

CLARKE®

weld



MMA/TIG INVERTER WELDERS

MODEL NO: MMA/TIG120, 160 & 200

PART NO: 6012100/6012101/6012102

OPERATION & MAINTENANCE INSTRUCTIONS



ORIGINAL INSTRUCTIONS

GC0722

INTRODUCTION

Thank you for purchasing this CLARKE Welder. Before attempting to operate the machine it is essential that you read this manual thoroughly and carefully follow all instructions given. In doing so you will ensure the safety of yourself and that of others around you, and you can also look forward to the welder giving you long and satisfactory service.

When unpacking, any damage or deficiency should be reported to your CLARKE dealer immediately.

PRINCIPLES OF THE MACHINE

Manual Metal Arc (MMA) welding uses a coated consumable electrode (stick) to lay the weld, therefore an additional welding torch kit is not required. The arc melts the core of the electrode to produce drops of molten metal (weld pool) that cool to create the welded joint. Because of the versatility and simplicity of MMA welding, it requires less skill and is used primarily to weld iron and steel (including stainless steel, but nickel and copper can also be welded using this method.

This machine is designed to be used for both metal ARC (MMA) and TIG welding. (TIG welding leads are not supplied with the machine. These are however, readily available from your CLARKE dealer (Part number 6012233).

SUITABILITY

MMA/Arc Welding	Carbon Steel, Low Alloy Steel, Stainless Steel, Cast Iron.
TIG Welding	Carbon Steel, Low Alloy Steel, Stainless Steel, Cast Iron, Titanium, Copper + Brass.

MAIN DESIGN FEATURES

ARC-FORCE	Automatically increases the current to prevent the electrode sticking when operating with a short arc length.
HOT START	Increases the welding current at the beginning of the welding process.
ANTI-STICK	The electrode can be easily withdrawn without it becoming damaged.
VOLTAGE REDUCTION SAFETY DEVICE (VRD)	Reduces open circuit voltage when not in use to prevent accidental injury

ENVIRONMENTAL RECYCLING POLICY



Through purchase of this product, the customer is taking on the obligation to deal with the WEEE in accordance with the WEEE regulations in relation to the treatment, recycling & recovery and environmentally sound disposal of the WEEE.

In effect, this means that this product must not be disposed of with general household waste. It must be disposed of according to the laws governing Waste Electrical and Electronic Equipment (WEEE) at a recognised disposal facility.

If disposing of this product or any damaged components, do not dispose of with general waste. This product contains valuable raw materials. Metal products should be taken to your local civic amenity site for recycling of metal products.

SAFETY PRECAUTIONS FOR ALL TYPES OF WELDING



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 MAY RESULT.

FAILURE TO FOLLOW THESE RULES MAY RESULT IN SERIOUS PERSONAL INJURY.

GENERAL PRECAUTIONS

BURN PREVENTION

Wear protective clothing - gauntlet gloves designed for use in welding, apron, and protective shoes. Button shirt collar and pocket flaps and wear cuffless trousers to avoid entry of sparks and slag. Wear helmet with safety goggles or glasses with side shields underneath, appropriate filter lenses or plates (protected by clear glass). This is a MUST for welding (and chipping) to protect the eyes from radiant energy and spatter. Replace cover glass when broken, pitted, or spattered. Avoid oily or greasy clothing. A spark may ignite them. Hot metal should never be handled without gloves. First aid facilities and a qualified first aid person should be available unless medical facilities are close by for immediate treatment of flash burns of the eyes and skin burns. Ear plugs should be worn when working overhead or in a confined space. A hard hat should be worn when others work overhead. Flammable hair preparations should not be used by persons intending to weld or cut.

NOTE: ALL protective wear incl. masks & head shields MUST comply with PPE Regulation (EU) 2016/425.

TOXIC FUME PREVENTION

Severe discomfort, illness or death can result from fumes, vapours, heat, or oxygen enrichment or depletion that welding (or cutting) may produce. Prevent them with adequate ventilation. NEVER ventilate with oxygen. Lead-, cadmium-, zinc-, mercury- and beryllium-, bearing materials, when welded (or cut) may produce harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area as well as the operator must wear an air- supplied respirator. For beryllium, both must be used. Metals coated with or containing materials that emit toxic fumes should not be heated unless coating is removed from the work surface, the area is well ventilated, or the operator wears an air-supplied respirator. Work in a confined space only while it is being force ventilated and, if necessary, while wearing an air-supplied respirator. Vapours from chlorinated solvents can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a highly toxic gas, and other lung and eye irritating by-products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapours to form phosgene. DO NOT WELD where solvent vapours can be drawn into the welding atmosphere or where the radiant energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

FIRE AND EXPLOSION PREVENTION

Causes of fire and explosion are:

1. Combustibles reached by the arc, flying sparks, hot slag or heated material;
2. Short circuits.

BE AWARE that flying sparks or falling slag can pass through cracks, along pipes, through windows or doors, and through wall or floor openings, out of sight of the goggled operator.

To prevent fires and explosion: keep equipment clean and operable, free of oil, grease, and (in electrical parts) of metallic particles that can cause short circuits. If combustibles are in the area, **DO NOT** weld. Move the work if practicable, to an area free of combustibles.

Avoid working in paint spray rooms, dip tanks, storage areas, ventilators. If the work cannot be moved, move combustibles away from sparks and heat; or protect against ignition with suitable fire- resistant covers or shields.

Walls, ceilings, and floor near work should be protected by heat resistant covers or shields. Fire watcher must be standing by with suitable fire extinguishing equipment during and for some time after welding or cutting if:

1. Appreciable combustibles (including building construction) are within 10m.
2. Appreciable combustibles are further than 10m, but can be ignited by sparks.

3. Openings (concealed or visible) in floors or walls can expose combustibles to sparks.
4. Combustibles adjacent to walls, ceilings, roofs or metal partitions can be ignited by radiant or conducted heat.

After work, check that area is free of sparks, glowing embers and flames. An empty container that held combustibles or that can produce flammable or toxic vapours when heated, must never be welded on or cut, unless the container has first been cleaned. This includes a thorough steam or caustic cleaning (or a solvent or water washing, depending on the combustible's solubility) followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment.

Water filling just below the working level may substitute for inerting.

A container with unknown contents should be cleaned (see paragraph above). **DO NOT** depend on sense of smell or sight to determine if it is safe to weld or cut. Hollow castings or containers must be vented before welding as they can explode.

In explosive atmospheres, NEVER weld or cut where the air may contain flammable dust, gas, or liquid vapours.

ELECTRIC ARC WELDING

Comply with precautions in above and this section. Arc welding, properly done, is a safe process but a careless operator invites trouble. The equipment carries high currents at significant voltages. The arc is very bright and hot. Sparks fly, fumes rise, ultraviolet and infrared energy radiates and work pieces are hot. The wise operator avoids unnecessary risks and protects himself and others from accidents.

BURN PROTECTION

The welding arc is intense and visibly bright. It's radiation can damage eyes, penetrate lightweight clothing, reflect from light coloured surfaces and burn the skin and eyes. Skin burns resemble acute sunburn, those from gas - shielded arcs are more severe and painful.

PROTECTIVE CLOTHING (PPE) MUST BE WORN

Wear long sleeved clothing (particularly for gas shielded arc) in addition to gloves, apron and strong shoes. As necessary, use additional protective clothing such as leather jacket or sleeves, flameproof apron, and fire-resistant leggings. Avoid outer garments of untreated cotton. Bare skin protection: Wear dark substantial clothing, Button collars closed to protect the chest and neck and button any pockets to prevent entry of sparks.

EYE AND HEAD PROTECTION

Protect eyes from exposure to arc. NEVER look at an electric arc without protection. Welding helmet or shield containing an appropriate filter plate (Please refer to the section `Welding Shield on page 12). Place over face before striking arc. Protect filter plate with a clear cover plate. Cracked or broken helmet or shield should NOT be worn; radiation can pass through to cause burns.

Cracked, broken, or loose filter plates must be replaced IMMEDIATELY. Replace clear cover plate when broken, pitted, or spattered. WE SUGGEST you wear flash goggles with side shields under the helmet, to give some protection to the eyes should the helmet not be lowered over the face before an arc is struck. Looking at an arc momentarily with unprotected eyes (particularly high intensity gas-shielded arc) can cause a retinal burn that may leave a permanent dark area in the field of vision. Before welding whilst wearing contact lenses, seek advice from your optician.

PROTECTION OF NEARBY PERSONNEL

For production welding, a separate, well vented room or enclosed bay is best. In open areas, surround the operation with low reflective, non- combustible screens or panels. Allow for free air circulation, particularly at floor level. Provide face shields for all persons who will be looking directly at the weld. Others working in the area should wear flash goggles. Before starting to weld, make sure that screen or bay doors are closed.

TOXIC FUME PREVENTION

Comply with all precautions above.

FIRE AND EXPLOSION PREVENTION

Do not overload arc welding equipment. It may overheat cables and cause a fire. Loose cable connections may overheat or flash and cause a fire. Never strike an arc on a cylinder or other pressure vessel. It creates a brittle area that can cause a violent rupture or lead to such a rupture later under rough handling.

SHOCK PREVENTION

Exposed live conductors or other bare metal in the welding circuit, or in unearthed, electrically-LIVE equipment can fatally shock a person whose body becomes a conductor. DO NOT STAND, SIT, LIE, LEAN ON, OR TOUCH a wet surface when welding without suitable protection.

PROTECTION FOR WEARERS OF ELECTRONIC LIFE SUPPORT DEVICES (PACEMAKERS)

Magnetic fields from high currents can affect pacemaker operation. Persons wearing pacemakers should consult with their doctor before going near arc welding or spot welding operations.

PROTECTION AGAINST SHOCK

Keep your body and clothing dry. Never work in damp area without adequate insulation against electric shock. Stay on a dry duckboard or rubber mat when dampness or sweat can not be avoided. Sweat, sea water, or moisture between body and an electrically LIVE part - or earthed metal - reduces the body surface electrical resistance, enabling dangerous and possibly lethal currents to flow through the body.

EARTHING THE EQUIPMENT

When arc welding equipment is earthed according to the National Electrical Code and the workpiece is earthed, a voltage may exist between the electrode and any conducting object.

Examples of conducting objects include, but are not limited to, buildings, electrical tools, work benches, welding power source cases, workpieces, etc. Never touch the electrode and any metal object unless the welding power source is off. When installing, connect the frames of each unit such as welding power source, control, work table, and water circulator to the building earth. Conductors must be adequate to carry earth currents safely. Equipment made electrically LIVE by stray current may shock, possibly fatally. Do not EARTH to electrical conduit, or to a pipe carrying ANY gas or a flammable liquid such as oil or fuel.

CABLES

Frequently inspect cables for wear, cracks and damage. IMMEDIATELY REPLACE those with excessively worn or damaged insulation to avoid possibly lethal shock from bared cable. Cables with damaged areas may be taped to give resistance equivalent to original cable. Keep cable dry, free of oil and grease and protected from hot metal and sparks.

TERMINALS AND OTHER EXPOSED PARTS

Terminals and other exposed parts of electrical units should have insulating covers secured before operation.

SAFETY DEVICES

Safety devices such as interlocks and circuit breakers should not be disconnected or shunted out. Before installation, inspection, or service of equipment, shut off all power and remove line fuses (or lock or red-tag switches) to prevent accidental turning ON of power. DO NOT open power circuit or change polarity while welding. If, in an emergency, it must be disconnected, guard against shock burns, or flash from switch arcing. Always shut OFF and disconnect all power to equipment. A power disconnect switch must be available near the welding power source.

PREPARATION OF THE WORKING AREA

The working area must be sufficiently spacious, not humid, and well-ventilated as to avoid any fumes which develop from the welding process and from incidental material adhering to the pieces to be welded (oils, paints, tars...) which may cause danger to the operator.

Avoid welding tanks which may contain flammable residuals.



WARNING: ELECTRIC SHOCK CAN BE FATAL. A PERSON QUALIFIED IN FIRST AID SHOULD ALWAYS BE PRESENT IN THE WORKING AREA. IF PERSON IS UNCONSCIOUS AND ELECTRIC SHOCK IS SUSPECTED, DO NOT TOUCH THE PERSON IF HE OR SHE IS IN CONTACT WITH THE WELDER OR CABLES. DISCONNECT THE WELDER FROM THE POWER SOURCE AND THEN USE FIRST AID. DRY WOOD, OR OTHER INSULATING MATERIAL CAN BE USED TO MOVE CABLES, IF NECESSARY, AWAY FROM THE PERSON.

ADDITIONAL PRECAUTIONS FOR MMA WELDING

1. ALWAYS ensure that there is full free air circulating around the outer casing of the machine and that the louvres are unobstructed.
2. A welding arc can seriously damage your eyes. Both operator and spectators must ALWAYS use a proper welding face shield or helmet with suitable filter lenses. Proper gloves and working clothes should be worn at all times.
3. ALWAYS remove all flammable materials from the welding area.
4. NEVER remove any of the panels unless the machine is disconnected from the supply and never use the machine with any of the panels removed.
5. NEVER use or store in a damp environment. DO NOT EXPOSE TO RAIN.
6. NEVER attempt any electrical or mechanical repair unless you are a qualified technician. If you have a problem with the machine contact your local CLARKE dealer.
7. ALWAYS keep a fire extinguisher handy (Dry Powder, CO₂ or BCF, NOT Water).
8. NEVER continue to weld, if, at any time, you feel even the smallest electric shock. Stop welding IMMEDIATELY and DO NOT attempt to use the machine until the fault is diagnosed and corrected.
9. NEVER allow the earth cable or torch to become wrapped around the operator or any person in the vicinity.

A comprehensive range of CLARKE safety equipment for use when welding is available from your local dealer. See page 28.

Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length.

The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturers recommendations.

SAFETY SYMBOLS

The following symbols may be displayed on the machine.

	Read this instruction booklet carefully before use.		Do not expose to rain.
	Wear welding mask		Recycle unwanted materials under WEEE Directive
	Wear protective gloves		General Hazard
	Wear a dust mask		Warning;- magnetic field created

ELECTRICAL CONNECTION (MMA/TIG120 ONLY)



WARNING! READ THESE ELECTRICAL SAFETY INSTRUCTIONS THOROUGHLY BEFORE CONNECTING THE PRODUCT TO THE MAINS SUPPLY.

Before switching the product on, make sure that the voltage of your electricity supply is the same as that indicated on the rating plate. This product is designed to operate on 230VAC 50Hz. Connecting it to any other power source may cause damage.

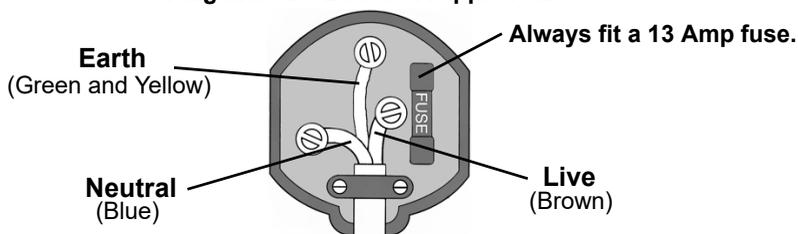
This product may be fitted with a non-rewireable plug. If it is necessary to change the fuse in the plug, the fuse cover must be refitted. If the fuse cover becomes lost or damaged, the plug must not be used until a suitable replacement is obtained.

If the plug has to be changed because it is not suitable for your socket, or due to damage, it should be cut off and a replacement fitted, following the wiring instructions shown below. The old plug must be disposed of safely, as insertion into a mains socket could cause an electrical hazard.

If the colours of the wires in the power cable of this product do not correspond with the markings on the terminals of your plug, proceed as follows.

- The **Blue** wire must be connected to the terminal marked **N** or coloured **Black**.
- The **Brown** wire must be connected to the terminal marked **L** or coloured **Red**.
- The **Yellow and Green** wire must be connected to the terminal marked **E** or  or coloured Green.

Plug must be BS1363/A approved.



Ensure that the outer sheath of the cable is firmly held by the clamp

We strongly recommend that this machine is connected to the mains supply via a Residual Current Device (RCD). If in any doubt, consult a qualified electrician. DO NOT attempt any repairs yourself.

POWER CONNECTION FOR MMA/TIG160 & 200

CONNECTING TO MAINS POWER

NOTE: These welders are earthed and must only be connected to the mains with an earth connection. DO NOT attempt to use it without one.

- These welders will draw far too much power for a normal domestic 230V mains plug and socket and will be supplied fitted with a 32Amp, 3-pin industrial plug.
- A high current 230V mains socket or terminal must be installed by a qualified and accredited professional electrician. A 32A socket used with a plug conforming to IEC 60309 is recommended.
- A non-socketed mains connection also requires connection by a qualified and accredited professional electrician. However, a socketed connection is safer and is recommended so the welder can be safely isolated when necessary. If directly wired to the mains, a double pole, double throw isolator switch must be fitted.
- The welder must be connected using a circuit protected by an RCD.
- Please refer to the Specification for details of the maximum current required by this welder.

If in any doubt, do not attempt to connect or use this welder until a professional electrician has been consulted.

OVERVIEW & INVENTORY



The items supplied include the following:

1. 1 x MMA/TIG Inverter Welder
2. 1 x Electrode Holder
3. 1 x Earth Clamp & Cable
4. 1 x Combination Wire Brush / Hammer
5. 1 x Face Shield

The welder is fitted with

6. Digital display
7. Menu selector button
8. Current /menu selector knob
9. Positive terminal
10. Negative terminal

ASSEMBLING THE WELDING SHIELD

1. The welding shield shown is supplied flat for shipping. Fold the sides of the shield around and clip to the top panel.

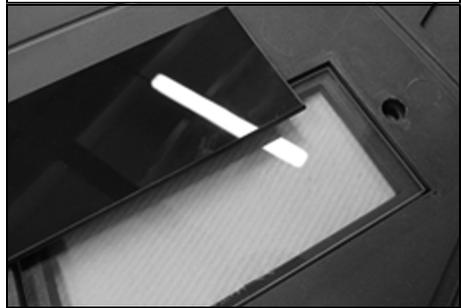


2. Insert both the glass lens panels into the recess inside the shield.

- The clear glass must be fitted first to face the outside.

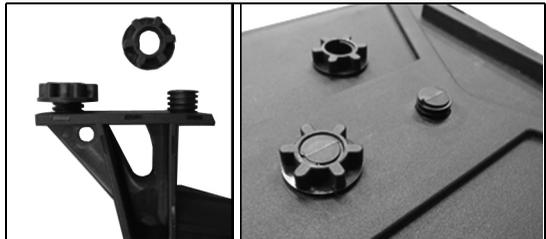
3. Insert the two plastic screws and use the plastic wingnuts to clamp the glass panels to the shield.

- The clear glass panel should be replaced when it becomes badly pitted.



4. When replacing the glass panels, only use parts supplied by Clarke International. The dark panel is a certified, optical glass and should not be exchanged for any other type.

5. Secure the handle in position using the plastic nuts provided.



- The handle will be mounted on the inside of the shield.



PREPARATION FOR USE

FITTING THE WELDING ROD

Select the appropriate welding rod and insert it into the welding rod holder.

- It should be approximately the same thickness as the workpieces being welded.

PREPARING THE WORKPIECE

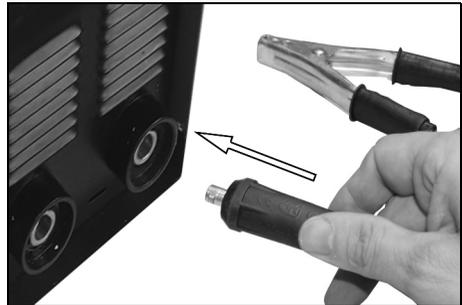
The area being welded should be perfectly clean. Any coating, plating or corrosion must be removed, otherwise a good weld will be impossible to achieve.

PREPARING THE MACHINE

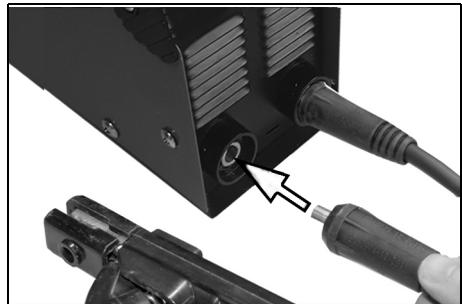
To prepare the machine for welding it is important that you follow the procedure below.

1. Making sure that the ON/OFF switch, located on the rear panel is in the OFF position, connect the welding leads as follows:

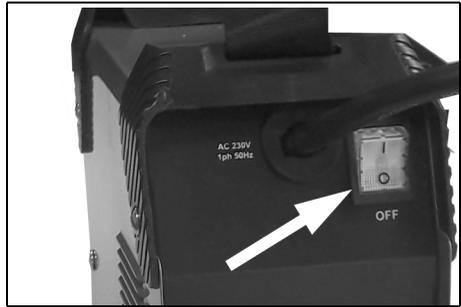
- Work clamp lead to the (-) Negative terminal.



- Welding rod holder lead to the (+) Positive terminal.



2. Switch ON using the switch located on the rear panel.
 - The digital display on the front panel will come on and show the current setting in amps.
 - If the machine stops at any time, the thermal overload device may have intervened. Wait until the welder has cooled sufficiently before restarting work.
3. Select the appropriate welding rod and fit it into the welding rod holder.
 - When the machine is on, the menu will display the size of the electrode fitting to the holder.



The following sizes can be used and are available from your CLARKE dealer.

MACHINE	ROD DIAMETER	WORKPIECE THICKNESS
MMA/TIG120,160,200	1.6 mm	1.5 - 2.0 mm
MMA/TIG120,160,200	2.5 mm	2.5 - 3.0 mm
MMA/TIG120,160,200	3.2 mm	3.5 - 4.5 mm
MMA/TIG160 & 200	4.0 mm	5.0 - 8.0 mm

See also page 28.

4. Attach the work clamp to the workpiece as close as possible to the area being welded. Clean with a wire brush where necessary to ensure the connection is as clean as possible.

5. Press the menu button to select MMA welding mode.
 - The current can be adjusted in this mode to match the material being welded.
 - To select the parameter use the menu to cycle between function.



6. Press the menu button to select Anti-Stick mode and switch it on or off by pressing the MENU control and turning the control knob.



7. Set the required current using the current selector knob.

- With practice you will gain a feel for the correct current setting for different welding rod thicknesses.
- The "Hot Start" function will be enabled which delivers a high current when striking the arc to prevent the rod from sticking.
- "Arc Force" will deliver a temporary increase in output current during welding when the arc is too short. This assists with welding by giving a consistent arc delivery to compensate for the positioning of the rod.



VOLTAGE REDUCTION DEVICE (VRD)

The VRD is a safety feature that It is also known as "Anti-shock". It's function is to lower the open circuit voltage across the output terminals to a safe 12V when the welder is not in use.

As soon as the welder is used (a load of 200 ohms or less is detected), the voltage will increase to the full output to enable welding to commence.

The "VRD" will only turn the output of the welder back to a reduced output state of 12 volts once the electrode is removed from the work piece or if the resistance across the output rises above 200 ohms.



If you wish to turn off this feature, set the VRD option on the menu panel to OFF by pressing the MENU control and turning the control knob. We recommend that you leave it switched ON.

ARC WELDING



WARNING: WHEN WELDING ALWAYS ENSURE THERE IS ADEQUATE VENTILATION IN THE WORK AREA AS THE WELDING PROCESS GIVES OFF TOXIC FUMES.

WARNING: DO NOT STRIKE THE ELECTRODE ON THE WORKPIECE, AS THIS MAY DAMAGE THE ELECTRODE.



WARNING: WELDING ARCS PRODUCE HARMFUL UV/IR LIGHT WHICH CAN SERIOUSLY DAMAGE YOUR EYES. ALWAYS USE A WELDING FACE-SHIELD WITH A SUITABLE FILTER THAT CONFORMS TO CURRENT STANDARDS.

WARNING: NEVER LOOK AT THE ARC WITHOUT A SUITABLE WELDING FACE-SHIELD

WARNING: PROTECT BYSTANDERS BY USING WELDING SCREENS/ CURTAINS.

The consumable electrode is connected to a high amperage low voltage supply which creates an electric arc between the electrode and the workpiece.

Benefits over TIG welding include less experience needed and torch kit or shielding gas are not required.

The most difficult aspect of the arc welding process, particularly for beginners, is that of striking an arc. We strongly recommend that you practice on some pieces of scrap metal to get the feel of the operation before you start an actual welding job.

1. Holding the welding mask close-up to your face, give a short stroke with the electrode on the workpiece. As soon as the arc is primed, withdraw the electrode from the workpiece to leave a gap. The current will flow across the gap with a crackling noise and a brilliant arc. Continue to weld in one direction, maintaining the small gap as you go.
2. As soon as the arc is struck, maintain a distance from the workpiece equal to the diameter of the electrode. Keep this distance as constant as possible for the duration of the weld. As you advance along the workpiece the angle of the electrode must be maintained at between 20° and 30°.

NOTE: When you prime the arc be sure to withdraw the electrode swiftly to leave the gap, otherwise the electrode will weld itself to the workpiece. If this occurs give the electrode a short sharp jerk to free it and, if necessary, prime the arc again. If you cannot free the electrode, switch the machine off immediately and free it. Take care the electrode will get red hot very quickly and will be capable of burning through welding gloves.

3. At the finish of the weld, bring the end of the electrode backward in order to fill the weld crater and then quickly lift the electrode from the weld pool to extinguish the arc.
4. Inspect the job carefully. Any slag forming on the surface should be chipped away with a chipping hammer or pick. ALWAYS wear your safety goggles when chipping away slag.

TIG WELDING

TIG welding is primarily for very thin materials. It uses a non-consumable tungsten (or tungsten alloy) electrode, held in a torch.

A shielding gas (100% Argon), is fed through the torch to protect:

- The electrode,
- Molten weld pool,
- Solidifying weld metal from contamination by the atmosphere.

The electric arc is produced by the passage of current through the conductive, ionized shielding gas. The arc is established between the tip of the electrode and the work. Heat generated by the arc melts the base metal. Once the arc and weld pool are established, the torch is moved along the joint and the arc progressively melts the joined surfaces. Filler wire, if used, is usually added to the leading edge of the weld pool to fill the joint.

This process is ideally suited for welding thin metals such as car body panels, pressure vessels, heat exchangers, pipes etc., where accuracy and a high quality weld is desired, as it produces a very low porosity weld.

MAIN FEATURES OF TIG WELDING

1. Electronic control of welding current.
2. Forced air cooling.
3. A thermal overload protection device prevents overheating.

TIG WELDING PROCESS ADVANTAGES

- It produces superior quality welds, generally free of defects.
- It is free of the spatter which occurs with other arc welding processes.
- It can be used with or without filler metal as required.
- It allows excellent control of root pass weld penetration.
- It can produce welds at high speeds.
- It allows precise control of the welding variables.

- It is capable of welding very thin material (0.5mm), without undue distortion.

LIMITATIONS

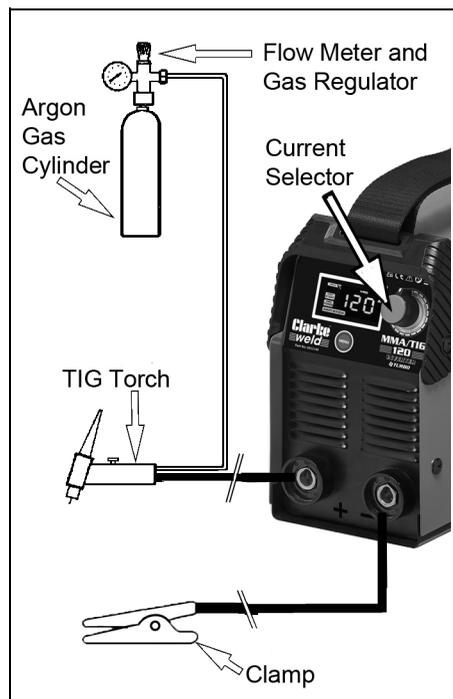
1. Greater weld dexterity is required.
2. These units have a DC output which is not suitable for welding aluminium.

TIG WELDING

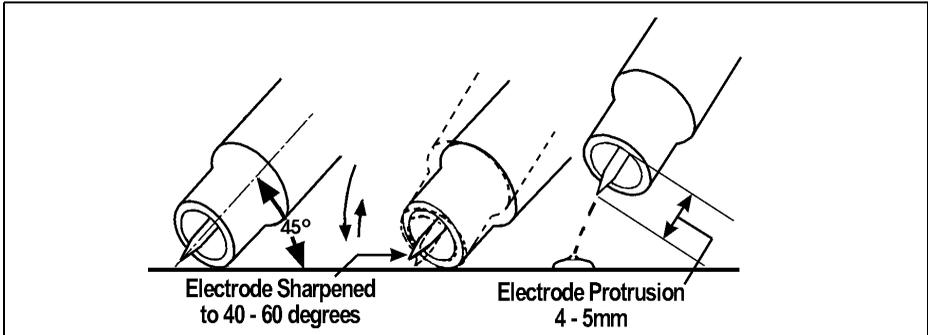
- **The machine is not equipped with a TIG welding torch and cables; these are available from your Clarke dealer (Part number 6012232).**
- **Additionally, before TIG welding, you must obtain a gas cylinder of 100% pure Argon.**

To prepare the unit for TIG welding, it is important that you adopt the following procedure.

1. Plug the work clamp lead in to the +ve terminal, and secure the work clamp to the workpiece.
 - For good contact, the work clamp must be attached to clean bare metal. Clean with a wire brush where necessary.
2. Plug the torch lead to the -ve terminal.
3. Screw the pressure regulator on to the gas bottle tightly, and attach the gas hose to the inlet connector securely, with a hose clip.
4. Turn the pressure regulator knob to set a pressure of approx. 2.5kg/cm² (35 lbf/in²).
5. Ensure the electrode at the torch nozzle, protrudes by 4 - 5mm, also ensure that the electrode is sharply pointed with an angle of 40°-60°, if it is not, grind it to shape. (Consult your TIG Torch manual for the procedure for adjusting the electrode).
6. Set the welding current in accordance with the thickness of the material to be welded and the size of tungsten electrode to be used, (See page 14).



7. Switch ON using the switch mounted on the rear panel. The green light on the front panel will glow.
8. If the machine stops at any time and the amber light comes ON, the thermal overload has intervened. Wait until the welder has cooled sufficiently (the amber light goes out) before restarting work. Open the gas valve on the torch handle,
 - This will allow gas to flow from the torch nozzle.
9. Cover your face with the head shield, bring the torch to within 3-4mm of the work, and at an angle of 45°, so that the ceramic nozzle gently touches the work surface.



10. Scratch the tip of the electrode against the piece to be welded, as soon as the welding arc starts, remove the electrode to a distance of 3-4 mm, and continue the weld. (See notes below).
 - This method is referred to as 'Scratch Arc'.
11. To stop welding, simply remove the torch from the workpiece.
12. Turn OFF the gas as soon as you finish welding.

Note:

- To avoid a visible strike mark on the surface of the workpiece it is advisable to strike the arc in the joint where the mark will be concealed by the weld.
- Thin sheet and stainless steel may be welded with or without filler, similar to gas welding.
- The filler is fed in at the edge of the pool. The rod must not touch the tip of the electrode or enter the arc. The end of the rod must always be shielded by the argon atmosphere to prevent as far as possible the formation of oxides of its surface. When welding stainless steel and copper, it is often possible to feed in the filler continuously at the edge of the pool.

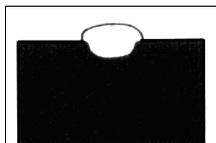
- The arc length generally varies between 3 and 6 mm depending on the type of joint, type and thickness of material and so on.
- The torch is advanced in the direction of welding, without lateral movement, maintaining the torch angle of 45° to the workpiece.

Guidelines for the TIG welding current needed and recommended electrode sizes etc. for different gauges of material are shown in the chart below:

Metal	Welding Current (Amps)	Workpiece Thickness (mm)	Filler Rod Dia (mm)	Welding Electrode Dia (mm)	Gas Flow ltr/min
Mild Steel	20-30	1	0-1	1.6	4-5
	60-80	2	1.2-1.6	1.6	4-5
	80-110	3	1.6-2.0	1.6/2.4	4-5
	100-130	3.5	2.0-2.4	2.4	5-6
	130-140	4	2.4	2.4	6-7
	140-150	4.5	2.4	2.4	7-8
	150-160	5	2.4	2.4	7-8
Stainless Steel	15-35	1	0-1	1.6	4-5
	60-80	2	1.2-1.6	2.4	4-5
	80-115	3	1.6-2.0	1.6/2.4	4-5
	100-130	3.5	2.0-2.4	2.4	5-6
	130-140	4	2.4	2.4	6-7
	140-150	4.5	2.4	2.4	7-8
	150-160	5	2.4	2.4	7-8
Copper	80	2	2.0	1.6	5-6
	125	3	2.4	2.4	5-6
	135-150	4	2.4	2.4	6-7
	150-160	4.5	2.4	2.4	7-8

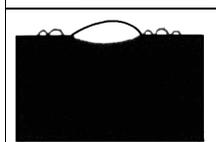
WELDING PITFALLS

The arc welding technique is an acquired skill and requires considerable practice before perfect results are obtained. The diagrams below will help to explain the pitfalls in your technique and how to overcome them.



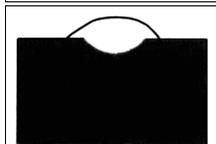
ARC TOO SHORT

This causes irregular masses of weld to be deposited, with slag contamination on an uneven surface.



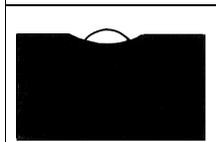
ARC TOO LONG

This causes poor penetration resulting in a weak weld with excessive spatter and porosity. Surface of the weld is rough and the arc makes a hissing sound



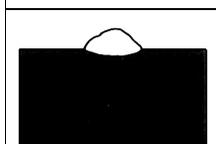
ELECTRODE MOVED TOO SLOWLY

This causes a very wide and heavy deposit which overlaps at the sides. It is wasteful both in terms of time and electrode use.



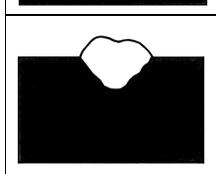
ELECTRODE MOVED TOO QUICKLY

This causes poor penetration with a 'stringy' and incomplete weld deposit. Slag is very hard to remove.



CURRENT TOO LOW

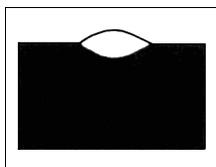
This causes poor penetration and causes the electrode to stick to the workpiece too readily. Also results in a very irregular and high weld deposit. Slag is very hard to remove.



CURRENT TOO HIGH

This causes excessive penetration with spatter and deep pointed crater. It may also cause holes to be burned in the workpiece.

Burns electrodes very quickly.



THE PERFECT WELD

With the correct combination of arc length, current regulation, inclination and speed of the electrode, you will, with practice, produce the perfect weld.

This should be regular with uniform ripples and no slag contamination. The arc will make a steady crackling sound.

TROUBLESHOOTING

DEFECT	CAUSES	SUGGESTIONS
Spark will not start	Bad clamp connection. Inverter printed circuit is defective.	Check clamp connection. Contact your nearest CLARKE dealer.
No output voltage	Overheated machine (the red LED should be on).	Wait for thermal cutout to be reset.
	Internal relay has failed.	Contact your nearest CLARKE dealer.
	Inverter printed circuit is defective.	Contact your nearest CLARKE dealer.
Wrong output current	Current selector control is defective.	Contact your nearest CLARKE dealer.
	Low power supply voltage.	Check the mains distribution system.
Porosity of welds	Acid electrode on steel with high sulphur content. Electrode oscillates too much. Workpieces are too far apart. Workpiece being welded is cold.	Use basic electrode. Move edges to be welded closer together. Move slowly at the beginning.
Cracks in weld	Material being welded is dirty (e.g.oil, paint, rust, oxides). Not enough current.	Clean workpiece before welding is an essential method of achieving neat weld beads.
Limited penetration	Low current, high welding rate, reversed polarity. Electrode inclined in position opposite to it's movement.	Ensure operating parameters are regulated and improve preparation of work pieces.
Profile defects	Welding parameters are incorrect. Pass rate is not related to operating parameter requirements. Electrode not inclined constantly while welding.	Follow basic and general welding principles.

DEFECT	CAUSES	SUGGESTIONS
High Sprays	Electrode is too inclined.	Make appropriate corrections.
Arc is unstable	Insufficient current.	Check condition of electrode and earth wire connection.
Electrode melts obliquely	Electrode core is not centred. Magnetic blow phenomenon.	Replace electrode. Connect two earth wires to opposite sites of the work piece.

CARE AND MAINTENANCE

WARNING: DISCONNECT FROM MAINS BEFORE CLEANING.

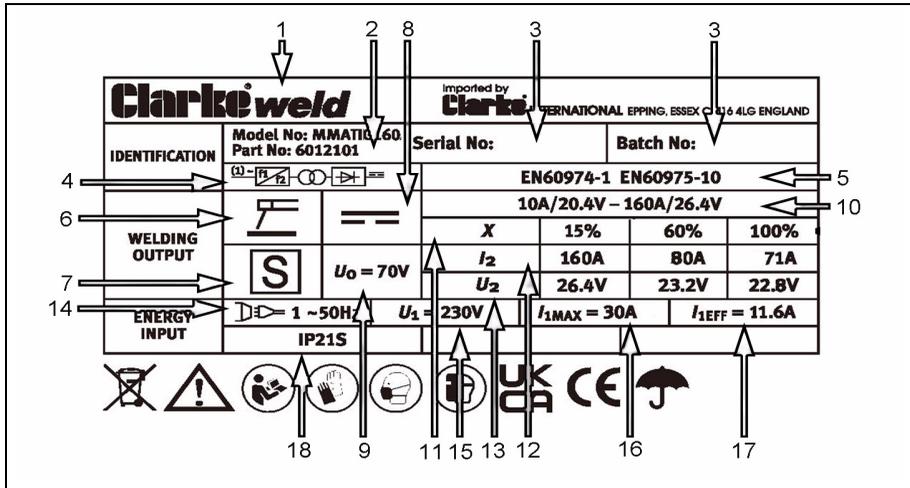


WARNING: DO NOT ATTEMPT TO CARRY OUT REPAIRS YOURSELF UNLESS YOU ARE FULLY COMPETENT. ALL REPAIR WORK MUST BE CARRIED OUT BY A QUALIFIED TECHNICIAN.

The machine requires no maintenance other than the following guidelines. Under normal working conditions removing the covers and cleaning with dry compressed air at reduced pressure once a year will be quite sufficient. Cleaning at more frequent intervals is advisable however, if the unit is operating in a very dusty environment.

1. Keep the louvres clean to avoid a build up of dirt and oxides inside the machine which can reduce machine output.
2. Check all cables periodically for condition and secure. They must be in good condition and not cracked.
3. Always avoid getting particles of metal inside the machine since they could cause short circuits.

RATING PLATE (EXAMPLE)



1	Name/address of manufacturer	10	Range of Output
2	Model Number / Part Number	11	Duty Cycle symbol
3	Serial / Batch number	12	Rated Welding Current symbol
4	Welding Power Source	13	Conventional Load Voltage symbol
5	British Standards applied	14	Energy Supply symbol
6	Welding Process symbol	15	Rated Supply Voltage
7	Suitable for use in an environment with increased risk of electric shock	16	Rated Maximum Supply Current
8	Welding Current symbol	17	Maximum Effective Supply Current
9	Rated No-load Voltage	18	Degree of Protection

DUTY CYCLE

This welder is covered by regulations EN IEC 60974-1:2018+A1:2019 / EN 60974-10:2014+A1:2015, where the Duty Cycle (X) is expressed as a percentage of time the machine may be used in a given period for a specified welding current.

e.g. When welding at 140 Amps the machine may be used for 6 minutes (60%) in any 10 minute period,

SPECIFICATIONS

	MMA/TIG120	MMA/TIG160	MMA/TIG200
Unpacked Weight (kg)	4.0	4.5	
Dimensions (l x w x h) (mm)	275 x 117 x 190	263 x 114 x 184	
Power Supply	230V~ 50Hz-(13A)	230V~ 50Hz-(32A)	
Connecting plugs	13A	32A	
Rated Input Capacity	4.6 KW	6.9 kW	8.7 kW
Rated Input Current	20A/7.7A	30A/11.6A	38A/12A
Rated Duty Cycle (@40°C)	15/60/100%	15/60/100%	10/60/100%
No Load Voltage (V)	70		
Output Welding Current	10A-120A	10A-160A	10A-200A
IP Rating	IP21S		
Insulation Grade	Class 1 - Grade H		
Suitable Electrode size	1.6/2.5/3.2mm	MMA 1.6-4 /TIG1.6-2.4mm	

NOTE: 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.

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.

CONSUMABLES

The following are some of the accessories available from your CLARKE dealer. Please quote the part numbers shown below.

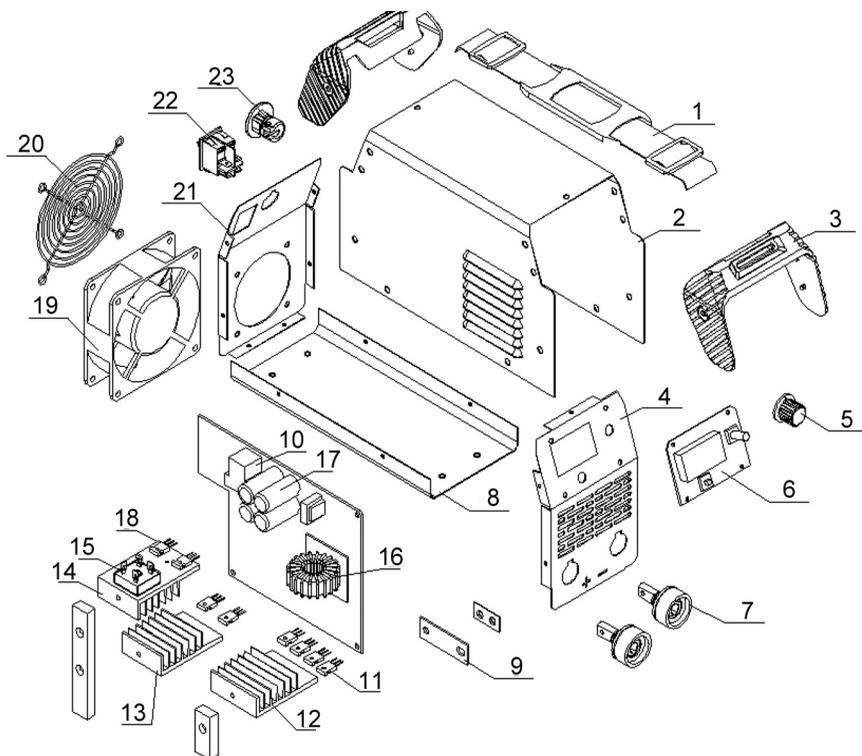
DESCRIPTION	PART NUMBER
1.6 x 300mm Arc Welding Rods	3050590
2.0 x 350mm Arc Welding Rods	3050592
2.5 x 350mm Arc Welding Rods	3050594
3.25 x 350mm Arc Welding Rods	3050596
4.0 x 400mm E6013 Welding Rods	3050598
TIG Welding Torch Assembly (MMA/TIG100)	6012232
TIG Welding Torch Assembly (MMA/TIG160/200)	6012233
Argon Gas Regulator	8134140

ARC ACTIVATED HEADSHIELDS

These highly popular head-shields activate instantly when the arc is struck and allow you to have both hands free when welding.

Model	Arc Activated	Grinding function	Solar Powered	Fixed Shade	Flip Up	Part Number
GWH4	✓	✓	✓			6000706
GWH7	✓	✓	✓			6000709
GWH5	✓	✓	✓			6000707
GWH6	✓	✓	✓			6000708
GWH3	✓	✓	✓			6000698
GWH2	✓	✓	✓			6000697
PG4	✓	✓	✓			6000716
HS1				✓	✓	6000700
HSF1				✓	✓	6000705

COMPONENT PARTS



NO	DESCRIPTION	NO	DESCRIPTION
1	Shoulder strap assembly	13	Insulated Gate Bipolar Transistors (1)
2	Housing	14	Insulated Gate Bipolar Transistors (2)
3	Front plastic cover	15	Rectifier bridge
4	Front plate	16	Transformer
5	Adjusting knob	17	Capacitors
6	Digital Display Panel	18	Relay
7	Pos/Neg connection sockets	19	Cooling fan assembly
8	Base plate	20	Fan grille
9	Output connection	21	Rear plate
10	Transformer	22	Power switch
11	Fast recovery diode	23	Power cable connector
12	FRD cooling radiator		

DECLARATION OF CONFORMITY -UK



Hemnal Street, Epping, Essex CM16 4LG

DECLARATION OF CONFORMITY

This is an important document and should be retained.

We hereby declare that this product(s) complies with the following statutory requirement(s):

Electromagnetic Compatibility Regulations 2016

Electrical Equipment (Safety) Regulations 2008

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The following standards have been applied to the product(s):

EN 60974-10:2014+A1:2015, EN IEC 60974-1:2018/A1:2019, IEC 62321-3-1:2013,

IEC 6231-4:2013+A1:2017, IEC 62321-5:2013, IEC 62321-6:2015, IEC 62321-7-1:2015,

IEC 62321-7-2:2017, IEC 62321-8:2017.

The technical documentation required to demonstrate that the product(s) meet(s) the requirement(s) of the aforementioned legislation has been compiled and is available for inspection by the relevant enforcement authorities.

The UKCA mark was first applied in: 2022

Product Description: MMA/TIG Inverter Welders
Model number(s): MMA/TIG120, MMA/TIG160, MMA/TIG200
Serial / batch Number: N/A
Date of Issue: 08/06/2022

Signed:

J.A. Clarke
Director

DECLARATION OF CONFORMITY - CE



Clarke[®]
INTERNATIONAL

Fitzwilliam Hall, Fitzwilliam Place, Dublin 2

DECLARATION OF CONFORMITY

This is an important document and should be retained.

We hereby declare that this product(s) complies with the following directive(s):

2014/30/EU *Electromagnetic Compatibility Directive*
2014/35/EU *Low Voltage Equipment Directive*
2011/65/EU *Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive*

The following standards have been applied to the product(s):

EN 60974-10:2014+A1:2015, EN IEC 60974-1:2018/A1:2019, IEC 62321-3-1:2013,
IEC 6231-4:2013+A1:2017, IEC 62321-5:2013, IEC 62321-6:2015, IEC 62321-7-1:2015,
IEC 62321-7-2:2017, IEC 62321-8:2017.

The technical documentation required to demonstrate that the product(s) meet(s) the requirement(s) of the aforementioned directive(s) has been compiled and is available for inspection by the relevant enforcement authorities.

The CE mark was first applied in: 2022

Product Description: MMA/TIG Inverter Welders
Model number(s): MMA/TIG120, MMA/TIG160, MMA/TIG200
Serial / batch Number: N/A
Date of Issue: 08/06/2022

Signed:

J.A. Clarke
Director

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