ESP-150

Plasma Cutting System

Instruction Manual (GB)

This manual provides installation and operation instructions for the following components beginning with Serial Number PORJ129127:

0558003744

BE SURE THIS INFORMATION REACHES THE OPERATOR.
YOU CAN GET EXTRA COPIES THROUGH YOUR SUPPLIER.

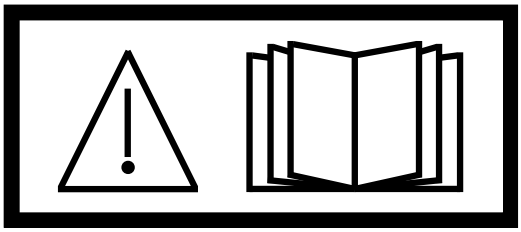
CAUTION

These INSTRUCTIONS are for experienced operators. If you are not fully familiar with the principles of operation and safe practices for arc welding and cutting equipment, we urge you to read our booklet, "Precautions and Safe Practices for Arc Welding, Cutting, and Gouging," Form 52-529. Do NOT permit untrained persons to install, operate, or maintain this equipment. Do NOT attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety Precautions before installing or operating this equipment.

USER RESPONSIBILITY

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Malfunctioning or poorly maintained equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, the manufacturer recommends that a telephone or written request for service advice be made to the Authorized Distributor from whom it was purchased.

This equipment or any of its parts should not be altered without the prior written approval of the manufacturer. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than the manufacturer or a service facility designated by the manufacturer.



READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.

PROTECT YOURSELF AND OTHERS!

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1.0 Safety Precautions

Users of ESAB welding and plasma cutting equipment have the ultimate responsibility for ensuring that anyone who works on or near the equipment observes all the relevant safety precautions. Safety precautions must meet the requirements that apply to this type of welding or plasma cutting equipment. The following recommendations should be observed in addition to the standard regulations that apply to the workplace.

All work must be carried out by trained personnel well acquainted with the operation of the welding or plasma cutting equipment. Incorrect operation of the equipment may lead to hazardous situations which can result in injury to the operator and damage to the equipment.

1. Anyone who uses welding or plasma cutting equipment must be familiar with:
   - its operation
   - location of emergency stops
   - its function
   - relevant safety precautions
   - welding and / or plasma cutting

2. The operator must ensure that:
   - no unauthorized person stationed within the working area of the equipment when it is started up.
   - no one is unprotected when the arc is struck.

3. The workplace must:
   - be suitable for the purpose
   - be free from drafts

4. Personal safety equipment:
   - Always wear recommended personal safety equipment, such as safety glasses, flame proof clothing, safety gloves.
   - Do not wear loose fitting items, such as scarves, bracelets, rings, etc., which could become trapped or cause burns.

5. General precautions:
   - Make sure the return cable is connected securely.
   - Work on high voltage equipment **may only be carried out by a qualified electrician**.
   - Appropriate fire extinquishing equipment must be clearly marked and close at hand.
   - Lubrication and maintenance **must not** be carried out on the equipment during operation.

WARNING

WELDING AND PLASMA CUTTING CAN BE INJURIOUS TO YOURSELF AND OTHERS. TAKE PRECAUTIONS WHEN WELDING OR CUTTING. ASK FOR YOUR EMPLOYER'S SAFETY PRACTICES WHICH SHOULD BE BASED ON MANUFACTURERS' HAZARD DATA.

ELECTRIC SHOCK - Can kill.

- Install and earth (ground) the welding or plasma cutting unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the workpiece.
- Ensure your working stance is safe.

FUMES AND GASES - Can be dangerous to health.

- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to take fumes and gases away from your breathing zone and the general area.

ARC RAYS - Can injure eyes and burn skin.

- Protect your eyes and body. Use the correct welding / plasma cutting screen and filter lens and wear protective clothing.
- Protect bystanders with suitable screens or curtains.

FIRE HAZARD

- Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.

NOISE - Excessive noise can damage hearing.

- Protect your ears. Use earmuffs or other hearing protection.
- Warn bystanders of the risk.

MALFUNCTION - Call for expert assistance in the event of malfunction.

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Figure 1 - ESP-150

ESP-150 POWER SUPPLY SPECIFICATIONS

Input Voltage	380-400 / 415 Vac, 3 Phase 50/60 Hz
Input Current	78A @ 380-400V, 71A @ 415V
Power Factor	54%
Output Current Rating	150 Amps (40% Duty), 110A (100% Duty)
Output Voltage	140 VDC (40% Duty), 124VDC (100% Duty)
Open Circuit Voltage	370V DC
Power Source Size	31.5" (800mm) H, 21.75" (552mm) W, 40" (1,016mm) L
Power Source Weight	792 lbs. (360 kg)
Plasma Gas (Cutting)	N_2 or Air @ 25psi (25 cfh) or H-35 @ 65psi (75 cfh)
Plasma Gas (Gouging)	H-35 or Air @ 20 psi (130 cfh)

FEATURES

- High speed cutting of most metals from gauge thickness to 2 in. thick
- 380-400/415 volt three-phase input - versatility
- Adjustable output - 25 to 150 amps for greater versatility
- Water cooled Torch PT-26 and PT-26 Inline
- Cuts with air, nitrogen, argon-hydrogen or nitrogen-hydrogen mixtures
- Torch design provides perfect electrode centering - provides longer tip life by minimizing the possibility of double-arcing
- Torch spare parts kit supplied with each outfit - ample supply of spare parts at no additional cost to minimize downtime
- Thermal overload switches - prevents damage if unit overheats due to insufficient air flow
- Line voltage compensation
- Automatic intermittent cutting - additional capability, permits continuous cutting of grates, expanded metal, heavy screen material, etc.
- Wheels and cylinder rack - all provided standard at no additional cost for portability and greater utilization
- Ideal for plasma gouging

PT-26 Technical Specifications (Plasma Gas)

Type of Gas	N_2, Air, AR-H_2, N_2-H_2		
Pressure	100 psig (6.9 bar)		
Flow	240 cfh (6.8 M^3/h)		
Purity Required	O_2 - 99.5% min., N_2-99.995% min., Air - clean and dry		
Recommended Liquid Cylinder Service Regulators	Inert Gas	R-76-150-580LC	19977
Recommended cylinder 2-Stage Regulators	Argon-Hydrogen	R-77-75-350	998341
	Nitrogen	R-77-75-580	998343
	Industrial Air	R-77-150-590	998348
Recommended Heavy-Duty Hi-Flow Station or Pipeline Regulators	Nitrogen	R-76-75-034	19155

PT-26 Technical Specifications (Starting Gas/Cutting Gas)

Type	N_2, Air (for Ar-H_2 Cut Gas Use N_2 or Ar-H_2)
Pressure	100 psig (6.9 bar
Flow	200 cfh (5.66M^3/h) @ 60 psig (4.1 bar)
Purity Required	N_2 - 99% min., Air - clean and dry

PT-26 Technical Specifications (Shield Gas)

Type	N_2 or Air
Pressure	100 psig (6.9 bar) maximum
Flow	200 cfh (5.66 M^3/h) @ 85 psig (5.86 bar)
Purity Required	Nitrogen - 99% minimum, Air - clean and dry

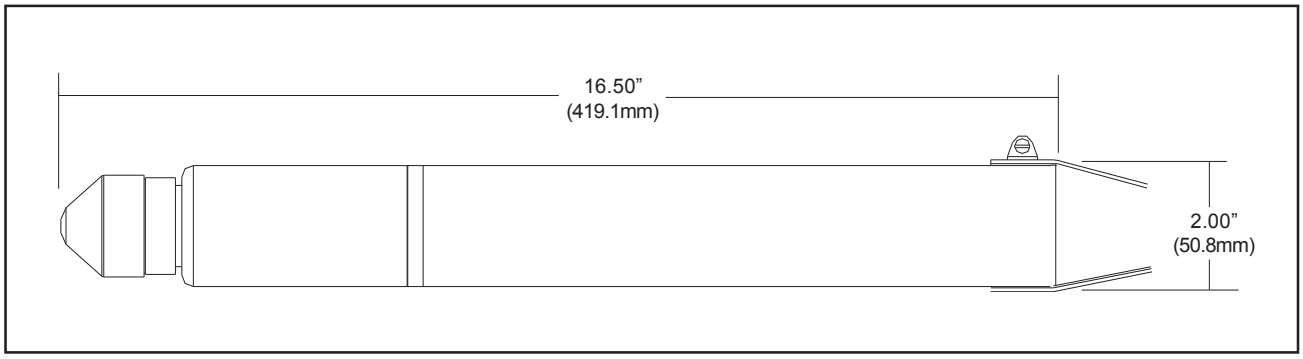


Figure 2a - PT-26 In-line Torch Dimensions

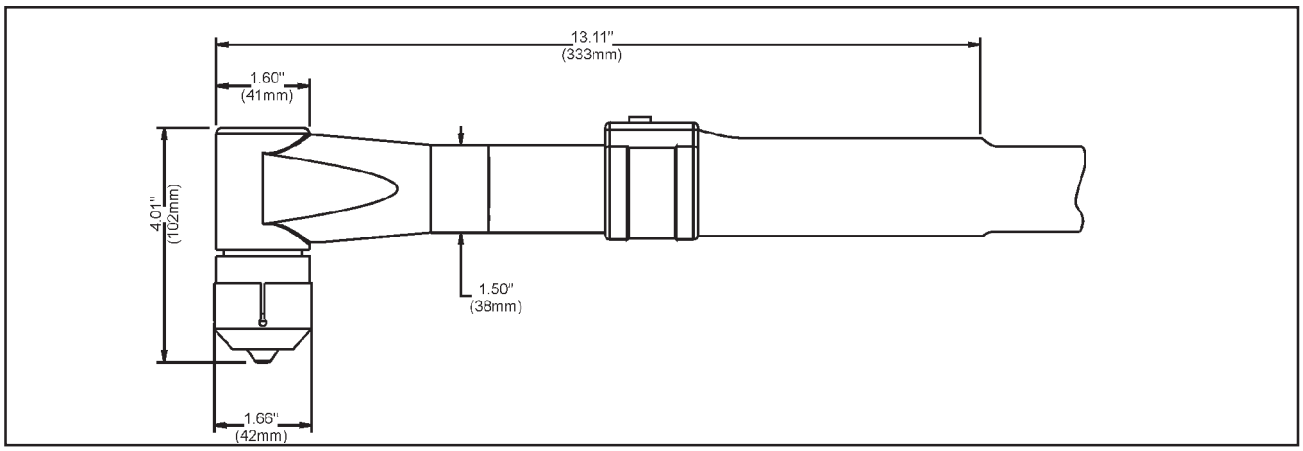


Figure 2b - PT-26 Manual Torch Dimensions

ESP-150 CE PLASMA CUTTING PACKAGES

0558003473	ESP-150 CE PT26 50' 70D AIR	
Part No.	Description	Qty.
0558002717	ESP-150 CONSOLE, CE	1
0558002209	PT-26 70DEG 50'	1
0558002864	SPARE PTS. KIT	1
680794	TRUCK & CYL RACK	1
0558003242	AIR REGULATOR ASSY	1
678724	WORK CABLE, 50'	1
156F05	TORCH COOLANT	4
08030354	HOSE CONNECTION	1
136Z08	NUT, B/I-G	3
08030247	NIPPLE, B/SIZE	3
3380	NUT, B/OXY	1
2064005	NIPPLE, BARBED	1

0558003475	ESP-150 CE PT26 50' 90D AIR	
Part No.	Description	Qty.
0558002717	ESP-150 CONSOLE, CE	1
36559	PT-26 90DEG 50'	1
0558002864	SPARE PTS. KIT	1
680794	TRUCK & CYL RACK	1
0558003242	AIR REGULATOR ASSY	1
678724	WORK CABLE, 50'	1
156F05	TORCH COOLANT	4
08030354	HOSE CONNECTION	1
136Z08	NUT, B/I-G	3
08030247	NIPPLE, B/SIZE	3
3380	NUT, B/OXY	1
2064005	NIPPLE, BARBED	1

0558003476	ESP-150 CE PT26 25' INLINE AIR	
Part No.	Description	Qty.
0558002717	ESP-150 CONSOLE, CE	1
0558002320	PT-26 IN-LINE 25'	1
0558002864	SPARE PTS. KIT	1
680794	TRUCK & CYL RACK	1
0558003242	AIR REGULATOR ASSY	1
678723	WORK CABLE, 25'	1
951188	LOCKNUT CONDUIT	1
33053	STRAIN RELIEF	1
156F05	TORCH COOLANT	4
08030354	HOSE CONNECTION	1
136Z08	NUT, B/I-G	3
08030247	NIPPLE, B/SIZE	3
3380	NUT, B/OXY	1
2064005	NIPPLE, BARBED	1

0558003477	ESP-150 CE PT26 50' INLINE AIR	
Part No.	Description	Qty.
0558002717	ESP-150 CONSOLE, CE	1
0558002321	PT-26 IN-LINE 50'	1
0558002864	SPARE PTS. KIT	1
680794	TRUCK & CYL RACK	1
0558003242	AIR REGULATOR ASSY	1
678724	WORK CABLE, 50'	1
951188	LOCKNUT CONDUIT	1
33053	STRAIN RELIEF	1
156F05	TORCH COOLANT	4
08030354	HOSE CONNECTION	1
136Z08	NUT, B/I-G	3
08030247	NIPPLE, B/SIZE	3
3380	NUT, B/OXY	1
2064005	NIPPLE, BARBED	1

⚠ WARNING

Precautionary measures should be taken to provide maximum protection against electrical shock. Be sure that all power is off by opening the line (wall) disconnect switch and unplug the power cord to the unit when primary electrical connections are made to the power supply.

⚠ WARNING

ELECTRIC SHOCK CAN KILL! Precautionary measures should be taken to provide maximum protection against electric shock. Be sure that all power is off by opening the line (wall) disconnect switch and by unplugging the power cord to the unit when connections are made inside of the power source.

GENERAL

Proper installation can contribute materially to satisfactory and trouble-free operation of the cutting outfit. Each step in this section should be studied carefully and followed as closely as possible.

A. INSPECTION AND PLACEMENT

1. Having removed the shipping container, and before removing the skid, inspect for evidence of concealed damage which may not have been apparent upon receipt of the unit. Notify the carrier of any defects or damage at once.

2. Check the container for any loose parts. Check air passages on rear panel of cabinet for any packing materials that may obstruct air flow through the power supply.

   The ESP-150 Power Source is equipped with one lifting eye that enables hoisting the unit. Be sure the lifting device has adequate capacity to lift the unit safely. Refer to the SPECIFICATIONS for the unit weight.

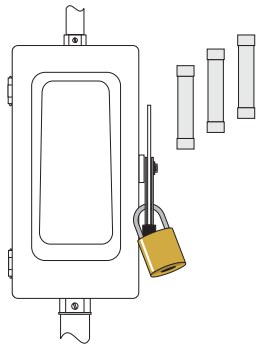
3. Mount the components of the TR-21 Truck Kit to the unit as covered by Form F-14-413 packed with the truck kit.

4. The machine components are maintained at proper operating temperatures by forced air which is drawn through the front panel louvers and holes in the base and out the rear panel by a heavy-duty fan. Locate this machine in an open area where air can circulate freely through the openings.Leave at least two feet of clearance between the unit and wall or other obstruction. The area around the unit should be relatively free of dust, fumes and excessive heat. *(Installing or placing any type of filtering device will restrict the volume of intake air, thereby subjecting the power source internal components to overheating. Use of any type of filter device voids the warranty.)*

5. A source of clean, dry air that supplies a minimum of 250cfh (7.08 M^3H at 110psig) is required for the cutting operation. The air supply should not exceed 150psig (10.3 bars) - maximum inlet pressure rating of the filter regulator supplied with the package.

WARNING

Precautionary measures should be taken to provide maximum protection against electrical shock. Be sure that all power is off by opening the line (wall) disconnect switch and unplug the power cord to the unit use proper lock out safety procedures when making primary electrical connections to the power supply.



WARNING

It is of the utmost importance that the chassis be connected to an approved electrical ground to prevent accidental shocking. Take care not to connect the ground wire to any of the primary leads.

B. PRIMARY INPUT ELECTRICAL CONNECTIONS

1. A line (wall) disconnect switch, with fuse or circuit breakers, should be provided at the main power panel. See Fig. 3. The primary power leads should be insulated copper conductors, and include three power leads and one ground wire. The wires may be heavy rubber covered cable, or may be run in a solid or flexible conduit. Refer to Table 1 for recommended input conductors and line fuse sizes.

FIG 3. Typical Installation - User Supplied 3 Phase Fused Power Disconnect Box with Recepticle and Plug

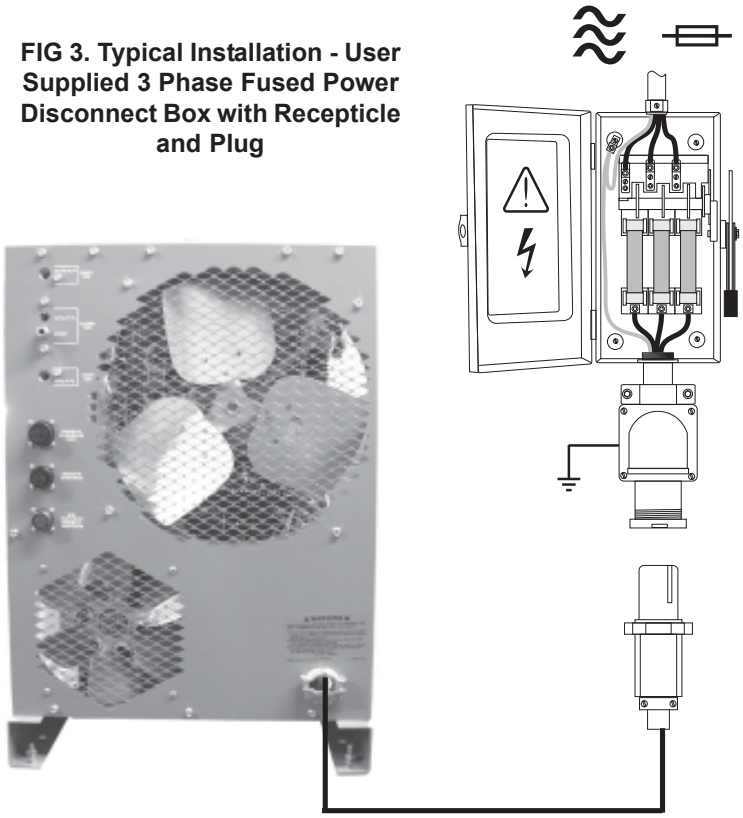


Table 1. Input Conductor and Line Fuse Size Recommendations

Input Requirements			Input & Gnd. Conductor	Fuse Ratings /Phase, Amps
Volts	Phase	Amps	CU/AWG	
220	3	121	No. 1	150
230	3	116	No. 1	150
380	3	70	No. 4	100
415	3	64	No. 6	90
460	3	58	No. 6	80
575	3	45	No. 6	70

Sizes per National Electrical Code for 75° rated conductors @ 30°C ambient. Not more than three conductors in raceway or cable. Local codes should be followed if they specify sizes other than those listed above.

WARNING

ELECTRIC SHOCK CAN KILL! Precautionary measures should be taken to provide maximum protection against electric shock. Be sure that all power is off by opening the line (wall) disconnect switch by unplugging the power cord to the unit or use proper lock out safety procedures when making connections inside of the power source.

2. **50 Hz Models** - As shipped from the factory, the ESP-150 is configured for the highest connectable voltage. If using other input voltages, the links on the terminal board (TB) inside the unit must be repositioned for the appropriate input voltage. See Figures 5a & 5b for input voltage configurations. To gain access to the terminal board, open the access panel on the left side.

Fig. 5a
Input Terminal Board
380/415 Vac Models

380-400 Vac Configuration

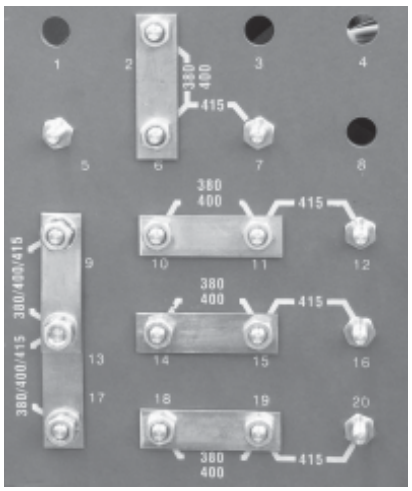
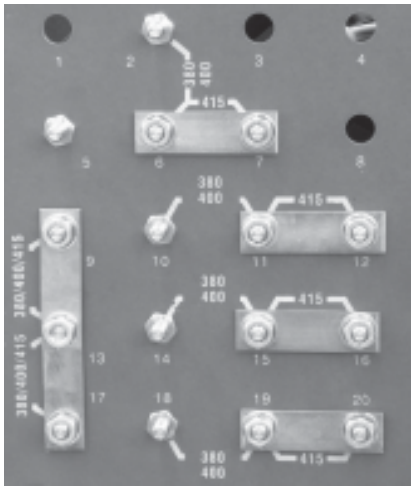


Fig. 5b
Input Terminal Board
380/415 Vac Models

415 Vac Configuration
(Factory Supplied)



WARNING

Before making any connections to the power source output terminals, make sure that all primary input power to the machine is de-energized (off) at the disconnect switch.

3. Safety codes specify that the Power Cable GROUND wire be the last to break connection should the cable be pulled out of the unit. Be sure to cut and strip wire as shown in Figure 6.

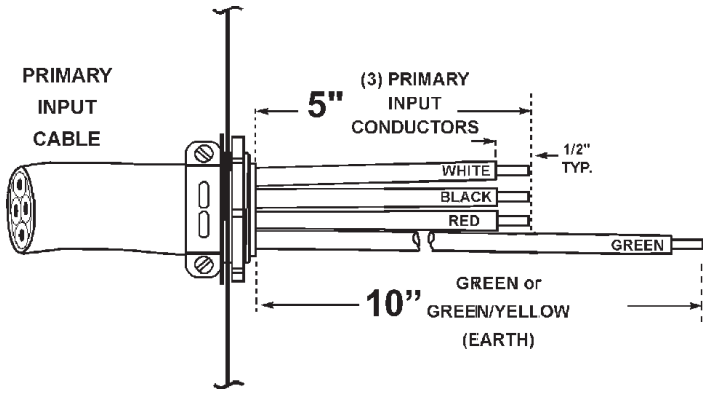


Fig. 6 - Primary Power Cable Configuration

WARNING

A poor connection or failure to connect work cable to workpiece can result in fatal shock.

Failure to connect the workpiece to earth ground will result in the opening of FUSE F3 and CIRCUIT BREAKER CB1, disabling the console.

4. Thread the input conductor cable from the wall disconnect switch through the strainrelief in the rear panel of the main contactor (MC). Connect the primary power leads to the main contactor terminals (see Figure 7) using UL listed pressure wire connectors. Also connect the ground wire to the stud provided on the chassis base inside the left-rear of the cabinet. Secure the input cable by tightening the strain relief coupling.

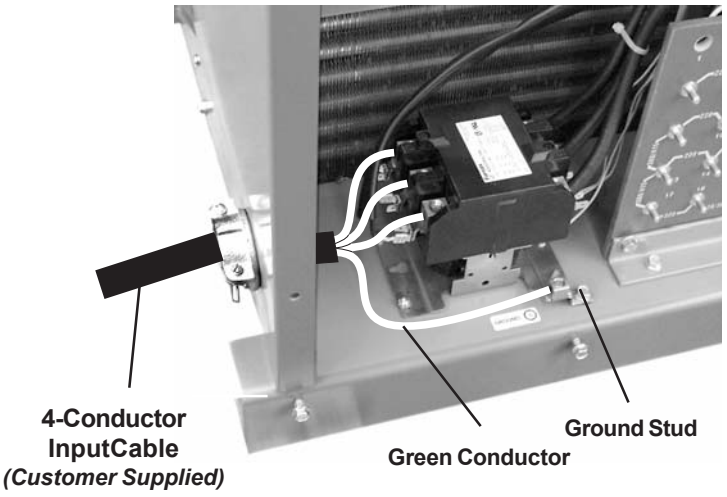
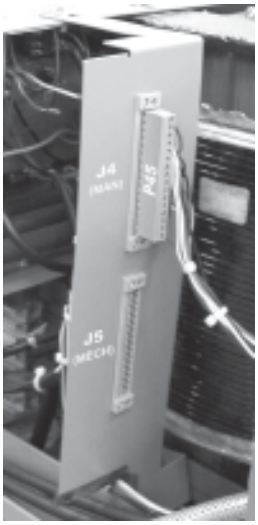


Fig. 7 Input Power Cable - Detail View, Left Side

5. Recheck all connections to make sure that they are tight, well insulated, and the proper connection has been made. Then close access panel and reinstall fasteners.

6. **Control Mode Selection for Operation with Remote Plumbing Box**
The ESP-150 is supplied from the factory with Plug P45 connected to the J4 (MAN) receptacle (torch gases and torch connected directly to the ESP-150 power source). If the unit is to be used with a remote plumbing box, move P45 to the J5 (MECH) receptacle.

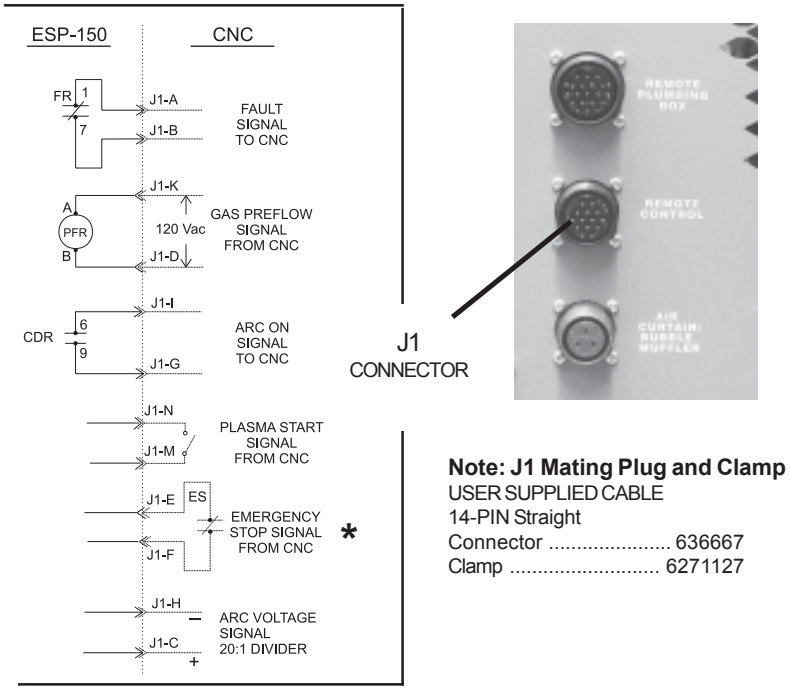


Factory supplied for standard operation - P45 to J4 (MAN)

P45 moved to the J5 (MECH) position to allow use of remote plumbing box

Figure 8. Manual vs. Mechanized Operation

*** NOTE: If CNC does not have a normally closed emergency stop switch, a jumper must be installed between TB1-16 and TB1-20.**



Note: J1 Mating Plug and Clamp
USER SUPPLIED CABLE
14-PIN Straight
Connector 636667
Clamp 6271127

Figure 9. J1 Remote Control Receptacle Pin Configuration for CNC Connection

D. TORCH CONNECTIONS

1. Open top front cover to gain access to the torch connections.(Fig. 10)
2. Thread the five service lines (gas, power, and switch lead) of the PT-26 torch through bushing at upper left corner of the front panel and connect them to the matching fittings on output terminal. Hose connections should be wrench-tight. Make sure plug of the switch lead is firmly locked in place. Then close and reinstall the hinged cover.
   a. If a PT-26 In-line Torch is being used in a mechanized installation where only an arc start signal is required, connect the optional Remote Hand Switch, ESAB part number 2075600, to the Torch Switch Receptacle on the hook-up panel in the front of the ESP-150 console. Fig. 11.
   b. If a PT-26 In-line Torch is being used in a mechanized installation with a CNC device, see Fig. 9 for Remote Control Receptacle I/O signal pin configuration and Fig. 8 for Control Mode Selection instructions.

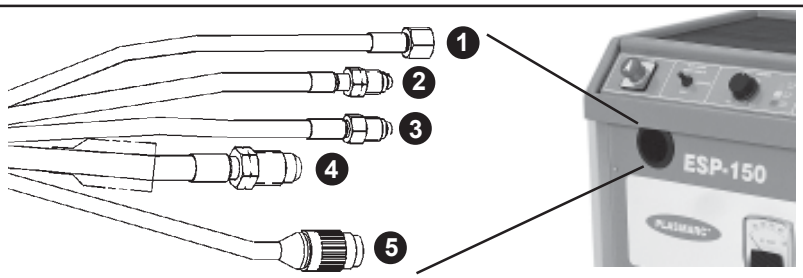


Fig. 10 - For manual torch applications, pass the service connections through the rubber grommet in the front of ESP-150 and make connections as shown.

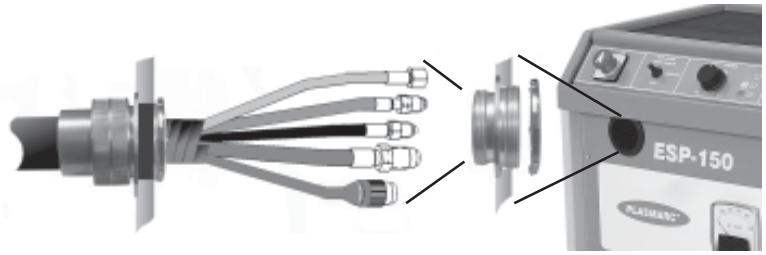


Fig. 11 - For Mechanized applications using a shielded in-line torch, remove the rubber grommet slide body through sheet metal front of ESP-150 and tighten with locknut.

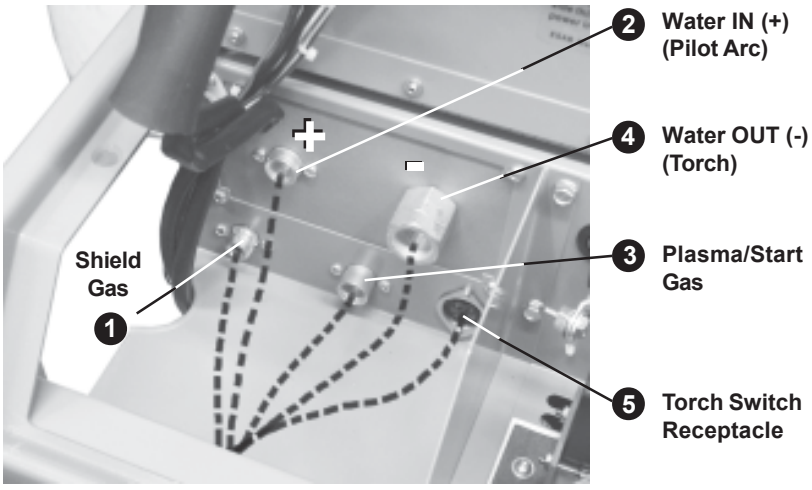


Fig. 12 - Interconnection Diagram - Front of ESP-150

E. GAS SUPPLY CONNECTIONS

1. Connect the gas supplies. The cylinders may be placed and secured on the cylinder rack of the truck. Before connecting the regulators, be sure to read, understand, and follow all instructions packed with each regulator.

2. Connect the gas hoses to the regulators and to the proper fittings (Adaptors: 74S76, Air; 19X54, Ar/H_2) on the rear panel of the ESP-150. Connections should be wrench tight including those that are plugged. (Fig. 14)

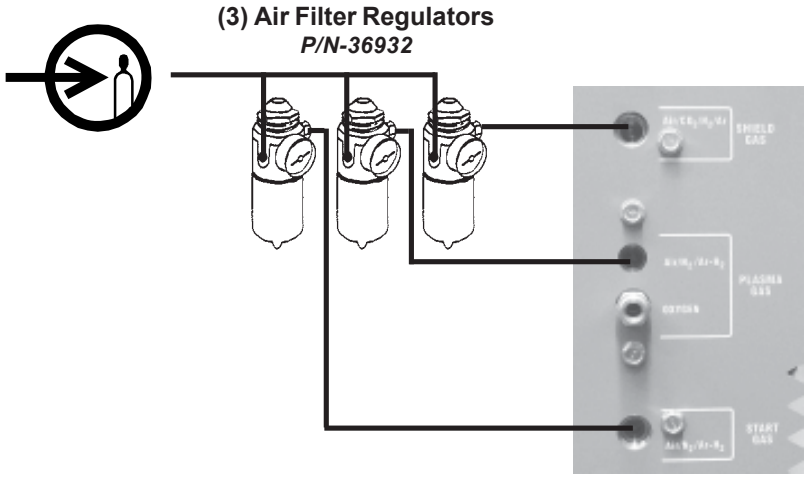


Fig. 13 - Air Filter Regulator Connections

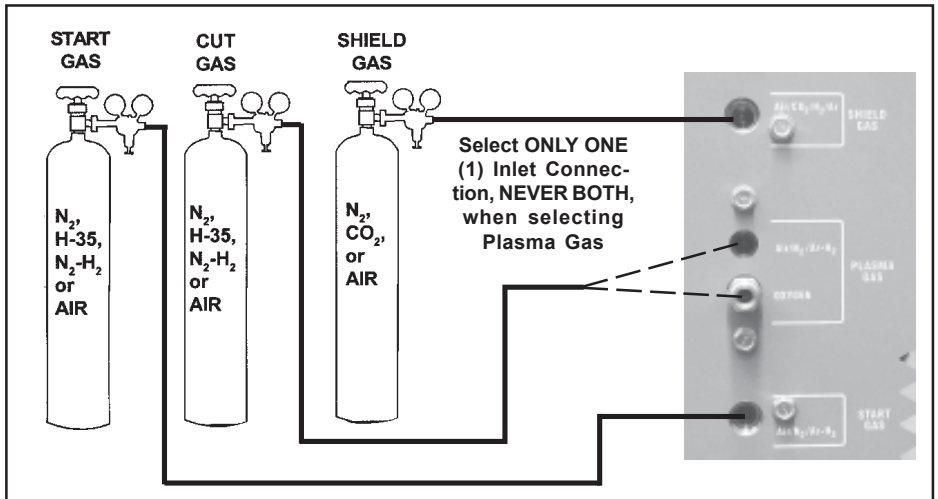


Fig. 14 - Gas Connections

F. WORK and EARTH CONNECTIONS

1. Connect terminal lug end of the work cable assembly to stud on lower left corner of front panel. Nut should be wrench tight. (Fig. 6). Electrically connect work cable to work piece. The connection must be made to a clean, exposed metal surface free of paint, rust, mill scale, etc. (Fig. 6)

2. Make sure workpiece is connected to an approved earth ground. Use copper ground cable equal to or larger than the power supply chassis ground listed in Table 1.

CAUTION

Operating the unit without coolant will cause permanent damage to coolant pump.

G. TORCH COOLANT PREPARATION

1. Remove the cap from the coolant filter tank. Fill coolant tank with 2 gallons (7.5 liters) of plasma system coolant (P/N 156F05) - supplied with the package. The coolant also provides antifreeze protection down to -34°F (1.1°C).

   Due to high electrical conductivity, use of tap water or commercial antifreeze is NOT recommended for torch cooling. Use of tap water can result in algae growth in the water cooler and torch. Automotive type antifreeze will adversely affect starting and will form deposits in the torch that will cause damage.

WARNING

Do not use commercial antifreeze or tap water. Equipment will malfunctio and damage will occur.

2. With installation completed, check all gas and coolant fittings for leaks using a standard solution.

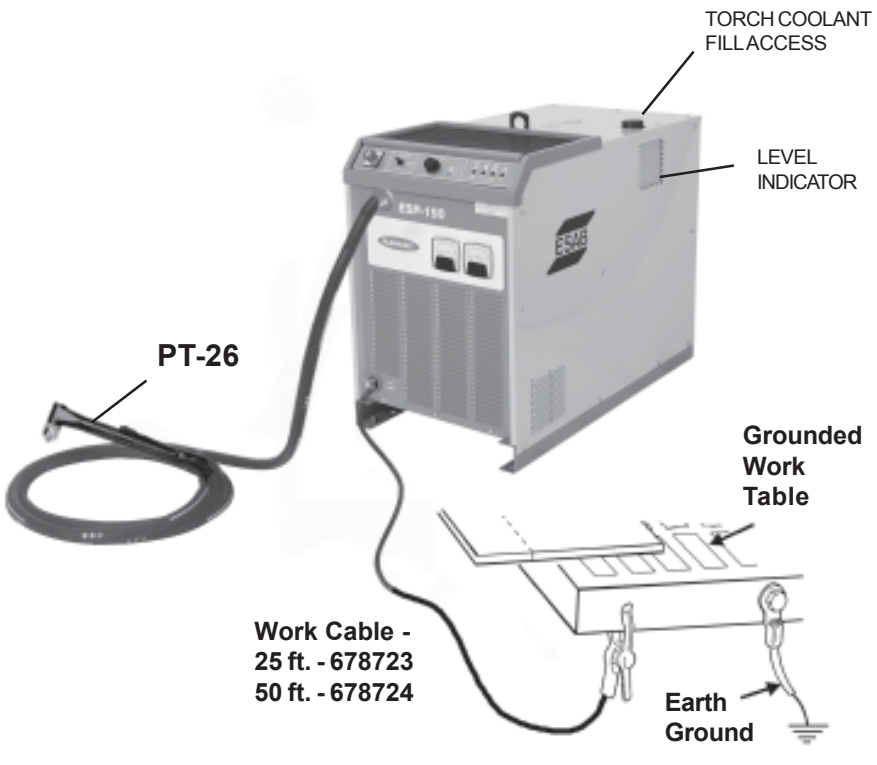


Fig. 15 - Access for filling Torch Coolant Tank

This section provides descriptions of the power source controls and general operating procedures plus, some tips on cut quality.

CONTROLS AND INDICATORS

The status lights located on the front of the top lid of the ESP-150 console provide the conditions of the circuitry during a normal plasma arc cutting operation. By knowing the proper sequencing of events and by observing the status lights one can troubleshoot the console in a short time to minimize downtime.

None of these lights will function unless proper input voltage is applied with the links on the input terminal board (TB) properly connected for the input voltage; the ON-OFF power switch is ON; and the top lid of the console is closed firmly.

The following are the functions of each control:

POWER (ROS) — Energizes power to the Fan, Water Cooler and Control Circuitry. This readies the unit for operation.

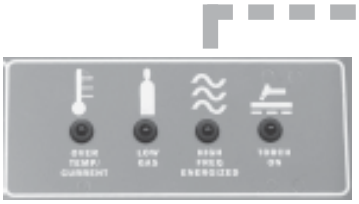
GAS MODE (OSS) — CUT - Allows for setup of cut gas pressure and flow; START/SHIELD - allows setup of start and shield gas pressure and flow; and OPERATE - position to use for cutting operations.

CURRENT CONTROL — Controls desired cutting current for optimizing speed and cut thickness. See Application Data on pages 27 through 28.

OVER TEMP — Will light if any (one or more) thermal switch in the console is open due to overheating. (This light may be dim when the gas flow is in the post-flow mode.) If light comes on, stop cutting operations and allow unit to cool down (with fan running) until light goes out. If the light is on and you suspect the unit is cool, then check for defective thermal switch(es) or loose connections.

READY/LOW GAS — This light serves as a READY light, torch switch and operate/set switch check as well as low gas flow or pressure indicator. It will light when the unit is at rest or READY (power ON-OFF switch is ON. It will continue to be lit when operate/set switch (OSS) is placed in the SET position even when proper gas flow or pressure is set properly. The light will not go out when the OSS switch is placed in the OPERATE position (gas solenoid valves will shut off).

In the operate mode, this light will then function as a LOW GAS light. After depressing the torch switch button and the LOW GAS lights up during a cutting operation, gas pressure or flow is insufficient.



HIGH FREQ ENERGIZED — This will light when the unit is in the OPERATE mode and the torch switch button is depressed. It should remain lit until the main cutting arc is established. It indicates that proper voltage (approx. 115 VAC) is applied to the primary of the high frequency transformer (HFTR). The voltage is applied to the HFTR through proper operation of the pilot arc contactor (PAC).

TORCH ON — This will light when the power supply is delivering the voltage to generate an arc (whether or not the main arc has been established). It is indicating there is greater than 50 volts between NEG output and WORK terminals. **Never touch the front end parts or make any adjustments to the torch if the TORCH ON light is on, even when the power ON-OFF is OFF.**

CAUTION

Never, under any circumstances, operate the power supply with the cover removed. In addition to the safety hazard, improper cooling may cause damage to internal components. Keep side panels closed when unit is energized. Also make sure you are adequately protected before you start cutting — protective helmet and gloves should always be worn. Refer to page 2 for additional operating precautions.

CAUTION

Voltage is available at the POWER On-Off switch on the hinged top cover when voltage is applied to the input terminal board even when the POWER switch is OFF.

WARNING

Before making any adjustments or performing any maintenance on the torch, make sure the power to the torch is shut off.

WARNING

ARC RAYS CAN BURN EYES AND SKIN, NOISE CAN DAMAGE HEARING!

Wear eye, ear, and body protection. Wear the usual protective gloves, clothing, and helmet. Helmet with filter lens shade No. 6 or 7 should provide adequate protection for your eyes.

Never touch any parts forward of the torch handle (tip, heat shield, electrode, etc.) unless the Power switch is in the OFF position.

ESP-150 ADJUSTMENTS

1. Slowly open each gas cylinder valve.
2. Place the ESP-150 GAS MODE and POWER switches in the OPERATE and OFF positions.
3. Place the primary (wall) switch in the ON position.
4. Place POWER to READY position. POWER light should light up. Fan should be running.
5. With GAS MODE switch in START/SHIELD position gas solenoid valves should be open. Adjust the START gas and SHIELD regulators to deliver the pressures specified in Table 2.

   Place switch in CUT position and adjust CUT Gas regulator to deliver pressures specified in Table 2.
6. Allow the gases to flow for a few minutes. This should remove any condensation that may have accumulated during shut down.
7. Place the GAS MODE switch in the OPERATE position. This will shut off the gas flows.
8. Adjust CURRENT CONTROL knob to approximate cutting current desired.

OPERATION

1. Position the torch on the workpiece by resting the heatshield on the edge of the workpiece where you intend to start the cut.
2. Lower your protective helmet and then lift the torch about 1/8-in. above the workpiece.
3. Push down on the torch switch button mounted on the torch handle. Pilot arc contactor and high frequency will energize, and gas will start flowing. Two seconds later, the main contactor will come on. The pilot arc should then transfer to the cutting arc.

NOTE: If cutting arc does not start within 6 seconds, the pilot arc will shut off. Release torch switch. Check to be sure gas pressures are adequate, work cable is firmly connected to workpiece, torch was about 1/8 to 1/4-in. above workpiece, etc. Then start from step 1 again.

4. For manual and mechanized cutting, maintain a standoff (torch-to-work distance) of about 3/8-in. (stand off guide, P/N 36648, provides that distance). Keep the torch head vertical, and move it at a rate that produces the desired cut quality. The cutting should produce a straight fine spray of molten metal emitting from beneath the workpiece as illustrated in Fig. 16. For mechanized cutting, see Table 2 or 3 for recommended cutting speed range.
5. If cutting arc is lost during a cut, the pilot arc will immediately reignite as long as the torch switch is depressed. You then have about 6 seconds to move the torch close enough to work to re-establish the cutting arc.

WARNING

Do NOT operate the unit with the cover removed.

Do NOT apply power to the unit while holding or carrying the unit.

Do NOT touch any torch parts with power switch on.

CAUTION

Position the ESP-150 at least 10 feet (3 meters) from the cutting area. Sparks and hot slag from the cutting operation can damage the unit.

6. The cutting arc will extinguish at the end of the cut; however, the torch switch should be released to keep the pilot arc from reigniting.
7. When cutting operation is completed, wait a few minutes before placing the POWER switch to the OFF position so that the cooling fan has time to remove the heat from the unit. Then shut off the primary power at the main disconnect switch.

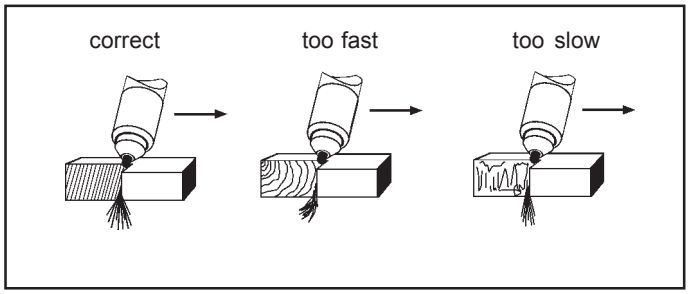


Fig. 16 - Effect of Cutting Speed

With a positive cut angle, the top dimension is slightly less than the bottom dimension. With a negative cut angle, the top dimension is slightly greater than the bottom dimension. The cut angle is controlled by the standoff (arc voltage), cutting speed and cutting current. If the cutting speed and the cutting current are correct and the part has an excessive positive angle, then the standoff is too high. Begin lowering the arc voltage in increments of 5 volts, observing cut squareness. There will always be slight top edge rounding of the part when using Nitrogen.

The optimum torch height is a point just before the part begins to develop a negative cut angle. To expand upon the other two variables; with the correct torch standoff, excessive cutting speed will result in a positive cut angle; insufficient cutting speed will produce a negative cut angle. If the cutting current is too high or low a positive cut angle will be produced.

Arc Voltage/Standoff - Interactive parameters that are proportional. The higher the torch above the plate (standoff), the higher the operating voltage required and vice versa.

Lag Lines - These lines appear on the cut surface. They are of assistance in determining if your process parameters are correct.

STANDOFF AND CUT QUALITY

Standoff (Arc Voltage) has a direct influence on cut quality and squareness. It is recommended that prior to cutting , that all cutting parameters are set to the manufacturer's suggested conditions. Refer to the Process Tables for recommendations. A sample cut should be made using actual part material followed by close examination of the part.

If the cut face of the part has excessive bevel or rounded top edge, it may be that the standoff is set too high. When standoff is controlled by an arc voltage height control, reducing the arc voltage setting will reduce the standoff.

Lower the standoff until the excessive bevel or rounded top edge disappears. The characteristics of plasma cutting hinder production of a perfectly square cut. On material thicknesses of 1/4 inch or greater, a standoff too close may result in a negative cut angle.

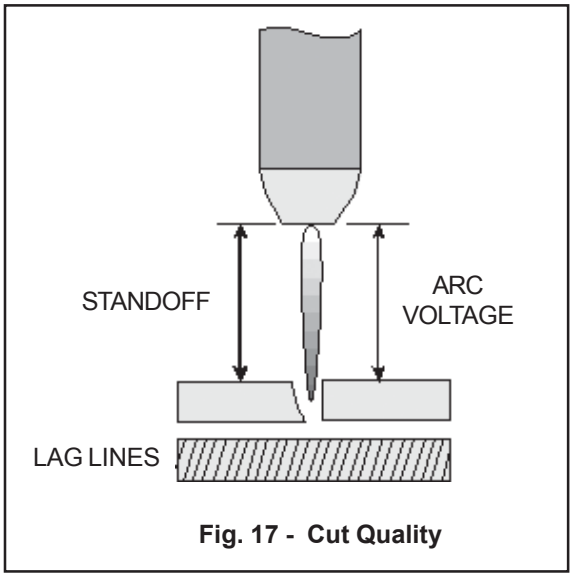


Fig. 17 - Cut Quality

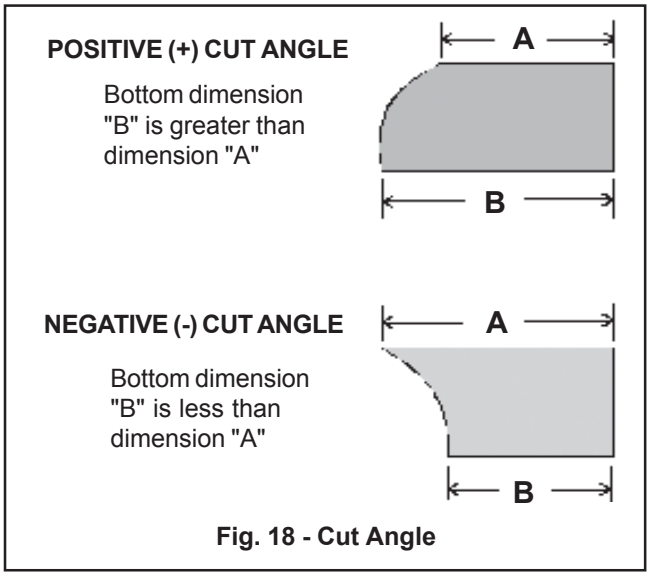


Fig. 18 - Cut Angle

Fig. 19 - Arc Voltage Too High (Positive Cut Angle)
Correct Cutting Speed
Positive Cut Angle
Rounded Top Edge
More Dross
Top Dross
Cut Face Smooth

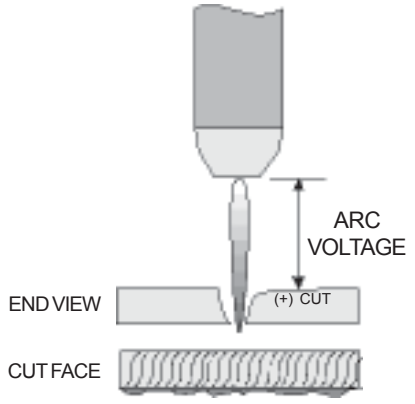


Fig. 20 - Arc Voltage Correct
Correct Cutting Speed
No Top Dross
Square Top Edge
Cut Face Smooth
Little or No Bottom Dross
Uniform Lag Lines

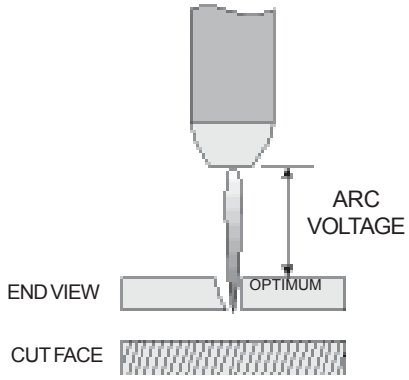


Fig. 21 - Arc Voltage Too Low (Negative Cut Angle)
Correct Cutting Speed
Under Cut Top Edge
Negative Cut Angle
Dross
Rough Cut Face

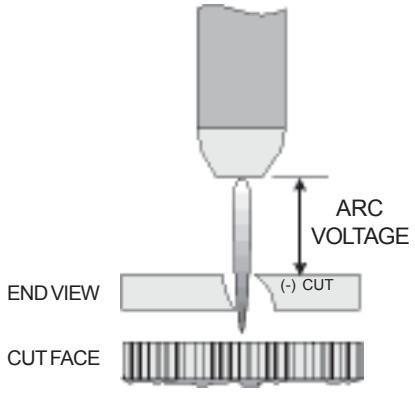
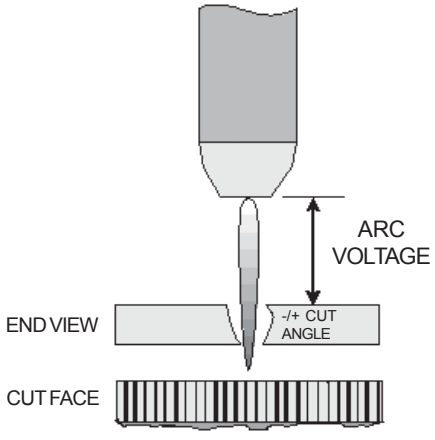


Fig. 22 - Arc Voltage Too Low (-/+ Cut Angle)
Correct Cutting Speed
Under Cut Top Edge
Negative Cut Angle
Dross
Rough Cut Face
Vertical Serrated Lag Lines



DROSS FORMATION

Cutting speed, gas selection and variations in metal composition contribute to dross formation. The correct cutting standoff also has an influence on dross formation. If the arc voltage is set too high, the cut angle becomes positive. In addition, dross forms on the bottom edge of the part. This dross can be very tenacious and require chipping and grinding for removal. Setting the cutting voltage too low results in undercutting the parts or negative cut angle. Dross formation occurs but in most cases it is easily removed.

Top Dross

Top dross usually appears as splatter near the top edge of the kerf. This is a result of torch standoff (arc voltage) set too high or cutting speed set too fast. Most operators use the parameter charts for recommended speed. The most common problem is torch standoff or arc voltage control. Simply lower the voltage settings in increments of 5 volts until the top dross disappears. If an arc voltage control is not used, the torch can be lowered manually until the dross disappears.

TOP DROSS:

Splatter appears on the top edge of both pieces of the plate.

Lower the voltage in increments of 5 volts dc (maximum) until top dross disappears.

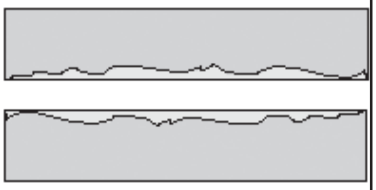


Fig. 23 - Top Dross Formation

HIGH SPEED DROSS:

Fine roll over dross that welds to bottom of edge. Cleaning requires chipping or grinding.

Fig. 24 - High Speed Dross

LOW SPEED DROSS

Globular dross that forms in large deposits. Comes off very easily.

Fig. 25 - Low Speed Dross Formation

SUMMARY

Arc voltage is a dependent variable. It is dependent upon cutting amperage, nozzle size, torch standoff, cut gas flow rate and cutting speed. An increase in arc voltage can result from a decrease in cutting speed, an increase in cutting amperage, a decrease in nozzle size, an increase in gas flow and an increase in torch standoff. Assuming that all of the variables are set as recommended, torch standoff becomes the most influential variable to the process. Good and accurate height control is a necessity in producing excellent cut quality.

COMMON CUTTING PROBLEMS

WARNING

Tripped circuit breaker (located under the top hinged cover) may indicate dangerous high voltage existed between the work cable and earth ground. This is usually caused by a missing or poor connection of the work cable to the work piece. The work cable MUST be electrically connected to the work piece to prevent dangerous shock conditions.

The following is a listing of common cutting problems and the probable cause. If problems are determined to be caused by the ESP-150, refer to the maintenance section of this manual. If the problem is not corrected after referring to the maintenance section, contact your ESAB representative.

A. Insufficient Penetration:
1. Cutting speed too fast
2. Damaged cutting nozzle
3. Improper gas settings
4. Inadequate delay for pierce

B. Main Arc Extinguishes:
1. Cutting speed too slow

C. Dross Formation:
1. Cutting speed too fast or too slow
2. Improper air pressure
3. Faulty nozzle or electrode
4. Improper standoff
5. Current too low

D. Double Arcing:
1. Low air pressure
2. Damaged cutting nozzle
3. Loose cutting nozzle
4. Heavy spatter
5. Nozzle touches work while cutting
6. Pierce height too low
7. Current too low

E. Uneven Arc:
1. Damaged cutting nozzle or worn electrode

F. Unstable Cutting Conditions:
1. Incorrect cutting speed
2. Loose cable or hose connections
3. Electrode and/or cutting nozzle in poor condition

G. Main Arc Does Not Strike:
1. Loose connections
2. Work clamp not connected
3. Gas pressures not correct
4. Insufficient coolant to operate flow switch

H. Poor Consumable Life:
1. Improper gas pressure
2. Contaminated air supply
3. Improper gas/electrode combination
4. Torch hitting work piece or turned up parts
5. Parts damaged by double arcing (see D above)
6. Use of non-genuine parts
7. Water leaks in torch
8. Torch not purged after changing consumables or idle period
9. Using wrong consumables for selected gases

STANDARD CONDITIONS

The cutting speeds and conditions in the following tables were selected to give the best quality with a particular gas combination at a specific current.

Consumables - Refer to PT-26 Torch manual for recommended parts for these conditions. Use of parts in combinations and applications other than as described herein can result in damage to the torch or poor performance.

Gas and Current Selection- Refer to Page 28 and the following tables to chose the most appropriate conditions for your application.

Table 2. PT-26 Carbon Steel Cutting Data

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m)	Cutting Height in.(mm)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
CS-1/8 (3.2)	50	195 (4.95)	5/16 (8)	Air - 30 (2.1)	Air - 60 (4.14)	Air - 50 (3.45)
CS-3/16 (4.7)		150 (3.8)				
CS-1/4 (6.35)		100 (2.58)				
CS-5/16 (8)		75 (1.9)				
CS-3/8 (9.5)		50 (1.27)				
CS-1/2 (12.7)		25 (.63)				
CS-5/8 (15.9)		12 (.3)				
CS-3/4 (19)		6 (.15)				
CS-1 (25.4)		2 (.05)				
CS-1/16 (1.6)	150	175 (4.45)	5/16 (8)	Air - 30 (2.1)	Air - 60 (4.14)	Air - 50 (3.45)
CS-1/8 (3.2)		155 (3.94)				
CS-1/4 (6.3)		137 (3.48)				
CS-5/16 (8)		125 (3.17)				
CS-3/8 (9.5)		87 (2.2)				
CS-1/2 (12.7)		76 (1.93)				
CS-5/8 (15.9)		62 (1.57)				
CS-3/4 (19)		50 (1.27)				
CS-1 (25.4)		30 (.76)				
CS-1-1/8 (28.6)		25 (.63)				
CS-1-1/4 (31.7)		20 (.5)				
CS-1-3/8 (34.9)		15 (.38)				
CS-1-1/2 (38)		13 (.33)				
CS-1-3/4 (44.5)		6 (.15)				
CS-2 (50.8)		4 (.10)				

Table 3 - PT-26 Aluminum Cutting Data

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m)	Cutting Height in.(mm)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
AL-1/4 (6.35)	150	112 (2.84)	5/16 (8)	H-35 or N_2 30 (2.1)	H-35 - 50 (3.45)	Air - 50 (3.45)
AL-5/16 (8)		100 (2.54)				
AL-3/8 (9.6)		93 (2.36)				
AL-1/2 (12.7)		78 (1.98)				
AL-5/8 (15.9)		63 (1.6)				
AL-3/4 (19)		52 (1.32)				
AL-1 (25.4)		37 (.94)				
AL-1-1/8 (28.6)		30 (.76)				
AL-1-1/4 (31.7)		25 (.63)				
AL-1-3/8 (34.9)		20 (.5)				
AL-1-1/2 (38)		18 (.46)				
AL-1-3/4 (44.5)		12 (.3)				
AL-2 (50.8)		10 (.25)				

RECOMMENDED GAS AND CURRENT

The following provide the recommended gas and current selection for common metals to obtain the best cutting results.

CARBON STEEL		**STAINLESS STEEL**	
1/8" (3.2mm) and Thinner	50 / 65 Amps, Air Plasma/Air Shield.	1/8" (3.2mm) and Thinner	50 - 65 Amps, N_2 Plasma/N_2 Shield produces best surface but light dross on 1/8" material.
3/16 - 1/2 (4.8-12.7mm)	100 Amps, Plasma/Air Shield. 100 Amps, Air Plasma/Air Shield is also good but there will be bottom dross on 1/2" (12.7mm) material.		50 - 65 Amps, Air Plasma/Air Shield can produce dross free cuts but the surface is rough.
1/2" - 2" (12.7mm - 50mm)	150 Amps, Plasma/Air		
STAINLESS STEEL		**ALUMINUM**	
1/4 - 3/8" (3.2-9.6mm)	100 Amps, N_2 Plasma/N_2 Shield can produce little or no dross and good surface quality through 1/2" (12.7mm) material.	1/4" (6.4mm) and Thinner	50/65 Amps, N_2 Plasma/N_2 Shield usually produces fairly smooth, dross free cuts.
	100 Amps, Air Plasma/Air Shield is as good on bottom dross but produces a rougher cut surface.		50/65 Amps, Air Plasma/Air Shield produces much rougher cut surfaces.
		1/4" (6.4mm) and Thicker	150 Amps, Plasma/N2 H-35