INTERNATIONAL STANDARD

ISO 4141-2

First edition
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Road vehicles — Multicore connecting cables —

Part 2:
Test methods and requirements for high performance sheathed cables

Véhicules routiers — Câbles de raccordement multiconducteurs —
Partie 2: Méthodes d'essai et exigences pour les câbles gainés à haute performance

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4141-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

Together with ISO 4141-1 and ISO 4141-3, this first edition of ISO 4141-2 cancels and replaces ISO 4141:1988, which has been technically revised.

ISO 4141 consists of the following parts, under the general title *Road vehicles – Multicore connecting cables*:

— *Part 1: Test methods and requirements for basic performance sheathed cables*

— *Part 2: Test methods and requirements for high performance sheathed cables*

— *Part 3: Construction, dimensions and marking of unscreened sheathed low-voltage cables*

— *Part 4: Test methods and requirements for coiled cable assemblies*

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1 Scope

This part of ISO 4141 specifies the test methods and requirements for high performance sheathed multicore cables for the connection of towing and towed vehicles, suitable for a temperature range of – 40 °C to + 85 °C.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 4141. At the time of publication, the edition indicated was valid. All Standards are subject to revision, and parties to agreements based on this part of ISO 4141 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4141-1:1998, *Road vehicles — Multicore connecting cables — Part 1: Test methods and requirements for basic performance sheathed cables.*

3 General requirements

High performance sheathed multicore cables shall be in accordance with ISO 4141-1 and shall meet the additional tests and requirements specified in clause 4.

Coiled multicore cables shall in addition meet the tests and requirements specified in clause 5.

4 Additional tests and requirements

4.1 Impact at low temperature

4.1.1 Test

Perform the low temperature impact test in accordance with ISO 4141-1:1998, subclause 4.13.1, but at a test temperature of (– 20 ± 2) °C.

4.1.2 Requirements

See ISO 4141-1:1998, subclause 4.13.2.

4.2 Pressure at high temperature

4.2.1 Test

Perform the high temperature pressure test in accordance with ISO 4141-1:1998, subclause 4.12.1.

4.2.2 Requirements

See ISO 4141-1, subclause 4.12.2. The thickness within the area of impression shall not be less than 60 % of the mean of the thicknesses at the other two measuring points.

4.3 Resistance of sheath to fluids

4.3.1 General

Carry out the tests specified in 4.3.2 on the outer sheath of a complete multicore test sample, taking care not to expose the test sample ends to the test fluids.

For each test, take three samples each of 300 mm minimum length at least 1 m apart on the cable.

Bend each test sample 180° min. to a radius of five times the outside diameter and secure it.

4.3.2 Tests

4.3.2.1 Resistance against sulfuric acid

Immerse the bent test samples for 48 h in dilute battery acid of density 1,275 g/cm^3 at a temperature of (23 ± 5) °C.

Remove the test samples from the test liquid, rinse and wipe them thoroughly, and then examine them visually.

4.3.2.2 Resistance against lubrication oil

Immerse the bent test samples for 168 h in lubrication oil No.1 as specified in ISO 1817 at a temperature of (23 ± 5) °C.

Remove the test samples from the test liquid, wipe them thoroughly, and then examine them visually.

4.3.2.3 Resistance against zinc chloride

Immerse the bent samples in an aqueous solution of zinc chloride, 50% mass fraction, for 168 h at a temperature of (23 ± 5) °C.

Remove the test samples, straighten them and examine them visually.

4.3.2.4 Resistance against ethanol

Immerse the bent samples in an aqueous solution of ethanol, 95% mass fraction, for 168 h at a temperature of (23 ± 5) °C.

Remove the test samples, straighten them and examine them visually.

4.3.3 Requirement

The sheath shall show no evidence of fracture or cracking.

4.4 Cyclic bending

4.4.1 Test

Perform the test on uncoiled cables as described in ISO 4141-1:1998, subclause 4.15 but with the number of bending cycles being 10 000.

NOTE The test specified in ISO 4141-1 does not apply to coiled cables.

4.4.2 Requirements

No conductor shall break during the test. On completion of the test, the test sample when inspected visually shall show no sign of fracture or cracking to the sheath.

If the test samples meet these requirements, perform the test specified in ISO 4141-1:1998, subclause 4.2.

5 Specific tests and requirements for coiled multicore cables

5.1 Elongation by cable weight

5.1.1 Test

Measure the block length of the complete coil at rest and in a horizontal position.

Then hang the cable vertically. After at least 60 s, measure the extended coil length.

5.1.2 Requirement

The extended coil length shall not be more than twice the block length originally measured.

5.2 Resistance against cyclic extension

5.2.1 Test

This test may be performed with the sample used in 5.1. Position the sample horizontally in a test apparatus and subject it to the two test sequences specified in table 1.

Table 1 — Cyclic extension test, number of cycles

Test sequence	Extension	Number of cycles[1)]
1	to working length	200 000
2	to max. admitted extension length	20 000

1) One cycle consists of
- extension of the sample to its working length (test sequence 1) or to its maximum admitted extension length (test sequence 2);
- contraction to its original block length including the uncoiled cable lengths.

The test shall be carried out at a frequency of (10 ± 5) cycles/min.

Core breakage shall be monitored throughout the entire test. If breakage occurs the test shall stop automatically.

5.2.2 Requirement

No conductor shall break during the test. At the end, under visual examination, the sheath shall show no evidence of fracture or cracking.

If the test samples meet this requirement, perform the test specified in ISO 4141-1:1998, subclause 4.2.

5.3 Restoring force

5.3.1 Test

Precondition the cable:

— by one extension to its max. admitted extension length;

— 5 min rest, unstretched, at room temperature;

— rest for 4h in a freezing chamber at (– 40 ± 2) °C.

Then within 60 s of removing the sample from the freezing chamber, measure the restoring force of the cable when extended to its max. admitted extension length.

5.3.2 Requirement

The restoring force shall not exceed 180 N.

5.4 Cable sag

5.4.1 Test

Mount one cable as shown in figure 1 and measure its sag successively after each of the following conditions:

a) one extension to its max. admitted extension length, and subsequently 60 s rest unstretched,

b) 2 h conditioning in a heating chamber at (80 ± 2) °C, one extension to its max. admitted extension length within 15 s after removing from the heating chamber, and subsequently 60 s rest at room temperature, unstretched;

c) the cyclic extension test in 5.2, and subsequently 5 min rest, unstretched.

5.4.2 Requirement

The measured cable sag shall not exceed the values specified in table 2.

Table 2 — Maximum cable sag

Measurement taken with cable at rest after conditioning according to	Cable sag, L_2 max. mm
5.4.1 a)	400
5.4.1 b)	450
5.4.1 c)	650

Dimensions in millimetres

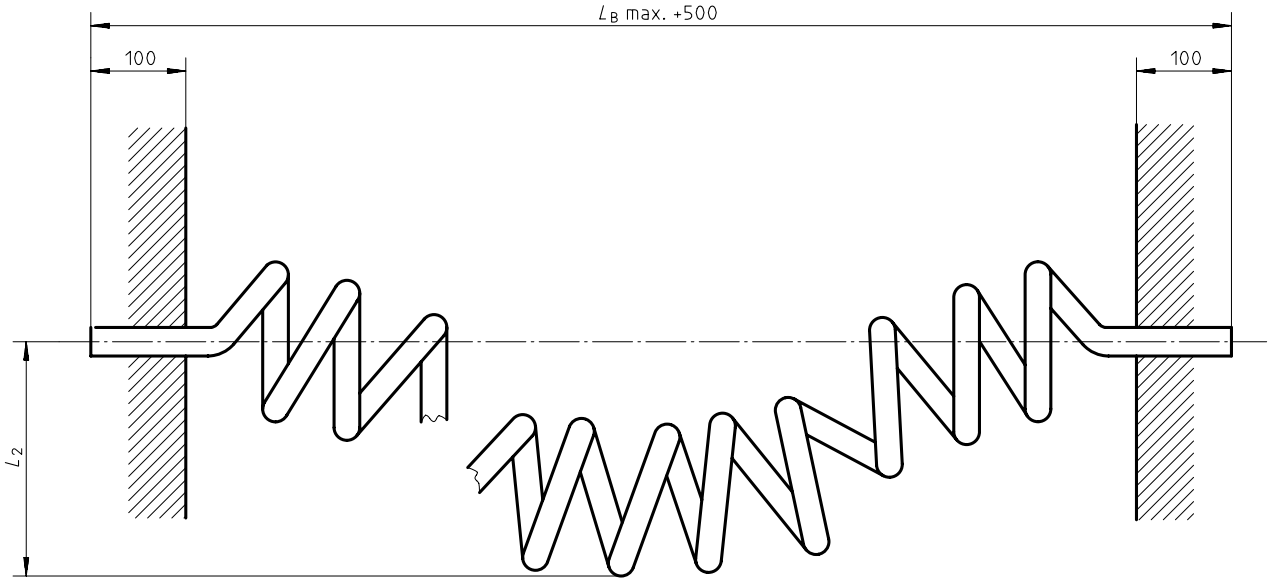

Figure 1 — Measurement of cable sag

5.5 Permanent elongation

5.5.1 Test

Measure the block length of one cable as delivered and after each of the following conditioning procedures:

a) one extension to its max. admitted extension length and subsequently 30 s rest, unstretched, at room temperature;

b) conditioning for 2 h at a temperature of (– 40 ± 2) °C, one extension to its max. admitted extension length within 15 s of removal from the heating chamber, and subsequently 120 s rest, unstretched, at room temperature;

c) as b), but 2 h conditioning at (60 ± 2) °C;

d) as b), but 2 h conditioning at (80 ± 2) °C.

Measurement shall be taken with the sample positioned horizontally on a plane surface of low friction. The released sample may be lifted and allowed to fall, to reduce the effect of friction.

5.5.2 Requirement

The measured change of block length shall not exceed the values specified in table 3.

Table 3 — Variation of block length

Measurements taken after conditioning as in	Change of block length % [1] max.
5.5.1 a)	10
5.5.1 b)	15
5.5.1 c)	20
5.5.1 d)	50

1) Percentage of the block length of the coiled cable as delivered (see ISO 4141-3:1998, figure 1).

ICS 43.040.10

Descriptors: road vehicles, vehicle combinations, electric connections, electric cables, sheathed cables, multicore cables, specifications, performance, tests, performance tests.

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