SLOVENSKI STANDARD
SIST EN 300 132-2 V2.1.2:2006

01-februar-2006

Okoljski inženiring (EE) – Napajalni vmesnik na vhodu v telekomunikacijsko opremo – 2. del: Obratovanje z enosmerno napetostjo (dc)

Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)

Ta slovenski standard je istoveten z: **EN 300 132-2 Version 2.1.2**

ICS:

19.040	Preskušanje v zvezi z okoljem	Environmental testing
33.050.01	Telekomunikacijska terminalska oprema na splošno	Telecommunication terminal equipment in general

SIST EN 300 132-2 V2.1.2:2006 **en**

ETSI EN 300 132-2 V2.1.2 (2003-09)

European Standard (Telecommunications series)

Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)

Reference
REN/EE-02008[2]

Keywords
Interface, power supply

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

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

The present document concerns the requirements for the interface between telecommunications equipment and its power supply, and includes requirements relating to its stability and measurement. Various other references and detailed measurement and test arrangements are contained in informative annexes.

The present document is part 2 of a multi-part deliverable covering Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment, as identified below:

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

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

Part 3: "Operated by rectified current source, alternating current source or direct current source up to 400 V".

National transposition dates	
Date of latest announcement of this EN (doa):	31 December 2003
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2004
Date of withdrawal of any conflicting National Standard (dow):	30 June 2004

1 Scope

The present document contains requirements for:

- the output performance of the direct current (dc) power equipment at the interface "A";
- the input of the telecommunications equipment connected to interface "A" powered by dc.

The dc voltage at interface "A" may be derived from the AC primary supply. The dc supply may incorporate a backup battery.

If any other equipment e.g. datacom equipment, are connected to interface "A" in parallel to telecommunications equipment, all requirements addressed in clause 4 of the present document must be fulfilled.

The present document aims at providing compatibility between the power supply equipment and the power consuming telecommunications equipment, and also between different system blocks connected to the same power supply.

NOTE 1: The present document is applicable only to -48 V_{dc} power supply interfaces. However, during a transitional period, other dc voltages may be used in existing installations. Annex A gives guidance on working in conjunction with existing -60 V_{dc} supply systems.

The power supply interface, interface "A", is a physical point to which all the requirements are related (see figure 1).

This point is situated between the power supply system(s) and the power consuming telecommunications equipment.

NOTE 2: Interface "A" is located at the power terminals of the telecommunications equipment. Subject to the installation preconditions this point may be located at any other point between the power supply system and the telecommunications equipment by mutual agreement of the relevant parties.

The requirements at interface "A" apply to:

- the output of the power supply equipment or power supply installation of telecommunications centres;
- the power supply input of telecommunications equipment installed at telecommunication centres;
- telecommunications equipment, installed in customers' premises, whose dc interface "A" is also used by equipment requiring a supply to this specification.

NOTE 3: Normally there is more than one load unit connected to interface "A". In these cases, interface "A" will undergo further restrictions with respect to noise limits or other disturbances specified in clause 4.8.

NOTE 4: Disturbances on the power supply interface "A" relating to the continuous wave phenomena below 20 kHz are covered within the present document.

NOTE 5: An example of a configuration in which interface "A" is identified is given in annex D.

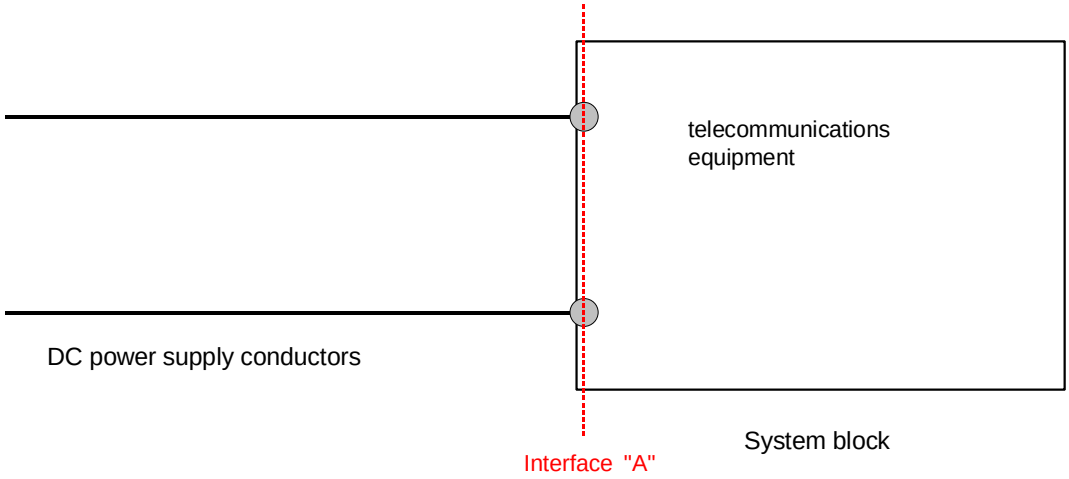

Figure 1: Identification of interface "A"

The purpose of the present document is:

- to use a power supply system with the same characteristics for all telecommunications equipment defined in the area of application;
- to facilitate inter working of different (types of) load units;
- to facilitate the standardization of telecommunications equipment;
- to facilitate the installation, operation and maintenance in the same network of equipment and telecommunications systems from different origins.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

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

[2] EN 60934: "Circuit-breakers for equipment (CBE)".

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

[4] ITU-T Recommendation Q.551: "Transmission characteristics of digital exchanges".

[5] ITU-T Recommendation Q.552: "Transmission characteristics at 2-wire analogue interfaces of digital exchanges".

[6] ITU-T Recommendation Q.553: "Transmission characteristics at 4-wire analogue interfaces of digital exchanges".

[7] ITU-T Recommendation Q.554: "Transmission characteristics at digital interfaces of digital exchanges".

[8] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

abnormal voltage range: range of steady-state voltage over which the equipment will not be expected to maintain normal service but will survive undamaged

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

interface "A": terminals at which the power supply is connected to the system block

NOTE 1: See also figure 1.

NOTE 2: This is a functional definition and not an exact depiction of the physical location.

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

maximum continuous input current: maximum continuous input current, stated by the manufacturer, for a fully-equipped equipment under test connected to interface "A", at nominal voltage (accordance clause 4.7.1 of EN 300 132-2)

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

normal service voltage range: range of steady-state voltages over which the equipment will maintain normal service

nominal voltage: nominal value of the voltage that designates the type of supply

power supply: power source to which telecommunications equipment is intended to be connected

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

NOTE: A system block may consist of equipment or a functional group of equipment. Different examples of configurations at interface "A" are given in annex D.

telecommunication centre: location where telecommunications equipment is installed and which is the sole responsibility of the operator

3.2 Symbols

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

I_t	instantaneous surge current (see clause 4.7.1)
I_m	maximum continuous input current
L	inductance of inductive element of LISN
R	resistance of resistive element of LISN
t	time
Z_c	capacitive impedance of immunity measurement circuit
Z_m	resistive impedance of immunity measurement circuit

3.3 Abbreviations

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

dc	direct current (also when used as a suffix to units of measurement)
EUT	Equipment Under Test
LISN	Line Impedance Stabilization Network
rms	root mean square (also when used as a suffix to units of measurement)

4 Requirements

4.1 Nominal voltage

The nominal value of the voltage at interface "A" shall be -48 V_{dc} (positive conductor is connected to earth).

NOTE 1: In most cases the voltage of interface "A" will be complemented by a 24 cell lead-acid battery.

NOTE 2: During a transitional period, other dc voltages may be used in existing installations. Annex A gives guidance on merging equipment with existing -60 V_{dc} supply systems.

4.2 Normal service voltage range at interface "A"

The normal service voltage range for the -48 V_{dc} nominal supply at interface "A" shall be -40,5 V_{dc} to -57,0 V_{dc}.

NOTE 1: The minimum voltage is based on the voltage drop in the distribution network and a battery cell end of discharge voltage.

NOTE 2: The voltages specified are measured at interface "A". It should be noted that if interface "A" is at any point other than the telecommunications equipment interface there will be a voltage drop between interface "A" and the equipment terminals.

NOTE 3: When the voltage is in the range -40,5 V_{dc} to -44,0 V_{dc} it is recognized that there may be a slight degradation of service performance.

4.3 Abnormal service voltage range at interface "A"

4.3.1 Abnormal service voltage under steady-state conditions

Telecommunications equipment operated at -48 V_{dc} shall not suffer any damage when subjected to the following voltage ranges:

0,0 V_{dc}	to	-40,5 V_{dc} and
-57,0 V_{dc}	to	-60,0 V_{dc}

4.3.2 Recovery from steady state abnormal voltage

Following the restoration of the supply to the normal voltage range, the power conversion and management systems on the load side of interface "A" shall automatically restore service. The telecommunications equipment shall then resume operation according to its specifications. The abnormal service voltage shall not lead to the disconnection of the power supply e.g. by causing circuit breakers, fuses or other such devices to operate.

NOTE: It is acceptable that the system may restart when the voltage is -40,5 V or greater within the nominal service voltage range and/or after a time delay.

4.3.3 Voltage transients

Voltage transients may occur at interface "A" when faults occur in the power distribution system. These transients are characterized by a voltage drop in the range: 0 V_{dc} to -40,5 V_{dc}, followed by an overvoltage often in excess of the maximum steady state abnormal service voltage range and dependent upon the power distribution up to interface "A" and the equipment connected to interface "A".

Telecommunications equipment operated at a nominal -48 V_{dc} shall not be damaged when subjected to these transients.

NOTE: TR 100 283 provides guidance for the protection of telecommunications equipment from the transients.

4.3.4 Recovery from voltage transients

After the occurrence of a voltage transient, as described in clause 4.3.3, telecommunications equipment shall continue to function within its operational specification without requiring manual intervention. The abnormal service shall not lead to the disconnection of power supply units e.g. by causing circuit breakers, fuses and other such devices to operate.

NOTE 1: In sensitive equipment, momentary and temporary interruption of the service may occur as a result of such transients at interface "A". Lengthening of the interruption to service (equipment is not functioning as intended) due to the recovery of software shall be taken in account. More detailed information about the service interruption shall be provided by the manufacturer on the request of the operator.

NOTE 2: To prevent system malfunctioning additional arrangements concerning the power supply system may be necessary.

For example:

- Dual feeding system.
- High Ohmic distribution system.
- Independent power distribution.

4.4 Voltage changes due to the regulation of the power supply

Telecommunication equipment may be subjected to a voltage change at interface "A" as a result of regulation of the voltage by the power supply system e.g. end cell switching.

This test applies to the telecommunication equipment connected to interface "A". The test can also be applied separately to each subpart of the equipment connected to the same interface "A".

4.4.1 Test conditions

Telecommunication equipment shall be subjected to a single maximum transition rate of the voltage at interface "A" with an amplitude of 6 V ±10 % for both the fall and rise time of the voltage and a change rate within the range 3 V/ms to 7 V/ms.

It is assumed that the voltage at interface "A" remains within the normal service voltage range during the test.

4.4.2 Performance criteria

During and after the occurrence of such a transition voltage, the telecommunication equipment shall fulfil the following performance criteria.

The tested part of the telecommunication equipment shall operate according to the specification and no loss of data or false alarm shall occur.