CT2050

MULTI-PROCESS IGBT INVERTER WELDER & CUTTER(AC/DC TIG, AC/DC PULSE TIG, STICK, PLASMA CUT WITH OUTER AIR AND BUILT-IN AIR)

OPERATOR'S MANUAL

YESWELDER®

Please read this manual before using your new CT2050 welding and cutting machine

Congratulations on your new YesWelder product! YesWelder creates quality products at discounted prices to make welding affordable to everyone. To help us serve you better and for further questions, visit www.yeswelder.com. Thank you for your purchase.

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SAFETY

THANK YOU FOR SELECTING A QUALITY PRODUCT BY YESWELDER.

PLEASE EXAMINE THE PACKING BOX AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, the title passes to the purchaser
upon receipt by the carrier. Consequently, claims for material damaged in shipment must be filed by the purchaser against the transportation company when the shipment is received.

SAFETY DEPENDS ON YOU

YESWELDER arc welding and cutting equipment are designed and built with safety. However, your overall safety can be increased by proper installation and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And most importantly, think before you act and be careful.

⚠ WARNING

This statement appears where the information must be followed precisely to avoid serious personal injury or loss of life.

⚠ CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance from the arc.
READ and obey the Safety Data Sheet (SDS) and the warning label on all welding materials containers.
USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.
IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).
USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you de develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.

WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).
PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.
PROTECT others from splatter, flash, and glare with protective screens or barriers.
IN SOME AREAS, protection from noise may be appropriate.
BE SURE protective equipment is in good condition. Also, wear safety glasses in work area
AT ALL TIMES.

SPECIAL SITUATIONS
DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned.
DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures:
PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.
BE SURE cylinders are never grounded or part of an electrical circuit.
REMOVE all potential fire hazards from welding area.
ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.

WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65 warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 et seq.)

WARNING: Cancer and Reproductive Harm
www.P65warnings.ca.gov

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.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended you download free PDF of Standard ANSI Z49.1 from the American Welding Society.
https://www.aws.org/library/doclib/AWS-Z49-2021.pdf

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE POWERED EQUIPMENT.

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 the electrode lead around your body.

2.d.3. Do not place your body between the electrode and workcables. 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 workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

SAFETY

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 while 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 workpiece 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 stringer, 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 stringers 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 should you get a shock.

3.j. Also see It ems 6.c. and 8.

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. Headshield and filter lens should conform to ANSI Z87. I standards.

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, nonflammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

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 hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also 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, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

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 and Cutting" (ANSI Standard Z49.1) 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". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

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, cuffless trousers, 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 cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.

6.j. 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 stringer 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 always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.

FOR ELECTRICALLY POWERED EQUIPMENT.

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

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment following the U.S. National Electrical Code and the manufacturer's recommendations.

SYMBOL EXPLANATION

WARNING 	Cautions in Operation		Power ON
	Items Need Special Instruction		Power OFF
	It's forbidden to dispose electric waste together with other ordinary waste. Please take care of our environment.		Ground Connection
SMART	SMART Function		Arc force current
INPUT VOLTAGE	Input Voltage	A	Current
FOOT PEDAL	Remote Control Mode or Torch Control Mode	Hz	Frequency
AC TIG	AC TIG Mode	%	Percentage
DC TIG	DC TIG Mode	S	Time
STICK	Stick Mode		Pulse Frequency
CUT	CUT-Outer Air		Width of Pulse Peak
CUT COM	CUT-Built-in Compressor Air		Gas Parameters of Welding

PRODUCT OVERVIEW

Ct2050 is a numerical controlled inverter plasma CUT/TIG ACDC/Stick welder of advanced technologies, multiple functions, and excellent performance. Equipped with AC/DC TIG, AC/DC Pulse TIG, Stick Welding, Plasma Cutting with outer air or with buit-in compressor air at the same time, it's widely applied for various metal materials' delicate welding. The integration of a unique electric structure with an air channel design in the CT2050 series can speed up the heat dissipation of the power device, so that to improve the duty cycle. The unique air channel heat dissipation efficiency can effectively prevent damage to the power devices and control circuits resulting from the dust absorbed by the fan, and greatly improve the welder's reliability thereby.

The overall streamlined design with a big arc transition perfectly integrates front and back panels, forming the most coherent and natural joints of the machine. It's a compact and versatile machine. Designed to break through the welding barriers and unlock new levels of skill, power, and creativity, it is suitable for both heavy industries and open fields. CT2050 is a good choice for experienced welder or beginners, as it could meet the requirements for various industries and fields.

FUNCTION OVERVIEW

Multi Functions Design

- **Multiple welding process:** AC/DC TIG, AC/DC Pulse TIG, Stick Welding, Plasma Cutting with outer air or with built-in compressor air.
- **Remote control available:** able to use pedal remoter and welding torch to torch on/off and welding amperage.
- **Real-time display of welding current:** the convenient display of welding output status.
- **Adjustable hot start:** easier and more reliable stick arc start.
- **VRD:** to ensure the operator's safety while in idle mode.
- **Adjustable arc force current:** ensure well operation while under long-distance welding.
- **HF arc start (TIG):** built-in pressurized arc ignition circuit; support HF pilot TIG arc ignition.
- **No-HF pilot arc start (CUT):** support no-HF pilot arc ignition when going plasma cutting.
- **Intelligent fan:** automatic cooling fan which works though temperature control and prolong the fan's lifespan.
- **Auto saving and recovery of welding parameters:** the welder will auto save the parameters for sudden power off, and will recovery last time's welding parameters when power on.
- **PFC Technology:** input voltage AC96~265V, improve the electric energy efficiency and decrease the loss.
- **Outer compressor compatible:** it could connect to outside compressor air to do perfect plasma cutting.
- **Built-in compressor available:** equipped with built-in compressor, suitable for outdoor projects and for places not have access to the an air compressor.

PERFORMANCE CHARACTERISTICS

IGBT inverter technology

- The adoption of 42 kHz inverting frequency and strong shock resistance IGBT for the main loop contributes to smaller welder size and lighter weight, and higher reliability.
- A great reduction in copper and core loss greatly enhances welding efficiency and saves energy.
- Switching frequency is beyond audio frequency, which almost eliminates noise pollution.

Cutting-edge control technique

- Advanced control scheme craters for various welding process requirements and greatly enhances welder performances.
- New control technology contributes to smaller voltage spike which is caused by second inversion, thus higher reliability and efficiency as well as smaller size.
- The adoption of MCU intelligent digital control technology and software digital controlled core welding functions brings upgraded performances when compared with traditional welders.
- Applicable to various acid and basic electrodes.

Nice shape and structure design

- Streamline design for the front and rear panels to achieve a better integral shape.
- Panels made of high-intensity engineering plastics guarantee high work efficiency in case of strong impact and drop or other harsh conditions.
- Excellent insulating property.
- Fine anti-static and anti-corrosion performance.

Optimized auto protection

- The machine has an optimized auto protection function. When there is large-scale voltage fluctuation, the welder will shut off automatically and display the failure information; the welder will restart when the network voltage is stable. The welder will shut off in case of over-heat, or other abnormalities, and display the according failure information. Multi protections largely prolong the welder's lifespan.

Excellent consistency and performance

- This product adopts intelligent digital control technology which is not sensitive to component parameters' change; certain components' changes won't affect the welder's performance. It's also insensitive to temperature and humidity. All the above contribute to better consistency and performance when compared with traditional welders.

Friendly interaction interface

- This welder adopts an international diagram form display, which is easy to understand and convenient to achieve accurate operation for different types of users.

Capable of high quality Stick welding

- The adoption of an excellent control algorithm largely improves Stick welding performance, bringing easy arc start, stable current, minimum spatter, no sticking, good shaping, and self-adaption to different cable lengths and cross-sections.

Capable of highly demanding argon arc welding

- Optimized digital CC adjustment technology guarantees low noise and stable arc; meanwhile, accurate control technology provides convenient operation for welding current. This welder is capable of 2T/4T to meet various welding process demands.

Remote control is available

- This welder is capable of pedal/torch remote control, allowing the operator's control on real-time welding current even further than 10m.

Non-volatile Memory

- The welding parameters will be automatically memorized when power off. And the latest welding parameter could be restored when power on.

TECHNICAL SPECIFICATIONS: CT2050

INPUT-SINGLE PHASE ONLY				
Standard Voltage/Frequency			Input Current	
Single Phase 96-265V, 50/60Hz			I1 max=47A, I1 eff=36A	
			I1 max=31A, I1 eff=24A	
RATED OUTPUT-DC ONLY				
Voltage	Mode	Duty Cycle	Current	Volts at Rated Current
220V	CUT	100%	45A	98V
	TIG	100%	200A	18V
	STICK	100%	200A	28V
110V	CUT	100%	25A	90V
	TIG	100%	160A	16.4V
	STICK	100%	160A	26.4V
OUTPUTRANGE				
Voltage	Mode	Open Circuit Voltage	Welding Current Range	Welding Voltage Range
220V	TIG	68V	5~200A	10.2~18V
	STICK	68V(with VRD 7V)	10~200A	20.4~28V
	CUT	312V	12~45A	84.8~98V
110V	TIG	68V	5~160A	10.2~16.4V
	STICK	68V(with VRD 7V)	10~160A	20.4~26.4V
	CUT	312V	12~25A	84.8~90V
OTHER PARAMETERS				
Machine	Power Factor	Efficiency	Protection Class	Insulation Class
CT2050	0.9988	85%	IP21S	F
PHYSICAL DIMENSIONS				
Machine	Length	Width	Height	Weight
CT2050	550mm	360mm	445mm	60lbs/27.2Kg
TEMPERATURE RANGE				
Operating Temperature Range			Storage Temperature Range	
-20°C ~ +50°C(-4°F~122°F)			-20°C ~ +50°C(-4°F~122°F)	

Read the entire installation section before you start the installation.

INSTALLATION

⚠ WARNIG

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Only personnel reading and understanding the CT2050 Operator's Manual should install and operate this equipment.**
- **The machine must be plugged into a grounded receptacle per national, local, or other applicable electrical codes.**
- **The CT2050 power switch should be in the OFF("O") position when installing the work cable and gun and connecting the power cord to input power.**

SELECT SUITABLE LOCATION

Locate the **CT2050** in a dry place with free clean air circulation to minimize the chance of dirt accumulation that can block air passages and cause overheating.

STACKING

Ct2050 cannot be stacked.

TILTING

The machine should be placed on a secure, level surface or a recommended cart. The equipment may topple over if this requirement is not followed.

ACCESSORIES

1. 13' M-IPL-50 Non-HF Cutting Torch (M16*1.5 Gas&Electric Connector)
2. 13' M-WP-26 TIG Torch with Amperage Control (KDP35-50 Electric Connector, M16*1.5 Gas Connector, 5-pin Control Cable)
3. 8' Gas Hose with 5/8"-18 RH
4. 13' Air Tube
5. Air Compressor Regulator Filter
6. 220V->110V Power Adapter
7. 10' Work Clamp&Cable
8. 10' Electrode Holder&Cable
9. Manual

DESCRIPTION

Panel Controls

1. **Operation Panel:** Permits function selection and parameters setting
2. **Positive Output Receptacle:** Permits attaching a work lead
3. **Torch Connector:** Permits attaching the TIG gas connector/CUT torch
4. **Pilot Arc Connector:** Permits connecting pilot arc wire of CUT torch
5. **5-pin Trigger Receptacle:** Permits triggering the torch to control welding on/off and adjust welding amperage. Connect the 5-pin connector present on the welding torch to the receptacle.
6. **Negative Output Receptacle:** Permits attaching an electrode holder or TIG welding torch electric connector.
7. **Value Adjusting/Function Knob:** Permits selecting and adjusting parameters.

8. Trademark
9. Handle
10. CNC Arc Voltage Connector
11. CNC Signal Control Connector
12. Intelligent Fan with Temperature Control
13. Input Power Cord
14. Outlet-Air Out
15. Cooling Fan
16. Inlet-Air In
17. Inlet-Argon gas
18. Power switch

DESCRIPTION

Panel Description

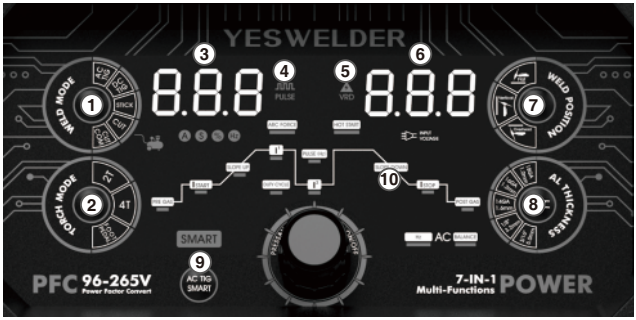


Fig 1 Panel Function

1. Weld Process Selection
2. Torch Operation Selection
3. Digital Display
4. Pulse Indicator
5. VRD Indicator
6. Input Voltage
7. Welding Angle Selection
8. Al Thickness
9. Smart Mode Selection
10. Parameter Indicators

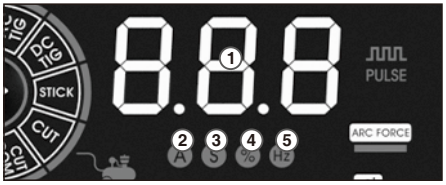


Fig 2 Digital Display

1. Parameter Value or Error Code
2. Current Indicator
3. Time Indicator
4. AC Balance (Clearance Width) or Duty Cycle (Pulse Width)
5. AC Frequency or Pulse Frequency

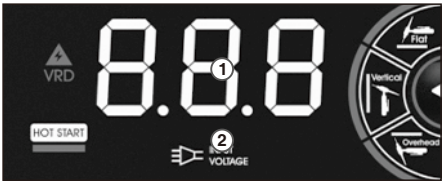


Fig 3 Input Voltage

1. Input Voltage
2. Power LED

Fig 4 Weld Mode Select

1. Welding Process Selection
2. Outer Air LED
3. CUT-Built-in Compressor Air
4. CUT-Outer Air
5. Stick
6. DC TIG
7. AC TIG

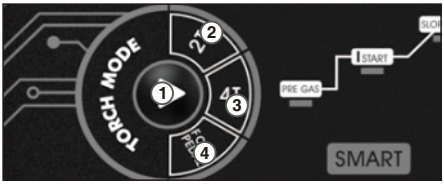


Fig 5 Torch Mode Select

1. Torch Operation Selection
2. 2T
3. 4T
4. Remote-Torch Remoter or Foot Pedal

DESCRIPTION

Fig 6 SMART Selection-Angle

1. Welding Angle Selection
2. Flat
3. Vertical
4. Overhead

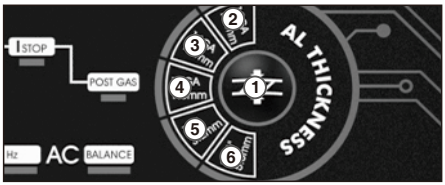


Fig 7 SMART Selection-Thickness

1. Aluminum Thickness-Selectection
2. 18GA 1.0mm
3. 16GA 1.3mm
4. 14GA 1.6mm
5. 1/8" 3.2mm
6. 3/16" 5.0mm

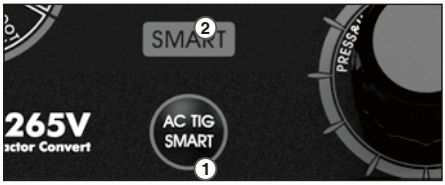


Fig 8 SMART Selection

1. SMART Button
2. SMART LED

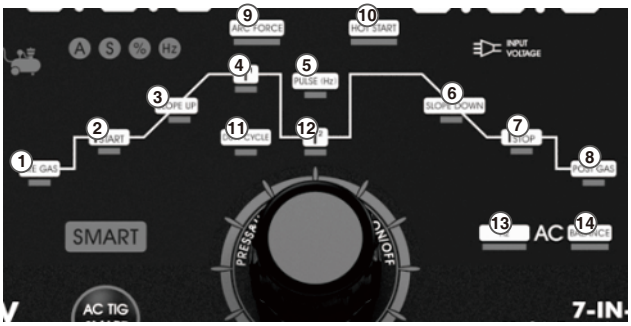


Fig 9 Parameters Select

1. Pre-flow
2. Initial Current
3. Upslope Time
4. Peak Current(Output Current)
5. Pulse Frequency
6. Downslope Time
7. Crater Current
8. Post Flow
9. Arc Force Current
10. Hot Start Current
11. Pulse Width (Duty Cycle)
12. Background Current
13. AC Frequency
14. Clearance Width/AC Balance

DESCRIPTION

Keys Operation Description

Welding Process Selection

Press ▶ when there is no load; can choose a different welding mode based on actual demands; this button is invalid in the middle of welding; the mode switch will roll when the welder goes back to no-load status. Please see the description below:

AC TIG | DC TIG | Stick | CUT-Outer Air | CUT-Built-in Compressor Air

Fig 10 Welding Modes Selection

Press and hold the Value Knob for 3s to turn Pulse on/off.

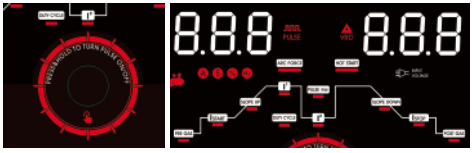


Fig 11 Torch Operation Selection

Welding Torch Operation Selection

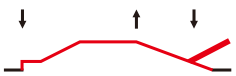
When under TIG mode or digital controlled torch mode, press ▶ to select different torch control modes based on actual welding demands. This button is invalid in the middle of welding; the mode switch will roll when the welder is back to no-load status. Please see the description below:

2T | 4T | Remote Control

Fig 12 Torch Operation Selection

Torch Operation Selection 2T/4T

Operation Modes

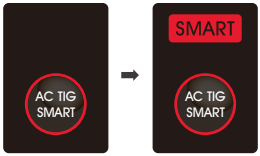
Mode No.	Operation	Torch Trigger Operation and Current Curve
1	**Standard 2T mode:** 1. Push the torch trigger: arc is ignited and current rises gradually. 2. Release the torch trigger: current drops gradually, and arc stops. If push the torch trigger again before arc stops, the current will gradually rise again, and then turn to 1.	
2	**Standard 4T mode:** 1. Push the torch trigger: arc is ignited and current reaches the initial value. 2. Release it: current rises gradually to the set amperage/voltage. 3. Push it again: current drops to pilot arc current value. 4. Release it: arc stops.	

Note: With Foot Pedal attached, TIG Torch Trigger will not turn on welding arc. Amperage is controlled exclusively with the Foot Pedal.

DESCRIPTION

SMART Mode Selection

When under AC/AC, Pulse TIG mode, press AC TIG SMART to select "SMART" mode. Please see below:



SMART OFF SMART ON

Fig 13 Operation Selection

When under SMART mode, one can press ◀ to select different welding angles according to actual application:

Flat Welding Angle Vertical Welding Angle Overhead Welding Angle

When under SMART mode, one can press to select aluminum plate thickness

18GA 1.0mm 16GA 1.3mm 16GA 1.6mm 1/8" 3.2mm 3/16" 5.0mm

DESCRIPTION

Welding Parameters Setting

Press rotary encoder potentiometer to adjust welding parameters based on actual demands. The parameters' setting can be done during no load or in the middle of welding without affecting welding.

Welding Mode	Torch Switch Mode	Pre-flow	Initial Current	Up Slope Time	Peak Current	Background Current	Pulse Frequency	Pulse Width
Stick	NO	×	×	×	●	×	×	×
DC TIG	2T	●	●	●	●	×	×	×
	4T	●	●	●	●	×	×	×
	Foot Pedal	●	●	●	●	×	×	×
DC Pulse TIG	2T	●	●	●	●	●	●	●
	4T	●	●	●	●	●	●	●
	Foot Pedal	●	●	●	●	●	●	●
AC TIG	2T	●	●	●	●	×	×	×
	4T	●	●	●	●	×	×	×
	Foot Pedal	●	●	●	●	×	×	×
AC Pulse TIG	2T	●	●	●	●	×	●	●
	4T	●	●	●	●	×	●	●
	Foot Pedal	●	●	●	●	●	●	●
CUT-Built-in compressor Air	2T	●	●	●	●	×	×	×
	4T	●	●	●	●	×	×	×
CUT-Outer Air	2T	●	●	●	●	×	×	×
	4T	●	●	●	●	×	×	×
Adjusting Direction		→						

DESCRIPTION

Welding Mode	Torch Switch Mode	Arc Force Current	Down Slope Time	Crater Current	Post-flow	AC Frequency	Clearance Width
Stick	NO	●	×	×	×	×	×
DC TIG	2T	×	●	●	●	×	×
	4T	×	●	●	●	×	×
	Foot Pedal	×	●	●	●	×	×
DC Pulse TIG	2T	×	●	●	●	×	×
	4T	×	●	●	●	×	×
	Foot Pedal	×	●	●	●	×	×
AC TIG	2T	×	●	●	●	●	●
	4T	×	●	●	●	●	●
	Foot Pedal	×	●	●	●	●	●
AC Pulse TIG	2T	×	●	●	●	●	●
	4T	×	●	●	●	●	●
	Foot Pedal	×	●	●	●	●	●
CUT-Built in compressor Air	2T	×	●	●	●	×	×
	4T	×	●	●	●	×	×
CUT-Outside Air	2T	×	●	●	●	×	×
	4T	×	●	●	●	×	×
Adjusting Direction		→					

Note:

● means available, × means null.

Performance Data Plate And Duty Cycle

On the machine, there is a plate that includes all the operating specifications for your new unit. The duty cycle rating of a welder defines how long the operator can weld and how long the welder must rest and be cooled. Duty cycle is expressed as a percentage of 1 O minutes and represents the maximum welding time allowed. The balance of the 1 0-minute cycle is required for cooling For example, a welder has a duty cycle rating of 30% at the rated output of 90A. With that machine, you can weld at 90 A output for three (3) minutes out of every 10 min with the remaining seven (7) minutes required for cooling The duty cycle of your new welder can be found on the data plate affixed to the machine. The picture below shows that the "X" row lists duty cycle percentages while the "I2" row lists the amp draw corresponding to the duty cycle. Various duty cycles at other amperage are listed on your data plate.

DESCRIPTION

MODEL: CT2050		S/N:			
		ANSI/IEC STD.60974-1			
	20~250Hz	U_1=110V		U_1=220V	
		5A/10.2V~160A/16.4V		5A/10.2V~200A/18V	
		X	100%	X	100%
	U_0=68V	I_2	160A	I_2	200A
		U_2	16.4V	U_2	18V
		U_1=110V		U_1=220V	
		10A/20.4V~160A/26.4V		10A/20.4V~200A/28V	
		X	60%	X	60%
	U_0=68V	I_2	160A	I_2	200A
		U_2	26.4V	U_2	28V
		U_1=110V		U_1=220V	
		12A/84.8V~25A/90V		12A/84.8V~45A/98V	
		X	100%	X	100%
	U_0=312V	I_2	25A	I_2	45A
		U_2	90V	U_2	98V
1~50Hz/60Hz	U_1=110V	I_1 max=47A		I_1 eff=36A	
	U_1=220V	I_1 max=31A		I_1 eff=24A	
Cooling Mode: Fan Cooling		Insulation Grade: F		**IP21S**	

Internal Thermal Protection

If you exceed the welder's duty cycle, the thermal protection system will engage, shutting off all welder output. After cooling, the thermal protector will automatically reset, and the welding functions can resume. The user needs to know it is the expected behavior of this machine. However, it would be best if you waited at least ten minutes after the thermal protector engages be fore resuming welding. You must do this even if the thermal protector resets itself before the ten minutes is up, or you may experience less than specified duty cycle performance.

Welding/Cutting Preparation

The key to making a good weld is preparation. It includes studying the process and equipment and practicing welding before attempting to weld the finished product. An organized, safe, ergonomic, comfortable, and well-lit work area should be prepared for the operator. The work area should be free of all flammables, with a fire extinguisher and a bucket of sand available to smother potential possible fires.

To properly prepare for welding with your new welder, it is necessary to:
- Read the safety precautions at the front of this manual.
- Prepare an organized, well-lit work area.
- Protect the eyes and skin of the operator and bystanders.
- Attach the work clamp to the bare metal to be welded, ensuring good contact.
- When for TIG Welding, ensure opening the gas cylinder valve for 100% Argon and adjust the gas pressure regulator to the correct flow rate.
- When for Cutting, ensure installing the air compressor filter regulator correctly.
- Plug the machine into a suitable power outlet, and recommend NEMA6-50.

EXPOSURE TO WELDING ARC IS EXTREMELY HARMFUL TO THE EYES AND SKIN. PROLONGED EXPOSURE TO A WELDING ARC CAN CAUSE BLINDNESS AND BURNS. NEVER STRIKE AN ARC OR BEGIN WELDING UNLESS YOU ARE ADEQUATELY PROTECTED. WEAR FIRE RESISTANT WELDING GLOVES, HEAVY LONG SLEEVED SHIRT, CUFFLESS PANTS; HIGH TOPPED SHOES AND A WELDING HELMET.

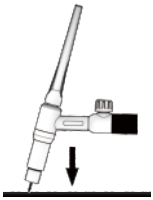
OPERATION

Set Up for TIG Welding (GTAW)

WARNING: TIG TORCH IS ALWAYS LIVE (ELECTRICALLY HOT). Use caution and ensure the TIG torch is not in contact with or close to a conductive or grounded material.

Note: REMOVE ALL THE COLLECTION FROM THE POSITIVE(+) , NEGATIVE(-) OUTPUT RECEPTACLE, AND TORCH CONNECTOR.

- Connect the TIG torch electric connector to the welder's Negative (-) Output Receptacle.
- Connect the TIG torch gas connector to the welder's Torch Connector.
- Plug the 5-pin torch control switch cable into to Trigger Connector Receptacle.
- Connect the work clamp to the welder's Positive(+)Output Receptacle, ensure it has good contact with the workpiece on a clean, bare metal surface free of rust, paint, or coating.
- Set the tungsten electrode to stick out approximately 1/4" inch from the end face of the gas cup. Please use the correct size and type of tungsten electrode in your project. The small size of tungsten can handle the low welding current. The tungsten electrode requires a sharpened tip in DC welding and a round tip in AC welding.
- Attach the work clamp to the workpiece that needs welding.
- Put the TIG torch away from all conductive materials.
- Install the gas hose into the Inlet for Argon Gas and connect to the gas pressure regulator (100% Argon only).
- Open the gas cylinder valve and adjust the gas pressure regulator to the correct flow rate(Recommend 20-35CFH).
- Plug the power cable into a suitable power outlet, recommend NEMA6-50R.
- Turn on the power source and select AC TIG/DC TIG/DC PULSE TIG/AC PULSE TIG process with the Welding Process Selection.
- Press the Value Knob to set parameters and rotate the knob to adjust the values.
- Place the electrode to the workpiece and trigger the torch control switch to initiate the welding arc with HF technique.



REMEMBER TO CLOSE THE VALVE ON THE GAS CYLINDER IMMEDIATELY AFTER ALL WELDING IS COMPLETED.

Welding Tips:

- Always weld clean, dry and well-prepared material.
- Hold the torch at a 45° angle to the workpiece with gas cup about 1/2" from the surface.
- Move the torch smoothly and steadily as you weld.
- Avoid welding in very drafty areas. A draft will fail the shielding gas protection and lead to a porosity defect.
- Keep wire and liner clean. Do not use rusty or dirty wire.
- Please don't bend or kink the welding torch cable.

Torch Assembling

- Match Collet and Collet Body size tungsten electrode.
- Thread the Collet Body into the front of the Torch.
- Match the size of the Ceramic Nozzle to shielding gas requirements for workpiece material thickness (see Settings Chart). Thread the correct Ceramic Nozzle onto Collet Body.
- Insert Collet into Collet Body. Insert tungsten Electrode into Collet.
- Lock Electrode in place with Back Cap. The electrode should protrude 1/8" to 1/4" beyond the Ceramic Nozzle.

1. Pyrex Glass Cup
2. Stubby Gas Lens
3. Temperature Resistant O-ring
4. Collet
5. Insulator Torch Body
6. Torch Head
7. Back Cap

1. Cermic Gas Nozzle
2. Collets Body
3. Collet
4. Insulator Torch Body
5. Torch Head
6. Back Cap

Current Ranges Recommendation for Tungsten Electrodes

Electrode Dia.	Recommended Welding Current	
	DCEN(A)	AC (A)
1/16"	70-150	60-120
3/32"	150-250	100-180
1/8"	250-400	160-250
5/32"	400-500	200-320

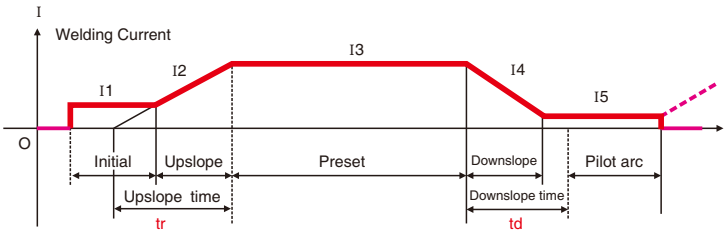
Welding Material Recommendation

Process	Welding Material	Tungsten Diameter	Metal Thickness	
			110V	220V
AC TIG	Aluminum, Aluminum Alloy Magnesium Alloy, etc.	1/16", 3/32", 1/8", 5/32"	1/25"~5/32"mm	1/25"~3/16"mm
AC Pulse TIG				
DC TIG	Carbon steel, stainless steel, copper, titanium alloy, etc.			
DC Pulse TIG				

TIG Electrodes Specification Reference Table

Settings Chart									
Material	Material Thickness	Amps	Tungsten Color	Tungsten Dia.	Filler Metal	Filler Metal Diameter	Ceramic Nozzle size	Gaas Flow	Gas Flow Rate(SCFH)
Mild Steel	1/16"	55~90	Grey, Orange, Red, White	1/16"	ER70S-2	1/16"	#4	2	11-12
Mild Steel	1/32"	90~120	Grey, Orange, Red, White	1/16"	ER70S-2	1/16"	#4-5	2	11-12
Mild Steel	1/8"	95~135	Grey, Orange, Red, White	1/16"~ 3/32"	ER70S-2	3/32"	#5-6	10	11-12
Mild Steel	3/16"	140~165+	Grey, Orange, Red, White	3/32"	ER70S-2	1/8"	#6-7	10	13-14
Stainless Steel	1/16"	50~80	Grey, Orange, Red, White	1/16"	ER70S-2	1/16"	#4	2	11-12
Stainless Steel	1/32"	80~110	Grey, Orange, Red, White	1/16"	ER70S-2	1/16"	#4-5	2	11-12
Stainless Steel	1/8"	85~120	Grey, Orange, Red, White	1/16"~ 3/32"	ER70S-2	3/32"	#5-6	10	11-12
Stainless Steel	3/16"	125~165+	Grey, Orange, Red, White	3/32"	ER70S-2	1/8"	#6-7	10	13-14

DC TIG Welding



I2: The current rise prosess from I1 to I3
I4: The current decrease prosess from I3 to I5

Fig 14 DC TIG Current Change Waveform

- **Current (I3):** This parameter can be set according to users' own technical requirements.
- **Initial Current (I1):** It is the current when the arc is ignited by pushing the torch trigger, and it should be set according to users' own technical requirements. If the initial current is high enough, the arc is easier to be ignited. However, it should not be too high when welding a thin plate, so as to avoid burning through the workpiece during arc ignition. In some operation modes, the current does not rise but stays at the initial current value to preheat the workpiece or illuminate it.
- **Crater Current (I5):** In some operation modes, the arc does not stop after the current downslope but stays in the pilot arc state. The working current in this state is called pilot arc current, and it should be set according to users' technical requirements.
- **Pre-flow Time:** It indicates the time from the torch trigger being pushed to the arc being ignited in non-contact mode. Commonly it should be longer than 0.5s to make sure that the gas has been delivered to the welding torch in normal flow before arc ignition. The pre-flow time should be increased if the gas hose is long.
- **Post-flow Time:** It indicates the time from the welding current being cut off to the gas valve inside the machine being closed. If it is too long, it will lead to a waste of argon gas; if it is too short, it will result in the oxidation of weld bead. When in AC TIG or for special materials, the time should be longer.
- **Upslope Time (tr):** It indicates the time spent on current rising from 0 to the preset value, and it should be set according to users' technical requirements.
- **Downslope Time (td):** It indicates the time spent on current dropping from the preset value to 0, and it should be set according to users' technical requirements.

DC TIG Parameters

Process	Parameter	Description	220V	110V	Default
DC TIG	PRE GAS	Pre-flow	0.1~15s	0.1~15s	0.3s
	Istart	Initial Current	5~160A	5~80A	15A
	SLOPE UP	UpSlope Time	0~10s	0~10s	0s
	I1	Peak Current	5-200A	5~160A	50A
	SLOPPE DOWN	Downslope Time	0~15s	0~15s	0s
	Istop	Crater Current	5~200A	5~100A	15A
	POST GAS	Post-flow	0.1~15s	0.1~15s	2s

The actual parameter can be flexibly selected according to actual workpiece thickness and technology.

Pulse TIG Welding

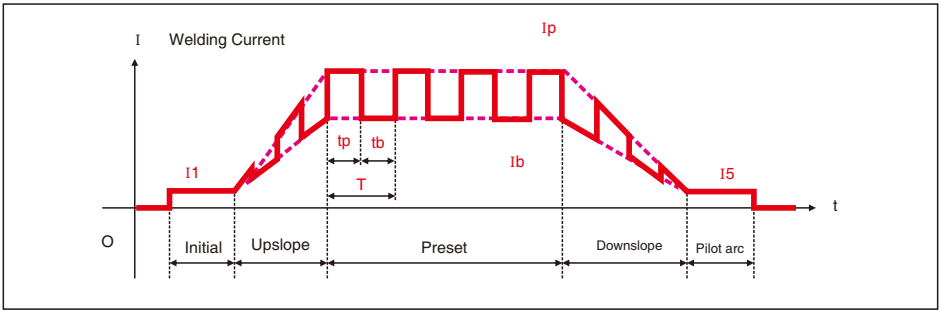


Fig 15 DC Pulse TIG Current Change Waveform

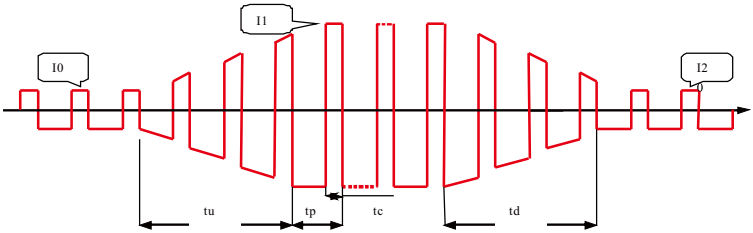
In pulse TIG mode, all DC TIG parameters except current (I3), could check the description above DC TIG Welding. There are 4 different adjustable parameters in this process. Describe them as below.

- **Peak Current (Ip):** It should be adjusted according to users' technical requirements.
- **Background Current (Ib):** It should be adjusted according to users' technical requirements.
- **Pulsed Frequency (1/T):** T=Tp+Tb. It should be adjusted according to users' technical requirements.
- **Pulse Duration Ratio (Pulse Width (100%*Tp/T):** The percentage peak current time holding in pulse period. It should be adjusted according to users' technical requirements.

DC Pulse TIG

Process	Parameter	Description	220V	110V	Default
DC Pulse TIG	PRE GAS	Pre-flow	0.1~15s	0.1~15s	0.3s
	Istart	Initial Current	5~160A	5~80A	15A
	SLOPE UP	UpSlope Time	0~10s	0~10s	0s
	I1	Peak Current	5-200A	5~160A	50A
	I2	Background Current	I1*10%-I1 A	I1*10%-I1 A	50A
	PULSE(Hz)	Pulse Frequency	0.2-200Hz	0.2-200Hz	0.5Hz
	DUTY CYCLE (I1:I2)	Pulse Width	10%-90%	10%-90%	
	SLOPPE DOWN	Downslope Time	0-15s	0-15s	0s
	Istop	Crater Current	5-200A	5-100A	15A
	POST GAS	Post-flow	0.1-15s	0.1-15s	2s

AC Square Wave TIG Welding



I0-Initial Current, I1-Welding Current, I2-Pilot Arc Current,
tu-Upslope Time, td-Downslope Time
tp-AC Period, tc-Cathode Current Time

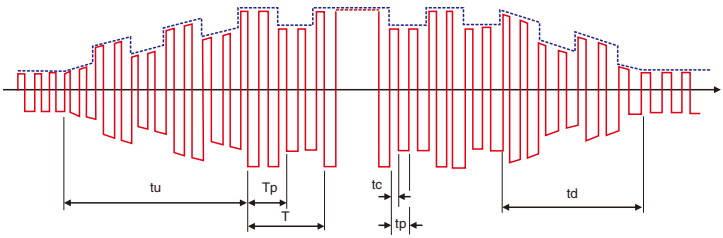
Fig 16 AC Square Wave TIG Current Change Waveform

In AC square wave TIG welding, the pre-flow time and post-flow time are the same with those in DC TIG welding, and others are described as below.

- **Initial Current (I0), Welding Current (I1) & Pilot Arc Current (I2):** The preset value of the three parameters is approximately the absolute average of the practical welding current, and can be adjusted according to users' technical requirements.
- **Pulse Frequency (1/tp):** It can be adjusted according to users' technical requirements.
- **Cleaning Strength (100%*Tc/Tp):** Generally, in AC welding, when taking the electrode as an anode, the current is called cathode current. Its main function is to break up the oxidized layer of the workpiece, and the cleaning strength is the percentage of cathode current holding in the AC period. This parameter is 10~40% commonly. When the value is smaller, the arc is concentrative, the molten pool is narrow and deep, and when it is bigger, the arc is dispersive, molten pool is wide and shallow.

Process	Parameter	Description	220V	110V	Default
AC TIG	PRE GAS	Pre-flow	0.1~15s	0.1~15s	0.3s
	Istart	Initial Current	5~160A	5~80A	15A
	SLOPE UP	UpSlope Time	0~10s	0~10s	0s
	I1	Peak Current	5-200A	5~160A	50A
	SLOPPE DOWN	Downslope Time	0~15s	0~15s	0s
	Istop	Crater Current	5~200A	5~100A	15A
	POST GAS	Post-flow	0.1~15s	0.1~15s	2s
	AC Hz	AC Frequency	20-250Hz	20-250Hz	85Hz
	AC BALANCE	Clearance Width	5-99A: 20-80% 100-200A: 20-65%	5-99A: 20-80% 100-160A: 10-65%	

AC Pulse TIG Welding



tc-Cathode Current time, tp-AC Period
Tp-Pulsed Peak Current Time, T-Pulse Period

Fig 17 AC Pulse TIG Current Change Waveform

AC pulse TIG welding is almost the same as AC square wave TIG welding, and what makes them different is that in AC pulsed TIG welding, the welding current varies with the pulse, peak current, and base current is generated because the welding current is controlled by a low-frequency pulse. The preset peak current and base currents are the low-frequency pulse peak value (average value) and base value (average value) respectively. For the AC square wave parameter selecting and setting, please refer to the corresponding contents in AC square wave TIG welding. For the pulse frequency and pulse duration ratio, users may refer to the corresponding contents in DC pulsed TIG welding. The pulse frequency (1/T) is a little low, and it can be adjusted between 0.5Hz and 5Hz. The pulse duration ratio (Tp/T) can be adjusted between 10% and 90%.

AC Pulse TIG

Process	Parameter	Description	220V	110V	Default
AC Pulse TIG	PRE GAS	Pre-flow	0.1~15s	0.1~15s	0.3s
	Istart	Initial Current	5~160A	5~80A	15A
	SLOPE UP	UpSlope Time	0~10s	0~10s	0s
	I1	Peak Current	5-200A	5~160A	50A
	I2	Background Current	I1*10%-I1 A	I1*10%-I1 A	50A
	PULSE(Hz)	Crater Current	0.2-200Hz	0.2-200Hz	0.5Hz
	DUTY CYCLE (I1:I2)	Post-flow	10%-90%	10%-90%	
	SLOPPE DOWN	Downslope Time	0-15s	0-15s	0s
	Istop	Crater Current	5-200A	5-100A	15A
	POST GAS	Post-flow	0.1-15s	0.1-15s	2s
	AC Hz	AC Frequency	20-250Hz		85Hz
	AC BALANCE	Clearance Width	5-99A: 20-80% 100-200A: 20-65%	5-99A: 20-80% 100-160A: 10-65%	

SMART Function

Smart Set makes welding easy by taking the guesswork out of AC TIG welding settings. Simply select welding angle (flat, vertical, or overhead) and Aluminum thickness; the machine will recommend the ideal parameters such as amperage, preflow, post flow, upslope time, downslope time, AC balance, etc. It is very friendly to beginners, especially for complex settings related to welded aluminum sheets.

SMART Selection: see details in 9.3.3 SMART Mode Selection

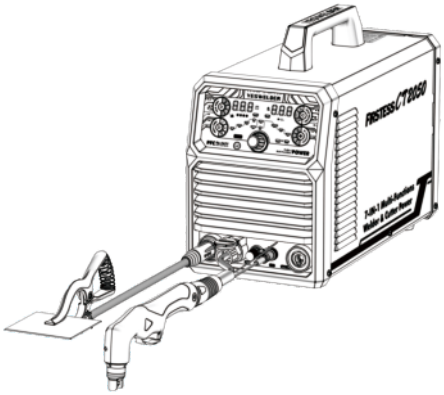
Smart Setting For AC Aluminum Welding (Tungsten: Diameter 3/32")

Process	Parameter	Description	Aluminum Workpiece Thickness				
			18GA 1.0mm	16GA 1.3mm	14GA 1.6mm	1/8" 3.2mm	3/16" 5.0mm
AC Pulse TIG	PRE GAS	Pre-flow	0.5	0.5	0.5	0.5	0.5
	Istart	Initial Current	10	15	20	25	30
	SLOPE UP	UpSlope Time	0	0	0	0	0
	I1	Peak Current	20	40	55	95	160
	I2	Background Current	10	10	10	10	25
	SLOPPE DOWN	Downslope Time	0	0	0	0	0
	Istop	Crater Current	20	20	20	20	20
	POST GAS	Post-flow	5	5	5	5	5
	AC Hz	AC Frequency	85	85	85	85	85
	AC BALANCE	Clearance Width	30	30	30	30	30
	PULSE(Hz)	Pulse Frequency	0.2~200	0.2~200	0.2~200	0.2~200	0.2~200
	DUTY CYCLE (I1:I2)	Pulse Width	10%~90%	10%~90%	10%~90%	10%~90%	10%~90%
AC TIG	PRE GAS	Pre-flow	0.5	0.5	0.5	0.5	0.5
	Istart	Initial Current	10	15	20	25	30
	SLOPE UP	Up Slope Time	0	0	0	0	0
	I1	Peak Current	20	40	55	95	160
	SLOPPE DOWN	Downslope Time	0	0	0	0	0
	Istop	Crater Current	20	20	20	20	20
	POST GAS	Post-flow	5	5	5	5	5
	AC Hz	AC Frequency	85	85	85	85	85
	AC BALANCE	Clearance Width	30	30	30	30	30

Set Up for Plasma Cutting

- Connect the Cutting torch to the Torch Connector.
- Plug the 5-pin torch control switch cable into to Trigger Connector Receptacle.
- Connect the work clamp to the Positive(+) Output Receptacle, ensure it has good contact with the workpiece on a clean, bare metal surface free of rust, paint, or coating. Note: Wrong connection for work clamp will lead to machine damage.

- Install the air filter regulator and connect between the air inlet and air compressor.
- Set the air pressure to 60-90PSI.
- Attach the work clamp to the workpiece that need cutting.
- Put the cutting torch away from all conductive materials.
- Plug the power cable into a suitable power outlet, recommend NEMA6-50R.
- Turn on the power source and select Plasma Cut-Built-in Compressor Air/Plasma Cut-Outer Air process with the Welding Process Selection.
- Trigger the torch and make sure there's the air flow and pilot arc.
- Press the Value Knob to set parameters and rotate the knob to adjust the values.
- Move the torch head to the workpiece and trigger the torch control switch to initiate the arc with blowback technique.



Cutting Torch Assembly

Plasma Cutting Torch Accessory

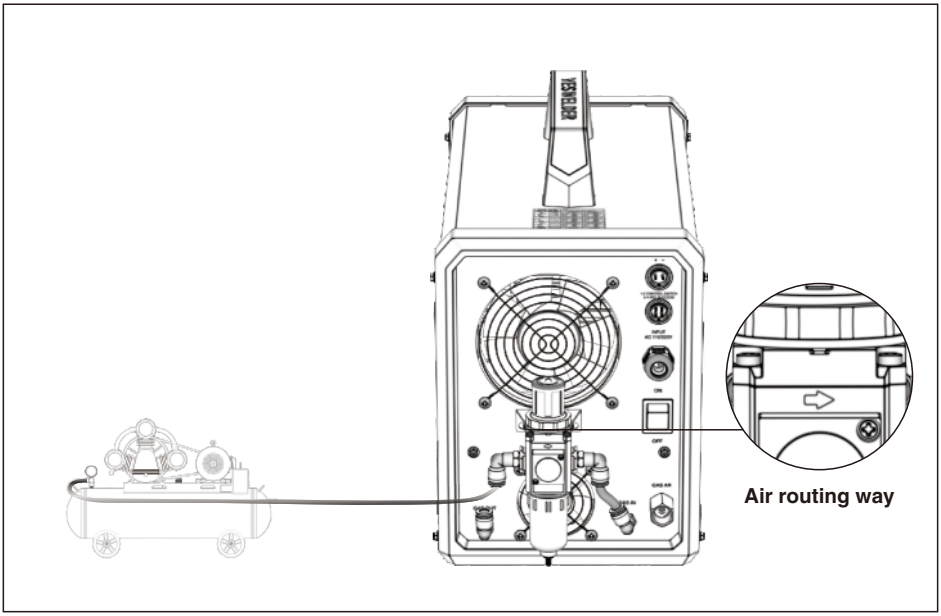
1. Spacer Guide
2. Outside Nozzle 6 holes
3. Nozzles Tips
4. Electrodes
5. Diffuser
6. Torch Head

Installation for Air Pressure Compressor Filter Regulator

YesWelder CT2050 could support plasma cutting with built-in compressor air and plasma cutting with outer air from an external compressor.

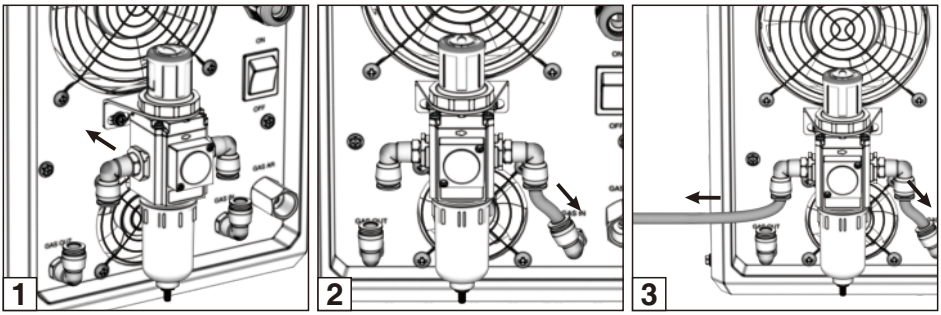
The built-in compressor makes it easy to take on various outdoor projects, and making life for welders on the road that much easier. It's able to start cutting without an extra air compressor.

Access to an external air compressor makes cutting more powerful and with better quality.

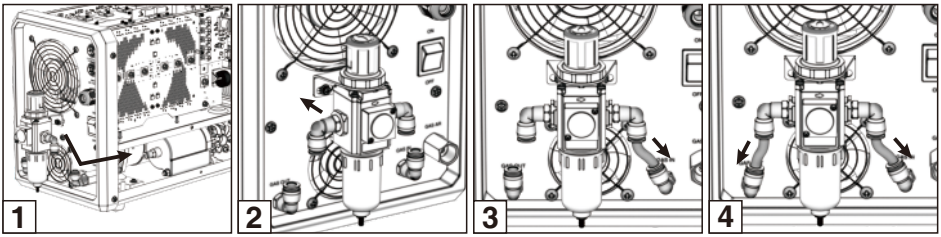


With External Air Compressor

Connection for Air Compressor Filter Regulator with an External Compressor



- Loose the fixing nuts on the rear panel to install the bracket.
- Place the air filter regulator on the bracket and fix it.
- Connect the Inlet-Air In with the filter regulator outlet nozzle by an air tube and tighten it with a clamping band.
- Connect the filter regulator inlet nozzle with an external air compressor by an air tube and tighten it with a clamping band.
- Connect to the air compressor.
- Pull up the gas pressure adjusting valve knob, then rotate left to reduce the outlet air pressure and right to increase the outlet air pressure.
- Pull down the pressure-reducing valve knob to fix it after the pressure is adjusted.



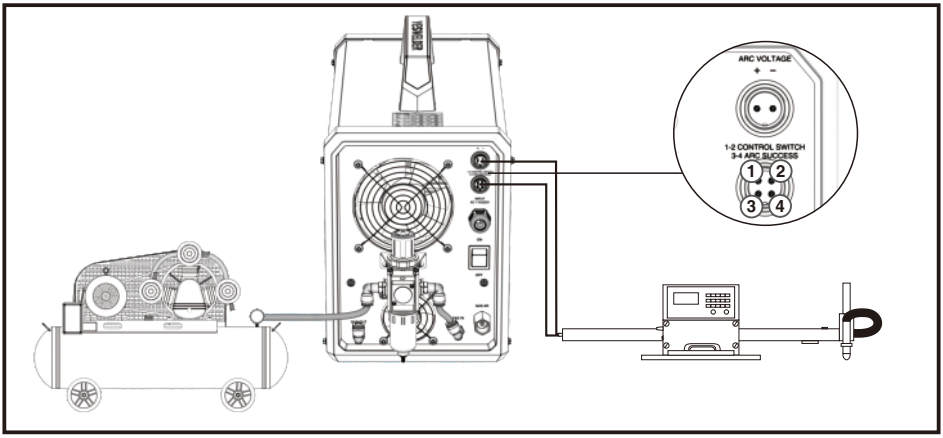
- Loose the fixing nuts on the rear panel to install the bracket.
- Place the air filter regulator on the bracket and fix it.
- Connect the Inlet-Air In with the filter regulator outlet nozzle by an air tube and tighten it with a clamping band.
- Connect the Inlet-Air Out with filter regulator inlet nozzle by an air tube and tighten it with a clamping band.
- Connect to the air compressor.
- Pull up the gas pressure adjusting valve knob, then rotate left to reduce the outlet air pressure and right to increase the outlet air pressure.
- Pull down the pressure-reducing valve knob to fix it after the pressure is adjusted.

Note:
Regularly drain the water inside the pressure-reducing valve.
When the water level reaches two-thirds of the water filter cup, water must be discharged; otherwise, the cut quality will be affected.

CNC Setting

YesWelder CT2050 is suitable for CNC automatic cutting and have CNC interface port. Great for making precision cuts that are impossible to get with a hand-held tool in auto repair, machine fabrication, and construction.

Back Connection



CNC Voltage Connector:

2-pin control socket, connection of CNC communication signals showing arc voltage output, pin1 is positive, pin 2 is negative, compatible with CNC table with ARC voltage feedback ratio 1:1.
CNC Signal Control: 4-pin control socket, switch control signal output, pin 1 and pin 2 for switch start/stop signals respectively, pin 3 and pin 4 for arc generating success signals.

Cutting Features

"Blowback" Arc Start

"Blowback" Arc or Non-High frequency uses the air pressure "blows back" a conductor held open by spring tension. Overcoming the spring tension and forcing the conductor back onto its seat, completing the pilot arc circuit.
The "blow-back" start comes without interference, is safe and ideal for general use, and is friendly to the surrounding electrical machine and human health.

Non-touch Pilot Arc

The pilot arc torch efficiently cuts through rough, painted, and rusty surfaces, while producing minimal slag.
Pilot arc technology allows cutter to cut without touching the tip of the metal, for better quality and longer consumable life.

PFC (Power Factor Correction) Technology

- The CT2050 welder&cutter comes with PFC technology, could work with 96-265V.
- It helps to reduce energy consumption and costs as it maximizes real power drawn from the grid supply, reducing energy and inefficiency. Thus saving electricity while stabilizing welding performance for a consistent output. Primarily, it ensures a stable cutting process with fluctuating voltage in the mains, using long extension cables.
- 96V-265V wide voltage range means the device can be used worldwide on construction sites.

General Technical Parameters

Process	Parameter	Description	220V	110V	Default
CUT	PRE GAS	Pre-flow	0.1~15s	0.1~15s	0.5s
	Istart	Initial Current	10~25A	10~25A	12A
	SLOPE UP	UpSlope Time	0~10s	0~10s	0s
	I1	Peak Current	12-45A	12~25A	45A
	SLOPPE DOWN	Downslope Time	0~15s	0~15s	0s
	Istop	Crater Current	10~25A	10~25A	10A
	POST GAS	Post-flow	0.1~15s	0.1~15s	15s

Cutting Setting Recommendation 1

Cutting Thickness	Distance to Torch	45A				25A			
		Quality Cutting		Productive Cutting		Quality Cutting		Productive Cutting	
		Cutting Speed	Output Voltage	Cutting Speed	Output Voltage	Cutting Speed	Output Voltage	Cutting Speed	Output Voltage
Inch	Inch	in/min	V	in/min	V	in/min	V	in/min	V
14ga 2mm	0.06	218	128	312	125	110	128	156	128
10ga 3mm		156	128	220	128	56	130	83.07	127
5/32"4mm		110	128	156	128	40.2	133	54.53	130
1/4" 6mm		56	130	83.07	127	30.7	136	36.22	134
5/16"8mm		40	133	54.53	130	21.25	140	27.16	138
3/8"10mm		31	136	36.22	134	12.2	146	15.75	141
1/2" 12mm	cut from the edge	21.25	140	27.16	138	6.7	152	9.45	147
5/8" 16mm		12.2	146	15.75	141	4.33	157	5.71	154
3/4" 20mm		6.7	152	9.45	147	-	-	-	-
1" 25mm		4.3	157	5.7	154	-	-	-	-
Recommended air flow rate/pressure:188 l/min (400 scfh) @ 5,9 bar (90 psi)									
The actual parameters can be flexibly selected according to the actual cutting workpiece thickness and technology.									

- Quality Cutting Setting: refers to the starting setting for qualified cut quality (best angle, least dross, best cut surface finish).
- Production Setting: Under this setting, at these recommended speeds, the maximum number of parts can be cut, but the quality will be not good.

Cutting Setting Recommendation 2

	Material	110V		220V	
CUT	Stainless Steel, Carbon Steel, Copper, Aluminum, Aluminum Alloy	Quality Cutting Thickness	Max Servance Thickness	Quality Cutting Thickness	Max Servance Thickness
		10mm 25/64"	20mm 25/32"	15mm 19/32"	30mm 13/13"

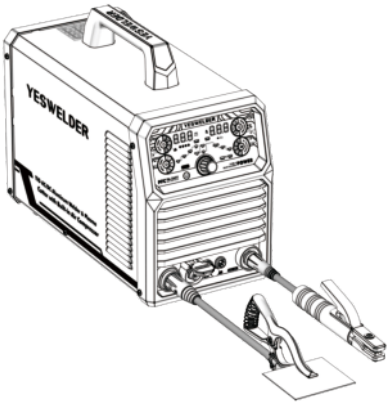
Set Up for Stick Welding (SMAW)

- Remove all the connection from the Positive(+) or Negative (-) Output Receptacle (Remove the TIG torch at the same time.)
- Check the electrode packaging to determine the recommended polarity and connect the electrode stringer and work clamp to the Positive(+) or Negative (-) Output Receptacle accordingly.
- Place the electrode into the electrode holder firmly.
- Ensure the work clamp has a good contact with the workpiece on a clean, bare metal surface free of rust, paint, or coating.
- Attach the work clamp to the workpiece that needs welding.

Note: For Stick welding, DCEP means the electrode holder is connected to the positive socket while the work clamp (workpiece) is connected to the negative socket.
However, various electrodes require a different polarity for optimum results. Please follow the electrode manufacturer's recommendation on the correct polarity.

Electrode	Polarity	Usage
E7018, E6011, E6013	DCEP	This electrode is best for use with clean, bare steel and is suitable for moderate penetration.
E6010	DCEN	This electrode is usually used for building up heavy deposits of materal with less penetration and thin sheet welding.

- Turn the power source on and select the Stick function with Process Selection Button on the front panel.
- Set the amperage with the Value Adjusting Knob.
- Strike the electrode against the workpiece to create an arc and hold the electrode steady to maintain the arc.
- Hold the electrode slightly above the work, maintaining the arc while traveling at an even speed.
- Break the arc by quickly snapping the electrode away from the workpiece to finish the weld.
- Wait to let the workpiece cool and chip away the slag carefully to reveal the below welding metal.



Welding Current Guide

Choosing the correct current for a particular welding job is critical. If the welding current is too low, the user will experience difficulty in striking and maintaining a stable arc. The electrode tends to stick to the workpiece, penetration is poor, and the weld ends up with a rounded profile. If the current is too high, the problems include burning through the base metal, undercut, and excessive spatters. The standard welding current for a particular job should be the maximum that won't burn through the base metal, overheat the tungsten electrode, or leave spatters sticking to the workpiece surface.

The table shows current ranges generally recommended for a general purpose type E6013 electrode.

Electrode Size ø mm/Inch	Current Range (Amps)
3/32" or 0.09" (2.4mm)	60~95
1/8" or 0.125" (3.2mm)	100~130
11/64" 0r 0.15" (4.0mm)	130~165
13/64" or 0.19" (5.0mm)	165~260

Built-in VRD

The voltage reduction device (VRD) is a hazard reduction device that lowers the welder's open circuit voltage (OCV) to prevent electric shock from welding current. A VRD is usually equipped with a stick welding machine in wet environments or conductive confined spaces.

YesWelder CT2050 has a VRD feature embedded in this welder and activates when the welder is on. It reduces the voltage of the open circuit to a safer level, thus reducing the chances of electric shock in case the wrong connection is for cutting the torch when the OCV is high in Cutting.

- The VRD function will promptly activate when the electrode does not touch the workpiece.
- When the electrode touches the workpiece to start welding, the VRD will be released.
- when welding is completed and leaves the workpiece, the VRD will be on again.

Adjustable Arc Force:

Arc force is a momentarily increase of the welding current during welding when the machine senses the drop of the arc voltage caused by a short arc length (when the output voltage is lower than 13.5V). Arc force compensates for the voltage drop by increasing the amperage. Increased amperage ensures that the heat stays the same and that the electrode will not dip into the base metal. This function dramatically helps stabilize the arc, prevent the arc from cutting out in the welding process, and prevent the electrode from sticking to the workpiece.

Arc force should be set according to the electrode diameter, preset current and the technical requirement. If the arc force is big, the molten drop can be transferred quickly, and electrode sticking seldom occurs. However, too big arc force may lead to excessive spatter. If the arc force is small, there will be little spatter, and the weld bead will be shaped well. However, too small arc force may lead to soft arc and electrode sticking. Therefore, the arc force should be increased when welding with thick electrode under low current.

In general welding operation, the user can set the arc force between 1-40A. For example, when the preset current is 50A, and the arc force is 10A, the actual welding current will be 60A. However, when the current increases to the maximum allowable value of 200A, the welding current won't ascend anymore.

Adjustable Hot Start

Hot start is a feature that pumps up the amperage for a short time when you start the arc. Higher amperage helps to start the arc easier without sticking the electrode to the base metal. A hot start helps warm the base metal to achieve deep penetration at the weld start.

CAUTION

Working Environment

1. Welding should be carried out in a dry environment with humidity of 90% or less.
2. The working environment temperature should be between -10°C and 40°C.
3. Avoid welding in the open air unless sheltered from sunlight and rain. Keep the welder dry.
4. Avoid welding in a dusty area or environment with corrosive chemical gas.
5. Gas shielded arc welding should be operated in an environment without strong airflow.

Safety Tips

Over-current/over-voltage/over-heating protection circuit is installed in this machine. When the network voltage, output current, or inner temperature exceeds the set standard, the machine will stop working automatically. However, excessive operation (overvoltage) will lead to welder damage. Therefore, please note:

1) Ventilation
This is an industrial welding machine and can create a large current that requires strict cooling devices instead of natural ventilation. Therefore the built-in two fans are very important to ensure effective cooling and stable working performance. The operator should make sure that the louvers be uncovered and unblocked. The minimum distance between the machine and nearby objects should be 30cm. Good ventilation is of critical importance to the normal performance and lifespan of the machine.

2) Over-load is forbidden
The welder is operated according to the allowable duty circle (refer to the corresponding duty cycle). Make sure that the welding current should not exceed the max load current. An overload could obviously shorten the machine's lifespan, or even damage the machine.

3) Over-voltage is forbidden
Please refer to "Technical Parameters" for the power supply voltage range. This machine is of automatic voltage compensation to ensure the welding current is within the given range. If the input voltage exceeds the stipulated value, it would possibly damage the components of the machine. The operator should take according measures in this case.

4) Reliable ground connection. There is an ground screw (with ground remark) in the rear part of each machine. Connect it with an earth cable (section ≥ 6mm2) to avoid the static and electric shock.

5) A sudden halt may occur with the front panel's red indicator lighting up while the machine is of over-load status. Under this circumstance, it is unnecessary to restart the machine for it's resulted from over-heating and triggering the temperature control switch. Keep the built-in fans working to lower the machine's temperature. Welding can be resumed when the temperature falls into the standard range and the red indicator is off.

BASIC KNOWLEDGE OF WELDING

Basic Knowledge of Stick

Manual metal arc welding (MMA/Stick) is arc welding by manually operating electrodes. Stick requires simple equipment and is a convenient, flexible, and adaptive welding processing type. Stick is applied to various metal materials with thicknesses of more than 2mm. It's suitable for various material structures, particularly for workpieces with complex structures and shapes, short weld joints or bending shapes, as well as weld joints in various spatial locations.

Welding Process of Stick

Connect the two output terminals of the welder to the workpiece and electrode holder respectively, and then clamp the electrode by the electrode holder. When welding, the arc is ignited between the electrode and the workpiece, and the end of the electrode and part of the workpiece is fused to form a welding crater under the high-temperature arc. The weld crater is quickly cooled and condensed to form a weld joint that can firmly integrally connect two separate pieces of the workpiece. The coating of the electrode is fused to produce slag to cover the weld crater. The cooled slag can form a slag crust to protect the weld joint. The slag crust is removed at last, and the joint welding is finished.

Tools for Stick

Common tools for Stick include electrode holder, welding mask, slag hammer, wire brush (see Fig 5.8), welding cable, and labor protection supplies.

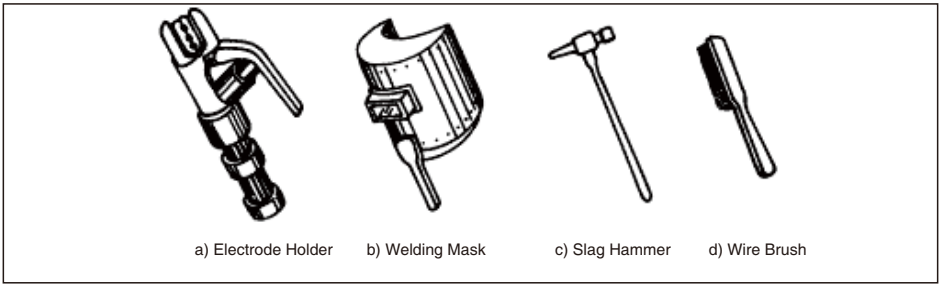


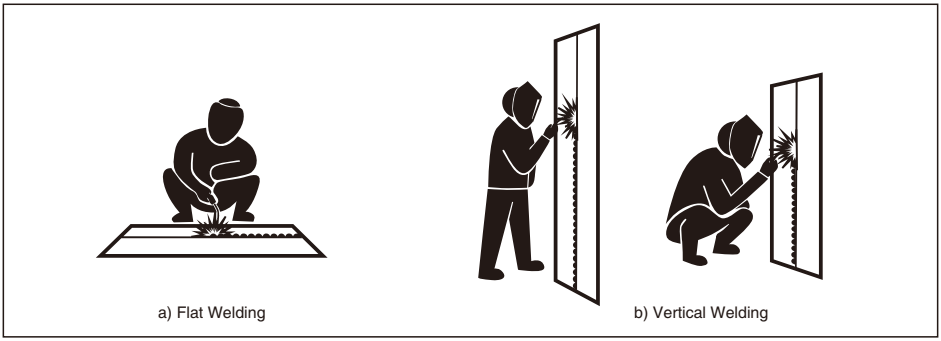
Fig 18 Tools for Stick

a) Electrode holder: a tool for clamping electrode and conducting current, mainly including 300A type and 500A type.
b) Welding mask: a shielding tool for protecting eyes and face from injury due to arc and spatter, including hand holding type and helmet type. Colored chemical glass is installed on the viewing window of the mask to filter ultraviolet rays and infrared rays. Arc burning condition and weld crater condition can be observed from the viewing window during welding. Thus, welding can be carried out by operators conveniently.
c) Slag hammer (peen hammer): for the use of removing slag crust on the surface of the weld joint.
d) Wire brush: for the use of removing dirt and rust at the joints of the workpiece before welding, as well as cleaning the surface of the weld joint and the spatter after welding.
e) Welding cable: generally cables formed from many fine copper wires. Both YHH type arc welding rubber sleeve cable and THHR type arc welding rubber sleeve extra-flexible cable can be used. The electrode holder and welding machine are connected via a cable, and this cable is named as welding cable (live wire). The welding machine and workpiece are connected via another cable (earth wire). The electrode holder is covered with insulating material performing insulation and heat insulating.

Basic Operation of Stick

1) Welding joint cleaning
Rust and greasy dirt at the joint should be removed completely before welding in order to implement arc igniting and arc stabilizing conveniently as well as ensure the quality of the weld joint. A wire brush can be used for conditions with low requirements for dust removal; a grinding wheel can be used for conditions with high requirements for dust removal.

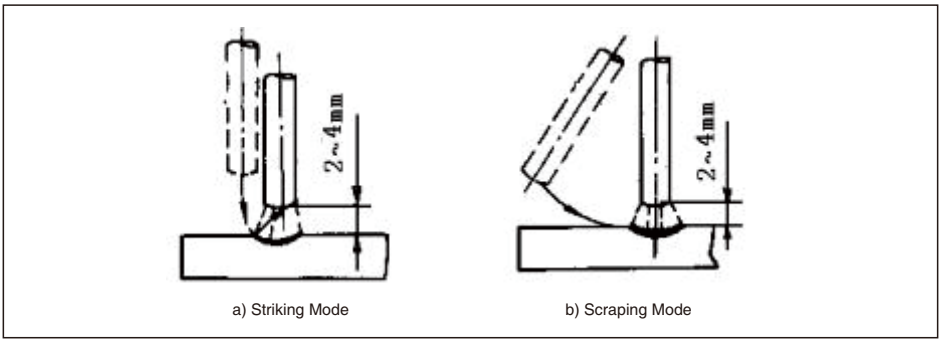
2) Posture in operating
Take flat welding of butt joint and T-shaped joint from left to right as an example. The operator should stand on the right side of the working direction of the weld joint with a mask in the left hand and an electrode holder in the right hand. The left elbow of the operator should be put on his left knee to prevent his upper body from following downwards, and his arm should be separated from the costal part so as to stretch out freely.



a) Flat Welding b) Vertical Welding

Fig 19 Posture in Welding

3) Arc Igniting
Arc igniting is the process of producing a stable arc between electrode and workpiece in order to heat them to implement welding. Common arc ignition mode includes scraping mode and striking mode. (See Fig.20) During welding, touch the surface of the workpiece with the end of the electrode by scraping or light striking to form a short circuit, and then quickly lift the electrode 2~4mm away to ignite the arc. If arc ignition fails, it is probably because there is coating at the end of the electrode, which affects the electric conduction. In this case, the operator can strongly knock the electrode to remove the insulation material until the metal surface of the core wire can be seen.



a) Striking Mode b) Scraping Mode

Fig 20 Arc Extinguishing Modes

4) Tack Weld
For fixing the relative positions of the two pieces of weldment and welding conveniently, 30~40mm short weld joints are welded every certain distance in order to fix the relative positions of the workpiece during welding assembly. This process is named tack weld.

5) Electrode Manipulation
The electrode manipulation actually is a resultant movement in which the electrode simultaneously moves in three basic directions: the electrode gradually moves along the welding direction; the electrode gradually moves toward the weld crater, and the electrode transversely swings. (See Fig 21) Electrode should be correctly manipulated in three movement directions after the arc is ignited. In butt welding and flat welding, the most important is to control the following three aspects: welding angle, arc length, and welding speed.

(1) Welding angle: the electrode should be inclined 70～80º forwards. (See Fig 22)
(2) Arc length: the proper arc length is equal to the diameter of the electrode in general.
(3) Welding speed: proper welding speed should make the crater width of the weld bead about twice the diameter of the electrode, and the surface of the weld bead should be flat with fine ripples. If the welding speed is too high, and the weld bead is narrow and high, the ripples are rough, and the fusion is not well implemented. If the welding speed is too low, the crater width is excessive, and the workpiece is easy to be burned through. Besides, the current should be proper, the electrode should be aligned, the arc should be low, and the welding speed should not be too high and should be kept uniform during the whole welding process.

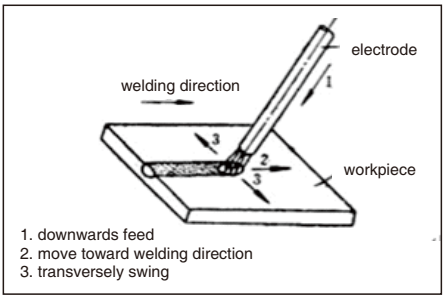


Fig 21 Three basic movement directions of electrode

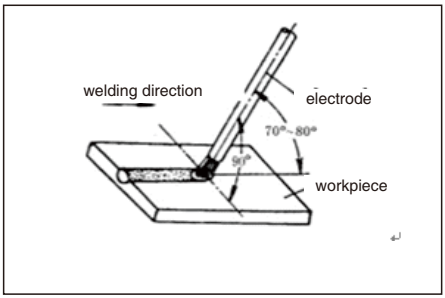
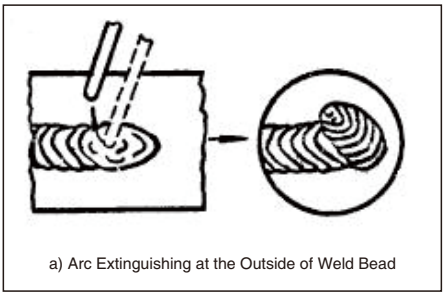


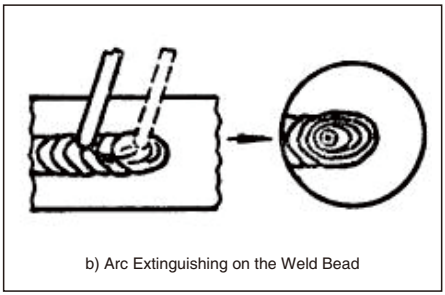
Fig 22 Angles of electrode in flat welding

6) Arc Extinguishing

Arc extinguishing is unavoidable during welding. Poor arc extinguishing may bring shallow weld craters and poor density and strength of weld metal by which cracks, air holes, slag inclusion, and shortage the like are easy to be produced. Gradually pull the end of the electrode to the groove and raise the arc when extinguishing the arc, in order to narrow the weld crater and reduce the metal and heat. Thus, defects such as cracks and air holes can be avoided. Pile up the weld metal of the crater to make the weld crater sufficiently transferred. Then, remove the excessive part after welding. The operation modes of arc extinguishing are shown in Fig 23.



a) Arc Extinguishing at the Outside of Weld Bead



b) Arc Extinguishing on the Weld Bead

Fig 23 Arc Extinguishing Modes

7) Weldment Cleaning

Clean welding slag and spatter with wire brush and tools the like after welding.

Argon Arc Welding

General Description of Argon Arc Welding

Argon arc welding is a kind of gas shielded arc welding using argon as shield gas, and the process of argon arc welding is shown in Fig 24. Tightly close protective layer is formed in the arc zone by the argon gas flow output from the torch nozzle. Thus, the metal molten pool can be protected and separated from the air. Meanwhile, the filler wire and base metal are molten by the heat generated from the arc. After the liquid molten pool cools down, a weld bead is formed.

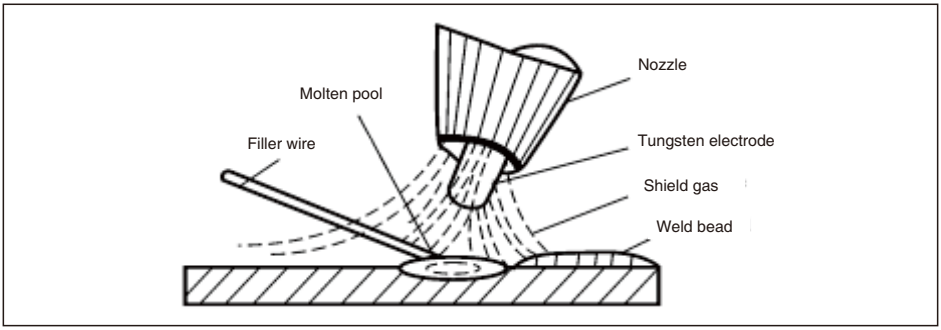


Fig 24 Sketch Map of Argon Arc Welding

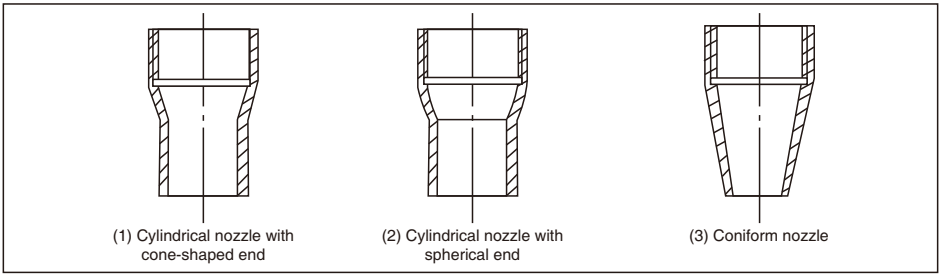
Since argon is a kind of inert gas and it does not react with metals, the alloying elements in the weld metal will not be burned out and the metal molten pool can be fully protected from oxidation. Besides, because argon is insoluble in liquid metal at high temperatures, air holes can be avoided in the weld bead. Therefore, the protective effect of argon is effective and reliable, and better welding quality can be obtained.

Characteristics of Argon Arc Welding

Compared with other arc welding methods, argon arc welding has the following features.
1. Argon has excellent protective performance, so corresponding flux is not needed when welding. It is basically a simple process of metal melting and crystallization, and pure weld beads of high quality can be obtained.
2. Due to the compression and cooling effect of argon flow, the heat of the arc is concentrated at a high temperature. Therefore, the heat-affected zone is very narrow, and there is little welding deformation stress and crack tendency. Thus, argon arc welding is especially suitable for thin plate welding.
3. Argon arc welding is a kind of open flame welding and is easy to operate and observe, so the mechanization and automation of the welding process can be achieved easily. Besides, welding at various spatial locations can be carried out under certain conditions.
4. Argon arc welding can be applied to welding a wide range of welding materials. Almost all metal materials can be welded by argon arc welding, and it is especially suitable for welding chemically active metals and alloys. Generally, it is used in the welding of aluminum, titanium, copper, low alloy steel, stainless steel, refractory steel, etc.
With the increase in product structure of non-ferrous metals, high alloy steel, and rare metals, common gas welding methods and arc welding methods are difficult to obtain the required welding quality. However, argon arc welding is being more and more widely used due to its remarkable characteristics above.

Gas Tungsten Arc Welding (GTAW)

a) Welding Torch
The function of the welding torch for GTAW is to clamp the electrode, conduct current, and carry argon flow. For manual welding, the ON/OFF button is mounted on the handle of the welding torch. Generally, welding torches can be divided into three categories, large-type, medium-type, and small-type. For small-type welding torches, the maximum welding current is 100A. And the welding current can reach up to 400~600A for a large-type welding torch with water cooling. The torch body is pressed from nylon, so it is light, small-sized, insulated, and heat-resistant.
The torch nozzle plays an important part in the protective performance of argon. The common nozzle shapes are shown in Fig 18. Cylindrical nozzle with a cone-shaped or spherical end has the best protective effect, since the argon flow speed is uniform, and laminar flow is easy to hold. The protective effect of the coniform nozzle is worse because the argon flow speeds up. However, this kind of nozzle is easy to operate and the visibility of the molten pool is good, so it is also commonly used in welding.



GTAW Process

1. Preweld cleaning

Clean the electrode and the zone near the weld joint of the workpiece, and remove impurities such as oil pollution and the oxidized film on the surface of the metal before carrying out argon arc welding to ensure good quality of weld bead. The methods for preweld cleaning are: mechanical cleaning, chemical cleaning and chemical & mechanical cleaning.

A. Mechanical cleaning: This method is simple with good effect, and it is suitable for large-sized workpiece. Generally, remove the oxidized film by grinding with a small-diameter stainless steel wire brush or by shoveling with a scraper to make the welding position appearing with metal luster, and then clean the weld joint zone with organic solvent for eliminating oil pollution.

B. Chemical cleaning: Chemical cleaning is commonly used for cleaning the filling electrode and small-sized workpiece. Compared with mechanical cleaning, this method has such characteristics as high cleaning efficiency, uniform and stable quality and long duration of clean state. The chemical solutions and processes used in chemical cleaning should be chosen according to the welding materials and welding requirements.

C. Chemical & mechanical cleaning: Use chemical cleaning method when cleaning firstly, and clean the welding position with mechanical cleaning method before welding. This combined cleaning method is suitable for the high quality welding.

2. Protective effect of gas

Argon is ideal protective gas. The boiling point of argon is -186°C, which is between that of helium and oxygen. Argon is a byproduct when the oxygen installation gets oxygen by fractionating the liquid air. Bottled argon is used for welding in our country. The filling pressure is 15MPa under room temperature, and the cylinder is painted gray and marked with “Ar”. The chemical composition requirements of pure argon are: $Ar \geq 99.99\%$; $He \leq 0.01\%$; $O2 \leq 0.0015\%$; $H2 \leq 0.0005\%$; $C \leq 0.001\%$; $H2O \leq 30mg/m3$.

Welding arc can be better protected and the consumption of shield gas can be reduced in flat position welding. As inert gas, argon does not react with metal chemically even under high temperature. Thus, the alloying elements will not be oxidized or burned out, and problems caused accordingly will be avoided. Meanwhile, argon is insoluble in liquid metal, so air holes can be avoided. Argon is a kind of monatomic gas, existing in atomic state, without molecular decomposition and atomic endotherm under high temperature. Besides, the specific heat capacity and heat conductivity is low, so the arc heat is not easy to lose. Accordingly, the welding arc can burn stably and heat can be concentrated, which is advantageous to welding.

The disadvantage of argon is that its ionization potential is high. When the arc space is fully filled with argon, arc is hard to ignite. However, arc will become stable once it is successfully ignited.

The gas protective effect of argon can be affected by various process factors during welding. Therefore, special attention should be paid to the effective protection of argon in GTAW to avoid interference and damage. Otherwise, satisfactory welding quality is hard to obtain.

Welding process factors such as gas flow, shape and diameter of nozzle, distance between nozzle and workpiece, welding speed and weld joint form may affect the gas protective effect, so all these should be fully considered and chosen correctly.

The gas protective effect can be judged by welding spot testing method through measuring the size of the effective gas protective area. For example, keep all welding process factors fixed when carrying out spot welding on aluminum plate with AC manual TIG, maintain the torch in the fixed position after arc is ignited, and cut off the power after the 5~10s, there will be a molten welding spot left on the aluminum plate. Due to the cathode cleaning action against the area around the welding spot, the oxidized film on the surface of the aluminum plate is eliminated, and a gray area with metallic luster appears. As shown in 26, this area is called effective argon protective area. The greater the diameter of the effective gas protective area, the better is the gas protective effect.

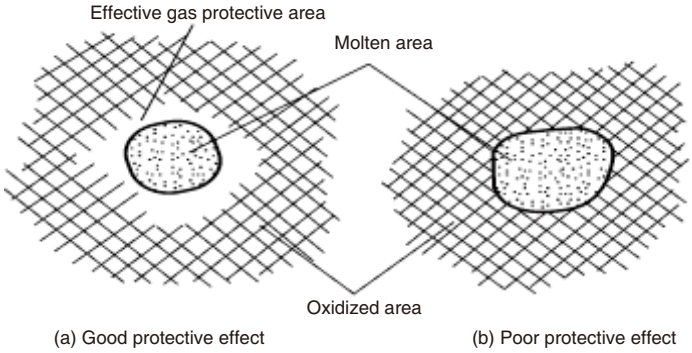


Fig 26 Effective protective area of argon

In addition, the gas protective effect can be judged by directly observing the color of the weld bead surface. Take stainless steel welding for example. If the weld bead surface appears silvery white or golden, it indicates that the gas protective effect is good. However, if the weld bead surface appears gray or black, it indicates that the gas protective effect is poor.

Welding Process Parameters

The gas protective effect, welding stability, and weld bead quality of GTAW have a direct relationship with the welding process parameters. Therefore, select appropriate welding process parameters to ensure high-quality weld joint.

The welding process parameters for GTAW include type and polarity of current, the diameter of tungsten electrode, welding current, argon gas flow, welding speed, and process factors, etc.

A. The type and polarity of current for GTAW should be chosen according to the workpiece material and also the operation mode.

B. Select tungsten electrodes with proper diameter mainly according to the thickness of the workpiece. Besides, when the thickness of the workpiece is the same, tungsten electrodes with different diameters should be chosen due to the different current types and polarities and different allowable current ranges for the tungsten electrode. Improper tungsten diameter will lead to unstable arc, serious burn, and tungsten in the weld bead.

C. Select proper welding current after the tungsten diameter is determined. Overly high or overly low welding current will cause poor weld bead or welding defects. For the allowable current ranges for thorium-tungsten/cerium tungsten electrodes with different diameters, please refer to the table below (Table 1).

Table 1 Allowable Current Ranges for Tungsten Electrodes with Different Diameters

Tungsten Dia. (mm)	DCEN (A)	DCEP (A)	AC (A)
1.0	15~80	–	20~60
1.6	70~150	10~20	60~120
2.4	150~250	15~30	100~180
3.2	250~400	25~40	160~250
4.0	400~500	40~55	200~320

D. The argon gas flow is selected mainly according to the tungsten diameter and nozzle diameter. For a nozzle with a certain aperture, the argon gas flow should be appropriate. If the gas flow is too high, the gas flow speed will increase. Thus, it is difficult to maintain stable laminar flow, and the welding zone can not be well protected. Meanwhile, more arc heat will be taken away, which will affect the arc stability. If the gas flow is too low, the gas protective effect will be affected due to the interference of the environmental airflow. Generally, the argon gas flow should be within 3~20L/min.

E. Under the condition of fixed tungsten diameter, welding current, and argon gas flow, overly high welding speed will make the protective gas flow deviate from the tungsten electrode and molten pool, and the gas protective effect will be affected accordingly. Besides, the welding speed affects the weld bead shape significantly. Therefore, it is very important to select the appropriate welding speed.

F. Process factors mainly refer to the shape and diameter of the nozzle, the distance between the nozzle and workpiece, stick-out and the diameter of filling wire, etc. Although the change in these factors is not big, it has more or less influence on the welding process and gas protective effect. Therefore, all factors should be selected according to specific welding requirements.

Generally, the nozzle diameter should be within 5~20mm, the distance between the nozzle and workpiece should not be greater than 15mm, the stick-out should be 3~4mm, and the filling wire diameter should be selected according to the thickness of the workpiece.

General Requirements for Argon Arc Welding

1. The control of gas: Pre-flow and post-flow are required in argon arc welding. Argon is a kind of inert gas that can be broken down easily. Fill the space between the workpiece and the tungsten electrode with argon firstly, and then the arc can be easier to ignite. Keep the gas flowing after welding ends, and the workpiece will not cool down too quickly. Thus, the oxidization of the workpiece can be avoided, and a good welding effect can be ensured.

2. The manual switch control of current: When the manual switch is switched on, the current supply should be delayed for the pre-flow time. After the manual switch is switched off and welding ends, the current supply should be cut off first and the gas flow maintains according to the post-flow time.

3. The generation and control of high voltage: The argon arc welding machine adopts high voltage arc ignition mode. It is required that there should be high voltage when igniting the arc and there should be no high voltage after the arc is successfully ignited.

4. Protection from interference: The high voltage for arc ignition in argon arc welding is accompanied by high frequency, which produces serious interference to the machine circuit. Thus, good anti-interference ability is required for the circuit.

BASIC KNOWLEDGE OF WELDING

Basic Knowledge of CUT

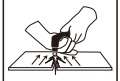
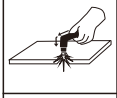
General Description of CUT (Plasma Cutting)

1. Economic and practical, since it can cut metals by adopting compressed air as the plasma gas source.
2. The cutting speed has increased by 1.8 times when compared with oxyacetylene cutting.
3. It can cut thick steel plates conveniently and quickly.
4. And the post-flow function is available.
5. Metal workpiece such as stainless steel, copper, cast iron, and aluminum can all be cut.
6. With simple operation and high cutting speed, a smooth cutting surface can be obtained, and polishing is unnecessary.
7. It is easy to ignite an arc by adopting HF arc ignition or non-HF pilot arc ignition, especially non-HF pilot arc, which is safer and reliable.

Operation Method of CUT (Plasma Cutting)

1. Turn on the power switch of the machine, the power indicator illuminates and the preset CUT current will show on the screen.
2. Check the indicators normal and select proper working mode 2T or 4T.
3. Set cutting current according to the thickness of the workpiece.
4. Bring the copper nozzle of the cutting torch into contact with the workpiece (For models with pilot arc function, keep a distance of about 2mm between the copper nozzle of the torch and the workpiece.), and then push the torch trigger. After the arc is ignited and started, raise the cutting torch to the position about 1mm above the workpiece, and start cutting.

Notes for Cutting Operation

	It is recommended not to ignite the arc in the air if not necessary, for it will shorten the electrode's lifespan and the torch's nozzle.
	It is recommended to initiate the cutting from the edge of workpiece, unless penetration is needed.
	Ensure spatters fly from the bottom of workpiece while cutting. If spatters fly from the top of workpiece, it indicates that the workpiece can not be fully cut because the cutting torch is moved too fast or the cutting current is too low.
	Keep the nozzle slightly touching the workpiece or keep a short distance between the nozzle and workpiece. If the torch is pressed against the workpiece, the nozzle may stick to the workpiece, and smooth cutting is unavailable.
	For cutting round workpiece or to meet precise cutting requirement, molding board or other assistant tools are needed.
	It is recommended to pull the cutting torch while cutting.
	Keep the nozzle of cutting torch upright over the workpiece, and check if the arc is moving with the cutting line. If the space is not enough, don't bend the cable too much, step on or press upon the cable to avoid suffocating of gas flow. The cutting torch may be burned because the gas flow is too small. Keep the cutting cable away from edge tools.
	Clean up the spatters on the nozzle timely, for it will affect the cooling effect of the nozzle. Clean up the dust and spatters on the torch head after using everyday to ensure good cooling effect.

BASIC KNOWLEDGE OF WELDING

The workpiece is not cut fully. This may be caused by:

The cutting current is too low.
The cutting speed is too high.
The electrode and nozzle of the torch are burned. The workpiece is too thick.

Molten slag drops from the bottom of workpiece. This may be caused by:

The cutting speed is too low.
The electrode and nozzle of the torch are burned.
The cutting current is too high.

Replacement of Electrode and Nozzle

When the phenomena below occur, the electrode and nozzle should be replaced. Otherwise, there will be strong arc in the nozzle, which will break down the electrode and the nozzle, or even burn the torch. Nozzles of different models are different, so ensure the nozzle is of the same model when replacing it.

1) Electrode wear > 1.5mm
2) Distortion of the nozzle
3) Cutting speed declining, arc with green flame
4) Difficult in arc ignition
5) Irregular cut

OPTIONAL ACCESS OPERATION DESCRIPTION

Pedal Remoter Operation

Pedal remoter control internal structure is composed by inching switch and sliding potentiometer (10K), as shown in below Fig 27.

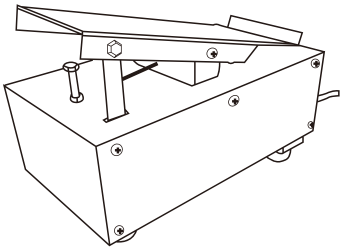


Fig 27 Pedal Remote Controller

The pedal controlling function is only used while it's under TIG mode.

• Connect the pedal remoter to the welder front panel pedal controller interface through dedicated cable. See Fig 28

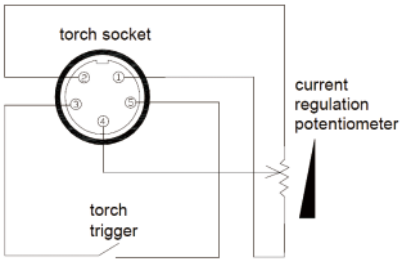


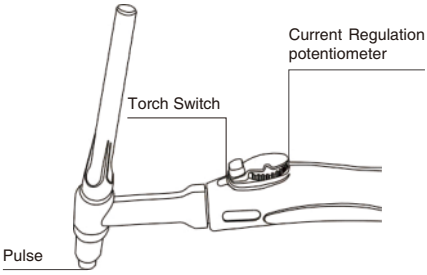
Fig 28

• Switch to remote mode by the torch mode select , and preset the Max. Welding current then can go welding.
• Tread the pedal control and start arc ignition. Non-contact arc ignition is the mostly applied method. Welding current will be control by pedal remoter after successful arc ignition. Max output current is the preset current.

Note: Pedal remote controller is optional. Please clarify your needs before placing orders.

Wire-drive Welding Torch Operation

YesWelder CT2050 is equipped with an analog control wire-drive welding torch .

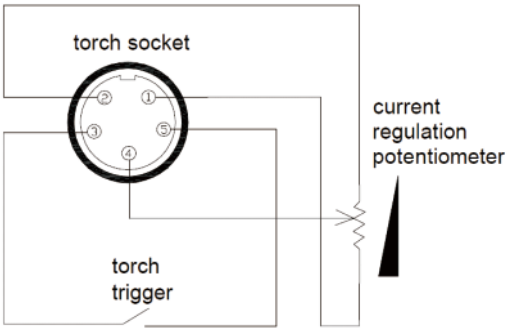


Analog Regulation Type

Fig 29

Wire-drive welding torch is usually applied while it's under TIG.

- Connect the wire-drive torch to the welder front panel pedal controller connection aviation socket through dedicated cable. See Fig below:



Analog Regulation Type Torch Socket Interface

Fig 30

- **The torch switch mode needs being set to remote when using analog regulation torch function.** Preset the max welding current through front panel and start welding. The welding current can be adjusted through torch potentiometer. The allowable max current is the preset peak current value.

MAINTENANCE

GENERAL MAINTENANCE

This welder has been engineered to need minimal service providing that a few very simple steps are taken to properly maintain it.

1. Keep the cabinet cover closed at all times unless the wire needs to be changed or the drive pressure needs adjusting.

2. Keep all consumables (contact tips, nozzles, and liner) clean and replace when necessary. See "Consumable Maintenance" (below) and "Troubleshooting" (page 25) for detailed information.

3. Replace INPUT POWER CABLE, ground cable, work clamp, or gun assembly when damaged or worn.

4. Avoid directing grinding particles towards the welder. These conductive particles can build up inside the machine and cause severe damage.

5. Periodically clean dust, dirt, grease, etc. from your welder. Every six months or as necessary, remove the side panels from the welder and use compressed air to blow out any dust and dirt that may have accumulated inside the welder.

6. If available, use compressed air to periodically clean the liner, especially when changing wire spools

WARNING: DISCONNECT FROM POWER SOURCE WHEN CARRYING OUT THIS OPERATION.

7. The wire feed drive roller will eventually wear during normal use. With the correct pressure, the idler roller must feed the wire without slipping. If the grooves in the wire feed drive roller are worn deep enough that the idler roller and the wire feed drive roller make contact when the wire is in place between them, the wire feed drive roller must be replaced.

8. Check all cables periodically. They must be in good condition and not cracked.

WARNING: ELECTRIC SHOCK CAN KILL! Be aware that the ON/OFF SWITCH, when OFF, does not remove power from all internal circuitry in the welder. To reduce the risk of electric shock, always unplug the welder from its AC power source and wait several minutes for electrical energy to discharge before removing side panels.

CONSUMABLE MAINTENANCE

IT IS VERY IMPORTANT TO MAINTAIN THE CONSUMABLES TO AVOID THE NEED FOR PREMATURE REPLACEMENT OF THE GUN ASSEMBLY.

MAINTAINING THE CONTACT TIP:
The purpose of the CONTACT TIP is to transfer welding current to the welding wire while allowing the wire to pass through it smoothly.
Always use a contact tip stamped with the same diameter as the wire it will be used with.

1. If the wire burns back into the tip, remove the tip from the gun and clean the hole running through it with an oxygen-acetylene torch tip cleaner or tip drill. If the burned-back wire cannot be removed, the tip will have to be replaced.
2. With extended use over time, this hole will become worn. Increased wear on the hole causes increased resistance in the transfer of welding current from the contact tip to the wire. This will result in less stable arc characteristics and difficult arc starting.

CAUTION: KEEP THE NOZZLE CLEAN!
During the welding process, spatter and slag will build up inside the nozzle and must be cleaned out periodically. Failure to clean and/or replace the nozzle in a timely fashion will cause damage to the front end of the gun assembly, which is not replaceable. The results of the inaction may require the replacement of the entire gun assembly.
Failure to keep the nozzle adequately cleaned can result in the following problems:
A shorted nozzle results when spatter buildup bridges across the insulation in the nozzle allowing welding current to flow through it as well as the contact tip. When shorted, a nozzle will steal welding current from the wire whenever it contacts the grounded workpiece. This causes erratic welds and reduced penetration. In addition, a shorted nozzle overheats the end of the gun which can damage the front-end of the gun.

TESTING FOR A SHORTED NOZZLE
Arcing between the nozzle and the workpiece always means the nozzle is shorted, but this can be hard to detect through the lens of a welding helmet. The following testing method is another way to tell if a nozzle is shorted.
With the welder unplugged from the AC power source, touch the probes of an ohmmeter or continuity tester to the end of the contact tip and the outside of the nozzle. If there is any continuity at all, the nozzle is shorted. Clean or replace as needed.

TROUBLESHOOTING

HOW TO USE TROUBLESHOOTING GUIDE

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting.

Step 2. POSSIBLE CAUSE.
The second column labeled "POSSIBLE CAUSE" lists the obvious external possibilities that may contribute to the machine symptom.

Step 3. RECOMMENDED COURSE OF ACTION
This column provides a course of action for the possible cause, If you do not understand or are unable to perform the Recommended Course of Action safely, contact YESWELDER support@yeswelder.com.

OBSERVE ALL SAFETY GUIDELINES DETAILED THROUGHOUT THIS MANUAL

Type	Alarm	Error Code	Welder Reaction	Reason	Solutions
Over-heat	Display error code	E-1	Temporary close of main circuit	Over-working of main circuit	Do not power off; restart welding when the overheat indicator stop lighting up.
Under -voltage	Display error code sound	E-2	Permanently close main circuit and need to restart the machine	Power grid under-voltage(lower than 96VAC)	Please restart the welder; if warning still remains, If there is a continuous power grid undervoltage, please wait and restart welder when the power grid is back to normal. If power grid voltage is normal but with undervoltage warning, please contact professional maintenance personnel.
Over -voltage	Display error code	E-3	Permanently close main circuit and need to restart the machine	Power grid over voltage(more than 265VAC)	Please shut off the welder and restart. If there is a continuous power grid overvoltage, please wait and restart welder when the power grid is back to normal. If power grid voltage is normal but with overvoltage warning, please contact professional maintenance personnel.
Abnormal	Display error code	E-4	Permanently close main circuit	Load current is too big or main power device is under over-current protection.	Pleas restart welder. If the warning still remains, please contact professional maintenance personnel.

TROUBLESHOOTING

TIG WELDING ISSUES

PROBLEM	POSSIBLE CAUSE	COURSE OF ACTION
Poor starting.	Poor work clamp connection.	Check and secure work connection.
	Start current is too low.	Increase Start current.
Black area along weld bead.	Oily or organic contamination on work	Clean work piece.
	Tungsten electrode may be contaminated.	Grind to clean electrode.
	Leaks in gas line or torch connection.	Check connection.
	Gas tank is near empty.	Replace the gas tank.
Unstable Arc.	Contaminated base metal.	Remove materials like paint, grease, oil, and dirt, including mill scale from base metal.
	Tungsten is contaminated.	Remove 25/64" of contaminated tungsten and re-grind the tungsten.
	Arc length too long.	Lower torch so that the tungsten is off of the work piece 5/64"-13/64"(2-5mm).
Arc wanders.	Tungsten incorrect or in poor condition.	Check that correct type of tungsten is being used. Remove tungsten 3/4" from the weld end and re-sharpen the tungsten.
	Insufficient gas shielding.	Check and set the gas flow between 20-30cfh flow rate.
	Contaminated gas or leaks in gas line, torch, or connections.	Check gas line & connections.
	Poorly prepared tungsten.	Recommend tungsten grind angles range from 15 to 60 degrees based on the type of metal, joint design and penetration you desire. Standard is 30 degrees.
	Contaminated base metal.	Remove contaminating materials like paint, grease, oil, and dirt, including mill scale from base metal.
	Contaminated/Incorrect filler.	Check the filler wire and remove all grease, oil, or moisture from filler metal.

TROUBLESHOOTING

TIG WELDING ISSUES

PROBLEM	POSSIBLE CAUSE	COURSE OF ACTION
HF TIG doesn't initiate an arc:	No gas, incorrect gas flow.	Check the gas is connected and cylinder valve open, check hoses, gas valve and torch are not restricted. Set the gas flow between 20-30 cfh flow rate.
	Poor work clamp connection.	Check & secure work clamp.
	Contaninated Tungsten.	Grind to ctean Tungsten.
	Loose connection.	Check all connectors and tighten.
	Earth clamp not connected to work.	Connect the work clamp directly to the work piece wherever possible.
Tungsten burning away quickly.	Incorrect Gas/Inadequate gas flow.	Check the gas cylinder contains pure Argon gas and is connected and the torch gas valve is open. Set the gas flow between 20-30cfh flow rate.
	Back cap not fitted correctly.	Make sure the torch back cap is fitted so that the o-ring is inside the torch body.
	Incorrect tungsten being used.	Check and change the tungsten type if necessary.
Contaminated tungsten.	Touching tungsten into the weld pool.	Keep tungsten from contacting weld puddle. Raise the torch so that the tungsten is off of the work piece 1/8-1/4.
	Touching the filler wire to the tungsten.	Keep the filler wire from touching the tungsten during welding, feed the filler wire into the leading edge of the weld pool in front of the tungsten.
	Tungsten melting into the weld pool.	Check that correct type of tungsten is being used. Too much current for the tungsten size so reduce the amps or change to a larger tungsten.

TROUBLESHOOTING

CUTTING ISSUES

PROBLEM	POSSIBLE CAUSE	COURSE OF ACTION
The arc does not transfer to the workpiece.	Insufficient work clamp contact with the workpiece.	Clean the area where the work clamp attaches to the workpiece to ensure a good metal to metal connection.
		Inspect the work clamp and its lead for damage, repair or replace as necessary.
	Improper cutting technique.	1. Brace the cutting hand to steady cutting hand, provides freedom of movement in all directions and helps maintain a constant 1/16"to 1/8" standoff. 2. Place the torch close and start cut from the edge of the metal with a roll 45-to-90 degree roll in case the sparks blow up into the torch.
	Plasma torch may not be in contact with the workpiece.	Be sure to physically drag the cutting nozzle on the workpiece as you cut.
Poor cut quality.	Improper use of Plasma torch.	Review operating instructions.
	Plasma torch parts are worn out.	Examine the consumables for wear and replace worn parts with new YesWelder consumable parts.
	Moisture or oil in air supply.	Excessive humidity or oil from the compressor may be contaminating the air supply. Install a moisture filter in the air supply line prior to machine.
Insufficient cut penetration.	Cutting speed too fast.	Decrease your torch travel speed.
	Plasma torch is too tilted.	Ensure that Plasma torch head is perpendicular to the workpiece.
	Workpiece is too thick.	Choose thinner workpiece material within the operational limits of the plasma cutting machine.
	Cutting current too low.	Turn current setting up.
		Ensure plasma cutting machine has proper input power.
		If used, eliminate or reduce length of extension cord.
	Plasma torch parts are worn out.	Examine the consumables for wear and replace worn parts with new YesWelder consumable parts.
	Non-genuine manufacturer's parts.	Use only genuine YesWelder consumables for optimum performance.
	Insufficient air flow or pressure.	Check for obstructions blocking air flow and ensure that there are 12 inches of clearance between any obstacles and the vents on all sides of the machine.

TROUBLESHOOTING

CUTTING ISSUES

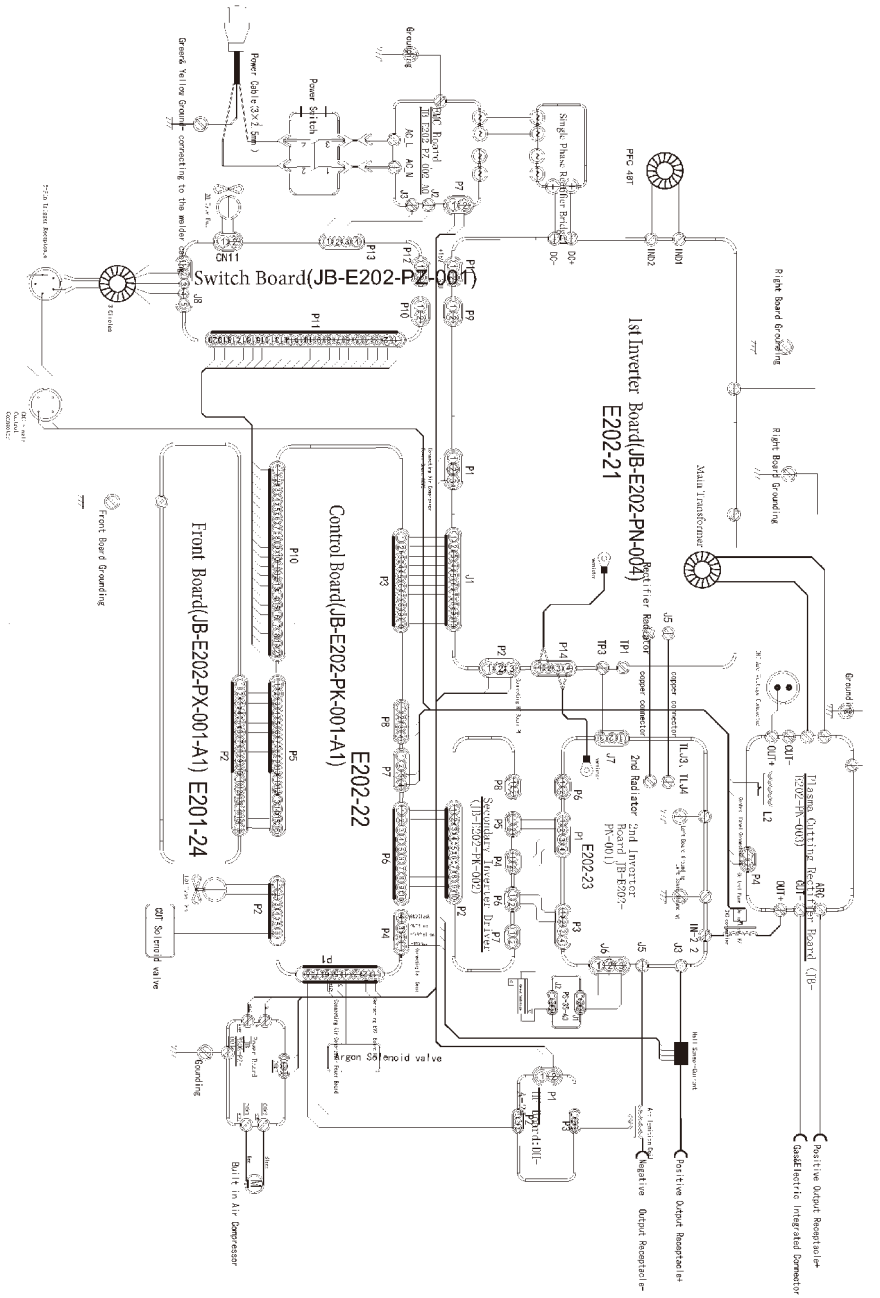
PROBLEM	POSSIBLE CAUSE	COURSE OF ACTION
Excessive dross.	Cutting speed too slow (bottom dross).	Increase your torch travel speed.
	Cutting speed too fast (top dross).	Decrease your torch travel speed.
	Cutting current too low.	Ensure plasma cutting machine has proper input power.
		If used, eliminate or reduce length of extension cord.
	Plasma torch parts are worn out.	Examine the consumables for wear and replace worn parts with new YesWelder consumable parts.
	Non-genuine manufacturer's parts.	Use only genuine YesWelder consumables for optimum performance.
Excessive wear of the cutting nozzle or electrode.	Air pressure too low.	Inspect air compressor, air lines, and filters for proper operation.
		Inspect consumables for obstructions and proper installation.
	Exceeding plasma cutting machine capability (material too thick).	Choose thinner workpiece material within the operational limits of the plasma cutting machine.
	Moisture or oil in air supply.	Excessive humidity or oil from the compressor may be contaminating the air supply. Install a moisture filter in the air supply line prior to machine.
	Improperly assembled or loose Plasma torch consumables	Check Plasma torch consumables for proper installation.
	Damaged Plasma torch consumable.	Check plasma torch consumables for damage and replace if damaged.
	Non-genuine manufacturer's parts.	Use only genuine YesWelder consumables for optimum performance.
Tilted cut edge angle (not perpendicular).	Plasma torch position not correct.	Ensure that plasma torch head is perpendicular to the workpiece.
	Workpiece thickness is near the capacity of the machine.	Cut thinner material. 15/32" thick material cuts will not have a clean cut edge.
	Asymmetric wear of cutting nozzle hole or wrong assemblage of the plasma torch parts.	Check plasma torch consumables for wear and proper installation.
		Examine the consumables for wear and replace worn parts with new YesWelder consumable parts.

TROUBLESHOOTING

STICK WELDING ISSUES

PROBLEM	POSSIBLE CAUSE	COURSE OF ACTION
Poor starting.	Poor work clamp connection.	Check and secure work connection
Stick electrode "blasts off" when arc is struck.	Current may be set too high for electrode size.	Adjust current.
Electrode "stick" in weld puddle.	Current may be set too low for electrode size.	Adjust current.
Porosity – small cavities or holes resulting from gas pockets in weld metal.	Arc length too long.	Reduce arc length.
	Damp electrode.	Use dry electrode.
	Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.
Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.	Amperage too high for electrode.	Decrease amperage or select larger electrode.
	Arc length too long or voltage too high.	Reduce arc length or voltage.
Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceeding weld bead.	Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
	Improper welding technique.	Place stringer bead in proper location at joint during welding.
		changed the word "work" to "electrode" to help better exapling angle when welding various positions.
		Momentarily hold arc on groove side walls when using weaving technique.
		Keep arc on leading edge of weld puddle.
	Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.
Lack Of Penetration – shallow fusion between weld metal and base metal.	Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove.
	Improper weld technique.	Keep arc on leading edge of weld puddle.
	Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
		Reduce travel speed.
Burn Through– weld metal melting completely through base metal resulting in holes where no metal remains.	Excessive heat input.	Select lower amperage. Use smaller electrode.
		Increase or maintain steady travel speed.

15. WIRING DIAGRAM



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