ETSI TS 102 121 V1.3.1 (2014-07)

Environmental Engineering (EE);
Power distribution to telecommunications and datacom (ICT) equipment

Reference
RTS/EE-02041

Keywords
distribution, earthing, power, power supply, system

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://ipr.etsi.org).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Environmental Engineering (EE).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document gives guidance on installation, connection and operation of power supply systems for telecommunication / datacom (ICT) systems and equipment. Also are considered items of equipment with their own power supply, which are connected to form a complete system.

1 Scope

The present document gives guidance on installation, connection and operation of power supply systems for telecommunication / datacom installations and equipments. Also are considered items of equipment with their own power supply, which are connected to form a complete system installation.

The present document contains definitions for power supply and distribution systems in complement to power interfaces standards EN 300 132 series [5], [6], [7], [i.6] and [i.7].

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.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

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

[1] IEC EN 60038: "IEC standard voltages".

[2] ETSI EN 300 386: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements".

[3] CENELEC EN 60950-1: "Information technology equipment - Safety - Part 1: General requirements".

[4] CENELEC EN 60896-21: "Stationary lead-acid batteries - Part 21: Valve regulated types - Methods of test".

[5] ETSI ETS 300 132-1: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (AC) derived from direct current (DC) sources".

[6] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (DC)".

[7] ETSI EN 300 132-3-1: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 1: Direct current source up to 400 V".

[8] ETSI EN 302 099: "Environmental Engineering (EE); Powering of equipment in access network".

[9] ETSI EN 300 253: "Environmental Engineering (EE); Earthing and bonding of telecommunication equipment in telecommunication centres".

[10] Recommendation ITU-T K.20: "Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents".

[11] Recommendation ITU-T K.21: "Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents".

[12] Recommendation ITU-T K.45: "Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents".

[13] CENELEC HD 384 (all parts)/HD 60364: "Electrical installations of buildings".

[14] ETSI EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".

[15] CENELEC EN 61000-3-2: "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)".

[16] CENELEC EN 61000-3-3: "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection".

[17] Recommendation ITU-T P.53: "Psophometer for use on telephone-type circuits".

[18] CENELEC EN 50310: "Application of equipotential bonding and earthing in buildings with information technology equipment".

[19] CENELEC EN 61000-4-11: "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests".

[20] CENELEC EN 50174-2: "Information technology - Cabling installation - Part 2: Installation planning and practices inside buildings".

[21] CENELEC EN 62040-1-1: "Uninterruptible power systems (UPS) - Part 1-1: General and safety requirements for UPS used in operator access areas".

[22] CENELEC EN 62040-1-2: "Uninterruptible power systems (UPS) - Part 1-2: General and safety requirements for UPS used in restricted access locations".

[23] CENELEC EN 60896-11: "Stationary lead-acid batteries - Part 11: Vented types - General requirements and methods of tests".

[24] CENELEC EN 62310-1: "Static transfer systems (STS) - Part 1: General and safety requirements".

[25] CENELEC EN 60896-22: "Stationary lead-acid batteries - Part 22: Valve regulated types - Requirements".

[26] ETSI EN 301 605: "Environmental Engineering (EE); Earthing and bonding of 400 V DC data and telecom (ICT) 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.

[i.1] IEC 60050-601: "International Electrotechnical Vocabulary. Chapter 601: Generation, transmission and distribution of electricity - General".

[i.2] CENELEC EN 62368-1 Ed. 1.0: "Audio/Video, Information and Communication Technology Equipment - Part 1: Safety requirements".

[i.3] IEC EN 60445: "Basic and safety principle for man-machine interface, marking and identification-Identification of equipment terminals, conductor terminations, and conductors".

[i.4] ETSI TR 100 283: "Environmental Engineering (EE); Transient voltages at Interface "A" on telecommunications direct current (DC) power distributions".

[i.5] 19 Pfl1: "Voltage limits for 60 V consumers in telecommunication installations of the Deutsche Telekom".

[i.6] ETSI EN 300 132-3-0: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 0: Overview".

[i.7] ETSI EN 300 132-3-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 2: Alternating up to 400 V solution".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

current-using equipment: either a further power supply system or a telecommunication equipment

NOTE: The telecommunication equipment with associated power supply may be considered as telecommunication installation or telecommunication equipment.

disturbance: electromagnetic disturbance having components in the radio frequency range

immunity: ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

power supply system: electrical equipment, which makes available energy obtained from a primary power source (e.g. AC distribution) in a form suitable for the current-using equipment

radio interference: degradation of the reception of a wanted signal caused by radio frequency disturbance

supply voltage: voltage preferably obtained from the public distribution system or other primary electric power sources

Transfer Switch (TS): integrated automatic bypass switch used in the UPS, which can be fully static, fully electromechanical or hybrid

3.2 Abbreviations

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

AC	Alternating Current
DC	Direct Current
EMC	Electro-Magnetic Compatibility
ERM	Electromagnetic Radio spectrum Matters
HD	Harmonization Document
ICT	Information and Communication Technology
MOS	Metal Oxide Semiconductor
PSI	Power Supply Interface
SBS	Systems Bypass Switch
SD	Safe Disconnection
STS	Static Transfer Switches (for the stand-alone static switches)
TS	Transfer Switch
UPS	Uninterruptible Power Supply

4 Types of power supply systems

In telecommunication and datacom installations and equipment the designation of a power supply system refers to its output.

In this sense there are DC and AC supplies. The operating modes described below are basic forms, which may be developed into more complex arrangements.

4.1 DC supply

4.1.1 Mains operation

The current-using equipment is supplied with DC voltage obtained by a rectifier from the AC system (see figure 1).

The nominal voltage is a normative definition used to enable differentiating power interfaces as defined in IEC 60050-601 [i.1].

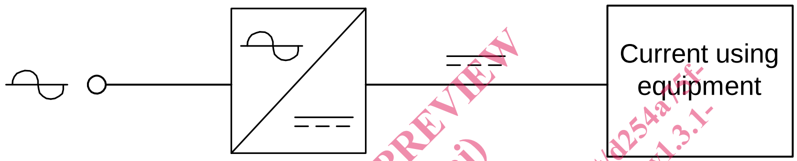

Figure 1: Principle of mains operation

4.1.2 Battery operation

The current-using equipment is supplied from a battery. Both primary and secondary cells (Accumulators) can be used as batteries. The Accumulator is disconnected from the current-using equipment for charging (see figure 2).

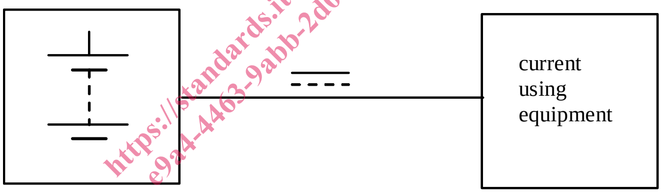

Figure 2: Principle of battery operation

4.1.3 Floating/Parallel operation

The current-using equipment is connected continuously to a rectifier and battery (see figure 3).

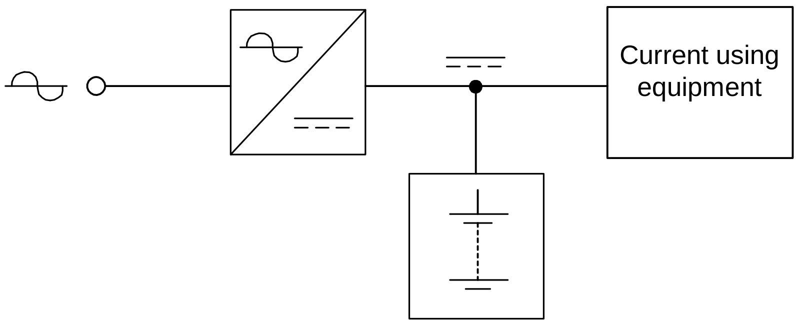

Figure 3: Principle of parallel operation

The current-using equipment is supplied in parallel operation; the rectifier being dimensioned in such a way that it can cover the total power consumption of the current-using equipment and in addition supply an appropriate charging current for the battery (see figure 3).

With this configuration the battery is continuously ready for operation in a fully charged condition. If the mains AC voltage is outside of the specification (e.g. fails, reduction of voltage, high harmonics), the current-using equipment continues to be supplied without interruption.

Parallel operation includes a very common charging mode known as floating mode and other charging modes such as intermittent charge.

Floating charge is a charging mode where the self-discharge of the battery is compensated by maintaining a sufficient voltage to the battery. The charging voltage can be varied due to temperature compensation.

Intermittent charge is a charging mode where the self-discharge of the battery is compensated by periodically raising the voltage of rectifiers for short periods. Between these periods the rectifier voltage is left lower than it should be in floating mode. The aim is to reduce plate corrosion and loss of water, as well as to reduce the risk of thermal runaway. This may help to prolong the life span of batteries used in outdoor equipments or areas with high ambient temperature.

4.1.3.1 DC switch operation

The power requirement of the current using equipment is normally provided by a rectifier. A disconnected battery is maintained in a charged condition by a separate charger. If the rectifier fails, the current-using equipment is switched to the battery and supplied by the latter (see figure 4).

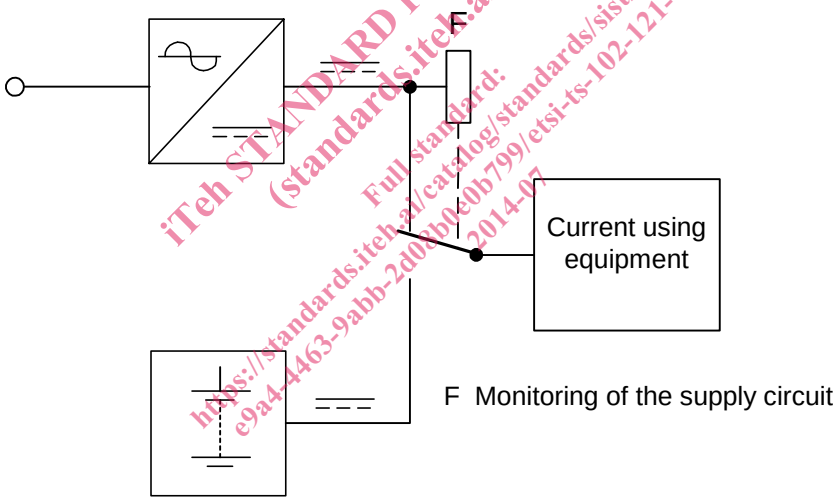

Figure 4: Principle of DC switch operation

4.1.3.1.1 Switch operation with interruption

The power supply of the equipment is briefly interrupted when the current-using equipment is switched between the rectifier and the battery.

The battery is not charged in this case by the main power supply but can be recharged in any mode (floating, intermittent) as previously described by a separate charger. Sizing of the primary AC power source and associated protection systems shall take into account the maximum load of the telecom equipment and battery charging power. Battery charging power depends on the battery capacity and required charging-time. Generally, the charging power is from 10 % to 100 % of the power supply of telecom equipment. This solution separates the functions of charging and supplying power to the current-using equipment and allows both to be optimized separately.

4.1.3.1.2 Switch operation without interruption

The current-using equipment is switched by switching equipment without interruption between the rectifier and the battery. The distance from the power source to the switching equipment as well as the input circuit of the current-using equipment should be considered.