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Gas cylinders — Cylinder valve outlets for gases and gas mixtures — Selection and dimensioning

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National foreword

This British Standard is the UK implementation of ISO 5145:2017.
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A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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ISO 5145

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Gas cylinders — Cylinder valve outlets for gases and gas mixtures — Selection and dimensioning

Bouteilles à gaz — Raccords de sortie de robinets de bouteilles à gaz et mélanges de gaz — Choix et dimensionnement

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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).

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).

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.

This document was prepared by Technical Committee ISO/TC 58 *Gas cylinders*, Subcommittee SC 2 *Cylinder fittings*.

This fourth edition cancels and replaces the third edition (ISO 5145:2014), which has been technically revised.

This edition includes the following significant changes with respect to the previous edition:

— reference to ISO 14456 has been added;

— former Annex A on gas groups and FTSC codes has been removed.

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Introduction

At the beginning of the 1960s, the members of ISO/TC 58/SC 2 were charged with the task of drafting an International Standard on gas cylinder valve outlets.

It soon became obvious that millions of different types of valve outlets are in use and the various countries concerned were not ready to give up their own systems. It was, therefore, only possible to draw up a list of the existing provisions, either standardized or in use, which was published as ISO/TR 7470. The number and variety of such provisions give an idea of the complexity and scope of the task.

Towards the end of the 1970s, ISO/TC 58/SC 2 realized that the task at hand could only be achieved by adopting a long-term solution; this was to create an ideal system of valve outlets which would not be interchangeable with the existing systems. This system would be based on the four fundamental criteria of safety, simplicity, compactness, and tightness.

Two key actions were then undertaken in parallel:

— a classification and grouping of gases and gas mixtures;

— a practical definition of an original and non-interchangeable connection system.

This document represents a synthesis of these two actions. It is a practical guide for the selection of cylinder valve outlets for gases and gas mixtures. In view of the fact that no country seemed ready to give up their national standards and to adopt an International Standard specifying the dimensions of gas cylinder valve outlets, it was agreed that this document need not be complied with where a national standard predates it.

This document presents a logical system for determining valve outlets for gas cylinders for all gases or gas mixtures. It is of special interest for those countries that have no national standards or regulations. Its provisions can be called for in the future in cases where a new gas or gas mixture is developed industrially.

The main purpose in standardizing valve outlets is to prevent the interconnection of non-compatible gases. The user is cautioned to ensure that a particular outlet connection when used is compatible with any other connections or gases that might be connected to that outlet. Because of the multiplicity of connections in use and the existence of many national standards, this concern cannot be overstated.

This document thus represents a basis for international agreement in the more or less remote future.

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Gas cylinders — Cylinder valve outlets for gases and gas mixtures — Selection and dimensioning

1 Scope

This document establishes practical criteria for determining valve outlet connections for gas cylinders.

It applies to the selection of gas cylinder valve outlet connections and specifies the dimensions for a number of them.

This document is not applicable to connections used for cryogenic gas withdrawal or gases for breathing equipment, which are the subjects of other International Standards.

NOTE Other safeguard provisions like labelling or colour coding are not affected by this document.

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 10156, *Gas cylinders — Gases and gas mixtures — Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*

ISO 10298, *Gas cylinders — Gases and gas mixtures — Determination of toxicity for the selection of cylinder valve outlets*

ISO 13338, *Gas cylinders — Gases and gas mixtures — Determination of tissue corrosiveness for the selection of cylinder valve outlets*

ISO 14456, *Gas cylinders — Gas properties and associated classification (FTSC) codes*

3 Terms and definitions

No terms and definitions are listed in this document.

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 https://www.iso.org/obp

4 Principle of the determination of valve outlets

4.1 Basic principle

ISO 14456 establishes a method of allocating to any gas or gas mixtures contained in cylinders a four-digit code (FTSC). This numerical code categorizes the gas or gas mixture in terms of its physical-chemical properties and/or flammability, toxicity, state of the gas (compressed gas and pressure rating, liquefied, etc.), and corrosiveness, as specified in ISO 14456. FTSC is the abbreviation of these properties.

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The FTSC code enables a gas or gas mixture to be assigned to one of the 15 “compatible” gas groups (see ISO 14456). Valve outlet connections are allocated to each group (see Clause 6).

NOTE 1 Attention is drawn to the fact that the only purpose of the numerical code is to group compatible gases together in order that the particular valve outlet assigned to each group can be selected. The code is only applicable for the valve outlet selection used in this International Standard and is not intended as an identification code.

NOTE 2 For example, for pressure rating subdivision 5 corresponds to working pressure between 35 bar and 250 bar.

4.2 Single gases

Single gases are assigned to one of the first 14 gas groups, group 15 being reserved for specific gas mixtures. It is recognized that a “pure gas” can contain some impurities, but it is intended that this should not affect the valve outlet selection.

Five of these groups only contain one single gas and are assigned to individual named gases from which mixtures and other gases are excluded. These five groups are as follows:

a) group 2 - carbon dioxide;

b) group 5 - air;

c) group 10 - oxygen;

d) group 11 - nitrous oxide;

e) group 14 - acetylene.

4.3 Gas mixtures

4.3.1 Definition

For the purposes of this document, a gas mixture is defined as an intentional combination of two or more gases, which can be either in the gaseous phase or liquefied under pressure when in a gas cylinder.

NOTE This document does not attempt to identify gas mixtures which can be safely and satisfactorily prepared; this is the responsibility of the gas manufacturer. It does not describe any methods or techniques for preparing gas mixtures.

4.3.2 Assignment of a gas mixture to a group

The principle of allocation of a FTSC code to gas mixtures is the same as that for single gases. The allocation of the FTSC code to a gas mixture, which allows the assignment of this mixture to one of the group of gases and gas mixtures (see ISO 14456), depends on the flammability, oxidizing ability, toxicity, and corrosiveness of the final mixture. For the determination of flammability and oxidizing ability, ISO 10156 shall be used, for toxicity, ISO 10298 shall be used, and for corrosiveness, ISO 13338 shall be used.

Mixtures containing spontaneously flammable gases (i.e. pyrophoric gases such as silane in ISO 14456:2015, Table 10) shall be considered as spontaneously flammable gas mixtures if the content of the pyrophoric gas(es) is more than 1,4 %.

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5 Determination of connection

5.1 Connection

A connection is a mechanical device which conveys gas via a gas cylinder valve to a filling or use system without leakage to the atmosphere. It shall be robust and able to withstand repeated connection and disconnection. It shall be designed such that it can only be used for the group of gases to which it is allocated.

A connection comprises a minimum of three parts (see Figure 1):

a) a valve outlet — the part of the cylinder valve through which gas is discharged;

b) a connector — the part of the filling or use system through which the gas is conveyed;

c) a union nut — the means by which the connector is secured to the valve outlet and by which the seal is ensured.

Annex B specifies requirements and provides recommendations regarding the use of union nuts requiring tools.

The design of the double-recess type of connection is derived from the "step index principle".

The step index system comprises a double recess (faucet) into the valve outlet, into which a spigot of two different diameters is designed to fit (see the figure in Table 1). The lengths of the recesses and spigots are the same for each connection but the diameters vary depending on the group of gases for which the recess or spigot is designed. The form, dimensions, and tolerances are illustrated in Table 1, which provides 42 non-interchangeable connections.

Three nominal diameters (24 mm, 27 mm, and 30 mm) have been adopted for the connections (specified in Annex A). The thread is a Whitworth thread with a pitch of 2 mm (see Figure 2).

NOTE Internal "double-recess step index connections" are not used because of their excessive size.

The dimensions in Figure 2 shall be toleranced according to the general principles for thread dimensioning. The tolerances shall be chosen from applicable national standards, or if they do not exist, use the example provided in Figure 2. Bilateral tolerancing systems, such as those in ISO 2768 (all parts), shall not be used. The dimensions are given in Table 2.

5.2 Leak tightness

Leak tightness is achieved by sealing the end of the connector bearing on the conical part of the valve outlet connection. This seal is maintained by the union nut (see Annex A).

Other methods of sealing can be adopted provided the non-interchangeability between connector types is maintained.

No details of the external dimensions of the union nut are given since this will be subject to the method adopted for applying the sealing force (e.g. with a wrench or by hand).

This document does not specify the choice of materials; however, it is necessary to employ materials for the O-ring, valve, and valve connector which are compatible with the gas content in the cylinder and the service for which they are intended.

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