

DRAFT INTERNATIONAL STANDARD

ISO/DIS 19642-12

ISO/TC 22/SC 32

Secretariat: JISC

Voting begins on:
2022-06-16

Voting terminates on:
2022-09-08

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ICS: 43.040.10

[ISO/PRF 19642-12](#)

<https://standards.iteh.ai/catalog/standards/sist/8c3d8637-711e-42a8-8c17-8c8293412791/iso-prf-19642-12>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.



Reference number
ISO/DIS 19642-12:2022(E)

© ISO 2022

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/PRF 19642-12

<https://standards.iteh.ai/catalog/standards/sist/8c3d8637-711e-42a8-8c17-8c8293412791/iso-prf-19642-12>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative References	1
3 Terms and definitions	1
4 Specifications	2
4.1 General test conditions.....	2
4.2 Safety concerns.....	2
4.3 Voltage rating.....	2
4.4 Temperature classes.....	2
4.5 Cable construction.....	2
4.5.1 Single Cores.....	2
4.5.2 Twisted pair.....	3
4.5.3 Separating element.....	3
4.5.4 Sheath.....	3
4.6 Cable designators.....	3
4.7 Representative cable elements testing.....	4
4.8 Reference and requirements for the tests.....	4
4.9 General remark on requirements.....	4
5 Requirements for the cable's dielectric cores	4
5.1 General.....	4
5.2 Dimensional tests.....	4
5.2.1 Cable outside diameter.....	4
5.2.2 Insulation thickness.....	5
5.2.3 Conductor diameter.....	5
5.2.4 Cross sectional area (CSA).....	5
5.2.5 In-process cable outside diameter.....	5
5.3 Electrical tests.....	5
5.3.1 Conductor resistance.....	5
5.3.2 Determination of temperature coefficients.....	5
5.3.3 Withstand voltage.....	5
5.3.4 Breakdown shall not occur.....	5
5.3.5 Insulation faults.....	5
5.3.6 Insulation volume resistivity.....	6
5.4 Mechanical tests.....	6
5.4.1 Strip force.....	6
5.4.2 Abrasion.....	6
5.4.3 Breaking force of the finished cable.....	6
5.4.4 Cyclic bending.....	6
5.4.5 Flexibility.....	6
5.5 Environmental tests.....	6
5.5.1 Test specimen preparation and winding tests.....	6
5.5.2 Long term heat ageing, 3 000 h, at temperature class rating.....	6
5.5.3 Short term heat ageing, 240 h at temperature class rating +25 K.....	6
5.5.4 Thermal overload, 6 h at temperature class rating + 50 K.....	6
5.5.5 Pressure test at high temperature.....	6
5.5.6 Shrinkage by heat.....	6
5.5.7 Low temperature winding.....	7
5.5.8 Cold impact.....	7
5.5.9 Temperature and humidity cycling.....	7
5.5.10 Resistance to hot water.....	7
5.5.11 Resistance to liquid chemicals.....	7

5.5.12	Durability of cable marking.....	7
5.5.13	Stress cracking resistance.....	7
5.5.14	Resistance to ozone.....	7
5.5.15	Resistance to flame propagation.....	7
6	Requirements for the finished UTP or JUTP cables.....	7
6.1	General.....	7
6.2	Dimensional tests.....	7
6.2.1	Cable outside diameter for JUTP cables.....	7
6.2.2	Ovality of sheath for JUTP cables.....	8
6.2.3	Thickness of sheath for JUTP cables.....	8
6.2.4	In-process cable outside diameter for JUTP cables.....	8
6.2.5	Lay length.....	8
6.3	Electrical tests.....	8
6.3.1	Electrical continuity.....	8
6.3.2	Withstand voltage at final inspection.....	8
6.3.3	Screening effectiveness.....	8
6.3.4	Sheath fault on screened cables.....	8
6.3.5	General information on electrical test setups of unscreened cables.....	8
6.3.6	General information on low frequency electrical tests.....	8
6.3.7	Resistance unbalance.....	8
6.3.8	Capacitance.....	9
6.3.9	Inductance.....	9
6.3.10	General information on high (RF) frequency electrical tests.....	9
6.3.11	Velocity of Propagation.....	9
6.3.12	Characteristic impedance in frequency domain (CIF).....	9
6.3.13	Characteristic impedance in time domain (CIT).....	10
6.3.14	Insertion loss, IL.....	10
6.3.15	Return loss, RL.....	10
6.3.16	Unbalance attenuations.....	10
6.4	Mechanical tests.....	10
6.4.1	Strip force of sheath.....	10
6.4.2	Cyclic bending.....	10
6.4.3	Flexibility.....	11
6.4.4	Cyclic bending test for RF cables.....	11
6.4.5	Dynamic bending tests for RF cables.....	11
6.4.6	Test for assessment of minimum bending radius.....	11
6.4.7	Strip force of screen.....	11
6.4.8	Abrasion test of sheath.....	11
6.5	Environmental tests.....	11
6.5.1	Test specimen preparation and winding tests.....	11
6.5.2	Long term heat ageing, 3 000 h at Temperature class rating.....	11
6.5.3	Short term heat ageing, 240 h at Temperature class rating + 25 °C.....	12
6.5.4	Thermal overload, 6 h at Temperature class rating + 50 K °C.....	12
6.5.5	Pressure test at high temperature.....	12
6.5.6	Shrinkage by heat of sheath.....	12
6.5.7	Low temperature winding.....	12
6.5.8	Cold impact.....	12
6.5.9	Temperature and humidity cycling.....	12
6.5.10	Resistance to liquid chemicals.....	12
6.5.11	Durability of sheath marking.....	12
6.5.12	Resistance to ozone.....	12
6.5.13	Artificial weathering.....	13
6.5.14	Resistance to flame propagation.....	13
7	Test overview tables.....	13
7.1	Test table for single cores.....	13
7.2	Test tables for finished cables.....	14
8	Cable types.....	16

8.1	Cable parameters	16
8.2	Application requirements.....	19
8.2.1	CAN.....	19
8.2.2	CAN FD	19
8.2.3	FlexRay.....	19
8.2.4	100BASE-T1 Ethernet.....	20
8.2.5	1000BASE-T1 Ethernet.....	23
Annex A (normative) Colour combinations		27

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/PRF 19642-12

<https://standards.iteh.ai/catalog/standards/sist/8c3d8637-711e-42a8-8c17-8c8293412791/iso-prf-19642-12>

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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 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. So 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/PRF 19642-12](https://standards.iteh.ai/catalog/standards/sist/8c3d8637-711e-42a8-8c17-8c8293412791/iso-prf-19642-12)

<https://standards.iteh.ai/catalog/standards/sist/8c3d8637-711e-42a8-8c17-8c8293412791/iso-prf-19642-12>

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 International Standard may involve hazardous materials, operations, and equipment. This standard 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 standard to establish appropriate safety practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard 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 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 19642-1, *Road vehicles — Automotive cables — Terminology and design guidelines*

ISO 19642-2, *Road vehicles — Automotive cables — 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, *Road vehicles — In-vehicle Ethernet — Part 8: Electrical 100-Mbit/s Ethernet transmission media, components and tests*

ASTM B 452, *Standard Specification for Copper-Clad Steel Wire for Electronic Application*

ASTM B 105, *Standard Specification for Hard-Drawn Copper Alloy Wires for Electric Conductors*

PD CEN/TS 13388 *Copper and copper alloys. Compendium of compositions and products*

3 Terms and definitions

See ISO 19642-1.

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 part only contains requirements and specific remarks. The cables shall be submitted to the tests as specified in “7. Test overview tables” of this document.

Note 1 The single cores of the UTP cable shall meet the requirements of ISO 19642-3. Dimensions and conductor definition may be different, but must be documented in the test report.

Note 2 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 3 The paragraph numbers in this part are aligned with the paragraph numbers in ISO 19642-2 “Test methods”. Paragraph numbers not required in this part are intentionally omitted.

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](#) below.

Table 1 — Additional permissible conductor materials

Specification	Conductor
PD 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](#) of this document.

4.5.1.1.3 Maximum conductor outside diameter

For conductor construction requirements of preferred cable types please 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 defined 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 defined in the supplier data sheet.

4.5.2 Twisted pair

4.5.2.1 Lay length

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

4.5.2.2 Diameter of twisted pair

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

4.5.3 Separating element

If a separating element is used, it shall be defined 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 retarded polymer compound or an intrinsically non-flammable polymer. The material used shall be defined 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 annex A.

4.6 Cable designators

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

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

Table 2 — Cable designator description

Designator	Valid Entries	Comment
construction	UTP	unshielded twisted Pair cable <u>without</u> a sheath
	JUTP	unshielded twisted Pair cable <u>with</u> 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 the tables in [section 7](#).

4.8 Reference and requirements for the tests

All tests are defined in ISO 19642-2. This part 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](#).

NOTE 1 for any UTP cable the cores shall meet all requirements of 19642-3, dimensions may be different but must be identified in the test report.

NOTE 2 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 fulfil the required tolerances in [Table 9](#) and [Table 10](#).