

SLOVENSKI STANDARD

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Varovalna obleka pred trdnimi lebdečimi delci, vključno z radioaktivno kontaminacijo - 1. del: Zahteve in preskusne metode za varovalno obleko z dovodom zraka za zaščito pred onesnaženjem z radioaktivnimi delci

Protective clothing against solid airborne particles including radioactive contamination - Part 1: Requirements and test methods for compressed air line ventilated protective clothing, protecting the body and the respiratory tract

Schutzkleidung gegen radioaktive Kontamination - Teil 1: Anforderungen und Prüfverfahren für belüftete Schutzkleidung gegen radioaktive Kontamination durch feste Partikel

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Vêtements de protection contre les particules solides en suspension dans l'air, incluant la contamination radioactive - Partie 1: Exigences et méthodes des vêtements de protection ventilés par une adduction d'air comprimé protégeant le corps et le système respiratoire

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ICS:

13.280	Varstvo pred sevanjem	Radiation protection
13.340.10	Varovalna obleka	Protective clothing

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EUROPEAN STANDARD

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**Protective clothing against solid airborne particles
including radioactive contamination - Part 1:
Requirements and test methods for compressed air line
ventilated protective clothing, protecting the body and the
respiratory tract**

Vêtements de protection contre les particules solides en suspension dans l'air, incluant la contamination radioactive - Partie 1: Exigences et méthodes des vêtements de protection ventilés par une adduction d'air comprimé protégeant le corps et le système respiratoire

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EN 1073-1:2016 (E)**European foreword**

This document (EN 1073-1:2016) has been prepared by Technical Committee CEN/TC 162 “Protective clothing including hand and arm protection and lifejackets”, 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of an identical text or by endorsement, at the latest by August 2016, and conflicting national standards shall be withdrawn at the latest by August 2016.

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

This document supersedes EN 1073-1:1998.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

EN 1073 is currently composed with the following parts:

- EN 1073-1, *Protective clothing (against solid airborne particles including radioactive contamination) — Part 1: Requirements and test methods for compressed air line ventilated protective clothing, protecting the body and the respiratory tract;*
<https://standards.iteh.ai/catalog/standards/sist/bcecd1f6-269e-49f8-8dd9-1a63795c0982/sist-en-1073-1-2016>
- EN 1073-2, *Protective clothing against radioactive contamination — Part 2: Requirements and test methods for non-ventilated protective clothing against particulate radioactive contamination.*

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the requirements and test methods for protective clothing, ventilated by an independent supply of air from an uncontaminated source, protecting the body and the respiratory system of the wearer against solid airborne particles including radioactive contamination. This kind of protective clothing can be provided with an emergency breathing facility.

This European Standard does not apply for the protection against ionizing radiation and the protection of patients against contamination with radioactive substances by diagnostic and/or therapeutic measures.

If additional protection against chemicals is required, reference should be made to the relevant standard and/or CEN/TR 15419.

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.

EN 132, *Respiratory protective devices — Definitions of terms and pictograms*

EN 134, *Respiratory protective devices — Nomenclature of components*

EN 136:1998, *Respiratory protective devices — Full face masks — Requirements, testing, marking*

EN 12021, *Respiratory equipment — Compressed gases for breathing apparatus*

EN 12941:1998, *Respiratory protective devices — Powered filtering devices incorporating a helmet or a hood — Requirements, testing, marking*

EN 13274-3:2001, *Respiratory protective devices — Methods of test — Part 3: Determination of breathing resistance*

EN 13274-4, *Respiratory protective devices — Methods of test — Part 4: Flame tests*

EN 13274-6, *Respiratory protective devices — Methods of test — Part 6: Determination of carbon dioxide content of the inhalation air*

EN 14325, *Protective clothing against chemicals — Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages*

EN 14594, *Respiratory protective devices — Continuous flow compressed air line breathing apparatus - Requirements, testing, marking*

EN 14605:2005+A1:2009, *Protective clothing against liquid chemicals — performance requirements for clothing with liquid-tight (Type 3) or spray-tight (Type 4) connections, including items providing protection to parts of the body only (Types PB [3] and PB [4])*

EN ISO 13688, *Protective clothing — General requirements (ISO 13688)*

CEN ISO/TR 11610, *Protective clothing — Vocabulary (ISO/TR 11610)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 134 and CEN ISO/TR 11610 for protective clothing, and in EN 132 and the following apply.

3.1 protective clothing against solid airborne particles including radioactive contamination
protective clothing intended to provide protection to the skin and if required to the respiratory tract against radioactive contamination and solid airborne particles

3.2 compressed air line ventilated protective clothing
protective clothing which is continuously supplied from a source of compressed breathable air ensuring internal ventilation and overpressure

**3.3 inward leakage in %
IL**

ratio of the concentration of contaminant in the ambient atmosphere to the concentration of the contaminant in the suit. The concentrations taken into account are the average concentrations recorded during a standardized test

**3.4 nominal protection factor (100: inward leakage, IL)
ratio of (100 %) / (inward leakage in %)**
ratio of the concentration of contaminant in the ambient atmosphere to the concentration of the contaminant in the suit

Note 1 to entry: The concentrations taken into account are the average concentrations recorded during a standardized test.

3.5 particulate radioactive contamination
radioactive substances on surfaces or within finely divided solids, where their presence is unintended or undesirable

**3.6 escape device
emergency breathing facility**
system, either integrally combined with the clothing, or intended for simultaneous use with the clothing, providing the wearer with respiratory protection in the event of the failure of the primary air supply to the suit, while he makes his escape from the contaminated environment

3.7 minimum air flow rate
minimum air flow rate with the device operating at the manufacturer's minimum pressure and any user's control valve to the minimum

3.8 maximum air flow rate
maximum air flow rate with the device operating at the manufacturer's maximum pressure and any user's control valve to the maximum

4 Requirements

4.1 Design

4.1.1 Compressed air line ventilated protective clothing shall comply with the relevant general requirements specified in EN ISO 13688.

4.1.2 The protective clothing shall be supplied with breathable air complying with EN 12021. The manufacturer shall indicate this clearly in the instructions for use (see Clause 7).

4.1.3 The design of the protective clothing shall be such that the protective clothing is straightforward to put on and take off, and to minimize the risk of contamination. Test according to “Practical performance test” (see 5.2).

In the instructions the manufacturer shall describe a specific method taking off the clothing so as to minimize cross contamination. Test during practical performance test.

4.1.4 The clothing shall be designated for single use or to be reusable.

4.1.5 The complete ventilated protective clothing shall cover the whole body and the respiratory tract. The ventilated protective clothing may consist of one or several ventilated parts to be worn together. Test according to 5.2.

Where relevant, the performance of the clothing is tested with any accessories also fitted according to the instructions of the manufacturer (see 5.1.2), and the information supplied by the manufacturer (see Clause 7) shall make this clear.

In this case, each accessory shall meet the requirements of the specific relevant standard, and the compatibility shall be checked between the clothing and each accessory.

4.1.6 The protective clothing may be provided with an escape device or an emergency breathing facility (see 4.14).

4.2 Materials

The materials used for the protective clothing against solid airborne particles including radioactive contamination shall meet the requirements according to Table 1 after the conditioning and the pre-treatment according to 5.1.3.

Table 1 — Requirements for the materials

Requirement	Test according to	For each material of reusable garment		For each material of single use garments	
		Required test	Minimum required class	Required test	Minimum required class
Abrasion resistance	EN 14325	Yes	6	Yes	1
Leak tightness	EN 14325	Yes	4	Yes	1
Puncture resistance	EN 14325	Yes	2	Yes	2
Tear resistance	EN 14325	Yes	4	Yes	1
Ignition resistance of materials, visor and ancillary parts	According to Annex A	Yes	—	Yes	—

4.3 Nominal protection factor

Tests shall be carried out according to 5.4.

Inward leakage test results (TIL_R , TIL_B , M_R , M_B) for ventilated protective clothing shall be classified according to Table 2. For the complete suit, the lowest class obtained defines the final test result, and the corresponding nominal protection factor. This classification shall be at least class 1.

Table 2 — Leakage

Data that shall be classified	Maximum values for one activity (%)	Maximum values for all the activities (%)	Nominal protection factor
	TIL_R TIL_B	M_R M_B	
Class 5	0,004	0,002	50 000
Class 4	0,01	0,005	20 000
Class 3	0,02	0,01	10 000
Class 2	0,04	0,02	5 000
Class 1	0,10	0,05	2 000

NOTE 1 Definitions of TIL_R , TIL_B , M_R and M_B are given in Annex B.

NOTE 2 Nominal protection factor (NPF) is the reciprocal of the inward leakage obtained during all activities (M_R or M_B). Its calculation is then given by the following relation: $NPF = 100 : M_{R/B}$, when $M_{R/B}$ is the maximum value from M_R or M_B expressed in %.

4.4 Seam strength, Joins and Assemblages

4.4.1 Seam strength

After the conditioning and the pre-treatment according to 5.1.3, a straight sample of each type of seam construction, including assemblages, shall be tested in accordance with EN 14325 (constant-rate-of-traverse).

Three specimens of each seam shall be tested and classified according to EN 14325. The weakest seam type strength (excluding low tear resistance bands for security which are tested according to 5.2) shall reach minimum class 1.

4.4.2 Detachable joins

The joins between the suit and detachable parts e.g. between gloves and sleeves, boots and trouser legs, shall be tested in accordance with 5.5 and withstand a pull of 100 N. Two samples shall be tested for each detachable part.

4.5 Visor

The visor shall comply with Table 3. Where antifogging compounds are used or specified by the manufacturer, they shall not have an adverse effect on the health of the wearer, or on the clothing.

Table 3 — Requirements of the visor

Properties of the visor	Requirements	Testing
Distortion of vision	The loss of sight shall not exceed two tenths on an optometrical chart (see also Annex C).	To read letters on a chart at a distance of 5 m during the practical performance test according to 5.2.
Field of vision	The field of vision shall be sufficiently adequate to allow the test subject to carry out all activities of the practical performance test.	Evaluated during the practical performance test according to 5.2.
Mechanical strength	Shall not be visibly damaged in such a way as to affect the performance of the suit system.	2 samples tested according to EN 12941:1998, 7.5.

The field of vision may also be evaluated according to Annex D.

4.6 Air supply system

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Couplings and connections shall comply with EN 14594. Two samples shall be tested.

The connection between the compressed air supply tube and the suit, including attachments, threaded parts, belt or other parts, or means of stabilizing the suit to the body shall withstand a 250 N pull when tested according to 5.5.

The test should be performed before the inward leakage test.

4.7 Air flow rate

Two suit systems shall be tested. When tested, the air flow rate into the suit system shall not be less than the manufacturer's minimum design flow rate. The maximum flow rate shall not exceed the maximum as stated by the manufacturer. Test in accordance with 5.3.

The flow rate and the distribution of the air into the suit system shall not cause distress to the wearer by local cooling. Test in accordance with 5.2.

4.8 Air flow rate warning device

A warning facility that immediately draws attention of the wearer or the assistant to the fact that the manufacturer's minimum design flow rate is not being achieved shall be provided. This warning facility can be fitted with either the clothing or the air supply system. It shall be tested by the wearer or the assistant before use (see Clause 7).

If an audible warning device is fitted, the sound pressure level shall be in the range above 90 dB(A), but below 118 dB(A) when measured at the ears of the wearer or within 1 m of the compressed air supply system in the case of an assistant. The frequency range of the warning device shall be between 2 000 Hz

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to 4 000 Hz. If fitted to the suit two warning devices shall be tested. Testing shall be according to EN 14594.

4.9 Supply valve

If a variable continuous flow valve is fitted, it shall comply to EN 14594. The valve shall permit adjustment of the air flow rate in the range from the minimum to the maximum as specified in 4.7. It shall not be possible to close the valve to restrict the air flow below the minimum design air flow rate.

4.10 Exhaust devices

If the protective clothing is fitted with exhaust devices, they shall be tested according to 5.6. Examine the exhaust device for signs of damage or failure. Two samples shall be tested.

4.11 Pressure in the suit

The overpressure shall not exceed 1 000 Pa mean and 2 000 Pa peak during the activity sequence as specified in Table B.1, the pressure tested with the maximum air flow rate. Two samples shall be tested.

A positive pressure shall be maintained when tested at the minimum air flow rate, checked during the determination of the nominal protective factor (see 5.4).

The pressure probe shall be located in the hood.

4.12 Carbon dioxide content of the inhalation air

The carbon dioxide content of the inhalation air, determined at the manufacturer's minimum flow condition, shall not exceed an average of 1,0 % (by volume), tested according to 5.8, when mounted on a test fixture according to 5.7. Two suits shall be tested, one of which shall be pre-treated as specified in 5.1.3.

4.13 Noise associated with the air supply to the suit

The noise measured in the suit at the ears shall not exceed 80 dB(A) at the maximum manufacturers' design flow rate, tested according to EN 14594. Human wearers may be used for this test, standing with arms along the body. The results would be expressed as a mean value on 30 s. Two suits shall be tested..

4.14 Escape device or emergency breathing facility

If fitted, this system shall comply with the relevant standard, in conjunction with the protective clothing and information supplied by the manufacturer (see Clause 7). Testing shall be according to 5.9. It shall comply to class 1 minimum according to Table 2.

4.15 Expressing of the results

Every tested specimen shall comply with the requirements.

5 Test methods**5.1 Test preparation****5.1.1 General**

In all tests using test person(s) the test person shall wear appropriate sized and well-fitting long sleeved and long legged cotton based workwear-overall (approximate weight 250 g/m²).