SLOVENSKI STANDARD
oSIST prEN IEC 60034-5:2019

01-september-2019

Električni rotacijski stroji - 5. del: Stopnja zaščite, ki jo zagotavlja celovita zasnova rotacijskih električnih strojev (koda IP) - Razvrščanje

Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification

Drehende elektrische Maschinen - Teil 5: Schutzarten aufgrund der Gesamtkonstruktion von drehenden elektrischen Maschinen (IP-Code) - Einteilung

Machines électriques tournantes - Partie 5: Degrés de protection procurés par la conception intégrale des machines électriques tournantes (code IP) - Classification

Ta slovenski standard je istoveten z: prEN IEC 60034-5:2019

ICS:

29.160.01	Rotacijski stroji na splošno	Rotating machinery in general

oSIST prEN IEC 60034-5:2019 en,fr,de

2/1960/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 60034-5 ED5**	
DATE OF CIRCULATION: **2019-07-05**	CLOSING DATE FOR VOTING: **2019-09-27**
SUPERSEDES DOCUMENTS: **2/1935/CD, 2/1951A/CC**	

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:

Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification

PROPOSED STABILITY DATE: 2022

NOTE FROM TC/SC OFFICERS:

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ROTATING ELECTRICAL MACHINES –

Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification

FOREWORD

1) La Commission Electrotechnique Internationale (CEI) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de la CEI). La CEI a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, la CEI – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de la CEI"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec la CEI, participent également aux travaux. La CEI collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.

2) Les décisions ou accords officiels de la CEI concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de la CEI intéressés sont représentés dans chaque comité d'études.

3) Les Publications de la CEI se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de la CEI. Tous les efforts raisonnables sont entrepris afin que la CEI s'assure de l'exactitude du contenu technique de ses publications; la CEI ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.

4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de la CEI s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de la CEI dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de la CEI et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.

5) La CEI n'a prévu aucune procédure de marquage valant indication d'approbation et n'engage pas sa responsabilité pour les équipements déclarés conformes à une de ses Publications.

6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.

7) Aucune responsabilité ne doit être imputée à la CEI, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de la CEI, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de la CEI ou de toute autre Publication de la CEI, ou au crédit qui lui est accordé.

8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.

9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de la CEI peuvent faire l'objet de droits de propriété intellectuelle ou de droits analogues. La CEI ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de propriété et de ne pas avoir signalé leur existence.

International Standard IEC 60034-5 has been prepared by IEC technical committee 2: Rotating machinery.

This fifth edition cancels and replaces edition 4.1 published in 2006. This edition constitutes a technical revision. The main changes with respect to the previous edition are
- the inclusion of an additional second numeral 9 including its test method,
- an additional note for clarification in Table 3,
- a clarification on the term open drain hole,
- a clarification on the ingress of dust in Table 4,
- pressure values given now in Pa only,
- a clarification in the scope on the applicability of this standard for (Ex) motors,
- a new clause 3 with definitions,
- the elimination of the words shall or should in notes.

The committee has decided that the contents of the base publication and its amendments 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.

ROTATING ELECTRICAL MACHINES –

Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification

1 Scope and object

This International Standard applies to the classification of degrees of protection provided by enclosures for rotating electrical machines. It defines the requirements for protective enclosures that are in all other respects suitable for their intended use and which, from the point of view of materials and workmanship, ensure that the properties dealt with in this standard are maintained under normal conditions of use.

This document does not specify degrees of protection against mechanical damage of the machine, or conditions such as moisture (produced for example by condensation), corrosive dust and vapour, fungus or vermin.

This document is also applicable to explosion proof machines, but it does not specifiy the types of protection for use in a potentially explosive (dust, gas) environment. Those are defined in the IEC 60079 series of standards.

In certain applications (such as agricultural or domestic appliances), more extensive precautions against accidental or deliberate contact may be specified.

This standard gives definitions for standard degrees of protection provided by enclosures applicable to rotating electrical machines as regards the:

a) protection of persons against contacts with or approach to live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure and protection of the machine against ingress of solid foreign objects;

b) protection of machines against the harmful effects due to ingress of water;

c) protection of machines against the harmful effects due to ingress of dust.

It gives designations for these protective degrees and tests to be performed to check that the machines meet the requirements of this standard.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-6, *Rotating electrical machines – Part 6: Methods of cooling (IC code)*

3 Definitions

3.1 Closed machine

a machine where no medium from the surrounding medium, for the purpose of cooling, passes through the machine
[SOURCE: IEC 60050-411:1996, 411-44-17]

3.2 Open machine

a machine with an open cooling circuit in which the coolant is drawn directly from the surrounding medium passing through the machine and then returning directly to the surrounding medium
[SOURCE: IEC 60050-411:1996, 411-44-16]

4 Designation

The designation used for the degree of protection consists of the letters IP followed by two characteristic numerals signifying conformity with the conditions indicated in the tables of clauses 4 and 5 respectively.

4.1 Single characteristic numeral

When it is required to indicate a degree of protection by only one characteristic numeral, the omitted numeral shall be replaced by the letter X, for example IPX5 or IP2X.

4.2 Supplementary letters

Additional information may be indicated by a supplementary letter following the second characteristic numeral. If more than one letter is used, the alphabetic sequence shall apply.

4.2.1 In special applications (such as machines with open circuit cooling for ship deck installation with air inlet and outlet openings closed during standstill), numerals may be followed by a letter indicating whether the protection against harmful effects due to ingress of water was verified or tested for the machine not running (letter S) or the machine running (letter M). In this case, the degree of protection in either state of the machine shall be indicated, for example IP55S/IP20M.

The absence of the letters S and M shall imply that the intended degree of protection will be provided under all normal conditions of use.

4.2.2 For air-cooled open machines suitable for specific weather conditions and provided with additional protective features or processes (as specified in clause 10), the letter W may be used.

4.3 Example of designation

IP 4 4

Characteristic letters

First characteristic numeral (see table 2)

Second characteristic numeral (see table 3)

5 Degrees of protection – First characteristic numeral

5.1 Indication of degree of protection

The first characteristic numeral indicates the degree of protection provided by the enclosure to persons and to the parts of the machine inside the enclosure.

Table 2 gives, in the third column, brief details of objects which will be ‘excluded’ from the enclosure for each of the degrees of protection represented by the first characteristic numeral.

The term ‘excluded’ implies that a part of the body, a tool or a wire held by a person, either will not enter the machine or, if it enters, that adequate clearance will be maintained between it and the live parts or dangerous moving parts (smooth rotating shafts and the like are not considered dangerous).

The third column of table 2 also indicates the minimum size of solid foreign objects which will be excluded.

5.2 Compliance to indicated degree of protection

Compliance of an enclosure with an indicated degree of protection implies that the enclosure will also comply with all lower degrees of protection in table 2. In consequence, the tests establishing these lower degrees of protection are not required, except in case of doubt.

5.3 External fans

The blades and spokes of fans external to the enclosure shall be protected against contact by means of guards complying with table 1.

Table 1 – Test requirements for guards

Protection of machine	Test
IP1X	50 mm sphere test
IP2X to IP6X	Finger test

For the test, the rotor shall be slowly rotated, for example by hand when possible.

Smooth rotating shafts and similar parts are not considered dangerous.

5.4 Drain holes

If the machine is provided with drain holes, the following shall apply:

– drain holes intended normally to be open on site shall be kept open during testing;
– drain holes are considered as open as long as no breather(s) or plug(s) etc. are mounted in a drain;
– if machines with protection IP3X or IP4X are intended to be run with open drain holes, the drain holes may comply with protection IP2X;
– if machines with protection IP5X are intended to be run with open drain holes, the drain holes shall comply with protection IP4X.

Table 2 – Degrees of protection indicated by the first characteristic numeral

First characteristic numeral	Degree of protection		Test conditions
	Brief description (NOTE 1)	**Definition**	
0	Non-protected machine	No special protection	No test
1 (NOTE 2)	Machine protected against solid objects greater than 50 mm	Accidental or inadvertent contact with or approach to live and moving parts inside the enclosure by a large surface of the human body, such as a hand (but no protection against deliberate access) Ingress of solid objects exceeding 50 mm in diameter	Table 4
2 (NOTE 2)	Machine protected against solid objects greater than 12 mm	Contact with or approach to live or moving parts inside the enclosure by fingers or similar objects not exceeding 80 mm in length Ingress of solid objects exceeding 12 mm in diameter	
3 (NOTE 2)	Machine protected against solid objects greater than 2,5 mm	Contact with or approach to live or moving parts inside the enclosure by tools or wires exceeding 2,5 mm in diameter Ingress of solid objects exceeding 2,5 mm in diameter	
4 (NOTE 2)	Machine protected against solid objects greater than 1 mm	Contact with or approach to live or moving parts inside the enclosure by wires or strips of thickness greater than 1 mm Ingress of solid objects exceeding 1 mm in diameter	
5 (NOTE 3)	Dust-protected machine	Contact with or approach to live or moving parts inside the enclosure Ingress of dust is not totally prevented but dust does not enter in sufficient quantity to interfere with satisfactory operation of the machine	
6	Dust-tight machines	Ingress of dust totally prevented	

NOTE 1 The brief description given in the second column of this table cannot be used to specify the type of protection.

NOTE 2 Machines assigned a first characteristic numeral 1, 2, 3 or 4 will exclude both regularly or irregularly shaped solid objects, provided that three normally perpendicular dimensions of the object exceed the appropriate figure in the 'Definition' column.

NOTE 3 The degree of protection against dust defined by this standard is a general one. When the nature of the dust (dimensions of particles, their nature, for instance fibrous particles) is specified, test conditions can be determined by agreement between manufacturer and user.

6 Degrees of protection – Second characteristic numeral

6.1 The second characteristic numeral indicates the degree of protection provided by the enclosure with respect to harmful effects due to ingress of water.

Table 3 gives, in the third column, details of the type of protection provided by the enclosure for each of the degrees of protection represented by the second characteristic numeral.

An air-cooled open machine is weather-protected when its design reduces the ingress of rain, snow and airborne particles, under specified conditions, to an amount consistent with correct operation.

This degree of protection is designated by the letter W placed after the second characteristic numeral.

6.2 For second characteristic numerals up to and including 6, compliance of an enclosure with an indicated degree of protection implies that the enclosure will also comply with all lower degrees of protection in table 3.

In consequence, the tests establishing these lower degrees of protection are not required, except in case of doubt.

For IPX7, IPX8 and IPX9, it shall not be assumed that compliance of the enclosure implies that the enclosure will also comply with all lower degrees of protection in table 3.