

# iBELL<sup>®</sup>

Hold the World. Digitally!



## MMA ARC WELDING MACHINE (IGBT) 220A

## USER MANUAL

# WELCOME

## Congratulations!

You have made an excellent choice with the purchase of iBELL® product.

By doing so you now have the assurance and peace of mind which comes from purchasing a product that has been manufactured to the highest standards of performance and safety, supported by the high-quality standards.

This iBELL® product is backed by a comprehensive manufacturer's 1-year warranty and an outstanding after sales service through our dedicated helpline.

We hope you will enjoy using your purchase for many years to come.

If you require technical support, please call our TOLL-FREE helpline for immediate assistance.

Warranty Terms / Conditions and procedures to follow for a warranty service are as given in warranty card.

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# SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

## 1-1. Symbol Usage



Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ Marks a special safety message.

☞ Means “Note”; not safety related.



This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

## 1-2. Arc Welding Hazards

▲ The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section NO TAG. Read and follow all Safety Standards.

▲ Only qualified persons should install, operate, maintain, and repair this unit.

▲ During operation, keep everybody, especially children, away.



### ELECTRIC SHOCK can kill.

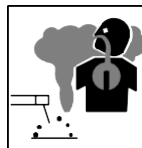
Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.

- If earth grounding of the workpiece is required, ground it directly with a separate cable – do not use work clamp or work cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

### SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



### FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



### ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

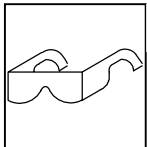
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in SafetyStandards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather and wool) and foot protection.



### WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see SafetyStandards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.



### FLYING METAL can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



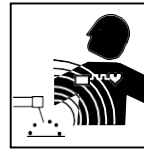
### BUILDUP OF GAS can injure or kill.

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



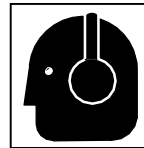
### HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.



### MAGNETIC FIELDS can affect pacemakers.

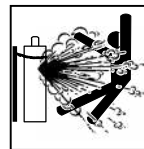
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



### NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



### CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in SafetyStandards.

### 1-3. Additional Symbols for Installation, Operation, and Maintenance



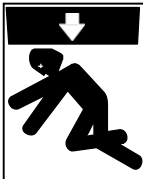
#### **FIRE OR EXPLOSION hazard.**

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.



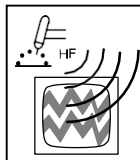
#### **MOVING PARTS can cause injury.**

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.



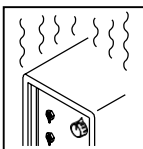
#### **FALLING UNIT can cause injury.**

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



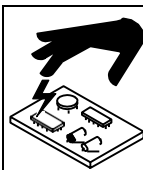
#### **H.F. RADIATION can cause interference.**

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



#### **OVERUSE can cause OVERHEATING**

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



#### **STATIC (ESD) can damage PC boards.**

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



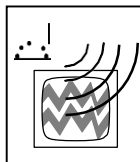
#### **MOVING PARTS can cause injury.**

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.



#### **WELDING WIRE can cause injury.**

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.



#### **ARC WELDING can cause interference.**

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

# INTRODUCTION

## 1. About Welding

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by using high heat to melt the parts together and allowing them to cool causing fusion. Arc welding uses an electrical arc to melt the work materials as well as filler material (sometimes called the welding rod) for welding joints. Arc welding involves attaching a grounding wire to the welding material or other metal surface. Another wire known as an electrode lead is placed on the material to be welded. Once that lead is pulled away from the material, an electric arc is generated. The arc then melts the work pieces along with the filler material that helps to join the pieces.

It should also be noted that in addition to proper cable size selection, it is very important to maintain the welding cable and the cable connections in good condition. Any cracks, cuts, worn spots, etc. in the weld cable can decrease its current carrying capability and create hot spots. In addition, worn or frayed cable connections to the work clamp, lugs or twist lock connectors can also decrease the ability to carry the current and create hot spots. All worn, frayed and damaged sections should be repaired immediately for proper operation and to minimize any potential safety hazards.

iBELL MMA inverter welding machine adopts full bridged advanced IGBT technology. Occurrence of inverter type arc welding equipment benefits from the occurrence of inverter power supply theory and device. Inverter arc welding power supply is to utilize the large power device IGBT, convert 50Hz power frequency into re-step-down rectification, output large power DC source through pulse width modulation (PWM) technology, weight and volume of main transformer is largely decreased, efficiency is increased by over 30%. Coming out of inverter welding machine is reputed as one revolution of welding machine industry by the experts.

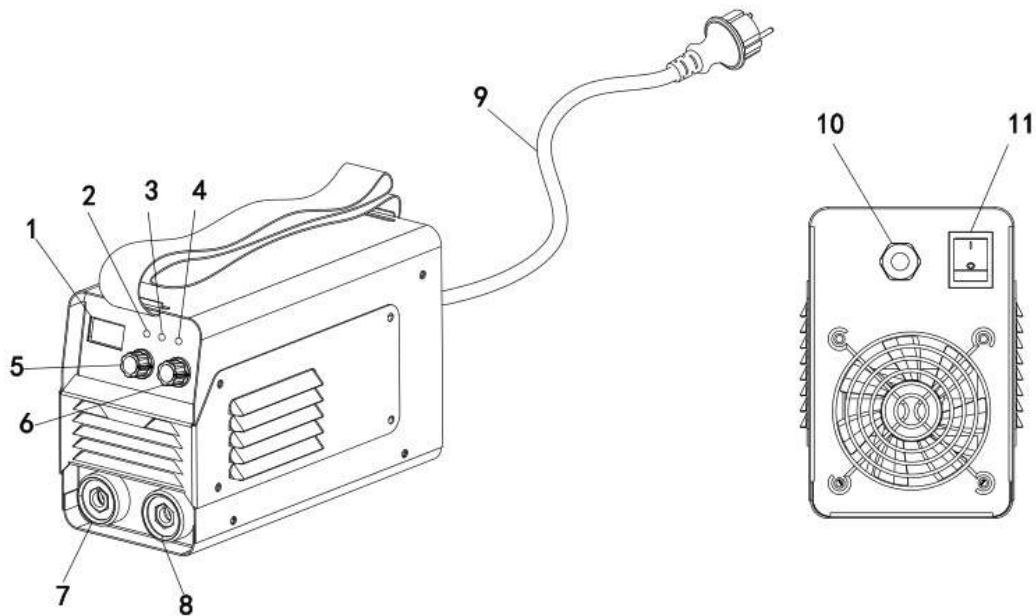
This machine can weld following types of metals:-

Metal Type	Electrodes Type

The equipment is packed in durable packages, designed especially for them. Nevertheless, always before using the equipment, make sure it was not damaged during transportation. Also check that you have received what you ordered and that there are instructions for it.

Place the unit on horizontal, solid and clean surface. Shield it from heavy rain and scorching sun. Make sure that cooling air circulates freely.

## IBL M220-76



1. Digital Display
2. Power indicator
3. Protection indicator
4. Fault Protection
5. Current adjusting knob
6. Arc force knob
7. Quick connector socket: welding machine output (-)
8. Quick connector socket: welding machine output (+)
9. Power Plug
10. Power cord anchorage
11. On-off Switch

## Technical data

Model	IBL M200-77	IBL M220-76
Rated Input Voltage	1Phase AC230V $\pm 15\%$	1Phase AC230V $\pm 15\%$
Power factor	0.7	0.7
Efficiency	80%	80%

## **Controls and Operational Features**

### Machine Start-Up

When the machine is turned ON, an auto-test is executed; during this test all LEDs and display's shown "888"; after few seconds the LEDs and display turn OFF. Only the Power ON/OFF LED lights up.

- The Machine is ready to operate when on the Front Control Panel lights up the Power ON LED with one of the four LED of the Welding mode command.

### **Front Panel Controls**

Output Current Knob: Potentiometer used to set the output current used during welding.

Arc Force: The Output Current temporary increments are adjustable between 0 and 50% of the current set through the Output Current Knob.

Power ON/OFF LED: This LED lights up when the machine is ON. If blinking, this LED indicates that an Input Voltage Over range protection is active; the Machine restarts automatically when the Input Voltage returns in the correct range. If the Machine does not restart automatically, an Internal auxiliary under voltage condition may be present: the machine needs to be turned OFF then ON again to restart.

Note: The Fan could be automatically switched OFF if the error condition persists for more than 2seconds.

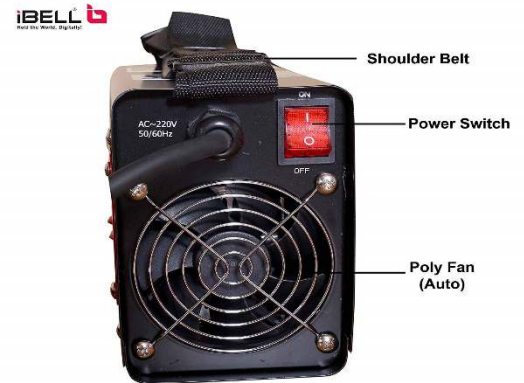
Thermal LED: This indicator will turn on when the machine is overheated, and the output has been disabled. This normally occurs when the duty cycle of the machine has been exceeded. Leave the machine on to allow the internal components to cool. When the indicator turns off, normal operation is again possible.

QC LED: This indicator turns on when the machine is overheated or overloaded.

Meter: The meter displays the preset welding current before welding and the actual welding current during welding.

## Other Controls and Features

- Power Switch: It turns ON / OFF the input power to the machine.
- Input cable: Connect it to the mains.
- Fan: This machine has a F.A.N. (Fan As Needed) circuitry inside; the fan is automatically turned ON or OFF. This feature reduces the amount of dirt which can be drawn inside the machine and reduces power consumption. When the machine is turned ON the fan will turn ON. The fan will continue to run whenever the machine is welding. If the machine doesn't weld for more than five minutes, the fan will turn OFF.
- Shoulder Belt: For easy transportation.



<b>IBL M 220-76</b>		<b>NO.:</b>			
		<b>EN 60974-1</b>			
		<b>20A/20.8V -160A/26.4V</b>			
<b>S</b>	<b>U<sub>0</sub>=70V</b>	<b>X %</b>	<b>30</b>	<b>60</b>	<b>100</b>
		<b>I<sub>2</sub> A</b>	<b>160</b>	<b>90</b>	<b>70</b>
		<b>U<sub>2</sub> V</b>	<b>26.4</b>	<b>23.8</b>	<b>22.8</b>
	<b>U<sub>1</sub>:230V</b>	<b>I<sub>1</sub>max=35.5A</b>	<b>I<sub>1</sub>eff=15.9A</b>		
<b>IP21S</b>	<b>H</b>		<b>FAN COOLING</b>		

\*Heating tests were conducted at ambient temperature.

\*The duty cycle was determined at 40 ° C by simulation.

## GRAPHIC SYMBOLS AND INDICATIONS

**U<sub>1</sub>**: Rated AV input voltage (with tolerance  $\pm 10\%$ )

**I<sub>1max</sub>**: Rated maximum input current

**I<sub>1eff</sub>**: Maximum effective input current

**X**: duty cycle

The ratio of given duration time/the full-cycle time

Note1: This ratio shall be within 0~1, and can be indicated by percentage.

Note2: In this standard, the full-cycle time is 10min.

For example, if the duty cycle is 60%, the load-applying time shall be 6min and the following no-load time shall be 4min.

**U<sub>0</sub>**: No-load voltage

Open circuit voltage of secondary winding.

**U<sub>2</sub>**: Load voltage

Output voltage of rated load:  $U_2 = (20 + 0.04I_2) \text{ V}$

**A / V—A / V**: range of current regulation and corresponding load voltage.

**IP**: degree of protection, such as IP21S



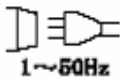
Can be used in the environment which has high risk of electric shock.



: Read this operation manual carefully before use



Single-phase static frequency converter-transformer rectifier



: Symbol of single-phase AC power supply and rated frequency



: Symbol of manual metal arc welding with covered electrodes



: Do not use outdoors

**H**

: Insulation class



: Do not dispose of electric tools together with domestic garbage.

## INSTALLATION

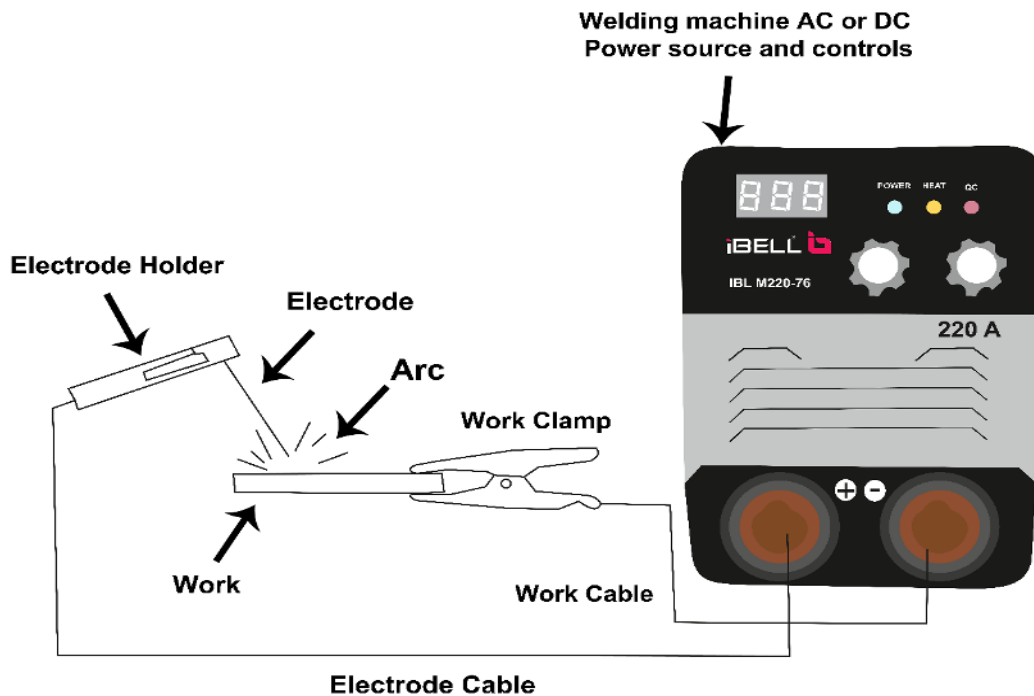


**Warning!** All the connections should be conducted after making sure that power supply is cut off.

This welding machine is equipped with power voltage compensation device, when power voltage varies in the range of  $\pm 5\%$  of rated voltage, it still can keep working.

When using longer cable, in order to reduce the voltage drop, it is recommend selecting larger section of cable; if connecting cable is too long, it may have a large effect on the arc starting performance of welding machine or even other performances of the system. Therefore, we suggest you should use the recommended configuration length (4.0m)

1. Make sure that the air vent of welding machine is not covered and clogged up to avoid failure of cooling system.
2. Make sure the additional Ground-connecting terminal (14) has been grounded separately and reliably.
3. Make sure that ground terminal of power socket has been grounded separately and reliably. In order to make sure the safety.
4. Connect the welding tongs (grounding clamp and electrode holder) correctly according to the following drawing. Firstly, make sure that cable, welding tongs and quick plugs are connected reliably.
5. Insert the quick plug that connects the electrode holder in the quick socket with the polarity of "+", and then tighten it by force clockwise.
6. Insert the quick plug that connects the grounding clamp into quick socket with the polarity of "-" on the panel of welding machine, tighten it by force clockwise, the grounding clamp connects to the workpiece.
7. Pay attention to the polarity of connection, If connected improperly, unstable electric arc, large splash and sticky welding rod may occur.



8. Connect the power plug to the corresponding voltage class of distribution box according to input voltage class of welding machine, don't connect the voltage by mistake. Meanwhile, make sure that tolerance of supply voltage is within the allowable range.



**Warning** Electric shock may result in personal death; high voltage direct current still exist on equipment even after power-off, please do not contact the current-carrying part on equipment. Improper power supply voltage may damage equipment.

9. Make sure that the air vent of welding machine is not covered and clogged up to avoid failure of cooling system.
10. It is suggested that power cord should be H07RN-F 3X2.5mm<sup>2</sup> (approved according to EN 50525-2-21), welding cable should be H01N2-D 1X16mm<sup>2</sup> and external fuse should be 16A. The recommended electrode holder is 20% 160A (approved according to EN 60974-11).

### Remember CLAMS

Now that you're ready to weld, remember CLAMS. Bringing all these points together in one moment of welding may seem like a lot to think about, but it becomes second nature with practice so don't get discouraged! Stick welding got its name not because the electrode looks like a stick, but because everyone sticks the rod to the workpiece when learning how to weld.

### Current setting

The correct current, or amperage, setting primarily depends on the diameter and type of electrode selected. For example, a 1/8-inch 6010 rod runs well from 75 to 125 amps, while a 5/32-inch 7018 rod

welds at currents up to 220 amps. The side of the electrode box usually indicates operating ranges. Select an amperage based on the material thickness, welding position (about 15 percent less heat for overhead work compared to a flat weld) and observation of the finished weld. Most new welding machines have a permanent label that recommends amperage settings for a variety of electrodes and material thicknesses.

### **Length of arc**

The correct arc length varies with each electrode and application. As a good starting point, arc length should not exceed the diameter of the metal portion (core) of the electrode. Holding the electrode too closely decreases welding voltage. This creates an erratic arc that may extinguish itself or cause the rod to freeze, as well as produces a weld bead with a high crown. Excessively long arcs (too much voltage) produce spatter, low deposition rates, undercuts and sometimes porosity. Many beginners weld with too long of an arc, so they produce rough beads with lots of spatter. A little practice will show you that a tight, controlled arc length improves bead appearance, creates a narrower bead and minimizes spatter.

### **Angle of travel**

Stick welding in the flat, horizontal and overhead positions uses a drag or backhand welding technique. Hold the rod perpendicular to the joint and tilt the top of the electrode in the direction of travel approximately 5 to 15 degrees. For welding vertical up, use a push or forehand technique and tilt the top of the rod 15 degrees away from the direction of travel.

### **Manipulation**

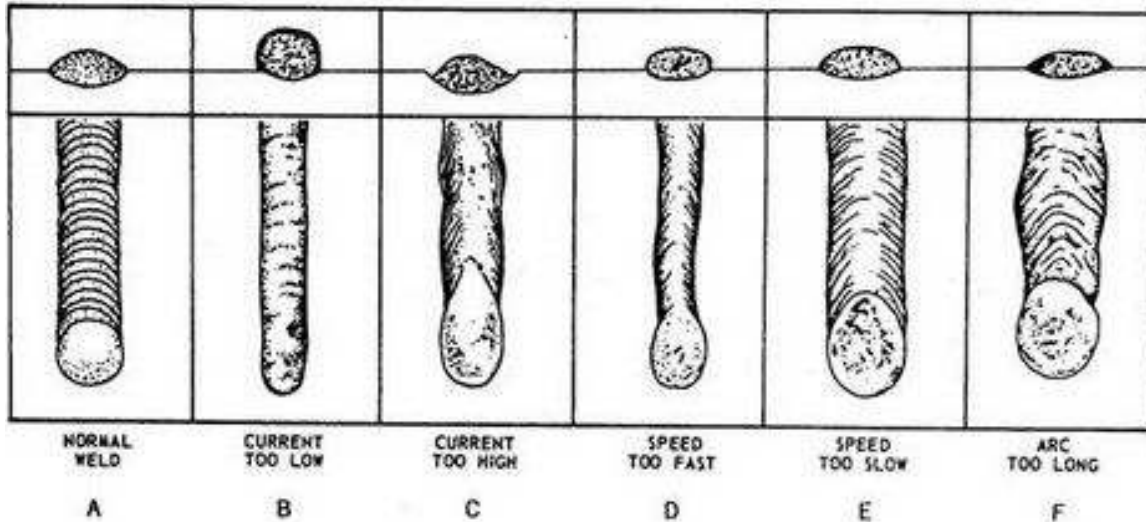
Each welder manipulates or weaves the electrode in a unique style. Develop your own style by observing others, practicing and creating a method that produces good results for you. Note that on material 1/4 inch and thinner, weaving the rod typically creates a bead that is wider than necessary. In many instances, plain, straight-ahead travel works fine. To create a wider bead on thicker material, manipulate the electrode from side to side creating a continuous series of partially overlapping circles, or in a Z-shaped, semi-circle or stutter-step pattern. Limit side-to-side motion to two and a half times the diameter of the electrode core. To cover a wider area, make multiple passes or stringer beads. When welding vertical up, focus on welding the sides of the joint and the middle will take care of itself. Pause slightly at the side to allow the far side of the bead to cool and the weld puddle to catch up and to ensure solid tie-in to the sidewall. If your weld looks like fish scales, you moved forward too quickly and didn't hold long enough on the sides.

### **Speed of travel**

The proper travel speed produces a weld bead with the desired contour (or crown), width and appearance. Adjust travel speed so that the arc stays within the leading one-third of the weld pool. Slow travel speeds produce a wide, convex bead with shallow penetration. Excessively high travel speeds also decrease penetration, create a narrower and/or highly crowned bead, and possibly undercuts. A few last words of advice. Always remember that you need a good view of the weld puddle. Otherwise, you can't ensure you're welding in the joint, keeping the arc on the leading edge of the puddle and using the right amount of heat (you can actually see a puddle with too much heat roll out of the joint). For the best view, keep your head off to the side and out of the smoke so you can easily see the puddle.

**A**lso remember that you learn through mistakes. There's no shame in grinding out bad welds. In fact, professional welders create perfect welds by recognizing imperfections, grinding them out and rewelding

## COMPARISON CHART OF WELDS



## OPERATION

- ⚠ It is forbidden to weld in places where there is a danger of fire or explosion!

### WELDING PROCESSES

In manual metal arc (MMA) the welding filler material is melted from the electrode to the weld pool. Rate of welding current is selected on the basis of electrode size used and welding position. Arc forms between electrode tip and welding piece. The melting electrode coating forms gas and slag, which protects the weld pool. Slag solidified over the weld is removed after welding e.g. with a chipping hammer.

### OPERATING FUNCTIONS

**Warning!** Make sure that welding cable and earth cable connections are tight. If a connection is slack, it will result in voltage drop that will cause the connection to heat.

**Warning!** During welding, it is forbidden to pull off any plug or cable in use, or it will lead to life-threatening danger and severe damage of the machine.

1. Always fix earth cable clamp directly on the welding piece. Clean connection surface of earth clamp from paint and rust. Connect the clamp carefully so that contact surface is as large as possible.
2. Turn the power switch on the rear panel to "ON" position. Cooling fan inside the machine should begin to work once welding starts. IBL MMA220-76 is equipped with automatic cooling technology; fan will work only when welding starts and helps to cool the internal circuit and components.

⚠ **Always start and stop the machine from the main switch, never use the plug as a switch!**

3. In accordance with the thickness of welding workpiece, diameter of welding rod, working position and technology needs, make sure suitable welding current.
4. Clamp the welding rod on the electrode holder, the machine is in the manual welding mode and in the standby state.
5. Select suitable welding current by adjusting knob (1) according to the thickness and processing techniques of workpiece under welding, diameter of welding rod, working position and technology

needs, make sure suitable welding current.

Generally, welding current is adequate to welding electrode according with as following:

<b>Diameter of welding rod/mm</b>	φ1,6	φ2.0	φ2.5	φ3.2	φ4.0	φ5.0	φ5.8
<b>Welding current /A</b>	40	55	80	115	160	190-260	250-300

Thickness of welding steel and diameter of selected welding rod:

<b>Thickness of steel plate /mm</b>	1-2	2-5	5-10	Over 10
<b>Diameter of welding rod /mm</b>	1-2.5	2.5-4	3.2-5.8	4-8

**☞ Welding fumes may be dangerous to your health, see that there is ample ventilation during welding! Never look at the arc without face shield made for arc welding! Protect yourself and your surroundings from the arc and hot spatter!**

**☞ It is recommended that you try welding and rate of welding current first on something else than the actual work piece.**

You can start welding after having made the necessary selections. Arc is lit by scratching the welding piece with electrode. Length of arc is regulated by holding electrode tip at a suitable distance from welding piece. Suitable arc length is usually about half the diameter of the electrode core wire. When arc is lit move the electrode slowly forwards tilting it to appr. 10-15° pulling angle. If necessary, adjust current value.

**IMPORTANT:**

Do not dab the work piece with the electrode since it could be damaged, making it more difficult to ignite the arc.

As soon as the arc has ignited, attempt to keep it a distance from the work piece equivalent to the diameter of the electrode.

This distance should be kept as constant as possible during the welding process. The angle of the electrode in the direction in which you are working should be 20°/30°.

**IMPORTANT:**

Always use tongs or pliers to remove spent electrodes and to move parts that you have just welded. Please note that the electrode holder (1) must always be put down so that it is insulated after you have completed the welding work.

Do not remove the slag until the weld has cooled. If you want to continue a weld after an interruption, the slag from your initial attempt must first be removed.

A yellow signal light of overheating will light on, when thermostat has tripped due to the unit's overheating. Fan will cool the unit and after the signal light goes off, the unit is again ready for welding.

For beginners, the first difficulty is priming the arc. For best results proceed as follows:

Test the current intensity and the electrode on a piece of scrap material.

- Hold the electrode approximately 2 cm above the start of the joint and hold the face shield in front of your face. Touch the workpiece with the electrode and stroke it repeatedly on and off the workpiece to start the arc, as if you were striking a match. It may occur that the breakaway movement of the electrode is not quick enough, which can mean that the electrode sticks to the workpiece. Remove the electrode with a firm lateral jerk. (If this does not work, release the electrode from the clamp on the electrode holder, then use pliers or tongs to remove the electrode from the workpiece).

- Watch the arc through the lens in the face shield and keep the arc length approximately 1 – 1.5 times the diameter of the electrode. The arc length is very important as it has an influence on the welding current and welding voltage.
- Incorrect current intensity produces a poor quality, weak joint.
- Hold the electrode at an angle approximately 70° – 80° to the workpiece in the direction of advancement. If the angle is too large, the slag can penetrate the joint; if the angle is too small, the arc flutters and sprays molten metal. In both cases, a weak, porous joint is produced.
- Ensure that the arc length remains constant by feeding the electrode continuously towards the workpiece as you progress down the joint. At the end of the joint; pull the electrode gently downwards away from joint to avoid producing a porous end crater.
- Wait until the joint has cooled completely before removing the slag. If you wish to continue welding a joint after taking a break, the slag at the end of the joint must be removed first. Prime the arc in the joint and melt the electrode at the point where the two joints meet.

**CAUTION:** Always use tongs, pliers or a similar tool to remove used, hot electrodes or to move hot welded workpieces. Ensure that the electrode holder is placed on an insulated surface when taking a break. Always turn off the welder after finishing work and during breaks, and always disconnect the machine from the mains.

Proceed as follows after connecting the electrical connections as described:

- Hold down the lever on the electrode holder and slide the uncovered part of the electrode into the electrode holder.
- Clamp the earth cable to the workpiece. Ensure that a good electrical connection exists between the workpiece and the earth clamp.
- Switch the machine on and adjust the welding current with the hand wheel. The welding current must be selected according to the size of the workpiece and the type of electrode.
- Hold the face shield in front of your face and strike the tip of the electrode on the workpiece as if you were lighting a match. This is the best method to start the arc.

**CAUTION:**

Do not bang the electrode on the workpiece as this could damage the electrode covering, making it more difficult to prime the arc.

- As soon as you have started the arc, try to keep the arc length constant. The arc length should be approximately 1 - 1.5 times the diameter of the electrode. The arc length should be kept as constant as possible. Hold the electrode at an angle approximately 70° - 80° to the workpiece.

**CAUTION:**

**FAN will automatically shut down once the internal circuit and components are cooled. Always OFF the welding machine after the FAN goes OFF it will increase the lifespan of the circuit and components.**

## Weld seam

### Appearance as a function of current intensity:

**Arc too short:** When the arc is too short, irregular masses of welded metal with inclusions of slag are produced.



**Arc too long:** A long arc causes poor penetration in the base metals, bubbles and sprays of molten metal. A defective joint can be produced.



**Appearance as a function of advancement speed:**

**Advancement speed too low:** Causes a wide deposit and inferior length. Leads to unnecessarily high electrode consumption and loss of working time.



**Advancement speed too high:** Leads to insufficient penetration of the base material, a narrow and high seam and large deposits of slag which can be difficult to remove.



**Appearance as a function of current intensity:**

**Current intensity too low:** Poor penetration, easy sticking, a very irregular cord, difficulty removing slag.



**Current intensity too high:** Very wide cord with excessive penetration of the base material sprays of molten metal and a deep crater. High current intensity can also cause minor breakages within the material



**High quality weld:** Working with the correct arc length, advancement speed, current intensity and inclination of the electrode produces a regular cord, a fine mesh and a joint free of porosity and slag inclusions



## Joins

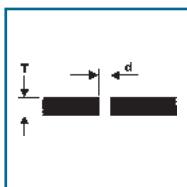
There are two fundamental types of welding joint: Butt joints and angle joints (outer corner, inner corner and superimposition).

### Butt joints

When welding a butt joint with material up to 2 mm thick, the entire faces of the material must be in contact with each other.

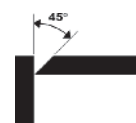
For thicker materials, use 'Table A' as a guide

Table A



T =	2 – 3 mm	3 – 4 mm	4 – 5 mm
Horizontal workpiece d =	0.5 – 1.5 mm	1.5 – 2.5 mm	2 – 3 mm
Face d =	1 – 2 mm	2 – 3 mm	3 – 4 mm
Vertical workpiece d =	1 – 1.5 mm	1.5 – 2.5 mm	2 – 3 mm

### External corner joints

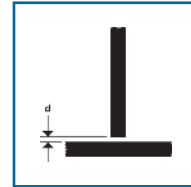


This joint is very simple to achieve, but is not practical for materials thicker than 10 mm. For materials thicker than 10 mm, we recommend preparing a joint as illustrate in figure.



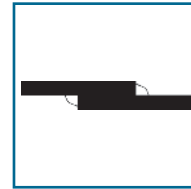
#### Internal corner joint

This joint is very simple to achieve, and is used for materials with a maximum thickness of 10 mm. The value of 'd' (see illustration) should be kept to a minimum and should always be less than 2 mm.



#### Overlap joints

The most common preparation is with right angle edges; the weld is completed with a standard angle weld. The materials must be as close together as possible.

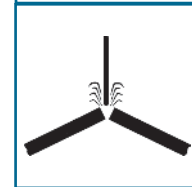
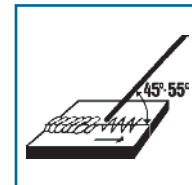


#### Flat butt joints

The weld must be performed in a single operation with sufficient penetration of the base material.

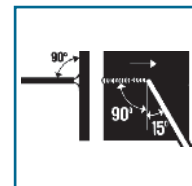
For this reason it is important to prepare well.

- The factors which affect the quality of the weld are as follows: the current intensity, the distance between the edges of the materials to be welded, the inclination of the electrode and the diameter of the electrode.
- The electrode should be inclined at approximately  $45^\circ / 55^\circ$  to the horizontal plane going through the axis of the weld. Keep in mind that increasing the inclination increases the penetration and vice versa.
- To prevent or reduce deformation which can arise during solidification of the material it is advisable, wherever possible, to fix the workpieces in a clamping device or similar which exerts force in the opposite direction of the expected contraction or deformation.
- Avoid stiffening of the welded structure to prevent breakages in weld. These difficulties can be reduced, if it is possible to rotate the workpiece so that the structure can be welded in two opposite places. In this case the electrode must be kept inclined at  $50^\circ / 70^\circ$  to the vertical axis going through the joint. Advance steadily with a light cross oscillation



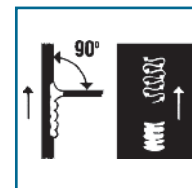
#### Vertical butt joints

Up to a material thickness of 4 mm it is not necessary to bevel the face of the workpiece. Keep the electrode at  $90^\circ + 15^\circ$ , as shown in the illustration, when welding the joint. The current intensity should be set to the same level as for a similar job on a level surface.



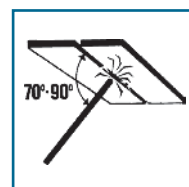
#### Horizontal butt joints

Up to a thickness of approximately 4 mm it is not necessary to prepare a junction. The welding technique used can be descendant, used for thinner workpieces, or ascendant for general use. Keep the electrode on a perpendicular plane with an inclination of  $90^\circ - 120^\circ$  to the axis of the joint. Move the electrode in a U shape across the join, emphasizing the bottom of the U. When the molten metal is too hot, move the electrode upwards. The current intensity for this type of joint can in general be set 10 - 15% lower than the current intensity required for similar jobs on a flat surface. To achieve good penetration and a correct weld it is necessary to repeat the procedure on the opposite side of the structure



#### Overhead butt joints

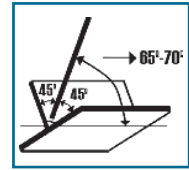
It is indispensable to set the current intensity so that a highly fluid bath is not produced, the current must however be sufficient to permit good penetration of the base materials. The electrode must be kept vertical with an inclination of  $70^\circ - 90^\circ$  in the direction of advancement and moved lightly from side-to-side. The arc must be kept very short and, if necessary, make quick jumps forward to ensure that the bath has time to solidify



# Corner joints

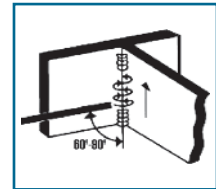
## Joints on a flat surface

If the workpiece is of a manageable size, it should be arranged as shown in the illustration. If the workpiece is cumbersome and cannot be easily rotated, carry out the weld in such a way that cross movements are avoided. Hold the electrode at  $40^\circ - 50^\circ$  in the direction of advancement and at  $30^\circ - 40^\circ$  to the horizontal plane.



## Vertical joints

The same rules apply to welding vertical corner joints as apply to vertical butt joints. The current intensity should be increased by approximately 10% however.



# Transport

Before transporting the welder you must first disconnect the power plug and remove the ground terminal from the workpiece. Then wind up the cable properly. Now you can carry the welder to a different place by the carry handle (1).

# Storage

Store the equipment and accessories out of children's reach in a dark and dry place at above freezing temperature. The ideal storage temperature is between  $5^\circ\text{C}$  and  $30^\circ\text{C}$ . Store the electric tool in its original packaging

# MAINTENANCE



### **Warning:**

All the maintenance work must be conducted under the condition of complete power failure; please make sure that power plug is pulled out.

Blind experiment and incautious maintenance may cause the expansion of failure area, and then cause some difficulties to formal maintenance. Exposed part of the equipment contains the hazardous voltage in the electrified state, any direct or indirect contact may cause the electric shock accident, and serious electric shock may cause death!

Note: During the warranty period, without the permission of company, if the user conducts the wrong maintenance to cause any failure, free maintenance warranty provided by the supplier should be invalid.

- Regularly remove the dust on the welding machine with dry compressed air. When use it in heavy fume and polluted air, do this job at least once a month.
- Compressed air should drop down to the required pressure to prevent damaging the small parts

and units in machine.

- Avoid water or moist getting into welding machine, or else, blow the welding machine to dry immediately, then measure the insulation with insulation resistance meter, it can only be used when the measuring result is accepted.
- In the event that the welding machine is not used for long-term, it should be placed into the original package and stored in dry place.
- Periodic maintenance and overhaul are for the purpose of the welder's normal use and conformity with the safety requirements.
- Any improper or incorrect operation may cause the welder's failure and damage.
- Routine maintenance on power control switch, grounding device, welding electrode holder, coupling device and set screws should be performed on a regular basis. If looseness, rust, bad connection of screws are identified, please tighten the screws and remove rusty spots.
- Measure the welder's insulation resistance with insulation resistance meter. The insulation resistance between primary windings and secondary windings should not be less than  $5M\Omega$  and between L/N windings and ground winding shall not be less than  $2.5 M\Omega$
- In the case of failure or replacement of wearing parts, please contact your supplier or Our company's service center immediately to seek for help from professional personnel.

## DISPOSAL

•Do not dispose of electrical equipment with normal waste!

•In observance of European Directive 2012/19/EU on waste electrical and electronic equipment, and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and taken to an appropriate environmentally responsible recycling facility

