

Automatic shut-off valves for gas burners and gas appliances

The European Standard EN 161:2001 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 161:2001. It supersedes BS EN 161:1991 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GSE/22, Safety and control devices for gas governors and gas burning appliances, to Subcommittee GSE/22/12, Automatic valves and flame failure devices, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Automatic shut-off valves for gas burners and gas appliances

Robinets automatiques de sectionnement pour brûleurs à gaz et appareils à gaz

Automatische Absperrventile für Gasbrenner und Gasgeräte

This European Standard was approved by CEN on 28 September 2001.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 58, Safety and control devices for gas burners and gas-burning appliances, the Secretariat of which is held 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of an identical text or by endorsement, at the latest by May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

This European Standard replaces EN 161:1991 and prEN 1531:1994.

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

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

The Annexes A, B, C and ZA are informative. Annex D is normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the safety, construction and performance requirements for automatic shut-off valves for gas burners, gas appliances and similar use, hereafter referred to as valves.

This European Standard covers type testing only.

It applies to valves with declared maximum working pressures up to and including 4 bar, for use on burners or in appliances using fuel gases of the 1st, 2nd or 3rd families.

It applies to electrically operated valves and to valves actuated by fluids where the control valves for these fluids are actuated electrically, but not to any external electrical devices for switching the control signal or actuating energy.

It applies to valves where the flow rate is controlled by external electrical signals, either in discrete steps or proportional to the applied signal.

It applies to valves fitted with closed position indicator switches.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 30-1-1:1998, *Domestic cooking appliances burning gas fuel — Part 1-1: Safety — General.*

EN 50165:1997, *Electrical equipment of non-electric appliances for household and similar purposes — Safety requirements.*

EN 55011:1998, *Industrial, scientific and medical (ISM) radio-frequency equipment — Radio disturbance characteristics; limits and methods of measurement (IEC/CISPR 11:1997, modified).*

EN 55014-1:2000, *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission (CISPR 14-1:2000).*

EN 55014-2:1997, *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 2: Immunity product family standard (CISPR 14-2:1997).*

EN 60529:1991, *Classification of degrees of protection provided by enclosures (IP Code) (IEC 60529:1989).*

EN 60730-1:1995, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:1993, modified).*

EN 61058-1:1992, *Switches for appliances — Part 1: General requirements (IEC 61058-1:1990).*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation.*

ISO 65:1981, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1.*

ISO 228-1:2000, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation.*

ISO 262:1998, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts.*

ISO 274:1975, *Copper tubes of circular section — Dimensions.*

ISO 301:1981, *Zinc alloy ingots intended for casting.*

ISO 1817:1999, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 4400:1994, *Fluid power systems and components — Three-pin electrical plug connectors — Characteristics and requirements.*

ISO 6952:1994, *Fluid power systems and components — Two-pin electrical plug connectors with earth contact — Characteristics and requirements.*

ISO 7005, *Metallic flanges.*

3 Terms and definitions

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

3.1

automatic shut-off valve

valve which opens when energized and closes automatically when de-energized

3.2

valve with step control

valve which controls the flow rate in steps

3.3

valve with modulating control

valve which controls the flow rate continuously between two limits in response to external electrical signals

3.4

closure member

movable part of the valve which shuts off the gas flow

3.5

actuating mechanism

part of the valve which moves the closure member

3.6

closed position indicator switch

switch fitted to a valve which indicates when the closure member is in the closed position

3.7

actuating energy

required energy for the actuating mechanism to move the closure member to the open position. The actuating energy can have an external source (electrical, pneumatic or hydraulic) and can be transformed inside the valve

3.8

opening force

force required to move the closure member to the open position

3.9

closing force

force available to close the valve, independent of any force provided by fuel gas pressure

3.10

sealing force

force acting on the valve seat when the closure member is in the closed position, independent of any force provided by fuel gas pressure

3.11

frictional force

largest force required to move the actuating mechanism and the closure member from the open position to the closed position with the closure spring removed, independent of any force provided by fuel gas pressure

3.12

external leak-tightness

leak-tightness of a gas-carrying compartment with respect to atmosphere

3.13**internal leak-tightness**

leak-tightness of the closure member (in the closed position) sealing a gas-carrying compartment with respect to another compartment or to the outlet of the valve

3.14**inlet pressure**

pressure at the inlet of the valve

3.15**outlet pressure**

pressure at the outlet of the valve

3.16**maximum working pressure**

highest inlet pressure declared by the manufacturer at which the valve may be operated

3.17**minimum working pressure**

lowest inlet pressure declared by the manufacturer at which the valve may be operated

3.18**actuating pressure**

hydraulic or pneumatic pressure supplied to the actuating mechanism of the valve

3.19**pressure difference**

difference between the inlet and outlet pressures

3.20**flow rate**

volume flowing through the valve in unit time

3.21**rated flow rate**

air flow rate at a specified pressure difference declared by the manufacturer, corrected to reference conditions

3.22**opening time**

time interval between energizing the valve and the attainment of the maximum or other defined flow rate

3.23**closing time**

time interval between de-energizing the valve and the closure member attaining the closed position

3.24**delay time**

time interval between energizing the valve and the start of flow

3.25**mounting position**

position declared by the manufacturer for mounting the valve

3.26**control valve**

valve which controls the fluid (e.g. compressed air) supplied to the actuating mechanism

3.27**maximum ambient temperature**

highest temperature of the surrounding air declared by the manufacturer at which the valve may be operated

3.28

minimum ambient temperature

lowest temperature of the surrounding air declared by the manufacturer at which the valve may be operated

3.29

rated voltage

voltage declared by the manufacturer at which the valve may be operated

3.30

rated current

current declared by the manufacturer at which the valve may be operated

4 Classification

4.1 Classes of valve

— *Class A, B and C valves*

Valves where the sealing force is not decreased by the gas inlet pressure. They are classified A, B or C according to the sealing force requirements of 7.8.

— *Class D valves*

Valves which are not subject to any sealing force requirements.

— *Class E valves*

Valves where the sealing force is decreased by the gas inlet pressure and which meet the requirements of 7.8.

— *Class J valves*

Disc-on-seat valves where the sealing force is not decreased by the gas inlet pressure and which meet the requirements of 7.8.

4.2 Groups of valve

A valve is classified as group 1 or group 2 according to the bending stresses that it is required to withstand (see Table 4).

— *Group 1 valves*

Valves for use in an appliance and/or installation where they are not subjected to bending stresses imposed by installation pipework, (e.g. by the use of rigid adjacent supports).

— *Group 2 valves*

Valves for use in any situation, either internal or external to the appliance, typically without support.

NOTE A valve which meets the requirements of group 2 valves also meets the requirements of group 1 valves.

5 Units of measurement

5.1 Dimensions

Dimensions are given in millimetres.

5.2 Pressures

Pressures are static pressures relative to atmospheric pressure and are given in millibars or bars.

5.3 Bending moments and torques

Bending moments and torques are given in newton metres.

6 Construction requirements

6.1 General

6.1.1 Valves shall be designed, manufactured and assembled in such a way that they function correctly when installed and used according to the manufacturer's instructions.

6.1.2 Valves shall be free from sharp edges and corners that could cause damage, injury or incorrect operation.

All parts shall be clean internally and externally.

Dismantling and reassembly of valves shall require the use of tools. There shall be no exposed shafts or operating levers that could adversely affect the ability of valves to close.

6.1.3 Holes for screws, pins, etc., which are used for the assembly of parts of the valve or for mounting, shall not penetrate gasways.

The wall thickness between these holes and gasways shall be at least 1 mm.

6.1.4 Holes necessary during manufacture which connect gasways to atmosphere but which do not affect the operation of the valve shall be permanently sealed by metallic means. Suitable jointing compounds may additionally be used.

6.1.5 Closure parts, including those of measuring and test points, which may be dismantled for servicing, adjustment or conversion, shall be constructed in such a way that leak-tightness in accordance with 7.7 is achieved mechanically (e.g. metal to metal joints, O-rings) without the use of jointing compounds such as liquids, pastes or tapes.

Jointing compounds, where used for permanent assemblies, shall remain effective under normal operating conditions.

6.1.6 Parts which require dismantling, (e.g. for servicing) shall be capable of being dismantled and reassembled using commonly available tools. They shall be constructed or marked in such a way that incorrect reassembly is impossible when following the manufacturer's instructions.

Screwed fastenings which may be removed during servicing shall have metric threads to ISO 262:1998.

Self-tapping screws which cut a thread and produce swarf shall not be used for connecting gas-carrying parts or parts which may be removed during servicing.

Self-tapping screws which form a thread and do not produce swarf may be used provided that they can be replaced with metric machine screws conforming to ISO 262:1998.

6.1.7 The operation of moving parts, (e.g. diaphragms, bellows) shall not be impaired by other parts.

6.1.8 Soldering or other processes where the jointing material has a melting point below 450 °C after application shall not be used for joining gas-carrying parts except for additional sealing.

6.1.9 Closed position indicator switches, where fitted, shall not impair the correct operation of valves. Adjusters shall be sealed to indicate interference. Any drift of the switch and actuating mechanism from its setting shall not impair correct valve operation.

6.1.10 Flow rates of valves with modulating control shall be adjustable over the full range declared by the manufacturer. If the adjustment of one flow rate affects the setting of any other flow rate, this shall be clearly indicated in the manufacturer's instructions for setting up. The setting of any flow rate shall require the use of tools and shall be sealed to discourage unauthorized adjustment.

6.2 Materials

6.2.1 General material requirements

The quality of materials, the dimensions used and the method of assembling the various parts of the valve shall be such that construction and performance characteristics are safe. Performance characteristics of the valve shall not alter significantly during a reasonable life when installed and used according to the manufacturer's instructions. Under these circumstances, all components shall withstand any mechanical, chemical, and thermal conditions to which they may be subjected during service.

6.2.2 Zinc alloys

Zinc alloys shall only be used for gas-carrying parts of valves up to DN 50 with maximum working pressures up to 200 mbar if of quality ZnAl4 to ISO 301:1981 and if the parts do not exceed a temperature of 80 °C. Where the main inlet or outlet threaded connections are made of zinc alloys, threads shall be external and conform to ISO 228-1:2000.

6.2.3 Housing

Parts of the housing which directly or indirectly separate a gas-carrying compartment from atmosphere shall either be made from metallic materials, or shall be such that, on removal or fracture of non-metallic parts other than O-rings, gaskets, seals and diaphragms, no more than 30 dm³/h of air escapes at the maximum working pressure, when tested to 8.7.2.2.

6.2.4 Closure members

Closure members of valves above DN 25 shall either have a mechanical support (e.g. metallic) to withstand the sealing force or shall be made of metal.

This requirement also applies to:

- all valves with a maximum working pressure above 150 mbar;
- parts transmitting the closing force.

6.2.5 Springs providing closing force and sealing force

Closing force and sealing force shall be provided by spring action. Springs providing the closing and sealing forces shall be designed for oscillating loads and for fatigue resistance. Springs with wire diameter up to and including 2,5 mm shall be made from corrosion-resistant materials.

Springs with wire diameter above 2,5 mm shall either be made from corrosion-resistant materials or shall be protected against corrosion.

6.2.6 Resistance to corrosion and surface protection

All parts in contact with gas or atmosphere, and springs other than those covered by 6.2.5, shall either be made from corrosion-resistant materials or shall be suitably protected. The corrosion protection for springs and other moving parts shall not be impaired by any movement.

6.2.7 Impregnation

Where impregnation is part of the manufacturing process, it shall be carried out using an appropriate procedure, (e.g. vacuum or internal pressure, using appropriate sealing materials).

6.3 Gas connections

6.3.1 General

Valves above DN 80 shall be flanged to ISO 7005.

NOTE In some countries there is a requirement for flanged connections above DN 50.

Equivalent connection sizes are given in Table 1.

Table 1 — Connection sizes

Nominal size	Designation of threads to ISO 7-1:1994 or to ISO 228-1:2000	Nominal size of flanges to ISO 7005	Outside diameter range for tubes for compression fittings
DN	Inches	mm	mm
6	$\frac{1}{8}$	6	$2 \leq 5$
8	$\frac{1}{4}$	8	$6 \leq 8$
10	$\frac{3}{8}$	10	$10 \leq 12$
15	$\frac{1}{2}$	15	$14 \leq 16$
20	$\frac{3}{4}$	20	$18 \leq 22$
25	1	25	$25 \leq 28$
32	$1\frac{1}{4}$	32	$30 \leq 32$
40	$1\frac{1}{2}$	40	$35 \leq 40$
50	2	50	$42 \leq 50$
65	$2\frac{1}{2}$	65	—
80	3	80	—
100	4	100	—
125	5	125	—
150	6	150	—

6.3.2 Threads

6.3.2.1 It shall be possible to make all gas connections using commonly available tools, e.g. by suitable spanner flats on the valve body.

6.3.2.2 Inlet and outlet threads shall be to ISO 7-1:1994 or to ISO 228-1:2000 and shall be chosen from the series given in Table 1.

NOTE Additional information on the use of these threads is given in Annex A.

6.3.2.3 Where connections are made with union joints, either the joints shall be included with the valve or full details shall be supplied if the threads do not conform to ISO 7-1:1994 or ISO 228-1:2000.

6.3.3 Flanges

Where flanges are used on valves above DN 50, they shall be suitable for connection to flanges to ISO 7005, PN 6 or PN 16.

Where flanges are used on valves up to and including DN 50 which are not suitable for connection to flanges to ISO 7005, either suitable adapters shall be supplied to enable connection to standard flanges and threads, or full details of mating parts shall be supplied.