SLOVENSKI STANDARD
SIST EN 60034-18-41:2014/A1:2020

01-januar-2020

Električni rotacijski stroji - 18-41. del: Električni izolacijski sistemi brez delne razelektritve (tip I), uporabljeni v električnih rotacijskih strojih, ki jih napajajo napetostni pretvorniki - Kvalificiranje in preskusi pri obvladovanju kakovosti (IEC 60034-18-1:2014/A1:2019)

Rotating electrical machines - Part 18-41: Partial discharge free electrical insulation systems (Type I) used in rotating electrical machines fed from voltage converters - Qualification and quality control tests (IEC 60034-18-41:2014/A1:2019)

Drehende elektrische Maschinen - Teil 18-41: Qualifizierung und Qualitätsprüfungen für teilentladungsfreie elektrische Isoliersysteme (Typ I) in drehenden elektrischen Maschinen, die von Spannungsumrichtern gespeist werden (IEC 60034-18-41:2014/A1:2019)

Machines électriques tournantes - Partie 18-41: Systèmes d'isolation électrique sans décharge partielle (Type I) utilisés dans des machines électriques tournantes alimentées par des convertisseurs de tension - Essais de qualification et de contrôle qualité (IEC 60034-18-41:2014/A1:2019)

Ta slovenski standard je istoveten z: **EN 60034-18-41:2014/A1:2019**

ICS:

29.080.30	Izolacijski sistemi	Insulation systems
29.160.01	Rotacijski stroji na splošno	Rotating machinery in general

SIST EN 60034-18-41:2014/A1:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60034-18-41:2014/A1

September 2019

ICS 29.160.01

English Version

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This amendment A1 modifies the European Standard EN 60034-18-41:2014; it was approved by CENELEC on 2019-07-30. 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.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 2/1949/FDIS, future IEC 60034-18-41/A1, prepared by IEC/TC 2 "Rotating machinery" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60034-18-41:2014/A1:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-04-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-07-30

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

Endorsement notice

The text of the International Standard IEC 60034-18-41:2014/A1:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60034-1	NOTE	Harmonized as EN 60034-1

IEC 60034-18-41

Edition 1.0 2019-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
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FOREWORD

This amendment has been prepared by IEC Technical Committee 2: Rotating machinery.

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

FDIS	Report on voting
2/1949/FDIS	2/1957/RVD

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 stability date indicated on the IEC website 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.

3 Terms and definitions

Replace the existing term and definition 3.19 with the following:

3.19
impulse voltage insulation class
IVIC
<for Type I insulation systems> peak to peak voltage classes A, B, C, D, S for reliable operation, assigned by the manufacturer in relation to the rated voltage for a specified converter-driven machine and indicated in its documentation and, if applicable, on its rating plate

Add the following new terms and definitions:

3.26
maximum allowable terminal voltage
U_{IVIC}
maximum allowable peak to peak phase to ground voltage in service, according to the IVIC specification

3.27
test voltage factor
TVF
maximum allowable peak to peak phase to ground voltage in service in units of U_N, divided by $2\sqrt{2}$

12 Routine tests

Replace the existing text of this clause with the following:

12.1 Optional PD test

It is good practice to perform a routine test on each winding. For this purpose, it is recommended that the PD tests described in 11.2 and 11.3 are performed in agreement between the manufacturer and customer on each machine produced. The passing of this PD routine test, that has been performed according to this document and to the IVIC specified, shall be entered into the documentation for the machine, if required, or stored in the relevant database of the manufacturer.

12.2 Routine withstand voltage test

A mandatory minimum withstand voltage test for all machines with or without IVIC is described in IEC 60034-1. This withstand voltage test may be required at an increased voltage level for converter-fed machines, according to the specified IVIC, as described in Annex D. The derivation of test voltage factors (TVF) for the routine withstand voltage test of Type I converter-fed rotating electrical machines and an example of routine withstand test voltages for a 500 V rated rotating machine fed from a converter are given in Annex D.

The passing of this test with the withstand voltage level according to this document and to the specified IVIC, shall be entered into the documentation for the machine, if required, or stored in the relevant database of the manufacturer.

During the routine testing of quantity produced machines up to 200 kW (or kVA) and rated for $U_N \leq 1$ kV, the 1 min test may be replaced by a test of 1 s (see IEC 60034-1) at 120 % of the test voltage specified in Table D.1, for example S – (manufacturer specified): $(B/\sqrt{2} \cdot U_N + 1\ kV) \cdot 1{,}2$.

For very small sized machines or windings, produced in large quantity, for example with a rated power of < 1 kW, a test level of 120 % for the 1s-withstand-test may be excessive in case of IVIC C or D specified machines. In this case an IVIC-specified test level of 100 % can be used instead, but at least to the test level defined in IEC 60034-1.

Annex B

B.3 Enhancement factors for PD tests

At the end of Clause B.3, after Table B.2, add the following new text:

It is known and well documented in the relevant literature, that relative humidity (environmental on-site conditions) and density of air (altitude) may affect the PD inception voltage during testing and in service to a similar extent as the temperature. Results reported in literature suggest, that the relative and absolute humidity during test and in service will influence the actual PDIV/RPDIV in both directions. For this reason, a further enhancement factor could be applied to correct PDIV/RPDIV results.

The influence of the altitude on the RPDIV can become quite high, according to the strongly reduced air-pressure resulting in reduced PDIV/RPDIV. Depending on the design of the insulation system and the expected maximum altitude in service, this should be reflected by an additional enhancement factor.

B.6 Calculation of test voltages

Replace the first paragraph with the following:

As an example, the peak/peak PD-test voltages for phase/phase and phase/ground insulation in a 500 V rated rotating machine fed from a 2-level converter are calculated as in Clause B.5 but without the additional factor of 1,1 (arising from line voltage variations) and multiplied by the relevant total enhancement factor shown in Table B.2. This applies whether the test voltage is sinewave or impulse. It is generally expected that the total enhancement factor will be 1,25. The resulting test voltages for the example shown in Table B.4 are given in Table B.5.

Replace Table B.5 with the following:

Table B.5 – Examples of maximum peak/peak PD-test voltage for a 500 V rated winding fed, e.g. from a 2-level converter, according to the stress categories of Table 4 and with EF 1,25

Stress category or impulse voltage insulation class (IVIC)	Examples of maximum peak to peak PD-test voltage	
	Phase to phase V	Phase to ground V
A (Benign)	1 857	1 300
B (Moderate)	2 532	1 773
C (Severe)	3 375	2 364
D (Extreme)	4 219	2 955
S (manufacturer specified)	To be decided	To be decided

According to Clause C.2, an IVIC S may be assigned by the manufacturer which defines the maximum allowable peak to peak voltages and the resulting PD test voltages.

C.1 Impulse voltage insulation class (IVIC) of the machine

Replace the third paragraph with the following:

The maximum allowable voltages assigned to the impulse insulation classes in Table C.1 have been derived using Formulae (1) and (2) together with the arbitrarily chosen stress category overshoot factors in Table 4. They are given in units of U_N (i.e. the voltages in Table B.4 divided by 500) in order to have them independent from various rated machine voltages. While these voltage limit steps have been derived from operating voltages experienced in service, they pose arbitrary classes in nature. In many cases, intermediate steps for these voltage limits and independency of the limits for phase-phase and phase-ground voltages may be required (see Clause C.2).

Add the following new Annex D:

Annex D
(informative)

Derivation of routine withstand test voltages and an example for a 500 V rated machine

Table D.1 shows the test voltage factors (TVF) for Type I converter-fed rotating machines, which have been qualified with an IVIC classification, and the resulting routine withstand test voltages for a 500 V rated machine as an example. The test voltage factor (TVF) shown in Table D.1 is defined as the maximum allowable operating peak to peak phase to ground voltage in units of U_N divided by $2\sqrt{2}$. Here, this divisor reflects, that U_N and accordingly related test voltages defined in IEC 60034-1 are given as r.m.s-value. The values are shown for each of the appropriate impulse voltage insulation classes. The routine withstand test voltage for a converter-fed machine is not permitted to be below the value for a line-fed machine having the same rated voltage.

Table D.1 – Withstand test voltages according to IVIC for Type I insulation systems

	Maximum allowable peak to peak operating voltages in units of U_N[a]		Maximum allowable enhancement ratio for the phase to ground peak to peak voltage	TVF	Examples of routine phase to ground test voltages for a machine with U_N = 500 V tested at 50/60 Hz according to IEC 60034-1 (kV r.m.s.)	
IVIC	Phase to phase	Phase to ground U_{IVIC} / U_N			Converter-fed (IVIC specified)	Line fed[b]
None (line)	2,8	1,6				2
A – Benign	3,0	2,1	1,3	0,7	2,0	2
B – Moderate	4,1	2,8	1,7	1,0	2,0	2
C – Severe	5,4	3,8	2,3	1,3	2,3	2
D – Extreme	6,7	4,7	2,9	1,7	2,7	2
S (manufacturer specified)	X	Y	$\frac{Y\sqrt{3}}{2\sqrt{2}}$	$\frac{Y}{2\sqrt{2}}$	$\frac{U_N + 1\text{kV}}{\sqrt{2}} \cdot Y$	2

[a] These voltages are calculated using the formulae described in Clause B.5. The factor of 1,1 for the variation of the line voltage is not included.

[b] The voltage in this column is the test voltage specified in IEC 60034-1 for U_N = 500 V.

NOTE 1 Enhancement ratio is the maximum allowable phase to ground peak to peak voltage under converter-fed operation U_{IVIC} divided by the phase to ground peak to peak voltage under line operation $U_N/\sqrt{3} \cdot 2/\sqrt{2}$.

NOTE 2 The values X and $Y = U_{IVIC} / U_N$ are independent and are chosen by the manufacturer.

NOTE 3 S is defined in Clause C.2.

NOTE 4 The test voltage is defined only by the maximum allowable peak to peak voltage at the motor terminals in operation. Other differences in the voltage waveform in operation are not taken into consideration.

NOTE 5 The equations in the line of IVIC “S” apply to the other IVICs A, B, C, D as well.