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Clarke[®]

weld



ARC/TIG INVERTERS

Model Nos. Arc/Tig90, Arc/Tig120 & Arc/Tig150

OPERATING & MAINTENANCE INSTRUCTIONS



Clarke[®]

INTERNATIONAL

This is an important document and should be retained

DECLARATION OF CONFORMITY



We declare that this product complies with the following standards/directives:

- 73/23/EEC
- 89/336/EEC
- EN 50 199
- EN 60 974-1

Description: **ARC/TIG WELDING MACHINE**

Model No: **ARC/TIG Range**






Serial (Batch) No: **See Product Data Label**

Signed: 

Clarke INTERNATIONAL
Hornsea Road, Epsom, Surrey SM18 4LZ

EXPLANATION OF ELECTRICAL SYMBOLS

The full technical specification for your inverter is to be found printed in a table on the back panel of the machine.
 The meaning of the markings and symbols shown in the table are explained as follows.

-  Symbol for dropping characteristic
-  Symbol for manual arc welding and covered electrodes
-  Symbol for the mains supply and No. of phases
- 1  1 Single Phase Transformer
- U_0 --- V Min. and Max. rated no load voltage
- 50Hz Rated frequency for alternating current
- I_2 --- A Min. and Max. rated value of the welding current
- \varnothing mm Symbol and dimension for the diameter of reference electrodes
- I_2 A Symbol and dimension for the welding current
- n_c Symbol for the number of reference electrodes capable of being melted with the welding power source, starting from the cold state without operation of the thermal cut-out
- U_1 --- V Rated value of the supply voltage
-  --- A Size of the necessary main fuse
- I_1 max_ A Symbol, rated value and dimension of the max. supply current
- IP__ Degree of protection (e.g. IP21)
- n_h Symbol for the No. reference electrodes being melted with the welding power source at the hot state, without operation of the thermal cut-out.
- H Code letter for degree of insulation
- X Duty Cycle (expressed as a %, i.e. 20%)
- S_1 (THERM) Rated value of Thermal Overload

ELECTROMAGNETIC INTERFERENCE (EMC)

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 AREA

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:

- other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the welding equipment;
- radio and television transmitters and receivers;
- computer and other control equipment;
- safety critical equipment, e.g. guarding of industrial equipment;
- pacemakers and hearing aids etc;
- equipment used for calibration or measurement;
- 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.

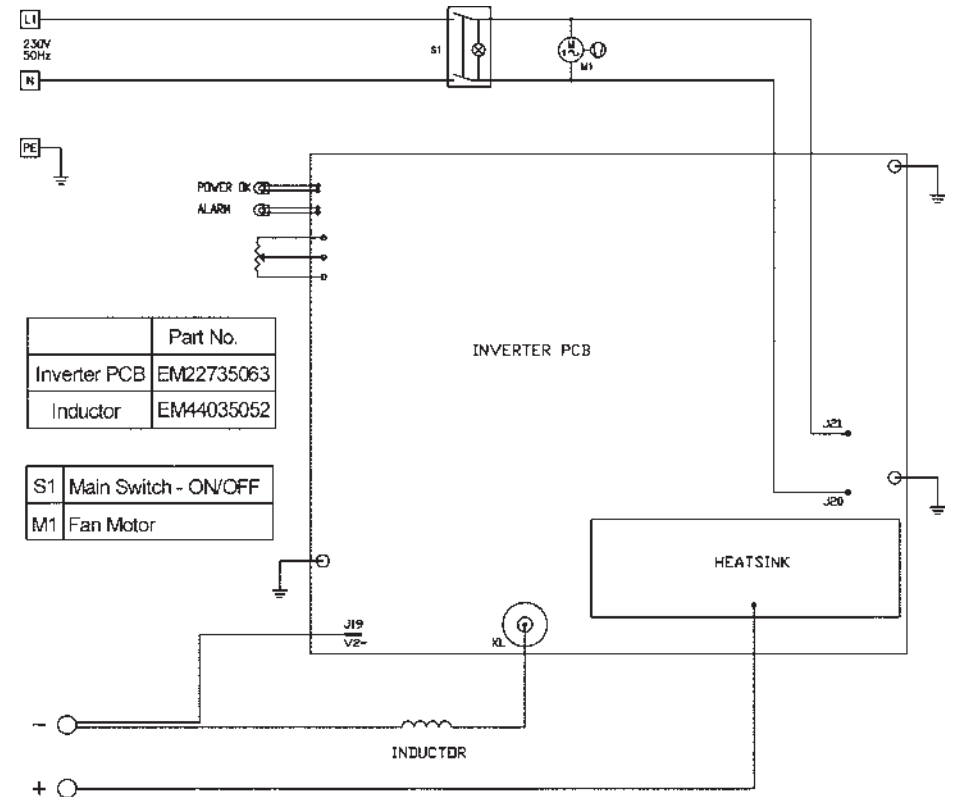
2. METHODS OF REDUCING EMISSIONS

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

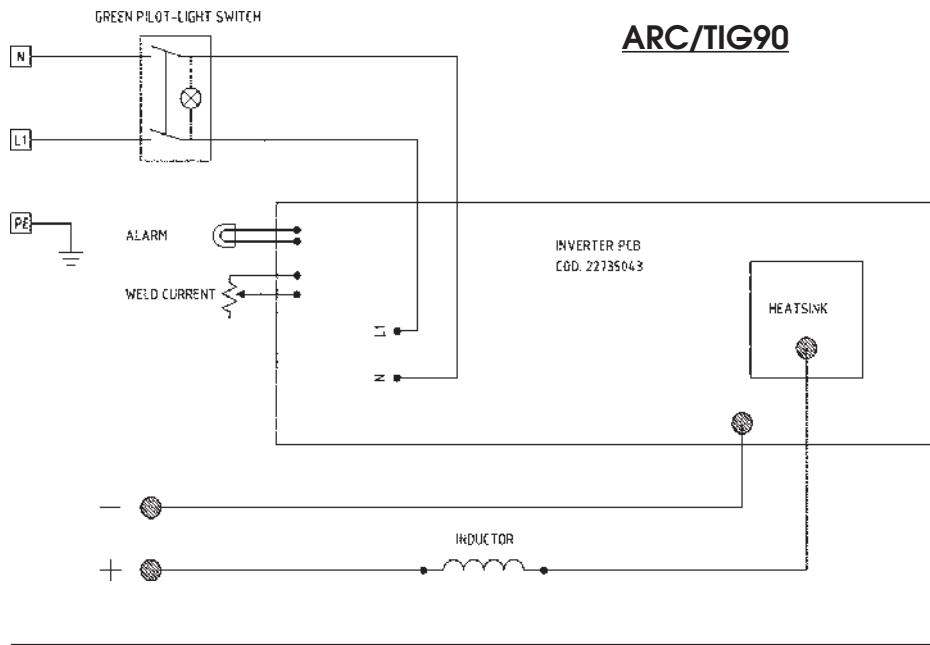
WIRING DIAGRAM

ARC/TIG150

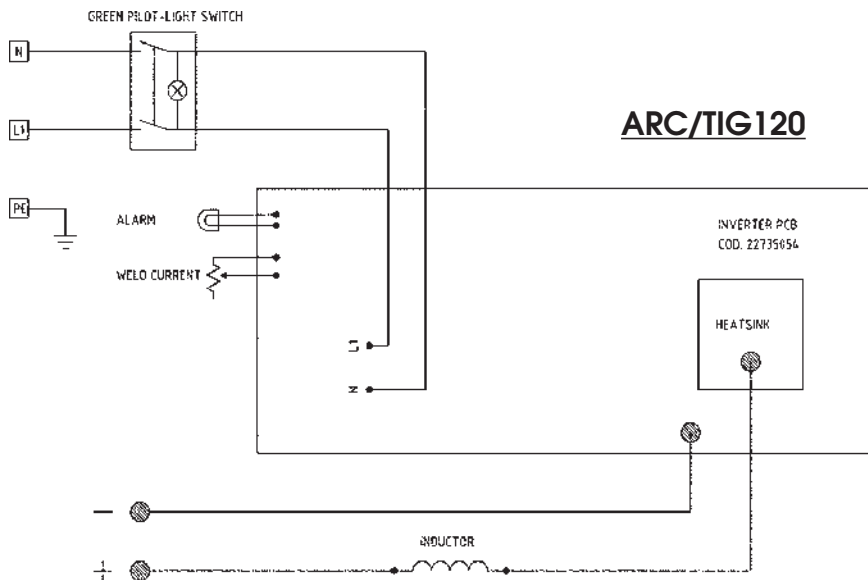


WIRING DIAGRAM

ARC/TIG90



ARC/TIG120



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 manufacturers 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

The 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 Equipotential 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.

SAFETY PRECAUTIONS

WARNING:

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

FAILURE TO FOLLOW THESE RULES MAY RESULT IN SERIOUS PERSONAL INJURY

1. GENERAL PRECAUTIONS

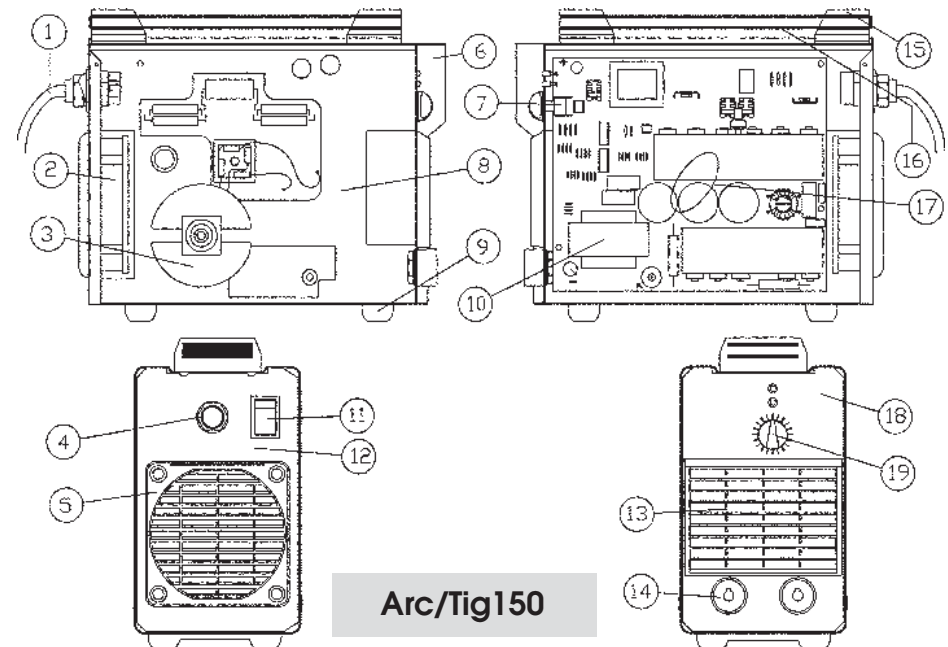
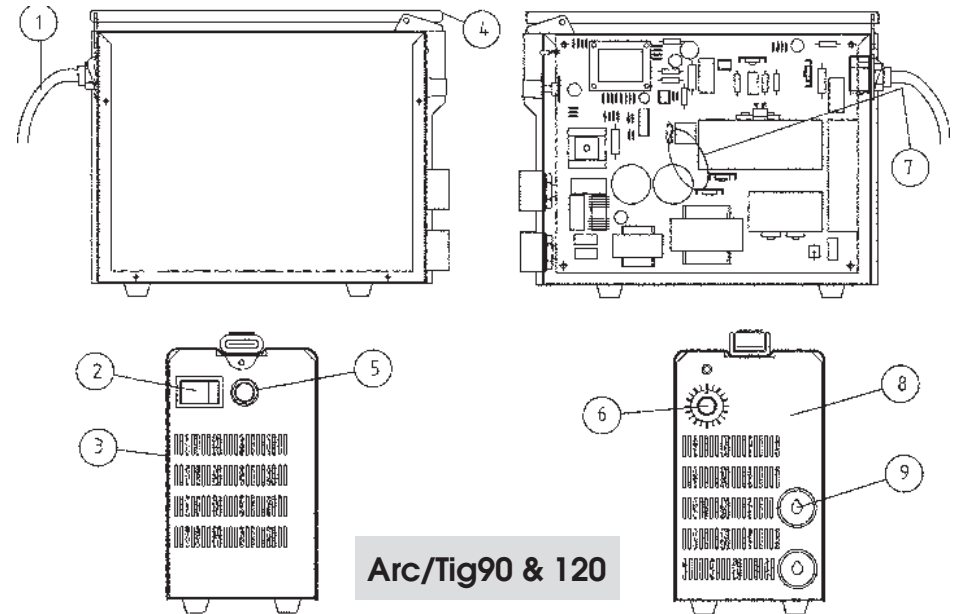
A) Burn prevention

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.

B) 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 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.

PARTS DIAGRAM



PARTS LISTS

TIG90 & TIG115

No.	Description	Qty	Part No.	Part No.
1	Input Cable	1	EM20220014	EM20220014
2	Green Pilot-light Switch 16a-250v	1	EM22200002	EM22200002
3	Upper Panel	1	EM33705220	EM33705220
4	Belt Regulator	1	EM21600024	EM21600024
5	Cable Clamp	1	EM21605009	EM21605009
6	Potentiometer Knob	1	EM21690127	EM21690127
7	Module For Inverter	1	EM42735015	EM42735016
8	Lower/Back Panel	1	EM33700139	EM33700139
9	Din Plug	2	EM22100002	EM22100002

TIG150

No.	Description	Qty	Part No.	Part No.
1	Input Cable	1	EM20220014	
2	Complete Fan	1	EM22800021	
3	Choke Winding Inverter	1	EM44035052	
4	Cable Clamp	1	EM21605010	
5	Plastic Vent	1	EM21690287	
6	Cover Panel	1	EM33705335	
7	Potentiometer 10k	1	EM26086008	
8	Dividing Panel	1	EM33620104	
9	Feet	2	EM21610019	
10	Transformer 230v	1	EM44155027	
11	On/Off Switch 16a-250v	1	EM22200002	
12	Rear Panel	1	EM33700180	
13	Plastic Abat-vent	1	EM21690286	
14	Female Dinse Plug	2	EM22100002	
15	Coupling For Belt	2	EM21690117	
16	Belt For Inverter	1	EM21600023	
17	Complete Inverter P.c.board	1	EM42735020	
18	Front Panel	1	EM33710250	
19	Potentiometer Knob	1	EM21690288	

C) Fire and explosion prevention

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 combustibles to sparks.
- d) combustibles adjacent to walls, ceilings, roofs or metal partitions can be ignited by radiant or conducted heat.

After work is done, 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 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 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.

2. ELECTRIC ARC (MIG, TIG) WELDING

Comply with precautions in 1 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, weldments are hot. The wise operator avoids unnecessary risks and protects himself and others from accidents.

2A) BURN PROTECTION

Comply with precautions in 2. 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.

DON'T GET BURNED! COMPLY WITH PRECAUTIONS!

1) Protective clothing

Wear long sleeved clothing (particularly for gas shielded arc) in addition to gloves, hat and shoes (2A). 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 collar to protect chest and neck and button pockets to prevent entry of sparks.

2) Eye and head protection

Protect eyes from exposure to arc. NEVER look at an electric arc without protection. Welding helmet or shield containing a filter plate shade no. 12 or denser must be used when welding. 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 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.

3) 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 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.

ACCESSORIES

1. ARC WELDING kit, **Part No. 6010810 (Arc/Tig 90 & 120)** **Part No. 6010825 (Arc/TIG 150)**

- comprising
1. Electrode Holder with cables
 2. Work Clamp with cable
 3. Head shield
 4. Wire Brush with pick

2. TIG WELDING kit **Part No. 6010800**

- comprising
1. TIG Torch w/hose
 2. Gas Regulator Assembly
 3. Work Clamp with cable

SPECIFICATIONS

	Arc/TIG90	Arc/TIG120	Arc/TIG 150
Power Supply	230V 50Hz 1Ph	230V 50Hz 1Ph	230V 50Hz 1Ph
Max. Input Current	13A	17.5A	24A
Open Circuit Voltage	51V	50V	92V
Protection Class.	IP21	IP21	IP21
Insulating Class.	H	H	H
Min/Max. Welding Current	20/90A	20/110A	15/130A
Useable Electrodes	1.6 - 2.5mm Dia.	1.6 - 2.5mm Dia.	1.6 - 3.2mm Dia.
Dimensions	270x115x200	270x115x200	350x140x255
Weight	4kg	6kg	6.5kg
Part No.	6012130	6012140	6012160

Duty Cycle	Welding Current	Welding Current	Welding Current
35%	70Amps	100Amps	130Amps
60%	50Amps	70Amps	100Amps
100%	40Amps	60Amps	80Amps

eg. With a TIG 120 machine, you may weld at 100 Amps for 3.5 minutes (35%) in a 10 min. cycle, or for 6 minutes at 70 Amps.

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 read the data label

TIG WELDING

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	2.4	2.4	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

Always ensure that the gas is turned OFF at the cylinder after use.

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: 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.

2B) TOXIC FUME PREVENTION

Comply with precautions in 2-B. Generator engine exhaust must be vented to the outside air. Carbon monoxide can kill.

2C) FIRE AND EXPLOSION PREVENTION

Comply with precautions in 2-C. Equipment's rated capacity. 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.

2D) 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.

2E) PROTECTION FOR WEARERS OF ELECTRONIC LIFE SUPPORT DEVICES (PACEMAKERS)

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, gouging, or spot welding operations.

2F) TO PROTECT AGAINST SHOCK:

Keep body and clothing dry. Never work in damp area without adequate insulation against electrical 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.

1) Earthing the equipment

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

2) Electrode holders

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

3) Connectors

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

4) 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.

5) Terminals and other exposed parts

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

6) Electrode

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.

7) 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. Power disconnect switch must be available near the welding power source.

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.*

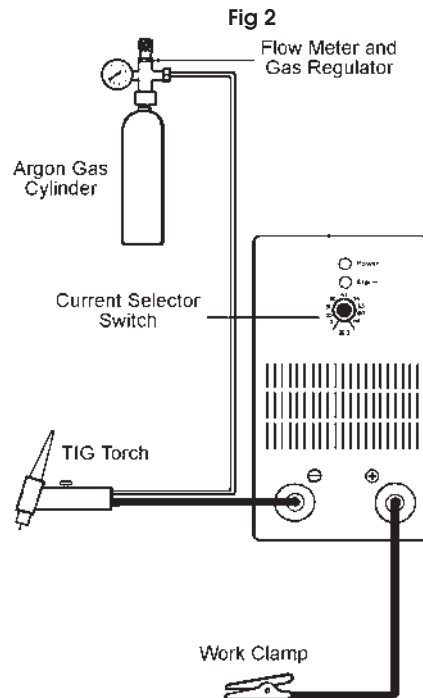
d) *The torch is advanced in the direction of welding, without lateral movement, maintaining the torch angle of 45° to the workpiece.*

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

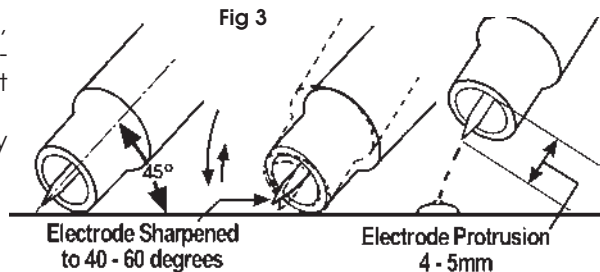
Additionally, before preparing for Tig welding, you must procure a large gas cylinder of 100% pure Argon.

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

1. Plug the **work return 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. Screw in the pressure regulator knob to set a pressure of approx. 2.5Kg./cm². (35 lbf/in²).
4. 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 longitudinally. (Consult your TIG Torch manual for the procedure for adjusting the electrode).
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.



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 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

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

SAFETY PRECAUTIONS for ARC/TIG WELDING

- ✓ **ALWAYS** ensure that there is full free air circulating around the outer casing of the machine, and that the louvres are unobstructed.
- ✓ 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.
- ✓ **ALWAYS** check that the pressure regulator and gauges are working correctly. DO NOT lubricate the regulator.
- ✓ **ALWAYS** use the correct regulator. Each regulator is designed to be used with a specific gas.
- ✓ **ALWAYS** inspect the hose before use to ensure it is in good condition.
- ✓ **ALWAYS** keep the free length of gas hose outside the work area.
- ✓ **ALWAYS** remove all flammable materials from the welding area.
- ✗ **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.
- ✗ **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.

- X NEVER** use or store in a wet/damp environment. DO NOT EXPOSE TO RAIN.
- X** 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.
- X NEVER**
 - a. Use a damaged cylinder.
 - b. Lift the cylinder by the valve.
 - c. Expose the cylinder to a heat source or sparks.
- X 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.
- X NEVER** use the Welder with input connections greater than 10M in length.
- X NEVER** point the TIG torch at any person or animal.
- X NEVER** touch the TIG torch nozzle until the welder is switched OFF and the nozzle has been allowed to cool off.
- X NEVER** connect, disconnect, or attempt to service the TIG torch, until the machine is switched OFF and disconnected from the mains supply.
- X 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.

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 commence.
 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 off.**
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 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 (Refer to Fig.2)

The machine is not equipped with a TIG welding torch and cables. We recommend the use of our **TIG WELDING KIT, Model TK1** (Part No. 6010800), which is designed specifically for use with this equipment, and is available from your CLARKE dealer.

WELDING TECHNIQUES

A. ARC WELDING (Refer to Fig 1.)

Arc welding cables are not supplied with this machine. We recommend the use of **CLARKE ARC WELDING KIT**, which is available from your CLARKE dealer, and is designed specifically for 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.

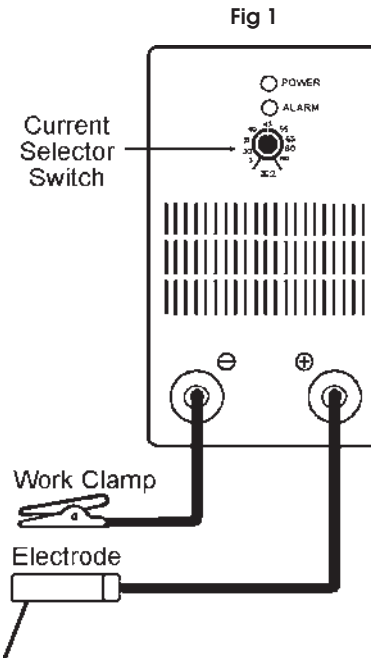
2. Attach the work clamp to the workpiece - as close as possible to the area being welded. Clean with a wire brush where necessary to ensure the connection is as clean as possible.
3. An appropriate current must then be set by turning the Welding Current Selector located on the front panel of the machine. 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.

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.



PRINCIPLES OF OPERATION

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.

Welding leads are not supplied with the machine. These are readily available from your CLARKE dealer. Please refer to 'Accessories' on page 21 for details.

1. ARC WELDING.

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 of 16 to 40V) and the current requirements (within the overall range of 20 to 550A). 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.

2. TIG WELDING

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

- 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 (0.5mm), without undue distortion.

Main Features of Tig Welding

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

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

ELECTRICAL CONNECTIONS

WARNING! THIS APPLIANCE MUST BE EARTHED.

a. Arc/TIG90

Connect the power cable directly to suitably fused, 230 volt (50Hz) domestic electrical supply or to a standard 13 amp BS 1363 plug, fitted with a 13 amp fuse. **We strongly recommend that this be done via a Residual Current Device (RCD).**

Fuse Rating

The fuse in the plug must be replaced with one of the same rating (**13 amps**) and this replacement must be ASTA approved to BS1362.

b. Arc/TIG's 120 & 150

Connect the mains lead, through a suitably fused isolator switch, to a 230 Volt (50Hz) electrical supply, with a fuse rating in accordance with the specifications shown on page 21. **A standard 13 Amp plug MUST NOT be used with these welders.**

c. ALL MODELS

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 Cable

If an extension cable is fitted, ensure the minimum cross section of the conductor is 1.5mm² for up to 15 metres in length, and 2.5mm² for up to 25 metres.