THERMAL DYNAMICS®

OUTPUT DC | MAX OUTPUT 40 AMPS | MAX OUTPUT 60 AMPS | VOLTAGE 208-480V | VOLTAGE 380-415V | INPUT POWER 1 PHASE | INPUT POWER 3 PHASE

A40i, A60i

PLASMA CUTTING SYSTEM

OPERATING MANUAL

Revision: AB	Issue Date: 7/3/2018	Manual No.: 0-5466

thermal-dynamics.com

WE APPRECIATE YOUR BUSINESS!

Congratulations on your new Thermal Dynamics product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service agency call 1-866-279-2628, or visit us on the web at **www.Thermal-Dynamics.com**.

This Operating Manual has been designed to instruct you on the correct use and operation of your Thermal Dynamics product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

YOU ARE IN GOOD COMPANY!

The Brand of Choice for Contractors and Fabricators Worldwide.

Thermal Dynamics is a Global Brand of manual and automation Plasma Cutting Products.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to developing technologically advanced products to achieve a safer working environment within the welding industry.

WARNING
Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.
While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Plasma Cutting Power Supplies
A40i, A60i
SL100SV 1Torch™
Operating Manual Number 0-5466

Published by:
Thermal Dynamics
2800 Airport Rd.
Denton, Texas 76207

www.Thermal-Dynamics.com

For Material Print Specifications, refer to document 47x1909
Original Publication Date: 16 November, 2017
Revision Date: 7/3/18

Record the following information for Warranty purposes:

Where Purchased:_____ _____

Purchase Date:_____ _____

Power Supply Serial #:_____ _____

Torch Serial #:_____ _____

Be sure this information reaches the operator.
You can get extra copies through your supplier.

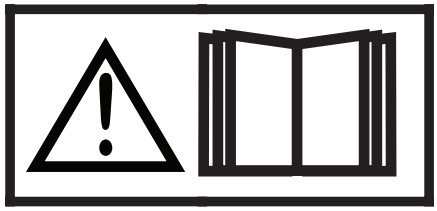
CAUTION

These INSTRUCTIONS are for experienced operators. If you are not fully familiar with the principles of operation and safe practices for arc welding and cutting equipment, we urge you to read our booklet, "Precautions and Safe Practices for Arc Welding, Cutting, and Gouging," Form 52-529. Do NOT permit untrained persons to install, operate, or maintain this equipment. Do NOT attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety Precautions before installing or operating this equipment.

USER RESPONSIBILITY

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Malfunctioning or poorly maintained equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, the manufacturer recommends that a telephone or written request for service advice be made to the Authorized Distributor from whom it was purchased.

This equipment or any of its parts should not be altered without the prior written approval of the manufacturer. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than the manufacturer or a service facility designated by the manufacturer.



READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.
PROTECT YOURSELF AND OTHERS!

ASSUREZ-VOUS QUE CE DOCUMENT D'INFORMATION EST DISTRIBUÉ À L'OPÉRATEUR. DES COPIES SUPPLÉMENTAIRES SONT DISPONIBLES CHEZ VOTRE FOURNISSEUR.

MISE EN GARDE

Les INSTRUCTIONS suivantes sont destinées aux opérateurs qualifiés seulement. Si vous n'avez pas une connaissance approfondie des principes de fonctionnement et des règles de sécurité applicables au soudage à l'arc et à l'équipement de coupage, nous vous suggérons de lire notre brochure « Précautions et pratiques de sécurité pour le soudage à l'arc, le coupage et le gougeage », Formulaire 52-529. Ne permettez PAS aux personnes non qualifiées d'installer, d'utiliser ou d'effectuer des opérations de maintenance sur cet équipement cet équipement. Ne tentez PAS d'installer ou d'utiliser cet équipement avant d'avoir lu et bien compris ces instructions. Si vous ne comprenez pas bien les instructions, renseignez-vous auprès de votre fournisseur. Assurez-vous de lire les Règles de Sécurité avant d'installer ou d'utiliser cet équipement.

RESPONSABILITÉS DE L'UTILISATEUR

Cet équipement fonctionnera conformément à la description contenue dans ce manuel, les étiquettes d'accompagnement et/ou les feuillets d'information à condition d'être installé, utilisé, entretenu et réparé selon les instructions fournies. L'équipement doit être contrôlé de manière périodique. Ne jamais utiliser un équipement qui ne fonctionne correctement bien ou n'est pas bien entretenu. Les pièces qui sont brisées, usées, déformées ou contaminées doivent être remplacées immédiatement. Dans le cas où une réparation ou un remplacement est nécessaire, e fabricant recommande de faire une demande de conseil de service écrite ou par téléphone auprès du distributeur agréé où l'équipement a été acheté.

Cet équipement ou ses pièces ne doivent pas être modifiés sans permission préalable écrite du fabricant. L'utilisateur de l'équipement sera le seul responsable de toute défaillance résultant de toute utilisation, maintenance, réparation incorrectes, de dommages ou encore de modification apportées par une personne autre que le fabricant ou un centre de service désigné par ce dernier.

ASSUREZ-VOUS DE LIRE ET DE COMPRENDRE LE MANUEL D'UTILISATION AVANT D'INSTALLER OU D'UTILISER L'UNITÉ.
PROTÉGEZ-VOUS ET LES AUTRES!

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EU DECLARATION OF CONFORMITY

According to
The Low Voltage Directive 2014/35/EU, entering into force 20 April 2016
The EMC Directive 2014/30/EU, entering into force 20 April 2016
The RoHS Directive 2011/65/EU, entering into force 2 January 2013

Type of equipment
PLASMA CUTTING SYSTEM

Type designation etc.
A40i and A60i, from serial number MX1723XXXXXX

Brand name or trade mark
Thermal Dynamics

Manufacturer or his authorised representative

Name, address, telephone No:
ESAB Group Inc.
2800 Airport Rd
Denton TX 76207 USA
Phone: +01 800 426 1888, FAX +01 603 298 7402

The following harmonised standard in force within the EEA has been used in the design:

IEC/EN 60974-1:2012 Arc Welding Equipment - Part 1: Welding power sources.
IEC/EN 60974-10:2014 + AMD 1:2015 Published 2015-06-19 Arc Welding Equipment - Part 10: Electromagnetic compatibility (EMC) requirements

Additional Information: Restrictive use, Class A equipment, intended for use in location other than residential.

By signing this document, the undersigned declares as manufacturer, or the manufacturer's authorised representative , that the equipment in question complies with the safety requirements stated above.

Date	**Signature**	**Position**
10 October, 2017	John Boisvert	Vice President, Global Cutting Mechanized Cutting

CE 2017

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SECTION 1:
GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

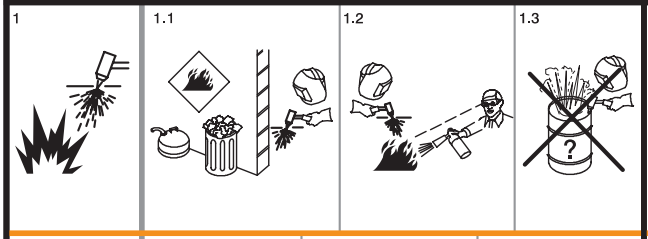
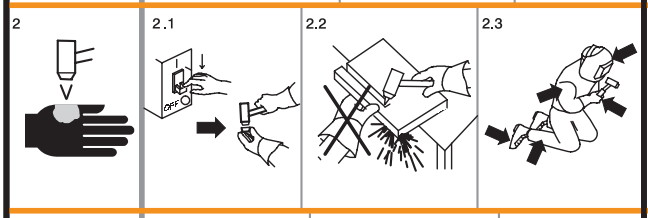
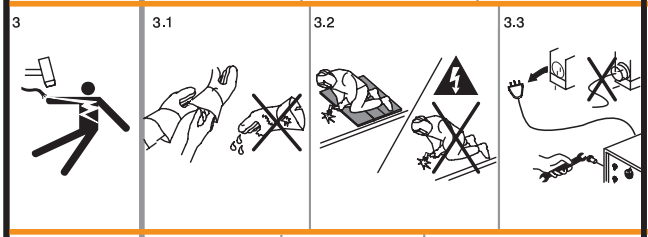
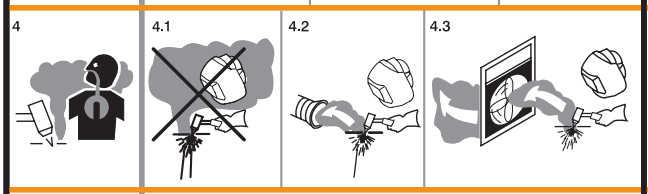
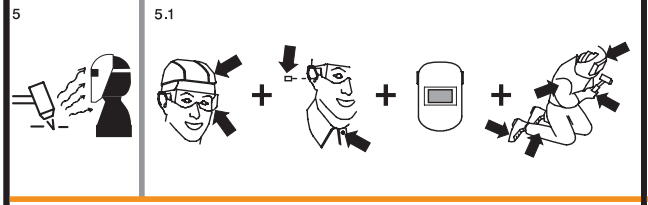
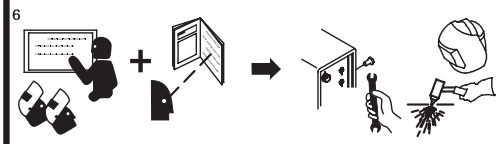
Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

NOTE!
An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION
A procedure which, if not properly followed, may cause damage to the equipment.

WARNING
A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

WARNING
Gives information regarding possible electrical shock injury.

	⚠ 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. 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. 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. 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. Les fumées plasma peuvent être dangereuses.** 4.1 Ne pas inhaler les fumées. 4.2 Utiliser une ventilation forcée ou un extracteur local pour dissiper 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. 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. Suivre une formation.** Seul le personnel qualifié a le droit de faire fonctionner cet équipement. Utiliser exclusivement les torches indiquées dans le manual. 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. Ne pas enlever, détruire ni couvrir cette étiquette.** La remplacer si elle est absente, endommagée ou usée.

Art # A-13294

Warranty:

Statement of Warranty

LIMITED WARRANTY: Subject to the terms and conditions established below, Thermal Dynamics warrants to the original retail purchaser that new Thermal Dynamics plasma cutting systems sold after the effective date of this warranty are free of defects in material and workmanship. Should any failure to conform to this warranty appear within the applicable period stated below, Thermal Dynamics shall, upon notification thereof and substantiation that the product has been stored operated and maintained in accordance with Thermal Dynamics' specifications, instructions, recommendations and recognized industry practice, correct such defects by suitable repair or replacement.

This warranty is exclusive and in lieu of any warranty of merchantability or fitness for a particular purpose.

ESAB will repair or replace, at its discretion, any warranted parts or components that fail due to defects in material or workmanship within the time periods set out below. Thermal Dynamics must be notified within 30 days of any failure, at which time Thermal Dynamics will provide instructions on the warranty procedures to be implemented.

Thermal Dynamics will honor warranty claims submitted within the warranty periods listed below. All warranty periods begin on the date of sale of the product to the original retail customer or 1 year after sale to an authorized Thermal Dynamics Distributor.

LIMITED WARRANTY PERIOD

Product	Power Supply Components (Parts and Labor)		Torch and Leads (Parts and Labor)
	U.S.	Non U.S.	
A40i, A60i	4 Years	3 Years	1 Year

This warranty does not apply to:

1. Consumable Parts, such as tips, electrodes, shield cups, o-rings, starter cartridges, gas distributors, fuses, filters.

2. Equipment that has been modified by an unauthorized party, improperly installed, improperly operated or misused based upon industry standards.

In the event of a claim under this warranty, the remedies shall be, at the discretion of Thermal Dynamics :

1. Repair of the defective product.
2. Replacement of the defective product.
3. Reimbursement of reasonable costs of repair when authorized in advance by Thermal Dynamics.
4. Payment of credit up to the purchase price less reasonable depreciation based on actual use.

These remedies may be authorized by Thermal Dynamics and are FOB West Lebanon, NH or an authorized Thermal Dynamics service station. Product returned for service is at the owner's expense and no reimbursement of travel or transportation is authorized.

LIMITATION OF LIABILITY: Thermal Dynamics shall not under any circumstances be liable for special or consequential damages such as, but not limited to, damage or loss of purchased or replacement goods or claims of customer of distributors (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal Dynamics with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of the goods covered by or furnished by Thermal Dynamics whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which liability is based.

This warranty becomes invalid if replacement parts or accessories are used which may impair the safety or performance of any Thermal Dynamics product.

This warranty is invalid if the Thermal Dynamics product is sold by non - authorized persons.

Effective July 18, 2017.

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SECTION 2 SYSTEM: INTRODUCTION

2.01 How To Use This Manual

This Owner's Manual applies to just specification or part numbers listed on page i.

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings.

Throughout this manual, the words WARNING, CAUTION, and NOTE may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

NOTE!
An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION
A procedure which, if not properly followed, may cause damage to the equipment.

WARNING
A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

WARNING
Gives information regarding possible electrical shock injury. Warnings will be enclosed in a box such as this.

Additional copies of this manual may be purchased by contacting Thermal Dynamics at the address and phone number in your area listed on back cover of this manual. Include the Operating Manual number and equipment identification numbers.

Electronic copies of this manual can also be downloaded at no charge in Acrobat PDF format by going to the ESAB web site listed below and clicking on "Product Support" / "ESAB Documentation": / "Download Library", then navigate to "Plasma Equipment" and then "Manual".

http://www.esab.com

2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a data tag attached to the bottom. Equipment which does not have a data tag such as torch and cable assemblies are identified only by the specification or part number printed on loosely attached card or the shipping container. Record these numbers on the bottom of page i for future reference.

2.03 Receipt Of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area listed in the inside back cover of this manual.

Include all equipment identification numbers as described above along with a full description of the parts in error.

Move the equipment to the installation site before un-crating the unit. Use care to avoid damaging the equipment when using bars, hammers, etc., to un-crate the unit.

2.04 Power Supply Specifications

A60i Power Supply Specifications				
Input Power	208 - 480 VAC, Single Phase, 50/60 Hz			
Input Power Cable	Power Supply includes 9' single phase 6AWG 3/C input cable with NEMA 6-50P Plug..			
Output Current	10 - 60 Amps, Continuously Adjustable			
Power Supply Gas Filtering Ability	Particulates to 5 Microns			
A60i Power Supply Duty Cycle *				
Ambient Temperature	Duty Cycle Ratings @ 40° C (104° F) Operating Range 0° - 50° C			
		Rating		
All Units	Duty Cycle	50% (208-230V ONLY)	80%	100%
	Current	60 Amps	60 Amps	40 Amps
	DC Voltage	132	132	119
* NOTE: The duty cycle will be reduced if the primary input power (AC) is low or the output voltage (DC) is higher than shown in this chart.				

A60i

A40i Power Supply Specifications			
Input Power	208 - 480 VAC, Single Phase, 50/60 Hz		
Input Power Cable	Power Supply includes 9' single phase 8AWG 3/C input cable with NEMA 6-50P Plug..		
Output Current	10 - 40 Amps, Continuously Adjustable		
Power Supply Gas Filtering Ability	Particulates to 5 Microns		
A40i Power Supply Duty Cycle *			
Ambient Temperature	Duty Cycle Ratings @ 40° C (104° F) Operating Range 0° - 50° C		
		Rating	
All Units	Duty Cycle	80%	100%
	Current	40 Amps	30 Amps
	DC Voltage	119	119
* NOTE: The duty cycle will be reduced if the primary input power (AC) is low or the output voltage (DC) is higher than shown in this chart.			

A40i

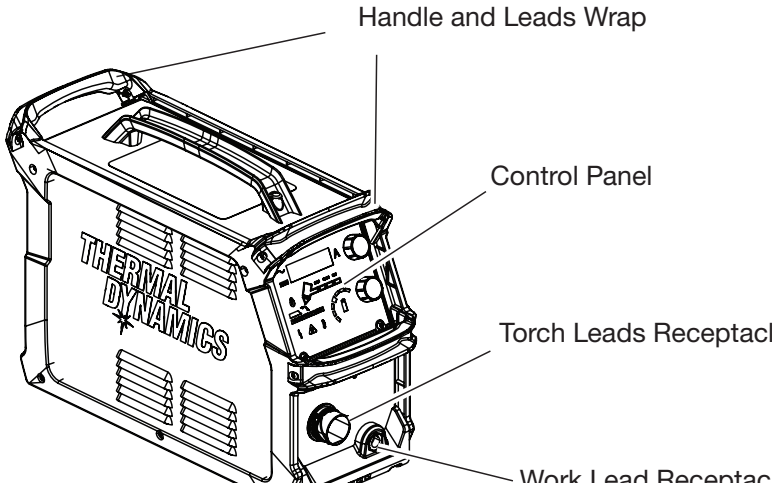
2.05 Input Wiring Specifications

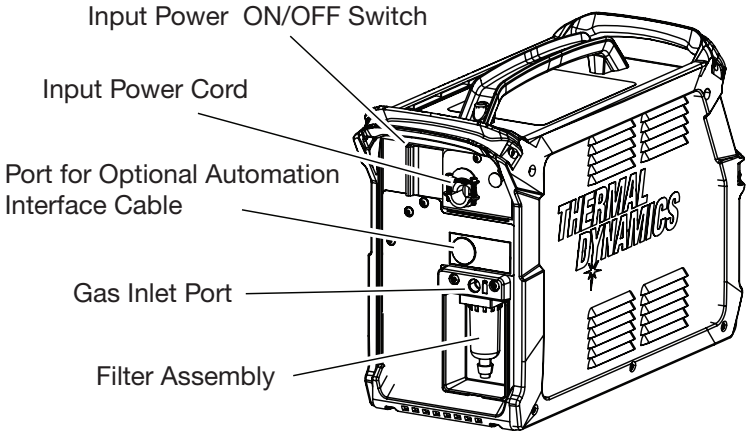
A60i Power Supply Input Cable Wiring Requirements							
	Input voltage	Freq	Power Input			Suggested Sizes	
	Volts	Hz	kVA	I max	I_1eff	Fuse (amps)	Flexible Cord (Min. AWG)
1 Phase	208	50/60	9.4	45.0	40.1	50	6 AWG (16 mm2)
	230	50/60	9.4	40.8	36.3	50	8 AWG 10 mm2)
	480	50/60	9.4	19.5	17.3	30	12 AWG (4 mm2)
3 Phase	208	50/60	9.8	27.3	24.3	50	8 AWG 10 mm2)
	230	50/60	9.7	24.5	21.8	50	10 AWG (6 mm2)
	380	50/60	9.5	14.5	12.9	30	14 AWG (2.5 mm2)
	400	50/60	9.6	13.8	12.3	30	14 AWG (2.5 mm2)
	415	50/60	9.6	13.4	11.9	30	14 AWG (2.5 mm2)
	480	50/60	9.8	11.8	10.5	20	14 AWG (2.5 mm2)
Line Voltages with Suggested Circuit Protection and Wire Sizes Based on National Electric Code and Canadian Electric Code							

A40i Power Supply Input Cable Wiring Requirements							
	Input voltage	Freq	Power Input			Suggested Sizes	
	Volts	Hz	kVA	I max	I_1eff	Fuse (amps)	Flexible Cord (Min. AWG)
1 Phase	208	50/60	5.6	27.1	24.1	50	10 AWG (6 mm2)
	230	50/60	5.6	24.5	21.8	50	12 AWG (4 mm2)
	480	50/60	5.6	11.7	10.4	20	16 AWG (1.5 mm2)
3 Phase	208	50/60	5.9	16.4	14.6	25	12 AWG (4 mm2)
	230	50/60	5.8	14.7	13.1	25	14 AWG (2.5 mm2)
	380	50/60	5.7	8.7	7.7	15	16 AWG (1.5 mm2)
	400	50/60	5.7	8.3	7.4	15	16 AWG (1.5 mm2)
	415	50/60	5.8	8.0	7.2	15	16 AWG (1.5 mm2)
	480	50/60	5.9	7.1	6.3	15	16 AWG (1.5 mm2)
Line Voltages with Suggested Circuit Protection and Wire Sizes Based on National Electric Code and Canadian Electric Code							

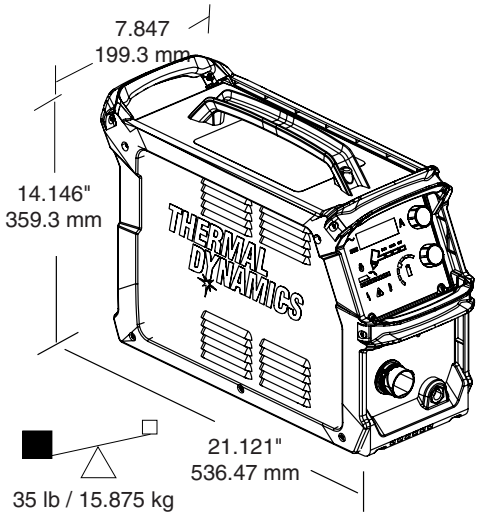
NOTE!
Refer to Local and National Codes or local authority having jurisdiction for proper wiring requirements.
Cable size is de-rated based on the Duty Cycle of the equipment.

2.06 Power Supply Features

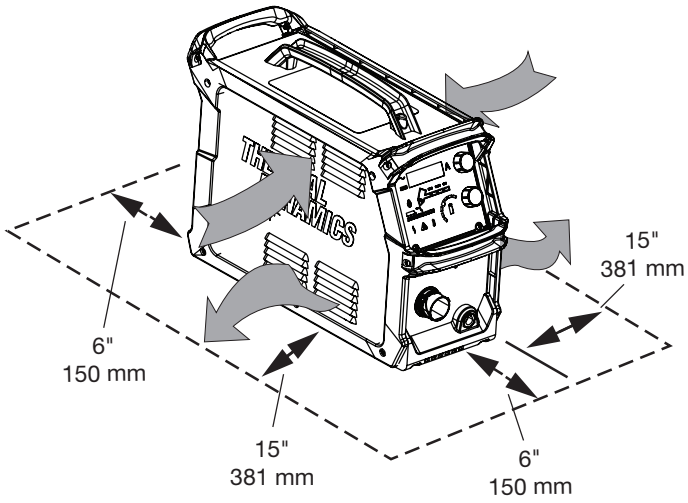




2.07 Power Supply Placement



Power Supply Dimensions & Weight



Ventilation Clearance Requirements

SECTION 2 TORCH: INTRODUCTION

2T.01 Scope of Manual

This manual contains descriptions, operating instructions and maintenance procedures for the 1Torch Models SL60QD™ hand torches and SL100SV Automated Plasma Cutting Torches. Service of this equipment is restricted to properly trained personnel; unqualified personnel are strictly cautioned against attempting repairs or adjustments not covered in this manual, at the risk of voiding the Warranty.

Read this manual thoroughly. A complete understanding of the characteristics and capabilities of this equipment will assure the dependable operation for which it was designed.

2T.02 General Description

Plasma torches are similar in design to the automotive spark plug. They consist of negative and positive sections separated by a center insulator. Inside the torch, the pilot arc starts in the gap between the negatively charged electrode and the positively charged tip. Once the pilot arc has ionized the plasma gas, the superheated column of gas flows through the small orifice in the torch tip, which is focused on the metal to be cut.

A single torch lead provides gas from a single source to be used as both the plasma and secondary gas. The air flow is divided inside the torch head. Single - gas operation provides a smaller sized torch and inexpensive operation.

NOTE!
Refer to Section "2T.05 Introduction to Plasma", for a more detailed description of plasma torch operation.

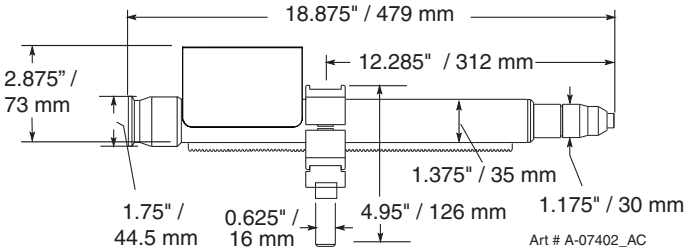
Refer to the Appendix Pages for additional specifications as related to the Power Supply used.

2T.03 Specifications

A. Torch Configurations

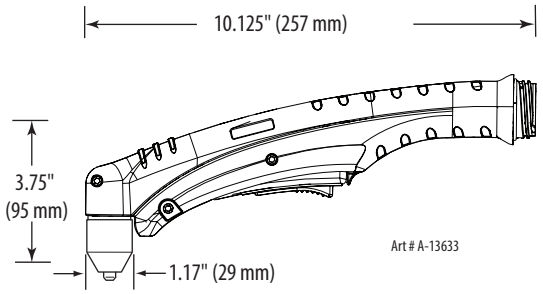
1. Automation Torch, Model

The standard automation torch has a positioning tube with rack & pinch block assembly and a solenoid valve.



2. Hand/Manual Torch, Models

The hand torch head is at 75° to the torch handle. The hand torches include a torch handle and torch trigger assembly.



B. Torch Leads Lengths

Hand Torches are available as follows:

- 20 ft / 6.1 m, with ATC connectors
- 50 ft / 15.2 m, with ATC connectors

Machine Torches are available as follows:

- 5 foot / 1.5 m, with ATC connectors
- 10 foot / 3.05 m, with ATC connectors
- 25 foot / 7.6 m, with ATC connectors
- 50 foot / 15.2 m, with ATC connectors

C. Torch Parts

Starter Cartridge, Electrode, Tip, Shield Cup

D. Parts - In - Place (PIP)

Torch Head has built - in switch

15 VDC circuit rating

E. Type Cooling

Combination of ambient air and gas stream through torch.

F. Torch Ratings

Automated / Machine Torch Ratings	
Ambient Temperature	104° F 40° C
Duty Cycle	100% @ 100 Amps @ 400 scfh
Maximum Current	120 Amps
Voltage (V_{peak})	500V

Manual Torch Ratings	
Ambient Temperature	104° F 40° C
Duty Cycle	100% @ 60 Amps @ 400 scfh
Maximum Current	60 Amps
Voltage (V_{peak})	500V
Arc Striking Voltage	500V

G. Gas Requirements

Manual and Mechanized Torch Gas Specifications	
Gas (Plasma and Secondary)	Compressed Air Argon
Operating Pressure Refer to NOTE	90 - 120 psi 6.2 - 8.3 bar
Maximum Input Pressure	125 psi / 8.6 bar
Gas Flow (Cutting and Gouging)	5 - 8.3 SCFM 300 - 500 scfh 142 - 235 lpm

WARNING

This Torch is not to be used with oxygen (O_2).

The SL60QD torch should not be used on an HF system.

NOTE!

Operating pressure varies with torch model, operating amperage, and torch leads length. Refer to gas pressure settings charts for each model..

H. Direct Contact Hazard

For standoff tip the recommended standoff is 3/16 inches / 4.7 mm.

2T.04 Quick Connection Torch

The new SL60QD™ (Quick Disconnect) torch allows for a quick change of the torch handle assembly from the leads. To change the torch handle assembly do the following.

1. Remove the torch handle assembly by grasping the torch handle in one hand and the coupler nut and leads in the other.
2. Rotate the nut a minimum of one full turn to the left (counter closkwise) and pull the torch handle assembly out from the leads in a straight line.
3. To reattach, grasp both as before and carefully align the internal connecting parts.
4. Carefully press the two together in a straight line.
5. Align the mark on the coupler nut with that on the top of the torch handle and rotate to the right (clockwise) drawing the two together and seating the connections inside.

2T.05 Options And Accessories

For options and accessories, see Section 6.

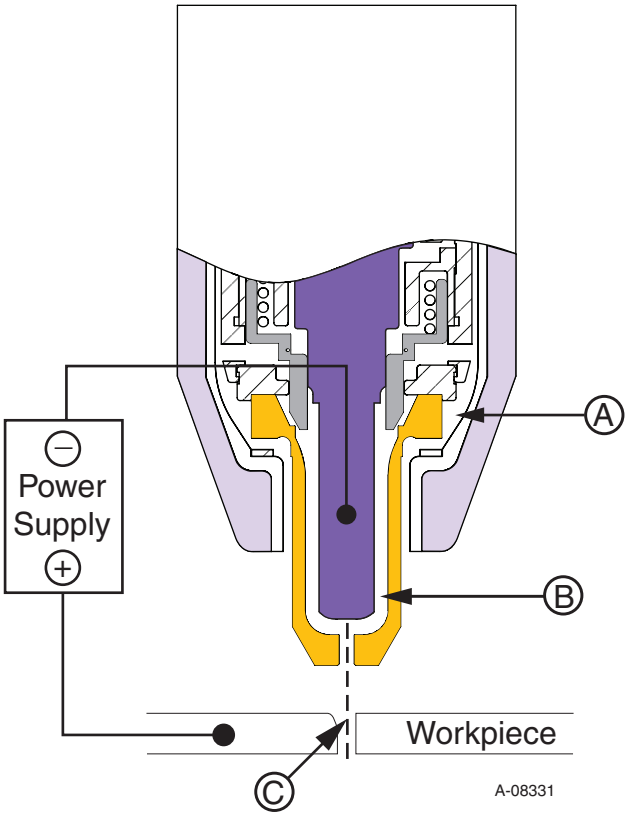
2T.06 Introduction to Plasma

A. Plasma Gas Flow

Plasma is a gas which has been heated to an extremely high temperature and ionized so that it becomes electrically conductive. The plasma arc cutting and gouging processes use this plasma to transfer an electrical arc to the workpiece. The metal to be cut or removed is melted by the heat of the arc and then blown away.

While the goal of plasma arc cutting is separation of the material, plasma arc gouging is used to remove metals to a controlled depth and width.

In a Plasma Cutting Torch a cool gas enters Zone B, where a pilot arc between the electrode and the torch tip heats and ionizes the gas. The main cutting arc then transfers to the workpiece through the column of plasma gas in Zone C.



Typical Torch Head Detail

By forcing the plasma gas and electric arc through a small orifice, the torch delivers a high concentration of heat to a small area. The stiff, constricted plasma arc is shown in Zone C. Direct current (DC) straight polarity is used for plasma cutting, as shown in the illustration.

Zone A channels a secondary gas that cools the torch. This gas also assists the high velocity plasma gas in blowing the molten metal out of the cut allowing for a fast, slag - free cut.

B. Gas Distribution

The single gas used is internally split into plasma and secondary gases.

The plasma gas flows into the torch through the negative lead, through the starter cartridge, around the electrode, and out through the tip orifice.

The secondary gas flows down around the outside of the torch starter cartridge, and out between the tip and shield cup around the plasma arc.

C. Pilot Arc

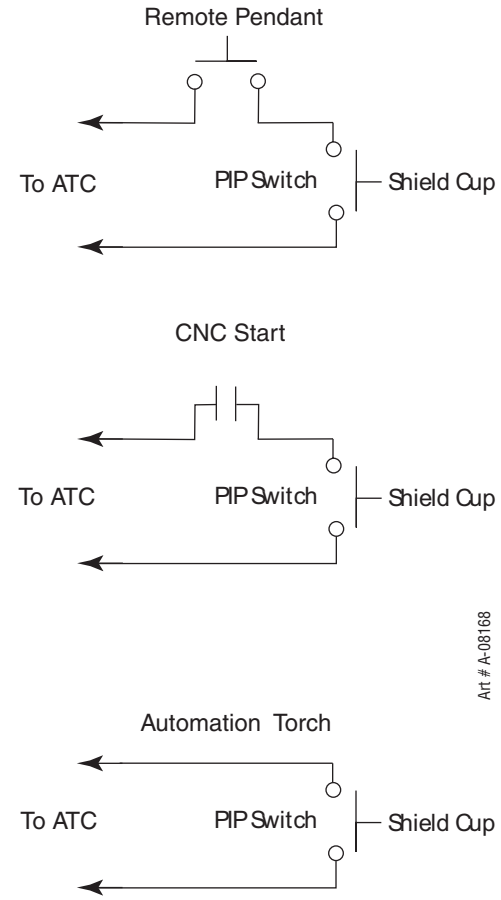
When the torch is started a pilot arc is established between the electrode and cutting or gouging tip. This pilot arc creates a path for the main arc to transfer to the work.

D. Main Cutting Arc

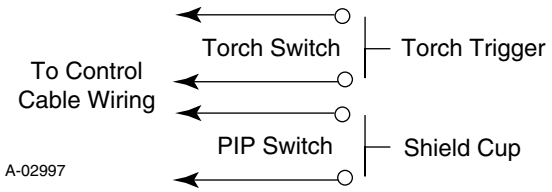
DC power is also used for the main cutting arc. The negative output is connected to the torch electrode through the torch lead. The positive output is connected to the workpiece via the work cable and to the torch through a pilot wire.

E. Parts - In - Place (PIP)

The torch includes a 'Parts - In - Place' (PIP) circuit. When the shield cup is properly installed, it closes a switch. The torch will not operate if this switch is open.



Parts - In - Place Circuit Diagram for Machine Torch



Parts - In - Place Circuit Diagram for Hand Torch

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SECTION 3 SYSTEM: INSTALLATION

3.01 Unpacking

1. Use the packing lists to identify and account for each item.
2. Inspect each item for possible shipping damage. If damage is evident, contact your distributor and / or shipping company before proceeding with the installation.
3. Record Power Supply and Torch model and serial numbers, purchase date and vendor name, in the information block at the front of this manual.

3.02 Lifting Options

The Power Supply includes handles for **hand lifting only.** Be sure unit is lifted and transported safely and securely.

WARNING

Do not touch live electrical parts.

Disconnect input power cord before moving unit.

FALLING EQUIPMENT can cause serious personal injury and can damage equipment.

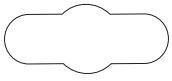
HANDLES are not for mechanical lifting.

- Only persons of adequate physical strength should lift the unit.
- Lift unit by the handles, using two hands. Do not use straps for lifting.
- Use optional cart or similar device of adequate capacity to move unit.
- Place unit on a proper skid and secure in place before transporting with a fork lift or other vehicle.

3.03 Power Supply location and Mounting

NOTE!
It is recommended that the unit be secured to a suitable surface using the mounting rails.

1. First choose an appropriate location for mounting the power supply. Choose one that allows for free movement of torch leads, complies with ventilation per section 2.04 and provides a safe firm surface where the unit can be secured.
2. Place the unit in the desired position and mark where the four keyway holes in the mounting rails touch.

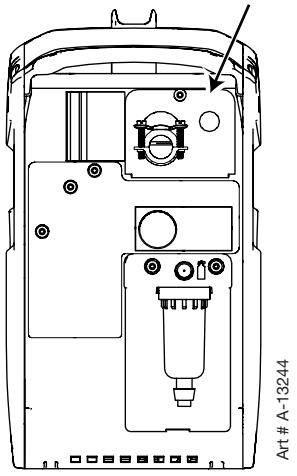


3. Remove the unit and using these markings, prepare holes for mounting hardware.
4. Insert proper hardware. If using hardware that screws into the mounting surface, leave all four loose enough for the thickness of the rail to slide under the head and washer if used.
5. Lower the power supply over the mounting hardware and slide forward or backward until the keyway stops against the mounting hardware.
6. Secure the hardware to the rail.

3.04 Opening the Main Switch Cover

Systems are configured for and come with power cord connected for single phase configuration. The input power switch is located on the rear panel along the top. To access the input locations, remove the screw at the top of the cover and flip down.

CAUTION
Disconnect power before removing the cover.

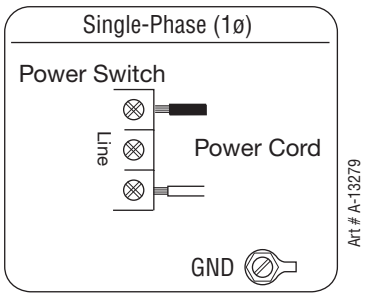


Main Switch Cover

3.05 Primary Input Power Connections

CAUTION
The primary power source, fuse, and any extension cords used must conform to local electrical code and the recommended circuit protection and wiring requirements as specified in Section 2.

NOTE!
As long as the power supply is connected to input power ranging from 208 VAC to 480 VAC, the system will automatically detect this and run accordingly.

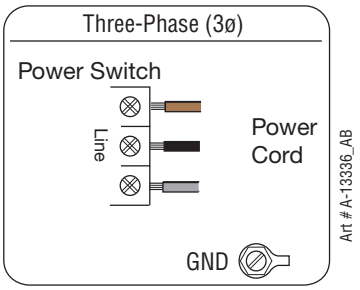


Single Phase Input Power Wiring

3.06 Primary Input Power Connections, THREE Phase

WARNING
Each A40i or A60i system is a dedicated 1 Phase OR 3 Phase system and cannot be reconfigured to the other. Personal injury could occur if changing the phase is attempted..

CAUTION
The primary power source, fuse, and any extension cords used must conform to local electrical code and the recommended circuit protection and wiring requirements as specified in Section 2.



Three Phase Input Power Wiring

NOTE!
As long as the power supply is connected to input power ranging from 208 VAC to 480 VAC, the system will automatically detect this and run accordingly.

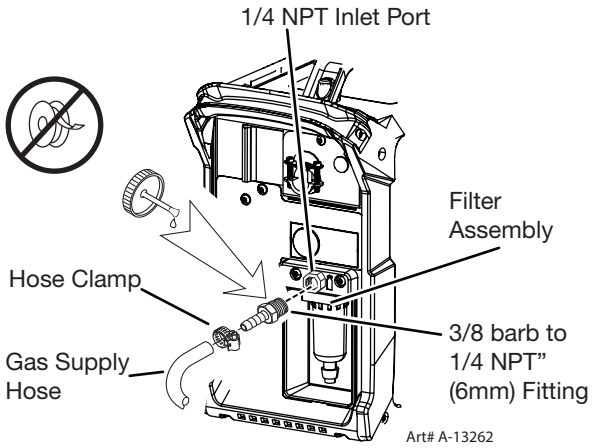
3.07 Gas Connections

Connecting Gas Supply to Unit

The connection is the same for compressed air or high pressure cylinders. Refer to the following two subsections if an optional air line filter is to be installed.

1. Connect the air or argon line to the inlet port. The illustration shows typical fittings as an example.

NOTE!
For a secure seal, apply thread sealant to the fitting threads, according to manufacturer's instructions. Do not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small air passages in the torch.



Air Connection to Inlet Port

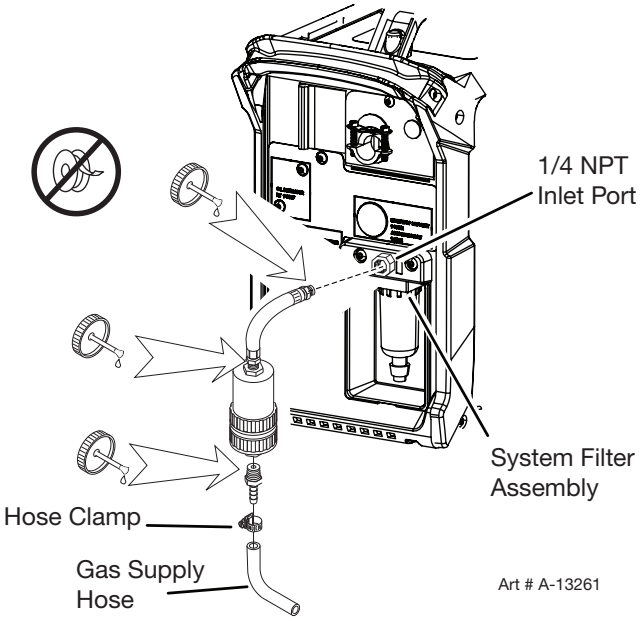
NOTE!
Filter replacement part numbers can be found in Section 6 of this manual

Installing Optional Single - Stage Air Filter

An optional filter kit is recommended for improved filtering with compressed air, to keep moisture and debris out of the torch.

1. Attach the Single - Stage Filter Hose to the Inlet Port 1/4" NPT of the system filter.
2. Attach the Filter Assembly to the filter hose.
3. Connect the air line to the Filter using the 1/4" NPT. The illustration shows typical fittings as an example.

NOTE!
For a secure seal, apply thread sealant to the fitting threads, according to manufacturer's instructions. Do not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small air passages in the torch.



Optional Single - Stage Filter Installation

NOTE!
Filter replacement part numbers can be found in Section 6 of this manual

Installing Optional Two - Stage Air Filter Kit

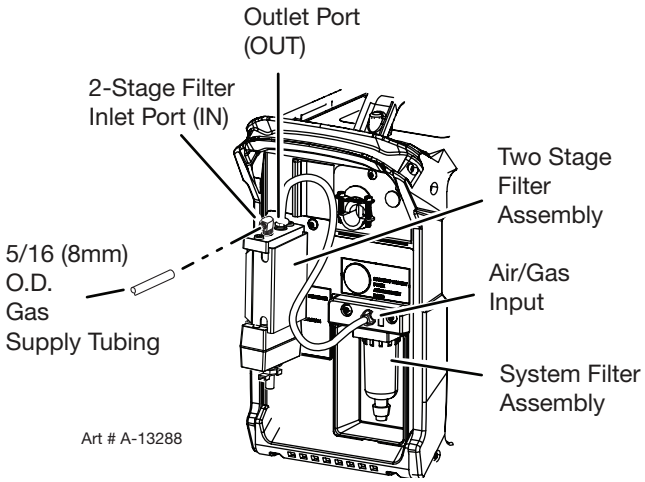
This optional two - stage air line filter is also for use on compressed air shop systems. Filter removes moisture and contaminants to at least 5 microns.

Connect the air supply as follows:

1. Attach the Two Stage Filter bracket to the back of the power supply with the screws supplied.

> **NOTE!**
> For a secure seal, apply thread sealant to the fitting threads, according to manufacturer's instructions. Do not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small air passages in the torch.

2. Connect the two stage filter outlet hose to the inlet port of the Regulator / Filter Assembly.
3. Use customer - supplied fittings to connect the air line to the Filter. A 5/16 (8mm) O.D. smooth tubing should be used with the press in fitting.



Optional Two - Stage Filter Installation

NOTE!
Filter replacement part numbers can be found in Section 6 of this manual

Using High Pressure Air Cylinders

When using high pressure air cylinders as the air supply:

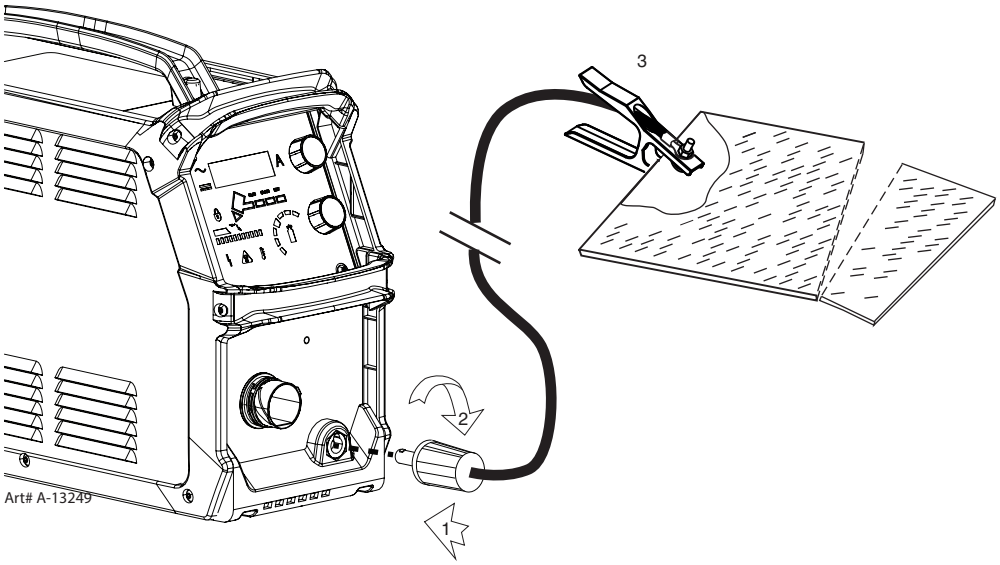
1. Refer to the manufacturer's specifications for installation and maintenance procedures for high pressure regulators.
2. Examine the cylinder valves to be sure they are clean and free of oil, grease or any foreign material. Briefly open each cylinder valve to blow out any dust which may be present.
3. The cylinder must be equipped with an adjustable high - pressure regulator capable of outlet pressures up to 120 psi (8.3 bar) maximum and flows of least 300-500 scfh / 5 - 8.3 CFM (142-235 lpm).
4. Connect supply hose to the cylinder.

NOTE!
Pressure should be set at 120 psi (8.3 bar) at the high pressure cylinder regulator.

3.08 Work Lead Connections

Connect the Work Lead to the power supply and the work piece.

1. Attache the Dinse type connection of the work lead to the power supply front panel as shown below. Push in and turn clockwise to the right until tight.
2. Connect the work clamp to the workpiece or cutting table. The area must be free from oil, paint and rust. Connect only to the main part of the work piece; do not connect to the part to be cut off.



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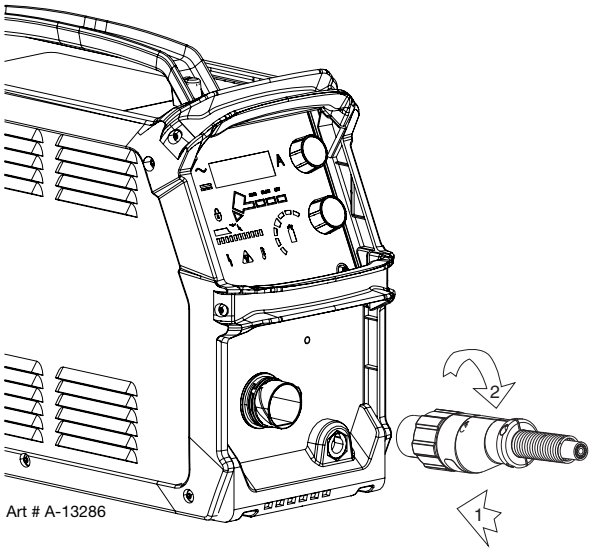
SECTION 3 TORCH: INSTALLATION

3T.01 Torch Connections

If necessary, connect the torch to the Power Supply. Connect only the Thermal Dynamics model SL60, SL60QD™ or SL100 / Mechanical Torch to this power supply. Maximum torch leads length is 100 feet / 30.5 m, including extensions.

WARNING
Disconnect primary power at the source before connecting the torch.

1. Align the ATC male connector (on the torch lead) with the female receptacle. Push the male connector into the female receptacle. The connectors should push together with a small amount of pressure.
2. Secure the connection by turning the locking nut clockwise until it clicks. DO NOT use the locking nut to pull the connection together. Do not use tools to secure the connection.



Connecting the Torch to the Power Supply

3. The system is ready for operation.

Check Air Quality

To test the quality of air:

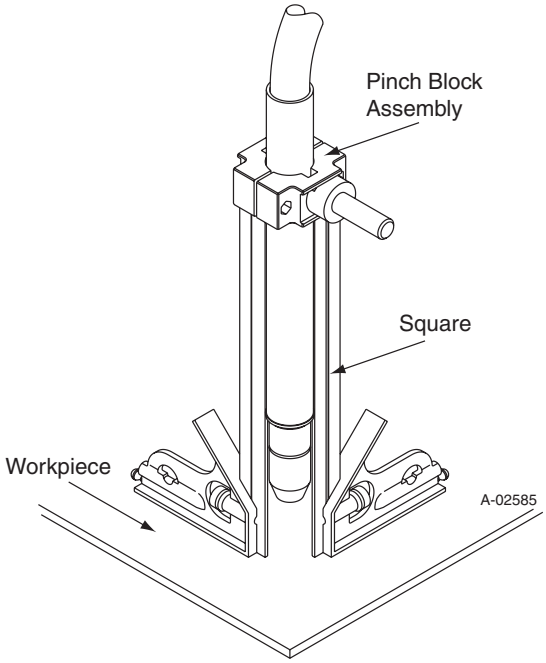
1. Put the ON / OFF switch in the ON (Left) position.
2. Select SET mode.
3. Place a welding filter lens in front of the torch and turn ON the air. **Do not start an arc!** Any oil or moisture in the air will be visible on the lens.

3T.02 Setting Up Mechanical Torch

WARNING
Disconnect primary power at the source before disassembling the torch or torch leads.

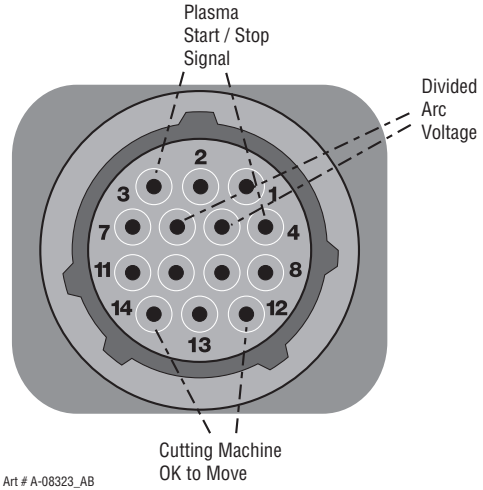
The mechanical torch includes a positioning tube with rack and pinch block assembly.

1. Mount the torch assembly on the cutting table.
2. To obtain a clean vertical cut, use a square to align the torch perpendicular to the surface of the workpiece.



Mechanical Torch Set - Up

3. The proper torch parts (shield cup, tip, start cartridge, and electrode) must be installed for the type of operation. Refer to Section "4T.01 Torch Parts Selection" on page 4T-1 for details.



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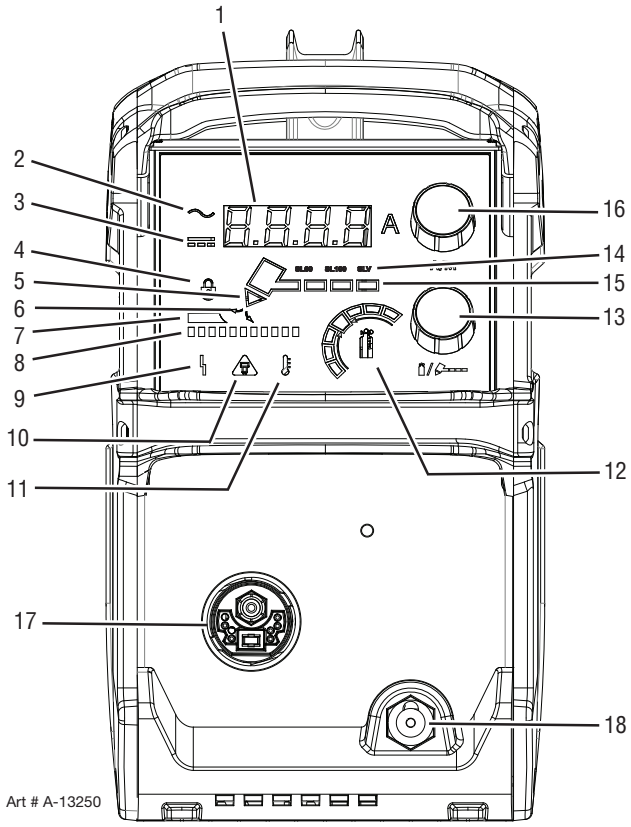
SECTION 4 SYSTEM: OPERATION

4.01 Front Panel Controls / Features

See Illustration for numbering Identification



1.  **Numeric Display**

- Displays software revision at start up
- Displays amperage values (Factory default)
- Displays error codes
- Displays pre-set (preview) maintenance functions

2. ~ **AC Indicator**

Steady light indicates power supply is ready for operation. Blinking light indicates the input voltage is outside of operating range or internal fault.

3. ⎓ **DC Indicator**

Indicator is ON when DC output circuit is active.

4.  **Latch/Lock**

Indicator is ON when unit is in "Latch" mode.

5.  Set Mode Indicator

Indicator is ON when unit is flowing gas and pressure can be set.

6.  Shield Cup In Place Indicator

Indicator is Blinking when any of the following are not in place or connected: Shield Cup, ATC leads or Quick Disconnect.

7.  Gouge Mode Indicator

Indicator is ON when unit is in "Gouge" mode and all Cutting Indicators (#8) are illuminated.

8.  Type of Cutting Indicator

Different segments will be illuminated to indicate different types of cutting.

- Gouging - All illuminated 
- Normal Cutting and Latch Mode - Center indicator will be off. 
- RAR (Rapid Auto Restart) Cutting - Every other indicator will be off. 
- Marking - The two indicators to the far right will be off. The Gouge Mode will be selected and gas pressure set below 20 lbs. 
- Set Mode - All indicators will be off.

9.  Fault Indicator

Indicator is ON when unit is in fault condition. See error codes appendix for fault light explanations. Flashing when active.

Factory default: Off

10.  EOL (End Of Life) Indicator

Indicator is normally off. It is also off during Drag Cutting.

When on it is to inform user that consumable failure is imminent

Active and/or operable in all cutting modes except Drag..

11.  Over Temp Indicator

Indicator is normally OFF. Indicator is ON/FLASHING when internal temperature exceeds normal limits. Let the unit cool before continuing operation.

12. Gas Pressure Indicator

Indicator used to show low, optimal and high gas pressure. Torch type, lead length, cutting mode and amperage should all be set prior to setting the gas pressure. (90 - 125 PSI / 6.2 - 8.6 bar)

One of 7 segments will always be on when unit is on. The gas bottle will be illuminated and flash during a gas pressure fault. Bottle will flash when pressure is below a minimum threshold. Bottle will be on continuously when acceptable.

Factory default: One, or two segments and gas bottle will be illuminated depending on the gas pressure level. The green indicator in the middle indicates the recommended pressure for the process (Amps, torch type, lead length). Different processes have different optimum pressures.

Yellow indicates above or below optimum pressure and red indicates unacceptable pressure for good cutting. Each LED represents 5 psi. Two adjacent LEDs will represent a value in between the two or 2.5 lb. pressure change..

13. Gas Pressure Selector

Rotate the lower knob to set the gas pressure.

14. SL60 SL100 SLV Torch Type Indicator

Used for selecting one of the three torch options and torch length for each. SLV will be automatically detected.

Factory default: On, SL60 which includes SL60QD™ (Quick Disconnect)

Press and release the lower knob without rotating it to step through selection of torch type.

NOTE!
If you have gone past the desired setting, you will need to continue to step through all the other torch types and lengths to get back to return to it..

15. Lead Length Indicator

Used for selecting torch lead length for each torch type ranging between 20' and 100' leads.

Factory default: On, 20' or 25'

Press and release the lower knob without rotating it to step through selection of torch type followed by lead length.

Up to 35' Lead (10.7 m)

Above 35' to 50' Lead (15.2 m)

Above 50' to 75' Lead (22.9 m)

Above 75' to 100' Lead (30.5 m)

NOTE!
If you have gone past the desired setting, you will need to continue to step through all the other torch types and lengths to get back to return to it..

16. Upper Knob - Amp and Mode Selector

Rotate knob to increase or decrease amperage. Indicator A is ON when numeric display is showing amperage output.

Press and release knob without turning to step through the different Modes.

Factory default: On

Numeric display 60 A

17. Torch Quick Disconnect Receptacle

Torch Leads are connected here by aligning the connectors, pressing in and turning locking ring clockwise-to-the-right to secure. Connection should only be snug with no tools used.

18. Work Lead Dinse type receptacle

Align Dinse type connector on work lead with receptacle, press in and turn clockwise to the right until tight.

4.02 Preparations for Operation

At the start of each operating session:

WARNING
Disconnect primary power at the source before assembling or disassembling power supply, torch parts, or torch and leads assemblies.

Torch Parts Selection

Check the torch for proper assembly and appropriate torch parts. The torch parts must correspond with the type of operation, and with the amperage output of this Power Supply (60 amps maximum). Refer to Section 4T.07 and following for torch parts selection.

Torch Connection

Check that the torch is properly connected. Only Thermal Dynamics models SL60, SL60QD™ / Manual or SL100 / Mechanical Torches may be connected to this Power Supply. See Section 3T of this manual.

Check Primary Input Power Source

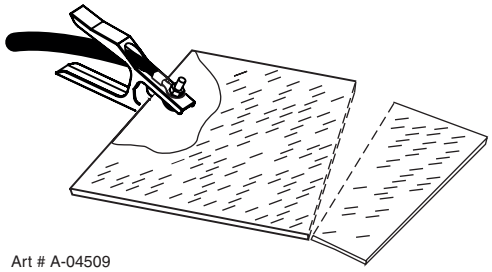
1. Check the power source for proper input voltage. Make sure the input power source meets the power requirements for the unit per Section 2, Specifications.
2. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

Air or Argon Source

Ensure source meets requirements (refer to Section 2). Check connections and turn air or argon supply ON.

Connect Work Cable

Clamp the work cable to the workpiece or cutting table. The area must be free from oil, paint and rust. Connect only to the main part of the workpiece; do not connect to the part to be cut off.



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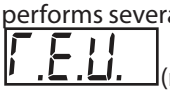
Power ON

Place the Power Supply ON / OFF switch to the ON (right) position. AC indicator ~ turns ON. The Control Board performs several tests to determine the system is ready to operate. During the self-tests the digital display first shows 

(revision) followed by the firmware revision number which includes decimals. 1.1.0 is an example of a production released code revision that may be displayed.

Next displayed is the "checksum" a combination of letters and numbers that are unique to the firmware revision. These are used by service personal to determine if the firmware has been corrupted.

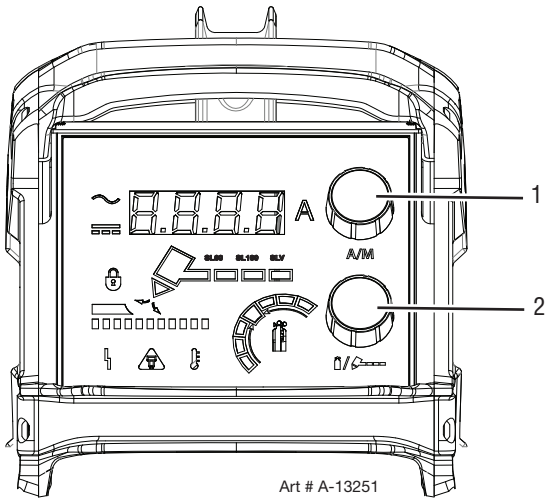
If there are no issues detected the output current setting will be displayed with the letter "A" to the right, showing the output current setting. Should a problem be detected the fault code in the format Exxx will display and the "A" will not be illuminated. Refer to Section 5.04 for fault code explanations.

Gas indicator turns ON if there is sufficient gas pressure for power supply operation and the cooling fan turns ON. (90 - 125 PSI / 6.2 - 8.6 bar)

NOTE!
Minimum pressure for power supply operation is lower than minimum for torch operation.

The cooling fan will turn ON as soon as the unit is turned ON. After a short amount of time the fan switches to low speed. The fan will return to high speed as soon as the torch switch (Start Signal) is activated or if the unit is turned OFF, then turned ON again. If an over temperature condition occurs, the fan will continue to run at high speed while the condition exists and for a five (5) minute period once the condition is cleared.

Select Cutting Mode



1. Press and release the upper knob without turning to enter the mode selection menu. Place the system in one of the four cutting modes available by pressing and releasing the knob until you reach the desired mode.:

RUN

LATCH .

RAPID AUTO RESTART

GOUGE

SET/PURGE (gas flow only)

MARKING

2. After selecting the cutting mode, set the output current by turning the knob.

Set Torch Parameters

1. Press and release the bottom knob without rotating to enter the torch type and leads length selections.

Set Operating Pressure

NOTE!
Before the gas pressure is set, the torch type, leads length, type of cutting and amperage should all be set as they will affect the pressures required. If any of those are changed, the pressure should be checked again to make sure it is optimized.

1. Gas pressure must be set in the cutting mode to be used, not in the SET/PURGE mode. Each mode may require a different pressure for optimal cutting. (90 - 125 PSI / 6.2 - 8.6 bar)

2. Set the gas pressure/flow using the lower knob, 2. Changes will show on the Gas Pressure Interlock The green indicator in the center is the ideal setting. Each indicator when lit separately is equal to 5 lbs. from the segment next to it. Each will show 5, 10 or 15 lbs or more below or above the ideal. When two segments are illuminated together then the change is half as much or 2.5 lbs.. The pressure settings will all be affected by the other settings for torch, torch length and type of cutting and will require adjustments to the pressure setting.

Cutting Operation

When the torch leaves the workpiece during cutting operations in the RUN mode, there is a brief delay in restarting the pilot arc. With the system in the RAPID AUTO RESTART mode, when the torch leaves the workpiece the pilot arc restarts instantly, and the cutting arc restarts instantly when the pilot arc contacts the workpiece. (Use the 'Rapid Auto Restart' mode when cutting expanded metal or gratings, or trimming operations when an uninterrupted restart is desired).

With the system in the LATCH mode the main cutting arc will be maintained after the torch switch is released. To exit or cancel the LATCH mode, press and release the trigger again or lift the torch from the cutting surface so the arc goes out.

Typical Cutting Speeds

Cutting speeds vary according to torch output amperage, the type of material being cut, and operator skill. Refer to Section "4T.08 Recommended Cutting Speeds for Mechanized Torch With Exposed Tip" and following for greater details.

Output current setting or cutting speeds may be reduced to allow slower cutting when following a line, or using a template or cutting guide while still producing cuts of excellent quality.

Postflow

Release the trigger to stop the cutting arc. Gas continues to flow for approximately 20 seconds. During post - flow, if the user moves the trigger release to the rear and presses the trigger, the pilot arc starts. The main arc transfers to the workpiece if the torch tip is within transfer distance to the workpiece.

Shutdown

Turn the ON / OFF switch to OFF, to the left as you face the unit from the rear. After a short delay all Power Supply indicators and fan shut OFF. Unplug the input power cord or disconnect input power. Power is removed from the system.

NOTE!
To maximize the longevity of the internal electronics, allow the power supply to continue running (without cutting) until the cooling fan speed changes to slow.. This may take a few minutes

4.03 Marking

Gas Type

1. The first thing you will want to do is determine which type of gas to use. When marking, you will use either air or argon and they both have their advantages and disadvantages. This chart helps to make the best choice.

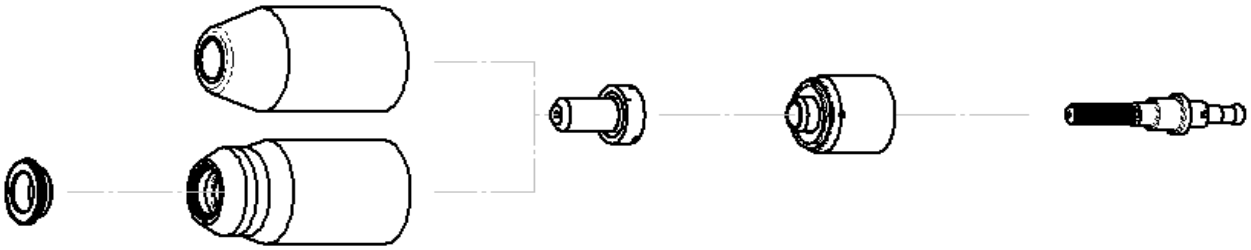
MARKING	Air	Argon
Advantage	•Lower Cost •Excellent process overall •No or little slag on mild steel	•Low heat imput which reduces the risk of deformation •High contrast
Disadvantage	•High heat input. Can be a problem for thin material •Edges may be jagged when used on aluminum •Wider markings and more dross than argon	•Higher cost than air. •When heavy scoring is needed there is more slag on mild steel

Marking Samples at 10 Amps and 0.100" / 2.5mm Standoff.

Marking with Air:

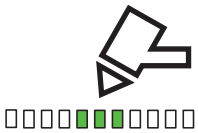
Marking with Argon:

2. Place the proper consumables in the torch for marking.



Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8241	9-8237	9-8225	9-8213	9-8215

Gas Used	Amperage	Torch Working Height (in)	Travel Speed (ipm)	Pierce Delay (sec)	Marking Density
Air	10	0.100	100	0	Heavy
Air	10	0.100	150	0	Medium
Air	10	0.100	200	0	Light
Argon	15	0.100	100	0	Heavy
Argon	15	0.100	150	0	Medium
Argon	15	0.100	200	0	Light



3. Set the power supply mode to Marking.
4. Set the current level to less than 20 amps.

Begin marking.

Types of Marking

Light Marking:

This will consist of lines that are clean, thin and with very little depth and no slag. This type of marking can usually be removed with secondary operations and are not as long lasting.

Heavy Marking/Scoring:

This type of marking will have deeper heavier lines that are long lasting. There can be a little slag associated with this type of marking.

Dimple Marking:

This consists of a series of dots or small circles to create lines. The look of the mark will vary depending on amperage, gas and dwell time.

SECTION 4 TORCH: OPERATION

4T.01 Machine and Automated Torch Operation

Cutting With Machine or Automated Torch

These torches are activated by remote control pendant or by a remote interface device such as CNC.

1. To start a cut at the plate edge, position the center of the torch along the edge of the plate.

Travel Speed

Proper travel speed is indicated by the trail of the arc which is seen below the plate. The arc can be one of the following:

1. Straight Arc

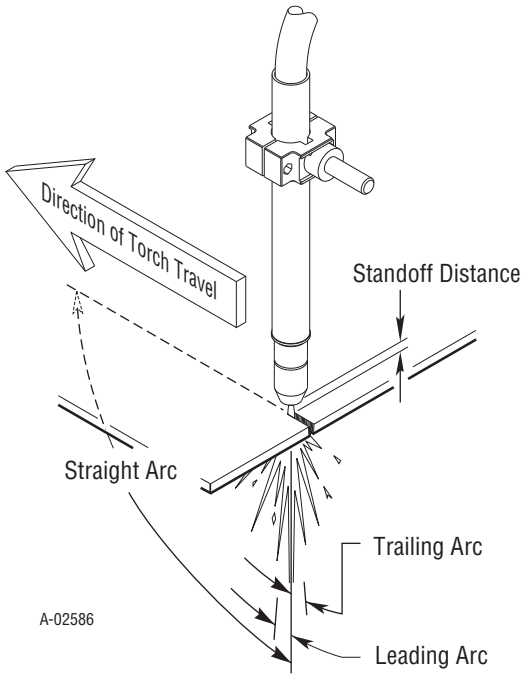
A straight arc is perpendicular to the workpiece surface. This arc is generally recommended for the best cut using air plasma on stainless or aluminum.

2. Leading Arc

The leading arc is directed in the same direction as torch travel. A five degree leading arc is generally recommended for air plasma on mild steel.

3. Trailing Arc

The trailing arc is directed in the opposite direction as torch travel.



Automation and Machine Torch Operation

For optimum smooth surface quality, the travel speed should be adjusted so that only the leading edge of the arc column produces the cut. If the travel speed is too slow, a rough cut will be produced as the arc moves from side to side in search of metal for transfer.

Travel speed also affects the bevel angle of a cut. When cutting in a circle or around a corner, slowing down the travel speed will result in a squarer cut. The power source output should be reduced also. Refer to the appropriate Control Module Operating Manual for any Corner Slowdown adjustments that may be required.

Piercing With Machine or Automated Torch

To pierce, the arc should be started with the torch positioned as high as possible above the plate while allowing the arc to transfer and pierce. This standoff helps avoid having molten metal blow back onto the front end of the torch.

When operating with a cutting machine, a pierce or dwell time is required. Torch travel should not be enabled until the arc penetrates the bottom of the plate. As motion begins, torch standoff should be reduced to the recommended 1/8 - 1/4 inch (3-6 mm) distance for optimum speed and cut quality. Clean spatter and scale from the shield cup and the tip as soon as possible. Spraying or dipping the shield cup in anti - spatter compound will minimize the amount of scale which adheres to it.

4T.02 Automation Torch Parts Selection

Check the torch for proper consumable parts. The parts supplied in the torch may not be correct for the operator's chosen amperage level. The torch parts must correspond with the type of operation.

Torch parts:

Shield Cup, Cutting Tip, Electrode and Starter Cartridge

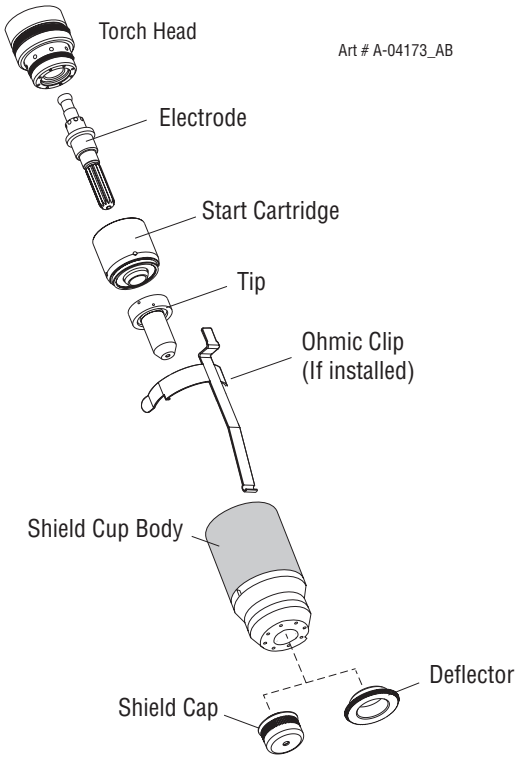
NOTE!
Refer to Section 4T.07 and following for additional information on torch parts.

Change the torch parts for a different operation as follows:

WARNING
Disconnect primary power at the source before assembling or disassembling torch parts, or torch and leads assemblies.

NOTE!
The shield cup holds the tip and start cartridge in place. Position the torch with the shield cup facing upward to keep these parts from falling out when the cup is removed.

1. If attached, remove the ohmic clip then unscrew and remove the shield cup assembly from the torch head. Wipe it clean or replace if damaged
2. Remove the Electrode by pulling it straight out of the Torch Head.



Automation Torch Parts

3. Install the replacement Electrode by pushing it straight into the torch head until it clicks.
4. Install the starter cartridge and desired tip for the operation into the torch head.
5. Hand tighten the shield cup assembly until it is seated on the torch head. If resistance is felt when installing the cup, check the threads before proceeding
6. If used, attach the ohmic clip to the shield cup.

4T.03 Machine and Hand Torch Parts Selection

Depending on the type of operation to be done determines the torch parts to be used.

Type of operation:

Drag cutting, standoff cutting or gouging

Torch parts:

Shield Cup, Cutting Tip, Electrode and Starter Cartridge

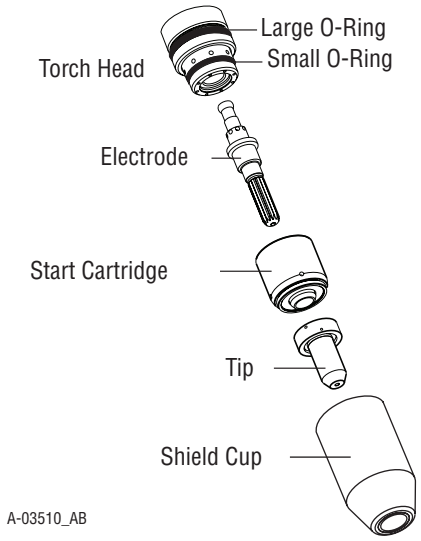
NOTE!
Refer to Section 4T.08 and following for additional information on torch parts..

Change the torch parts for a different operation as follows:

WARNING
Disconnect primary power at the source before assembling or disassembling torch parts, or torch and leads assemblies.

NOTE!
The shield cup holds the tip and start cartridge in place. Position the torch with the shield cup facing upward to keep these parts from falling out when the cup is removed.

1. Unscrew and remove the shield cup assembly from the torch head.
2. Remove the Electrode by pulling it straight out of the Torch Head.



Torch Parts (Drag Shield Cap & Shield Cup Body

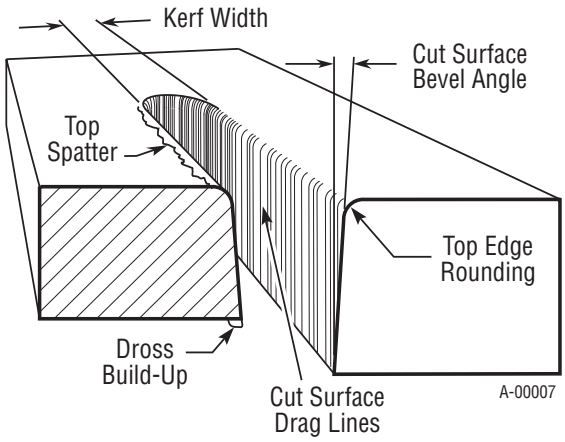
Shown)

3. Install the replacement Electrode by pushing it straight into the torch head until it clicks.
4. Install the starter cartridge and desired tip for the operation into the torch head.
5. Hand tighten the shield cup assembly until it is seated on the torch head. If resistance is felt when installing the cup, check the threads before proceeding.

4T.04 Cut Quality

NOTE!
Cut quality depends heavily on setup and parameters such as torch standoff, alignment with the workpiece, cutting speed, gas pressures, and operator ability.

Cut quality requirements differ depending on application. For instance, nitride build - up and bevel angle may be major factors when the surface will be welded after cutting. Dross - free cutting is important when finish cut quality is desired to avoid a secondary cleaning operation. The following cut quality characteristics are illustrated in the following figure:



Cut Quality Characteristics

Cut Surface

The desired or specified condition (smooth or rough) of the face of the cut.

Nitride Build - Up

Nitride deposits can be left on the surface of the cut when nitrogen is present in the plasma gas stream. These buildups may create difficulties if the material is to be welded after the cutting process.

Bevel Angle

The angle between the surface of the cut edge and a plane perpendicular to the surface of the plate. A perfectly perpendicular cut would result in a 0° bevel angle.

Top - Edge Rounding

Rounding on the top edge of a cut due to wearing from the initial contact of the plasma arc on the workpiece.

Bottom Dross Buildup

Molten material which is not blown out of the cut area and resolidifies on the plate. Excessive dross may require secondary cleanup operations after cutting.

Kerf Width

The width of the cut (or the width of material removed during the cut).

Top Spatter (Dross)

Top spatter or dross on the top of the cut caused by slow travel speed, excess cutting height, or cutting tip whose orifice has become elongated.

4T.05 General Cutting Information

WARNING
Disconnect primary power at the source before assembling or disassembling the power supply, torch parts, or torch and leads assemblies. Frequently review the Important Safety Precautions at the front of this manual. Be sure the operator is equipped with proper gloves, clothing, eye and ear protection. Make sure no part of the operator's body comes into contact with the workpiece while the torch is activated.

CAUTION
Sparks from the cutting process can cause damage to coated, painted, and other surfaces such as glass, plastic and metal.

NOTE!
ForHandle torch leads with care and protect them from damage..

Piloting

Piloting is harder on parts life than actual cutting because the pilot arc is directed from the electrode to the tip rather than to a workpiece. Whenever possible, avoid excessive pilot arc time to improve parts life.

Torch Standoff

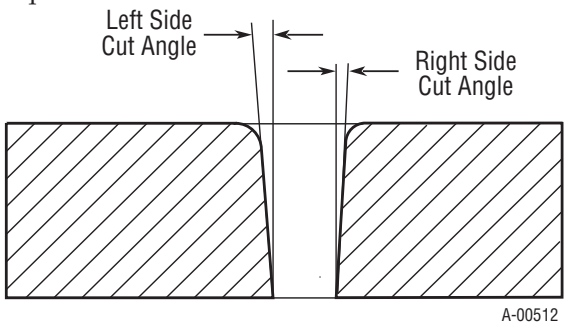
Improper standoff (the distance between the torch tip and workpiece) can adversely affect tip life as well as shield cup life. Standoff may also significantly affect the bevel angle. Reducing standoff will generally result in a more square cut.

Edge Starting

For edge starts, hold the torch perpendicular to the workpiece with the front of the tip near (not touching) the edge of the workpiece at the point where the cut is to start. When starting at the edge of the plate, do not pause at the edge and force the arc to "reach" for the edge of the metal. Establish the cutting arc as quickly as possible.

Direction of Cut

In the torches, the plasma gas stream swirls as it leaves the torch to maintain a smooth column of gas. This swirl effect results in one side of a cut being more square than the other. Viewed along the direction of travel, the right side of the cut is more square than the left.



Side Characteristics Of Cut

To make a square - edged cut along an inside diameter of a circle, the torch should move counterclockwise around the circle. To keep the square edge along an outside diameter cut, the torch should travel in a clockwise direction.

Dross

When dross is present on carbon steel, it is commonly referred to as either "high speed, slow speed, or top dross". Dross present on top of the plate is normally caused by too great a torch to plate distance. "Top dross" is normally very easy to remove and can often be wiped off with a welding glove. "Slow speed dross" is normally present on the bottom edge of the plate. It can vary from a light to

heavy bead, but does not adhere tightly to the cut edge, and can be easily scraped off. "High speed dross" usually forms a narrow bead along the bottom of the cut edge and is very difficult to remove. When cutting a troublesome steel, it is sometimes useful to reduce the cutting speed to produce "slow speed dross". Any resultant cleanup can be accomplished by scraping, not grinding.

4T.06 Hand Torch Operation

Standoff Cutting With Hand Torch

NOTE!
For best performance and parts life, always use the correct parts for the type of operation.

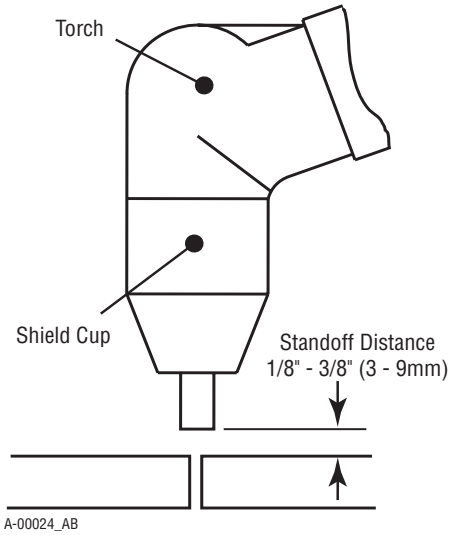
1. The torch can be comfortably held in one hand or steadied with two hands. Position the hand to press the Trigger on the torch handle. With the hand torch, the hand may be positioned close to the torch head for maximum control or near the back end for maximum heat protection. Choose the holding technique that feels most comfortable and allows good control and movement.

NOTE!
The tip should never come in contact with the workpiece except during drag cutting operations.

2. Depending on the cutting operation, do one of the following:

   a. For **edge starts**, hold the torch perpendicular to the workpiece with the front of the tip on the edge of the workpiece at the point where the cut is to start.

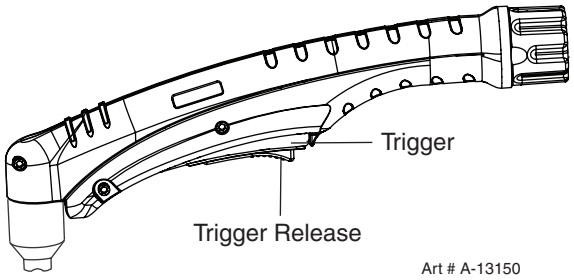
   b. For **standoff cutting,** hold the torch 1/8 - 3/8 in (3-9 mm) from the workpiece as shown below.



Standoff Distance

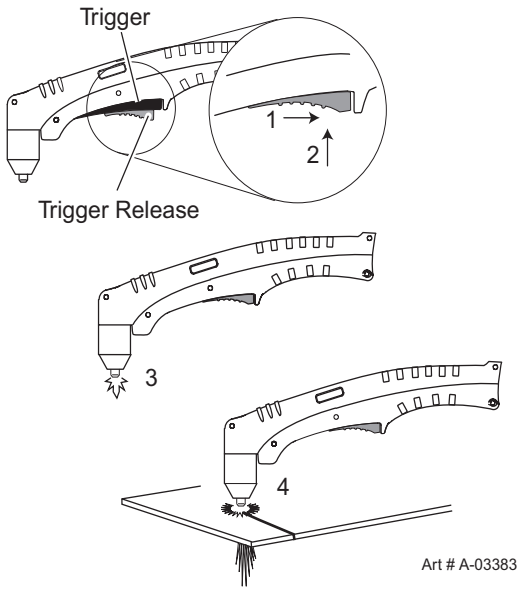
3. Hold the torch away from your body.

4. Slide the trigger release toward the back of the torch handle while simultaneously squeezing the trigger. The pilot arc will start.



5. Bring the torch within transfer distance to the work. The main arc will transfer to the work, and the pilot arc will shut off.

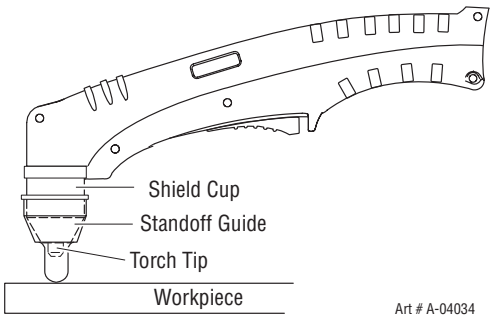
NOTE!
The gas preflow and postflow are a characteristic of the power supply and not a function of the torch.



6. Cut as usual. Simply release the trigger assembly to stop cutting.
7. Follow normal recommended cutting practices as provided in the power supply operator's manual.

NOTE!
When the shield cup is properly installed, there is a slight gap between the shield cup and the torch handle. Gas vents through this gap as part of normal operation. Do not attempt to force the shield cup to close this gap. Forcing the shield cup against the torch head or torch handle can damage components.

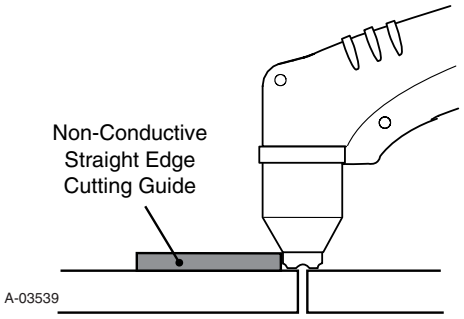
8. For a consistent standoff height from the workpiece, install the standoff guide by sliding it onto the torch shield cup. Install the guide with the legs at the sides of the shield cup body to maintain good visibility of the cutting arc. During operation, position the legs of the standoff guide against the workpiece.



Shield Cup With Straight Edge

The drag shield cup can be used with a non conductive straight edge to make straight cuts by hand.

WARNING
The straight edge must be non - conductive.



Using Drag Shield Cup With Straight Edge

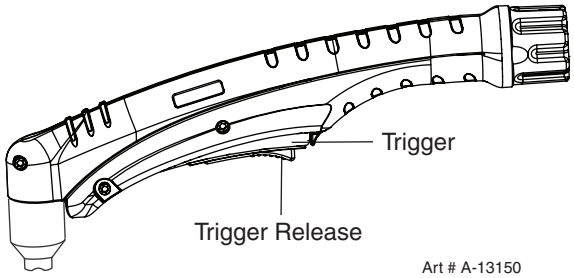
The crown shield cup functions best when cutting 3/16 inch (4.7 mm) solid metal with relatively smooth surface.

Drag Cutting With a Hand Torch

Drag cutting works best on metal 1/4" (6 mm) thick or less.

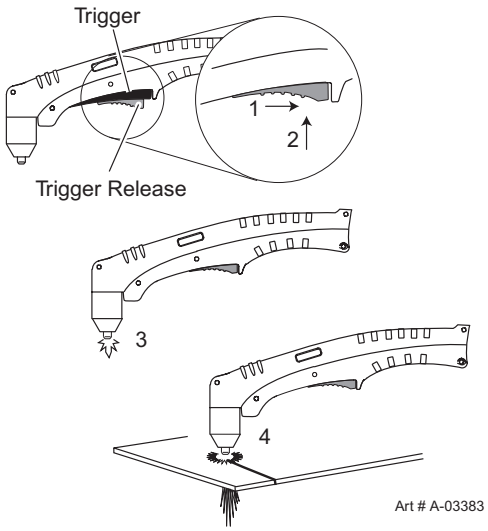
NOTE!
For best performance and parts life, always use the correct parts for the type of operation.

1. Install the drag cutting tip and set the output current.
2. The torch can be comfortably held in one hand or steadied with two hands. Position the hand to press the Trigger on the torch handle. With the hand torch, the hand may be positioned close to the torch head for maximum control or near the back end for maximum heat protection. Choose the holding technique that feels most comfortable and allows good control and movement.
4. Keep the torch in contact with the workpiece during the cutting cycle.
5. Hold the torch away from your body.
6. Slide the trigger release toward the back of the torch handle while simultaneously squeezing the trigger. The pilot arc will start.



7. Bring the torch within transfer distance to the work. The main arc will transfer to the work, and the pilot arc will shut off.

NOTE!
The gas preflow and postflow are a characteristic of the power supply and not a function of the torch.



8. Cut as usual. Simply release the trigger assembly to stop cutting.
9. Follow normal recommended cutting practices as provided in the power supply operator's manual.

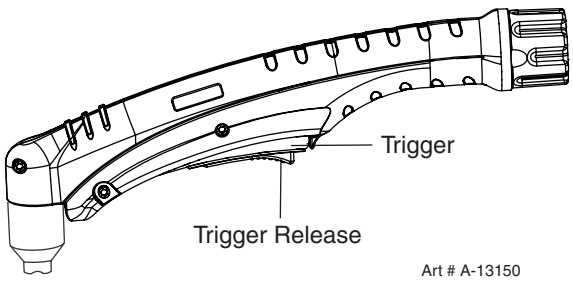
NOTE!
When the shield cup is properly installed, there is a slight gap between the shield cup and the torch handle. Gas vents through this gap as part of normal operation. Do not attempt to force the shield cup to close this gap. Forcing the shield cup against the torch head or torch handle can damage components.

Piercing With Hand Torch

1. The torch can be comfortably held in one hand or steadied with two hands. Position the hand to press the Trigger on the torch handle. With the hand torch, the hand may be positioned close to the torch head for maximum control or near the back end for maximum heat protection. Choose the technique that feels most comfortable and allows good control and movement.

NOTE!
The tip should never come in contact with the workpiece except during drag cutting operations.

2. Angle the torch slightly to direct blowback particles away from the torch tip (and operator) rather than directly back into it until the pierce is complete.
3. In a portion of the unwanted metal start the pierce off the cutting line and then continue the cut onto the line. Hold the torch perpendicular to the workpiece after the pierce is complete.
4. Hold the torch away from your body.
5. Slide the trigger release toward the back of the torch handle while simultaneously squeezing the trigger. The pilot arc will start.



6. Bring the torch within transfer distance to the work. The main arc will transfer to the work, and the pilot arc will shut off.

NOTE!
The gas preflow and postflow are a characteristic of the power supply and not a function of the torch.

NOTE!
The gas preflow and postflow are a characteristic of the power supply and not a function of the torch.
When the shield cup is properly installed, there is a slight gap between the shield cup and the torch handle. Gas vents through this gap as part of normal operation. Do not attempt to force the shield cup to close this gap. Forcing the shield cup against the torch head or torch handle can damage components.

7. Clean spatter and scale from the shield cup and the tip as soon as possible. Spraying the shield cup in anti - spatter compound will minimize the amount of scale which adheres to it.

Cutting speed depends on material, thickness, and the operator's ability to accurately follow the desired cut line. The following factors may have an impact on system performance:

- Torch parts wear
- Air quality
- Line voltage fluctuations
- Torch standoff height
- Proper work cable connection

4T.07 Gouging

WARNING
Be sure the operator is equipped with proper gloves, clothing, eye and ear protection and that all safety precautions at the front of this manual have been followed. Make sure no part of the operator's body comes in contact with the workpiece when the torch is activated.
Disconnect primary power to the system before disassembling the torch, leads, or power supply.

CAUTION
Sparks from the cutting process can cause damage to coated, painted, and other surfaces such as glass, plastic and metal.
Check torch parts. The torch parts must correspond with the type of operation. Refer to Section 4T.09, Torch Parts Selection.

Gouging Parameters

Gouging performance depends on parameters such as torch travel speed, current level, lead angle (the angle between the torch and workpiece), and the distance between the torch tip and workpiece (standoff).

CAUTION
Touching the torch tip or shield cup to the work surface will cause excessive parts wear..

Torch Travel Speed

NOTE!
Refer to Appendix Pages for additional information as related to the Power Supply used..

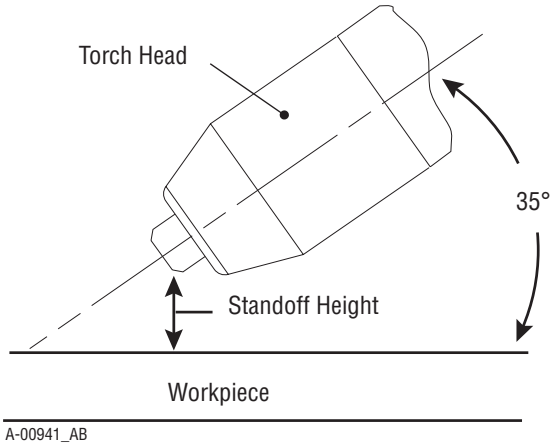
Optimum torch travel speed is dependent on current setting, lead angle, and mode of operation (hand or machine torch).

Current Setting

Current settings depend on torch travel speed, mode of operation (hand or machine torch), and the amount of material to be removed.

Lead Angle

The angle between the torch and workpiece depends on the output current setting and torch travel speed. The recommended lead angle is 35°. At a lead angle greater than 45° the molten metal will not be blown out of the gouge and may be blown back onto the torch. If the lead angle is too small (less than 35°), less material may be removed, requiring more passes. In some applications, such as removing welds or working with light metal, this may be desirable.



Gouging Angle and Standoff Distance

Standoff Distance

The tip to work distance affects gouge quality and depth. Standoff distance of 1/8 - 1/4 inch (3 - 6 mm) allows for smooth, consistent metal removal. Smaller standoff distances may result in a severance cut rather than a gouge. Standoff distances greater than 1/4 inch (6 mm) may result in minimal metal removal or loss of transferred main arc.

Slag Buildup

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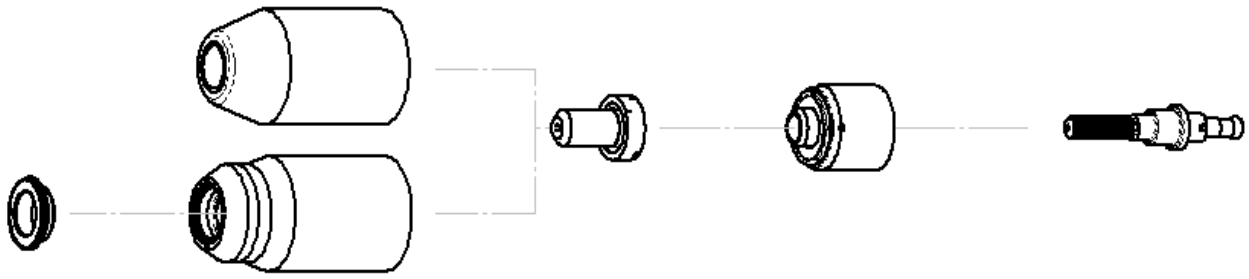
Slag generated by gouging on materials such as carbon and stainless steels, nickels, and alloyed steels, can be removed easily in most cases. Slag does not obstruct the gouging process if it accumulates to the side of the gouge path. However, slag build - up can cause inconsistencies and irregular metal removal if large amounts of material build up in front of the arc. The build - up is most often a result of improper travel speed, lead angle, or standoff height.

4T.08 Recommended Cutting Speeds for Machine and Automated Torches With Exposed Tip

Mild Steel
40A
Air Plasma / Air Shield



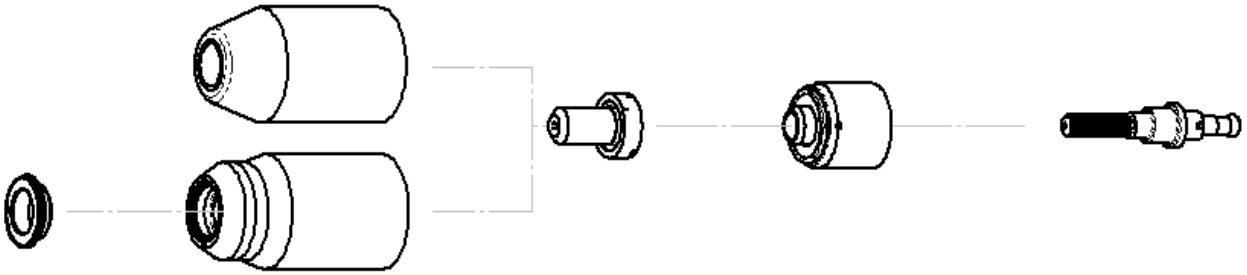
Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8243	9-8218 9-8237	9-8208	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
20		0.036	70 (25') 75 (50')	101	0.14	160	0.18	0.0	0.05
16		0.060		103	0.14	140	0.18	0.0	0.05
14		0.075		105	0.14	120	0.18	0.1	0.06
12		0.105		108	0.14	80	0.18	0.2	0.06
10		0.135		110	0.14	60	0.18	0.3	0.06
	3/16	0.188		111	0.14	55	0.18	0.4	0.06
	1/4	0.250		117	0.14	40	0.18	0.5	0.07
	3/8	0.375		119	0.14	25	0.18	1.2	0.07
	1/2	**0.500**		**120**	**0.14**	**15**	**0.2**	**2.0**	**0.07**

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	4.8 (7.6m) 5.2 (15.2m)	101	3.6	3990	4.6	0.0	1.1
2		105	3.6	2920	4.6	0.1	1.4
3		109	3.6	1810	4.6	0.3	1.5
4		110	3.6	1470	4.6	0.3	1.6
5		112	3.6	1345	4.6	0.4	1.6
6		116	3.6	1100	4.6	0.5	1.7
8		118	3.6	815	4.6	1.0	1.7
10		119	3.6	595	4.6	1.5	1.8
12		**120**	**3.6**	**435**	**5.1**	**2.0**	**1.8**

BOLD TYPE indicates maximum piercing parameters.

Stainless Steel
40A
Air Plasma / Air Shield



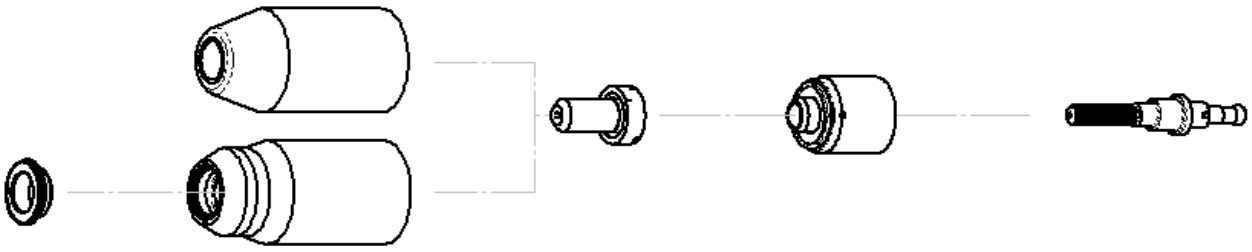
Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8243	9-8218 9-8237	9-8208	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
18		0.050	75 (25') 80 (50')	110	0.19	60	0.20	0.00	0.07
16		0.063		100	0.19	50	0.20	0.00	0.07
14		0.078		105	0.19	45	0.20	0.10	0.07
12		0.109		110	0.19	40	0.20	0.20	0.07
10		0.141		108	0.19	35	0.20	0.30	0.07
	3/16	0.188		110	0.19	30	0.20	0.40	0.07
	1/4	0.250		120	0.19	18	0.20	0.50	0.08
	3/8	**0.375**		**126**	**0.19**	**10**	**0.20**	**2.00**	**0.08**
	1/2	0.500		118	0.19	8	Edge start		0.09

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.2 (7.6) 5.5 (15.2)	112	4.8	1670	4.8	0.0	1.7
2		105	4.8	1140	5.1	0.1	1.8
3		109	4.8	980	5.1	0.2	1.8
4		109	4.8	845	5.1	0.3	1.8
5		111	4.8	715	5.1	0.4	1.8
6		118	4.8	525	5.1	0.5	2.0
8		123	4.8	350	5.1	1.5	2.0
10		**125**	**4.8**	**245**	**5.1**	**2.0**	**2.0**
12		120	4.8	215	Edge Start		2.2

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

Aluminum
40A
Air Plasma / Air Shield



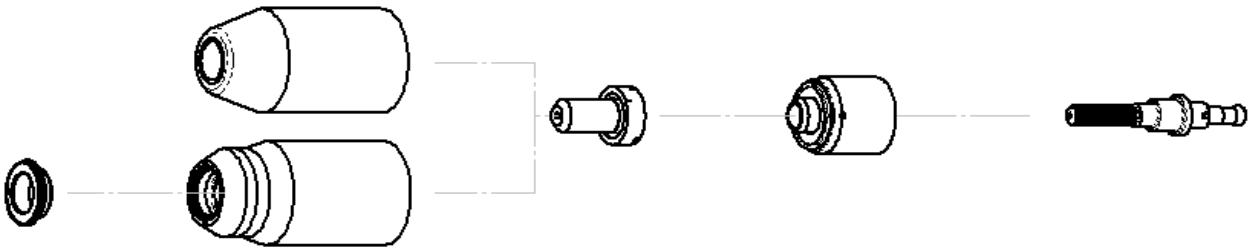
Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8243	9-8218 9-8237	9-8208	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
20		0.040		95	0.16	300	0.16	0.0	0.06
16		0.063		97	0.16	170	0.16	0.0	0.06
12		0.097		113	0.16	100	0.16	0.2	0.07
11		0.125	70 (25')	115	0.16	90	0.18	0.3	0.07
9		0.160	75 (50')	113	0.18	85	0.18	0.4	0.07
	3/16	0.188		116	0.18	75	0.18	0.5	0.07
	1/4	**0.250**		**128**	**0.18**	**30**	**0.18**	**1.0**	**0.08**
	3/8	0.375		150	0.18	10	Edge Start		0.09

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1.0	4.8 (7.6m) 5.2 (15.2m)	95	4.1	7620	4.1	0.0	1.5
2.0		104	4.1	3500	4.1	0.2	1.6
3.0		115	4.1	2350	4.6	0.3	1.7
4.0		113	4.6	2170	4.6	0.4	1.7
5.0		118	4.6	1740	4.6	0.5	1.8
6.0		**125**	**4.6**	**1015**	**4.6**	**0.8**	**1.9**
8.0		139	4.6	500	Edge Start		2.0
10.0		153	4.6	180	Edge Start		2.2

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

Mild Steel
60A
Air Plasma / Air Shield



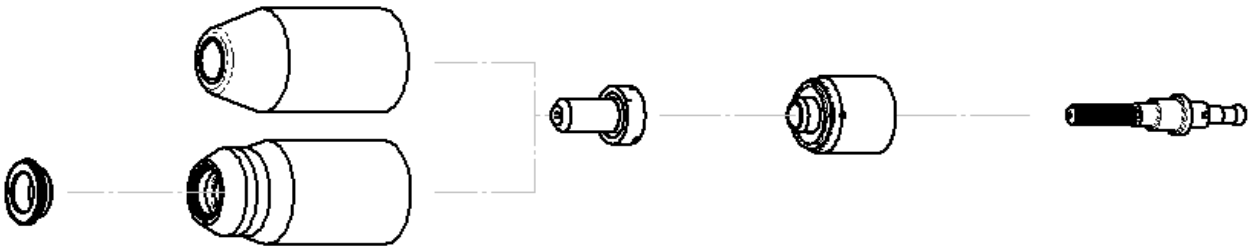
Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8243	9-8218 9-8237	9-8210	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
16		0.060	85 (25') 90 (50')	118	0.19	290	0.19	0.00	0.08
14		0.075		120	0.19	285	0.19	0.10	0.08
11		0.120		118	0.19	180	0.19	0.10	0.08
10		0.135		119	0.19	176	0.19	0.10	0.07
	3/16	0.188		121	0.19	100	0.19	0.20	0.08
	1/4	0.250		122	0.19	80	0.19	0.30	0.08
	3/8	0.375		124	0.19	50	0.19	0.50	0.09
	1/2	**0.500**		**132**	**0.19**	**26**	**0.19**	**0.75**	**0.10**
	5/8	0.625		135	0.19	19	Edge Start		0.10
	3/4	0.750		136	0.19	14	Edge Start		0.08
	1	1.000		150	0.19	6	Edge Start		0.11

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.9 (7.6m) 6.2 (15.2m)	115	4.8	7540	4.8	0	2.1
2		120	4.8	7015	4.0	0.10	1.9
3		118	4.8	4570	4.8	0.10	0.1
4		120	4.8	3650	4.8	0.20	1.9
5		121	4.8	2465	4.8	0.20	2.1
6		122	4.8	2145	4.8	0.30	2.0
8		123	4.8	1635	4.8	0.40	2.2
10		125	4.8	1180	4.8	0.60	2.4
12		**130**	**4.8**	**795**	**4.8**	**0.75**	**2.4**
15		134	4.8	530	Edge Start		2.4
20		138	4.8	325	Edge Start		2.2
25		149	4.8	165	Edge Start		2.7

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

Stainless Steel
60A
Air Plasma / Air Shield



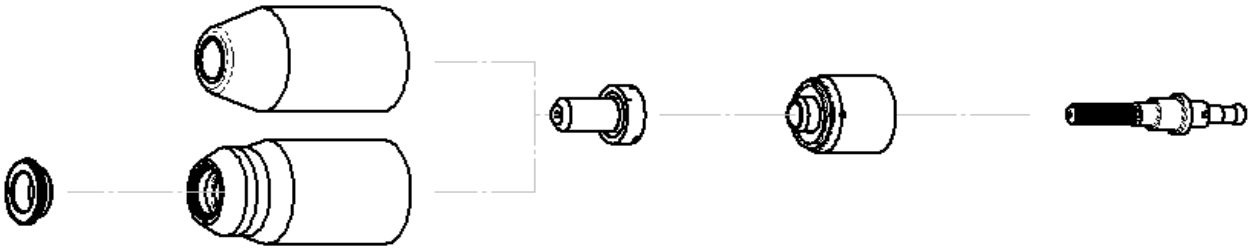
Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8243	9-8218 9-8237	9-8210	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
16		0.063	85 (25') 90 (50')	119	0.19	350	0.20	0.00	0.05
14		0.078		116	0.19	300	0.20	0.10	0.07
11		0.125		123	0.19	150	0.20	0.10	0.07
10		0.141		118	0.19	125	0.20	0.10	0.08
	3/16	0.188		122	0.19	90	0.20	0.20	0.08
	1/4	0.250		123	0.19	65	0.20	0.30	0.09
	3/8	0.375		130	0.19	30	0.20	0.50	0.09
	1/2	**0.500**		**132**	**0.19**	**21**	**0.20**	**0.90**	**0.08**
	5/8	0.625		132	0.19	14	Edge Start		0.11
	3/4	0.750		135	0.19	10	Edge Start		0.10

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.9 (7.6m) 6.2 (15.2m)	124	4.8	10890	5.1	0.00	0.8
2		116	4.8	7560	5.1	0.10	1.7
3		122	4.8	4365	5.1	0.10	1.7
4		119	4.8	2865	5.1	0.20	2.1
5		122	4.8	2195	5.1	0.20	2.1
6		123	4.8	1790	5.1	0.30	2.2
8		127	4.8	1190	5.1	0.40	2.2
10		130	4.8	725	5.1	0.50	2.2
12		**132**	**4.8**	**580**	**5.1**	**0.90**	**2.1**
15		132	4.8	405	Edge Start		2.6
20		136	4.8	230	Edge Start		2.5

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

Aluminum
60A
Air Plasma / Air Shield



Deflector	Standard Shield Cup Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8243	9-8218 9-8237	9-8210	9-8213 9-8277	9-8232

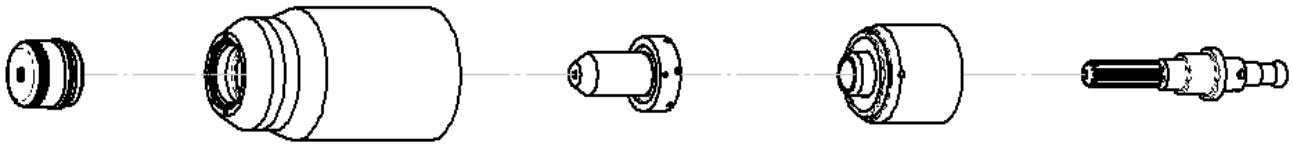
Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
16		0.064	85 (25') 90 (50')	123	0.25	440	0.25	0.00	0.08
14		0.079		126	0.25	300	0.25	0.10	0.09
11		0.120		128	0.25	250	0.25	0.10	0.09
	3/16	0.188		132	0.25	170	0.25	0.20	0.09
	1/4	0.250		132	0.25	85	0.25	0.30	0.09
	3/8	0.375		141	0.25	45	0.25	0.50	0.10
	1/2	**0.500**		**148**	**0.25**	**30**	**0.25**	**0.80**	**0.09**
	5/8	0.625		145	0.19	18	Edge Start		0.08
	3/4	0.750		147	0.19	12	Edge Start		0.10

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.9 (7.6m) 6.2 (15.2m)	118	6.4	17010	6.4	0.00	1.8
2		126	6.4	7680	6.4	0.10	2.3
3		128	6.4	6410	6.4	0.10	2.3
4		130	6.4	5230	6.4	0.20	2.3
5		132	6.4	4010	6.4	0.20	2.4
6		132	6.4	2640	6.4	0.30	2.4
8		137	6.4	1630	6.4	0.40	2.4
10		142	6.4	1085	6.4	0.60	2.4
12		**146**	**6.4**	**845**	**6.4**	**0.70**	**2.3**
15		146	4.8	540	Edge Start		2.1
20		148	4.8	260	Edge Start		2.5

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

4T.09 Recommended Cutting Speeds for Machine and Automated Torches With Shielded Tip

Mild Steel
40A
Air Plasma / Air Shield



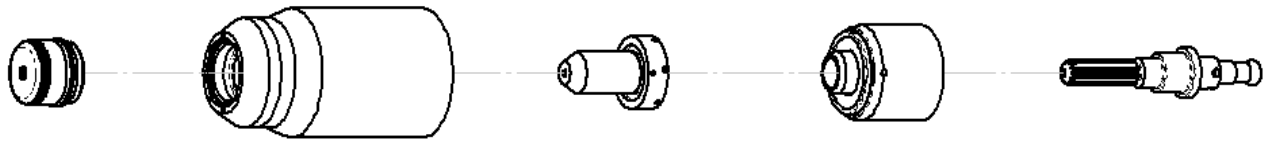
Shield Cap	Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8245	9-8237	9-8208	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
20		0.036	75 (25') 80 (50')	107	0.16	130	0.16	0.0	0.06
16		0.060		113	0.16	120	0.16	0.0	0.06
14		0.075		108	0.16	90	0.16	0.1	0.06
12		0.105		111	0.16	75	0.16	0.2	0.06
10		0.135		114	0.16	65	0.16	0.3	0.07
	3/16	0.188		115	0.16	65	0.16	0.4	0.07
	1/4	0.250		118	0.16	45	0.16	0.5	0.07
	3/8	0.375		123	0.16	23	0.16	1.2	0.08
	1/2	**0.500**		**128**	**0.16**	**18**	**0.16**	**2.0**	**0.08**

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.2 (7.6) 5.5 (15.2)	108	4.1	3266	4.1	0.0	1.4
2		108	4.1	2239	4.1	0.0	1.5
3		112	4.1	1794	4.1	0.1	1.7
4		114	4.1	1651	4.1	0.2	1.7
5		115	4.1	1578	4.1	0.3	1.7
6		117	4.1	1256	4.1	0.4	1.7
8		121	4.1	853	4.1	0.5	1.7
10		124	4.1	565	4.1	1.2	1.8
12		**127**	**4.1**	**485**	**4.1**	**2.0**	**1.9**

BOLD TYPE indicates maximum piercing parameters.

Stainless Steel
40A
Air Plasma / Air Shield



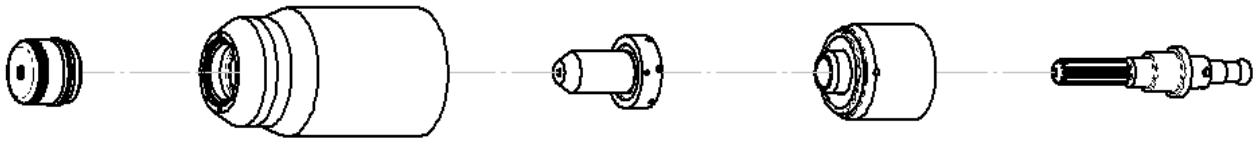
Shield Cap	Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8245	9-8237	9-8208	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
18		0.050	75 (25') 80 (50')	110	0.16	60	0.16	0.0	0.06
16		0.063		108	0.16	50	0.16	0.1	0.07
14		0.078		114	0.16	45	0.16	0.1	0.07
12		0.109		113	0.16	40	0.16	0.2	0.07
10		0.141		116	0.16	35	0.16	0.3	0.07
	3/16	0.188		115	0.16	30	0.16	0.4	0.07
	1/4	0.250		118	0.16	20	0.16	1.2	0.07
	3/8	0.375		125	0.16	15	0.16	1.8	0.08
	1/2	**0.500**		**127**	**0.16**	**10**	0.16	**2.0**	**0.08**

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.2 (7.6) 5.5 (15.2)	109	4.1	1670	4.1	0.0	1.7
2		114	4.1	1140	4.1	0.1	1.8
3		114	4.1	980	4.1	0.2	1.8
4		116	4.1	845	4.1	0.3	1.8
5		115	4.1	725	4.1	0.4	1.8
6		117	4.1	565	4.1	0.5	2.0
8		122	4.1	440	4.1	1.5	2.0
10		125	4.1	360	4.1	1.8	2.0
12		**127**	**4.1**	**280**	**4.1**	**2.0**	**2.2**

BOLD TYPE indicates maximum piercing parameters.

Aluminum
40A
Air Plasma / Air Shield



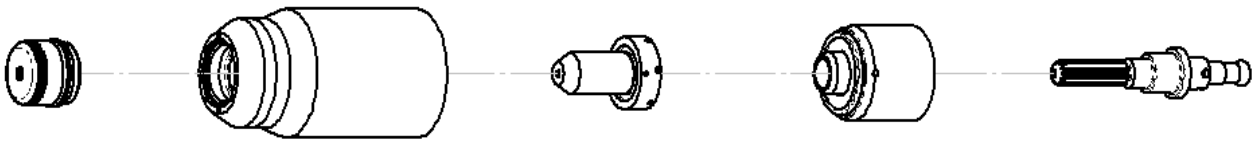
Shield Cap	Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8245	9-8237	9-8208	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
20		0.040	75 (25') 80 (50')	110	0.19	300	0.20	0.0	0.06
16		0.063		113	0.19	170	0.20	0.1	0.07
12		0.097		120	0.19	100	0.20	0.2	0.07
11		0.125		125	0.19	90	0.20	0.3	0.07
9		0.160		126	0.19	85	0.20	0.4	0.07
	3/16	0.188		128	0.19	70	0.20	0.5	0.07
	1/4	0.250		137	0.19	30	0.20	1.0	0.08
	3/8	**0.375**		**145**	**0.19**	**10**	**0.20**	**2.0**	**0.09**

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1.0	5.2 (7.6) 5.5 (15.2)	110	4.8	7660	5.1	0.0	1.6
2.0		116	4.8	3490	5.1	0.2	1.8
3.0		124	4.8	2350	5.1	0.3	1.8
4.0		126	4.8	2170	5.1	0.4	1.8
5.0		129	4.8	1630	5.1	0.6	1.8
6.0		135	4.8	990	5.1	1.0	1.9
8.0		141	4.8	500	5.1	1.6	2.0
10.0		**146**	**4.8**	**180**	**5.1**	**2.1**	**2.3**

BOLD TYPE indicates maximum piercing parameters.

Mild Steel
60A
Air Plasma / Air Shield



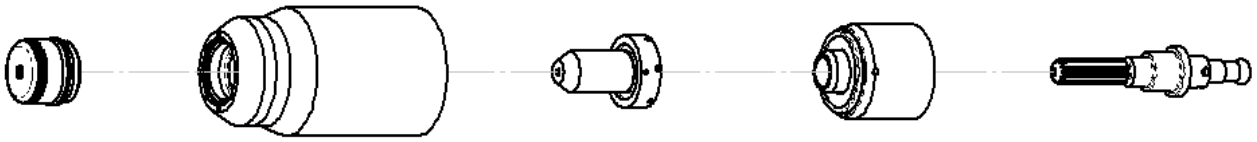
Shield Cap	Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8238	9-8237	9-8210	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
16		0.060	85 (25') 90 (50')	128	0.19	250	0.20	0.00	0.09
14		0.075		129	0.19	237	0.20	0.10	0.09
11		0.120		126	0.19	200	0.20	0.10	0.08
10		0.135		128	0.19	142	0.20	0.10	0.09
	3/16	0.188		132	0.19	115	0.20	0.20	0.09
	1/4	0.250		134	0.19	80	0.20	0.30	0.08
	3/8	0.375		132	0.19	34	0.20	0.70	0.10
	1/2	**0.500**		**144**	**0.19**	**23**	**0.20**	**0.75**	**0.10**
	5/8	0.625		150	0.19	14	Edge Start		0.10
	3/4	0.750		145	0.19	14	Edge Start		0.10
	1	1.000		160	0.19	4	Edge Start		0.12

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.9 (7.6m) 6.2 (15.2m)	127	4.8	6804	5.1	0	2.2
2		129	4.8	5942	5.1	0.10	2.2
3		126	4.8	5080	5.1	0.10	0.1
4		130	4.8	3316	5.1	0.20	2.3
5		132	4.8	2794	5.1	0.20	2.2
6		134	4.8	2230	5.1	0.30	2.1
8		133	4.8	1425	5.1	0.40	2.3
10		134	4.8	822	5.1	0.60	2.5
12		**141**	**4.8**	**646**	**5.1**	**0.75**	**2.5**
15		148	4.8	419	Edge Start		2.6
20		147	4.8	318	Edge Start		2.7
25		159	4.8	118	Edge Start		3.0

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

Stainless Steel
60A
Air Plasma / Air Shield



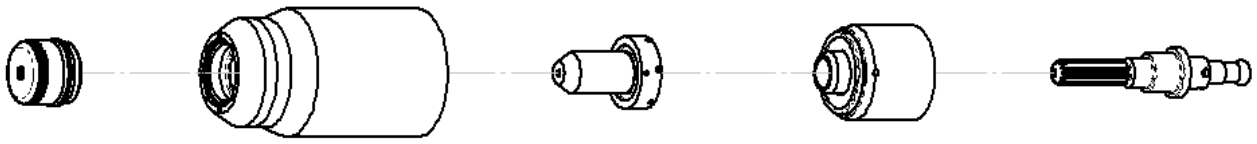
Shield Cap	Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8238	9-8237	9-8210	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
16		0.063	85 (25') 90 (50')	110	0.13	165	0.20	0.00	0.06
14		0.078		116	0.13	155	0.20	0.10	0.07
11		0.125		118	0.13	125	0.20	0.10	0.07
10		0.141		126	0.13	80	0.20	0.10	0.09
	3/16	0.188		125	0.13	75	0.20	0.20	0.09
	1/4	0.250		127	0.13	60	0.20	0.30	0.08
	3/8	0.375		134	0.13	28	0.20	0.50	0.08
	1/2	**0.500**		**136**	**0.19**	**17**	**0.25**	**0.75**	**0.09**
	5/8	0.625		131	0.13	14	Edge Start		0.08
	3/4	0.750		142	0.19	10	Edge Start		0.11

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.9 (7.6m) 6.2 (15.2m)	101	3.3	4590	5.1	0.00	1.2
2		116	3.3	3925	5.1	0.10	1.7
3		118	3.3	3285	5.1	0.10	1.7
4		126	3.3	1985	5.1	0.20	2.2
5		125	3.3	1850	5.1	0.20	2.1
6		127	3.3	1605	5.1	0.30	2.1
8		131	3.3	1100	5.1	0.40	2.1
10		134	3.3	670	5.1	0.50	2.1
12		**136**	**4.8**	**490**	**6.4**	**0.90**	**2.2**
15		132	3.3	375	Edge Start		2.6
20		144	4.8	230	Edge Start		2.5

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

Aluminum
60A
Air Plasma / Air Shield



Shield Cap	Maximum Life Shield Cup	Tip	Starter Cartridge Heavy Duty Starter Cartridge	Electrode
9-8238	9-8237	9-8210	9-8213 9-8277	9-8232

Material Thickness			Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(GA)	(in)	inch	PSI (torch lead length)	Volts	(in)	(ipm)	(in)	(sec)	(in)
16		0.064	85 (25') 90 (50')	118	0.13	350	0.25	0.00	0.07
14		0.079		118	0.13	350	0.25	0.10	0.08
11		0.120		123	0.13	275	0.25	0.10	0.08
	3/16	0.188		125	0.13	140	0.25	0.20	0.08
	1/4	0.250		132	0.13	80	0.25	0.30	0.08
	3/8	0.375		135	0.13	45	0.25	0.50	0.08
	1/2	**0.500**		**140**	**0.13**	**26**	**0.25**	**0.80**	**0.08**
	5/8	0.625		148	0.19	18	Edge start		0.10
	3/4	0.750		155	0.19	12	Edge start		0.11

Material Thickness	Gas Pressure (Air)	Arc Voltage	Torch Working Height	Travel Speed	Initial Piercing Height	Pierce Delay	Kerf Width @ Rec. Speed
(mm)	Bar (torch lead length)	Volts	(mm)	(mm/min)	(mm)	(sec)	(mm)
1	5.9 (7.6m) 6.2 (15.2m)	118	6.4	8890	6.4	0.00	2
2		118	6.4	8890	6.4	0.10	2.0
3		123	6.4	7070	6.4	0.10	2.1
4		124	6.4	5095	6.4	0.20	2.0
5		126	6.4	3335	6.4	0.20	2.0
6		130	6.4	2370	6.4	0.30	2.0
8		134	6.4	1570	6.4	0.40	2.0
10		136	6.4	1070	6.4	0.60	2.0
12		**139**	**6.4**	**765**	**6.4**	**0.70**	**2.0**
15		146	4.8	515	Edge start		2.4
20		157	4.8	260	Edge start		2.7

BOLD TYPE indicates maximum piercing parameters. ***BOLD ITALIC*** indicates edge starts only.

PATENT INFORMATION

Plasma Cutting Torch Patents

The following parts are covered under U.S. and Foreign Patents as follows:

Catalog #	Description	Patent(s)
9-8215	Electrode	US Pat No(s) 6163008; 6987238 Other Pat(s) Pending
9-8232	Electrode	US Pat No(s) 6163008; 6987238 Other Pat(s) Pending
9-8213	Cartridge	US Pat No(s) 6903301; 6717096; 6936786; 6703581; D496842; D511280; D492709; D499620; D504142 Other Pat(s) Pending
9-8205	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8206	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8207	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8252	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8208	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8209	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8210	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8231	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8211	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8212	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8253	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8233	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8225	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8226	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8227	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8228	Tip	US Pat No(s) 6774336; 7145099; 6933461 Other Pat(s) Pending
9-8241	Shield Cap	US Pat No(s) 6914211; D505309 Other Pat(s) Pending
9-8243	Shield Cap	US Pat No(s) 6914211; D493183 Other Pat(s) Pending
9-8235	Shield Cap	US Pat No(s) 6914211; D505309 Other Pat(s) Pending
9-8236	Shield Cap	US Pat No(s) 6914211; D505309 Other Pat(s) Pending
9-8237	Shield Cup	US Pat No(s) 6914211; D501632; D511633 Other Pat(s) Pending
9-8238	Shield Cap	US Pat No(s) 6914211; D496951 Other Pat(s) Pending

Catalog #	Description	Patent(s)
9-8239	Shield Cap	US Pat No(s) 6914211; D496951 Other Pat(s) Pending
9-8244	Shield Cap	US Pat No(s) 6914211; D505309 Other Pat(s) Pending
9-8245	Shield Cap	US Pat No(s) 6914211; D496951 Other Pat(s) Pending

The following parts are also licensed under U.S. Patent No. 5,120,930 and 5,132,512:

Catalog #	Description
9-8235	Shield Cap
9-8236	Shield Cap
9-8237	Shield Cup
9-8238	Shield Cap
9-8239	Shield Cap
9-8244	Shield Cap
9-8245	Shield Cap

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SECTION 5 SYSTEM: SERVICE

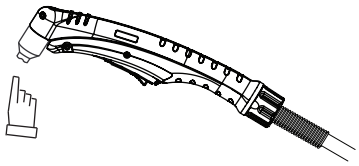
5.01 General Maintenance

Warning!
Disconnect input power before maintaining.

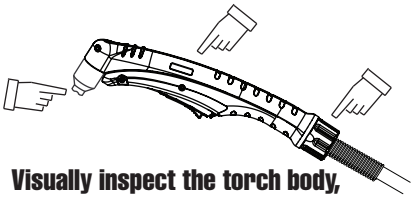
Maintain more often if used under severe conditions

Each Use

Visual check of torch tip and electrode

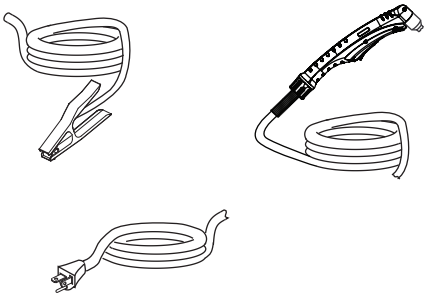


Weekly



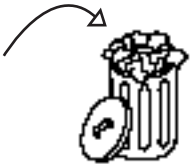
Visually inspect the torch body, consumables and Quick Connect

Visually inspect the cables and leads. Replace as needed

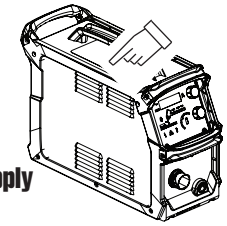


3 Months

Replace all broken parts



Clean exterior of power supply



Art# A-13267

5.02 Maintenance Schedule

NOTE!
The actual frequency of maintenance may need to be adjusted according to the operating environment.

Daily Operational Checks or Every Six Cutting Hours:

1. Check torch consumable parts, replace if damaged or worn.
2. Check plasma and secondary supply and pressure/flow.
3. Purge plasma gas line to remove any moisture build-up.

Weekly or Every 30 Cutting Hours:

1. Check fan for proper operation and adequate air flow.
2. Inspect torch for any cracks or exposed wires, replace if necessary.
3. Inspect input power cable for damage or exposed wires, replace if necessary.

Six Months or Every 720 Cutting Hours:

1. Check the in-line air filter(s), clean or replace as required.
2. Check cables and hoses for leaks or cracks, replace if necessary.

CAUTION
Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

5.03 Common Faults

Problem - Symptom	Common Cause
Insufficient Penetration	1. Cutting speed too fast. 2. Torch tilted too much. 3. Metal too thick. 4. Worn torch parts 5. Cutting current too low. 6. Non - Genuine Thermal Dynamics parts used 7. Incorrect gas pressure
Main Arc Extinguishes	1. Cutting speed too slow. 2. Torch standoff too high from workpiece. 3. Cutting current too high. 4. Work cable disconnected. 5. Worn torch parts. 6. Non - Genuine Thermal Dynamics parts used
Excessive Dross Formation	1. Cutting speed too slow. 2. Torch standoff too high from workpiece. 3. Worn torch parts. 4. Improper cutting current. 5. Non - Genuine Thermal Dynamics parts used 6. Incorrect gas pressure
Short Torch Parts Life	1. Oil or moisture in air source. 2. Exceeding system capability (material too thick). 3. Excessive pilot arc time 4. Gas pressure too low. 5. Improperly assembled torch. 6. Non - Genuine Thermal Dynamics parts used
Difficult Starting	1. Worn torch parts. 2. Non - Genuine Thermal Dynamics parts used. 3. Incorrect gas pressure.

5.04 Fault Indicator

At initial power up, the system goes through a series of self checks before it is ready for use. If during those checks it detects something is not within proper operating parameters, a fault will occur. If that happens the Fault indicator  will light followed by the Error Code  , and number in the digital display.

Error Code Indicator

Indicates when there is something that needs to be adjusted or repaired.

E001, E002, etc. Light up fault indicator also.

Error Code	Description	
E001	Over Temp	Ambient too high, duty cycle exceeded, fan failure or other internal fault.
E002	Input Fault	Input voltage outside the range of the unit or internal fault resulting in low bus voltage.
		1phase / 3phase jumpers J300 on Bias PCB set wrong.
E004	PIP Fault	Parts in Place fault. Shield cup not in place or tight.
E005	PIC Fault	Parts in Contact fault. Missing or worn tip/start cartridge or electrode.
		Inlet pressure exceeds rating causing continuous gas flow.
E009	Fan Fault	Fan failed or disconnected.
E012	Output Fault	Tip to electrode voltage too low. Consumables fail to separate when gas flows, start cartridge stuck, failed power supply, no output or shorted torch body.
E014	Trigger Fault	Torch trigger (start signal) active at start up.
E016	Pressure Fault	Low pressure. Output pressure too low for selected parameters.

5.05 Basic Troubleshooting Guide

WARNING
There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

Problem - Symptom	Possible Cause	Recommended Action
ON / OFF Switch is **ON** but the A/C Indicator does not light	1. Primary power disconnect is in OFF position. 2. Primary fuses / breakers are blown or tripped. 3. Faulty components in unit.	1. Turn primary power disconnect switch to ON position. 2. a) Have qualified person check primary fuses / breakers. b) Connect unit to known good primary power receptacle 3. Return to authorized service center for repair or replacement.
Fault indicator flashing, Error Code E002	1. Primary input voltage problem. 2. Faulty components in unit.	1. Have qualified person check primary voltage to insure it meets unit requirements see Section "2.05 Input Wiring Specifications" on page 2-3. 2. Return to authorized service center for repair or replacement.
TEMPERATURE indicator **ON**. FAULT indicator flashing. Error Code E001	1. Air flow through or around the unit is obstructed. 2. Duty cycle of the unit has been exceeded. 3. Failed components in unit.	1. Refer to clearance information – see Section "2.04 Power Supply Specifications" on page 2-2 2. Allow unit to cool. 3. Return to authorized service center for repair or replacement.
GAS LED **OFF**, FAULT and MIN pressure indicators flashing. Error Code E016	1. Gas supply not connected to unit. 2. Gas supply not turned **ON**. 3. Gas supply pressure too low. 4. Failed components in unit.	1. Connect gas supply to unit. 2. Turn gas supply **ON**. 3. Set air supply inlet pressure to unit to 120 psi. 4. Return to authorized service center for repair or replacement.
FAULT and indicators flashing. Error Code E004	1. Shield Cup loose. 2. Torch not properly connected to power supply. 3. Problem in torch and leads PIP circuit. 4. Failed components in unit.	1. Hand tighten the shield cup until it is snug. 2. Insure torch ATC is securely fastened to unit. 3. Replace torch and leads or return to authorized service center for repair or replacement. 4. Return to authorized service center for repair or replacement.
FAULT and indicators flashing. Error Code E014	1. Start signal is active when ON/OFF SWITCH is turned to ON position. 2. Problem in the torch and leads switch circuit. 3. Failed components in unit.	1. Start can be active for one of the following: • Hand torch switch held closed • Hand pendant switch held closed • CNC START signal is active low Release the START signal source 2. Replace torch and leads or return to authorized service center for repair or replacement. 3. Return to authorized service center for repair or replacement.

Problem - Symptom	Possible Cause	Recommended Action
FAULT indicators flashing. Gas flow is cycling ON and OFF. Error code E005	1. Torch shield cup is loose. 2. Torch tip, electrode or starter cartridge missing. 3. Torch start cartridge is stuck. 4. Unit inlet gas pressure is too high causing continuous gas flow. 5. Open conductor in torch leads. 6. Problem in the torch and leads switch circuit. 7. Failed components in unit.	1. Tighten shield cup by hand. Do not overtighten. 2. Turn OFF power supply. Remove shield cup. Install missing parts. 3. Turn OFF power supply. Bleed down system pressure. Remove shield cup, tip and start cartridge. Check start cartridge lower end fitting for free movement. Replace if fitting does not move freely. 4. Decrease gas supply pressure to 125 PSI or less. 5. Replace torch and leads or return to authorized service center for repair or replacement. 6. Replace torch and leads or return to authorized service center for repair or replacement. 7. Return to authorized service center for repair or replacement.
Nothing happens when torch switch or remote switch is closed (Or CNC START signal is active) No gas flow, DC LED OFF.	1. Problem in the torch and leads switch circuit (Remote pendant switch circuit). 2. CNC Controller device not providing Start signal. 3. Failed components in unit.	1. Take Torch and Leads (Remote Pendant) to Authorized Repair Facility. 2. Contact Controller manufacturer. 3. Return to authorized service center for repair or replacement.
FAULT indicators flashing. Error code E012	1. Upper O-ring on torch head is in wrong position. 2. Torch starter cartridge is stuck. 3. Worn or faulty torch parts. 4. Shorted Torch.	1. Remove shield cup from torch; check upper O-ring position; correct if necessary. 2. Turn OFF power supply. Bleed down system pressure. Remove shield cup, tip and starter cartridge. Check starter cartridge lower end fitting for free movement. Replace if fitting does not move freely. 3. Inspect torch consumable parts. Replace if necessary. 4. Replace torch and leads or return to an authorized service center for repair.
No Fault lights ON, no arc in torch.	1. Failed components in unit.	1. Return to an authorized service center for repair.
FAULT indicators flashing Error code E024 or E031	1. Internal Error	1. Turn the ON / OFF switch OFF then back ON again. If that does not clear the fault, return to an authorized service center for repair.
Pilot arc is ON but cutting arc will not establish	1. Work cable not connected to work piece. 2. Work cable/connector broken. 3. Failed components in unit.	1. Connect work cable. 2. Replace work cable. 3. Return to an authorized service center for repair.
Torch cutting is diminished	1. Incorrect current setting. 2. Worn torch consumables. 3. Poor work cable connection to work piece. 4. Torch being moved too fast. 5. Excessive oil or water in torch. 6. Failed components in unit.	1. Check and adjust to proper setting. 2. Check torch consumables and replace as needed. 3. Check the connection of the Work Lead to the work piece. 4. Reduce cutting speed. 5. Refer to "Check air quality" in Section 3 Torch. 6. Return to an authorized service center for repair.

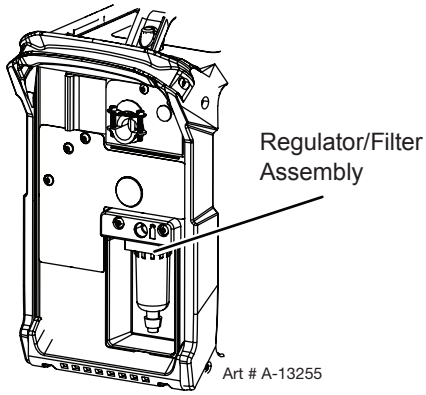
5.06 Power Supply Basic Parts Replacement

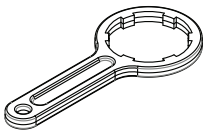
WARNING
Disconnect primary power to the system before disassembling the torch, leads, or power supply.

This section describes procedures for basic parts replacement. For more detailed parts replacement procedures, refer to the Power Supply Service Manual.

A. Filter Element Assembly Replacement

The Filter Element Assembly is in the rear panel. For better system performance, the filter element should be checked per the Maintenance Schedule (Section 5.02), and either cleaned or replaced.

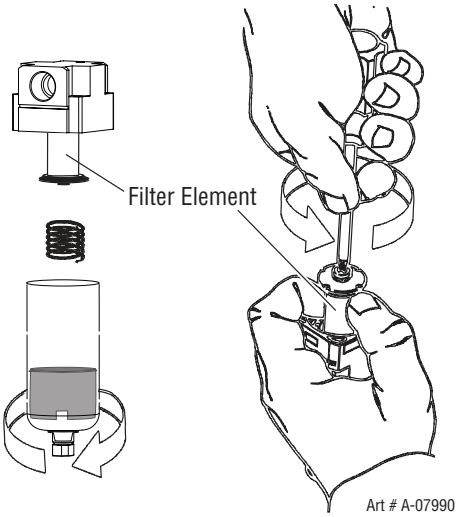


1. Remove power from the power supply; turn OFF the gas supply and bleed down the system.
2. Remove the clear filter bowl with wrench  provided with the system.

NOTE!
Filter replacement part numbers can be found in Section 6 of this manual

3. Remove the filter element and clean or replace..

NOTE!
If replacing or cleaning just the filter element refer to the following illustration for disassembly.



4. Install the new or cleaned assembly by reversing these procedures.
5. Turn ON the air supply and check for leaks before reinstalling the cover.

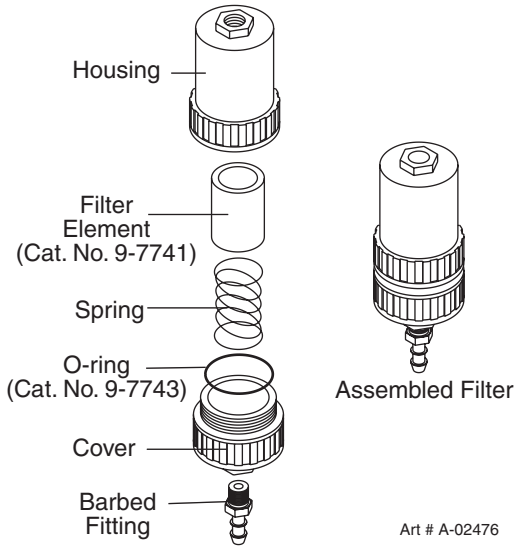
Optional Single-Stage Filter Element Replacement

These instructions apply to power supplies where the optional Single-Stage Filter has been installed.

The Power Supply shuts down automatically when the Filter Element becomes completely saturated. The Filter Element can be removed from its housing, dried, and reused. Allow 24 hours for Element to dry. Refer to Section 6, Parts List, for replacement filter element catalog number.

1. Remove power from power supply.
2. Shut OFF air supply and bleed down system before disassembling Filter to change Filter Element.
3. Disconnect gas supply hose.

4. Turn the Filter Housing Cover counter-clockwise and remove it. The Filter Element is located inside the Housing.



Optional Single-Stage Filter Element Replacement

5. Remove the Filter Element from the Housing and set Element aside to dry.
6. Wipe inside of housing clean, then insert the replacement Filter Element open side first.
7. Replace Housing on Cover.
8. Reattach gas supply.

NOTE!
If unit leaks between housing and cover, inspect the O-ring for cuts or other damage.

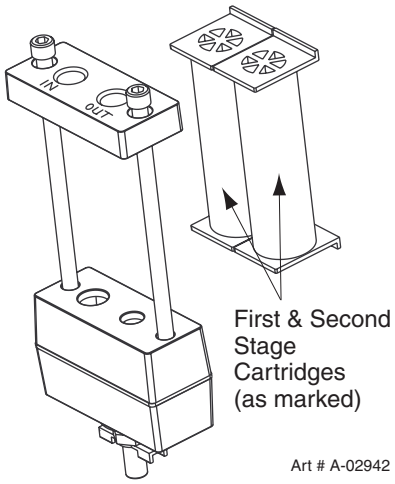
Optional Two-Stage Filter Element Replacement

The Two-Stage Air Filter has two Filter Elements. When the Filter Elements become dirty the Power Supply will continue to operate but cut quality may become unacceptable. Refer to Section 6, Parts List, for replacement filter element catalog number.

1. Shut OFF primary input power.
2. Shut OFF air supply and bleed down system.

> **WARNING**
> Always turn OFF the air supply and bleed the system before disassembling the Filter Assembly as injury could result.

3. Loosen the two bolts on the top of the Filter Assembly enough to allow the Filter Elements to move freely.
4. Note the location and orientation of the old Filter Elements.
5. Slide out the old Filter Elements.



Optional Two-Stage Filter Replacement

6. Slide the replacement Filter Elements into the Filter Assembly, with the same orientation as noted in Step 4 above.
7. Hand tighten the two bolts evenly, then torque each bolt to 20 - 30 in-lbs (2.3 - 3.4 Nm). Improper torque may damage the gasket.
8. Slowly apply air pressure to the assembly, checking for leaks.

> **NOTE!**
> A small amount of air leakage from the bottom fitting is normal.

> **NOTE!**
> Filter replacement part numbers can be found in Section 6 of this manual

This completes the parts replacement procedures.

SECTION 5 TORCH: SERVICE

5T.01 General Maintenance

NOTE!
Refer to Previous "Section 5: System" for common and fault indicator descriptions.

Cleaning Torch

Even if precautions are taken to use only clean air with a torch, eventually the inside of the torch becomes coated with residue. This buildup can affect the pilot arc initiation and the overall cut quality of the torch.

WARNING
Disconnect primary power to the system before disassembling the torch or torch leads.
DO NOT touch any internal torch parts while the AC indicator light of the Power Supply is ON.

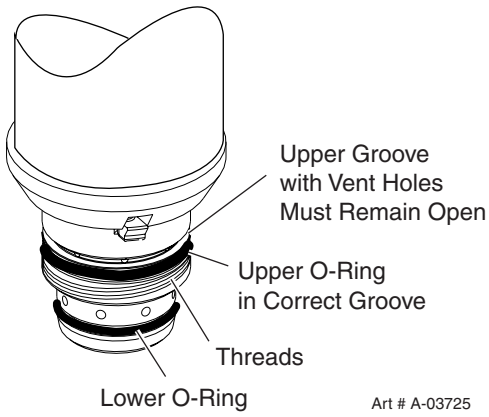
The inside of the torch should be cleaned with electrical contact cleaner using a cotton swab or soft wet rag. In severe cases, the torch can be removed from the leads and cleaned more thoroughly by pouring electrical contact cleaner into the torch and blowing it through with compressed air.

CAUTION
Dry the torch thoroughly before reinstalling.

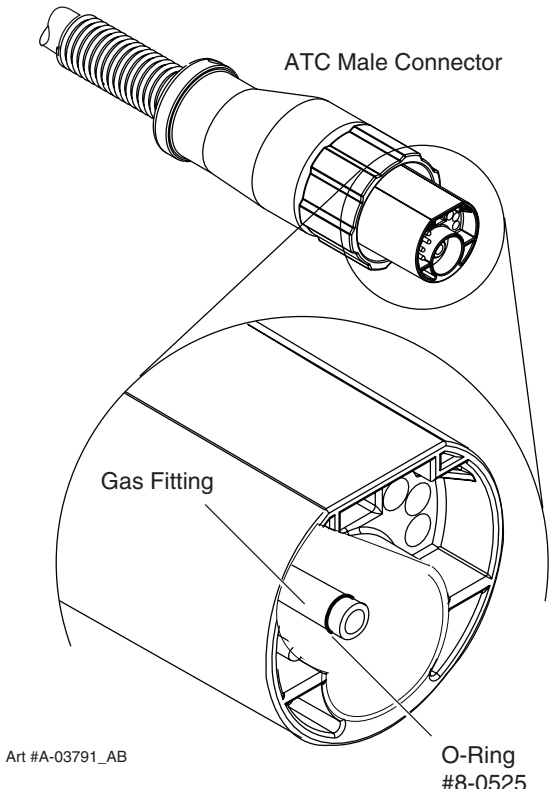
O-Ring Lubrication

An O-Ring on the Torch Head and ATC Male Connector requires lubrication on a scheduled basis. This will allow the O-Rings to remain pliable and provide a proper seal. The O-Rings will dry out, becoming hard and cracked if the lubricant is not used on a regular basis. This can lead to potential performance problems.

It is recommended to apply a very light film of O-Ring lubricant (Catalog # 8-4025) to the O-Rings on a weekly basis.



Torch Head O-Ring



ATC O-Ring

NOTE!
DO NOT use other lubricants or grease, they may not be designed to operate within high temperatures or may contain "unknown elements" that may react with the atmosphere. This reaction can leave contaminants inside the torch. Either of these conditions can lead to inconsistent performance or poor parts life.

5T.02 Inspection and Replacement of Consumable Torch Parts

WARNING
Disconnect primary power to the system before disassembling the torch or torch leads.
DO NOT touch any internal torch parts while the AC indicator light of the Power Supply is ON.

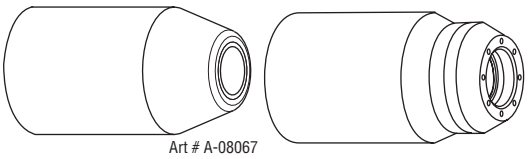
Remove the consumable torch parts as follows:

NOTE!
The shield cup holds the tip and starter cartridge in place. Position the torch with the shield cup facing upward to prevent these parts from falling out when the cup is removed.

1. Unscrew and remove the shield cup from the torch.

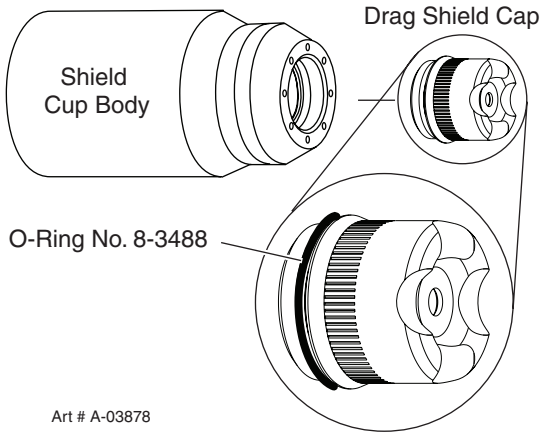
NOTE!
Slag built up on the shield cup that cannot be removed may effect the performance of the system.

2. Inspect the cup for damage. Wipe it clean or replace if damaged.

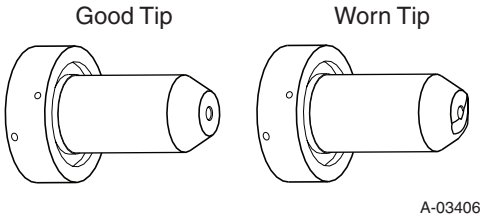


Shield Cups

3. On torches with a shield cup body and a shield cap or deflector, ensure that the cap or deflector is threaded snugly against the shield cup body. In shielded drag cutting operations (only), there may be an O-Ring between the shield cup body and drag shield cap. Do not lubricate the O-Ring.

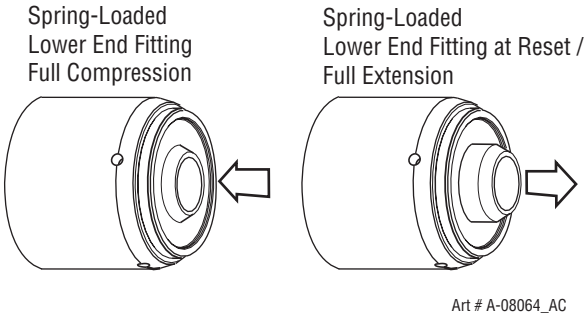


4. Remove the tip. Check for excessive wear (indicated by an elongated or oversized orifice). Clean or replace the tip if necessary.

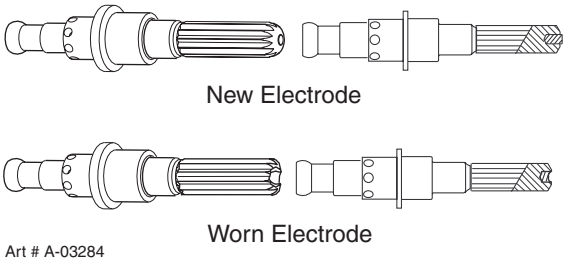


Example of Tip Wear

5. Remove the starter cartridge. Check for excessive wear, plugged gas holes, or discoloration. Check the lower end fitting for free motion. Replace if necessary.



6. Pull the Electrode straight out of the Torch Head. Check the face of the electrode for excessive wear. Refer to the following figure.



Electrode Wear

7. Reinstall the Electrode by pushing it straight into the torch head until it clicks.
8. Reinstall the desired starter cartridge and tip into the torch head.
9. Hand tighten the shield cup until it is seated on the torch head. If resistance is felt when installing the cup, check the threads before proceeding.

This completes the parts replacement procedures.

SECTION 6:
PARTS LISTS

6.01 Introduction

A. Parts List Breakdown

The parts list provide a breakdown of all replaceable components. The parts lists are arranged as follows:

NOTE

Parts listed without item numbers are not shown, but may be ordered by the catalog number shown.

B. Returns

If a product must be returned for service, contact your distributor. Materials returned without proper authorization will not be accepted.

6.02 Ordering Information

Order replacement parts by catalog number and complete description of the part or assembly, as listed in the parts list for each type item. Also include the model and serial number of the power supply. Address all inquiries to your authorized distributor.

6.03 Power Supply Replacement

The following items are included with the replacement power supply: work cable & clamp, input power cable, gas pressure regulator / filter, and operating manual.

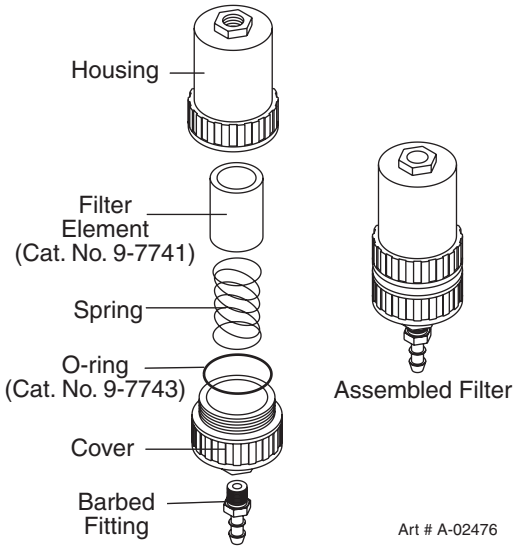
Qty	Description	Catalog #
1	A40i Power Supply 208-480V, Single Phase	3-5634-1
1	A40i Power Supply 208-480V Three Phase	3-5634-2
1	A40i Power Supply 400V Three Phase	3-5634-3
1	A40i Power Supply 400V, Three Phase, CE,	3-5634-4
1	A40i Power Supply 400V, Three Phase, CCC,	3-5634-3C
1	A60i Power Supply 400V Three Phase	3-6634-3
1	A60i Power Supply 400V, Three Phase, CE,	3-6634-4
1	A60i Power Supply 400V, Three Phase, CCC,	3-6634-3C

6.04 Replacement Power Supply Parts

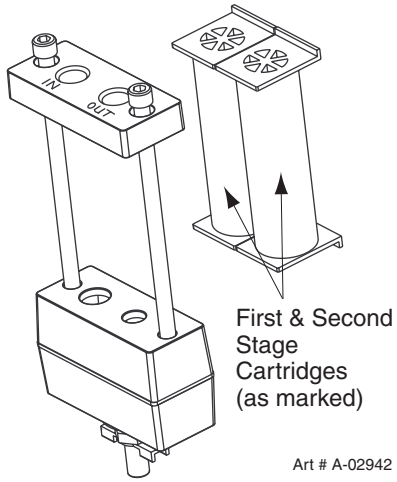
Qty	Description	Catalog #
1	Filter Assembly Replacement Element	9-0116
1	Input Power Cord for 208/480 V Power Supply	

6.05 Options and Accessories

Qty	Description	Catalog #
1	Single - Stage Filter Kit (includes Filter & Hose)	7-7507
1	Replacement Filter Body	9-7740
1	Replacement Filter Hose (not shown)	9-7742
2	Replacement Filter Element	9-7741
1	Two - Stage Filter Kit (includes Hose & Mounting Screws)	9-9387
1	Two - Stage Air Filter Assembly	9-7527
1	First Stage Cartridge	9-1021
1	Second Stage Cartridge	9-1022
1	Work Cable #8 with 50mm Dinse plug	9-9692
1	Multi - Purpose Cart	7-8888
1	Filter Wrench (Factory Filter)	9-9675



Optional Single - Stage Filter Kit



Optional Two - Stage Filter Kit

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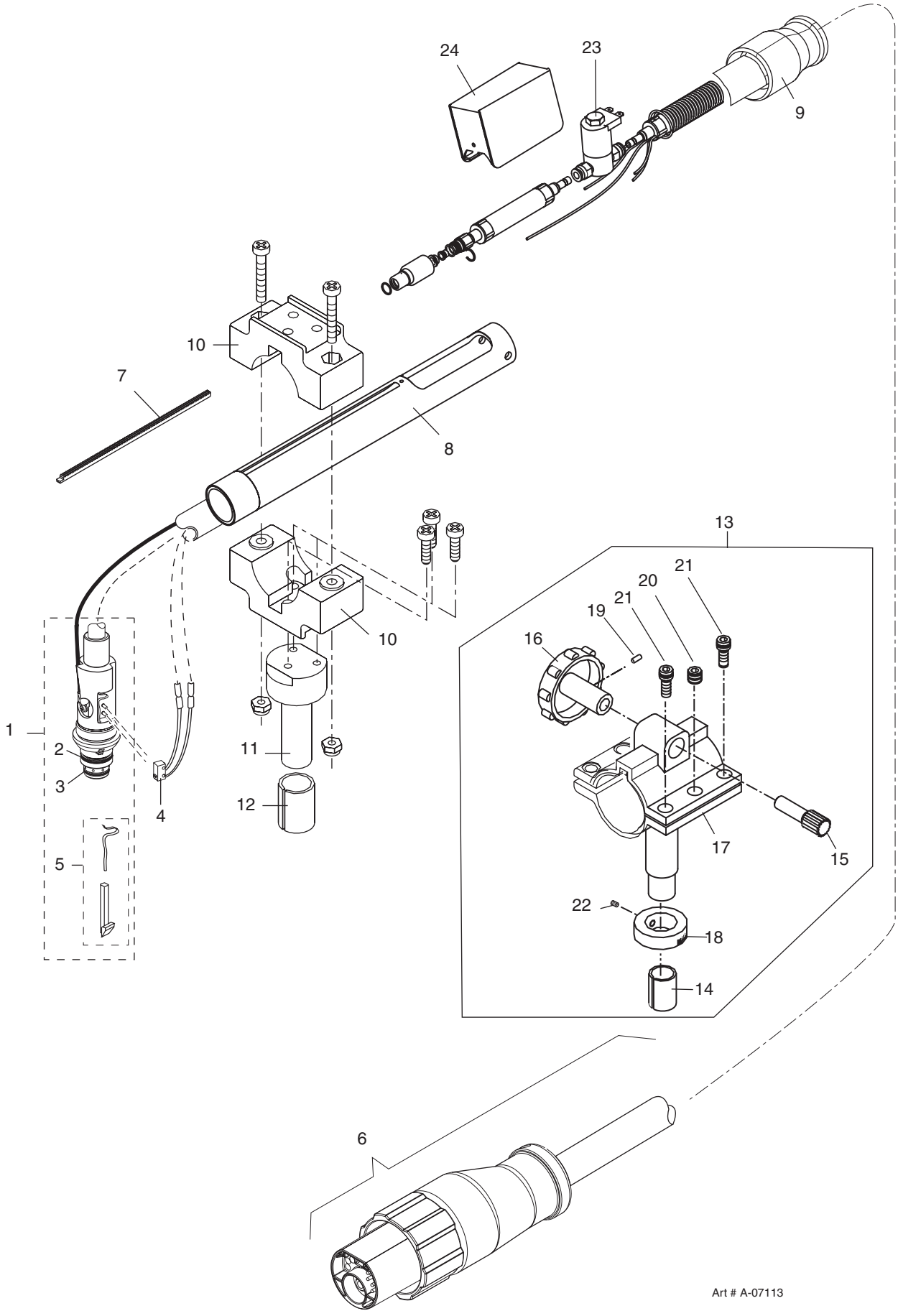
6.06 Torch Replacement Parts SL100SV Torch (with Solenoid on Mounting Tube)

Item No.	Qty	Description	Catalog No.
1	1	Torch Head Assembly without leads (includes items 2, 3, and 14)	9-8220
2	1	Large O-Ring	8-3487
3	1	Small O-Ring	8-3486
4	1	PIP Switch Kit	9-7036
5	1	PIP Plunger and Return Spring Kit	9-7045
6		Automated Leads Assemblies with ATC connectors	
	1	25 - foot / 7.6 m Leads Assembly with ATC connector	4-3058
	1	35 - foot / 10.6 m Leads Assembly with ATC connector	4-3059
	1	50 - foot / 15.2 m Leads Assembly with ATC connector	4-3060
7	1	Rack	9-9448
8	1	Mounting Tube	9-9445
9	1	End Cap Assembly	9-7044
10	2	Body, Mounting, Pinch Block	9-4513
11	1	Pin, Mounting, Pinch Block	9-4521
12	1	Torch Holder Sleeve	7-2896
13	1	Pinion Assembly (does not include positioning tube)	7-2827
14	1	Torch Holder Sleeve	7-2896
15	1	Pinion Gear-Short	8-6074
16	1	Handwheel (Torch Holder)	9-4514
17	1	Low Profile Torch Holder (1 3/8 Dia) w/o Hardware	9-4515
18	1	Calibrated Torch Holder Bushing	9-4366
19	1	5/32 Dia x 5/8 Lg Slotted Spring Pin	See Note 1
20	1	3/8-24 x 3/8 Soc Hd Set Screw, Cup Point	See Note 1
21	2	1/4-20 x 5/8 Hex Socket Head Screw	See Note 1
22	1	#10-24 x 3/8 Hex Socket Set Screw, Cup Point	See Note 1
23	1	Solenoid Assembly	9-9447
24	1	Solenoid Cover	9-9446

NOTE

Purchase these parts locally.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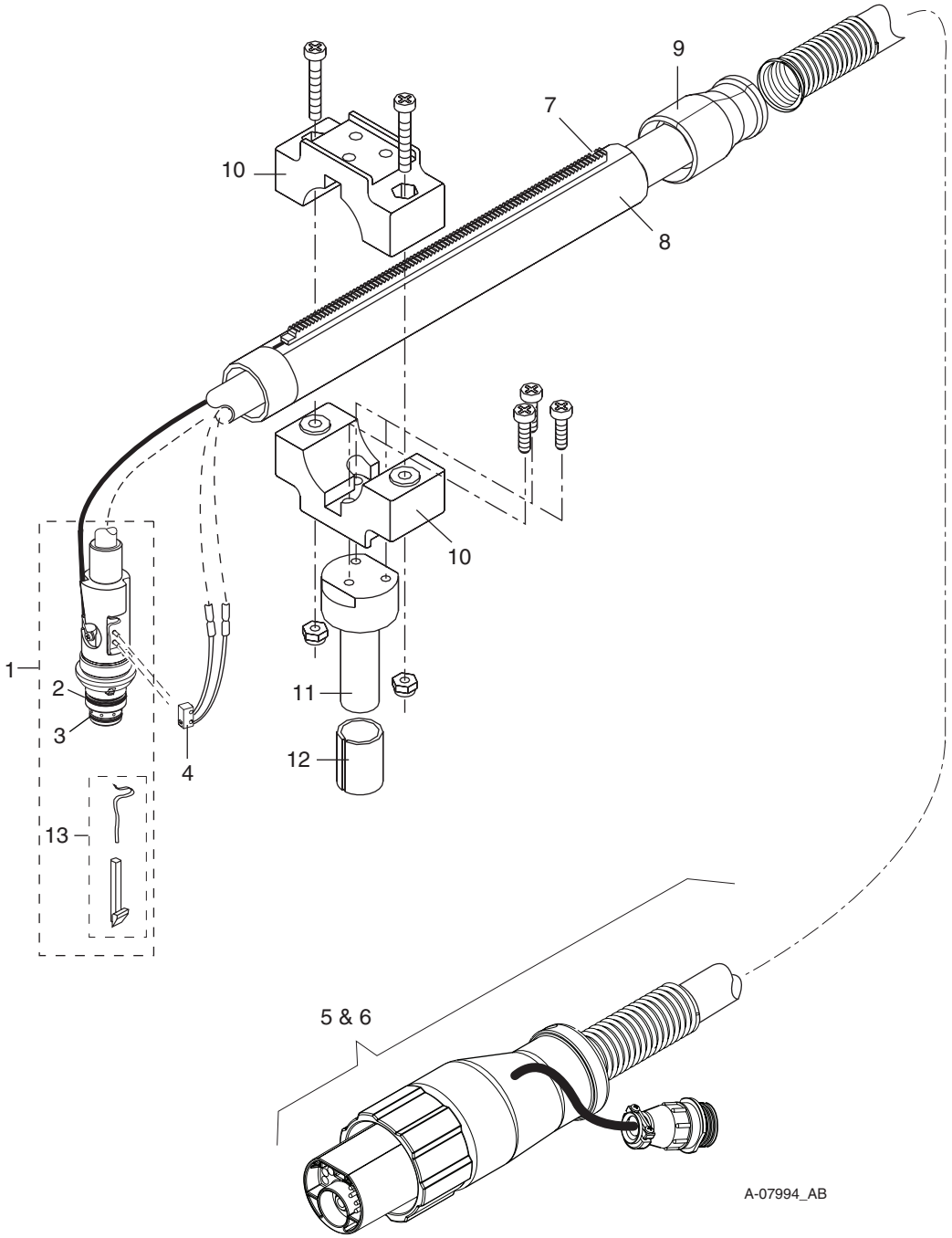
6.07 Replacement Parts - for Machine Torches with Unshielded Leads

Item No.	Qty	Description	Catalog No.
1	1	Torch Head Assembly without leads (includes items 2, 3, and 14)	9-8220
2	1	Large O-Ring	8-3487
3	1	Small O-Ring	8-3486
4	1	PIP Switch Kit	9-7036
5		Unshielded Automated Leads Assemblies with ATC connectors	
	1	5 - foot / 1.5 m Leads Assembly with ATC connector	4-7850
	1	10 - foot / 3.05 m Leads Assembly with ATC connector	4-7851
	1	25 - foot / 7.6 m Leads Assembly with ATC connector	4-7852
	1	50 - foot / 15.2 m Leads Assembly with ATC connector	4-7853
6		Unshielded Mechanized Leads Assemblies with ATC connectors	
	1	5 - foot / 1.5 m Le-ads Assembly with ATC connector	4-7842
	1	10 - foot / 3.05 m Leads Assembly with ATC connector	4-7843
	1	25 - foot / 7.6 m Leads Assembly with ATC connector	4-7844
	1	50 - foot / 15.2 m Leads Assembly with ATC connector	4-7845
7	1	11” / 279 mm Rack	9-7041
8	1	11” / 279 mm Mounting Tube	9-7043
9	1	End Cap Assembly	9-7044
10	2	Body, Mounting, Pinch Block	9-4513
11	1	Pin, Mounting, Pinch Block	9-4521
12	1	Torch Holder Sleeve	7-2896
13	1	PIP Plunger and Return Spring Kit	9-7045
	1	Pinion Assembly (Not shown)	7-2827
	1	5” / 126 mm Positioning Tube (Not shown)	9-7042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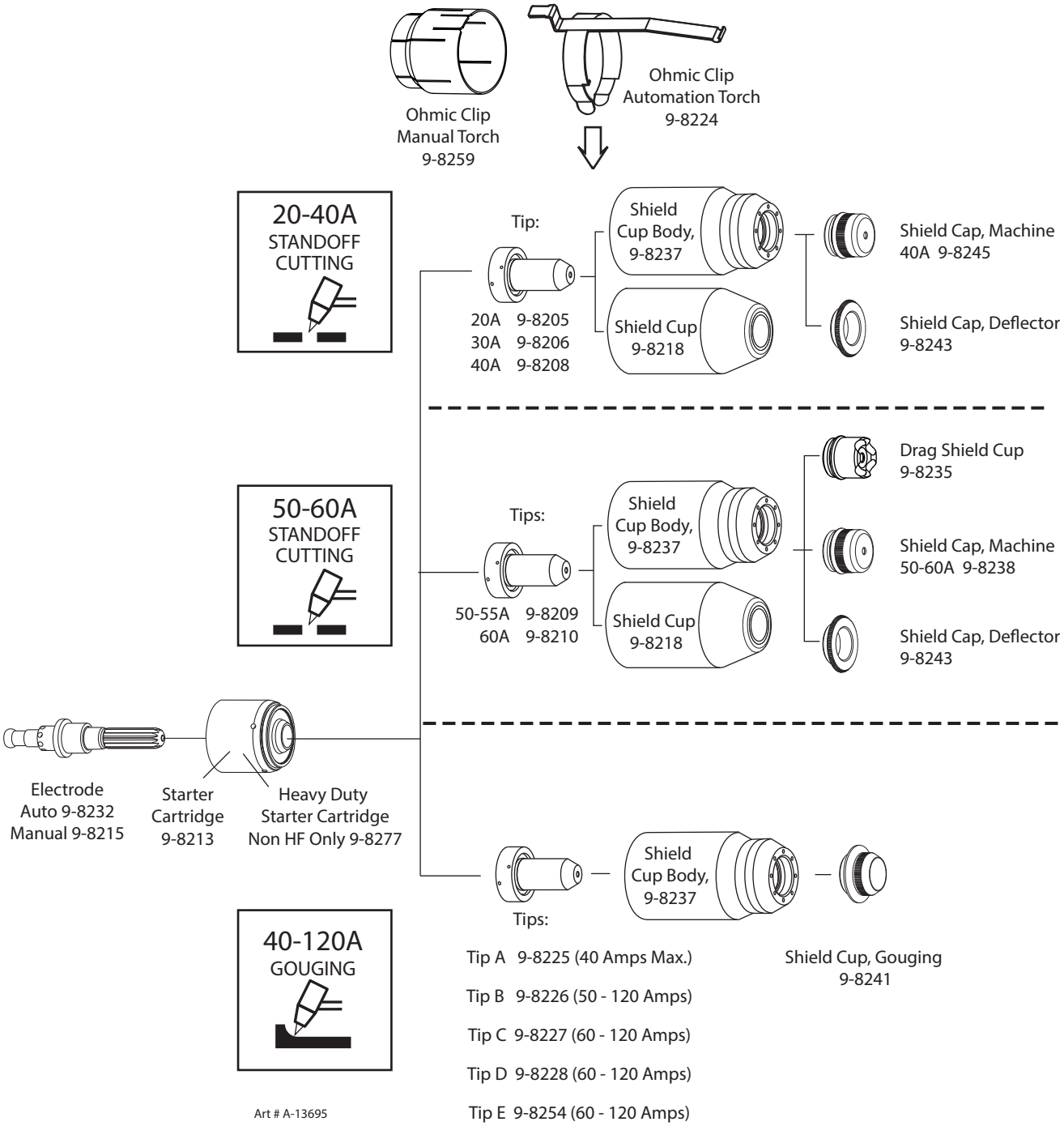
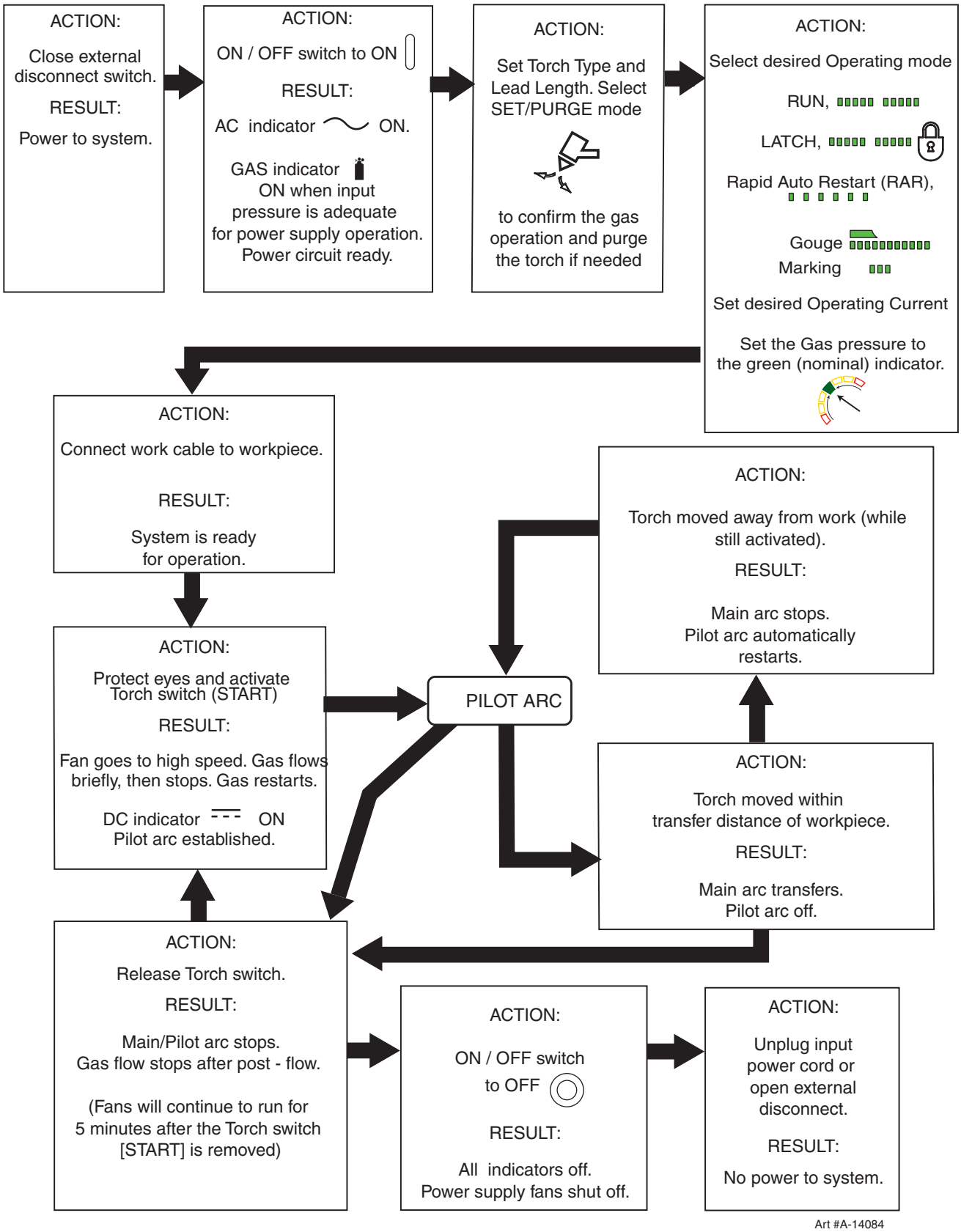
6.08 Torch Consumable Parts Automation / Machine (SL100)Torch



APPENDIX 1: SEQUENCE OF OPERATION (BLOCK DIAGRAM)



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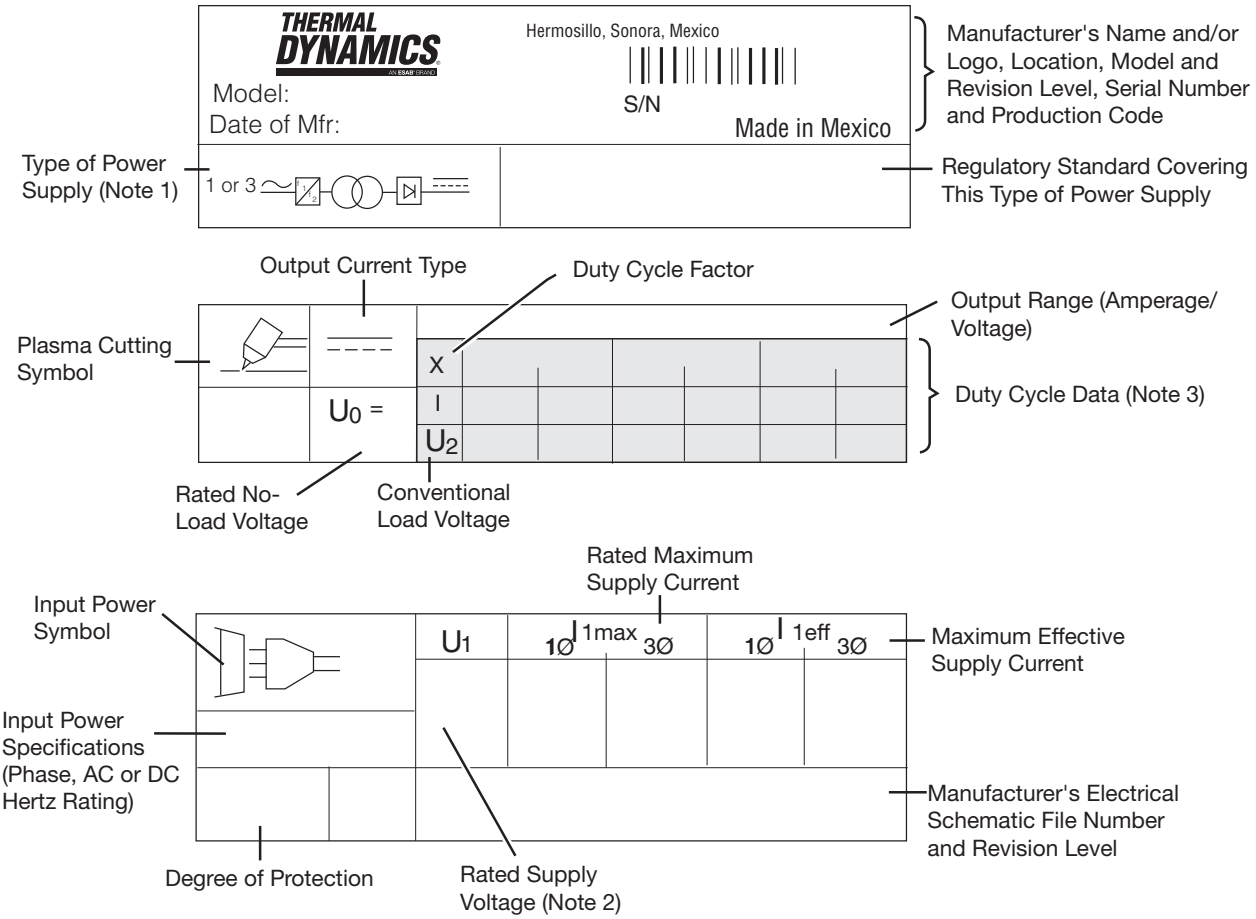
APPENDIX 2: DATA TAG INFORMATION



NOTES:

1. Symbol shown indicates single- or three-phase AC input, static frequency converter-transformer-rectifier, DC output.
2. Indicates input voltages for this power supply. Most power supplies carry a label on the bottom of the unit showing input voltage requirements for the power supply as built.
3. Top row: Duty cycle values.
   Duty cycle values meet or exceed the IEC specified rating.
   Second row: Rated cutting current values.
   Third row: Conventional load voltage values.
4. Sections of the Data Tag may be applied to separate areas of the power supply.

Standard Symbols

~	AC
⎓	DC
Ø	Phase

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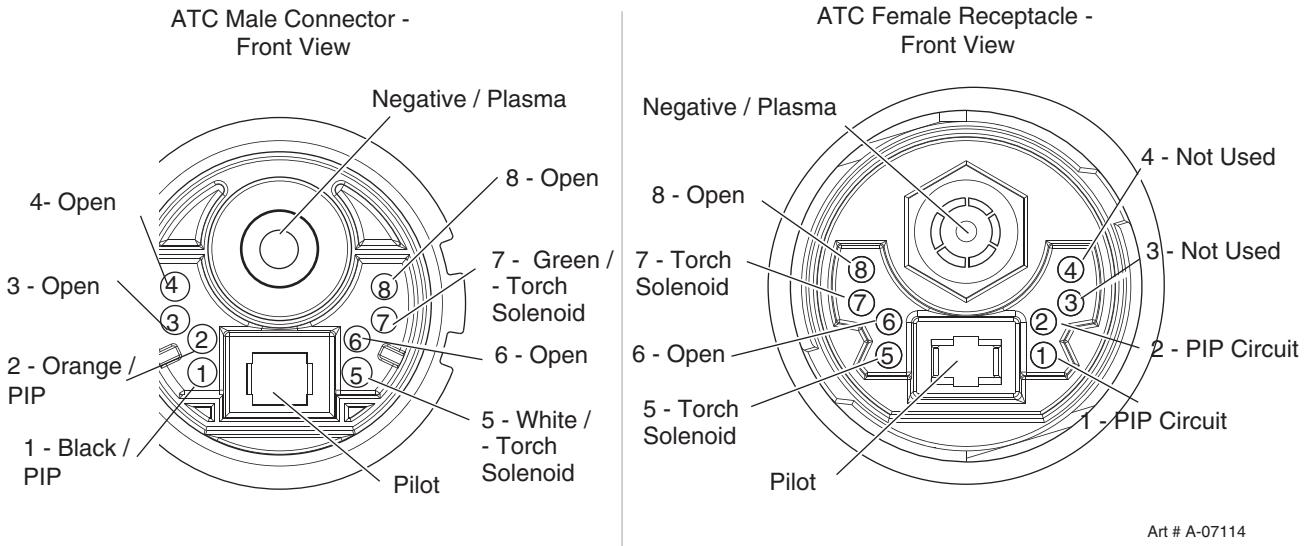
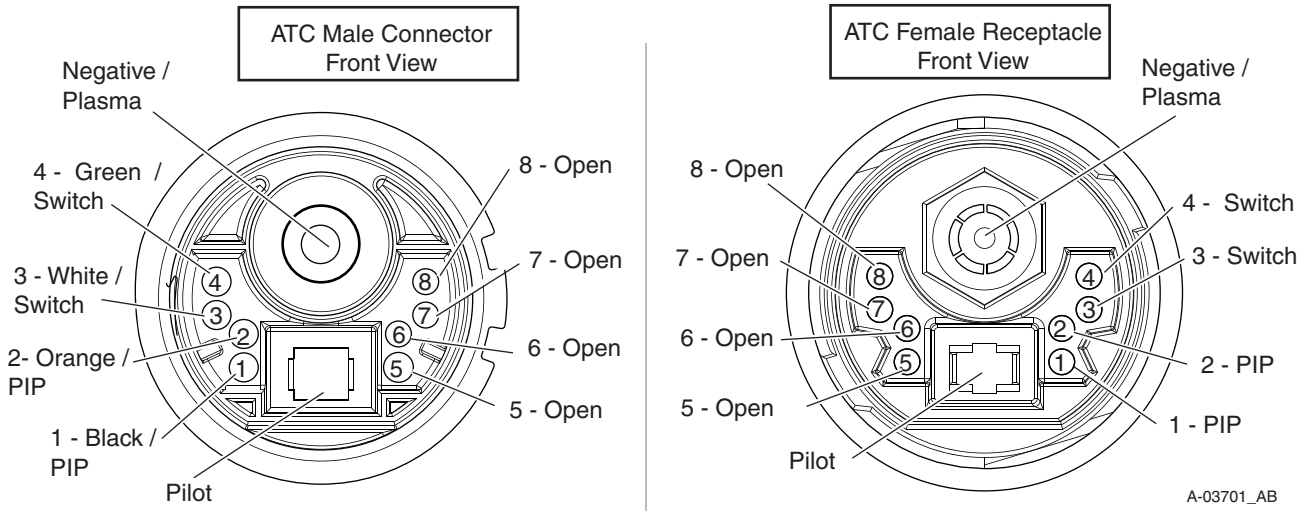
APPENDIX 3: TORCH PIN - OUT DIAGRAMS

A. Automation SL100SV Torch Pin-Out Diagram

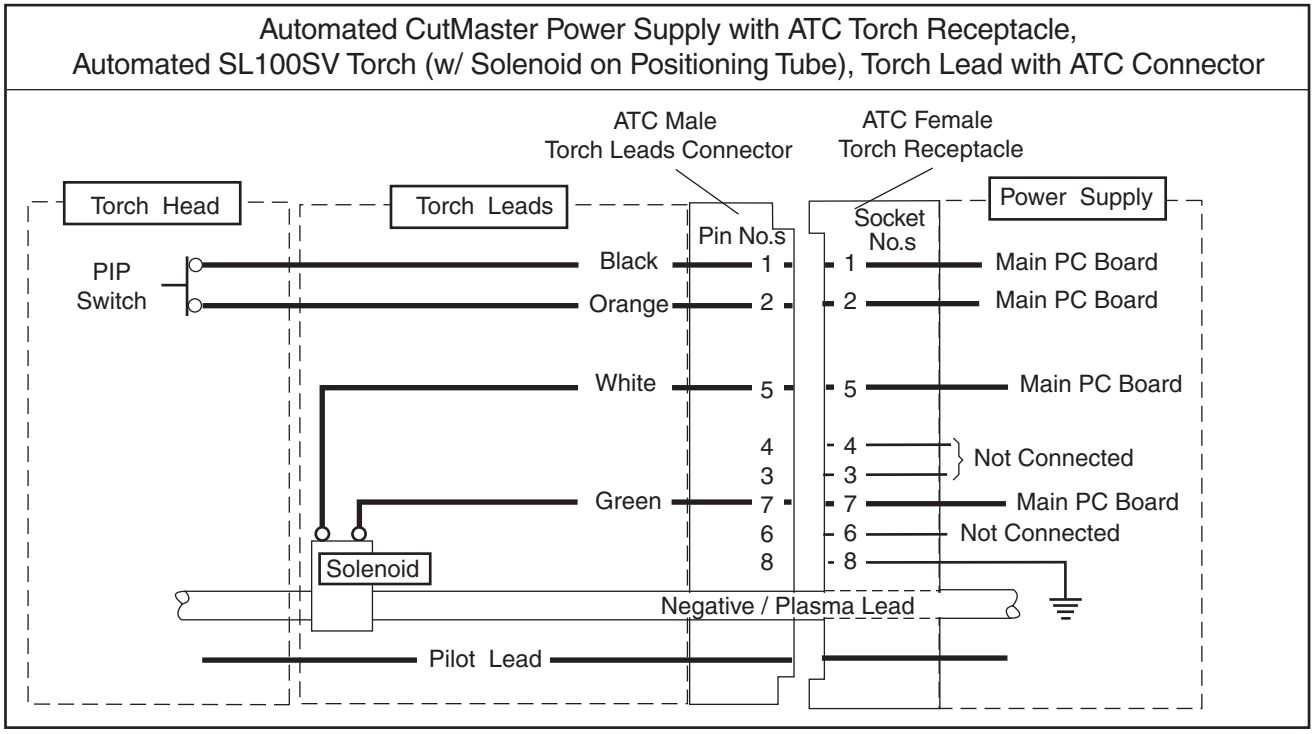


B. Hand Torch Pin - Out Diagram



APPENDIX 4: TORCH CONNECTION DIAGRAMS

A. Automation (SL100SV) Torch Connection Diagram



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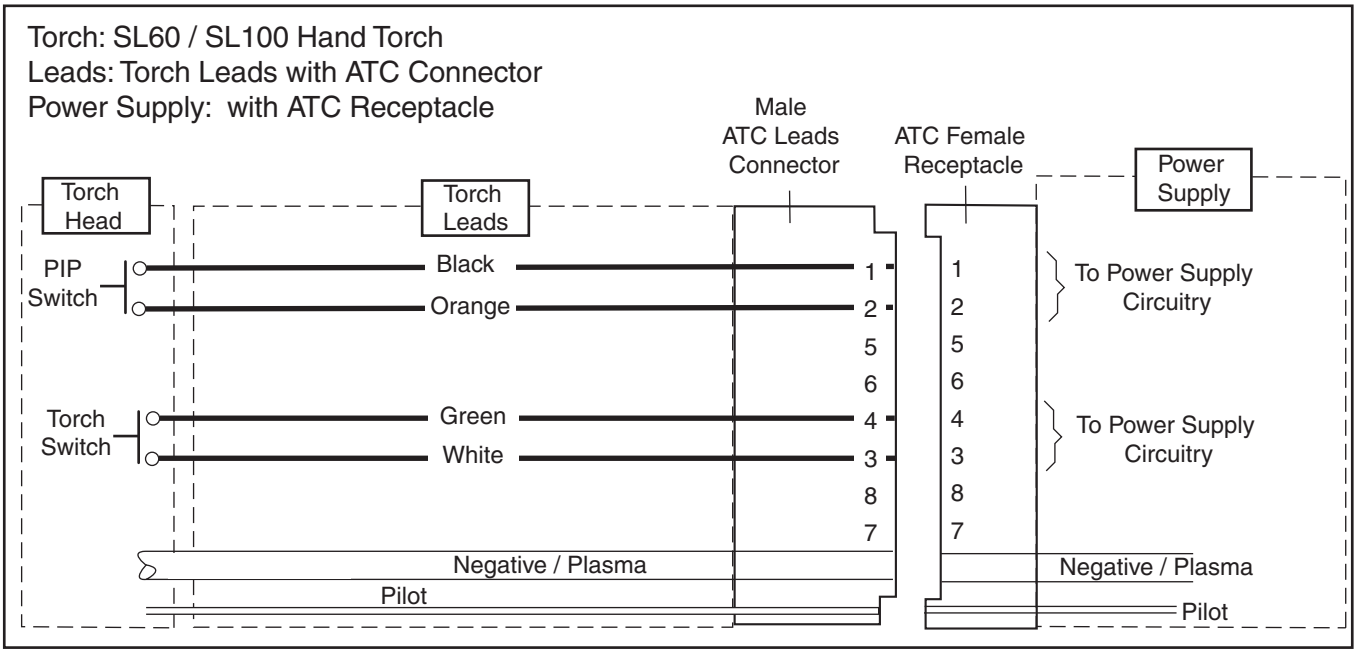
B. Hand Torch Connection Diagram



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APPENDIX 5: CNC CABLE COLOR CODE

3 Red - START (+)

4 Black - START (-)

5 Yellow - DIVIDED ARC V (-)

6 Blue - DIVIDED ARC V (+)

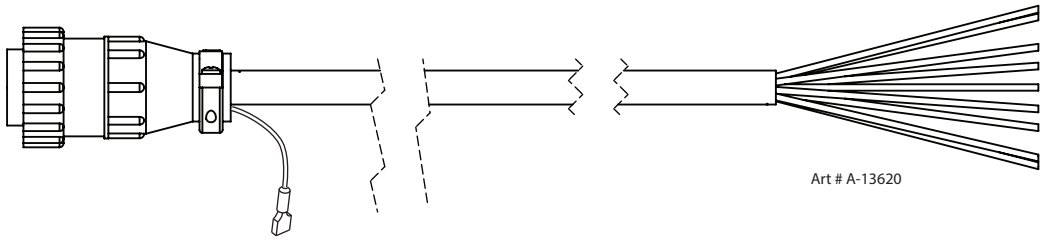
10 Brown PLATE CONTACT GND

11 Orange - PLATE CONTACT OUT

12 White - OK to MOVE (CONTACT)

13 Red with male faston - OHMIC SENSE WIRE

14 Green - OK to MOVE (CONTACT)



Art # A-13620

APPENDIX 6: Automation Interface

The Automation Interface PCB with Ohmic Sense features several selectable divided voltage ratios. The divided output signal is isolated allowing connection of either signal polarity to ground. The board also has Plate Contact "Ohmic" sensing for use with the iHC XT and iCNC height controls via either the exposed torch tip (selectable) or via a separate connection to the torch shield cup using the available sensing clip. The ohmic sensing can also provide collision sensing when used with the iHC XT or iCNC. The plate contact output is a normally open relay contact which may be adapted for use with other height controls as well.

Signals at the CNC connector (J1 on this board) are START / STOP on J1-3 (common) and J1-4 (+); Isolated & Divided Arc voltage on J1-5 (-) and J1-6 (+); PLATE CONTACT OUT (relay contact) between J1-10 and J1-11; OK TO MOVE OUT (relay contact) between J1-12 and J1-14.

Also available are ¼" "Faston" tabs for access to negative Arc Voltage (J3) and Work (J4).

Voltage divider;

The 6 position DIP switch, SW3, makes available the following divide ratios: Only one position should be on at a time.

SW3-1 ON = 80:1 for TD iHC;

SW3-2 ON = 50:1 for IHT, SC3000 & 3100, Hypertherm; (Factory Setting)

SW3-3 ON = 40:1 for Inova;

SW3-4 ON = 30:1;

SW3-5 ON = 20:1 for ESAB;

SW3-6 in spare.

SW3 all OFF = 16.7:1 for SC11.

Divided arc voltage signal is isolated, either the positive signal (J1-6) or negative signal (J1-5) may be grounded or both can be floating. Load impedance for the divided signal should not be less than 10K ohms or signal accuracy will be reduced.

Ohmic sensing and Collision via shield cup Ohmic Clip.

The CNC cable for this Automation Interface PCB includes a connection to pin 13 which can be connected to a wire from the ohmic clip. When the shield cup, with contact from the ohmic clip, contacts work it closes the relay between J1-10 and J1-11 providing the PLATE CONTACT OUT signal.

This may be used during height finding to detect the location of the plate. During cutting the plate contact signal may be used to detect collision.

Ohmic Sense via exposed TIP:

The factory default position of SW2 is OFF which disables the exposed tip ohmic sensing.

With SW2 turned ON and the plasma is idle, neither START to the plasma nor OK to MOVE is active, the exposed torch tip contacting the work will activate the Plate Contact relay closing the contacts at J1-10 and J1-11.

Collision Sense via exposed TIP:

The factory default position of SW1 is OFF which disables the exposed tip collision sensing.

With SW1 turned ON and OK to Move active, i.e. you have a transferred cutting arc, if the exposed torch tip contacts the work it will activate the Plate Contact relay closing the contacts at J1-10 and J1-11.

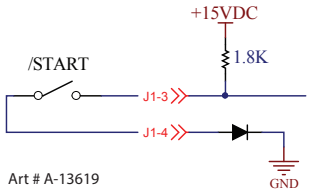
Indicators:

Red LED, D12, indicates PLATE CONTACT whenever contact with the plate is detected..

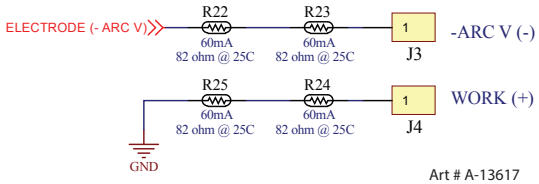
Rating:

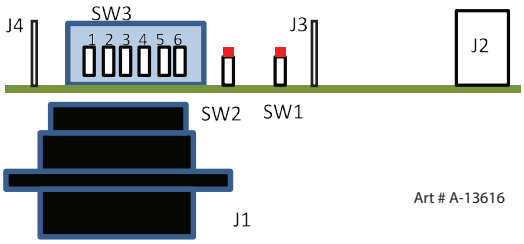
The OK to Move and the Plate Contact Out are relay contacts rated for maximum of 30VAC or DC at 1 amp maximum.

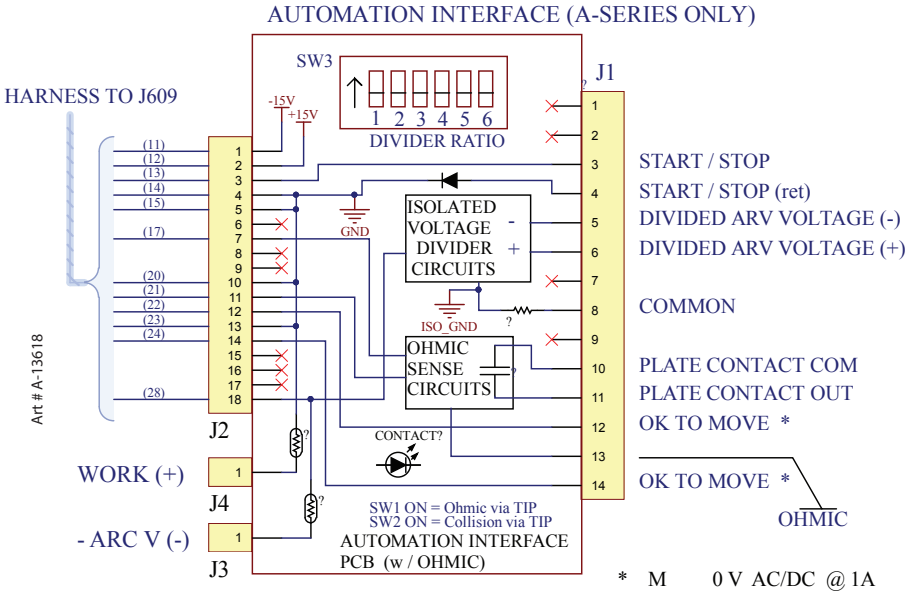
Start SW input requires a switch or relay contact rated for at least + 15VDC at minimum of 10 ma.



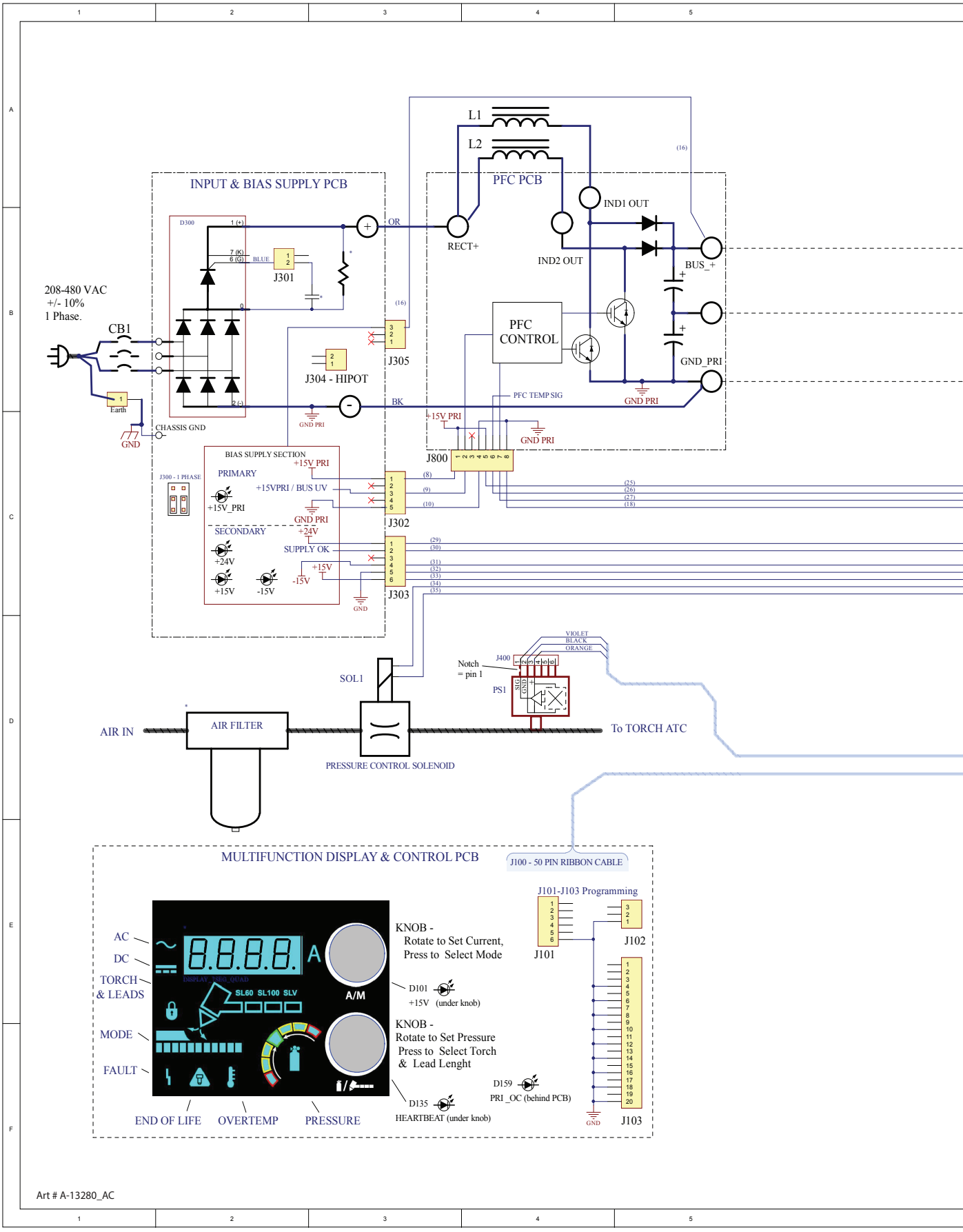
Arc Voltage Tabs. Series PTC resistors protect in case of short circuit. They add 160-200 ohms between the tabs and actual arc voltage and work. Total load resistance must be such that current drawn does not exceed 60 ma. Thus with an open circuit of around 300V the total resistance between J3 & J4 should not be less than 5K ohms. However the voltage dropped across the protection PTCs with a 5K load would result in about a 10% measurement error. 50K-100K load would be much more practical giving only 1% or less error.

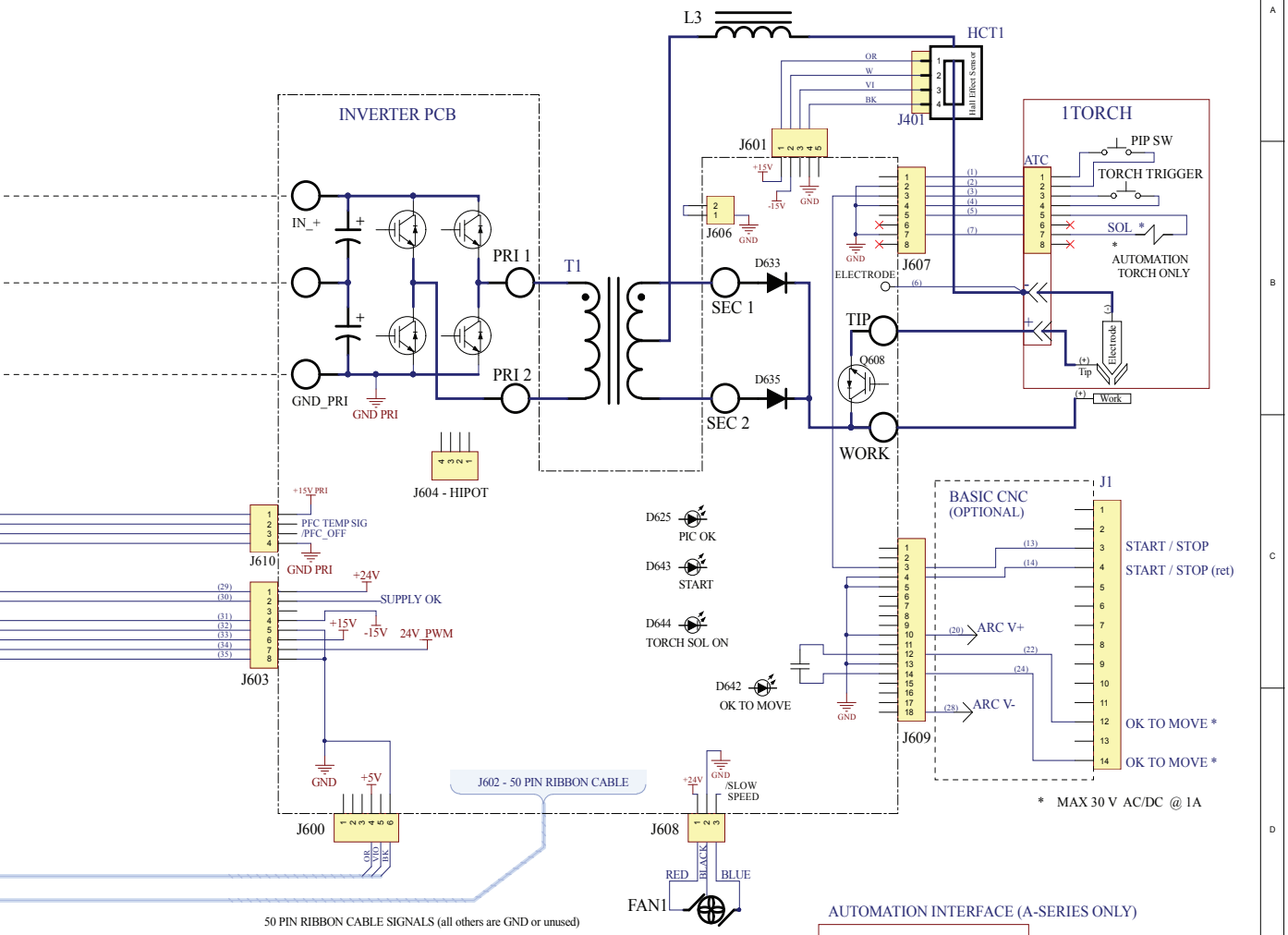






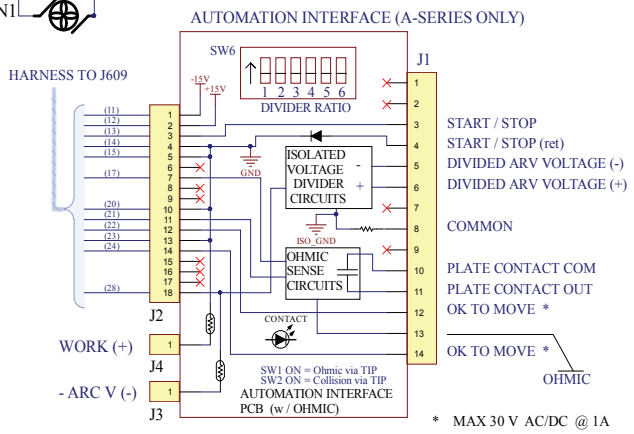
APPENDIX 7: SYSTEM SCHEMATIC, 208/480V 1PHASE





50 PIN RIBBON CABLE SIGNALS (all others are GND or unused)

PIN	NAME (Description) " /" means signal active low.
1, 3	GATE B, GATE A (Gate drive signals)
5, 6	+15V
7, 9	I_PRI_A, I_PRI_B, (Primary Current Sense signals)
12	/PFC_OFF (Disables PFC)
13	V_SENSE (Output Voltage signal)
17	I_SENSE (Output Current signal)
19	/OVERTEMP (System over temperature)
20	FAN_ON (Signal turns Fan on)
23	GAS_PWM (Proportional Gas Solenoid drive)
25	/RAR (Rapid Auto Restart Mode)
26	PILOT_SW_ON (Signal turns Pilot IGBT on)
28	/PIC (Tip & Electrode in contact before preflow)
31	/PIP (Torch shield cup is in place)
33	/TRIG_ON (Torch trigger or Start on)
35	SUPPLY_OK (Input voltage in range and Bias Supply OK)
36	SPARE
37	FAN_FAULT
38	-15V
39	PRESSURE_IN (Reserved for input pressure signal, not used)
40	PRESSURE_OUT (Analog signal gas pressure to the torch)
41	SPARE9_IN (Spare input)
42	I_WORK_SENSE (Work Current Signal)
43	/TORCH_SOL_DETECT (Automation Torch Solenoid detected)
45	TOR_SOL_ON (24V PWM drive to automation torch solenoid)
46	/OK_TO_MOVE (turns on OK to Move relay)
48	+3.3V
49	TIP_VOLTS (Signal relative to voltage on tip)



Art # A-13280_AC

Rev	Revision	By	Date
AA	Production Release	DAT	12/07/2016
AB	VCN 01479 & J301-1	DAT	3/23/2017
AC		DAT	10/6/2017

Victor Technologies Headquarters
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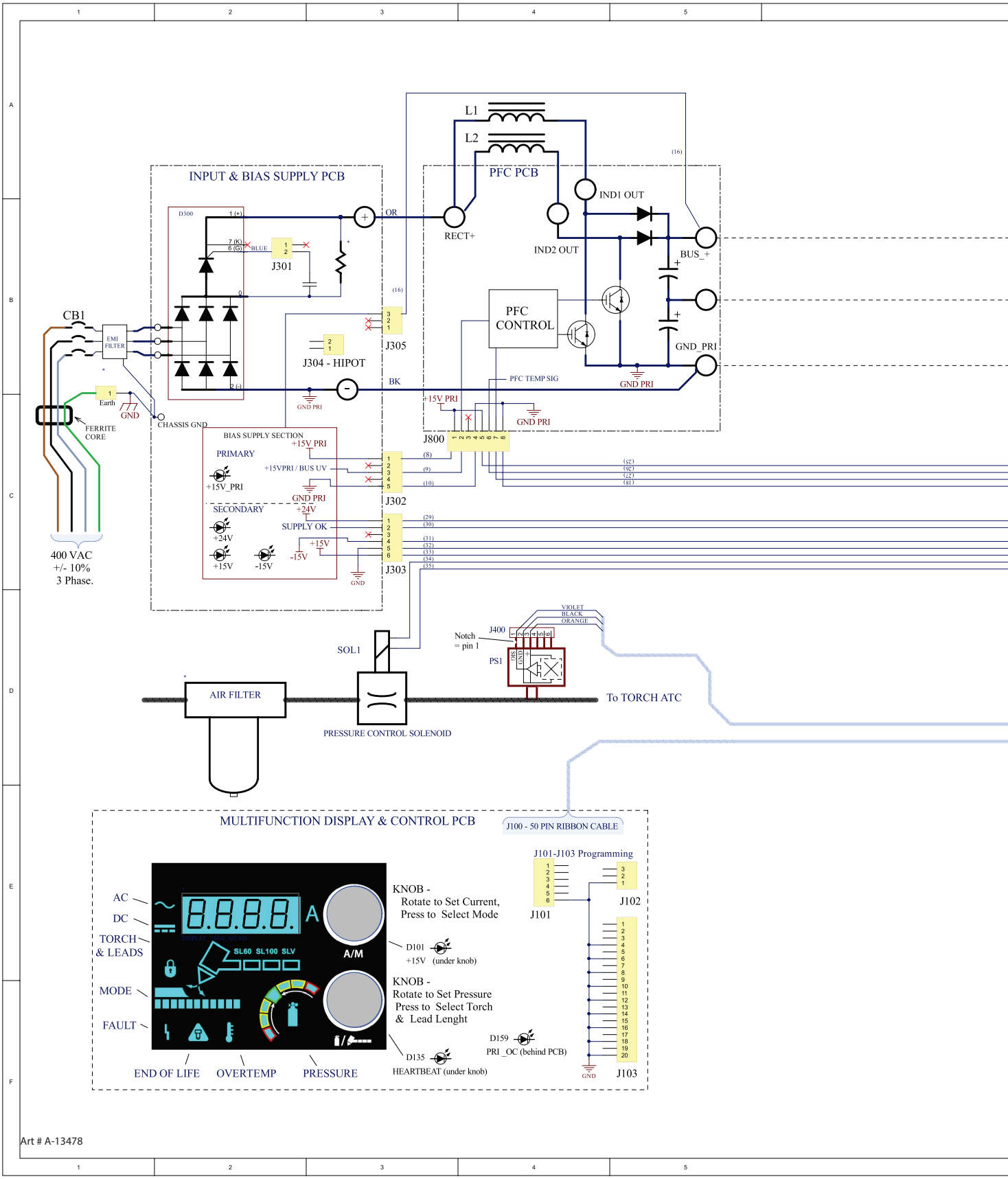
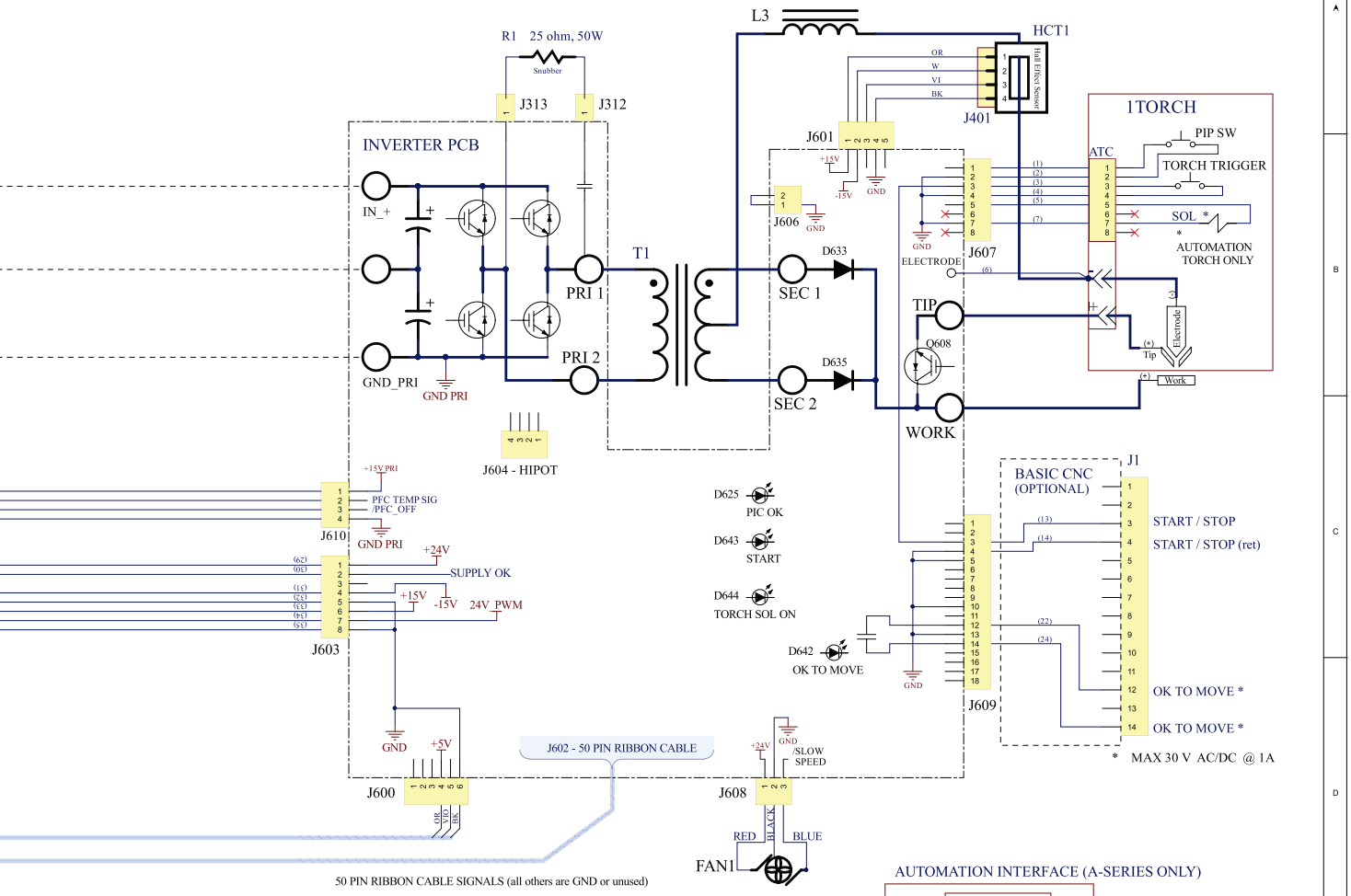
Sheet	1 of 1

Title: SCHEMATIC
CM60i 208-480VAC, 1 PHASE

Drawing Number: 042X1369

APPENDIX 8: SYSTEM SCHEMATIC, 400V 3PHASE CE





50 PIN RIBBON CABLE SIGNALS (all others are GND or unused)

PIN	NAME (Description) " /" means signal active low.
1, 3	GATE B, GATE A (Gate drive signals)
5, 6	+15V
7, 9	I_PRI_A, I_PRI_B, (Primary Current Sense signals)
12	/PFC_OFF (Disables PFC)
13	V_SENSE (Output Voltage signal)
17	I_SENSE (Output Current signal)
19	/OVERTEMP (System over temperature)
20	FAN_ON (Signal turns Fan on)
23	GAS_PWM (Proportional Gas Solenoid drive)
25	/RAR (Rapid Auto Restart Mode)
26	PILOT_SW_ON (Signal turns Pilot IGBT on)
28	/PIC (Tip & Electrode in contact before preflow)
31	/PIP (Torch shield cup is in place)
33	/TRIG_ON (Torch trigger or Start on)
35	SUPPLY_OK (Input voltage in range and Bias Supply OK)
36	SPARE
37	FAN_FAULT
38	-15V
39	PRESSURE_IN (Reserved for input pressure signal, not used)
40	PRESSURE_OUT (Analog signal gas pressure to the torch)
41	SPARE9_IN (Spare input)
42	I_WORK_SENSE (Work Current Signal)
43	/TORCH_SOL_DETECT (Automation Torch Solenoid detected)
45	TOR_SOL_ON (24V PWM drive to automation torch solenoid)
46	/OK_TO_MOVE (turns on OK to Move relay)
48	+3.3V
49	TIP_VOLTS (Signal relative to voltage on tip)

Art # A-13478

Rev	Revision	By	Date
AA	VCN 01479 (1st Prod.)	DAT	4/4/2017

Victor Technologies Headquarters
16052 Swingley Ridge Road, Suite 300
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Date Printed	7/14/2017
Date Revised	7/14/2017
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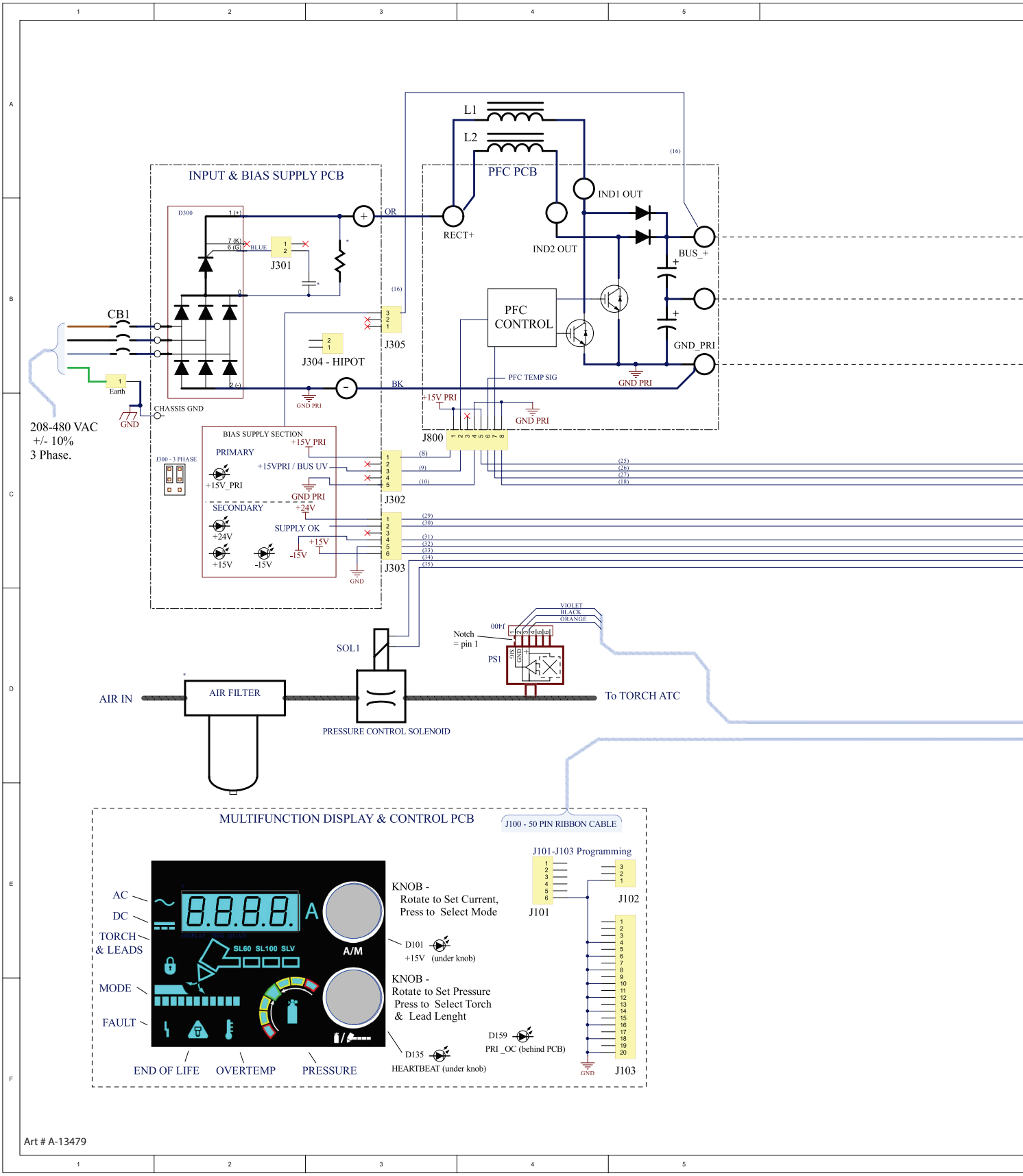
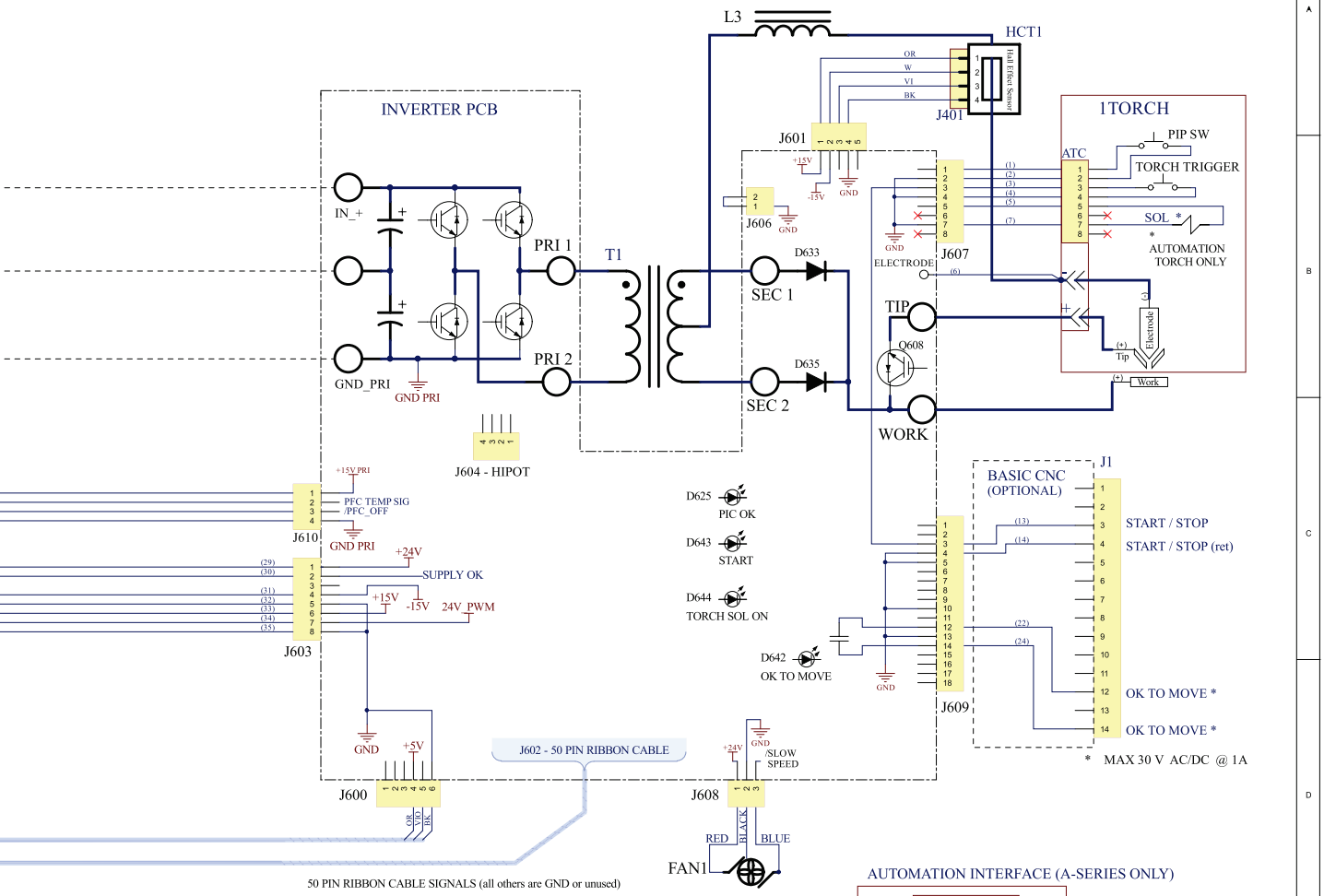
Date	4/4/2017
Size	C
Sheet	1 of 1

Title: SCHEMATIC
CM60i 400 VAC 3 PHASE CE

Drawing Number: 042X1371

APPENDIX 9: SYSTEM SCHEMATIC, 208/480V 3PHASE





50 PIN RIBBON CABLE SIGNALS (all others are GND or unused)

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13	V_SENSE (Output Voltage signal)
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20	FAN_ON (Signal turns Fan on)
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26	PILOT_SW_ON (Signal turns Pilot IGBT on)
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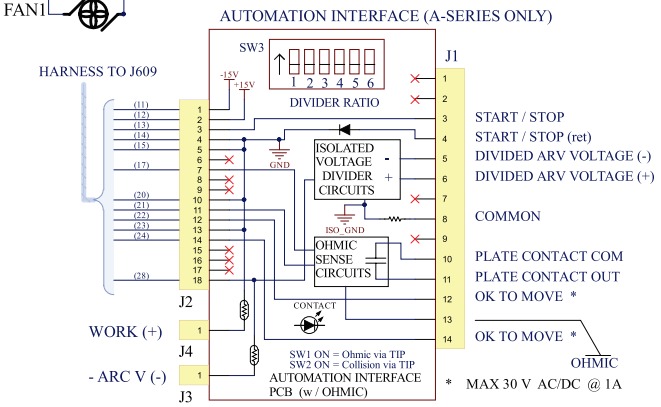

Art # A-13479

Rev	Revision	By	Date
AA	VCN 01479	DAT	3/23/2017

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Title: SCHEMATIC
CM60i 208-480VAC, 3 PHASE

Drawing Number: 042X1370

APPENDIX 10: Publication History

Cover Date	Rev.	Change(s)
Nov. 16, 2017	AA	Manual released.
Mar. 7, 2018	AB	Remove excess translations of safety section. Add a Duty Cycle section 2, update marking table section 4, correct two "Shielded" cut charts section 4T per ECR-03048.

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