Specification for

Electrically operated automatic gas shut-off valves fitted with throughput adjusters, proof of closure switches, closed position indicator switches or gas flow control

BSI STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Gas Standards Policy Committee (GSE/-) to Technical Committee GSE/22, upon which the following bodies were represented:

Association of Control Manufacturers — TACMA (BEAMA Ltd.)
British Combustion Equipment Manufacturers' Association
British Gas plc
Chief and Assistant Chief Fire Officers' Association
Department of Trade and Industry (Consumer Safety Unit, CA Division)
Health and Safety Executive
Liquefied Petroleum Gas Industry Technical Association (UK)
Society of British Gas Industries

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Contents

Foreword

This British Standard has been prepared under the direction of the Gas Standards Policy Committee for publication alongside BS EN 161, the European Standard for automatic shut-off valves that replaces BS 5963 : 1982, which is withdrawn.

This standard specifies requirements and methods of test for throughput adjusters, proof of closure switches, closed position indicator switches or gas flow control which may be fitted to electrically operated automatic gas shut-off valves which were previously within the scope of BS 5963 : 1982 and are outside the scope of BS EN 161.

The requirements and methods of test for automatic shut-off valves themselves are now covered by BS EN 161.

This standard retains the requirements for such additional features, pending publication of European Standards for additional features, and will be withdrawn on the publication of such standards.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This standard specifies the requirements and test methods for throughput adjusters, proof of closure switches, closed position indicator switches, start-gas flow control and electrical variation of flow rate when fitted to electrically operated automatic gas shut-off valves which themselves fall within the scope of BS EN 161.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard, the definitions given in BS EN 161 apply, together with the following.

2.1 closed position indicator switch

A switch fitted to a class A, B or C automatic shut-off valve which indicates when the valve is in the nominally closed position.

2.2 proof of closure switch

A switch fitted to a class A, B or C automatic shut-off valve with mechanical overtravel which proves the valve to be in the closed position.

2.3 throughput adjuster

A device which restricts the throughput of the valve and is set before or during commissioning.

2.4 start-gas flow rate

The restricted gas flow rate admitted either to a separate pilot burner or to the main burner during the start-gas flame establishment period.

2.5 hazardous condition

An abnormal condition involving risk to persons or property.

3 Valves fitted with throughput adjusters

3.1 General

3.1.1 Throughput adjusters shall be identified and shall be marked to indicate the direction of adjustment.

3.1.2 For adjusters operating over a single turn, means shall be provided for indicating the actual setting and the minimum and maximum positions.

3.1.3 For adjusters operating with a multi-turn screw, the direction of increase and/or decrease shall be indicated.

3.1.4 Adjusters shall retain their set position under normal conditions of use and shall either:

(a) require the use of tools for their access and setting; or

(b) require the use of tools for adjustment and be capable of being sealed after setting.

3.2 Adjusters forming part of the valve body

3.2.1 Adjusters forming part of the valve body shall be tested in accordance with appendix A, after which they shall comply with **3.1.4.**

A single sample shall be tested for each size of adjuster.

3.2.2 Where the adjuster limits the travel of the valve disc, an endurance test, as specified in **4.11.3** of BS EN 161 : 1991, shall be carried out on three samples with the adjuster set to give either minimum flow or 10 % of maximum flow, whichever is the greater. Following this endurance test, any variation in the set flow shall not exceed ± 10 %.

3.3 Adjusters forming part of the valve actuating mechanism

Adjusters forming part of the valve actuating mechanism shall comply with **3.2.2.**

4 Valves fitted with proof of closure switches

4.1 General

Valves fitted with proof of closure switches shall be designated as type 0 or type 50 according to the following.

The switch shall be fitted to the valve in such a manner that the switch will not indicate closure until:

(a) for valves designated type 0, the valve is fully closed and leak-tight when tested in accordance with **4.7.3** of BS EN 161 : 1991; or

(b) for valves designated type 50, the valve is closed and does not pass in excess of 50 dm^3/h when tested in accordance with **4.7.3** of BS EN 161 : 1991.

Valves with a mechanical overtravel characteristic and fitted with proof of closure switches shall comply with **4.2** to **4.5** and in addition shall comply with BS EN 161.

4.2 Drift from design/setting position

The switch assembly and actuating mechanism shall be such that any drift from its design/setting position shall not impair its correct operation. Setting adjusters shall be sealed to prevent interference.

4.3 Indication of proof of closure

A single modified valve shall be tested to determine leakage in accordance with **B.1**. The leakage measured shall not exceed the maximum permitted value for the type of switch as specified in **4.1**.

4.4 Endurance

Three unmodified valves fitted with proof of closure switches shall be tested in accordance with **B.2**, after which no failure which could cause a hazardous condition shall have occurred.

4.5 Indication of proof of closure after endurance test

The valves used for the test in **4.4** shall be modified and tested in accordance with **B.1**. All three shall not exceed the maximum permitted leakage for the type of swich as specified in **4.1**.

5 Valves fitted with closed position indicator switches

5.1 General

Whilst closed position indicator switches may indicate closure before the valve is fully closed, they shall not indicate closure until the flow through the valve is equal to or less than 10 % of the equivalent fully open flow at the same pressure differential or until the valve is within 1 mm of its closed position.

Valves fitted with closed position indicator switches shall comply with **5.2** to **5.5** and in addition shall comply with BS EN 161.

5.2 Drift from design/setting position

The switch assembly and actuating mechanism shall be such that any drift from its design/setting position shall not impair its correct operation. Any setting adjuster shall be sealed to prevent interference.

5.3 Indication of closure

A single modified valve shall be tested in accordance with **C.1** for flow or distance open. Flow or distance open shall not exceed the maximum value specified in **5.1**.

5.4 Endurance

Three unmodified valves fitted with closed position indicator switches shall be tested in accordance with **C.2**, after which no failure which could cause a hazardous condition shall have occurred.

5.5 Indication of closure after endurance test

The valves used for the test in **5.4** shall be modified and tested in accordance with **C.1**. Flow or distance open for all three valves shall not exceed the maximum permitted value specified in **5.1**.

6 Valves incorporating start-gas flow control and valves in which the flow rate may be varied electrically

6.1 General

Valves of the following type shall comply with **6.2** and BS EN 161:

(a) valves where the burner start-gas flow rate can be electrically controlled by the burner management system after having been manually pre-set;

(b) valves where the levels of flow can be achieved by the valve's responding to external electrical signals, either in discrete steps (e.g. high/low) or in proportion to the applied signal.

6.2 Requirements and tests

6.2.1 *Adjustment and mechanical inspection*

The method of adjustment of each flow level shall allow adjustment over the full range claimed by the manufacturer. When setting up in accordance with the manufacturer's instructions, the adjustment of one level of flow shall not alter or disturb the setting of any other by more than 5 %. If the adjustment of one flow level is capable of disturbing the setting of any other flow level, this shall be clearly indicated in the manufacturer's instructions for setting up. The setting of any gas rate shall require the use of tools and shall be protected by a method which discourages unauthorized adjustments. Compliance with these requirements shall be confirmed by inspection and measurement as necessary. All measurements of flow shall be performed as specified in **4.10** of BS EN 161 : 1991 and shall be declared as percentages of the fully open flow rate at the pressure differences specified in **4.10** of BS EN 161 : 1991 as appropriate.

6.2.2 *Performance*

It shall not be possible for the start-gas flow rate to exceed 50 % of the maximum flow.

NOTE. This may be achieved either by the incorporation of a physical limit to the start-gas adjustment or by limiting the setting of an electrical interlock. These methods are referred to in other standards, e.g. BS 5885 : Part 1, as type P and type I respectively.

Where the start-gas position of the valve is interlocked, the interlock shall be such that it forms no part of the normal start-gas flow rate control circuitry of the valve. When the valve is opened beyond the set start-gas flow rate position the interlock shall operate before the flow rate through the valve exceeds 1.1 times the set start-gas flow rate. The setting of the interlock shall require the use of tools and shall be protected by a method which discourages unauthorized adjustment.

For any setting within the manufacturer's declared adjustment range, when the valve is tested in accordance with appendix D the flow rate at the end of the endurance test shall be within ± 10 % of that set prior to the start of the endurance test, when measured under the same conditions.

When the flow rate is changed under the effect of external electrical signals, the flow shall not, while attaining the new level of flow, overshoot the new flow level by more than 20 % of the flow at the particular set point or 10 % in the case of a start-gas flow rate setting when opening.

The manufacturer shall declare the maximum available start-gas flow rate as a percentage of the fully open flow rate. It shall not be possible to adjust the start-gas flow rate to a level in excess of 1.1 times the declared maximum start-gas flow rate.

Tests shall be performed to ensure that all valves subjected to the endurance test (see **4.11.3** of BS EN 161 : 1991 and appendix D) comply with the requirements of this subclause before the endurance test and on completion of the endurance test. In addition, those tests which can be made without adjusting or disturbing the set-point shall be performed to ensure that all valves subjected to the endurance test comply with the requirements of this subclause after completion of the endurance test as detailed in **4.11.3** of BS EN 161 : 1991 and appendix D.

Appendices

Appendix A. Test for valves fitted with throughput adjusters

Operate the adjuster over the full range of adjustment 25 times and test for external leak-tightness in accordance with **4.7** of BS EN 161 : 1991.

Appendix B. Test for valves fitted with proof of closure switches

B.1 Indication of proof of closure test

Modify a single valve to enable the valve sealing member to be moved and positioned in any partially open position. Slowly close the valve until the switch just indicates valve closure and then test for leakage.

B.2 Endurance test

Test three unmodified valves fitted with proof of closure switches in accordance with **4.11.3** of BS EN 161 : 1991. Check that the switch indicates valve closure when the valve is de-energized and indicates that the valve is open when the valve is energized.

Appendix C. Test for valves fitted with closed position indicator switches

C.1 Indication of closed position test

Modify a single valve to enable the valve sealing member to be moved and positioned in any partially open position. Slowly close the valve until the switch just indicates valve closure and then test for flow or distance open, as appropriate.

C.2 Endurance test

Test three unmodified valves fitted with closed position indicator switches in accordance with **4.11.3** of BS EN 161 : 1991. Check that the switch indicates valve closure when the valve is de-energized and indicates that the valve is open when the valve is energized.

Appendix D. Tests for valves incorporating start-gas flow control and in which the flow rate may be varied

D.1 Prepare the valves for the endurance test by adjusting the setting levels of the various flow levels so that, for valves switching in steps, at least one valve is set at each of the upper and lower extremes, but not less than 5 % of the fully open flow rate, and at least one valve is set at the midpoint of the adjustable range of each switched flow setting. Measure the flows at these settings. For proportional action valves similarly adjust the set proportional ranges.

Test the valves in accordance with **4.11.3** of BS EN 161 : 1991, switching the valves as described in **D.2.**

D.2 Operate the valves such that they are switched betweeen each level (e.g. off/low/high or off/lowest point on proportional setting/maximum point on proportional setting) both in the increasing and decreasing flow modes, to ensure that each valve is subjected to all possible modes of operation during its opening and closing in the endurance test.

Ensure that each valve is switched from each flow level to the off (closed) position an approximately equal number of times during the endurance test and that the total number of closures does not exceed the specified life. For example a high/low/off slow opening valve with two flow levels would be switched 125,000 times through the following cycle:

off-low-high-low-off-high-off.

During this test, ensure that each valve maintains each flow level for not less than 3 s .

D.3 Check the correct operation of any start-gas rate interlock prior to and at the end of the endurance test and periodically for correct switching function during the endurance test.

Publication(s) referred to

BS 5885 Automatic gas burners
Part 1 Specification for burners with input rating 60kw and above

BS EN 161 Automatic shut-off valves for gas burners and gas appliances

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