SLOVENSKI STANDARD
SIST EN 300 132-3-1 V2.1.1:2012

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Okoljski inženiring (EE) - Napajalni vmesnik na vhodu v telekomunikacijsko in podatkovno-komunikacijsko opremo - 3. del: Napajanje z usmerjenim tokovnim virom, izmenično napetostjo ali enosmerno napetostjo do 400 V - 1. poddel: Enosmerna napetost do 400 V

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

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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

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Contents

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE).

The present document concerns the requirements for the interface between telecommunication or datacommunication equipment (so called telecommunications and datacom (ICT) equipment) and its power supply. It includes requirements relating to its stability and measurement. Various other references and detailed measurement and test arrangements are contained in informative annexes.

The introduced interface operated by DC source up to 400 V is considering power consumption increase and equipment power density increase in order to get higher energy efficiency with less material than with low voltage -48 VDC or permanent AC powering solution.

The DC interface could also simplify the use of renewable energy with DC output such as photovoltaic generator.

The present document is part 3-1 of a multi-part deliverable covering Environmental Engineering (EE); Power supply interface at the input to telecommunication and datacom (ICT) equipment, as identified below:

Part 1: "Operated by alternating current (ac) derived from direct current (dc) sources";

Part 2: "Operated by -48 V direct current (dc)";

Part 3-0: "Operated by rectified current source, alternating current source or direct current source up to 400 V, Sub-part 0: Overview";

Part 3-1: "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";

Part 3-2: "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";

Part 3-3: "Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 3: Rectified current up to 400 V solution".

The parts 3-0 to 3-3 are the result of a revision of EN 300 132-3 [3]. This revision was necessary, because the present document was not clear. Sub-parts have been introduced for voltage interfaces A3 up to 400 V.

National transposition dates	
Date of adoption of this EN:	9 February 2012
Date of latest announcement of this EN (doa):	31 May 2012
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 November 2012
Date of withdrawal of any conflicting National Standard (dow):	30 November 2012

1 Scope

The present document contains requirements for:

- the output performance of the power equipment at the interface A3;
- the input of the telecommunications and datacom (ICT) equipment connected to interface A3.

The voltage at interface A3 defined in the present document is DC voltage between 260 V and 400 V.

The DC power can be supplied by the battery backup of a DC power system.

The present document aims at providing compatibility between the power supply equipment and both the telecommunications and datacom (ICT) equipment, and the different load units connected to the same interface A3 (e.g. control/monitoring, cooling system, etc.).

The purpose of the present document is:

- to identify a power supply system with the same characteristics for all telecommunications and datacom (ICT) equipment defined in the area of application; the area of application may be any location where the interface A3 is used i.e. telecommunication centers, Radio Base Stations, datacenters and customer premises;
- to facilitate interworking of different (types of) loads;
- to facilitate the standardization of power supply systems for telecommunications and datacom (ICT) equipment;
- to facilitate the installation, operation and maintenance in the same network of telecommunications and datacom (ICT) equipment and systems from different origins.

General requirements for safety and EMC are out of the scope of the present document series unless specific requirement not defined in existing safety or EMC standards.

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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NOTE: While any hyperlinks included in the present 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 60947-2: "Low-voltage switchgear and controlgear - Part 2: Circuit-breakers".

[2] IEC/EN 60269-1: "Low-voltage fuses - Part 1: General requirements".

[3] IEC/EN 61000-4-5: "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test".

[4] IEC/EN 61000-4-29: "Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests".

[5] IEC/EN 60898-2: "Circuit-breakers for overcurrent protection for household and similar installations - Part 2: Circuit-breakers for a.c. and d.c. operation".

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] 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".

[i.2] 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)".

[i.3] IEC 60050-601: "International Electrotechnical Vocabulary. Chapter 601: Generation, transmission and distribution of electricity - General".

[i.4] ETSI EN 300 253: "Environmental Engineering (EE); Earthing and bonding of telecommunication equipment in telecommunication centres".

[i.5] ETSI EN 300 386: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements".

[i.6] IEC/EN 60950-1: "Information technology equipment - Safety - Part 1: General requirements".

[i.7] CENELEC EN 62368-1 Ed. 1.0: "Audio/Video, Information and Communication Technology Equipment - Part 1: Safety requirements".

[i.8] IEC/EN 60445: "Basic and safety principle for man-machine interface, marking and identification- Identification of equipment terminals, conductor terminations, and conductors".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

abnormal service voltage ranges: steady-state voltage ranges over which the telecommunications and datacom (ICT) equipment will not be expected to maintain normal service but will survive undamaged

area of application: any location where the interface A3 is used i.e. telecommunication centers, Radio Base Stations, datacenters andcustomer premises

compliance criteria:

Criteria a): The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criteria b): Temporary loss of function or degradation of performance, which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention.

NOTE: In the present document, the apparatus is the telecommunications and datacom (ICT) equipment.

customer premises: any location which is the sole responsibility of the customer

interface A3: interface, physical point, at which power supply is connected in order to operate the telecommunications and datacom (ICT) equipment

load unit: power consuming equipment, that is part of a system block

nominal voltage: value of the voltage by which the electrical installation or part of the electrical installation is designated and identified

normal operating condition: typical environmental and powering conditions for operation of telecommunications and datacom (ICT) equipment, power supply, power distribution and battery

normal operating voltage: typical value of the voltage at A3 interface within the normal operating voltage range

normal operating voltage range: the voltage range at A3 interface where the system operates most of the time, e.g. in general linked to battery floating voltage

normal service: service mode where telecommunications and datacom (ICT) equipment operates within its specification

normal service voltage range: range of the steady-state voltage at the A3 interface over which the equipment will maintain normal service

operating voltage: value of the voltage under normal conditions, at a given instant and a given point (A3 interface) of the system

power supply: power supply to which telecommunications and datacom (ICT) equipment is intended to be connected

reference test voltage: voltage used as a reference to define the test voltage in the present document. The test voltage may be also a percentage of this voltage

system block: functional group of telecommunications and datacom (ICT) equipment depending for its operation and performance on its connection to the same power supply

telecommunications and datacom (ICT) equipment: in this context, telecommunications and datacom (ICT) equipment means telecommunication or datacommunication equipment that is a part of ICT equipment definition

telecommunication centre: any location where telecommunications and datacom (ICT) equipment is installed and is the sole responsibility of the operator

3.2 Symbols

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

I_m	maximum steady state current drain at 260 VDC at interface A3
I_{mss}	maximum steady state current drain in the abnormal service voltage range at interface A3
I_n	current rating of the over-current protective device
I_p	peak inrush current at interface A3
I_{UT}	maximum steady state current drain at U_T at interface A3
T_{50}	time duration of the inrush current pulse at 50 % of Ip

3.3 Abbreviations

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

AC	Alternating Current

NOTE: Also when used as a suffix to units of measurement.

CB	Circuit Breaker
DC	Direct Current

NOTE: Also when used as a suffix to units of measurement.

EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
HOD	High-Ohmic Distribution
ICT	Information and Communication Technology

LOD	Low-Ohmic Distribution
MTTR	Mean Time To Repair
N	Neutral conductor
PE	Protective Earth
U_T	Reference Test Voltage
VAC	Volts Alternating Current
VDC	Volts Direct Current
VRLA	Valve Regulated Lead Acid

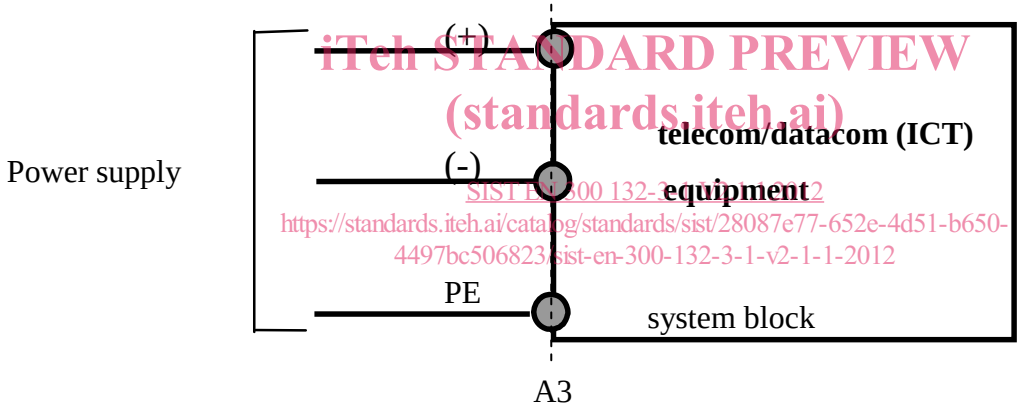
4 Interface A3

The power supply interface, interface A3 of figure 1, is a physical point to which all the requirements are related. This point is situated between the power supply system(s) and the power consuming telecommunications and datacom (ICT) equipment.

An examples of configurations in which interface A3 is identified are given in annex B.

Interface A3 is located at the power terminals of the telecommunications and datacom (ICT) equipment or system as defined by the manufacturer in accordance to IEC 60445 [i.8].

NOTE: Subject to the installation preconditions, this point may be located at any other point between the power supply system and the telecommunications and datacom (ICT) equipment by mutual agreement of the relevant parties.



(+) Positive DC terminal.
(-) Negative DC terminal.
PE Protective Earth.

Figure 1: General identification of the interface A3

5 DC interface requirements

The definition of the DC interface voltages ranges and typical operating voltage values are illustrated in annex H.

5.1 Nominal voltage

The nominal voltage is a normative definition used to enable differentiating power interfaces as defined in IEC 60050-601 [i.3].

The selected battery in general determines this nominal voltage, the operating voltage and the normal service voltage range in the system.

NOTE 1: For example, 336 V is a nominal voltage defined with 168 lead-acid battery cells multiplied by the nominal cell voltage 2 V. This nominal DC voltage is equivalent to 48 V multiplied by 7. It allows the use of existing 48 V battery rack (e.g. Lithium battery racks). There may be other nominal voltage defined with different number of cells e.g. 156 lead-acid battery cells that lead to 312 V nominal voltage. Other battery technologies are possible in the future and will influence nominal voltage as well. For detailed calculation, refer to the annex C.

NOTE 2: Sometimes, the nominal voltage is not linked to the nominal battery voltage e.g. in architectures that include a boost converter in the battery string.

5.2 Normal service voltage range at interface A3

The normal service voltage range at powering interface A3 of telecommunications and datacom (ICT) equipment shall be as follows:

- minimum voltage: 260 VDC;
- maximum voltage: 400 VDC.

NOTE 1: The voltage at the output of the power supply must take into account the voltage drop in the cable at maximum steady current I_m and/or the maximum battery charge to stay in the normal service voltage range at the interface A3 as explained in annexes A, B and C.

NOTE 2: For examples on how to calculate normal service voltage range, refer to annex C.

5.3 Normal operating voltage range at interface A3

The normal operating voltage range at interface A3 is defined by the voltage levels where the system will operate most of the time under normal operating conditions; this range shall be within the normal service voltage range.

The normal operating voltage is a typical voltage inside the normal operating voltage range.

NOTE 1: Examples of normal operating voltages are 354 V and 380 V.
354 V corresponds to 156 VRLA cells in floating mode (351 V to 359 V with 2.25 V to 2.30 V per cell) and with no voltage drop in the power distribution.
380 V corresponds to 168 VRLA cells in floating mode (378 V to 386 V with 2.25 V to 2.30 V per cell) and with no voltage drop in the power distribution.

NOTE 2: For examples on how to calculate normal operating voltage range, refer to annex C.

5.4 Reference test voltage (U_T) at interface A3

The reference test voltage (U_T) for telecommunications and datacom (ICT) equipment is defined at:

$$U_T = 365 \text{ V} +/- 15 \text{ V}$$

NOTE: The powering solution should work in any site even with very long power cables i.e. U_T at the input of telecommunications and datacom (ICT) equipment is lower than power supply output. For constant power telecommunications and datacom (ICT) equipment, the current is increasing as a function of decreasing voltage.

5.5 Abnormal service voltage ranges at interface A3

The telecommunications and datacom (ICT) equipment may be subjected to steady state voltage out of the normal service voltage range. Limits of abnormal service voltage range are defined as follows:

- 0 V < U < 260 V
- 400 V < U < 410 V