



**IN MIG IC Series Inverter
CO2 MAG Welding Machines**

Operating Manual

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Index

1. Safety Precautions.....	(1)
2. Principle & Technical data.....	(7)
3. Features & Applications.....	(11)
4. Installation Guide.....	(12)
5. Operating Instruction	(16)
6. Repair & Maintenance.....	(20)
Appendix A: EMC Suggestion for installation and use of welder.....	(24)

This operating manual can be fit for INMIG-IC (including INMIG-250/350/500 IC) series welding machines. The technical data are measured with power supply 3 phase 415V, the data will be changed when you use different voltage such as 380V and 400V, etc.

Safety Precautions

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING. BE SURE THAT ONLY QUALIFIED INDIVIDUALS PERFORM ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES



For Engine Powered equipments

- 1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- 1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
- 1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.
- 1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- 1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- 1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- 1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
- 1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

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



ELECTRIC SHOCK can kill

- 3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.
In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the work piece or ground) use the following equipment:

Semiautomatic DC Constant Voltage (Wire) Welder

DC Manual (Stick) Welder

AC Welder with Reduced voltage control

- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
- 3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
- 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- 3.g. Never dip the electrode in water for cooling.
- 3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- 3.i. When working above floor level, use a safety belt to protect yourself from a fall



ARC RAYS can burn.

- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Head shield and filter lens should conform to ANSI Z87.I standard.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or material.



FUMES AND GASES can be dangerous

- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium and plated steel and other materials or coatings which produce highly toxic fumes, keep exposure as low as possible

and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.

- 5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.
- 5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used,

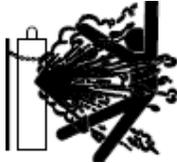


WELDING AND CUTTING SPARKS can cause fire or explosion.

- 6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding & Cutting" (ANSI Standard Z59.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned".
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields

when in a welding area.

- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cable until they fail.
- 6.h. Also see item 1.c.
- 6.i. Do not use a welding power source for pipe thawing.



CYLINDER may explode if damaged.

- 7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage, A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should be always be in place and hand tight expect when the cylinder is in use or connected for use.



FOR ELECTRICALLY powered equipment

- 8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

Principle & Technical data

INMIG-IC Series Block diagram of principle shown as Figure 1

Input (3~4150V/50Hz)

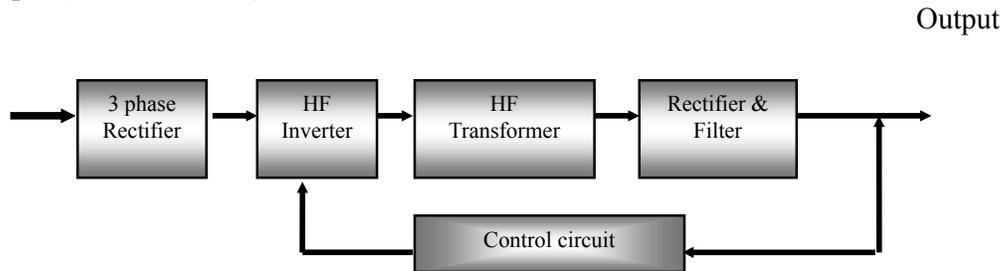


Figure1: Block diagram of principle

This series welding machines apply IGBT soft switch inverter technology. 3-phase input volt 415V are rectified by rectifier, inverted into HF AC, reduced by HF transformer, rectified and filtered by HF rectifier, then output DC power suitable for welding. After this process, the welder's dynamically responsive speed has been greatly increased, so the welder size and weight are reduced noticeably. Power source enjoys good anti-fluctuating ability and high-quality performance.

INMIG-IC Series Volt-Ampere Curve as shown in Figure 2:

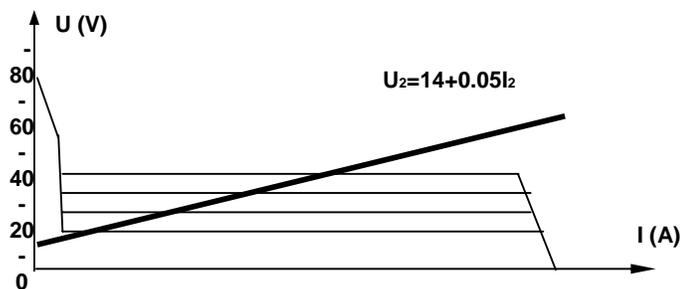


Figure 2: MIG Series Volt-Ampere Curve

1. Main technical parameters

№	Items	INMIG-250IC	INMIG-350IC	INMIG-500IC
01	Voltage/frequency	3-phase 415V/50Hz		
02	Rated input power	8KVA	14.5KVA	24.3KVA
03	Rated input current	11A	20A	34A
04	Rated duty cycle	60%		
05	Output current	60 ~ 250A	60 ~ 350A	60 ~ 500A
06	Output voltage	14 ~ 30V	14 ~ 40V	14 ~ 50V
07	Output open voltage	72V	72V	81V
08	Efficiency	≥89%		
09	Power factor	≥0.95		
10	Wire diameter(mm)	Φ0.8 ~ Φ1.2		Φ1.0 ~ Φ1.6
11	Weight	20Kg	26Kg	27Kg
12	Dimensions (mm ³)	501×232×495		501×232×495
13	CO ₂ gas flow rate	15 ~ 20 L/min		
14	Insulation class of main transformer	H		
15	Insulation class of output reactor	B		

Table 1: Parameter Specification

2. Main circuit diagram

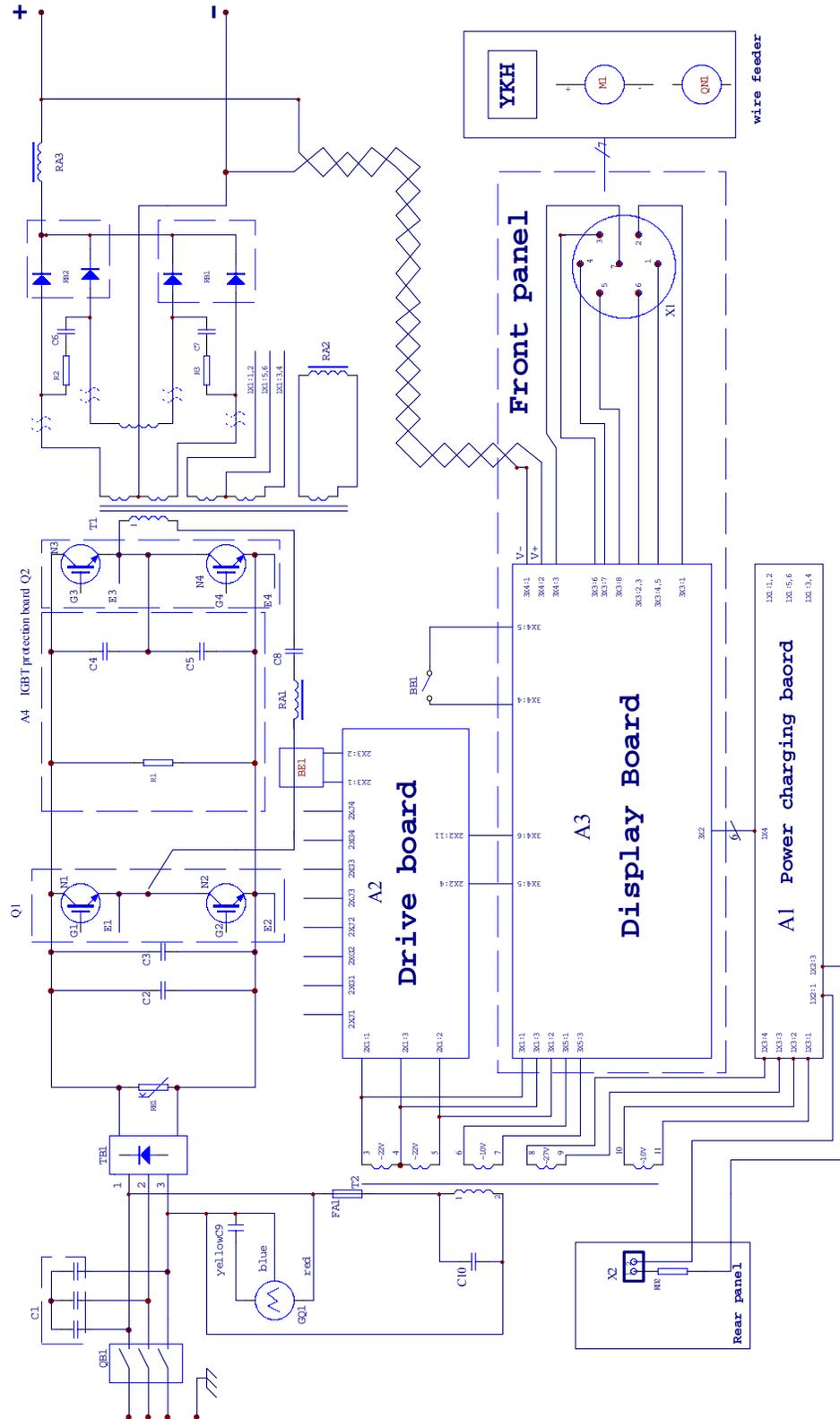


Figure 3: Main Circuit Diagram

3. Main components list

No.	Tab	Item	Quantity	Remark
1	QB1	Circuit Breaker	1	INMIG-500IC
			1	INMIG-350IC
			1	INMIG-250IC
2	TB1	3-phase rectifier module	1	INMIG-350/500IC
			1	INMIG-250IC
3	Q1/Q2	IGBT module	1	INMIG-500IC
			1	
			2	INMIG-250/350IC
4	T1	Main transformer	1	INMIG-500IC
			1	INMIG-350IC
			1	INMIG-250IC
5	RB1/RB2	Fast recovery diode module	3	INMIG-500IC
			2	INMIG-350IC
			1	INMIG-250IC
6	T2	Transformer for ZKB/QDB □	1	All purpose (380V)
			1	All purpose (415V)
7	FA1	Fuse	1	All purpose
8	GQ1	Fan	1	INMIG-500IC (380V)
			1	INMIG-250/350IC (380V)
			1	INMIG-250/350IC (415V)
9	BB1	Thermal switch	1	INMIG-350/500IC
			1	INMIG-250IC
10	A4	IGBT protection board	1	INMIG-500IC
			1	INMIG-350IC
			1	INMIG-250IC
11	A2	Drive board	1	All purpose
12	A3	Display board	1	INMIG-500IC
			1	INMIG-350IC
			1	INMIG-250IC
13	A1	Power board	1	All purpose

Features & Applications

This inverter CO₂/MAG welders are high-quality performers that can be used for all-purpose, semi-automatic CO₂ gas shield welding with solid or flux-cored wire (Φ 0.8- Φ 1.6mm) for welding mild steel and low alloy steel work pieces. This series welder enjoys reasonable static characteristic and sound dynamic characteristic.

Features and benefits:

- ◆ Inverter technology can ensure fairly good stability of output volt when fluctuation occurs in input primary volt or arc length changes, as well as starting arc self-adjustability and stable welding process.
- ◆ Less spatter, high deposit efficiency.
- ◆ Less weld distortion, good weld formation.
- ◆ High success rate of arc-starting due to stronger pulse strike.
- ◆ Reducing molten ball while stopping arc.
- ◆ Reducing labor intensity while welding long weld by using auto-lock function.
- ◆ Stable wire feeding due to consistent output of power circuit.
- ◆ Small, light and portable.
- ◆ Digital control, with error code display functions.
- ◆ Energy-saving, low expense and flexible to various input primary quality.

1 . Pre-installation

1.1 Installation Environment

The INMIG-IC series welding machines are designed for use in adverse environments. Examples of environments with increased adverse conditions are

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

1.2. Installation Location

Be sure to locate the welder according to the following guidelines:

- In areas, free from moisture and dust.
- Ambient temperature between 0 degrees C to 40 degrees C.
- In areas, free from oil, steam and corrosive gases.
- In areas, not subjected to abnormal vibration or shock.
- In areas, not exposed to direct sunlight or rain.
- Place at a distance of 12" (304.79mm) or more from walls or similar boundaries that could restrict natural airflow for cooling.

1.3 Power Source Connections

Warning

Thermal Arc advises that this equipment be electrically connected by a qualified electrician.

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.

DO NOT TOUCH live electrical parts.

- SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures.
- Lockout/tagging procedures consist of padlocking line disconnect switch in open position.
- Removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

1.4 . Power Supplier Requirements

- Input volt must be standard sine wave, effective value $415V \pm 10\%$, frequency 50Hz.
- Unbalance degree of 3-phase volt must be no more than 5%.
- Power supply

Model		INMIG-250IC	INMIG-350IC	INMIG-500IC
Power supply		3 phase AC 415V		
Min. capacity	Power network	12KVA	26KVA	45KVA
	Generator	16KVA	34KVA	60KVA
Input volt protection	Fuse	20A	30A	50A
	Circuit breaker	20A	32A	63A
Cable size (cross-section)	Input volt	$\geq 1.5\text{mm}^2$	$\geq 2.5\text{mm}^2$	$\geq 4\text{mm}^2$
	Output volt	25mm^2	35mm^2	50mm^2
	Ground lead	$\geq 1.5\text{mm}^2$	$\geq 2.5\text{mm}^2$	$\geq 4\text{mm}^2$

Table 3: Power supply connection

Note: The size of fuse and breaker in the table are for reference only.

1.5. Machine Assembling Guide:

This series welder is small, light and portable. They will be more convenient if place them on the trolleys. Ensure the location where to place the welder is even.

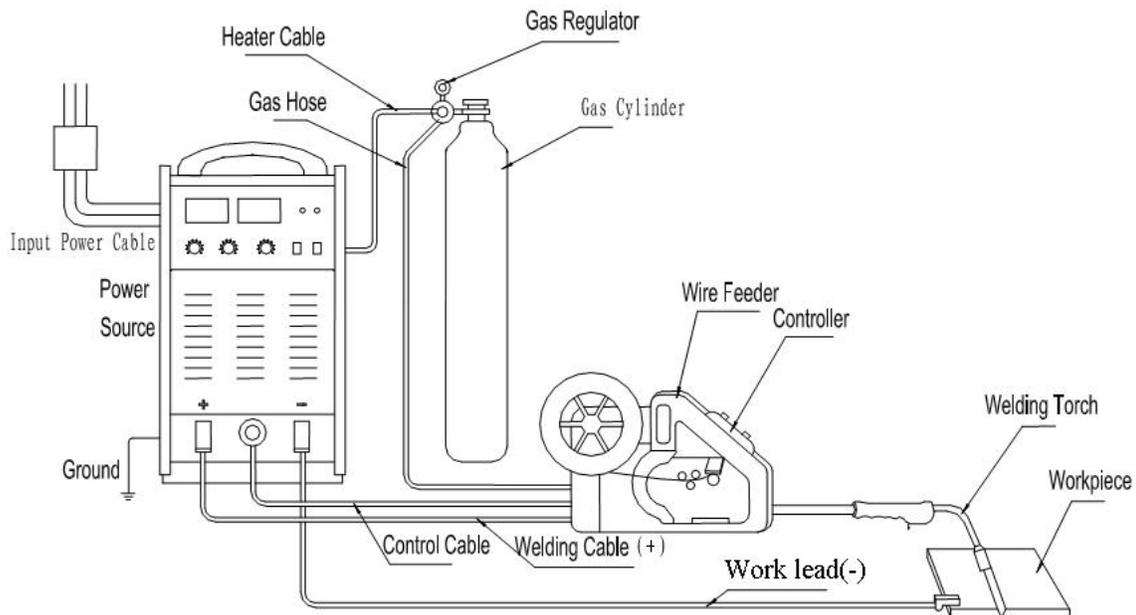


Figure 4: Connection Chart for MIG Series

Preparation prior to operation procedure:

- (1) Connect the welder's terminal plug (-) to the work piece by work lead.
- (2) Connect the welder's terminal plug (+) to the wire feeder by welding cable.
- (3) Connect the welder's control cable socket to the wire feeder by control cable.
- (4) Connect feeder's gas hose to the regulator.
- (5) Connect the regulator's heater cable to the welder's "gas heater power" cable socket. (on the rear panel).
- (6) Connect the welder's power cable to the disconnection switchboard, while grounds the lead safely.
- (7) Reset the circuit breaker on the welder's rear panel.

2. Operating procedure:

Reset the circuit breaker on the switchboard, then the welder's indicator lamp will turn on, and the cooling fan will spin. Press on the "Inch feeding" button on the feeder's controller, the feeder begin to feed wire. Preset the process parameters by regulating the controller, tuning the knob, and flipping the switch to proper location on the front panel of the welder. When the torch switch is pulled, the feeder start to feed wire, and CO₂ will blow out of the nozzle, therefore it can be used for welding. Operators can select parameters from table listed below. Be sure to turn off the valve of gas bottle and unplug the power cord while stop welding.

Welding current (A)	Welding voltage (V)	Suitable wire (mm)
60~80	17~18	Φ1.0
80~130	18~21	Φ1.0、Φ1.2
130~200	20~24	Φ1.0、Φ1.2
200~250	24~27	Φ1.0、Φ1.2
250~350	26~32	Φ1.2、Φ1.6
350~500	31~39	Φ1.6

Table 4: Suggest welding parameters for selected wire

Operating Instruction

1. Panel I illustration and parts number reference

1. 1 Front panel illustration and parts number reference

Front panel is illustrated below, other models are little different from this.

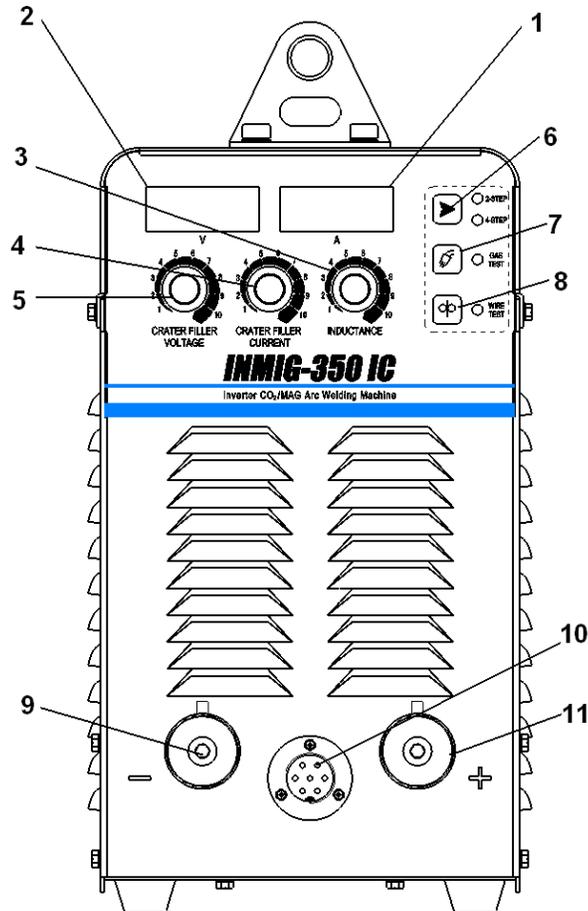


Figure 5: Front panel

(1) “Output Amp” meter

Display relative feeding speed while in open load, and display practical value of current while in welding.

(2) “Output volt” meter

Display preset value of volt while in open load, and display practical value while in welding.

(3) “Inductance” regulation knob

Altering welding stability, penetration and spatter volume. Recommend value is 5-7.

(4) “Crater filler Current” regulation knob

Adjusting crater filler current value in 4-step mode

(5) “Crater filler voltage” regulation knob

Adjusting crater filler voltage value in 4-step mode

(6) “4-step /2-step” mode switch

Switch to “2-step”, perform welding when push torch switch, stop welding when release the switch. This mode is suitable for short weld. To “4-step”, after successfully starting arc by push torch switch, then you can perform welding by release the switch, when you push torch switch again, torch will turn into crater-filling situation which was preset by stop- arc knobs on the front panel. The welder will stop welding when release the switch. This mode is suitable for welding long weld.

(7) Gas Test button

Press this button, the gas flow will keep for 30s; while it will stop the gas if press it during the 30s.

(8) Wire Test button

This button function is the same as torch switch. Press this button, the wire will feeding; release the button, the wire feeding will stopped.

(9) Negative terminal (-)

Connect to the work lead by the ground cable.

(10) Wire feeder’s control cable socket

Connect to wire feeder’s control cable

(11) Positive terminal (+)

Connect to wire feeder’s welding cable

2. The rear panel and parts number reference

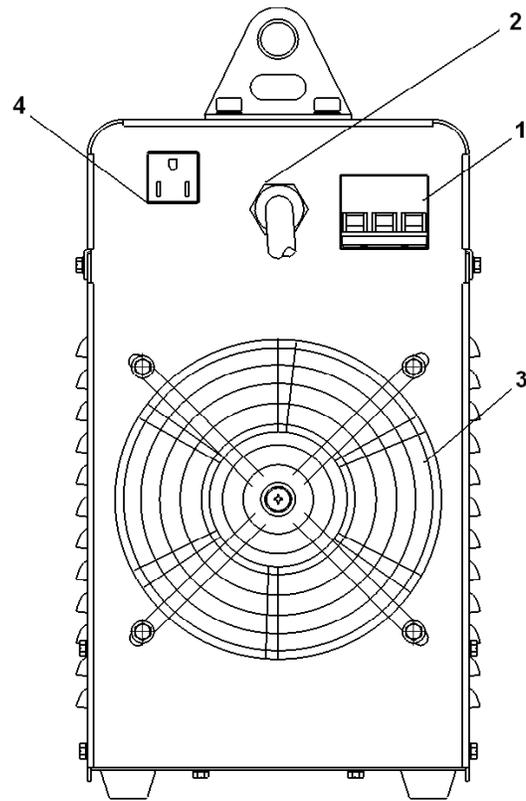


Figure 6: Rear panel

(1) Circuit breaker

The function of circuit breaker is to protect welding machine by automatic trip to turn-off power supply while in machine overload or failure. Normally, the switch flipped to upward which means power-on. Use switch on the disconnected switchboard or switchbox (customers prepare by them) to start or stop welding machine, avoiding using the circuit breaker.

(2) Input power cable

The mixed-colored wire must be firmly grounded, the rest wires connect to 3-phase power (415V/50Hz) respectively.

(3) Cooling fan

Cool down the heat components in the welding machine.

(4) Specification plate

(5) Gas Heater power cable socket

Connect to CO2 regulator's heating coil. The voltage is 10V in stand by mode (to protect the gas meter).

3. Controller

This controller is fixed on the panel of wire feeder.

Panel illustration and parts number reference

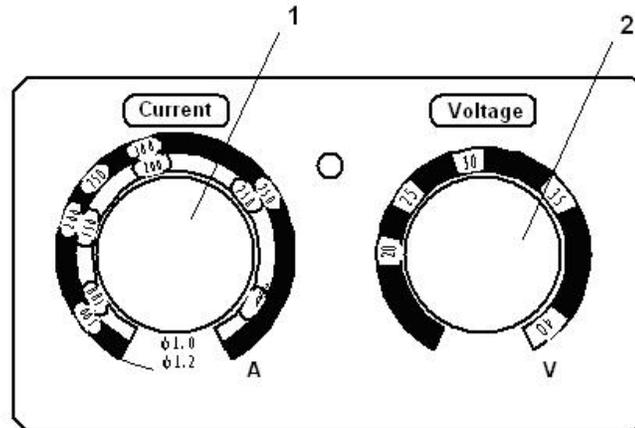


Figure 7: Controller Control panel

- (1) Current regulation knob
Adjusting welding current
- (2) Volt regulation knob
Adjusting welding volt

4. Sub-menu operation

Pressing “2 step /4 step” and “gas test” buttons together for 2s, it will come into the sub-menu interface.

Pressing “wire test” button will adjust and select the sub-menu parameter.

Pressing “2 step /4 step” button will increase the parameters value.

Pressing “gas test” button will reduce the parameter value.

If in “P08”, pressing “gas test” or “2 step /4 step” will restore the factory setting.

The regarding sub-menu parameters value will saved automatically if there is none operation in 10s. The illustration of sub-menu parameters is as chart below:

Code	Parameter	Valve Range
P02	Slow wire feeding speed	3-100
P03	Pre-gas time	0.10-9.90
P04	Post-gas time	0.10-9.90
P08	Restore factory settings	FAC”–means restore factory setting “PRO” – means sub-menu change

Repair & Maintenance

WARNING: Have a qualified electrician do the maintenance and trouble shooting work. Turn the input power off, using the disconnect switch at the fuse box before working inside the machine.

1. Cautions:

- Rivet equipment name tag on the specified area of the case, otherwise the inside parts will possibly be damaged.
- Connect welding cable to terminals firmly, otherwise the terminals will be burn out which will cause the instability of welding process.
- Avoid welding cable and control cable being broken, and prevent welding machine from being short circuit.
- Never let welding machine be bumped into or stacked up by heavy objects.
- Ensure good ventilation
- Under high temperature, if work with large current for long period, welder may shut down automatically due to thermal protection acts .At this point, let the machine runs under open-load for a few minutes, and it will be automatically recover.
- Under high temperature, if work with large current for long period, welder may shut down automatically due to circuit breaker trips. Cut off the power supply to the electricity switchboard on frame, and wait for 5 minutes to turn on the circuit breaker on the power source fist then connect the power supply to the electricity switchboard on frame. And leave the machine runs under open-load condition for a while.
- After welding, cut off the gas supply and the power supply.

2. General maintenance

- Remove dust from power resource with pressure air by qualified individuals every 3-6 months. Check if the jointers are loose.
- Check regularly if cables are worn out, knobs are loose, and components of panel are damaged.
- Check regularly if cables are tightly connected to cable connecting terminals in case of terminals being burnt out.
- Clean and replace Contact Tip in time.

3. Procedure for regular checking prior to maintenance

- Check if all front panel switches are on the proper positions.
- Check if the input volt has the phase missing, and range are between 375~456V.
- Check if the input cable is connected correctly and firmly with the power source.
- Check if the ground lead is connected correctly and firmly.
- Check if the welding cables are connected correctly and firmly.
- Check if gas regulator is in good situation and gas flows out normally.

WARNING: Have a qualified electrician do the maintenance and trouble shooting work. Turn the input power off, using the disconnect switch at the fuse box before working inside the machine. Don't open up case uninstructed, the max volt inside machine is 600V. Never discharge high voltage to welder case with welding torch! Shut down power source before changing or repairing welding cable or torch.

№	Trouble	Probable cause	Remedy
01	Indicator lamp does not light on when machine switches on.	(1) Phase missing (2) Circuit breaker is damaged (3) Fuse is broken	(1) Check power supply (2) Replace (3) Replace
02	Circuit breaker trips immediately after the machine is switched on.	(1) Circuit breaker is collapsed. (2) IGBT module is damaged (3) 3-phase rectifier bridge is damaged. (4) Varistor is damaged (5) Welder's control board is damaged	(1) Replace (2) Replace IGBT module and drive board (3) Replace (4) Replace (5) Replace main control board
03	Circuit breaker trips while in welding	(1)Welding machine operates in long term overload (2)Circuit breaker is damaged	(1) Operating machine in rated duty cycle (2) Replace
04	Welding current can not be adjusted	(1) Wire feeder's control cable is broken or controller is damaged (2) Control board is damaged (3) Conductive wire connected the rectifier is broken	(1) Change control cable or controller (2) Replace (3) Reconnect the broken wires
05	Instable arc welding, more spatter	(1) Incorrect welding parameters (2) Contact tip is worn out severely	(1) Fine tune parameters (2) Replace
06	CO ₂ gas regulator can't heat	(1) CO ₂ regulator is damaged (2) Heater cable is broken or shorten (3) Thermistor in power source is damaged	(1) Replace (2) Check and repair (3) Replace
07	Push welding torch switch, wire feeding is normal but airflow is blocked	(1) Control board is damaged (2) Electromagnet valve is damaged	(1) Replace (2) Replace
08	Push welding torch switch, wire feeder do not work and there is no open load volt display	(1) Torch switch is damaged (2) Feeder's control cable is broken (3) Control board is damaged	(1) Replace welding torch (2) Repair control cable (3) Replace main control board

Table 5: Trouble Shooting Table

During the event of failure, the welder will automatically display the error code:

Error Code	Description	Cause	Solution
E17	Over-current protection	The output terminals (+) and (-) is in short circuit or exceed the rated welding current	Check the output cables or reduce the welding current value
E19	Over-heat protection	Welding machine is too hot or the thermal switch is broken	Wait several minutes or replace with new thermal switch
E24	Communication is abnormal	Display board has fault.	Replace the display board
E34	Given is abnormal	No given signal	Check the control circuit
E35	Wire feeding motor has fault	Wire feeder motor control cable has fault or display board is damaged	Check the wire feeding motor circuit or replace display board, power board.

Table 6: Error Code

Appendix A

1. General

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

NOTE: The welding circuit may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury.

2. Assessment of area

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

- 1) Other supply cables, control cables, signaling and telephone cables, above, below and adjacent to the arc welding equipment;
- 2) Radio and television transmitters and receivers;
- 3) Computer and other control equipment;
- 4) Safety critical equipment, for example guarding of industrial equipment;
- 5) The health of the people around, for example the use of pacemakers and hearing aids;
- 6) Equipment used for calibration or measurement;
- 7) The immunity of other equipment in the environment is compatible. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
- 8) The time of day that welding or other activities are to be carried out.

3. Methods of reducing emissions

1) Public supply system

Arc welding equipment should be connected to the public supply system according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the public supply system. Consideration should

be given to shielding the supply cable of permanently installed arc welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

2) Maintenance of the arc welding equipment

The arc welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the arc welding equipment is in operation. The arc welding equipment should not be modified in any way, except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

3) Welding cables

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

4) Equipotent bonding

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

5) Earthling of the work piece

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

6) Screening and shielding

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