SLOVENSKI STANDARD
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Laboratorijske lokalne odsesovalne naprave - 1. del: Členkasta izvlečna roka

Laboratory local exhaust devices - Part 1: Articulated extraction arm

Lokale Absaugeinrichtungen im Labor - Teil 1: Absaugarme mit Gelenken

Dispositifs d'aspiration locale de laboratoire - Partie 1 : Bras articulé d'extraction

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Dispositifs d'aspiration locale de laboratoire - Partie 1 : Bras articulé d'extraction

Lokale Absaugeinrichtungen im Labor - Teil 1: Absaugarme mit Gelenken

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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

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European foreword

This document (prEN 16589-1:2021) has been prepared by Technical Committee CEN/TC 332 “Laboratory equipment”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede CEN/TR 16589:2013.

Introduction

Articulated extraction arms are local exhaust devices consisting of capture devices that may be constructed in a variety of geometric shapes (hoods, nozzles, flat screens etc.) which are connected to or mounted on extraction arms or arms with flexible joints. They are used for a variety of different applications in the laboratory where contaminants are encountered. The design of articulated extract arms for laboratories may differ for different applications.

The ability of capture devices to capture contaminants is subject to a number of factors. These factors are extract volume flow, capture velocity, capture hood design, manoeuvrability, position in relation to emission source, user activity, air speed etc. The capture ability is rapidly decreased with increased distance to the emission source. Higher air velocity in the opening of the device improves the capture ability but commonly results in increased noise level and pressure drop of the capture device and extract arm.

Good information to the user on how to use the device as well as information about the limitations of the device are essential for safety and health in the laboratories.

The performance values specified in this standard for type testing are considered appropriate to determine the products compliance with the standard. Performance values on site may vary due to local conditions and should be assessed as part of a specific risk assessment.

Articulated extract arms are useful for very small emission sources or when the emission source is too large to reasonably be enclosed and has distinct points where the pollution might occur like a HPLC (High pressure liquid chromatograph).

1 Scope

This document applies to an articulated extraction arm used as a local exhaust device in laboratories and comprised of a specific capture device (receiving, enclosing or capture hood, nozzle or flat screen) connected to a specific extraction arm which is articulated ducting to move air from the capture device to discharge.

This document specifies:

- a method for type testing;
- a method to assess the three-dimensional capture zone of local exhaust devices mounted on an articulated extract arm;
- a method for assessing the isothermal and low energy emission release capture efficiency of local exhaust devices connected to an articulated extract arm and its robustness to a challenge of air disturbance directly in front of and in close proximity to the capture hood and release source positioned on a table;
- a method for establishing the reachable, three-dimensional workspace of local exhaust devices mounted on an articulated extract arm by measuring the possible positions of the opening of the device;
- a method for measuring the pressure drop and noise level in the type test and at onsite commissioning;
- instructions for marking the device and recommended information to transfer to users in the product manual;
- guidance for use describing the limitations of local exhaust devices with articulated extract arm for different airflow rates establishing the capture zone;
- guidance on selection, installation, commissioning, and testing of articulated extract arms and their local exhaust ventilation systems.

The standard covers only product performance test methods. Occupational health and safety assessments methods are not included in this standard.

Point sources with initial velocity due to temperature, pressure release, work process or similar are not covered by this standard.

The scope does not include filtration requirements and impact of fully or partly recirculated airflow extracted by an articulated extract arm.

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.

EN 1093-4, *Safety of machinery — Evaluation of the emission of airborne hazardous substances — Part 4: Capture efficiency of an exhaust system — Tracer method*

EN 14175-1, *Fume cupboards - Part 1: Vocabulary*

EN ISO 11204, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions applying accurate environmental corrections (ISO 11204)*

3 Terms and definitions

For the purposes of this document, EN 14175-1 and the following terms and definitions apply.

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

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

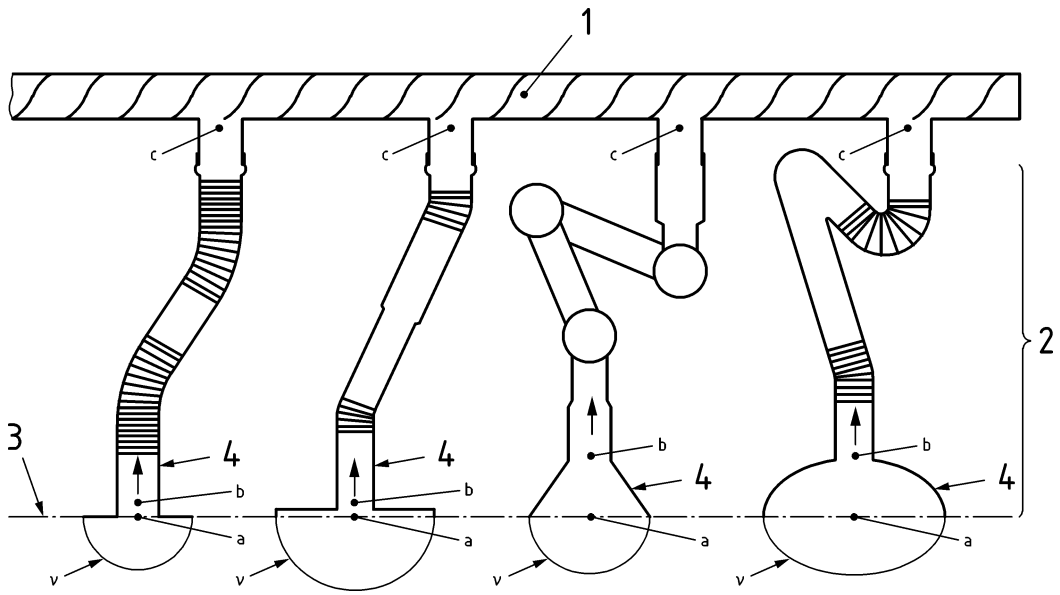
3.1
capture device
equipment designed to capture or collect air pollutants at source connected directly to a duct or mounted on an extraction arm

Note 1 to entry: Examples of capture devices are e.g. hood, flat screen, suction nozzle.

3.2
extraction arm
fixed, flexible or articulated ducting connecting the capture device with the main extract air duct

3.3
articulated extraction arm
AEA
articulated extract ducting assembly including capture device

Note 1 to entry: The articulated extraction arm can be moved and positioned so that the capture zone of the hood is located at the identified hazard release zone. See examples in Figure 1.



Key

v schematic capture zone
a centre point of entry surface
b duct of capture device
c duct connecting to main duct
1 main duct
2 articulated extraction arms
3 entry surface
4 capture device

Figure 1 — Example of common designs of capture devices and extraction arms

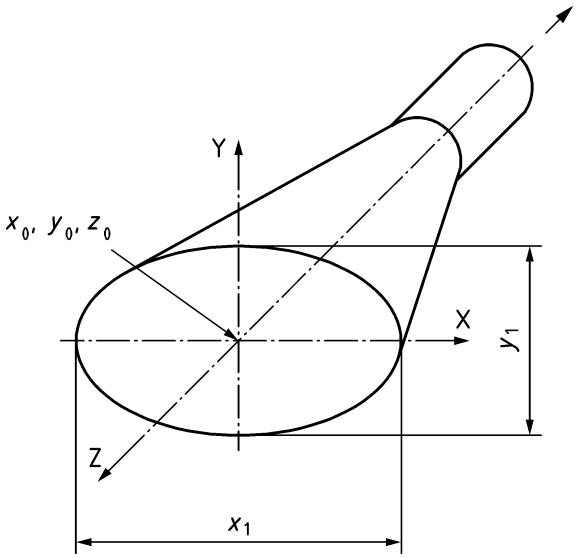
3.4
capture zone
three-dimensional space in front of the entry surface of a capture device in which the air velocity is greater than or equal to the minimum air velocity required for effective capture of pollutants

3.5
entry surface
plane touching the outermost parts of the capture device regardless of the shape

Note 1 to entry: A schematic expression of entry surface independent on the shape is given in Figure 1 and 3.

3.6
aspect ratio
ratio of the lengths x and y in the entry surface, with $x_1 > y_1$

Note 1 to entry: Schematic layout of an ellipse capture device see Figure 2. The aspect ratio is 1 for a circular device and greater than 1 for other shapes.



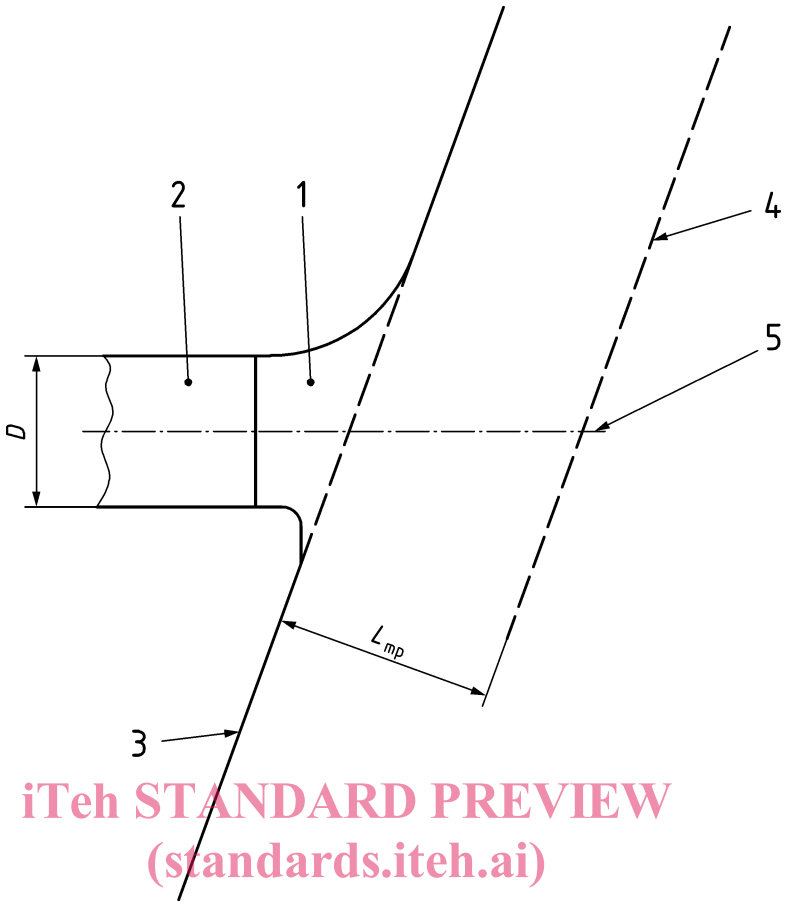
Key

x_0, y_0, z_0	centre point of the entry surface and origin for the measurement point co-ordinates
x_1	length of the entry surface of the capture device in the x-direction ($x_1 > y_1$)
y_1	length of the entry surface of the capture device in the y-direction ($x_1 > y_1$)

Figure 2 — Schematic layout of an ellipse capture device

3.7
measurement plane
two-dimensional area in front of the capture device and parallel to the entry surface)

Note 1 to entry: Distance from the measuring position to the entry surface (L_{mp}) is specified in the air velocity measurement procedure. A schematic layout showing position of the measurement plane in relation to the entry surface is included in Figure 3.



Key

1	Capture device
2	Duct of capture device
3	Entry surface
4	Measurement plane
5	Center line
D	Internal diameter of the duct of the capture device
L_{mp}	Measurement plane distance from the capture device entry surface specified in the air velocity measurement procedure

Figure 3 — Schematic layout showing position of the measurement plane in relation to the entry surface

3.8
reachable workspace
three-dimensional workspace in which the specified capture zone is achievable with movement of an articulated extraction arm

Note 1 to entry: The capture zone extract volume flow can vary with changes in the articulated extraction arm configuration.

3.9
working zone
space where the activity or process generates the contaminant cloud that should be removed by the capture device

4 Test room and general test conditions

4.1 Dimension and construction of the test room

The test room shall consist of an enclosure of cuboid shape, constructed of suitable materials, within an existing building or laboratory. The internal width and length shall be not less than 4,0 m and the ceiling height not less than 2,7 m. The ceiling and floor shall be level and the room shall be devoid of internal supports, internal walls or other obstacles to the airflow.

The test zone boundary shall extend approx. 1,5 m from the capture device opening in all directions and over the full room height.

4.2 Test room conditions

The room air temperature shall be (23 ± 3) °C. The make-up air temperature during measurements shall be room air temperature ± 1 °C. Temperature gradients shall be avoided to the greatest possible extent. The make-up air shall be supplied at a distance greater than 2 m from the front of the capture device.

Room extract air shall be extracted symmetrically on the opposite side to the make-up air supply and from outside the test zone. The air speed shall be less than 0,05 m/s at the test zone boundaries. Care shall be taken regarding uncontrolled air streams and draughts entering the test room.

Any device the temperature of which exceeds 40 °C, shall be located outside the test zone boundaries.

The air extracted from the test room shall be discharged to atmosphere in such a way as to prevent its re-entrainment in the make-up air.

4.3 Articulated extract arm installation

The articulated extract arm shall be installed centrally in the test room.

The test shall be carried out on articulated extract arm installed in the test room in accordance with the manufacturer's installation instructions.

4.4 Test conditions

4.4.1 General

No person other than the operator(s) shall be present in the test room during the measurements. No person shall remain in the test zone during the measurements. There shall be no unnecessary obstructions or equipment within the test zone.

Windows and doors of the test room shall remain closed during measurements.

4.4.2 Setting extract air volume flow rate

Tests shall be performed with extract air volume flow rates in the capture device duct corresponding to set air velocities of 5 m/s, 9 m/s, 12 m/s and 15 m/s and higher at position b in Figure 1. Air velocity of 15 m/s and higher can be excluded if specified by the manufacturer. The flow rate shall be measured in the extract duct in accordance with EN ISO 5167-1:2003. The uncertainty of measurement shall not exceed ± 5 %.