

Health and safety in welding and allied processes -  
Requirements, testing and marking of equipment for air  
filtration - Part 3: Determination of the capture  
efficiency of on-torch welding fume extraction devices  
(ISO 21904-3:2018)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 21904-3:2018 sisaldab Euroopa standardi EN ISO 21904-3:2018 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 21904-3:2018 consists of the English text of the European standard EN ISO 21904-3:2018.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 21.03.2018.	Date of Availability of the European standard is 21.03.2018.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 13.100, 25.160.01

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

EUROPEAN STANDARD

EN ISO 21904-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2018

ICS 13.100; 25.160.01

English Version

Health and safety in welding and allied processes -  
Requirements, testing and marking of equipment for air  
filtration - Part 3: Determination of the capture efficiency  
of on-torch welding fume extraction devices (ISO 21904-  
3:2018)

Hygiène et sécurité en soudage et techniques connexes  
- Exigences, essais et marquage des équipements de  
filtration d'air - Partie 3: Détermination de l'efficacité  
de captage des torches aspirantes (ISO 21904-3:2018)

Arbeits- und Gesundheitsschutz beim Schweißen und  
bei verwandten Verfahren - Anforderungen, Prüfung  
und Kennzeichnung von Luftreinigungssystemen - Teil  
3: Bestimmung des Erfassungsgrades von  
brennerintegrierten Absaugeinrichtungen für  
Schweißrauch (ISO 21904-3:2018)

This European Standard was approved by CEN on 1 March 2018.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

## European foreword

This document (EN ISO 21904-3:2018) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding and allied processes", 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 September 2018, and conflicting national standards shall be withdrawn at the latest by September 2018.

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

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Endorsement notice

The text of ISO 21904-3:2018 has been approved by CEN as EN ISO 21904-3:2018 without any modification.

# Contents

	Page
<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 Test equipment and materials</b> .....	<b>2</b>
5.1 General requirement.....	2
5.2 Test equipment.....	2
<b>6 Test procedure</b> .....	<b>4</b>
6.1 Preliminary tests.....	4
6.1.1 Setting the shielding gas flow rate.....	4
6.1.2 Measuring the flow rates and determination of leakage.....	4
6.1.3 Establishing the arcing time for total fume emission rate test.....	5
6.1.4 Setting up the test equipment.....	5
6.2 Capture efficiency tests.....	6
6.2.1 General.....	6
6.2.2 Test procedure.....	6
6.2.3 Calculation of the results.....	7
<b>7 Test parameters for generating capture efficiency data</b> .....	<b>8</b>
<b>8 Test report</b> .....	<b>9</b>
<b>Annex A (informative) Equipment notes</b> .....	<b>10</b>
<b>Annex B (normative) Trial tests</b> .....	<b>12</b>
<b>Annex C (informative) Examples of test chambers</b> .....	<b>14</b>
<b>Annex D (normative) Test procedures</b> .....	<b>16</b>
<b>Annex E (informative) Data processing for test method 3</b> .....	<b>17</b>
<b>Annex F (normative) Test parameters form to be filled</b> .....	<b>19</b>
<b>Annex G (informative) Information about the necessity to measure leakage</b> .....	<b>20</b>
<b>Bibliography</b> .....	<b>21</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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

A list of all parts in the ISO 21904 series can be found on the ISO website.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 9 via your national standards body. A complete listing of these bodies can be found at [www.iso.org](http://www.iso.org).

## Introduction

Welding generates fumes and gases which, if inhaled, can be harmful to human health. Therefore, control of the fume and gases needs to be exercised to minimize worker exposure.

The most effective method of welding fume control is local exhaust ventilation (LEV) which captures the fumes at source before they enter the general environment and the breathing zone of workers.

One form of LEV used in welding is on-torch extraction in which the extraction system is either an integral part of the welding torch or is attached to it close to the arc area. Anecdotal evidence within the fabrication industry suggested that it is impossible to capture fume efficiently while maintaining weld metal integrity but research (see Bibliography entry [6]) has shown this not to be the case, certainly as far as weld metal porosity is concerned.

It has been presumed in the drafting of this document that appropriately qualified and experienced people would execute its provisions and interpret the results obtained.

# Health and safety in welding and allied processes — Requirements, testing and marking of equipment for air filtration —

## Part 3: Determination of the capture efficiency of on-torch welding fume extraction devices

### 1 Scope

This document defines a laboratory method for measuring the welding fume capture efficiency of on-torch extraction systems. The procedure only prescribes a methodology, leaving selection of the test parameters to the user, so that the effect of different variables can be evaluated.

It is applicable to integrated on-torch systems and to systems where a discrete extraction system is attached to the welding torch close to the arc area. The methodology is suitable for use with all continuous wire welding processes, all material types and all welding parameters.

The method can be used to evaluate the effects of variables such as extraction flow rate, extract nozzle position, shielding gas flow rate, welding geometry, welding torch angle, fume emission rate, etc., on capture efficiency.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15767, *Workplace atmospheres — Controlling and characterizing uncertainty in weighing collected aerosols*

ISO/IEC Guide 98 (all parts), *Uncertainty of measurement*

### 3 Terms and definitions

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

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

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

#### 3.1

##### **test chamber**

semi-enclosed extracted chamber in which welding fume capture efficiency testing is performed

#### 3.2

##### **isokinetic sampler**

device for collecting aerosol samples at the same velocity as the air being sampled