

# Clarke<sup>TM</sup>



## ARC/TIG WELDER

Model No. Arc/Tig135

PART NO: 6010790

## OPERATING & MAINTENANCE INSTRUCTIONS



07/10

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## INTRODUCTION

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Thank you for purchasing this CLARKE Arc/Tig welder.

Before attempting to use the machine, 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 welder giving you long and satisfactory service.

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## GUARANTEE

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This product is guaranteed against faulty manufacture for a period of 12 months from the date of purchase. Please keep your receipt which will be required 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.

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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. Always consult the machine's data plate.

## LIST OF EQUIPMENT

When unpacking, check for damage and /or omissions etc. Any found should be reported to your CLARKE dealer where the appliance was originally purchased.

The AT135 Arc/Tig welder is delivered with the following components:

- 1 x Welding Inverter with Shoulder Strap
- 1 x Instruction Manual (this document)
- 1 x Electrode Holder with Lead
- 1 x Earth Clamp with Lead
- 1 x Welders Mask Assembly with Lens
- 1 x Wire Brush & Hammer



## SPECIFICATIONS

CLARKE part no	6010790
Dimensions L x W x H	285 x 120 x 220
Weight	4.3kg (8kg with briefcase & accessories)
Power Supply	230v 50Hz 1ph
Max. Input Current	23.5A
Open Circuit Voltage	80V
Protection Class	IP21
Insulation Class	H
Max/min Welding Current	30/130A
Usable Electrodes	1.5 - 3.25mm dia

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## PRINCIPLES OF OPERATION

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The ARC/TIG welder, as its name suggests, is designed to be used for both Metal ARC, **AND** TIG welding. To accomplish this, two sets of welding leads are required, one for each method employed.

### ARC WELDING

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Shielded Metal Arc welding is by far the most widely used of the various arc welding processes. It employs the heat of the arc to melt the base metal and the tip of a consumable flux covered electrode.

The electrode and the workpiece are part of an electric circuit. This circuit begins with the electric power source and includes the welding cables, an electrode holder, a workpiece connection, the workpiece, and an arc welding electrode. One of the two cables from the power source is attached to the work. The other is attached to the electrode holder.

Welding commences when an electric arc is struck between the tip of the electrode and the work. The intense heat of the arc melts the tip of the electrode and the surface of the work close to the arc. Tiny globules of molten metal rapidly form on the tip of the electrode, then transfer through the arc stream into the molten weld pool. In this manner, filler metal is deposited as the electrode is progressively consumed.

The arc is moved over the work at an appropriate arc length and travel speed, melting and fusing a portion of the base metal and continuously adding filler metal. Since the arc is one of the hottest of the commercial sources of heat (temperatures above 9000°F (5000°C) have been measured at its centre), melting of the base metal takes place almost instantaneously upon arc initiation.

If welds are made in either the flat or the horizontal position, metal transfer is induced by the force of gravity, gas expansion, electric and electromagnetic forces, and surface tension. For welds in other positions, gravity works against the other forces.

The process requires sufficient electric current to melt both the electrode and a proper amount of base metal. It also requires an appropriate gap between the tip of the electrode and the base metal or the molten weld pool. These requirements are necessary to set the stage for coalescence.

The sizes and types of electrodes for shielded metal arc welding define the arc voltage requirements within the overall range and the current requirements within the overall range. The current may be either alternating or direct, depending upon the electrode being used, but the power source must be able to control the level of current within a reasonable range in order to respond to the complex variables of the welding process itself.

## **TIG WELDING**

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TIG welding is primarily a DC current process, but can also utilise AC, usually for very thin materials and when welding Aluminium or other non ferrous metals. It uses a non-consumable tungsten (or tungsten alloy) electrode, held in a torch.

Shielding gas (100% Argon), is fed through the torch to protect;

- a. the electrode,
- b. molten weld pool, and
- c. 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, pressure vessels, heat exchangers, pipes etc., where accuracy and a high quality weld is desired, as it produces a very low porosity weld.

## **TIG Welding Process Advantages**

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- 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 for the specific application.
- It allows excellent control of root pass weld penetration.
- It can produce inexpensive autogenous welds at high speeds.
- It can use relatively inexpensive power supplies.
- It allows precise control of the welding variables.
- Welds all metals
- Capable of welding very thin material without undue distortion.

## **Main Features of TIG Welding**

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1. Welds all metals.
2. Electronic control of welding current.
3. Forced air cooling.
4. A Thermal Overload Protection Device prevents overheating the transformer.

## **Limitations**

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1. Greater weld dexterity is required.
2. It is more expensive to weld thicker materials - greater than 4 - 5mm.

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## GENERAL SAFETY PRECAUTIONS

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**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**

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### PREVENTION OF BURNS

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Wear protective clothing - gauntlet gloves designed for use in welding, hat, 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 cover glass). This is a MUST for welding or cutting, (and chipping) to protect the eyes from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered. Avoid oily greasy clothing. A spark may ignite them. Hot metal such as electrode stubs and workpieces should never be handled without gloves. First aid facilities and a qualified first aid person should be available for each shift 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.

### PREVENTION OF TOXIC FUMES

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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 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 products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapours to form phosgene. DO NOT WELD or cut where solvent vapours can be drawn into the welding or cutting atmosphere or where the radiant energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

### PREVENTION OF FIRE & EXPLOSION

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Causes of fire and explosion are:

- 1) combustibles reached by the arc, flame, flying sparks, hot slag or heated material;
- 2) misuse of compressed gases and cylinders;
- 3) 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. Sparks and slag can fly 10m.

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 area, do NOT weld or cut. Move the work if practicable, to an area free of combustibles.

Avoid paint spray rooms, dip tanks, storage areas, ventilators. If the work cannot be moved, move combustibles at least 10m. away out of reach of sparks and heat; or protect against ignition with suitable and snug fitting, fire- resistant covers or shields.

Walls touching combustibles on opposite sides should not be welded on (or cut).

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:

- a) appreciable combustibles (including building construction) are within 10m.
- b) appreciable combustibles are further than 10m but can be ignited by sparks.
- c) openings (concealed or visible) in floors or walls within 10m can expose combustible materials to sparks.
- d) combustibles adjacent to walls, ceilings, roofs or metal partitions can be ignited by radiant or conducted heat.

After the work is done, check that the 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, while using personal protective equipment.

Water filling just below 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 or cutting - they can explode.

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

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## ELECTROMAGNETIC INTERFERENCE (EMC) IN THE WORKPLACE

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Whilst this unit complies with EMC regulations, the user is responsible for installing and using the welding equipment according to the manufacturers instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation. In some cases this remedial action may be as simple as earthing the welding circuit, see 'Note'. In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

**Note - The welding circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorised by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding current return paths which may damage the earth circuits of other equipment.**

### 1 ASSESSMENT OF THE WELDING AREA

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Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. Avoid using your inverter in the vicinity of:

- a) other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the welding equipment;
- b) radio and television transmitters and receivers;
- c) computer and other control equipment;
- d) safety critical equipment, e.g. guarding of industrial equipment;
- e) pacemakers and hearing aids etc;
- f) equipment used for calibration or measurement;
- g) other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.

It may be possible to avoid the above by changing the time of day that welding or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

### 2 REDUCING EMC EMISSIONS

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#### 2.1 Mains Supply

Welding equipment should be connected to the mains supply according to the manufacturers recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. 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.

## **2.2 Maintenance of the welding equipment**

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 manufacturers instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturers recommendations.

## **2.3 Welding cables**

Welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

## **2.4 Equi-potential bonding**

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrodes at the same time. The operator should be insulated from all such bonded metallic components.

## **2.5 Earthing of the workpiece**

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g. ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances.

Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment.

Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

## **2.6 Screening and shielding**

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

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## **SAFE OPERATION OF ELECTRIC ARC (MIG, TIG) WELDERS**

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Comply with precautions 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, workpieces are hot. The wise operator avoids unnecessary risks and protects himself and others from accidents.

### **Burn Protection**

Comply with precautions above. The welding arc is intense and visibly bright. Its 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**

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

### **Eye & Head Protection**

Protect the eyes from exposure to arc. NEVER look at an electric arc without protection. The welding helmet or shield containing a filter plate shade No. 12 or denser must be used when welding. Place over the face before striking an arc. Protect the filter plate with a clear cover plate. A 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 a 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 a 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 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 anyone 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**

Welding fumes must be vented to the outside air. Carbon monoxide can kill if inhaled in large quantities.

## **Fire & Explosion Prevention**

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Do not exceed the equipment's rated capacity or overload the 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 rupture or lead to such a rupture later under rough handling.

## **Shock Prevention**

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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 of Wearers of Electronic Life Support Devices (Pacemakers)**

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Magnetic fields from high currents can affect pacemaker operation. Persons wearing electronic life support equipment (pacemaker) should consult with their doctor before going near arc welding operations.

## **Protection Against Shock**

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Keep 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 cannot 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**

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When arc welding equipment is earthed according to the National Electrical Code, and the work is also 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.

## **Electrode Holders**

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Fully insulated electrode holders should be used. Do NOT use holders with protruding screws or with any form of damage.

## **Connectors**

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Fully insulated lock-type connectors should be used to join welding cable.

## **Cables**

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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 & other Exposed parts**

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

## **Electrodes**

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- a) Equipment with output on/off control (contactor)

Welding power sources for use with the gas metal arc welding, gas tungsten arc welding and similar processes normally are equipped with devices that permit on/off control of the welding power output. When so equipped the electrode wire becomes electrically LIVE when the power source switch is ON and welding gun switch is closed. Never touch the electrode wire or any conducting object in contact with the electrode circuit unless the welding power source is off.

- b) Equipment without output on/off control (no contactor). Welding power sources used with shielded metal arc welding and similar processes may not be equipped with welding power output on/off control devices. With such equipment the electrode is electrically LIVE when the power switch is turned ON. Never touch the electrode unless the welding power source is off.

## **Safety Devices**

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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.

## **Safety Precautions for ARC/TIG Welding**

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**ALWAYS** ensure that there is full free air circulating around the outer casing of the machine, and that the louvres are unobstructed.

- 1 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.
- 2 **ALWAYS** check that the pressure regulator and gauges are working correctly. DO NOT lubricate the regulator.
- 3 **ALWAYS** use the correct regulator. Each regulator is designed to be used with a specific gas.
- 4 **ALWAYS** inspect the hose before use to ensure it is in good condition.

- 5 **ALWAYS** keep the free length of gas hose outside the work area.
- 6 **ALWAYS** remove all flammable materials from the welding area.
- 7 **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.
- 8 **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.
- 9 **NEVER** use or store in a wet/damp environment. DO NOT EXPOSE TO RAIN.
- 10 The TIG welding process uses an INERT gas to protect the weld pool. It is important to ensure the appropriate gas is being used. **NEVER** use gas from a cylinder, the content of which is unknown.
- 11 **NEVER**
  - a. Use a damaged cylinder.
  - b. Lift the cylinder by the valve.
  - c. Expose the cylinder to a heat source or sparks.
- 12 **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.
- 13 **NEVER** use the welder with input connections greater than 10M in length.
- 14 **NEVER** point the TIG torch at any person or animal.
- 15 **NEVER** touch the TIG torch nozzle until the welder is switched OFF and the nozzle has been allowed to cool off.
- 16 **NEVER** connect, disconnect, or attempt to service the TIG torch, until the machine is switched OFF and disconnected from the mains supply.
- 17 **NEVER** allow the cables to become wrapped around the operator or any person in the vicinity.

### **Additional Precautionary Measures**

#### **IMPORTANT:**

**The TIG machine generates both airborne and line interference due to the high frequencies involved. It is important not to locate electronic or electrically sensitive equipment in the vicinity of the welder or alternatively, do not locate the welder in vicinity of electronic or electrically sensitive equipment.**

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## PREPARATION OF THE WELDING AREA

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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 annoyance to the operator.

Avoid welding by contact with humid parts nearby combustible liquids. Least of all, do not weld upon tanks which may contain inflammable residuals.

## SAFETY EQUIPMENT

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

## ELECTRICAL CONNECTIONS

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### ***WARNING! THIS APPLIANCE MUST BE EARTHED.***


Connect the mains lead, through a suitably fused isolator switch, to a 230 Volt (50Hz) electrical supply, with a fuse rating of 32amps.

***A standard domestic 13 Amp plug MUST NOT be used with this welder.***

**IMPORTANT:** The wires in the mains lead are coloured in accordance with the following code:

***Green & Yellow ..... Earth***  
***Blue ..... Neutral***  
***Brown ..... Live***

As the colours of the flexible cord of this appliance may not correspond with the coloured markings identifying terminals in your plug, proceed as follows:

- Connect GREEN & YELLOW cord to plug terminal marked with a letter "E" or Earth symbol "  ", or coloured GREEN or GREEN & YELLOW.
- Connect BROWN cord to plug terminal marked letter "L" or coloured RED.
- Connect BLUE cord to plug terminal marked letter "N" or coloured BLACK.

### **Extension Cables**

If an extension cable is fitted, ensure the minimum cross section of the conductor is 1.5mm<sup>2</sup> for up to 15 metres in length, and 2.5mm<sup>2</sup> for up to 25 metres.

## FEATURES OF THE ARC/TIG 135 WELDER






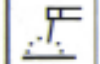

The ARC/TIG 135 welder has been designed to work with unstable input voltages. The use of power components and of electrolytic capacitors with higher voltage and a special control circuit grant a high welding current stability in spite of the mains voltage fluctuations. The machine allows coated electrode (MMA) welding by scratch starting the tungsten inert gas (TIG) welding. The technology used to manufacture the generator, combined to both MMA and TIG functions, make it easy to use from scratch.

The generator is composed of a control and printed circuit (p.c.) board, a switching transformer, and a levelling inductance. The pc board includes different electronic functions in order to improve the arc striking and the dynamics of the welding to achieve an optimum weld with any type of electrode with simplicity of performance.

An IGBT bridge guarantees a fast speed of response and greater precision, together with a drastic reduction in magnetic components and a consequent reduction in generator weight. The unit is easy to carry using the carrying strap and the low electricity consumption make it ideal for all types of welding applications.

## ELECTRICAL SYMBOLS DISPLAYED ON THE MACHINE

The full technical specification for your inverter is to be found printed in a rating plate on the back panel or underside of the ARC/TIG 135 machine. The meaning of the markings and symbols shown are explained as follows.

		EN 60974-1 EN 50199			
		30A / 21,2V - 130A / 25,2V			
		X	35%	60%	100%
	U <sub>0</sub> =80V	I <sub>2</sub>	130A	100A	75A
		U <sub>2</sub>	25,2V	24V	23V
		U <sub>1</sub> = 230V	I <sub>1max</sub> = 23,5A	I <sub>1eff</sub> = 13A	
IP21		I.C.L.	H	COOLING	AF

EN 60974 -1: (2005) European Standard-Arc Welding Equipment

EN 50199: (1996) Electromechanical Compatability (EMC)



Single-phase static frequency converter/transformer/rectifier



Symbol for Drooping Characteristic



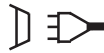
Direct Current



Symbol for manual metal arc welding with covered electrodes

U<sub>0</sub>=\_\_ V

Min rated no-load voltage



Symbol for mains supply & No of phases

IP\_\_

Degree of protection (e.g. IP21)

\_\_A/ \_\_ V to \_\_A/ \_\_ V

Range of output, min & max welding current and their corresponding load voltage

X

Duty Cycle (expressed as a %, e.g.35%)

I<sub>2</sub> A

Max/min rated value of the welding current for the duty cycle

U<sub>2</sub>\_\_ V

Conventional load voltage for the duty cycle

U<sub>1</sub>\_\_ V

Rated value of the supply voltage

L 1max = \_\_ A

Symbol, rated value and dimension of the max. supply current

I<sub>1eff</sub> = \_\_ A

Size of the necessary main fuse

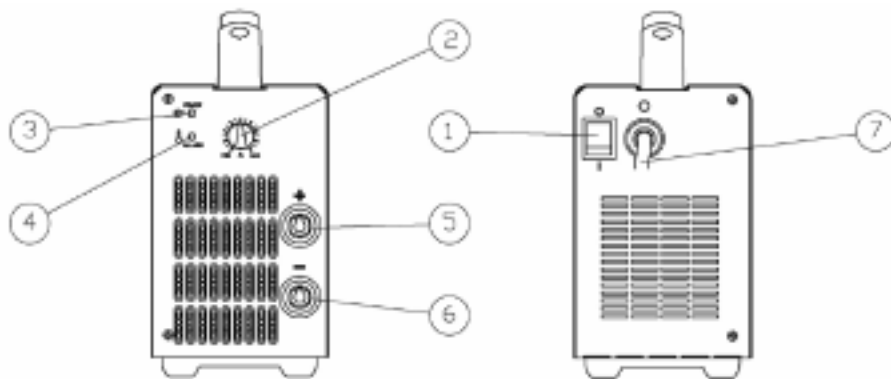
H

Code letter for degree of insulation (I.C.L.)

COOLING

Air Fan

## THE ARC/TIG 135 COMPONENTS



- 1 ON/OFF Switch
- 2 Adjusting weld current potentiometer
- 3 Green LED indicating power ON

LED ON = Power ON, when switching the unit on, it illuminates a short while after the orange LED. Flashing LED = indicates an alarm condition due to an anomaly in the input voltage. During the green LED flashing time, the unit checks the line voltage until it reaches an acceptable value. When there is no alarm condition, the green LED stays on.

- 4 Orange LED

LED on = indicates an alarm condition due to overheating of the primary circuit. If both orange and green LEDs are on, the unit needs to cool down. After cooling, the orange LED will automatically go out.

Flashing LED = an alarm condition exists due to undervoltage, overheating on the secondary or an input short circuit. Leave the unit to cool down if the temperature has been exceeded. When there is no alarm condition, the orange LED goes off and the green LED stays on.

- 5 25mm<sup>2</sup> positive socket
- 6 25mm<sup>2</sup> negative socket
- 7 Input (power) cable

## WELDING TECHNIQUES

### A ARC WELDING

Arc welding cables are supplied with this machine. The kit comprises all necessary cables, plus a hand shield and wire brush with chipping pick.

To prepare the unit for ARC welding, it is important that you follow the procedure below.

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

Welding Electrode lead to the +ve terminal.

Work Clamp lead to the -ve terminal.

2. 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.
3. An appropriate current must then be set by turning the Welding Current Selector located on the front panel of the machine. With practice you will gain a feel for the correct current setting for different welding rod thicknesses.

The size (diameter) of welding rod should be approximately the same as the thickness of metal to be welded.

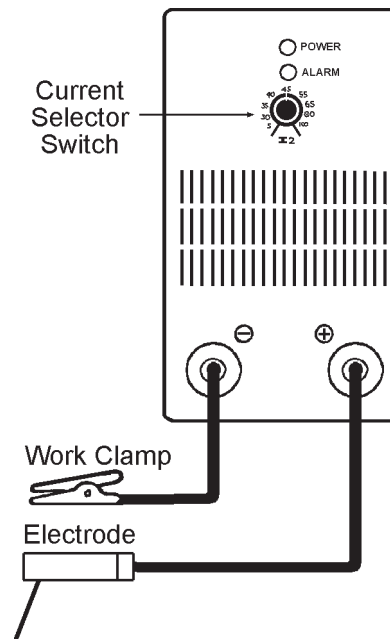


Fig. 1

For beginners, the following table gives some useful guidelines.

SIZE OF WELDING ROD	THICKNESS OF WORKPIECE	CURRENT SETTING (AMPS)
1.5mm	16 SWG - 1.5 MM	30 - 40
2.0mm	14 SWG - 2.0 MM	50 - 65
2.5mm	12 SWG - 2.5 MM	70 - 100
3.0mm	10 SWG - 3.25MM	100 - 130

4. Switch ON using the switch located on the rear panel. The green light on the front panel should glow, indicating the machine is ON.

**Note: If the machine stops at any time and the amber light comes ON the thermal overload has intervened.**

5. 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 on an actual welding job.
6. Hold the electrode about 10mm from the work and at an angle of about 70° to 80° to the work surface. Take care not to accidentally touch the workpiece until you are ready to start.
7. Holding the welding mask close-up to the 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 tiny gap of around 1.5mm (1/16"). The current will flow across the gap with a crackling noise and brilliant arc. Continue to weld in one direction, maintaining the small gap as you go. At the end of the run just withdraw the electrode fully from the workpiece.

**Note: When you prime the arc be sure to withdraw the electrode fairly swiftly to leave the 1.5mm. gap, otherwise the electrode will weld itself to the workpiece. Should this occur, 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.**

8. Inspect the job carefully. With a correct combination of rod size and current setting, the area of the weld should be a complete fusion of the electrode metal with the metals being joined. Slag forming on the surface should be chipped away with a chipping hammer or pick. **ALWAYS** wear your safety goggles when chipping away slag.

**NOTE: If the resultant weld looks irregular or messy, or shows signs of porosity or slag contamination, you have almost certainly failed to achieve the correct combination, (or else dirt /oil is present on workpiece). Do not worry as practice will soon cure this.**

**HEALTH WARNING:**

**When welding, always ensure there is adequate ventilation in the work area as the welding process gives off toxic fumes.**

## B TIG WELDING

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

1. Plug the **work return lead (earth clamp)** 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. Screw in the pressure regulator knob to set a pressure of approx. 2,5Kg./cm<sup>2</sup>. (35 lbf/in<sup>2</sup>).
4. Ensure the electrode at the torch nozzle, protrudes by 4 - 5mm., also ensure that the electrode is sharply pointed within an angle of 40°-60, if it is not, grind it longitudinally.
5. 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 chart on page 20), and switch ON using the switch mounted on the rear panel. The green light on the front panel will glow.
6. Open the gas valve on the torch handle, allowing gas to flow from the torch nozzle. 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. See fig. 3.

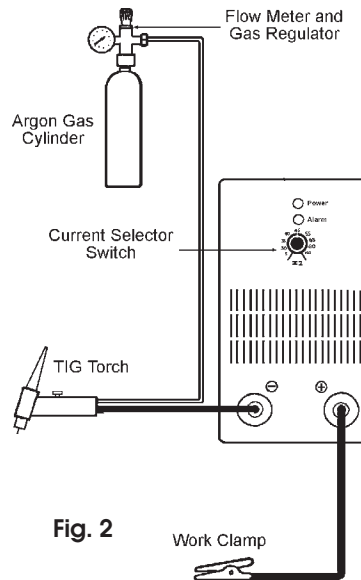


Fig. 2

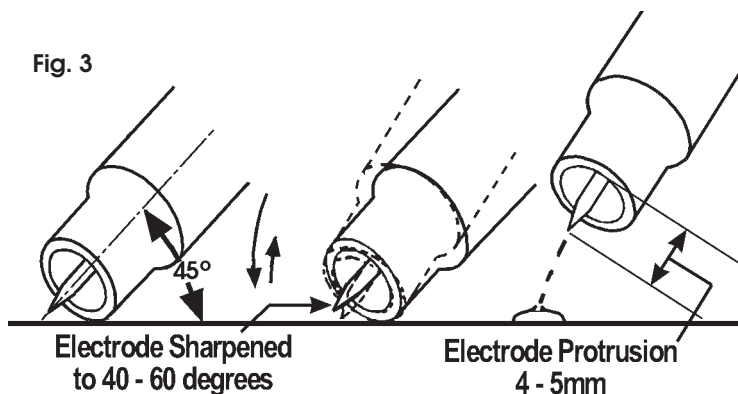


Fig. 3

Scratch the tip of the electrode on soon as an arc develops, quickly withdraw the electrode to maintain a gap of approx 3-4 mm, and proceed to weld. (See notes below).

To stop welding, simply remove the torch from the workpiece. This method is referred to as 'Scratch Arc'.

REMEMBER to turn OFF the gas immediately you finish welding.

**NOTES:**

- a) 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.
- b) 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.
- c) The arc length generally varies between 3 and 6mm depending on the type of joint, type and thickness of material, and so on.
- d) 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 on the following chart:

**TIG WELDING DATA**

METAL	WELDING CURRENT (Amps)	WORKPIECE THICKNESS (mm)	FILLER ROD Dia (mm)	WELDING ELECTRODE Dia (mm)	GAS FLOW Ltr/min
Mild Steel	30	1	0-2	1.6	4
	70	2	2.0	1.6	4
	115	3	2.4	2.4	4.3
	140	4	2.4	2.4	4.6
Stainless Steel	35	1	0-2	1.6	4
	80	2	2.0	1.6	4.3
	130	3	2.4	2.4	4.6
	160	4	2.4	2.4	5
Copper	80	2	2.4	2.4	5
	130	3	3.2	2.4	5

## TROUBLESHOOTING

DEFECT	CAUSES	SUGGESTIONS
Porosity of welds	<p>Acid electrode on steel with high sulphur content. Electrode oscillates too much.</p> <p>Workpieces are too far apart. Workpiece being welded is cold.</p>	<p>Use basic electrode.</p> <p>Move edges to be welded closer together. Move slowly at the beginning. Lower welding current.</p>
Cracks in weld	<p>Material being welded is dirty (e.g.oil, paint, rust, oxides)</p> <p>Not enough current</p>	<p>Clean the workpiece before welding is an essential method of achieving neat weld beads.</p>
Limited penetration	<p>Low current High welding rate Reversed polarity Electrode inclined in position opposite to its movement</p>	<p>Ensure operating parameters are regulated and improve preparation of work pieces.</p>
High Sprays	<p>Electrode is too inclined</p>	<p>Make appropriate corrections</p>
Profile Defects	<p>Welding parameters are incorrect. Pass rate is not related to operating parameter requirements. Electrode not inclined constantly while welding.</p>	<p>Follow basic and general welding principles.</p>
Arc is unstable	<p>Insufficient current.</p>	<p>Check condition of electrode and earth wire connection.</p>
Electrode melts obliquely	<p>Electrode core is not centred. Magnetic blow phenomenon.</p>	<p>Replace electrode. Connect two earth wires to opposite sites of the work piece.</p>

## MAINTENANCE

The ARC/TIG Inverter, requires very little maintenance other than the guidelines shown below. 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 dusty and dirty 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 security: They must be in good condition and not cracked.
3. Always try to avoid getting particles of metal inside the machine since they could cause short circuits.

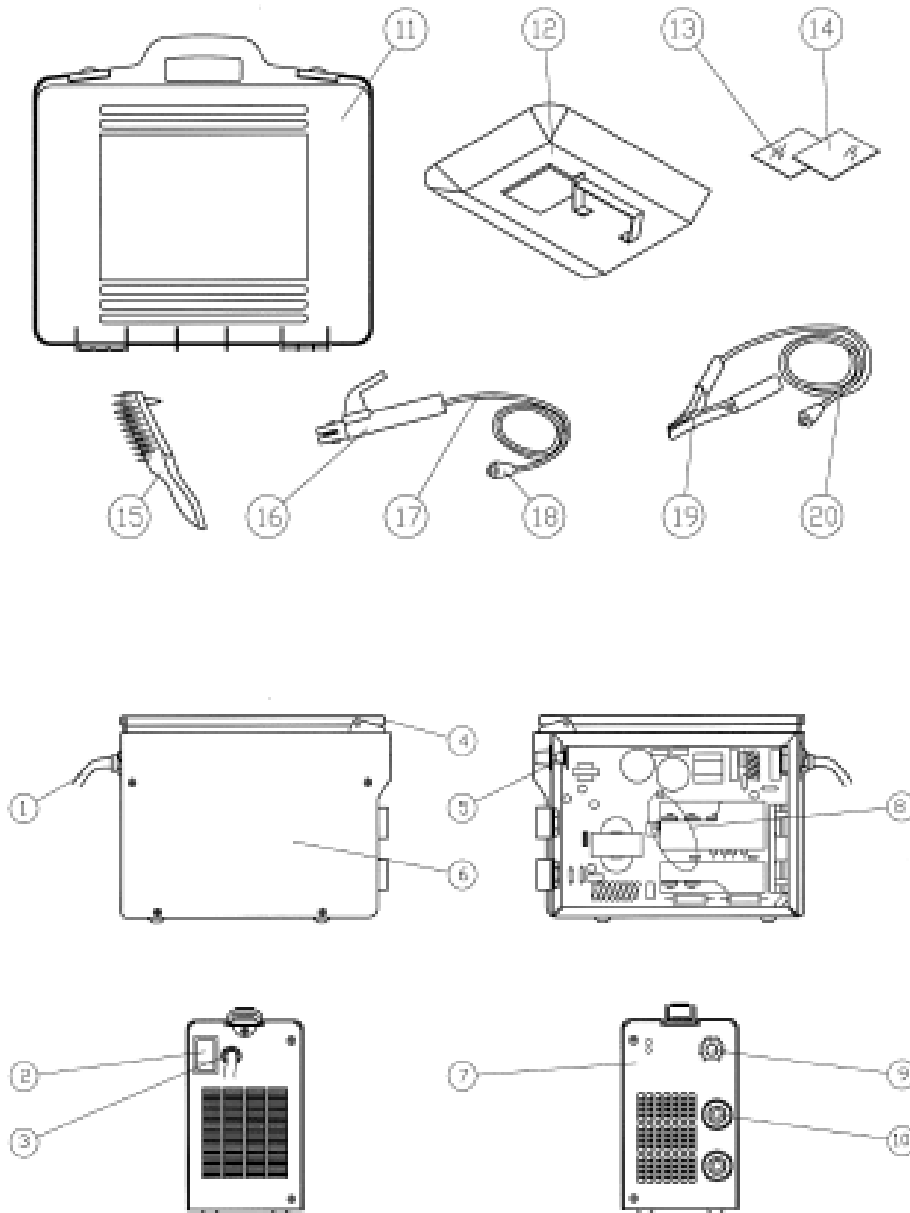
**IMPORTANT - Disconnect from mains before cleaning.**

**DO NOT attempt to carry out repairs yourself, unless you are fully competent, all work must be carried out by a qualified technician.**

## FAULTFINDING

DEFECT	CAUSES	SUGGESTIONS
Spark will not start	Bad primary connection. Inverter card is defective.	Check primary connection. Contact your nearest CLARKE dealer.
No output voltage	Overheated machine (LED should be on).	Wait for thermal cutout to be reset.
	Undervoltage/overvoltage limits exceeded. Orange LED on and green LED flashing.	Check the mains distribution system. Wait for internal checkof input voltage When this is within normal limits, the orange LED will go out and the green LED will stay on.
	Internal relay has failed.	Contact your nearest CLARKE dealer.
	Inverter card is defective.	Contact your nearest CLARKE dealer.
Wrong output current	Control potentiometer is defective.	Contact your nearest CLARKE dealer.
	Low primary power supply voltage.	Check the mains distribution system.

## PARTS DIAGRAM



## PARTS LIST

NO	CODE	DESCRIPTION	Qty	NO	CODE	DESCRIPTION	Qty
1	EM20220014	Input cable	1	11	EM21690447	Briefcase	1
2	EM22200043	Double Pole Switch	1	12	EM21905018	Plastic mask	1
3	EM21605009	Cable Clamp	1	13	EM21905020	Clear Glass	2
4	EM04600152	Belt-complete	1	14	EM21905021	Dark Glass	2
5	EM22735197	Potentiometer with Panduit	1	15	EM21905039	Hammer-Brush	1
6	EM33705469	Cover Panel	1	16	EM22110011	Electrode Holder	1
7	EM33700258	Rear panel	1	17	EM43205054	Welding Cable	1
8	EM42735087	Complete PC Board	1	18	EM22100001	Plug 25mm sq	2
9	EM21690418	Control Knob for potentiometer D20	1	19	EM22110005	Earth Clamp	1
10	EM22100002	Female Plug 25 sq mm CX30	2	20	EM43210006	Earth Cable	1

Additional accessories and consumables are available from your CLARKE dealer.

For parts & Servicing, please contact your nearest dealer, or  
CLARKE International, on one of the following numbers.

**PARTS & SERVICE TEL: 020 8988 7400**  
**PARTS & SERVICE FAX: 020 8558 3622**  
**or e-mail as follows:**  
**PARTS: Parts@clarkeinternational.com**  
**SERVICE: Service@clarkeinternational.com**

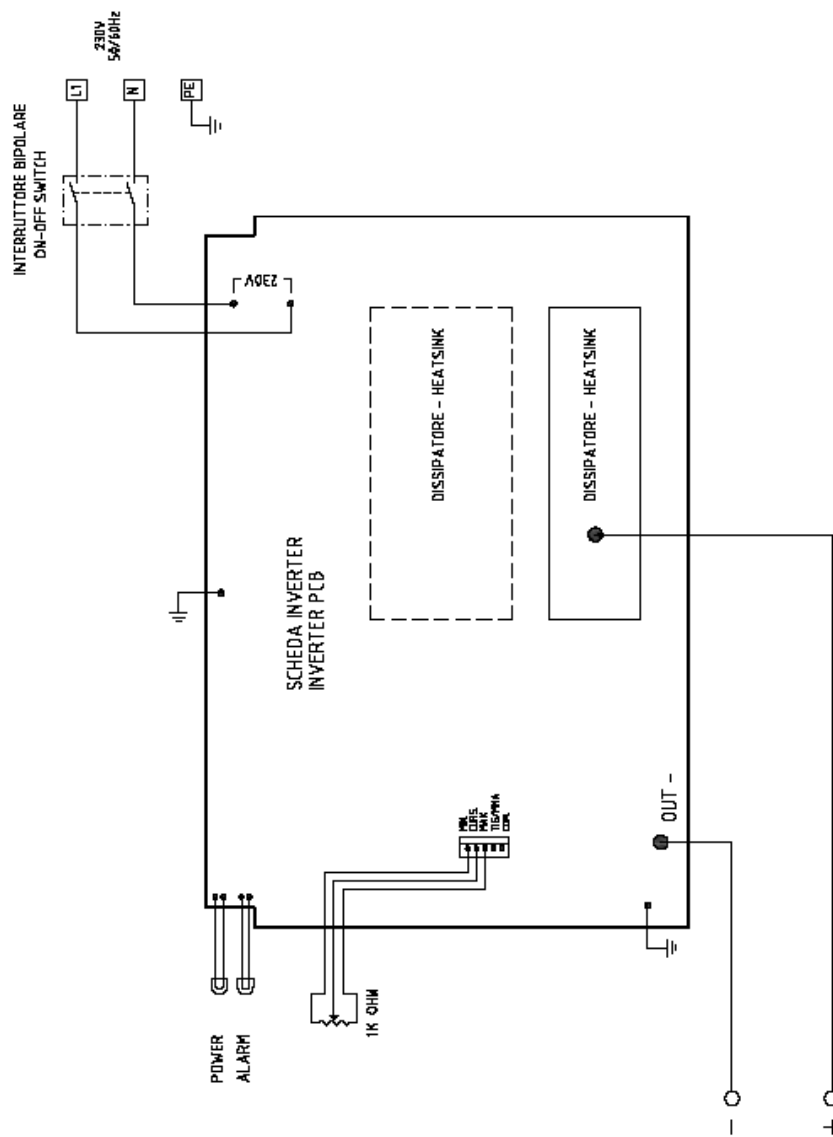


When disposing of this product, do not dispose of with general waste. It must be disposed of according to the laws governing Waste Electrical and Electronic Equipment, at a recognised disposal facility. Such products should be recycled in an environmentally safe way instead of disposing of them as waste.

**weld**

**Clarke**

# WIRING DIAGRAM



## DECLARATION OF CONFORMITY



### DECLARATION OF CONFORMITY

This is an important document and should be retained.



**We declare that this product complies with the following directives:**

89/336/EEC Electromagnetic Compatibility directive, (amended 2004/108/EC).

73/23/EEC Low Voltage Equipment directive (amended 93/68/EEC).

**The Following Standards have been applied to the product:**

BS 638- 10:1990,

EN 60974-1:1990:

BS EN 50199:1995:

BS EN 60974-1:1998+A1+A,2

BS EN 50060:

The technical documentation required to demonstrate that the products meet the requirements of the Low Voltage Equipment directive has been compiled and is available for inspection by the relevant enforcement authorities.

The CE mark was first applied in: **2007**

**Product Description:** Arc/Tig Welder  
**Model number(s):** Arc /Tig 135  
**Serial / batch Number:** Current Manufacture.  
**Date of Issue:** 01/05/2008

Signed

A handwritten signature in black ink, appearing to read "Aiken".

A.C. AIKEN

Senior Manager Clarke International.

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Hemnall Street, Epping, Essex CM16 4LG