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TECHNICAL REPORT

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Information technology – Telecommunications cabling requirements for remote powering of terminal equipment

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CONTENTS

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC TR 29125:2010
https://standards.iteh.ai/catalog/standards/sist/8d034c16-5735-4729-b3d8-8805c125b43a/iso-iec-tr-29125-2010

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INFORMATION TECHNOLOGY – TELECOMMUNICATIONS CABLING REQUIREMENTS FOR REMOTE POWERING OF TERMINAL EQUIPMENT

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- type 2, when the subject is still under technical development or where, for any other reason, there is the future but not immediate possibility of an agreement on an International Standard;
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Technical reports of types 1 and 2 are subject to review within three years of publication to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 29125, which is a technical report of type 2, was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This document is issued in the type 2 technical report series of publications (according to 16.2.2 of the Procedures for the technical work of ISO/IEC JTC 1 (5th edition, 2004)) as a prospective standard for provisional application in the field of remote powering of terminal equipment, because there is an urgent requirement for guidance on how standards in this field should be used.

This document is not to be regarded as an International Standard. It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to IEC Central Office.

A review of this type 2 technical report will be carried out not later than three years after its publication with the option of extension for a further three years, conversion into an International Standard or withdrawal.

This Technical Report has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

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This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

ISO/IEC TR 29125:2010
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IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This Technical Report specifies the use of generic balanced cabling for customer premises, as specified in international standards ISO/IEC 11801, ISO/IEC 15018, ISO/IEC 24702 and ISO/IEC 24764, for remote powering of terminal equipment. It provides guidance on new cabling installations and renovations. The customer premises may encompass one or more buildings or may be within a building that contains more than one organisation. The cabling may be installed prior to the selection of remote powering equipment or powered terminal equipment.

International standards ISO/IEC 11801, ISO/IEC 15018, ISO/IEC 24702 and ISO/IEC 24764 specify a structure and performance requirements for cabling subsystems that support a wide range of applications. They provide appropriate equipment interfaces to the cabling infrastructure in equipment rooms, telecommunications rooms and work areas.

A growing number of organisations employ equipment at locations that require the provision of remote powering. This Technical Report was created to provide supplementary information to ISO/IEC 11801 to implement remote powering over generic balanced cabling as specified in ISO/IEC 11801, ISO/IEC 15018, ISO/IEC 24702 and ISO/IEC 24764.

This Technical Report provides additional guidance for remote powering on the use of balanced cabling systems as specified in ISO/IEC 11801, ISO/IEC 15018, ISO/IEC 24702 and ISO/IEC 24764 guidance on different installation conditions that require special considerations;

- information to bring together all the considerations about remote powering in a single document,
- guidance on mating and unmating of connectors that convey remote power.

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This Technical Report does not include requirements from national or local safety standards and regulations.

ISO/IEC TR 29125:2010
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The Technical Report was developed based on a number of contributions describing remote powering over telecommunications cabling under different installation conditions. Consult with the relevant safety standards and regulations, application standard, and with equipment manufacturers for guidance on factors that should be taken into account during design of the generic balanced cabling that supports the distribution of remote powering.

INFORMATION TECHNOLOGY – TELECOMMUNICATIONS CABLING REQUIREMENTS FOR REMOTE POWERING OF TERMINAL EQUIPMENT

1 Scope

This Technical Report:

- targets the support of applications that provide remote power over balanced cabling to terminal equipment;
- covers the transmission and electrical parameters needed to support remote power over balanced cabling;
- covers various installation scenarios and how these may impact the capability of balanced cabling to support remote powering;
- specifies design and configuration of cabling as specified in International Standards ISO/IEC 11801, ISO/IEC 15018, ISO/IEC 24702 and ISO/IEC 24764;
- provides requirements and guidelines that will enable the support of a wide variety of extra low voltage (ELV) limited power source (LPS) applications using remote power supplied over balanced cabling.

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Requirements and guidelines are provided with respect to

- cabling selection and performance (Clause 5),
- installation conditions (Clause 6),
- transmission requirements (Clause 7),
- power delivery (Clause 8),
- connecting hardware (Clause 9),
- mitigation considerations (Annex A).

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Safety (electrical, fire, etc.) and electromagnetic compatibility (EMC) requirements are outside the scope of this Technical Report.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

ISO/IEC 14763-2,– *Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation*[1]

ISO/IEC 15018, *Information technology – Generic cabling for homes*

ISO/IEC 18010, *Information technology – Pathways and spaces for customer premises cabling*

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1 To be published.

ISO/IEC 24702, *Information technology – Generic cabling – Industrial premises*

ISO/IEC TR 24746, *Information technology – Generic cabling for customer premises – Mid-span DTE power insertion*

ISO/IEC 24764, *Information technology – Generic cabling systems for data centres*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11801, ISO/IEC 18010, ISO/IEC 14763-2, and the following apply.

3.1.1
power source equipment
equipment that provides power

3.1.2
remote powering
supply of power to application specific equipment via balanced cabling

3.1.3
terminal equipment
equipment that provides access to an application / service

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3.1.4
current carrying capacity
maximum current a cable circuit (one or several conductors) can support resulting in a specified increase of the surface temperature of the conductor beyond the ambient temperature, not exceeding the maximum allowed operating temperature of the cable

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[IEC 61156-1:2007, 3.24]

3.1.5
temperature rise
difference in the temperature in degrees C between the initial temperature of the conductor surface without power and the final temperature at the surface of the powered conductor at steady state

3.2 Abbreviations

EMC	Electromagnetic Compatibility
FD	Floor Distributor

4 Conformance

For cabling to conform to this Technical Report the following applies:

- the design of the cabling shall conform to the relevant cabling design standard such as ISO/IEC 11801, ISO/IEC 15018, ISO/IEC 24702 and ISO/IEC 24764);
- the installation conditions meet the additional requirements of this Technical Report.

5 Cabling selection and performance

The remote powering should be implemented using 4-pair balanced cabling.

NOTE Two pairs may be used as an alternative to four pairs, however this may not support some applications.

This channel will be used simultaneously to support signal transmission and remote power feeding for the terminal equipment. This Technical Report assumes the use of balanced cabling models and components specified in the reference implementation clause of the relevant design standards.

6 Installation conditions

6.1 General

Cabling may be installed in different types of pathway systems such as trays, conduit, hangers, etc., and shall be installed in accordance with ISO/IEC 14763-2. The installation conditions shall not compromise safety regulations (e.g. exceed the temperature rating of the cable). For example, assuming all 4 pairs are energized, larger cable bundles (number of cables) retain more heat than smaller cable bundles.

The cable bundle size should take account of the temperature rise and current capacity information in 6.3.

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6.2 Ambient temperature

The ambient temperature at different length segments of a link or channel has an impact on the local temperature rise of the cable used for the link or channel and may limit the remote power delivery to the powered terminal equipment. The worst case installed cabling condition with respect to the maximum ambient temperature shall be used to determine the maximum operating temperature for a link or channel when under electrical load.

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6.3 Temperature rise and current capacity

When remote power is applied to balanced cabling, the temperature of the cabling will rise due to resistive heat generation in the conductors. Depending on cable construction and installed cabling conditions, the heat generated will be dissipated into the surrounding environment until a steady state is reached with the temperature of the cable bundle (operating temperature) higher than the ambient temperature of the surrounding environment. The maximum temperature of any cable (at the cable conductor surface) shall not exceed the temperature rating of the cable. Generally, balanced cables used in commercial premises have a temperature rating of 60 °C.

Temperature rise in the cable will lead to an increase in insertion loss as specified in ISO/IEC 11801 and should be taken into account when selecting cables.

The maximum current per pair for different temperature rises in a bundle of 100 cables of 4 pair category 5 cables with solid conductors with all pairs energized is shown in Table 1. For example, cable bundles up to 100 cables are expected to support remote powering with all pairs energized with up to 600 mA, if the ambient temperature along the cabling is less than 50 °C for 60 °C rated cables.

Table 1 – Maximum current per pair versus temperature rise in a bundle of 100 4 pair Category 5 cables (all pairs energized)

Temperature rise °C	Current per pair mA
5,0	420
7,5	520
10,0	600
12,5	670
15,0	720
NOTE These values are based on conductor temperature measurement of typical cables.	

Table 2 shows current capacity for different categories of cable, independent of construction, for a given temperature rise. Manufacturers'/suppliers' specifications should be consulted for information relating to a specific cable.

Table 2 – Current per pair versus temperature rise in a bundle of 100 4 pair cables (all pairs energized)

Temperature rise °C	Current per pair [a] mA				
	Category 5	Category 6	Category 6_A	Category 7	Category 7_A
2,0	268	294	316	316	330
4,0	380	416	447	447	467
6,0	465	509	547	547	572
8,0	537	588	632	632	660
10,0	600	657	706	706	738
12,0	657	720	774	774	809
14,0	710	778	836	836	873
a Calculated values for worst case.					
NOTE 1 The values in this table are based on the implicit DC resistance derived from the insertion loss of the various categories of cable. Manufacturers'/suppliers' specifications should be consulted for information relating to a specific cable. NOTE 2 The current per pair for each category is dependent on the cable construction.					

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ISO/IEC TR 29125:2010
https://standards.iteh.ai/catalog/standards/sist/8d034c16-5735-4729-b3d8-8805e125b43a/iso-iec-tr-29125-2010

6.4 Factors affecting temperature increase

6.4.1 General

The excess heat responsible for the conductor temperature rise of any power carrying cable is the difference of the resistive heat generation in the cable minus the heat dissipated into the environment, be it the open atmosphere, trays, ducts or other cables which may also be power carrying cables.

6.4.2 Cable count within a bundle

This Technical Report uses 100-cable bundles as the basis for developing the temperature rise and current per pair with all pairs energized. The correlation between cable bundle size and temperature rise was established from measured data. For other cases (e.g. where bundle count exceeds 100 cables), the guidelines provided in this clause can be used. Refer to Table 3 to determine the maximum temperature rise using 600 mA per pair for cable bundles of different count.