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SERIES K: PROTECTION AGAINST INTERFERENCE

Protection of small-size telecommunication installations with poor earthing conditions

Recommendation ITU-T K.134

ITU-T

Recommendation ITU-T K.134

Protection of small-size telecommunication installations with poor earthing conditions

Summary

Recommendation ITU-T K.134 provides engineering solutions for lightning protection and safety of small-size telecommunication installations under poor earthing conditions. These protection measures compromise alternatives due to restrictions of circumstance or expense. These protection measures are not common requirements for most circumstances and have defined conditions for certain applications. The selection of appropriate and feasible solutions is helpful to acquire the best technology to cost ratio.

Accompanying the miniaturization development trends of network termination units, more and more telecommunication installations, e.g., wire or wireless access units, are being installed in customer premises or other uncontrolled places. Compared with dedicated telecommunication buildings, these installation environments may be more complex and severe. Recommendations ITU-T K.66 and ITU-T K.120 provide bonding and earthing requirements for customer premises and miniature base stations, respectively. However, in some scenarios, it may be very difficult or expensive to satisfy these requirements. If ignored, there is a risk of equipment damage or human safety due to lightning strikes or electric shock.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Keywords

Earthing, lightning protection, safety, small-size telecommunication installation.

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FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation ITU-T K.134

Protection of small-size telecommunication installations with poor earthing conditions

1 Scope

This Recommendation:

- provides engineering solutions for lightning protection and safety for small-size telecommunication installations under poor earthing conditions. These protection measures are not common requirements for most circumstances and have defined conditions for certain applications. If these installations have equivalent inherent capacity and function, the same results can be acquired;
- is not intended to replace traditional rules on bonding configurations and earthing. These protection measures compromise alternatives under poor earthing conditions due to restrictions of circumstance or expense;
- is intended to apply to installations powered by a.c. mains and comply with [IEC 60364 series] or national standards bodies on a.c. power installations;
- is intended to apply to installations powered by remote power output up to 400 VDC IT system and comply with [ETSI EN 302 099] and [ETSI EN 301 605].

The applied objects in this Recommendation are small-size telecommunication installations which are owned by network operators and controlled by skilled or trained personnel.

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.21] | Recommendation ITU-T K.21 (2018), <i>Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents.</i> |
| [ITU-T K.66] | Recommendation ITU-T K.66 (2011), <i>Protection of customer premises from overvoltages.</i> |
| [ITU-T K.75] | Recommendation ITU-T K.75 (2016), <i>Classification of interface for application of standards on resistibility and safety of telecommunication equipment.</i> |
| [ITU-T K.85] | Recommendation ITU-T K.85 (2011), <i>Requirements for the mitigation of lightning effects on home networks installed in customer premises.</i> |
| [ITU-T K.95] | Recommendation ITU-T K.95 (2016), <i>Surge parameters of isolating transformers used in telecommunication devices and equipment.</i> |
| [ITU-T K.98] | Recommendation ITU-T K.98 (2014), <i>Overvoltage protection guide for telecommunication equipment installed in customer premises.</i> |
| [ITU-T K.120] | Recommendation ITU-T K.120 (2016), <i>Lightning protection and earthing of a miniature base station.</i> |

- [IEC 60364 series] IEC 60364-series, *Low-voltage electrical installations*.
- [IEC 60364-4-41] IEC 60364-4-41 (2005), *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*.
- [IEC 61558-1] IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*.
- [IEC 62305-2] IEC 62305-2 (2010), *Protection against lightning – Part 2: Risk management*.
- [IEC 62368-1] IEC 62368-1:2018, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*.
- [ETSI EN 301 605] ETSI EN 301 605 V1.1.1 (2013), *Environmental Engineering (EE); Earthing and bonding of 400 VDC data and telecom (ICT) equipment*.
- [ETSI EN 302 099] ETSI EN 302 099 V2.1.1 (2014), *Environmental Engineering (EE); Powering of equipment in access network*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 breakdown [b-IEC 61340-1]: Failure, at least temporarily, of the insulating properties of an insulating medium under electric stress.

3.1.2 distant power receiver [ETSI EN 302 099]: Power equipment electrically connected to a Remote Power Unit.

NOTE – Its function is to supply telecommunications equipment situated at the same location. It may be combined with the item of telecommunications equipment itself.

3.1.3 equipment class I [ITU-T K.66]: Equipment where protection against electric shock is achieved by:

- 1) using basic insulation; and also
- 2) providing a means of connecting to the protective earthing conductor in the building wiring those conductive parts that are otherwise capable of assuming hazardous voltages if the basic insulation fails.

3.1.4 equipment class II [ITU-T K.66]: Equipment in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation are provided, there being no reliance on either protective earthing or installation conditions.

3.1.5 equipotential bonding [b-ITU-T Handbook]: An electrical connection putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential.

Distinction is made between:

- the main equipotential bonding;
- supplementary equipotential bonding;
- earth-free equipotential bonding.

Equipotential bonding does not necessarily have to connect to earth.

3.1.6 impulse withstand voltage [b-IEC 60664-2-1]: Highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation under specified conditions.

3.1.7 inherent protection [b-ITU-T K.44]: Inherent protection is protection that is provided within the equipment either by virtue of its intrinsic characteristics, by specific design, or by suitable protection components.

3.1.8 insulation (electrical) [b-IEC 62477-1]: Electrical separation between circuits or conductive parts provided by clearance or creepage distance or solid insulation or combinations of them.

3.1.9 isolation transformer [b-IEC 60065]: Transformer with protective separation between the input and output windings

3.1.10 miniature base station [ITU-T K.120]: A type of radio base station (RBS) whose size and RF power are much smaller than typical macro-base station or DBS base stations.

3.1.11 multiservice surge protective device (MSPD) [ITU-T K.85]: A surge protective device (SPD) containing both telecommunications and mains protection. It may also include port protection for video or Ethernet.

3.1.12 remote powering (RP) [ETSI EN 302 099]: Power feeding of a telecommunications equipment by a remote power circuit.

NOTE – Such a circuit consists of a remote power unit, distribution wiring, and fed receivers.

3.1.13 remote power unit (RPU) [ETSI EN 302 099]: Power unit, connected to the mains or from a centralized power plant, which supplies distant telecommunications equipment.

3.1.14 surge isolating transformer (SIT) [b-IEC 61643-351]: Isolation transformer which has high impulse withstand voltage with/without electrostatic screen between input and output windings.

3.1.15 system [b-ITU-T Handbook]: An electrical system consisting of a single source of electrical energy and an installation. Types of system are identified as follows, depending upon the relationship of the source, and of exposed-conductive-parts of the installation, to Earth. Further details of these systems can be found in the document IEC 60364-4:

- **TN system:** a system having one or more points of the source of energy directly earthed, the exposed-conductive-parts of the installation being connected to that point by protective conductors.
- **TN-C system:** in which neutral and protective functions are combined in a single conductor throughout the system,
- **TN-S system:** having separate neutral and protective conductors throughout the system,
- **TN-C-S system:** in which neutral and protective functions are combined in a single conductor in part of the system.
- **TT system:** a system having one point of the source of energy directly earthed, and exposed-conductive-parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the source.
- **IT system:** a system having no direct connection between live parts and Earth, the exposed-conductive-parts of the electrical installation being earthed.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 enclosure live voltage detection: Function intended to detect whether or not a conductive enclosure is live.

3.2.2 poor earthing conditions: The actual situations which hinder the construction of valid earthing and bonding configurations compliant with the requirements of the relevant ITU-T K-series Recommendations, e.g., [ITU-T K.66] and [ITU-T K.120], due to the restriction of circumstance or expense.