

**SAFETY;
Remote Power Feeding Installations;
Safety requirements for the erection and operation
of information technology installations
with remote power feeding**



Reference

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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Telecommunications Equipment Safety (Safety).

1 Scope

The present document contains safety requirements for the erection of information technology installations with remote power feeding at an operating a.c. voltage exceeding 50 V (rms value) or an operating d.c. voltage exceeding 120 V, conductor to conductor and/or conductor to earth. It applies in addition to EN 60950-1 [3] and EN 60950-21 [4] and contains terms, requirements and tests.

If special standards are applicable for installations and parts of installations these shall take precedence; for example EN 60950-1 [3] and EN 60950-21 [4].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] CENELEC EN 60417-1 (1999): "Graphical symbols for use on equipment. Overview and application".
- [2] CENELEC EN 60900 (2004): "Live working. Hand tools for use up to 1 000 V a.c. and 1 500 V d.c".
- [3] CENELEC EN 60950-1: "Information technology equipment - Safety - Part 1: General requirements".
- [4] CENELEC EN 60950-21: "Information technology equipment - Safety - Part 21: Remote power feeding".
- [5] ITU-T Directives concerning the protection of telecommunication lines against harmful effects from electric power and electrified railway lines (volume IV).
- [6] ITU-T Recommendation K.10: "Low frequency interference due to unbalance about earth of telecommunication equipment".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions given in EN 60950-1 [3], EN 60950-21 [4] and the following apply:

load power-fed point: load power-fed point extracts electric power from the remote power feeding circuits via its remote power feeding equipment

remote power feeding: supply of electric power in the form of direct or alternating current to information technology installations through cables of the associated telecommunication line

remote power feeding cables: cables of a telecommunication line which are used for remote power feeding and may at the same time be telecommunication cables

NOTE: They are components of the information technology installation.

remote power feeding circuit: circuit which is established by interconnecting remote power feeding devices and cables to form a functional entity

NOTE: See also RFT circuit (remote feeding telecommunication circuit), RFT-C circuits and RFT-V circuits according to EN 60950-21 [4].

remote power feeding devices: devices used for remote power feeding, e.g. to supply or extract electric power

remote power feeding equipment: equipment from which the electric power necessary for the remote power feeding of information technology installations is extracted

NOTE 1: It is a component of the information technology installation.

NOTE 2: For information technology equipment see EN 60950-1 [3].

remote power feeding point: remote power feeding point supplies remote power feeding circuits with electrical current via its remote power feeding equipment

remote power feeding section: part of remote power feeding circuits located between a remote power feeding point and the immediately following power-fed point, or between two adjacent power-fed points

RFT-C circuit: RFT circuit which is so designed and protected that under normal operating conditions and single fault conditions, the currents in the circuit do not exceed defined values

NOTE: See EN 60950-21 [4].

RFT-V circuit: RFT circuit which is so designed and protected that under normal operating conditions and single fault conditions, the voltages are limited and the accessible area of contact is limited

NOTE: See EN 60950-21 [4].

type of remote power feeding: electrical operating mode of the remote power feed in a remote power feeding circuit. It is specified by particular characteristics of the circuit configuration and power feeding method. A distinction is made in particular between the following ones:

- **a.c. remote power feeding:** power-fed points receive an a.c. supply;
- **d.c. remote power feeding:** power-fed points receive a d.c. supply;
- **double-ended remote power feeding:** remote power feeding circuit has two remote power feeding points;
- **external remote power feeding:** different cables are used for the remote power feeding and telecommunications connections;
- **internal remote power feeding:** same cables are used for the remote power feeding and telecommunications connections;

- **parallel remote power feeding:** power-fed points within a remote power feeding circuit are connected in parallel;
- **series remote power feeding:** power-fed points within a remote power feeding circuit are connected in series;
- **single-ended remote power feeding:** the remote power feeding circuit has only one remote power feeding point.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

a.c.	alternating current
d.c.	direct current
RFT circuit	Remote Feeding Telecommunication circuit
RFT-C circuit	Remote Feeding Telecommunication-Current circuit
RFT-V circuit	Remote Feeding Telecommunication-Voltage circuit

4 Limits

4.1 Permitted limit values in maintenance range

For limit values during normal operation and during single fault conditions see EN 60950-21 [4], clause 6.

4.2 Equipment with which limit values are exceeded according to clause 4.1

For equipment with which the limit values according to clause 4.1 are exceeded, EN 60950-1 [3] shall be valid along with clauses 5 to 7 of the present document.

5 General requirements

- 5.1** Remote power supply equipment shall be operated in restricted access locations according to EN 60950-1 [3], see clause 1.2.7.3. Remotely fed equipment e.g. a repeater, shall also be accommodated in locations with limited access.
For example, joint boxes and chambers in cable systems which can be opened only with the aid of tools shall comply with the requirements for restricted limited access locations.
- 5.2** Voltage sources where the output current is limited according to clause 4.1 shall always switch themselves off reliably when exceeding these limit values by +10 %.
- Test:** *Check the current control circuits switch-off level.*
- 5.3** Remote power circuits according to clause 4.2 shall have a monitoring system for detection of faults and unbalance. Any deviation from target values shall activate an alarm or be displayed to people in the operator service area or in the restricted access location.
- Test:** *Make the monitoring system respond to earth faults or unbalance.*
- 5.4** Remote power devices shall be constructed so as to provide protection against an electrical shock or power hazard according to EN 60950-1 [3].
- Test:** *According to EN 60950-1 [3].*

- 5.5** All cables (according to the hazard levels for voltage and/or current of clause 4.2) shall be continuously labelled with the symbol for the telephone and the telephone adapter (IEC 60417 [1]-5090). In addition to this symbol the symbols for hazardous electrical voltage (IEC 60417 [1]-5036; lightning symbol without triangle) has to be added, also in a longitudinal direction. Table 1 is a guide for the placement of the symbols.

Table 1: Guide to placement of symbols on the remote power cable

Diameter D over cable sheath or jacketing mm	Height h of the symbol mm	Spacing k between adjacent symbols mm	Spacing l between symbol pairs mm
up to 30	12	6	25
over 30	20	10	40

Under certain circumstances, labelling at the ends of the remote power feeding sections is sufficient.

Test: *Visual inspection.*

- 5.6** Information referring to the safety requirements in the operating instructions shall be clearly visible at the installation site of the remote power feeding equipment.
- 5.7** The isolation points of remote power lines at each end of each remote power feeding section shall be labeled - besides usual labelling - such that different remote power circuits cannot be mixed up.

6 Requirements on equipment and lines

- 6.1** Remote power units or corresponding switching units shall be designed so that the remote power source can be switched off at an easily accessible point and reactivation of the remote power source can be prevented e.g. by a lock.

Test: *Visual inspection.*

- 6.2** Equipment for the detection of disconnected remote power circuits shall be constructed so that they are only effective when the remote power sources are switched off.

Test: *Visual inspection.*

- 6.3** In the case of the feeding of remote a.c. power sources via the central conductors of coaxial pairs, the outer wires of the individual coaxial pairs shall be connected to the ends of the remote power circuit and to the conductive cable jacketing at all remotely fed points.

Test: *Visual inspection.*

- 6.4** In the case of influence through power mains installations, the measures according to 6.4 a) and 6.4 b) shall be applied along with safety protection according to ITU-T Recommendation K.10 [6] and the ITU-T directives concerning the protection of telecommunication lines against harmful effects from electric power and electrified railway lines [5].

a) Remote power feeding shall be balanced to earth.

Test: *Measurements of the partial voltages to earth.*

b) In the case of d.c. remote power sources via the central conductors of coaxial pairs, operation with non-earthed outer wires may be used to protect connected units (floating potential).

Test: *Measurement of the resistance to earth potential (type testing).*

7 Requirements on operating instructions

Operating instructions for safety equipment and electrical safety services shall be available.

They shall take into account all the particulars of the installation:

- Operating instructions shall be provided for each telecommunication installation with remote power feeding. The safety requirements in the text shall be highlighted.

8 Recommendation of operating instructions (informative)

The following proposals for content in an operating instruction are normally covered by national regulation.

However, the information below is offered as a reminder on what an operating instruction should contain.

The persons that are allowed to carry out work on remote power feeding devices, should be trained electricians or suitably qualified individuals working under the instructions of a responsible person.

This can be done by:

- a person responsible for the work;
- a person responsible for the installation;
- a skilled person; or
- a report or instruction given in oral or in written form about the operation of the electrical installation.

The operation of a telecommunication installation is:

- the service and maintenance;
- the work at and in electrical installations;
- the service, the inspection, the restoration;

and the live working on electrically energized systems only under the instruction of a skilled person using protective clothing and additional measuring devices according to protection and health. Live working is only allowed in locations, where no fire and explosion risk exists.

Ordinary persons should be supervised by skilled or instructed persons.

It should be identified how a system that has been taken out of service (e.g. for maintenance work) can be protected against inadvertent reactivation, including attachment of warning signs to the equipment.

The requirement that earth faults or unbalance in remote power feeding circuits in which the limit values according to clause 4.1 are exceeded and indicated as in clause 5.3 should be eliminated immediately.

The requirement that, if the limits according to clause 4.1 are exceeded in one or more remote power feeding circuits of a cable, all remote power feeding circuits should always be disconnected from all remote power feeding equipment before working on the cable (e.g. in the case of double-ended remote power feeding).

The circumstances under which work may still be carried out when the limit values according to clause 4.1 are exceeded in one or more remote power feeding circuits. This may be the case if the cable sheath is not opened or, if after opening the cable sheath, it is not possible to touch any live conductors (e.g. cables with plastic-insulated conductors or coaxial pairs where the power flows through the center conductor). See EN 60900 [2] on isolated tools.

The requirement that the outer conductor of live coaxial pairs or plastic insulation of symmetrical conductors should not be damaged during the work.

The requirement that work which involves perforation or drilling of the cable sheathing, e.g. for compressed air measurements or fault-tracing gas, should only be carried out using insulating tools.

The circumstances under which work should be carried out on joint boxes and chambers, terminal boxes or similar equipment while the remote power feeding to other conductors is still active, should be specified.

It should be specified how cables or conductors can be identified to be without remote power feeding or deactivated from such.

Cables or installations should be labeled immediately and clearly on site to avoid mix-ups later on.

When working on cables with paper insulated conductors carrying remote power voltage, the remote power feeding in the remote power section should be switched off and secured against reactivation before opening of cable sheaths or cable fittings (e.g. through locking the switch and securing the key and through warning signs which indicate that work is being carried out on the cable and that reactivation is currently prohibited).

It is required that before working on aerial cables and overhead lines, all remote power feeding circuits should be disconnected if the permitted limit values in clause 4.1 are exceeded.

Additional information for incorporation in the operating manual can be taken from the relevant standards for high voltage and power influences to remote feeding lines (e.g. a.c., d.c. railway tractions).

For working on telecommunication installations in the case of interference by electric power installations insulated tools should be used only.

Works on telecommunication installations with voltages > 50 V a.c. or 120 V d.c. should be carried out by instructed persons only. If these are permanent voltages, these works shall be carried out by skilled persons. The workers should insulate themselves through additional protection (for instance insulation mat, gloves or shoes).

Labels

In order to prevent danger, suitable safety labels should, as necessary, be attached when operating or working on electrical installation safety labels should correspond to relevant European, national or international standards, as far as such exist.

A reminder should be implemented that remote power feeding shall only be switched on again when all work has been completed and when all those persons involved have reported that their working areas are safe.

History

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