
British Standard Specification for

**Handheld blowpipes, mixers and nozzles,
using fuel gas and oxygen, for gas welding,
cutting and related processes**

Chalumeaux manuels, dispositifs mélangeurs et buses pour GPL et oxygène utilisés
pour le soudage au gaz, le coupage et autres procédés connexes — Spécifications

Handbrenner, Mischkammern und Düsen für Brenngas und Sauerstoff für Schweißen,
Schneiden und verwandte Verfahren

Foreword

This British Standard has been prepared under the direction of the Welding Standards Committee, to provide a specification for handheld blowpipes and nozzles that will perform satisfactorily and safely in service.

Because of their crucial function in the safe and stable operation of equipment, certain aspects of nozzle performance and manufacture are also specified and the requirements of this standard should be applied regardless of the source of manufacture of the nozzles.

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.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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

Contents

	Page
Foreword	Inside front cover
Committees responsible	Back cover
Specification	
1 Scope	2
2 Definitions	2
3 Design requirements	2
4 Safety and operational requirements	3
5 Type approval tests	4
6 Data to be supplied	10
7 Marking	10
Appendices	
A Additional terminology	13
B Information on legal requirements and publications relevant to safety for handheld blowpipes, nozzles and associated equipment	16
Table	
1 Abuse test: overheating. Test duration	5
Figures	
1 Method of occlusion for abuse test: occlusion	6
2 Apparatus for abuse test: overheating	7
3 Method of immersion for abuse test: stability against backpressure	8
4 Apparatus for test for stability in wind	9
5 Arrangement of apparatus for abuse test: sustained backfire	11
6 Examples of welding and cutting blowpipes	14
7 Examples of mixers and cutting nozzles	15

Specification

1 Scope

This British Standard specifies materials, construction, safety, performance and test requirements for handheld blowpipes and performance, safety and test requirements for nozzles, used with oxygen and fuel gas, for gas welding, cutting and heating processes.

This standard does not apply to blowpipes intended for metal scarfing, de-seaming, metal spraying or processes involving the entrainment, by the oxy-fuel gas stream, of metal powders or powder fluxes. Nor does it apply where air is used in the compressed state or by entrainment as the primary oxidizing gas.

A brief list of some of the legal and specialist publications relevant to safety for handheld blowpipes, nozzles and associated equipment is given in appendix B.

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 standard, the following definitions apply. For other terms, the definitions in BS 499 : Part 1 apply.

NOTE. For additional information on terminology concerning welding and cutting blowpipes, see appendix A.

2.1 blowpipe. A unit or combination of units necessary for the safe control, mixing and delivery of oxygen and fuel gas from the hoses to the nozzle.

NOTE. A blowpipe may be for a single purpose, e.g. cutting only, or, by the interchange of components, may be used for combined service on any or all of the specified processes.

2.2 high pressure fuel gas supply. A supply of fuel gas where the pressure is equal to or greater than 30 mbar*.

2.3 low pressure fuel gas supply. A supply of fuel gas where the pressure is lower than 30 mbar.

2.4 mixer. That part of the blowpipe to which gases are separately conducted and in which the mixing of gases takes place.

NOTE. The mixer may require the provision of gases at approximately equal pressures, or may require relatively high oxygen pressure in relation to that of the fuel gas. A mixer may be so designed as to provide fuel gas induction over the whole or a part of its designated flow capacity. This flow capacity may be matched to a range of nozzle orifice sizes or to only one.

Mixers may be detachable units or integral with the blowpipe or may derive from assembly, by the operator, of mating parts. They may be located in the shank, neck, head or nozzle of the blowpipe.

2.5 nozzle. That part of the blowpipe which provides the final control of velocity and gas profile as the gas or gases emerge to atmosphere.

2.6 welding nozzle. Normally a nozzle having a single orifice, supplied with mixed gases in suitable proportion.

NOTE. Welding nozzles may be relatively short detachable pieces and a range of sizes may share a common blowpipe neck and mixer. They may also be of integral pattern embodying the neck.

2.7 cutting nozzle. A nozzle that provides a pre-heat flame of mixed gases and a suitably disposed jet of cutting oxygen.

NOTE. Pre-heat flames may be annular, multi- or single jet, and the cutting jet may be surrounded by or be external to the pre-heat flame. A cutting nozzle may be supplied with pre-heat gases in mixed or unmixed condition. In the latter case, where mixing is carried out inside the nozzle, the term 'nozzle-mixing' defines the function.

The nozzle may comprise one or more components and may be mounted into the blowpipe by integral threading or by the use of separate nozzle nuts.

2.8 heating nozzles. A nozzle that, by suitable disposition of orifices, provides a flame or grouping of flames suitable for heating processes.

NOTE. The shape of the zone of combustion is defined by the process requirement.

2.9 backfire. The return of the flame towards the blowpipe mixer with a popping sound, the flame being either extinguished or re-ignited at the nozzle.

2.10 sustained backfire. The return of the flame towards the blowpipe mixer with continued burning within the neck or mixer.

NOTE. This may be accompanied by an initial popping sound followed by a hissing sound from the continued burning.

2.11 intermittent backfire. A rapid succession of backfires with the flame re-igniting at the nozzle.

NOTE. This may be accompanied by a noise resembling machine gun fire.

2.12 flashback. The return of the flame upstream of the mixer possibly into the hoses, regulators and into the primary gas supply.

2.13 decomposition. The disassociation of acetylene into carbon and hydrogen in the absence of oxygen, giving rise to high temperatures and pressures.

NOTE. This may be initiated by mechanical shock or high temperature or a combination of both.

2.14 backflow. A flowing back of the gas with the higher pressure into the hose of the gas with the lower pressure.

NOTE. This can be caused by the nozzle exit becoming blocked or restricted.

3 Design requirements

3.1 Constructional design

The constructional design shall comply with the requirements of clause 5 when tested by the methods and under the conditions specified therein.

NOTE. Compliance with this requirement establishes suitability for the intended purpose.

Hose connections shall comply with BS 1389 and shall comprise either permanently fitted hose coupling tail pieces, or threaded unions.

*1 mbar = 100 N/m² = 100 Pa.

3.2 Materials

3.2.1 General. The materials used for the manufacture of blowpipes shall comply with the requirements of clause 5 when tested by the methods and under the conditions specified therein.

NOTE. Compliance with this requirement establishes suitability for the intended purpose.

Materials likely to come into contact with the gases used shall be resistant to the chemical, mechanical and thermal action of the gases under operating conditions.

3.2.2 Acetylene applications. The copper content of materials used in the construction of components for use with acetylene shall not exceed 70 % *m/m** except for nozzles where there is no restriction of the copper content. 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 % *m/m** and the silver content shall not exceed 43 % *m/m**.

3.2.3 Oxygen applications. Springs designed for use in oxygen shall be manufactured from corrosion resistant materials and they shall not be plated.

All components in contact with oxygen shall be free from substances that can react violently with the gas under normal operating conditions, e.g. hydrocarbon based solvents, oils and greases.

Only lubricants suitable for use in oxygen at the service pressures and temperatures shall be used.

3.3 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 from lacquer or paint.

4 Safety and operational requirements

4.1 Gas tightness

All gas passages, connections, valve seats and glands shall comply with the requirements of 5.2, and the glands shall also comply with the requirements of 5.6.2, when tested by the methods and under the conditions specified therein.

4.2 Strength

The blowpipe shall comply with the requirements of clause 5 when tested by the methods and under the conditions specified therein.

NOTE. Compliance with this requirement establishes that the blowpipe is sufficiently robust, rigid, and is constructed of materials suitable for the intended purpose.

The valve elements shall remain captive and shall comply with the requirements of 5.6.1 when tested by the method specified therein.

4.3 Resistance to sustained backfire

Each blowpipe, mixer and nozzle combination shall be considered to be resistant to sustained backfire with a designated fuel gas when it complies with the requirements of, and is tested by the methods and under the conditions specified in, the following abuse tests.

- (a) Abuse test: occlusion (see 5.3).
- (b) Abuse test: overheating (see 5.4).
- (c) Abuse test: stability of cutting blowpipes against back pressure (see 5.5).
- (d) Abuse test: sustained backfire (see 5.11).

4.4 Nozzles

In combination with the range of blowpipes for which they are intended, nozzles shall comply with the requirements of 4.1 and 4.3.

4.5 Gas flow

The stated flow of oxygen and fuel gas, as specified by the blowpipe manufacturer, shall be obtained when the gases are supplied to each blowpipe/nozzle combination at the manufacturer's recommended nominal gas pressure and the combination is tested as specified in 5.7.

4.6 Adjustment of flame

The flame shall be continuously adjustable from carburizing to oxidizing around the stated nominal flow when the combination is tested by the method and under the conditions specified in 5.8.

4.7 Turn down ratio

A stable neutral flame shall be obtainable at flows which are 25 % below the stated nominal flows when the combination is tested by the method and under the conditions specified in 5.9.

4.8 Stability in wind

It shall be possible to maintain a neutral flame at the stated nominal flow in a transverse airflow when the combination is tested by the method and under the conditions specified in 5.10 and figure 4.

4.9 Safety in the event of sustained backfire

Where the initial point of mixing of the oxygen and fuel gases is downstream of the area designed to be used as the holding point of the blowpipe, the blowpipe, mixer and nozzle combination shall comply with 5.3, 5.4 and 5.5. Where the initial point of mixing of the oxygen and fuel gases is either within or upstream of the area designed to be used as the holding point, the blowpipe, mixer and nozzle combination shall comply with 5.3, 5.4, 5.5 and 5.11.

NOTE. If sustained backfire occurs and is allowed to continue, the chamber where this condition occurs may melt, with an accompanied eruption of hot metal and flame.

*% *m/m* denotes percentage by mass.

5 Type approval tests

5.1 General

5.1.1 Accuracy of instrumentation. The accuracy of instrumentation for tests shall be as follows:

- (a) flow measuring equipment $\pm 3\%$;
- (b) pressure measuring equipment $\pm 1\%$.

All flows shall be expressed at STP for temperate climate, i.e. 23 °C and 1.013 bar. All pressures shall be expressed as gauge pressures in bar.

5.1.2 Applicability of tests. Each test shall be carried out for each blowpipe/mixer/nozzle combination.

5.1.3 Rejection. Failure of either the blowpipe or the nozzle to meet the requirements of this clause (clause 5) shall be cause for rejecting the combination as failing to comply with this standard.

5.2 Test for gas tightness

5.2.1 General. The test procedure given in 5.2.3 shall be carried out both before and after the abuse tests for occlusion and overheating (see 5.3 and 5.4) have been satisfactorily completed.

The tests shall be carried out using dry, oil free air or nitrogen* and by immersion of the blowpipe in water. The length of time of immersion for each component's test shall be at least 2 min.

5.2.2 Test pressures. The nozzle to blowpipe seat joint shall be tightened to a maximum torque of 10 N·m. The test pressure shall be 4 bar or 1.5 × the manufacturer's highest recommended maximum inlet pressure, whichever is the greater.

For valve glands the test shall be made at both 1.5 × the manufacturer's recommended maximum inlet pressure and 0.5 × the manufacturer's recommended minimum inlet pressure.

All other tests shall be carried out at 1.5 × the manufacturer's recommended maximum inlet pressure, but at not less than 2.5 bar.

5.2.3 Test procedure. Due to variations in design and construction, this standard does not include a detailed test procedure. Individual test procedures shall be devised to cover the following:

(a) *valves:*

- (1) leak through closed valve seat into the blowpipe;
- (2) leak to atmosphere through valve gland with valve spindle successively in the closed, half open and fully open position;

NOTE. For this test it will be necessary to plug the nozzle orifices.

(b) *each gas line:*

- (1) leak to atmosphere;
- (2) leak to alternative gas line;

NOTE. For this test it will be necessary to plug both gas lines at the point of mixing.

(c) *nozzle seats(s):*

- (1) leaks both internally and to atmosphere.

NOTE. For these tests it will be necessary to plug the nozzle orifice(s).

5.2.4 Acceptance requirements. The blowpipe shall be deemed to be gas tight if, during immersion in water at a depth of between 50 mm and 100 mm for a period of 2 min, there is no visible sign of leakage of the test gas denoted by escaping bubbles.

5.3 Abuse test: occlusion

5.3.1 General. The test procedure given in 5.3.2 shall be carried out with each size and type of nozzle together, where applicable, with the appropriate mixer or injector and designated fuel gas according to the manufacturer's recommendations.

5.3.2 Test procedure

5.3.2.1 Connect the blowpipe to the gas supply by 5 m lengths of hose, the bore of which shall be in accordance with the manufacturer's recommendations.

5.3.2.2 Fit appropriate safety devices into the fuel gas and oxygen supply lines. For the purpose of these type tests, a suitable flame arrestor and non-return valve shall be regarded as a minimum requirement.

5.3.2.3 Ensure that the blowpipe and nozzle are at ambient temperature for each new test sequence, i.e. a change of nozzle.

5.3.2.4 Measure the gas pressures by test gauge at the inlets to the blowpipe (to prevent damage to these pressure gauges, protect by isolating valves) with blowpipe oxygen and fuel valves just open. Adjust gas pressures to manufacturer's mean pressure recommendations. Close blowpipe and test gauge isolating valves.

5.3.2.5 Adjust the blowpipe valves so that the maximum neutral flame without stand off, that conditions in 5.3.2.4 will give, is established at the nozzle.

5.3.2.6 Allow the blowpipe to burn in free air for 1 min without alteration to the valve setting or gas supply pressure.

NOTE. During this warming up period it is permitted to re-tighten the nozzle.

*Oil free air or nitrogen is taken to imply suspended droplets less than 1 mg/m³ and dry gas a maximum of 50 cm³/m³ content of moisture corresponding to a dew point of -48 °C.