

<b>STN</b>	<b>Točivé elektrické stroje</b> <b>Časť 27-1: Nezávislé merania čiastočných výbojov</b> <b>v izolácii statorového vinutia točivých elektrických</b> <b>strojov</b>	<b>STN</b> <b>EN IEC</b> <b>60034-27-1</b>  35 0000
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Rotating electrical machines - Part 27-1: Off-line partial discharge measurements on the stator winding insulation of rotating electrical machines

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/18

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English Version

**Rotating electrical machines - Part 27-1: Off-line partial  
discharge measurements on the stator winding insulation of  
rotating electrical machines  
(IEC 60034-27-1:2017)**

Machines électriques tournantes - Partie 27-1: Mesures à l'arrêt des décharges partielles effectuées sur le système d'isolation des enroulements statoriques des machines électriques tournantes  
(IEC 60034-27-1:2017)

Drehende elektrische Maschinen - Teil 27-1: Off-line Teilentladungsmessungen an Ständerwicklungsisolierungen drehender elektrischer Maschinen  
(IEC 60034-27-1:2017)

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**EN IEC 60034-27-1:2018****European foreword**

The text of document 2/1877/FDIS, future edition 1 of IEC 60034-27-1:2017, prepared by IEC/TC 2 "Rotating machinery" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60034-27-1:2018.

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) 2018-12-29
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-06-29

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IEC 60034-18-41 NOTE Harmonized as EN 60034-18-41 (not modified).

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-18-32	-	Rotating electrical machines -- Part 18-32: Functional evaluation of insulation systems - Test procedures for form-wound windings - Evaluation of electrical endurance	EN 60034-18-32	-
IEC 60034-18-42	-	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	EN 60034-18-42	-
IEC 60034-27-4	-	Rotating electrical machines - Part 27-4: Measurement of insulation resistance and polarization index of winding insulation of rotating electrical machines	EN IEC 60034-27-4	-
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60060-2	-	High-voltage test techniques - Part 2: Measuring systems	EN 60060-2	-
IEC 60270	2000	High-voltage test techniques - Partial discharge measurements	EN 60270	2001
+ A1	2015		+ A1	2016
IEC/TS 60034-27-2	-	Rotating electrical machines - Part 27-2: On-line partial discharge measurements on the stator winding insulation of rotating electrical machines	-	-



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Edition 1.0 2017-12

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Rotating electrical machines –  
Part 27-1: Off-line partial discharge measurements on the winding insulation**

**Machines électriques tournantes –  
Partie 27-1: Mesurages à l'arrêt des décharges partielles effectués sur le  
système d'isolation des enroulements**





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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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**Rotating electrical machines –  
Part 27-1: Off-line partial discharge measurements on the winding insulation**

**Machines électriques tournantes –  
Partie 27-1: Mesurages à l'arrêt des décharges partielles effectués sur le  
système d'isolation des enroulements**

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## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references .....	9
3 Terms and definitions .....	10
4 Nature of PD in rotating machines .....	12
4.1 Basics of PD .....	12
4.2 Types of PD in rotating machines.....	13
4.2.1 General .....	13
4.2.2 Internal discharges .....	13
4.2.3 Slot discharges.....	13
4.2.4 End-winding gap and surface discharges.....	14
4.2.5 Foreign conductive materials discharges .....	14
4.3 Pulse propagation in windings.....	14
5 Measuring technologies and instrumentation .....	15
5.1 General.....	15
5.2 Influence of frequency response of measuring system .....	15
5.3 Effects of PD coupling units .....	16
5.4 Effect of the measuring instrument.....	17
6 Visualization of measurements .....	17
6.1 General.....	17
6.2 Minimum scope of PD data presentation .....	17
6.3 Additional means of PD data representation.....	18
6.3.1 General .....	18
6.3.2 Partial discharge pattern.....	19
7 Test circuits.....	19
7.1 General.....	19
7.2 Individual winding components.....	20
7.3 Complete windings.....	21
7.3.1 General .....	21
7.3.2 Standard measurements (SX.X).....	22
7.3.3 Optional, extended measurements (EX.X) .....	23
7.3.4 Using integrated test equipment (IX.X) .....	24
8 Normalization of measurements.....	25
8.1 General.....	25
8.2 Individual winding components.....	26
8.3 Complete windings.....	26
9 Test procedures .....	28
9.1 Acquiring PD measurements on windings and winding components .....	28
9.1.1 General .....	28
9.1.2 Test equipment and safety requirements .....	28
9.1.3 Preparation of test objects .....	28
9.1.4 Conditioning .....	29
9.1.5 Test voltages .....	29
9.1.6 PD test procedure.....	30



9.2	Identifying and locating the source of partial discharges .....	32
10	Interpretation of test results .....	32
10.1	General.....	32
10.2	Interpretation of PD magnitude, inception and extinction voltage.....	33
10.2.1	Basic interpretation.....	33
10.2.2	Trend in PD in a machine over time .....	34
10.2.3	Comparisons between winding components or between windings .....	34
10.3	PD pattern recognition .....	35
10.3.1	General .....	35
10.3.2	Basic interpretation.....	35
11	Test report.....	37
Annex A (informative)	Influence parameters of test frequency to testing procedure .....	39
Annex B (informative)	Alternative methods to determine discharge magnitudes .....	40
B.1	$Q_M$ , according to definition 3.14.....	40
B.2	Cumulative repetitive PD magnitude $Q_r$ .....	41
Annex C (informative)	Other off-line methods for PD detection and methods for localization .....	43
Annex D (informative)	External noise, disturbance and sensitivity .....	44
D.1	General.....	44
D.2	Sensitivity .....	44
D.3	Noise and signal-to-noise ratio.....	46
D.4	Disturbances.....	46
Annex E (informative)	Methods of disturbance suppression .....	47
E.1	Frequency range limiting.....	47
E.2	Phase window masking .....	47
E.3	Masking by noise signal triggering .....	47
E.4	Noise signal detection by measuring the propagation time .....	47
E.5	Two-channel signal difference method .....	48
E.6	Suppression of constant wave (CW) signals by digital filtering .....	49
E.7	Noise and disturbance rejection using signal processing techniques .....	49
Annex F (informative)	Interpretation of PD magnitude data and phase resolved PD patterns .....	52
F.1	Instructions for interpretation of PRPD patterns .....	52
F.1.1	Example of PRPD patterns .....	52
F.1.2	Relative severity of different PD mechanisms .....	54
F.1.3	Interpretation of the PD measurements from the line side and from the star point .....	55
F.1.4	Inductive discharges / Vibration sparking.....	55
Annex G (informative)	Test circuits for complete windings .....	57
G.1	General.....	57
G.2	Schemes and illustrations (see Figure G.1).....	57
Annex H (informative)	Wide-band and narrow-band measuring systems .....	62
H.1	General.....	62
H.2	Wide band systems.....	63
H.3	Narrow band systems .....	63
Bibliography	.....	64

Figure 1 – Frequency response of a PD pulse and coupling units of various time constants .....	16
Figure 2 – PD magnitude as a function of the normalized test voltage $Q=f(U/U_{\max})$ .....	18
Figure 3 – Example of a PRPD pattern.....	19
Figure 4 – Basic test circuits in accordance with IEC 60270.....	21
Figure 5 – Test circuit for PD measurement (S1.1) on complete windings .....	22
Figure 6 – Normalization of the test circuit for measurement S1.1 .....	27
Figure 7 – Test voltage applied to the test object during PD measurement.....	30
Figure 8 – Example for identification and localization of PD sources .....	36
Figure B.1 – Example for the indication of polarity effect.....	40
Figure B.2 – Effect of A/D conversion accuracy and the calculation of $Q_r$ , Example .....	42
Figure D.1 – Recharging of the test object by various current components.....	45
Figure E.1 – Without window masking.....	47
Figure E.2 – With window masking.....	47
Figure E.3 – Pulse currents through the measuring circuit .....	48
Figure E.4 – Example of noise rejection .....	50
Figure E.5 – Example of cross-talk rejection .....	51
Figure F.1 – Example of PRPD patterns.....	53
Figure G.1 – Illustrated diagrams for Y- and $\Delta$ -connections, according to 7.3 .....	61
Figure H.1 – Typical pulse responses of wide band and narrow band PD systems .....	62
Table 1 – Connection configuration S1 for open star point .....	22
Table 2 – Connection configuration S2 for closed star point.....	23
Table 3 – Connection configuration E1 for open star point .....	23
Table 4 – Connection configuration E2 for closed star point.....	24
Table 5 – Connection configuration I1 for integrated equipment and open star point, measurement on high voltage side.....	24
Table 6 – Connection configuration I2 for integrated equipment and open star point, measurement on star point side .....	25
Table 7 – Connection configuration I3 for integrated equipment and closed star point.....	25
Table A.1 – Recommended minimum measurement time and maximum slew rates .....	39
Table F.1 – Severity associated with the main PD sources in rotating machines .....	54

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on the winding insulation****FOREWORD**

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International Standard IEC 60034-27-1 has been prepared by IEC technical committee 2: Rotating machinery.

This International Standard cancels and replaces IEC TS 60034-27 (2006). It constitutes a technical revision.

The main technical changes with regard to IEC TS 60034-27 (2006) are as follows:

- In 1<sup>st</sup> version the scope was not well defined, and open to a too wide range of measurement frequencies. That has been corrected.
- In 1<sup>st</sup> version pulse magnitude was defined in different ways. Now, 2 definitions are given, one for each method.
- In 1<sup>st</sup> version the types of PD were erroneous. Especially the definition of the most critical “slot discharges” has been improved.

- Adding one more common test arrangement to Clause 7.
- Adding Annex A.
- Adding Annex B.
- Adding Annex G.
- Moving part of the original text (valid for old fashioned instruments) to new Annex H.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
2/1877/FDIS	2/1887/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60034 series, published under the general title *Rotating electrical machines*, can be found on the IEC website.

NOTE A table of cross-references of all IEC TC 2 publications can be found in the IEC TC 2 dashboard on the IEC website.

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## INTRODUCTION

For many years, the measurement of partial discharges (PD) has been employed as a means of assessing the quality of new insulation systems and the condition of aged insulation systems. It is also considered as a means of detecting localized sources of PD in used electrical winding insulation arising from operational stresses in service. Compared with other dielectric tests (e.g. the measurement of dissipation factor or insulation resistance) the differentiating character of partial discharge measurements allows PD sources within the insulation system to be detected.

In connection with the servicing and overhaul of rotating machines, the measurement and analysis of partial discharges can also provide information on:

- presence of ageing effects and potential defects in the insulating system;
- ageing processes;
- further measures and intervals between overhauls.

Although the PD testing of rotating machines has gained widespread acceptance, it has emerged from several studies that not only are there different methods of measurement in existence but also the criteria and methods of analysing and finally assessing the measured data are often different and not comparable. Consequently, there is a need to give some guidance to those users who are considering the use of PD measurements to assess the condition of their insulation systems.

Partial discharge testing of stator windings can be divided into two broad groups:

- a) off-line measurements, in which the stator winding is isolated from the power system and a separate power supply is employed to energize the winding;
- b) on-line measurements, in which the rotating machine is operating normally and connected to the power system (IEC 60034-27-2).

Both of these approaches have advantages and disadvantages with respect to one another. While acknowledging the extensive world-wide use of on-line methods and their proven value to industry, this international standard is confined to off-line techniques. This approach is considered necessary to render this standard sufficiently concise to be of use by non-specialists in the field of PD testing.

Limitations:

When PD measurements are performed on stator windings, several external factors will inevitably affect the result. Consequently, PD measurements are only comparable under certain conditions.

In a factory or site environment, the PD measurement results will be influenced by noise, unless provisions have been made to reduce the influence of noise. Different hardware and software methods, affecting for example measurement frequency band or noise cancellation algorithms, are used in different equipment systems to separate relevant PD signals from noise. Recalculation of the measured PD signal to an equivalent charge is an additional step that will be dependent on the measurement and the calibration equipment that has been used for normalization, as well as the method used.

Measurement conditions including temperature and moisture as well as test object set-up will further affect the PD result. In case of a stator winding, the attenuation and dispersion of the PD pulse during propagation will be dependent on the actual winding design and the origin of the pulse.

Based on the above reasons, absolute PD magnitude limits for the windings of rotating machines, for example as acceptance criteria for production or operation are difficult to define.

In addition, the degree of deterioration, and hence the risk of insulation system failure, depends on the specific type of PD source and its location within the stator winding insulation, both of which can influence the test results significantly.

Users of PD measurement should be aware that, due to the principles of the method, not all insulation-related problems in stator windings can be detected by measuring partial discharges (for example insulation failure mechanisms, which are not accompanied by pulse signals due to conductive paths between different elements of the insulation). Pulse signals may further remain undetected in practice due to the impact of electrical noise and disturbance conditions, which limit the detection sensitivity.

For individual bars and coils, absolute limits for PD magnitude are also difficult to establish due to disparities between different test equipment and test setups. Therefore, no absolute limits are given in the current version of this document.

# ROTATING ELECTRICAL MACHINES –

## Part 27-1: Off-line partial discharge measurements on the winding insulation

### 1 Scope

This part of IEC 60034 provides a common basis for:

- measuring techniques and instruments;
- the arrangement of test circuits;
- normalization and testing procedures;
- noise reduction;
- the documentation of test results;
- the interpretation of test results,

with respect to partial discharge off-line measurements on the winding insulation of rotating electrical machines.

The measurement methods described in this document are applicable to stator windings of machines with or without conductive slot coating and to the stator windings of machines made with form wound or random wound windings. In special cases like high voltage rotor field windings, this document is applicable as well. The measurement methods are applicable when testing with alternating sinusoidal voltages from 0,1 Hz up to 400 Hz.

Interpretation guidelines are given in this document and are applicable only if all the following requirements are fulfilled:

- Measurements performed with power frequency of 50 Hz or 60 Hz, or when testing with power supply within a frequency range of 45 Hz to 65 Hz.
- Form wound windings and winding components such as bars and coils.
- Winding with conductive slot coating. This is usually valid for machines with voltage rating of 6 kV and higher.

For machines with random wound windings, form-wound windings without conductive slot coating, and testing at frequencies differing from power frequencies, the interpretation guidelines are not applicable. The testing procedures for off-line PD-measurements of this document can be used for assessing the uniform quality of manufacturing or/and the trending of these kind of windings as well as converter driven machine windings.

NOTE Testing of low voltage machines with so called Type I insulation systems is defined in reference [10]<sup>1</sup>. Testing procedures for qualification of converter driven high voltage machines with so called Type II insulation systems are dealt with in IEC 60034-18-42 (in addition to the optional electric tests described therein).

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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<sup>1</sup> Numbers in square brackets refer to the Bibliography.

IEC 60034-18-32, *Rotating electrical machines – Part 18-32: Functional evaluation of insulation systems – Test procedures for form-wound windings – Evaluation by electrical endurance*

IEC 60034-18-42, *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*

IEC TS 60034-27-2, *Rotating electrical machines – Part 27-2: On-line partial discharge measurements on the stator winding insulation of rotating electrical machines*

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**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**