:

1) explosion-proof equipment is divided into the following groups:

I - mine explosion-proof equipment intended for use in underground workings of mines, mines and in their land structures, dangerous for mine gas and / or combustible dust;

II - explosion-proof equipment for indoor and outdoor installation, designed for potentially explosive environments, other than underground workings of mines and mines and their ground structures, hazardous for mine gas and / or dust;

2) Group II equipment can be subdivided into subgroups according to the category of explosiveness of the mixture for which it is intended.

In the case of explosion protection types "explosion-proof enclosure d" and "intrinsically safe circuit i", the equipment of group II is subdivided into subgroups IIA, IIB and IIC. This unit is based on a safe experimental maximum cladding gap or minimum ignition current for equipment with intrinsically safe circuits. Classification of subgroups based on these parameters is given in Table 1 .

Table No. 1

Equipment sub-group	Safe experimental maximum clearance	Minimum ignition current
IIA	> 9 mm	> 8
IIB	from 0,5 to 0,9 mm	0.45 to 0.8
IIC	<0 , 5 mm	<0 , 45

Equipment labeled as IIB is also suitable for applications where subgroup IIA equipment is required. Similarly, equipment marked IIC is also suitable for applications where subgroup IIA or IIB equipment is required;

3) the explosion-proof equipment of groups I and II, depending on the level of explosion protection, is divided into:

equipment of increased reliability against explosion;

explosion-proof equipment;

explosion-proof equipment.

If the equipment includes elements with different levels of explosion protection , the overall level of explosion protection of the equipment should be installed at the lowest element level (this requirement does not apply to systems that may include products with different levels of protection).

2. Requirements for explosion-proof equipment should be as follows:

1) requirements for temperature and permissible heating:

a) the maximum surface temperature of the equipment of Group I shall not exceed:

150 ºC in case of formation of layers of coal dust on the equipment;

450 ºC in the case where the presence of coal dust is excluded, as well as when it is possible that the temperature exceeds 150 ºC, but not more than 450 ºC and the subsequent cooling to a temperature of 150 ºC occurs in a time not more than 180 s;

b) the maximum surface temperature for Group II equipment should not exceed the values given in Table 2 .

Table No. 2

Temperature class	Maximum surface temperature, ºC
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

The maximum temperature of Group II equipment intended for dust hazardous industries should be lower by 50 ° C than the smoldering temperature or no more than two thirds of the autoignition temperature (for non-tacky dust);

c) the maximum surface temperature should not be higher than the value of the lowest self-ignition temperature of this explosive atmosphere (atmosphere).

However, for parts whose total surface area does not exceed 10 cm^2, the surface temperature may exceed the values of the lowest autoignition temperature for a given temperature class indicated on Group II equipment or the corresponding maximum surface temperature for Group I if there is no danger of ignition from these parts when exceeding by:

50 ° C for temperature classes T1 - T3;

25 ° C for temperature classes T4 - T6 and group I;

2) requirements for shells should be as follows:

a) the shells of the equipment must be made of materials:

non-flammable, flame -resistant and fire-resistant;

resistant to mechanical and thermal impact caused by the operation of equipment in normal operation and operating conditions;

b) the electrical resistance of insulation of plastic materials used for shells should not be more than 109 Ohm;

c) light alloys used for the manufacture of shells of equipment of groups I and II shall provide frictional intrinsic safety .

It is allowed to provide frictional intrinsic safety of shells from light alloys with the help of protective coatings;

d) for shells with threaded connections, it is necessary to choose pairs of materials that exclude occurrence of contact corrosion;

e) pouring masses and seals should maintain their protective properties over the entire temperature range that arise under normal operating conditions of the equipment;

(e) Locking devices used to attach parts of shells that provide explosion protection or prevent access to uninsulated parts under voltage shall consist of:

of nuts, screws and bolts with hexagonal, pentagonal, triangular, sectoral and other types of heads without splines;

from security rings or depressions around each head of a bolt or nut.

Guard rings should cover the bolt or nut at least two thirds of the circumference and should be part of the shell or rigidly attached to the shell, or rigidly connected to each other so that they can not be turned.

The difference between the inner circumference of the guard ring and the circumscribed circle around the head of the bolt, screw or nut must allow the use of standard end keys;

g) for capturing the parts of the shells of Group I equipment that are opened during operation for adjustments and inspections, captive bolts must be used. The diameter of the bolts, screws and studs intended for fixing the details of the shells of Group I equipment must be at least 6 mm. For fixing the parts of the shells of instrumentation and automation devices, it is allowed to use fastening bolts, screws and studs with a diameter of at least 5 mm.

The minimum diameter requirements for fastening bolts, screws and studs do not apply to the enclosures of appliances if the fasteners are not to be unscrewed in the shaft conditions, for example mounted on a glue or sealed;

3) requirements for input devices should be as follows:

a) the opening devices must correspond to one of the types of explosion protection in accordance with clause 41 , enumeration b) of this Technical Regulation and have a degree of protection from external influences not lower than IP54.

Composition of the IP code:

IP - letters of the code (international protection);

The first digit (digits from 0 to 6) indicates the degree of protection against penetration of solid mechanical objects;

The second digit (numbers from 0 to 8) indicates the degree of protection from the effects of liquid. Degrees of protection are given in Table No. 3 ;

b) the equipment must have connecting terminals for external electrical circuits, which may be located in the lead-in box or directly in the equipment shell;

4) the requirements for connecting terminals and insulators are as follows:

a) the connecting contact clamps and insulators must be fixed in such a way that they are not weakened and / or cranked at the torque values given in Table No. 4 ;

b) contact clamps must be marked, if the absence of the latter can lead to incorrect connection;

c) the current-carrying parts of the contact clamps must be connected in such a way that the electrical contact at the connection point for a long time does not deteriorate from heating under conditions of variable thermal conditions, changes in the dimensions of the insulation parts and vibration. It is not allowed to transfer contact pressure to electrical connections through insulating materials, unless pressure is transferred through porcelain, steatite or other materials with similar thermal and mechanical properties;

d) the diameter of the contact screws (bolts, studs) for connection of external wires and cores of equipment of Group I equipment must be not less than 6 mm;

Table No. 4

Nominal diameter of clamp thread	Torque, N · m
M4	2
M5	3
M6	5
M8	10
M10	16
M12	25
M16	50
M20	85
M24	130

5) the requirements for cable entries are as follows:

a) the cable glands shall ensure a strong and permanent sealing of the cable and wires and be carried out with a degree of protection from external influences of not less than IP54;

b) cable glands, in the presence of external mechanical influences on the cable, must be designed so that the tensile force and twisting are not transmitted to the wires and cores of the cable at the point of their connection with current-carrying terminals;

c) the device for unloading the cable strands from tension may be part of the input or be located inside the input device;

d) the inputs of flexible cables must be without sharp edges. If the cable is bent along the input axis in any direction up to 90º, the radius of the rounding of the input should be such that the bending radius of the cable at the entry point is not less than one quarter of the maximum allowable cable diameter for this input. It is allowed to reduce the radius of the rounding of the input to 5 - 10 mm in the following cases:

in stationary equipment;

in equipment in which separate parts are connected by permanently laid cables;

when using a rubber hose, metal hose and other means of protecting the cable from damage;

e) openings not used for inputs shall be closed so as to ensure the appropriate type of explosion protection ;

6) the blocking requirements are as follows:

a) the blocking, if necessary, must be carried out in such a way that a violation of its function is possible only as a result of the destruction or elimination of any part of the blockage or as a result of opening fasteners made in accordance with transfers 2 e) and 2 g);

b) the electrical control circuits for blocking equipment of Group I must be protected against loss of controllability;

c) electrical insulating materials, leakage paths and electrical gaps of Group I equipment must satisfy the requirements for insulation, leakage paths and electrical gaps of mine normal equipment;

7) the requirements for switching devices are as follows:

a) it is inadmissible to manufacture switching devices that disconnect the DC load (for example, contactors, circuit breakers, controllers) whose contacts are under oil;

b) the disconnectors must meet the following requirements:

simultaneously turn off all phases or poles;

the position of the disconnector must be determined from the outside;

disconnectors, circuit breakers are used as the idle current, must have a lock formed in accordance with the enumeration 6 a). These requirements do not apply to disconnectors that are designed to function as load switches or switches for the motor;

c) the circuit-breakers with interlocking of the reclosing must be designed so that the possibility of automatic or remote unlocking when the overcurrent protection is activated is excluded;

d) circuit breakers and switches with remote control must be interlocked so that local or remote switching on or off with open casings is not possible;

e) interlocking is not necessary if a disconnector is installed in front of the circuit breaker or remote control switch or if they are used for rolling stock. In this case, a clearly visible warning plate should be installed on the main part of the disconnected switches.

This exception does not apply to circuit breakers and switches with remote control of Group I equipment;

8) the requirements for the level of explosion protection of equipment are as follows:

a) the equipment of the raised reliability against explosion can be provided:

Explosion protection type "i" with the level of intrinsically safe electric circuit " ic " and higher;

explosion protection type "p" (filling or purging the shell under excessive pressure), which has a signaling device to prevent unacceptable pressure drop;

Explosion protection of the type "q" (quartz filling of the shell);

protection of the type "e" (type of explosion protection of equipment, consisting in the fact that equipment that does not have normally sparking parts, or part of it, is taken by a number of measures, in addition to those used in general-purpose equipment that hamper the occurrence of dangerous heat, electric sparks and arcs);

protection of the type "m" (sealing compound);

Explosion protection of the type "d" (flameproof enclosure) for equipment of increased reliability against explosion;

oil filling for the equipment of group II and filling with non-flammable liquid for the equipment of group I shells satisfying the requirements of explosion protection type "o";

Explosion protection of the type "s" (special type of explosion protection , based on principles other than those listed above, but recognized sufficient to provide explosion protection);

b) Explosion-proof equipment can be provided:

Explosion protection type "i" with the level of intrinsically safe electric circuit not lower than " i_{in} ";

explosion protection type "p" with alarm device and automatic power supply shutdown, except for intrinsically safe circuits of level " i_a ", with unacceptable pressure drop;

explosion protection type "d" for explosion-proof equipment;

special type of protection "s";

protection type "e", enclosed in an explosion-proof shell;

enclosure, provided for protection "p" with a signaling device for lowering the pressure below the permissible value of the equipment of group II with protection of the type "e";

c) special explosion-proof equipment can be provided:

Explosion protection of the type "i" with the level of the intrinsically safe electric circuit " i_a ";

special type of protection "s";

explosion-proof equipment with additional means of protection (for example, the conclusion of spark-safe parts filled with a compound or immersed in a liquid or loose dielectric into an explosion-proof enclosure, or by blowing an explosion-proof shell with clean air under excessive pressure, with pressure monitoring devices, signaling and automatic power failure with an unacceptable reduction pressure or damage to the flameproof enclosure). In this case, the level of intrinsically safe circuits " i_a " must be provided for the outgoing connections .

(Collected Legislation of the Republic of Uzbekistan, 2017, No. 9, Article 128)

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