INTERNATIONAL STANDARD

ISO 16900-2

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Respiratory protective devices — Methods of test and test equipment —

Part 2: Determination of breathing resistance

Appareils de protection respiratoire — Méthodes d'essai et équipement d'essai —

Partie 2: Détermination de la résistance respiratoire

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 16900-2 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 15, *Respiratory protective devices*.

ISO 16900 consists of the following parts, under the general title *Respiratory protective devices — Methods of test and test equipment*:

— *Part 1: Determination of inward leakage*

— *Part 2: Determination of breathing resistance*

— *Part 3: Determination of particle filter penetration*

— *Part 4: Determination of gas filter capacity*

Introduction

This part of ISO 16900 is intended as a supplement to the relevant performance standards for respiratory protective devices. Test methods are specified for complete devices or parts of devices. If deviations from the test method given in this part of ISO 16900 are necessary, these deviations will be specified in the relevant performance standard.

Respiratory protective devices — Methods of test and test equipment —

Part 2: Determination of breathing resistance

1 Scope

This part of ISO 16900 specifies the method(s) of test for breathing resistance for:

— complete respiratory protective devices [1];

— filters for respiratory protective devices;

— respiratory interfaces.

2 Normative references

The following referenced documents are indispensable for the application 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 16972, *Respiratory protective devices — Terms, definitions, graphical symbols and units of measurement*

ISO/TS 21748:2004, *Guidance for the use of repeatability, reproducibility and trueness estimates in measurement uncertainty estimation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16972 apply together with the following.

3.1
static breathing resistance
differential pressure caused by an RPD when the breathing gas is passed through the device at a constant flow

3.2
dynamic breathing resistance
differential pressure caused by an RPD when the breathing gas is delivered by a breathing machine adjusted to a specified breathing minute volume and waveform

1) Respiratory protective device = RPD.

4 Prerequisites

In order to implement this part of ISO 16900, at least the following parameters need to be specified in the performance standard:

— the number of specimens;

— the selection and type(s) of support such as dummy head/dummy torso;

— any prior conditioning or testing;

— flow rate (static test method);

— breathing minute volume and waveform (dynamic test method);

— test method;

— any deviations from the method(s).

5 General test requirements

Unless otherwise specified, the values stated in this part of ISO 16900 are expressed as nominal values. Except for temperature limits, values which are not stated as maxima or minima shall be subject to a tolerance of ± 5 %. Unless otherwise specified, the ambient temperature for testing shall be between 16 °C and 32 °C and 50 % ± 30 % RH. Any temperature limits specified shall be subject to an accuracy of ± 1°C.

6 Method 1: Static breathing resistance

6.1 Principle

The device is mounted on a support as described in the performance standard, and air is drawn through the device at a constant flow.

NOTE The convention of reporting breathing resistance is that if, during the inhalation resistance test, the pressure inside the facepiece relative to atmosphere is negative, no sign is used in front of the result. If the relative pressure inside the facepiece is positive, the result is prefixed with a '+'.

6.2 Equipment

6.2.1 Pressure gauge, calibrated in the appropriate range relevant to the performance standard.

6.2.2 Flowmeter(s), calibrated in the appropriate volumetric flow rate range and corrected for the ambient temperature and ambient atmospheric pressure during use.

6.2.3 Ambient temperature and ambient atmospheric pressure measuring equipment.

6.2.4 Regulated blower/compressed air source and/or a **variable suction device**.

6.2.5 Support for the device, (e.g. filter holder, dummy head or dummy torso) as described in the performance standard.

NOTE It is important that the holder of the filter or facepiece does not reduce the effective working area of the filter or facepiece.

6.3 Procedure

6.3.1 Procedure for filters for respiratory protective devices

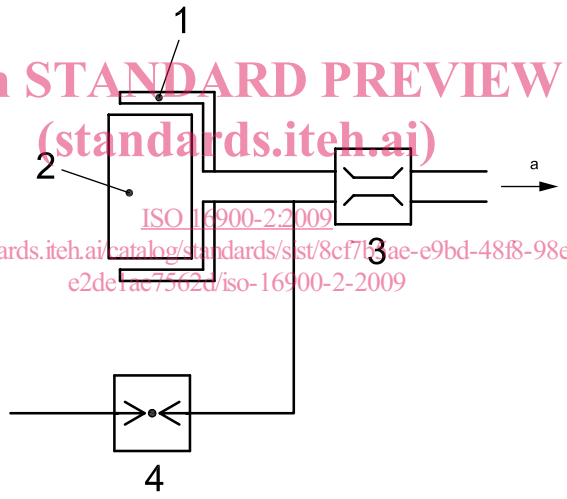
The method draws air through the filter holding system (see Figure 1) and the pressure drop, between ambient and a pressure port fitted at a suitable point between the support system and the connection to the suction device, is measured.

Ensure that the filter has been pre-conditioned according to the performance standard and that an equipment connector, or the holder intended by the manufacturer, is available.

Mount the filter in a leaktight manner as indicated in Figure 1. Draw the appropriate airflow, as specified in the performance standard, through the filter support system. Measure and record the pressure drop, Δp_F, across the support system.

Remove the filter. Draw the same airflow through the filter holding system. Measure and record the pressure drop, Δp_H, of the set-up.

Report the breathing resistance of the filter at the flow rate as: $\Delta p_F - \Delta p_H$.



Key

1 filter support
2 filter
3 flow meter
4 pressure gauge

[a] Regulated suction.

Figure 1 — Examples of arrangement for measurement of breathing resistance of filters

6.3.2 Procedure for complete respiratory protective devices and respiratory interfaces

6.3.2.1 General

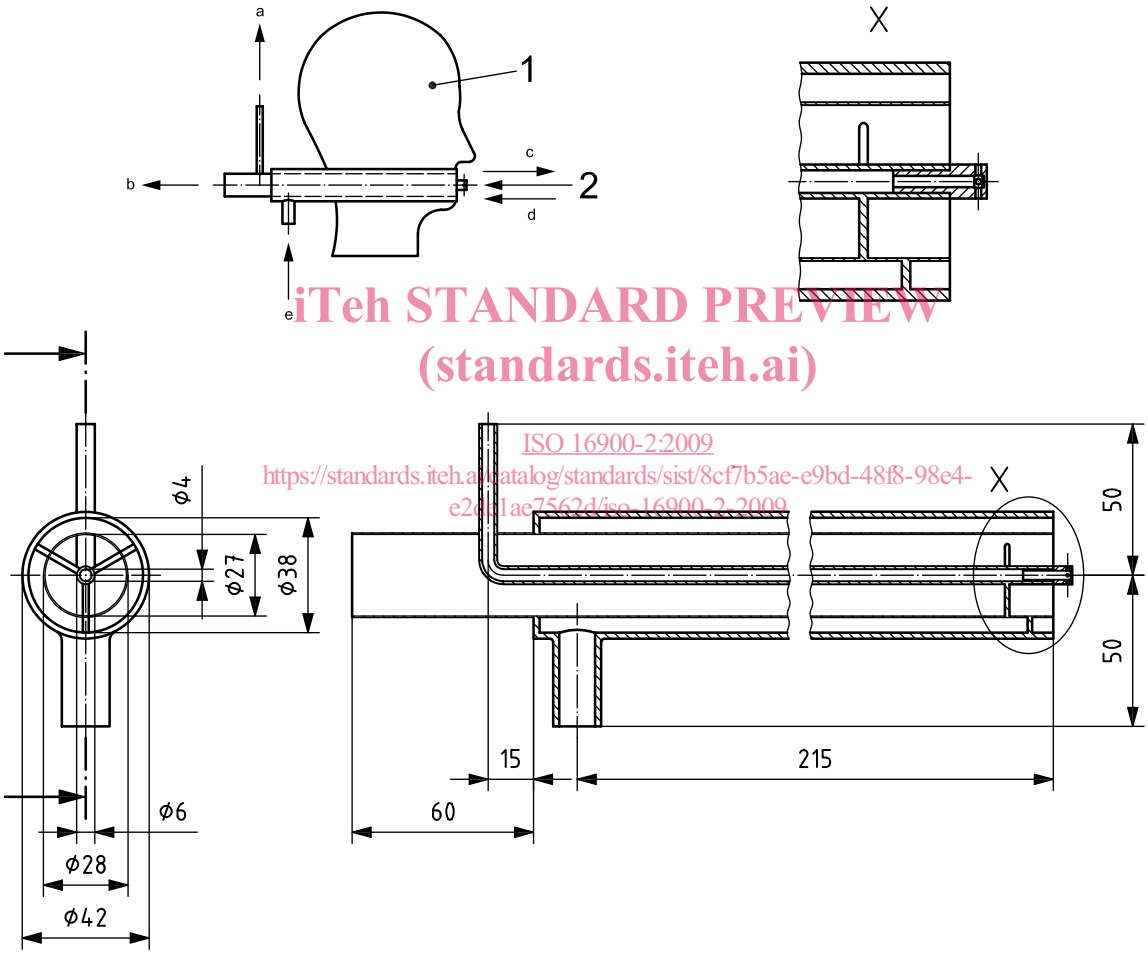
Ensure that the device has been pre-conditioned according to the performance standard.

Determine the pressure offset of the support system at the relevant flow rate. The measured resistance of the complete system shall be corrected for the offset.

Fit the respiratory interface of the device on the dummy head (see Figure 2) or dummy torso as defined by the performance standard (see Figure 3), ensuring leak tightness, but without deformation. This may involve the use of a sealant.

For hoods fitting around the neck, the fitting procedure given in Annex B (see Figure B.1) shall be used.

Dimensions in millimetres



Key

1 dummy head

2 pressure port with button probe (see Figure 4)

a To pressure gauge.

b To breathing machine/suction device, inhalation.

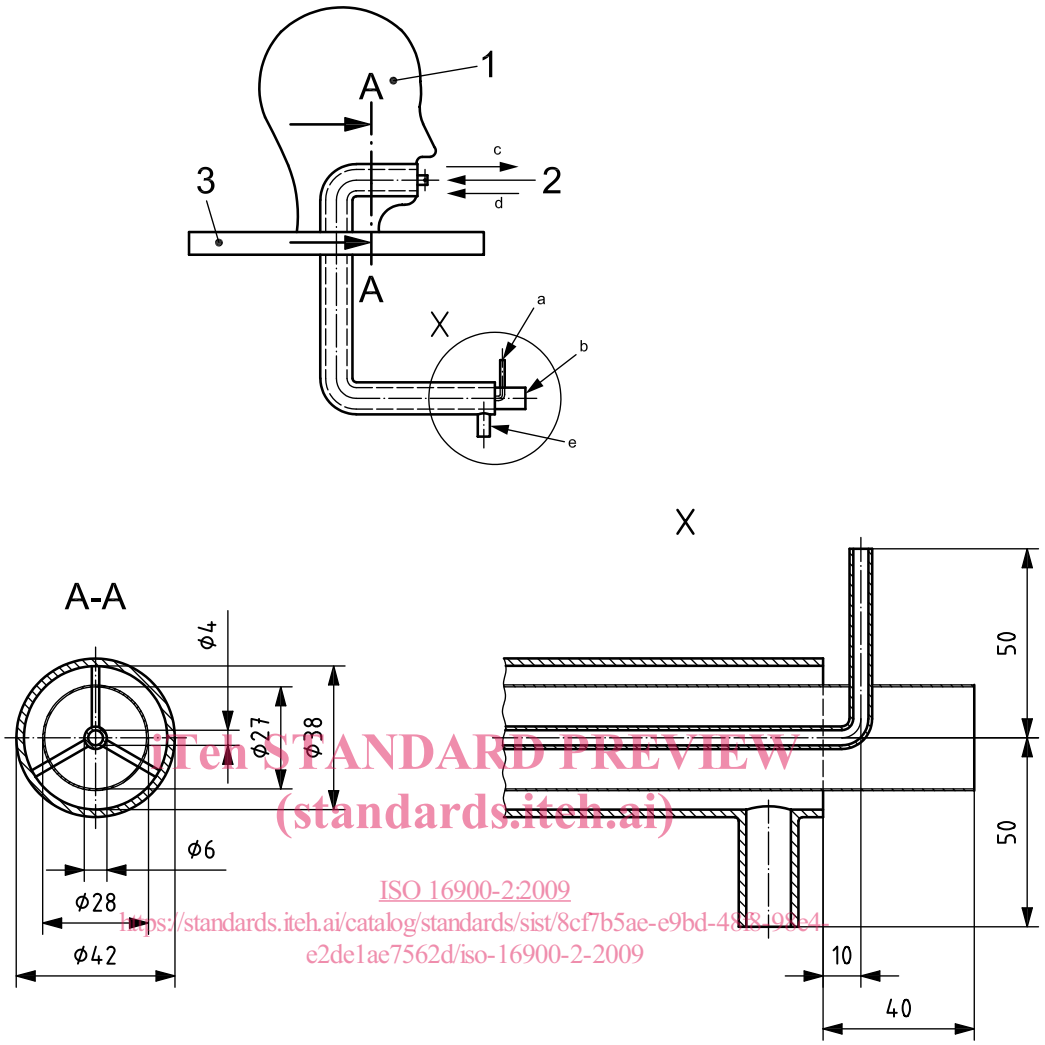
c Exhaled air.

d Inhaled air.

e From breathing machine/blower, exhalation.

Figure 2 — Required dimension and a typical arrangement of tubes in dummy head for measurement of breathing resistance

Dimensions in millimetres



Key

1 dummy torso
2 pressure port with button probe (see Figure 4)
3 adjustable flow collar (see Figure B.1)

a To pressure gauge.
b To breathing machine/suction device, inhalation.
c Exhaled air.
d Inhaled air.
e From breathing machine/blower, exhalation.

Figure 3 — Required dimension and a typical arrangement of tubes in dummy torso for measurement of breathing resistance for hoods sealing around the neck