

SmartSYNC™ Robotic Torches

Operator Manual



811450 – REVISION 0

ENGLISH



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Original instructions

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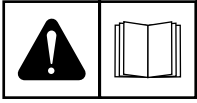
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For training and education resources, go to the Hypertherm Cutting Institute (HCI) online at www.hypertherm.com/hci.



ENGLISH

WARNING! Before operating any Hypertherm equipment, read the safety instructions in your product's manual, the *Safety and Compliance Manual* (80669C), *Waterjet Safety and Compliance Manual* (80943C), and *Radio Frequency Warning Manual* (80945C). Failure to follow safety instructions can result in personal injury or in damage to equipment.

Copies of the manuals can come with the product in electronic and printed formats. Electronic copies are also on our website. Many manuals are available in multiple languages at www.hypertherm.com/docs.

BG (БЪЛГАРСКИ/BULGARIAN)

ПРЕДУПРЕЖДЕНИЕ! Преди да работите с което и да е оборудване Hypertherm, прочетете инструкциите за безопасност в ръководството на вашия продукт, „Инструкция за безопасност и съответствие“ (80669C), „Инструкция за безопасност и съответствие на Waterjet“ (80943C) и „Инструкция за предупреждение за радиочестота“ (80945C).

Продуктът може да е съпроводен от копия на ръководствата в електронен и в печатен формат. Тези в електронен формат са достъпни също на уебсайта ни. Много ръководства са налице на няколко езика на адрес www.hypertherm.com/docs.

CS (ČESKY/CZECH)

VAROVÁNÍ! Před uvedením jakéhokoli zařízení Hypertherm do provozu si přečtěte bezpečnostní pokyny v příručce k produktu a v *Manuálu pro bezpečnost a dodržování předpisů* (80669C), *Manuálu pro bezpečnost a dodržování předpisů při řezání vodním paprskem* (80943C) a *Manuálu varování ohledně rádiových frekvencí* (80945C).

Kopie příruček mohou být součástí dodávky produktu, a to v elektronické i tištěné formě. Elektronické kopie jsou k dispozici i na našich webových stránkách. Mnoho příruček je k dispozici v různých jazycích na stránce www.hypertherm.com/docs.

DA (DANSK/DANISH)

ADVARSEL! Inden Hypertherm udstyr tages i brug skal sikkerhedsinstruktionerne i produktets manual og i *Manual om sikkerhed og overholdelse af krav* (80669C), *Manual om sikkerhed og overholdelse af krav for vandstråleskæring* (80943C), og *Manual om radiofrekvensadvarsel* (80945C), gennemlæses.

Kopier af manualerne kan leveres med produktet i elektronisk og trykt format. Elektroniske kopier findes også på vores hjemmeside. Mange manualer er tilgængelige på flere sprog på www.hypertherm.com/docs.

DE (DEUTSCH/GERMAN)

WARNUNG! Bevor Sie ein Hypertherm-Gerät in Betrieb nehmen, lesen Sie bitte die Sicherheitsanweisungen in Ihrer Bedienungsanleitung, das *Handbuch für Sicherheit und Übereinstimmung* (80669C), das *Handbuch für Sicherheit und Compliance bei Wasserstrahl-Schneidanlagen* (80943C) und das *Handbuch für Hochfrequenz-Warnung* (80945C).

Bedienungsanleitungen und Handbücher können dem Gerät in elektronischer Form oder als Druckversion beiliegen. In elektronischer Form liegen sie auch auf unserer Website vor. Viele Handbücher stehen in verschiedenen Sprachen auf www.hypertherm.com/docs zur Verfügung.

ES (ESPAÑOL/SPANISH)

¡ADVERTENCIA! Antes de operar cualquier equipo Hypertherm, lea las instrucciones de seguridad del manual de su producto, del *Manual de seguridad y cumplimiento* (80669C), del *Manual de seguridad y cumplimiento en corte con chorro de agua* (80943C) y del *Manual de advertencias de radiofrecuencia* (80945C).

El producto puede incluir copias de los manuales en formato digital e impreso. Las copias digitales también están en nuestra página web. Hay diversos manuales disponibles en varios idiomas en www.hypertherm.com/docs.

ET (EESTI/ESTONIAN)

HOIATUS! Enne Hyperthermi mis tahes seadme kasutamist lugege läbi toote kasutusjuhendis olevad ohutusjuhised ning *Ohutus- ja vastavusjuhend* (80669C), *Veejõa ohutuse ja vastavuse juhend* (80943C) ja *Raadiosageduse hoiatusjuhend* (80945C). Ohutusjuhiste eiramine võib põhjustada vigastusi ja kahjustada seadmeid.

Juhiste koopiad võivad tootega kaasas olla elektrooniliselt või trükituna. Elektroonilised koopiad on saadaval ka meie veebilehel. Paljud kasutusjuhendid on erinevates keeltes saadaval veebilehel www.hypertherm.com/docs.

FI (SUOMI/FINNISH)

VAROITUS! Ennen minkään Hypertherm-laitteen käyttöä lue tuotteen käyttöoppaassa olevat turvallisuusohjeet, *turvallisuuden ja vaatimustenmukaisuuden käsikirja* (80669C), *vesileikkauksen turvallisuuden ja vaatimustenmukaisuuden käsikirja* (80943C) ja *radiotaajuusvaroitusten käsikirja* (80945C).

Käyttöoppaiden kopiot voivat olla tuotteen mukana sähköisessä ja tulostetussa muodossa. Sähköiset kopiot ovat myös verkkosivustollamme. Monet käyttöoppaat ovat myös saatavissa useilla kielillä www.hypertherm.com/docs.

FR (FRANÇAIS/FRENCH)

AVERTISSEMENT! Avant d'utiliser tout équipement Hypertherm, lire les consignes de sécurité du manuel de votre produit, du *Manuel de sécurité et de conformité* (80669C), du *Manuel de sécurité et de conformité du jet d'eau* (80943C) et du *Manuel d'avertissement relatif aux radiofréquences* (80945C).

Les exemplaires des manuels qui accompagnent le produit peuvent être sous forme électronique ou papier. Les manuels sous forme électronique se trouvent également sur notre site Internet. Plusieurs manuels sont offerts en plusieurs langues à www.hypertherm.com/docs.

GR (ΕΛΛΗΝΙΚΑ/GREEK)

ΠΡΟΕΙΔΟΠΟΙΗΣΗ! Πριν θέσετε σε λειτουργία οποιονδήποτε εξοπλισμό της Hypertherm, διαβάστε τις οδηγίες ασφαλείας στο εγχειρίδιο του προϊόντος και στο *εγχειρίδιο ασφαλείας και συμμόρφωσης* (80669C), στο *εγχειρίδιο ασφαλείας και συμμόρφωσης του waterjet* (80943C) και στο *εγχειρίδιο προειδοποιήσεων για τις ραδιοσυχνότητες* (80945C).

Το προϊόν μπορεί να συνοδεύεται από αντίγραφα των εγχειριδίων σε ηλεκτρονική και έντυπη μορφή. Τα ηλεκτρονικά αντίγραφα υπάρχουν επίσης στον ιστότοπό μας. Πολλά εγχειρίδια είναι διαθέσιμα σε διάφορες γλώσσες στο www.hypertherm.com/docs.

HU (MAGYAR/HUNGARIAN)

VIGYÁZAT! Mielőtt bármilyen Hypertherm berendezést üzemeltetne, olvassa el a biztonsági információkat a termék kézikönyvében, a *Biztonsági és szabálykövetési kézikönyvben* (80669C), a *Vízugaras biztonsági és szabálykövetési kézikönyvben* (80943C) és a *Rádiófrekvenciás figyelmeztetéseket tartalmazó kézikönyvben* (80945C).

A termékhez a kézikönyv példányai elektronikus és nyomtatott formában is mellékelve lehetnek. Az elektronikus példányok webhelyünkön is megtalálhatók. Számos kézikönyv áll rendelkezésre több nyelven a www.hypertherm.com/docs weboldalon.

ID (BAHASA INDONESIA/INDONESIAN)

PERINGATAN! Sebelum mengoperasikan peralatan Hypertherm, bacalah petunjuk keselamatan dalam manual produk Anda, *Manual Keselamatan dan Kepatuhan* (80669C), *Manual Keselamatan dan Kepatuhan Jet Air* (80943C), dan *Manual Peringatan Frekuensi Radio* (80945C). Kegagalan mengikuti petunjuk keselamatan dapat menyebabkan cedera pribadi atau kerusakan pada peralatan.

Produk mungkin disertai salinan manual atau petunjuk dalam format elektronik maupun cetak. Salinan elektronik juga tersedia di situs web kami. Berbagai manual tersedia dalam beberapa bahasa di www.hypertherm.com/docs.

IT (ITALIANO/ITALIAN)

AVVERTENZA! Prima di usare un'attrezzatura Hypertherm, leggere le istruzioni sulla sicurezza nel manuale del prodotto, nel *Manuale sulla sicurezza e la conformità* (80669C), nel *Manuale sulla sicurezza e la conformità Waterjet* (80943C) e nel *Manuale di avvertenze sulla radiofrequenza* (80945C).

Copie del manuale possono accompagnare il prodotto in formato cartaceo o elettronico. Le copie elettroniche sono disponibili anche sul nostro sito web. Molti manuali sono disponibili in diverse lingue all'indirizzo www.hypertherm.com/docs.

JA (日本語/JAPANESE)

警告! Hypertherm 機器を操作する前に、この製品説明書にある安全情報、「安全とコンプライアンスマニュアル」(80669C)、「ウォータージェット的安全とコンプライアンス」(80943C)、「高周波警告」(80945C)をお読みください。

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。電子コピーは当社ウェブサイトにも掲載されています。説明書の多くは www.hypertherm.com/docs にて複数の言語でご用意しています。

KO (한국어/KOREAN)

경고! Hypertherm 장비를 사용하기 전에 제품 설명서와 안전 및 규정 준수 설명서(80669C), 워터젯 안전 및 규정 준수 설명서(80943C) 그리고 무선 주파수 경고 설명서(80945C)에 나와 있는 안전 지침을 읽으십시오.

전자 형식과 인쇄된 형식으로 설명서 사본이 제품과 함께 제공될 수 있습니다. 전자 사본도 Hypertherm 웹사이트에서 보실 수 있으며 설명서 사본은 www.hypertherm.com/docs 에서 여러 언어로 제공됩니다.

NE (NEDERLANDS/DUTCH)

WAARSCHUWING! Lees voordat u Hypertherm-apparaat gebruikt de veiligheidsinstructies in de producthandleiding, in de *Veiligheids- en nalevingshandleiding* (80669C) in de *Veiligheids- en nalevingshandleiding voor waterstralen* (80943C) en in de *Waarschuwingshandleiding radiofrequentie* (80945C).

De handleidingen kunnen in elektronische en gedrukte vorm met het product worden meegeleverd. Elektronische versies zijn ook beschikbaar op onze website. Veel handleidingen zijn in meerdere talen beschikbaar via www.hypertherm.com/docs.

NO (NORSK/NORWEGIAN)

ADVARSEL! Før du bruker noe Hypertherm-utstyr, må du lese sikkerhetsinstruksjonene i produktets håndbok, *håndboken om sikkerhet og samsvar* (80669C), *håndboken om vannjet sikkerhet og samsvar* (80943C), og *håndboken om radiofrekvensadvarslar* (80945C).

Eksemplarer av håndbøkene kan følge med produktet i elektronisk og trykt form. Elektroniske eksemplarer finnes også på nettstedet vårt. Mange håndbøker er tilgjengelig i flere språk på www.hypertherm.com/docs.

PL (POLSKI/POLISH)

OSTRZEŻENIE! Przed rozpoczęciem obsługi jakiegokolwiek systemu firmy Hypertherm należy się zapoznać z instrukcjami bezpieczeństwa zamieszczonymi w podręczniku produktu, w *podręczniku bezpieczeństwa i zgodności* (80669C), *podręczniku bezpieczeństwa i zgodności systemów strumienia wody* (80943C) oraz *podręczniku z ostrzeżeniem o częstotliwości radiowej* (80945C).

Do produktu mogą być dołączone podręczniki użytkownika w formie elektronicznej i drukowanej. Kopie elektroniczne znajdują się również w naszej witrynie internetowej. Wiele podręczników jest dostępnych w różnych językach pod adresem www.hypertherm.com/docs.

PT (PORTUGUÊS/PORTUGUESE)

ADVERTÊNCIA! Antes de operar qualquer equipamento Hypertherm, leia as instruções de segurança no manual do seu produto, no *Manual de Segurança e de Conformidade* (80669C), no *Manual de Segurança e de Conformidade do Waterjet* (80943C) e no *Manual de Advertência de radiofrequência* (80945C).

Cópias dos manuais podem vir com o produto nos formatos eletrônico e impresso. Cópias eletrônicas também são encontradas em nosso website. Muitos manuais estão disponíveis em vários idiomas em www.hypertherm.com/docs.

RO (ROMÂNĂ/ROMANIAN)

AVERTIZARE! Înainte de utilizarea oricărui echipament Hypertherm, citiți instrucțiunile de siguranță din manualul produsului, *manualul de siguranță și conformitate* (80669C), *manualul de siguranță și conformitate Waterjet* (80943C) și din *manualul de avertizare privind radiofrecvența* (80945C).

Produsul poate fi însoțit de copii ale manualelor în format tipărit și electronic. Exemplarele electronice sunt disponibile și pe site-ul nostru web. Numeroase manuale sunt disponibile în mai mult limbi la adresa: www.hypertherm.com/docs.

RU (РУССКИЙ/RUSSIAN)

БЕРЕГИТЬСЯ! Перед работой с любым оборудованием Hypertherm ознакомьтесь с инструкциями по безопасности, представленными в руководстве, которое поставляется вместе с продуктом, в *Руководстве по безопасности и соответствию* (80669C), в *Руководстве по безопасности и соответствию для водоструйной резки* (80943C) и *Руководстве по предупреждению о радиочастотном излучении* (80945C).

Копии руководств, которые поставляются вместе с продуктом, могут быть представлены в электронном и бумажном виде. Электронные копии также доступны на нашем веб-сайте. Целый ряд руководств доступны на нескольких языках по ссылке www.hypertherm.com/docs.

SK (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), *Manuáli o bezpečnosti a súlade s normami pre systém rezania vodou* (80943C) a v *Manuáli s informáciami o rádiových frekvenciách* (80945C).

Návod na obsluhu sa dodáva spolu s produktom v elektronickej a tlačenej podobe. Jeho elektronickej formát je dostupný aj na našej webovej stránke. Mnohé z návodov na obsluhu sú dostupné vo viaczjazyčnej mutácii na stránke www.hypertherm.com/docs.

SL (SLOVENŠČINA/SLOVENIAN)

OPOZORILO! Pred uporabo katerekoli Hyperthermove opreme preberite varnostna navodila v priročniku vašega izdelka, v *Priročniku za varnost in skladnost* (80669C), v *Priročniku za varnost in skladnost sistemov rezanja z vodnim curkom* (80943C) in v *Priročniku Opozorilo o radijskih frekvencah* (80945C).

Izvodi priročnikov so lahko izdelku priloženi v elektronski in tiskani obliki. Elektronski izvodi so na voljo tudi na našem spletnem mestu. Številni priročniki so na voljo v različnih jezikih na naslovu www.hypertherm.com/docs.

SR (SRPSKI/SERBIAN)

UPOZORENJE! Pre rukovanja bilo kojom Hyperthermovom opremom pročitajte uputstva o bezbednosti u svom priručniku za proizvod, *Priručniku o bezbednosti i usaglašenosti* (80669C), *Priručniku o bezbednosti i usaglašenosti Waterjet tehnologije* (80943C) i *Priručniku sa upozorenjem o radio-frekvenciji* (80945C).

Уз производ се испоручују копије приручника у електронском или штампаном формату. Електронске копије су такође доступне на нашем веб-сајту. Многи приручници су доступни на више језика на адреси www.hypertherm.com/docs.

SV (SVENSKA/SWEDISH)

VARNING! Läs häftet säkerhetsinformationen i din produkts *säkerhets- och efterlevnadsmanual* (80669C), *säkerhets- och efterlevnadsmanualen för Waterjet* (80943C) och *varningsmanualen för radiofrekvenser* (80945C) för viktig säkerhetsinformation innan du använder eller underhåller Hypertherm-utrustning. Kopior av manualerna kan medfölja produkten i elektroniskt och tryckt format. Elektroniska kopior finns också på vår webbplats. Många manualer finns på flera språk på www.hypertherm.com/docs.

TH (ภาษาไทย/THAI)

คำเตือน! ก่อนการใช้งานอุปกรณ์ของ Hypertherm ทั้งหมด โปรดอ่านคำแนะนำด้านความปลอดภัยในคู่มือการใช้สินค้า คู่มือด้านความปลอดภัยและการปฏิบัติตาม (80669C), คู่มือด้านความปลอดภัยและการปฏิบัติตามสำหรับการใช้หัวตัดระบบวอเตอร์เจ็ต (80943C) และ คู่มือคำเตือนเกี่ยวกับความถี่วิทยุ (80945C) การไม่ปฏิบัติตามคำแนะนำด้านความปลอดภัยอาจส่งผลให้เกิดการบาดเจ็บหรือเกิดความเสียหายต่ออุปกรณ์
สำเนาคู่มือทั้งในรูปแบบอิเล็กทรอนิกส์และแบบสิ่งพิมพ์จะถูกแนบมาพร้อมกับผลิตภัณฑ์ สำหรับสำเนาคู่มือในรูปแบบอิเล็กทรอนิกส์ของผลิตภัณฑ์และสำเนาคู่มือต่างๆ ในหลากหลายภาษายังมีให้บริการบนเว็บไซต์ www.hypertherm.com/docs ของเรอีกด้วย

TR (TÜRKÇE/TURKISH)

UYARI! Bir Hypertherm ekipmanını çalıştırmadan önce, ürününüzün kullanım kılavuzunda, *Güvenlik ve Uyumluluk Kılavuzu'nda* (80669C), *Su Jeti Güvenlik ve Uyumluluk Kılavuzu'nda* (80943C) ve *Radyo Frekansı Uyarısı Kılavuzu'nda* (80945C) yer alan güvenlik talimatlarını okuyun.

Kılavuzların kopyaları, elektronik ve basılı formatta ürüne birlikte verilebilir. Elektronik kopyalar web sitemizde de yer alır. Kılavuzların birçokğu www.hypertherm.com/docs adresinde birçok dilde mevcuttur.

VI (TIẾNG VIỆT/VIETNAMESE)

CẢNH BÁO! Trước khi vận hành bất kỳ thiết bị Hypertherm nào, hãy đọc các hướng dẫn an toàn trong hướng dẫn sử dụng sản phẩm của bạn, *Sổ tay An toàn và Tuân thủ* (80669C), *Sổ tay An toàn và Tuân thủ Tia nước* (80943C), và *Hướng dẫn Cảnh báo Tần số Vô tuyến* (80945C). Không tuân thủ các hướng dẫn an toàn có thể dẫn đến thương tích cá nhân hoặc hư hỏng thiết bị.

Bản sao của sổ tay có thể đi kèm với sản phẩm ở định dạng điện tử và in. Bản điện tử cũng có trên trang web của chúng tôi. Nhiều sổ tay có sẵn bằng nhiều ngôn ngữ tại www.hypertherm.com/docs.

ZH-CN (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、《安全和法规遵守手册》(80669C)、《水射流安全和法规遵守手册》(80943C) 以及《射频警告手册》(80945C) 中的安全操作说明。

随产品提供的手册可提供电子版和印刷版两种格式。电子版本同时也在我们的网站上提供。很多手册有多种语言版本, 详见 www.hypertherm.com/docs。

ZH-TW (繁體中文/CHINESE TRADITIONAL)

警告! 在操作任何 Hypertherm 設備前, 請先閱讀您產品手冊內的安全指示, 包括《安全和法規遵從手冊》(80669C)、《水刀安全和法規遵從手冊》(80943C), 以及《無線電頻率警示訊號手冊》(80945C)。

電子版和印刷版手冊複本可能隨產品附上。您也可以前往我們的網站下載電子版手冊。我們的網站上還以多種語言形式提供多種手冊, 請造訪 www.hypertherm.com/docs。

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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.

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.

All third-party engines, engine accessories, alternators, and alternator accessories are covered by the respective manufacturers' warranties and not covered by this warranty.

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.



Where to Find More Information

This operator manual gives information to help you do the following:

- Mount the SmartSYNC™ robotic torch
- Operate the SmartSYNC robotic torch
- Troubleshooting common issues and maintain the torch

For related information, refer to the following documents:

- *Powermax65/85/105 SYNC Operator Manual (810470)*
- *Powermax65/85/105 SYNC Cut Charts Guide (810500MU)*
- *Powermax65/85/105 SYNC Mechanized Cutting Guide (810480)*
- *Safety and Compliance Manual (80669C)*

For replacement part numbers for robotic torches, torch accessories, and cartridges, refer to the *Powermax65/85/105 SYNC Parts Guide (810490)*.

You can find these documents on the USB memory stick that came with your plasma power supply. Technical documentation is also available at www.hypertherm.com/docs.



Technical documentation is current as of the date of its release. Subsequent revisions are possible. Refer to www.hypertherm.com/docs for the most recent revisions of released documents.

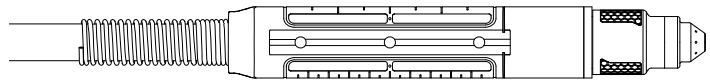
1 **Where to Find More Information**

2

Specifications

About the robotic torch

SmartSYNC robotic torch features include the following:




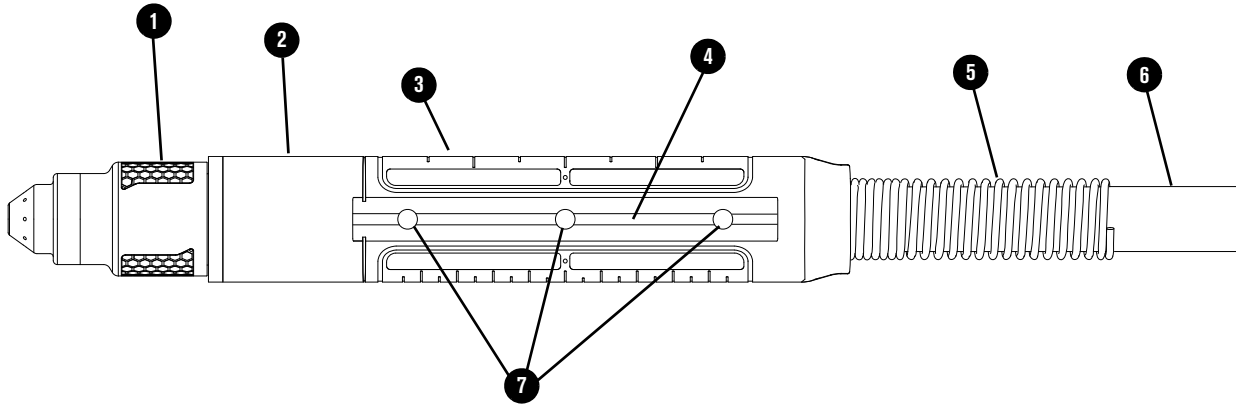
- Automatic setting of operating mode, amperage, and gas pressure related to the Hypertherm cartridge that you install, the torch type, and the torch lead length.
- Communication of Hypertherm cartridge usage information to the plasma power supply, including cartridge end-of-life detection. Refer to the *Powermax65/85/105 SYNC Operator Manual* (810470) for more information.
- The FastConnect™ quick-disconnect system to easily remove the torch for transport or to change from one torch to another.

For information about the thicknesses that you can cut and pierce with a SmartSYNC robotic torch, refer to the [Cutting processes](#) on page 27.

Robotic torch components, dimensions, weights

Components

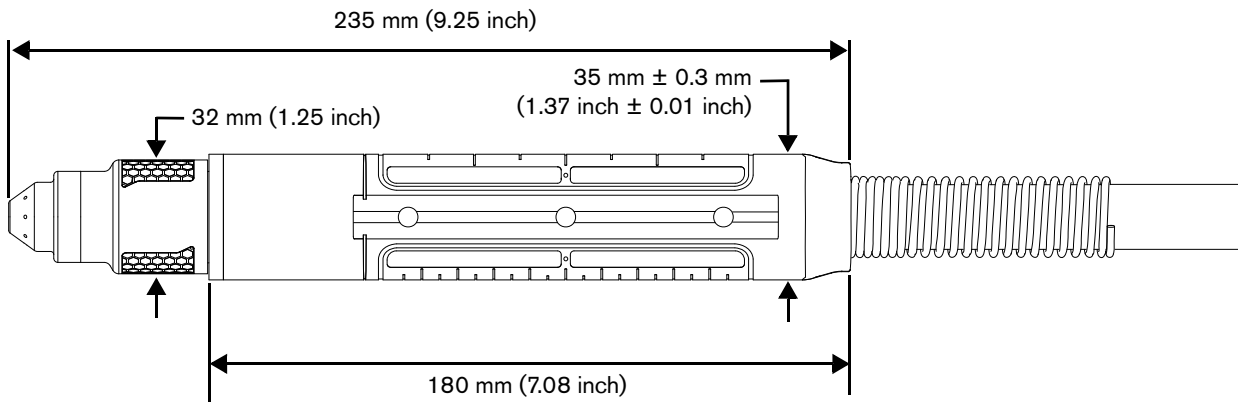
 A SmartSYNC 180° robotic torch is shown.



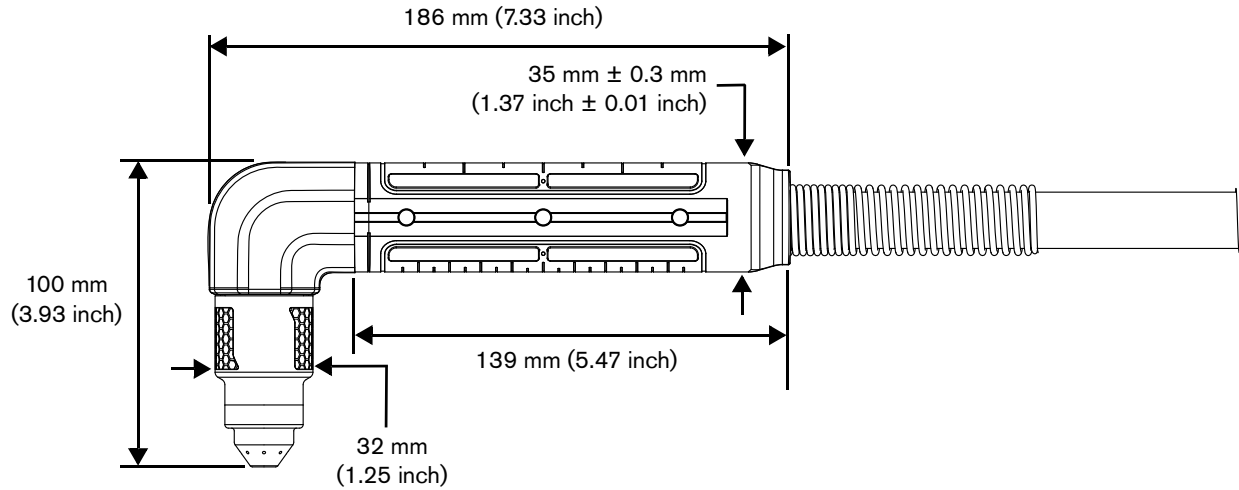
- | | |
|------------------------|--------------------------------|
| 1 Hypertherm cartridge | 5 Strain relief for torch lead |
| 2 Shell | 6 Torch lead |
| 3 Increment markings | 7 Positioning holes (3) |
| 4 Anti-rotational slot | |

Dimensions

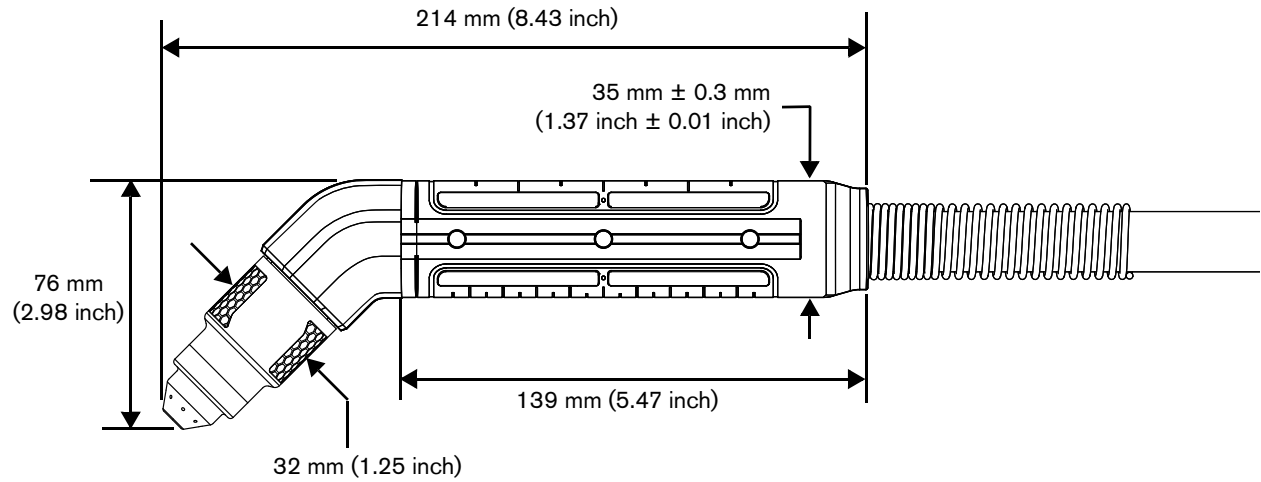
180° robotic torch



90° robotic torch



45° robotic torch



Weights

180° robotic torch with torch lead

Torch	Weight*
180° robotic torch with 4.6 m (15 foot) lead	2.1 kg (5 lb)
180° robotic torch with 7.6 m (25 foot) lead	3.1 kg (7 lb)
180° robotic torch with 15 m (50 foot) lead	5.7 kg (13 lb)

* Without a Hypertherm cartridge installed.

90° robotic torch with torch lead

Torch	Weight*
90° robotic torch with 7.6 m (25 foot) lead	3.5 kg (8 lb)
90° robotic torch with 15 m (50 foot) lead	6.5 kg (14 lb)
90° robotic torch with 23 m (75 foot) lead	9.6 kg (21 lb)

* Without a Hypertherm cartridge installed.

45° robotic torch with torch lead

Torch	Weight*
45° robotic torch with 7.6 m (25 foot) lead	3.5 kg (8 lb)
45° robotic torch with 15 m (50 foot) lead	6.5 kg (14 lb)
45° robotic torch with 23 m (75 foot) lead	9.6 kg (21 lb)

* Without a Hypertherm cartridge installed.

3

Mount the Robotic Torch

The robotic torch must be mounted correctly to the robot's arm to make sure that there is correct torch-to-work distance throughout each cut.

A robotic torch clamp with mating positioning dowels and anti-rotational tabs is available from Hypertherm. Refer to [Mount with a Hypertherm robotic torch clamp \(228806\)](#) on page 20.

If you use an alternate torch clamp, comply with the manufacturer's instructions on how to mount the torch in the clamp.

NOTICE

SENSITIVE ELECTRONICS AND OTHER COMPONENTS INSIDE THE TORCH. PERMANENT DAMAGE CAN OCCUR.

Do not disassemble the torch or the quick-disconnect shell to put the torch in the robotic cutting system.

For information about how to configure the Powermax power supply for remote operation, refer to the *Powermax65/85/105 SYNC Mechanized Cutting Guide* (810480).

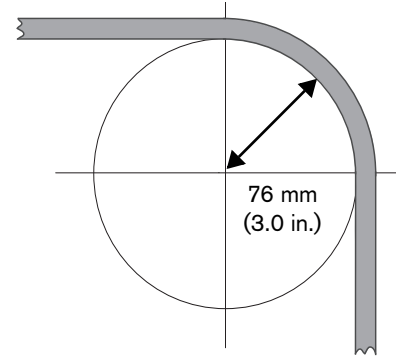
Minimum bend radius

NOTICE

MINIMUM BEND RADIUS. KINKING AND OTHER DAMAGE CAN OCCUR.

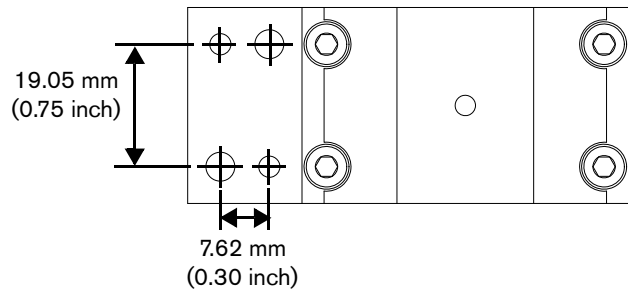
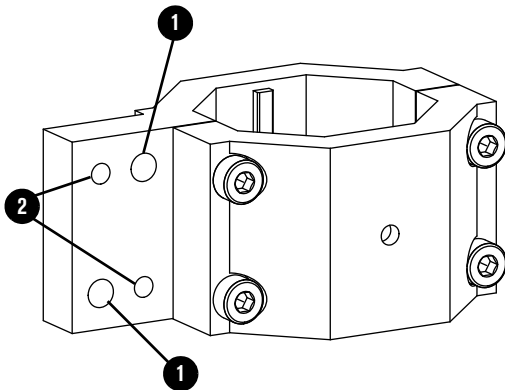
Do not bend the torch lead too far.

Do not bend the torch lead around a radius that is less than the minimum bend radius of 76 mm (3.0 inches).



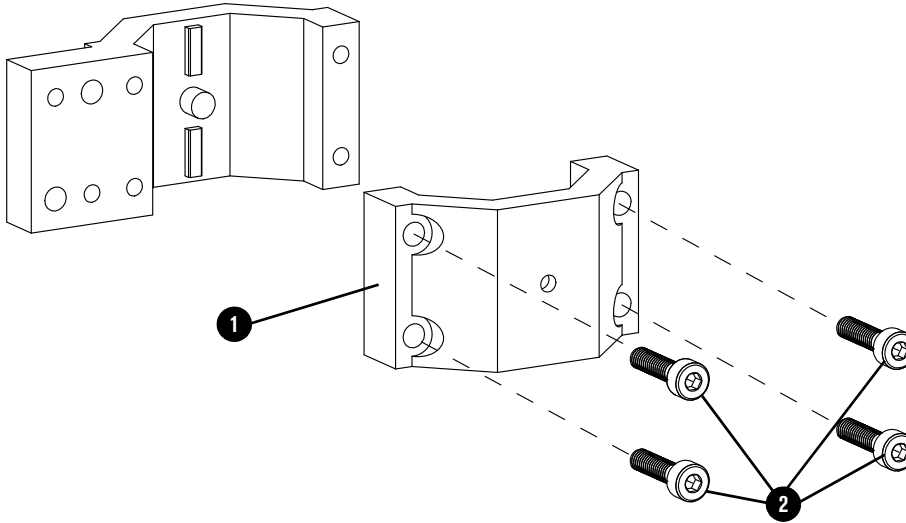
Mount with a Hypertherm robotic torch clamp (228806)

1. Mount the torch clamp to the robot arm using mounting holes ❶ or ❷.



- 1 4.5 mm (0.18 inch) unthreaded holes
- 2 M4 x 0.7 threaded holes

2. Disconnect the front half of the clamp **1** by removing the 4 screws **2**.

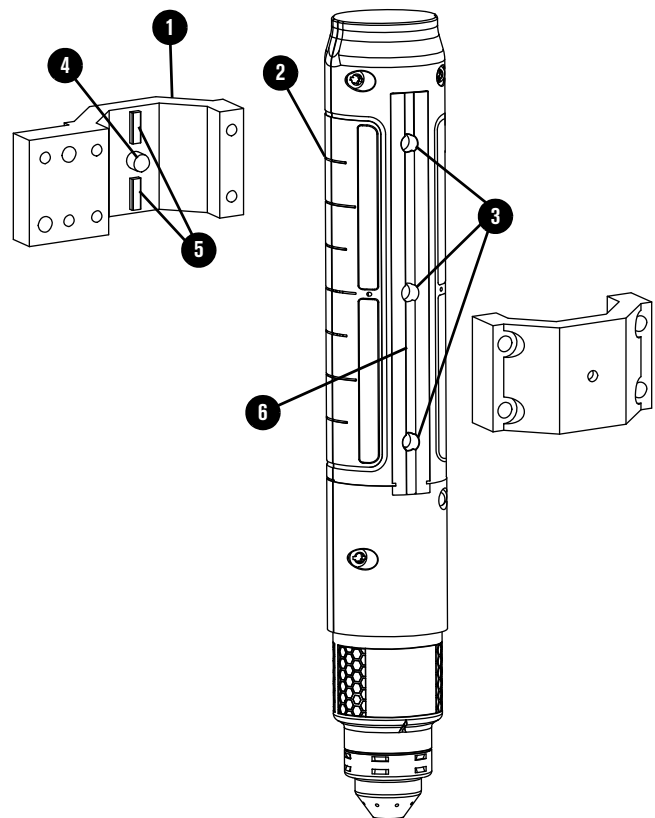


3. Align the torch with the rear half of the clamp **1** using either the increment markings **2** or the positioning holes **3**.



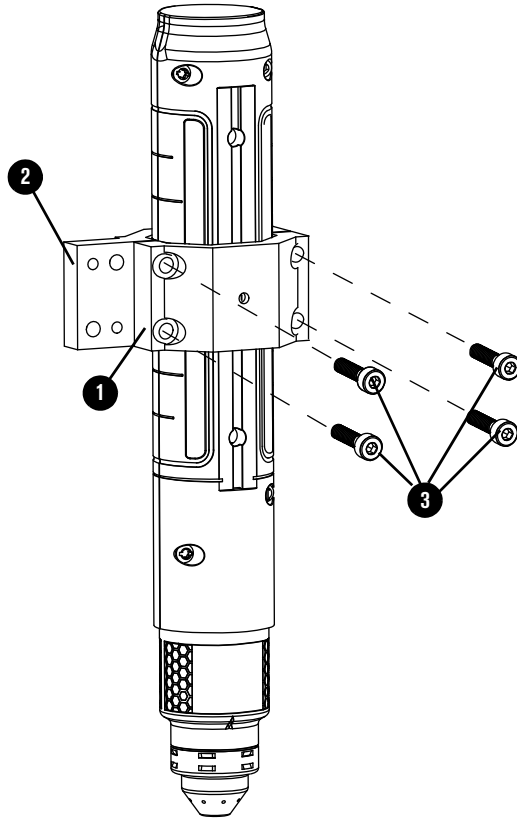
If you are using the increment markings, remove the positioning dowel **4**. Push the dowel through the clamp.

4. Make sure that the anti-rotational tabs **5** on each half of the torch clamp are aligned with the slot **6** in the torch.



3 Mount the Robotic Torch

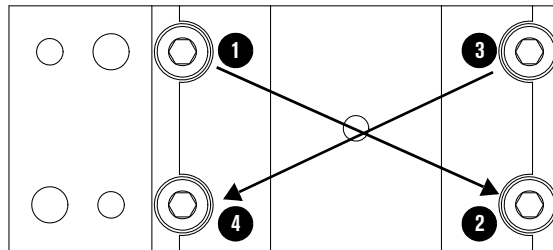
5. Attach the front half of the clamp ① to the rear half of the clamp ② with the 4 screws ③.



6. Tighten the 4 screws to 1.7 N·m (15 lbf·in) in the order shown.

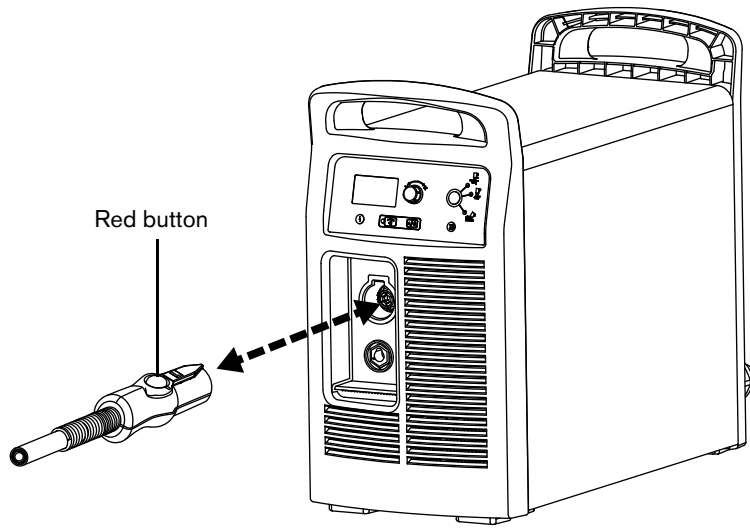
NOTICE

Do not tighten the screws too much. If you tighten the screws too much, you can cause damage to the internal components of the torch.



Connect the torch lead

- Always set the power switch on the plasma power supply to OFF (O) before you connect or disconnect a torch.
- To connect a hand torch or machine torch, push the connector into the receptacle on the front of the plasma power supply. The connector makes a click when it is fully engaged.
- To disconnect the torch, push the red button on the connector and pull the connector out of the receptacle.



4

Operate the Robotic Torch

This section gives information to help you do the following:

- Use the robotic teach tool
- Select the correct Hypertherm cutting or gouging cartridge
- Pierce and cut metal
- Optimize cut quality
- Gouge metal

To troubleshoot cutting system problems, refer to [Troubleshooting and Maintenance Tasks](#) on page 35.

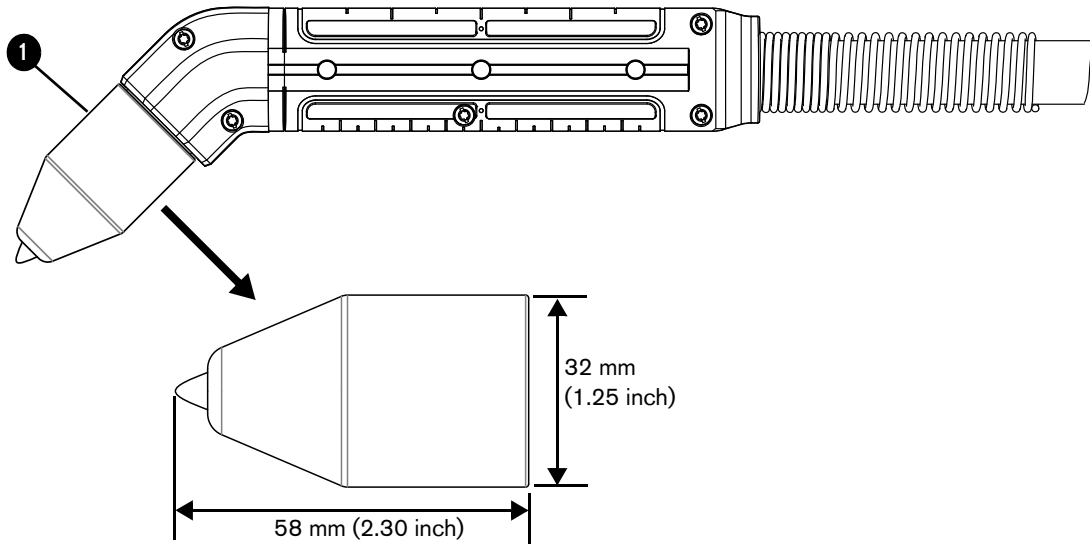
Use the robotic teach tool

A robotic torch teach tool (429054) is available from Hypertherm to help with programming the robot before cutting.

Run your program with the torch teach tool installed on the torch to visually make sure that the torch will not touch the workpiece while cutting.

Contact with the workpiece while cutting can cause damage to the cartridge and the cut surface. The torch teach tool has a spring-loaded tip so that you can simulate different cartridge lengths and stand-off distances. To install the torch teach tool do the following steps:




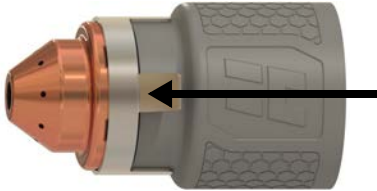
1. Set the power switch on the plasma power supply to OFF (O).
2. Remove the cartridge from the torch.
3. Install the torch teach tool ① on the torch.



Cutting processes

Select the cartridge

Hypertherm offers the following types of cutting cartridges for robotic torches:

Cartridge Type	Purpose
 <p>Standard cut (gray)</p>	Use these standard cartridges for the widest range of cutting applications.
 <p>FineCut® (gray)</p>	Use these cartridges to get a narrower kerf on thin mild steel and stainless steel up to 3 mm (10 gauge).
 <p>FlushCut™ (black)</p>	Use these cartridges to cut as close to the base as possible without piercing or causing damage to the workpiece.
 <p>Ohmic ring</p>	Use this cartridge accessory with torch height controls (THCs) that have support for ohmic contact to find the surface of the workpiece before each cut.


- For a full list of the cutting and gouging cartridges available refer to the *Powermax65/85/105 SYNC Parts Guide* (810490).
- For information on gouging processes and cartridges, refer to [Gouging processes](#) on page 30.
- For help installing the cartridge, refer to *Powermax65/85/105 SYNC Operator Manual* (810470).
- Select the cartridge with the amperage that is best for the thickness of the material that you want to cut.




Make sure that the cartridge that you select is an amperage supported by the plasma power supply. For example, if you have a Powermax85 SYNC, select an 85 A, 65 A, or 45 A cartridge, not a 105 A cartridge.

4 Operate the Robotic Torch


Select the best cartridge for the material you that you want to cut.

	Metric material thickness (mm)											
	0.5	1	2	3	5	8	10	12	15	20	25	30
FineCut	Optimal	Optimal	Optimal	Optimal	Near optimal	Decreased	Decreased	Decreased	Decreased	Decreased	Decreased	Decreased
45 A	Near optimal	Near optimal	Near optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
65 A	Decreased	Decreased	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
85 A	Decreased	Decreased	Decreased	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
105 A	Decreased	Decreased	Decreased	Decreased	Decreased	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal

	English material thickness (in.)										
	0.02	0.06	1/8	1/4	3/8	1/2	5/8	3/4	1	1-1/4	1-1/2
FineCut	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
45 A	Near optimal	Near optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
65 A	Decreased	Decreased	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
85 A	Decreased	Decreased	Decreased	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
105 A	Decreased	Decreased	Decreased	Decreased	Decreased	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal

Optimal cut quality
Near to optimal cut quality
Decreased cut quality or speed

Cutting guidelines

- Always start with the recommended settings from the cut charts. Refer to the *Powermax65/85/105 SYNC Cut Charts Guide (810500MU)*.
 - Do not let the torch touch the workpiece during cutting system operation. Contact with the workpiece can cause damage to the cartridge and to the surface of the workpiece.
 - Do all cutting system maintenance tasks as scheduled. Refer to [Troubleshooting and Maintenance Tasks](#) on page 35.
 - Do not fire the torch unnecessarily. It decreases cartridge life.
-  Starting at the edge of the workpiece is permitted if the arc makes contact with the workpiece when started.
- Prevent lead-outs that move away from the workpiece and stretch the plasma arc.

- Do the following to prevent the loss of a transferred plasma arc:
 - Complete every cut with the plasma arc still attached to the workpiece.
 - Decrease the cutting speed when the end of the cut is near.

Piercing guidelines

Piercing goes through the full thickness of the workpiece. Piercing is also typically the first action involved in cutting a part.



Starting at the edge of the workpiece is permitted if the arc makes contact with the workpiece when started.

You can keep unwanted results to a minimum, increase the number of pierces, and get maximum cartridge life when you use the pierce and cut height settings that Hypertherm recommends in the cut charts. Refer to the *Powermax65/85/105 SYNC Cut Charts Guide* (810500MU) and the following:

- **Pierce delay:** Pierce delay is the length of time that the torch stays at the specified pierce height before the torch starts to move for cutting. The pierce delay must be long enough that the arc can pierce the material before the torch moves, but not so long that the pierce hole enlarges and causes the arc to “wander” or extinguish before the torch starts to move.

Pierce delay times given in the cut charts use average delay times throughout the life of the cartridges. If necessary, as the cartridge wears, increase the pierce delay time.
- **Pierce height:** Pierce height is the distance between the torch and the workpiece that is necessary to initially pierce the workpiece before beginning to cut. For the Powermax65/85/105 SYNC, the pierce height is generally between 150% and 400% of the cut height. Refer to the *Powermax65/85/105 SYNC Cut Charts Guide* (810500MU) for specific values.
- **Pierce maximum thickness:** When piercing materials close to the maximum thickness for a specific process, think about the following important factors:
 - Use a lead-in distance approximately equal to the thickness of the material being pierced. For example, a 20 mm (3/4 inch) lead-in is necessary for 20 mm (3/4 inch) material.
 - To prevent damage to the cartridge from the collection of molten material caused by the pierce, do not let the torch descend to cut height until it is away from the puddle of molten material.

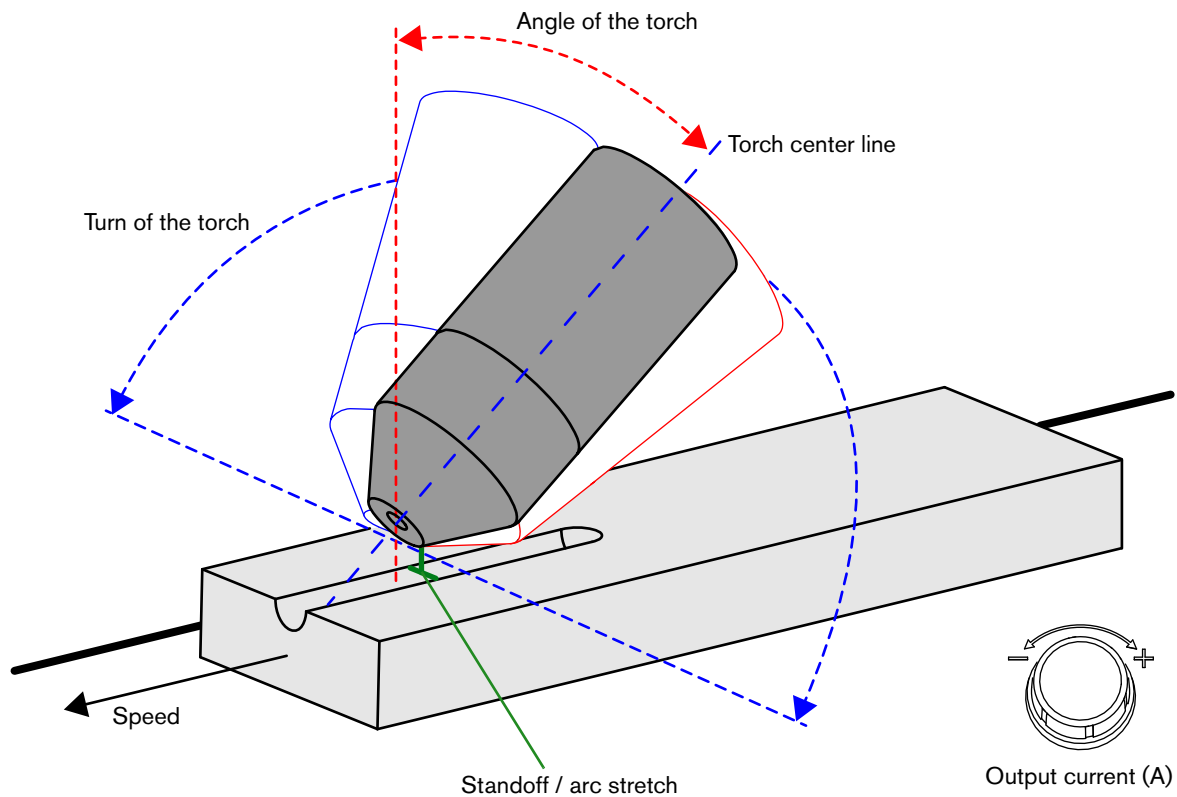
Gouging processes

Hypertherm offers the following gouging cartridges:

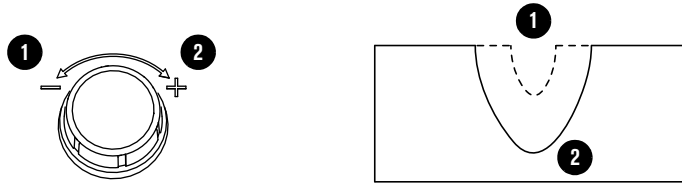
Cartridge Type	Purpose
 <p>Maximum Control gouging (green)</p>	<p>Use these cartridges for more precise metal removal, shallow gouge contours, and light metal washing.</p>
 <p>Maximum Removal gouging (green)</p>	<p>Use these cartridges for aggressive metal removal, deep gouge contours, and extreme metal washing.</p>

Change the gouge contour

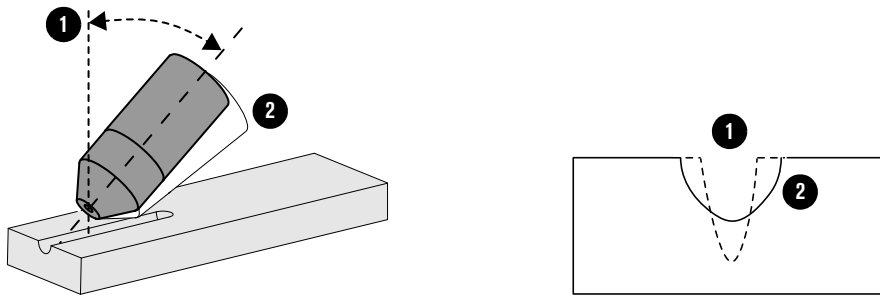
The width and the depth of the gouge contour are a result of the following factors. **Adjust these factors in combination to get the gouge that you want.**



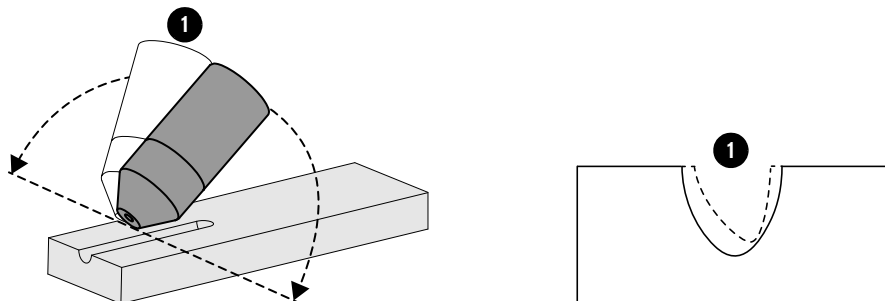
- **Output current (A) of the plasma power supply** – Decrease the amperage on the front panel to make the gouge narrower and shallower ❶. Increase the amperage to make the gouge wider and deeper ❷.



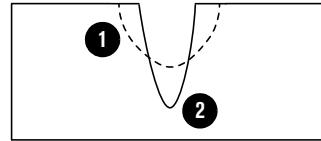
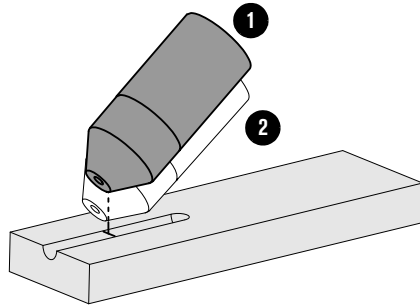
- Arc stretch is related to the output current (A) of the plasma power supply. The higher the amperage, the longer that you can stretch the arc. Hypertherm recommends that you keep amperage and arc stretch consistent.
- The lowest and highest possible amperage setting relates to the plasma power supply and the Hypertherm cartridge you are using.
- **Angle of the torch to the workpiece** – Put the torch in a more upright position to make the gouge narrower and deeper ❶. Tilt down the torch so that it is closer to the workpiece to make the gouge wider and more shallow ❷.



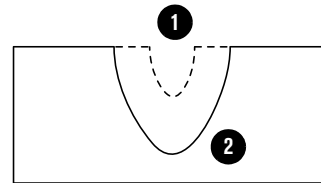
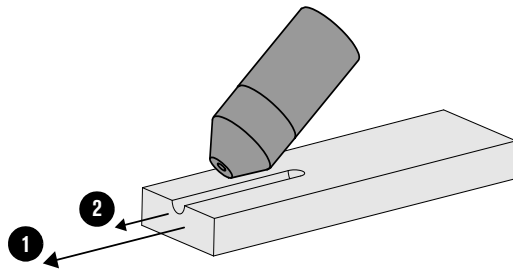
- **Turn of the torch** – Turn the torch relative to the torch center line to make the gouge flatter and steeper on one side ❶.



- **Torch-to-work standoff / arc stretch** – Move the torch away from the workpiece to make the gouge wider, shallower, and smoother on the bottom ❶. Move the torch closer to the workpiece to make the gouge narrower and deeper ❷.



- Arc stretch is related to the output current (A) of the plasma power supply. The higher the amperage, the longer that you can stretch the arc. Hypertherm recommends that you keep amperage and arc stretch consistent.
- Keep at least a small distance between the torch tip and the molten metal to increase cartridge life and prevent damage to the torch.
- **Speed of the torch** – Increase the speed of the torch movement to make the gouge narrower and more shallow ❶. Decrease the speed of the torch movement to make the gouge wider and deeper ❷.



4 *Operate the Robotic Torch*

5

Troubleshooting and Maintenance Tasks



This section is a supplement to the troubleshooting information in the *Powermax65/85/105 SYNC Operator Manual (810470)*. When you troubleshoot a robotic cutting problem, use both resources.

NOTICE

SENSITIVE ELECTRONICS AND OTHER COMPONENTS INSIDE THE TORCH. PERMANENT DAMAGE CAN OCCUR.

Do not disassemble the torch or the quick-disconnect shell to put the torch in the robotic cutting system.

When a troubleshooting problem occurs, go through the troubleshooting information in this chapter first.

If you cannot find a solution to the problem by complying with the recommendations in this chapter, or if further aid is necessary, do the following:

1. Get the serial number for your system from the data plate that is on the rear panel.
2. Speak to your Hypertherm distributor or authorized repair facility.
3. Speak to the nearest Hypertherm office shown in the front of this manual.



Refer to the *Powermax65/85/105 SYNC Parts Guide (810490)* for information on common replacement parts.

Cutting system problems

Problem	Solutions
<p>The plasma arc sputters or hisses, or you lose the plasma arc.</p>	<ul style="list-style-type: none"> ▪ Make sure that the cartridge is installed correctly. ▪ Examine the cartridge. Replace it if it is worn or damaged. A higher rate of 0-30-0 faults is typical as a cartridge gets near end-of-life. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Examine the gas filtration system for signs of moisture. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470).
<p>The plasma arc does not transfer to the workpiece.</p>	<ul style="list-style-type: none"> ▪ Clean the workpiece surface of any material that can prevent a good metal-to-metal connection. ▪ Make sure that the work lead is correctly connected to the plasma power supply. ▪ Make sure that the work lead is making good contact with the cutting table or workpiece, and is not damaged. Repair or replace it if necessary. Refer to the <i>Powermax65/85/105 SYNC Parts Guide</i> (810490). ▪ Make sure that the cutting table is correctly grounded and is making good contact with the workpiece. ▪ Decrease the cut height. Refer to the <i>Powermax65/85/105 Cut Charts Guide</i> (810500MU).
<p>The torch does not completely pierce the workpiece, and there is excessive sparking on the top of the workpiece.</p>	<ul style="list-style-type: none"> ▪ Examine the cartridge. Replace it if it is worn or damaged. A higher rate of 0-30-0 faults is typical as a cartridge gets near end-of-life. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Decrease your cut speed. ▪ Restart the plasma power supply. Does it correctly recognize the type of cartridge installed? Does it correctly set the amperage and operating mode to align with the cartridge? If it does not, look at the LCD screen. Do you see the icon at right on the LCD screen? If yes, there is possibly a plasma power supply configuration setting that you must change. If no, there is possibly a problem with the cartridge, torch, or plasma power supply. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Increase the output current (A) on the plasma power supply. ▪ If the output current (A) cannot be increased, do a check to see if the thickness of the workpiece is more than the maximum capacity for this plasma power supply. Refer to the cutting specifications in the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Clean the workpiece surface of any material that can prevent a good metal-to-metal connection. ▪ Examine the torch lead. Make it straight if it is twisted or kinked. Replace it if it is damaged. ▪ Examine the gas pressure and the gas supply hose. ▪ Adjust the gas flow rate. Refer to the gas supply specifications in the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Make sure that the cut chart parameters or the program code values are correct. Refer to the <i>Powermax65/85/105 SYNC Cut Charts Guide</i> (810500MU).



Problem	Solutions
<p>Cartridge life is shorter than expected.</p>	<ul style="list-style-type: none"> ▪ Do a check of the gas pressure and the gas supply hose. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Do not start or stop cuts off of the surface of the workpiece. Starting at the edge of the workpiece is permitted if the arc makes contact with the workpiece when started. ▪ Examine the torch lead. Make it straight if it is twisted or kinked. Replace it if it is damaged. ▪ Make sure that the output current, arc voltage, cut speed, and other cut settings are correct. Refer to the <i>Powermax65/85/105 SYNC Cut Charts Guide</i> (810500MU). ▪ Use the correct torch height for piercing. Refer to the <i>Powermax65/85/105 SYNC Cut Charts Guide</i> (810500MU) for the initial pierce height. ▪ Make sure that the pierce delay time is correct. Refer to the <i>Powermax65/85/105 SYNC Cut Charts Guide</i> (810500MU). ▪ Examine the gas filtration system for signs of contaminants that. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). ▪ Examine the cut data on the Cartridge Data screen and the Power Supply Data screen. Refer to the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470). Also refer to Cartridge maintenance on page 44. ▪ A faulty pilot arc IGBT can decrease cartridge life. Contact your Hypertherm distributor or authorized repair facility, or contact the nearest Hypertherm office shown in the front of this manual.

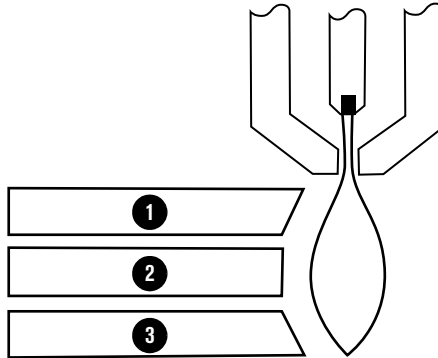
Cut quality problems

The following are problems that you can have when the appearance of a cut is not satisfactory:

- **Cut angle (bevel)** – The degree of angularity of the cut edge.
- **Dross** – The molten material that becomes solid on the top or bottom of the workpiece.

Each is explained in the following sections.

Cut angle (bevel)





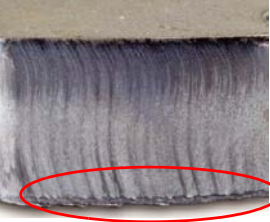
	Cut angle (bevel)	Causes	Solution
❶	Negative bevel More material is removed from the bottom of the cut than from the top.	<ul style="list-style-type: none"> ▪ The cutting speed is too slow. ▪ The torch is too low. ▪ The amperage is too high. 	<ul style="list-style-type: none"> ▪ Increase the cutting speed in small increments (125 mm/min or 5 in/min or less). ▪ Lift the torch in small increments (2 mm or 1/16 in.). ▪ Decrease the amperage in 10 A increments.
❷	No bevel (square cut)	This is good cut quality.	
❸	Positive bevel More material is removed from the top of the cut than from the bottom.	<ul style="list-style-type: none"> ▪ The cartridge is worn. ▪ The cutting speed is too fast. ▪ The torch is too high. ▪ The amperage is too low. 	<ul style="list-style-type: none"> ▪ Install a new cartridge. ▪ Decrease the cutting speed in small increments (125 mm/min or 5 in/min or less). ▪ Lower the torch in small increments (2 mm or 1/16 in.). ▪ Increase the amperage in 10 A increments.
	Irregular bevel Positive and negative bevel on the same workpiece.	<ul style="list-style-type: none"> ▪ The cartridge is severely worn. ▪ The torch is not aligned perpendicular to the workpiece. ▪ Cut surface is concave on one side and convex on the other side. 	<ul style="list-style-type: none"> ▪ Install a new cartridge.



The squarest cut angle is always on the right side with respect to the forward motion of the torch. The left side always has some degree of bevel. A bevel angle of more than 5 degrees shows a possible problem.

Dross

Dross (slag) is molten metal that is the result of the cut process and that hardens on the bottom of the part. There is always some amount of dross when cutting with plasma. To keep the amount and type of dross to a minimum, adjust your system correctly for your application.

Problem	Causes	Solution
<p>Too much dross (splatter) on the top of the plate.</p> 	<ul style="list-style-type: none"> ▪ The cartridge is worn. ▪ The cutting speed is too fast. ▪ The torch is too high. Or, if you are using a torch height control, arc voltage is too high. 	<ul style="list-style-type: none"> ▪ Install a new cartridge. ▪ Decrease the cutting speed in small increments (125 mm/min or 5 in/min or less). ▪ Lower the torch in small increments (2 mm or 1/16 in.). Or, if you are using a torch height control, decrease the arc voltage in small increments (5 volts or less).
<p>Low-speed dross that collects on the bottom of the cut and is heavy and bubbly.</p> 	<ul style="list-style-type: none"> ▪ The cutting speed is too slow. ▪ The torch is too low. Or, if you are using a torch height control, arc voltage is too low. ▪ The amperage is too high. 	<ul style="list-style-type: none"> ▪ Increase the cutting speed in small increments (125 mm/min or 5 in/min or less). ▪ Lift the torch in small increments (2 mm or 1/16 in.). Or, if you are using a torch height control, increase the arc voltage in small increments (5 volts or less). ▪ Decrease the amperage in 10 A increments.
<p>High-speed dross near the cut that is a thin, linear bead of solid metal. It is welded to the bottom of the cut and is difficult to remove.</p> 	<ul style="list-style-type: none"> ▪ The cartridge is worn. ▪ The cutting speed is too fast. ▪ The torch is too high. Or, if you are using a torch height control, arc voltage is too high. ▪ The amperage is too low. 	<ul style="list-style-type: none"> ▪ Install a new cartridge. ▪ Decrease the cutting speed in small increments (125 mm/min or 5 in/min or less). ▪ Lower the torch in small increments (2 mm or 1/16 in.). Or, if you are using a torch height control, decrease the arc voltage in small increments (5 volts or less). ▪ Increase the amperage in 10 A increments.

Gouging problems

When gouging, always make sure of the following:

- A Hypertherm gouging cartridge is installed.
- The Hypertherm cartridge is not worn or damaged.
- The operating mode is set to Gouge mode.
 - When you install a Hypertherm gouging cartridge, the plasma power supply automatically sets the operating mode to Gouge mode. There is a condition in which the operating mode does **not** automatically set to Gouge mode even if a Hypertherm gouging cartridge is used.

Problem	Solution
The arc goes out during gouging.	<ul style="list-style-type: none"> ▪ Decrease the arc stretch (standoff). ▪ Put the torch in a more upright position.
The torch tip hits the molten metal (slag).	<ul style="list-style-type: none"> ▪ Increase the arc stretch (standoff). ▪ Keep the torch tip pointed in the direction of the gouge that you want to make.
The gouge has too much depth.	<ul style="list-style-type: none"> ▪ Tilt the torch down so that it is closer to the workpiece. ▪ Increase the arc stretch (standoff). ▪ Increase the gouging speed. ▪ Decrease the output current (A).
The gouge does not have enough depth.	<ul style="list-style-type: none"> ▪ Put the torch in a more upright position. ▪ Decrease the arc stretch (standoff). ▪ Decrease the gouging speed. ▪ Increase the output current (A).
The gouge has too much width.	<ul style="list-style-type: none"> ▪ Put the torch in a more upright position. ▪ Decrease the arc stretch (standoff). ▪ Increase the gouging speed. ▪ Decrease the output current (A).
The gouge does not have enough width.	<ul style="list-style-type: none"> ▪ Tilt the torch down so that it is closer to the workpiece. ▪ Increase the arc stretch (standoff). ▪ Decrease the gouging speed. ▪ Increase output current (A).

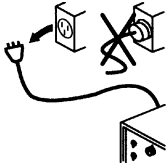
Routine maintenance

WARNING



ELECTRIC SHOCK CAN KILL

Disconnect electric power before doing installation or maintenance. You can get a serious electric shock if electric power is not disconnected. Electric shock can seriously injure or kill you.



All work that requires removal of the plasma power supply outer cover or panels must be done by a qualified technician.

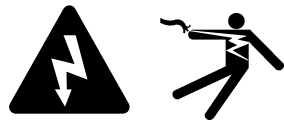
Refer to the *Safety and Compliance Manual (80669C)* for more safety information.

WARNING



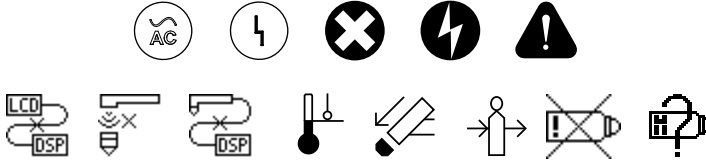
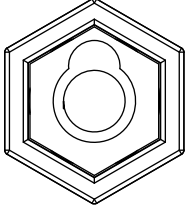
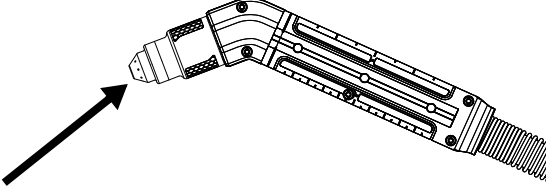
RISK OF BURNS AND ELECTRIC SHOCK – USE INSULATED GLOVES

Always put on insulated gloves when changing the cartridges. The cartridges get very hot during cutting and can cause severe burns.

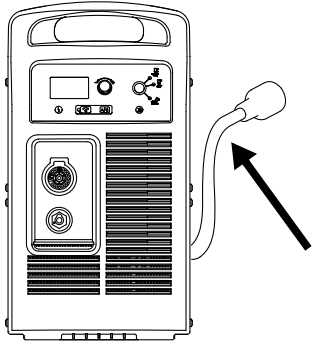
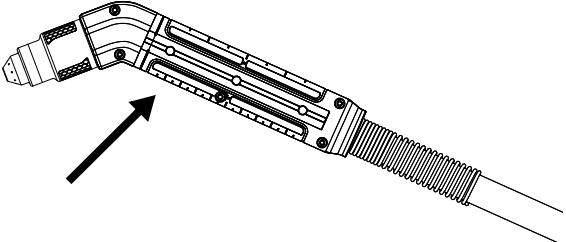
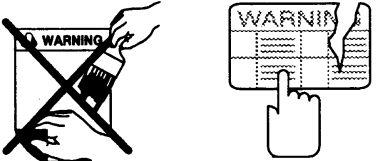
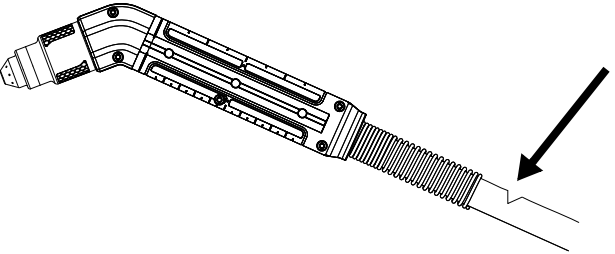


Touching the cartridges can also cause electric shock if the plasma power supply is ON and the torch-lock switch is not in the yellow lock (X) position.

Every use

Plasma power supply	Torch
<p>1</p>  <p>Examine the indicator LEDs and correct any fault conditions. Refer the <i>Powermax65/85/105 SYNC Operator Manual</i> (810470).</p> <p>2</p>  <p>To prevent overheating, do the following:</p> <ul style="list-style-type: none"> Examine the work lead connector to make sure that it is fully connected to the plasma power supply and is not loose. Make sure that you turn the connector clockwise approximately 1/4 turn until the connector is fully engaged and locked in position. Do a check of the plug on the work lead. When a plug is replaced, damage to the wire inside the plug can occur. If the plug on the work lead has been replaced, look for damage. 	<p>3</p>  <p>Examine the cartridge for correct installation and for wear. Refer to Cartridge maintenance on page 44.</p>

Every 3 months

Plasma power supply	Torch
<p data-bbox="175 319 240 382">1</p>  <p data-bbox="175 835 808 928">Examine the power cord and plug. Replace them if they are damaged. Refer to the <i>Powermax65/85/105 SYNC Parts Guide</i> (810490).</p>	<p data-bbox="831 319 896 382">3</p>  <p data-bbox="831 835 1466 970">Examine the torch for cracks and exposed wires. Have a qualified service technician replace any damaged parts. Contact your distributor or authorized repair facility.</p>
<p data-bbox="175 1012 240 1075">2</p>  <p data-bbox="175 1579 808 1671">Examine the labels. Replace any damaged labels. Refer to the <i>Powermax65/85/105 SYNC Parts Guide</i> (810490).</p>	<p data-bbox="831 1012 896 1075">4</p>  <p data-bbox="831 1579 1466 1671">Examine the torch lead. Have a qualified service technician replace it if it is damaged. Contact your distributor or authorized repair facility.</p>

Cartridge maintenance

To help keep a cartridge operating correctly, do the following:

- Carefully remove molten metal that might collect on the cartridge. **Do not push the unwanted material inside the nozzle ① or shield ②.**
- Carefully remove molten metal that causes a blockage of the holes ③ in the shield that are necessary for airflow. **Do not push the unwanted material inside the nozzle or shield.**
- Examine the O-ring ④ on the torch body. If the O-ring is cracked or worn, replace it. If the O-ring is dry, or if it is not easy to install the cartridge, apply a thin layer of silicone lubricant on the O-ring and the threads. Make sure that the O-ring is shiny, but do not apply too much lubricant.

