

IEC TR 62271-307

Edition 1.0 2015-09

TECHNICAL REPORT

RAPPORT TECHNIQUE



High-voltage switchgear and controlgear D PREVIEW Part 307: Guidance for the extension of validity of type tests of AC metal and solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

https://standards.iteh.ai/catalog/standards/sist/8884764b-4f14-48ff-a817-Appareillage à haute tension e=407b41ef/iec-tr-62271-307-2015

Partie 307: Lignes directrices pour l'extension de validité des essais de type d'appareillages en courant alternatif sous enveloppe métallique et d'isolation solide pour tensions assignées supérieures à 1 kV et jusqu'à 52 kV inclus





THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

| IEC Central Office | Tel.: +41 22 919 02 11 |
|--------------------|------------------------|
| 3, rue de Varembé | Fax: +41 22 919 03 00 |
| CH-1211 Geneva 20 | info@iec.ch |
| Switzerland | 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. 052c407b41et/iec-1

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 more than 30 000 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

More than 60 000 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.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



IEC TR 62271-307

Edition 1.0 2015-09

TECHNICAL REPORT

RAPPORT TECHNIQUE



High-voltage switchgear and controlgear D PREVIEW Part 307: Guidance for the extension of validity of type tests of AC metal and solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including $52_{E}kV_{R\,62271-307:2015}$

https://standards.iteh.ai/catalog/standards/sist/8884764b-4f14-48ff-a817-Appareillage à haute tensiônc407b41ef/iec-tr-62271-307-2015

Partie 307: Lignes directrices pour l'extension de validité des essais de type d'appareillages en courant alternatif sous enveloppe métallique et d'isolation solide pour tensions assignées supérieures à 1 kV et jusqu'à 52 kV inclus

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.130.10

ISBN 978-2-8322-2903-3

Warning! Make sure that you obtained this publication from an authorized distributor. Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

 Registered trademark of the International Electrotechnical Commission Marque déposée de la Commission Electrotechnique Internationale

– 2 – IEC TR 62271-307:2015 © IEC 2015

CONTENTS

| FC | FOREWORD | | |
|----|------------|--|------|
| 1 | Gene | eral | 7 |
| | 1.1 | Scope | 7 |
| | 1.2 | Normative references | 7 |
| 2 | Term | s and definitions | 7 |
| 3 | Use | of extension criteria | 9 |
| | 3.1 | General | 9 |
| | 3.2 | Parameters for extension criteria | |
| | 3.3 | Use of calculations | . 10 |
| | 3.3.1 | | |
| | 3.3.2 | | |
| | 3.3.3 | • | |
| | 3.3.4 | Mechanical stress calculations | .11 |
| | 3.3.5 | Short-circuit current calculations | .11 |
| | 3.3.6 | Internal arc pressure rise calculations | . 12 |
| | 3.4 | Information needed for extension of type test validity | |
| 4 | | cation of extension criteria | |
| | 4.1 | Dielectric tests eh. STANDARD PREVIEW | |
| | 4.2 | | |
| | 4.3 | Temperature rise tests Mechanical tests | 15 |
| | 4.4 | Short-time and peak withstand current tests | |
| | 4.5 | Making and breaking tests <u>IEC TR 62271-3072015</u> Making and breaking tests <u>All All All All All All All All All Al</u> | 16 |
| | 4.6 | Internal arc fault tests052c407b41cf/icc-tr-62271-307-2015 | .17 |
| | 4.6.1 | | |
| | 4.6.2 | | |
| | 4.6.3 | | |
| 5 | | nding the validity of type tests | |
| • | 5.1 | General | |
| | 5.2 | Extension of validity of a test report to other functional units (situation a) | |
| | 5.3 | Validation of a family by selection of test objects (situation b) | |
| | 5.3.1 | | |
| | 5.3.2 | | |
| | 5.3.3 | | |
| | 5.4 | Validation of an assembly by existing test reports (situation c) | |
| | 5.5 | Validation of a design modification (situation d) | |
| Ar | | informative) Rationale for the extension criteria | |
| | A.1 | General | |
| | A.1 A.2 | Dielectric tests | |
| | A.2.1 | | |
| | A.2.1 | | |
| | A.2.2 | | |
| | A.2.3 | | |
| | A.2.4 | | |
| | A.2.0 | | |
| | A.3 | Temperature rise tests | |
| | A.3 | • | |
| | 7.0.1 | | 20 |

| A.3.2 | Centre distance between phase conductors (Item 1) | 26 |
|----------|--|----|
| A.3.3 | Phase to earth distance (Item 2) | 26 |
| A.3.4 | Enclosure and compartment volume (Item 3) | 26 |
| A.3.5 | Insulating gas (Item 4) | 27 |
| A.3.6 | Conductors (Items 5 and 6) | 27 |
| A.3.7 | Conductor joints and connections (Items 7, 8 and 9) | 27 |
| A.3.8 | Ventilation area of partitions and enclosure (Item 10) | 27 |
| A.3.9 | Power dissipation of components (Item 11) | |
| A.3.10 | Insulating barriers (Item 12) | |
| A.3.11 | Insulating coating of conductors and enclosures (Item 13 and 14) | |
| A.3.12 | Insulating material in contact with conductors (Item 15) | 29 |
| A.4 Mec | hanical tests | 29 |
| A.4.1 | General | 29 |
| A.4.2 | Shutter systems (Item 1) | |
| A.4.3 | Contacts of removable parts (Item 2) | 30 |
| A.4.4 | Interlocking systems (Items 3 and 4) | |
| A.5 Sho | rt-time and peak withstand current tests | |
| A.5.1 | General | |
| A.5.2 | Centre distance between phase conductors (Item 1) | |
| A.5.3 | Conductors (Items 2, 5 and 6) | |
| A.5.4 | Insulating conductor supports (Items 3 and 4) | |
| A.5.5 | Insulating material in contact with conductors (Item 7) | |
| A.5.6 | Enclosure, partitions or bushings (Item 8) | |
| A.5.7 | Contacts of removable part (Item 9) IEC TR 62271-307:2015 | 32 |
| A.6 Mak | ing and breaking tests allog/standards/sist/8884764b-4f14-48ff-a817- | 32 |
| A.6.1 | General | 32 |
| A.6.2 | Clearance between phases and to earth (Items 1 and 2) | |
| A.6.3 | Enclosure and compartment volume (Item 3) | |
| A.6.4 | Insulating gas (Item 4) | |
| A.6.5 | Conductors (Items 5 and 6) | |
| A.6.6 | Insulating supports (Items 7, 8 and 9) | 33 |
| A.7 Inte | rnal arc fault tests | 34 |
| A.7.1 | General | |
| A.7.2 | Clearance between phases and to earth (Items 1 and 2) | 34 |
| A.7.3 | Compartment volume (Item 3) | |
| A.7.4 | Pressure of insulating gas (Item 4) | 35 |
| A.7.5 | Material in the region of arc initiation (Items 5, 6, 7 and 8) | |
| A.7.6 | Pressure relief opening devices (Items 9, 10 and 11) | |
| A.7.7 | Enclosure and compartments (Items 12, 13, 14 and 15) | 36 |
| | onale for extension criteria with respect to arc fault ratings and allation conditions | |
| A.8.1 | General | |
| A.8.2 | Rated arc fault current and duration (items 1 and 2) | |
| A.8.3 | Rated voltage (item 3) | |
| A.8.4 | Rated frequency (item 4) | 37 |
| A.8.5 | Arrangement of assembly (items 5, 6 and 7) | 37 |
| A.8.6 | Indoor or outdoor installation (item 8) | 37 |
| A.8.7 | Type of accessibility (item 9) | 37 |
| A.8.8 | Accessible sides (item 10) | |

| B.1 General | Annex B (informative) Examples for the extension of validity of type tests | . 38 |
|--|---|------|
| B.3 Design modification of an AIS bus riser functional unit by adding current transformers | B.1 General | . 38 |
| transformers 39 B.4 Design modification of a key-lock in the door of a functional unit of AIS 41 B.5 Extension of a ring-main unit (GIS) to functional units with larger width | B.2 Design modification of a cable terminal in air insulated switchgear (AIS) | .38 |
| B.4 Design modification of a key-lock in the door of a functional unit of AIS | | 20 |
| B.5 Extension of a ring-main unit (GIS) to functional units with larger width | | |
| B.6 Extension of a family of gas insulated switchgear (GIS) by a functional unit 43 Bibliography. 46 Figure 1 – Extension of validity of one test report; situation a) 20 Figure 2 – Validation of a family by selection of appropriate test objects; situation b) 21 Figure 8.1 – Cable terminals in the connection compartment of air insulated switchgear 23 Figure B.2 – Addition of block-type current transformers into the bus riser functional 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the 40 door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional 41 Figure B.5 – Cross-section of two different functional units of GIS 44 Landards.iteh.ai) 42 Figure B.5 – Extension criteria for dielectic withstand performance 13 Table 1 – Examples of design parameters 10 Table 3 – Extension criteria for temperature rise performances 14 Table 4 – Extension criteria for temperature rise performances 14 Table 5 – Extension criteria for short-time and peak withstand current performance 15 Table 6 – Extension criteria for internal arc fault classification with respect to 17 Table | | |
| Bibliography 46 Figure 1 – Extension of validity of one test report; situation a) 20 Figure 2 – Validation of a family by selection of appropriate test objects; situation b) 21 Figure 3 – Validation of actual assembly with existing test reports; situation c) 23 Figure B.1 – Cable terminals in the connection compartment of air insulated switchgear 38 Figure B.2 – Addition of block-type current transformers into the bus riser functional unit of air insulated switchgear 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit 42 Figure B.5 – Cross-section of two different functional units of GIS 44 Value B.5 – Cross-section of two different functional units of GIS 44 Table 1 – Examples of design parameters 10 Table 2 – Extension criteria for dielectric withstand performance 14 Table 3 – Extension criteria for mechanical performance 15 Table 4 – Extension criteria for short-time and peak withstand current performance 16 Table 5 – Extension criteria for internal arc fault withstand performance 18 Table 6 – Extension criteria for internal arc fault withstand performance 1 | | |
| Figure 2 – Validation of a family by selection of appropriate test objects; situation b). 21 Figure 3 – Validation of actual assembly with existing test reports; situation c) 23 Figure B.1 – Cable terminals in the connection compartment of air insulated switchgear. 38 Figure B.2 – Addition of block-type current transformers into the bus riser functional unit of air insulated switchgear. 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit 42 Figure B.5 – Cross-section of two different functional units of GIS 44 Catanatards. 10 Table 1 – Examples of design parameters. 10 Table 2 – Extension criteria for dielectric withstand performance 14 Table 3 – Extension criteria for mechanical performance 14 Table 4 – Extension criteria for mechanical performance 16 Table 5 – Extension criteria for making and breaking capacity 17 Table 6 – Extension criteria for internal arc fault withstand performance 18 Table 7 – Extension criteria for internal arc fault withstand performance 18 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions <td></td> <td></td> | | |
| Figure 2 – Validation of a family by selection of appropriate test objects; situation b). 21 Figure 3 – Validation of actual assembly with existing test reports; situation c) 23 Figure B.1 – Cable terminals in the connection compartment of air insulated switchgear. 38 Figure B.2 – Addition of block-type current transformers into the bus riser functional unit of air insulated switchgear. 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit 42 Figure B.5 – Cross-section of two different functional units of GIS 44 Catanatards. 10 Table 1 – Examples of design parameters. 10 Table 2 – Extension criteria for dielectric withstand performance 14 Table 3 – Extension criteria for mechanical performance 14 Table 4 – Extension criteria for mechanical performance 16 Table 5 – Extension criteria for making and breaking capacity 17 Table 6 – Extension criteria for internal arc fault withstand performance 18 Table 7 – Extension criteria for internal arc fault withstand performance 18 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions <td></td> <td></td> | | |
| Figure 3 – Validation of actual assembly with existing test reports; situation c) 23 Figure B.1 – Cable terminals in the connection compartment of air insulated switchgear. 38 Figure B.2 – Addition of block-type current transformers into the bus riser functional unit of air insulated switchgear. 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit. 42 Figure B.5 – Cross-section of two different functional units of GIS 44 Table 1 – Examples of design parameters. 10 Table 2 – Extension criteria for dielectric withstand performance 14 Table 3 – Extension criteria for mechanical performance 14 Table 5 – Extension criteria for mechanical performance 14 Table 6 – Extension criteria for making and breaking capacity 17 Table 7 – Extension criteria for internal arc fault withstand performance 18 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 6 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions 19 | Figure 1 – Extension of validity of one test report; situation a) | .20 |
| Figure B.1 – Cable terminals in the connection compartment of air insulated switchgear | Figure 2 – Validation of a family by selection of appropriate test objects; situation b) | .21 |
| Figure B.2 – Addition of block-type current transformers into the bus riser functional unit of air insulated switchgear 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit. 42 Figure B.5 – Cross-section of two different functional units of GIS 44 Canadards.iteh.ai) 41 Table 1 – Examples of design parameters 10 Table 2 – Extension criteria for dielectric withstand performance 14 Table 3 – Extension criteria for temperature rise performance 15 Table 4 – Extension criteria for mechanical performance 15 Table 5 – Extension criteria for mechanical performance 16 Table 6 – Extension criteria for internal arc fault withstand performance 18 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8.1 – Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit 30 Table B.2 – Affirmation of extension criteria with respect to temperature rise 40 | Figure 3 – Validation of actual assembly with existing test reports; situation c) | .23 |
| unit of air insulated switchgear 40 Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit. 42 Figure B.5 – Cross-section of two different functional units of GIS 42 Figure B.5 – Cross-section of two different functional units of GIS 44 Catandards.iteh.ai 40 Table 1 – Examples of design parameters. 10 Table 2 – Extension criteria for dielectric withstand performance. 13 Table 3 – Extension criteria for temperature rise performance. 14 Table 4 – Extension criteria for mechanical performance. 15 Table 5 – Extension criteria for short-time and peak withstand current performance. 16 Table 6 – Extension criteria for internal arc fault withstand performance. 18 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions. 19 Table 8.1 – Affirmation of extension criteria with respect to dielectric withstand performance of a functional unit. 39 Table B.2 – Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit. 40 | Figure B.1 – Cable terminals in the connection compartment of air insulated switchgear | . 38 |
| Figure B.3 – Special type of key-lock as replacement for a standard key-lock in the 41 figure B.4 – Front view and top cross sectional view of a combination of functional 41 units making up a ring-main unit 42 Figure B.5 – Cross-section of two different functional units of GIS 42 Table 1 – Examples of design parameters. 10 Table 2 – Extension criteria for dielectric withstand performance 14 Table 3 – Extension criteria for temperature rise performance 14 Table 4 – Extension criteria for mechanical performance 14 Table 5 – Extension criteria for mechanical performance 15 Table 5 – Extension criteria for short-time and peak withstand current performance 16 Table 6 – Extension criteria for internal arc fault withstand performance 18 Table 8 – Extension criteria for internal arc fault withstand performance 19 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8.1 – Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit 39 Table 8.2 – Affirmation of extension criteria with respect to short-time current 40 Table 8.3 – Affirmation of extension criteria with respect to temperature rise 40 | • | |
| door of air insulated switchgear 41 Figure B.4 – Front view and top cross sectional view of a combination of functional units making up a ring-main unit. 42 Figure B.5 – Cross-section of two different functional units of GIS 44 (standards.iteh.ai) 44 Table 1 – Examples of design parameters 10 Table 2 – Extension criteria for dielectric withstand performance 13 Table 3 – Extension criteria for mechanical performance 14 Table 4 – Extension criteria for short-time and peak withstand current performance 15 Table 5 – Extension criteria for internal arc fault withstand performance 16 Table 6 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8.1 – Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit 39 Table 8.2 – Affirmation of extension criteria with respect to temperature rise 40 | C C C C C C C C C C C C C C C C C C C | .40 |
| units making up a ring-main unit 42 Figure B.5 - Cross-section of two different functional units of GIS 44 (standards.iteh.ai) 44 Table 1 - Examples of design parameters 10 Table 2 - Extension criteria for dielectric withstand performance 13 Table 3 - Extension criteria for temperature rise performances 14 Table 4 - Extension criteria for mechanical performance 15 Table 5 - Extension criteria for short-time and peak withstand current performance 16 Table 6 - Extension criteria for internal arc fault withstand performance 18 Table 7 - Extension criteria for internal arc fault withstand performance 18 Table 8 - Extension criteria for internal arc fault classification with respect to installation conditions 19 Table 8.1 - Affirmation of extension criteria with respect to dielectric withstand performance of a functional unit 39 Table 8.2 - Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit 40 Table 8.3 - Affirmation of extension criteria with respect to temperature rise 40 | | .41 |
| (standards.iteh.ai)Table 1 – Examples of design parameters.10Table 2 – Extension criteria for dielectric withstand performance13Table 3 – Extension criteria for temperature rise performances.14Table 4 – Extension criteria for mechanical performance15Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 8 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table 8.1 – Affirmation of extension criteria with respect to dielectric withstand39Table 8.2 – Affirmation of extension criteria with respect to short-time current30Table 8.3 – Affirmation of extension criteria with respect to temperature in the stand performance of a functional unit40Table 8.3 – Affirmation of extension criteria with respect to temperature rise40 | Figure B.4 – Front view and top cross sectional view of a combination of functional | 40 |
| (standards.iteh.ai)Table 1 – Examples of design parameters.10Table 2 – Extension criteria for dielectric withstand performance13Table 3 – Extension criteria for temperature rise performances.14Table 4 – Extension criteria for mechanical performance15Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 8 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table 8.1 – Affirmation of extension criteria with respect to dielectric withstand39Table 8.2 – Affirmation of extension criteria with respect to short-time current30Table 8.3 – Affirmation of extension criteria with respect to temperature in the stand performance of a functional unit40Table 8.3 – Affirmation of extension criteria with respect to temperature rise40 | units making up a ring-main unit, TANDARD PREVIEW | .42 |
| Table 1 – Examples of design parameters10Table 2 – Extension criteria for dielectric withstand performance13Table 3 – Extension criteria for temperature rise performance14Table 4 – Extension criteria for mechanical performance15Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table 8.1 – Affirmation of extension criteria with respect to short-time current39Table 8.2 – Affirmation of extension criteria with respect to short-time current40Table 8.3 – Affirmation of extension criteria with respect to temperature rise40 | | .44 |
| Table 3 – Extension criteria for temperature rise performances14Table 4 – Extension criteria for mechanical performance15Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table 8.1 – Affirmation of extension criteria with respect to dielectric withstand39Table 8.2 – Affirmation of extension criteria with respect to short-time current40Table 8.3 – Affirmation of extension criteria with respect to temperature rise40 | | |
| Table 3 – Extension criteria for temperature rise performances14Table 4 – Extension criteria for mechanical performance15Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table 8.1 – Affirmation of extension criteria with respect to dielectric withstand39Table 8.2 – Affirmation of extension criteria with respect to short-time current40Table 8.3 – Affirmation of extension criteria with respect to temperature rise40 | Table 1 – Examples of design parameters | .10 |
| Table 4 – Extension criteria for mechanical performance15Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table B.1 – Affirmation of extension criteria with respect to dielectric withstand39Table B.2 – Affirmation of extension criteria with respect to short-time current40Table B.3 – Affirmation of extension criteria with respect to temperature rise40 | Table 2 – Extension criteria for dielectric withstand performance https://standards.iten.avcatalog/standards/sist/88847640-4114-48ff-a817- | .13 |
| Table 5 – Extension criteria for short-time and peak withstand current performance16Table 6 – Extension criteria for making and breaking capacity17Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table B.1 – Affirmation of extension criteria with respect to dielectric withstand39Table B.2 – Affirmation of extension criteria with respect to short-time current40Table B.3 – Affirmation of extension criteria with respect to temperature rise | | |
| Table 6 – Extension criteria for making and breaking capacity17Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table B.1 – Affirmation of extension criteria with respect to dielectric withstand19Table B.2 – Affirmation of extension criteria with respect to short-time current39Table B.3 – Affirmation of extension criteria with respect to to short-time current40 | | |
| Table 7 – Extension criteria for internal arc fault withstand performance18Table 8 – Extension criteria for internal arc fault classification with respect to19Table B.1 – Affirmation of extension criteria with respect to dielectric withstand39Table B.2 – Affirmation of extension criteria with respect to short-time current40Table B.3 – Affirmation of extension criteria with respect to temperature rise | | |
| Table 8 – Extension criteria for internal arc fault classification with respect to installation conditions19Table B.1 – Affirmation of extension criteria with respect to dielectric withstand performance of a functional unit39Table B.2 – Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit40Table B.3 – Affirmation of extension criteria with respect to temperature rise | | |
| installation conditions | | .18 |
| performance of a functional unit | • | . 19 |
| Table B.2 – Affirmation of extension criteria with respect to short-time current withstand performance of a functional unit | | . 39 |
| withstand performance of a functional unit | | |
| | | .40 |
| | Table B.3 – Affirmation of extension criteria with respect to temperature rise performance of a ring-main-unit | .43 |
| Table B.4 – Affirmation of extension criteria with respect to internal arc classification of a GIS circuit-breaker compartment | | 11 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR -

Part 307: Guidance for the extension of validity of type tests of AC metal and solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

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.
- 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. 052c407b41et/iec-tr-62271-307-2015
- 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.
- 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 62271-307, which is a technical report, has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear.

This Technical Report is to be read in conjunction with IEC 62271-200 published in 2011 and IEC 62271-201 published in 2014.

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

| Enquiry draft | Report on voting |
|---------------|------------------|
| 17C/625/DTR | 17C/632/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.

A list of all parts in the IEC 62271 series, published under the general title *High-voltage switchgear* and *controlgear*, can be found on the IEC website.

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.

iTeh STANDARD PREVIEW

IMPORTANT – The 'colour inside' logo on the coven page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

052c407b41ef/iec-tr-62271-307-2015

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 307: Guidance for the extension of validity of type tests of AC metal and solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

1 General

1.1 Scope

This Part of IEC 62271, which is a Technical Report, refers to prefabricated metal-enclosed and solid-insulation enclosed (both hereinafter called enclosed) switchgear and controlgear assemblies for alternating current of rated voltages above 1 kV and up to and including 52 kV as specified in IEC 62271-200 and IEC 62271-201, and to other equipment included in the same enclosure with any possible mutual influence.

This Technical Report may be used for the extension of the validity of type tests performed on one test object with a defined set of ratings to another switchgear assembly of the same family with a different set of ratings or different arrangements of components. It supports the selection of representative test objects composed of functional units of a family of switchgear and controlgear aimed at the optimization of type tests in order to perform a consistent conformity assessment.

(standards.iteh.ai)

This Technical Report utilises a combination of sound technical and physical principles, manufacturer and user experience and calculations to establish guidance for the extension of validity of type tests, covering various design and rating aspects 4.486 a817-

052c407b41ef/iec-tr-62271-307-2015

1.2 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 60050-441:1984, International Electrotechnical Vocabulary. Switchgear, controlgear and fuses IEC 60050-441:1984/AMD1:2000

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications* IEC 62271-1:2007/AMD1:2011

IEC 62271-200:2011, High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

IEC 62271-201:2014, High-voltage switchgear and controlgear – Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

2 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-441, IEC 62271-1, IEC 62271-200, IEC 62271-201, as well as the following apply.

NOTE Some standard terms and definitions are recalled here for ease of reference.

2.101

switchgear and controlgear

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures

[SOURCE: IEC 60050-441:1984, 441-11-01]

2.102

family of switchgear and controlgear

functional units designed to be physically combined in assemblies and providing a range of ratings and characteristics (e.g. current, voltage, degree of protection)

2.103

functional unit (of an assembly)

a part of an assembly of switchgear and controlgear comprising all the components of the main circuits and auxiliary circuits that contribute to the fulfilment of a single function

Note 1 to entry: Functional units may be distinguished according to the function for which they are intended e.g.: incoming unit, through which electrical energy is normally fed into the assembly, outgoing unit through which electrical energy is normally supplied to one or more external circuits.

[SOURCE: IEC 60050-441:1984, 441-13-04]

iTeh STANDARD PREVIEW

assembly (of switchgear and controlgear) and site ai) a combination of switchgear and/ or controlgear completely assembled with all internal electrical and mechanical interconnections

IEC TR 62271-307:2015

Note 1 to entry: An assembly is comprised of one of more functional units 4114-48ff-a817-052c407b41ef/iec-tr-62271-307-2015

[SOURCE: IEC 60050-441:1984, 441-12-01, modified – addition of a note to entry.]

2.105

2.104

component

essential part of the high voltage or earthing circuits of metal and solid-insulation enclosed switchgear and controlgear which serves a specific function

Note 1 to entry: Examples of components include: circuit-breaker, disconnector, switch, fuse, instrument transformer, bushing, bus-bar.

[SOURCE: IEC 62271-200:2011, 3.113, modified - rephrasing of the definition and addition of a note to entry.]

2.106

main circuit

all the high voltage conductive parts of metal and solid-insulation enclosed switchgear and controlgear included in a circuit which is intended to carry the rated normal current

[SOURCE: IEC 60050-441:1984, 441-13-02, modified – rephrasing of the definition.]

2.107

test object item submitted to a test, including any accessories, unless otherwise specified

[SOURCE: IEC 60050-151:2001, 151-16-28]

2.108

extension (of validity) criterion

criterion based on the design parameters, which can be applied to validate the performance of an untested assembly based on the positive results of a test performed on another assembly for a specific characteristic

2.109

homogeneous group

group of functional units of a family of switchgear and controlgear having design parameters which allows for a specific characteristic extending the validity of the result of a type test performed on one member of the group to the rest of the group

2.110

clearance

the distance between two conductive parts along a string stretched the shortest way between these conductive parts

[SOURCE: IEC 60050-441:1984, 441-17-31]

2.111

clearance between phases

the clearance between any conductive parts of adjacent phases

[SOURCE: IEC 60050-441:1984, 441-17-32; modified modification of the term.]

2.112

(standards.iteh.ai)

clearance to earth

the clearance between any conductive parts and any parts which are earthed or intended to be earthed <u>IEC TR 62271-307:2015</u>

https://standards.iteh.ai/catalog/standards/sist/8884764b-4f14-48ff-a817-

[SOURCE: IEC 60050-441:1984, 441-17-33]

2.113

centre distance between phases

distance between the centres of adjacent phase conductors

3 Use of extension criteria

3.1 General

Because of the variety of types of functional units, ratings and possible combinations of components, it is not practical to perform type tests with all the possible assemblies of enclosed switchgear and controlgear. Therefore, the performance of a particular assembly may be evaluated by reference to type test reports of other assemblies of the same family of switchgear and controlgear. Subclauses 4.1 to 4.6 provide for each kind of type test (or characteristic) a non-exhaustive list of design parameters, which should be analysed for extension of validity.

The analysis should be based on sound technical and physical principles and may be supported by calculations, if applicable.

Each design parameter of the assembly to be assessed listed in the respective column of the tables in 4.1 to 4.6 should be compared with the design parameter of the already type tested assembly applying the acceptance criteria provided in the same tables. The affirmation of every extension criterion allows a test performed on one assembly having specific characteristics to be applied to another assembly of the same family with different characteristics (e.g. some of the ratings or dimensions). For example, the affirmation of

item (1) in Table 2 reads: the clearance between phases of the assessed assembly is larger or equal the clearance between phases of the tested assembly.

If any of the extension criteria cannot be affirmed, further evidence is required e.g. by technical arguments, calculation /simulation or specific tests. Calculations can only be applied in a comparative sense as indicated in 3.3.

3.2 Parameters for extension criteria

The criteria for the extension of type tests available for a family of switchgear and controlgear depend on a number of design parameters such as the ones listed in Table 1. Every assembly is characterized by its own set of design parameters.

Component parameters are design and operating parameters that influence the capability of the component with respect to its own ratings. These parameters are controlled and specified by the manufacturer of the component. All applications of a component within a family of switchgear and controlgear should meet the manufacturer's specified tolerances for component parameters. The extension of validity of type tests according to a component standard is outside the scope of this Technical Report.

NOTE Some switching devices, such as earthing switches, may not be available as a separate component and need to be tested inside an assembly according to their relevant component standards.

| TDesign parameter DARD PREV | Related to |
|--|----------------------|
| Raw material of a contact in a switching device dards.iteh.ai) | Component |
| Geometry of a contact in a switching device | Component |
| Opening and closing speed of a switching device TR 62271-307:2015 | Component |
| Allowable rebound time of a switching device the architecture of a switching device the architec | Component |
| Clearance between phases | Component / assembly |
| Clearance to earth | Component / assembly |
| Pressure of insulating gas in a compartment | Component / assembly |
| Insulation class of all insulation parts in contact with conductors | Component / assembly |
| Length of unsupported section of bus-bar | Assembly |
| Arrangement of components | Assembly |
| NOTE This table includes examples only; it is not intended to be complete | |

Table 1 – Examples of design parameters

Assembly parameters are those parameters that are directly influenced by the design of an assembly of a family of switchgear and controlgear, however, they may depend on component parameters. Assembly parameters are considered within the scope of this Technical Report.

3.3 Use of calculations

3.3.1 General

For the purpose of this Technical Report, calculations and simulations may only be applied in a comparative sense using calculation results available for a type tested assembly and results obtained for another assembly that is under investigation. The comparison is always based on the design parameters and the acceptance criteria in Tables 2 to 7.

In many cases the performance of a given assembly, with respect to a particular type test, cannot be evaluated by a single value of a design parameter due to the complexity of the design. For example, the clearance between phase conductors might vary considerably along the current path. Calculations have the potential to compare the respective design parameter with spatial resolution supporting a comparison using technical arguments and expertise.

IEC TR 62271-307:2015 © IEC 2015 - 11 -

Depending on the type test and the particular design parameter, sometimes a simple model of the relevant switchgear might be sufficient using an analytical or empirical formula, and sometimes a complete three-dimensional simulation model might be required using a complex numerical tool provided the results of the simulation tool are consistent and repeatable.

The validation of software tools and calculation methods themselves is outside the scope of this Technical Report. Some of these calculation methods are briefly mentioned below with their particular characteristics.

3.3.2 Temperature rise calculations

The Technical Report IEC TR 60890 [1]¹ provides calculation procedures for low voltage assemblies, which could also be applied to high voltage switchgear assemblies having regard to the particular limitations of this calculation method. The calculation is done in dependence of the total power generated inside, the area of enclosure walls and their mounting conditions, the number of horizontal partitions, and the area of ventilation openings. The temperature of air inside the tested compartment is the parameter to compare.

For complex geometries, a comparison may be performed by thermal networks, where the whole assembly with all components is divided into discrete elements built from heat generating resistors and heat conducting and convection elements. Also, more complex CFD tools (computational fluid dynamics) may be applied requiring a complete 3-dimensional model of the switchgear.

3.3.3 Electric field calculations ANDARD PREVIEW

The dielectric withstand performance of two assemblies may be assessed by an electric field simulation of both designs comparing the resulting electric field strengths. Finite element (FE) or finite volume (FV) software tools exist, which allow simulating even complex threedimensional geometries. A CIGRE publication [2] concludes in particular with respect to electric field calculations. Simulation is tan excellent and instructive tool... to predict performance, where performance is proven by tests on similar designs (interpolation)".

It may be remarked that this Technical Report does not provide information for extrapolation but only for interpolation of characteristics, e.g. extending validity to higher values of electric field strengths is not covered.

3.3.4 Mechanical stress calculations

Simulation software for operating mechanisms exists and can give information on the mechanical stress on parts of the mechanism. However, it is not feasible to assess the mechanical endurance by these programs. Therefore at the present state of available simulation software, it is not recommended to use simulations for the extension of validity of mechanical type tests. Nevertheless, the strength of single parts or mechanical supports may be assessed by such calculations.

3.3.5 Short-circuit current calculations

With respect to the short-time current withstand performance, guidance and calculation formulas for bus-bar designs can be found in a guideline on short-circuit withstand of low voltage assemblies [3, 4, 5]. This includes the determination of mutual electromagnetic forces between phase conductors and the resulting mechanical stress which is able to bend bus-bar conductors and damage insulators. The mechanical stress on bus-bars and forces on the supports may be assessed through stress analysis programs, when applying the calculated electro-magnetic forces. Additionally, a calculation of the thermal stress using $I_k^2 t_k$ might be done when the assessment is made for a lower I_k and higher t_k than the ones tested.

¹ Numbers in square brackets refer to the Bibliography.

3.3.6 Internal arc pressure rise calculations

The comparison of the pressure withstand performance of two assemblies may be substantiated by pressure rise calculations for the compartments under investigation [6]. The calculations are able to provide the pressure rise in the compartments under consideration of the opening of pressure relief devices. An assessment of the strength of the enclosure walls under the pressure stress can be made for simple geometries using calculation formula, otherwise using finite element mechanical stress analysis.

The flow of hot gases expelled from the compartment may be simulated by CFD programs, however, it is, at the time of the publication of this Technical Report, not possible to simulate the ignition of indicators, which is an important acceptance criterion in the type test. Therefore such programs have limited applications for the extension of type test validity.

3.4 Information needed for extension of type test validity

For the extension of type test validity, similar information on the assembly under evaluation should be collected as is required for type test objects according to IEC 62271-1:2007, 6.1.3. In addition, the tables given in Clause 4 should be used to provide for each characteristic i.e. type test relevant information on design parameters of the tested object and of the functional units under evaluation. Only the tables that are relevant for the characteristic under evaluation need to be used.

The applicable type test reports of the tested assembly should be provided as far as they concern the comparison of the two assemblies. RD PREVIEW

It is recommended that the manufacturer provides relevant information on design parameters of the tested object as listed in the tables of Clause 4 to be included in any type test report in addition to the information required by the product standards.

Most often single value design parameters are not sufficient to perform the evaluation. In this case relevant drawings of both objects may be necessary.

If a comparison is substantiated by calculations, numerical data or by formula, the type of software used, the reference number of the calculation report and short summary of the results should be given.

Documents providing traceability of the analysis performed should be established. Such documents should be part of the report for extending the validity of performed type tests to the whole family or part of the family of switchgear and controlgear.

4 Application of extension criteria

4.1 Dielectric tests

The criteria listed in Table 2 should be taken into consideration for all parts of the switchgear and controlgear assembly. The evaluation is applicable to the extension of validity of dielectric withstand tests from one functional unit or assembly to another belonging to the same family of switchgear and controlgear having the same or a lower rated insulation level.

If necessary for dielectric performance, insulating barriers and supplementary insulation may have been included in type tested objects according to IEC 62271-1:2007, 6.2.3, and therefore extension of the type test validity may only be performed on functional units or assemblies having the same arrangement and design of such insulation.

The test object shall contain suitable items or replicas that reproduce the field configuration of, for example, the high voltage connections of instrument transformers or fuses posing the most onerous test conditions (refer to IEC 62271-200:2011, 6.2.6.1 and 6.2.6.2). This allows

IEC TR 62271-307:2015 © IEC 2015 - 13 -

extending the validity of type tests to the use of components with different technical specification provided they have the same external electric field configuration. The same considerations can be made for other high and low voltage accessories like surge arresters and heaters.

| ltem | Design parameter | Acceptance criterion | Condition |
|--------|---|-------------------------|--|
| (1) | (2) | (3) | (4) |
| 1 | Clearance between phases | ≥ | |
| 2 | Clearance to earth | ≥ | |
| 3 | Creepage distance | ≥ | NOTE 1 |
| 4 | Electrical properties of Insulating material | 2 | A comparative result between two materials might be required (e.g. Comparative Tracking Index according to IEC 60112 [7]) |
| 5 | Surface roughness of live parts | \leq | |
| 6 | Radius of conductive parts | 2 | Not only the radius of live parts, but also the radius of all other conductive parts facing live parts (e.g. earthing devices, enclosure, LV wiring, supporting structures) should be considered. |
| | | | NOTE 2 |
| 7 | Open contact gap I en S | IAŊDA | If influenced by the switchgear assembly |
| 8 | Isolating distance | standard | If influenced by the switchgear assembly |
| 9 | Minimum functional pressure for insulation | ≥ | Same fluid; for fluid insulated switchgear |
| | TOP INSULATION IFC TR 62271-307:2015 | | |
| NOTE 1 | 1 The field distribution along the linsulating surface is also relevant. 4f14-48ff-a817- | | |
| NOTE 2 | NOTE 2 The geometry of parts made of insulating materials changes the electric field as well. | | |

Table 2 – Extension criteria for dielectric withstand performance

4.2 Temperature rise tests

The extension criteria for temperature rise performance at rated normal current equal to or smaller than assigned to the type tested functional unit are summarised in Table 3. The table does not consider forced ventilation.

The current carrying capacity of a functional unit is also dependent on the design of the busbar connection and on the distribution of current in adjacent functional units. Since the temperature rise test should be performed under the most severe conditions as required by the standard (e.g. IEC 62271-200:2011, 6.5), it is assumed that the impact of surrounding functional units on the temperature rise performance is equal or lower than the impact during the type test.

Where a functional unit may include different members of a family of components such as instrument transformers or fuses, these components should be compared one by one with respect to power dissipation in order to extend the validity of the type test to the whole family of components.

For extension of rated frequency from 50 Hz to 60 Hz refer to 6.5.2 of IEC 62271-200:2011.

Current transformers have to be tested and verified according to their own component standards. Where current transformers are fitted in a functional unit they may be considered acceptable if they have a power dissipation of the primary and secondary windings at the rated normal current of the functional unit that is equal to or less than that installed in the type tested functional unit. Current transformers with lower current rating that have higher primary resistance can only be applied in the switchgear and controlgear at lower normal current,