IEC TR 63021

Edition 1.0 2016-09

TECHNICAL REPORT

Rotating electrical machinery – Natural graphite brush for slip-ring in wound rotor-type induction motor – Application information

IEC TR 63021:2016-09(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC TR 63021

Edition 1.0 2016-09

TECHNICAL REPORT

Rotating electrical machinery – Natural graphite brush for slip-ring in wound rotor-type induction motor – Application information

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.160.01

ISBN 978-2-8322-3602-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

ROTATING ELECTRICAL MACHINERY –

Natural graphite brush for slip-ring in wound rotor-type induction motor – Application information

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a Technical Report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 63021, which is a Technical Report, has been prepared by IEC technical committee 2: Rotating machinery.

The text of this Technical Report is based on the following documents:

Enquiry draft	Report on voting
2/1794/DTR	2/1823A/RVC

Full information on the voting for the approval of this Technical Report 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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This Technical Report has been prepared after considering implications of the withdrawal of IEC PAS 62072:2005 and its potential conversion into an International Standard, and after analysing practical information obtained through the application of natural graphite (NG) brush for slip-ring in wound-rotor type induction motor, compared with copper brush.

Practical values obtained through the application of NG-brushes into slip-rings in various kinds of wound rotor-type induction motor are given in Annex A.

ROTATING ELECTRICAL MACHINERY –

Natural graphite brush for slip-ring in wound rotor-type induction motor – Application information

1 Scope

This document presents technical characteristics, application results and practical information on NG-brush for slip-ring obtained through the application of NG-brush in various kinds of wound rotor-type induction motor (large-size water pump, belt conveyer, lift, winder motor, grinding mill and crusher in coal or ore mine; crane, rolling mill, compressor and winder motor for boring in oil or gas facility).

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.

IEC 60413, *Test procedures for determining physical properties of brush materials for electrical machines*

IEC 60773, *Test methods and apparatus for measurement of the operational characteristics of brushes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
fire-spark
glittering phenomenon observed macroscopically between the brush and slip-ring during the operation of a wound rotor-type induction motor

3.2
life
critical time since the brushes have been installed into the wound rotor-type induction motor and started to operate until the brush and the slip-ring can no longer contribute to the motor's operation

3.3
dust diffusion
phenomenon whereby fine powders, caused by wear of the brush, diffuse in air during the operation of a wound rotor-type induction motor

3.4
noise
acoustic signal of high intensity caused between the brush and slip-ring among the acoustic signals of several wavelengths made during the operation of a wound rotor-type induction motor

3.5
vibration absorbing ability
ability of the brush to absorb or decrease electromagnetic and mechanical vibrations caused during the operation of a wound rotor-type induction motor

4 General remarks

Generally, it is traditional to use the metal grade brush including copper brush for the wound rotor-type induction motor.

The metal grade brush, including copper brushes, can usually damage the slip-ring by the fire-spark during operation. The dust generated by the wear of the copper brush can be the cause of accidents and also contaminates the environment. Compared with the formerly used copper brush, the NG-brush shows high operating characteristics when it is used for the slip-ring of a wound rotor-type induction motor. There is nearly no fire-spark between the NG-brush and slip-ring and no environmental pollution due to reduced wear. It also has sufficient ability of electromotion.

Table 1 shows the size and quantity of typical NG-brushes that are used for wound rotor-type induction motors of various powers.

Table 1 – Typical kinds of brushes

No.	Denomination	Size mm	Quantity (for a motor)	Power kW
1	motor for elevator	25×32×60	36	180
2	motor for compressor	25×32×60	9 to 18	75
3	motor for winder	25×32×60	9 to 18	250
4	motor for boring	25×32×60	6 to 36	1 600 to 3 000
5	motor for grinding mill	25×32×60	18	120 to 250
6	motor for crusher	25×32×60	18	120 to 250

5 General conditions of brush and slip-ring for stability in the operation of a wound rotor-type induction motor

5.1 Fire-spark

Fire-spark causes damage to the surface of the slip-ring. In severe conditions, it bursts out and becomes the cause of accidents or explosions.

5.2 Life

The life of the brush and the slip-ring are the main conditions for the motor's normal operation. The life of the brush is decided by its wear. The life of the slip-ring is also mutually related to the physical characteristics of the brush.