



BSI Standards Publication

Gas Infrastructure — Gas installation pipework with an operating pressure greater than 0,5 bar for industrial installations and greater than 5 bar for industrial and non-industrial installations

Part 1: Detailed functional requirements for design,
materials, construction, inspection and testing

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This British Standard is the UK implementation of EN 15001-1:2023. It supersedes BS EN 15001-1:2009, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GSE/33, Gas supply.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication has been prepared under a mandate given to the European Standards Organizations by the European Commission and the European Free Trade Association. It is intended to support requirements of the EU legislation detailed in the European Foreword. A European Annex, usually Annex ZA or ZZ, describes how this publication relates to that EU legislation.

For the Great Britain market (England, Scotland and Wales), if UK Government has designated this publication for conformity with UKCA marking (or similar) legislation, it may contain an additional National Annex. Where such a National Annex exists, it shows the correlation between this publication and the relevant UK legislation. If there is no National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. Therefore Annex ZA/ZZ in the European text, and references to EU legislation, are still valid for this market.

UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of [\[http://www.gov.uk/ext-link%3e.%3c/pwww.gov.uk\]](http://www.gov.uk/ext-link%3e.%3c/pwww.gov.uk).

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 580 96014 7

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

ICS 23.040.01; 91.140.40

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2023.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

EUROPÄISCHE NORM

February 2023

ICS 23.040.01

Supersedes EN 15001-1:2009

English Version

Gas Infrastructure - Gas installation pipework with an operating pressure greater than 0,5 bar for industrial installations and greater than 5 bar for industrial and non-industrial installations - Part 1: Detailed functional requirements for design, materials, construction, inspection and testing

Infrastructures gazières - Canalisations d'installations de gaz avec une pression de service supérieure à 0,5 bar pour les installations industrielles et supérieure à 5 bar pour les installations industrielles et non industrielles (domestiques et commerciales) - Partie 1 : Exigences fonctionnelles détaillées relatives à la conception, aux matériaux, à la construction, à l'inspection et aux essais

Gasinfrastruktur - Gas-Leitungsanlagen mit einem Betriebsdruck größer 0,5 bar für industrielle Installationen und größer 5 bar für industrielle und nicht-industrielle Installationen - Teil 1: Detaillierte funktionale Anforderungen an Planung, Material, Bau, Inspektion und Prüfung

This European Standard was approved by CEN on 9 October 2022.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

Contents

European foreword	7
1 Scope.....	9
2 Normative references.....	10
3 Terms and definitions	17
3.1 Definitions relating to pressure	17
3.2 Definitions relating to the gas installation	18
3.3 Definition relating to means of isolation.....	19
3.4 Definitions relating to jointing methods	19
3.5 Definitions relating to components	20
3.6 Definitions relating to tests.....	21
3.7 Definition relating to testing and inspection	22
3.8 Definitions relating to assembly processes for metallic materials	22
3.9 Definitions relating to pressure regulating and metering.....	22
4 General.....	23
4.1 Quality system and competence	23
4.2 Selection of materials.....	23
4.2.1 Specification of materials and components	23
4.2.2 Compliance with EU Directive 2014/68/EU.....	23
4.2.3 Certification of materials and components	24
4.3 Protection against hazards.....	24
4.3.1 Resistance to fire.....	24
4.3.2 Resistance to corrosive substances and atmosphere	24
4.3.3 Protection against variations in the operating pressure	24
4.3.4 Protection against gas hazards	24
4.3.5 Electrical installation	25
4.4 Accommodation and location of gas pressure control and metering systems, gas pressure compressors and gas mixing systems.....	25
4.4.1 Requirements for the enclosure of installations.....	25
4.4.2 Installation in an appliance room.....	25
4.4.3 Protection against adverse influences	26
5 Materials	26
5.1 Standards and specifications for pipes and pipe fittings	26
5.1.1 General.....	26
5.1.2 Carbon steel pipes	26
5.1.3 Carbon steel and iron fittings.....	28
5.1.4 Stainless steel pipes and pipe fittings (including flanges and valves).....	28
5.1.5 Copper.....	30
5.1.6 Polyethylene	30
5.1.7 Ancillaries.....	30
5.1.8 Valves	30
6 Design of pipework	31
6.1 General.....	31
6.1.1 Installation drawings and technical file	31
6.1.2 Measuring and test instruments	31
6.1.3 Properties of gas	31
6.2 Layout.....	32
6.2.1 Limits of the pipework location.....	32

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

6.2.2	Above-ground pipework.....	32
6.2.3	Buried pipework.....	32
6.2.4	Distance between buried pipework and buildings.....	32
6.2.5	Unacceptable locations for gas pipework in buildings.....	32
6.3	Dimensioning.....	33
6.3.1	Pressure loss.....	33
6.3.2	Gas velocity.....	33
6.4	Pressure and wall thickness.....	33
6.4.1	PS and test pressure.....	33
6.4.2	Pipe wall thickness.....	34
6.5	Safety engineering.....	39
6.5.1	Principles of pipework.....	39
6.5.2	Isolation of the gas supply.....	40
6.5.3	Location of pipework.....	43
6.5.4	Supporting structures.....	43
6.5.5	Depressurising and purging.....	43
6.6	Detail engineering.....	43
6.6.1	Pipe transits.....	43
6.6.2	Branches.....	44
6.6.3	Joints.....	47
6.6.4	Ancillaries.....	49
6.6.5	Above ground pipework inside and outside buildings.....	50
6.6.6	Buried pipework.....	53
6.6.7	Wall thickness related to bending of steel pipes.....	55
6.6.8	Provision for expansion and flexibility.....	56
6.7	Hot tapping carbon steel pipe.....	56
6.7.1	General.....	56
6.7.2	Principles.....	56
6.7.3	Conditions.....	56
6.7.4	Design evaluation.....	57
7	Design of pressure control systems.....	57
7.1	General.....	57
7.2	Pressure regulating system.....	58
7.3	Instrumentation.....	58
7.4	Permanent bypasses.....	59
7.4.1	Bypasses for equalization or testing.....	59
7.4.2	Bypasses of the safety system.....	59
7.5	Construction requirements.....	59
7.5.1	Pressure resistance.....	59
7.5.2	Operation.....	59
7.5.3	Insulating joint/flange.....	59
7.5.4	Gas velocity.....	59
7.5.5	External sensing lines.....	59
7.5.6	Breather and vent pipes.....	60
7.5.7	Isolating valves.....	61
7.5.8	Filter, separators.....	61
7.5.9	Pressure gauges.....	61
7.5.10	Pressure tappings and purge connections.....	61
7.6	Low gas temperature.....	61
7.6.1	Functional requirements.....	61
7.6.2	Design temperature effects.....	61
7.6.3	Condensation.....	62

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

7.7	Gas compressors	62
7.7.1	Construction	62
7.7.2	Temperature rise	62
7.7.3	Pressure variation	62
7.8	Safety systems	62
7.8.1	Pressure safety system	62
7.8.2	Gas pressure compressors	65
7.8.3	Gas mixing systems	66
8	Construction	66
8.1	Identification of the installation	66
8.1.1	Installation drawings	66
8.1.2	Identification of the components	66
8.1.3	Weld identification	66
8.2	External hazards	67
8.2.1	Mechanical loads	67
8.2.2	Electric currents	67
8.2.3	Environmental influences	67
8.3	Gas pipework passing through exterior walls	67
8.3.1	Buried pipe transits	67
8.3.2	Aboveground pipe transits	69
8.4	Identification of pipework	70
8.4.1	Identification of above-ground pipework	70
8.4.2	Identification of buried pipework	70
8.5	Specifications and requirements for joints	70
8.5.1	Welded joints and pipe fittings in carbon steel and stainless steel pipes	70
8.5.2	Joints in copper pipework	75
8.5.3	Fusion joints in plastic pipes	75
8.5.4	Flange joints	75
8.5.5	Compression joints	75
8.5.6	Threaded joints	75
8.6	Joint suitability	75
8.7	Connections	76
8.7.1	Connection points/pipe ends	76
8.7.2	Appliance isolating valves	76
8.8	Corrosion protection	77
8.8.1	Metal-to-metal contact	77
8.8.2	Above-ground protection of pipework	77
8.8.3	Protection of buried pipework	79
8.8.4	Corrosion at pipe supports	82
8.9	Handling and installation of pipework	82
8.9.1	PE pipework	82
8.9.2	Steel pipework	82
8.9.3	Copper pipework	83
8.9.4	Pipe trench filling	83
8.10	Bending of pipes	84
8.10.1	Bending of steel pipes	84
8.10.2	PE pipe bending	84
8.10.3	Copper pipe bending	85
8.11	Welding of supports and anchor points to carbon steel pipework	85
8.12	Installation of pressure regulating systems	86
8.12.1	Protection of the installation space	86
8.12.2	Construction requirements	87

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

9	Documentation, inspection and testing	87
9.1	General	87
9.2	Documentation	88
9.2.1	General	88
9.2.2	Technical file	88
9.3	Inspection	89
9.3.1	Joint inspection	89
9.3.2	Corrosion protection	93
9.3.3	Recording of test results	93
9.4	Testing	94
9.4.1	General	94
9.4.2	Instrumentation	94
9.4.3	Test Media	95
9.4.4	Strength testing	95
9.4.5	Tightness testing	96
9.4.6	Procedure for strength and tightness testing	96
9.4.7	Safety during tests	96
9.4.8	Hot tapping	97
9.4.9	Pressure regulating systems and ancillaries	97
9.4.10	Recording of test results	97
	Annex A (informative) Examples of methods for testing	98
A.1	General	98
A.2	Strength test on metallic pipework	98
A.2.1	Duration	98
A.2.2	Conditions	98
A.2.3	Pneumatic testing	99
A.2.4	Hydrostatic testing	99
A.2.5	Pressure assessment	99
A.3	Tightness test on metallic pipework	100
A.3.1	General	100
A.3.2	Pipework which can be inspected visually	100
A.3.3	Pipework which cannot be inspected fully by visual means	101
A.4	Strength and tightness test on PE pipework	102
	Annex B (informative) Flammable gases mixing systems	104
B.1	Reverse Flow	104
B.2	Control of mixture composition	104
B.3	Matching pressures of components for mixing	106
	Annex C (informative) Examples of supports	107
	Annex D (normative) Materials	115
D.1	General	115
D.2	Materials with a demonstrated safe history of application in this type of equipment	118

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

Annex E (informative) Significant technical changes between this European standard and the previous version EN 15001-1:2009	120
Annex ZA (informative) Relationship between this European Standard and the essential requirements of EU Directive 2014/68/EU aimed to be covered	125
Bibliography	127

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

European foreword

This document (EN 15001-1:2023) has been prepared by Technical Committee CEN/TC 234 "Gas Infrastructure", the secretariat of which is held by DIN.

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 August 2023, and conflicting national standards shall be withdrawn at the latest by August 2023.

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

This document supersedes EN 15001-1:2009.

A list of the significant changes compared to EN 15001-1:2009 can be found in informative Annex E, Table E.1.

This document includes requirements concerning current design practice and reflects the state of the art at the time of publication. It provides clear solutions for users of the document. Other design solutions and construction materials, as well as new developments, may be used if equal or greater safety than that required by this document can be demonstrated or established.

The scope of this revised document is extended with biomethane and vaporized LNG gases. This document is not designed for various mixtures of natural gas and hydrogen which may be allowed in the different member states.

With respect to hydrogen there are proposals to inject hydrogen (H₂) from renewable sources into the natural gas network. Investigations have been conducted to evaluate the impact. According to EN 16726:2015+A1:2018 at present it is not possible to specify a limiting hydrogen value which would generally be valid for all parts of the European gas infrastructure.

There is a complete suite of functional standards prepared by CEN/TC 234 "Gas infrastructure" to cover all parts of the gas supply system from the input of gas to the transmission system up to the inlet connection of the gas appliances, whether for residential, commercial or industrial purposes.

In preparing this document, a basic understanding of gas supply by the user has been assumed.

Gas supply systems are complex and the importance on safety of their construction and use has led to the development of very detailed codes of practice and operating manuals in the member countries. These detailed statements embrace recognized standards of gas engineering and the specific requirements imposed by the legal structures of the member countries.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of "BS EN 15001-1:2023". [Click here to purchase the full version from the ANSI store.](#)

1 Scope

This document specifies detailed functional requirements for the design, selection of materials, construction, inspection and testing of:

- industrial gas installation pipework and assemblies with an operating pressure greater than 0,5 bar; and
- non-industrial gas installation pipework (residential and commercial) with an operating pressure greater than 5 bar in buildings;

starting from the outlet of the network operator's point of delivery up to the inlet connection to the gas appliance; normally the inlet isolation valve. This document also covers the pipework to the inlet connection of a gas appliance that is not included within the scope of the appliance standard.

Apart from the exceptions stated below, this document applies to gas installation pipework operating at ambient temperatures between -20 °C and 40 °C and operating pressures up to and including 60 bar. For operating conditions outside these limitations, reference is additionally made to EN 13480 (all parts) for metallic pipework.

For industrial gas installation pipework up to and including 0,5 bar and for non-industrial (residential and commercial) gas installation pipework up to and including 5 bar in buildings, EN 1775 applies.

For gas installation pipework that do not fall within the scope of EN 1775 or other European Standards, this document applies.

In this document, the term "gas" refers to combustible gases, which are gaseous at 15 °C and 1 013 mbar absolute atmospheric pressure (normal conditions). These gases are commonly referred to as manufactured gas, natural gas or Liquefied Petroleum Gas (LPG). They are also referred to as first, second or third family gases as classified in EN 437:2021, Table 1. The given values are considered as normal conditions for all volumes given in this document.

This document is applicable to gas installation pipework for the carriage of:

- processed, non-toxic and non-corrosive natural gas according to EN 437:2021 and EN 16726:2015+A1:2018 "Gas infrastructure — Quality of gas — Group H";
- biomethane, complying with EN 16723-1:2016;
- vaporized LNG.

NOTE The specification of vaporized LNG is equal to that of natural gas as classified in EN 437:2021.

This document does not cover pipework for hydrogen rich gases that fall outside the definitions within EN 437:2021.

LPG storage vessels (including all ancillaries fitted directly to storage vessels) are excluded. Also excluded are LPG installations and sections of LPG installations operating at vapour pressure or in the liquid state.

In this document, all pressures are gauge pressures unless otherwise stated.

This document has been harmonized to address the essential safety requirements of the Pressure Equipment Directive (PED, 2014/68/EU [formerly 97/23/EC]) relevant for the joining of gas installation pipework (assemblies) falling within the scope of the PED. These are listed in Annex ZA. "However, this Directive should not apply to the assembly of pressure equipment on the site and under the responsibility of a user who is not the manufacturer, as in the case of industrial installations." (PED, Preamble, 7th recital, last paragraph).