

**SLOVENSKI STANDARD**  
**oSIST prEN ISO 21904-1:2019**  
**01-marec-2019**

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**Zdravje in varnost pri varjenju in sorodnih tehnikah - Oprema za zajem in ločevanje varilnega dima - 1. del: Splošne zahteve (ISO/DIS 21904-1:2019)**

Health and safety in welding and allied processes - Equipment for capture and separation of welding fume - Part 1: General requirements (ISO/DIS 21904-1:2019)

Arbeits- und Gesundheitsschutz beim Schweißen und bei verwandten Verfahren - Einrichtungen zum Erfassen und Abscheiden von Schweißrauch - Teil 1: Allgemeine Anforderungen (ISO/DIS 21904-1:2019)

Hygiène et sécurité en soudage et techniques connexes - Exigences, essais et marquage des équipements de filtration d'air - Partie 1: Exigences générales (ISO/DIS 21904-1:2019)

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13.100	Varnost pri delu. Industrijska higiena	Occupational safety. Industrial hygiene
25.160.30	Varilna oprema	Welding equipment

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ISO/TC 44/SC 9

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## Health and safety in welding and allied processes — Equipment for capture and separation of welding fume — Part 1: General requirements

*Hygiène et sécurité en soudage et techniques connexes — Exigences, essais et marquage des équipements de filtration d'air —*

*Partie 1: Exigences générales*

ICS: 13.100; 25.160.01

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## ISO/DIS 21904-1:2019(E)

## 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)).

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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 and allied processes generate fumes and gases which, if inhaled, can be harmful to human health. Therefore, control of the fumes and gases generated is to be exercised to minimize worker exposure.

The most effective method of control is to capture the fumes and gases close to their source before they enter a worker's breathing zone or the general workplace environment.

Ventilation equipment used to capture the fumes and gases is to be fit for purpose because inefficient capture could result in high exposure and can be detrimental to workers' health. It is important therefore that it adheres to defined manufacturing, materials and design requirements and gives warning of malfunction.

This part of ISO 21904 defines the general requirements that are necessary for ventilation equipment to maintain exposure to fumes at acceptable levels.

This part of ISO 21904 is a type-B standard as stated in ISO 12100.

This part of ISO 21904 is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of this part of ISO 21904 by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this part of ISO 21904.

In addition, this part of ISO 21904 is intended for standardization bodies elaborating type-C standards.

The requirements of this part of ISO 21904 can be supplemented or modified by a type-C standard.

For machines which are covered by the scope of a type-C standard and which have been designed and built according to the requirements of that standard, the requirements of that type-C standard take precedence.



# Health and safety in welding and allied processes — Equipment for capture and separation of welding fume —

## Part 1: General requirements

### 1 Scope

This part of ISO 21904 defines the general requirements for ventilation equipment used to capture and separate fumes generated by welding and allied processes e.g. arc welding and thermal cutting. It applies to the design and manufacture of parts of the equipment including hoods for welding, ducting, filter units, air movers, systems that inform of unsafe operation and workplace practices to ensure safe working with regard to exposure.

Significant hazards are listed in [Clause 4](#). It does not cover electrical, mechanical and pneumatic hazards.

This part of ISO 21904 is applicable to the following:

- local exhaust ventilation systems (LEV) excluding draught tables;
- mobile and stationary equipment;
- separation equipment used for welding and allied processes;

This part of ISO 21904 is not applicable to the following:

- general ventilation, air make up or air movement systems;
- air conditioning systems;
- grinding dust.

This part of ISO 21904 also specifies the test data to be marked on the capture devices.

This part of ISO 21904 applies to systems designed and manufactured after its publication.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 21904-2:2013, *Health and safety in welding and allied processes — Equipment for capture and separation of welding fume — Part 2: Requirements for testing and marking of separation efficiency*

ISO 21904-4, *Health and safety in welding and allied processes — Requirements, testing and marking of equipment for air filtration — Part 4: Determination of the minimum air volume flow rate of captor hoods and nozzles*

IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

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IEC 60335-2-69, *Household and similar electrical appliances — Safety — Part 2-69: Particular requirements for wet and dry vacuum cleaners, including power brush, for commercial use*

IEC 60695-2-12, *Fire hazard testing — Part 2-12: Glowing/hot-wire based test methods — Glow-wire flammability index (GWFI) test method for materials*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and ISO/TR 25901-2 and the following apply.

#### 3.1 welding fume separation equipment

air filtration equipment, the purpose of which is to separate particles generated by welding and allied processes from workplace atmosphere

Note 1 to entry: Some separation equipment is designed to also remove gases generated by welding, but this series of standards does not address the efficiency of gas separation.

#### 3.2 filter cleaning system

system designed to clean the filter of welding fume separation equipment in order to restore the air flow rate through the filter when it is reduced by an accumulation of welding fume particles

#### 3.3 on-line filter cleaning system

filter cleaning system operating while welding fume separation equipment is working

#### 3.4 off-line filter cleaning system

filter cleaning system operating after the air mover of the filtration equipment is switched off

#### 3.5 separation efficiency by mass

ratio of the mass of particles retained by welding fume separation equipment to the mass of particles entering the equipment during a given period

Note 1 to entry: General information on test methods for determination of separation efficiency is described in EN 1093-6 and EN 1093-7.

#### 3.6 emission rate

mass of the particles emitted by the welding fume source per time

Note 1 to entry: Emission rate is expressed in milligrams per second.

#### 3.7 local exhaust ventilation

##### LEV

use of extraction to remove contaminated air at or near to its source

#### 3.8 filter protector

device normally positioned at the intake of the welding fume separation equipment, used to minimize the possibility of damaging impacts of sparks or large particles on filter media

Note 1 to entry: Filter media can also be protected against sparks and large particles by the internal design of the welding fume separation equipment.

Note 2 to entry: Examples of filter protectors are cyclones, spin separators, baffles or sieves. A filter protector may be designed to also protect against flame damage.

### 3.9 extraction device

#### 3.9.1

##### on-torch extraction device

##### on-gun extraction device

equipment, integrated or attached, on torch used for capturing welding fume, when connected to an extraction source

#### 3.9.2

##### captor hood

##### captor nozzle

equipment, movable or static, used for capturing welding fume, when connected to an extraction source

#### 3.9.3

##### receiving hood

##### canopy

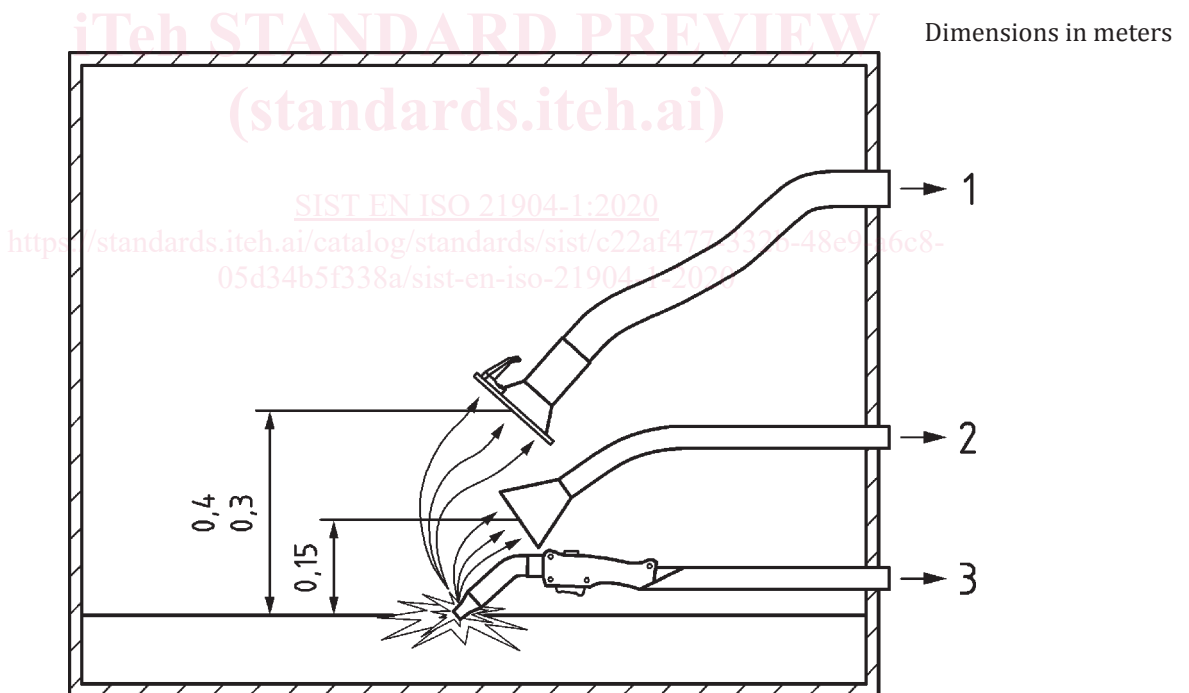
equipment, movable or static, normally positioned above a hot process, where the contaminated air is propelled into it by process-induced air movement

#### 3.9.4

##### enclosure

##### chamber

fully or partially enclosed space where the process takes place, designed to contain and prevent the escape of hazardous substances into the workshop air



#### Key

- 1 low vacuum extraction, 700 m<sup>3</sup>/h to 1000 m<sup>3</sup>/h, 800 Pa to 2000 Pa
- 2 high vacuum extraction, 100 m<sup>3</sup>/h to 150 m<sup>3</sup>/h, 5 kPa to 10 kPa
- 3 on-gun extraction, 50 m<sup>3</sup>/h to 100 m<sup>3</sup>/h, 10 kPa to 18 kPa

**Figure 1**

### 3.10

#### suction equipment

unit with air mover and with or without a filter

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**3.11****fume**

airborne particles typically with diameter smaller than 1µm generated by thermal processes

**3.12****minimum air volume flow rate**

air volume flow rate required for acceptable capture of fume

Note 1 to entry: The minimum air volume flow rate depends on the type and the geometric dimensions of the capture device and the test positions selected to demonstrate the extent of the capture zone (see 7.3).

**3.13****suction field**

the volume around a capture device, in which the air velocity required to capture welding fume is exceeded

**4 Significant hazards**

Exposure to fumes and gases generated by welding and allied processes can be detrimental to health. Control of exposure can usually be achieved using ventilation equipment but any failure of this equipment, such as poor design and the use of parts made of unsuitable materials, can result in reduced extraction efficiency and hence over exposure and ill health.

Common health effects include respiratory disease, but exposure to carcinogenic substances during the welding of alloyed materials can occur and shall be considered.

The requirements of the ventilation equipment are dependent on the level of control necessary.

**5 Requirements and verifications****5.1 General**

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