SLOVENSKI STANDARD
SIST EN 60172:2001/A2:2010

01-september-2010

Preskusni postopek za določanje temperaturnega indeksa emajlirane žice za navitja (IEC 60172:1987/A2:2010)

Test procedure for the determination of the temperature index of enamelled winding wires (IEC 60172:1987/A2:2010)

Prüfverfahren zur Bestimmung des Temperaturindex von Lackdrähten (IEC 60172:1987/A2:2010)

Méthode d'essai pour la détermination de l'indice de température des fils de bobinage émaillés (CEI 60172:1987/A2:2010)

Ta slovenski standard je istoveten z: **EN 60172:1994/A2:2010**

ICS:

29.060.10 Žice Wires

SIST EN 60172:2001/A2:2010 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60172/A2

February 2010

ICS 29.060.10

English version

Test procedure for the determination of the temperature index of enamelled winding wires
(IEC 60172:1987/A2:2010)

Méthode d'essai pour la détermination de l'indice de température des fils de bobinage émaillés
(CEI 60172:1987/A2:2010)

Prüfverfahren zur Bestimmung des Temperaturindex von Lackdrähten
(IEC 60172:1987/A2:2010)

This amendment A2 modifies the European Standard EN 60172:1994; it was approved by CENELEC on 2010-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 60172:1994/A2:2010 E

Foreword

The text of document 55/1140/CDV, future amendment 2 to IEC 60172:1987, prepared by IEC TC 55, Winding wires, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60172:1994 on 2010-02-01.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-11-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	2013-02-01

Endorsement notice

The text of amendment 2:2010 to the International Standard IEC 60172:1987 was approved by CENELEC as an amendment to the European Standard without any modification.

IEC 60172

Edition 3.0 2010-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

Test procedure for the determination of the temperature index of enamelled winding wires

Méthode d'essai pour la détermination de l'indice de température des fils de bobinage émaillés

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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FOREWORD

This amendment has been prepared by IEC technical committee 55: Winding wires.

The text of this amendment is based on the following documents:

CDV	Report on voting
55/1140/CDV	55/1174/RVC

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

5 Test specimens

5.1.1 Enamelled round wire with a nominal conductor diameter of 0,800 mm up to and including 1,500 mm

Replace the title and text of this subclause by the following:

5.1.1 Enamelled round wire with a nominal conductor diameter of 0,224 mm up to and including 2,65 mm

The grade of insulation used for determining the thermal index shall be grade 2 or grade 2B for self-bonding winding wires.

Wire sizes 0,315 mm and 0,28 mm are permitted for use when the specification size range is limited to 0,50 mm and finer.

NOTE For round enamelled winding wires, in order to avoid undue fragility of the test specimen, experience has shown that nominal conductor diameters of 0,800 mm up to and including 2,65 mm are generally found convenient to handle and test.

Replace the existing Table 1 by the following new Table 1:

Table 1 – Force and number of twists for specimens

Nominal diameter mm		Force applied to wire pairs N	Number of twists per 125 mm
Over	Up to and including		
0,224	0,25	0,85	33
0,25	0,35	1,7	23
0,35	0,50	3,4	16
0,50	0,75	7,0	12
0,75	1,05	13,5	8
1,05	1,50	27,0	6
1,50	2,15	54,0	4
2,15	2,65	108,0	3

5.3 Number of test specimens

Replace the text of this subclause by the following new text:

Experience has shown that 20 specimens without impregnation and 10 specimens with impregnation give results with an acceptable tolerance. A minimum of 10 specimens shall be used.

5.4 Specimen holder

Replace the last sentence of this subclause by the following new sentence:

The holder shall be designed for at least 10 specimens to decrease handling time.

6 Temperature exposure

Replace the eighth paragraph of this clause by the following new paragraph:

Test specimens should be exposed to a minimum of three and preferably four exposure temperatures. The lowest temperature, recommended at 20 °C above the desired thermal class, should be one which results in a time frame to failure of more than 5000 h. The highest exposure temperature must have a value of at least 100 h to be considered a valid data point. Exposure temperatures should not be more than 20 °C apart. The accuracy of the temperature index predicted from the results will increase as the exposure temperature approaches the temperature to which the insulation is exposed in service.

7 Test voltage and its application

Replace the third paragraph of this clause by the following new paragraph:

The test specimens are removed from the ovens and cooled to room temperature. Each specimen is subjected to a proof voltage according to the average thickness of the enamel as

specified in Table 3. For self-bonding wires, the self-bonding layer is included in the increase in diameter due to the insulation.

Annex A

Replace Table A1 by the following new Table A.1:

Table A.1 – Commonly used test temperatures in degrees Celsius and the corresponding Kelvin's with its reciprocal and reciprocal squared values

θ °C	T K	X = 1/T (K^{-1})	$X^2 = 1/T^2$ (K^{-2})
105	378	$2{,}646 \times 10^{-3}$	$6{,}999 \times 10^{-6}$
120	393	$2{,}545 \times 10^{-3}$	$6{,}475 \times 10^{-6}$
125	398	$2{,}513 \times 10^{-3}$	$6{,}313 \times 10^{-6}$
130	403	$2{,}481 \times 10^{-3}$	$6{,}157 \times 10^{-6}$
140	413	$2{,}421 \times 10^{-3}$	$5{,}863 \times 10^{-6}$
150	423	$2{,}364 \times 10^{-3}$	$5{,}589 \times 10^{-6}$
155	428	$2{,}336 \times 10^{-3}$	$5{,}459 \times 10^{-6}$
165	438	$2{,}283 \times 10^{-3}$	$5{,}212 \times 10^{-6}$
175	448	$2{,}232 \times 10^{-3}$	$4{,}982 \times 10^{-6}$
180	453	$2{,}208 \times 10^{-3}$	$4{,}873 \times 10^{-6}$
185	458	$2{,}183 \times 10^{-3}$	$4{,}767 \times 10^{-6}$
190	463	$2{,}160 \times 10^{-3}$	$4{,}665 \times 10^{-6}$
200	473	$2{,}114 \times 10^{-3}$	$4{,}470 \times 10^{-6}$
210	483	$2{,}070 \times 10^{-3}$	$4{,}287 \times 10^{-6}$
220	493	$2{,}028 \times 10^{-3}$	$4{,}114 \times 10^{-6}$
225	498	$2{,}008 \times 10^{-3}$	$4{,}032 \times 10^{-6}$
230	503	$1{,}988 \times 10^{-3}$	$3{,}952 \times 10^{-6}$
240	513	$1{,}949 \times 10^{-3}$	$3{,}800 \times 10^{-6}$
250	523	$1{,}912 \times 10^{-3}$	$3{,}656 \times 10^{-6}$
260	533	$1{,}876 \times 10^{-3}$	$3{,}520 \times 10^{-6}$
270	543	$1{,}842 \times 10^{-3}$	$3{,}392 \times 10^{-6}$
280	553	$1{,}808 \times 10^{-3}$	$3{,}270 \times 10^{-6}$
300	573	$1{,}745 \times 10^{-3}$	$3{,}048 \times 10^{-6}$
320	593	$1{,}686 \times 10^{-3}$	$2{,}844 \times 10^{-6}$
Calculations for X^2 are based on non-rounded values.			

Annex B
(normative)

Correlation coefficient

Replace the existing Annex B by the following new Annex B:

Annex B
(normative)

Correlation coefficient

The correlation coefficient *r* is a measure of the amount of relationship between variables.

When *r* = 1,0, a perfect association between the variable exists, and when *r* = 0, a completely random relation exists.

$$r = \sqrt{\frac{aY + bXY - N(Avg\,Y)^2}{Y^2 - N(Avg\,Y)^2}}$$

where

N is the number of test temperatures used, and
X, Y are the variables.

Using the example data in Table AII in Annex A:

$$\text{Correlation Coefficient – Linearity } r = \sqrt{\frac{a\Sigma Y + b\Sigma XY - N(Avg\,Y)^2}{\Sigma Y^2 - N(Avg\,Y)^2}} = 0.996$$

If the correlation coefficient *r* is equal to or greater than 0,95, the data is said to be linear and the data points will be reasonably close to a straight line.

In the event that the correlation coefficient is less than 0,95, the data is said to be nonlinear and additional tests at other test temperatures are required. It is recommended that the new temperature point be 10 °C below the previous lowest temperature point.

When recalculating the temperature index and correlation coefficient, it is permissible for one temperature point to be deleted, starting with the highest temperature, provided that there are still three valid data points.

The data will be linear if the thermal deterioration of the film insulated wire or the varnished film insulated wire appears as one chemical reaction. Nonlinearity possibly indicates the following:

1) two or more reactions that have different activation energies (slopes) are predominant at different temperatures within the testing range; or
2) errors have been introduced through the sampling technique or the testing procedure, or both.