
**Road vehicles — Automotive cables —
Part 12:
Dimensions and requirements for
unscreened twisted pair RF cables
with a specified analogue bandwidth
up to 1 GHz**

Véhicules routiers — Câbles automobiles —

*Partie 12: Dimensions et exigences pour les câbles RF en paire
torsadée non blindés de bande passante analogique spécifiée jusqu'à
1 GHz* 19642-12:2023

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

A list of all parts in the ISO 19642 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document has been added to existing standards in the ISO 19642 series. It was prepared following a joint resolution to improve the general structure of the ISO Automotive Electric Cable standards. This new structure adds more clarity and, by defining a new standard family, opens up the standard for future amendments.

Many other standards currently refer to ISO 6722-1, ISO 6722-2 and ISO 14572. Therefore, these standards will stay valid at least until the next scheduled systematic review and will be replaced later on by the ISO 19642 series.

For new automotive cable projects customers and suppliers are advised on using the ISO 19642 series.

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Road vehicles — Automotive cables —

Part 12:

Dimensions and requirements for unscreened twisted pair RF cables with a specified analogue bandwidth up to 1 GHz

WARNING — The use of this document may involve hazardous materials, operations, and equipment. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies the dimensions and requirements for unscreened single twisted pair RF cables with a specified analogue bandwidth up to 1 GHz intended for use in road vehicle applications where the nominal system voltage is 30 V a.c. or 60 V d.c.

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 19642-1, *Road vehicles — Automotive cables — Part 1: Terminology and design guidelines*

ISO 19642-2:—¹⁾, *Road vehicles — Automotive cables — Part 2: Test methods*

ISO 19642-3, *Road vehicles — Automotive cables — Part 3: Dimensions and requirements for 30 V a.c. or 60 V d.c. single core copper conductor cables*

ISO 21111-8:2022, *Road vehicles — In-vehicle Ethernet — Part 8: Electrical 100-Mbit/s Ethernet transmission media, components and tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19642-1 apply.

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

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

4 Specifications

4.1 General test conditions

The test conditions of ISO 19642-2 shall apply. The descriptions of the tests are found in ISO 19642-2. This document only contains requirements and specific remarks. The cables shall be submitted to the tests as specified in [Clause 7](#).

1) Second edition under preparation. Stage at the time of publication: ISO/PRF 19642-2:2023.

The single cores of the UTP cable shall meet the requirements of ISO 19642-3. Dimensions and conductor definitions may be different, but shall be documented in the test report.

If suppliers and customers agree upon modifications or changes to the methods and requirements, it is required that all the changes and modifications are clearly documented.

NOTE The clause numbers in this document are aligned with the clause numbers in ISO 19642-2. Test clause numbers not needed in this document are identified as “Test is not required” or “Test is not possible”.

4.2 Safety concerns

See the “Warning” at the beginning of this document.

4.3 Voltage rating

The voltage rating is established by the rating of the cores 30 V a.c. or 60 V d.c.

4.4 Temperature classes

The temperature class rating is established by the rating(s) of the core and sheath. The rating of the cable shall be equal to the lowest rating of the core and sheath. For details on temperature classes, see ISO 19642-1.

4.5 Cable construction

For detailed information on preferred constructions please refer to [Table 9](#) and [Table 10](#). Other constructions and materials are permissible when agreed between customer and supplier.

4.5.1 Single Cores

4.5.1.1 Conductor

4.5.1.1.1 Conductor material

For conductor materials see ISO 19642-3 and for additional materials see [Table 1](#).

Table 1 — Additional permissible conductor materials

| Specification | Conductor material |
|---------------|---------------------------------|
| CEN/TS 13388 | Copper magnesium alloy (CuMg02) |
| | Copper silver alloy (CuAg01) |
| | Copper tin alloy (CuSn03) |
| ASTM B452 | Copper clad steel (CCS) |
| ASTM B105 | Copper alloy |

4.5.1.1.2 Conductor construction

For conductor construction of the core see ISO 19642-3 and [Table 9](#) and [Table 10](#).

4.5.1.1.3 Maximum conductor outside diameter

For conductor construction requirements of preferred cable types, refer to [Table 9](#) and [Table 10](#). If possible, use maximum conductor outside diameter values as specified in ISO 19642-3.

4.5.1.2 Insulation material

The material used shall be documented in the supplier data sheet.

4.5.1.3 Maximum outside diameter of the single cores

The maximum and minimum diameter of the single cores depend upon the specified impedance and may not follow the specifications according to ISO 19642-3. If different, outside diameters and minimal wall thickness shall be documented in the supplier data sheet.

4.5.2 Twisted pair

4.5.2.1 Lay length

The lay length shall be documented in the supplier data sheet.

4.5.2.2 Diameter of twisted pair

For JUTP cables the diameter of the twisted pair is referenced as inner diameter of sheath.

4.5.3 Separator

If a separator is used, it shall be documented in the supplier data sheet. The description shall contain information about type of material, e.g. PP foil, PETP foil, powder, etc.

4.5.4 Sheath

4.5.4.1 Sheath material

The sheath material shall be a flame retardant polymer compound or an intrinsically non-flammable polymer. The material used shall be documented in the supplier data sheet.

4.5.4.2 Sheath thickness

For sheathed cables, different sheath thicknesses are allowed per this document.

For new constructions it is recommended to define the thickness of the sheath according to ISO 19642-1:—²⁾, Annex A.

4.6 Cable designators

For the definition of the cable designators see [Table 2](#).

For reference numbers of preferred cable types refer to [Table 9](#) and [Table 10](#).

2) Second edition under preparation. Stage at the time of publication: ISO/PRF 19642-1:2023.

Table 2 — Cable designator description

| Designator | Valid entries | Comment |
|--------------|---------------|--|
| construction | UTP | unshielded twisted pair cable without a sheath |
| | JUTP | Jacketed unshielded twisted pair cable with a sheath |
| delimiter | - | |
| impedance | 100, 120, ... | nominal value of the differential RF cable impedance |
| delimiter | - | |
| reference # | 1, 2, 3, ... | up to 3-digit reference number to identify similar cable types |
| version | a | lower case version designator to differentiate between similar constructions |
| delimiter | white space | delimiter |
| # of cores | 2x | 2x for pair |
| CSA of cores | 0,13 | cross sectional area of cores [mm ²] |

EXAMPLE JUTP-100 -11a 2x0,13.

4.7 Representative cable elements testing

When a test is required, all combinations of different cable elements shall meet the appropriate requirements. However, if testing of representative cable elements is permitted, compliance for cables with different dimensions, but with the same insulation and sheath compound, may be demonstrated by testing samples of the cable with the thinnest sheath wall thickness only. For all other cables a reduced test procedure is acceptable. The remaining mandatory tests for initial certification shall be performed following [Tables 4 to 7](#).

4.8 Reference and requirements for the tests

All tests are defined in ISO 19642-2. This document only contains requirements and specific remarks.

4.9 General remark on requirements

Requirements for preferred unscreened single pair RF cable types are specified in [Table 9](#) and [Table 10](#). The requirements for other unscreened single pair RF cable types shall be as agreed between customer and supplier.

5 Requirements for the cable's dielectric cores

5.1 General

The cable's dielectric cores shall be tested according to ISO 19642-2 at the cable temperature class rating. Tests on the dielectric cable cores in JUTP cables shall be performed according to [Table 4](#).

For any UTP cable the cores shall meet all requirements of ISO 19642-3, dimensions may be different but shall be identified in the test report.

NOTE For preferred cable types refer to [Table 9](#) and [Table 10](#).

5.2 Dimensional tests

5.2.1 Cable outside diameter

The dielectric core outside diameter shall meet the required tolerances in [Table 9](#) and [Table 10](#).

5.2.2 Insulation thickness

The insulation thickness shall be checked and documented against the supplier datasheet.

5.2.3 Conductor diameter

No single value shall be outside the required tolerances in [Table 9](#) and [Table 10](#).

5.2.4 Cross sectional area (CSA)

No single value shall be outside the required tolerances in [Table 9](#) and [Table 10](#).

5.2.5 In-process cable outside diameter

In-process cable outside diameter monitoring is mandatory. No single value shall be outside the required tolerances in [Table 9](#) and [Table 10](#).

5.3 Electrical tests

5.3.1 Conductor resistance

No single value shall be outside the required tolerances in [Table 9](#) and [Table 10](#). The conductor resistance in [Table 9](#) and [Table 10](#) includes the twisting loss. For determination of maximum conductor resistance refer to the design guidelines in ISO 19642-1:—, A.5.

5.3.2 Determination of temperature coefficients

Test is not required.

5.3.3 Withstand voltage

5.3.3.1 Test voltage

After applying the test voltage of 1 kV a.c. for 30 min, no ramp up of the voltage is required.

5.3.3.2 Requirement

Breakdown shall not occur.

5.3.4 Withstand voltage after environmental testing

5.3.4.1 Test voltage

The test voltage is 1 kV a.c., hold for 1 min.

5.3.4.2 Requirement

Breakdown shall not occur.

5.3.5 Insulation faults

All cores shall be subjected to the inline insulation faults test during the extrusion process.

5.3.5.1 Test voltage

The test voltage is 1 kV a.c.