

# **OPERATING INSTRUCTIONS**

## **Milano1600 Welding Machine**



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**For questions or suggestions, please contact us [www.smart-iwm.com](http://www.smart-iwm.com)**



## **WARNINGS**

Read and understand this entire Manual and your employer's safety practices before installing, operating ,or servicing the equipment. While The operating instructions provide an introduction to the safe use of the products.

- Read the operating instructions for all system components!
- Observe accident prevention regulations!
- Observe all local regulations!
- Confirm with a signature where appropriate.

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### **Record the following information for Warranty purposes:**

Where Purchased: \_\_\_\_\_

Purchase Date: \_\_\_\_\_

Serial NO.: \_\_\_\_\_

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#### WARNING

**PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.**

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

Safe practices are outlined in the European Standard EN60974-1 entitled: Safety in welding and allied processes Part 2: Electrical HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.

### 1.1 Arc Welding Damage



#### WARNING 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 semi-automatic 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.



**WARNING** 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 to protect your face and eyes when welding or watching;
2. Wear approved safety glasses. Side shields recommended;
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;
6. Never wear contact lenses while welding.



**WARNING** 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 breathe 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. 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.
5. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapours to form highly toxic and irritating gases.
6. 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.



**WARNING** WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The fly 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 far away from 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 travelling 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.



**WARNING** 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.



**WARNING** 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.
8. Read and follow instructions on compressed gas cylinders, associated equipment.



**WARNING** ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fuelling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuelling is spilled, clean up before starting engine.



**WARNING 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.



**WARNING 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 batteries.



**WARNING 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.

**NOTE**

**1.2 Effects Of Low Frequency Electric and Magnetic Fields**

Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). The discuss on the effect of EMF is ongoing all the world. Up to now, no material evidences show that EMF may have effects on health. However, the research on damage of EMF is still ongoing. Before any conclusion, we should minimize exposure to EMF as few as possible.

**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 cable around the body.
4. Keep welding Power Source and cables as far away from body as practical.
5. The people with heart-pacemaker should be away from the welding area.

**1.3 Symbol Chart**

Note that only some of these symbols will appear on your model.

	ON		Single Phase		Wire Feed Function
	OFF		Three Phase		Wire Feed Towards Workpiece With Output Voltage OFF.
	Dangerous Voltage		Three Phase Static Frequency Converter-Transformer-Rectifier		Welding Gun
	Increase/Decrease		Remote		Purging Of Gas
	Circuit Breaker		Duty Cycle		Continuous Weld Mode
	AC Auxiliary Power		Percentage		Spot Weld Mode
	Fuse		Panel/Local		Spot Time
	Amperage		Shielded Metal Arc Welding (SMAW)		Prewlow Time
	Voltage		Gas Metal Arc Welding (GMAW)		Postflow Time
	Hertz (cycles/sec)		Gas Tungsten Arc Welding (GTAW)		2 Step Trigger Operation Press to initiate wirefeed and welding, release to stop.
	Frequency		Air Carbon Arc Cutting (CAC-A)		4 Step Trigger Operation Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.
	Negative		Constant Current		Burnback Time
	Positive		Constant Voltage Or Constant Potential		Inches Per Minute
	Direct Current (DC)		High Temperature		Meters Per Minute
	Protective Earth (Ground)		Fault Indication		See Note
	Line		Arc Force		See Note
	Line Connection		Touch Start (GTAW)		Pulse Welding
	Auxiliary Power		Variable Inductance		
	115V 15A Receptacle Rating-Auxiliary Power		Voltage Input		

## 2.1 Brief Introduction

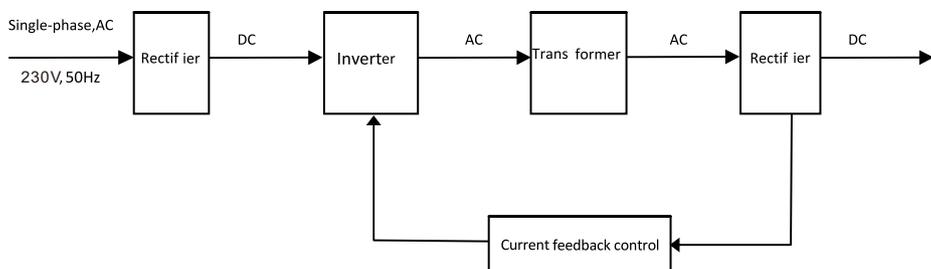
Milano1600 MIG welding machines adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

### Milano1600 MIG machines Characteristics:

- ◆MCU control system, responds immediately to any changes.
- ◆High frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.
- ◆Lift TIG operation, If the tungsten electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆Simple select material/wire diameter and the stored know-how controls the welding process automatically
- ◆Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.

## 2.2 Working Principle

The working principle of Milano1600 welding machines is shown as the following figure. Single-phase 230V work frequency AC is rectified into DC(about 312V), then is converted to medium frequency AC (about 20-40KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes),then is outputted DC .The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet the requirements of welding craft.



## 2.3 Specifications

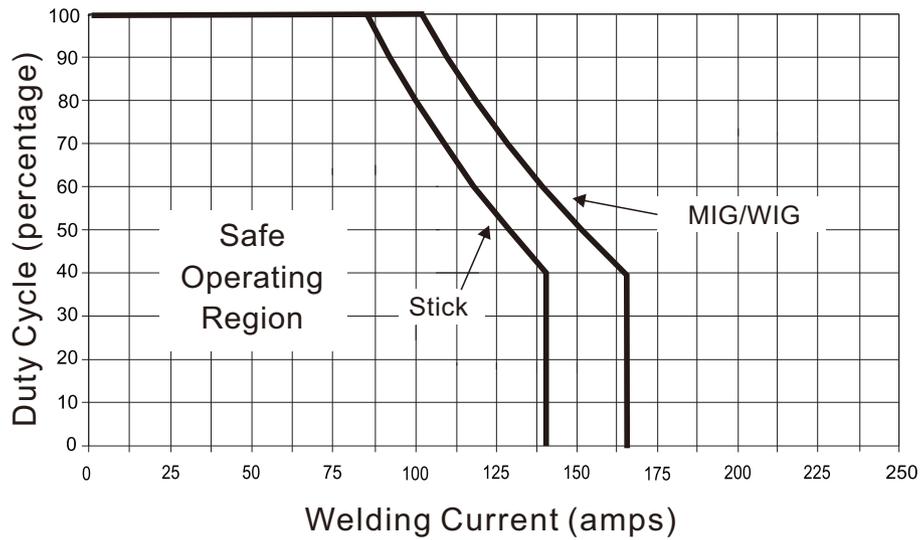
Description	SIWM DIGITALF Milano1600
Dimensions	H490mmxB225mmxT380mm
Weight	13.6kg
Cooling	Fan Cooled
Welder Type	Multi Process Inverter Power Source
European Standards	EN 60974-1 / IEC60974-1
Number of Phases	1
Nominal Supply Voltage	230VAC ± 15%
Nominal Supply Frequency	50/60Hz
Open Circuit Voltage	66V
Output Voltage Range	10-25 V
Wirefeeder Speed Range	2.5-18
Wire roll weight	5kg
Wire roll diameter	0.6/0.8
Protection Class	IP23
Insulation Class	F
Thickness of material	Up to 0.8mm
Efficiency	80%
Power Factor	0.8
Welding Current Range (MIG Mode)	30-160 A
Welding Current Range (MMA Mode)	10-140 A
Welding Current Range (WIG Mode)	10-160A
Effective Input Current	15.4A
Maximum Input Current	24.3 A
Single Phase Generator Requirement	10KVA
Duty cycle, 40°C, 10 min(MIG)	160A@ 40%22V 101A@ 100%19V
Duty cycle, 40°C, 10 min(MMA)	140A@ 40%25.6V 88A@ 100%23.5V
Duty cycle, 40°C, 10 min(WIG)	160A@ 40%16.4V 101A@ 100%14V
Gas Follow	3s

### NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

## 2.4 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. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 160 amperes at 22 volts. This means that it has been designed and built to provide the rated amperage (160A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



## 2.5 Packaged Items

- ◆ 3m MB-15AK MIG Gun – 16m<sup>2</sup>
- ◆ 3m Gas Hose 8x13.5
- ◆ 200 A electrode holder with 2.5m cable.
- ◆ 200 A earth clamp with 2.5m cable
- ◆ 2.5m Power cable
- ◆ Drive Rolls
- ◆ Operating Manual

## 3.1 Layout For The Panel R221

### Front



# Behind



## 1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

## 2. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

## 3. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present base current Amps, just press SAVE.

## 4. Weld Process Selection Button

Press and release this button to change the selected weld process mode from mig to tig to stick. The weld process will change to the next process in the sequence each time the button is pressed and released. The green indicators next to the button will illuminate to identify mig to tig to stick process mode.

## 5. Digital Ammeter

The digital meter is used to display the pre-set (preview) amperage in STICK / Mig modes and actual welding amperage of the power source when welding, it is also used to display parameters from selecting function button 6.

## 6. Digital Voltmeter

The digital meter is used to display the pre-set (preview) Voltage in Mig modes and actual welding Voltage of the power source when welding. This digital meter is used to display the Welding Output Terminal Voltage in STICK modes during non-welding or welding.

## 7. 2T - 4T Trigger Latch Button

Press and release the button to change the selected operating mode of the trigger. The selected mode can be either "2T" (unlatched) or "4T" (latched) operation. The green indicator next to the button will illuminate to identify which mode is selected (2T or 4T). In the 4T mode once the weld has been started you can release the trigger and continue welding until the trigger is activated again or the welding arc is broken to stop the welding arc.

## 8. 0.6/0.8/SPL

Press this button to choose the welding materials diameter, SPL is stainless steel.

## 9. Welding current adjustment

Clockwise rotate to enlarge the current, and anti-clockwise rotate to reduce the current.

## 10. MIG Torch Connecting

The MIG Torch Adapter is the connection point for the MIG Torch. Press the MIG Torch in and secure by turning the locking ring to the right (clockwise)

**11. Remote Control Switch**

Remote Control Switch receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:  
To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise. The socket information is included in the event the supplied cable is not suitable and it is necessary to wire a plug or cable to interface with the receptacle.

**12. Positive Welding Output Terminal**

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the MIG Gun (via the MIG Gun polarity lead) or ground clamp (for Stick function). Positive welding current flows from the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

**13. Negative Welding Output Terminal**

The negative welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the earth clamp (for Mig function) or electrode holder (for Stick function). Negative welding current flows to the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

**14. Power switch**

before using the machine. Pull the switch to the closure state of "AN" to operate the machine, and pull the switch to "AUS" after use. Turn off the power input, and the machine will stop operating.

**15. Gas input port**

The gas port is connected with the gas valve output port. After connection, check whether there is gas leakage. (As shown in the picture of section 3.2: Gas valve assembly)

**16. Program downloading port**

Change the program downloading connection port, and use the plastic cover to prevent the dust from polluting and oxidizing the port after use.

**WARNING**

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

**3.2 MIG Gun Polarity Lead**

The polarity lead is used to connect the MIG Gun to the appropriate positive or negative output terminal (allowing polarity reversal for different welding applications). In general, the polarity lead should be connected in to the positive welding terminal (+) when using steel, stainless steel or aluminum electrode wire. When using gasless wire, the polarity lead is generally connected to the negative welding terminal (-). If in doubt, consult the manufacturer of the electrode wire for the correct polarity. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

**3.3 Installing a 5 kg Spool 300mm Diameter**

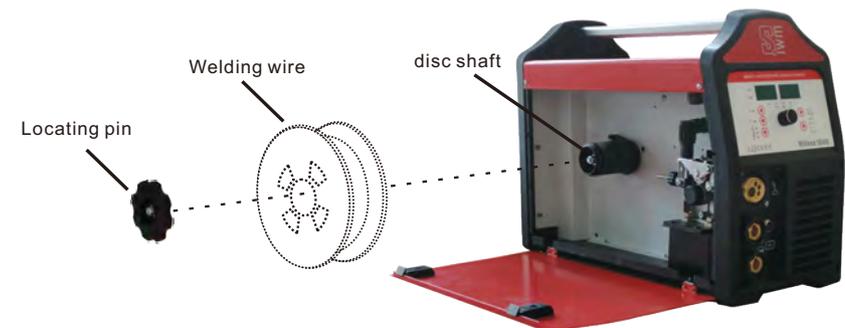
In order to install a 5 kg / 300mm diameter spool, assemble the wire into the spool hub and replace the wire spool hub cover.

Installation of wire spool.

1. Remove Wire Spool hub cover.
2. Place Wire Spool onto the hub, put back the hub cover back, turn securely to keep the wire spool stable on the hub.

**CAUTION**

Use care in handling the spooled wire as it will tend to "unravel" when loosened from the spool. Grasp the end of the wire firmly and don't let go of it.



### 3.4 Inserting Wire Into The Feed Mechanism



#### WARNING

ELECTRIC SHOCK CAN KILL! Make certain the input power is disconnected from the power source before proceeding. DO NOT reattach the input power until told to do so in these instructions.

1. Loosen the Spring Pressure Adjusting Knob if needed and swing it down (See part 1) .
2. Move the Pressure (top) Roller Arm by swinging it to the right. (See part 2) .
3. Make sure the end of the wire is free of any burrs and is straight. Pass the end of wire through the Inlet Wire Guide and over the Feed roll. Make certain the proper groove is being used. (See part 2) .
4. Pass the MIG wire over the drive roll groove, through the outlet guide and out past the MIG Torch Adaptor. Then fit the MIG Torch to ensure the MIG wire passes into the MIG Torch liner of the MIG Torch.
5. Close the Pressure Roller Arm.
6. Swing the Spring Pressure Adjusting Knob back into place.
7. Use the Spring Pressure Adjusting Knob to create a "snug" condition. (Clockwise to Tighten and Counter Clockwise to loosen).
8. Last picture shows the result with wire installed. Continue to the next section for proper setting of tension.

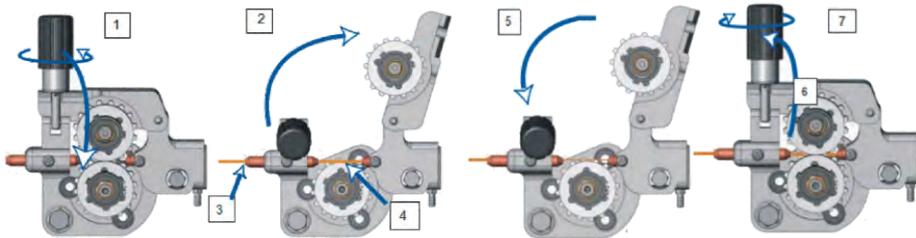


Illustration 1

Illustration 2

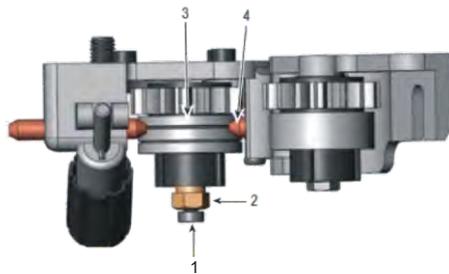


Illustration 3

### 3.5 Feed Roller Pressure Adjustment

The roller on the swing arm applies pressure to the grooved roller via an adjustable tension device. The Tension Adjuster should be set to a minimum pressure that will provide satisfactory wire feed without slippage. If slipping occurs, and inspection of the wire out of the MIG Gun reveals no deformation or wear, the conduit liner should be checked for kinks or clogging from metal flakes. If this is not the cause of slipping, the feed roll pressure can be increased by rotating the Tension Adjusting knob clockwise. The use of excessive pressure may cause rapid wear of the feed roller, motor shaft and motor bearings.

#### NOTE

Genuine contact tips and liners should be used. Many non-genuine liners use inferior materials which can cause wire feed problems.

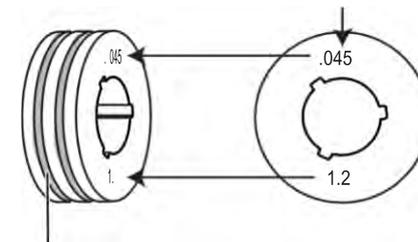
### 3.6 Changing The Feed Roll

#### NOTE

Feed rolls often come with a rust prohibitive coating that needs to be cleaned off before installation. A Feed roll consists of four different sized grooves. As delivered from the factory the drive roll is installed for 0.6 / 0.8 mm .

The stamped marking on the feed roll refers to the groove furthest from the stamped marking. When mounted, that will be the groove closest to the motor and the one to thread.

To ensure proper wire feed, the groove closest to the motor must match the electrode wire size being used.



1.2mm (.045") Groove

The size that is visible when fitting the feedroll is the groove size in use.

#### NOTE

All grooved feed rolls have their wire size or range stamped on the side of the roll. On rolls with different size grooves, the outer (visible when installed) stamped wire size indicates the groove in use.

Refer to feed roll kit in the Appendix for the proper selection and ordering of feed roll kits. Kit includes drive rolls, an input wire guide and an output wire guide for a specific wire type and size.

Feed rolls are removed by twisting the feed roll retainer cap and aligning the retaining knob splines/tabs with the drive gear splines. Feed rolls are installed by putting the feed roll onto the drive gear splines and twisting the feed roll retainer cap so that the splines/tabs rest against the face of the feed roll where they will click into place.

**WARNING**

The welding wire is electrically Hot if it is fed by depressing MIG Gun switch. Electrode contact to work piece will cause an arc with MIG Gun switch depressed.

### 3.7 Shielding Gas Regulator Operating Instructions

**WARNING**

This equipment is designed for use with welding grade (Inert) shielding gases only.

**NOTE**

Shielding Gas is not required if the unit is used with self shielded FCAW (flux cored arc welding) wires

**Shielding Gas Regulator Safety**

Gas regulators are designed to reduce and control high pressure gas from a cylinder or pipeline to the working pressure required for the equipment using it. If the equipment is improperly used, hazardous conditions are created that may cause accidents. It is the users responsibility to prevent such conditions. Before handling or using the equipment, understand and comply at all times with the safe practices prescribed in the manufacturer's instructions. SPECIFIC PROCEDURES for the use of regulators are listed below.

1. NEVER subject the regulator to inlet pressure greater than its rated inlet pressure.
2. NEVER pressurize a regulator that has loose or damaged parts or is in a questionable condition. NEVER loosen a connection or attempt to remove any part of a regulator until the gas pressure has been relieved. Under pressure, gas can dangerously propel a loose part.
3. Do NOT remove the regulator from a cylinder without first closing the cylinder valve and releasing gas in the regulator high and low pressure chambers.
4. Do NOT use the regulator as a control valve. When downstream equipment is not in use for extended periods of time, shut OFF the gas at the cylinder valve and release the gas from the equipment.
5. OPEN the cylinder valve SLOWLY. Close after use.

**User Responsibilities**

This equipment will perform safely and reliable only when installed, operated and maintained, and repaired in accordance with the instructions provided. Equipment must be checked periodically and repaired, replaced, or reset as necessary for continued safe and reliable performance. Defective equipment should not be used. Parts that are broken, missing, obviously worn, distorted, or contaminated should be replaced immediately.

The user of this equipment will generally have the sole responsibility for any malfunction, which results from improper use, faulty maintenance, or by repair by anyone other than an accredited repairer.

**CAUTION**

Match regulator to cylinder. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.

**NOTE**

The regulator/ ow meters used with argon based and carbon dioxide shielding gases are different. A suitable regulator/ ow meter will need to be fitted.

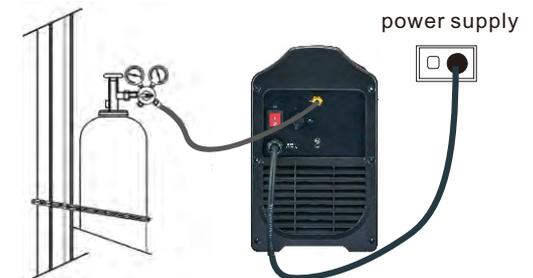
**NOTE**

All valves downstream of the regulator must be opened to obtain a true ow rate reading on the outlet gauge. (Welding power source must be triggered) Close the valves after the pressure has been set.

**Installation**

1. Remove cylinder valve plastic dust seal. Clean the cylinder valve outlet of impurities that may clog orifices and damage seats before connecting the regulator. Crack the valve (open then close) momentarily, pointing the outlet away from people and sources of ignition. Wipe with a clean lint free cloth.
2. Match regulator to cylinder. Before connecting, check that the regulator label and cylinder marking agree and that the regulator inlet and cylinder outlet match. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.
3. Connect the regulator inlet connection to cylinder or pipeline and Tighten it firmly but not excessively, with a suitable spanner.
4. Attach supplied gas line between the regulator output and the desired input at the rear of the power source.

Ensure that the gas cylinder is secured to a building pillar, wall bracket or otherwise securely fixed in an upright position.



- To protect sensitive down-stream equipment a separate safety device may be necessary if the regulator is not fitted with a pressure relief device.

### Operation

With the regulator connected to cylinder or pipeline, and the adjustment screw/knob fully disengaged, pressurize as follows:

- Stand to one side of regulator and slowly open the cylinder valve. If opened quickly, a sudden pressure surge may damage internal regulator parts.
- With valves on downstream equipment closed, adjust regulator to approximate working pressure. It is recommended that testing for leaks at the regulator connection points be carried out using a suitable leak detection solution or soapy water.
- Purge air or other unwanted welding grade shielding gas from equipment connected to the regulator by individually opening then closing the equipment control valves. Complete purging may take up to ten seconds or more, depending upon the length and size of the hose being purged.

### Adjusting Flow Rate



With the regulator ready for operation, adjust working ow rate as follows:

- Slowly turn adjusting screw/knob in (clockwise) direction until the outlet gauge indicates the required ow rate.

### NOTE

It may be necessary to re-check the shielding gas regulator ow rate following the first weld sequence due to back pressure present within shielding gas hose assembly.

- To reduce ow rate, allow the welding grade shielding gas to discharge from regulator by opening the down- stream valve. Bleed welding grade shielding gas into a well ventilated area and away from any ignition source. Turn adjusting screw counterclockwise, until the required ow rate is indicated on the gauge. Close downstream valve.
- Adjust regulator pressure adjusting screw to the required ow rate, indicated on gauge dial. The gas ow rate should be adequate to cover the weld zone to stop weld porosity. Excessive gas ow rates may cause turbulence and weld porosity.

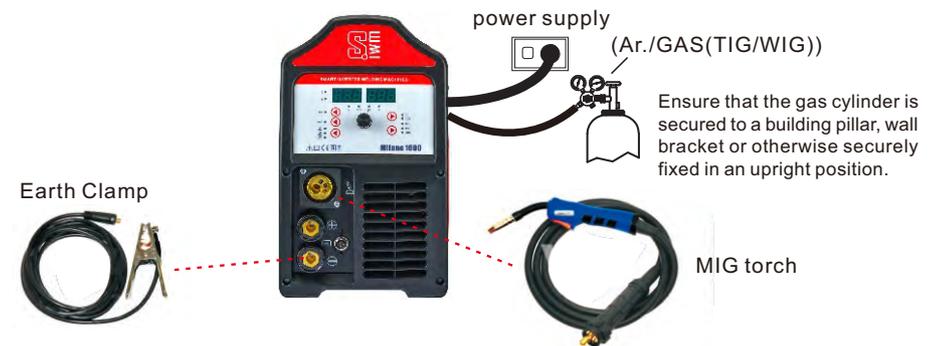
### Shutdown

Close cylinder valve whenever the regulator is not in use. To shut down for extended periods (more than 30 minutes).

- Close cylinder or upstream valve tightly.
- Open downstream equipment valves to drain the lines. Bleed gas into a well ventilated area and away from any ignition source.
- After gas is drained completely, disengage adjusting screw and close downstream equipment valves.
- Before transporting cylinders that are not secured on a cart designed for such purposes, remove regulators.

### 3.8 Set-up MIG (GMAW) Welding With Gas Shielded MIG Wire

When using a non shielded wire, you need to have an external gas source attached to the unit. For most Non Shielded Wire, connect the Work Lead to the negative - terminal and connect the MIG Gun polarity lead to the positive + terminal. If in doubt, consult the MIG electrode wire manufacturer.



- Turn the Main ON/OFF switch OFF (located on the rear panel).
- Check that the MIG wire size, contact tip, MIG Gun liner and drive roll groove are all the same size before fitting the MIG wire into the Power Source.
- Connect the MIG Gun Polarity Lead to the positive welding terminal (+). If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
- Fit the MIG wire spool and MIG Gun to the machine.
- Connect the work lead to the negative welding terminal (-). If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
- Fit the welding grade shielding gas regulator/ ow gauge to the shielding gas cylinder then connect the shielding gas hose from the rear of machine to the regulator/ow gauge outlet.
- Turn the Main ON/OFF switch ON (located on the rear panel).
- Select MIG mode with the process selection control.

9. Remove the MIG Gun nozzle and contact tip.
10. Depress MIG Gun trigger to feed the MIG wire out through the MIG Gun gas diffuser then fit the contact tip on the MIG wire and securely fasten it to the MIG Gun then fit the nozzle in place.
11. Refer to the Weld Guide located on the inside of the wire feed compartment door for further information on Voltage/Wirespeed settings.

**WARNING**

Before connecting the work clamp to the work make sure the mains power supply is switched OFF.

Secure the welding grade shielding gas cylinder in an upright position by chaining it to a suitable stationary support to prevent falling or tipping.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

Remove any packaging material prior to use. DO NOT block the air vents at the front or rear of the Welding Power Source.

**NOTE**

Depending on the type of wire you will be using the MIG Gun polarity may need to be switched. Follow the wire manufacturers recommendation.

**3.9 Set-up for MIG (FCAW) Welding with Gas less MIG Wire**

When using a gasless flux cored wire, you do not need to have an external gas source attached to the unit. For most Self Shielded Flux Cored Wire, connect the Work Lead to the positive + terminal and connect the MIG Torch polarity lead to MIG torch connector. If in doubt, consult the Flux Cored electrode wire manufacturer.



1. Turn the Main ON/OFF switch OFF (located on the rear panel).
2. Check that the MIG wire size, contact tip, MIG Gun liner and drive roll groove are all the same size before fitting the MIG wire into the Power Source.
3. Connect the MIG Gun Polarity Lead to mig torch connector. If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
4. Fit the MIG (FCAW) wire spool and MIG Gun to the machine.
5. Connect the work lead to the positive welding terminal (+). If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
6. If gasless MIG (FCAW) wire is fitted then shielding gas is not required for welding. Otherwise fit the welding grade shielding gas regulator/flow gauge to the shielding gas cylinder then connect the shielding gas hose from the rear of the machine to the regulator/flow gauge outlet.
7. Turn the Main ON/OFF switch ON (located on the rear panel).
8. Select MIG mode with the process selection control.
9. Remove the MIG Gun nozzle and contact tip.
10. Depress MIG Gun trigger to feed the MIG wire out through the MIG Gun gas diffuser then fit the contact tip on the MIG wire and securely fasten it to the MIG Gun then fit the nozzle in place.
11. Refer to the Weld Guide located on the inside of the wire feed compartment door for further information on Voltage/Wirespeed settings.

**WARNING**

Before connecting the work clamp to the work make sure the mains power supply is switched OFF.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

Remove any packaging material prior to use. DO NOT block the air vents at the front or rear of the Welding Power Source.

**NOTE**

Depending on the type of wire you will be using the MIG Gun polarity may need to be switched. Follow the wire manufacturers recommendation.

**3.10 Set-up For LIFT TIG (GTAW) Welding****WARNING**

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment

**NOTE**

The following steps will assume that you have already set up the proper shielding gas.

**NOTE**

The following set up is known as straight polarity or DC electrode positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF switch (located on the rear panel) to OFF.
2. Connect the work earth clamp to the positive output terminal, and the LIFT TIG Torch cable to the negative output terminal.
3. Connect the gas line/hose to the proper shielding gas source, and connect the aviation plug for trigger switch to 5 pin control socket. (The device is not equipped with an argon output interface, Need one external connection).
4. Slowly open the argon cylinder valve to the fully open position.
5. Connect the work earth clamp to your work piece.
6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.

2 to 2-1/2 Times Electrode Diameter



7. Install the tungsten with approximately 1.0mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current Control Knob to the desired amperage.
12. You are now ready to begin LIFT TIG Welding.



TIG torch

Argon need external connections.

**3.11 Set-up For STICK Metal Arc Welding (MMA)**



**WARNING**

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

**NOTE**

The following set up is known as DC Electrode Positive or reverse polarity. Please consult with the STICK electrode manufacturer for specific polarity recommendations.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Attach the STICK and Work Leads, connection as picture.



3. Set the welding process to STICK.
4. Set the Weld Current Control Knob to the desired amperage.
5. Install a STICK electrode in the electrode holder.
6. You are now ready to begin STICK Welding.

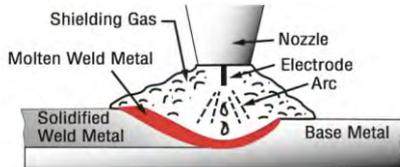
**NOTE**

To weld, gently strike the electrode on the work piece to generate a welding arc, and slowly move along the work piece while holding a consistent arc length above base metal.

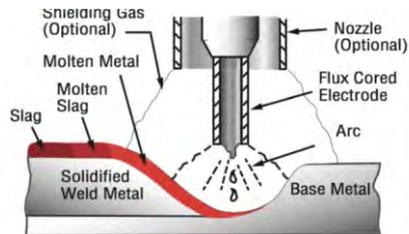
### 4.1 MIG (GMAW/FCAW) Basic Welding Technique

Two different welding processes are covered in this section (GMAW and FCAW), with the intention of providing the very basic concepts in using the MIG mode of welding, where a MIG Gun is hand held, and the electrode (welding wire) is fed into a weld puddle, and the arc is shielded by an inert welding grade shielding gas or inert welding grade shielding gas mixture.

**GAS METAL ARC WELDING (GMAW):** This process, also known as MIG welding, Co<sub>2</sub> welding, Micro Wire Welding, short arc welding, dip transfer welding, wire welding etc., is an electric arc welding process which fuses together the parts to be welded by heating them with an arc between a solid continuous, consumable electrode and the work. Shielding is obtained from an externally supplied welding grade shielding gas or welding grade shielding gas mixture. The process is normally applied semi automatically; however the process may be operated automatically and can be machine operated. The process can be used to weld thin and fairly thick steels, and some non-ferrous metals in all positions.

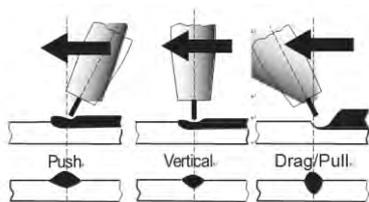


**FLUX CORED ARC WELDING (FCAW):** This is an electric arc welding process which fuses together the parts to be welded by heating them with an arc between a continuous flux filled electrode wire and the work. Shielding is obtained through decomposition of the flux within the tubular wire. Additional shielding may or may not be obtained from an externally supplied gas or gas mixture. The process is normally applied semi automatically; however the process may be applied automatically or by machine. It is commonly used to weld large diameter electrodes in the flat and horizontal position and small electrode diameters in all positions. The process is used to a lesser degree for welding stainless steel and for overlay work.



### Position of MIG Gun

The angle of MIG Gun to the weld has an effect on the width of the weld.



The MIG Gun should be held at an angle to the weld joint. (See Secondary Adjustment Variables below)

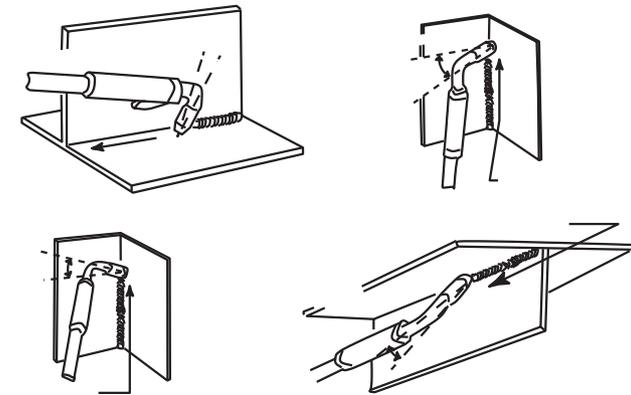
Hold the MIG Gun so that the welding seam is viewed at all times. Always wear the welding helmet with proper filter lenses and use the proper safety equipment.



### WARNING

Do NOT pull the MIG Gun back when the arc is established. This will create excessive wire extension (stick-out) and make a very poor weld.

The electrode wire is not energized until the MIG Gun trigger switch is depressed. The wire may therefore be placed on the seam or joint prior to lowering the helmet.



### Distance from the MIG Gun Nozzle to the Work Piece

The electrode wire stick out from the MIG Gun nozzle should be between 10 - 20 mm (3/8" - 3/4"). This distance may vary depending on the type of joint that is being welded.

### Travel Speed

The speed at which the molten pool travels influences the width of the weld and penetration of the welding run.

### Establishing the Arc and Making Weld Beads

Before attempting to weld on a finished piece of work, it is recommended that practice welds be made on a sample metal of the same material as that of the finished piece.

The easiest welding procedure for the beginner to experiment with MIG welding is the flat position. The equipment is capable of flat, vertical and overhead positions.

For practicing MIG welding, secure some pieces of 1.6 mm or 5.0 mm (1/16" or 3/16") mild steel plate 150 mm x 150 mm (6" x 6"). Use 0.9 mm (.035") flux cored gasless wire or a solid wire with shielding gas.

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### Setting of the Power Source

Power source and Wirefeeder setting requires some practice by the operator, as the welding plant has two control settings that have to balance. These are the Wirespeed control (refer to section 3.06.4) and the welding Voltage Control (refer to section 3.06.10). The welding current is determined by the Wirespeed control, the current will increase with increased Wirespeed, resulting in a shorter arc. Less wire speed will reduce the current and lengthen the arc. Increasing the welding voltage hardly alters the current level, but lengthens the arc. By decreasing the voltage, a shorter arc is obtained with a little change in current level.

When changing to a different electrode wire diameter, different control settings are required. A thinner electrode wire needs more Wirespeed to achieve the same current level.

A satisfactory weld cannot be obtained if the Wirespeed and Voltage settings are not adjusted to suit the electrode

wire diameter and the dimensions of the work piece.

If the Wirespeed is too high for the welding voltage, "stubbing" will occur as the wire dips into the molten pool and does not melt. Welding in these conditions normally produces a poor weld due to lack of fusion. If, however, the welding voltage is too high, large drops will form on the end of the wire, causing spatter. The correct setting of voltage and Wirespeed can be seen in the shape of the weld deposit and heard by a smooth regular arc sound. Refer to the Weld Guide located on the inside of the wirefeed compartment door for setup information.

### Electrode Wire Size Selection

The choice of Electrode wire size and shielding gas used depends on the following:

Thickness of the metal to be welded

Type of joint

Capacity of the wire feed unit and Power Source

The amount of penetration required

The deposition rate required

The bead profile desired

The position of welding

Cost of the wire

## 5.1 Troubleshooting



### WARNING

There are extremely dangerous voltage and power levels present inside this product. Do not attempt to open or repair unless you are a qualified electrical tradesperson and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an accredited reseller for repair. The basic level of troubleshooting is that which can be performed without special equipment or knowledge.

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan is not working.	Fan is broken	Change fan
		There is something in the fan	Clean it
		The start capacitor of fan damaged	Change capacitor
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, fan is not working, power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
4	Turn on the power source, power indicator is lit, fan is working, there is no welding output.	Control board is broken	Change it
		1 <sup>st</sup> inverter circuit damaged	Replace it
5	The number of the display is not intact	The display panel is damaged	Change the display panel
		Digital tube is broken	Change it
6	No no-load voltage output (MMA)	If the overheat indicator is on	Wait a few minutes, the machine can be operated normal
		The main circuit is broken	Check and repair
		The machine is broken	Consult the dealer or the manufacturer

Nr.	Troubles	Reasons	Solution
7	Turn on the power source ,power indicator is lit, gas flows, wire roller cannot feed	The wire roller is wrong installed	Check and change it
		The wire roller is twined	Check and sort it out
		Pressure roller arm is fitted firmly	Check and connect correctly
		The wire is not correctly through the inlet wire guide	Check and install correctly
		The size of the groove ,wire and torch tip are not from the same size	Change to the same size of the needed parts
		Control board is broken	Consult the dealer or the manufacturer
8	Turn on the power source ,power indicator is lit ,gas flows, wire feeding, no arc igniting	Check the welding circuit is correct	Correct properly
		The mig torch is not correctly fitted to machine	Check and connect correctly
		Control board is broken	Consult the dealer or the manufacturer
9	No gas flow (TIG)	Gas cylinder is close or gas pressure is low	Open or change the gas cylinder
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
		Air tube is brocken	Change it
		Pressure too high or air regulator is broken	Check gas
10	Gas always flows	If the gas checking function is selected	Close it
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
11	Without triggering the mig torch but the wire roller feeding wire automatically	Checking if the wire checking indicator is on	Close the wire checking function
		Wire feeding board is broken or the control board is broken	Consult the dealer or the manufacturer
12	The welding current cannot be adjusted	Checking if the electorde stick to the work piece that the anti-stick function is on	Separate the electrode and work piece
		Control board is broken	Repair or change it
		Shut off the power when changing the torch	
13	The welding current displayed isn't accordant with the actual value	The min value displayed isn't accordant with the actual value	Adjust potentiometer lmin on the control board
		The max value displayed isn't accordant with the actual value	Adjust potentiometer lmax on the control board
14	The penetration of molten pool is not enough	The welding current is adjusted too low	Increase the welding current
		The arc is too long in the welding process	Adjust the distance from torch to work piece
		The power cable or the welding cable is too long	Use the suitable length from manufacturer

Nr.	Troubles	Reasons	Solution
15	Thermal overload indicator light is on	Over-heat protection ,too much welding current	Reduce the welding current
		Over-heat protection ,working too much time	Reduce the welding time
		Over-current protection, current in the main circuit is out of control	Check and repair main circuit and drive board
		Input voltage is too low	Check the power supply
		Fan is broken	Change the fan
		16	Tig electrode melts when welding (for R231)
17	Arc flutters during Tig welding	Tungsten electrode is too big for the welding current	Select the correct size of tungsten electrode
		Check the earth clamp position on the work piece	Adjust the position of earth clamp

## 6.1 Maintenance

In order to guarantee that arc welding machine works high-efficiently and in safety, it must be maintained regularly. Let customers understand the maintenance methods and means of arc welding machine more, enable customers to carry on simple examination and safeguarding by oneself, try one's best to reduce the fault rate and repair times of arc welding machine, so as to lengthen service life of arc welding machine. Maintenance items in detail are in the following table.

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

Date	Maintenance item
Daily examination	<p>Observe that whether panel knob and switch in the front and at the back of arc welding machine are flexible and put correctly in place. If the knob has not been put correctly in place, please correct, if you can't correct or fix the knob, please replace immediately</p> <p>If the switch is not flexible or it can't be put correctly in place, please replace immediately; Please get in touch with maintenance service department if there are no accessories</p> <p>After turn-on power, watch/listen to that whether the arc welding machine has shaking, whistle calling or peculiar smell. If there is one of the above problems, find out the reason to get rid of, if you can't find out the reason, Please contact local this area agent or the branch company</p> <p>Observe that whether the display value of LED is intact. If the display number is not intact, please replace the damaged LED. If it still doesn't work, please maintain or replace the display PCB</p> <p>Observe that whether the min/max value on LED accords with the set value. If there is any difference and it has affected the normal welding craft, please adjust it</p> <p>Check up that Whether fan is damaged and is normal to rotate or control. If the fan is damaged, please change immediately. If the fan does not rotate after the arc welding machine is overheated, observe that whether there is something blocked in the blade, if it is blocked, please get rid of; If the fan does not rotate after getting rid of the above problems, you can poke the blade by the rotation direction of fan. If the fan rotates normally, the start capacitor should be replaced; If not, change the fan</p> <p>Observe that whether the fast connector is loose or overheated. If the arc welding machine has the above problems, it should be fastened or changed</p> <p>Observe that Whether the current output cable is damaged. If it is damaged, it should be wrapped up, insulated or changed</p> <p>Using the dry compressed air to clear the inside of arc welding machine. Especially for clearing up the dusts on radiator, main voltage transformer, inductance, IGBT module, the fast recover diode and PCB, etc</p>
Monthly examination	<p>Check up the bolt in arc welding machine, if it is loose, please screw down it. If it is skid, please replace. If it is rusty, please erase rust on bolt to ensure it works well</p>
Quarter-yearly examination	<p>Whether the actual current accords with the displaying value. If they does not accord, they should be regulated. The actual current value can be measured by the adjusted plier-type ampere meter</p>
Yearly examination	<p>Measure the insulating impedance among the main circuit, PCB and case, if it below 1MΩ, insulation is thought to be damaged and need to change, and need to change or strengthen insulation</p>