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Respiratory protective devices — Performance requirements —

Part 6: Special application escape - Filtering RPD and supplied breathable gas RPD

Appareils de protection respiratoire — Exigences de performances —

Partie 6: Application particulière d'évacuation - APR alimentés en gaz respirable et APR filtrants

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Contents

Page

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*.

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 including its elements and components used for special applications for escape devices.

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. It also includes for safety reason 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 6: Special application escape - Filtering RPD and supplied breathable gas RPD

1 Scope

This document specifies the requirements for supplied breathable gas RPD and for filtering RPD to be used for special application escape for use in the workplace to protect the wearer.

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 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 16900-1:2019, *Respiratory protective devices — Methods of test and test equipment — Part 1: Determination of inward leakage*

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

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 16900-9, *Respiratory protective devices — Methods of test and test equipment — Part 9: Determination of carbon dioxide content of the inhaled gas*

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

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 23269-2:2011, *Ships and marine technology — Breathing apparatus for ships — Part 2: Self-contained breathing apparatus for shipboard firefighters*

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 60079-32-1:2013, *Explosive atmospheres — Part 32-1: Electrostatics hazards — Guidance*

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

IEC 60721-1:2003, *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 50303, *Group 1, category M1 equipment intended to remain functional in atmospheres endangered by firedamp and/or coal dust*

3 Terms, definitions and abbreviations

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 assisted filtering RPD: blower unit, battery, 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.

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

3.1.4
RPD in ready for assembly state
RPD with seals, 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, but seals, plug, or other environmental protective means are already removed

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 container unopened.

3.2 Abbreviated terms

RI	Respiratory Interface
RPD	Respiratory Protective Devices
V_T	Tidal volume
WoB	Work of Breathing

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.

The following subclause applies in addition to ISO 17420-2:2021, Clause 4:

4.2 Supplied breathable gas RPD for escape

In addition, 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
Escape	ES MN t^a (Underground mining escape) ES MA t^a (Marine escape) ES FF t^a (Escape from fire) ES t^a (Escape general supplied breathable gas)
[a] Nominal service life in *t* minutes, e.g. ES 15.	

Example for a special application escape with Protection class (PC4), RI class (dL) and special application class (ES 15).

EXAMPLE PC4 dL ES 15.

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

4.3 Filtering RPD for escape

In addition, 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
Escape	ES MN t^a (Underground Mining Escape) ES FF t^a (Escape from fire) ES XX[b] t^a (Escape general filtering)
[a] Nominal service life in "t" minutes, e.g. ES 10. [b] Gas type.	

Example for a special application escape general with Protection class (PC3), RI class (bT) and special application escape (ES), particle filter performance class (F3) and gas filter class (AC) and class t (10).

EXAMPLE PC3 bT ES F3 AC10.

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 apply.

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 test schedules given in ISO 17420-2:2021, Annex C or ISO 17420-4:2021, Annex C can be used as a guideline.

7 Special application for supplied breathable gas escape RPD and filtering escape RPD

7.1 Special application escape RPD - Requirement matrices

7.1.1 General

Supplied breathable gas escape RPD shall fulfil all requirements given in Table 3

Filtering escape RPD shall fulfil all requirements given in Table 4.

7.1.2 Supplied breathable gas RPD — Escape

Table 3 gives an overview about requirements and preconditioning of special application supplied breathable gas RPD — Escape.

For each line in the table, at least one RPD shall be tested after the required preconditioning or set of pre-conditionings where combined by “&”. Combined preconditioning shall be completed in the order specified.

Table 3 shall be read as follows:

In the first column the clause numbers of the requirements are given. In the third to sixth column the required pre-conditioning for different escape classes are given.

In the second column the requirement is titled.

For each pre-conditioning within one line of the cell different sample(s) shall be used.

For the requirement 7.2.10.1 and class marine escape the following applies:

At least one sample shall be pre-conditioned TH&VSS&IE (Exposure to temperature and humidity, exposure to vibration and shock – marine and intermittend exposure).

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

For the total number of samples see ISO 17420-1:2021, 5.1.

Table 3 — Special application requirement overview — Supplied breathable gas RPD — Escape

Requirement	Title	Supplied breathable gas escape general ES t[a] Protection class ≥PC3	Escape from fire ES FF t[a] Protection class ≥PC3	Marine escape ES MA t[a] Protection class ≥PC3	Underground mining escape ES MN t[a] Protection class ≥PC3
		Pre-conditioning			
7.2.1	Exposure to dust	X[b]	X[b]	X[b]	X[b]
7.2.2.1[c]	Contact with hot and cold surfaces – Supplied breathable gas escape RPD	TH&VS&IE	TH&VSF&IE	TH&VSS&IE	TH&VSM&PR&IE
7.2.3	Avoidance of frictional sparks	AR/NP	AR/NP	AR/NP	AR/NP
7.2.4.1	Six burner dynamic	—[d]	AR	AR	AR
7.2.6.2	Intrinsic Safety – Firefighting	—[d]	AR/NP	—[d]	—[d]
7.2.6.3	Intrinsic Safety – Mining	—[d]	—[d]	—[d]	AR/NP
7.2.6.4	Intrinsic Safety – Marine	—[d]	—[d]	AR/NP	—
7.2.7.1	Antistatic properties - General	—[d]	AR/NP	AR/NP	AR/NP

[a] Nominal service life in "t" min, see also 7.2.9.1.

[b] X means exposure to dust has to be addressed by the FMEA (see 7.2.1).

[c] Will be determined during the validation of escape RPD performance regime specified in 7.2.10.

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

AR as received.

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

TH&VS&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock (ISO 17420-4:2021, 6.11.1.1.3) and intermittent exposure to salt spray (7.3.3).

TH&VSF&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock-fire fighting (ISO 17420-5:—, 7.3.2) and intermittent exposure to salt spray (7.3.3).

TH&VSS&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock marine (7.3.5) and intermittent exposure to salt spray (7.3.3).

TH&VSM&PR&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock mining (7.3.6), resistance to changes in atmospheric pressure (7.3.2) and intermittent exposure to salt spray (7.3.3).

DR Exposure to impact from drop (7.3.1).

Table 3 *(continued)*

7.2.7.2	Antistatic properties – Fire-fighting	—[d]	AR/NP	—[d]	—[d]
7.2.7.3	Antistatic properties - Mining	—[d]	—[d]	—[d]	AR/NP
7.2.7.4	Antistatic properties - Exposed RPD hoses	—[d]	AR/NP	AR/NP	AR/NP
7.2.8	Eye irritation (external)	AR/NP	AR/NP	AR/NP	AR/NP
7.2.9.2	Determination of duration (*t*) of Escape RPD	TH&VS&IE	TH&VSF&IE	TH&VSS&IE	TH&VSM&PR&IE
		DR	DR	DR	DR
7.2.10.1	Validation of escape RPD performance requirements	TH&VS&IE	TH&VSF&IE	TH&VSS&IE	TH&VSM&PR&IE
		DR	DR	DR	DR
7.2.10.4	Donning and doffing	AR/NP	AR/NP	AR/NP	AR/NP

[a] Nominal service life in "*t*" min, see also 7.2.9.1.

[b] X means exposure to dust has to be addressed by the FMEA (see 7.2.1).

[c] Will be determined during the validation of escape RPD performance regime specified in 7.2.10.

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

AR as received.

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

TH&VS&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock (ISO 17420-4:2021, 6.11.1.1.3) and intermittent exposure to salt spray (7.3.3).

TH&VSF&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock-fire fighting (ISO 17420-5:—, 7.3.2) and intermittent exposure to salt spray (7.3.3).

TH&VSS&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock marine (7.3.5) and intermittent exposure to salt spray (7.3.3).

TH&VSM&PR&IE Exposure to temperature and humidity (ISO 17420-4:2021, 6.11.1.1.2), exposure to vibration and shock mining (7.3.6), resistance to changes in atmospheric pressure (7.3.2) and intermittent exposure to salt spray (7.3.3).

DR Exposure to impact from drop (7.3.1).

7.1.3 Filtering escape RPD

Table 4 gives an overview about requirements and preconditioning of filtering RPD.

At least one RPD shall be tested after each required preconditioning. Pre-conditionings shall not be combined.

Table 4 shall be read as follows:

In the first column the requirements are given. In the third to fifth column the required pre-conditioning for different escape classes are given.

In the second column the requirement is titled.

For each pre-conditioning within one line of the cell different sample(s) shall be used.

For the requirement 7.2.10.2.2 and class mining escape the following applies:

At least one sample shall be pre-conditioned TH&VSM&PR&IE (Exposure to temperature and humidity, exposure to vibration and shock – mining, exposure to positive pressure and intermittent exposure).

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

For the total number of samples see ISO 17420-1:2021, 5.1.