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Environmental Engineering (EE);
Power supply interface at the input to Information and Communication Technology (ICT) equipment;
Part 1: Operated by Alternating Current (AC) source

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

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

Part 1: "Operated by Alternating Current (AC) source";

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

Part 3: "Operated by up to 400 V Direct current source";

NOTE: Part 3 replaces ETSI EN 300 132-3-1.

Part 4: "Operated by up to 400 V direct current (dc) or alternating current (ac)".

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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.

1 Scope

With reference to clause 4, the present document contains requirements for:

- the output of the power supply feeding interface A3ac;
- the input of the ICT equipment connected to interface A3ac.

The voltage at interface A3ac defined in the present document is single phase and three phase AC.

The following voltage range categories are covered:

- A3ac-1: narrow single and three phase AC voltage range defined to comply with nominal European AC voltages [6].
- A3ac-2: wide single and three phase AC voltage range for worldwide nominal AC voltages.

The present document aims at providing compatibility between the power supply equipment and both the ICT equipment, and the different load units connected to the same interface A3ac (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 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 centres, Radio Base Stations, datacentres and customer premises;
- to facilitate interworking of different (types of) loads;
- to facilitate the standardization of power supply systems for ICT equipment;
- to facilitate the installation, operation and maintenance in the same network of 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.

The present document concerns the requirements for the interface between Information and Communication Technology (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.

2 References

2.1 Normative 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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://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.

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

[1] IEC 60947-2: "Low-voltage switchgear and controlgear - Part 2: Circuit-breakers".

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

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

[4] IEC 61000-4-11:2004: "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests".

[5] Void.

[6] IEC 60038:2011: "IEC standard voltages".

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

2.2 Informative 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 referenced document (including any amendments) applies.

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

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: "Environmental Engineering (EE); Power supply interface at the input to Information and Communication Technology (ICT) equipment; Part 1: Operated by Alternating Current (AC) source".

[i.2] Void.

[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 ICT equipment powered by -48 VDC in telecom and data centres".

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

[i.6] IEC 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 60445: "Basic and safety principle for man-machine interface, marking and identification-Identification of equipment terminals, conductor terminations, and conductors".

[i.9] IEC 60898-1:2015: "Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Part 1: Circuit-breakers for a.c. operation".

[i.10] IEC 60898-2: " Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Part 2: Circuit-breakers for a.c. and d.c. operation".

[i.11] IEC 60364-5-54:2011: "Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors".

[i.12] CENELEC EN 61000-3-2:2006: "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)".

[i.13] CENELEC EN 61000-3-3:2013: "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".

[i.14] IEC 62040 series: "Uninterruptible power systems (UPS)".

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 ICT equipment will not be expected to maintain normal service but will survive undamaged

area of application: any location where the interface A3ac is used i.e. telecommunication centres, Radio Base Stations, datacentres and customer premises

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

ICT equipment: Information and Communication Technology Equipment

interface A: interface, physical point, at which -48 VDC power supply is connected in order to operate the ICT equipment

interface A3: interface, physical point, at which 400 VDC power supply is connected in order to operate the ICT equipment

interface A3ac: interface, physical point, at which AC power supply is connected in order to operate the ICT equipment

NOTE: A3ac-1 and A3ac-2 are also used for different voltage ranges.

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 ICT equipment, power supply, power distribution and battery

normal operating voltage: typical value of the voltage at A3ac interface within the normal operating voltage range

normal operating voltage range: voltage range at A3ac interface where the system operates most of the time, e.g. in general linked to battery floating voltage

normal service: service mode where ICT equipment operates within its specification

normal service voltage range: range of the steady-state voltage at the A3ac 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 (A3ac interface) of the system

power supply: power supply to which ICT equipment is intended to be connected

reference test voltage: voltage used as a reference to define the test voltage in the present document

NOTE: The test voltage may be also a percentage of this voltage.

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

telecommunication centre: any location where 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 interface A3ac
I_t	Instantaneous surge current at interface A3ac
I_{UT}	maximum steady state current drain at U_T at interface A3ac

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.

DC	Direct Current

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

EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
HOD	High-Ohmic Distributions
ICT	Information and Communication Technology
LOD	Low-Ohmic Distribution
N	Neutral conductor
PE	Protective Earth
RMS	Root Mean Square
U_T	Reference Test Voltage
VAC	Volts Alternating Current
VDC	Volts Direct Current

4 Interface A3ac

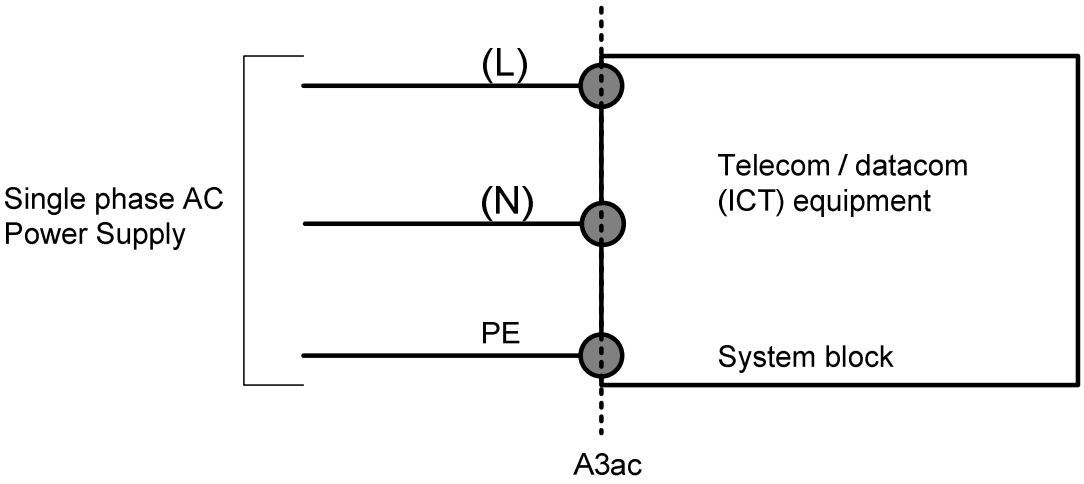
The power supply interface, interface A3ac of figure 1, is a physical point to which all the requirements are related. This point is situated between the power supply system(s) and the power consuming ICT equipment of the area of application defined in the scope of the present document.

An example of configurations in which interface A3ac is identified is given in annex B.

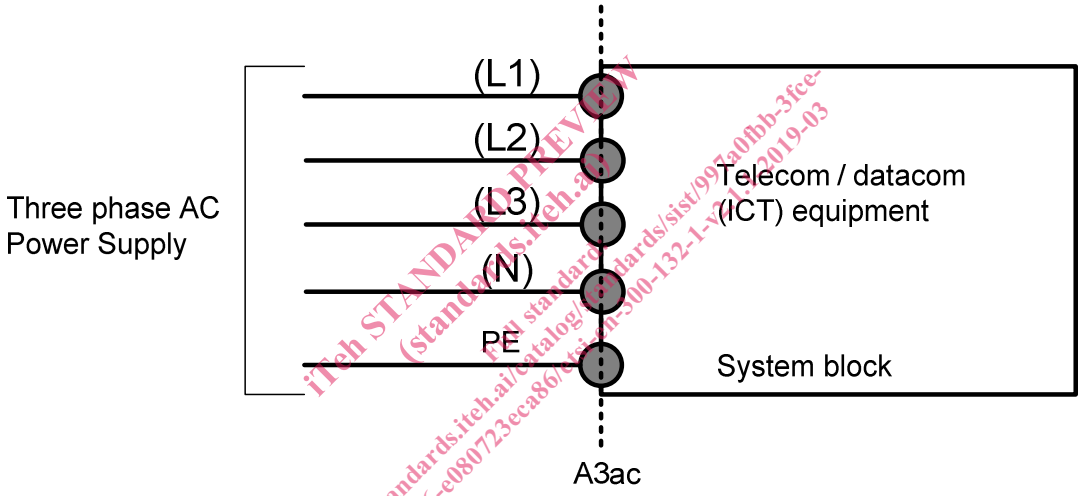
Interface A3ac is located at the power terminals of the ICT equipment or system as defined by the manufacturer in accordance to IEC 60445 [i.8].

NOTE 1: Subject to the installation preconditions, this point may be located at any other point between the power supply system and the ICT equipment by mutual agreement of the relevant parties.

NOTE 2: The power supply can be derived from AC grid e.g. through AC bypass of UPS or inverters.



(L) Live AC terminal in single phase supply.
(N) Neutral AC terminal.
PE Protective Earth.



(L1, L2, L3) Live AC terminals in 3 phases supply.
(N) Optional Neutral AC terminal.
PE Protective Earth.

Figure 1: General identification of the interface A3ac in single and 3 phase AC supply

5 AC interface requirements (A3ac)

5.0 Introduction

The definition of the AC interface voltages ranges and typical operating voltage values are defined in following clauses of the present clause 5.

5.1 Nominal voltage at interface A3ac

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

The nominal voltage for an AC source of 230 V single phase and 400 V three phase is defined according to IEC 60038 [6].

In addition, a wide worldwide nominal single phase AC voltage range from 100 V to 240 V is commonly used, along with a corresponding nominal 3 phase voltage range from 173 V to 415 V.

NOTE: Nominal voltage range (without tolerance) is defined in IEC 60950-1 [i.6].

5.2 Normal service voltage range categories at interface A3ac

The normal service voltage range categories at powering interface A3ac of ICT equipment shall be as follows:

A3ac-1 narrow single phase voltage range:

- A3ac-1 single phase minimum voltage: 197 VAC RMS (line to neutral interface)
- A3ac-1 single phase maximum voltage: 253 VAC RMS (line to neutral interface)

NOTE 1: The minimum voltage at interface A3ac-1 is calculated as 230 V nominal -10 % at the incoming supply terminals of a building and a further -4 % maximum voltage drop allowance on the AC distribution within the building.

NOTE 2: The maximum voltage at interface A3ac-1 is calculated as 230 V nominal +10 %.

A3ac-1 narrow three phase voltage range:

- A3ac-1 three phase minimum voltage:
  - 344 VAC RMS for line to line interface;
  - or optionally same voltage as narrow single phase minimum voltage for line to neutral interface.
- A3ac-1 three phase maximum voltage:
  - 440 VAC RMS for line to line interface;
  - or optionally same voltage as narrow single phase maximum voltage in case of line to neutral interface.

NOTE 3: The minimum voltage at interface A3ac-1 is calculated as 400 V nominal -10 % at the incoming supply terminals of a building and a further -4 % maximum voltage drop allowance on the AC distribution within the building.

NOTE 4: The maximum voltage at interface A3ac-1 is calculated as 400 V nominal +10 %.

A3ac-2 wide single phase voltage range:

- A3ac-2 single phase minimum voltage: 86 VAC RMS; (line to neutral interface).
- A3ac-2 single phase maximum voltage: 264 VAC RMS (line to neutral interface).

NOTE 5: The minimum voltage at interface A3ac-2 is calculated as 100 V nominal -10 % at the incoming supply terminals of a building and a further -4 % maximum voltage drop allowance on the AC distribution within the building.

NOTE 6: The maximum voltage at interface A3ac-2 is calculated as 240 V nominal +10 %.

A3ac-2 wide three-phase voltage range:

- A3ac-2 minimum voltage:
  - 149 VAC RMS for line to line interface;
  - or optionally same voltage as narrow single phase minimum voltage for line to neutral interface.