Inverter Gas Metal Arc Welding Machine

MODELS

MIG-250TD & MIG-300TD

Operation Manual

Read this manual carefully before installing, operating and maintaining the machine.

Description: This machine is designed and built to weld ferrous and non-ferrous metals.

Disclaimer: The information, illustrations and instructions described in this manual are based on the latest product information available at the time of publication. The manufacturer and distributors reserve the right to modify the contents of the owner's manual at any time. Modifications may result following product modifications and the manufacturer and distributors are not obliged to notify any organization or individual of such modifications. Welding work must be executed only by professionally trained and qualified individuals. Therefore, the manufacturer and distributors will only accept responsibility for product quality. No liability, joint or several, shall be accepted for incidents including but not limited to loss of profit resulting from omissions or misdirection that may be printed in this operating manual. This manual will contain as far as possible preventive and safe operation measures related to the equipment but cannot exclude the occurrence of accidents. Therefore, the manufacturer and distributors shall not be liable for any direct or indirect, joint or several liability for any incidental or consequential damages which may occur. For detailed health and safety information, the relevant professional agencies and manufacturers of consumables such as welding materials and flux should be contacted.

Warranty Exclusions:

- ✓ Consumable items such as welding wires, welding flux, fuse, quick connector, drive roller, tension roller, etc.
- ✓ Machine damages caused by incorrect voltage input or power surges.
- ✓ Machine or parts malfunction owing to incorrect connections or user operation.
- ✓ Illegal disassembly or re-fitment of the machine without permission of the manufacturer, resulting in damage or malfunction.
- ✓ Accidental damage during shipment, transportation and storage.
- ✓ Damage owing to incorrect handling, natural disaster and other force majeure occurrences.

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Safety Precautions

The equipment is designed for use by qualified personnel who have completed professional training and have obtained a qualification certificate as a welder. The operator shall have sufficient professional knowledge of welding, cutting and circuitry. The machine should be operated only after having read and fully understood all the safety precautions and warnings contained in this manual and those generally applicable to welding operations. The risk of personal injury and damage to equipment is reduced by safety precautions being followed when using tools and equipment. This machine is easy to operate and the selection of its functions is straight forward. Improper use and maintenance will reduce the safe operation of the machine and the following safety precautions must be followed:

1. The operator must have the relevant certificate before operating the equipment.
2. A qualified professional should be employed to ensure that the machine and all cables are properly connected, grounded and installed.
3. Personal protective equipment approved by the local safety authority must be used. All relevant safety procedures must be adhered to.
4. Before operation insulation layers on wires and cables as well as connection sequences should be inspected and corrected if required.
5. Repairs and maintenance should be carried out by qualified technicians only after the machine has been disconnected from the electricity supply.
6. Operating the machine in a humid environment may result in a short circuit or may cause an electric shock to the operator.
7. Modifications to the machine or equipment are not allowed.
8. The disposal of scrap machine parts and equipment must comply with local regulations.

Warnings

Welding and cutting operations are specialised operations which present a certain degree of risk. Professional training, correct operating procedures and protective measures reduce the accident risk and damage to equipment.

Personal Safety Protection	
	**Welding and cutting operations generate noise, bright light and high-temperature sparks which will cause harm to human hearing, eyes and skin unless personal protective measures are implemented and proper operational instructions are adhered to.**
1	Wear flame retardant personal protective equipment (PPE) such as gloves, overalls, welding helmets with correct shading filter, shoes and aprons to protect against thermal radiation, sparks and hot metal particles.
2	Hot sparks and metal fragments can cause skin damage. Avoid clothes with front pockets and button-up sleeves and collars.
3	Use appropriate flame-retardant shields or curtains to protect bystanders from arc radiation and high temperature sparks. Bystanders also need to wear a protective helmet fitted with a shading filter to protect face and eyes or a pair of spectacles fitted with shading filters.
4	Avoid burns and scalds by not touching a welded work piece with bare hands.
Fire and Explosion Dangers	
	**Welding and cutting operations generate high-temperature flames and arc which can cause fires and explosions. The same applies to welding slag and sparks.**
1	Operators and bystanders must be protected from arc, sparks and metal fragments.
2	The welding/cutting area should be free from flammable and explosive materials. Should these materials be required in the welding/cutting process, flame retardant covers should be applied.
3	Care should be taken to avoid fire hazards from cracked floors and walls.

4	Welding and cutting on sealed gas tanks will cause explosions. These operations are prohibited.
5	Welding and cutting areas must be provided with adequate fire extinguishing equipment. Regular testing for efficiency of this equipment is compulsory as is training of staff in the use of the equipment.
6	Once the welding/cutting operation is completed, check for any high temperature spark or metal which might cause a fire and immediately dispose of it. If necessary, employ the assistance of a firefighter.

Electricity Hazards

Electric shock can cause serious injury or even death to the individual when contact is made with live wires. Humid conditions can add to the risk and great care should be taken when welding or cutting machines are used in these conditions.

1	Reliable grounding of machine and work piece as well as a secure ground clamp, is important.
2	Insulation layers of electric wires and cables must be checked regularly for wear and replaced if necessary.
3	All equipment used and clothing worn during the welding/cutting operation should be free from moist and kept dry.
4	Do not make direct body contact with any live electrical parts.
5	Wearing rubber-insulated shoes and standing on an insulated platform greatly reduce the risk of accidental shock.
6	Refrain from replacing the ground cable on the machine with wires not suitable for the task.
7	The machine operates on high voltage and capacitors remain charged even after power is switched off. Removing covers for maintenance procedures must only be executed by qualified professionals.

Effects of Electromagnetic Fields

Electric current flowing through a conductor produces magnetic fields (EMF). The discussion on the topic of the effects of EMF on the human body is ongoing worldwide and up to the present no evidence has been forthcoming proving negative effects on

	health. However, it would be wise to limit exposure to EMF as far as possible and the following procedures are suggested:
1	Welders and cutters with cardiac pacemaker implants should obtain medical advice on the effects of EMF on the implant.
2	Welders should minimise the possibility of electromagnetic field damage through the following methods.
2.1	Route the electrode and ground cables together and, where possible, secure them with tape.
2.2	Do not wrap wires and cables around arms or coil power cables around body parts. If possible, keep cables away from the body.
2.3	Keep the distance between the ground clamp to the workpiece and the electrode as short as possible.
2.4	Keep a safe distance between the operator and the welding/cutting machine.
Protection from Fumes and Gases	
	**During the welding or cutting process, fumes can be produced which may be detrimental to health.**
1	The working area should be well ventilated and welding/cutting activities should not be executed in confined spaces. Eye, nose or throat discomfort can be the result of inadequate ventilation.
2	Welding and cutting in or near locations where chlorinated hydrocarbon vapours are produced such as degreasing, cleaning and spraying operations, should not be undertaken since phosgene, a highly toxic gas as well as other irritants can be reaction products.
3	The industry offers a variety of respiratory masks and must be used in conditions where clean breathing air is required.
Gas Cylinder Safety	
	**Gas leaks can occur on cylinders connected to welding/cutting operations if the system is not properly managed and maintained. A ruptured cylinder or relief valve can cause serious injury or can even be fatal.**

1	Gas cylinders should be kept away from extreme temperatures and fire sources. Scratching on cylinder walls with hard objects should be avoided.
2	A flowmeter should be installed on the gas cylinder in use in accordance with the manufacturer's operating instructions. Quick-coupling connectors must not be used and gas hose fittings should be tested for leaks.
3	Gas cylinders must always be kept upright and chained or belted to a cylinder trolley, base, wall, post or shelf. Never fix a gas cylinder to a worktable or machine: It can become party to an electrical circuit and explode.
4	Ensure that the cylinder valve is closed when not in use. If there is no hose connected to the flowmeter then cover the outlet with a dust cap.

Protection Against Moving and Rotating Parts	
 	**Moving parts, such as fans, rotors and belts, can be hazardous.**
1	Ensure that all protective covers, doors and panels on the machine are closed or securely intact before starting an operation.
2	Ensure that maintenance on machines are only carried out by qualified technicians.
3	Ensure that hands, hair, clothing and tools are safely out of range from moving and rotating parts.

Packaging and Transportation

1. Pay attention to and comply with packaging, storage and transportation instructions which are clearly identified on the containers.
2. Always handle all containers with care.
3. Equipment must be stored in waterproof, moisture proof and well-ventilated facilities within the temperature range -25°C - 55°C.

Parameters

Model	MIG-250TD	MIG-300TD
Item	Parameters	
Rated input voltage:	1PH--AC220V±15% 50/60Hz	3PH--AC380V±15% 50/60Hz
Rated input power:	10.5kVA	14.0kVA
Rated input current:	16A	25.0A
Rated duty cycle:	60%	
Output current range(A):	50-250	50-300
Open circuit voltage:	52V	55V
Efficiency:	≥85%	
Wire diameter:	Φ0.8-Φ1.2(mm)	
Gas flow-rate:	2～24(L/min)	
IP grade	IP21S	
Insulation grade:	F	
Package dimensions :	740*375*750(mm)	
N.W.:	41.0kg	42.0kg

Product Description

The welding machine in this series inverts the 50/60Hz power supply to a high-frequency, high-voltage power supply. The inversion process is facilitated by a powerful IGBT device followed by step-down rectification and pulse-width modulation (PWM) technology producing a high-power DC output suitable for welding. The advanced inverter technology allows for the construction of a smaller volume and light-weight, stable and reliable transformer with a 30% improved efficiency. Added to the advantages of the inverted power supply, the

machine has good dynamic characteristics, and offers a stable arc, good welding quality and ease of control.

This semi-automatic, high-performance machine is designed for CO_2 and mixed-gas welding on low-carbon steel, low-alloy steel, stainless steel, galvanized sheet and copper. Steel and stainless steel wire as well as other solid wires with diameter Φ0.8 - Φ1.2mm can be used.

The inverter welding machines in this series are manufactured in accordance with IEC60974-1 <Arc Welding Equipment - Part 1: Welding Power Sources >, Safety Requirements for Arc Welding Equipment.

1. Product Functions and Features:

1.1. All-in-one multiple welding functions served by a digital CPU control system delivering a precise digital output.

1.2. High efficiency and duty cycle and a noiseless rectifier.

1.3. A stable welding process and excellent arc self regulation is ensured by the closed-loop control system regulating a stable voltage in cases of grid-voltage fluctuation.

1.4. Less spatter and a high metal-deposition rate as well as excellent weld-seam appearance and low metal distortion.

1.5. The self-locking function greatly reduces operator fatigue owing to extended welding operations.

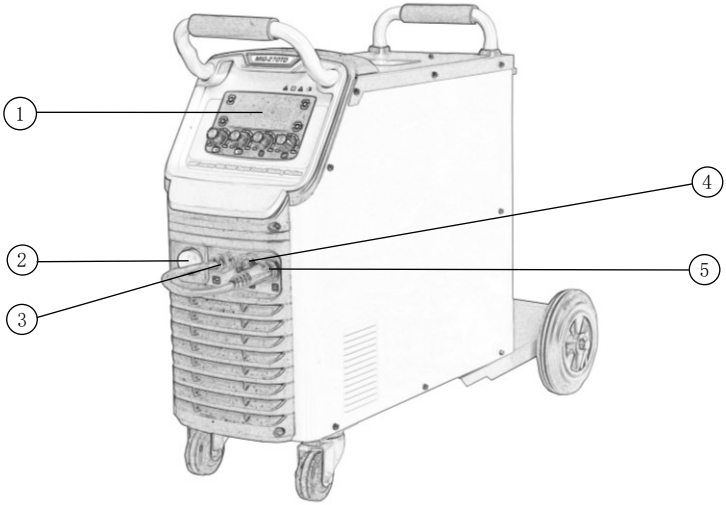
1.6. The MMA function allows the use of a variety of different diameter electrodes such as acid, alkaline, stainless steel, and cast iron.

1.7. Troubleshooting is minimised by the protection circuit ensuring safety and reliability.

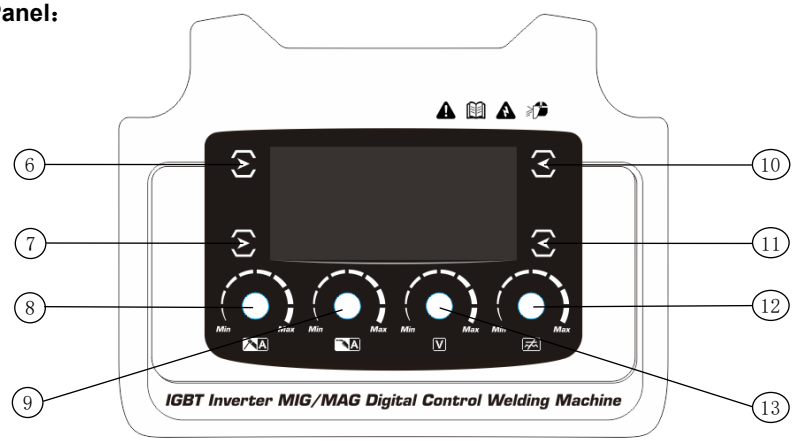
1.8. The IP21S protection level ensures reliability even in harsh environments.

2. Appearance Diagram:

MIG-350I/500I



Panel:



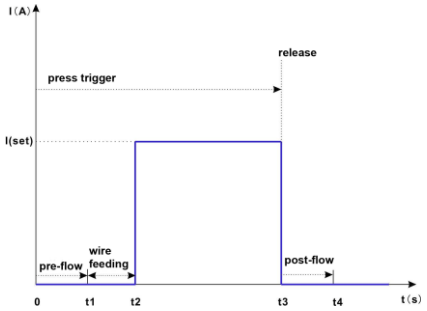
1	**Control Panel**
2	**Euro Standard Torch Connector:** Connects the welding torch.
3	**Polarity conversion plug:** When using flux-cored wires the coupling device is connected to the negative pole.

4 + 5	**Terminal sockets - positive pole (+) and negative pole (-):** In MMA mode the electrode holder cable is connected to the positive terminal and the earth cable is connected to the negative terminal and should be reversed when using scratch start DC TIG in MMA mode. In MIG mode the polarity cable is connected to the positive terminal and the earth cable is connected to the negative terminal for all MIG welding applications, except for gasless flux-core welding where the polarity cable is reversed and connected to the negative terminal and the earth cable is connected to the positive terminal.
6	**Welding Mode Selection Button:** Selection between MIG/MAG and MMA when the corresponding indicator light is lit.
7	**Inching Wire Feed Button:** Press and hold the button to feed the wire. Releasing the button will stop the wire feeding.
8	**MMA Welding Adjustment Knob:** Rotate to regulate the welding current.
9	**Welding current/wire-feed speed Knob:** Rotate to regulate the wire feed speed or welding current.
10	**Trigger Mode Button:** Switch between 2T and 4T trigger modes and operate when the corresponding light is lit.
11	**Gas Button：** Press and hold the gas button to start the gas flow inspection. Releasing the button will stop the gas flow**.**
12	**Induction Adjustment Knob:** Rotate the knob to adjust inductance and regulating arc intensity.
13	**Voltage Adjustment Knob:** Rotate to regulate the output-voltage.

3. Setting the Trigger Mode

3.1. 2T Mode

This setting applies for short-spell welds and the responding current curve is depicted below.



0~t1: Press torch trigger. Gas pre-flow starts.

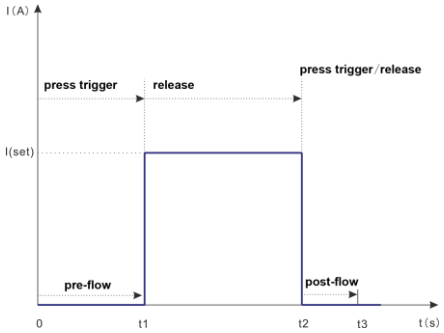
t1~t2: Wire feed starts. Gas flows.

t2: Welding operation starts and current reaches preset value.

t3~t4: Trigger released. Wire feeding stops and current drops to zero. Post-flow gas will continue for a short period. Note: the gas pre-flow and post-flow not adjustable in T2 mode.

3.2. 4T Mode

This setting applies for longer-spell welds and the responding current curve is depicted below.



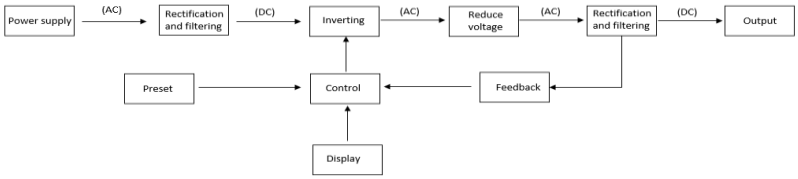
0~t1: Press torch trigger. Gas pre-flow starts.

t1~t2: Release the trigger and the wire feed starts and current reaches preset value.

t2~t3： Pressing the trigger again, stops the wire feeding and drops the current to zero. Post-flow gas will continue for a short period.

Working Principle

1. Diagram Explaining Working Principle



1.1. A bridge rectifier converts AC to DC;

1.2. After secondary rectification and reactor filtering, output welding current is delivered that meets the welding requirements;

1.3. Controlled by PWM the IGBT inverts the DC to 20KHz AC which is transmitted via a high-frequency transformer;

1.4. The in-time protection circuit provides signals to the PWM warning for overheat and over-current situations;

1.5. A closed-loop control system ensures a good anti-grid fluctuation ability and an excellent cutting performance..

Installation and Wiring

1. Location Requirements

1.1. The machine should not be installed in an area where it is exposed to direct sunlight or rain but where the humidity is as low as possible and the ambient temperature is within the range of -10°C - 40°C.

1.2. The machine should be installed on a flat, preferable level surface but, in any case not on a surface with an inclination of more than 10 °.

1.3. The machine should not be operated in a work station exposed to wind. Should a windy environment be unavoidable, suitable screening should be installed.

1.4. In order to allow for efficient ventilation, a clear space of at least 20cm should be allowed in front of and behind the machine as well as at least 10cm at each side.

2. Power Input Requirements

The power supply waveform should be the standard sin wave, the rated voltage 380V±10% 50/60Hz. Three phase voltage unbalance should be ≤ 5%.

Model	MIG-250TD	MIG-300TD
Parameters	**Value**	
Power supply：	1PH-AC220V ±15% 50/60Hz	3PH-AC380V±15% 50/60Hz
Rated input current:	16A	25.0A
Input cable：	≥2.5mm^2	≥2.5mm^2
Output cable：	25mm^2	30mm^2
Ground cable：	≥2.5mm^2	≥2.5mm^2

3. Main Power Supply Connection

Pay attention to prevent electric shock | **Wear goggles**

Take note of the following when the machine is connected to the main power supply:

3.1. The connection must be carried out by a qualified electrician or technician.

3.2. The connection must be in compliance with national and local regulations.

3.3. Before the connection is carried out, the main power supply to the control box must be switched off.

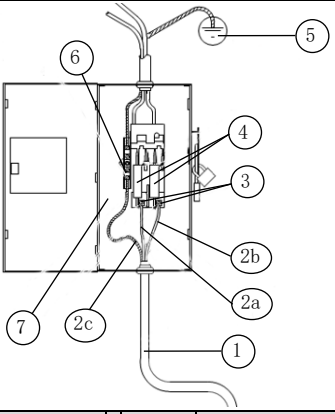
3.4. An earth cable set must be securely connected from the machine to the work-piece. The machine must be earthed.

3.5. Ensure that the required power supply of the machine (as printed on its nameplate) corresponds to the main power supply.

3.6. The connection screws on the terminal block must be tight ensuring a solid connection between the machine cable wires and the main power supply.

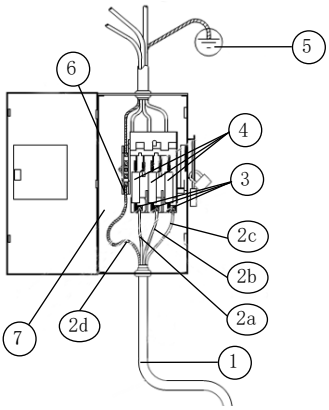
3.7. The correct wiring procedure is explained in the following diagram:

Wiring of single phase AC, 50/60Hz welding machine



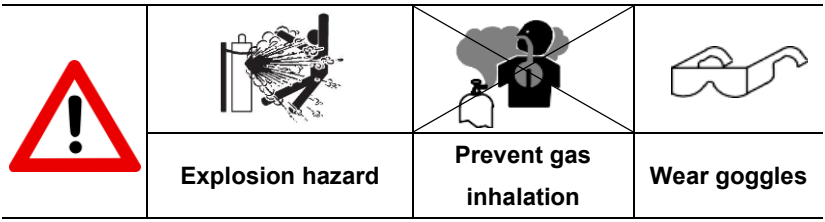
No.	Item	No.	Item
1	Power cord	**4**	Overcurrent protection device
2a	Live wire L	**5**	GND
2b	Neutral wire N	**6**	Earth wire terminal block
2c	Earth wire	**7**	Electric control box
3	Terminal block		

Wiring of three phase AC, 50/60Hz welding machine



No.	Item	No.	Item
1	Power cord	**3**	Terminal block
2a	Live wire L1	**4**	Overcurrent protection device
2b	Live wire L2	**5**	GND
2c	Live wire L3	**6**	Earth wire terminal block
2d	Earth wire	**7**	Electric control box

4. Gas-cylinder Connection



Warning: The following safety instructions are important when connecting a gas cylinder to the welding machine.

4.1. The cylinder must be fixed to a wall, cylinder rack or support. Its centre of gravity can cause the cylinder to topple resulting in injury and material damage.

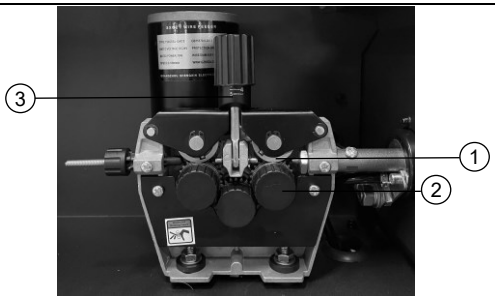
4.2. The cylinder must be placed out of reach of the operator's welding station and not in contact with the work table or the welding machine.

4.3. Connect the gas hose firmly from the flowmeter outlet to the gas inlet situated at the back of the welding machine. Gas leakage is not allowed.

4.4. Adjust the flowrate in accordance with the manufacturer's recommendation. Generally, 15 -20 litres/min.

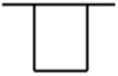
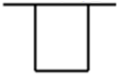
5. Wire Feeder

5.1. Composition



No.	Item	No.	Item
1	Tensioner roller	3	Pressure regulating handle
2	Drive roll		

5.2. Selection of Tensioner Roller and Drive Roll

	Non-groove	Non-groove
Tensioner roller		
Drive roll		
	V groove	knurled
V groove roll	Suited for hard wires such as carbon steel and stainless steel wire.	
Knurled roll	Suited for flux-cored wires.	

5.3. Wire-feed Pressure Selection

The wire feeding pressure scale is on the pressure regulating handle ③. For welding wires of different materials and diameters, the reference value of pressure is as follows:

Scale Table				
1 2 3 4	Diameter / Pressure / Drive roll	Ø0.8mm	Ø1.0mm	Ø1.2mm
	V groove roll	3	3	2.5
Pressure scale	Knurled roll	-	1.5	2

The actual pressure scale to be used will be determined by the length of the torch cable, the type of welding torch and welding wire as well as wire-feeding conditions.

After adjustment of the drive roll, press the tensioner roller. Should the wire slip when exiting the contact tip, readjust.

！However:

- **Take care not to apply excessive pressure which will result in wire being deformed and coatings being damaged.**
- **Excessive pressure will also result in faster drive-roll wear.**

6. Installation of Wire Liner and MIG Torch

In order to deliver a smooth and successful welding job, it is important to confirm that the wire liner and contact tip is compatible with the welding torch and that the wire liner is suitable for the diameter and type of wire to be used.

!Attention:

- **Take care that the wire in the liner is not too tight or too loose. Both will increase unstable wire feed.**
- **Ensure the MIG torch is securely connected to prevent voltage drop and over-heating of the wire-feeder and MIG torch.**

7. Installation and Adjustment of Welding Wire

			
	Prevent injuries caused by wire	**Prevent injuries caused by moving parts**	**Wear goggles**

！ Attention:

◆ **The wire speed generated by the feeder is relatively fast and safety during the installation and adjustment process is of prime importance. Never point the welding torch nozzle to a face or other body part. The speed of the wire exiting the nozzle can cause a nasty jab.**

Brief Procedure for the Welding Operation

1. Procedure for MIG Welding

1.1. Wear the necessary welding protection equipment such as helmet, mask, earplugs, protective clothing, gloves, insulating safety shoes.

1.2. Confirm the electrical grid connected to the welding machine is consistent with the correct power supply of the machine.

1.3. Confirm that the insulation layers on all the wires and cables of the welding machine are intact and that the cable set is secure and correctly connected to the machine.

1.4. Confirm the machine is freely vented and that the vents on the machine are not obstructed and no objects are lying on the machine body.

1.5. Connect and tighten the earth cable to the negative pole. Clamp the other end of the cable to the workpiece.

1.6. Connect and tighten the welding(polarity) cable of the wire feeder to the positive pole.

1.7. Connect and tighten the wire feeder control cable to the aviation socket.

1.8. Connect the wire-feeder gas hose to the flowmeter. If the flowmeter has a heating power cable, then connect it to the heating power supply socket on the rear of the machine.

1.9. Connect the MIG torch to the Euro socket adaptor on the wire feeder and tighten the connection nut.

1.10. Switch on the machine and ensure the indicator light is lit and the fan is operational. Open the gas valve on the cylinder and regulate the gas flow to the required flow-rate.

1.11. Ensure that the locating hole on the wire spool corresponds with the locating pin on the hub, install the wire spool on the hub shaft and lock the spool with the hub nut.

1.12. Ensure that the groove position of the wire feeding roller and the diameter of the nozzle are compatible with the wire diameter.

1.13. Release the wire feed pressure and direct the welding wire into the groove of the wire feeding roller, through the wire guide tube into the wire guide tube of the central socket.

1.14. Adjust the pressure to the point where wire does not slip or the wire is deformed by a too high pressure.

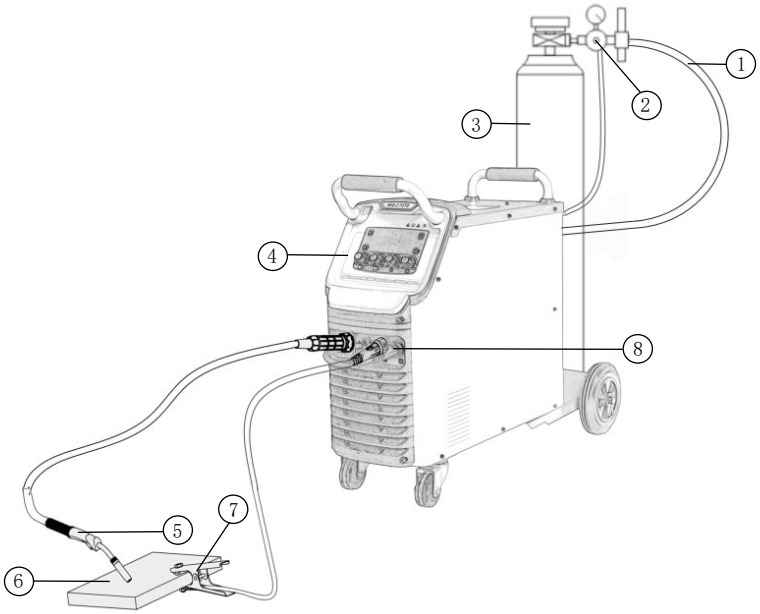
1.15. Press the inching wire feed switch allowing the wire to be fed through the torch until it protrudes the required length from the nozzle.

1.16. Set the required parameters for the job at hand. To start the welding operation, press the torch trigger.

1.17. During the welding operation, the parameters can be modified to suit the situation.

1.18. After welding operation is completed, switch off the power on the machine and distribution box.

2. Schematic Diagram for the MIG Welding Process



When self-shielded welding wire is used, connector 8 must be connected to the negative pole of the coupling device and the earth clamp cable end to the positive pole of the coupling device.

Attention: When self-shielded flux-cored wire is used in gasless self-shielded welding mode, a knurled wire feeder is required.

No.	Item		No.	Item
1	Gas hose		5	Welding torch
2	Flowmeter		6	Work piece
3	Gas cylinder		7	Earth clamp
4	Welding power supply		8	Polarity conversion plug

3. MMA Welding Operation Procedure

3.1. Wear the necessary welding protection equipment such as helmet, mask, earplug, protective clothing, gloves, insulating safety shoes.

3.2. Confirm the electrical grid connected to the welding machine is consistent with the correct power supply of the machine.

3.3. Confirm that the insulation layers on all the wires and cables of the welding machine are intact and that the cable set is secure and correctly connected to the machine.

3.4. Confirm the machine is freely vented and that the vents on the machine are not obstructed and no objects are lying on the machine body.

3.5. Connect and tighten the earth cable to the negative pole. Clamp the other end of the cable to the workpiece.

3.6. Connect and tighten the welding cable to the positive pole. Use the electrode holder to clamp the electrode.

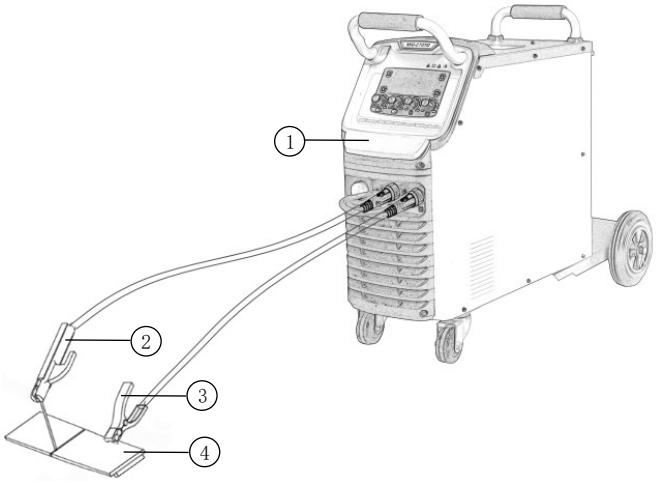
3.7. Switch on the machine and ensure the indicator light is lit and the fan is operational.

3.8. Select the MMA mode on the front panel. Preset the welding current in accordance with the specifications of the welding electrodes.

3.9. During the welding operation the parameters can be modified to suit the situation.

3.10. After welding operation is completed, switch off the power on the machine and distribution box.

4. Schematic Diagram for the MMA Welding Process



Direct Current Electrode Negative (DCEN): Suitable for acid electrode welding(as shown in the figure above).

Direct Current Electrode Positive (DCEP): Suitable for alkaline and cellulose electrode welding.

No.	Item		No.	Item
1	Welding machine		3	Earth clamp
2	Electrode holder		4	Work piece

5. Suggested Settings for MMA Welding

Electrode diameter （mm）	Welding current range （A）	Welding Voltage range （V）
Φ2.0	40~65	21.6~22.6
Φ2.5	50~90	22.0~23.6
Φ3.2	90~130	23.6~24.2
Φ4.0	140~180	24.6~27.2
Φ5.0	180~220	27.2~28.8

6. Suggested settings for MIG welding：

	Plate thickness （mm）	Wire diameter （mm）	Amperage (A)	Voltage (V)	Wire speed (cm/min)	Free wire length （mm）	Gas flow (L/min)
I square butt weld	0.8	0.8、0.9	60~70	16~16.5	50~60	10	10
	1.0	0.8、0.9	75~85	17~17.5	50~60	10	10~15
	1.2	0.8、0.9	80~90	17~17.5	50~60	10	10~15
	1.6	0.8、0.9	95~105	17~18	45~50	10	10~15
	2.0	1.0、1.2	110~120	18~19	45~50	10	10~15
	2.3	1.0、1.2	120~130	19~19.5	45~50	10	10~15
	3.2	1.0、1.2	140~150	20~21	45~50	10~15	10~15
	4.5	1.0、1.2	160~180	22~23	45~50	15	15
		1.2	220~270	24~28	45~50	15	15~20

	Plate thickness （mm）	Wire diameter （mm）	Amperage (A)	Voltage (V)	Wire speed (cm/min)	Free wire length （mm）	Gas flow (L/min)
Fillet butt welding	1.6	0.8、0.9	60~80	16~17	40~50	10	10
	2.3	0.8、0.9	80~100	19~20	40~55	10	10~15
	3.2	1.0、1.2	120~160	20~22	35~45	10~15	10~15
	4.5	1.0、1.2	150~180	21~23	30~40	10~15	20~25
Horizontal fillet butt welding T joint	1.0	0.8、0.9	70~80	17~18	50~60	10	10~15
	1.2	0.9、1.0	85~90	18~19	50~60	10	10~15
	1.6	1.0、1.2	100~110	19~20	50~60	10	10~15
	2.0	1.0、1.2	115~125	19~20	50~60	10	10~15
	2.3	1.0、1.2	130~140	20~21	50~60	10	10~15
	3.2	1.0、1.2	150~170	21~22	45~50	15	15~20
	4.5	1.0、1.2	140~200	22~24	45~50	15	15~20
	6	1.2	230~270	24~28	45~50	20	15~20
Horizontal fillet welding joint	0.8	0.8、0.9	60~70	16~17	40~45	10	10~15
	1.2	0.8、0.9	80~90	18~19	45~50	10	10~15
	1.6	0.8、0.9	90~100	19~20	45~50	10	10~15
	2.3	0.8、0.9	100~130	20~21	45~50	10	10~15
		1.0、1.2	120~150	20~21	45~50	10	10~15
	3.2	1.0、1.2	150~180	20~22	35~45	10~15	20~25
	4.5	1.2	200~270	24~28	45~50	10~15	20~25

7. Possible Welding Deficiencies

The following deficiencies are related to situations outside the electronic circuits and are mostly attributed to accessories, gas and power supply and external circumstances. These can be circumvented by controlling the environmental factors.

7.1. Blackened Welding Spots

This phenomenon indicates that the welding spot is oxidised owing to insufficient protection. The following remedial actions can be pursued:

7.1.1. Check the efficiency of gas flow and pressure. As a general rule the pressure in the cylinder should be above 0.5 mPa. If not, exchange or refill the cylinder.

7.1.2. Check the gas flow and ensure there is sufficient flow-rate shielding for the job at hand. The flow-rate should never be below 3 l/min.

7.1.3. Ensure that the gas flow to the torch is unobstructed.

7.1.4. Ensure that the gas being used is correct and of good quality.

7.1.5. Strong air flow in the welding environment may influence gas shielding.

7.2. Difficult Arc Start or Easy Arc Break.

7.2.1. Only use a good quality electrode to meet the requirements for high-quality welding.

7.2.2. Ensure that electrodes are sufficiently dried. Electrodes with a too high moisture content will cause arc instability, welding defects and poor welding quality.

7.2.3. Extended welding cables can cause excessive voltage drop at the torch end resulting in arc problems.

7.3. The Output Current is Below the Rated Value

Power supply which deviates from the rated voltage, will have a consequential effect on the output current. Under-power input will result in under-power output.

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Maintenance

Safe operation of the machine is dependent on regular maintenance and the replacement of worn and defective parts where necessary.

1. Daily Precautionary Checks

1.1. For any abnormal vibrations, sounds or odours.

1.2. For any sign of overheating on cable connections.

1.3. Whether the power switch is operational and the fan operates smoothly when the machine is switched on.

1.4. Whether cables are correctly connected, insulated and in sound order.

1.5. Torch consumables are subject to wear and tear and should be replaced when worn..

2. Three to Six Monthly Check List

2.1. Dust Removal

Remove the side cover plate and clean off all parts with dry compressed air. Since the effective cooling of the machine is dependent on a designed air flow pattern, it is important to return the side cover plate after the cleaning operation. Not paying attention to this detail, will result in over-heating of and consequent damage to the transformer and semi-conductor parts.

2.2. Wire Feeder Parts

The guide tube, drive rolls and tensioner rollers are subject to wear and tear and should be checked and replaced if worn.

Common Machine Malfunctions and Solutions

⚠ Warning: Machine maintenance and repair must be carried out by qualified technicians. The operating voltage in the machine can be up to 600V and it is important that power be cut at the machine and at the control box before covers are removed and repairs carried out. A cooling-down period of at least 5 minutes is required before commencement of any inspection and repairs. This will allow the capacitor to fully discharge.

1. Inspection Before Overhaul

1.1. Check if the line voltage on the three-phase power supply is within the range of 340V-420V and, all phases are intact. In case of a single-phase supply, check if the line voltage is within the range of 200V – 240V

1.2. Check if the power cable as well as the earth wire is firmly connected.

1.3. Check whether the wiring connections are correct and firmly connected.

2. Common Machine Problems and Troubleshooting

No.	Problem	Root cause	What to do
1	Machine is switched on, no digital display, fan not operational, no open-circuit voltage.	Power switch malfunction or damaged.	Repair or replace switch.
		Power phase down.	Check power supply phases and rectify.
		No power supply from the grid.	Check the power grid.
		Filter capacitor and/or rectifier bridge damaged.	Replace filter capacitor and/or bridge rectifier.
		Transformer damaged.	Replace the transformer.
		Control board damaged.	Replace the control board.
2	Welding current not adjustable.	Broken wire feeder control cable or controller.	Replace wire-feeder control cable or the controller.
		Control board damaged.	Replace the control board.
		Wire at both ends of the diverter inside the machine is broken.	Reconnect or replace the broken wire.
3	Unstable arc and excessive spatter	Welding parameters do not match or irregular operation.	Readjust parameters or improve operation.
		Badly worn contact tip.	Replace contact tip.

4	Error indicator light is lit, fan operational and digital meter in good order. No no-load voltage.	Overheated power supply owing to insufficient ventilation.	Improve ventilation condition
		Ambient temperature too high.	Wait 5-10 minutes with no welding to allow recovery.
		Duty cycle exceeded.	Wait 5-10 minutes with no welding to allow recovery.
5	No heated-gas delivery from CO2 regulator.	Faulty CO2 regulator.	Replace the regulator.
		Broken or short-circuited heating cable.	Repair or replace the heating cable.
		Faulty thermistor on the power supply.	Replace the thermistor.
6	When torch trigger is pressed and held, wire feed is normal but no gas flow.	No gas output from the hose.	Inspect the gas hose.
		Gas solenoid terminal contacts are good, the solenoid valve may be defective.	Replace solenoid valve.
		If problem persists after replacement of solenoid valve, the fault lies with the control board.	Replace control board.
		Blocked electric air socket aperture blocked.	Remove blockage.
7	When torch trigger is pressed and held, wire feeder fails and there is no indication of OCV.	Torch trigger is damaged.	Replace trigger or torch.
		Broken wire feeding control.	Repair the wire feeding control cable.
		Damaged control circuit board.	Replace the control circuit board.

3. Common Welding Imperfections and Analysis

No.	Imperfect	Root cause
1	Porosity	1. Impure gas or insufficient gas supply. 2. Absorption of air during welding. 3. Failed preheater. 4. Poor gas shielding owing to strong wind. 5. Torch nozzle blocked by spatter. 6. Too great a distance between nozzle and workpiece. 7. Polluted welding surface with oil and dust or moisture caused from insufficient cleaning not sufficiently removed. 8. Arc length too long and voltage too high. 9. Insufficient silicon and manganese content in welding wire .
2	Incomplete penetration	1. Welding parameters unsuitable for the current job. 2. Welding wire out of position and not aligned with the centre of the welding bead. 3. Centre deviation of wire feed roller. 4. Wire straighteners not properly adjusted. 5. Loose or worn contact tip.
3	Poor welding bead	1. Unsuitable welding parameters 2. The welding wire is out of position, and not aligned 3. with the middle of the welding bead 4. Center deviation of wire feeding roller 5. Wire straighteners is improperly adjusted 6. Contact tip is loosen

No.	Imperfect	Root cause
4	Unstable welding arc	1. Loose or worn contact tip or too large in diameter for the wire thickness. 2. Uneven wire spool rotation: excessive wear on the groove of the drive roll and the pressure from the tensioner roller not adequate. 3. Too low welding current and fluctuation of arc voltage. 4. Protruding welding wire outside the the contact tip too long. 5. Surface pollution of the workpiece from rust, paint or grease. 6. The earth cable set not properly connected.
5	Spatter	1. Too large or too small inductance in short circuit transition. 2. Imbalance between arc voltage and welding current. 3. Inadequate cleaning of welding wire and material.

4. Circuit Diagram