

Hypertherm[®]

Powermax125[®]

Plasma Arc Cutting System



Service Manual

808070 | Revision 3.1 | English

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One of Hypertherm's long-standing core values is a focus on minimizing our impact on the environment. Doing so is critical to our, and our customers', success. We are always striving to become better environmental stewards; it is a process we care deeply about.

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Powermax125

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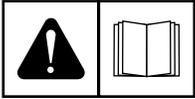
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ENGLISH

WARNING! Before operating any Hypertherm equipment, read the safety instructions in your product's manual and in the *Safety and Compliance Manual* (80669C). Failure to follow safety instructions can result in personal injury or in damage to equipment.

Copies of the manuals may accompany the product in electronic and printed formats. You can also obtain copies of the manuals, in all languages available for each manual, from the "Documents library" at www.hypertherm.com.

DEUTSCH / GERMAN

WARNUNG! Bevor Sie ein Hypertherm-Gerät in Betrieb nehmen, lesen Sie bitte die Sicherheitsanweisungen in Ihrer Bedienungsanleitung sowie im *Handbuch für Sicherheit und Übereinstimmung* (80669C). Das Nichtbefolgen der Sicherheitsanweisungen kann zu Verletzungen von Personen oder Schäden am Gerät führen.

Bedienungsanleitungen und Handbücher können dem Gerät in elektronischer Form oder als Druckversion beiliegen. Alle Handbücher und Anleitungen können in den jeweils verfügbaren Sprachen auch in der „Dokumente-Bibliothek“ unter www.hypertherm.com heruntergeladen werden.

FRANÇAIS / FRENCH

AVERTISSEMENT! Avant d'utiliser tout équipement Hypertherm, lire les consignes de sécurité importantes dans le manuel de votre produit et dans le *Manuel de sécurité et de conformité* (80669C). Le non-respect des consignes de sécurité peut engendrer des blessures physiques ou des dommages à l'équipement.

Des copies de ces manuels peuvent accompagner le produit en format électronique et papier. Vous pouvez également obtenir des copies de chaque manuel dans toutes les langues disponibles à partir de la « Bibliothèque de documents » sur www.hypertherm.com.

ESPAÑOL / SPANISH

¡ADVERTENCIA! Antes de operar cualquier equipo Hypertherm, leer las instrucciones de seguridad del manual de su producto y del *Manual de Seguridad y Cumplimiento* (80669C). No cumplir las instrucciones de seguridad podría dar lugar a lesiones personales o daño a los equipos.

Pueden venir copias de los manuales en formato electrónico e impreso junto con el producto. También se pueden obtener copias de los manuales, en todos los idiomas disponibles para cada manual, de la "Biblioteca de documentos" en www.hypertherm.com.

ITALIANO / ITALIAN

AVVERTENZA! Prima di usare un'attrezzatura Hypertherm, leggere le istruzioni sulla sicurezza nel manuale del prodotto e nel *Manuale sulla sicurezza e la conformità* (80669C). Il mancato rispetto delle istruzioni sulla sicurezza può causare lesioni personali o danni all'attrezzatura.

Il prodotto può essere accompagnato da copie elettroniche e cartacee del manuale. È anche possibile ottenere copie del manuale, in tutte le lingue disponibili per ogni manuale, dall'"Archivio documenti" all'indirizzo www.hypertherm.com.

NEDERLANDS / DUTCH

WAARSCHUWING! Lees voordat u Hypertherm-apparatuur gebruikt de veiligheidsinstructies in de producthandleiding en in de *Veiligheids- en nalevingshandleiding* (80669C). Het niet volgen van de veiligheidsinstructies kan resulteren in persoonlijk letsel of schade aan apparatuur.

De handleidingen kunnen in elektronische en gedrukte vorm met het product worden meegeleverd. De handleidingen, elke handleiding beschikbaar in alle talen, zijn ook verkrijgbaar via de "Documentenbibliotheek" op www.hypertherm.com.

DANSK / DANISH

ADVARSEL! Inden Hypertherm udstyr tages i brug skal sikkerhedsinstruktionerne i produktets manual og i *Manual om sikkerhed og overholdelse af krav* (80669C), gennelæses. Følges sikkerhedsvejledningen ikke kan det resultere i personskade eller beskadigelse af udstyret.

Kopier af manualerne kan ledsage produktet i elektroniske og trykte formater. Du kan også få kopier af manualer, på alle sprog der er til rådighed for hver manuel, fra "Dokumentbiblioteket" på www.hypertherm.com.

PORTUGUÊS / PORTUGUESE

AVERTÊNCIA! Antes de operar qualquer equipamento Hypertherm, leia as instruções de segurança no manual do seu produto e no *Manual de Segurança e de Conformidade* (80669C). Não seguir as instruções de segurança pode resultar em lesões corporais ou danos ao equipamento.

Cópias dos manuais podem acompanhar os produtos nos formatos eletrônico e impresso. Também é possível obter cópias dos manuais em todos os idiomas disponíveis para cada manual na "Biblioteca de documentos" em www.hypertherm.com.

日本語 / JAPANESE

警告! Hypertherm 機器を操作する前に、安全に関する重要な情報について、この製品説明書にある安全情報、および製品に同梱されている別冊の「安全とコンプライアンスマニュアル」(80669C)をお読みください。安全情報に従わないと怪我や装置の損傷を招くことがあります。

説明書のコピーは、電子フォーマット、または印刷物として製品に同梱されています。各説明書は、www.hypertherm.com の「ドキュメントライブラリ」から各言語で入手できます。

简体中文 / CHINESE (SIMPLIFIED)

警告! 在操作任何海宝设备之前, 请阅读产品手册和《安全法规遵守手册》(80669C) 中的安全操作说明。若未能遵循安全操作说明, 可能会造成人员受伤或设备损坏。

随产品提供的手册可能提供电子版和印刷版两种格式。您也可从 "Documents library" (文档资料库) 中获取每本手册所有可用语言的副本, 网址为 www.hypertherm.com。

NORSK / NORWEGIAN

ADVARSEL! Før du bruker noe Hypertherm-utstyr, må du lese sikkerhetsinstruksjonene i produktets håndbok og i *Håndboken om sikkerhet og samsvar* (80669C). Unnlattelse av å følge sikkerhetsinstruksjoner kan føre til personskade eller skade på utstyr.

Eksemplarer av håndbøkene kan medfølge produktet i elektroniske og trykte utgaver. Du kan også få eksemplarer av håndbøkene i alle tilgjengelige språk for hver håndbok fra dokumentbiblioteket på www.hypertherm.com.

SVENSKA / SWEDISH

VARNING! Läs häftet *säkerhetsinformationen i din produkts säkerhets- och efterlevnadsmanual* (80669C) för viktig säkerhetsinformation innan du använder eller underhåller Hypertherm-utrustning. Underlåtenhet att följa dessa säkerhetsinstruktioner kan resultera i personskador eller skador på utrustningen.

Kopior av manualen kan medfölja produkten i elektronisk och tryckform. Du hittar även kopior av manualerna i alla tillgängliga språk i dokumentbiblioteket (Documents library) på www.hypertherm.com.

한국어 / KOREAN

경고! Hypertherm 장비를 사용하기 전에 제품 설명서와 안전 및 규정 준수 설명서 (80669C)에 나와 있는 안전 지침을 읽으십시오. 안전 지침을 준수하지 않으면 신체 부상이나 장비 손상을 초래할 수 있습니다.

전자 형식과 인쇄된 형식으로 설명서 사본이 제품과 함께 제공될 수 있습니다. www.hypertherm.com 의 'Documents library (문서 라이브러리)' 에서도 모든 언어로 이용할 수 있는 설명서 사본을 얻을 수 있습니다.

ČESKY / CZECH

VAROVÁNÍ! Před uvedením jakéhokoliv zařízení Hypertherm do provozu si přečtěte bezpečnostní pokyny v příručce k produktu a v *Manuálu pro bezpečnost a dodržování předpisů* (80669C). Nedodržování bezpečnostních pokynů může mít za následek zranění osob nebo poškození majetku.

Kopie příruček a manuálů mohou být součástí dodávky produktu, a to v elektronické i tištěné formě. Kopie příruček a manuálů ve všech jazykových verzích, v nichž byly dané příručky a manuály vytvořeny, naleznete v „Knihovně dokumentů“ na webových stránkách www.hypertherm.com.

POLSKI / POLISH

OSTRZEŻENIE! Przed rozpoczęciem obsługi jakiegokolwiek systemu firmy Hypertherm należy się zapoznać z instrukcjami bezpieczeństwa zamieszczonymi w podręczniku produktu oraz w *Podręczniku bezpieczeństwa i zgodności* (80669C). Nieprzestrzeganie instrukcji bezpieczeństwa może skutkować obrażeniami ciała i uszkodzeniem sprzętu.

Do produktu mogą być dołączone kopie podręczników w formie elektronicznej i drukowanej. Kopie podręczników, w każdym udostępnionym języku, można również znaleźć w „Bibliotece dokumentów” pod adresem www.hypertherm.com.

РУССКИЙ / RUSSIAN

БЕРЕГИСЬ! Перед работой с любым оборудованием Hypertherm ознакомьтесь с инструкциями по безопасности, представленными в руководстве, которое поставляется вместе с продуктом, а также в *Руководстве по безопасности и соответствию* (80669J). Невыполнение инструкций по безопасности может привести к телесным повреждениям или повреждению оборудования.

Копии руководств, которые поставляются вместе с продуктом, могут быть представлены в электронном и бумажном виде. Копии руководств на всех языках, на которые переведено то или иное руководство, можно также загрузить в разделе «Библиотека документов» на веб-сайте www.hypertherm.com.

SUOMI / FINNISH

VAROITUS! Ennen minkään Hypertherm-laitteen käyttöä lue tuotteen käyttöoppaassa olevat turvallisuusohjeet ja *turvallisuus- ja vaatimustenmukaisuusohje* (80669C). Turvallisuusohjeiden laiminlyönti voi aiheuttaa henkilökohtaisen loukkaantumisen tai laitevahingon.

Käyttöoppaiden kopiot voivat olla tuotteen mukana elektronisessa ja tulostetussa muodossa. Voit saada käyttöoppaiden kopiot kaikilla kielillä ”latauskirjastosta”, joka on osoitteessa www.hypertherm.com.

БЪЛГАРСКИ / BULGARIAN

ПРЕДУПРЕЖДЕНИЕ! Преди да работите с което и да е оборудване Hypertherm, прочетете инструкциите за безопасност в ръководството на вашия продукт и „Инструкция за безопасност и съответствие“ (80669C). Неспазването на инструкциите за безопасност би могло да доведе до телесно нараняване или до повреда на оборудването.

Копия на ръководствата може да придружават продукта в електронен и в печатен формат. Можете да получите копия на ръководствата, предлагани на всички езици, от „Documents library“ (Библиотека за документи) на адрес www.hypertherm.com.

ROMÂNĂ / ROMANIAN

AVERTIZARE! Înainte de utilizarea oricărui echipament Hypertherm, citiți instrucțiunile de siguranță din cadrul manualului produsului și din cadrul *Manualului de siguranță și conformitate* (80669C). Nerespectarea instrucțiilor de siguranță pot rezulta în vătămare personală sau în avarierea echipamentului.

Produsul poate fi însoțit de copii ale manualului în format tipărit și electronic. De asemenea, dumneavoastră puteți obține copii ale manualelor, în toate limbile disponibile pentru fiecare manual, din cadrul secțiunii „Biblioteca documente” afiată pe site-ul www.hypertherm.com.

TÜRKÇE / TURKISH

UYARI! Bir Hypertherm ekipmanını çalıştırmadan önce, ürün kullanım kılavuzunda ve *Güvenlik ve Uyumluluk Kılavuzu'nda* (80669C) yer alan güvenlik talimatlarını okuyun. Güvenlik talimatlarına uyulmaması durumunda kişisel yaralanmalar veya ekipman hasarı meydana gelebilir.

Kılavuzların kopyaları, elektronik ve basılı formatta ürünle birlikte verilebilir. Her biri tüm dillerde yayınlanan kılavuzların kopyalarını www.hypertherm.com adresindeki “Documents library” (Dosyalar kitaplığı) başlığından da elde edebilirsiniz.

MAGYAR / HUNGARIAN

VIGYÁZAT! Mielőtt bármilyen Hypertherm berendezést üzemeltetne, olvassa el a biztonsági információkat a termék kézikönyvében és a *Biztonsági és szabálykövetési kézikönyvben* (80669C). A biztonsági utasítások betartásának elmulasztása személyi sérüléshez vagy a berendezés károsodásához vezethet.

A termékhez a kézikönyv példányai elektronikus és nyomtatott formában is mellékelve lehetnek. A kézikönyvek példányai (minden nyelven) a www.hypertherm.com weboldalon a „Documents library” (Dokumentum könyvtár) részben is beszerezhető.

ΕΛΛΗΝΙΚΑ / GREEK

ΠΡΟΕΙΔΟΠΟΙΗΣΗ! Πριν θέσετε σε λειτουργία οποιοδήποτε εξοπλισμό της Hypertherm, διαβάστε τις οδηγίες ασφαλείας στο εγχειρίδιο του προϊόντος και στο *Εγχειρίδιο ασφαλείας και συμμόρφωσης* (80669C). Η μη τήρηση των οδηγιών ασφαλείας μπορεί να επιφέρει σωματική βλάβη ή ζημία στον εξοπλισμό.

Αντίγραφα των εγχειριδίων μπορεί να συνοδεύουν το προϊόν σε ηλεκτρονική και έντυπη μορφή. Μπορείτε, επίσης, να λάβετε αντίγραφα των εγχειριδίων σε όλες τις γλώσσες που διατίθενται για κάθε εγχειρίδιο από την ψηφιακή βιβλιοθήκη εγγράφων (Documents library) στη διαδικτυακή τοποθεσία www.hypertherm.com.

繁體中文 / CHINESE (TRADITIONAL)

警告！在操作任何 Hypertherm 設備前，請閱讀您產品手冊和《安全 and 法務遵從手冊》(80669C) 內的安全指示。不遵守安全指示可能會導致人身傷害或設備損壞。

手冊複本可能以電子和印刷格式隨附產品提供。您也可以從 www.hypertherm.com 的「文檔資料庫」內獲取所有手冊的多語種複本。

SLOVENŠČINA / SLOVENIAN

OPOZORILO! Pred uporabo katerekoli Hyperthermove opreme preberite varnostna navodila v priročniku vašega izdelka ter v *Priročniku za varnost in skladnost* (80669C). Neupoštevanje navodil za uporabo lahko povzroči telesne poškodbe ali materialno škodo.

Izdelku so lahko priloženi izvodi priročnikov v elektronski ali tiskani obliki. Izvode priročnikov v vseh razpoložljivih jezikih si lahko prenesete tudi iz knjižnice dokumentov “Documents library” na naslovu www.hypertherm.com.

SRPSKI / SERBIAN

UPOZORENJE! Pre rukovanja bilo kojom Hyperthermovom opremom pročitajte uputstva o bezbednosti u svom priručniku za proizvod i u *Priručniku o bezbednosti i usaglašenosti* (80669C). Oglašavanje o praćenje uputstava o bezbednosti može da ima za posledicu ličnu povredu ili oštećenje opreme.

Može se dogoditi da kopije priručnika prate proizvod u elektronskom i štampanom formatu. Takođe možete da pronađete kopije priručnika, na svim jezicima koji su dostupni za svaki od priručnika, u “Biblioteci dokumenata” (“Documents library”) na www.hypertherm.com.

SLOVENČINA / SLOVAK

VÝSTRAHA! Pred použitím akéhokoľvek zariadenia od spoločnosti Hypertherm si prečítajte bezpečnostné pokyny v návode na obsluhu vášho zariadenia a v *Manuáli o bezpečnosti a súlade s normami* (80669C). V prípade nedodržania bezpečnostných pokynov môže dôjsť k ujme na zdraví alebo poškodeniu zariadenia.

Kópia návodu, ktorá je dodávaná s produktom, môže mať elektronickú alebo tlačенú podobu. Kópie návodov, vo všetkých dostupných jazykoch, sú k dispozícii aj v sekcii z „knihnice Dokumenty“ na www.hypertherm.com.

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Introduction

Hypertherm's CE-marked equipment is built in compliance with standard EN60974-10. The equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN60974-10 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 cutting equipment is designed for use only in an industrial 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 the workpiece*. In other cases, it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases, electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Assessment of area

Before installing the equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

- a. Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the cutting equipment.
- b. Radio and television transmitters and receivers.
- c. Computer and other control equipment.
- d. Safety critical equipment, for example guarding of industrial equipment.
- e. Health of the people around, for example the use of pacemakers and hearing aids.
- f. Equipment used for calibration or measurement.
- g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.
- h. Time of day that cutting or other activities are to be carried out.

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

Methods of reducing emissions

Mains supply

Cutting equipment must 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 must 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 as set forth in and in accordance with the manufacturer's written instructions. For example, 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 (nozzle for laser heads) at the same time.

The operator should be insulated from all such bonded metallic components.

Electromagnetic Compatibility (EMC)

Earthing of the 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 steel work, 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 provided in IEC 60974-9, Arc Welding Equipment, Part 9: 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.

Attention

Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage or injury caused by the use of other than genuine Hypertherm parts may not be covered by the Hypertherm warranty, and will constitute misuse of the Hypertherm Product.

You are solely responsible for the safe use of the Product. Hypertherm does not and cannot make any guarantee or warranty regarding the safe use of the product in your environment.

General

Hypertherm Inc. warrants that its Products shall be free from defects in materials and workmanship for the specific periods of time set forth herein and as follows: if Hypertherm is notified of a defect (i) with respect to the plasma power supply within a period of two (2) years from the date of its delivery to you, with the exception of Powermax brand power supplies, which shall be within a period of three (3) years from the date of delivery to you, and (ii) with respect to the torch and leads within a period of one (1) year from its date of delivery to you, with the exception of the HPRXD short torch with integrated lead, which shall be within a period of six (6) months from the date of delivery to you, and with respect to torch lifter assemblies within a period of one (1) year from its date of delivery to you, and with respect to Automation products one (1) year from its date of delivery to you, with the exception of the EDGE Connect CNC, EDGE Connect T CNC, EDGE Connect TC CNC, EDGE Pro CNC, EDGE Pro Ti CNC, MicroEDGE Pro CNC, and ArcGlide THC, which shall be within a period of two (2) years from the date of delivery to you, and (iii) with respect to HyIntensity fiber laser components within a period of two (2) years from the date of its delivery to you, with the exception of laser heads and beam delivery cables, which shall be within a period of one (1) year from its date of delivery to you.

This warranty shall not apply to any Powermax brand power supplies that have been used with phase converters. In addition, Hypertherm does not warranty systems that have been damaged as a result of poor power quality, whether from phase converters or incoming line power. This warranty shall not apply to any product which has been incorrectly installed, modified, or otherwise damaged.

Hypertherm provides repair, replacement or adjustment of the Product as the sole and exclusive remedy, if and only if the warranty set forth herein properly is invoked and applies. Hypertherm, at its sole option, shall repair, replace, or adjust, free of charge, any defective 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, or to an authorized Hypertherm repair facility, all costs, insurance and freight pre paid by the customer. Hypertherm shall not be liable for any repairs, replacement, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph and with Hypertherm's prior written consent.

The warranty set forth above is exclusive and is in lieu of all other warranties, express, implied, statutory, or otherwise with respect to the Products or as to the results which may be obtained therefrom, and all implied warranties or conditions of quality or of merchantability or fitness for a particular purpose or against infringement. The foregoing shall constitute the sole and exclusive remedy for any breach by Hypertherm of its warranty.

Distributors/OEMs may offer different or additional warranties, but Distributors/OEMs are not authorized to give any additional warranty protection to you or make any representation to you purporting to be binding upon Hypertherm.

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 will have the right to defend or settle, at its own expense, any suit or proceeding brought against you alleging that the use of the Hypertherm product, alone and not in combination with any other product not supplied by Hypertherm, infringes any patent of any third party. You shall notify Hypertherm promptly upon learning of any action or threatened action in connection with any such alleged infringement (and in any event no longer than fourteen (14) days after learning of any action or threat of action), and Hypertherm's obligation to defend shall be conditioned upon Hypertherm's sole control of, and the indemnified party's cooperation and assistance in, the defense of the claim.

Limitation of liability

In no event shall Hypertherm be liable to any person or entity for any incidental, consequential direct, indirect, punitive or exemplary damages (including but not limited to lost profits) regardless of whether such liability is based on breach of contract, tort, strict liability, breach of warranty, failure of essential purpose, or otherwise, and even if advised of the possibility of such damages. Hypertherm shall not be liable for any losses to Distributor based on down time, lost production or lost profits. It is the intention of the Distributor and Hypertherm that this provision be construed by a court as being the broadest limitation of liability consistent with applicable law.

National and local codes

National and local codes governing plumbing and electrical installation shall take precedence over any instructions contained in this manual. In no event shall Hypertherm be liable for injury to persons or property damage by reason of any code violation or poor work practices.

Warranty

Liability cap

In no event shall Hypertherm's liability, if any, whether such liability is based on breach of contract, tort, strict liability, breach of warranties, failure of essential purpose or otherwise, for any claim, action, suit or proceeding (whether in court, arbitration, regulatory proceeding or otherwise) arising out of or relating to the use of the Products exceed in the aggregate the amount paid for the Products that gave rise to such claim.

Insurance

At all times you will have and maintain insurance in such quantities and types, and with coverage sufficient and appropriate to defend and to hold Hypertherm harmless in the event of any cause of action arising from the use of the products.

Transfer of rights

You may transfer any remaining rights you may have hereunder only in connection with the sale of all or substantially all of your assets or capital stock to a successor in interest who agrees to be bound by all of the terms and conditions of this Warranty. Within thirty (30) days before any such transfer occurs, you agree to notify in writing Hypertherm, which reserves the right of approval. Should you fail timely to notify Hypertherm and seek its approval as set forth herein, the Warranty set forth herein shall be null and void and you will have no further recourse against Hypertherm under the Warranty or otherwise.

Waterjet product warranty coverage

Product	Parts coverage
HyPrecision pumps	27 months from the ship date, or 24 months from the date of proven installation, or 4,000 hours, whichever occurs first
PowerDredge abrasive removal system	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
EcoSift abrasive recycling system	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
Abrasive metering devices	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
On/off valve air actuators	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
Diamond orifices	600 hours of use with the use of a thimble filter and compliance with Hypertherm's water quality requirements

Consumable parts are not covered by this warranty. Consumable parts include, but are not limited to, high-pressure water seals, check valves, cylinders, bleed-down valves, low-pressure seals, high-pressure tubing, low- and high-pressure water filters and abrasive collection bags. All third-party pumps, pump accessories, hoppers, hopper accessories, dryer boxes, dryer box accessories and plumbing accessories are covered by the respective manufacturers' warranties and not covered by this warranty.

Safety information

Before operating any Hypertherm equipment, read the separate *Safety and Compliance Manual* (80669C) included with your product for important safety information.

Powermax125 System description

The Powermax125 is a highly portable, 125 A, handheld and mechanized plasma cutting system appropriate for a wide range of applications. The Powermax system uses air or nitrogen to cut electrically conductive metals, such as mild steel, stainless steel, or aluminum. Smart Sense™ technology automatically adjusts the gas pressure according to cutting mode and torch lead length for optimum cutting.

The Powermax125 is recommended for metal thicknesses up to 44 mm (1-3/4 inches), can sever up to 57 mm (2-1/4 inches), and can pierce thicknesses up to 25 mm (1 inch). FastConnect™ provides a simple push-button torch connection to the power supply for quick torch changes.

The typical handheld Powermax125 system includes a Duramax™ Hyamp 85° hand torch *with* a starter consumable kit, a box of spare electrodes and nozzles, and a work lead cable. Reference materials include: operator manual, quick setup card, registration card, setup DVD, and safety manual.

The typical mechanized Powermax125 system includes a Duramax Hyamp 180° full-length machine torch with a starter consumable kit, a box of spare electrodes and nozzles, work lead cable, and remote-start pendant. Reference materials include: operator manual, quick setup card, registration card, setup DVD, and safety manual.

See your Hypertherm distributor for other system configurations. You can order additional styles of torches, consumables, and accessories, such as the plasma cutting guide. See *Parts* on page 297 for a list of spare and optional parts.

Powermax125 CSA and CE power supplies ship without a plug on the power cord. See *Power Supply Setup* on page 29.



CCC certified configurations do not ship with a power cord.

1 – Specifications

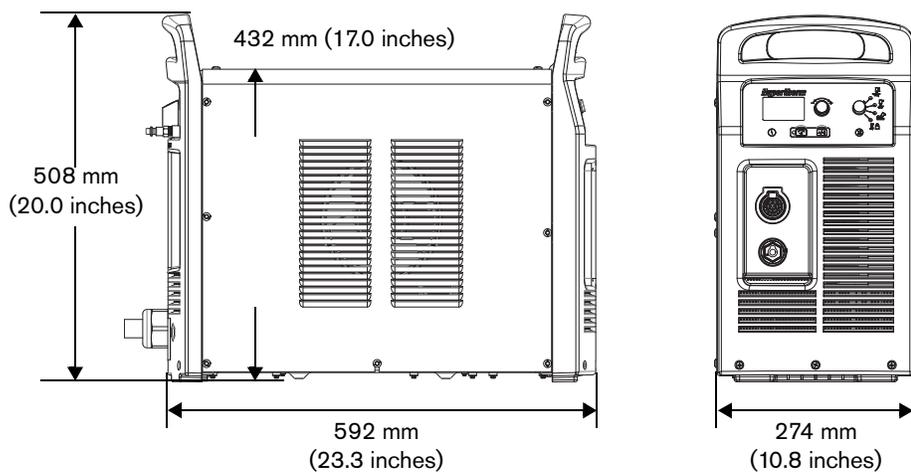
Powermax125 3-phase systems include the following models:

- 480 V CSA (480 V only)
- 600 V CSA (600 V only)
- 400 V CE (400 V only)
- 380 V CCC (380 V only)



To maintain CE certification, install power cord kit 228886.

Power supply dimensions



Component weights (125 A systems)

Table 1 – Power supply weights

Voltage	480 V CSA	600 V CSA	400 V CE	380 V CCC (no power cord)
Power supply	41 kg (90 pounds)	40 kg (89 pounds)	42 kg (92 pounds)	38 kg (84 pounds)
With 7.6 m (25 foot) hand torch and 7.6 m (25 foot) work lead	48 kg (106 pounds)	48 kg (105 pounds)	49 kg (108 pounds)	45 kg (100 pounds)

Table 2 – Torch weights

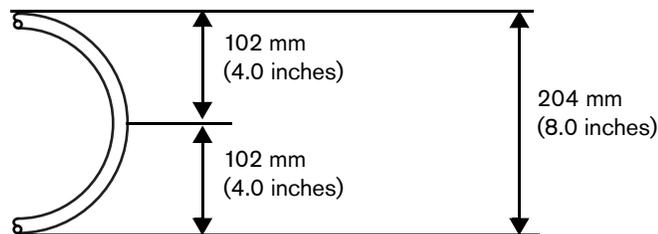
Hand torch 7.6 m (25 feet)	3.5 kg (7.7 pounds)
Hand torch 15 m (50 feet)	6.2 kg (13.7 pounds)
Hand torch 23 m (75 feet)	8.8 kg (19.5 pounds)
Machine torch 7.6 m (25 feet)	3.7 kg (8.2 pounds)
Machine torch 11 m (35 feet)	4.8 kg (10.6 pounds)
Machine torch 15 m (50 feet)	6.4 kg (14.2 pounds)
Machine torch 23 m (75 feet)	9.2 kg (20.3 pounds)

Table 3 – Work lead weights

Work lead 7.6 m (25 feet)	3.6 kg (8 pounds)
Work lead 15 m (50 feet)	6.6 kg (14.6 pounds)
Work lead 23 m (75 feet)	9.6 kg (21.2 pounds)



The recommended minimum bend radius for the Powermax125 torch lead is 102 mm (4.0 inches).



$$\text{Diameter} = 2 \times \text{Radius} = 204 \text{ mm (8.0 inches)}$$

Hypertherm power supply ratings

Rated open-circuit voltage (U_0)	480/600 V CSA 400 V CE 380 V CCC	320 VDC 305 VDC 290 VDC
Output characteristic*	Drooping	
Rated output current (I_2)	30 – 125 A	
Rated output voltage (U_2)	175 VDC	
Duty cycle at 40° C (104° F)	480/600 V CSA 400 V CE 380 V CCC	100% at 125 A, 480/600 V, 3-PH 100% at 125 A, 400 V, 3-PH 100% at 125 A, 380 V, 3-PH
Operating temperature	-10° to 40° C (14° to 104° F)	
Storage temperature	-25° to 55° C (-13° to 131° F)	
Power factor	0.94	
$R_{s_{ce}}$ – Short Circuit Ratio (CE models only)	U_1 – Volts AC rms, 3-PH	$R_{s_{ce}}$
	400 V CE	250
EMC emissions classification CISPR 11 (CE models only)**	Class A	
Input voltage (U_1)/ Input current (I_1) at rated output ($U_{2\text{MAX}}$ $I_{2\text{MAX}}$) (See <i>Power Supply Setup</i> on page 29.)	480/600 V CSA	480/600 V, 3-PH, 50/60 Hz, 31/24 A
	400 V CE†‡	400 V, 3-PH, 50/60 Hz, 36 A
	380 V CC	380 V, 3-PH, 50/60 Hz, 38 A
Gas type	Air	Nitrogen
Gas quality	Clean, dry, oil-free per ISO 8573-1 Class 1.2.2	99.95% pure
Recommended gas inlet flow rate/pressure	Cutting: 260 slpm (550 scfh, 9.2 scfm) at: <ul style="list-style-type: none"> ▪ 5.9 bar (85 psi) for 7.6 m (25 foot) and 15 m (50 foot) torches ▪ 6.6 bar (95 psi) for 23 m (75 foot) torches Gouging: 212 slpm (450 scfh, 7.5 scfm) at 4.1 bar (60 psi)	

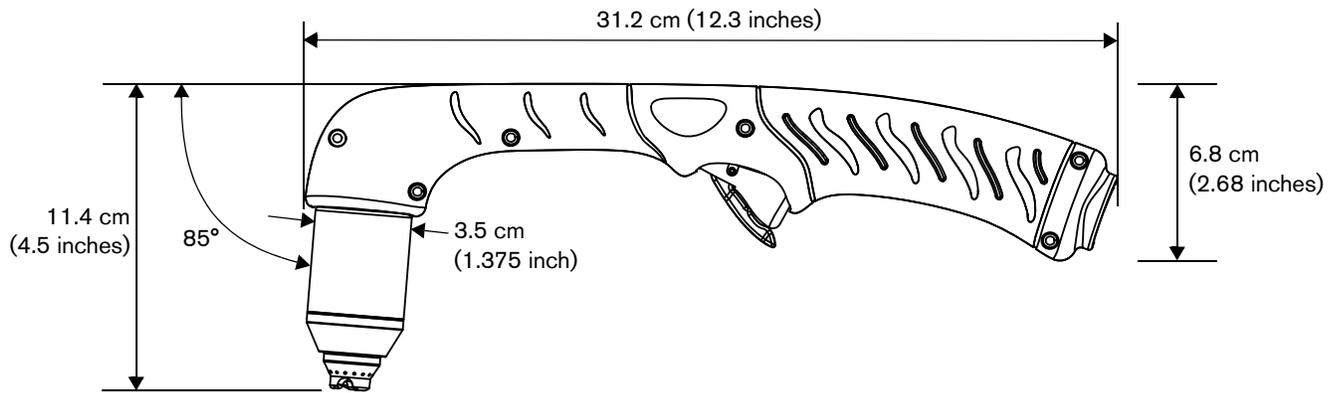
* Defined as a plot of output voltage versus output current.

** This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations due to conducted or radiated disturbances.

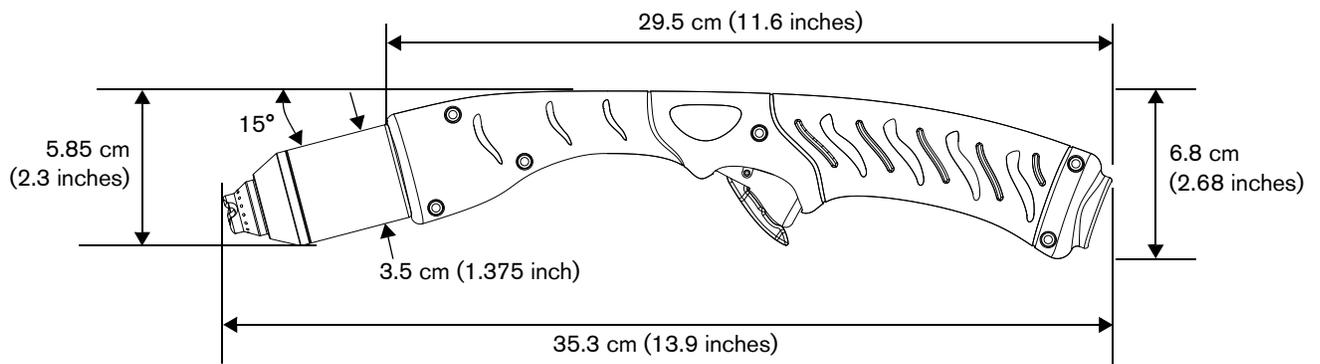
† This product meets the technical requirements of IEC 61000-3-3 and is not subject to conditional connection.

‡ Equipment complies with IEC 61000-3-12 provided that the short-circuit power S_{sc} is greater than or equal to 5363 KVA at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power S_{sc} greater than or equal to 5363 KVA.

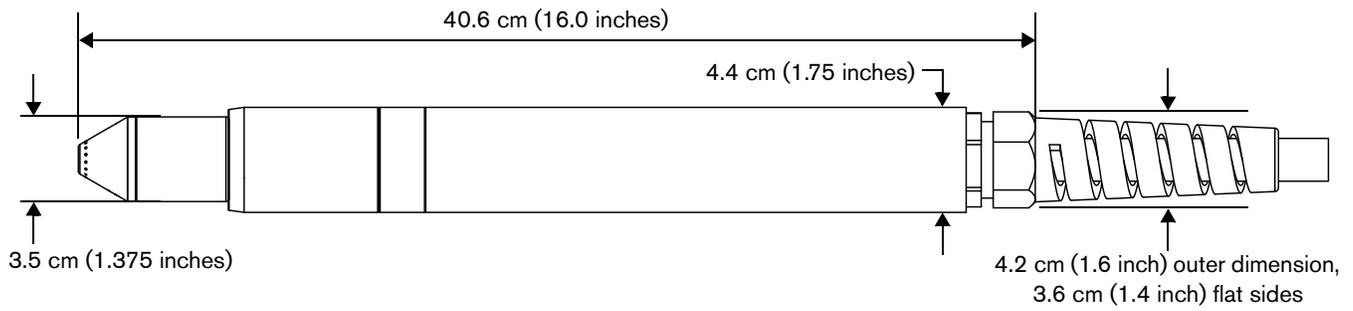
Duramax Hyamp 85° hand torch dimensions



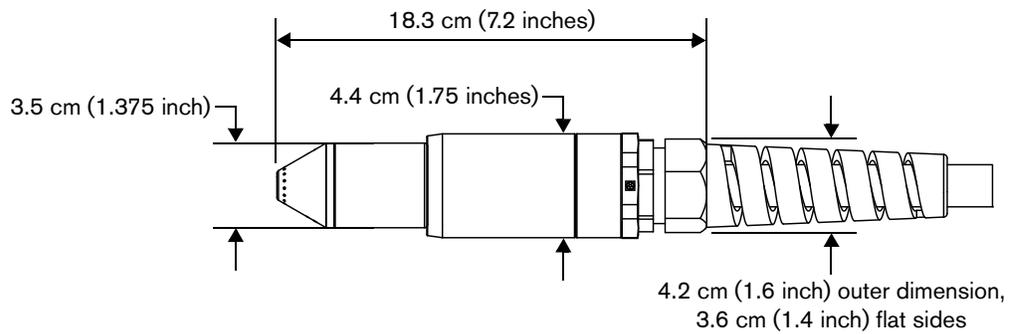
Duramax Hyamp 15° hand torch dimensions



Duramax Hyamp 180° full-length machine torch dimensions



Duramax Hyamp 180° mini machine torch dimensions



Powermax125 cutting specifications

Handheld cut capacity (material thickness)	
Recommended cut capacity at 457 mm/min (18 ipm)*	38 mm (1-1/2 inches)
Recommended cut capacity at 250 mm/min (10 ipm)*	44 mm (1-3/4 inches)
Severance capacity at 125 mm/min (5 ipm)*	57 mm (2-1/4 inches)
Pierce capacity (material thickness)	
Pierce capacity for handheld cutting, or mechanized cutting with programmable torch height control	25 mm (1 inch)
Pierce capacity for mechanized cutting without programmable torch height control	22 mm (7/8 inch)
Maximum cut speed** (mild steel)	
6 mm (1/4 inch)	7160 mm/min (282 ipm)
10 mm (3/8 inch)	4390 mm/min (173 ipm)
12 mm (1/2 inch)	2950 mm/min (116 ipm)
16 mm (5/8 inch)	2110 mm/min (83 ipm)
20 mm (3/4 inch)	1470 mm/min (58 ipm)
22 mm (7/8 inch)	1170 mm/min (46 ipm)
25 mm (1 inch)	940 mm/min (37 ipm)
32 mm (1-1/4 inches)	610 mm/min (24 ipm)
38 mm (1-1/2 inches)	457 mm/min (18 ipm)
Gouging capacity	
Metal removal rate on mild steel (125 A)	12.5 kg/hour (27 pounds/hour)
Duramax Hyamp series torch weights (refer to <i>Component weights (125 A systems)</i> on page 21)	
Duty cycle and voltage information (refer to <i>Hypertherm power supply ratings</i> on page 22)	

* Cut capacity speeds are not necessarily maximum speeds. They are the speeds that must be achieved to be rated at that thickness.

** Maximum cut speeds are the results of Hypertherm's laboratory testing. Actual cutting speeds may vary based on different cutting applications.

Symbols and marks

Your product may have one or more of the following markings on or near the data plate. Due to differences and conflicts in national regulations, not all marks are applied to every version of a product.



S mark

The S mark indicates that the power supply and torch are suitable for operations carried out in environments with increased hazard of electrical shock according to IEC 60974-1.



CSA mark

Products with a CSA mark meet the United States and Canadian regulations for product safety. The products were evaluated, tested, and certified by CSA-International. Alternatively, the product may have a mark by one of the other Nationally Recognized Testing Laboratories (NRTL) accredited in both the United States and Canada, such as UL or TÜV.



CE mark

The CE marking signifies the manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of products with a CE marking located on or near the data plate have been tested for compliance with the European Low Voltage Directive and the European Electromagnetic Compatibility (EMC) Directive. EMC filters needed to comply with the European EMC Directive are incorporated within versions of the product with a CE marking.



Eurasian Customs Union (CU) mark

CE versions of products that include an EAC mark of conformity meet the product safety and EMC requirements for export to Russia, Belarus, and Kazakhstan.



GOST-TR mark

CE versions of products that include a GOST-TR mark of conformity meet the product safety and EMC requirements for export to the Russian Federation.



N30932

C-Tick mark

CE versions of products with a C-Tick mark comply with the EMC regulations required for sale in Australia and New Zealand.



CCC mark

The China Compulsory Certification (CCC) mark indicates that the product has been tested and found compliant with product safety regulations required for sale in China.



UkrSEPRO mark

The CE versions of products that include a UkrSEPRO mark of conformity meet the product safety and EMC requirements for export to the Ukraine.



Serbian AAA mark

CE versions of products that include a AAA Serbian mark meet the product safety and EMC requirements for export to Serbia.

Noise levels

This plasma system may exceed acceptable noise levels as defined by national and local codes. Always wear proper ear protection when cutting or gouging. Any noise measurements taken depend on the specific environment in which the system is used. Refer to *Noise can damage hearing* in the *Safety and Compliance Manual (80669C)* included with your system.

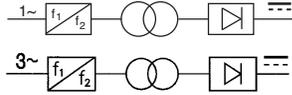
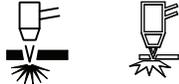
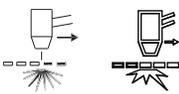
In addition, you can find an *Acoustical Noise Data Sheet* for your system in the Hypertherm downloads library at <https://www.hypertherm.com>:

1. Click “Downloads library.”
2. Select a product from the “Product type” menu.
3. Select “Regulatory” from the “Category” menu.
4. Select “Acoustical Noise Data Sheets” from the “Sub Category” menu.

1 – Specifications

IEC symbols

The following symbols may appear on the power supply data plate, control labels, switches, LEDs, and LCD screen.

	Direct current (DC)		Power is ON
	Alternating current (AC)		Power is OFF
	Plasma torch cutting		An inverter-based power source, either 1-phase or 3-phase
	Plate metal cutting		Volt/amperage curve, "drooping" characteristic
	Expanded metal cutting		Power is ON (LED)
	Gouging		System fault (LED)
	Torch lock		Inlet gas pressure fault (LCD)
	AC input power connection		Missing or loose consumables (LCD)
	The terminal for the external protective (earth) conductor		Power supply is out of temperature range (LCD)

Unpack the Powermax system

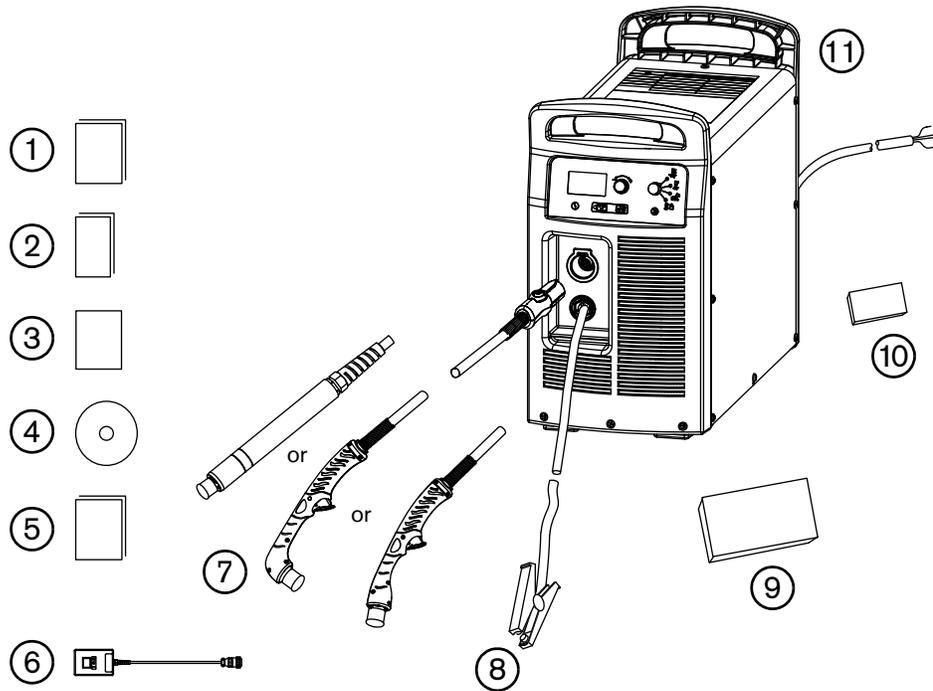
1. Verify that all items on your order have been received in good condition. Contact your distributor if any parts are damaged or missing.
2. Inspect the power supply for damage that may have occurred during shipping. If there is evidence of damage, refer to *Claims*. All communications regarding this equipment must include the model number and the serial number located on the back of the power supply.
3. Before you set up and operate this Hypertherm system, read the separate *Safety and Compliance Manual* (80669C) included with your system for important safety information.

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 the nearest Hypertherm office listed in the front of this manual.
- **Claims for defective or missing merchandise** – If any component is missing or defective, contact your Hypertherm distributor. If you need additional assistance, call the nearest Hypertherm office listed in the front of this manual.

Contents

The following illustration shows typical system components. A vinyl cap is installed on torches that ship with new systems. Consumables are included in the starter consumable kit, and the small consumables box next to the air filter contains spare electrodes and nozzles.



- | | |
|-----------------------------------|--|
| 1 Operator Manual | 7 Torches |
| 2 Quick Setup Card | 8 Ground clamp and work lead |
| 3 Registration card | 9 Starter consumable kit |
| 4 Setup DVD | 10 Box with extra consumables (located next to air filter) |
| 5 Safety and Compliance Manual | 11 Power supply |
| 6 Remote-start pendant (optional) | |

Position the power supply

Locate the power supply near an appropriate power receptacle for your installation:

- 480 V (3-phase, CSA certified)
- 600 V (3-phase, CSA certified)
- 400 V (3-phase, CE certified)
- 380 V (3-phase, CCC certified)

CSA and CE certified power supplies include a 3 m (10 foot) power cord (depending on the model). CCC certified power supplies do not ship with a power cord. To maintain CE certification, install power cord kit 228886.

Allow at least 0.25 m (10 inches) of space around the power supply for proper ventilation.

The power supply is not suitable for use in rain or snow.

To avoid toppling, do not set the power supply on an incline greater than 10 degrees.

Prepare the electrical power

Hypertherm (designated HYP on the data plate) input current ratings are used to determine conductor sizes for power connection and installation instructions. The HYP rating is determined under maximum normal operating conditions, and the higher HYP input current value should be used for installation purposes.

	CAUTION!
Protect the circuit with appropriately sized time-delay (slow-blow) fuses and a line-disconnect switch.	

The maximum output voltage will vary based on your input voltage and the circuit's amperage. Because the current draw varies during startup, slow-blow fuses are recommended as shown in *Power connection for the Powermax125* on page 32. Slow-blow fuses can withstand currents up to ten times the rated value for short periods of time.

Install a line-disconnect switch

Use a line-disconnect switch for each power supply so that the operator can turn off the incoming power quickly in an emergency. Locate the switch so that it is easily accessible to the operator. Installation must be performed by a licensed electrician according to national and local codes. The interrupt level of the switch must equal or exceed the continuous rating of the fuses. In addition, the switch should:

- Isolate the electrical equipment and disconnect all live conductors from the incoming supply voltage when in the OFF position.
- Have one OFF and one ON position that are clearly marked with **O** (OFF) and **I** (ON).
- Have an external operating handle that can be locked in the OFF position.
- Contain a power-operated mechanism that serves as an emergency stop.
- Have appropriate slow-blow fuses installed. See *Power connection for the Powermax125* on page 32 for recommended fuse sizes.

Requirements for grounding

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

- The power supply must be grounded through the power cord according to national and local electrical codes.
- Three-phase service must be of the 4-wire type with a green or green/yellow wire for protective earth ground and must comply with national and local requirements.
- Refer to the separate *Safety and Compliance Manual* included with your system for more information on grounding.

2 – Power Supply Setup

Power connection for the Powermax125

Powermax125 3-phase systems are available in the following fixed-voltage configurations:

- 480 V CSA
- 600 V CSA
- 400 V CE
- 380 V CCC



To maintain CE certification, install power cord kit 228886.

The Hypertherm rated output is 30 – 125 A, 175 VDC.

Table 4 – 480 V CSA

Input voltage (V)	480
Input current (A) at rated output (21.9 kW)	31
Input current (A) at arc stretch	50
Fuse, slow-blow (A)	50
Voltage tolerance	+20% / -15%

Table 5 – 600 V CSA

Input voltage (V)	600
Input current (A) at rated output (21.9 kW)	24
Input current (A) at arc stretch	38
Fuse, slow-blow (A)	40
Voltage tolerance	+10% / -15%

Table 6 – 400 V CE

Input voltage (V)	400
Input current (A) at rated output (21.9 kW)	36
Input current (A) at arc stretch	55
Fuse, slow-blow (A)	60
Voltage tolerance	+20% / -15%

Table 7 – 380 V CCC

Input voltage (V)	380
Input current (A) at rated output (21.9 kW)	38
Input current (A) at arc stretch	55
Fuse, slow-blow (A)	60
Voltage tolerance	+20% / -15%

Three-phase power cord and plug installation

Powermax125 power supplies ship with the following power cords:

- CSA models: 8 AWG 4-wire power cord (no power plug included)
- CE models: 10 mm² 4-wire HAR power cord (no power plug included)

CCC certified configurations do not ship with a power cord. To maintain CE certification, install power cord kit 228886.

If you need to install a different power cord on the system, the cable you use must have a diameter within one of the following ranges to ensure a proper fit in the power cord strain relief:

- CSA and CCC models: 15.0 – 25.4 mm (0.59 – 1.00 inches)
- CE models: 20.0 – 25.9 mm (0.79 – 1.02 inches)

To operate the Powermax, use a plug that meets national and local electrical codes. The plug must be connected to the power cord by a licensed electrician.

Decrease output current for lower-rated power plugs

To operate the power supply at full output and 100% duty cycle as rated, you must size your electrical service accordingly. To operate the power supply using a lower-rated power plug or service, you must turn down the current (amperage setting).



For more information on setting the current, see *Adjusting the current (amperage)* on page 48.

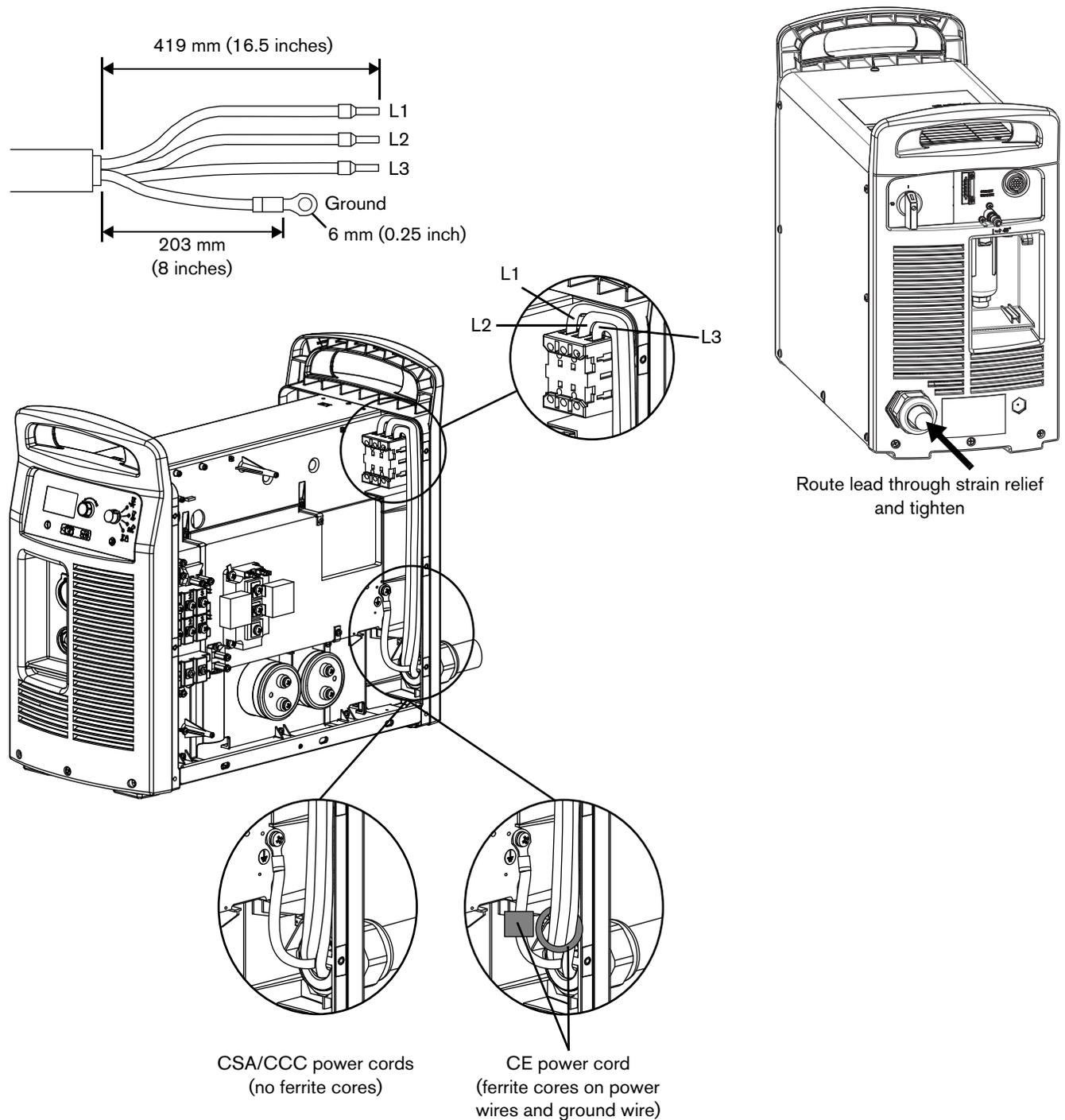
Example: Table 8 shows the recommended output current for operating a 400 V CE power supply installed with a 32 A power plug. To operate at 400 V in this scenario, run the power supply at 109 A to maintain 100% duty cycle.

Table 8 – Recommended ratings for operating 400 V CE unit on 32 A power plug

Input voltage	Phase	Recommended output current to maintain 100% duty cycle
380 V	3	104 A
400 V	3	109 A
415 V	3	114 A

2 – Power Supply Setup

Strip and prepare the power cord wires as shown in the following figure. For CE units, ferrite cores are installed around the three power wires and around the ground wire; CSA and CCC models do not have ferrite cores on the power cord wires.



CCC models do not ship with a power cord. To maintain CE certification, install power cord kit 228886.

Extension cord recommendations

Any extension cord must have an appropriate wire size for the cord length and system voltage. Use a cord that meets national and local codes.

For all Powermax125 configurations, the recommended gauge size for any three-phase extension cord between 3 – 45 m (10 – 150 feet) is 10 mm² (8 AWG).

Engine-driven generator recommendations

Generators used with the Powermax125 should satisfy the voltage requirements in the following table and in *Hypertherm power supply ratings* on page 22.

Engine drive rating	System output current	Performance (arc stretch)
40 kW	125 A	Full
30 kW	125 A	Limited
30 kW	100 A	Full
25 kW	100 A	Limited
22.5 kW	75 A	Full
20 kW	75 A	Limited
20 kW	60 A	Full
15 kW	60 A	Limited
12 kW	40 A	Full
10 kW	40 A	Limited
10 kW	30 A	Full
8 kW	30 A	Limited



Based on the generator rating, age, and condition, adjust the cutting current as needed.



If a fault occurs while using a generator, turning the power switch quickly to OFF and then to ON again (sometimes called a “quick reset”) may not clear the fault. Instead, turn OFF the power supply and wait 60 to 70 seconds before turning it ON again.

Prepare the gas supply

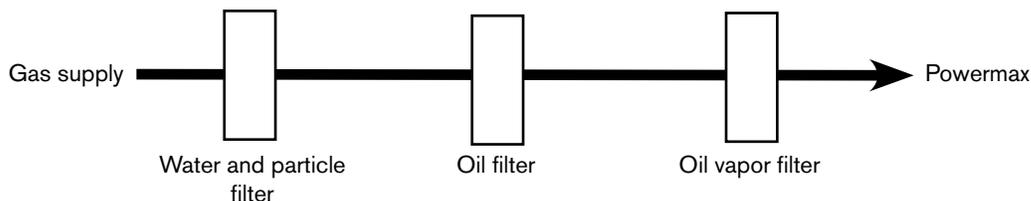
The air can be supplied by a compressor or from high-pressure cylinders. A high-pressure regulator must be used on either type of supply and must be capable of delivering gas to the air inlet on the power supply at the flow rate and pressure specified in *Hypertherm power supply ratings* on page 22.

	CAUTION!
Synthetic lubricants containing esters that are used in some air compressors will damage polycarbonates used in the air regulator bowl.	

The system contains a built-in filter element, but additional filtration may be required depending on the quality of the gas supply. If the supply quality is poor, cut speeds decrease, cut quality deteriorates, cutting thickness capability decreases, and the life of the consumables shortens. To address these issues, use an optional air filtration system, such as the Hypertherm Eliminer filter kit (228890). For optimal performance, the gas should be compliant with ISO8573-1:2010, Class 1.2.2 (that is, it should have a maximum number of solid particulate per meter cubed of 20,000 for particle sizes in the range of 0.1 – 0.5 microns, a maximum of 400 for particle sizes in the range of 0.5 – 1 microns, and a maximum of 10 for particle sizes in the range of 1 – 5 microns). The maximum water vapor dew point should be -40° C (-40° F). The maximum oil (aerosol, liquid, and vapor) content should be 0.1 mg/m³.

Additional gas filtration

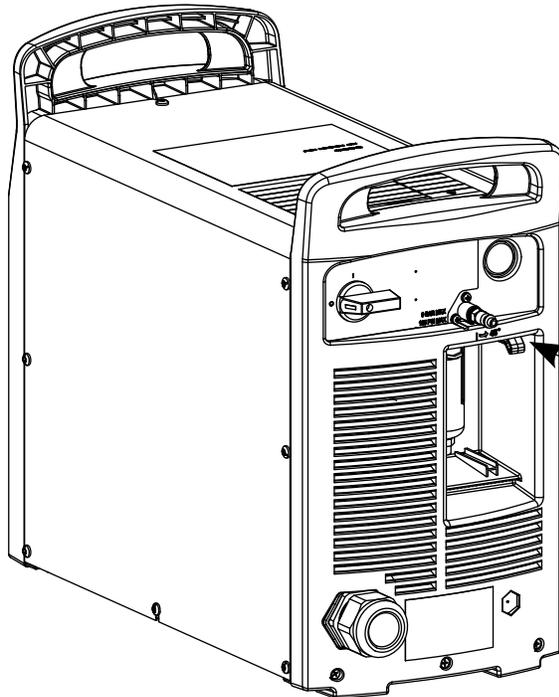
When site conditions introduce moisture, oil, or other contaminants into the gas line, use a 3-stage coalescing filtration system. A 3-stage filtering system works as follows to clean contaminants from the gas supply.



The filtering system should be installed between the gas supply and the power supply. Additional gas filtration may require higher pressure from the source.

Connect the gas supply

Connect the gas supply to the power supply using an inert-gas hose with a 9.5 mm (3/8 inch) internal diameter and a 1/4 NPT quick-disconnect coupler (CSA units) or a 1/4 NPT x G-1/4 BSPP (CE/CCC units) quick-disconnect coupler.



The recommended inlet pressure while gas is flowing is 5.9 – 9.3 bar (85 – 135 psi).



WARNING!

Do not allow the gas supply pressure to exceed 9.3 bar (135 psi). The filter bowl may explode if this pressure is exceeded.

2 – Power Supply Setup

Minimum inlet pressure (while gas is flowing)

This table shows the minimum required inlet pressure when the recommended inlet pressure is not available.

Torch lead length	7.6 m (25 feet)	15.2 m (50 feet)	22.9 m (75 feet)
Process	Minimum inlet pressure		
Cutting	5.9 bar (85 psi)	5.9 bar (85 psi)	6.6 bar (95 psi)
Gouging	4.1 bar (60 psi)	4.1 bar (60 psi)	4.1 bar (60 psi)

Gas flow rates

Process	Gas flow rate
Cutting	260 slpm (550 scfh, 9.2 scfm) at a minimum: <ul style="list-style-type: none">▪ 5.9 bar (85 psi) for 7.6 m (25 foot) and 15 m (50 foot) torches▪ 6.6 bar (95 psi) for 23 m (75 foot) torches
Gouging	212 slpm (450 scfh, 7.5 scfm) at a minimum 4.1 bar (60 psi)

Controls and indicators

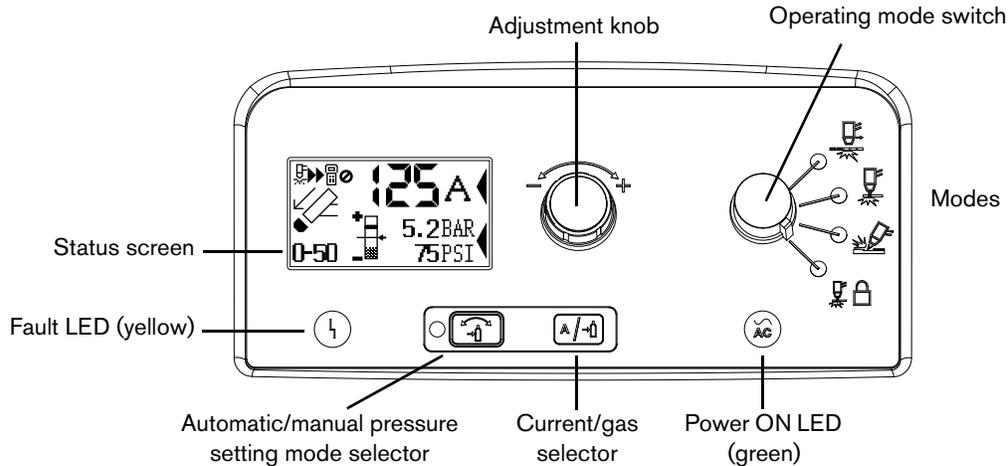
Powermax power supplies have the following controls and indicators: ON/OFF switch, adjustment knob, automatic/manual pressure setting mode selector, current/gas selector, operating mode switch, indicator LEDs, and a status screen. These controls and indicators are described on the following pages.

Rear controls



ON (I)/OFF (O) power switch – Activates the power supply and its control circuits.

Front controls and LEDs



LEDs



Power ON LED (green) – When illuminated, this LED indicates that the power switch has been set to I (ON) and that the safety interlocks are satisfied. When blinking, the power supply has a fault.



Fault LED (yellow) – When illuminated, this LED indicates that there is a fault with the power supply.

Selectors



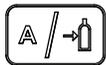
Automatic/manual pressure setting mode selector – The selector switches between automatic and manual mode. In automatic mode, the power supply automatically sets the gas pressure based on the torch type and lead length, and the adjustment knob sets only the amperage. In manual mode, the adjustment knob sets either the gas pressure or the amperage. This LED is illuminated in manual mode.



Manual mode should be used by experienced users who need to optimize the gas setting (override the automatic gas setting) for a specific cutting application.

When you switch from manual mode to automatic mode, the power supply automatically sets the gas pressure, and the amperage setting is unchanged. When you switch from automatic mode to manual mode, the power supply remembers the previous manual gas pressure setting, and the amperage setting is unchanged.

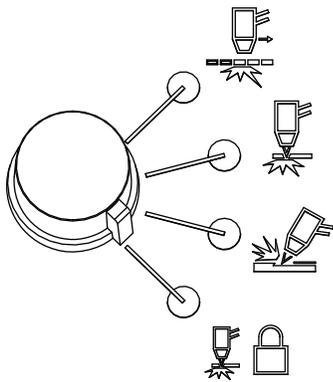
When you reset the power, the power supply remembers the previous mode, gas pressure, and amperage settings.



Current/gas selector – When in manual mode, this selector toggles between amperage and gas pressure for manual adjustments using the adjustment knob.

Operating mode switch

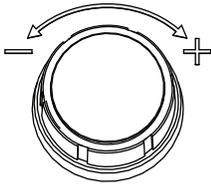
For more information on these modes, see *Set the operating mode switch* on page 47.



The operating mode switch can be set in one of four positions:

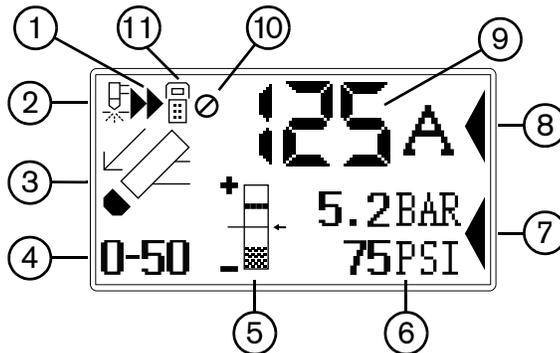
- Continuous pilot arc. Cuts expanded metal or grate.
- Non-continuous pilot arc. Cuts or pierces metal plate. This is the standard setting for normal drag-cutting.
- Gouge. Gouges metal plate.
- Torch lock. Same as the non-continuous pilot arc mode except the torch is locked in the ON position when you release the trigger during a cut. The torch goes out when the transfer is lost or the torch is retriggered.

Amperage adjustment knob



This knob adjusts the amperage. When operating in manual mode, you can also use this knob to adjust the gas pressure, overriding the automatic setting for optimized applications.

Status screen

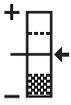


- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Torch is cutting 2 Torch start 3 Fault icon 4 Fault code 5 Visual pressure setting 6 Pressure setting | <ul style="list-style-type: none"> 7 Pressure selection cursor 8 Current selection cursor 9 Current setting (amperage) 10 Electrode end of life detection manually disabled 11 Remote connected |
|--|--|

3 – Basic System Operations

Gas pressure indicators

In manual mode, the gas pressure is displayed in measurements of bar and psi. The gas pressure bar is also a visual indicator of the gas pressure.



Gas pressure bar – When the arrow is centered in the vertical bar (the reference pressure of the automatic pressure setting), the gas pressure is set to the preset (factory-defined) value. If the pressure is higher than the preset value, the arrow appears above the mid-point of the bar. If the pressure is lower than the preset value, the arrow appears below the mid-point of the bar.



In automatic mode, the power supply adjusts the pressure to the preset value. You can use manual mode to adjust the pressure to satisfy the needs of a particular cutting job. See *Manually adjusting the gas pressure* on page 48.

System status icons

The screen displays icons to indicate the system's status.



Torch started – Indicates that the torch has received a start signal.



Torch is cutting – Indicates that the cutting arc has transferred to the metal, and the torch is cutting.



Remote control – Indicates that a remote control or CNC is controlling the power supply using serial communications. All local controls are disabled.



Electrode end-of-life detection manually disabled – Indicates that the electrode end-of-life detection feature is manually disabled.

Fault codes and icons

When a power supply or torch fault occurs, the system displays a fault code in the lower-left corner of the status screen and displays a corresponding fault icon above the code.

0-50

Fault code – The first digit is always zero. The other two digits identify the problem. Fault code information is included later in this manual.



Only one fault code is displayed. If more than one fault occurs at the same time, only the fault code with the highest priority is displayed.

Fault icon – The fault icons that appear on the left side of the status screen are described below. A fault code also appears to identify the fault. Refer to the troubleshooting information later in this manual.



Warning – The system continues to run.



Fault – The system stops cutting. If you cannot correct the problem and restart the system, contact your distributor or Hypertherm Technical Service.



Error – The system requires service. Contact your distributor or Hypertherm Technical Service.



Torch cap sensor – Indicates that the consumables are loose, improperly installed, or missing. Turn OFF the power, properly install the consumables, and turn ON the system again to reset the power supply.



Temperature – Indicates that the temperature of the power supply power module is outside the acceptable operating range.



Gas – Indicates that the gas is disconnected from the rear of the power supply or there is a problem with the gas supply.



Internal Serial Communications Interface – Indicates a problem with communications between the control board and the DSP board.

Operating the Powermax

Follow the steps below to begin cutting or gouging with the system.

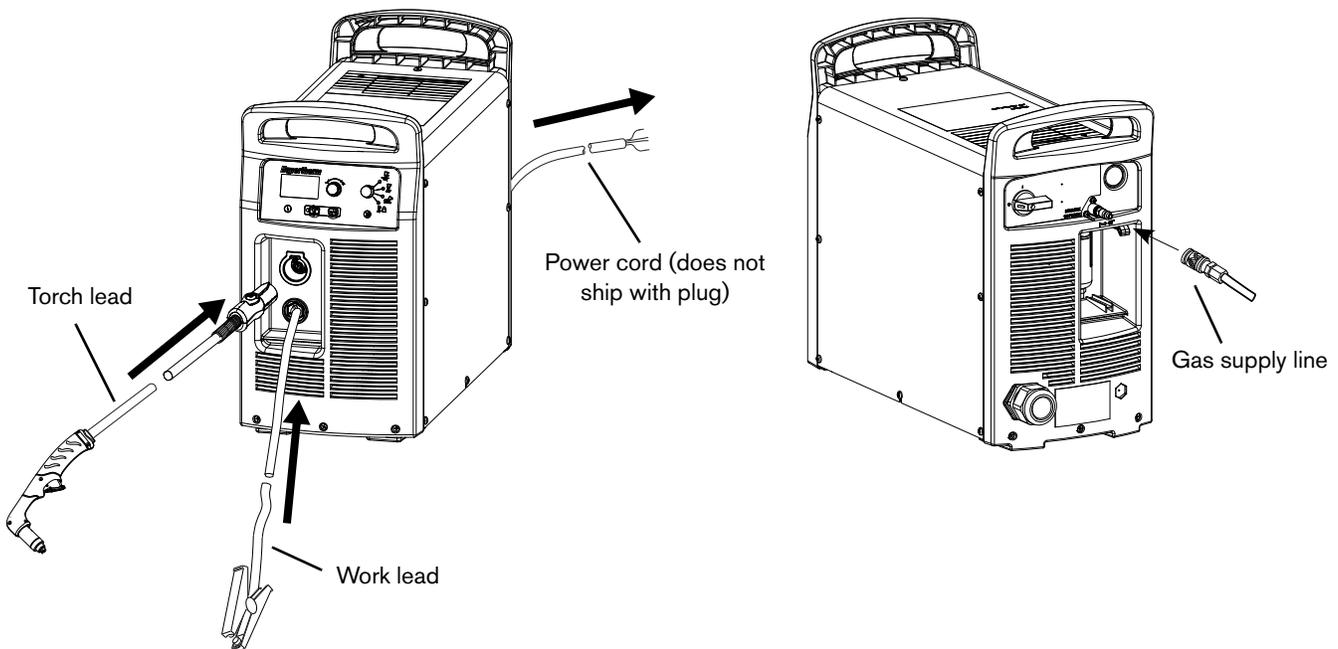


This section provides basic operating instructions. Before operating your system in a production environment, refer to *Hand Torch Setup* on page 51 or *Machine Torch Setup* on page 67.

Connect the electrical power, gas supply, and torch lead

For information on connecting the proper plug to the power cord, refer to *Power Supply Setup* on page 29.

Plug in the power cord and connect the gas supply line. For more information about the electrical requirements and the gas supply requirements of the Powermax, see *Power Supply Setup* on page 29. To connect the torch, push the FastConnect connector into the receptacle on the front of the power supply. You will attach the work lead in the next step.



CCC units do not ship with a power cord. To maintain CE certification, install power cord kit 228886.

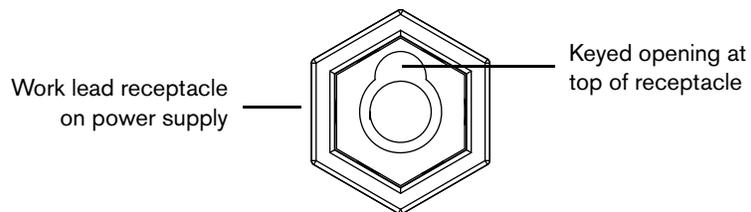
Attach the work lead to the power supply**CAUTION!**

Make sure you use a work lead that is appropriate for your power supply. Use a 125 A work lead with the Powermax125. The amperage is marked near the rubber boot of the work lead connector.

1. Insert the work lead connector into the receptacle on the front of the power supply.



The receptacle is keyed. Align the key on the work lead connector with the opening at the top of the receptacle on the power supply.



2. Push the work lead connector all the way into the receptacle on the power supply and turn clockwise, approximately 1/4 turn, until the connector is fully seated against the stop in order to achieve an optimal electrical connection.



A loose connection will overheat the connector. Frequently check the work lead for a reliable electrical connection.

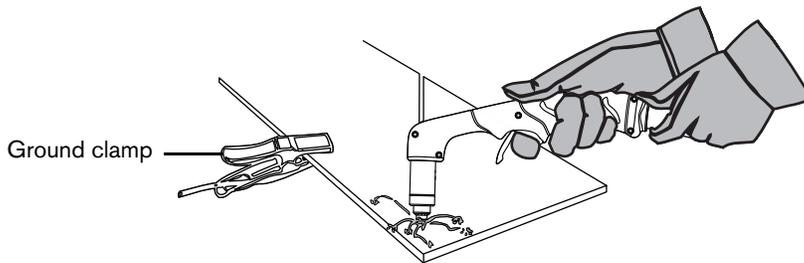
**CAUTION!**

Make sure the work lead is fully seated in the receptacle to prevent overheating.

Attach the ground clamp to the workpiece

The ground clamp must be connected to the workpiece while you are cutting. If you are using the Powermax with a cutting table, you can connect the work lead directly to the table instead of attaching the ground clamp to the workpiece. See your table manufacturer's instructions.

-  Make sure that the ground clamp and the workpiece make good metal-to-metal contact. Remove rust, dirt, paint, coatings, and other debris to ensure the work lead makes proper contact with the workpiece.
-  For the best cut quality, attach the ground clamp as close as possible to the area being cut.

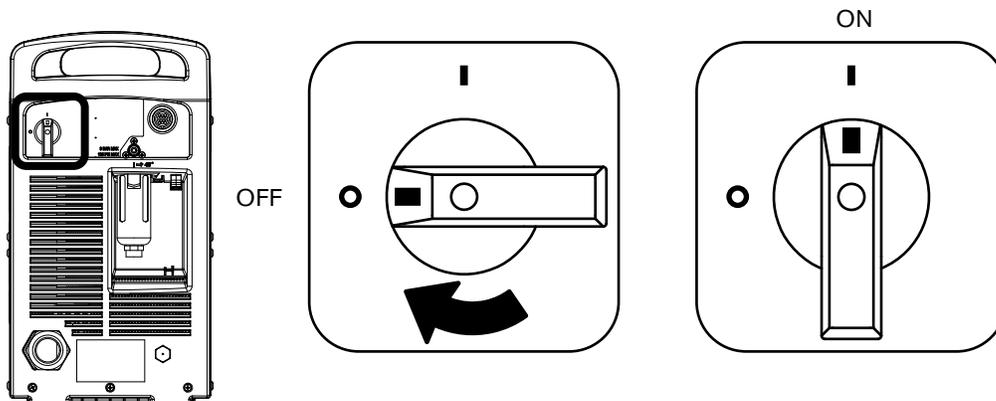


CAUTION!

Do not attach the ground clamp to the portion of the workpiece to be cut away.

Turn on the system

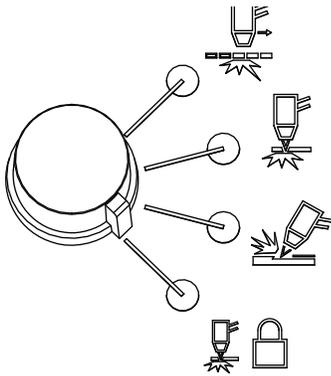
Set the ON/OFF switch to the ON (I) position.



Set the operating mode switch

Use the operating mode switch to select the type of work you want to perform.

In automatic gas mode, Smart Sense technology automatically adjusts the gas pressure according to the selected cutting mode and torch lead length for optimum cutting.



For cutting expanded metal, grates, metal containing holes, or any job that requires a continuous pilot arc. Using this mode to cut standard metal plate reduces consumable life.

For cutting or piercing metal. This is the standard setting for normal drag-cutting.

For gouging metal.



Using this mode while cutting results in poor cut quality.

For locking the torch in the ON (fire) position. With this option selected, press the trigger to fire the torch. The trigger will remain on when you release the trigger. The arc will go out when transfer is lost or you press the trigger again.

Check the indicators

Verify the following:

- The green power ON LED on the front of the power supply is illuminated.
- The Fault LED is *not* illuminated.
- No error icons appear in the status screen.

If a fault icon appears in the status screen, or the Fault LED is illuminated, or the power ON LED is blinking, correct the fault condition before continuing. More troubleshooting information is included later in this manual.

Manually adjusting the gas pressure

For normal operations, the power supply automatically adjusts the gas pressure. If you need to adjust the gas pressure for a specific application, you can use manual mode to do so.



Manual mode should be used by experienced users who need to optimize the gas setting (override the automatic gas setting) for a specific cutting application.

When you switch from manual mode to automatic mode, the power supply automatically sets the gas pressure, and the amperage setting is unchanged. When you switch from automatic mode to manual mode, the power supply remembers the previous manual gas pressure setting, and the amperage setting is unchanged.

When you reset the power, the power supply remembers the previous mode, gas pressure, and amperage settings.

To adjust the pressure:

1. Press the automatic/manual pressure setting mode selector so that the LED next to the selector illuminates. Refer to *Front controls and LEDs* on page 40.
2. Press the current/gas selector until the selection cursor is opposite the gas pressure setting in the status screen.
3. Turn the adjustment knob to adjust the gas pressure to the desired level. Watch the arrow in the pressure bar as you adjust the pressure. (See *Gas pressure indicators* on page 42.)

Adjusting the current (amperage)

Turn the adjustment knob to adjust the current for your particular cutting application.

If the system is in manual mode, do the following to adjust the amperage:

1. Press the current/gas selector until the selection cursor is opposite the amperage setting in the status screen.
2. Turn the adjustment knob to change the amperage.
3. If you wish to exit manual mode, press the automatic/manual pressure setting mode selector. The LED goes off.



When you exit manual mode, the gas pressure resets to the factory-optimized value.

When you switch between manual mode and automatic mode, the power supply retains the amperage setting. When you reset the power, the power supply returns to the previous mode (automatic mode or manual mode) and remembers the previous amperage setting.

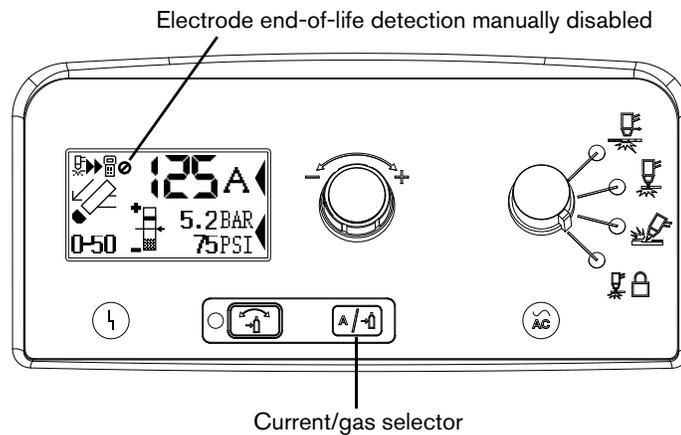
Electrode end-of-life detection feature

The electrode end-of-life detection feature on the system protects the torch and workpiece from damage by automatically stopping power to the torch when the electrode reaches its end of life. Fault code 0-32 also displays on the front panel status screen. If you have the current set below 55 A, this feature is automatically disabled without displaying the icon on the status screen.

To manually disable the feature:

1. Set the system to auto mode.
2. Press the current/gas selector button (see *Figure 1*) 5 times in quick succession, less than one second apart.
The icon (see *Figure 1*) displays on the status screen.
3. To re-enable the feature, press the current/gas selector button 5 times again in quick succession, less than one second apart.
The icon disappears.

Figure 1 – Front panel controls



Understanding duty-cycle limitations

The duty cycle is a percentage of time out of 10 minutes that a plasma arc will remain on when operating at an ambient temperature of 40° C (104° F). For example, if the system runs for 6 minutes before overheating and cools off enough to produce an arc in less than 4 minutes, it has a 60% duty cycle.

If the power supply overheats, the temperature fault icon appears in the status screen, the arc shuts off, and the cooling fan continues to run. You cannot resume cutting until the temperature fault icon disappears and the fault LED goes off.



The fan may run during normal operation of the system.

With a Powermax125:

- At 125 A (480/600 V CSA, 400 V CE, 380 V CCC), the arc can remain on for 10 minutes out of 10 minutes without causing the unit to overheat (100% duty cycle).



If you are operating the power supply using a lower-rated power plug or service, turn down the current (amperage setting). See *Decrease output current for lower-rated power plugs* on page 33.

Introduction

Duramax Hyamp series hand torches are available for Powermax125 systems. The FastConnect quick-disconnect system makes it easy to remove the torch for transport or to switch from one torch to the other if your applications require the use of different torches. The torches are cooled by ambient air and do not require special cooling procedures.

This section explains how to set up your hand torch and choose the appropriate consumables for the job.

Consumable life

How often you need to change the consumables on your torch will depend on a number of factors:

- The thickness of the metal being cut.
- The average length of the cut.
- The air quality (presence of oil, moisture, or other contaminants).
- Whether you are piercing the metal or starting cuts from the edge.
- Proper torch-to-work distance when gouging.
- Proper pierce height.
- Whether you are cutting in “continuous pilot arc” mode or normal mode. Cutting with a continuous pilot arc causes more consumable wear.

Under normal conditions, the nozzle will wear out first when hand cutting. As general rule, a set of consumables lasts approximately 1 to 3 hours of actual “arc on” time for 125 A hand cutting. Cutting at lower amperages may yield longer consumable life.

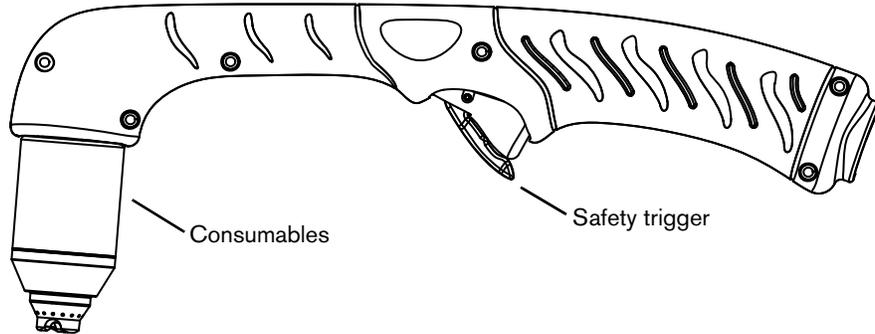
You will find more information about proper cutting techniques in *Hand Cutting* on page 57.

4 – Hand Torch Setup

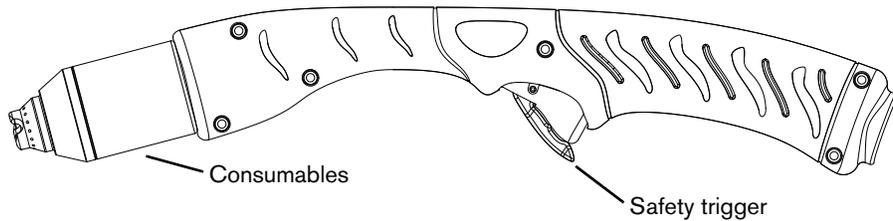
Hand torch components

The hand torches ship without consumables installed.

Duramax Hyamp 85° hand torch



Duramax Hyamp 15° hand torch



Choose the hand torch consumables

Hypertherm includes a starter consumable kit and a box of spare electrodes and nozzles with your system. Both styles of hand torches shown above use the same consumables.

Hand torches use shielded consumables. Therefore, you can drag the torch tip along the metal.

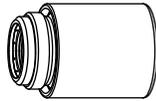
Consumables for hand cutting are shown below. Notice that the retaining cap and electrode are the same for cutting, gouging, and FineCut® applications. Only the shield, nozzle, and swirl ring are different.

For the best cut quality on thin materials (approximately 4 mm/10 GA or less), you may prefer to use FineCut consumables, or use a 45 A nozzle and reduce the amperage to that setting.

Drag-cutting 105/125 A consumables



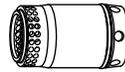
420000
Shield



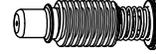
220977
Retaining cap



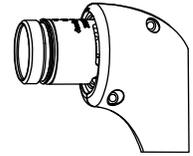
220975
Nozzle



220997
Swirl ring



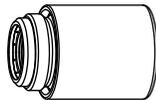
220971
Electrode



Drag-cutting 45 A and 65 A consumables



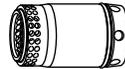
420172
Shield



220977
Retaining cap



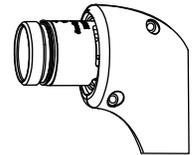
420158 (45 A)
420169 (65 A)
Nozzle



220997
Swirl ring



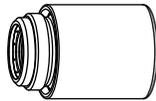
220971
Electrode



Gouging consumables



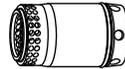
420112
Shield



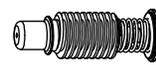
220977
Retaining cap



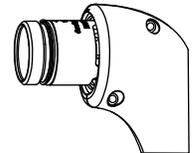
420001
Nozzle



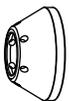
220997
Swirl ring



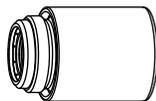
220971
Electrode



FineCut consumables



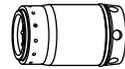
420152
Shield



220977
Retaining cap



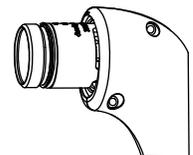
420151
Nozzle



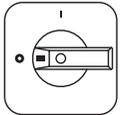
420159
Swirl ring



220971
Electrode

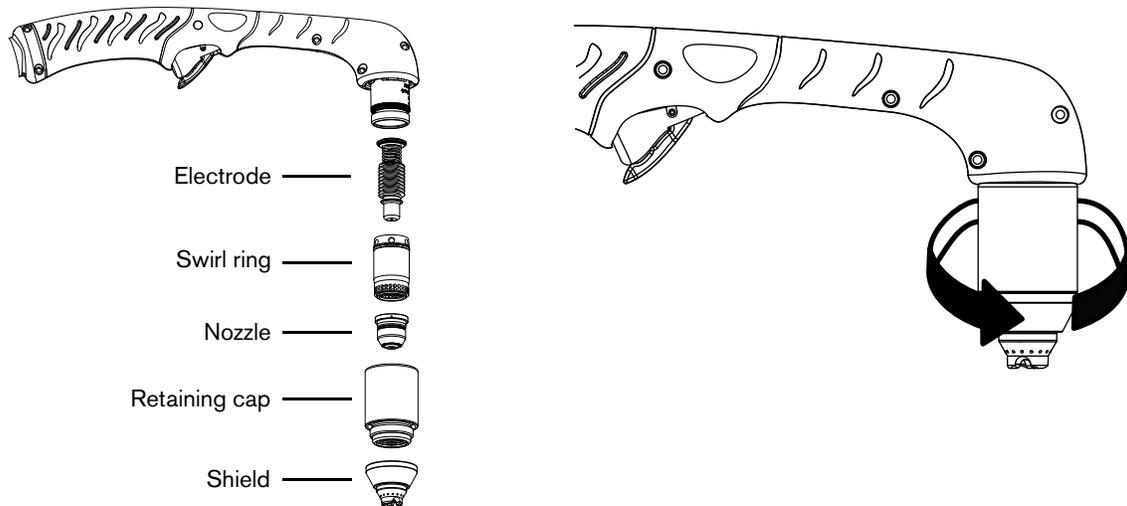


Install the hand torch consumables

		WARNING! INSTANT-ON TORCHES PLASMA ARC CAN CAUSE INJURY AND BURNS
	The plasma arc comes on immediately when the torch trigger is activated. Make sure the power is OFF before changing consumables.	

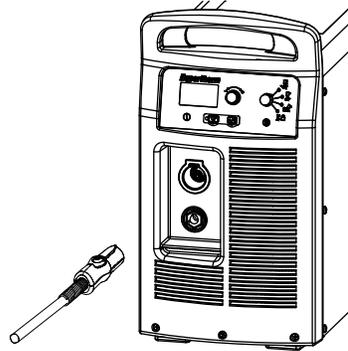
To operate the hand torch, a complete set of consumable parts must be installed: shield, retaining cap, nozzle, electrode, and swirl ring. Torches ship without consumables installed. Pull off the vinyl cap before installing your consumables.

With the power switch in the OFF (O) position, install the Powermax125 torch consumables as shown.

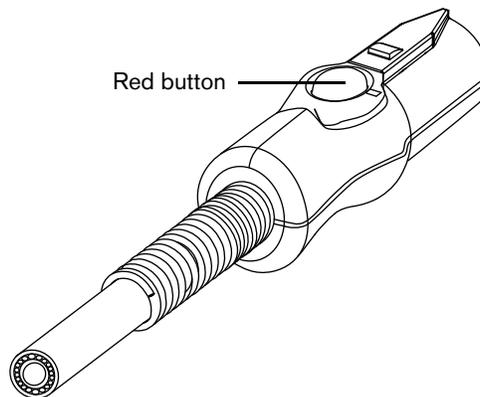


Connecting the torch lead

The system is equipped with FastConnect, a quick-disconnect system for connecting and disconnecting handheld and machine torch leads. When connecting or disconnecting a torch, first turn OFF the system. To connect the torch, push the connector into the receptacle on the front of the power supply.



To remove the torch, press the red button on the connector and pull the connector out of the receptacle.

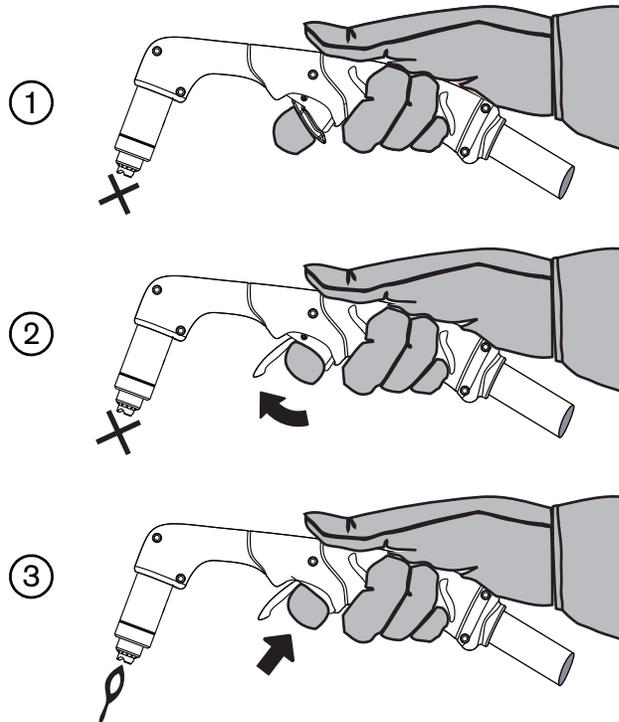


Using the hand torch

		WARNING! INSTANT-ON TORCHES PLASMA ARC CAN CAUSE INJURY AND BURNS
<p>Plasma arc comes on immediately when the torch trigger is activated. The plasma arc will cut quickly through gloves and skin.</p>		
<ul style="list-style-type: none">■ Wear correct and appropriate protective equipment.■ Keep hands, clothing, and objects away from the torch tip.■ Do not hold the workpiece and keep your hands clear of the cutting path.■ Never point the torch toward yourself or others.		

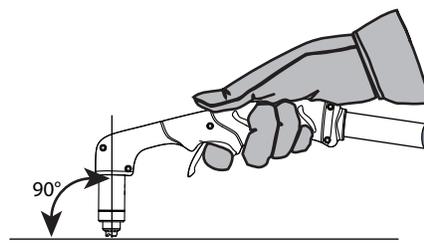
Operate the safety trigger

The hand torches are equipped with a safety trigger to prevent accidental firings. When you are ready to use the torch, flip the trigger's safety cover forward (toward the torch head) and press the red torch trigger.



Hand torch cutting guidelines

- Drag the torch tip lightly along the workpiece to maintain a steady cut.
- While cutting, make sure that sparks exit from the bottom of the workpiece. The sparks should lag slightly behind the torch as you cut (15 – 30° angle from vertical).
- If sparks spray up from the workpiece, move the torch more slowly, or set the output current higher.
- With either hand torch, hold the torch nozzle perpendicular to the workpiece so that the nozzle is at a 90° angle to the cutting surface. Observe the cutting arc as the torch cuts.

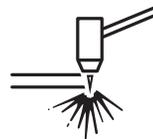


- If you fire the torch unnecessarily, you will shorten the life of the nozzle and electrode.



- Pulling, or dragging, the torch along the cut is easier than pushing it.
- For straight-line cuts, use a straight edge as a guide. To cut circles, use a template or a radius cutter attachment (a circle cutting guide).

Start a cut from the edge of the workpiece



1. With the ground clamp attached to the workpiece, hold the torch nozzle perpendicular (90°) to the edge of the workpiece.



2. Press the torch's trigger to start the arc. Pause at the edge until the arc has cut completely through the workpiece.

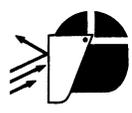
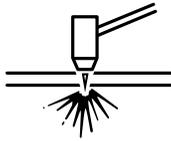


5 – Hand Cutting

3. Drag the torch tip lightly across the workpiece to proceed with the cut. Maintain a steady, even pace.



Pierce a workpiece



WARNING!

SPARKS AND HOT METAL CAN INJURE EYES AND BURN SKIN

When firing the torch at an angle, sparks and hot metal will spray out from the nozzle. Point the torch away from yourself and others. Always wear proper protective equipment including gloves and eye protection.

1. With the ground clamp attached to the workpiece, hold the torch at an approximate 30° angle to the workpiece with the torch tip within 1.5 mm (1/16 inch) of the workpiece before firing the torch.



2. Fire the torch while still at an angle to the workpiece. Slowly rotate the torch to a perpendicular (90°) position.

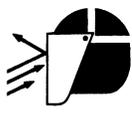
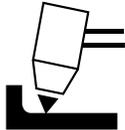


3. Hold the torch in place while continuing to press the trigger. When sparks exit below the workpiece, the arc has pierced the material.



4. When the pierce is complete, drag the nozzle lightly along the workpiece to proceed with the cut.

Gouge a workpiece

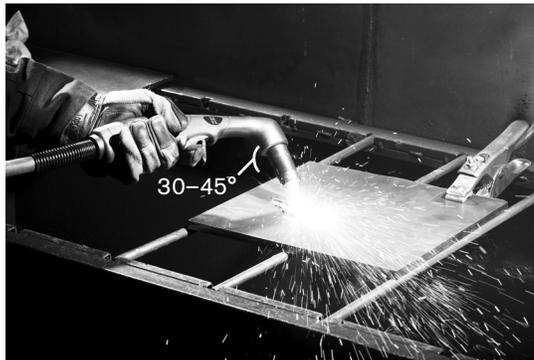


WARNING!

SPARKS AND HOT METAL CAN INJURE EYES AND BURN SKIN

When firing the torch at an angle, sparks and hot metal will spray out from the nozzle. Point the torch away from yourself and others. Always wear proper protective equipment including gloves and eye protection.

1. Hold the torch so that the torch tip is slightly above the workpiece before firing the torch.
2. Hold the torch at a 30 – 45° angle to the workpiece, with a small gap between the torch tip and the workpiece. Press the trigger to obtain a pilot arc. Transfer the arc to the workpiece.

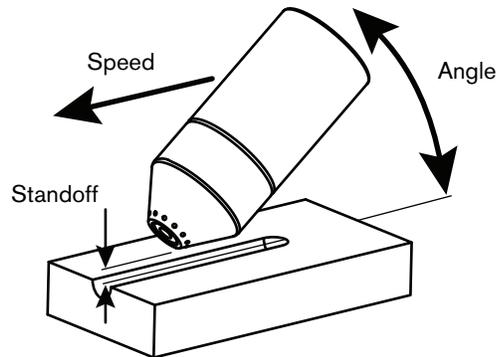


3. Change the torch's angle as needed to achieve the desired dimensions for the gouge. Refer to *Varying the gouge profile* on page 64 and *125 A gouging profile chart* on page 64.
4. Maintain the same angle to the workpiece as you feed into the gouge. Push the plasma arc in the direction of the gouge you want to create. Keep a small distance between the torch tip and the molten metal to avoid reducing consumable life or damaging the torch.



Gouge profile

- You can vary the gouge profile by varying the:
 - Speed of the torch over the workpiece
 - Torch-to-work standoff distance
 - Angle of the torch to the workpiece
 - Current output of the power supply

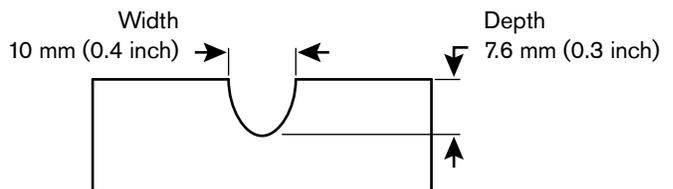


Operating parameters	
Speed	508 – 1270 mm/min (20 – 50 ipm)
Standoff	6.4 – 10.2 mm (1/4 – 2/5 inch)
Angle	30 – 35°

Typical gouging profile

125 A

Metal removal rate on mild steel 12.5 kg/hour
(27 pounds/hour)



Varying the gouge profile

Follow these recommendations to change the gouge profile as needed:

- **Increasing the speed** of the torch will **decrease width** and **decrease depth**.
- **Decreasing the speed** of the torch will **increase width** and **increase depth**.
- **Increasing the standoff** of the torch will **increase width** and **decrease depth**.
- **Decreasing the standoff** of the torch will **decrease width** and **increase depth**.
- **Increasing the angle** of the torch (more vertical) will **decrease width** and **increase depth**.
- **Decreasing the angle** of the torch (less vertical) will **increase width** and **decrease depth**.
- **Increasing the current** of the power supply will **increase width** and **increase depth**.
- **Decreasing the current** of the power supply will **decrease width** and **decrease depth**.

125 A gouging profile chart

The following tables show the 125 A gouging profile at 30° and 35° on mild steel. These settings are intended to serve as a starting point to help you determine the best gouging profile for a given cutting job. Adjust these settings as needed for your application and table to obtain the desired result.

Table 9 – Metric

Torch angle	Standoff (mm)	Speed (mm/min)	Depth (mm)	Width (mm)	Width/depth ratio
30°	6.3	508	7.9	8.4	1.06
		762	6.6	7.6	1.16
		1016	5.5	6.6	1.21
		1270	4.4	6.1	1.38
	10.1	508	7.6	9.8	1.30
		762	6.1	8.7	1.43
		1016	4.8	7.3	1.50
		1270	4.2	7.0	1.66
35°	6.3	508	7.5	6.8	0.92
		762	5.7	6.5	1.13
		1016	4.5	5.7	1.26
		1270	4.2	5.2	1.24
	10.1	508	7.3	8.1	1.12
		762	5.7	7.5	1.30
		1016	5.7	6.4	1.12
		1270	4.4	6.0	1.35

Table 10 – English

Torch angle	Standoff (inches)	Speed (ipm)	Depth (inches)	Width (inches)	Width/depth ratio
30°	0.25	20	0.31	0.33	1.06
		30	0.26	0.30	1.16
		40	0.22	0.26	1.21
		50	0.17	0.24	1.38
	0.40	20	0.30	0.39	1.30
		30	0.24	0.34	1.43
		40	0.19	0.29	1.50
		50	0.17	0.28	1.66
35°	0.25	20	0.30	0.27	0.92
		30	0.23	0.26	1.13
		40	0.18	0.22	1.26
		50	0.17	0.21	1.24
	0.40	20	0.29	0.32	1.12
		30	0.23	0.30	1.30
		40	0.23	0.25	1.12
		50	0.18	0.24	1.35

Common hand-cutting faults

The torch does not cut completely through the workpiece. The causes can be:

- The cut speed is too fast.
- The consumables are worn.
- The metal being cut is too thick for the selected amperage.
- Gouging consumables are installed instead of drag-cutting consumables.
- The ground clamp is not attached properly to the workpiece.
- The gas pressure or gas flow rate is too low.
- Gouging mode is selected on the power supply.

Cut quality is poor. The causes can be:

- The metal being cut is too thick for the amperage.
- The wrong consumables are being used (gouging consumables are installed instead of drag-cutting consumables, for example).
- The torch is moving too quickly or too slowly.

The arc sputters and consumable life is shorter than expected. The causes can be:

- Moisture in the gas supply.
- Incorrect gas pressure.
- Consumables incorrectly installed.
- The consumables are worn.

Section 6

Machine Torch Setup

Introduction

Duramax Hyamp series machine torches are available for this system. The FastConnect quick-disconnect system makes it easy to remove the torch for transport or to switch from one torch to the other if your applications require the use of different torches. The torches are cooled by ambient air and do not require special cooling procedures.

This section explains how to set up your machine torch and choose the appropriate consumables for the job.

Consumable life

How often you need to change the consumables on your torch will depend on a number of factors:

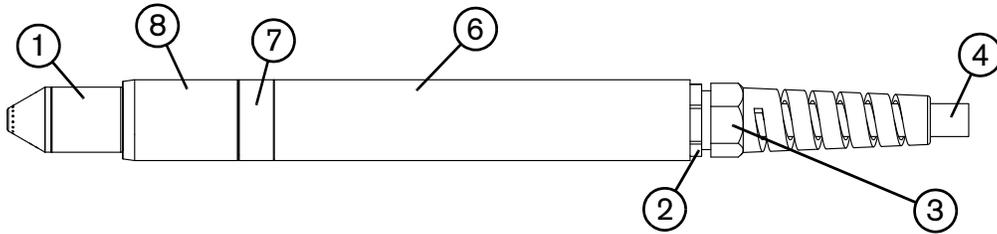
- The thickness of the metal being cut.
- The average length of the cut.
- The air quality (presence of oil, moisture, or other contaminants).
- Whether you are piercing the metal or starting cuts from the edge.
- Proper torch-to-work distance when gouging.
- Proper pierce height.
- Whether you are cutting in “continuous pilot arc” mode or normal mode. Cutting with a continuous pilot arc causes more consumable wear.

Under normal conditions, the electrode will wear out first during machine cutting. As general rule, a set of consumables should last about 1 to 3 hours for 125 A mechanized cutting, depending on the job. Cutting at lower amperages may yield longer consumable life.

You will find more information about proper cutting techniques in *Mechanized Cutting* on page 99.

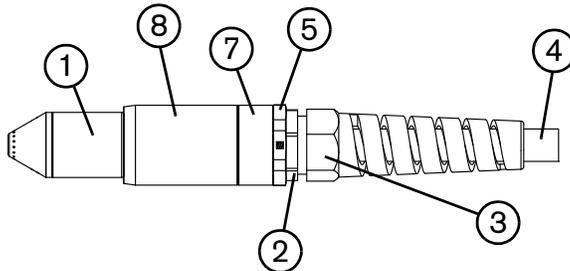
Machine torch components

Duramax Hyamp 180° machine torch



See the following callout table.

Duramax Hyamp 180° mini machine torch



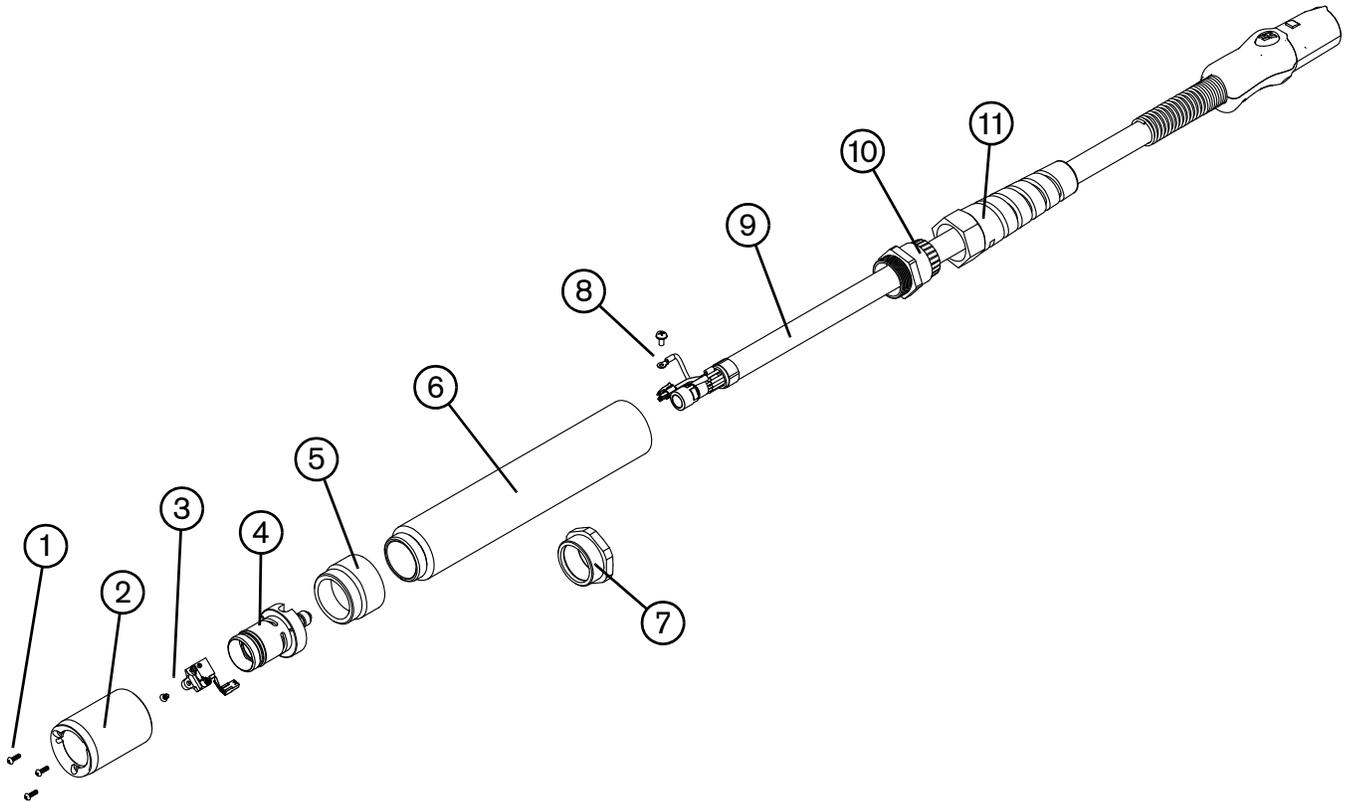
- | | |
|---------------------|---|
| 1 Consumables | 5 Adapter (not used in the full-length machine torch) |
| 2 Strain relief | 6 Positioning sleeve (not used in the mini machine torch) |
| 3 Strain relief nut | 7 Coupler |
| 4 Torch lead | 8 Mounting sleeve |

Before using either style of machine torch, you must:

- Mount the torch on your cutting table or other equipment.
- Choose and install the consumables.
- Align the torch square to the plate.
- Attach the torch lead to the power supply.
- Set up the power supply for remote starting with either the remote-start pendant or a machine interface cable.

Disassemble the machine torch

You may need to disassemble the machine torch in order to mount it on a cutting table (see *Mount the torch* on page 72). Another reason to disassemble the machine torch is to convert it from the full-length machine torch to a mini machine torch (see *Convert a full-length machine torch to a mini machine torch* on page 71).



- | | | | |
|---|---|----|-----------------------------------|
| 1 | Mounting sleeve screws | 7 | Adapter (mini machine torch only) |
| 2 | Mounting sleeve | 8 | Pilot arc wire and screw |
| 3 | Cap-sensor switch and screw | 9 | Torch lead |
| 4 | Torch body | 10 | Strain relief |
| 5 | Coupler | 11 | Strain relief nut |
| 6 | Positioning sleeve (full-length machine torch only) | | |

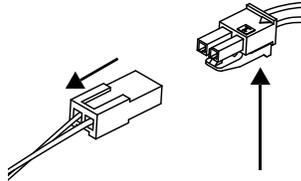


While disconnecting and reconnecting the torch parts, maintain the same orientation between the torch head and torch lead. Twisting the torch head in relation to the torch lead can cause damage to the torch wires.

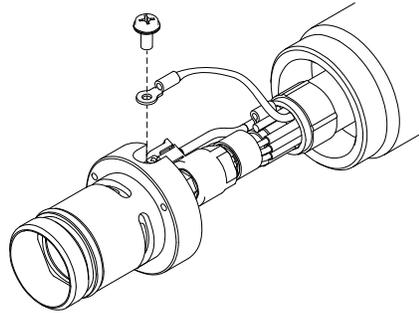
1. Disconnect the torch lead from the power supply, and remove the consumables from the torch.
2. Unscrew the strain relief nut from the strain relief, and slide the nut back along the torch lead.
3. If you are disassembling the full-length machine torch, unscrew the strain relief from the positioning sleeve. If you are disassembling the mini machine torch, unscrew the strain relief from the adapter. Slide the strain relief back along the torch lead.

6 – Machine Torch Setup

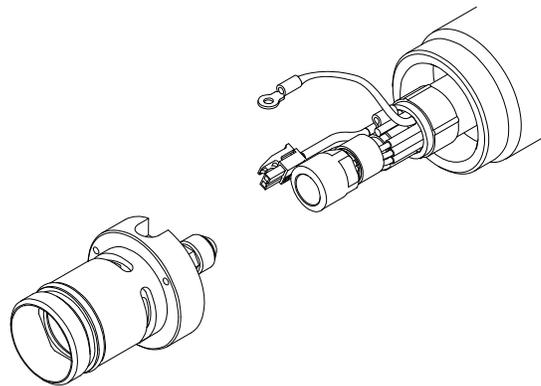
4. If you are disassembling the full-length machine torch, unscrew the positioning sleeve from the coupler. If you are disassembling the mini machine torch, unscrew the adapter from the coupler.
5. Unscrew the coupler from the mounting sleeve.
6. Remove the three screws from the consumables end of the mounting sleeve, and slide the mounting sleeve off the front of the torch body.
7. Disconnect the wire connector for the cap-sensor switch.



8. Remove the screw that secures the torch's pilot wire to the torch body.



9. Use 5/16-inch and 1/2-inch wrenches, or adjustable wrenches, to loosen the nut that secures the gas supply line to the torch lead. Set the torch body aside.



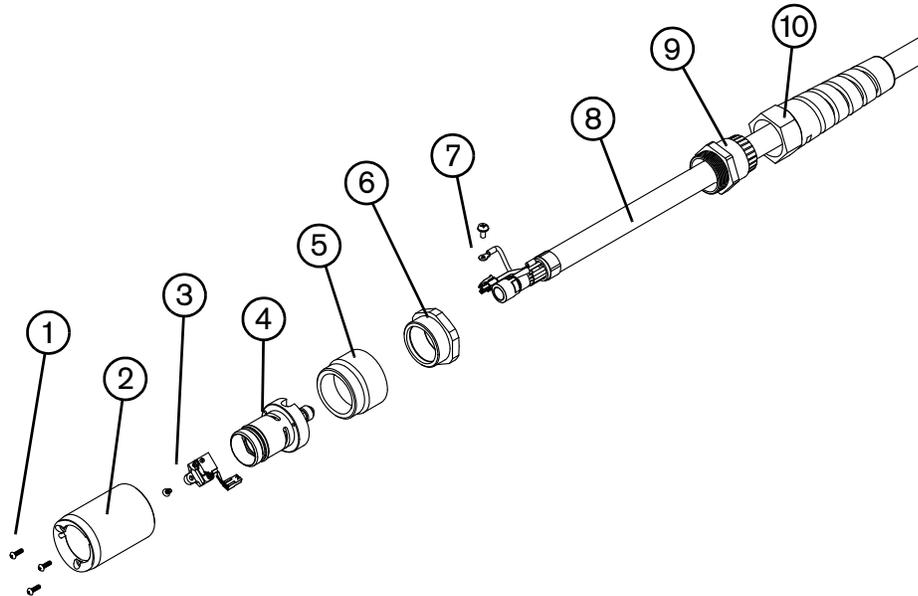
10. Slide the coupler off the front of the torch lead.
11. If you are disassembling a full-length machine torch, slide the positioning sleeve off the front of the torch lead. If you are disassembling a mini machine torch, slide the adapter off the front of the torch lead.

Convert a full-length machine torch to a mini machine torch

You will need the mini machine torch adapter kit (428146) to complete the following procedure. This kit enables you to convert a full-length machine torch to a mini machine torch by removing the positioning sleeve and installing a small adapter ring in its place.



If you are converting a full-length machine torch to a mini machine torch and mounting the torch at the same time, skip this procedure and follow the instructions in *Mount the torch* on page 72.



- | | | | |
|---|-----------------------------|----|--------------------------|
| 1 | Mounting sleeve screws | 6 | Adapter (428146) |
| 2 | Mounting sleeve | 7 | Pilot arc wire and screw |
| 3 | Cap-sensor switch and screw | 8 | Torch lead |
| 4 | Torch body | 9 | Strain relief |
| 5 | Coupler | 10 | Strain relief nut |

1. Follow the instructions in *Disassemble the machine torch* on page 69.
2. Slide the adapter over the torch lead.
3. Slide the coupler over the torch lead.
4. Screw the adapter onto the coupler.
5. Reconnect the gas supply line to the torch lead.
6. Reattach the torch's pilot wire to the torch body using the screw.
7. Reconnect the cap-sensor switch's wire connector.

6 – Machine Torch Setup

8. Slide the mounting sleeve over the front of the torch body. Align the slot on the front of the mounting sleeve (next to one of the three screw holes) with the cap-sensor plunger on the torch body.
9. Attach the mounting sleeve to the torch body using the three screws.
10. Screw the coupler onto the mounting sleeve.
11. Screw the strain relief onto the adapter.
12. Screw the strain relief nut onto the strain relief.
13. Reinstall the consumables in the torch, and reconnect the torch lead to the power supply.

Mount the torch

The machine torches can be mounted on a wide variety of X-Y tables, track burners, pipe bevelers, and other equipment. Install the torch per the manufacturer's instructions. Use the following procedure to disassemble and reassemble the torch if you need to do so in order to route the torch through the cutting table's track or other mounting system.

If your cutting table's track is large enough for you to route the torch through it without removing the torch body from the lead, do so and then attach the torch to the lifter per the manufacturer's instructions.



While disconnecting and reconnecting the torch parts, maintain the same orientation between the torch head and torch lead. Twisting the torch head in relation to the torch lead can cause damage to the torch wires.

1. Follow the instructions in *Disassemble the machine torch* on page 69.
-
- 
- Cover the end of the gas line on the torch lead with tape to keep dirt and other contaminants from getting in the gas line when you route the lead through the track.
2. Route the torch lead through the mounting system for the cutting table. Slide the strain relief and strain relief nut along the torch lead as needed to move them out of the way as you route the torch lead through the track.
 3. If you are mounting a full-length machine torch, slide the positioning sleeve over the torch lead. If you are mounting a mini machine torch, slide the adapter over the torch lead.
 4. Slide the coupler over the torch lead.
 5. Reconnect the gas supply line to the torch lead.
 6. Reattach the torch's pilot wire to the torch body using the screw.
 7. Reconnect the cap-sensor switch's wire connector.
 8. Slide the mounting sleeve over the front of the torch body. Align the slot on the front of the mounting sleeve (next to one of the three screw holes) with the cap-sensor plunger on the torch body.
 9. Attach the mounting sleeve to the torch body using the three screws.
 10. Screw the coupler into the mounting sleeve.

11. If you are mounting a full-length machine torch, screw the positioning sleeve into the coupler. If you are mounting a mini machine torch, screw the adapter into the coupler.
12. Screw the strain relief into the positioning sleeve (for a full-length machine torch) or the adapter (for a mini machine torch).
13. Screw the strain relief nut into the strain relief.
14. Attach the torch to the lifter per the manufacturer's instructions.
15. Reinstall the consumables in the torch.

Choose the machine torch consumables

Systems with the Duramax Hyamp 180° full-length machine torch or Duramax Hyamp 180° mini machine torch ship with a starter consumable kit as well as a box of spare electrodes and nozzles. There are two starter mechanized consumable kits. One includes the standard retaining cap, and one includes the ohmic retaining cap. Notice that the retaining cap, electrode, and swirl ring are the same for cutting, gouging, and FineCut applications. Only the shield and nozzle are different.

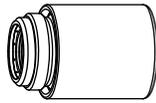
Both styles of machine torches use the same consumables. Mechanized consumables are shielded. Therefore, if the torch touches the workpiece it will not damage the nozzle.

Machine torch consumables

Mechanized shielded 105 A/125 A consumables



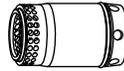
220976
Shield



220977
Retaining cap



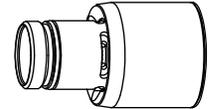
220975
Nozzle



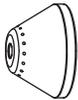
220997
Swirl ring



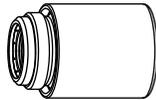
220971
Electrode



Mechanized shielded 45 A and 65 A consumables



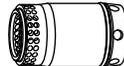
420168
Shield



220977
Retaining cap



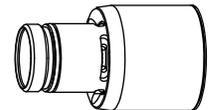
420158 (45 A)
420169 (65 A)
Nozzle



220997
Swirl ring



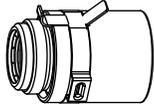
220971
Electrode



Mechanized shielded with ohmic 105 A/125 A consumables



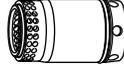
220976
Shield



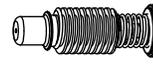
420156
Ohmic-sensing
retaining cap



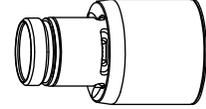
220975
Nozzle



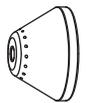
220997
Swirl ring



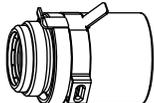
220971
Electrode



Mechanized shielded with ohmic 45 A and 65 A consumables



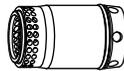
420168
Shield



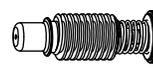
420156
Ohmic-sensing
retaining cap



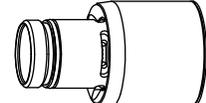
420158 (45 A)
420169 (65 A)
Nozzle



220997
Swirl ring



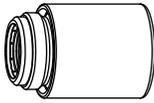
220971
Electrode



Gouging consumables



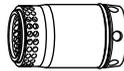
420112
Shield



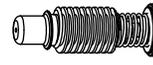
220977
Retaining cap



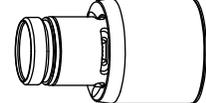
420001
Nozzle



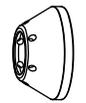
220997
Swirl ring



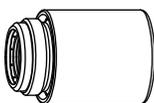
220971
Electrode



FineCut shielded consumables



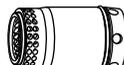
420152
Shield



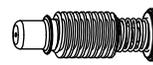
220977
Retaining cap



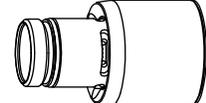
420151
Nozzle



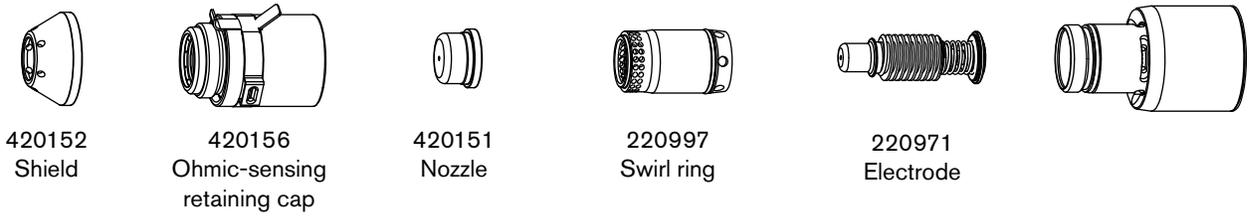
220997
Swirl ring



220971
Electrode



FineCut shielded with ohmic consumables



Install the machine torch consumables

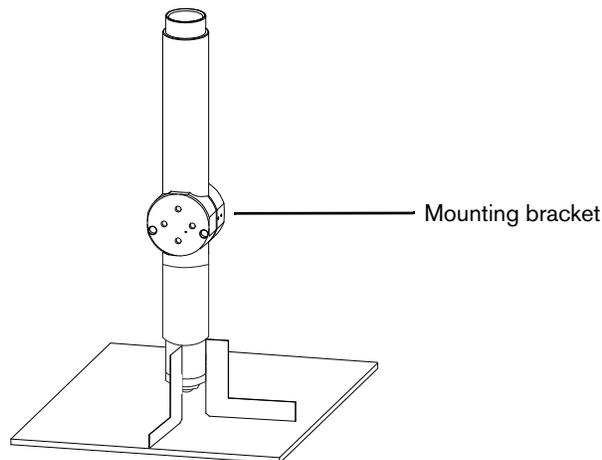
		<p>WARNING!</p> <p>INSTANT-ON TORCHES</p> <p>PLASMA ARC CAN CAUSE INJURY AND BURNS</p>
	<p>The plasma arc comes on immediately when the torch trigger is activated. Make sure the power is OFF before changing consumables.</p>	

To operate the machine torch, a complete set of consumable parts must be installed: shield, retaining cap, nozzle, electrode, and swirl ring.

With the power switch in the OFF (O) position, install the machine torch consumables in a manner similar to the hand torch consumables. See *Hand Torch Setup* on page 51.

Aligning the torch

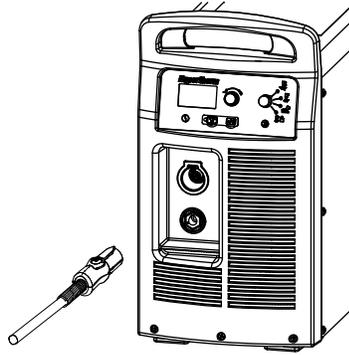
Mount the machine torch perpendicular to the workpiece in order to get a vertical cut. Use a square to align the torch at right angles to the workpiece.



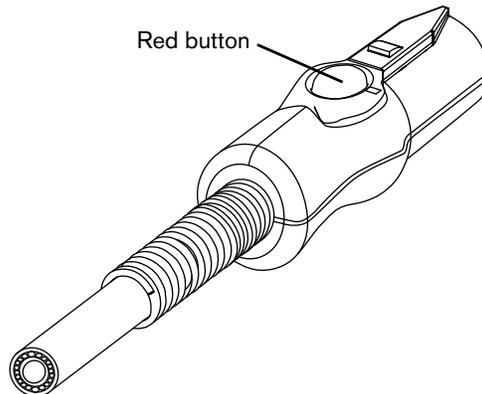
 Position the mounting bracket as low on the torch as possible to minimize vibration at the tip of the torch.

Connecting the torch lead

This system is equipped with FastConnect, a quick-disconnect system for connecting and disconnecting handheld and machine torch leads. When connecting or disconnecting a torch, first turn OFF the system. To connect the torch, push the connector into the receptacle on the front of the power supply.



To remove the torch, press the red button on the connector and pull the connector out of the receptacle.



Using the cut charts

The following tables provide cut charts for each set of mechanized consumables. For each consumable type, there are metric and English charts for mild steel, stainless steel, and aluminum. A consumable diagram with part numbers precedes each set of cut charts.

Each cut chart contains the following information:

- **Amperage setting** – The amperage setting at the top left side of the page applies to all the settings given on that page. In FineCut charts, the amperage setting for each thickness is included in the cut chart.
- **Material Thickness** – Thickness of the workpiece (metal plate being cut).
- **Torch-to-Work Distance** – Distance between the shield and the workpiece during cutting. This may also be known as cut height.
- **Initial Pierce Height** – Distance between the shield and the workpiece when the torch is triggered, prior to descending to the cut height.
- **Pierce Delay Time** – Length of time the triggered torch remains stationary at the pierce height before the torch starts the cutting motion.
- **Best Quality Settings** (cut speed and voltage) – Settings that provide the starting point for finding the best cut quality (best angle, least dross, best cut-surface finish). Adjust the speed for your application and table to obtain the desired result.
- **Production Settings** (cut speed and voltage) – 70% to 80% of the maximum speed ratings. These speeds result in the greatest number of cut parts, but not necessarily the best possible cut quality.



The arc voltage increases as the consumables wear, so the voltage setting may need to be increased to maintain the correct torch-to-work distance. Some CNCs monitor the arc voltage and adjust the torch lifter automatically.

Each cut chart lists hot and cold air flow rates.

- **Hot air flow rate** – Plasma is on, the system is operating at running current, and the system is in a steady state at the default system pressure (automatic mode).
- **Cold air flow rate** – Plasma is off and the system is in a steady state with air flowing through the torch at the default system pressure.



Hypertherm collected the cut chart data under laboratory test conditions using new consumables.

Estimated kerf-width compensation

The widths in the following tables are for reference. The data are obtained with the “Best Quality” settings. Differences between installations and material composition may cause actual results to vary from those shown in the tables.

Estimated kerf-width compensation – Metric (mm)

Process	Thickness (mm)														
	0.5	1	2	3	6	8	10	12	16	20	25	30	32	35	40
Mild steel															
125 A shielded					2.2	2.3	2.4	2.4	2.6	2.8	3.1	3.6	3.8	3.9	4.1
105 A shielded					2	2.1	2.2	2.3	2.4	2.5	2.7	3	3.2		
65 A shielded			1.6	1.6	1.8	1.9	2.0	2.2	2.7	3.2	3.7				
45 A shielded	1.6	1.4	1.3	1.5	1.6										
FineCut	1.3	1.2	1.2	1.2											
Stainless steel															
125 A shielded					1.9	2.2	2.4	2.6	2.6	2.7	3.1	3	3	3.2	3.6
105 A shielded					1.6	1.9	2.2	2.3	2.4	2.5	2.9	2.9	2.9		
65 A shielded			1.4	1.5	1.8	1.8	1.9	1.9	2.1	2.3					
45 A shielded	1.4	1.2	1.2	1.5	1.7										
FineCut	1.2	1.2	1.0	1.0											
Aluminum															
125 A shielded					2.3	2.5	2.6	2.6	2.8	2.9	2.8	2.9	3	3.3	3.7
105 A shielded					1.9	2.0	2.2	2.2	2.1	2.1	2.5	2.5	2.5		
65 A shielded			1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.2					
45 A shielded		1.5	1.4	1.6	1.8										

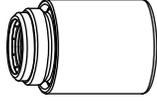
Estimated kerf-width compensation – English (inches)

Process	Thickness (inches)													
	22 GA	18 GA	14 GA	10 GA	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4	1-1/2
Mild steel														
125 A shielded						0.089	0.094	0.095	0.103	0.108	0.109	0.123	0.150	0.158
105 A shielded						0.080	0.088	0.091	0.094	0.099	0.103	0.107	0.125	
65 A shielded			0.062	0.065	0.067	0.070	0.079	0.088	0.104	0.120	0.134	0.147		
45 A shielded	0.062	0.048	0.052	0.061	0.062	0.064								
FineCut	0.049	0.047	0.048	0.048										
Stainless steel														
125 A shielded						0.078	0.094	0.103	0.103	0.103	0.112	0.123	0.116	0.137
105 A shielded						0.067	0.085	0.091	0.094	0.093	0.111	0.116	0.116	
65 A shielded			0.054	0.060	0.065	0.071	0.074	0.076	0.083	0.090				
45 A shielded	0.056	0.042	0.048	0.062	0.065	0.068								
FineCut	0.045	0.044	0.039	0.042										
Aluminum														
		1/32	1/16	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4	1-1/2	
125 A shielded					0.091	0.103	0.104	0.110	0.119	0.101	0.112	0.116	0.140	
105 A shielded					0.075	0.086	0.085	0.083	0.083	0.087	0.101	0.100		
65 A shielded			0.074	0.074	0.075	0.077	0.079	0.082	0.085					
45 A shielded		0.060	0.052	0.062	0.070									

125 A shielded consumables



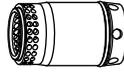
220976
Shield



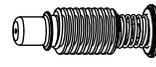
220977
Retaining cap



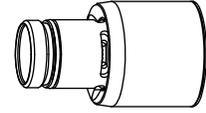
220975
Nozzle



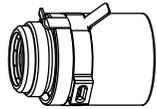
220997
Swirl ring



220971
Electrode



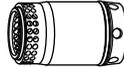
220976
Shield



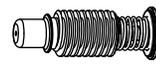
420156
Ohmic-sensing
retaining cap



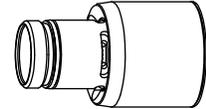
220975
Nozzle



220997
Swirl ring



220971
Electrode



125 A shielded cutting – mild steel

Air flow rate – slpm/scfh	
Hot	260 / 550
Cold	345 / 730

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
6	4.6	9.2	200	0.2	4980	158	5960	155
8				0.3	3800	158	4570	157
10				0.4	2750	158	3330	158
12				0.5	2050	157	2510	157
16		11.5	250	0.6	1260	162	1660	164
20				2.0	980	165	1140	164
25				3.5	610	169	780	167
30				Edge Start*	1.0	460	169	580
32		400	174			500	172	
35		340	177			430	175	
40	240	180	310			178		

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
inches	inches	inches	%	seconds	ipm	volts	ipm	volts
1/4	0.18	0.36	200	0.2	188	158	225	155
3/8				0.4	114	158	138	158
1/2				0.5	75	158	93	158
5/8		0.45	250	0.6	50	162	66	164
3/4				0.8	42	164	48	163
7/8				2.0	31	168	37	166
1				3.5	23	169	30	167
1-1/4		Edge Start*	1.0	16	174	20	172	
1-1/2				11	179	14	177	

* You can pierce thicknesses up to 32 mm (1-1/4 inch) if your CNC software and torch height control system enable you to temporarily raise the torch in order to clear the puddle of dross that can form during the pierce. In Hypertherm's Phoenix CNC software, for example, this function is referred to as the "puddle jump height." Using this piercing function may affect consumable life.

6 – Machine Torch Setup

125 A shielded cutting – stainless steel

Air flow rate – slpm/scfh	
Hot	260 / 550
Cold	345 / 730

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts	
6	4.6	9.2	200	0.5	5910	156	7690	157	
8					4060	157	5550	157	
10					2540	159	3700	157	
12					2170	163	2710	157	
16		11.5	250	0.7	1140	165	1460	162	
20					940	167	1030	163	
25		Edge Start			1.0	540	172	760	166
30						430	173	640	166
32					400	177	600	169	
35					1.2	320	180	450	173
40						180	185	210	179

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
inches	inches	inches	%	seconds	ipm	volts	ipm	volts	
1/4	0.18	0.36	200	0.5	220	156	288	157	
3/8					104	158	154	157	
1/2					78	163	98	158	
5/8		0.45	250	0.7	45	165	58	162	
3/4					40	167	43	163	
7/8		Edge Start			0.8	30	168	35	164
1					1.0	20	173	29	166
1-1/4					1.1	16	177	24	169
1-1/2					1.2	9	183	12	177

125 A shielded cutting – aluminum

Air flow rate – slpm/scfh	
Hot	260 / 550
Cold	345 / 730

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts	
6	4.6	9.2	200	0.2	7660	159	8560	156	
8				0.3	5100	161	6100	157	
10				0.4	2980	163	4020	159	
12				0.5	2140	+++++++ +++++++ +++++++ +++++++1 65	3070	162	
16		11.5	250	0.6	1540	169	2090	163	
20				2.0	1260	170	1500	167	
25				3.5	850	174	1050	167	
30		Edge Start			1.0	540	175	830	167
32					1.1	430	182	750	174
35					1.2	370	183	580	176
40						270	185	300	179

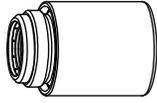
English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
inches	inches	inches	%	seconds	ipm	volts	ipm	volts	
1/4	0.18	0.36	200	0.2	284	159	320	156	
3/8				0.4	124	163	166	158	
1/2				0.5	80	166	114	162	
5/8		0.45	250	0.6	61	169	83	163	
3/4				0.8	52	170	62	167	
7/8				2.0	44	171	52	167	
1				3.5	32	175	40	167	
1-1/4		Edge Start			1.0	17	182	30	174
1-1/2						12	184	16	178

105 A shielded consumables



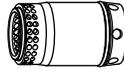
220976
Shield



220977
Retaining cap



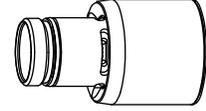
220975
Nozzle



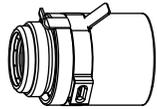
220997
Swirl ring



220971
Electrode



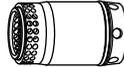
220976
Shield



420156
Ohmic-sensing
retaining cap



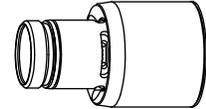
220975
Nozzle



220997
Swirl ring



220971
Electrode



105 A shielded cutting – mild steel

Air flow rate – slpm/scfh	
Hot	283 / 600
Cold	345 / 730

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
6	4.6	9.2	200	0.5	4110	158	4920	146
8				0.6	3220	158	3770	150
10				0.8	2410	159	2730	153
12				0.7	1810	163	1980	156
16		11.5	250	1.0	1050	165	1230	155
20				1.3	780	168	850	157
25		Edge Start		1.0	540	174	580	162
30					420	176	440	168
32				1.2	370	177	400	170

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
inches	inches	inches	%	seconds	ipm	volts	ipm	volts
1/4	0.18	0.36	200	0.5	156	158	186	147
3/8				0.75	100	158	114	152
1/2				0.75	66	163	73	156
5/8		0.45	250	1.0	42	165	49	155
3/4				1.0	33	168	35	156
7/8				2.0	26	169	30	158
1		Edge Start		1.0	21	175	22	163
1-1/4					1.2	15	177	16

6 – Machine Torch Setup

105 A shielded cutting – stainless steel

Air flow rate – slpm/scfh	
Hot	283 / 600
Cold	345 / 730

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
6	4.6	9.2	200	0.5	5320	158	5780	144
8					3650	159	3940	148
10					2230	160	2420	151
12					1490	162	1960	154
16		11.5	250	1.0	950	166	1050	156
20				2.5	660	169	730	158
25		Edge Start		1.0	440	174	520	162
30					330	176	450	167
32				1.2	290	177	420	169

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
inches	inches	inches	%	seconds	ipm	volts	ipm	volts
1/4	0.18	0.36	200	0.5	198	158	215	145
3/8					94	160	100	150
1/2					55	163	71	154
5/8		0.45	250	1.0	38	166	42	156
3/4				2.5	28	168	30	157
7/8		Edge Start		1.0	22	172	26	159
1					17	174	20	163
1-1/4				1.2	12	177	17	169

105 A shielded cutting – aluminum

Air flow rate – slpm/scfh	
Hot	283 / 600
Cold	345 / 730

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts	
6	4.6	9.2	200	0.5	6340	158	6390	154	
8				0.6	4330	162	4690	154	
10				0.8	2660	164	3250	155	
12				0.7	2020	167	2590	159	
16		11.5	250	1.0	1350	169	1550	157	
20				1.3	970	172	1020	161	
25		Edge Start			1.0	660	176	800	167
30						460	180	580	174
32					1.2	390	182	490	176

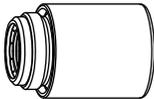
English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
inches	inches	inches	%	seconds	ipm	volts	ipm	volts	
1/4	0.18	0.36	200	0.5	236	159	240	154	
3/8				0.75	110	164	134	154	
1/2					75	167	95	159	
5/8		0.45	250		1.0	54	169	62	157
3/4						40	171	42	160
7/8					2.0	34	173	37	164
1						1.0	25	176	31
1-1/4		1.2	16	182	20	176			

65 A shielded consumables



420168
Shield



220977
Retaining cap



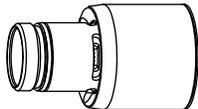
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Nozzle



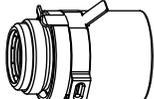
220997
Swirl ring



220971
Electrode



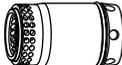
420168
Shield



420156
Ohmic-sensing
retaining cap



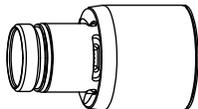
420169
Nozzle



220997
Swirl ring



220971
Electrode



65 A shielded cutting – mild steel

Air flow rate – slpm/scfh	
Hot	222 / 470
Cold	250 / 530

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts	
2	1.5	3.8	250	0.1	5930	122	7015	123	
3				0.2	5150	123	6080	123	
4				0.5	4370	123	5145	123	
6					2815	125	3275	124	
8					1815	127	2235	126	
10		4.5	300	0.7	1085	129	1490	128	
12				1.2	845	131	1140	130	
16		6	400	2.0	565	136	740	135	
20		Edge start				355	141	450	140
25		Edge start				215	146	270	146

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
inches	inches	inches	%	seconds	ipm	volts	ipm	volts	
16 GA	0.06	0.15	250	0.1	248	122	294	122	
10 GA					190	123	224	123	
3/16				0.2	149	124	174	123	
1/4					0.5	100	125	116	124
3/8						45	129	62	128
1/2		0.18	300	1.2	30	132	40	131	
5/8		0.24	400	2.0	23	136	30	135	
3/4		Edge Start				15	140	19	139
7/8		Edge Start				12	143	15	143
1		Edge Start				8	146	10	146

6 – Machine Torch Setup

65 A shielded cutting – stainless steel

Air flow rate – slpm/scfh	
Hot	222 / 470
Cold	250 / 530

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
2	1.5	3.8	250	0.1	7405	119	9970	121
3				0.2	6120	120	8240	122
4				0.5	4840	122	6110	123
6					2275	125	2840	125
8				0.7	1505	127	1860	127
10		1115	130		1245	128		
12		720	133		925	130		
16		Edge Start			465	137	505	136
20		Edge Start			320	141	345	141

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
inches	inches	inches	%	seconds	ipm	volts	ipm	volts	
16 GA	0.06	0.15	250	0.1	316	118	425	120	
10 GA					220	121	296	122	
3/16				0.2	152	123	168	123	
1/4					0.5	72	125	96	125
3/8						48	130	52	128
1/2		0.18	300	1.2	23	134	32	131	
5/8					Edge Start			19	137
3/4		Edge Start			14	140	15	140	

65 A shielded cutting – aluminum

Air flow rate – slpm/scfh	
Hot	222 / 470
Cold	250 / 530

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
2	1.5	3.8	250	0.1	7805	123	10265	122
3				0.2	6565	125	8790	123
4				0.5	5320	126	7320	124
6					2845	129	4375	126
8				0.7	2015	133	2750	129
10		4.5	300		1535	136	1650	132
12					1055	139	1330	135
16		Edge Start			640	143	805	140
20		Edge Start			335	146	550	144

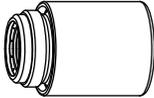
English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
inches	inches	inches	%	seconds	ipm	volts	ipm	volts
1/16	0.06	0.15	250	0.1	328	123	428	122
1/8					250	125	336	123
1/4				0.5	95	130	152	126
3/8					65	135	68	131
1/2		0.18	300	1.2	35	140	48	136
5/8		Edge Start			26	143	32	140
3/4		Edge Start			16	145	24	143

45 A shielded consumables



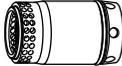
420168
Shield



220977
Retaining cap



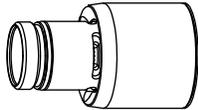
420158
Nozzle



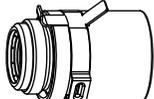
220997
Swirl ring



220971
Electrode



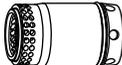
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Shield



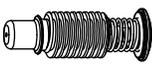
420156
Ohmic-sensing
retaining cap



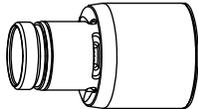
420158
Nozzle



220997
Swirl ring



220971
Electrode



45 A shielded cutting – mild steel

Air flow rate – slpm/scfh	
Hot	217 / 460
Cold	241 / 510

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
0.5	0.5	2.0	400	0.0	8890	118	12510	120
1				0.1	8890	119	10760	120
1.5				0.3	8040	123	10160	123
2	1.5	3.8	250	0.4	6565	128	7770	125
3				0.5	3725	129	4890	128
4				0.4	2250	130	3550	130
6				0.5	1265	132	2050	130

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
inches	inches	inches	%	seconds	ipm	volts	ipm	volts
26 GA	0.02	0.08	400	0.0	350	118	500	120
22 GA				0.1	350	118	450	120
18 GA				0.1	350	119	400	120
16 GA	0.06	0.15	250	0.1	314	123	400	123
14 GA				0.2	270	128	320	125
12 GA				0.4	185	129	216	127
10 GA				0.4	100	130	164	130
3/16				0.5	74	131	108	130
1/4				0.6	43	132	73	130

6 – Machine Torch Setup

45 A shielded cutting – stainless steel

Air flow rate – slpm/scfh	
Hot	217 / 460
Cold	241 / 510

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts	
0.5	0.5	2.0	400	0.0	8890	113	12510	120	
1					8890	113	10760	120	
1.5					7825	117	10160	120	
2	1.5	3.8	250	0.3	6095	122	8615	122	
3					0.4	3585	123	4405	123
4						2185	126	2810	126
6						975	132	1140	132

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
inches	inches	inches	%	seconds	ipm	volts	ipm	volts	
26 GA	0.02	0.08	400	0.0	350	113	500	120	
22 GA					350	113	450	120	
18 GA					0.1	350	113	400	120
16 GA	305	117	400	120					
14 GA	0.06	0.15	250	0.2	250	122	360	122	
12 GA					0.4	175	123	206	123
10 GA						100	124	134	124
3/16					0.5	68	128	80	128
1/4						30	133	35	133

45 A shielded cutting – aluminum

Air flow rate – slpm/scfh	
Hot	217 / 460
Cold	241 / 510

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	mm/min	volts	mm/min	volts
1	1.5	3.8	250	0.0	9145	126	11100	124
2				0.1	7470	125	9210	124
3				0.2	4675	125	6190	125
4				0.4	3700	129	4845	127
6				0.5	1740	135	2795	132

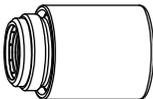
English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
inches	inches	inches	%	seconds	ipm	volts	ipm	volts
1/32	0.06	0.15	250	0.0	360	126	450	124
1/16				0.1	360	126	400	124
3/32				0.2	233	124	328	124
1/8				0.4	177	126	224	125
1/4				0.5	55	136	96	133

FineCut consumables



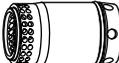
420152
Shield



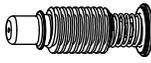
220977
Retaining cap



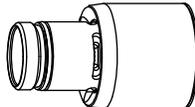
420151
Nozzle



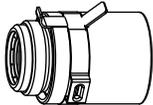
220997
Swirl ring



220971
Electrode



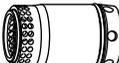
420152
Shield



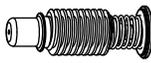
420156
Ohmic-sensing
retaining cap



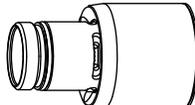
420151
Nozzle



220997
Swirl ring



220971
Electrode



FineCut – mild steel

Air flow rate – slpm/scfh	
Hot	217 / 460
Cold	226 / 480

Metric

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	mm/min	volts
0.5	30	1.5	2.25	150	0.0	4330	83
0.6						4080	85
0.8						4065	85
1	40				0.2	4825	81
1.5						0.4	4825
2	4740						78
3	45				0.5	3445	80
4						1270	80

English

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
inches	A	inches	inches	%	seconds	ipm	volts
26 GA	30	0.06	0.09	150	0.0	175	82
24 GA						160	85
22 GA						160	85
20 GA	40				0.1	160	85
18 GA						0.2	190
16 GA	0.4				190		79
14 GA					45	0.4	190
12 GA	0.5						165
10 GA		100	80				

6 – Machine Torch Setup

FineCut – stainless steel

Air flow rate – slpm/scfh	
Hot	217 / 460
Cold	226 / 480

Metric

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	mm/min	volts
0.5	30	0.51	2.03	400	0.0	4825	77
0.6						4825	77
0.8						4825	73
1	40				0.2	4825	86
1.5						0.4	4825
2	4550						72
3	45				0.5	2335	70
4						995	72

English

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
inches	A	inches	inches	%	seconds	ipm	volts
26 GA	30	0.02	0.08	400	0.0	190	77
24 GA						190	77
22 GA						190	74
20 GA	40				0.1	190	72
18 GA						0.2	190
16 GA	0.4						190
14 GA					45	0.5	190
12 GA	110						70
10 GA	70	71					

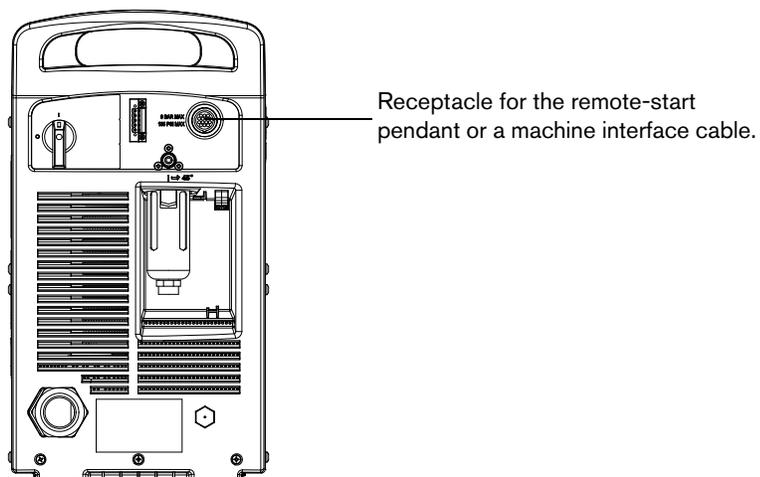
Connecting an optional remote-start pendant

Powermax125 configurations with a Duramax Hyamp machine torch can include an optional remote-start pendant.

- Part number 128650: 7.6 m (25 feet)
- Part number 128651: 15 m (50 feet)
- Part number 128652: 23 m (75 feet)

Remove the machine interface receptacle cover on the rear of the power supply, and plug the Hypertherm remote-start pendant into the receptacle.

 The remote-start pendant is for use only with a machine torch. It will not operate if a handheld torch is installed.



Connecting the machine interface cable

The Powermax125 is equipped with a factory-installed five-position voltage divider board. The built-in voltage divider provides a scaled down arc voltage of 20:1, 21.1:1, 30:1, 40:1, or 50:1 (maximum output of 16 V). A receptacle on the rear of the power supply (see the previous illustration) provides access to the scaled down arc voltage and signals for arc transfer and plasma start.



The factory presets the voltage divider to 50:1. To change the voltage divider to a different setting, refer to *Setting the five-position voltage divider* on page 103.

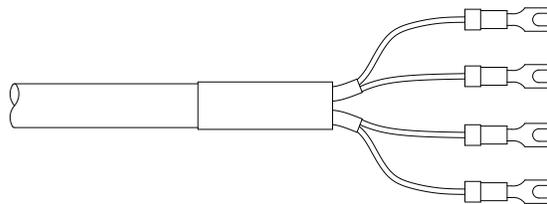


CAUTION

The factory-installed internal voltage divider provides a maximum of 16 V under open circuit conditions. This is an impedance-protected functional extra low voltage (ELV) output to prevent shock, energy, and fire under normal conditions at the machine interface receptacle and under single fault conditions with the machine interface wiring. The voltage divider is not fault tolerant, and ELV outputs do not comply with safety extra low voltage (SELV) requirements for direct connection to computer products.

Hypertherm offers several choices of machine interface cables:

- To use the built-in voltage divider that provides a scaled down arc voltage in addition to signals for arc transfer and plasma start:
 - Use part number 228350 (7.6 m, 25 feet) or 228351 (15 m, 50 feet) for wires terminated with spade connectors.
 - Use one of the following part numbers for a cable terminated with a D-sub connector. (Compatible with Hypertherm products, such as EDGE® Pro Ti and Sensor™ PHC.)
 - 223354 (3.0 m, 10 feet)
 - 223355 (6.1 m, 20 feet)
 - 223048 (7.6 m, 25 feet)
 - 223356 (10.7 m, 35 feet)
 - 123896 (15 m, 50 feet)
- To use signals for arc transfer and plasma start only, use either part number 023206 (7.6 m, 25 feet) or part number 023279 (15 m, 50 feet). These cables have spade connectors as follows:



Refer to *Machine interface pinout* on page 102 for receptacle pinout information.



The cover on the machine interface receptacle prevents dust and moisture from damaging the receptacle when not in use. This cover should be replaced if damaged or lost (part number 127204).

Refer to *Parts* on page 297 for more information.

Installation of the machine interface cable must be performed by a qualified service technician. To install a machine interface cable:

1. Turn OFF the power and disconnect the power cord.
2. Remove the machine interface receptacle's cover from the rear of the power supply.
3. Connect the Hypertherm machine interface cable to the power supply.
4. If you are using a cable with a D-sub connector on the other end, plug it into the appropriate pin connector on the torch height controller or CNC. Secure it with the screws on the D-sub connector.

If you are using a cable with wires and spade connectors on the other end, terminate the machine interface cable inside the electrical enclosure of the torch height controller or CNC controller to prevent unauthorized access to the connections after installation. Verify that the connections are correct and that all live parts are enclosed and protected before operating the equipment.

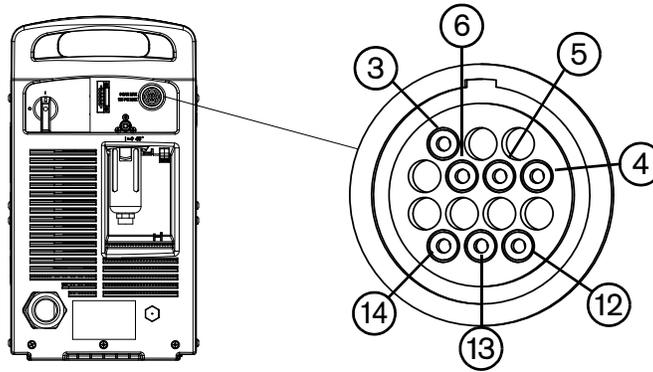


The integration of Hypertherm equipment and customer-supplied equipment including interconnecting cords and cables, if not listed and certified as a system, is subject to inspection by local authorities at the final installation site.

The connector sockets for each type of signal available through the machine interface cable are shown in *Figure 2* on page 102. *Table 11* on page 102 provides details about each signal type.

Machine interface pinout

Figure 2 – Connector sockets



Refer to *Table 11* when connecting the power supply to a torch height controller or CNC controller with a machine interface cable.

Table 11 – Machine interface cable signals

Signal	Type	Notes	Connector sockets	External cable wires
Start (start plasma)	Input	Normally open. 18 VDC open circuit voltage at START terminals. Requires dry contact closure to activate.	3, 4	Green, black
Transfer (start machine motion)	Output	Normally open. Dry contact closure when the arc transfers. 120 VAC/1 A maximum at the machine interface relay.	12, 14	Red, black
Ground	Ground		13	
Voltage divider	Output	Divided arc signal of 20:1, 21.1:1, 30:1, 40:1, 50:1 (provides a maximum of 16 V).	5 (-), 6 (+)	Black (-), white (+)

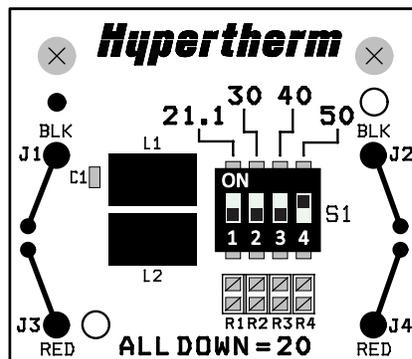
Setting the five-position voltage divider

To change the factory preset voltage divider from 50:1 to a different setting:

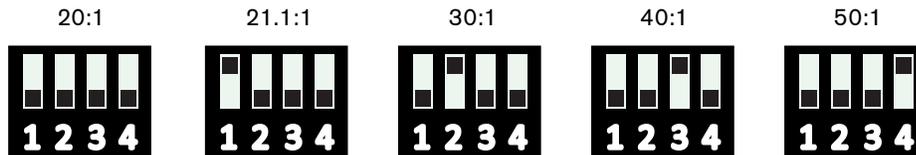
1. Turn OFF the power supply and disconnect the power cord.
2. Remove the power supply cover.
3. Locate the voltage divider DIP switches on the fan side of the power supply.

 *Figure 3* shows the default setting (50:1) with the number 4 switch up.

Figure 3 – Voltage divider at default setting (50:1)



4. Set the DIP switches to one of the following settings, and replace the power supply cover.



If the Hypertherm five-position voltage divider does not supply the required voltage for your application, contact your system integrator for assistance.

Accessing raw arc voltage

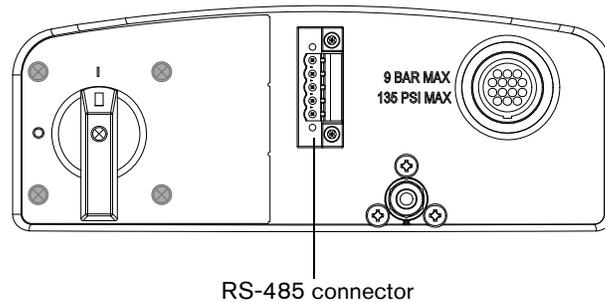
To access divided raw arc voltage, refer to Field Service Bulletin 807060.

		WARNING! SHOCK HAZARD, ENERGY HAZARD, AND FIRE HAZARD
		Connecting directly to the plasma circuit for access to raw arc voltage increases the risk of shock hazard, energy hazard, and fire hazard in the event of a single fault. The output voltage and the output current of the circuit are specified on the data plate.

Connecting an optional RS-485 serial interface cable

The RS-485 serial interface connector on the back of the power supply allows you to connect an external device to your Powermax. For example, you can remotely operate the Powermax with a CNC controller.

The Powermax power supply must be equipped with a factory-installed (or user-installed) RS-485 serial interface connector on the rear panel. The receptacle on the rear of the power supply provides access to the RS-485 board inside the power supply.



If your power supply is not equipped with the RS-485 connector, order kit 228539, "Powermax65/85/105/125 RS-485 board with cables". Follow the installation instructions in the *Power Supply Component Replacement* section of the Powermax125 Service Manual (808070), which you can download from the Downloads Library at www.hypertherm.com.

With the RS-485 connector installed:

1. Shut OFF the power supply.
2. Connect the RS-485 cable from your external device to the receptacle on the back of the Powermax power supply.

Serial port cables

The following serial cables are available with the specified lengths and connectors:

- 223236 – RS-485 cable, unterminated, 7.6 m (25 feet)
- 223237 – RS-485 cable, unterminated, 15 m (50 feet)
- 223239 – RS-485 cable, 9-pin D-sub connector for Hypertherm controls, 7.6 m (25 feet)
- 223240 – RS-485 cable, 9-pin D-sub connector for Hypertherm controls, 15 m (50 feet)

Using the machine torch

Since the Powermax with a machine torch can be used with a wide variety of cutting tables, track burners, pipe bevelers, and so on, you will need to refer to the manufacturer's instructions for specifics on operating the machine torch in your configuration. However, the following topics will help you optimize cut quality and maximize consumable life.

Setting up the torch and table

- Use a square to align the torch at right angles to the workpiece in two dimensions.
- The torch may travel more smoothly if you clean, check, and “tune” the cutting table's rails and drive system. Unsteady machine motion can cause a regular, wavy pattern on the cut surface.
- Ensure that the torch does not touch the workpiece during cutting. Contact with the workpiece can damage the shield and nozzle and affect the cut surface.

Understand and optimize cut quality

Several factors affect cut quality:

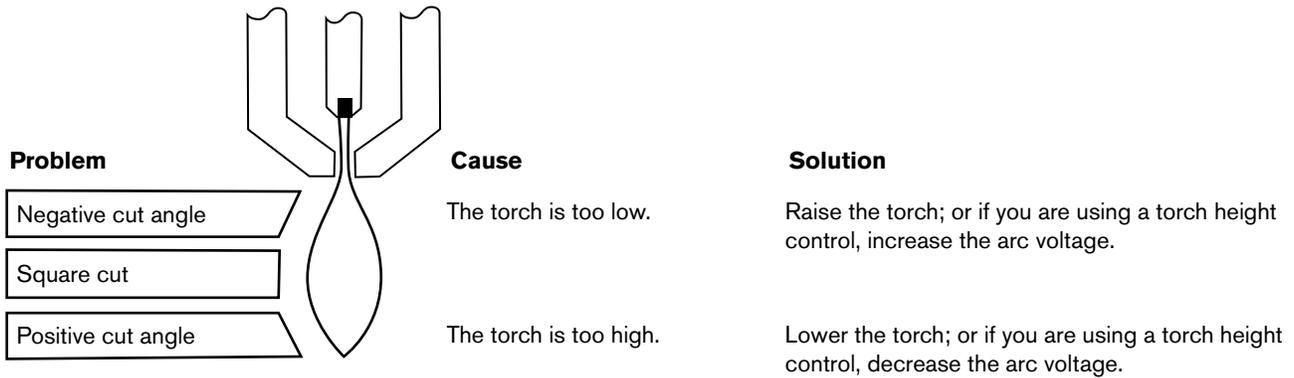
- Cut angle – The degree of angularity of the cut edge.
- Dross – The molten material that solidifies on the top or bottom of the workpiece.
- Straightness of the cut surface – The cut surface can be concave or convex.

The following topics explain how these factors can affect cut quality.

Cut or bevel angle

- A positive cut angle results when more material is removed from the top of the cut than from the bottom.
- A negative cut angle results when more material is removed from the bottom of the cut.

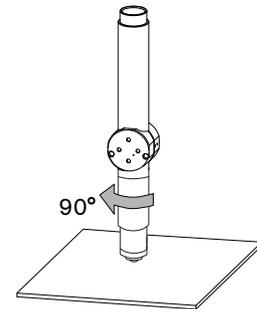
Figure 4 – Cut angles



 The squarest cut angle will be on the *right* side with respect to the forward motion of the torch. The left side will always have some degree of cut angle.

To determine whether a cut-angle problem is being caused by the plasma system or the drive system, make a test cut and measure the angle of each side. Next, turn the torch 90° in its holder and repeat the process. If the angles are the same in both tests, the problem is in the drive system.

If a cut-angle problem persists after mechanical causes have been eliminated (see *Setting up the torch and table* on page 105), check the torch-to-work distance, especially if the cut angles are all positive or all negative. Also consider the material being cut: if the metal is magnetized or hardened, you are more likely to experience cut angle problems.



Dross

Some amount of dross will always be present when cutting with air plasma. However, you can minimize the amount and type of dross by adjusting your system correctly for your application.

Excess dross appears on the top edge of both pieces of the plate when the torch is too low (or voltage is too low when using a torch height control). Adjust the torch or adjust the voltage in small increments (5 volts or less) until the dross is reduced.

Low-speed dross forms when the torch's cutting speed is too slow and the arc angles ahead. It forms as a heavy, bubbly deposit at the bottom of the cut and can be removed easily. Increase the speed to reduce this type of dross.

High-speed dross forms when the cutting speed is too fast and the arc angles behind. It forms as a thin, linear bead of solid metal attached very close to the cut. It is more firmly attached to the bottom of the cut than at low speed and is difficult to remove. To reduce high-speed dross:

- Decrease the cutting speed.
- Decrease the torch-to-work distance.

Piercing a workpiece using the machine torch

As with the hand torch, you can start a cut with the machine torch at the edge of the workpiece or by piercing the workpiece. Piercing may result in a shorter consumable life than with edge starts.

The cut charts include a column for the recommended torch height when starting a pierce. For the Powermax125, the pierce height is generally between 1.5 and 4 times the cut height. Refer to the cut charts for specific values.

The pierce delay must be long enough that the arc can pierce the material before the torch moves, but not so long that the arc “wanders” while trying to find the edge of a large hole. As consumables wear, this delay time may need to be increased. Pierce delay times given in the cut charts are based on average delay times throughout the life of the consumables.

When piercing materials close to the maximum thickness for a specific process, consider the following important factors:

- Allow a lead-in distance approximately equal to the thickness of the material being pierced. For example, 20 mm (3/4 in) material requires a 20 mm lead-in.
- To avoid damage to the shield from the buildup of molten material created by the pierce, do not allow the torch to descend to cut height until it has cleared the puddle of molten material.
- Different material chemistries can have an adverse effect on the pierce capability of the system. In particular, high-strength steel with a high manganese or silicon content can reduce the maximum pierce capability. Hypertherm derives mild steel parameters using certified A-36 plate.

Common machine-cutting faults

The torch's pilot arc will initiate, but will not transfer.

- The work lead is not making good contact with the cutting table, or the cutting table is not making good contact with the workpiece.
- The torch-to-work distance/cut height is too large.

The workpiece is not totally pierced, and there is excessive sparking on the top of the workpiece.

- The metal surface is not clean of rust or paint.
- The consumables are worn and need to be replaced. For optimized performance in a mechanized application, replace the nozzle and the electrode together.
- The work lead is not making good contact with the cutting table, or the cutting table is not making good contact with the workpiece.
- The current (amperage) is set too low. See *Machine Torch Setup* on page 67.
- The cut speed is too high. See the cut charts under *Using the cut charts* on page 77.
- The metal being cut exceeds the maximum capacity for the selected amperage. See *Specifications* on page 19.

7 – Mechanized Cutting

Excessive cross forms on the bottom of the cut.

- The gas setting is too high or too low.
- The consumables are worn and need to be replaced. For optimized performance in a mechanized application, replace the nozzle and the electrode together.
- The cutting speed is not correct. See the cut charts under *Using the cut charts* on page 77.
- The current (amperage) is set too low. See the cut charts under *Using the cut charts* on page 77.

The cut angle is not square.

- The torch is not square to the workpiece.
- The gas setting is incorrect.
- The consumables are worn and need to be replaced. For optimized performance in a mechanized application, replace the nozzle and the electrode together.
- The direction of the torch travel is incorrect. The high-quality cut is always on the right with respect to the forward motion of the torch.
- The torch-to-work distance/cut height is too large or too small.
- The cutting speed is not correct. See the cut charts under *Using the cut charts* on page 77.

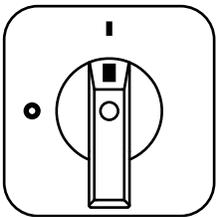
The consumable life is shortened.

- The gas setting is incorrect.
- The arc current, arc voltage, travel speed, and other variables are not set as recommended in the cut charts.
- Firing the arc in the air (beginning or ending the cut off of the plate surface). Starting at the edge is acceptable as long as the arc makes contact with the workpiece when started.
- Starting a pierce with an incorrect torch height. Refer to the cut charts for the specific initial pierce height.
- The pierce time is incorrect.
- The air quality is poor (oil or water in the air).
- There might be a faulty pilot arc IGBT, which can shorten nozzle life (refer to *Troubleshooting and System Tests* on page 109, or contact your closest Hypertherm technical service in the front of this manual).
- The swirl ring or retaining cap is worn and needs to be replaced.

Controls and indicators

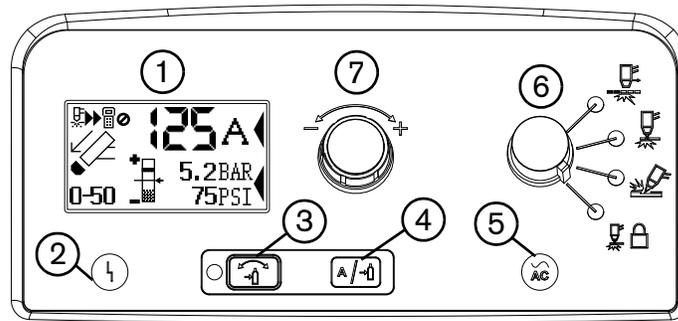
The system's controls and indicators are described in Basic System Operations on page 39. The following figures are included for reference.

Rear panel



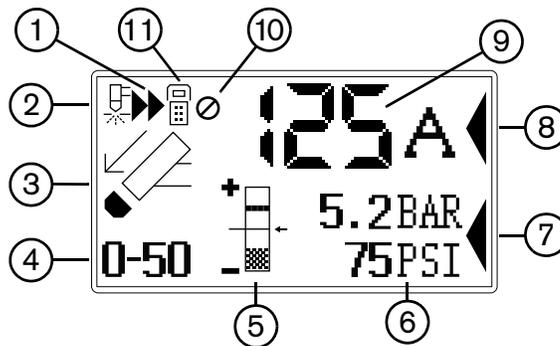
ON (I)/OFF (O) power switch – Activates the power supply and its control circuits.

Front panel



- | | |
|---|-------------------------|
| 1 Status screen | 5 Power ON LED (green) |
| 2 Fault LED (yellow) | 6 Operating mode switch |
| 3 Automatic/manual pressure setting mode selector | 7 Adjustment knob |
| 4 Current/gas selector | |

Status screen



- | | |
|---------------------------|--|
| 1 Torch is cutting | 7 Pressure selection cursor |
| 2 Torch start | 8 Current selection cursor |
| 3 Fault icon | 9 Current setting (amperage) |
| 4 Fault code | 10 Electrode end of life detection manually disabled |
| 5 Visual pressure setting | 11 Remote connected |
| 6 Pressure setting | |

Theory of operation

480 V and 600 V CSA 3-phase power supply functional description

AC power enters the system through the power switch (S1) to the input diode bridge (D38). The voltage from the bridge provides a nominal 650 VDC bus voltage for the 480 V power supply and 810 VDC bus voltage for the 600 V power supply. The bus supplies voltage and current to the inverter and the flyback circuit (DC to DC converter) on the power board (PCB3). The power board provides noise suppression and spike protection. A “soft start” is implemented by the power board resistors (RT4, RT5) and relays (K2, K3).

The inverter consists of a dual IGBT (insulated gate bipolar transistor) package (Q12), the power transformer, an output current sensor, and the control circuit. The inverter operates as a pulse-width modulated half-bridge circuit driving an isolation transformer. The output of the isolation transformer is rectified by the output bridge (D36 and D37).

The output circuitry consists of 2 current sensors located on the power board, the pilot arc IGBT (Q13), and the output choke.

The digital signal processor (PCB2) monitors and regulates the system's operation and safety circuits. The amperage adjustment knob on the control board (PCB1) sets the output current to the desired value: 30 – 125 A. The system compares this set-point to the output current by monitoring the current sensors and adjusting the output of the inverter IGBT module (Q12).

400 V CE, 380 V CCC 3-phase power supply functional description

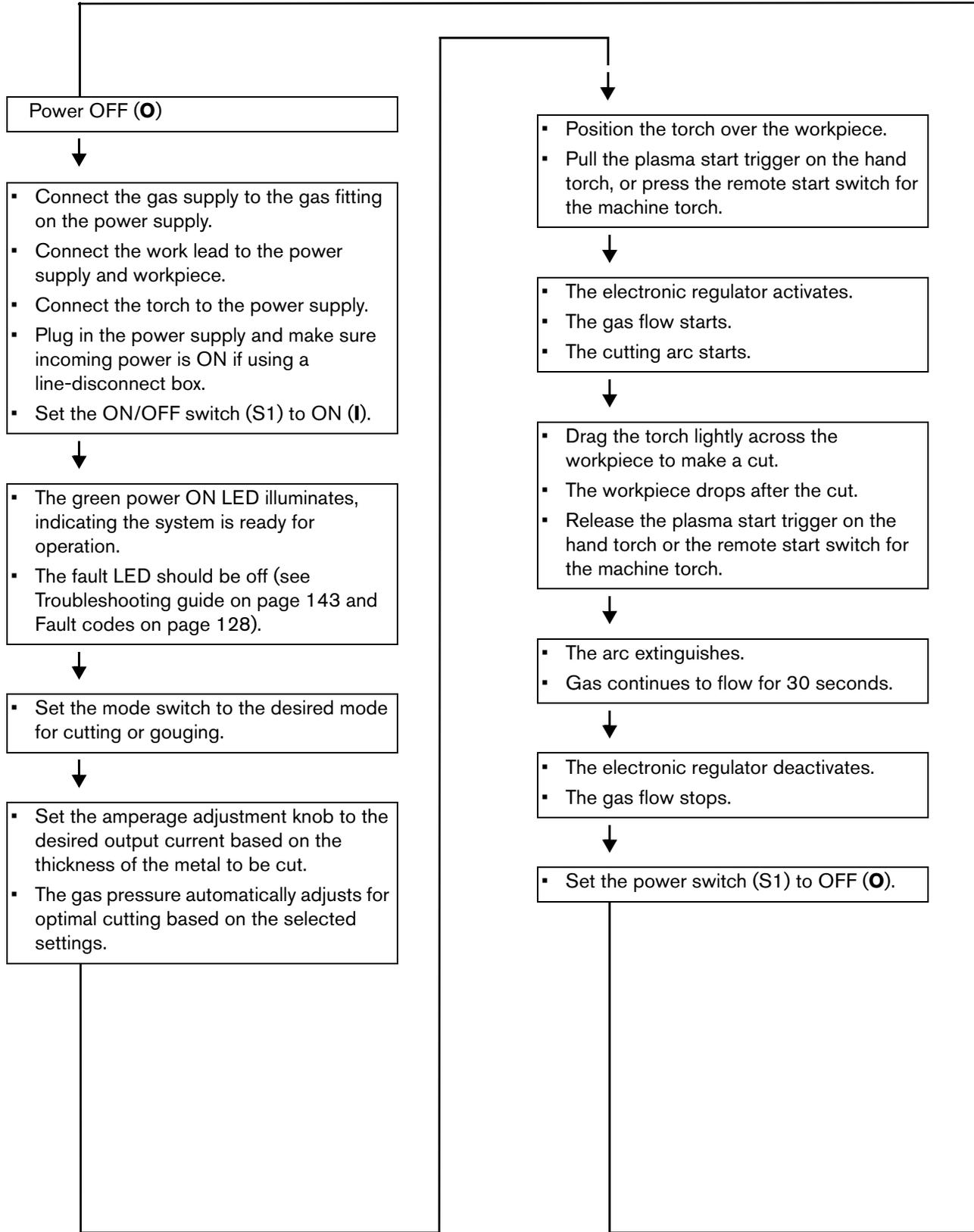
AC power enters the system through the power switch (S1) to the input diode bridge (D38). The voltage from the bridge provides a nominal 510 to 540 VDC bus voltage. The bus supplies voltage and current to the inverter and the flyback circuit (DC to DC converter) on the power board (PCB3). The power board provides noise suppression and spike protection. A “soft start” is implemented by the power board resistors (RT4, RT5) and relay (K2).

The inverter consists of a dual IGBT package (Q12), the power transformer, a current sensor, and the control circuit. The inverter operates as a pulse-width modulated half-bridge circuit driving an isolation transformer. The output of the isolation transformer is rectified by the output bridge (D36 and D37).

The output circuitry consists of 2 current sensors located on the power board, the pilot arc IGBT (Q13), and the output choke.

The digital signal processor (PCB2) monitors and regulates the system's operation and safety circuits. The amperage adjustment knob on the control board (PCB1) sets the output current to the desired value: 30 – 125 A. The system compares this set-point to the output current by monitoring the current sensors and adjusting the output of the inverter IGBT module (Q12).

Sequence of operation



Troubleshooting preparation

The complexity of the system circuits requires that service technicians have a working knowledge of inverter power supply theory. In addition to being technically qualified, technicians must perform all testing with safety in mind.

If questions or problems arise during servicing, call the Hypertherm Technical Services team listed in the front of this manual.

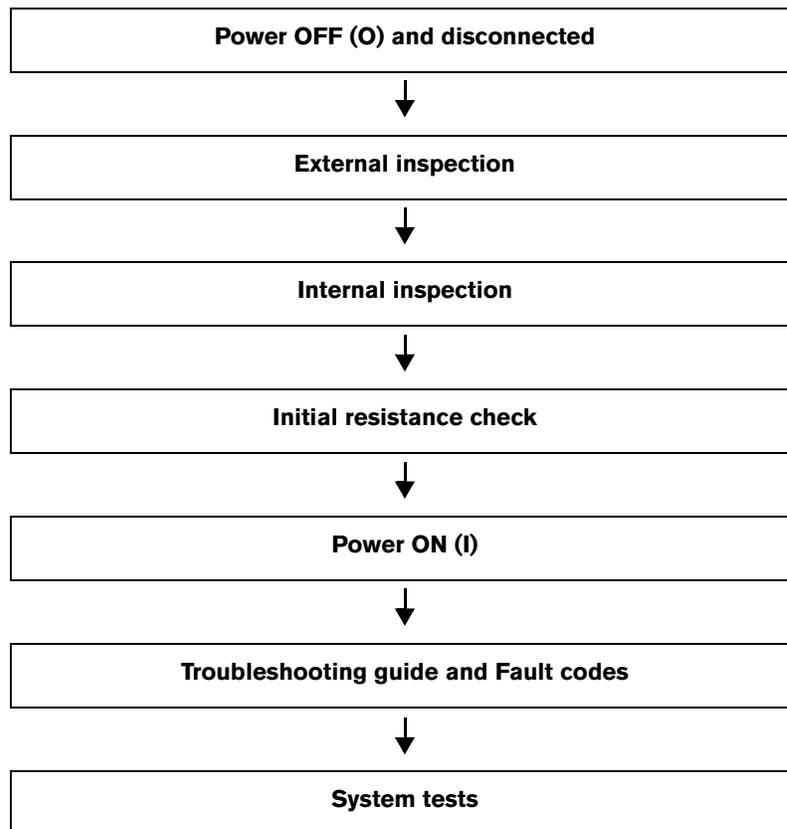
Test equipment

- Multimeter
- IGBT tester (128883)

Troubleshooting procedures and sequence

When performing the troubleshooting procedures, refer to:

- *Safety and Compliance Manual* (80669C) for detailed safety information.
- Power Supply Component Replacement on page 165 or Torch Component Replacement on page 269.
- Troubleshooting and System Tests on page 109.
- Wiring Diagrams on page 321.



After the problem has been located and repaired, refer to Sequence of operation on page 112 to test the power supply for proper operation.

	<p>WARNING!</p>
	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power and remove the input power plug from its receptacle before removing the cover from the power supply. If the power supply is connected directly to a line disconnect box, switch the line disconnect to OFF (O). 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.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.</p> <p>Do not attempt to repair the power board or control board. Do not cut away or remove any protective conformal coating from either board. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the power supply to cool before servicing.</p>
	<p>MOVING BLADES CAN CAUSE INJURY</p> <p>Keep hands away from moving parts.</p>
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>

External inspection

1. Inspect the exterior of the power supply for damage to the cover and external components, such as the power cord and plug.
2. Inspect the torch and the torch lead for damage.
3. Inspect the consumables for damage or wear.
4. Repair or replace components as necessary.

Internal inspection

1. Turn OFF (O) the power, disconnect the electrical power, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See Remove the power supply cover on page 174.)
3. Remove the component barrier. (See Remove the component barrier on page 175.)
4. Inspect the inside of the power supply, especially on the side with the power board. Look for broken or loose wiring connections, burn and char marks, damaged components, and so on.
5. Repair or replace components as necessary.

Initial resistance check

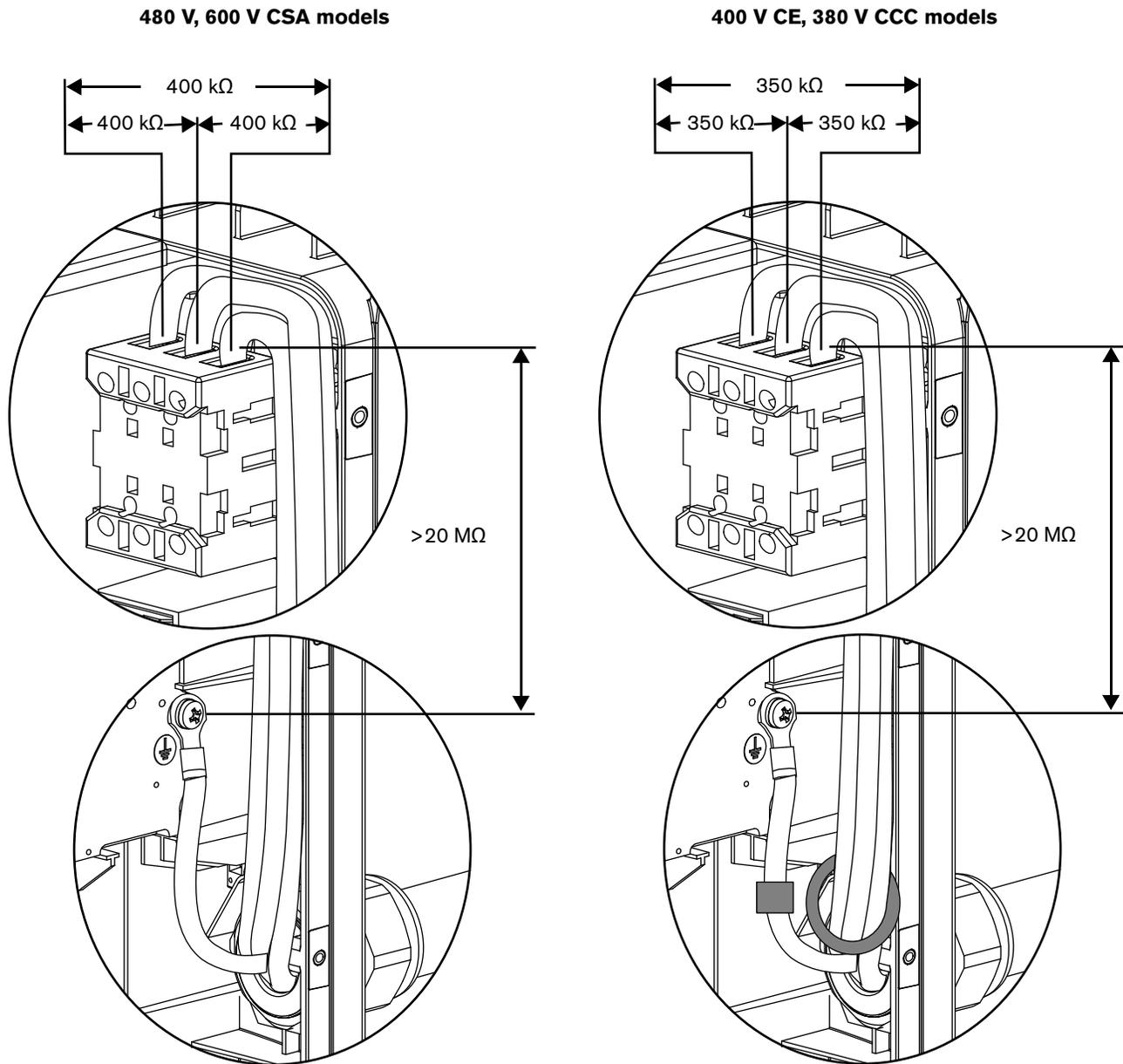
All resistance values must be taken with the power cord disconnected and all internal power supply wires attached. Perform the steps in Internal inspection (above) before continuing in this section.

- The type of multimeter you use significantly affects the results of the tests in this section. The resistance values in this manual are intended as a general reference point.
- If resistance values indicate a problem based on the range of values provided in this section, isolate the problem by removing wires attached to the resistance check points or component until the problem is found.
- After the problem is located and repaired, see Sequence of operation on page 112 to test the power supply for proper operation.

Check the power switch

1. Set power switch to OFF (O), disconnect the electrical power and torch, and then set the power switch (S1) to ON (I).
2. Check the resistance across the input leads (the leads are labeled L1, L2, and L3 on the power switch).
 - 480 V CSA, 600 V CSA: resistance across the input leads = 400 k Ω .
 - 400 V CE, 380 V CCC: resistance across the input leads = 350 k Ω .

Figure 5 – Power switch resistance



CE models have a ferrite core installed over the ground wire and over the power wires. CSA models do not have ferrite cores. CCC models do not ship with a power cord.

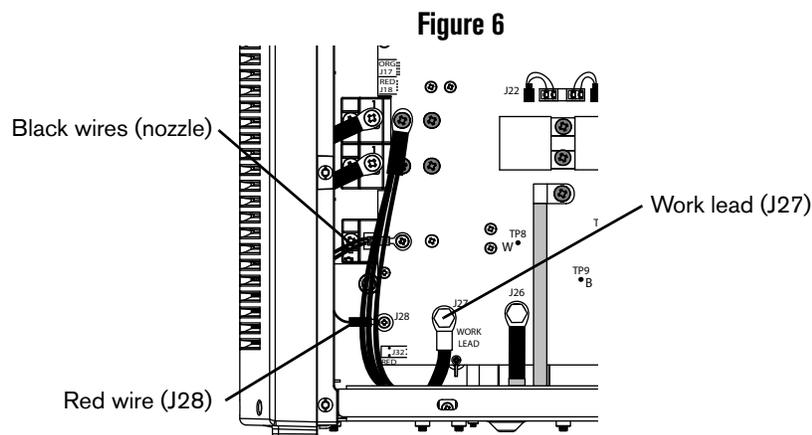
3. Check the resistance from the input leads to ground to verify that it reads as open. For all power supplies, the resistance from input to ground should read as $> 20 \text{ M}\Omega$.

 With the power disconnected and the ON/OFF switch (S1) set to OFF (O), all circuits should read as open.

 The electrical values shown are $\pm 50\%$. However, this range is intended only for reference. Resistance values can vary widely depending on the type of multimeter and the polarity used to measure the readings.

4. Check the output resistance for the values shown in the table.

Measure resistance from	All models with the torch removed
Work lead (J27) to nozzle (black wires)	230 k Ω
Work lead (J27) to electrode (red wire)	9 k Ω
Electrode (red wire) to nozzle (black wires)	230 k Ω
Output to ground (not shown)	$>20 \text{ M}\Omega$



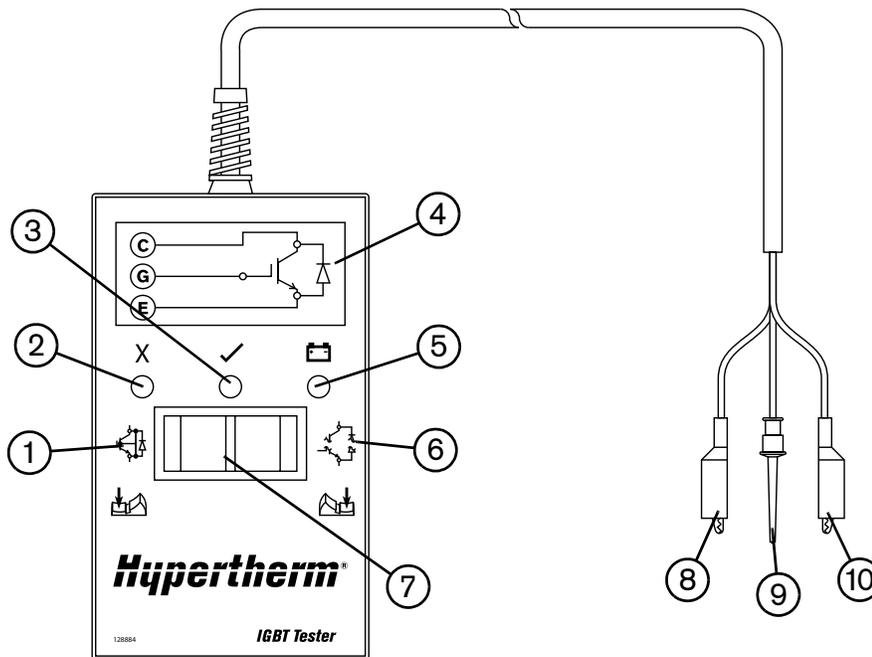
If no problems were found during the visual inspection or the initial resistance check, and the power supply still does not operate correctly, see the Troubleshooting guide on page 143.

 The Troubleshooting guide on page 143 provides most probable causes and solutions. Study the Powermax125 schematic diagram on page 323 and understand the Theory of operation on page 111 before troubleshooting. Before purchasing any major replacement component, verify the problem with Hypertherm Technical Service or the nearest Hypertherm repair facility.

Hypertherm IGBT tester

Use the Hypertherm IGBT tester (128883) as described in the following sections, or assemble your own IGBT tester from the schematic diagram shown in Figure 10 on page 123 and use it to test the IGBTs.

Figure 7



- 1 Test for shorted IGBT
- 2 Fail LED (red)
- 3 Pass LED (green)
- 4 Circuit diagram
- 5 Low battery LED (red)

- 6 Test for open IGBT
- 7 Rocker switch
- 8 Collector (red)
- 9 Gate (yellow)
- 10 Emitter (black)

Indicator LEDs and device tests

-  Green “pass” LED
When illuminated, this LED indicates that the IGBT passed the test for an open IGBT when the switch is pressed to the right or for a short-circuited IGBT when the switch is pressed to the left.
-  Red “fail” LED
When illuminated, this LED indicates that the IGBT failed the test for an open IGBT when the switch is pressed to the right or for a short-circuited IGBT when the switch is pressed to the left.
-  Red “low battery” LED
When illuminated, this LED indicates that the remaining voltage in the battery is insufficient to power the test circuitry. Replace the battery.

 The Hypertherm IGBT tester requires a minimum of 8 V to power its circuitry properly.

IGBT test preparation

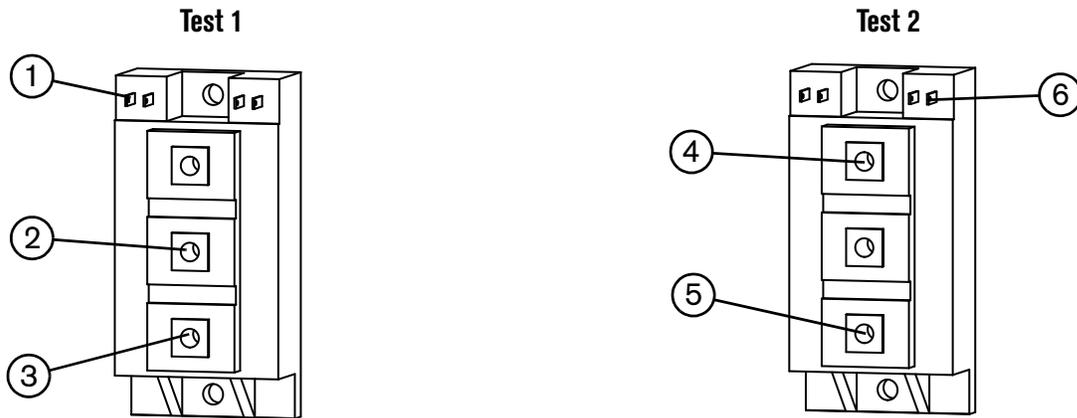
Before testing with the Hypertherm IGBT tester, connect the colored leads to the IGBT as shown in Figure 8 and Figure 9.

 Before an IGBT can be tested, it must be electrically isolated from all circuits. If the IGBT is installed in a power supply, remove the power board and any lead connections before testing. (See Remove the power board on page 207.)

	CAUTION!
Failure to isolate the IGBT may result in false readings and/or damage to the IGBT tester.	

Figure 8 and Figure 9 depict 3 common configurations of an IGBT. Each connection on the IGBT will be labeled with an abbreviation.

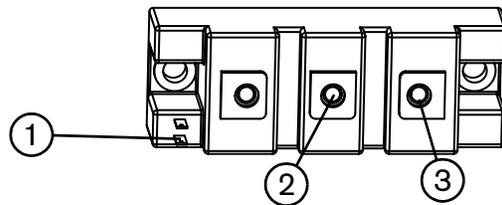
Figure 8 – IGBT, inverter tests



- 1 Yellow lead Gate ("G2" or "6")
- 2 Black lead Emitter ("E2" or "2")
- 3 Red lead Collector ("C2E1" or "1")

- 4 Red lead Collector ("C1" or "3")
- 5 Black lead Emitter ("C2E1" or "1")
- 6 Yellow lead Gate ("G1" or "4")

Figure 9 – IGBT, pilot arc



- 1 Yellow lead Gate 2 ("G2" or "6")
- 2 Black lead Emitter 2 ("E2" or "2")

- 3 Red lead Collector 2 ("C2" or "1")

IGBT device test using the Hypertherm tester

Using the Hypertherm IGBT tester, press and hold the switch in the desired position to perform each test described in the following table.

Switch Position	LED			This may mean	Corrective action
	Fail	Pass	Battery		
Left	X	-	-	IGBT is short-circuited	Replace IGBT
Left	-	X	-	IGBT passed the short-circuit test	None
Left	-	-	X	Battery below 8 V	Replace battery
Left	-	-	-	Dead battery	Replace battery
Right	X	-	-	IGBT is open	Replace IGBT
Right	-	X	-	IGBT passed the open test	None
Right	-	-	X	Battery below 8 V	Replace battery
Right	-	-	-	Dead battery	Replace battery

Troubleshoot the Hypertherm IGBT tester

1. Inspect the leads and the IGBT tester for damage.
2. Verify that the battery voltage is greater than 8 V.
3. Test the IGBT Tester itself as shown in the following table. If the results do not match the table, replace the lead connections.

Connect leads	 Short test	 Open test
None	Pass	Fail
Red to Black	Fail	Pass

IGBT device test using a non-Hypertherm tester

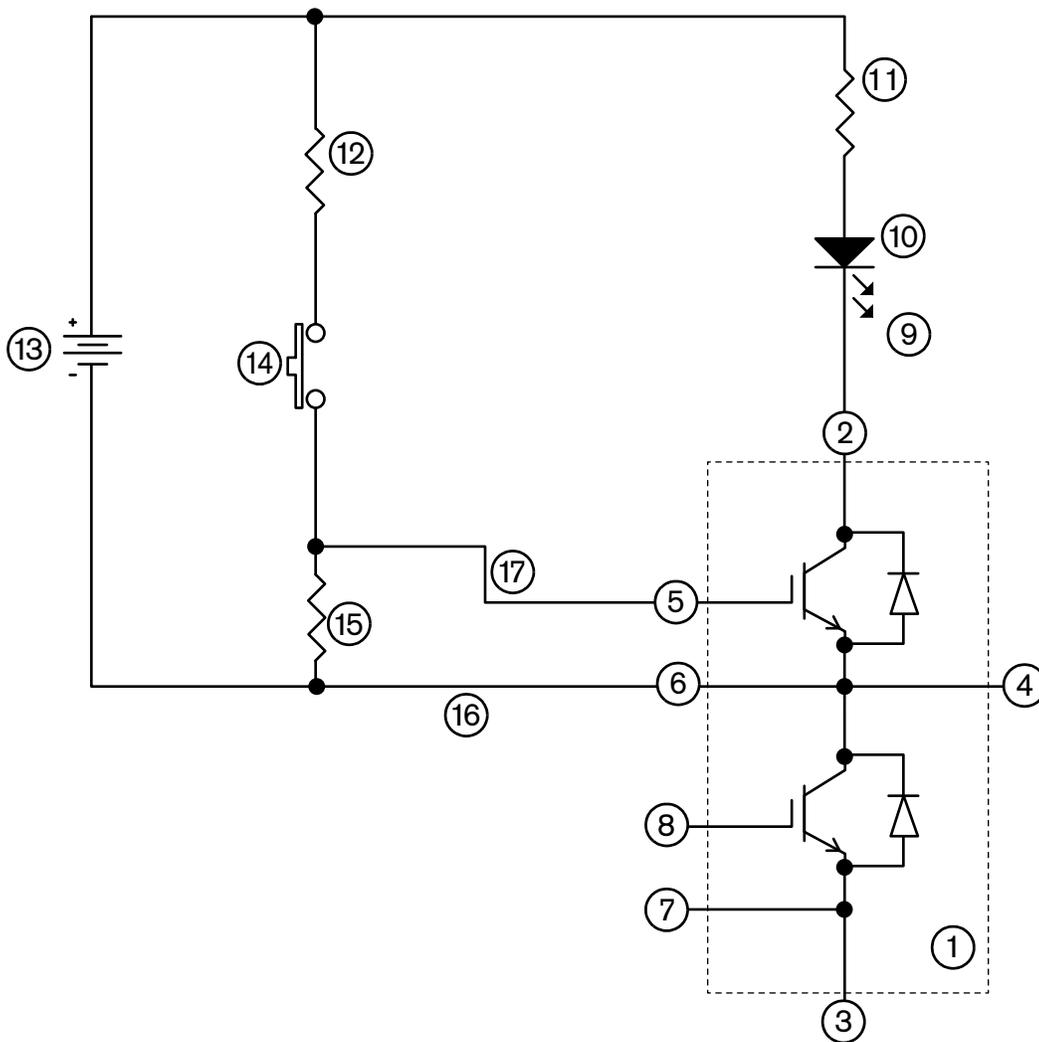
The device tester shown in Figure 10 on page 123 has 1 LED and 1 push-button switch that are used in combination to perform 2 tests.



Before an IGBT can be tested, it must be electrically isolated from all circuits. If the IGBT is installed in a power supply, remove the power board and any lead connections before testing.

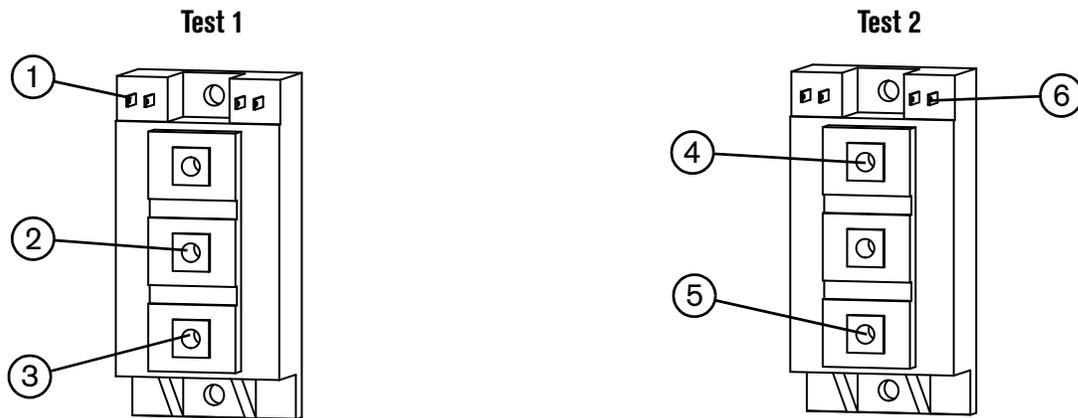
1. Inspect the IGBT for cracks or black marks. If it is damaged, replace the IGBT.
2. Verify that the 9 V battery reads greater than 8.0 V.
3. Connect the test leads as shown in Figure 10.
4. With the test leads connected and without pressing the push-button switch, the LED should not illuminate. If the LED is illuminated, then the IGBT is shorted. Replace the IGBT.
5. With the test leads connected, press the push-button switch. This time, the LED should illuminate. If the LED does not illuminate, then the IGBT is open. Replace the IGBT.

Figure 10 – Schematic for building an IGBT tester



- | | | | |
|---|---|----|----------------------------------|
| 1 | IGBT module to be tested (inside the dashed line) | 10 | D1 Red LED lamp (109092) |
| 2 | Collector ("C1" or "3") | 11 | R3 2.0K (009036) |
| 3 | Emitter ("E2" or "2") | 12 | R4 2.0K (009036) |
| 4 | Collector, Emitter ("C2E1" or "1") | 13 | 9 VDC battery |
| 5 | Gate ("G1" or "4") | 14 | Normally open push-button switch |
| 6 | Emitter ("E1" or "5") | 15 | R1 3.01M (009464) |
| 7 | Emitter ("E2" or "2") | 16 | Black minigrabber test clip |
| 8 | Gate ("G2" or "6") | 17 | Yellow minigrabber test clip |
| 9 | Red minigrabber test clip | | |

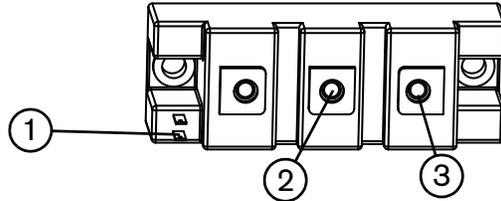
Figure 11 – IGBT, inverter tests



- 1 Yellow lead Gate (“G2” or “6”)
- 2 Black lead Emitter (“E2” or “2”)
- 3 Red lead Collector (“C2E1” or “1”)

- 4 Red lead Collector (“C1” or “3”)
- 5 Black lead Emitter (“C2E1” or “1”)
- 6 Yellow lead Gate (“G1” or “4”)

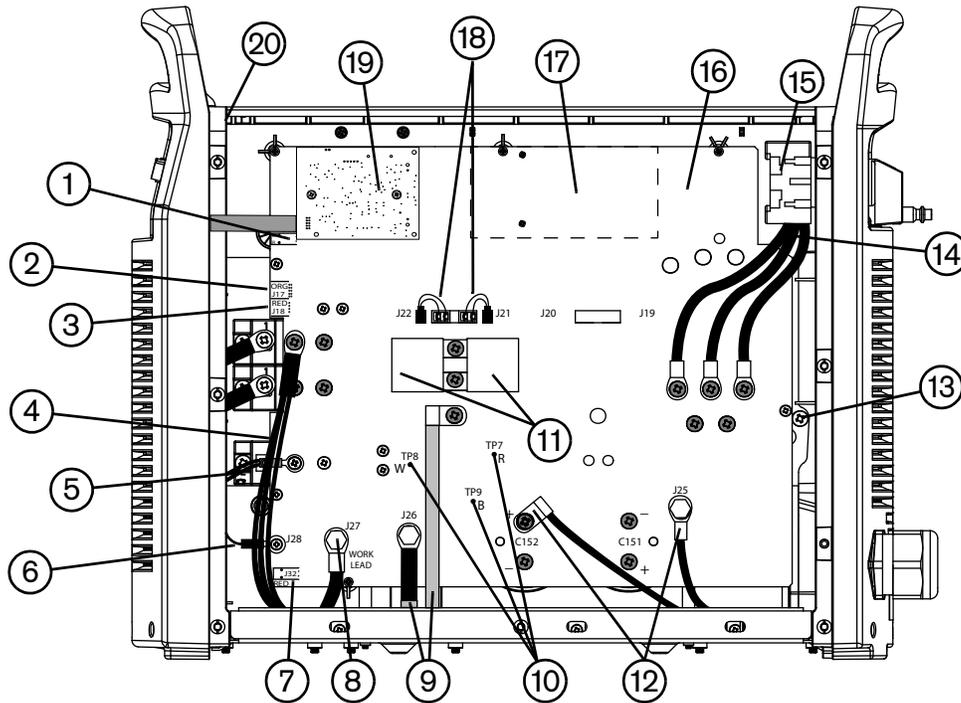
Figure 12 – IGBT, pilot arc



- 1 Yellow lead Gate 2 (“G2” or “6”)
- 2 Black lead Emitter 2 (“E2” or “2”)

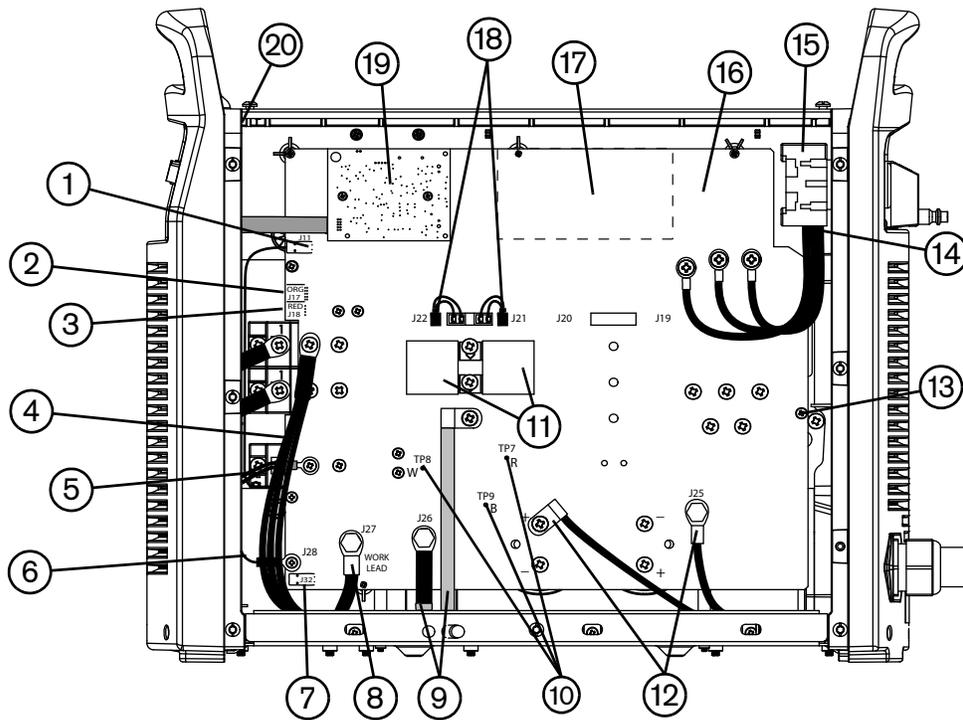
- 3 Red lead Collector 2 (“C2” or “1”)

Figure 13 – 480 V, 600 V CSA power supply overview



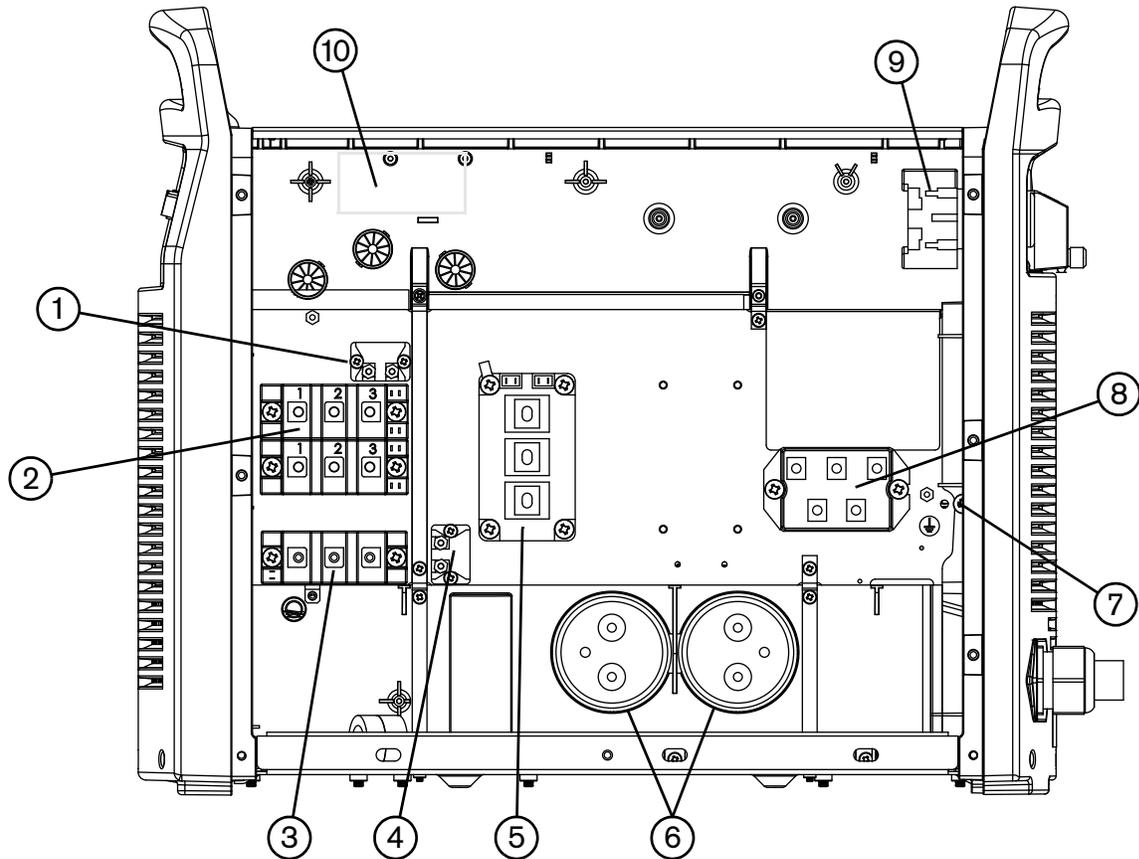
- | | |
|-------------------------|---|
| 1 J11 | 11 4 μ F Capacitors |
| 2 J17 | 12 PFC inductor wires |
| 3 J18 | 13 Ground |
| 4 Output inductor wires | 14 AC input wires |
| 5 Nozzle wires | 15 Power switch |
| 6 Electrode wire | 16 Power board |
| 7 J32 | 17 Flyback circuit |
| 8 Work lead | 18 Gate drive connectors |
| 9 Transformer wires | 19 Digital signal processor (DSP) board |
| 10 Test points | 20 Control board |

Figure 14 – 380 V CCC, 400 V CE power supply overview



- | | |
|-------------------------|---|
| 1 J11 | 11 4 μ F Capacitors |
| 2 J17 | 12 PFC inductor wires |
| 3 J18 | 13 Ground |
| 4 Output inductor wires | 14 AC input wires |
| 5 Nozzle wires | 15 Power switch |
| 6 Electrode wire | 16 Power board |
| 7 J32 | 17 Flyback circuit |
| 8 Work lead | 18 Gate drive connectors |
| 9 Transformer wires | 19 Digital signal processor (DSP) board |
| 10 Test points | 20 Control board |

Figure 15 – Power supply overview, all systems (power board removed)



- | | | | |
|---|---------------------------|----|-----------------------|
| 1 | Output snubber resistor | 6 | Bulk capacitors |
| 2 | Output diode bridge | 7 | Ground |
| 3 | Pilot arc IGBT | 8 | Input diode bridge |
| 4 | Inverter snubber resistor | 9 | Power switch (S1) |
| 5 | Inverter IGBT module | 10 | Optional serial board |

Fault codes

Fault codes displayed on the LCD screen in “service mode” are in the format *N-nn-n*. Fault codes displayed on the LCD screen in “operator mode” appear in the format *N-nn*. The tables in this section show all digits.

The fault priority is assigned based on the fault code value: the higher the number, the higher the fault priority. If more than one fault occurs at the same time, only the fault with the highest priority is shown.

Important fault icons

One of the following fault icons may appear on the LCD display in operator mode:



Warning

The system continues to operate.



Fault

The system stops cutting and is able to recover when the fault is cleared.



Error

The system needs service.

Displaying the service screen

You can view system information that aids troubleshooting by accessing the service screen. This screen displays recent fault codes, arc hours, the software version on your system, and several additional details. You can also run a gas test from this screen.

For example, if a fault code displays on the status screen (in the format *N-nn*) while you are operating the system, you can check the service screen for an additional 4-digit fault code (in the format *N-nn-n*). This 4-digit fault code will help a qualified service technician to diagnose the problem and service the system.

To display the service screen (Figure 17 on page 129), simultaneously press the automatic/manual and current/gas mode selectors for approximately 2 seconds.

Figure 16

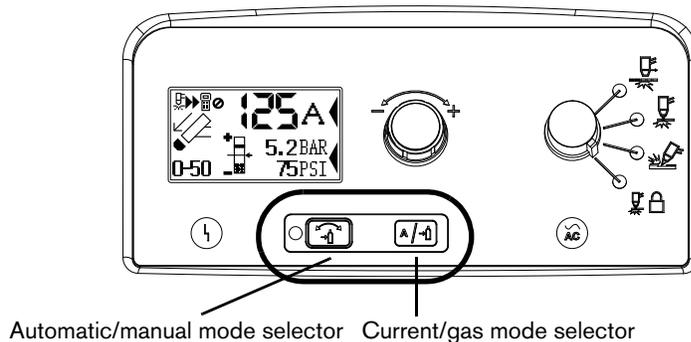
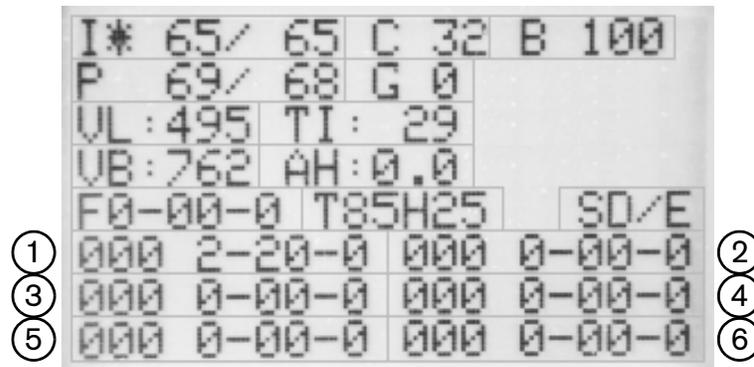


Figure 17



Designator	Description
I	Current set/read
C	LCD contrast
B	LCD brightness (percent)
P	Pressure set/read
G	Gas test enable (1)/disable (0)
VL	Incoming AC line voltage
TI	Inverter module temperature (°C)
VB	DC bus voltage
AH	Arc hours
F	Live 4-digit fault code for diagnosing system errors
T	Torch identifier (amperage/hand (H) or machine (M)/lead length in feet)
S	Control/DSP board software versions
(callouts 1 – 6)	Fault log of recent fault codes recorded by the system (0-00-0) and the last 3 digits of the arc hour count when the fault occurred (000). Callout 1 is the most recent fault code.

 Fault codes beginning with zero (0-*nn-n*) are not recorded in the fault log.

To move the field selector (*) between fields, press the current/gas mode selector. The asterisk indicates the selected field. You can alter the I, C, B, P, and G fields by turning the adjustment knob.

To toggle between (I) Current set/read and (P) Pressure set/read, press the automatic/manual mode selector. The LED is illuminated when the Pressure set/read field is selected.

To exit the service screen, simultaneously press the automatic/manual and current/gas mode selectors. The operator screen displays.

Run a gas test

Gas test mode is referenced in the system tests. The following procedure describes how to put your power supply into gas test mode.

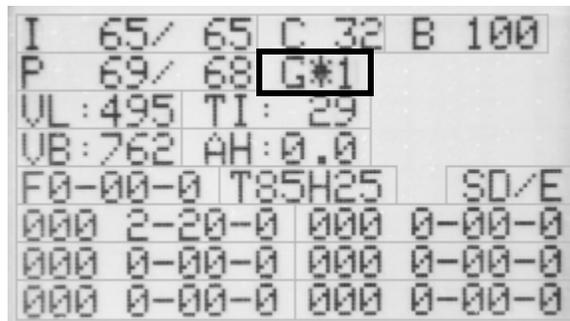


WARNING!

Point the torch away from you before performing a gas test. Always keep hands, clothes, and objects clear of the torch tip, and never point the torch toward yourself or others.

1. Display the service screen by simultaneously pressing the automatic/manual and current/gas mode selectors for approximately 2 seconds.
2. Select the gas test field by pressing the current/gas mode selector until the asterisk (*) is next to the "G." (See Figure 18.)
3. Use the adjustment knob to set the gas test field from 0 to 1.

Figure 18



4. Use the adjustment knob to set the gas test field back to 0.
5. Simultaneously press the automatic/manual and current/gas mode selectors to exit the service screen.

Perform a cold restart

Sometimes a “cold restart” clears the fault. When a cold restart is recommended in one of the Solutions below, do the following:

1. Power OFF the machine.
2. Wait 30 seconds or until the red LED near the top of the DSP board blinks once.
3. Power ON the machine.

Fault codes and solutions

Each table below describes a fault category and suggests solutions for each fault code. Several of the fault solutions show a test number. Refer to System tests on page 149 to perform the indicated numbered test.



If a fault occurs while using a generator, turning the power switch quickly to OFF and then to ON again (sometimes called a “quick reset”) may not clear the fault. Instead, see Perform a cold restart on page 131.

Fault code format – 0-00-0

This fault code indicates normal operations.

0-00-0					
Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-00-0	None	On	Off	-	No errors

8 – Troubleshooting and System Tests

Fault code format – 0-*nn-n*

These fault codes identify operational faults. On the operator screen, the last digit is omitted. Display the service screen for more information on faults 11, 19, 30, 40, 60, and 99.



Fault codes beginning with zero (0-*nn-n*) are not recorded in the fault log.

0-*nn-n*

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-11-0	Remote controller cut mode invalid. Valid remote cut modes for Powermax125: 1 – Normal; 2 – CPA (continuous pilot arc); 3 – gouge; 5 – lock.	On	Off		<p>There is a problem with the remote controller or the software interface to the system. The system cannot interpret the cut mode, cut current, or pressure information coming from the controller.</p> <ul style="list-style-type: none"> Fix the controller. Check the interface cable.
0-11-1	Remote controller current invalid. Valid remote current settings for Powermax125 are: 30 – 125 A.				
0-11-2	Remote controller pressure invalid. Valid remote pressure setting for Powermax125 depends on the torch.				
0-12-1	Output gas pressure low	On	Off		<ul style="list-style-type: none"> Adjust the gas inlet pressure as needed. Check for kinked or blocked air lines. Perform Test 10 – Pressure sensor on page 163.
0-12-2	Output gas pressure high				
0-12-3	Output gas pressure unstable				
0-13-0	AC input unstable (line resonance): Alert	Blinks (3 Hz)	Off		<ul style="list-style-type: none"> Perform a cold restart. If the fault does not clear, correct the power source. Change the character, generally the impedance, of the line.

0-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-19-9	<p>Power board hardware protection. One or more major power board hardware faults (or electrical noise) detected: Alert.</p> <p>Fault 0-19-9 can occur 3 to 10 times before becoming a 0-99 fault.</p> <p>If fault code 0-19 appears upon power-up, wait 1 minute to see if fault code 0-99 appears. This could indicate a faulty auxiliary switch.</p>	On	On		<p>The inverter shuts down and does not fire again for several seconds. If the fault is caused by electrical noise, the fault clears in a few seconds and the machine operates normally.</p> <p>If a true fault continues to occur, the 0-99 fault code appears on the operator screen:</p> <ul style="list-style-type: none"> ▪ Access the fault log in the service screen to identify the major fault. ▪ Perform Test 12 – AUX switch on page 164 if fault code 0-99 occurs after fault code 0-19 displays for 1 minute.
0-20-0	<p>Low gas pressure</p> <p>The gas pressure has fallen below the minimum pressure for that process, mode, and lead length.</p>	On	On		<ul style="list-style-type: none"> ▪ Verify that the gas line is properly installed. ▪ Replace the air filter element if it is dirty. ▪ Replace the gas supply line if it is restricted. ▪ Verify that the inlet pressure is 5.9 to 9.3 bar (85 to 135 psi). <p>With proper air connected, measure the resistance between J5 pins 1 and 2.</p> <ul style="list-style-type: none"> ▪ If the circuit is shorted, replace the power board. ▪ If the circuit is open, check the cable harness between J5 and the pressure switch. If the harness is good, replace the pressure switch (228688). ▪ Perform Test 10 – Pressure sensor on page 163.

8 – Troubleshooting and System Tests

0-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-21-0	Excessive arc voltage change: check consumables, gas flow	On	On		<p>The DSP monitors the nozzle to electrode voltage and if it detects a rapid change in that voltage, the inverter shuts down. Usually this indicates a rapid loss of gas pressure from a kinked or blocked air supply line.</p> <ul style="list-style-type: none"> ▪ Correct any gas supply restrictions and restart the power supply. ▪ Check the torch lead for leaks or kinking. ▪ Verify that air flows through the electronic regulator in gas test mode. Replace the regulator if necessary. ▪ Possible faulty DSP or power board. ▪ Change the consumables. ▪ For mechanized applications, lock out the torch height control.
0-22-0	No gas input	On	On		<ul style="list-style-type: none"> ▪ Restore the gas supply. ▪ Restart the power supply. <p>With proper air connected, measure the resistance between J5 pins 1 and 2.</p> <ul style="list-style-type: none"> ▪ If the circuit is shorted, replace the power board. ▪ If the circuit is open, check the cable harness between J5 and the pressure switch. If the harness is good, replace the pressure switch (228688). ▪ Perform Test 10 – Pressure sensor on page 163.

0-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-30-0	Torch stuck open The nozzle and electrode are not touching after a start is received.	On	On		<ul style="list-style-type: none"> ▪ If incorrect consumables are installed or the consumables became loose or were removed while the power supply is ON, turn OFF the power supply, correct the problem and then turn ON the power supply to clear this fault. ▪ Inspect the torch for signs of wet or oily air. ▪ Inspect the torch for any signs of damage or pitting on the electrode contact surface. ▪ If the consumables appear to be installed correctly, the torch may be damaged. Test with a known working torch. ▪ Perform Test 6 – Torch stuck open/torch stuck closed on page 158. ▪ If the problem persists, contact your Hypertherm distributor or authorized repair facility.
0-30-1	Torch stuck closed The nozzle and electrode will not separate after a start is received. The regulator may not be functioning properly.				
0-32-0	End of consumable life (or the power supply is working in an electrically noisy environment)				

8 – Troubleshooting and System Tests

0-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-40-2	Inverter IGBT module under temperature	On	On		<p>For an over-temperature fault: (480 V CSA units > 81° C [178° F], 600 V CSA and CE/CCC units > 76° C [169° F])</p> <ul style="list-style-type: none"> ▪ Leave the machine powered ON and confirm that the fan is operating. ▪ Verify that adequate air flow around the unit. ▪ Verify that the cover is placed with the air fins on the fan side of the power supply. ▪ If the duty cycle has been exceeded, let the unit cool and work within the duty cycle limits listed in Basic System Operations on page 39. <p>For an under-temperature fault (all units < -30° C [$< -22^{\circ}$ F]):</p> <ul style="list-style-type: none"> ▪ Move the unit to a warmer location. ▪ Perform Test 4 – Inverter temperature sensor on page 154.
0-40-3	Inverter IGBT module over temperature				
0-50-0*	Retaining cap off	On	On		<ul style="list-style-type: none"> ▪ Verify that proper consumables and retaining cap are installed. Replace damaged parts. Refer to Hand Torch Setup on page 51 or Machine Torch Setup on page 67. ▪ Perform Test 8 – Torch cap switch on page 161. ▪ If the consumables appear to be installed correctly, the torch may be damaged. Test with a known working torch. ▪ After correcting the problem, perform a cold restart.

0-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-51-0*	Start/trigger signal is on at power up This situation indicates that the power supply is receiving a start signal at power-up. It is sometimes referred to as a "stuck start."	On	On		<p>If the power supply is turned on while the torch trigger is pressed, the system is disabled.</p> <ul style="list-style-type: none"> ▪ Release the trigger and cycle the power to the machine. ▪ Check for continuity between pin 6 and pin 7 of the torch connector. There should be very low resistance when the torch trigger is pulled. ▪ Test with a known working torch.
0-52-0*	Torch is not connected				
0-60-0	Phase loss	On	On		<p>Wear proper personal protection equipment when checking the voltage.</p> <ul style="list-style-type: none"> ▪ Check for proper voltage (phase to phase and phase to ground) at the power source and at the machine.
0-60-1	Under voltage				<ul style="list-style-type: none"> ▪ Increase the supply voltage.
0-60-2	Over voltage				<ul style="list-style-type: none"> ▪ Decrease the supply voltage.
0-61-0	AC input unstable: Shutdown	On	On		<ul style="list-style-type: none"> ▪ Test the machine from another AC power source. ▪ Power down and correct the line resonance problem before continuing.
0-98-0	Internal communication failure The control board and the DSP are not communicating.	On	On		<ul style="list-style-type: none"> ▪ Perform a cold restart. ▪ Confirm that the connecting ribbon cable is installed properly between the control board and the DSP board.
0-99-0	System hardware fault (service required) Indicates a major fault with the system.	On	On		<ul style="list-style-type: none"> ▪ Display the service screen. ▪ A qualified service technician must service the system. Contact your distributor or authorized repair facility.

* Perform a continuity check on the FastConnect receptacle on the power supply using the instructions in Torch-related faults – continuity check on page 142.

8 – Troubleshooting and System Tests

Fault code format – 1-nn-n

These fault codes can only be seen on the service screen.

1-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
1-00-0	Digital signal processor fault	On	On		<p>These are internal processor checks and are not likely to be caused by a hardware failure.</p> <ul style="list-style-type: none"> Perform a cold restart. <p>If that does not fix the problem, it is possible that the DSP or power board has failed.</p>
1-10-0	Analog to Digital (A/D) converter fault				
1-20-0	I/O fault				

Fault code format – 2-nn-n

These fault codes usually relate to either the DSP or the power board and can only be seen on the service screen.

2-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
2-00-0	Analog to Digital (A/D) converter value out of range	On	On		<ul style="list-style-type: none"> Perform a cold restart. <p>If that does not fix the problem, it is possible that the DSP or power board has failed.</p>
2-01-0	Auxiliary switch disconnected				<ul style="list-style-type: none"> Check the auxiliary switch cable. Perform Test 12 – AUX switch on page 164.
2-10-0	Inverter module temperature sensor open				<ul style="list-style-type: none"> Check the associated wiring. Perform Test 4 – Inverter temperature sensor on page 154.
2-10-1	Inverter module temperature sensor shorted				<p>If no problems are found, it is possible that the inverter heatsink temperature sensor assembly (228805) has failed.</p>

2-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
2-11-0	Pressure sensor is open	On	On		<ul style="list-style-type: none"> ▪ Check the associated wiring. ▪ Perform Test 10 – Pressure sensor on page 163. ▪ If necessary, replace the pressure sensor (228689).
2-11-1	Pressure sensor is shorted				
2-20-0*	Torch ID The DSP does not recognize the torch.				

* Perform a continuity check on the FastConnect receptacle on the power supply using the instructions in Torch-related faults – continuity check on page 142.

Fault code format – 3-nn-n

These fault codes can only be seen on the service screen.

3-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
3-10-0	Fan speed The fan speed is below the minimum speed.	On	On		<ul style="list-style-type: none"> ▪ Clean the fan assembly. ▪ Perform Test 11 – Fan on page 164.
3-10-1	Fan				<ul style="list-style-type: none"> ▪ Check the associated wiring. ▪ Perform Test 11 – Fan on page 164. ▪ If necessary, replace the fan assembly.
3-20-0	Fill valve Indicates that the fill valve is not connected.				<ul style="list-style-type: none"> ▪ Check the associated wiring. ▪ Perform Test 9 – Electronic regulator on page 162. ▪ If necessary, replace the electronic regulator (228687).

8 – Troubleshooting and System Tests

3-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
3-20-1	Dump valve Indicates that the dump valve is not connected.	On	On		<ul style="list-style-type: none"> Check the associated wiring. Perform Test 9 – Electronic regulator on page 162. If necessary, replace the electronic regulator (228687).
3-20-2	Valve ID				<p>The DSP does not recognize the electronic regulator.</p> <ul style="list-style-type: none"> Check the harness from the regulator to J6.
3-20-3	Electronic regulator is disconnected The electronic regulator is not drawing current.				<ul style="list-style-type: none"> Inspect the associated wiring, particularly the 7-pin connector at J6 on the power board. If necessary, replace the electronic regulator (228687).
3-41-0	Drive fault	On	On		If an activation signal is sent to a device and the device does not activate (machine motion relay or in-rush relay for example) this fault will occur.
3-42-0	5 or 24 VDC fault				<p>The 5 or 24 VDC supply from the flyback circuit is out of range.</p> <p>Perform Test 5 – Flyback circuit (DC minor voltages) on page 156.</p>
3-42-1	Driver voltage fault				<p>The 18 VDC supply from the flyback circuit is out of range.</p> <ul style="list-style-type: none"> Replace the power board. Check the inverter IGBT module and replace if necessary.

3-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
3-43-0	Inverter capacitors unbalanced	On	On		<ul style="list-style-type: none"> ▪ Voltage across one or both inverter capacitors is more than 25% different than nominal. <p>480 V CSA units Bus voltage is 650 VDC. Nominal is 325 VDC for each capacitor. Fault condition: < 235 or > 415 VDC across either capacitor.</p> <p>600 V CSA units Bus voltage is 810 VDC. Nominal is 405 VDC for each capacitor. Fault condition: < 295 or > 515 VDC across either capacitor.</p> <p>400 V CE units Bus voltage is 540 VDC. Nominal is 270 VDC for each capacitor. Fault condition: < 200 or > 360 VDC across either capacitor.</p> <p>380 V CCC units Bus voltage is 510 VDC. Nominal is 255 VDC for each capacitor. Fault condition: < 200 or > 360 VDC across either capacitor.</p> <ul style="list-style-type: none"> ▪ Test the IGBT module. ▪ Replace the bulk capacitors.

8 – Troubleshooting and System Tests

3-nn-n

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
3-51-1	Inverter saturation fault (the inverter is over current)	On	On		<p>Upper and lower inverter IGBTs are being activated in phase rather than 180° out of phase.</p> <ul style="list-style-type: none"> ▪ Test the 2 inverter IGBTs in the module. ▪ Perform Test 3 – Output diodes on page 154. ▪ Replace the module if either is faulty. ▪ If necessary, replace the power board.
3-52-0	Shoot through				
3-60-0	Power board	On	On		<p>The DSP does not recognize the power board. The code is for future machines where the current DSP board will not work with future power boards.</p>
3-70-0	Internal serial communications fault				<p>There is a fault with the communication between the DSP and power board.</p> <ul style="list-style-type: none"> ▪ Check the board connector. ▪ If necessary, replace either the DSP or power board.

Torch-related faults – continuity check

Check for continuity between the following points:

Torch FastConnect receptacle	J17 on the power board
5	1
7	2
6	3
8	4
9	5
10	6
11	7
12	8



If there is no continuity between any 2 test points, replace the torch FastConnect receptacle.

Troubleshooting guide



Fault icons and corresponding fault codes appear in the user display for many errors. If a fault code appears, refer to Fault codes on page 128 before using this troubleshooting guide.

The following table provides an overview of the most common problems that can arise when using the Powermax and explains how to solve them. See System tests on page 149 for detailed test procedures.

Problem	Meaning	Causes	Solution
The ON/OFF power switch is set to ON (I), but the power ON LED is not illuminated.	There is insufficient voltage to the control circuits or a short-circuited power component.	<ul style="list-style-type: none"> No voltage, improper voltage applied to the unit, a faulty power switch (S1), or a faulty input diode. 	<ul style="list-style-type: none"> Check to see that the system is plugged into an appropriately-sized circuit and that the circuit breaker has not been tripped. Verify that the power is ON at the main power panel or at the line-disconnect switch box. Verify that the line voltage is not too low (more than 15% below the rated voltage). Perform Test 1 – Voltage input on page 150 to check the incoming voltage and the power switch. Perform Test 12 – AUX switch on page 164.
		<ul style="list-style-type: none"> Faulty power board, fan, or solenoid valve. 	<ul style="list-style-type: none"> Perform Test 5 – Flyback circuit (DC minor voltages) on page 156.
		<ul style="list-style-type: none"> Faulty power board or IGBT. 	<ul style="list-style-type: none"> Perform Test 1 – Voltage input on page 150, Test 2 – DC power bus on page 152, and Test 3 – Output diodes on page 154 and replace any faulty components.
		<ul style="list-style-type: none"> Faulty control board. 	<ul style="list-style-type: none"> Replace the control board.
The power ON LED is illuminated and no fault codes are displayed, but no gas flows when the torch trigger is pulled.	The start signal is not reaching the control board.	<ul style="list-style-type: none"> The torch or torch lead may be damaged. 	<ul style="list-style-type: none"> Inspect the torch and torch lead for damage. Verify that the start icon appears on the LCD screen when the trigger is pulled. If it does not, perform Test 7 – Start signal on page 160 to check the start signal from the power board.
		<ul style="list-style-type: none"> The power board may be faulty. The control board may be faulty. 	

8 – Troubleshooting and System Tests

Problem	Meaning	Causes	Solution
Power ON LED blinks or goes out while cutting.	A power component is shorted.	▪ Faulty fan.	▪ Perform Test 11 – Fan on page 164.
		▪ Faulty power board or IGBT.	▪ Perform Test 1 – Voltage input on page 150, Test 2 – DC power bus on page 152, or Test 3 – Output diodes on page 154.
		▪ Faulty DSP board.	
The arc does not transfer to the workpiece.	Poor continuity exists between the work lead and the workpiece.	<ul style="list-style-type: none"> ▪ The workpiece is dirty. ▪ The ground clamp is damaged. ▪ The pierce height distance is too large. 	<ul style="list-style-type: none"> ▪ Clean the area where the ground clamp contacts the workpiece to allow a good metal-to-metal connection. ▪ Inspect the ground clamp for damage, and repair as necessary. ▪ The pierce height distance may be too large. Move the torch closer to the workpiece and fire the torch again.
Gas flows from the torch at power-up when neither the torch trigger nor a remote start is activated.	The electronic regulator, power board, or control board is faulty.	<ul style="list-style-type: none"> ▪ Faulty electronic regulator. ▪ Faulty power board. ▪ Faulty DSP board. 	▪ Perform Test 9 – Electronic regulator on page 162.
	The incoming gas pressure is too high.	▪ The gas pressure from the compressor or cylinder may be too high.	▪ Check the gas supply to make sure that it does not exceed 9.3 bar (135 psi). If necessary, reduce the pressure.

Problem	Meaning	Causes	Solution
When pressing the torch trigger or start switch, gas flows from the torch, but the torch does not fire or fires for only a short duration.	Worn or damaged consumables.	<ul style="list-style-type: none"> ▪ Overused or improperly installed consumables. 	<ul style="list-style-type: none"> ▪ Replace consumables.
		<ul style="list-style-type: none"> ▪ Oil, moisture, or contaminants in the gas supply line. 	<ul style="list-style-type: none"> ▪ Replace the air filter element. ▪ Add appropriate filtration and purge the lines with nitrogen to flush out oil and moisture.
	Damaged torch or lead assembly.	<ul style="list-style-type: none"> ▪ Electrode is not moving properly in the torch, or the torch lead is damaged. 	<ul style="list-style-type: none"> ▪ Perform Test 6 – Torch stuck open/torch stuck closed on page 158.
	Insufficient or excessive gas flow.	<ul style="list-style-type: none"> ▪ Gas pressure is too high or too low, or the gas supply is leaking or restricted. 	<ul style="list-style-type: none"> ▪ Verify that the inlet pressure is 5.9 to 9.3 bar (85 to 135 psi). ▪ Repair air leaks or restrictions. ▪ Manually adjust the gas pressure on the power supply.
	Poor air quality.	<ul style="list-style-type: none"> ▪ Air filter element is dirty. ▪ Oil, moisture, or contaminants in the gas supply line. 	<ul style="list-style-type: none"> ▪ Replace the air filter element. ▪ Add appropriate filtration and purge the lines with nitrogen to flush out oil and moisture.
	Insufficient input power.	Undersized electrical supply installation. <ul style="list-style-type: none"> ▪ Breaker or fuse. ▪ Supply wire. ▪ Extension cord. 	<ul style="list-style-type: none"> ▪ Verify that the external electrical power is installed according to Specifications on page 19.
	Faulty inverter IGBT module or power board.	<ul style="list-style-type: none"> ▪ Faulty inverter IGBT module or power board. 	<ul style="list-style-type: none"> ▪ Use an IGBT tester to check the inverter IGBT module.
	Capacitor voltage imbalance on the power board.	<ul style="list-style-type: none"> ▪ Faulty resistors on the power board or faulty bulk capacitor(s). 	<ul style="list-style-type: none"> ▪ Perform Test 1 – Voltage input on page 150, Test 2 – DC power bus on page 152, or Test 3 – Output diodes on page 154. ▪ If the voltage across the capacitors is not balanced, replace the power board.

8 – Troubleshooting and System Tests

Problem	Meaning	Causes	Solution
Arc goes out while cutting or intermittently will not fire.	The arc lost contact with the workpiece.	<ul style="list-style-type: none">▪ The work lead or work lead connection may be faulty.▪ The material being cut may require the use of continuous pilot arc mode.	<ul style="list-style-type: none">▪ If you are cutting expanded metal, grate, or any metal with holes, set the mode switch to continuous pilot arc mode.▪ Check for loose connections at the ground clamp and at the power supply.▪ Reposition the work lead on the workpiece.▪ Clean the cutting surface to allow a better connection with the work lead.
	Faulty fan.	<ul style="list-style-type: none">▪ The fan could be overloading the flyback circuit.	<ul style="list-style-type: none">▪ Perform Test 5 – Flyback circuit (DC minor voltages) on page 156 and Test 11 – Fan on page 164.

Problem	Meaning	Causes	Solution
The cut quality is poor, or the cut does not sever the metal.	<ul style="list-style-type: none"> ▪ Worn consumables ▪ Poor work lead connection ▪ Low output power from the power supply ▪ the power board is producing low current ▪ Incorrect cutting mode is selected ▪ Poor air quality 	<ul style="list-style-type: none"> ▪ The consumables need to be replaced. 	<ul style="list-style-type: none"> ▪ Inspect the consumables and replace them if necessary.
		<ul style="list-style-type: none"> ▪ The work lead may be damaged or not properly connected to the workpiece. 	<ul style="list-style-type: none"> ▪ Inspect the work lead for damage. Reposition it and clean the work surface to allow good contact.
		<ul style="list-style-type: none"> ▪ The amperage adjustment knob is set too low. 	<ul style="list-style-type: none"> ▪ Increase the amperage as needed.
		<ul style="list-style-type: none"> ▪ The power board may be faulty. 	<ul style="list-style-type: none"> ▪ Perform Test 1 – Voltage input on page 150, Test 2 – DC power bus on page 152, and Test 3 – Output diodes on page 154 and replace any faulty components.
		<ul style="list-style-type: none"> ▪ The cutting mode switch is in the wrong position for the cutting operation. 	<ul style="list-style-type: none"> ▪ Verify that the cutting mode switch is in the correct position.
		<ul style="list-style-type: none"> ▪ Faulty pilot arc IGBT. 	<ul style="list-style-type: none"> ▪ 1) Turn the power OFF, 2) remove the consumables, and 3) check the resistance between the cathode and the ground clamp. ▪ If the resistance is less than 5 kΩ, check the resistance across the pilot arc IGBT. If that resistance is less than 5 kΩ, replace the pilot arc IGBT.
		<ul style="list-style-type: none"> ▪ Air filter element is dirty. ▪ Oil, moisture, or contaminants in the gas supply line. 	<ul style="list-style-type: none"> ▪ Replace the air filter element. ▪ Add appropriate filtration, and purge the lines with nitrogen to flush out oil and moisture.
While in continuous pilot arc mode, the pilot arc extinguishes when you move the plasma arc off the workpiece while still pulling the torch's trigger.	The continuous pilot arc feature is not working.	<ul style="list-style-type: none"> ▪ The mode switch may be set incorrectly. 	<ul style="list-style-type: none"> ▪ Verify that the mode switch is set to continuous pilot arc.
		<ul style="list-style-type: none"> ▪ The power board or the DSP board may be faulty. 	<ul style="list-style-type: none"> ▪ Perform Test 1 – Voltage input on page 150, Test 2 – DC power bus on page 152, and Test 3 – Output diodes on page 154 and replace the power board or DSP board if necessary.

8 – Troubleshooting and System Tests

Problem	Meaning	Causes	Solution
The arc extinguishes, but re-ignites when the torch trigger is pressed again.	The consumables are worn or damaged, the air filter element is contaminated, or the input gas pressure is not at the proper level.	<ul style="list-style-type: none"> The consumables need to be replaced. 	<ul style="list-style-type: none"> Replace the consumables as needed.
		<ul style="list-style-type: none"> The air filter element needs to be replaced. 	<ul style="list-style-type: none"> Replace the air filter element if it is contaminated.
		<ul style="list-style-type: none"> The gas pressure is too high or too low. 	<ul style="list-style-type: none"> Manually adjust the gas pressure as needed.
The arc sputters and hisses.	The air filter element is contaminated, or the input gas line contains moisture.	<ul style="list-style-type: none"> The air filter element needs to be replaced. 	<ul style="list-style-type: none"> Replace the air filter element if it is contaminated.
		<ul style="list-style-type: none"> The input gas supply needs to be cleaned. 	<ul style="list-style-type: none"> Inspect the gas line for moisture. If necessary, install or repair the gas filtration to the power supply. See Power Supply Setup on page 29.
Machine does not cut well (does not appear to be cutting at full cutting power) and the arc does not time out after 5 seconds.	Inadequate ground.	<ul style="list-style-type: none"> Poor work lead connection. 	<ul style="list-style-type: none"> Verify that the work lead is attached to the workpiece and the workpiece is free of rust, paint, or other coatings.
		<ul style="list-style-type: none"> Damaged work lead. 	<ul style="list-style-type: none"> Check the resistance across the work lead. If the resistance is greater than 3 Ω, repair or replace the work lead.
		<ul style="list-style-type: none"> Faulty pilot arc IGBT. 	<ul style="list-style-type: none"> 1) Turn the power OFF, 2) remove the consumables, and 3) check the resistance between the plunger and the workpiece. If the resistance is less than 5 kΩ, check the resistance across the pilot arc IGBT. If that resistance is less than 5 kΩ, replace the pilot arc IGBT.
	<ul style="list-style-type: none"> Faulty DSP board. 	<ul style="list-style-type: none"> Replace the DSP board. 	
	Low output from the power supply.	<ul style="list-style-type: none"> Current is set too low. 	<ul style="list-style-type: none"> Increase the current as needed.

System tests

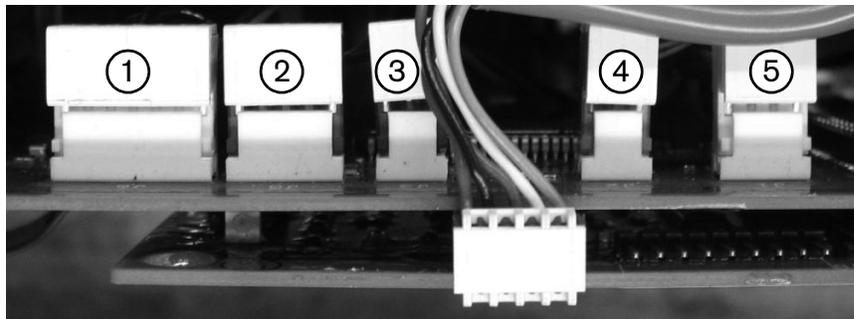
Test number	Description	Associated fault codes
1	Voltage input	0-60-ALL
2	DC power buss	3-43-0
3	Output diode bridge	General
4	Temperature out of range	0-40-ALL, 2-10-ALL
5	Flyback (DC to DC) circuit	3-00-0, 3-42-ALL, 3-43-ALL
6	Torch stuck open/closed	0-30-ALL
7	Start signal	General, 0-51-0
8	Torch cap-sensor switch	0-50-0
9	Electronic regulator	0-21-0, 3-20-ALL
10	Pressure sensor	0-12-0, 0-20-0, 2-11-ALL
11	Fan	3-10-ALL
12	Power switch auxiliary	Unreported interlock at START

Before performing any tests, complete the Internal inspection on page 115 and the resistance check in Test 2 – DC power bus on page 152. These tests should only be performed by a qualified service technician. Wear the proper personal protective equipment and use approved tools and measurement equipment.

Before purchasing a major replacement component, verify the problem with Hypertherm Technical Service or the nearest Hypertherm repair facility.

Several connectors require you to remove a white cap to access the test points. Figure 19 shows examples of connectors located at the top of the power board. You can pry off most covers with your thumbnail. However, you may need to use a small blade screwdriver to carefully pry off some of the covers. Be careful not to bend or break the connectors.

Figure 19



- | | |
|--|------------------------------------|
| 1 Electronic regulator (J6) | 4 Inverter temperature sensor (J2) |
| 2 Pressure switch/auxiliary contactor (J5) | 5 Fan (J1) |
| 3 Pressure sensor (J3) | |

8 – Troubleshooting and System Tests

Test 1 – Voltage input

Symptom: Voltage fault (0-60-0, -1 or -2)

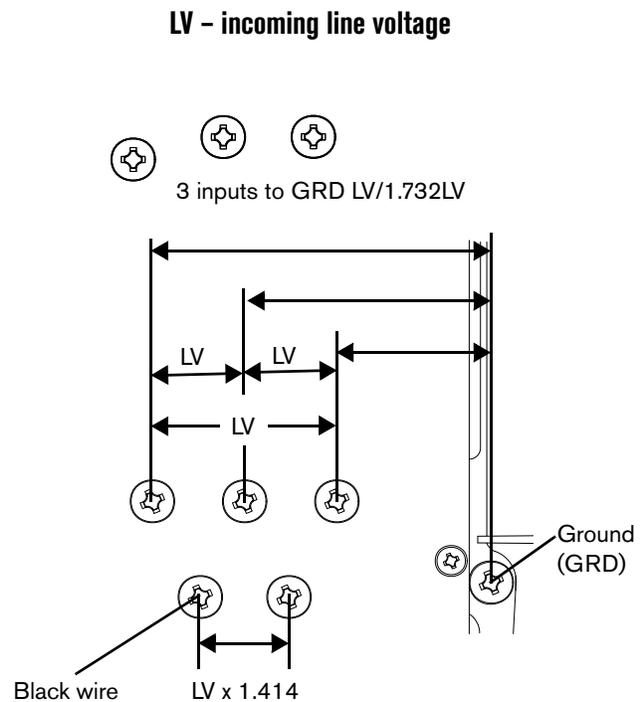
- Check the line voltage at the top of the power switch (S1) with the switch in the OFF (O) position.
- Check the input voltage to the input diode bridge with the switch in the ON (I) position.
 - The AC voltage between any 2 input wires should equal the line voltage.
- If there is proper voltage to the power switch and low voltage to the input diode bridge, replace the power switch.
- Check the output voltage of the input diode bridge.
 - Output VDC = Line Voltage x 1.414 VDC.



All values are $\pm 15\%$.

Figure 20

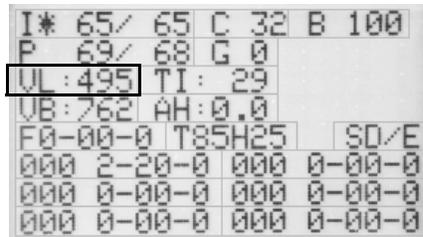
	3-phase
L1	Black (CSA) Brown (CE)
L2	White (CSA) Black (CE)
L3	Red (CSA) Gray (CE)
PE	Green (CSA) Green/Yellow (CE)



Wire colors may vary in power cords not purchased from Hypertherm.

- If there is a fault and the diode bridge output value is correct:
 - Display the service screen (Figure 21) and confirm that the value “VL” is $\pm 15\%$ of AC line voltage.

Figure 21



The image shows a monochrome LCD display with the following text:

```
I* 65/ 65 C 32 B 100
P 69/ 68 G 0
VL: 495 TI: 29
VB: 762 AH: 0.0
F0-00-0 T85H25 SD/E
000 2-20-0 000 0-00-0
000 0-00-0 000 0-00-0
000 0-00-0 000 0-00-0
```

The value "VL: 495" is highlighted with a black rectangular box.

- If there is a fault and the “VL” value is correct:
 - Verify the DSP board by replacing it with a known good board.
 - If the DSP board is not the problem, replace the power board.

Test 2 – DC power bus

Resistance check

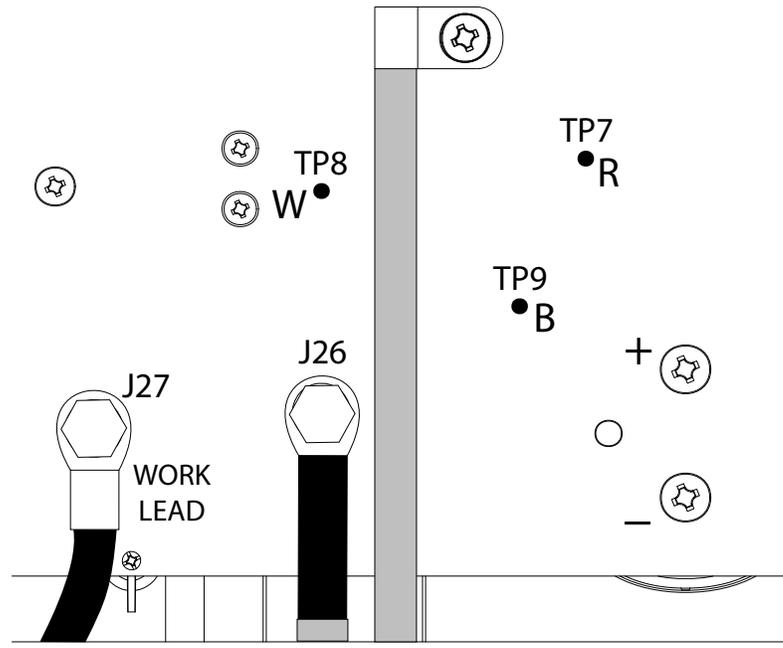
 All resistance values must be taken with the power cord disconnected and all internal power supply wires attached.

- Remove the mounting screws from the bulk capacitors and pull the capacitors away from the power board.
- Measure the resistances described in the following tables.

Figure 22

600 V CSA	
Test points	Value
TP 7 and 9	25 kΩ
TP 8 and 9	25 kΩ

480 V CSA, 380 V CCC, 400 V CE	
Test points	Value
TP 7 and 9	18 kΩ
TP 8 and 9	18 kΩ



- Replace the bulk capacitor mounting screws before you turn ON the power.

Voltage check

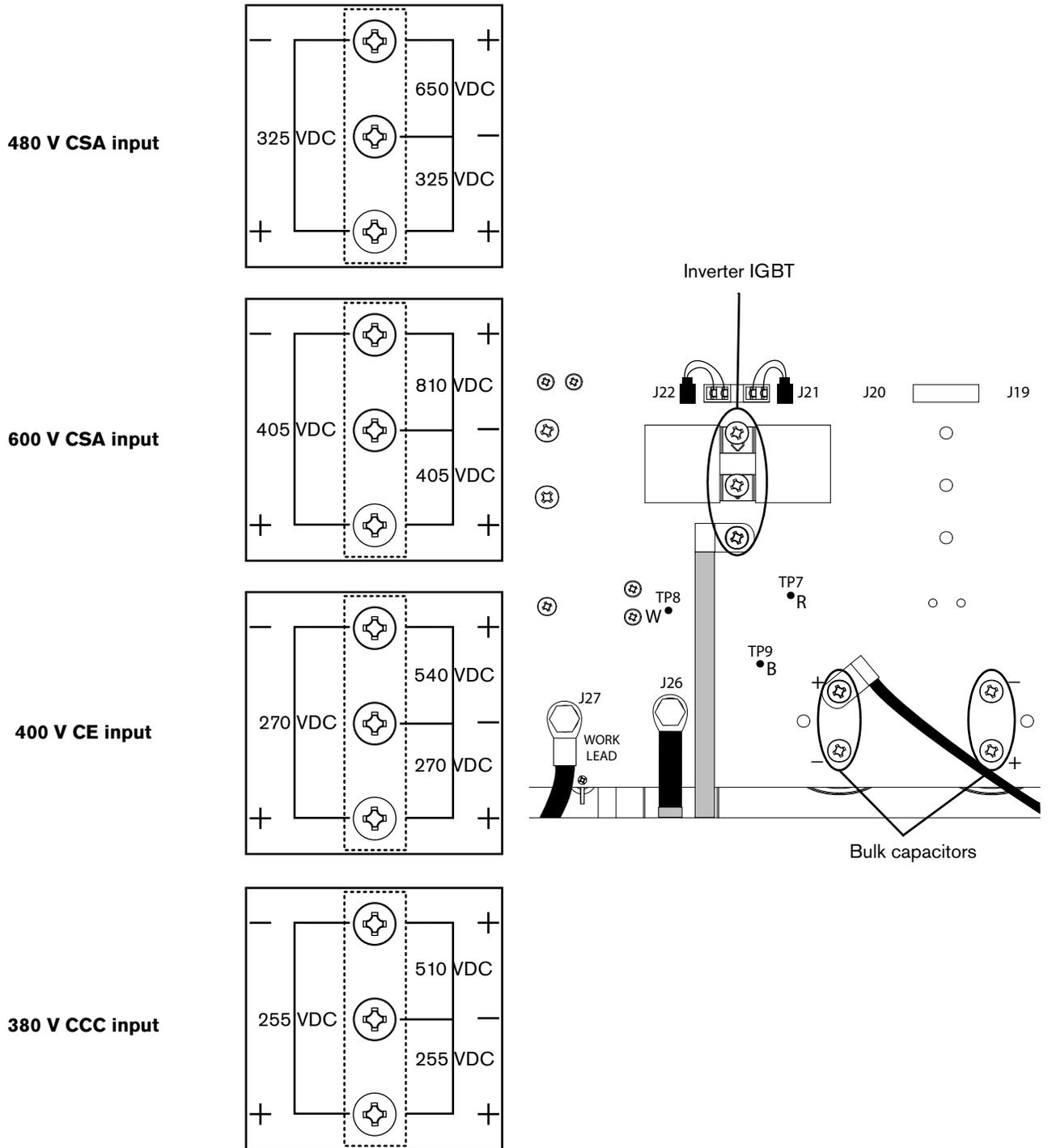
All voltages must be measured with the input power connected and the machine on. (See Figure 23 on page 153.)

 Wear proper personal protective equipment (PPE) before testing powered equipment. All values are $\pm 50\%$. However, this range is intended only for reference. Resistance values can vary widely depending on the type of multimeter and the polarity used to measure the readings.

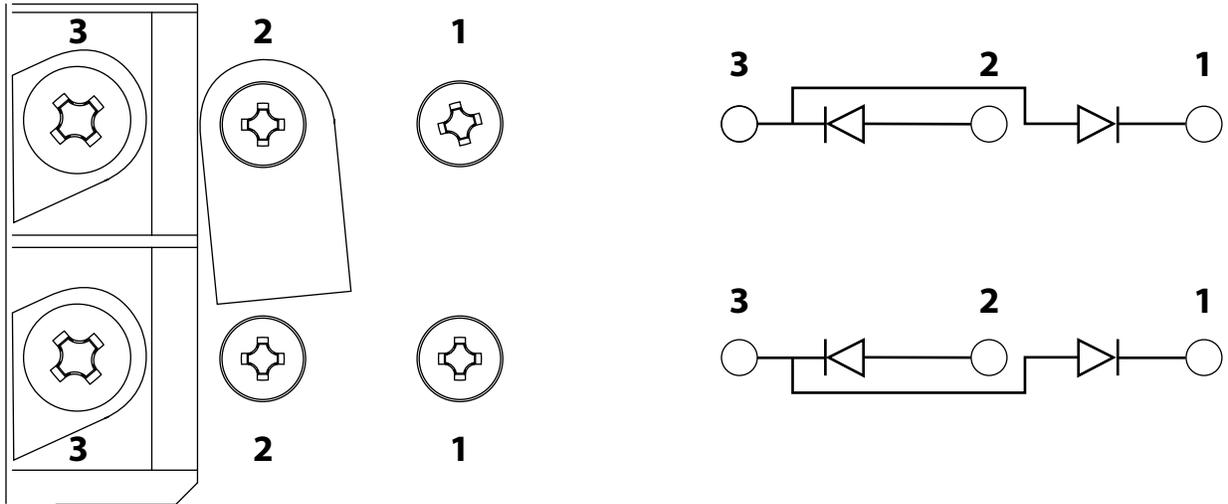
 Check the inverter IGBT module voltages as described below.

 The voltage measured across the bulk capacitors (half the bus voltage or the smaller values above) should be the same before and during torch operation.

Figure 23



Test 3 – Output diodes



- Turn OFF the power switch and disconnect the power cord.
- Check the 4 diodes in the bridge with an ohmmeter in diode test mode.
- For each diode, the value should be “open” (very high resistance) with the meter leads in one direction, and 0.1 V to 1.0 V with the meter leads reversed.
 - A diode is shorted if the value is less than 0.1 V. Replace both bridges.
 - A diode is open if the value is greater than 1.0 V in both directions. Replace both bridges.

 In each case, common (black) should be on 3.

 Always replace output diodes as a pair.

Test 4 – Inverter temperature sensor

Symptom: Fault code 0-40 appears in the operator screen.

Remove power and allow the system to reach room temperature (at least 60 minutes after use).

If the system has a temperature interlock, either fault code 0-40 or fault code 0-99 appears on the operator screen. Display the service screen and check the “F” field for the live (most recent) fault code. Fault code 0-40 appears on the operator screen, but you need to identify the specific 0-40 fault code variation:

- 0-40-2 Inverter module under temperature.
- 0-40-3 Inverter module over temperature.

If fault code 0-99 appears on the operator screen, display the service screen and check the “F” field for:

- 2-10-0 Inverter module temperature sensor open.
- 2-10-1 Inverter module temperature sensor shorted.

For operational fault codes 0-40-2 and 0-40-3 or power board faults 2-10-0 and 2-10-1

1. Remove the inverter temperature sensor connector from the top-rear of the power board (J2).
2. Measure the resistance between pins 1 and 3 on the plug.
3. If the resistance is not within $\pm 15\%$ of 10 k Ω (at approximately 25°C or 77°F), replace the temperature sensor.
4. If the value is correct, remove the DSP board and measure the resistance between pins 1 and 3 on the power board with the temperature sensor disconnected. The resistance should be approximately 57.6 k Ω .
5. If the value is correct, replace the DSP board.
6. If the value is incorrect, replace the power board.

Figure 24

Inverter temperature sensor
connector (J2)



8 – Troubleshooting and System Tests

Test 5 – Flyback circuit (DC minor voltages)

Symptom: Minor voltages are not present.



Wear proper personal protective equipment (PPE) before testing powered equipment.

The flyback circuit is the source of the minor DC voltages in the power supply. It provides +3.3 VDC, +5 VDC, +24 VDC, and +48 VDC.

Check the voltages as described in Table 12. If a value is not within $\pm 15\%$, perform the appropriate test later in this section.

Table 12

Volts DC	Test points (use chassis for negative)
	All units
+48	J1 – pin 1
+24	J5 – pin 1
+5.0	J3 – pin 3
+3.3	J15 – pin 4

Figure 25

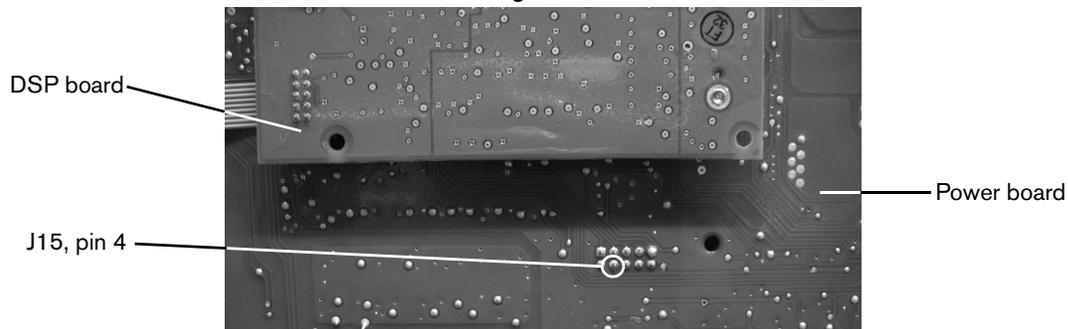
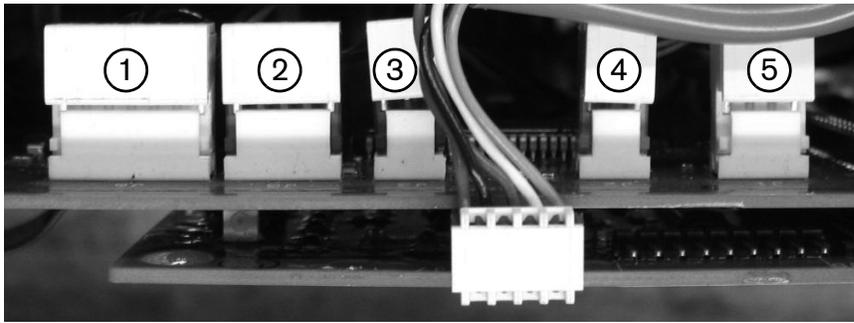


Figure 26



- | | |
|--|------------------------------------|
| 1 Electronic regulator (J6) | 4 Inverter temperature sensor (J2) |
| 2 Pressure switch/auxiliary contactor (J5) | 5 Fan (J1) |
| 3 Pressure sensor (J3) | |

 Remove the connector covers to access the pins on the top-rear of the power board.

If the +48 VDC value is incorrect:

- Remove the fan connector (J1) and repeat the test.
- If the value is now correct, replace the fan.
- If the value is still incorrect, replace the power board.

If the +24 VDC value is incorrect:

- Remove the pressure switch connector (J5) and repeat the test.
- If the value is now correct, replace the pressure switch.
- If the value is still incorrect, replace the pressure switch connector, remove the solenoid valve connector (J6) and repeat the test. If the value is now correct, replace the solenoid valve. If the value is still incorrect, replace the power board.

If the +5 VDC value is incorrect:

- Remove the pressure sensor connector (J3) and repeat the test.
- If the value is now correct, replace the pressure sensor.
- If the value is still incorrect, remove the DSP board and repeat the test.
- If the value is now correct, replace the DSP board.
- If the value is still incorrect, replace the power board.

If the +3.3 VDC value is incorrect:

- Remove the DSP board.
- If the value is still incorrect, replace the power board.

Otherwise, the DSP board or control board may be bad. Do the following:

- Reinstall the DSP board with the ribbon cable disconnected. If the value is now correct, replace the control board. Otherwise, replace the DSP board.

Test 6 – Torch stuck open/torch stuck closed

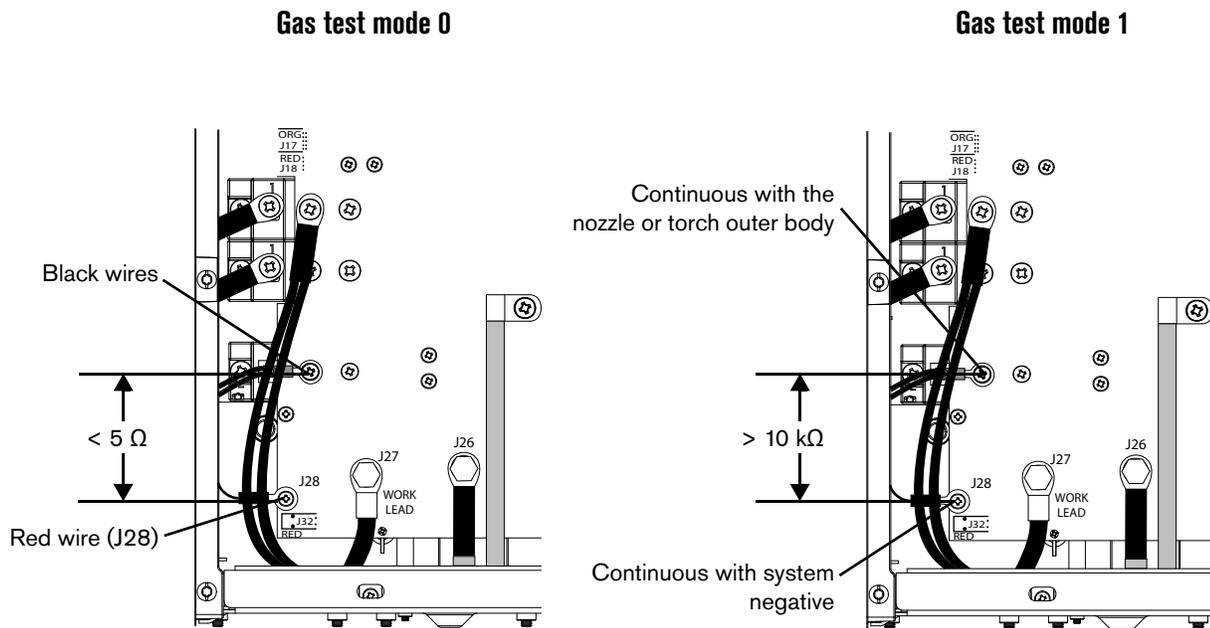
Symptom: No fault occurs at power-up, but an 0-30 fault displays on the operator screen when attempting to fire the torch.

Confirm that all of the proper consumables are installed in the torch.

In an idle (no start signal) working system with the torch and consumables installed, there should be continuity between the dual black wires connected to the center post of the pilot arc IGBT and the red wire connecting to J28. With gas flowing through the torch (gas test mode 1) there should be very high resistance between those 2 points.

-  To set the system to gas test mode, display the service screen (refer to Displaying the service screen on page 128), move the cursor to “G” (gas), and use the adjustment knob to toggle to “1” (gas test mode). If air does not flow, the regulator might be faulty. Examine the fault log to see if any 3-20-n faults are logged. (See Run a gas test on page 130.)

Figure 27



Before continuing, turn OFF the power.

If the resistance value is always less than 100 Ω, remove the torch and recheck the resistance. If the value is still less than 100 Ω:

- Use an IGBT tester to check for a shorted pilot arc IGBT.
- Replace the pilot arc IGBT if it is shorted.

If the resistance is always greater than 100 Ω:

- Replace all consumables and recheck.
- If the resistance is correct ($< 100 \Omega$) the old consumables are bad.

- If the resistance is still greater than 100 Ω , measure the resistance in the torch between the pilot arc wires (pin 1 or 2) and negative arc power (the center connection).
- If the resistance is still too high, replace the torch and lead.

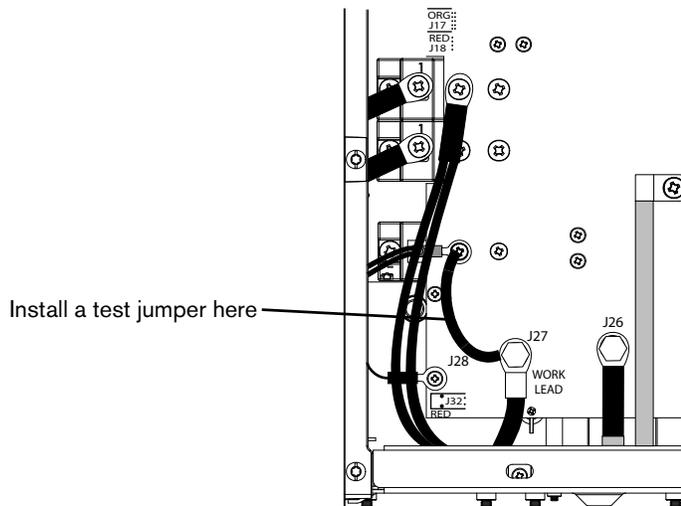
 The retaining cap should be snug but not overtightened.

 All values are $\pm 50\%$. However, this range is intended only for reference. Resistance values can vary widely depending on the type of multimeter and the polarity used to measure the readings.

Check the function of the pilot arc IGBT:

- Turn the machine OFF and disconnect the power.
- Install a jumper wire (at least 8 AWG) from the work lead (J27) to the pilot arc IGBT (dual black wires).
- Reconnect the power and turn on the machine.
- Attempt to fire the torch.
- If the torch fires, replace the pilot arc IGBT.

Figure 28



Test 7 – Start signal

Symptom: There is no arc when the torch trigger is closed. See Powermax125 schematic diagram on page 323.

If the start icon is displayed and there is a fault code 0-51 at power up:

- Remove the torch from the system.
- Check the resistance between pin 6 and pin 7 In the lead plug, with the torch trigger open (not pulled).
- If there is very low resistance, inspect the lead set and trigger switch for shorts and replace or repair as necessary.

If the icon is not displayed at power up and does not appear when the torch trigger is closed:

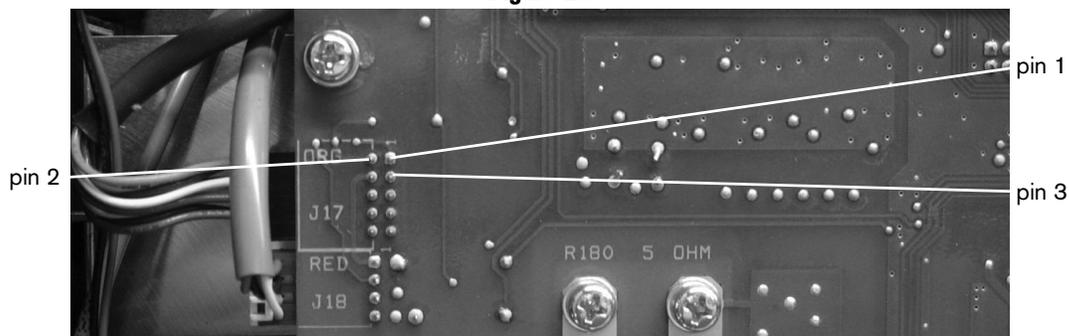
- Remove the torch from the system.
- Close the trigger switch and check the resistance between pin 6 and pin 7.
- If there is very high resistance, inspect the lead and trigger switch for opens and replace or repair as necessary.

If there is no problem found with the torch wiring or trigger switch and there is still no arc or start icon:

- Turn the machine OFF and disconnect the power.
- Remove the nozzle and electrode from the torch and reinstall the retaining cap.
- Reconnect the power and turn the machine on.
- Temporarily connect J17 pin 2 to pin 3.

	WARNING!
Point the torch away from you before performing a gas test. Always keep hands, clothes, and objects clear of the torch tip, and never point the torch toward yourself or others.	

Figure 29



- If gas does not flow and there is no start icon on the display, perform Torch-related faults – continuity check on page 142:
 - Verify the DSP board is working by replacing it with a known good DSP board.
 - If the DSP board is not the problem, replace the power board.

Test 8 – Torch cap switch

Symptom: Fault code 0-50 and the cap-sensor switch icon appear on the operator screen.

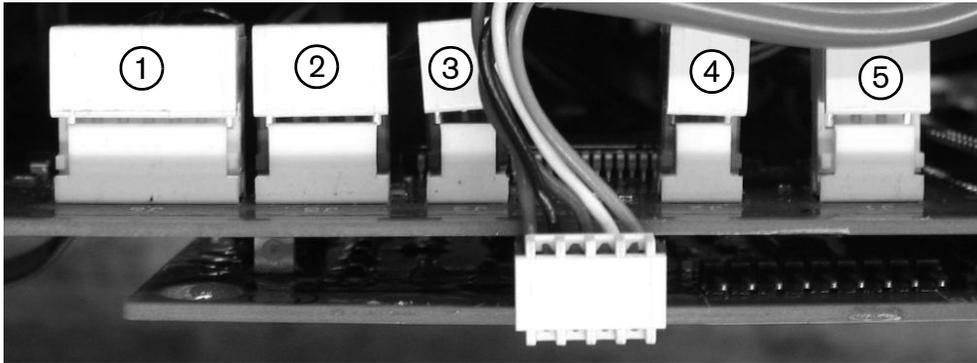
1. Confirm that the retaining cap is in place.
2. Remove the torch from the power supply and check the resistance between pin 5 and pin 7 in the torch lead plug.
 - a. If the resistance is very high, check for opens in the torch leads and cap-sensor switch.
 - b. If the resistance is approximately 0 Ω :
 - Reconnect the torch.
 - Measure for continuity between pin 1 and pin 2 at J17 on the power board.
 - If there is no continuity, inspect and perform a resistance test on the torch disconnect.
 - c. If there is no problem with the leads or switch, test the circuit boards.
 - Turn OFF the machine and disconnect the power.
 - Put a jumper wire between ~~J20~~J17 pins 1 and 2.
 - Reconnect the power and turn on the machine.
 - If the cap-sensor switch icon is not displayed, verify the DSP board by replacing it with a known working board. If the DSP is not the problem, replace the power board.

Test 9 – Electronic regulator

Symptom: Air flows continuously through the torch.

1. Turn OFF the machine and disconnect the power.
2. Disconnect the electronic regulator control cable (J6) from the power board.
 - ❑ If air continues to flow, replace the electronic regulator.
 - ❑ If the air stops flowing, verify the DSP board by replacing it with a known good one. If the DSP board is not the problem, replace the power board.

Figure 30



- | | |
|--|------------------------------------|
| 1 Electronic regulator (J6) | 4 Inverter temperature sensor (J2) |
| 2 Pressure switch/auxiliary contactor (J5) | 5 Fan (J1) |
| 3 Pressure sensor (J3) | |

Test 10 – Pressure sensor

Symptom: The pressure sensor reading does not agree with known pressures.



Wear proper personal protective equipment (PPE) before testing powered equipment.

1. Remove the white cover on the plug at J3 on the power board.
2. Turn the machine ON.
3. Measure power to the sensor between pin 2 (-) and pin 3 (+).

If not 5.0 VDC ($\pm 5\%$), perform Test 5 – Flyback circuit (DC minor voltages) on page 156.

4. From the service screen, enable the gas test.

Note the flowing gas pressure in the “P” field to the right of the slash.

5. Measure VDC between pin 2 (-) and pin 1 (+).

The value should be 0.0463 times the pressure, for example (68 psi * 0.0463 VDC/psi = 3.148 VDC).

If the voltage measurement is within $\pm 10\%$ of the correct value and you have a pressure alert or fault:

- a. Test with a known working DSP board.
- b. If the measured voltage is correct, replace the DSP board.
- c. If the measured voltage is not correct, replace the pressure sensor.

Test 11 – Fan

Symptom: The fan does not operate properly.



Wear proper personal protective equipment (PPE) before testing powered equipment.

1. Remove the inverter temperature sensor plug from J2 on the power board.
2. Place a jumper between pin 1 and pin 3 of connector J2 on the power board.
3. Remove the white cover from the fan control cable at J1.
4. Turn the machine ON. (The fan should be running.)
5. With the fan control cable connected to J1, measure the DC voltage between pin 1 and pin 4 in the plug.
 - a. If the voltage is 48 VDC ($\pm 5\%$), replace the fan.
 - b. If the voltage is not correct:
 - Remove the fan control cable and re-measure the DC voltage on the power board connector between pin 1 and pin 4 of J1.
 - If the voltage is 48 VDC, replace the fan. Otherwise, perform Test 5 – Flyback circuit (DC minor voltages) on page 156.
 - c. If the system passes the flyback circuit test:
 - If the voltage between pin 1 and pin 3 (J1) is 0 VDC, replace the DSP board.
 - If the voltage is greater than 0 VDC, replace the power board.

Test 12 – AUX switch

Symptom: Upon power-up, fault code 0-19 displays. After 1 minute, fault code 0-99 displays. In service mode, the live fault code is 2-01-1.

1. Turn the machine OFF and disconnect the power.
2. Disconnect the auxiliary switch cable from J5 on the power board.
3. Measure the resistance on the cable plug between pin 4 and pin 5.
4. If the power switch is closed (ON) there should be very low resistance.
5. If the power switch is open (OFF) there should be very high resistance.
6. If the resistance measurement does not agree, check the cable, plug, and switch for opens or shorts.

Section 9

Power Supply Component Replacement

	WARNING!
	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power and remove the input power plug from its receptacle before removing the cover from the power supply. If the power supply is connected directly to a line disconnect box, switch the line disconnect to OFF (O). 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.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.</p> <p>Do not attempt to repair the power board or control board. Do not cut away or remove any protective conformal coating from either board. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p> <p>See the <i>Safety and Compliance Manual (80669C)</i> included with your system for more safety precautions.</p>

	CAUTION!
	<p>Static electricity can damage circuit boards. Use proper precautions when handling printed circuit (PC) boards.</p> <p>Store PC boards in anti-static containers.</p> <p>Wear a grounded wrist strap when handling PC boards.</p>

Installing a machine interface cable for raw arc voltage

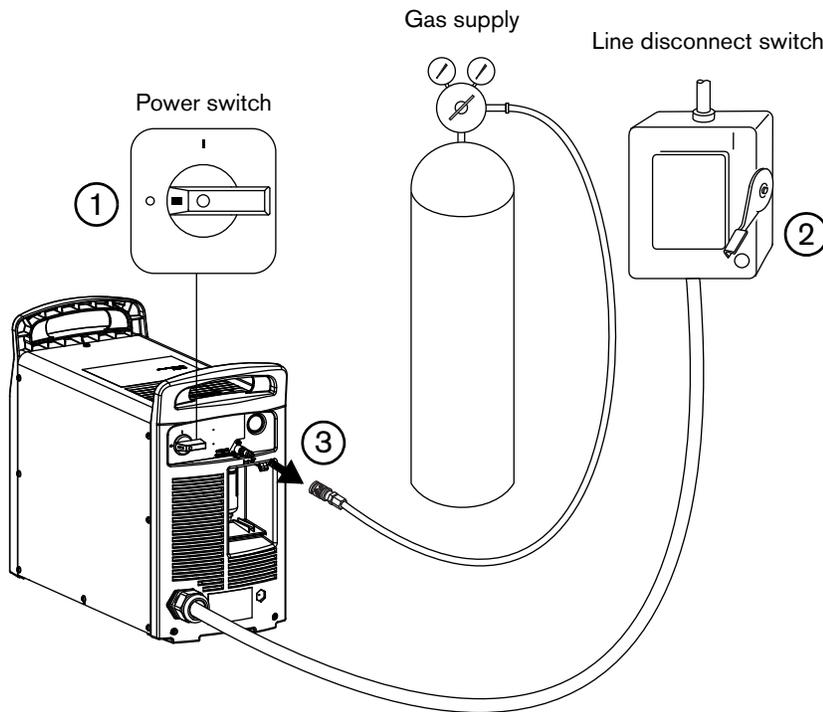
Kit number	Description
228711	Kit: Powermax65/85/105/125 machine interface for raw arc voltage (strain relief)

To access divided raw arc voltage, refer to Field Service Bulletin 807060.

Disconnect the power and gas supply

1. Turn the plasma power supply switch to OFF (O).
2. Turn the line disconnect switch to OFF (O).
3. Disconnect the gas supply hose from the plasma power supply.

Figure 31



Replacing the air filter element and air filter bowl

Kit number	Description
228695	Kit: Powermax65/85/105/125 air filter element (inside filter bowl) and O-ring (compatible with all bowl types)
428352*, †	Kit: Powermax65/85/105/125 plastic air filter bowl (includes O-ring)
428415*, †	Kit: Powermax65/85/105/125 optional nylon air filter bowl (includes O-ring) (greenish-blue)
428015‡	Kit: Powermax65/85/105/125 metal guarded air filter bowl (includes O-ring)

* Filter bowl kits 428352 and 428415 only fit on new air filter assembly kit 428351. See page 168.

† The plastic air filter bowl (kit 428352) that comes with the Powermax125 is compatible with most air systems, but the airline should be maintained clean. Organic solvents, chemicals, cutting oil, synthetic oil, alkali, and thread lock solutions may cause harmful effects to the plastic air filter bowl. An optional nylon bowl (kit 428415) is available for sites that have difficulty preventing harsh chemicals from entering the air system.

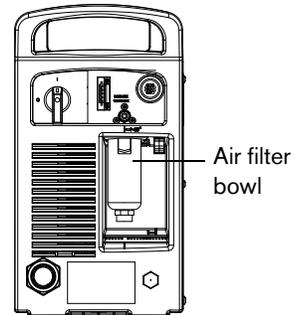
‡ Filter bowl kit 428015 only fits on old air filter assembly kit 228685. See page 168.

Remove the air filter bowl

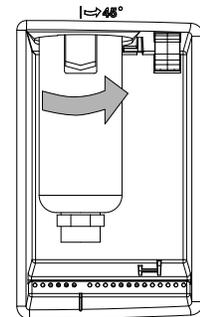
1. Disconnect the power and gas supply. See page 166.
2. Position the rear of the power supply so the removable air filter bowl is accessible.



Remove the consumables case if it is next to the air filter bowl.



3. Hold the filter bowl with your right hand. Push down the thumb latch and rotate the filter bowl approximately 45 degrees to the right.
4. Pull the filter bowl straight down to remove.



Identify air filter assembly model

Because of a manufacturing change, your Powermax125 may have one of the two air filter assemblies shown below. Filter bowl replacement kits are not interchangeable. (See page 299 for details.) Both filter bowls use the same air filter element, but the procedures to replace the element are different for each bowl.

**Old air filter assembly
(with metal guarded filter bowl)**



If you have the old air filter assembly model with the metal guarded filter bowl, go to:

- Page 170 to replace the air filter element.
- Page 170 to install the filter bowl.
- Page 225 to replace the entire air filter assembly.

**New air filter assembly
(with plastic or nylon filter bowl)**



If you have the new air filter assembly with the plastic or nylon filter bowl, go to:

- Page 169 to replace the air filter element.
- Page 170 to install the filter bowl.
- Page 225 to replace the entire air filter assembly.

 The optional nylon filter is greenish-blue. See page 299.

Install the air filter element (for plastic or nylon filter bowl)

1. Twist and pull up on the black element retainer at the top of the filter bowl.



2. Carefully twist the black element retainers until they come apart and you can remove the dirty air filter element from them.



3. Slide the new element onto the retainer.

4. Twist the element retainers until they lock together and fit snugly against the new air filter element.

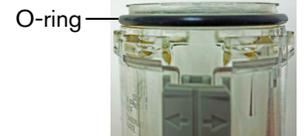


If the black element retainers are damaged, order a new air filter assembly (kit 428351).



5. If you are not replacing the air filter bowl:

- ❑ Clean the bowl of any oil, dirt, or other contaminants.
- ❑ Install the thicker O-ring in kit 228695 onto the existing filter bowl.



Use the thicker O-ring.

6. Put the air filter element in the filter bowl, so that the wider black part goes at the top.



7. Twist the top plastic part of the filter element until it fastens to the top of the filter bowl.



To install the air filter bowl, go to page 170.

9 – Power Supply Component Replacement

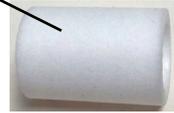
Install the air filter element for metal guarded filter bowl

1. Locate the white filter element and retaining nut. Unscrew the plastic retaining nut that holds the filter element.
2. Replace the dirty element with the new element (shown at the right).
3. Install the original plastic retaining nut to finger-tight only.



If the black retaining nut is damaged, order a new air filter assembly (kit 428351, or 228685 if still available from the factory).

New filter element



4. If you are not replacing the air filter bowl:

- Clean the bowl of any oil, dirt, or other contaminants.
- Install the thinner of the two O-rings in kit 228695 onto the existing filter bowl.

Use the thinner O-ring

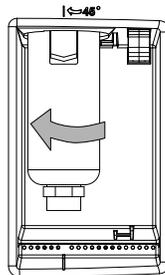


O-ring



Install the air filter bowl (metal guarded, plastic, or nylon)

1. Vertically align the metal guarded filter bowl and firmly push the filter bowl up to the top of the receptacle to seat the bowl.
2. Once the bowl is seated correctly, rotate the bowl 45 degrees to the left until you hear the thumb latch click into place.



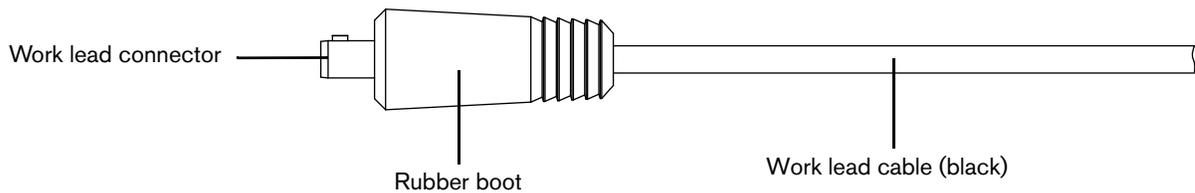
3. Reconnect the gas supply hose to the gas fitting on the rear of the power supply and check for leaks.
4. Reconnect the electric power and turn ON the power switch.

Replacing the work lead connector

Kit number	Description
228891	Kit: Powermax105/125 work lead connector replacement (lead side)

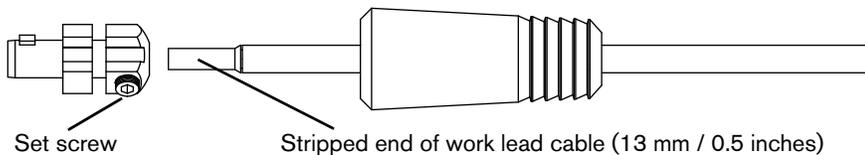
1. Disconnect the power and gas supply. (See Disconnect the power and gas supply on page 166.)
2. Use cable cutters to cut the black work lead cable close to the rubber boot so that both the rubber boot and the work lead connector are removed from the cable.

Figure 32



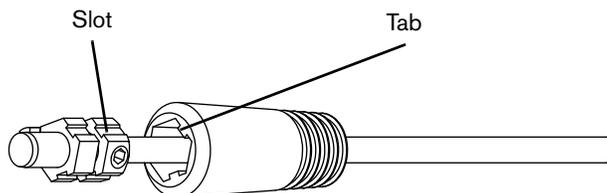
3. Slide the new rubber boot over the work lead cable.
4. Strip 13 mm (0.5 inches) off the end of the work lead cable.
5. Insert the stripped end of the work lead cable into the new work lead connector. Tighten the set screw to 115.2 kg-cm (100 inch-pounds).

Figure 33



6. Align the tabs in the rubber boot with the mating slots in the work lead connector. Slide the rubber boot over the work lead connector until it is fully seated.

Figure 34

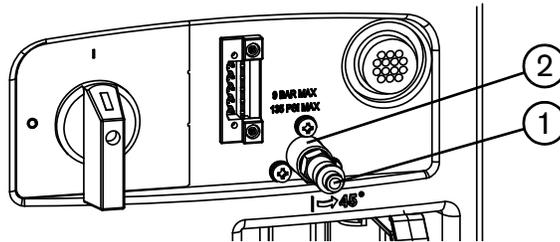


Installing the optional filter kit

Kit number	Description
228890	Kit: Eliminator gas filter with protective metal cover for the Powermax105/125

1. Disconnect the power and gas supply. (See Disconnect the power and gas supply on page 166.)
2. Remove the gas inlet fitting ① from the bracket ②.

Figure 35

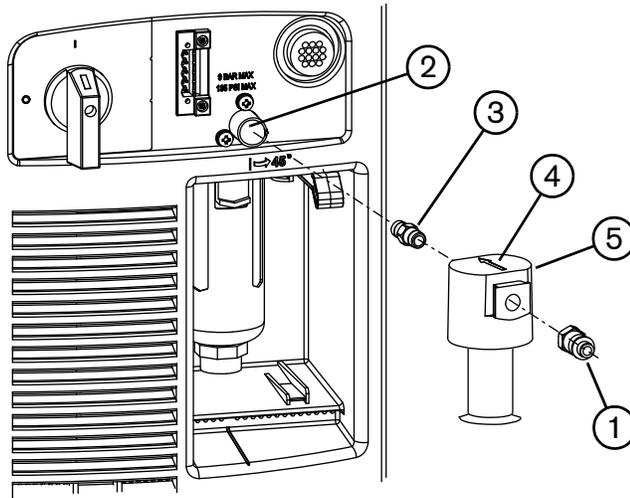


CAUTION!

Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.

3. Apply thread sealant to the adapter fitting and tighten it into the bracket. (See Figure 36 on page 173.)
4. Apply thread sealant to the other side of the adapter fitting, and, with the arrow pointing toward the power supply, tighten the filter onto the adapter fitting.
5. Apply thread sealant to the gas inlet fitting, and tighten it into the filter.

Figure 36

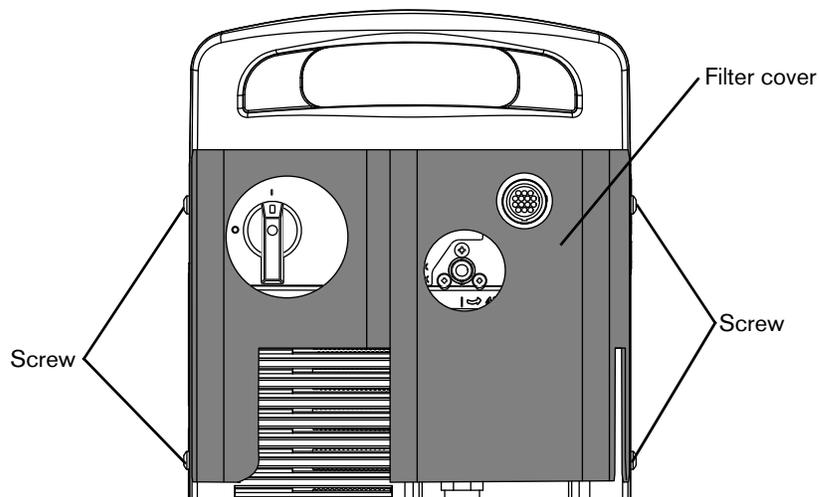


- 1 Gas inlet fitting
- 2 Bracket
- 3 Adapter fitting

- 4 Arrow pointing to power supply
- 5 Filter

- 6. Remove the upper 2 screws from each side of the power supply (Figure 37).
- 7. Place the filter cover over the filter on the rear of the power supply, aligning the screw holes with the holes in the power supply cover.
- 8. Install the 4 screws provided in the kit through the filter cover and power supply cover. Tighten the screws to 23 kg-cm (15 inch-pounds).
- 9. Reconnect the power and gas supply.

Figure 37



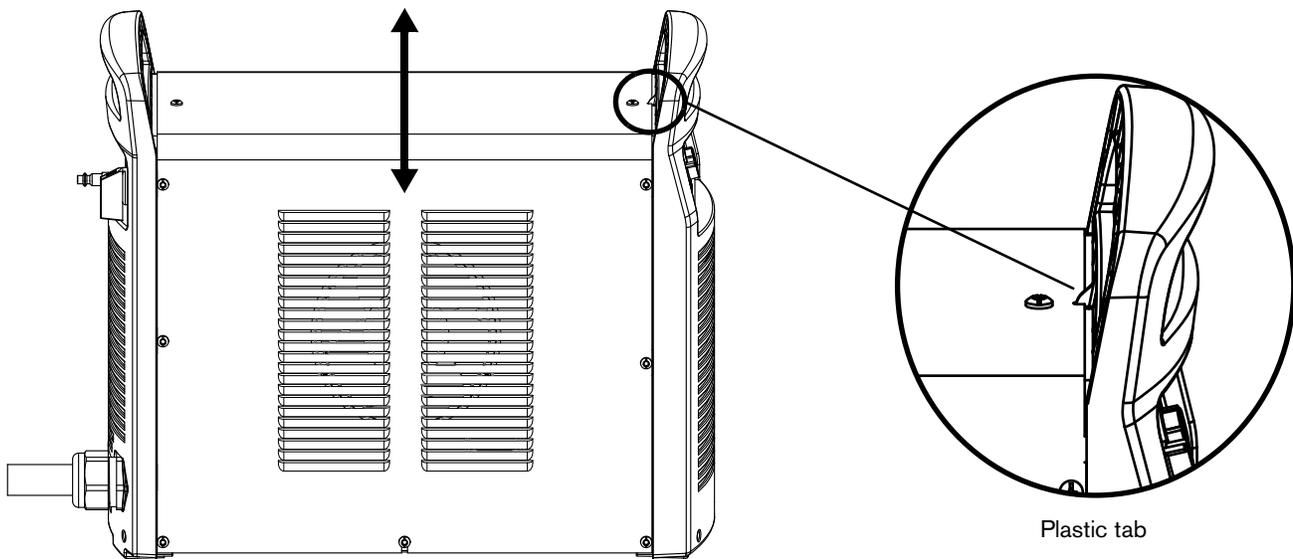
Replacing the power supply cover

Kit number	Description
428115	Kit: Powermax125 CSA power supply cover with labels
428116	Kit: Powermax125 CE power supply cover with labels
428247	Kit: Powermax125 CCC power supply cover with labels

Remove the power supply cover

1. Disconnect the power and gas supply. (See Disconnect the power and gas supply on page 166.)
2. Remove the 16 screws from the sides and top of the power supply cover.
3. Lift the cover off the power supply.

Figure 38



Install the power supply cover

1. Place the cover over the power supply, aligning the slot in the top of the cover with the plastic tab in the front panel. The slot and tab ensure that the vent in the side of the cover is over the fan. (See Figure 38.)
2. Tighten the 16 screws in the sides and top of the cover to 23 kg-cm (15 inch-pounds).
3. Reconnect the power and gas supply.

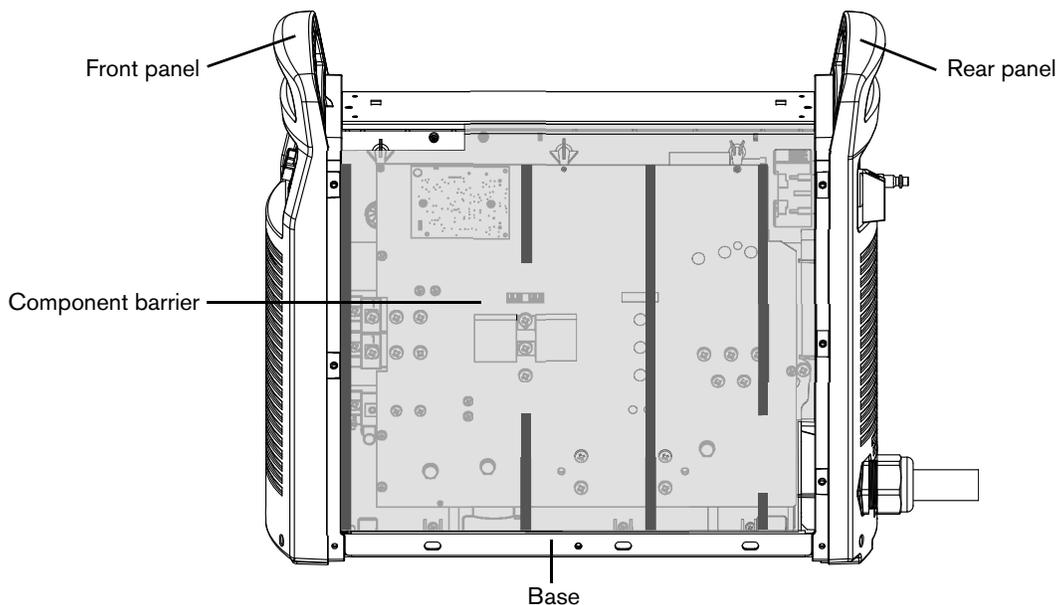
Replacing the component barrier

Kit number	Description
428114	Kit: Powermax125 component barrier

Remove the component barrier

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
2. Remove the component barrier from the power board side of the power supply. The component barrier is flexible and can be bent slightly for removal.

Figure 39



Install the component barrier

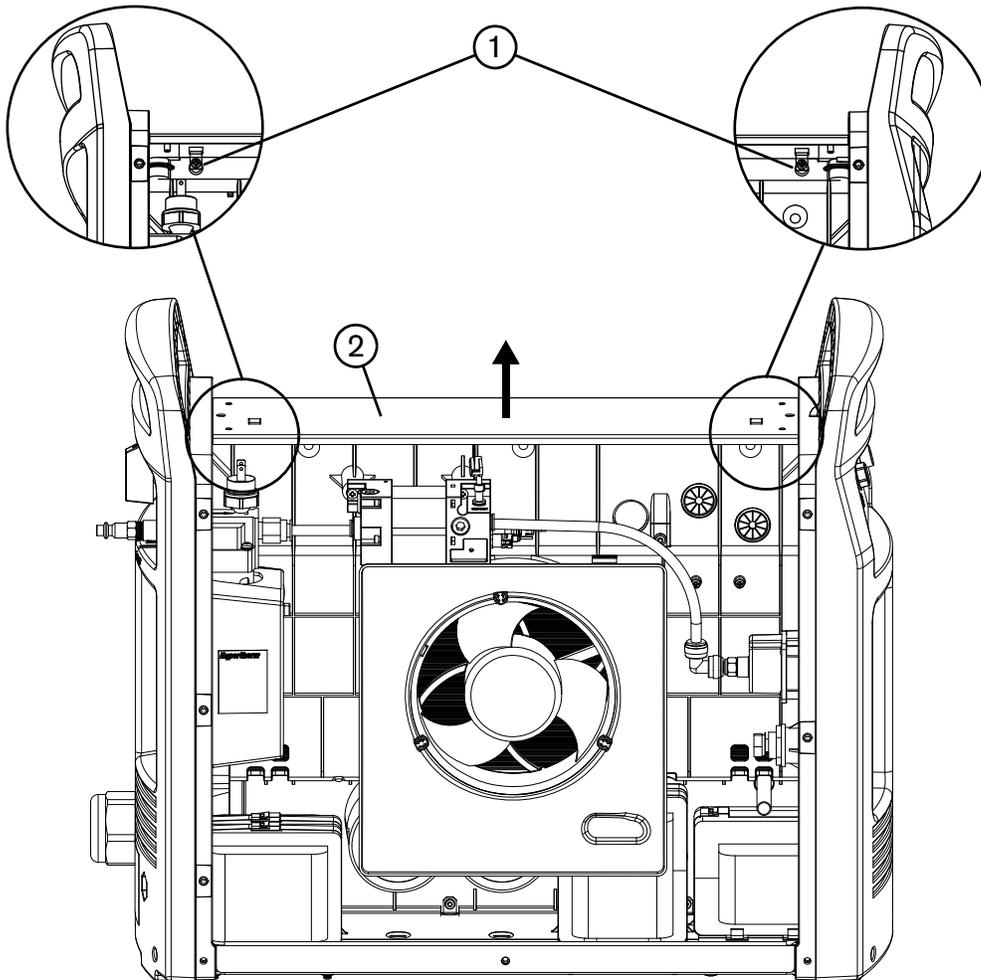
1. Slide the side and bottom edges of the component barrier behind the end panel edges and down to the base.
2. Bend the bottom-right of the component barrier at the perforation, and insert it between the power cord wires and the edge of the power board.
3. Bend the top-right of the component barrier at the perforation and place over the top of the power switch.
4. Center the barrier between the front and rear panels.
5. Put the power supply cover back in place. (See Install the power supply cover on page 174.)
6. Reconnect the power and gas supply.

Replacing the end panel bracket

Remove the end panel bracket

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
2. Remove the 2 mounting screws ① from the end panel bracket ②.
3. Lift the end panel bracket straight up from the power supply.

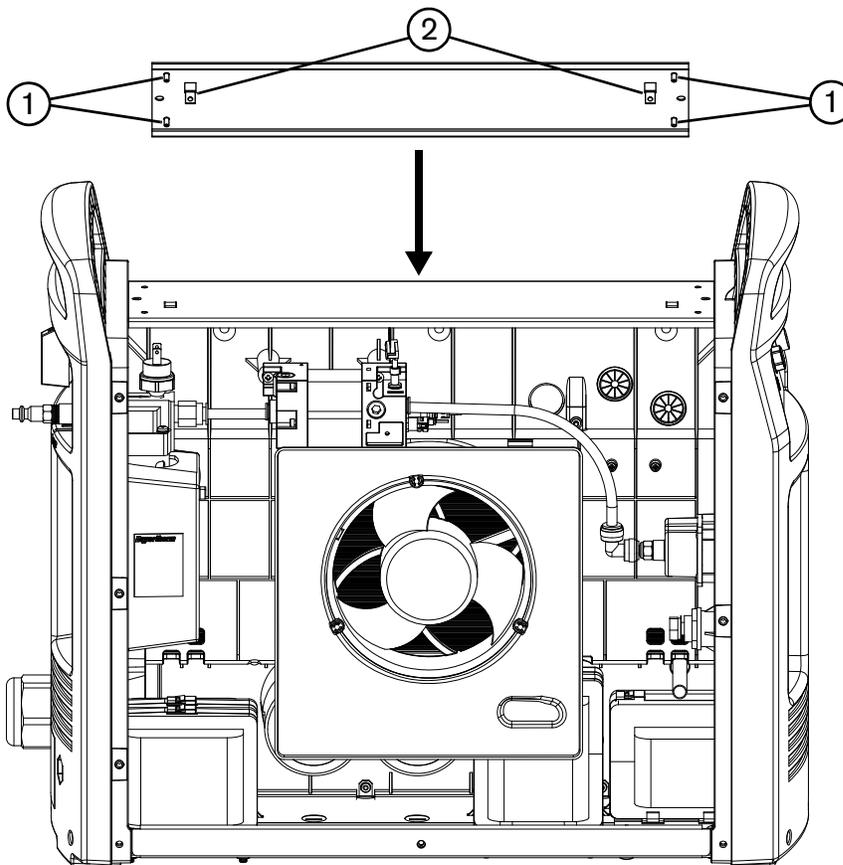
Figure 40



Install the end panel bracket

1. Align the end panel bracket positioning posts ① with the holes in the top of the front and rear panels. Make sure the end panel bracket mounting tabs ② are positioned on the fan side of the power supply.
2. Push the end panel bracket straight down onto the power supply.
3. Tighten the 2 end panel bracket mounting screws to 11.5 kg-cm (10 inch-pounds).

Figure 41



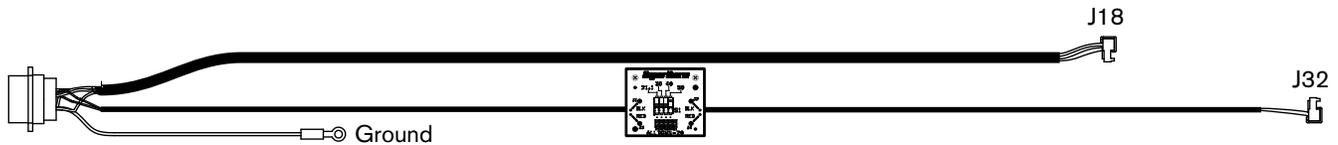
4. Complete the following procedures:
 - a. See Install the component barrier on page 175.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

Replacing the machine interface cable with voltage divider board

Kit number	Description
228884	Kit: Powermax105/125 machine interface cable, internal cable with voltage divider board (CPC port)

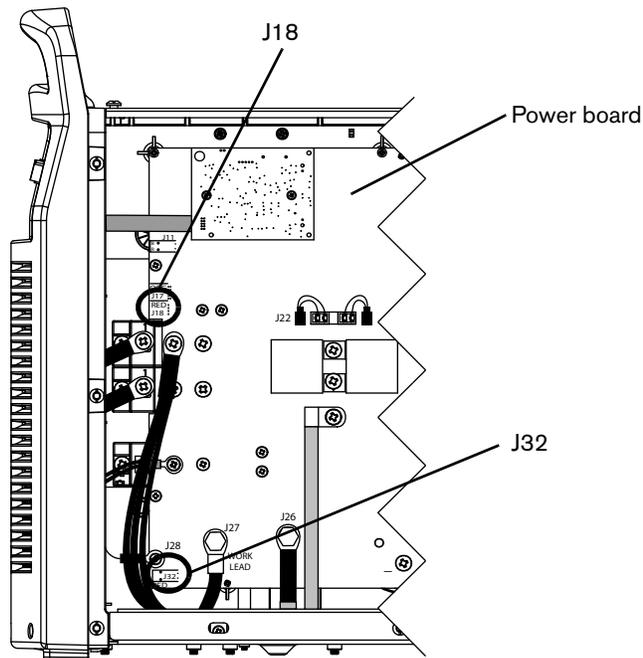
Remove the machine interface cable with voltage divider board

Figure 42



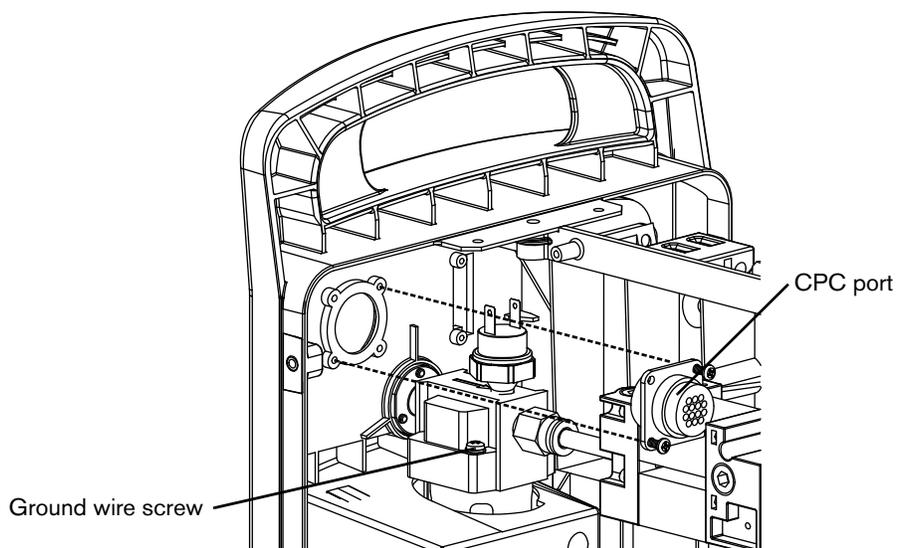
1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
2. Disconnect the cable connectors at J18 and J32.

Figure 43



3. Push the cables through the right grommet (see Figure 45 on page 180) from the power board side to the fan side of the power supply.
4. Remove the green/yellow ground wire screw from the air filter housing. (See Figure 44.)
5. Remove the CPC port by removing the 2 screws.

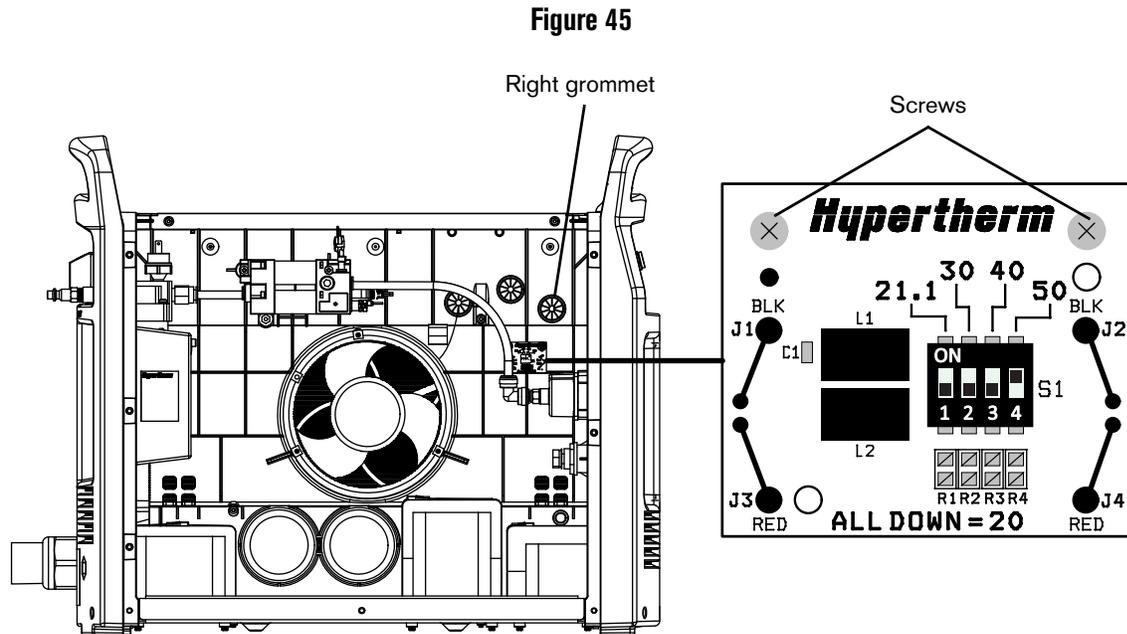
Figure 44



6. Remove the 2 screws from the voltage divider board and remove the voltage divider board and attached cables. (See Figure 45 on page 180.)

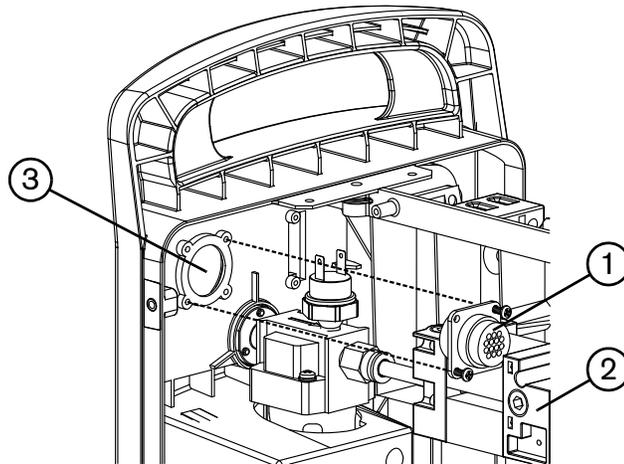
Install the machine interface cable with voltage divider board

1. Verify the power supply is turned OFF, the power is disconnected, and the gas supply is disconnected.
2. Remove the power supply cover and the component barrier, if they are not already.
3. Install the voltage divider board to the right of the power supply fan by tightening 2 of the supplied screws to 11.5 kg-cm (10 inch-pounds).



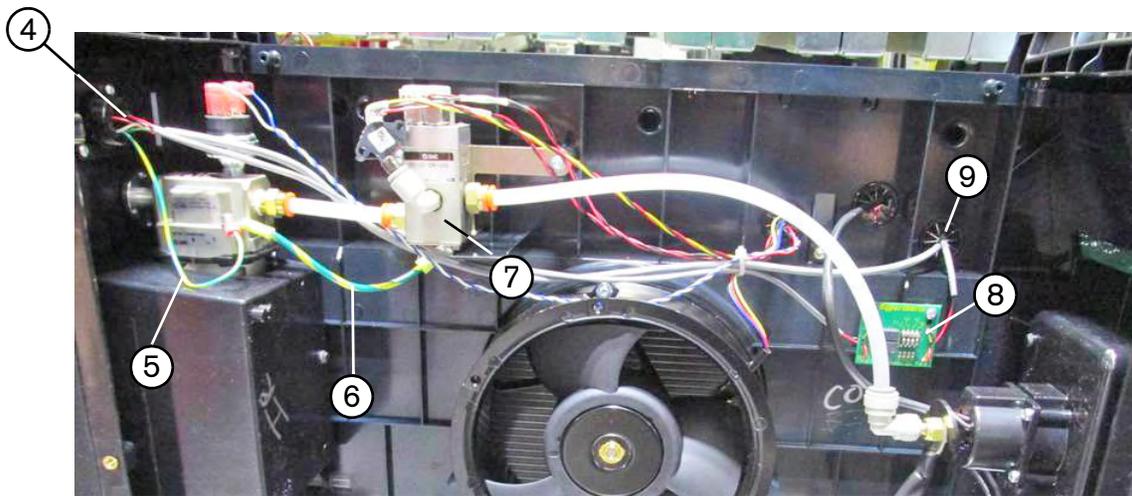
4. Route the CPC port ① and attached cables above the solenoid valve ② and over to the CPC port opening ③ on the rear panel of the power supply. (See Figure 46 on page 181.)
5. Insert the CPC port into the CPC port opening from inside the power supply. Be sure to position the port with the green/yellow ground wire at the bottom of the port.
6. Attach the CPC port by tightening 2 of the supplied screws to 11.5 kg-cm (10 inch-pounds). Two screws are sufficient when inserted in opposite corners of the CPC port.

Figure 46



7. Attach the green/yellow ground wire (from the CPC port) to the air filter housing using the same screw that secures the large ground wire connected to the center panel. Tighten the ground wire screw to 17.3 kg-cm (15 inch-pounds).
8. Route the 2 cables through the right grommet one at a time and down the left side of the power board.

Figure 47

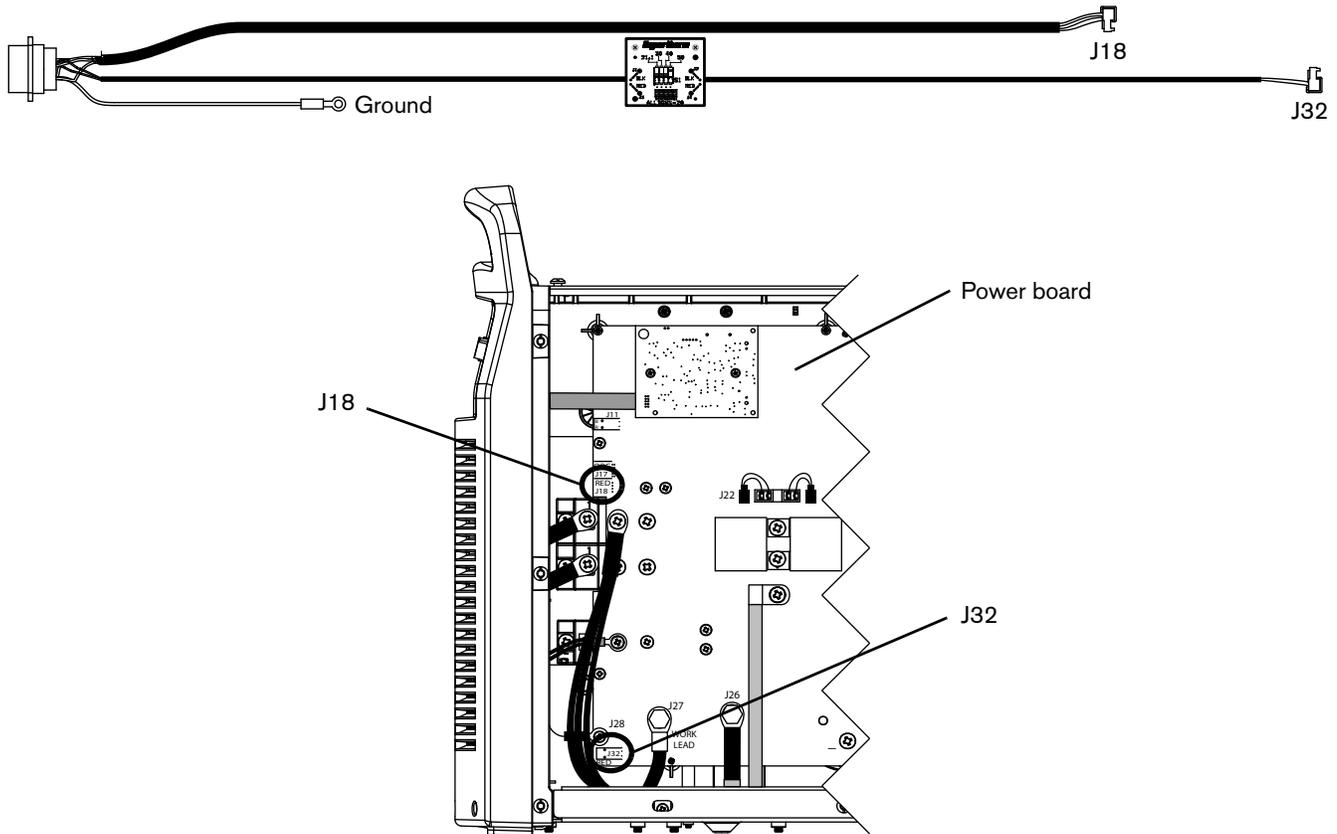


- | | |
|---------------------------------------|-------------------------|
| 4 CPC port | 7 Solenoid valve |
| 5 CPC port ground wire | 8 Voltage divider board |
| 6 Large ground wire from center panel | 9 Right grommet |

9 – Power Supply Component Replacement

9. Route the larger diameter cable to J18. At J18 align the red wire in the cable connector with the “RED” that is printed on the power board, and push the cable connector into the power board connector.
10. Route the smaller diameter cable to J32. At J32 align the red wire in the cable connector with the “RED” that is printed on the power board, and push the cable connector into the power board connector.

Figure 48



11. From the fan side of the power supply, secure both cables in the cable clip attached to the center panel under the left grommet.
12. Set the voltage divider board. (See Set the voltage divider board on page 183.)
13. Complete the following procedures:
 - a. See Install the component barrier on page 175.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

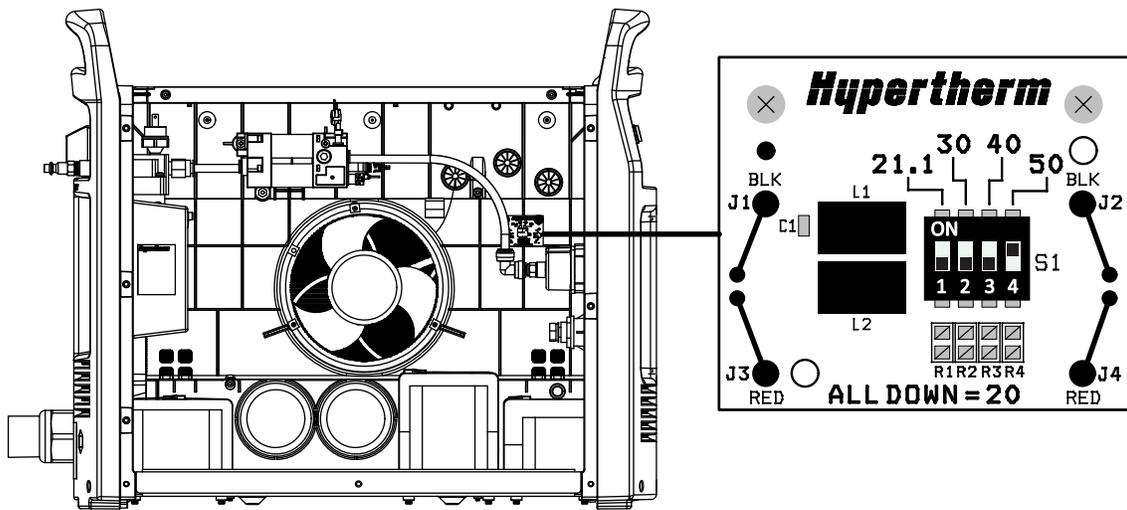
Set the voltage divider board

The factory presets the voltage divider to 50:1.

	<h2>CAUTION!</h2>
<p>The factory-installed internal voltage divider provides a maximum of 16 V under open circuit conditions. This is an impedance-protected functional extra low voltage (ELV) output to prevent shock, energy, and fire under normal conditions at the machine interface receptacle and under single fault conditions with the machine interface wiring. The voltage divider is not fault tolerant and ELV outputs do not comply with safety extra low voltage (SELV) requirements for direct connection to computer products.</p>	

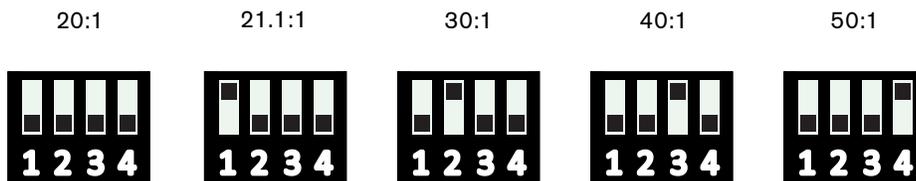
1. To change the voltage divider to a different setting:
 - a. Locate the voltage divider DIP switches on the left side of the power supply. Figure 49 shows the default setting (50:1) with the number 4 switch up.

Figure 49



- b. Set the DIP switches to one of the settings shown in Figure 50.

Figure 50



Installing the machine interface cable

Kit number	Description
228350	Kit: External Machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 7.6 m (25 feet), spade connectors
228351	Kit: External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 15 m (50 feet), spade connectors

1. Do you need to change the setting on the voltage divider board?
 - If yes, complete the following procedures:
 - i. See Disconnect the power and gas supply on page 166.
 - ii. See Remove the power supply cover on page 174.
 - iii. See Set the voltage divider board on page 183.
 - iv. See Connect the external machine cable to the CNC or THC, below.
 - v. See Install the power supply cover on page 174.
 - vi. Reconnect the power and gas supply.
 - If no, continue with the Connect the external machine cable to the CNC or THC procedure, below.

Connect the external machine cable to the CNC or THC

1. Remove the machine interface receptacle's cover from the rear of the power supply.



The cover on the machine interface receptacle prevents dust and moisture from damaging the receptacle when not in use. This cover (127204) should be replaced if damaged or lost.

2. Connect the machine interface cable CPC to the power supply. (See Figure 51 on page 185.)
3. Terminate the machine interface cable spade terminals inside the electrical enclosure of listed and certified torch height controllers (THCs) or CNC controllers to prevent unauthorized access to the connections after installation. Verify that the connections are correct and that all live parts are enclosed and protected before operating the equipment.

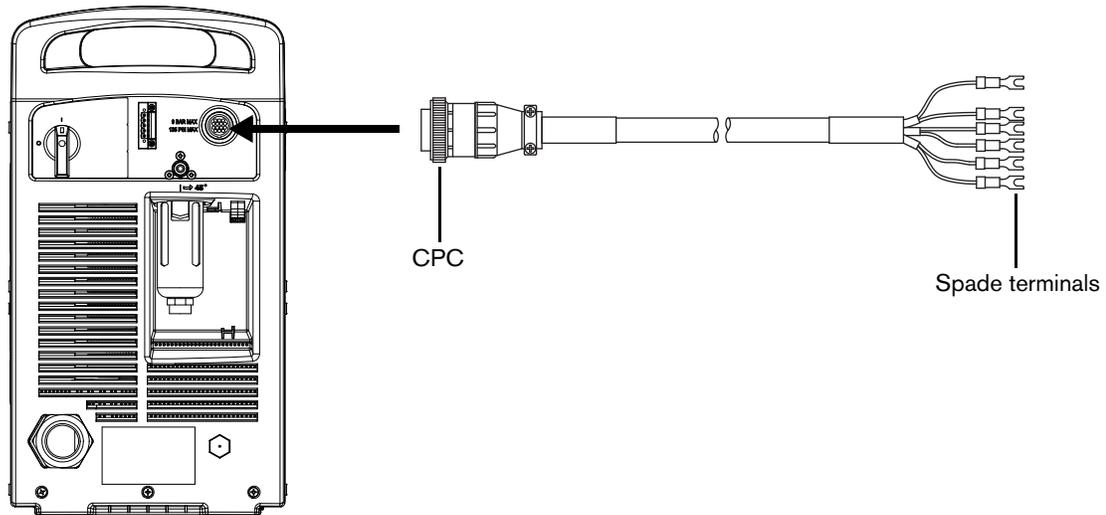


The integration of Hypertherm equipment and customer-supplied equipment including interconnecting cords and cables, if not listed and certified as a system, is subject to inspection by local authorities at the final installation site.



See Connecting the machine interface cable on page 100 for more information on each type of signal available through the machine interface cable and for the part numbers of the various machine interface cables that Hypertherm offers.

Figure 51



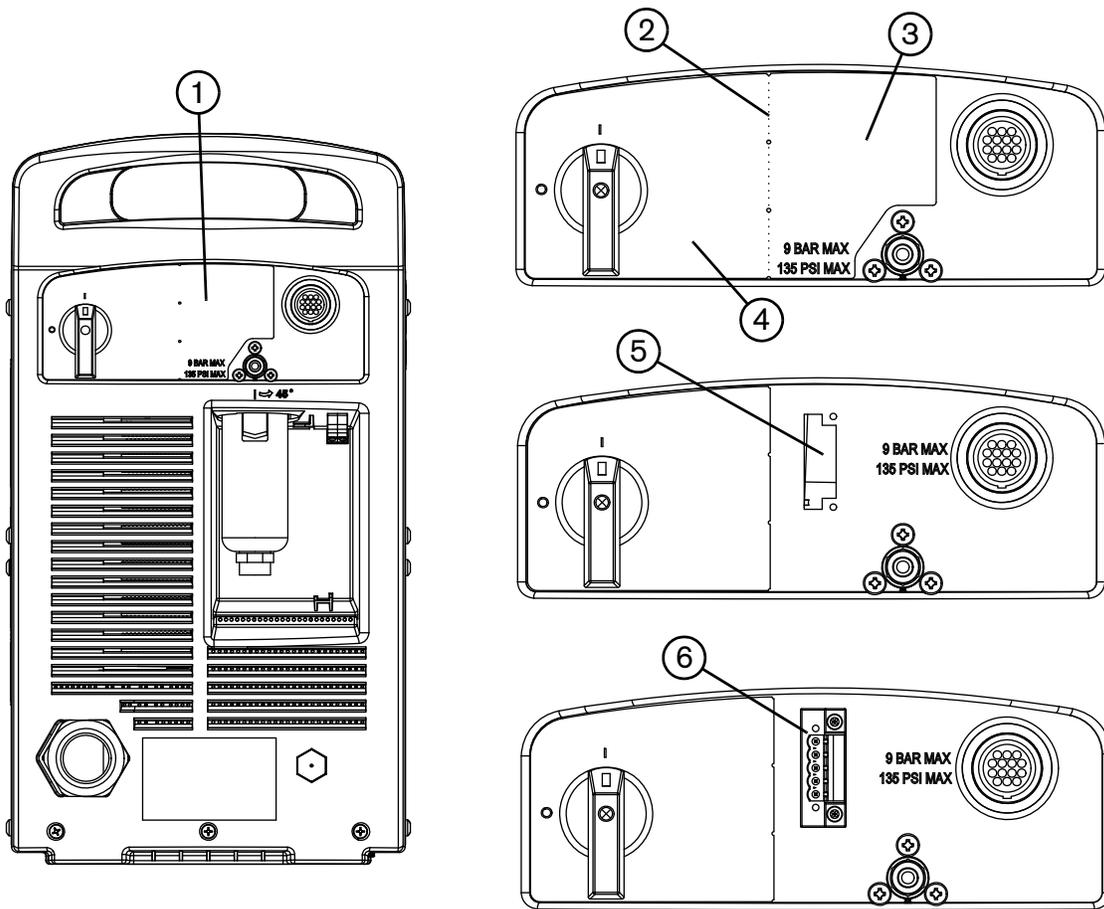
Installing the RS-485 serial interface cable

Kit number	Description
228539	Kit: Serial interface port, internal cables, and RS-485 board

Refer to Connecting an optional RS-485 serial interface cable on page 104 for information on connecting an external device to the RS-485 serial interface connector and for the part numbers of the RS-485 serial cables that Hypertherm offers.

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
2. Pry up the right edge of the power switch label using a knife or blade screwdriver. (See Figure 52.)
3. Peel the right half of the label back to the perforation.
4. Apply pressure to the left half of the label while tearing the right half away. Discard the right half of the label.

Figure 52

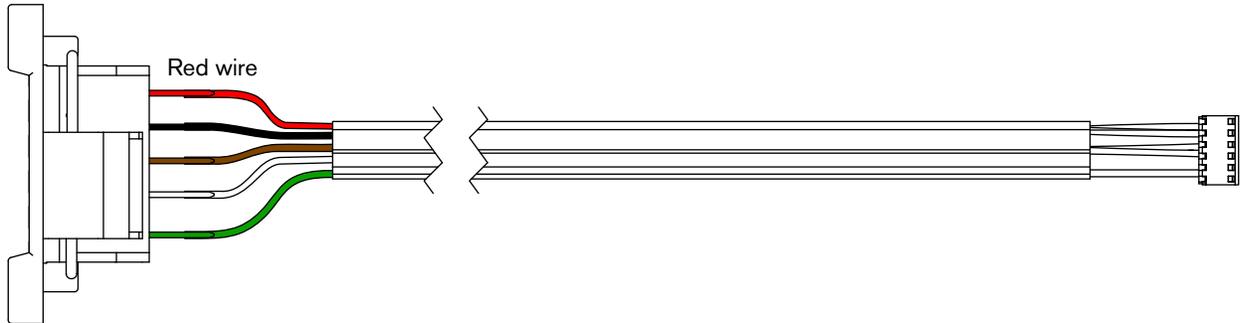


- 1 Power switch label
- 2 Perforation
- 3 Right half of label

- 4 Left half of label
- 5 RS-485 connector mounting hole
- 6 RS-485 connector

5. Route the long cable, small connector first, through the RS-485 mounting hole in the rear panel.
6. Fasten the RS-485 connector in the mounting hole of the rear panel, with the red wire on top (see Figure 53), by tightening the 2 supplied screws to 11.5 kg-cm (10 inch-pounds).

Figure 53

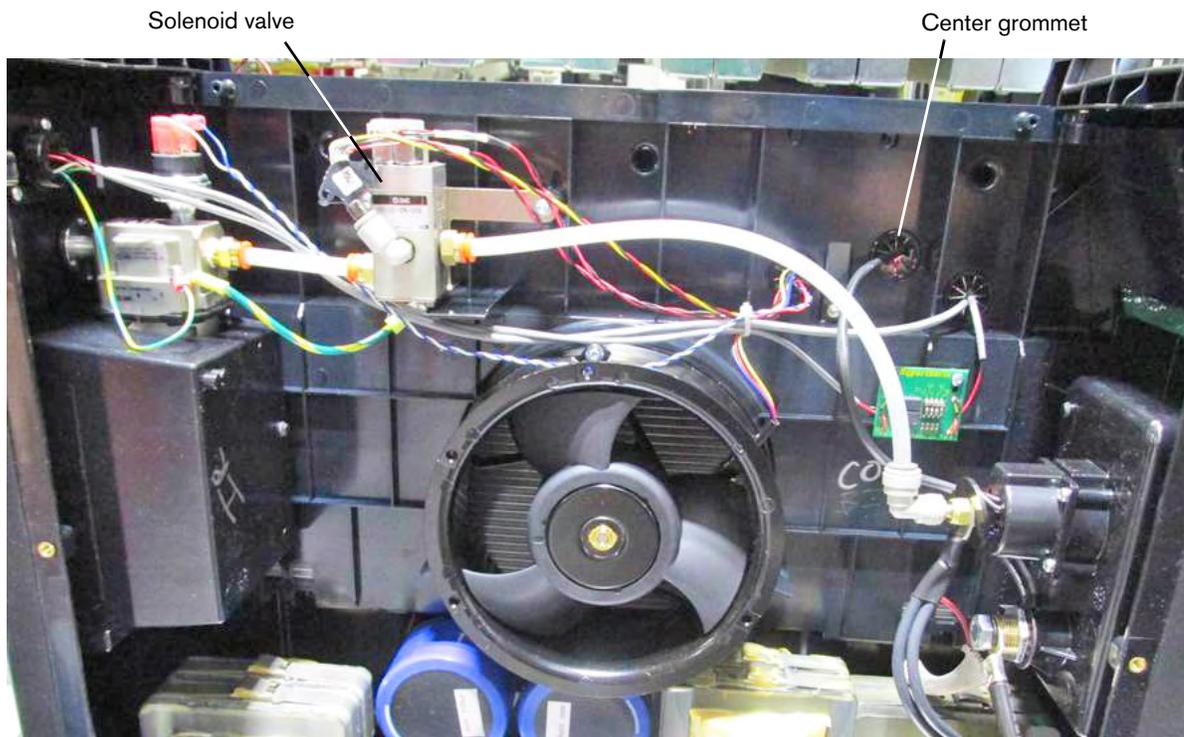


7. Route the RS-485 cable next to the 2 existing gray cables, below the solenoid valve.

 The RS-485 cable and two gray cables on older Powermax125 systems are routed above the solenoid valve.

8. Push the small connector from the RS-485 cable through the center grommet in the center panel.

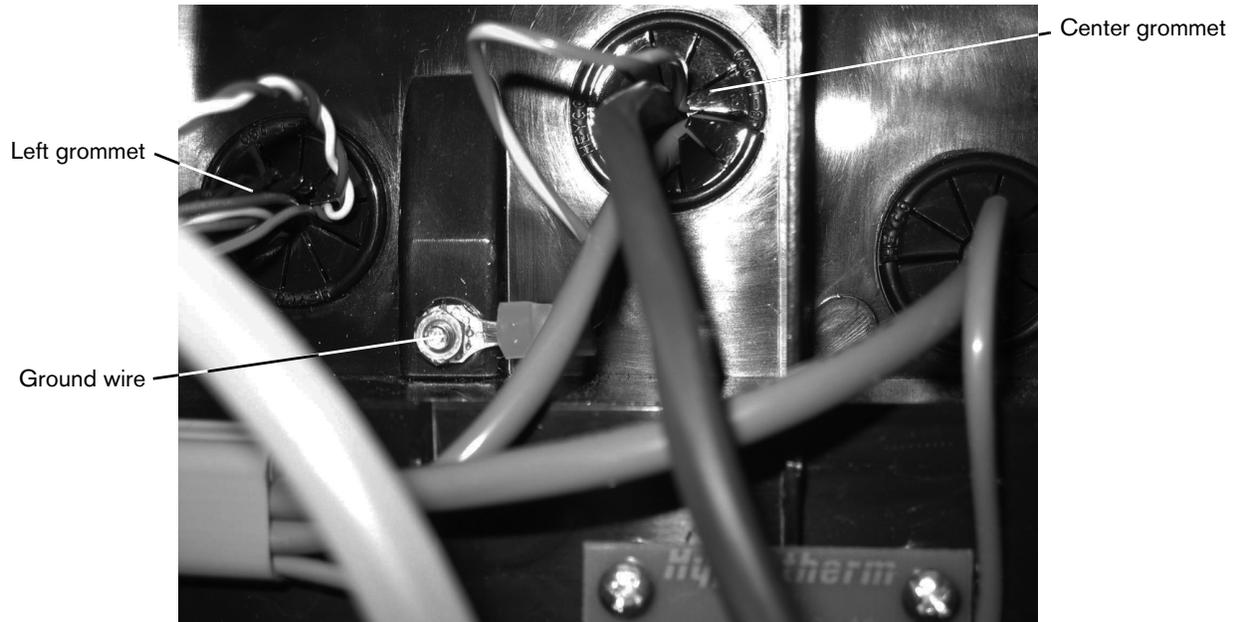
Figure 54



9 – Power Supply Component Replacement

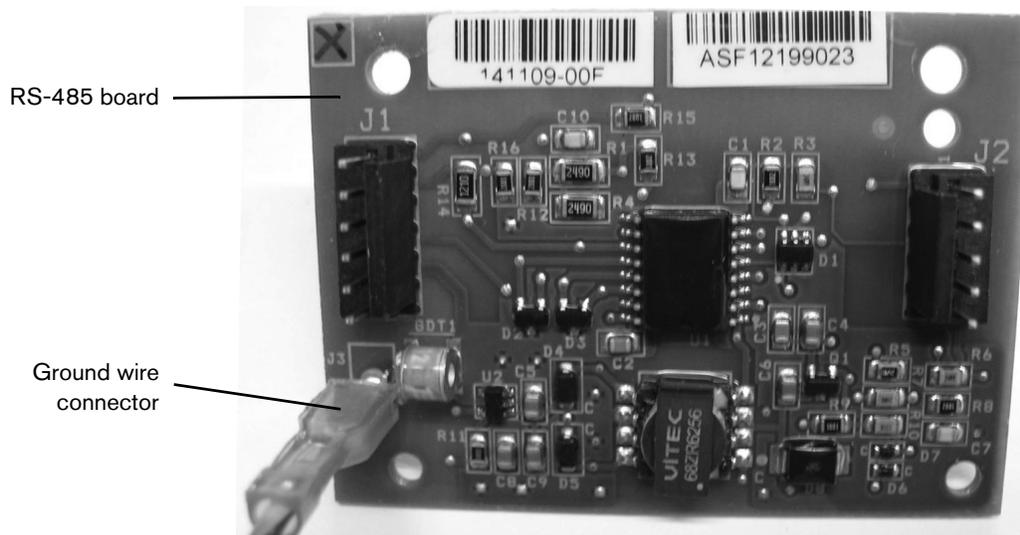
9. Attach the green/yellow ground wire ring connector to the threaded post located between the center and left grommets. (See Figure 55.) Tighten the supplied nut onto the threaded post to 17.3 kg-cm (15 inch-pounds).
10. Push the ground wire connector through the center grommet.

Figure 55



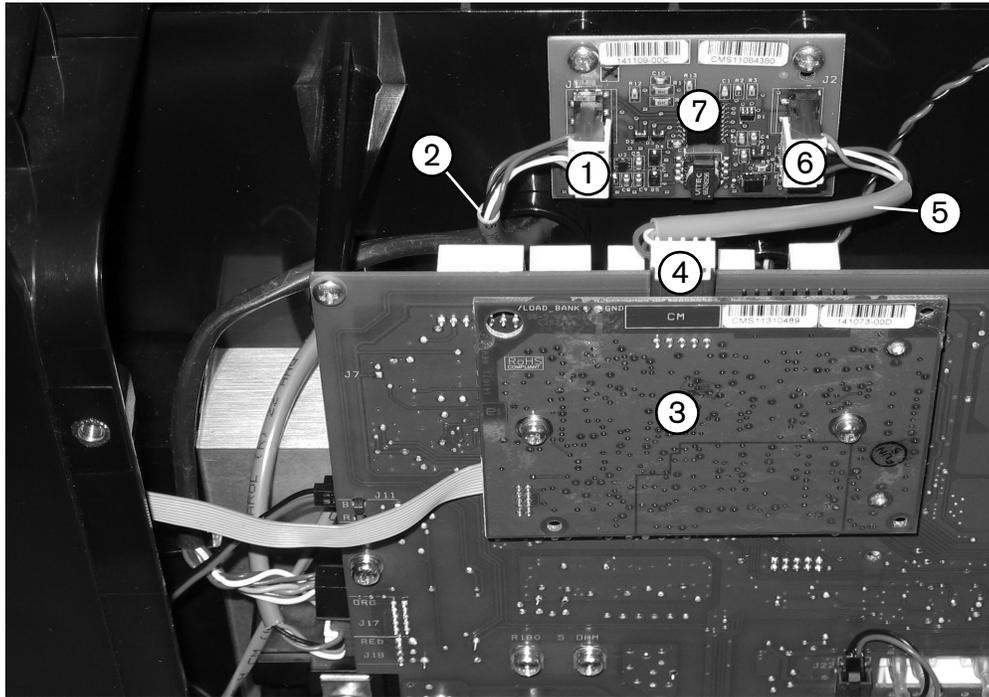
11. From the power board side of the power supply, secure the RS-485 board to the plastic mounting posts located on the center panel directly behind the DSP board. Tighten the 2 supplied screws to 11.5 kg-cm (10 inch-pounds). See Figure 57 on page 189.
12. Attach the ground wire connector to the bottom left connector on the RS-485 board.

Figure 56



13. Push the connector from the long RS-485 cable onto the J1 connector of the RS-485 board.
14. On the short RS-485 cable, push the connector with the smaller white dust cover onto the J7 connector of the DSP board.
15. Push the other connector onto the J2 connector of the RS-485 board.

Figure 57



- | | |
|---------------------|----------------------|
| 1 J1 connector | 5 Short RS-485 cable |
| 2 Long RS-485 cable | 6 J2 connector |
| 3 DSP board | 7 RS-485 board |
| 4 J7 connector | |

16. Complete the following procedures:
 - a. See Install the end panel bracket on page 177.
 - b. See Install the component barrier on page 175.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

Disconnect the gas tube

Several part replacement procedures require you to disconnect the following gas tube in order to tilt the rear panel away from the power supply.

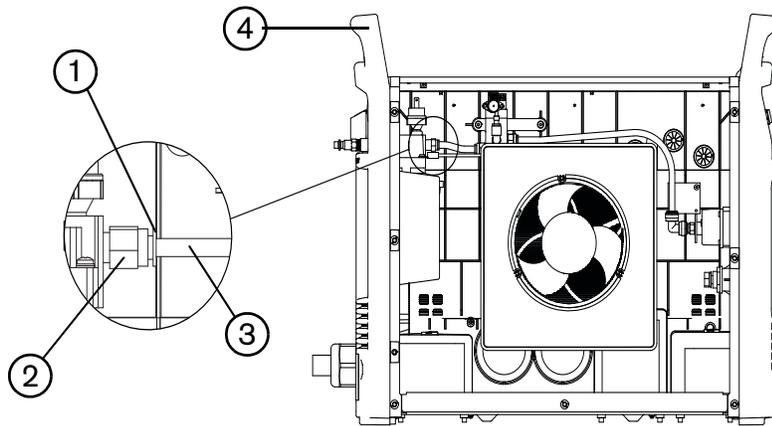


CAUTION!

Do not allow dust or other contaminants into the gas tube while it is disconnected. These contaminants can get into the solenoid valve and negatively affect the system's air pressure.

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
2. From the fan side of the power supply, push to disconnect the end of the hose nearest the rear panel. (See Figure 59 on page 191.) Gently tilt the top of the rear panel away from the power supply as needed to work the gas tube free of the push-to-connect fitting.

Figure 58

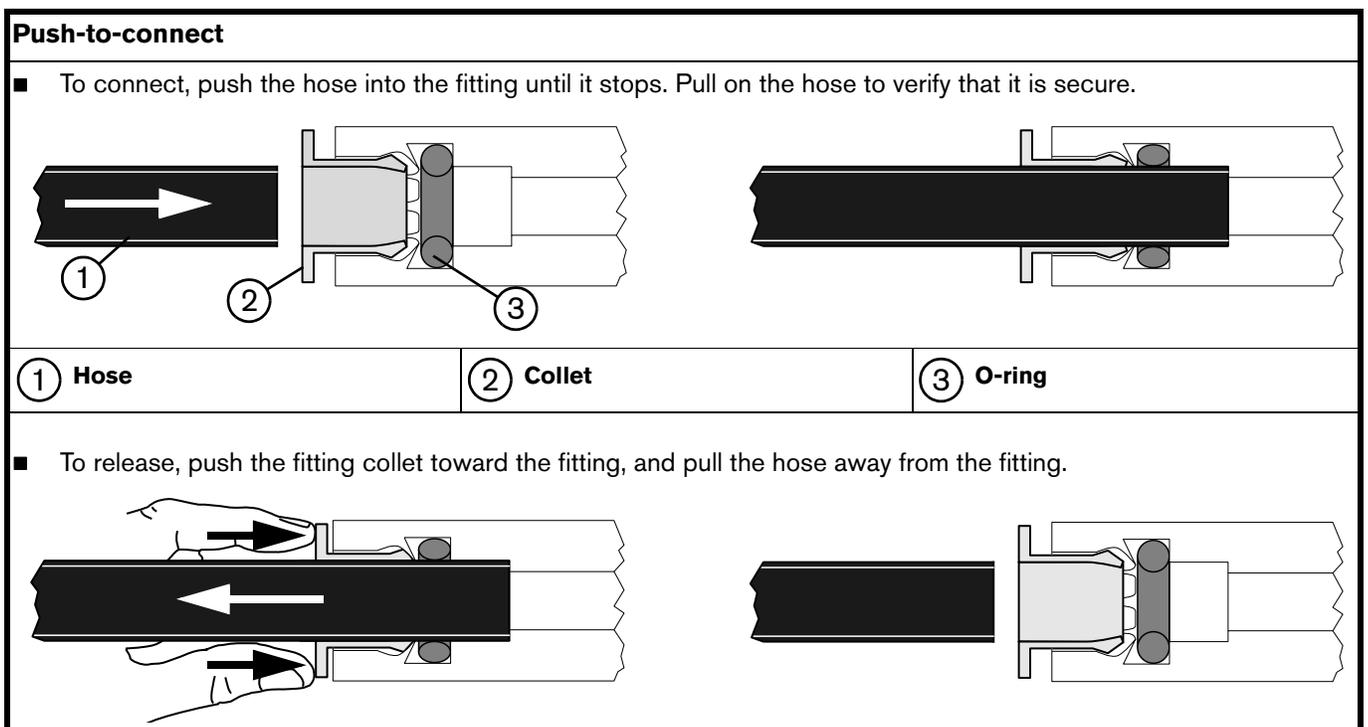


- | | |
|---------------------------|--------------|
| 1 Plastic ring | 3 Gas tube |
| 2 Push-to-connect fitting | 4 Rear panel |

Connect the gas tube

1. Align the end of the gas tube with the push-to-connect fitting.
2. Gently push the top of the rear panel toward the power supply until the gas tube is fully seated in the push-to-connect fitting.
3. Complete the following procedures:
 - a. See Install the end panel bracket on page 177.
 - b. See Install the component barrier on page 175.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

Figure 59 – How to use push-to-connect fittings



Replacing the power cord and strain relief

Kit number	Description
428121	Kit: Powermax125 power cord with strain relief 480 V and 600 V CSA
228886	Kit: Powermax105 power cord with strain relief 230 – 400 V CE; Powermax125 power cord with strain relief 400 V CE
228914	Kit: Powermax105 power cord strain relief 400 V CE/380 V CCC; Powermax125 power cord strain relief 480 V and 600 V CSA/380 V CCC
228913	Kit: Powermax105 power cord strain relief 230 – 400 V CE; Powermax125 power cord strain relief 400 V CE

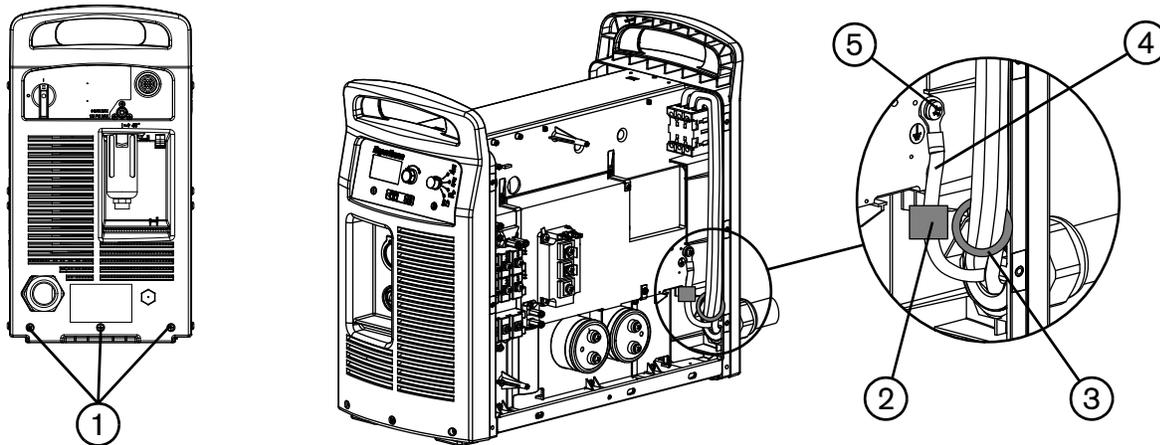
Remove the power cord and strain relief

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
 - e. See Disconnect the gas tube on page 190.
2. Remove the 3 mounting screws from the bottom of the rear panel.
3. From the power board side of the power supply, remove the screw securing the ground wire to the heatsink.



The ground wire screw is located behind the power board. The power board is removed in Figure 60 to show the ground wire connection on the heatsink.

Figure 60

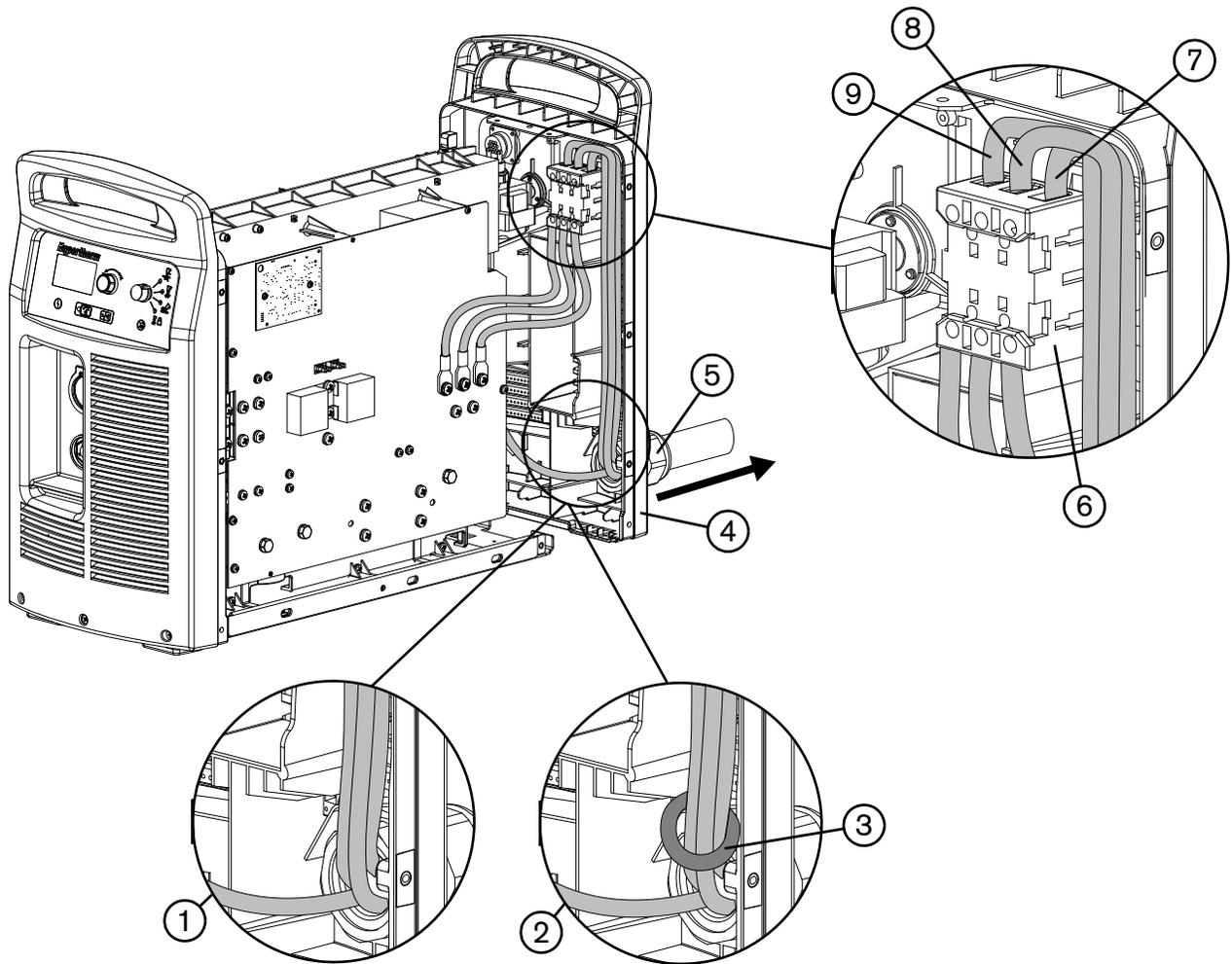


- | | | | |
|---|--------------------------------------|---|-------------|
| 1 | Rear panel mounting screws | 4 | Ground wire |
| 2 | Ground wire ferrite core (CE models) | 5 | Screw |
| 3 | Power wire ferrite core (CE models) | | |

 CE models have a ferrite core installed over the ground wire and over the power wires. CSA models do not have ferrite cores. CCC models do not ship with a power cord; to maintain CE certification, install power cord kit 228886.

4. Slide the rear panel approximately 4.0 cm (1.5 inches) away from the power supply.
5. Verify that power to the system has been turned OFF and disconnected. Loosen the set screws that secure the 3 power wires (L1, L2, L3) to the top of the power switch. (See Figure 61 on page 194.)
6. Pull the wires straight up to remove them from the power switch.
7. On the outside of the power supply, unscrew the power cord's strain relief retention nut so that the wires move freely. Slide the nut back along the power cord.
8. **CSA models:** Pull the wires through the strain relief from outside the power supply to remove the power cord.
CE models: Pull the wires forward through the strain relief from inside the rear panel. (You cannot remove the wires from outside the power supply because of the ferrite core installed on the 3 power wires.)

Figure 61

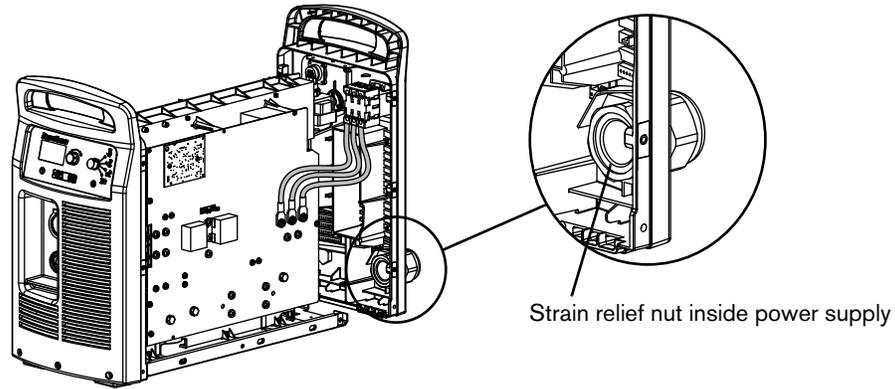


- 1 CSA power cord
- 2 CE power cord
- 3 Ferrite core
- 4 Rear panel
- 5 Strain relief retention nut

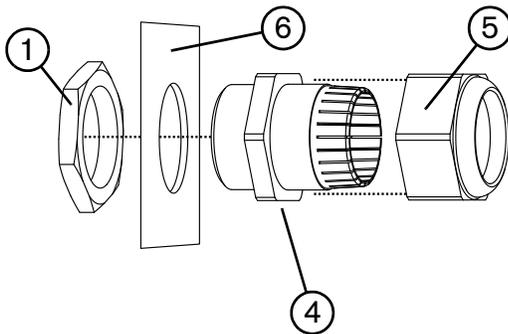
- 6 Power switch
- 7 L3
- 8 L2
- 9 L1

9. If you are replacing the strain relief, loosen and remove the strain relief nut on the inside of the power supply.
10. Remove the remaining parts of the strain relief connector from the power supply.

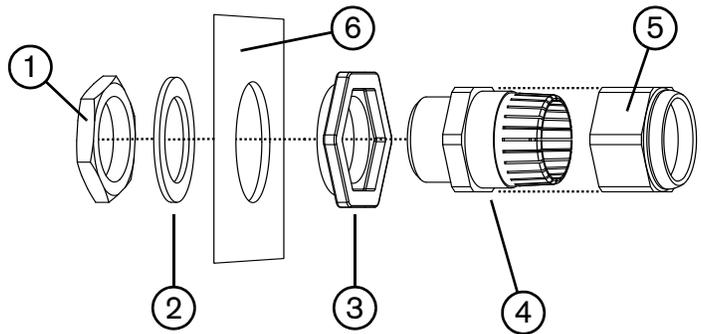
Figure 62



Strain relief on CE models



Strain relief on CSA/CCC models



- 1 Strain relief nut inside power supply
- 2 Aluminum washer (CSA/CCC models only)
- 3 Strain relief adapter (CSA/CCC models only)

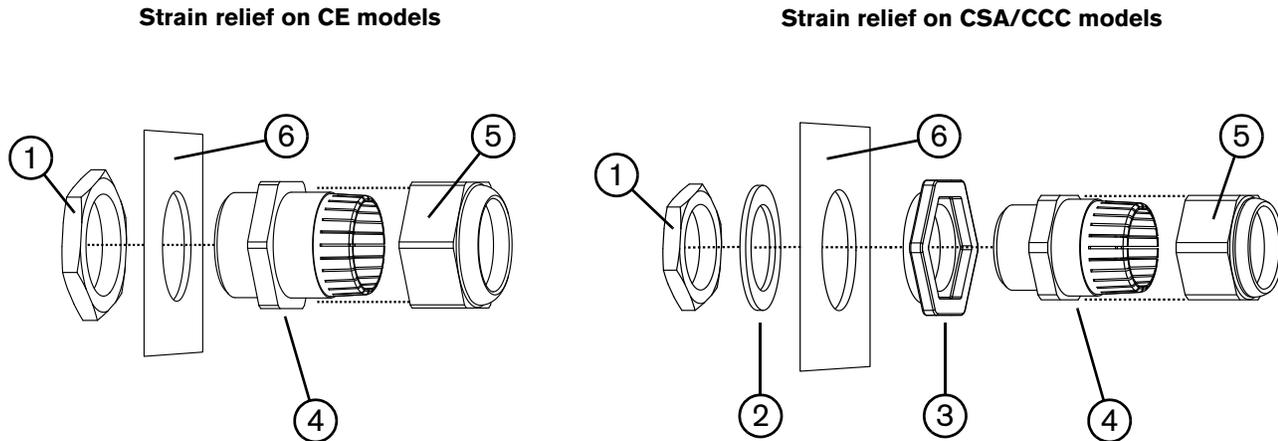
- 4 Strain relief
- 5 Strain relief retention nut
- 6 Rear panel of power supply

Install the power cord and strain relief

1. Are you installing a new strain relief?

- ❑ If yes, install the strain relief as shown in Figure 63. Do not tighten the strain relief retention nut.
- ❑ If no, loosen the strain relief retention nut on the strain relief.

Figure 63



- | | |
|---|-------------------------------|
| 1 Strain relief nut inside power supply | 4 Strain relief |
| 2 Aluminum washer (CSA/CCC models only) | 5 Strain relief retention nut |
| 3 Strain relief adapter (CSA/CCC models only) | 6 Rear panel of power supply |

2. Tighten the strain relief nut inside the power supply to secure the strain relief to the power supply.

3. **CSA models:** From the outside of the power supply, slide the power cord through the strain relief.

CE models: Push the power cord through the strain relief from inside the rear panel. (You cannot route the power cord through the strain relief from outside the power supply because of the ferrite core installed on the power wires.)

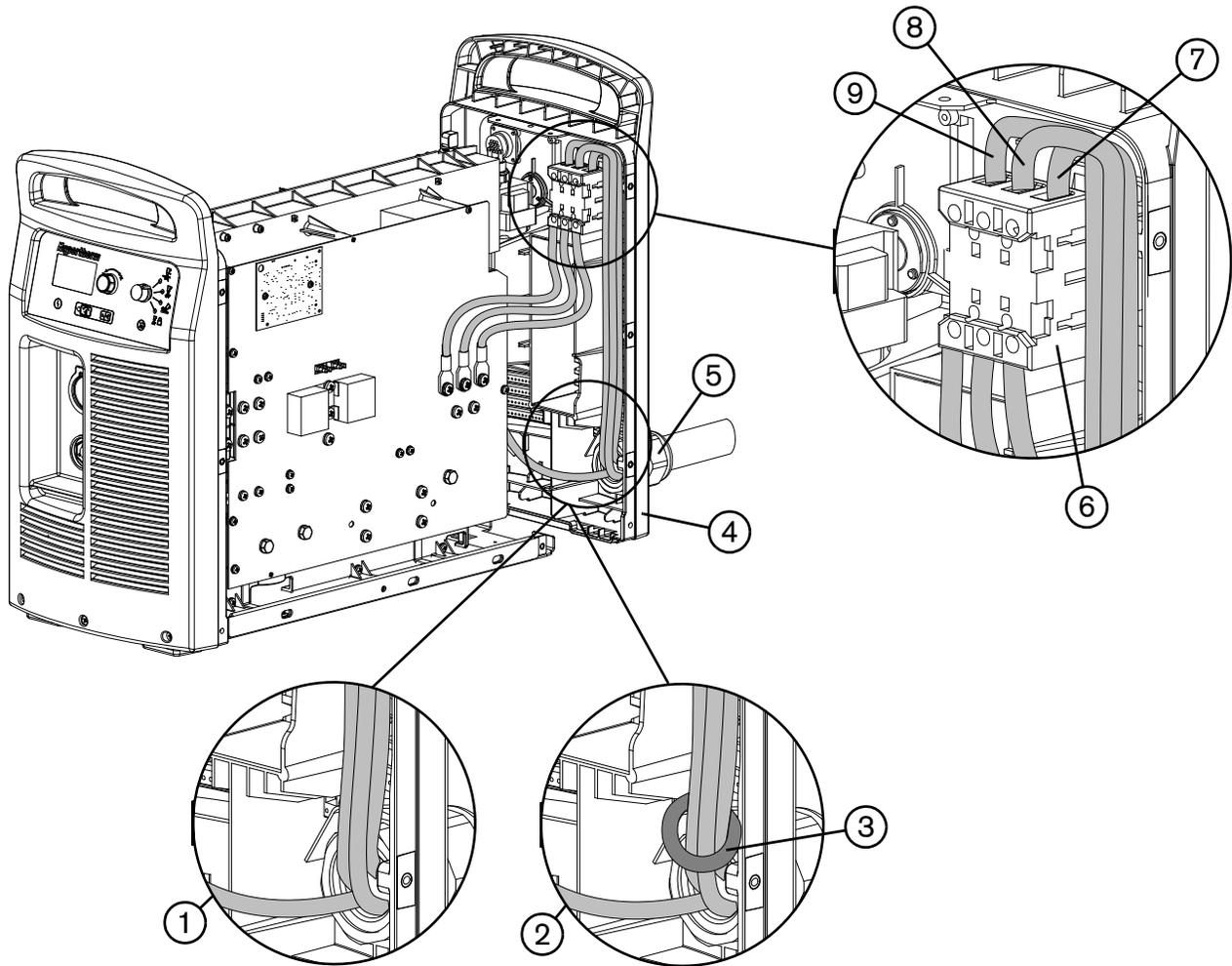
CCC models do not ship with a power cord. To install a power cord on a CCC system, slide the power cord through the strain relief from the outside of the power supply; or, to maintain CE certification, install power cord kit 228886.

4. Route the 3 power wires up the chase inside the rear panel to the top of the power switch.

5. Insert the 3 wires in the top of the power switch as shown in Figure 64 and Table 13 on page 197. Tighten the 3 set screws to 23 kg-cm (20 inch-pounds).

6. Tighten the strain relief retention nut.

Figure 64



- | | |
|-------------------------------|----------------|
| 1 CSA power cord | 6 Power switch |
| 2 CE power cord | 7 L3 |
| 3 Ferrite core | 8 L2 |
| 4 Rear panel | 9 L1 |
| 5 Strain relief retention nut | |

Table 13 – Power cord connections*

Wire	CSA	CE
L1	Black	Brown
L2	White	Black
L3	Red	Gray

* Wire colors may vary in power cords not purchased from Hypertherm.

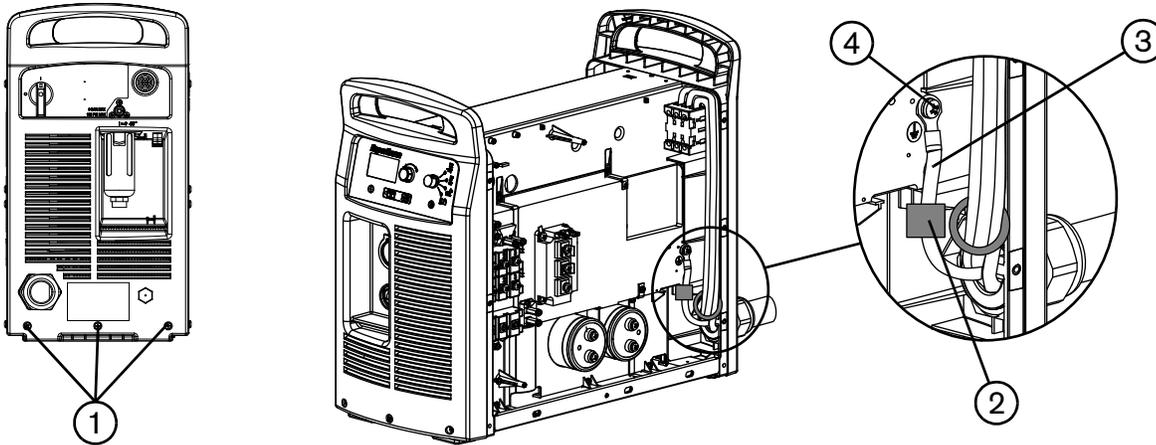
9 – Power Supply Component Replacement

7. Lift up the end of the power supply base, and carefully slide the rear panel against the base until the base sits securely on the panel. Tighten the 3 supplied mounting screws to 23 kg-cm (20 inch-pounds).
8. Secure the ground wire to the heatsink by tightening the ground screw to 23 kg-cm (20 inch-pounds).



The power board is removed in Figure 65 to show the ground wire connection on the heatsink.

Figure 65



- | | | | |
|---|----------------------------|---|-------------|
| 1 | Rear panel mounting screws | 3 | Ground wire |
| 2 | Ferrite core (CE models) | 4 | Screw |

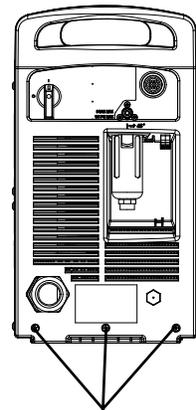
9. Complete the following procedures:
 - a. See Connect the gas tube on page 191.
 - b. See Install the end panel bracket on page 177.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Replacing the power switch

Kit number	Description
228880	Kit: Powermax105/125 power switch 400 V CE/380 V CCC/480 V, 600 V CSA

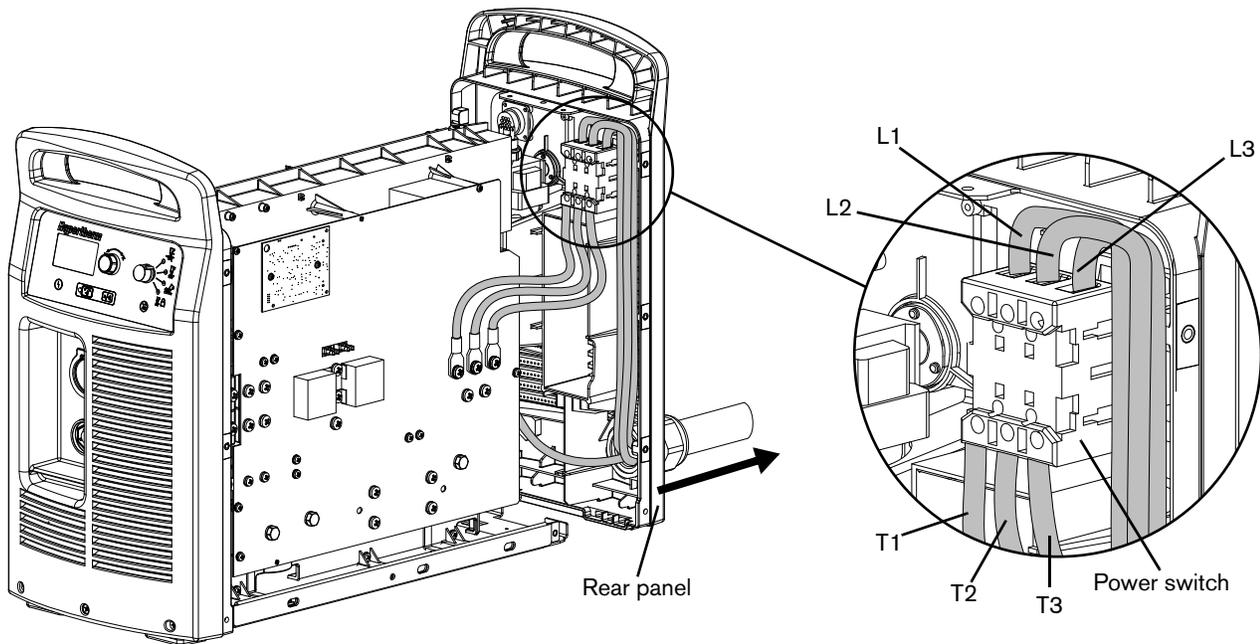
Remove the power switch

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
 - e. See Disconnect the gas tube on page 190.
2. Remove the 3 mounting screws from the bottom of the rear panel.
3. Tilt the rear panel approximately 4.0 cm (1.5 inches) away from the power supply.
4. Verify that power to the system has been turned OFF and disconnected. Loosen the set screws that secure the 3 power wires (L1-L2-L3) to the top of the power switch. (See Figure 66 on page 200.)
5. Pull the wires straight up to remove them from the power switch.
6. Loosen the set screws that secure the 2 wires (red, black) to the auxiliary switch located on top of the power switch behind the L1-L2-L3 wires.
7. Pull the wires straight up to remove them from the auxiliary switch.
8. Loosen the set screws that secure the 3 power wires (T1-T2-T3) to the bottom of the power switch.
9. Pull the wires straight down to remove them from the power switch.



Rear panel mounting screws

Figure 66

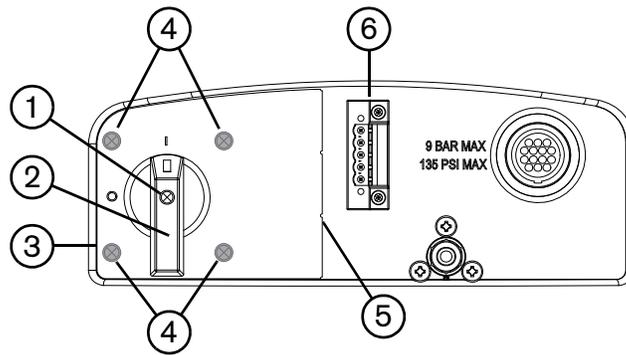


10. Remove the handle screw that secures the power switch handle to the post. (See Figure 67 on page 201.)
11. Pull the power switch handle straight off the post and set aside the handle and screw. If the white plastic cap does not come off with the handle, pull the cap off the post as well.
12. Pry up the edge of the power switch label using a knife or blade screwdriver. If the optional RS-485 connector is not installed, the label extends to the right side of the inlet gas fitting.
13. Peel off the entire label to expose the 4 mounting screws that secure the power switch to the rear panel.
14. Disengage the power switch from the rear panel by removing the 4 mounting screws.

Install the power switch

1. Secure the power switch to the rear panel by tightening the 4 supplied mounting screws to 11.5 kg-cm (10 inch-pounds).
2. If the RS-485 connector is installed, bend and tear the new label at the perforation.
3. Peel the backing off the label and affix to the rear panel, being careful to align the hole in the label with the corresponding hole in the rear panel.
4. Push the power switch handle straight onto the post and tighten the handle screw to 11.5 kg-cm (10 inch-pounds).

Figure 67 – Left half of label used when RS-485 connector is installed



- | | | | |
|---|---------------------|---|---|
| 1 | Handle screw | 4 | Power switch screws (behind label) |
| 2 | Power switch handle | 5 | Right edge of label ends at perforation |
| 3 | Left edge of label | 6 | Optional RS-485 connector |

Figure 68 – Full label used when RS-485 connector is *not* installed

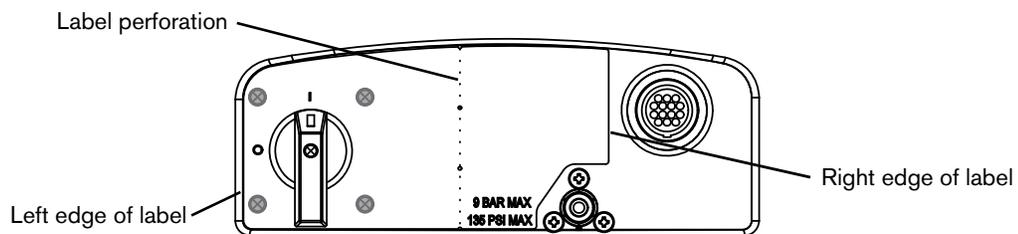


Figure 69

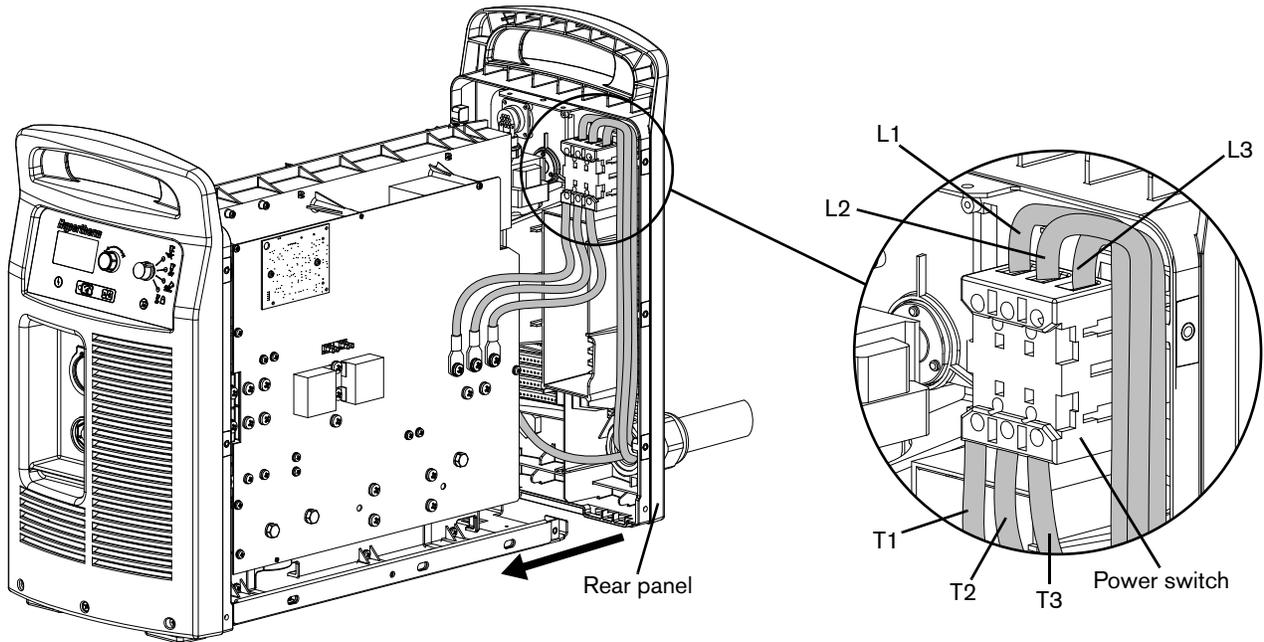
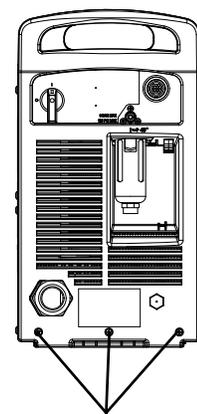


Table 14 – Power cord connections

Wire	CSA	CE
L1	Black	Brown
L2	White	Black
L3	Red	Gray

* Wire colors may vary in power cords not purchased from Hypertherm.

5. Insert the red and black wires in the top of the auxiliary switch and tighten the set screws to 11.5 kg-cm (10 inch-pounds). The red wire connects to the “13” terminal, and the black wire connects to the “14” terminal.
6. Insert the 3 power wires in the bottom of the power switch as shown in Figure 69 and Table 14. Tighten the T1-T2-T3 set screws to 23 kg-cm (20 inch-pounds).
7. Insert the 3 power wires in the top of the power switch as shown in Figure 69 and Table 14. Tighten the L1-L2-L3 set screws to 23 kg-cm (20 inch-pounds).
8. Lift up the end of the power supply base, and carefully slide the rear panel against the base until the base sits securely on the panel. Tighten the 3 mounting screws in the bottom of the rear panel to 23 kg-cm (20 inch-pounds).



Rear panel mounting screws

9. Complete the following procedures:
 - a. See Connect the gas tube on page 191.
 - b. See Install the end panel bracket on page 177.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Replacing the control board

Kit number	Description
228657	Kit: Powermax65/105/125 control board (141165)

Remove the control board

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
2. Remove the current adjustment knob and operating mode switch knob from the front panel by pulling them straight off. See Figure 70 on page 204.
3. Carefully pull the top of the front panel away from the power supply. The front panel is still attached to the bottom of the power supply and can only move a short distance.
4. Remove the 3 screws that secure the control board to the front panel. 2 screws are installed at the top of the control board, one at each end. The third screw (not shown) is installed in the middle of the control board along the bottom edge.



Access the third screw from the fan side of the power supply.

5. Carefully slide the control board from behind the front panel toward the power board side of the power supply.
6. Disconnect the ribbon cable from the control board.

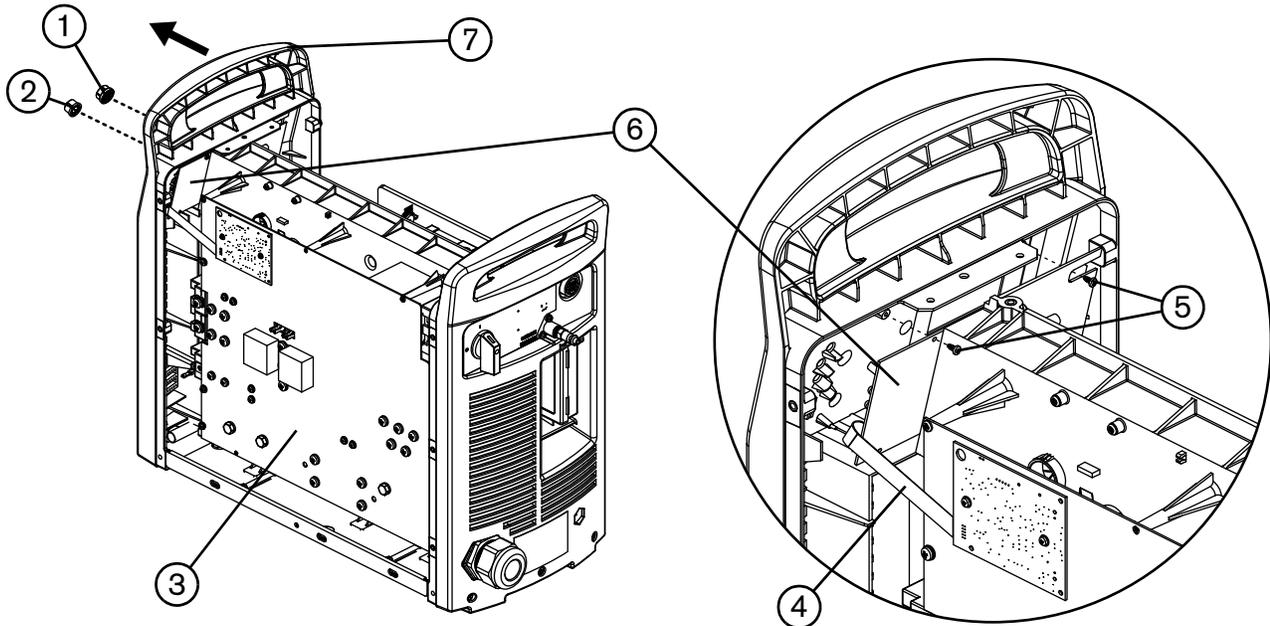
Install the control board

1. Plug the ribbon cable into the J6 connector on the control board. See Figure 70 on page 204.
2. Carefully pull the top of the front panel away from the power supply and slide the control board into place. Angle the bottom of the board into the correct position first, then angle the top of the board into place.
3. Secure the control board to the front panel using the 3 supplied mounting screws. Tighten the bottom screw first to ensure the control board is aligned properly, then tighten the 2 top screws. Tighten all 3 screws to 5.7 kg-cm (5 inch-pounds).

9 – Power Supply Component Replacement

4. Align the inside flat edge of the operating mode switch knob (with the white line) with the flat side of the control board post, and push the knob straight onto the post.
5. Align the inside flat edge of the current adjustment knob with the flat side of the control board post, and push the knob straight onto the post.

Figure 70



- | | | | |
|---|-------------------------|---|---------------------|
| 1 | Current adjustment knob | 5 | Top mounting screws |
| 2 | Operating mode knob | 6 | Control board |
| 3 | Power board | 7 | Top of front panel |
| 4 | Ribbon cable | | |

6. Complete the following procedures:
 - a. See Install the end panel bracket on page 177.
 - b. See Install the component barrier on page 175.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

Replacing the DSP board

Kit number	Description
428119	Kit: Powermax125 DSP board (141316)

Remove the DSP board

See Figure 71 on page 206.

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
2. Is an RS-485 communication board installed in the power supply?
 - If yes, disconnect the DSP connector from the top of the DSP board (J7).
 - If no, continue with the next step.
3. Remove the 2 screws from the DSP board.

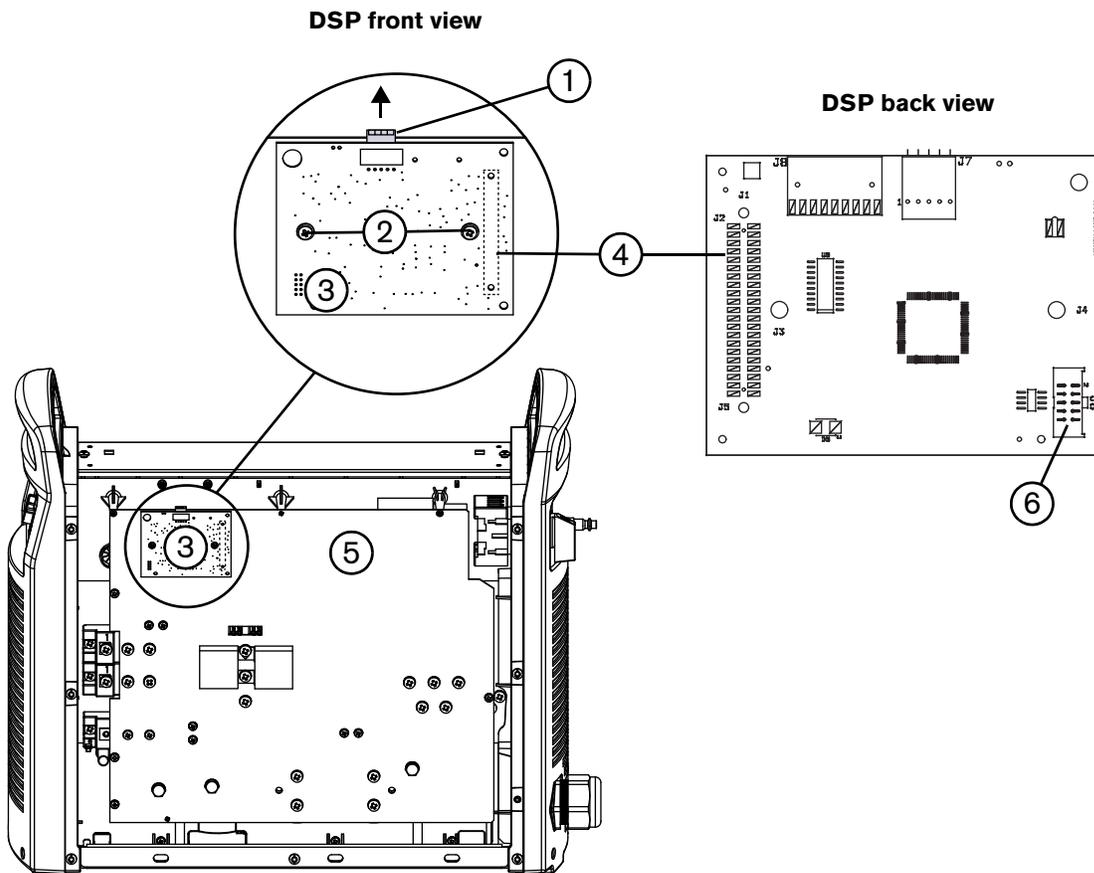
2 rows of connector pins are located on the back of the DSP board as shown in Figure 71. The dashed rectangle in the graphic identifies the location of the pins on the back of the board.
4. Carefully pull the DSP board straight out from the power board. Do not bend the pins.
5. Disconnect the ribbon cable from the J6 ribbon cable connector on the back of the DSP board. Set the DSP board aside.

Install the DSP board

See Figure 71 on page 206.

1. Connect the ribbon cable from the control board to the J6 connector on the back of the DSP board.
2. Carefully align the 2 rows of connector pins located on the back of the DSP board with the mating holes in the power board.
3. Gently push the DSP board connector pins into the power board until fully seated. Be careful not to bend the pins.
4. Is an RS-485 communication board installed in the power supply?
 - If yes, connect the DSP connector to the top of the DSP board at J7.
 - If no, continue with the next step.
5. Tighten the 2 mounting screws to 8.1 kg-cm (7 inch-pounds).

Figure 71



- | | |
|----------------------------|------------------|
| 1 DSP connector (J7) | 4 Connector pins |
| 2 DSP connector screws (2) | 5 Power board |
| 3 DSP board | 6 J6 connector |

6. Complete the following procedures:

- a. See Install the component barrier on page 175.
- b. See Install the power supply cover on page 174.
- c. Reconnect the power and gas supply.

Replacing the power board

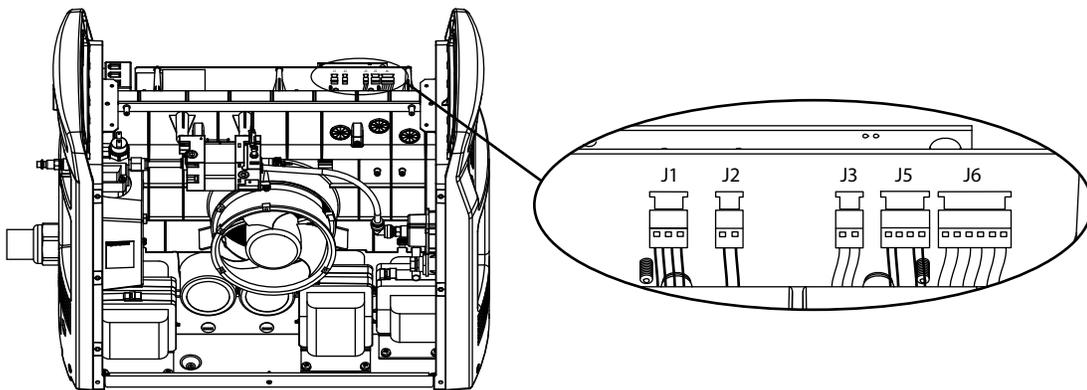
Kit number	Description
428123	Kit: Powermax125 power board 480 V CSA (141204)
428124	Kit: Powermax125 power board 600 V CSA (141290)
428122	Kit: Powermax125 power board 400 V CE/380 V CCC (141207)

Remove the power board

Complete the instructions below while referring to the applicable figure:

- Figure 73 – 480 V / 600 V CSA power board on page 209
 - Figure 74 – 400 V CE / 380 V CCC power board on page 210
1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the DSP board on page 205.
 2. Unplug the 5 wire connectors located at J1, J2, J3, J5, and J6 on the component side of the power board.

Figure 72



3. Disconnect the gate drive wire connectors (J21, J22) from the power board.
4. Remove the two 4 μ F capacitors from the power board.
5. Remove all the screws and bolts securing wires to the power board.
6. Remove all the remaining screws from the power board except the 7 board mounting screws and the 2 transformer mounting screws.
7. Remove the 7 board mounting screws. Do not remove the 2 transformer mounting screws.

9 – Power Supply Component Replacement

8. Pull the right-hand edge of the power board forward, while pushing the gate drive wires through the openings in the board.



Silkscreen printing above the openings in the board denotes the color and order of the gate drive wires. The printing from left to right is “BLK” (black), “RED” (red), “BLK” (black), “RED” (red).

9. Unplug the J11 and J17 wire connectors from the left side of the power board. Gently move the J17 connector side-to-side to work it free from the power board.
10. Unplug the J18 and J32 wire connectors from the left side of the power board.
11. Remove the power board from the power supply.

Install the power board

Complete the instructions below while referring to the applicable figure:

- Figure 73 – 480 V / 600 V CSA power board on page 209
- Figure 74 – 400 V CE / 380 V CCC power board on page 210

1. Place the power board in the mounting position while routing the gate drive wires through the respective openings in the board.



Verify that all the wires that were disconnected while removing the power board are now positioned in front of the power board.

2. Tighten the 7 board mounting screws to 17.3 kg-cm (15 inch-pounds).
3. Plug the gate drive wires into the respective connectors on the power board (J22 and J21).

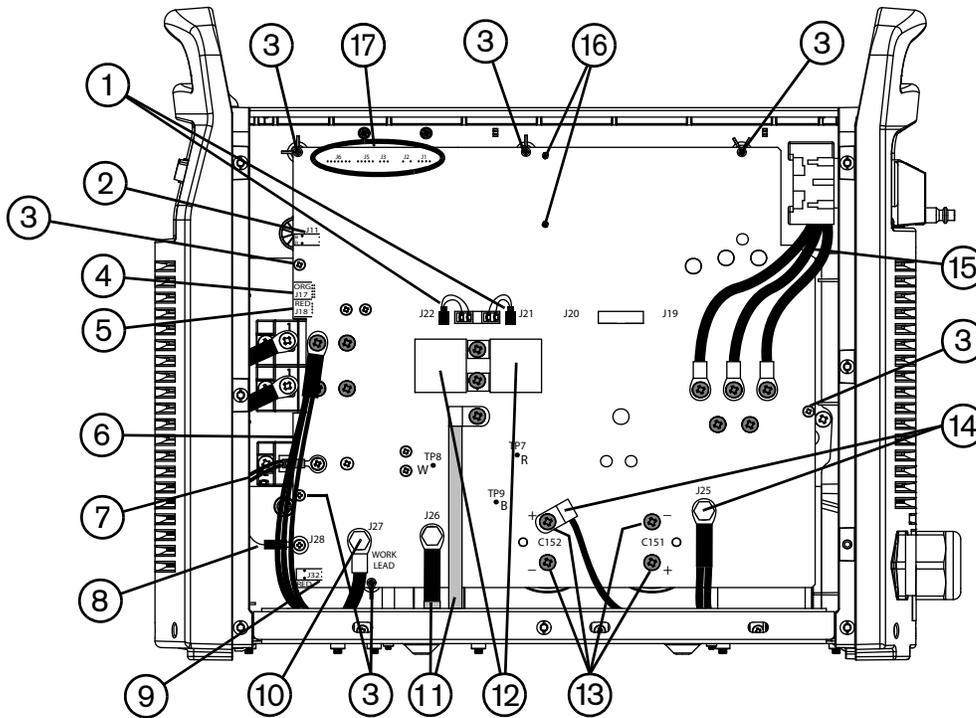


Silkscreen printing above the openings in the board denotes the color and order of the gate drive wires. The printing from left to right is “BLK” (black), “RED” (red), “BLK” (black), “RED” (red).

4. Plug the respective wire connectors into the J1, J2, J3, J5, and J6 connectors on the back of the power board.
5. Plug the J11 and J17 wire connectors into the respective connectors on the left side of the power board.
6. Plug the J18 and J32 wire connectors into the respective connectors on the left side of the power board.
7. Secure the respective wires to the power board at J25, J26, and J27 by tightening the bolts to 63.4 kg-cm (55 inch-pounds).
8. Install and tighten to 40.3 kg-cm (35 inch-pounds) the screws that are shaded gray in Figure 73 on page 209 and Figure 74 on page 210.
 - Attach the previously removed wires to the power board.
 - Attach the two 4 μ F capacitors onto the board below the gate drive wires.
9. Install and tighten the remaining screws to 23 kg-cm (20 inch-pounds). Attach the previously removed wires to the power board.

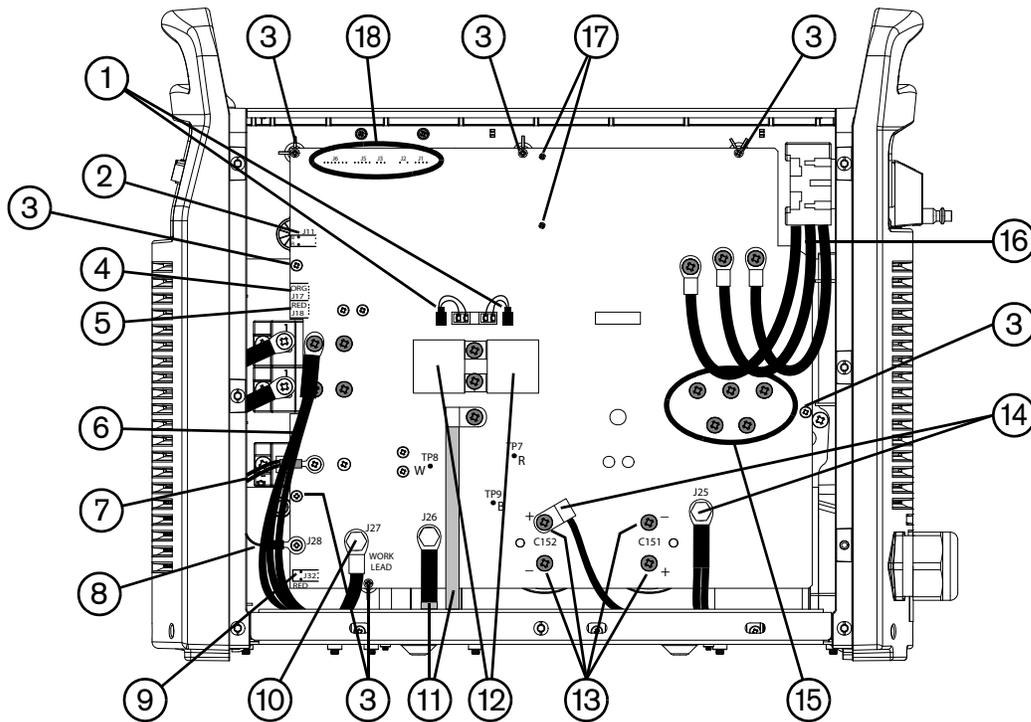
10. Attach any remaining connectors and reinstall the DSP board as explained in Install the DSP board on page 205.
11. Complete the following procedures:
 - a. See Install the component barrier on page 175.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

Figure 73 – 480 V / 600 V CSA power board



- | | |
|---|---|
| <ol style="list-style-type: none"> 1 Gate drive connectors 2 J11 3 Board mounting screws (7) 4 J17 5 J18 6 Output inductor wires 7 Nozzle wires 8 Electrode wire 9 J32 | <ol style="list-style-type: none"> 10 Work lead 11 Transformer wires 12 4 μF capacitors 13 Capacitor screws (4) 14 PFC inductor wires 15 AC input wires (3) 16 Transformer mounting screws 17 J6, J5, J3, J2, and J1 |
|---|---|

Figure 74 – 400 V CE / 380 V CCC power board



- | | |
|-----------------------------|----------------------------------|
| 1 Gate drive connectors | 10 Work lead |
| 2 J11 | 11 Transformer wires |
| 3 Board mounting screws (7) | 12 4 μ F capacitors |
| 4 J17 | 13 Capacitor screws (4) |
| 5 J18 | 14 PFC inductor wires |
| 6 Output inductor wires | 15 Input diode bridge screws (5) |
| 7 Nozzle wires | 16 AC input wires (3) |
| 8 Electrode wire | 17 Transformer mounting screws |
| 9 J32 | 18 J6, J5, J3, J2, and J1 |

Replacing the input diode bridge

Kit number	Description
128746	Kit: Powermax105/125 input diode bridge

- 1.** Complete the following procedures:
 - a.** See Disconnect the power and gas supply on page 166.
 - b.** See Remove the power supply cover on page 174.
 - c.** See Remove the component barrier on page 175.
 - d.** See Remove the DSP board on page 205.
 - e.** See Remove the power board on page 207.
- 2.** Remove the 2 mounting screws from the input diode bridge brackets, and remove the input diode bridge from the heatsink. See Figure 75 on page 217.
- 3.** Clean the area where the input diode bridge was mounted using isopropyl alcohol to remove the old thermal grease from the heatsink.
- 4.** Apply a 0.0762 mm (0.003 inch) layer of thermal grease, about the thickness of a sheet of paper, evenly to the input diode bridge mounting surface.
- 5.** Mount the input diode bridge to the heatsink by hand-tightening the 2 supplied mounting screws.
- 6.** Step-torque the 2 mounting screws to the proper torque value as shown in Figure 75 on page 217.
- 7.** Complete the following procedures:
 - a.** See Install the power board on page 208.
 - b.** See Install the DSP board on page 205.
 - c.** See Install the component barrier on page 175.
 - d.** See Install the power supply cover on page 174.
 - e.** Reconnect the power and gas supply.

Replacing the output diode bridge

Kit number	Description
428139	Kit: Powermax125 output diode with thermal grease

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the DSP board on page 205.
 - e. See Remove the power board on page 207.
2. Disconnect the 2 wires on the left side of the output diode bridge. See Figure 75 on page 217.
3. Remove the 4 mounting screws from the output diode bridge.
4. Remove the output diode bridge from the heatsink.
5. Clean the area where the output diode bridge was mounted, using isopropyl alcohol to remove the old thermal grease from the heatsink.
6. Apply a 0.0762 mm (0.003 inch) layer of thermal grease, about the thickness of a sheet of paper, evenly to the output diode bridge mounting surface.
7. Mount the output diode bridge to the heatsink by hand-tightening the 4 supplied mounting screws.
8. Step-torque the 4 mounting screws in a diagonal sequence to the proper torque value as shown in Figure 75 on page 217.
9. Reconnect the 2 wires to the left side of the output diode bridge.
10. Complete the following procedures:
 - a. See Install the power board on page 208.
 - b. See Install the DSP board on page 205.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Replacing the pilot arc IGBT

Kit number	Description
428138	Kit: Powermax125 pilot arc IGBT with thermal grease

- 1.** Complete the following procedures:
 - a.** See Disconnect the power and gas supply on page 166.
 - b.** See Remove the power supply cover on page 174.
 - c.** See Remove the component barrier on page 175.
 - d.** See Remove the DSP board on page 205.
 - e.** See Remove the power board on page 207.
- 2.** Remove the 2 mounting screws from the pilot arc IGBT. See Figure 75 on page 217.
- 3.** Remove the pilot arc IGBT with its red and black wire pair from the heatsink.
- 4.** Clean the area where the pilot arc IGBT was mounted, using isopropyl alcohol to remove the old thermal grease from the heatsink.
- 5.** Apply a 0.0762 mm (0.003 inch) layer of thermal grease, about the thickness of a sheet of paper, evenly to the pilot arc IGBT mounting surface.
- 6.** Mount the pilot arc IGBT to the heatsink by hand-tightening the 2 supplied mounting screws.
- 7.** Step-torque the 2 mounting screws to the proper torque value as shown in Figure 75 on page 217.
- 8.** Connect the supplied cable to the pilot arc IGBT terminals. The black wire connects to the top terminal (labeled “E2” or “7”), and the red wire connects to the bottom terminal (labeled “G2” or “6”).
- 9.** Complete the following procedures:
 - a.** See Install the power board on page 208.
 - b.** See Install the DSP board on page 205.
 - c.** See Install the component barrier on page 175.
 - d.** See Install the power supply cover on page 174.
 - e.** Reconnect the power and gas supply.

Replacing the inverter IGBT module

Kit number	Description
428140	Kit: Powermax125 inverter IGBT with thermal grease

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the DSP board on page 205.
 - e. See Remove the power board on page 207.
2. Remove the 4 mounting screws from the inverter IGBT module. See Figure 75 on page 217.
3. Remove the thermal sensor and set it aside.
4. Remove the inverter IGBT module from the heatsink.
5. Clean the area where the inverter IGBT module was mounted, using isopropyl alcohol to remove the old thermal grease from the heatsink.
6. Apply a 0.0762 mm (0.003 inch) layer of thermal grease, about the thickness of a sheet of paper, evenly to the inverter IGBT module mounting surface.
7. Mount the inverter IGBT module to the heatsink by hand-tightening the 4 supplied mounting screws, using the longer brass screw to capture the ring terminal of the thermal sensor between the screw head and the upper left mounting hole of the inverter IGBT module.
8. Step-torque the 4 mounting screws in a diagonal sequence to the proper torque value as shown in Figure 75 on page 217.
9. Connect the supplied gate drive cables to the inverter IGBT module terminals, as follows:
 - a. On the left side:
 - Attach the black wire from one cable to the “G2” or “6” terminal.
 - Attach the red wire from the same cable to the “E2” or “7” terminal.
 - b. On the right side:
 - Attach the black wire from the other cable to the “E1” or “5” terminal.
 - Attach the red wire from the same cable to the “G1” or “4” terminal.
10. Complete the following procedures:
 - a. See Install the power board on page 208.
 - b. See Install the DSP board on page 205.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Replacing the snubber resistor

Kit number	Description
428137	Kit: Powermax125 snubber resistor 7.5 Ω with thermal grease
228898	Kit: Powermax105/125 snubber resistor 15 Ω with thermal grease

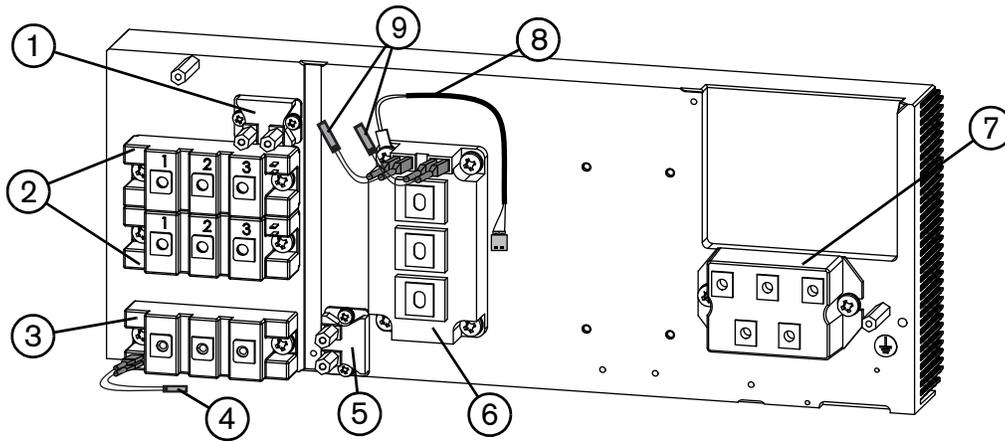
1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the DSP board on page 205.
 - e. See Remove the power board on page 207.
2. Remove the 2 mounting screws from the appropriate snubber resistor. See Figure 75 on page 217.
3. Remove the snubber resistor from the heatsink.
4. Clean the area where the snubber resistor was mounted using isopropyl alcohol to remove the old thermal grease from the heatsink.
5. Apply a 0.0762 mm (0.003 inch) layer of thermal grease, about the thickness of a sheet of paper, evenly to the snubber resistor mounting surface.
6. Mount the snubber resistor to the heatsink as follows by hand-tightening the 2 supplied mounting screws. (See Figure 75 on page 217.)
 - Kit 428137 – Align the snubber resistor so the 2 threaded studs are on the bottom of the snubber resistor.
 - Kit 228898 – Align the snubber resistor so the 2 threaded studs are on the left side of the snubber resistor.
7. Step-torque the 2 mounting screws to the proper torque value as shown in Figure 75 on page 217.
8. Tighten the 2 supplied standoffs in the threaded holes of the snubber resistor to 11.5 kg-cm (10 inch-pounds). Verify the standoffs are firmly seated to the resistor for a solid electrical connection.
9. Complete the following procedures:
 - a. See Install the power board on page 208.
 - b. See Install the DSP board on page 205.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Replacing the thermal sensor

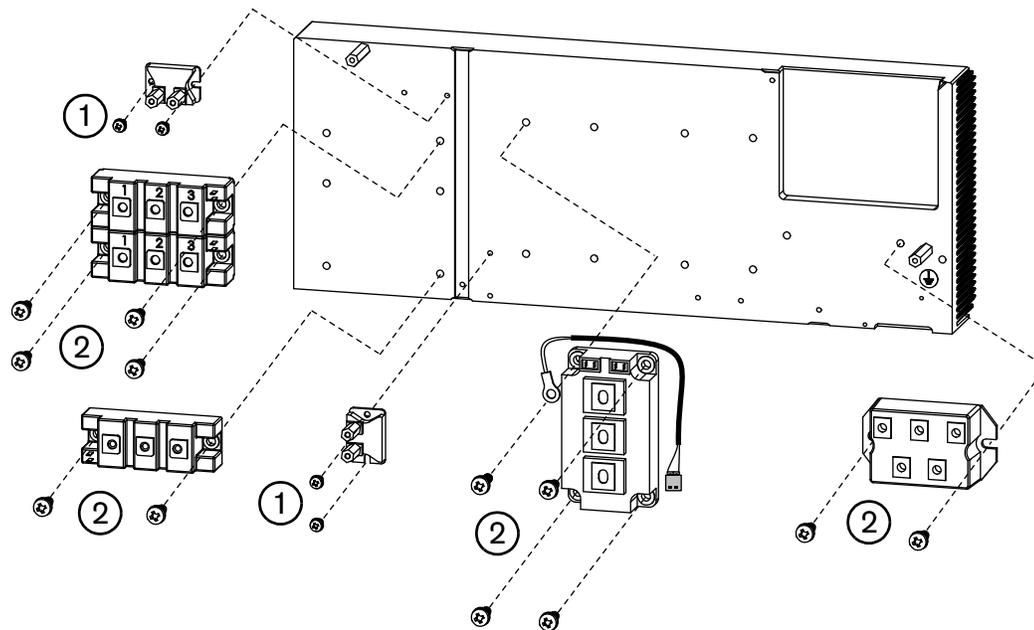
Kit number	Description
228805	Kit: Powermax65/85/105/125 thermal switch

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the DSP board on page 205.
 - e. See Remove the power board on page 207.
2. Remove the upper left screw from the inverter IGBT module. See Figure 75 on page 217.
3. Remove the thermal sensor.
4. Align the ring terminal of the new thermal sensor with the upper left hole in the inverter IGBT module.
5. Hand-tighten the supplied screw through the ring terminal, then step-torque the supplied screw to the proper value as shown in Figure 75 on page 217.
6. Complete the following procedures:
 - a. See Install the power board on page 208.
 - b. See Install the DSP board on page 205.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Figure 75 – Heatsink components



- | | |
|--|--|
| 1 Snubber resistor 7.5 Ω 200 W (Kit 428137) | 6 Inverter IGBT module (Kit 428140) |
| 2 Output diode bridge (2) (Kit 428139) | 7 Input diode bridge (Kit 128746) |
| 3 Pilot arc IGBT (Kit 428138) | 8 Thermal sensor (Kit 228805) |
| 4 Pilot arc IGBT gate drive cable | 9 Inverter IGBT module gate drive cables |
| 5 Snubber resistor 15 Ω 200 W (Kit 228898) | |



- | | |
|--|--|
| 1 Torque to 17.3 kg-cm (15 inch-pounds). | 2 Torque to 40 kg-cm (35 inch-pounds). |
|--|--|

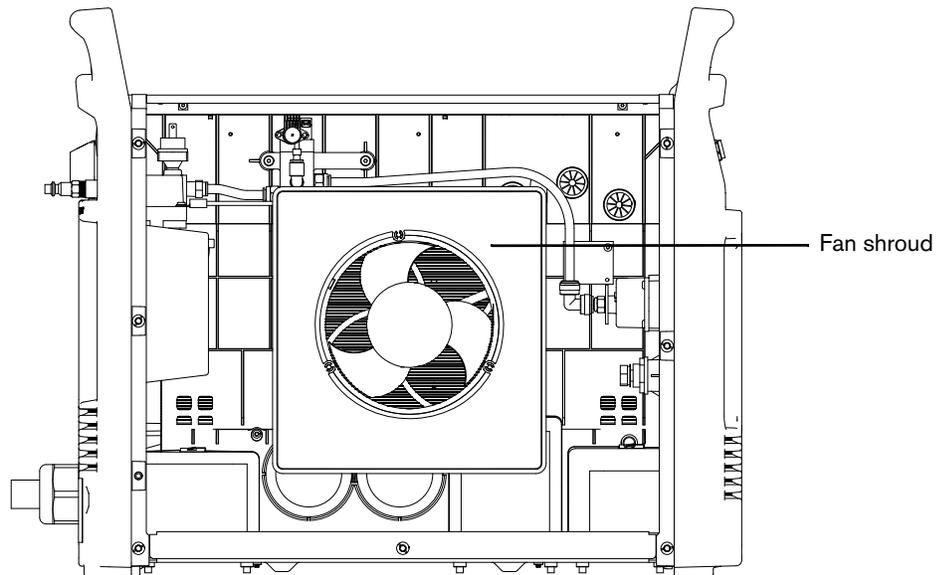
Replacing the fan shroud

Kit number	Description
228910	Kit: Powermax105/125 fan shroud

Remove the fan shroud

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
2. Grasp the fan shroud with two hands.
3. Pull the fan shroud straight off the fan housing.

Figure 76



Install the fan shroud

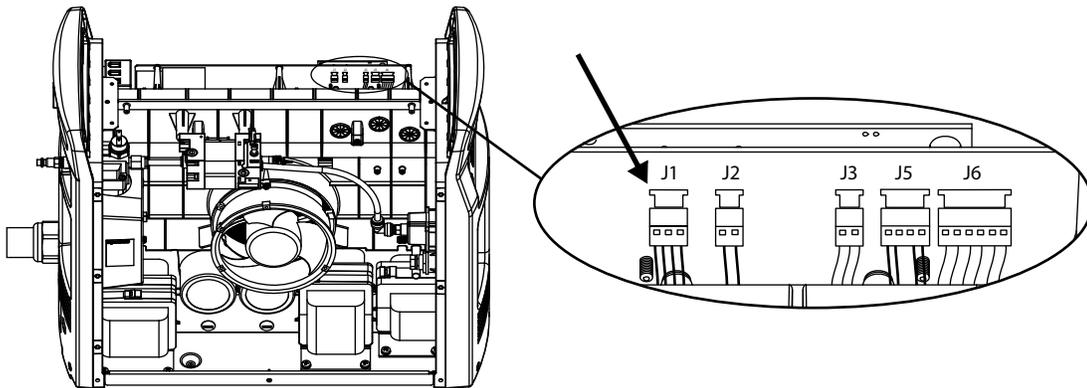
1. Align the 3 plastic posts on the back side of the fan shroud with the corresponding holes in the fan housing.
2. Push the fan shroud straight onto the fan housing.
3. Complete the following procedures:
 - a. See Install the power supply cover on page 174.
 - b. Reconnect the power and gas supply.

Replacing the fan

Kit number	Description
228881	Kit: Powermax105/125 fan assembly

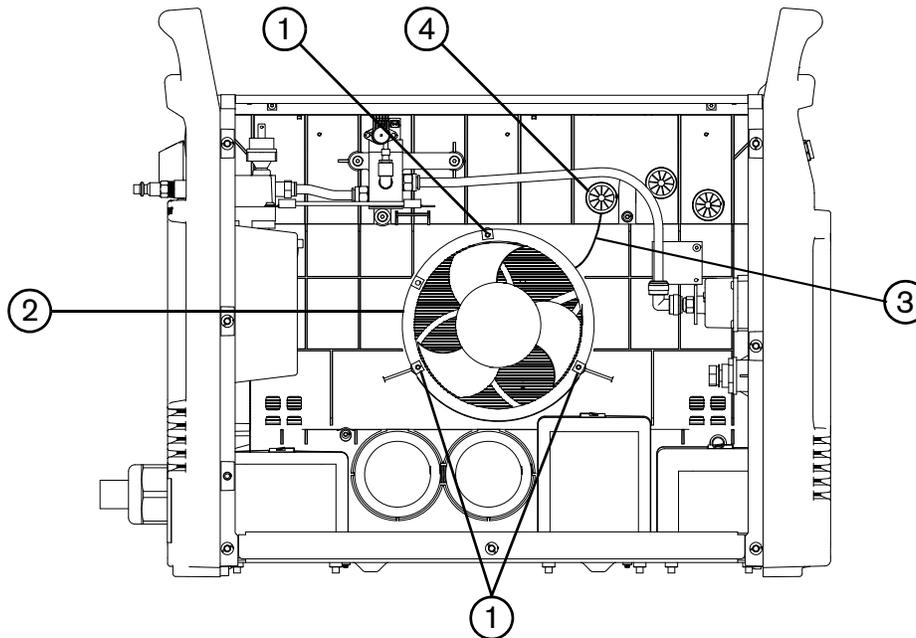
1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the end panel bracket on page 176.
 - d. See Remove the fan shroud on page 218.
2. Unplug the J1 connector from the back side of the power board.

Figure 77



3. Pull the fan wire and connector through the left grommet from the fan side of the power supply. (See Figure 78 on page 220.)
4. Remove the 3 mounting screws located behind the fan flange.
5. Remove the fan from the power supply.
6. Orient the new fan so the wires extend from the top right of the fan (see Figure 78). Tighten the 3 supplied mounting screws to 23 kg-cm (20 inch-pounds).
7. Route the fan wire through the left grommet.
8. Plug the fan wire connector into the J1 connector on the power board.

Figure 78



- | | |
|-----------------------------------|-----------------------|
| 1 Mounting screw locations | 3 Fan wire |
| 2 Fan flange | 4 Left grommet |

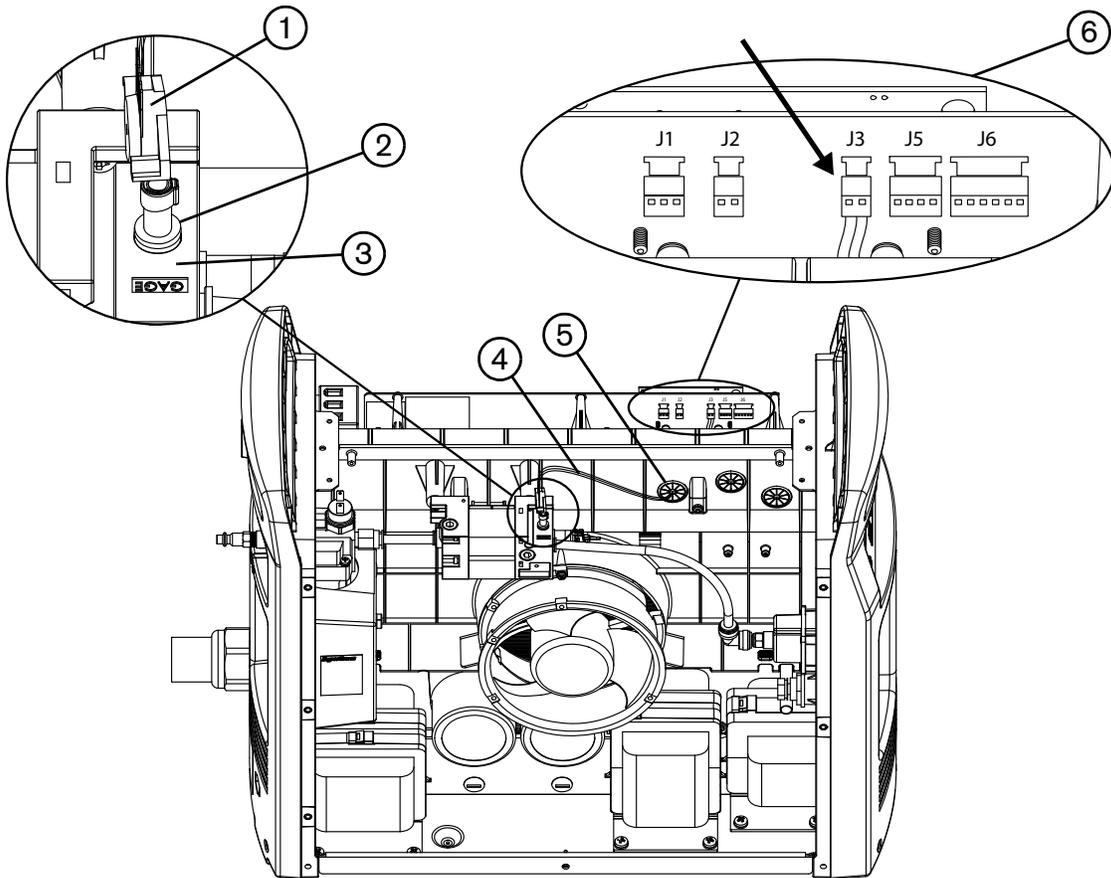
- 9.** Complete the following procedures:
- a.** See Install the fan shroud on page 218.
 - b.** See Install the end panel bracket on page 177.
 - c.** See Install the power supply cover on page 174.
 - d.** Reconnect the power and gas supply.

Replacing the pressure transducer

Kit number	Description
228689	Kit: Powermax65/85/105/125 pressure transducer

- 1.** Complete the following procedures:
 - a.** See Disconnect the power and gas supply on page 166.
 - b.** See Remove the power supply cover on page 174.
 - c.** See Remove the end panel bracket on page 176.
- 2.** Unplug the J3 connector from the back side of the power board. (See Figure 79 on page 222.)
- 3.** Pull the pressure transducer wires and connector through the left grommet from the fan side of the power supply.
- 4.** Remove the pressure transducer from the solenoid valve by pushing-to-disconnect the plastic ring against the valve while pulling up on the pressure transducer.
- 5.** Insert the new pressure transducer into the valve and push down until fully seated.
- 6.** Route the pressure transducer connector and wires through the left grommet.
- 7.** Plug the pressure transducer connector into the J3 connector on the power board.
- 8.** Complete the following procedures:
 - a.** See Install the end panel bracket on page 177.
 - b.** See Install the power supply cover on page 174.
 - c.** Reconnect the power and gas supply.

Figure 79



- | | |
|--------------------------------|--------------------------|
| 1 Pressure transducer | 4 Transducer wires |
| 2 Push-to-connect plastic ring | 5 Left grommet |
| 3 Solenoid valve | 6 Power board connectors |

Replacing the pressure switch

Kit number	Description
228688	Kit: Powermax65/85/105/125 pressure switch

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the end panel bracket on page 176.
2. Unplug the wire terminals from the top of the pressure switch. (See Figure 80 on page 224.)
3. Clean all dust and debris from the top of the air filter housing.



CAUTION!

Contamination in the gas line can cause the solenoid valve to malfunction or fail.

4. Loosen the pressure switch with a 1-1/16-inch wrench or a large adjustable wrench.
5. Remove the pressure switch from the air filter housing.
6. Lightly apply thread sealant to the threads of the new pressure switch.
 -  If applied too heavily, excess amounts of thread sealant can contaminate the gas line.

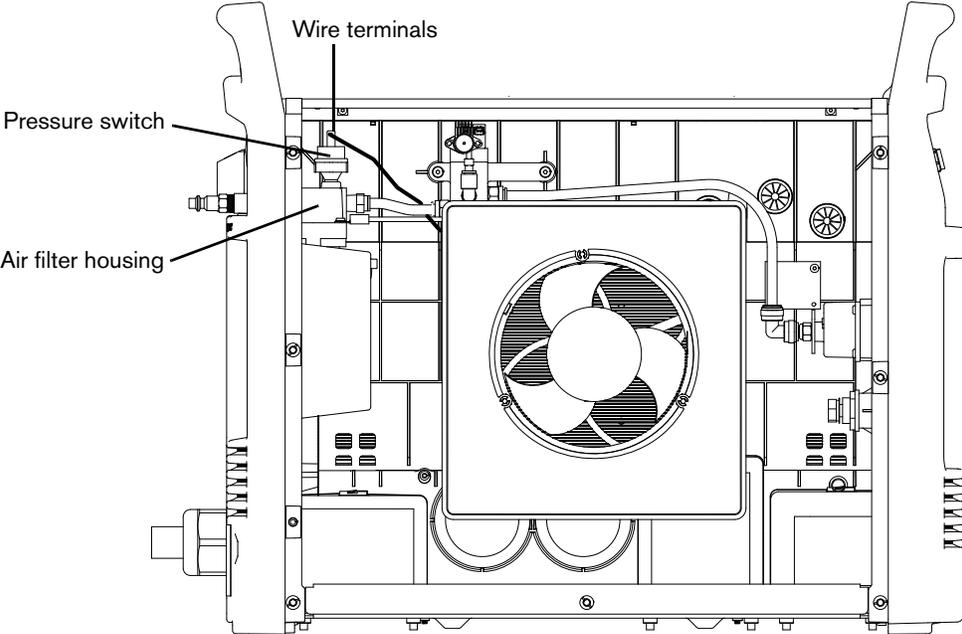


CAUTION!

Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.

7. Tighten the new pressure switch into the air filter housing.
8. Connect the wire terminals to the pressure switch (blue wire closest to the center panel).
9. Complete the following procedures:
 - a. See Install the end panel bracket on page 177.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

Figure 80



Replacing the air filter assembly

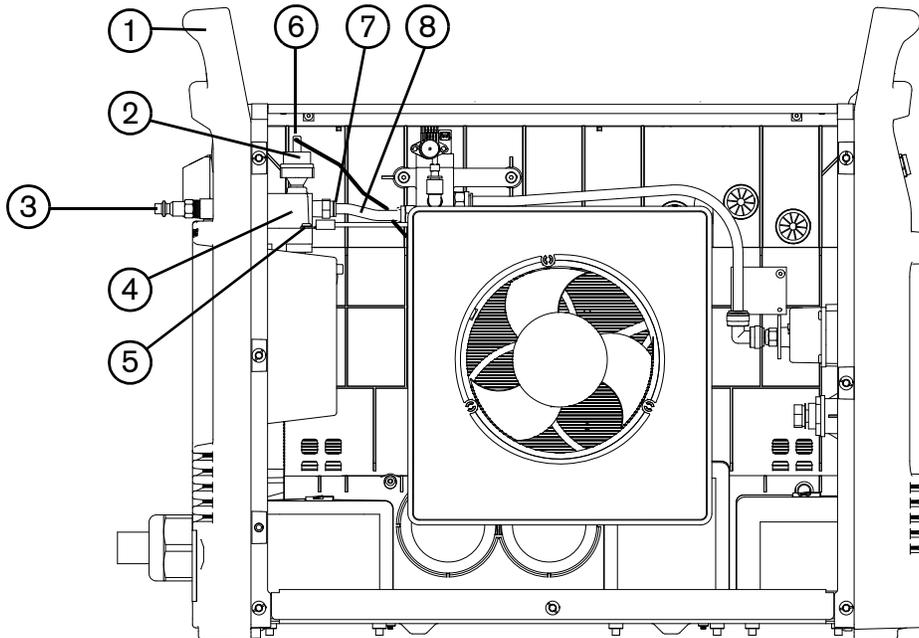
Kit number	Description
428351*	Kit: Powermax65/85/105/125 air filter assembly (includes filter bowl, filter element, and O-ring)

* Because of a manufacturing change, new air filter assembly kit 428351 shown on page 303 replaces old air filter assembly kit 228685.

Remove the air filter assembly

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the end panel bracket on page 176.
 - d. See Remove the air filter bowl on page 167.
2. Disconnect the 2 wire terminals from the top of the pressure switch. See Figure 81.

Figure 81

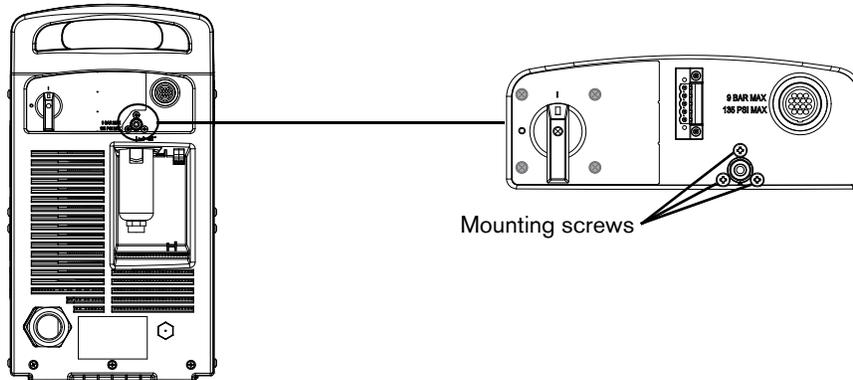


- | | |
|----------------------|---------------------------|
| 1 Rear panel | 5 Ground wire screw |
| 2 Pressure switch | 6 Wire terminals |
| 3 Gas fitting | 7 Push-to-connect fitting |
| 4 Air filter housing | 8 Gas tube |

9 – Power Supply Component Replacement

3. Remove the screw that holds the 2 ground wires to the air filter housing.
4. Push in the plastic ring on the push-to-connect fitting. Carefully pull the top of the rear panel away from the power supply until the gas tube pulls out of the push-to-connect fitting
5. Remove the gas fitting from the rear panel.
6. Remove the 3 mounting screws around the gas fitting on the rear panel. See Figure 82.

Figure 82



7. Remove the air filter assembly from the power supply.

Install the air filter assembly

1. Remove the filter bowl from the new air filter assembly. See page 167.
2. Position the new air filter assembly in the power supply.
3. Tighten the 3 mounting screws in the rear panel to 23 kg·cm (20 in·lb).
4. Apply thread sealant to the gas fitting threads and tighten the gas fitting into the bracket on the rear panel.



Too much thread sealant can contaminate the gas line.



CAUTION!

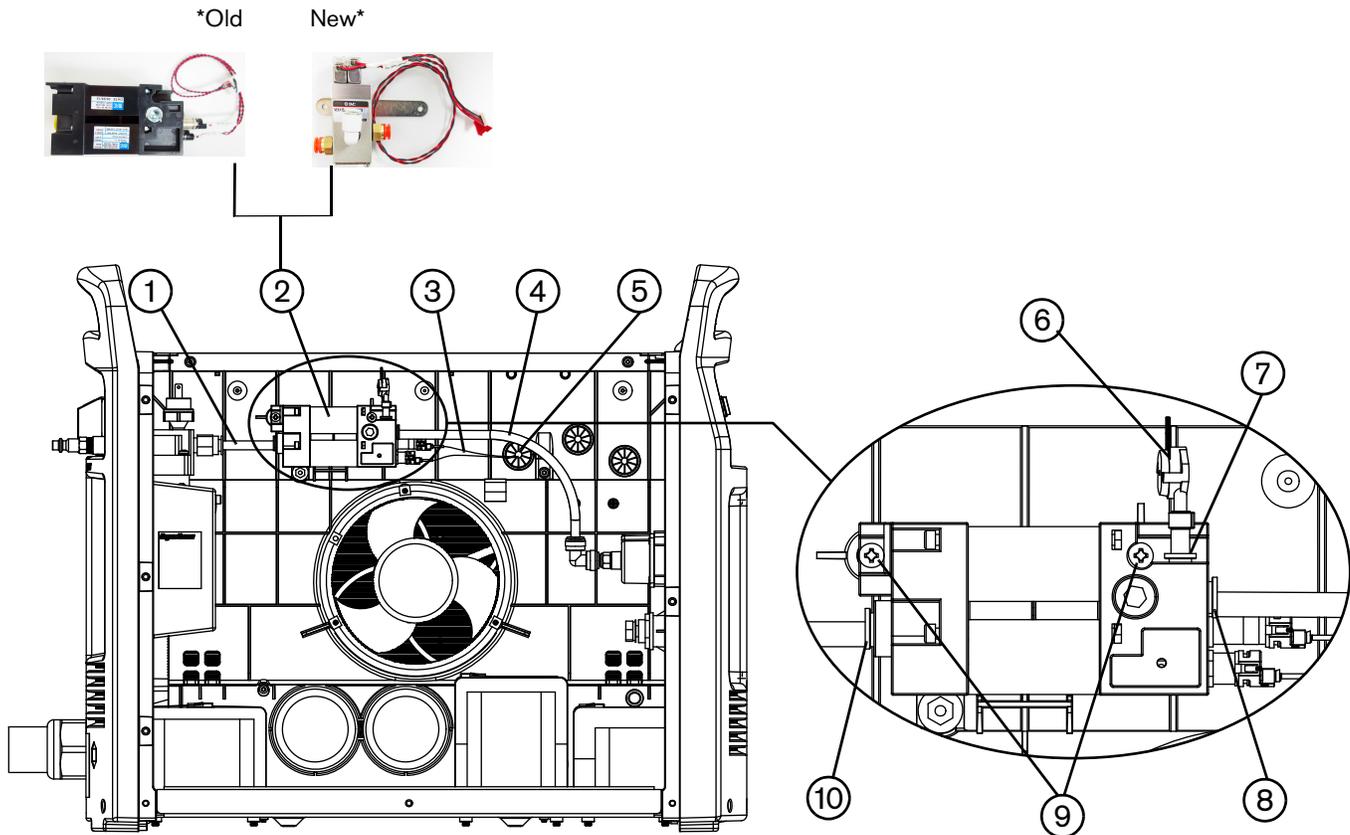
Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.

5. Align the end of the gas tube with the push-to-connect fitting, and gently push the rear panel toward the power supply until the gas tube is fully seated.
6. Use the ground wire screws to attach the ground wire to the air filter housing. Tighten the screws to 11.5 kg·cm (10 in·lb).
7. Connect the 2 wires to the top of the pressure switch. The wires are interchangeable.
8. Install the filter bowl with the filter element assembly onto the filter assembly at the rear of the power supply. See Install the air filter bowl (metal guarded, plastic, or nylon) on page 170.
9. Complete the following procedures:
 - a. See Install the end panel bracket on page 177.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

Replacing the solenoid valve

Kit number	Description
228687†	Kit: Powermax105/125 regulator/solenoid valve (new) (includes tubing and screws)

Figure 83



- | | |
|------------------------------|-------------------------------|
| 1 Short gas tube | 6 Pressure transducer |
| 2 Solenoid valve* | 7 Pressure transducer fitting |
| 3 Solenoid valve power wires | 8 Long gas tube fitting |
| 4 Long gas tube | 9 Mounting screws |
| 5 Left grommet | 10 Short gas tube fitting |

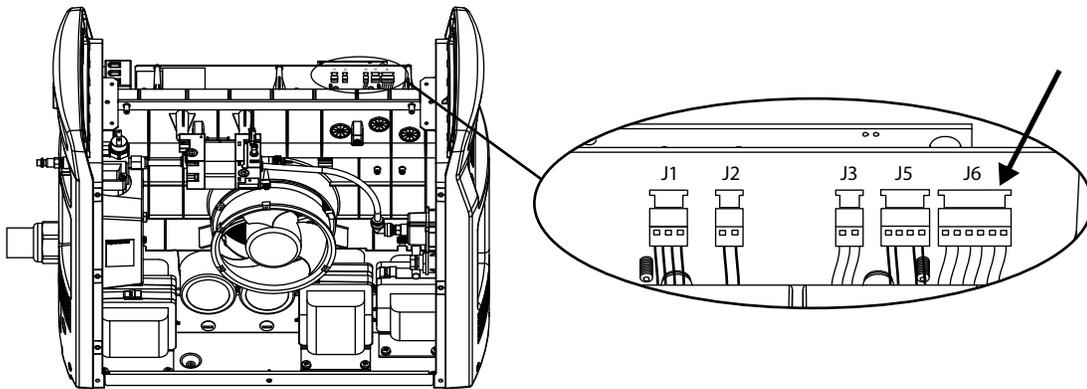
† Because of a manufacturing change, solenoid valve kit 228687 replaces old solenoid valve kit 228882, as also shown on page 304. The steps on the following pages describe how to remove both solenoid valve models.

Remove the old solenoid valve

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the end panel bracket on page 176.
 - d. See Remove the fan shroud on page 218.
2. Disconnect the J6 connector from the back side of the power board.

 If needed, fold back the top of the component barrier to access the J6 connector.

Figure 84



3. Pull the solenoid valve power wires and J6 connector through the left grommet from the fan side of the power supply. See Figure 83 on page 228.
4. Push in the plastic ring on the pressure transducer fitting while pulling the pressure transducer out of the solenoid valve.
5. Push in the plastic ring on the long gas tube fitting while pulling the long gas tubing out of the right side of the solenoid valve and 90° push-to-connect fitting.
6. Remove the 2 mounting screws from the solenoid valve.
7. Push in the plastic ring on the short gas tube fitting while pulling the solenoid valve off the short gas tube.
8. Remove the solenoid valve.

9 – Power Supply Component Replacement

Install the new solenoid valve

9. Align and push the solenoid valve onto the short gas tube until fully seated. See Figure 83.
10. Use the 2 supplied mounting screws to install the new solenoid valve onto the center panel. Tighten the screws to 23 kg·cm (20 in·lb).
11. Push the 30.48 cm (12 inch) long gas tube into the solenoid valve until fully seated. Push the other end of the long gas tube into the 90° push-to-connect fitting until fully seated.



CAUTION!

The kit includes two tubing lengths to accommodate different Powermax systems. For your Powermax125, be careful to use the longer 30.48 cm (12 inch) tube.

12. Push the pressure transducer into the solenoid valve until fully seated.
13. Route the solenoid valve power wires and connector through the left grommet as shown in Figure 83 on page 228.
14. Connect the solenoid valve connector to the J6 connector on the power board.
15. Position the top of the component barrier back into place.
16. Complete the following procedures:
 - a. See Install the fan shroud on page 218.
 - b. See Install the end panel bracket on page 177.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

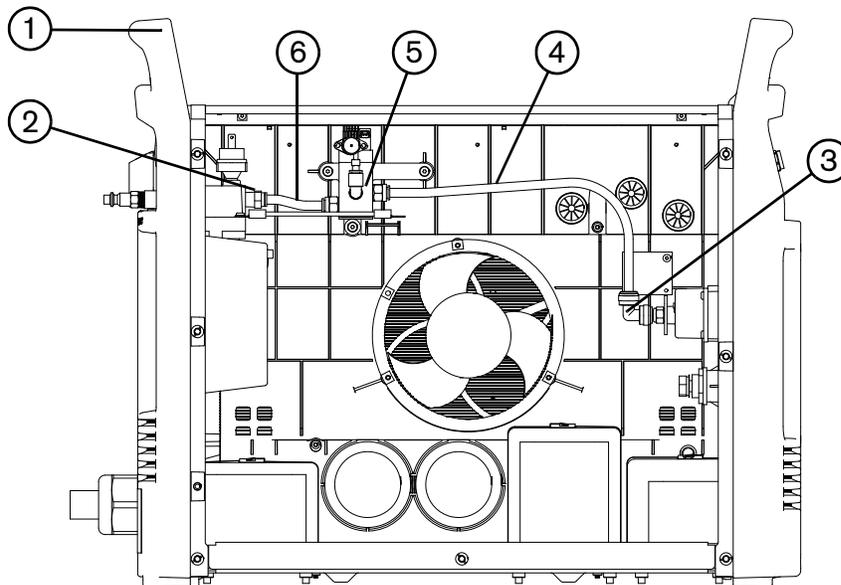
Replacing the gas tubing

Kit number	Description
228865	Kit Powermax105/125 gas tubing

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the end panel bracket on page 176.
2. Push in the plastic ring on the straight push-to-connect fitting while gently pulling the top of the rear panel away from the power supply, until the end of the short gas tube pulls out of the straight push-to-connect fitting. See Figure 85 on page 231.
3. Push in the plastic ring on the solenoid valve fitting, and pull the short gas tube out of the fitting.

4. Push one end of the new short gas tube into the solenoid valve fitting until fully seated.
5. Align the other end of the short gas tube with the straight push-to-connect fitting, and gently push the top of the rear panel toward the power supply until the short gas tube is fully seated in the straight push-to-connect fitting.
6. Push in the plastic ring on top of the 90° push-to-connect fitting, and pull the long gas tube out of the fitting.
7. Push in the plastic ring on the solenoid valve fitting, and remove the long gas tube by pulling it out of the fitting.
8. Push one end of the new long gas tube into the solenoid valve fitting until fully seated.
9. Push the other end of the new long gas tube into the 90° push-to-connect fitting until fully seated.
10. Complete the following procedures:
 - a. See Install the end panel bracket on page 177.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

Figure 85



- | | |
|------------------------------------|------------------|
| 1 Rear panel | 4 Long gas tube |
| 2 Straight push-to-connect fitting | 5 Solenoid valve |
| 3 90° push-to-connect fitting | 6 Short gas tube |

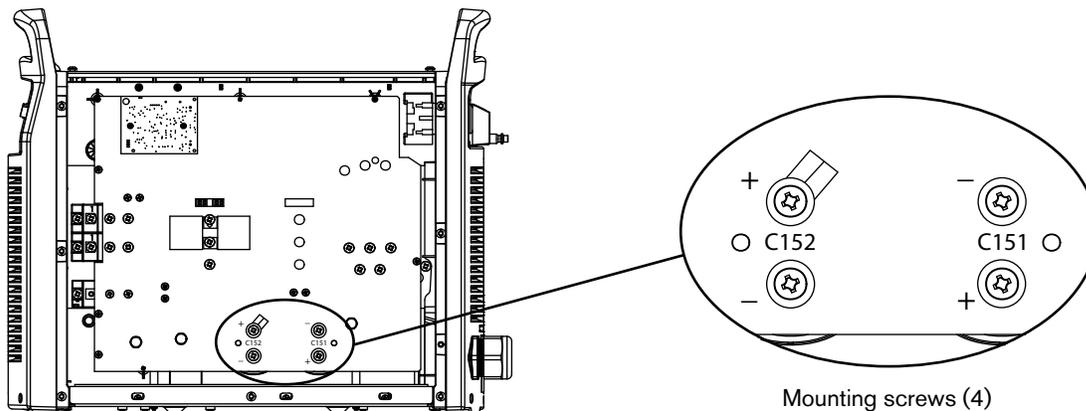
Replacing the bulk capacitors

Kit number	Description
428136	Kit: Powermax125 bulk capacitor 480 V CSA
228888	Kit: Powermax105 bulk capacitor CSA, 230 – 400 V CE; Powermax125 bulk capacitor 600 V CSA
428135	Kit: Powermax125 bulk capacitor 400 V CE/380 V CCC

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the fan shroud on page 218.
2. Remove the 4 bulk capacitor mounting screws from the power board.

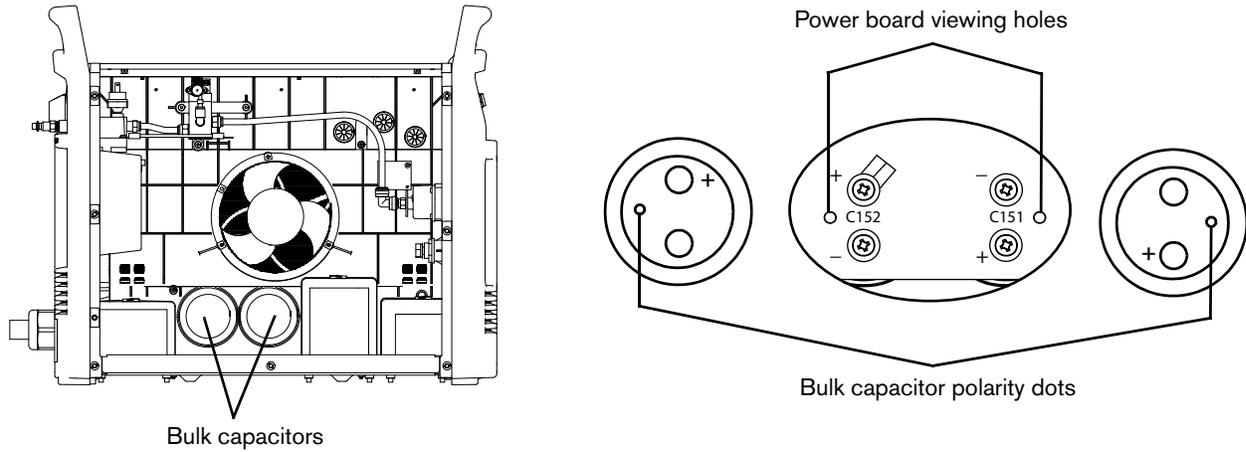
 The C152 top mounting screw also secures an inductor wire to the power board.

Figure 86



3. From the fan side of the power supply, remove the bulk capacitors by pulling them straight out.
4. Insert the new bulk capacitors from the fan side of the power supply, noting the orientation of the polarity dot in regard to the viewing hole in the power board. See Figure 87 on page 233.
5. From the fan side, rotate each capacitor until the polarity dot aligns with the viewing hole on the front side of the power board.
6. Secure the inductor wire with the C152 top mounting screw. Start the 4 supplied mounting screws by hand, then tighten to 40.3 kg-cm (35 inch-pounds).

Figure 87



7. Complete the following procedures:
 - a. See Install the fan shroud on page 218.
 - b. See Install the component barrier on page 175.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

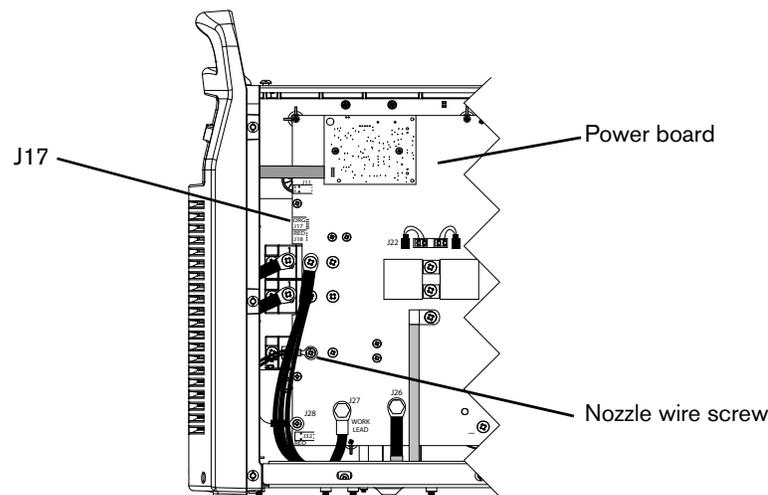
Replacing the torch quick disconnect receptacle

Kit number	Description
428120	Kit: Powermax125 quick disconnect receptacle replacement (power supply side)

Remove the torch quick disconnect receptacle

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
 - e. See Remove the fan shroud on page 218.
2. Unplug the wire connector from the J17 power board socket.
3. Disconnect the nozzle wires by removing the screw that secures the ring terminal to the power board.

Figure 88



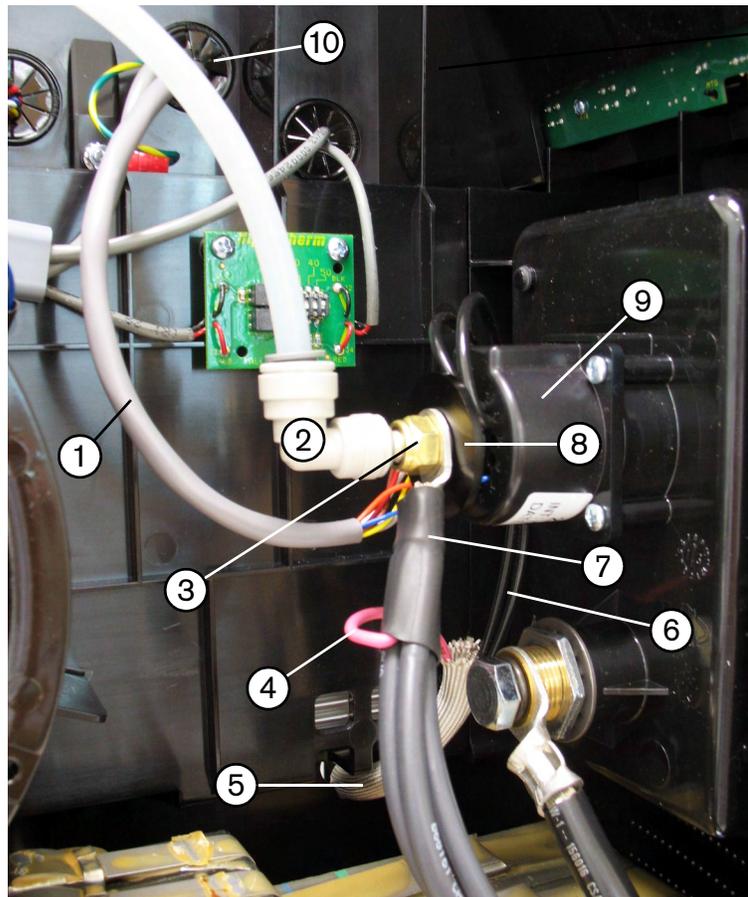
4. From the fan side, pull the torch interface cable through the center grommet. See Figure 89 on page 235.
5. From the fan side, pull the nozzle wires through the protective sheathing that passes through the center panel.
6. Disconnect the 90° push-to-connect fitting by pushing in the plastic ring (closest to the brass nut) and pulling the fitting away from the nut.
7. Disconnect the electrode wire and 2 output inductor wires by removing the brass nut that secures the ring terminal to the quick disconnect receptacle.



The electrode wire and 2 output inductor wires are captured in the same wire connector.

8. Remove the plastic washer.
9. Remove the silver-plated fitting by pushing it out through the front of the quick disconnect receptacle housing.
10. Remove the quick disconnect receptacle by removing the 4 mounting screws that secure the quick disconnect receptacle to the front panel.

Figure 89

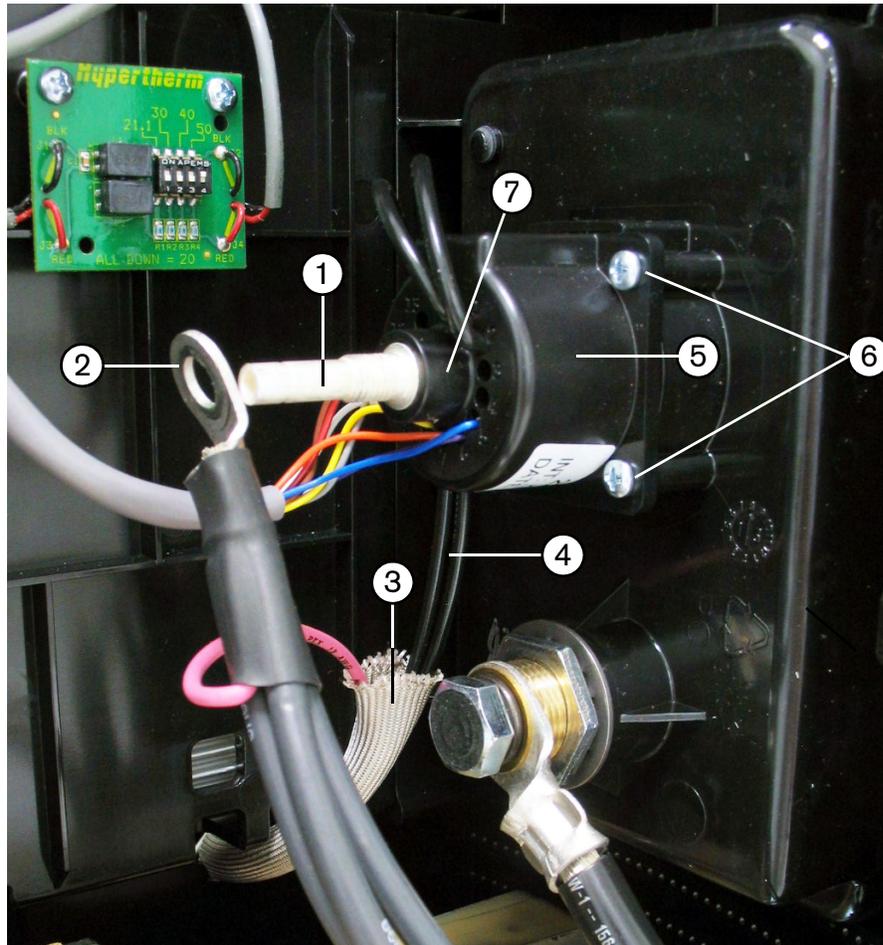


- | | |
|-------------------------------|-------------------------------|
| 1 Torch interface cable | 6 Nozzle wires (2) |
| 2 90° push-to-connect fitting | 7 Output inductor wires (3) |
| 3 Brass nut | 8 Plastic washer |
| 4 Electrode wire (red) | 9 Quick disconnect receptacle |
| 5 Protective sheathing | 10 Center grommet |

Install the quick disconnect receptacle

1. Secure the quick disconnect receptacle to the front panel by tightening the 4 supplied mounting screws to 23 kg-cm (20 inch-pounds). See Figure 90 on page 237.
2. From the front of the power supply, insert the small end of the silver-plated fitting into the center hole of the quick disconnect receptacle until fully seated.
3. Install the plastic washer over the silver-plated fitting and the plastic hub on the rear of the quick disconnect receptacle.
4. Place the ring terminal over the silver-plated fitting and tighten the brass nut onto the silver-plated fitting. Tighten the nut to 46.1 kg-cm (40 inch-pounds), but do not overtighten – the plastic washer should be able to spin when the brass nut is installed.
5. Push the 90° push-to-connect fitting onto the silver-plated fitting until fully seated.
6. Route the nozzle wires through the protective sheathing in the center panel.
7. Route the torch interface cable through the center grommet.

Figure 90

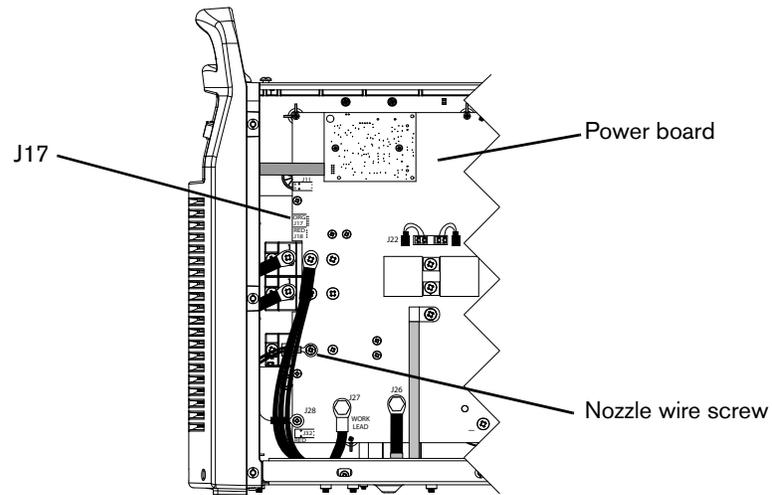


- | | |
|-------------------------|-------------------------------|
| 1 Silver-plated fitting | 5 Quick disconnect receptacle |
| 2 Ring terminal | 6 Mounting screws (4) |
| 3 Protective sheathing | 7 Plastic hub |
| 4 Nozzle wires (2) | |

9 – Power Supply Component Replacement

8. Secure the nozzle wires ring terminal to the power board by tightening the screw to 23 kg-cm (20 inch-pounds).
9. Plug the torch interface cable connector into the J17 socket on the power board. Align the orange wire in the connector with the “ORG” that is printed on the power board.

Figure 91



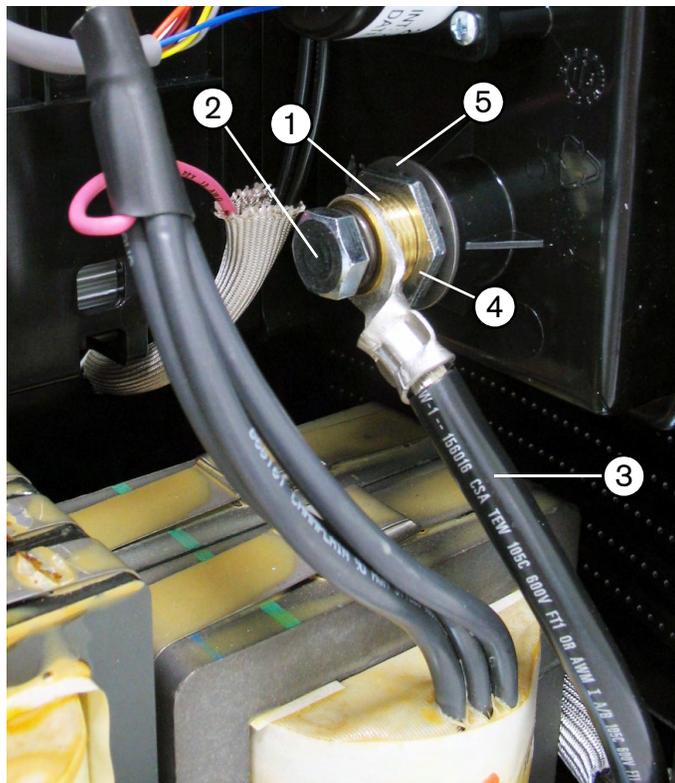
10. Complete the following procedures:
 - a. See Install the fan shroud on page 218.
 - b. See Install the end panel bracket on page 177.
 - c. See Install the component barrier on page 175.
 - d. See Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.

Replacing the work lead receptacle

Kit number	Description
228912	Kit: Powermax105/125 work lead receptacle (power supply side)

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the fan shroud on page 218.
2. Remove the bolt securing the work cable to the work lead receptacle.
3. Remove the nut and lock washer securing the work lead receptacle to the front panel.
4. Push the work lead receptacle out through the front panel.

Figure 92

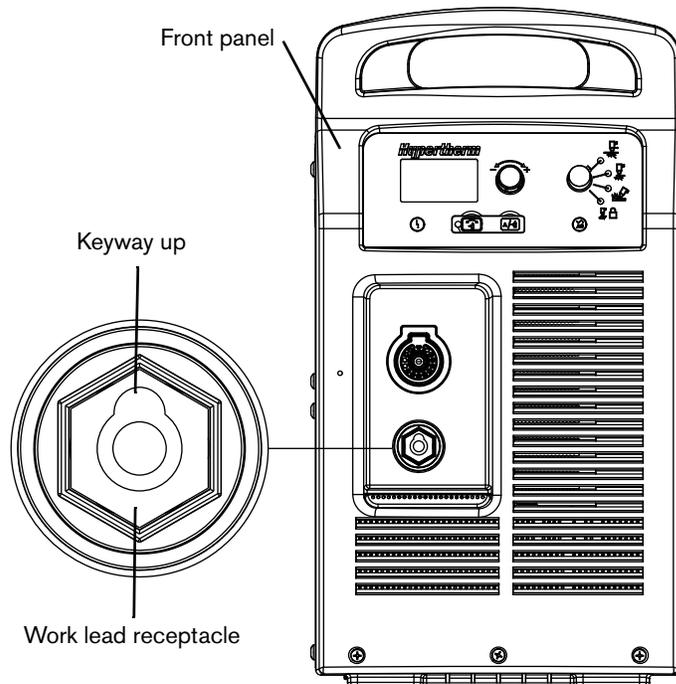


- | | | | |
|---|----------------------|---|-------------|
| 1 | Work lead receptacle | 4 | Nut |
| 2 | Bolt | 5 | Lock washer |
| 3 | Work cable | | |

9 – Power Supply Component Replacement

5. Push the threaded end of the new work lead receptacle into the opening in the front panel, with the keyway facing up, until fully seated. (See Figure 93.)
6. Place the lock washer over the work lead receptacle inside the power supply.
7. Tighten the nut onto the work lead receptacle.
8. Secure the work cable to the work lead receptacle by tightening the bolt.

Figure 93



9. Complete the following procedures:
 - a. See Install the fan shroud on page 218.
 - b. See Install the power supply cover on page 174.
 - c. Reconnect the power and gas supply.

Replacing the output inductor

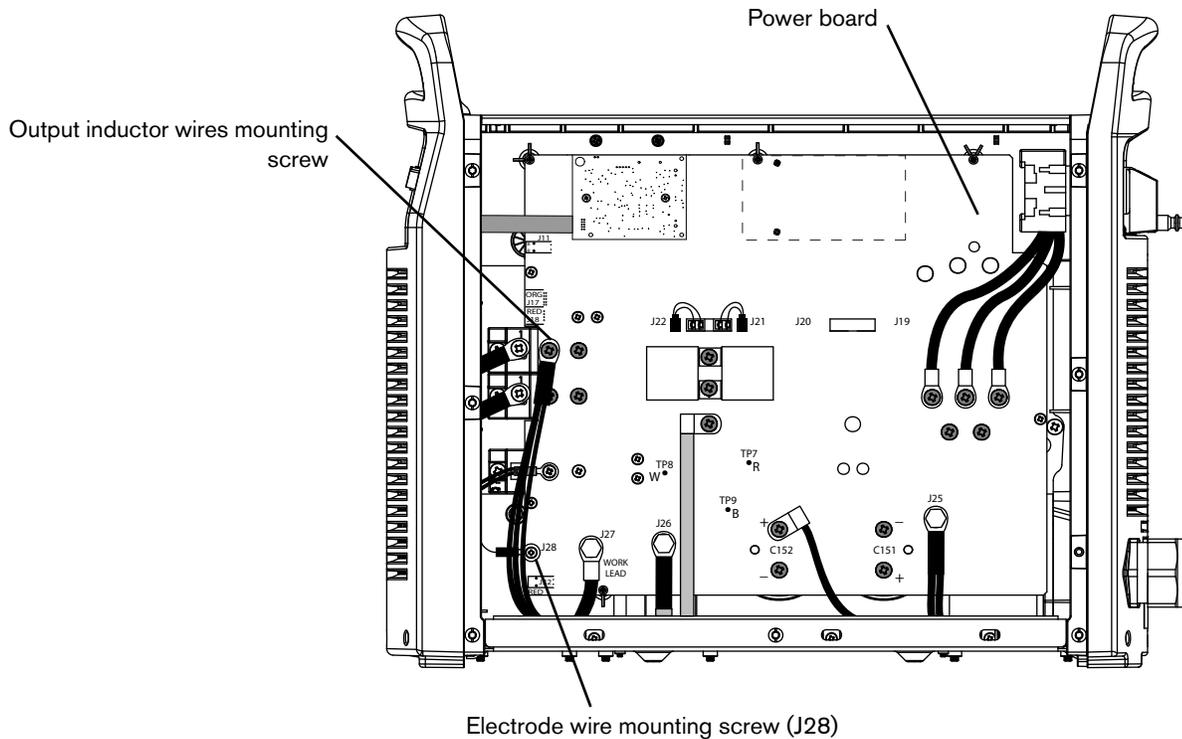
Kit number	Description
428125	Kit: Powermax125 output inductor

Remove the output inductor

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
 - e. See Remove the fan shroud on page 218.
2. Remove the screw at J28 that secures the electrode wire to the power board.
3. Remove the screw securing the output inductor wires to the power board.

 The power board in Figure 94 is a CSA model. The connections for the output inductor wires and the electrode wire are the same for all models.

Figure 94



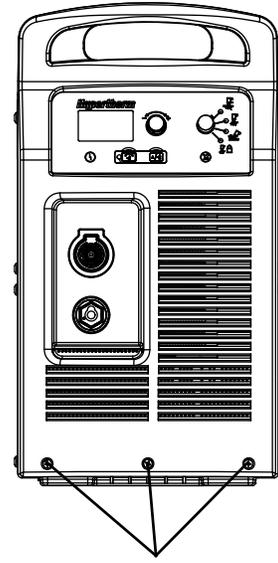
9 – Power Supply Component Replacement

4. Remove the 3 mounting screws from the bottom of the front panel.
5. From the fan side of the power supply, disconnect the 90° push-to-connect fitting by pushing in the plastic ring (closest to the brass nut) and pulling the fitting away from the nut. (See Figure 95 on page 243.)
6. Disconnect the electrode wire and short inductor wires by removing the brass nut that secures the ring terminal to the quick disconnect housing.



The electrode wire and short inductor wires are captured in the same wire connector.

7. Pull the electrode wire through the protective sheathing that passes through the center panel.
8. Carefully slide the front panel a short distance away from the base of the power supply.
9. Remove the 2 mounting screws in the base of the output inductor.
10. Lift the output inductor out of the power supply while guiding the long inductor wires through the opening in the bottom of the center panel.



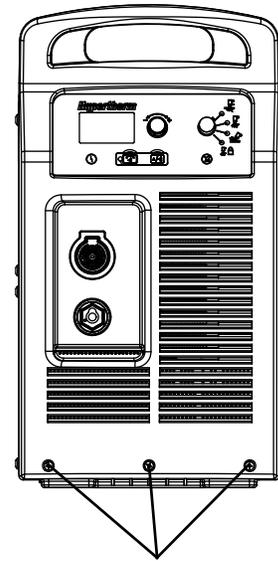
Front panel mounting screws

Install the output inductor

1. Place the output inductor in the power supply while guiding the long inductor wires through the opening in the bottom of the center panel. See Figure 96 on page 245.
2. Insert the tabs on the front of the output inductor into the slots in the base of the power supply.
3. Push the electrode wire through the protective sheathing that passes through the center panel.
4. Tighten the 2 supplied mounting screws in the base of the output inductor to 69.1 kg-cm (60 inch-pounds).
5. Verify that the plastic washer is installed over the plastic hub on the rear of the quick disconnect receptacle.
6. Place the ring terminal over the silver-plated fitting and tighten the nut onto the fitting. Tighten the nut to 46.1 kg-cm (40 inch-pounds), but do not overtighten – the plastic washer should be able to spin when the brass nut is installed.
7. Push the 90° push-to-connect fitting onto the silver-plated fitting until full seated.

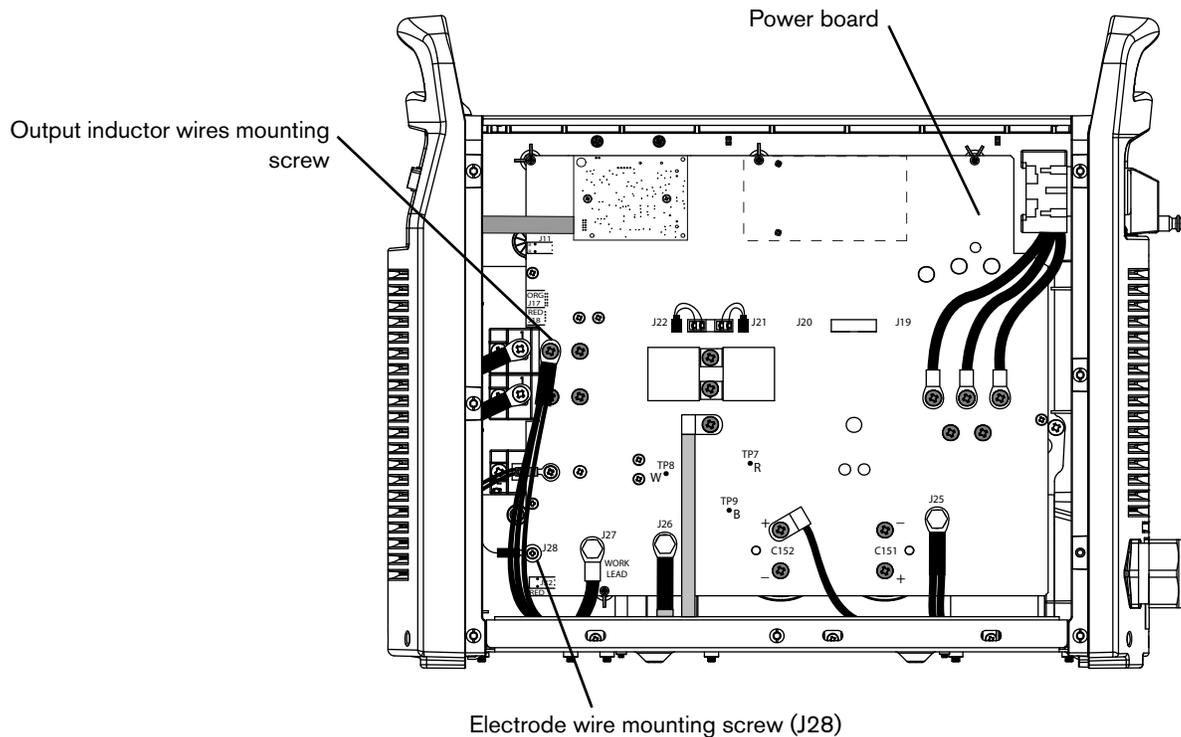
9 – Power Supply Component Replacement

8. Lift up the end of the power supply base, and carefully slide the front panel against the base.
9. Tighten the 3 mounting screws in the bottom of the front panel to 23 kg-cm (20 inch-pounds).
10. Secure the electrode wire to the power board at J28 by tightening the screw to 23 kg-cm (20 inch-pounds).
11. Secure the output inductor wires to the power board by tightening the screw to 40.3 kg-cm (35 inch-pounds).
12. Complete the following procedures:
 - a. Install the fan shroud on page 218.
 - b. Install the end panel bracket on page 177.
 - c. Install the component barrier on page 175.
 - d. Install the power supply cover on page 174.
 - e. Reconnect the power and gas supply.



Front panel mounting screws

Figure 97



Replacing the transformer

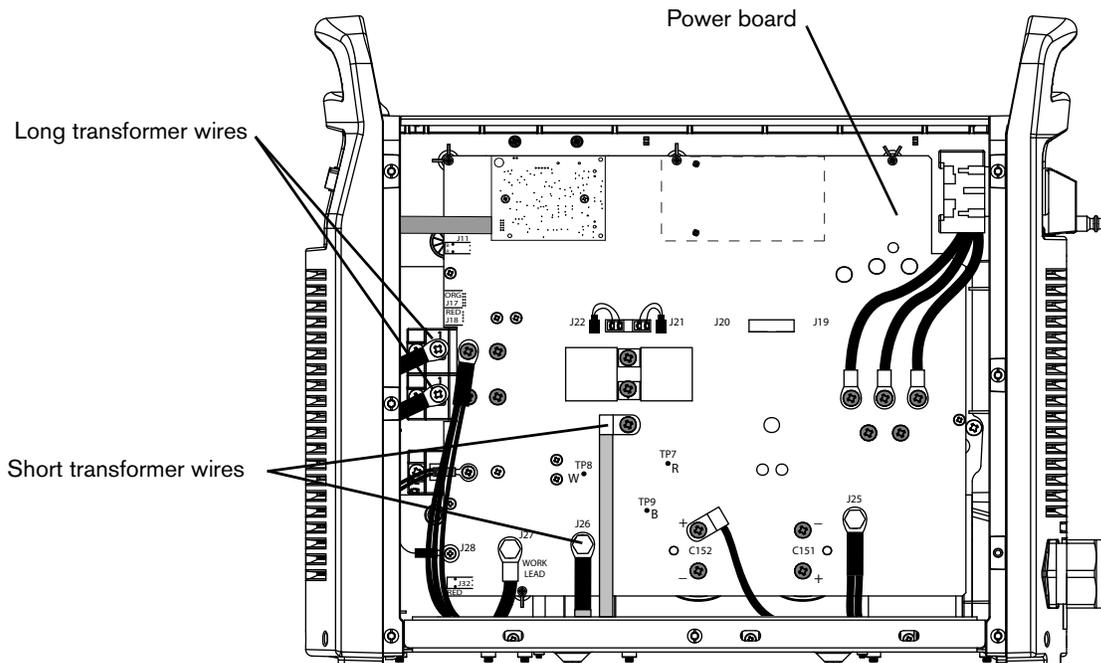
Kit number	Description
428129	Kit: Powermax125 transformer 480 V CSA
428130	Kit: Powermax125 transformer 600 V CSA
428128	Kit: Powermax125 transformer 400 V CE/380 V CCC

Remove the transformer

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the fan shroud on page 218.
2. From the power board side of the power supply, remove the 2 screws securing the long transformer wires to the output diode bridge.
3. Remove the screw and bolt securing the short transformer wires to the power board.

 The power board in Figure 98 is a CSA model. The connections for the transformer wires are the same for all models.

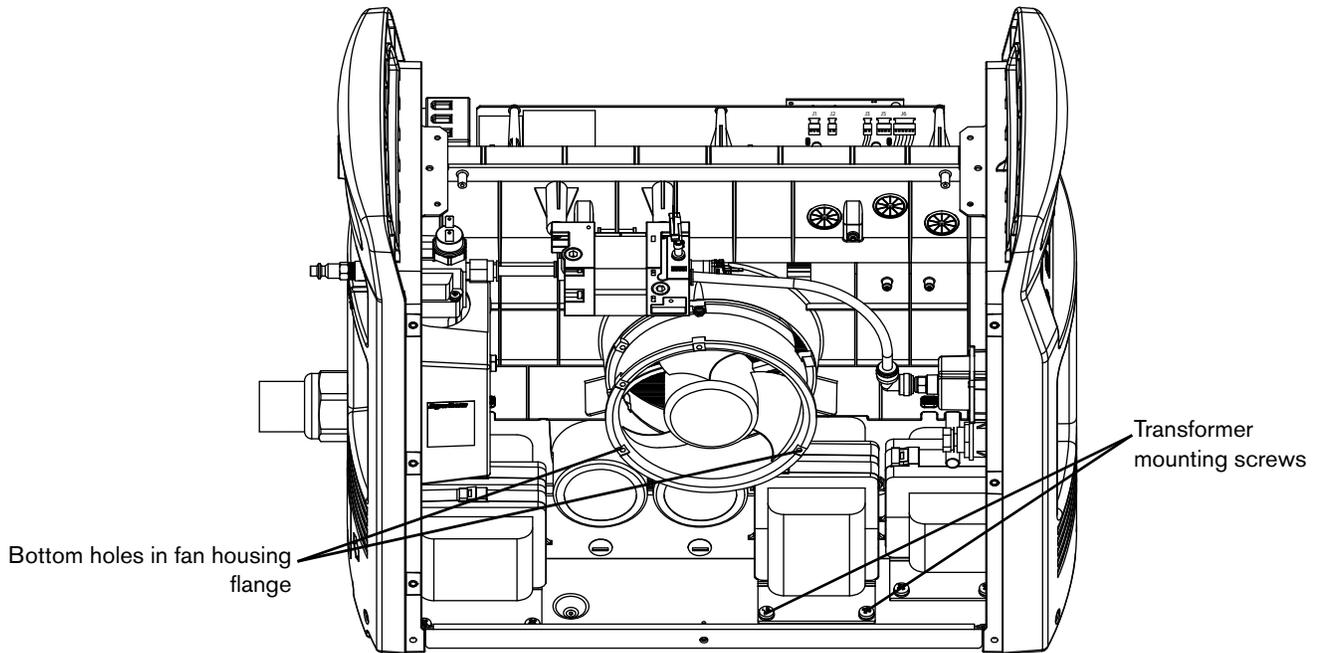
Figure 98



9 – Power Supply Component Replacement

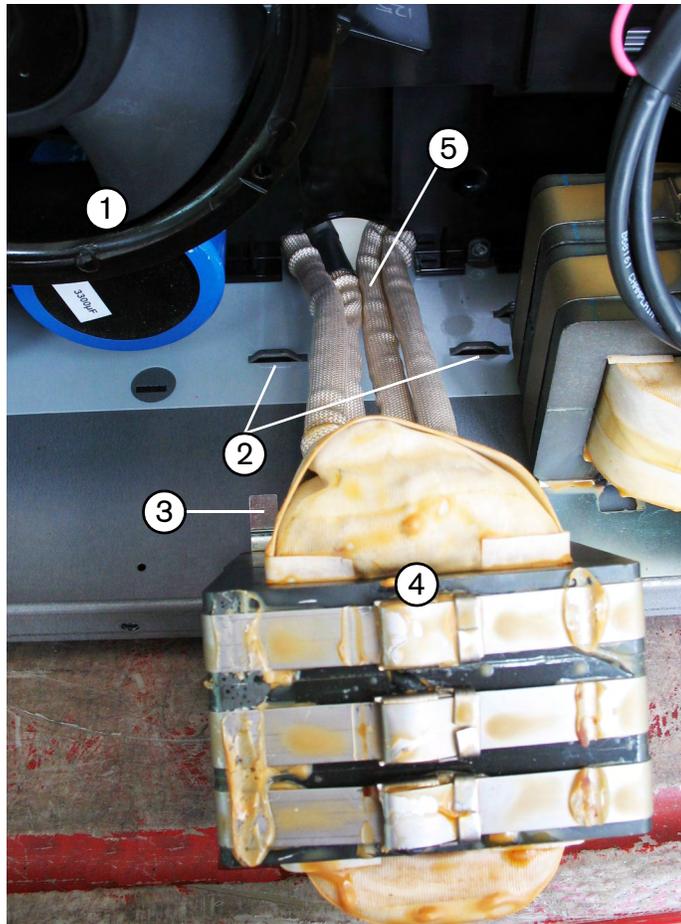
4. From the fan side, remove the 2 mounting screws from the base of the transformer.
5. Remove the bottom 2 fan mounting screws. The screws are located directly behind the bottom holes in the fan housing flange.
6. Push the bottom of the fan to the left so that it will not interfere with the removal of the transformer.

Figure 99



7. Lift the transformer out of the power supply while carefully guiding the transformer wires through the opening in the bottom of the center panel.

Figure 100



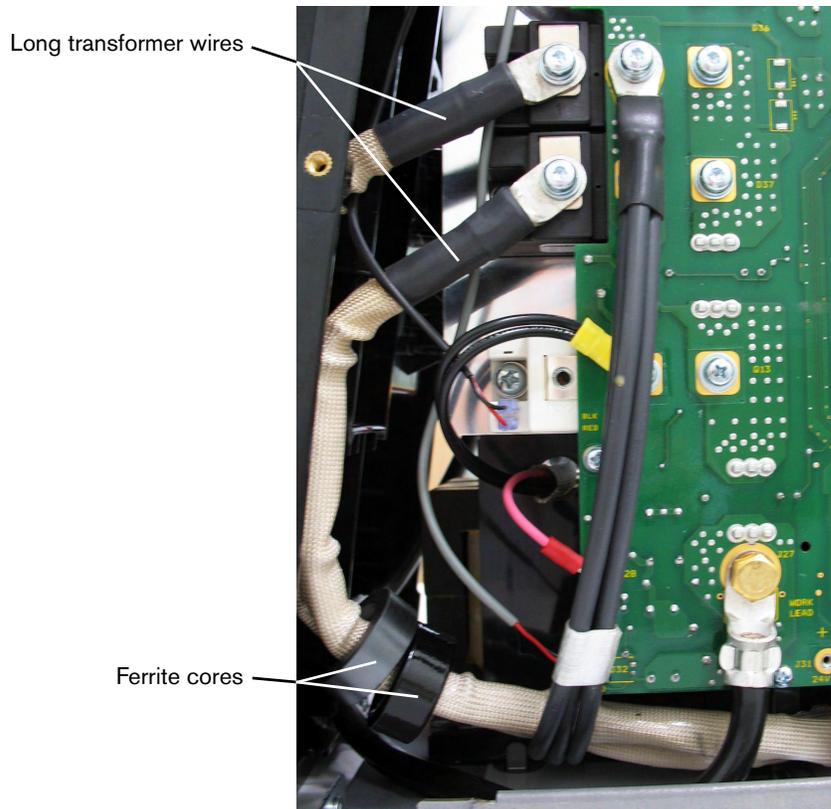
- 1 Bottom of fan
- 2 Slots in base
- 3 Transformer tab

- 4 Transformer
- 5 Transformer wires (4)

9 – Power Supply Component Replacement

- From the power board side, remove the 2 ferrite cores installed over the long transformer wires while removing the transformer from the power supply.

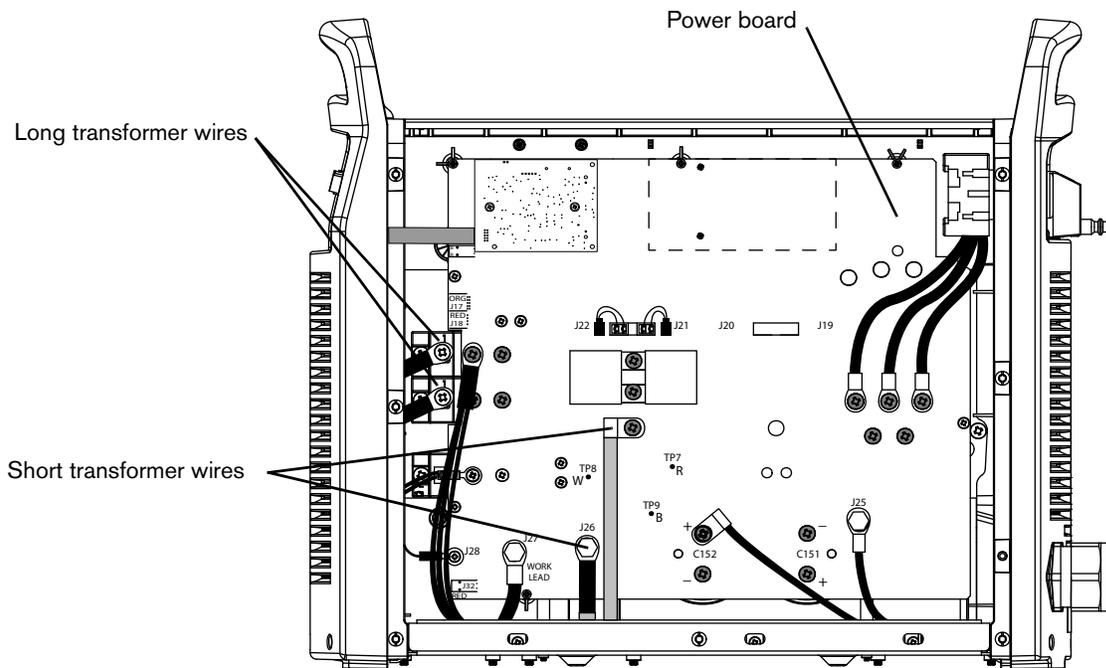
Figure 101



Install the transformer

1. Place the new transformer in the power supply while guiding the transformer wires through the opening in the bottom of the center panel.
2. Slide the tabs on the front of the transformer into the slots in the base of the power supply.
3. Tighten the 2 supplied mounting screws in the base of the transformer to 69.1 kg-cm (60 inch-pounds).
4. Align the 2 bottom fan holes with the corresponding holes in the center panel. Tighten the 2 fan mounting screws to 23 kg-cm (20 inch-pounds).
5. From the power board side, install the 2 ferrite cores over the long transformer wires.
6. Secure the long transformer wires to the output diode bridge by tightening the screws to 40.3 kg-cm (35 inch-pounds).
7. Secure the short transformer wires to the power board using the screw and bolt removed in step 3 on page 247. Tighten the screw to 40.3 kg-cm (35 inch-pounds) and the bolt at J26 to 63.4 kg-cm (55 inch-pounds).

Figure 102



8. Complete the following procedures:
 - a. See Install the fan shroud on page 218.
 - b. See Install the component barrier on page 175.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

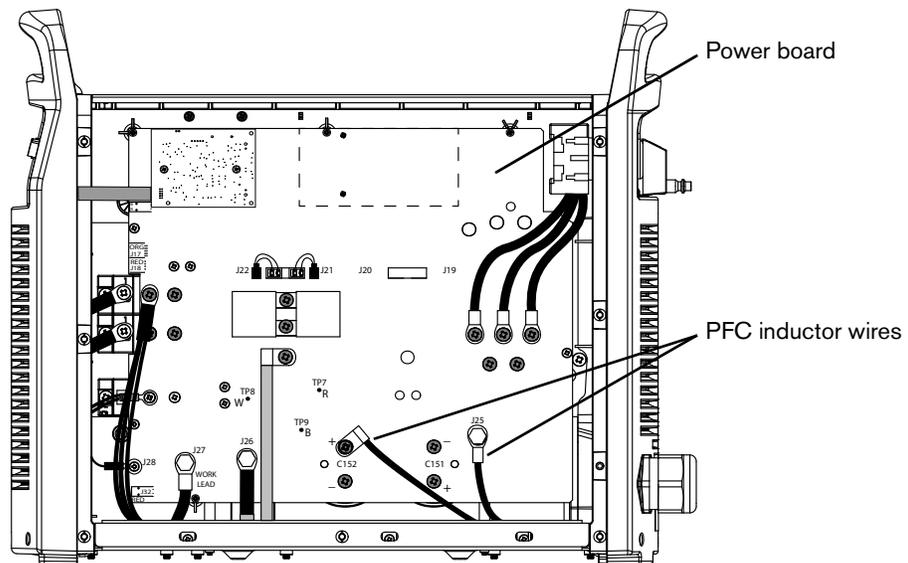
Replacing the PFC inductor

Kit number	Description
428127	Kit: Powermax125 PFC inductor 480 V/600 V CSA
428126	Kit: Powermax125 PFC inductor 400 V CE/380 V CCC

Remove the PFC inductor

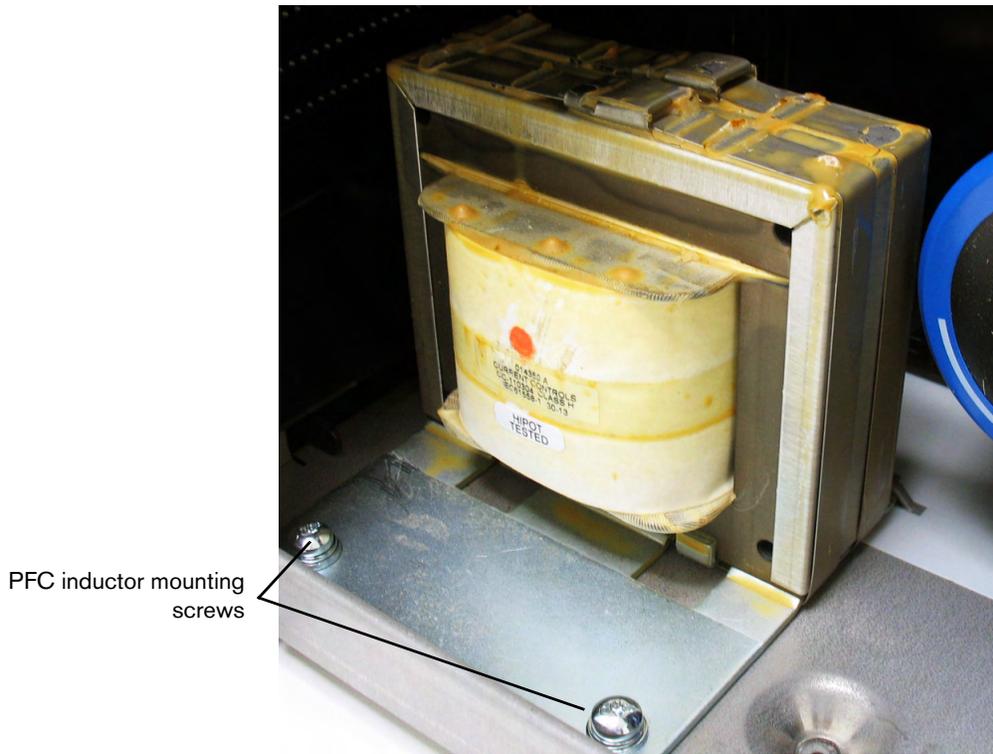
1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the fan shroud on page 218.
2. Remove the screw and bolt securing the PFC inductor wires to the power board.

Figure 103



3. Remove the 2 mounting screws from the base of the PFC inductor.

Figure 104

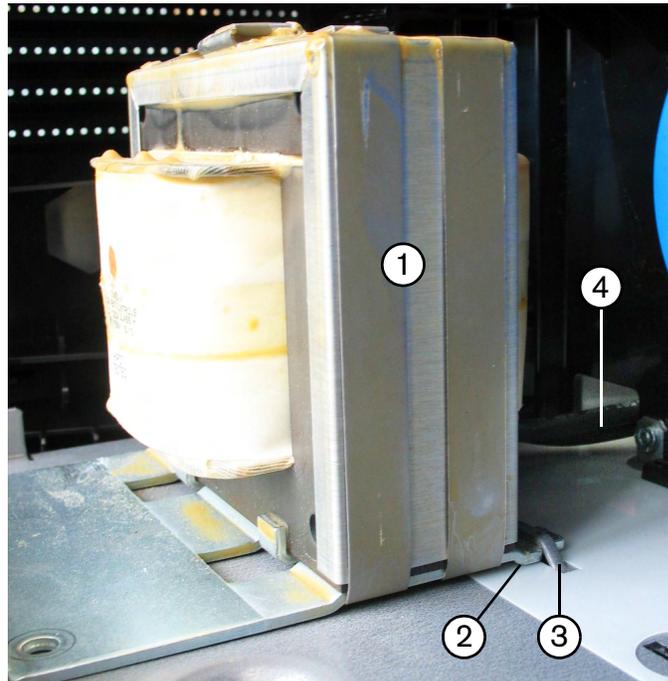


4. Lift the PFC inductor out of the power supply, while carefully guiding the PFC inductor wires through the opening in the bottom of the center panel.

Install the PFC inductor

1. Place the PFC inductor in the power supply while guiding the PFC inductor wires through the opening in the bottom of the center panel.
2. Slide the tabs on the front of the PFC inductor into the slots in the base of the power supply.
3. Tighten the 2 supplied mounting screws in the base of the PFC inductor to 69.1 kg-cm (60 inch-pounds).
4. Secure the PFC inductor wires to the power board using the screw and bolt removed in step 2 on page 252. Tighten the screw to 40.3 kg-cm (35 inch-pounds) and the bolt at J25 to 63.4 kg-cm (55 inch-pounds).

Figure 105



- 1 PFC inductor
- 2 PFC inductor tab

- 3 Slot in base
- 4 PFC inductor wires (2)

5. Complete the following procedures:
 - a. See Install the fan shroud on page 218.
 - b. See Install the component barrier on page 175.
 - c. See Install the power supply cover on page 174.
 - d. Reconnect the power and gas supply.

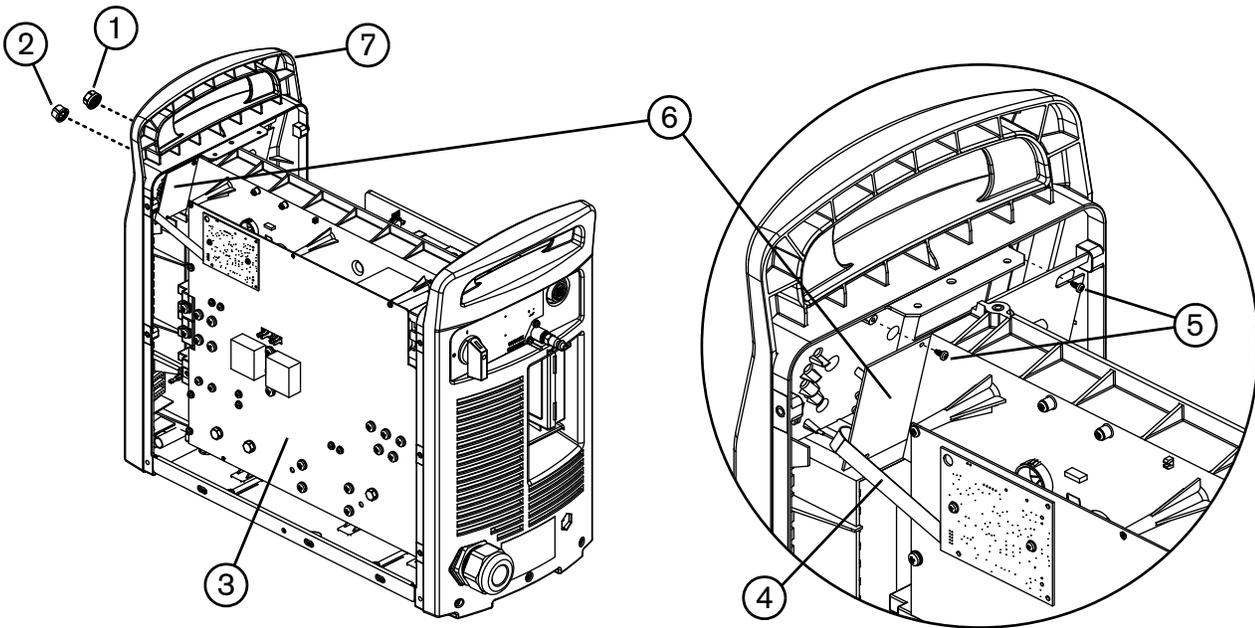
Replacing the front panel

Kit number	Description
228866	Kit: Powermax105/125 front panel

Remove the front panel

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
 - e. See Remove the fan shroud on page 218.
2. Remove the current adjustment knob and operating mode switch knob from the front panel by pulling them straight off their respective posts. (See Figure 106 on page 256.)
3. Carefully tilt the top of the front panel away from the power supply. The front panel is still attached to the bottom of the power supply and can only move a short distance.
4. Remove the 3 screws that secure the control board to the front panel. Two screws are installed at the top of the control board, one at each end. The third screw (not shown) is installed in the middle of the control board along the bottom edge.
 Access the third screw from the fan side of the power supply.
5. Carefully slide the control board from behind the front panel toward the power board side of the power supply.
6. Disconnect the ribbon cable from the control board and set aside the control board.

Figure 106

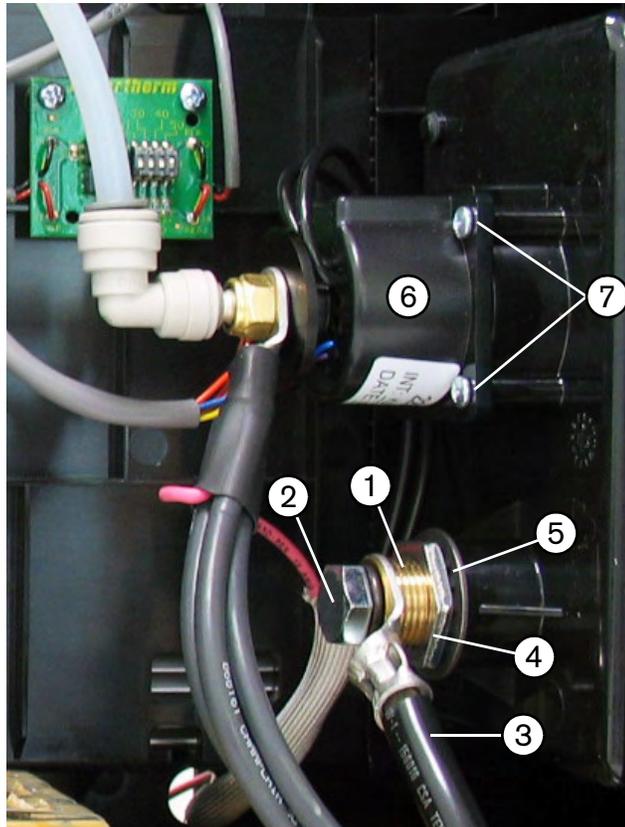


- 1 Current adjustment knob
- 2 Operating mode knob
- 3 Power board
- 4 Ribbon cable

- 5 Top mounting screws for control board
- 6 Control board
- 7 Top of front panel

7. Disconnect the quick disconnect receptacle from the front panel by removing the 4 mounting screws.
8. Remove the bolt securing the work cable to the work lead receptacle.
9. Remove the nut and lock washer securing the work lead receptacle to the front panel.
10. Push the work lead receptacle out through the front panel.

Figure 107

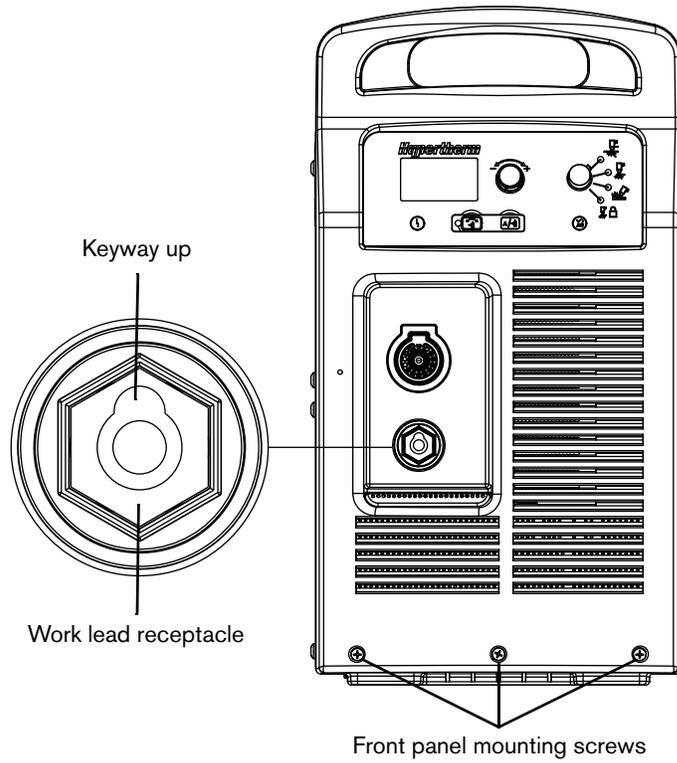


- | | |
|------------------------|-------------------------------|
| 1 Work lead receptacle | 5 Lock washer |
| 2 Bolt | 6 Quick disconnect receptacle |
| 3 Work cable | 7 Mounting screws (4) |
| 4 Nut | |

9 – Power Supply Component Replacement

11. Remove the 3 front panel mounting screws.
12. Remove the front panel from the power supply.

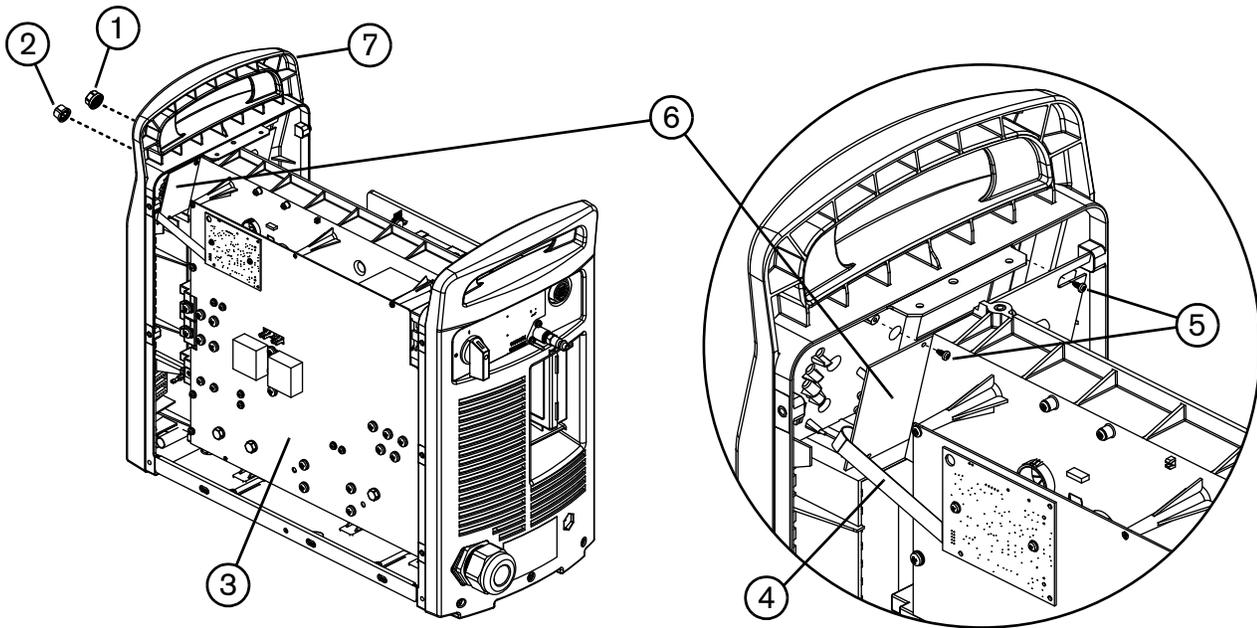
Figure 108



Install the front panel

1. Insert the threaded end of the work lead receptacle into the front panel, making sure that the keyway is facing up. See Figure 108 on page 258.
2. Place the lock washer over the work lead receptacle, and tighten the nut onto the work lead receptacle. See Figure 107 on page 257.
3. Secure the work cable to the work lead receptacle by tightening the bolt.
4. Secure the quick disconnect to the front panel by tightening the 4 mounting screws to 23 kg-cm (20 inch-pounds).
5. Lift up the end of the power supply base, and carefully slide the front panel against the base. Tighten the 3 supplied mounting screws to 23 kg-cm (20 inch-pounds).
6. Plug the ribbon cable into the J6 connector on the control board.
7. Carefully tilt the top of the front panel away from the power supply and slide the control board into place. Angle the bottom of the board into the correct position first, then angle the top of the board into place.
8. Secure the control board to the front panel using the 3 supplied mounting screws. Tighten the bottom screw first to ensure the control board is aligned properly, then tighten the 2 top screws. Tighten the screws to 8.1 kg-cm (7 inch-pounds).
9. Align the inside flat edge of the operating mode switch knob (with the white line) with the flat side of the control board post, and push the knob straight onto the post.
10. Align the inside flat edge of the current adjustment knob with the flat side of the control board post, and push the knob straight onto the post.

Figure 109



- 1 Current adjustment knob
- 2 Operating mode knob
- 3 Power board
- 4 Ribbon cable

- 5 Top mounting screws for control board
- 6 Control board
- 7 Top of front panel

11. Complete the following procedures:

- a. See Install the fan shroud on page 218.
- b. See Install the end panel bracket on page 177.
- c. See Install the component barrier on page 175.
- d. See Install the power supply cover on page 174.
- e. Reconnect the power and gas supply.

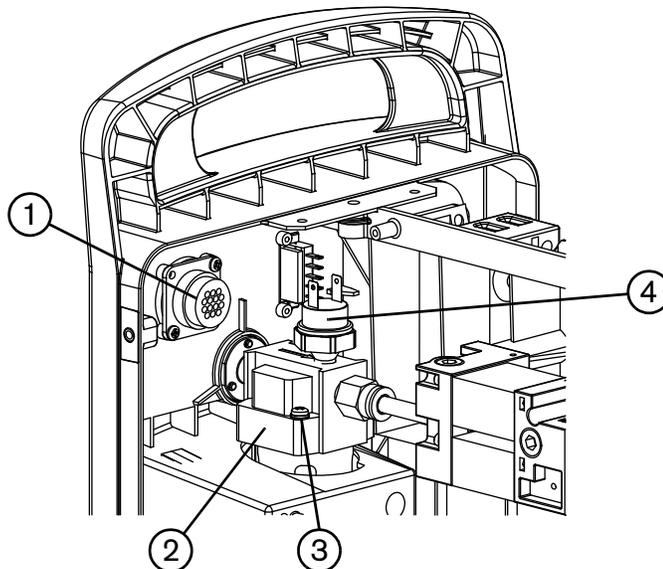
Replacing the rear panel

Kit number	Description
428110	Kit: Powermax125 480V CSA rear panel
428112	Kit: Powermax125 600V CSA rear panel
428111	Kit: Powermax125 400V CE rear panel
428113	Kit: Powermax125 380V CCC rear panel

Remove the rear panel

1. Complete the following procedures:
 - a. See Disconnect the power and gas supply on page 166.
 - b. See Remove the power supply cover on page 174.
 - c. See Remove the component barrier on page 175.
 - d. See Remove the end panel bracket on page 176.
 - e. See Disconnect the gas tube on page 190.
 - f. See Remove the power cord and strain relief on page 192.
2. Remove the screw securing the 2 ground wires to the air filter housing.
3. Unplug the 2 wire connectors from the terminals on top of the pressure switch.
4. Remove the 2 mounting screws securing the CNC interface to the rear panel.

Figure 110

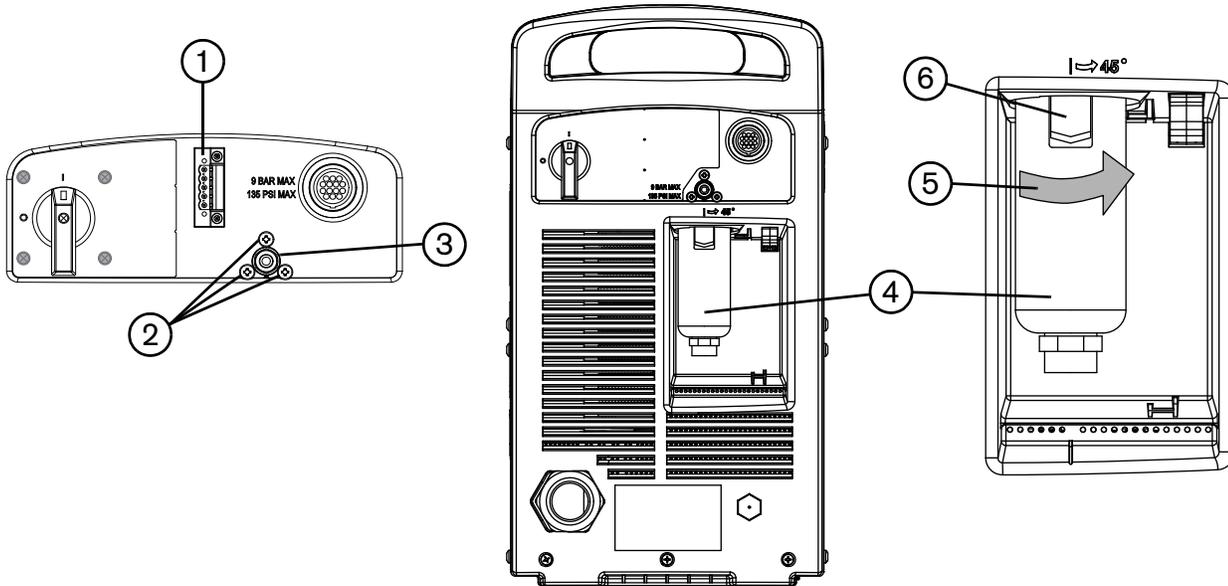


- | | |
|---------------------------|---------------------|
| 1 CNC interface connector | 3 Ground wire screw |
| 2 Air filter assembly | 4 Pressure switch |

9 – Power Supply Component Replacement

5. Remove the filter bowl. See page 167 for details.
6. Remove the air filter assembly. See page 225 for details.
7. If the optional RS-485 connector is installed, remove it by unplugging the 5 wires from the connector terminals inside the power supply and removing the 2 mounting screws from the rear panel.

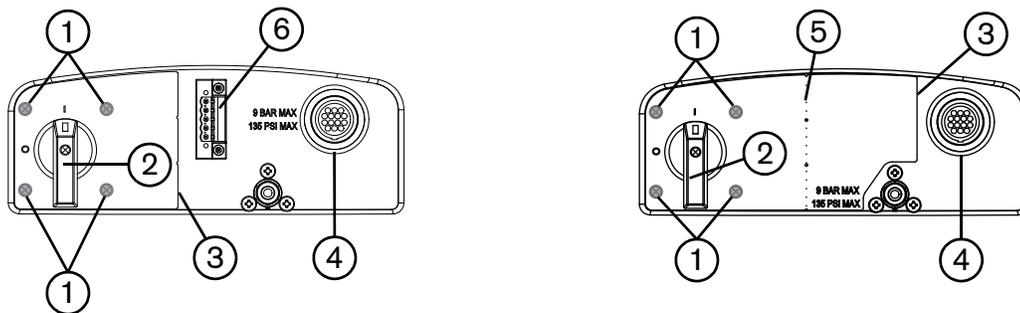
Figure 111



- | | | | |
|---|---|---|-----------------|
| 1 | Optional RS-485 connector | 4 | Air filter bowl |
| 2 | Air filter assembly mounting screws (3) | 5 | Twist to remove |
| 3 | Air fitting | 6 | Thumb latch |

8. Remove the handle screw that secures the power switch handle to the post.
9. Pull the power switch handle straight off the post. If the white plastic cap does not come off with the handle, pull the cap off the post as well.
10. Pry up the right edge of the power switch label. If the optional RS-485 connector is not installed, the label extends to the right side of the inlet gas fitting.
11. Peel off the entire label to expose the 4 mounting screws that secure the power switch to the rear panel.
12. Remove the power switch from the rear panel by removing the 4 mounting screws.
13. Remove the 3 mounting screws from the base of the rear panel, if they are not already removed.
14. Remove the rear panel.

Figure 112 – Rear panel with and without the RS-485 connector installed

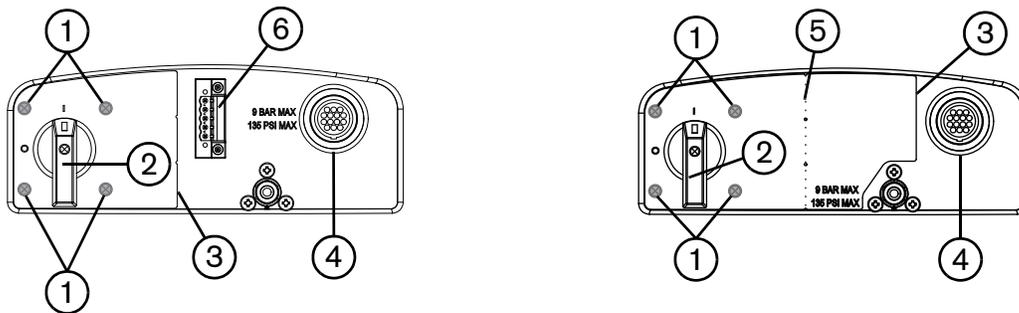


- | | |
|--|-----------------------------|
| 1 Power switch screws (4) (behind label) | 4 CNC interface connector |
| 2 Power switch handle | 5 Label perforation |
| 3 Right edge of label | 6 Optional RS-485 connector |

Install the rear panel

1. Align the power switch mounting holes in the rear panel with the corresponding holes in the power switch.
2. Secure the power switch to the rear panel by tightening the 4 mounting screws to 17.3 kg-cm (15 inch-pounds).
3. If the RS-485 connector is installed, bend and tear the new label at the perforation.
4. Peel the backing off the new label and affix it to the rear panel, being careful to align the hole in the label with the corresponding hole in the rear panel.
5. Push the power switch handle straight onto the post, and tighten the handle screw to 11.5 kg-cm (10 inch-pounds).
6. If removed in step 7 on page 262, secure the RS-485 connector to the rear panel by tightening the 2 mounting screws to 11.5 kg-cm (10 inch-pounds).

Figure 113 – Rear panel with and without the RS-485 connector installed

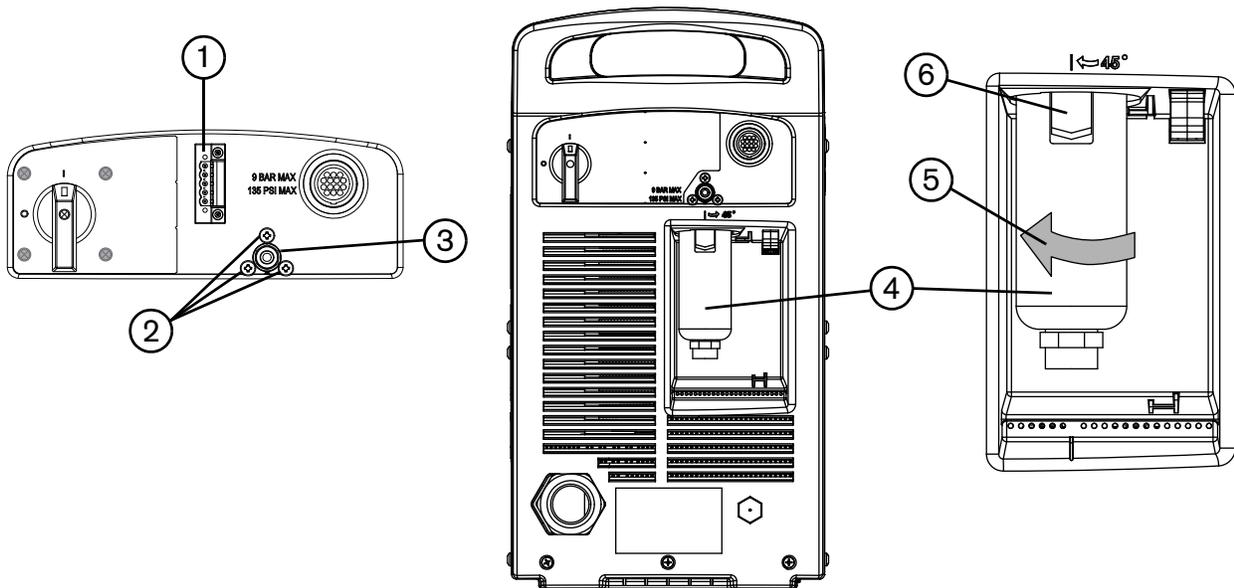


- | | |
|--|-----------------------------|
| 1 Power switch screws (4) (behind label) | 4 CNC interface connector |
| 2 Power switch handle | 5 Label perforation |
| 3 Right edge of label | 6 Optional RS-485 connector |

7. Install the air filter assembly. See Figure 114 below and the procedure on page 227 for details.

	CAUTION!
Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.	

Figure 114

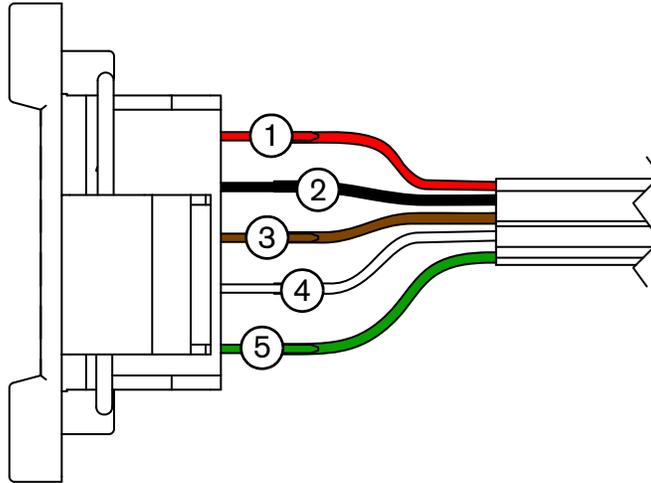


- 1 Optional RS-485 connector
- 2 Air filter assembly mounting screws (3)
- 3 Gas fitting

- 4 Air filter bowl
- 5 Twist to install
- 6 Thumb latch

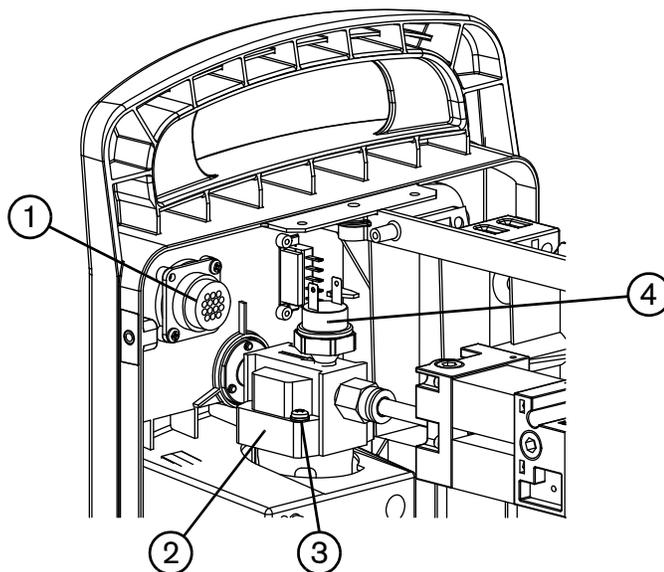
9 – Power Supply Component Replacement

8. If disconnected in step 7 on page 262, connect the wires to the RS-485 connector terminals, starting from the top, in the following order: ① red; ② black; ③ brown; ④ white; ⑤ green.



9. Attach the CNC interface connector to the rear panel by tightening the 2 mounting screws to 11.5 kg-cm (10 inch-pounds).
10. Secure the 2 ground wires to the air filter housing by tightening the ground wire screw to 11.5 kg-cm (10 inch-pounds).
11. Reinstall the power cord. See Install the power cord and strain relief on page 196.
12. If needed, secure the end panel to the power supply by tightening the 3 mounting screws at the base of the panel to 23 kg-cm (20 inch-pounds).

Figure 115



1 CNC interface connector

2 Air filter assembly

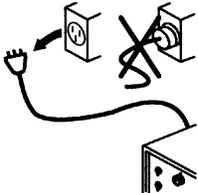
3 Ground wire screw

4 Pressure switch

13. Complete the following procedures:

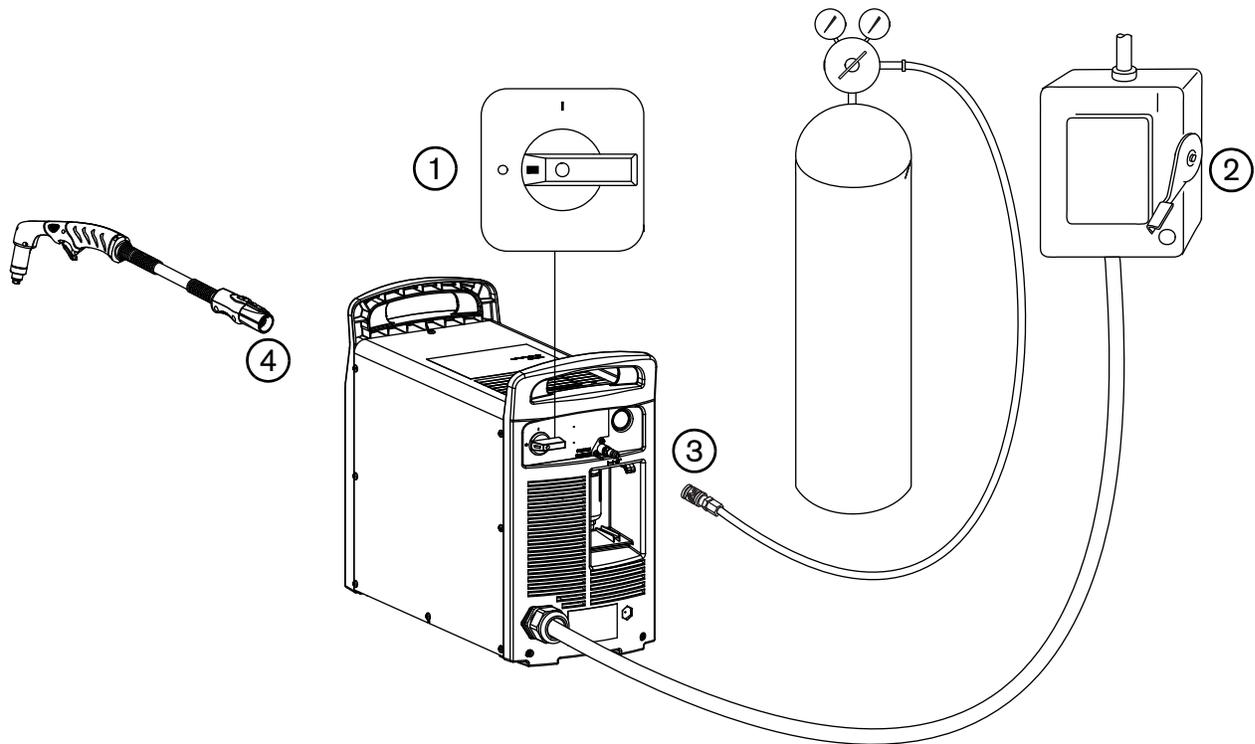
- a.** See Connect the gas tube on page 191.
- b.** See Install the end panel bracket on page 177.
- c.** See Install the component barrier on page 175.
- d.** See Install the power supply cover on page 174.
- e.** Reconnect the power and gas supply.

Section 10
Torch Component Replacement

		WARNING! ELECTRIC SHOCK CAN KILL
		<p>Disconnect electrical power before performing any maintenance. See the <i>Safety and Compliance Manual (80669C)</i> for more safety precautions.</p>

Disconnect the power, gas supply, and torch

Figure 116

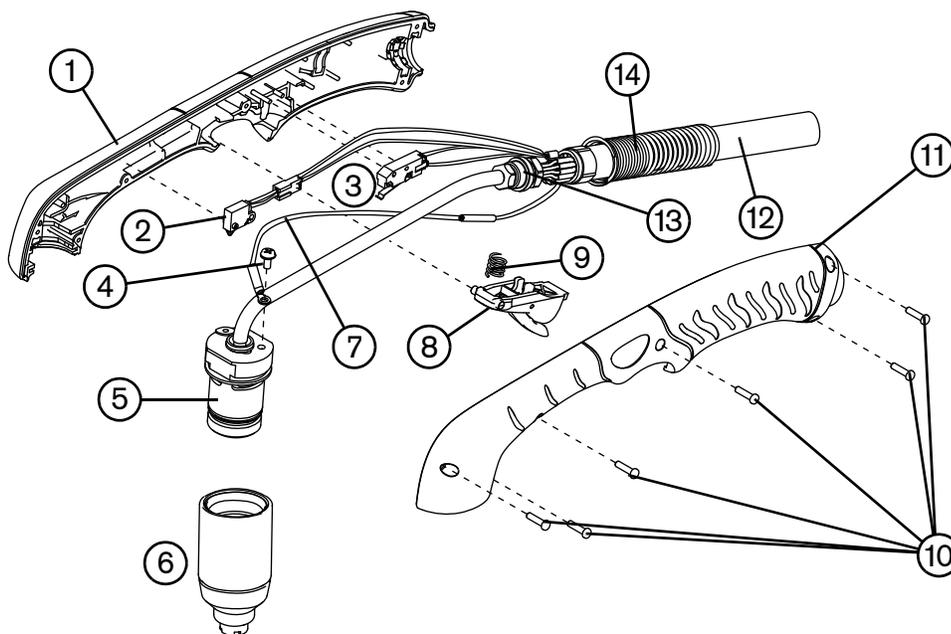


1. Turn the plasma power supply switch to OFF (○).
2. Turn the line disconnect switch to OFF (○).
3. Disconnect the gas supply hose from the plasma power supply.
4. Disconnect the torch from the plasma power supply.

Hand torches

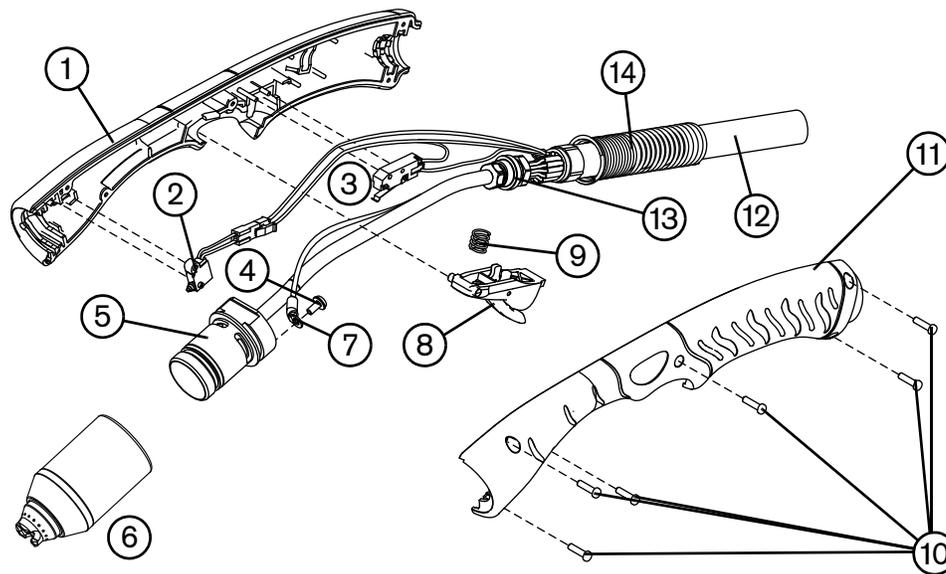
For this system there are 2 hand torches that can be used. (See Figure 117 – 85° hand torch and Figure 118 – 15° hand torch.)

Figure 117 – 85° hand torch



- | | | | |
|---|--------------------------|----|---------------------------|
| 1 | Right side of the handle | 8 | Trigger |
| 2 | Cap-sensor switch | 9 | Spring |
| 3 | Start switch | 10 | Screws (6) |
| 4 | Pilot terminal screw | 11 | Left side of the handle |
| 5 | Torch body | 12 | Torch lead |
| 6 | Consumables | 13 | Gas hose fitting's flange |
| 7 | Pilot arc wire | 14 | Strain relief |

Figure 118 – 15° hand torch



- 1 Right side of the handle
- 2 Cap-sensor switch
- 3 Start switch
- 4 Pilot terminal screw
- 5 Torch body
- 6 Consumables
- 7 Pilot arc wire

- 8 Trigger
- 9 Spring
- 10 Screws (6)
- 11 Left side of the handle
- 12 Torch lead
- 13 Gas hose fitting's flange
- 14 Strain relief

Replacing the handle

Kit	Description
428154	Kit: Duramax Hyamp 15° torch handle replacement
428155	Kit: Duramax Hyamp 85° torch handle replacement

Remove the handle

Many repairs require the removal of the handle and other components. Several other procedures in this section reference this procedure. To replace the handle, you need to remove all of the internal components from the handle.

1. Turn OFF (O) the power, disconnect the gas supply, and disconnect the torch.
2. Remove the consumables from the torch.
3. Place the torch on a flat surface with the left handle facing up.

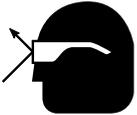


The left side of the handle is the side with the screws.



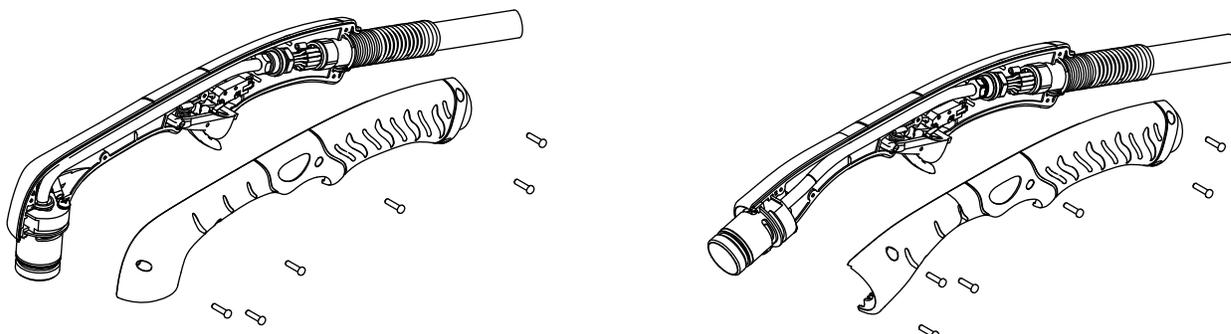
It may be helpful to clamp the lead in place to keep it from moving.

4. Remove the screws from the left handle.

	<p>CAUTION!</p> <p>Wear eye protection, as the trigger spring can launch out of the handle.</p>
--	---

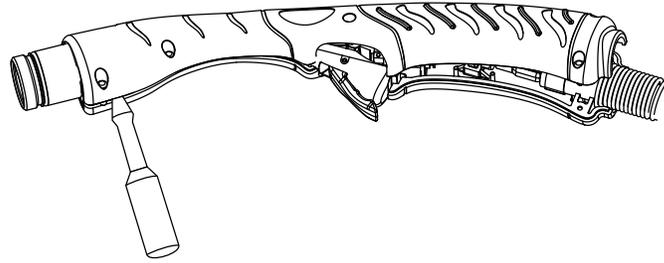
5. Being careful to keep the trigger spring from launching out of the handle, lift the left side of the handle away from the torch.

Figure 119



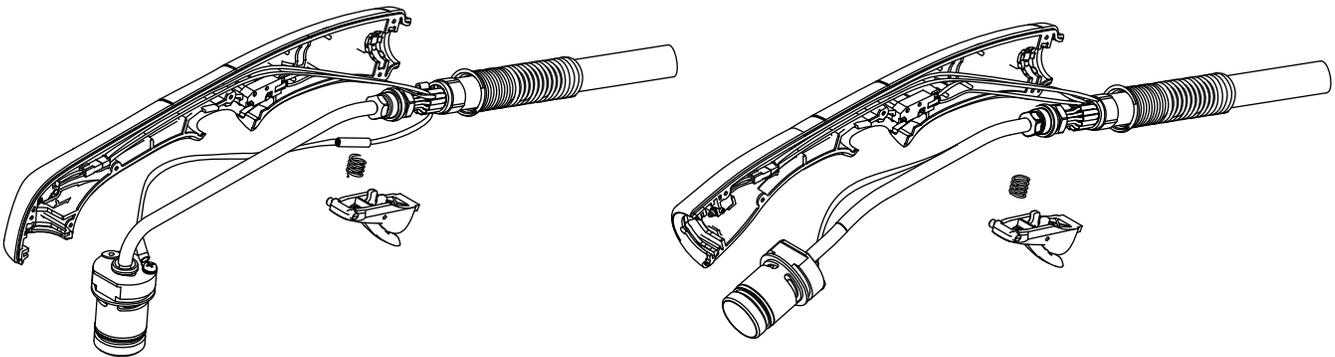
For the 15° hand torch, carefully lift up the right end of the handle. Insert a blade screwdriver between the handles on the left end. Gently twist the screwdriver to pry up the handle. (See Figure 120.)

Figure 120



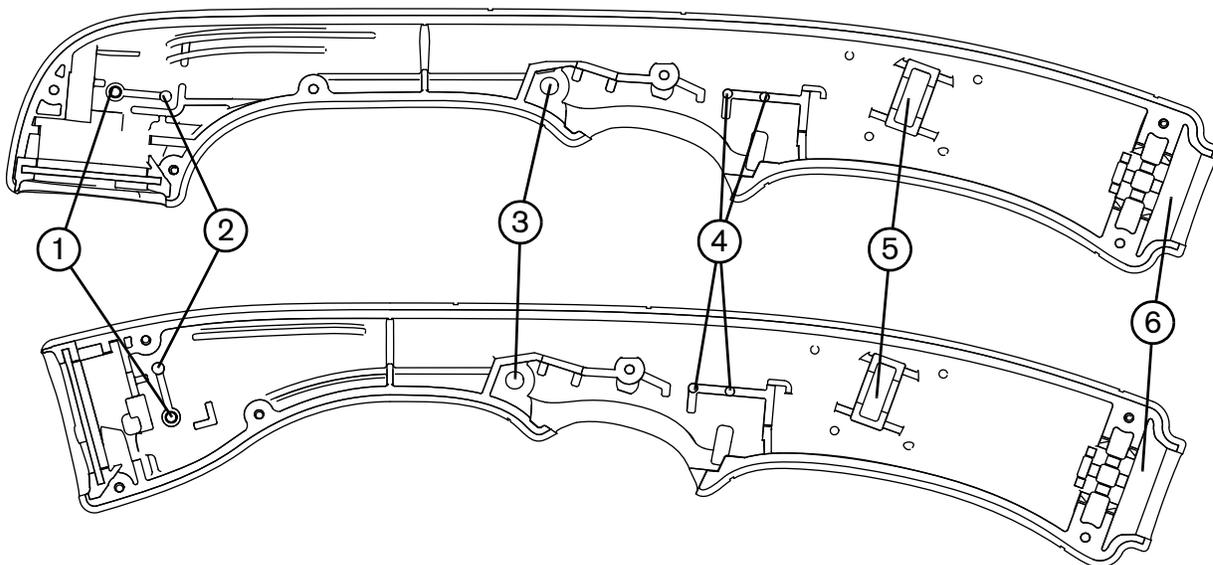
6. While holding the spring in place, slide the trigger and spring up and out of the handle. Set them aside.
7. The torch body fits snugly into the right side of the handle. While holding the torch body, gently press the right side of the handle away from the torch body to remove it.

Figure 121



8. Slide the cap-sensor switch off its mounting post. (See Figure 123 on page 275.)

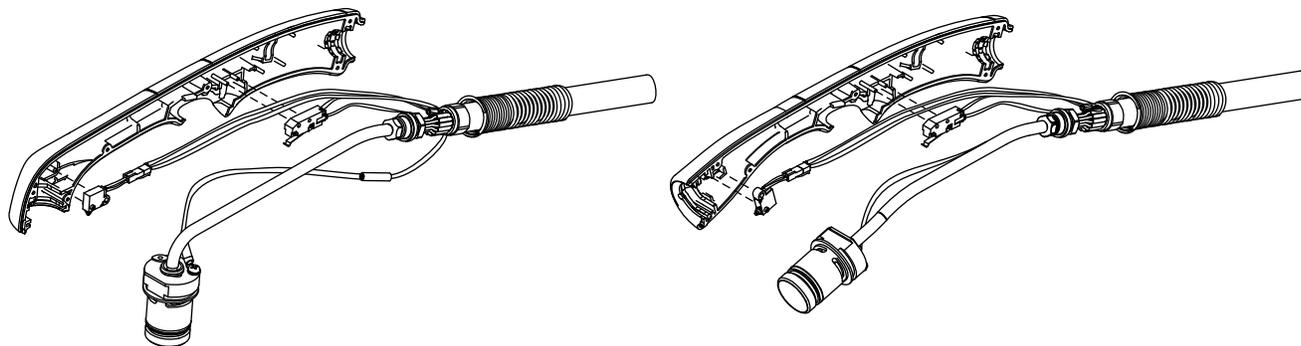
Figure 122



- | | |
|-------------------------------------|--|
| 1 Cap-sensor switch's post hole | 4 Start switch's mounting posts |
| 2 Cap-sensor switch's mounting post | 5 Slot for the gas hose fitting's flange |
| 3 Trigger's pivot hole | 6 Strain relief slot |

9. Using a blade screwdriver, pry the start switch off the 2 mounting posts.

Figure 123



10 – Torch Component Replacement

Install the handle

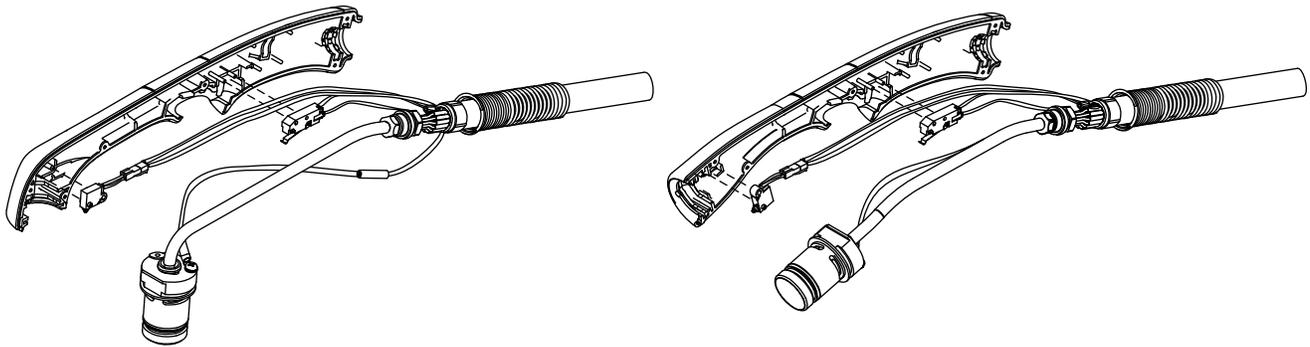
1. Make sure that the pilot terminal screw is tightened to 17.3 kg-cm (15 inch-pounds).
2. Lay the right side of the handle on a flat surface with the inside facing up.



If replacing the handles, apply the “H” label to the right side of the torch handle and the Duramax label to the left side of the torch handle.

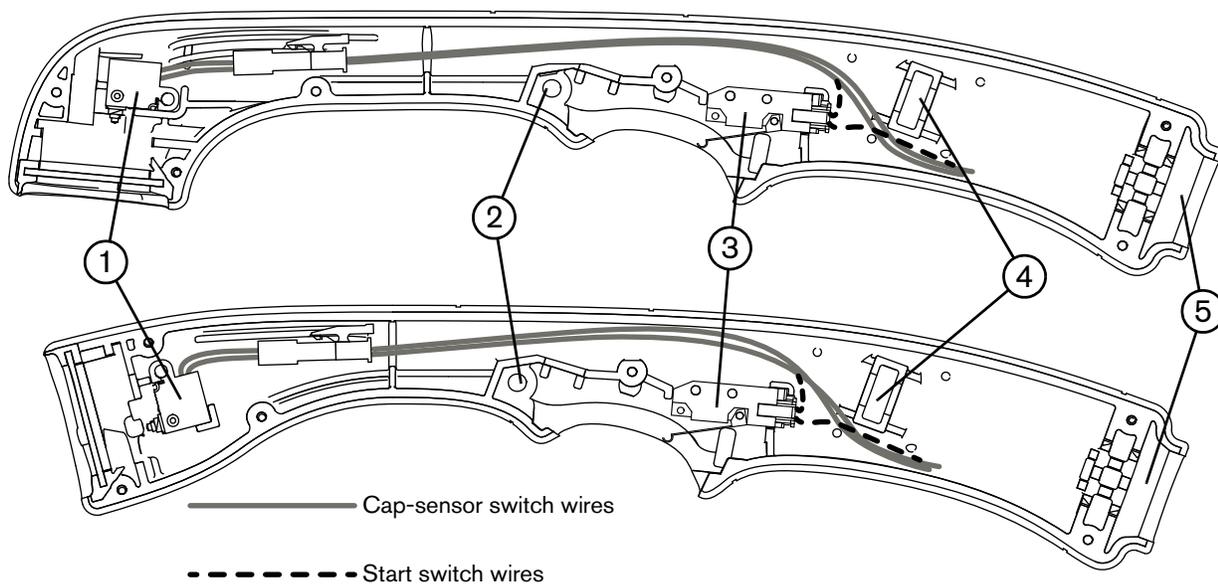
3. Press the cap-sensor switch into its post hole and onto its mounting posts. (See Figure 122 on page 275.)

Figure 124



4. Route the cap-sensor wires as shown in Figure 125. Position the wires below the slot for the gas hose fitting's flange.
5. Press the start switch onto the 2 mounting posts and position the wires below the slot for the gas hose fitting's flange. (See Figure 124 and Figure 125.)

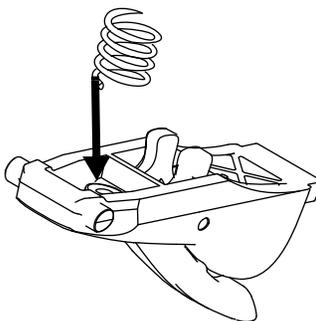
Figure 125



- | | |
|------------------------|--------------------------------------|
| 1 Cap-sensor switch | 4 Slot for gas hose fitting's flange |
| 2 Trigger's pivot hole | 5 Slot for torch lead strain relief |
| 3 Start switch | |

6. Press the torch body into the torch handle with the gas hose fitting's flange aligned with the slot in the handle.
7. Align the strain relief with the strain relief slot in the handle. (See Figure 125 for the location of the strain relief slot.)
8. Compress the trigger spring into the front half of the trigger. Slide the trigger and spring into place.

Figure 126



9. Being careful that the handle and gas fitting flange do not pinch the wires, align the left half of the handle with the right half. Verify that the trigger pivots are both located in the trigger pivot holes. (See Figure 125.)
10. Install the handle screws loosely.

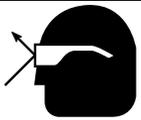
10 – Torch Component Replacement

11. Make sure the trigger is in its pivot holes by pulling it a few times.
12. Tighten the handle screws to 15.0 kg-cm (13 inch-pounds).
13. Install the consumables.
14. Reconnect the torch and gas supply, and turn ON (I) the power.

Replacing the trigger assembly

Kit	Description
428156	Kit: Duramax Hyamp hand torch trigger with spring replacement

1. Turn OFF (O) the power, disconnect the gas supply, and disconnect the torch.
2. Remove the consumables from the torch.
3. Place the torch on a flat surface with the left handle facing up.
4. Remove the screws from the left handle. Set the screws aside.

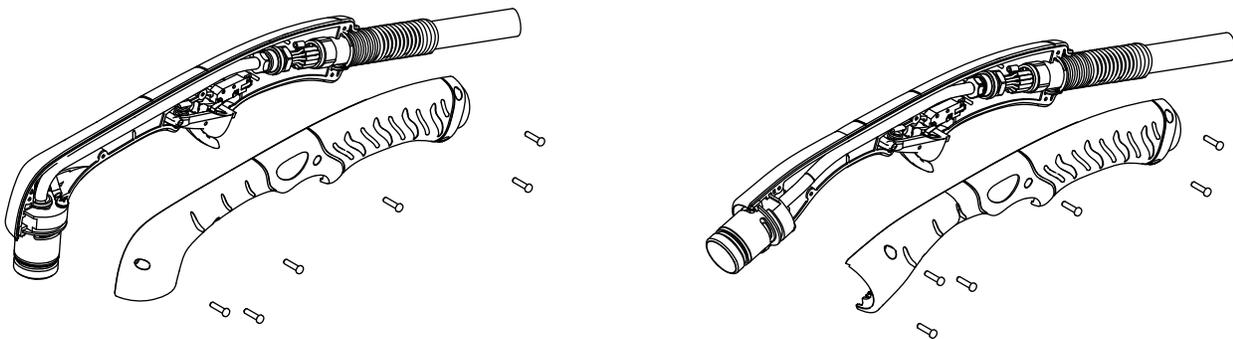


CAUTION!

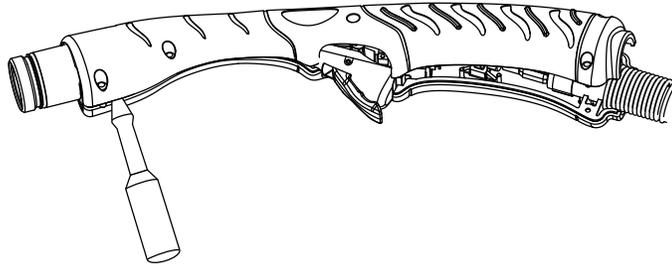
Wear eye protection, as the trigger spring can launch out of the handle.

5. Being careful to keep the trigger spring from launching out of the handle, lift the left side of the handle away from the torch.

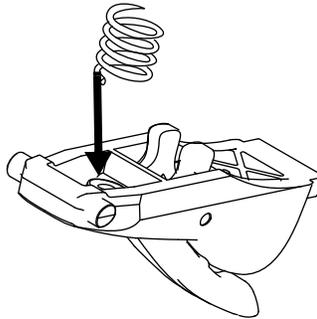
Figure 127



For the 15° hand torch, carefully lift up the right end of the handle. Insert a blade screwdriver between the handles on the left end. Gently twist the screwdriver to pry up the handle. (See Figure 128.)

Figure 128

6. While holding the spring in place, slide the trigger and spring up and out of the handle. Set them aside.
7. Compress the new trigger spring into the front half of the new trigger. Slide the trigger and spring into place.

Figure 129

8. Making sure that the handle and gas fitting flange do not pinch the wires, align the left half of the handle with the right half. Verify that the trigger pivots are both located in the trigger pivot holes. (See Figure 125 on page 277.)
9. Install the handle screws loosely.
10. Make sure the trigger is in its pivot holes by pulling it a few times.
11. Tighten the handle screws to 15.0 kg-cm (13 inch-pounds).
12. Install the consumables.
13. Reconnect the torch and gas supply, and turn ON (I) the power.

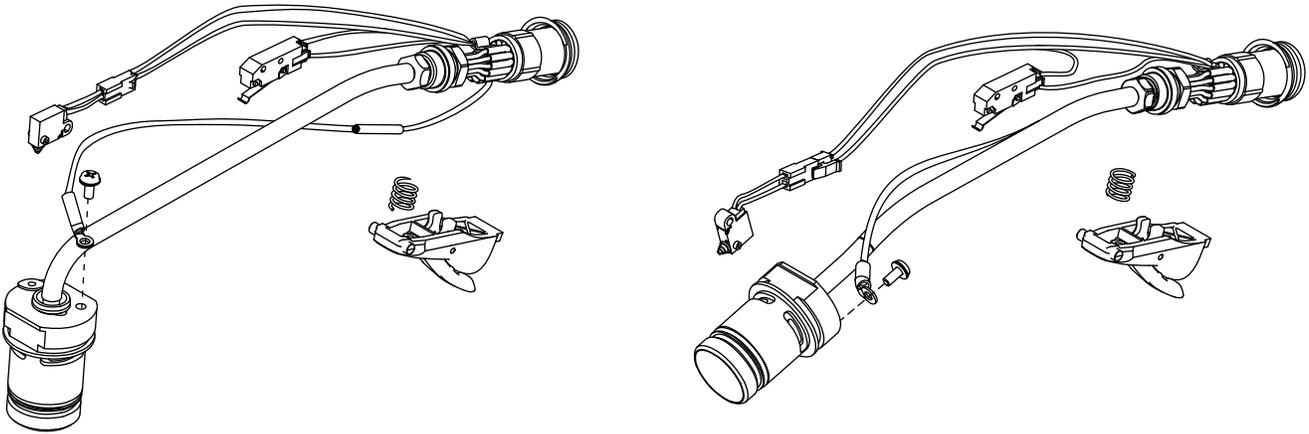
10 – Torch Component Replacement

Replacing the torch body

Kit	Description
428157	Kit: Duramax Hyamp 15° hand torch main body replacement
428158	Kit: Duramax Hyamp 85° hand torch main body replacement

1. Complete the following procedures:
 - a. See Disconnect the power, gas supply, and torch on page 270.
 - b. Remove all components from the torch. See Remove the handle on page 273.
2. Remove the pilot terminal screw.

Figure 130



3. Use a 3/8-inch and 1/2-inch wrench together (or 2 adjustable wrenches) to loosen the gas fitting that secures the torch body to the torch lead.



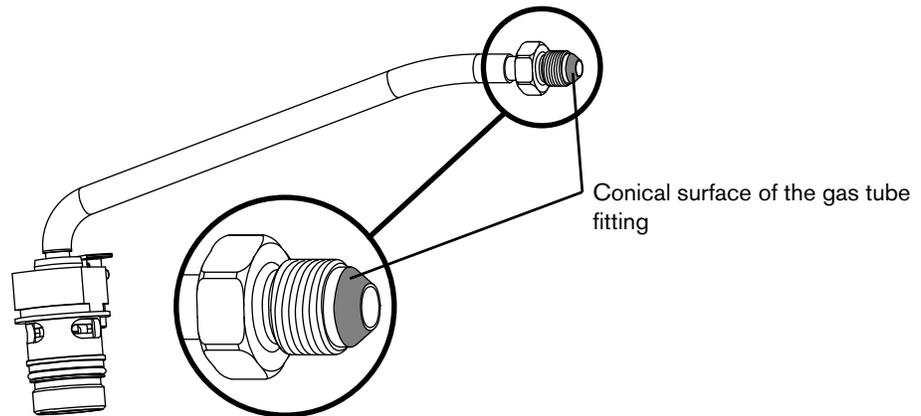
CAUTION!

Always use 2 wrenches to properly loosen and tighten the hex nuts and bolts mentioned in these procedures. A strong thread sealant is used to assemble the torch, and loosening the nuts incorrectly can damage the threads.

4. Apply threadlocker (330103) to the threads of the gas tube fitting on the torch body. Be careful not to get any threadlocker on the conical surface of the gas tube fitting to avoid damage to the torch.

	CAUTION!
Do not get any threadlocker on the conical surface of the gas tube fitting to avoid causing damage to the torch. If any threadlocker does get on this surface, clean it off immediately.	

Figure 131



5. Thread the torch body into the torch lead until snug.



The white wires of the lead should be facing up.

6. Use a 3/8-inch and 1/2-inch wrench together (or 2 adjustable wrenches) to tighten the gas fitting that secures the torch body to the torch lead to 69.1 kg-cm (60 inch-pounds).

7. Tighten the pilot terminal screw to 17.3 kg-cm (15 inch-pounds).



The wire should go down into the left handle. Bend the terminal slightly if necessary.

8. Complete the following procedures:

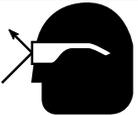
- a. Install all of the torch components that you removed. See Install the handle on page 276.
- b. Reconnect the torch and gas supply, and turn ON (I) the power.

10 – Torch Component Replacement

Replacing the start switch

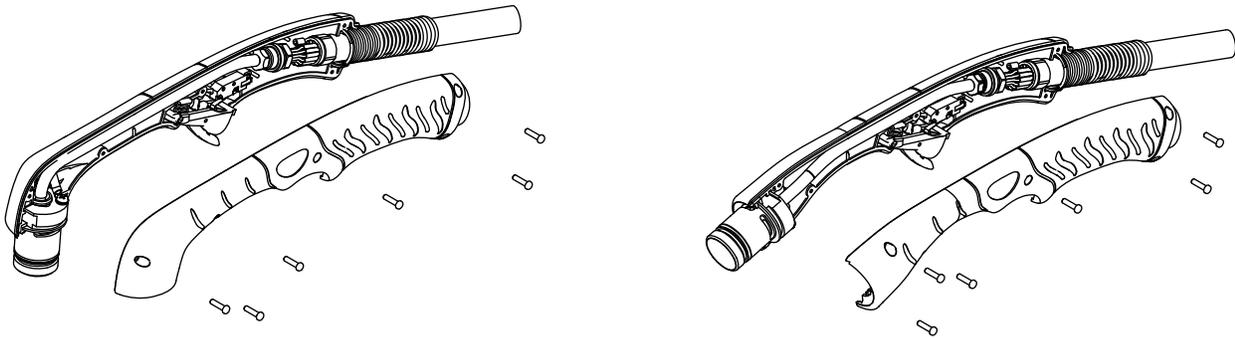
Kit	Description
428162	Kit: Duramax Hyamp start switch replacement

1. Turn OFF (●) the power, disconnect the gas supply, and disconnect the torch.
2. Remove the consumables from the torch.
3. Place the torch on a flat surface with the left handle facing up.
4. Remove the screws from the left handle.

	CAUTION!
Wear eye protection, as the trigger spring can launch out of the handle.	

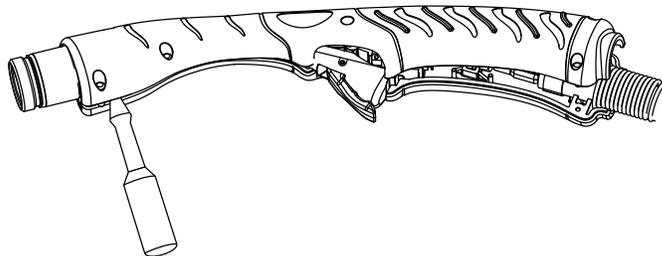
5. Being careful to keep the trigger spring from launching out of the handle, lift the left side of the handle away from the torch.

Figure 132

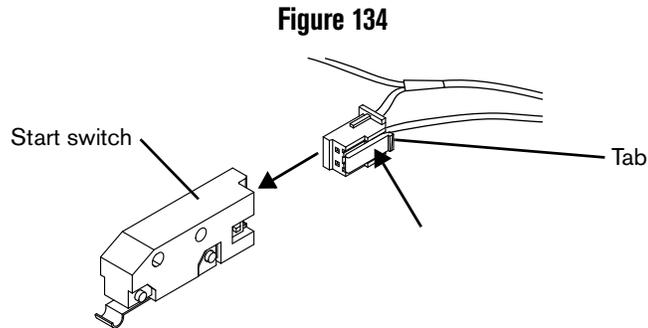


For the 15° hand torch, carefully lift up the right end of the handle. Insert a blade screwdriver between the handles on the left end. Gently twist the screwdriver to pry up the handle.

Figure 133



6. While holding the spring in place, slide the trigger and spring up and out of the handle. Set them aside.
7. Using a blade screwdriver, pry the start switch off the 2 mounting posts.
8. Disconnect the start switch by pushing the tab and pulling the start switch away from the connector.



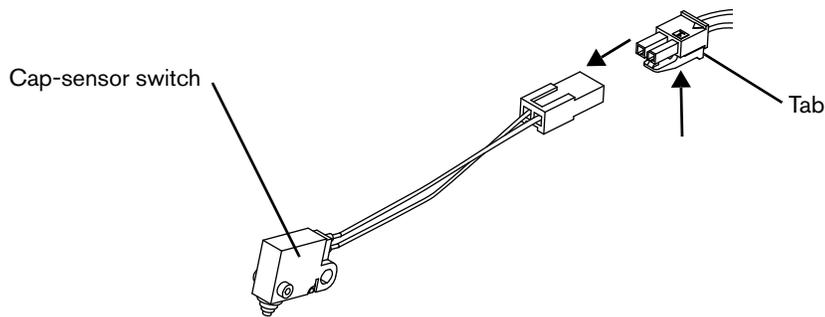
9. Connect the new start switch by pushing the mating plug into the socket.
10. Press the new start switch onto the 2 mounting posts.
11. Make sure that the pilot terminal screw is tightened to 17.3 kg-cm (15 inch-pounds).
12. Press the torch body into the torch handle with the gas hose fitting's flange aligned with the slot in the handle.
13. Align the strain relief with the strain relief slot in the handle.
14. Compress the trigger spring into the front half of the trigger. Slide the trigger and spring into place.
15. Making sure that the handle and gas fitting flange do not pinch the wires, align the left half of the handle with the right half. Verify that the trigger pivots are both located in the trigger pivot holes.
16. Install the handle screws loosely.
17. Make sure the trigger is in its pivot holes by pulling it a few times.
18. Tighten the handle screws to 15.0 kg-cm (13 inch-pounds).
19. Install the consumables.
20. Reconnect the torch and gas supply, and turn ON (I) the power.

Replacing the cap-sensor switch

Kit	Description
228719	Kit: Duramax and Duramax Hyamp hand torch cap-sensor switch replacement

1. Complete the following procedures:
 - a. See Disconnect the power, gas supply, and torch on page 270.
 - b. Remove all components from the torch. See Remove the handle on page 273.
2. Disconnect the cap-sensor switch by pressing the tab on the connector and pulling the connector apart.

Figure 135



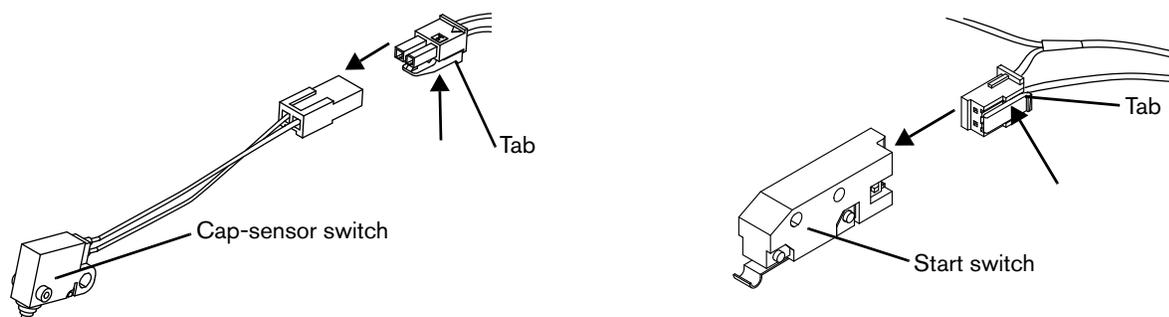
3. Connect the new cap-sensor switch to the torch lead by pushing the mating plug on the torch lead wires into the socket.
4. Complete the following procedures:
 - a. Install all of the components that you removed. See Install the handle on page 276.
 - b. Reconnect the torch and gas supply, and turn ON (I) the power.

Replacing the torch lead

Kit	Description
428159	Kit: Duramax Hyamp hand torch lead replacement, 7.6 m (25 foot) Kit:
428160	Duramax Hyamp hand torch lead replacement, 15 m (50 foot) Kit:
428161	Duramax Hyamp hand torch lead replacement, 23 m (75 foot)
428762	Kit: Duramax Hyamp hand torch lead replacement, 45.7 m (150 foot)

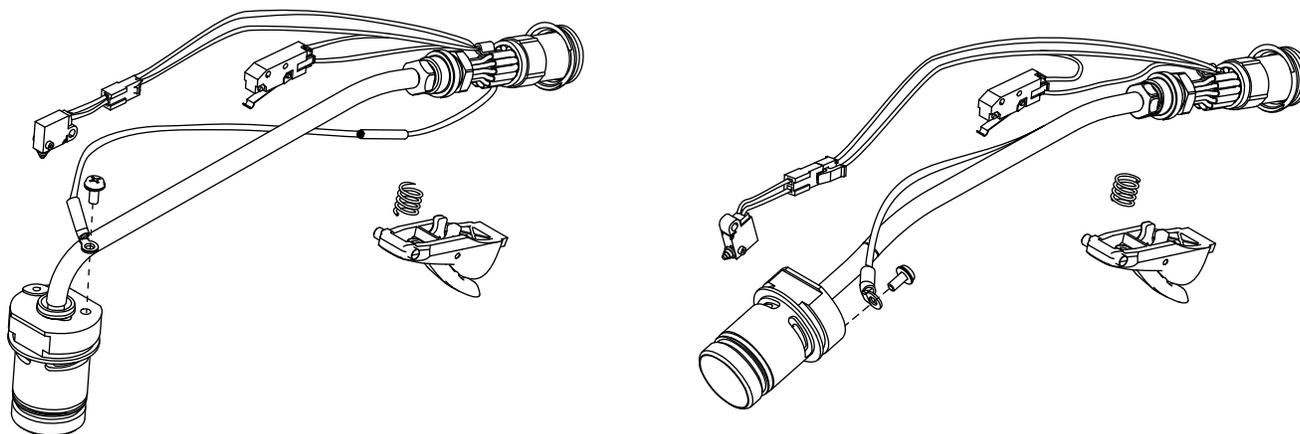
1. Complete the following procedures:
 - a. See Disconnect the power, gas supply, and torch on page 270.
 - b. Remove all components from the torch. See Remove the handle on page 273.
2. Disconnect the cap-sensor switch and start switch.

Figure 136



3. Remove the pilot terminal screw.

Figure 137



10 – Torch Component Replacement

4. Use a 3/8-inch and 1/2-inch wrench together (or 2 adjustable wrenches) to loosen the gas fitting that secures the torch body to the torch lead.



CAUTION!

Always use 2 wrenches to properly loosen and tighten the hex nuts and bolts mentioned in these procedures.

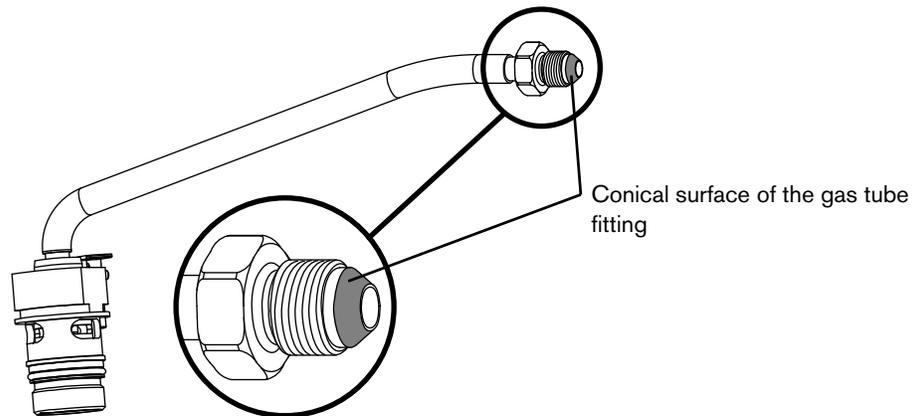
5. Apply threadlocker (330103) to the threads of the gas tube fitting on the torch body. Be very careful not to get any threadlocker on the conical surface of the gas tube fitting to avoid damage to the torch. (See Figure 138.)



CAUTION!

Do not get any threadlocker on the conical surface of the gas tube fitting to avoid causing damage to the torch. If any threadlocker does get on this surface, clean it off immediately.

Figure 138



6. Thread the torch body into the torch lead until snug.



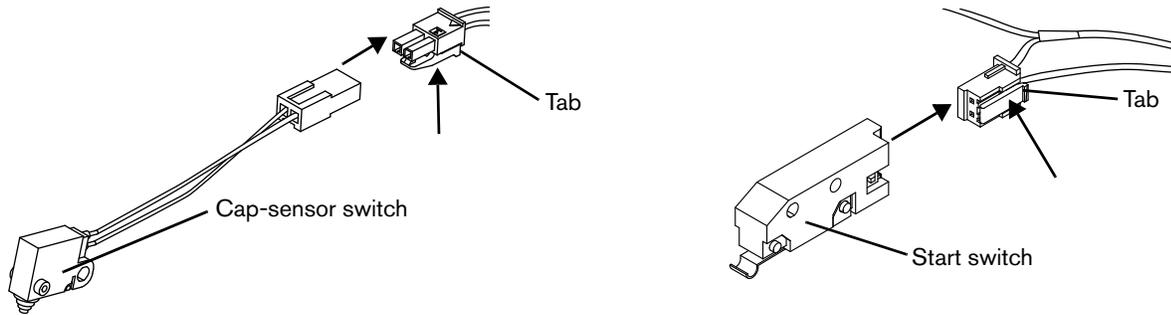
The white wires of the lead should be facing up.

7. Use a 3/8-inch and 1/2-inch wrench together (or 2 adjustable wrenches) to tighten the gas fitting that secures the torch body to the torch lead to 69.1 kg-cm (60 inch-pounds).

8. Tighten the pilot terminal screw to 17.3 kg-cm (15 inch-pounds).

9. Connect the cap-sensor switch and start switch.

Figure 139

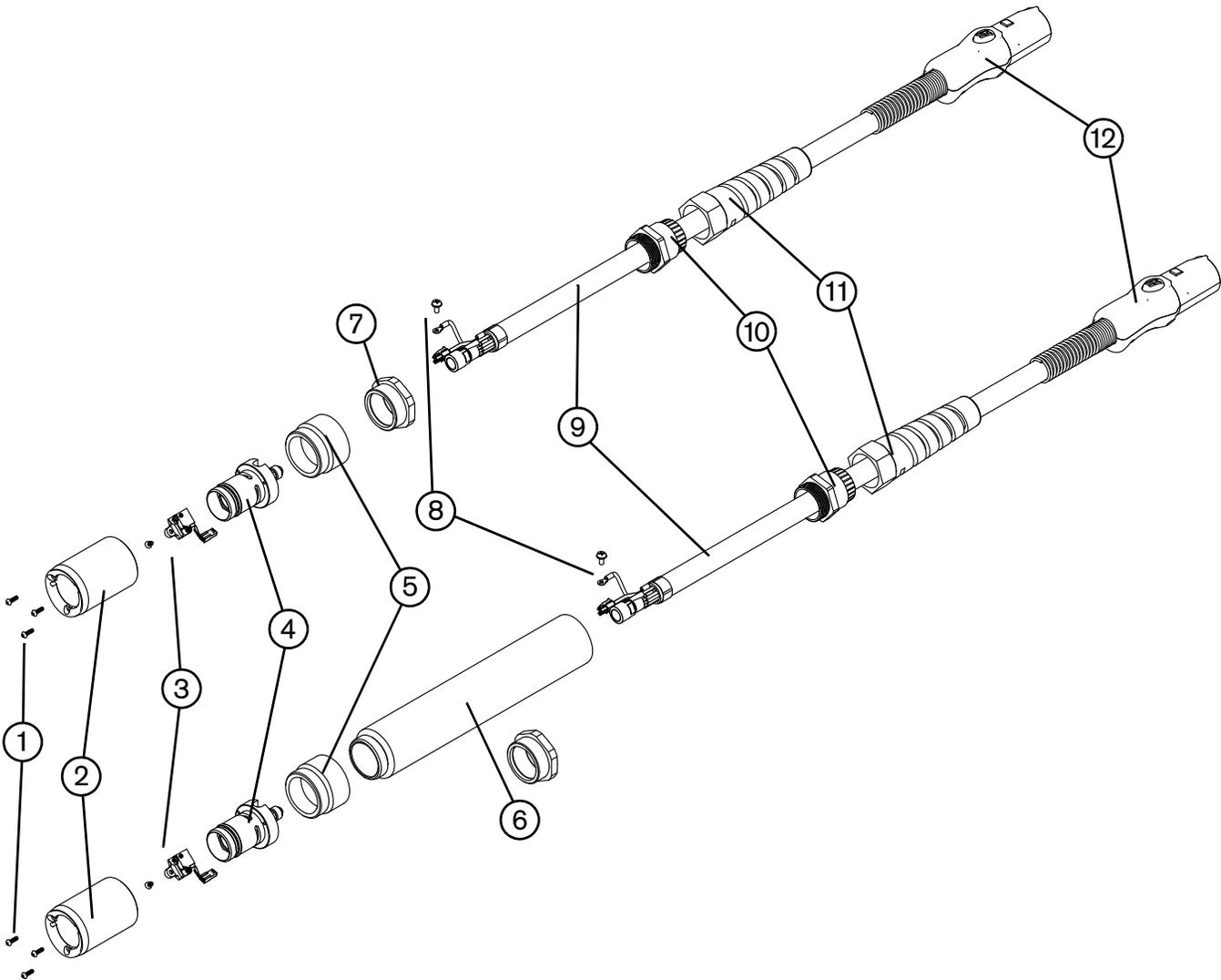


10. Complete the following procedures:

- a. Install all of the components that you removed. See Install the handle on page 276.
- b. Reconnect the torch and gas supply, and turn ON (I) the power.

Machine torches

Figure 140



- | | | | |
|---|-----------------------------|----|--------------------------|
| 1 | Mounting sleeve screws | 7 | Adapter |
| 2 | Mounting sleeve | 8 | Pilot arc wire and screw |
| 3 | Cap-sensor switch and screw | 9 | Torch lead |
| 4 | Torch body | 10 | Strain relief |
| 5 | Coupler | 11 | Strain relief nut |
| 6 | Positioning sleeve | 12 | Quick disconnect |

Replacing the mounting sleeve

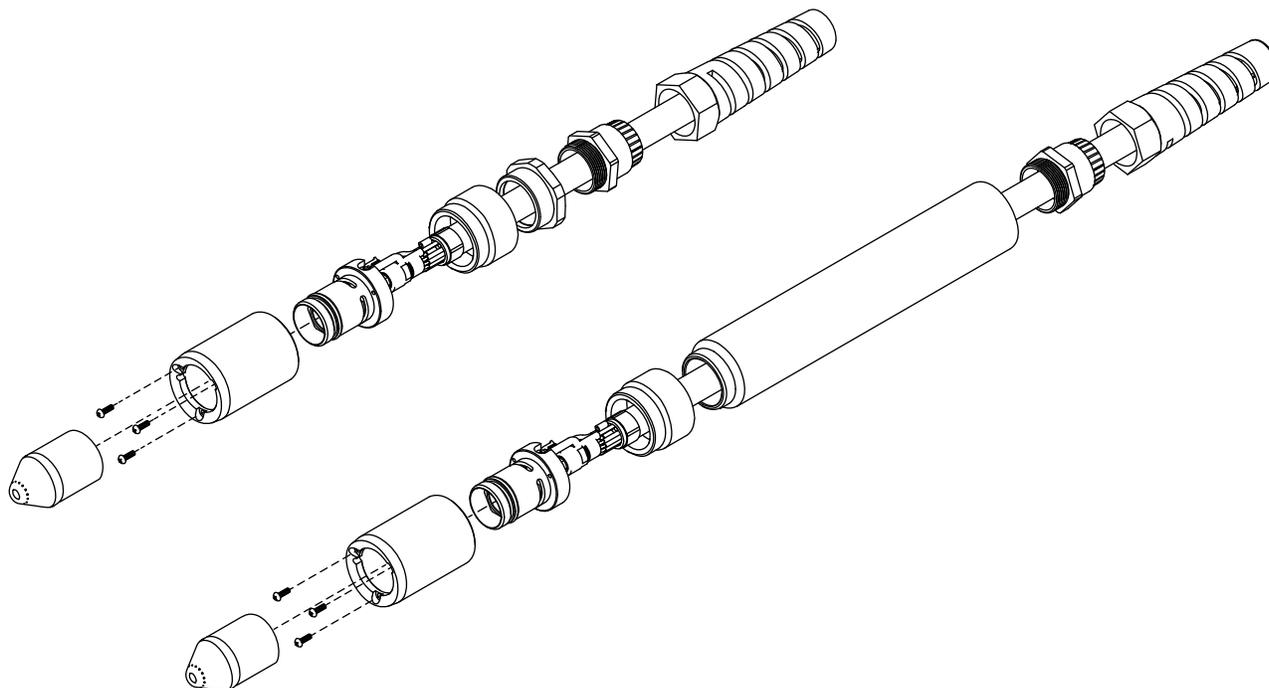
Kit	Description
428145	Kit: Duramax Hyamp 180° machine torch mounting sleeve

Remove the mounting sleeve

Many repairs require you to remove the mounting sleeve of the machine torch. Several other procedures in this section reference this procedure.

1. Turn OFF (●) the power, disconnect the gas supply, and disconnect the torch.
2. Remove the consumables.
3. Unscrew the strain relief nut from the strain relief, and slide the strain relief nut back along the torch lead.
4. Unscrew the strain relief from the positioning sleeve (full-length only) or adapter (mini only) and slide the nut back along the torch lead. (See Figure 141 on page 289.)
5. Unscrew the positioning sleeve (full-length only) or adapter (mini only) from the coupler.
6. Unscrew the coupler from the mounting sleeve.
7. Remove the screws from the front face of the mounting sleeve and set them aside.
8. Slide the mounting sleeve off of the torch body.

Figure 141



10 – Torch Component Replacement

Install the mounting sleeve

1. Slide the mounting sleeve onto the torch body.
2. Install the screws on the face of the mounting sleeve.
3. Reinstall the consumables.
4. Screw the coupler onto the mounting sleeve.
5. Screw the positioning sleeve (full-length only) or adapter (mini only) onto the coupler.
6. Screw the strain relief onto the positioning sleeve (full-length only) or adapter (mini only).
7. Screw the strain relief nut onto the strain relief.
8. Reconnect the torch and gas supply, and turn ON (I) the power.

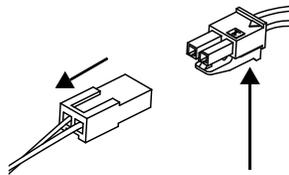
Replacing the cap sensor switch

Kit	Description
228720	Kit: Duramax/Hyamp/MRT 180° machine torch cap-sensor switch replacement

Remove the cap sensor switch

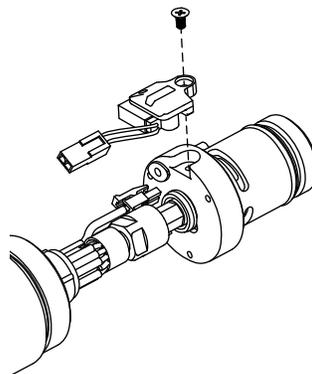
1. Complete the following procedures:
 - a. See Disconnect the power, gas supply, and torch on page 270.
 - b. See Remove the mounting sleeve on page 289.
2. Disconnect the cap-sensor switch by pressing the tab on the connector and pulling the connector apart.

Figure 142



3. Remove the screw from the cap-sensor switch and remove the switch from the torch body.

Figure 143



Install the cap-sensor switch

1. Install the cap-sensor switch and screw.
2. Connect the cap-sensor switch to the torch lead.
3. Complete the following procedures:
 - a. See Install the mounting sleeve on page 290.
 - b. Reconnect the torch and gas supply, and turn ON (I) the power.

10 – Torch Component Replacement

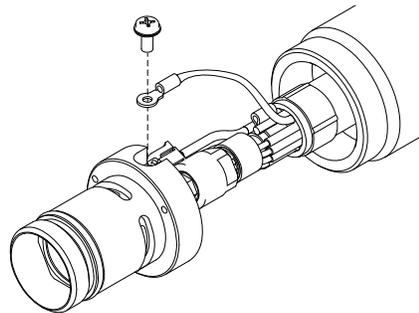
Replacing the torch body

Kit	Description
428147	Kit: Duramax Hyamp 180° machine torch main body replacement

Remove the torch body

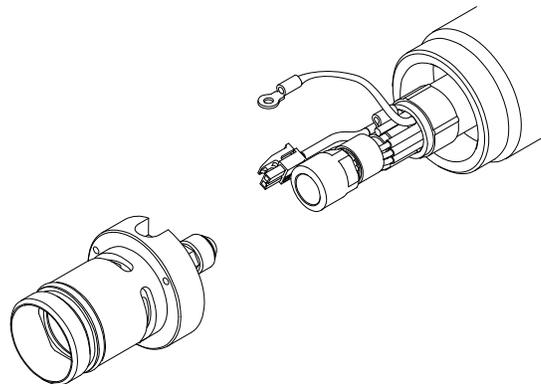
1. Complete the following procedures:
 - a. See Disconnect the power, gas supply, and torch on page 270.
 - b. See Remove the mounting sleeve on page 289.
 - c. See Remove the cap sensor switch on page 291.
2. Remove the pilot terminal screw and wire. Set the screw aside.

Figure 144



3. Using a 3/8-inch and 1/2-inch wrench together (or 2 adjustable wrenches), loosen the nut that secures the gas supply line to the torch to remove the torch body.

Figure 145



Install the torch body

1. Using a 3/8-inch and 1/2-inch wrench together (or 2 adjustable wrenches), tighten the torch body onto the torch lead to 69.1 kg-cm (60 inch-pounds).
2. Install the pilot arc wire and screw. Tighten to 17.3 kg-cm (15 inch-pounds).
3. Complete the following procedures:
 - a. See Install the cap-sensor switch on page 291.
 - b. See Install the mounting sleeve on page 290.
 - c. Reconnect the torch and gas supply, and turn ON (I) the power.

Replacing the coupler and positioning sleeve (full-length only) or adapter (mini only)

Kit	Description
428144	Kit: Duramax Hyamp 180° full-length machine torch positioning sleeve
428146	Kit: Duramax Hyamp 180° mini machine torch adapter ring
428248	Kit: Duramax Hyamp 180° machine torch coupler

1. Complete the following procedures:
 - a. See Disconnect the power, gas supply, and torch on page 270.
 - b. See Remove the mounting sleeve on page 289.
 - c. See Remove the torch body on page 292.
2. Slide the coupler off the torch lead.
3. Slide the positioning sleeve (full-length only) or adapter (mini only) off the torch lead.
4. Slide the positioning sleeve (full-length only) or adapter (mini only) onto the torch lead.
5. Slide the coupler onto the torch lead.
6. Complete the following procedures:
 - a. See Install the torch body on page 293.
 - b. See Install the mounting sleeve on page 290.
 - c. Reconnect the torch and gas supply, and turn ON (I) the power.

Replacing the torch lead

Kit	Description
428149	Kit: Duramax Hyamp 180° machine torch lead replacement, 4.6 m (15 feet)
428150	Kit: Duramax Hyamp 180° machine torch lead replacement, 7.6 m (25 feet)
428151	Kit: Duramax Hyamp 180° machine torch lead replacement, 10.7 m (35 feet)
428152	Kit: Duramax Hyamp 180° machine torch lead replacement, 15 m (50 feet)
428153	Kit: Duramax Hyamp 180° machine torch lead replacement, 23 m (75 feet)
428761	Kit: Duramax Hyamp 180° machine torch lead replacement, 45.7 m (150 feet)

The torch lead comes with the strain relief and strain relief nut. (See Figure 140 on page 288 for the fully disassembled torch.)

Complete the following procedures:

1. See Disconnect the power, gas supply, and torch on page 270.
2. See Remove the mounting sleeve on page 289.
3. See Remove the torch body on page 292.
4. See Replacing the coupler and positioning sleeve (full-length only) or adapter (mini only) on page 293.



Install the coupler and positioning sleeve or adapter onto the new lead.

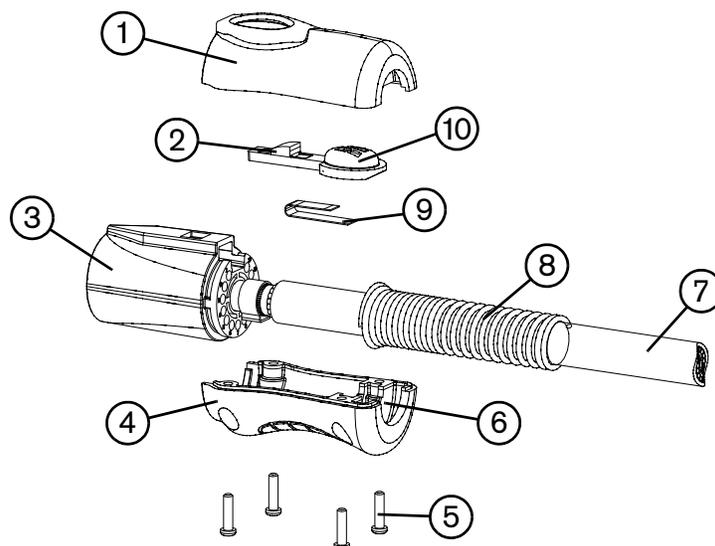
5. See Install the torch body on page 293.
6. See Install the mounting sleeve on page 290.
7. Reconnect the torch and gas supply, and turn ON (I) the power.

Replacing the quick disconnect housing

Kit	Description
428260	Kit: Duramax and Duramax Hyamp torch quick disconnect repair (lead side)

1. Turn OFF (●) the power, disconnect the gas supply, and disconnect the torch.
2. Remove the screws from the bottom half of the shell. (See Figure 146 on page 295.)
3. Remove the 2 shell halves.
4. Remove the latch by using a blade screwdriver to press down firmly on the latch tab while pushing the tab down and out toward the lead.
5. Pull the spring out of the quick disconnect housing.

Figure 146



- | | |
|----------------------------|----------------------|
| 1 Top shell half | 6 Strain relief slot |
| 2 Latch tab | 7 Torch lead |
| 3 Quick disconnect housing | 8 Strain relief |
| 4 Bottom shell half | 9 Spring |
| 5 Screws (4) | 10 Latch |

6. Place the new latch into the quick disconnect housing.
7. Hold up the end of the latch and insert the new spring under the latch.
8. Use a blade screwdriver to push the spring into the recess until it clicks into place.

10 – Torch Component Replacement

9. Install the new shell halves onto the torch lead, making sure the strain relief fits in the slot of the shell and the wires are not pinched or do not interfere with the latch.
10. Install and tighten the screws.

Section 11

Parts

Use the Hypertherm kit numbers in this section to order replacement parts, consumables, and accessories for your power supply, hand torch, and machine torch.

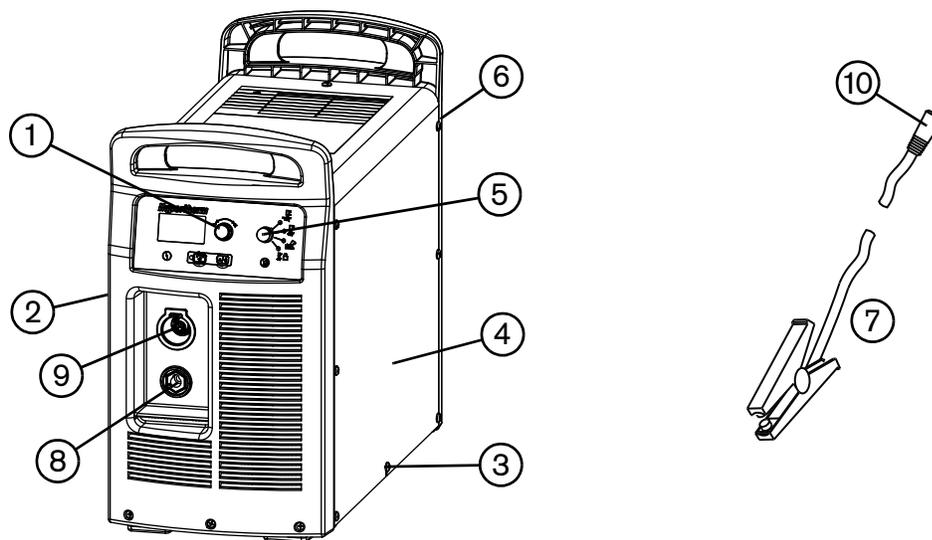
You can find procedures explaining how to install these kits in *Power Supply Component Replacement* on page 165 and *Torch Component Replacement* on page 269.

For instructions on installing the consumables in the hand torches, see *Install the hand torch consumables* on page 54.

For instructions on installing the consumables in the machine torches, see *Install the machine torch consumables* on page 75.

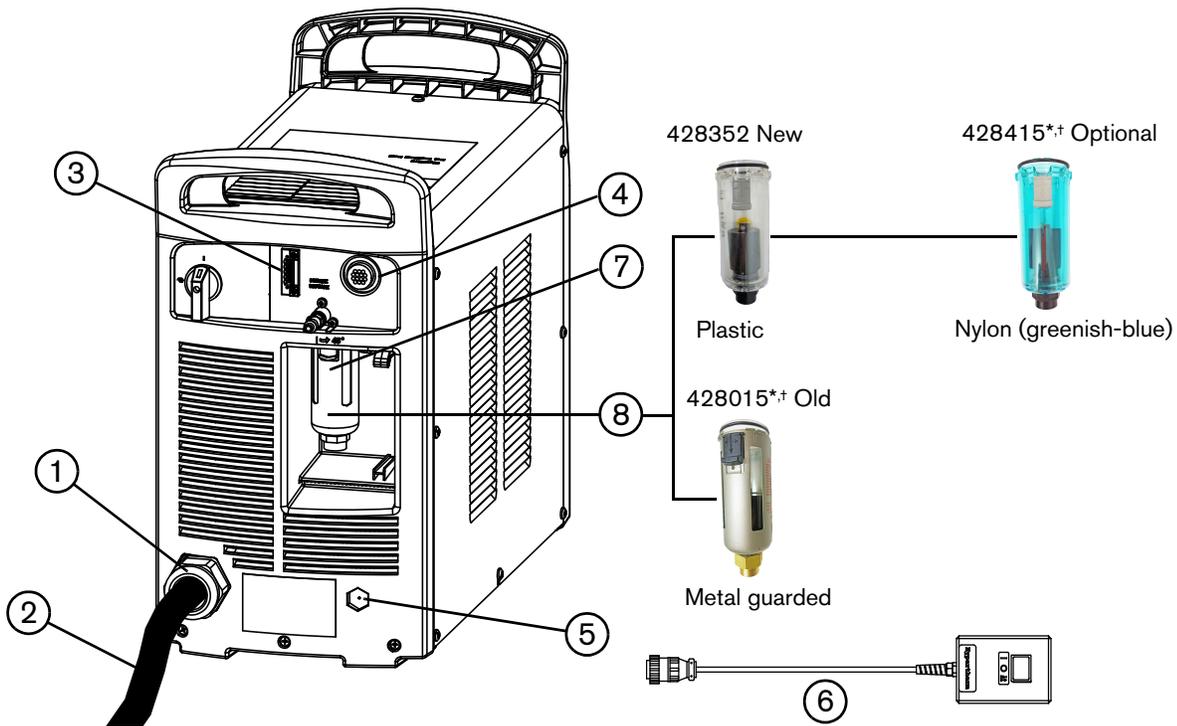
Power supply parts

Exterior, front



Part Number	Description
1 428143	Kit: Adjustment knob
2 228866	Kit: Powermax105/125 front panel
3 428141	Kit: Powermax105/125 cover screws
4 428115	Kit: Powermax125 CSA power supply cover with labels
4 428116	Kit: Powermax125 CE power supply cover with labels
4 428247	Kit: Powermax125 CCC power supply cover with labels
5 428142	Kit: Operating mode knob
6 428110	Kit: Powermax125 480V CSA rear panel
6 428112	Kit: Powermax125 600V CSA rear panel
6 428111	Kit: Powermax125 400V CE rear panel
6 428113	Kit: Powermax125 380V CCC rear panel
7	Work lead (See <i>Accessory parts</i> on page 312.)
8 228912	Kit: Powermax105/125 work lead receptacle (power supply side)
9 428120	Kit: Powermax125 quick disconnect receptacle replacement (power supply side)
10 228891	Kit: Powermax105/125 work lead connector replacement (lead side)

Exterior, rear



Part Number	Description
1 228914	Kit: Powermax105 power cord strain relief 400 V CE/380 V CCC; Powermax125 power cord strain relief 480 V and 600 V CSA/380 V CCC
1 228913	Kit: Powermax105 power cord strain relief 230 – 400 V CE; Powermax125 power cord strain relief 400 V CE
2 428121	Kit: Powermax125 power cord with strain relief 480 V and 600 V CSA
2 228886	Kit: Powermax105 power cord with strain relief 230 – 400 V CE; Powermax125 power cord with strain relief 400 V CE
3 228539	Kit: Serial interface port, internal cables, and RS-485 board
223236	RS-485 cable, unterminated, 7.6 m (25 feet)
223237	RS-485 cable, unterminated, 15 m (50 feet)
223239	RS-485 cable, 9-pin D-sub connector for Hypertherm controls, 7.6 m (25 feet)
223240	RS-485 cable, 9-pin D-sub connector for Hypertherm controls, 15 m (50 feet)
4 228884	Kit: Powermax105/125 machine interface cable, internal cable with voltage divider board (CPC port)
127204	Cover for Powermax45/65/85/105/125 machine interface (CPC) receptacle
023206	External machine interface cable (start, stop, arc transfer signals), 7.6 m (25 feet), spade connectors

Part Number	Description
023279	External machine interface cable (start, stop, arc transfer signals), 15 m (50 feet), spade connectors
228350	Kit: External Machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 7.6 m (25 feet), spade connectors
228351	Kit: External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 15 m (50 feet), spade connectors
223354	External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 3.0 m (10 feet), D-sub connector with screws
223355	External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 6.1 m (20 feet), D-sub connector with screws
223048	External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 7.6 m (25 feet), D-sub connector with screws
223356	External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 10.7 m (35 feet), D-sub connector with screws
123896	External machine interface cable (start, stop, arc transfer signals) for divided arc voltage, 15 m (50 feet), D-sub connector with screws
5 228711	Kit: Powermax65/85/105/125 machine interface for raw arc voltage (strain relief)
6 128650	Remote start pendant for machine torch, 7.6 m (25 feet)
6 128651	Remote start pendant for machine torch, 15 m (50 feet)
6 128652	Remote start pendant for machine torch, 23 m (75 feet)
7 228695	Kit: Powermax65/85/105/125 air filter element (inside filter bowl) and O-ring (compatible with all bowl types)
8 428352* [†]	Kit: Powermax65/85/105/125 plastic air filter bowl (includes O-ring)
8 428415* [†]	Kit: Powermax65/85/105/125 optional nylon air filter bowl (includes O-ring) (greenish-blue)
8 428015 [‡]	Kit: Powermax65/85/105/125 metal guarded air filter bowl (includes O-ring)

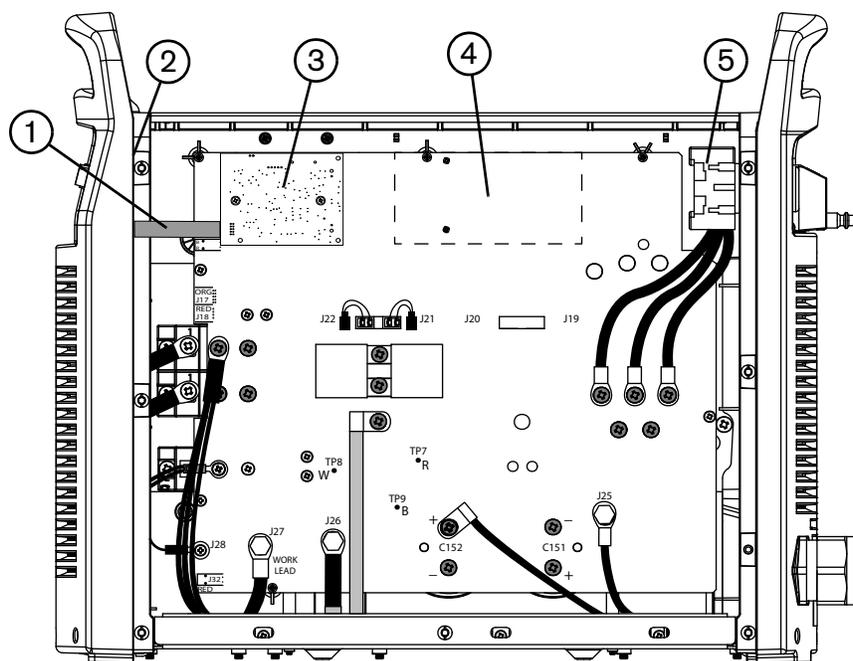
* Filter bowl kit 428352 and 428415 only fit on air filter assembly kit 428351 (see page 303).

[†] The plastic air filter bowl (kit 428352) that comes with the Powermax125 is compatible with most air systems, but the airline should be maintained clean. Organic solvents, chemicals, cutting oil, synthetic oil, alkali, and thread lock solutions may cause harmful effects to the plastic air filter bowl. An optional nylon bowl (kit 428415) is available for sites that have difficulty preventing harsh chemicals from entering the air system.

[‡] The filter bowl kits are not interchangeable. Filter bowl kit 428015 only fits on old air filter assembly kit 228685 (see page 303). Order kit 428015 if you currently have a metal guarded filter bowl (see page 299).

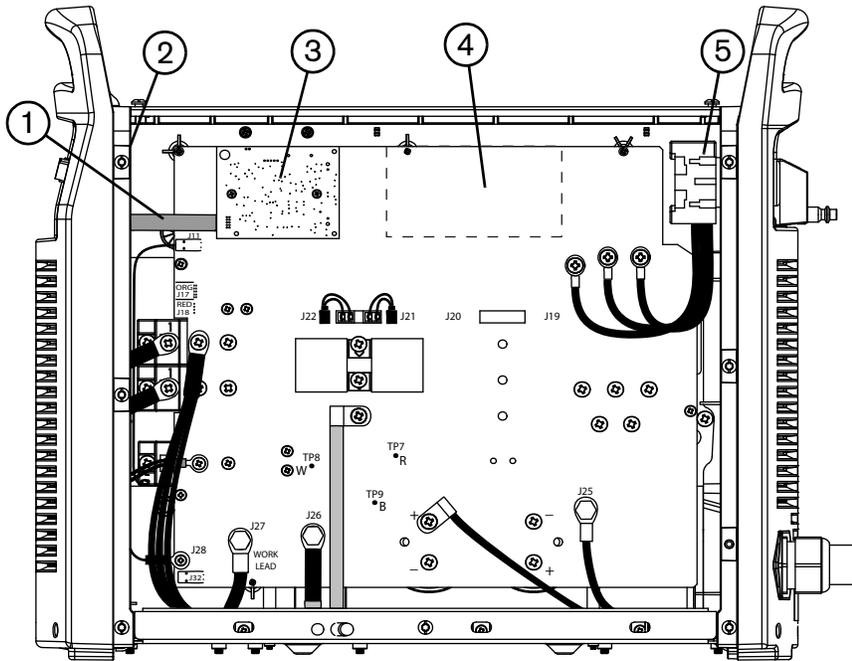
Interior, power board side

480 V, 600 V CSA



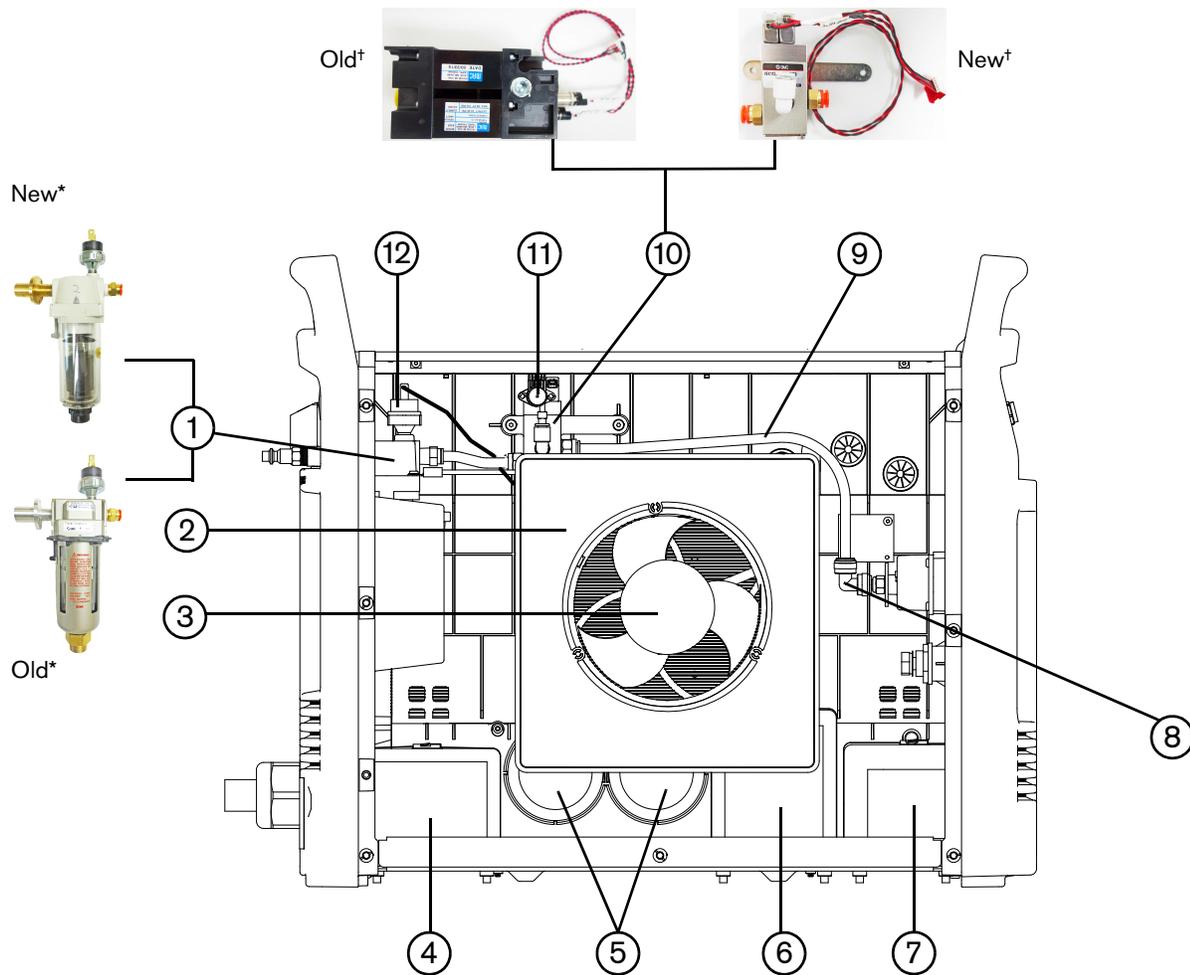
	Part Number	Description
1	428068	Kit: Powermax65/85/105/125 ribbon cable
2	228657	Kit: Powermax65/105/125 control board (141165)
3	428119	Kit: Powermax125 DSP board (141316)
4	428123	Kit: Powermax125 power board 480 V CSA (141204)
4	428124	Kit: Powermax125 power board 600 V CSA (141290)
5	228880	Kit: Powermax105/125 power switch 400 V CE/380 V CCC/480 V, 600 V
	428114	CSA Kit: Powermax125 component barrier
	428919	Kit: Powermax125 power board capacitor

400 V CE/380 V CCC



Part Number	Description
1 428068	Kit: Powermax65/85/105/125 ribbon cable
2 228657	Kit: Powermax65/105/125 control board (141165)
3 428119	Kit: Powermax125 DSP board (141316)
4 428122	Kit: Powermax125 power board 400 V CE/380 V CCC (141207)
5 228880	Kit: Powermax105/125 power switch 400 V CE/380 V CCC/480 V, 600 V CSA
428114	Kit: Powermax125 component barrier

Interior, fan side



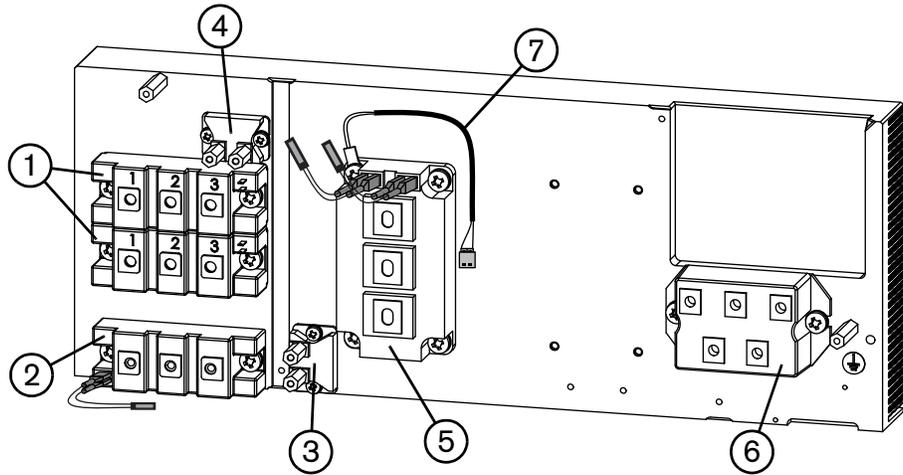
Part Number	Description
1 428351*	Kit: Powermax65/85/105/125 air filter assembly (includes filter bowl, filter element, and O-ring)
2 228910	Kit: Powermax105/125 fan shroud
3 228881	Kit: Powermax105/125 fan assembly
4 428127	Kit: Powermax125 PFC inductor 480 V/600 V CSA
4 428126	Kit: Powermax125 PFC inductor 400 V CE/380 V CCC
5 228888	Kit: Powermax105 bulk capacitor CSA, 230 – 400 V CE; Powermax125 bulk capacitor 600 V CSA
5 428136	Kit: Powermax125 bulk capacitor 480 V CSA
5 428135	Kit: Powermax125 bulk capacitor 400 V CE/380 V CCC
228884	Kit: Powermax105/125 machine interface cable, internal cable with voltage divider board (CPC port)

	Part Number	Description
6	428129	Kit: Powermax125 transformer 480 V CSA
6	428130	Kit: Powermax125 transformer 600 V CSA
6	428128	Kit: Powermax125 transformer 400 V CE/380 V CCC
7	428125	Kit: Powermax125 output inductor
8	428250	Kit: Powermax65/85/105/125 90° elbow fitting
9	228865	Kit Powermax105/125 gas tubing
10	228687 [†]	Kit: Powermax105/125 regulator/solenoid valve (new) (includes tubing and screws)
11	228689	Kit: Powermax65/85/105/125 pressure transducer
12	228688	Kit: Powermax65/85/105/125 pressure switch

* Because of a manufacturing change, the new air filter assembly in kit 428351 replaces the old air filter assembly in kit 228685. Although kit 228685 is no longer available to order, you can still order its individual filter bowl and filter element (see page 300).

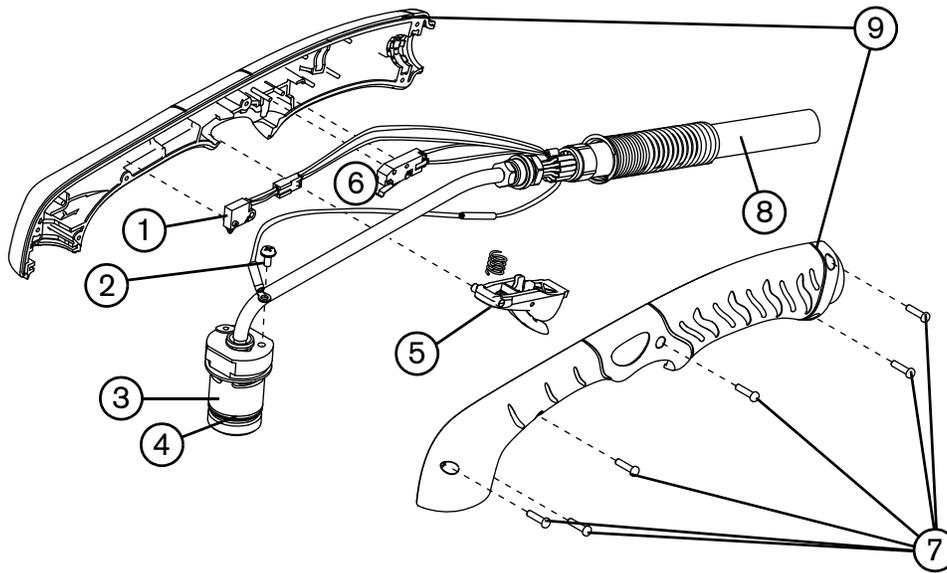
† Because of a manufacturing change, new solenoid valve kit 228687 replaces old solenoid valve kit 228882.

Interior, heatsink assembly



Part Number	Description
1 428139	Kit: Powermax125 output diode with thermal grease
2 428138	Kit: Powermax125 pilot arc IGBT with thermal grease
3 228898	Kit: Powermax105/125 snubber resistor 15 Ω with thermal grease
4 428137	Kit: Powermax125 snubber resistor 7.5 Ω with thermal grease
5 428140	Kit: Powermax125 inverter IGBT with thermal grease
6 128746	Kit: Powermax105/125 input diode bridge
7 228805	Kit: Powermax65/85/105/125 thermal switch
128836	Thermal grease, 1/8 ounce

Duramax Hyamp 85° hand torch replacement parts

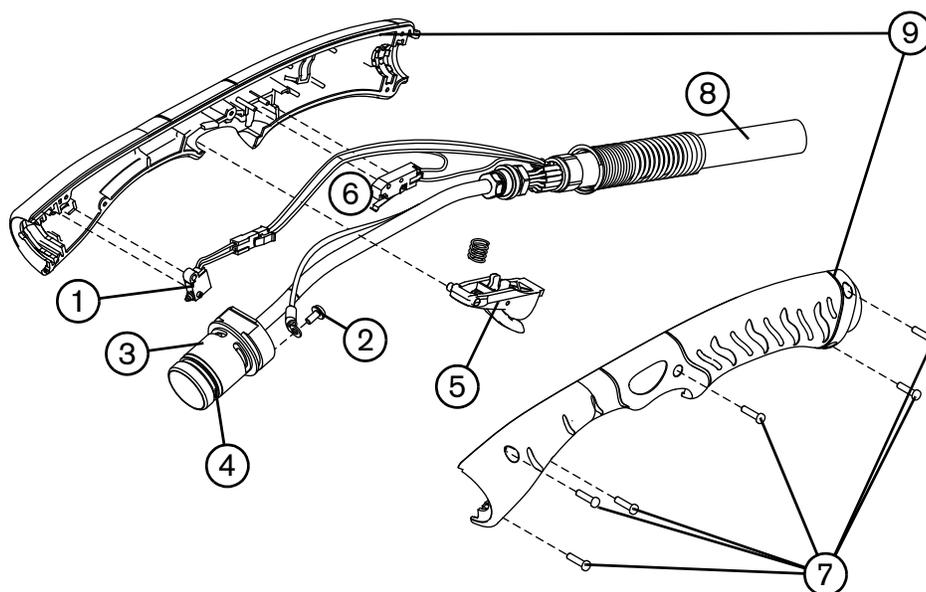


The entire hand torch and lead assembly can be replaced, or individual component parts can be replaced. Part numbers starting with 059 indicate complete torch and lead assemblies.

Part Number	Description
059492*	Duramax Hyamp 85° hand torch assembly with 7.6 m (25 foot) lead
059493*	Duramax Hyamp 85° hand torch assembly with 15 m (50 foot) lead
059494*	Duramax Hyamp 85° hand torch assembly with 23 m (75 foot) lead
1 228719	Kit: Duramax and Duramax Hyamp hand torch cap-sensor switch replacement
2 075696	Pilot terminal screw
3 428158	Kit: Duramax Hyamp 85° hand torch main body replacement
4 428253	Kit: Duramax Hyamp O-ring replacement (5)
5 428156	Kit: Duramax Hyamp hand torch trigger with spring replacement
6 428162	Kit: Duramax Hyamp start switch replacement
7 428148	Kit: Duramax Hyamp hand torch handle screws
8 428159	Kit: Duramax Hyamp hand torch lead replacement, 7.6 m (25 foot)
8 428160	Kit: Duramax Hyamp hand torch lead replacement, 15 m (50 foot)
8 428161	Kit: Duramax Hyamp hand torch lead replacement, 23 m (75 foot)
9 428155	Kit: Duramax Hyamp 85° torch handle replacement
428260	Kit: Duramax and Duramax Hyamp torch quick disconnect repair (lead side)

* The torch assembly does not include consumables. See page 308 for a list of consumable part numbers.

Duramax Hyamp 15° hand torch replacement parts



The entire hand torch and lead assembly can be replaced, or individual component parts can be replaced. Part numbers starting with 059 indicate complete torch and lead assemblies.

Part Number	Description
059495*	Duramax Hyamp 15° hand torch assembly with 7.6 m (25 foot) lead
059496*	Duramax Hyamp 15° hand torch assembly with 15 m (50 foot) lead
059497*	Duramax Hyamp 15° hand torch assembly with 23 m (75 foot) lead
1 228719	Kit: Duramax and Duramax Hyamp hand torch cap-sensor switch replacement
2 075696	Pilot terminal screw
3 428157	Kit: Duramax Hyamp 15° hand torch main body replacement
4 428253	Kit: Duramax Hyamp O-ring replacement (5)
5 428156	Kit: Duramax Hyamp hand torch trigger with spring replacement
6 428162	Kit: Duramax Hyamp start switch replacement
7 428148	Kit: Duramax Hyamp hand torch handle screws
8 428159	Kit: Duramax Hyamp hand torch lead replacement, 7.6 m (25 feet)
8 428160	Kit: Duramax Hyamp hand torch lead replacement, 15 m (50 feet)
8 428161	Kit: Duramax Hyamp hand torch lead replacement, 23 m (75 feet)
9 428154	Kit: Duramax Hyamp 15° torch handle replacement
428260	Kit: Duramax and Duramax Hyamp torch quick disconnect repair (lead side)

* The torch assembly does not include consumables. See page 308 for a list of consumable part numbers.

Hand torch consumables

Drag cutting

Part Number	Description
420172	Duramax Hyamp shield 45/65 A
420000	Duramax Hyamp shield 105/125 A
220977	Duramax Hyamp retaining cap
420158	Duramax Hyamp nozzle 45 A
420169	Duramax Hyamp nozzle 65 A
220975	Duramax Hyamp nozzle 105/125 A
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

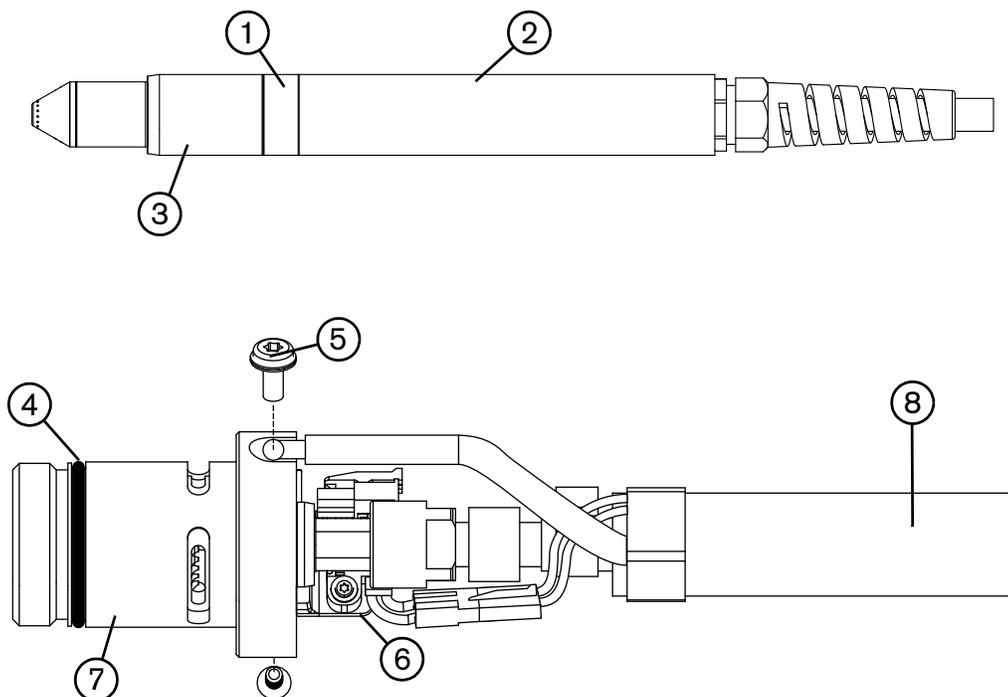
Gouging

Part Number	Description
420112	Duramax Hyamp gouging shield
220977	Duramax Hyamp retaining cap
420001	Duramax Hyamp gouging nozzle
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

FineCut

Part Number	Description
420152	Duramax Hyamp FineCut shield
220977	Duramax Hyamp retaining cap
420151	Duramax Hyamp FineCut nozzle
220971	Duramax Hyamp electrode
420159	Duramax Hyamp FineCut swirl ring

Duramax Hyamp 180° full-length machine torch replacement parts



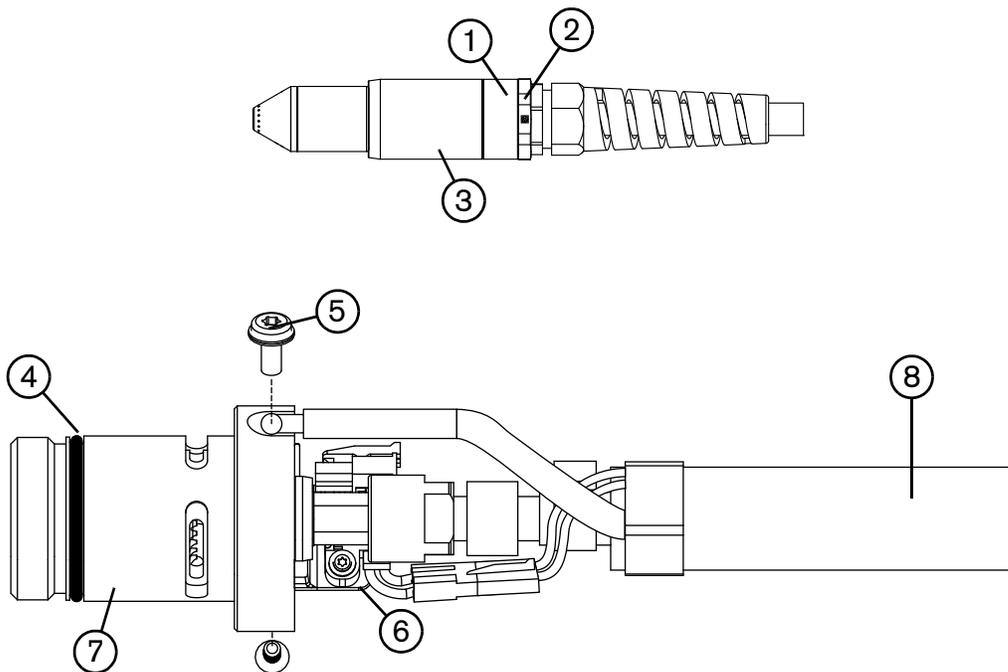
The entire machine torch and lead assembly can be replaced, or individual component parts can be replaced. Part numbers starting with 059 indicate complete torch and lead assemblies.

Part Number	Description
059519*	Duramax Hyamp 180° full-length machine torch assembly with 4.6 m (15 feet) lead
059520*	Duramax Hyamp 180° full-length machine torch assembly with 7.6 m (25 feet) lead
059521*	Duramax Hyamp 180° full-length machine torch assembly with 10.7 m (35 feet) lead
059522*	Duramax Hyamp 180° full-length machine torch assembly with 15 m (50 feet) lead
059523*	Duramax Hyamp 180° full-length machine torch assembly with 23 m (75 feet) lead
1 428248	Kit: Duramax Hyamp 180° machine torch coupler
2 428144	Kit: Duramax Hyamp 180° full-length machine torch positioning sleeve
3 428145	Kit: Duramax Hyamp 180° machine torch mounting sleeve
4 428253	Kit: Duramax Hyamp O-ring replacement (5)
5 075696	Pilot terminal screw
6 228720	Kit: Duramax/Hyamp/MRT 180° machine torch cap-sensor switch replacement
7 428147	Kit: Duramax Hyamp 180° machine torch main body replacement
8 428149	Kit: Duramax Hyamp 180° machine torch lead replacement, 4.6 m (15 feet)
8 428150	Kit: Duramax Hyamp 180° machine torch lead replacement, 7.6 m (25 feet)

Part Number	Description
8 428151	Kit: Duramax Hyamp 180° machine torch lead replacement, 10.7 m (35 feet)
8 428152	Kit: Duramax Hyamp 180° machine torch lead replacement, 15 m (50 feet)
8 428153	Kit: Duramax Hyamp 180° machine torch lead replacement, 23 m (75 feet)
428260	Kit: Duramax and Duramax Hyamp torch quick disconnect repair (lead side)

* The torch assembly does not include consumables. See page 311 for a list of consumable part numbers.

Duramax Hyamp 180° mini machine torch replacement parts



The entire machine torch and lead assembly can be replaced, or individual component parts can be replaced. Part numbers starting with 059 indicate complete torch and lead assemblies.

Part Number	Description
059514*	Duramax Hyamp 180° mini machine torch assembly with 4.6 m (15 foot) lead
059515*	Duramax Hyamp 180° mini machine torch assembly with 7.6 m (25 foot) lead
059516*	Duramax Hyamp 180° mini machine torch assembly with 10.7 m (35 foot) lead
059517*	Duramax Hyamp 180° mini machine torch assembly with 15 m (50 foot) lead
1 428248	Kit: Duramax Hyamp 180° machine torch coupler
2 428146	Kit: Duramax Hyamp 180° mini machine torch adapter ring
3 428145	Kit: Duramax Hyamp 180° machine torch mounting sleeve

	Part Number	Description
4	428253	Kit: Duramax Hyamp O-ring replacement (5)
5	075696	Pilot terminal screw
6	228720	Kit: Duramax/Hyamp/MRT 180° machine torch cap-sensor switch replacement
7	428147	Kit: Duramax Hyamp 180° machine torch main body replacement
8	428149	Kit: Duramax Hyamp 180° machine torch lead replacement, 4.6 m (15 feet)
8	428150	Kit: Duramax Hyamp 180° machine torch lead replacement, 7.6 m (25 feet)
8	428151	Kit: Duramax Hyamp 180° machine torch lead replacement, 10.7 m (35 feet)
8	428152	Kit: Duramax Hyamp 180° machine torch lead replacement, 15 m (50 feet)
	428260	Kit: Duramax and Duramax Hyamp torch quick disconnect repair (lead side)

* The torch assembly does not include consumables. See page 311 for a list of consumable part numbers.

Machine torch consumables

Shielded

Part Number	Description
420168	Duramax Hyamp shield 45/65 A
220976	Duramax Hyamp shield 105/125 A
220977	Duramax Hyamp retaining cap
420156	Duramax Hyamp Ohmic retaining cap
420158	Duramax Hyamp nozzle 45 A
420169	Duramax Hyamp nozzle 65 A
220975	Duramax Hyamp nozzle 105/125 A
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

Gouging

Part Number	Description
420112	Duramax Hyamp gouging shield
220977	Duramax Hyamp retaining cap
420001	Duramax Hyamp gouging nozzle
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

FineCut

Part Number	Description
420152	Duramax Hyamp FineCut shield
220977	Duramax Hyamp retaining cap
420156	Duramax Hyamp Ohmic retaining cap
420151	Duramax Hyamp FineCut nozzle
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

Accessory parts

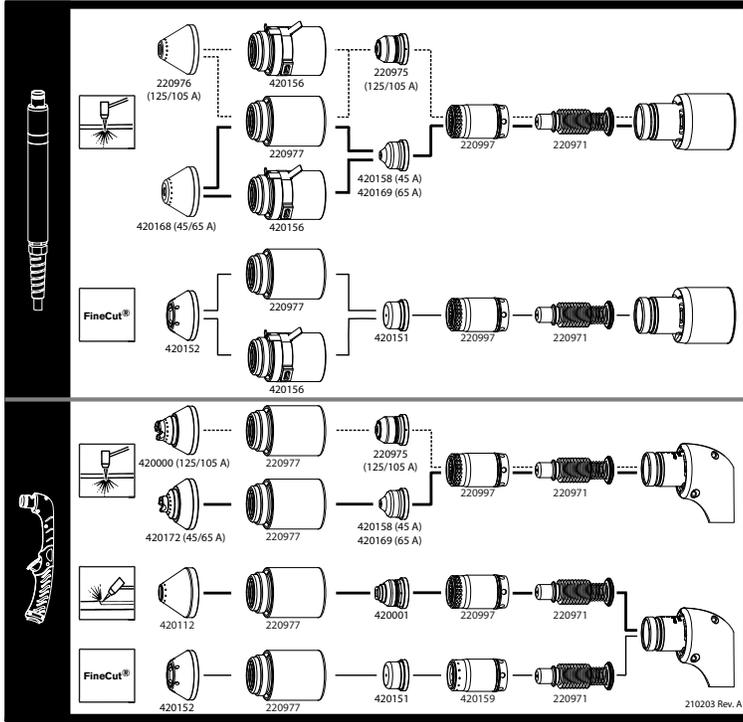
Part Number	Description
024548	Brown leather torch sheathing, 7.6 m (25 foot)
024877	Black leather torch sheathing with Hypertherm logo, 7.6 m (25 foot)
127360	Powermax105/125 dust cover
228890	Kit: Eliminer gas filter with protective metal cover for the Powermax105/125
101215	Kit: Eliminer gas filter protective metal cover for the Powermax105/125 (cover only)
223292	Kit: 125 A work lead with hand clamp, 7.6 m (25 feet)
223293	Kit: 125 A work lead with hand clamp, 15 m (50 feet)
223294	Kit: 125 A work lead with hand clamp, 23 m (75 feet)
223298	Kit: 125 A work lead with C-style clamp, 7.6 m (25 feet)
223299	Kit: 125 A work lead with C-style clamp, 15 m (50 feet)
223300	Kit: 125 A work lead with C-style clamp, 23 m (75 feet)
223295	Kit: 125 A work lead with ring terminal, 7.6 m (25 feet)
223296	Kit: 125 A work lead with ring terminal, 15 m (50 feet)
223297	Kit: 125 A work lead with ring terminal, 23 m (75 feet)
008539	Ground hand clamp: 500 A
229467	Kit: Powermax105/125 wheel kit assembly
229570	Kit: Powermax105/125 gantry mount frame

Powermax125 labels

Part Number	Description
428117	Kit: Powermax125 labels, CSA
428118	Kit: Powermax125 labels, CE
428257	Kit: Powermax125 labels, CCC

The label kits include the consumables label, appropriate safety labels, display panel label, power switch label, and side decals.

The following illustrations show the consumables label and safety labels.



Consumables label



CE/CCC safety label

Read and follow these instructions, employer safety practices, and material safety data sheets. Refer to ANS Z49.1, "Safety in Welding, Cutting and Allied Processes" from American Welding Society (http://www.aws.org) and OSHA Safety and Health Standards, 29 CFR 1910 (http://www.osha.gov).		WARNING		AVERTISSEMENT	
1. Cutting sparks can cause explosion or fire. 1.1 Do not cut near flammables. 1.2 Have a fire extinguisher nearby and ready to use. 1.3 Do not use a drum or other closed container as a cutting table.		1.1 Do not cut near flammables. 1.2 Have a fire extinguisher nearby and ready to use. 1.3 Do not use a drum or other closed container as a cutting table.		Le coupage plasma peut être préjudiciable pour l'opérateur et les personnes qui se trouvent sur les lieux de travail. Consulter le manuel avant de faire fonctionner. Le non respect des ces instructions de sécurité peut entraîner la mort. 1. Les étincelles de coupage peuvent provoquer une explosion ou un incendie. 1.1 Ne pas couper près des matières inflammables. 1.2 Un extincteur doit être à proximité et prêt à être utilisé. 1.3 Ne pas utiliser un fût ou un autre contenant fermé comme table de coupage.	
2. Plasma arc can injure and burn; point the nozzle away from yourself. Arc starts instantly when triggered. 2.1 Turn off power before disassembling torch. 2.2 Do not grip the workpiece near the cutting path. 2.3 Wear complete body protection.		2.1 Turn off power before disassembling torch. 2.2 Do not grip the workpiece near the cutting path. 2.3 Wear complete body protection.		2. L'arc plasma peut blesser et brûler; éloigner la buse de soi. Il s'allume instantanément quand on l'amorce. 2.1 Couper l'alimentation avant de démonter la torche. 2.2 Ne pas saisir la pièce à couper de la trajectoire de coupage. 2.3 Se protéger entièrement le corps.	
3. Hazardous voltage. Risk of electric shock or burn. 3.1 Wear insulating gloves. Replace gloves when wet or damaged. 3.2 Protect from shock by insulating yourself from work and ground. 3.3 Disconnect power before servicing. Do not touch live parts.		3.1 Wear insulating gloves. Replace gloves when wet or damaged. 3.2 Protect from shock by insulating yourself from work and ground. 3.3 Disconnect power before servicing. Do not touch live parts.		3. Tension dangereuse. Risque de choc électrique ou de brûlure. 3.1 Porter des gants isolants. Remplacer les gants quand ils sont humides ou endommagés. 3.2 Se protéger contre les chocs en s'isolant de la pièce et de la terre. 3.3 Couper l'alimentation avant l'entretien. Ne pas toucher les pièces sous tension.	
4. Plasma fumes can be hazardous. 4.1 Do not inhale fumes. 4.2 Use forced ventilation or local exhaust to remove the fumes. 4.3 Do not operate in closed spaces. Remove fumes with ventilation.		4.1 Do not inhale fumes. 4.2 Use forced ventilation or local exhaust to remove the fumes. 4.3 Do not operate in closed spaces. Remove fumes with ventilation.		4. Les fumées plasma peuvent être dangereuses. 4.1 Ne pas inhaler les fumées. 4.2 Utiliser une ventilation forcée ou un extracteur local pour disperser les fumées. 4.3 Ne pas couper dans des espaces clos. Chasser les fumées par ventilation.	
5. Arc rays can burn eyes and injure skin. 5.1 Wear correct and appropriate protective equipment to protect head, eyes, ears, hands and body. Button shirt collar. Protect ears from noise. Use welding helmet with the correct shade of filter.		5.1 Wear correct and appropriate protective equipment to protect head, eyes, ears, hands and body. Button shirt collar. Protect ears from noise. Use welding helmet with the correct shade of filter.		5. Les rayons d'arc peuvent brûler les yeux et blesser la peau. 5.1 Porter un bon équipement de protection pour se protéger la tête, les yeux, les oreilles, les mains et le corps. Boutonner le col de la chemise. Protéger les oreilles contre le bruit. Utiliser un masque de soudeur avec un filtre de nuance appropriée.	
6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.		6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.		6. Suivre une formation. Seul le personnel qualifié a le droit de faire fonctionner cet équipement. Utiliser exclusivement les torches indiquées dans le manuel. Le personnel non qualifié et les enfants doivent se tenir à l'écart.	
7. Do not remove, destroy, or cover this label. Replace if it is missing, damaged, or worn.		7. Do not remove, destroy, or cover this label. Replace if it is missing, damaged, or worn.		7. Ne pas enlever, détruire ni couvrir cette étiquette. La remplacer si elle est absente, endommagée ou usée.	

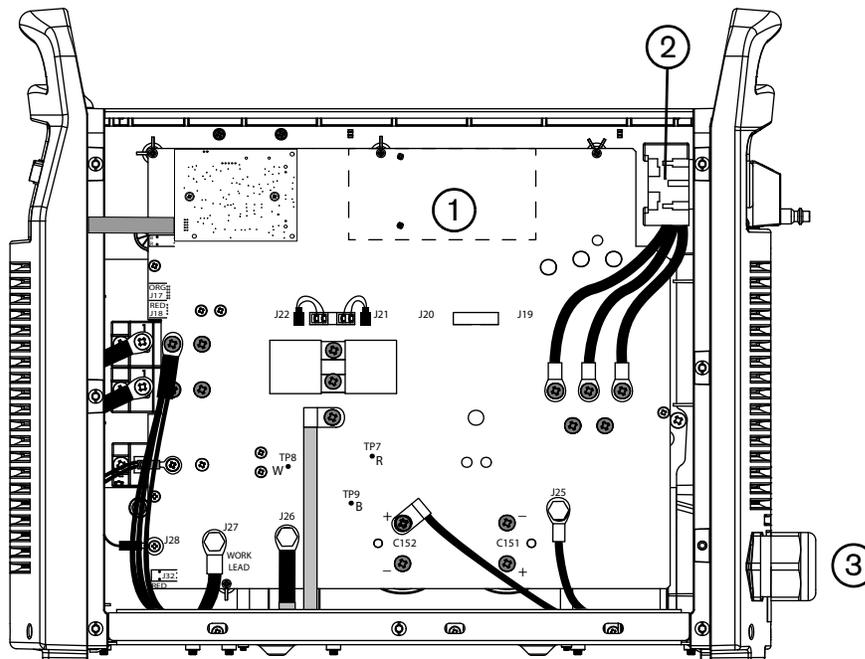
CSA safety label

Safety-critical parts

Genuine Hypertherm parts are factory-recommended parts for your Hypertherm system. Any damage caused by the use of parts that are not from Hypertherm may not be covered by the Hypertherm warranty. In addition, the following parts are safety-critical parts that must be replaced only with genuine Hypertherm parts to maintain the warranty and system certifications, including CE, CSA, and CCC certification.

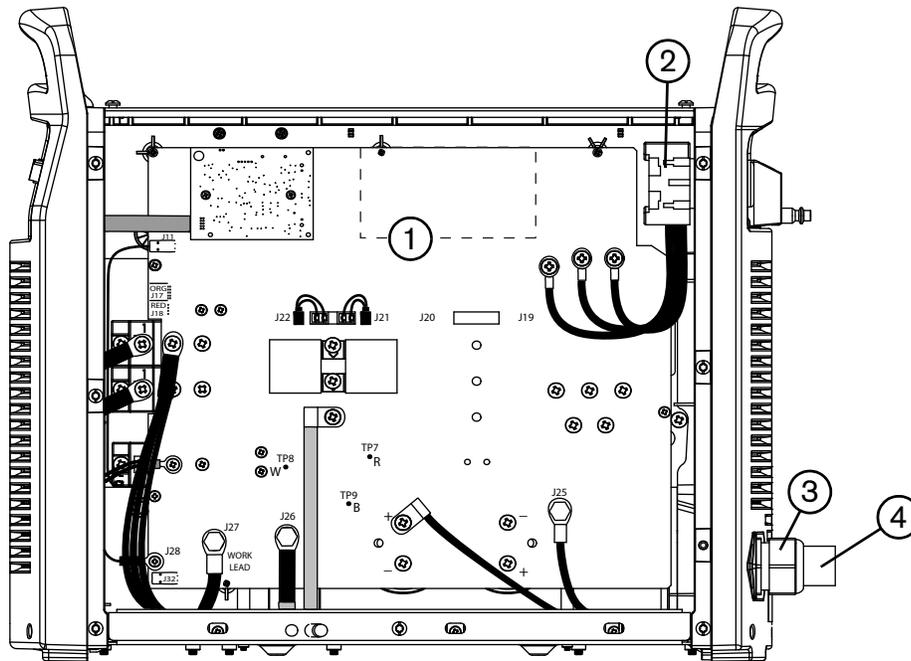
Power supply, power board side

480 V, 600 V CSA



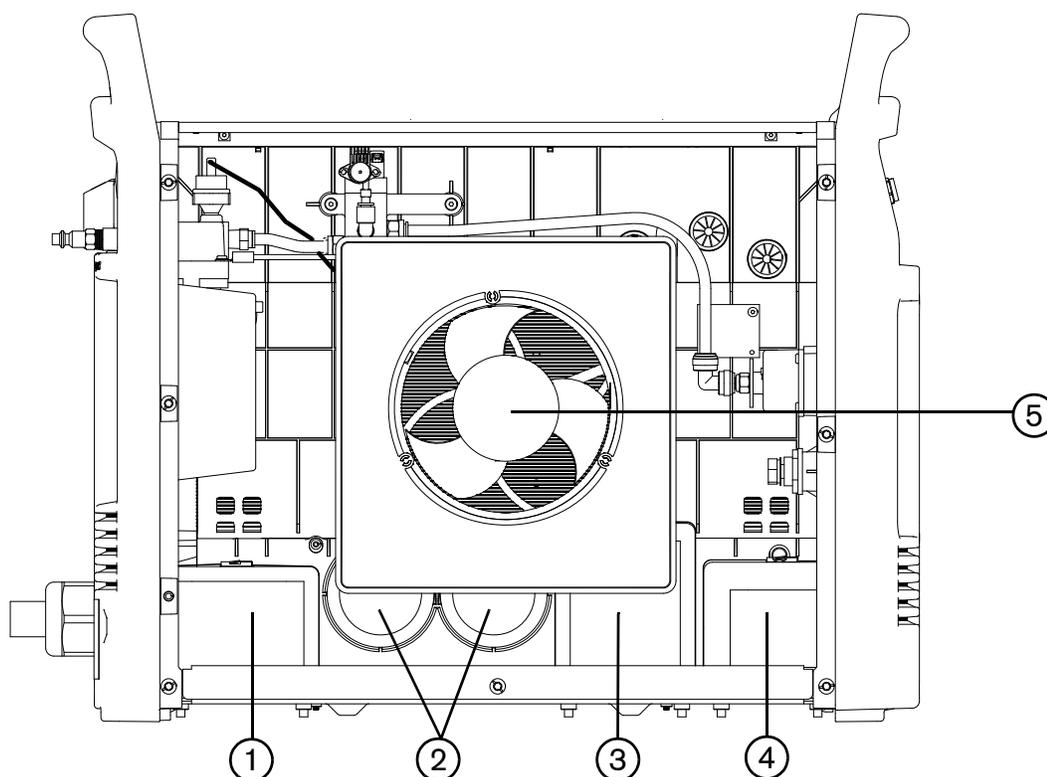
Part Number	Description
1 428123	Kit: Powermax125 power board 480 V CSA (141204)
1 428124	Kit: Powermax125 power board 600 V CSA (141290)
2 228880	Kit: Powermax105/125 power switch 400 V CE/380 V CCC/480 V, 600 V CSA
3 428121	Kit: Powermax125 power cord with strain relief 480 V and 600 V CSA

400 V CE/380 V CCC



Part Number	Description
1 428122	Kit: Powermax125 power board 400 V CE/380 V CCC (141207)
2 228880	Kit: Powermax105/125 power switch 400 V CE/380 V CCC/480 V, 600 V CSA
3 228913	Kit: Powermax105 power cord strain relief 230 – 400 V CE; Powermax125 power cord strain relief 400 V CE
4 228886	Kit: Powermax105 power cord with strain relief 230 – 400 V CE; Powermax125 power cord with strain relief 400 V CE

Power supply, fan side



Part Number	Description
1 428127	Kit: Powermax125 PFC inductor 480 V/600 V CSA
1 428126	Kit: Powermax125 PFC inductor 400 V CE/380 V CCC3
2 228888	Kit: Powermax105 bulk capacitor CSA, 230 – 400 V CE; Powermax125 bulk capacitor 600 V CSA
2 428136	Kit: Powermax125 bulk capacitor 480 V CSA
2 428135	Kit: Powermax125 bulk capacitor 400 V CE/380 V CCC
3 428130	Kit: Powermax125 transformer 600 V CSA
3 428128	Kit: Powermax125 transformer 400 V CE/380 V CCC
4 428125	Kit: Powermax125 output inductor
5 228881	Kit: Powermax105/125 fan assembly

Recommended spare parts

Hypertherm recommends that service centers keep the following spare parts on hand for repairs because these parts are critical or are usually exposed to heavy and repeated wear. You may find that you need to revise or expand this list for your customers, based on the conditions and work environments in your region.

Part Number	Description
428143	Kit: Adjustment knob
428142	Kit: Operating mode knob
223292	Kit: 125 A work lead with hand clamp, 7.6 m (25 feet)
228866	Kit: Powermax105/125 front panel
228657	Kit: Powermax65/105/125 control board (141165)
428123	Kit: Powermax125 power board 480 V CSA (141204)
428124	Kit: Powermax125 power board 600 V CSA (141290)
428122	Kit: Powermax125 power board 400 V CE/380 V CCC (141207)
228880	Kit: Powermax105/125 power switch 400 V CE/380 V CCC/480 V, 600 V CSA
428130	Kit: Powermax125 transformer 600 V CSA
428128	Kit: Powermax125 transformer 400 V CE/380 V CCC
428136	Kit: Powermax125 bulk capacitor 480 V CSA
428135	Kit: Powermax125 bulk capacitor 400 V CE/380 V CCC
428127	Kit: Powermax125 PFC inductor 480 V/600 V CSA
428126	Kit: Powermax125 PFC inductor 400 V CE/380 V CCC
428125	Kit: Powermax125 output inductor
228688	Kit: Powermax65/85/105/125 pressure switch
228687	Kit: Powermax105/125 regulator/solenoid valve (new) (includes tubing and screws)
228881	Kit: Powermax105/125 fan assembly
428351	Kit: Powermax65/85/105/125 air filter assembly
228695	Kit: Powermax65/85/105/125 air filter element (inside filter bowl) and O-ring (compatible with all bowl types)
428253	Kit: Duramax Hyamp O-ring replacement (5)
428155	Kit: Duramax Hyamp 85° torch handle replacement
428154	Kit: Duramax Hyamp 15° torch handle replacement
428148	Kit: Duramax Hyamp hand torch handle screws
428156	Kit: Duramax Hyamp hand torch trigger with spring replacement
228719	Kit: Duramax and Duramax Hyamp hand torch cap-sensor switch replacement
428159	Kit: Duramax Hyamp hand torch lead replacement, 7.6 m (25 foot)

Part Number	Description
428160	Kit: Duramax Hyamp hand torch lead replacement, 15 m (50 foot)
428161	Kit: Duramax Hyamp hand torch lead replacement, 23 m (75 foot)
428762	Kit: Duramax Hyamp hand torch lead replacement, 45.7 m (150 foot)
428144	Kit: Duramax Hyamp 180° full-length machine torch positioning sleeve
428146	Kit: Duramax Hyamp 180° mini machine torch adapter ring
428145	Kit: Duramax Hyamp 180° machine torch mounting sleeve
428248	Kit: Duramax Hyamp 180° machine torch coupler
228720	Kit: Duramax/Hyamp/MRT 180° machine torch cap-sensor switch replacement
428149	Kit: Duramax Hyamp 180° machine torch lead replacement, 4.6 m (15 feet) Kit:
428150	Duramax Hyamp 180° machine torch lead replacement, 7.6 m (25 feet) Kit:
428151	Duramax Hyamp 180° machine torch lead replacement, 10.7 m (35 feet) Kit:
428152	Duramax Hyamp 180° machine torch lead replacement, 15 m (50 feet) Kit:
428153	Duramax Hyamp 180° machine torch lead replacement, 23 m (75 feet)
428761	Duramax Hyamp 180° machine torch lead replacement, 45.7 m (150 feet)

Section 12

Wiring Diagrams

This section contains the following diagrams:

- Powermax generic timing chart
- Powermax125 schematic diagram

Powermax generic timing chart

