

RYOBI POWER EQUIPMENT WARRANTY

Subject to the warranty conditions below, this RYOBI tool (hereinafter called "the Product"), is warranted by Ryobi (herein called "the Company") to be free from defects in material or workmanship for a period of 24 months from the date of original purchase covering both parts and labour. Under the terms of this warranty, the repair or replacement of any part shall be the opinion of the Company or its authorised agent. Should service become necessary during the warranty period, the owner should contact the authorised Ryobi retailer from whom the product was purchased, or the nearest Company branch office. In order to obtain warranty service, the owner must include the Sales Docket and Warranty Certificate to confirm date of purchase. This Product is sold by the dealer or agent as principal and the dealer has no authority from the Company to give any additional warranty or guarantee on the Company's behalf except as herein contained or herein referred to.

Warranty Conditions

This warranty only applies provided that the Product has been used in accordance with the manufacturer's recommendations under normal use and reasonable care (in the opinion of the Company) and such warranty does not cover consumable components, damage, malfunction or failure resulting from

misuse, neglect, abuse, or used for a purpose for which it was not designed, or is not suited and no repairs, alterations or modifications have been attempted by other than an Authorised Service Agent. This guarantee will not apply if the tool is damaged by accident or if repairs arise from normal wear and tear.

Accessories such as bits, blades, sanding discs, cutting lines, etc., are excluded from this guarantee. Normal consumable parts, such as carbon brushes, bearings, chucks, cord assembly's, spark plugs, recoil pulleys and bump head assembly's are specifically excluded from this guarantee.

The Company accepts no additional liability pursuant to this warranty for the costs of traveling or transportation of the Product or parts to and from the service dealer or agent - which costs are not included in the warranty.

Nothing herein shall have the effect of excluding, restricting or modifying any conditions, warranty, right or liability imposed, to the extent only that such exclusion, restriction or modification would render any term herein void.



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THIS WARRANTY FORM SHOULD BE RETAINED BY THE CUSTOMER AT ALL TIMES.

For your record and to assist in establishing date of purchase (necessary for in-warranty service), please keep your purchase docket and this form, completed with the following particulars.

PURCHASED FROM:.....

ADDRESS OF DEALER:.....

DATE:..... MODEL NO..... SERIAL NO.....

Present this form with your Purchase Docket when Warranty Service is required.

RYOBI®

OWNER'S OPERATING MANUAL MMA INVERTER WELDER MODEL MMA-200

SPECIFICATIONS

Rated input power supply.....	AC 230V±5% 50/60Hz
Rated input capacity.....	8.7KVA
Current adjustment range.....	20-200A
Rated duty cycle.....	80%
Rated voltage.....	20.8-28V
No load voltage.....	61V
Overall efficiency.....	85%
Housing protection grade.....	IP21S
Power factor.....	0.73 cosφ
Insulation grade.....	F
Electrode diameter.....	1.6-5mm
Noise.....	<70dB(A)
Dimensions.....	381 x 132 x 286mm
Net weight.....	5.8kg

THANK YOU FOR BUYING A RYOBI MMA INVERTER WELDER

Your new inverter generator has been engineered and manufactured to Ryobi's high standard of dependability, ease of operation and operator safety. Properly cared for, it will give you years of rugged, trouble free performance. If you use your inverter generator properly and only for what it is intended, you will enjoy years of safe, reliable service.



CAUTION: Carefully read through this entire owner's manual, paying close attention to the general safety rules and rules for safe operation, before using.

KEEP THIS MANUAL FOR FUTURE REFERENCE

IMPORTANT SAFETY INSTRUCTIONS

The purpose of safety rules is to attract your attention to possible dangers. The safety symbols and the explanations with them, require your careful attention and understanding. The safety warnings do not by themselves eliminate any danger. The instruction or warnings they give are not substitutes for proper accident prevention measures.



SAFETY ALERT SYMBOL. Indicates danger, caution or warning. May be used in conjunction with other symbols or pictures.

Failure to obey a safety warning can result in serious injury to yourself or to others. Always follow the safety precautions to reduce the risk of fire, electric shock and personal injury.

Do not attempt to operate this tool until you have read thoroughly and completely understood the safety rules, etc. contained in this manual. Failure to comply can result in accidents involving fire, electric shock or serious personal injury. Save this Owners Operating Manual and review it frequently for continual safe operation and for instructing others who may use this tool.

EMF INFORMATION

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields. Welding current, as it flows through welding cables, will cause electro- magnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power- frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.

3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to work piece as close to the weld as possible.

ABOUT PACEMAKERS

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

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.

Only qualified persons should service, test, maintain, and repair this unit.

During servicing, keep everybody, especially children, away.



ARC RAYS can burn eyes and skin; NOISE can damage hearing. Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter (ANSI Z49.1) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended. Never wear contact lenses while welding.
3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.

IMPORTANT SAFETY INSTRUCTIONS

Recommended Protective Filters for Electric Welding		
Description of Process	Approximate Range of Welding Current in Amps	Minimum Shade Number of Filter(s)
Manual Metal Arc Welding - covered electrodes (MMAW)	Less than or equal to 100	8
	100 to 200	10
	200 to 300	11
	300 to 400	12
	Greater than 400	13
Gas Metal Arc Welding (GMAW) (MIG) other than Aluminium and Stainless Steel	Less than or equal to 150	10
	150 to 250	11
	250 to 300	12
	300 to 400	13
	Greater than 400	14
Gas Metal Arc Welding (GMAW) (MIG) Aluminium and Stainless Steel	Less than or equal to 250	12
	250 to 350	13
Gas Tungsten Arc Welding (GTAW) (TIG)	Less than or equal to 100	10
	100 to 200	11
	200 to 250	12
	250 to 350	13
	Greater than 350	14
Flux-cored Arc Welding (FCAW) -with or without shielding gas.	Less than or equal to 300	11
	300 to 400	12
	400 to 500	13
	Greater than 500	14
Air - Arc Gouging	Less than or equal to 400	12
Plasma - Arc Cutting	50 to 100	10
	100 to 400	12
	400 to 800	14
Plasma - Arc Spraying	—	15
Plasma - Arc Welding	Less than or equal to 20	8
	20 to 100	10
	100 to 400	12
	400 to 800	14
Submerged - Arc Welding	—	2(5)
Resistance Welding	—	Safety Spectacles or eye shield

IMPORTANT SAFETY INSTRUCTIONS



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.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.



FUMES & GASES Can Be Dangerous

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

1. Keep your head out of the fumes. Do not breath the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator.

Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. 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.
7. 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.

IMPORTANT SAFETY INSTRUCTIONS



FLYING SPARKS Can Cause Injury

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal.

As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.



CYLINDERS Can Explode If Damaged

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.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.



WELDING Can Cause Fire or Injury

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. 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.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
11. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

IMPORTANT SAFETY INSTRUCTIONS



MOVING PARTS Can Cause Injury

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.



SPARKS Can Cause BATTERY GASES TO EXPLODE

SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin. Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and -) on



SPARKS Can Cause BATTERY GASES TO EXPLODE

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.



H.F. RADIATION Can Cause Interference

1. High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
2. Have only qualified persons familiar with electronic equipment install, test, and service H.F. producing units.
3. The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
4. If notified by the FCC about interference, stop using the equipment at once.
5. Have the installation regularly checked and maintained.
6. 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.

IMPORTANT SAFETY INSTRUCTIONS



ELECTRIC AND MAGNETIC FIELDS May Be Dangerous

1. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines.
2. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.
3. Exposure to EMF fields in welding may have other health effects which are now not known.
4. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:
5. Route the electrode and work cables together - Secure them with tape when possible.
6. Never coil the electrode lead around your body.
7. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
8. Connect the work cable to the workpiece as close as possible to the area being welded.
9. Do not work next to welding power source.



FALLING UNIT Can Cause Injury

1. Lift unit with handle on top of case.
2. Use handcart or similar device of adequate capacity.
3. If using a fork lift vehicle, place and secure unit on a proper skid before transporting.



FOR ELECTRICALLY Powered Equipment

1. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
2. Install equipment in accordance with the countries National Electrical Code, all local codes and the manufacturer's recommendations.
3. Ground the equipment in accordance with the countries National Electrical Code and the manufacturer's recommendations.



HOT PARTS Can Cause Severe Burns

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



FIRE or EXPLOSION Hazard

1. Do not place unit on, over, or near combustible surfaces.
2. Do not service unit near flammables.



STATIC Can Damage PC Boards

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

IMPORTANT SAFETY INSTRUCTIONS



OVERUSE Causes OVERHEATING

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



READ THE INSTRUCTIONS

1. Consult the Owner's Manual for welding safety precautions. Do not install, operate or repair this equipment without reading this manual and the safety precautions throughout.
2. Use only genuine replacement parts

ADDITIONAL SAFETY INSTRUCTIONS

1. ALWAYS ensure that there is full free air circulating around the outer casing of the machine, and that the louvres are unobstructed.
2. ALWAYS use a proper welding face shield or helmet, with suitable filter lenses. Proper gloves and working clothes should be worn at all times.
3. ALWAYS check that the pressure regulator and gauges are working correctly. DO NOT lubricate the regulator.
4. ALWAYS use the correct regulator. Each regulator is designed to be used with a specific gas.
5. ALWAYS inspect the hose before use to ensure it is in good condition.
6. ALWAYS keep the free length of gas hose outside the work area.
7. ALWAYS remove all flammable materials from the welding area.
8. NEVER remove any of the panels unless the machine is disconnected from the supply, AND never use the machine with any of the panels removed.
9. NEVER attempt any electrical or mechanical repair unless you are a qualified technician. If you have a problem with the machine contact your local RYOBI dealer.
10. NEVER use or store in a wet/damp environment. DO NOT EXPOSE TO RAIN.
11. NEVER use gas from a cylinder, the content of which is unknown. It is important to ensure the appropriate gas is being used.
12. NEVER use a damaged cylinder.
13. NEVER lift the cylinder by the valve.
14. NEVER expose the cylinder to a heat source or sparks.
15. NEVER continue to weld, if, at any time, you feel even the smallest electric shock. Stop welding IMMEDIATELY, and DO NOT attempt to use the machine until the fault is diagnosed and corrected.
16. NEVER use the welder with input connections greater than 10M in length.
17. NEVER point the torch at any person or animal.
18. NEVER touch the torch nozzle until the welder is switched OFF and the nozzle has been allowed to cool off.
19. NEVER connect, disconnect, or attempt to service the torch, until the machine is switched OFF and disconnected from the mains supply.
20. NEVER allow the cables to become wrapped around the operator or any person in the vicinity.
21. Safety devices such as interlocks and circuit breakers should not be disconnected or shunted out.
22. Before installation, inspection, or service of equipment, shut OFF all power and remove line fuses to prevent accidental turning ON of power.
23. Do not open power circuit or change polarity while welding.

ADDITIONAL SAFETY INSTRUCTIONS

24. If, in an emergency, it must be disconnected, guard against shock burns, or flash from switch arcing. Always shut OFF and disconnect all power to equipment. Power disconnect switch must be available near the welding power source.
25. Fully insulated electrode holders should be used. Do NOT use holders with protruding screws or with any form of damage.
26. Fully insulated lock-type connectors should be used to join welding cable.
27. Frequently inspect cables for wear, cracks and damage. IMMEDIATELY REPLACE those with excessively worn or damaged insulation to avoid possibly lethal shock from bared cable. Cables with damaged areas may be taped to give resistance equivalent to original cable. Keep cable dry, free of oil and grease, and protected from hot metal and sparks.

INSTALLATION

ENVIRONMENT

These units are designed for use in environments with increased hazard of electric shock.

- A. Examples of environments with increased hazard of electric shock are:
 1. In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts.
 2. In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator.
 3. In wet or damp hot locations where humidity or perspiration considerable reduces the skin resistance of the human body and the insulation properties of accessories.
- B. Environments with increased hazard of electric shock do not include places where electrically conductive parts in the near vicinity of the operator, which can cause increased hazard, have been insulated.

LOCATION

This machine can operate in harsh environments. However, it is important that simple preventative measures are followed to assure long life and reliable operation:

- This machine must be located where there is free circulation of clean air without restrictions for air movement to and from the air vents. Do not cover the machine with paper, cloth or rags when switched on.

- Dirt and dust that can be drawn into the machine should be kept to a minimum.
- This machine has a protection rating of IP21S. Keep it dry and do not place it on wet ground or in puddles. Do not use in wet or damp locations. Store indoors.
- Locate the machine away from radio controlled machinery. Normal operation may adversely affect the operation of nearby radio controlled machinery, which may result in injury or equipment damage.

Read the section on electromagnetic compatibility in this manual.

- Do not operate in areas with an ambient temperature greater than 40°C.

TILTING

Place the machine directly on a secure, level surface.

Do not place or operate this machine on a surface with an incline greater than 15° from horizontal. The machine may topple over if this procedure is not followed.

VENTILATION

This cutting machine can create powerful cutting current and has strict cooling requirements that cannot be met with natural ventilation. Therefore the built-in fan is very important in enabling the machine to work stable with effective cooling. The operator should make sure that the louvers be uncovered and unblocked. The minimum distance between the machine and nearby objects should be 25cm.

INSTALLATION

CONNECTION OF INPUT CABLE

In order to ensure personal safety and avoid electric shock, please ground the machine reliably by connecting the ground wire of the machine to the grounding device in the switching box.

The primary cable should be tightly connected to the correct socket to avoid oxidization.

Check whether the voltage value varies in acceptable range with a multi-meter.

The Mains supply voltage should be within $\pm 5\%$ of the rated Mains supply voltage. Too low a voltage may cause poor welding performance. Too high a supply voltage will cause components to overheat and possibly fail.

The Welding Power Source must be:

- Correctly installed, if necessary, by a qualified electrician.
- Correctly earthed (electrically) in accordance with local regulations.

DUTY CYCLE

The rated duty cycle of a Welding Power Source, is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts.

This product has a rated duty cycle of 80%. The percentage represents the welding time in a 10 minute period for example 80% means that the welding time is 8 minutes with a rest time of 2

minutes in a ten minute period although the actual duty cycle will depend on the amperage used. If the Welding Power Supply is used for longer than the duty cycle or if you are welding using large welding rods you may experience a temporary current shut off. This is to protect the transformer inside the Welding Power Supply from overheating.

Welding longer than rated duty cycle can damage gun and void the warranty.

ELECTROMAGNETIC COMPATIBILITY



WARNING. Extra precautions for Electromagnetic Compatibility may be required when this Welding Power Source is used in a domestic situation.

A. Installation and Use - Users Responsibility

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding circuit, see Note below. In other cases it could involve constructing an electromagnetic screen enclosing the Welding Power Source and the work, complete with associated input filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorised by a

person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC 974-13 Arc Welding Equipment - Installation and use (under preparation).

B. Assessment of Area

Before installing welding equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

1. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the welding equipment.
2. Radio and television transmitters and receivers.
3. Computer and other control equipment.
4. Safety critical equipment, e.g. guarding of industrial equipment.

ELECTROMAGNETIC COMPATIBILITY

5. The health of people around, e.g. the use of pacemakers and hearing aids.
6. Equipment used for calibration and measurement.
7. The time of day that welding or other activities are to be carried out.
8. The immunity of other equipment in the environment: the user shall ensure that other equipment being used in the environment is compatible: this may require additional protection measures.

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

C. Methods of Reducing Electromagnetic Emissions

1. Mains Supply

Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the Welding Power Source so that good electrical contact is maintained between the conduit and the Welding Power Source enclosure.

2. Maintenance of Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation.

The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilising devices should be adjusted and maintained according to the manufacturer's recommendations.

3. Welding Cables

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

4. Equipotential Bonding

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

5. Earthing of the Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the work piece to earth should be made by direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

6. Screening and Shielding

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

SYMBOL CHART

	On
	Off
	Dangerous Voltage
	Increase/Decrease
	Circuit Breaker
	AC Auxiliary Power
	Fuse
A	Amperage
V	Voltage
Hz	Hertz (cycles/sec)
f	Frequency
	Negative
	Positive
	Direct Current (DC)
	Protective Earth (Ground)
	Line
	Line Connection
	Auxiliary Power
115V 15A 	Receptacle Rating-Auxiliary Power

1 	Single Phase
3 	Three Phase
	Three Phase Static Frequency Converter-Transformer-Rectifier
	Remote
X	Duty Cycle
%	Percentage
	Panel/Local
	Shielded Metal Arc Welding (SMAW)
	Gas Metal Arc Welding (GMAW)
	Gas Tungsten Arc Welding (GTAW)
	Air Carbon Arc Cutting (CAC-A)
	Constant Current
	Constant Voltage Or Constant Potential
	High Temperature
	Fault Indication
	Arc Force
	Touch Start (GTAW)
	Variable Inductance
	Voltage Input

	Wire Feed Function
	Wire Feed Towards Workpiece With Output Voltage Off.
	Welding Gun
	Purging Of Gas
	Continuous Weld Mode
	Spot Weld Mode
	Spot Time
	Prewflow Time
	Postflow Time
 Press to initiate wirefeed and welding, release to stop.	2 Step Trigger Operation
 Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.	4 Step Trigger Operation
	Burnback Time
	Disturbance In Ground System
IPM	Inches Per Minute
MPM	Meters Per Minute

DESCRIPTION



1. Carry handle
2. On/Off switch
3. Current control knob
4. Power indicator
5. Thermal cutout indicator
6. Earth clamp connection point (- negative)
7. Welding mask
8. Electrode holder
9. Earth clamp
10. Chipping hammer and wire brush
11. Cooling fan
12. Power lead
13. Electrode holder connection point (+ positive)

UNPACKING



CAUTION. This packaging contains sharp objects. Take care when unpacking. Remove the machine, together with the accessories supplied, from the packaging. Check carefully to ensure that the machine is in good condition and account for all the accessories listed in this manual. Also make sure that all the accessories are complete.

If any parts are found to be missing, the machine and its accessories should be returned together in their original packaging to the retailer. Do not throw the packaging away, keep it safe throughout the guarantee period, then recycle if possible, otherwise dispose of it by the proper means. Do not let children play with empty plastic bags due to the risk of suffocation.

ASSEMBLY



WARNING. ELECTRIC SHOCK can kill. Keep the electrode holder and cable insulation in good condition.

Do not touch electrically live parts or electrode with skin or wet clothing.

Insulate yourself from work and ground.

Turn the input line switch on the welder "OFF" before connecting or disconnecting output cables or other equipment.

FITTING THE EARTH CLAMP AND ELECTRODE HOLDER

Insert the plug on the end of the earth clamp lead into the negative (-) socket (Fig.1) and twist in a clockwise direction to secure into position.

The plug on the end of the electrode holder can be fitted into the positive (+) socket (Fig.1) in the same way.

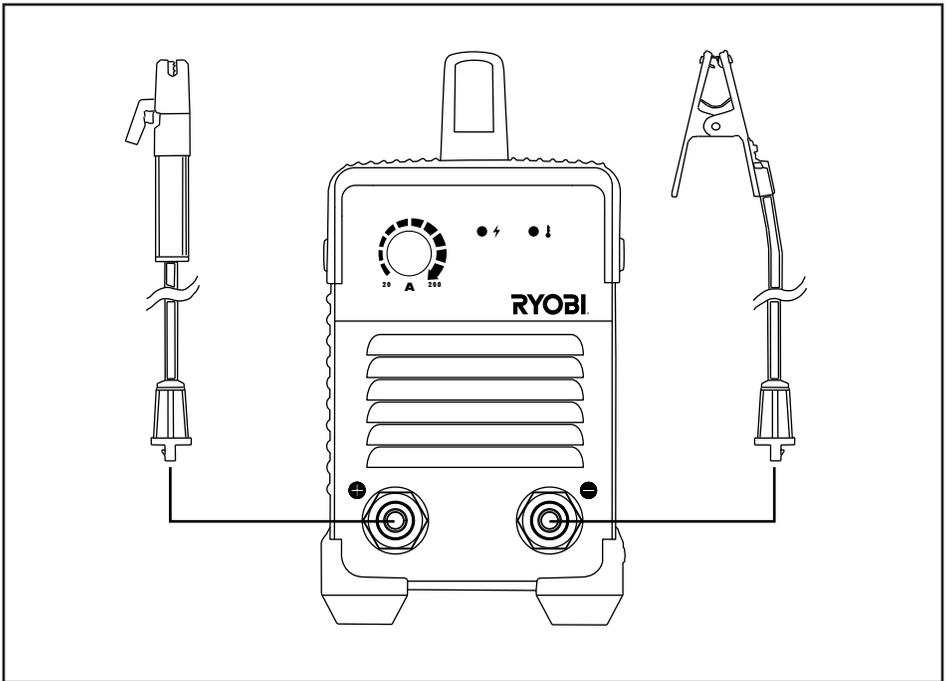


Fig. 1

ASSEMBLY

Note: Before carrying out any assembly or disassembly of the unit please ensure that the unit is not connected to the electrical supply.

ASSEMBLING THE WELDING MASK

Attach the handle to the Welding Shield by lining up the two rectangular tabs on the handle with the corresponding holes in the welding shield and:

- A. press the tabs through the holes and then
- B. slide the tabs forward from the back, locking the round tab in place.

Insert the clear glass panel followed by the dark glass panel into the recess in the shield, refer to Fig.2 & Fig.3.

The dark panel is a certified, specific optical class, and should not be exchanged for any other type. The clear glass panel should be replaced when it becomes badly pitted.



WARNING! NEVER look at an electric arc without eye protection as this can injure the eyes permanently. ALWAYS use a protection mask or welding helmet.

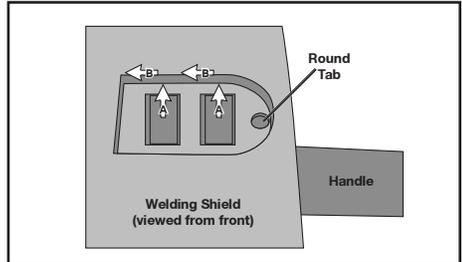


Fig. 2

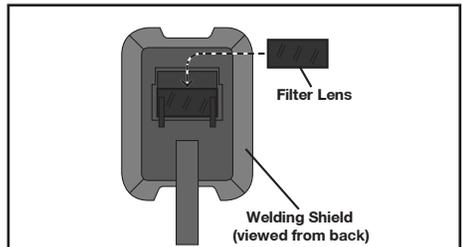


Fig. 3

OPERATION

DESCRIPTION

Your Welding Power Supply features a single phase transformer suitable for welding with an alternating current using stick electrodes with diameters from 1.6mm to 5mm. The welding current is regulated by using the welding current control (regulator).

ELECTRODE SELECTION

The pages of this manual are restricted to the basic safe use of an MMA welding power supply and very basic welding technique. The electrodes used in MMA welding are many and varied. You are advised to seek advice from your local welding equipment supplier for the correct selection of electrode for the work being performed.

OPERATION



WARNING! If you have no welding experience, we recommend you seek training from an experienced person.



CAUTION: This manual is a basic guide to welding. We recommend you purchase a good quality publication on welding or if you have internet access visit one of the numerous welding related web sites to be able to use the welding power supply to its full potential.

THE QUALITY OF ANY WELDED JOINT IS DEPENDANT ON THE PREPARATION OF THE JOINT THE SELECTION OF THE CORRECT ELECTRODE AND THE SKILL AND EXPERIENCE OF THE WELDER.

Ensure the Welding Power Supply is disconnected from the mains supply.

Ensure that the area of the work piece where the earth clamp is to be connected is clean using a file or a grinder, to ensure a good electrical contact.

Ensure the earth lead is connected to the workpiece, and the other lead to the electrode holder.

OPERATION

Important: Ensure also that the earth clamp is attached to clean, solid metal. If necessary thoroughly clean with a wire brush or similar to guarantee a good connection.

The earth clamp must only be connected to the work piece. The area to be welded must be clean and free from dirt, rust, paint, grease and oil.

Insert an electrode into the electrode holder (Fig.4) ensuring there is a good connection.

Set the amperage (see Table 1) by adjusting the regulator (Fig.5)(A) until the desired setting is reached.

The chart below is an indicator of the electrode diameter and the corresponding welding current. This is intended as a guide only.

Electrode size (mm)	Material thickness (mm)	Welding current (A)
1.6	1 - 1.6	25 - 40
2.0	1.6 - 2.6	40 - 70
2.5	2.6 - 4.0	60 - 100
3.2	3.0 - 5.0	80 - 130
4.0	5.0 - 7.0	130 - 170
5.0	7.0 - 9.0	170 - 200



WARNING! Always wear a full welding mask, welding gloves and protective clothing. Wear goggles while chipping slag.

Do not switch on the power supply until you are ready to start welding. Practice welding on a piece of scrap material.

Connect to the mains supply and press the On/Off switch (Fig.6) to the ON position (I). The power indicator lamp on the front panel (Fig.5)(B) will illuminate. To stop the machine, press the On/Off switch to the OFF position (O).

Note: If the machine stops at any time and the thermal cut out indicator on the front panel illuminates, the thermal cutout has intervened.

This indicator will turn on when the machine is overheated and the output has been disabled. This

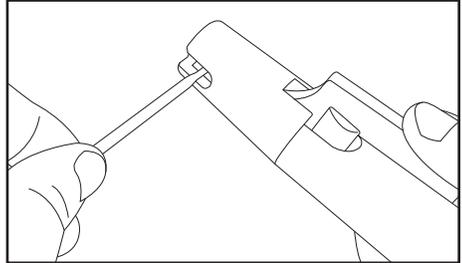


Fig. 4

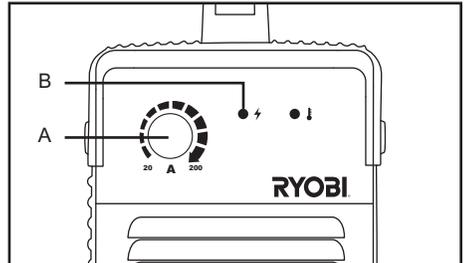


Fig. 5



Fig. 6

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.

STICK (MMAW) BASIC WELDING TECHNIQUE

A WORD TO BEGINNERS

For those who have not yet done any welding, the simplest way to commence is to run beads on a piece of scrap plate. Use mild steel plate about 6.0mm thick and a 3.2mm electrode. Clean any paint, loose scale or grease off the plate and set it firmly on the work bench so that welding can be carried out in the downhand position. Make sure that the work clamp is making good electrical contact with the work, either directly or through the work table. For light gauge material, always clamp the work lead directly to the job, otherwise a poor circuit will probably result.

THE WELDER

Place yourself in a comfortable position before beginning to weld. Get a seat of suitable height and do as much work as possible sitting down. Don't tense your body. Relax and you will find that the job becomes much easier. Wear a leather apron and gauntlets. This will protect you from being burnt or sparks setting alight to your clothes.

Place the work so that the direction of welding is across, rather than to or from, your body. The electrode holder lead should be clear of any obstruction so that you can move your arm freely along as the electrode burns down. If the lead is slung over your shoulder, it allows greater freedom of movement and takes a lot of weight off your hand. Be sure the insulation on your cable and electrode holder is not faulty, otherwise you are risking an electric shock.

STRIKING THE ARC

Holding a face mask in front of your face stroke the electrode point on the workpiece as if striking a match.

Maintain a steady gap between the end of the electrode and the workpiece of approximately 2mm (Fig.7).

Maintain this distance as constantly as possible during the weld remember that the angle of the electrode to the work piece must be 20-30° (Fig.8).

Do not hit the electrode on the workpiece as this may damage the electrode. Withdraw with a clean movement at the end of the welding run.

Note: This is the most difficult aspect for most beginners. It is recommended that you practice on some scrap material in order to get a feel of the operation.

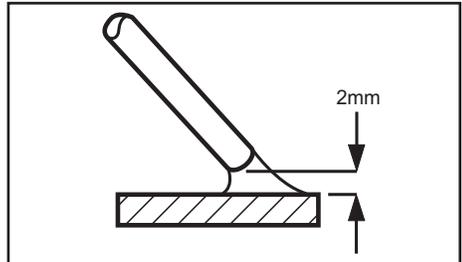


Fig. 7

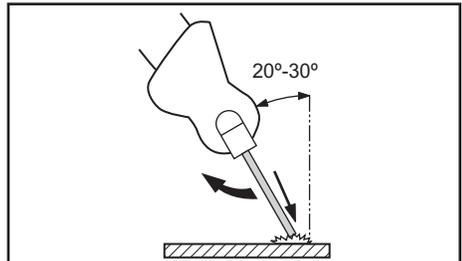


Fig. 8

If the electrode is not withdrawn quickly enough once the arc is primed, there is a possibility that the electrode will weld itself to the workpiece. Should this happen, give it a sharp tug to free it, and try again. If this fails to free it, turn off the machine immediately as it will quickly overheat.

If you withdraw the electrode too far once the arc is primed, you will lose the arc and have to try again.

Inspect the job carefully. With a correct combination of electrode size and current setting the area of weld should be complete fusion of the electrode and parent metal/s. Any slag which forms on the surface should be chipped away with the pick/brush supplied.

If the resultant weld looks messy and irregular, this is an indication of porosity or slag contamination, and you have almost certainly failed to achieve the correct combination. This is a common problem, so do not worry as practice will quickly cure this.

STICK (MMAW) BASIC WELDING TECHNIQUE

ARC LENGTH

The securing of an arc length necessary to produce a neat weld soon becomes almost automatic. You will find that a long arc produces more heat. A very long arc produces a crackling or spluttering noise and the weld metal comes across in large, irregular blobs. The weld bead is flattened and spatter increases. A short arc is essential if a high quality weld is to be obtained although if it is too short there is the danger of it being blanketed by slag and the electrode tip being solidified in. If this should happen, give the electrode a quick twist back over the weld to detach it. Contact or "touch-weld" electrodes do not stick in this way, and make welding much easier.

RATE OF TRAVEL

After the arc is struck, your next concern is to maintain it, and this requires moving the electrode tip towards the molten pool at the same rate as it is melting away. At the same time, the electrode has to move along the plate to form a bead. The electrode is directed at the weld pool at about 20° from the vertical. The rate of travel has to be adjusted so that a well-formed bead is produced. If the travel is too fast, the bead will be narrow and strung out and may even be broken up into individual globules. If the travel is too slow, the weld metal piles up and the bead will be too large.

MAKING WELDED JOINTS

Having attained some skill in the handling of an electrode, you will be ready to go on to make up welded joints.

When welding material up to 7mm in thickness place the pieces 2-3mm apart, run the welding bead along the join. A second bead can go along the underside for extra strength (Fig.9).

When welding material from 7mm to 30mm thick prepare the material as shown in Fig.10 filling up the space with several layers of weld.

When welding together material over 30mm in thickness prepare the material as shown in Fig.11 filling up the space with several layers of weld, welding each side in turn with each welding pass.

Disconnect the Welding Power Supply from the mains supply before changing or removing electrodes. Use pliers to remove used electrodes from the electrode holder or to move the welded pieces.

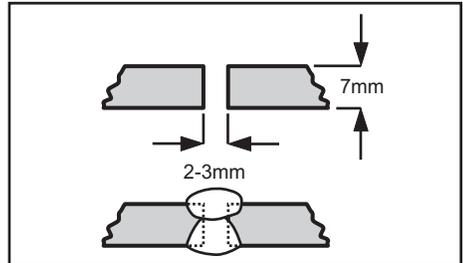


Fig. 9

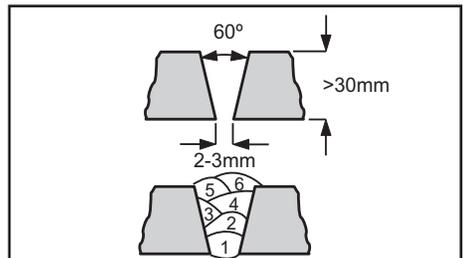


Fig. 10

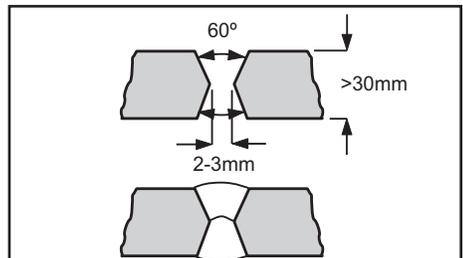


Fig. 11

THE MANUAL METAL ARC PROCESS

When an arc is struck between the metal rod (electrode) and the workpiece, both the rod and workpiece surface melt to form a weld pool. Simultaneous melting of the flux coating on the rod will form gas and slag which protects the weld pool from the surrounding atmosphere. The slag will solidify and cool and must be chipped off the weld bead once the weld run is complete (or before the next weld pass is deposited). The process allows only short lengths of weld to be produced before a new electrode needs to be inserted in the holder.

STICK (MMAW) BASIC WELDING TECHNIQUE

Weld penetration is low and the quality of the weld deposit is highly dependent on the skill of the welder.

TYPES OF FLUX/ELECTRODES

Arc stability, depth of penetration, metal deposition rate and positional capability are greatly influenced by the chemical composition of the flux coating on the electrode. Electrodes can be divided into three main groups:

- Cellulosic
- Rutile
- Basic

Cellulosic electrodes contain a high proportion of cellulose in the coating and are characterised by a deeply penetrating arc and a rapid burn-off rate giving high welding speeds. Weld deposit can be coarse and with fluid slag, deslagging can be difficult. These electrodes are easy to use in any position and are noted for their use in the stovepipe (vertical down position) welding technique.

Features:

- Deep penetration in all positions
- Suitability for vertical down welding
- Reasonably good mechanical properties
- High level of hydrogen generated - risk of cracking in the heat affected zone

Rutile Electrodes contain a high proportion of titanium oxide (rutile) in the coating. Titanium oxide promotes easy arc ignition, smooth arc operation and low spatter. These electrodes are general purpose electrodes with good welding properties. They can be used with AC and DC power sources and in all positions. The electrodes are especially suitable for welding fillet joints in the horizontal/vertical position.

Features:

- Moderate weld metal mechanical properties
- Good bead profile produced through the viscous slag
- Positional welding possible with a fluid slag (containing fluoride)
- Easily removable slag

Basic electrodes contain a high proportion of calcium carbonate (limestone) and calcium fluoride (fluorspar) in the coating. This makes their slag coating more fluid than rutile coatings - this is also fast-freezing which assists welding in the vertical and overhead position. These electrodes are used for welding medium and heavy section fabrications where higher weld quality, good mechanical properties and resistance to cracking (due to high restraint) are required.

Features:

- Low hydrogen weld metal
- Requires high welding currents/speeds
- Poor bead profile (convex and coarse surface profile)
- Slag removal difficult

Iron powder electrodes contain an addition of metal powder to the flux coating to increase the maximum permissible welding current level. Thus, for a given electrode size, the metal deposition rate and efficiency (percentage of the metal deposited) are increased compared with an electrode containing no iron powder in the coating. The slag is normally easily removed. Iron powder electrodes are mainly used in the flat and horizontal/vertical positions to take advantage of the higher deposition rates. Efficiencies as high as 130 to 140% can be achieved for rutile and basic electrodes without marked deterioration of the arcing characteristics but the arc tends to be less forceful which reduces bead penetration.

CARE OF ELECTRODES

The quality of weld relies upon consistent performance of the electrode. The flux coating should not be chipped, cracked or, more importantly, allowed to become damp.

DRYING OF ELECTRODES

Drying is usually carried out following the manufacturer's recommendations and requirements will be determined by the type of electrode.

STICK (MMAW) WELDING TROUBLESHOOTING

Problem	Possible Cause	Remedy
Welding current varying.	Control knob is set at a value that causes the welding current to vary excessively with the arc length.	Reduce the control knob until welding current is reasonably constant while prohibiting the electrode from sticking to the workpiece when you "dig" the electrode into the workpiece.
A gap is left by failure of the weld metal to fill the root of the weld.	Welding current too low. Electrode too large for joint. Insufficient gap.	Increase welding current. Use smaller diameter electrode. Allow wider gap.
Non-metallic particles are trapped in the weld metal.	Non-metallic particles may be trapped in undercut from previous run. Joint preparation too restricted. Irregular deposits allow slag to be trapped. Lack of penetration with slag trapped beneath weld bead. Rust or mill scale is preventing full fusion. Wrong electrode for position in which welding is done.	If a bad undercut is present clean slag out and cover with a run from a smaller gauge electrode. Allow for adequate penetration and room for cleaning out the slag. If very bad, chip or grind out irregularities. Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from corners. Clean joint before welding. Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.
A groove has been formed in the base metal adjacent to the toe of a weld and has not been filled by the weld metal (undercut).	Welding current is too high. Welding arc is too long. Angle of the electrode is incorrect. Joint preparation does not allow correct electrode angle. Electrode too large for joint. Insufficient deposit time at edge of weave.	Reduce welding current. Reduce the length of the welding arc. Electrode should not be inclined less than 45° to the vertical face. Allow more room in joint for manipulation of the electrode. Use smaller gauge electrode. Pause for a moment at edge of weave to allow weld metal buildup.

STICK (MMAW) WELDING TROUBLESHOOTING

Problem	Possible Cause	Remedy
<p>Portions of the weld run do not fuse to the surface of the metal or edge of the joint.</p>	<p>Small electrodes used on heavy cold plate.</p> <p>Welding current is too low.</p> <p>Wrong electrode angle.</p> <p>Travel speed of electrode is too high.</p> <p>Scale or dirt on joint surface.</p>	<p>Use larger electrodes and preheat the plate.</p> <p>Increase welding current.</p> <p>Adjust angle so the welding arc is directed more into the base metal.</p> <p>Reduce travel speed of electrode.</p> <p>Clean surface before welding.</p>
<p>Gas pockets or voids in weld metal (porosity).</p>	<p>High levels of sulphur in steel.</p> <p>Electrodes are damp.</p> <p>Welding current is too high.</p> <p>Surface impurities such as oil, grease, paint, etc.</p> <p>Welding in a windy environment.</p> <p>Electrode damaged ie. flux coating incomplete.</p>	<p>Use an electrode that is designed for high sulphur steels.</p> <p>Dry electrodes before use.</p> <p>Reduce welding current.</p> <p>Clean joint before welding.</p> <p>Shield the weld area from the wind.</p> <p>Discard damaged electrodes and only use electrodes with a complete flux coating.</p>
<p>Crack occurring in weld metal soon after solidification commences.</p>	<p>Rigidity of joint.</p> <p>Insufficient throat thickness.</p> <p>Weld current is too high.</p>	<p>Redesign to relieve weld joint of severe stresses or use crack resistance electrodes.</p> <p>Travel slightly slower to allow greater build up in throat.</p> <p>Decrease welding current.</p>
<p>Excessive spatter</p>	<p>Improper welding polarity</p> <p>Long Arc Length.</p> <p>Weld current is too high.</p>	<p>Make sure the electrode holder is plugged into the positive "+" output terminal.</p> <p>Move the electrode closer into the weld joint.</p> <p>Decrease welding current.</p>

MAINTENANCE



WARNING. ELECTRIC SHOCK can kill.
Have an electrician install and service this equipment.

Turn the input power off at the fuse box, disconnect supply lines and allow machine to sit for five minutes minimum to allow the power capacitors to discharge before working inside this equipment.

Do not touch electrically hot parts.



WARNING. Do not open this machine and do not introduce anything into its openings. Power supply must be disconnected from the machine before each maintenance and service. After each repair, perform proper tests to ensure safety.



CAUTION. The power supply must be disconnected from the machine before each maintenance and service. Always use gloves in compliance with the safety standards.

ROUTINE MAINTENANCE

The welder must be kept clean and dry at all times. Use a dry cloth to clean the welder.

Keep the electrodes clean and dry and ensure all cables are in good condition.

Keep the louvre passages clean to avoid a build up of dirt and oxides inside the machine, which can reduce machine output.

The nozzle will occasionally need to be cleaned of spatter from welding. Clean it with a metal brush. When the nozzle deteriorates or can no longer be cleaned, it will need to be replaced. Unscrew the nozzle and replace it with a new one.

Always try to avoid getting particles of metal inside the machine since they could cause short circuits.

Periodically clean the inside of the welder with compressed air, ensuring you wear a mask during the operation.

Caution: Water must never come into contact with the welder.

Regularly check the general condition of the tool. Check for loose screws, misalignment or binding of moving parts, cracked or broken parts, damaged electrical wiring, and any other condition that may affect its safe operation.

If the supply cord requires replacing, the task must be carried out by the manufacturer, the manufacturer's agent, or an authorised service centre to avoid a safety hazard.

WELDING MASK MAINTENANCE

Always maintain your welding mask in good condition. If the clear glass protection lens becomes badly pitted, sufficient to interfere with vision, or cracked, have it replaced immediately.

NEVER use any dark filter lens other than that provided by RYOBI, or one with the same certified 'Optical class' (degree of protection).

The shield should always be cleaned with a clean soft cloth after use, ensuring the lenses are clean. Remove any dust that may have accumulated and store it in a safe place where it cannot be damaged.

NEVER use a shield that is not in perfect condition.

ELECTRODE STORAGE

Electrodes should always be kept in a dry and well-ventilated store. It is good practice to stack packets of electrodes on wooden pallets or racks well clear of the floor. Also, all unused electrodes which are to be returned should be stored so they are not exposed to damp conditions to regain moisture. Good storage conditions are 10°C above external air temperature. As the storage conditions are to prevent moisture from condensing on the electrodes, the electrode stores should be dry rather than warm. Under these conditions and in original packaging, electrode storage time is practically unlimited. It should be noted that electrodes are now available in hermetically sealed packs which obviate the need for drying. However, if necessary, any unused electrodes must be redried according to manufacturer's instructions.

TROUBLESHOOTING



DANGER! Follow all safety precautions whenever diagnosing or servicing the tool. Dis connect power supply before service.

Problem	Possible Cause	Remedy
The welding arc cannot be established.	<p>The primary supply voltage has not been switched ON.</p> <p>The welding power source switch is switched OFF.</p> <p>Loose connections internally.</p>	<p>Switch ON the primary supply voltage.</p> <p>Switch ON the welding power source.</p> <p>Have an qualified service technician repair the connection.</p>
Maximum output welding current cannot be achieved with nominal mains supply voltage.	Defective control circuit.	Have an qualified service technician inspect then repair the welder.
Welding current reduces when welding.	Bad work clamp to workpiece connection.	Ensure that the work lead has a positive electrical connection to the work piece.
Welder will not start.	<p>No power at outlet.</p> <p>Cord not connected.</p> <p>Line voltage incorrect.</p>	<p>Check power at outlet.</p> <p>Check that cord is plugged in.</p> <p>Make sure the welder is plugged into a 230V electrical outlet.</p>
No weld output with ready light on.	<p>Weld cable loose.</p> <p>Bad work clamp to workpiece connection.</p>	<p>Tighten weld cable connection at welder.</p> <p>Make sure the area where the clamp is attached is clean, exposed metal; free of dirt, paint and oil.</p>
No weld output; high temperature light on.	<p>Welder overheated.</p> <p>Duty cycle or amps too high.</p> <p>Airflow is blocked.</p>	<p>Allow unit to cool with the fan on.</p> <p>Reduce duty cycle or amps.</p> <p>Clean vents and fan out with compressed air.</p>
Fan not operating.	<p>Fan blocked/dirty.</p> <p>Fan broken.</p>	<p>Remove obstruction and clean with compressed air.</p> <p>Have the fan replaced by a qualified service technician.</p>

TROUBLESHOOTING

Problem	Possible Cause	Remedy
Erratic or improper arc or welding output.	Bad weld connections.	Clean and tighten weld connections.
	Polarity incorrect.	Connect polarity correctly.
	Workpiece painted or dirty.	Clean workpiece thoroughly.
	Nozzle obstructed by welding spatter.	Clean or replace nozzle.
Main supply fuse shuts off frequently.	Circuit Breaker rating is too low.	Install a circuit breaker rated for greater than ?? Amps.

SYMBOLS

Some of the following symbols may be used on this tool. Please study them and learn their meaning. Proper interpretation of these symbols will allow you to operate the tool better and safer.

SYMBOLS	DESIGNATION/EXPLANATION
	Conforms to relevant safety standards.
	To reduce the risk of injury, the user must read and understand the operator's manual before using this product.
	Warning! Electrical welding process.
	Do not use this welder in damp conditions.
	Protect operator and passerby from the effect of uV radiation. This can cause permanent damage to the eye. Make sure the arc and resulting flash is shielding at all times.
	Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your Local Authority or retailer for recycling advice.
	Keep bystanders and pets clear of the welding power supply when in use.
	Always wear approved face mask with correct filter, gloves and apron to protect against welding operation.

SYMBOLS

Symbols and Technical Data	
EN 60974-1	European standard relating to Welding Power Supply's for limited use
MMA-200	Type ID
	Single phase transformer
	Symbol for manual arc welding and covered electrodes
50Hz	Nominal mains frequency
∅	Diameter of electrodes
U_0	No load voltage
...A/...V to ...A/...V	Range of output
X%	Duty cycle
I_2	Conventional welding current
U_2	Conventional load voltage
U_1	Mains voltage
$I_1 \text{ max}$	Maximum absorbed current
$I_1 \text{ eff}$	Effective supply current
IP21S	Grade of protection
	Standardised plug
	Suitable for welding in an environment with increased hazard of electric shock

NOTES

NOTES