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Kapslade kopplingsutrustningar för lågspänning – Vägledning för provning med ljusbåge beroende på internt fel

Enclosed low-voltage switchgear and controlgear assemblies – Guide for testing under conditions of arcing due to internal fault (IECTechnical Report 61641:2014)

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Upplysningar om **sakinnehållet** i rapporten lämnas av
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Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

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IEC TR 61641

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TECHNICAL REPORT

RAPPORT TECHNIQUE

Enclosed low-voltage switchgear and controlgear assemblies – Guide for testing under conditions of arcing due to internal fault

Ensembles d'appareillage à basse tension sous enveloppe – Guide pour l'essai en conditions d'arc dues à un défaut interne

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ENCLOSED LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

GUIDE FOR TESTING UNDER CONDITIONS OF ARCING DUE TO INTERNAL FAULT

FOREWORD

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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 61641, which is a technical report, has been prepared by subcommittee SC 121B: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage.

This third edition cancels and replaces the second edition published in 2008. It constitutes a technical revision.

This third edition includes the following significant technical changes with respect to the previous edition:

– arcing classes to define the different forms of protection provided against arcing faults; (i) personnel protection, (ii) damage restricted to part of the ASSEMBLY, and (iii) ASSEMBLY suitable for limited further service.;

– two levels of personnel protection afforded by ASSEMBLIES under arcing fault conditions; (i) for ASSEMBLIES installed in areas where access to the ASSEMBLY is restricted to skilled persons, and (ii) for ASSEMBLIES installed in areas where the area is accessible to ordinary persons;

– option of individually insulating all live conductors to make the complete ASSEMBLY an arc ignition protected zone (referred to as an ‘arc free zone’ in previous editions of the Technical report);

– arc fault protection front, back and sides of an ASSEMBLY as the normal requirement;

– minimum performance requirements for arc ignition protected zone.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
121B/4/DTR	121B/14/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The reader’s attention is drawn to the fact that Annex B lists all of the “in-some-country” clauses on differing practices of a less permanent nature relating to the subject of this Technical Report.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

INTRODUCTION

The IEC 61439 series of standards gives rules and requirements for interface characteristics, service conditions, construction, performance and verification of low-voltage switchgear and controlgear assemblies, hereafter called ASSEMBLIES.

The main objective of these standards is to achieve the safe operation of low-voltage switchgear and controlgear assemblies under normal operating conditions as well as under abnormal operating conditions, e.g. occurrence of overvoltages, overload or short-circuit currents. Therefore no characteristics, design and verification requirements are given dealing with the case of an arc fault inside the ASSEMBLY.

Nevertheless the occurrence of an internal arc cannot completely be excluded. On the rare occasions that they do occur, typically internal arc faults result from:

– conducting materials inadvertently left in ASSEMBLIES during manufacture, installation or maintenance;
– faults in materials or workmanship;
– entry of small animals such as mice, snakes, etc.;
– use of an incorrect ASSEMBLY for the application resulting in overheating and subsequently an internal arcing fault;
– inappropriate operating conditions;
– incorrect operation; or,
– lack of maintenance.

The occurrence of arcs inside enclosed ASSEMBLIES is coupled with various physical phenomena. For example, the arc energy resulting from an arc developed in air at atmospheric pressure within the enclosure will cause an internal overpressure and local overheating which will result in mechanical and thermal stressing of the ASSEMBLY. Moreover, the materials involved may produce hot decomposition products, either gases or vapours, which may be discharged to the outside of the enclosure.

Due to the risk of personal injury, damage and loss of energy supply as consequences of arc faults there is a demand for arc fault tested ASSEMBLIES, even though an arc fault in an ASSEMBLY is considered as an unlikely event. The purpose of this technical report is to give guidance on the method of testing of ASSEMBLIES under conditions of arcing in air due to an internal failure.

The ability of an ASSEMBLY to pass tests according to this technical report is only one aspect when assessing the potential risk due to an arc fault within an ASSEMBLY. The skill of personnel having access to the ASSEMBLY, the personal protective equipment (PPE) used, the working procedures applied and the conditions in the location where the ASSEMBLY is installed, are other aspects that need to be taken into account.

The possibility of an arc fault within an ASSEMBLY can be reduced by the addition of suitable solid insulation of all conductors. Such ASSEMBLIES are categorised as arcing class I. This technical report does not provide any indication of performance in the unlikely event of an arcing fault within an arcing class I ASSEMBLY (see 4.1).

General information about arc fault behaviour and possible protective measures from the perspective of the user of an ASSEMBLY is given in IEC/TR 61439-0:2013, C.3 and Annex A of this technical report.

ENCLOSED LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

GUIDE FOR TESTING UNDER CONDITIONS OF ARCING DUE TO INTERNAL FAULT

1 Scope

This technical report gives guidance on the method of testing of ASSEMBLIES under conditions of arcing in air due to an internal fault.

The purpose of this test is to assess the ability of the ASSEMBLY to limit the risk of personal injury, damage of ASSEMBLIES and its suitability for further service as a result of an internal arcing fault.

The test procedure given in this technical report applies only:

– to enclosed, floor-standing or wall-mounted low-voltage switchgear and controlgear assemblies according to IEC 61439-2 (power switchgear and controlgear assemblies – PSC ASSEMBLIES);

NOTE This technical report can be used as a reference for arc fault tests of other products, but adaptations of the test procedures and acceptance criteria can apply taking into account the specifics of such other ASSEMBLIES or products.

– to situations when doors and covers of the ASSEMBLY are closed and correctly secured.

When tests under different or more severe conditions are agreed between the user and the manufacturer, this technical report can be used as a guide.

The test procedure given in this technical report takes into consideration:

– the effects of the internal overpressure acting on covers, doors, etc.;
– the thermal effects of the arc or its roots on the enclosures and of ejected hot gases and glowing particles.

The test procedure given in this technical report does not cover:

– other effects which can constitute a risk, such as toxic gases and loud noises;
– conditions during maintenance work, open doors or similar;
– access to the top and bottom of the ASSEMBLY.

This is a voluntary test made at the discretion of the manufacturer.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD 1:1999
IEC 60529:1989/AMD 2:2013

IEC 61439-1:2011, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

IEC 61439-2:2011, *Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies*