



SLOVENSKI STANDARD

SIST EN 149:1996

01-april-1996

Oprema za varovanje dihal - Polobrazne maske za zaščito pred delci - Zahteve, preskušanje, označevanje

Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking

Atenschutzgeräte - Filtrierende Halbmasken zum Schutz gegen Partikel - Anforderungen, Prüfung, Kennzeichnung

Appareils de protection respiratoire - Demi-masques filtrants contre les particules - Exigences, essais, marquage

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ICS:

13.340.30 Varovalne dihalne naprave Respiratory protective devices

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EUROPEAN STANDARD

EN 149:1991

NORME EUROPEENNE

EUROPAISCHE NORM

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UDC: 614.894.24:620.1:62-777

Descriptors: Respiratory protective equipment, accident prevention, safety masks, filters, specifications, tests, marking

English version

Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking

Appareils de protection respiratoire - Demi-masques filtrants contre les particules - Exigences, essais, marquage	-	Atemschutzgeräte - Filtrierende Halbmasken zum Schutz gegen Partikeln - Anforderungen, Prüfung, Kennzeichnung
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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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FOREWORD

This draft European Standard was drawn up by CEN/TC 79 "Respiratory Protective Devices", the Secretariat of which is held by DIN.

In 1980 the Sub-Group 3 "Facepieces" (SG 3) with DIN secretariat started to work on this draft proposal.

At the Plenary Meeting of CEN/TC 79 in Monteporzio (Rom) in October 1987 this draft proposal was presented and unanimously accepted by CEN/TC 79. It was then submitted to the secretariat of CEN/TC 79 for publication as Draft European Standard.

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In accordance with the Common CEN/CENELEC Rules, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

A given respiratory protective device can only be approved when the individual components satisfy the requirements of the test specification which may be a complete standard or part of a standard, and practical performance tests have been carried out on complete apparatus where specified in the appropriate standard. If for any reason a complete apparatus is not tested then simulation of the apparatus is permitted provided the respiratory characteristics and weight distribution are similar to those of the complete apparatus.

1 Object and Field of Application

This European Standard specifies minimum requirements for filtering half masks as respiratory protective devices against particles except for escape purposes.

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Laboratory and practical performance tests are included for the assessment of compliance with the requirements.

2 References

- EN 136: 1989 Respiratory protective devices; Full face masks;
Requirements, testing, marking
- EN 140: 1989 Respiratory protective devices; Half masks and quarter masks;
Requirements, testing, marking
- EN 143: Respiratory protective devices; Particle filters;
Requirements, testing, marking

3 Definition and Description

A filtering half mask is one which covers the nose and mouth and possibly the chin and

- a) consists entirely or substantially of filter material or,
- b) comprises a facepiece in which the main filter(s) form an inseparable part of the device and where the prefilter may be replaceable.

It is intended to provide adequate sealing on the face of the wearer against the ambient atmosphere, when the skin is dry or moist and when the head is moved.

Air enters the filtering half mask and passes directly to the nose and mouth area of the facepiece or, via an inhalation valve(s) if fitted. The exhaled air flows through the filter material and/or an exhalation valve (if fitted) directly to the ambient atmosphere.

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These devices can be designed to protect against solid and water-based aerosols only or against both solid and liquid aerosols where a solid aerosol is defined as a suspension of solid particles in air, a liquid aerosol is defined as a suspension of liquid droplets in air and a water-based aerosol is defined as one which is produced from solutions and/or suspensions of solid materials in water such that the only hazardous component is attributable to the solid material.

4 Requirements

4.1 Material

- 4.1.1 After undergoing the conditioning described in 5.2.1 none of the filtering half masks shall have suffered mechanical failure of the facepiece or straps.

Three filtering half masks shall be tested.

- 4.1.2 When conditioned in accordance with 5.2.1 and 5.2.2 the filtering half mask shall not collapse.
- 4.1.3 Any material from the filter media released by the air flow through the filter should not constitute a hazard or nuisance for the wearer.

4.1.4 Metal

The use of aluminium, magnesium and titanium or alloys containing such proportions of these metals as will, on impact, give rise to frictional sparks capable of igniting flammable gas mixtures for exposed parts i.e. those which may be subjected to impact during use of the apparatus shall be restricted to a minimum.

4.2 Cleaning and Disinfecting [SIST EN 149:1996
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If the filtering half mask is designed for more than a single shift (i.e. not designed for single use only), the materials used shall withstand the cleaning and disinfecting agents recommended by the manufacturer.

4.3 Practical performance test

The filtering half mask shall undergo practical performance tests under realistic conditions. These general tests serve the purpose of checking the equipment for imperfections that cannot be determined by the tests described elsewhere in this standard.

Where in the opinion of the test station approval is not granted because practical performance tests show the apparatus has imperfections related to wearer's acceptance the test station shall provide full details of those parts of the practical performance tests which revealed these imperfections. This will enable other test stations to duplicate the tests and assess the results thereof.

Testing according to 5.3.

4.4 Leakage

4.4.1 Total inward leakage

The laboratory tests shall indicate that the filtering half mask can be used by the wearer to protect with high probability against the potential hazard to be expected.

The total inward leakage consists of three components: face seal leakage, exhalation valve leakage (if exhalation valve fitted) and filter penetration.

For filtering half masks fitted in accordance with the manufacturer's instructions, at least 46 out of the 50 individual exercise results (i.e. 10 subjects x 5 exercises) for total inward leakage shall be not greater than

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25 % for FFP1
11 % for FFP2
5 % for FFP3

and, in addition, at least 8 out of the 10 individual wearer arithmetic means for the total inward leakage shall be not greater than

22 % for FFP1
8 % for FFP2
2 % for FFP3

Testing according to 5.4.

4.4.2 Penetration of filter material

The penetration of the filter of the filtering half mask shall meet the requirements of table 1.

Table 1: Penetration of filter material

Type/class	Initial penetration of test aerosols	
	Sodium chloride test 95 l/min % max.	Paraffin oil test 95 l/min % max.
FFP1	20	-
FFP2	6	2
FFP3	3	1

A total of 12 filtering half masks shall be tested for each aerosol: 3 as received, 3 after temperature conditioning in accordance with 5.2.2, 3 after the simulated wearing treatment described in 5.2.1, and 3 after the test for mechanical strength in accordance with 5.2.3.

Testing according to EN 143.

4.5 Compatibility with skin

Materials that may come into contact with the wearer's skin shall not be known to be likely to cause irritation or any other adverse effect to health.

4.6 Flammability

The material used shall not present a danger for the wearer and shall not be of highly flammable nature.

When tested in accordance with 5.5 a filtering half mask shall not continue to burn after removal from the flame.

It is not required that the filtering half mask still has to be useable after the test.

4.7 Carbon dioxide content of the inhalation air

When tested in accordance with 5.6 the carbon dioxide content of the inhalation air (dead space) shall not exceed an average of 1,0 % (by volume).

4.8 Head harness

4.8.1 The head harness shall be designed so that the filtering half mask can be donned and removed easily.

Testing according to 5.3.

4.8.2 The head harness shall be adjustable or self-adjusting and shall be sufficiently robust to hold the filtering half mask firmly in position and be capable of maintaining total inward leakage requirements for the device.

Testing according to 5.3 and 5.4.

4.9 Field of vision

The field of vision is acceptable if determined so in practical performance tests in accordance with 5.3.

Note:

For comparative testing of the field of vision the method described in the European Standard for half masks EN 140 shall be used.

4.10 Inhalation and exhalation valves

4.10.1 Inhalation valve(s)

A filtering half mask may have one or more inhalation valve(s).

4.10.2 Exhalation valve(s)

A filtering half mask may have one or more exhalation valve(s), which shall function correctly in all orientations.

Testing according to 5.4.

- 4.10.2.1 If an exhalation valve is provided it shall be protected against dirt and mechanical damage and shall be shrouded or shall include any other device that may be necessary for the filtering half mask to comply with 4.4.

- 4.10.2.2 If an exhalation valve is provided it shall continue to operate correctly after a continuous exhalation flow of 300 l/min over a period of 30 s. A total of 3 filtering half masks shall be tested; one as received and 2 temperature conditioned in accordance with 5.2.2.

- 4.10.2.3 When the exhalation valve housing is attached to the faceblank, it shall withstand axially a tensile force of 10 N applied for 10 s.

Testing according to 5.7.

4.11 Breathing resistance

The requirements apply to valved and valveless filtering half masks.

When tested in accordance with 5.8 the breathing resistances shall meet the requirements of table 2.

Table 2: Breathing resistance

Class	Maximum permitted resistance (mbar)		
	inhalation		exhalation
	30 l/min	95 l/min	160 l/min
FFP1	0,6	2,1	3,0
FFP2	0,7	2,4	3,0
FFP3	1	3	3,0

4.12 Clogging

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4.12.1 General

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Only for single-use devices the clogging test is an optional test.

Two types of tests are available using coal dust for coal mining use and dolomite dust for other applications.

Devices designed to be "resistant to clogging" (= slow increase of breathing resistance when loaded with dust) shall be subjected to the treatment described in 5.9.

4.12.2 Breathing resistance

4.12.2.1 Valved filtering half masks

When tested for breathing resistance in accordance with 5.8 after the treatment:

- the inhalation resistances shall not exceed

FFP1:	4 mbar
FFP2:	5 mbar

 at 95 l/min continuous flow.

- the exhalation resistance shall not exceed 3 mbar at 160 l/min continuous flow.

4.12.2.2 Valveless filtering half masks

When tested for breathing resistance in accordance with 5.8 after the treatment:

- the inhalation and exhalation resistances shall not exceed
 - FFP1: 3 mbar
 - FFP2: 4 mbar
- at 95 l/min continuous flow.

4.12.3 Filter penetration

All types (valved and valveless) of filtering half masks claimed to meet the clogging requirement shall also meet the penetration requirements given in 4.4.2 after the treatment.

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4.13 Demountable parts

All demountable parts (if fitted) shall be readily connected and secured, where possible by hand.

Testing according to 5.1.

5 Testing

Note: For Summary of testing see table 3.

Table 3: Testing - Filtering half masks against particles

CLAUSE	REQUIREMENT	NO. OF SAMPLES	CONDITIONING	TEST CLAUSE
4.13 5.3,5.4 6 and 7	Visual Inspection	All	A.R.	5.1
4.2	Cleaning & Disinfection	5	A.R.	Manufacturer's instructions
4.6	Flammability	4	A.R. (2) T.C. (2)	5.5
4.7	Carbon Dioxide Content	3	A.R.	5.6
4.10.2.3	Exhalation Valve Pull	3	A.R. (1) S.W. (1) T.C. (1)	5.7
4.10.2.2	Exhalation Valve Flow	3	A.R. (1) T.C. (2)	-
4.11	Breathing Resistance	9	A.R. (3) S.W. (3) T.C. (3)	5.8
4.4.2	Particle Filter Penetration	12 (for each aerosol)	A.R. (3) M.S. (3) S.W. (3) T.C. (3)	EN 143 Clause 6.4
4.4.1	Total Inward Leakage	10	A.R. (5) T.C. (5)	5.4
4.1.2	Clogging Test (Optional for FFP1 + FFP2 single use devices only)*	3	A.R. (1) T.C. (2)	5.9
4.3,4.8.1 4.8.2,4.9	Practical Performance	2	A.R.	5.3

A.R. As Received
M.S. Mechanical Strength
S.W. Simulated Wearing Treatment
T.C. Temperature Conditioned

* Two tests available:
(a) coal dust - for mining applications
(b) dolomite dust - for other applications

5.1 Visual Inspection

The visual inspection is carried out where appropriate by the test station prior to laboratory or practical performance tests. The visual inspection includes marking and instructions for use.

5.2 Conditioning

5.2.1 Simulated wearing treatment

Conditioning by simulated wearing treatment shall be carried out by the following process.

A breathing machine is adjusted to 25 cycles/min and 2 l/stroke. The filtering half mask is mounted on a Sheffield dummy head. For testing, a saturator is incorporated in the exhalation line between the breathing machine and the dummy head, the saturator being set at a temperature in excess of 37 °C to allow for the cooling of the air before it reaches the mouth of the dummy head. The air shall be saturated at $(37 \pm 2) ^\circ\text{C}$ at the mouth of the dummy head. In order to prevent excess water spilling out of the dummy's mouth and contaminating the filtering half mask the head shall be inclined so that the water runs away from the mouth and is collected in a trap.

The breathing machine is brought into operation, the saturator switched on and the apparatus allowed to stabilize. The filtering half mask under test shall then be mounted on the dummy head. During the test time at approximately 20 min intervals the filtering half mask shall be completely removed from the dummy head and refitted such that during the test period it is fitted ten times to the dummy head.