INTERNATIONAL STANDARD

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

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

Reference number
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Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

It also incorporates the Amendments ISO 5145:2004/Amd1:2006 and ISO 5145:2004/Amd1:2008. This third edition cancels and replaces the second edition (ISO 5145:2004), of which it constitutes a minor revision with the following changes:

— tolerances have been added.

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 Technical Report ISO/TR 7470. The number and variety of such provisions give an idea of the complexity and scope of the task entrusted to ISO/TC 58/SC 2.

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.

ISO 5145 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 International Standard need not be complied with where a national standard predates it.

ISO 5145 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.

ISO 5145 thus represents a basis for international agreement in the more or less remote future.

The purpose of this International Standard is to fix some editorial mistakes and to incorporate into the main text ISO 5145:2004/Amd1:2006 and ISO 5145:2004/Amd1:2008. Annexes A, B, and C form an integral part of this International Standard.

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

1 Scope

This International Standard 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 International Standard does not apply 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 International Standard.

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

ISO 10286, *Gas cylinders — Terminology*

ISO 10298, *Determination of toxicity of a gas or gas mixture*

ISO 13338, *Determination of tissue corrosiveness of a gas or gas mixture*

3 Principle of the determination of valve outlets

3.1 Basic principle

This International Standard establishes a method of allocating to any gas or mixture of gases contained in cylinders four-digit codes numbers (FTSC). This code number categorizes the gas or gas mixture in terms of its physical-chemical properties and/or Flammability, Toxicity, State of the gas, and Corrosiveness (see A.1). FTSC is the abbreviation of these properties.

The FTSC code enables a gas or gas mixture to be assigned to one of the 15 “compatible” gas groups (see A.2). Valve outlet connections are allocated to each group (see Clause 5).

NOTE 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.

3.2 Single gases

Pure 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.

3.3 Gas mixtures

3.3.1 Definition

For the purposes of this International standard, 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 International Standard 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.

3.3.2 Assignment of a gas mixture to a group

The principle of allocation of a four-digit numerical code (FTSC) 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 Table A.1), depends on the flammability, oxidizing ability, toxicity, and corrosiveness of the final mixture. For the determination of flammability and oxidizing ability, use ISO 10156, for toxicity, use ISO 10298, and for corrosiveness, use ISO 13338.

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

4 Determination of connection

4.1 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.

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 for 42 non-interchangeable connections.

Three nominal diameters (24 mm, 27 mm, and 30 mm) have been adopted for the connections (see Annex B). 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, shall not be used.

4.2 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 B).

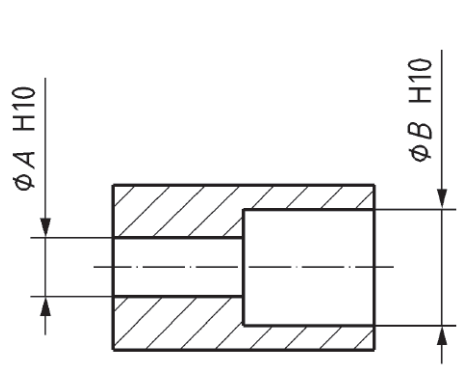
Other methods of sealing can be adopted provided the non-interchangeability between connector types is maintained.

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).

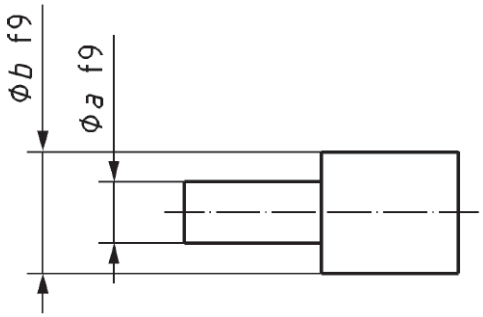
This International Standard does not specify the choice of materials; however, it is necessary to employ materials for the O-ring, valve, and valve connector which are compatible with the gas content in the cylinder and the service for which they are intended.

Table 1 — Non-interchangeable combinations *A* + *B*

Dimensions in millimetres



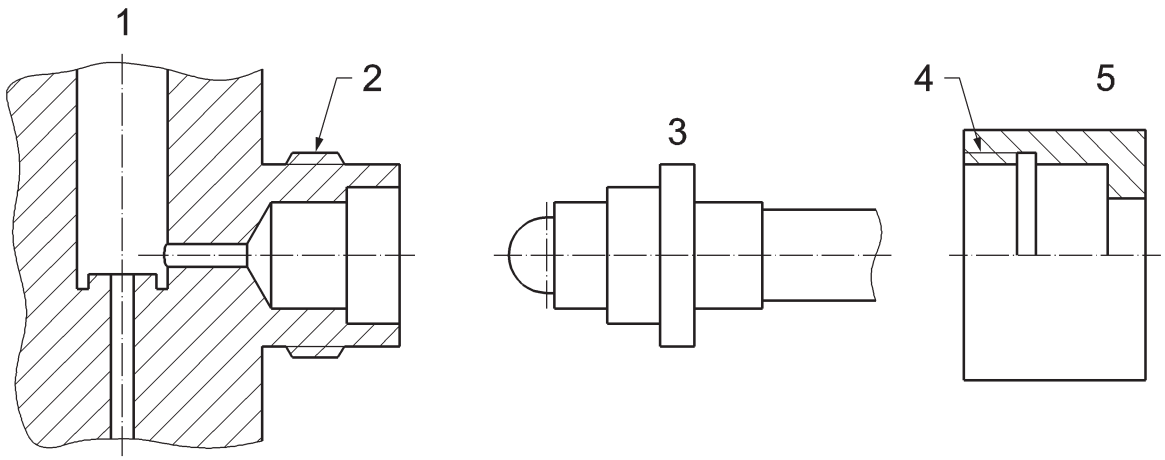
Female



Male

Nominal diameter of the connection = nominal thread diameter *D*, *d*	**Constant *A* + *B***						**Available combinations**		
	28		32		36				
	A	*B*	*A*	*B*	*A*	*B*	Right-hand thread	Left-hand thread	Total of right- and left-hand threads
24	11,2 11,9 12,6 13,3 14	16,8 16,1 15,4 14,7 14	-	-	-	-	5	5	10
27	-	-	11,8 12,5 13,2 13,9 14,6 15,3 16	20,2 19,5 18,8 18,1 17,4 16,7 16	-	-	7	7	14
30	-	-	-	-	12,4 13,1 13,8 14,5 15,2 15,9 16,6 17,3 18	23,6 22,9 22,2 21,5 20,8 20,1 19,4 18,7 18	9	9	18
Total number of combinations							21	21	42

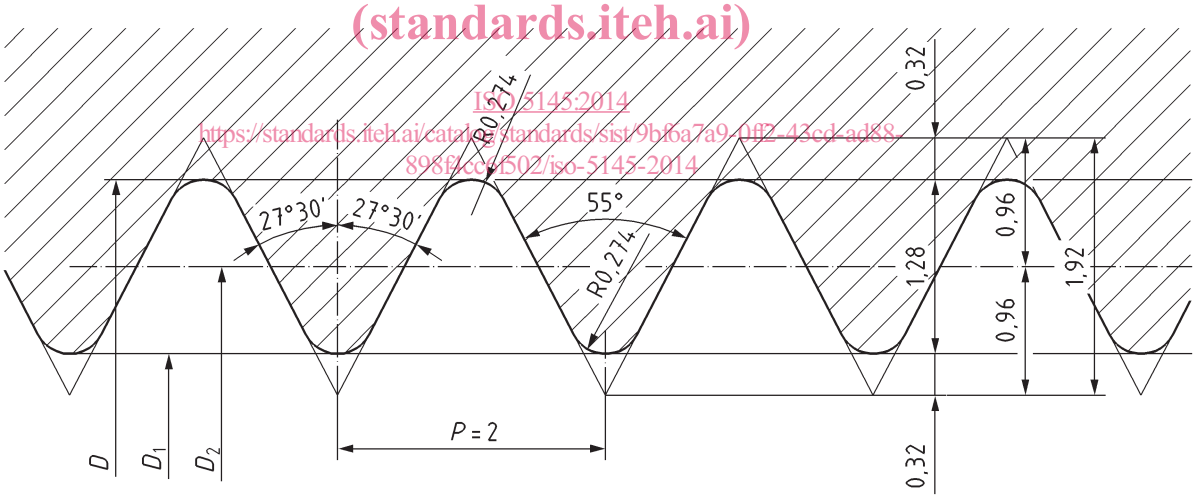
NOTE For the tolerances, see ISO 286-1 and ISO 286-2.

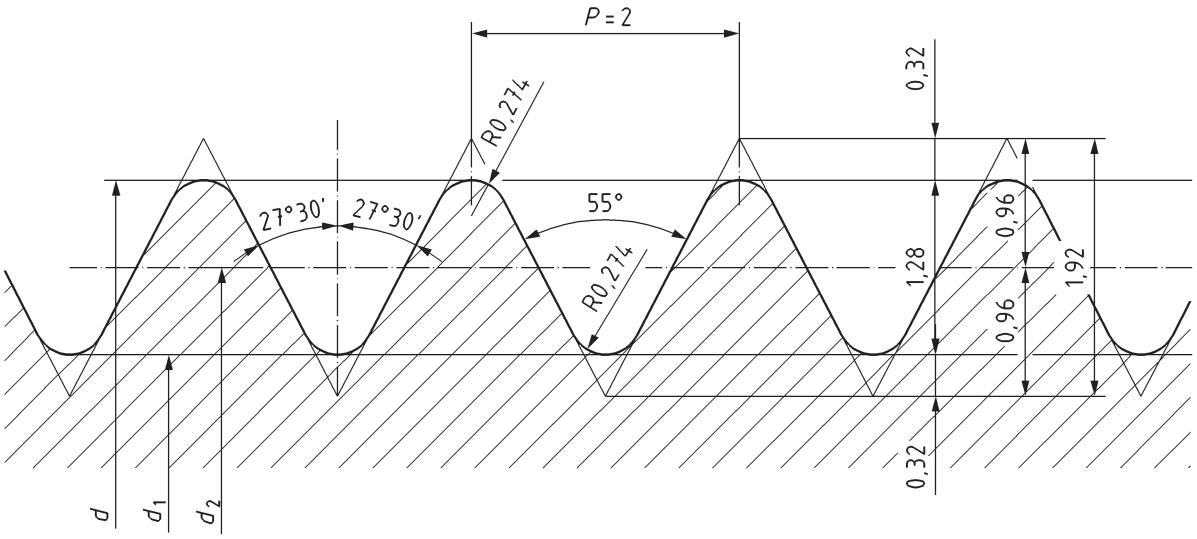


Key

1 valve
2 threads according to Figure 2
3 connector
4 threads according to Figure 2
5 union nut

Figure 1 — Principles for male and female connection





Nominal diameter = major diameter	D_t d	24	27	30
Pitch diameter	D_2 d_2	22,72	25,72	28,72
Minor diameter	D_1 d_1	21,44	24,44	27,44

Figure 2 — Basic dimensions of Whitworth threads with pitch *P* equal to 2 mm

Table 2 — Basic dimensions of Whitworth threads with pitch *P* equal to 2 mm

	Internal threads (union nut)	External thread (valve)
Nominal diameter = major diameter = D, d	D minimal (tolerances optional)	–38 –280
Pitch diameter = D_2, d_2	+224 +0	–38 –170
Minor diameter = D_1, d_1	+375 +0	D maximum (tolerances optional)

5 Marking

The outlets and the connections shall be marked with the number of the corresponding outlet as indicated in Table 3.

Table 3 — Marking

DN	A	B	Mark number	
			Left hand	Right hand
24	11,2	16,8	6	1
	11,9	16,1	7	2
	12,6	15,4	8	3
	13,3	14,7	9	4
	14	14	10	5
27	11,8	20,2	18	11
	12,5	19,5	19	12
	13,2	18,8	20	13
	13,9	18,1	21	14
	14,6	17,4	22	15
	15,3	16,7	23	16
	16	16	24	17
30	12,4	23,6	34	25
	13,1	22,9	35	26
	13,8	22,2	36	27
	14,5	21,5	37	28
	15,2	20,8	38	29
	15,9	20,1	39	30
	16,6	19,4	40	31
	17,3	18,7	41	32
	18	18	42	33

6 Allocation of connections

The allocation of 33 connections from the 42 that are available is shown in Table 4. Table 5 shows that each group of gases has been established in accordance with

a) the FTSC code,

b) the gases for other groups which can be component parts of the mixture of which the final properties are similar to those of that group, and

c) the connection(s) which is (are) allocated to the group.

In Table 4, the numbers of the outlets are added in bold font. To refer to one of these outlets, use e.g. ISO 5145 N° 2 for oxygen (4050 industrial).