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**Respiratory protective devices —  
Performance requirements —**

**Part 4:  
Requirements for supplied  
breathable gas RPD**

*Appareils de protection respiratoire — Exigences de performances —*

*Partie 4: Exigences pour les équipements de protection respiratoire  
alimentés en gaz respirable*

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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 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](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*.

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](http://www.iso.org/members.html).

## Introduction

This document describes basic requirements for supplied breathable gas respiratory protective devices (RPD) and its elements and components.

Requirements for RPD used in environments for special applications are given in the relevant parts of the ISO 17420 series.

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.

[Annex A](#) gives information about reliability.

[Annex B](#) features an example of a FMEA (Failure Mode and Effects Analysis).

[Annex C](#) gives the test schedules including any pre-conditioning and number of samples.

[Annex D](#) provides information for normalisation of test results.

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.

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# Respiratory protective devices — Performance requirements —

## Part 4: Requirements for supplied breathable gas RPD

### 1 Scope

This document specifies requirements for the performance and testing of supplied breathable gas respiratory protective devices (RPD) in accordance with their classification and for use in the workplace to protect the wearer from hazardous atmospheres and/or environments.

### 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.

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

ISO 10297:2014, *Gas cylinders — Cylinder valves — Specification and type testing*

ISO 10297:2014/Amd 1:2017, *Gas cylinders — Cylinder valves — Specification and type testing — Amendment 1: Pressure drums and tubes*

ISO 12209, *Gas cylinders — Outlet connections for gas cylinder valves for compressed breathable air*

ISO 13341, *Gas cylinders — Fitting of valves to gas cylinders*

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:—<sup>1)</sup>, *Respiratory protective devices — Methods of test and test equipment — Part 6: Mechanical resistance/strength of components and connections*

ISO 16900-7:2020, *Respiratory protective devices — Methods of test and test equipment — Part 7: Practical performance test methods*

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

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

ISO 16900-13, *Respiratory protective devices — Methods of test and test equipment — Part 13: RPD using regenerated breathable gas and special application mining escape RPD: Consolidated test for gas concentration, temperature, humidity, work of breathing, breathing resistance, elastance and duration*

1) Under preparation, Stage at the time of publication ISO/DIS 16900-6:2020.

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

EN 144-2, *Respiratory protective devices — Gas cylinder valves — Part 2: Outlet connections*

EN 388:2016, *Protective gloves against mechanical risks*

CGA V-1, *Compressed Gas Cylinder Valve Outlet and Inlet Connections*

JIS B 8246, *Valves for high pressure gas cylinders*

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 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*

### **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**

##### **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: gas 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.

##### **3.1.2**

##### **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, such as connections of components as part of the donning process.

**3.1.3****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.

**3.1.4****integrated RPD**

RPD designed so that components in the breathable gas supply chain are non separable

**3.1.5****replacement part**

identical to the one originally supplied with the RPD by the manufacturer, and declared interchangeable by the manufacturer

**3.2 Abbreviated terms**

BTPS	Body Temperature Pressure Saturated
STPD	Standard Temperature Pressure Dry
FMEA	Failure Mode and Effects Analysis
RI	Respiratory Interface
$V_T$	Tidal volume
WoB	Work of Breathing

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### 3.3 Symbols

#### 3.3.1



Product information; information point (ISO 7000-2760).

Indication for the RI that it is a part of a RPD system with multiple configurations.

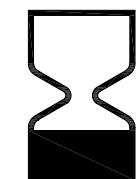
#### 3.3.2



Operator's manual; operating instructions (ISO 7000-1641).

Booklet: "See information supplied by the RPD manufacturer"

#### 3.3.3



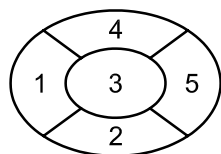
yyyy/mm

Use by date (ISO 7000-2607)

Hourglass: "End of shelf life"

Key: yyyy year, mm month

#### 3.3.4



RPD headform number allocation for size designation

## 4 Classification overview

ISO 17420-1:2021, 4.1 applies with the following addition:

The classification of a supplied breathable gas RPD is determined by the appropriate combination of the classes:

Example for supplied breathable gas RPD with protection class (PC5), work rate class (W3), RI class (cT), supplied breathable gas capacity class (S1800).

Marking for the given example    PC5 W3 cT S1800

Multifunctional supplied breathable gas RPD have separate classifications for each function, e.g. one classification as an airline RPD and one classification as an non-airline RPD.

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

Additionally supplied breathable gas RPD may be classified for one or more special applications, as given in ISO 17420-5 to ISO 17420-9.

## 5 General requirements

### 5.1 General

ISO 17420-1:2021, 5.1, applies.

### 5.2 Field of vision

ISO 17420-1:2021, 5.2, applies.

### 5.3 Resistance to flame – Single burner dynamic

ISO 17420-1:2021, 5.3, applies.

### 5.4 Compatibility with additional equipment

ISO 17420-1:2021, 5.4, applies.

### 5.5 Monitor performance

ISO 17420-1:2021, 5.5, applies with the following addition:

If the performance of the RPD is dependent on high pressure it shall be equipped with a pressure monitor, such as a pressure gauge, that continuously monitors that pressure. The accuracy of the pressure monitor shall be within  $\pm 2,5$  % of the full scale with the exception of the redundant cylinder valve pressure gauge.

Check in accordance with [7.2](#) and [Clause 9](#).

### 5.6 Warning and checking device(s)

#### 5.6.1 Performance of warning device(s)

RPD shall be checked after sequential pre-conditioning in accordance with [6.11.1.1](#).

RPD powered by an energy source shall be equipped with a low energy warning device to warn the wearer at least 5 min prior to the performance of the RPD falling below the manufacturer's minimum design conditions. From the activation of the warning the RPD shall be tested in accordance with [6.2](#) for a period of 5 min but with a fixed setting of 35 l/min, see [Table 1](#).

Check in accordance with [7.2](#) and [Clause 9](#).

Any warning shall be detectable by the wearer without any intervention by the wearer. Any warning shall be detectable by the wearer within 15 s.

Testing shall be performed in accordance with ISO 16900-7:2020, Annex B, k).

Any warnings which require different reactions by the wearer shall be distinguishable from one another.

Check in accordance with [7.2](#).

During use, warning devices shall not switch off automatically and shall not be capable of being switched off by the wearer while the cause of the warning remains other than to correct the warning condition.

Check in accordance with [7.2](#).

### 5.6.2 Type Sxxxx RPD

Type Sxxxx RPD using high pressure compressed breathable gas shall have a suitable warning device that operates when the cylinder pressure drops to a predetermined level to warn the wearer.

This warning device shall be activated at a pressure corresponding to at least 200 l of breathable gas per person connected.

The warning shall continue for at least 1 min.

Testing shall be performed in accordance with [6.2](#) and assessment shall be performed in accordance with [7.2](#).

### 5.6.3 Type Sxxxx RPD using generated breathable gas

For RPD using generated breathable gas, a warning shall be activated at, or prior to, the point where any limits in [6.3](#), [6.5](#) and [6.6](#) are no longer met.

### 5.6.4 Type SY RPD

Type SY RPD using medium or high pressure compressed gas shall be equipped with a warning device to indicate to the wearer when the manufacturer's minimum design conditions are not being achieved.

Testing shall be performed in accordance with [6.2](#) and assessment shall be performed in accordance with [7.2](#).

### 5.6.5 Performance of checking device

ISO 17420-1:2021, 5.6.2, applies.

## 5.7 Protection class determination

### 5.7.1 General

ISO 17420-1:2021, 5.7.1, applies.

### 5.7.2 Total inward leakage (TIL)

ISO 17420-1:2021, 5.7.2, applies.

## 5.8 Validation by practical performance

### 5.8.1 General

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

Two RPD as received shall undergo practical performance tests.

Prior to the practical performance testing the RPD performance shall have passed the tests according to at least the following clauses:

— Warning and checking device(s) ([5.6](#));