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**Characteristics and ratings of solid-state,
self-restoring overcurrent protectors for the
protection of telecommunications installations**

Recommendation ITU-T K.82



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Recommendation ITU-T K.82

Characteristics and ratings of solid-state, self-restoring overcurrent protectors for the protection of telecommunications installations

Summary

Recommendation ITU-T K.82 defines the basic requirements and parameters of solid-state, self-restoring overcurrent protectors (OCPs) for the protection of telecommunication installations (for example, exchange equipment, access equipment, telecommunication lines and subscriber or customer equipment).

This Recommendation should be used for the harmonization of existing or future specifications issued by solid-state, self-restoring overcurrent protector manufacturers, telecommunication equipment manufacturers, administrations or network operators.

History

Edition	Recommendation	Approval	Study Group
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Keywords

CPTC, ECL, overcurrent protection, PPTC, PTC, self-restoring, surge protective component, surge protective device, thermistor.

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.

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Introduction

Unlike fuses and heat coils, self-restoring overcurrent protectors (OCPs) automatically reset after the end of the overcurrent condition without the need for manual intervention, generally after power is removed at the end of the overcurrent. All the OCPs covered are solid-state. Having no moving parts, these OCPs are at least four times more reliable than thermal circuit breakers and six times more reliable than mechanical disk switches.

The current reducing action is for the normally low (untripped) OCP resistance to transition to a very high tripped resistance value, which greatly reduces the circuit current flow. The positive temperature coefficient (PTC) thermistor OCPs transition is caused by the component body reaching a critical temperature. The body temperature rise is caused by the i^2R heating of the overcurrent flowing through the component. Being thermally operated, PTC thermistor OCPs generally do not operate for short duration lightning currents, but will operate for AC overcurrents caused by power faults. Electronic current limiter (ECL) OCPs operate on a preset current threshold level and will reduce both AC and lightning overcurrents. Under lightning surge conditions, both OCP types assist in the coordination function.

Many of the performance tests and values can be applied to the three types of OCP technology. Some tests are specific to OCP used in SPDs (surge protective devices) or in equipment connected to an SPD and others to OCPs used in equipment. Differences between technologies mean that some tests will be specific to a given technology.

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Recommendation ITU-T K.82

Characteristics and ratings of solid-state, self-restoring overcurrent protectors for the protection of telecommunications installations

1 Scope

This Recommendation applies to 2-terminal, series connected, solid-state, self-restoring overcurrent protectors (OCPs) used in surge protective devices (SPDs) and telecommunications equipment. These OCPs are directly connected to a device or equipment port and provide overcurrent protection and coordination functions for telecommunications installations during lightning surges and AC power faults, in accordance with [b-ITU-T K.11]. The port test levels and criterion are defined by [ITU-T K.20], [ITU-T K.21] and [ITU-T K.45], as appropriate. [ITU-T K.44] supports these three equipment performance ITU-T Recommendations with test circuit details and application guidance.

This Recommendation provides the basic requirements, and parameter tests, for OCPs used in the protection of telecom installations. This Recommendation covers the following types of solid-state, self-restoring OCP:

- a) polymer positive temperature coefficient (PPTC) thermistors;
- b) ceramic positive temperature coefficient (CPTC) thermistors;
- c) electronic current limiters (ECLs).

It does not deal with:

- a) mountings and their effect on OCP performance, the test results only apply for the mounting method used for that test;
- b) system signal performance such as insertion loss, see [b-ITU-T G.117];
- c) mechanical dimensions;
- d) RoHS requirements;
- e) electrical overload;
- f) quality assurance requirements, see [IEC 60738-1];
- g) specific cases of user agreed and regional values.

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.12] Recommendation ITU-T K.12 (2006), *Characteristics of gas discharge tubes for the protection of telecommunications installations*.
- [ITU-T K.20] Recommendation ITU-T K.20 (2008), *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*.
- [ITU-T K.21] Recommendation ITU-T K.21 (2008), *Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents*.

- [ITU-T K.28] Recommendation ITU-T K.28 (1993), *Characteristics of semi-conductor arrester assemblies for the protection of telecommunications installations.*
- [ITU-T K.44] Recommendation ITU-T K.44 (2008), *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation.*
- [ITU-T K.45] Recommendation ITU-T K.45 (2008), *Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents.*
- [IEC 60068-1] IEC 60068-1 (1988), *Environmental testing – Part 1: General and guidance, plus Amendment 1 (1992).*
- [IEC 60068-2-1] IEC 60068-2-1 (2007), *Environmental testing – Part 2-1: Tests – Test A: Cold.*
- [IEC 60068-2-2] IEC 60068-2-2 (2007), *Environmental testing – Part 2-2: Tests – Test B: Dry heat.*
- [IEC 60068-2-6] IEC 60068-2-6 (2007), *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal).*
- [IEC 60068-2-13] IEC 60068-2-13 (1983), *Environmental testing – Part 2-13: Tests – Test M: Low air pressure.*
- [IEC 60068-2-14] IEC 60068-2-14 (2009), *Environmental testing – Part 2-14: Tests – Test N: Change of temperature.*
- [IEC 60068-2-20] IEC 60068-2-20 (2008), *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads.*
- [IEC 60068-2-21] IEC 60068-2-21 (2006), *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices.*
- [IEC 60068-2-27] IEC 60068-2-27 (2008), *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock.*
- [IEC 60068-2-29] IEC 60068-2-29 (1987), *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump.*
- [IEC 60068-2-30] IEC 60068-2-30 (2005), *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h+12 h cycle).*
- [IEC 60068-2-45] IEC 60068-2-45 (1980), *Environmental testing – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents.*
- [IEC 60068-2-54] IEC 60068-2-54 (2006), *Environmental testing – Part 2-54: Tests – Test Ta: Solderability testing of electronic components by the wetting balance method.*
- [IEC 60068-2-58] IEC 60068-2-58 (2004), *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD).*
- [IEC 60068-2-69] IEC 60068-2-69 (2007), *Environmental testing – Part 2-69: Tests – Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method.*
- [IEC 60068-2-78] IEC 60068-2-78 (2001), *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state.*
- [IEC 60695-11-5] IEC 60695-11-5 (2004), *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance.*