



ISO/IEC TS 29125

Edition 1.2 2024-10

# INTERNATIONAL STANDARD

Corrected version  
2025-12

CONSOLIDATED VERSION

---

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 35.200

ISBN 978-2-8322-9971-5

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
INTRODUCTION to Amendment 1.....	7
INTRODUCTION to Amendment 2.....	7
1 Scope.....	8
2 Normative references.....	8
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions .....	9
3.2 Abbreviated terms .....	9
4 Conformance .....	10
5 Cabling selection and performance .....	10
6 Installation conditions .....	10
6.1 General.....	10
6.2 Ambient temperature .....	10
6.3 Temperature rise and current capacity .....	11
6.4 Factors affecting temperature increase .....	13
6.4.1 General .....	13
6.4.2 Installation near equipment .....	13
6.4.3 Cable count within a bundle .....	13
6.4.4 Reducing temperature increase .....	15
6.4.5 Cable bundle suspended in air .....	21
6.4.6 Administration .....	21
7 Remote power delivery over balanced cabling .....	21
7.1 4-pair balanced cabling .....	21
7.2 1-pair balanced cabling .....	23
8 Connecting hardware .....	24
8.1 General.....	24
8.2 4-pair balanced cabling .....	24
8.3 1-pair balanced cabling .....	25
Annex A (informative) Mitigation considerations for installed cabling .....	26
A.1 General.....	26
A.2 Minimum cabling class .....	26
A.3 Bundle size and location.....	26
A.4 Mitigation options .....	26
Annex B (informative) Modelling temperature rise for cable types, bundle sizes and installation conditions .....	27
B.1 Model basics.....	27
B.2 Power dissipated ( $P$ ) .....	27
B.3 Temperature difference from ambient temperature to bundle surface ( $\Delta T_U$ ).....	28
B.3.1 Model equations.....	28
B.3.2 Typical values for constant $\rho_U$ .....	28
B.4 Temperature difference from bundle surface to bundle centre ( $\Delta T_{th}$ ) .....	28
B.4.1 Model equations.....	28
B.4.2 Typical values for constant $\rho_{th}$ .....	28
B.5 Temperature variation within the bundle ( $\Delta T(x)$ ) .....	29

B.6	Alternative presentation of the model.....	29
B.7	Adaptation model used to derive temperature rise vs. cables in a bundle.....	29
B.8	Calculations .....	30
B.9	Example.....	30
B.10	Coefficients for air and conduit .....	31
Annex C (informative)	Transmission parameters related to remote powering .....	33
C.1	DC loop resistance.....	33
C.1.1	4-pair cabling .....	33
C.1.2	1-pair cabling .....	33
C.2	DC resistance unbalance (within pair).....	34
C.2.1	General .....	34
C.2.2	4-pair cabling .....	34
C.2.3	1-pair cabling .....	34
C.3	DC resistance unbalance (pair to pair).....	34
Annex D (informative)	Illustrations of heating of various bundle sizes and configurations .....	36
D.1	Limiting cable bundle size .....	36
D.2	Separating into smaller bundles.....	37
Annex E (informative)	Test protocol.....	38
E.1	Background.....	38
E.2	Test set-up.....	38
Annex F (informative)	Detailed test procedure .....	41
F.1	General.....	41
F.2	Test set-up.....	41
F.2.1	Thermocouple placement .....	41
F.2.2	Measurement of cable bundle in air .....	42
F.2.3	Measurement of cable bundle in conduit .....	43
Bibliography .....	45	
Figure 3 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	18	
Figure 4 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit .....	19	
Figure 6 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	20	
Figure 7 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit .....	21	
Figure 1 – Examples of end point powering systems using signal pairs (top) and spare pairs (bottom) .....	22	
Figure 2 – Examples of mid-span powering systems .....	23	
Figure 5 – Single pair remote powering using signal pairs.....	24	
Figure B.1 – Temperature rise profile .....	27	
Figure D.1 – 91-cable bundle .....	36	
Figure D.2 – Three bundles of 37 cables .....	36	
Figure D.3 – Three bundles of 37 cables with separation .....	37	
Figure E.1 – 37-cable bundle and temperature location.....	38	
Figure E.2 – "Perfect bundle" and thermocouple configuration .....	39	

Figure E.3 – 4-pair cabling conductor configuration .....	39
Figure E.4 – 1-pair cabling conductor configuration .....	39
Figure F.1 – Placement of thermocouple .....	41
Figure F.2 – Securing of the thermocouple .....	42
Figure F.3 – Test set-up for cable bundles in air .....	43
Figure F.4 – Test set-up for cable bundles in conduit .....	44
Table 1 – Maximum current per conductor versus temperature rise in a 37 4-pair cable bundle in air and conduit <del>(all 4 pairs energized)</del> .....	11
Table 5 – Maximum current per conductor versus temperature rise in a 37 1-pair cable bundle in air and conduit .....	12
Table 2 – Calculated worst case current per conductor versus temperature rise in a bundle of 37 4-pair cables (all pairs energized) .....	12
Table 6 – Calculated worst case current per conductor versus temperature rise in a bundle of 37 1-pair cables of different conductor diameters in air and conduit .....	13
Table 3 – Temperature rise versus 4-pair cable bundle size (500 mA per conductor) .....	14
Table 7 – Temperature rise versus 1-pair cable bundle size (1 000 mA per conductor) .....	15
Table 4 – Temperature rise for a type of 4-pair cable versus the number of energized pairs in a 37-cable bundle (500 mA per conductor) .....	17
Table 8 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	17
Table 9 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit .....	18
Table 10 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	19
Table 11 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit .....	20
Table B.1 – Bundling coefficients for different types of 4-pair cables and cords (all 4 pairs energized) in air and conduit .....	31
Table B.2 – DC resistance and bundling coefficients for 1-pair cables of different conductor diameters (all conductors energized) in air and conduit .....	32
Table C.1 – Maximum DC loop resistance of channels .....	33
Table C.4 – Maximum DC loop resistance of 1-pair channels .....	33
Table C.2 – DC resistance unbalance of 4-pair cables, connecting hardware and channels .....	34
Table C.3 – DC resistance unbalance (pair to pair) .....	35

## INFORMATION TECHNOLOGY –

# TELECOMMUNICATIONS CABLING REQUIREMENTS FOR REMOTE POWERING OF TERMINAL EQUIPMENT

## FOREWORD

- 1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
- 2) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO National bodies.
- 3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO are not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this document.
- 7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
- 8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
- 9) IEC and ISO draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC and ISO take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC and ISO had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch> and [www.iso.org/patents](http://www.iso.org/patents). IEC and ISO shall not be held responsible for identifying any or all such patent rights.

**This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.**

**ISO/IEC TS 29125 edition 1.2 contains:**

- **the first edition (2017-04)**
- **the amendment 1 (2020-05) [documents JTC1-SC25/2919/DTS and JTC1-SC25/2945/ RVDTS]**
- **the corrigendum 1 (2025-12) to the amendment 1**
- **the amendment 2 (2024-10) [documents JTC1-SC25/3272/DTS and JTC1-SC25/3289/ RVDTS].**
- **the corrigendum 1 (2025-12) to the amendment 2**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.**

The main task of the joint technical committee is to prepare International Standards. In exceptional circumstances, the joint technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- 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.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

ISO/IEC TS 29125, which is a Technical Specification, has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This first edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) extension of the current per conductor from 300 mA to 500 mA;
- b) provision of additional details of installation conditions that were not described in ISO/IEC TR 29125:2010;
- c) inclusion of guidelines for cords;
- d) inclusion of a model to calculate temperature rise in different bundle sizes.

This Technical Specification 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.

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

**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 document specifies the use of generic balanced cabling for customer premises, as specified in the ISO/IEC 11801 series, 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 organization. The cabling may be installed prior to the selection of remote powering equipment or powered terminal equipment.

ISO/IEC 11801-1 specifies 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 organizations employ equipment at locations that require the provision of remote powering. This document was created to provide supplementary information to ISO/IEC 11801-1 to implement remote powering over generic balanced cabling as specified in ISO/IEC 11801-1.

This document provides additional guidance for remote powering on the use of balanced cabling systems as specified in ISO/IEC 11801-1 and 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 wire diameter and bundling on heating;
- guidance on mating and un-mating of connectors that convey remote power.

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

This document was developed based on a number of contributions describing remote powering over telecommunications cabling under different installation conditions. The relevant safety standards and regulations, application standard, and equipment manufacturers give guidance on factors that should be taken into account during design of the generic balanced cabling that supports the distribution of remote powering.

This document extends the current per conductor specified in ISO/IEC TR 29125:2010 from 300 mA to 500 mA. This document covers additional details of installation conditions that are not described in ISO/IEC TR 29125:2010. This document includes guidelines for cords. This document addresses the use of generic balanced single pair cabling for customer premises, to be specified in future amendments of the ISO/IEC 11801 series, for remote powering of terminal equipment. This document uses measurements and empirical models to estimate the thermal performance of single pair cable bundles of various conductor diameters.

## INTRODUCTION to Amendment 1

This amendment incorporates changes necessary to include remote powering using single pair cabling.

## INTRODUCTION to Amendment 2

This amendment incorporates changes necessary to extend the current for remote powering using single pair cabling up to 2 000 mA.

**INFORMATION TECHNOLOGY –****TELECOMMUNICATIONS CABLING REQUIREMENTS  
FOR REMOTE POWERING OF TERMINAL EQUIPMENT****1 Scope**

This document

- a) addresses the support of safety extra low voltage (SELV) and limited power source (LPS) applications that provide remote power over:
  - 4-pair balanced cabling in accordance with the reference implementations of ISO/IEC 11801 series standards using currents per conductor of up to 500 mA;
  - 1-pair balanced cabling using currents per conductor of up to 2 000 mA;and targets the support of applications that provide remote power over balanced cabling to terminal equipment,
- b) covers the transmission and electrical parameters needed to support remote power over balanced cabling,
- c) covers various installation scenarios and how these may impact the capability of balanced cabling to support remote powering,
- d) specifies design and configuration of cabling as specified in ISO/IEC 11801-1.

NOTE SELV requirements specify a maximum voltage of 60 V DC and LPS is understood in the applications referenced to be up to 100 W supplied within ~~4-pair~~ cabling.

This document includes a mathematical model to predict the behaviour of different bundle sizes, various cabling constructions, and installation conditions for different current capacities.

Safety (e.g. electrical safety and protection and fire) and electromagnetic compatibility (EMC) requirements are outside the scope of this document, and are covered by other standards and regulations. However, information given by this document can be of assistance.

**2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

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

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

## Bibliography

IEC 60512-2-1:2002, *Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method*

IEC 60512-99-001, *Connectors for electronic equipment – Tests and measurements – Part-99-001: Test schedule for engaging and separating connectors under electrical load – Test 99a: Connectors used in twisted pair communication cabling with remote power*

IEC 60512-99-002, *Connectors for electrical and electronic equipment – Tests and measurements – Part 99-002: Endurance test schedules – Test 99b: Test schedule for unmating under electrical load*

IEC 60512-99-003, *Connectors for electrical and electronic equipment – Tests and measurements – Part 99-003: Endurance test schedules – Test 99c: Test schedule for balanced single-pair connectors separating (unmating) under electrical load*

IEC 60603-7 (all parts), *Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60950-21, *Information technology equipment – Safety – Part 21: Remote power feeding*

IEC 61076-3-104, *Connectors for electrical and electronic equipment – Product requirements – Part 3-104: Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to ~~4~~ 2 000 MHz*

IEC 61076-3-110, *Connectors for electronic equipment – Product requirements – Part 3-110: Detail specification for ~~shielded~~, free and fixed connectors for data transmission with frequencies up to ~~4~~ 3 000 MHz*

IEC 61156-1:~~2007~~, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC TR 61156-1-6, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-6: Nominal DC-resistance values of floor-wiring and work-area cables for digital communications*

IEC 61935-1, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801 and related standards*

IEC 61935-4, *Specification for the testing of balanced and coaxial information technology cabling – Part 4: Installed balanced single pair cabling as specified in ISO/IEC 11801-1 and related standards<sup>1</sup>*

ISO/IEC 11801 (all parts), *Information technology – Generic cabling for customer premises*

ISO/IEC 11801-1:2017/AMD1:–2, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

<sup>1</sup> First edition under preparation. Stage at the time of publication: IEC CD 61935-4:2024.

<sup>2</sup> Under preparation. Stage at the time of publication: ISO/IEC CD 11801-1:2017/AMD1:2023.

ISO/IEC 18598, *Information technology – Automated infrastructure management (AIM) systems – Requirements, data exchange and applications*

ISO/IEC/IEEE 8802-3:~~2014~~, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Standard for Ethernet*

---

## CONTENTS

FOREWORD .....	5
INTRODUCTION .....	7
INTRODUCTION to Amendment 1 .....	7
INTRODUCTION to Amendment 2 .....	7
1 Scope .....	8
2 Normative references .....	8
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions .....	9
3.2 Abbreviated terms .....	9
4 Conformance .....	10
5 Cabling selection and performance .....	10
6 Installation conditions .....	10
6.1 General .....	10
6.2 Ambient temperature .....	10
6.3 Temperature rise and current capacity .....	11
6.4 Factors affecting temperature increase .....	13
6.4.1 General .....	13
6.4.2 Installation near equipment .....	13
6.4.3 Cable count within a bundle .....	13
6.4.4 Reducing temperature increase .....	15
6.4.5 Cable bundle suspended in air .....	21
6.4.6 Administration .....	21
7 Remote power delivery over balanced cabling .....	21
7.1 4-pair balanced cabling .....	21
7.2 1-pair balanced cabling .....	23
8 Connecting hardware .....	24
8.1 General .....	24
8.2 4-pair balanced cabling .....	24
8.3 1-pair balanced cabling .....	25
Annex A (informative) Mitigation considerations for installed cabling .....	26
A.1 General .....	26
A.2 Minimum cabling class .....	26
A.3 Bundle size and location .....	26
A.4 Mitigation options .....	26
Annex B (informative) Modelling temperature rise for cable types, bundle sizes and installation conditions .....	27
B.1 Model basics .....	27
B.2 Power dissipated ( $P$ ) .....	27
B.3 Temperature difference from ambient temperature to bundle surface ( $\Delta T_U$ ) .....	28
B.3.1 Model equations .....	28
B.3.2 Typical values for constant $\rho_U$ .....	28
B.4 Temperature difference from bundle surface to bundle centre ( $\Delta T_{th}$ ) .....	28
B.4.1 Model equations .....	28
B.4.2 Typical values for constant $\rho_{th}$ .....	28
B.5 Temperature variation within the bundle ( $\Delta T(x)$ ) .....	29

B.6	Alternative presentation of the model .....	29
B.7	Adaptation model used to derive temperature rise vs. cables in a bundle .....	29
B.8	Calculations .....	30
B.9	Example .....	30
B.10	Coefficients for air and conduit .....	31
Annex C (informative)	Transmission parameters related to remote powering .....	32
C.1	DC loop resistance .....	32
C.1.1	4-pair cabling .....	32
C.1.2	1-pair cabling .....	32
C.2	DC resistance unbalance (within pair) .....	32
C.2.1	General .....	32
C.2.2	4-pair cabling .....	33
C.2.3	1-pair cabling .....	33
C.3	DC resistance unbalance (pair to pair) .....	33
Annex D (informative)	Illustrations of heating of various bundle sizes and configurations .....	35
D.1	Limiting cable bundle size .....	35
D.2	Separating into smaller bundles .....	36
Annex E (informative)	Test protocol .....	37
E.1	Background .....	37
E.2	Test set-up .....	37
Annex F (informative)	Detailed test procedure .....	40
F.1	General .....	40
F.2	Test set-up .....	40
F.2.1	Thermocouple placement .....	40
F.2.2	Measurement of cable bundle in air .....	41
F.2.3	Measurement of cable bundle in conduit .....	42
Bibliography .....	44	

Figure 3 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	18
Figure 4 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit .....	19
Figure 6 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	20
Figure 7 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit .....	21
Figure 1 – Examples of end point powering systems using signal pairs (top) and spare pairs (bottom) .....	22
Figure 2 – Examples of mid-span powering systems .....	23
Figure 5 – Single pair remote powering using signal pairs .....	24
Figure B.1 – Temperature rise profile .....	27
Figure D.1 – 91-cable bundle .....	35
Figure D.2 – Three bundles of 37 cables .....	35
Figure D.3 – Three bundles of 37 cables with separation .....	36
Figure E.1 – 37-cable bundle and temperature location .....	37
Figure E.2 – "Perfect bundle" and thermocouple configuration .....	38

Figure E.3 – 4-pair cabling conductor configuration .....	38
Figure E.4 – 1-pair cabling conductor configuration .....	38
Figure F.1 – Placement of thermocouple.....	40
Figure F.2 – Securing of the thermocouple.....	41
Figure F.3 – Test set-up for cable bundles in air .....	42
Figure F.4 – Test set-up for cable bundles in conduit.....	43
 Table 1 – Maximum current per conductor versus temperature rise in a 37 4-pair cable bundle in air and conduit.....	11
Table 5 – Maximum current per conductor versus temperature rise in a 37 1-pair cable bundle in air and conduit.....	12
Table 2 – Calculated worst case current per conductor versus temperature rise in a bundle of 37 4-pair cables (all pairs energized).....	12
Table 6 – Calculated worst case current per conductor versus temperature rise in a bundle of 37 1-pair cables of different conductor diameters in air and conduit.....	13
Table 3 – Temperature rise versus 4-pair cable bundle size (500 mA per conductor) .....	14
Table 7 – Temperature rise versus 1-pair cable bundle size (1 000 mA per conductor) .....	15
Table 4 – Temperature rise for a type of 4-pair cable versus the number of energized pairs in a 37-cable bundle (500 mA per conductor) .....	17
Table 8 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	17
Table 9 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit.....	18
Table 10 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air .....	19
Table 11 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit.....	20
Table B.1 – Bundling coefficients for different types of 4-pair cables and cords (all 4 pairs energized) in air and conduit .....	31
Table B.2 – DC resistance and bundling coefficients for 1-pair cables of different conductor diameters (all conductors energized) in air and conduit .....	31
Table C.1 – Maximum DC loop resistance of channels .....	32
Table C.4 – Maximum DC loop resistance of 1-pair channels .....	32
Table C.2 – DC resistance unbalance of 4-pair cables, connecting hardware and channels .....	33
Table C.3 – DC resistance unbalance (pair to pair).....	34

## INFORMATION TECHNOLOGY –

# TELECOMMUNICATIONS CABLING REQUIREMENTS FOR REMOTE POWERING OF TERMINAL EQUIPMENT

## FOREWORD

- 1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
- 2) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO National bodies.
- 3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO are not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this document.
- 7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
- 8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
- 9) IEC and ISO draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC and ISO take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC and ISO had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch> and [www.iso.org/patents](http://www.iso.org/patents). IEC and ISO shall not be held responsible for identifying any or all such patent rights.

**This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.**

**ISO/IEC TS 29125 edition 1.2 contains:**

- the first edition (2017-04)
- the amendment 1 (2020-05) [documents JTC1-SC25/2919/DTS and JTC1-SC25/2945/RVDTs]
- the corrigendum 1 (2025-12) to the amendment 1
- the amendment 2 (2024-10) [documents JTC1-SC25/3272/DTS and JTC1-SC25/3289/RVDTs].
- the corrigendum 1 (2025-12) to the amendment 2

**This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.**

The main task of the joint technical committee is to prepare International Standards. In exceptional circumstances, the joint technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- 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.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

ISO/IEC TS 29125, which is a Technical Specification, has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This first edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) extension of the current per conductor from 300 mA to 500 mA;
- b) provision of additional details of installation conditions that were not described in ISO/IEC TR 29125:2010;
- c) inclusion of guidelines for cords;
- d) inclusion of a model to calculate temperature rise in different bundle sizes.

This Technical Specification 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.

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

**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 document specifies the use of generic balanced cabling for customer premises, as specified in the ISO/IEC 11801 series, 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 organization. The cabling may be installed prior to the selection of remote powering equipment or powered terminal equipment.

ISO/IEC 11801-1 specifies 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 organizations employ equipment at locations that require the provision of remote powering. This document was created to provide supplementary information to ISO/IEC 11801-1 to implement remote powering over generic balanced cabling as specified in ISO/IEC 11801-1.

This document provides additional guidance for remote powering on the use of balanced cabling systems as specified in ISO/IEC 11801-1 and 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 wire diameter and bundling on heating;
- guidance on mating and un-mating of connectors that convey remote power.

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

This document was developed based on a number of contributions describing remote powering over telecommunications cabling under different installation conditions. The relevant safety standards and regulations, application standard, and equipment manufacturers give guidance on factors that should be taken into account during design of the generic balanced cabling that supports the distribution of remote powering.

This document extends the current per conductor specified in ISO/IEC TR 29125:2010 from 300 mA to 500 mA. This document covers additional details of installation conditions that are not described in ISO/IEC TR 29125:2010. This document includes guidelines for cords. This document addresses the use of generic balanced single pair cabling for customer premises, to be specified in future amendments of the ISO/IEC 11801 series, for remote powering of terminal equipment. This document uses measurements and empirical models to estimate the thermal performance of single pair cable bundles of various conductor diameters.

## INTRODUCTION to Amendment 1

This amendment incorporates changes necessary to include remote powering using single pair cabling.

## INTRODUCTION to Amendment 2

This amendment incorporates changes necessary to extend the current for remote powering using single pair cabling up to 2 000 mA.

**INFORMATION TECHNOLOGY –****TELECOMMUNICATIONS CABLING REQUIREMENTS  
FOR REMOTE POWERING OF TERMINAL EQUIPMENT****1 Scope**

This document

- a) addresses the support of safety extra low voltage (SELV) and limited power source (LPS) applications that provide remote power over:
  - 4-pair balanced cabling in accordance with the reference implementations of ISO/IEC 11801 series standards using currents per conductor of up to 500 mA;
  - 1-pair balanced cabling using currents per conductor of up to 2 000 mA;and targets the support of applications that provide remote power over balanced cabling to terminal equipment,
- b) covers the transmission and electrical parameters needed to support remote power over balanced cabling,
- c) covers various installation scenarios and how these may impact the capability of balanced cabling to support remote powering,
- d) specifies design and configuration of cabling as specified in ISO/IEC 11801-1.

NOTE SELV requirements specify a maximum voltage of 60 V DC and LPS is understood in the applications referenced to be up to 100 W supplied within cabling.

This document includes a mathematical model to predict the behaviour of different bundle sizes, various cabling constructions, and installation conditions for different current capacities.

Safety (e.g. electrical safety and protection and fire) and electromagnetic compatibility (EMC) requirements are outside the scope of this document, and are covered by other standards and regulations. However, information given by this document can be of assistance.

**2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

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

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

## Bibliography

IEC 60512-2-1:2002, *Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method*

IEC 60512-99-001, *Connectors for electronic equipment – Tests and measurements – Part-99-001: Test schedule for engaging and separating connectors under electrical load – Test 99a: Connectors used in twisted pair communication cabling with remote power*

IEC 60512-99-002, *Connectors for electrical and electronic equipment – Tests and measurements – Part 99-002: Endurance test schedules – Test 99b: Test schedule for unmating under electrical load*

IEC 60512-99-003, *Connectors for electrical and electronic equipment – Tests and measurements – Part 99-003: Endurance test schedules – Test 99c: Test schedule for balanced single-pair connectors separating (unmating) under electrical load*

IEC 60603-7 (all parts), *Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60950-21, *Information technology equipment – Safety – Part 21: Remote power feeding*

IEC 61076-3-104, *Connectors for electrical and electronic equipment – Product requirements – Part 3-104: Detail specification for 8-way, shielded free and fixed connectors for data transmissions with frequencies up to 2 000 MHz*

IEC 61076-3-110, *Connectors for electronic equipment – Product requirements – Part 3-110: Detail specification for free and fixed connectors for data transmission with frequencies up to 3 000 MHz*

IEC 61156-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC TR 61156-1-6, *Multicore and symmetrical pair/quad cables for digital communications – Part 1-6: Nominal DC-resistance values of floor-wiring and work-area cables for digital communications*

IEC 61935-1, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801 and related standards*

IEC 61935-4, *Specification for the testing of balanced and coaxial information technology cabling – Part 4: Installed balanced single pair cabling as specified in ISO/IEC 11801-1 and related standards<sup>1</sup>*

ISO/IEC 11801 (all parts), *Information technology – Generic cabling for customer premises*

ISO/IEC 11801-1:2017/AMD1:–2, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

<sup>1</sup> First edition under preparation. Stage at the time of publication: IEC CD 61935-4:2024.

2 Under preparation. Stage at the time of publication: ISO/IEC CD 11801-1:2017/AMD1:2023.

ISO/IEC 18598, *Information technology – Automated infrastructure management (AIM) systems – Requirements, data exchange and applications*

ISO/IEC/IEEE 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Standard for Ethernet*

---