

# SVENSK STANDARD

## SS-EN ISO 14456:2016

Fastställt/Approved: 2016-10-05  
Publicerad/Published: 2016-10-10  
Utgåva/Edition: 1  
Språk/Language: engelska/English  
ICS: 23.020.30

---

### **Gasflaskor – Gasegenskaper och tillhörande klassificeringskoder (ISO 14456:2015)**

### **Gas cylinders – Gas properties and associated classification (FTSC) codes (ISO 14456:2015)**



# Standarder får världen att fungera

*SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.*

## Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

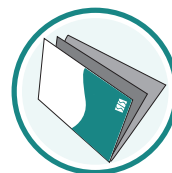
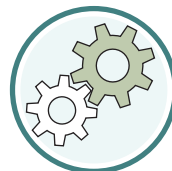
## Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

## Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

**Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på [www.sis.se](http://www.sis.se) eller ta kontakt med oss på tel 08-555 523 00.**



# Standards make the world go round

*SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.*

## Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

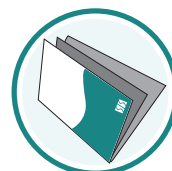
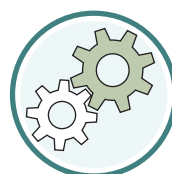
## Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

## Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

**If you want to know more about SIS, or how standards can streamline your organisation, please visit [www.sis.se](http://www.sis.se) or contact us on phone +46 (0)8-555 523 00**



Europastandarden EN ISO 14456:2016 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 14456:2016.

The European Standard EN ISO 14456:2016 has the status of a Swedish Standard. This document contains the official English version of EN ISO 14456:2016.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

*Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.*

*Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.*

Denna standard är framtagen av kommittén för Gasflaskor, SIS/TK 296.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på [www.sis.se](http://www.sis.se) - där hittar du mer information.



EUROPEAN STANDARD

**EN ISO 14456**

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2016

---

ICS 23.020.30

English Version

## Gas cylinders - Gas properties and associated classification (FTSC) codes (ISO 14456:2015)

Bouteilles à gaz - Propriétés des gaz et codes de  
classification associés (FTSC) (ISO 14456:2015)

Gasflaschen - Eigenschaften von Gasen und zugehörige  
Klassifizierungscodes (FTSC) (ISO 14456:2015)

This European Standard was approved by CEN on 2 September 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

# Contents

Page

<b>European foreword</b> .....	<b>vi</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Gas properties</b> .....	<b>2</b>
4.1 Numerical gas code (FTSC).....	2
4.1.1 General.....	2
4.1.2 Fire potential, category I.....	2
4.1.3 Acute toxicity, category II.....	3
4.1.4 State of the gas (in the cylinder at 15 °C), category III.....	3
4.1.5 Corrosiveness, category IV.....	3
<b>5 List of gases and liquids with the corresponding FTSC codes</b> .....	<b>4</b>
5.1 Basic principles and single gases.....	4
5.2 Assignment of a gas mixture to a group.....	4
5.3 Tables of compatible groups of gases and liquids.....	5
<b>Bibliography</b> .....	<b>17</b>

## European foreword

The text of ISO 14456:2015 has been prepared by Technical Committee ISO/TC 58 “Gas cylinders” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 14456:2016 by Technical Committee CEN/TC 23 “Transportable gas cylinders” the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2017, and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### Endorsement notice

The text of ISO 14456:2015 has been approved by CEN as EN ISO 14456:2016 without any modification.

## Introduction

This International Standard establishes a method of allocating a four-digit code number (FTSC) to any gas, liquids that are transported under pressure or mixture of gases contained in cylinders. This code number categorizes the gas, liquids that are transported under pressure or gas mixture in terms of its physical-chemical properties and/or flammability, toxicity, state of the gas, and corrosiveness (see [4.1](#)). FTSC is the abbreviation of these properties.

The FTSC code enables a gas, liquids that are transported under pressure or gas mixture to be assigned to one of the 15 “compatible” gas groups.

The FTSC codes and the method for their determination are currently given in ISO 5145:2014, Annex A for use in the selection of valve outlets. This annex from ISO 5145 will be removed when the present standard is published.

The properties and the selection criteria are aligned as appropriate with the Globally Harmonized System for the Classification and Labelling of Chemicals (GHS).



# Gas cylinders — Gas properties and associated classification (FTSC) codes

## 1 Scope

This International Standard gives a list of FTSC (fire potential, i.e. “oxidizing potential and flammability”, toxicity, state of the gas, and corrosiveness) codes determined according to the relevant properties of gases and of some liquids that are transported under pressure.

It does not cover gas material compatibility which is covered by ISO 11114 (all parts).

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

ISO 10286:2015, *Gas cylinders — Terminology*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **gas mixture**

combination of different single gases deliberately mixed in specified proportions

[SOURCE: ISO 10286:2015, definition 704]

### 3.2

#### **liquefied gas**

gas, which, when packaged for transport, is partially liquid (or solid) at temperature above  $-50\text{ °C}$

[SOURCE: ISO 10286:2015, definition 706]

### 3.3

#### **compressed gas**

gas, which, when packaged under pressure for transport, is entirely gaseous at  $-50\text{ °C}$

Note 1 to entry: This category includes all gases with a critical temperature less than or equal to  $-50\text{ °C}$ .

[SOURCE: ISO 10286:2015, definition 705]

**SS-EN ISO 14456:2016 (E)****3.4****lethal concentration 50****LC<sub>50</sub>**

concentration of a gas (or a gas mixture) in air administered by a single exposure during a short period of time (24 h or less) to a group of young adult albino rats (males and females) which leads to the death of half of the animals in at least 14 d

[SOURCE: ISO 10298:2010, definition 2.1]

**4 Gas properties****4.1 Numerical gas code (FTSC)****4.1.1 General**

The code number assigned to a gas or liquid is based on the following four physical-chemical properties:

- a) Category I (F): fire potential, defining the gas behaviour with respect to combustion;
- b) Category II (T): acute toxicity;
- c) Category III (S): gas state, defining the physical state of the fluid in the cylinder at 15 °C within a given pressure range;
- d) Category IV (C): corrosiveness (ability to damage or destroy living tissues: eyes, skin, and mucous membranes).

Each category is subdivided into different characteristics (subdivisions), each identified by a different digit. In this way, a gas in a given state is characterized by a series of four digits (one digit per category) as illustrated below.

**4.1.2 Fire potential, category I**

Subdivision 0: inert (any gas not classified under subdivisions 1 to 5 below);

Subdivision 1: supports combustion (gas having an oxidizing power equal to or less than a mixture containing 23,5 % of oxygen in nitrogen);

Subdivision 2: flammable (gas having flammability limits in air);

NOTE 1 See ISO 10156 for more information.

Subdivision 3: pyrophoric (spontaneously flammable);

Subdivision 4: oxidizing (gas having an oxidizing power greater than a mixture containing 23,5 % O<sub>2</sub> in N<sub>2</sub>);

NOTE 2 See ISO 10156 for more information.

Subdivision 5: chemically unstable (flammable and subject to rapid decomposition or polymerization).

NOTE 3 When considering the properties of gases from subdivisions 1 and 4, the following applies:

- a) Subdivision 4 considers the risk of accelerating combustion more than air does;
- b) For gas material compatibility with gases under pressure of subdivisions 1 and 4, it is considered that the risk of ignition exists when the oxygen partial pressure is more than 30 bar;
- c) For valves outlet selection (for example, see ISO 5145), the risk is to mix a flammable gas (subdivision 2 and/or 3) with a gas of subdivision 1 and/or 4.

#### 4.1.3 Acute toxicity, category II

Subdivision 0: supporting human life;

Subdivision 1: non-toxic  $LC_{50 \text{ rat } 1\text{h}} > 0,5 \%$  by volume (5 000 ppm);

Subdivision 2: toxic;  $0,02 \%$  by volume (200 ppm)  $< LC_{50 \text{ rat } 1\text{h}} \leq 0,5 \%$  by volume (5 000 ppm);

Subdivision 3: very toxic  $LC_{50 \text{ rat } 1\text{h}} < 0,02 \%$  by volume (200 ppm).

NOTE See ISO 10298 for more information.

#### 4.1.4 State of the gas (in the cylinder at 15 °C), category III

All pressures for compressed gases are working pressures according to the definition given in ISO 10286.

For liquefied gases, this is the developed pressure at 65 °C (normally equal to the cylinder test pressure).

Subdivision 0: liquefied gas of 35 bar or less;

Subdivision 1: liquefied gas at a pressure greater than 35 bar;

Subdivision 2: liquid withdrawal – liquefied gas (optional);

Subdivision 3: dissolved gas;

Subdivision 4: gas phase withdrawal at 35 bar or less;

Subdivision 5: compressed gas between 35 bar and 250 bar (Europe);

Subdivision 6: compressed gas between 35 bar and 207 bar (North America);

Subdivision 7: compressed gas above 207 bar (North America) or 250 bar (Europe).

NOTE 1 Subdivisions 5 and 6 have been adopted as a result of a compromise between the European and the North American approach. The European preference for a limit of 250 bar reflects the current tendency towards higher pressure applications. The current North American practice requires a limit of 207 bar for which their pressure reducing valves are designed. This is the working pressure at the referenced temperature of 15 °C. Therefore, three pressure classes have been retained. Other jurisdictions might use different values.

Either subdivision 5 or subdivision 6 shall be used, never both. The selection of either subdivision will determine the applicable pressure for subdivision 7.

Subdivision 5 or 6: medium pressure range, each user being required to select one subdivision exclusively to determine the upper limit of the medium pressure range (i.e. 182 bar or 250 bar).

Subdivision 7: high pressure range, the lower limit (182 bar or 250 bar) of which depends on the subdivision selected for the medium pressure range.

After the introduction of subdivisions 5, 6, and 7, a number of pressure ranges have been (or are being) established to make the selection of the proper cylinder valve outlet connection (e.g. 500 bar, 800 bar, sub atmospheric pressure). These ranges have been chosen to protect downstream regulators and other ancillary equipment from over-pressurized conditions. Consequently, for the tables in [5.3](#), the third digit (S) used for all compressed gases is “5” to indicate that this is a compressed gas.

NOTE 2 Subdivisions 8 and 9 have been allocated for liquid withdrawal cylinders of cryogenic gases in the USA.

#### 4.1.5 Corrosiveness, category IV

Subdivision 0: non-corrosive;

Subdivision 1: non-halogen acid forming;

Subdivision 2: basic;