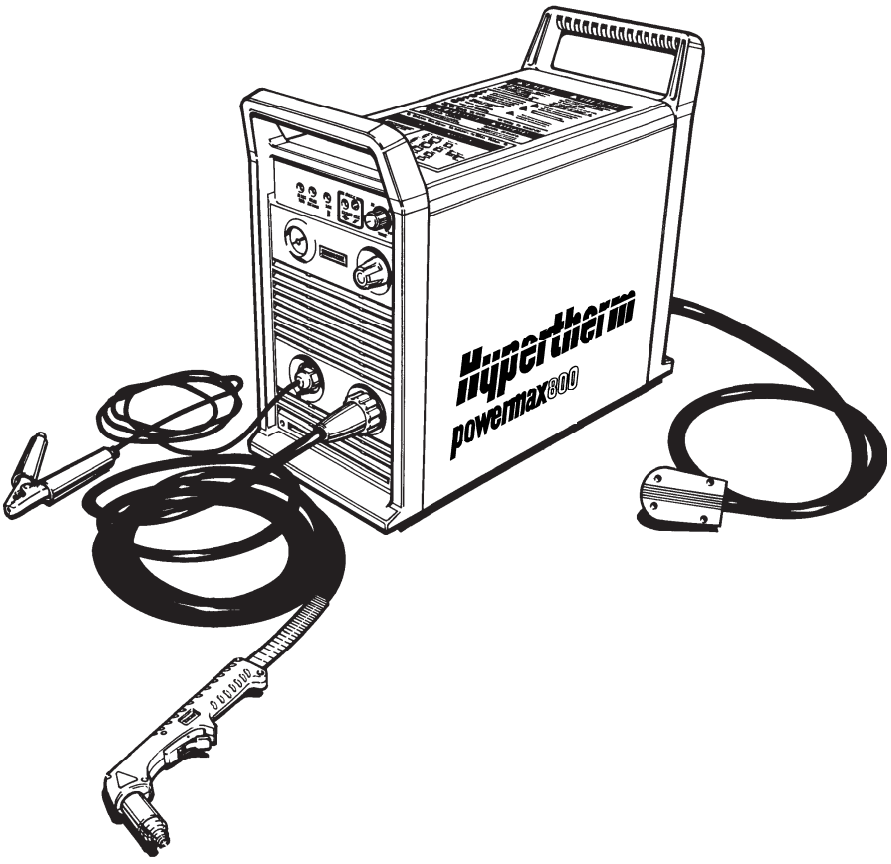
# powermax800®

## *Plasma Arc Cutting System*

***Operator Manual***
***802270 Revision 5***




CE

*EN50199*
*EN50192*

# powermax800

## Plasma Arc Cutting System

# Operator Manual
# IM-227
# (P/N 802270)

**Revision 5 November, 2013**

**Hypertherm, Inc.**
**P.O. Box 5010**
**Hanover, New Hampshire 03755-5010**
**Tel.: 603 643-3441**
**Fax: 603 643-5352**

**© Copyright 2013 Hypertherm, Inc.**
**All Rights Reserved**

**HYPERTHERM and POWERMAX are trademarks of Hypertherm, Inc. and may be registered in the United States and/or other countries.**

## *Hypertherm Offices Worldwide*:


**Hypertherm, Inc.**
**Etna Road, P.O. Box 5010**
**Hanover, NH 03755 USA**
**Tel.: (603) 643-3441 (Main Office)**
**Fax: (603) 643-5352 (All Departments)**
**Tel.: (800) 643-9878 (Technical Service)**
**Tel.: (800) 737-2978 (Customer Service)**

**Hypertherm Plasmatechnik GmbH**
**Technologiepark Hanau**
**Rodenbacher Chaussee 6**
**D–63457 Hanau-Wolfgang, Germany**
**Tel.: 49 6181 58 2100**
**Fax: 49 6181 58 2134**

**European Technical Support Organization (ETSO)**
**Technologiepark Hanau**
**Rodenbacher Chaussee 6**
**D–63457 Hanau-Wolfgang, Germany**
**Tel.: 49 6181 58 2100**
**Fax: 49 6181 58 2134**

**Hypertherm Singapore Pte Ltd**
**No. 19 Kaki Bukit Road 2**
**K.B. Warehouse Complex**
**Singapore 417847, Republic of Singapore**
**Tel.: 65 841 2489**
**Fax: 65 841 2490**

**Hypertherm U.K.**
**9 Berkeley Court • Manor Park**
**Runcorn, Cheshire, England WA7 1TQ**
**Tel.: 44 1928 579 074**
**Fax: 44 1928 579 604**

**Hypertherm France**
**10, Allée de l'Isara**
**F-95000 Cergy-Pontoise, France**
**Tel.: 33 1 34 24 03 05**
**Fax: 33 1 34 25 09 64**

**Hypertherm Italy**
**Via Stilicone 18**
**20154 Milan, Italy**
**Tel.: 39 2 34 53 22 11**
**Fax: 39 2 34 53 20 18**

**EMC INTRODUCTION**

The 400V CE power supply has been built in compliance with standard EN50199. To ensure that the equipment works in a compatible manner with other radio and electronic systems, the equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN50199 may not be adequate to completely eliminate interference when the affected equipment is in close proximity or has a high degree of sensitivity. In such cases it may be necessary to use other measures to further reduce interference.

This plasma equipment should be used only in an industrial environment. It may be difficult to ensure electromagnetic compatibility in a domestic environment.

**INSTALLATION AND USE**

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

**ASSESSMENT OF AREA**

Before installing the equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:
a. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.
b. Radio and television transmitters and receivers.
c. Computer and other control equipment.
d. Safety critical equipment, for example guarding of industrial equipment.
e. Health of the people around, for example the use of pacemakers and hearing aids.
f. Equipment used for calibration or measurement.
g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.
h. Time of day that cutting or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

**METHODS OF REDUCING EMISSIONS**

**Mains Supply**

Cutting equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed cutting equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the cutting mains supply so that good electrical contact is maintained between the conduit and the cutting power source enclosure.

**Maintenance of Cutting Equipment**

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

**Cutting Cables**

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

**Equipotential Bonding**

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

**Earthing of Workpiece**

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

Note: The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC TC26 (sec)94 and IEC TC26/108A/CD Arc Welding Equipment Installation and Use.

**Screening and Shielding**

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

**WARNING**

**Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage caused by the use of other than genuine Hypertherm parts may not be covered by the Hypertherm warranty.**

## GENERAL

HYPERTHERM, Inc. warrants that Products shall be free from defects in materials and workmanship, under proper and normal use for which such Equipment is recommended, for a period of two (2) years, except only with respect to the Torch, for which the warranty period shall be one (1) year, from the date of its delivery to you.

HYPERTHERM, at its sole option, shall repair, replace, or adjust, free of charge, any Products covered by this warranty which shall be returned with HYPERTHERM's prior authorization (which shall not be unreasonably withheld), properly packed, to HYPERTHERM's place of business in Hanover, New Hampshire, all costs, insurance and freight prepaid, and which examination proves not to be free from defects in materials and workmanship. HYPERTHERM shall not be liable for any repairs, replacements, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph or with HYPERTHERM's written consent. This warranty shall not apply to any Product which has been mishandled, incorrectly installed, modified or assembled by you or any other person. HYPERTHERM shall be liable for breach of this warranty only if it receives written notice of such breach within the applicable warranty period specified herein above. THE FOREGOING SHALL CONSTITUTE THE SOLE REMEDY TO DISTRIBUTORS OR THEIR CUSTOMERS FOR ANY BREACH BY HYPERTHERM OF ITS WARRANTY.

## PATENT INDEMNITY

Except only in cases of Products not manufactured by HYPERTHERM or manufactured by a person other than HYPERTHERM not in strict conformity with HYPERTHERM's specifications, and in cases of designs, processes, formulae or combinations not developed or purported to be developed by HYPERTHERM, HYPERTHERM agrees to indemnify, protect and hold harmless Distributors and their customers against any and all liability or claims in any manner imposed upon or accruing against Distributors and their customers because of the use in or about the construction or operation of Equipment or any design, system, formula, combination, article or material which infringes or alleges to infringe on any patent or other right. Distributors shall notify HYPERTHERM promptly upon learning of any action or threatened action in connection with any such alleged infringement, and each party may appoint its own counsel for any such action or threatened action.

## DISCLAIMER OF OTHER WARRANTIES

HYPERTHERM MAKES NO WARRANTIES REGARDING PRODUCTS MANUFACTURED BY IT OR OTHERS (INCLUDING WITHOUT IMPLIED LIMITATION WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), EITHER EXPRESS OR IMPLIED, EXCEPT AS PROVIDED HEREIN. This warranty is in lieu of any and all warranties, express or implied, by law or otherwise; and Distributors are not authorized to give any other warranty purporting to be binding upon HYPERTHERM upon resale of Products to their customers. IN NO EVENT shall HYPERTHERM be liable for incidental or consequential damages or injury to the person or property of anyone by reason of any defect in any Equipment sold hereunder.

**ELECTROMAGNETIC COMPATIBILITY** ..... i

**WARRANTY** ..... ii

**SECTION 1 SAFETY** ..... 1-1
About Notes, Cautions & Warnings ..... 1-1
Safety Instructions ..... 1-2
- Eye Protection ..... 1-2
- Skin Protection ..... 1-2
- Toxic Fume Protection ..... 1-2
- Fire Prevention ..... 1-2
- Electric Shock Prevention ..... 1-2
- Explosion Prevention ..... 1-3
- Noise Protection ..... 1-4
- Grounding ..... 1-4
- Safety Reminders ..... 1-4
- Electronic Health Support Equipment ..... 1-4

**SECTION 1A SÉCURITÉ** ..... 1a-1
Au sujet des Notes, Attention et avertissement ..... 1a-1
Consignes de sécurité ..... 1a-2
- Protection des yeux ..... 1a-2
- Protection de la peau ..... 1a-2
- Prévention des vapeurs toxiques ..... 1a-2
- Prévention des incendies ..... 1a-2
- Prévention des chocs électriques ..... 1a-2
- Prévention des explosions ..... 1a-3
- Protection contre le bruit ..... 1a-4
- Mise à la masse et à la terre ..... 1a-4
- Rappels de sécurité ..... 1a-4
- Prothèses électroniques ..... 1a-4

**SECTION 2 DESCRIPTION & SPECIFICATIONS** ..... 2-1
Introduction ..... 2-2
Specifications ..... 2-3
PAC121 50A Torches ..... 2-4
IEC Symbols Used ..... 2-6

**SECTION 3 SETUP** ..... 3-1
Upon Receipt ..... 3-2
Claims ..... 3-2
Hoisting Requirements ..... 3-3
208/240/480 Voltage Configurations ..... 3-4
200/230/400 Voltage Configurations ..... 3-5
Power Cord Plugs ..... 3-6
Single-Phase and Three-Phase Power Cords - 208/240/480V, Three-Phase Power Cords - 600V ..... 3-6
Single-Phase and Three-Phase Power Cords - 200/230/400V ..... 3-6
Single-Phase and Three-Phase Power Configurations ..... 3-7
Power Requirements ..... 3-9
Grounding Requirements ..... 3-9

Work Cable and Clamp ..... 3-10
Gas Supply Requirements ..... 3-10
Gas Supply Connection ..... 3-11
Torch Lead Connection ..... 3-12
Machine Interface with PAC121MS ..... 3-13

**SECTION 4 OPERATION ..... 4-1**
Controls and Indicators ..... 4-2
Operating Instructions ..... 4-3
Operating Tips ..... 4-6
Cut Chart - 50A Standard Consumables ..... 4-12
Cut Chart - 40A Consumables ..... 4-13
Common Cutting Faults ..... 4-14

**SECTION 5 MAINTENANCE/PARTS ..... 5-1**
Introduction ..... 5-2
Routine Maintenance ..... 5-2
PAC121TS Torch Parts Removal and Replacement ..... 5-4
PAC121MS Torch Parts Removal and Replacement ..... 5-6
Basic Troubleshooting ..... 5-8
Technical Questions ..... 5-10
Parts ..... 5-11
Power Supplies - 208/240/480V ..... 5-15
Power Supplies - 200/230/400V ..... 5-15
Power Supplies - 400V CE ..... 5-16

**APPENDIX A CHANGING FUSES ..... a-1**
**APPENDIX B STANDARDS INDEX ..... b-1**
**APPENDIX C AERATION MANIFOLD ..... c-1**

**ILLUSTRATIONS**

**Figure 2-1** Powermax800 Hand Plasma Cutting System ..... 2-2
**Figure 2-2** Powermax800 Power Supply with Dimensions ..... 2-3
**Figure 2-3** PAC121TS Torch with Dimensions ..... 2-4
**Figure 2-4** PAC121MS Torch with Dimensions ..... 2-4
**Figure 2-5** S Mark Label ..... 2-5

**Figure 3-1** Powermax800 Power Supply Hoisting Setup ..... 3-3
**Figure 3-2** Rear Panel ..... 3-4
**Figure 3-3** 208V Configuration ..... 3-4
**Figure 3-4** 240V Configuration ..... 3-4
**Figure 3-5** 480V Configuration ..... 3-4
**Figure 3-6** 200V Configuration ..... 3-5
**Figure 3-7** 230V Configuration ..... 3-5
**Figure 3-8** 400V Configuration ..... 3-5
**Figure 3-9A** Single-Phase Power Configuration - 208/240/480V ..... 3-7
**Figure 3-9B** Single-Phase Power Configuration - 200/230/400V ..... 3-7
**Figure 3-10A** Three-Phase Power Configuration - 208/240/480V ..... 3-8
**Figure 3-10B** Three-Phase Power Configuration - 200/230/400V ..... 3-8

**Figure 3-10C** Three-Phase Power Configuration - 400V CE ..... 3-8
**Figure 3-11** Proper Work Clamp Connection ..... 3-10
**Figure 3-12** Recommended Three-Stage Air Filtration System ..... 3-11
**Figure 3-13** Rear Panel, Gas Supply Connection to Filter ..... 3-11
**Figure 3-14** ON/OFF Pendant Connection ..... 3-12
**Figure 3-15** Aligning the Machine Torch with Square ..... 3-13
**Figure 3-16** Machine Interface Cable and Signals ..... 3-13
**Figure 3-17** Feeding Arc Voltage Cable to Machine Interface Board ..... 3-14
**Figure 3-18** Machine Interface Board Connections for Arc Voltage ..... 3-14

**Figure 4-1** Powermax800 Controls and Indicators ..... 4-2
**Figure 4-2** Powermax800 Operating Indicators and Adjustments ..... 4-3
**Figure 4-3** Proper Work Clamp Connection ..... 4-4
**Figure 4-4** PAC121TS Torch Safety Trigger Operation ..... 4-5
**Figure 4-5A** Consumables ..... 4-7
**Figure 4-5B** Consumables - CE Compliance ..... 4-7
**Figure 4-6** Starting a Cut ..... 4-8
**Figure 4-7** Cutting a Circle ..... 4-9
**Figure 4-8** Dragging the Torch ..... 4-9
**Figure 4-9** Piercing ..... 4-10
**Figure 4-10** Gouging ..... 4-11

**Figure 5-1** Filter Assembly ..... 5-2
**Figure 5-2** Air Filter Removal ..... 5-3
**Figure 5-3** PAC121TS Torch Main Body Removal ..... 5-4
**Figure 5-4** PAC121TS Torch Switch Removal ..... 5-5
**Figure 5-5** PAC121MS Torch Assembly ..... 5-7
**Figure 5-6A** Consumable Parts ..... 5-11
**Figure 5-6B** Consumable Parts - CE Compliance ..... 5-12
**Figure 5-7** PAC121TS Torch Assembly and Leads ..... 5-13
**Figure 5-8** PAC121MS Torch Assembly and Leads ..... 5-14

**Figure a-1** F1 and F2 Fuse Location ..... a-1
**Figure c-1** Aeration Manifold ..... c-1

# Section 1 SAFETY

In this section:


About Notes< Cautions and Warnings ..... 1-1
Safety Instructions ..... 1-2
Eye Protection ..... 1-2
Skin Protection ..... 1-2
Toxic Fume Prevention ..... 1-2
Fire Prevention ..... 1-2
Electric Shock Prevention ..... 1-2
Explosion Prevention ..... 1-3
Compressed Gas Cylinders ..... 1-3
Pressure Regulators ..... 1-3
Hoses ..... 1-3
Noise Protection ..... 1-4
Grounding ..... 1-4
Input Power ..... 1-4
Work Cable ..... 1-4
Work Table ..... 1-4
Safety Reminders ..... 1-4
Electronic Health Support Equipment ..... 1-4


***Before using this plasma arc system. . . .***

***Each person who will operate this equipment, perform service or maintenance, or supervise its use must read the safety instructions and warnings in this manual and the labels on the equipment.***

## About Notes, Cautions and Warnings

Notes: Throughout this manual, useful information for operating the plasma system is presented in “notes”, such as shown in this paragraph.

**Cautions: Information in bold type and surrounded by a box describes a situation that may cause damage to the plasma system.**

**WARNINGS**

**Warnings describe situations that present a physical danger to the operator, and advice to avoid or correct the situation. Each type of warning includes applicable danger symbols, such as a hand burn, electrical shock, fire, explosion, etc.**

**WARNING — Instant-On Torches**

**Instant-on torches produce a plasma arc immediately after the torch switch is pushed.**

**Always hold a hand torch away from your body as a precaution against accidental torch firing. Be aware of this hazard, which has potential for serious bodily injury.**

**WARNING — Electric Shock**

- **Never touch the torch body, workpiece or the water in a water table when operating the plasma system.**
- **When using a water table, be sure that it is correctly connected to earth ground.**
- **Operating the plasma system completes an electrical circuit between the torch and the workpiece and anything touching the workpiece. The workpiece is part of the electrical circuit.**

## Eye Protection

- Wear dark safety glasses or goggles with side shields, or a welding helmet, in accordance with applicable national or local codes, to protect eyes against the plasma arc's ultraviolet and infrared rays.

| Arc Current | Lens Shade AWS (USA) | Lens Shade ISO-4850 |
|---|---|---|
| Up to 100 A | No. 8 | No. 11 |
| 100–200 A | No. 10 | No. 11-12 |
| 200–400 A | No. 12 | No. 13 |
| Over 400 A | No. 14 | No. 14 |

- Replace the glasses, goggles or helmet when the lens becomes pitted or broken.
- Warn other people in the area not to look directly at the arc unless they are wearing glasses, goggles or a helmet.
- Prepare the cutting area in a manner that reduces the reflection and transmission of ultraviolet light:
  - Paint walls and other surfaces with dark colors to reduce reflection.
  - Install protective screens or curtains to reduce ultraviolet transmission.

## Skin Protection

- Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal:
  - Gauntlet gloves, safety shoes and hat.
  - Flame-retardant clothing which covers all exposed areas.
  - Cuffless trousers to prevent entry of sparks and slag.

## Toxic Fume Prevention

- Keep the cutting area well ventilated.
- Remove all chlorinated solvents from the cutting area before cutting. Certain chlorinated solvents decompose when exposed to ultraviolet radiation to form phosgene gas.
- Wear proper breathing mask and use proper ventilation when cutting galvanized metal.
- Do not cut containers with toxic materials inside. Clean containers that have held toxic materials thoroughly before cutting.

**WARNING — Toxic Fumes**

**Do not cut metal or painted metals containing zinc, lead, cadmium or beryllium unless the operator, or anyone else subjected to the fumes, wears respiratory equipment or an air-supplied helmet.**

## Fire Prevention

- Make fire extinguishers available in the cutting area.
- Remove all combustible materials from the immediate cutting area to a distance of at least 35 feet (10 m).
- Quench freshly cut metal or allow metal to cool before handling it or bringing it into contact with combustible materials.
- Never use a plasma system to cut containers with potentially flammable materials inside. Such containers must be thoroughly cleaned prior to cutting.
- Ventilate potentially flammable atmospheres before cutting with a plasma system. When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.
- Never operate the plasma system in an atmosphere which contains heavy concentrations of dust, flammable gas or combustible liquid vapors unless properly vented.

## Electric Shock Prevention

All Hypertherm plasma systems use high voltage (up to 280 VDC) to initiate the plasma arc. Take the following precautions when operating the plasma system:

- Wear insulated gloves and boots, and keep body and clothing dry.
- Do not stand, sit or lie on—or touch—any wet surface when using the plasma system.
- Maintain proper insulation against electrical shock. If you must work in or near a damp area, use extreme caution.
- Provide a wall-mounted disconnect switch with properly sized fuses close to the power supply. This switch allows the operator to turn the power supply off quickly in an emergency situation.
- Conform to all local electrical codes for primary wiring sizes and types.
- Inspect the primary power cord frequently for damage or cracking of the cover. Bare wiring can kill. Do not use a system with a damaged power cord. Replace a damaged power cord immediately.
- Inspect the torch leads. Replace if frayed or damaged.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached during the cutting process.

## Electric Shock Prevention (continued)

- Before changing the torch parts, disconnect the main power or unplug the power supply. After changing torch parts and replacing the retaining cap, plug in the power supply again.
- Never bypass or shortcut the safety interlocks.
- Before removing a power supply cover for maintenance, disconnect the main power at the wall disconnect switch or unplug the power supply. To avoid exposure to severe electrical hazard, wait five minutes after disconnecting the main power to allow capacitors to discharge.
- Never operate the plasma system unless the power supply unit covers are in place. Exposed power supply connections present a severe electrical hazard.

## Explosion Prevention

**WARNING — Compressed Gas**

**The plasma system uses compressed gas. Observe proper precautions when handling and using compressed gas equipment and cylinders.**

- Do not use the plasma system if explosive dust or vapors may be present.
- Do not cut pressurized cylinders or any closed container.

**WARNING — Hydrogen Explosion Hazard**

**If your system uses hydrogen, remember that this is a flammable gas that presents an explosion hazard. Keep flames away from cylinders containing hydrogen mixtures and hoses that carry hydrogen mixtures. Also, keep flames and sparks away from the torch when using argon-hydrogen as the plasma gas.**

### Compressed Gas Cylinders

Handle and use compressed gas cylinders in accordance with safety standards published by the U.S. Compressed Gas Association (CGA), American Welding Society (AWS), Canadian Standards Association (CSA) or applicable national or local codes.

- Never use a cylinder that leaks or is physically damaged.
- Never use a cylinder that is not upright and secured in place.
- Never move or transport a cylinder without its protective valve cover in place.
- Never use a gas cylinder or its contents for any purpose other than that for which it is intended.
- Never lubricate cylinder valves with oil or grease.
- Never allow electrical contact between the plasma arc and a cylinder.
- Never expose cylinders to excessive heat, sparks, slag or open flame.
- Never use hammers, wrenches or other tools to open stuck cylinder valves.

## Pressure Regulators

- Be certain that all pressure regulators are in proper working condition.
- Never use a regulator for any gas other than that for which it is intended.
- Never use a regulator that leaks, creeps excessively or is physically damaged in any way.
- Never attempt to lubricate a regulator with oil or grease.

**WARNING — Hydrogen Detonation with Aluminum Cutting**

**When cutting aluminum underwater, or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece and detonate during plasma cutting operations.**

**Installing an aeration manifold on the floor of the water table is an effective way to eliminate the possibility of hydrogen detonation when cutting aluminum. Refer to the Appendix section of this manual for instructions on how to fabricate an aeration manifold.**

### Hoses

- Label and color-code all gas hoses in order to clearly identify the type of gas in each hose. Consult applicable national or local codes.
- Never use the oxygen hose for any gas other than oxygen.
- Examine hoses at regular intervals for leaks, wear, loose connections or other hazard.
- Replace hose that is damaged in any way.

### Hoses (continued)

- Keep hose lengths to a minimum to prevent damage, reduce pressure drop and to prevent possible flow restrictions.
- Prevent kinking by laying out hoses as straight as possible between termination points.
- Coil any excess hose and place it out of the way to prevent damage and to eliminate the danger of tripping.

## Noise Protection

The plasma cutting process can generate high levels of noise. Depending on the arc current, material being cut, acoustics and size of the cutting room, distance from the torch and other factors, acceptable noise levels as defined by national or local codes may be exceeded by your plasma system.

- Always wear proper ear protection when cutting or gouging with the plasma system.

## Grounding

### Input Power

- Be sure to connect the power cord ground wire to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, be sure to properly connect the power cord ground wire. Conform to Canadian Standards Association (CSA) standards by placing the power cord ground wire on the stud first; then place any other ground wires on top of the power cord ground. Fasten the retaining nut tightly.
- Tighten all electrical connections to avoid excessive heating.

### Work Cable

- Attach the work cable securely to the workpiece or the work table by making good metal-to-metal contact.
  Do not connect it to the piece that will fall away when the cut is complete.

### Work Table

- Connect the work table to a high-quality earth ground, in accordance with the U.S. National Electrical Code, Article 250, Section H, Grounding Electrode System, or other appropriate national or local codes.

## Safety Reminders

- Never bypass or shortcut the safety interlocks on any of the plasma system units.
- Except in Hypertherm's largest mechanized systems, all Hypertherm torches are designed with a safety interlock that prevents firing of the plasma arc when the retaining cap is loosened.
- Each Hypertherm plasma system is designed to be used only with specific Hypertherm torches. Do not substitute other torches which could overheat and present a potentially dangerous situation to the operator and any personnel in the area. Hypertherm's warranty does not cover problems caused by the use of torches not made by Hypertherm.
- Use only consumable parts and replacement parts made by Hypertherm. Hypertherm's warranty does not cover problems caused by the use of parts not made by Hypertherm.
- Never operate the plasma system with any of its covers not in place. This would be hazardous to the operator and other people in the area, and prevents the proper cooling of the equipment.

## Electronic Health Support Equipment

Plasma arc cutting and gouging systems create electric and magnetic fields that may interfere with the correct operation of electronic health support equipment, such as pacemakers or hearing aids. Any person who wears a pacemaker or hearing aid should consult a doctor before operating or being near any plasma system when it is in use. To minimize exposure to EMF:

- Keep both the work cable and the torch lead on one side of your body. Keep your body from coming in between the torch lead and the work cable.
- Route torch leads as close as possible to work cable.
- Do not wrap the torch lead or work cable around your body.
- Stay as far away from the power supply as possible.

## IDENTIFIER LES CONSIGNES DE SÉCURITÉ

Les symboles indiqués dans cette section sont utilisés pour identifier les risques éventuels. Si vous trouvez un symbole de sécurité, que ce soit dans ce manuel ou sur l'équipement, soyez conscient des risques de blessures et suivez les instructions correspondantes afin d'éviter ces risques.

## SUIVRE LES INSTRUCTIONS DE SÉCURITÉ

Lire attentivement toutes les consignes de sécurité dans le présent manuel et sur les étiquettes de sécurité se trouvant sur la machine.

- Les étiquettes de sécurité doivent rester lisibles. Remplacer immédiatement les étiquettes manquantes ou abîmées.
- Apprendre à faire fonctionner la machine et à utiliser correctement les commandes. Ne laisser personne utiliser la machine sans connaître son fonctionnement.
- Garder la machine en bon état. Des modifications non autorisées sur la machine peuvent engendrer des problèmes de sécurité et raccourcir la durée d'utilisation de l'équipement.

## DANGER AVERTISSEMENT PRÉCAUTION

Les signaux DANGER ou AVERTISSEMENT sont utilisés avec un symbole de sécurité, DANGER correspondant aux risques les plus sérieux.

- Les étiquettes de sécurité DANGER et AVERTISSEMENT sont situées sur la machine pour signaler certains dangers spécifiques.
- Les messages d'AVERTISSEMENT précèdent les instructions d'utilisation expliquées dans ce manuel et signalent les risques de blessures ou de mort au cas où ces instructions ne seraient pas suivies correctement.
- Les messages de PRÉCAUTION précèdent les instructions d'utilisation contenues dans ce manuel et signalent que le matériel risque d'être endommagé si les instructions ne sont pas suivies correctement.

## LE COUPAGE PEUT PROVOQUER UN INCENDIE OU UNE EXPLOSION

**Prévention des incendies**

- Avant de commencer, s'assurer que la zone de coupage ne présente aucun danger. Conserver un extincteur à proximité.
- Éloigner toute matière inflammable à une distance d'au moins 10 m du poste de coupage.
- Tremper le métal chaud ou le laisser refroidir avant de le manipuler ou avant de le mettre en contact avec des matériaux combustibles.
- Ne jamais couper des récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.
- Aérer toute atmosphère potentiellement inflammable avant d'utiliser un système plasma.
- Lors de l'utilisation d'oxygène comme gaz plasma, un système de ventilation par aspiration est nécessaire.

**Prévention des explosions**

- Ne pas couper en présence de poussière ou de vapeurs.
- Ne pas couper de bouteilles, de tuyaux ou autres récipients fermés et pressurisés.
- Ne pas couper de récipients contenant des matières combustibles.

### AVERTISSEMENT

Risque d'explosion
Argon-hydrogène et méthane

L'hydrogène et le méthane sont des gaz inflammables et potentiellement explosifs. Conserver à l'écart de toute flamme les bouteilles et tuyaux contenant des mélanges à base d'hydrogène ou de méthane. Maintenir toute flamme et étincelle à l'écart de la torche lors de l'utilisation d'un plasma d'argon-hydrogène ou de méthane.

### AVERTISSEMENT

Détonation de l'hydrogène lors du coupage de l'aluminium

- Lors du coupage de l'aluminium sous l'eau, ou si l'eau touche la partie inférieure de la pièce d'aluminium, de l'hydrogène libre peut s'accumuler sous la pièce à couper et détonner lors du coupage plasma.
- Installer un collecteur d'aération au fond de la table à eau afin d'éliminer les risques de détonation de l'hydrogène. Se référer à l'annexe du manuel pour plus de renseignements sur les collecteurs d'aération.

## LES CHOCS ÉLECTRIQUES PEUVENT ÊTRE FATALS

Toucher une pièce électrique sous tension peut provoquer un choc électrique fatal ou des brûlures graves.

- La mise en fonctionnement du système plasma ferme un circuit électrique entre la torche et la pièce à couper. La pièce à couper et tout autre élément en contact avec cette pièce font partie du circuit électrique.
- Ne jamais toucher le corps de la torche, la pièce à couper ou l'eau de la table à eau pendant le fonctionnement du système plasma.

**Prévention des chocs électriques**

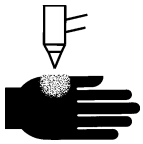
Tous les systèmes plasma Hypertherm utilisent des hautes tensions pour le coupage (souvent de 200 à 400 V).On doit prendre les précautions suivantes quand on utilise le système plasma :

- Porter des bottes et des gants isolants et garder le corps et les vêtements au sec.
- Ne pas se tenir, s'asseoir ou se coucher sur une surface mouillée, ni la toucher quand on utilise le système plasma.
- S'isoler de la surface de travail et du sol en utilisant des tapis isolants secs ou des couvertures assez grandes pour éviter tout contact physique avec le travail ou le sol. S'il s'avère nécessaire de travailler dans ou près d'un endroit humide, procéder avec une extrême prudence.
- Installer un sectionneur avec fusibles appropriés, à proximité de la source de courant. Ce dispositif permet à l'opérateur d'arrêter rapidement la source de courant en cas d'urgence.
- En cas d'utilisation d'une table à eau, s'assurer que cette dernière est correctement mise à la terre.
- Installer et mettre à la terre l'équipement selon les instructions du présent manuel et conformément aux codes électriques locaux et nationaux.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fendu. Remplacer immédiatement un cordon endommagé. **Un câble dénudé peut tuer**.
- Inspecter et remplacer les câbles de la torche qui sont usés ou endommagés.
- Ne pas saisir la pièce à couper ni les chutes lors du coupage. Laisser la pièce à couper en place ou sur la table de travail, le câble de retour connecté lors du coupage.
- Avant de vérifier, de nettoyer ou de remplacer les pièces de la torche, couper l'alimentation ou débrancher la prise de courant.
- Ne jamais contourner ou court-circuiter les verrouillages de sécurité.
- Avant d'enlever le capot du système ou de la source de courant, couper l'alimentation électrique. Attendre ensuite 5 minutes pour que les condensateurs se déchargent.
- Ne jamais faire fonctionner le système plasma sans que les capots de la source de courant ne soient en place. Les raccords exposés de la source de courant sont extrêmement dangereux.
- Lors de l'installation des connexions, attacher tout d'abord la prise de terre appropriée.
- Chaque système plasma Hypertherm est conçu pour être utilisé uniquement avec des torches Hypertherm spécifiques. Ne pas utiliser des torches inappropriées qui pourraient surchauffer et présenter des risques pour la sécurité.

## LE COUPAGE PEUT PRODUIRE DES VAPEURS TOXIQUES

Le coupage peut produire des vapeurs et des gaz toxiques qui réduisent le niveau d'oxygène dans l'air et peuvent provoquer des blessures, voire la mort.

- Conserver le poste de coupage bien aéré ou utiliser un masque respiratoire homologué.
- Ne pas procéder au coupage près d'endroits où s'effectuent le dégraissage, le nettoyage ou la vaporisation. Certains solvants chlorés se décomposent sous l'effet des rayons ultraviolets et forment du phosgène.
- Ne pas couper des métaux peints ou contenant des matières toxiques comme le zinc (galvanisé), le plomb, le cadmium ou le béryllum, à moins que la zone de travail soit très bien ventilée et que l'opérateur porte un masque respiratoire. Les revêtements et métaux contenant ces matières peuvent produire des vapeurs toxiques lors du coupage.
- Ne jamais couper de récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.



## L'ARC PLASMA PEUT PROVOQUER DES BLESSURES OU DES BRÛLURES

**Torches à allumage instantané**
L'arc plasma s'allume immédiatement après que la torche soit mise en marche.

L'arc plasma coupe facilement les gants et la peau.
- Rester éloigné de l'extrémité de la torche.
- Ne pas tenir de métal près de la trajectoire de coupe.
- Ne jamais pointer la torche vers soi ou d'autres personnes.

## LES RAYONS DE L'ARC PEUVENT BRÛLER LES YEUX ET LA PEAU

**Protection des yeux** Les rayons de l'arc plasma produisent de puissants rayons visibles ou invisibles (ultraviolets et infrarouges) qui peuvent brûler les yeux et la peau.
- Utiliser des lunettes de sécurité conformément aux codes locaux ou nationaux en vigueur.
- Porter des lunettes de protection (lunettes ou masque muni d'écrans latéraux ou encore masque de soudure) avec des verres teintés appropriés pour protéger les yeux des rayons ultraviolets et infrarouges de l'arc.

| Courant de l'arc | Puissance des verres teintés AWS (É.-U.) | ISO 4850 |
|---|---|---|
| Jusqu'à 100 A | N° 8 | N° 11 |
| 100-200 A | N° 10 | N° 11-12 |
| 200-400 A | N° 12 | N° 13 |
| Plus de 400 A | N° 14 | N° 14 |

**Protection de la peau** Porter des vêtements de sécurité pour se protéger contre les brûlures que peuvent causer les rayons ultraviolets, les étincelles et le métal brûlant :
- Gants à crispin, chaussures et casque de sécurité.
- Vêtements ignifuges couvrant toutes les parties exposées du corps.
- Pantalon sans revers pour éviter que des étincelles ou des scories puissent s'y loger.
- Avant le coupage, retirer de ses poches tout objet combustible comme les briquets au butane ou les allumettes.

**Zone de coupage** Préparer la zone de coupage afin de réduire la réverbération et la transmission de la lumière ultraviolette :
- Peindre les murs et autres surfaces de couleur sombre pour réduire la réflexion de la lumière.
- Utiliser des écrans et autres dispositifs de protection afin de protéger les autres personnes de la lumière et de la réverbération.
- Prévenir les autres personnes de ne pas regarder l'arc. Utiliser des affiches ou des panneaux.

## MISE À LA MASSE ET À LA TERRE

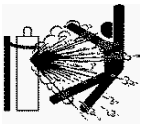
**Câble de retour** Bien fixer le câble de retour (ou de masse) à la pièce à couper ou à la table de travail de façon à assurer un bon contact métal-métal. Ne pas fixer le câble de retour à la partie de la pièce qui doit se détacher.

**Table de travail** Raccorder la table de travail à la terre, conformément aux codes de sécurité locaux ou nationaux appropriés.

**Alimentation**
- S'assurer que le fil de terre du cordon d'alimentation est connecté à la terre dans le coffret du sectionneur.
- S'il est nécessaire de brancher le cordon d'alimentation à la source de courant lors de l'installation du système, s'assurer que le fil de terre est correctement branché.
- Placer tout d'abord le fil de terre du cordon d'alimentation sur le plot de mise à la terre puis placer les autres fils de terre par-dessus. Bien serrer l'écrou de retenue.
- S'assurer que toutes les connexions sont bien serrées pour éviter la surchauffe.

## SÉCURITÉ DES BOUTEILLES DE GAZ COMPRIMÉ

- Ne jamais lubrifier les robinets des bouteilles ou les régulateurs avec de l'huile ou de la graisse.
- Utiliser uniquement les bouteilles, régulateurs, tuyaux et accessoires appropriés et conçus pour chaque application spécifique.
- Entretenir l'équipement et les pièces d'équipement à gaz comprimé afin de les garder en bon état.
- Étiqueter et coder avec des couleurs tous les tuyaux de gaz afin d'identifier le type de gaz contenu dans chaque tuyau. Se référer aux codes locaux ou nationaux en vigueur.



## LES BOUTEILLES DE GAZ COMPRIMÉ PEUVENT EXPLOSER EN CAS DE DOMMAGES

Les bouteilles de gaz contiennent du gaz à haute pression. Si une bouteille est endommagée, elle peut exploser.

- Manipuler et utiliser les bouteilles de gaz comprimé conformément aux codes locaux ou nationaux.
- Ne jamais utiliser une bouteille qui n'est pas placée à la verticale et bien assujettie.
- Le capuchon de protection doit être placé sur le robinet sauf si la bouteille est en cours d'utilisation ou connectée pour utilisation.
- Éviter à tout prix le contact électrique entre l'arc plasma et une bouteille.
- Ne jamais exposer des bouteilles à une chaleur excessive, aux étincelles, aux scories ou aux flammes nues.
- Ne jamais utiliser des marteaux, des clés ou d'autres outils pour débloquer le robinet des bouteilles.

## LE BRUIT PEUT PROVOQUER DES PROBLÈMES AUDITIFS

Une exposition prolongée au bruit du coupage ou du gougeage peut provoquer des problèmes auditifs.

- Utiliser un casque de protection homologué lors de l'utilisation du système plasma.
- Prévenir les personnes aux alentours des risques encourus en cas d'exposition au bruit.

## PACEMAKERS ET PROTHÈSES AUDITIVES

Les champs magnétiques produits par les courants à haute tension peuvent affecter le fonctionnement des prothèses auditives et des pacemakers. Les personnes portant ce type d'appareil doivent consulter un médecin avant de s'approcher d'un lieu où s'effectue le coupage ou le gougeage plasma.

Pour réduire les risques associés aux champs magnétiques :

- Garder loin de soi et du même côté du corps le câble de retour et le faisceau de la torche.
- Faire passer le faisceau de la torche le plus près possible du câble de retour.
- Ne pas s'enrouler le faisceau de la torche ou le câble de retour autour du corps.
- Se tenir le plus loin possible de la source de courant.

# Section 2

# DESCRIPTION & SPECIFICATIONS

In this section:


Introduction ..... 2-2
Specifications ..... 2-3
  Power Supply ..... 2-3
PAC121 50A Torches ..... 2-4
  PAC121TS Hand Torch Assembly ..... 2-4
  PAC121MS Machine Torch Assembly ..... 2-4
  S Mark ..... 2-5
IEC Symbols Used ..... 2-6

## INTRODUCTION

The Powermax800 plasma cutting system uses an inverter power supply to provide a smooth DC output voltage, producing excellent cut and gouge quality on mild steel, stainless steel, aluminum and other metals. The Powermax800 power supply provides constant-current output variable from 20 to 50 amps, for optimum performance on all thicknesses of metal up to 1/2 inch (12 mm) thick. At 50 amps, the Powermax800 can cut metals up to 3/4 inch (20 mm) thick and will sever metals up to 1 inch (25 mm) thick.

Air is the primary plasma gas, providing low operating cost combined with high-speed performance. Cylinder air or shop air can be used as long as it is clean, dry and oil-free. When properly set and maintained, the pressure regulator and gas filter on the power supply ensure that the correct pressure and flow rate is supplied to the system at the proper quantity and quality. The Powermax800 can also cut with nitrogen when extended electrode life is a priority.

This instruction manual provides information for the user to set up and operate the system and perform limited maintenance on the torch and power supply. This manual also provides a detailed list of safety practices so that the system can be safely operated and maintained. **READ THE SAFETY SECTION (Section 1) FIRST!**

The Powermax800 service manual provides higher-level troubleshooting and a more complete parts list.

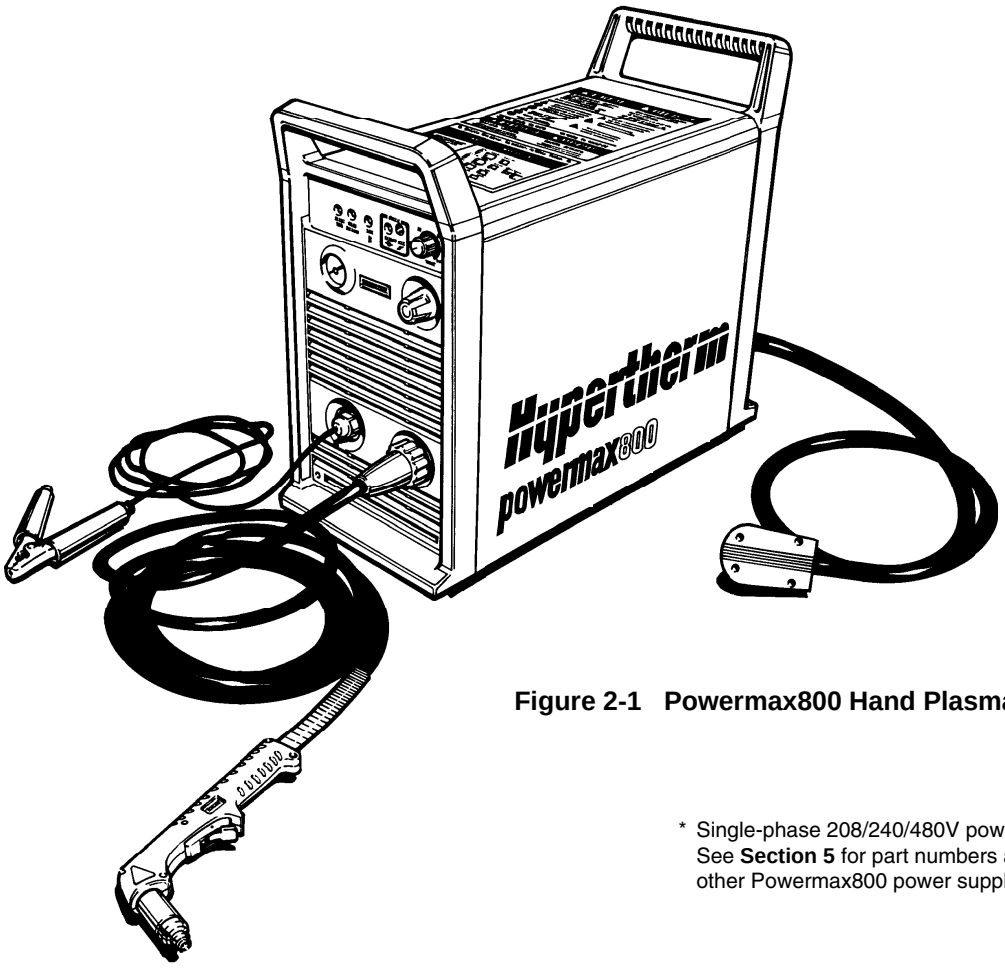



**Figure 2-1 Powermax800 Hand Plasma Cutting System***

* Single-phase 208/240/480V power supply shown. See **Section 5** for part numbers and descriptions of other Powermax800 power supplies.

## SPECIFICATIONS

### Power Supply

| | |
|---|---|
| Rated Open Circuit Voltage (OCV) ($U_0$) | 300 VDC |
| Rated Output Current ($I_2$) | 20–50 amps |
| Rated Output Voltage ($U_2$) | 120 VDC |
| Duty Cycle (X) @ 40°C | 50% ($I_2$=50A, $U_2$=120V)<br>100% ($I_2$=35A, $U_2$=120V)See data tag on power supply for more information on duty cycle |
| Ambient temperature/duty cycle | Power supplies will operate between +14° and 104° F (-10° and +40° C). Power supplies operated in an ambient temperature above 86° F (30° C) may show some decrease in duty cycle. |
| Apparent Input Power ($S_1$) | 10.4kVA ($U_1I_1$) |
| Input Voltage ($U_1$)/Input Current ($I_1$) @ 6 kw Output | 208V/50A; 240V/43A; 480V/25A - 1ϕ, 60 Hz<br>208V/29A; 240V/25A; 480V/13A - 3ϕ, 60 Hz<br>200V/52A; 230V/45A; 400V/30A - 1ϕ, 50/60 Hz<br>200V/30A; 230V/26A; 400V/16A - 3ϕ, 50/60 Hz<br>400V (CE)/16A - 3ϕ, 50/60 Hz<br>600V/11A - 3ϕ, 60 Hz |
| Dimensions and Weight: | |
| Depth | 23.1" (590 mm) |
| Width | 10.4" (260 mm) without wheels<br>15.3" (390 mm) with wheels |
| Height | 19.6" (500 mm) without wheels<br>23.7" (620 mm) with wheels<br>27.7" (700 mm) for 600V power supply |

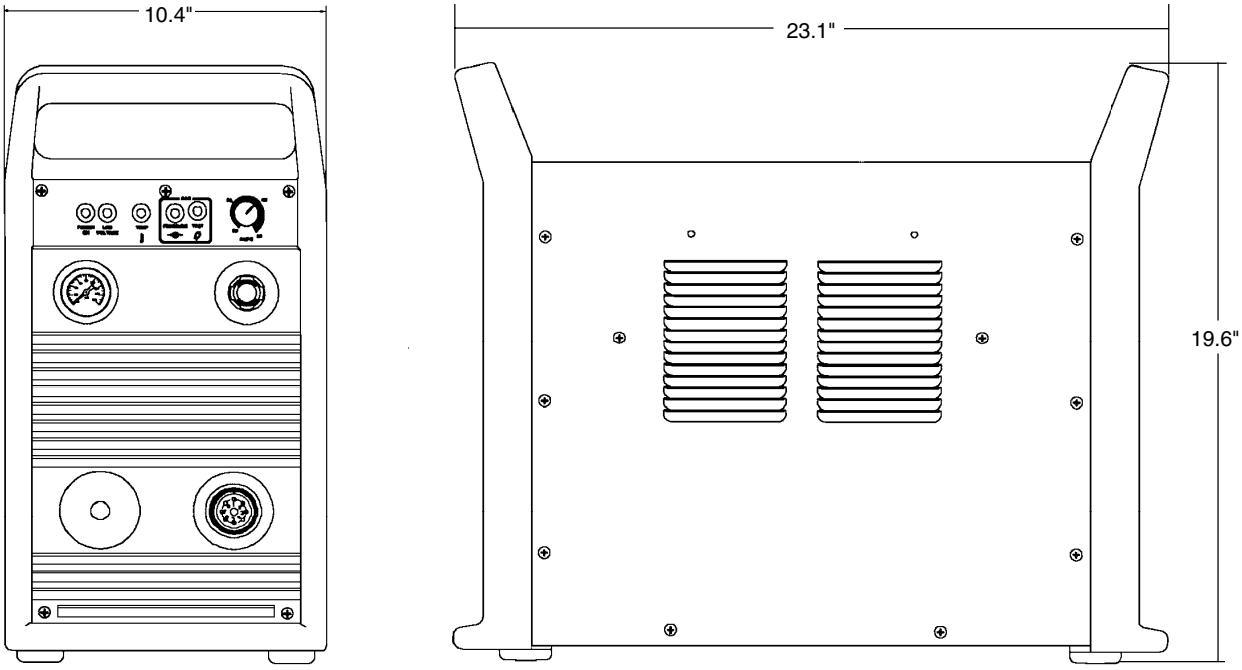



**Figure 2-2 Powermax800 Power Supply with Dimensions**

| | |
|---|---|
| Weight | 65 pounds (30 kg) without wheels<br>72 pounds (33 kg) with wheels<br>128 pounds (58 kg) for 600V power supply |
| Gas Type | Air or Nitrogen |
| Gas Quality, Air | Clean, dry, oil-free |
| Gas Quality, Nitrogen | 99.995% pure |
| Gas Inlet Pressure | 90 psi (6.2 bar) |
| Gas Flow | 320 scfh/5.3 scfm at 90 psi (150 l/min at 6.2 bar) supplied to power supply pressure regulator |
| Power Supply pressure regulator setting | 70 psi (4.8 bar) flowing |

## PAC121 50A TORCHES

| | |
|---|---|
| Maximum 50A Cutting Capacity (PAC121TS) | 3/4" (20 mm) @ 50% duty cycle |
| Maximum 50A Cutting Capacity (PAC121MS) | 3/8" (10 mm) @ 50% duty cycle |
| Maximum 35A Cutting Capacity (PAC121MS) | 1/4" (6 mm) @ 100% duty cycle |
| Maximum current at 50% duty cycle | 50 amps |
| Gas Flow | 320 scfh/5.3 scfm at 70 psi (150 l/min at 4.8 bar) |
| Gouging Capability (metal removal rate) | 6.3 pounds (2.9 kg)/hr |
| Weight PAC121TS | 4.5 pounds (2 kg) with 25 ft (7.6 m) lead<br>7 pounds (3.2 kg) with 50 ft (15 m) lead |
| Weight PAC121MS | 7 pounds (3.2 kg) with 25 ft (7.6 m) lead<br>9.5 pounds (4.3 kg) with 50 ft (15 m) lead |

### PAC121TS Hand Torch Assembly

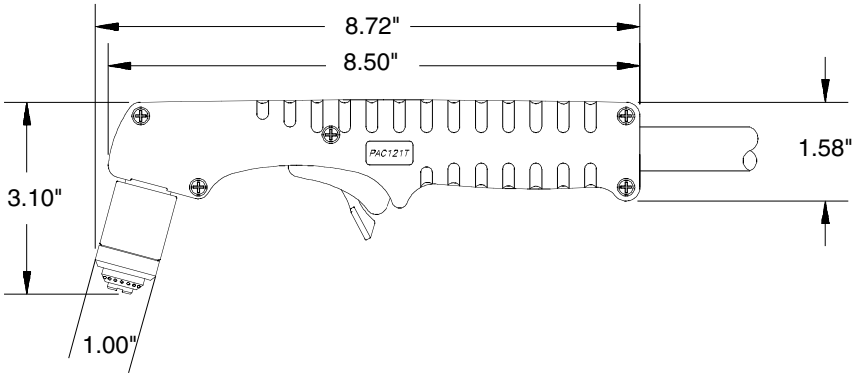



**Figure 2-3 PAC121TS Torch with Dimensions**

### PAC121MS Machine Torch Assembly

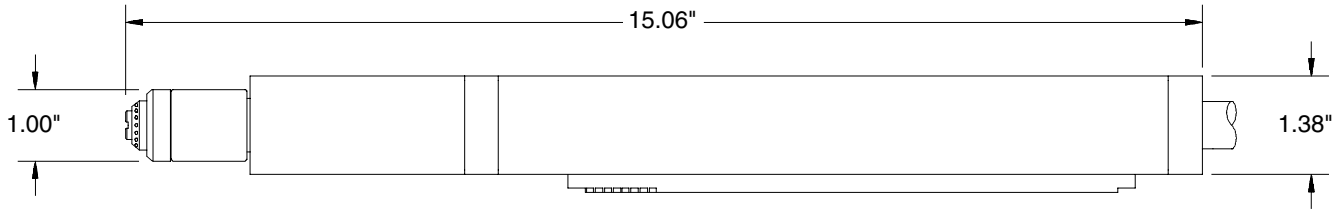



**Figure 2-4 PAC121MS Torch with Dimensions**

## S MARK

The Powermax800 conforms to CE standard EN50192. The S mark indicates that the power supply and torch are suitable for use in environments with increased hazard of electrical shock. The torches must have shielded consumable parts to maintain S mark compliance. See warning below and Figure 2-5.

**WARNING**

**The voltage between the tip of the torch and the workpiece will exceed 113VDC if shielded consumable parts are not installed in the torch. If using the 400V CE power supply, the PAC121TS torch must be operated with shielded parts to maintain the S mark and CE low-voltage compliance for hand held applications. See Section 5:** *Consumable Parts - For CE Compliance* **for a list of CE consumable parts. This requirement does not apply to machine torch applications.**

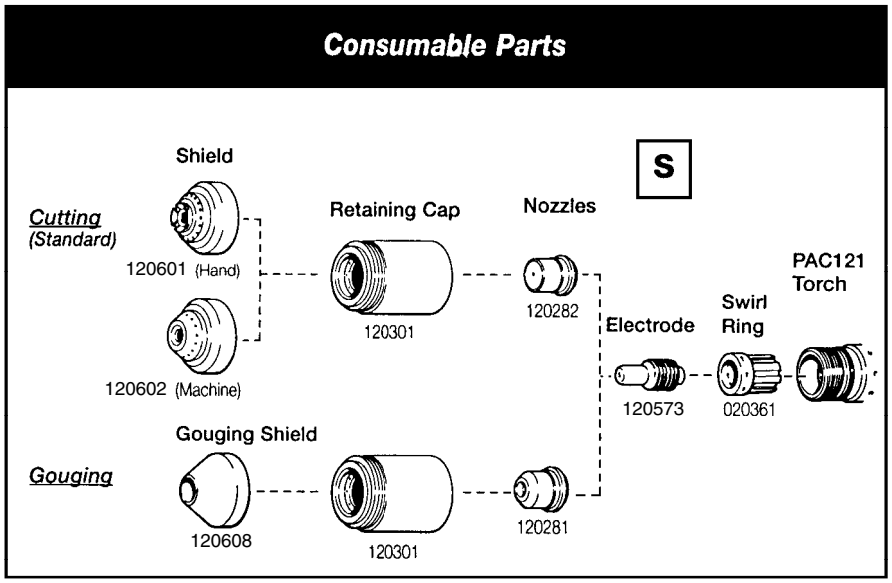



**Figure 2-5 S Mark Label**

## IEC SYMBOLS USED

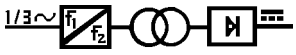
Direct Current (DC)

Alternating current (AC)

Plasma cutting torch

AC input power connection

The terminal for the external protective (earth) conductor




An inverter-based power source

Anode (+) work clamp

Temperature switch

Pressure switch

Plasma torch in the TEST position (cooling and cutting gas exiting nozzle)

**I** Power is on

**O** Power is off

Volt/amp curve, "drooping" characteristic

# Section 3 SETUP

In this section:


Upon Receipt ..... 3-2
Claims ..... 3-2
Hoisting Requirements ..... 3-3
208/240/480 Voltage Configurations ..... 3-4
200/230/400 Voltage Configurations ..... 3-5
Power Cord Plugs ..... 3-6
Single-Phase and Three-Phase Power Cords - 208/240/480V,
Three-Phase Power Cords - 600V ..... 3-6
Single-Phase and Three-Phase Power Cords - 200/230/400V ..... 3-6
Single-Phase and Three-Phase Power Configurations ..... 3-7
- Single-Phase 208/240/480V ..... 3-7
- Single-Phase 200/230/400V ..... 3-7
- Three-Phase 208/240/480V and 600V ..... 3-8
- Three-Phase 200/230/400V ..... 3-8
- Three-Phase 400V CE ..... 3-8

Power Requirements ..... 3-9
- Line Disconnect Switch ..... 3-9

Grounding Requirements ..... 3-9
Work Cable and Clamp ..... 3-10
Gas Supply Requirements ..... 3-10
- Cylinder or Shop Compressed Air Supply ..... 3-10
- Additional Air Filtration ..... 3-11
- Nitrogen Supply ..... 3-11

Gas Supply Connection ..... 3-11
Torch Lead Connection ..... 3-12
- PAC121MS ON/OFF Pendant Connection ..... 3-12
- PAC121MS Torch ON/OFF Switch Connection Data ..... 3-12
- PAC121MS Torch Alignment ..... 3-13

Machine Interface with PAC121MS ..... 3-13
- Arc Voltage ..... 3-14

## UPON RECEIPT

1. Verify that all parts and items on your order have been received. Alert your distributor if any parts or items are damaged or missing.

2. Inspect the power supply for any physical damage that may have occurred during shipping. If there is evidence of damage, refer to the *Claims* section below.

   All communications regarding this equipment must include the model number and serial number located on the back of the Powermax800.

3. Before setting up and operating the Powermax800, read the **Safety** section of this manual.

## CLAIMS

**Claims for damage during shipment** — If your unit was damaged during shipment, you must file a claim with the carrier. Hypertherm will furnish you with a copy of the bill of lading upon request. If you need additional assistance, call Customer Service at 1 800 643 0030 in the U.S. and Canada, or your authorized Hypertherm distributor.

**Claims for defective or missing merchandise** — All units shipped from Hypertherm undergo rigorous quality control inspections for defects. If any of the merchandise is defective or missing, call your authorized Hypertherm distributor. If you need additional assistance, call Customer Service at 1 800 643 0030 in the U.S. and Canada.

## HOISTING REQUIREMENTS

In the event that the power supply has to be hoisted, read the **Warning** first and then perform the following procedure. See Fig. 3-1:

**WARNING**

**The Powermax800 power supply weighs up to 72 pounds (33 kg) alone, 79 pounds (36 kg) with the torch and up to 135 pounds (61 kg) for the 600V unit with torch. Use a hoisting machine with a hoisting strap through both handles to hoist the power supply. Always hoist the power supply with its cover secured in place. Do not hoist the power supply by one handle (see Fig. 3-1); it is not designed to support the weight of the power supply.**

**Failure to heed this warning could result in personal injury and damage to the power supply.**

1. Use a hoisting strap rated for a minimum hoisting weight of 200 pounds (91 kg). Approved hoisting straps have attached labels with ratings.
2. Ensure the power supply cover is secured prior to hoisting.
3. Route strap between the two handles as shown in Fig. 3-1.
4. Bring the strap ends together over the center of the power supply and connect them to the hoisting machine.
5. Hoist and lower the power supply slowly and smoothly.

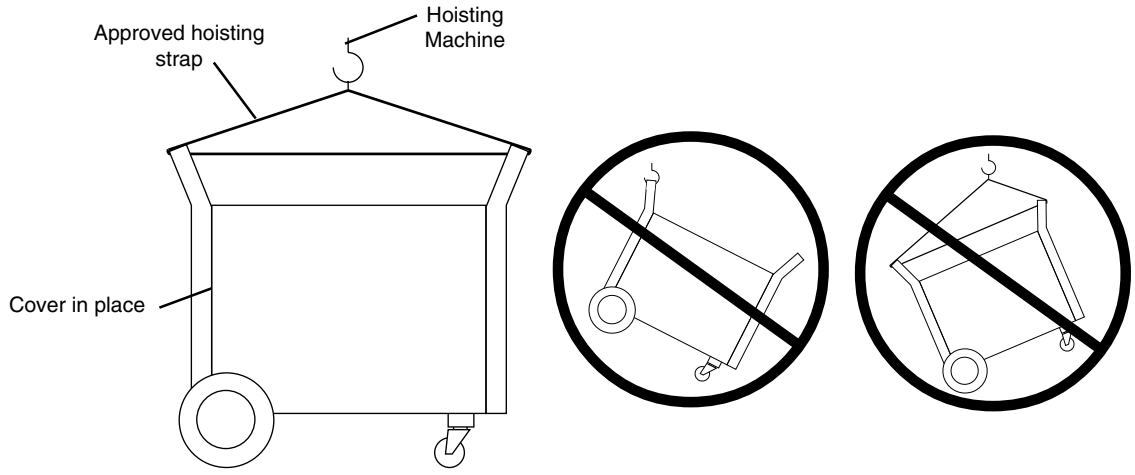



**Figure 3-1 Powermax800 Power Supply Hoisting Setup**

## 208/240/480 VOLTAGE CONFIGURATIONS

**WARNING**

**SHOCK HAZARD: Always turn off power, unplug cord from wall and wait 5 minutes before removing any power supply cover. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

**The 208/240/480V Powermax800 power supplies are shipped to operate at 240 volts (Fig. 3-4).** To operate at 208 volts or 480 volts, or to switch from one voltage to another, remove the rear panel (Fig. 3-2), and configure the wires and jumpers on TB2 and TB3 as shown below in Fig. 3-3 (208V), Fig. 3-4 (240V) or Fig. 3-5 (480V).

Notes: • When switching to 480V configuration, secure unused link box jumper in the clip located in the link box.
- If using the 600V transformer option kit, configure the Powermax800 for 480V (Fig. 3-5).
- See also *Single-Phase and Three-Phase Power Cords - 208/240/480V, Three-Phase Power Cords - 600V* later in this section.

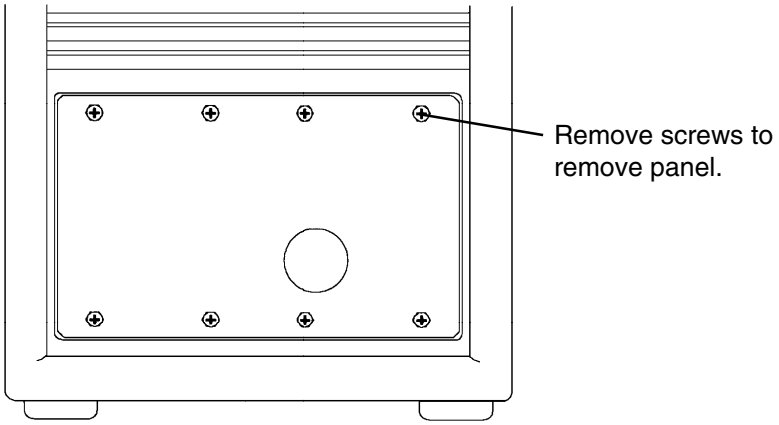



**Figure 3-2 Rear Panel**

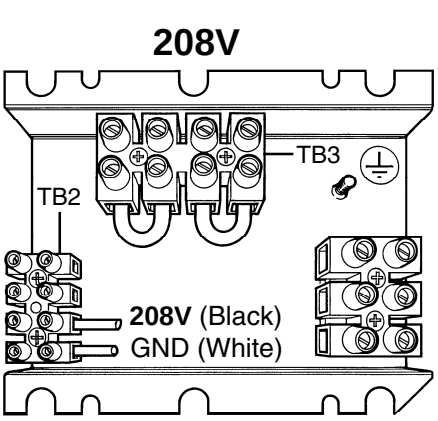



**Figure 3-3**
**208V Configuration**

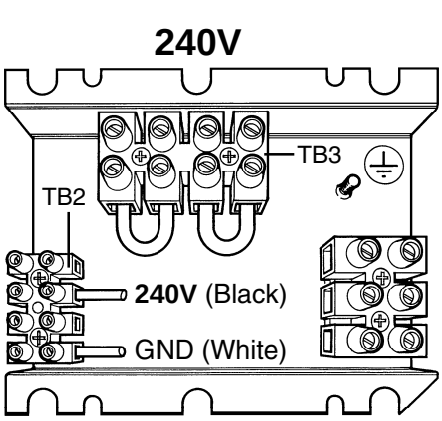



**Figure 3-4**
**240V Configuration**

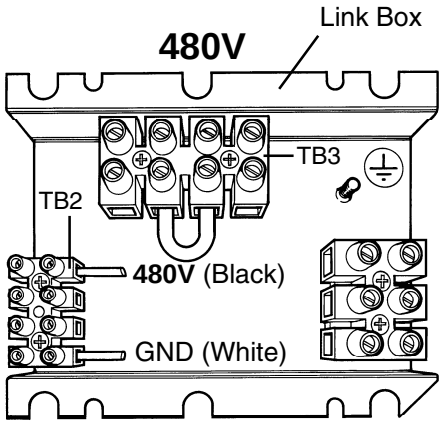



**Figure 3-5**
**480V Configuration**

## 200/230/400 VOLTAGE CONFIGURATIONS

**WARNING**

**SHOCK HAZARD: Always turn off power, unplug cord from wall and wait 5 minutes before removing any power supply cover. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

**The 200/230/400V Powermax800 power supplies are shipped to operate at 400 volts (Fig. 3-8).** To operate at 200 volts or 230 volts, or to switch from one voltage to another, remove the rear panel (Fig. 3-2), and configure wires and jumpers on TB2 and TB3 as shown below in Fig. 3-6 (200V), Fig. 3-7 (230V) or Fig. 3-8 (400V).

When switching to 200V or 230V from the 400V configuration, remove unused jumper from the clip located in the link box and connect it to TB3 as shown in Figs. 3-6 or 3-7.

Notes: • The 400V CE power supply cannot be configured for alternate voltages.
• See also *Single-Phase and Three-Phase Power Cords - 200/230/400V* later in this section.

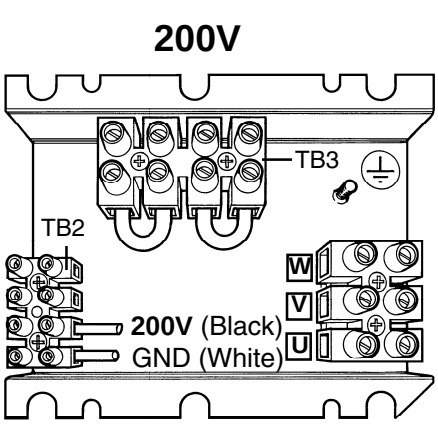



**Figure 3-6**
**200V Configuration**

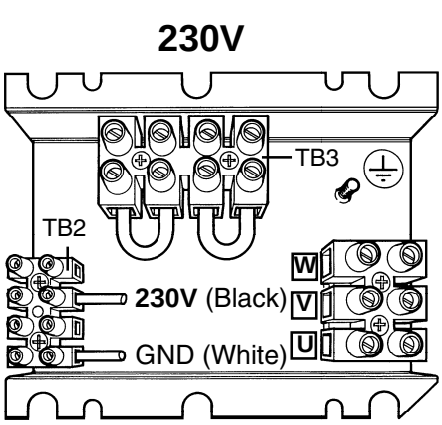



**Figure 3-7**
**230V Configuration**

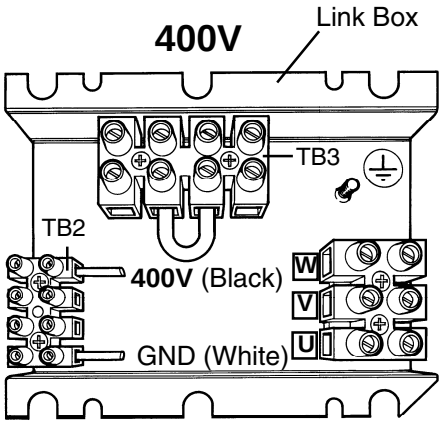



**Figure 3-8**
**400V Configuration**

## POWER CORD PLUGS

**All 208/240/480V power supplies are shipped with a single-phase power cord and plug**. To operate as a three-phase unit, the user must obtain a power cord and plug that is certified by national or local electrical codes. The plug should be connected to the power cord by a licensed electrician. (See also *Single-Phase and Three-Phase Power Cords - 208/240/480V* later in this section.)

**All 200/230/400V and 400V CE power supplies are shipped with a three-phase power cord and no plug**. The user must obtain a plug that is certified by national or local electrical codes. The plug should be connected to the power cord by a licensed electrician. (See also *Single-Phase and Three-Phase Power Cords - 200/230/400V* later in this section.)

## SINGLE-PHASE AND THREE-PHASE POWER CORDS - 208/240/480V, THREE-PHASE POWER CORDS - 600V

If the single-phase power cord length needs to be changed, or if a three-phase cord is needed, use the table below to choose the proper gauge size for the appropriate length. Use a 3-conductor SO type cord for single-phase, and a 4-conductor SO type cord for three-phase power supplies. The cord should be installed only by a licensed electrician.

| Input Voltage | Phase | Input Current | Recommended Power Cord Gauge Size (AWG) | | | | |
|---|---|---|---|---|---|---|---|
| | | | to 10 ft | 10 – 25 ft | 25 – 50 ft | 50 – 100 ft | 100 – 150 ft |
| 208 VAC | 1 | 50A | 8 | 8 | 8 | 6 | 6 |
| 240 VAC | 1 | 43A | 8 | 8 | 8 | 8 | 6 |
| 480 VAC | 1 | 25A | 10 | 10 | 10 | 10 | 8 |
| 208 VAC | 3 | 29A | 10 | 10 | 10 | 8 | 8 |
| 240 VAC | 3 | 25A | 10 | 10 | 10 | 10 | 8 |
| 480 VAC | 3 | 13A | 12 | 12 | 12 | 12 | 10 |
| 600 VAC | 3 | 11A | 12 | 12 | 12 | 12 | 10 |

## SINGLE-PHASE AND THREE-PHASE POWER CORDS - 200/230/400V

If the three-phase power cord length needs to be changed, or if a single-phase cord is needed, use the table below to choose the proper gauge size for the appropriate length. In Europe, use a 3-conductor Harmonized ("HAR") type cord for single-phase, and a 4-conductor "HAR" type cord for three-phase power supplies. In other countries, use cords that are certified by local or national codes. The cord should be installed only by a licensed electrician.

| Input Voltage | Phase | Input Current | Recommended Power Cord Gauge Size ($mm^2$) | | | | |
|---|---|---|---|---|---|---|---|
| | | | to 3 m | 3 – 7.5 m | 7.5 – 15 m | 15 – 30 m | 30 – 45 m |
| 200 VAC | 1 | 52A | 10.0 | 10.0 | 10.0 | 16.0 | 16.0 |
| 230 VAC | 1 | 45A | 10.0 | 10.0 | 10.0 | 10.0 | 16.0 |
| 400 VAC | 1 | 30A | 6.0 | 6.0 | 6.0 | 6.0 | 10.0 |
| 200 VAC | 3 | 30A | 6.0 | 6.0 | 6.0 | 10.0 | 10.0 |
| 230 VAC | 3 | 26A | 6.0 | 6.0 | 6.0 | 6.0 | 10.0 |
| 400 VAC | 3 | 16A | 2.5 | 2.5 | 2.5 | 2.5 | 4.0 |

## SINGLE-PHASE AND THREE-PHASE POWER CONFIGURATIONS

**All 208/240/480V Powermax800 power supplies are shipped for single-phase operation.**
**All 200/230/400V Powermax800 power supplies are shipped for three-phase operation.**
However, all Powermax800 power supplies except the 400V CE and 600V power supplies can operate from either a single-phase or three-phase input. The 400V CE and 600V power supplies operate only from a three-phase input.

Power cords must meet the specifications described earlier in this section. Follow applicable local or national wire color conventions.

**WARNING**

**SHOCK HAZARD: Always turn off power, unplug cord from wall and wait 5 minutes before removing any power supply cover. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

### Single-Phase 208/240/480V

Remove the rear panel (Fig. 3-2) and connect the power cable to terminal block TB1 as shown in Fig. 3-9A. Connect the ground wire to the stud marked ⏚ above the terminal block.

| Conductor | Color |
|---|---|
| Ground | Green |
| Neutral/Line | White |
| Line | Black |

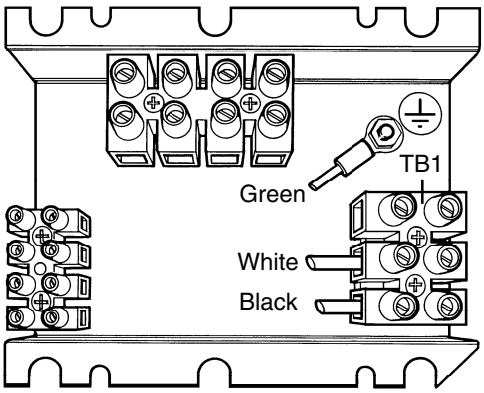



**Figure 3-9A**
**Single-Phase Power**
**208/240/480V**

### Single-Phase 200/230/400V

Remove the rear panel (Fig. 3-2) and connect the power cable to terminal block TB1 as shown in Fig. 3-9B. Connect the ground wire to the stud marked ⏚ above the terminal block.

| Conductor | Color |
|---|---|
| Ground | Green/Yellow |
| Neutral/Line (V) | Blue |
| Line (U) | Brown |

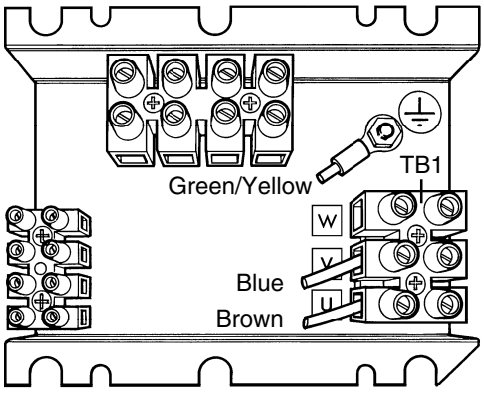



**Figure 3-9B**
**Single-Phase Power**
**200/230/400V**

### Three-Phase 208/240/480V and 600V

Remove the rear panel (Fig. 3-2) and connect the power cable to terminal block TB1 as shown in Fig. 3-10A. Connect the ground wire to the stud marked ⏚ above the terminal block. .

| Conductor | Color |
|---|---|
| Ground | Green |
| L3 | Red |
| L2 | White |
| L1 | Black |

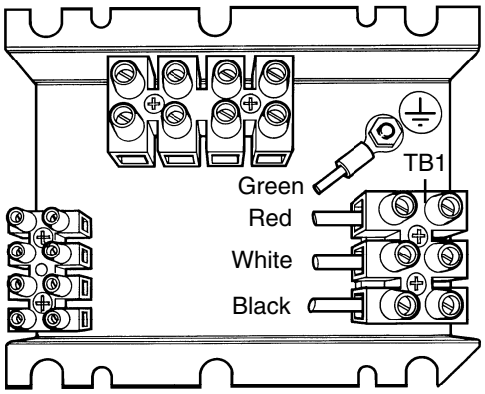



**Figure 3-10A**
**Three-Phase Power**
**208/240/480V**

### Three-Phase 200/230/400V

Remove the rear panel (Fig. 3-2) and connect the power cable to terminal block TB1 as shown in Fig. 3-10B. Connect the ground wire to the stud marked ⏚ above the terminal block. .

| Conductor | Color |
|---|---|
| Ground | Green/Yellow |
| L3 (W) | Black |
| L2 (V) | Blue |
| L1 (U) | Brown |

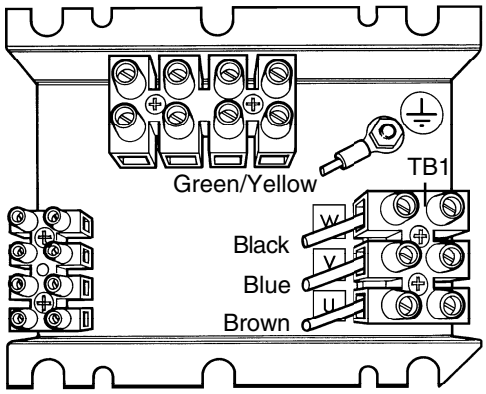
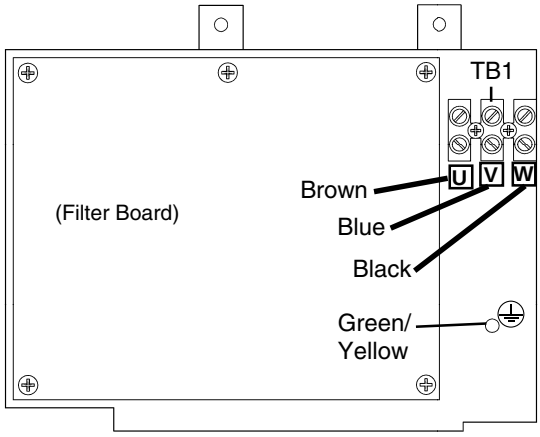



**Figure 3-10B**
**Three-Phase Power**
**200/230/400V**

### Three-Phase 400V CE

Remove the rear panel (Fig. 3-2) and connect the power cable to terminal block TB1 as shown in Fig. 3-10C. Connect the ground wire to the stud marked ⏚ above the terminal block. .

| Conductor | Color |
|---|---|
| Ground | Green/Yellow |
| L3 (W) | Black |
| L2 (V) | Blue |
| L1 (U) | Brown |




Note: See also **EMC Compatibility** and *Mains Supply* on page i for further power (supply) cable shielding recommendations for CE compliance.

**Figure 3-10C**
**Three-Phase Power**
**400V CE**

## POWER REQUIREMENTS

### Line Voltage Disconnect Box

Use a line disconnect box for each power supply. This disconnect box allows the operator to turn the power supply off quickly in an emergency situation. The switch should be located on a wall near the power supply, and should be easily accessible to the operator. The interrupt level of the switch must be equal to or exceed the continuous rating of the fuses. Use slow-blow fuses according to the power requirements listed below.

| Input Voltage | Phase | Input Current @ 6 kw Output | Recommended Slow-Blow Fuse Size |
|---|---|---|---|
| 200 VAC | 1 | 52 amps | 70 amp |
| 208 VAC | 1 | 50 amps | 70 amp |
| 230 VAC | 1 | 45 amps | 60 amp |
| 240 VAC | 1 | 43 amps | 60 amp |
| 400 VAC | 1 | 30 amps | 40 amp |
| 480 VAC | 1 | 25 amps | 35 amp |
| 200 VAC | 3 | 30 amps | 40 amp |
| 208 VAC | 3 | 29 amps | 40 amp |
| 230 VAC | 3 | 26 amps | 35 amp |
| 240 VAC | 3 | 25 amps | 35 amp |
| 400 VAC | 3 | 16 amps | 20 amp |
| 480 VAC | 3 | 13 amps | 20 amp |
| 600 VAC | 3 | 11 amps | 20 amp |

## GROUNDING REQUIREMENTS

To ensure personal safety, proper operation, and to reduce electromagnetic interference (EMI), the Powermax800 must be properly grounded:

- The power supply must be properly grounded through the power cord according to your local or national electrical codes. The power supply chassis is electrically conductive and can present a shock hazard if it is not properly grounded through the line voltage disconnect box. Single-phase service must be of the 3-wire type with a green or green/yellow wire for protective earth ground. It must comply with local electrical requirements. **Do not use a 2-wire service!** Refer to *Grounding*, in the **Safety** section. Three-phase service must be of the 4-wire type with a green/yellow wire for protective earth ground. It must comply with local electrical requirements.

- Refer to the *Standards Index,* in the **Safety** section, for other electrical codes.

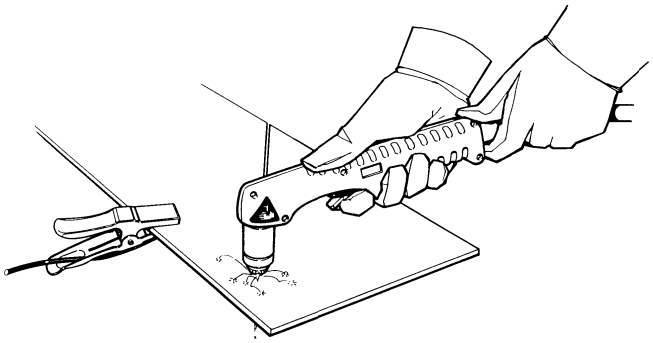


**Figure 3-11 Proper Work Clamp Connection**

## WORK CABLE AND CLAMP

The work clamp must be attached to the workpiece to perform plasma cutting. Ensure that the work clamp and the workpiece make good metal-to-metal contact. Attach the work clamp as close as possible to the area being cut to reduce exposure to electric and magnetic fields (EMF). Do not attach the work clamp to the portion of the workpiece being cut away. See Fig. 3-11.

## GAS SUPPLY REQUIREMENTS

The gas supply for the Powermax800 can be either air or nitrogen. Air can be supplied as shop compressed air or cylinder compressed air. Nitrogen can be supplied from compressed gas cylinders or liquid containers. A high-pressure regulator on either type of supply must be used and must be capable of delivering the following:

> **320 scfh/5.3 scfm (150 l/min)** at a pressure of **90 psi (6.2 bar)** to the filter on the power supply.

The filter is mounted at the rear of the Powermax800 power supply. See Fig. 3-13.

**WARNING**

**Do not allow the gas inlet pressure to the filter on the power supply to exceed 120 psi (8.2 bar). The plastic filter bowl is rated for 150 psi (10.3 bar) and may explode if this pressure is exceeded. See the label on the filter bowl for other safety warnings.**

### Cylinder or Shop Compressed Air Supply

The cylinder or shop compressed air supply must be clean, dry and oil-free. If air supply quality is poor, cut speeds decrease, cut quality deteriorates, cutting thickness capability decreases, and parts life shortens.

### Additional Air Filtration

Use a three-stage coalescing filtration system as shown in Fig. 3-12 when site conditions introduce moisture, oil or other contaminants into the air line.

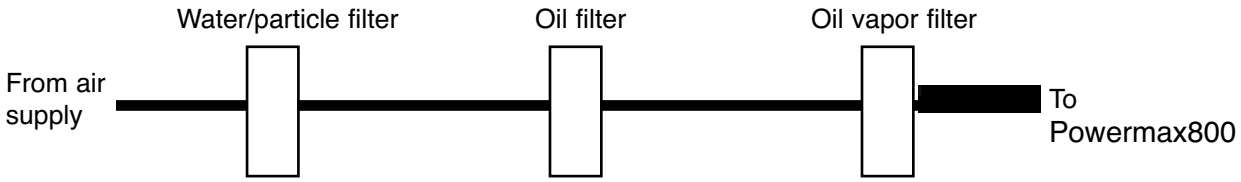



**Figure 3-12 Recommended Three-Stage Air Filtration System**

### Nitrogen Supply

Nitrogen must be supplied to the Powermax800 at 99.995% purity. If the purity level of the nitrogen is too low, cut speeds decrease, cut quality deteriorates, cutting thickness capability decreases, and parts life shortens. (Note: These conditions also occur if there are leaks in the gas supply hoses or connections.) The nitrogen supply can be compressed gas cylinders or liquid containers.

## GAS SUPPLY CONNECTION

Use a 3/8 inch ID inert gas hose to connect the gas supply (air or nitrogen) to the filter at the rear of the power supply. To connect the hose to the power supply, install a 1/8 NPT nipple to the filter block as shown in Fig. 3-13. Apply liquid pipe sealant to the threads to ensure a leak-free installation. The 1/8 NPT nipple and other adapters come with the consumable parts kit.

CAUTION: Never use PTFE tape when installing the nipple or adapters. Bits of tape can break off and enter the air line and harm the pressure regulator, pressure switch and valve.

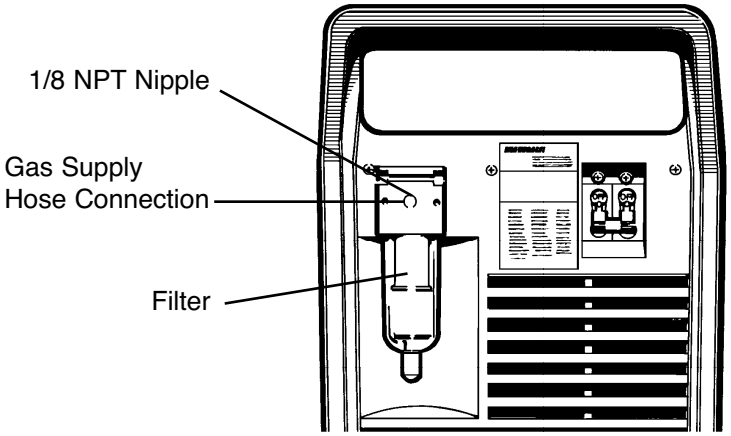



**Figure 3-13 Rear Panel, Gas Supply Connection to Filter**

## TORCH LEAD CONNECTION

To connect the torch lead to the power supply:

1. Align the connector key plug (on torch lead) with the connector receptacle key slot (on power supply) and push in until pins seat.

2. Turn the connector securing ring 1/4 turn to the left to ensure that the securing ring threads and the connector receptacle threads are aligned prior to tightening.

3. Turn the connector securing ring to the right to tighten.

### PAC121MS ON/OFF Pendant Connection

**WARNING**

**Do not connect cutting machine interface START signal if using the ON/OFF pendant! (See page 3-13)**

To connect the on/off pendant lead to the PAC121MS machine torch pigtail:

1. Align the pendant lead connector key plug with the connector receptacle key slot on the pigtail and push in until pins seat.

2. Turn the connector securing ring to the right to tighten.

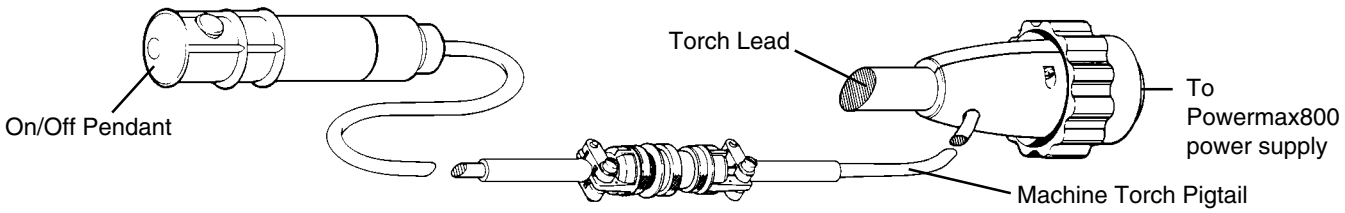



**Figure 3-14 ON/OFF Pendant Connection**

### PAC121MS Torch ON/OFF Switch Connection Data

The PAC121MS torch lead is supplied with a pigtail so that the on/off pendant may be used. If you want to use a different on/off switch configuration, note that the wiring configuration to the 3-socket female receptacle on the pigtail is as follows:

| | |
|---|---|
| Socket A | White Wire |
| Socket B | Not Used |
| Socket C | Black Wire |

### PAC121MS Torch Alignment

Make sure that the machine torch is mounted at right angles to the workpiece in order to get a vertical cut. Use a square to align the torch at 0° and 90° as shown in Fig. 3-15.

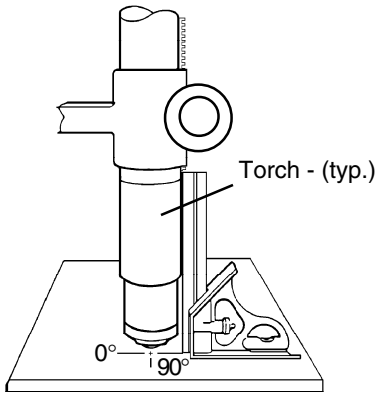



**Figure 3-15 Aligning the Machine Torch with Square**

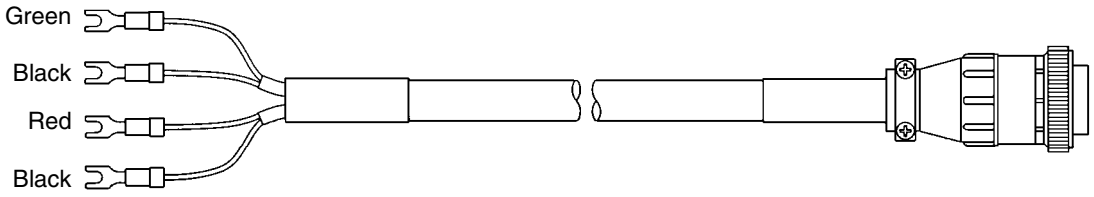
## MACHINE INTERFACE WITH PAC121MS

Signals for arc transfer and start are available on power supplies that have the machine interface option. The machine interface option is also available as an upgrade kit.

**WARNING**

**Do not connect cutting machine interface START signal if using an ON/OFF pendant!**

- Plug the machine interface cable into the connector on the rear panel. See Fig. 3-16 to hook up the machine interface cable to the cutting machine.




| Signal: | START (start plasma) | XFER (start machine motion) |
|---|---|---|
| Type: | Input | Output |
| Notes: | Normally open. 24VAC open circuit voltage at START terminals.<br>Requires dry contact closure to activate. | Normally open. Dry contact closure when arc transfers. 120VAC maximum at machine interface relay or switching device. |
| Rear panel sockets | 3, 4 | 12, 14 |
| Cable wires | Green, Black | Red, Black |

**Figure 3-16 Machine Interface Cable and Signals**

## Arc Voltage

If arc voltage is necessary for activating a torch height control, the customer must supply an 18AWG, single pair, unshielded cable rated for 300V or greater. The arc voltage signal on the machine interface board can be accessed as follows:

**WARNING**

**SHOCK HAZARD: Always turn off power, unplug cord from wall and wait 5 minutes before removing any power supply cover. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

1. Disconnect power from Powermax800 - see warning above.
2. Remove the 22 screws that attach Powermax800 cover to the chassis. Remove the cover.
3. Feed cable through strain relief in the rear of Powermax800. See Fig. 3-17.

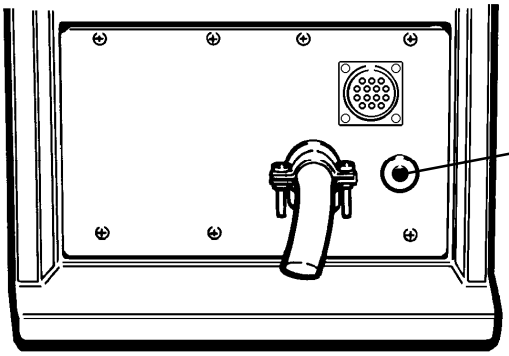
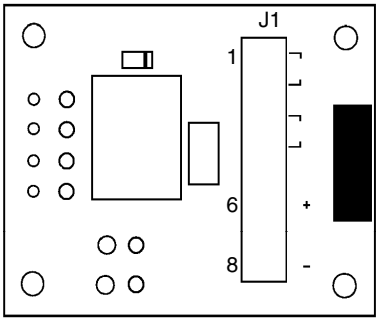



**Figure 3-17 Feeding Arc Voltage Cable to Machine Interface Board** (208/240/480V power supply shown)

4. Find the machine interface board on the top of the unit near the Powermax800 control board and connect the arc voltage cable as shown in Fig. 3-18.




| Signal: | ARC VOLTAGE (torch height control) |
|---|---|
| Type: | Output |
| Notes: | Full arc voltage. No voltage divider. 300VDC maximum. (Signal not available on rear panel connector.) |
| J1-6 | +VDC |
| J1-8 | -VDC |

**Figure 3-18 Machine Interface Board Connections for Arc Voltage**

# Section 4 OPERATION

In this section:


Controls and Indicators ..... 4-2
Operating Instructions ..... 4-3
- Pilot Arc Controller Option ..... 4-4
- PAC121TS Safety Trigger Operation ..... 4-5

Operating Tips ..... 4-6
- Changing Consumable Parts ..... 4-6
- Cutting ..... 4-8
- Piercing ..... 4-10
- Gouging ..... 4-11

Cut Chart - 50A Standard Consumables ..... 4-12
Cut Chart - 40A Consumables ..... 4-13
Common Cutting Faults ..... 4-14

## CONTROLS AND INDICATORS

- **Green POWER ON LED**
  When illuminated, indicates that all control circuits are activated, the torch safety interlock is satisfied and the system is ready for operation.

- **Yellow LINE VOLTAGE LED**
  When illuminated, indicates that the AC line voltage is above or below proper operating limits.

- **Yellow TEMP LED**
  When illuminated, indicates that the power supply temperature has exceeded operating limits.

- **Green GAS PRESSURE LED**
  When illuminated, indicates that the gas pressure is within operating limits.

- **GAS TEST Switch**
  When pushed in, allows the operator to view and adjust pressure setting.

- **AMPS Output Adjustment Knob**
  Adjusts output current between 20 and 50 amps.

- **Pressure Regulator**
  Regulates input gas pressure to power supply.

- **Pressure Gauge**
  Indicates gas pressure at power supply.

- **ON (I)/OFF (0) Power Switch**
  Activates the power supply and its control circuits.

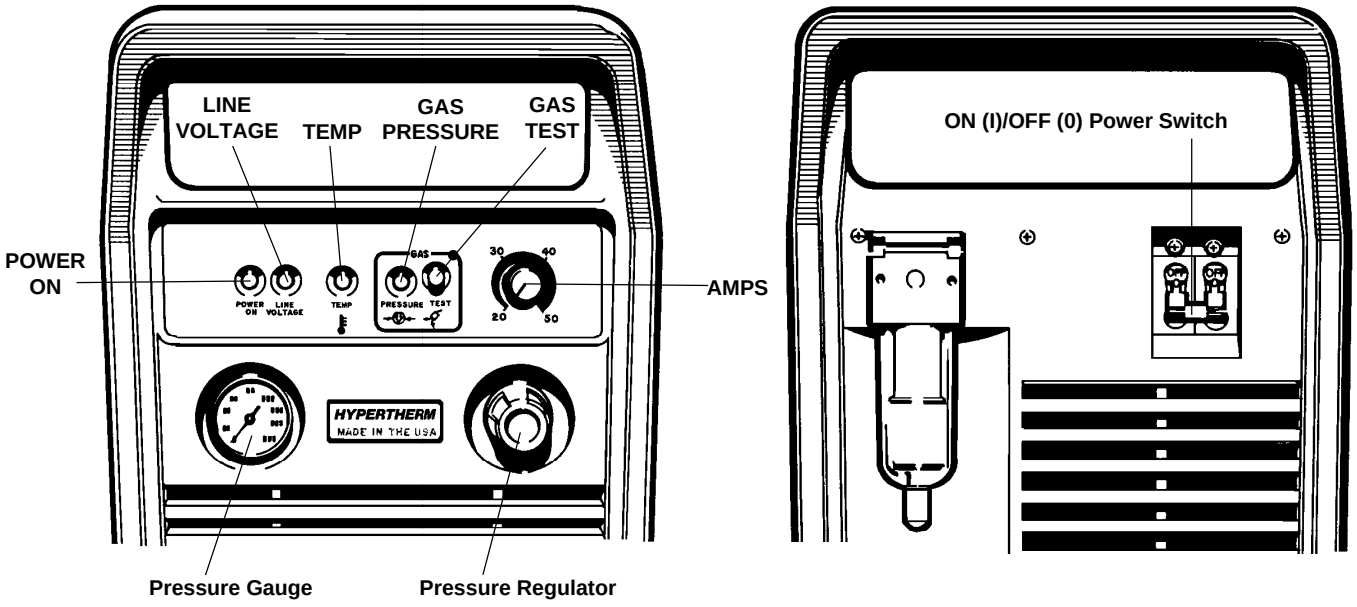



**Figure 4-1 Powermax800 Controls and Indicators**

## OPERATING INSTRUCTIONS

**WARNING**

**Before operating this system, read the Safety section of this manual thoroughly!**

1. Ensure that the work environment and your clothing meet the safety requirements outlined in the **Safety** section.

2. Follow the instructions in the **Setup** section. Verify that the input gas supply pressure is set to 90 psi (6.2 bar).

3. At the rear of the power supply, set the power switch to the ON (I) position. The POWER ON and GAS PRESSURE LEDs should illuminate. The LINE VOLTAGE LED will illuminate for 5 seconds and then go off. The TEMP LED should remain off.

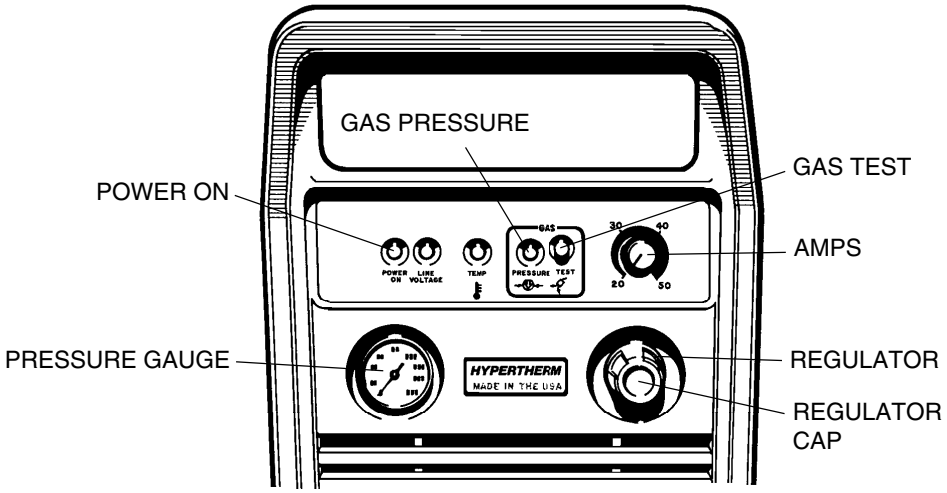



**Figure 4-2 Powermax800 Operating Indicators and Adjustments**

4. **Adjust the gas pressure REGULATOR for a reading of 70 psi (4.8 bar) on the PRESSURE GAUGE.** To adjust regulator pressure:

   - Pull the REGULATOR CAP out
   - Push the GAS TEST switch in
   - Turn the REGULATOR CAP while still holding in the GAS TEST switch
   - After adjustment to 70 psi (4.8 bar), release the GAS TEST switch
   - Push the REGULATOR CAP back in

   Note: If using 50 ft (15.2 m) torch leads, adjust pressure to 75 psi (5 bar).

5. Adjust the AMPS knob to the desired setting. See *Cut Chart* later in this section if necessary.

6. Attach the work clamp securely to the workpiece. **Do not attach it to the portion that will fall away.**

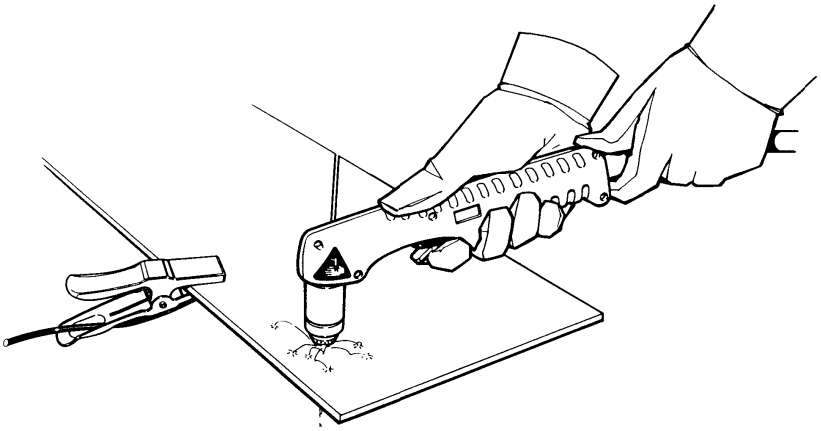


**Figure 4-3 Proper Work Clamp Connection**

**WARNING**

**The PAC121 torches are instant-on torches. These torches produce a plasma arc immediately after the torch start switch closes. Always hold the hand torch away from your body as a precaution against accidental torch firing. Be aware of this hazardous potential. Failure to do so can result in serious bodily injury.**

7. The Powermax800 is now ready to operate. When you are ready to cut, place the tip of the torch on the workpiece. Press the torch switch to start the arc. See *PAC121TS Safety Trigger Operation* later in this section for proper operation of the safety trigger.

8. The arc will transfer from the torch to the workpiece. Move the torch in the desired direction, at a speed which will ensure good cut quality. See *Cut Chart* later in this section.

9. When the cut is finished, release the torch switch to stop the arc. The arc will also extinguish when transfer to the workpiece is no longer sensed.

## Pilot Arc Controller Option

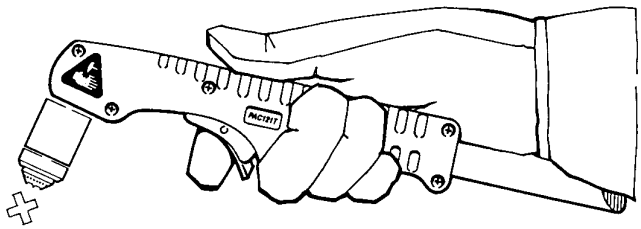
In power supplies with the pilot arc controller option, the torch will return to a pilot arc after finishing a cut if the torch switch remains pressed. After a short delay, the pilot arc will then go out if no arc transfer is sensed. The pilot arc controller option is especially useful if you are cutting expanded metal. See *Powermax800 Field Upgrade Kits and Optional Parts* in **Section 5** for part number information.

## PAC121TS Safety Trigger Operation

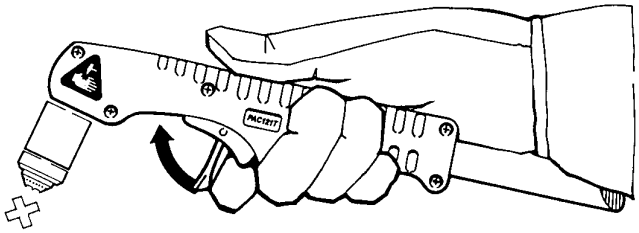
The PAC121TS safety trigger torch allows operators to safely handle the torch before and after the cut and to minimize the possibility of accidental torch firing.

The safety trigger is easy to operate. Follow the steps below.

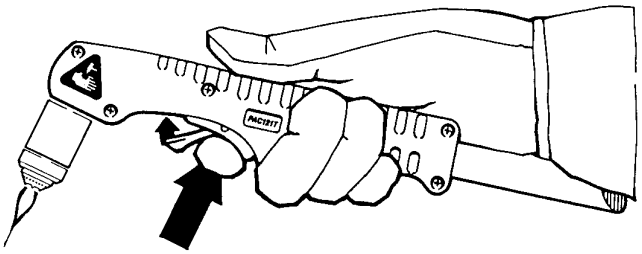
1. **Safety On** position. In this position the trigger cannot be pulled back, so that the torch cannot be accidentally fired.



2. Start pushing the safety forward. Do not pull back on the trigger now; wait until the safety reaches the **Safety Off** position as shown in step 3.



3. **Safety Off** position. In this position, the trigger can be pulled back so that the torch can be fired.



4. Release the safety to return to the **Safety On** position as shown in step 1.

**Figure 4-4 PAC121TS Torch Safety Trigger Operation**

## OPERATING TIPS

### Changing Consumable Parts

**WARNING**

**SHOCK HAZARD: Always turn off power and unplug cord from wall before changing consumable parts. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. Do not rely on the cap-on sensor switch to remove power. It is provided strictly for safety backup.**

**In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

Changing the consumable parts requires no tools:

1. Unscrew the retaining cap and the remaining parts will come apart easily. When you unscrew the retaining cap, you will hear a click. This click is a microswitch (cap-on sensor switch) that disables the power supply if it is plugged in.

2. Check the shield (if applicable) for external signs of wear. The shield should be clean and clear of metal debris. The gas holes along the edge of the shield should not be blocked with debris. The center hole should not have any nicks or gouges, and should show no signs of arcing activity.

3. Unscrew the shield. Inspect the gas holes from the inside. The holes should be clear of metal debris. If the gas holes are blocked by debris, try to open them by pushing a pin through each one from the outside of the shield to the inside. If the shield is still good, screw it back on to the retaining cap. If it is damaged, replace it with a new one and screw it back on to the retaining cap.

4. Inspect the nozzle for damage or wear. If the hole in the nozzle is worn or oval-shaped, replace the nozzle.

5. Inspect the electrode. If the center of the electrode has a pit more than 1/16 inch (1.6 mm) deep, replace it.

6. Inspect the swirl ring. It should be clean, and the holes along the side should not be plugged. If the swirl ring is damaged, replace it with a new one.

7. Inspect the O-ring on the torch. It should be lubricated and undamaged. If it is dry, lubricate it with a thin film of the lubricant provided in the spare parts kit. If it is damaged, replace it.

8. Replace the parts as shown in Fig. 4-5A or 4-5B. Each part fits in only one direction, so you cannot put the parts in backwards. Also, the torch will not fire if the parts are improperly assembled.

9. When the nozzle, electrode and swirl ring are properly in place, replace the retaining cap and shield (or deflector). When the retaining cap is tightened, the microswitch will click, indicating that the torch is again ready for operation. Plug the power supply back in.

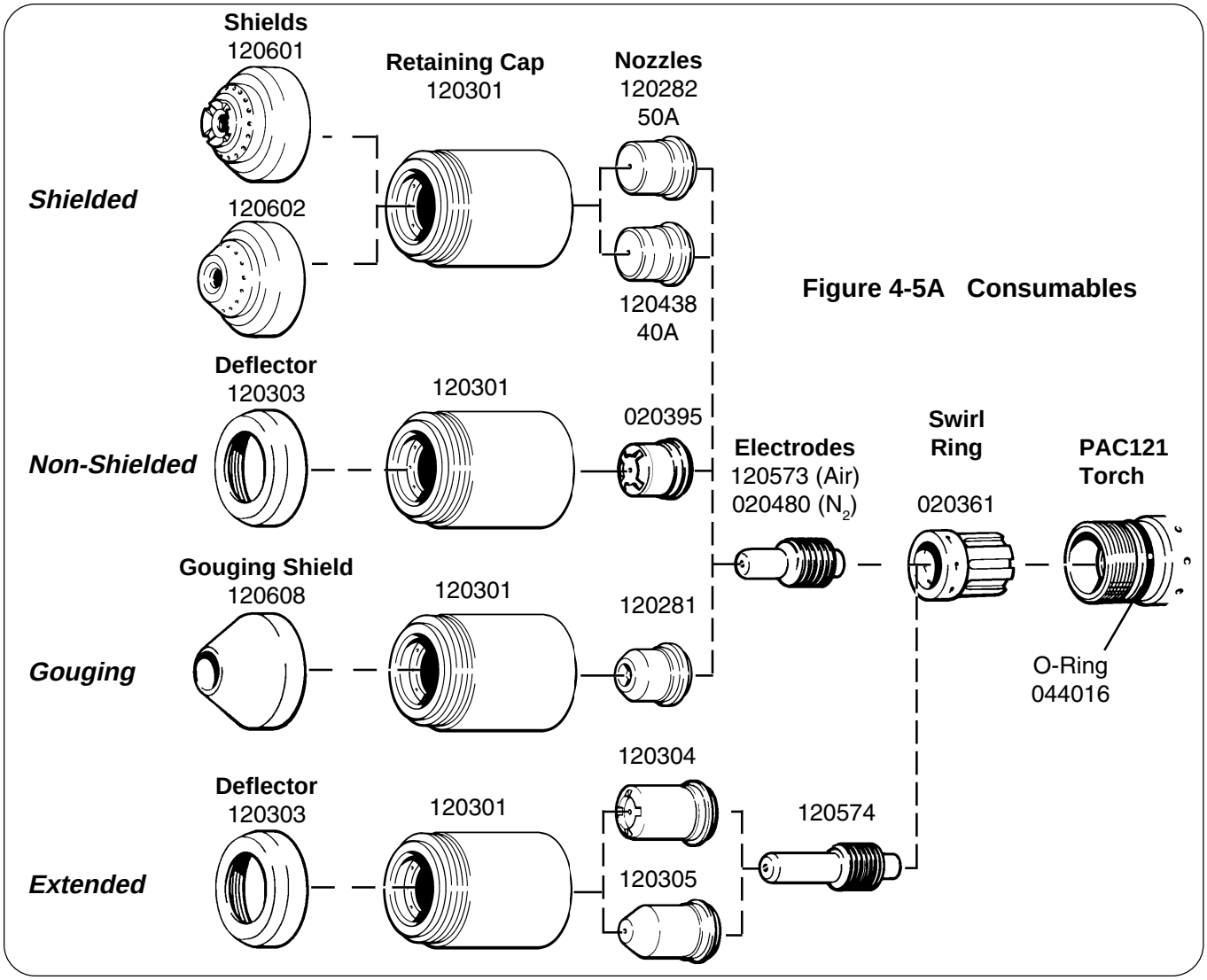



**Figure 4-5A Consumables**

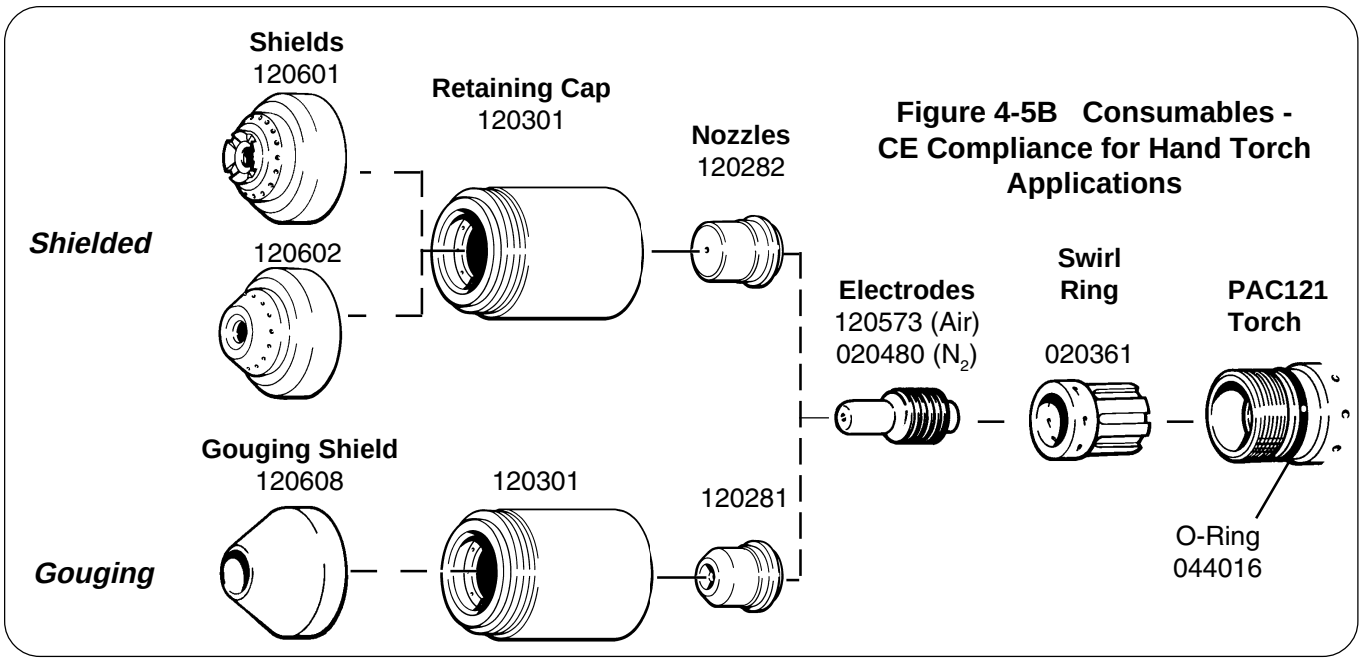



**Figure 4-5B Consumables - CE Compliance for Hand Torch Applications**

## Cutting

- Do not fire the pilot arc into the air needlessly—doing so causes a significant reduction of the nozzle and electrode life.
- If arc transfer to the workpiece does not occur within 5 seconds, the pilot arc will shut off. Release the torch start switch and press it again to reset the pilot arc timer.
- Start cutting from the edge of the workpiece (Fig. 4-6).
- When cutting, make sure that the sparks are coming out of the bottom of the workpiece. If they are spraying on top of the workpiece, you are moving the torch too fast, or you do not have sufficient power to fully penetrate the workpiece.
- Hold the torch lightly on the metal or just off the metal. Holding the torch firmly to the workpiece causes the shield or nozzle to stick and makes smooth cutting difficult. The arc transfers to the workpiece once the torch is within 1/8 inch (3 mm) of the workpiece.
- Pulling the torch through the cut is easier than pushing it.
- Hold the torch nozzle at a vertical position and watch the arc as it cuts along the line (Fig. 4-8). By lightly dragging the shield or nozzle on the workpiece, you can maintain a steady cut. For straight-line cuts, use any straight edge as a guide.
- When cutting thin material, reduce the amps until you get the best quality cut.
- To cut perfect circles for spin fittings, use a template or a radius cutter attachment (Fig. 4-7).

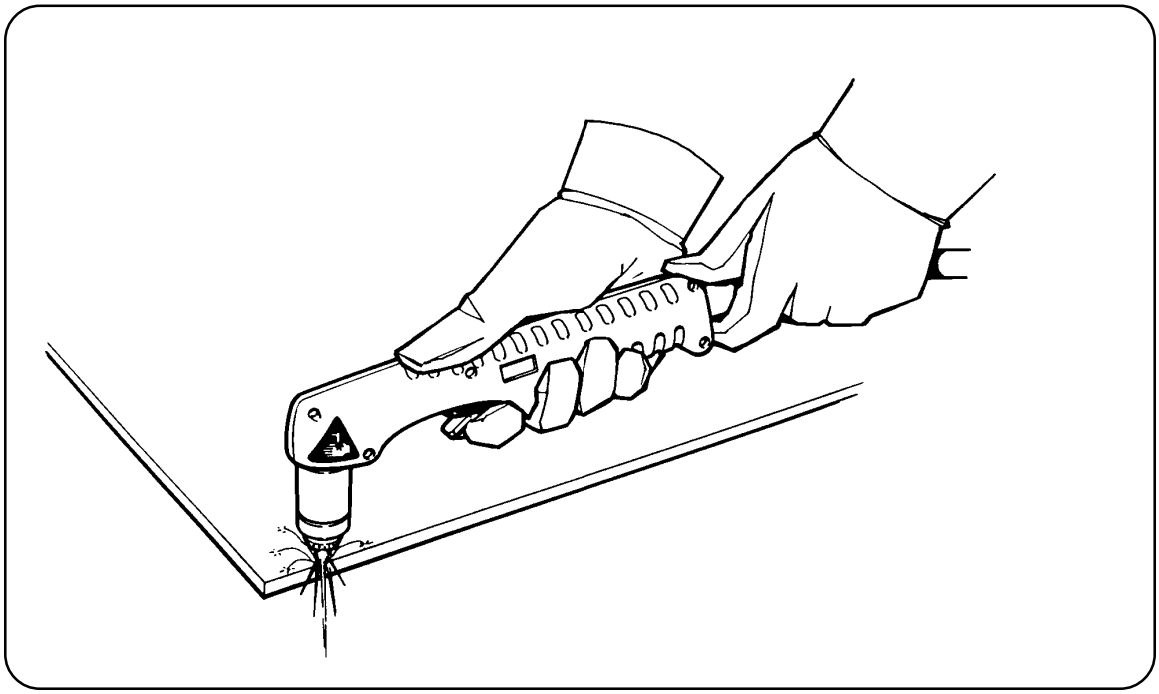


**Figure 4-6 Starting a Cut**

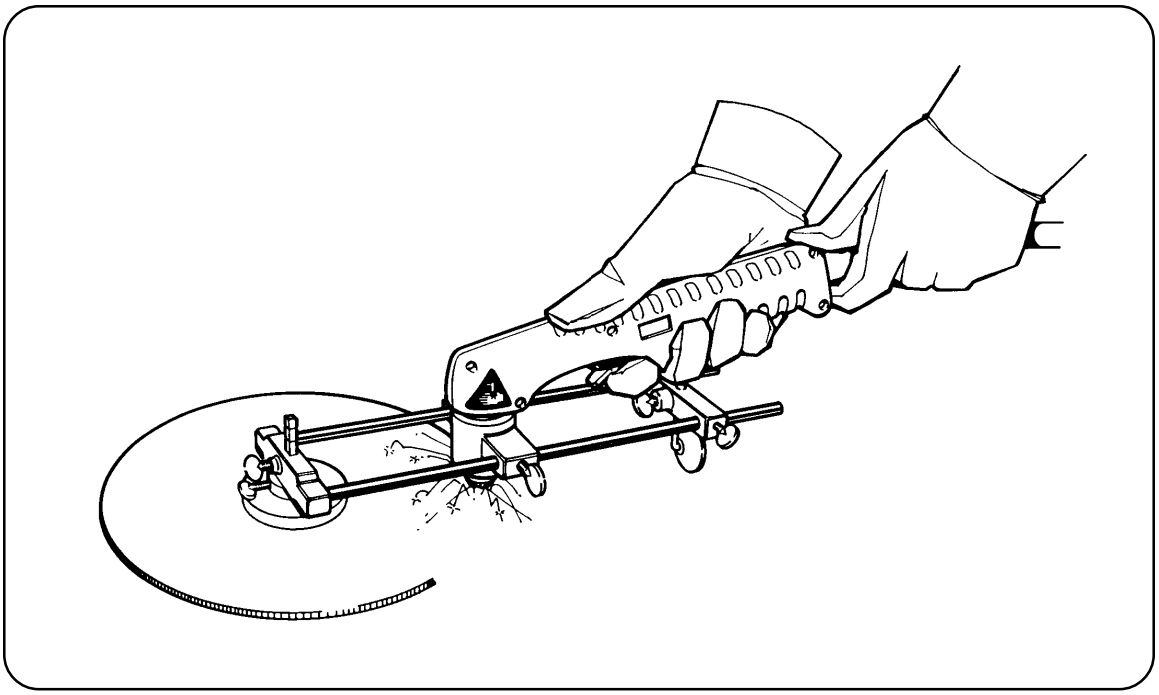


**Figure 4-7 Cutting a Circle**

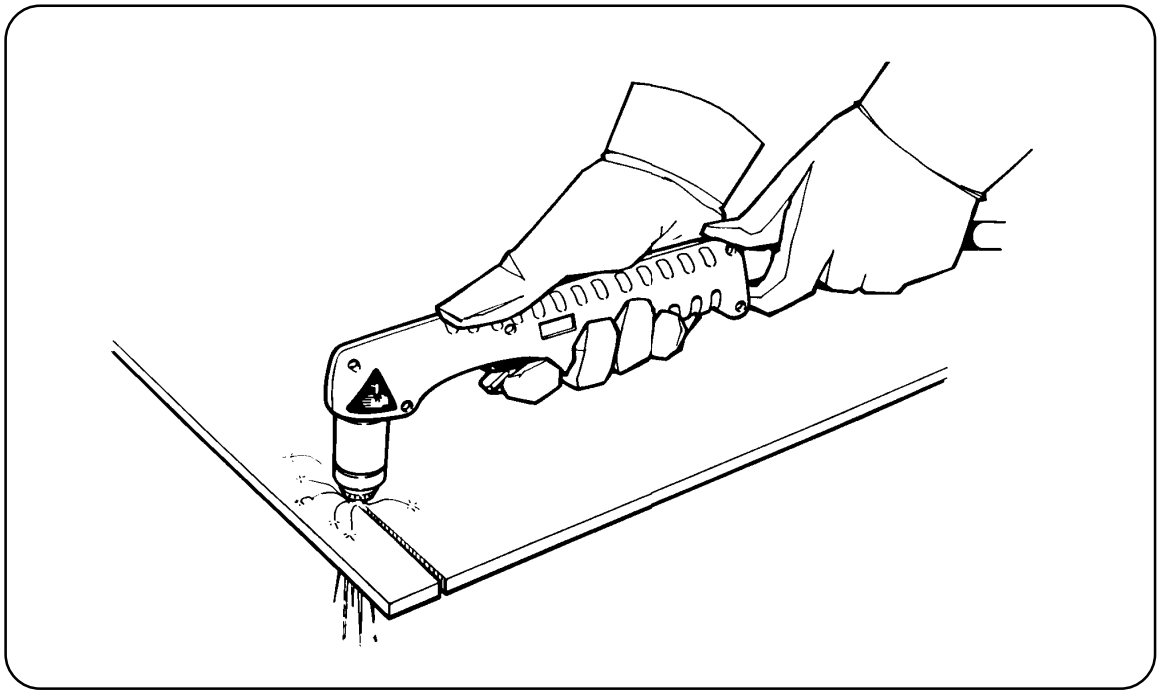
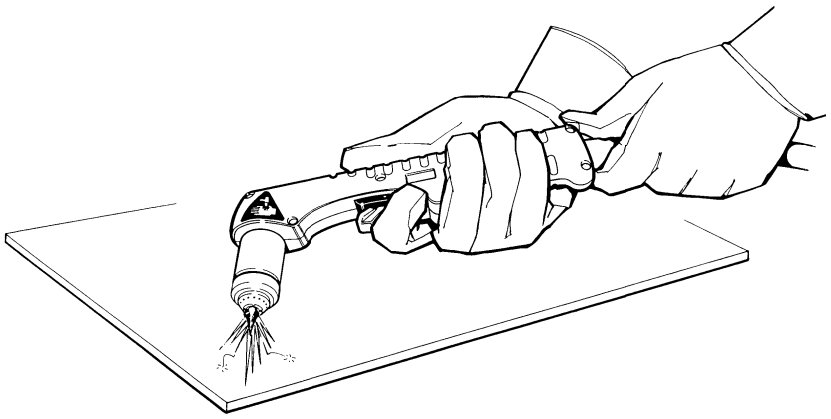


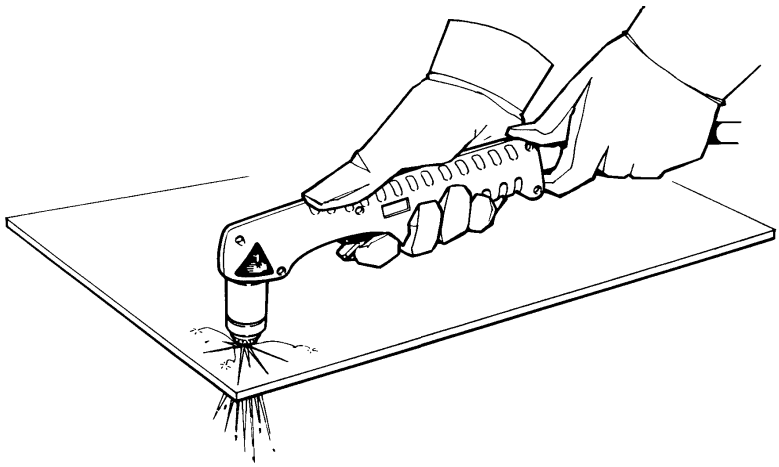
**Figure 4-8 Dragging the Torch**

## Piercing

- Hold the torch so that the nozzle is approximately 1/16 inch (1.6 mm) away from the workpiece before firing the torch. This method maximizes the life of the nozzle.
- Hold the torch at an angle to the workpiece away from yourself, then slowly rotate it to an upright position. (This is particularly important when cutting thicker material.) Make sure that the torch is pointed away from you and the people around you to avoid any danger from sparks and hot metal (Fig. 4-9).
- When the pierce is complete, proceed with the cut.
- Start the cut at an angle rather than in an upright position. This method permits the hot metal to escape to one side rather than splashing back against the nozzle. This will protect the operator from the sparks and extend the life of the nozzle.



1. Tilt the torch and press the start button.



2. Rotate the torch to an upright position.

**Figure 4-9 Piercing**

## Gouging

The Powermax800 can be used for gouging mild steel by using the optional gouging nozzle and gouging shield. To gouge:

- Always wear full protection:
  - A welding helmet with at least a #8 lens shade
  - Welding gloves
  - A welding jacket

The arc is fully exposed and will cause serious burns if the skin is not covered.

- Install the gouging nozzle and shield just as you would install a standard cutting nozzle and shield. See *Changing Consumable Parts* earlier in this section.

- Adjust the air pressure to 50–55 psi (3.4–3.8 bar) with air flowing from the torch. Note that this is lower than the cutting pressure.

- Tilt the torch approximately 45° from the surface to be gouged and feed into the gouge. Multiple passes or "wearing" may be necessary to gouge wider and deeper sections. See Fig. 4-10.

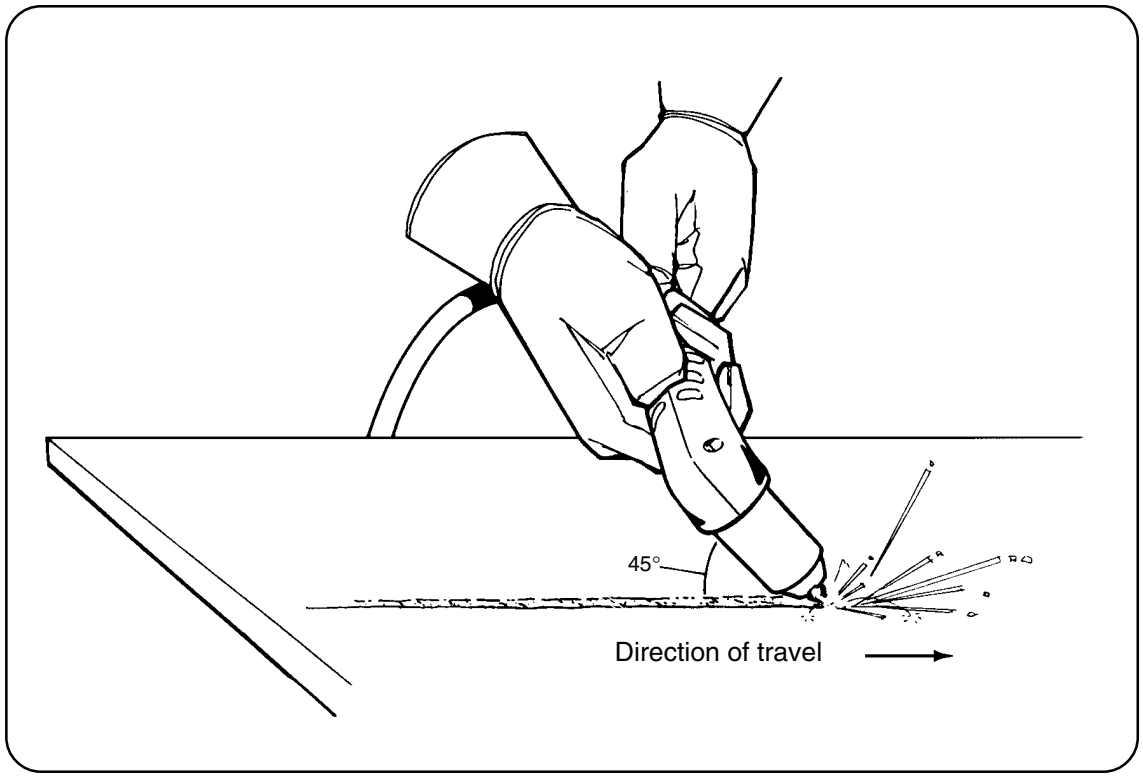
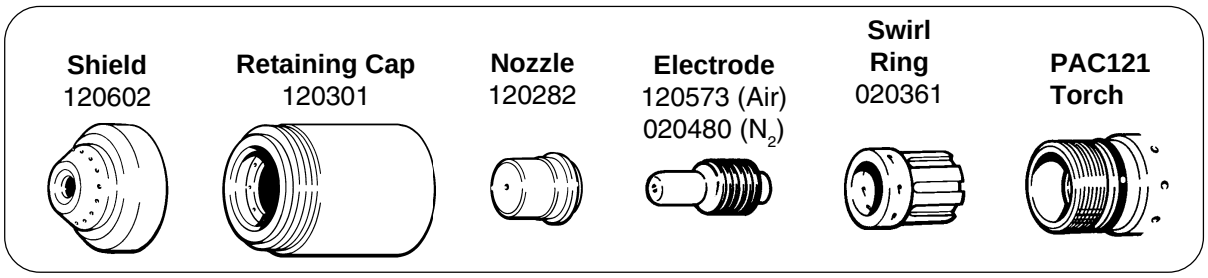



**Figure 4-10 Gouging**

## CUT CHART - 50A STANDARD CONSUMABLES

The following recommended settings are for mechanized cutting at 50 amps. Torch-to-work distance for the following cut charts is 1/16 inch (1.6 mm) for all cuts.




| Material Thickness (ga. or in.) | (mm) | Material | Arc Current (A) | Arc Voltage (V) | Recommended Travel Speed* (ipm) | (mm/min ) | Pierce Delay (S) |
|---|---|---|---|---|---|---|---|
| 1/16" | 1.5 | Mild/Galvanized | 50 | 103 | 250 | 6350 | – |
| 3/16" | 4.8 | Mild steel | 50 | 117 | 97 | 2470 | 0.7 |
| 1/4" | 6.4 | Mild steel | 50 | 118 | 58 | 1480 | 1.0 |
| 3/8" | 9.5 | Mild steel | 50 | 121 | 31 | 790 | 2.0 |
| 1/16" | 1.5 | Stainless Steel | 50 | 110 | 200 | 5080 | – |
| 1/8" | 3.0 | Stainless Steel | 50 | 115 | 105 | 2670 | 0.5 |
| 1/4" | 6.4 | Stainless Steel | 50 | 117 | 36 | 915 | 1.0 |
| 3/8" | 9.5 | Stainless Steel | 50 | 121 | 22 | 560 | 2.0 |
| 1/8" | 3.0 | Aluminum | 50 | 108 | 170 | 4320 | 0.5 |
| 1/4" | 6.4 | Aluminum | 50 | 117 | 50 | 1270 | 1.0 |
| 3/8" | 9.5 | Aluminum | 50 | 123 | 27 | 690 | 2.0 |

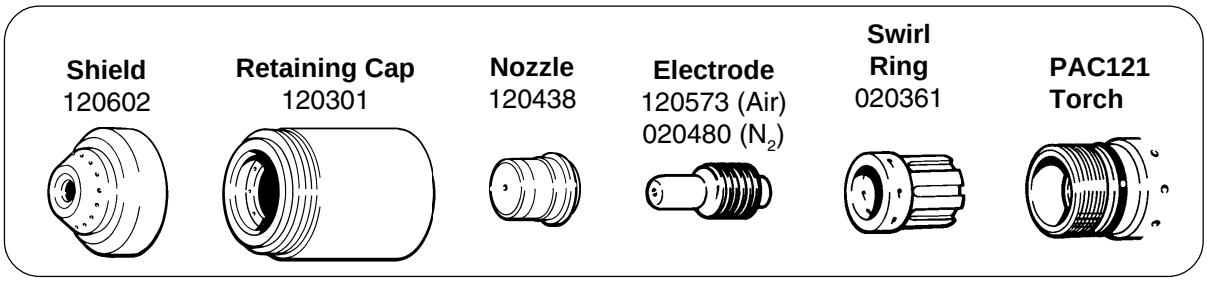
* Recommended travel speeds are 10–20% slower than maximum. These slower speeds will produce optimum cut quality.

**WARNING**

**The voltage between the tip of the torch and the workpiece will exceed 113VDC if shielded consumable parts are not installed in the torch. If using the 400V CE power supply, the PAC121TS torch must be operated with shielded parts to maintain the S mark and CE low-voltage compliance for hand held applications. See Section 5:** *Consumable Parts - For CE Compliance* **for a list of CE consumable parts. This requirement does not apply to machine torch applications.**

## CUT CHART - 40A CONSUMABLES

Use 40 amp consumables on thin material to obtain a narrow kerf width and to minimize the heat-affected zone. The following recommended settings are for mechanized cutting. Torch-to-work distance is 1/16 inch (1.6 mm) for all cuts.




| Material Thickness (ga. or in.) | Material Thickness (mm) | Material | Arc Current (A) | Arc Voltage (V) | Recommended Travel Speed* (ipm) | Recommended Travel Speed* (mm/min ) | Pierce Delay (S) |
|---|---|---|---|---|---|---|---|
| 26 ga. | 0.5 | Mild/Galvanized | 20 | 121 | 180 | 4570 | – |
| 24 ga. | 0.6 | Mild/Galvanized | 30 | 116 | 280 | 7110 | – |
| 18 ga. | 1.2 | Mild steel | 30 | 108 | 200 | 5080 | – |
| 16 ga. | 1.5 | Mild steel | 40 | 108 | 180 | 4570 | – |
| 10 ga. | 3.4 | Mild steel | 40 | 106 | 110 | 2790 | 0.5 |
| 1/4" | 6.4 | Mild steel | 40 | 115 | 35 | 890 | 2.0 |
| 3/8" | 9.5 | Mild steel | 40 | 124 | 15 | 380 | 2.5 |
| 27 ga. | 0.4 | Stainless Steel | 40 | 114 | 250 | 6350 | – |
| 24 ga. | 0.6 | Stainless Steel | 40 | 102 | 200 | 5080 | – |
| 16 ga. | 1.5 | Stainless Steel | 40 | 110 | 125 | 3180 | – |
| 10 ga. | 3.4 | Stainless Steel | 40 | 111 | 60 | 1520 | 0.5 |
| 1/4" | 6.4 | Stainless Steel | 40 | 118 | 22 | 560 | 2.0 |
| 3/8" | 9.5 | Stainless Steel | 40 | 123 | 12 | 305 | 2.5 |
| 1/16" | 1.5 | Aluminum | 40 | 104 | 200 | 5080 | – |
| 1/8" | 3.0 | Aluminum | 40 | 123 | 100 | 2540 | 0.6 |
| 3/8" | 9.5 | Aluminum | 40 | 130 | 13 | 330 | 2.5 |

* Recommended travel speeds are 10–20% slower than maximum. These slower speeds will produce optimum cut quality.

Cut Chart Notes:

The Cut Charts on these pages are optimized to provide the best cut angle, least dross and best cut surface finish. **Remember that cut charts are intended to provide a good starting point for each different cutting assignment. Every cutting system requires "fine-tuning" for each cutting application to the materials on site in order to obtain optimum cut quality.**

Cut Chart Notes (continued):

- Maximum recommended mechanized cutting capacity: 3/8 inch (10 mm).
- See page 4-7 or **Section 5** for additional consumable parts.
- Compressed air or nitrogen must be available to the power supply filter/pressure regulator at a flow rate of 320 scfh/5.3 scfm (150 l/min) at a pressure of 90 psi (6.2 bar). The dynamic (flowing) pressure when operating is 70 psi (4.8 bar). If torch leads are 50 ft (15.2 m), the dynamic pressure when operating is 75 psi (5 bar). If the pressure to the power supply falls below 40 psi (2.8 bar), the torch will go out.
- After several minutes of running, the torch retaining cap may become hot. To cool it, push in and hold the GAS TEST switch until the cap cools down.
- The duty cycle, or the amount of time the pilot or plasma arc can remain "on" in minutes within a 10-minute period, is affected by many factors. When the current is set at 50 amps, the Powermax800 has a 50% duty cycle at a temperature of 40° C (104° F). At these conditions, the plasma arc can remain on 5 minutes out of every 10 minutes without causing the temperature sensors to disable the unit. The duty cycle increases to 100% at a temperature of 40° C (104° F) when the current is set below 35 amps.
- To avoid performance deterioration of the Powermax800, input voltage should be within 10% of the specified system line voltage setting.

## COMMON CUTTING FAULTS

- The workpiece is not totally penetrated. Causes can be:
  - The current is too low.
  - The cut speed is too high.
  - The torch parts are worn.
  - The metal being cut is too thick.
  - The work clamp is not properly attached to the workpiece.
- Dross forms on the bottom of the cut. Causes can be:
  - The cutting speed is too slow.
  - The torch parts are worn.
  - The metal being cut is too thick.
  - The current is too low.

# Section 5 MAINTENANCE/PARTS

In this section:


Introduction ..... 5-2
Routine Maintenance ..... 5-2
Bowl Draining and Filter Element Cleaning ..... 5-2
Cooling Air Filter Removal, Cleaning and Replacement ..... 5-3
PAC121TS Torch Parts Removal and Replacement ..... 5-4
Torch Main Body Removal and Replacement ..... 5-4
Torch Switch Removal and Replacement ..... 5-5
PAC121MS Torch Parts Removal and Replacement ..... 5-6
Removal ..... 5-6
Replacement ..... 5-6
Basic Troubleshooting ..... 5-8
Technical Questions ..... 5-10
Parts ..... 5-11
Consumable Parts ..... 5-11
Hand Consumable Spare Parts Kit ..... 5-11
Machine Consumable Spare Parts Kit ..... 5-11
Consumable Parts - For CE Compliance ..... 5-12
Consumable Spare Parts Kit ..... 5-12
PAC121TS Torch Assembly ..... 5-13
PAC121MS Torch Assembly ..... 5-14
Powermax800 Field Upgrade Kits and Optional Parts ..... 5-15
Power Supplies - 208/240/480V ..... 5-15
Power Supplies - 200/230/400V ..... 5-15
Power Supplies - 400V CE ..... 5-16

## INTRODUCTION

This section contains information for simple maintenance and troubleshooting. A brief parts list is also included. For higher level troubleshooting, see *Technical Questions* later in this section.

## ROUTINE MAINTENANCE

### Bowl Draining and Filter Element Cleaning

Moisture coming out of the torch can cause the torch to sputter and hiss. If there is moisture, purge the lines. If moisture builds up in the bowl of the filter at the rear of the power supply, drain the bowl and clean the filter element:

1. Shut off the gas supply and disconnect the gas supply hose from the filter assembly before proceeding.

2. Remove the cap at the bottom of the filter bowl and turn the knurled drain valve to the right to release water from the bowl.

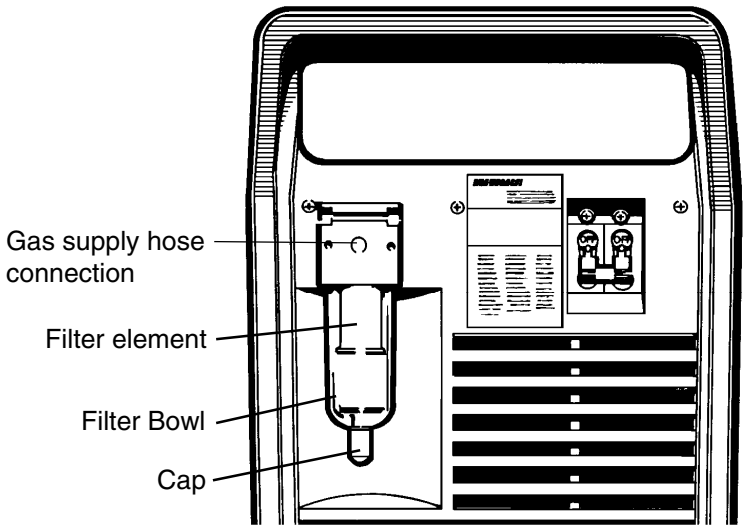



**Figure 5-1 Filter Assembly**

3. Unscrew the filter bowl.

4. Unscrew the filter element. See *Powermax800 Field Upgrade Kits and Optional Parts* later in this section for part number information.

5. Clean the filter element with alcohol, then blow it out with air from the inside of the filter element. Clean the bowl with household soap only.

6. Replace the filter element and filter bowl.

7. Reconnect the gas supply hose.

## Cooling Air Filter Removal, Cleaning and Replacement

Powermax800 systems are normally shipped without air filters. If your Powermax800 has the air filter option, it will need cleaning periodically. Excessively dirty or dusty environments can block the cooling air filter (if installed) and cause the power supply to overheat and shut down.

**WARNING**

**SHOCK HAZARD: Always turn off power, unplug cord from wall and wait 5 minutes before removing any power supply cover. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

1. **Turn the Powermax800 power switch to the OFF (0) position**, unplug the power cable from the wall receptacle and disconnect the gas supply. See warning above.

2. Remove the 22 screws that secure the power supply cover to the chassis.

3. Remove the cover, and remove the cooling air filter from the clips by sliding the filter to the left and then up - Fig. 5-2. See *Powermax800 Field Upgrade Kits and Optional Parts* later in this section for part number information.

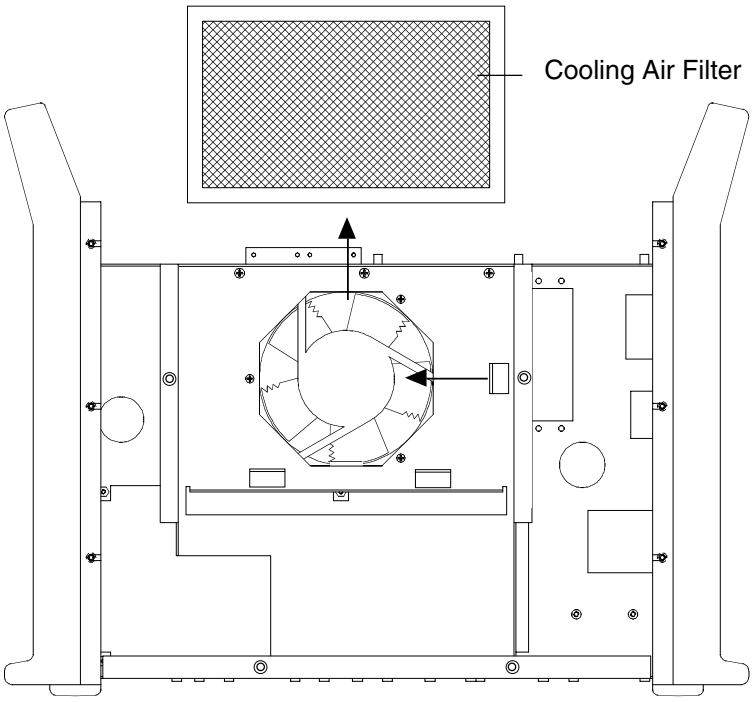



**Figure 5-2 Air Filter Removal**

4. Clean the air filter with either soap and water or with low pressure compressed air.

5. Replace the dry filter in the power unit with the wire mesh facing the fan.

6. Replace and re-fasten the power supply cover with the existing screws.

## PAC121TS TORCH PARTS REMOVAL AND REPLACEMENT

### Torch Main Body Removal and Replacement

To remove and replace the torch main body, order the torch main body with cap-on sensor switch and refer to the following procedure and Figures 5-3 and 5-4.

1 **Set the Powermax800 power switch to O (off), unplug the power cable, and disconnect the gas supply. Disconnect the torch lead quick disconnect from the power supply.**

2. Remove the five screws that secure the handle halves together and remove handles from torch main body, torch switch and safety trigger (Fig. 5-4).

3. Remove the red wires attached to the pilot arc tab (Fig. 5-3).

   Note for step 4: Disconnect wires by pulling on terminals. Do **not** pull on wires.

4. Disconnect the two lead terminals (blue wire in each terminal) from the two white wires of the cap sensor microswitch (Fig. 5-3).

5. Disconnect the plunger wire from the torch main body by holding the plunger nut with a 1/4" (6mm) wrench or nut driver and removing the plunger screw (Fig. 5-3).

6. Disconnect the torch main body and torch lead gas fittings using 5/16" (8mm) and 7/16" (11mm) open-end wrenches.

7. Replace the new torch main body by reversing these instructions. Note: When connecting the plunger wire, be certain to keep the plunger wire terminal at the proper angle as shown in the Fig. 5-3 inset. Tighten the plunger screw with 8 lb-in (9 kg-cm) of torque.

8. Install the torch main body and torch switch back into handle (Fig. 5-4). Be certain that the torch switch slides into position above the safety trigger, and that trigger movement activates the switch pushbutton and then releases. While positioning the handle halves together, be careful not to pinch any wires.

9. Replace the five screws to secure the handle halves together.

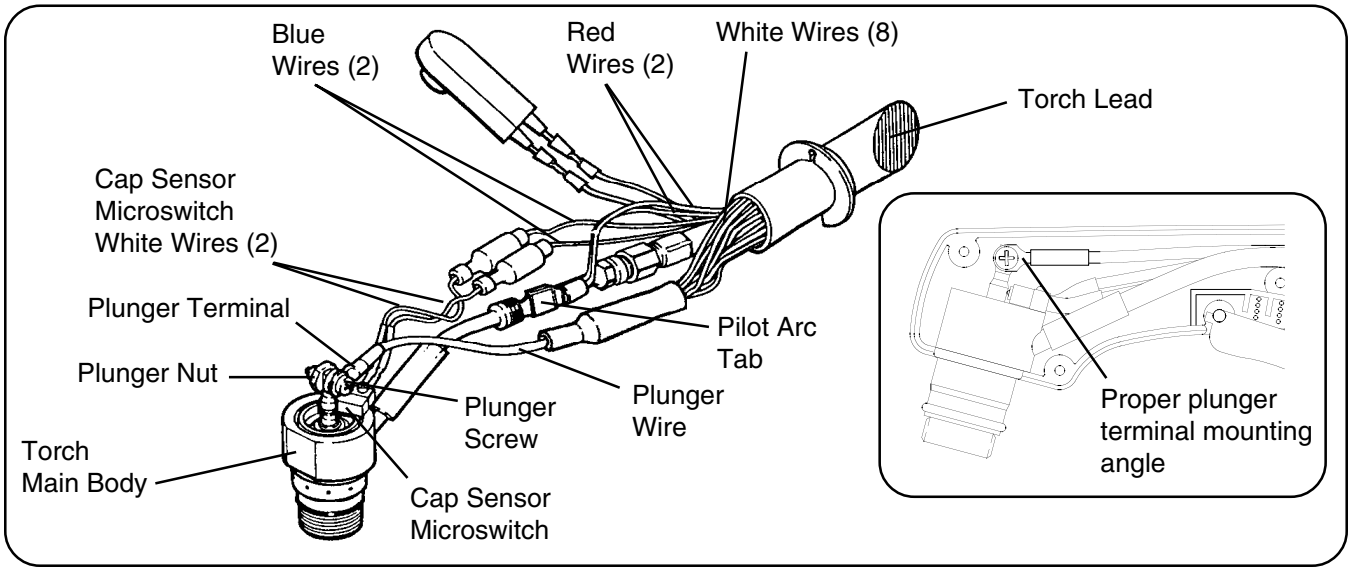



**Figure 5-3 PAC121TS Torch Main Body Removal**

### Torch Switch Removal and Replacement

To remove and replace the torch switch, order the torch switch and two splices (074069) and refer to the following procedure and Fig. 5-4. See *Parts* later in this section for a complete list of torch parts.

1. **Ensure the Powermax800 power switch is positioned to O (off), unplug the power cable, and disconnect the gas supply.**
2. Remove the five screws that secure the handle halves together.
3. Remove the torch switch from the handle.
4. Remove the torch switch by cutting the two splices at the torch lead (violet wires).
5. Replace the torch switch by crimping the switch wires and the violet wires from the torch lead together with the splices.
6. Install the torch switch back into the handle. Be certain that the torch switch slides into position above the safety trigger, and that trigger movement activates the switch pushbutton and then releases. While positioning the handle halves together, be careful not to pinch any wires.
7. Replace the five screws to secure the handle halves together.

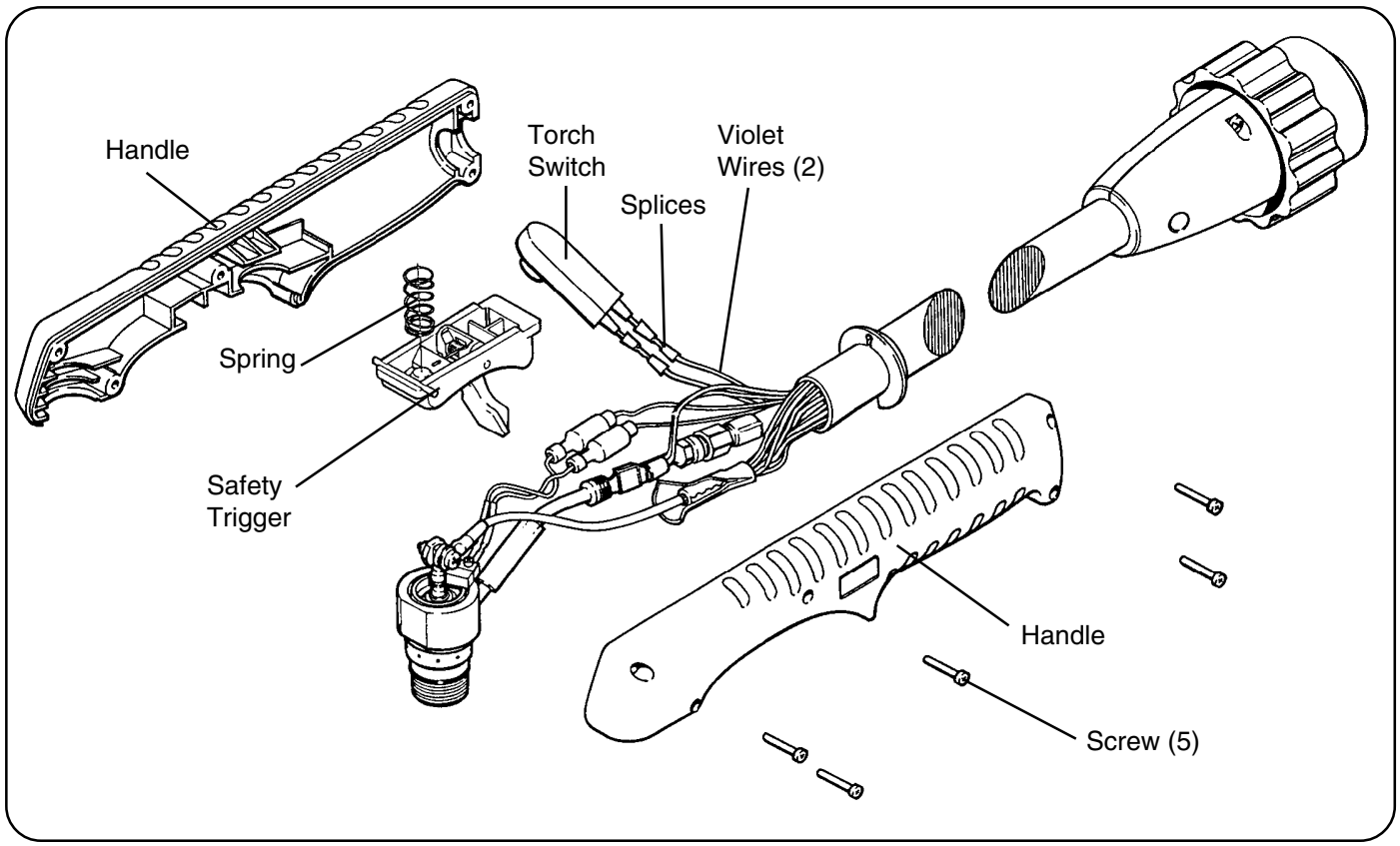



**Figure 5-4 PAC121TS Torch Switch Removal**

## PAC121MS TORCH PARTS REMOVAL AND REPLACEMENT

Repair of the PAC121MS machine torch normally requires replacement of the torch main body and/or the torch lead. Order the torch main body. Refer to Fig. 5-5 and perform the steps below. See *Parts* later in this section for a complete list of torch parts.

### Removal

1. **Set the Powermax800 power switch to O (off), unplug the power cable, and disconnect the gas supply. Disconnect the torch lead quick disconnect from the power supply.**
2. Unscrew the retaining cap and remove the remaining parts (nozzle, electrode and swirl ring).
3. Remove the O-ring from the torch main body.
4. Remove the three screws securing the torch sleeve to the torch main body.
5. Unscrew the torch position sleeve from the torch sleeve and slide it back out of the way.
6. Remove the screw securing the red wires from the torch lead to the torch main body.

   Note for steps 7 and 8: Disconnect wires by pulling on terminals. Do **not** pull on wires.

7. Disconnect the 2 lead terminals (4 white wires in each terminal) from the 2 black plunger wire terminals of the torch main body.
8. Disconnect the 2 lead terminals (blue wire in each terminal) from the 2 white wires of the cap sensor microswitch.
9. Disconnect the torch main body and torch lead gas fitting using the 5/16" (8 mm) and 7/16" (11 mm) open-end wrenches.

### Replacement

| Caution: Use caution when removing the O-ring, it can easily be damaged. |
|---|

1. Remove the O-ring from the replacement torch main body.
2. Connect the torch main body to the torch lead gas fitting using open-end wrenches.
3. Connect the two lead terminals (blue wire in each terminal) to the two white wires of the cap sensor microswitch.
4. Connect the two lead terminals (four white wires in each terminal) to the two black plunger wires of the torch main body.
5. Secure the red wires from the torch lead to the torch main body with screw.

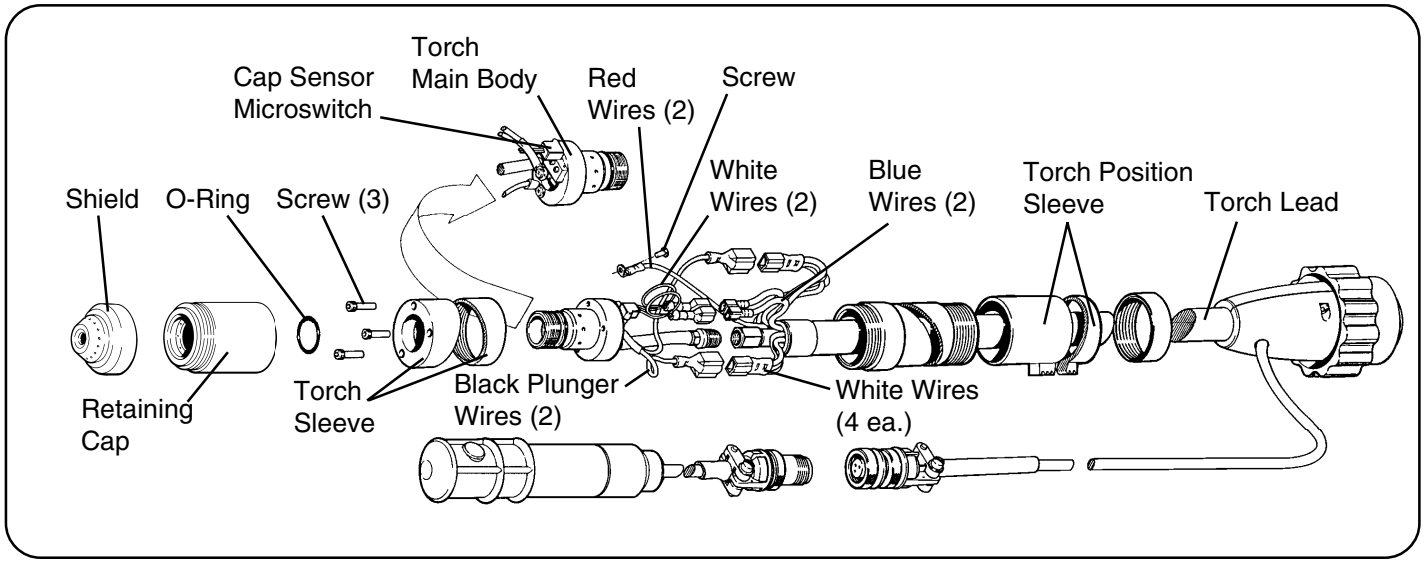



**Figure 5-5 PAC121MS Torch Assembly**

6. Position the torch sleeve onto the torch main body and secure it with the 3 screws.

7. Use caution when installing the O-ring onto the torch main body, it can be easily damaged. Lightly coat with silicone.

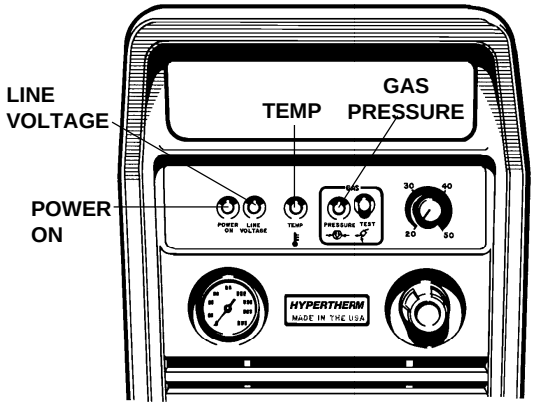
8 Screw the torch position sleeve and the torch sleeve together.

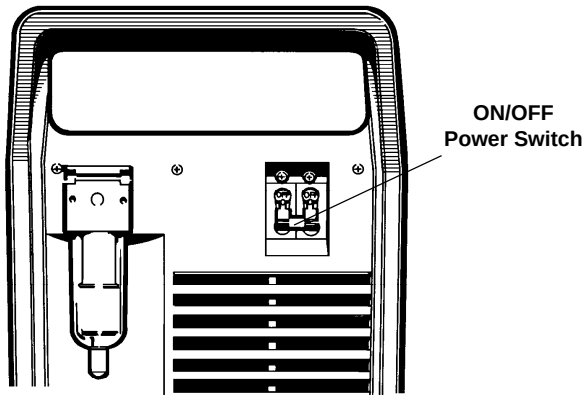
9. When the nozzle, electrode and swirl ring are properly in place, replace the retaining cap with the shield. When the retaining cap is tightened, the microswitch will click, indicating that the torch main body has been replaced correctly.

10. Align the connector plug key (on torch lead) with the connector receptacle key slot (on power supply) and push it in until the pins seat.

11. Turn the connector securing ring 1/4 turn to the left to ensure that the securing ring threads and the connector receptacle threads are aligned prior to tightening. Turn the connector securing ring to the right to tighten.

## BASIC TROUBLESHOOTING




| Problem | *Cause* / Solution |
|---|---|
| **1. The ON/OFF power switch is set to I (ON), but the fan does not operate and the POWER ON LED is not illuminated.** | ***1.1 The power cord is not plugged into the power receptacle.*** Plug in the power supply. |
| | ***1.2 The disconnect power switch is not set to ON or there is no power available to the disconnect power switch box.*** Turn the power ON at the main power panel or at the disconnect power switch box. |
| | ***1.3 A fuse is blown.*** See **Appendix A** *Changing Fuses*. |
| **2. The POWER ON LED is illuminated but the GAS PRESSURE LED is not illuminated.** | ***2.1 The gas supply is turned OFF or not connected to the power supply.*** Verify that the gas is turned on and connected to the power supply. |
| | ***2.2 Gas pressure is too low.*** Set gas supply pressure to 90 psi (6.2 bar). Verify that there are no leaks in the gas supply line. |
| **3. The POWER ON LED is illuminated, the LINE VOLTAGE LED stays illuminated and the torch is disabled.** | ***3.1 Power supply voltage links are incorrect.*** See voltage configuration settings in **Section 3**. |
| | ***3.2 Line voltage is too low.*** The following table represents the operating range of the Powermax800 power supplies. Have an electrical technician check incoming power. |

| Problem | *Cause* / Solution |
|---|---|

Note: To avoid performance deterioration of the Powermax800, input voltage should be within 10% of the specified system line voltage setting.

| Lower Limit | System Line Voltage | Upper Limit |
|---|---|---|
| 170VAC | 200VAC | 235VAC |
| 178VAC | 208VAC | 239VAC |
| 195VAC | 230VAC | 270VAC |
| 204VAC | 240VAC | 276VAC |
| 340VAC | 400VAC | 470VAC |
| 408VAC | 480VAC | 552VAC |
| 510VAC | 600VAC | 690VAC |

**4. The power supply shuts off after it turns on, or the LINE VOLTAGE LED illuminates for a short time and then the power supply shuts off.**

***4.1 The retaining cap is loose.***
Tighten the retaining cap.

***4.2 The torch is defective.***
See *Technical Questions* on page 5-10.

***4.3 Power supply voltage links are incorrect.***
See voltage configuration settings in **Section 3**.

***4.4 Line voltage is too high.***
See table above.

**5. The fuse on the incoming power line fails during cutting.**

***5.1 The power supply has exceeded the capacity of the fuse.***
Check the fuse for proper amperage rating. See *Power Requirements* in **Section 3**. Check power cable for a short circuit or loose connection.

**6. The POWER ON LED is illuminated, the TEMP LED stays illuminated and the torch will not fire.**

***6.1 One of the internal thermostat switches has opened due to overheating.***
Leave power supply on to allow fan to cool power supply down, then shut down and restart. Clean internal air filter (if installed). See *Cooling Air Filter Removal, Cleaning and Replacement* earlier in this section.

**7. The arc does not transfer after 5 seconds.**

***7.1 The five-second time-out for the pilot arc has occurred.***
Press the torch start button again.

***7.2 The work clamp is not connected or it is broken.***
Connect or repair the work clamp.

| Problem | *Cause* / Solution |
|---|---|
| | ***7.3 The workpiece is too far away from the torch.*** Move the torch head closer (1/16 inch (1.5 mm) maximum distance) to the workpiece and press the torch start button again. |
| **8. The arc blows out, but re-ignites when the torch switch is depressed.** | ***8.1 There are faulty consumable parts.*** Inspect and change the consumable parts, if necessary. See *Operating Tips* in **Section 4**. |
| | ***8.2 The gas pressure is incorrect.*** Adjust the gas pressure. Incoming gas pressure is 90 psi (6.2 bar) at a flow of 320 scfh (150 l/m). Pressure at unit in TEST mode is 70 psi (4.8 bar) for lead length of 25 feet (7.6 m) and 75 psi (5 bar) for lead length of 50 feet (15.2 m). See *Operating Instructions* in **Section 4** to adjust gas pressure, if necessary. |
| | ***8.3 The gas filter at the rear of the supply contains excessive moisture.*** Drain filter bowl and clean filter. See *Routine Maintenance* earlier in this section. |
| **9. The arc sputters and hisses.** | ***9.1 The gas filter at the rear of the supply contains excessive moisture.*** Drain filter bowl and clean filter. See *Routine Maintenance* earlier in this section. |
| **10. The power supply cuts poorly.** | ***10.1 Power supply voltage links are incorrect.*** See voltage configuration settings in **Section 3**. |
| | ***10.2 Consumables are worn.*** See *Operating Tips* in **Section 4.** |

## TECHNICAL QUESTIONS

If you are unable to fix the problem with your Powermax800 by following this basic troubleshooting guide or if you need further assistance:

1. Call your distributor. He/she will be able to help you, or refer you to an authorized Hypertherm repair facility.

2. Call Hypertherm's Technical Service group at 1 800 643 9878 or the nearest Hypertherm office, listed in the front of this manual.

3. See the Powermax800 service manual for wiring diagrams, higher level troubleshooting and more parts list information.

# PARTS

## Consumable Parts

**WARNING**

**For CE compliance in hand torch applications, shielded consumable parts must be used. See page 5-12 for a complete list.**

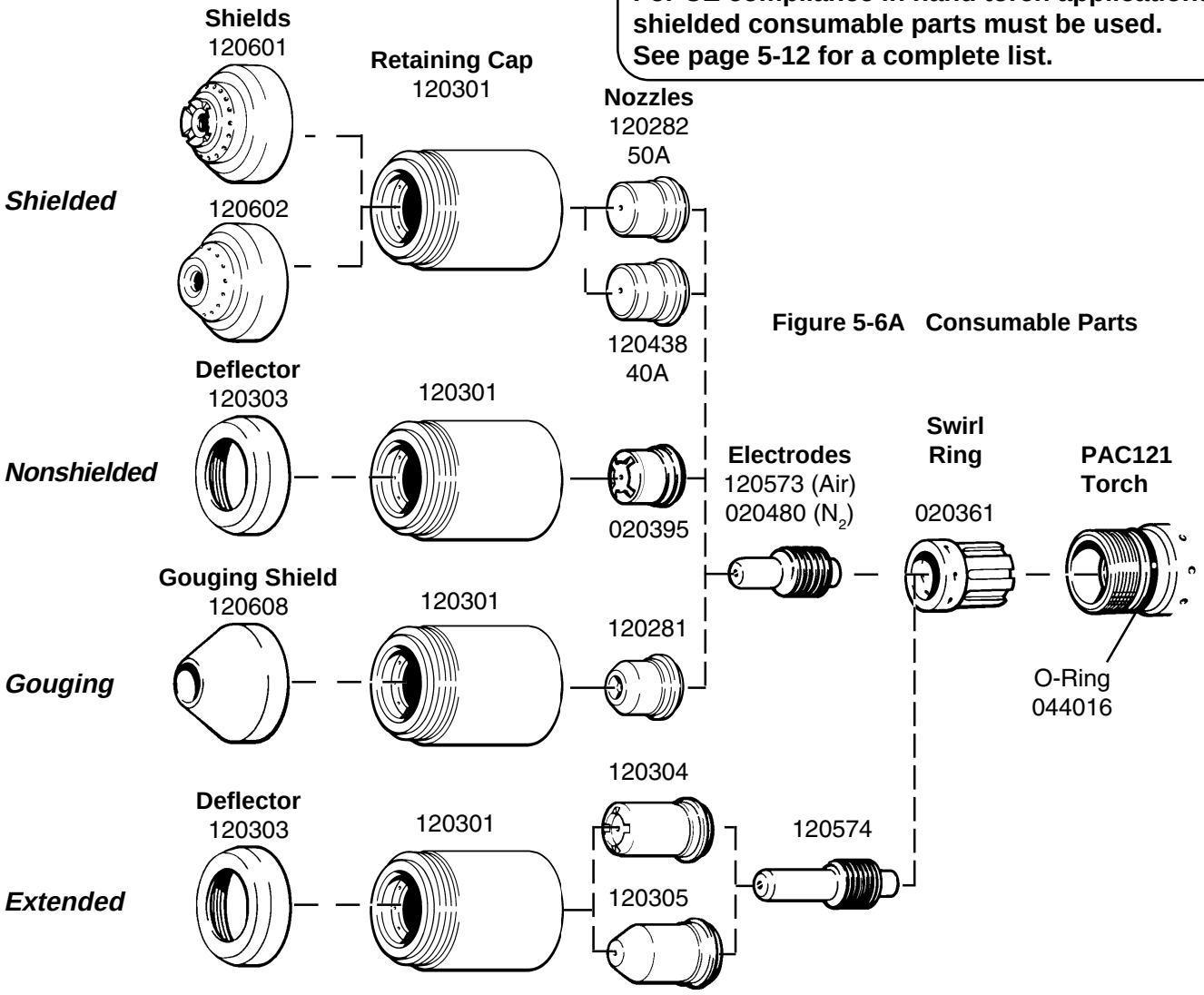



**Figure 5-6A Consumable Parts**

| Hand Consumable Spare Parts Kit (028904) | |
|---|---|
| **Part Number** | **Description (Quantity)** |
| 001285 | Box, Consumable Parts (1) |
| 120573 | Electrode (3) |
| 120574 | Electrode, Extended (1) |
| 120282 | Nozzle, 50A, Shielded (3) |
| 120281 | Nozzle, 50A, Gouging (1) |
| 120305 | Nozzle, Pipe Saddle, Extended (1) |
| 120601 | Shield, T torch (1) |
| 120608 | Shield, Gouging (1) |
| 120303 | Deflector (1) |
| 044016 | O-Ring (3) |
| 015152 | Nipple, 1/8 NPT,QDisc, Steel (1) |
| 015570 | Bushing, Reducer, 1/4 X 1/8, Brass (1) |
| 015604 | Reducer, 1/4 FPT X 1/8 NPT, Brass (1) |
| 027055 | Lubricant, Silicone 1/4 Oz Tube (1) |

| Machine Consumable Spare Parts Kit (128030) | |
|---|---|
| **Part Number** | **Description (Quantity)** |
| 001285 | Box, Consumable Parts (1) |
| 120573 | Electrode, Air (4) |
| 120574 | Electrode, Extended (2) |
| 120282 | Nozzle, 50A, Shielded (2) |
| 120438 | Nozzle, 40A, Shielded (2) |
| 120305 | Nozzle, Pipe Saddle, Extended (2) |
| 120602 | Shield, M torch (1) |
| 120303 | Deflector (1) |
| 044016 | O-Ring (3) |
| 015152 | Nipple, 1/8 NPT, QDisc, Steel (1) |
| 015570 | Bushing, Reducer, 1/4 X 1/8, Brass (1) |
| 015604 | Reducer, 1/4 FPT X 1/8 NPT, Brass (1) |
| 027055 | Lubricant, Silicone 1/4 Oz Tube (1) |

## Consumable Parts - For CE Compliance in Hand Torch Applications

Note: See page 5-11 for a list of consumable parts for non-CE countries.

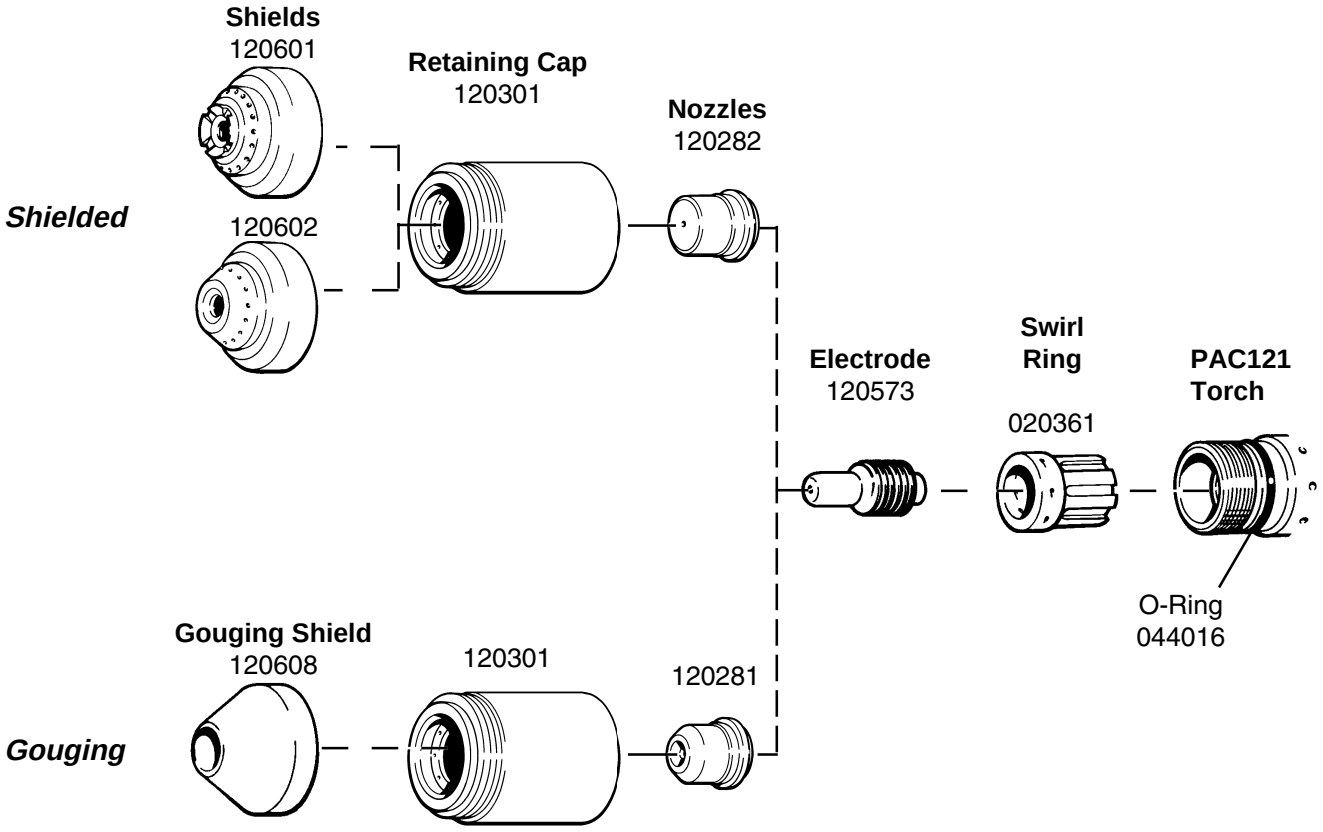



**Figure 5-6B Consumable Parts - CE Compliance**

| Consumable Spare Parts Kit - CE (128033) | |
|---|---|
| **Part Number** | **Description (Quantity)** |
| 001285 | Box, Consumable Parts (1) |
| 120573 | Electrode, (3) |
| 020361 | Swirl Ring (1) |
| 120282 | Nozzle, 50A, Shielded (3) |
| 120281 | Nozzle, 50A, Gouging (1) |
| 120601 | Shield, T torch (1) |
| 120602 | Shield, M torch (1) |
| 120608 | Shield, Gouging (1) |
| 044016 | O-Ring (3) |
| 015152 | Nipple, 1/8 NPT, QDisc, Steel (1) |
| 015570 | Bushing, Reducer, 1/4 X 1/8, Brass (1) |
| 015604 | Reducer, 1/4 FPT X 1/8 NPT, Brass (1) |
| 027055 | Lubricant, Silicone 1/4 Oz Tube (1) |

## PAC121TS Torch Assembly and 25 ft (7.6 m) Lead - 083003
## PAC121TS Torch Assembly and 50 ft (15.2 m) Lead - 083004

| Part Number | Description |
|---|---|
| 001288 | Handle, PAC121T |
| 002244 | Safety Trigger, PAC121T |
| 005094 | Switch, Torch Pushbutton |
| 020351 | Electrode, Air |
| 020361 | Ring, Swirl |
| 027254 | Trigger Spring, PAC121T |
| 027466 | Ring, Gutcha |
| 075340 | Screws, P/S, # 4 X 5/8, PH, RND, S/B |
| 120282 | Nozzle: PAC121 50A Shield |
| 120283 | Shield: PAC121 50A |
| 120301 | Cap, Retaining |
| 120556 | Torch Main Body with Switch, PAC121T |
| 044016 | O-Ring: BUNA 90 Duro .614X.070 |
| 129001* | Torch Lead, 25 ft (7.6 m) |
| 129002** | Torch Lead, 50 ft (15.2 m) |
| 044009 | Quick Disconnect O-Ring (not shown) |

* Used only in 083003

** Used only in 083004

Note: See page 5-11 or 5-12 for detail of consumable parts

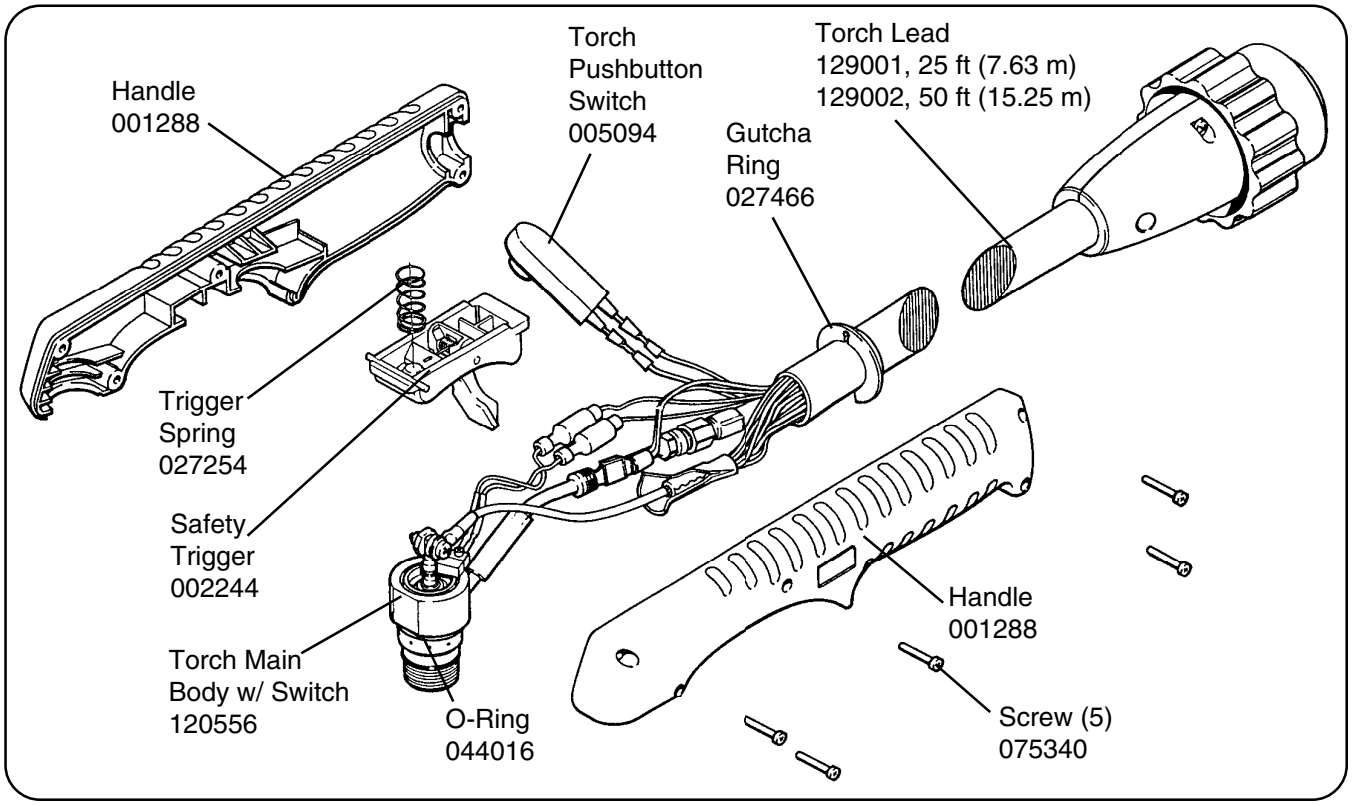



**Figure 5-7 PAC121TS Torch Assembly and Leads**

**PAC121MS Torch Assembly and 14 ft (4.3 m) Lead - 083049 w/pigtail, 083054 no pigtail**
**PAC121MS Torch Assembly and 25 ft (7.6 m) Lead - 083011 w/pigtail, 083056 no pigtail**
**PAC121MS Torch Assembly and 35 ft (10.6 m) Lead - 083044 w/pigtail, 083057 no pigtail**
**PAC121MS Torch Assembly and 50 ft (15.2 m) Lead - 083012 w/pigtail, 083058 no pigtail**

| Part Number | Description |
|---|---|
| 020351 | Electrode |
| 020361 | Ring, Swirl |
| 020559 | Sleeve, Machine Torch, PAC121M |
| 020620 | Sleeve, Torch Position, PAC121M |
| 028923 | Torch Lead w/pigtail, 14 ft (4.3 m) |
| 028918 | Torch Lead w/pigtail, 25 ft (7.6 m) |
| 028926 | Torch Lead w/pigtail, 35 ft (10.6 m) |
| 028919 | Torch Lead w/pigtail, 50 ft (15.2 m) |
| 128123 | Torch Lead, no pigtail, 14 ft (4.3 m) |
| 128125 | Torch Lead, no pigtail, 25 ft (7.6 m) |
| 128126 | Torch Lead, no pigtail, 35 ft (10.6 m) |
| 128127 | Torch Lead, no pigtail, 50 ft (15.2 m) |
| 044009 | Quick Disconnect O-Ring (not shown) |
| 075321 | Socket Cap, 4-40 X 1/2, HX, SS |
| 075322 | M/S, 4-40 X 1/4, SL, SZ |
| 120282 | Nozzle: PAC121 50A Shield |
| 120326 | Shield: PAC121M Machine Torch |
| 120301 | Cap, Retaining |
| 120558 | Torch Main Body w/ Switch, PAC121M |
| 044016 | O-Ring: BUNA 90 Duro .614X.070 |

Note: See page 5-11 or 5-12 for detail of consumable parts

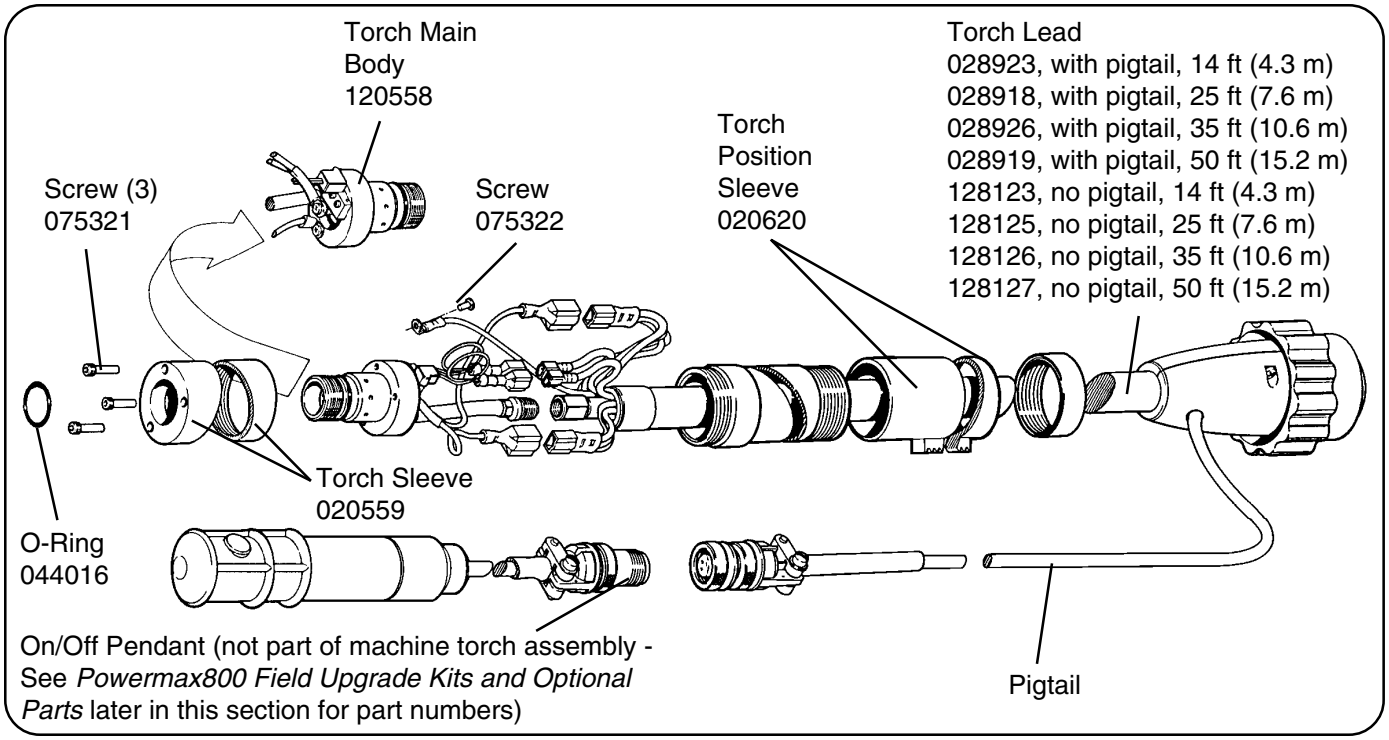



**Figure 5-8 PAC121MS Torch Assembly and Leads**

### Powermax800 Field Upgrade Kits and Optional Parts

| Part Number | Description |
|---|---|
| 028714 | On/Off Pendant with Lead, 25 ft (7.6 m) (Also comes standard with most machine torch system configurations. See note below.) |
| 128061 | On/Off Pendant with Lead, 50 ft (15.2 m) |
| 128062 | On/Off Pendant with Lead, 75 ft (23 m) |
| 028864 | Kit: Powermax800 Power Unit Wheels |
| 028898 | Pilot Arc Controller Kit |
| 028905 | Machine Interface Kit, 208/240/480V |
| 128035 | Machine Interface Kit, 200/230/400V |
| 128036 | Machine Interface Kit, 400V CE |
| 028907 | Work Cable, 50 ft (15.2 m) |
| 028908 | Cooling Air Filter Kit:Powermax800 |
| 011079 | Filter Element |
| 129019 | Jumper:Powermax800 Link Box |
| 128032 | Kit: Powermax800 600V |
| 008809 | Fuse:1A 600V 13/32 X 1-1/2 Slo (Used on 208/240/480V power supplies) |
| 008958 | Fuse:1A 500V 10mm X 38mm Slo (Used on 200/230/400V and 400V CE power supplies) |
| 023206 | Cable: Machine Interface, 25 ft (7.6 m) (Comes standard with machine torch system configurations and with machine interface kits.) |

## POWER SUPPLIES - 208/240/480V, 1ϕ/3ϕ, 60 HZ

| Part Number | For Torch Type | With Pilot Arc Control | With Machine Interface |
|---|---|---|---|
| 083002 | Hand | No | No |
| 083015 | Hand | Yes | No |
| 083016 | Machine | No | Yes |
| 083017 | Machine | Yes | Yes |

## POWER SUPPLIES - 200/230/400V, 1ϕ/3ϕ, 50/60 HZ

| Part Number | For Torch Type | With Pilot Arc Control | With Machine Interface |
|---|---|---|---|
| 083030 | Hand | No | No |
| 083033 | Hand | Yes | No |
| 083036 | Machine | No | Yes |
| 083039 | Machine | Yes | Yes |

Note: Contact your distributor or call the nearest Hypertherm office for hand and machine torch system configurations.

## POWER SUPPLIES - 400V CE, 3ϕ, 50 HZ

| Part Number | For Torch Type | With Pilot Arc Control | With Machine Interface |
|---|---|---|---|
| 083018 | Hand | No | No |
| 083021 | Hand | Yes | No |
| 083024 | Machine | No | Yes |
| 083027 | Machine | Yes | Yes |

Note: Contact your distributor or call the nearest Hypertherm office for hand and machine torch system configurations.

In the event that the Powermax800 was configured incorrectly for the incoming power, fuses F1 and/or F2 may have blown to protect the power supply.

**WARNING**

**SHOCK HAZARD: Always turn off power, unplug cord from wall and wait 5 minutes before removing any power supply cover. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate local or national safety procedures.**

1. Turn the Powermax800 power switch to the OFF (0) position, unplug the power cable from the wall receptacle and disconnect the gas supply. See warning above.

2. Remove the 22 screws that secure the power supply cover to the chassis.

3. Remove the cover and find F1 and F2 power fuses - Fig. a-1.

4. Remove and check the fuses. Replace, if necessary:

   Fuse part number 008809 for 208/240/480V power supplies;
   Fuse part number 008958 for 200/230/400V and 400V CE power supplies.

5. Replace the power supply cover.

6. Be certain that a licensed electrician verifies incoming power and configures the Powermax800 appropriately. See voltage configurations in the **Setup** section beginning on page 3-4.

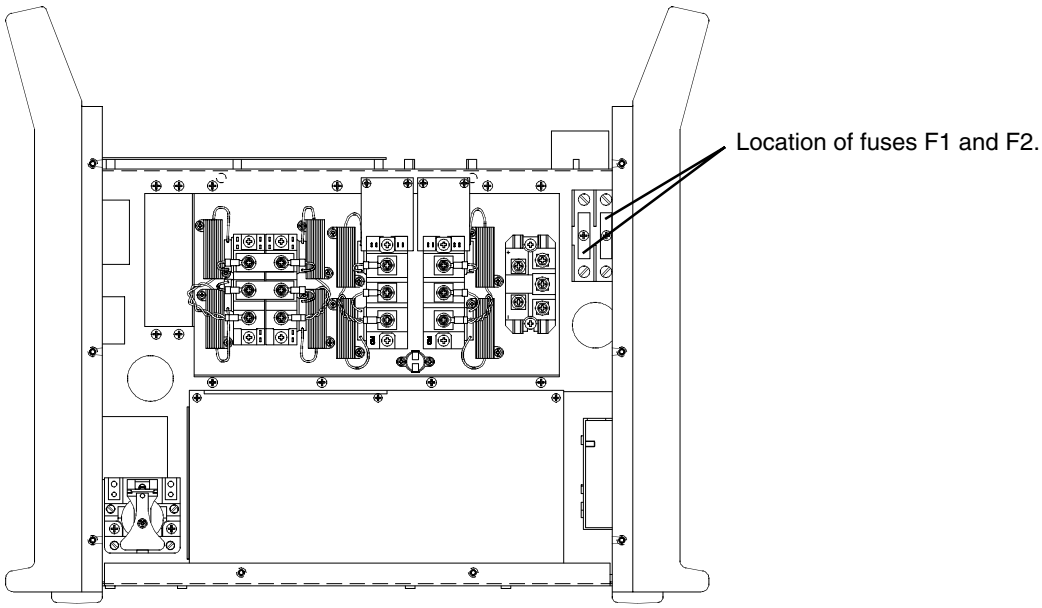



**Figure a-1 F1 and F2 Fuse Location**

## STANDARDS INDEX

The *Standards Index* contains a list of publications dealing with plasma arc cutting equipment safety practices.

1. ANSI Standard Z49.1, *Safety in Welding and Cutting*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351020, Miami, FL 33135.

2. NIOSH, *Safety and Health in Arc Welding and Gas Welding and Cutting*, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

3. OSHA, *Safety and Health Standards*, 29FR 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.

4. ANSI Standard Z87.1, *Safe Practices for Occupation and Educational Eye and Face Protection*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

5. ANSI Standard Z41.1, *Standard for Men's Safety-Toe Footwear*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

6. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

7. AWS Standard A6.0, *Welding and Cutting Containers Which Have Held Combustibles*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135.

8. NFPA Standard 51, *Oxygen — Fuel Gas Systems for Welding and Cutting*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

9. NFPA Standard 70-1978, *National Electrical Code*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

10. NFPA Standard 51B, *Cutting and Welding Processes*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

11. CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders*, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

12. CSA Standard W117.2, *Code for Safety in Welding and Cutting*, obtainable from the Canadian Standards Association Standard Sales, 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada.

13. NWSA booklet, *Welding Safety Bibliography*, obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.

14. American Welding Society Standard AWS F4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135.

15. ANSI Standard Z88.2, *Practices for Respiratory Protection*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

16. Canadian Electrical Code Part 1, *Safety Standards for Electrical Installations*, obtainable from the Canadian Standards Association, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W1R3.

# AERATION MANIFOLD FOR PLASMA CUTTING ALUMINUM

## Introduction

When plasma arc cutting aluminum at the water table surface or below water, free hydrogen gas may be generated by the cutting process. The high temperature of the plasma process causes disassociation of oxygen and hydrogen from the water in the water table. The hot aluminum, which has a high affinity for oxygen, then combines with the oxygen leaving free hydrogen.

An effective means of avoiding free hydrogen buildup is to install an aeration manifold on the floor of the water table to replenish the oxygen content of the water.

## Making an Aeration Manifold - Figure c-1

Make an **Aeration Manifold** with two-inch (50 mm) PVC tubing with one-inch (25 mm) **Distribution Lines** connected to it. Drill 1/8 inch (3 mm) holes every six inches (150 mm) in the distribution lines. Cap the ends of the distribution lines and install the lines so that oxygen is delivered to all parts of the cutting area.

Connect the manifold to a shop air line. Set a pressure regulator to obtain a steady stream of bubbles.

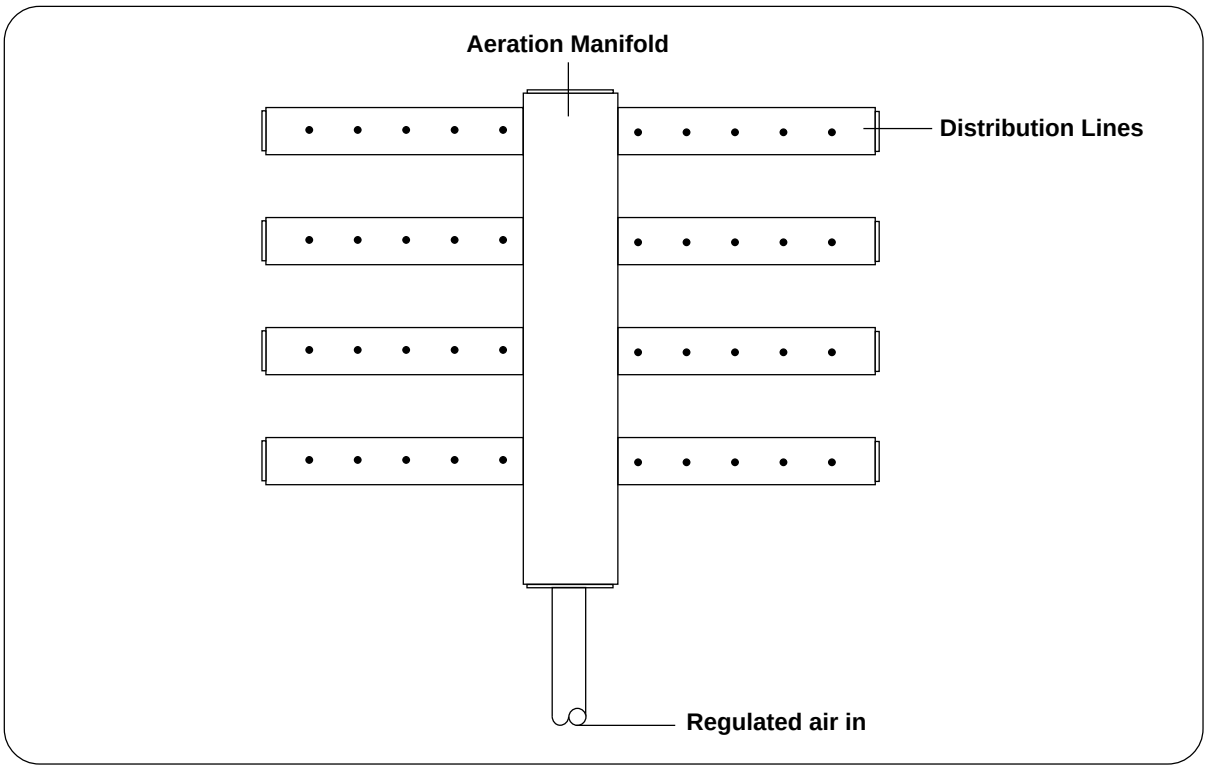



**Figure c-1 Aeration Manifold**