



**SLOVENSKI STANDARD**  
**SIST HD 605 S1:1998/A2:2002**  
**01-april-2002**

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**Electric cables - Additional test methods - Amendment A2**

Electric cables - Additional test methods

Elektrokabel - Ergänzende Prüfverfahren

Câbles électriques - Méthodes d'essai supplémentaires

**Ta slovenski standard je istoveten z: HD 605 S1:1994/A2:2001**

[SIST HD 605 S1:1998/A2:2002](https://standards.iteh.ai/catalog/standards/sist/b2a938d9-a317-4508-90bb-d5acb521978e/sist-hd-605-s1-1998-a2-2002)

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**ICS:**

29.060.20      Kabli                                      Cables

**SIST HD 605 S1:1998/A2:2002                      en**

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HARMONIZATION DOCUMENT

**HD 605 S1/A2**

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

April 2001

ICS 29.060.20  
UDC 621.315.2:620.1

English version

**Electric cables - Additional test methods**Câbles électriques -  
Méthodes d'essai supplémentairesElektrokabel -  
Ergänzende Prüfverfahren

This amendment A2 modifies the Harmonization Document HD 605 S1:1994; it was approved by CENELEC on 2000-01-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this amendment on a national level.

Up-to-date lists and bibliographical references concerning such national implementation may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German).

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

### Foreword

This amendment to HD 605 S1:1994 has been prepared by WG9 of CENELEC TC20 "Electric Cables". CENELEC TC 20 confirmed at its Barcelona meeting (May 1998) that the amendment should go to the Unique Acceptance Procedure.

NOTE Since the publication of HD 605 S1 (and A1) a number of changes have been made to other standards to which cross-reference is made in the original texts.

In particular:

- HD 505 (Parts 1.1 to 1.4 inclusive) has been replaced by EN 60811 (Parts 1-1 to 1-4 inclusive);
- HD 405.1 and HD 405.2 have been replaced by EN 50265-2-1 and EN 50265-2-2 respectively;
- IEC 502 (4<sup>th</sup> edition) has been replaced by IEC 60502-1 and IEC 60502-2.

In general the updating of these references has not been included in this amendment unless a complete test method has been introduced or replaced.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A2 to HD 605 S1:1994 on 2000-01-01.

The following dates were fixed:

- latest date by which the existence of the amendment has to be announced at national level (doa) 2000-07-01
- latest date by which the amendment has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 2001-10-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2003-01-01

**Subclause 2.1.4.3(a)**

*In the second line, delete: “of this sampling”.*

**Subclause 2.1.10.1 (b) (iii)**

*Delete the existing text and replace as follows, (the figure remains unchanged) :*

Sporadic irregularities are allowed taking into account the following conditions:

- Irregularities for which the maximum dimension (L) is less than 0,05 mm are not considered;
- Irregularities for which the maximum dimension (L) is greater than 0,20 mm are not authorised;
- If irregularities are observed for which the maximum dimension (L) is greater than 0,05 mm but less than or equal to 0,20 mm a second sample, taken close to the first one, shall be examined and shall not be permitted to show irregularities.

**Subclause 2.1.12.1**

*Delete the title and text and insert “Spare”.*

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**Subclause 2.2.2**

*Introduce Method 3 as follows.*

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**2.2.2.3 Method 3****(a) General**

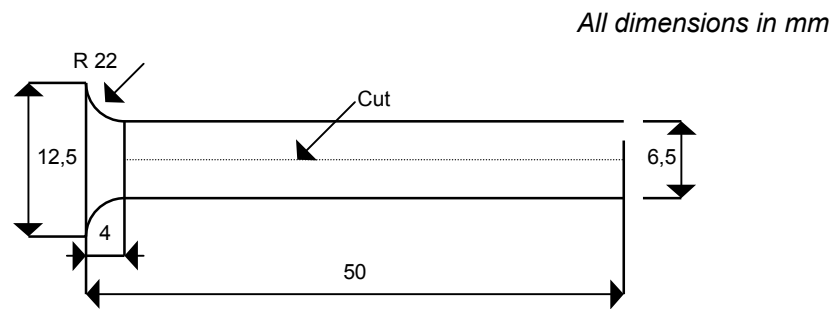
Three cable samples of 150 mm length each shall be taken from two parts of the cable, at least 1 m distant from each other.

The sheath of the samples shall be cut along the direction of the cable axis and the cores and metallic screens removed.

A portion of each sample sheath shall be obtained with two smooth, flat and parallel surfaces, avoiding excessive heating.

The thickness of each portion should be between 1 mm and 2 mm.

By means of a die or a sharp knife the test pieces with the dimensions indicated in figure 2.2.2.3 shall be obtained.

**Figure 2.2.2.3**

A central longitudinal cut, perpendicular to the width of the test piece, shall be made with a sharp razor to a point of 4 mm from the wider end.

**(b) Procedure**

Test each test piece in the following way. Place the halves of the split end in the jaws of a tensile testing machine and separate the jaws at a rate of  $(500 \pm 5)$  mm/min.

The maximum load needed for the complete tearing of each test piece shall be recorded.

**(c) Evaluation of results**

The tear resistance is determined by dividing the maximum load (in N) by the thickness of the test piece (in mm).

The mean value of the results obtained shall be in accordance with the requirements in the particular specification.

**Subclause 2.2.8.6**

*Replace the third paragraph with the following:*

Make two parallel cuts separated by  $(13 \pm 1)$  mm in the semi-conducting insulation screen material, down to the insulation and longitudinally from end to end of the core sample.

Remove approximately 50 mm length of the 13 mm strip from each end of the core by manually pulling it away from the core.

Mount the sample in a tensile test machine, with one end of the strip clamped in the upper jaws, and with the sample held horizontally at approximately  $90^\circ$  to the clamped strip. Measure the force to separate the 13 mm strip whilst maintaining the strip at approximately  $90^\circ$  to the sample, using a pulling speed of approximately 8 mm/s. Continue until approximately the midpoint of the sample.

Repeat the test from the other end of the sample.

**Subclause 2.3.1.1**

*Replace the second paragraph with the following:*

The cross-sectional area may be determined by weighing a test piece of approximately 350 mm from the aluminium strip material. The test piece length shall be measured with a tolerance of  $\pm 0,5$  mm, the mass shall be measured with a tolerance of  $\pm 0,02$  g. The density of aluminium shall be taken as  $2700 \text{ kg/m}^3$ .

**Subclause 2.4.1.7**

*Replace the first sentence of the first paragraph with the following:*

Bend the cable sample around a test cylinder at ambient temperature for at least once complete turn.

**Subclause 2.4.1.8**

*Replace with the following:*

**2.4.1.8 Cold bend test**

A sample of the cable with a length of at least five times the test drum diameter shall be subject to the partial discharge test in accordance with **3.10.3**. The sample shall then be cooled to  $0^\circ\text{C}$  for at least 4 h.

The sample shall then, without delay, be bent around a test cylinder, for at least one complete turn. It shall then be unwound and the process repeated after rotating the sample through  $180^\circ$  about its axis.

The sample shall be bent at a reasonably uniform speed, each half cycle of the test taking approximately 1,0 s per millimetre of overall cable diameter.

The diameter of the test cylinder shall be not greater than  $20(D + d)$  mm, where D is the overall diameter of the cable and d is the conductor diameter as detailed in the cable specification.

The sample shall then again be subjected to the partial discharge test in accordance with **3.10.3**.

The insulation, lead alloy sheath and oversheath shall then be visually examined.

**Subclause 2.4.3**

*Replace the first paragraph with the following:*

The test shall be carried out on a sample of sheath taken from a complete cable.

**Subclause 2.4.12.3**

Delete the title and text and insert "Spare".

**Subclause 2.4.18**

Delete the title and text and insert "Spare".

**Subclause 2.4.22**

Introduce new subclause as follows:

**2.4.22 Abrasion test (conic piece)**

A complete piece of cable shall be tightly tied to a fixed metallic base.

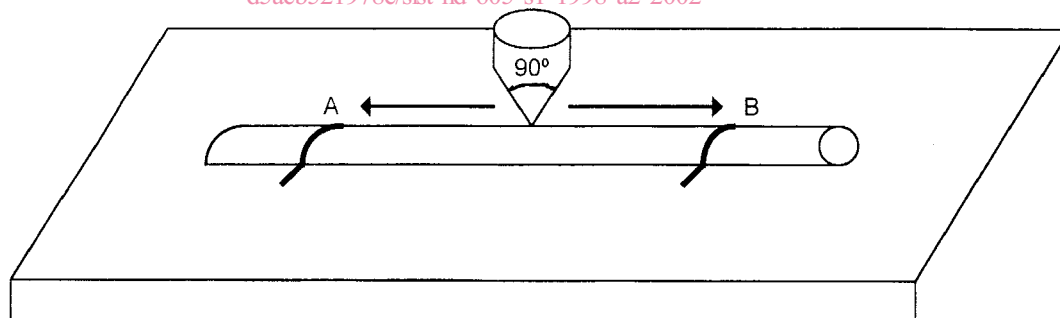
A metallic conic piece shall be applied to the superior generatrix of the cable.

The conic piece shall have a radius of curvature at its point of 1 mm and the angle shall be of 90°. The mass of the conic piece shall be as given in the particular specification.

The conic surface shall not be rough.

The conic piece shall be subjected to a to-and-fro motion, at constant speed, between the A and B marks, (see figure 2.4.22).

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**Figure 2.4.22**

The characteristics of the test shall be:

- Distance between A and B: 50 cm  $\pm$  10 cm
- Speed of the conic piece between A and B: 0,3 m/s with a tolerance of  $\pm$  5%.

At the end of the specified number of motions it shall not be possible to see, with normal or corrected vision without amplification, the metallic screen under the sheath between the A, B marks.



### Subclause 2.4.23

Introduce new subclause as follows:

#### 2.4.23 Resistance to UV rays

##### (a) Test principle and definition of the light source

This test is based on the prolonged exposure of the flat surface of the outer side of the cable test specimens to ultra-violet rays.

The light source used should be such that in a dry atmosphere (relative humidity below 30%) the exposed surface of the two flat surfaces of the test specimen, the side corresponding to the outside of the test specimen cable, receives a radiation in which the wavelength-dependent energy distribution complies with the values indicated on the curve (figure 2.4.23).

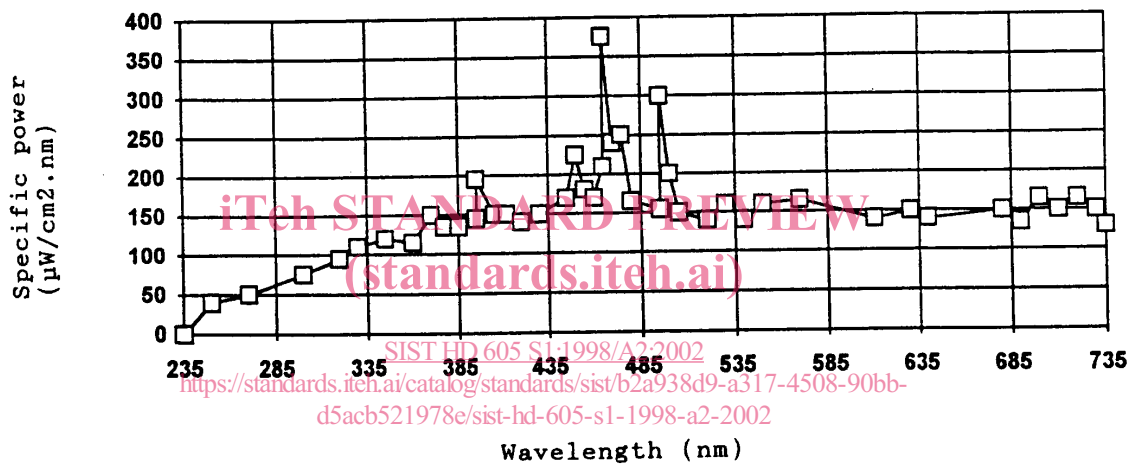


Figure 2.4.23

To take account of the dispersion of the lamps and their ageing, the following tolerances are accepted:

- (i) 20% in the area of ultra-violet radiation (wavelengths below 400 nm).
- (ii) 50% for the visible radiation (wavelengths above 400 nm)

This radiation may be obtained with a xenon lamp fitted with quartz filters.

##### (b) Test method

The samples shall follow a cycle of 5 days. During these days they shall be subjected to the following tests:

- Exposure for one day to light radiation in a humid atmosphere, (relative humidity  $\geq 85\%$ ), at the temperature of  $(25 \pm 2)^\circ\text{C}$  with sprinkling.

NOTE The sprinkling of demineralized water lasts three minutes per period of twenty minutes; it is done with the aid of injectors in which the water discharge should be sufficient to ensure the washing of all the test specimens.

- Exposure for one day in a humid atmosphere at the temperature of  $(50 \pm 2)^\circ\text{C}$  with thermal shocks obtained by being put into an enclosure kept at  $(-25 \pm 2)^\circ\text{C}$  for three one-hour periods. The hot-cold or cold-hot transfers should be done in the shortest time possible.

The time the test specimens remain in a humid atmosphere between two thermal shocks should be one hour or more.

- Two days exposure to light radiation in a dry atmosphere during which the temperature is kept at  $(70 \pm 2)^\circ\text{C}$  and the relative humidity is less than 30%.
- The fifth day, exposure for 8 hours with 0,067% in volume of sulphur dioxide and kept at a temperature of  $(40 \pm 3)^\circ\text{C}$  with saturating humidity. For the last 16 hours the door of the enclosure is left open to the laboratory environment.

During the exposures the test-pieces, similar to those defined for the tensile test, shall be placed on supports, taking care that they are not subjected to any tensile force.

At the end of the test, the samples shall be removed and kept protected from direct sunlight in the laboratory atmosphere for 24 hours at least. A visual verification shall then be carried out to ensure that there is no significant discolouration between the aged test pieces and those not subjected to the test.

(c) **Test pieces** (standards.iteh.ai)

The test requires two batches of six test-pieces; one of them being the reference batch.

- The reference batch shall be kept at ambient temperature avoiding direct sunlight throughout the environmental testing.
- The other batch shall be subjected to the specified 5 days cycle and then conditioned like the reference batch for 24 hours.

After the visual for any significant discolouration the elongation at break (A....) and tensile strength (R....) of the test-pieces from each of the batches shall be measured in accordance with EN 60811-1-1 subclause 9.2, i.e. respectively:

- Reference batch:  $A_0$  and  $R_0$
- Exposed batch:  $A_1$  and  $R_1$

The measured median values shall comply with the following requirements:

$$1. \quad \left| \frac{A_1 - A_0}{A_0} \right| \times 100 \leq 15$$

$$2. \quad \left| \frac{R_1 - R_0}{R_0} \right| \times 100 \leq 15$$

**Subclause 2.5.1.1D**

*Delete the first sentence and insert the following:*

Fill a 600 ml beaker with an acid solution as follows:

- 100 ml of hydrochloric acid (density at 20°C = 1,19 g/ml)
- 5 ml of antimony chloride solution, obtained by dissolving 20 g of Sb<sub>2</sub>O<sub>3</sub> or 32 g of SbCl<sub>3</sub> in 1000 ml of hydrochloric acid (density at 20°C = 1,19 g/ml).

**Subclause 2.5.5.3(b)**

*Delete the first sentence and insert the following:*

The wax compound used for sealing shall be such that it adheres firmly both to the surfaces of the specimen and to the dish and is not brittle at ambient temperature.

**Subclause 2.5.14**

*Replace the title with:*

**Wet compatibility test for type approval**

*Replace the first paragraph with:*

The following test shall be undertaken when galvanised steel wire is in contact with a carbon loaded tape layer.

*Delete the "(a)".*

*In the fourth paragraph (beginning "After 168 hours ...") delete "(this value is subject to review)".*

*Delete "(b)" and "(c)" along with the associated text.*

**Subclause 2.5.15**

*Introduce new subclause as follows:*

**2.5.15 Degree of cross-linking of vulcanised polyethylene****(a) Equipment**

- (i) A 0,001 g precision balance;
- (ii) Equipment for cutting the sample in thin sheets;
- (iii) Steel mesh bag with holes of 250 µm diameter, maximum;
- (iv) 1 mm diameter copper wire;
- (v) A 2000 ml capacity flask;
- (vi) Reflux condenser with ground joint-fitting to the flask;