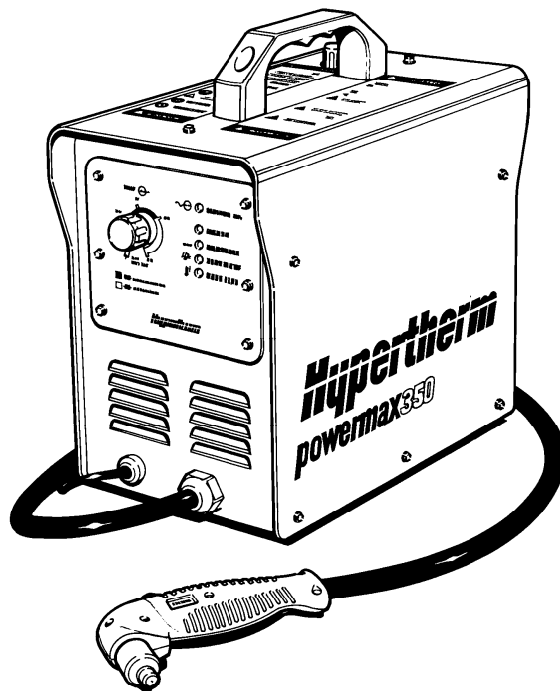


powermax350[®]

Plasma Arc Cutting System

***Operator Manual
802900 Rev. 0***



EN50199
EN50192

Hypertherm
*The world leader in
plasma cutting technology*

powermax350[®]

Plasma Arc Cutting System

Operator Manual

IM-290

(P/N 802900)

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EMC INTRODUCTION

The 115/230V 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

In this section:

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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 CHOC ÉLECTRIQUES PEUVENT ÊTRE FATAUX

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.

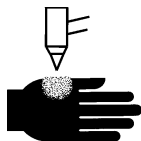
- Installer et mettre à la terre l'équipement selon les instructions du présent manuel et conformément aux codes électriques locaux et nationaux.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fendu. Remplacer immédiatement un cordon endommagé. **Un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

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.
- Entretenir l'équipement et les pièces d'équipement à gaz comprimé afin de les garder en bon état.
- Étiqueter et coder avec des couleurs tous les tuyaux de gaz afin d'identifier le type de gaz contenu dans chaque tuyau. Se référer aux codes locaux ou nationaux en vigueur.



LES BOUTEILLES DE GAZ COMPRIMÉ PEUVENT EXPLOSER EN CAS DE DOMMAGES

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

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



LE BRUIT PEUT PROVOQUER DES PROBLÈMES AUDITIFS

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

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



PACEMAKERS ET PROTHÈSES AUDITIVES

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

Pour réduire les risques associés aux champs magnétiques :

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

Section 2

SPECIFICATIONS

In this section:

Introduction	2-2
Specifications	2-2
Power Supply	2-2
PAC110 Torch	2-3
S Mark	2-4
IEC Symbols Used	2-4

SPECIFICATIONS

INTRODUCTION

The Powermax350 plasma cutting system uses a chopper power supply to cut mild steel, stainless steel, aluminum and other metals. Cylinder air or shop air is used as the plasma gas. Air used for plasma cutting must be clean, dry and oil-free.

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

The Powermax350 service manual provides higher-level troubleshooting and a more complete parts list.

SPECIFICATIONS

Power Supply

Rated Open Circuit Voltage (OCV) (U_0)	255 VDC
Rated Output Current (I_2)	17–27 amps
Full Rated Output	27 amps at 91 VDC at 104° F (40° C)
Duty Cycle (X) at 40° C, at rated output voltage (U_2), and at rated output current (I_2)	35% ($I_2=27A$, $U_2=91V$) 60% ($I_2=21A$, $U_2=88V$) 100% ($I_2=17A$, $U_2=87V$) See power supply data tag for more information on duty cycle.
Ambient Temperature and Duty Cycle	Power supplies will operate between +14° and 104° F (-10° and +40° C). Power supplies operated in an ambient temperature above 86° F (30° C) may show some decrease in duty cycle.
Apparent Input Power (S_1)	3.8 kVA ($U_1 I_1$) both non CE and CE power supplies
Input Voltage (U_1)/Input Current (I_1) at 2.25 kw Output	115/230V/33.3/17.8A 1-Phase, 60 Hz (Non CE) 115/230V/33.3/17.8A 1-Phase, 50 Hz (CE)
Dimensions	See Figure 2-1.
Weight	44 pounds (20 kg) 47 pounds (21.4 kg) with torch
Gas Requirements:	
Gas Type	Air - clean, dry, oil-free
Supplied Air Pressure and Flowrate	70 -120 psi (4.8 - 8.3 bar) @ 270 scfh/4.5 scfm (127 l/min) supplied to power supply pressure regulator.
Power Supply Pressure Regulator Setting	60 psi (4.1 bar) flowing

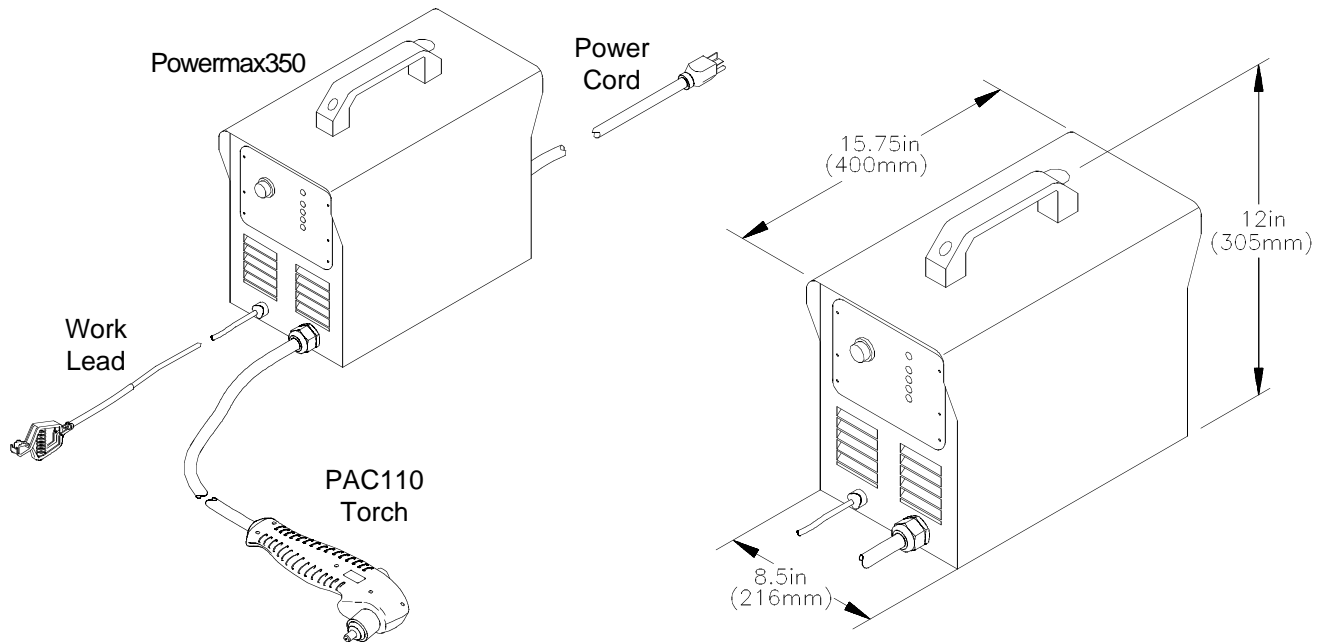


Figure 2-1 Powermax350 Plasma Cutting System

PAC110 Torch

Recommended Cutting Capacity	1/4 inch (6 mm) @ 25A (35% duty cycle)
Maximum Cutting Capacity	3/8 inch (10 mm) @ 25A (35% duty cycle)
Severance Cutting Capacity	1/2 inch (12 mm) @ 25A (35% duty cycle)
Gas Flow	270 scfh/4.5 scfm at 60 psi (127 l/min at 4.1 bar)
Weight	3 pounds (1.4 kg)

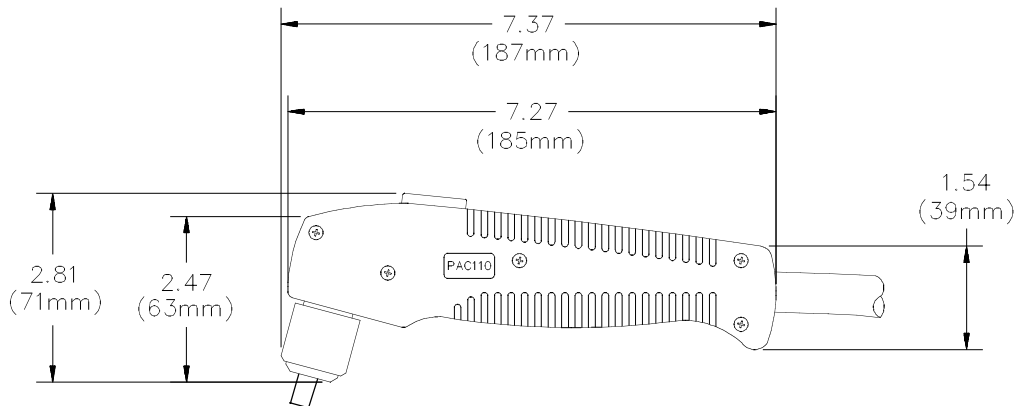















Figure 2-2 PAC110 Torch with Dimensions

SPECIFICATIONS

S MARK

The Powermax350 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.

IEC SYMBOLS USED

	Direct Current (DC).
	Alternating current (AC).
	Plasma cutting torch.
	AC input power connection.
	The terminal for the external protective (earthed) conductor.
	A chopper-based power source.
	Anode (+) work clamp.
	Temperature switch.
	Pressure switch.
	Plasma torch in the TEST position (cooling and cutting gas exiting nozzle).
	The power is on.
	The power is off.
	Volt/amp curve.

Section 3 SETUP

In this section:

Upon Receipt	3-2
Claims	3-2
Locating Power Supply	3-2
115/230 Voltage Configurations	3-2
Input Voltage Selector Switch	3-2
Power Cord Plugs.....	3-2
Grounding	3-4
Work Cable and Clamp	3-4
Plasma Air Supply	3-4
Additional Air Filtration	3-5
Air Hose Connection	3-5

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 Powermax350.

3. Before setting up and operating the Powermax350, 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.

LOCATING POWER SUPPLY

Locate the Powermax350 power supply near the 115V or 230V wall receptacle. Allow at least 10 inches (0.25 m) of space at the front and back of the power supply for proper ventilation.

115/230 VOLTAGE CONFIGURATIONS

The 115/230V Powermax350 power supplies are shipped to operate at the following voltages: the 60 Hz units at 115 volts and the 50 Hz units at 230 volts.

Input Voltage Selector Switch

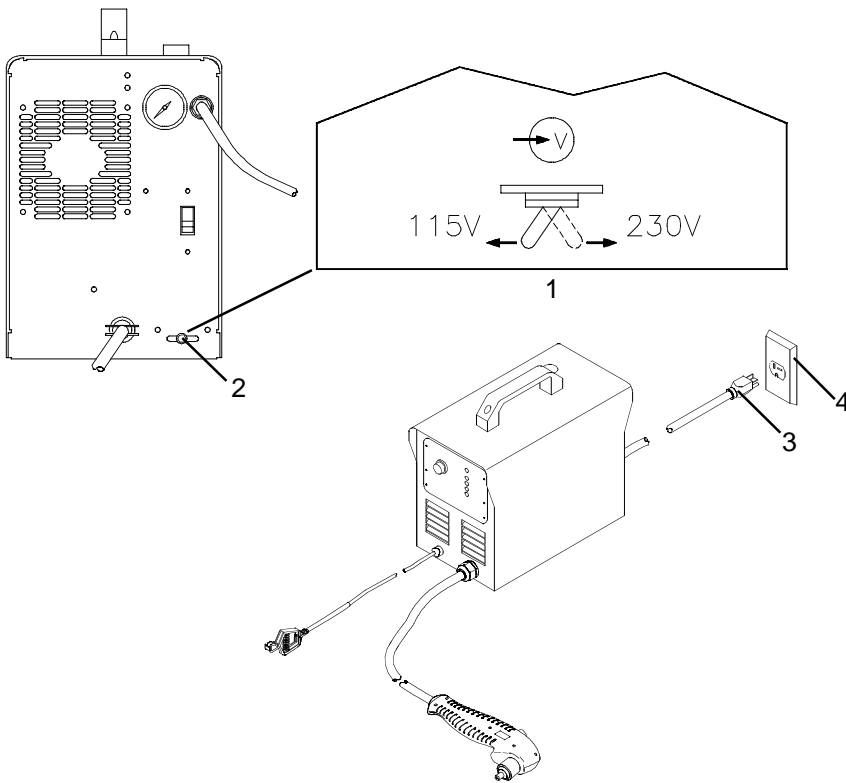
The Input Voltage Selector switch allows either 115V or 230V to be used as the Powermax350 input voltage. To set the required voltage, refer to the procedure on the following page (see Fig. 3-1).

Power Cord Plugs

The 115/230V Powermax350 power supplies are shipped with the following power cord configurations: the 60 Hz units are shipped with a 115V plug on the power cord; the 50 Hz units are shipped without a plug on the power cord. To operate at 230V, obtain a plug that meets national or local electrical codes. The plug should be connected to the power cord by a licensed electrician. Also, note that some 115V receptacles may require a plug that is different from the plug on the power cord. To install the required plug, refer to the procedure on the following page (see Fig. 3-2). The installed 115V plug and cords must conform to national or local electrical codes.

This procedure is necessary if 230V input power is required.

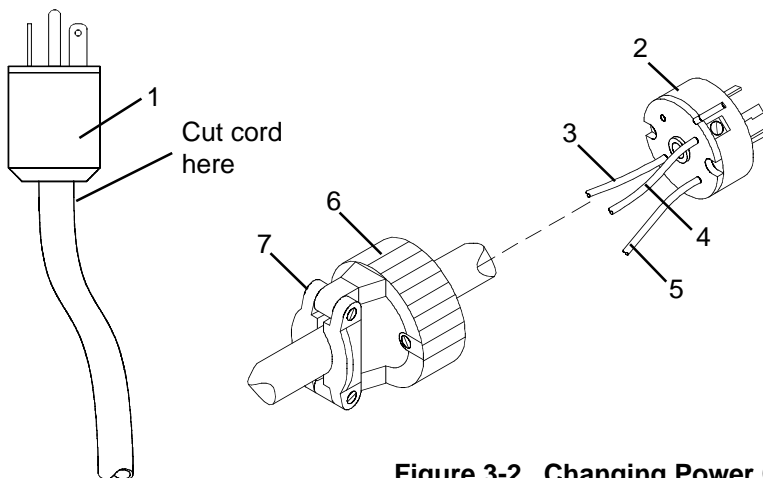
See the procedure in Fig. 3-2 for installing a power cord plug.



- 1 Input Voltage Selector switch
- 2 Retaining screw
 - Remove screw and position switch to select required voltage.
 - Reinstall retaining screw and tighten to secure switch in place.
- 3 Power Cord plug (115V shown)
 - If plug does not match voltage at receptacle or type of receptacle, install suitable plug as shown below.
- 4 115 or 230V receptacle (115V shown)
 - To use rated output (see specifications in section 2), an individual branch circuit capable of carrying 33A, 115V at 35% duty cycle; or 18A, 230V at 35% duty cycle and protected by fuses or circuit breakers is required.

Figure 3-1 Repositioning Input Voltage Selector Switch

This procedure is required if the power supply is to be connected to a 230V receptacle, or to a 115V receptacle that requires a plug that is different from the plug on the power cord.



- 1 Power Cord plug (115V shown)
 - Cut cord close to plug.
- 2 230V plug
- 3 To load 1 (brass) terminal
- 4 To load 2 (brass) terminal
- 5 To ground (green) terminal
- 6 Outer shell
- 7 Cord grip

Strip cord insulation back in order to separate conductors. Strip conductor insulation back in order to make good contact with plug terminals. Make connections, reinstall outer shell and cord grip and secure with screws. Do not overtighten.

Figure 3-2 Changing Power Cord Plugs

GROUNDING

To ensure personal safety, proper operation, and to reduce electromagnetic interference (EMI), the Powermax350 must be properly grounded:

The power supply must be properly grounded through the power cord according to national or local electrical codes. Single-phase service must be of the 3-wire type with a green or green/yellow wire for protective earth ground and must comply with national or local electrical requirements. **Do not use a 2-wire service!** Refer to *Grounding*, in the **Safety** section.

WORK CABLE AND CLAMP

The work clamp must be attached to the workpiece while 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.

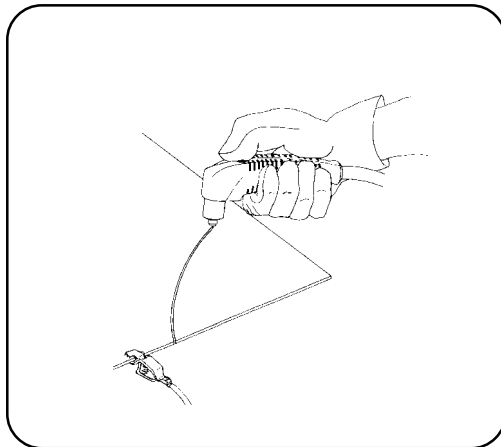


Figure 3-3 Proper Work Clamp Connection

PLASMA AIR SUPPLY

The air supply for the Powermax350 can be supplied as shop compressed air or cylinder compressed air. A high-pressure regulator on either type of supply must be used and must be capable of delivering air at **270 scfh/4.5 scfm (127 l/min)** at a pressure of **70 psi (4.8 bar)** to the filter on the power supply. If air supply quality is poor, cut speeds decrease, cut quality deteriorates, cutting thickness capability decreases, and parts life shortens.



WARNING



Do not allow the air inlet pressure to the filter on the power supply to exceed 120 psi (8.3 bar). The filter bowl may explode if this pressure is exceeded.

Additional Air Filtration

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

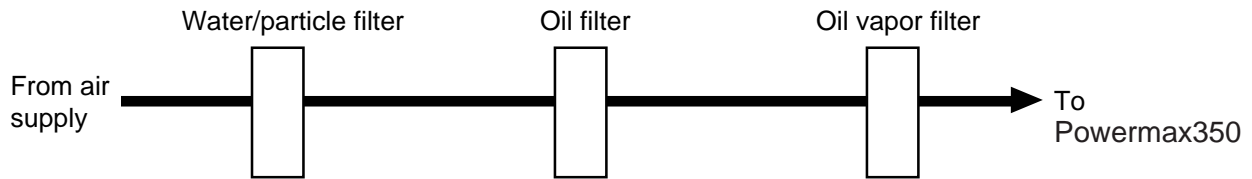
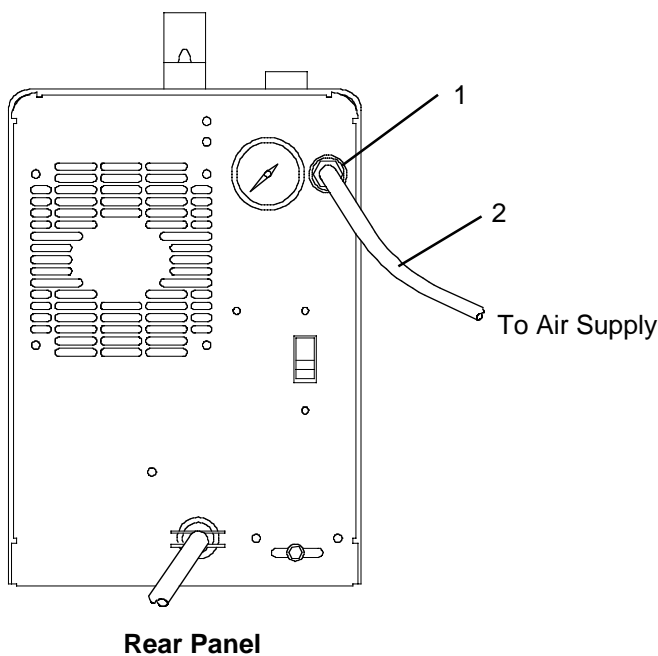


Figure 3-4 Recommended Three-Stage Air Filtration System

AIR HOSE CONNECTION

Connect the air hose as follows:



- 1 Air fitting
 - Install 1/4 NPT quick-disconnect nipple on to air fitting using a liquid pipe sealant.

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.

- Nipple is found in the consumables box, located in the left side of the power supply cover.
- 2 Air hose
 - Use a 3/8 inch (9.5 mm) ID inert gas hose with a 1/4 NPT quick-disconnect coupler. Connect it to the nipple installed in step 1.

Adjust the air pressure according to the procedure in Section 4.

Figure 3-5 Air Supply Connection

Section 4 OPERATION

In this section:

Controls and Indicators	4-2
Operating Instructions	4-3
Operating Tips	4-4
Changing Consumable Parts	4-4
Cutting	4-5
Piercing	4-6
Operating Data - 25A Consumables	4-7
Common Cutting Faults	4-8
Duty Cycle and Overheating	4-8

CONTROLS AND INDICATORS

- **Green POWER ON LED**
When illuminated, indicates that the Power Switch has been set at I (On).
- **Green READY LED**
When illuminated, indicates that the safety interlocks are satisfied.
- **Yellow PRESSURE LED**
When illuminated, indicates that the air pressure is below 40 psi (2.8 bar).
- **Yellow TORCH CAP LED**
When illuminated, indicates that the torch retaining cap is loose.
- **Yellow OVER-TEMP LED**
When illuminated, indicates that the power supply has overheated.
- **AMPS-GAS TEST/SET Adjustment Knob**
Adjusts output current between 16 and 25 amps. The **GAS TEST/SET** position allows adjustment of the air pressure.
- **Pressure Regulator Adjustment Knob**
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.

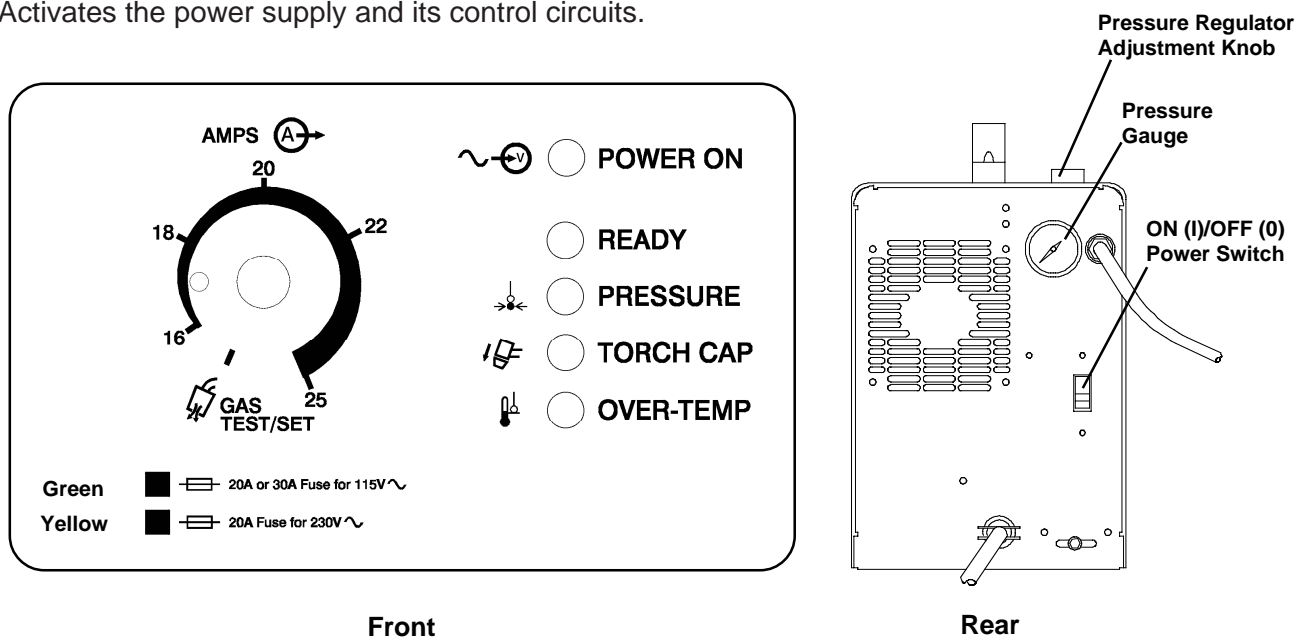


Figure 4-1 Powermax350 Controls and Indicators

OPERATING INSTRUCTIONS



WARNING



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

1. Ensure that the work environment and your clothing meet the safety requirements outlined in the **Safety** section. Follow the instructions in the **Setup** section.
2. Verify that the air supply pressure is set between 70 and 120 psi (4.8 - 8.3 bar).
3. At the rear of the power supply, move the power switch to the ON (I) position. The POWER ON and READY LEDs should illuminate. The PRESSURE, TORCH CAP and OVER-TEMP LEDs should remain extinguished.
4. Adjust the pressure regulator to 60 psi (4.1 bar) on the pressure gauge:
 - Set the knob to GAS TEST/SET position.
 - Pull up on the adjustment knob and turn it to adjust the pressure to 60 psi (4.1 bar).
 - Push down the knob to lock it.
5. Adjust the AMPS knob to the desired setting. See *Cut Chart* later in this section.
6. Attach work clamp securely to the workpiece. **Do not attach it to the portion that will fall away.**



WARNING



The PAC110 torch is an instant-on torch which produces 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.

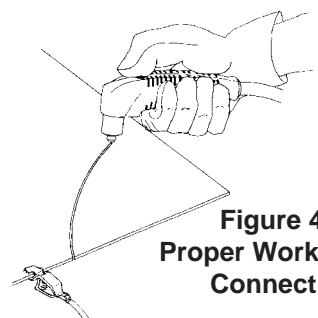


Figure 4-2
Proper Work Clamp
Connection

7. The Powermax350 is now ready to operate. When you are ready to cut, place the tip of the torch on the workpiece. Press the torch switch to start the arc.
8. The arc will transfer from the torch to the workpiece. Move the torch in the desired direction, at a speed which will ensure good cut quality. See *Cut Chart* later in this section.
9. When the cut is finished, release the torch switch. Postflow will continue for approximately 10 seconds. The arc can be instantly restarted during postflow by pressing the torch switch.

OPERATING TIPS

Changing Consumable Parts



WARNING



SHOCK HAZARD: Always turn off the power and unplug the cord before changing consumable parts. Do not rely on the cap-on sensor switch to remove power. It is provided strictly for safety backup. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.

Changing the consumable parts requires no tools:

1. Unscrew the retaining cap and the remaining parts will come apart easily. When you unscrew the retaining cap, you will hear a click. This click is a microswitch (cap-on sensor switch) that disables the power supply if it is plugged in.
2. Inspect the nozzle for damage or wear. If the hole is worn or oval-shaped, replace it.
3. Inspect the electrode. If the center has a pit more than 1/16 inch (1.6 mm) deep, replace it.
4. Inspect the swirl ring. It should be clean, and the holes along the side should not be plugged. If it is damaged, replace it.
5. 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.
6. Replace the parts as shown in Fig. 4-3. Each part fits in only one direction, so you cannot put the parts in backwards. Also, the torch will not fire if the parts are improperly installed.
7. When the nozzle, electrode and swirl ring are properly in place, replace the retaining cap. When the retaining cap is tightened, the microswitch will click, indicating that the torch is again ready for operation. Plug the power supply back in.

The consumable parts are found in a box, located in the left side of the power supply cover.

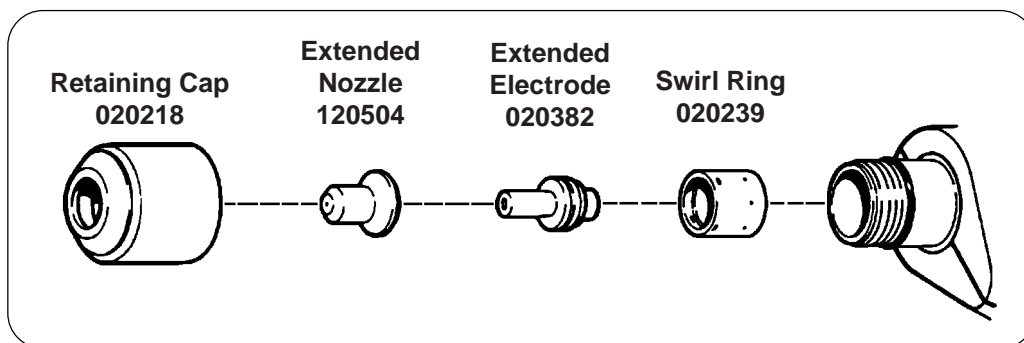


Figure 4-3 Consumable Parts

Cutting

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

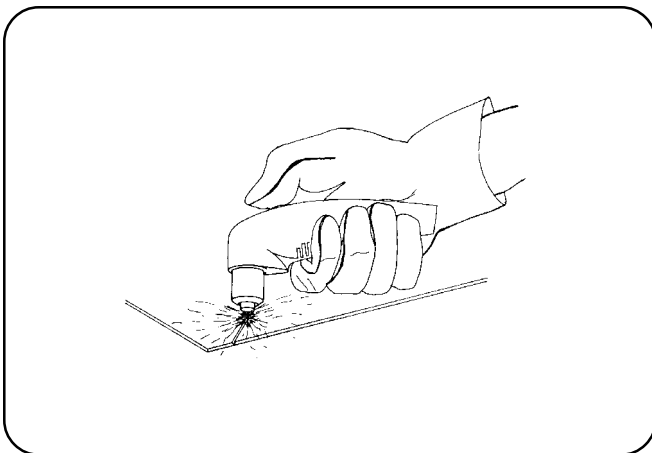


Figure 4-4 Starting a Cut

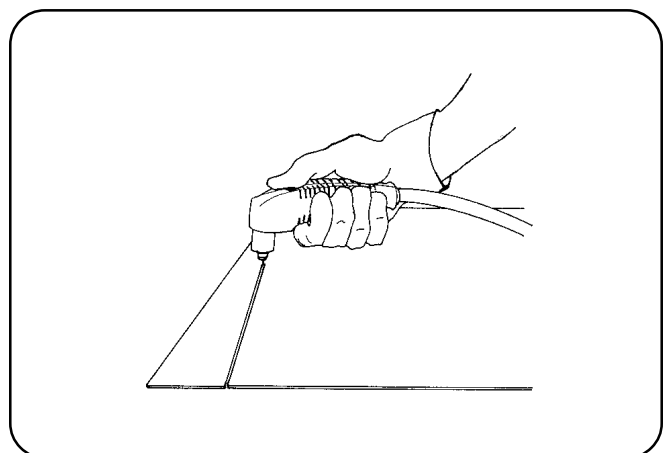


Figure 4-5 Dragging the Torch

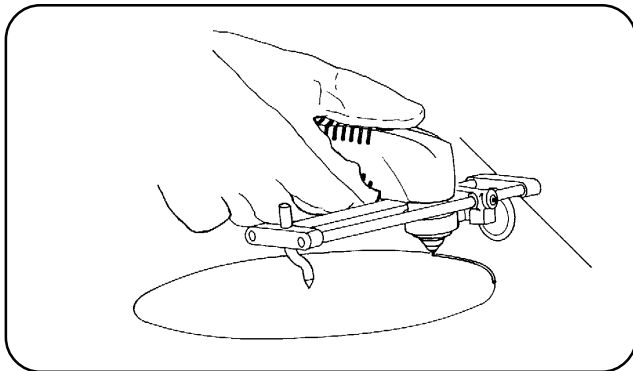


Figure 4-6
Cutting a Circle

Piercing

- Hold the torch so that the nozzle is approximately 1/16 inch (1.6 mm) away from the workpiece before firing the torch. This method maximizes the life of the nozzle.
- Hold the torch at an angle to the workpiece away from yourself, then slowly rotate it to an upright position. This is particularly important when cutting thicker material. Make sure that the torch is pointed away from you and the people near you to avoid any danger from sparks and hot metal (Fig. 4-7).
- When the pierce is complete, bring the torch to a perpendicular position and proceed with the cut.
- Start the cut at an angle rather than in an upright position. This method permits the hot metal to escape to one side rather than splashing back against the nozzle. This will protect the operator from the sparks and extend the life of the nozzle.

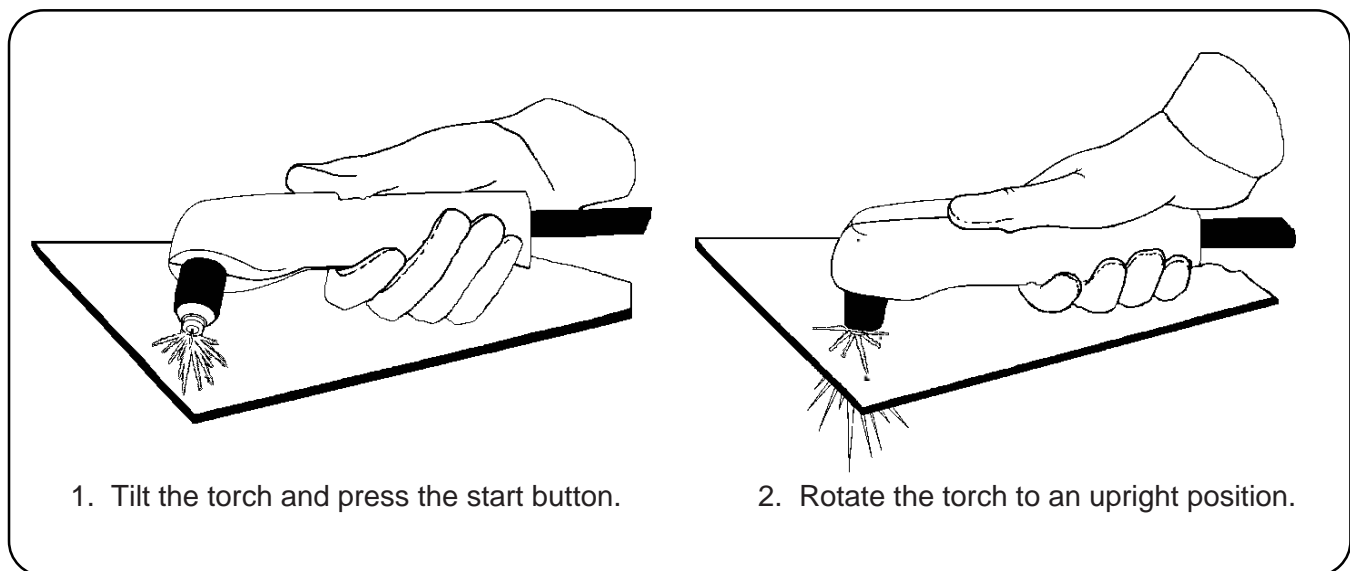
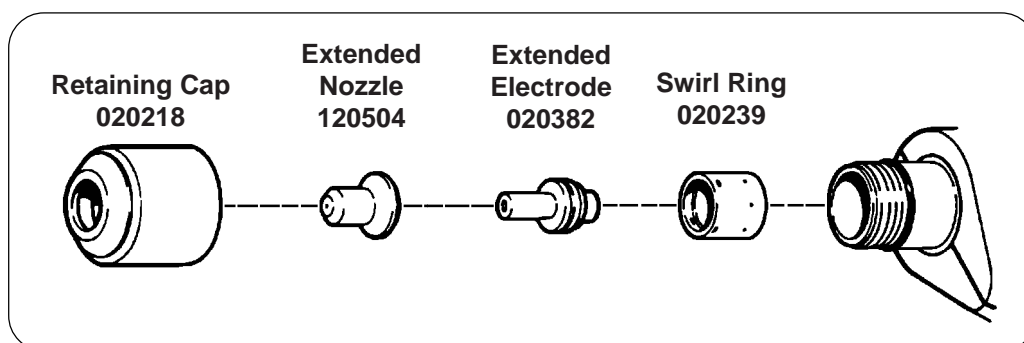


Figure 4-7 Piercing

OPERATING DATA - 25A CONSUMABLES

The following recommended settings are for hand-held cutting at 25 amps. Torch-to-work distance for the following cut charts is 1/16 inch (1.6 mm) for all cuts. The settings are optimized to provide the best cut angle, least dross and best cut surface finish. **Remember that these settings are intended to provide a good starting point for each different cutting assignment. Every cutting system requires "fine-tuning" for each cutting application to the materials on site in order to obtain optimum cut quality.**



Material	Thickness		Arc Current (A)	Approximate Travel Speed*	
	(ga. or in.)	(mm)		(ipm)	(mm/min)
Mild Steel	18 GA	1.3	25	70	1775
	12 GA	2.8	25	52	1320
	1/8	3.6	25	47	1190
	3/16	4.8	25	33	825
	1/4	6.0	25	17	430
	3/8	9.0	25	9	225
Stainless Steel	18 GA	1.3	25	65	1650
	12 GA	2.8	25	48	1215
	1/8	3.6	25	41	1040
	3/16	4.8	25	27	685
	1/4	6.0	25	14	355
	3/8	9.0	25	7	175
Aluminum	18 GA	1.3	25	81	2055
	12 GA	2.8	25	55	1395
	1/8	3.6	25	44	1115
	3/16	4.8	25	29	735
	1/4	6.0	25	9	225
	3/8	9.0	25	5	125

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

COMMON CUTTING FAULTS

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

DUTY CYCLE AND OVERHEATING

- The duty cycle is the amount of time, in minutes, that a pilot or plasma arc can remain "on" within a 10-minute period when operating at 104° F (40° C).
 - At the 25-amp setting, the arc can remain on 3.5 minutes out of every 10 minutes without causing the temperature sensors to disable the unit.
 - At 20 amps, the duty cycle is 60%, or 6 minutes out of every 10 minutes.
 - At 17 amps, the duty cycle increases to 100%.
- If the power supply overheats, the OVER-TEMP LED will illuminate, the arc will shut off and the cooling fan will continue to run.
- To resume cutting, wait for the OVER-TEMP LED to extinguish (usually 15 minutes or less) and reduce amperage or duty cycle.

Section 5 MAINTENANCE/PARTS

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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



WARNING



SHOCK HAZARD: Always turn off the power and unplug the cord before changing consumable parts. Do not rely on the cap-on sensor switch to remove power. It is provided strictly for safety backup. In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.

Under severe conditions, routine maintenance should be performed more frequently.

Before Each Use

- Check the air pressure.
- Check the torch and consumables.

Every Week

- Check the torch cap -on sensor system by listening for the micro-switch to "click" when the retaining cap is loosened. See Changing Consumable Parts in the Operation section.

3 Months

- Replace damaged or unreadable labels.
- Service the filter and pressure regulator.
- Check the air supply hose.
- Replace any cracked parts.
- Check the torch body and torch lead.
- Replace the torch lead if the insulation is broken.

6 Months

- Blow out or vacuum inside of power supply.

TROUBLE LED INDICATORS

If certain problems occur, the READY LED extinguishes, a trouble LED illuminates and the torch stops firing.

- **PRESSURE** LED - Illuminates if air pressure is below 40 psi (2.8 bar).

Turn power Off (O) and check for proper air pressure (see Section 4, Operating Instructions)

- **TORCH CAP** LED - Illuminates if the retaining cap is loose.

Turn power Off (O) and check that the retaining cap is tight. **Whenever the torch cap shutdown system has been activated, turn the power Off (O) and then On (I) to reset the system.** Check the torch cap shutdown system once a week as follows:

Turn power On (I) and loosen the torch cap.

If shutdown system works properly, READY LED extinguishes and TORCH CAP LED illuminates.

If the shutdown system does not work properly, turn power Off (O) and check for proper air pressure (see Section 4, Operating Instructions), blocked or leaking hose or loose torch cap. Check the system by retightening the retaining cap and resetting the power as described above.

- **OVER-TEMP** LED - Illuminates if power supply overheats. See Duty Cycle and Overheating in the Operation section.

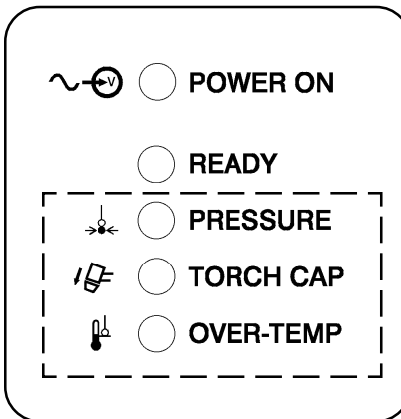


Figure 5-1 Trouble LED Indicators

PAC110 TORCH REPAIR

Parts and Required Tools

The PAC110 torch can be repaired in the field by removing the torch main body from the torch assembly and installing a new torch main body and a plastic cinch strap (Tyrap). To perform the repair, the following customer-supplied tools are required:

- #1 Phillips-head screwdriver
- 7/16" open-end wrench
- Wire cutters
- Crimping tool



WARNING



SHOCK HAZARD: Always turn off power, unplug cord from wall before working on the torch. 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.

Remove Torch Main Body

To disassemble and repair the torch, refer to Figure 5-2 and perform the following procedure:

1. Remove the five screws which secure the handle halves together.
2. Remove the torch main body and torch switch from the handle halves.
3. Disconnect the cinch strap (Tyrap).
4. Cut the four white wires connecting the torch lead to the plunger. Cut the wires at the butt splice.
5. Cut the two blue wires connecting the torch lead to the microswitch. Cut the wires at the butt splices.
6. Cut the two red wire connecting the torch lead to the pilot arc lead. Cut the wire at the butt splice.
7. Disconnect the torch main body and torch lead gas fitting using the 7/16" open-end wrench.

Install New Torch Main Body

To install the new torch, reverse the removal procedure:

1. While holding the torch main body to keep the wires from twisting, connect the body assembly and the torch lead gas fitting using the 7/16" open-end wrench.

2. Connect the two red wire from the torch lead to the butt splice connecting the red wire to the pilot arc fitting using the crimping tool.
3. Connect the two blue wires from the torch lead to the butt splices connecting the white wires to the microswitch using the crimping tool.
4. Connect the four white wires from the torch lead to the butt splice connecting the black plunger wire to the torch main body using the crimping tool.
5. Connect the cinch strap (Tyrap) as shown.
6. Install the torch main body assembly and torch switch into one of the handle halves. While positioning the handle halves together, **be careful not to pinch any wires**. **Be especially careful around the torch switch retainers**.
7. Replace the five screws to secure the handle halves together. If the seams do not fit together tightly, remove the screws and check for pinched wires.

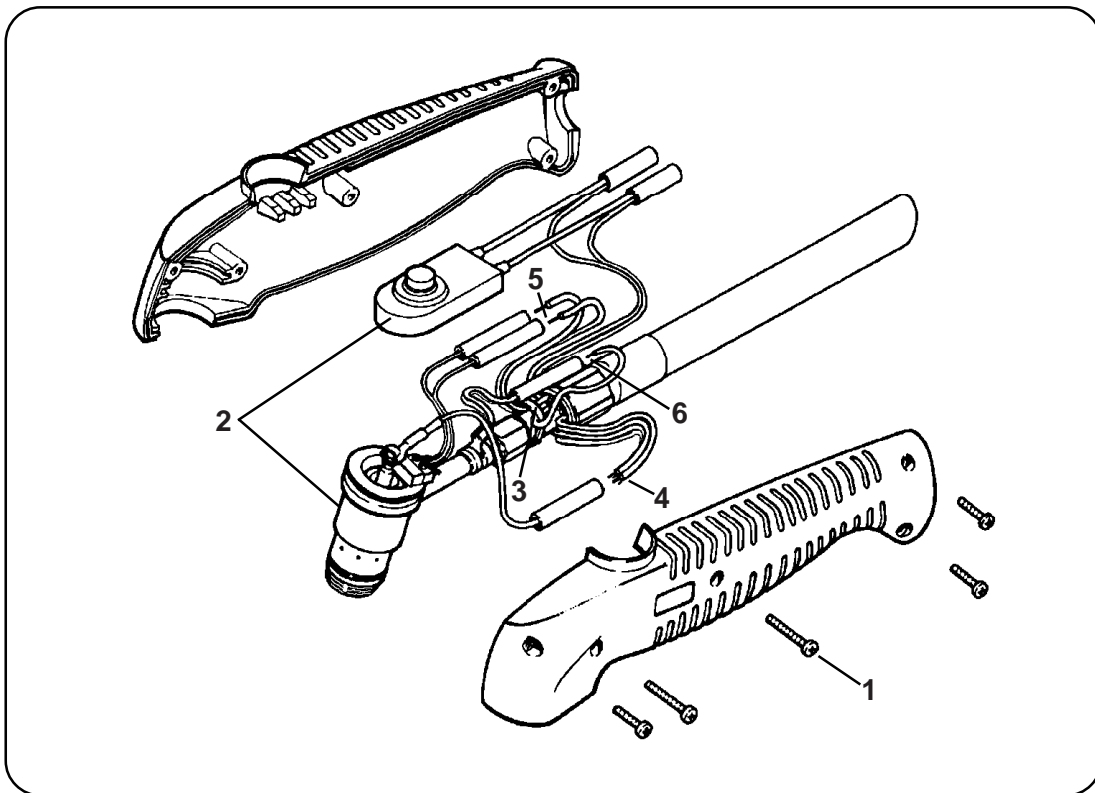


Figure 5-2 PAC110 Torch Repair

BASIC TROUBLESHOOTING

Problem	Cause/Solution
1. No pilot arc; difficulty in establishing an arc.	<ul style="list-style-type: none">1.1 Clean or replace worn consumables as necessary.1.2 Check for proper installation of swirl ring.1.3 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
2. No cutting output; POWER ON, READY, PRESSURE, TORCH CAP and OVER-TEMP LEDs extinguished; fan not running.	<ul style="list-style-type: none">2.1 Place the Power switch to On(I)2.2 Plug in the power cord.2.3 Check line disconnect fuses and replace if needed or reset circuit breakers.2.4 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
3. No cutting output; POWER ON and READY LEDs illuminated; PRESSURE, TORCH CAP and OVER-TEMP LEDs extinguished; fan running.	<ul style="list-style-type: none">3.1 Check that the work clamp is connected.3.2 Clean or replace worn consumables as necessary.3.3 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
4. No cutting output; POWER ON LED illuminated; READY, PRESSURE, TORCH CAP and OVER-TEMP LEDs extinguished; fan running.	<ul style="list-style-type: none">4.1 Reset the power switch.4.2 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
5. No control of cutting output.	<ul style="list-style-type: none">5.1 Check position of input voltage selector switch S2.5.2 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
6. No air flow; POWER ON and READY LEDs illuminated; PRESSURE, TORCH CAP and OVER-TEMP LEDs extinguished; fan running.	<ul style="list-style-type: none">6.1 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
7. PRESSURE LED illuminated; READY LED extinguished.	<ul style="list-style-type: none">7.1 Check for correct air pressure (see Section 4, Operation Instructions).7.2 Check for sufficient air supply pressure (see Section 2, Specifications).

Problem	Cause/Solution
	7.3 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
8. TORCH CAP LED illuminated; READY LED extinguished.	8.1 Check torch retaining cap to ensure it is tight. 8.2 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
9. OVER-TEMP LED illuminated; READY LED extinguished.	9.1 Thermostat in power supply is open (overheating). Allow the fan to run; the thermostat closes when the unit has cooled (see Section 4, Duty Cycle and Overheating). 9.2 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
10. Fan not running; POWER ON and READY LEDs illuminated.	10.1 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.
11. PRESSURE, TORCH CAP and OVER-TEMP LEDs not working.	11.1 Refer to Service Manual IM-292 (802920) for more detailed troubleshooting.

TECHNICAL QUESTIONS

If you are unable to fix the problem with your Powermax350 by following this basic troubleshooting guide or if you need further assistance:

1. Call your distributor. He/she will be able to help you, or refer you to an authorized Hypertherm repair facility.
2. Call Hypertherm's Technical Service group at 1 800 643 9878 or the nearest Hypertherm office, listed in the front of this manual.
3. See the Powermax350 Service Manual IM-292 (802920) for wiring diagrams, higher level troubleshooting and more parts list information.

PARTS

Powermax350 Hand Systems

070052 115/230 VAC, 1 Phase, 60 Hz 15 ft (4.5 M)

070053 115/230 VAC, 1 Phase, 60 Hz 25 ft (7.6 M)

070055 CE 115/230 VAC, 1 Phase, 50 Hz 15 ft (4.5 M)

070056 CE 115/230 VAC, 1 Phase, 50 Hz 25 ft (7.6 M)

Consumable Parts

Part Number	Description
020239	Ring, Swirl
020382	Electrode, Extended
120504	Nozzle, Extended, 25A
020218	Cap, Retaining

The consumable parts are found in a box, located in the left side of the power supply cover.

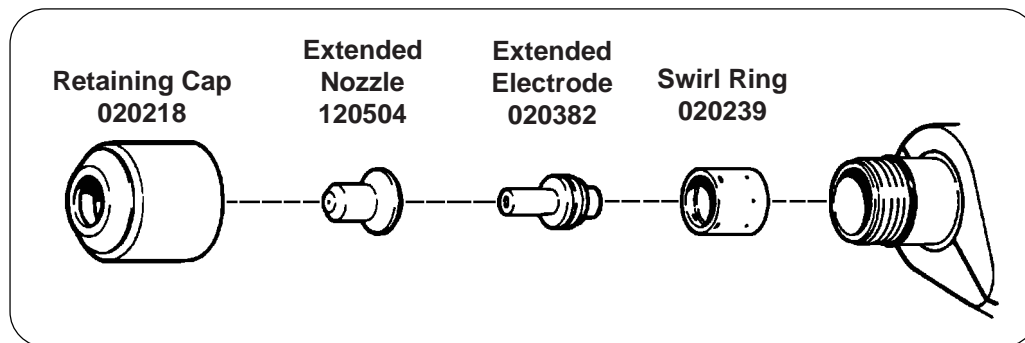


Figure 5-3 Consumable Parts

PAC110 Torch Assembly and 15 ft (4.5 m) Torch Lead, 25A - 070057
PAC110 Torch Assembly and 25 ft (7.6 m) Torch Lead, 25A - 070058

Part Number	Description
001192	Handle, PAC110
075339	Screws (3), P/S, # 4 X 1/2, PH, RND, S/B
075341	Screws (2), P/S, # 4 X 3/4, PH, RND, S/B
005094	Switch, Torch Pushbutton
020239*	Ring, Swirl
020382*	Electrode, Extended
120504*	Nozzle, Extended, 25A
020218*	Cap, Retaining
020588	Torch Main Body with Switch, PAC110
044016	O-Ring: BUNA 90 Duro .614X.070
029241	Torch Lead, 15 ft (4.5 m)
029257	Torch Lead, 25 ft (7.6 m)

* See Fig. 5-3 for consumable parts.

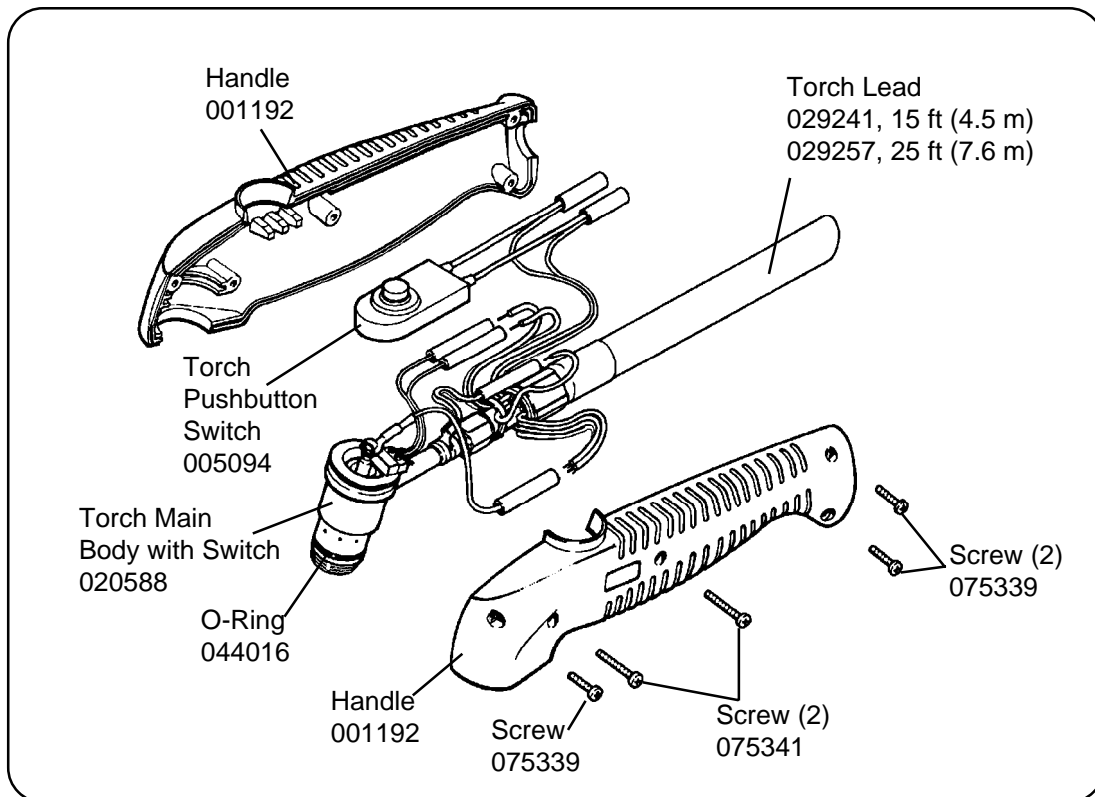


Figure 5-4 PAC110 Torch Assembly and Torch Lead