SLOVENSKI STANDARD
SIST EN 60034-18-42:2018/oprA1:2019

01-februar-2019

Električni rotacijski stroji - 18-42. del: Električni izolacijski sistemi, odporni proti delni razelektritvi (tip II), ki se uporabljajo v električnih rotacijskih strojih, napajanih prek napetostnih pretvornikov - Preskusi zahtevanih pogojev

Rotating electrical machines - Part 18-42: Partial discharge resistant electrical insulation systems (Type II) used in rotating electrical machines fed from voltage converters - Qualification tests

Drehende elektrische Maschinen - Teil 18-42: Teilentladungsresistente Isoliersysteme (Typ II) von drehenden elektrischen Maschinen, die von Spannungsumrichtern gespeist werden - Qualifizierungsprüfungen

Machines électriques tournantes - Partie 18-42: Systèmes d'isolation électrique résistants aux décharges partielles (Type II) utilisés dans des machines électriques tournantes alimentées par convertisseurs de tension - Essais de qualification

Ta slovenski standard je istoveten z: **EN 60034-18-42:2017/prA1:2018**

ICS:

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

SIST EN 60034-18-42:2018/oprA1:2019 **en,fr,de**

2/1931/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 60034-18-42/AMD1 ED1**	
DATE OF CIRCULATION: **2018-12-21**	CLOSING DATE FOR VOTING: **2019-03-15**
SUPERSEDES DOCUMENTS: **2/1895/RR**	

IEC TC 2 : ROTATING MACHINERY	
SECRETARIAT: United Kingdom	SECRETARY: Mr Charles Whitlock
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Amendment 1 – Rotating electrical machines – Part 18-42: Partial discharge resistant electrical insulation systems (Type II) used in rotating electrical machines fed from voltage converters – Qualification tests

PROPOSED STABILITY DATE: 2021

NOTE FROM TC/SC OFFICERS:

TC 2 officers support decision of MT10 to skip CD stage on this amendment with the following justifications :

- DC (2/1883/DC) which closed on 12/2017 has received plenty of comments and MT 10 has dealt with all these comments (please see 2/1893A/INF).
- This first draft of amendment not contain fundamental changes, and appropriate to submit as CDV

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

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

Pub	Report on voting
IEC 60034-18-42:2017	XX/XX/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 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.

The National Committees are requested to note that for this publication the stability date is 2020

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ROTATING ELECTRICAL MACHINES

Part 18-42: Partial discharge resistant electrical insulation systems (Type II) used in rotating electrical machines fed from voltage converters - Qualification tests

Amendment 1

Replace definitions with the following

3.11
impulse voltage repetition rate
f
average of the inverse of the time between two successive impulses of the same polarity, whether unipolar or bipolar – in a considered set of pulses, e.g. for one periode

3.18
impulse voltage insulation class for Type II insulation systems
IVIC
peak to peak voltage classes 1, 2, 3, 4, 5, 6, 7, S including certain time parameters 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

Replace 3.29 with the following

3.29
maximum allowable peak to peak phase to ground voltage
U_{IVIC}
maximum allowable peak to peak phase to ground voltage in service, according to the IVIC-specification

Add the following definition

3.30 TVF
Test Voltage Factor
TVF
Max. allowable peak to peak operating phase-ground-voltages in units of UN , divided by $2\sqrt{2}$

Replace Table 1 with the following.

Table 1 – Examples of the measured values of characteristics of the terminal voltages for two converter-fed machines

Machine rating	**3,3 kV**	**6,6 kV**
Measured Peak to peak voltage on the phase to ground insulation	7,9 kV	13,9 kV
Fundamental frequency	50/60 Hz	50/60 Hz
Impulse rise time at the motor terminals	1 µs	3 µs
Impulse repetition rate	1 kHz	900 Hz
IVIC required to qualify the insulation for this service (See Table D.2, column 2)	3	2

The maximum change in voltage or jump voltage (U_j) at the impulse repetition rate is shown in Figure 3. This parameter is important in defining the voltage enhancement that can occur across the first or last coil in the winding. A fundamental frequent double jump transition (Figure 3, $U_{j\,max}$)) is possible and needs to be considered accordingly..

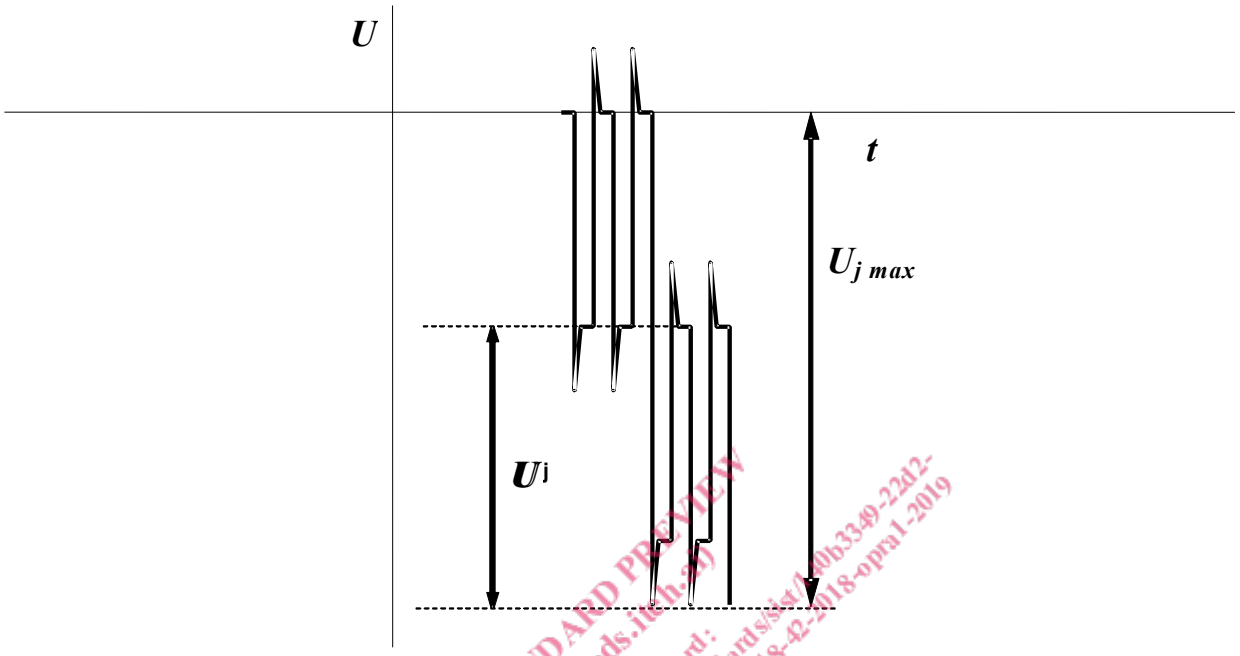

Figure 3 - Jump voltage ($U_{j\,or}$ $U_{j\,max}$) at the terminals of a machine fed from a converter drive

10.2 Test methods

The purpose of testing is to show that the electrical life of the turn insulation provides a life in service which is acceptable to the customer. It is expected that the manufacturer will know the maximum peak to peak voltage to appear between turns in a particular service application. The worst case insulation stress (depending on winding and coil design) shall be chosen. If the maximum peak to peak voltage between turns in service U_{turn} is unknown, it shall be assumed that the complete jump voltage falls across the first coil and so the amplitude of U_{turn} is the jump voltage divided by the number of turns (for one layer coils) or calculated according to the arrangement of turns (for multilayer coils). The peak-peak turn-turn voltage is than normally twice the amplitude – as the rise time and the fall time of the jumps is usually the same.

12.4 Stress control specimens

To qualify the stress control system to be used, testing of coils or bars, built to production standards and fitted into representative slots, is undertaken. The slots shall be equipped with heaters for the heating of the straight part to service temperature. Heating may be produced by passing current through the conductors. In order to reduce the capacitive load on the test supply, the specimens and slots may be of reduced length but the specimens shall otherwise be manufactured in the same way as the coils or bars used in service. Supplemental heating by thermostatic chamber or other heating devices may be applied for the stable heating. Supplemental heating temperature should be below the operating temperature of stator coils – see 7..

87

88

89 **13.2 Mainwall insulation**

90 *Replace the third paragraph with the following.*

91 At least three voltages shall be selected and the end-point is when electrical breakdown of the
92 insulation takes place. At least seven separate bars or coil legs shall be tested at each voltage,
93 using pass criterion a) or b) (see below). If pass criterion c) is to be applied, at least four separate
94 bars or coil legs shall be tested at each voltage . The life line for the candidate insulation system is
95 compared with the reference life curve, i.e. one that has been derived from an insulation system
96 that has been shown to provide an acceptable service life at the fundamental frequency (IEC
97 60034-18-1). The reference life line may have been obtained from satisfactory service life under
98 converter drive.

99 **14 Qualification test pass criteria**

100 *Replace 14.1 with the following*

101 **14.1 Mainwall insulation**

102 Comparison between the candidate and reference life lines shall be at the same frequency. Any
103 corrections for a different frequency used in testing shall be undertaken according to 9.3 before the
104 comparison is made. The mainwall insulation is qualified according to IEC 60034-18-32 if

105 a) the upper 90 % confidence limit of the candidate system life line exceeds the upper 90 %
106 confidence limit of the reference mainwall insulation life line over the same test voltages or

107 b) the lower 90 % confidence limit of the candidate system life line exceeds or is equal to the lower
108 90 % confidence limit of the reference mainwall insulation life line at the lowest test voltage and
109 the slope of the regression line of the mean values of the candidate system life line is steeper
110 than that of the reference mainwall insulation life line (i.e. the value of n for the candidate
111 system is greater than for the reference system).

112 *c)* If there are no confidence intervals available from the reference system – e.g. reference line
113 Annex E - the pass criterion for the candidate system shall be that not more than one of the
114 specimens at each voltage has a lifetime less than indicated by the reference line (see Annex
115 E1.1). If one sample of the four falls below the reference line, than at least two more specimens
116 have to be tested and pass. *[15]*

117 Note deleted

118 . *Replace Table D.1 with the following.*

119 **Table D.1 - IVIC- and test voltage factor definition for Type II insulation systems**
120

IVIC	Maximum allowable operating peak-peak-phase-ground-voltages (U_{IVIC}) in units of U_N	TVF	Maximum allowable enhancement ratio for the phase to ground peak to peak voltage	Examples of r.m.s. routine test voltages at 50/60 Hz (U_N = 6,6 kV)	
				Converter fed (Note deleted)	Line fed
None (line)	1,6	-	1,0	U_N = 6,6 kV	
1	1,8	0,6	1,1	14,2	14,2
2	2,1	0,8	1,3	14,2	14,2
3	2,4	0,9	1,5	14,2	14,2

4	2,8	1,0	1,7	14,2	14,2
5	3,3	1,2	2,0	16,4	14,2
6	3,8	1,3	2,3	18,5	14,2
7	4,2	1,5	2,6	20,8	14,2
S (manufacture specified)	B	$\frac{B}{2\sqrt{2}}$	$\frac{B\sqrt{3}}{2\sqrt{2}}$	$\frac{B \times U_N}{\sqrt{2}} + 1 \ kV$	14,2

NOTE 1 Enhancement ratio is the phase-ground peak to peak machine terminal voltage under converter operation divided by the phase-ground peak to peak machine terminal voltage under normal line operation. The latter one is being calculated by $U_N/(3)*2*sqrt(2)$

NOTE 2 The value $B = U_{IVIC}/U_N$ – as it is used in 60034-18-41, is to be chosen by the manufacturer, specifying different values of U_{IVIC} than given in the second column

NOTE 3 14,2 kV is the test voltage specified by IEC 60034-1 for U_N = 6,6 kV

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 1…7 as well.

131 *Replace Table D.2 with the following.*

132 **Table D.2 Impulse voltage insulation classes (IVIC)**

Impulse voltage insulation classes for Type II insulation systems – Severity codes and limiting values						
IVIC		Independent parameters of the IVIC				
		Phase to ground machine terminal voltage		Phase to ground impulse voltage		
		Maximum allowable enhancement ratio for the voltage (Column 1)	Maximum allowable fundamental frequency (Column 2)	ratio of the Maximum allowable jump voltage to the Maximum allowable phase to ground peak to peak voltage (Column 3)	Maximum allowable impulse voltage repetition rate (f) (Column 4)	Minimum allowable phase to ground impulse voltage rise time (t_r) (Column 5)
		$U_{pk/pk}$ converter operation divided by $U_{pk/pk}$ direct on line operation $\sqrt{3}(U_{IVIC}/U_N)/2\sqrt{2}$	Hz	$U_j/U_{pk/pk}$	kHz	µs
Severity code	1	1,1	Value to be reported in the documentation	Value to be reported in the documentation	Value to be reported in the documentation	Value to be reported in the documentation
	2	1,3				
	3	1,5				
	4	1,7				
	5	2,0				
	6	2,3				
	7	2,6				
	S	To be chosen by the manufacturer				

133