FICHA TÉCNICA

Producto: **Powermaster256 TIG AC/DC IGBT Inverter**

DESCRIPCIÓN: Soldador equipado todo en uno TIG AC/DC, electrodo, corte con plasma. Powermaster256 tiene la potencia que se requiere en la industria, arrojando 250 amperios de potencia de soldadura TIG y 200 Amp de MMA en monofásico 220V, con un ciclo de trabajo del 60% en TIG y 35% en MMA. La unidad está equipada con frecuencia de AC, control de balance de AC, con función de corte con plasma de 60 A que corta hasta 22 mm de espesor en acero al carbón con inicio de arco blow-back y arco piloto. El módulo inversor IGBT reduce el tamaño. La unidad cuenta con capacidad de arranque de bajo amperaje en AC o DC, hasta 5 amperios. Sus componentes modulares hacen fácil el diagnóstico y cambio de partes en un proceso sencillo y rápido.

CÓDIGO: B015.01

Accesorios Incluidos

USO INDUSTRIAL!

Especificaciones principales		
Voltaje Monofásico		1x AC220/240V 50/60Hz
AC TIG	No-Load Voltaje	60~80V
	Rango de ajuste amp	5~250A
	Balance AC (SP%)	10%-90%
	Frecuencia de onda cuadrada	20-250Hz
	Ciclo de trabajo	60%
DC TIG	Rango de ajuste amp	5~250A
	Ciclo de trabajo	60%
	Tiempo de Corriente de subida	0-10 segundos
	Tiempo de Corriente de bajada	0-25 segundos
	Rango de pulso (amp/base)	5 ~ 95%
	Tiempo de pulsación	0.1 ~ 0.9
	Frecuencia de pulsaciones	0.5~ 25(25~ 250)Hz
DC MMA	No-Load Voltaje	70V
	Rango de ajuste	5~200A
	Funciones MMA predefinidas fijas	Inicio de alto amperaje auto-regulado. Tiene tecnología anti-pegado de electrodo
	Control Fuerza del arco	Ajustable en el panel 0~100%
	Ciclo de trabajo	35%
CORTE PLASMA	Rango de ajuste	20-60A
	Presión recomendada para corte	65-75 psi
	Tipo de inicio de arco	Blow-back , Arco Piloto y Arco piloto de reinicio
	Ciclo de trabajo	60%
	Capacidad de compresor recomendado	6 CFM @ 90 psi/30 galones
	Capacidad de corte(se recomienda usar un secador de aire para mayor duración de los consumibles)	16 mm (5/8") Corte rápido @ 15-20 ipm 19 mm (3/4") Corte limpio @ 8-12 ipm 22 mm (7/8") Corte de separación @ 3-5 ipm
Tiempo de Pre flujo de gas		1 ~10 segundos
Tiempo de Post flujo de gas		1 ~ 25 segundos
Canales de memoria		No
Tipo de panel		Análogo de perillas
Modo de inicio de arco		Alta frecuencia HF
Eficiencia		>83%
Peso		28Kg
Tipo de protección		IP21S
Medidas		470x235x435 mm

Capacidad (1/16"-5/32")

Con funciones avanzadas

Pedal o control remoto en la antorcha

Facilita el arranque y corte en superficies pintadas, también en mallas y rejillas

DC INVERTER

PowerMaster256

AC/DC TIG/DC STICK/CUT

4IN1 MACHINE

(Suitable for 1x220V)

Operators's Manual

Safety, Setup and General Use Guide

REV.2 0 00147-16
Issue Date: May.19, 2016
Manual No.: 0-1537

EMPRESAS CARBONE S.A.
Calle 5ta. Rio Abajo, Panamá, Panamá
Telefonos: (507) 3916309 / 3916313
www.empresascarbone.com

Dear Customer,

Thank you for selecting the our machine. We appreciate you as a customer and hope that you will enjoy years of use from your welder.

Please go directly to the our website to register your unit and receive your warranty information. Your unit registration is important should any information such as product updates or re-calls be issued. It is also important so that we may track your satisfaction with our products and services. If you are unable to register by website, contact our directly through the sales department through the main customer service number in your country. Your unit will be registered and warranty will be issued and in full effect. Keep all information regarding your purchase. **In the event of a problem you must contact technical support before your welder can be a candidate for warranty service and returned.**

Please review the current online warranty statement and information found on the website of the our division located in or nearest to your country. Print it for your records and become familiar of its terms and conditions.

We offers full technical support, in several different forms. We have online support available through email, and a welding support forum designed for customers and noncustomer interaction. Technical advisors are active on the forum daily. We also divide our support into two divisions: technical and welding performance. Should you have an issue or question concerning your unit, please contact performance/ technical support available through the main company headquarters available in your country. For best service call the appropriate support line and follow up with an email, particularly if off hours, or you cannot reach a live person. In the event you do not reach a live person, particularly during heavy call volume times, holidays, and off hours, leave a message and your call will normally be returned within 24 hours. Also for quick answers to your basic questions, join the company owned forum available through the website.

Should you need to call or write, always know your model name, purchase date and welder manufacturing inspection date. This will assure the quick and accurate customer service. **REMEMBER: Be as specific and informed as possible. Technical and performance advisors rely upon you to carefully describe the conditions and circumstances of your problem or question. Take notes of any issues as best you can. You may be asked many questions by the advisors to clarify prob-lems or issues that may seem very basic. However, diagnosis procedures MUST be followed to begin the warranty process. Advisors can't assume anything, even with experienced users, and must cover all aspects to properly diagnose the problem. Depending upon your issue, it is advisa-ble to have basic tools handy such as screwdrivers, wrenches, pliers, and even an inexpensive test meter with volt/ohm functions before you call.**

Let us know how we may be of service to you should you have any questions.

We want you to take pride in operating our machine as much pride as we have taken in making this product for you. Please read all information in this manual before operation

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt from the courier. Consequently all claims for material damaged in shipment must be made by purchaser against the transportation company used.

Please record your equipment identification below for future reference. This information can be found on data plate at rear of machine.

Product： **PowerMaster 256**

Serial No. _____

Date of Purchase _____

Where Purchased _____

Whenever you request replacement parts or information on this equipment please always supply information you have recorded above

This product is covered by 1 years parts and labour warranty, you are responsible for costs of shipping unit to us, we will cover cost of returning item to you. External items, torch, earth lead etc are covered by 3 months warranty. Any faults/damage found caused by customer will be charged prorata.

Pay particular attention to the safety instructions we have provided you for your protection The level of seriousness to be applied to each section is explained below

WARNING 

This statement appears where the information must be followed exactly to avoid serious personal injury.

CAUTION

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

We are dedicated to providing you with the best possible equipment and service to meet the demanding jobs that you have. We want to go beyond delivering a satisfactory product to you. That is the reason we offer technical support to assist you with your needs should an occasion occur. With proper use and care your product should deliver years of trouble free service.

Safe operation and proper maintenance is your responsibility.

We have compiled this operator's manual, to instruct you in basic safety, operation and maintenance of our product to give you the best possible experience. Much of welding and cutting is based upon experience and com-mon sense. As thorough as this welding manual may be, it is no substitute for either. Exercise extreme caution and care in all activities related to welding or cutting. Your safety, health and even life depends upon it. While accidents are never planned, preventing an accident requires careful planning.

Please carefully read this manual before you operate machine. This manual is not only for the use of the machine, but to assist in obtaining the best performance out of your unit. Do not operate the unit until you have read this manual and you are thoroughly familiar with the safe operation of the unit. If you feel you need more information please contact our Support.

The warranty does not cover improper use, maintenance or consumables. **Do not attempt to alter or defeat any piece or part of your unit, particularly any safety device.** Keep all shields and covers in place during unit operation should an unlikely failure of internal components result in the possible presence of sparks and explosions. If a failure occurs, discontinue further use until mal-functioning parts or accessories have been repaired or replaced by qualified personnel.

Note on High Frequency electromagnetic disturbances:

Certain welding and cutting processes generate High Frequency (HF) waves. These waves may disturb sensitive electronic equipment such as televisions, radios, computers, cell phones, and related equipment. High Frequency may also interfere with fluorescent lights. Consult with an electrician if disturb-ance is noted. Sometimes, improper wire routing or poor shielding may be the cause.

HF can interfere with pacemakers. See EMF warnings in following safety sec-tion for further information. Always consult your physician before entering an area known to have welding or cutting equipment if you have a pacemaker.

MOVING PARTS can cause injury.

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

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.

These safety precautions are for protection of safety and health. Failure to follow these guidelines may result in serious injury or death. Be careful to read and follow all cautions and warnings. Protect yourself and others.

Welding and cutting processes produce high levels of ultraviolet (UV) radiation that can cause severe skin burn and damage. There are other potential hazards involved with welding such as severe burns and respiratory related illnesses. Therefore ob-serve the following to minimize potential accidents and injury:

Use appropriate safety glasses with wrap around shields while in the work area, even under welding helmets to protect your eyes from flying sparks and debris. When chip-ping slag or grinding, goggles and face shields may be required.

When welding or cutting, always use an approved shielding device, with the correct shade of filter installed. Always use a welding helmet in good condition. Discard any broken or cracked filters or helmets. Using broken or cracked filters or helmets can cause severe eye injury and burn. Filter shades of no less than shade 5 for cutting and no less than shade 9 for welding are highly recommended. Shades greater than 9 may be required for high amperage welds. Keep filter lenses clean and clear for maxi-mum visibility. It is also advisable to consult with your eye doctor should you wear contacts for corrective vision before you wear them while welding.

Do not allow personnel to watch or observe the welding or cutting operation unless fully protected by a filter screen, protective curtains or equivalent .protective equip-ment. If no protection is available, exclude them from the work area. Even brief expo-sure to the rays from the welding arc can damage unprotected eyes.

Always wear hearing protection because welding and cutting can be extremely noisy. E ar protection is necessary to prevent hearing loss. Even prolonged low levels of noise has been known to create long term hearing damage. Hearing protection also further protects against hot sparks and debris from entering the ear canal and doing harm.

Always wear personal protective clothing. Flame proof clothing is required at all times. Sparks and hot metal can lodge in pockets, hems and cuffs. Make sure loose clothing is tucked in neatly. Leather aprons and jackets are recommended. Suitable welding jackets and coats may be purchased made from fire proof material from welding supply stores. Discard any burned or frayed clothing. Keep clothing away from oil, grease and flammable liquids.

Leather boots or steel toed leather boots with rubber bottoms are required for ade-quate foot protection. Canvas, polyester and other man made materials often found in shoes will either burn or melt. Rubber or other non conductive soles are necessary to help protect from electrical shock.

Flame proof and insulated gauntlet gloves are required whether welding or cutting or handling metal. Simple work gloves for the garden or chore work are not sufficient. Gauntlet type welding gloves are available from your local welding supply companies. Never attempt to weld with out gloves. Welding with out gloves can result in serious burns and electrical shock. If your hand or body parts comes into contact with the arc of a plasma cutter or welder, instant and serious burns will occur. **Proper hand protection is required at all times when working with welding or cutting machines!**

WARNING! Persons with pacemakers should not weld, cut or be in the welding area until they consult with their physician. Some pacemakers are sensitive to EMF radiation and could severely malfunction while welding or while being in the vicinity of someone welding. Serious injury or death may occur!

Welding and plasma cutting processes generate electro-magnetic fields and radiation. While the effects of EMF radiation are not known, it is suspected that there may be some harm from long term exposure to electromagnetic fields. Therefore, certain pre-cautions should be taken to minimize exposure:

* Lay welding leads and lines neatly away from the body.
* Never coil cables around the body.
* Secure cables with tape if necessary to keep from the body.
* Keep all cables and leads on the same side the body.
* Never stand between cables or leads.
* Keep as far away from the power source (welder) as possible while welding.
* Never stand between the ground clamp and the torch.
* Keep the ground clamp grounded as close to the weld or cut as possible.

Welding and cutting processes pose certain inhalation risks. Be sure to follow any guidelines from your chosen consumable and electrode suppliers regarding possible need for respiratory equipment while welding or cutting. Always weld with adequate ventilation. Never weld in closed rooms or confined spaces. Fumes and gases re-leased while welding or cutting may be poisonous. Take precautions at all times.

Any burning of the eyes, nose or throat are signs that you need to increase ventilation.

* Stop immediately and relocate work if necessary until adequate ventilation is ob-tained.
* Stop work completely and seek medical help if irritation and discomfort persists.

WARNING! Do not weld on galvanized steel, stainless steel, beryllium, titanium, cop-per, cadmium, lead or zinc without proper respiratory equipment and or ventilation.

WARNING! This product when used for welding or cutting produces fumes and gas-es which contains chemicals known to the State of California to cause birth defects and in some cases cancer. (California Safety and Health Code § 25249.5 et seq.)

WARNING! Do not weld or cut around Chlorinated solvents or degreasing areas. Release of Phosgene gas can be deadly. Consider all chemicals to have potential deadly results if welded on or near metal containing residual amounts of chemicals.

Keep all cylinders upright and chained to a wall or appropriate holding pen. Certain regulations regarding high pressure cylinders can be obtained from OSHA or local regulatory agency. Consult also with your welding supply company in your area for further recommendations. The regulatory changes are frequent so keep informed.

All cylinders have a potential explosion hazard. When not in use, keep capped and closed. Store chained so that overturn is not likely. Transporting cylinders incorrectly can lead to an explosion. Do not attempt to adapt regulators to fit cylinders. Do not use faulty regulators. Do not allow cylinders to come into contact with work piece or work. Do not weld or strike arcs on cylinders. Keep cylinders away from direct heat, flame and sparks.

WARNING! Electrical shock can kill. Make sure all electrical equipment is properly grounded. Do not use frayed, cut or otherwise damaged cables and leads. Do not stand, lean or rest on ground clamp. Do not stand in water or damp areas while weld-ing or cutting. Keep work surface dry. Do not use welder or plasma cutter in the rain or in extremely humid conditions. Use dry rubber soled shoes and dry gloves when welding or cutting to insulate against electrical shock. Turn machine on or off only with gloved hand. Keep all parts of the body insulated from work, and work tables. Keep away from direct contact with skin against work. If tight or close quarters ne-cessitates standing or resting on work piece, insulate with dry boards and rubber mats designed to insulate the body from direct contact.

All work cables, leads, and hoses pose trip hazards. Be aware of their location and make sure all personnel in area are advised of their location. Taping or securing ca-bles with appropriate restraints can help reduce trips and falls.

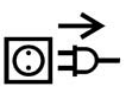
WARNING! Fire and explosions are real risks while welding or cutting. Always keep fire extinguishers close by and additionally a water hose or bucket of sand. Periodi-cally check work area for smoldering embers or smoke. It is a good idea to have someone help watch for possible fires while you are welding. Sparks and hot metal may travel a long distance. They may go into cracks in walls and floors and start a fire that would not be immediately visible. Here are some things you can do to reduce the possibility of fire or explosion:

* Keep all combustible materials including rags and spare clothing away from area.
* Keep all flammable fuels and liquids stored separately from work area.
* Visually inspect work area when job is completed for the slightest traces of smoke or embers.
* If welding or cutting outside, make sure you are in a cleared off area, free from dry tender and debris that might start a forest or grass fire.
* Do not weld on tanks, drums or barrels that are closed, pressurized or anything that held flammable liquid or material.

Metal is hot after welding or cutting! Always use gloves and or tongs when handling hot pieces of metal. Remember to place hot metal on fire-proof surfaces after han-dling. Serious burns and injury can result if material is improperly handled.

WARNING! Faulty or poorly maintained equipment can cause injury or death. Prop-er maintenance is your responsibility. Make sure all equipment is properly maintained and serviced by qualified personnel. Do not abuse or misuse equipment.

Keep all covers in place. A faulty machine may shoot sparks or may have exploding parts. Touching uncovered parts inside machine can cause discharge of high amounts of electricity.



Do not allow employees to operate poorly serviced equipment. Always check condition of equipment thoroughly before start up. Disconnect unit from power source before any service attempt is made and for long term storage or electrical storms.

Further information can be obtained from The American Welding Society (AWS) that relates directly to safe welding and plasma cutting. Additionally, your local welding supply company may have additional pamphlets available concerning their products. Do not operate machinery until your are comfortable with proper operation and are able to assume inherent risks of cutting or welding.

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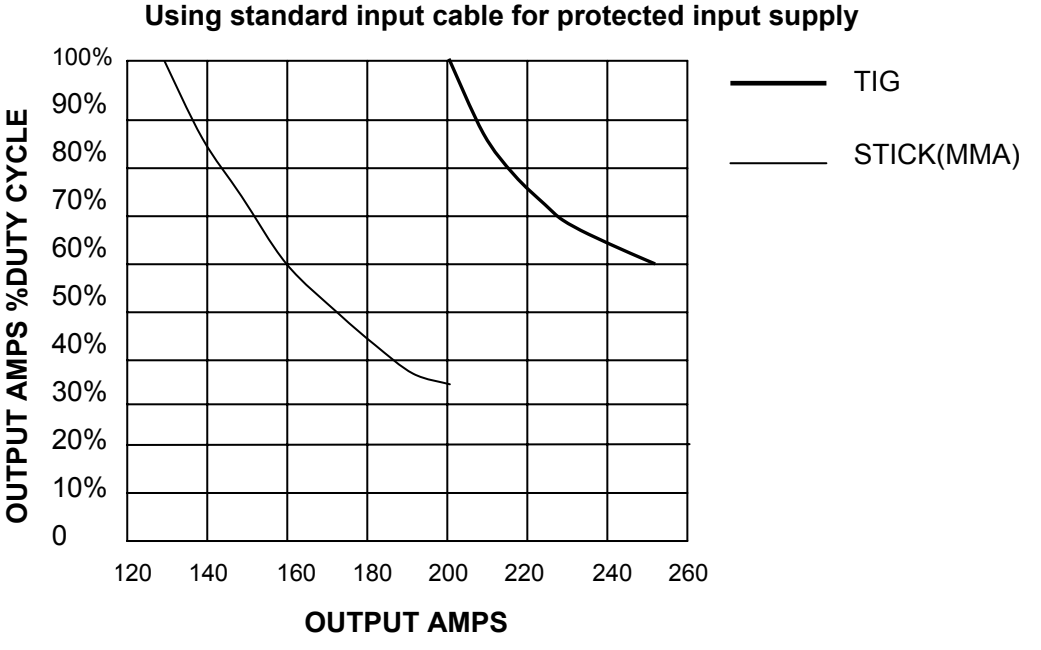
TECHNICAL SPECIFICATIONS -

max. rated Output Amps @% Duty Cycle (Based on a 10 minute cycle) (Example; 200A@35% for DC Stick and 250A@60% for AC/DC Balance TIG)

MODEL		PowerMaster 256
INPUT	Voltage	1~AC220/230/ 240V 50/60Hz
	Fuse rating	42A
AC TIG	No-load Voltage	60 - 80V
	Base current Adjusting Range	5~250A
	AC balance	10%~90 %
	AC Square Wave Frequency	20~250Hz
	Rated Duty Cycle	60%
	Pre Flow	0-10s
	Start Amps	5-250A
	End Amps	5-250A
DC TIG	AMP Adjusting Range	5~250A
	Rated Duty Cycle	60%
	Current Up-slope Time	0~10S
	Current Down-slope Time	0~25S
	pulse(Base/AMP) Current Ratio	5%-95%
	Pluse Time On	0.1~0.9
	Pluse Frequency	0.5~25(25~250)Hz
	post Flow Time	0~25s
	Arc starting Mode	high frequency arc striking
	Pre Flow	0-10s
	Start Amps	5-250A
	End Amps	5-250A
DC STICK	No-load Voltage	70V
	Current Range	5-200A
	Rated Output Current	200A
	Rated Duty Cycle	35%
CUT	(Base) current Adjusting Range	20A~60A
	Rated Duty Cycle	60%
Efficiency		≥83%
Mass		28kg
Protection Class of enclosure		IP21S
Outline Dimensions mm^3		470x235x435

Chart gives max. rated Output Amps @% Duty Cycle (Based on a 10 minute cycle) (Example; 200A@35% for DC Stick and 250A@60% for AC/DC Balance TIG)



(1)

Wiring and protection based on the IEC60974.1 National Electric Code: Use a Super Lag type fuse or circuit breaker with a delay in tripping action. Models with NEMA 6-50P plug may be used with a 50 amp protected 6-50R receptacle, or with a maximum 70 amp protected 6-50R receptacle if dedicated for the welder.

SAFETY PRECAUTIONS

Read entire installation section before starting installation.

⚠ WARNING

ELECTRIC SHOCK can kill.

·Only qualified personnel should perform this installation.

·Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.

·Do not touch electrically hot parts.

·Always connect the MACHINE to a power supply grounded per the National Electrical Code and any local codes.

SELECT SUITABLE LOCATION

Place the welder where clean cooling air can freely circulate in and out through the rear louvers. Dirt, dust or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shut-downs.

GRINDING

Do not direct grinding particles towards the welder. An abundance of conductive material can cause maintenance problems.

STACKING

The machine cannot be stacked.

TRANSPORT - UNLOADING

Never underestimate the weight of the equipment.

Never make the cargo pass or leave it suspended over people or things.

Neither let the equipment or the single unit fall, nor put it down with force.

Once it has been removed from the packing, the power source can be used to move it in the hand or on the shoulder.

Never lift welder with gas cylinder attached.

Never lift welder above personnel.

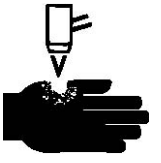
TILTING

Each machine must be placed on a secure, level surface, either directly or on a recommended undercarriage. The machine may topple over if this

⚠ WARNING

FALLING EQUIPMENT cause injury

procedure is not followed. 10°



PLASMA ARC can injure

Keep your body away from nozzle and plasma arc

Operate the pilot arc with cation. The pilot arc is capable of burning the operator,others even piercing safety clothing

ENVIRONMENTAL RATING

The welding machine power source carries an IP21s environmental rating. It may be used in normal industrial and commercial environments. Avoid using it in environments which have falling water such as rain.

Read and follow "Electric Shock Warnings" in the Safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or on or in the workpiece.

MACHINE GROUNDING AND HIGH FREQUENCY INTERFERENCE PROTECTION

This welder must be grounded! See your local and national electrical codes for proper grounding methods.

The high frequency generator, being similar to a radio transmitter, may cause radio, TV and electronic equipment interference problems. These problems may be the result of radiated interference. Proper grounding methods can reduce or eliminate radiated interference.

Radiated interference can develop in the following four ways:

1 Direct interference radiated from the welder.

2 Direct interference radiated from the welding leads.

3 Direct interference radiated from feedback into the power lines.

4 Interference from re-radiation of "pickup" by ungrounded metallic objects.

Keeping these contributing factors in mind, installing equipment per the following instructions should minimize problems.

1 Keep the welder power supply lines as short as possible and enclose as much of them as possible in rigid metallic conduit or equivalent shielding for a distance of 50 feet (15.2m). There should be good electrical contact between this conduit and the welder case ground. Both ends of the conduit should be connected to a driven ground and the entire length should be continuous.

2 Keep the work and electrode leads as short as possible and as close together as possible. Lengths should not exceed 25 ft (7.6m). Tape the leads together when practical.

3 Be sure the torch and work cable rubber coverings are free of cuts and cracks that allow high frequency leakage.

4 Keep the torch in good repair and all connections tight to reduce high frequency leakage.

5 The work piece must be connected to an earth ground close to the work clamp, using one of the following methods:

a) A metal underground water pipe in direct contact with the earth for ten feet or more.

b) A 3/4" (19mm) galvanized pipe or a 5/8" (16mm)solid galvanized iron, steel or copper rod driven at least eight feet into the ground.

The ground should be securely made and the grounding cable should be as short as possible using cable of the same size as the work cable, or larger. Grounding to the building frame electrical conduit or along pipe system can result in reradiation, effectively making these members radiating antennas.

6 Keep cover and all screws securely in place.

7 Electrical conductors within 50 ft (15.2m) of the welder should be enclosed in grounded rigid metallic conduit or equivalent shielding, wherever possible. Flexible metallic conduit is generally not suitable.

8 When the welder is enclosed in a metal building, the metal building should be connected to several good earth driven electrical grounds (as in 5 (b) above) around the periphery of the building.

Failure to observe these recommended installation procedures can cause radio or TV and electronic equipment interference problems and result in unsatisfactory welding performance resulting from lost high frequency power.

INPUT CONNECTIONS

Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate, located on the rear of the machine.

Have a qualified electrician provide input power supply to the receptacle or cord in accordance with all local and national electrical codes. Use a single phase line or one phase of a two or three phase line.

Choose an input and grounding wire size according to local or national codes. Refer to **the Technical Specifications** page at the beginning of this section. Fuse the input circuit with the recommended super lag fuses or delay type circuit breakers.

Using fuses or circuit breakers smaller than recommended may result in "nuisance" shut-off from welder inrush currents even if not welding at high currents.

1Also called "inverse time" or "thermal/magnetic" circuit breakers; circuit breakers which have a delay in tripping action that decreases as the magnitude of the current increases.

INPUT RECONNECT PROCEDURE

On multiple input voltage welders, be sure the machine is connected per the following instructions for the voltage being supplied to the welder.

Failure to follow these instructions can cause immediate failure of components within the welder and void machine's warranty.

Multiple voltage models are shipped connected for the highest voltage. To change this connection refer to the following instructions.

⚠ WARNING

ELECTRIC SHOCK can kill.

Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.

. Have a qualified electrician install and service this equipment.

. Turn the input power OFF and unplug the machine from the receptacle before working on this equipment.

. Allow machine to sit for 5 minutes minimum to allow the power capacitors to discharge before working inside this equipment.

. Do not touch electrically hot parts.

. Machine must be plugged into a receptacle that is grounded according to the National Electrical Code and local codes.

. Do not remove or defeat the purpose of the power cord ground pin.

RECONNECT PROCEDURE

The Inverter machine auto reconnects to either 115V or 230V supply.

Fuse the input circuit with time delay fuses or delay type1 circuit breakers. Using fuses or circuit breakers smaller than recommended may result in "nuisance" shut-offs from welder inrush currents even if not welding at high currents.

The Inverter machine is recommended for use on an individual branch circuit.

1Also called "inverse time" or "thermal/magnetic" circuit breakers.

These circuit breakers have a delay in tripping action that decreases as the magnitude of the current increases.

220/230/240V INPUT

The equipment is provided with a 230 cable, 6.6ft.(2m) in length with a 230V 6-50P attachment plug.

ATTACHMENT PLUG INSTALLATION

Connect the white (neutral) wire under terminal clamp with silver screw, and black (hot) wire under terminal clamp with brass screw. Connect green wire under terminal clamp with green screw.

⚠ WARNING

. Failure to wire as instructed may cause personal injury or damage to equipment. To be installed or checked by an electrician or qualified person only.

In all cases, the green or green/yellow grounding wire must be connected to the grounding pin of the plug, usually identified by a green screw.

Attachment plugs must comply with the Standard for Attachment Plugs and Receptacles,.

The product is considered acceptable for use only when an attachment plug as specified is properly attached to the supply cord.

For use on engine drives, keep in mind the above input draw restrictions and the following precaution.

ENGINE DRIVEN GENERATOR

The Inverter machine can be operated on engine driven generators as long as the 220/230/240 volt auxiliary meets the following conditions:

. The AC waveform peak voltage is below 400 volts.

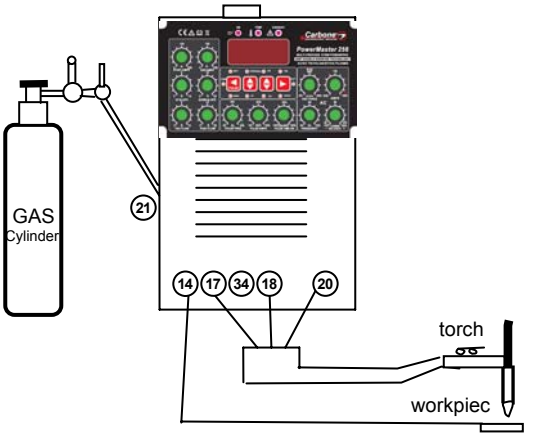
. The AC waveform frequency is between 45 and 65Hz.

The following Lincoln engine drives meet these conditions when run in the high idle mode:

●Ranger 250,305 ●. Commander 300, 400, & 500

Some engine drives do not meet these conditions (e.g. Miller Bobcats, etc). Operation of the Inverter machine is not recommended on engine drives not conforming to these conditions. Such drives may deliver unacceptably high voltage levels to the Inverter machine power source.

CONNECTIONS FOR TIG (GTAW) WELDING



TIG TORCH CONNECTION

Refer to Included Equipment in the Operation Section of this manual for TIG welding equipment which is included with the machine

The TIG Torch Twist-Mate and work cable Twist-Mate Connectors are supplied with the welder. To connect the cables, turn the Power Switch "OFF". Connect the torch cable Twist-Mate plug into the DC(-)

Electrode Receptacle on the front of the welder and turn it clockwise until snug,(Do not Over tighten). This is a quick connect terminal

To avoid receiving a high frequency shock, keep the TIG torch and cables in good condition.

WORK CABLE CONNECTION

Next, connect the work cable to the "+" output terminal in the same way.

To minimize high frequency interference, refer to Machine Grounding and High Frequency Interference Protection section of this manual for the proper procedure on grounding the work clamp and work piece.

SHIELDING GAS CONNECTION

Obtain the necessary inert shielding gas (usually argon). Connect the cylinder of gas with the pressure regulator and flow gage. Install the gas hose between the regulator and gas inlet (located on the rear of the welder).

CYLINDER could explode if damaged.

Keep cylinder upright and chained to a support.

Keep cylinder away from areas where it could be damaged.

Never allow the torch to touch the cylinder.

Keep cylinder away from live electrical circuits.

Maximum inlet pressure 150 psi.

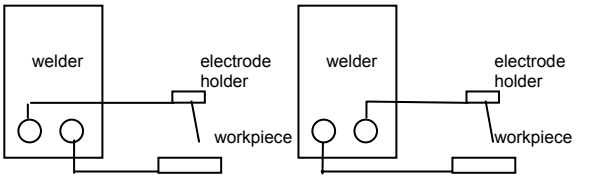
A cylinder is loaded by leaning it slightly sideways and rocking it up on the platform, being careful not to allow the Under-Storage Cart to roll. Secure the cylinder in place with the provided chain. Unload by following these steps in reverse.

ADJUSTABLE FOOT CONTROL CONNECTION

A Adjustable foot control receptacle is provided on the case front of the welder for connecting a remote control to the machine.

CONNECTIONS FOR STICK (SMAW) WELDING

A. NEGATIVE CONNECTION B . POSITIVE CONNECTION



STICK ELECTRODE CABLE AND WORK CABLE CONNECTION

Refer to Field Installed Options in Accessories Section of this manual for STICK welding equipment which is available for use with the inverter machine. An electrode holder with Twist-Mate cable and Twist-Mate connector are available separately for use with the inverter machine.. Turn the Power Switch "OFF". Connect the Twist-Mate quick connect plug into the Electrode and turn it clockwise until it is tight. The work cable and work clamp are factory connected.

Read and understand this entire section before operating the machine.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

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

· Insulate yourself from work and ground.

· Always wear dry insulating gloves.

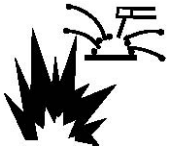
Read and follow "Electric Shock Warnings" in the Safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or on or in the workpiece.

FUMES AND GASES can be dangerous.

· Keep your head out of fumes.

· Use ventilation or exhaust at the arc, or both, to remove fumes and gases from breathing zone and general area.

WELDING SPARKS can cause fire or explosion



· Keep flammable material away.

· Do not weld on containers that have held combustibles.

RC RAYS can burn.

Wear eye, ear and body protection.

Only qualified personnel should operate this equipment. Observe additional Safety Guidelines detailed in the beginning of this manual.

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

INPUT POWER

POSITIVE OUTPUT

NEGATIVE OUTPUT

DIRECT CURRENT

PROTECTIVE GROUND

WARNING OR CAUTION

DO NOT SWITCH WHILE WELDING

PRODUCT DESCRIPTION

The Precision TIG is a member of our field acclaimed Precision TIG family of industrial arc welding power sources. Premium features include:

1 Precise constant current output.

2 Full range square wave AC/DC TIG (GTAW) welding.

3 Enhanced version of the patented Micro-Start Technology for its lower Minimum(5 amps at DC) to higher Maximum output control range.

4 Built-in high frequency stabilization for DC TIG starting and continuous AC TIG welding.

5 DC Stick (SMAW capability.)

The Precision TIG patented convenient built-in storage provisions for welding components and cable management.

The Precision ADC also provides advanced features such as:

- ●Digital Meter
- ●Timers for fixed Preflow and variable Postflow shielding gas.
- ●Tool-less Twist-Mate electrode cable connection.

RECOMMENDED PROCESSES AND EQUIPMENT

RECOMMENDED PROCESSES

The Precision TIG is recommended for the TIG (GTAW) and Stick (SMAW) welding processes within its output capacity range of 5 amps DC , or 5 amps AC, to MAX amps AC/DC. It is compatible with most Magnum TIG accessories, as well as many industry standard items, such as TIG torches (adapted for Twist-Mate), hoses.

PROCESS LIMITATIONS

The Precision TIG machines are not recommended for arc gouging due to it's limited output capacity, and are also not recommended for pipe thawing.

RECOMMENDED QUIPMENT/INTERFACE

(See Installed Options in Accessories Section for more details)

The Precision TIG will be available as a basic Machine (Only) and in Factory Basic module will also be available as with Domestic,.

(**SEE PACKING LIST,PLEASE**)

EQUIPMENT LIMITATIONS

The Precision TIG machines are protected from over loads beyond the output ratings and duty cycles, per the Specifications in the Installation Section, with Thermostat protection of the output power coils and rectifiers.

If a Precision Tig is powered from an engine generator which doesn't have sufficient capacity, the AC Balance control and the Output control will not provide full range of control.

WELDING CAPABILITY(Duty Cycle)

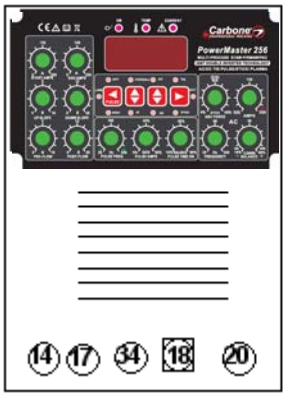
The PRECISION TIG is rated at 250 amps, 20 volts, at 60% duty cycle on a ten minute basis. It is capable of higher duty cycles at lower output currents. See rated output graph, on specification sheet located in the Installation Section. If the duty cycle is exceeded, a thermal protector will shut off the output until the machine cools.

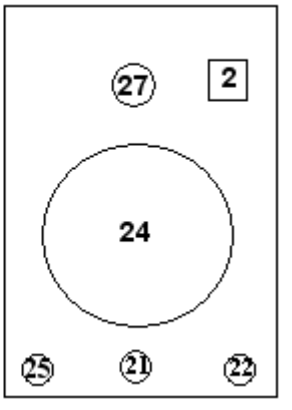
CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front of the TIG machine. Refer to Figure B.1 and the corresponding explanations.

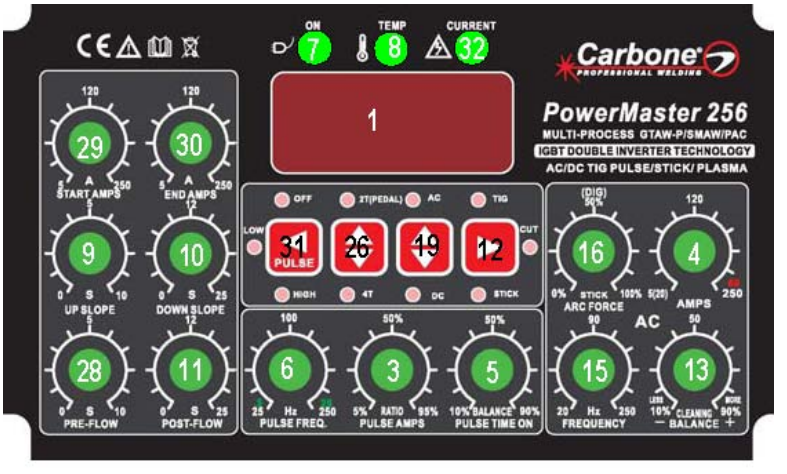
FIGURE B.1 CONTROL PANEL

1. FRONT PANEL 2. BACK PANEL





1.indication of welding current 2.power switch 3.pulse current regulator 4.AMP regulator 5.Pulse Ttime On 6.pulse Freq. regulator 7.indicating light of power 8. indicating light of over heat 9. current up-slope time regulator 10.current down-slope time regulator 11.post flow time regulator 12.MMA/TIG/CUT switch 13.AC balance14.output"+" 15.AC square wave Frequency 16. arc force 17.argon out 18.torch control (or remote control) 19. AC/DC TIG switch 20. output"-" 21.argon inlet 22.power supply 23.nameplate 24.fan 25.safety earthing column 26. 2 steps/ 4 steps switch 27. 220v receptacle 28,PreFlow29.Start Amps 30.End Amps 31.Pulse On/Off. 32.warning indicating light 34.Pilotarc



CONTROL FUNCTIONALITY

1 DIGITAL METER - A 3 digit LED meter is used to display the preset output current level before welding, and actual output level while welding: A lit display indicates input power is turned on. (See Item 2.)

2.POWER SWITCH - Input line switch turns input power ON or OFF, as indicated by the on or off status of the front panel digital display (See Item 1).

3. Pulse current regulator

Regulating the knob, It can be selected between 5A TO 250A.

4. welding current regulator

Regulating the knob, It can be selected between 5A TO 250A. For Remote TIG this knob sets the Max.Amp level, with the Remote Adjustable foot control (if used).

5.pulse width regulator

Regulating the knob, It can be selected between 0.1 TO 0.9.

6.pulse Freq. regulator

Regulating the knob, It can be selected between 0.5Hz TO 250Hz.

7.indicating light of power

Turn power on, it will illuminate indicating.

8. indicating light of over heat

-If the welder overheats due to blocked air flow, high ambient air temperature, or exceeded duty cycle, an internal thermostat will open disabling the welding output and this yellow light will illuminate. The cooling fans will continue to run to cool the unit during this time. The light will go out when the unit cools and the thermostat resets. Once the light goes out, the machine will again become available to weld.

9.current up-slope time regulator

Regulating the knob, It can be selected between 0s TO 10s

10.current down-slope time regulator

Regulating the knob, It can be selected between 0s TO 25s.

11.post flow time regulator

Sets the TIG mode shielding gas post flow time over the range of about 0 to 25 seconds after the arc is shut off.

12. MMA/TIG/CUT switch (MODE SWITCH)

This button is used to select one of three processes: HF start TIG, Plasma Cutting (Cut) or stick mode. The TIG mode features HF start for a touchless arc initiation. The cut mode is used to select for the plasma cutting mode. The stick mode is used for stick welding only. Note: Cut and Stick modes only allow DC operation.

13. SP %（AC Balance）

The AC Balance Control permits adjustment of the AC TIG wave balance adjustment from Max. Penetration (70% negative wave) at full CW rotation setting, to Max. Cleaning (70% positive wave) at CCW rotation,.

This setting position feature automatically provides the proper amount of cleaning and penetration for normal AC TIG welding.

14. output"+" （Electrode Connection (Positive)）

For quick disconnect system using Twist-Mate cable plugs

15. AC square wave Frequency

Regulating the knob, It can be selected between 20 TO 250Hz.

16.arc force

Regulating arc force

17. argon out

connected gas pipe of torch

18. REMOTE RECEPTACLE *note (OR argon arc control)

Provides for connection of remote control and/or arc start switch in TIG Mode: Plugging a remote current control (Adjustable foot control) into this receptacle automatically switches the output control from the panel Max Output Control (See Item 3) to the remote control.

The connected remote control will then control the output current between the Min. range of the machine and the setting of the panel Max Output Control.

19. AC/DC TIG SWITCH

Select the mode of output

⚠ CAUTION

Do not switch the switch while welding or damage may result to the machine.

20.output"-" （Electrode Connection (Negative) ）

This quick connect Twist-Mate receptacle provides electrical connection to the electrode holder and cable for Stick welding and connection for the TIG torch when TIG welding.

21.argon inlet

connected gas pipe of flow meter

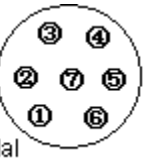
22.power supply

connected main supply

23.nameplate

The data plate stamped on the metal structure complies with the EN 60974-1, EN50199(EN60974-10) international standards and contains the following information:

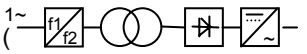
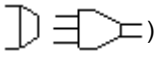
***note：**



①② connect torch switch

③④⑤ connect potentiometer(2K2 to 47K)

⑥⑦ if shorted,the "5. panel/pedal switch" is no use.the Functionalism of '5' is Pedal

* (a) Manufacturer's name and address
* (b) Trademark
* (c) Model ~
* (No) Serial number
* () The welding power source comprises a frequency converter followed by an transformer and rectifier that transforms input voltage into direct current.
* (EN 60974-1/EN 50199) Standards applied.
* (⎓) Direct current.
* (x) Utilisation factor expressed as a percentage of useful work over a cycle of 10 minutes at an ambient temperature of 40°C.
* (I_2) Rated weld current.
* (U_2) Conventional load voltage.
* (Uo) Rated no-load voltage.
* () TIG welding.
* () MMA welding.
* () 1input phases.

* (IP21S) Casing protection degree in compliance with the EN 60529 Standard:
IP2XX Casing protected against access to dangerous components with fingers and against the introduction of foreign matters with diameter 12.5 mm.
IPX3X Casing protected against rain failing at 60~on the vertical line.
IPXXC Casing protected against contact of a test gauge ϕ 2.5 mm length 100 mm with live dangerous parts,
* (U_1) Rated power supply voltage.
* (50/60 Hz) Power supply rated frequency.
* (I_{1max}) Maximum supply current.
($I_{1\ eff}$) Effective supply current.* (S) Generator suitable for installation in places where major risks of electric shocks are preset
* (CE) In compliance with the European regulations in force.

24.fan

when power switch on, the cooling fan runs

25.safety earthing column

The earthing must be made according to the national regulations. Make sure that the supply mains and the earthing are sufficient and adequate

26. 2 steps/ 4 steps switch

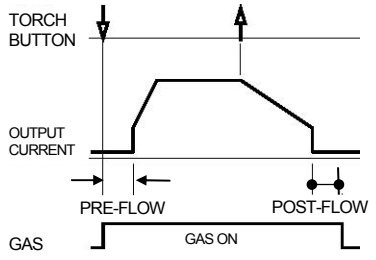
Tig Trigger Sequences -

For the TIG machine AC/DC, TIG welding can be done in either the 2-step or 4-step mode which is selected with the Trigger Mode Push Button.

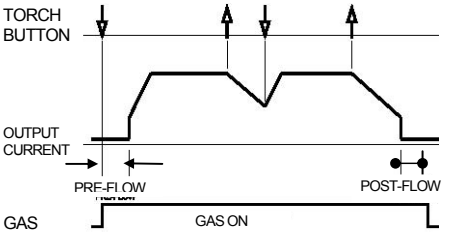
2-Step Sequence

With the Trigger Mode switch in the 2-step position, the following welding sequence will occur. This sequence is shown in (2-step diagram 1)

2 STEP DIAGRAM 1



1. Press and hold the Arc Start Switch to start the sequence.
The machine will open the gas valve to start the flow of the shielding gas. After a 0.5 second preflow time, to purge air from the torch hose, the output of the machine is turned ON. At this time the arc is started.
After the arc is started the output current will be increased from the start current to the welding current. Both the start current and increase, or upslope time are presettable. The default start current is 15 amps and the default upslope time is 0.2 seconds.
2. Release the Arc Start Switch to stop welding.
The machine will now decrease the output current at a controlled rate, or down slope time, until the Finish current, (also commonly referred to as Crater Current) is reached and the output of the machine is turned OFF. Both the Down slope Time and the Finish Current are can be preset.
After the arc is turned OFF, the gas valve will remain open to continue the flow of the shielding gas to the hot electrode and work piece. The duration of this postflow shielding gas is adjusted by the Postflow Parameter.
Possible variations of this standard sequence is shown in (2 step diagram 2). It is possible to press and hold the TIG torch trigger a second time during downslope to restart. After the trigger is pressed the output current will increase to the welding current.
This operation is shown in (2 step diagram 2).



2 STEP DIAGRAM 2

4-Step Sequence

With the 4-step Selected, the following welding sequence will occur.

1. Press and hold the Arc Start Switch to start the sequence.

The machine will open the gas valve to start the flow of the shielding gas. After a 0.5 second preflow time, to purge air from the torch hose, the output of the machine is turned ON. At this time the arc is started.

After the arc is started the output current will be at the Start current. This condition can be maintained as long or as short as necessary.

If the Start current is not necessary, do not hold the TIG torch trigger as described at the beginning of this step. Instead, quickly press and release the trigger. In this condition, the machine will automatically pass from Step 1 to Step 2 when the arc is started.

2. Release the TIG torch trigger to start the main part of the weld.

The output current will be increased from the start current to the welding current. Both the start current and increase, or upslope time are presettable. The default start current is 15 amps and the default upslope time is 0.2 seconds.

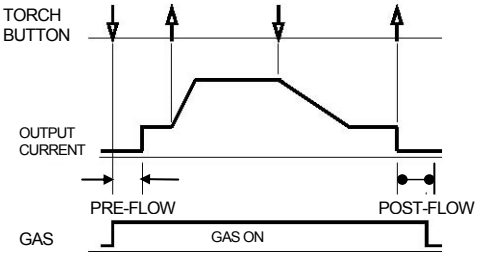
3. Press and hold the TIG torch trigger when the main part of the weld is complete.

The machine will now decrease the output current at a controlled rate, or down slope time, until the Finish current is reached. Both the Down slope Time and the Finish Current are presettable. This Finish current can be maintained as long or as short as necessary.

4. Release the TIG torch trigger.

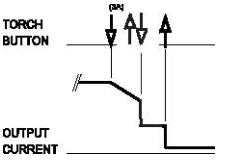
The output current of the machine will turn OFF and the gas valve will remain open to continue the flow of the shielding gas. The duration of this postflow time is adjusted by the Postflow parameter. This operation is shown in (4 step diagram 1).

4 STEP DIAGRAM 1



Possible variations of this standard sequence are shown below. By releasing and re-pressing the TIG torch trigger during the downslope step, the output will immediately drop to and hold at the Finish Current. Releasing the trigger will turn off the output and begin postflow. This operation shown in

(4 step diagram 2)



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27. 220v receptacle

This connection supplies power to the water cooler. This is a 220 VAC outlet. Do not use this connection to power any other device. 4 amp max.

28. PreFlow

Sets the TIG mode shielding gas pre flow time over the range of about 0 to 10 seconds before the arc will shut on.

29. Start Amps &30. End Amps

Serves as the 2T/4T beginning and final amp value while using the torch switch. Allows the arc to be started and ended at a different amp value than normal welding while using the torch switch.

31. Pulse On/Off.

Press the touch-pad button to select the desired pulse mode.

32. warning indicating light

output current is too high or the machine fails.

34.Pilotarc Connector

Loosen the black thumb screw to connect the pilot arc wire to the plasma cutting torch. The thumbscrew is only used with the plasma torch.

OPERATING STEPS

WELDING IN TIG MODE

1 Connect the TIG torch and cable Twist-Mate quick connect plug to the Electrode/Gas output receptacle. This receptacle also contains an integral gas connection for the torch. Connect the work clamp to the work piece.

2 Set the TIG/MMA/CUT switch to "TIG".

3 Set the AC/DC Switch to DC for welding steel or stainless steel; or to AC for welding aluminum.

4 Connect the arc start switch (or Adjustable foot control)to the Remote Control Connector.

5 Turn on the cylinder gas valve and adjust the flow regulator to obtain desired flow.

6 Turn the power switch to "ON".

7 Preset the Output Control on the control panel to the maximum desired amps, as read on the digital meter.

8 Depress the Adjustable foot control to energize the torch and establish an arc with the work piece. The digital meter reads the actual amps while welding.

NOTE: When the TIG/MMA switch is set to "TIG", depressing the remote control will start a 0.5 second gas pre-flow before energizing the TIG torch. When the remote control is released the TIG torch is de-energized and gas flow will continue for the time set by the Post Flow Time control. When the polarity switch is set to DC, the TIG Arc Starter will turn on and off automatically to start and stabilize the arc. In AC the TIG Arc Starter will turn on with the output and remain on continuously until the remote control is released.

WELDING POLARITY

DC Electrode Negative Polarity (Direct Current Straight Polarity) (see FIGURE B.4)

While Welding, there is a continuous flow of electrons from the electrode to the workpiece.

This is the most used polarity, ensuring limited wear of the electrode, since the majority of the heat concentrates on the anode (workpiece). Narrow and deep welds are obtained with high travel speeds.

Most materials, with the exception of aluminum and magnesium, are welded with this polarity.

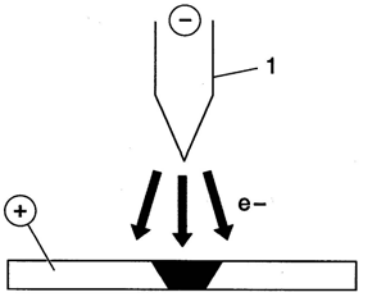


FIGURE B.4

DC Electrode Positive Polarity. (Direct Current Reverse Polarity) (see Figure B.5)

In this case, there is a continuous flow of electrons from the workpiece to the electrode. The reverse polarity is used for welding alloys covered with a layer of refractory oxide.

With this polarity the electrode functions as anode and is subjected to a high degree of heat; the workpiece is bombardment by positive ions sent from the electrode which break the surface oxide.

In Electrode Positive Polarity, high currents cannot be used, since they would cause an excessive wear of the electrode.

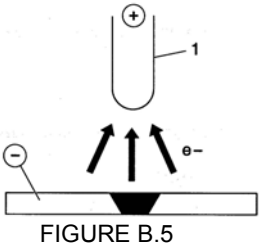


FIGURE B.5

D.C.-Pulsed TIG (see Figure B-6)

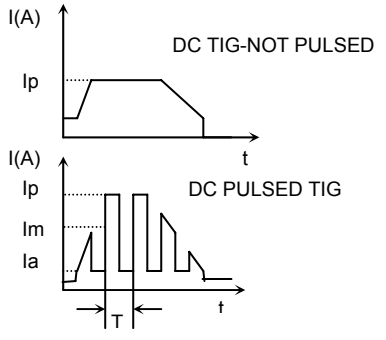
The use of pulsed direct current allows better control of the weld pool during certain operating conditions.

When compared with traditional TIG welding

performed at the same average current, pulsed welding results in a smaller heat affected zone which results in fewer deformations and reduced chance of cracking and gas entrapment.

Increasing the frequency constricts the arc, increases stability and improves weld quality.

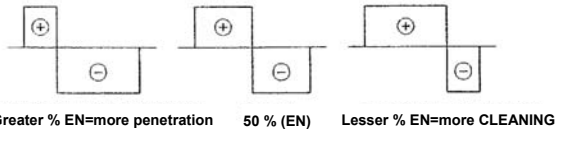
FIGURE B.6



A.C. (Alternating Current) (see Figure B.7)

Alternating Current welding is typically used for Tig welding aluminum (and its alloys) or magnesium. The polarity alternates between Electrode Positive and Electrode Negative (EN). During the positive halfwave the oxide is broken. During the negative halfwave, the electrode cools, the workpiece melts and penetration occurs.

FIGURE B.7



Greater % EN=more penetration **50 % (EN)** **Lesser % EN=more CLEANING**

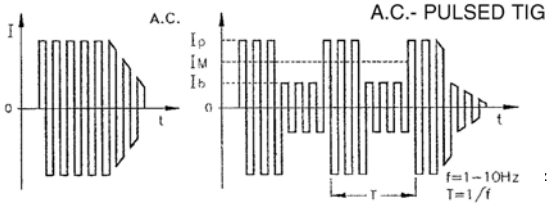
Greater % EN = MORE PENETRATION 50% (EN) Lesser % EN = more CLEANING

Changing the wave balance alters the ratio between the cleaning and the penetrating current.

A.C.-Pulsed TIG

When AC welding, a pulsed current can be used, with similar effects to those described in pulsed direct current welding.

FIGURE B.8



STEEL TIG WELDING

The TIG process is very effective for welding both carbon steel and alloy steel, especially in applications requiring precision results. DC Electrode Negative Polarity is required. Since this process does not include the removal of impurities, proper cleaning and preparation of the edges is required.

FILLER MATERIAL:

The filler rods must deposit welds with mechanical characteristics appropriate for the application.

COPPER TIG WELDING

Since the TIG welding is a process characterized by high heat concentration, it is particularly suitable for welding materials with high thermal conductivity, like copper. As with steel, the DC Electrode Negative

Polarity is employed, with argon as protective gas. Considering the fluidity of molten copper, the use of backup support may prove useful.

FILLER MATERIAL:

In order to avoid the oxidation of the molten material, filler materials containing phosphorus, silicon or other deoxidating materials are typically used. The mechanical properties can also be improved through the use of silver.

TIPS FOR AC TIG WELDING

AC Inverter TIG power sources offer two significant advantages over conventional Silicon Controlled Rectifier (SCR) / transformer power sources:

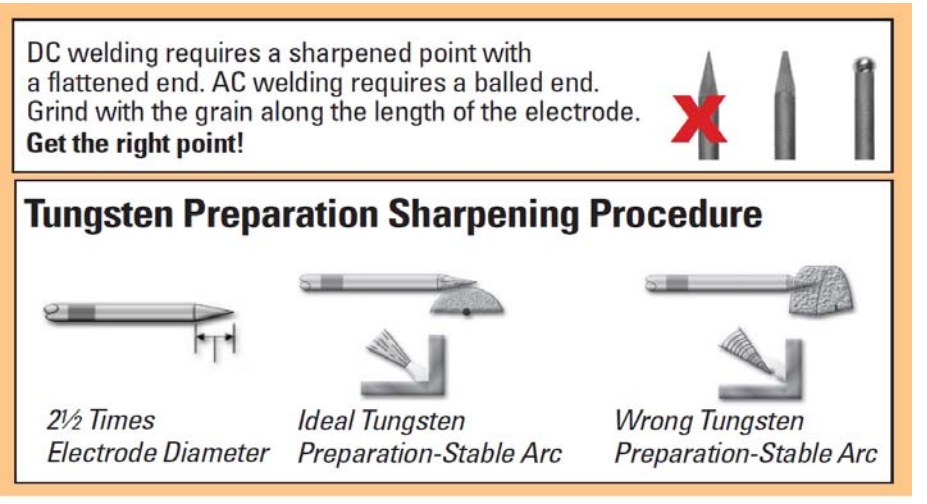
1. The AC wave balance(SP%) can be set to a higher percentage electrode negative which minimizes tungsten heating and erosion.
2. The AC frequency can be varied to "focus" the arc. Increasing the AC frequency above 60Hz will narrow the cone shape arc from the tungsten's tip. Decreasing the AC frequency below 60Hz will broaden the cone shape arc from the tungsten's tip.

The two above benefits can be used to maintain a tight focus of the arc for precise heat control and tight joint access. Because of the AC inverters abilities in these areas the following recommendations are made as a starting point:

●A 2% Thoriated tungsten is recommended instead of the Pure tungsten that is normally recommended for AC welding. Thoriated tungstens emit electrons easier and therefore will improve starting.

●. Sharpen the tungsten to a point. Normally it is recommended to preball a pure tungsten when AC welding with a conventional power source.

However, the AC inverter with it's extended AC balance control minimized tungsten heating thus allowing for a pointed tungsten to be used.



·● Set the AC Balance control to maximum 70% electrode negative. This can be reduced if the material welded is heavily oxidized, however starting at maximum and adjusting to less is desired.

. ●Set the AC Frequency in the 100 to 120 Hz range. This is a "Sweet Spot" for most aluminum applications.

GTAW Process

Electrode Polarity	DC	AC		Approximate Argon	
Electrode Tip Preparation	Sharpened	Balled		Gas Flow Rate	
Electrode Type	EWTh-1, EWLa-1 EWTh-2, EWCE-2 EWG	EWP	EWTh-1, EWLa-1 EWTh-2, EWCE-2 EWG, EWZr	C.F.H. (l/min.)	
Electrode Size-in. (mm)				Aluminum	Stainless Steel
.010 (0.25)	Up to 15 A.	Up to 10 A.	Up to 15 A.	3-8 (2-4)	3-8 (2-4)
.020 (0.50)	Up to 15 A.	Up to 15 A.	Up to 20 A.	5-10 (3-5)	5-10 (3-5)
040 (1.0)	. Up to 80 A.	Up to 40 A.	Up to 60 A.	5-10 (3-5)	5-10 (3-5)
1/16 (1.6)	Up to 150 A.	Up to 100 A	Up to 130 A	. 5-10 (3-5)	9-13 (4-6)
3/32 (2.4)	Up to MAX. A.	Up to 160. A.	Up to MAX. A.	13-17 (6-8)	11-15 (5-7)
1/8 (3.2)	X	Up to MAX. A.	X	15-23 (7-11)	11-15 (5-7)

Tungsten electrodes are classified as follows by the American Welding Society (AWS):

Pure..... .....EWP.....green
+2% Thoria.....EWTh-2...red
+1.5% Lanthana .....EWLa-1 ...black
TRI-MIX of elements.....EWG.....gray
+1% Thoria.....EWTh-1...yellow
+2% Ceria ....EWCE-2...orange
+0.5% to 0.40%Zirconia....EWZr.....brown

Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.

PROTECTIVE GAS

Both argon and helium work when welding aluminum. Argon is preferred, due to its lower cost and consumption rate. This gas also tends to stabilize the arc, thus making it easy to operate. For some applications, however, the use of helium, or argon-helium blends, is recommended due to better weld penetration and faster travel speed. Helium is especially suitable for welding thick workpieces. The recommended gas flow rates are shown in table 5.

TABLE 5

Current (A)	Helium cfh-(l/min)
50	29 - (14)
100	29 - (14)
150	42 - (20)
200	42 - (20)
250	53 - (25)
300	53 - (25)

Welder Function Summary and Explanations.

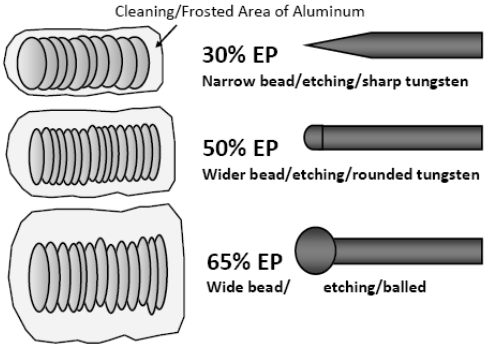
AC Frequency.

The AC frequency only applies to the AC mode. Standard transformer welders typi-cally have a fixed frequency of 60 Hz which is es-sentially the line input frequency supplied by the power company. But with inverters, the capability of AC frequency adjustment is practically limitless due to the IGBT components that create its own frequency. Frequency adjustment capability is use-ful to help improve directional control of the arc, and to focus the arc so that a narrower bead profile can be achieved. Also, at higher frequencies, the puddle agitation is greater which improve the breakup of undesirable oxides. All wave forms can be adjusted from 30-250 Hz。

200 Hz 60 Hz

AC Balance.

The AC output is formed by rapidly alternating polarity between electrode negative and electrode positive, creating something that resembles a wave when viewed on an oscilloscope. Normally, with standard transformer welders, both standard sine wave and even square wave weldershave little or no way to change the ratio of EN to EP, which results in welding with a molten ball at the tip of the tungsten and a less stable arc. Electrode nega-tive (EN) provides penetration in the TIG welding pro-cess. Electrode positive (EP) creates a strong reverse flow of electricity that breaks up the weld-resistant oxidation that covers aluminum and magnesium com-ponents. It also places a lot of heat on the tungsten. In a “balanced” wave where both EP and EN are equal in time length (50%), penetration is reduced and over-cleaning results in wide etch lines running parallel to the side of the weld. Not all welds conditions will be alike so more cleaning is required at times than others. Similarly, more penetration will be required at times than others. Ordinarily, about 30-35% electrode posi-tive is considered an ideal amount (65-70% electrode negative). This means that more heat is put into the work than on the tungsten and a sharper point can be used. Cleaning is still sufficient at that level. Good re-sults can be achieved with about 30% EP or less. The cleaning action is still significant even at these levels. Ideally, the cleaning action should be adjusted until a small amount of frosting can be seen no more than 1/8” distance from the edge of the weld. If a piece of metal is particularly heavily oxidized or dirty, more cleaning action will be required. If too much cleaning action is used, the tungsten will begin to ball and even may start to burn away. If this much cleaning action is truly needed, then switch to a larger sized tungsten that can handle the increased heating level. Signs of too little cleaning action while welding aluminum are sooty, black or dull looking welds. A dedicated stain-less brush and suitable aluminum cleaner such as ace-tone should still be used before welding any type of aluminum to help break up the heaviest oxide layer so less EP is needed and better penetration can be achieved. Even if the aluminum has a mirror like shine, it is still oxidized.



AC TIG WELDING QUICK START UP

⚠ WARNING

ELECTRIC SHOCK can kill.

. Have an electrician install and service this equipment.

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

. Do not touch electrically hot parts.

Connect the shielding gas – typically argon – using a appropriate regulator. Connect the Adjustable foot control, torch and work lead to the power source.

With the work cable connected to a properly grounded work piece, turn the power source on.

The Inverter machine is ready to AC TIG weld with the following features:

. AC TIG
. Local control
. AC Square Wave
. AC Balance(sp%) 50% EN
. AC Frequency 100Hz
. Post Flow 5 sec.
. High Freq Start

Set the maximum output current desired using the Output Control. Initiate the arc by closing the arc start switch. The Adjustable foot control will control the output current from 10 amps to current level set by Output Control.

To change the AC Frequency, Regulating the AC Frequency knob, It can be selected between 20 to 250Hz.. The AC Frequency is now selected and can be varied by the Output Control.

To change the (SP%) AC Balance, Regulating the AC SP% knob, It can be selected between 10% TO 90%. Adjust the Output Control for the desired AC Balance.

.

To change the Post Flow time, Regulating the Post flow knob, It can be selected between 1 to 10s. Adjust the Output control to the desired Post Flow time.

DC TIG WELDING QUICK START UP

⚠ WARNING

ELECTRIC SHOCK can kill.

. Have an electrician install and service this equipment.

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

. Do not touch electrically hot parts.

Connect up the shielding gas – typically argon – using an appropriate regulator. Connect Adjustable foot control, torch and work lead to power source.

With the Work cable connected to a properly grounded work piece, turn the power source on.

To change to DC TIG Welding:

. Press Mode button to select "DC TIG."

. Press Local / Remote Mode button and set for Remote.

Set the maximum output current desired using the Output Control.

Initiate the arc by closing the Adjustable foot control's arc start switch. The Adjustable foot control will control the output current from 10 amps to current level set by output control.

To change the Post Flow time, repeatedly push the Parameter button until the Post Flow indicator light is on. Adjust the Output control to the desired Post Flow time as indicated on digital display.

REMOTE CONTROL OPERATION

A Adjustable foot control (optional) is included with the PRECISION TIG models and available for other models (See Accessories Section) for remote current control while TIG welding. An Arc Start Switch may be used to start and stop the welding if no remote control of the current is desired. Refer to the Accessories Section of this manual.

Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models. The term "minimum" refers to a foot pedal in the "up" position, as it would be with no foot pressure, or a Hand Ampcontrol in the relaxed position, with no thumb pressure.

"Maximum" refers to a fully depressed Foot Ampcontrol,or a fully extended Hand Ampcontrol. When the welder is in TIG modes activating the Ampcontrol energizes the electrode terminal and varies the output welding current from its minimum value of 5 Amp (DC) or 20 Amp (AC), to the maximum value set by the Current Control on the control panel. This helps eliminate accidental high current damage to the work piece and/or tungsten, and provides a fine control of the current. When the welder is in the stick mode a remote control has no effect and is not used.

It is important to note that, in some cases, the tungsten will not start an arc at the minimum current because the tungsten may be too large or cold. To start an arc reliably, it is important to depress the Ampcontrol far enough so that the machine output current is near the tungsten operating range. For example, a 3/32" tungsten may be used on DC- to weld over the full range of the machine.

To start the arc, the operator may have to turn the cur-rent control up and depress the Ampcontrol approximately 1/4 of the way down. Depressing the Ampcontrol to its minimum position may not start the arc. Also if the current control is set too low, the arc may not start. In most cases, a large or cold tungsten will not readily establish an arc at low currents. This is normal. In Direct Current mode the PRECISION TIG will start a 3/32", 2% thoriated tungsten electrode at 20 amperes provided the electrode tip is properly grounded and not contaminated.

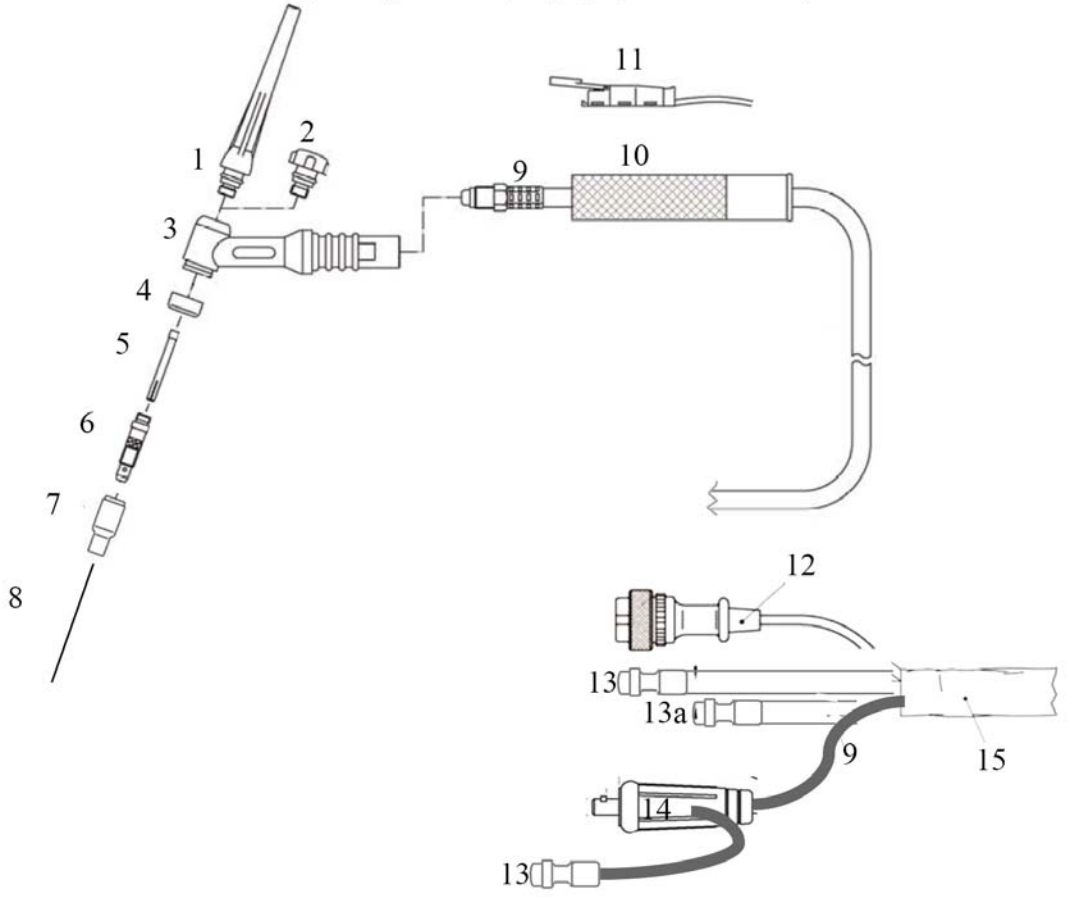
BENEFITS OF THE PRECISION TIG DESIGN

In AC TIG welding of aluminum, the positive portion of the AC wave provides cleaning (removal of aluminum oxide) of the work piece. This is desirable on materials with a heavy oxide coating. However the positive portion may also cause the electrode to overheat at high currents causing "tungsten spitting". The negative portion of the AC wave offers no cleaning action but concentrates more heat on the work.

The AC waveform of the PRECISION TIG optimizes cleaning and heating of the work. The result is the capability to weld through the complete range in AC TIG or DC- TIG requiring only one electrode, a 3/32" 2% thoriated tungsten.

EXPANDED VIEW OF TIG TORCH

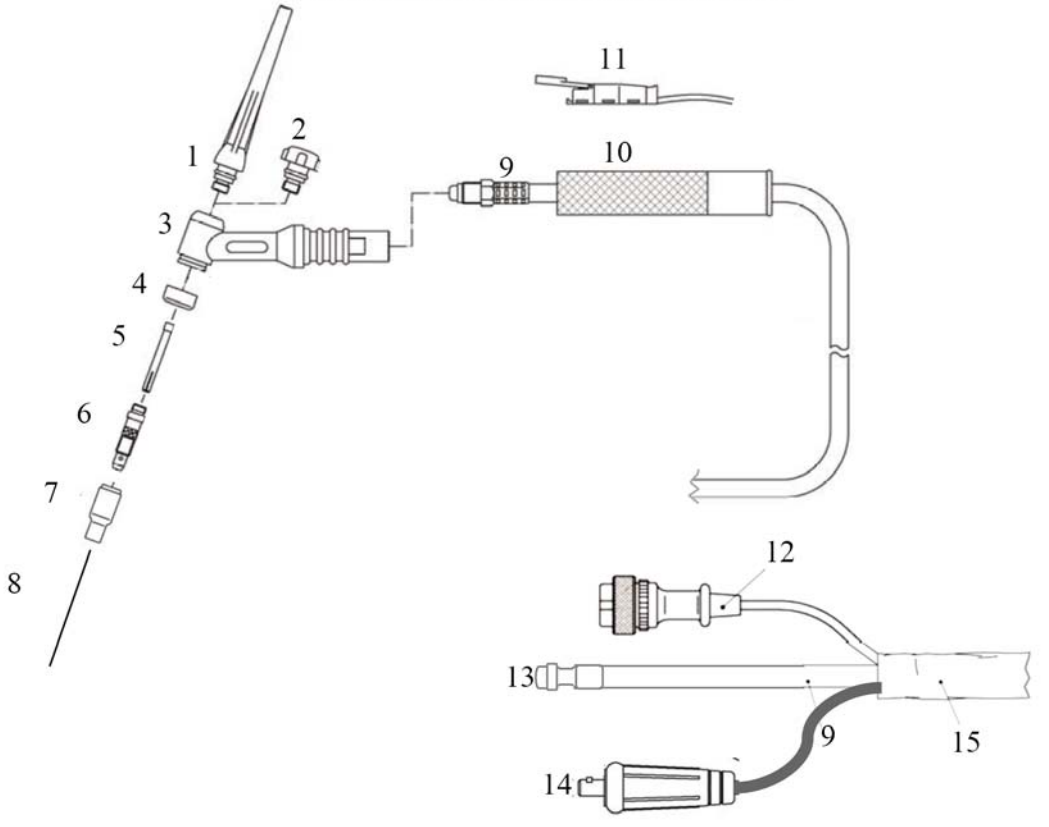
(Actual appearance may vary slightly from what is listed.)



NO.	PARTS FOR 18 Series Torch (STYLE MAY VARY)	QTY.
1	Long Back Cap with O-Ring	1
2	Short Back Cap	Opt.
3	Torch Head	1
4	Insulator	1
5	Collet 1/16 or 3/32	1
6	Collet Holder	1
7	Ceramic Cup Assorted	1
8	Tungsten (customer supplied)	0
9	Torch Cable	1
10	Torch Handle (Blue ergo handle std, not pictured)	1
11	Torch Switch (Built into ergo handle, separate on straight handle)	1
12	Torch Switch Connector	1
13 13a	9mm (1/8") b quick connect coupling (male) gas/water	1 1
14	Power Connector with water return cable and fitting	1
15	Protective Synthetic Rubber Cover	1

EXPANDED VIEW OF TIG TORCH

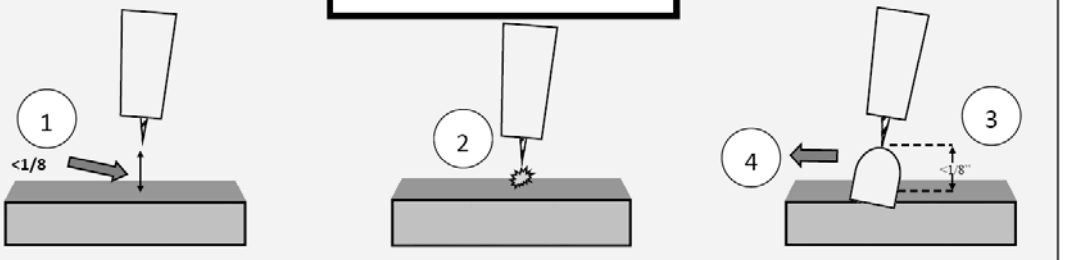
(Actual appearance may vary slightly from what is listed.)



NO.	PARTS FOR 17 Series Torch (STYLE MAY VARY)	QTY.
1	Long Back Cap with O-Ring	1
2	Short Back Cap	Opt.
3	Torch Head	1
4	Insulator	1
5	Collet 1/16 or 3/32	1
6	Collet Holder	1
7	Ceramic Cup #5,6, or 7	1
8	Tungsten (customer supplied)	0
9	Torch Cable	1
10	Torch Handle (Blue ergo handle std, not pictured)	1
11	Torch Switch (Built into ergo handle, separate on straight handle)	1
12	Torch Switch Connector	1
13	9mm (1/8") b quick connect coupling (male)	1
14	Power Connector	1
15	Protective Synthetic Rubber Cover	1

HIGH FREQUENCY START TIG OPERATION

FOR AC OR DC USE.



1. Position the point of the sharpened tungsten about 1/8" or less above the metal.
2. Press the torch trigger or press the foot pedal to initiate the arc. The HF arc will be initiated. It may appear briefly as a blue spark.
3. An arc should form, almost immediately after the pre-flow cycle is completed. HF arc initiation will be delayed by the amount of pre-flow time used. If arc does not start after the pre-flow interval, and the HF is creating a spark, then check the work clamp contact with the work piece. Move the tungsten closer to the work. Repeat steps 1 and 2.
4. Leave 1/8" or less gap between the tungsten tip and the metal and proceed with welding, leaving the torch inclined at a 15° angle.

General TIG Arc Starting Steps

1. Turn unit on, allow time for power up cycle to complete its start up process.
2. Select either HF or Lift Start TIG with the HF/Lift Start/Stick selector switch. Select DC mode with the AC/DC torch switch.
3. Plug in Torch and select 4T or 2T mode with the selector switch ***OR*** plug in foot pedal and select 2T.
4. If using the torch switch select start/end amps amperage by rotating the knob to increase or decrease amps for starting and ending the weld.
5. If using the torch switch, select up/ down slope time by rotating the knob to increase/decrease the ramp up or ramp down time of the amperage.
6. Adjust amps with amp control knob.
7. Start arc as depicted above.
8. If using 2T, continue to hold the torch switch until you are ready to stop welding. Release the switch. The Arc will then cease. If using pedal raise foot fully off the pedal and arc will stop automatically.
9. If using 4T, release the switch, after arc initiates. Continue to weld without holding the switch down. To stop, press and release the switch again.

WELDING IN STICK MODE

1 Put the electrode holder and cable quick connect plug into the electrode output receptacle. Turn clockwise until tight. Connect the work clamp to the work piece.

2 Set the TIG/STICK/CUT switch to "STICK".

3 Set the MMA/TIG/CUT Switch to the MMA mode desired for the type of electrode being used (most commonly DC+).

4 Place the electrode in the electrode holder.

In Stick Mode the output terminal and electrode will be electrically hot whenever the power switch is turned on.

5 Turn the power switch to "ON".

6 Adjust the Current Control to the desired amps.

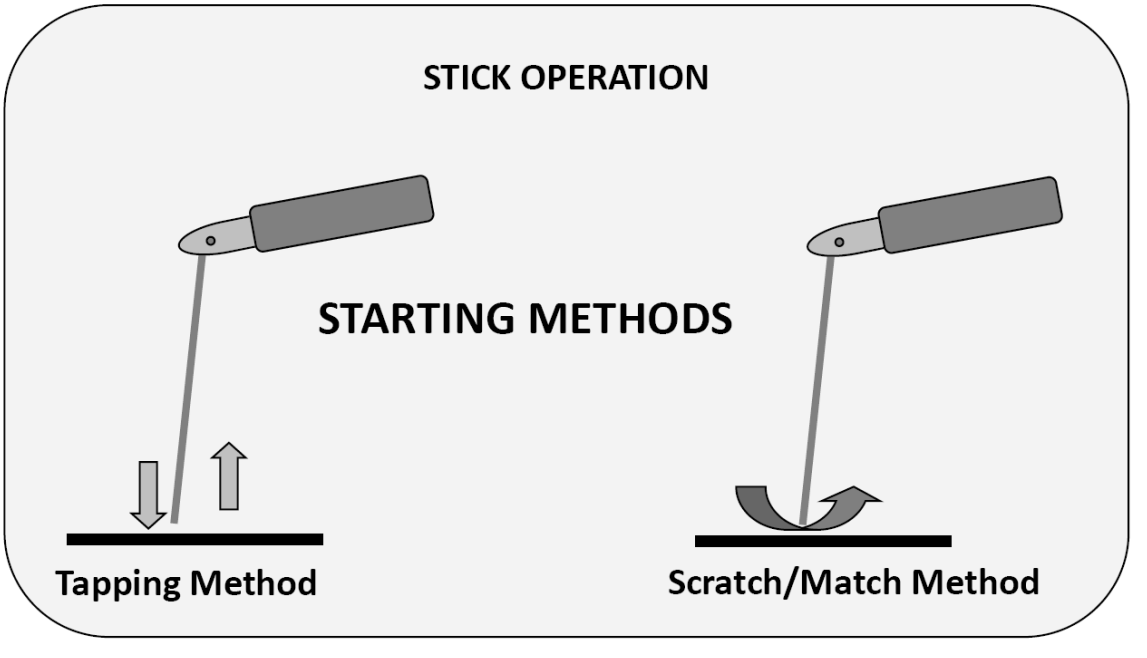
7 Strike an arc and weld.

NOTE: When the MMA/TIG/CUT switch is set to "MMA" the output is always on when the power switch is on. A remote control has no effect on the welding current and the gas flow and high frequency TIG arc starter are disabled.

RECOMMENDED ELECTRODE AMPERAGE RANGES

SMAW Process

	Welding Amp Range for Stick Electrode Size			
ELECTRODE TYPE	POLARITY	3/32"	1/8"	5/32"
E6010	DC+	40 -70	75 - 130	90 - 175
E6011	DC+	40 - 80	55 - 110	105 - 135
E6013	DC+	70 - 95	100 - 135	145 - 180
E7014	DC-	75 - 95	100 - 145	135 - 200
E7018	DC+	85 - 110	110 - 160	130 - 200
Stainless	DC+	40 - 80	75 - 110	95 - 150



1. Turn on the power switch on the rear of the unit. Allow unit to cycle through its start up program.
2. Select the Stick mode with the HF/Lift Start/Stick selector switch.
3. Make sure electrode holder is connected to the positive terminal and the work clamp is connected to the negative connector. Make sure the connectors are twisted until light resistance is met.

4. Select the amps desired. Use the electrode diameter selection chart in this manual to determine the approximate range of amps suitable for the rod size selected. Consult the welding electrode manufacturer's recommendation for proper amperage range. Each manufacturer has specific recommendations for its electrodes. Usually these can be found on the packaging or on the respective manufacturer's website.
5. Use the arc force control to select the desired arc characteristics, creating the desired arc characteristic and automatic amp response needed to maintain the arc when voltage falls below the threshold. 6011 Cellulose electrodes may require more arc force control than other rods, but each brand and size will weld a little differently. The arc force control setting will vary from person to person as well, with different rod angles, positions, and arc lengths all factoring into the arc force control performance. Set the arc start intensity by adjusting the "start amps" knob to increase the hot start action and reduce rod sticking at the start of the weld.
6. Strike the arc with either the tapping method or the match strike method. Beginners usually find that the match strike method yields best results. Professionals tend to gravitate toward the tapping method because of its placement accuracy which helps prevent arc striking outside of the weld zone.
7. Terminate the arc by flipping the tip of the electrode up quickly with a quick flick of the wrist. Alternately, pull directly back on the rod with a brisk, smooth motion.

IMPORTANT: Do not attempt to stick weld with the electrode holder while in the TIG Mode.

CUTTING IN CUT MODE

1 Put the Cutting torch and cable quick connect plug into the electrode output receptacle. Turn clockwise until tight. Connect the work clamp to the work piece.

2 Set the TIG/STICK/CUT switch to "cut".

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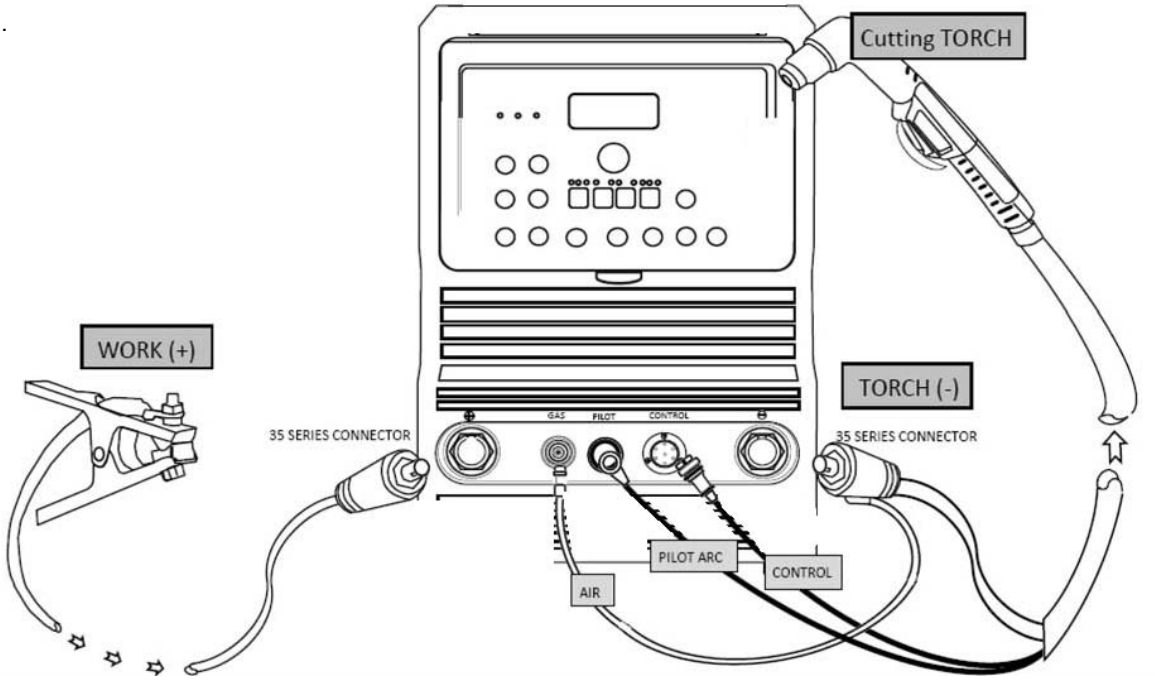


OPERATING NOTES:

1. For safest operation, be sure 2T is selected. Do not attempt to use the foot pedal to control the amps.

2. Do not attempt to use the plasma torch in any other mode or test in any other mode with torch connected.

3. Attempt to operate only with sufficient air pressure. If pressure is too low, the unit will cease output and the green indicator light next to the pressure gauge will go out to indicate the air pressure is too low to operate safely.

4. See torch manual included in this manual for best pressure settings and parts identification.

5. Do not exceed 90 psi air supply pressure from compressor or failure or leakage of internal line components may result.

6. Do not use with an oiler or with an air line that has had oil run through the line.

7. Adjust torch operation pressure to 72 psi (5 bar) for best results while post flow is flowing.

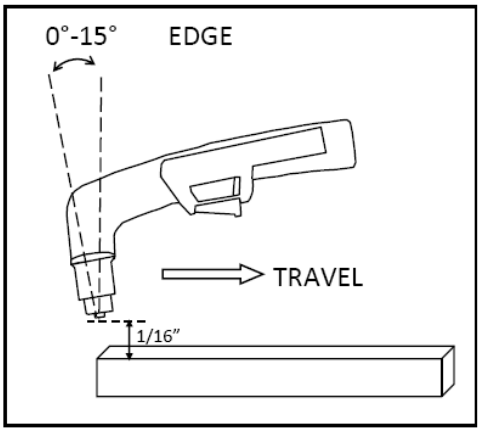
8. When using lower amperage levels, the nozzles will need to be changed out for ones with a smaller diameter orifice.

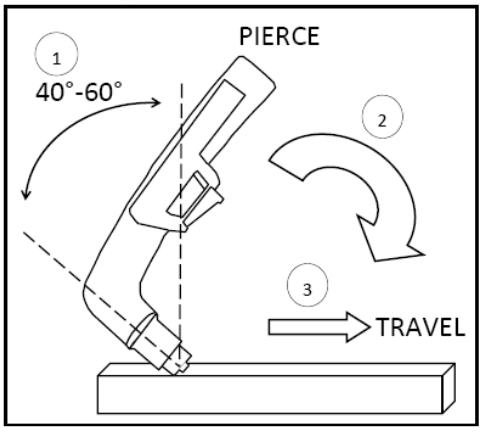
STOP: Do not fire the torch continuously without attempting to make a cut. Doing so will keep the pilot arc engaged and will drastically shorten the life of the consumables. The Pilot arc should only be used to initiate the arc to start a cut. Always make sure the work clamp is directly connected to a deoxidized, unpainted location on the part being cut. Use a grinder to ensure proper contact is being made between the work clamp and the metal if necessary. Turn the unit off while changing torches to prevent accidental arc strikes.

WARNING: Plasma cutting uses a high voltage, high temperature arc. **Do not touch any part of the consumable while cutting or with the torch energized even if the arc is not present!** Always switch the unit off while changing consumables. Do not disable the yellow safety cover over the torch switch.

CAUTION: Never attempt to use the torch while hooked up to the positive (+) connector or damage may occur to the consumables and/or the torch. Always verify correct torch polarity before each use. Do not change processes while the Plasma torch is connected or severe damage may result to the machine and torch.

Plasma Cutting Technique





Edge Starts are the best type of start to use if possible to promote consumable and torch life. This reduces blow back of molten material and allows a smooth gradual start of the cut.

1. Line up the hole on the tip of the electrode on the edge of the cut. Hold torch perpendicular to the cut initially, about 1/16" off the metal. Slide the yellow safety lock and squeeze the trigger. Wait for arc to start.
2. Once the arc starts, wait for the arc to penetrate all the way through the metal.
3. As the torch penetrates its flame all the way through the metal, tilt the torch so there is a slight lead in the flame if metal is thin. If it is thick, keep holding torch in a nearly vertical position.
4. Begin moving the torch in the direction of the cut. Maintain 1/16" standoff height.
5. Move the torch fast enough so the sparks and flame trails from the bottom edge at an angle of no more than 30° and no less than 10° from perpendicular to the metal. Excess angle of sparks/flame indicate too fast of travel speed or practical cut capacity has been reached. Little or no angle indicates too slow of travel speed.

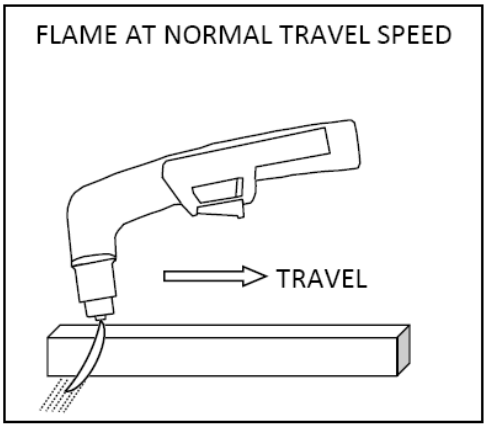
Piercing starts often result in rapid consumable wear and excess blow back of molten metal deposited onto torch and consumables. This should be performed only as necessary.

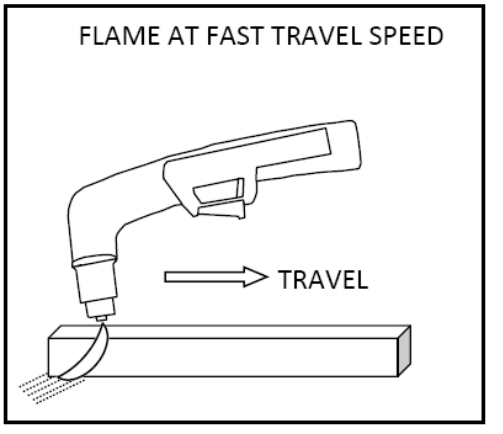
1. Tilt the torch in the direction of travel or toward the side of the metal to be discarded or wasted at a 40° to 60° angle. Slide the yellow safety lock and squeeze the trigger. Wait for arc to start.
2. Once the arc starts, wait for the arc to transfer from pilot arc to the cutting arc.
3. As the torch penetrates it flame at an angle rotate the torch slowly to the vertical position, as the arc penetrates the metal. Tilt the torch from 0°-15° for thin metal cuts, or hold it nearly perpendicular for thicker metal cuts.
4. Begin moving the torch in the direction of the cut. Maintain 1/16" standoff height.
5. Move the torch fast enough so the sparks and flame trails from the bottom edge at an angle of no more than 30° and no less than 10° from perpendicular to the metal. Excess angle of sparks/flame indicate too fast of travel speed or practical cut capacity has been reached. Little or no angle indicates too slow of travel speed.

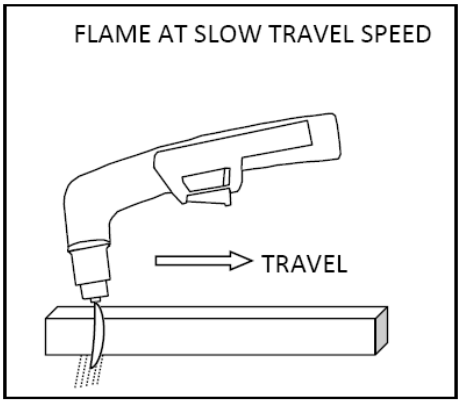
IMPORTANT PLASMA CUTTER OPERATING NOTES:

1) If you use a standoff guide with the torch, it must be adjusted to provide no more than 1/8" standoff, less if possible. Too much standoff reduces cut capacity and quality. Kerf and dross will be increased. It will also increase consumable wear and may prevent the pilot arc from correctly transferring to the work piece. However, do not drag the consumables unless you are using shielded consumables.
2) If arc fails to transfer check the work clamp connection. Make sure the work clamp is directly contacting the metal to be cut and is on a clean section of metal. If not reroute the work-clamp so that it directly contacts the metal. If necessary, grind a spot clean to ensure good contact.
3) The design of the blow back start ***may*** cause a slight delay in the arc as the air pressure must built inside the torch tubing and head to create the pressure needed to force the electrode off the nozzle seat. This may take up to two seconds. Restarting the arc with the post flow going may not cause a delay. If the torch does not light after 3 seconds, let go of the trigger and press it again. **If arc or arc start is inconsistent or otherwise unstable check the nozzle and electrode for tightness and wear. Also make sure the swirl ring is installed and not damaged.**

TIP: For longer consumable life do not use the pilot arc unnecessarily. Keeping the pilot arc engaged for long periods of time will quickly wear consumables and cause poor quality cuts and eventual torch malfunction. Routinely check the consumable orifice for wear. While the pilot arc is engaged, amperage will automatically be lowered to reduce wear.





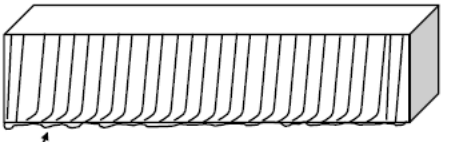


NOTE: When stepping down amps to cut thinner material, you must change to smaller orifice nozzle. Standard nozzle supplied is rated for 50-60 amp cutting. Nozzles are offered through in different sizes which are appropriate for different amp levels. Too large of a diameter orifice will result in arc instability and a rough cut. Lowering the air pressure below 65 psi to try to get the torch to cut will only result in a lazy, wandering arc.

IMPORTANT: Check consumables regularly for wear and change them out before they are completely worn. Allowing the consumables to wear until they quit working may damage related torch components, creating a more costly repair.

RESULTS OF CUT AT CORRECT SPEED, AIR PRESSURE AND TORCH ANGLE

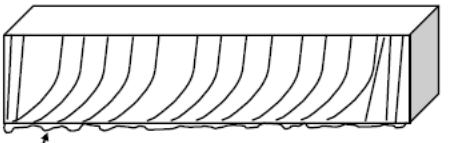
SMOOTH, EVEN CUT LINES WITH A S REARWARD SWEEP



MINIMAL EASY TO CLEAN DROSS

RESULTS OF CUT AT FAST SPEED

ROUGH, DISTINCT CUT LINES SPACED FAR APART



NOTICEABLE SMALL, HARD DROSS

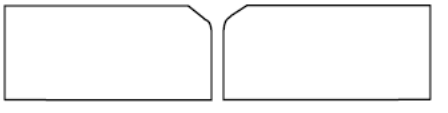
RESULTS OF CUT AT SLOW SPEED

VERTICAL CUT LINES

SIGNIFICANT SOFT, POROUS DROSS

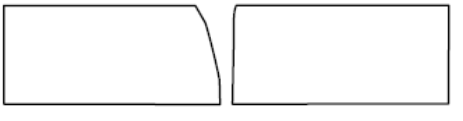
RESULTS OF TOO MUCH CURRENT OR TOO MUCH STAND OFF HEIGHT (SIDE VIEW)

MELTED TOP EDGE

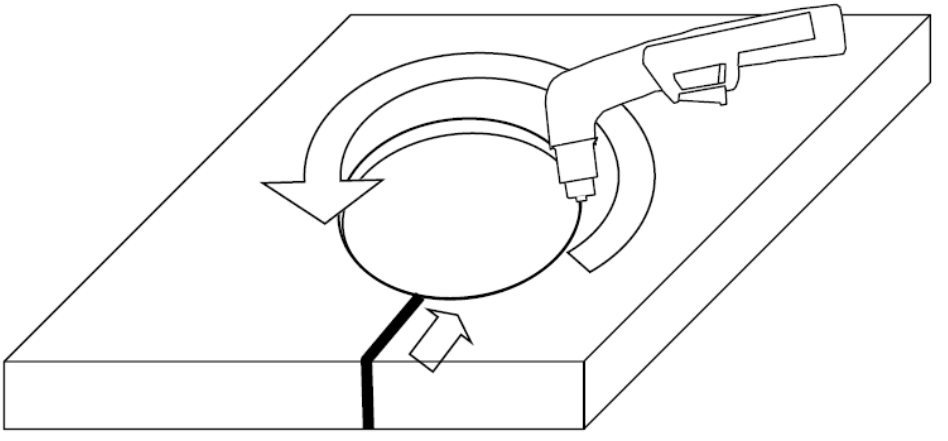


RESULTS OF WORN CONSUMABLE(S) OR LOW AIR PRESSURE (SIDE VIEW)

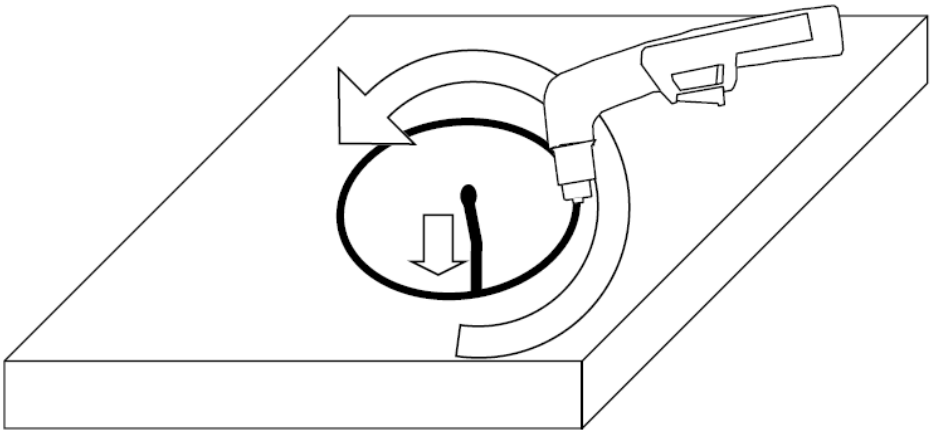
SEVERLY ANGLED CUT AT TOP



AN EXAMPLE OF CUTTING A LEAD-IN WHEN CUTTING OUT A DISK SHAPED OBJECT



AN EXAMPLE OF CUTTING A LEAD-IN WHEN CUTTING HOLE IN AN OBJECT



NOTE: When cutting an object, particularly a pattern shape, where the torch must pierce or re-fire in-line at an intersection of a cut, a lead-in cut should be employed. A lead-in is a cut that is made in the disposable part (also known as a drop) of the object to "lead" into the main part of the cut so that the destructive force of the arc is not directed into the desirable side of the cut itself. Also, all plasma cutters exhibit some angularity or bevel in the cut which is greater on one side than the other. Keep this in mind when cutting an object to size to prevent too much metal from being accidentally removed.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

● Only qualified personnel should per-form this maintenance.

● Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.

● Do not touch electrically hot parts.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

⚠ WARNING

The machine has internal capacitors which are charged to a high voltage during power-on conditions. This voltage is dangerous and must be discharged before the machine can be serviced. Discharging is done automatically by the machine each time the power is switched off. However, you must allow the machine to sit for at least 5 minutes to allow time for the process to take place.

⚠ WARNING

To avoid receiving a high frequency shock, keep the TIG torch and cables in good condition.

ROUTINE AND PERIODIC MAINTENANCE

1 Disconnect power supply lines to machine before performing periodic maintenance.

2. Periodically clean the inside of the machine with a low pressure air system. Be sure to clean the following components thoroughly.

Main Transformer
Electrode/Gas Output Receptacle
Polarity Switch
Rectifier Assembly
Arc Starter/Spark Gap Assembly
PC Boards
Fan Blades

3 Inspect welder output and control cables for fraying, cuts, and bare spots.

4 Keep TIG torch and cables in good condition.

5 Clean air louvers to ensure proper air flow and cooling.

6 The fan motor has sealed ball bearings which require no maintenance.

7 **SPARK GAP ADJUSTMENT**

The spark gap .020(.5mm) is set at the factory to a gap of 0.015 inches (0.4mm) See Figure D.1. This setting is adequate for most applications. Where less high frequency is desired, the setting can be reduced to 0.015 inches (0.4mm).

⚠ WARNING

Use extreme caution when working with circuit of the high frequency. The high voltages developed can be lethal. Turn the input power off using the disconnect switch or fuse box before working inside machine. This is particularly important when working on the secondary circuit of the high voltage transformer (T3) because the output voltage is dangerously high.

Refer to figure D.1. Note in highly dirty environments where there is an abundance of conductive contaminants, use a low pressure air stream or a firm piece of paper to clean the spark gap. Do not disturb the factory setting.

To check the spark gap:

-Turn off input power as specified above.

-Remove the right side panel from the machine, the spark gap box is located on the lower right side.

-Check the spark gap with a feeler gauge. If adjustment is needed:

-Adjust the gap by loosening the head screw in one of the aluminum blocks, near the front of the unit and tighten the screw in the new position.

If the gap is correct:

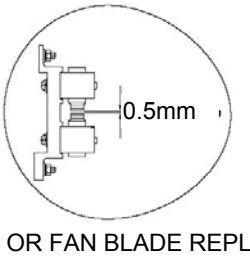
-Replace the wraparound.

8 Inspect gas hose and inlet fitting for cracks or leaks.

9 Replace any unreadable labels or decals.

10 Verify that the machine and welding circuit is properly grounded.

FIGURE D.1 SPARK GAP



FAN MOTOR OR FAN BLADE REPLACEMENT

When installing a new fan blade or fan motor be sure to maintain proper shaft spacing.

D-1 TROUBLESHOOTING D-1

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and Repair should only be performed by our Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.
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, generally it states to contact your local Authorized Field Service Facility. If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Authorized Field Service Facility.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Local Authorized Field Service Facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

OUTPUT PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS	RECOMMENDED COURSE OF ACTION
Machine is Dead -No Output - No Fan	1. Make certain that the input power switch is in the "ON" position and machine is plugged in. 2. Check the input voltage at the machine. Input voltage must match the rating plate and voltage connection. Refer to Reconnect Procedure in the Installation section of this manual. 3. Blown or missing fuses in input line.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
Fan runs normally at power up - No output from machine in either Stick or TIG modes.	1. Check for proper input voltages per nameplate and voltage reconnection. 2. Check to make sure polarity switch is not in between two positions.	
Fan runs - No output from machine in either Stick or TIG modes and the yellow light on the control panel is on.	1. Welding application may have exceed the recommended duty cycle. Allow the unit to run until the fan cools the unit and the yellow light goes out.	
Machine does not respond (no gas flow, no high frequency and no open circuit voltage) when arc start switch or Ampcontrol is activated - fan is working.	1. Machine MUST be in the TIG Mode. 2. The Ampcontrol may be defective. Check for continuity between pins "D" and "E" on cable connector when Ampcontrol is depressed.	
Welding stops, and warning light is on	Self-protection has engaged 1.Display "E01" -over-temperature 2.Display "E02" -over-current, 3.Display "E05"- torch switch always close 4.Display "E06"- air pressure is too lower @CUT	

Note:Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Local Authorized Field Service Facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

OUTPUT PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Machine regularly over heats - thermostat opens, Yellow(green and red light at the same time) light on front panel glows The fan runs but machine has no output	1. Welding application may exceed recommended duty cycle. Reduce the duty cycle. 2. Dirt and dust may have clogged the cooling channels inside the machine. Blow out unit with clean, dry low pressure air. 3. Air vents and exhaust louvers may be blocked due to inadequate clearance around machine.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
Output current reduced significantly when AC Balance control knob is set near or at max. penetration or when Output control is set near or at full output.	1. Input power to machine doesn't have sufficient capacity. Try changing Input power to a sufficient supply, refer to Installation section. 2. Machine is powered from an engine generator or an engine welder. If welding at high currents are needed, try powering machine from electricity grid instead of engine generator. 3. Set AC Balance control at 50% position.	

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TIG MODE PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Machine output is intermittently lost. Gas flow and high frequency are also interrupted.	1. Problem may be caused by high frequency interference. Make sure that the machine is grounded properly according to the installation instructions. If there are other high frequency sources in the area, make certain that they are grounded properly. 2. Check Ampcontrol for proper operation and loose connections. 3. Check for proper input voltage and proper voltage reconnection.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
Arc "Flutters" when TIG welding.	1. Tungsten electrode may be too large in diameter for the current setting. 2. Tungsten not "sharp" when welding in DC - mode. 3. Gas shielding may be insufficient. Increase gas flow; reduce tungsten stick out beyond gas cup. 4. Check for contaminated gas or leaks in the gas line, torch, or connections. 5. If a helium blend is used as a shielding gas, then reduce the percentage of helium.	
Arc "Pulsates" when AC TIG welding.	1. Micro Switch mounted on Polarity Switch is not opening in "AC" mode.	

Note:Both the Hand and `Adjustable foot control` work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

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Observe all Safety Guidelines detailed throughout this manual

TIG MODE PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Black areas along weld bead	1. Clean any oily or organic contamination from the work piece. 2. Tungsten electrode may be contaminated. Replace or sharpen. 3.Check for contaminated gas or leaks in the gas line, torch, or connections. 4.Gas shielding may be insufficient. Increase gas flow; reduce tungsten stick out beyond gas cup.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
Weak high frequency - machine has normal welding output.	1. Check for poor connections in the welding circuit. 2. Gas shielding may be insufficient. Increase gas flow; reduce tungsten stick out beyond gas cup. 3. Check for work and electrode cables in poor condition allowing high frequency to "Leak Off". 4. Keep cables as short as possible. 5. Check Spark Gap operation and setting (0.5mm).	
High frequency "spark" is present at tungsten electrode, but operator is unable to establish a welding arc. Machine has normal open circuit voltage (refer to Technical Specifications in the Installation Chapter).	1. The tungsten electrode may be contaminated. Replace or sharpen. 2. The current control may be set too low. 3. The tungsten electrode may be too large for the process. 4. If a helium blend is used as a shielding gas, then reduce the percentage of helium.	

Note:Both the Hand and Adjustable foot control work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

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Observe all Safety Guidelines detailed throughout this manual

TIG WELD PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
No high frequency. Machine is in the TIG Mode and has normal output.	1. If the machine location is in a highly dirty environment with conductive contaminants, check and clean the spark gap with a low pressure air stream per the maintenance instructions.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
No gas flow when Ampcontrol is activated in the TIG Mode. Machine has output - fan runs. A "Click" can be heard indicating that the gas solenoid valve is operating.	1. Gas supply is empty or not turned on. 2. Flow regulator may be set too low. 3. Gas hose may be pinched. 4. Gas flow may be blocked with dirt. Check filter screen inside gas inlet fitting to solenoid valve. Use filters to prevent reoccurrence. 5. Consult your local welder/gas distributor.	
When AC TIG welding, the arc is erratic and there is a loss of "cleaning" of the work piece.	1. Tungsten electrode may be too small for process. Use a larger diameter tungsten or a pure tungsten. 2. If a helium blend is used as a shielding gas, then reduce the percentage of helium.	
The end of the tungsten electrode melts away.	1. The welding current is too high for the electrode type and/or size. See Electrode Amperage Ranges in the Operation Section of this manual.	

Note:Both the Hand and `Adjustable foot control` work in a similar manner. For simplicity, the following explanation will refer only to "Ampcontrol", meaning both Foot and Hand models

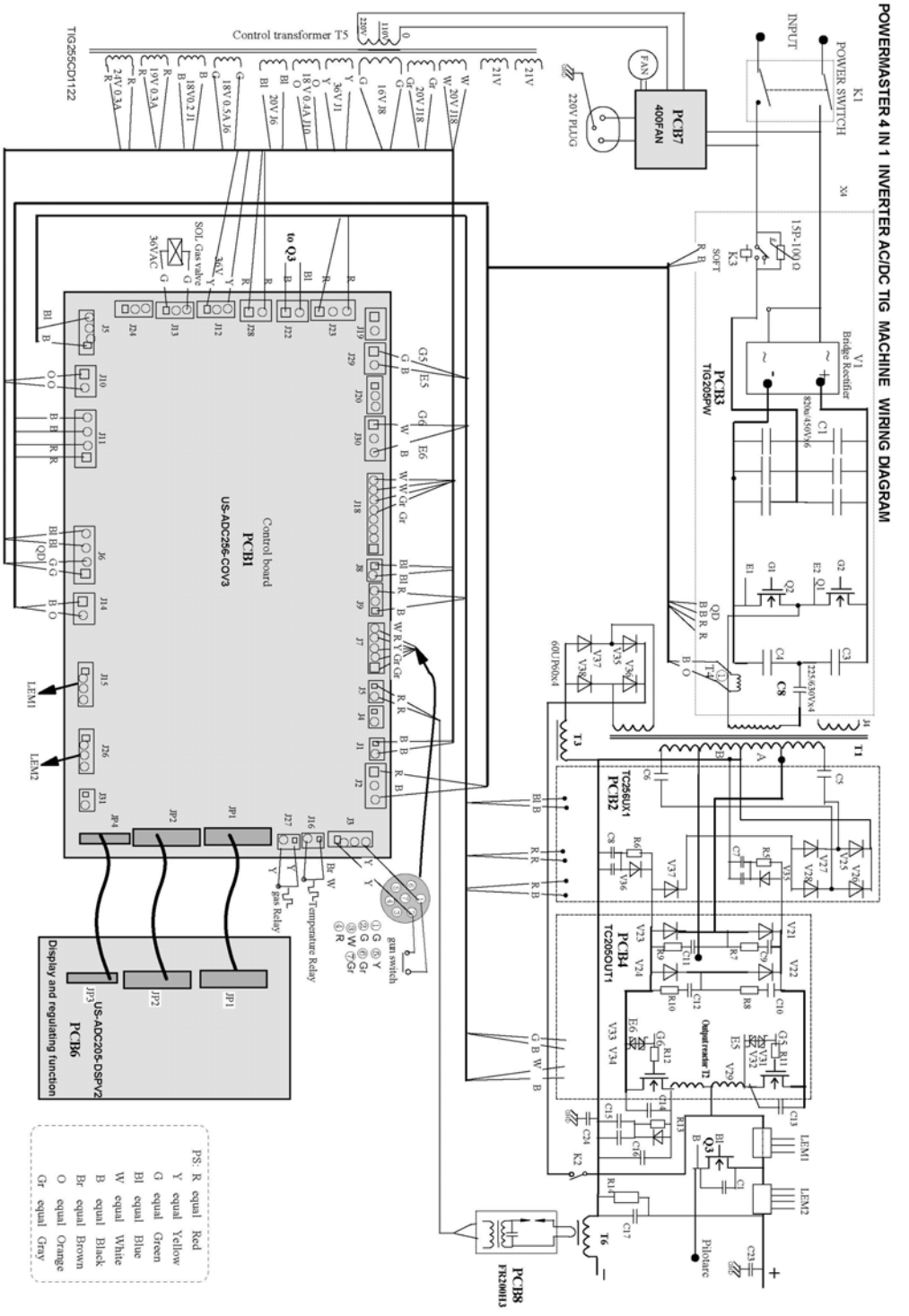
If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Local Authorized Field Service Facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

STICK WELDING PROBLEMS

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Stick electrode "Blasts Off" when arc is struck.	1. Weld current may be set too high for electrode size. Reduce current control setting, or use a larger diameter electrode. 2. Dirty materials 3. Hydrogen in weld (present on electrode coating).	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Authorized Field Service Facility.
Stick electrode "sticks" in the weld puddle.	1. The weld current may be set too low. Increase the current control setting or use a smaller diameter electrode. 2. Arc too short.	
Excessive spatter	1. Long arc 2. High current	
Craters	1. Fast movement of the electrode away from piece.	
Inclusions	1. Poor cleanliness or distribution of the Welding passes. 2. Improper movement of the electrode.	
Insufficient penetration	1. High progression speed. 2. Welding current too low. 3. Narrow chamfering.	
Porosity	1. Humidity in electrode. 2. Long arc.	

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Local Authorized Field Service Facility for technical troubleshooting assistance before you proceed.



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.

Appendix

FACTORY INSTALLED OPTIONS

PACKING LIST

★ ★★

PowerMaster 256 4 IN 1 MACHINE	1		
Ground clamp	1		
TIG welding torch	1		
Welding holder	1		
gas inlet pipe	1		
Air pressure Regulator	1		
flow meter	1		
Adjustable foot control	1		
Cutting torch	1		
Electrode	5		
Tip 1.0	5		
Ceramic shieid	3		
Operation instructions	1		
Certificate of quality	1		

No.

Certificate of quality

Name of product: AC/DC TIG/DC STICK/DC CUT WELDING

Type of product: PowerMaster 256

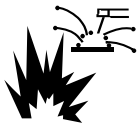
Packing No:___________________________

Test results of this welder fulfils_____________

_________technical requirements and its release

from the works is granted.

Inspector_________ Date___________

			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweibrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os paineis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
●頭部遠離煙霧。 ●在呼吸區使用通風或排風器除煙。	●維修前切斷電源。	●儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的説明以及應該使用的銀捍材料，並請遵守貴方的有関勞動保護規定。

이 제폼에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.