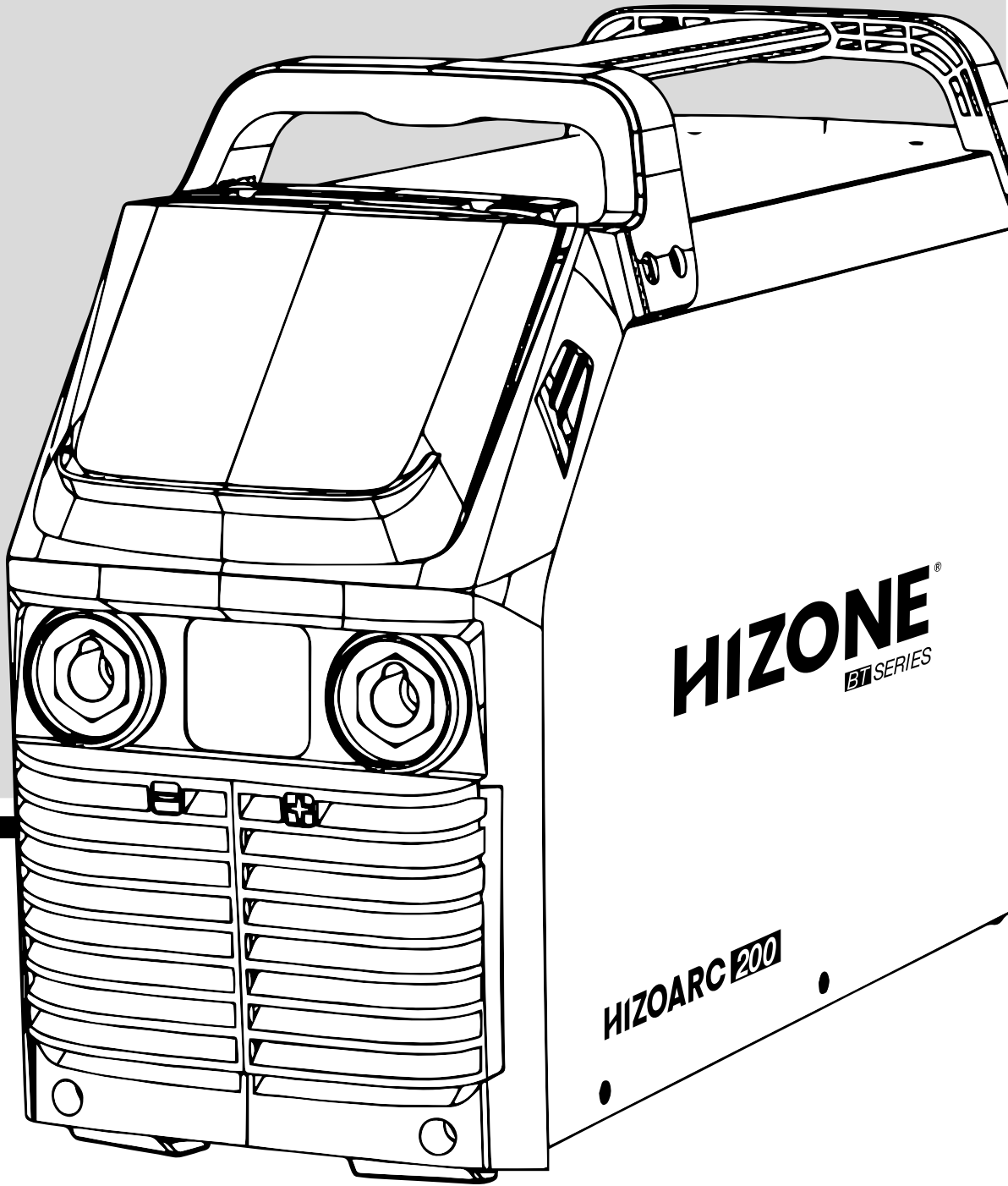
HIZONE®

BT SERIES

HIZOARC 200

USERMANUAL



OPERATOR'S MANUAL

HIZONE®

BT SERIES

BT HIZOARC 200

INVERTER Based Welding Machines

IMPORTANT: **Read this Owner's Manual Completely** before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. Contact your distributor if you do not fully understand this manual.

CONTENT

§1 Safety

Notice: **The instructions are for reference only. The manufacturer reserves the right to explain the differences between the description and the product due to product changes and upgrades!**

The device is manufactured using state-of-the-art technology and according to recognised safety standards. If used incorrectly or misused, however, it can cause:

- Injury or death to the operator.
- Damage to the device and other material assets belonging to the operating company.
- Inefficient operation of the device.

General

All persons involved in commissioning, operating, maintaining and servicing the device must:

- Be suitably qualified.
- Have sufficient knowledge of welding.
- Read and follow these operating instructions carefully.

The operating instructions must always be at hand wherever the device is being used. In addition to the operating instructions, attention must also be paid to any generally applicable and local regulations regarding accident prevention and environmental protection.

Before switching on the device, rectify any faults that could compromise safety.

This is for your personal safety!

Environment

Products are limited to use under suitable conditions. In extreme cases, the use of products, such as high temperature, low temperature, thunderstorm weather, will shorten the life of the machine and even cause damage, please avoid the above situation.

Excessive ambient temperature will cause the machine heat dissipation is not smooth, so that the internal components of the machine heat seriously. Usually the maximum operating temperature is 104°F (40°C).

Low temperature may lead to performance degradation or damage of components inside the product, resulting in ice inside the water tank. Usually the lowest operating temperature is 14°F (-10°C). Please keep warm and add antifreeze in the water tank if necessary.

Too humid environment may lead to rust of shell and circuit components. In rainy weather, using products may lead to short circuit and other abnormalities. Please try to avoid using in the above environment. If the machine is wet, please dry in time.

Areas

Running parts and specific parts of risk will take damage for your body or others. The corresponding notices are as follows. It is quite a safe operation after taking several necessary protection measures.

Items being welded generate and hold high heat and can cause severe burns. Don’t touch hot parts with bare hands. Allow a cooling period before working on the welding gun. Use insulated welding gloves and clothing to handle hot parts and prevent burns.

A high risk of injury exists when the welding wire emerges from the welding torch. Always keep the torch well away from the body.

Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-gears, fans and all other moving parts when starting, operating or repairing equipment, for example:

- Fans
- Cogs
- Rollers
- Shafts
- Wire spools and welding wire

By product

Many harmful phenomena, such as noise, bright light and harmful gas, will inevitably occur in the welding process. In order to avoid harmful phenomena causing harm to the human body, it is necessary to make corresponding preparations in advance.

Arc rays from the welding process produce intense visible and invisible ultraviolet and infrared rays that can burn eyes and skin.

- Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding.
- Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

Noise from some processes or equipment can damage hearing. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.

The build up of gas can causes a toxic environment, deplete the oxygen content in the air resulting in death or injury. Many gases use in welding are invisible and odorless.

- Shut off shielding gas supply when not in use.
- Always ventilate confine spaces or use approved air-supplied respirator.

Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.

- Do not breathe the smoke and gas generated whilst welding or cutting, keep your head out of the fumes. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. Additional precautions are also required when welding on galvanized steel.

- Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet and follow your employer's safety practices.

Explosion

In the process of using, careless operation will lead to fire, explosion and gas leakage or other dangers. Before using the product, we need to know the correct preventive measures in order to avoid accidents.

Don't add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

Flying sparks from the welding arc, hot work piece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating or fire.

- Welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Avoid welding near hydraulic lines.
- Have a fire extinguisher readily available. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situation.

- Vent hollow castings or containers before heating, cutting or welding. They may explode.
- Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuff less trousers, high shoes and a cap over your hair.
- Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

- Protect gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames sparks, and arcs.

- Insure cylinders are held secure and upright to prevent tipping or falling over.
- Never allow the welding electrode or earth clamp to touch the gas cylinder, do not drape welding cables over the cylinder.
- Open the cylinder valve slowly and turn your face away from the cylinder outlet valve and gas regulator.

Cylinder

Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

- Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

Electricity

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and internal machine circuits are also live when power is on.

Different products have different requirements for input voltage, such as single-phase and three-phase. If the machine with three-phase electricity as input appears phase absence or voltage fluctuation, it may cause serious damage to the product interior.

All products must be well grounded before they are connected to the power supply. In case of abnormal case such as shell leakage, please disconnect the power supply immediately and notify the professionals for maintenance.

Don’t sling cables or leads around either the body or parts of the body.

The electrode (rod electrode, tungsten electrode, welding wire, etc) must

- Never be immersed.
- Never be touched when current is flowing.

When the machine is connected to the power supply, there is electricity inside the machine. Please do not touch the wires, circuit boards and related electrical parts in order to avoid life hazards and property losses.

During MIG/MAG or TIG welding, the welding wire, the wire spool, the drive rollers and all metal parts that are in contact with the welding wire are live. Always set the wire-feed unit up on a sufficiently insulated surface or use a suitable, insulated wire-feed unit mount.

According to the domestic and international standards, the ambient devices’ electromagnetism situation and anti-interference ability must be checked:

- Safety device.
- Power line, Signal transmission line and Date transmission line.
- Date processing equipment and telecommunication equipment.
- Inspection and calibration device.

Supporting measures for avoidance of EMC problems:

1. Mains supply

If electromagnetic interference arises despite correct mains connection, additional measures are necessary.

2. Welding power leads must be kept as short as possible, must run close together and be kept well apart from other leads
3. Equipotential bonding
4. Earthing of the workpiece

If necessary, establish an earth connection using suitable capacitors.

5. Shielding, if necessary

- Shield off other nearby devices.
- Shield off entire welding installation.

Radiation Class A Device.

- Only can be used in the industrial area.
- If it is used in other area, it may cause connection and radiation problems of circuit.

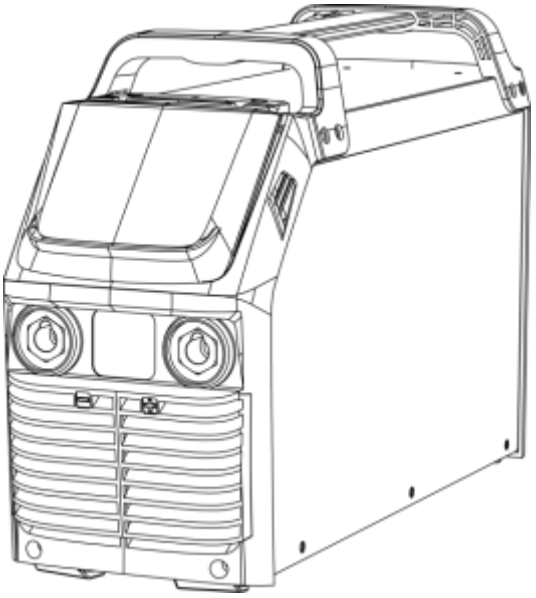
Radiation Class B device.

- Satisfy the emissions criteria for residential and industrial areas. This is also true for residential areas in which the energy is supplied from the public low-voltage mains.

EMC device classification as per the rating plate or technical data.

§2 Overview

§2.1 Features



- New appearance and new panel design: More trendy and humanized.
- Capable of welding with Lift TIG Mode.
- Adjustable arc force, hot start & anti-stick for greater control and ease of use.
- LCD screen display for accurate pre-setting and feedback of welding parameters & output.
- Temperature, voltage and current sensors for increased reliability & safety.
- Light weight & compact design, ideal for portable applications.
- Designed to work with diesel generators and to avoid failures due to its voltage spikes.

§2.2 Brief Introduction

BT HIZOARC series welder is a MMA arc welder which adopts the insulated gate bipolar transistor (IGBT) power module. It can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, it is characterized with portable, small size, light weight, low consumption and noise etc.

BT HIZOARC series has excellent performance: constant current output makes welding arc more stable; fast dynamic response speed reduces the impact form the arc length fluctuation to the current.

There are also some automatic protection functions for under voltage, over current, over heat, etc. inside the welders, when the problems listed before occurred, the LCD on the front panel will display and at the same time the output current will be cut off. It can self-protect and prolong the using life and greatly improved the reliability of the welders.

BT HIZOARC series can be ignited easily, also with little splash and good weld bead. BT HIZOARC series is widely used in Petroleum, chemical, mechanical, shipbuilding, architecture, boiler, pressure container, war industry and installation and so on. This

machine has high duty cycle even in the 40℃, which can keep the continuous operation. The frame is Stability of the machine, which can keep working under high temperature and corrosion environment.

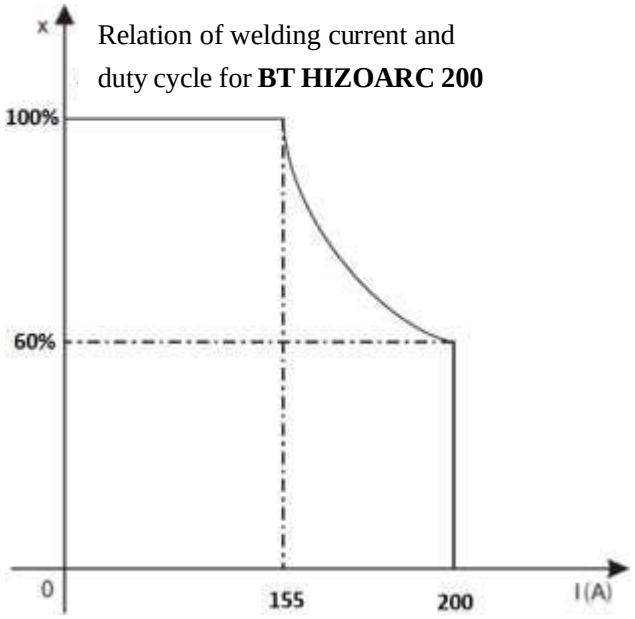
§2.3 Technical Data

Model / Parameters	BT HIZOARC 200	
Power Voltage (V)	1-230±10%	
Frequency (Hz)	50/60	
	MMA	TIG
Rate Input Current (A)	45.0	30.5
Rated Input Power (kVA)	10.3	7.0
Welding Current (A)	10~200	
No Load Voltage (V)	80	77
Duty Cycle (40℃ 10min)	60% 200A 100% 155A	
Efficiency (%)	≥80	
Power Factor	0.6	
Protection Class	IP23S	
Cooling	AF	
Circuit breaker standard	JD03-A1 30A	
Net Weight (Kg)	7.0	
Dimensions (mm)	460*160*290	
Electrode Diameter	φ1.6~φ4.0	
Electrode Type	6013,7018 etc.	

Note: The above parameters are subject to change with future machine improvement!

§2.4 Duty cycle and Over-heat

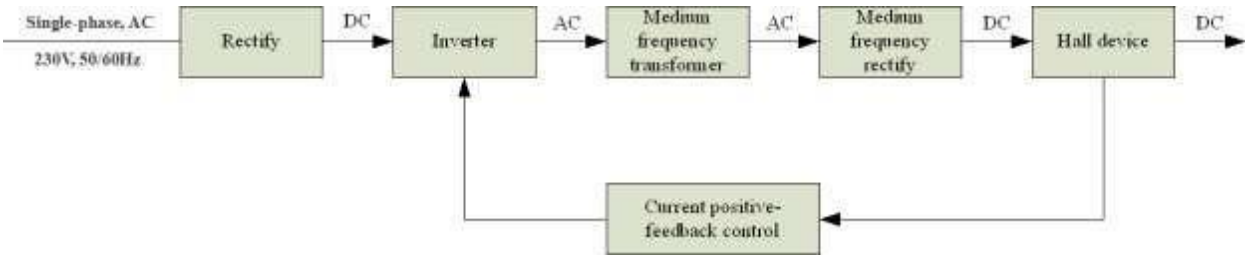
The letter “X” stands for Duty Cycle, whichis defined as the portion of the time a welding machine can weld continuously with its rated output current within a certain time cycle (10 minutes). The relation between the duty cycle “X” and the output welding current “I” is shown as the right figure. If the welding machine is overheating, the IGBT over-heat protection sensing will send a signal to the welding machine control unit to cut the output welding current OFF and the error code is displayed on the screen. In that case, the machine should not be welding for 10~15 minutes to cool down with the fanrunning. When operating the machine again, the welding output current or the duty cycle should be reduced.



Relation of welding current and duty cycle for **BT HIZOARC 200**

§2.5 Working Principle

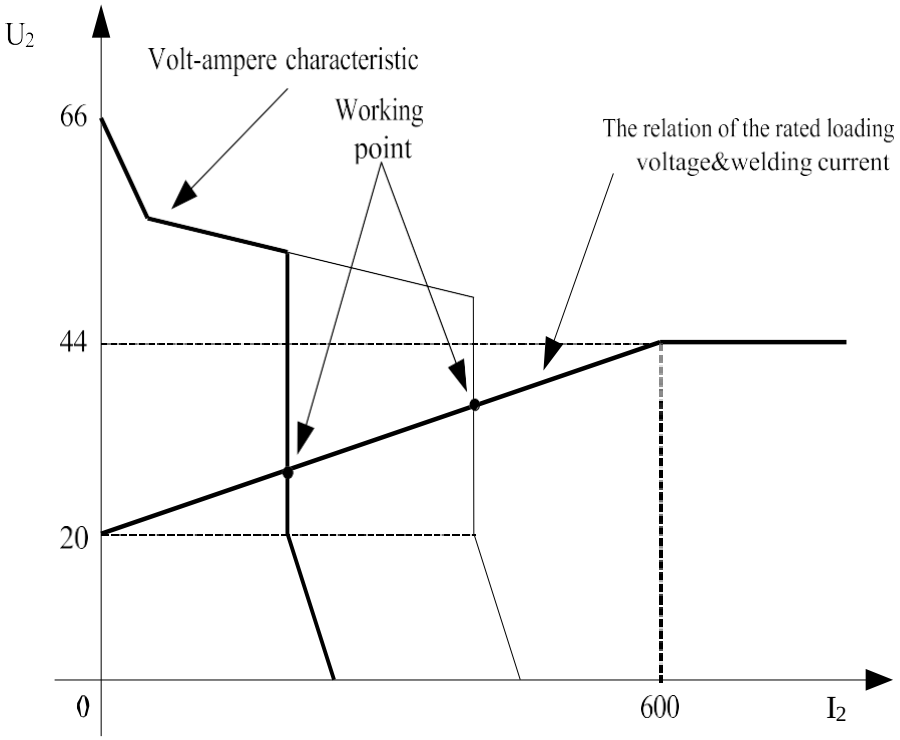
The working principle of BT HIZOARC series of welding machines is shown in the following figure. Single-phase 230V line frequency AC is rectified into DC (about 312V), then is converted to medium frequency AC (about 50KHz) by inverter device (IGBT), after reducing voltage by medium transformer (the main transformer) and rectified by medium frequency rectifier (fast recovery diode), and is outputted by inductance filtering. The circuit adopts current feedback control technology to insure current output stability. Meanwhile, the welding current parameters can be adjusted continuously and steplessly to meet with the requirements of welding craft.



§2.6 Volt-Ampere Characteristic

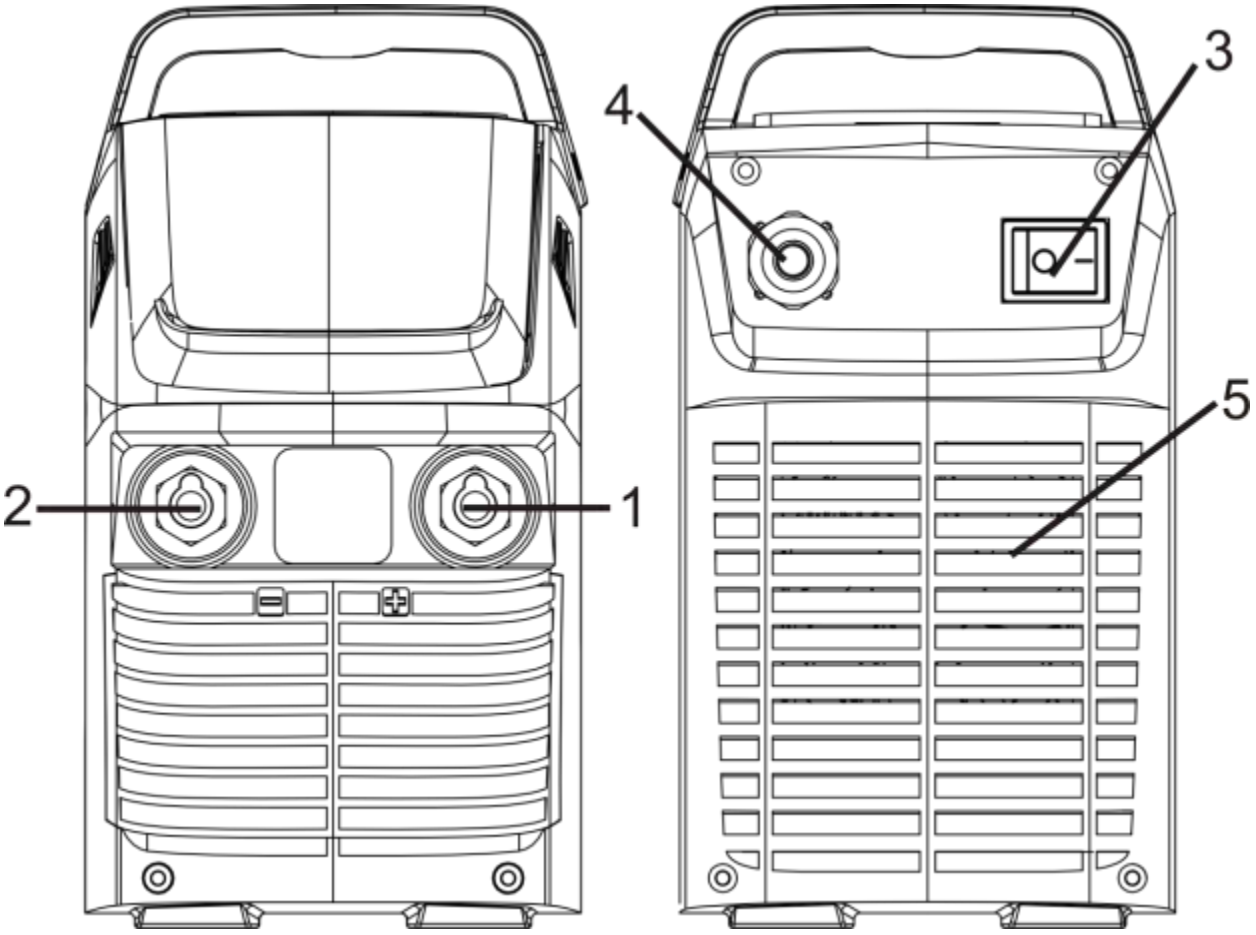
BT HIZOARC series of welding machines has excellent volt-ampere characteristic. Referring to the following graph. In MMA welding, the relation between the rated loading voltage U_2 and welding current I_2 is as follows:

When $I_2 \leq 600A$, $U_2 = 20 + 0.04I_2$ (V); When $I_2 > 600A$, $U_2 = 44$ (V).



§3 Installation & Operation

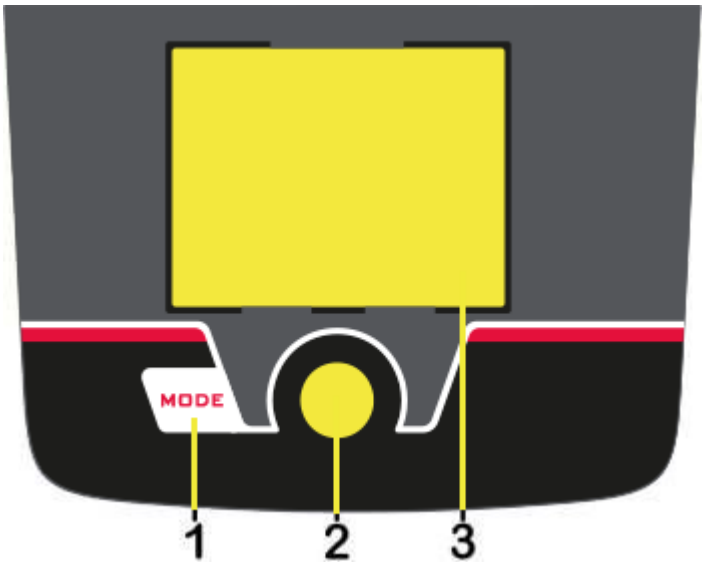
§3.1 Layout for the front and rear panel



1. **Positive output**: Connect the welding the clamp.
2. **Negative output**: Connect to pliers.
3. **Power switch**: Control power through and break.
4. **Power Access Client**: Access to cable.
5. **Fan:** Help plant cooling.

§3.2 Layout for Control panel

§3.2.1 Control panel



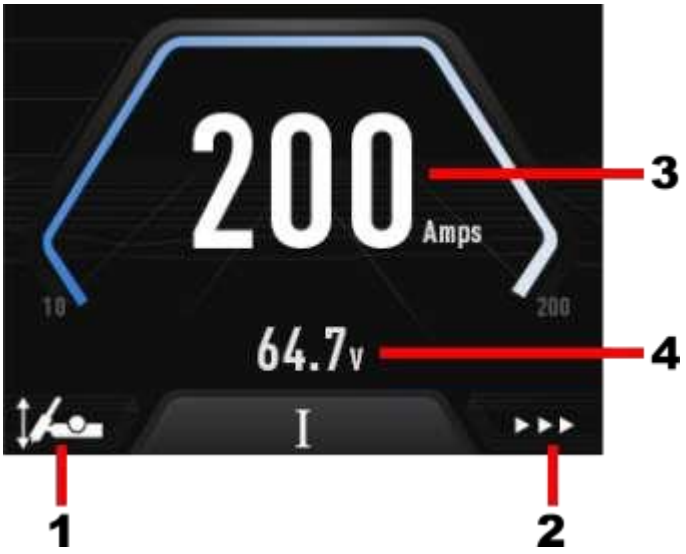
1. **Welding mode button**: Press it to select MMA or TIG welding mode.
2. **Parameter knob**: Press it to select parameters and rotate it to adjust value.
3. **Screen**: It displays welding mode, current and other parameters or error code.

§3.2.2 MMA display introduction

1. **Welding mode display**: Press the welding mode key to select MMA/MMA VRD.
2. **Welding Current value**: Press the knob to select and rotate it to adjust value. Range: 10~200A.
3. **Hot Start value**: Press the knob to select and rotate it to adjust value. Range: 0~10.

4. **Arc Force value**: Press the knob to select and rotate it to adjust value. Range: 0~10.
5. **Working condition display**: There are three small arrows. If the machine is in welding state, the small arrows will change colors in order.
6. **Current display.**
7. **Voltage display.**

§3.2.3 TIG display introduction



1. **Welding mode display**: Press the welding mode button to select TIG Lift.
2. **Working condition display**: There are three small arrows. If the machine is in welding state, the small arrows will change colors in order.
3. **Current display:** Rotate the knob to adjust value**.**
4. **Voltage display.**

§3.2.4 Language setting panel

Press the welding mode button and hold it for 3s to enter the Language interface. Here you can adjust the language by the knob.

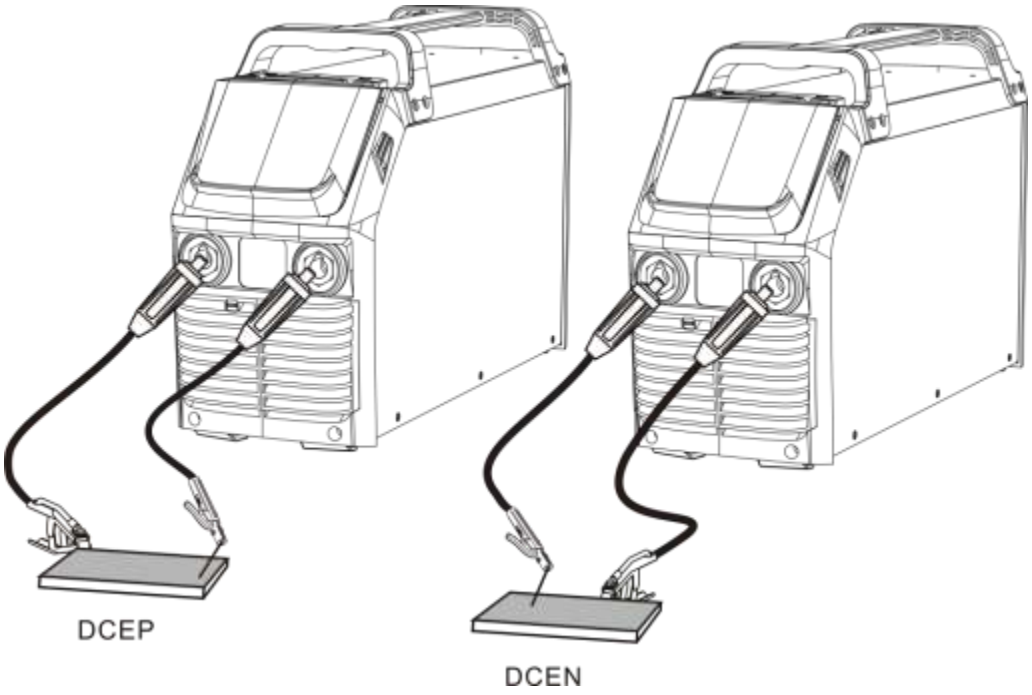
§3.3 Installation & Operation for MMA Welding

§3.3.1 Connection of Output Cables

Two sockets are available on this welding machine. For MMA welding the electrode holder is shown be connected to the positive socket, while the earth lead (work piece) is connected to the negative socket, this is known as DCEP. However various electrodes require a different polarity for optimum results and careful attention should be paid to the polarity, refer to the electrode manufacturer information for the correct polarity.

DCEP: Electrode connected to “+” output socket.

DCEN: Electrode connected to “-” output socket.



(1) Connect the earth lead to “-”, tighten clockwise;

(2) Connect the electrode lead to “+”, tighten clockwise;

(3) Each machine is equipped with a power cable should be based on the input voltage welding power cable connected to the appropriate position, not to pick the wrong voltage;

(4) With the corresponding input power supply terminal or socket good contact and prevent oxidation;

(5) With a multi meter measure the input voltage is within the fluctuation range;

(6) The power ground is well grounded.

§3.3.2 Operation for MMA Welding

(1) According to the above method to install is correct, turn the power switch, so that the power switch is “ON” position, then the screen light, the fan comes on, the device work properly.

(2) Select the MMA function with the welding mode button.

(3) Set the welding current, Hot Start and Arc Force relevant to the electrode type and size being used as recommended by the electrode manufacturer.

(4) Place the electrode into the electrode holder and clamp tight.

(5) Strike the electrode against the work piece to create and arc and hold the electrode steady to maintain the arc.

(6) Commence welding. If necessary, readjust the Weld Current control to obtain the welding condition required.

(7) After completion of welding the Power Source should be left turned ON for 2 to 3 minutes. This allows the fan to run and cool the internal components.

(8) Switch the ON/OFF Switch to the OFF position.

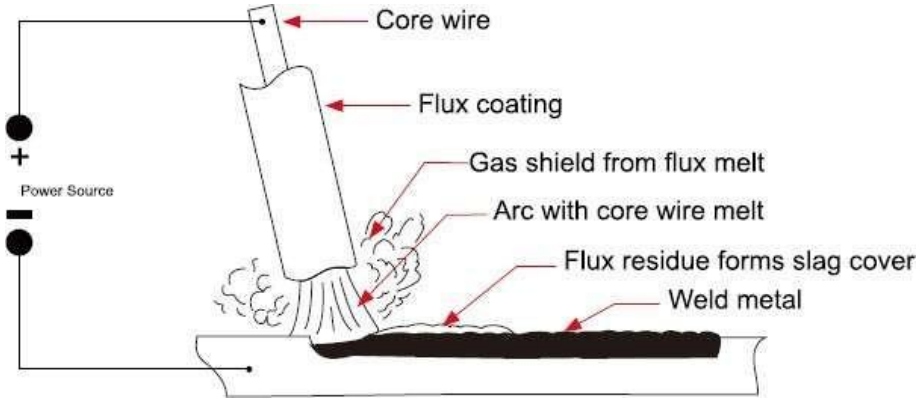
NOTE:

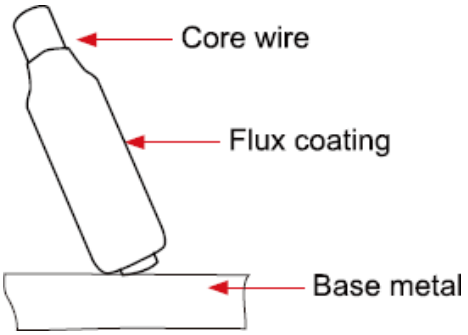
- Note the polarity of wiring, the general DC welding wire in two ways. Selected according to the technical requirements of welding the appropriate connection, if you choose incorrectly will result in arc instability and spatter large adhesion and other phenomena, such cases can be quickly reversed to joints.
- If the work piece distance from the welding machine, the second line (electrode holder and ground) is longer, so choose the appropriate conductor cross-sectional area should be larger to reduce cable voltage drop.

§3.3.3 MMA Welding

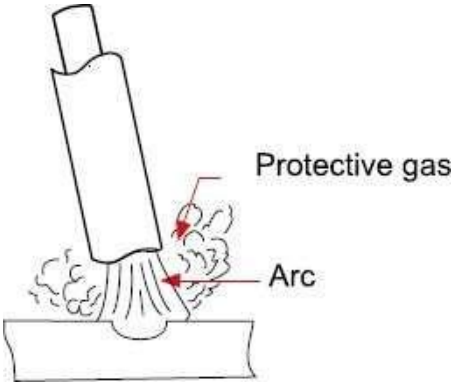
One of the most common types of arc welding is manual metal arc welding (MMA) or stick welding. An electric current is used to strike an arc between the base material and a consumable electrode rod or “stick”. The electrode rod is made of a material that is compatible with the base material being welded and is covered with a flux that gives off gaseous vapours that serve as a shielding gas and providing a layer of slag, both of

which protect the weld area from atmospheric contamination. The electrode core itself acts as filler material the residue from the flux that forms slag covering over the weld metal must be chipped away after welding.





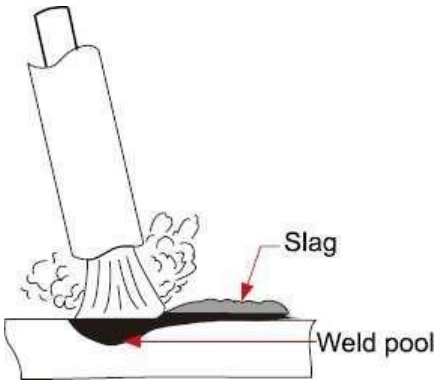
- The arc is initiated by momentarily touching the electrode to the base metal.
- The heat of the arc melts the surface of the base metal to form a molten pool at the end of the electrode.
- The melted electrode metal is transferred across the arc into the molten pool and becomes the deposited weld metal.
- The deposit is covered and protected by a slag which comes from the electrode coating.
- The arc and the immediate area are enveloped by an atmosphere of protective gas.



Manual metal arc (stick) electrodes have a solid metal wire core and a flux coating. These electrodes are identified by the wire diameter and by a series of letters and numbers. The letters and numbers identify the metal alloy and the intended use of the electrode.

The **Metal Wire Core** works as conductor of the current that maintains the arc. The core wire melts and is deposited into the welding pool.

The covering on a shielded metal arc welding electrode is called **Flux**. The flux on the electrode performs many diferent functions.



These include:

- producing a protective gas around the weld area
- providing fluxing elements and deoxidizer
- creating a protective slag coating over the weld as it cools
- establishing arc characteristics
- adding alloying elements.

Covered electrodes serve many purposes in addition to filler metal tothe molten pool. These additional functions are provided mainly by the covering on the electrode.

§3.3.4 MMA Welding Fundamentals

Electrode Selection

As a general rule, the selection of an electrode is straight forward, in that it is only a matter of selecting an electrode of similar composition to the parent metal. However, for some metals there is a choice of several electrodes, each of which has particular properties to suit specific classes of work. It is recommend to contact your welding supplier for the correct selection of electrode.

Electrode Size

Average Thickness of Material	Maximum Recommended Electrode Diameter
1.0~2.0 mm	2.5 mm
2.0~5.0 mm	3.2 mm
5.0~8.0 mm	4.0 mm
>8.0 mm	5.0 mm

The size of the electrode generally depends on the thickness of the section being welded, and the thicker the section the larger the electrode required. The table gives the maximum size of electrodes that may be used for various thicknesses of section base on using a general purpose type 6013 electrode.

Welding Current (Amperage)

Electrode Size ø mm	Current Range (Amps)
2.5 mm	60~95
3.2 mm	100~130
4.0 mm	130~165
5.0 mm	165~260

Correct current selection for a particular job is an important factor in arc welding. With the current set too low, difficulty is experienced in striking and maintaining astable arc. The electrode tends to stick to the work, penetration is poor and beads with a distinct rounded profile will be deposited. Too high current is accompanied by overheating of the electrode resulting undercut and burning through of the base metal and producing excessive spatter. Normal current for a particular job may be considered as the maximum, which can be used without burning through the work, over-heating the electrode or producing a rough spattered surface. The table shows current ranges generally recommended for a general purpose type 6013 electrode.

Arc Length

To strike the arc, the electrode should be gently scraped on the work until the arc is established. There is a simple rule for the proper arc length; it should be the shortest arc that gives a good surface to the weld. An arc too long reduces penetration, produces spatter and gives a rough surface finish to the weld. An excessively short arc will cause sticking of the electrode and result in poor quality welds. General rule of thumb for down hand welding is to have an arc length no greater than the diameter of the core wire.

Electrode Angle

The angle that the electrode makes with the work is important to ensure a smooth, even transfer of metal. When welding in down hand, fillet, horizontal or overhead the angle of the electrode is generally between 5 and 15 degrees towards the direction of travel. When vertical up, welding the angle of the electrode should be between 80 and 90 degrees to the work piece.

Travel Speed

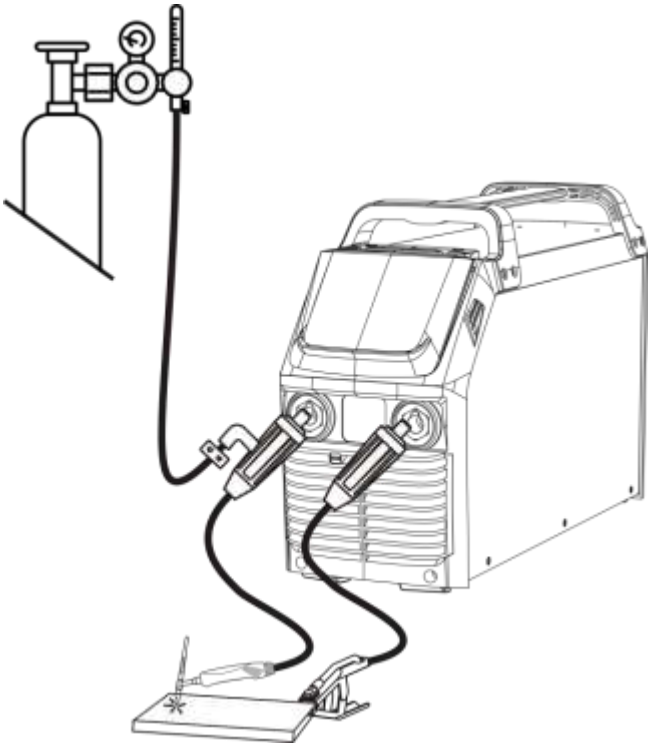
The electrode should be moved along in the direction of the joint being welded at a speed that will give the size of run required. At the same time, the electrode is fed downwards to keep the correct arc length at all times. Excessive travel speeds lead to poor fusion, lack of penetration etc, while too slow a rate of travel will frequently lead to arc instability, slag inclusions and poor mechanical properties.

Material and Joint Preparation

The material to be welded should be clean and free of any moisture, paint, oil, grease, mill scale, rust or any other material that will hinder the arc and contaminate the weld material. Joint preparation will depend on the method used include sawing, punching, shearing, machining, flame cutting and others. In all cases, edges should be clean and free of any contaminates. The type of joint will be determined by the chosen application.

§3.4 Installation & Operation for TIG Welding

§3.4.1 Set up installation for TIG Welding



(1) Switch the ON/OFF Switch to OFF;

(2) Connect the earth lead to “+”, tighten clockwise;

(3) Connect the TIG torch cable to “-”, tighten clockwise;

(4) Using a secured Argon cylinder, slowly crack open then close the cylinder valve while standing off to the side of the valve. This will remove any debris that may be around the valve & regulator seat area;

(5) Install the regulator and tighten with a wrench;

(6) Connect the gas hose to the outlet of the Argon regulator, and tighten with a wrench;

(7) Be sure the gas valve on the torch is closed, and slowly open the Argon Cylinder Valve to the fully open position;

(8) Connect the ground clamp to your work piece;

(9) Plug the power cable into the appropriate outlet.

NOTE:

- When TIG operation, the shielded gas is inputted to welding gun directly.
- Secure the gas cylinder in an upright position by chaining them to a stationary support to prevent falling or tipping.

§3.4.2 Operation for TIG Welding

(1) According to the above method to install is correct, turn the power switch to the “ON” position, the screen should illuminate, the fan comes on, the device work properly.

(2) Press the welding mode key to select TIG Lift.

(3) Set the weld current control knob to the desired amperage.

(4) The tungsten must be ground to a blunt point in order to achieve optimum welding results. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning.

(5) Install the tungsten with approximately 3mm to 7mm sticking out from the gas cup, ensuring you have correct sized collet.

(6) Tighten the back cap.

(7) Commence welding. If necessary, readjust the Weld Current control to obtain the

welding condition required.

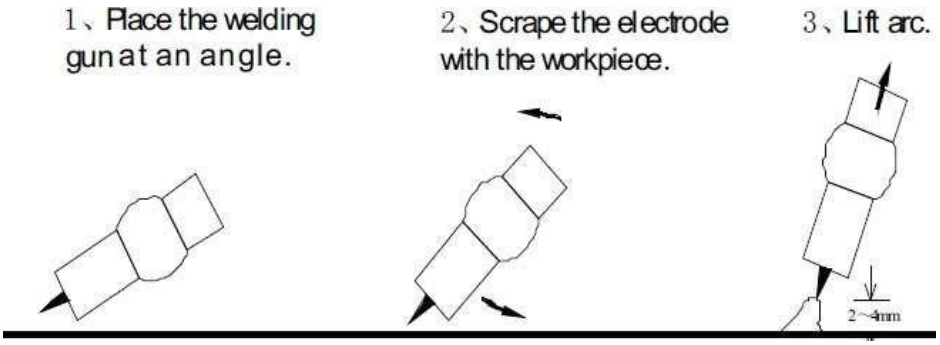
(8) After completion of welding the Power Source should be left turned ON for 2 to 3 minutes. This allows the fan to run and cool the internal components.

(9) Switch the ON/OFF Switch to the OFF.

§3.4.3 TIG Welding Fundamentals

Stricking the arc for TIG Operation: when tungsten electrode touches the workpiece, the short-circuit current is only 28A. After generating arc, current can rise to the setting welding current. If the tungesten electrode touches the workpiece when welding, the current will drop to 5A within 2s, which can reduce tungsten waste, prolong the using life of the tungsten electrode, and prevent tungsten clipping.

■ Scraping arc



■ Tungsten Electrode Current Ranges

Electrode Diameter	DC Current
1.0mm	25 - 85
1.6mm	50 - 160

■ Shielding Gas Selection

Alloy	Shielding Gas
Carbon Steel	Welding Argon
Stainless Steel	Welding Argon
Nickel Alloy	Welding Argon
Copper	Welding Argon
Titanium	Welding Argon

■ Tungsten Electrode Types

Electrode Type (Ground Finish)	Welding Application	Features	Colour Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, long life, high current carrying capacity.	Red
Ceriated 2%	AC & DC welding of mild steel, stainless steel, copper aluminium magnesium and their alloys.	Longer life, more stable arc, easier starting, wilder current range, narrower more concen-trated arc.	Grey

■ TIG Welding Parameters for Steel

Base Metal Thickness	DC Current		Electrode Diameter	Filler Rod Diameter	Argon Gas Flow Rate
	Mild Steel	Stainless Steel			
1.0mm	40-50	25-35	1.0mm	1.6mm	5LPM
1.6mm	70-90	50-70	1.6mm	1.6mm	7LPM
3.2mm	90-115	90-110	1.6mm	2.4mm	7LPM

§3.5 Operation environment

▲Height above sea level ≤1000 M.

▲Operation temperature range: -10 ~ +40℃.

▲Air relative humidity is below 90% (20℃).

▲Preferable site the machine some angles above the floor level, the maximum angle does not exceed 15℃.

▲Protect the machine against heavy rain and against direct sunshine.

▲The content of dust, acid, corrosive gas in the surrounding air or substance cannot exceed normal standard.

▲Take care that there is sufficient ventilation during welding. There must be at least 30cm free distance between the machine and wall.

§3.6 Operation Notices

▲Read Section §1 carefully before starting to use this equipment.

▲Connect the ground wire with the machine directly.

▲Ensure that the input is 50/60Hz, single-phase: 230V ±10%.

▲Before operation, none concerned people should not be around the working area and especially children. Do not watch the arc in unprotected eyes.

▲Ensure good ventilation of the machine to improve Duty Cycle.

▲Turn off the engine when the operation finished for energy consumption efficiency.

▲When power switch shuts off protectively because of failure. Don’t restart it until problem is resolved. Otherwise, the range of problem will be extended.

▲In case of problems, contact your local dealer if no authorized maintenance staff is available!

§4 Maintenance & Troubleshooting

§4.1 Maintenance

In order to guarantee safe and proper operation of welding machines, they must be maintained regularly. Let customers understand the maintenance procedure of welding machines. Enable customers to carry on simple examination and inspections. Do your best to reduce the fault rate and repair times of welding machines to lengthen service life of arc welding machine. Maintenance items in detail are in the following table.

• **Warning: For safety while maintaining the machine, please shut off the main input power and wait for 5 minutes, until capacitors voltage already drop to safe voltage 36V!**

Date	Maintenance items
Daily examination	Observe that the knobs and switches in the front and at the back of arc welding machine are flexible and put correctly in place. If any knob has not been put correctly in place, please correct. If you can't correct or fix the knob, please replace immediately. If any switch is not flexible or it can't be put correctly in place, please replace immediately! Please get in touch with maintenance service department if there are no accessories. After turn-on power, watch/listen if the arc-welding machine has shaking, whistle calling or peculiar smell. If there is one of the above problems, find out the reason and clear it. If you can't find out the reason, please contact your local service repair station or distributor/Agent. Observe that the display value of LCD is intact. If the display number is not intact, please replace the damaged LCD. If it still doesn’t work, please maintain or replace the display PCB. Observe that the min./max.Values on LCD agree with the set value. If there is any difference and it has affected the normal welding results, please adjust it. Check whether the fan is damaged and whether it is normal to rotate or control. If the fan is damaged, please change immediately. If the fan does not rotate after the machine is overheated, observe if there is something blocking the blade. If it is blocked, please clear the problem. If the fan does not rotate after getting rid of the above problems, you can poke the blade by the rotation direction of fan. If the fan rotates normally, the start capacity should be replaced. If not, change the fan. Observe whether the fast connector is loose or overheated. If the arc-welding machine has the above problems, it should be fastened or changed. Observe whether the current output cable is damaged. If it is damaged, it should be insulated or changed.

Monthly examination	Using the dry compressed air to clear the inside of arc welding machine. Especially for clearing up the dusts on radiator, main voltage transformer, inductors, IGBT modules, fast recover diodes, PCB's, etc. Check the screws and bolts in the machine. If any is loose, please screw it tight. If it is shaved, please replace. If it is rusty, please erase rust on all bolts to ensure it works well.
Quarter-yearly examination	Check whether the actual current accords with the displaying value. If they did not accord, they should be regulated. The actual welding current value can be measured by and adjusted by plier-type ampere meter.
Yearly examination	Measure the insulating impedance among the main circuit, PCB and case, if it below 1MΩ, insulation is thought to be damaged and need to change, and need to change or strengthen insulation.

§4.2 Troubleshooting

- **Before the welding machines are dispatched from the factory, they have already been tested and calibrated accurately. It is forbidden for anyone who is not authorized by our company to do any change to the equipment!**
- Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to user!
- Only professional maintenance staff that is authorized by our company could overhaul the machine!
- **Be sure to shut off the Main Input Power before doing any repair work on the welding machine!**
- If there is any problem and there is no authorized professional maintenance personal on site, please contact local agent or the distributor!

If there are some simple troubles with the welding machine, you can consult the following Chart:

S/N	Troubles	Reasons	Solutions
1	Turn on the power source, and the LCD is on, but fan doesn't work	There is something in the fan	Clear out
		The fan motor damaged	Change fan motor
2	Turn on the power source, and the LCD is not on, and fan doesn't work	No input voltage	Check whether there is input voltage
		Overvoltage (Input voltage is too much or not)	Check input voltage
3	No no-load voltage output	There is trouble inside the machine	Check the main circuit, Pr1 and Pr2

4	No current output in the welding	Welding cable is not connected with the two output of the welder.		Connect the welding cable to the welder's output
		Welding cable is broken		Wrap, repair or change the welding cable
		Earth cable is not connected or loosen		Check the earth clamp
5	Not easy to start arc in the welding, or easy to cause sticking	The plug loosen or connect not well		Check and tighten the plug
		Oil or dust covered the workpiece		Check and clear out
6	The arc is not stable in the welding process	The arc force is too small		Increase the arc force
7	The welding current cannot be adjusted	Welding current potentiometer in the front panel connection not so good or damaged		Repair or change the potentiometer
8	The penetration of molten pool is not enough (MMA)	The welding current adjusted too low		Increase the welding current
		The arc force adjusted too small		Increase the arc force
9	Arc blow	Airflow disturbance		Use the shelter from airflow
		The electrode eccentricity		Adjust the electrode angle
				Change the electrode
		Magnetic effect		Incline the electrode to the opposite way of the magnetic blow
				Change the position of earth clamp or add earth cable in the two side of workpiece
				Use the short arc operation
10	The error code appears on the screen	Over heat protection	Over welding current	Induce the welding current output
			Working time too long	Induce the duty cycle (interval work)
		Over current protection	Unusual current in the main circuit	Test and repair the main circuit and drive PCB

§4.3 MMA welding trouble shooting

The following chart addresses some of the common problems of MMA welding. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly adhered to and followed.

NO.	Trouble	Possible Reason	Suggested Remedy
1	**No arc**	Incomplete welding circuit	Check earth lead is connected. Check all cable connections
		No power supply	Check that the machine is switched on and has a power supply
2	**Porosity − small cavities or holes resulting from gas pockets in weld metal**	Arc length too long	Shorten the arc length
		Work piece dirty, contaminated or moisture	Remove moisture and materials like paint, grease, oil and dirt, including mill scale from base metal
		Damp electrodes	Use only dry electrodes
3	**Excessive Spatter**	Amperage too high	Decrease the amperage or choose a larger electrode
		Arc length too long	Shorten the arc length
4	**Weld sits on top, lack of fusion**	Insufficient heat input	Increase the amperage or choose a larger electrode
		Work piece dirty, contaminated or moisture	Remove moisture and materials like paint, grease, oil and dirt, including mill scale from base metal
		Poor welding technique	Use the correct welding technique or seek assistance for the correct technique
5	**Lack of penetration**	Insufficient heat input	Increase the amperage or choose a larger electrode
		Poor welding technique	Use the correct welding technique or seek assistance for the correct technique
		Poor joint preparation	Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up
6	**Excessive penetration - burn through**	Excessive heat input	Reduce the amperage or use a smaller electrode
		Incorrect travel speed	Try increasing the weld travel speed

7	**Uneven weld appearance**	Unsteady hand, wavering hand	Use two hands where possible to steady up, practice your technique
8	**Distortion − movement of base metal during welding**	Excessive heat input	Reduce the amperage or use a smaller electrode
		Poor welding technique	Use the correct welding technique or seek assistance for the correct technique
		Poor joint preparation and or joint design	Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up
9	**Electrode welds with different or unusual arc characteristic**	Incorrect polarity	Change the polarity, check the electrode manufacturer for correct polarity

§4.4 DC TIG Welding trouble shooting

The following chart addresses some of the common problems of DC TIG welding. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly adhered to and followed.

NO.	Trouble	Possible Reason	Suggested Remedy
1	T**ungsten burning away quickly**	Incorrect Gas or No Gas	Use pure Argon. Check cylinder has gas, connected, turned on and torch valve is open
		Inadequate gas flow	Check the gas is connected, check hoses, gas valve and torch are not restricted
		Back cap not fitted correctly	Make sure the torch back cap is fitted so that the O-ring is inside the torch body
		Torch connected to DC+	Connect the torch to the DC- output terminal
		Incorrect tungsten being used	Check and change the tungsten type if necessary
		Tungsten being oxidized after weld is finished	Keep shielding gas flowing 10~15 seconds after arc stoppage. 1 second for each 10amps of welding current.
2	**Contaminated tungsten**	Touching tungsten into the weld pool	Keep tungsten from contacting weld puddle. Raise the torch so that the tungsten is off of the work piece 2~5mm

		Touching the filler wire to the tungsten	Keep the filler wire from touching the tungsten during welding, feed the filler wire into the leading edge of the weld pool in front of the tungsten
3	**Porosity - poor weld appearance and color**	Wrong gas/ poor gas flow/ gas leak	Use pure argon. Gas is connected, check hoses, gas valve and torch are not restricted. Set the gas flow between 6~12 l/min. Check hoses and fittings for holes, leaks et
		Contaminated base metal	Remove moisture and materials like paint, grease, oil and dirt from base metal
		Contaminated filler wire	Remove all grease, oil or moisture from filler metal
		Incorrect filler wire	Check the filler wire and change if necessary
4	**Yellowish residue/ smoke on the alumina nozzle & discolored tungsten**	Incorrect Gas	Use pure Argon gas
		Inadequate gas flow	Set the gas flow between 10~15 l/min flow rate
		Alumina gas nozzle too small	Increase the size of the alumina gas nozzle
5	**Unstable Arc during DC welding**	Torch connected to DC+	Connect the torch to the DC- output terminal
		Contaminated base metal	Remove materials like paint, grease, oil and dirt, including mill scale from base metal.
		Tungsten is contaminated	Remove 10mm of contaminated tungsten and re grind the tungsten
		Arc length too long	Lower torch so that the tungsten is off of the work piece 2~5mm
6	**Arc wanders during DC welding**	Poor gas flow	Check and set the gas flow between 10~15 l/min flow rate
		Incorrect arc length	Lower torch so that the tungsten is off of the work piece 2~5mm
		Tungsten incorrect or in poor condition	Check that correct type of tungsten is being used. Remove 10mm from the weld end of the tungsten and re sharpen the tungsten
		Poorly prepared tungsten	Grind marks should run lengthwise with tungsten, not circular. Use proper grinding method and wheel.
		Contaminated base metal or filler wire	Remove contaminating materials like paint, grease, oil and dirt, including mill scale from base metal. Remove all grease, oil or moisture from filler metal

7	**Arc difficult to start or will not start DC welding**	Incorrect machine set up	Check machine set up is correct
		No gas, incorrect gas flow	Check the gas is connected and cylinder valve open, check hoses, gas valve and torch are not restricted. Set the gas flow between 10~15 l/min flow rate
		Incorrect tungsten size or type	Check and change the size and or the tungsten if required
		Loose connection	Check all connectors and tighten
		Earth clamp not connected to work	Connect the earth clamp directly to the work piece wherever possible

§4.5 List of error code

Error Type	Error code	Description
Thermal relay	E01	Over-heating (1st thermal relay)
	E02	Over-heating (2nd thermal relay)
	E03	Over-heating (3rd thermal relay)
	E04	Over-heating (4th thermal relay)
	E09	Over-heating (Program in default)
Welding machine	E10	Phase loss
	E11	No water
	E12	No gas
	E13	Under voltage
	E14	Over voltage
	E15	Over current
	E16	Wire feeder over load
Switch	E20	Button fault on operating panel when switch on the machine
	E21	Other faults on operating panel when switch on the machine
	E22	Torch fault when switch on the machine
	E23	Torch fault during normal working process
Accessory	E30	Cutting torch disconnection
Communication	E40	Connection problem between wire feeder and power source
	E41	Communication error

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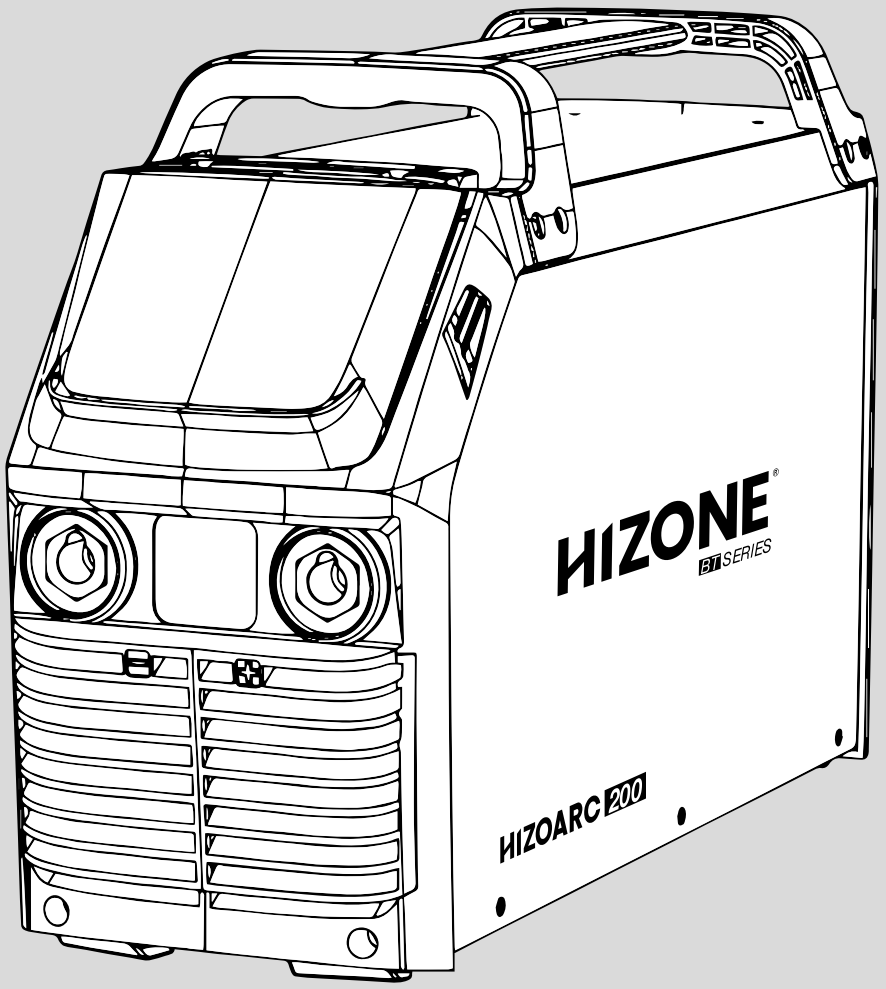

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