ETSI ES 203 408 V1.2.1 (2026-11)



ETSI STANDARD

Environmental Engineering (EE);
Colour and marking of DC cable and connecting devices

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Foreword

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

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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Introduction

The present document has been developed to assist the ICT industry in their development and wider use of DC powering solutions above the DC voltage range mainly used until now for Telecommunication network equipment (-48 VDC ETSI EN 300 132-2 [7]).

The present document has been jointly developed by ETSI TC EE and ITU-T Study Group 5 in order to ensure equivalent technical content. It is published respectively by ITU as Recommendation ITU-T L.1203 [1] and ETSI Standard ETSI ES 203 408.

DC power has been the main source of power for the Telecommunication industry since the very beginning as it is efficient, reliable and easily scalable.

This solution is a well proven arrangement that has been used for over a century in almost all telecommunication network equipment sites in cohabitation with AC for servers and other buildings services (lighting, facility plugs, lifts, etc.).

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It is recognized that DC power has many potential applications further to those for ICT equipment and that such applications could benefit from the standards defined in ITU/ETSI. It is also recognized that further standardization activities on LVDC are now starting in other standardization organizations such as IEC. Thus ITU-T/ETSI will pursue cooperation with such organizations to reach maximum international alignment.

ETSI and ITU-T have standardized the widespread DC power interface at inputs of Telecom/ICT equipment used in Telecom networks, Data centers, and customer sites. The legacy interface for billions of equipment is the SELV voltage range so called -48 VDC, where the positive pole is grounded as defined for example for interface "A" in ETSI EN 300 132-2 [7]. Other complementary ETSI standards define a whole DC distribution including earthing and bonding such as ETSI EN 300 253 [9].

Higher voltages than -48 VDC are already widely used in Telecom networks for remote powering of signal repeaters on copper or optical Telecom transmission lines, with a usual operation in symmetrical voltage up to ±200 V in RFT-C or RFT-V telecom remote power feeding standardized in ETSI EN 302 099 [i.1].

The higher power density of ICT equipment and overall site power in MW for Data centers have led to the use of higher voltage levels, firstly in AC single or 3 phases up to 400 VAC at the input of servers. The need for resilience, energy efficiency and cost optimization has pushed the introduction of the up to 400 VDC power feeding interface standardized in ETSI EN 300 132-3 [8] and in Recommendation ITU-T L.1200 [2]. This is now available on many servers and Telecommunication network equipment.

As there is a progressive introduction of the new DC power interface in cohabitation with existing -48 VDC and AC distribution, ETSI EN 301 605 [10] has been introduced to ensure safety and proper operation, especially in mass bonding of EMC sensitive equipment and correct earthing connection to the building structure earthing network.

There is also a requirement for Telecom/Data center operators, equipment manufacturers, installers and end customers to clarify the colour and marking of cables in their installations. This avoids confusion and errors between the different AC and DC power interfaces and distribution equipment used in the building and inside ICT systems.

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Considering the user side, and very long background experience in use of DC of the Telecom sector, the present document makes recommendations directly contributing to safety principles laid down in IEC Guide 104 [i.9] and ISO/IEC Guide 51 [i.10]. It accelerates and encourages the preparation of international standards of cable identification intended for use by manufacturers, users or certification bodies.

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With reference to safety, it is important there is no ambiguity with respect to cable colours and identification. The present document therefore recommends harmonisation with existing IEC standards including IEC 60445 [3] and IEC 60050-195 [i.2], allowing a standardized industry approach.

For useful information, colours of cables inside equipment are considered in annex A as DC is already widely used for a multitude of applications, e.g. ICT equipment, car and trucks electric circuits, solar PV, etc.

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1 Scope

The scope of the present document is to define common practice for identification of cabling or parts of the DC power distribution for the Telecom sites (buildings/rooms) feeding ICT and facilities equipment (power plant, cooling, building access systems, monitoring, etc.).

This applies to 400 VDC cabling for ICT equipment and environment equipment using interface defined in ETSI EN 300 132-3 [8] or Recommendation ITU-T L.1200 [2] and avoids confusion between the DC colour and marking of up to 400 VDC distribution (interface A3) and the other power interfaces identification: -48 VDC distribution interface A, AC interface A1 and uninterrupted AC given by inverters or UPS systems used in the building.

To ensure safety, it is important there is no ambiguity with respect to cable colours and identification, The present document therefore recommends harmonisation with existing IEC standards including IEC 60445 [3] and IEC 60050-195 [i.2], allowing a standardized industry approach.

The Recommendation defines:

- requirements for the colour and identification of separate wires used in DC distribution systems and installations, and as much as possible inside equipment between A or P interface and end use;
- marking and identification of DC multiwire cables, connectors and any associated equipment for DC power distribution;
- marking identification for sub-distribution boards and interconnection boxes;
- harmonisation with IEC 60445 [3].

For DC wires in multiwire cables, recommendations are given for harmonization with separate individual wire requirements.

Recommendations are given on other distribution items (wires, cables and interconnection items) including the functional earthing and bonding arrangement for distribution outside and inside equipment to avoid any confusion with DC distribution identification of the present document.

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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 in the ETSI docbox.

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] Recommendation ITU-T L.1203: "Colour and marking identification of up to 400VDC power distribution for ICT systems".

[2] Recommendation ITU-T L.1200 (2012): "Direct current power feeding interface up to 400 V at the input to telecommunication and ICT equipment".

[3] IEC 60445:2021: "Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors".

[4] IEC 60757:2021: "Code for designation of colours".

[5] IEC 60417:2026 DB: "Graphical symbols for use on equipment".

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