DRAFT INTERNATIONAL STANDARD

ISO/DIS 17420-5

ISO/TC **94**/SC **15**

Secretariat: **DIN**

Voting begins on:
2020-03-20

Voting terminates on:
2020-06-12

Respiratory protective devices — Performance requirements —

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

ICS: 13.340.30

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

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 17420-5:2020(E)

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Published in Switzerland

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Foreword

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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.

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 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60068-2-64:2009, Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance

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

IEC 60079-11, Explosive atmospheres — Part 11: Equipment protection by intrinsic safety "i"

IEC/TS 60079-32-1:2013, Explosive atmospheres. Electrostatic hazards, guidance

IEC 60079-32-2:2015, Explosive atmospheres — Part 32-2: Electrostatics hazards — Tests

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

IEC 60721-1:1990, 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

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 16900-1:2014, 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 level

ISO 16972, Respiratory protective devices — Terms, definitions, graphical symbols and units of measurement

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

ISO 17420-1:201x, Respiratory protective devices — Performance requirements — Part 1: General

ISO 17420-2:201x, Respiratory protective devices — Performance requirements — Part 2: Requirements for filtering RPD

ISO 17420-4:201x, Respiratory protective devices — Performance requirements — Part 4: Requirements for supplied breathable gas RPD

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)

ASTM E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

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

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

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:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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 assembly state
RPD with seal, plug, or other environmental protective means, still in place

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

3.1.5
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.

Note 2 to entry: For escape devices this includes also the RPD in its carrying container unopened.

3.2 Abbreviated terms

RI	Respiratory Interface
RPD	Respiratory protective devices

3.3 Symbols

3.3.1

Crossed out 2: “For single shift use only”

4 Classification overview

ISO 17420-2:201x, Clause 4 or ISO 17420-4:201x, Clause 4 applies.

4.1 General

ISO 17420-1:201x, 4.1 applies.

The following subclause applies in addition to ISO 17420-4:201x, *Clause 4*:

4.2 Supplied breathable gas RPD

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 (Structural firefighting type R2)[a] FF4 (Structural firefighting type R1) [a] FF3 (Hazardous material) FF2 (Rescue) FF1 (Wildland firefighting)
[a] FF4 (R1) and FF5 (R2) items of RPD have differing performance characteristics. For example, level 2- R1 provides material thermal performance tested at 180°C maximum and is commonly used for defensive firefighting and is not intended to be used for internal attack firefighting. Level 2- R2 provides a material thermal performance tested at 260°C maximum and is commonly used for internal attack firefighting. To ensure compatibility of the selected RPD being worn with other items of PPE, a risk assessment process that includes consideration of operational practices, environmental conditions, local building standards and others shall be used to determine the correct level of RPD thus ensuring compatibility.	

Example for a supplied breathable gas RPD for special application structural 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

The following subclause applies in addition to ISO 17420-2:201x, *Clause 4*.

4.3 Filtering RPD

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 17420-1:201x, Clause 5 and ISO 17420-2:201x, Clause 5 or ISO 17420-4:201x, Clause 5 applies.

6 Basic requirements for supplied breathable gas RPD and filtering RPD

All requirements of ISO 17420-2:201x, Clause 6 or ISO 17420-4:201x, Clause 6 applies 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 17420-2:201x, Annex C or ISO 17420-4:201x, Annex C can be used as a guideline for testing.

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

7.1 Special application 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.

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

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

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

At least one further sample shall be preconditioned DU (Exposure to dust).

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

Requirement	Title	Wildland Firefighting FF1	Rescue FF2	Hazardous Materials FF3	Structural Firefighting FF4 [a]	Structural Firefighting 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
				DU[c]	DU	DU
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- R1	— [b]	—	—	AR/NP	—
7.2.1.8	Temperature of operation – level 2- R2	—	—	—	—	AR/NP
7.2.1.9	Temperature of operation at level 3 and flammability	—	—	—	AR/NP	AR/NP
7.2.1.10	Temperature of operation at level 4 and flammability	—	—	—	—	AR/NP
7.2.1.11	Thermal shock	—	—	—	—	AR/NP
7.2.2.2	Fabric material flame resistance performance	AR/NP	AR/NP	AR/NP	—	—
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	—	—	—	AR/NP	AR/NP
7.2.3.4	Radiant heat – level 3	—	—	—	—	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	—	AR/NP	AR/NP	AR/NP	AR/NP
7.2.6	Hazardous materials	—	—	AR/NP	—	—
7.2.7.1	Contact with hot and cold surfaces	AR/NP	AR/NP	AR/NP	AR/NP	AR/NP
7.2.8	Avoidance of frictional sparks	—	AR/NP	AR/NP	AR/NP	AR/NP
7.2.9	Visor after chemical exposure	—	AR/NP	AR/NP	AR/NP	AR/NP
Fehler! Verweisquelle konnte nicht gefunden werden.	Connections	—	AR/NP	AR/NP	AR/NP	AR/NP
7.2.10.3	Abrasion resistance of visor	—	—	AR/NP	AR/NP	AR/NP
7.2.11	Requirements for audible warning devices	—	—	AR/NP	AR/NP	AR/NP
7.2.12	Practical performance - RPD	—	AR/NP	AR/NP	AR/NP	AR/NP