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Draft for Development

# Respiratory protective equipment

Part 14. Specification for power assisted particle filtering devices incorporating full face masks, half masks and quarter masks

Projet à développer

Appareils de protection respiratoire

Partie 14. Appareils filtrants contre les particules à ventilation assistée avec masques complets, demi-masques et quarts de masques

Entwurf zur weiteren Ausarbeitung

Atem schutzgeräte

Teil 14. Vollmasken, Halbmasken und Viertelfmasken mit Partikelfilter und Gebläse

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### This publication is not to be regarded as a British Standard

It is being issued in the Draft for Development series of publications and is of a provisional nature because the draft European Standard that it reproduces, prEN 147 'Respiratory protective equipment — Power assisted particle filtering devices incorporating full face masks, half masks and quarter masks' is under further review to improve certain of its contents. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication.

Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. Observations which it is felt should receive attention before the official call for comments will be welcomed.

According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

## Foreword

This Draft for Development has been prepared under the direction of the Personal Safety Equipment Standards Committee and its technical content is identical with that agreed at the meeting of CEN/TC 79, Respiratory protection, held in November 1985.

This Draft for Development is one of a series dealing with respiratory protection devices based on CEN draft documents and is being published in this way to enable experience to be gained in its use within the UK.

Other Parts published or in preparation in this series are as follows:

- |          |                                                                                      |
|----------|--------------------------------------------------------------------------------------|
| Part 1   | Glossary of terms                                                                    |
| Part 2   | Classification                                                                       |
| Part 3   | Nomenclature of piece parts                                                          |
| Part 4   | Schedule of equivalent terms                                                         |
| Part 5*  | Specification for full face masks                                                    |
| Part 6*  | Specification for half and quarter masks                                             |
| Part 7*  | Specification for mouthpieces                                                        |
| Part 8*  | Specification for particle filters                                                   |
| Part 9*  | Specification for gas and combined filters                                           |
| Part 10* | Specification for fresh air hose breathing apparatus                                 |
| Part 11* | Specification for compressed air line breathing apparatus                            |
| Part 12* | Specification for self-contained open circuit breathing apparatus                    |
| Part 13* | Specification for powered particle filtering devices incorporating helmets and hoods |

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\* In preparation.

# Specification

## 0 Introduction

A given piece of respiratory equipment can only be approved when the individual components satisfy the requirements of specifications which may be complete standards or parts of standards and man 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 weight distribution and respiratory characteristics are similar to those of the complete apparatus.

## 1 Object and field of application

This Draft for Development specifies minimum requirements for power assisted respiratory protection devices which incorporate a full face mask, half mask or a quarter mask together with a particle filter. It does not cover devices designed for use in circumstances where there is or might be an oxygen deficiency (i.e. oxygen less than 17 % by volume). It also does not cover respiratory protection devices designed for escape purposes.

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

## 2 References

- BS 3928 Method for sodium flame test for air filters (other than for air supply to i.c. engines and compressors)
- BS 4400 Sodium chloride particulate test for respirator filters
- BS 5501 Electrical apparatus for potentially explosive atmospheres  
Part 7 Intrinsic safety 'i'
- BS 5969 Specification for sound level meters
- DD 97 Respiratory protective equipment  
\*Part 5 Specification for full face masks  
\*Part 6 Specification for half and quarter masks  
\*Part 8 Specification for particle filters

## 3 Definitions and description

**3.1 power assisted particle filtering device incorporating a full face mask, a half mask or a quarter mask.** A device dependent on the ambient air. The device provides protection against solid, or solid and liquid aerosols of negligible volatility and decomposition or a combination of such aerosols. The device consists of:

- (a) a full face mask, half mask or quarter mask;

(b) a power-operated blower which supplies filtered ambient air to the facepiece at a flow rate which maintains positive pressure inside the face piece up to peak inhalation flow of 120 L/min, (the energy supply for the blower may or may not be carried on the person);

(c) a filter or filters through which all the air supplied to the facepiece passes and which gives protection against solid and/or liquid aerosols or any combination of these (where the aerosol is wholly or partly liquid then the liquid has to be either water or have negligible volatility);

(d) an exhalation valve(s) through which surplus and exhaled air is discharged.

**3.2 manufacturer's minimum design flow rate.** The flow rate, as stated by the manufacturer, above which the class requirements are met.

## 4 Classification and designation

Devices are classified and designated as a function of their maximum total inward leakage as given in table 1.

Table 1. Classification of devices

| Class | Maximum total inward leakage (power-on) |
|-------|-----------------------------------------|
| PM 1  | %                                       |
| PM 2  | 5                                       |
| PM 3  | 1                                       |
|       | 0.05                                    |

The total inward leakage shall be measured against sodium chloride at the manufacturer's minimum design flow rate which shall not be less than 120 L/min.

NOTE. The 'power-off' state is considered to be an abnormal situation. In this state total inward leakage is measured as required by 5.3.

## 5 Requirements

### 5.1 Materials

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

**5.1.2 Cleaning and disinfection.** The materials used shall withstand the cleaning and disinfecting agents recommended by the manufacturer.

\*In preparation.

## 5.2 Facepieces

**5.2.1 General.** Where the facepiece is fitted with the standard thread connection as defined in DD 97 : Part 5 and therefore can be used with other equipment, for example with filters, it shall comply with the requirements of DD 97 : Part 5 or DD 97 : Part 6 as appropriate.

Where the facepiece is designed solely for use as a power assisted respirator it shall not be fitted with the standard thread connection and shall meet the requirements of 5.2.2 for full face masks and of 5.2.3 for half masks and quarter masks.

### 5.2.2 Full face masks

#### 5.2.2.1 Connection to full face mask

**5.2.2.1.1** The connection to the full face mask shall be gastight and shall withstand a tensile force of 500 N applied axially. Test time shall be approximately 10 s and the facepiece shall be held by the faceblank.

**5.2.2.1.2** All demountable connections shall be readily connected and secured, where possible by hand. Any means of sealing used shall be retained in position when the connection is disconnected during normal maintenance.

#### 5.2.2.2 Exhalation valve

**5.2.2.2.1** A full face mask shall have at least one exhalation valve to allow the escape of exhaled air and, where applicable, any excess air delivered by the air supply.

**5.2.2.2.2** The exhalation valve(s) shall be protected against dirt and mechanical damage and shall be shrouded or shall include any other device that may be necessary to comply with 5.3.

**5.2.2.2.3** The exhalation valve(s) shall continue to operate correctly after a continuous exhalation flow of 300 L/min (short term, approximately 1 min). This shall be done immediately after the test in 6.4.

**5.2.2.2.4** The exhalation valve housing, mounted in the facepiece shall withstand axially a tensile force of 150 N (short term, approximately 10 s).

#### 5.2.2.3 Head harness

**5.2.2.3.1** The head harness shall be designed so that the full face mask can be donned and removed quickly.

**5.2.2.3.2** The head harness shall be adjustable and shall hold the full face mask firmly and comfortably in position.

**5.2.2.3.3** Each strap shall withstand a pull of 150 N in the direction of pulling when the full face mask is donned (short term, approximately 10 s).

#### 5.2.2.4 Oculars and visor(s)

**5.2.2.4.1** Oculars and anti-fog discs designed to serve as oculars shall be attached in a reliable and gastight manner to the face blank.

**5.2.2.4.2** Oculars shall not distort vision nor shall misting occur as subjectively determined in the course of testing as in 6.1.

**5.2.2.4.3** The field of vision shall be adequate as determined in 6.1 and when tested in accordance with 6.7 of DD 97 : Part 5 shall meet the following requirements.

(a) The effective field of vision of a full face mask fitted with a single visor shall be not less than 70 %, related to the natural field of vision, and the overlapped field of vision, related to the natural overlapped field of vision, shall be not less than 80 %.

(b) The effective field of vision of a full face mask with two oculars shall be not less than 70 %, and the overlapped field of vision shall be not less than 20 %.

**5.2.2.4.4** When tested in accordance with 6.8 of DD 97 : Part 5 oculars or visor shall not be damaged in any way that may make the mask ineffective. The effectiveness is tested in accordance with 6.8 of DD 97 : Part 5 by comparing the tightness of the full face mask before and after the test; when tested for leak tightness, the facepiece shall not indicate increased leakage after the test.

**5.2.2.5 Speech diaphragm.** Where the facepiece is designed with a speech diaphragm it shall be protected against mechanical damage and shall withstand a positive pressure of 15 mbar\* and negative pressure of 80 mbar (static pressure).

**5.2.2.6 Resistance to temperature.** The facepiece shall show no appreciable deformation and there shall be no distortion of the lenses or visor after the facepiece has been exposed:

- (a) for 72 h in a dry atmosphere at 70 °C; and
- (b) for 72 h in an atmosphere of 70 °C and a relative humidity greater than 95 %; and
- (c) for 24 h at -30 °C; and
- (d) returned to ambient conditions.

### 5.2.3 Half and quarter masks

#### 5.2.3.1 Facepiece connector

**5.2.3.1.1** The connection shall be gastight.

**5.2.3.1.2** All demountable connections shall be readily connected and secured, where possible by hand. Any means of sealing used shall be retained in position when the connection is disconnected during normal maintenance.

#### 5.2.3.2 Exhalation valve(s)

**5.2.3.2.1** A half or quarter mask shall have at least one exhalation valve to allow the escape of exhaled air and, where applicable, any excess air delivered by the air supply.

**5.2.3.2.2** The exhalation valve shall be protected against dirt and mechanical damage and shall be shrouded or shall include any other device that may be necessary to comply with 5.3.

\*1 mbar = 100 N/m<sup>2</sup> = 100 Pa.