

DRAFT INTERNATIONAL STANDARD

ISO/DIS 15012-4

ISO/TC 44/SC 9

Secretariat: BSI

Voting begins on:
2013-09-05

Voting terminates on:
2014-02-05

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

Part 4: Design requirements

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

Partie 4: Exigences générales

ICS: 25.160.30

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ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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Reference number
ISO/DIS 15012-4:2013(E)

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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 15012-4 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 9 and by Technical Committee CEN/TC 121, *Welding* in collaboration.

ISO 15012 consists of the following parts, under the general title *Health and safety in welding and allied processes — Equipment for capture and separation of welding fume*:

- *Part 1: Requirements, testing and marking of separation efficiency*
- *Part 2: Determination of the minimum air volume flow rate of captor hoods and nozzles*
- *Part 3: Determination of the capture efficiency of on-gun welding fume extraction device¹⁾*
- *Part 4: Design requirements*

1) Under development

Introduction

During the preparation of ISO 15012-1 to -3 it became clear, that some general requirements are essential for the proper operation of welding fume separation equipment. Therefore this part of ISO 15012 was created.

Welding and allied processes generate fume and gases, which, if inhaled, can be harmful to human health. The use of a local exhaust ventilation system (LEV) can remove these harmful from the welder's breathing zone.

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Health and safety in welding and allied processes — Equipment for capture and separation of welding fume — Part 4: General requirements

1 Scope

Equipment for capture and separation of welding fumes like local exhaust ventilation systems (LEV) or ventilated enclosures for extracting welding fumes are safety components. In case of malfunction it may cause hazards to the workers' health.

Equipment for capture and separation of welding fume consists of capture elements, pipes, filter units and air movers. The dimensioning of each has influence on the function of the whole system. This shall be considered by the designer.

This International Standard specifies the requirements on equipment for capture and separation of welding fumes to fulfil the safety functions. This equipment can be a LEV or enclosure. This standard does not cover basic safety aspects for the device as machinery like electrical, mechanical and pneumatic hazards.

This standard covers:

- LEV (local exhaust ventilation systems)
- Enclosures which are not accessible for persons when they are in use
- Mobile and stationary equipment

This standard does not cover:

- General ventilation, air make-up, or air movement systems
- Air conditioning systems
- Separation of gases generated by or used for welding processes
- LEV used for welding and allied processes that generate reactive, potentially explosive particles and atmospheres

This standard applies to systems designed after the date of its publication.

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 13849, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design*

ISO 15012-1, *Health and safety in welding and allied processes — Requirements, testing and marking of equipment for air filtration — Part 1: Requirements, testing and marking of separation efficiency*

ISO 15012-2, *Health and safety in welding and allied processes — Requirements, testing and marking of equipment for air filtration — Part 2: Determination of the minimum air volume flow rate of captor hoods and nozzles*

IEC 60695-2-11, *Fire hazard testing — Part 2-11: Glowing/hot-wire based test methods — Glow-wire flammability test method for end-products*

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*

3 Terms and definitions

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 air

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 fan 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**preseparator**

device, normally positioned at the intake of welding fume separation equipment, used to prevent the damaging impact of sparks and large particles on filter media

Note 1 to entry Examples of preseparators are a cyclone, spin separator, baffle or sieve.

Note 2 to entry A preseparator may be designed to also protect against flame damage.

3.9**fixed hood**

immovable equipment, used to capture emissions of airborne hazardous substances

3.10**cantilevered hood**

movable equipment, used to capture emissions of airborne hazardous substances, connected to welding fume separation equipment or to fixed extraction ducts by a flexible tube

3.11**receiving hood**

fixed installed device for collecting hazardous substances, normally positioned above a process where hazardous substances were emitted

Note 1 to entry An example of a receiving hood is a chimney stack installed above a robot cell bordered by a "curtain chamber" and used as an enclosure.

3.12**enclosure (chamber)**

closed space, covering a process emitting hazardous substances, to prevent the escape of hazardous substances from their source into the workshop air

4 Significant Hazards

Welding processes generate fumes and gases, which may be risks for welders when inhaled. These hazardous substances shall be extracted by welding fume separation equipment. A failure of the device can result in the endangering of the welders and other employees in the welding shop by these substances.

Welding fumes have damaging effects to respiratory system and lung and can be toxic.

Welding of alloyed steel can emit additional carcinogenic substances e.g. hexavalent chromium compounds or nickel oxide.

Requirements for the used equipment are dependent on the hazard of the expected substances.

5 Requirements and verifications**5.1 Welding fume separation equipment**

All parts and materials shall resist the working conditions defined by the manufacturer during the intended use e.g. thermal, mechanical, and UV-radiation. This can be achieved by considering the properties of the materials used or by referring to long term experience with respective devices.

Conformity shall be checked by referencing the manufacturer's datasheets.