

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



GROUP SAFETY PUBLICATION
PUBLICATION GROUPEE DE SÉCURITÉ

**Test on gases evolved during combustion of materials from cables –
Part 2: Determination of acidity (by pH measurement) and conductivity**

**Essai sur les gaz émis lors de la combustion des matériaux prélevés
sur câbles –
Partie 2: Détermination de la conductivité et de l'acidité (par mesure du pH)**

This is a preview. [Click here to purchase the full publication.](#)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 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
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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.

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.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

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 une fois par mois par email.

Service Clients - webstore.iec.ch/csc

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

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 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.

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



GROUP SAFETY PUBLICATION
PUBLICATION GROUPÉE DE SÉCURITÉ

**Test on gases evolved during combustion of materials from cables –
Part 2: Determination of acidity (by pH measurement) and conductivity**

**Essai sur les gaz émis lors de la combustion des matériaux prélevés
sur câbles –
Partie 2: Détermination de la conductivité et de l'acidité (par mesure du pH)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 13.220.40; 29.020; 29.060.20

ISBN 978-2-8322-7659-4

**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.**

REDLINE VERSION

VERSION REDLINE



GROUP SAFETY PUBLICATION
PUBLICATION GROUPEE DE SÉCURITÉ

**Test on gases evolved during combustion of materials from cables –
Part 2: Determination of acidity (by pH measurement) and conductivity**

**Essai sur les gaz émis lors de la combustion des matériaux prélevés
sur câbles –
Partie 2: Détermination de la conductivité et de l'acidité (par mesure du pH)**

This is a preview. [Click here to purchase the full publication.](#)

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Test method principle	8
5 Test apparatus	8
5.1 General.....	8
5.2 Tube furnace.....	8
5.3 Quartz glass tube	8
5.4 Combustion boats	8
5.5 Bubbling devices for gases.....	9
5.6 Air supply system	9
5.7 Analytical balance	10
5.8 Laboratory glassware	10
5.9 pH meter	10
5.10 Conductivity measuring device	10
6 Test specimen	11
6.1 General.....	11
6.2 Conditioning of specimen	11
6.3 Mass of specimen	11
7 Test procedure	11
7.1 General.....	11
7.2 Test apparatus and arrangement.....	11
7.3 Heating procedure.....	11
7.4 Washing procedure	12
7.5 Determination of the pH value and conductivity	12
8 Evaluation of the test results	12
8.1 General method.....	12
8.2 Simplified method.....	13
8.3 Weighted values.....	13
8.3.1 General	13
8.3.2 Value of pH	13
8.3.3 Conductivity.....	13
9 Performance requirement	13
10 Test report.....	13
Annex A (informative) Recommended performance requirements	23
Bibliography.....	24
Figure 1 – Device for inserting combustion boat and test specimen	15
Figure 2 – Example of a gas washing bottle	16
Figure 3 – Test apparatus: method 1 – Use of synthetic or compressed air from a bottle	18
Figure 4 – Test apparatus: method 2 – Use of laboratory compressed air supply	20

Figure 5 – Test apparatus: method 3 – Use of ambient air sucked by means of a suction pump	22
---	----

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TEST ON GASES EVOLVED DURING
COMBUSTION OF MATERIALS FROM CABLES –****Part 2: Determination of acidity
(by pH measurement) and conductivity**

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.

DISCLAIMER

This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.

This Consolidated version of IEC 60754-2 bears the edition number 2.1. It consists of the second edition (2011-11) [documents 20/1265/FDIS and 20/1275/RVD] and its amendment 1 (2019-11) [documents 20/1883/FDIS and 20/1890/RVD]. The technical content is identical to the base edition and its amendment.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60754-2 has been prepared by IEC technical committee 20: Electric cables.

It has the status of a group safety publication in accordance with IEC Guide 104.

This second edition constitutes a technical revision.

The significant technical changes with respect to the previous edition are as follows:

- improved definition of safety requirements relating to capture of gases;
- introduction of guidance on the preparation of test specimens for more even combustion;
- better expression of tolerances and precision;
- clarification of the conductivity and acidity functions;
- improved definition of the heating procedure;
- greater precision in the definition of the test temperature for the determination of pH value and conductivity;
- correction of the formulae for the calculation of the test results.

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

A list of all the parts in the IEC 60754 series, published under the general title *Test on gases evolved during combustion of materials from cables*, can be found on the IEC website.

Le comité a décidé que le contenu de la publication de base et de son amendement ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

IMPORTANT – Le logo "*colour inside*" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.

INTRODUCTION

IEC 60754 consists of the following parts, under the general title *Test on gases evolved during combustion of materials from cables*:

- Part 1: *Determination of the halogen acid gas content*
- Part 2: *Determination of acidity (by pH measurement) and conductivity.*
- Part 3: *Measurement of low level of halogen content by ion chromatography*

IEC 60754-2 was originally developed due to concerns expressed by cable users over the amount of acid gas evolved when some cable insulating, sheathing and other materials are burned, as such corrosive effluent can cause extensive damage to electrical and electronic equipment not involved in the fire itself.

NOTE Guidance on the corrosivity of fire effluent is given in IEC 60695-5-1.

This standard provides a method for determining the acidity (by pH measurement) and conductivity of an aqueous solution of gases evolved during the combustion of materials so that limits can be agreed for cable specifications. As the test is not carried out on a complete cable test piece, for a hazard assessment the actual material volumes of the cable components should be taken into consideration.

The method provides an indirect assessment of corrosivity. However, the recommended limits of pH and conductivity can only be regarded as an indication, as the relationship between corrosion and these two parameters does not necessarily embrace all materials.

This part of IEC 60754 is linked with both IEC 60754-1, ~~but the test procedure differs considerably~~ and IEC 60754-3. The test procedure for obtaining the absorption solution in this part of IEC 60754 is the same as for IEC 60754-3 but the test procedure differs considerably from IEC 60754-1.

TEST ON GASES EVOLVED DURING COMBUSTION OF MATERIALS FROM CABLES –

Part 2: Determination of acidity (by pH measurement) and conductivity

1 Scope

This part of IEC 60754 specifies the apparatus and procedure for the determination of the potential corrosivity of gases evolved during the combustion of materials taken from electric or optical fibre cable constructions by measuring the acidity (pH) and conductivity of an aqueous solution resulting from the gases evolved during the combustion. The heating (combustion) procedure of this part of IEC 60754 is the same as in IEC 60754-3.

The general method specified in this standard is intended for the testing of individual components used in a cable construction. Formulae are given for the calculation of a weighted value for a combination of materials found in a specified cable. The use of this method will enable the verification of relevant requirements for either individual components or combined components of a cable construction stated in the appropriate cable specification.

A simplified method is included for the testing of individual components where it is required only to demonstrate compliance with a stated performance requirement for quality control purposes.

NOTE 1 The relevant cable standard should indicate which components of the cable should be tested, and which method of calculation (see Clause 8) should be used in the case of dispute.

NOTE 2 This test method may be used to test materials to be used in cable manufacture, but a declaration of cable performance should not be made based on such a test.

NOTE 3 For the purposes of this standard, the term “electric cable” covers all insulated metallic conductor cables used for the conveyance of energy or signals.

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.

ISO 1042, *Laboratory glassware – One-mark volumetric flasks*
(available only in French)

ISO 3696, *Water for analytical laboratory use – Specification and test methods*

3 Terms and definitions

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

3.1

pH value

pH of an aqueous solution resulting from the gases evolved during the combustion of the material under the conditions given in this standard