Clarke®

weld

WELDING KIT

Model No: CGW1

Part No : 6000670

OPERATING & MAINTENANCE INSTRUCTIONS

CE

0305

Please note that the details and specifications contained herein are correct at the time of going to print.
However CLARKE International reserve the right to change specifications at any time without prior notice.

NOTES

NOTES

Thank you for purchasing this CLARKE Welding Kit.

Before attempting to use the welding kit, please read this manual thoroughly and follow the instructions carefully. In doing so you will ensure the safety of yourself and that of others around you, and you can look forward to the equipment giving you long and satisfactory service.

Please note, these instructions are designed to aid you in the basic principles of welding, flame cutting, brazing, silver soldering, heating and the safe use of gases, regulators and torches, they are NOT a definitive instruction manual. With practice, a beginner can become proficient in the art of gas welding and flame cutting. Once acquired, this skill will prove to be very useful and possibly profitable.

CLARKE GUARANTEE

This CLARKE product is guaranteed against faulty manufacture for a period of 12 months from the date of purchase. Please keep your receipt as proof of purchase.

This guarantee is invalid if the product is found to have been abused or tampered with in any way, or not used for the purpose for which it was intended.

Faulty goods should be returned to their place of purchase, no product can be returned to us without prior permission.

This guarantee does not effect your statutory rights.

Specifications

Model No: GWC1

Part No: 6000670

Check List

Item	Qty
Moulded Carry Case:	1
Oxygen Regulator:	1
Acetylene Regulator:	1
Welding Torch/Handle:	1
Welding Nozzle Adapter:	1
Cutting Torch:	1
Welding Nozzles:	3
Cutting Nozzles:	3
Hoses:	2
Non Return Valve/Flashback Arrestor:	2
Spark Igniter:	1
Tip Cleaners:	1

General Safety Precautions

⚠ WARNING ⚠

As with all machinery, there are certain hazards involved with their operation and use. Exercising respect and caution will considerably lessen the risk of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator or damage to property, may result.

1. **ALWAYS** Learn the machines applications, limitations and the specific potential hazards peculiar to it. Read and become familiar with the entire operating manual.
2. **ALWAYS** use a face or dust mask if operation is particularly dusty.
3. **ALWAYS** check for damage. Before using the machine, any damaged part, should be checked to ensure that it will operate properly, and perform its intended function. Check for alignment of moving parts, breakage of parts, mountings, and any other condition that may affect the machines operation. Any damage should be properly repaired or the part replaced. If in doubt, **DO NOT** use the machine. Consult your local dealer.
4. **ALWAYS** disconnect the tool/machine from the power supply before servicing and when changing accessories.
5. **ALWAYS** wear safety goggles, manufactured to the latest European Safety Standards. Everyday eyeglasses do not have impact resistant lenses, they are not safety glasses.
6. **ALWAYS** keep work area clean. Cluttered areas and benches invite accidents.
7. **ALWAYS** ensure that adequate lighting is available. A minimum intensity of 300 lux should be provided. Ensure that lighting is placed so that you will not be working in your own shadow.

8. **ALWAYS** keep children away. All visitors should be kept a safe distance from the work area, especially whilst operating the machine.
9. **ALWAYS** maintain machine in top condition. Keep tools/machines clean for the best and safest performance. Follow maintenance instructions.

10. **ALWAYS** handle with extreme care do not carry the tool/machine by its' electric cable, or yank the cable to disconnect it from the power supply.
11. **ALWAYS** ensure the switch is off before plugging in to mains. Avoid accidental starting.
12. **ALWAYS** concentrate on the job in hand, no matter how trivial it may seem. Be aware that accidents are caused by carelessness due to familiarity.

13. **ALWAYS** keep your proper footing and balance at all times - don't overreach. For best footing, wear rubber soled footwear. Keep floor clear of oil, scrap wood, etc.

Trouble Shooting

Problem	Probable Cause	Remedy
Welding tip popping.	• Tip is operated at too low heat.	• Increase pressures, consult tip table (page 6).
	• Nozzle too large.	• Use next smallest size nozzle.
	• Tip too close to work.	• Move tip further from the work area.
Flames not clearly defined, smooth or even.	• Dirty tip.	• Clean with tip cleaner or replace nozzle.
Regulator not holding constant pressure.	Defective seat.	• Return unit for replacement.
Cutting tip popping.	• Nozzle loose.	• Tighten nozzle nut.
	• Seat nicked.	• Replace nozzle.
Difficult to light.	• Too much pressure.	• Consult pressure table. (page 9).
Flame changes during cutting.	• Oxygen needle valve on torch handle partly closed.	• Fully open oxygen valve.
	• Oxygen cylinder almost empty.	• Replace cylinder with full one.

Accessories

A wide range of tools and accessories is available from your nearest CLARKE dealer, for further information, contact your nearest dealer, or telephone CLARKE International Sales department on 01992 565300.

IMPORTANT:

The use of parts other than CLARKE replacement parts may result in safety hazards, decreased tool performance and may invalidate your warranty.

Flame Cutting Contd

Once the correct nozzle is tightly secured in the cutting torch, correct pressure set on the regulators, and flame is adjusted to a neutral one, follow these simple procedures to cut steel using oxyacetylene.

1. Before lighting, open the oxygen valve on torch handle, one full turn. Make all oxygen adjustments with valve on the cutting attachment.

2. Move the flame to the edge of the steel and position the preheat cones just above the metal.

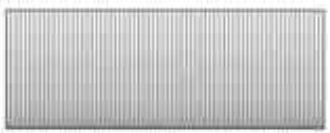
3. When the steel becomes red, slowly depress the cutting lever to release the oxygen stream to cut through the steel.

4. Slowly move the torch in the direction of the cut. The correct speed is accompanied by a sputtering sound, and a steady stream of sparks. This results in a clean, slag free cut with square top and bottom edges.

5. Too fast a movement does not allow time for the oxygen stream to cut all the way through the metal. Slag fills the kerf and the two pieces are not severed.

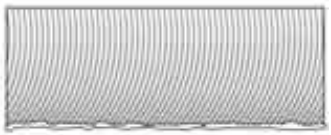
6. Too slow a movement leaves a rounded top edge with slag sticking to the bottom of the metal.

7. The size of the preheat flame determines how quickly the cut can be started. Often, a small preheat flame is desirable to conserve gases, and prevent melting of the top edges.



Perfect Cut

Shows regular surface with slightly sloping drag lines. Surface can be used for many purposes without the need to machine.



Extremely Fast

Not enough time is allowed for the slag to blow out of the kerf. Cut face is often slightly concave.

Extremely Slow

Produces pressure marks which indicate too much oxygen for cutting conditions.

Too Hot Preheat

Rounded top edge caused by too much preheat. Excess preheat does not increase cutting speed. It only wastes gases.

Additional Safety Precautions

1. **ALWAYS** Wear the correct safety wear specified for welding, i.e. welding goggles, welding gloves, apron and safety shoes etc.

2. **ALWAYS** Handle cylinders with care, chain or otherwise secure cylinders to a permanent fixture. Take care when moving.

3. **ALWAYS** use acetylene cylinders in an upright position, **NEVER** lying down.

4. **ALWAYS** Store gas cylinders and related equipment etc, according to local regulations.

5. **ALWAYS** prepare the work area before welding/cutting, work in a well ventilated area.

6. **ALWAYS** ensure all hoses and connections are tight and leak free, test for leaking joints etc using soapy water, NEVER use an open flame. DO NOT overtighten connections.

7. **ALWAYS** ensure non return valves/flash back arrestors are fitted to both lines.

8. **ALWAYS** use recommended pressure settings. Improper settings are wasteful. Extreme pressure build up in regulators is a warning to have them checked and repaired.

9. **ALWAYS** "Crack" the oxygen cylinder valve before installing the regulator, this is carried out by briefly opening the valve and allowing the escaping oxygen to clear away any dust which could damage the regulator.

10. **ALWAYS** prime oxygen and acetylene lines separately before lighting up, this will help prevent incorrect mixing of gases.

11. **NEVER** use oxygen to blow off work or clothing. Pure oxygen supports combustion and a spark can ignite oxygen-saturated clothing.

12. **NEVER** use oil or grease on the equipment, oil and grease is easily ignited and burns violently in the presence of oxygen.

13. **NEVER** work with damaged/leaking hoses and equipment, check for leaks using soapy water, any defects must be rectified before continuing.

!! WARNING !!

Ensure there are no naked flames or sparks which could ignite when priming or purging the lines etc.

Ensure a fire extinguisher is always to hand in case of accidents.

Setting Up Instructions

Attaching The Regulators (Fig. 1)

Open the oxygen cylinder valve (arrowed) briefly to blow out any dust etc, ensure the valve is fully closed before continuing. Attach the oxygen regulator (**Blue**) and tighten the connector using 25mm open ended spanner, **DO NOT** overtighten.
Repeat the above procedure for attaching the acetylene regulator (**Red**).

NOTE: The acetylene connections are all left handed whilst the oxygen connections are all right handed.

Connect the hoses to the regulators, blue hose to the oxygen outlet reg marked **'OUT'** and red hose to the acetylene outlet reg marked **'OUT'**, again observing left and right handed threads. Tighten both connectors using a 19mm open ended spanner. **DO NOT** overtighten.

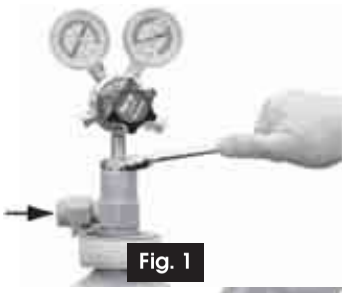


Fig. 1

Attaching The Torch (Fig. 2)

Attach the acetylene hose (**Red**) to the torch inlet valve marked **'GAS'** and the oxygen hose (**Blue**) to the torch inlet valve marked **'OX'**. Tighten both connectors using a 19mm open ended spanner, **DO NOT** overtighten. Ensure both valves are closed fully before continuing.


Fig. 2

Opening The Valves (Fig. 3)

Ensure both regulator knobs are opened fully (turned anticlockwise), carefully using cylinder key, slowly open both cylinder valves in turn, starting with the oxygen one.


Fig. 3

Adjusting Operating Pressure (Fig. 4)

When adjusting the operating pressures, refer to the relevant table on page 6, depending whether welding or cutting etc.
Adjust the operating pressure on both cylinders by turning the regulator valve knobs in a clockwise direction, observe the low pressure gauge (**Right Hand Gauge)** until gauge reading is at the correct pressure setting.

NOTE: the left hand gauge shows the pressure in the cylinder, and is not adjustable, this is an indication how much oxygen/acetylene remains inside the cylinder.


Fig. 4

Installing Cutting/Welding Nozzle (Fig .5)

Welding: Remove the cutting torch if fitted, attach the welding nozzle adapter to the welding torch/ handle, tighten hand tight only.
Select the required welding nozzle and screw into the adapter, to prevent the adaptor from turning, hold in


Fig. 5

Flame Cutting

Flame cutting is a simple process that can be quickly mastered. Only steel can be cut with the oxyacetylene method, since cast iron, stainless steel, aluminium, brass and other ferrous metals do not burn the way that steel does.

The way to cut steel is to heat it to its kindling temperature (a reddish colour), then burn it with pure oxygen. A cutting torch provides both the preheat flames and pure oxygen cutting stream. Acetylene and oxygen are combined in the torch head, and burn at the torch tip with a 6000ºF flame, these are the preheat flames. The centre hole in the cutting tip is the cutting oxygen hole, through which pure oxygen, which is not mixed with acetylene, flows to cut the steel after the metal is sufficiently preheated.

Cutting Nozzles

Cutting nozzles are available in a wide range of sizes, the correct size being determined by the steel thickness. Refer to the table below for correct pressures and tip sizes.

Metal Thickness (mm)	Tip Size	Oxygen Pressure (P.S.I.)	Acetylene Pressure (P.S.I.)
3.2 - 6.4mm	00	25 - 35	6
9.6mm	0	25 - 35	6
12.7 - 25.4mm	1	35 - 45	6
50.8mm	2	45 - 50	6
76.2 - 101.6mm	3	45 - 55	6
127 - 152mm	4	55 - 65	6

Tip size and pressure may vary according to operator choice. This table is a guide only.

Brazing

Brazing differs from welding because the two pieces of metal to be joined are not fused together. The brazing rod melts at a lower temperature than the parent metal, and the braze strength comes from the surface overlay of the brazing rod.

The advantage of brazing over welding is that it is the best way to join dissimilar metals, or repair cast iron. Almost any two metals can be joined by brazing, excluding aluminium and magnesium.

Brazing is separated into two types, depending on the type of rod used, bronze or silver. Bronze is less expensive than silver, and should be used when the fit between the two metals to be joined is not close. The metals must be cleaned thoroughly before attempting to braze, gently play the flame onto both parts until they become a dull reddish colour. Both pieces must be of equal temperature otherwise the braze will flow to the hottest piece. Heat the rod by placing it in the flame, then dip it into the flux (note the heat causes the flux to melt and stick to the rod). If a prefluxed rod is used, this heating and dipping step may be eliminated. Once the rod is fluxed, and the metals are heated to the correct temperature, touch the rod to the joint, the rod melts and flows over the heated area, depending on the size of the joint, it may be necessary to dip the rod into the flux again. Abundant flux must be used, otherwise the molten rod will not stick to the metals being joined.

Silver brazing is a little faster than bronze brazing. This is because silver melts at a much lower temperature, and less heat is required, however, the joint must fit tightly together. Bronze bridges a gap much better than silver. Instead of putting flux on the silver rod, the joint should be painted with flux. The way to determine when the metals are at the correct temperature is to watch the flux as it starts to bubble, as it does so it is time to apply the silver. The silver melts as it touches the hot metal and the molten silver flows over the fluxed area.

position with a 11mm open ended spanner. Adjust the nozzle position by turning to the desired position using an 11mm open ended spanner on the nozzle connector.

Cutting: Remove the welding nozzle and nozzle adapter if fitted. Attach the cutting torch to the welding torch/handle, tighten the securing collar by hand, ensuring the operating lever does not foul on the valve knobs etc. Remove the cutting nozzle securing nut, select the required nozzle and place into the securing nut, screw into the cutting torch and lock in place using a 23mm open ended spanner **(FIG.7)**, **DO NOT** overtighten.

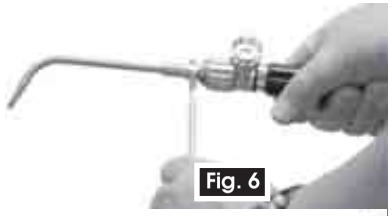


Fig. 6

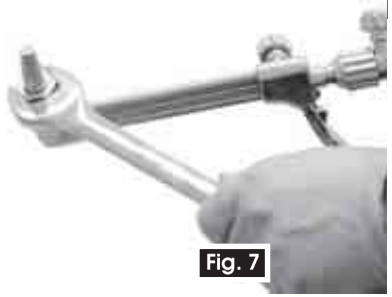


Fig. 7

Lighting the torch (Fig .8)

Open the torch acetylene valve approximately one half turn and ignite using the supplied spark igniter. Open the torch valve until the flame stops excessive smoking and leaves the end of the nozzle tip about 3mm, then reduce slightly to bring the flame back to the tip. Open the torch oxygen valve until a bright inner cone appears in the flame.

The point at which the feathery edges of the flame disappear and a sharp inner cone is visible is called the "Neutral Flame".


Fig. 8

Basic Welding Procedures

Gas welding is a method of joining similar metals by heating the adjacent surfaces to melting point with an oxyacetylene flame, and allowing the two parts to fuse together, with a filler metal being required on materials 5mm thick or more. The resulting weld is as strong as the parent metal.
All metal to be joined, should be thoroughly cleaned before welding. Oil, grease, rust, scale or other impurities affect the weld quality, and the tensile strength. Metal 5mm and over should be bevelled before attempting to weld, and when bevelled edges are to be joined, a filler rod of the same material must be used.
The table below is a guide only showing recommended, oxygen and acetylene pressures relating to the size of the material to be welded etc.
If a too larger tip is used and the flame is softened, the tip heats up unnecessarily and is often accompanied by a popping noise which splatters the weld puddle. Too hot a flame burns the steel, and too small a flame is not big enough to get the job done.

Welding Rod

Welding rods are available in various sizes with the most common being 1.6mm, 2.4mm and 3.2mm, they are also available for welding mild steel, cast iron and aluminium.
The size of rod will be determined by the type of weld, the metal thickness, and the amount of filler metal required.

Welding Flame

A neutral flame is used for almost all gas welding. The oxyacetylene flame consumes all oxygen in the welding area, which leaves an uncontaminated weld area and a weld of maximum strength.

An oxidizing flame is rarely used.

A carburizing flame is used mainly for flame hardening and brazing.

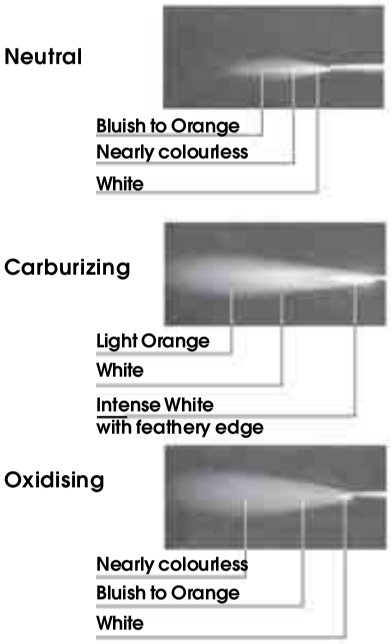


Fig. 7

Metal Thickness (mm)	Tip Size	Rod Size	Oxygen Pressure (P.S.I.)	Acetylene Pressure (P.S.I.)	Number Of Passes
1.6mm	2	1.6mm	3	3	1
2.4mm	5	2.4mm	5	5	1
3.2mm	5	3.2mm	5	5	1
6.4mm	10	3.2mm	9	9	2

Welding - Practices and Exercises

Gas welding is not a difficult art. The following exercises of torch movement are good practice, and make subsequent welding easy

Exercise 1

Using a small welding nozzle and correct pressures (Table above). Point the flame directly onto the steel (3.2mm stock recommended) with the flame cone just above the metal surface. When a puddle begins to form, slowly move the torch back and forth to move the puddle across the steel. This action has to be done slowly as it is necessary to have good penetration, which comes from a deep puddle. When moving the puddle, it is helpful to lean the nozzle at an angle of approx 45° away from the direction you want the puddle to move Fig. 8.

Fig. 8

Exercise 2

Place two pieces of 3.2mm steel together as shown in fig. 9. Make the puddle again with a back and forth torch motion, move the puddle along the seam. Move the torch slowly for a good penetration. This can be checked by turning the parts over. The penetration should be visible from the bottom side. Test the weld strength by attempting to pull the pieces apart.

Fig. 9

Exercise 3

Repeat exercise 2, but add welding rod this time. while the flame is directed at the steel to form the puddle, put the rod into the flame. when it becomes red, maintain this temperature by moving it in and out of the flame. Once the weld is started dip the rod into the puddle, the rod will melt and build up the weld so that the top is rounded instead of concave. Remember, welding rod is necessary on all double joints and once the you become an experienced welder, you will prefer to use rod on all welds, regardless of how thin the steel to be welded.

Fig. 10

Material 5mm or thicker should be bevelled before welding. A 30° bevel on each piece is the recommended angle. This is necessary to obtain the best penetration possible through the entire thickness. A rod is necessary on all welds with bevelled edges. Once the torch movement and puddle control are mastered, you will be able to make vertical, horizontal and flat welds with confidence.

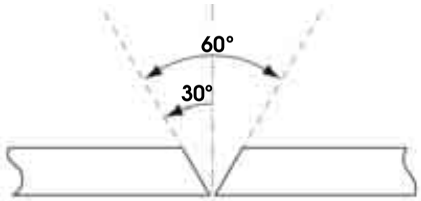


Fig. 11