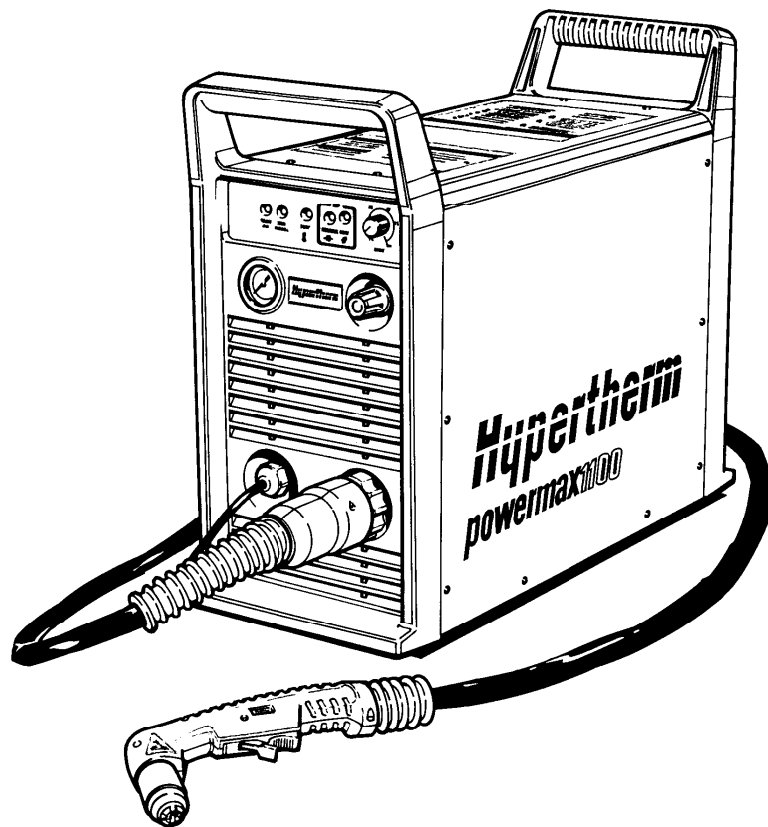


# ***powermax1100***<sup>®</sup>

## ***Plasma Arc Cutting System***

***Operator Manual  
802730 Revision 1***



EN50199  
EN50192

***powermax1100***  
**Plasma Arc Cutting System**

**Operator Manual  
IM-273  
(P/N 802730)**

**for systems beginning with serial number  
1100-010000**

**Revision 1 July, 1999**

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## EMC INTRODUCTION

The 230/400V 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:

- Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.
- Radio and television transmitters and receivers.
- Computer and other control equipment.
- Safety critical equipment, for example guarding of industrial equipment.

- Health of the people around, for example the use of pacemakers and hearing aids.
- Equipment used for calibration or measurement.
- 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.
- 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.

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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.

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# Section 1 SAFETY

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## ***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.



# SAFETY

## 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)	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 300 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 an earth ground, in accordance with appropriate national or local electrical 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.

# Section 1a SÉCURITÉ



## 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.

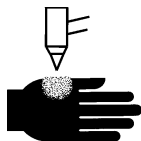
- Installer et mettre à la terre l'équipement selon les instructions du présent manuel et conformément aux codes électriques locaux et nationaux.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fendu. Remplacer immédiatement un cordon endommagé. **Un 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 béryllium, 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.

- 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.

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 :



## 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.
- Entretien 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 SPECIFICATIONS

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# ***SPECIFICATIONS***

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## **INTRODUCTION**

The Powermax1100 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 Powermax1100 power supply provides constant-current output variable from 30 to 80 amps, for optimum performance on all thicknesses of metal up to 3/4 inch (20 mm) thick. At 80 amps, the Powermax1100 can cut metals up to 1 inch (25 mm) thick and will sever metals up to 1-1/4 inch (32 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 Powermax1100 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 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 Powermax1100 service manual provides higher-level troubleshooting and a more complete parts list.

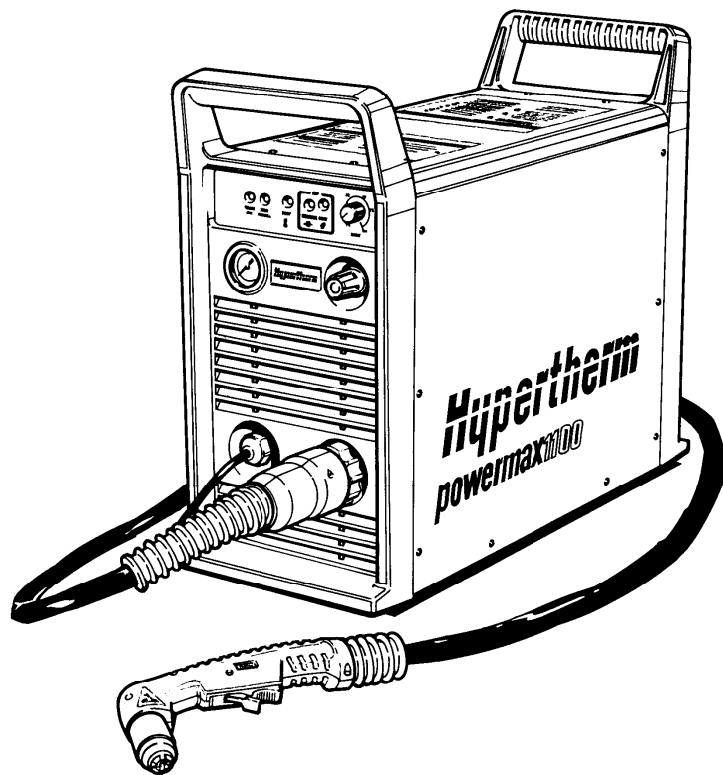


Figure 2-1 Powermax1100 Hand Plasma Cutting System

**SPECIFICATIONS****Power Supply**

Rated Open Circuit Voltage (OCV) ( $U_0$ ) .....	280-320 VDC
Rated Output Current ( $I_2$ ) .....	30–80 amps
Rated Output Voltage ( $U_2$ ) .....	140 VDC
Duty Cycle (X) @ 104° F (40° C) .....	50% ( $I_2=80A$ , $U_2=140V$ ) 100% ( $I_2=57A$ , $U_2=140V$ ) See data tag on power supply for more information on duty cycle
Ambient temperature .....	Power supplies will operate between +14° and 104° F (-10° and +40° C).
Apparent Input Power ( $S_1$ ) .....	19.2 kVA ( $U_1I_1$ ) non CE power supplies 13.1 kVA ( $U_1I_1$ ) CE power supplies
Input Voltage ( $U_1$ )/Input Current ( $I_1$ ) @ 11.2 kw Output .....	208V/92A; 240V/80A; 480V/40A - 1 $\phi$ , 50/60 Hz 208V/53A; 240V/46A; 480V/23A - 3 $\phi$ , 50/60 Hz 200V/96A; 230V/84A; 400V/48A - 1 $\phi$ , 50/60 Hz 200V/56A; 230V/49A; 400V/28A - 3 $\phi$ , 50/60 Hz 230V/33A; 400V/19A (CE) - 3 $\phi$ , 50/60 Hz 600V/20A - 3 $\phi$ , 60 Hz
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 .....	400 scfh/6.7 scfm at 90 psi (189 l/min at 6.2 bar) supplied to power supply pressure regulator
Power Supply pressure regulator setting .....	65 psi (4.5 bar) flowing
Dimensions and Weight:	
Depth .....	25.1" (638 mm)
Width .....	10.4" (264 mm) without wheels 15.8" (401 mm) with wheels
Height .....	19.6" (498 mm) without wheels 23.7" (602 mm) with wheels
Weight, 208/240/480V and 200/230/400V without power cord .....	77 pounds (35 kg) without wheels 89 pounds (40 kg) with wheels
Weight, 230/400V CE with power cord .....	87 pounds (39 kg) without wheels 99 pounds (45 kg) with wheels
Weight, 600V with power cord .....	160 pounds (73 kg) with wheels

# SPECIFICATIONS

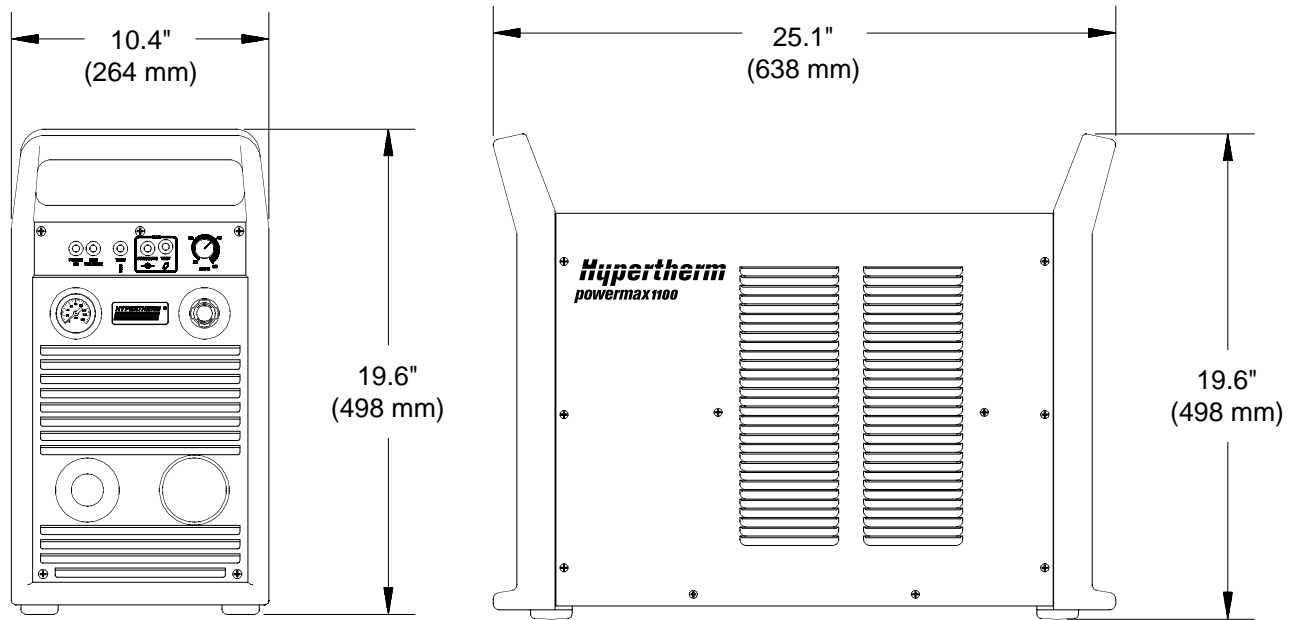
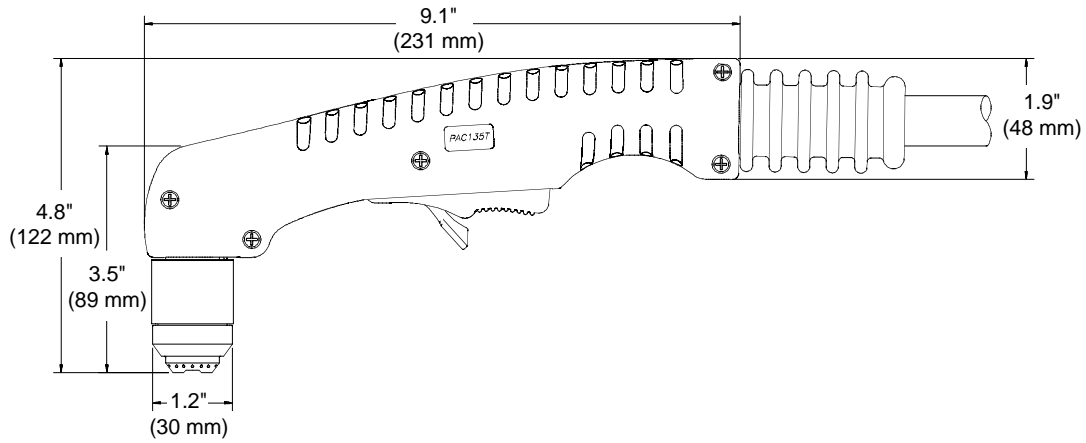


Figure 2-2 Powermax1100 Power Supply Dimensions

## PAC135 80A TORCHES

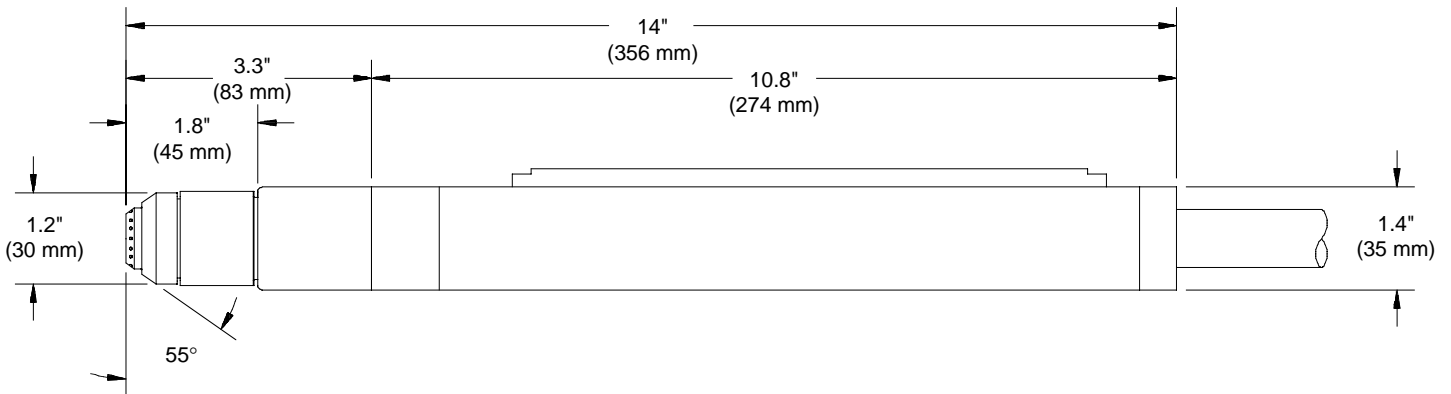
Maximum 80A Cutting Capacity (PAC135T) .....	1" (25 mm) @ 50% duty cycle
Recommended 80A Cutting Capacity (PAC135T) .....	3/4" (20 mm) @ 100% duty cycle
Maximum 80A Cutting Capacity (PAC135M) .....	1/2" (12 mm) @ 50% duty cycle
Recommended 80A Cutting Capacity (PAC135M) .....	3/8" (9.5 mm) @ 100% duty cycle
Maximum current at 50% duty cycle .....	80 amps
Gas Flow .....	400 scfh/6.7 scfm at 65 psi (189 l/min at 4.5 bar)
Gouging Capability (metal removal rate) .....	6.6 pounds (3.0 kg)/hr
Weight PAC135T .....	9.3 pounds (4.2 kg) with 25 ft (7.6 m) lead
	17.8 pounds (8.1 kg) with 50 ft (15 m) lead
Weight PAC135M .....	9.6 pounds (4.4 kg) with 25 ft (7.6 m) lead
	18 pounds (8.2 kg) with 50 ft (15 m) lead

**PAC135T Hand Torch Assembly**



**Figure 2-3 PAC135T Torch with Dimensions**

**PAC135M Machine Torch Assembly**



**Figure 2-4 PAC135M Torch with Dimensions**














**S MARK**

The Powermax1100 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 hand torches must have shielded consumable parts to maintain **S** mark compliance.

# SPECIFICATIONS

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## 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)
	Power is on
	Power is off
	Volt/amp curve, "drooping" characteristic

## Section 3 SETUP

In this section:

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## 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 Powermax1100.

3. Before setting up and operating the Powermax1100, 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, or your authorized Hypertherm distributor.

## HOISTING REQUIREMENTS

In the event that the power supply has to be hoisted, follow the steps below.

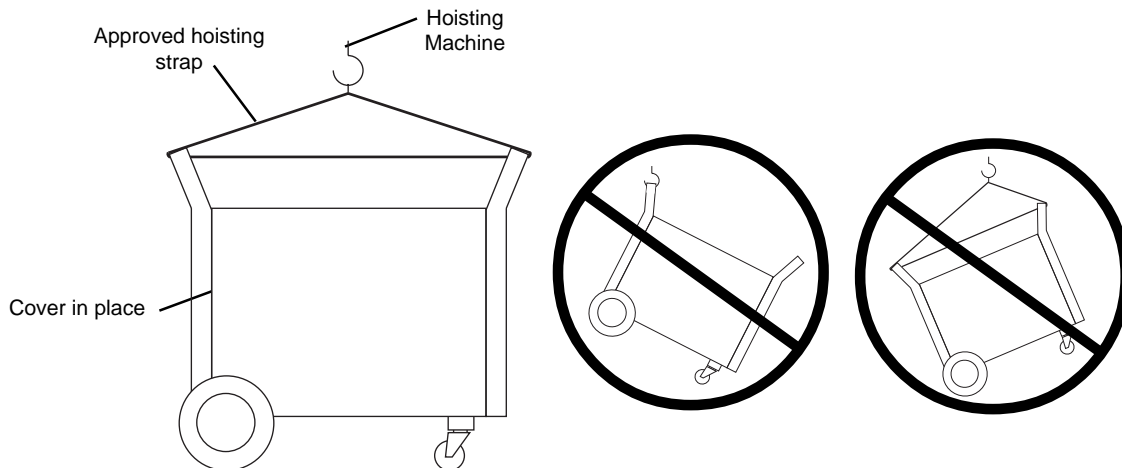


### WARNING



The Powermax1100 power supply weighs up to 100 pounds (45 kg) when fully configured with torch, torch leads and wheels. The fully configured 600V power supply weighs nearly 200 pounds (91 kg). 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; 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 400 pounds (182 kg). Approved hoisting straps have attached labels with ratings.
2. Ensure the power supply cover is in place prior to hoisting.
3. Route the 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 Powermax1100 Power Supply Hoisting Setup**



**VOLTAGE CONFIGURATIONS**



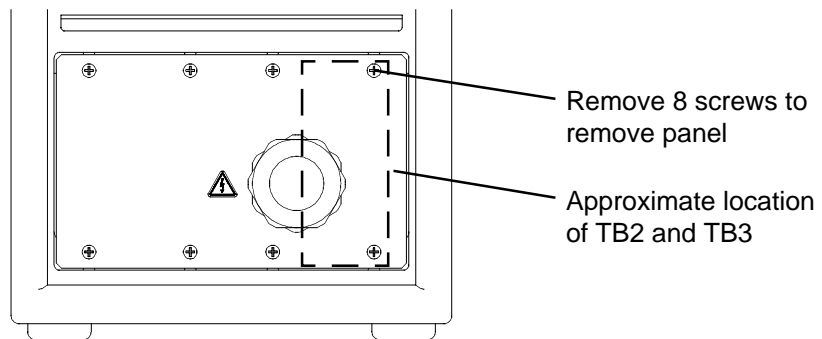
**WARNING**



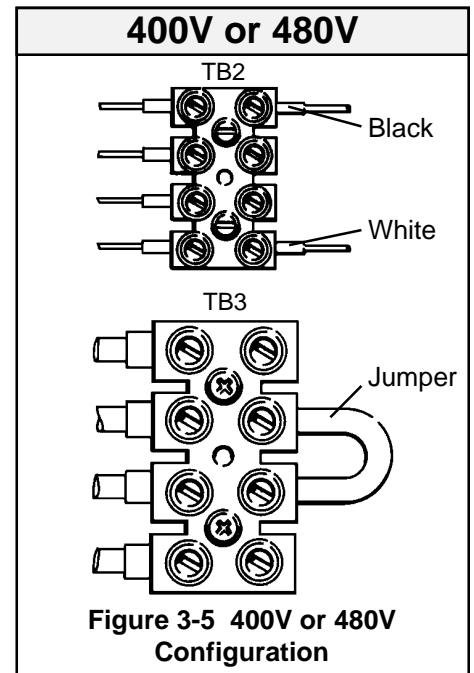
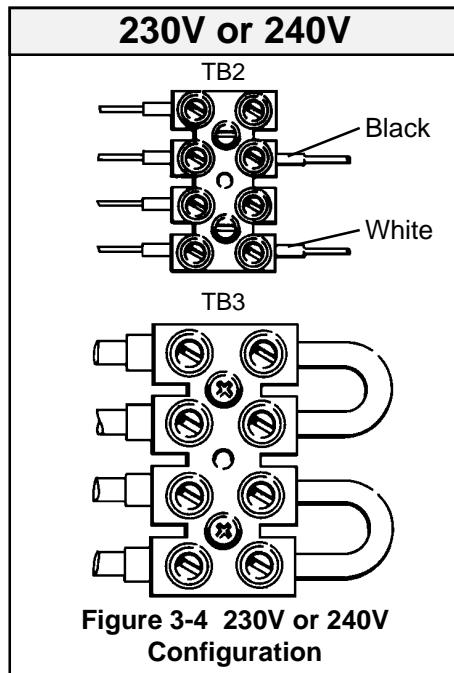
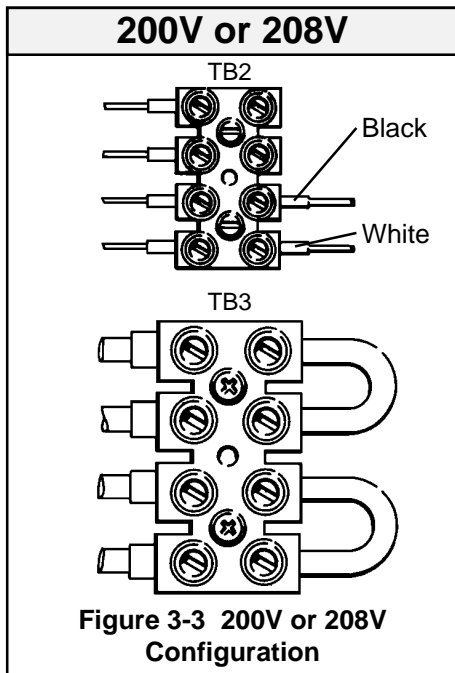
**SHOCK HAZARD:** Always turn off the power, unplug the cord and wait 5 minutes before removing any power supply cover. If the power supply is directly connected to a line disconnect switch, place switch in the OFF position. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance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

The 208/240/480V Powermax1100 power supplies are shipped to operate at 480 volts. The 200/230/400V and 230/400V CE Powermax1100 power supplies are shipped to operate at 400 volts. To operate at an alternate voltage, remove the rear panel, and configure the wires and jumpers on TB2 and TB3 as shown below.

- Notes:
- When switching from the 480V or 400V configuration, use the spare jumper in the clip located on the floor of the power supply.
  - If using the 600V transformer option kit, configure the Powermax1100 for 480V.



**Figure 3-2 Rear Panel**



## POWER CORDS - 208/240/480V, 200/230/400V and 600V POWER SUPPLIES

The 208/240/480V and 200/230/400V power supplies are shipped without a power cord. Use the tables below to choose the proper wire size for the appropriate length cord. In the U.S., use a 3-conductor SO type cord for single-phase, and a 4-conductor SO type cord for three-phase power supplies. In other countries, use cords that are certified by local or national codes. Strip the power cord wires as shown in Fig. 3-6. Cap or tin the conductor leads and use a #10 terminal on the ground wire. The cord should be installed only by a licensed electrician.

The 600V conversion kit comes with a 10 AWG 7 ft (2 m) power cord. If changing the cord length, use a 10 AWG power cord.

### 208/240/480V Power supplies

Input Voltage	Phase	Input Current	Recommended Power Cord Wire Size (AWG)				
			< 10 ft	10 – 25 ft	25 – 50 ft	50 – 100 ft	100 – 150 ft
208 VAC	1	92A	4	4	4	2	2
240 VAC	1	80A	6	6	4	4	4
480 VAC	1	40A	8	8	8	8	6
208 VAC	3	53A	6	6	6	6	4
240 VAC	3	46A	8	8	8	6	6
480 VAC	3	23A	10	10	10	10	8

### 200/230/400V Power supplies

Input Voltage	Phase	Input Current	Recommended Power Cord Wire Size (mm <sup>2</sup> )				
			< 3 m	3 – 7.5 m	7.5 – 15 m	15 – 30 m	30 – 45 m
200 VAC	1	96A	25	25	25	35	35
230 VAC	1	84A	25	25	25	25	35
400 VAC	1	48A	10	10	10	10	16
200 VAC	3	56A	10	10	16	16	16
230 VAC	3	49A	10	10	10	10	16
400 VAC	3	28A	4	4	4	6	6

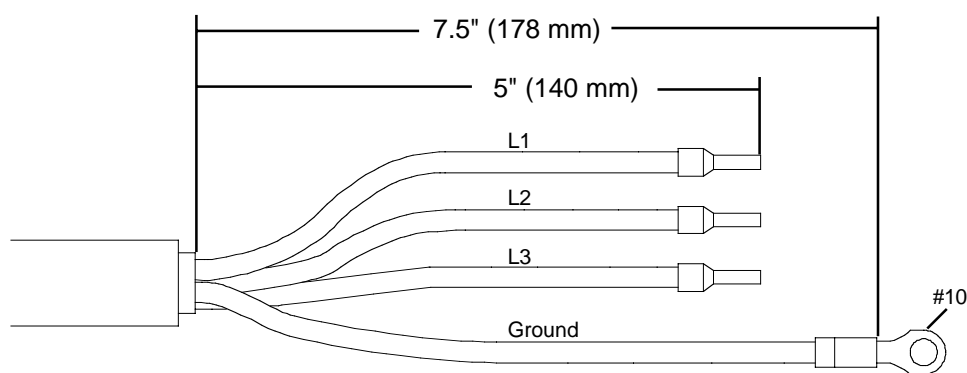


Figure 3-6 Power Cord Stripping for 208/240/480V and 200/230/400V Power Supplies

## POWER CORDS - 230/400V CE POWER SUPPLIES

The 230/400V CE power supply is shipped with a power cord. If the three-phase power cord length needs to be changed, use the table below to choose the proper wire size for the appropriate length. Use a 4-conductor "HAR" type cord. Strip the power cord wires as shown in Fig. 3-7. Cap or tin conductor leads and use a #10 terminal on the ground wire. The cord should be installed only by a licensed electrician.

Input Voltage	Phase	Input Current	Recommended Power Cord Wire Size (mm <sup>2</sup> )				
			< 3 m	3 – 7.5 m	7.5 – 15 m	15 – 30 m	30 – 45m
230 VAC	3	33A	4	4	6	6	6
400 VAC	3	19A	4	4	4	4	4

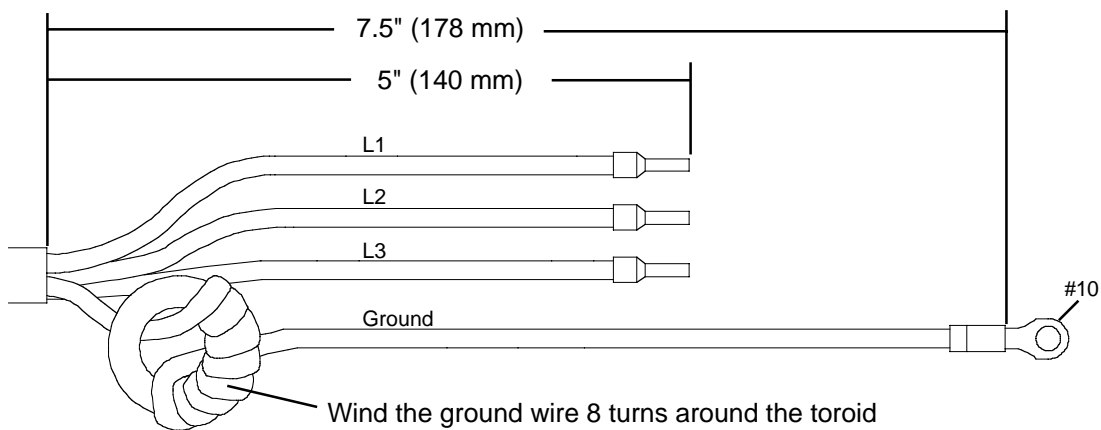


Figure 3-7 Power Cord Stripping 230/400V CE Power Supplies

## CHANGING THE STRAIN RELIEF SLEEVE

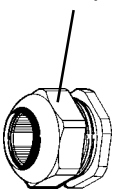
Depending on the diameter of the power cord you choose, the rear panel strain relief sleeve may need to be changed. Alternate sleeves are located on the floor of the power supply behind the rear panel.

To choose the correct sleeve, either push the power cord through the smallest sleeve that it will go through, or measure the power cord diameter and use the adjacent table.

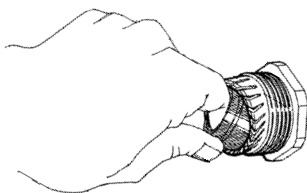
To change a sleeve:

Power Cord Diameter	Use
Over 7/8" (22mm)	Largest sleeve
3/4" to 7/8" (19mm to 22mm)	Second largest sleeve
Under 3/4" (19mm)	Smallest sleeve

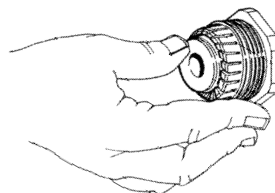
1. Remove strain relief cap



2. Remove strain relief sleeve



3. Install new strain relief sleeve and press it into place



4. Replace strain relief cap - After installing power cord, tighten cap.

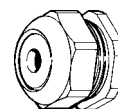


Figure 3-8 Changing a Power Cord Strain Relief Insert

## SINGLE-PHASE AND THREE-PHASE POWER CONFIGURATIONS

All Powermax1100 power supplies except the 230/400V CE and 600V power supplies can operate from either a single-phase or three-phase input. The 230/400V 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. See also **EMC Compatibility** and *Mains Supply* on page i for further CE compliance recommendations.



### WARNING



**SHOCK HAZARD:** Always turn off the power, unplug the cord and wait 5 minutes before removing any power supply cover. If the power supply is directly connected to a line disconnect switch, place switch in the 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

Remove the rear panel (Fig. 3-2) and connect the power cable to contactor as shown in Fig. 3-9. Connect the ground wire to the stud marked .

Conductor	Color
Line (U)	Black or Brown
Neutral/Line (V)	White or Blue
Ground	Green or Green/Yellow

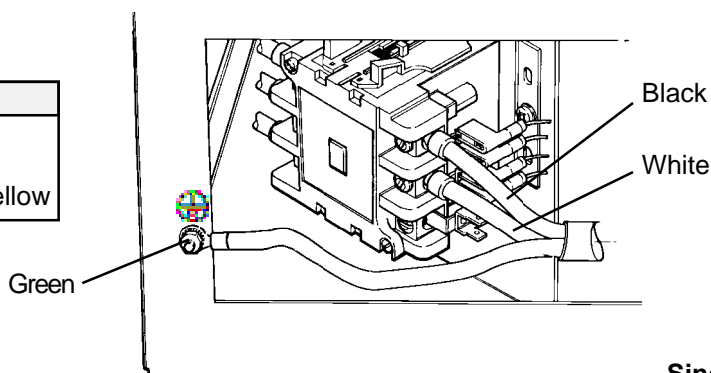


Figure 3-9  
Single-Phase Power

### Three-Phase

Remove the rear panel (Fig. 3-2) and connect the power cable to the contactor as shown in Fig. 3-10. Connect the ground wire to the stud marked .

Conductor	Color
L1 (U)	Brown or Black
L2 (V)	Blue or White
L3 (W)	Black or Red
Ground	Green/Yellow or Green

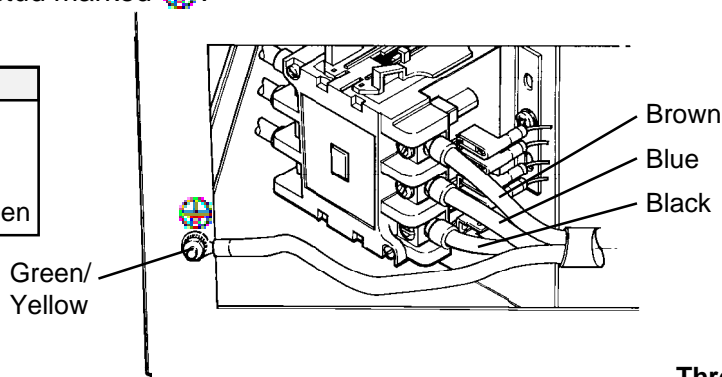


Figure 3-10  
Three-Phase Power

## POWER CORD PLUGS

The user must obtain a power cord plug that is certified by national or local electrical codes. The plug should be connected to the power cord by a licensed electrician.

## POWER REQUIREMENTS

### Line Voltage Disconnect Box

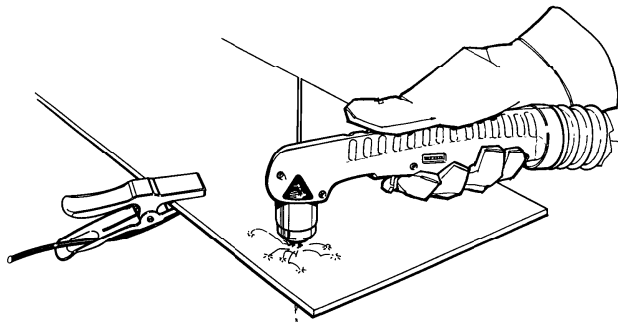
Use a separate line disconnect box for each power supply. This disconnect box allows the operator to turn the power supply off quickly in an emergency situation. The switch should be located near the power supply, and should be easily accessible to the operator. The interrupt level of the switch must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

<u>Input Voltage</u>	<u>Phase</u>	<u>Input Current @ 11.2 kw Output</u>	<u>Recommended Slow-Blow Fuse Size</u>
200 VAC	1	96 amps	125 amp
208 VAC	1	92 amps	125 amp
230 VAC	1	84 amps	110 amp
240 VAC	1	80 amps	110 amp
400 VAC	1	48 amps	70 amp
480 VAC	1	40 amps	60 amp
200 VAC	3	56 amps	80 amp
208 VAC	3	53 amps	70 amp
230 VAC	3	49 amps	70 amp
230 VAC CE	3	33 amps	40 amp
240 VAC	3	46 amps	60 amp
400 VAC	3	28 amps	35 amp
400 VAC CE	3	19 amps	30 amp
480 VAC	3	23 amps	30 amp
600 VAC	3	20 amps	30 amp

## GROUNDING REQUIREMENTS

To ensure personal safety, proper operation, and to reduce electromagnetic interference (EMI), the Powermax1100 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.



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

## WORK CABLE AND CLAMP

The work clamp must be attached to the workpiece when 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 to be cut away.

## GAS SUPPLY REQUIREMENTS

The gas supply for the Powermax1100 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:

**400 scfh/6.7 scfm (189 l/min) at a pressure of 90 psi (6.2 bar) to the filter on the power supply.**

The filter location is shown in 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.**

## Air Supply Quality

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.

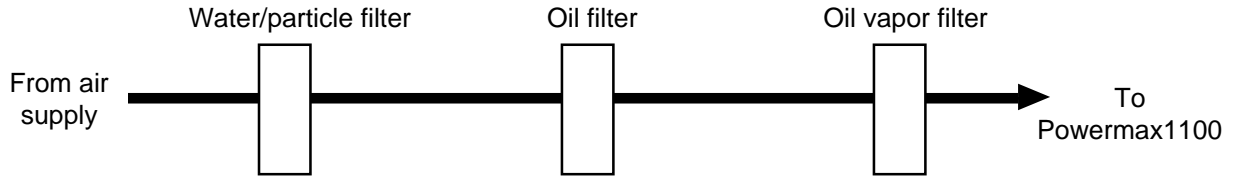


Figure 3-12 Recommended Three-Stage Air Filtration System

## Nitrogen Supply Quality

Nitrogen must be supplied to the Powermax1100 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 (9.5 mm) ID inert gas hose to connect the gas supply (air or nitrogen) to the power supply filter. To connect the hose, install a 1/4 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. A nipple and adapters are included in the consumable parts kit.

**CAUTION:** Never use Teflon 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.

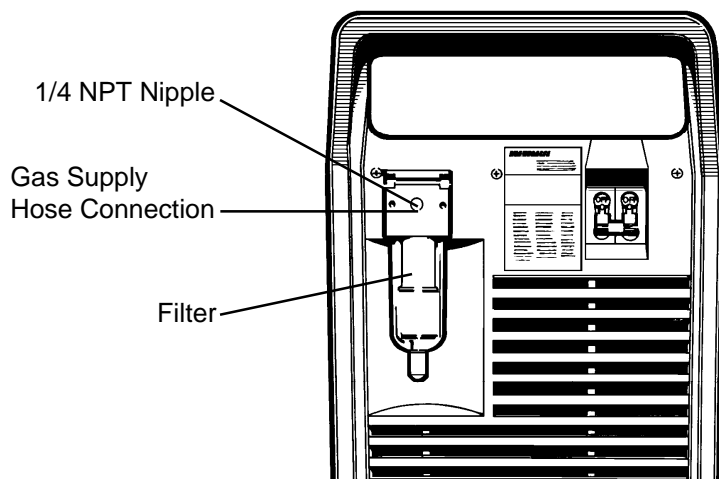



Figure 3-13 Rear Panel, Gas Supply Connection to Filter

## TORCH LEAD CONNECTION


To connect the torch lead to the power supply:

1. Align the connector key plug on the torch lead with the connector receptacle key slot on the power supply and push in until the pins seat. The top of the torch connector is marked "TOP".
2. Before tightening, 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.
3. Turn the securing ring to the right to tighten.

## PAC135M ON/OFF Pendant Connection



**WARNING**



**Do not connect the cutting machine interface START signal if using the ON/OFF pendant! (See page 3-12)**

To connect the on/off pendant lead to the PAC135M machine torch pigtail:

1. Align the pendant lead connector key plug with the connector receptacle key slot on the pigtail and push in until the pins seat.
2. Turn the connector securing ring to the right to tighten.

## PAC135M Torch ON/OFF Switch Connection Data

The PAC135M 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

## PAC135M 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. 3-14.



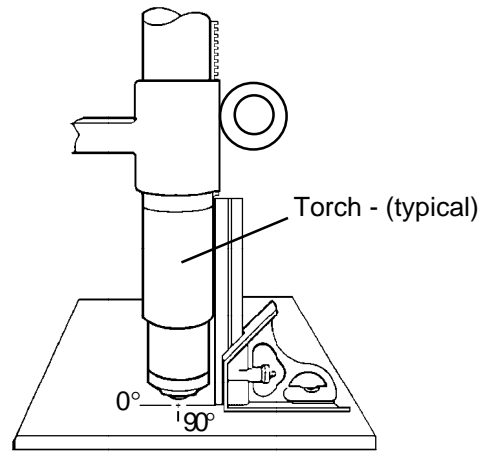


Figure 3-14 Aligning the Machine Torch with Square

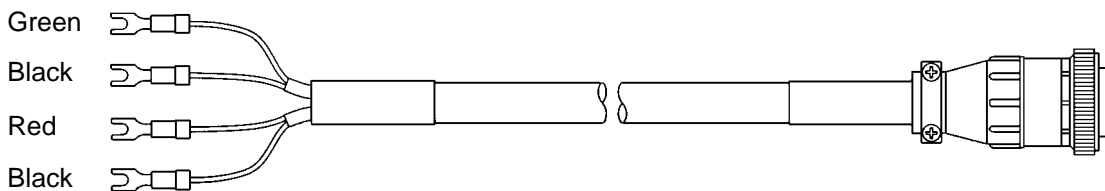
## MACHINE INTERFACE WITH PAC135M

Signals for arc transfer, start, and arc voltage are available on power supplies that have the machine interface option.

WARNING

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

- Plug the machine interface cable into the connector on the rear panel and connect the machine interface cable to the cutting machine.




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


Figure 3-15 Machine Interface Cable 023206 and Signals

### Arc Voltage

If arc voltage is necessary for activating a torch height control, the customer must supply an 18 AWG, single pair, unshielded cable rated for 300V or greater. The arc voltage signal should be connected only by qualified service personnel.



### WARNING



**SHOCK HAZARD:** Always turn off the power, unplug the cord and wait 5 minutes before removing any power supply cover. If the power supply is directly connected to a line disconnect switch, place switch in the 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 Powermax1100.
2. Remove the screws that attach Powermax1100 cover to the chassis. Remove the cover.
3. Push the cable through the strain relief at the rear of Powermax1100.

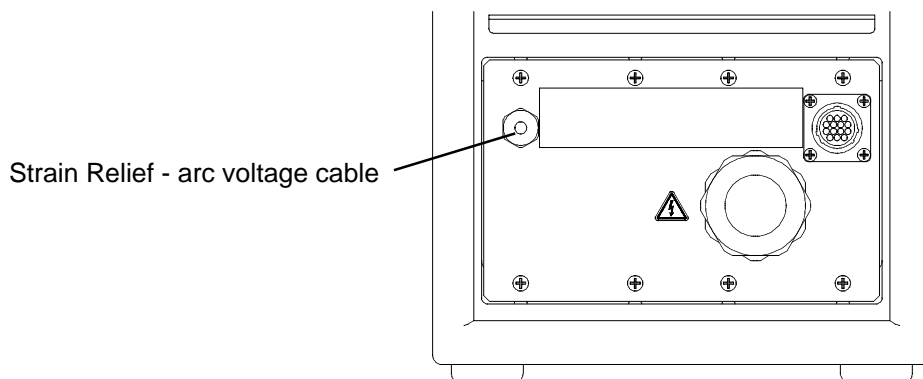
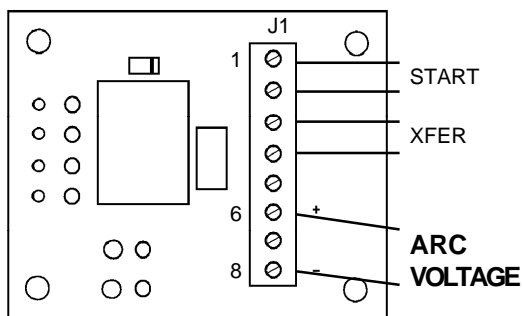


Figure 3-16 Location of Arc Voltage Cable Strain Relief

4. Route the cable to the machine interface board located on the top of the power supply near the Powermax1100 control board. Connect the arc voltage cable as shown in Fig. 3-17. Tighten the strain relief.



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

Figure 3-17 Machine Interface Board Connections for Arc Voltage

# Section 4 OPERATION

In this section:

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Operating Instructions .....	4-3
Pilot Arc Controller (Optional) .....	4-4
PAC135T Safety Trigger Operation .....	4-5
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Cut Chart - 40A Consumables .....	4-13
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# OPERATION

## 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 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 adjust the pressure setting.
- **AMPS Output Adjustment Knob**  
Adjusts output current between 30 and 80 amps.
- **Pressure Regulator**  
Regulates input gas pressure to the power supply.
- **Pressure Gauge**  
Indicates gas pressure at the power supply.
- **ON (I)/OFF (0) Power Switch**  
Activates the power supply and its control circuits.

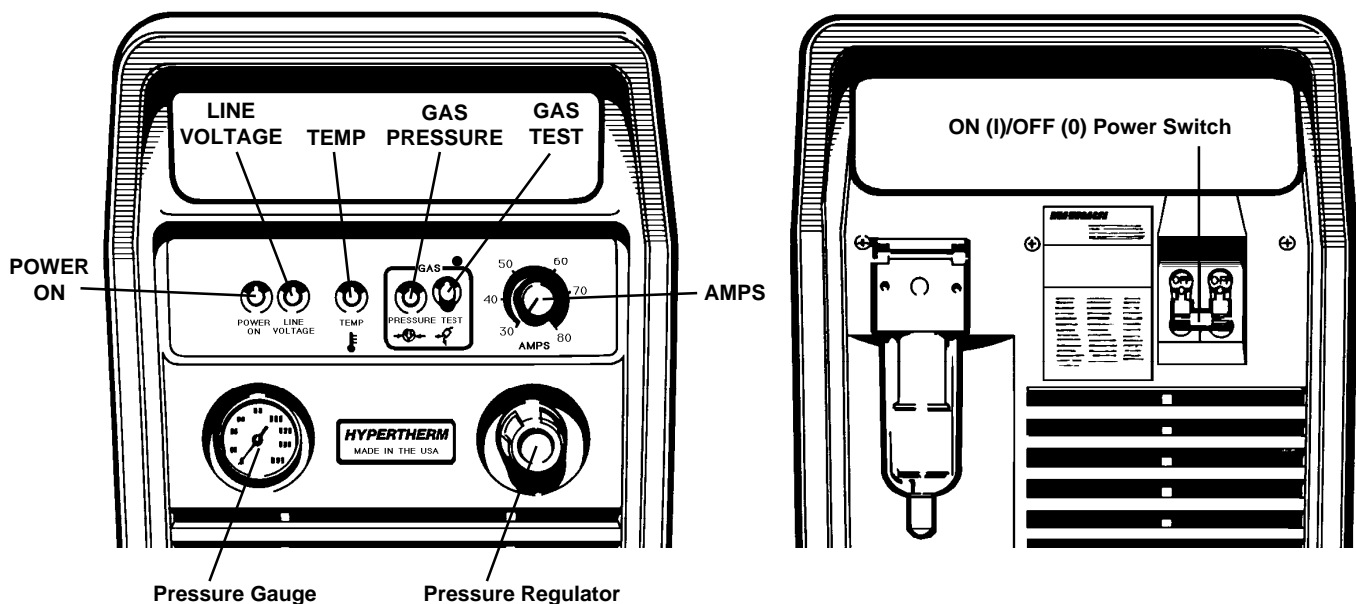


Figure 4-1 Powermax1100 Controls and Indicators

## OPERATING INSTRUCTIONS



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 blink and then extinguish. The TEMP LED will remain extinguished.

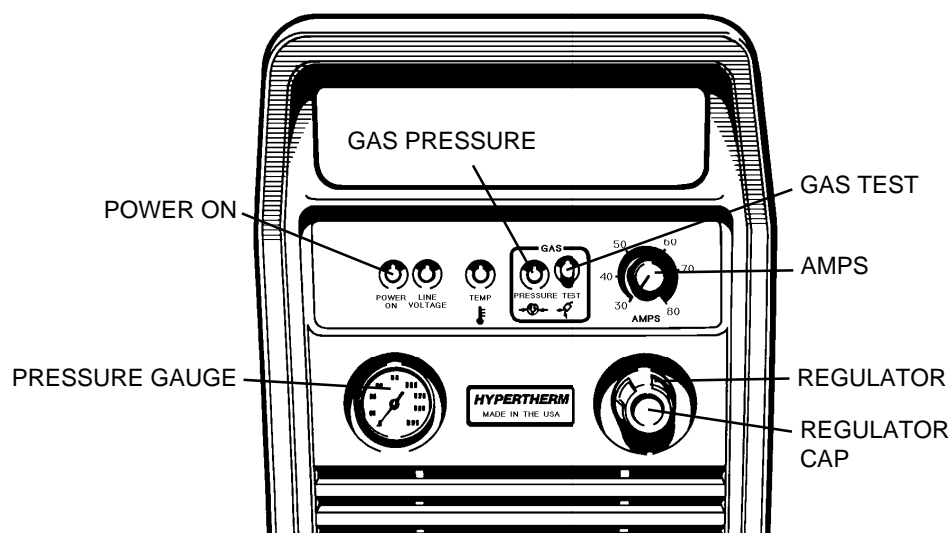


Figure 4-2 Powermax1100 Operating Indicators and Adjustments

4. **Adjust the gas pressure REGULATOR to 65 psi (4.5 bar):**
  - Pull the REGULATOR CAP out
  - Push the GAS TEST switch in
  - Turn the REGULATOR CAP while still pushing in the GAS TEST switch
  - After adjusting to 65 psi (4.5 bar), release the GAS TEST switch
  - Push the REGULATOR CAP back in

Note: If using 50 ft (15.2 m) torch leads, adjust the pressure to 70 psi (4.8 bar).

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

## OPERATION

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

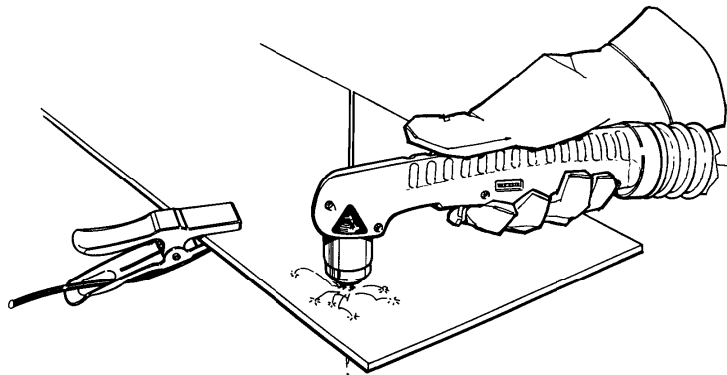


Figure 4-3 Proper Work Clamp Connection



### WARNING



The PAC135 torches are contact-start torches that 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.

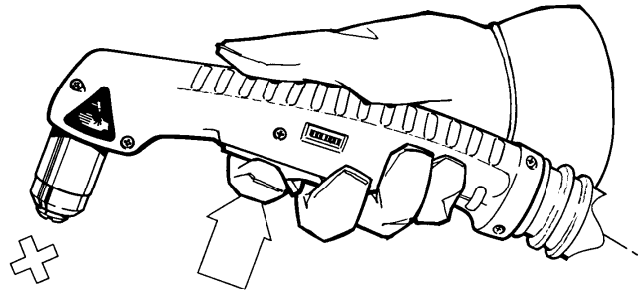
7. The Powermax1100 is now ready to operate. When you are ready to cut, place the tip of the torch at the edge of the workpiece. Pull back on the trigger switch to start the arc. See *PAC135T Safety Trigger Operation* later in this section for proper operation of the safety trigger. To begin cutting from within the workpiece see *Piercing* later in this section.
8. As the torch moves across the workpiece, 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. When using shielded consumables, drag the torch tip directly on the workpiece. See *Operating Tips* and *Cut Charts* later in this section.
9. When the cut is finished, release the torch switch to extinguish the arc. The arc will also extinguish when transfer to the workpiece is no longer sensed.

### Pilot Arc Controller (Optional)

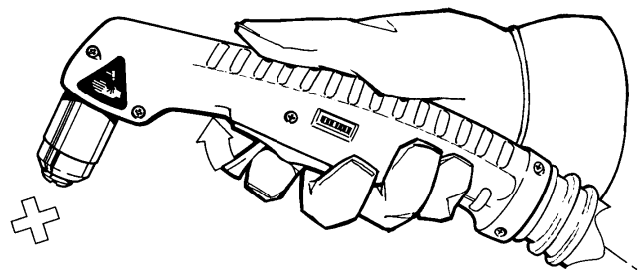
In power supplies with the pilot arc controller option, the torch will return to a pilot arc after finishing a cut if the torch switch remains pressed. After 5 seconds, the pilot arc will then extinguish if no arc transfer is sensed. The pilot arc controller option is especially useful if you are cutting expanded metal. See *Powermax1100 Field Upgrade Kits and Optional Parts* in **Section 5** for part number information.

**PAC135T Safety Trigger Operation**

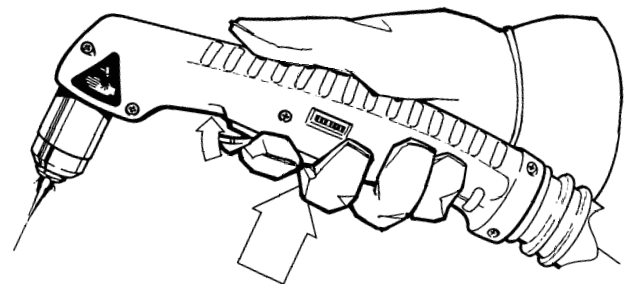
- 1 **Safety On** position. In this position the trigger cannot be pulled back, so that the torch cannot be accidentally fired.



- 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 PAC135T Torch Safety Trigger Operation

### OPERATING TIPS

#### Changing Consumable Parts



#### WARNING

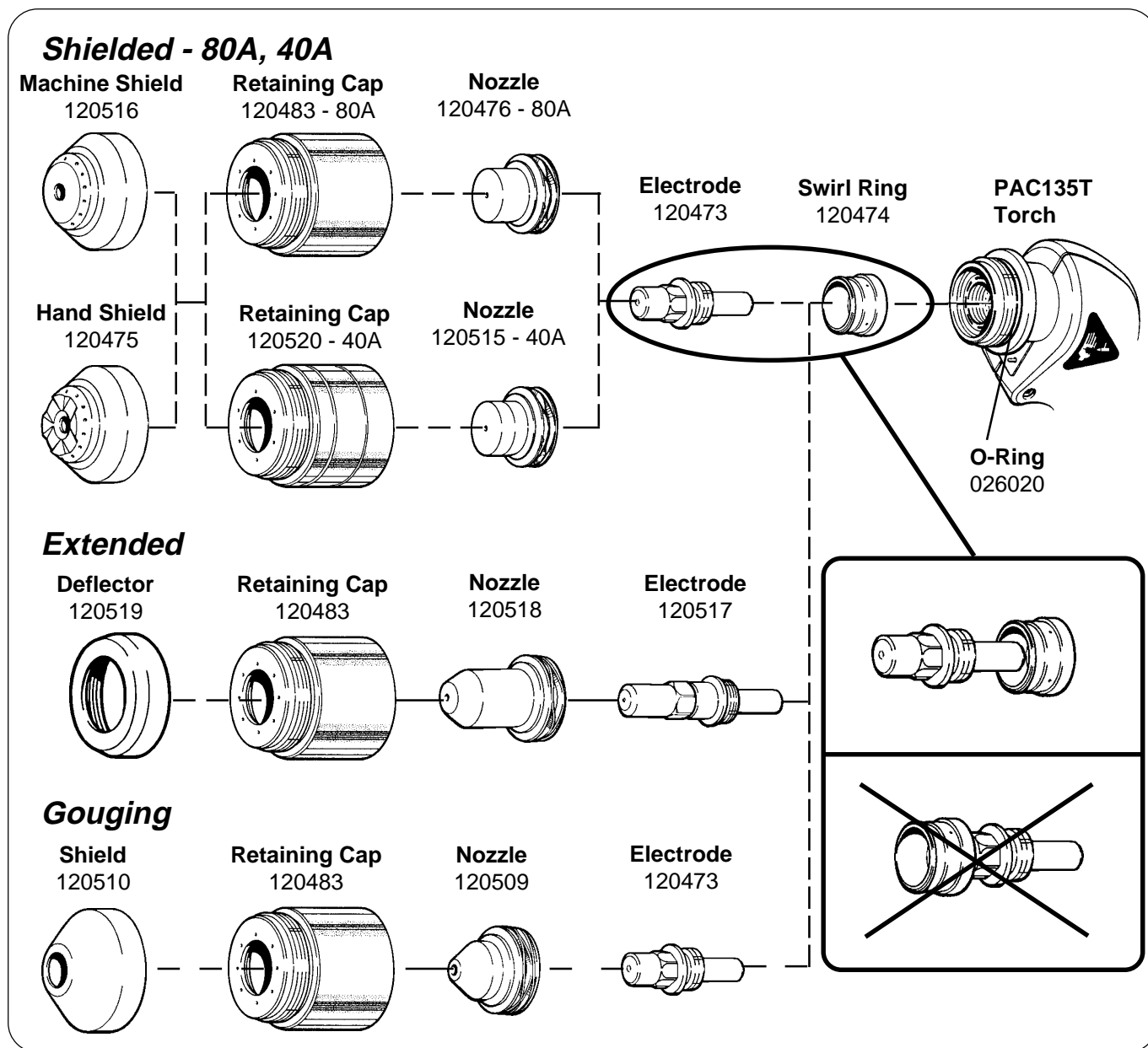


**SHOCK HAZARD:** Always turn off power and unplug cord from wall before changing consumable parts. If power supply is directly connected to a line disconnect switch, place line disconnect switch to OFF position. Do not rely on the cap-on sensor circuit to remove power. It is provided strictly for safety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

1. Unscrew the retaining cap. The nozzle will be released when the retaining cap is removed.
2. Check the shield 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 from the retaining cap. 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.
4. Inspect the nozzle for damage or wear. If the hole in the nozzle is worn or oval-shaped, replace the nozzle.
5. Using the electrode wrench supplied in the consumable parts kit, unscrew the electrode from the torch body. The swirl ring will be released when the electrode is removed.
6. Inspect the electrode. If the center of the electrode has a pit more than 1/16 inch (1.6 mm) deep, replace it.
7. 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.
8. 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 consumable parts kit. If it is damaged, replace it.
9. Replace the consumable parts as shown in Fig. 4-5.
10. When the retaining cap is tightened, the circuit between the pin contacts located on the torch head will close, indicating that the torch is again ready for operation. Plug the power cord back in, or place the line disconnect switch to the ON position.





**Figure 4-5 Consumables**

**Description of Consumables**

- **Shielded 80A** For cutting above 40A. Shielded nozzle allows the torch tip to be dragged directly on the workpiece.
- **Shielded 40A** For optimal cutting on thinner materials at or below 40A.
- **Extended** For increased visibility and access for special applications. The nozzle is not shielded. Maintain a standoff distance from the workpiece of approximately 1/8" (3 mm) when cutting above 40A to avoid accelerated consumable parts wear. Use only with the machine torch in CE countries.
- **Gouging** For metal removal without cutting. Use for weld removal or setup. Nozzle shield may be placed directly on the workpiece.

## OPERATION

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### 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 trigger and press it again to reset the pilot arc timer.
- Start cutting from the edge of the workpiece (Fig. 4-6). To penetrate fully and cut cleanly through the workpiece, pause momentarily at the beginning and at the end of each cut.
- 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 (if using shielded consumables) or just above the metal. Holding the torch firmly to the workpiece causes the shield 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 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 circles, use a template or a radius cutter attachment (Fig. 4-7).

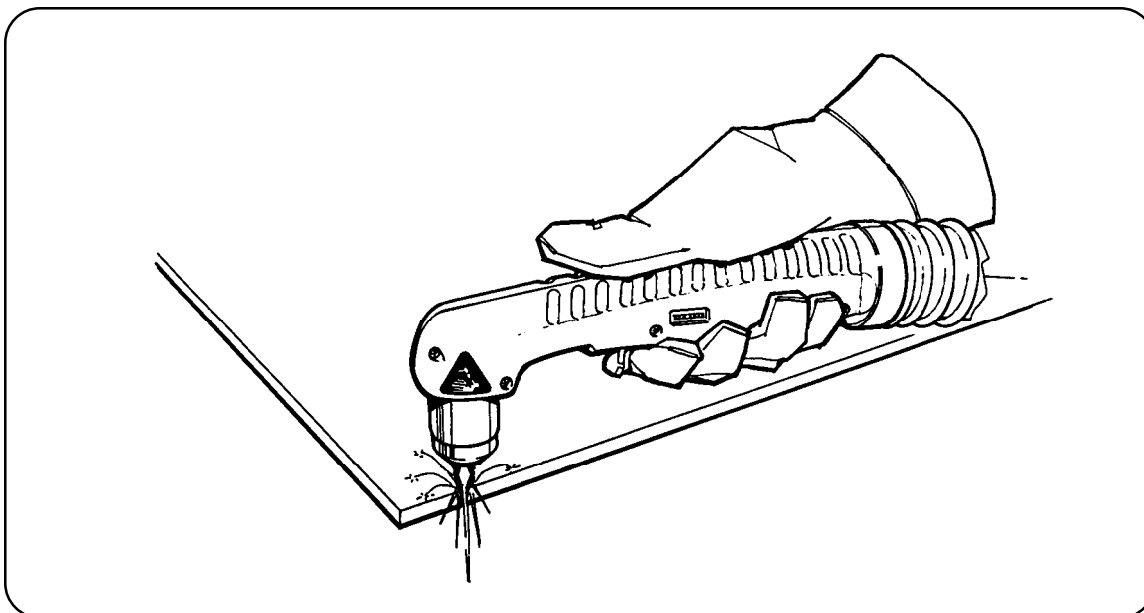
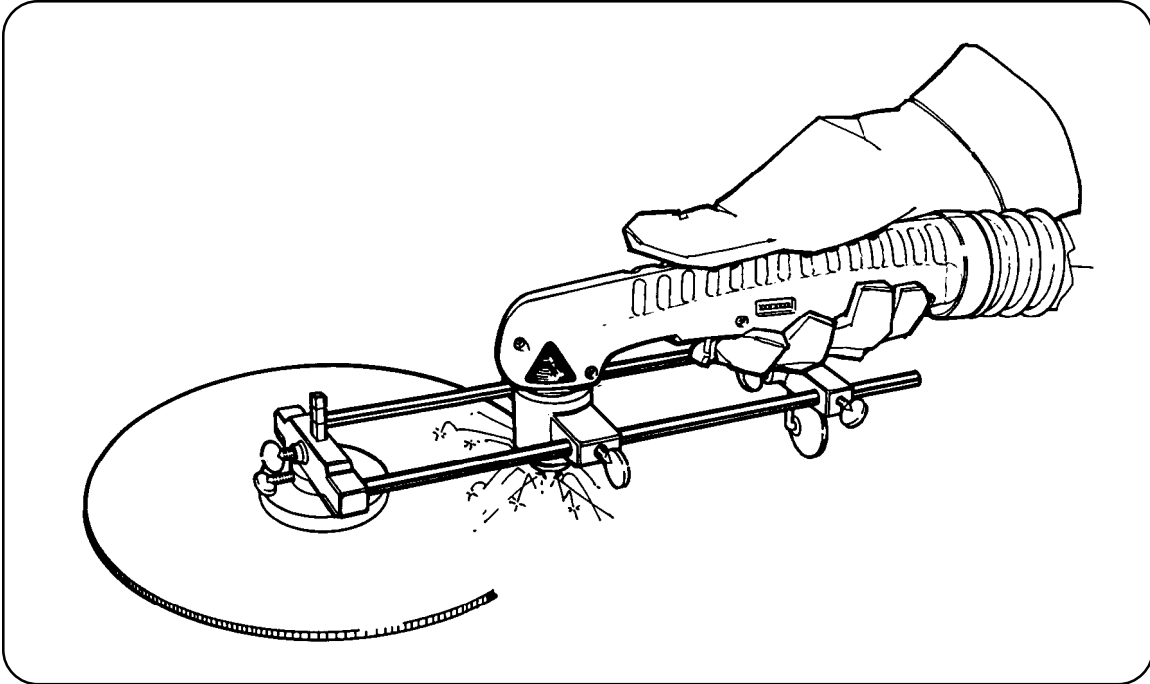
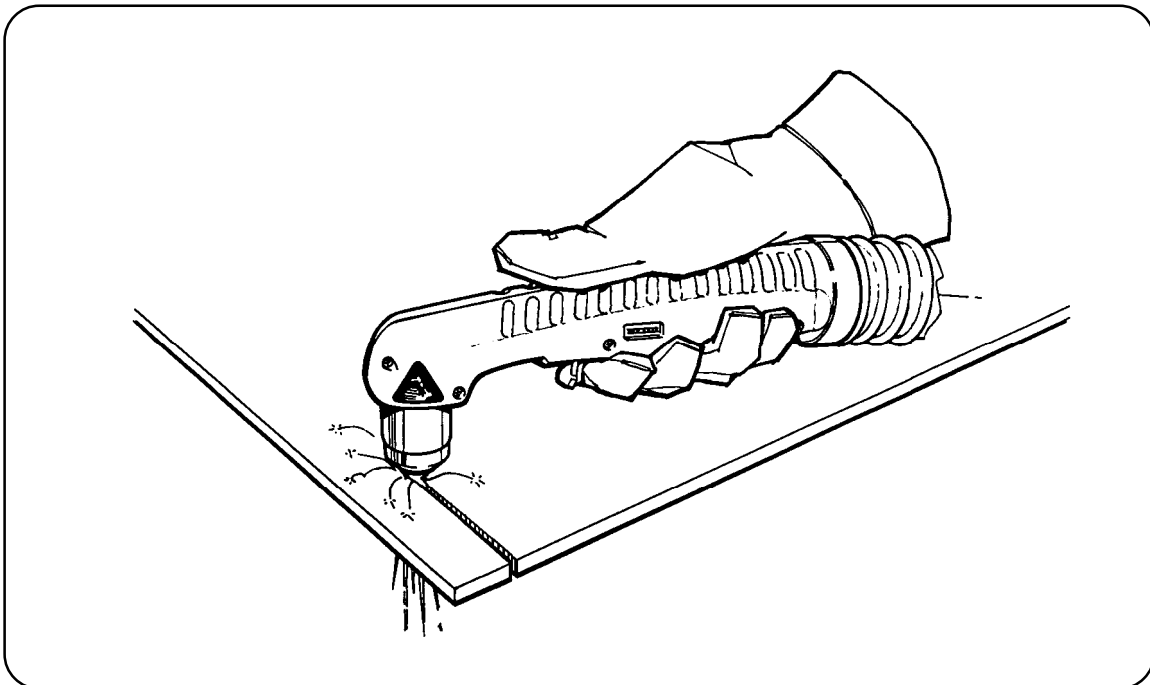


Figure 4-6 Starting a Cut



**Figure 4-7 Cutting a Circle**



**Figure 4-8 Dragging the Torch**

## OPERATION

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### Piercing

- Hold the torch so that the tip 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, pull back on the trigger and slowly rotate the torch 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 near you to avoid any danger from sparks and hot metal.
- When the pierce is complete, bring the torch head to a perpendicular position and proceed with the cut.

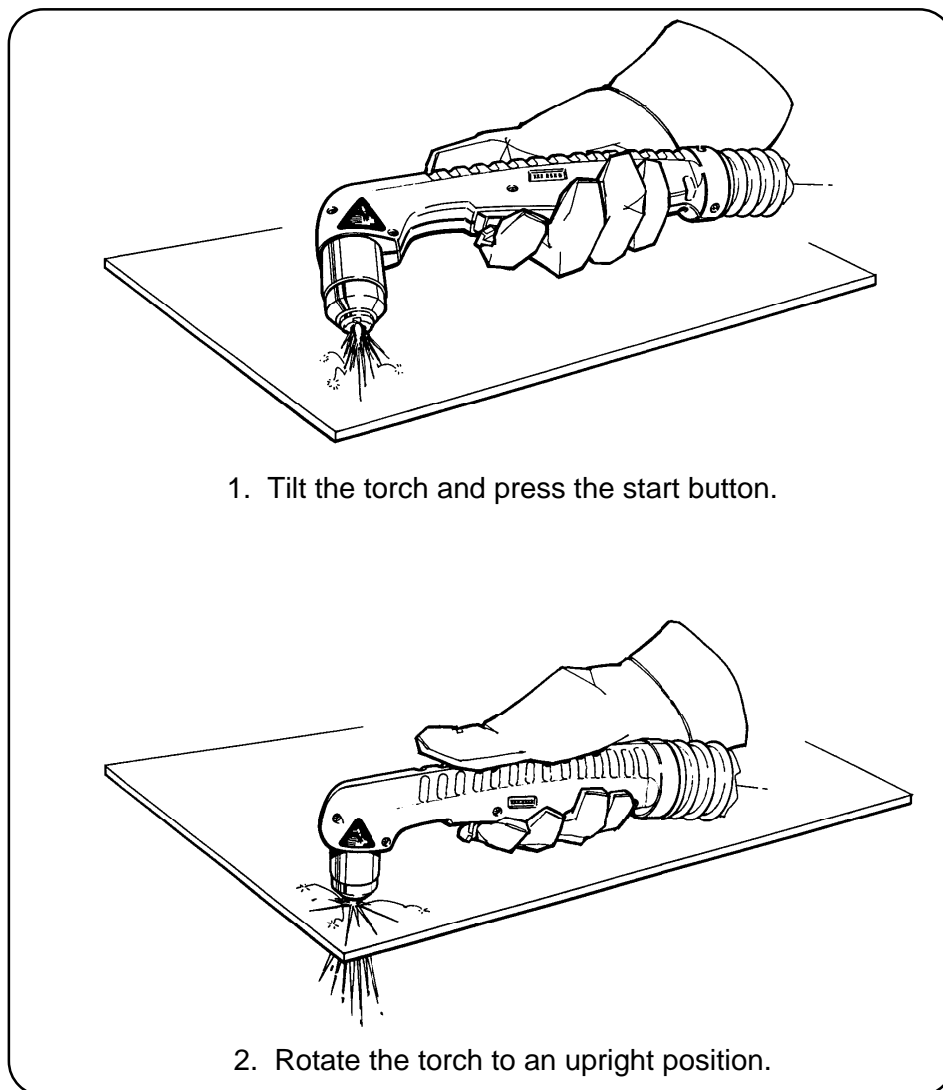


Figure 4-9 Piercing

## Gouging

The Powermax1100 can be used for gouging mild steel by using the optional gouging nozzle and gouging shield.

- Always wear full protection:
  - A welding helmet with at least a #8 lens shade – Hypertherm recommends using a #10 lens shade when gouging
  - 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 the same as a standard cutting nozzle and shield. See *Changing Consumable Parts* earlier in this section.
- Adjust the air pressure to 60–65 psi (4.1–4.5 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 push the torch in the desired direction. Multiple passes or "wearing" may be necessary to gouge wider and deeper sections.

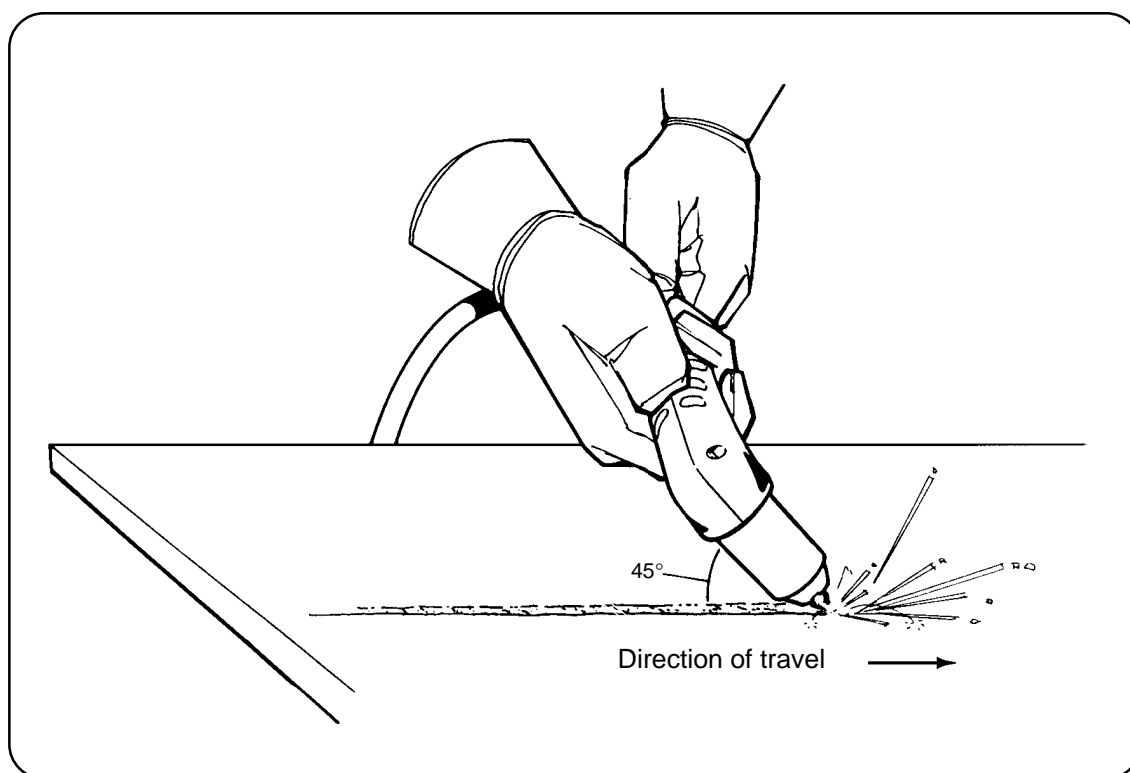
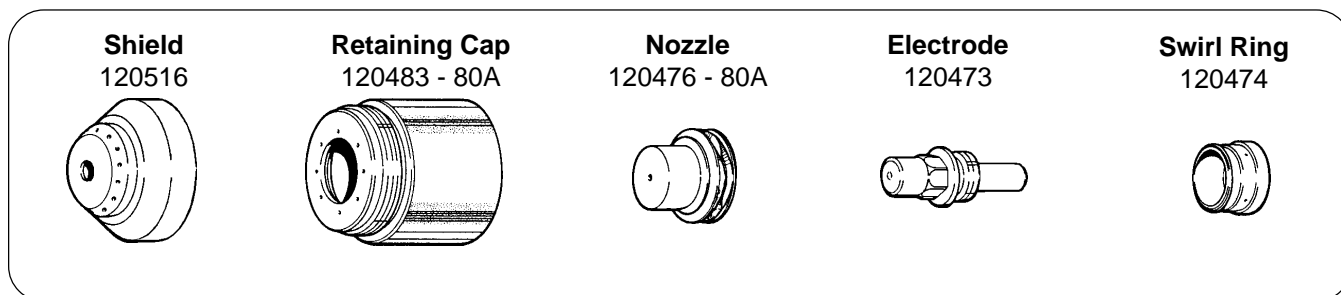


Figure 4-10 Gouging

## OPERATION

### CUT CHART - 80A STANDARD CONSUMABLES

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

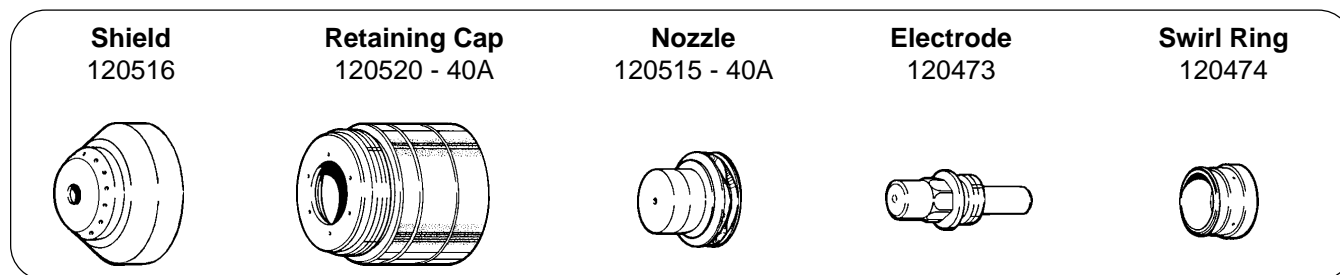


Material Thickness		Material	Arc Current (A)	Arc Voltage (V)	Recommended Travel Speed*		Pierce Delay (S)
(in.)	(mm)				(ipm)	(mm/min)	
3/16"	4.8	Mild steel	80	115	160	4060	0
1/4"	6.4	Mild steel	80	117	110	2800	0.25
3/8"	9.5	Mild steel	80	116	57	1450	0.50
1/2"	12.7	Mild steel	80	120	38	965	0.75
5/8"	15.9	Mild steel	80	124	25	635	1.75
3/4"	19.0	Mild steel	80	124	20	510	n/a
7/8"	22.2	Mild steel	80	132	14	355	n/a
1"	25.4	Mild steel	80	133	11	280	n/a
3/16"	4.8	Stainless Steel	80	120	160	4060	0.25
1/4"	6.4	Stainless Steel	80	121	100	2540	0.50
3/8"	9.5	Stainless Steel	80	122	53	1345	1.00
1/2"	12.7	Stainless Steel	80	123	32	810	1.25
5/8"	15.9	Stainless Steel	80	123	25	635	1.75
3/4"	19.0	Stainless Steel	80	126	18	460	n/a
1"	25.4	Stainless Steel	80	133	10	255	n/a
1/8"	3.2	Aluminum	80	119	340	8640	0
1/4"	6.4	Aluminum	80	120	140	3560	0.25
3/8"	9.5	Aluminum	80	122	90	2285	0.50
1/2"	12.7	Aluminum	80	129	60	1525	1.00
3/4"	19.0	Aluminum	80	131	31	790	n/a

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

## CUT CHART - 40A CONSUMABLES

Use 40-amp consumables on thin material to obtain a narrower 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.) (mm)		Material	Arc Current (A)	Arc Voltage (V)	Recommended Travel Speed* (ipm) (mm/min)		Pierce Delay (S)
26 ga.	0.5	Mild steel	30	116	510	12950	0
22 ga.	0.8	Mild steel	30	116	360	9140	0
20 ga.	0.9	Mild steel	30	116	240	6100	0
18 ga.	1.2	Mild steel	30	118	210	5330	0
16 ga.	1.5	Mild steel	30	118	120	2050	0
14 ga.	1.9	Mild steel	40	117	200	5080	0.25
10 ga.	3.4	Mild steel	40	121	100	2540	0.50
3/16"	4.8	Mild steel	40	116	70	1780	1.00
1/4"	6.4	Mild steel	40	119	42	1070	1.25
3/8"	9.5	Mild steel	40	126	19	480	n/a
1/2"	12.7	Mild steel	40	131	14	355	n/a
26 ga.	0.5	Stainless steel	30	116	520	13200	0
22 ga.	0.8	Stainless steel	30	116	260	6600	0
20 ga.	0.9	Stainless steel	30	117	170	4320	0
18 ga.	1.2	Stainless steel	40	116	310	7870	0
16 ga.	1.5	Stainless steel	40	117	200	5080	0
14 ga.	1.9	Stainless steel	40	115	170	4320	0.25
10 ga.	3.4	Stainless steel	40	118	70	1780	0.50
3/16"	4.8	Stainless steel	40	119	48	1220	1.00
1/4"	6.4	Stainless steel	40	120	35	890	1.50
3/8"	9.5	Stainless steel	40	125	16	410	n/a
1/2"	12.7	Stainless steel	40	126	11	280	n/a
1/32"	0.8	Aluminum	30	117	600	15240	0
1/16"	1.6	Aluminum	30	117	240	6100	0
3/32"	2.4	Aluminum	40	117	250	6350	0.25
1/8"	3.2	Aluminum	40	117	170	4320	0.50
1/4"	6.4	Aluminum	40	122	53	1350	1.50
3/8"	9.5	Aluminum	40	132	28	710	n/a

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

## OPERATION

---

### Cut Chart Notes:

The cut charts 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 cutting assignment. Every cutting system requires "fine-tuning" each cutting set up to the materials on site, in order to obtain optimum cut quality.**

- Maximum recommended mechanized cutting capacity with 80A consumables: 1/2 inch (12 mm) on mild steel, and 3/8 inch (9.5 mm) on stainless steel and aluminum.
- A manual machine motion signal must be given in mechanized applications when cutting material thinner than 18 gauge (1.2 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 400 scfh/6.7 scfm (189 l/min) at a pressure of 90 psi (6.2 bar). The dynamic (flowing) pressure when operating is 65 psi (4.5 bar). If torch leads are 50 ft (15.2 m), the dynamic pressure when operating is 70 psi (4.8 bar). If the pressure to the power supply falls below 40 psi (2.8 bar), the torch will extinguish.
- 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 80 amps, the Powermax1100 has a 50% duty cycle at a temperature of 104° F (40° C). 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 104° F (40° C) when the current is set below 57 amps.
- To avoid performance deterioration of the Powermax1100, input voltage should be within 10% of the specified system line voltage setting.
- When using extended consumables, maintain a torch-to-work distance of approximately 1/8" (3 mm) when cutting above 40A to avoid accelerated consumable parts wear. The torch will extinguish if the nozzle is pressed back against the electrode.

## COMMON CUTTING FAULTS

- If the workpiece is not totally penetrated,
  - The current may be too low.
  - The cut speed may be too high.
  - The torch parts may be worn.
  - The metal being cut may be too thick.
  - The work clamp may not be properly attached to the workpiece.
- If dross forms on the bottom of the cut,
  - The cutting speed may be too slow.
  - The torch parts may be worn.
  - The metal being cut may be too thick.
  - The current may be too low.



## Section 5 MAINTENANCE/PARTS

In this section:

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Routine Maintenance .....	5-2
Bowl Draining and Filter Element Cleaning .....	5-2
Removal, Cleaning and Replacement of the Cooling Air Filter.....	5-3
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## 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 in the torch can cause the torch to sputter and hiss. If moisture is present, purge the gas lines. If moisture builds up in the bowl of the filter, 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.

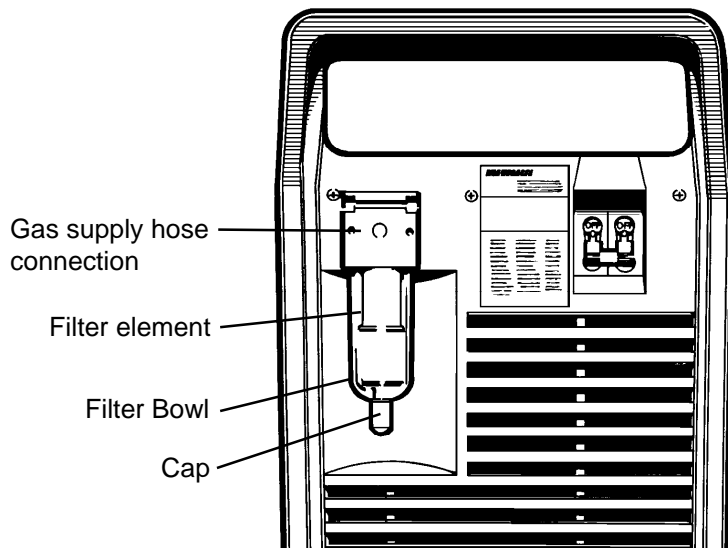


Figure 5-1 Filter Assembly

3. Unscrew the filter bowl.
4. Unscrew the filter element.
5. Clean the filter element with alcohol, then blow it out with air. Clean the bowl with household soap only.
6. Replace the filter element and filter bowl.
7. Reconnect the gas supply hose.

## Removal, Cleaning and Replacement of the Cooling Air Filter

Powermax1100 systems are normally shipped without an air filter. If your Powermax1100 has the air filter option, the filter will need cleaning periodically. Excessively dirty or dusty environments can block the filter (if installed) and cause the power supply to overheat and shut down.

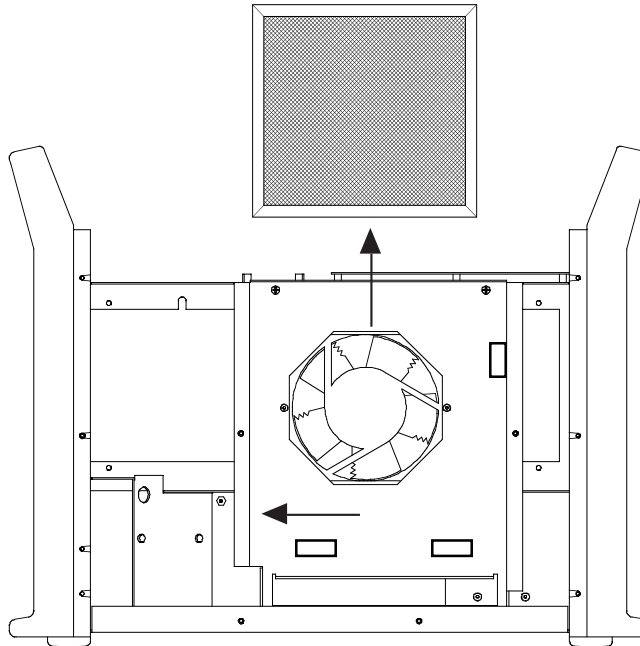


### WARNING



**SHOCK HAZARD:** Always turn off the power, unplug the cord and wait 5 minutes before removing any power supply cover. If the power supply is directly connected to a line disconnect switch, place switch in the 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.

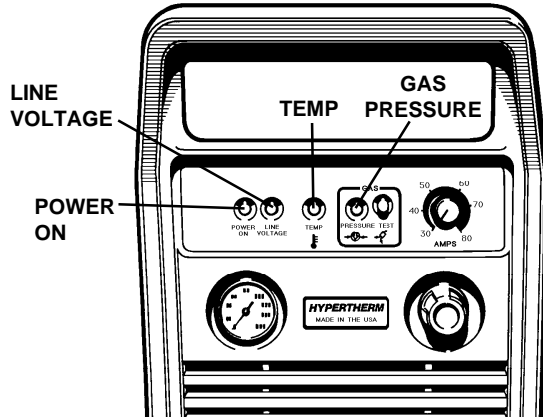
1. Turn the Powermax1100 power switch to the OFF (0) position, unplug the power cord, or turn off the wall receptacle, and disconnect the gas supply.
2. Remove the screws that secure the power supply cover to the chassis.
3. Remove the cover, and remove the cooling air filter from the clips by sliding the filter to the left and then up.



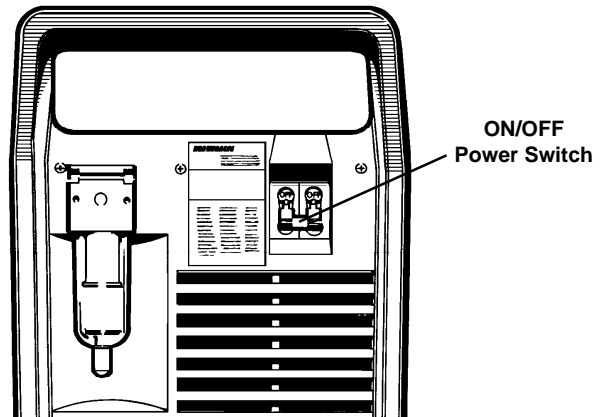
**Figure 5-2 Air Filter Removal**

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 refasten the power supply cover's screws.

## 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.

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 and the LINE VOLTAGE LED is illuminated.

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 Powermax1100 power supplies. Have an electrical technician check incoming power.

**Problem****Cause / Solution**

Note: When the power supply operates at the Lower Limit, the line voltage LED will illuminate and the power supply will function with some performance degradation. At -20% of the System Line Voltage, the line voltage LED will illuminate but the torch will not function. To avoid performance deterioration, the input voltage should be within +/-10% of the System Line Voltage.

	<u>System</u>	
<u>Lower Limit</u>	<u>Line Voltage</u>	<u>Upper Limit</u>
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 immediately after it is switched on.

**4.1 The retaining cap is loose.**

Tighten the retaining cap.

**4.2 The torch is defective.**

See *Technical Questions* on page 5-7.

5. The power supply shuts off approximately 5 seconds after it is switched on.

**5.1 Power supply voltage links are incorrect.**

See voltage configuration settings in **Section 3**.

**5.2 Line voltage is too high.**

See the table above.

6. The fuse on the incoming power line fails during cutting.

**6.1 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.

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

**7.1 One of the internal thermostat switches has opened due to overheating.**

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

Problem	Cause / Solution
8. The arc does not transfer after 5 seconds.	<b>8.1 The 5-second time-out for the pilot arc has occurred.</b> Press the torch start button again.
	<b>8.2 The work clamp is not connected or it is broken.</b> Connect or repair the work clamp.
	<b>8.3 The work clamp is not making good metal-to-metal contact.</b> Verify that the work clamp is properly attached to the workpiece. Remove paint or any coating on the workpiece before attempting to cut.
	<b>8.4 The workpiece is too far away from the torch.</b> Move the torch head closer (1/8 inch (3 mm) maximum distance) to the workpiece and start the torch again.
9. The arc blows out, but reignites when the torch switch is depressed.	<b>9.1 There are faulty consumable parts.</b> Inspect and change the consumable parts, if necessary. See <i>Operating Tips</i> in <b>Section 4</b> .
	<b>9.2 The gas pressure is incorrect.</b> See <i>Operating Instructions</i> in <b>Section 4</b> to adjust the gas pressure, if necessary.
	<b>9.3 The gas filter at the rear of the supply contains excessive moisture.</b> Drain the filter bowl and clean the filter. See <i>Routine Maintenance</i> earlier in this section.
	<b>9.4 When using extended consumables, the torch nozzle is being pressed against the electrode.</b> Maintain a torch-to-work distance of approximately 1/8" (3 mm) when using extended consumables..
10. The torch sputters and hisses.	<b>9.4 The torch is defective.</b> See <i>Technical Questions</i> on page 5-7.
	<b>10.1 The gas filter at the rear of the supply contains excessive moisture.</b> Drain the filter bowl and clean the filter. See <i>Routine Maintenance</i> earlier in this section.

<b>Problem</b>	<b>Cause / Solution</b>
<b>11. The torch cuts poorly.</b>	<b>11.1 Power supply voltage links are incorrect.</b> See voltage configuration settings in <b>Section 3.</b>
	<b>11.2 Torch consumables are worn.</b> See <i>Operating Tips</i> in <b>Section 4.</b>
	<b>11.3 Line voltage is too low.</b> See <b>Cause/Solution 3.2.</b>

## **TECHNICAL QUESTIONS**

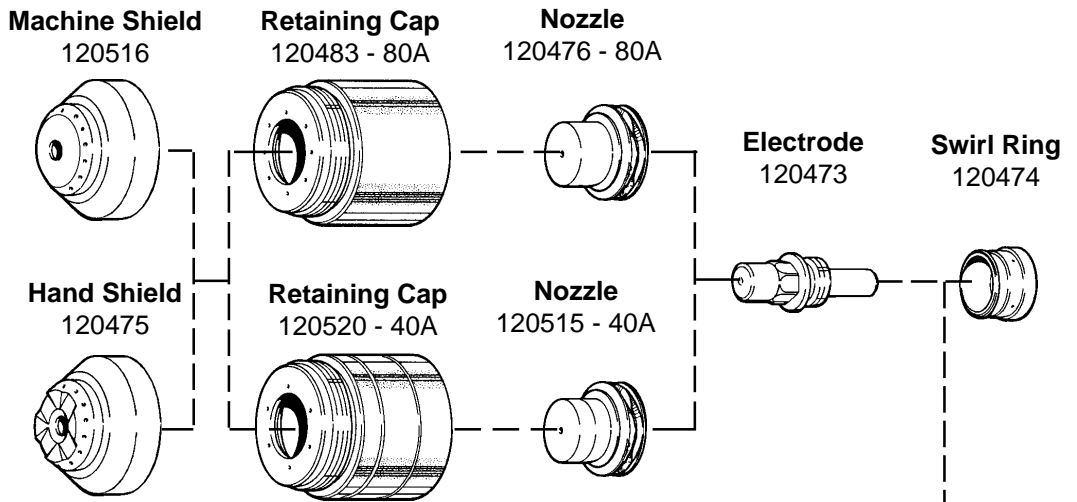
If you are unable to fix the problem with your Powermax1100 by following this basic troubleshooting guide or if you need further assistance:

1. Call your distributor. He will be able to help you, or refer you to an authorized Hypertherm repair facility.
2. Call the nearest Hypertherm office, listed in the front of this manual.
3. See the Powermax1100 service manual for wiring diagrams, higher level troubleshooting and more parts list information.

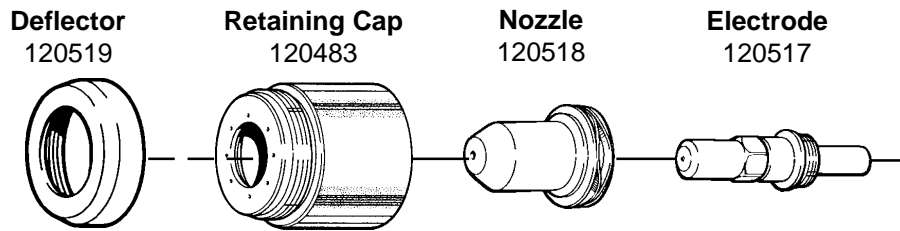
**PARTS**

**PAC135 Consumable Parts**

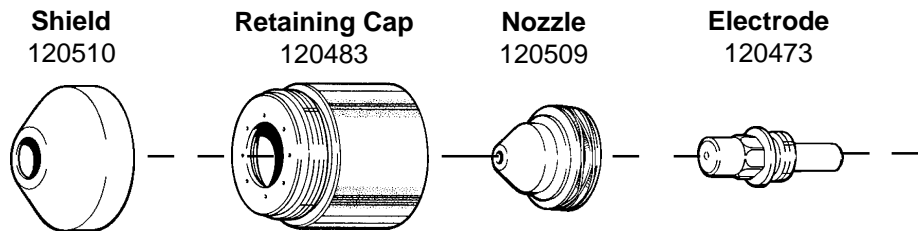
**Shielded - 80A, 40A**



**Extended**



**Gouging**



**Figure 5-3 PAC135 Consumable Parts**

*See page 4-7 for a description of the consumable parts*



**Consumable Parts Kits**

<b>Hand Consumable Parts Kit (128148)</b>	
<b>Part Number</b>	<b>Description</b>
120473 .....	Electrode, PAC135
120517 .....	Electrode, PAC135 Extended
120476 .....	Nozzle, PAC135, 80A
120509 .....	Nozzle, PAC135 Gouging
120518 .....	Nozzle, PAC135 Extended
120475 .....	Shield, PAC135 Hand
120510 .....	Shield, PAC135 Gouging
120519 .....	Deflector, PAC135
026020 .....	O-Ring, .864 X .070
027055 .....	Lubricant, Silicone 1/4 Oz Tube
027526 .....	Electrode Wrench, PAC135
015152 .....	Nipple, 1/8 NPT, QDisc, Steel
015570 .....	Bushing, Reducer, 1/4 X 1/8, Brass
001285 .....	Box, Consumable Parts

<b>Machine Consumable Parts Kit (128149)</b>	
<b>Part Number</b>	<b>Description</b>
120473 .....	Electrode, PAC135
120516 .....	Shield, PAC135 Machine
120476 .....	Nozzle, PAC135, 80A
120515 .....	Nozzle, PAC135, 40A
120520 .....	Cap, PAC135, 40A
026020 .....	O-Ring, .864 X .070
027055 .....	Lubricant, Silicone 1/4 Oz Tube
027526 .....	Electrode Wrench, PAC135
015152 .....	Nipple, 1/8 NPT, QDisc, Steel
015570 .....	Bushing, Reducer, 1/4 X 1/8, Brass
001285 .....	Box, Consumable Parts

<b>Consumable Parts Kit - CE (128170)</b>	
<b>Part Number</b>	<b>Description</b>
120473 .....	Electrode, PAC135
120476 .....	Nozzle, PAC135, 80A
120509 .....	Nozzle, PAC135 Gouging
120475 .....	Shield, PAC135 Hand
120510 .....	Shield, PAC135 Gouging
026020 .....	O-Ring, .864 X .070
027055 .....	Lubricant, Silicone 1/4 Oz Tube
027526 .....	Electrode Wrench, PAC135
015145 .....	Adapter, 1/4NPT X G 1/4 Hose
001285 .....	Box, Consumable Parts

# MAINTENANCE/PARTS

## PAC135T Torch Assembly and 25 ft (7.6 m) Lead - 085001 PAC135T Torch Assembly and 50 ft (15.2 m) Lead - 085061

Index No.	Part No.	Description	Qty.
	<b>002287</b>	<b>Handle Assembly: PAC135T w/screws</b>	
1	001615	Handle, PAC135T	1
2	075497	#6 X 5/8 Phillips Head, Pan Head	5
3	<b>002299</b>	<b>Safety Trigger Assembly, PAC135T</b>	1
4	<b>005212</b>	<b>Switch Assembly, Cap on Sensor</b>	1
	120473	Electrode, Air: PAC135	1
	120474	Swirl Ring: PAC135	1
	120475	Shield: PAC135 80A	1
	120476	Nozzle: PAC135 80A Shield	1
	120483	Retaining Cap: PAC135	1
5	<b>120477</b>	<b>Torch Main Body, PAC135T</b>	1
6	026020	O-Ring: Silicon .864 X .070	1
7	<b>129559*</b>	<b>Torch Lead, 25 ft (7.6 m)</b>	1
7	<b>129560**</b>	<b>Torch Lead, 50 ft (15.2 m)</b>	1
8	005247	Push Button Switch: Lo-Profile	1
9	128122	Plug Assembly: PAC135T Torch Quick Disconnect	1
10	074069	Splice:22-18 Butt	2
11	046056	Tubing:5/8" ID	4"
12	046072	Heatshrink:1/2" ID	2.5"

\* Used only in 085001

\*\* Used only in 085061

Note: See page 5-8 for detail of consumable parts

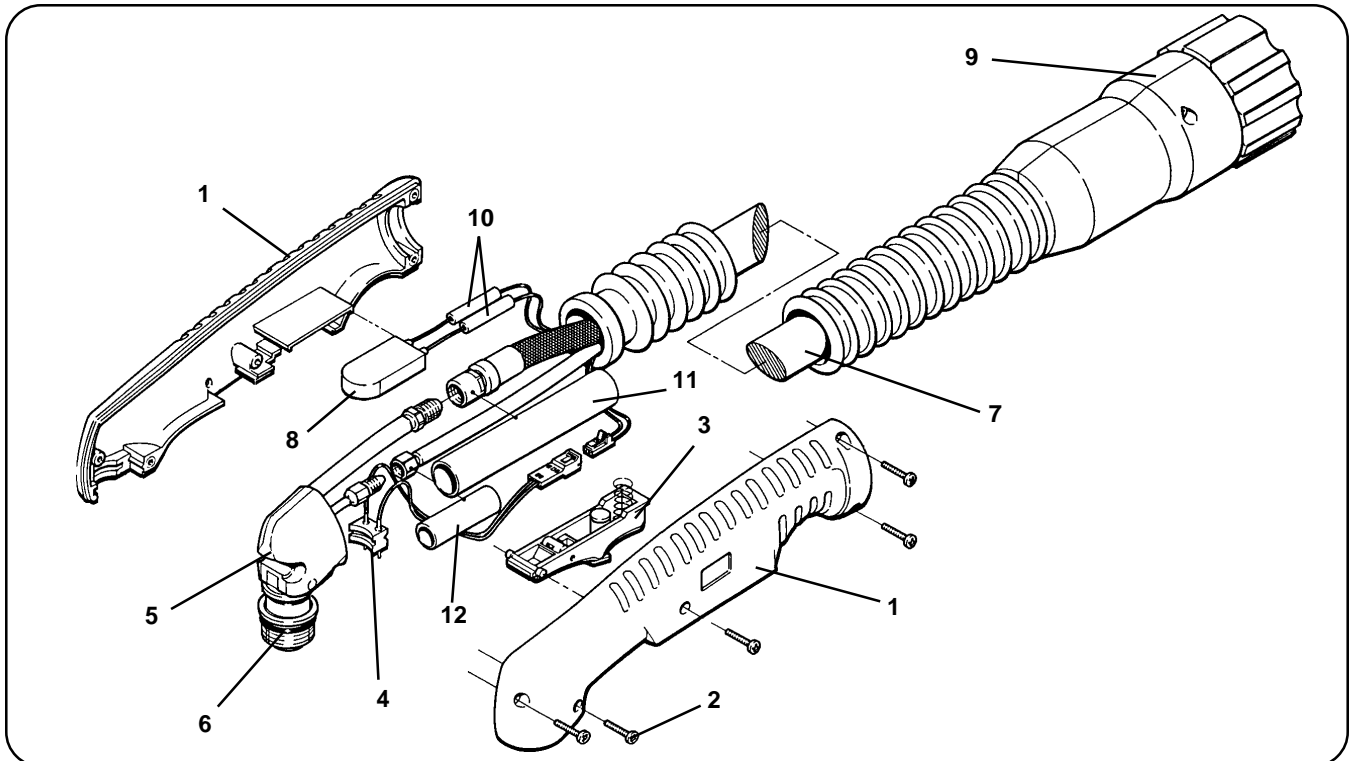


Figure 5-4 PAC135T Torch Assembly and Leads

**PAC135M Torch Assembly and 14 ft (4.3 m) Lead - 085062**  
**PAC135M Torch Assembly and 25 ft (7.6 m) Lead - 085063**  
**PAC135M Torch Assembly and 35 ft (10.6 m) Lead - 085064**  
**PAC135M Torch Assembly and 50 ft (15.2 m) Lead - 085065**

Index No.	Part No.	Description	Qty.
1	020243	Sleeve, Torch Position	1
2	<b>129240*</b>	<b>Torch Lead, 14 ft (4.3 m)</b>	1
2	<b>129241**</b>	<b>Torch Lead, 25 ft (7.6 m)</b>	1
2	<b>129242***</b>	<b>Torch Lead, 35 ft (10.6 m)</b>	1
2	<b>129243****</b>	<b>Torch Lead, 50 ft (15.2 m)</b>	1
3	128122	Plug Assembly:PAC135 Torch Quick Disconnect	1
4	008268	Plug:3-Socket Female	1
5	108034	Receptacle Housing:2-Position 26-22AWG	1
	120473	Electrode	1
	120474	Ring, Swirl	1
	120516	Shield: PAC135M Machine Torch	1
	120476	Nozzle: PAC135 80A Shield	1
	120483	Cap, Retaining	1
6	<b>120508</b>	<b>Torch Main Body, PAC135M</b>	1
7	026020	O-Ring: Silicon .864 X .070	1
8	108035	Pin Housing:2-Position 26-22AWG	1
9	108040	Contact:PAC135M Cap-On Sensor Switch	1
10	046056	Tubing:5/8" ID	4"
11	046072	Heatshrink:1/2" ID	2.5"

\* Used only in 085062 assembly  
 \*\* Used only in 085063 assembly

\*\*\* Used only in 085064 assembly  
 \*\*\*\* Used only in 085065 assembly

Note: See page 5-8 for detail of consumable parts

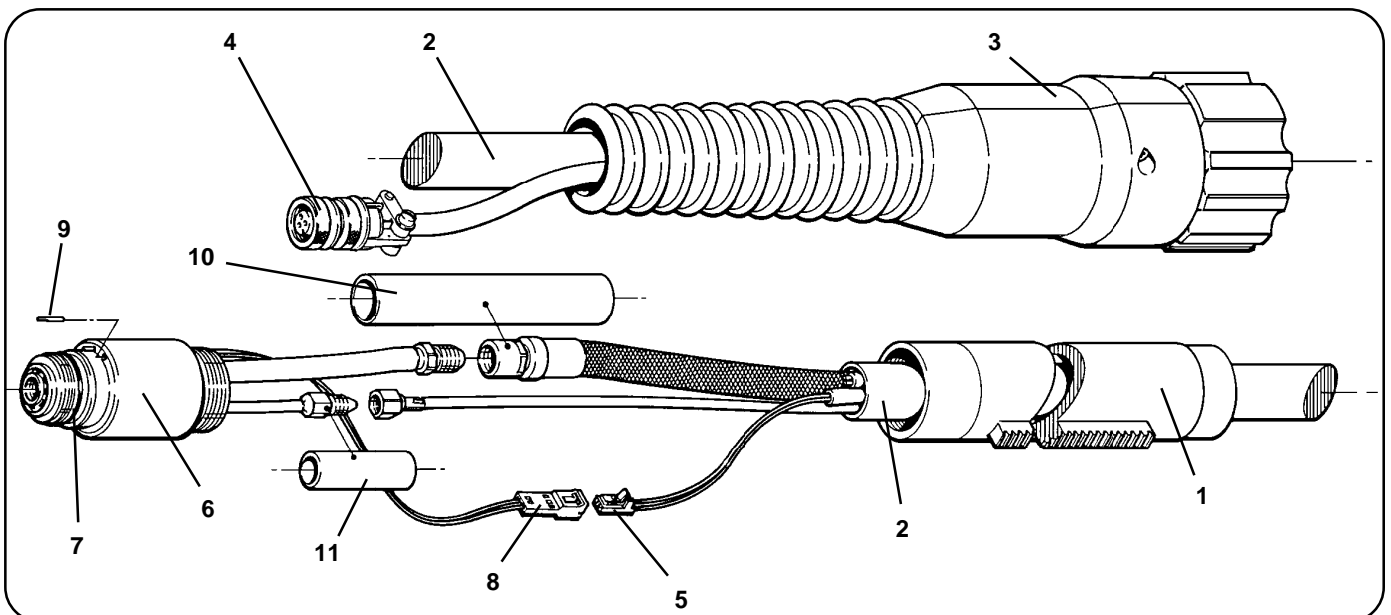


Figure 5-5 PAC135M Torch Assembly and Leads

## Powermax1100 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.)
128061	On/Off Pendant with Lead, 50 ft (15.2 m)
128062	On/Off Pendant with Lead, 75 ft (23 m)
128142	Kit: Wheels, Powermax1100
128143	Kit: Pilot Arc Controller, Powermax1100
128144	Kit: Machine Interface, Powermax1100, 208/240/480V
128168	Kit: Machine Interface, Powermax1100, 200/230/400V
128169	Kit: Machine Interface, Powermax1100, 230/400V CE
128145	Kit: Work Cable, 50 ft (15.2 m), Powermax1100
128146	Kit: Cooling Air Filter, Powermax1100
128147	Kit: 600V Conversion, Powermax1100
011079	Filter Element: Gas Supply Filter
129146	Jumper: Powermax1100 Link Box
023206	Cable: Machine Interface, 25 ft (7.6 m) (Comes standard with machine torch system configurations and with machine interface kits.)
109068	Toroid for power cord ground, Powermax1100 (CE power supplies only)
002282	Strain Relief Sleeve: 0.875
002283	Strain Relief Sleeve: 0.750
002286	Strain Relief Sleeve: 0.625 - Shipped in CE power supply rear panels

Note: Field upgrade kits must be installed by qualified service personnel.

## POWER SUPPLIES - 208/240/480V, 1 $\phi$ /3 $\phi$ , 50/60 HZ

Part Number	For Torch Type	With Pilot Arc Control	With Machine Interface
085000	Hand	No	No
085012	Hand	Yes	No
085013	Machine	No	Yes
085014	Machine	Yes	Yes

## POWER SUPPLIES - 200/230/400V, 1 $\phi$ /3 $\phi$ , 50/60 HZ

Part Number	For Torch Type	With Pilot Arc Control	With Machine Interface
085002	Hand	No	No
085034	Hand	Yes	No
085035	Machine	No	Yes
085036	Machine	Yes	Yes

## POWER SUPPLIES - 230/400V CE, 3 $\phi$ , 50-60 HZ

Part Number	For Torch Type	With Pilot Arc Control	With Machine Interface
085003	Hand	No	No
085023	Hand	Yes	No
085025	Machine	No	Yes
085024	Machine	Yes	Yes

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

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**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 b-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.

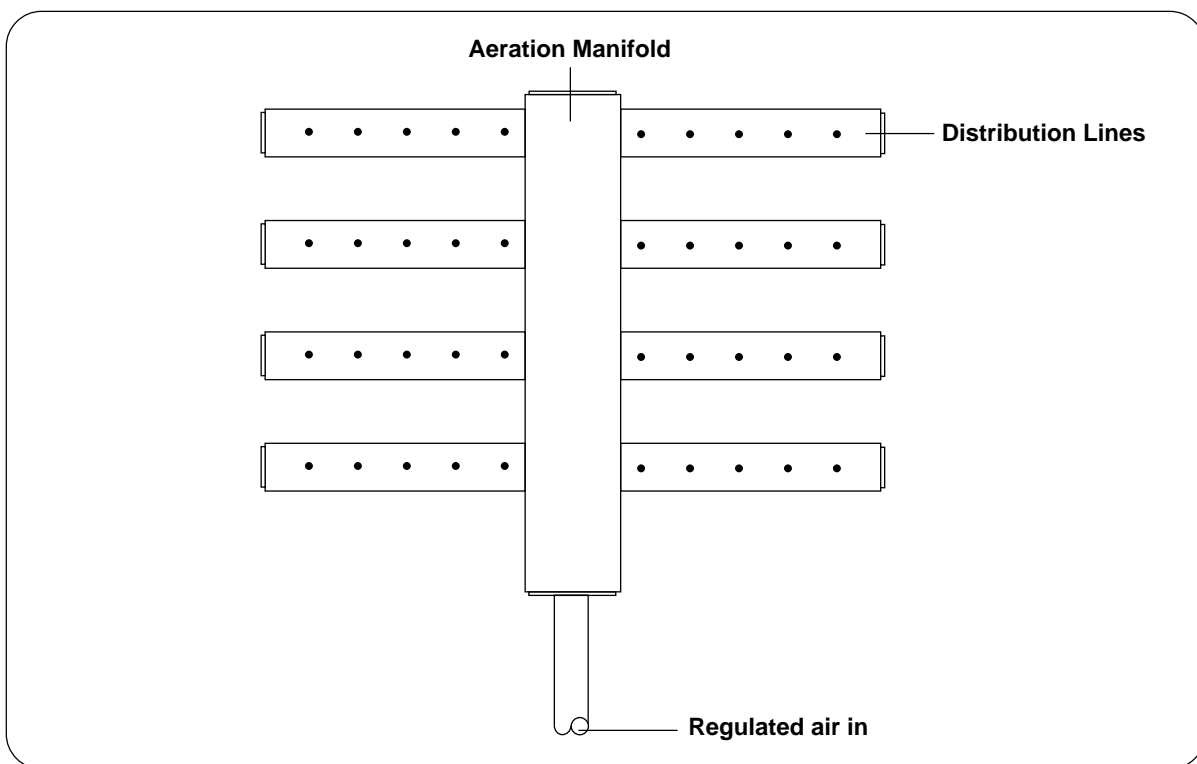


Figure b-1 Aeration Manifold