



## TECHNICAL INFORMATION SHEET 29

### OXY-FUEL GAS EQUIPMENT – SELECTION AND ASSEMBLY

Oxy-fuel gas equipment is designed to safely allow fuel gases and oxygen to be mixed together for welding and cutting applications. However, the various components of an oxy-fuel set have to be correctly selected, assembled and used appropriately. This document highlights the fundamental health and safety practices for selecting and assembling oxy-fuel equipment.

For comprehensive information when using oxy-fuel equipment refer to BCGA Code of Practice 7 (2), *The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply)*.

Premise owners and users of welding equipment should ensure they have adequate insurance to cover their activities and that they use their gases and look after their gas cylinders in a safe and responsible way. Have you told your insurers what gases you have and what you do with them?

Before handling or using oxy-fuel gas equipment ensure you have received appropriate training and are competent to do so. Before handling a gas cylinder and / or using a gas always refer to the Safety Data Sheet; know and understand the properties and hazards associated with the gas.

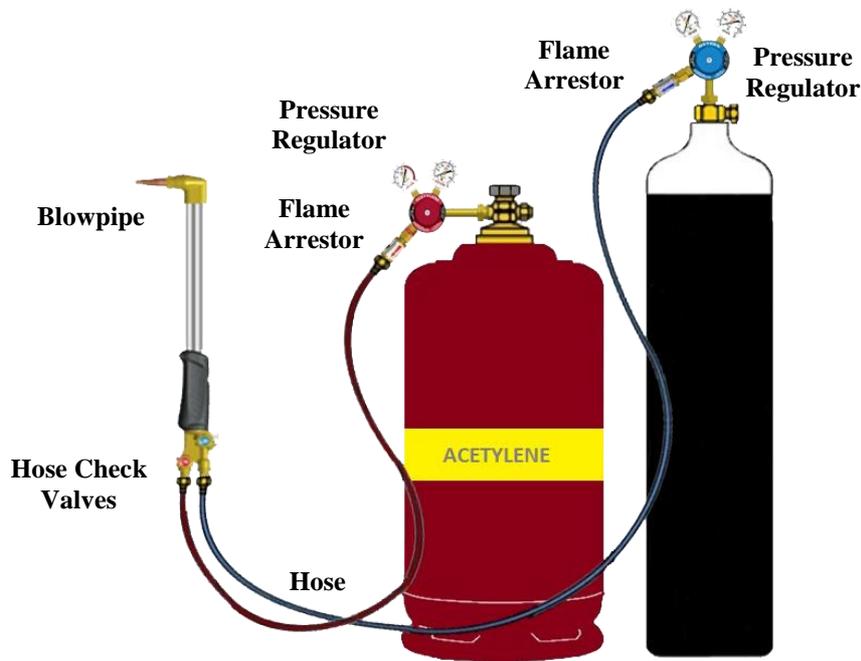
Choose the correct fuel gas for your particular application. Acetylene and propane are the common fuel gases. Both have their advantages, but your choice is fundamental to the components that are selected for use and the quality, safety, efficiency and cost-effectiveness of your processes, refer to BCGA TIS 32 (5), *Acetylene or propane (for welding cutting and allied processes)*. When using acetylene compliance is required with the *Acetylene Safety (England and Wales and Scotland) Regulations (1)*.

Equipment is generally marked and identified to show the gas service it has been designed for and the service for which it is intended. However, some equipment is manufactured such that it can be used with multiple gas types. Once equipment has been used in a particular gas service its material properties will have been affected by that particular gas, by the pressure at which that gas is delivered to the equipment and by the way it is delivered. Over time this can result in wear and deterioration which is specific to that gas. This will have been allowed for in the design and manufacture of that equipment. The subsequent use of this equipment in another gas service may result in adverse conditions being set up which would not have been considered in the original design. This might result in over-pressurisation, excessive decay of internal elastomers and excessive withdrawal rates from gas cylinders. The BCGA recommends that once an equipment product has been used in a particular gas environment or service, that it should remain in that specific gas service for the lifetime of the product.

All equipment supplied for and used with oxygen shall only be used with oxygen to ensure that safe operating conditions are met. Equipment not cleaned or marked for oxygen service by the manufacturer shall not be used with oxygen.

Specialist oxygen compatible jointing tape may be used by some manufactures of gas equipment. However, jointing tape should not be used by end-users. If your equipment is worn or leaking, replace it, or contact your equipment provider or gas supplier for further advice.

Under no circumstances shall oil and grease be used on any gas components. When installing or connecting equipment ensure your hands are free from oil and grease or any other potential contaminants (for example, hydrocarbons are used in many products, such as barrier creams).



**Figure 1:** Minimum equipment requirement

Before assembling and working with oxy-fuel equipment a risk assessment shall be carried out to identify potential hazards and the control measures that are appropriate to prevent harm. Guidance is available in BCGA TIS 15 (3), *Model risk assessment for the storage and use of gas cylinders for oxy-fuel applications*.

Some components are allocated a shelf life or a manufacturer's replacement date, primarily because some internal components will deteriorate over a period of time. Typically, these are replaced 5 years after manufacture or to the manufacturers' recommendation. Manufacturers stamp either a date of manufacture or a replacement date on their bodies. For advice on marking refer to BCGA TIS 18 (4), *Gas equipment inspection / replacement date marking*.

All oxy-fuel equipment is to be checked before each use to ensure it has been assembled correctly, is undamaged, is safe and is ready for use. An annual inspection is to be carried out by an oxy-fuel equipment competent inspector.

'Before use' checks are to be carried out by the User of the equipment in accordance with BCGA CP 7 (2). In particular users are to ensure:

- The components are correct for the gas type;
- The components are within their allocated life;
- The components, including hoses, are undamaged, serviceable and function correctly;

- Cylinder pressure is compatible with the regulator inlet pressure;

Cylinders should always be secured in an upright, vertical position. When in use this ensures that only gas is released from the valve outlet.

## PRESSURE REGULATOR

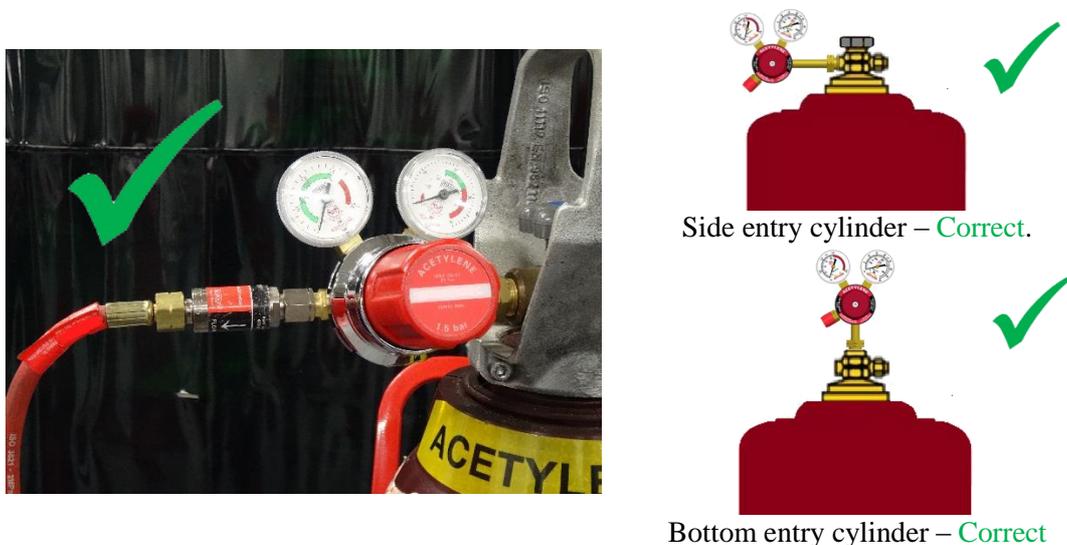
A pressure regulator shall be fitted to the outlet of the gas cylinder valve or manifold. It reduces the pressure of the gas from the cylinder pressure to the lower pressure required for the operation of the process equipment.

Regulators are to comply with a recognized standard, such as BS EN ISO 2503 (9), *Gas welding equipment. Pressure regulators for gas cylinders used in welding, cutting and allied processes up to 300 bar.*

Regulators are not to be interchanged between different gas types under any circumstances. The *Acetylene Safety Regulations* (1) require that a pressure regulator for use with acetylene gas is designed and constructed specifically for that use. The use of incorrect materials during construction could allow explosive acetylides to be formed. For additional information refer to BCGA Safety Alert 1 (6), *The hazards of using incorrect regulators on acetylene gas cylinders.*

The use of an incorrect regulator could potentially inhibit delivery pressure and the subsequent flow required for the process. The use of low inlet pressure regulators with a high-pressure compressed gas cylinders could result in over pressurisation and potentially catastrophic failure of the main regulator body.

Traditionally, gas cylinder valve outlet connections were predominantly bottom entry. However, many valves now use side entry outlet connections. Regulators are designed to fit either a bottom entry or a side entry gas cylinder outlet. The regulator should face the operator, allowing the pressure gauges to be viewed, the controls to be accessible and operable, with space for the flashback arrester and the hose to be connected and to lie naturally towards the ground. Imposed restrictions to the gas flow, such as a kinked hose, increase the likelihood of flashbacks occurring.



**Figure 2:** Examples of correctly set-up regulators on cylinders



Bottom entry regulator on side entry gas cylinder – **Incorrect.**

Side entry regulator on bottom entry cylinder – **Incorrect.**

**Figure 3:** Examples of incorrectly set-up regulators on cylinders

## FLAME ARRESTOR

This is a device which extinguishes a flame front (for example, caused by a flashback). Often referred to as a flashback arrestor, it may incorporate several individual safety devices such as a flame arresting element, a non-return valve, a shut-off device, a temperature sensitive shut off valve or a pressure sensitive shut-off valve. Flame arrestors are marked with the direction of gas flow, a manufacture or an inspection / replacement date and the manufacturing standard.

Flame arrestors are to comply with a recognized standard such as BS EN ISO 5175-1 (11), *Gas welding equipment. Safety devices. Devices incorporating a flame (flashback) arrestor.*

For acetylene, in accordance with the Acetylene Safety Regulations (1), a minimum of a 3 function flame arrestor shall be placed within one metre of the pressure regulator. Images of typical flame arrestors are shown in Figure 4.



Regulator mounted re-settable

Regulator mounted re-settable lever operated

Regulator mounted

Blowpipe (torch) mounted

**Figure 4:** Flame arrestors

## FLEXIBLE HOSES

A hose assembly consists of a hose tail inserted into the end of a flexible hose and secured by a suitable hose clamp. The hose will be designed for a specific gas at the low pressure required for welding and cutting operations. The hose provides a flexible connection between the flashback arrestor and the blowpipe.

Hose assemblies shall conform to BS EN 1256 (8), *Gas welding equipment. Specification for hose assemblies for equipment for welding, cutting and allied processes.*

Hoses are to comply with a recognized standard such as BS EN ISO 3821 (10), *Gas welding equipment. Rubber hoses for welding, cutting and allied processes.*

Hoses for welding equipment have identification marks and are colour coded to denote gas and hose material compatibility. Refer to Figure 5. Hoses should not be used with gases for which they are not designed as this can result in premature hose failure. The multi-use fuel hose can usually be found on CNC profile cutting tables.



**Figure 5:** Hoses – Colour code

The good condition of hoses is of vital importance to safety. Hoses shall be protected from heat, mechanical damage, traffic, sparks, hot splatter, slag and contamination, for example, by oil or grease. Always discard hoses when the general condition shows signs of deterioration (refer to BCGA CP 7 (2)). Localised repairs are not recommended. Correct hose connections, properly fitted and tested and retained by suitable clips or ferrules, are essential. Hoses are not to be secured using worm drive clips. For examples, refer to Figure 6.

Hose connections shall conform to BS EN 560 (7), *Gas welding equipment -Hose connections for equipment for welding, cutting and allied processes.*



**Figure 6:** Hose connections

## HOSE CHECK VALVES

A check valve is a safety device designed to prevent the unintentional backflow of gases. This prevents a hazardous mixing of the gases in the hoses. They should be located at the blowpipe connection end of the hose. Check valves are marked with the direction of gas flow.



**Figure 7:** Hose check valve

Hose check valves shall conform to BS EN ISO 5175-2 (12), *Gas welding equipment. Safety devices. Devices not incorporating a flame (flashback) arrestor.*

### References:

1. SI 2104 No. 1639, Acetylene Safety (England and Wales and Scotland) Regulations 2014.
2. BCGA, CP 7, *The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply).*
3. BCGA TIS 15, *Model risk assessment for the storage and use of gas cylinders for oxy-fuel applications.*
4. BCGA TIS 18, *Gas equipment inspection / replacement date marking.*
5. BCGA TIS 32, *Acetylene or propane (for welding, cutting and allied processes).*
6. BCGA Safety Alert 1, *The hazards of using incorrect regulators on acetylene gas cylinders.*
7. BS EN 560, *Gas welding equipment. Hose connections for equipment for welding, cutting and allied processes.*
8. BS EN 1256, *Gas welding equipment. Specification for hose assemblies for equipment for welding, cutting and allied processes.*
9. BS EN ISO 2503, *Gas welding equipment. Pressure regulators for gas cylinders used in welding, cutting and allied processes up to 300 bar.*
10. BS EN ISO 3821, *Gas welding equipment. Rubber hoses for welding, cutting and allied processes.*
11. BS EN ISO 5175-1, *Gas welding equipment. Safety devices, incorporating a flame arrestor.*
12. BS EN ISO 5175-2, *Gas welding equipment. Safety devices, not incorporating a flame arrestor.*

### For more information:

British Compressed Gases Association (BCGA)  
Health and Safety Executive (HSE)  
British Standards Institute (BSI)

[www.bcgga.co.uk](http://www.bcgga.co.uk)  
[www.hse.gov.uk](http://www.hse.gov.uk)  
[www.bsigroup.co.uk](http://www.bsigroup.co.uk)