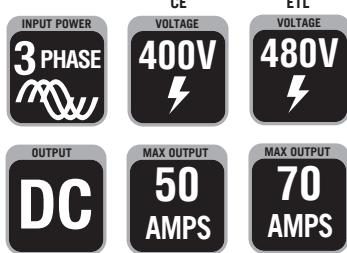


THERMAL DYNAMICS®

AN ESAB® BRAND

CUTMASTER® 50+ CUTMASTER® 70+ PLASMA CUTTING SYSTEM



OPERATING MANUAL



Revision: AA Issue Date: June, 2023 Manual No.: 0700 402 228



WARNING

Cancer and Reproductive Harm
www.P65Warnings.ca.gov
Wash hands after handling.

esab.com

THERMAL DYNAMICS®

AN **ESAB® BRAND**

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 1-800-426-1888, or visit us on the web at www.esab.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 for ESAB.

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 judgment, the Manufacturer assumes no liability for its use.

Plasma Cutting Power Supply
CutMaster® 50+, CutMaster® 70+
SL60™ 1Torch™
Operating Manual Number 0700 402 228

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www.esab.com

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Original Publication Date: 8 June, 2023
Revision Date: 8 June, 2023

See website for Warranty Information.

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 CETTE INFORMATION EST DISTRIBUÉE À L'OPÉRATEUR.
VOUS POUVEZ OBTENIR DES COPIES SUPPLÉMENTAIRES CHEZ VOTRE FOUR-
NISSEUR.**

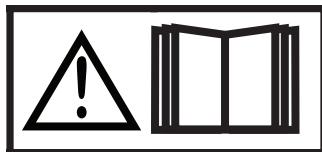
MISE EN GARDE

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 pour le soudage à l'arc et l'équipement de coupe, nous vous suggérons de lire notre brochure « Precautions and Safe Practices for Arc Welding, Cutting and Gouging, » Brochure 0-5407. Ne permettez PAS aux personnes non qualifiées d'installer, d'opérer ou de faire l'entretien de cet équipement. Ne tentez PAS d'installer ou d'opérer cet équipement avant de lire et de bien comprendre ces instructions. Si vous ne comprenez pas bien les instructions, communiquez avec votre fournisseur pour plus de renseignements. Assurez-vous de lire les **Règles de Sécurité** avant d'installer ou d'opérer cet équipement.

RESPONSABILITÉS DE L'UTILISATEUR

Cet équipement opérera conformément à la description contenue dans ce manuel, les étiquettes d'accompagnement et/ou les feuillets d'information si l'équipement est installé, opéré, entretenu et réparé selon les instructions fournies. Vous devez faire une vérification périodique de l'équipement. Ne jamais utiliser un équipement qui ne fonctionne pas 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, il est recommandé par le fabricant de faire une demande de conseil de service écrite ou par téléphone chez le Distributeur Autorisé de votre équipement.

Cet équipement ou ses pièces ne doivent pas être modifiés sans permission préalable écrite par le fabricant. L'utilisateur de l'équipement sera le seul responsable de toute défaillance résultant d'une utilisation incorrecte, un entretien fautif, des dommages, une réparation incorrecte ou une modification par une personne autre que le fabricant ou un centre de service désigné par le fabricant.



**ASSUREZ-VOUS DE LIRE ET DE COMPRENDRE LE MANUEL D'UTILISATION
AVANT D'INSTALLER OU D'OPÉRER 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

The Ecodesign Directive 2009/125/EC entering into force 1 January 2021

Type of equipment

PLASMA CUTTING SYSTEM

Type designation etc.

Cutmaster 50+, from serial number DC306YYWWXXXX (YY – Year produced; WW – Calendar week produced; XXXX– Sequential number system of all units produced in that week.)

Brand name or trade mark

Thermal Dynamics, an ESAB Brand

Manufacturer or his authorised representative

Name, address, telephone No:

ESAB AB

Lindholmsallén 9, Box 8004, SE-402 77 Göthenburg, Sweden

Phone +46 31 50 90 00, www.esab.com

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

EN/IEC 60974-1:2018/A1:2019 Arc Welding Equipment - Part 1: Welding power sources.
EN60974-10:2014/AMD1:2015 Arc Welding Equipment - Part 10: Electromagnetic compatibility (EMC) requirements.
EU reg. no. 2019/1784 Ecodesign requirements for welding equipment pursuant to Directive 2009/125/EC.

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

7.February 2023

Peter Burchfield

General Manager
Equipment Solutions

CE 2023



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

The Ecodesign Directive 2009/125/EC entering into force 1 January 2021

Type of equipment

PLASMA CUTTING SYSTEM

Type designation etc.

Cutmaster 70+, from serial number DC306YYWWXXXX (YY – Year produced; WW – Calendar week produced; XXXX– Sequential number system of all units produced in that week.)

Brand name or trade mark

Thermal Dynamics, an ESAB Brand

Manufacturer or his authorised representative

Name, address, telephone No:

ESAB AB

Lindholmsallén 9, Box 8004, SE-402 77 Göthenburg, Sweden

Phone +46 31 50 90 00, www.esab.com

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

EN/IEC 60974-1:2018/A1:2019 Arc Welding Equipment - Part 1: Welding power sources.

EN60974-10:2014/AMD1:2015 Arc Welding Equipment - Part 10: Electromagnetic compatibility (EMC) requirements.

EU reg. no. 2019/1784 Ecodesign requirements for welding equipment pursuant to Directive 2009/125/EC.

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

7.February 2023

Peter Burchfield

General Manager
Equipment Solutions

CE 2023

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1.01 Safety Precautions

Users of Thermal Dynamics welding and plasma cutting equipment have the ultimate responsibility for ensuring that anyone who works on or near the equipment observes all the relevant safety precautions. Safety precautions must meet the requirements that apply to this type of welding or plasma cutting equipment. The following recommendations should be observed in addition to the standard regulations that apply to the workplace.

All work must be carried out by trained personnel well acquainted with the operation of the welding or plasma cutting equipment. Incorrect operation of the equipment may lead to hazardous situations which can result in injury to the operator and damage to the equipment.

1. Anyone who uses welding or plasma cutting equipment must be familiar with:
 - its operation
 - location of emergency stops
 - its function
 - relevant safety precautions
 - welding and / or plasma cutting
2. The operator must ensure that:
 - no unauthorized person stationed within the working area of the equipment when it is started up.
 - no one is unprotected when the arc is struck.
3. The workplace must:
 - be suitable for the purpose
 - be free from drafts
4. Personal safety equipment:
 - Always wear recommended personal safety equipment, such as safety glasses, flame proof-clothing, safety gloves.
 - Do not wear loose fitting items, such as scarves, bracelets, rings, etc., which could become trapped or cause burns.
5. General precautions:
 - Make sure the return cable is connected securely.
 - Work on high voltage equipment may only be carried out by a qualified electrician.
 - Appropriate fire extinguishing equipment must be clearly marked and close at hand.
 - Lubrication and maintenance must not be carried out on the equipment during operation.



Dispose of electronic equipment at the recycling facility!

In observance of European Directive 2002/96/EC on Waste Electrical and Electronic Equipment and its implementation in accordance with national law, electrical and/or electronic equipment that has reached the end of its life must be disposed of at a recycling facility.

As the person responsible for the equipment, it is your responsibility to obtain information on approved collection stations.

For further information contact the nearest ESAB dealer.

ESAB can provide you with all necessary cutting protection and accessories.

1.02 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.

ELECTRIC SHOCK - Can kill.

- Install and earth (ground) the welding or plasma cutting unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the workpiece.
- Ensure your working stance is safe.

FUMES AND GASES - Can be dangerous to health.

- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to take fumes and gases away from your breathing zone and the general area.

ARC RAYS - Can injure eyes and burn skin.

- Protect your eyes and body. Use the correct welding / plasma cutting screen and filter lens and wear protective clothing.
- Protect bystanders with suitable screens or curtains.

FIRE HAZARD

- Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.

NOISE - Excessive noise can damage hearing.

- Protect your ears. Use earmuffs or other hearing protection.
- Warn bystanders of the risk.

MALFUNCTION - Call for expert assistance in the event of malfunction.

READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.

PROTECT YOURSELF AND OTHERS!

WARNING

Do not use the power source for thawing frozen pipes.

CAUTION

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

**CAUTION**

This product is solely intended for metal removal. Any other use may result in personal injury and / or equipment damage.

CAUTION

Read and understand the instruction manual before installing or operating.

**CAUTION**

This equipment does not comply with IEC 61000-3-12:2011. If it is connected to a public low voltage system, it is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator, that the equipment may be connected.

	 	 WARNING	 AVERTISSEMENT
1		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 coupe 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 coupe.
2		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 torches. 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 coupe. 2.3 Se protéger entièrement le corps.
3		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		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		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		6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.	6. Suivre une formation. Seul le personnel qualifié a le droit de faire fonctionner cet équipement. Utiliser exclusivement les torches indiquées dans le manuel. Le personnel non qualifié et les enfants doivent se tenir à l'écart.
7		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

CUTMASTER 50+, CUTMASTER 70+

SECTION 2 SYSTEM: INTRODUCTION

2.01 How To Use This Manual

This Owner's Manual applies to just product(s) listed on page i.

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

Electronic copies of this manual can be downloaded at no charge in Acrobat PDF format on the ESAB web site listed below then clicking on "SUPPORT" / "Manuals", and you can also use your phone or tablet to scan the QR code on page i, enter your search criteria above to locate the documents.

<http://www.esab.com>

2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number appear on a data tag attached to the rear panel. 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

CE

Included items:

- CutMaster 50+ Power Supply
- CutMaster 70+ Power Supply
- SL60™ Torch and Leads
- Work Lead with Work Clamp
- Spare Parts Kit (2 Electrodes, 2 Cutting Tips, 1 Gouging Tip, 1 Shield Cap, 1 Start Cartridge, 1 Shield Cup Body, 1 Deflector Shield Cup, 1 Standoff Cutting Guide and 1 Shield cup)
- Operating Manual
- Quick Start Guide
- Air fitting 1/4" NPT EU type

ETL

Included items:

- CutMaster 50+ Power Supply
- CutMaster 70+ Power Supply
- SL60™ Torch and Leads
- Work Lead with Work Clamp
- Spare Parts Kit (2 Electrodes, 2 Cutting Tips, 1 Gouging Tip, 1 Shield Cap, 1 Start Cartridge, 1 Shield Cup Body, 1 Deflector Shield Cup, 1 Standoff Cutting Guide and 1 Shield cup)
- Operating Manual
- Quick Start Guide
- Air fitting 1/4" NPT Milton type D

Move the equipment to the installation site before un-boxing the unit. Use care to avoid damaging the equipment when opening the box.

2.04 Power Supply Specifications CE

CM 50+, 70+ 400 VAC 3 Phase Power Supply Specifications		
Model	CM 50+	CM 70+
Input Power	400 VAC $\pm 15\%$, 3 Phase, 50/60 Hz	
3 Phase Input Power Cable CE	3 M, 2.5mm ² with 16A plug	3 M, 4mm ² with 32A plug
Output Current	15 - 50A, Continuously Adjustable	15 - 70A, Continuously Adjustable
Idle Power	26.3W	
Efficiency at Max Current	92.7%	92.6%
Power Factor at Max Current	0.60	0.68
Power Supply Gas Filtering Ability	Particulates to 5 Microns	
Inlet Pressure	90-125 psi (6.2-8.6 bar / 620-862 kPa)	

2.04.01 Additional Power Supply Specifications

CM 50+ Power Supply Duty Cycle *				
Ambient Air Temperature	Duty Cycle Ratings @ 40°C (104°F) Operating Range -10°C - 50°C			
		Rating		
400 VAC Units	Duty Cycle*		60%	100%
	Current		50A	40A
	DC Voltage		150V	150V

* 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.

CM 70+ Power Supply Duty Cycle *				
Ambient Air Temperature	Duty Cycle Ratings @ 40°C (104°F) Operating Range -10°C - 50°C			
		Rating		
400 VAC Units	Duty Cycle*	50%	60%	100%
	Current	70A	60A	50A
	DC Voltage	150V	150V	150V

* 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.

2.05 Input Wiring Specifications CE

3 Phase Input Cable Wiring Requirements

3 Phase Cutmaster 50+ Power Supply Input Cable Wiring Requirements							
	Input voltage	Freq	Power Input			Suggested Sizes	
	Volts (V/AC)	Hz	kVA	I max (A)	I _{eff} (A)	Fuse (A)	Flexible Cord (Min. mm ²)
3 Phase	400	50/60	14.2	20.4	15.8	25	2.5mm ²

3 Phase Cutmaster 70+ Power Supply Input Cable Wiring Requirements

	Input voltage	Freq	Power Input			Suggested Sizes	
	Volts (V/AC)	Hz	kVA	I max (A)	I _{eff} (A)	Fuse (A)	Flexible Cord (Min. mm ²)
3 Phase	400	50/60	17.3	25	20.4	32	4mm ²

**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.

**WARNING**

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

2.06 Generator Recommendations CE

When using generators to power the CM 50+ Plasma Cutting System, the following ratings are a minimum and are to be used along with the ratings previously listed.

CM 50+ Generator Specifications		
Generator Output Rating	Output Current	Arc Characteristic
10 kW / 400V	40A	Full
12 kW / 400V	50A	Full
NOTE: If Generator is equipped with an idle mode it will need to be in "Run" mode to operate at 50 amps.		

When using generators to power the CM 70+ Plasma Cutting System, the following ratings are a minimum and are to be used along with the ratings previously listed.

CM 70+ Generator Specifications		
Generator Output Rating	Output Current	Arc Characteristic
12 kW / 400V	50A	Full
15 kW / 400V	60A	Full
20 kW / 400V	70A	Full
NOTE: If Generator is equipped with an idle mode it will need to be in "Run" mode to operate at 70 amps.		

**NOTE!**

Due to circuitry, age and condition two generators with the same ratings may produce different results. Adjust the amperage accordingly.

CM 50+ cut capacity	Thickness	
	mm	inches
Pierce Capacity	16	5/8
Standard Edge Cutting Capacity	25	1
Maximum Severance Cutting Capacity	32	1 1/4

CM 70+ cut capacity	Thickness	
	mm	inches
Pierce Capacity	20	3/4
Standard Edge Cutting Capacity	30	1 1/8
Maximum Severance Cutting Capacity	38	1 1/2

**NOTE!**

Mild steel will typically have a larger cut thickness capacity because the material can also benefit from exothermic reaction due to carbon content. Stainless steels, specialty hardened alloys, and non ferrous materials such as aluminum and copper will generally have 20% or more lower cut capacity and slower cut speeds.

2.07 Power Supply Specifications ETL

CM 50+, 70+ 480 VAC 3 Phase Power Supply Specifications		
Model	CM 50+	CM 70+
Input Power	480 VAC±15%, 3 Phase, 50/60 Hz	
3 Phase Input Power Cable ETL	Power Supply includes 3 M three phase 11AWG input cable	
Output Current	15 - 50A, Continuously Adjustable	15 - 70A, Continuously Adjustable
Idle Power	26.3W	
Efficiency at Max Current	93.5%	93%
Power Factor at Max Current	0.72	0.74
Power Supply Gas Filtering Ability	Particulates to 5 Microns	
Inlet Pressure	90-125 psi (6.2-8.6 bar / 620-862 kPa)	

2.07.01 Additional Power Supply Specifications

CM 50+ Power Supply Duty Cycle *				
Ambient Air Temperature	Duty Cycle Ratings @ 40°C (104°F) Operating Range -10°C - 50°C			
	Rating			
480 VAC Units	Duty Cycle*		60%	100%
	Current		50A	40A
	DC Voltage		150V	150V

* 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.

CM 70+ Power Supply Duty Cycle *				
Ambient Air Temperature	Duty Cycle Ratings @ 40°C (104°F) Operating Range -10°C - 50°C			
	Rating			
480 VAC Units	Duty Cycle*	50%	60%	100%
	Current	70A	60A	40A
	DC Voltage	150V	150V	150V

* 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.

2.08 Input Wiring Specifications ETL

3 Phase Input Cable Wiring Requirements

3 Phase Cutmaster 50+ Power Supply Input Cable Wiring Requirements							
	Input voltage	Freq	Power Input			Suggested Sizes	
	Volts (V/AC)	Hz	kVA	I _{max} (A)	I _{eff} (A)	Fuse (A)	Flexible Cord (Min. AWG)
3 Phase	480	50/60	11.5	13.8	11	20	11
Line Voltages with Suggested Circuit Protection and Wire Sizes Based on National Electric Code and Canadian Electric Code							

3 Phase Cutmaster 70+ Power Supply Input Cable Wiring Requirements							
	Input voltage	Freq	Power Input			Suggested Sizes	
	Volts (V/AC)	Hz	kVA	I _{max} (A)	I _{eff} (A)	Fuse (A)	Flexible Cord (Min. AWG)
3 Phase	480	50/60	16	19.2	13.8	25	11
Line Voltages with Suggested Circuit Protection and Wire Sizes Based on National Electric Code and Canadian Electric Code							

**WARNING**

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

2.09 Generator Recommendations ETL

When using generators to power the CM 50+ Plasma Cutting System, the following ratings are a minimum and are to be used along with the ratings previously listed.

CM 50+ Generator Specifications		
Generator Output Rating	Output Current	Arc Characteristic
10 kW / 480V	40A	Full
12 kW / 480V	50A	Full
NOTE: If Generator is equipped with an idle mode it will need to be in "Run" mode to operate at 50 amps.		

When using generators to power the CM 70+ Plasma Cutting System, the following ratings are a minimum and are to be used along with the ratings previously listed.

CM 70+ Generator Specifications		
Generator Output Rating	Output Current	Arc Characteristic
10 kW / 480V	40A	Full
15 kW / 480V	60A	Full
20 kW / 480V	70A	Full
NOTE: If Generator is equipped with an idle mode it will need to be in "Run" mode to operate at 70 amps.		

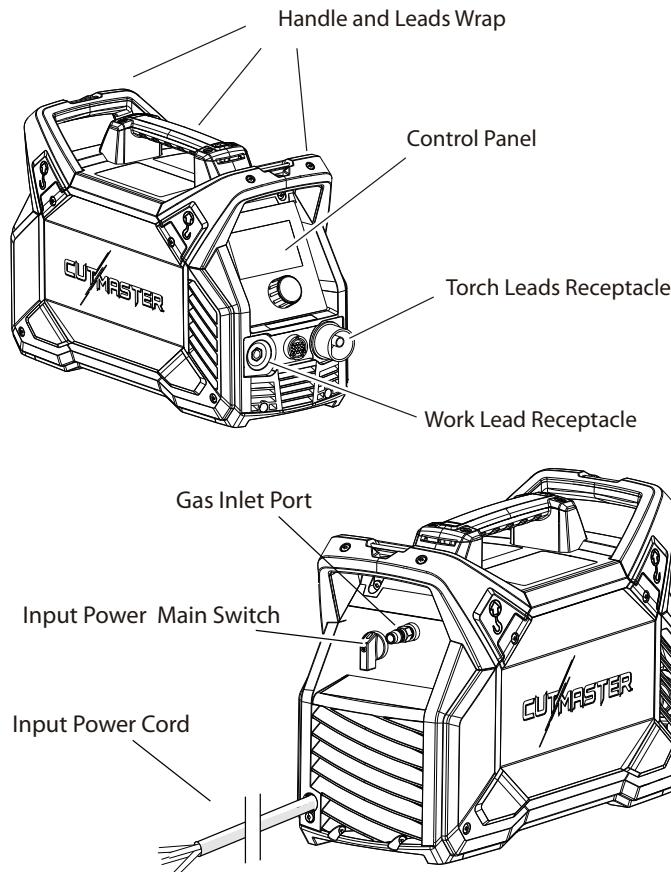
CM 50+ cut capacity	Thickness	
	mm	inches
Pierce Capacity	16	5/8
Standard Edge Cutting Capacity	25	1
Maximum Severance Cutting Capacity	32	1 1/4

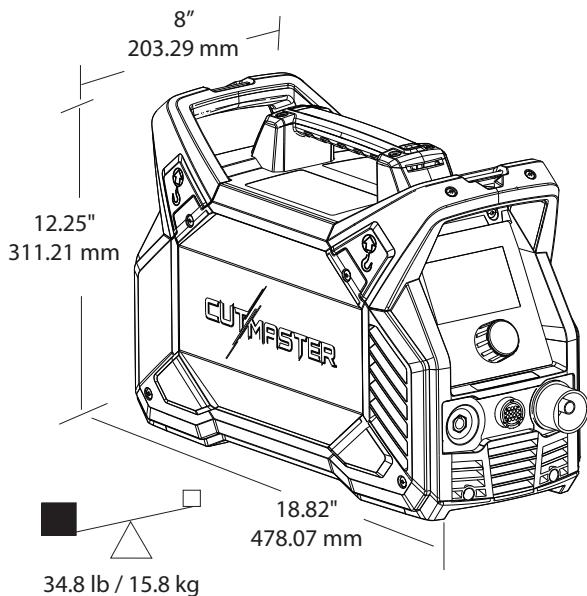
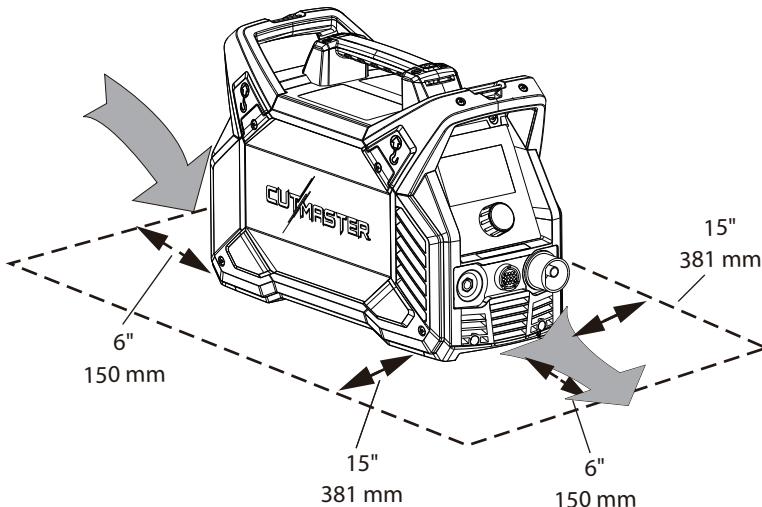
CM 70+ cut capacity	Thickness	
	mm	inches
Pierce Capacity	20	3/4
Standard Edge Cutting Capacity	30	1 1/8
Maximum Severance Cutting Capacity	38	1 1/2

NOTE!

Mild steel will typically have a larger cut thickness capacity because the material can also benefit from exothermic reaction due to carbon content. Stainless steels, specialty hardened alloys, and non ferrous materials such as aluminum and copper will generally have 20% or more lower cut capacity and slower cut speeds.

2.10 Power Supply Features



Weights and Dimensions*Power Supply Dimensions & Weight***Clearances for Operation and Ventilation***Ventilation Clearance Requirements*

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SECTION 2 TORCH: INTRODUCTION**2T.03 Specifications****2T.01 Scope of Manual**

This manual contains descriptions, operating instructions and maintenance procedures for the 1Torch Models SL60/Manual and SL100/Mechanized 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.

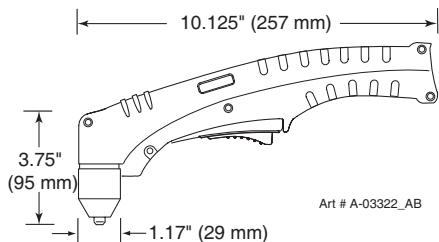
**NOTE!**

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

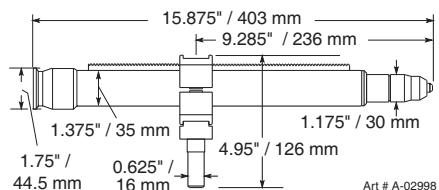
Refer to the Appendix Pages for additional specifications as related to the Power Supply used.

A. Torch Configurations**1. 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.

**2. Machine Torch, Model**

The standard machine torch has a positioning tube with rack & pinch block 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 / Automation 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

Note: The maximum length of the torches above is 50 foot / 15.2 m

C. Torch Parts

Start cartridge, Electrode, Tip, Shield Cup

D. Parts - In - Place (PIP)

Torch Head has built - in switch

22±1.5 VDC circuit rating



NOTE!

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

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
Arc Striking Voltage	500V

Manual Torch Ratings	
Ambient Temperature	104° F 40° C
Duty Cycle	100% @ 60 Amps @ 400 scfh
Maximum Current	80 Amps
Voltage (V_{peak})	500V
Arc Striking Voltage	500V

G. Gas Requirements

Automated, Manual and Machine Torch Gas Specifications	
Gas (Plasma and Secondary)	Compressed Air
Operating Pressure Refer to NOTE	60 - 75 psi 4.1 - 5.2 bar 410 - 520 kPa
Maximum Input Pressure	125 psi / 8.6 bar / 860 kPa
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 (O₂).

H. Direct Contact Hazard

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

2T.04 Options And Accessories

For options and accessories, see Section 6.

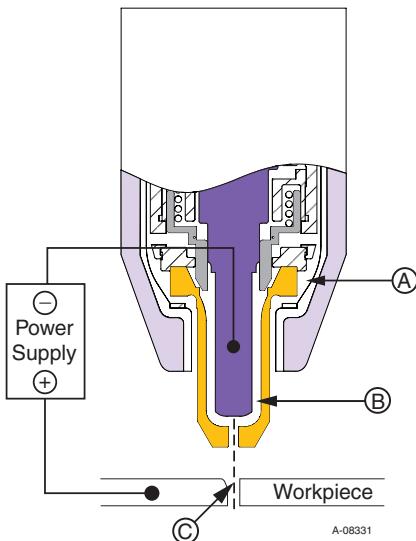
2T.05 Introduction to Plasma

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 start cartridge, around the electrode, and out through the tip orifice.

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

C. Pilot Arc

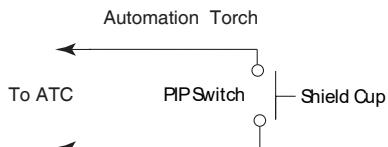
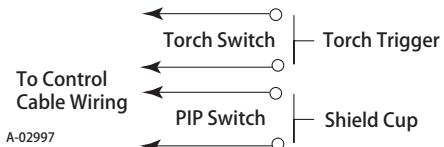
When the torch is started a pilot arc is established between the electrode and cutting tip. This pilot arc creates a path for the main arc to transfer to the work.

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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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.

3.03 Gas Connections

Connecting Gas Supply to Unit

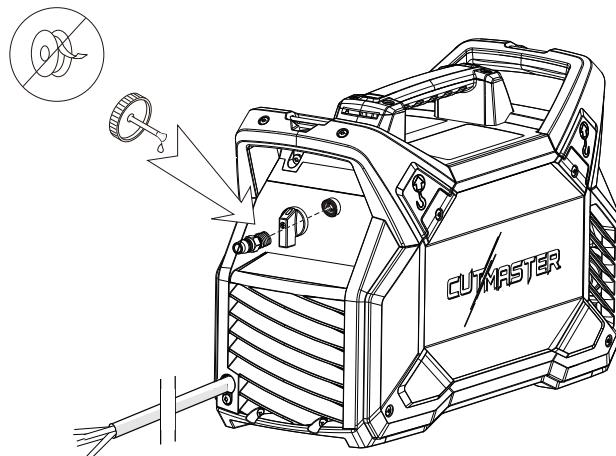
The connection is the same for compressed air or high pressure cylinders.

1. Connect the air line to the quick connect inlet port. The following illustration shows typical gas line with quick connect fittings as an example.

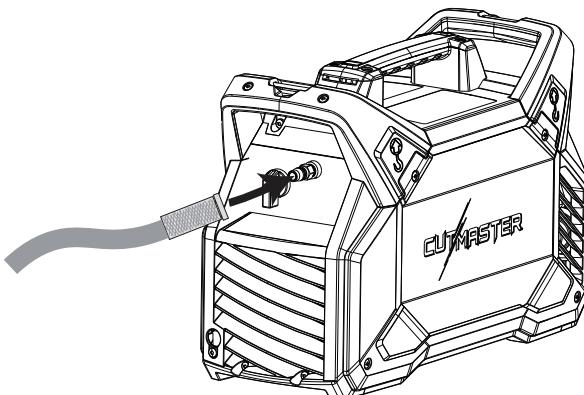


NOTE!

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.



Applying Thread Sealant



Air Connection to Inlet Port

2. IF using high pressure cylinders, or your supply pressure exceeds 125 psi / 8.62 bar / 862 kPa, you **MUST** use regulator to lower pressure to between 90 - 125 psi / 6.2 - 8.6 bar / 620 - 862 kPa before introducing air to the system.

**WARNING**

Failure to regulate inbound air pressure below 125 psi / 8.62 bar / 862 kPa may cause damage to the unit.

3.04 Primary Input Power Connections**CAUTION**

Check your power source for correct voltage before connecting the unit to input power. 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.

Power Cords Included With the Power Supply

Power cable come attached on all systems.

For Europe it will come with a 2.5mm² (CM50+) or 4mm² (CM70+) cable and a plug for use on a 400V circuit.

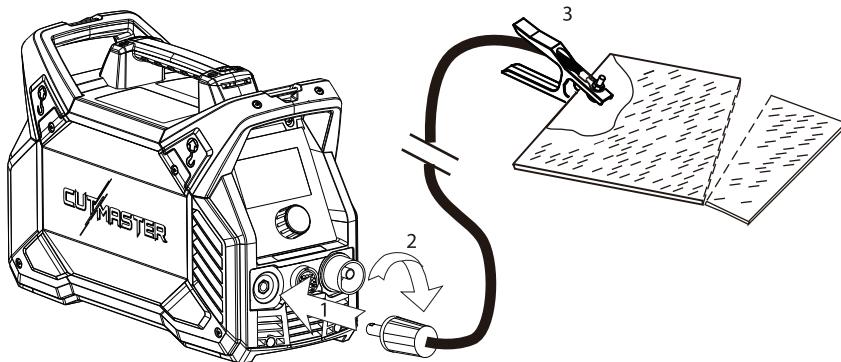
For North America it will come with a 11AWG cable for use on a 480V circuit.

Input Voltage	Model	Rated Output	Amps (RMS) input at rated output, 50 Hz, three-phase	kVA
400V (CE)	CM50+	50A, 150V	20.4A	14.2
	CM70+	70A, 150V	25A	17.3
480V (ETL)	CM50+	50A, 150V	13.8A	11.5
	CM70+	70A, 150V	19.2A	16.0

3.05 Work Lead Connections

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

1. Attach the Dinse type connection of the work lead to the power supply front panel as shown below.
2. Push in and turn clockwise to the right until tight.
3. 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.



See section 3T for torch installation.

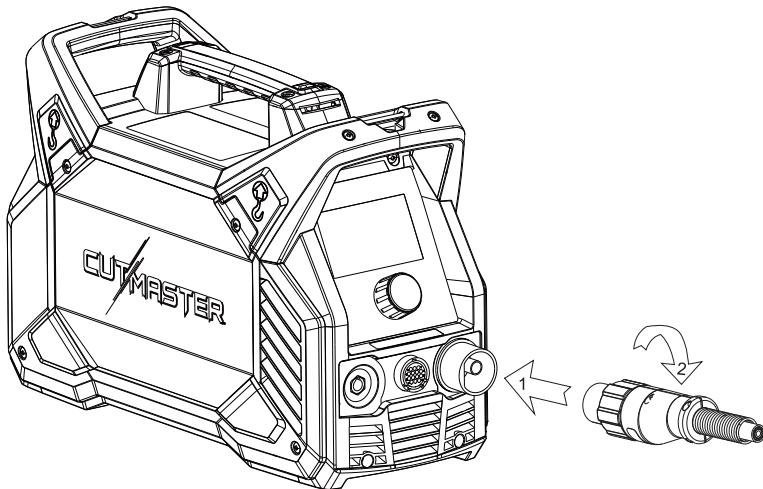
SECTION 3 TORCH: INSTALLATION**3T.01 Torch Connections**

Connect the torch to the Power Supply. Connect only the ESAB model SL60 / Manual or SL100 / Mechanical torch to this power supply.

**WARNING**

Disconnect primary power at the source before connecting the torch.

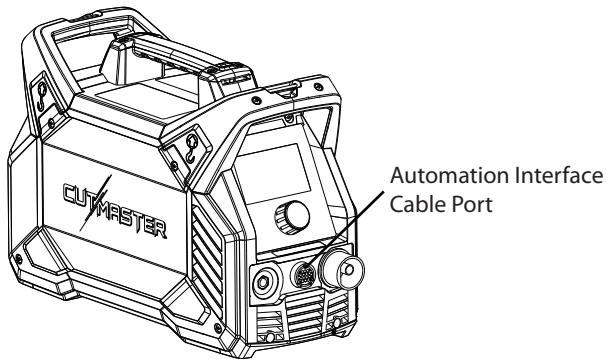
1. Align the ATC male connector (on the torch lead) with the female receptacle. Push the male connector into the female receptacle. The connectors should push together with a small amount of pressure.
2. Secure the connection by turning the locking nut clockwise until it clicks. DO NOT use the locking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



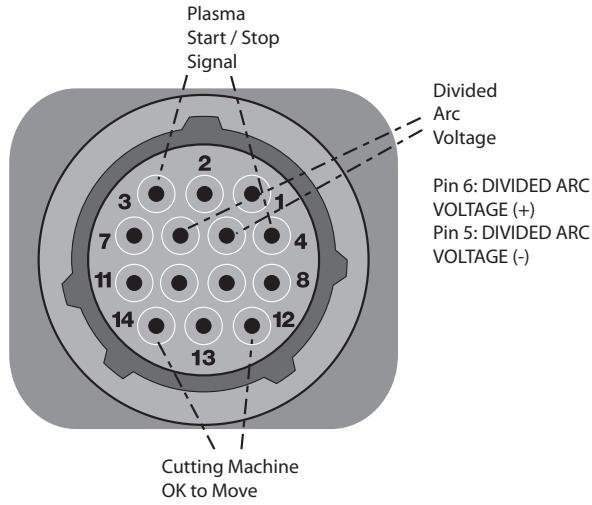
Connecting the Torch to the Power Supply

3T.02 CNC Connections

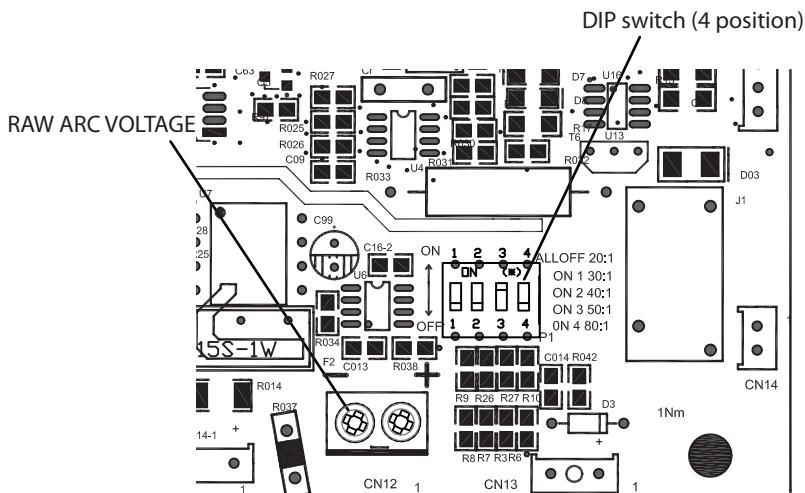
1. Locate the interface connection port on the front of the power supply.



2. Note the pin-out of the connector and that the customer supplied connector matches.



3T.03 Voltage divider



Voltage divider

The 4 position DIP switch, P1, makes available the following divide ratios:

- All OFF: = 20:1 for ESAB;
DIV1-1 ON: = 30:1;
DIV1-2 ON: = 40:1 for Inova;
DIV1-3 ON : = 50:1 for IHT, SC3000&3100, Hypertherm® (Default);
DIV1-4 ON: = 80:1 for TD iHC

Divided arc voltage signal is isolated.

Raw Arc Voltage

Refer to Appendix 4.



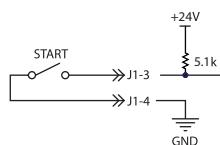
NOTEI

NOTE: Only one position should be on at a time

Rating:

The OK to Move are relay contacts rated for maximum of 30V AC or DC at 1 amp maximum.

Start SW input requires a switch or relay contact rated for at least 24VDC at 5mA.



3T.04 Setting Up Automation or Machine Torch**NOTE!**

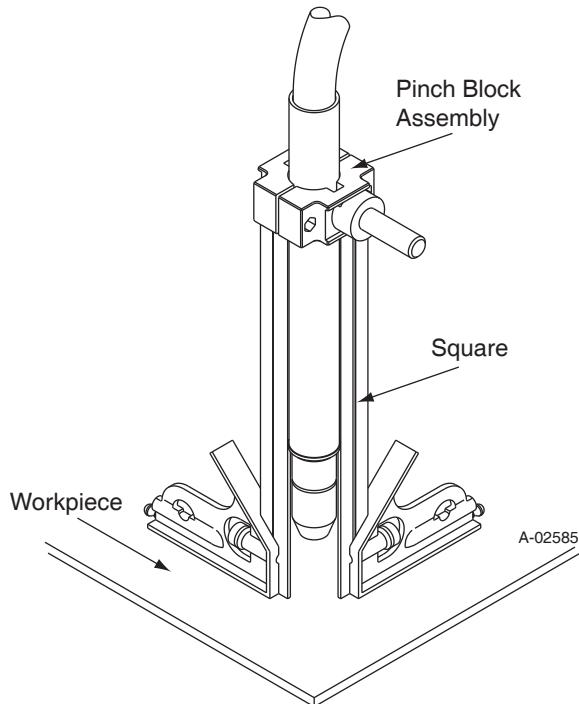
An adapter is required to be installed in the power supply if converting a hand torch system to operate a machine or automation torch.

**WARNING**

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

The Automation and Machine torch include a positioning tube with rack and pinch block assembly.

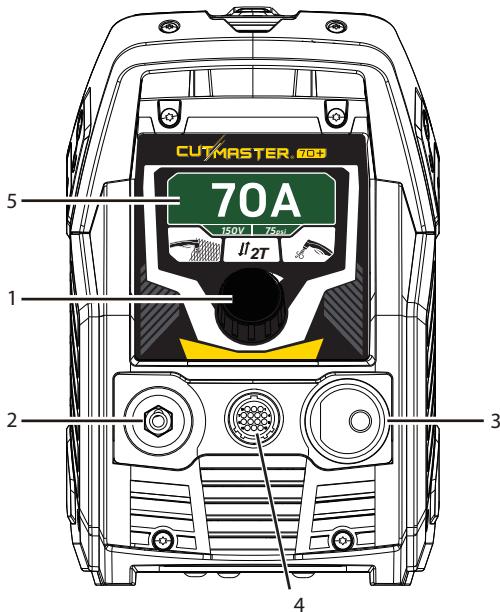
1. Mount the torch assembly on the cutting table.
2. To obtain a clean vertical cut, use a square to align the torch perpendicular to the surface of the workpiece.

*Automated and Machine 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.08, Torch Parts Selection for details.

4.01 Front Panel Controls / Features

See Illustration for numbering identification (Cutmaster 70+ shown as example)



1. Control Knob

To select the Menu or change values.



To adjust the cutting current:

- Turn clockwise to increase the cutting current.
- Turn counterclockwise to reduce the cutting current.

To select an option in the menu displayed, press the control knob to enter the menu screen. After entering the menu screen, the options are highlighted in sequence at each turn.

-   To select the icon on the menu screen and exit menu screen.
-  To change the selection.

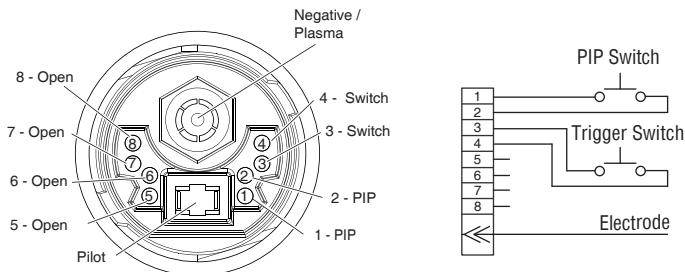
CUTMASTER 50+, CUTMASTER 70+

2. Work lead Dinse type receptacle

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

3. 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.



4. Automation Interface Cable Port

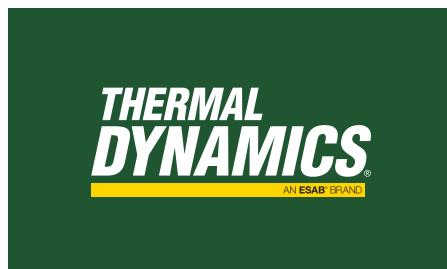
Refer to sections 3T.02 and 3T.03.

5. LCD screen (Cutmaster 70+ shown as example)

The front panel has an LCD screen to display the cutting mode, cutting current, cutting voltage, air pressure, and error information.

WELCOME SCREEN

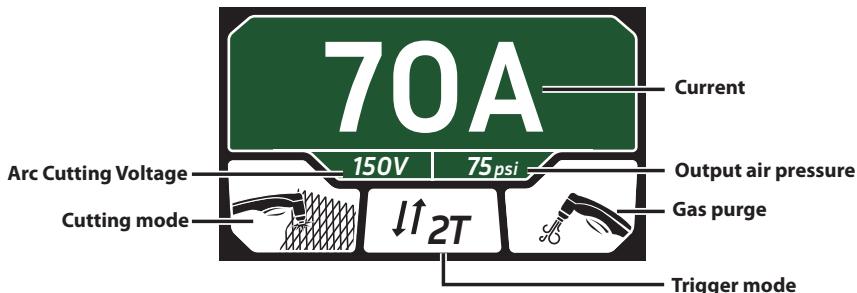
The welcome screen is displayed for 3 seconds while the equipment turns ON.



After the welcome screen, the model name is displayed for 3 seconds.



MAIN SCREEN



MENU SCREEN

To enter the menu screen, press the control knob. In the menu screen, the user may adjust the cutting mode, trigger mode, and gas purge. To exit the menu screen, rotate the control knob to main screen.

1) CUTTING MODE SELECTION SCREEN

To enter the cutting mode selection, press the control knob, the cutting mode is highlighted.

To change the selection, press the knob, the cutting mode changes between plate cutting mode and grid cutting mode.

Plate Cutting Mode: Used for general cutting operations;

Grid Cutting Mode: Allows for faster restarting of the Pilot Arc for uninterrupted cutting. With the system in the grid cutting 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 'grid cutting' mode when cutting expanded metal or gratings, or trimming operations when an uninterrupted restart is desired).

To confirm the selection, rotate the control knob to exit cutting mode selection menu.



2) TRIGGER MODE SELECTION SCREEN

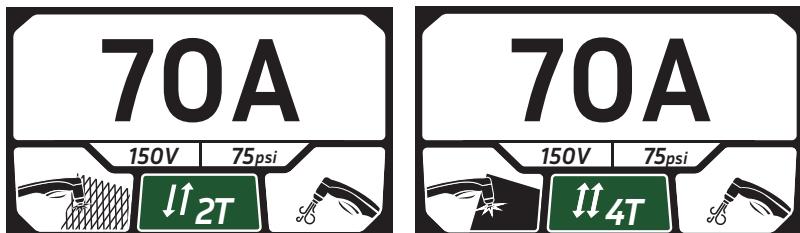
To enter the trigger mode selection, press the control knob to enter menu screen. Turn the knob clockwise to enter trigger mode screen. The trigger mode is highlighted. To change the selection, press the knob, the trigger mode changes between 2T (normal) mode and 4T (lock) mode. Rotate the control knob to exit the trigger mode selection screen to confirm the selection.

2T (normal): Once the cutting arc is established, it should continue to cut until the trigger is released.

4T (lock mode): Used for longer hand held or mechanical cuts. (Does not apply to automation). Once a cutting arc is established, the torch switch can be released. The cutting arc will remain ON until the torch is lifted away from the workpiece or the torch leaves the edge of the workpiece or the torch switch is triggered again.

CUTMASTER 50+, CUTMASTER 70+

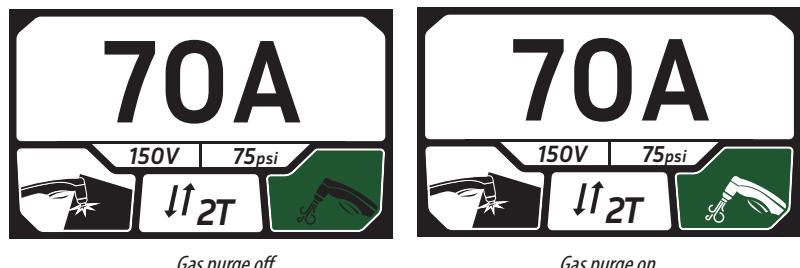
Note that 4T trigger mode is only available at plate cutting mode. When grid cutting mode is selected, 4T trigger mode can't be selected.



3) GAS PURGE SCREEN

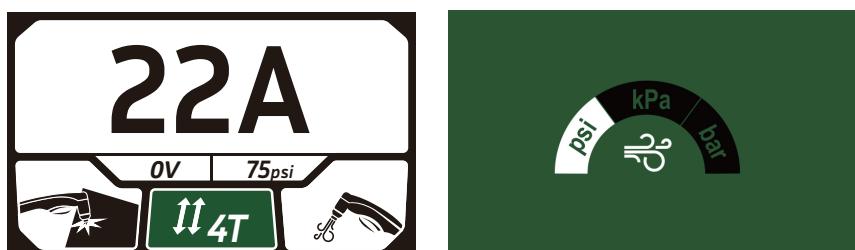
To enter gas purge, press the control knob to enter menu screen. Turn the knob clockwise to enter gas purge screen.

Press the control knob to active the gas purge, press control knob again to stop the gas purge, rotate the control knob to exit the gas purge screen.



4) GAS PRESSURE UNIT SELECTION SCREEN

In idle state, set 22A current and select 4T trigger mode. Only when the 4T trigger mode is highlighted, press the control knob for about 5s to enter the gas pressure unit selection screen. Turn the control knob, select the gas pressure unit (psi/bar/kPa), and press the control knob to confirm the selection.



Error screen

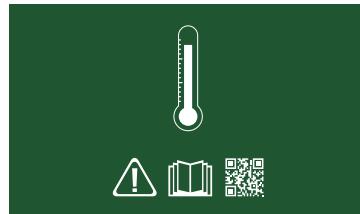
There are several error warnings screens to indicate errors. When an error happens, the communication screen will display and cut off the output until the error is cleared.

1) OVERHEATING COMMUNICATION SCREEN

The cutting equipment is protected by a temperature sensor. The overheating communication screen is displayed if the machine is overheated, which normally occurs if the equipment duty cycle is exceeded.

If the overheating communication screen displays the machine output shall be deactivated. Let the equipment ON to allow the internal components to cool down. When the equipment is cool enough, the overheating communication screen disappears automatically.

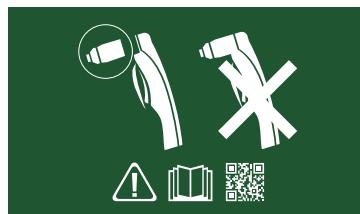
Notice that the main switch must remain in the I position, so that the fan continues to operate and allow the equipment to cool down enough.

**2) AIR PRESSURE COMMUNICATION SCREEN**

The air pressure communication screen is displayed if the output air pressure is out of range (below 43.5 psi / 3 bar / 300kPa, or above 110 psi / 7.6 bar / 760kPa). Note: the machine will not display the communication if the torch is not connected to ATC.

**3) TORCH INSTALLATION OR COVER ASSEMBLY COMMUNICATION SCREEN**

The torch installation or incorrect cover assembly communication screen is displayed when the torch or torch consumable is not installed correctly. Note: the machine will not display the communication if the torch is not connected to ATC.



4) ELECTRODE OR TIP INSTALLATION COMMUNICATION SCREEN

The electrode or tip installation communication screen is displayed when the tip and electrode are not installed correctly or wear seriously. Check or replace the worn tip and electrode.

**5) INPUT VOLTAGE COMMUNICATION SCREEN**

The input voltage communication screen is displayed when the input voltage is out of range or missing phase.

CE: the input voltage is under AC340V or above AC460V, check that the input voltage is not less than AC360V or more than AC440V.

ETL: the input voltage is under AC408V or above AC552V, check that the input voltage is not less than AC430V or more than AC528V.

**(6) START ERROR COMMUNICATION SCREEN**

Start signal is active before Input Power Main Switch is turned to ON position.

Start can be active for the following:

- Hand torch switch held closed
- CNC start signal held on



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 (70 amps maximum at AC400V or AC480V). Refer to Section 4T.01 for torch parts order.

Torch Connection

Check that the torch is properly connected. Only Thermal Dynamics models SL60 Manual Torches or SL100 Mechanized Torches may be connected to this Power Supply. See Section 3T.01 of this manual.

Check Primary Input Power Source

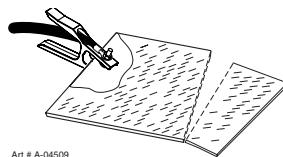
1. Check the power source for proper input voltage. Make sure the input power source meets the power requirements for the unit per Section 2, Specifications.
2. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

Air Source

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

Connect Work Cable

Clamp the work cable to the workpiece or cutting table. The work cable clamp 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.



Art # A-04509

Power ON

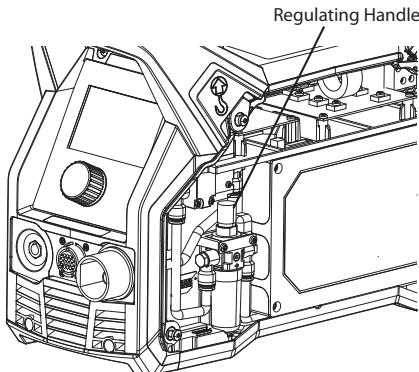
Place the Power Supply main switch to the "I" (right) position. LCD turns ON. The Main Board performs several tests to determine the system is ready to operate.

If there are no issues detected the output current setting will be displayed from 15 to 50 or 70 amps.

The cooling fan will turn ON for one second as the unit is turned ON and will auto to run when the unit is working normally.

Set Operating Pressure

Gas pressure can be set in the power supply, from 50 - 90 psi / 3.4 - 6.2 bar / 340- 620 kPa.



1. Remove the right panel, inbuilt air regulator assembly is located in front of the power supply;
2. Turn the control knob to the GAS PURGE position, press the knob, and gas will flow.
3. Pull the regulating handle to adjust the gas pressure;
Make clockwise adjustment to increase the gas pressure;
Make counterclockwise adjustment to decrease the gas pressure;
4. After finishing the adjustment, push the regulating handle.
5. Reinstall the right panel.

Cutting Operation

Once the cutting arc is established, it should continue to cut until the trigger is released (ex. 2T), the torch is moved too far from the workpiece or the duty cycle has been exceeded causing the system to go into an over temperature mode. In the first two instances release the torch trigger, ensure that the torch tip is close to the workpiece, activate the trigger and reestablish the cutting arc. In the event of an over temperature fault, release the trigger, allow the unit to run so it will cool down. When the fault clears you can begin cutting again.

Typical Cutting Speeds

Cutting speeds vary according to torch output amperage, gas pressure, the type of material being cut, and operator skill.

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. As thickness of metal being cut increases cutting speed will need to slow. The opposite is true. As thickness of metal being cut decreases, allowable cutting speed can increase.

Postflow

Release the trigger to stop the cutting arc. Gas continues to flow for approximately 30 seconds. During post - flow, if the user quickly presses and releases the trigger, the gas will shut off. If the user continues to hold the trigger and not release it, the pilot arc starts. The main arc will transfer to the workpiece if the torch tip is within transfer distance.

Shutdown

Turn the main switch to "O" to the left as you face the unit from the rear. After a short delay LCD 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) for a few minutes before turning OFF. This will allow them to cool faster.

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

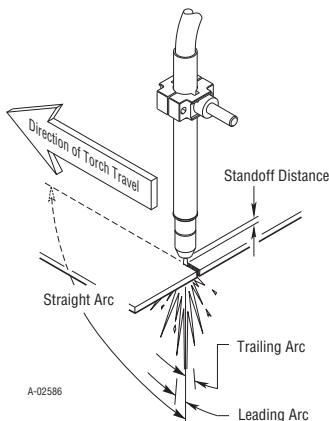
A straight arc is perpendicular to the workpiece surface. This arc is generally recommended for the best cut using air plasma on stainless or aluminum.

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 or operation type. Use Deflector in mechanized applications that do not require "Ohmic-Touch" initial height sensing. Use Shield Cap and Ohmic Clip in mechanized applications that require "Ohmic-Touch" initial height sensing. The torch parts must correspond with the type of operation.

Torch parts:

Shield Cup, Cutting Tip, Electrode and Start Cartridge



NOTE!

Refer to Sections "4T.02 Automation Torch Parts Selection" and following for additional information on torch parts.

Change the torch parts for a different operation as follows:



WARNING

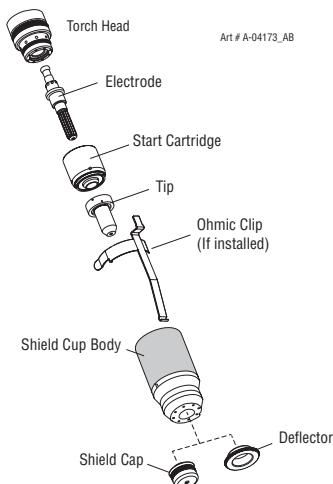
Disconnect primary power at the source before assembling or disassembling torch parts, or torch and leads assemblies.



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 start 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

The type of operation determines the torch parts to be used.

Type of operation:

Drag cutting, standoff cutting or gouging

Torch parts:

Shield Cup, Cutting Tip, Electrode and Start Cartridge



NOTE!

Refer to Section "4T.03 Machine and Hand Torch Parts Selection" and following for additional information on torch parts.

Change the torch parts for a different operation as follows:



WARNING

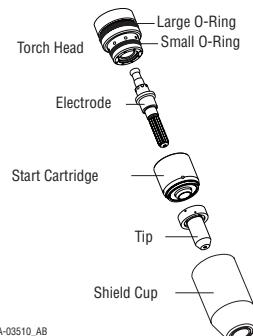
Disconnect primary power at the source before assembling or disassembling torch parts, or torch and leads assemblies.



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 start 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.

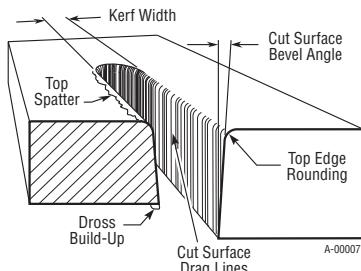
4T.04 Cut Quality



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 disassembling the power supply, torch, or torch leads.

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!

Handle 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

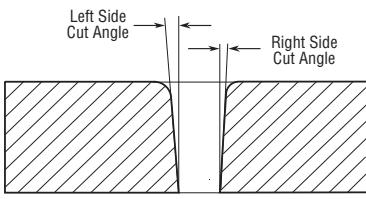
Improper standoff (the distance between the torch tip and workpiece) can adversely affect tip life as well as shield cup life. Standoff may also significantly affect the bevel angle. Reducing standoff will generally result in a more square cut.

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.



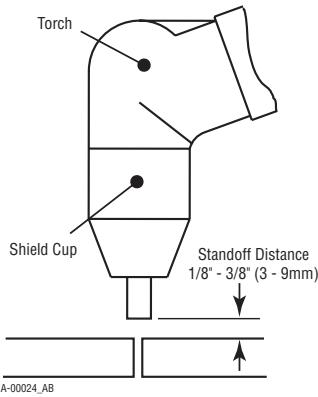
NOTE!

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

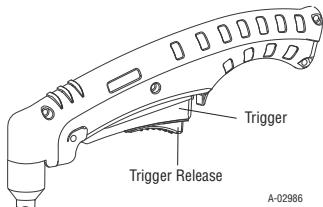
of the workpiece at the point where the cut is to start.

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



Standoff Distance

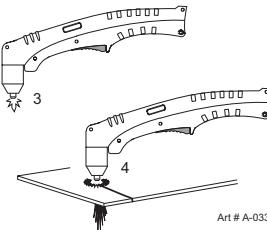
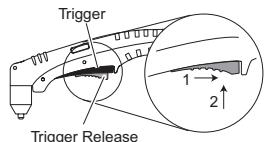
3. Hold the torch away from your body.
4. Slide the trigger release toward the back of the torch handle while simultaneously squeezing the trigger. The pilot arc will start.



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.



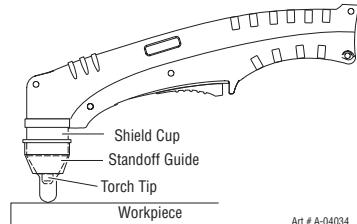
6. Cut as usual. Simply release the trigger assembly to stop cutting.
7. Follow normal recommended cutting practices as provided in the power supply operator's manual.



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.



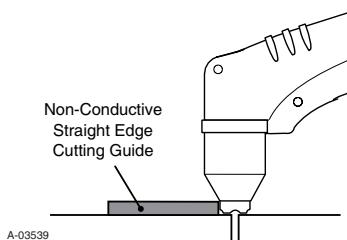
Shield Cup With Straight Edge

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

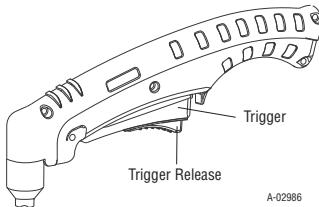
Drag cutting works best on metal 1/4" (6 mm) thick or less.



NOTE!

For best parts performance and 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.
3. Keep the torch in contact with the work-piece during the cutting cycle.
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.

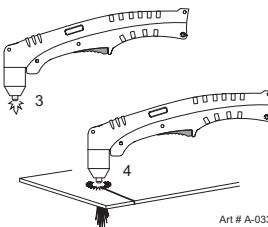
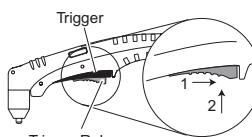


6. Bring the torch within transfer distance to the work. The main arc will transfer to the work, and the pilot arc will shut OFF.



NOTE!

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



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7. Cut as usual. Simply release the trigger assembly to stop cutting.
8. 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

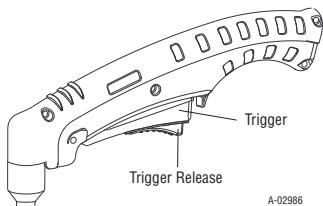
1. The torch can be comfortably held in one hand or steadied with two hands. Position the hand to press the Trigger on the torch handle. With the hand torch, the hand may be positioned close to the torch head for maximum control or

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 blow-back 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.



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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.

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 plasma gouging can cause damage to coated, painted or 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.03 Machine and Hand 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.

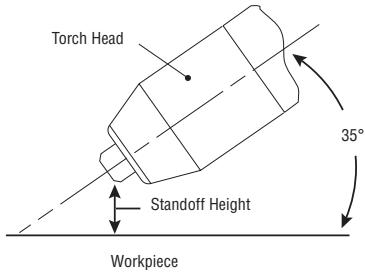
Optimum torch travel speed is dependent on current setting, lead angle, and mode of operation (hand or machine torch).

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.



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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

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.

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

Torch With Exposed Tip							Type Material: Mild Steel							
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch							
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	_inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches mm
0.036	0.9	9-8207	104	40	340	8.64	0.19	4.8	70	4.8	55	170	0	0.2 5.1
0.06	1.5	9-8207	108	40	250	6.35	0.19	4.8	70	4.8	55	170	0.1	0.2 5.1
0.075	1.9	9-8207	108	40	190	4.83	0.19	4.8	70	4.8	55	170	0.3	0.2 5.1
0.135	3.4	9-8207	110	40	105	2.67	0.19	4.8	70	4.8	55	170	0.4	0.2 5.1
0.188	4.8	9-8207	113	40	60	1.52	0.19	4.8	70	4.8	55	170	0.6	0.2 5.1
0.25	6.4	9-8207	111	40	40	1.02	0.19	4.8	70	4.8	55	170	1	0.2 5.1
0.375	9.5	9-8207	124	40	21	0.53	0.19	4.8	70	4.8	55	170	NR	NR NR
0.5	12.7	9-8207	123	40	11	0.28	0.19	4.8	70	4.8	55	170	NR	NR NR
0.625	15.9	9-8207	137	40	7	0.18	0.19	4.8	70	4.8	55	170	NR	NR NR

Torch With Exposed Tip							Type Material: Stainless Steel							
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch							
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	_inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches mm
0.036	0.9	9-8207	103	40	355	9.02	0.125	3.2	70	4.8	55	170	0	0.2 5.1
0.05	1.3	9-8207	98	40	310	7.87	0.125	3.2	70	4.8	55	170	0	0.2 5.1
0.06	1.5	9-8207	98	40	240	6.1	0.125	3.2	70	4.8	55	170	0.1	0.2 5.1
0.075	2	9-8207	100	40	125	3.18	0.125	3.2	70	4.8	55	170	0.3	0.2 5.1
0.135	3.4	9-8207	120	40	30	0.76	0.187	4.8	70	4.8	55	170	0.4	0.2 5.1
0.188	4.8	9-8207	124	40	20	0.51	0.187	4.8	70	4.8	55	170	0.6	0.2 5.1
0.25	6.4	9-8207	122	40	15	0.38	0.187	4.8	70	4.8	55	170	1	0.2 5.1
0.375	9.5	9-8207	126	40	10	0.25	0.187	4.8	70	4.8	55	170	NR	NR NR

Torch With Exposed Tip							Type Material: Aluminum							
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch							
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	_inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches mm
0.032	0.8	9-8207	110	40	440	11.18	0.187	4.8	70	4.8	55	170	0	0.2 5.1
0.051	1.3	9-8207	109	40	350	8.89	0.187	4.8	70	4.8	55	170	0.1	0.2 5.1
0.064	1.6	9-8207	112	40	250	6.35	0.187	4.8	70	4.8	55	170	0.1	0.2 5.1
0.079	2	9-8207	112	40	200	5.08	0.19	4.8	70	4.8	55	170	0.3	0.2 5.1
0.125	3.2	9-8207	118	40	100	2.54	0.19	4.8	70	4.8	55	170	0.4	0.2 5.1
0.188	4.8	9-8207	120	40	98	2.49	0.187	4.8	70	4.8	55	170	0.6	0.2 5.1
0.25	6.4	9-8207	123	40	50	1.27	0.187	4.8	70	4.8	55	170	1	0.2 5.1
0.375	9.5	9-8207	134	40	16	0.41	0.187	4.8	70	4.8	55	170	NR	NR NR

Torch With Exposed Tip							Type Material: Mild Steel								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8209	109	50	270	6.86	0.19	4.8	75	5.2	90	245	0	0.19	4.8
0.075	1.9	9-8209	114	50	238	6.04	0.19	4.8	75	5.2	90	245	0.1	0.19	4.8
0.135	3.4	9-8209	115	50	138	3.50	0.19	4.8	75	5.2	90	245	0.1	0.19	4.8
0.188	4.8	9-8209	117	50	80	2.03	0.19	4.8	75	5.2	90	245	0.2	0.19	4.8
0.25	6.4	9-8209	115	50	60	1.53	0.19	4.8	75	5.2	90	245	0.3	0.19	4.8
0.375	9.5	9-8209	124	50	36	0.90	0.19	4.8	75	5.2	90	245	0.5	0.19	4.8
0.5	12.7	9-8209	125	50	19	0.47	0.19	4.8	75	5.2	90	245	0.75	0.19	4.8
0.625	15.9	9-8209	132	50	13	0.33	0.19	4.8	75	5.2	90	245	NR	NR	NR

Torch With Exposed Tip							Type Material: Stainless Steel								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8209	109	50	295	7.51	0.19	4.8	75	5.2	90	245	0	0.2	5.1
0.075	1.9	9-8209	108	50	213	5.41	0.19	4.8	75	5.2	90	245	0.1	0.2	5.1
0.135	3.4	9-8209	119	50	78	1.97	0.19	4.8	75	5.2	90	245	0.1	0.2	5.1
0.188	4.8	9-8209	123	50	55	1.40	0.19	4.8	75	5.2	90	245	0.2	0.2	5.1
0.25	6.4	9-8209	121	50	40	1.02	0.19	4.8	75	5.2	90	245	0.3	0.2	5.1
0.375	9.5	9-8209	128	50	20	0.51	0.19	4.8	75	5.2	90	245	0.5	0.2	5.1

Torch With Exposed Tip							Type Material: Aluminum								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8209	111	50	345	8.77	0.25	6.4	75	5.2	90	245	0	0.25	6.4
0.075	1.9	9-8209	111	50	320	8.13	0.25	6.4	75	5.2	90	245	0.1	0.25	6.4
0.12	3	9-8209	117	50	175	4.45	0.25	6.4	75	5.2	90	245	0.1	0.25	6.4
0.188	3.4	9-8209	118	50	134	3.41	0.25	6.4	75	5.2	90	245	0.2	0.25	6.4
0.25	6.4	9-8209	128	50	68	1.72	0.25	6.4	75	5.2	90	245	0.3	0.25	6.4
0.375	9.5	9-8209	137	50	31	0.78	0.25	6.4	75	5.2	90	245	0.5	0.25	6.4

CUTMASTER 50+, CUTMASTER 70+

Torch With Exposed Tip							Type Material: Mild Steel								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8231	112	70	305	7.75	0.19	4.8	75	4.8	115	340	0	0.19	4.8
0.12	3	9-8231	117	70	205	5.21	0.19	4.8	75	4.8	115	340	0.1	0.19	4.8
0.135	3.4	9-8231	117	70	175	4.45	0.19	4.8	75	4.8	115	340	0.1	0.19	4.8
0.188	4.8	9-8231	118	70	120	3.05	0.19	4.8	75	4.8	115	340	0.2	0.19	4.8
0.25	6.4	9-8231	117	70	90	2.29	0.19	4.8	75	4.8	115	340	0.3	0.19	4.8
0.375	9.5	9-8231	121	70	46	1.17	0.19	4.8	75	4.8	115	340	0.4	0.19	4.8
0.5	12.7	9-8231	123	70	30	0.75	0.19	4.8	75	4.8	115	340	0.6	0.19	4.8
0.625	15.9	9-8231	130	70	21	0.52	0.19	4.8	75	4.8	115	340	0.75	0.19	4.8
0.75	19.1	9-8231	131	70	16	0.41	0.19	4.8	75	4.8	115	340	NR	NR	NR
0.875	22.2	9-8231	133	70	9	0.23	0.19	4.8	75	4.8	115	340	NR	NR	NR
1	25.4	9-8231	136	70	8	0.20	0.19	4.8	75	4.8	115	340	NR	NR	NR

Torch With Exposed Tip							Type Material: Stainless Steel								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8231	120	70	345	8.78	0.25	6.4	75	4.8	115	340	0	0.25	6.4
0.12	3	9-8231	122	70	225	5.72	0.25	6.4	75	4.8	115	340	0.1	0.25	6.4
0.135	3.4	9-8231	119	70	203	5.15	0.25	6.4	75	4.8	115	340	0.1	0.25	6.4
0.188	4.8	9-8231	121	70	115	2.93	0.25	6.4	75	4.8	115	340	0.2	0.25	6.4
0.25	6.4	9-8231	120	70	83	2.10	0.25	6.4	75	4.8	115	340	0.3	0.25	6.4
0.375	9.5	9-8231	128	70	40	1.02	0.25	6.4	75	4.8	115	340	0.4	0.25	6.4
0.5	12.7	9-8231	131	70	25	0.62	0.25	6.4	75	4.8	115	340	0.8	0.25	6.4
0.625	15.9	9-8231	133	70	18	0.45	0.25	6.4	75	4.8	115	340	1	0.25	6.4
0.75	19.1	9-8231	143	70	11	0.28	0.25	6.4	75	4.8	115	340	NR	NR	NR
0.875	22.2	9-8231	143	70	9	0.23	0.25	6.4	75	4.8	115	340	NR	NR	NR
1	25.4	9-8231	146	70	8	0.20	0.25	6.4	75	4.8	115	340	NR	NR	NR

Torch With Exposed Tip							Type Material: Aluminum								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8231	115	70	395	10.04	0.25	6.4	75	4.8	115	340	0	0.25	6.4
0.12	3	9-8231	120	70	275	6.99	0.25	6.4	75	4.8	115	340	0.1	0.25	6.4
0.188	4.8	9-8231	120	70	175	4.45	0.25	6.4	75	4.8	115	340	0.2	0.25	6.4
0.25	6.4	9-8231	130	70	98	2.48	0.25	6.4	75	4.8	115	340	0.3	0.25	6.4
0.375	9.5	9-8231	138	70	50	1.27	0.25	6.4	75	4.8	115	340	0.4	0.25	6.4
0.5	12.7	9-8231	141	70	34	0.87	0.25	6.4	75	4.8	115	340	0.6	0.25	6.4
0.625	15.9	9-8231	144	70	23	0.59	0.25	6.4	75	4.8	115	340	0.75	0.25	6.4
0.75	19.1	9-8231	145	70	21	0.54	0.25	6.4	75	4.8	115	340	NR	NR	NR
0.875	22.2	9-8231	153	70	8	0.20	0.25	6.4	75	4.8	115	340	NR	NR	NR
1	25.4	9-8231	162	70	5	0.13	0.25	6.4	75	4.8	115	340	NR	NR	NR

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

Torch With Shielded Tip							Type Material: Mild Steel								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.036	0.9	9-8207	114	40	170	4.32	0.19	4.8	70	4.8	55	170	0	0.2	5.1
0.06	1.5	9-8207	120	40	90	2.29	0.19	4.8	70	4.8	55	170	0.1	0.2	5.1
0.075	1.9	9-8207	121	40	80	2.03	0.19	4.8	70	4.8	55	170	0.3	0.2	5.1
0.135	3.4	9-8207	122	40	75	1.91	0.19	4.8	70	4.8	55	170	0.4	0.2	5.1
0.135	3.4	9-8207	122	40	75	1.91	0.19	4.8	70	4.8	55	170	0.4	0.2	5.1
0.188	4.8	9-8207	123	40	30	0.76	0.19	4.8	70	4.8	55	170	0.6	0.2	5.1
0.25	6.4	9-8207	125	40	25	0.64	0.19	4.8	70	4.8	55	170	1	0.2	5.1
0.375	9.5	9-8207	138	40	11	0.28	0.19	4.8	70	4.8	55	170	NR	NR	NR
0.5	12.7	9-8207	142	40	7	0.18	0.19	4.8	70	4.8	55	170	NR	NR	NR
0.625	15.9	9-8207	152	40	3	0.08	0.19	4.8	70	4.8	55	170	NR	NR	NR

Torch With Shielded Tip							Type Material: Stainless Steel								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.036	0.9	9-8207	109	40	180	4.57	0.125	3.2	70	4.8	55	170	0	0.2	5.1
0.05	1.3	9-8207	105	40	165	4.19	0.125	3.2	70	4.8	55	170	0	0.2	5.1
0.06	1.5	9-8207	115	40	120	3.05	0.125	3.2	70	4.8	55	170	0.1	0.2	5.1
0.078	2	9-8207	120	40	65	1.65	0.187	4.8	70	4.8	55	170	0.3	0.2	5.1
0.135	3.4	9-8207	125	40	25	0.64	0.187	4.8	70	4.8	55	170	0.4	0.2	5.1
0.188	4.8	9-8207	132	40	20	0.51	0.187	4.8	70	4.8	55	170	0.6	0.2	5.1
0.25	6.4	9-8207	130	40	15	0.38	0.187	4.8	70	4.8	55	170	1	0.2	5.1
0.375	9.5	9-8207	130	40	10	0.25	0.187	4.8	70	4.8	55	170	NR	NR	NR

Torch With Shielded Tip							Type Material: Aluminum								
Type Plasma Gas: Air							Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)		Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.032	0.8	9-8207	116	40	220	5.59	0.187	4.8	70	4.8	55	170	0	0.2	5.1
0.051	1.3	9-8207	116	40	210	5.33	0.187	4.8	70	4.8	55	170	0	0.2	5.1
0.064	1.6	9-8207	118	40	180	4.57	0.187	4.8	70	4.8	55	170	0.1	0.2	5.1
0.079	2	9-8207	116	40	150	3.81	0.19	4.8	70	4.8	55	170	0.3	0.2	5.1
0.125	3.2	9-8207	130	40	75	1.91	0.19	4.8	70	4.8	55	170	0.4	0.2	5.1
0.188	4.8	9-8207	132	40	60	1.52	0.187	4.8	70	4.8	55	170	0.6	0.2	5.1
0.25	6.4	9-8207	134	40	28	0.71	0.187	4.8	70	4.8	55	170	1	0.2	5.1
0.375	9.5	9-8207	143	40	11	0.28	0.187	4.8	70	4.8	55	170	NR	NR	NR

CUTMASTER 50+, CUTMASTER 70+

Torch With Shielded Tip						Type Material: Mild Steel								
Type Plasma Gas: Air						Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)	Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches mm
0.06	1.5	9-8209	122	50	170	4.32	0.19	4.8	75	5.2	90	245	0	0.2 5.1
0.075	1.9	9-8209	124	50	159	4.03	0.19	4.8	75	5.2	90	245	0.1	0.2 5.1
0.12	3	9-8209	124	50	153	3.88	0.19	4.8	75	5.2	90	245	0.1	0.2 5.1
0.135	3.4	9-8209	125	50	109	2.76	0.19	4.8	75	5.2	90	245	0.1	0.2 5.1
0.188	4.8	9-8209	126	50	78	1.97	0.19	4.8	75	5.2	90	245	0.2	0.2 5.1
0.25	6.4	9-8209	124	50	53	1.34	0.19	4.8	75	5.2	90	245	0.3	0.2 5.1
0.375	9.5	9-8209	135	50	23	0.57	0.19	4.8	75	5.2	90	245	0.5	0.2 5.1
0.5	12.7	9-8209	140	50	15	0.38	0.19	4.8	75	5.2	90	245	0.75	0.2 5.1
0.625	15.9	9-8209	146	50	9	0.22	0.19	4.8	75	5.2	90	245	NR	NR NR

Torch With Shielded Tip						Type Material: Stainless Steel								
Type Plasma Gas: Air						Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)	Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches mm
0.06	1.5	9-8209	113	50	143	3.62	0.13	3.2	75	5.2	90	245	0	0.2 5.1
0.075	1.9	9-8209	118	50	110	2.80	0.13	3.2	75	5.2	90	245	0.1	0.2 5.1
0.135	3.4	9-8209	122	50	53	1.34	0.13	3.2	75	5.2	90	245	0.1	0.2 5.1
0.188	4.8	9-8209	126	50	48	1.21	0.13	3.2	75	5.2	90	245	0.2	0.2 5.1
0.25	6.4	9-8209	126	50	38	0.95	0.13	3.2	75	5.2	90	245	0.3	0.2 5.1
0.375	9.5	9-8209	130	50	19	0.48	0.13	3.2	75	5.2	90	245	0.5	0.2 5.1

Torch With Shielded Tip						Type Material: Aluminum								
Type Plasma Gas: Air						Type Secondary Gas: Single Gas Torch								
Thickness		Tip	Output	Amperage	Speed (Per Minute)	Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height	
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches mm
0.06	1.5	9-8209	112	50	265	6.73	0.13	3.2	75	5.2	90	245	0	0.2 5.1
0.075	1.9	9-8209	113	50	250	6.35	0.13	3.2	75	5.2	90	245	0.1	0.2 5.1
0.12	3	9-8209	120	50	175	4.45	0.13	3.2	75	5.2	90	245	0.1	0.2 5.1
0.188	3.4	9-8209	127	50	100	2.54	0.13	3.2	75	5.2	90	245	0.2	0.2 5.1
0.25	6.4	9-8209	134	50	54	1.37	0.19	4.8	75	5.2	90	245	0.3	0.2 5.1
0.375	9.5	9-8209	142	50	28	0.71	0.19	4.8	75	5.2	90	245	0.5	0.2 5.1

CUTMASTER 50+, CUTMASTER 70+

Torch With Shielded Tip						Type Material: Mild Steel									
Type Plasma Gas: Air						Type Secondary Gas: Single Gas Torch									
Thickness		Tip	Output	Amperage	Speed (Per Minute)	Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height		
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8231	126	70	265	6.73	0.19	4.8	75	4.8	115	340	0	0.2	5.1
0.12	3	9-8231	126	70	217	5.50	0.19	4.8	75	4.8	115	340	0.1	0.2	5.1
0.135	3.4	9-8231	128	70	162	4.12	0.19	4.8	75	4.8	115	340	0.1	0.2	5.1
0.188	4.8	9-8231	128	70	131	3.33	0.19	4.8	75	4.8	115	340	0.2	0.2	5.1
0.25	6.4	9-8231	127	70	90	2.29	0.19	4.8	75	4.8	115	340	0.3	0.2	5.1
0.375	9.5	9-8231	133	70	37	0.94	0.19	4.8	75	4.8	115	340	0.5	0.2	5.1
0.5	12.7	9-8231	137	70	30	0.75	0.19	4.8	75	4.8	115	340	0.6	0.2	5.1
0.625	15.9	9-8231	142	70	18	0.45	0.19	4.8	75	4.8	115	340	0.75	0.2	5.1
0.75	19.1	9-8231	145	70	14	0.36	0.19	4.8	75	4.8	115	340	NR	NR	NR
0.875	22.2	9-8231	150	70	13	0.34	0.19	4.8	75	4.8	115	340	NR	NR	NR
1	25.4	9-8231	159	70	7	0.18	0.19	4.8	75	4.8	115	340	NR	NR	NR

Torch With Shielded Tip						Type Material: Stainless Steel									
Type Plasma Gas: Air						Type Secondary Gas: Single Gas Torch									
Thickness		Tip	Output	Amperage	Speed (Per Minute)	Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height		
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8231	110	70	340	6.35	0.125	3.2	75	4.8	115	340	0	0.2	5.1
0.12	3	9-8231	115	70	260	4.84	0.125	3.2	75	4.8	115	340	0.1	0.2	5.1
0.135	3.4	9-8231	116	70	250	4.14	0.125	3.2	75	4.8	115	340	0.1	0.2	5.1
0.188	4.8	9-8231	117	70	170	3.08	0.125	3.2	75	4.8	115	340	0.2	0.2	5.1
0.25	6.4	9-8231	119	70	85	1.83	0.125	3.2	75	4.8	115	340	0.3	0.2	5.1
0.375	9.5	9-8231	126	70	45	0.92	0.125	3.2	75	4.8	115	340	0.4	0.25	6.4
0.5	12.7	9-8231	134	70	18	0.44	0.125	3.2	75	4.8	115	340	0.75	0.25	6.4
0.625	15.9	9-8231	135	70	16	0.38	0.125	3.2	75	4.8	115	340	1	0.25	6.4
0.75	19.1	9-8231	143	70	8	0.23	0.125	3.2	75	4.8	115	340	NR	NR	NR
0.875	22.2	9-8231	138	70	7	0.18	0.125	3.2	75	4.8	115	340	NR	NR	NR
1	25.4	9-8231	140	70	7	0.18	0.125	3.2	75	4.8	115	340	NR	NR	NR

Torch With Shielded Tip						Type Material: Aluminum									
Type Plasma Gas: Air						Type Secondary Gas: Single Gas Torch									
Thickness		Tip	Output	Amperage	Speed (Per Minute)	Standoff		Plasma Gas Pressure		Flow (CFH)		Pierce	Pierce Height		
Inches	mm	(Cat. No.)	Volts (VDC)	(Amps)	Inches	Meters	Inches	mm	psi*	bar	Plasma	Total**	Delay (Sec)	Inches	mm
0.06	1.5	9-8231	110	70	320	8.51	0.13	3.2	75	4.8	115	340	0	0.25	6.4
0.12	3	9-8231	115	70	240	6.55	0.13	3.2	75	4.8	115	340	0.1	0.25	6.4
0.25	6.4	9-8231	129	70	100	2.29	0.13	3.2	75	4.8	115	340	0.3	0.25	6.4
0.375	9.5	9-8231	139	70	60	1.33	0.19	4.8	75	4.8	115	340	0.4	0.25	6.4
0.5	12.7	9-8231	143	70	36	0.79	0.19	4.8	75	4.8	115	340	0.6	0.25	6.4
0.625	15.9	9-8231	144	70	26	0.57	0.19	4.8	75	4.8	115	340	0.75	0.25	6.4
0.75	19.1	9-8231	150	70	18	0.42	0.19	4.8	75	4.8	115	340	NR	NR	NR
0.875	22.2	9-8231	156	70	7	0.18	0.19	4.8	75	4.8	115	340	NR	NR	NR
1	25.4	9-8231	164	70	5	0.13	0.19	4.8	75	4.8	115	340	NR	NR	NR

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5.01 General Maintenance

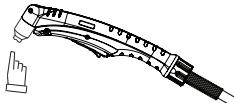


Warning!
Disconnect input power before maintaining.

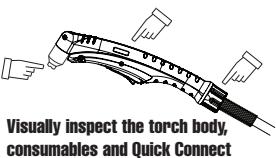
Maintain more often
if used under severe
conditions

Each Use

Visual check of
torch tip and electrode



Weekly



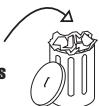
Visually inspect the
torch body,
consumables and Quick Connect

Visually inspect the
cables and leads.
Replace as needed



3 Months

Replace all
broken parts



Clean
exterior
of power supply



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.

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 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	<ol style="list-style-type: none">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. Line pressure 90-125 psi (6.2-8.6 bar / 620-862 kPa).
Main Arc Extinguishes	<ol style="list-style-type: none">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.7. Line voltage drop due to extension cord or supply line being too long.
Excessive Dross Formation	<ol style="list-style-type: none">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	<ol style="list-style-type: none">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	<ol style="list-style-type: none">1. Worn torch parts.2. Non - Genuine Thermal Dynamics parts used.3. Incorrect gas pressure.4. Line voltage too low.5. Wrong parts for current selection.6. Hose restriction.

5.04 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
Main Switch is ON but the LCD 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.
Overheating communication screen 	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. Allow unit to cool. 2. Refer to clearance information – see Section "2.04 Power Supply Specifications CE" on page 16 or Section "2.07 Power Supply Specifications ETL" on page 19. 3. Return to authorized service center for repair or replacement.
Air pressure communication screen 	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 / 8.27 bar / 827 kPa. Set leads length to match the actual length being used. 4. Return to authorized service center for repair or replacement.
Torch installation or cover assembly communication screen (PIP) 	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.
Electrode or tip installation communication screen (PIC) 	1. Torch shield cup is loose. 2. Torch tip, electrode or start 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 / 8.62 bar / 862 kPa 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.
Start error communication screen 	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: <ul style="list-style-type: none"> • Hand torch switch held closed • CNC START signal is active low 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
Input voltage communication screen 	1. Primary input voltage problem. The input voltage is under AC340V, or above AC460V (CE); under AC408V or above AC552V (ETL). 2. Missing phase 3. Failed components in unit.	1. Have qualified person check primary voltage to insure it meets unit requirements see Section "2.05 or 2.08 Input Wiring Specifications". 2. Missing phase. Measure all 3 phases, L1 to L2, L2 to L3 and L3 to L1. Best to take these measurements at the input bridge AC terminals which are marked ~ ,this way it also checks that the voltage is getting through the rear panel circuit breaker. 3. 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	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.
No Fault screen, no arc in torch	1. Failed components in unit.	1. Return to an authorized service center for repair.
Pilot arc in 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.

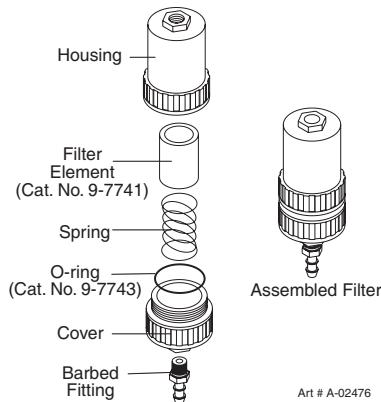
5.05 Power Supply Basic Parts Replacement

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. Check for leaks.



NOTE!

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

This completes the parts replacement procedures.

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SECTION 5 TORCH: SERVICE**5.1.01 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.

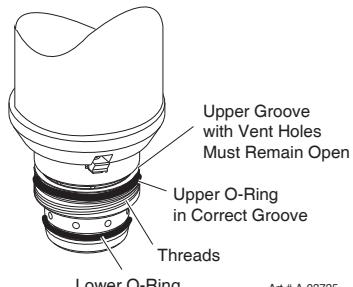
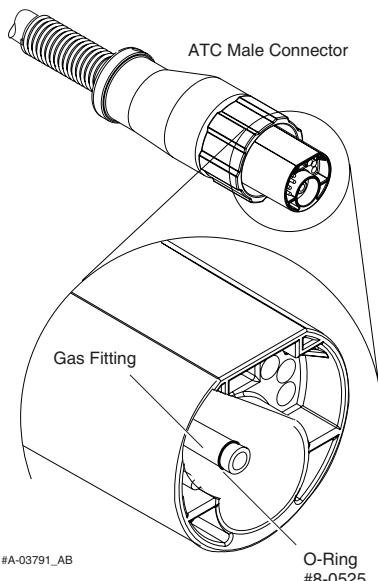
**CAUTION**

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 start cartridge in place. Position the torch with the shield cup facing upward to prevent these parts from falling out when the cup is removed.

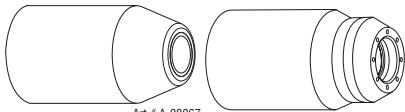
1. Unscrew and remove the shield cup from the torch.



NOTE!

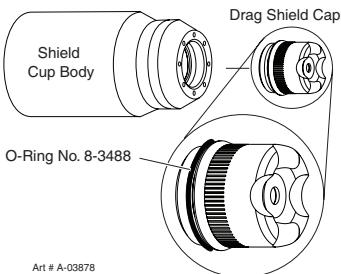
Slag built up on the shield cup that cannot be removed may effect the performance of the system.

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

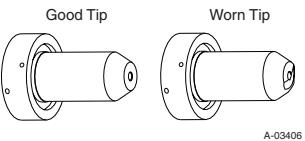


Shield Cups

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.

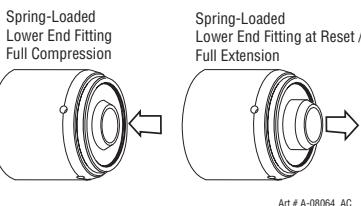


4. Remove the tip. Check for excessive wear (indicated by an elongated or oversized orifice). Clean or replace the tip if necessary.



Example of Tip Wear

5. Remove the start 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.



New Electrode



Worn Electrode

Art # A-03284

Electrode Wear

7. Reinstall the Electrode by pushing it straight into the torch head until it clicks.
8. Reinstall the desired start 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.

6.01 Introduction

A. Parts List Breakdown

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

- 6.03 Power Supply Replacement
- 6.04 Replacement Parts
- 6.05 Options and Accessories
- 6.06 Replacement Parts for SL60 Hand Torch
- 6.07 Torch Consumable Parts (SL60)
- 6.08 Torch Consumable Parts Manual (SL60)Torch
- 6.09 Replacement Parts - for SL100 Mechanized
- 6.10 Torch Consumable Parts Machine (SL100)Torch



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.

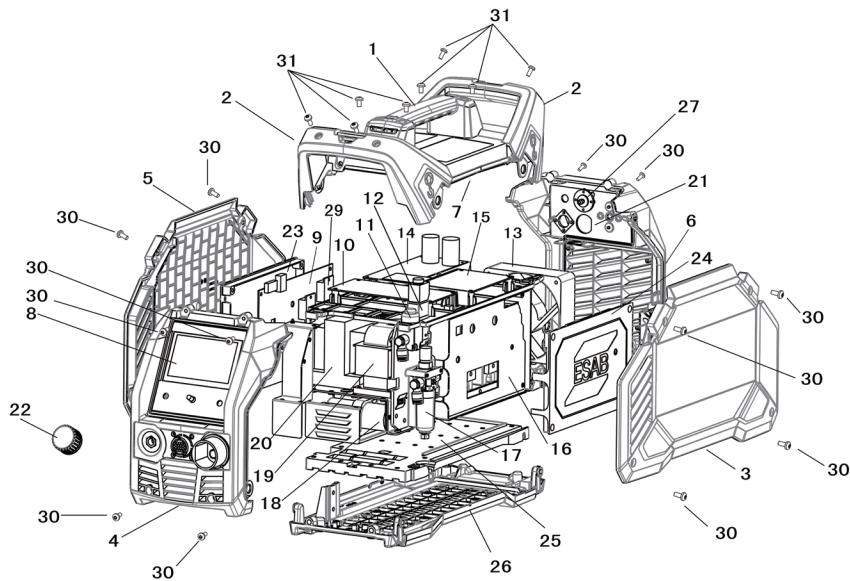
6.03 Power Supply Replacement

The following items are included with the replacement power supply: work cable & clamp, input power cable, gas pressure regulator / filter, SL60 Torch, spare parts kit, and operating manual.

Oty	Description	Catalog #
1	CUTMASTER 50+ Plasma cutting machine package TD ETL	1-5000-2
1	CUTMASTER 50+ Plasma cutting machine package TD CE with input power cable and 16A plug	1-5000-4
1	CUTMASTER 70+ Plasma cutting machine package TD ETL	1-7000-2
1	CUTMASTER 70+ Plasma cutting machine package TD CE with input power cable and 32A plug	1-7000-4

6.04 Replacement Parts

Item #	Oty	Description	Catalog #
1	1	Top Handle Kit	0464565880
2	1	Handle Cover	0465952001
3	1	Panel RH CM50 TD_AEB	0700402255
		Panel RH CM70 TD_AEB	0700402257
4	1	Assembly Panel Front CM50+/70+	0700402259
5	1	Panel LH CM50 TD_AEB	0700402260
	1	Panel LH CM70 TD_AEB	0700402262
6	1	Assembly Panel Rear CM50+/70+ TD_AEB	0700402264
7	1	Top Panel	0465951001
8	1	Assembly PCB Display CM50+ TD_AEB	0700402304
	1	Assembly PCB Display CM70+ TD_AEB	0700402305
9	1	Mur PCBA Assembly	0700402268
10	1	Control PCBA Assembly (50+)	0700402269
	1	Control PCBA Assembly (70+)	0700402306
11	1	Pressure Sensor, XGZP6161D102V	0700402270
12	1	Solenoid Assembly, V3211-06E4 & Aluminum block	0700402271
13	1	Fan, 0.61A, RUNDA	0700400941
14	1	Switching Mode Power Supply PCB	0700402272
15	1	EMC PCBA Assembly	0700402273
16	1	IGBT PCBA Assembly	0700402274
17	1	Inbuilt Air Regulator Assembly, AW1000-M8	0700402276
18	1	Capacitor	0700402277
19	1	Reactor	0700402278
20	1	Main Transformer	0700402279
21	1	Power Switch, LW26-25 4GO-03/2 690V	0700402280
22	1	Conrol Knob	0700402281
23	1	Mur Plastic Cover	0700402282
24	1	IGBT Plastic Cover	0700402283
25	1	Plastic Support	0700402284
26	1	Plastic Base Plate	0700402285
27	1	Air Fitting EU Type 1/4 NPT	0700400997
28	1	Input Cable CE, 4x4MM ² , 3 M (not shown)	0700402286
29	4	Fast recovery module, ES1100BN60SN	0700402315
30	16	Screw, black, full thread, M5X12	0700400995
31	12	Screw, black, self-tapping, 4.8X16	0700400996
32	1	Input Cable ETL, 4x11AWG, 3 M (not shown)	0700402321
33	1	Air Fitting Type 1/4 NPT Milton type D (USA) (not shown)	0700400917

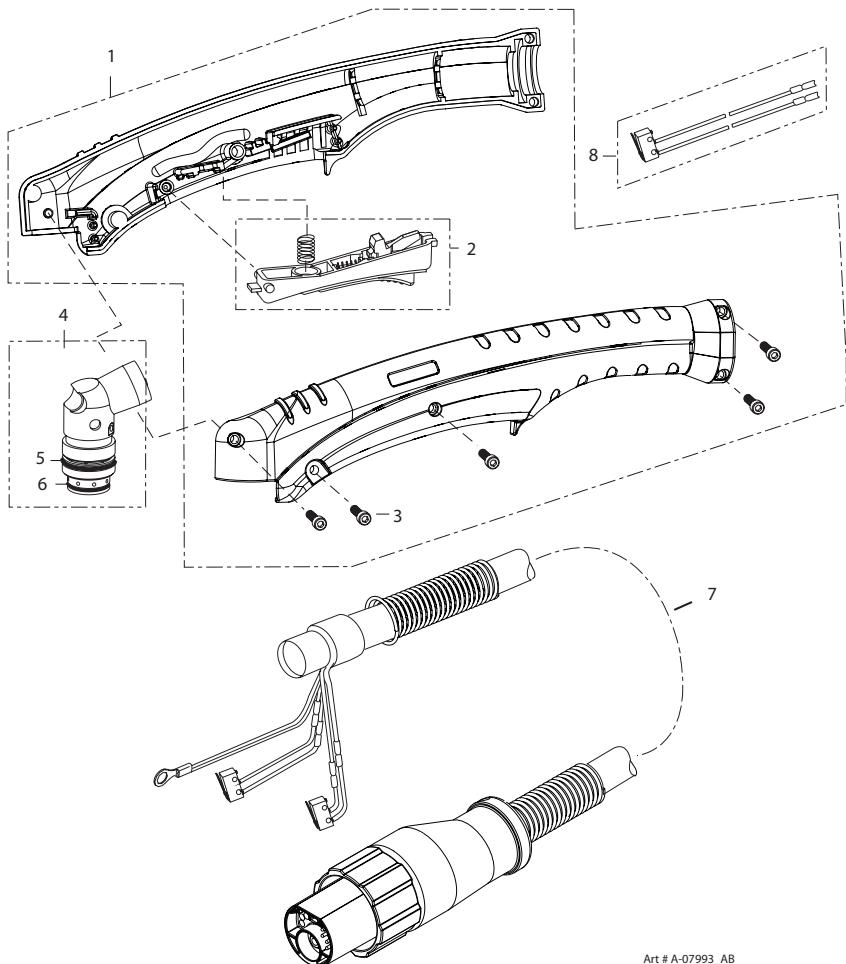


6.05 Options and Accessories

Oty	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	Work Cable #8 with 50mm Dinse plug	9-9692
1	Multi - Purpose Cart	7-8888
1	Shoulder strap kit	0445197880

6.06 Replacement Parts for SL60 Hand Torch

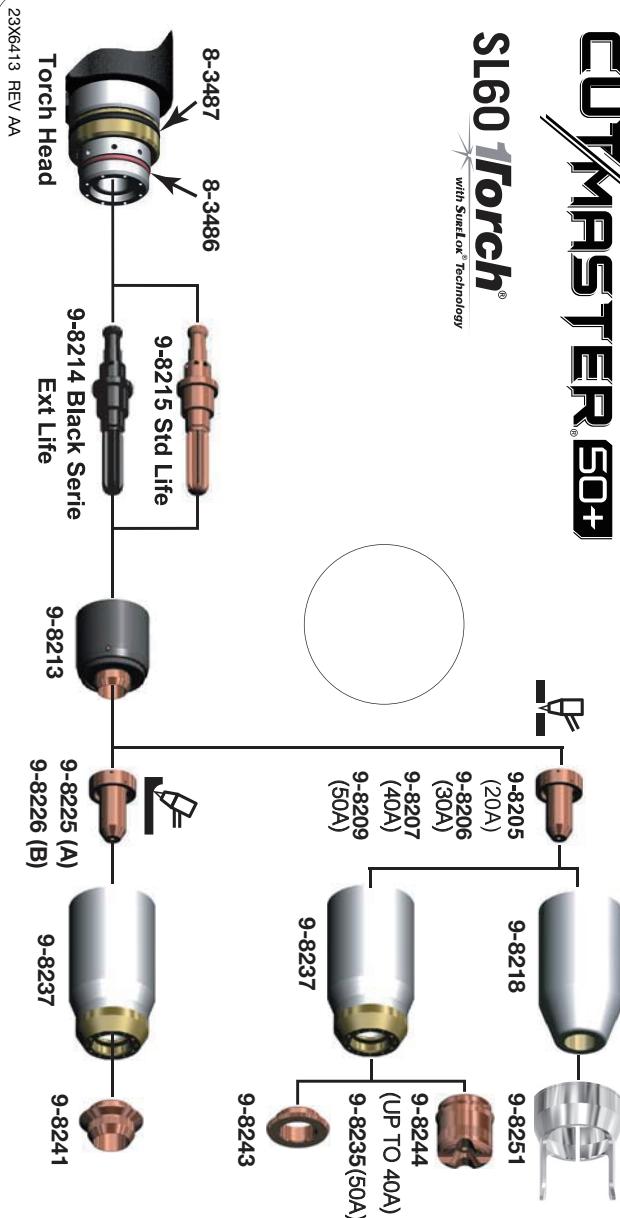
Item #	Oty	Description	Catalog #
1	1	Torch Handle Replacement Kit (includes items No. 2 & 3)	9-7030
2	1	Trigger Assembly Replacement Kit	9-7034
3	1	Handle Screw Kit (5 each, 6-32 x 1/2" cap screw, and wrench)	9-8062
4	1	Torch Head Assembly Replacement Kit (includes items No. 5 & 6)	9-8219
5	1	Large O-Ring	8-3487
6	1	Small O-Ring	8-3486
7		Leads Assemblies with ATC connectors (includes switch assemblies)	
	1	SL60, 20 - foot / 6.1m Leads Assembly with ATC connector	4-7834
	1	SL60, 50 - foot / 15.2m Leads Assembly with ATC connector	4-7835
8	1	Switch Kit	9-7031



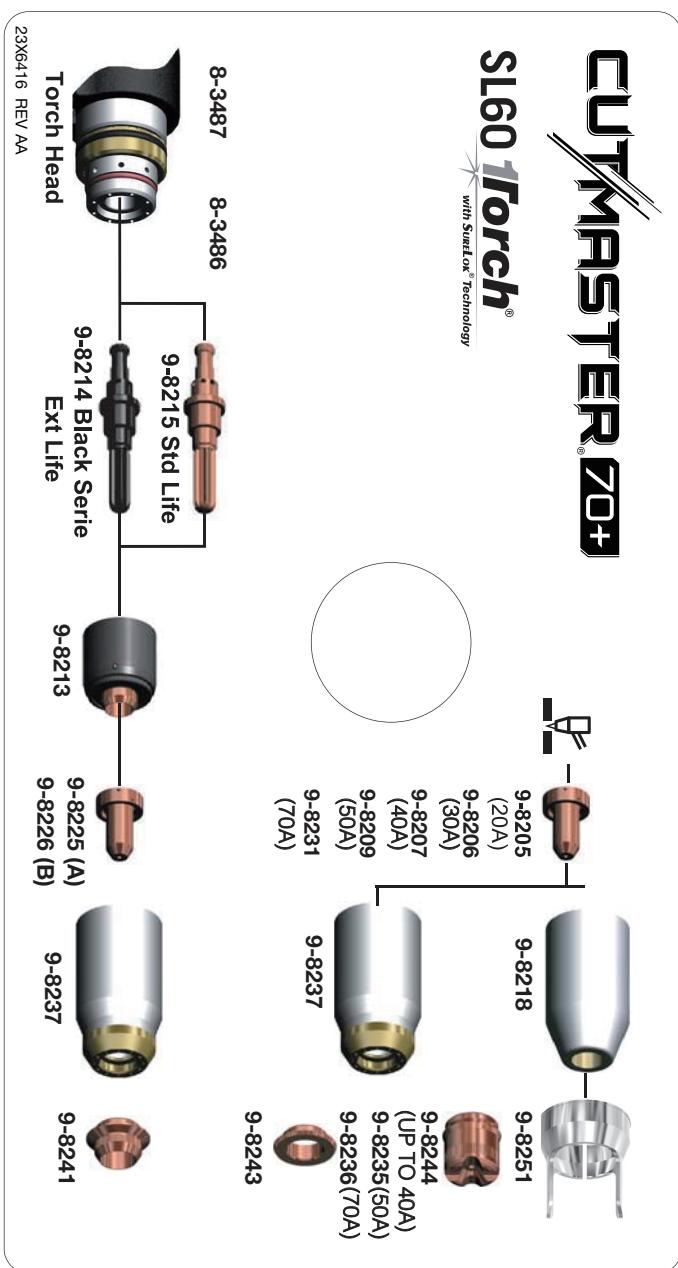
Art # A-07993_AB

CUTMASTER® 50+

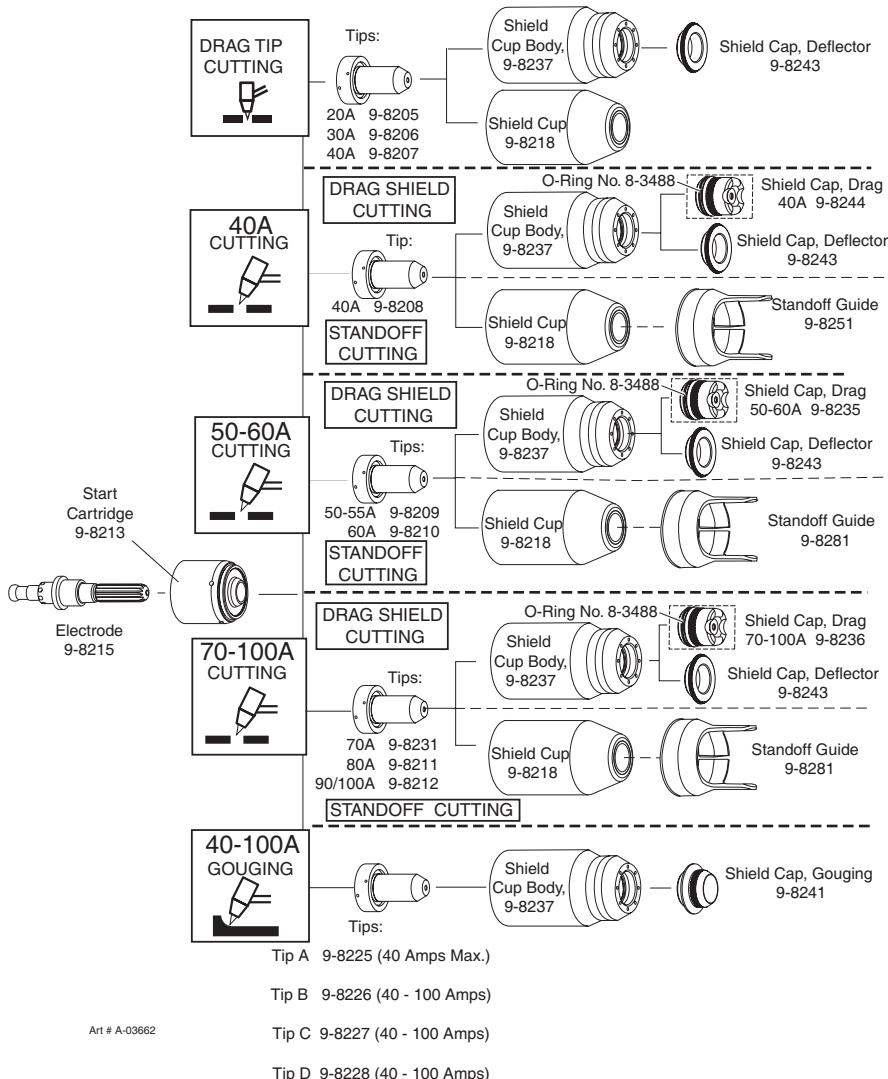
SL60 Torch®
with SureLock™ Technology



6.08 CM70+ Torch Consumable Parts (SL60)



6.09 Torch Consumable Parts Manual (SL60) Torch



Art # A-03662

Tip A 9-8225 (40 Amps Max.)

Tip B 9-8226 (40 - 100 Amps)

Tip C 9-8227 (40 - 100 Amps)

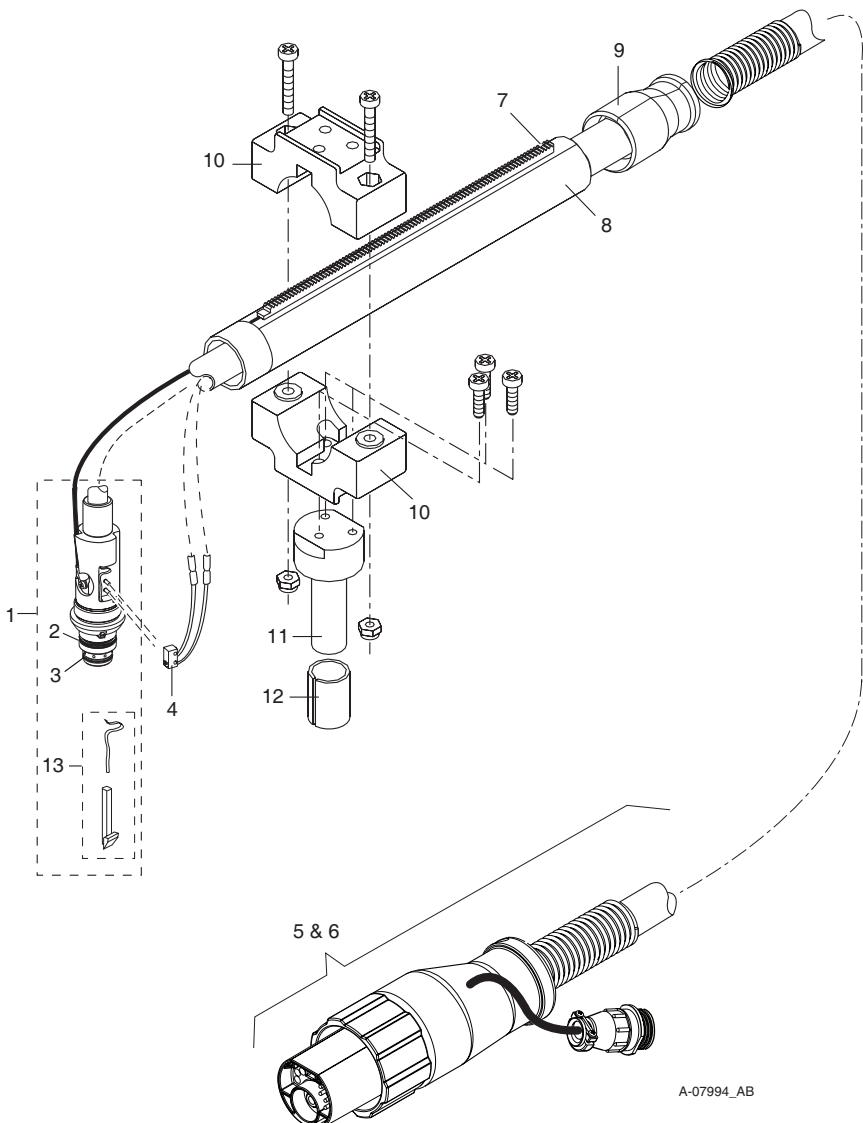
Tip D 9-8228 (40 - 100 Amps)

6.10 Replacement Parts - for SL100 Mechanized Torches with Unshielded Leads

Item #	Oty	Description	Catalog #
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 Leads 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

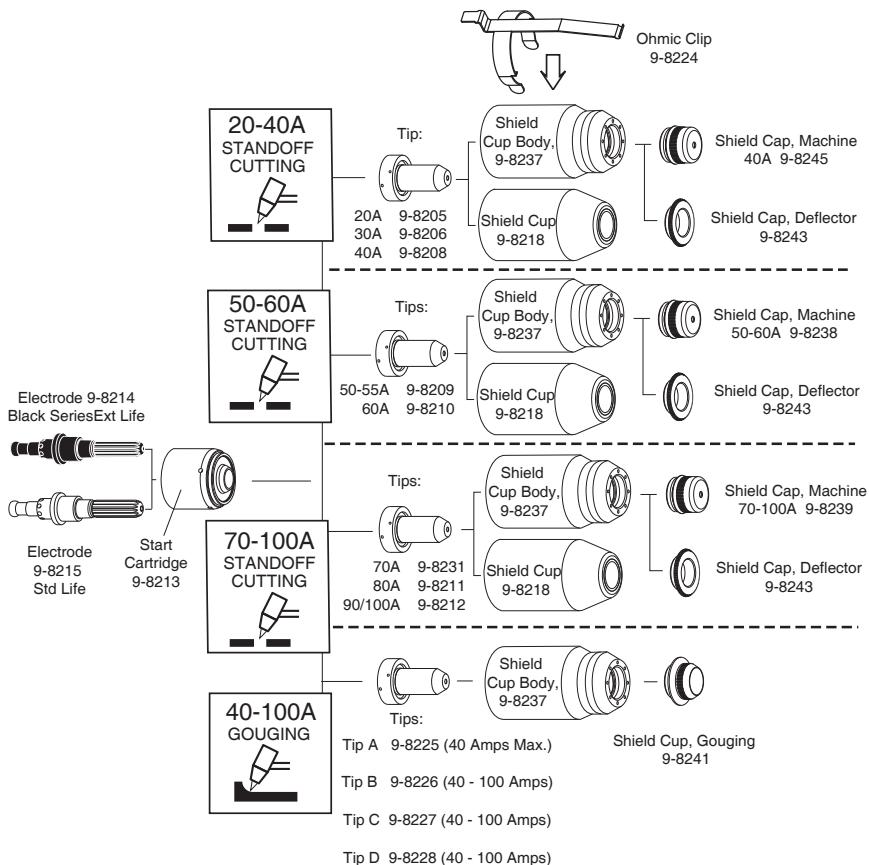
**NOTE!**

* Does not include Control Cable Adapter or Through - Hole Protector.



A-07994_AB

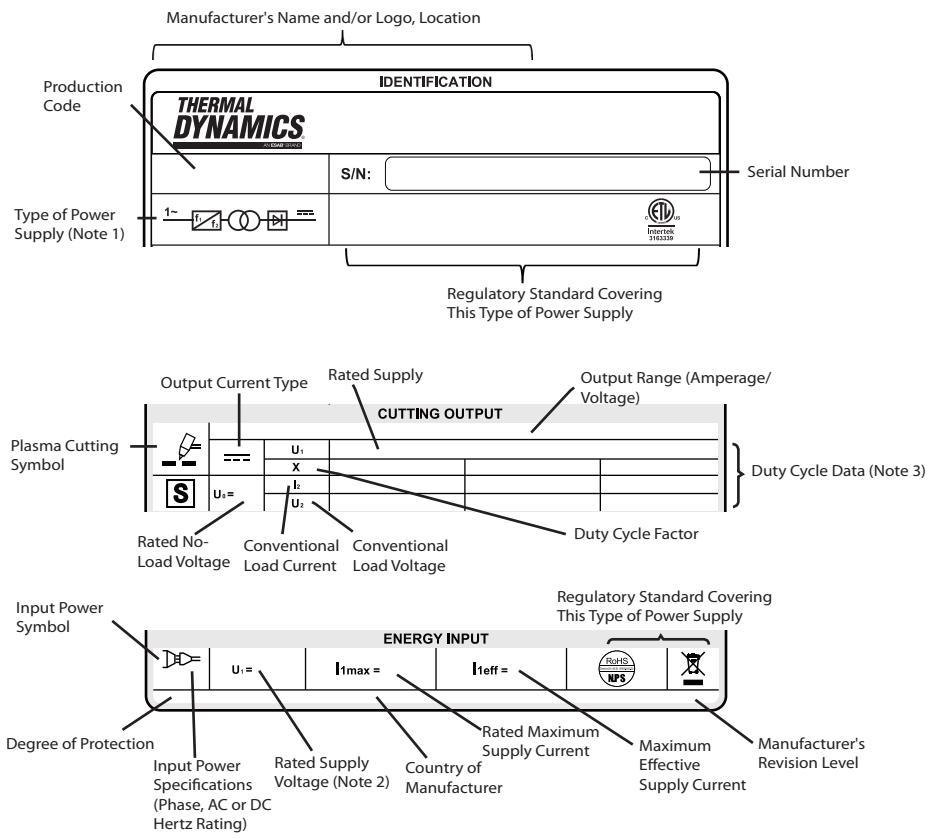
6.11 Torch Consumable Parts Machine (SL100) Torch



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CUTMASTER 50+, CUTMASTER 70+

APPENDIX 1: DATA TAG INFORMATION

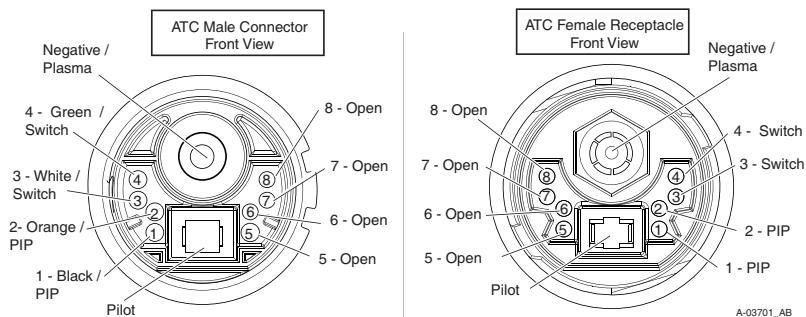


NOTES:

- Symbol shown indicates single- or three-phase AC input, static frequency converter-transformer-rectifier, DC output.
- 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.
- 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.
- Sections of the Data Tag may be applied to separate areas of the power supply.

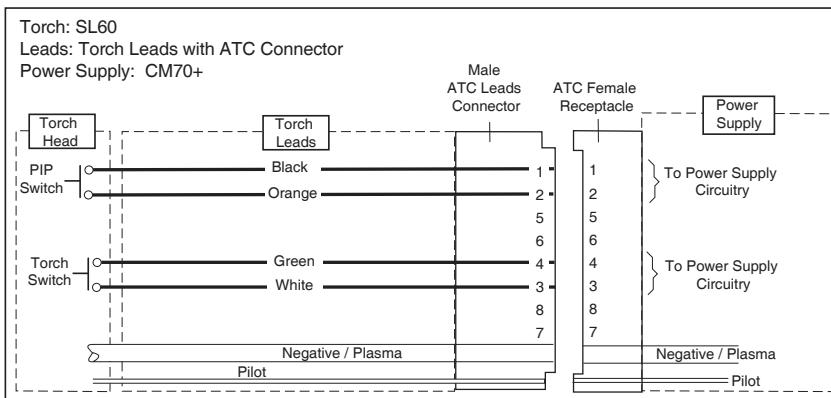
Standard Symbols

~	AC
—	DC
Ø	Phase

A. Hand SL60 & Machine SL100 Torch Pin - Out Diagram

CUTMASTER 50+, CUTMASTER 70+
APPENDIX 3: TORCH CONNECTION DIAGRAMS

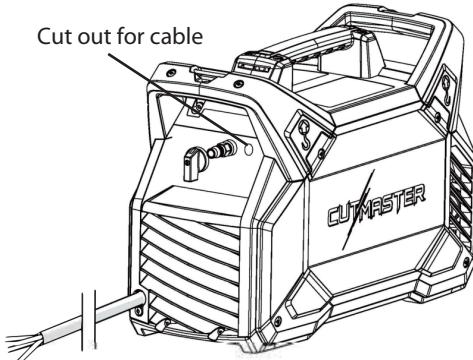
A. Hand Torch Connection Diagram



APPENDIX 4: RAW ARC VOLTAGE

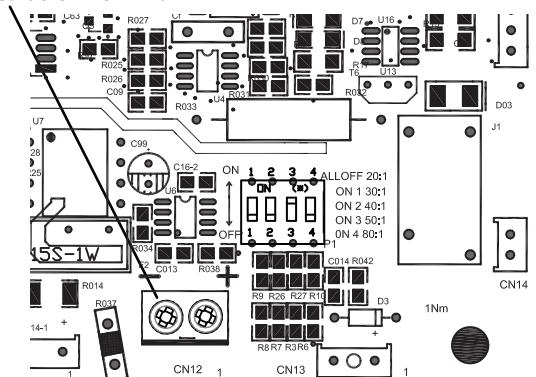
If raw arc voltage is necessary for the torch height control, the customer must supply an 18 AWG (1.0mm²), single pair, unshielded cable rated for 400V or greater. All work must be performed following applicable local and national codes.

1. Disconnect the power from the power supply.
2. Remove the left and right panel, and then remove the top cover.
3. Remove the hole plug located on the rear panel, and route the cable through the hole.



4. Connect to CN12 on the main control board: - (negative) polarity and + (positive) polarity.

**RAW ARC VOLTAGE
PCB Screw Terminal**

**WARNING**

The raw arc voltage can exceed 350VDC!!!!

5. Tighten the PCB screw terminal.
6. Assemble the top cover and side panels.
7. Connect the cable to the negative and positive polarities of Torch Height Control.

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