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**Respiratory protective devices —  
Performance requirements —**

**Part 8:**

**Special application chemical,  
biological, radiological and nuclear  
(CBRN) filtering and radiological-  
nuclear (RN) filtering RPD**

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*Dispositifs de protection respiratoire — Exigences de performance —*

*Partie 8: APP d'application spéciale de filtrage chimique, biologique,  
radiologique et nucléaire (NRBC) et de filtrage radiologique-nucléaire  
(RN)*

**PROOF/ÉPREUVE**

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# Contents

Page

<b>Foreword</b>	<b>vi</b>
<b>Introduction</b>	<b>vii</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>2</b>
<b>3 Terms, definitions and abbreviations</b>	<b>2</b>
3.1 Terms and definitions	3
3.2 Abbreviated terms	4
<b>4 Designation and classification</b>	<b>5</b>
4.1 General	5
4.2 Special application CBRN1	5
4.3 Special application CBRN2	5
4.4 Special application Escape CBRN	5
4.5 CBRN RPD summary of capabilities	5
4.6 CBRN filtering RPD classes	6
4.6.1 General	6
4.6.2 CBRN filtering RPD	6
4.6.3 Escape CBRN filtering RPD	6
<b>5 RN filters - Designation and classification</b>	<b>7</b>
5.1 General	7
5.2 RN filters	7
5.3 RN filter classification	7
<b>6 Requirements</b>	<b>7</b>
6.1 General	7
6.2 Test samples	8
6.3 CBRN filtering RPD	8
6.3.1 CBRN filtering RPD operation	8
6.3.2 CBRN filtering RPD	8
6.3.3 Escape CBRN filtering RPD	10
6.4 RN filters	11
<b>7 Pre-conditioning</b>	<b>12</b>
7.1 General	12
7.2 Components excluded from pre-conditioning – Exposure to vibration	12
7.3 CBRN filtering RPD-specific pre-conditioning	13
7.3.1 Temperature and humidity pre-conditioning	13
7.3.2 Humidity pre-conditioning of filters for radioactive iodomethane test	13
<b>8 CBRN filtering RPD</b>	<b>14</b>
8.1 Requirements for complete CBRN filtering RPD	14
8.1.1 General	14
8.1.2 Airflow	15
8.1.3 Protection class	15
8.1.4 Temperature of operation	16
8.2 Chemical resistance	16
8.2.1 General	16
8.2.2 CBRN1 and CBRN2 chemical resistance requirements	16
8.2.3 Pass/fail criteria	17
8.3 Requirements for filters and components of CBRN filtering RPD	17
8.3.1 Respiratory Interfaces (RIs)	17
8.3.2 Connectors	18
8.3.3 Filters	18
8.4 CBRN filtering RPD with standardized connector	23
8.4.1 General	23

8.4.2	Components of CBRN filtering RPD with standardized connector .....	23
8.4.3	Assisted CBRN filtering RPD with a standardized connector with a tight-fitting RI .....	25
8.4.4	Assisted CBRN filtering RPD with standardized connector with a loose-fitting RI .....	26
<b>9</b>	<b>Escape CBRN filtering RPD .....</b>	<b>26</b>
9.1	General .....	26
9.2	Requirements .....	27
9.2.1	Specification of duration, <i>t</i> , of escape CBRN filtering RPD .....	27
9.2.2	Validation of Escape CBRN filtering RPD performance .....	27
9.2.3	Protection class .....	27
9.2.4	CBRN chemical resistance .....	28
9.2.5	Practical performance testing .....	29
9.3	Requirements for filters and components of Escape CBRN filtering RPD .....	29
9.3.1	RI .....	29
9.3.2	Connectors .....	29
9.3.3	Filter .....	29
<b>10</b>	<b>RN Filters — Requirements and testing .....</b>	<b>31</b>
10.1	General .....	31
10.2	Particle filter efficiency .....	32
10.3	Gas filtration performance .....	32
10.3.1	Radioactive iodomethane retention requirements .....	32
10.3.2	Organic vapour capacity requirements .....	32
10.4	RN Filters with standardized connector .....	32
10.4.1	Work rate of filters with a standardized connector .....	32
10.4.2	Mass and size of filters with a standardized connector .....	32
10.4.3	Airflow resistance of RN filters with standardized connector .....	32
<b>11</b>	<b>Multi-functional RPD .....</b>	<b>32</b>
11.1	General .....	32
11.2	CBRN1 and CBRN2 RPD .....	33
11.3	ES CBRN filtering RPD .....	33
<b>12</b>	<b>Optional features .....</b>	<b>33</b>
12.1	General .....	33
12.2	Hydration .....	33
12.3	End of service life indicator for filters (ESLI) .....	33
<b>13</b>	<b>Training components .....</b>	<b>33</b>
<b>14</b>	<b>Reliability .....</b>	<b>34</b>
<b>15</b>	<b>Inspection and practical performance testing .....</b>	<b>34</b>
<b>16</b>	<b>Test methods .....</b>	<b>34</b>
16.1	General .....	34
16.2	Toxic agent penetration and permeation tests .....	34
16.2.1	General .....	34
16.2.2	Materials and test methods .....	35
16.2.3	Liquid and vapour permeation test .....	35
16.2.4	Test report .....	37
16.3	Radioactive Iodomethane gas test .....	37
16.3.1	Test apparatus .....	37
16.3.2	Test agent .....	38
16.3.3	Filter testing .....	38
16.3.4	Test procedure .....	38
16.3.5	Radioactivity retention determination .....	39
16.3.6	Test report .....	40
<b>17</b>	<b>Marking .....</b>	<b>40</b>
17.1	General .....	40

17.2	Marking of CBRN filtering RPD and components.....	40
17.3	Escape CBRN filtering RPD marking.....	41
17.4	RN filter marking.....	42
17.5	Standardized connector .....	42
<b>18</b>	<b>Information supplied by the manufacturer .....</b>	<b>42</b>
18.1	General.....	42
18.2	CBRN filtering or RN filtering RPD information.....	42
<b>Annex A</b>	<b>(informative) Number of samples and test schedules.....</b>	<b>43</b>
<b>Annex B</b>	<b>(informative) CBRN RPD configurations.....</b>	<b>44</b>
<b>Annex C</b>	<b>(informative) Application of uncertainty of measurement.....</b>	<b>51</b>

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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.

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)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 15, *Respiratory protective devices*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

The personal protection requirements of personnel who respond to emergencies are recognised as being different from those of the regular workforce. With respect to response to incidents involving release of chemical, biological or radiological materials, or after nuclear events (CBRN events), specific requirements have to be established. The hazardous exposures occurring in such incidents can result in severe consequences for an improperly protected responder.

Specifically, for the types of protection required:

- a) Protection levels need to be high for those in the vicinity of an incident.
- b) Materials used in construction of the equipment shall withstand permeation by highly aggressive chemicals.
- c) The range of chemical protection offered by filtering systems needs to be very broad, as the opportunity for assessment of the nature of the hazard ahead of the time of use of the equipment may be limited.
- d) The efficiency of particle filtration needs to be high to protect the equipment wearer against ingress of radioactive particulate matter or biological agents.

These requirements in the ISO system are summarized in this document covering the special application CBRN. This document is an adjunct to other parts of ISO 17420 and should be read together with them.

This document provides classification of equipment, performance requirements and specific test methods for respiratory protective devices (RPD) for use in CBRN response. Selection requirements are addressed in separate documents.

**NOTE** The performance requirements included in this document refer to laboratory testing using specified test agents under specified conditions which might not indicate the performance of the device in actual usage.

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# Respiratory protective devices — Performance requirements —

## Part 8:

## Special application chemical, biological, radiological and nuclear (CBRN) filtering and radiological-nuclear (RN) filtering RPD

### 1 Scope

This document specifies the requirements for respiratory protective devices for use by workers during response to incidents involving chemical, biological radiological or nuclear (CBRN) materials used with intent to cause harm or in cases of accidental release outside traditional hazardous materials response categories. For the purposes of this document, all incidents described here are named CBRN incidents.

This document is applicable to RPD for use by personnel in the following roles:

- First responders: including police, fire service, emergency medical, search and rescue, sampling and detection teams.
- Workers needed for specific roles during response (utility, transportation, service continuity).
- Medical personnel working with casualties of CBRN incidents.
- Responders to release incidents involving nuclear materials.
- Non-emergency but CBRN-related roles.
- Workers in need of protection during escape from a CBRN or radiological release incident.
- Workers in need of protection from nuclear materials.

The requirements for RPD use by the following groups are not addressed by this document:

- Military personnel outside of first responder roles.
- Children.
- Animals.

Requirements for the following are not covered by this document:

- Collective protection systems including ventilated casualty/body bags.
- Methods of and criteria for decontamination of RPD.
- Disposal of used equipment.

This document is focused on respiratory protection requirements, but it is recognised that CBRN RPD are always used as part of an ensemble with protective clothing. The total ensemble effectiveness is not covered by this document.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 16900-1, *Respiratory protective devices — Methods of test and test equipment — Part 1: Determination of inward leakage*

ISO 16900-2, *Respiratory protective devices — Methods of test and test equipment — Part 2: Determination of breathing resistance*

ISO 16900-4, *Respiratory protective devices — Methods of test and test equipment — Part 4: Determination of gas filter capacity and migration, desorption and carbon monoxide dynamic testing*

ISO 16900-5, *Respiratory protective devices — Methods of test and test equipment — Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools and verification tools*

ISO 16900-8:2015, *Respiratory protective devices — Methods of test and test equipment — Part 8: Measurement of RPD air flow rates of assisted filtering RPD*

ISO 16972, *Respiratory protective devices — Vocabulary and graphical symbols*

ISO/TS 16973, *Respiratory protective devices — Classification for respiratory protective device (RPD), excluding RPD for underwater application*

ISO 17420-1:2021, *Respiratory protective devices — Performance requirements — Part 1: General*

ISO 17420-2:2021, *Respiratory protective devices — Performance requirements — Part 2: Requirements for filtering RPD*

ISO 17420-3, *Respiratory protective devices — Performance requirements — Part 3: Thread connection*

ISO 17420-4:2021, *Respiratory protective devices — Performance requirements — Part 4: Requirements for supplied breathable gas RPD*

ISO 17420-5:2021, *Respiratory Protective Devices — Performance Requirements — Part 5: Special application fire services - Supplied breathable gas RPD and filtering RPD*

ISO 17420-6:2021, *Respiratory protective devices — Performance requirements — Part 6: Special application escape - Filtering RPD and supplied breathable gas RPD*

ISO/TS 17420-9:—, *Respiratory Protective Devices — Performance Requirements — Part 9: Special application Chemical, Biological, Radiological and Nuclear (CBRN) supplied breathable gas devices*

IEC 60721-1, *Classification of Environmental Conditions - Part 1: Environmental Parameters and their Severities*

ASTM D2854, *Standard Test Method for Apparent Density of Activated Carbon*

ASTM D3803, *Standard Test Method for Nuclear-Grade Activated Carbon*

ASTM E300, *Standard Practice for Sampling Industrial Chemicals*

## 3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in ISO 16972, other parts of ISO 17420 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1 Terms and definitions

#### 3.1.1

##### **chemical agent**

substance that can be disseminated to cause harm, including chemical warfare agents and toxic industrial chemicals

#### 3.1.2

##### **biological agent**

micro-organism that is a pathogen and that has the potential to be used intentionally to cause harm

#### 3.1.3

##### **decontamination**

physical and/or chemical process of removing as much contamination as possible from people or equipment

#### 3.1.4

##### **gaseous**

material in the gaseous state may either be present as a gas or vapour

#### 3.1.5

##### **joint**

place at which two or more components or materials are connected or united, either rigidly or flexibly, separably or inseparably

#### 3.1.6

##### **manifold**

component which accommodates two or more filters connected to inlets with a single outlet

#### 3.1.7

##### **manufacturer**

entity that directs and controls product design, product manufacturing, or product quality assurance; can also refer to the entity that assumes the liability for the product or provides the warranty for the product

#### 3.1.8

##### **penetration**

movement of a substance through closures, seams, pinholes, or other imperfections of a protective item, or the movement of a substance through an air-purifying element without being removed

#### 3.1.9

##### **permeation**

process by which a substance migrates through a given material on a molecular level

#### 3.1.10

##### **responder**

person who intervenes in an emergency

#### 3.1.11

##### **receiver**

medical professional who works remotely from an incident

#### 3.1.12

##### **sarin**

##### **GB**

extremely toxic chemical warfare agent

Note 1 to entry: Isopropyl methyl phosphonofluoridate [IUPAC: (RS)-propan-2-yl methylphosphonofluoridate, CAS Number: 107-44-8], classified as a nerve agent

### 3.1.13

#### **shelf life**

life expectancy of CBRN RPD under proper storage, care, and maintenance conditions

### 3.1.14

#### **sulphur mustard**

#### **HD**

extremely toxic chemical warfare agent

Note 1 to entry: [IUPAC: bis(2-chloroethyl) sulphide, CAS Number: 505-60-2] classified as a vesicant (blister agent).

### 3.1.15

#### **non pre-conditioned state**

without pre-conditioning but possibly modified to carry out tests or already used in non-destructive tests

Note 1 to entry: This includes e.g., cleaning and disinfection.

### 3.1.16

#### **RPD in as worn state**

RPD where all components are connected and assembled in the way that it is intended to be used (e.g. worn by the wearer, adapted to an RPD headform or RPD headform and torso or suitable holder)

Note 1 to entry: All of the various components [e.g. for an assisted filtering device: blower unit, battery, respiratory interface (RI), filters, etc.] have been completely assembled and then connected (RI connected to the hose of the blower unit) together in accordance with the information supplied by the manufacturer..

### 3.1.17

#### **RPD in ready for use state**

RPD ready to be donned as described by the *manufacturer* (3.1.7)

Note 1 to entry: In line with the information supplied by the manufacturer for donning the RPD, further actions can be necessary.

### 3.1.18

#### **ready for assembly state**

RPD or components with seals, plugs or other environmental protective means, still in place ready to be assembled and/or donned

Note 1 to entry: RPD or components can remain sealed and plugged until donning if so stated in the information supplied by the manufacturer.

## 3.2 Abbreviated terms

CBRN	Chemical, biological, radiological, nuclear
ES CBRN	Escape CBRN RPD operating in the filtering mode
GB	Sarin
HD	Sulphur mustard
RH	Relative humidity
RI	Respiratory interface
RN	Radiological, nuclear

## 4 Designation and classification

### 4.1 General

CBRN filtering RPD are classified as CBRN1 or CBRN2.

RPD classified as CBRN3 are restricted to supplied breathable gas mode only, with requirements in accordance with ISO/TS 17420-9, and no requirements in this document apply.

The following classifications shall be used for RPD under special application CBRN, special application Escape CBRN.

### 4.2 Special application CBRN1

CBRN1 “Receiver” RPD shall:

- incorporate RIs of classes cL, cT, dL, dT, eL or eT in accordance with ISO/TS 16973;
- provide a minimum protection class PC4 in accordance with ISO/TS 16973;
- provide protection against gaseous chemical agent permeation;
- provide a minimum particle filter efficiency class F4.

### 4.3 Special application CBRN2

CBRN2 “Responder in known threat environment” RPD shall:

- incorporate RIs of classes cL, cT, dL, dT, eL or eT in accordance with ISO/TS 16973;
- provide a minimum protection class PC5 in accordance with ISO/TS 16973;
- provide protection against liquid and gaseous chemical agent permeation and penetration;
- provide a minimum particle filter efficiency class F5.

### 4.4 Special application Escape CBRN

Escape CBRN filtering RPD shall:

- incorporate RIs of classes cL, cT, dL, dT, eL or eT according to ISO/TS 16973;
- provide a minimum protection class PC4 according to ISO/TS 16973;
- provide protection against liquid and vapour chemical agent permeation and penetration.
- provide a minimum particle filter efficiency class F4.

Escape CBRN RPD operating in the filtering mode is designated ES CBRN.

### 4.5 CBRN RPD summary of capabilities

[Table 1](#) provides a matrix description of the minimum capabilities for CBRN RPD.

**Table 1 — Summary of minimum capabilities for CBRN filtering RPD and filters**

Capability	CBRN1	CBRN2	ES CBRN
Permeation and penetration test	Gaseous <sup>a</sup> only	Gaseous <sup>a</sup> and liquid	Gaseous <sup>a</sup> and liquid
RI type	T <sup>b</sup> or L <sup>c</sup>	T or L	T or L
Particle filter efficiency class	≥F4	F5	≥F4
Protection class	≥PC4	≥PC5	≥PC4
Work rate	≥W1	≥W1	Escape flow rate <sup>d</sup>
<sup>a</sup> "Gaseous" refers to both gas and vapour states. <sup>b</sup> Tight-fitting. <sup>c</sup> Loose-fitting. <sup>d</sup> In accordance with 9.2.2.			

## 4.6 CBRN filtering RPD classes

### 4.6.1 General

CBRN filtering RPD and ES CBRN filtering RPD shall follow the system classification in 4.6.2 and 4.6.3 specific to CBRN requirements.

Combined RPD operate in both filtering and supplied breathable gas mode and are classified separately for each mode.

### 4.6.2 CBRN filtering RPD

CBRN filter performance class is defined in Table 2. CBRN filtering RPD shall follow the classification:

For RPD: (protection class) (work rate class) (RI class) (particle filter efficiency class) (CBRN class)/(CBRN filter performance class).

EXAMPLE For a RPD: PC5 W1 cT F5 CBRN2/C.

For a filter: (optional standardized connector symbol) (optional ISO 17420-2 gas filter performance class) (particle filter efficiency class) (CBRN class) (CBRN filter performance class) (work rate class).

EXAMPLE For a filter with a non-standardized connector: OV1 F4 CBRN1/B W2.

EXAMPLE For a filter with a standardized connector: ☉ OV1 F5 CBRN2/A W1.

### 4.6.3 Escape CBRN filtering RPD

ES CBRN filtering RPD shall follow a classification incorporating the applicable designated duration *t* in accordance with 9.1.

For ES CBRN filtering RPD: (protection class) (RI class) (particle filter efficiency class) ES CBRN (duration).

EXAMPLE PC4 dL F5 ES CBRN 15.

RPD may have combined capability for CBRN and escape in other classes in ISO 17420-6 and the classification shall indicate this, with CBRN being the first type listed.

EXAMPLE PC4 cT F4 ES CBRN ES FF 20 – RPD for escape from CBRN incidents and from fire.

## 5 RN filters - Designation and classification

### 5.1 General

The designation “RN” applies only to filters. These are used with other RPD components in configurations specified in ISO 17420-2.

### 5.2 RN filters

Filters designated RN “Radiological-Nuclear” shall:

- satisfy the requirements for particle filter efficiency class F5;
- satisfy the requirements for organic vapour performance, as a minimum class OV1, as specified in ISO 17420-2;
- provide protection against radioactive iodine and radioactive organiodides.

### 5.3 RN filter classification

RN filters shall follow the classification (particle filter efficiency class) (ISO 17420-2 gas filter performance class) (RN) (work rate class).

EXAMPLE F5 OV1 RN w1.

NOTE Class RN can be added to filters meeting other gas filter performance classes under ISO 17420-2, so that combined capability is provided. OV classes 2, 3, and 4 are permitted.

EXAMPLE F5 OV2 AC1 RN w2.

## 6 Requirements

### 6.1 General

Unless specified in the individual clauses, CBRN filtering RPD shall be tested as a system. Although it may be possible to use components of the same design in more than one configuration of RPD, the following shall apply:

- every configuration shall meet the requirements of this document;
- components shall be marked appropriately in accordance with [Clause 17](#);
- information supplied by the manufacturer shall provide proper guidance on designed configurations and the protection provided.

The requirements specified in [Clauses 8](#) to [11](#) shall be fulfilled by all RPD or components in accordance with their class.

Unless otherwise specified in the individual requirement clauses,

- testing shall be performed on test samples without pre-conditioning,
- each sample shall pass the test, and
- testing shall be performed at ambient laboratory conditions between 16 °C and 32 °C and a relative humidity of (50 ± 30) %.

If no tolerances are given, ±10 % shall be used.

For determination of pass/fail, conformity of quantitative test measurements with specification limits is determined in accordance with [Annex C](#).