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# Health and safety in welding and allied processes — Laboratory method for sampling fume and gases

**Part 2: Determination of the emission rates of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) during arc welding, cutting and gouging (ISO 15011-2:2009)**

ICS 13.040.40; 13.100; 25.160.10

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**National foreword**

This British Standard is the UK implementation of EN ISO 15011-2:2009. It supersedes BS EN ISO 15011-2:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/40, Health and safety in welding.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2009.

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Health and safety in welding and allied processes - Laboratory method for sampling fume and gases - Part 2: Determination of the emission rates of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) during arc welding, cutting and gouging (ISO 15011-2:2009)

Hygiène et sécurité en soudage et techniques connexes - Méthode de laboratoire d'échantillonnage des fumées et des gaz - Partie 2: Détermination des débits d'émission du monoxyde de carbone (CO), du dioxyde de carbone (CO<sub>2</sub>), du monoxyde d'azote (NO) et du dioxyde d'azote (NO<sub>2</sub>) lors du soudage à l'arc, du coupage et du gougeage (ISO 15011-2:2009)

Arbeits- und Gesundheitsschutz beim Schweißen und bei verwandten Verfahren - Laborverfahren zum Sammeln von Rauch und Gasen - Teil 2: Bestimmung der Emissionsraten von Kohlenmonoxid (CO), Kohlendioxid (CO<sub>2</sub>), Stickstoffmonoxid (NO) und Stickstoffdioxid (NO<sub>2</sub>) beim Lichtbogenschweißen, Schneiden und Fugenhobeln (ISO 15011-2:2009)

This European Standard was approved by CEN on 29 September 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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## Foreword

This document (EN ISO 15011-2:2009) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding" the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2010, and conflicting national standards shall be withdrawn at the latest by April 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 15011-2:2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of ISO 15011-2:2009 has been approved by CEN as a EN ISO 15011-2:2009 without any modification.

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<b>Contents</b>	<b>Page</b>
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>2</b>
<b>5 Equipment and materials</b> .....	<b>2</b>
<b>6 Test procedures</b> .....	<b>4</b>
<b>6.1 Welding procedure selection</b> .....	<b>4</b>
<b>6.2 Setting up the test equipment</b> .....	<b>4</b>
<b>6.3 Blank test</b> .....	<b>5</b>
<b>6.4 Manual metal arc welding</b> .....	<b>5</b>
<b>6.5 Continuous wire processes and autogeneous TIG welding</b> .....	<b>5</b>
<b>6.6 Cutting and gouging</b> .....	<b>6</b>
<b>7 Calculating and reporting the results</b> .....	<b>7</b>
<b>Annex A (informative) Possible designs of hood</b> .....	<b>8</b>
<b>Annex B (informative) Equipment notes</b> .....	<b>10</b>
<b>Annex C (informative) Welding parameters for gas-shielded arc welding</b> .....	<b>12</b>
<b>Annex D (normative) Test procedures</b> .....	<b>15</b>
<b>Annex E (normative) Calculation of the average stable gas concentration</b> .....	<b>16</b>
<b>Annex F (normative) Test report</b> .....	<b>17</b>
<b>Bibliography</b> .....	<b>18</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15011-2 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 9, *Health and safety*.

This second edition cancels and replaces the first edition (15011-2:2003), which has been technically revised.

ISO 15011 consists of the following parts, under the general title *Health and safety in welding and allied processes — Laboratory method for sampling fume and gases*:

- *Part 1: Determination of fume emission rate during arc welding and collection of fume for analysis*
- *Part 2: Determination of the emission rates of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) during arc welding, cutting and gouging*
- *Part 3: Determination of ozone emission rate during arc welding*
- *Part 4: Fume data sheets*
- *Part 5: Identification of thermal-degradation products generated when welding or cutting through products composed wholly or partly of organic materials*

The following part is under preparation:

- *Part 6: Procedure for quantitative determination of fume and gases from resistance spot welding*  
[Technical Specification]

Request for an official interpretation of technical aspects of this part of ISO 15011 should be directed to the secretariat of ISO/TC 44/SC 9 via the user's national standardization body; a listing of these bodies can be found at [www.iso.org](http://www.iso.org).

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## Introduction

Welding and allied processes generate fume and gases, which, if inhaled, can be harmful to human health. Knowledge of the composition and the emission rate of the fume and gases can be useful to occupational health professionals in assessing worker exposure and in determining appropriate control measures.

Absolute exposure is dependent upon factors such as welder position with respect to the plume and draughts and cannot be predicted from emission rate data. However, in the same work situation, a higher emission rate is expected to correlate with a higher exposure and a lower emission rate with a lower exposure. Hence, emission rate data can be used to predict relative changes in exposure that might occur in the workplace under different welding conditions and to identify measures for reducing such exposure, but they cannot be used to calculate ventilation requirements.

This part of ISO 15011 specifies a method for measuring the emission rate of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) during arc welding, cutting and gouging using a hood technique. The procedure simply prescribes a methodology, leaving selection of the test parameters to the user, so that the effect of different variables can be evaluated.

It is assumed that the executions of the provisions and the interpretation of the results obtained in this part of ISO 15011 are entrusted to appropriately qualified and experienced people.

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# Health and safety in welding and allied processes — Laboratory method for sampling fume and gases —

## Part 2:

# Determination of the emission rates of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) during arc welding, cutting and gouging

## 1 Scope

This part of ISO 15011 defines laboratory methods for measuring the emission rates of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) generated during arc welding, cutting and gouging, using a hood technique. The methodology is suitable for use with all open arc welding processes, cutting and gouging but different designs of hood are used depending on the process and whether or not it can be conducted automatically.

The method can be used to evaluate the effects of welding wires, welding parameters, processes, shielding gases, test piece composition and test piece surface condition on emission rate.

## 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/TR 25901, *Welding and related processes — Vocabulary*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 25901 and the following apply.

### 3.1

#### **bubble flow meter**

primary device for measuring gas flow rate, where the time for a bubble of gas, defined by a soap film, to pass through a calibrated volume in a vertical tube is measured

### 3.2

#### **test chamber**

semi-enclosed, continuously extracted chamber used in emission rate tests performed during arc welding, cutting or gouging operations