
**Respiratory protective devices —
Performance requirements —**

**Part 8:
Special application chemical,
biological, radiological and nuclear
(CBRN) filtering and radiological-
nuclear (RN) filtering RPD**

Appareils de protection respiratoire — Exigences de performances —

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

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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).

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).

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.

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.

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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 17420-9:2021, *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 D3803-91, *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 material

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

3.1.2

biological material

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

Note 1 to entry: Human pathogens are relevant to RPD selection.

3.1.3

radiological material

substance that emits ionizing radiation that can be disseminated to cause harm or released from a nuclear facility

3.1.4

nuclear material

radioactive matter resulting from fissile activity

3.1.5

decontamination

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

3.1.6

gaseous

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

3.1.7

hydration system

system, usually consisting of a connector and tube attached to a reservoir, that when attached to an RPD permits the user to drink water or other liquids specified by the manufacturer while wearing the RPD

3.1.8

joint

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

3.1.9

manifold

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

3.1.10

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

3.1.11

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

3.1.12

permeation

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

3.1.13

responder

person who intervenes in an emergency

3.1.14

receiver

medical professional who works remotely from an incident

3.1.15

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

3.1.16

shelf life

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

3.1.17

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).

3.1.18

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.

3.1.19

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..

3.1.20

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.

3.1.21

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 in accordance with ISO/TS 16973;
- provide a minimum protection class PC4 in accordance with 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 ^a only	Gaseous ^a and liquid	Gaseous ^a and liquid
RI type	T ^b or L ^c	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 ^d
^a “Gaseous” refers to both gas and vapour states. ^b Tight-fitting. ^c Loose-fitting. ^d 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 7](#). 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](#).