
Specification for
Gas governors

THIS BRITISH STANDARD, having been approved by the Gas Industry Standards Committee, was published under the authority of the Executive Board on 16 August, 1972

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ISBN: 0 580 07246 0

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The following BSI references relate to the work on this standard:

Committee reference GSE/22 Draft for comment 71/40084

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Department of Trade and Industry	National Federation of Plumbers and Domestic Heating Engineers
*Gas Council	*Society of British Gas Industries
Heating and Ventilating Contractors' Association	Water-tube Boilermakers' Association
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Institution of Heating and Ventilating Engineers	

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British Compressed Gases Association	British Oil and Gas Firing Equipment Manufacturers' Association
British Industrial Measuring and Control Apparatus Manufacturers' Association	Chief Fire Officers' Association
British Non-ferrous Metals Federation	National Brassfoundry Association



BS 3554 : Part 2 : 1972

UDC 662.76.073.4 : 621.646.4.02

Specification for Gas governors

Part 2. Independent governors for inlet pressures up to 350 mbar

Amendments issued since publication

Amd. No.	Date of issue	Text affected

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Foreword

BS 3554 : Part 1 covers independent governors for 1st and 2nd family gases at inlet pressures of up to 25 mbar and outlet pressures above 4 mbar for domestic, catering and commercial appliances, with connections between 1/8 in and 2 in BSP. This Part 2 has been published to meet the demand for governors of larger sizes, which are required mainly for use with commercial and industrial appliances, for low pressure 1st and 2nd family gases. It also covers governors which in BS 3554 : 1962 were designated high performance governors. The whole of the pressure range covered in this Part of this standard is not necessarily available in any one type or size of governor. Pressure regulators for use with 3rd family gases are specified in BS 3016, 'Pressure regulators for use with butane/propane gases'.

To satisfy the essential requirements of this standard will not necessarily ensure satisfaction in use; the correct application is also important. Some guidance on application is to be found in CP 332, 'Selection and installation of town gas space heating', Part 3, 'Boilers of more than 150 000 Btu/h (44 kW) and up to 2 000 000 Btu/h (586 kW) output', and on installation in CP 331, 'Installation of pipes and meters for town gas', Part 1, 'Service pipes'.

It should be noted that the methods of test given are primarily for approval testing and are not necessarily the tests used in the manufacture of production models; some of the tests are type tests that would be carried out by a suitably equipped testing house or approval authority.

An explanatory note regarding the grouping of gases into 'families' is given in Appendix B of BS 1179, 'Glossary of terms used in the gas industry'.

Factors for the conversion of metric into imperial units are given in Appendix F. More comprehensive conversions will be found in BS 350, 'Conversion factors and tables'.

British Standard Specification for

Gas governors

Part 2. Independent governors for
inlet pressures up to 350 mbar

1. Scope

This Part of this British Standard covers general-purpose independent lock-up self-acting constant-pressure governors, both spring and weight loaded or, when applicable, combined types, with connections between $\frac{1}{8}$ in and 6 in BSP, for use with 1st and 2nd family gases at inlet pressures up to 350 mbar* and outlet pressures from 4 mbar to 80 mbar.

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

2. Definitions

2.1 General

For the purposes of this Part of this British Standard, the definitions given in BS 1179 apply.

NOTE. The nominal size of a governor, which is defined as the nominal diameter of the inlet connection, does not necessarily define the governor rating (see 2.2.3(6)).

2.2 Specific

2.2.1 Function

- (1) *Self-acting governor*. A governor that operates without external source of power.
- (2) *Independent governor*. A governor that is not integral with any appliance or other controls. It may, however, be connected to and used in conjunction with other controls or an appliance.

2.2.2 Governor parts (see Figs. 1, 2 and 3)

- (1) *Main diaphragm*. The flexible member which, under the influence of the forces of loading and pressure, operates the valve.
- (2) *Compensating diaphragm*. A diaphragm that compensates for the effect of inlet pressure on the valve head.
- (3) *Single beat valve*. A valve assembly having only one valve head.
- (4) *Double beat valves*. A balanced valve assembly of two valve heads of nominally equal size.
- (5) *Diaphragm plate*. A stiffening plate fitted to the diaphragm.
- (6) *Valve head or valve bob*. The component attached to the valve stem that moves to regulate the flow of gas through the valve seating.
- (7) *Valve seating*. That portion of the body with which the valve head(s) co-operates for regulation of the gas flow.
- (8) *Valve stem*. The component that joins the valve head(s) to the diaphragm.
- (9) *Breather*. The orifice or channel in a pressure governor through which atmospheric or other referenced pressure is maintained on one side of the main diaphragm.

*1 mbar = 10^2 N/m² = 10^2 Pa.

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- (10) *Breather valve.* A valve to facilitate rapid movements of the main diaphragm while
Anti-fluctuation valve. permitting normal breathing in its closed position.
Vent valve.

(11) *Impulse port.* The orifice or channel through which the controlled pressure is communicated to the main diaphragm.

2.2.3 Performance nomenclature

(1) *Class A governor.* A governor that is capable of working with inlet pressures of up to 75 mbar and a minimum differential of 2.5 mbar.

(2) *Class B governor.* A governor that is capable of working with inlet pressures of up to 350 mbar and a minimum differential of 7.5 mbar.

(3) *Maximum inlet pressure (P_{imax}).* The highest pressure that may be applied to the inlet of the governor.

(4) *Minimum inlet pressure (P_{imin}).* The lowest inlet pressure for which satisfactory governing is obtained.

(5) *Nominal outlet pressure (P_{on}).* The manufacturer's stated outlet pressure when the inlet pressure applied is the mean of the inlet pressure range (i.e. mean of P_{imin} and P_{imax}) and the flow rate is 15 % of the manufacturer's stated maximum flow rate (Q_{max}).

(6) Q_{max} . The nominal gas rate in cubic metres per hour (m^3/h) that a governor is designed to control (see 7.1.2).

(7) Q_{min} . The minimum gas rate that the governor is designed to control (see 7.1.2).

3. Materials

3.1 General

All component parts shall be manufactured from or treated with materials that are not affected adversely by chemical or thermal influences or handling that may be encountered in normal use. Notwithstanding the requirements laid down in this standard any materials that give results at least equivalent to those specified shall be acceptable.

3.2 Metal components

Metal components shall be of appropriate materials in accordance with the requirements of any relevant British Standards, e.g.:

Material	Specification
Brass (cast)	BS 1400, SCB 3-C
Brass for hot pressings	BS 2872, CZ 122
Brass bars for screwing and turning	BS 2874, CZ 121
Brass sheet	BS 2870, CZ 108
Aluminium castings	BS 1490
Cast iron	BS 1452
Zinc alloy die castings	BS 1004 and CP 3001

3.3 Castings and hot pressings

Castings shall be in all respects sound and good, free from laps, blow holes and pitting and both the external and internal surfaces shall be clean, smooth and free from foreign matter. This does not exclude accepted methods of impregnation or rectification of castings.

3.4 Diaphragm and covering of valve head

3.4.1 Synthetic material. Where synthetic material, including rubber and plastics, is used, it shall be free from porosity, pits and foreign particles and shall have a smooth non-tacky surface with a minimum of talc or bloom. See also 8.4.

3.4.2 Leather. Where leather is used, it shall be of good quality tanned (Persian) sheepskin free from flaying defects and serious imperfections of grain, generally in accordance with the requirements of BS 2797 : Part 1. It shall be suitably treated to ensure flexibility, soundness and a reasonable service life.

3.5 Diaphragm gaskets

Diaphragm gaskets shall be made from materials complying with the requirements of the relevant British Standard. They shall form an effective seal and shall be capable of repeated use for at least five times on any one governor.

3.6 Leather dressing

Any dressing applied to a leather diaphragm shall either be dried before assembly and not likely to run in conditions of use or, if an oil dressing, shall be inert and not subject to the formation of gum or resinous material, so as to ensure adequate service life. A suitable material is a selected, highly refined mineral oil of viscosity approximately 183 cSt at 60 °C (approximately 750 s, Redwood No. 1 at 140 °F).

3.7 Corrosion resistance

3.7.1 Internal. Internal parts shall be fully resistant to or protected from the harmful effects of the constituents of the gas.

3.7.2 External. Materials used in the construction of any parts liable to corrosion in normal atmospheres shall be suitably protected. If unplated mild steel is used, this shall have a minimum thickness of 1.6 mm.

4. Design

4.1 Pressure adjustment

Whatever method of loading adjustment is used it shall not be possible for it to interfere with the free movement of the valve. Means shall be provided to discourage unauthorized interference with the loading adjustment.

NOTE. Suitable means of sealing the adjusting mechanism include locknuts, locking-wire with a lead seal, a cover screw with a screwdriver slot or any means that requires the use of tools to gain access to the adjusting mechanism.

4.2 Breather

The breather shall be so located that it does not easily become blocked and that it would be difficult for a cleaning device inserted through the breather to reach the diaphragm. If the size of the breather hole is such that, in the event of main diaphragm leakage, the flow of gas of relative density 0.5 (air = 1) at a pressure of 25 mbar escaping from the compartment above the diaphragm exceeds 100 dm³/h or if the governor is designed for inlet pressure over 50 mbar, the breather shall be provided with a screwed connection for a vent pipe, and the screw thread shall be to BS 21. See also 4.6.

4.3 Chamber above main diaphragm

The design of the chamber above the main diaphragm shall be such that it can readily be made gas tight. This excludes the breather hole. The shell of this chamber and its method of attachment shall withstand without failure a pressure of 1.5 P_{imax} .

4.4 Gaskets

Where gaskets liable to shrinkage in use are used to make gas tight joints between metal parts, provision shall be made to take up automatically any shrinkage that may occur in use, e.g. by means of spring washers.

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4.5 Self-tapping screws

The application of self-tapping screws shall be limited to malleable materials and, to prevent cracking of the material, they shall be centred not closer to the edge than 1.5 times the major diameter of the thread.

Only self-tapping screws that form fully swaged machine type screw threads shall be used to secure together the external joint of a gas carrying component or part that may be removed in servicing; for servicing purposes it shall be possible to fit machine screws in place of these self-tapping screws.

4.6 Fire performance

When a governor is required to withstand fire conditions, it shall satisfy the 30 minute furnace test based on the standard time-temperature curve of BS 476 : Part 8, and given in Appendix A, without the external leakage rate exceeding the value given in Table 1.

A governor designed to comply with the requirements of this clause shall have a screwed connection for a vent pipe (see 4.2).

Table 1. Leakage after fire test

Governor size	Maximum leakage (free air)
in BSP	dm ³ /h
up to 1	75
over 1, to 2	150
over 2, to 3	225
over 3, to 4	400
over 4, to 6	750

5. Assembly and workmanship

5.1 Sharp edges

The constituent parts of a governor shall be free from sharp edges that might cause damage.

5.2 Cleanliness

An assembled governor shall not contain dirt, casting sand, swarf or other foreign matter. There shall be no excess diaphragm dressing or jointing compound in a position in which it could enter the breather or impulse port, cause a valve head to stick to its seating or otherwise interfere with the performance of the governor.

6. Connections and threads

6.1 Connections

Inlets and outlets shall be provided either with drilled flanges in accordance with the requirements of BS 10 : 1962 or BS 4504, or with screwed connections in accordance with the requirements of BS 21, unless otherwise specified by the purchaser. It is desirable that the dimensions of the bosses of screwed connections should permit the use of standard spanners to BS 192.

6.2 Resistance to deformation

6.2.1 Bending. A governor shall not exhibit external leakage greater than that specified in 9.1 when the bending moment shown in Table 2 is applied to the inlet connection in accordance with B.1.

6.2.2 Torque. A governor shall withstand at each end, without deformation, breakage or leakage greater than that specified in 9.1, the torque shown in Table 2 when tested in accordance with B.2.

Table 2. Resistance to deformation

Nominal size	Bending moment	Torque
in BSP	N m	N m
$\frac{1}{2}$	105	50
$\frac{3}{4}$	340	75
1	340	90
$1\frac{1}{4}$	610	105
$1\frac{1}{2}$	610	115
2	1 080	135
$2\frac{1}{2}$ -3	2 440	145
4-6	9 720	160

6.3 Screw threads

Other than those specified in 6.1, screw threads should comply with the requirements of relevant British Standards, e.g. BS 1580, BS 2779 and BS 3643.

7. Technical data

7.1 General

7.1.1 Gas density. In this standard the performance of governors is based on the use of gas of relative density 0.5 (air = 1) for 1st family gas and 0.6 for 2nd family gas.

7.1.2 Governor capacity

7.1.2.1 Maximum capacity. The maximum capacity of a governor shall be not less than that defined by the equations below up to the value of $Q_{\max}$ declared in 7.2(1).

$$Q = 4.5 D^2 \sqrt{(P_1 - P_o)/S}$$

where Q = flow at metric standard reference conditions ($\text{m}^3(\text{st})/\text{h}^*$)

D = nominal size of governor (in)

P_1 = pressure at inlet to governor (mbar)

P_o = pressure at outlet from governor (mbar)

S = relative density of gas flowing (air = 1)

$$\text{or } Q = 250 D^2 \sqrt{(P_1 - P_o)/S}$$

where Q = flow at s.r.c.† (ft^3/h)

D = nominal size of governor (in)

P_1 = pressure at inlet to governor (in w.g.)

P_o = pressure at outlet from governor (in w.g.)

S = relative density of gas flowing (air = 1).

Table 3 gives the minimum value of the maximum capacity, $Q_{\max}$, for Class A and Class B governors operating at their minimum differential for 1st family gas, 2nd family gas and air.

* The symbol (st) denotes the metric standard reference conditions 15 °C, 1013.25 mbar, dry.

† Imperial standard reference conditions 60 °F, 30 inHg, saturated.