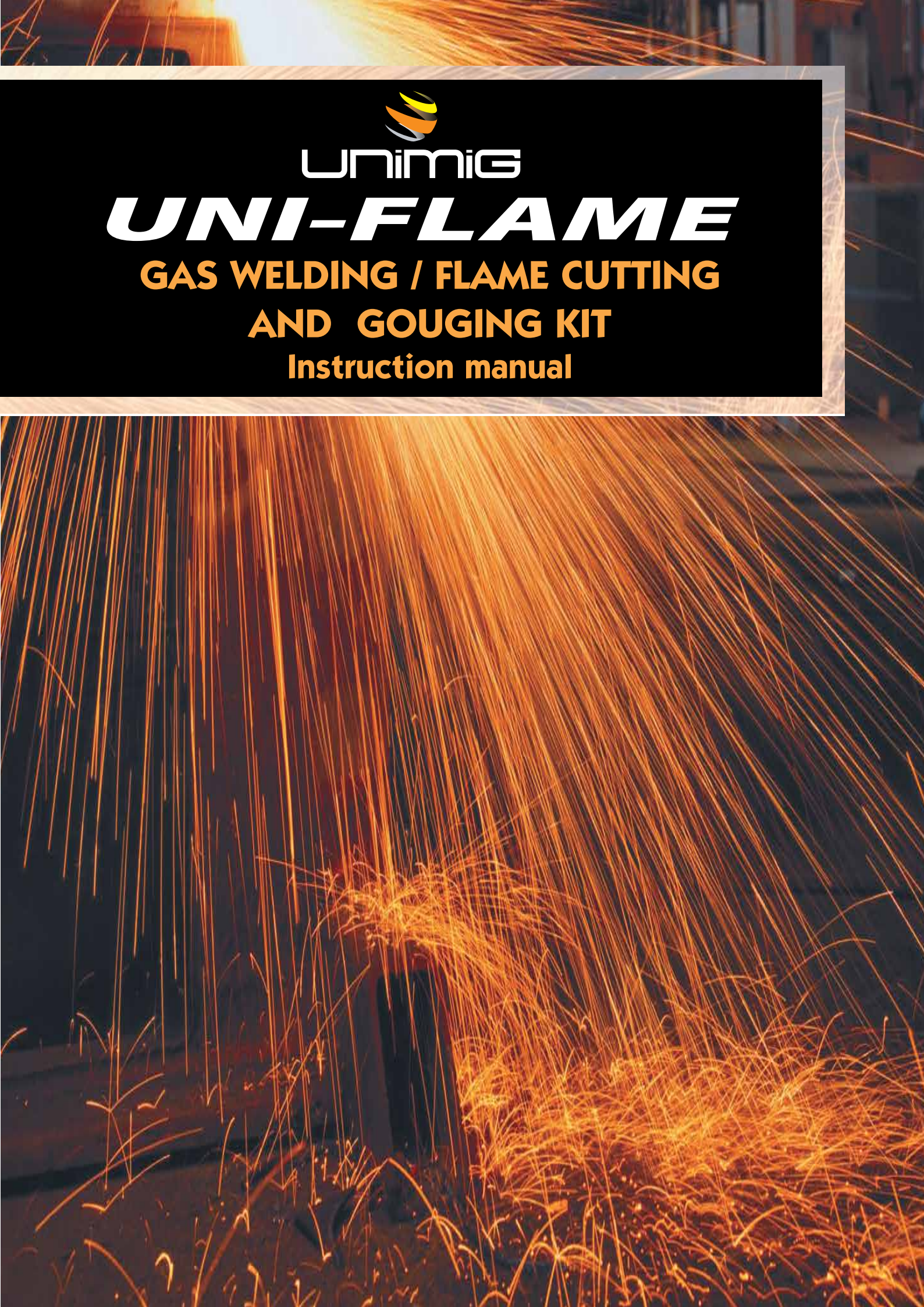
UNIMIG

# UNI-FLAME

## GAS WELDING / FLAME CUTTING AND GOUGING KIT

### Instruction manual



# INSTRUCTION MANUAL FOR UNI-FLAME GAS WELDING, FLAME CUTTING AND GOUGING KIT

## UNI-FLAME GAS WELDING EQUIPMENT

**Dear customer,**

Congratulations on your excellent choice of oxy/acetylene welding and cutting equipment.
The **UNI-FLAME** range of gas welding and cutting equipment has been rigorously tested by independent laboratories and conform to the following **AUSTRALIAN STANDARDS** for gas welding and cutting processes:

| | |
|---|---|
| Regulators | AS4267 including the **PROMOTED IGNITION TEST** |
| Gas hose | AS1335 |
| Flash arrestors | AS4603 |

This manual refers to safety measures that must be adhered to for safe operation of your Uni-Flame gas cutting and welding equipment. Please read and understand these warnings and instructions before use. Failure to do so could result in serious injury or death. Uni-Flame gas cutting and welding equipment should only be used by operators who are properly trained and qualified in the safe use of this type of equipment.

Technical information in this Instruction Manual is based upon information available in two Expert Technology Tools published by the Welding Technology Institute of Australia (WTIA):
WTIA Technical Note 5 Flame cutting of steels (1996)
WTIA Technical Note 7 Health and safety in welding (2004)

Further information and copies of these publications, and technical support in welding and related activities, are available from WTIA Tel: +61 (0)2 9748 4443 Fax; +61 (0)2 9748 2858 or email info@wtia.com.au. For information about other publications and the activities of the WTIA and WGA visit www.wtia.com.au. or www.unimig.com.au

## General Safety Information

Safety consideration for both the operator and his surroundings must be given to the heat source produced by mixing compressed oxygen with a fuel gas and igniting the resulting mixture.
When using any of these processes, particular safety considerations apply in respect of:

**a)** Burns from flames, hot objects, malfunctioning hand-held equipment, molten particles etc.
**b)** Explosion from mixed gas concentrations created by fuel gas leakage from cylinders, bulk supplies, hoses, welding equipment breakable connections, etc.
**c)** Fire caused by ignition of flammable materials, leakage of fuel gases, contact with hot slag, welding equipment in poor condition etc. Plant, buildings, ship and bush fires have occurred.
**d)** Ignition of materials not normally considered flammable due to oxygen enrichment
**e)** Violent rupture or explosion of components due to being pressurised beyond their design pressures.
**f)** Asphyxiation due to displacement of atmospheric, breathable air by inert or toxic gases, e.g. leakages in confined spaces or lack of oxygen resulting from excessive rusting in confined spaces
**g)** Radiation damage (to eyes principally and other exposed surfaces).
**h)** Fumes originating from the particular materials being welded, heated or cut.
**i)** Electric shock which could result when gas welding or cutting on cables or other conductors at high voltage.
**j)** Influence on the workplace from the above hazards (containers, vessels, heights, etc).

## Gas Properties and Particular Hazards

### Gases Used

The flames used in gas welding, cutting and allied processes are obtained by the ignition of mixtures of oxygen and appropriate fuel gases, the most common being acetylene and LPG.
All of these fuel gases, especially when mixed with compressed oxygen, are capable of releasing very large amounts of energy in the form of heat or explosion, requiring minimum energy to start the reaction.
Consequently, they should be treated with great care and in accordance with well defined safety procedures.
Some industrial gases may be flammable, oxidising, toxic or corrosive, and users need to take special precautions in handling them. Users should always have on hand Material Safety Data Sheets, normally available from Gas Suppliers, for each of the gases stored and used at any location.

## CHART 1

The properties of these and other commonly used gases are listed in the table below.

| Property | Oxygen (O2) | Acetylene (C2H2) Note 1 | LP Gas (C3H8) |
|---|---|---|---|
| Density relative to air | 1.103 | 0.901 | 1.52 to 2 |
| Ignition limits V% - in air | - | 2.5 to 80 | 2.2 to 9.5 |
| Ignition limits V% - in oxygen | - | 2.5 to 80 | 2 to 57 |
| Ignition temp ∞C - in air | - | 423 | 554 |
| Ignition temp ∞C - in oxygen | - | 428 | 530 |
| Flame temp in air (Note 4) | - | 2325 | 1925 |
| Flame temp in oxygen (Note 4) | - | 3100 | 2800 |
| Smell | Odourless | Pungent (Sweet) | Pungent |
| Colour | Colourless | Colourless | Colourless |
| Gas cylinder colour (AS 4484) | Black | Maroon | Silver/Grey |
| Regulator colour (AS 4267, AS 4480) | Black | Red | Orange |
| Welding Hose colour (AS 1335) | Blue | Red | Orange |
| Safety device colour (AS 4603) | Blue | Red | Red |

This table summarises the properties, characteristics and hazards of the more common gases used in gas welding, cutting and allied processes.

## PHYSICAL AND SAFETY PROPERTIES OF GASES

**Notes**

**1** LP Gas consists primarily of Propane (C3H8) - other constituents include artificial odourisers for safety

**2** Approximate calculated values only - there is some scatter in the literature.

**3** N/S = Not specified in this Standard

### Oxygen

Cylinder colour is black. Oxygen has no smell, and is generally considered non-toxic at atmospheric pressure.

Oxygen normally constitutes 21% of air and when the concentration of oxygen exceeds 21%, flammable materials become increasingly easier to ignite and burn more rapidly and with a higher flame temperature. Oxygen itself does not burn, but supports and accelerates combustion in other substances including those not normally considered combustible and which may be readily ignited by sparks. Metals may also burn. Hence, great caution must be exercised in preventing oxygen enrichment of the atmosphere, particularly in confined space situations. Oxygen should never be called "air".

Oxygen in contact with oil, grease, other hydrocarbons or oil based substances can cause spontaneous ignition and consequential fire or explosion. Hence all oxygen systems (e.g. cylinders, pipework, regulators, blowpipes) must be kept completely free of oil or grease.

Proper advice should be sought, e.g. from Gas Suppliers and Equipment manufacturers, before using any materials for oxygen service, especially lubricants, seals and thread sealants, including **PTFE** tape, which have not been supplied for use with oxygen and marked accordingly.

When the oxygen concentration in the atmosphere is less than 21%, gradual and sometimes undetectable changes occur in operator's alertness and efficiency.

Each year many accidents ranging from minor to fatal types occur through either misuse of oxygen or failure to understand its properties and their significance.

Some lessons which have been learnt through misuse or unsafe use of oxygen are:

**a)** DO NOT use oxygen to refresh air: There is often a temptation to use oxygen to 'sweeten' air when welding or cutting operations have been carried out in confined spaces. Large amounts of oxygen can be released locally in a short time from gas cylinders under pressure. In one situation where this was done, hot work in the form of flame cutting was

carried out with a subsequent ignition of worker's clothes and fatal burns.

**b)** TAKE CARE in confined spaces: Do not leave blowpipes or hoses connected to the supply gases within confined spaces during work breaks or overnight. Even slow leaks can result in very hazardous situations, with possible fire and explosion on re-ignition of the blowpipe.

**c)** VENTILATE confined spaces: In flame cutting not all of the oxygen released from the cutting nozzle is necessarily used in cutting. In confined spaces this may result in a dangerous increase in oxygen content in the air, pointing to the need for adequate ventilation in such situations.

**d)** DO NOT use oxygen as a substitute for compressed air: There are many examples of this situation where oxygen has been used, such as in cleaning, resulting in serious and fatal accidents due to fire or explosion from spontaneous ignition. NEVER use oxygen to start engines, drive air tools etc.

**e)** DO NOT use oxygen or compressed air to dust off clothes. Clothes can become readily flammable and even self-igniting through oxygen enrichment.

**f)** DO NOT KINK pressure hosing: Kinking or nipping hose to interrupt gas flows or whilst changing torches is a very dangerous practice. Gas can still bleed through the system, or more seriously, escape rapidly should the operator lose his grip or the hose rupture.

## Fuel Gases

Each of the fuel gas-oxygen combinations warrants care in use, from handling of the gas supplies through to the point of intended ignition. There are greatly increased risks of fire and explosion in the case of leaks. Asphyxiation is also possible due to exclusion of air in leakage situations.

All fuel gases have special properties, which warrant additional precautions:

**a) Acetylene:**

Cylinder colour is Claret / Maroon. Acetylene has a distinctive garlic smell. It is non-toxic, but asphyxiation is possible through depletion of oxygen. Acetylene is lighter than air and not likely to collect in ducts and drains, but could collect in roof spaces. It requires minimum energy to ignite in air or oxygen. A concentration of as little as 2.5% in the air can burn. Acetylene is a potential fire and explosion hazard. Adequate ventilation and leak free systems are required. Hot metallic particles or hot slag can cause ignition of leaks remote from the area where welding or cutting is taking place.

This gas, in its free state under pressure, may decompose with explosive violence. For this reason it is supplied in special cylinders . Explosions can occur in pure acetylene subjected to excessive temperature or pressure. Mechanical shock to the cylinder due to mishandling, or overheating when under high pressure, may also cause decomposition, giving rise to high temperatures and possible detonation even in the absence of oxygen. Another possible cause of detonation is flashback in welding, heating or cutting blowpipes, and safety devices are recommended in blowpipe gas supply.

Under certain conditions, acetylene can react with metals such as copper and silver to produce explosive acetylides. This places a restriction on materials which can be used for the construction of pressure regulators, other equipment and piping. Copper alloys containing more than 70% copper or 43% silver should never be used with acetylene.

Free acetylene must never be used outside the cylinder at pressure exceeding 150 kPa gauge.

The properties of acetylene are taken into account in systems developed for its storage and supply, and with adherence to safe procedures, dangerous situations will not arise.

**b) Liquefied Petroleum Gas (LPG):**

Cylinder colour is aluminium. LPG is usually supplied as a mixture of gases with propane as the main constituent.

Standard LPG has been odourised and has a fish-like smell. It is non-poisonous, but may cause asphyxiation through depletion of oxygen.

It is denser (heavier) than air and will collect in low or confined spaces, e.g. ducts, drains, basements, boats, ships and closed tanks. A concentration of as little as 2.2% in the air can burn. It is a fire and explosion hazard, and requires minimum energy to ignite when mixed with air or pure oxygen. LPG will ignite and burn instantly from a spark or piece of hot metal.

## Gas Supply

### General

Your Uni-Flame gas welding and cutting equipment is designed to be used by gases delivered to the point of use from portable compressed gas cylinders. In all cases, gas supplies may be subject to statutory or regulatory provisions. Many Australian Standards cover the subject. The location, separation, allowed quantities and signage of gas storage should be in accordance with the relevant statutory requirements and manufacturer's provisions.

## Cylinder Types and General Care

Cylinders used for oxygen, acetylene, LPG, are in effect thin walled highly pressurised vessels. Due to the presence of gases under pressure, full or partially filled cylinders can cause serious injury or damage should they rupture.
Also, slow leakage of gas may result in a high risk of fire or explosion or the possibility of asphyxiation. Oxygen, hydrogen, carbon dioxide and inert gas cylinders, are fitted with a bursting disc safety device. LPG cylinders have a spring-loaded pressure relief valve.
Acetylene cylinders differ from those used for other gases in that they are filled with a porous substance saturated with acetone in which the acetylene is dissolved under pressure. Acetylene is unstable and highly reactive at high pressure. The porous substance or filler is therefore intended to quench heat of spontaneous decomposition and reduce the risk of explosion. Fusible safety plugs are fitted in the shoulder of the cylinder to permit the gas to escape rather than the cylinder explode in the event of overheating.
Because of these factors and the particular properties of the stored gases , particular care is always required in the handling and usage of cylinders as follows:

**a)** Cylinders are generally obtained on loan or hire from gas suppliers. This allows the periodical testing specified in Australian Standards and statutory regulations to be carried out by the owner.

**b)** Do not tamper with the markings or colour codings of cylinders. Do not use cylinders without labels/colour code. Do not guess contents - return cylinder to supplier.

**c)** Refilling of cylinders must be carried out only by competent organisations with the correct gas and with the owner's approval. Refilling with any other gas is not permitted.

**d)** Gas should only be used for the particular intended purpose, e.g. never use oxygen for cleaning (dusting), or to provide ventilation or to support breathing.

**e)** Gases should only be identified by their correct name so as to avoid dangerous mix-ups.

**f)** Never attempt to disguise or repair damage to a cylinder such as denting. Such cylinders must not be used until advice is obtained from the gas supply company.

**g)** Valve seats and outlets should be protected by keeping all kinds of dirt and contamination away from cylinders, especially during connection and disconnection. Grit, loose fibres and other dirt may lodge in connectors and on valve seats causing leaks or are picked up by high velocity gas streams, causing hot spots in regulators potentially resulting in ignition . Organic matter such as oil, grease and hydrocarbon liquids which may ignite spontaneously in high pressure oxygen is another hazard to regulators and other downstream equipment. Any damage to valves or outlets should be reported.

**h)** Avoid flame impingement from the welding or cutting blowpipe. Keep cylinders away from all sources of artificial heat (furnaces, boilers, radiators, flames). The fusible plugs at the top of an acetylene cylinder are particularly sensitive to heat and operation can lead to an extensive acetylene flame vertically from the top of the cylinder.

**i)** Do not tamper with safety devices.

**j)** Return cylinders with the valve closed.

## Cylinder Storage, Transport, Handling and Use

### Storage

All storage areas must comply with statutory requirements. Australian Standard AS 4332:1995. Dangerous Goods Regulations give complete requirements.
Cylinder storage areas should be well ventilated and away from sources of heat. External storage is preferred. Protection from weather is desirable but not at the expense of ventilation. Other products should not be stored with cylinders, especially oil, paints or corrosive liquids. Oxygen cylinders must be separated from fuel gas cylinders by a distance greater than 3 meters. LPG cylinders in excess of 50 kg total capacity should not be stored within 3 meters of any other cylinders, including acetylene. Cylinders should always be stored upright and restrained to prevent falling. Full cylinders should be segregated from empty ones and fuel gases from oxygen. **"NO SMOKING OR NAKED LIGHTS"** signs should be displayed where fuel gases are stored.

### Transport

Take sensible precautions and ensure ADG Code and other regulatory requirements are met.
Use open vehicles wherever possible. If closed vans or cars have to be used make sure they are properly ventilated at all times.

Ensure all valves are fully closed and that there are no leaks. Secure cylinders against movement within the vehicle. Do not allow any part of the cylinder to protrude from vehicle (this prohibits cylinders being carried horizontally across forklift tines). Disconnect all equipment (e.g. pressure regulators) from cylinders. Do not use cylinders in a closed vehicle.
Acetylene and LPG cylinders must be transported upright even when empty (this ensures that the safety device is in contact with vapour and not liquid).

**Handling**
Do not move cylinders with the cylinder valves open.
Never lift a cylinder with magnets, chains or a sling. Use a cradle when lifting cylinders by crane. Never roll a cylinder along the ground. This damages the identification labels, and may cause the valve to open. Use a trolley for manual handling. The trolley should incorporate a heat shield because of the proximity of the fuel gas to the oxygen cylinder .

**Cylinder Use**
The manufacturer's instructions and recommendations should always be followed.

**a)** Never "crack" a fuel gas cylinder valve when adjacent to any ignition source.

**b)** Damaged valves or regulators or those suspected to be damaged should not be used until checked by a qualified service agent/organisation or person.

**c)** Cylinders must never be used as rollers to assist moving other objects.

**d)** Acetylene and LPG cylinders must always be in the vertical or near vertical position when in use and when empty

**e)** Acetylene can only be used to a maximum pressure of 150 kPa (gauge). With increasing pressure explosion may occur due to instability of this gas.

**f)** Opening of cylinder valves should only be carried out with approved keys or hand wheels. Do not use excessive force or extension key to open or close cylinder valves.

**g)** Acetylene valves should not be opened more than about one and a half turns, one turn is preferable to allow for quick closing in an emergency.

**h)** Empty cylinders should have the valves closed, any protective caps fitted and be suitably identified, eg "MT" in chalk.

**Connection to regulators and hoses**
Keep the cylinder valve clean, especially its outlet connection. No grit, dirt, oil or dirty water should be present. Particles of dirt and residual moisture may be removed by "cracking" open the valve momentarily and then closing it. Note: great care must be taken when "cracking" as serious injuries can occur.
Make sure the Uni-Flame pressure regulator is suitable for the gas and pressure in the cylinder and that its inlet connection is the same thread as that in the cylinder valve. Fuel gas connections have left handed threads. Never force any connection that does not fit.
Open the cylinder valve slowly using its hand wheel or a suitable key for key-operated cylinder valves. Do not over tighten the spindle when shutting off the valve as this will destroy the soft seating material in the valve. If the valve spindle is too stiff to turn with the hand wheel or the correct key, do not increase the leverage on the spindle and return the cylinder to the gas supplier.

## Equipment Specifications and Assembly

**General**
Uni-Flame gas cutting and welding equipment has been properly designed, manufactured and tested independently to meet Australian standards. It must be maintained and used with full consideration of the hazards inherent to the use of oxy-fuel gas mixtures detailed previously.

**Pressure Regulators and Gauges**
Gas cutting and welding applications should never be supplied directly from compressed gas cylinders. A Uni-Flame pressure regulator must be connected to the gas cylinder to control the pressure of the gas at the welding or cutting blowpipe.
Uni-Flame regulators are fitted with two pressure gauges to allow monitoring of the cylinder contents and the delivery pressure to the end application.
Although accidents rarely occur as a direct result of regulator failure, care must be continuously exercised because the potential hazards are severe. This is particularly true of oxygen regulators where ignition and explosion is possible under adverse conditions.
The following recommendations should be observed in order to ensure continued safe operations:

**a)** Uni-Flame Regulators should be used only with the gas and maximum cylinder pressure for which they are designed and labelled (see AS 4267).

**b)** Never test a regulator for gas leaks with a naked flame.

**c)** Acetylene and LPG regulators should only be used with the gas for which they are designed. Use of an LPG regulator on acetylene cylinders could result in exceeding the maximum safe use pressure of acetylene.

**d)** Regulators having damaged pressure gauges or inlet and outlet connections etc should never be used. Inlet and outlet connections should never be changed from the original manufacturing specification.

**e)** Do not use oil or grease on any regulator. Do not handle a regulator with a rag, hands or gloves contaminated with oil or grease.

**f)** Keep your regulators clean. When not in use the dust covers supplied to protect the inlet and outlet connections should be fitted.

**g)** Never use a regulator that is leaking gas or exhibiting signs of excessive creep (build up of gas pressure when blowpipe valves are closed). Pressure build up beyond 35kpa is excessive and regulator should be removed from use and be either replaced or repaired.

**h)** To avoid damage to regulator, operator must always fully release regulator adjusting knob by turning it in an anticlockwise direction before opening gas cylinder valve and subjecting regulator to high pressure. Note: never release the regulator adjusting knob whilst there is pressure in the gas hoses.

**i)** Ensure regulator is securely attached to gas cylinder before opening cylinder valve and subjecting regulator to high pressure.

**j)** Do not stand in front of regulator when opening cylinder valve, always stand to one side.

## Hoses and fittings

### Requirements

Uni-Flame Hose and fittings for use in gas welding, cutting and allied processes meet the requirements, including colour coding, specified in AS 1335 and AS 4267.

### Colour coding

Use blue hose only for oxygen

It should be noted that AS 1335 specifies different test methods and cover colours for acetylene hose (red) and LPG hose (orange) . These hoses should never be interchanged.

### Location

Hoses should be located and protected from heat, mechanical damage, traffic, sparks, slag, grease and oil so that accidental damage such as piercing or burning cannot occur. Location of hoses over sharp edges or manifolds or under sparks or hot slag from welding or cutting should be avoided.

### Fittings

These must be as specified in AS 1335, of an appropriate type, securely made and leak tight. Wire should never be used to fasten hose to fittings. Oxygen fittings have right hand threaded nuts, fuel gases left hand thread nuts. Use only Uni-Flame gas hoses and connectors when replacement is required.

### Length and diameter

It is recommended that the maximum hose length should not exceed fifteen (15) metres for each gas, or such distance which will allow the operator of hand-held equipment to be in sight of all the supply gas cylinders, whichever is the smaller.

## General maintenance of gas hoses

Never use insulation tape to affix hose connections or to attempt repair or lengthening of gas hoses. Do not crimp or kink gas hoses to temporarily stop gas flow .Gas hoses must be replaced immediately if they show signs of leaking or damage from flashback burning, physical damage or weakness due to ageing. Examine all hoses regularly for leaks, wear and loose connections. Gas hoses can be tested for leaks by immersion in water at normal operating gas pressures.

## Blowpipes, cutting attachment and mixers

Blowpipes perform the gas control and mixing function with the aid of a gas mixer therefore blowpipe and mixer must perform the mixing of oxygen and fuel gas with due consideration to potential back-flow of gases and flashback. The following points must be considered before use

**a)** The inlet connections are suitable for the welding hose fittings supplied. Never attempt to connect hoses with fittings that are not compatible. Ensure that all connections are tight and not leaking. Never force a connection.

**b)** The control valves are clearly marked ‘oxygen’ and ‘fuel’ (by the abbreviations ‘O’ and ‘F’), and colour coded blue for oxygen and red for fuel same as the welding hose.

**c)** Only suitable mixers and other attachments should be fitted to a blowpipe.

**d)** Keep all equipment clean. Do not use oil or grease on any blowpipe, cutting attachment, mixer or accessory to suit. Do not handle any of these items with a rag, hands or gloves contaminated with oil or grease.

**e)** Particular attention should be paid to the recommended maximum and minimum operating pressures and flows for the blowpipe-mixer tip or nozzle combination. These should always be respected.

**f)** Never hang a blowpipe or gas hose on a regulator or cylinder valve.

**g)** Never test for leaks with a flame.

### Tips, nozzles and their attachment fittings

**i)** Uni-Flame Tips and nozzles are well identified and carry information relating to their use such as size, recommended gas pressures and plate thickness to be cut.

**ii)** Uni-Flame Tips and cutting nozzles appropriate to the particular fuel gas should be used. See Cutting guide chart 2.1 & 2.2 below for appropriate nozzle recommendation.

**iii)** It should be noted that tips and nozzles operate safely and efficiently over a limited range of flows. Below a minimum

## CHART 2.1

### 1. CUTTING GUIDE FOR TYPE 41 ACETYLENE NOZZLES

| Plate Thickness mm | Nozzle Size | Pressure Oxygen kPa | Pressure Acetylene kPa | Cutting Speed mm/min | Typical Consumption L/min | |
|---|---|---|---|---|---|---|
| | | | | | Oxy | Acet |
| 6 | 8 | 200 | 100 | 450 | 19 | 3 |
| 12 | 12 | 200 | 100 | 380 | 38 | 4 |
| 20 | 12 | 250 | 100 | 360 | 45 | 5 |
| 25 | 15 | 220 | 100 | 320 | 56 | 6 |
| 40 | 15 | 350 | 100 | 270 | 75 | 7 |
| 50 | 15 | 400 | 100 | 240 | 84 | 7 |
| 75 | 15 | 450 | 100 | 180 | 95 | 8 |
| *100 | 20 | 400 | 100 | 150 | 134 | 9 |
| 125 | 20 | 450 | 100 | 150 | 155 | 10 |
| 150 | 24 | 450 | 100 | 130 | 211 | 11 |
| 200 | 24 | 500 | 100 | 100 | 234 | 14 |
| 250 | 32 | 600 | 100 | 90 | 420 | 20 |
| 300 | 32 | 600 | 100 | 90 | 420 | 20 |

*** Maximum thickness recommended for cutting attachments.**

## CHART 2.2

### 2. CUTTING GUIDE FOR TYPE 44 LPG NOZZLES

| Plate Thickness mm | Nozzle Size | Pressure Oxygen kPa | Pressure LPG kPa | Cutting Speed mm/min | Typical Consumption L/min | |
|---|---|---|---|---|---|---|
| | | | | | Oxy | LPG |
| 6 | 8 | 200 | 100 | 450 | 30 | 3.5 |
| 12 | 12 | 200 | 100 | 380 | 50 | 4 |
| 20 | 12 | 250 | 100 | 360 | 68 | 4.5 |
| 25 | 15 | 220 | 100 | 320 | 72 | 5.5 |
| 40 | 15 | 350 | 100 | 270 | 90 | 5.5 |
| 50 | 15 | 400 | 100 | 240 | 99 | 5.5 |
| 75 | 15 | 450 | 100 | 180 | 111 | 6 |
| *100 | 20 | 400 | 100 | 150 | 149 | 6 |
| 125 | 20 | 450 | 100 | 150 | 171 | 6.5 |
| 150 | 24 | 450 | 100 | 130 | 228 | 7 |
| 200 | 24 | 500 | 100 | 100 | 256 | 9 |
| 250 | 32 | 600 | 100 | 90 | 456 | 14 |
| 300 | 32 | 600 | 100 | 90 | 456 | 14 |

*** Maximum thickness recommended for cutting attachments.**

## CHART 3

### GUIDE FOR TYPE 551WELDING TIPS OXY/ ACETYLENE

| TIP SIZE | PRESSURE Kpa OXYGEN | PRESSURE Kpa ACETYLENE | FUEL GAS L/MIN |
|---|---|---|---|
| 4 | 50 | 50 | 1.5 |
| 6 | 50 | 50 | 1.5 |
| 8 | 50 | 50 | 2 |
| 10 | 50 | 50 | 3 |
| 12 | 50 | 50 | 4 |
| 15 | 50 | 50 | 6.5 |
| 20 | 50 | 50 | 12 |

***ALL FIGURES ARE APPROXIMATE AND CAN VARY**

flow the flame will recede into the tip or mixer with potential hazard of flashback. Manufacturer's recommendations for correct operating pressures and flows should be followed.

**iv)** Recommended operating pressures for tips and nozzles should take into account the pressure drop introduced by long lengths or small diameters of hoses and any added safety devices.

## Safety Devices

**Requirements**

It is recommended that safety devices should always be used in oxygen-fuel systems. Safety devices should comply with AS 4603. Regulatory requirements may apply. In Western Australia, the use of flashback arrestors on both ends of the gas delivery hoses is mandated.

Uni-Flame gas welding and cutting kits are therefore supplied with four IBEDA flashback arrestors that comply to AS4603. Two pieces to suit the torch end and two pieces to suit the regulator end for optimum protection. **The Uni-Flame gas welding and cutting kit must not be operated without the four flashback arrestors being installed**. Failure to install flashback arrestors could lead to a flashback and possible injury or death.

The Flashback Arrestors supplied will provide sufficient flow rate for the equipment and welding hose configurations supplied in this cutting & welding kit. Should equipment requiring higher flow rates be used with this kit (eg: a large heating head), consideration must be given to fitting flashback arrestors with higher flow rates to ensure correct gas flow for operation of that equipment. Nozzle and tip flow rates are available from the manufacturer.

**Note: The use of safety devices like non-return valves or flashback arrestors does not reduce the need to follow correct and safe operating procedures.**

## Personal protective equipment

Personal protective equipment should be used by operators of oxy-fuel gas equipment.

It is necessary to wear suitable protective clothing to protect the operators body and clothing from

**a)** Heat from the work

**b)** Burns which may result from contact with hot components or small globules of hot metal

**c)** Ultraviolet light which may burn the skin or eyes

**d)** Radiation which may burn skin or eyes

Therefore the operator must protect himself with clothing, gloves and footwear that is suitable to prevent the entry of hot particles or objects and be flame resistant. Aprons, sleeves, shoulder covers, leggings or spats of pliable flame resistant leather or other suitable materials may also be required where the areas of the body will encounter hot metal.

Eye protection is also necessary. Recommended minimum shade numbers are listed below. If any discomfort is felt darker filters should be used.

| | | |
|---|---|---|
| **Flame cutting and gouging** | - Light | Shade 4 |
| | - Medium | Shade 5 |
| | - Heavy-close | Shade 6 |

| | | |
|---|---|---|
| **Gas Welding** | - Low heat input | Shade 3 |
| | - Light fusion welds | Shade 4 |
| | - Heavy fusion welds | Shade 5 |

## Cylinder trolleys

Cylinder trolleys should be designed and built with due regard to stability in operation.
The cylinders, maximum of one each oxygen and fuel, should rest fully and securely on the base of the trolley. Means of restraint of the cylinders, e.g. a chain or strap, should be provided. The maximum size of cylinder stated on a permanent label on the trolley should not be exceeded.
Consideration should be given to possible release of the cylinder safety devices, and unimpeded gas release from them should be provided.

## System Assembly

### General compatibility

Your Uni-Flame gas welding and cutting kit comprises many components. It is important for safe operation that replacement parts purchased in the future are genuine Uni-Flame parts or parts that are compatible and suitable for use with Uni-Flame gas equipment.

### Fuel gas

The choice of fuel gas uniquely determines several of the system operating parameters, especially equipment and operating pressures. Only equipment specified by the manufacturer for use with that particular fuel gas shall be used.
Acetylene gas should not be used at flowing pressures exceeding 150 kPa downstream of the outlet of the pressure regulator (see AS 4267). LPG equipment including especially regulators and hose, should never be used in Acetylene systems. It should be noted that Gas Suppliers recommend that the maximum acetylene gas draw-off rate should not exceed 1/7 of the cylinder contents per hour, which for the common large Acetylene cylinder of 7 m3 gas capacity limits the maximum flow to 0.14 m3/hr or 17 l/min.
LPG systems should comprise only equipment especially designated for LPG except for multi-fuel gas components where the manufacturer specifically nominates LPG amongst the recommended fuels. LPG systems are not subject to maximum outlet pressure limitations except that at low temperatures the vapour pressure in the cylinders for some mixtures may prevent high system pressures. 400 kPa is a commonly used upper limit.

### Flow capacity

The tip or nozzle in use determines the required system pressures and flows and hence the pressure regulator outlet pressure settings. Particular care must be taken in allowing for pressure drops, especially through long lengths of small diameter hose and multiple safety devices. Manufacturer's instructions should be carefully followed. A system which has excessive pressure drops may become unstable resulting in possible retreat of the flame into the tip leading to overheating, backfire or flashback. Pressure drop is particularly important in acetylene systems because of the limitation in maximum operating pressure to only 150 kPa maximum.

## Setting Up Plant Safely

### System operation

Before operation these important steps must be carried out:

**a) Leak testing**

Prior to initial use of gas equipment, all breakable connections, glands and valves should be checked for leakages, e.g. by a pressure drop method or by means of a leak detecting fluid. Smell should not be relied upon as many persons have a poor sense of smell. NEVER test for leaks with a flame.

**b) Purging**

It is strongly recommended to purge oxygen and fuel gas hoses prior to usage at the start of the day and after the blowpipe has been shut down for a substantial period of time such as lunch periods or overnight. This must not be done in confined spaces or in the presence of any ignition source. Always refer to operating instructions for the correct purging procedures.

**c) Lighting**

Flint lighters or stationary pilot flames should be used for ignition of flames. Blowpipes must not be lit or re-lit by hot metal, matches, hot electrodes or welding arc. When lighting, ensure that the flame cannot touch either nearby personnel or any combustible material. Always refer to operating instructions for the correct lighting procedures. (See Chart 5)

**d)** **Work Interruption**
When blowpipes are not in use, the oxygen and fuel gas should be closed off at the supply and hoses blown down to prevent possible leakage and gauge failure. Blowpipes and hoses should be safely placed so accidents or damage cannot occur.

## Equipment Inspection and Maintenance

### Inspection and Maintenance

Inspection and maintenance should be carried out on a routine basis for all items of Uni-flame gas and cutting equipment. Guidance on inspection and maintenance for the equipment are described in Charts 4 and 5.
Servicing of equipment must only be completed by either the importer Welding Guns of Australia Pty Ltd or its accredited repairers or by organisations which specialise in maintenance of such equipment.

### Detailed inspection and maintenance

Some useful guidance on inspection and maintenance for specific equipment follows:

**a)** Checks for gas leakage should be carried out on all regulators, valves and cylinders regularly and at least each time the equipment is set up.

**b)** Repair and maintenance of regulators must only be carried out by approved persons or organisation, e.g. repairers accredited by manufacturers or suppliers.

**c)** If a regulator shows excessive delivery pressure "creep", it should be replaced immediately and the defective regulator repaired.

**Note:** To check for "creep" (pressure build-up when the blowpipe valves are closed), close the welding or cutting blowpipe valves whilst the regulator is open and check for continuing increase in pressure beyond the pressure that has been set . Pressure build up beyond 35kpa is excessive and regulator should be removed from use and be either replaced or repaired.

**d)** If pressure gauges or indicators do not return to the stop when pressure is released, replacement and repair is required.

**e)** Checks of regulator pressure indicator accuracy should be carried out at least annually.

**f)** Damaged hoses should be discarded and not repaired. Rubber hose should never be repaired with adhesive tape. When flashback has occurred all hoses should be discarded as internal damage has probably resulted.

**g)** All blowpipes, welding tips and cutting nozzles should be handled carefully and protected from dirt. Blowpipes must not be left burning on a bench unless supported in a safe holder.

**h)** Regular dismantling and cleaning of blowpipes, by either the manufacturer or other qualified organisations, is recommended. See Chart 4 for recommended inspection intervals.

**i)** Cutting nozzles and welding tips should be cleaned only by methods which have been recommended by the manufacturer. Drills should not be used for this purpose as any damage may promote the occurrence of flashback. Nozzles and tips should be stored in such a way as to minimise damage to the seating area, eg by use of rubber caps or storage blocks.

**j)** Safety devices should be inspected strictly according to the requirements in AS 4603

**k)** O-rings used on regulator inlet connections, mixer attachments etc should be replaced regularly or when they show signs of damage. Use only manufacturer supplied replacements.

**l)** Only oxygen compatible PTFE tape should be used in making up threaded connections.

## Emergencies and Incidents

### Backfires and Flashbacks

Instability of the flame in a tip or nozzle is a common cause of emergencies and incidents in Oxygen-fuel gas systems. These emergencies can occur during lighting up or during operation.
Incorrect lighting up procedures (especially neglecting to purge hoses, low operating pressures at the tip or nozzle resulting from inadequate gas supply, damaged or poorly maintained equipment or a combination of all these are usually the cause.
The problems show up as:
**BACKFIRE** is the return of the flame into the blowpipe with a popping sound, the flame being either extinguished or re-ignited at the nozzle.
**SUSTAINED BACKFIRE** is the return of the flame into the blowpipe with continued burning within the neck or handle. This is accompanied by an initial popping sound followed by a hissing sound from the continued burning within the blowpipe. In this case, immediately turn off gases at the blowpipe, oxygen first, and check nozzle or tip condition, gas pressure and connections to torch and cylinder.

**FLASHBACK** is the return of flame through the blowpipe into the hoses and even the regulators. Depending on its severity, it may also reach the acetylene cylinder, causing heating and decomposition of the contents.
If any of these events occurs, especially flashback, immediately close the oxygen blowpipe valve followed by the fuel gas blowpipe valve. Close cylinder valves and if cylinders heat up, cool as described below.
Check operating conditions and equipment faults before restarting. Discard any gas hose when flashback into the hose has occurred.

**Gas leaks**

Leaking gas is a potential hazard wherever it occurs and whichever the gas. Fuel gases present the greatest hazard since all commonly used fuels can ignite even when in low concentrations in air and require minimum energy to do so, i.e. any spark or source of high temperature is sufficient to start a fire or an explosion.
Oxygen makes all materials more readily combustible and will increase the intensity and severity of any fire.
Inert gases displace oxygen and can cause unnoticed loss of alertness and then asphyxiation.
The sources of gas leaks include:

**a)** Cylinder fittings (valves, safety devices) damaged or in poor condition
**b)** Valves not closed off when equipment is not in use.
**c)** Breakable connections improperly made up or in poor condition (scored or dirty nipples, conical seatings, O-rings). The typical oxygen-fuel gas plant has many connections points in the cylinder valves, regulators, hoses, blowpipe and tips and nozzles. Each of these is a potential leak point if not in good condition.
**d)** Hoses in poor condition.

Whenever a gas leak is suspected or detected, operations should cease, the leak rectified immediately if possible, heat sources removed or switched off and the area cleared until gas has dispersed.

## Ignition of Oxygen Regulators, Hoses and other High Pressure Equipment

Although accidents of this type are rare, when they do occur the results may include serious injury, a major fire or even fatality. Care in use and maintenance of oxygen regulators and other equipment is therefore extremely important.
Ignition may occur due to:

**a)** Spontaneous ignition of oil, grease or hydrocarbon liquids in high pressure oxygen. Keep oil and grease away from regulators and other equipment, do not use oil or grease as a lubricant for tight threads etc and do not use oily rags, tools or operate with oily hands.
**b)** Use of equipment (e.g. pressure regulators, manifolds, high pressure leads) not clearly designated as suitable for high pressure oxygen and rated for the same pressure as the cylinders in use. Use only equipment clearly marked for oxygen, of a suitable pressure rating, clean and in good operating condition.
**c)** Particles entrained in high-velocity gas streams (e.g. piping, valve connections) causing ignition in cylinder valve or regulator seats and seals. Cleanliness and generally good housekeeping practice are required. Always "crack" the cylinder valve before fitting equipment.
**d)** Rapid opening of the oxygen cylinder valve causing a high temperature at the regulator seat and seals. The cylinder valve **MUST BE OPENED SLOWLY.**

**Cylinders in fires**

The most common incidents are those involving ignitions of fuel leakages from regulator and hose connections near the cylinder. If this occurs, as appropriate, either the cylinder valve should be closed or the pressure regulator adjusting screw released, using a gloved hand, and the fire extinguished as soon as possible. Otherwise, use of a dry powder or CO2 fire extinguisher should be followed by closing of the cylinder valve to prevent re-ignition.
If it is not possible to extinguish quickly fires of any type with a fire extinguisher, further attempts should not be made and:

**a)** The area should be evacuated (100 metres minimum).
**b)** The fire brigade should be called.
**c)** If attempts are made to fight the fire, they should be done only from a protected position and using copious quantities of water.
**d)** Cylinders not involved in the fire and which have not become heated should be moved away as quickly as possible, provided this can be done without risk. Cylinder valves should be closed. Cylinders which have been heated can explode even after the fire has been extinguished, particularly acetylene cylinders.
**e)** When the fire brigade arrives, they should be notified of the location and number of cylinders involved in the fire, and the name of the gases they contain.
**f)** Inform the gas supplier as soon as possible
**g)** If the cylinder contents are unknown, the actions taken should be those for acetylene cylinders

**Acetylene Cylinder Overheating**

Acetylene cylinders may become hot either through flashback or due to accidental heating (e.g. contact with hot objects, fires). To prevent serious accidents, the following procedure should be carried out immediately overheating is noted:

**a)** Shut cylinder valve quickly and have the supplier notified as soon as practicable. If the cylinder is on fire, call the fire brigade.

**b)** Clear all personnel from the area.

**c)** Cool the cylinder with a plentiful supply of water, preferably from a fire hydrant and with the person behind a suitable protective barrier.

**d)** If the cylinder safety device functions and issuing gas ignites, cool as above, but do not extinguish the flames. Where gas does not ignite, all sources of ignition must be removed from the area if this can be done safely.

**e)** Continue cooling but with stops at intervals to check if the cooling water dries off the cylinder or if it remains wet.

**f)** When the cylinder remains wet on removal of the water, the cylinder should be removed to an open space away from any ignition source and placed under water e.g., in a 200 litre drum.

**g)** Continue cooling for 24 hours or as advised by a competent authority.

**Oxygen Cylinder Explosions**

Accidents have been reported which involve explosion of an oxygen cylinder due to direct flame impingement from an adjacent acetylene cylinder. Such accidents arise when the fusible plugs melt due to cylinder overheating, the escaping gas ignites and the flame impinges on the oxygen cylinder. This causes softening, bulging and bursting of this cylinder without appreciable increase in its internal pressure, i.e. without causing the bursting disc to rupture.

Where oxygen and acetylene cylinders in use are adjacent to each other, consideration should be given to protecting the oxygen cylinder by placing a non-flammable shield, e.g. a 2-3 mm sheet of steel or refractory fibre between the cylinders. The shield should extend at least from the shoulder of the acetylene cylinder to the top of the oxygen cylinder regulator .

**REFURBISHMENT OR REPLACEMENT INTERVALS**

**1.** REGULATORS (including their integral protective devices)
Visual examination to determine suitability for service (eg gas, pressure rating, damage), condition of threads and sealing surfaces, oil or grease contamination.
**Leak test all joints at working pressure. Six monthly:**
Functional tests to ensure the correct operation of internal components.
Manufacturer or supplier recommendation, but not exceeding 5 years.

**2.** **FLASHBACK ARRESTORS** and other external devices (including non-return valves)
Visual examination to determine suitability for service (e.g. gas, pressure rating, damage), condition of threads and sealing surfaces, oil or grease contamination.
**Leak test all joints at working pressure. Yearly as detailed in AS 4603 or following a flashback:**
Proper functioning of the non-return valves and flashback arrestors.
For pressure-activated valves, check there is no flow in the normal direction with the valve tripped.
Manufacturer or supplier recommendation, but not exceeding 5 years4.

**3.** **HOSE ASSEMBLIES** Visual examination to determine suitability for service (e.g. gas, pressure rating, damage), condition of cover, threads and sealing surfaces of the end fittings.
**Leak test all joints at working pressure Six monthly:**
Check for absence of cuts and excessive wear by bending the hose in a tight radius, to ensure reinforcement is not visible.Determined by the hose assembly condition.

**4.** **BLOWPIPES, MIXERS AND ATTACHMENTS** Visual examination for damage of the threads and sealing surfaces of the hose connections and the attachment connections.

**Test control valve function.**

Blank the attachment connection and leak test for internal malfunction. Manufacturer or supplier recommendation, but not exceeding 5 years.

## CHART 4
## GUIDANCE ON EQUIPMENT MAINTENANCE

| EQUIPMENT | WEEKLY 1 | AS NOMINATED 2 | REFURBISHMENT OR REPLACEMENT INTERVALS 3 |
|---|---|---|---|
| **1. REGULATORS (including their integral protective devices)** | Visual examination to determine suitability for service (eg gas, pressure rating, damage), condition of threads and sealing surfaces, oil or grease contamination.<br><br>Leak test all joints at working pressure. | Six monthly:<br>Functional tests to ensure the correct operation of internal components. | Manufacturer or supplier recommendation, but not exceeding 5 years. |
| **2. FLASHBACK ARRESTORS and other external devices (including non-return valves)** | Visual examination to determine suitability for service (e.g. gas, pressure rating, damage), condition of threads and sealing surfaces, oil or grease contamination.<br>Leak test all joints at working pressure. | **Yearly as detailed in AS 4603 or following a flashback:**<br>Proper functioning of the non-return valves and flashback arrestors.<br>For pressure-activated valves, check there is no flow in the normal direction with the valve tripped. | Manufacturer or supplier recommendation, but not exceeding 5 years. |
| **3. HOSE ASSEMBLIES** | Visual examination to determine suitability for service (e.g. gas, pressure rating, damage), condition of cover, threads and sealing surfaces of the end fittings.<br><br>Leak test all joints at working pressure | Six monthly:<br>Check for absence of cuts and excessive wear by bending the hose in a tight radius, to ensure reinforcement is not visible. | Determined by the hose assembly condition. |
| **4. BLOWPIPES, MIXERS AND ATTACHMENTS** | Visual examination for damage of the threads and sealing surfaces of the hose connections and the attachment connections.<br><br>Leak test all joints at working pressure. | Six monthly:<br>Test control valve function.<br><br>Blank the attachment connection and leak test for internal malfunction. | Manufacturer or supplier recommendation, but not exceeding 5 years. |

**Notes:**

**1.** If in constant use or **BEFORE EVERY USE** (to be performed by the operator according to manufacturer's instructions).

**2.** To be carried out by a qualified service agent/organisation or person..

**3.** Equipment condition determines whether refurbishment or replacement is required.

**4.** Regulator elastomers and seals will wear and deteriorate in service or on the shelf. Items stored for 1 year or over without use, should receive inspection as per the annual maintenance inspection.

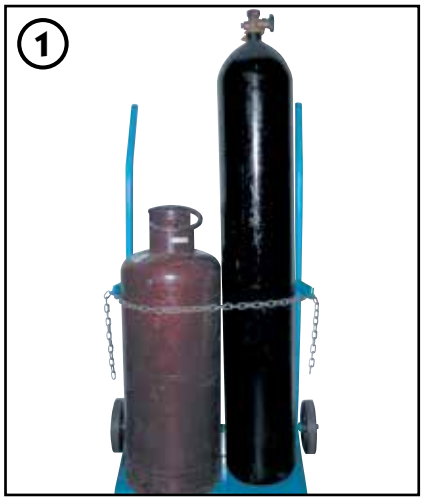
## CHART 5

### SAFE PROCEDURES FOR SETTING UP AND CLOSING DOWN GAS WELDING, HEATING AND CUTTING EQUIPMENT

| STEP | ACTION | COMMENT |
|---|---|---|
| **1 SETTING UP** | | |
| **1.1 Equipment connection** | 1 Check that all equipment, equipment connections and especially both valve outlets and regulator inlets are clean and free from oil and grease | |
| **Refer to Photo 2, 2a**<br>**Set up Procedure** | 2 Standing to one side of the cylinder "Crack" (briefly open and close) the cylinder valves.<br>Caution: Fuel valves should be cracked in a well ventilated area clear of sources of ignition | This not only removes any contaminants from the valve outlet, it also frees the valve to allow its subsequent operation. Always stand to one side of the cylinder and ensure that hands and gloves are free of all grease or oil before cracking a cylinder valve. Never crack a cylinder valve when adjacent to any ignition source. |
| **Refer to Photo 3, 3a**<br>**Set up Procedure** | 3 Screw regulators into cylinder valves, using an appropriate spanner where applicable. Make sure the regulators adjusting knobs are fully released. | Note that all oxygen connections have right hand nuts and fuel gas connections left hand nuts. |
| **Refer to Photo 4, 4a, 5**<br>**Set up Procedure** | 4 Fit Flash Arrestors to regulators then gas hoses to Flash Arrestors outlets, using appropriate spanner. | Regulators and hoses should be colour coded blue for oxygen, red for acetylene and orange for LPG. Safety devices are blue for oxygen and red for fuel gases. |
| **Refer to Photo 6, 6a,**<br>**Set up Procedure** | 5 Slowly open the oxygen cylinder valve, then the acetylene cylinder valve. | Open slowly enough to observe the rise in the cylinder pressure gauge on the regulator. Sudden opening of the cylinder valve can cause damage to the regulator seat and lead to fire and explosion on an oxygen regulator |
| **Refer to Photo 7**<br>**Set up Procedure** | 6 Adjust the oxygen regulator to allow a small flow through the hose and then release the control knob fully. Repeat for the fuel gas regulator. | This blows off dust and chalk from the hoses. This operation should be done especially for new hoses. |
| **Refer to Photo 8**<br>**Set up Procedure** | 7 Connect the blowpipe to the other hose ends, including flashback arrestors using the appropriate spanner | Flashback arrestors at the blowpipe end should always be used. Blowpipe inlet connections and control valves should be marked O for oxygen, F for fuel gas. |
| | 8 Connect any required attachments, mixers, tips or nozzles to the blowpipe | Ensure blowpipe, attachment and mixer, tips and nozzles are compatible |
| **Pressure setting and leak test**<br>**Refer to Photo 9**<br>**Set up Procedure** | 9 Check that the blowpipe valves are closed and adjust the oxygen regulator to the required pressure. | Set the pressure recommended by the manufacturer of the equipment. Refer to CHART 2 or CHART 3 |
| | 10 Close the oxygen cylinder valve and check for pressure drop on the regulator gauges. | Any drop indicates a leak between the cylinder valve (including gland) and the blowpipe valve. Leaks through the blowpipe valve will show at mixer, tip or nozzle. |
| | 11 Check also for leaks at the top of the cylinder, particularly at the safety device, gland nut and regulator inlet and outlet connections using a solution of leak detecting fluid like Teepol HB7. | These will not show as a pressure drop. Any leak on the cylinder and its fittings must be referred to the gas supplier. |

| | | |
|---|---|---|
| | 12 Once all leaks have been corrected, re-open cylinder valve slowly. | |
| | 13 Repeat the procedure (steps 9 tp 12) for the fuel gas. | |
| | 14 If the valve is not handwheel operated, leave the cylinder key in the fuel gas cylinder valve. | This will allow quick shut-down in an emergency. |
| **2 USE LIGHTING PROCEDURE FOR UNIFLAME OXY ACETYLENE CUTTING** | 1 Open, then close, each blowpipe valve and oxygen control valve on the cutting attachment in turn for 2 seconds for every 5 meters of hose. | Make certain that no source of ignition is nearby. Purging will eliminate mixed gases in hose - a cause of flashback at lighting up. |
| **2.1 Purge** | 1 Open the blowpipe fuel gas about 1/4 turn. | |
| **3 Lighting up Procedure Welding Photo 1 / Cutting Photo 1** | 2 Light the gas at the tip or nozzle using only flint type lighter supplied. | |
| **Flame Adjustment refer to Lighting procedure for Cutting & Welding Fig A,B,C & D** | 3 Increase the fuel gas flow until the flame no longer produces soot. | |
| | 4 Open the cutting attachment oxygen heating control valve, and adjust until a neutral flame is obtained with the cutting leaver depressed. | |
| | 5 Check the regulator set pressures and readjust if necessary. | Set the pressure recommended by the manufacture |
| **4 Shutting off blowpipe** | 1 Close blowpipe fuel gas valve. | This cuts off fuel supply to the flame. |
| | 2 Close blowpipe oxygen control valve. If cutting attachment is connected depress oxygen cutting leaver then close oxygen heating valve on cutting attachment | This procedure is satisfactory for temporary halts not involving leaving the equipment unattended. |
| | 3 IN CASE OF SUSTAINED BACKFIRE, CLOSE IMMEDIATELY BLOWPIPE OXYGEN VALVE FIRST | This cuts off oxygen supply to the internal flame and should extinguish it immediately. |
| **5 CLOSING DOWN** | 1 Shut off blowpipe as in 4.1, 4.2 above. | This procedure should be performed whenever the equipment is left unattended or whenever cylinders are being changed. |
| | 2 Close both cylinder valves. | |
| | 3 Open the blowpipe oxygen control valve to allow the gas to drain out. If using cutting attachment, then open the oxygen heating control valve and depress cutting leaver. | This will release all pressure in the regulator, hose and blowpipe. |
| | 4 Unscrew the oxygen regulator control knob once the contents pressure gauge reads zero. | |
| | 5 Repeat the procedure (5.1 - 5.4) for the fuel gas valve and regulator. | |

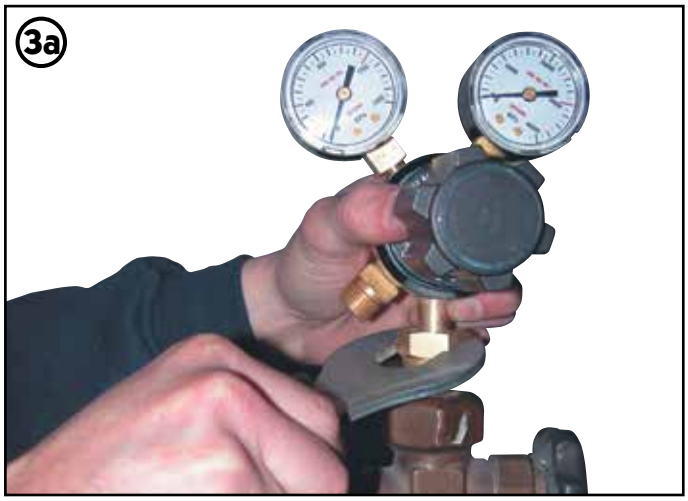
# Set up procedure for oxy acetylene kit




**1.** Secure both oxygen and acetylene cylinders on approved carry stand or trolley. (Not supplied)

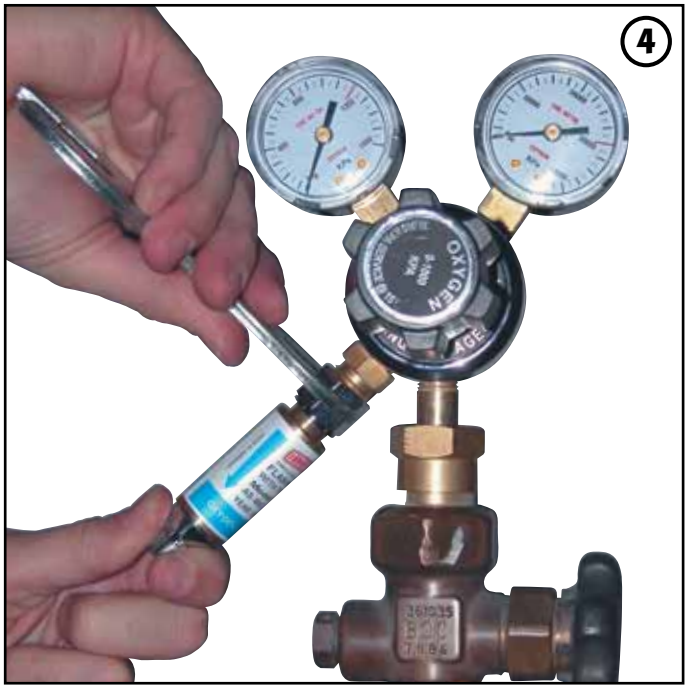


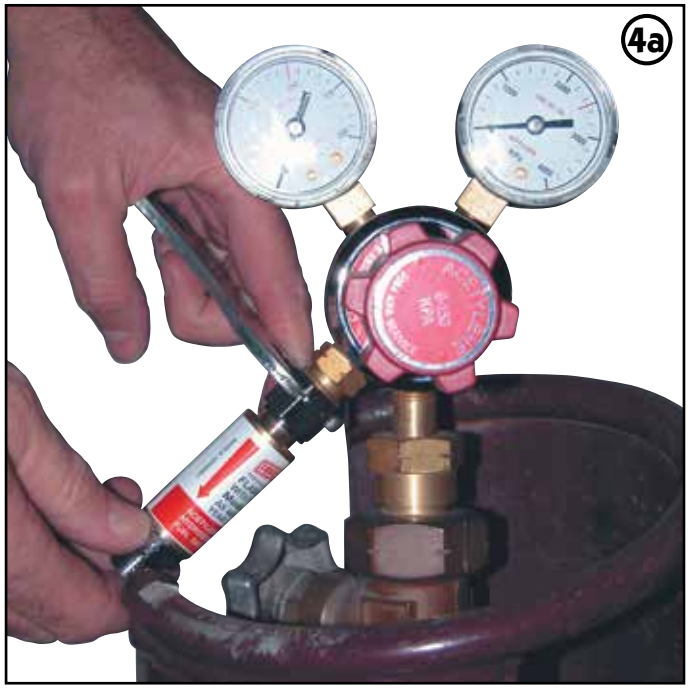
**2 - 2a.** Stand to one side and crack both oxygen and acetylene cylinders to clear any foreign material that may interfere with seating or clog orifices and threads.

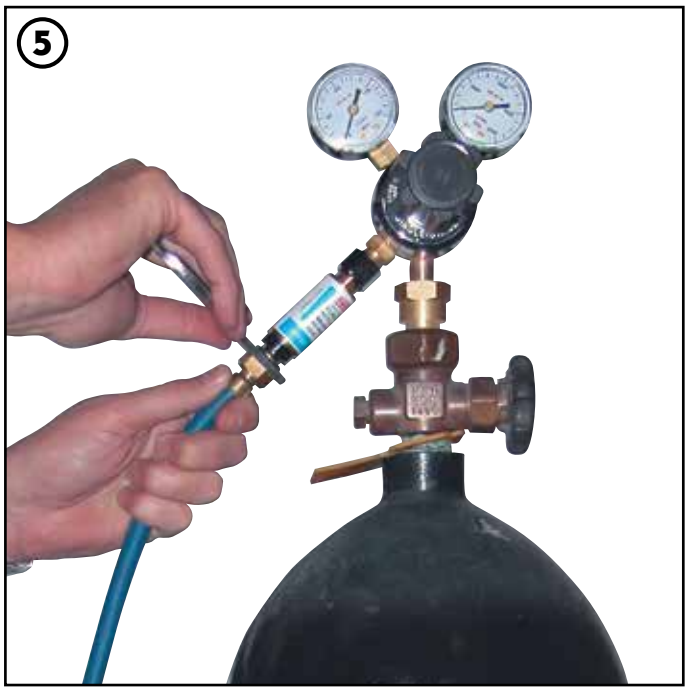

**3 - 3a.** Attach regulators to respective cylinders tighten using appropriate spanner supplied (note: black cylinder for oxygen and maroon cylinder for acetylene)

# Set up procedure for oxy acetylene kit



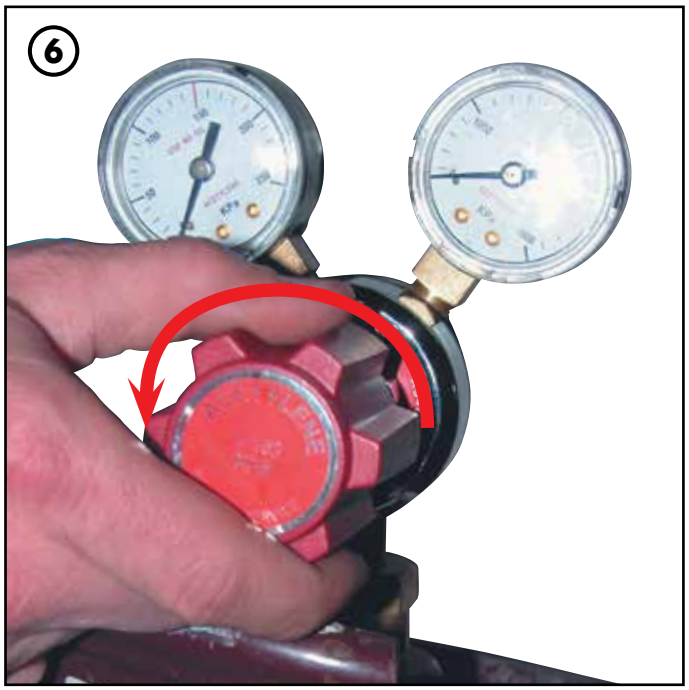




**4.** Connect approved **IBEDA** flash arrestors (AS4603 supplied) and tighten with appropriate spanner to regulators.
**Note: These are colour coded and are thread orientated.**



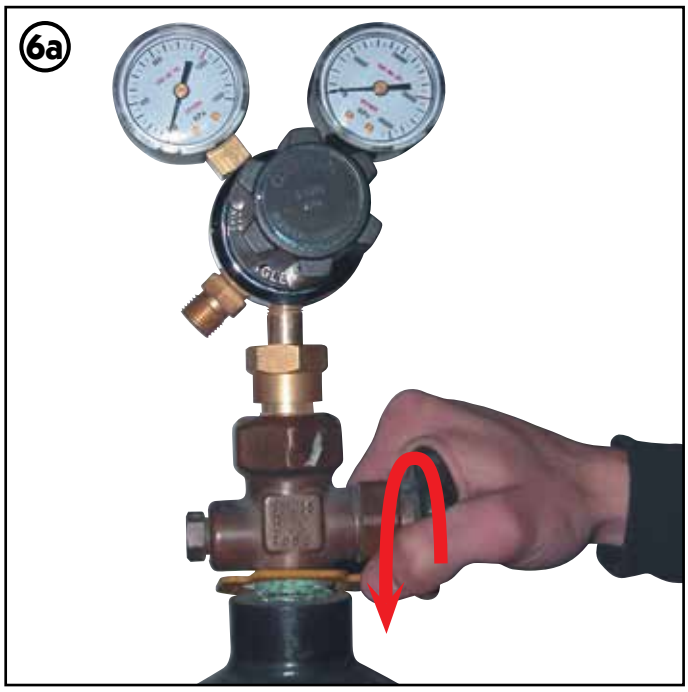

**5.** Attach gas hoses to flash arrestor on regulators using appropriate spanner. **Note: These are colour coded and thread orientated**

# Set up procedure for oxy acetylene kit





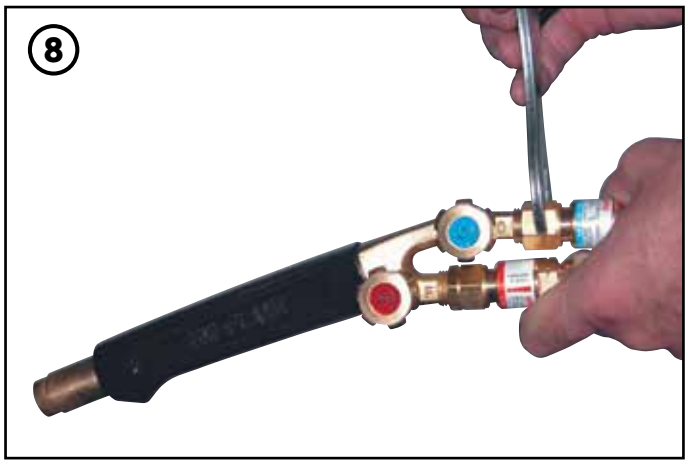
**6.** Before opening cylinder valves with regulators attached, **ENSURE** that regulator control knobs are fully wound in the **ANTI-CLOCKWISE** position.



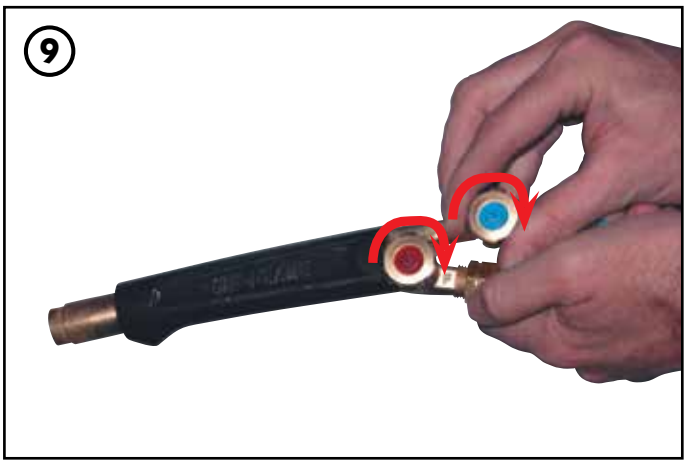

**6a. SLOWLY** open the cylinder valves so that high pressure gauge needle moves up gradually and check for leaks.
**Note: never open cylinder valves suddenly as the in rush of high-pressure gases can damage the regulator components and void your warranty.**

# Set up procedure for oxy acetylene kit


**7.** Holding the gas hose away from body and any ignition source, slowly turn **CLOCK WISE** the oxygen regulator control knob to achieve a small gas flow to purge any foreign material from tubing. When hose and regulators have been cleared return regulator control knob to the fully **ANTI CLOCK WISE** position. Repeat procedure for the acetylene fuel gas regulator and tubing.



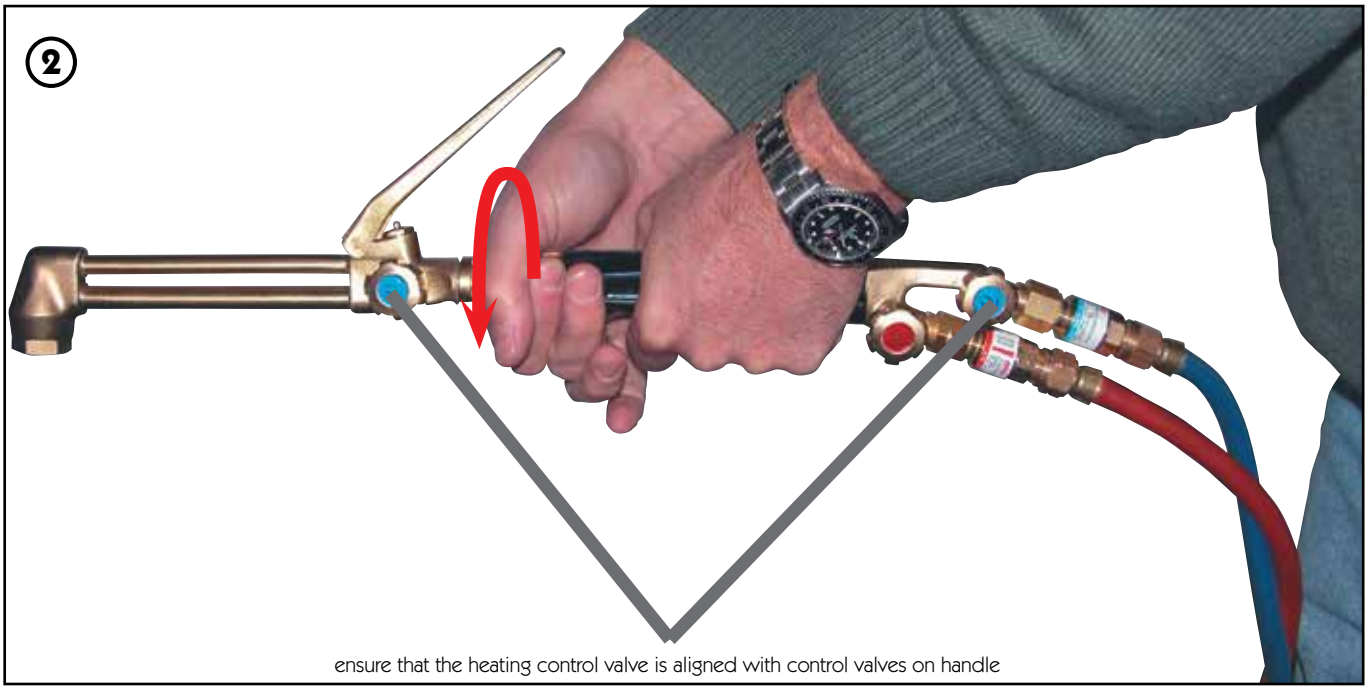

**8.** Attach **IBEDA** (AS4603) flash arrestors to blowpipe matching the respective colours and threads. Then attach the gas hose, which are colour coded and also thread oriented.




**9.** Ensure that both blowpipe control valves are closed, open fuel gas cylinder control valve and **CHECK FOR LEAKS**. Then close the fuel gas cylinder control valve and open the blowpipe fuel control valve until both needles on the fuel gauge regulator read zero. Repeat this procedure for the oxygen gas.

# Set up procedure for oxy acetylene cutting

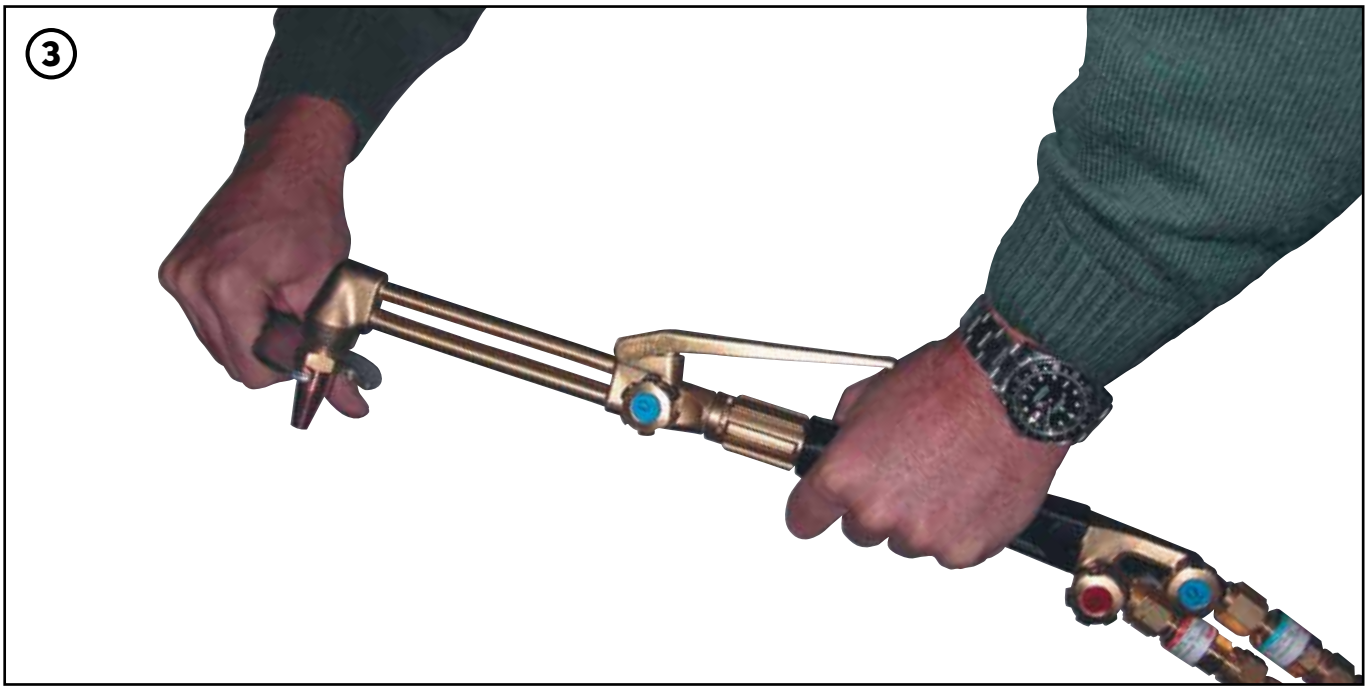
**1. Follow the set up procedure steps 1 to 9**




ensure that the heating control valve is aligned with control valves on handle

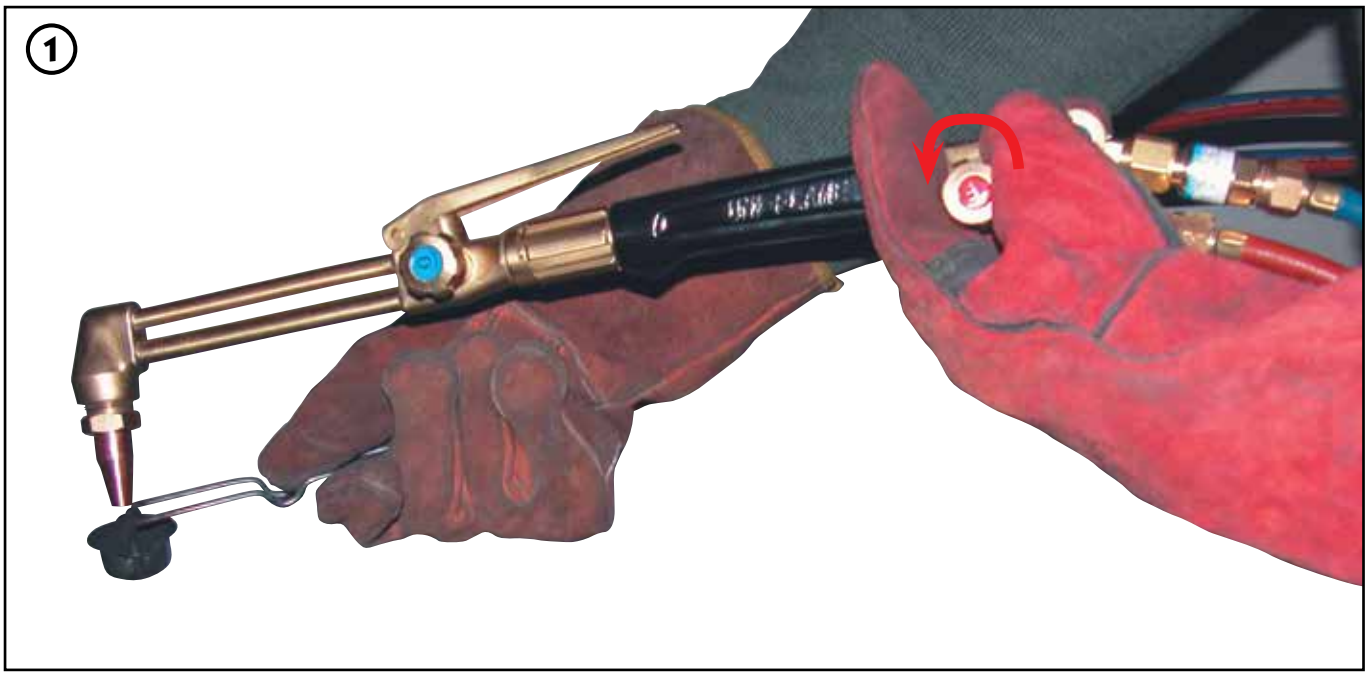
**2.** Fit the cutting attachment into the blowpipe handle, and ensure that the heating control valve is aligned with control valves on handle **tighten by hand**. Ensure that cutting attachment is secure and **CHECK FOR LEAKS.**

**3.** Install cutting nozzle into the head of the cutting attachment then tighten nozzle nut using spanner supplied and **CHECK FOR LEAKS**. (Refer to manufactures chart (Chart 2) for nozzle size and set pressures for procedure to be preformed).



# Set up procedure for oxy acetylene cutting

**1.** Open the acetylene fuel control valve on blowpipe, turn regulator control knob **CLOCK-WISE** to obtain correct set pressure required (Refer to refer to manufactures chart) (Chart 2) then close the control valve at the blowpipe.
**2.** Fully open the oxygen control valve on blowpipe handle, then open oxygen heating control valve on cutting attachment. Turn the regulator control knob **CLOCK-WISE** to obtain correct pressure required. (Refer to refer to manufactures chart )(Chart 2) then close the oxygen heating control valve on the cutting attachment.
**3.**Open the acetylene fuel gas valve 1/4 turn holding away from body and light issuing gas with appropriate flint lighter supplied **Note: ONLY USE FLINT LIGHTER SUPPLIED**. Continue to open the acetylene fuel gas control valve until flame no longer produces soot and cutting tip has flame retention.




**4.** Open the oxygen heating control valve until a neutral flame is obtained with the cutting lever depressed. (Refer to flame adjustment setting chart fig A B C & D.)

## Temporary shut down procedure for oxy acetylene cutting

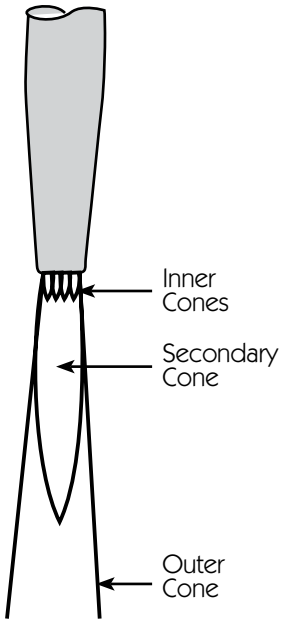
**1.** Close blowpipe acetylene fuel gas control valve
**2.** Close the oxygen gas control valve.
**3.** Close the oxygen heating control valve adjacent to the cutting lever after steps 1 and 2

## Permanent shut down procedure for oxy acetylene cutting

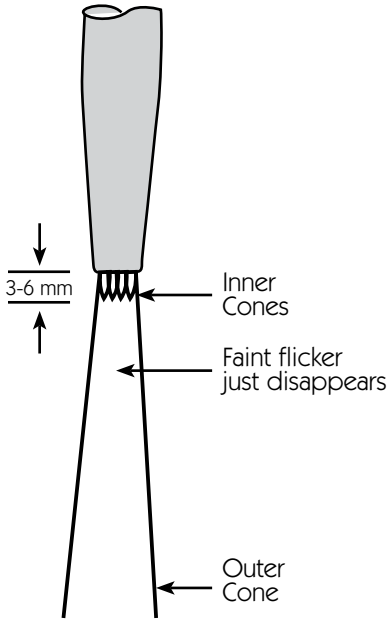
**1.** Follow temporary shut down procedure.
**2.** Close both cylinder valves
**3.** Open the blowpipe oxygen control valve to allow the gas to drain out
**SO THAT CONTENTS PRESSURE GAUGE READS ZERO.**
**4.** Turn the oxygen regulator control knob to the fully **ANTI-CLOCKWISE** position.
**5.** Repeat procedure 3 and 4 for the acetylene fuel gas valve and regulator.

# Set up procedure for oxy acetylene cutting

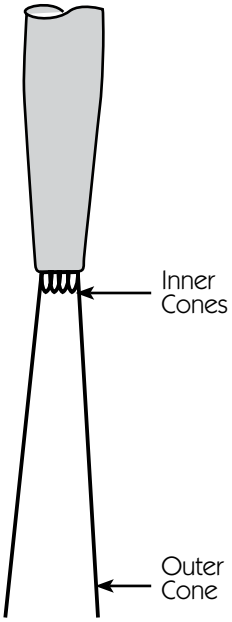
**Oxygen-Acetylene flame settings (as viewed through cutting goggles)**



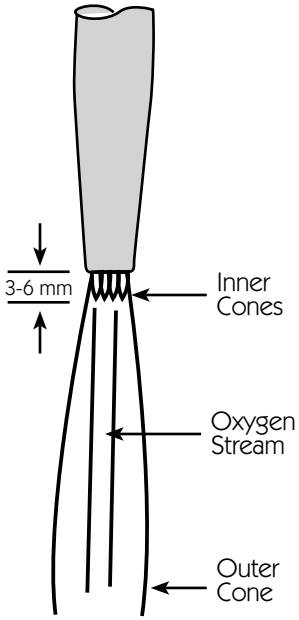

**A**
**Insufficient Oxygen**
- individual inner cones
- secondary (luminous) cone
- Outer bluish cone




**B**
**Correct Neutral Flame**
- Clearly defined inner cones
- Faint flicker at end of cone indicating a very slight secondary cone just disappears on adjustment from (a).
- Outer bluish cone

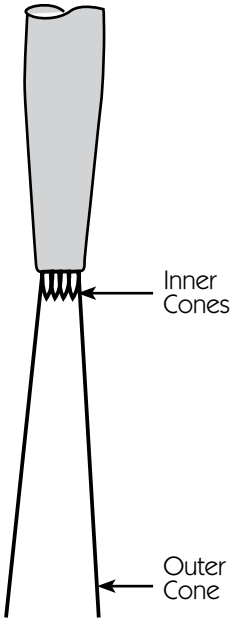



**C**
**Excess Oxygen**
- Very short individual inner cones
- no sign of secondary cone

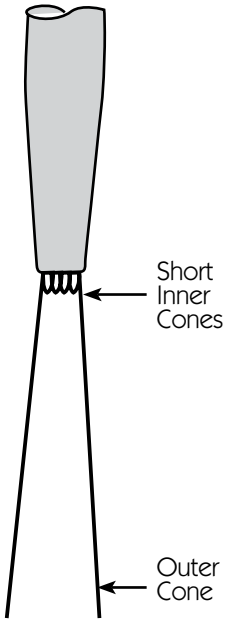



**D**
**Correct Flame with Cutting Oxygen Flowing**
- Cutting oxygen stream well defined

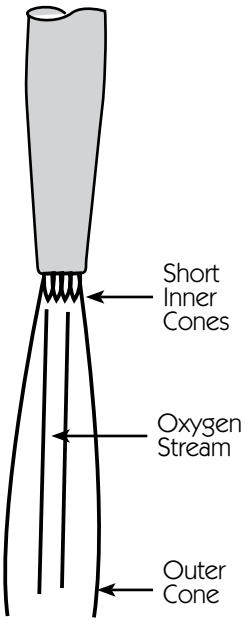
**Oxygen-LP Gas flame settings (as viewed through cutting goggles)**




**A**
**Insufficient Oxygen**
- Clearly defined inner cones
- Long outer cone
- Appears similar to oxy-acetylene neutral flame



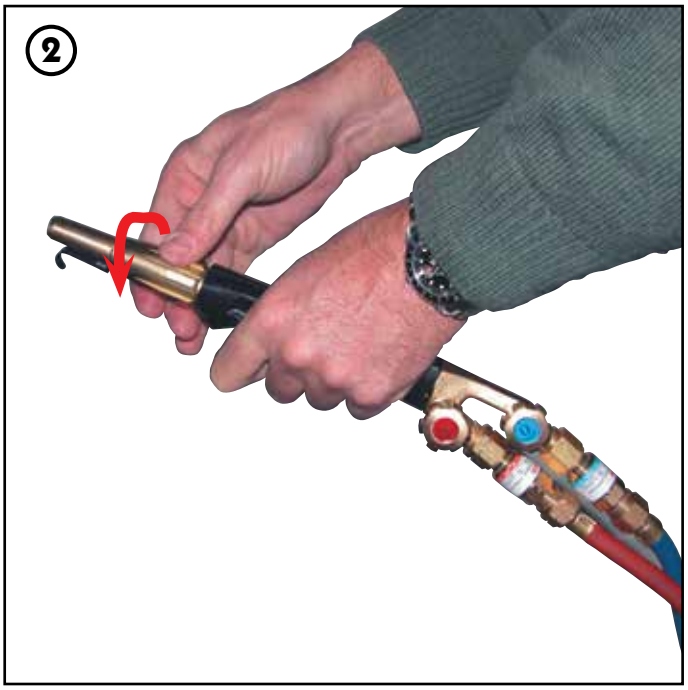

**B**
**Correct Neutral Flame**
- Very short inner cones
- Short and narrow outer cone




**C**
**Correct Flame with Cutting Oxygen Flowing**
- Cutting oxygen stream well defined

# Set up procedure for oxy acetylene welding

**1. Follow the set up procedure steps 1 to 9**




**2.** Fit mixer to the blowpipe handle and tighten by hand

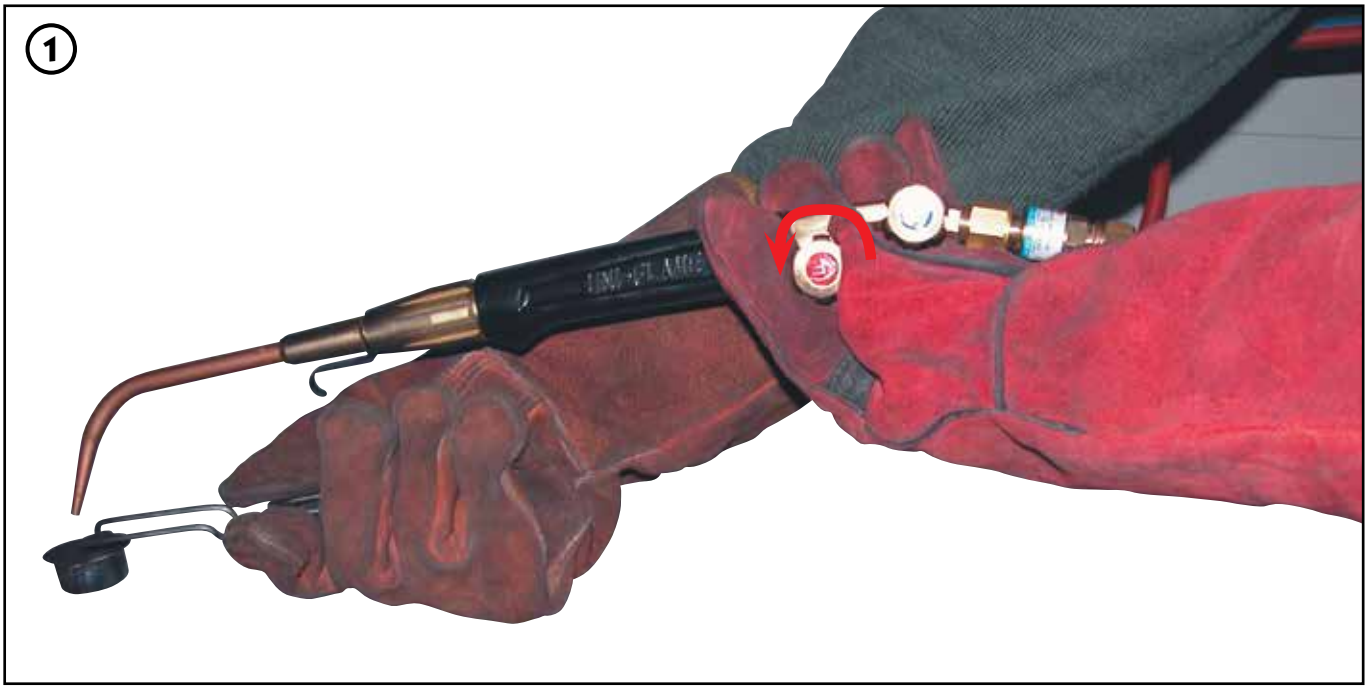
**3.** Install appropriate welding tip (refer to manufactures chart (Chart 3) for tip size and set pressures for procedure to be preformed)


**4.** Adjust welding tip alignment by loosening mixer to correct the angle of the tip for operators safety and comfort and tighten mixer and **CHECK FOR LEAKS.**

# Lighting procedure for oxy acetylene welding

**1.** Open the blowpipe fuel control valve and turn the acetylene regulator control knob **CLOCK-WISE** until the correct pressure is obtained on the delivery gauge then close the fuel control valve at blowpipe. Repeat this procedure for the oxygen gas. (Refer to refer to manufactures chart (Chart 2) for correct settings for tip size)

**2.** Holding the torch away from your body open the acetylene fuel gas valve 1/4 turn and light issuing fuel gas with appropriate flint lighter supplied. **Note: ONLY USE FLINT LIGHTER SUPPLIED**. Continue to open fuel gas valve until flame no longer produces soot and welding tip has flame retention




**3.** Open blowpipe oxygen control valve until a neutral flame is produced.

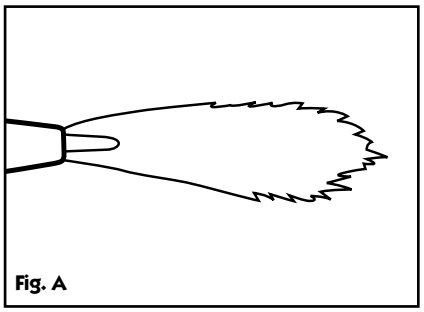


Fig. A

**Neutral flame** (obtained by having equal quantities oxygen and acetylene). Ideal for welding steel, stainless steel, cast iron, copper, aluminium, etc.

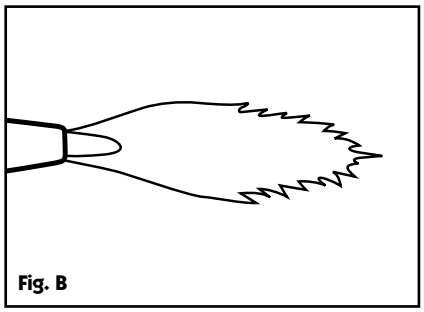


Fig. B

**Oxidising flame** (obtained by having excess oxygen). Ideal for welding brass.

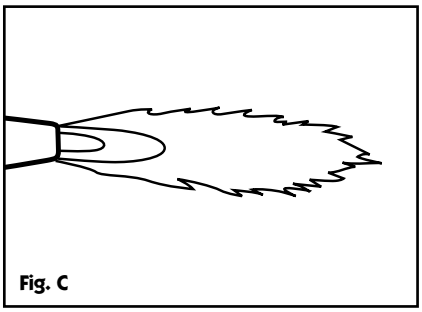


Fig. C

**Carburising flame** (obtained by having small excess acetylene). Ideal for hardening.

## Temporary shut down procedure for oxy acetylene welding

**1.** Close blowpipe acetylene fuel gas control valve
**2.** Close the oxygen gas control valve.

## Permanent shut down procedure for oxy acetylene welding

**1.** Follow temporary shut down procedure.
**2.** Close both cylinder valves
**3.** Open the blowpipe oxygen control valve to allow the gas to drain out
**SO THAT CONTENTS PRESSURE GAUGE READS ZERO.**
**4.** Turn the oxygen regulator control knob to the fully **ANTI-CLOCKWISE** position.
**5.** Repeat procedure 3 and 4 for the acetylene fuel gas valve and regulator.

# INSTRUCTION MANUAL

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