BS 6158 : 1982

UDC 621.791.5 : 621.6.02 : 614.8

Specification for

Safety devices for fuel gases and oxygen or compressed air for welding, cutting and related processes

Spécification pour les dispositifs de sécurité pour les gaz combustibles et l'oxygène ou l'air comprimé utilisés pour le soudage, le coupage ou autres procédés connexes

Spezifikation für Sicherheitseinrichtungen für Brenngase und Sauerstoff oder Druckluft für das Schweißen, Schneiden oder ähnliche Verfahren

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

British Standards

Full document details: BS 6158:1982

Contents

	Page
Cooperating organizations	Back cover
Foreword	Inside front cover

Specification

		Page
1.	Scope	1
2.	References	1
3.	Definitions	1
4.	Units of pressure	1
5.	Design, materials and installation	1
5.1	Constructional design	1
5.2	Materials	1
5.3	Material finishes	2
5.4	Installation	2
6.	Operational requirements	2
6.1	General	2
6.2	Non-return valve	2
6.3	Flame arrestor	2
6.4	Pressure relief valve	2
6.5	Heat sensitive cut-off valve	2
6.6	Pressure sensitive cut-off valve	2
7.	Type approval test requirements applicable to all devices	2
7.1	General	2
7.2	Strength test	2
7.3	Requirements for test gases	2
7.4	Measurement of gas flow	3
7.5	Test for gas tightness	3
8.	Type approval test requirements applicable to specific devices	3
8.1	General	3
8.2	Non-return valve	3
8.3	Flame arrestor	3
8.4	Pressure relief valve	3
8.5	Heat sensitive cut-off valve	4
8.6	Pressure sensitive cut-off valve	4
9.	Instrumentation accuracy and test methods for type approval tests	4
9.1	Instrumentation accuracy	4
9.2	Measurement of gas flow	4
9.3	Gas tightness test	4
9.4	Non-return valve test	4
9.5	Flame arrestor test	5
9.6	Pressure relief valve test	6
9.7	Heat sensitive cut-off valve test	6
9.8	Pressure sensitive cut-off valve test	6
10.	Marking	6
10.1	General	6
10.2	Colour coding	7
11.	Manufacturers' tests	7

Appendix

	Page
A. Maintenance and repair	8

Table

	Page
1. Coefficient for multiplication of gas discharge	2

Figures

	Page
1. Typical non-return valve	3
2. Typical flame arrestor	3
3. Typical pressure relief valve	4
4. Typical heat sensitive cut-off valve	4
5. Typical pressure sensitive cut-off valve	4
6. Typical method of measurement and recording of gas flow	5
7. Typical test apparatus for non-return valve	5
8. Typical test apparatus for flame arrestor	6
9. Typical test apparatus for heat sensitive cut-off valve	7

Foreword

This British Standard was prepared under the direction of the Welding Standards Committee, to provide a specification for safety devices which will perform satisfactorily and safely in service.

The initial draft for this standard was provided by the British Compressed Gases Association and, in its preparation, due account was taken of work being carried out in the field of international standards.

AVA Documents
Document Sharing Hub

Full document details: BS 6158:1982

British Standard Specification for

Safety devices for fuel gases and oxygen or compressed air for welding, cutting and related processes

1. Scope

This British Standard specifies requirements for oxygen or compressed air and fuel gas safety devices, used between the cylinder regulators or pipeline regulators or downstream of the pipeline valve outlet and the blowpipe (burning device), for welding, cutting and related processes.

The devices covered are

(a) non-return valve

(b) flame arrestor

(c) pressure relief valve

(d) heat sensitive cut-off valve

(e) pressure sensitive cut-off valve

NOTE. The use of safety equipment may prevent damage resulting from misuse/malfunction during the operation of the blowpipe.

This standard excludes safety equipment demanded by national piped gas supply undertakings which may have specialized requirements.

2. References

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

3. Definitions

For the purposes of this British Standard, the following definitions apply. For other terms the definitions in BS 499 : Part 1 apply.

3.1 backfire. The return of the flame into the blowpipe with a popping sound, the flame being either extinguished or reignited at the nozzle.

3.2 sustained backfire. The return of the flame into the blowpipe with continued burning within the neck or mixer. (This may be accompanied by an initial popping sound followed by a hissing sound from the continued burning within the blowpipe.)

3.3 flashback. The return of the flame through the blowpipe into the hoses and even the regulators. (It may also reach the acetylene cylinder, causing heating and decomposition of the contents.)

3.4 backflow. Flowing back of the gas with the higher pressure into the hose of the gas with the lower pressure. (This can be caused by the nozzle exit becoming blocked or restricted.)

3.5 non-return valve. A valve which prevents the passage of gas in the opposite direction to the normal gas flow (see figure 1).

3.6 flame arrestor. A device which quenches a flame front (flashback or acetylene decomposition) (see figure 2).

3.7 pressure relief valve. A valve which automatically vents gas to atmosphere when the pressure exceeds a predetermined value and which automatically reseals when the conditions causing the over-pressure are corrected (see figure 3).

3.8 cut-off valve (heat sensitive). A valve which closes the gas supply before a flame arrestor reaches a sufficient temperature to ignite the gas on the upstream side (see figure 4).

3.9 cut-off valve (pressure sensitive). A valve which automatically closes in the event of slow or sudden back pressure from the downstream side of the cut-off valve. The valve remains closed unless manually reset (see figure 5).

3.10 stoichiometric ratio. The mixture of oxygen/fuel gas which will give a flame where only the theoretical oxygen requirements for complete combustion have been added.

4. Units of pressure

Pressure is measured in 'gauge' pressure, i.e. pressure exceeding atmospheric pressure. The preferred unit is the 'bar'. Subdivisions of the bar are used, where relevant.

1 bar = 10^5 N/m^2 (newtons per square metre)
= 10^5 Pa (pascal)

1 mbar = 10^2 N/m^2 = 10^2 Pa.

5. Design, materials and installation

5.1 Constructional design. The construction shall be suitable for the purpose intended, particularly in regard to routine inspection and maintenance requirements.

The design of the connections shall prevent interchangeability between fuel and other gases and shall comply with the requirements of BS 1389, e.g. left-hand threads for fuel gases.

If filters are incorporated and it is necessary to remove them for routine maintenance, the design shall be such that servicing can be carried out without detriment to the safety function.

If elastomeric seals are incorporated and it is necessary to change them during routine maintenance, the design shall be such that the changing of a seal is not detrimental to the safety function.

5.2 Materials

5.2.1 *General.* It shall be determined by the type approval test requirements (see clauses **7** and **8**) that the materials used for the manufacture of safety equipment are effective for the purpose intended.

The materials of safety equipment components likely to come into contact with the gases shall have adequate

AVA Documents
Document Sharing Hub

Full document details: BS 6158:1982

resistance to the chemical/mechanical and the thermal action of these gases under operating conditions.

5.2.2 *Acetylene applications.* The copper content of material used in the construction of components for use with acetylene, with the exception of flame arresting elements, shall not exceed 70 % by mass. Flame arresting elements shall be manufactured from copper-free materials.

Where silver/copper alloy solders are used in the construction, the filler metal joint width in contact with the gas shall not exceed 0.3 mm; the copper content shall not exceed 21 % by mass and the silver content shall not exceed 43 % by mass.

5.2.3 *Oxygen applications.* Springs designed for use in oxygen shall be manufactured from corrosion resistant materials. They shall not be plated.

All components in contact with oxygen shall be free of oil, grease and other lubricants which are flammable at normal operating conditions.

Only lubricants suitable for oxygen shall be used.

5.3 Material finishes. Any finishing lacquer or paint applied to the exterior of the devices shall be prevented from entering any of the orifices and, additionally, threads and sealing surfaces shall be free of lacquer or paint.

5.4 Installation. The sequence shall be varied to suit the functional conditions and shall be in accordance with the manufacturer's instruction, in each case ensuring maximum protection to the operator and equipment.

The manufacturer shall supply to the purchaser data which shall include maximum inlet pressure, related pressure drop, gas flow and, where relevant, additional marking data (see **10.1**).

If the operation of the device depends on a specific orientation this shall be stated by the manufacturer.

6. Operational requirements

6.1 General

6.1.1 *Leakage.* Safety devices shall be leak-free to atmosphere and between internal passages and chambers within the device where a pressure differential could exist when internal valves are closed.

6.1.2 *Strength.* The construction shall be adequate to resist both the maximum operating pressure of the device and the pressure wave emitted from an ignition of mixed gases at approximately stoichiometric proportions.

6.2 Non-return valve. The non-return valve shall prevent both slow and sudden reverse flows of gas before and, if not protected by the flame arrestor, after the flashback test.

6.3 Flame arrestor. The flame arrestor shall prevent the passage of a flame front and shall be appropriate for the gases, whether flowing or static, at the maximum inlet pressure. An arrestor shall be considered unsuitable if there are any signs of transmission of flame through the arrestor.

6.4 Pressure relief valve. The pressure relief valve shall be leak-free up to the manufacturer's prescribed opening pressure. The relief valve setting shall be such that the reseal pressure is not less than the maximum delivery pressure of the gas control regulator immediately before the valve.

The design shall be such as to discourage unauthorized personnel from tampering with the pressure setting. Any gas or flames emitted shall be vented in such a manner as to reduce the risk of injury to operator or damage to equipment.

6.5 Heat sensitive cut-off valve. The heat sensitive cut-off valve shall shut off the gas flow in the normal direction when actuated by a rise in temperature. The thermal trigger of the cut-off valve shall operate before a flame arrestor reaches a temperature sufficient to ignite an oxygen/fuel gas mixture on the upstream side of the flashback arrestor.

6.6 Pressure sensitive cut-off valve. The pressure sensitive cut-off valve shall shut off the inlet gas flow if there is a pressure rise from downstream (the pressure rise may be either slow or sudden) and the valve shall remain closed unless manually reset.

NOTE. The valve may operate if, during a period of shutdown, locked-up gas downstream of the trigger mechanism is greater than the upstream pressure of the gas at the non-return valve. This condition could arise if the upstream supply is shut off and the upstream gas is either vented or leaks to atmosphere.

7. Type approval test requirements applicable to all devices

7.1 General. The requirements of this clause shall apply to all devices.

7.2 Strength test. This test shall be done once on one sample.

The housings of safety devices shall resist a pressure equal to at least five times the maximum inlet pressure and, in all cases, not less than 60 bar. No permanent deformation shall occur after a test duration of at least 5 min. No other tests shall be carried out either prior or subsequent to this test on the samples used nor shall they be used for any other purpose.

NOTE. Conventional hydraulic testing equipment should be used for this test.

7.3 Requirements for test gases. With the exception of the flow test on units embodying a porous flame arresting element (see **7.4**), gas tightness and gas flow tests (**7.4** and **7.5**) shall be carried out with air or nitrogen free of oil and grease, which is taken to imply suspended droplets less than 1 mg/m^3.

In all cases the tests shall be made with dry gas, maximum 50 cm^3/m^3 (50 p.p.m.*) of moisture, corresponding to a dew point of $-48\ ^{\circ}C$. Data shall be established for air or nitrogen at 23 °C and 1.013 bar, with the appropriate conversion to the gas required (see table 1).

Table 1. Coefficient for multiplication of gas discharge

Test gas	Oxygen	Acetylene	Propane	Butane	Natural gas	Hydrogen
Air	0.951	1.049	0.800	0.695	1.348	3.807
Nitrogen	0.930	1.031	0.786	0.683	1.325	3.742

(Basis $1/\sqrt{\rho}$ where ρ is the gas density.)

*Parts per million (volume basis).

Documents
Document Sharing Hub
Full document details: BS 6158:1982