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Respiratory protective devices — Performance requirements —

Part 5: Special application fire and rescue services - Supplied breathable gas RPD and filtering RPD

Appareils de protection respiratoire — Exigences de performances — Partie 5: Applications particulières des pompiers et services de sauvetage - APR alimentés en gaz respirable et APR filtrants

Member bodies are requested to consult relevant national interests in ISO/TC 94/SC 14 before casting their ballot to the e-Balloting application.

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Foreword

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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).

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For an explanation on 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 the following URL: 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* in close cooperation with Subcommittee SC 14, *Firefighters' personal equipment*.

A list of all parts in the ISO 17420 series can be found on the ISO website.

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.

Introduction

This document describes requirements for RPD used for special applications fire and rescue services and its elements and components.

Some test methods are described. For other test methods references are given to the ISO 16900 series "Methods of test and test equipment" or other test methods not developed by ISO/TC 94/SC 15.

The sequence of testing follows the principle to minimize the necessary number of samples by carrying out destructive tests at the end. For safety reason it also includes that tests with test subjects are only carried out after the test samples have shown their safe performance in other tests.

To apply this standard properly consider the following:

— ISO 17420-1 specifies the general requirements for supplied breathable gas RPD and filtering RPD and cannot be used as a standard for "certification" alone. Therefore, compliance with the requirements and tests of ISO 17420-2 or ISO 17420-4 is required in addition.

The structure of the standards is as follows:

ISO 17420-1 specifies the general requirements for RPD.

ISO 17420-2 and ISO 17420-4 gives requirements for filtering or supplied breathable gas RPD and give information if any of the general requirements in Part 1 needs an addition.

EXAMPLE for ISO 17420-4 5.8.1 General

ISO 17420-1:2021, 5.8.1 applies with the following in addition:

ISO 17420-5 to ISO 17420-9 gives requirements for filtering or supplied breathable gas RPD — Special application and some of the requirements will supersede requirements specified in ISO 17420-2 or ISO 17420-4.

EXAMPLE for ISO 17420-5 7.2.1.3 Temperature of operation – level 0 — Supplied breathable gas RPD

This clause supersedes ISO 17420-4:2021, 6.1.

For more information see also the introduction in the other parts of the ISO 17420 series.

Respiratory protective devices — Performance requirements —

Part 5:
Special application fire and rescue services - Supplied breathable gas RPD and filtering RPD

1 Scope

This document specifies the minimum requirements for supplied breathable gas RPD and filtering RPD to be used for special application fire and rescue services.

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 6529:2013, *Protective clothing — Protection against chemicals — Determination of resistance of protective clothing materials to permeation by liquids and gases*

ISO 8031, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 10297, *Gas cylinders — Cylinder valves — Specification and type testing*

ISO 13506-1, *Protective clothing against heat and flame — Part 1: Test method for complete garments — Measurement of transferred energy using an instrumented manikin*

ISO 16900-1:2019, *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 16900-5, *Respiratory protective devices — Methods of test and test equipment — Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools and verification tools*

ISO 16900-6, *Respiratory protective devices — Methods of test and test equipment — Part 6: Mechanical resistance/strength of components and connections*

ISO 16900-7, *Respiratory protective devices — Methods of test and test equipment — Part 7: Practical performance test methods*

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

ISO 16900-10, *Respiratory protective devices — Methods of test and test equipment — Part 10: Resistance to ignition, flame, radiant heat and heat*

ISO 16900-12, *Respiratory protective devices — Methods of test and test equipment — Part 12: Determination of volume-averaged work of breathing and peak respiratory pressures*

ISO 16900-14, *Respiratory protective devices — Methods of test and test equipment — Part 14: Measurement of sound pressure level*

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

ISO/TS 16975-1:2016, *Respiratory protective devices — Selection, use and maintenance — Part 1: Establishing and implementing a respiratory protective device programme*

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

ISO 80079-36:2016, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*

IEC 60068-2-27:2010, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock*

IEC 60068-2-64, *Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance*

IEC 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements*

IEC 60529:2013, *Degrees of protection provided by enclosures (IP Code)*

IEC 60721-1:2002, *Classification of environmental conditions — Part 1: Environmental parameters and their severities*

IEC 60721-3-2:2018, *Classification of environmental conditions — Part 3-2: Classification of groups of environmental parameters and their severities — Transportation and Handling*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity standard for industrial environments*

EN 15333-1:2008, *Respiratory equipment - Open-circuit umbilical supplied compressed gas diving apparatus - Part 1: Demand apparatus*

ASTM D1003:2013, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics*

ASTM D6413, *Standard Test Method for Flame Resistance of Textiles (Vertical Test)*

NFPA 1981:2019, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*

3 Terms, definitions, abbreviations and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16972 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 http://www.electropedia.org/

3.1.1
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.

3.1.2
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 SCBA: cylinder, respiratory interface, demand valve, harness etc.) have been completely assembled and then connected (RI connected to the demand valve) together in accordance with the information supplied by the manufacturer.

3.1.3
component in ready for assembly state
component with seal, plug, packaging or other environmental protective means, still in place

3.1.4
RPD in ready for use state
RPD ready to be donned as described by the manufacturer

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

3.2 Abbreviated terms

RI	Respiratory Interface
RPD	Respiratory protective devices

4 Classification overview

ISO 17420-2:2021, Clause 4 or ISO 17420-4:2021, Clause 4 applies.

4.1 General

ISO 17420-1:2021, 4.1 applies.

4.2 Supplied breathable gas RPD

This subclause applies in addition to ISO 17420-4:2021, Clause 4.

Additionally supplied breathable gas RPD may be classified for one or more special applications, as given in Table 1.

Table 1 — Special application classification supplied breathable gas RPD

Special application	Classes
Fire and rescue services	FF5 (Firefighting type R2)[a] FF4 (Firefighting type R1)[a] FF3 (Hazardous material) FF2 (Rescue) FF1 (Wildland firefighting)
[a] Selection of the RPD shall be based on a risk assessment, which includes compatibility of the selected RPD being worn with other items of PPE, taking into consideration operational practices, environmental conditions, local building regulations or standards and other technical standards. See e.g. ISO 17420-1:2021, 5.4 and ISO 11999-2. FF4 (type R1) and FF5 (type R2) items of RPD have differing performance characteristics. For example, type R1 provides material thermal performance tested at 180 °C maximum and is commonly used for defensive firefighting and is generally not intended to be used for internal attack firefighting. Type R2 provides a material thermal performance tested at 260 °C maximum and is commonly used for internal attack firefighting.	

Example for a supplied breathable gas RPD for special application firefighting type R1 with protection class (PC5), work rate class (W3), RI class (cT), supplied breathable gas capacity class (S1800) and special application class (FF4)

Marking for the given example PC5 W3 cT S1800 FF4

4.3 Filtering RPD

This subclause applies in addition to ISO 17420-2:2021, Clause 4.

Additionally filtering RPD may be classified for one or more special applications, as given in Table 2.

Table 2 — Special application classification of filtering RPD

Special application	Classes
Fire and rescue services	FF2 (Rescue) FF1 (Wildland firefighting)

Example for a filtering RPD for special application wildland firefighting with protection class (PC3), work rate class (W2), RI class (bT), particle filter performance class (F3) and special application class (FF1).

Marking for the given example PC3 W2 bT F3 FF1

Multi-functional filtering RPD have separate classifications for each function, i.e. one classification for the unassisted mode and one classification for the assisted mode.

5 General requirements for RPD

ISO 17420-1:2021, Clause 5 and ISO 17420-2:2021, Clause 5 or ISO 17420-4:2021, Clause 5 applies.

6 Basic requirements for supplied breathable gas RPD and filtering RPD

All requirements of ISO 17420-2:2021, Clause 6 or ISO 17420-4:2021, Clause 6 apply unless superseded by this document and indicated in the relevant clauses.

NOTE 1 Optional features are also given in ISO 17420-2 or ISO 17420-4.

NOTE 2 Where requirements are superseded by those in Clause 7 of this document, the test schedules given in ISO 17420-2:2021 Annex C or ISO 17420-4:2021, Annex C can be used as a guideline for testing.

7 Special application for fire and rescue services filtering and supplied breathable gas RPD

7.1 Special application for fire and rescue services RPD – Requirement matrices

7.1.1 General

Supplied breathable gas fire and rescue services RPD shall fulfil all requirements specified in Table 3.

Filtering fire and rescue services RPD shall fulfil all requirements specified in Table 4.

7.1.2 Supplied breathable gas fire and rescue services RPD

Table 3 gives an overview about requirements and preconditioning of supplied breathable gas fire and rescue services RPD.

Table 3 shall be read as follows:

In the first column the requirements are specified. In the third to seventh column the required pre-conditioning for different fire and rescue services classes are specified.

For each pre-conditioning within one line of the cell different sample(s) shall be used. At least one RPD shall be tested after each required pre-conditioning.

For the requirement 7.2.1.3 and class hazardous materials (FF3) the following applies.

At least one sample shall be pre-conditioned VS & CE (Exposure to vibration and shock – firefighting and enhanced resistance to corrosion – constant exposure).

At least one further sample shall be pre-conditioned DR (Exposure to impact from drop).

Table 3 — Special application requirement overview – Supplied breathable gas fire and rescue services RPD

Requirement	Title	Wildland Firefighting	Rescue	Hazardous Materials	Firefighting	
		FF1	**FF2**	**FF3**	**FF4**[a]	**FF5**[a]
		Protection class ≥PC3	Protection class ≥PC3	Protection class ≥PC4	Protection class ≥PC5	Protection class ≥PC5
		Work rate class ≥W2	Work rate class ≥W2	Work rate class ≥W2	Work rate class ≥W3	Work rate class =W4
		Pre-conditioning				
7.2.1.3	Temperature of operation – level 0	VS&CE	VS&CE	VS&CE	VS&CE	VS&CE
		DR	DR	DR	DR	DR
7.2.1.5	Temperature of operation – level 1	AR/NP	AR/NP	AR/NP	AR/NP	AR/NP
7.2.1.7	Temperature of operation – level 2- type R1	—[b]	—[b]	—[b]	AR/NP	—[b]
7.2.1.8	Temperature of operation – level 3- type R2	—[b]	—[b]	—[b]	—[b]	AR/NP
7.2.1.9	Temperature of operation at level 2 and flammability	—[b]	—[b]	—[b]	AR/NP	AR/NP
7.2.1.10	Temperature of operation at level 3 and flammability	—[b]	—[b]	—[b]	—[b]	AR/NP
7.2.1.11	Thermal shock	—[b]	AR/NP	AR/NP	AR/NP	AR/NP
7.2.2.2	Fabric material flame resistance performance	AR/NP	AR/NP	AR/NP	—[b]	—[b]
7.2.3.2	Radiant heat – level 1	AR/NP	AR/NP	AR/NP	AR/NP	AR/NP
7.2.3.3	Radiant heat – level 2	—[b]	—[b]	—[b]	AR/NP	AR/NP
7.2.3.4	Radiant heat – level 3	—[b]	—[b]	—[b]	—[b]	AR/NP
7.2.4	Resistance to hot particles	AR/NP	AR/NP	AR/NP	AR/NP	AR/NP
7.2.5.1	Chemical resistance of materials	—[b]	AR/NP	AR/NP	AR/NP	AR/NP
7.2.6	Hazardous materials	—[b]	—[b]	AR/NP	O	O
7.2.7.1	Contact with hot and cold surfaces	AR/NP	AR/NP	AR/NP	AR/NP	AR/NP

[a] Selection of the RPD shall be based on a risk assessment, which includes compatibility of the selected RPD being worn with other items of PPE, taking into consideration operational practices, environmental conditions, local building regulations or standards and other technical standards. See e.g. ISO 17420-1:2021, 5.4 and ISO 11999-2.

FF4 (type R1) and FF5 (type R2) items of RPD have differing performance characteristics.

For example, type R1 provides material thermal performance tested at 180 °C maximum and is commonly used for defensive firefighting and is generally not intended to be used for internal attack firefighting. Type R2 provides a material thermal performance tested at 260 °C maximum and is commonly used for internal attack firefighting.

[b] — means that a test is not required for this combination of requirement and special application class.

[c] X means exposure to dust has to be addressed by the FMEA (see 7.2.19).

AR/NP as received or in non pre-conditioned.

VS & CE Exposure to vibration and shock (see 7.3.2) and enhanced resistance to corrosion –constant exposure (see 7.3.5).

DR Exposure to impact from drop (see 7.3.4).

O Optional feature.