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Okoljski inženiring (EE) - Napajalni vmesnik na vhodu v opremo informacijske in komunikacijske tehnologije (IKT) - 3. del: Enosmerno napajanje (DC) do 400 V

Environmental Engineering (EE) - Power supply interface at the input of Information and Communication Technology (ICT) equipment - Part 3: Up to 400 V Direct Current (DC)

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35.200	Vmesniška in povezovalna oprema	Interface and interconnection equipment

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SIST EN 300 132-3 V2.3.1:2023

Contents

iTeh STANDARD PREVIEW
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SIST EN 300 132-3 V2.3.1:2023
https://standards.iteh.ai/catalog/standards/sist/51a7a455-ace9-4ee9-a57e-fbcee2b92dc0/sist-en-300-132-3-v2.3.1-2023

SIST EN 300 132-3 V2.3.1:2023

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 300 132-3 V2.3.1:2023
https://standards.iteh.ai/catalog/standards/sist/51a79435-aec5-4cc9-a57c-fbcce2f92dc0/sist-en-300-132-3-v2-3-1-2023

SIST EN 300 132-3 V2.3.1:2023

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Foreword

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

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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, detailed measurement and test arrangements are contained in informative annexes.

The introduced interface up to 400 V Direct Current (DC) 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 up to 400 VDC interface could also simplify the use of renewable energy source with DC output such as photovoltaic generator.

The present document is part 3 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: "Alternating Current (AC)";

Part 2: "-48 V Direct Current (DC)";

Part 3: "Up to 400 V Direct Current (DC)".

National transposition dates	
Date of adoption of this EN:	18 January 2023
Date of latest announcement of this EN (doa):	30 April 2023
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 October 2023
Date of withdrawal of any conflicting National Standard (dow):	31 October 2023

SIST EN 300 132-3 V2.3.1:2023

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).

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(standards.iteh.ai)
SIST EN 300 132-3 V2.3.1:2023
https://standards.iteh.ai/catalog/standards/sist/51a79435-aec5-4cc9-a57c-fbcce2f92dc0/sist-en-300-132-3-v2-3-1-2023

SIST EN 300 132-3 V2.3.1:2023

1 Scope

The present document contains requirements and measurements methods for the physical interface "A3" that is situated between the power supply system(s) and the power consuming ICT equipment:

- the nominal voltage at power interface "A3" of ICT equipment defined in the present document is DC voltage up to 400 V;
- the output performance of the power equipment including the cable network at the interface "A3";
- the input of the ICT equipment connected to interface "A3".

The DC power can be supplied by a DC output power system e.g. via on-grid AC rectifiers, from DC/DC converters in solar systems, fuel cells, standby generators including a battery backup.

The present document aims at providing compatibility at interface "A3" between the power supply equipment and different ICT equipment (including/monitoring, cooling system, etc.) connected to the same power supply.

The requirements are defined for the purpose of the present document 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;
- facilitate interworking of different loads;
- facilitate the standardization of power supply systems for ICT equipment;
- facilitate the installation, operation and maintenance in the same network of ICT equipment and systems from different origins;
- secure robustness against temporary voltage deviations and transients during abnormal conditions.

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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.

SIST EN 300 132-3 V2.3.1:2023
https://standards.iteh.ai/catalog/standards/sist/51a79435-aec5-4cc9-a57c-fbcce2f92dc0/sist-en-300-132-3-v2-3-1-2023

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 the present 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".

SIST EN 300 132-3 V2.3.1:2023

[4] IEC 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 60898-2: "Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Part 2: Circuit-breakers for AC and DC operation".

[6] ETSI EN 301 605 (V1.1.1) (2013): "Environmental Engineering (EE); Earthing and bonding of 400 VDC data and telecom (ICT) equipment".

[7] Recommendation ITU-T L.1207 (2018): "Progressive migration of a telecommunication/information and communication technology site to 400 VDC sources and distribution".

[8] IEC 60364-4-41: "Low voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock".

[9] EN 60445: "Basic and safety principle for man-machine interface, marking and identification-Identification of equipment terminals, conductor terminations and conductors", (produced by CENELEC).

[10] Recommendation ITU-T L.1203 (2016): "Colour and marking identification of up to 400 VDC power distribution for information and communication technology systems".

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.

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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 EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input of Information and Communication Technology (ICT) equipment; Part 2: -48 V Direct Current (DC)".

[i.2] IEC 60050-601: "International Electrotechnical Vocabulary. Chapter 601: Generation, transmission and distribution of electricity - General".

[i.3] ETSI EN 300 386: "Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements; Harmonised Standard covering the essential requirements of the Directive 2014/30/EU".

[i.4] EN 62368-1: "Audio/video, information and communication technology equipment - Part 1: Safety requirements", (produced by CENELEC).

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms 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

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SIST EN 300 132-3 V2.3.1:2023

area of application: any location where the interface "A3" is used

NOTE: I.e. telecommunication centres, Radio Base Stations, datacentres and customer premises.

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

dual feeding system: independent power systems i.e. two separate power sources (A+B)

high-ohmic distribution system: distribution system in which the equipment is connected separately to the battery with added impedance

NOTE 1: The high impedance can be achieved with long cables and in some cases additional resistors are installed.

NOTE 2: With this distribution the undervoltage effects of fuse blowing transients are reduced on other equipment connected to the battery.

ICT equipment: telecommunication or datacommunication equipment

independent power distribution: redundant power distribution i.e. dual feeders (A+B) from two separate power sources (A+B) or a single power source

NOTE: Equipment having two power feeds is fitted with OR-ing devices or separate power supply units.

interface "A3": power interface at the input terminals of ICT, physical point, at which power supply is connected in order to operate the ICT equipment

IT system: The codes used have the following meanings:

- First letter: Relationship of the power system to earth:
  I: all live parts isolated from earth, or one point connected to earth through a high impedance
- Second letter: Relationship of the exposed-conductive-parts of the installation to earth:
  T: direct electrical connection of exposed-conductive-parts to earth, independently of the earthing of any point of the power system

NOTE: See ETSI EN 301 605 [6].

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 300 132-3 V2.3.1:2023
https://standards.iteh.ai/catalog/standards/sist/51a79435-aec5-4cc9-a57c-fbcce2f92dc0/sist-en-300-132-3-v2.3.1-2023

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

NOTE: This definition is based on nominal voltage defined in IEC 60050-601 [i.2].

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 "A3" interface within the normal operating voltage range

normal operating voltage range: 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 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

NOTE: In general this wider than the normal operating voltage range as it includes a part of the battery discharge voltage range.

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

power supply network: network interconnecting the power source and the ICT equipment

SIST EN 300 132-3 V2.3.1:2023

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:

Ω	ohm
k Ω	Kilo ohm
°C	Celsius
A	Ampere
di/dt	derivative of a considered current versus time
Hz	Hertz
I	current
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"
m	meter
ms	milli seconds
s	seconds
T_{50}	time duration of the inrush current pulse at 50 % of Ip
U_o	output voltage range of a generator
U_T	Reference Test Voltage
V	Volt
W	Watt
µs	micro seconds

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 300 132-3 V2.3.1:2023
https://standards.iteh.ai/catalog/standards/sist/51a79435-aec5-4cc9-a57c-fbcce2f92dc0/sist-en-300-132-3-v2-3-1-2023

3.3 Abbreviations

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

AC	Alternating Current
B	Battery
CB	Circuit Breaker
CLD	Current Limiting Device
DC	Direct Current
DC/DC	DC converter
EE	Environmental Engineering
EMC	ElectroMagnetic Compatibility
EN	European Standard
EUT	Equipment Under Test
ICT	Information and Communication Technology
PE	Protective Earth
S	manual Switch or contactor
T	current Transducer
VAC	Volts Alternating Current
VDC	Volts Direct Current
VRLA	Valve Regulated Lead Acid