

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Connectors for electrical and electronic equipment – Shielded or unshielded free and fixed connectors for balanced single-pair data transmission with current-carrying capacity – General requirements and tests

Connecteurs pour équipements électriques et électroniques – Fiches et embases écrantées ou non écrantées pour transmission de données sur une seule paire symétrique avec courant admissible – Exigences générales et essais



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT –
SHIELDED OR UNSHIELDED FREE AND FIXED CONNECTORS
FOR BALANCED SINGLE-PAIR DATA TRANSMISSION
WITH CURRENT-CARRYING CAPACITY –
GENERAL REQUIREMENTS AND TESTS**

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
48B/2863/FDIS	48B/2866/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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INTRODUCTION

The IEC 63171 series is a set of International Standards covering shielded or unshielded free and fixed connectors for balanced single-pair data transmission with current carrying capacity.

This document, identified as IEC 63171, is the general requirements and tests part (general specification) of the whole series. Subsequent parts, identified as IEC 63171 followed by a dash and a progressive number starting with 1, are the product detail specifications of this series and do not duplicate information given in this document, but list only additional requirements.

Each subsequent part is identified by a type of connector covered with the same number identifying the part. Some parts can describe more than connector geometries (rectangular, circular), sharing the core element and the relevant features.

For the complete specifications regarding a connector of this series, both this general specification and the relevant detail specification are therefore required.

For the qualification of a connector of this series, both this general specification and the relevant detail specification shall be met.

Figure 1 shows the interrelation of the standards:

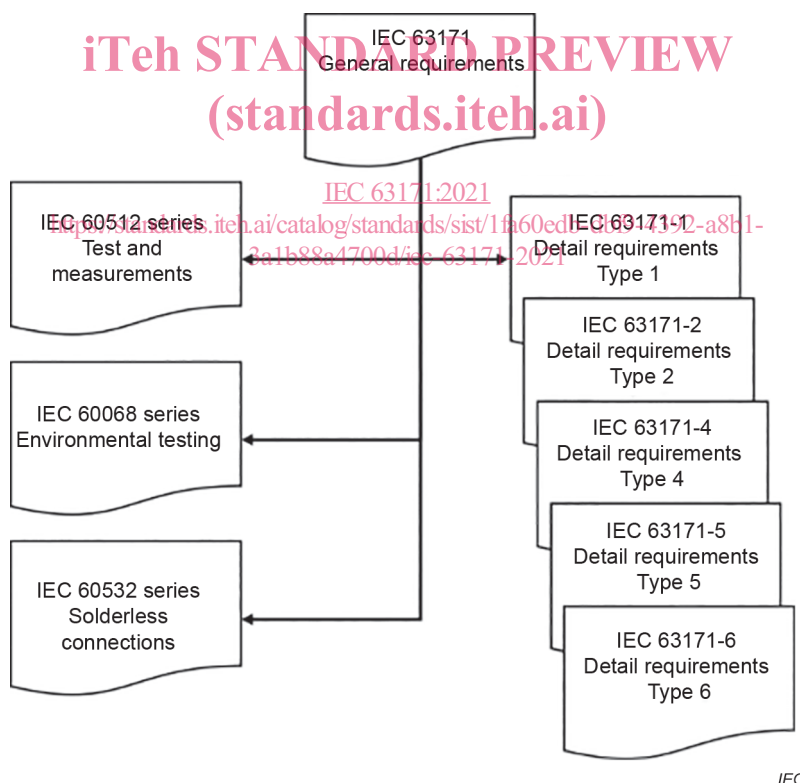


Figure 1 – Relationships between the IEC 63171 series and their related references

NOTE IEC 63171-1 and IEC 63171-6 contain duplicate information, which is either equal to or better than the minimum requirements of this document; such duplicate information is due to be removed in later editions.

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – SHIELDED OR UNSHIELDED FREE AND FIXED CONNECTORS FOR BALANCED SINGLE-PAIR DATA TRANSMISSION WITH CURRENT-CARRYING CAPACITY – GENERAL REQUIREMENTS AND TESTS

1 Scope

This document covers shielded and unshielded free and fixed connectors, circular or rectangular, for balanced single-pair data transmission, with current-carrying capacity.

It specifies the IEC 63171 series' common mechanical, electrical and transmission characteristics and environmental requirements, as well as required test specifications.

This document does not describe a specific mating interface. Detail specifications of mating interfaces complying with this document can be found in the family of detail specification standards IEC 63171-X (type X).

Within their own type, the shielded and unshielded connectors are interoperable for their transmission performance and can be exchanged, though the shielded version has improved alien crosstalk and coupling attenuation properties.

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.

IEC 60050-581, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60512-1, *Connectors for electrical and electronic equipment – Tests and measurements – Part 1: Generic specification*

IEC 60512-1-1, *Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: Visual examination*

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

IEC 60512-2-5, *Connectors for electronic equipment – Tests and measurements – Part 2-5: Electrical continuity and contact resistance tests – Test 2e: Contact disturbance*

IEC 60512-3-1, *Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation tests – Test 3a: Insulation resistance*

IEC 60512-4-1, *Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof*

IEC 60512-5-2, *Connectors for electronic equipment – Tests and measurements – Part 5-2: Current-carrying capacity tests – Test 5b: Current-temperature derating*

IEC 60512-6-4, *Connectors for electronic equipment – Tests and measurements – Part 6-4: Dynamic stress tests – Test 6d: Vibration (sinusoidal)*

IEC 60512-9-1, *Connectors for electronic equipment – Tests and measurements – Part 9-1: Endurance tests – Test 9a: Mechanical operation*

IEC 60512-9-2, *Connectors for electronic equipment – Tests and measurements – Part 9-2: Endurance tests – Test 9b: Electrical load and temperature*

IEC 60512-11-4, *Connectors for electronic equipment – Tests and measurements – Part 11-4: Climatic tests – Test 11d: Rapid change of temperature*

IEC 60512-11-7, *Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic tests – Test 11g: Flowing mixed gas corrosion test*

IEC 60512-11-12, *Connectors for electronic equipment – Tests and measurements – Part 11-12: Climatic tests – Test 11m: Damp heat, cyclic*

IEC 60512-13-2, *Connectors for electronic equipment – Tests and measurements – Part 13-2: Mechanical operation tests – Test 13b: Insertion and withdrawal forces*

IEC 60512-15-6, *Connectors for electronic equipment – Tests and measurements – Part 15-6: Connector tests (mechanical) – Test 15f: Effectiveness of connector coupling devices*

IEC 60512-25-9, *Connectors for electronic equipment – Tests and measurements – Part 25-9: Signal integrity tests – Test 25i: Alien crosstalk*

IEC 60512-26-100, *Connectors for electronic equipment – Tests and measurements – Part 26-100: Measurement setup, test and reference arrangements and measurements for connectors according to IEC 60603-7 – Tests 26a to 26g*

IEC 60512-28-100, *Connectors for electronic equipment – Tests and measurements – Part 28-100: Signal integrity tests up to 2 000 MHz – Tests 28a to 28g*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 62153-4-9:2018/AMD1:2020, *Metallic communication cable test methods – Part 4-9: Electromagnetic compatibility (EMC) – Coupling attenuation of screened balanced cables, triaxial method*

IEC 62153-4-15, *Metallic communication cable test methods – Part 4-15: Electromagnetic compatibility (EMC) – Test method for measuring transfer impedance and screening attenuation – or coupling attenuation with triaxial cell*

IEC TR 63040:2016, *Guidance on clearances and creepage distances in particular for distances equal to or less than 2 mm – Test results of research on influencing parameters*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581 and IEC 60512-1 as well as the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

shield contact between the fixed and free connectors

contact between shield parts of fixed and free connectors

4 Common features and typical connector pair

This document does not describe a specific mating interface. Detail specifications of mating interfaces complying with this document can be found in the family of detail specification standards IEC 63171-X (type X).

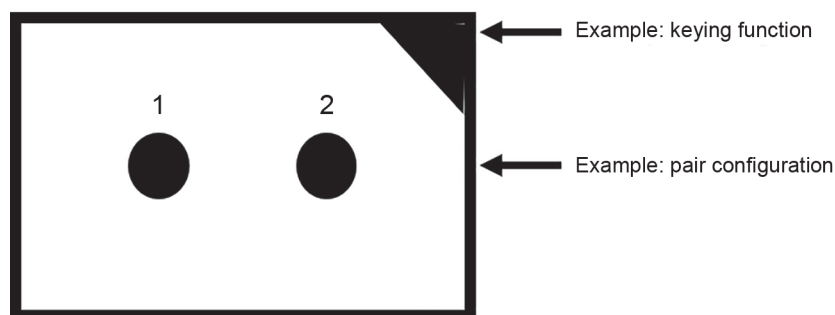
5 Characteristics

5.1 General

Conformance to the test schedules shall ensure the reliability of all performance parameters, including transmission parameters, over the range of operating climatic conditions.

5.2 Pin assignment

For those specifications where pin assignment is relevant, the pin assignment shall be specified as shown in Figure 2, unless otherwise specified. For those connector interfaces foreseeing multiple instances of the same 2-way interface within the same connector body, the pin assignment shall be specified for each of such individual 2-way interfaces.



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Figure 2 – Example of front view of fixed connector pin assignment

5.3 Classification into climatic category

The temperature range and climatic category shall be compatible with ISO/IEC 11801-1 classification of an M₁I₁C₁E₁ environment.

The upper temperature of the climatic category shall be compatible with the upper limiting temperature and the current-carrying capacity requirements of 5.4.3 (derating diagram in Figure 3 or Figure 4, ULT ≥ 90 °C).

NOTE As detailed in IEC 60068-1:2013, Annex A:

The category is indicated by a series of three groups of digits separated by oblique strokes corresponding respectively to the temperature in the cold test and that in the dry heat test, and the number of days of exposure to damp heat (steady state) the components will withstand, as follows:

First set: two digits denoting the minimum ambient temperature of operation (cold test). Where the temperature requires the use of only one digit, it shall be prefixed by the figure "0" for a negative temperature or the symbol "+" for a positive temperature to make up the two-character group.

Second set: three digits denoting the maximum ambient temperature of operation (dry heat test). Where the temperature requires the use of only two digits, they shall be prefixed by the figure "0" to make up the three-digit group.

Third set: two digits denoting the number of days of the damp heat, steady-state test (Test Ca). Where the duration requires the use of only one digit, it shall be prefixed by the figure "0" to make up the two-digit group. The figures "00" shall be used to indicate that the component is not required to be exposed to damp heat (steady state).

In order to belong to a given category, components shall comply with the requirements of the relevant specification when subjected to the whole set of tests prescribed for their category.

5.4 Electrical characteristics

5.4.1 Creepage and clearance distances

The permissible operating voltages depend on the application and the specified safety requirements.

Although insulation coordination is not required for safety aspects by the connector covered in this document and in the relevant detail product specification, it is still required for electrical functional requirements.

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In general, for minimum values of clearances and creepage distances, IEC 60664-1 shall apply, based on the assigned voltage rating 50 V AC and 60 V DC.

<https://standards.iteh.ai/catalog/standards/sist/1fa60edb-dbf9-4392-a8b1->

NOTE As indicated in IEC 60664-1, IEC TR 63040 provides an alternative and more precise dimensioning procedure for clearances equal to or less than 2 mm.

The creepage and clearance distances given in the relevant detail product specification apply for mated connectors.

The creepage and clearance distances that cover performance requirements in IEC 60664-1 may be reduced, based on IEC TR 63040.

Furthermore, in practice, based on the conductive pattern of the printed board or the wiring used, reductions in creepage or clearance distances are permitted.

5.4.2 Voltage proof

Conditions:

- IEC 60512-4-1, Test 4a, Method A.
- Standard atmospheric conditions.
- Mated connectors.

All variants:

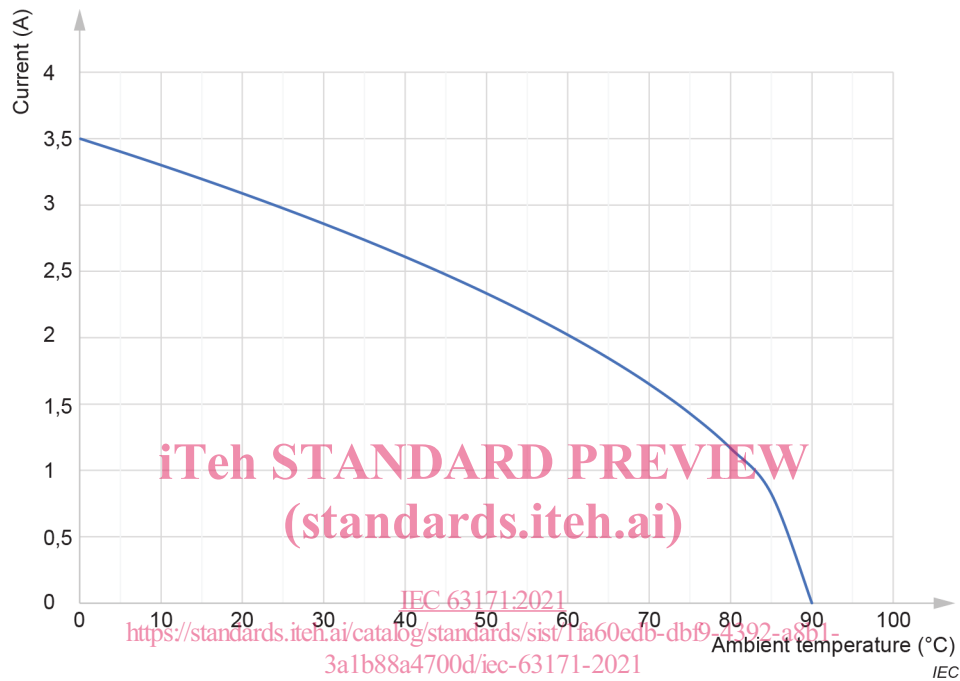
- 1 000 V DC: contact to contact.
- 1 500 V AC (RMS at 50 Hz to 60 Hz) or 2 250 V DC: all contacts connected together, to shield (if applicable).

NOTE For connector interfaces providing more than one individual 2-way shielded connector, the test is repeated on each of these individual connectors.

5.4.3 Current-temperature derating

Conditions:

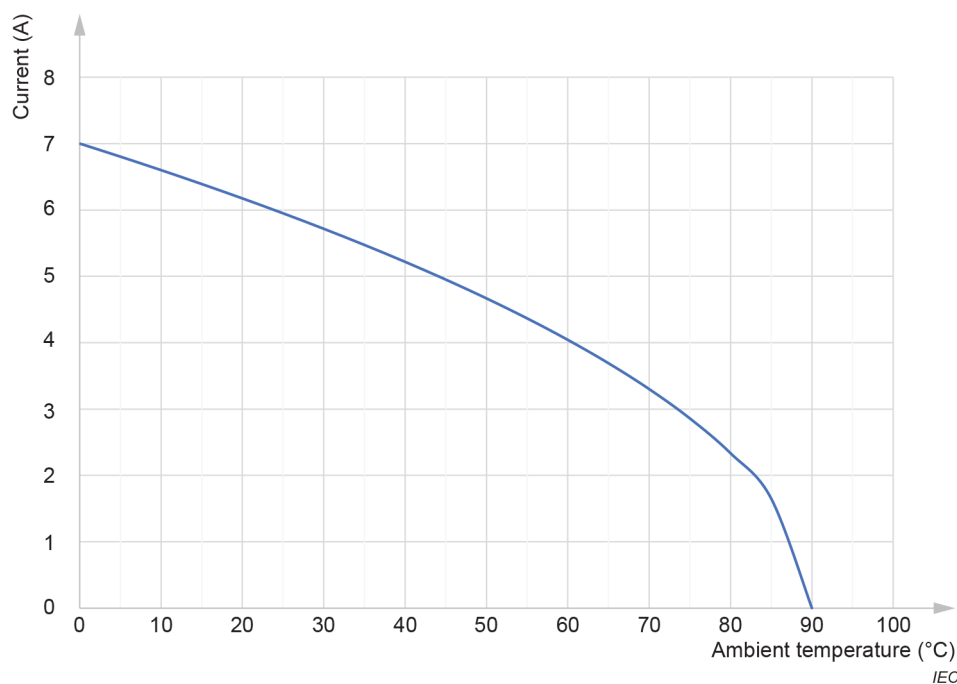
- IEC 60512-5-2, Test 5b.
- All contacts connected in series.
- Testing shall be carried out with the minimum supported wire size.
- The current-carrying capacity of connectors shall comply with the derating values given in Figure 3 for Level I and Figure 4 for Level II.



NOTE 1 The maximum permissible current for a given ambient temperature (T) is: $I_{(T)} = 3,5 \cdot \left(1 - \frac{T}{90}\right)^{0,5}$

NOTE 2 For ambient temperatures lower than 0 °C, the maximum permissible current per conductor is 3,5 A

Figure 3 – Level I connector de-rating curve



NOTE 1 The maximum permissible current for a given ambient temperature (T) is: $I_{(T)} = 7,0 \cdot \left(1 - \frac{T}{90}\right)^{0,5}$.

NOTE 2 For ambient temperatures lower than 0 °C, the maximum permissible current per conductor is 7,0 A

Figure 4 – Level II connector de-rating curve

IEC 63171:2021

5.4.4 Interface contact resistance – initial only

Conditions:

- IEC 60512-2-1, Test 2a.
- Arrange for measurement in accordance with 6.3.
- Mated connectors.
- Measurement points: as specified in Figure 5.
- All Types: 20 mΩ maximum.
- Shielding resistance: 100 mΩ maximum (if applicable).

5.4.5 Input to output DC resistance

Conditions:

- IEC 60512-2-1, Test 2a.
- Arrange for measurement in accordance with 6.3.
- Mated connectors.
- Measurement points: as specified in Figure 5a or 5b.
- All types: 50 mΩ maximum.

5.4.6 Input to output DC resistance unbalance

Conditions:

- IEC 60512-2-1, Test 2a.
- Arrange for measurement in accordance with 6.3.
- Mated connectors.
- Measurement points: as specified in Figure 5a or 5b.
- Among all signal conductors, maximum difference.
- All Types: 25 mΩ maximum.

5.4.7 Initial insulation resistance

Conditions:

- IEC 60512-3-1, Test 3a, Method A.
- Mated connectors.
- Test voltage: 500 V DC.
- All types: 500 MΩ minimum.

5.5 Transmission characteristics

5.5.1 General

This document specifies three different performance categories:

- category A specified from 0,1 MHz to 20 MHz;
- category B specified from 0,1 MHz to 600 MHz;
- category C specified from 0,1 MHz to 1 250 MHz.

Compliance with this document, with respect to transmission characteristics, shall be determined in accordance with specified test methods described in test group FP.

All transmission performance requirements shall apply between the reference planes specified in IEC 60512-28-100.

All transmission performance results shall be reported as worst-case overall result after testing all samples.

5.5.2 Insertion loss

Conditions:

- IEC 60512-28-100, test 28a.
- Mated connectors.

Requirements: see Table 1.