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SERIES K: PROTECTION AGAINST INTERFERENCE

Safety criteria for telecommunication equipment

Recommendation ITU-T K.51

ITU-T

International Telecommunication Union

Recommendation ITU-T K.51

Safety criteria for telecommunication equipment

Summary

Recommendation ITU-T K.51 provides guidance on safety criteria for telecommunication network infrastructure equipment. It specifies requirements intended to reduce risks of fire, electric shock or injury for specified classes of persons who may come into contact with the equipment. This Recommendation refers to the IEC safety standards IEC 60950-1 and IEC 62368-1 and provides additional requirements when these are not covered by the IEC standards. Equipment complying with the relevant requirements in this Recommendation is considered suitable for use in a telecommunication network. However, this Recommendation does not include requirements for performance or functional characteristics of equipment.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Keywords

Remote power feeding, safety, telecommunication equipment.

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Introduction

This Recommendation provides guidance on safety criteria for telecommunication network infrastructure equipment. The requirements of the original 2009 version of this Recommendation where developed in cooperation with IEC TC108 based on [IEC 60950-1]. This updated version of this Recommendation incorporates the new definitions and requirements of [IEC 62368-1], a new hazard-based safety standard created by IEC TC 108. This Recommendation should be read together with [IEC 60950-1] and [IEC 62368-1] for best comprehension.

Recommendation ITU-T K.51

Safety criteria for telecommunication equipment

1 Scope

1.1 Equipment covered by this Recommendation

This Recommendation is applicable to mains-powered, battery-powered or remotely-powered telecommunication network infrastructure equipment.

This Recommendation specifies requirements intended to reduce risks of fire, electric shock, mechanical hazards or injury for the designated classes of user, ordinary person, instructed person, service person and skilled person.

This Recommendation is intended to reduce such risks with respect to installed equipment, whether it consists of a system of interconnected units or independent units, subject to installing, operating and maintaining the equipment in the manner prescribed by the manufacturer.

Equipment complying with the relevant requirements in this Recommendation is considered suitable for use in a telecommunication network. However, this Recommendation does not include requirements for performance or functional characteristics of equipment.

1.2 Additional requirements

Requirements additional to those specified in this Recommendation may be necessary for:

– equipment intended for operation in special environments, for example: extremes of temperature; excessive dust, moisture or vibration; flammable gases; and corrosive or explosive atmospheres;

– equipment intended to be used in vehicles, on board ships or aircraft, in tropical countries, or at altitudes greater than 2000 m;

– equipment intended for use where ingress of water is possible.

NOTE – Attention is drawn to the fact that authorities of some countries impose additional requirements.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T K.50] Recommendation ITU-T K.50 (2000), *Safe limits of operating voltages and currents for telecommunication systems powered over the network*.

[IEC 60950-1] IEC 60950-1 (2005), *Information technology equipment – Safety – Part 1: General requirements*.

[IEC 60950-21] IEC 60950-21 (2002), *Information technology equipment – Safety – Part 21: Remote power feeding*.

[IEC 62368-1] IEC 62368-1 (2014), *Audio/video, information and communication technology equipment – Part 1: Safety requirements*.

NOTE 1 – This Recommendation refers to [IEC 60950-1], but the related concepts or requirements of [IEC 60950] are still applicable in countries where [IEC 60950] is still used.

NOTE 2 – [IEC 60950-21] is a companion standard to [IEC 60950-1] that covers remote power feeding. IEC TC 108 is developing a corresponding companion standard to [IEC 62368-1] with a designation of IEC 62368-3.

3 Definitions

In this Recommendation, definitions introduced by [ITU-T K.50], [IEC 60950-1], [IEC 62368-1] and [IEC 60950-21] are used to maintain conformity. For convenience, they are reproduced here. Other definitions, currently under study in IEC, have been added.

NOTE – The definition of circuits in [IEC 60950-1] is limited to circuits internal to equipment. In [IEC 62368-1] the definition of circuits is limited to circuits external to equipment, which are normally considered to be a telecommunication network. For this Recommendation, the definition of circuits is extended to include network cable conductors that carry the same voltages/currents.

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 basic insulation [IEC 60950-1]: Insulation to provide basic protection against electric shock.

NOTE – [IEC 62368-1] refers to "basic safeguard" rather than "basic protection" and notes "This concept does not apply to insulation used exclusively for functional purposes".

3.1.2 double insulation [IEC 60950-1] [IEC 62368-1]: Insulation comprising both basic insulation and supplementary insulation.

3.1.3 ELV circuit [IEC 60950-1]: Secondary circuit with voltages between any two conductors of the circuit, and between any one such conductor and earth (see clause 1.4.9), not exceeding 42,4 V peak, or 60 V d.c., under normal operating conditions, which is separated from hazardous voltage by basic insulation, and which neither meets all of the requirements for an SELV circuit nor meets all of the requirements for a limited current circuit.

3.1.4 external circuit [IEC 62368-1]: Electrical circuit that is external to the equipment and is not mains.

NOTE – An external circuit is classified as operating at ES1, ES2 or ES3, and PS1, PS2, or PS3 levels.

3.1.5 functional insulation [IEC 62368-1]: Insulation between conductive parts which is necessary only for the proper functioning of the equipment.

NOTE – [IEC 60950-1] adds the informative note "functional insulation by definition does not protect against electric shock. It may, however, reduce the likelihood of ignition and fire".

3.1.6 hazardous voltage [IEC 60950-1]: Voltage exceeding 42,4 V peak, or 60 V d.c., existing in a circuit that does not meet the requirements for either a limited current circuit or a TNV circuit.

NOTE – The corresponding [IEC 62368-1] requirement would be voltages exceeding ES1.

3.1.7 instructed person [IEC 62368-1]: Person instructed or supervised by a skilled person as to energy sources and who can responsibly use equipment safeguards and precautionary safeguards with respect to those energy sources.

NOTE 1 – Supervised, as used in the definition, means having the direction and oversight of the performance of others.

NOTE 2 – In the context of this Recommendation, the term instructed person is synonymous with user [IEC 60950-1].

3.1.8 limited current circuit [IEC 60950-1]: Circuit that is so designed and protected that, under both normal operating conditions and single fault conditions, the current that can be drawn is not hazardous.

NOTE 1 – Simulated faults and abnormal conditions are defined in [IEC 60950-1] clause 1.4.14.

NOTE 2 – The limit value of d.c. is defined as 2 mA d.c. through a 2 kΩ resistor connected between any two parts of a limited current circuit, or between any such part and earth in clause 2.4 of [IEC 60950-1].

3.1.9 ordinary person [IEC 62368-1]: Person who is neither a skilled person nor an instructed person.

NOTE – In the context of this Recommendation, the term ordinary person is synonymous with user [IEC 60950-1].

3.1.10 primary circuit [IEC 60950-1]: Circuit that is directly connected to the AC mains supply.

3.1.11 prospective touch voltage [IEC 62368-1]: Voltage between simultaneously accessible conductive parts when those conductive parts are not being touched.

3.1.12 public network interface [b-ISO/IEC 11801]: A point of demarcation between public and private network. In many cases the public network interface is the point of connection between the network provider's facilities and the customer premises cabling.

3.1.13 reinforced insulation [IEC 62368-1]: Single insulation system that provides a degree of protection against electric shock equivalent to double insulation.

NOTE – [IEC 60950-1] adds the informative note "The term "insulation system" does not imply that the insulation has to be in one homogeneous piece. It may comprise several layers that cannot be tested as basic insulation and supplementary insulation".

3.1.14 RFT-C circuit [ITU-T K.50]: A current limited RFT circuit.

NOTE – The detailed characteristics of an RFT-C circuit are described in [ITU-T K.50].

3.1.15 RFT-V circuit: A voltage limited RFT circuit.

NOTE – The detailed characteristics of an RFT-V circuit are described in [ITU-T K.50].

3.1.16 secondary circuit [IEC 60950-1]: Circuit that has no direct connection to a primary circuit and derives its power from a transformer, converter or equivalent isolation device, or from a battery.

NOTE 1 – In the context of this Recommendation, the definition of circuits is extended to include network cable conductors that carry the same voltages/currents.

NOTE 2 – [IEC 62368-1] does not define the term secondary circuit, but refers to it as "circuit within the equipment not connected to an a.c. mains".

3.1.17 SELV circuit [IEC 60950-1]: Secondary circuit which is so designed and protected that, under normal and single fault conditions, its voltages do not exceed a safe value.

NOTE 1 – Simulated faults and abnormal conditions are defined in IEC 60950, clause 1.4.14.

NOTE 2 – Maximum safe d.c. voltages are defined as 60 V d.c., under normal operating conditions and 120 V d.c. for less than 200 ms, under single fault conditions in IEC 60950, clause 2.2.

3.1.18 service personnel [IEC 60950-1]: Persons having appropriate technical training and experience necessary to be aware of hazards to which they are exposed in performing a task and of measures to minimize the danger to themselves or other persons.

NOTE – In the context of this Recommendation, service personnel must be authorized by the network operator.

3.1.19 skilled person [IEC 62368-1]: Person with relevant education or experience to enable him or her to identify hazards and to take appropriate actions to reduce the risks of injury to themselves and others.

NOTE – In the context of this Recommendation, the term skilled personnel is synonymous with service personnel [IEC 60950-1].

3.1.20 supplementary insulation [IEC 60950-1]: Independent insulation applied in addition to basic insulation in order to reduce the risk of electric shock in the event of a failure of the basic insulation.

NOTE – [IEC 62368-1] refers to "supplementary safeguard" rather than "in addition to basic insulation".

3.1.21 TNV circuit [IEC 60950-1]: Circuit that is in the equipment and to which the accessible area of contact is limited and that is so designed and protected that, under normal operating conditions and single fault conditions, the voltages do not exceed specified limit values.

NOTE 1 – Simulated faults and abnormal conditions are defined in [IEC 60950-1] clause 1.4.14.

NOTE 2 – TNV circuits are classified as TNV-1, TNV-2 and TNV-3 circuits.

3.1.22 TNV-1 circuit [IEC 60950-1]: TNV circuit whose normal operating voltages do not exceed the limits for an SELV circuit under normal operating conditions and on which overvoltages from telecommunication networks are possible.

3.1.23 TNV-2 circuit [IEC 60950-1]: TNV circuit whose normal operating voltages exceed the limits for an SELV circuit under normal operating conditions which is not subject to overvoltages from telecommunication networks.

NOTE – TNV-2 circuits operate a d.c. voltage levels above 60 V d.c. but not exceeding 120 V d.c.

3.1.24 TNV-3 circuit [IEC 60950-1]: TNV circuit whose normal operating voltages exceed the limits for an SELV circuit under normal operating conditions on which overvoltages from telecommunication networks are possible.

NOTE – TNV-3 circuits operate a d.c. voltage levels above 60 V d.c. but not exceeding 120 V d.c.

3.1.25 touch current [IEC 62368-1]: Electric current through a human body when body parts touch two or more accessible parts or one accessible part and earth.

NOTE – [IEC 60950-1] has a similar, but less comprehensive, definition for the term touch current.

3.1.26 user [IEC 60950-1]: Any person other than service personnel.

NOTE – [IEC 60950-1] states that the terms user and operator are synonymous.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 electrical energy source (ES): Capacitive source with defined capacitance and charge voltage or prospective touch voltage and the touch current source with defined values for normal operation, abnormal operation, and single fault conditions or a pulsed source with defined values of voltage, current and pulse duration.

NOTE – [IEC 62368-1] does not have a formal term and definition entry for ES. This definition is a summary of [IEC 62368-1] clause 5.2.

3.2.2 electrical energy source class 1, ES1: Class 1 energy source with levels not exceeding ES1 limits under normal operating conditions, abnormal operating conditions, single fault conditions of a component, device or insulation not serving as a safeguard and not exceeding ES2 limits under single fault conditions of a basic safeguard.

NOTE 1 – [IEC 62368-1] does not have a formal term and definition entry for ES1. This definition is a summary of [IEC 62368-1] clause 5.2.

NOTE 2 – ES1 may be accessible to an ordinary person, user, instructed person, service person or a skilled person. ES1 effects are; not painful on the body, but may be detectable and ignition of combustible materials not likely.

NOTE 3 – ES1 parameter values are given in [IEC 62368-1] clause 5.2.

3.2.3 electrical energy source class 2, ES2: Class 2 energy source with levels not exceeding ES2 limits under normal operating conditions, abnormal operating conditions, and single fault conditions, but exceeding ES1 limits.

NOTE 1 – [IEC 62368-1] does not have a formal term and definition entry for ES2. This definition is a summary of [IEC 62368-1] clause 5.2.

NOTE 2 – ES2 may be accessible to an instructed person, service person or a skilled person. ES2 effects are; painful on the body, but not an injury Ignition of combustible materials possible, but limited growth and spread of fire.

NOTE 3 – ES2 parameter values are given in [IEC 62368-1] clause 5.2.

3.2.4 electrical energy source class 3, ES3: Class 3 energy source with one or more parameters exceeding ES2 limits.

NOTE 1 – [IEC 62368-1] does not have a formal term and definition entry for ES3. This definition is a summary of [IEC 62368-1] clause 5.2.

NOTE 2 – ES3 may be accessible to a service person or a skilled person. ES3 effects are; injury to the body and ignition of combustible materials likely with rapid growth and spread of fire.

NOTE 3 – ES3 parameter values are given in [IEC 62368-1] clause 5.2.

3.2.5 electrical power source (PS): Power source classed by the maximum delivered power values for a power source operating with a worse-case load and for a power source fault operating with the specified normal load.

NOTE – [IEC 62368-1] does not have a formal term and definition entry for PS. This definition is a summary of [IEC 62368-1] clause 6.2.

3.2.6 electrical power source class 1 (PS1): Circuit where the power source does not exceed a defined limit values measured at specific times.

NOTE 1 – [IEC 62368-1] does not have a formal term and definition entry for PS1. This definition is a summary of [IEC 62368-1] clause 6.2.

NOTE 2 – The power available from external circuits described in [IEC 62368-1] Table 14, ID numbers 1 and 2, are considered to be PS1.

NOTE 3 – [IEC 62368-1] clause 6.2 defined limit values are 500 W <3 s and 15 W >3 s.

3.2.7 electrical power source class 2 (PS2): Circuit where the power source exceeds PS1 limits; and does not exceed a defined limit value measured after a specified time.

NOTE 1 – [IEC 62368-1] does not have a formal term and definition entry for PS2. This definition is a summary of [IEC 62368-1] clause 6.2.

NOTE 2 – [IEC 62368-1] clause 6.2 defined limit values are 100 W >5 s.

3.2.8 electrical power source class 3 (PS3): Circuit whose power source exceeds PS2 limits, or any circuit whose power source has not been classified.

NOTE – [IEC 62368-1] does not have a formal term and definition entry for PS3. This definition is a summary of [IEC 62368-1] clause 6.2.

3.2.9 hazardous voltage secondary circuit: Secondary circuit operating at a voltage exceeding 42,4 V peak, or 60 V d.c., existing in a circuit that does not meet the requirements for either a limited current circuit or a TNV circuit.

NOTE 1 – Definition is derived from [IEC 60950-1] terms secondary circuit and hazardous voltage.

NOTE 2 – The term combination hazardous voltage secondary circuit is used in [IEC 60950-1] but not defined.

3.2.10 RFT circuit (remote feeding telecommunication circuit): Equipment circuit, without a direct mains connection or being a SELV circuit or a TNV service or a limited current circuit or an ES1 PS1 circuit, intended to supply or receive d.c. power, at voltages, currents and powers that do

not exceed defined values under specified operational conditions when connected to paired-conductor communications network on which overvoltages are possible.

NOTE 1 – A telecommunications service is not required to be present on an RFT circuit.

NOTE 2 – Specified conditions include normal operating and single fault conditions and may include abnormal operating and safeguard failure conditions.

NOTE 3 – In the context of this Recommendation, RFT circuits can be regarded as hazardous voltage secondary circuits with defined voltages and currents.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ES Electrical energy Source

ES1 Electrical energy Source class 1

ES2 Electrical energy Source class 2

ES3 Electrical energy Source class 3

PS Power Source

PS1 Power Source class 1

PS2 Power Source class 2

PS3 Power Source class 3

RFT Remote Feeding Telecommunication circuit

RFT-C Remote Feeding Telecommunication circuit-Current limited

RFT-V Remote Feeding Telecommunication circuit-Voltage limited

SELV Safety Extra Low Voltage

TNV Telecommunication Network Voltage

5 Safety criteria for telecommunication network infrastructure equipment

5.1 General requirements

Telecommunication network infrastructure equipment shall comply with all the relevant requirements of [IEC 60950-1] and [IEC 60950-21] or [IEC 62368-1].

5.2 Special requirements

Remote feeding telecommunication circuits (RFTs circuits) are defined in both [ITU-T K.50] and [IEC 60950-21]. For RFT circuits the requirements in clauses 5.2.1, 5.2.2, 5.2.3 and 5.2.6 apply.

The requirements for openings in telecommunication network infrastructure equipment are described in [IEC 60950-1] and [IEC 62368-1]; however, the existing requirements do not restrict the entry of vermin or geckos. For enclosure openings, the requirements of clauses 5.2.5 and 5.2.6 apply.

For the reader's convenience, a cross-reference, between the requirements of this Recommendation and similar paragraphs of [IEC 60950-1] and [IEC 62368-1] is provided in Appendix I.

5.2.1 Protection from electric shock and energy hazards

5.2.1.1 Access to energized parts

The equipment shall be so constructed that in user or ordinary person access areas, there is adequate protection against contact with bare parts of RFT circuits. An instructed person may have access to electrical energy source class 2 (ES2) areas.

5.2.1.2 Protection in service access areas

Bare parts at hazardous voltages, except for RFT circuits, shall be located or guarded so that unintentional contact with such parts is unlikely during service operations involving other parts of the equipment.

Bare parts at hazardous (ES2 or electrical energy source class 3 (ES3)) voltage, including RFT circuits, shall be located or guarded so that accidental shorting to safety extra low voltage (SELV) circuits or to telecommunication network voltage (TNV) circuits or electrical energy source class 1 (ES1) circuits or non-RFT ES2 circuits, for example by tools or test probes used by service personnel, is unlikely.

5.2.1.3 Protection in restricted access locations

For equipment to be installed in a restricted access location, contact is permitted with the bare parts of RFT circuits by the test finger as defined in Figure 2A of [IEC 60950-1] or Figure V1 and V2 of [IEC 62368-1]. However, such parts shall be so located or guarded that unintentional contact is unlikely.

5.2.2 Interconnection of equipment

5.2.2.1 General requirements

Where equipment is intended to be electrically connected to other equipment, interconnection circuits shall be selected to provide continued conformance to the requirements of [ITU-T K.50] for RFT circuits, after making the connections.

NOTE 1 – This is normally achieved by connecting RFT-C circuits to RFT-C circuits and RFT-V circuits to RFT-V circuits.

NOTE 2 – It is permitted for an interconnecting cable to contain more than one type of circuit (e.g., SELV, limited current, TNV, ELV, RFT, or hazardous voltage) provided that they are separated as required by this Recommendation, [IEC 60950-1] and [IEC 62368-1].

5.2.2.2 Types of interconnecting circuits

An RFT can be an interconnection circuit.

5.2.2.3 Interconnection between RFT circuits

The interconnection of one RFT-V circuit to another RFT-V circuit shall not result in exceeding the limits specified in [ITU-T K.50]. The interconnection of one RFT-C circuit to another RFT-C circuit shall not result in exceeding the limits specified in [ITU-T K.50].

5.2.3 Protection of telecommunication network service personnel, and users of other equipment connected to the network, from hazards in the equipment

5.2.3.1 Protection from hazardous voltages

Circuitry intended to be directly connected to a telecommunication network shall comply with the requirements of an SELV circuit, a TNV circuit, ES1 circuit, ES2 circuit or an RFT circuit.

5.2.4 Separation from other circuits and parts

An RFT circuit shall be separated from:

– other RFT circuits by functional isolation; provided that neither circuit exceeds the limits of [ITU-T K.50] if this isolation is short-circuited. Otherwise, the circuits shall be separated as if one were at a hazardous voltage;
– ELV circuits by supplementary insulation;
– earthed accessible parts, earthed SELV circuits, earthed TNV circuits, earthed ES1 circuits and earthed ES2 circuits by basic insulation;
– unearthed accessible parts, unearthed SELV circuits, unearthed TNV circuits, unearthed ES1 circuits, and circuits at hazardous (ES2 or ES3) voltages by one or both of the following:
  – double or reinforced insulation;
  – basic insulation, together with protective screening connected to the main protective earthing terminal.

Compliance is checked by inspection and measurement.

5.2.5 Preventing vermin ingress

Vermin ingress can have a number of adverse effects such as:

– biting or stinging of service personnel;
– causing faults in the equipment;
– causing a fire in the equipment.

Equipment enclosure holes or openings are restricted in size, by [IEC 60950-1], to prevent hazardous contact with energized circuitry. This is verified by the use of a jointed test finger, pin and probe such as described in [IEC 60950-1], Figures 2A, 2B and 2C, respectively or [IEC 62368-1] Figures V1, V2, V3 and V4, respectively.

The test pin has the smallest diameter. An enclosure opening smaller than 3 mm will prevent test pin entry. Circular or mesh openings of 3 mm or less will also prevent the entry of most common stinging insects such as: honey bees, bumble bees, yellow jackets, bald-faced hornets, European hornets, and some other solitary wasp species. Only very small insects, such as 1 mm long fire ants, can still enter through a 3 mm hole and establish nests.

Ground level and subterranean enclosures are particularly vulnerable to ant infestation. Mounting the enclosure above ground, on a pole or to the side of a building reduces the risk of infestation. Enclosures designed to prevent the entry of rain and dust further reduce the risk of ant infestation.

5.2.6 Installation instructions

For equipment using an RFT circuit intended for interconnection with other equipment, the installation instructions shall specify all of the following:

– the effective capacitance of the equipment:
  – between the connection points for the conductors of the telecommunication network; and
  – between the connection point for one conductor of the telecommunication network and earth;
– that a system assessment shall be carried out to ensure that the effective capacitance of the total system, including the capacitance of the equipment, does not exceed the values specified in Figure 1;
– that the voltage rating of the telecommunication network must be adequate for the normal RFT circuit voltage, together with any superimposed transient;
– RFT circuit voltage.

For equipment with enclosure holes or openings, the installation instructions shall specify detailed installation requirements for preventing vermin or gecko entry, e.g., installation location, safeguard methods.

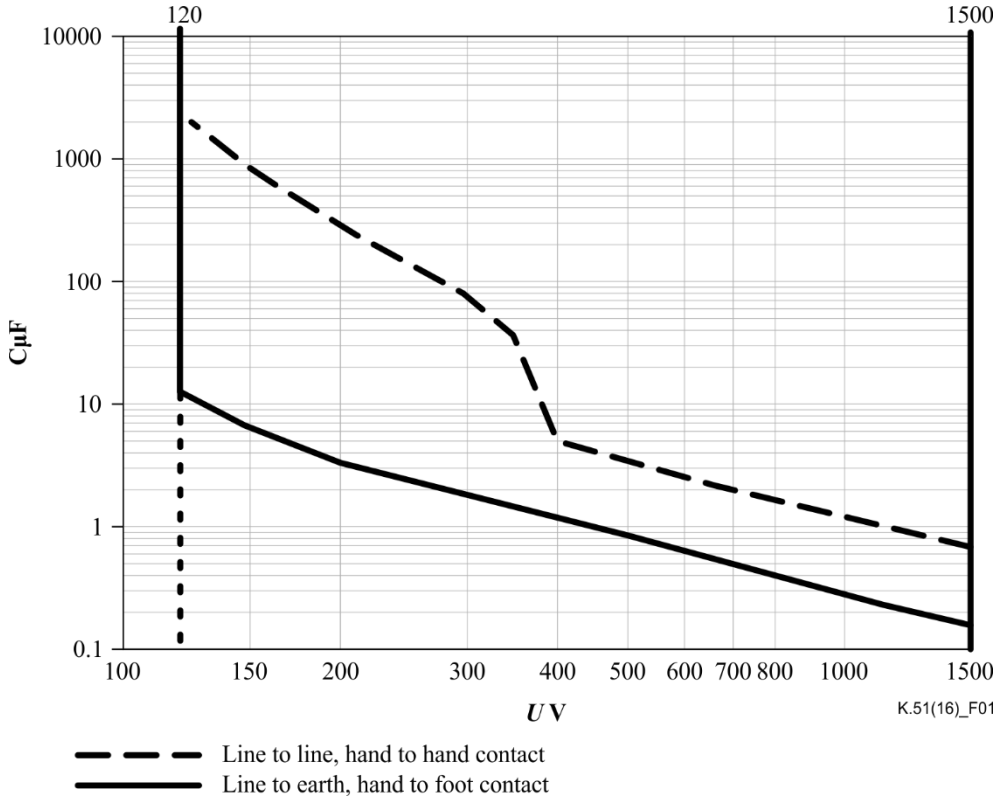

Figure 1 – Limits for capacitance values of RFT circuits or of the total system

Appendix I

Cross-reference between Recommendation ITU-T K.51, IEC 60950-1 and IEC 62368-1

(This appendix does not form an integral part of this Recommendation.)

For the reader's convenience, this appendix provides a cross-reference between the requirements of this Recommendation and paragraphs of [IEC 60950-1] and [IEC 62368-1] where similar requirements for other circuits are given (Table I.1).

Table I.1

ITU-T K.51 clause	IEC 60950-1 paragraph	IEC 62368-1 paragraph
5.2.1.1 Access to energized parts	2.1.1.1 Access to energized parts	5.3.2 Protection of an ordinary person (Annex V for probes)
5.2.1.2 Protection in service access areas	2.1.2 Protection in service access areas	5.3.3 Protection of an instructed person (Annex V for probes)
5.2.1.3 Protection in restricted access locations	2.1.3 Protection in restricted access locations	5.3.4 Protection of a skilled person (Annex V for probes)
5.2.2 Interconnection of equipment	3.5 Interconnection of equipment	6.7 Safeguards against fire due to the connection of secondary equipment
5.2.2.1 General requirements	3.5.1 General requirements	Annex Q (normative) Interconnection with building wiring
5.2.2.2 Types of interconnecting circuits	3.5.2 Types of interconnection circuits	–
5.2.2.3 Interconnection between RFT circuits	–	–
5.2.3 Protection of telecommunication network service personnel, and users of other equipment connected to the network, from hazards in the equipment	6.1 Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment	5.7.6 Prospective touch voltage and touch current due to external circuits
5.2.3.1 Protection from hazardous voltages	6.1.1 Protection from hazardous voltages	5.7.6 Prospective touch voltage and touch current due to external circuits
5.2.4 Separation from other circuits and parts	–	

Table I.1

ITU-T K.51 clause	IEC 60950-1 paragraph	IEC 62368-1 paragraph
5.2.5 Preventing vermin ingress	–	
5.2.6 Installation instructions	–	

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