



# SLOVENSKI STANDARD SIST EN ISO 22065:2019

01-september-2019

Nadomešča:  
SIST EN 1076:2010

---

**Izpostavljenost na delovnem mestu - Plini in pare - Zahteve za vrednotenje postopkov za merjenje z vzorčevalniki s črpanjem (ISO 22065:2019)**

Workplace air - Gases and vapours - Requirements for evaluation of measuring procedures using pumped samplers (ISO 22065:2019)

Arbeitsplatzatmosphäre - Verfahren zur Messung von Gasen und Dämpfen mit pumpenbetriebenen Probenahmeeinrichtungen - Anforderungen und Prüfverfahren (ISO 22065:2019)

Air des lieux de travail - Gaz et vapeurs - Exigences pour l'évaluation des procédures de mesure à l'aide de dispositifs de prélèvement par pompage (ISO 22065:2019)

**Ta slovenski standard je istoveten z: EN ISO 22065:2019**

---

**ICS:**

13.040.30      Kakovost zraka na delovnem mestu      Workplace atmospheres  
mestu

**SIST EN ISO 22065:2019**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 22065:2019

<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>

EUROPEAN STANDARD

EN ISO 22065

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2019

ICS 13.040.30

Supersedes EN 1076:2009

English Version

## Workplace air - Gases and vapours - Requirements for evaluation of measuring procedures using pumped samplers (ISO 22065:2019)

Air des lieux de travail - Gaz et vapeurs - Exigences pour l'évaluation des procédures de mesure à l'aide de dispositifs de prélèvement par pompage (ISO 22065:2019)

Arbeitsplatzatmosphäre - Gase und Dämpfe - Anforderungen und Prüfverfahren zur Messung mit pumpenbetriebenen Probenahmearrichtungen (ISO 22065:2019)

This European Standard was approved by CEN on 24 May 2019.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, 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

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 22065:2019  
<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>

## European foreword

This document (EN ISO 22065:2019) has been prepared by Technical Committee ISO/TC 146 "Air quality" in collaboration with Technical Committee CEN/TC 137 "Assessment of workplace exposure to chemical and biological agents" 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 January 2020, and conflicting national standards shall be withdrawn at the latest by January 2020.

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.

This document supersedes EN 1076:2009.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**iTeh STANDARD PREVIEW**  
**Endorsement notice**  
**(standards.iteh.ai)**

The text of ISO 22065:2019 has been approved by CEN as EN ISO 22065:2019 without any modification.

[SIST EN ISO 22065:2019  
https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019](https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019)

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 22065:2019

<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>

INTERNATIONAL  
STANDARD

ISO  
22065

First edition  
2019-06

---

---

**Workplace air — Gases and vapours  
— Requirements for evaluation of  
measuring procedures using pumped  
samplers**

*Air des lieux de travail — Gaz et vapeurs — Exigences pour  
l'évaluation des procédures de mesure à l'aide de dispositifs de  
prélèvement par pompage*

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[SIST EN ISO 22065:2019](https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019)

<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>



Reference number  
ISO 22065:2019(E)

© ISO 2019

## iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 22065:2019

<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>



### **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland



# Contents

Page

<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</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 Symbols and abbreviated terms</b> .....	<b>2</b>
<b>5 Sampler types</b> .....	<b>3</b>
<b>6 Requirements</b> .....	<b>3</b>
6.1 General.....	3
6.2 Sampler requirements.....	3
6.2.1 Flow resistance.....	3
6.2.2 Sampler leak test (for Type B samplers).....	4
6.2.3 Shelf life.....	5
6.2.4 Sampler identification.....	5
6.2.5 Marking.....	5
6.2.6 Instructions for use.....	5
6.3 Measuring procedure requirements.....	5
6.3.1 Sampling procedure requirements.....	5
6.3.2 Analytical procedure requirements.....	6
6.3.3 Expanded uncertainty.....	7
6.3.4 Method description.....	7
<b>7 General test conditions</b> .....	<b>8</b>
7.1 Reagents.....	8
7.2 Apparatus.....	8
7.3 Calibration gas mixture.....	9
7.3.1 Generation.....	9
7.3.2 Determination of mass concentration.....	9
7.3.3 Independent method.....	9
<b>8 Test methods</b> .....	<b>10</b>
8.1 General.....	10
8.2 Sampler test methods.....	10
8.2.1 Flow resistance.....	10
8.2.2 Sampler leak test (for Type B samplers).....	10
8.2.3 Shelf life (for Type A impregnated supports).....	10
8.2.4 Sample identification.....	11
8.2.5 Marking.....	11
8.2.6 Instructions for use.....	11
8.3 Measuring procedure test methods.....	11
8.3.1 Determination of the recommended sampling conditions.....	11
8.3.2 Analytical procedure test methods.....	14
8.3.3 Method recovery and method precision.....	15
8.4 Uncertainty of measurement.....	17
8.4.1 Identification of random and non-random uncertainty components.....	17
8.4.2 Estimation of individual uncertainty components.....	17
8.4.3 Calculation of expanded uncertainty.....	19
<b>9 Test report</b> .....	<b>19</b>
<b>Annex A (informative) Examples for the determination of the breakthrough volume</b> .....	<b>20</b>
<b>Annex B (informative) Experiments for method validation</b> .....	<b>22</b>
<b>Annex C (informative) Estimation of uncertainty of measurement</b> .....	<b>24</b>

ISO 22065:2019(E)

<b>Annex D (informative) Example for estimation of expanded uncertainty</b> .....	<b>34</b>
<b>Bibliography</b> .....	<b>38</b>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 22065:2019

<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>

## 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 of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 2, *Workplace atmospheres*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

**ISO 22065:2019(E)****Introduction**

This document provides a framework for assessing the performance of procedures for measuring gases and vapours against the general requirements for the performance of procedures for measuring chemical agents in workplace atmospheres as specified in ISO 20581. It enables manufacturers and users of pumped samplers and developers and users of procedures for measuring gases and vapours to adopt a consistent approach to method validation (see [Annex B](#)).

**iTeh STANDARD PREVIEW  
(standards.iteh.ai)**

SIST EN ISO 22065:2019

<https://standards.iteh.ai/catalog/standards/sist/9fb6e0f5-2de8-442c-bb63-676097d49c0d/sist-en-iso-22065-2019>

# Workplace air — Gases and vapours — Requirements for evaluation of measuring procedures using pumped samplers

## 1 Scope

This document specifies performance requirements and test methods under prescribed laboratory conditions for the evaluation of pumped samplers used in conjunction with an air sampling pump and of procedures using these samplers for the determination of gases and vapours in workplace atmospheres.

This document addresses requirements for method developers and/or manufacturers.

NOTE 1 For the purposes of this document, a manufacturer can be any commercial or non-commercial entity.

NOTE 2 For the sampling of semi-volatile compounds which can appear as a mixture of vapours and airborne particles in workplace atmospheres see EN 13936.

This document is applicable to pumped samplers and measuring procedures using these samplers in which sampling and analysis are carried out in separate stages.

This document is not applicable to:

- pumped samplers which are used for the direct determination of concentrations, for example, length-of-stain detector tubes;
- samplers which rely on sorption into a liquid, and subsequent analysis of the solution (bubblers).

## 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 8655-2, *Piston-operated volumetric apparatus — Part 2: Piston pipettes*

ISO 8655-6, *Piston-operated volumetric apparatus — Part 6: Gravimetric methods for the determination of measurement error*

ISO 13137:2013, *Workplace atmospheres — Pumps for personal sampling of chemical and biological agents — Requirements and test methods*

ISO 18158, *Workplace air — Terminology*

ISO 20581, *Workplace air — General requirements for the performance of procedures for the measurement of chemical agents*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18158 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/>

## ISO 22065:2019(E)

## 4 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviations apply.

NOTE See 8.4 and Annex C for symbols used in conjunction with uncertainty of measurement only.

CRM	certified reference material
LV	limit value
$m_{a1}$	mass of analyte desorbed from tube blank, in micrograms ( $\mu\text{g}$ )
$m_{a2}$	mass of analyte desorbed from spiked tube, in micrograms ( $\mu\text{g}$ )
$m_{a,lt}$	maximum mass uptake of analyte in a leak test performed on a sealed sampler used for making measurements for comparison with a long-term limit value, in milligrams (mg)
$m_{a,st}$	maximum mass uptake of analyte in a leak test performed on a sealed sampler used for making measurements for comparison with a short-term limit value, in milligrams (mg)
$\dot{m}_1$	mass loss from permeation tube, in micrograms per minute ( $\mu\text{g} \cdot \text{min}^{-1}$ )
$M_a$	molar mass of analyte, in grams per mole ( $\text{g} \cdot \text{mol}^{-1}$ )
$n$	number of replicate samples
$p_{at}$	pressure of the test atmosphere sampled, in kilopascals (kPa)
$R_{me}$	method recovery
$R_{an}$	analytical recovery
RH	relative humidity of the test atmosphere sampled, in percent (%)
$t_H$	hold-up time of the unretained substance, in minutes (min)
$t_s$	sampling time, in minutes (min)
$T_{at}$	temperature of the test atmosphere sampled, in Kelvins (K)
$V_{at}$	volume of the test atmosphere sampled, in litres (l)
$V_H$	gas (vapour) hold-up volume (dead volume), in litres (l)
$V_R$	uncorrected retention volume, in litres (l)
$(V_R)'$	corrected retention volume, in litres (l)
$\dot{v}$	flow rate into the exposure chamber, for example, in litres per minute ( $\text{l} \cdot \text{min}^{-1}$ )
$v_a$	volumetric air flow rate through the sampler, for example, in litres per minute ( $\text{l} \cdot \text{min}^{-1}$ )
$\beta_a$	mass concentration of the analyte in the calibration gas mixture, in milligrams per cubic metre ( $\text{mg} \cdot \text{m}^{-3}$ )
$\bar{\beta}_{a,R}$	mean mass concentration of the analyte recovered from the test gas atmosphere, in milligrams per cubic metre ( $\text{mg} \cdot \text{m}^{-3}$ )

$\beta_{cg}$	mass concentration of the calibration gas mixture, in milligrams per cubic metre ( $\text{mg} \cdot \text{m}^{-3}$ )
$\vartheta_{at}$	temperature of the test atmosphere sampled, in degrees Celsius ( $^{\circ}\text{C}$ )
$K_v$	coefficient of variation (CV) NOTE The predecessor term "relative standard deviation" is deprecated. See also ISO 3534-1:2006, 2.38, Note 2.
$\rho_{LV,lt}$	long-term limit value given as concentration, in milligrams per cubic metre ( $\text{mg} \cdot \text{m}^{-3}$ )
$\rho_{LV,st}$	short-term limit value given as concentration, in milligrams per cubic metre ( $\text{mg} \cdot \text{m}^{-3}$ )
$\phi_a$	volume fraction of the analyte, in microlitres per litre ( $\mu\text{l} \cdot \text{l}^{-1}$ )

## 5 Sampler types

Samplers for gases and vapours can be divided into type A samplers and type B samplers:

Type A samplers rely on sorption onto a collection substrate which can be impregnated with a reagent. The collection substrate is always desorbed with a solvent, and subsequently analysed.

Type B samplers rely on sorption onto a solid, thermal desorption, and analysis of the desorbate.

## 6 Requirements

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

### 6.1 General

Some requirements (see 6.2) shall be initially verified by the manufacturer once for each type of sampler. Other requirements (see 6.3) shall be verified for each combination sampler/chemical agent.

Measuring procedures shall meet the requirements for measuring procedures specified in 6.3. When use of a sampler for measurement of a particular gas or vapour is claimed, the sampler shall meet the requirements specified in 6.2.

Known or suspected interferences shall be noted as required in 6.3.4.1. The results of any tests performed to evaluate interferences, including suitable and sufficient information to minimize their effects shall be presented in the method report as required in 6.3.4.2.

NOTE No useful performance requirements can be given for the effect of interferences (with the exception of water vapour). The effect of interferences is difficult to predict for a non-ideal sorbent without adsorption isotherm data on mixed systems which is normally unavailable.

### 6.2 Sampler requirements

#### 6.2.1 Flow resistance

When tested in accordance with 8.2.1, at least 95 % of samplers shall have a back pressure less than the appropriate maximum value indicated in Table 1. A minimum of 20 samplers shall be tested.

NOTE Typical back pressure values for type A samplers and type B samplers are given in [1].