MAX200®

Hand Torch Plasma Arc Cutting System

Instruction Manual
800870 – Revision 16

CE

EN50199
EN60974-1

Hypertherm®

The world leader in plasma cutting technology

Changed Page **Description** **IM087 Revision 16** 6/20/04

6.20	Added 128904 torch handle replacement kit and rearranged parts list.
6.21	Added numbers to illustrate what parts are included in kit 128904.
6.22	Added 128905 torch handle replacement kit and rearranged parts list.
6.23	Added numbers to illustrate what parts are included in kit 128905.

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Subsidiaries	Updated addresses and #s
Safety	Updated
4.18 - 4.39	Part # 120667 changed to 220021. Added max pierce recommendation to applicable cut charts.
4.18	Updated consum. Index to reflect part# change below
4.26,33	Electrode Part# changed to 120547 (100A air/air)
5.7	Revised item 8 and 10 part numbers
5.9	Revised item 2 part number
5.13	Revised item 14 part number
5-15	P/N 029618 was corrected to 129618
5.18-29	Part # 120667 changed to 220021.
5.18	Electrode Part# changed to 120547 (100A air/air)
5.20,22	Part # changed from 002228 to 001217
d.2 & 3	Part # 120667 changed to 220021. Electrode Part# changed to 120547 (100A air/air
d.4	Part # changed from 002228 to 001217

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Cover	New Revision
Title Page	New Revision
Diagrams	Revised 013179 sheet 7
Diagrams	Revised 013179 sheet 8
i	Added plumbing/electrical code statement to warranty page
1.1-1.6	New safety section
1a.1-1a.6	New French safety section
3.2	Added pre-installation for plumbing/electrical codes
3.3	Added hard plumbing statement
3.4	Revised coolant mixture
5.14&15	New Coolant tank
7	Deleted section 7. Standards included in section 1.
Diagrams	Revised 013179 sheet 3
Diagrams	Revised 013179 sheet 7
Diagrams	Revised 013179 sheet 8

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Cover	New Revision
Title Page	New Revision
2.2	Revised duty cycle rating
2.3	Added 073036 power supply
4.18 & 19	Added 120667 electrode
4.21-39	Added 120667 electrode, revised motion delay and notes
5.3	Removed reference to machine torch options
5.5	Removed reference to machine torch options
5.9	Removed reference to machine torch options
5.11	Corrected 007022 shunt rating
5.13	Corrected item 9 P/N and description
5.14 & 15	Revised coolant pump and motor listing
5.18 - 21	Added 120667 electrode
5.22 & 23	General clairifcation
5.24	Added 120667 electrode
5.25	Revised figure 5- 12
5.26	Added 120667 electrode & revised figure 5-13
5.27- 32	Added MAX200 Rev 1 hand torch and leads
b.1	Spelling correction
d.2-4	Added 120667 electrode

Changed Page **Description** **IM87 Revision 12** 8/98

Cover	New Revision
Title Page	New Revision
4.21	Correction, view of 020917 shield
4.27	Correction, view of 020917 shield
4.34	Correction, view of 020917 shield
5.14	Revised Figure 5-7, new sol. Valve SA 129383
5.15	New Solenoid valve subassembly
5.19	Revised Figure 5-8 to include 020917 shield
d.3	Revised Figure d-1 to include 020917 shield
Appendix B	New Coolant MSDS
DIAGRAMS	013179, Added sheet 9
DIAGRAMS	Add 029313 Coolant Diagram

4-18	Added new Electrode
4-20	Added new Electrode
4-23	Added new Electrode
5-18	Added new Electrode
5-19	Added new Electrode
5-21	Revised Kit contents
d-2	Added new Electrode
d-3	Added new Electrode and Revised Kit contents

Cover	Uprevved manual due to LVD compliance
Title Page	Uprevved manual due to LVD compliance
0.01	Changed reference from 220-380-415V CE to 400V CE
0.03	updated table of contents
0.04	updated table of contents
0.05	updated table of contents
0.06	updated table of contents
1.01	New Safety section
1.02	New Safety section
1.03	New Safety section
1.04	New Safety section
1a.01	New French Safety section
1a.02	New French Safety section
1a.03	New French Safety section
1a.04	New French Safety section
2.02	Changed reference from 220-380-415V CE to 400V CE
2.04	Changed reference from 220-380-415V CE to 400V CE
3.01	Changed reference from 220-380-415V to 220-380-400-415V
3.05	Changed warning on propylene glycol to not induce vomiting.
3.06	Added specs for 400V
3.08	Changed figures of transformers to show new configurations
3.09	Changed figures of transformers to show new configurations
3.10	Changed reference from 220-380-415V CE to 400V CE
3.11	Changed figure to show new designations
3.12	Changed figure to show new designations
3.13	Changed figure to show new designations
4.01	Added STATUS indicators Before Startup to Sect. 4 TOC
4.02	Added new STATUS logic
4.03	Added STATUS indicators Before Startup
4.04	Added "See Status Indicators Before Startup" to step 5.
5.03	Changed part nos. of items 1 &10
5.07	Changed reference from 220-380-415V to 220-380-400-415V
5.07	Changed part nos. of items 11 &12. Added temp sw.
5.09	Changed reference from 220-380-415V to 220-380-400-415V
5.09	Changed part nos. of items 18 &20. Added temp sw.
5.11	Changed reference from 220-380-415V to 220-380-400-415V
5.11	Changed part no. of chopper. Added temp sw.
5.13	Changed reference from 220-380-415V to 220-380-400-415V
5.13	Changed part no. of chopper. Added temp sw.
5.15	New coolant reservoir part no.; added part nos. for gauge, drain valve.
5.16	Changed part nos. in Recommended Spare Parts
6.03	Changed troubleshooting (second problem)
6.04	Removed word "red" in second & third problem descriptions
6.05	Removed word "red" in first problem description
e.03	Changed reference from 220-380-415V CE to 400V CE
8 sheets	MAx200 wiring diagram format changes 013-2-179 Rev K

MAX200

Hand Torch

Instruction Manual
(P/N 800870)

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Hypertherm, Inc.
Hanover, NH USA

www.hypertherm.com

Hypertherm, Inc.
Etna Road, P.O. Box 5010
Hanover, NH 03755 USA
603-643-3441 Tel (Main Office)
603-643-5352 Fax (All Departments)
info@hypertherm.com (Main Office Email)
800-643-9878 Tel (Technical Service)
service@hypertherm.com (Technical Service Email)
800-737-2978 Tel (Customer Service)
customer.service@hypertherm.com (Customer Service Email)

Hypertherm Automation, LLC
5 Technology Drive, Suite 300
West Lebanon, NH 03755 USA
603-298-7970 Tel
603-298-7977 Fax

Hypertherm Plasmatechnik, GmbH
Technologiepark Hanau
Rodenbacher Chaussee 6
63457 Hanau-Wolfgang, Deutschland
49 6181 58 2100 Tel
49 6181 58 2134 Fax
49 6181 58 2123 (Technical Service)

Hypertherm (S) Pte Ltd.
No. 19 Kaki Bukit Road 2
K.B. Warehouse Complex
Singapore 417847, Republic of Singapore
65 6 841 2489 Tel
65 6 841 2490 Fax
65 6 841 2489 (Technical Service)

Hypertherm (Shanghai) Consulting Co., Ltd.
Suite 305, CIMIC Towers
1090 Century Boulevard, Pudong
Shanghai 200120
P.R. China
86-21-5835-5362 /3 Tel
86-21-5835 5220 Fax
86-21-5835-5362 /3 (Technical Service)

Hypertherm UK, Ltd.
9 Berkeley Court, Manor Park
Runcorn, Cheshire, England WA7 1TQ
44 1928 579 074 Tel
44 1928 579 604 Fax

France
15 Impasse des Rosiers
95610 Eragny, France
00 800 3324 9737 Tel
00 800 4973 7329 Fax

Hypertherm S.r.l.
Via Torino 2
20123 Milano, Italia
39 02 725 46 312 Tel
39 02 725 46 400 Fax
39 02 725 46 314 (Technical Service)

Hypertherm Europe B.V.
Vaartveld 9
4704 SE Roosendaal, Nederland
31 165 596907 Tel
31 165 596901 Fax
31 165 596908 Tel (Marketing)
31 165 596900 Tel (ETSO – Technical Service)
00 800 49 73 7843 Tel (ETSO – Technical Service toll-free in Europe)

Japan
1952-14 Yata-Natsumegi
Mishima City, Shizuoka Pref.
411-0801 Japan
81 0 559 75 7387 Tel
81 0 559 75 7376 Fax

Hypertherm Brasil Ltda.
Rua Visconde de Santa Isabel, 20 – Sala 611
Vila Isabel, RJ
Brasil CEP 20560-120
55 21 2278 6162 Tel
55 21 2578 0947 Fax

EMC INTRODUCTION

Hypertherm's CE-marked equipment is built in compliance with standard EN50199. The equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN50199 may not be adequate to completely eliminate interference when the affected equipment is in close proximity or has a high degree of sensitivity. In such cases it may be necessary to use other measures to further reduce interference.

This plasma equipment is designed for use only in an industrial environment.

INSTALLATION AND USE

The user is responsible for installing and using the plasma equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the cutting circuit, see *Earthing of Workpiece*. In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

ASSESSMENT OF AREA

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

a. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.

b. Radio and television transmitters and receivers.

c. Computer and other control equipment.

d. Safety critical equipment, for example guarding of industrial equipment.

e. Health of the people around, for example the use of pacemakers and hearing aids.

f. Equipment used for calibration or measurement.

g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.

h. Time of day that cutting or other activities are to be carried out.

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

METHODS OF REDUCING EMISSIONS

Mains Supply

Cutting equipment must be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed cutting equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the cutting mains supply so that good electrical contact is maintained between the conduit and the cutting power source enclosure.

Maintenance of Cutting Equipment

The cutting equipment must be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the cutting equipment is in operation. The cutting equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Cutting Cables

The cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential Bonding

Bonding of all metallic components in the cutting installation and adjacent to it should be considered. However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example, ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitances selected according to national regulations.

Note. The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC TC26 (sec)94 and IEC TC26/108A/CD Arc Welding Equipment Installation and Use.

Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire plasma cutting installation may be considered for special applications.

WARNING

Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage caused by the use of other than genuine Hypertherm parts may not be covered by the Hypertherm warranty.

WARNING

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

GENERAL

Hypertherm, Inc. warrants that its Products shall be free from defects in materials and workmanship, if Hypertherm is notified of a defect (i) with respect to the power supply within a period of two (2) years from the date of its delivery to you, with the exception of Powermax Series power supplies, which shall be within a period of three (3) years from the date of delivery to you, and (ii) with respect to the torch and leads within a period of one (1) year from its date of delivery to you. This warranty shall not apply to any Product which has been incorrectly installed, modified, or otherwise damaged. Hypertherm, at its sole option, shall repair, replace, or adjust, free of charge, any defective Products covered by this warranty which shall be returned with Hypertherm's prior authorization (which shall not be unreasonably withheld), properly packed, to Hypertherm's place of business in Hanover, New Hampshire, or to an authorized Hypertherm repair facility, all costs, insurance and freight prepaid. Hypertherm shall not be liable for any repairs, replacement, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph or with Hypertherm's prior written consent. **The warranty above is exclusive and is in lieu of all other warranties, express, implied, statutory, or otherwise with respect to the Products or as to the results which may be obtained therefrom, and all implied warranties or conditions of quality or of merchantability or fitness for a particular purpose or against infringement. The foregoing shall constitute the sole and exclusive remedy for any breach by Hypertherm of its warranty**. Distributors/OEMs may offer different or additional warranties, but Distributors/OEMs are not authorized to give any additional warranty protection to you or make any representation to you purporting to be binding upon Hypertherm.

PATENT INDEMNITY

Except only in cases of products not manufactured by Hypertherm or manufactured by a person other than Hypertherm not in strict conformity with Hypertherm's specifications and in cases of designs, processes, formulae, or combinations not developed or purported to be developed by Hypertherm, Hypertherm will defend or settle, at its own expense, any suit or proceeding brought against you alleging that the use of the Hypertherm product, alone and not in combination with any other product not supplied by Hypertherm, infringes any patent of any third party. You shall notify Hypertherm promptly upon learning of any action or threatened action in connection with any such alleged infringement, and Hypertherm's obligation to indemnify shall be conditioned upon Hypertherm's sole control of, and the indemnified party's cooperation and assistance in, the defense of the claim.

LIMITATION OF LIABILITY

In no event shall Hypertherm be liable to any person or entity for any incidental, consequential, indirect, or punitive damages (including but not limited to lost profits) regardless of whether such liability is based on breach of contract, tort, strict liability, breach of warranties, failure of essential purpose or otherwise and even if advised of the possibility of such damages.

LIABILITY CAP

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

INSURANCE

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

NATIONAL AND LOCAL CODES

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

TRANSFER OF RIGHTS

You may transfer any remaining rights you may have hereunder only in connection with the sale of all or substantially all of your assets or capital stock to a successor in interest who agrees to be bound by all of the terms and conditions of this Warranty.

TABLE OF CONTENTS

Section 1

SAFETY

In this section:

RECOGNIZE SAFETY INFORMATION

The symbols shown in this section are used to identify potential hazards. When you see a safety symbol in this manual or on your machine, understand the potential for personal injury, and follow the related instructions to avoid the hazard.

FOLLOW SAFETY INSTRUCTIONS

Read carefully all safety messages in this manual and safety labels on your machine.

- Keep the safety labels on your machine in good condition. Replace missing or damaged labels immediately.
- Learn how to operate the machine and how to use the controls properly. Do not let anyone operate it without instruction.
- Keep your machine in proper working condition. Unauthorized modifications to the machine may affect safety and machine service life.

DANGER WARNING CAUTION

A signal word DANGER or WARNING is used with a safety symbol. DANGER identifies the most serious hazards.

- DANGER and WARNING safety labels are located on your machine near specific hazards.
- WARNING safety messages precede related instructions in this manual that may result in injury or death if not followed correctly.
- CAUTION safety messages precede related instructions in this manual that may result in damage to equipment if not followed correctly.

CUTTING CAN CAUSE FIRE OR EXPLOSION

Fire Prevention

- Be sure the area is safe before doing any cutting. Keep a fire extinguisher nearby.
- Remove all flammables within 35 feet (10 m) of the cutting area.
- Quench hot metal or allow it to cool before handling or before letting it touch combustible materials.
- Never cut containers with potentially flammable materials inside – they must be emptied and properly cleaned first.
- Ventilate potentially flammable atmospheres before cutting.
- When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.

Explosion Prevention

- Do not use the plasma system if explosive dust or vapors may be present.
- Do not cut pressurized cylinders, pipes, or any closed container.
- Do not cut containers that have held combustible materials.

WARNING

Explosion Hazard
Argon-Hydrogen and Methane

Hydrogen and methane are flammable gases that present an explosion hazard. Keep flames away from cylinders and hoses that contain methane or hydrogen mixtures. Keep flames and sparks away from the torch when using methane or argon-hydrogen plasma.

WARNING

Hydrogen Detonation with Aluminum Cutting

- When cutting aluminum underwater, or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece and detonate during plasma cutting operations.
- Install an aeration manifold on the floor of the water table to eliminate the possibility of hydrogen detonation. Refer to the Appendix section of this manual for aeration manifold details.


ELECTRIC SHOCK CAN KILL

Touching live electrical parts can cause a fatal shock or severe burn.

- Operating the plasma system completes an electrical circuit between the torch and the workpiece. The workpiece and anything touching the workpiece are part of the electrical circuit.
- Never touch the torch body, workpiece or the water in a water table when the plasma system is operating.

Electric Shock Prevention

All Hypertherm plasma systems use high voltage in the cutting process (200 to 400 VDC are common). Take the following precautions when operating this system:

- Wear insulated gloves and boots, and keep your body and clothing dry.
- Do not stand, sit or lie on – or touch – any wet surface when using the plasma system.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. If you must work in or near a damp area, use extreme caution.
- Provide a disconnect switch close to the power supply with properly sized fuses. This switch allows the operator to turn off the power supply quickly in an emergency situation.
- When using a water table, be sure that it is correctly connected to earth ground.
- Install and ground this equipment according to the instruction manual and in accordance with national and local codes.
- Inspect the input power cord frequently for damage or cracking of the cover. Replace a damaged power cord immediately. **Bare wiring can kill.**
- Inspect and replace any worn or damaged torch leads.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached during the cutting process.
- Before checking, cleaning or changing torch parts, disconnect the main power or unplug the power supply.
- Never bypass or shortcut the safety interlocks.
- Before removing any power supply or system enclosure cover, disconnect electrical input power. Wait 5 minutes after disconnecting the main power to allow capacitors to discharge.
- Never operate the plasma system unless the power supply covers are in place. Exposed power supply connections present a severe electrical hazard.
- When making input connections, attach proper grounding conductor first.
- Each Hypertherm plasma system is designed to be used only with specific Hypertherm torches. Do not substitute other torches which could overheat and present a safety hazard.

CUTTING CAN PRODUCE TOXIC FUMES

Cutting can produce toxic fumes and gases that deplete oxygen and cause injury or death.

- Keep the cutting area well ventilated or use an approved air-supplied respirator.
- Do not cut in locations near degreasing, cleaning or spraying operations. The vapors from certain chlorinated solvents decompose to form phosgene gas when exposed to ultraviolet radiation.
- Do not cut metal coated or containing toxic materials, such as zinc (galvanized), lead, cadmium or beryllium, unless the area is well ventilated and the operator wears an air-supplied respirator. The coatings and any metals containing these elements can produce toxic fumes when cut.
- Never cut containers with potentially toxic materials inside – they must be emptied and properly cleaned first.
- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer.

A PLASMA ARC CAN CAUSE INJURY AND BURNS

Instant-On Torches
Plasma arc comes on immediately when the torch switch is activated.

The plasma arc will cut quickly through gloves and skin.
- Keep away from the torch tip.
- Do not hold metal near the cutting path.
- Never point the torch toward yourself or others.

ARC RAYS CAN BURN EYES AND SKIN

Eye Protection Plasma arc rays produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.
- Use eye protection in accordance with applicable national or local codes.
- Wear eye protection (safety glasses or goggles with side shields, and a welding helmet) with appropriate lens shading to protect your eyes from the arc's ultraviolet and infrared rays.

Arc Current	Lens Shade AWS (USA)	Lens Shade ISO 4850
Up to 100 A	No. 8	No. 11
100-200 A	No. 10	No. 11-12
200-400 A	No. 12	No. 13
Over 400 A	No. 14	No. 14

Skin Protection Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal.
- Gauntlet gloves, safety shoes and hat.
- Flame-retardant clothing to cover all exposed areas.
- Cuffless trousers to prevent entry of sparks and slag.
- Remove any combustibles, such as a butane lighter or matches, from your pockets before cutting.

Cutting Area Prepare the cutting area to reduce reflection and transmission of ultraviolet light:
- Paint walls and other surfaces with dark colors to reduce reflection.
- Use protective screens or barriers to protect others from flash and glare.
- Warn others not to watch the arc. Use placards or signs.

GROUNDING SAFETY

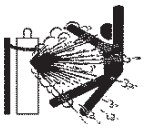
Work Cable Attach the work cable securely to the workpiece or the work table with good metal-to-metal contact. Do not connect it to the piece that will fall away when the cut is complete.

Work Table Connect the work table to an earth ground, in accordance with appropriate national or local electrical codes.

Input Power
- Be sure to connect the power cord ground wire to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, be sure to connect the power cord ground wire properly.
- Place the power cord's ground wire on the stud first, then place any other ground wires on top of the power cord ground. Fasten the retaining nut tightly.
- Tighten all electrical connections to avoid excessive heating.

COMPRESSED GAS EQUIPMENT SAFETY

- Never lubricate cylinder valves or regulators with oil or grease.
- Use only correct gas cylinders, regulators, hoses and fittings designed for the specific application.
- Maintain all compressed gas equipment and associated parts in good condition.
- Label and color-code all gas hoses to identify the type of gas in each hose. Consult applicable national or local codes.



GAS CYLINDERS CAN EXPLODE IF DAMAGED

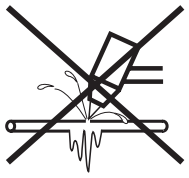
Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

- Handle and use compressed gas cylinders in accordance with applicable national or local codes.
- Never use a cylinder that is not upright and secured in place.
- Keep the protective cap in place over valve except when the cylinder is in use or connected for use.
- Never allow electrical contact between the plasma arc and a cylinder.
- Never expose cylinders to excessive heat, sparks, slag or open flame.
- Never use a hammer, wrench or other tool to open a stuck cylinder valve.

NOISE CAN DAMAGE HEARING

Prolonged exposure to noise from cutting or gouging can damage hearing.

- Use approved ear protection when using plasma system.
- Warn others nearby about the noise hazard.



A PLASMA ARC CAN DAMAGE FROZEN PIPES

Frozen pipes may be damaged or can burst if you attempt to thaw them with a plasma torch.

PACEMAKER AND HEARING AID OPERATION

Pacemaker and hearing aid operation can be affected by magnetic fields from high currents.
Pacemaker and hearing aid wearers should consult a doctor before going near any plasma arc cutting and gouging operations.

To reduce magnetic field hazards:

- Keep both the work cable and the torch lead to one side, away from your body.
- Route the torch leads as close as possible to the work cable.
- Do not wrap or drape the torch lead or work cable around your body.
- Keep as far away from the power supply as possible.

ADDITIONAL SAFETY INFORMATION

1. ANSI Standard Z49.1, *Safety in Welding and Cutting,* American Welding Society, 550 LeJeune Road P.O. Box 351020, Miami, FL 33135
2. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes,* American National Standards Institute 1430 Broadway, New York, NY 10018
3. ANSI Standard Z87.1, *Safe Practices for Occupation and Educational Eye and Face Protection,* American National Standards Institute, 1430 Broadway, New York, NY 10018
4. AWS F4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances,* American Welding Society 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135
5. AWS F5.2, *Recommended Safe Practices for Plasma Arc Cutting,* American Welding Society 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135
6. CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders,* Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202
7. CSA Standard W117.2, *Code for Safety in Welding and Cutting,* Canadian Standards Association Standard Sales 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada
8. NFPA Standard 51B, *Cutting and Welding Processes,* National Fire Protection Association 470 Atlantic Avenue, Boston, MA 02210
9. NFPA Standard 70–1978, *National Electrical Code,* National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
10. OSHA, *Safety and Health Standards,* 29FR 1910 U.S. Government Printing Office, Washington, D.C. 20402

Hypertherm

Section 1a

SÉCURITÉ

Dans cette section :

IDENTIFIER LES CONSIGNES DE SÉCURITÉ

Les symboles indiqués dans cette section sont utilisés pour identifier les risques éventuels. Si vous trouvez un symbole de sécurité, que ce soit dans ce manuel ou sur l'équipement, soyez conscient des risques de blessures et suivez les instructions correspondantes afin d'éviter ces risques.

SUIVRE LES INSTRUCTIONS DE SÉCURITÉ

Lire attentivement toutes les consignes de sécurité dans le présent manuel et sur les étiquettes de sécurité se trouvant sur la machine.

- Les étiquettes de sécurité doivent rester lisibles. Remplacer immédiatement les étiquettes manquantes ou abîmées.
- Apprendre à faire fonctionner la machine et à utiliser correctement les commandes. Ne laisser personne utiliser la machine sans connaître son fonctionnement.
- Garder la machine en bon état. Des modifications non autorisées sur la machine peuvent engendrer des problèmes de sécurité et raccourcir la durée d'utilisation de l'équipement.

DANGER AVERTISSEMENT PRÉCAUTION

Les signaux DANGER ou AVERTISSEMENT sont utilisés avec un symbole de sécurité, DANGER correspondant aux risques les plus sérieux.

- Les étiquettes de sécurité DANGER et AVERTISSEMENT sont situées sur la machine pour signaler certains dangers spécifiques.
- Les messages d'AVERTISSEMENT précèdent les instructions d'utilisation expliquées dans ce manuel et signalent les risques de blessures ou de mort au cas où ces instructions ne seraient pas suivies correctement.
- Les messages de PRÉCAUTION précèdent les instructions d'utilisation contenues dans ce manuel et signalent que le matériel risque d'être endommagé si les instructions ne sont pas suivies correctement.

LE COUPAGE PEUT PROVOQUER UN INCENDIE OU UNE EXPLOSION

Prévention des incendies

- Avant de commencer, s'assurer que la zone de coupage ne présente aucun danger. Conserver un extincteur à proximité.
- Éloigner toute matière inflammable à une distance d'au moins 10 m du poste de coupage.
- Tremper le métal chaud ou le laisser refroidir avant de le manipuler ou avant de le mettre en contact avec des matériaux combustibles.
- Ne jamais couper des récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.
- Aérer toute atmosphère potentiellement inflammable avant d'utiliser un système plasma.
- Lors de l'utilisation d'oxygène comme gaz plasma, un système de ventilation par aspiration est nécessaire.

Prévention des explosions

- Ne pas couper en présence de poussière ou de vapeurs.
- Ne pas couper de bouteilles, de tuyaux ou autres récipients fermés et pressurisés.
- Ne pas couper de récipients contenant des matières combustibles.

AVERTISSEMENT

Risque d'explosion argon-hydrogène et méthane

L'hydrogène et le méthane sont des gaz inflammables et potentiellement explosifs. Conserver à l'écart de toute flamme les bouteilles et tuyaux contenant des mélanges à base d'hydrogène ou de méthane. Maintenir toute flamme et étincelle à l'écart de la torche lors de l'utilisation d'un plasma d'argon-hydrogène ou de méthane.

AVERTISSEMENT

Détonation de l'hydrogène lors du coupage de l'aluminium

- Lors du coupage de l'aluminium sous l'eau, ou si l'eau touche la partie inférieure de la pièce d'aluminium, de l'hydrogène libre peut s'accumuler sous la pièce à couper et détonner lors du coupage plasma.
- Installer un collecteur d'aération au fond de la table à eau afin d'éliminer les risques de détonation de l'hydrogène. Se référer à l'annexe du manuel pour plus de renseignements sur les collecteurs d'aération.


LES CHOCS ÉLECTRIQUES PEUVENT ÊTRE FATALS

Toucher une pièce électrique sous tension peut provoquer un choc électrique fatal ou des brûlures graves.

- La mise en fonctionnement du système plasma ferme un circuit électrique entre la torche et la pièce à couper. La pièce à couper et tout autre élément en contact avec cette pièce font partie du circuit électrique.
- Ne jamais toucher le corps de la torche, la pièce à couper ou l'eau de la table à eau pendant le fonctionnement du système plasma.

Prévention des chocs électriques

Tous les systèmes plasma Hypertherm utilisent des hautes tensions pour le coupage (souvent de 200 à 400 V). On doit prendre les précautions suivantes quand on utilise le système plasma :

- Porter des bottes et des gants isolants et garder le corps et les vêtements au sec.
- Ne pas se tenir, s'asseoir ou se coucher sur une surface mouillée, ni la toucher quand on utilise le système plasma.
- S'isoler de la surface de travail et du sol en utilisant des tapis isolants secs ou des couvertures assez grandes pour éviter tout contact physique avec le travail ou le sol. S'il s'avère nécessaire de travailler dans ou près d'un endroit humide, procéder avec une extrême prudence.
- Installer un sectionneur avec fusibles appropriés, à proximité de la source de courant. Ce dispositif permet à l'opérateur d'arrêter rapidement la source de courant en cas d'urgence.
- En cas d'utilisation d'une table à eau, s'assurer que cette dernière est correctement mise à la terre.
- Installer et mettre à la terre l'équipement selon les instructions du présent manuel et conformément aux codes électriques locaux et nationaux.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fendu. Remplacer immédiatement un cordon endommagé. **Un câble dénudé peut tuer**.
- Inspecter et remplacer les câbles de la torche qui sont usés ou endommagés.
- Ne pas saisir la pièce à couper ni les chutes lors du coupage. Laisser la pièce à couper en place ou sur la table de travail, le câble de retour connecté lors du coupage.
- Avant de vérifier, de nettoyer ou de remplacer les pièces de la torche, couper l'alimentation ou débrancher la prise de courant.
- Ne jamais contourner ou court-circuiter les verrouillages de sécurité.
- Avant d'enlever le capot du système ou de la source de courant, couper l'alimentation électrique. Attendre ensuite 5 minutes pour que les condensateurs se déchargent.
- Ne jamais faire fonctionner le système plasma sans que les capots de la source de courant ne soient en place. Les raccords exposés de la source de courant sont extrêmement dangereux.
- Lors de l'installation des connexions, attacher tout d'abord la prise de terre appropriée.
- Chaque système plasma Hypertherm est conçu pour être utilisé uniquement avec des torches Hypertherm spécifiques. Ne pas utiliser des torches inappropriées qui pourraient surchauffer et présenter des risques pour la sécurité.

LE COUPAGE PEUT PRODUIRE DES VAPEURS TOXIQUES

Le coupage peut produire des vapeurs et des gaz toxiques qui réduisent le niveau d'oxygène dans l'air et peuvent provoquer des blessures, voire la mort.

- Conserver le poste de coupage bien aéré ou utiliser un masque respiratoire homologué.
- Ne pas procéder au coupage près d'endroits où s'effectuent le dégraissage, le nettoyage ou la vaporisation. Certains solvants chlorés se décomposent sous l'effet des rayons ultraviolets et forment du phosgène.
- Ne pas couper des métaux peints ou contenant des matières toxiques comme le zinc (galvanisé), le plomb, le cadmium ou le béryllium, à moins que la zone de travail soit très bien ventilée et que l'opérateur porte un masque respiratoire. Les revêtements et métaux contenant ces matières peuvent produire des vapeurs toxiques lors du coupage.
- Ne jamais couper de récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.
- Quand on utilise ce produit pour le soudage ou le coupage, il dégage des fumées et des gaz qui contiennent des produits chimiques qui, selon l'État de Californie, provoquent des anomalies congénitales et, dans certains cas, le cancer.

L'ARC PLASMA PEUT PROVOQUER DES BLESSURES OU DES BRÛLURES

Torches à allumage instantané

L'arc plasma s'allume immédiatement après que la torche soit mise en marche.

L'arc plasma coupe facilement les gants et la peau.

- Rester éloigné de l'extrémité de la torche.
- Ne pas tenir de métal près de la trajectoire de coupe.
- Ne jamais pointer la torche vers soi ou d'autres personnes.

LES RAYONS DE L'ARC PEUVENT BRÛLER LES YEUX ET LA PEAU

Protection des yeux Les rayons de l'arc plasma produisent de puissants rayons visibles ou invisibles (ultraviolets et infrarouges) qui peuvent brûler les yeux et la peau.

- Utiliser des lunettes de sécurité conformément aux codes locaux ou nationaux en vigueur.
- Porter des lunettes de protection (lunettes ou masque muni d'écrans latéraux et encore masque de soudure) avec des verres teintés appropriés pour protéger les yeux des rayons ultraviolets et infrarouges de l'arc.

Courant de l'arc	Puissance des verres teintés AWS (É.-U.)	ISO 4850
Jusqu'à 100 A	N° 8	N° 11
100-200 A	N° 10	N° 11-12
200-400 A	N° 12	N° 13
Plus de 400 A	N° 14	N° 14

Protection de la peau Porter des vêtements de sécurité pour se protéger contre les brûlures que peuvent causer les rayons ultraviolets, les étincelles et le métal brûlant :

- Gants à crispin, chaussures et casque de sécurité.
- Vêtements ignifuges couvrant toutes les parties exposées du corps.
- Pantalon sans revers pour éviter que des étincelles ou des scories puissent s'y loger.
- Avant le coupage, retirer de ses poches tout objet combustible comme les briquets au butane ou les allumettes.

Zone de coupage Préparer la zone de coupage afin de réduire la réverbération et la transmission de la lumière ultraviolette :

- Peindre les murs et autres surfaces de couleur sombre pour réduire la réflexion de la lumière.
- Utiliser des écrans et autres dispositifs de protection afin de protéger les autres personnes de la lumière et de la réverbération.
- Prévenir les autres personnes de ne pas regarder l'arc. Utiliser des affiches ou des panneaux.

MISE À LA MASSE ET À LA TERRE

Câble de retour Bien fixer le câble de retour (ou de masse) à la pièce à couper ou à la table de travail de façon à assurer un bon contact métal-métal. Ne pas fixer le câble de retour à la partie de la pièce qui doit se détacher.

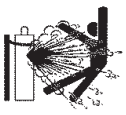
Table de travail Raccorder la table de travail à la terre, conformément aux codes de sécurité locaux ou nationaux appropriés.

Alimentation

- S'assurer que le fil de terre du cordon d'alimentation est connecté à la terre dans le coffret du sectionneur.
- S'il est nécessaire de brancher le cordon d'alimentation à la source de courant lors de l'installation du système, s'assurer que le fil de terre est correctement branché.
- Placer tout d'abord le fil de terre du cordon d'alimentation sur le plot de mise à la terre puis placer les autres fils de terre par-dessus. Bien serrer l'écrou de retenue.
- S'assurer que toutes les connexions sont bien serrées pour éviter la surchauffe.

SÉCURITÉ DES BOUTEILLES DE GAZ COMPRIMÉ

- Ne jamais lubrifier les robinets des bouteilles ou les régulateurs avec de l'huile ou de la graisse.
- Utiliser uniquement les bouteilles, régulateurs, tuyaux et accessoires appropriés et conçus pour chaque application spécifique.
- Entretenir l'équipement et les pièces d'équipement à gaz comprimé afin de les garder en bon état.
- Étiqueter et coder avec des couleurs tous les tuyaux de gaz afin d'identifier le type de gaz contenu dans chaque tuyau. Se référer aux codes locaux ou nationaux en vigueur.



LES BOUTEILLES DE GAZ COMPRIMÉ PEUVENT EXPLOSER EN CAS DE DOMMAGES

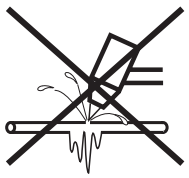
Les bouteilles de gaz contiennent du gaz à haute pression. Si une bouteille est endommagée, elle peut exploser.

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

LE BRUIT PEUT PROVOQUER DES PROBLÈMES AUDITIFS

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

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



UN ARC PLASMA PEUT ENDOMMAGER LES TUYAUX GELÉS

Les tuyaux gelés peuvent être endommagés ou éclater si l'on essaie de les dégeler avec une torche plasma.

PACEMAKERS ET PROTHÈSES AUDITIVES

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

Pour réduire les risques associés aux champs magnétiques :

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

Hypertherm

Section 2

SPECIFICATIONS

In this section:

General

MAX200s are normally shipped from the factory (configured for mild steel cutting) with air supplied to both the plasma and shield gas inlets from a single pressure/filter regulator. The regulator ensures that the correct air pressure is supplied to the system at the proper quality.

For better cut quality on metals such as stainless steel, aluminum, and other non-ferrous materials, use either nitrogen or argon/hydrogen (Hypertherm recommends a mixture of 35% hydrogen and 65% argon) as the plasma gas. When cutting mild steel, use oxygen as the plasma gas. Nitrogen, air and carbon dioxide are the shield gases.

Hypertherm offers two hand torches for plasma cutting: the PAC200T (90°) cutting trigger torch, and the optional PAC200T (65°) cutting trigger torch (refer to Appendix D). In addition to cutting, the MAX200 is also a plasma arc gouging system when used with the PAC200E (65°) gouging trigger torch.

An EMI filter, standard with all 400V CE power supplies (073200 and 073213), meets the CE requirement for filtering incoming power. Refer to Appendix E to connect incoming power to the filter and for part numbers specific to the CE power supplies.

Product Specifications

MAX200 Power Supplies

The MAX200 is a constant current, secondary converter chopper power supply providing continuously variable amperage from 40 to 200 amps. It conforms to the following specifications:

Maximum OCV (U_0)	280 VDC
Output Current (I_2)	40-200 amps
Output Voltage (U_2)	150 VDC
Duty Cycle Rating (X)	100% up to 30 kw
Ambient Temperatures/Duty Cycle	Power supplies will operate between +14° and 104°F (-10° and +40°C). Power supplies operated in an ambient temperature above 86°F (30°C) may show some decrease in duty cycle.

Input Power: (Input Voltage (U_1) x Input Current (I_1))**:**

# 073002	240/480 VAC, 3Ø, 60 Hz, 90/45 amps
# 073003	600 VAC, 3Ø, 60Hz, 36 amps
# 073004	208 VAC, 3Ø, 60Hz, 104 amps
# 073005	220/380/415 VAC, 3Ø, 50 Hz, 98/57/52 amps
# 073026	200 VAC, 3Ø, 50 Hz, 108 amps
# 073036	500 VAC, 3Ø, 50 Hz, 43 amps

Dimensions:

Width	28-1/4" (71 cm)
Height	35-1/2" (90 cm) w/o casters 43" (109 cm) w/casters
Depth	41-1/4" (104 cm) w/o handle 50" (127 cm) w/handle
Weight	780 pounds (351 kg)

Cooling	Forced Air (Class F)

Gas Requirements:

Gas Type/Quality	Air (compressed)/clean, dry, oil-free Oxygen (liquid)/99.5% Nitrogen (liquid)/99.995% Carbon Dioxide (compressed or liquid)/ 99.5%

Plasma Gases	Air, Oxygen (O_2), Nitrogen (N_2), Argon/Hydrogen (H35 = 35% Hydrogen/65% Argon)
Shield Gases	Air, Carbon Dioxide (CO_2), Nitrogen (N_2)
Plasma Gas Flow	66 scfh (Air), 60 scfh (N_2), 70 scfh (H35), 72 scfh (O_2)
Shield Gas Flow	220 scfh (CO_2), 280 scfh (Air), 290 scfh (N_2)
Plasma Gas Inlet Pressure	90/120 psi dynamic (flowing)
Shield Gas Inlet Pressure	90 psi dynamic (flowing)
Plasma Gas Pressure (Test/Run)	13/48, 22/48 psi (Air); 13/44, 15/48 psi (O_2); 15/35, 17/37 psi (N_2); 23/56 psi (H35)
Shield Gas Pressure	70 psi
Torch Coolant Tank Capacity	2.9 gallons (11 liters); refer to Section 3, *Torch Coolant System*, for coolant specifications, warning, and cautions

CE Power Supplies

The specifications specific to the 400V CE, 3 Ph, 50 Hz power supplies (073200 and 073213) are listed below. These CE power supplies conform to all other non CE power suppy specifictions as listed above. Refer to the Appendix E for EMC requirements, power cable connections, and parts information specific to the MAX200 CE power supplies.

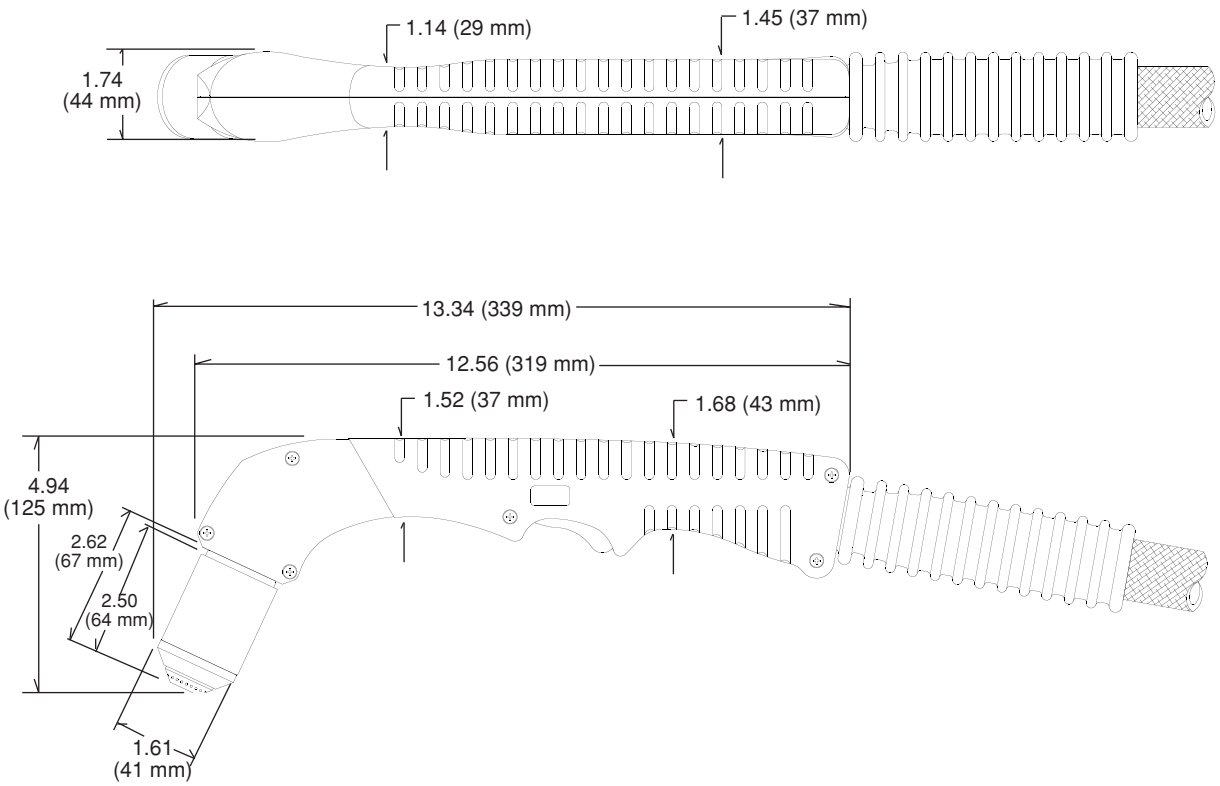
Input Power (Input Voltage (U_1) x Input Current (I_1))**:**

# 073200 (without THC)	400 VAC, 3Ø, 50 Hz, 56 amps
# 073213 (with THC)	400 VAC, 3Ø, 50 Hz, 56 amps

Dimensions:

Height	40-3/4" (104 cm) w/o casters 48.25" (122 cm) w/casters
Weight	800 pounds (363 kg)

PAC200T (90°) Cutting Trigger Torch – #073190*

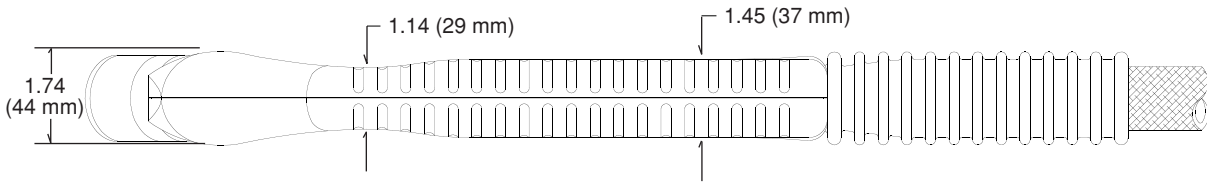


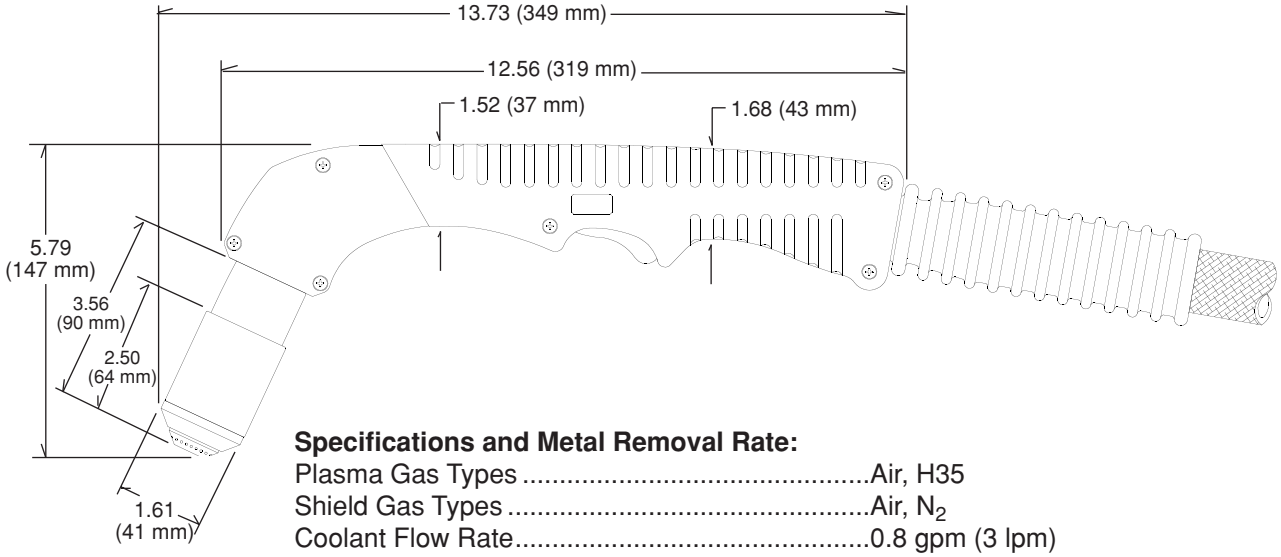
Specifications:

Maximum cutting thickness range	2" (51 mm)
Maximum current at 100% duty cycle	200 amps
Plasma Gas Flow at 200 amps	Air: 66 scfh
	N_2: 60 scfh
	H35: 70 scfh
	O_2: 72 scfh
Shield Gas Flow at 200 amps	CO_2: 220 scfh
	Air: 280 scfh
	N_2: 290 scfh
Coolant Flow Rate	0.8 gpm (3 lpm)
Weight (without leads)	2.5 pounds (1.1 kg)

* Note: This number is for torch only (without leads). See **Parts List** section for torch assembly with leads.

PAC200E (65°) Gouging Trigger Torch – #073188*





Specifications and Metal Removal Rate:

Plasma Gas Types .....Air, H35
Shield Gas Types .....Air, N_2
Coolant Flow Rate.....0.8 gpm (3 lpm)
Weight (without leads).....2.5 pounds (1.1 kg)

Metal	Gouging Technique**	Metal Removal Rate***
Mild Steel	Straight Gouge	46 lbs/hr (21 kg/hr)
	Side Gouge	43 lbs/hr (19 kg/hr)
	Side Weaving Gouge	65 lbs/hr (29 kg/hr)
	Straight Weaving Gouge	66 lbs/hr (30 kg/hr)
Stainless Steel	Straight Gouge	83 lbs/hr (37 kg/hr)
	Side Gouge	77 lbs/hr (35 kg/hr)
	Side Weaving Gouge	89 lbs/hr (40 kg/hr)
	Straight Weaving Gouge	86 lbs/hr (39 kg/hr)
Aluminum	Straight Gouge	36 lbs/hr (16 kg/hr)
	Side Gouge	43 lbs/hr (19 kg/hr)
	Side Weaving Gouge	52 lbs/hr (23 kg/hr)
	Straight Weaving Gouge	41 lbs/hr (18 kg/hr)

* Note: This number is for torch only (without leads). See **Parts List** section for torch assembly with leads.

** See *Gouging* in **Section 4** for examples of gouging techniques.

*** When Argon-Hydrogen is used as the plasma gas.

Hypertherm

Section 3

SETUP

In this section:

Upon Receipt

The MAX200 power supply is shipped mounted to a skid and protected by a heavy carton cover. Before unpacking the unit, inspect the carton for evidence of damage during shipment.

1. Remove all packing material and discard and remove the power supply from the shipping skid.

2. Verify that the MAX200 torch standard system configuration items and parts listed below are included. Alert your distributor if any of the items or parts are missing. All communications regarding this equipment must include the model number and serial number (located on the back of the MAX200).

   MAX200 System – Hand Torch Configuration

   - MAX200 power supply
   - PAC200T or PAC200E hand torch and torch lead assembly
   - 25-foot work cable (ground) with clamp
   - Consumable spare parts kit
   - Torch coolant – four gallons
   - Instruction manual 800870

Damage Claims

If your unit was damaged during shipment, you must file a claim with the carrier. Hypertherm will furnish you with a copy of the bill of lading upon request. Call Customer Service listed in the front of this manual or your authorized Hypertherm distributor.

Pre-Installation

Installation and service of the electrical and plumbing systems must conform to national or local electrical and plumbing codes. Have this work performed only by qualified, licensed personnel.

Power Supply Placement

- Place the power supply in an area that is free of excessive moisture, has proper ventilation, and is relatively clean.

- Place the power supply so that air flow is not blocked in any way. (Cooling air is drawn in through the front panel grating, and is exhausted through the rear of the unit by a cooling fan.)

- Do not place any filter device over the air intake locations. This reduces cooling efficiency and VOIDS THE WARRANTY.

Air and Gas Supply Requirements

If making hard plumbing connections, avoid using iron pipe. Never use teflon tape on any joint preparation. After installation, pressurize the entire system and check for leaks.

Air Supply

Use cylinder compressed air or shop compressed air as the source supply for the MAX200. Use an inert gas hose to connect the air supply to the input connection on the filter/pressure regulator mounted on the rear of the power supply.

WARNING

Do not exceed 150 psi to the filter/pressure regulator when using cylinder compressed air or shop compressed air. The plastic filter bowl may explode if this pressure is exceeded causing serious injury. See the warning label on the filter bowl for other safety warnings.

Cylinder Compressed Air

The cylinder air supply must be clean, dry and oil-free. A high-pressure regulator on the cylinder must be used and must be capable of delivering air at a pressure of between 110 and 130 psi to the filter/pressure regulator on the power supply. The filter/pressure regulator must be set for a 90 psi input to the power supply (refer to the procedure below). Refer to the *Cut Charts* in **Section 4** for detailed information.

Shop Compressed Air

The shop air supply must be clean, dry and oil-free. Shop air must be capable of delivering air at a pressure of between 110 and 130 psi to the filter/pressure regulator on the power supply. The filter/pressure regulator must be set for a 90 psi input to the power supply (refer to the procedure below). Refer to the *Cut Charts* in **Section 4** for detailed information.

Adjusting the Filter/Pressure Regulator

To adjust the filter/pressure regulator for the required air pressure (90 psi) to the power supply:

1. Turn the lock knob, which secures the adjusting knob, counter clockwise (ccw).

2. Set the adjusting knob until the pressure gauge indicates 90 psi.

3. Turn the lock knob clockwise (cw) to secure the adjusting knob.

Additional Air Filtration

When site conditions introduce moisture, oil, or other contaminants into the air line, additional filtration is required. Refer to *Appendix A* for filtration components and mounting sequence.

Gas Supply

Use inert gas hoses to connect the plasma and shield gas supplies to the gas input connectors on the rear of the power supply.

Plasma Gas

To use liquid nitrogen, liquid oxygen, or argon/hydrogen as the plasma gas, it must be supplied to the MAX200 at these purities: nitrogen, 99.995% and oxygen, 99.5%. The gas supply source can be compressed gas cylinders or liquid containers. It must be capable of delivering the required gas at a delivery pressure of 120 psi to the power supply. Refer to Section 4, *Cut Charts* for detailed information. If the purity level of the gas is too low or if there are leaks in the supply hoses or connections:

- Cut speeds can decrease
- Cut quality can deteriorate
- Cutting thickness capability can decrease
- Parts life can shorten

Shield Gas

To use liquid nitrogen or carbon dioxide (compressed or liquid) as the shield gas, it must be supplied to the MAX200 at these purities: nitrogen,99.995% and carbon dioxide, 99.5%. The gas supply source can be compressed gas cylinders or liquid containers. It must be capable of delivering the required gas at a delivery pressure of 90 psi to the power supply. Refer to Section 4, *Cut Charts* for detailed information.

Torch Coolant Requirements

The power supply is shipped without any coolant in the tank. A standard mixture of propylene glycol (30%), deionized water (69.9%) and 0.1% benzotriazole is recommended. This mixture resists freezing to +10° F (-12° C) and contains a corrosion inhibitor (benzotriazole) to protect copper surfaces in the coolant loop. This mixture is available in one-gallon containers by ordering 028872. 100% propylene glycol is available by ordering 028873.

For operating temperatures colder than the temperature stated above, the percentage of propylene glycol must be increased. Refer to graph on the next page. Failure to do so could result in a cracked torch head, leads, or other damage to the torch coolant system due to the coolant freezing.

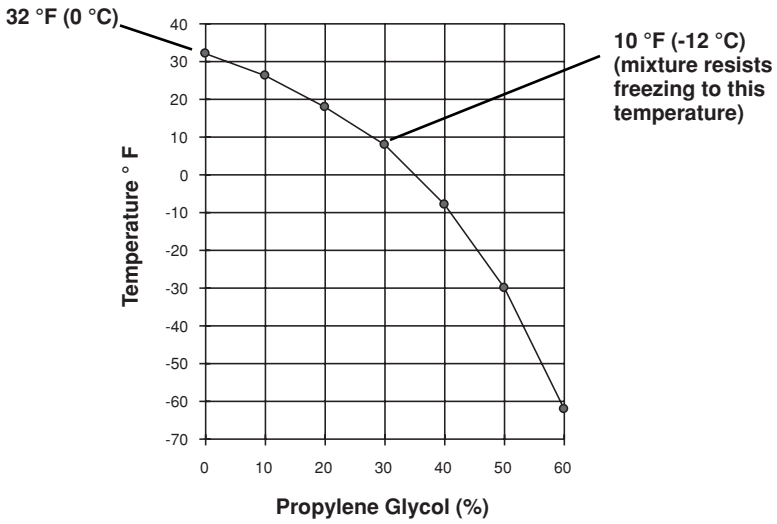
Observe the warning and cautions below. Refer to the Material Safety Data Sheets in Appendix B for data on safety, handling, and storage of propylene glycol and benzotriazole.

WARNING

Propylene glycol and benzotriazole are irritating to skin and eyes, and harmful or fatal if swallowed. Upon contact, flush skin or eyes with water. If swallowed, drink water and call a physician immediately. Do not induce vomiting.

Caution: Always use propylene glycol in the coolant mixture. Do not use anti-freeze in place of propylene glycol. Anti-freeze contains corrosion inhibitors that will damage the torch coolant system.

Always use purified water in the coolant mixture in order to prevent corrosion in the torch coolant system. The hardness of purified water should be between .206 and 8.5 ppm. If using a conductivity meter to measure water purity, the recommended level is between .5 and 18 µSiemens/cm at 77° F (25° C).



Filling the System

To fill the torch coolant tank prior to initial start-up:

1. Ensure the torch lead is connected. Refer to page 3-14, *Connecting the Torch Lead Assembly*.

   Note: Always add coolant with the MAX200 system off.

2. Fill the tank with coolant until the level reaches the bottom of the neck, approximately 2.9 gallons (11 liters).

Power Requirements

All line disconnect switches, slow-blow fuses and power cables are customer supplied and must conform to all applicable national and/or local electrical codes. Installation must be performed by qualified personnel.

Line Disconnect Switch

- Use a primary line disconnect switch for each power supply. This disconnect switch allows you to turn the power supply off quickly in an emergency situation. Install the switch on a wall near the power supply and easily accessible to the operator. The interrupt level of the switch must be equal to or exceed the continuous rating of the fuses. Size the disconnect switch to the following requirements:

Input Voltage	Phase	Rated Input Current @ 30 kw Output	Recommended Slow-Blow Fuse Size
200 VAC	3	108 amps	150 amps
208 VAC	3	104 amps	150 amps
220 VAC	3	98 amps	150 amps
380 VAC	3	57 amps	80 amps
400 VAC	3	56 amps	80 amps
415 VAC	3	52 amps	70 amps
480 VAC	3	45 amps	60 amps
600 VAC	3	36 amps	50 amps

Power Cables

- Use AWG wire sizes as outlined by applicable local electrical codes. Wire sizes vary based on the distance of the receptacle from the main box.

- Use a 4-conductor Type SO input power cable with a conductor temperature rating of 60°C (140°F) according to the following requirements:

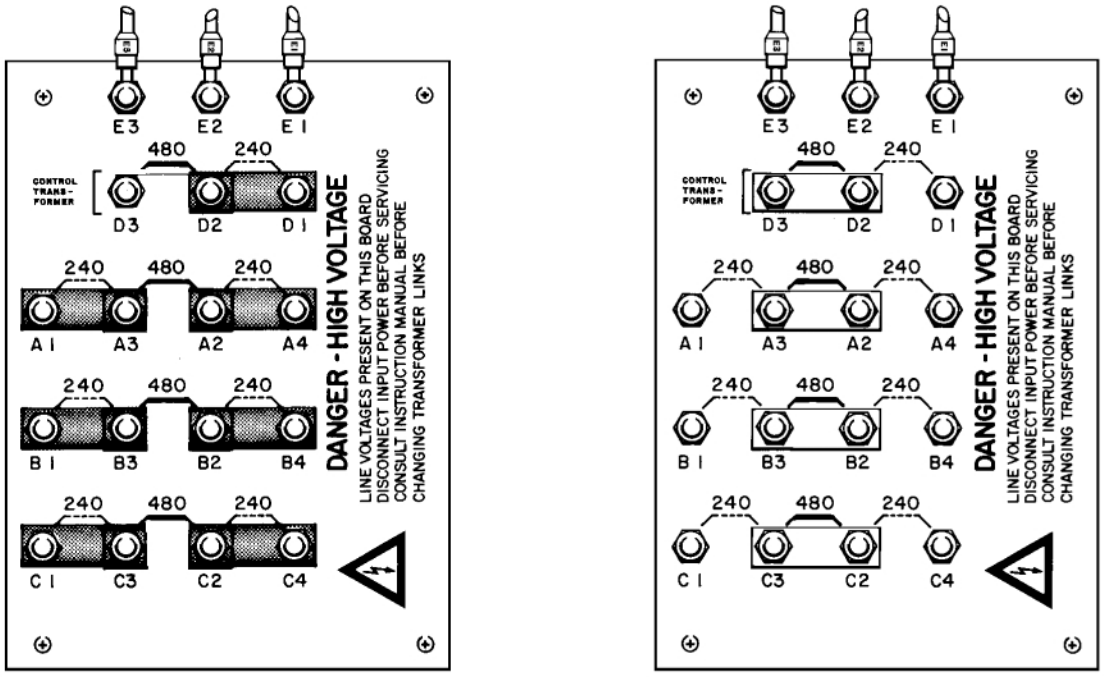
Input Voltage	Cable Size	Current Rating
200 VAC	1/4	107 amps
208 VAC	1/4	107 amps
220 VAC	1/4	107 amps
380 VAC	4/4	69 amps
400 VAC	4/4	69 amps
415 VAC	4/4	69 amps
480 VAC	6/4	52 amps
600 VAC	8/4	39 amp

240/480V Linkboard Configurations

- Hypertherm ships the 240/480-volt unit (#073002) from the factory linked for 480-volt operation. The links must be moved for 240-volt operation. Ensure that the linkboard is configured properly to the appropriate voltage line (see Figure 3-1).
- When changing the voltage for 240-volt operation, the line fuses F1 and F2 must also be changed from 7.5A to 20A. The alternate fuses are located on the floor of the power supply.

WARNING

Danger: High Voltage. Line voltage may be present on this linkboard. Disconnect input power before servicing.



240-Volt Configuration **480-Volt Configuration**

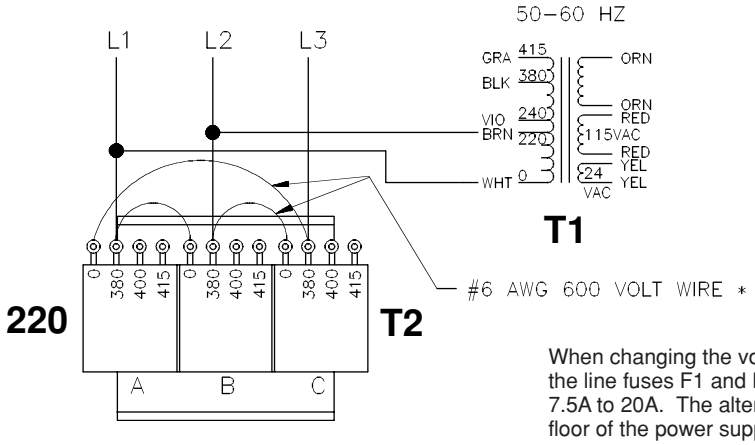
Figure 3-1 Dual Voltage 240/480-Volt Linkboard Configurations

220/380/400/415V Transformer T1 and T2 Configurations

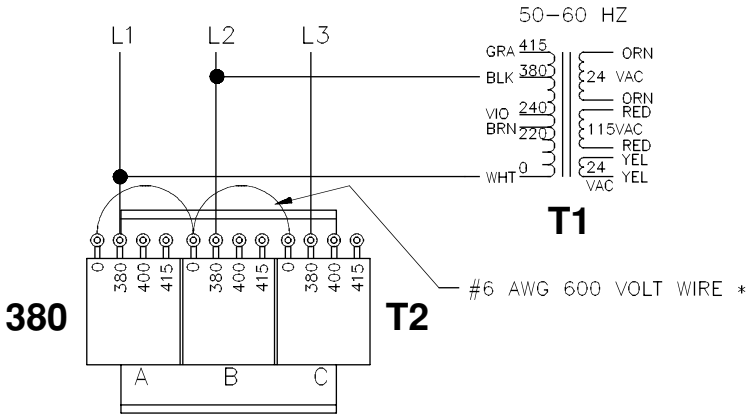
- The 220/380/400/415 volt, 3 PH, 50 Hz power supply is shipped from the factory set up for 380-volt operation, unless otherwise specified. To change the power supply to a different voltage the control transformer T1 and 30 kw transformer T2 must be reconfigured (see Figure 3-2).

WARNING

Danger: High Voltage. Always disconnect input power at the line disconnect switch before servicing.



When changing the voltage for 220-volt operation, the line fuses F1 and F2 must also be changed from 7.5A to 20A. The alternate fuses are located on the floor of the power supply.



*** A long # 6 wire is shipped with every unit.**

Figure 3-2 220/380/400/415V Transformer T1 and T2 Configurations (1 of 2)

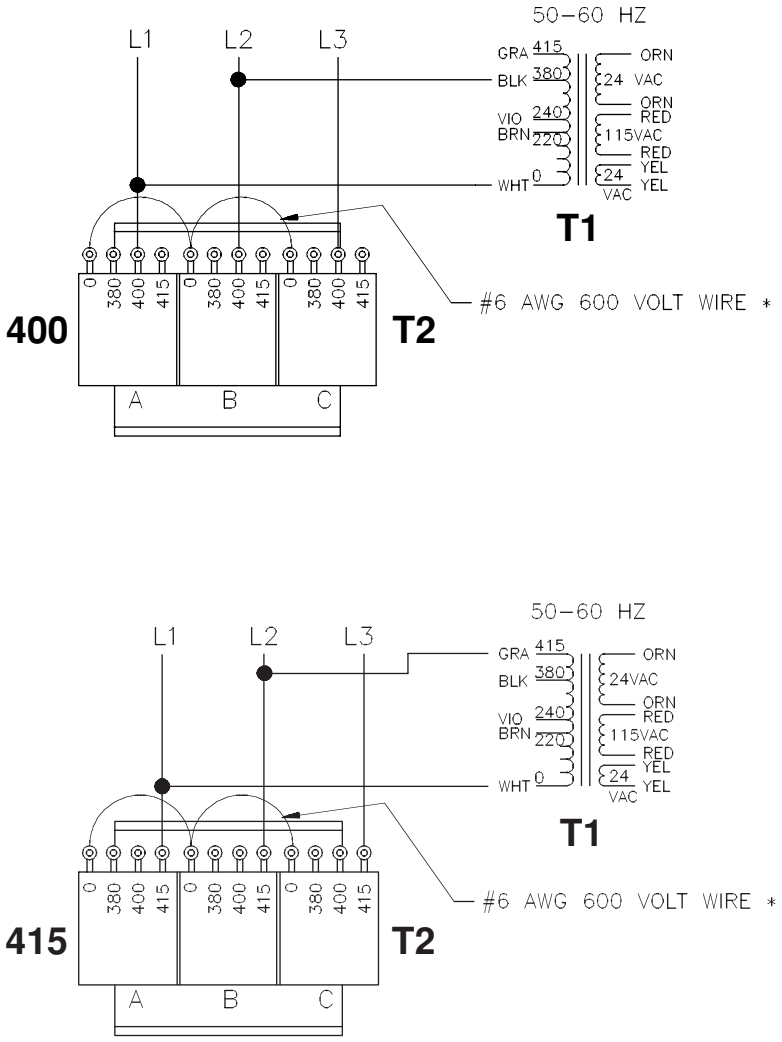


Figure 3-2 220/380/400/415V Transformer T1 and T2 Configurations (2 of 2)

Power, Gas, Torch Lead, and Torch Connections

Connecting the Power Cable

To connect the power cable to the 400V CE power supplies (073200 and 073213), refer to Appendix E. For other power supply voltages use the procedure below.

To connect the power cable to the MAX200, proceed as follows (see Figure 3-3):

1. Insert the power cable through the strain relief at the rear of the MAX200.
   Connect the power cable leads to TB1 located at the rear center panel of the right side.

2. Connect the power leads to the L1, L2, and L3 terminals of TB1.

3. Connect the ground lead to the yellow/green terminal of TB1.

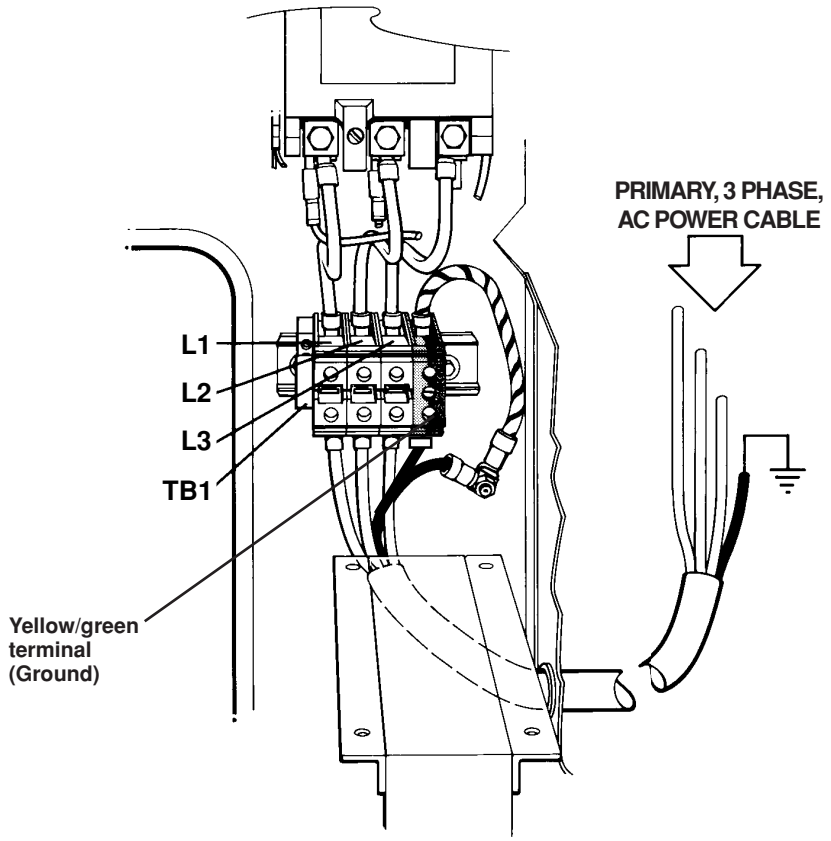


Figure 3-3 Power Cable Connections

Connecting the Air and Gas Hoses

When connecting pipeline shop air or compressed gas cylinders, use inert gas hoses for the plasma and shield connections to the MAX200.

Plasma (Air) and Shield (Air) Hoses

MAX200 systems are normally shipped from the factory configured, so that air is supplied to both the **PLASMA** and **SHIELD GAS** inlets from a single filter/pressure regulator. The filter is used to maintain a high air purity level. All moisture, oil, and other contaminants must be removed. If the air hoses must be re-connected, proceed as follows (see Figure 3-4):

1. Connect the plasma air hose from the regulator to the **PLASMA** gas inlet.

2. Connect the shield air hose from the regulator to the **SHIELD** gas inlet.

3. Connect the shop-supplied or cylinder-supplied air hose to the input of the filter/pressure regulator.

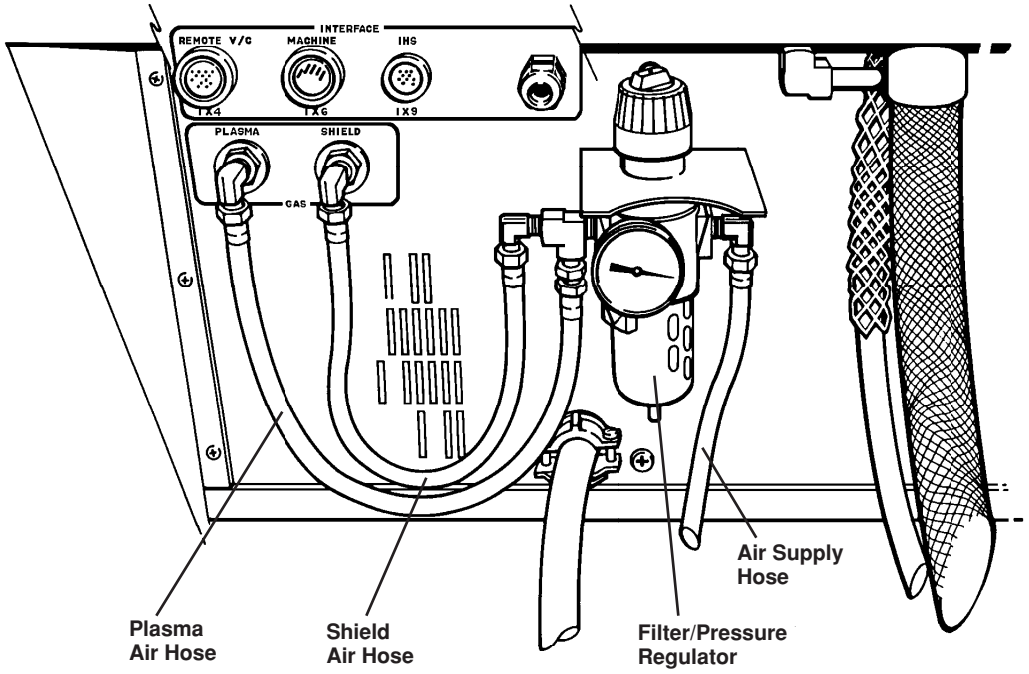


Figure 3-4 Plasma Air and Shield Air Connections

Plasma (Gas) and Shield (Air) Hoses

When the plasma required is a gas other than air and the shield gas required is air, the hoses must be connected as follows (see Figure 3-5):

1. Connect the plasma gas supply hose to the **PLASMA** gas inlet.

2. Connect the shield air hose from the regulator to the **SHIELD** gas inlet.

   Note: In this configuration, the **plasma air hose** must be disconnected from the regulator and replaced by a supplied **# 6 JIC cap**. The cap is required to stop the discharge of air from the regulator plasma output in order to keep the shield air pressure within specification.

3. Connect the shop-supplied or cylinder-supplied air hose to the input of the filter pressure regulator.

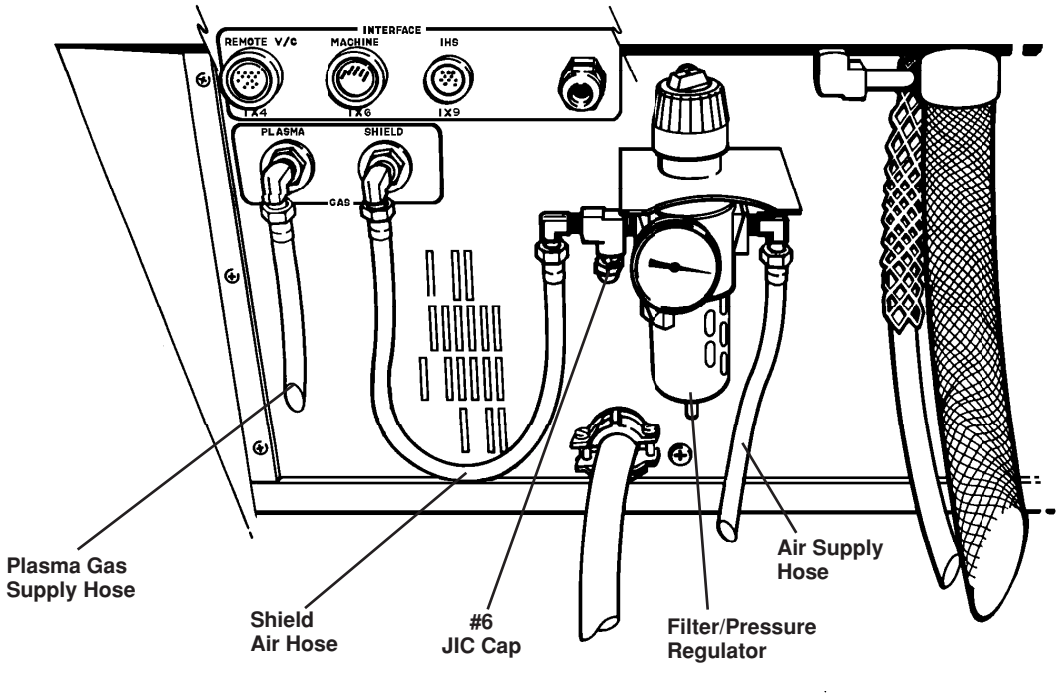


Figure 3-5 Plasma Gas and Shield Air Connections

Plasma (Gas) and Shield (Gas) Hoses

When gases other than air are used, the user must connect the liquid or compressed bottled gases to the MAX200 as follows (see Figure 3-6):

1. Connect the plasma gas supply hose to the **PLASMA** gas inlet.

2. Connect the shield gas supply hose to the **SHIELD** gas inlet.

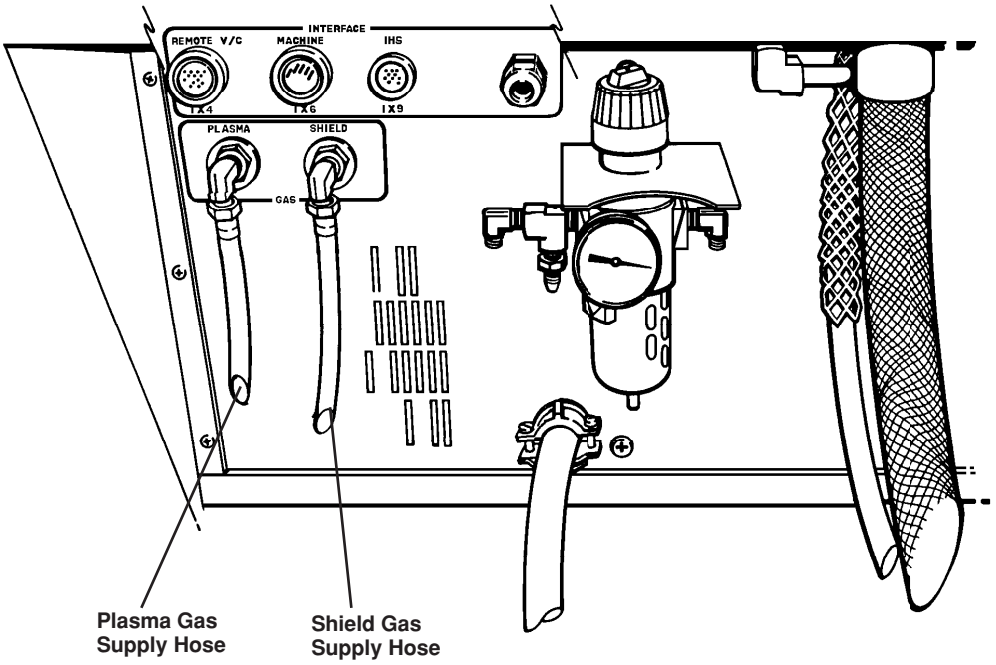


Figure 3-6 Plasma Gas and Shield Gas Connections

Connecting the Torch Lead Assembly

WARNING

Press the OFF (O) pushbutton switch on the power supply and place the wall mounted disconnect box switch to OFF before working on the torch or torch leads!

To connect the PAC200T/E torch lead assembly to the MAX200, proceed as follows (see Figure 3-7):

1. Connect the torch **COOLANT RETURN** lead (red w/red band for 25' leads; blue w/red band for extended leads) to the bulkhead adapter.
2. Connect the torch **COOLANT SUPPLY** lead (blue w/green band) to the bulkhead adapter.
3. Connect the **SHIELD GAS** lead (grey w/blue band for 25" leads; blue for extended leads) to the high-frequency coil.
4. Connect the **PLASMA GAS** lead (red) to adapter 2. This connection is left hand-threaded; it tightens in a counter-clockwise (ccw) direction.
5. Connect the **CAP SENSE** lead (grey) to adapter 1.
6. Connect the shielded **PLASMA START SWITCH LEADS** (red and black) to terminal block **TB2**.

Note: **The 90° hand torch lead assemblies are not interchangeable with the PAC200T/E lead assembly.**

If removing the 90° hand-torch leads from the power supply, reverse the *Connecting the Torch Lead Assembly* procedure. The connection locations and descriptions of each lead are otherwise identical to the PAC200T/E leads.

Note: If changing the length of the torch leads, refer to *Increase or Decrease Torch Lead Length* on page 5-9.

Connecting the Work Cable

Connect the **WORK CABLE** (black) to the bulkhead. (See Figure 3-7.)

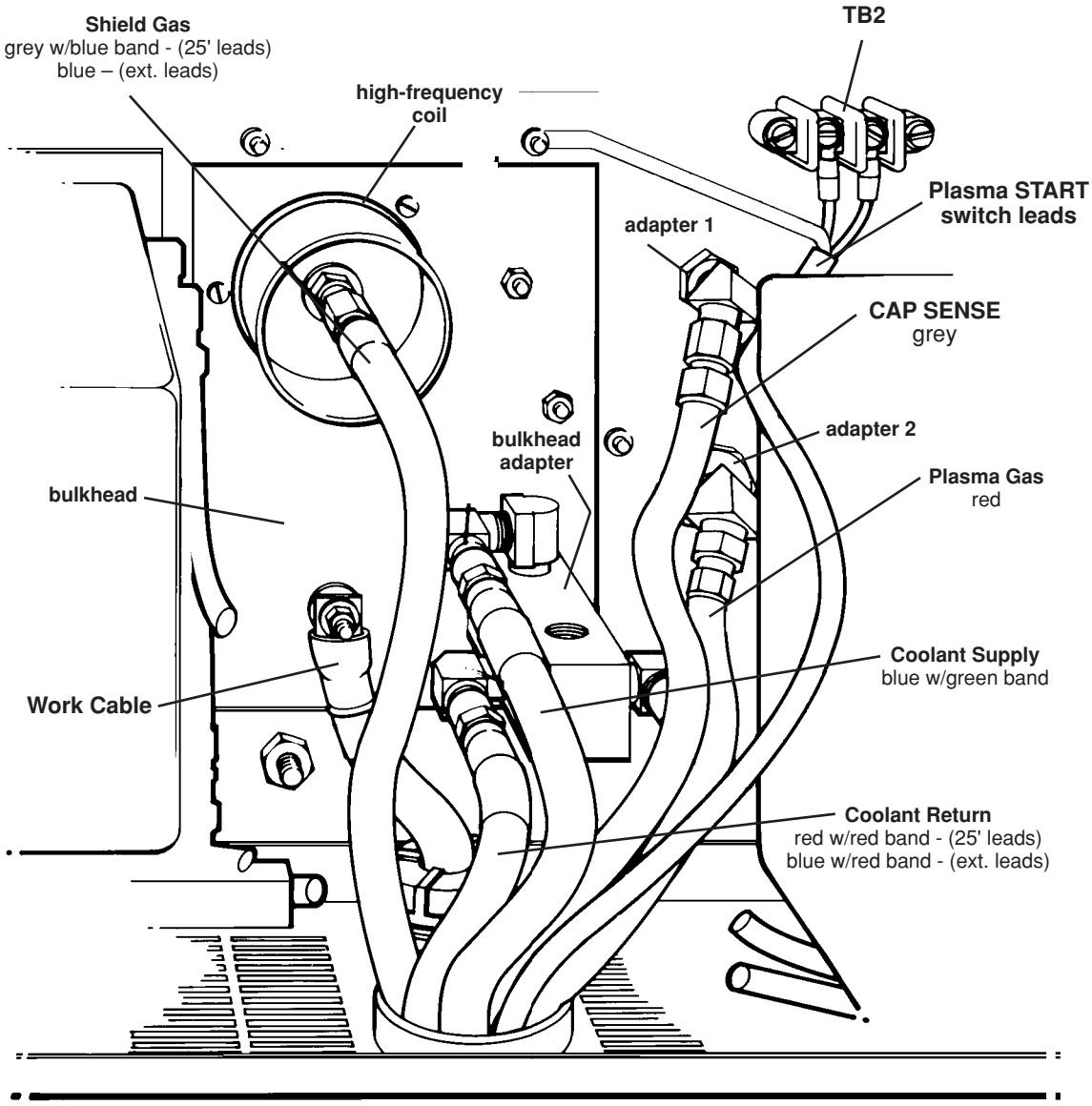


Figure 3-7 PAC200T/E Torch Lead Connections to MAX200

Connecting the Torch to the Torch Leads

WARNING

Press the OFF (0) pushbutton switch on the power supply and place the wall mounted disconnect box switch to OFF before working on the torch or torch leads!

1. Remove the six (6) **SCREWS** securing the two **HANDLE** halves and separate.
2. Remove the torch **SWITCH** and **TRIGGER** from the handle. Take care not to lose the trigger **SPRING**.
3. On the two largest leads, use a 3/8" open-end wrench to hold the torch body fittings and a 1/2" open-end wrench to turn the torch lead fittings.

   On the two next smaller leads, use a 5/16" open-end wrench to hold the torch body fittings and a 7/16" open-end wrench to turn the torch lead fittings.
   Note that the red lead fitting is reverse threaded and must be turned in the opposite direction (clockwise) to loosen.

   On the smallest lead (grey), use a 5/16" wrench to loosen.
4. Remove the **TORCH MAIN BODY**.
5. Connect the torch leads to the torch main body. Thread the torch main body fittings and the torch lead fittings together clockwise (cw). Use the size wrenches called out above. Note that the red lead fitting is reverse threaded and must be turned in the opposite direction (ccw).
6. Ensure the **LEAD INSULATOR** is positioned over the shield gas (grey w/ blue band) lead fitting.
7. Insert the torch main body into one of the handle halves and then align the body and handle slots.
8. Insert the torch switch and trigger into the handle half that it was removed from.
9. Insert the top rib of the **BOOT** into the handle just above the screw holes.
10. Align both halves of the handle, press together, and secure with the six (6) screws.
11. Add torch coolant to system. See *Filling the System* on page 3-5.

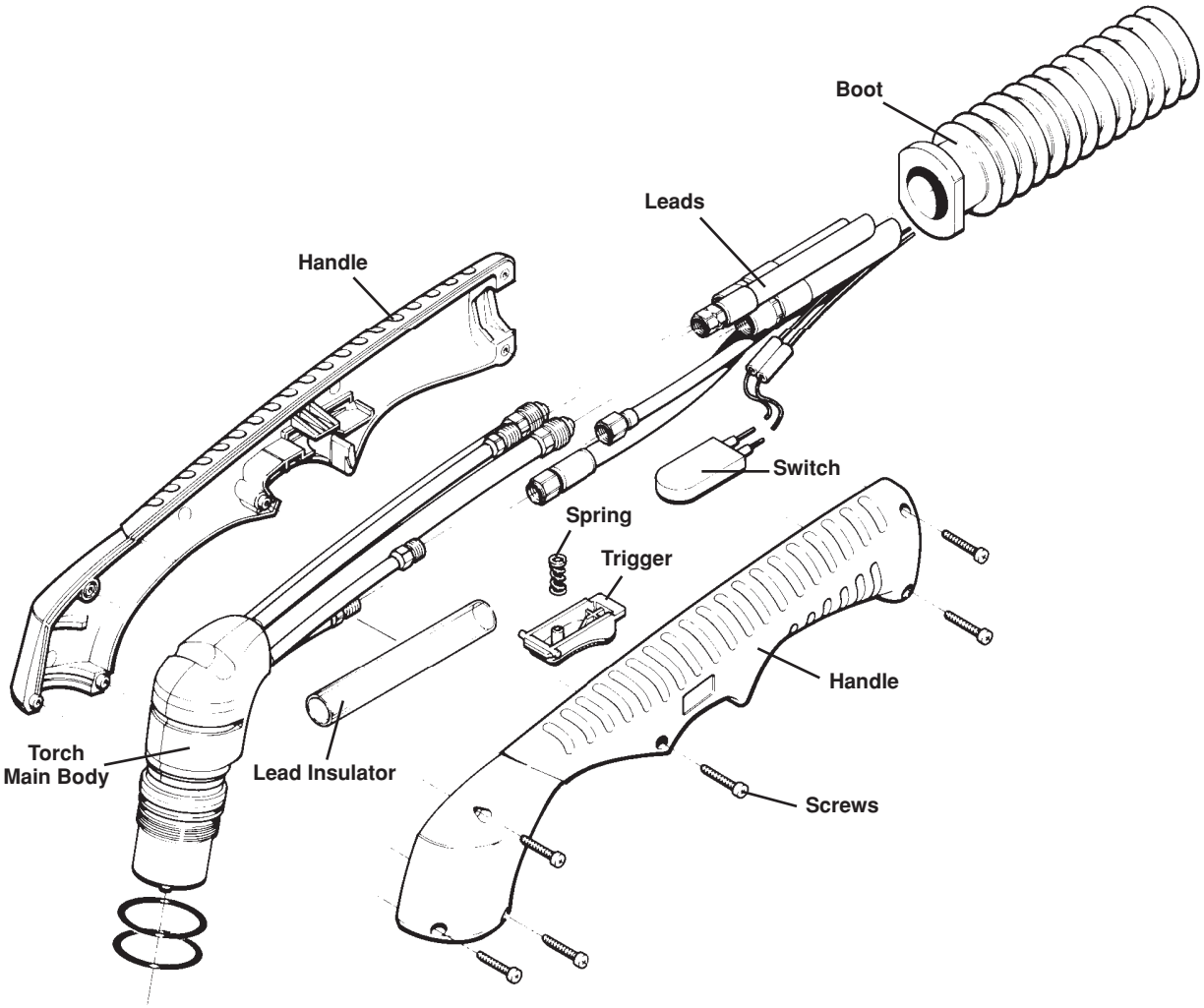


Figure 3-8 PAC200T (90°) Cutting Trigger Torch Assembly

Grounding

To ensure proper operation, personal safety, and to reduce emission of radio frequency interference, the MAX200 must be properly grounded:

Work Clamp

1. Attach the work clamp to the workpiece. Make sure that the work clamp and the workpiece make good metal-to-metal contact.

2. Do not attach the work clamp to the section of the workpiece that will fall away (see Figure 3-9).

3. For more information, refer to the National Electrical Code, Article 250, Section H, Grounding Electrode System or other appropriate code.

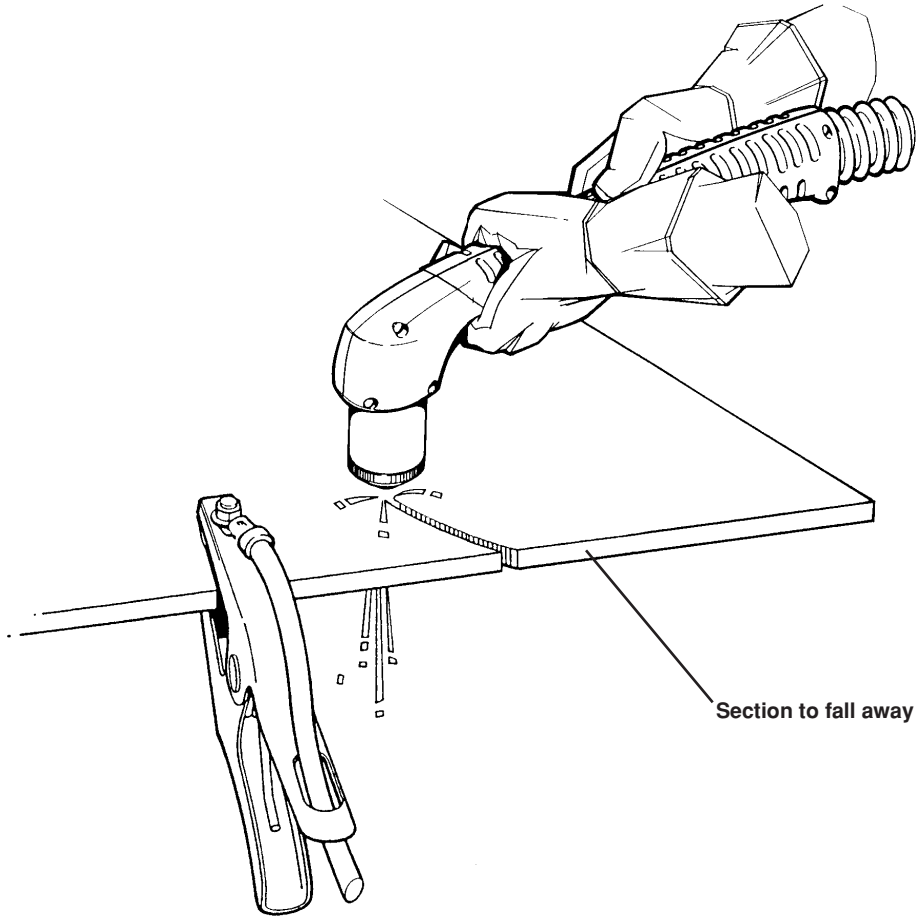


Figure 3-9 Proper Work Clamp Connection

Adjusting Plasma Gas

If your torch leads are greater than 50 feet in length, the plasma gas must be adjusted.

1. At the front panel of the MAX200 power supply while in TEST mode, adjust the PLASMA gas valve control by increasing the TEST pressure approximately **5 psi per 50 ft of lead length (beyond 50 ft)** from what is called out in the Cut Charts.
   See note on page 4-17.

	WARNING
Use extreme caution when making the following adjustment:	

2. If the plasma gas RUN pressure does not quickly reach the value stated in the Cut Charts **after arc transfer**, you may need to adjust PS4. Remove the right side panel of the power supply. On the floor of the power supply, locate pressure switch PS4 by referring to Figure 3-10 and adjust by turning the PS4 Adjustment screw in a clockwise direction.

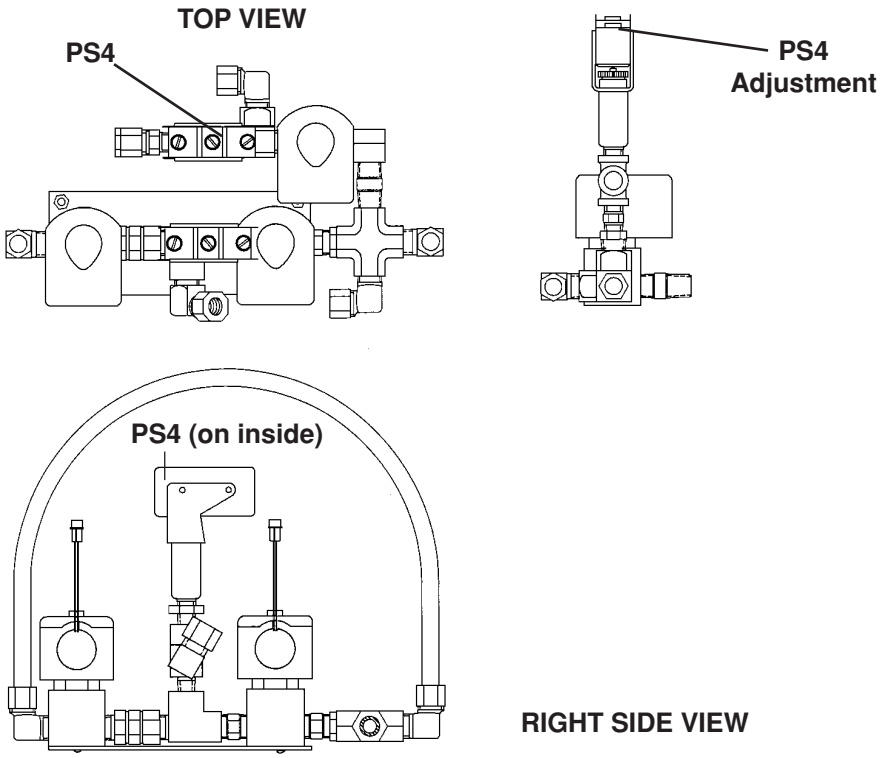


Figure 3-10 Pressure Switch PS4 and Adjustment Location

Hypertherm

Section 4

OPERATION

In this section:

Front Panel Controls

Power

- **ON (I)** pusbutton/indicator switch
  Activates the power supply and its control circuits.

- **OFF (O)** pushbutton switch
  Shuts the power supply down.

- **DC ON** LED
  Illuminates when main contactor closes, indicating that DC power is present at the torch.

- **AMPS** thumbwheel switch (supplied on units w/o THC)
  Adjusts output current.

- **MACHINE DELAY** dial
  Adjusts the machine motion delay from 0.1 seconds to 6.0 seconds.

Status

The STATUS indicators are all extinguished during normal operation.

- **INTERLOCK** LED (Spare interlock for future use)
  When illuminated, indicates that the interlock jumper on TB4-34 & 35 has been removed. For assistance in reinstalling the jumper, refer to *Claims and Technical Questions* later in this section.

- **TRANSFORMER** LED
  When illuminated, indicates that either the main transformer or one of the choppers has overheated.

- **COOLANT LEVEL** LED
  When illuminated, indicates the coolant level is too low.

- **SHIELD GAS/CAP** LED
  When illuminated, indicates the shield gas pressure is too low or the cap is not installed properly on the torch.

- **PLASMA GAS** LED
  When illuminated, indicates that the plasma gas pressure is too low.

- **COOLANT TEMP** LED
  When illuminated, indicates that the torch coolant temperature is too high (above 70° C, 160° F).

- **COOLANT FLOW** LED
  When illuminated, indicates that the coolant flow from the torch is inadequate.

Status Indicators Before Startup

When Power is applied from the line disconnect switch and before the POWER ON (I) button is pushed, the COOLANT FLOW LED will be illuminated. Once the POWER ON button is pushed, this LED will extinguish if the system is in the proper working condition. Other fault conditions may also be indicated when the line power is switched on. Correct any other fault conditions before pressing the the POWER ON (I) button. See Troubleshooting in Section 3 of MAX200 Service Manual, IM-162 (801620).

Gas

- **TEST**/**RUN** switch
  Sets dynamic (flowing) gas flow.

- **PLASMA** pressure gauge/plasma gas needle valve
  Adjusts and displays the plasma gas flow pressure.

- **SHIELD** pressure gauge/shield gas needle valve
  Adjusts and displays the shield gas flow pressure.

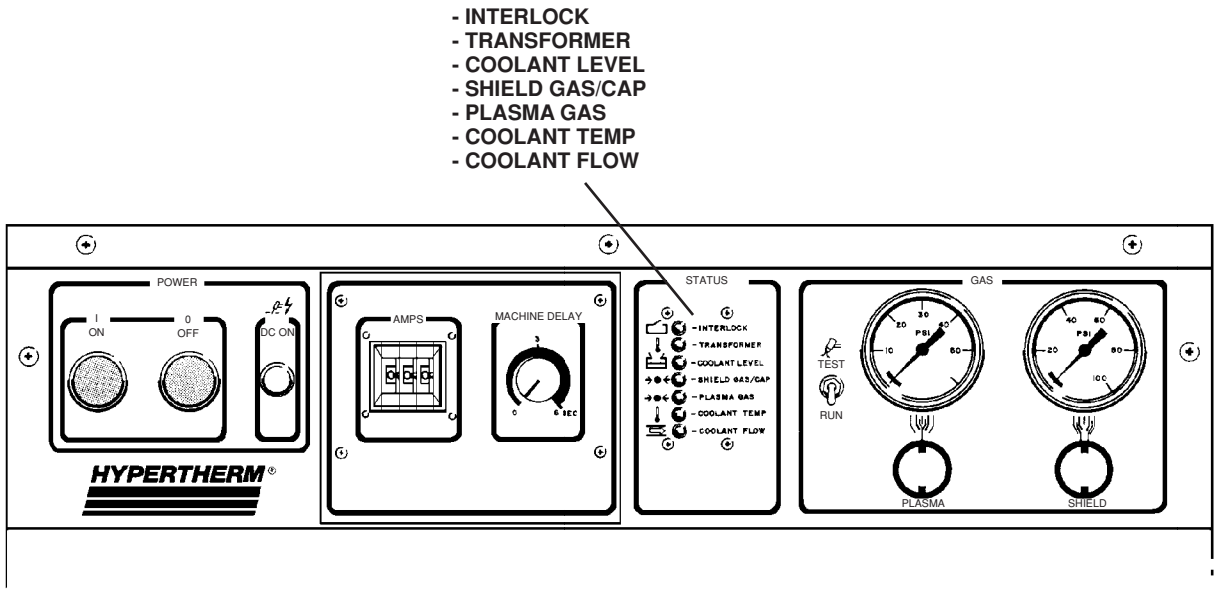


Figure 4-1 Front Panel Controls

Pre-operation

1. **You must read the Safety section thoroughly before attempting to operate this system!! Be certain that the cutting environment and clothing meet the requirements outlined in the Safety section.**

2. Refer to the *Cut Charts* (later in this section) for the type and width of material you plan to cut and to select the gas combination that will create the desired results.

   - Check to see if your gas supplies are input to the power supply at the proper pressure and that there is an adequate amount for your cutting needs.

> **Caution: Input gas pressures below 60 psi (plasma) and 70 psi (shield/cap) will cause the safety interlock circuit to shut down the power supply. If the low pressure interlocks are bypassed for any reason and low gas pressures occur, the consumables and torch can burn out.**

3. Select the proper torch parts from the *Cut Charts*.

   - Install the parts in the torch. (Refer to *Changing Consumable Parts*)

4. Attach the MAX200 work clamp to the workpiece.

   - Do not attach the work clamp to the section of workpiece that will fall away.

   - Do not attach the work clamp to the work table.

   - Make sure that there is good metal-to-metal contact between the work clamp and the workpiece.

5. Apply power to the MAX200 power supply via the wall disconnect switch. See *Status Indicators Before Startup* earlier in this section.

Operation

1. Press the green ON power button until it lights (approximately 5 seconds).

   - If the ON button does not light, refer to *Troubleshooting* in **Section 5**.

2. Move the RUN/TEST switch to the TEST position.

3. Adjust and display the PLASMA and SHIELD gas flow pressures. Refer to the *Cut Charts* to determine the correct gas pressures. See caution above.

4. Move the RUN/TEST switch to the RUN position.

5. Set the AMP thumbwheel switch to the correct amperage.

   - Refer to the *Cut Charts* to determine the correct amperage.

6. Position the torch at the edge of the workpiece at the point where the cut will begin. (If you plan to pierce or gouge, see *Operating Tips* for proper techniques.)

7. Squeeze the torch trigger switch. There will be a two-second flow of gases before the pilot arc ignites.

8. Once the pilot arc ignites, move the torch into the cut path. When the torch is close enough to transfer the pilot arc (the arc will intensify), hesitate until the cutting arc is at full power.

   Note: Ensure that the plasma gas pressure is properly adjusted – it may be off 2-3 psi from the original setting. Readjust it if necessary.

9. Move the torch along the cut path until the cut is complete.

10. When all cutting is complete, push the red OFF button until the green ON button goes out.

11. Shut off all gas supplies.

Operating Tips

Changing Consumable Parts


WARNING

Always unplug the power supply before inspecting or changing the torch parts.

Monitor the consumable parts periodically for signs of wear. A good rule of thumb is to check the parts after every 150 starts (pierces, edge starts, parts cut, etc.). (Refer to *PAC200T/E Consumables* in **Section 6**.)

To remove the consumables:

1. Unscrew and remove the retaining cap.

2. Check the shield for external signs of wear. The shield must be clean and clear of metal debris. The gas holes along the edge of the shield must not be blocked with debris. Check that the center hole does not have any nicks or gouges, and shows no signs of arcing.

3. Unscrew and remove the shield from the retaining cap. Inspect the gas holes from the inside. Check that the holes are clear of metal and other debris. (Debris will cause arcing.) If the shield is still good, screw it back on to the retaining cap and tighten it. If it is damaged, replace it with a new one.

4. Inspect the two O-rings on the torch. They must be lubricated and undamaged. If they are dry, lubricate them lightly with a very thin film of the lubricant provided in the spare parts kit. If they are damaged, replace them.

5. Using the 3/4" side of the 027194 wrench, remove the nozzle. Inspect it for damage or signs of wear. Check that the inside of the nozzle is clean and bright, with no deposits from the electrode. If you clean the inside of the nozzle with steel wool, remove any pieces of the steel wool afterward. The hole in the nozzle must not be worn or oval-shaped.

6. Using the 3/8" center hole in the 027194 wrench, remove the electrode. If the center of the electrode has a pit more than 2.0 mm (1/16") deep, replace it. If the electrode is still good, inspect its O-ring – it must be lubricated and undamaged. If it is dry, lubricate it lightly with a very thin film of lubricant provided in the spare parts kit. If it is damaged, replace it.

7. Remove the swirl ring from the electrode and inspect it. It must be clean, and the holes on the top and sides must be unplugged. If the swirl ring is still good, inspect its O-ring. It must be lubricated and undamaged. If it is dry, lubricate it lightly with a very thin film of lubricant provided in the spare parts kit. If it is damaged, replace it.

8. Inspect the inside of the torch body by using a mirror, or by looking carefully inside. The inside of the torch body must be clean and undamaged. If the center water tube is nicked or damaged, see *Changing the Water Tube* on page 4-8.

9. Replace the electrode and tighten it with the wrench. **Do not overtighten it.**

10. Install the swirl ring with the bottom O-ring facing the inside of the torch - it won't fit in properly if it is installed in the wrong direction. Push it into place.

11. Install the nozzle and finger-tighten it. Finish tightening it with the wrench. **Do not overtighten it.**

12. Replace the retaining cap. Make sure that it is tightened snugly; if it is loose, it can affect the shield gas flow.

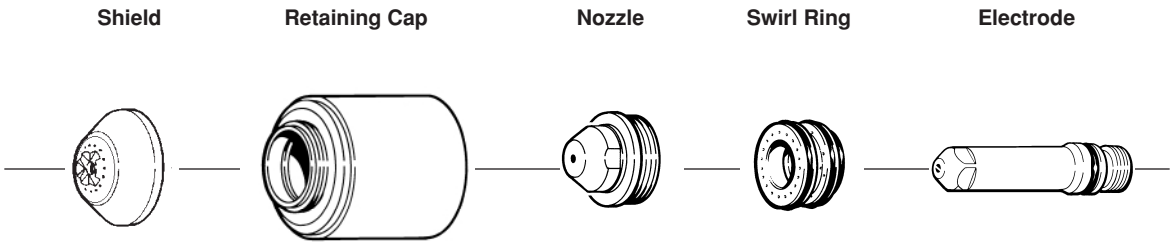


Figure 4-2 Changing Consumable Parts

Operating Tips (cont.)

Changing the Water Tube

Problems and causes you may find with a defective or improperly installed water tube:

- Short electrode life: Water tube not screwed in tightly
- Flow switch interlock shutting down the system: Water flow restricted due to loose water tube.
- Humming or rattling sound coming from the torch: Water tube bent or loose
- Electrode will not screw down into torch: Gouging water tube in cutting torch

If you suspect a problem with the water tube, you may need to replace it.

1. Disconnect power supply from power source.
2. Remove all consumables from torch (see *Changing Consumable Parts* – pg. 4-6).
3. Verify that the correct water tube is installed - The cutting water tube (020963) extends about .2 inches (5 mm) from the end of the cutting torch head. The gouging water tube (020913) extend about .2 inches (5 mm) from the end of the gouging torch head. Note: part numbers are laser engraved on the water tubes.
4. Look for any damage or bends in the water tube.
5. Remove and replace the water tube by using the water tube wrench (027347) supplied by Hypertherm (Fig. 4-3). **When installing water tube, do not over tighten!** Snug down by hand only.

WARNING

Always unplug the power supply before inspecting or changing the torch parts.

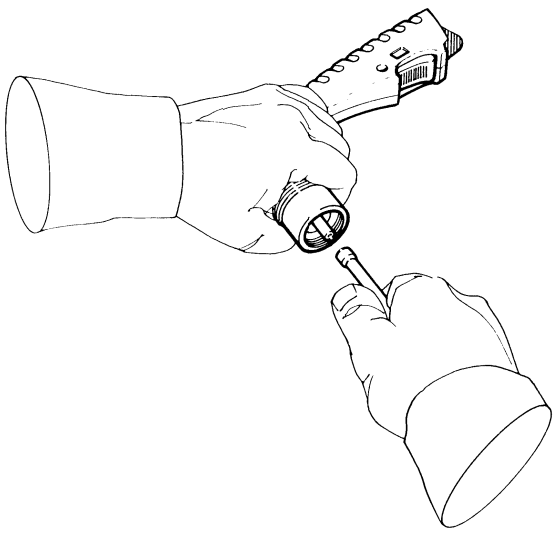


Figure 4-3 Changing the Water Tube

PAC200T/E Safety Trigger Operation

The PAC200T/E safety trigger torch allows operators the ability to safely handle the torch before and after the cut and to minimize the possibility of accidental torch firing. The safety trigger is easy to operate. Follow the steps below:

① Safety **On** position. In this position the trigger cannot be pulled back, so that the torch cannot be accidentally fired.

② Start pushing the safety forward. Do not pullback on the trigger now, wait until the safety reaches the Safety **Off** position as shown in step 3.

③ Safety **Off** position. In this position the trigger can be pulled back, so that the torch can be fired.

④ Release the safety to return to the Safety **On** position as shown in step 1.

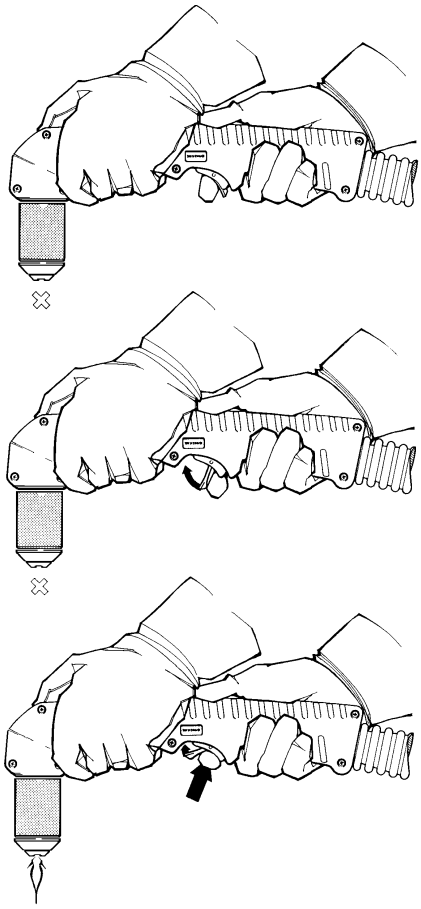


Figure 4-4 PAC200T/E Torch Safety Trigger Operation

Cutting

Caution: Do not fire the pilot arc into the air needlessly—this causes a drastic reduction of the nozzle and electrode life.

1. Start cutting from the edge of the workpiece (Fig. 4-5) unless you must pierce. For tips on piercing, see *Piercing*, page 4-15.

   Note: When cutting, make sure that the sparks are coming out of the bottom of the workpiece. If they are spraying on top of the workpiece, you are moving the torch too fast, or you do not have sufficient power to fully penetrate the workpiece.

2. Hold the torch lightly on the metal or just off the metal. Check the Torch-to-work Distance in the *Cut Charts* and drag the torch across the metal. The arc transfers once the torch is within 1/4 inch (6 mm) of the workpiece.

3. Pull the torch through the cut. Pulling it is easier than pushing it.

4. Hold the torch nozzle (tip) at a vertical position and watch the arc as it cuts along the line (Fig. 4-6). By lightly dragging the nozzle on the workpiece, you can maintain a steady cut. For straight-line cuts, use any straight edge as a guide.

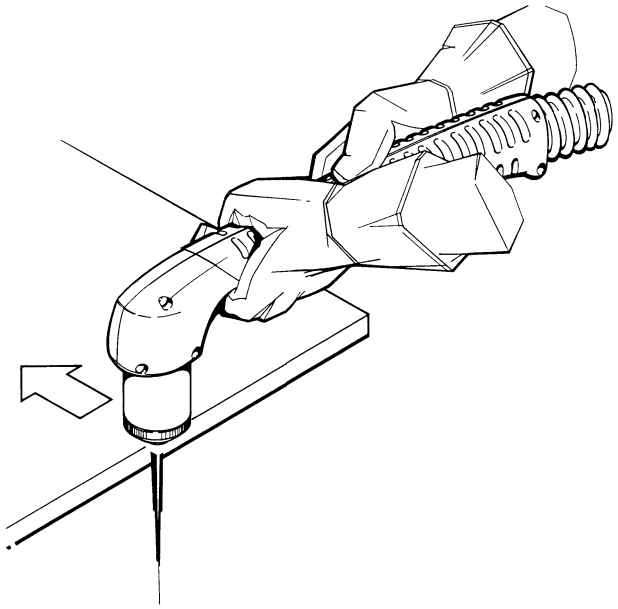


Figure 4-5 Starting a Cut

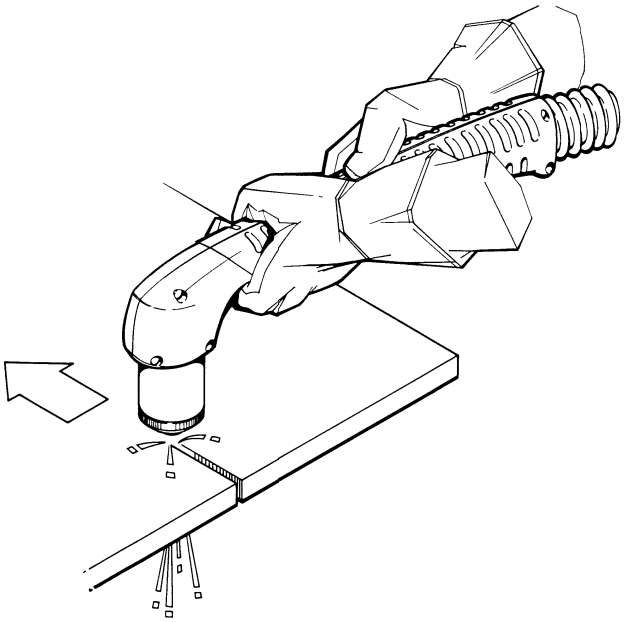


Figure 4-6 Dragging the Torch

Gouging

The MAX200 gouges mild steel, stainless steel, and aluminum when using the PAC200E gouging torch with gouging consumables. Use the following guidelines to assist you with the gouging process:

1. When gouging, it is absolutely necessary to wear full protection – a welding helmet with at least a #12 glass, welding gloves and a welding jacket. The arc is fully exposed and will cause serious burns if skin is not covered. Hypertherm provides a heat shield (#020881) for further protection.

2. Install the gouging nozzle just as you would install a standard cutting nozzle. Refer to *Changing Consumable Parts,* page 4-6.

3. Adjust the plasma pressure and the shield pressure according to the Cut Charts later in this section. Note that the gouging pressures are lower than the cutting pressures.

4. Tilt the torch approximately 40° from the surface to be gouged and feed into the gouge (Fig. 4-7). Use the straight gouge (90°) or side gouge (45°) technique (see Figs. 4-8 and 4-9). Multiple passes or “weaving” may be necessary to gouge wider and deeper sections (see Fig. 4-8 for straight weaving and Fig. 4-9 for side weaving).

5. When gouging mild steel, stainless steel, or aluminum, the approximate metal removal rates are as follows:

Metal	Gouging Technique	Metal Removal Rate*
Mild Steel	Straight Gouge	46 lbs/hr (21 kg/hr)
	Straight Weaving Gouge	66 lbs/hr (30 kg/hr)
	Side Gouge	43 lbs/hr (19 kg/hr)
	Side Weaving Gouge	65 lbs/hr (29 kg/hr)
Stainless Steel	Straight Gouge	83 lbs/hr (37 kg/hr)
	Straight Weaving Gouge	86 lbs/hr (39 kg/hr)
	Side Gouge	77 lbs/hr (35 kg/hr)
	Side Weaving Gouge	89 lbs/hr (40 kg/hr)
Aluminum	Straight Gouge	36 lbs/hr (16 kg/hr)
	Straight Weaving Gouge	41 lbs/hr (18 kg/hr)
	Side Gouge	43 lbs/hr (19 kg/hr)
	Side Weaving Gouge	52 lbs/hr (23 kg/hr)

* When Argon-Hydrogen is used as the plasma gas

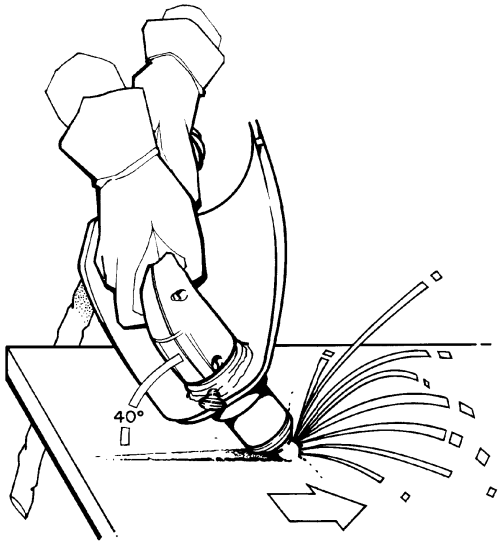
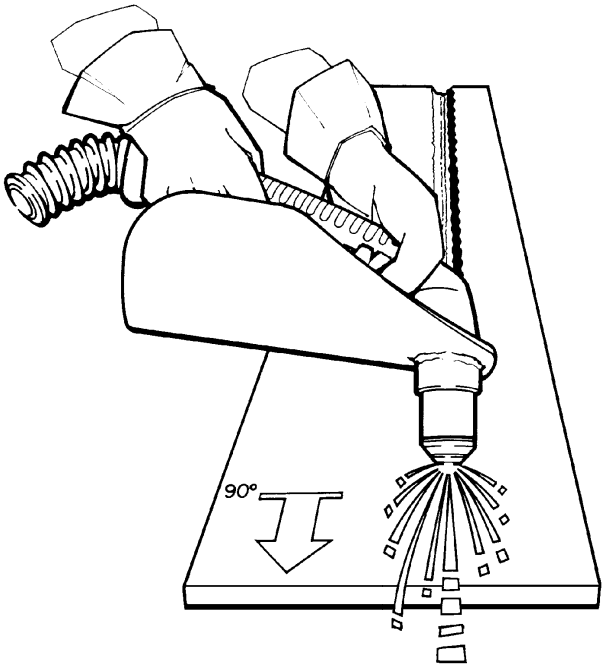
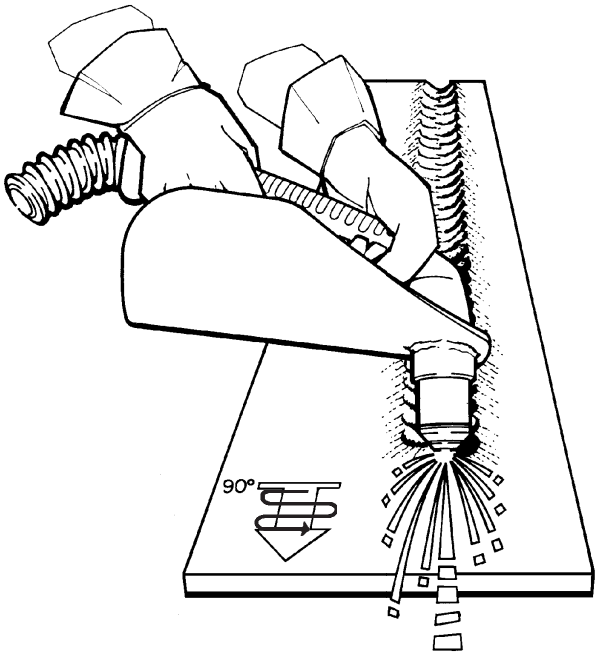


Figure 4-7 Feeding Into Gouge

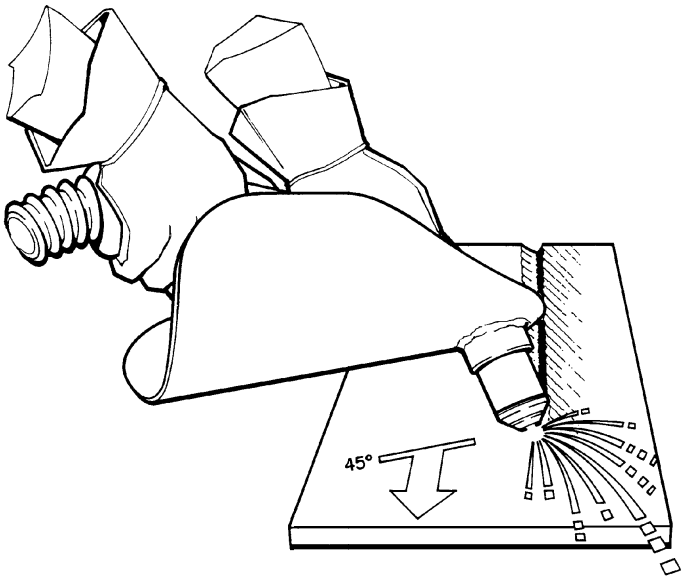


Straight Gouge

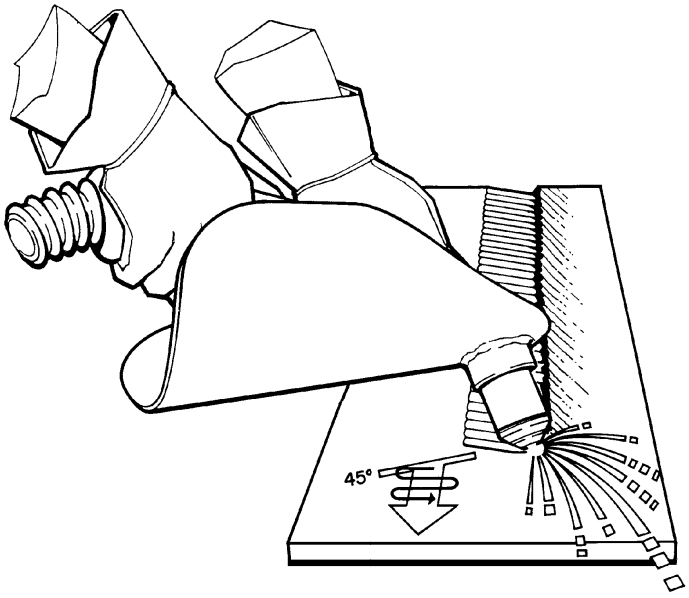


Weaving Gouge

Figure 4-8 Straight Gouging Techniques



Side Gouge



Weaving Gouge

Figure 4-9 Side Gouging Techniques

Piercing

1. Start by holding the torch so that the nozzle is approximately 1/16 inch away from the workpiece before squeezing the trigger switch. This method maximizes the life of the nozzle. (See Fig. 4-10)

2. Hold the torch at an angle to the workpiece away from yourself, then slowly roll it to a vertical position. (This is particularly important when cutting thicker material.) Make sure that the torch is pointed away from you and the people around you to avoid any danger from sparks and hot metal.

3. Start the cut at an angle rather than in an upright position. This permits the hot metal to escape to one side rather than splashing back against the nozzle, protecting the operator from the sparks and extending the torch nozzle life.

4. When the pierce is complete, proceed with the cut.

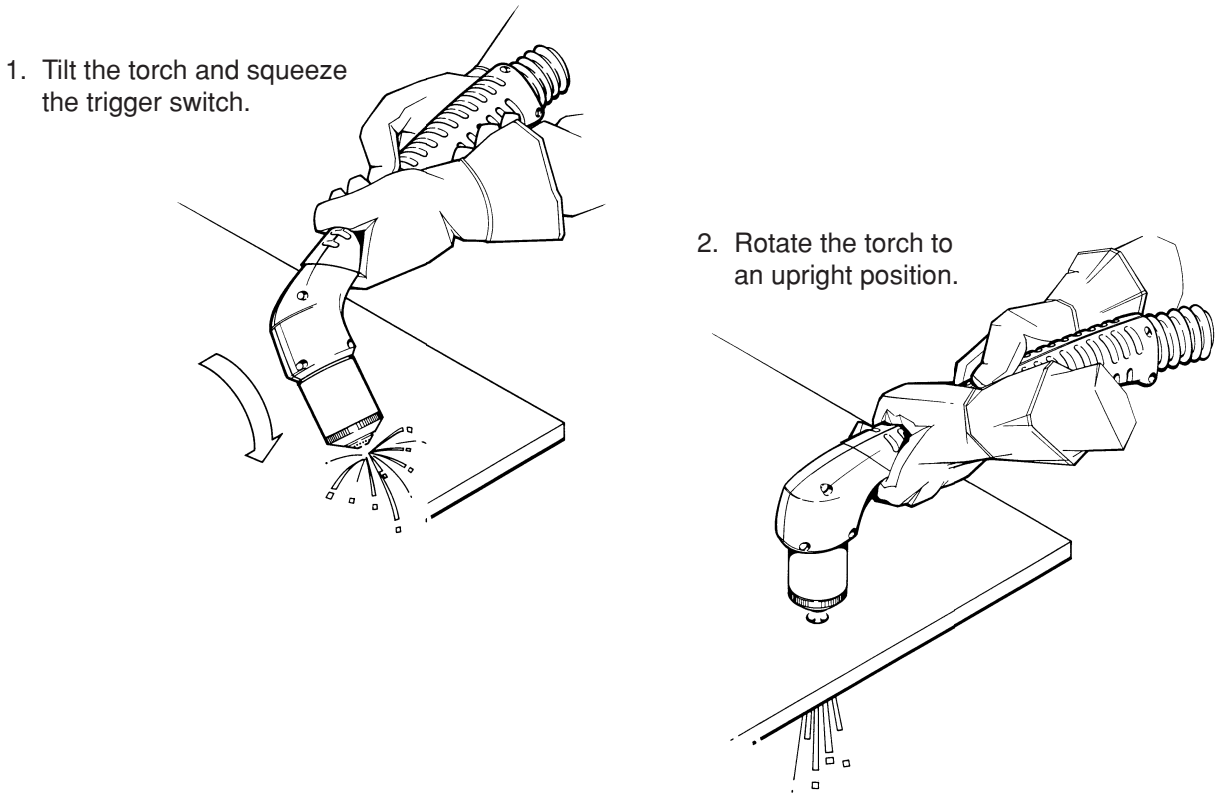


Figure 4-10 Piercing

Common Cutting Faults

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

Duty Cycle

The duty cycle is reduced if:

- The input line voltage is less than nominal, due to a long power cord, poor utility supply, etc.
- You are cutting material greater than one-inch thick.
- The work clamp is not making a good electrical contact to the workpiece due to paint, rust, etc.
- Arc voltage is greater than 150 volts (at 200 amps).

Claims and Technical Questions

Claims for defective merchandise – All units shipped from Hypertherm undergo rigorous quality control testing. However, if your unit does not function correctly:

1. Read the *Troubleshooting* section of this manual. You may find the problem is quite easy to fix, such as a loose connection.

2. If you are unable to solve the problem, call your distributor. He will be able to help you, or refer you to an authorized Hypertherm repair facility.

3. If you need additional assistance, call our Customer Service or Field Service group at 1-800-643-9878.

Cut Charts

The following cut charts provide the necessary information for the operator to successfully cut or gouge with the MAX200 system.

If using leads greater than 50 feet, increase the Plasma Gas Pressure TEST setting 5 psi for every 50 feet of extra torch lead length.

For example, if you are cutting mild steel at 200 amps with air/air, the Cut Chart TEST pressure reads 44-48 psi (see pg. 4-19). If you have 100 ft leads, increase this TEST pressure to 49-53 psi.

The index on the following page provides the operator with a quick reference to the cut charts and consumables used for all cutting and gouging applications with the PAC200T (90°) cutting torch and PAC200E (65°) gouging torch.

CUT CHART AND CONSUMABLE PARTS INDEX

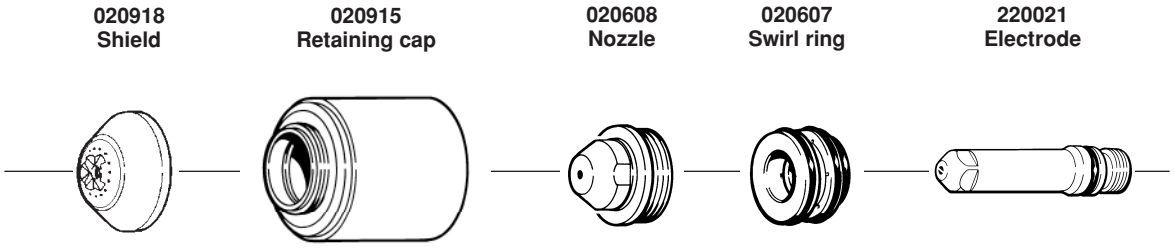
	Metal	Amps	Plasma Gas/ Shield Gas	Shield	Retaining Cap	Nozzle	Swirl Ring	Electrode	Page
CUTTING	Mild Steel	200	Air / Air	020918	020915	020608	020607	220021	4-19
		100	Air / Air	020919	020915	020611	020607	120547	4-20
		40	Air / Air	020917	020915	020689	020613	220021	4-21
		200	O_2 / Air	020918	020915	020605	020604	220021	4-22
		100	O_2 / Air	020919	020915	020616	020617	120547	4-23
		200	N_2 / CO_2	020918	020915	020608	020607	020415	4-24
	Stainless Steel	200	Air / Air	020918	020915	020608	020607	220021	4-25
		100	Air / Air	020919	020915	020611	020607	120547	4-26
		40	Air / Air	020917	020915	020689	020613	220021	4-27
		200	N_2 / Air	020918	020915	020608	020607	020415	4-28
		200	N_2 / CO_2	020918	020915	020608	020607	020415	4-29
		200	H35 / N_2	020920	020915	020608	020607	020415	4-30
		100	H35 / N_2	020919	020915	020611	020607	020415	4-31
	Aluminum	200	Air / Air	020918	020915	020608	020607	220021	4-32
		100	Air / Air	020919	020915	020611	020607	120547	4-33
		40	Air / Air	020917	020915	020689	020613	220021	4-34
		200	N_2 / Air	020918	020915	020608	020607	020415	4-35
		200	N_2 / CO_2	020918	020915	020608	020607	020415	4-36
		200	H35 / N_2	020918	020915	020608	020607	020415	4-37
		100	H35 / N_2	020919	020915	020611	020607	020415	4-38
GOUGING	Mild Steel	200	Air / Air	020891	020882	020615	020607	220021	4-39
		200	H35/Air	020891	020882	020934	020607	020933	4-40
	Stainless Steel	200	H35 / N_2	020891	020882	020934	020607	020933	4-41
	Aluminum	200	H35 / N_2	020891	020882	020934	020607	020933	4-42

PAC200T/PAC200E Hand Torch

Mild Steel

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding can occur.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/4	6	**Air**	**44-48* / 58-62**	**Air**	**70**	1/8	3	**200**	130	135	3400	0.5	**90**	**90**
.315	8		(66 SCFH)		(280 SCFH)	1/8	3		135	115	2900	0.5		
3/8	10					1/8	3		135	100	2540	1.0		
1/2	13					1/8	3		140	80	2030	2.0		
5/8	15					.157	4		145	60	1520	2.0		
3/4	20					3/16	5		150	45	1140	2.5		
7/8	22					1/4	6		155	30	760	2.5		
1	25					1/4	6		160	25	635	2.5		
1-1/4	32					1/4	6		165	15	380			
1-1/2	38					1/4	6		170	10	250			
1-3/4	44					5/16	8		180	7	180			
2	50					5/16	8		185	5	130			

Piercing above 1 inch (25 mm) not recommended.

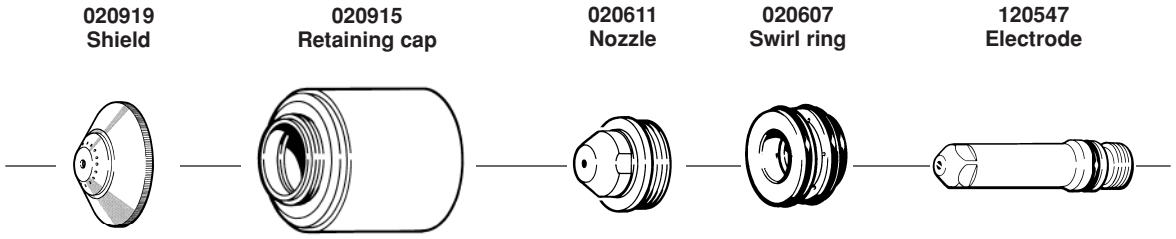
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Mild Steel

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross level and is very economical. Some surface nitriding can occur. While this process may be used on thicker materials, optimal recommended range is to 3/8 inch (10 mm).



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
.075	2	**Air**	**22-26*** / **48-52**	**Air**	**60**	5/64	2	**80**	120		6050		**90**	**90**
1/8	3		**22-26*** / **54-58**		**60**	5/64	2	**100**	130	120	3050	0.5		
3/16	5		(37 SCFH)		(270 SCFH)	1/8	3		130	100	2540	0.5		
1/4	6					1/8	3		135	80	2030	0.5		
3/8	10					1/8	3		140	50	1270	1.0		
1/2	12					1/8	3		140	35	890	1.5		
5/8	15					.157	4		145	25	635	2.0		
3/4	20					3/16	5		150	20	510			

Piercing above 5/8 inch (15 mm) not recommended.

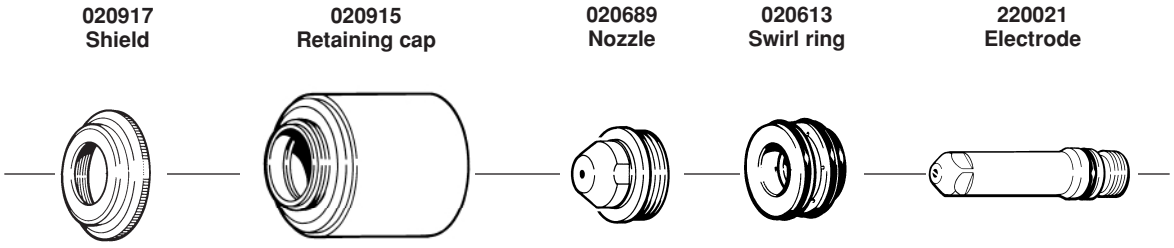
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Mild Steel

40 amps • Air Plasma / Air Shield

This gas combination gives good cut speeds, low dross levels and is very economical. Some surface nitriding can occur.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
.0156	(28 GA.)	**Air**	**16-20* / 56-60**	**Air**	**60**	1/16	1.5	**40**	110	340	8650		**90**	**90**
.0188	(26 GA.)		(25 SCFH)		(275 SCFH)	1/16	1.5		100	320	8150			
.025	(24 GA.)					1/16	1.5		105	285	7250			
.035	1					1/16	1.5		110	235	5950			
.050	(18 GA.)					1/16	1.5		110	195	4950			
1/16	1.5					1/16	1.5		115	170	4300	.50		
.075	2					1/16	1.5		115	145	3700	.50		
1/8	3					1/16	1.5		115	100	2550	1.00		
.158	4					5/64	2		125	70	1750			
.197	5					5/64	2		130	45	1150			
1/4	6					5/64	2		135	30	750			
3/8	10					5/64	2		140	12	300			

Piercing above 1/8 inch (3 mm) not recommended.

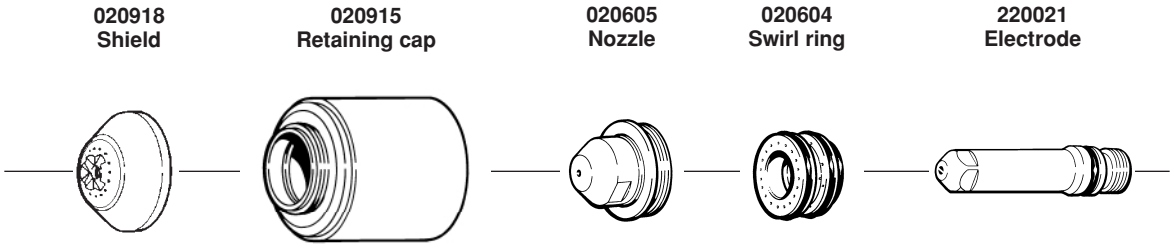
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Mild Steel

200 amps • O_2 Plasma / Air Shield

This gas combination gives superior cut speed, minimum dross, minimum amount of surface nitriding and excellent weldability.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/4	6	**O_2**	**48-52*** / **64-68**	**Air**	**70**	1/8	3	**200**	120	160	4060	0.5	**120**	**90**
.315	8		(72 SCFH)		(280 SCFH)	1/8	3		125	120	3000	0.5		
3/8	10					1/8	3		125	100	2540	1.0		
1/2	12					1/8	3		125	80	2030	2.0		
5/8	15					.158	4		130	70	1780	2.0		
3/4	20					3/16	5		135	55	1400	2.5		
7/8	22					1/4	6		135	45	1140	2.5		
1	25					1/4	6		140	35	890	2.5		
1-1/4	32					1/4	6		150	22	560			
1-1/2	38					1/4	6		155	15	380			
1-3/4	44					5/16	8		165	10	250			
2	50					5/16	8		170	7	180			

Piercing above 1 inch (25 mm) not recommended.

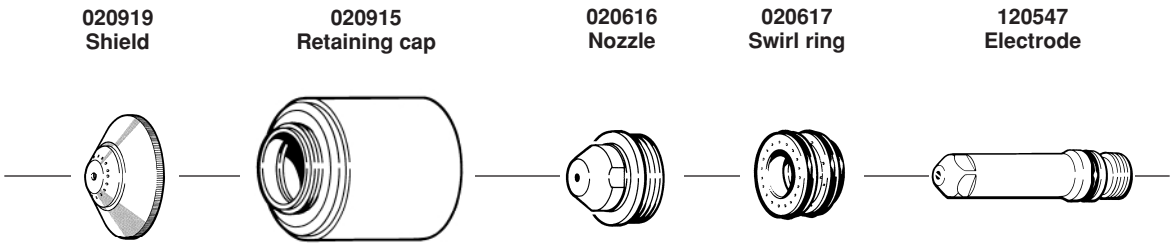
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Mild Steel

100 amps • O_2 Plasma / Air Shield

This gas combination gives good cut speed, low dross level and is very economical. Some surface nitriding can occur. While this process may be used on thicker materials, optimal recommended range is to 3/8 inch (10 mm).



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/8	3	**O_2**	**20-24* / 60-64**	**Air**	**60**	5/64	2	**100**	110	210	5330		**120**	**90**
3/16	5		(40 SCFH)		(270 SCFH)	1/8	3		115	130	3300			
1/4	6					1/8	3		115	100	2540	0.5		
3/8	10					1/8	3		120	75	1900	0.5		
1/2	12					1/8	3		120	62	1575			
5/8	15					.158	4		130	45	1150			
3/4	20					3/16	5		135	30	760			

Piercing above 3/8 inch (10 mm) not recommended.

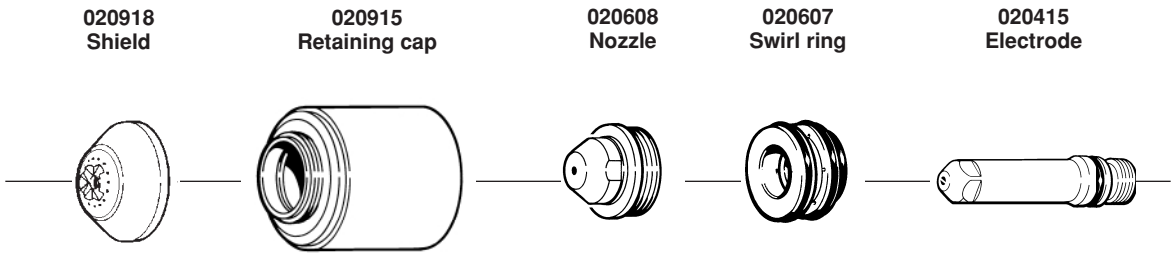
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Mild Steel

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when cut edge quality and surface nitriding are less important. Electrode life is extended when this combination is used.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**N_2**	**36-40 */ 52-56**	**CO_2**	**70**	1/8	3	**200**	120	130	3300	0.5	**120**	**90**
1/4	6		(60 SCFH)		(220 SCFH)	1/8	3		125	110	2800	1.0		
3/8	10					1/8	3		130	85	2160	1.5		
1/2	12					1/8	3		130	55	1400	2.0		
5/8	15					.157	4		135	45	1140	2.0		
3/4	20					3/16	5		145	25	635	2.5		
7/8	22					1/4	6		150	20	510	3.0		
1	25					1/4	6		160	15	380	3.0		
1-1/4	32					1/4	6		165	10	250			
1-1/2	44					1/4	6		175	5	130			

Piercing above 1 inch (25 mm) not recommended.

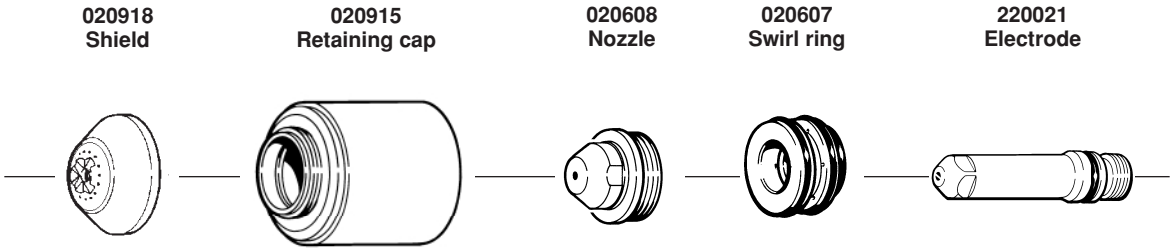
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**Air**	**44-48* / 58-62**	**Air**	**70**	1/8	3	**200**	125	220	5600		**90**	**90**
1/4	6		(66 SCFH)		(280 SCFH)	1/8	3		130	195	5000	0.5		
3/8	10					1/8	3		130	145	3700	1.0		
1/2	12					1/8	3		135	105	2700	2.0		
5/8	15					.157	4		140	75	1900	2.0		
3/4	20					3/16	5		140	55	1400	2.5		
7/8	22					1/4	6		145	40	1000	3.0		
1	25					1/4	6		150	30	760			
1-1/4	32					1/4	6		160	15	380			
1-1/2	38					1/4	6		170	10	250			

Piercing above 7/8 inch (22 mm) not recommended.

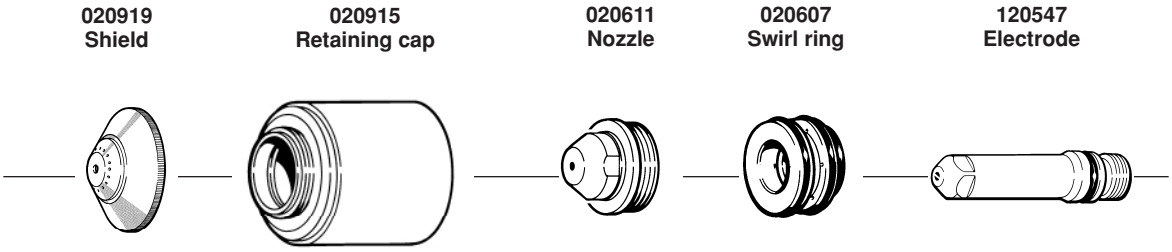
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/8	3	**Air**	**22-26* / 54-58**	**Air**	**60**	5/64	2	**100**	125	140	3560		**90**	**90**
3/16	5		(37 SCFH)		(270 SCFH)	1/8	3		130	110	2800	0.5		
1/4	6					1/8	3		130	80	2030	0.5		
3/8	10					1/8	3		135	55	1400	0.5		
1/2	12					1/8	3		140	35	890			
5/8	15					.157	4		145	25	635			
3/4	20					3/16	5		150	20	510			

Piercing above 3/8 inch (10 mm) not recommended.

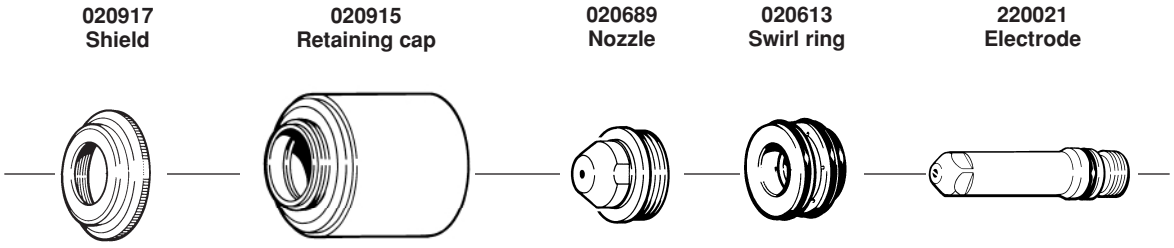
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

40 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
.0156	(28 GA.)	**Air**	**16-20* / 56-60**	**Air**	**60**	5/64	2	**40**	110	280	7100		**90**	**90**
.0188	(26 GA.)		(25 SCFH)		(275 SCFH)	5/64	2		110	240	6100			
.025	(24 GA.)					5/64	2		115	220	5550			
1/32						5/64	2		115	200	5050	0.5		
.050	(18 GA.)					5/64	2		120	145	3700	0.5		
1/16	1.5					5/64	2		120	120	3050	1.0		
1/8	3					5/64	2		125	75	1900	1.5		
1/4	6					1/8	3		135	30	750			
3/8	10					1/8	3		140	12	300			

Piercing above 1/8 inch (3 mm) not recommended.

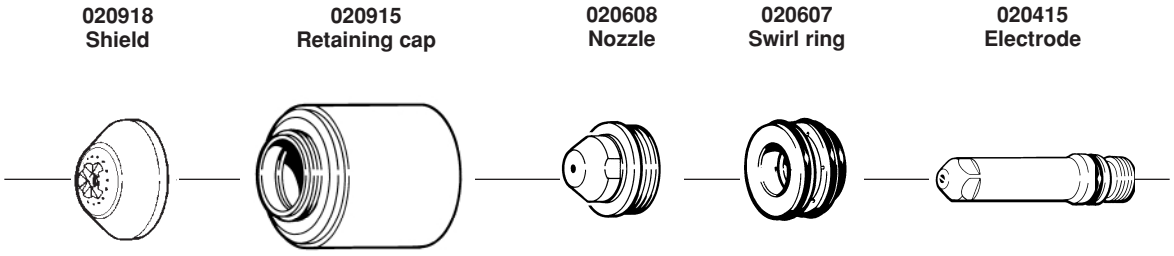
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

200 amps • N_2 Plasma / Air Shield

This gas combination is used when cut edge quality, surface nitriding and surface oxidation of alloying elements are less important. Electrode life is extended when this combination is used.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**N_2**	**34-38* / 50-54**	**Air**	**70**	1/8	3	**200**	125	135	3430		**120**	**90**
1/4	6		(60 SCFH)		(280 SCFH)	1/8	3		130	120	3050	0.5		
3/8	10					1/8	3		130	100	2540	1.0		
1/2	12					1/8	3		135	75	1900	2.0		
5/8	15					.157	4		140	60	1520	2.0		
3/4	20					3/16	5		140	45	1140	2.5		
7/8	22					1/4	6		145	35	890	2.5		
1	25					1/4	6		150	20	510			
1-1/4	32					1/4	6		160	15	380			
1-1/2	38					1/4	6		160	10	250			

Piercing above 7/8 inch (22 mm) not recommended.

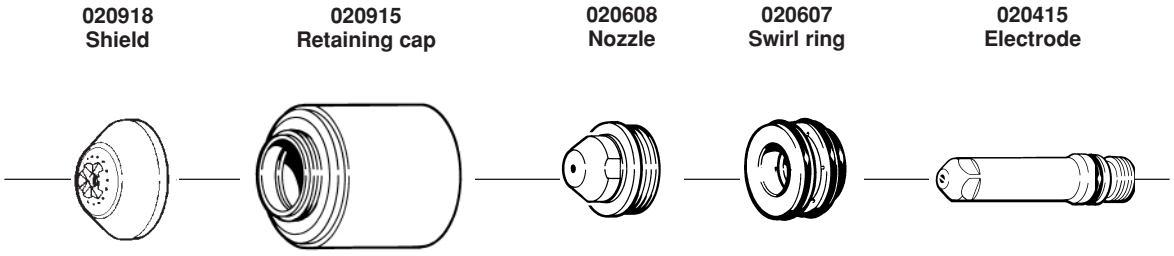
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when surface nitriding and surface oxidation of alloying elements is less important. Electrode life is extended when using this gas combination.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**N_2**	**36-40* / 52-56**	**CO_2**	**70**	1/8	3	**200**	125	190	4800	0.5	**120**	**90**
1/4	6		(60 SCFH)		(220 SCFH)	1/8	3		130	170	4300	1.0		
3/8	10					1/8	3		130	125	3200	1.5		
1/2	12					1/8	3		135	95	2400	2.0		
5/8	15					.157	4		140	70	1800	2.0		
3/4	20					3/16	5		140	50	1250	2.5		
7/8	22					1/4	6		145	40	1000	3.0		
1	25					1/4	6		150	30	760			
1-1/4	32					1/4	6		160	15	380			
1-1/2	38					1/4	6		170	10	250			

Piercing above 7/8 inch (22 mm) not recommended.

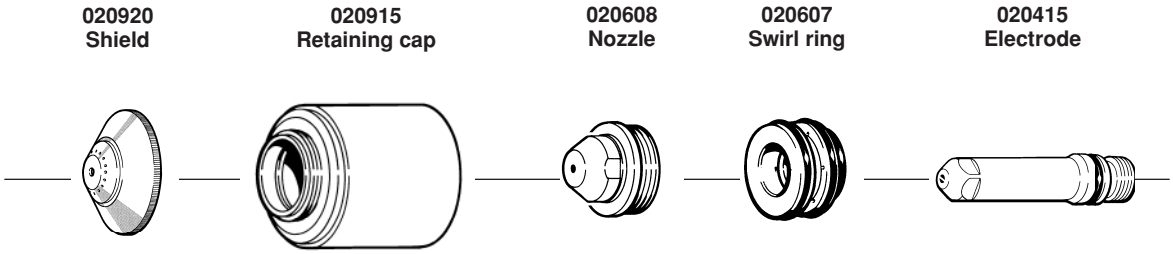
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

200 amps • H35 Plasma / N_2 Shield

This gas combination (Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas) gives maximum thickness cutting capability, minimum dross levels, minimum amount of surface contamination, excellent weldability and excellent cut quality. Electrode life is extended when this combination is used.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/4	6	**H35**	**36-40* / 62-66**	**N_2**	**70**	3/16	5	**200**	135	62	1600	1.0	**120**	**90**
3/8	10		(70 SCFH)		(290 SCFH)	3/16	5		140	52	1300	1.0		
1/2	12					3/16	5		140	42	1100	2.0		
5/8	15					1/4	6		145	37	940	2.0		
3/4	20					1/4	6		150	32	810	2.5		
7/8	22					5/16	8		155	27	690	2.5		
1	25					5/16	8		155	22	560			
1-1/4	32					5/16	8		165	16	400			
1-1/2	38					5/16	8		170	11	280			
1-3/4	44					5/16	8		180	8	200			
2	50					5/16	8		185	6	150			

Piercing above 7/8 inch (22 mm) not recommended.

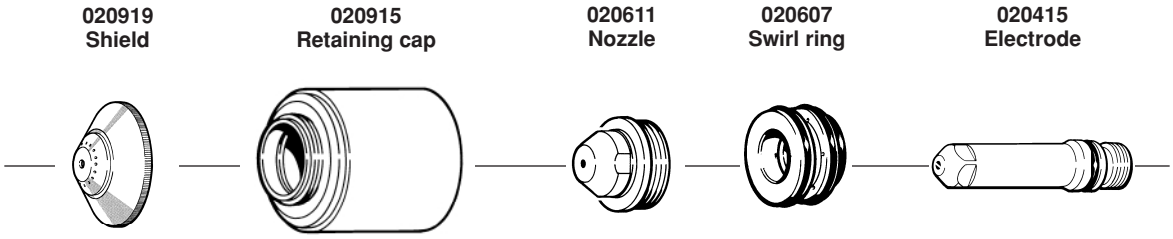
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Stainless Steel

100 amps • H35 Plasma / N_2 Shield

This gas combination gives good cut speed, low dross levels and is very economical. Some surface nitriding and surface oxidation of alloying elements can occur.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/8	3	**H35**	**32-36*/ 56-60**	**N_2**	**60**	5/64	2	**100**	130	50	1260		**120**	**90**
3/16	5	(20 SCFH)		(270 SCFH)		1/8	3		135	40	1060	0.5		
1/4	6					1/8	3		140	35	890	0.5		
3/8	10					1/8	3		140	30	750	0.5		
1/2	13					1/8	3		145	25	630			

Piercing above 3/8 inch (10 mm) not recommended.

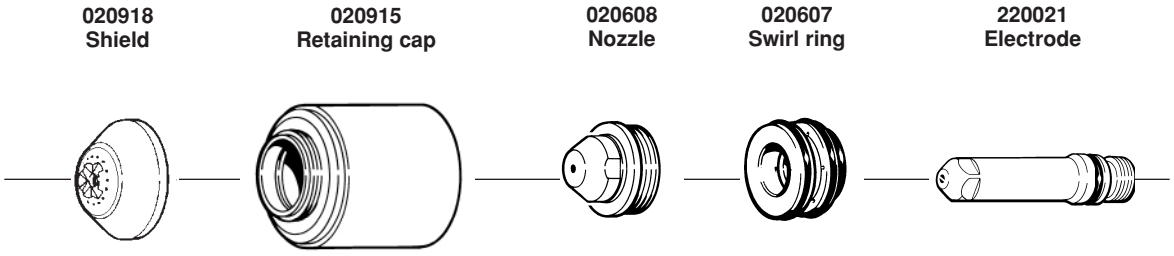
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

200 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**Air**	**44-48*** / **58-62**	**Air**	**70**	1/8	3	**200**	130	220	5600	0.5	**90**	**90**
1/4	6		(66 SCFH)		(280 SCFH)	1/8	3		140	190	4800	1.0		
3/8	10					1/8	3		140	145	3700	2.0		
1/2	12					1/8	3		145	110	2800	2.5		
5/8	15					.157	4		150	85	2200	2.5		
3/4	20					3/16	5		155	65	1650	2.5		
7/8	22					1/4	6		160	50	1300	2.5		
1	25					1/4	6		165	35	900			
1-1/4	32					1/4	6		170	20	500			
1-1/2	38					1/4	6		175	12	300			

Piercing above 7/8 inch (22 mm) not recommended.

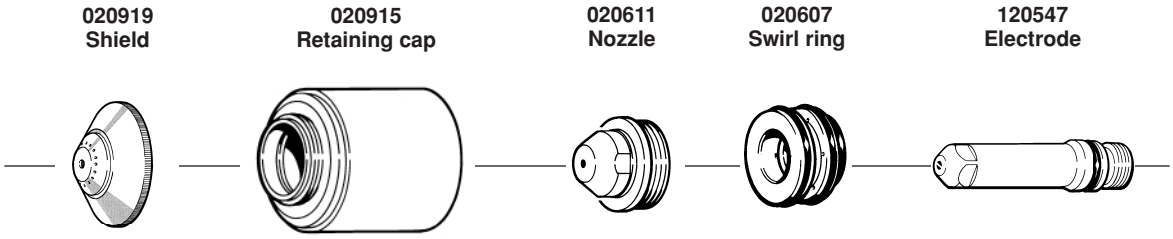
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

100 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/8	3	**Air**	**22-26*** / **54-58**	**Air**	**60**	5/64	2	**100**	135	110	2800		**90**	**90**
3/16	5		(37 SCFH)		(270 SCFH)	1/8	3		140	90	2290	0.5		
1/4	6					1/8	3		145	70	1780	0.5		
3/8	10					1/8	3		145	50	1270	0.5		
1/2	12					1/8	3		150	40	1010			
5/8	15					.157	4		155	30	760			
3/4	20					3/16	5		160	25	635			

Piercing above 3/8 inch (10 mm) not recommended.

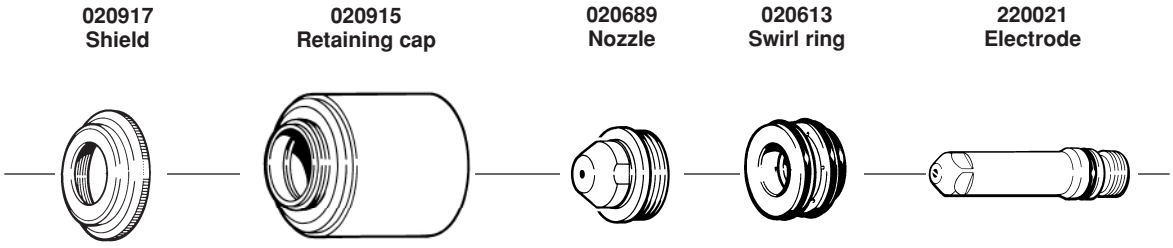
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

40 amps • Air Plasma / Air Shield

This gas combination gives good cut speed, low dross levels and is very economical.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/32		**Air**	**16-20* / 56-60**	**Air**	**60**	5/64	2	**40**	100	240	6100	.50	**90**	**90**
1/16	1.5		(25 SCFH)		(275 SCFH)	5/64	2		110	170	4300	.75		
3/32	2.5					5/64	2		120	140	3550	1.00		
1/8	3					5/64	2		130	100	2550	1.00		
1/4	6					1/8	3		140	35	900			
3/8	10					1/8	3		150	15	350			

Piercing above 1/8 inch (3 mm) not recommended.

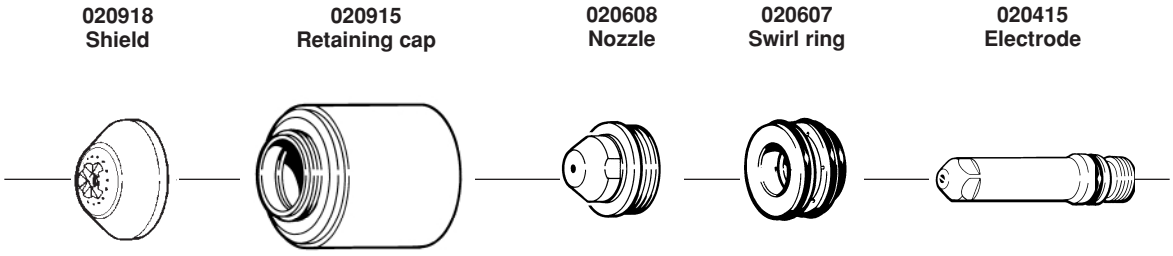
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

200 amps • N_2 Plasma / Air Shield

This gas combination is used when cut edge quality is less important. Electrode life is extended when this combination is used.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**N_2**	**34-38*** / **54-54**	**Air**	**70**	1/8	3	**200**	130	180	4570	0.5	**120**	**90**
1/4	6		(60 SCFH)		(280 SCFH)	1/8	3		135	160	4060	1.0		
3/8	10					1/8	3		135	120	3050	1.5		
1/2	12					1/8	3		140	80	2030	2.0		
5/8	15					.157	4		140	70	1780	2.0		
3/4	20					3/16	5		150	50	1270	2.5		
7/8	22					1/4	6		160	35	890	2.5		
1	25					1/4	6		165	25	635			
1-1/4	32					1/4	6		175	20	510			
1-1/2	38					1/4	6		185	10	250			

Piercing above 7/8 inch (22 mm) not recommended.

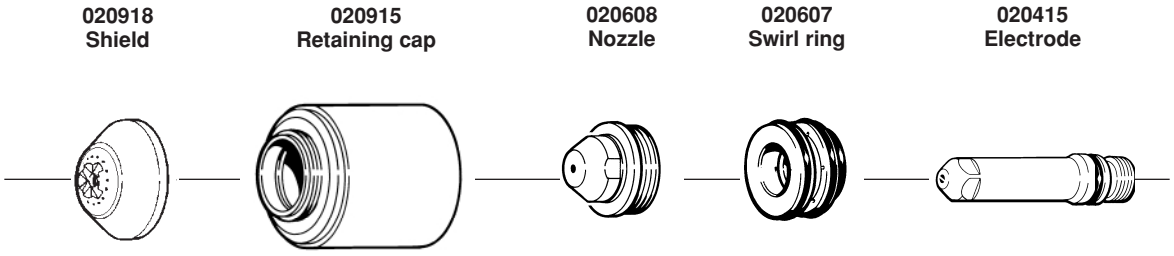
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

200 amps • N_2 Plasma / CO_2 Shield

This gas combination is used when cut edge quality is less important. lectrode life is extended when this combination is used.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**N_2**	**36-40* / 52-56**	**CO_2**	**70**	1/8	3	**200**	130	185	4700	0.5	**120**	**90**
1/4	6		(60 SCFH)		(220 SCFH)	1/8	3		135	160	4050	1.0		
3/8	10					1/8	3		135	120	3050	2.0		
1/2	12					1/8	3		140	95	2400	2.5		
5/8	15					.157	4		140	70	1800	2.5		
3/4	20					3/16	5		150	55	1400	3.0		
7/8	22					1/4	6		160	42	1050	3.0		
1	25					1/4	6		165	33	840			
1-1/4	32					1/4	6		175	20	510			
1-1/2	38					5/16	8		185	11	280			

Piercing above 7/8 inch (22 mm) not recommended.

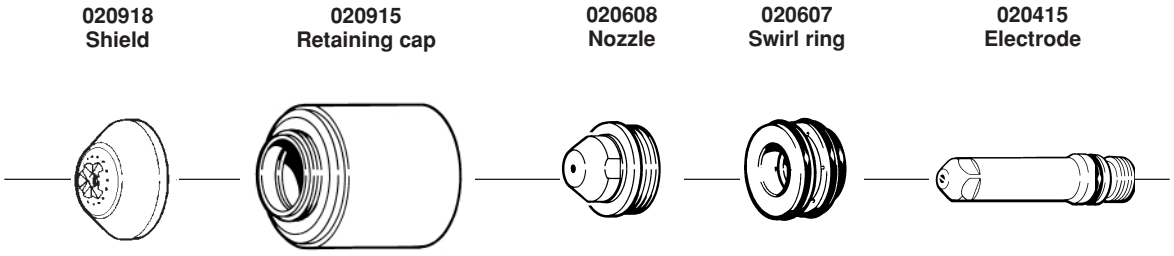
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

200 amps • H35 Plasma / N_2 Shield

This gas combination (Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas) gives maximum thickness cutting capability, excellent cut quality and excellent weldability. Electrode life is extended when this combination is used.



Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
3/16	5	**H35**	**36-40* / 62-66**	**N_2**	**70**	3/16	5	**200**	130	170	4300	0.5	**120**	**90**
1/4	6		(70 SCFH)		(290 SCFH)	3/16	5		130	155	4000	1.0		
3/8	10					1/4	6		135	120	3000	2.0		
1/2	12					1/4	6		140	100	2550	2.0		
5/8	15					1/4	6		145	80	2000	2.5		
3/4	20					5/16	8		150	60	1500	2.5		
7/8	22					5/16	8		155	50	1250	2.5		
1	25					5/16	8		155	40	1000			
1-1/4	32					5/16	8		165	26	660			
1-1/2	38					5/16	8		170	18	460			
1-3/4	44					5/16	8		180	12	300			
2	50					5/16	8		185	7	180			

Piercing above 7/8 inch (22 mm) not recommended.

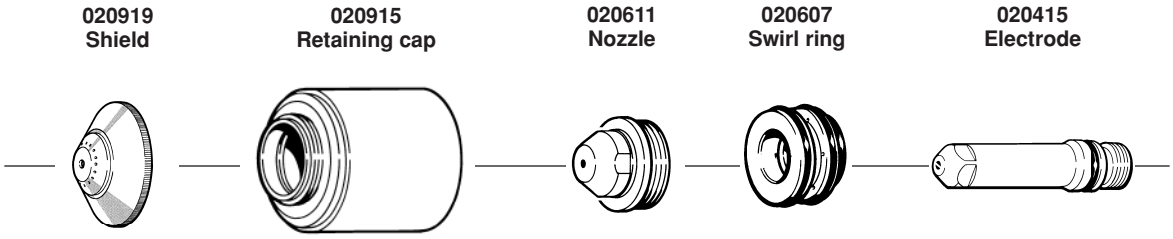
* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200T/PAC200E Hand Torch

Aluminum

100 amps • H35 Plasma / N_2 Shield

This gas combination gives good cut speed, low dross levels and is very economical.



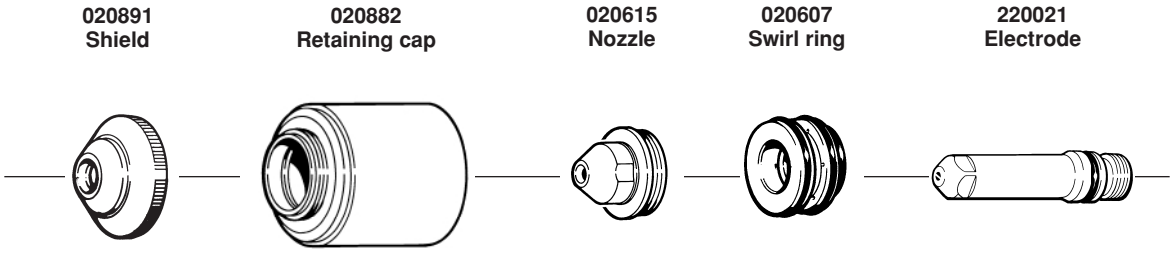
Material Thickness		Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Torch-to-work Distance		Arc Current Setting	Arc Voltage Setting	Travel Speed		Approx. Motion Delay Time	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
(Inches)	(mm)		(psi)		(psi)	(Inches)	(mm)	(amps)	(volts)	(ipm)	(mm/min)	(sec)	(psi)	(psi)
1/8	3	**H35**	**32-36*** / **56-60** (20 SCFH)	**N_2** (270 SCFH)	**60**	5/64	2	**100**	135	95	2440		**120**	**90**
3/16	5					1/8	3		140	85	2200	0.5		
1/4	6					1/8	3		145	80	1980	0.5		
3/8	10					1/8	3		145	60	1530	0.5		
1/2	12					1/8	3		150	50	1280			

Piercing above 1/2 inch (12 mm) not recommended.

* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200E Hand Torch

Mild Steel – Gouging
200 amps • Air Plasma / Air Shield



Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Arc Current Setting	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
	(psi)		(psi)	(amps)	(psi)	(psi)
Air	**49-51* / 50-52**	**Air**	**50**	**200**	**90**	**90**

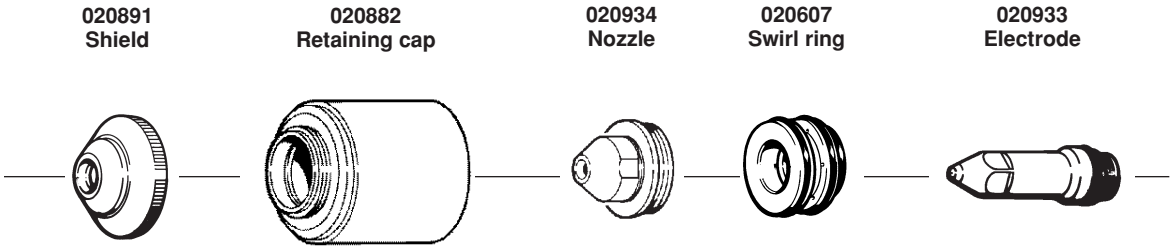
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200E Hand Torch

Mild Steel – Gouging
200 amps • H35 Plasma / Air Shield

Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas.



Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Arc Current Setting	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
	(psi)		(psi)	(amps)	(psi)	(psi)
H35	**60* / 62**	**Air**	**60**	**200**	**120**	**120**

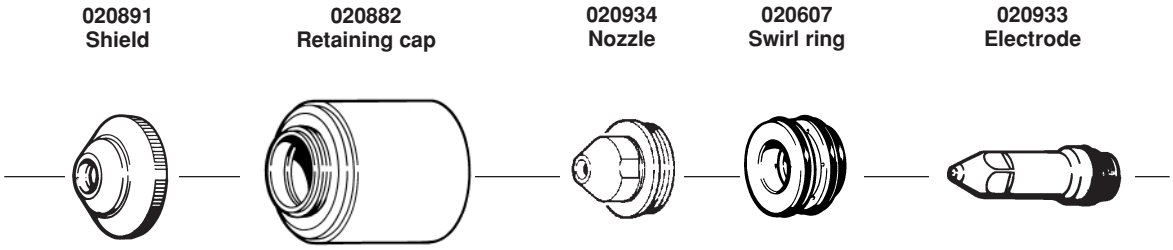
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200E Hand Torch

Stainless Steel – Gouging
200 amps • H35 Plasma / N_2 Shield

Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas.



Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Arc Current Setting	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
	(psi)		(psi)	(amps)	(psi)	(psi)
H35	**49-51* / 50-52**	**N_2**	**50**	**200**	**120**	**120**

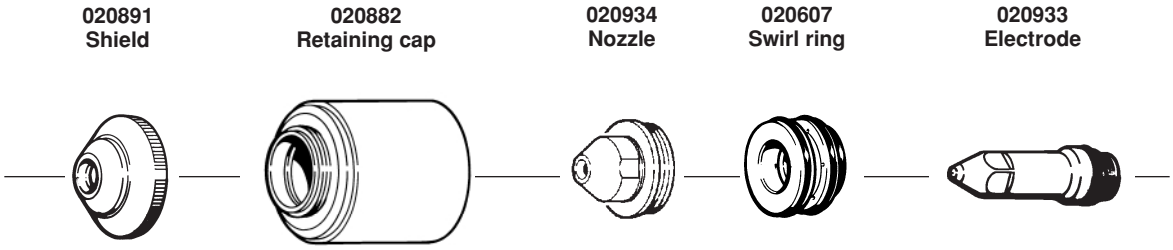
1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

PAC200E Hand Torch

Aluminum – Gouging
200 amps • H35 Plasma / N_2 Shield

Hypertherm recommends a mixture of 35% hydrogen and 65% argon for the plasma gas.



Plasma Gas Type	Plasma Gas Pressure TEST/RUN	Shield Gas Type	Shield Gas Pressure	Arc Current Setting	Plasma Gas Inlet Pressure	Shield Gas Inlet Pressure
	(psi)		(psi)	(amps)	(psi)	(psi)
H35	**49-51* / 50-52**	**N_2**	**50**	**200**	**120**	**120**

1 inch = 25.4 mm; 1 scfh = 28.316 liter/hour; 1 psi = .0689 bar = 6.895 KPa

* If leads are greater than 50 feet, increase TEST pressure 5 psi for every extra 50 feet of torch lead length.

Hypertherm

Section 5

MAINTENANCE

In this section:

WARNING

SHOCK HAZARD: The large electrolytic capacitor(s) (blue-cased cylinder(s)) store large amounts of energy in the form of electric voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals, on the chopper, and the diode heatsinks. Never discharge the capacitor(s) with a screwdriver or other implement…explosion, property damage and/or personal injury will result. Wait at least five minutes after turning the power supply off before touching the chopper or the capacitor(s).

Routine Maintenance

The MAX200 system is designed to require very little regular maintenance under normal use. Refer to MAX200 Service Manual, IM-162 (#801620) for torch, torch leads, torch coolant and power supply routine maintenance checks to keep your system in top running condition.

Troubleshooting

Becoming familiar with the contents of this manual will aid in safely troubleshooting the MAX200 power supply and torch should the need arise. The following procedures will show the user how to locate the most common problems. Refer to the electrical schematic for additional information. Also, **Section 6**, *Parts List* will help you locate the components when using these troubleshooting procedures. For more in-depth troubleshooting information, see IM162 (#801620) MAX200 Service manual.

If you need additional assistance, call our Technical Service Group at 1-800-643-9878.

Problem: **The green POWER ON pushbutton switch PB1 is pressed, but the fans are not operating and the green POWER ON indicator does not illuminate.**

Cause: Main power is not available to the power supply.
Solution: Turn on power at the main power panel or at the line disconnect switch box.

Cause: The fuse(s) inside the line disconnect switch box are blown.
Solution: Verify the fuse(s) are sized correctly. Replace the fuse(s).

Cause: Fuse F1 or F2 is blown.
Solution: Verify the fuse(s) are sized correctly. Replace the fuse(s).

Cause: Control transformer T1 is defective.
Solution: Replace transformer T1.

Cause: The green POWER ON pushbutton switch PB1, the red POWER OFF pushbutton switch PB2, or the associated switch wiring is not making good contact or is defective.
Solution: Replace the defective switch or correct or replace the switch wiring as required.

Problem: **The green POWER ON pushbutton switch PB1 is pressed, the fans are operating, but the green POWER ON indicator does not illuminate.**

Cause: Pushbutton switch PB1 was not held down long enough.
Solution: Press and hold PB1 for a minimum of five seconds.

Cause: One or more of the green STATUS interlock LED(s) does not light indicating a fault condition(s).
Solution: Refer to Section 4, *Operation*, *Front Panel Controls* for interlock indicator descriptions and *Status Indicators Before Startup*.

Cause: Fuse F1 on the power distribution board PCB6 is blown.
Solution: Replace fuse F1.

Cause: Relay CR1 on the power distribution board PCB6 is defective.
Solution: Replace relay CR1.

Problem: The green POWER ON pushbutton switch PB1 is pressed, the green POWER ON indicator illuminates, but the fans are not operating.

Cause: Fuse F2 on the power distribution board PCB6 is blown.
Solution: Replace fuse F2.

Cause: Relay CR2 on the power distribution board is defective.
Solution: Replace relay CR2.

Problem: The fans are operating, the green POWER ON indicator is illuminated, and the torch switch is pressed, but the DC ON indicator does not illuminate.

Cause: The torch switch or the switch connections are defective.
Solution: Check the torch switch connections on TB2 for loose or broken wiring.
Replace the torch start switch.

Cause: The contactor CON1 is defective.
Solution: Replace contactor CON1

Cause: The control board PCB7 is defective.
Solution: Replace control board PCB7.

Problem: The green POWER ON indicator is illuminated, the torch switch is pressed and DC ON indicator illuminates, but there is no high frequency and no pilot arc.

Cause: There is no spark between the spark gap electrodes.
Solution: Clean (with emery cloth), align, and/or regap (.020" per gap) the electrodes if necessary. Ensure the electrode surfaces between the gaps are flat. If they are rounded, replace and regap. The two outside electrode assemblies are #004061; the inside electrode assembly is #004089.

Solution: Inspect the high voltage transformer T5 for leaking oil or overheating. If either of these conditions exist, replace T5.

Solution: Inspect the electrical connections at connectors PL26/REC26 (T5), TB3-60 and 61, and pins 3 and 4 at connectors PL6/REC2 (PCB7). Repair or replace any defective connectors or wires.

Solution: Disconnect the PL26/REC26 connectors and connect an external 120 VAC power source to REC26 connector pins. If a spark is observed across the spark gaps, replace control board PCB7. If a spark is not observed across the gaps, remove capacitors C7 and C8. If a faint spark is now observed across the gaps, replace T5 and reconnect the capacitors. If a spark is not observed, replace C7 and C8.
(Always replace the capacitors in pairs).

Problem: **The green POWER ON indicator is illtuminated, the torch switch is pressed and the DC ON indicator illuminates, and there is high frequency, but there is no pilot arc.**

Cause: There is no high frequency at the torch.
Solution: Check for a shorted torch, a damaged pilot arc lead, or loose lead connections. Replace the torch or pilot arc lead or tighten the lead connections.

Cause: The pilot arc relay CR1 is defective.
Solution: Replace relay CR1.

Cause: Control board PCB7 is defective.
Solution: Replace board PCB7.

Problem: **The unit shuts itself off after it is turned on.**

Cause: The system has overheated
Solution: Wait for the unit to cool down.

Cause: There is insufficient air or gas pressure.
Solution: Check the gauge on the back panel. Increase the air or gas pressure to the unit.

Cause: Auxiliary switches on the safety contactor are loose.
Solution: Tighten the switches.

Problem: **The unit is not cutting well.**

Cause: The work clamp is not connected or it is broken.
Solution: Connect or repair the work clamp.

Cause: The torch is cracked.
Solution: Replace the torch.

Cause: The pilot arc relay CR1 is defective. Check for contacts that are welded shut
Solution: Replace relay CR1.

Removal and Replacement of Torch

WARNING

Press the OFF (O) pushbutton switch on the power supply and place the wall mounted disconnect box switch to OFF before working on the torch or torch leads!

Removal

1. Remove the six (6) **Screws** securing the two **Handle** halves and separate.
2. Remove the torch **Switch** and **Safety Trigger** from the handle. Take care not to lose the **Trigger Spring**.
3. On the two largest leads, use a 3/8" open-end wrench to hold the torch body fittings and a 1/2" open-end wrench to turn the torch lead fittings.

   On the two next smaller leads, use a 5/16" open-end wrench to hold the torch body fittings and a 7/16" open-end wrench to turn the torch lead fittings.
   Note that the red lead fitting is reverse threaded and must be turned in the opposite direction (clockwise) to loosen.

   On the smallest lead (grey), use a 5/16" wrench to loosen.
4. Remove the **Torch Main Body**.

Replacement

1. Connect the torch leads to the replacement torch main body. Thread the torch main body fittings and the torch lead fittings together clockwise (cw). Use the size wrenches called out in the *Removal* procedure above. Note that the red lead fitting is reverse threaded and must be turned in the opposite direction (ccw).
2. Ensure the **Lead Insulator** is positioned over the shield gas (grey w/ blue band) lead fitting.
3. Insert the torch main body into one of the handle halves and then align the body and handle slots.
4. Insert the torch **Switch, Safety Trigger** and **Trigger Spring** into the handle half that it was removed from.
5. Insert the top rib of the **Boot** into the handle just above the screw holes.
6. Align both halves of the handle, press together, and secure with the six (6) screws.

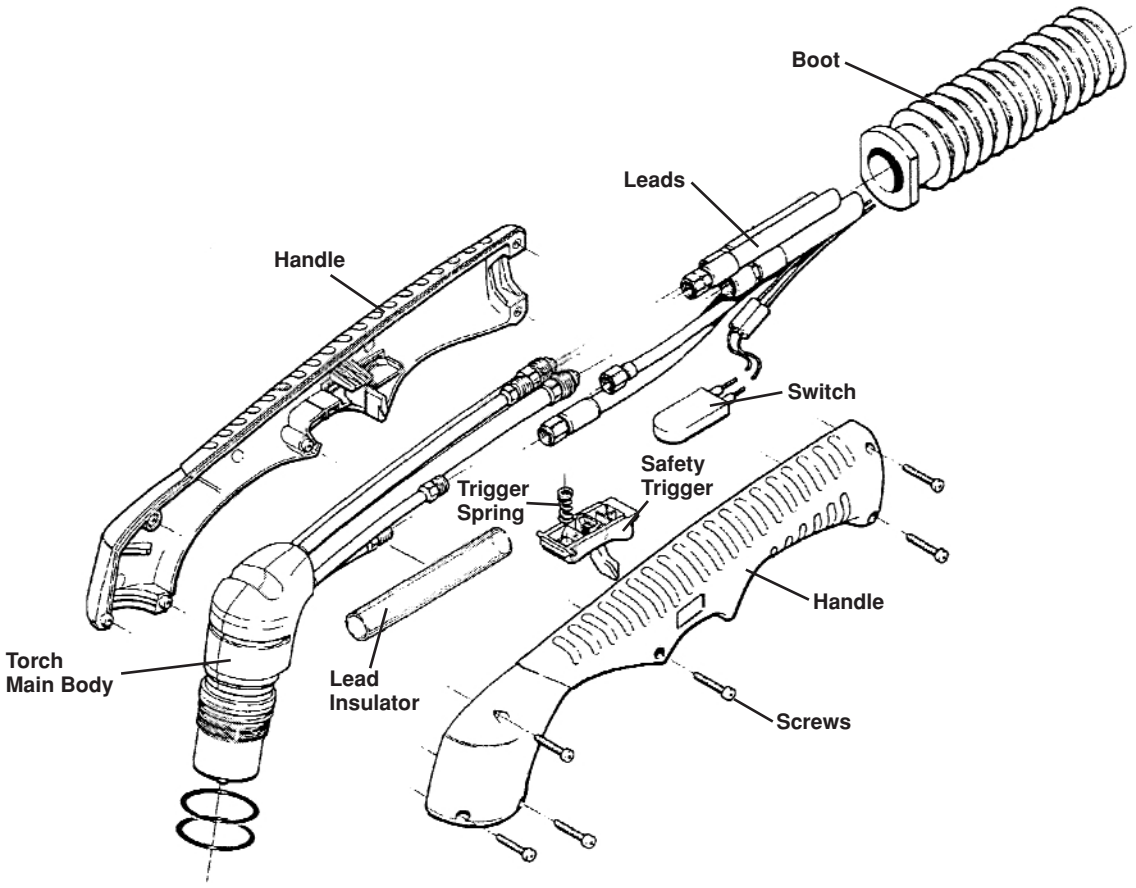


Figure 5-1 PAC200T (90°) Torch Assembly

Removal and Replacement of Torch Lead Assembly

Note: To change length of torch lead assemblies, see *Increase or Decrease Torch Lead Length* on page 5-9.

Perform the following procedure to remove and replace entire lead assemblies.

Removal

1. Disconnect the torch lead assembly from the power supply by reversing the *Connecting the Torch Lead Assembly* procedure on page 3-14.

2. Disconnect the torch from the torch lead assembly as described in the *Removal and Replacement of Torch* procedure on page 5-6.

Replacement

1. Connect the torch lead assembly to the power supply by referring to the *Connecting the Torch Lead Assembly* procedure on page 3-14.

2. Connect the torch lead assembly to the torch by referring to the *Removal and Replacement of Torch* procedure on page 5-6.

Increase or Decrease Torch Lead Length

In order to increase or decrease the torch lead length between 50 and 150 ft at 25-foot increments, look at the torch lead part numbers on pg. 6-25 to determine the leads that you need. The center section leads (029593) and the torch-to-extension-box leads (029866) come with the male adapters (015036, 015049, and 015208) necessary to mate leads to the next section – see Figure 5-3 on pg. 5-11. After ordering the correct leads, follow the general procedures below and refer to Figure 5-2 on pg. 5-10.

Note: If you have the PAC200T/E 25-foot leads (029865) that come with the 25-foot MAX200 system and you want to lengthen the leads, you cannot use these 25-foot leads with any of the extended leads sets. You must use the 029866 25-foot leads. See pg. 6-25.

1. Remove the eight (8) screws from the extension box halves and separate.
2. Slide the three lead insulators away from the pilot/shield lead and the two coolant hose connections.
3. Loosen connections using 1/2" wrenches on the coolant hose fittings, and 7/16" wrenches on all other fittings.
4. Add or remove lead sections as required. Match color-coded leads when connecting. Note that the red plasma gas leads are all left-hand threaded.
5. After making the connections, slide the lead insulators over the connection joints.
6. Using tyraps, secure the two coolant hoses together. Also secure the other leads and torch switch leads together. Do this on both sides of the connections.
7. Position the coolant hoses and other leads into one of the box halves. The two coolant hoses go to the narrow side of the divider. The other leads go to the wider side.
8. Position each boot into the box half, so that the top rib fits over the lip just above the screw holes.
9. Align both halves of the box, press together, and secure with the eight (8) screws.
10. Route the torch leads prior to connecting the torch and power supply.
11. Connect extension leads to power supply. See page 3-14.
12. Connect leads to torch. See page 5-6.

(continued on page 5-11)

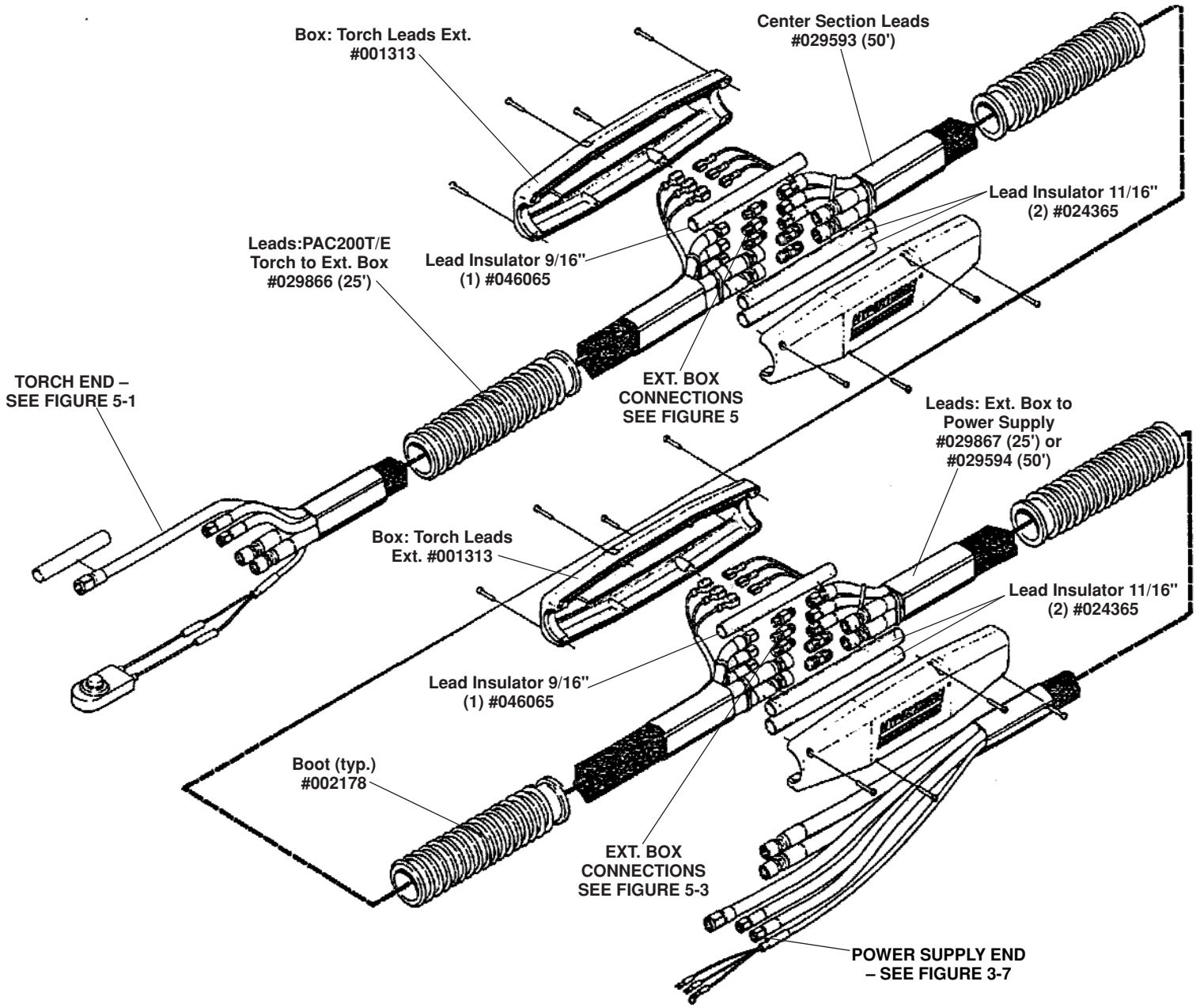


Figure 5-2 Extended Torch Lead Interconnections

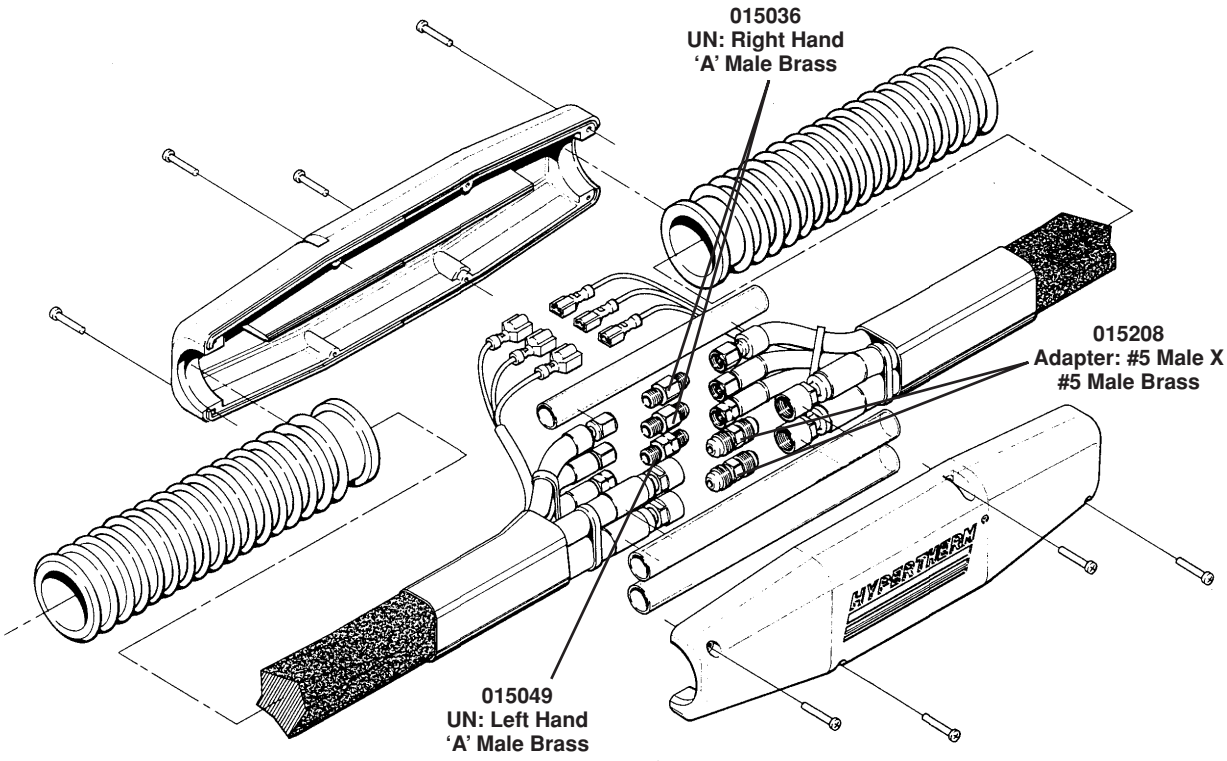


Figure 5-3 Extension Connectors

13. After installing the torch to the torch leads, check the coolant level in the tank prior to startup. More coolant may be required if lead lengths were increased. See page 3-5 to add torch coolant.

14. If you have increased torch lead length from 50 feet or under to 75 feet or over, see *Adjusting Plasma Gas* on page 5-12.

Adjusting Plasma Gas

If you have increased torch lead length from 50 feet or under to 75 feet or over, the plasma gas pressure must be re-adjusted to accommodate the extra torch lead length:

1. At the front panel of the MAX200 power supply while in TEST mode, adjust the PLASMA gas valve control by increasing the TEST pressure approximately **5 psi per 50 ft of lead length (beyond 50 ft)** from what is called out in the Cut Charts. See note on page 4-17.

	WARNING
Use extreme caution when making the following adjustment:	

2. If the plasma gas RUN pressure does not quickly reach the value stated in the Cut Charts **after arc transfer**, you may need to adjust PS4. Remove the right side panel of the power supply. On the floor of the power supply, locate pressure switch PS4 by referring to Figure 5-4 and adjust by turning the PS4 Adjustment screw in a clockwise direction.

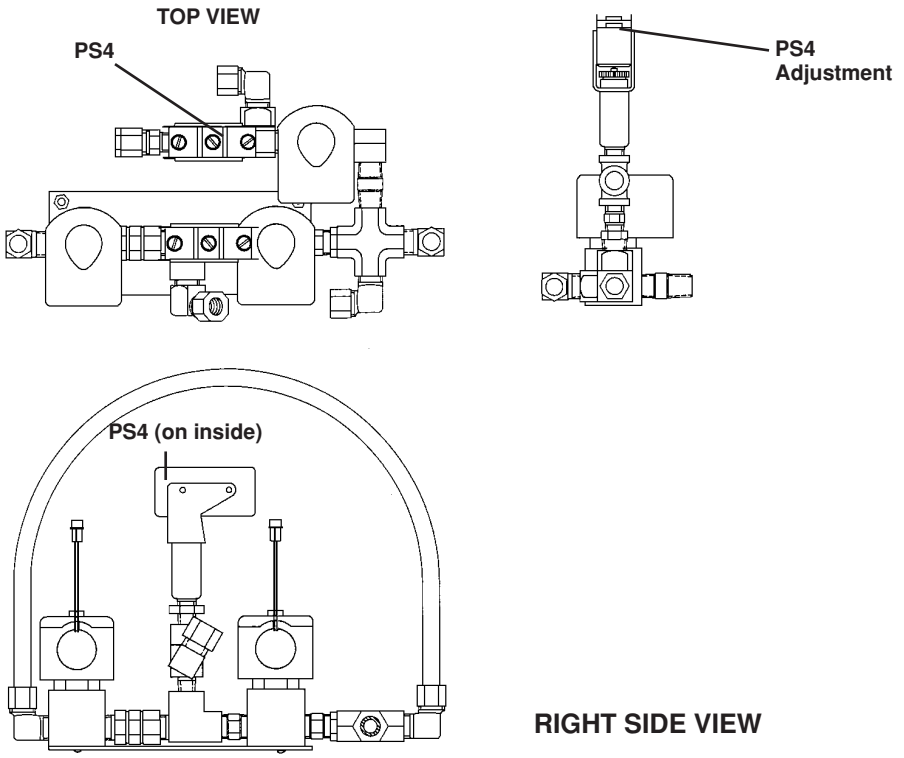


Figure 5-4 Pressure Switch PS4 and Adjustment Location

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Section 6

PARTS LIST

In this section:

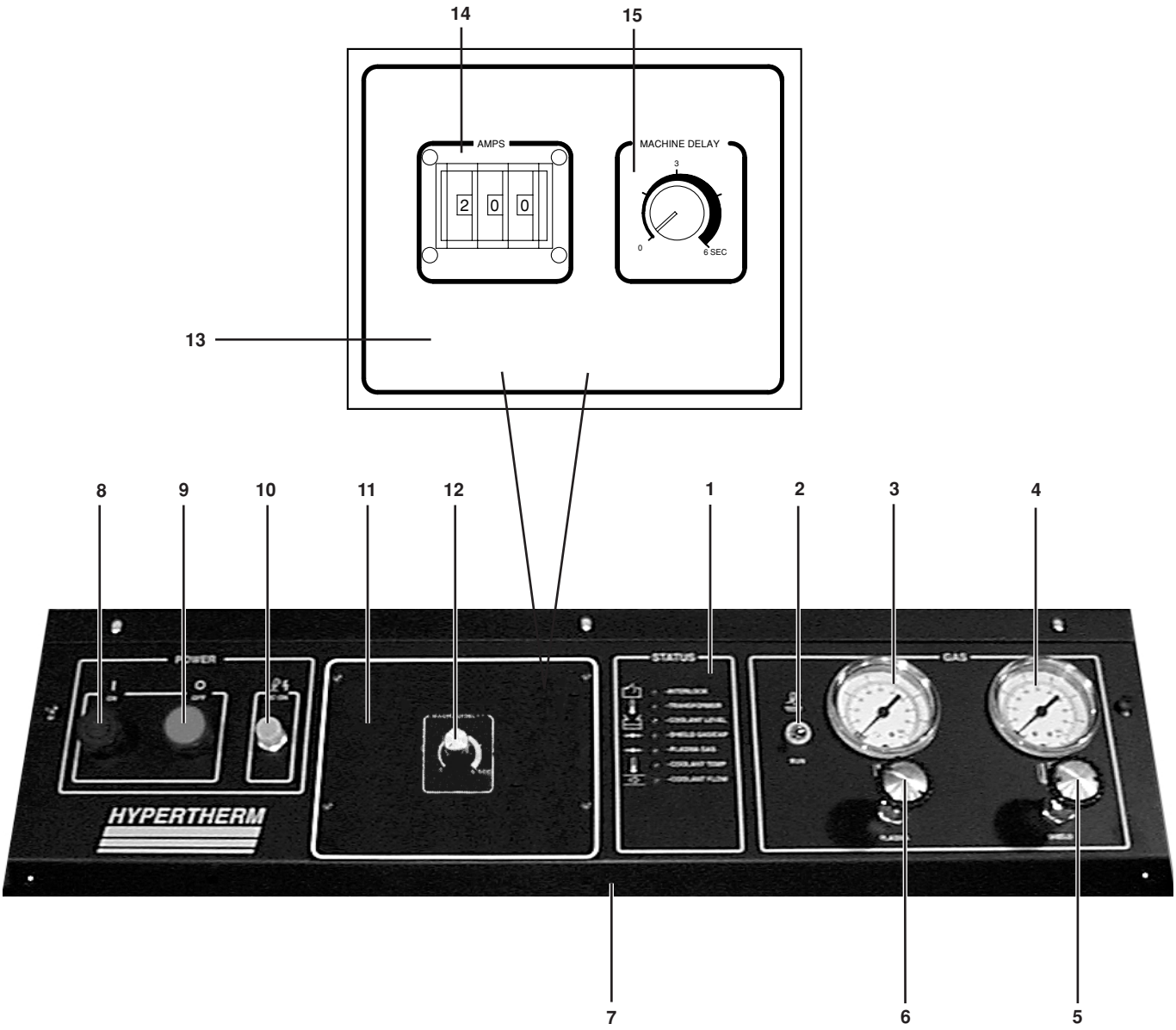


Figure 6-1 Power Supply – Control Panel SA, Front

Item	Part Number	Description	Designator	Qty.
	029319	**Panel, Control SA**		
1	041536	PCB, interlock display SA		1
	009063	Diode, LED, amber	LED 1-7	7
2	005041	Switch, toggle DPDT	S1	1
3	022008	Gauge, pressure 0-100 psi	PG1	1
4	022008	Gauge, pressure 0-100 psi	PG2	1
5	006038	Valve, needle .188 orifice	V6	1
6	006027	Valve, needle .125 orifice	V5	1
7	001222	Panel, control		1
8	005121	Pushbutton, green, illmn.	PB1	1
9	005122	Pushbutton, red, extended	PB2	1
10	005088	Holder, lamp		1
	005168	Bulb, 28VDC		1
	005089	Lens, white for 005088		1
11	-	Not applicable to hand torch system.		
12	-	Not applicable to hand torch system.		
13	029360	Panel, thumbwheel/machine delay SA		1
14	005123	Thumbwheel	S3	1
15	009604	Resistor, variable, 100 K, 1 turn	R9	1

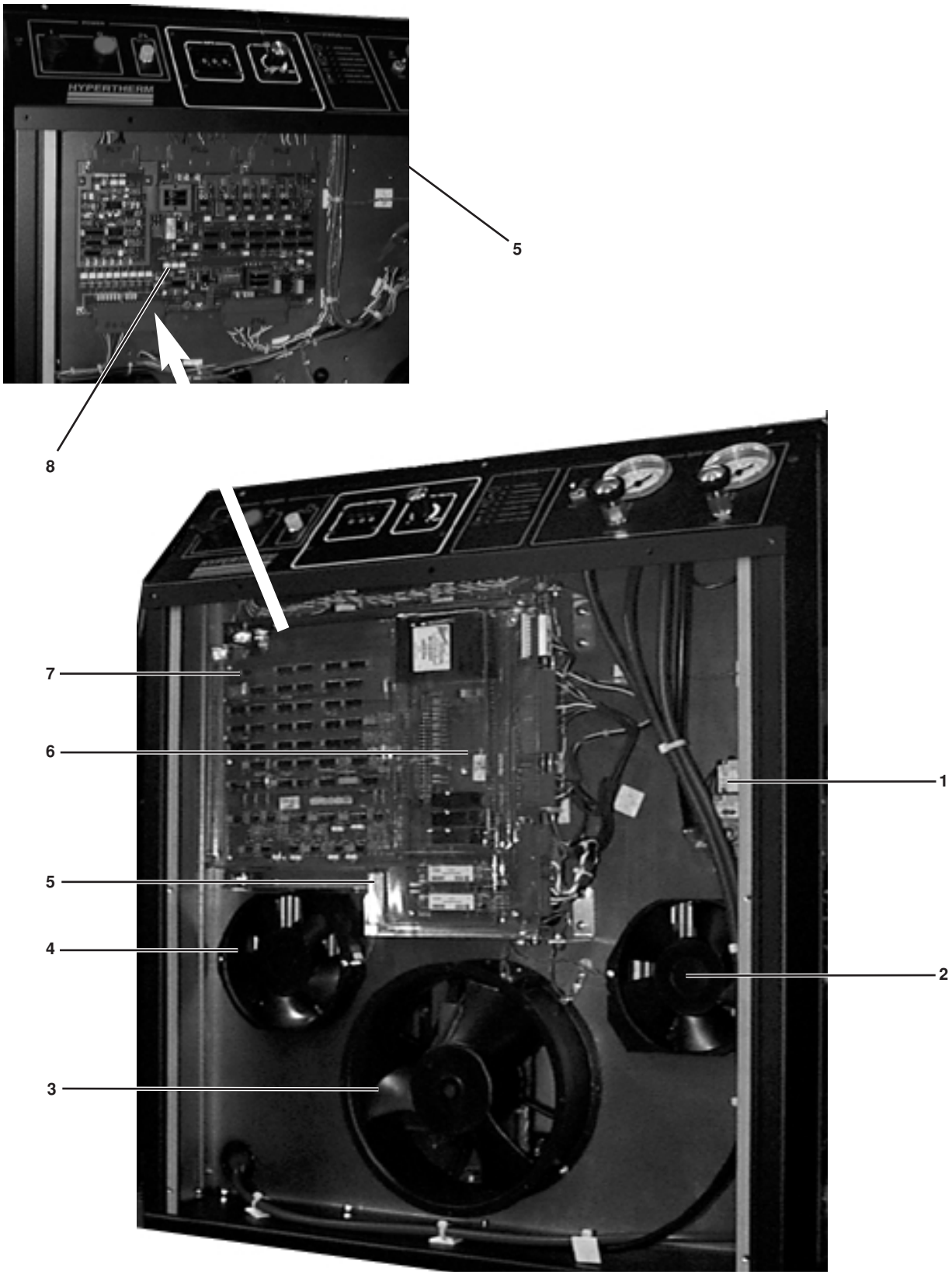


Figure 6-2 Power Supply – Front View

Item	Part Number	Description	Designator	Qty.
	029315	**P/O Shield Gas Supply SA**		
1	006032	Valve, solenoid, shield gas	V2	1
		P/O Power Supply Assy		
2	027080	Fan, 225 CFM, 120 VAC, 50/60 Hz	M2	1
3	027079	Fan, 450-550 CFM, 120 VAC, 50/60 Hz	M4	1
4	027080	Fan, 225 CFM, 120 VAC, 50/60 Hz	M3	1
5	-	Not applicable to hand torch system.		
6	-	Not applicable to hand torch system.		
7	-	Not applicable to hand torch system.		
8	041143	PCB, control	PCB7	1
	001566*	Panel, MAX200 front filter		1
	001567*	Cover, MAX200 front filter panel		1
	27441*	Filter, 24 X 24 X 2 fiberglass air		1

* Items not shown in Figure 6-2. Refer to MAX200 Service Manual IM-162 (801620), Section 3, *Routine Maintenance* to check and replace filter.

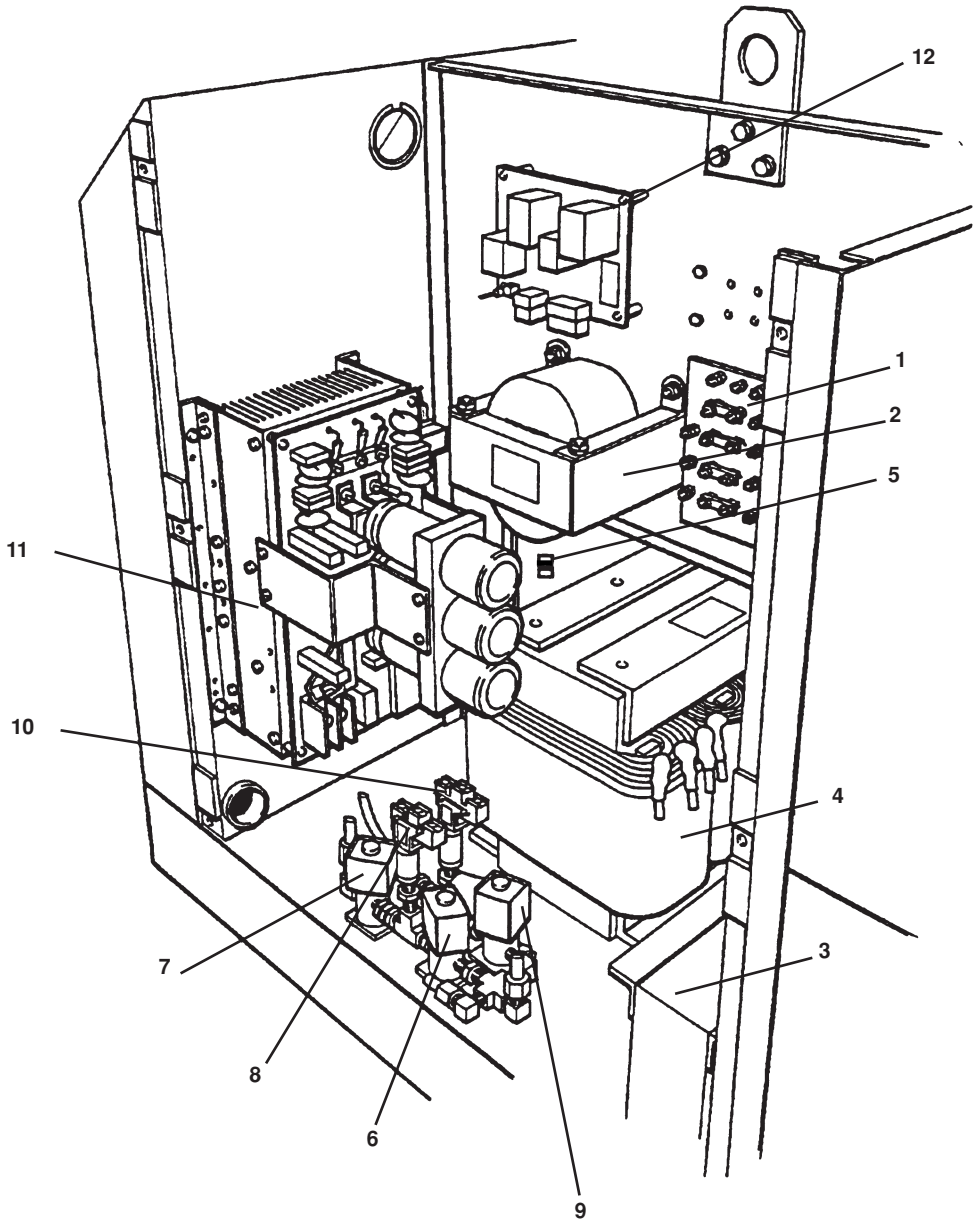


Figure 6-3 Power Supply – Right Side, Front View

Item	Part Number	Description	Designator	Qty.
	*, **	**P/O Power Supply Assy**		
1	029359	Linkboard SA (240/480V models only)	LB1	1
2	014079	Trans, control, 208/240/480V, 1Ø, 60 Hz	T1	1
	014081	Trans, control, 220/380/400/415V, 3Ø, 50 Hz	T1	1
	014083	Trans, control, 600V, 3Ø, 60 Hz	T1	1
	014101	Trans, control, 200V, 3Ø, 60 Hz	T1	1
3	014080	Inductor, 4 mh, 100 Amps, DC	L1	1
4	014078	Trans, 30 kw, 240/480V, 3Ø, 60 Hz	T2	1
	014088	Trans, 30 kw, 220/380/400/415V, 3Ø, 50 Hz	T2	1
	014082	Trans, 30 kw, 600V, 3Ø, 60 Hz	T2	1
	014097	Trans, 30 kw, 208V, 3Ø, 60 Hz	T2	1
	014100	Trans, 30 kw, 200V, 3Ø, 60 Hz	T2	1
◊5	005102	Thermostat, 160°C, 6 Amp	TS1	1
	029314	**P/O Plasma Gas Supply SA**		
6	006014	Valve, solenoid	V3	1
7	006014	Valve, solenoid	V1	1
8	005235	Switch, pressure, 0-90 psi	PS1	1
9	006014	Valve, solenoid	V9	1
10	005239	Switch, pressure, 0-90 psi	PS4	1
11	129118	**Chopper SA, CH130 CE/LVD**	CH1	**1**
	005199	Switch, temperature 82° C	TSW1	1
	*, **	**P/O Power Supply Assy**		
12	041534	PCB, power distribution	PCB6	1
	008322	Fuse, Amp., 250 VAC		1

* Power Supplies with THC – 073020, 073021, 073022, 073023, 073024 and 073213 (CE)

** Power Supplies without THC – 073002, 073003, 073004, 073005, 073026 and 073200 (CE)

◊ Connector to thermostat is shown. Thermostat is in transformer.

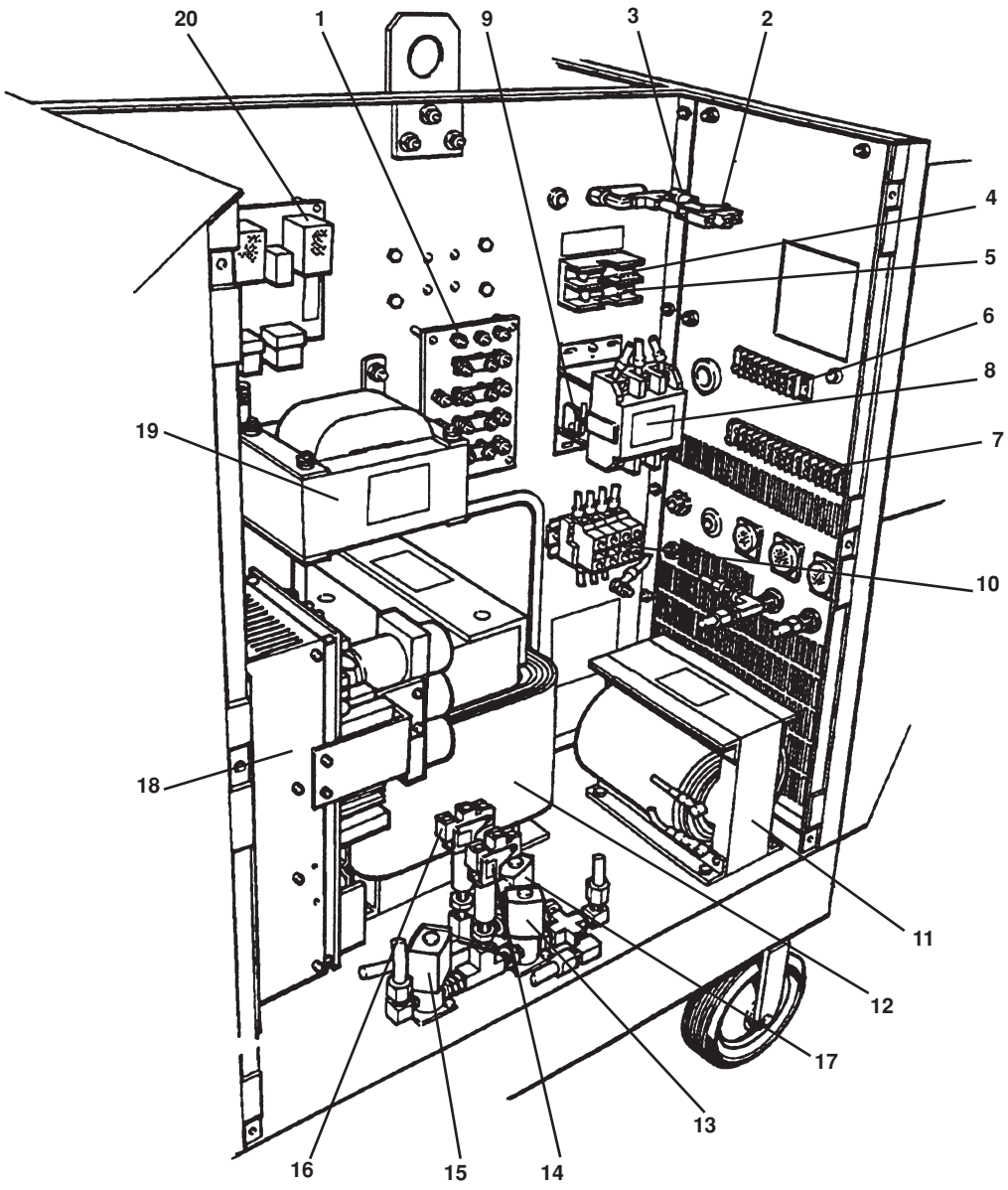


Figure 6-4 Power Supply – Right Side, Rear View

Item	Part Number	Description	Designator	Qty.
		P/O Power Supply Assy		
1	029359	Linkboard SA (240/480V models only)	LB1	1
	029315	**P/O Shield Gas Supply SA**		
2	005233	Switch, pressure, 0-90 psi	PS2	1
3	006037	Valve, solenoid	V4	1
4	008551	Fuse, 7.5 Amp, 600V	F1	1
5	008551	Fuse, 7.5 Amp, 600V	F2	1
6	008073	Terminal strip (8)	TB4	1
7	008134	Terminal strip (16)	TB3	1
8	003092	Contactor, 90 Amp, 3-pole, 24 VAC	CON1	1
9	003093	Switch, aux contactor	SW2	1
10	029316	Terminal block, power SA	TB1	1
11	014080	Inductor, 4 mh, 100 Amps, DC	L1	1
12	014078	Trans, 30 kw, 240/480V, 3Ø, 60 Hz	T2	1
	014088	Trans, 30 kw, 220/380/400/415V, 3Ø, 50 Hz	T2	1
	014082	Trans, 30 kw, 600V, 3Ø, 60 Hz	T2	1
	014097	Trans, 30 kw, 208V, 3Ø, 60 Hz	T2	1
	014100	Trans, 30 kw, 200V, 3Ø, 60 Hz	T2	1
	029314	**P/O Plasma Gas Supply SA**		
13				
14				
15		**See Figure 6-3.**		
16				
17				
18	129118	**Chopper SA, CH130 CE/LVD**	CH1	**1**
	005199	Switch, temperature 82° C	TSW1	1
19	014079	Trans, control, 208/240/480V, 1Ø, 60 Hz	T1	1
	014081	Trans, control, 220/380/400/415V, 3Ø, 50 Hz	T1	1
	014083	Trans, control, 600V, 3Ø, 60 Hz	T1	1
	014101	Trans, control, 200V, 3Ø, 60 Hz	T1	1
20	041534	PCB, power distribution	PCB6	1
	008322	Fuse, Amp., 250 VAC		

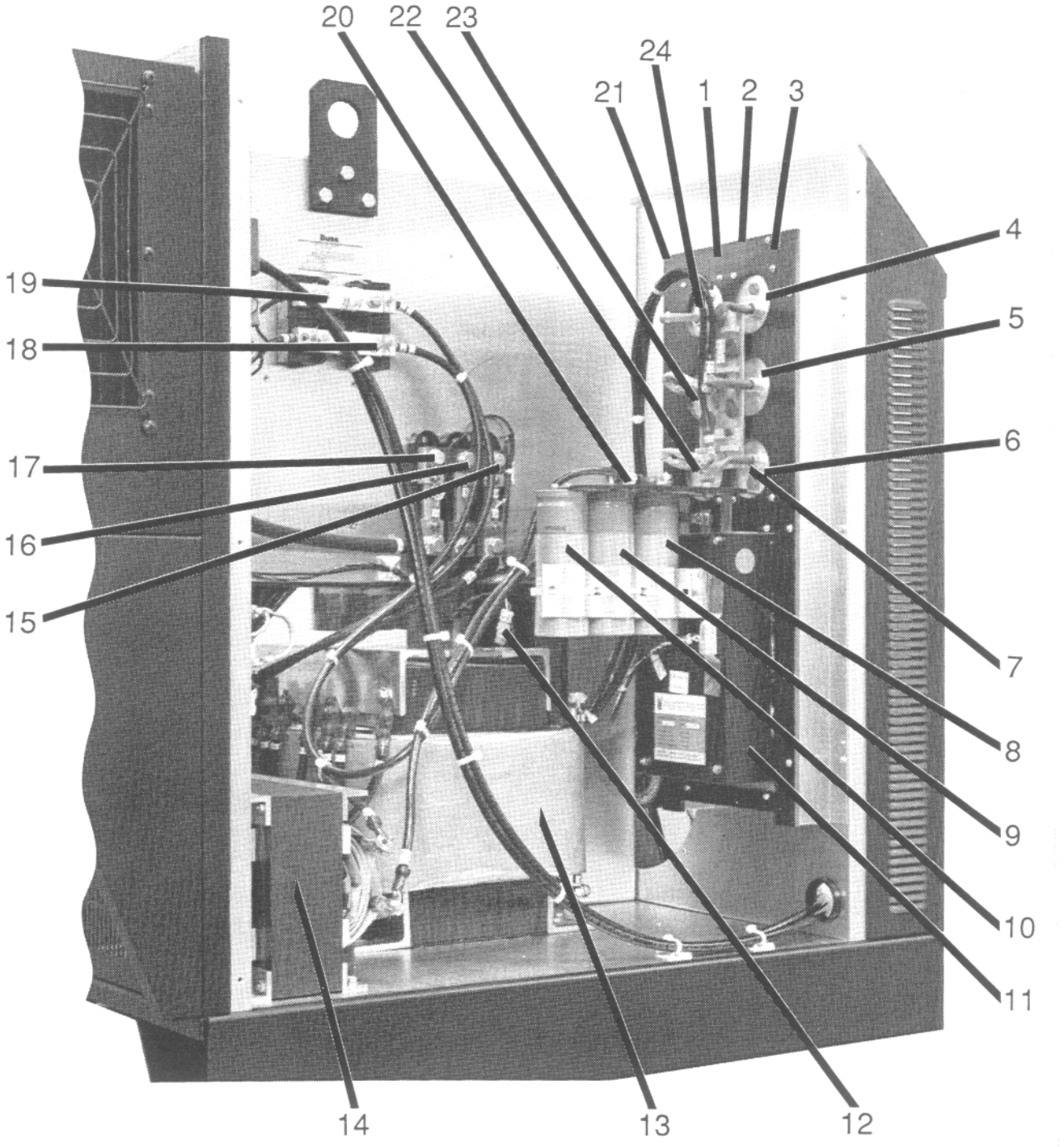
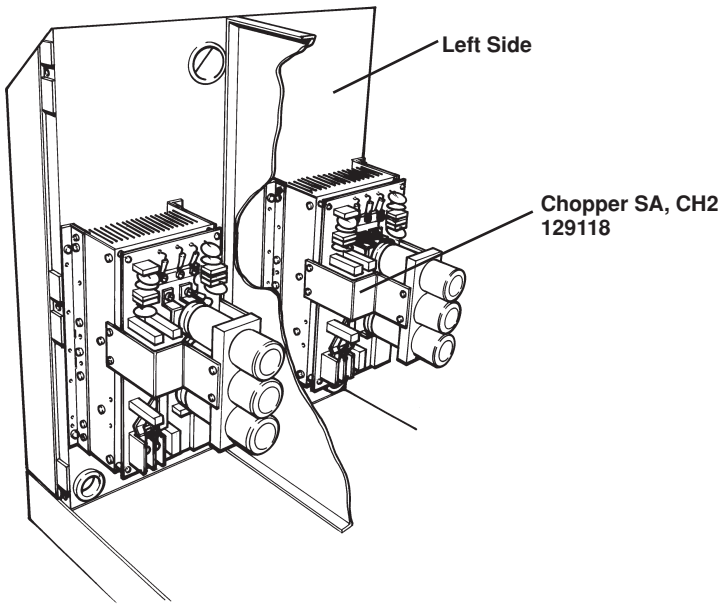


Figure 6-5 Power Supply – Left Side, Front View

Item	Part Number	Description	Designator	Qty.
	129118	**Chopper SA, CH130 CE/LVD** (see Fig. below)	CH2	**1**
	005199	Switch, temperature 82° C	TSW2	1
1, 2 -11		Obsoleted Chopper SA 029320		
		P/O Power Supply Assy		
12	005102	Thermostat, 160°C, 6 Amp	TS1	1
13	014078	Trans, 30 kw, 240/480V, 3Ø, 60 Hz	T2	1
	014088	Trans, 30 kw, 220/380/400/415V, 3Ø, 50 Hz	T2	1
	014082	Trans, 30 kw, 600V, 3Ø, 60 Hz	T2	1
	014097	Trans, 30 kw, 208V, 3Ø, 60 Hz	T2	1
	014100	Trans, 30 kw, 200V, 3Ø, 60 Hz	T2	1
14	014080	Inductor, 4 mh, 100 Amps, DC	L2	1
15	007022	Shunt, 100 Amp, 100 mv	R2	1
16	007022	Shunt, 100 Amp, 100 mv	R1	1
17	007024	Shunt, 200 Amp, 100 mv	R3	1
18	008317	Fuse, semiconductor, 125 Amp, 250 V	F4	1
19	008317	Fuse, semiconductor, 125 Amp, 250 V	F3	1
20 -24		Obsoleted chopper SA 029320		



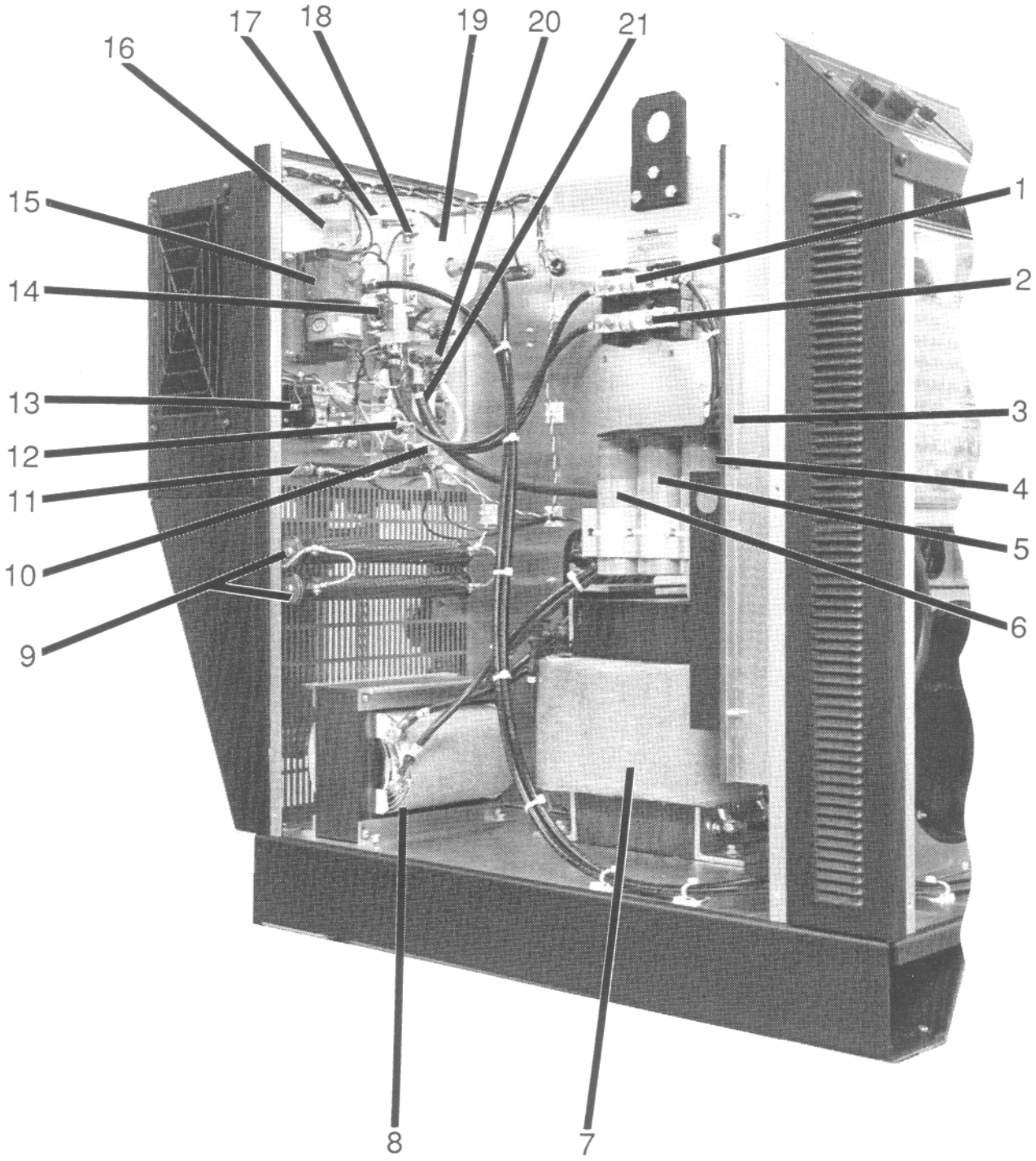
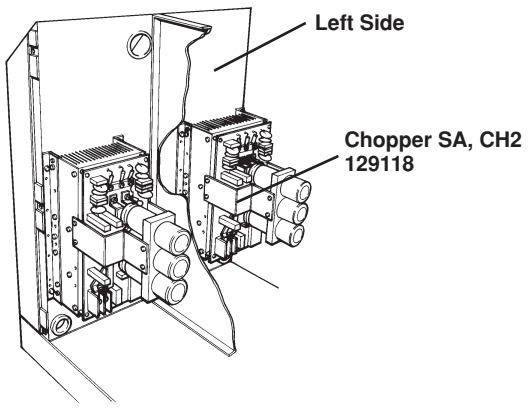


Figure 6-6 Power Supply – Left Side, Rear View

Item	Part Number	Description	Designator	Qty.
		P/O Power Supply Assy		
1	008317	Fuse, semiconductor, 125 Amp, 250 V	F3	1
2	008317	Fuse, semiconductor, 125 Amp, 250 V	F4	1
	129118	**Chopper SA, CH130 CE/LVD** (see Fig. below)	CH2	**1**
	005199	Switch, temperature 82° C	TSW2	1
3 - 6		Obsoleted Chopper SA 029320		
		P/O Power Supply Assy		
7	014078	Trans, 30 kw, 240/480V, 3Ø, 60 Hz	T2	1
	014088	Trans, 30 kw, 220/380/400/415V, 3Ø, 50 Hz	T2	1
	014082	Trans, 30 kw, 600V, 3Ø, 60 Hz	T2	1
	014097	Trans, 30 kw, 208V, 3Ø, 60 Hz	T2	1
	014100	Trans, 30 kw, 200V, 3Ø, 60 Hz	T2	1
8	014080	Inductor, 4 mh, 100 Amps, DC	L2	1
9	009684	Resistor, 4 Ohm, 420 W	R6	2
10	009015	Resistor, 10 K Ohm, 10 W	R5	1
11	009438	Resistor, 5 Ohm, 50 W	R4	1
12	009506	Capacitor, elec, 250 uf, 350 VDC	C9	1
13	003021	Relay, 120 VAC	CR1	1
	029314	**P/O Plasma Gas Supply SA**		
14	005228	Switch, pressure, SPDT, 0-15 psi	PS3	1
		P/O Power Supply Assy		
15	029317	Transformer, High Voltage SA	T5	1
16	008479	Terminal strip, quick connect	TB2	1
17	029312	**High Freq Input/Output Panel SA**		1
18	009350	Assembly, spark gap	SG1	1
19	009349	Assembly, coil, high frequency	T6	1
20	041145	PCB, input/output	PCB5	1
21	029202	Sensor, current	CS1	1



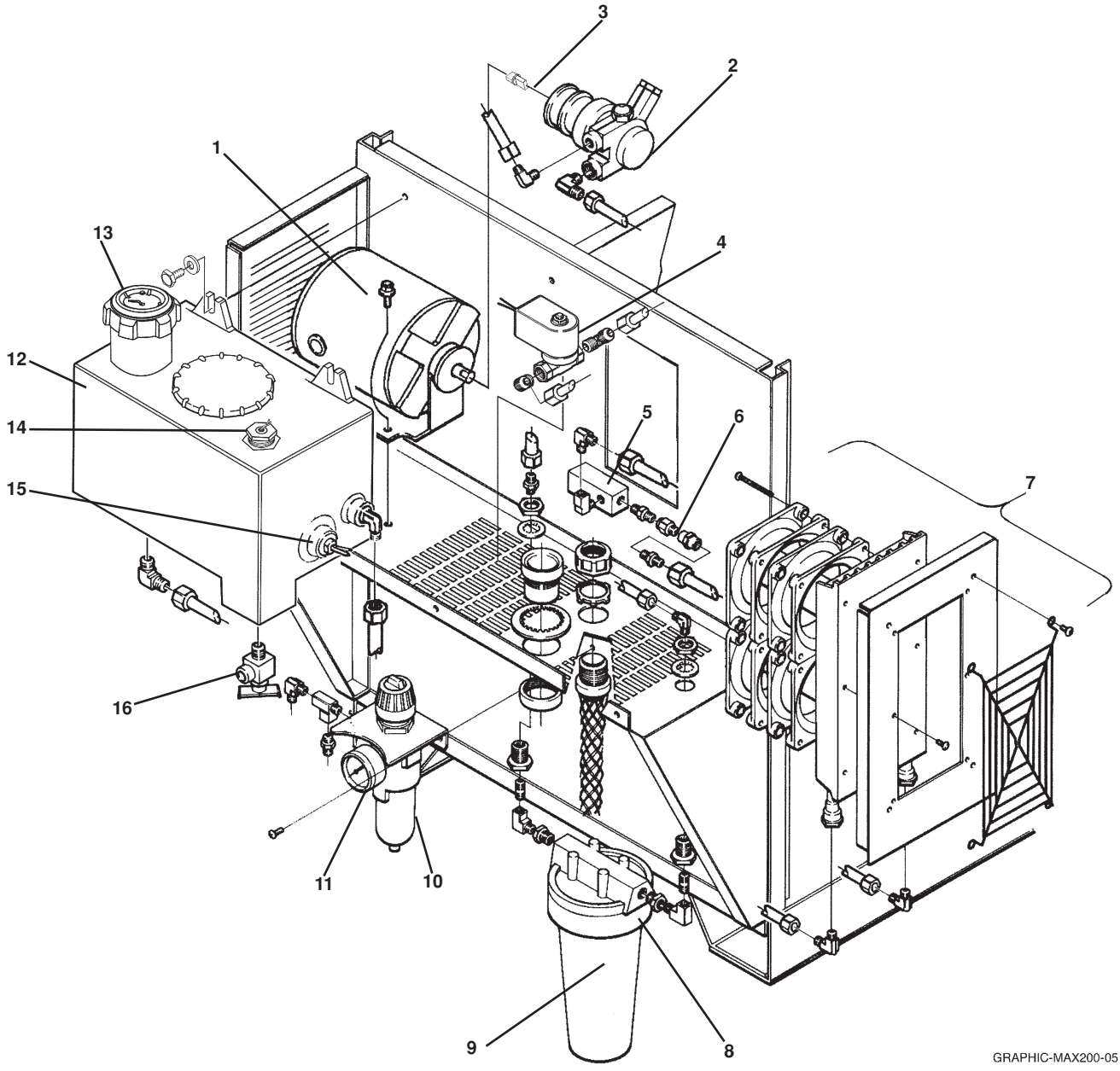


Figure 6-7 Power Supply – Rear View

Rear Wall Outside – MAX200 Power Supply

Item	Part Number	Description	Designator	Qty.
	129252	**Pump Motor Subassembly**		**1**
1	128385	Kit, Replacement Motor, 1/3 HP	M1	1
2	128384	Kit, Replacement Pump, 70 GPH		1
3	031122	Drive Coupling, Pump to motor		1
	129383	**Valve Subassembly (w/ elec connectors)**	**1**	
4	006046	Valve, Sol 240V 3/8 NPT NC	V7	1
	029361	**Flowswitch Subassembly (w/ elec connector)**	**1**	
5	005119	Flowswitch, 0.5 GPM	FS1	1
6	006053	Valve, Check 1/3 PSI, 1/4 NPTM		1
7	027136	Heat Exchanger, Water/Air	MX1	1
8	027139	Filter Housing, 10" X 3/8 NPT		1
9	027005	Filter, Element		1
10	011025	Filter Regulator		1
11	011027	Gauge, High Press (for 011025)		1
12	002304	Reservoir, coolant		1
13	022036	Gauge, liquid level		1
14	129618	Level Switch Subassembly, 1/2 NPT	LS1	1
15	029323	Temp Switch Subassembly, 162 Deg F	TS2	1
16	006099	Bib drain valve 1/4 NPT		1

Recommended Spare Parts

Power Supply

Part Number	Description	Designator
005044	Switch, toggle SPDT	S1
005121	Pushbutton, green, illmn.	PB1
005122	Pushbutton, red extended	PB2
005088	Holder, lamp	-
005168	Bulb, 28 VDC	-
005089	Lens, white	-
009604	Resistor, variable, 100 K, 1 turn	R9
027080	Fan, 225 CFM, 120 VAC, 50/60 Hz	M2
027079	Fan, 450-550 CFM, 120 VAC, 50/60 Hz	M4
027080	Fan, 225 CFM, 120 VAC, 50/60 Hz	M3
041151*	PCB, THC motherboard	PCB10
041186*	PCB, SA-THC	PCB9
041143	PCB, Control	PCB7
005102	Thermostat, 160°C, 6 Amp	TS1
006014	Valve, solenoid	V1
005093	Switch, pressure, 0-90 psi	PS1
129118	Chopper SA, CH130 CE/LVD	CH1/CH2
041534	PCB, power distribution	PCB6
008322	Fuse, 8 Amp, 250 VAC	-
008317	Fuse, semiconductor, 125 Amp, 250 V	F3, F4
003021	Relay, 120 VAC	CR1
029202	Sensor, current	CS1
027137	Filter, coolant, deionizing	-
011025	Filter/regulator	FR1
011031	Filter element (used with 011025)	-
011027	Gauge, high pressure	-
029323	Switch, water temperature, 162°F	TS2
029326	Switch, level	LS1
029361	Switch, flow, 0.5 gpm	FS1
028872	Coolant, propylene glycol 30%/ deionized water 70% (standard mixture)	
028873	Coolant, propylene glycol 100%	

* Power Supplies with THC

Hand Torch and Torch Leads

Part Number	Description	Designator
120045	PAC200T 90° (cutting) Torch Main Body	-
020908	PAC200E 65° (gouging) Torch Main Body	-
029865	Leads SA:PAC200T/E Torch/PS 25 ft	-

Hand Torch Systems

MAX200T (90°) Hand Torch Cutting Systems

MAX200T (90°) HAND TORCH CUTTING SYSTEMS						
PAC200T Torch w/	**200VAC**	**208VAC**	**380/415VAC**	**240/480VAC**	**500VAC**	**600VAC**
25' Leads	**073163**	**073139**	**073151**	**073115**	**073175**	**073127**
50' Leads	**073164**	**073140**	**073152**	**073116**	**073176**	**073128**
75' Leads	**073165**	**073141**	**073153**	**073117**	**073177**	**073129**
100' Leads	**073166**	**073142**	**073154**	**073118**	**073178**	**073130**
125' Leads	**073167**	**073143**	**073155**	**073119**	**073179**	**073131**
150' Leads	**073168**	**073144**	**073156**	**073120**	**073180**	**073132**

MAX200E (65°) Hand Torch Gouging Systems*

MAX200E (65°) HAND TORCH GOUGING SYSTEMS						
PAC200E Torch w/	**200VAC**	**208VAC**	**380/415VAC**	**240/480VAC**	**500VAC**	**600VAC**
25' Leads	**073169**	**073145**	**073157**	**073121**	**073181**	**073133**
50' Leads	**073170**	**073146**	**073158**	**073122**	**073182**	**073134**
75' Leads	**073171**	**073147**	**073159**	**073123**	**073183**	**073135**
100' Leads	**073172**	**073148**	**073160**	**073124**	**073184**	**073136**
125' Leads	**073173**	**073149**	**073161**	**073125**	**073185**	**073137**
150' Leads	**073174**	**073150**	**073162**	**073126**	**073186**	**073138**

* Heat shield (020881) included in MAX200E systems

PAC200T/E Consumables, Torch Assemblies and Torch Leads

Note: Refer to Appendix D for the optional PAC200T (65°) cutting trigger torch data.

PAC200T/E Trigger Torch Consumables – Figures 6-8, 6-9

Note: See pages 6-20 and 6-22 for consumable part kits

	Metal	Amps	Plasma Gas/ Shield Gas	Shield	Retaining Cap	Nozzle	Swirl Ring	Electrode
 CUTTING	**Mild Steel**	**200**	Air / Air	020918	020915	020608	020607	220021
		100	Air / Air	020919	020915	020611	020607	120547
		40	Air / Air	020917	020915	020689	020613	220021
		200	O_2 / Air	020918	020915	020605	020604	220021
		100	O_2 / Air	020919	020915	020616	020617	120547
		200	N_2 / CO_2	020918	020915	020608	020607	020415
	Stainless Steel	**200**	Air / Air	020918	020915	020608	020607	220021
		100	Air / Air	020919	020915	020611	020607	220021
		40	Air / Air	020917	020915	020689	020613	220021
		200	N_2 / Air	020918	020915	020608	020607	020415
		200	N_2 / CO_2	020918	020915	020608	020607	020415
		200	H35 / N_2	020920	020915	020608	020607	020415
		100	H35 / N_2	020919	020915	020611	020607	020415
	Aluminum	**200**	Air / Air	020918	020915	020608	020607	220021
		100	Air / Air	020919	020915	020611	020607	220021
		40	Air / Air	020917	020915	020689	020613	220021
		200	N_2 / Air	020918	020915	020608	020607	020415
		200	N_2 / CO_2	020918	020915	020608	020607	020415
		200	H35 / N_2	020918	020915	020608	020607	020415
		100	H35 / N_2	020919	020915	020611	020607	020415
 GOUGING	**Mild Steel**	**200**	Air / Air	020891	020882	020615	020607	220021
		200	H35/Air	020891	020882	020934	020607	020933
	Stainless Steel	**200**	H35 / N_2	020891	020882	020934	020607	020933
	Aluminum	**200**	H35 / N_2	020891	020882	020934	020607	020933

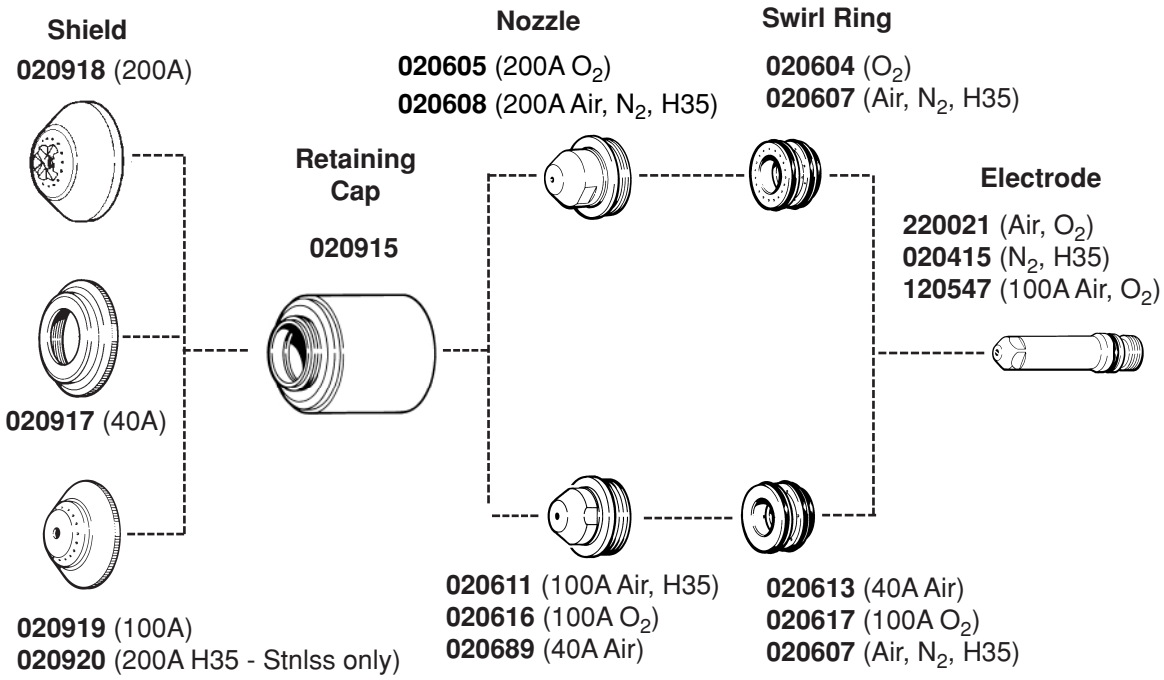


Figure 6-8 PAC200T (90°) Cutting Trigger Torch Consumable Parts

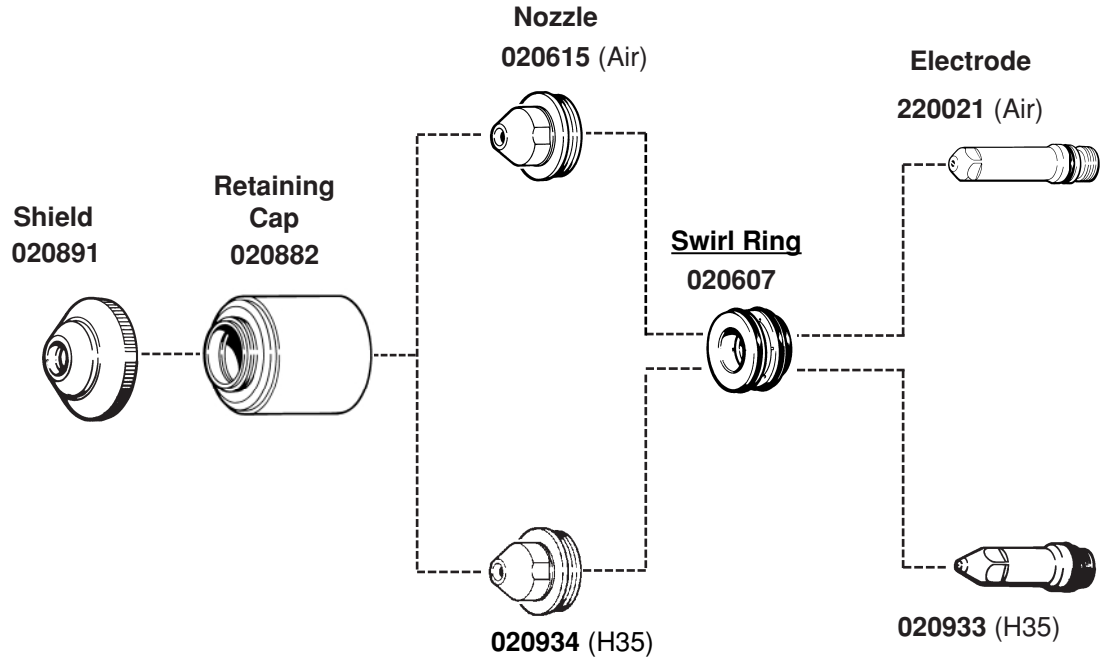


Figure 6-9 PAC200E (65°) Gouging Trigger Torch Consumable Parts

PAC200T (90°) Cutting Torch Assembly (no leads)

Item	Part Number	Description	Qty
	073190	**PAC200T (90°) Cutting Torch Assembly**	1
1	002244	Safety Trigger: PAC120/200T/E Tch	1
2	**128904**	**Kit: PAC200T/E (90°) Torch Handle Replacement**	1
3	002519	Boot: PAC200T/E Torch Handle	1
4	075365	P/S, #6X3/4, PH, Pan	6
5	**120045**	**PAC200T (90°) Torch Main Body**	1
	020963	Water Tube:PAC200T Electd Cool	1
6	044027	O-Ring:Buna 1.301X.070	2
7	027254	Spring, Trigger, PAC120/200T/E Torch	1
	220021	Electrode: MAX200 Air/Oxygen	1
	020607	Swirl Ring: MAX200 Air/N2/H35	1
	020608	Nozzle: MAX200 .086 200A Air/N2/H35	1
	020915	Shield Cap: PAC200T Cutting Torch	1
	020918	Shield: PAC200T 200A	1

PAC200T (90°) Cutting Torch Assembly with 25 Ft Lead

Item	Part Number	Description	Qty
	073189	**PAC200T (90°) Cutting Torch Assembly 25 ft**	1
1	002244	Safety Trigger: PAC120/200T/E Tch	1
2	**128904**	**Kit: PAC200T/E (90°) Torch Handle Replacement**	1
3	002519	Boot: PAC200T/E Torch Handle	1
4	075365	P/S, #6X3/4, PH, Pan	6
5	**120045**	**PAC200T (90°) Torch Main Body**	1
	020963	Water Tube:PAC200T Electd Cool	1
6	044027	O-Ring:Buna 1.301X.070	2
7	027254	Spring, Trigger, PAC120/200T/E Torch	1
8	029865	Leads SA:PAC200T/E Torch/PS 25 ft	1
	220021	Electrode: MAX200 Air/Oxygen	1
	020607	Swirl Ring: MAX200 Air/N2/H35	1
	020608	Nozzle: MAX200 .086 200A Air/N2/H35	1
	020915	Shield Cap: PAC200T Cutting Torch	1
	020918	Shield: PAC200T 200A	1

PAC200T Cutting Torch Consumable Parts Kit 028750

Part Number	Description	Qty
028750	**Parts Kit: PAC200T**	
001067	Box:Gray Plastic	1
015015	Adapter:1/4NPT X #6 Male 90 Brass	1

015193	Cap:#6 Brass	1
220021	Electrode:MAX200 Air/Oxy	5
020415	Electrode:MAX200 N2/H35	5
020918	Shield:PAC200T Hand Torch 200A	5
020604	Swirl Ring:MAX200 Oxy	1
020605	Nozzle:MAX200 .082 200A Oxy	5
020607	Swirl Ring:MAX200 Air/N2/H35	1
020608	Nozzle:MX200 .086 200A Air/N2	5
027055	Lubricant:Silicone 1/4-Oz Tube	1
027194	Nozzle Wrench:MAX200/HT2000	1
044027	O-Ring:BUNA 70DURO 1.301X.070	2
027347	Tool:Water Tube Replacement	1

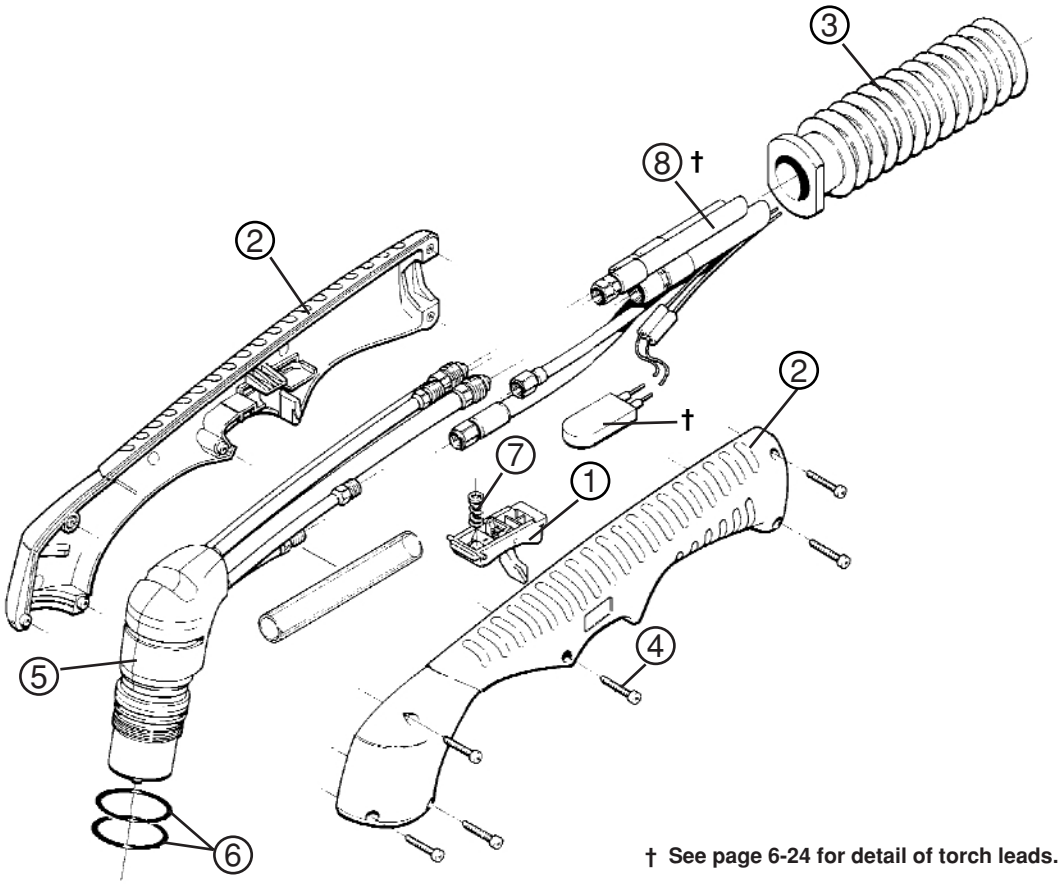


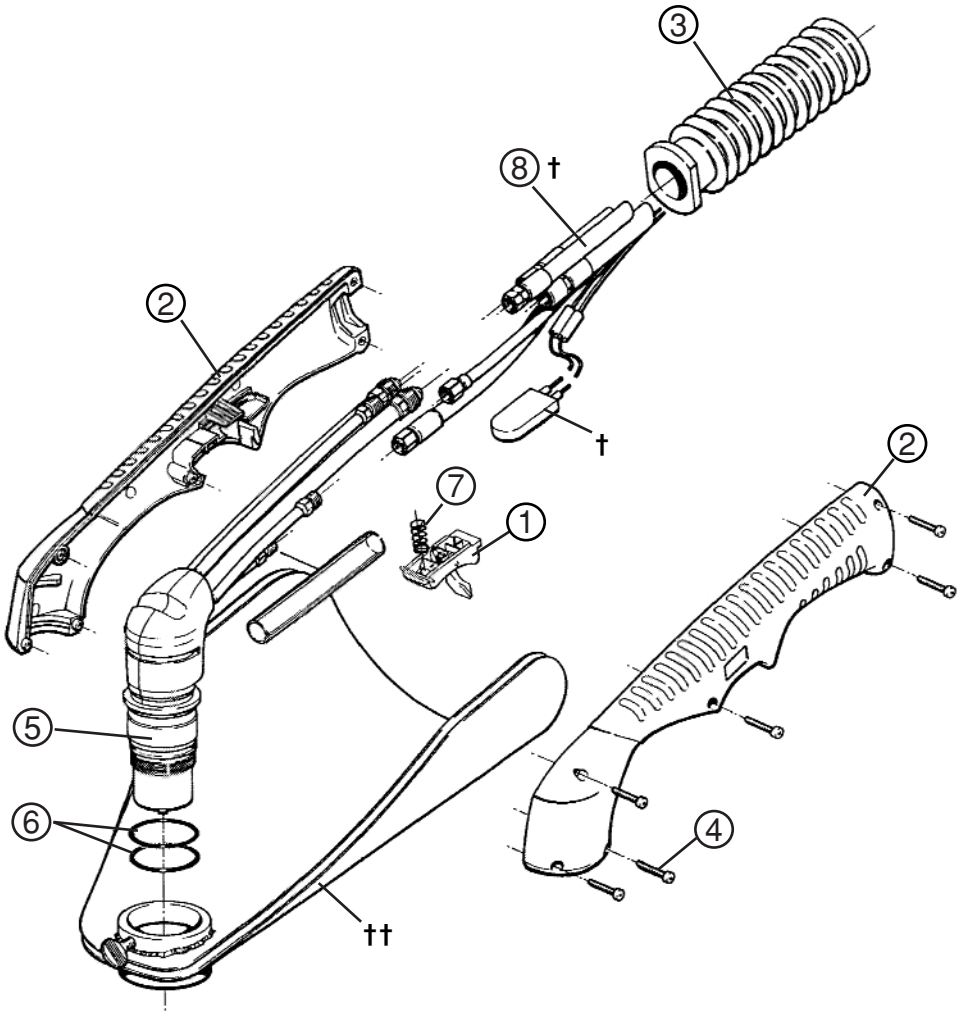
Figure 6-10 PAC200T (90°) Cutting Trigger Torch Assembly

PAC200E Gouging Torch Assembly (no leads)

Item	Part Number	Description	Qty
	073188	**PAC200E Gouging Torch Assembly**	1
1	002244	Safety Trigger: PAC120/200T/E Tch	1
2	**128905**	**Kit: PAC200T/E (65°) Torch Handle Replacement**	1
3	002519	Boot: PAC200T/E Torch Handle	1
4	075365	P/S, #6X3/4, PH, Pan	6
5	**020908**	**PAC200E Torch Main Body**	1
	020913	Water Tube:PAC200E Electd Cool	1
6	044027	O-Ring:Buna 1.301X.070	2
7	027254	Spring, Trigger, PAC120/200T/E Torch	1
	020933	Electrode: PAC200E	1
	020607	Swirl Ring: MAX200 Air/N2/H35	1
	020934	Nozzle: PAC200E N2	1
	020882	Shield Cap: PAC200E Torch	1
	020891	Shield: PAC200E Torch	1

PAC200E Gouging Torch Assembly with 25 Ft Lead

Item	Part Number	Description	Qty
	073111	**PAC200E Gouging Torch Assembly 25 ft**	1
1	002244	Safety Trigger: PAC120/200T/E Tch	1
2	**128905**	**Kit: PAC200T/E (65°) Torch Handle Replacement**	1
3	002519	Boot: PAC200T/E Torch	1
4	075365	P/S, #6X3/4, PH, Pan	6
5	**020908**	**PAC200E Torch Main Body**	1
	020913	Water Tube:PAC200E Electd Cool	1
6	044027	O-Ring:Buna 1.301X.070	2
7	027254	Spring, Trigger, PAC120/200T/E Torch	1
8	029865	Leads SA:PAC200T/E Torch/PS 25 ft	1
	020933	Electrode: PAC200E	1
	020607	Swirl Ring: MAX200 Air/N2/H35	1
	020934	Nozzle: PAC200E N2	1
	020882	Shield Cap: PAC200E Torch	1
	020891	Shield: PAC200E Torch	1



† See page 6-24 for detail of torch leads.
†† Heat Shield 020881 not included in PAC200E Torch Assembly. Order separately.

Figure 6-11 PAC200E (65°) Gouging Trigger Torch Assembly

PAC200E Gouging Torch Consumable Parts Kit 028751

Part Number	Description	Qty
028751	**Parts Kit: PAC200E**	
001067	Box:Gray Plastic	1
015015	Adapter:1/4NPT X #6 Male 90 Brass	1
015145	Adapter:1/4NPT X G-1/4-BSPP Brass	1
015146	Adapter:1/4NPT X G-3/8-BSPP Brass	1
015147	Adapter:1/4NPT X G-1/2-BSPP Brass	1
015193	Cap:#6 Brass	1
020607	Swirl Ring:MAX200 Air/N2/H35	1
020891	Shield:PAC200E Torch	1
020918	Shield:PAC200T 200A	1
020933	Electrode:PAC200E Torch	5
220021	Electrode:MAX200 Air/Oxy	5
020934	Nozzle:PAC200E Torch N2/H35	5
020615	Nozzle:MAX200 Air/H35 Gouging	5
020608	Nozzle:MAX200 .086 200A Air/N2/H35	5
027055	Lubricant:Silicone 1/4-Oz Tube	1
027194	Nozzle Wrench:MAX200/HT2000	1
044027	O-Ring:BUNA 70DURO 1.301X.070	2
027347	Tool:Water Tube Replacement	1

Trigger Torch 25 – Foot Lead Assembly (Torch to Power Supply)*

Item	Part Number	Description	Qty
	029865	**Leads SA:PAC200T/E Trch/PS 25 ft**	1
1	024375	Hose:200T/E Cap Sensor Trch/PS	1
2	024194	Hose Assy:3/16 Red LH	1
3	023714	Cable: 200T/E Water Cooled Blue	1
4	023716	Cable: 200T/E Water Cooled Red	1
5	023715	Cable: 200T/E Shield Gas	1
6	047203	Cable, 16-1 Pair	1
7	005094	Push Button Switch: Torch	1
–	074069	Splice	2
8	024197	Sheath: MAX200 Hand Torch Leads 25'	1

* Note: If leads longer than 25 feet are needed, use extended leads (see page 6-25).

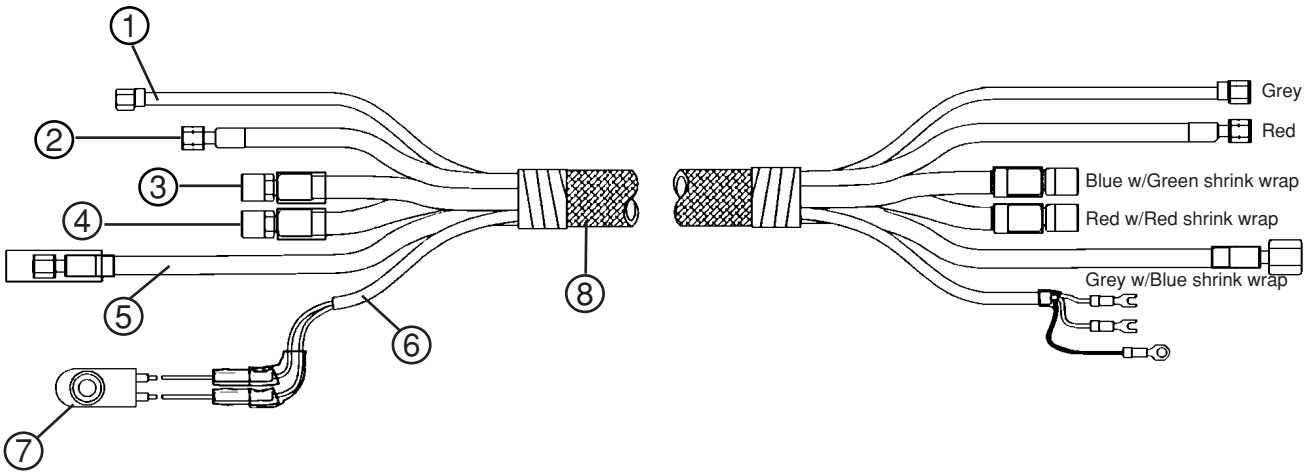


Figure 6-12 PAC200T/E Trigger Torch Lead Assemblies

Extended Leads

Part Number	Description	Qty	Length
028715	**PAC200T/E Torch Leads Ext 50'**	**1**	**50 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029867	Leads SA:PAC200T/E XBT-PS 25'	1	
001313	Box:Torch Leads Ext (one half)	1 pair	
028716	**PAC200T/E Torch Leads Ext 75'**	**1**	**75 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029594	Leads MAX200 Hand Torch XT 50' PS End	1	
001313	Box:Torch Leads Ext	1 pair	
028717	**PAC200T/E Torch Leads Ext 100'**	**1**	**100 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029593	Leads MAX200 Hand Torch XT 50' CTRSC	1	
029867	Leads SA:PAC200T/E XBT-PS 25'	1	
001313	Box:Torch Leads Ext	2 pair	
028718	**PAC200T/E Torch Leads Ext 125'**	**1**	**125 ft**
029866*	Leads SA:PAC200T/E TCH-XBT 25'	1	
029593	Leads MAX200 Hand Torch XT 50' CTRSC	1	
029594	Leads MAX200 Hand Torch XT 50' PS End	1	
001313	Box:Torch Leads Ext	2 pair	
028719	**PAC200T/E Torch Leads Ext 150'**	**1**	**150 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029593	Leads MAX200 Hand Torch XT 50' CTRSC	2	
029867	Leads SA:PAC200T/E XBT-PS 25'	1	
001313	Box:Torch Leads Ext	3 pair	

Notes: *See page 6-26 for detail.

Trigger Torch 25 – Foot Lead Assembly (Torch to Extension Box)

Item	Part Number	Description	Qty
	029866	**Leads SA:PAC200T/E Torch-Ext. Box 25'**	1
1	024376	Hose:200T/E Cap Sensor Torch/Box	1
2	024379	Hose Assy:3/16 Red LH'A' 25'1"	1
3	023714	Cable: 200T/E Water Cooled Blue	1
4	023716	Cable: 200T/E Water Cooled Red	1
5	023717	Cable: 200T/E Shield Gas Torch/Box	1
6	047203	Cable, 16-1 Pair	1
7	005094	Push Button Switch: Torch	1
–	074069	Splice	2
8	024197	Sheath: MAX200 Hand Torch Leads 25'	1
9	015036	UN: Right Hand 'A' Male Brass	2
10	015049	UN: AC'A' Male Brass	1
11	015208	Adapter: #5 Male X #5 Male Brass	2
12	074067	Term 22-18 .25 Male QC Insul	3

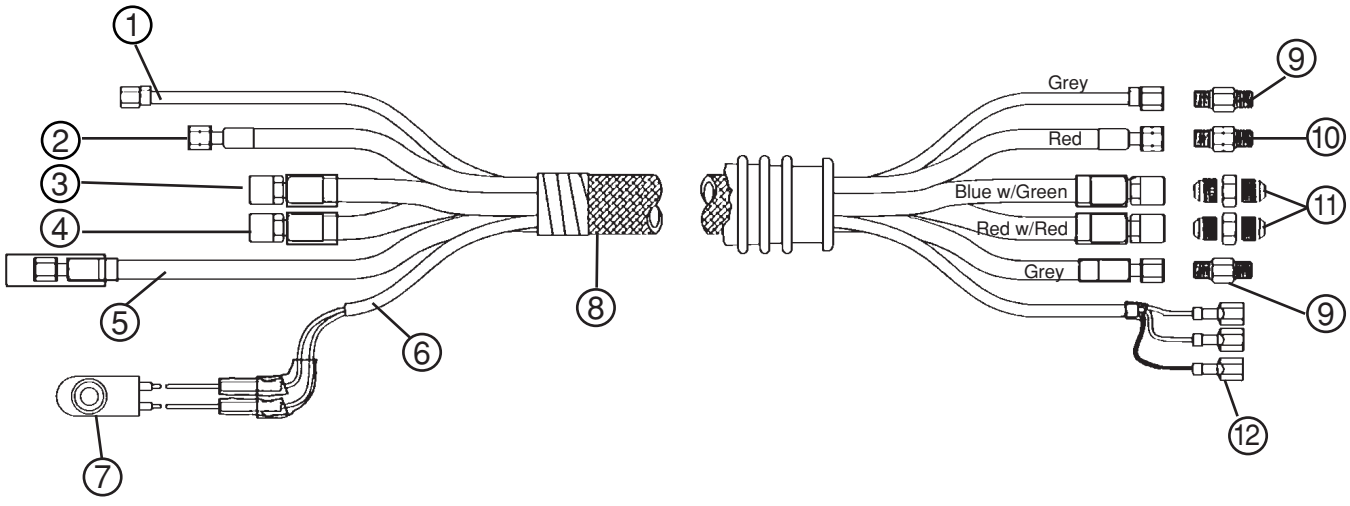


Figure 6-13 #029866 – Leads SA:PAC200T/E Torch to Extension Box – 25'

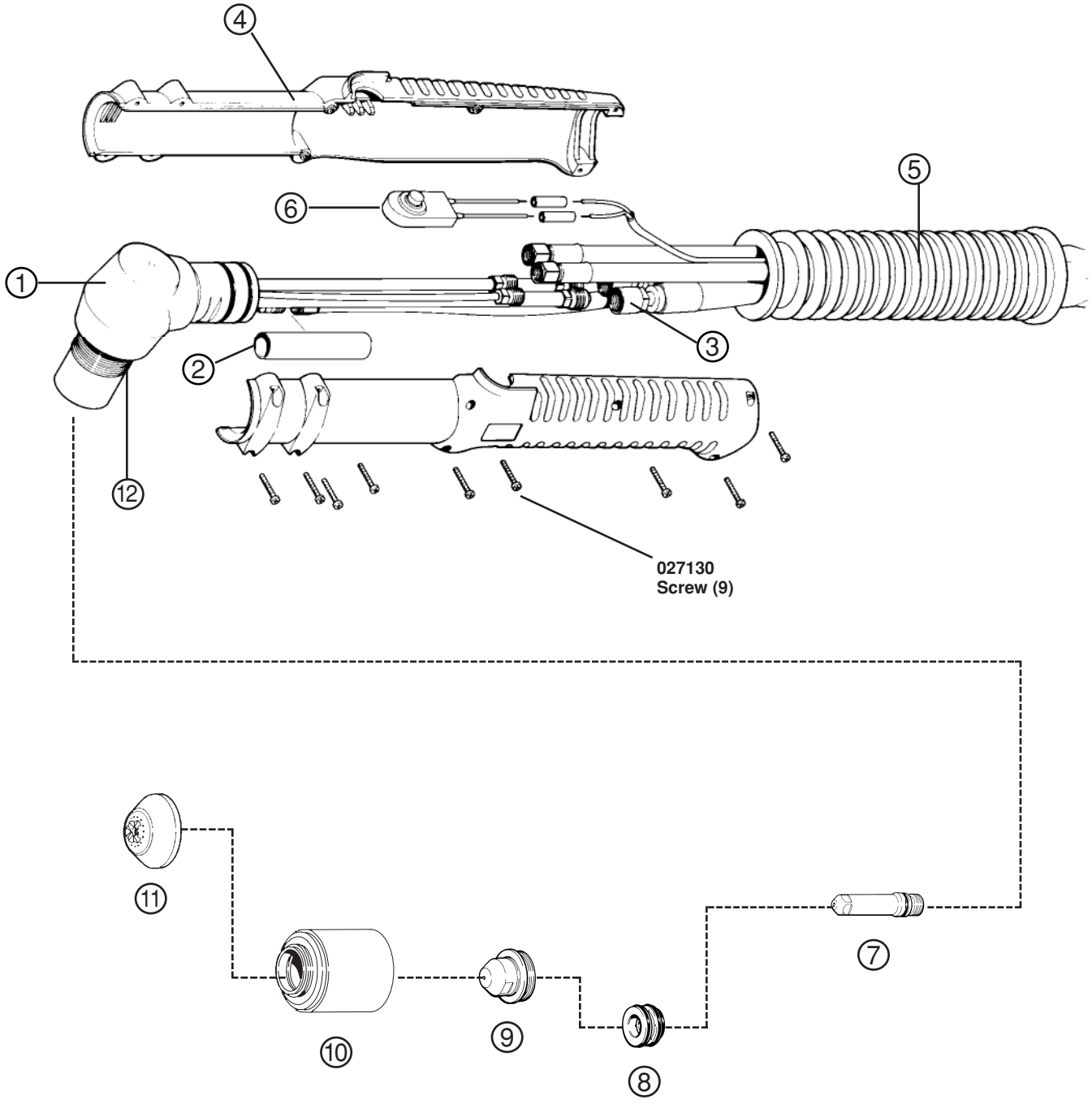


Figure 6-14 MAX200 Rev 1 Hand Torch Assembly

MAX200 Rev 1 Hand Torch Assembly

The following is a listing of the MAX200 Rev 1 90° Hand Torch with 25 foot and 50 foot leads. Refer to Figure 6-14.

Item	Part Number	Description	Qty.
	073008	**MAX200 90 Deg. Hand Torch 25'**	**1**
1	**020484**	**MAX200 90 Deg Hnd Tch Main Body**	**1**
3	***029309**	**Leads SA MAX200 Hand Torch 25'**	**1**
	073009	**MAX200 90 Deg. Hand Torch 50'**	**1**
1	**020484**	**MAX200 90 Deg Hnd Tch Main Body**	**1**
3	***029310**	**Leads SA MAX200 Hand Torch 50'**	**1**

The following items are common to the MAX200 Rev 1 Hand Torch assemby:

2	020536	Lead Insulator 9/16 X 2.5 Tef	1
4	001258	Handle, MAX200 Hand Torch	1
5	002178	Boot, MAX200 Torch	1
6	005094	Switch, PB, Torch	1
7	220021	Electrode, MAX200 Air O/2	1
8	020607	Swirl Ring, MAX200 Air/N2/H35	1
9	020608	Nozzle, MX200 200A .086 Air/N2/H35	1
10	020423	Cap, Nozzle Retaining, MAX200	1
11	020446	Shield, MAX200 Hnd 200A	1
12	044027	O-ring, Buna-N	1

* Lead subassemblies are broken down on page 6-30.

MAX200 Rev 1 Hand Torch Lead Assembly Parts

Item	Part Number	Description	Qty
	029309	**Hand Torch Lead, 25 Ft.**	1
1	023326	Lead Pilot, Shield Gas, 25 Ft. (blue)	1
2	024194	Lead, Plasma Gas, 25 Ft. (red)	1
3	024192	Lead, Cap Sensor, 25 Ft. (gray)	1
4	023324	Cable, Water Cooled, 25 Ft. (blue- red band)	1
5	023324	Cable, Water Cooled, 25 Ft. (blue- green band)	1
6	047032	Cable, Switch, 26 Ft.	1
7	020536	Lead Insulator, 9/16" ID x 2-1/2"	1
8	046026	Tubing, 1-1/2" ID Shrink Black	2
9	024197	Sheath, 25 Ft.	1
	029310	**Hand Torch Lead, 50 Ft.**	1
1	023327	Lead Pilot, Shield Gas, 50 Ft. (blue)	1
2	024195	Lead, Plasma Gas, 50 Ft. (red)	1
3	024193	Lead, Cap Sensor, 50 Ft. (gray)	1
4	023325	Cable, Water Cooled, 50 Ft. (blue- red band)	1
5	023325	Cable, Water Cooled, 50 Ft. (blue- green band)	1
6	047032	Cable, Switch, 51 Ft.	1
7	020536	Lead Insulator, 9/16" ID x 2-1/2"	1
8	046026	Tubing, 1-1/2" ID Shrink Black	2
9	024198	Sheath, 50 Ft.	1

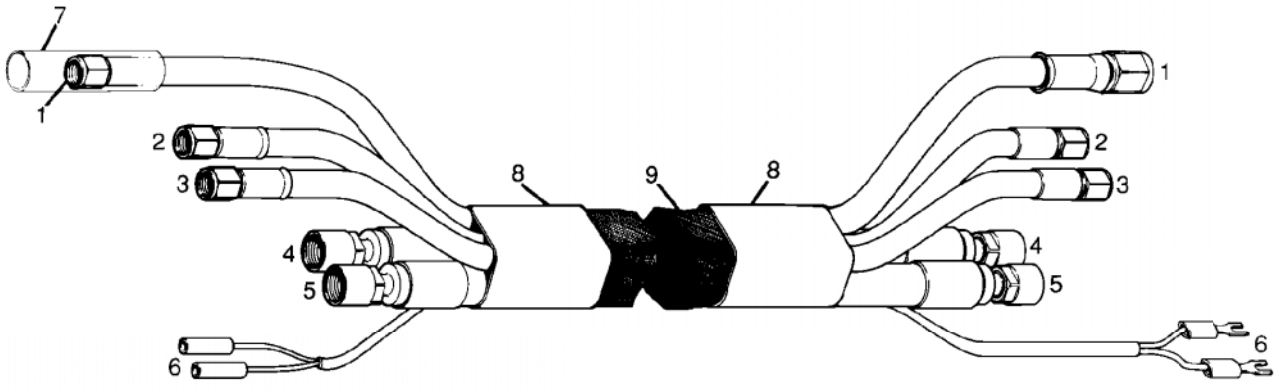


Figure 6-15 Hand Torch Lead Assemblies

MAX200 Rev 1 Hand Torch Lead Extensions

Part No.	Description	Length
028496	Lead Extensions, Hand Torch	100 ft
028497	Lead Extensions, Hand Torch	150 ft

For more detailed information on hand-torch lead extensions and their installation, please refer to instruction manual IM-140 (P/N 801400).

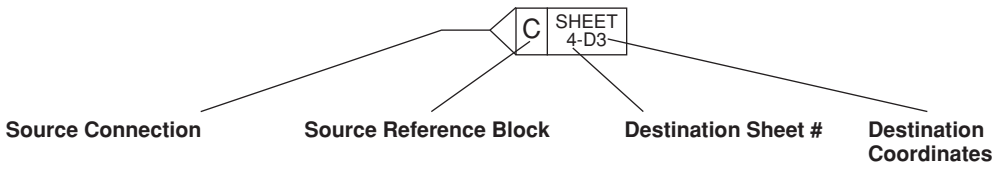
Section 7

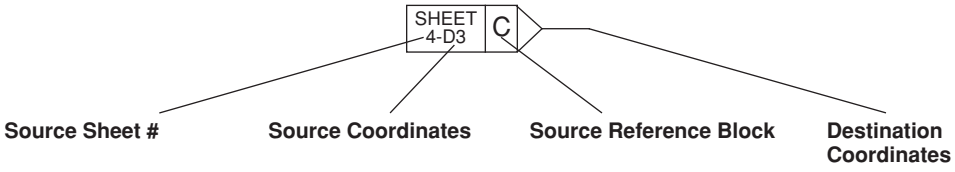
WIRING DIAGRAMS

Introduction

This section contains the wiring diagrams for the MAX200 system. When tracing a signal path or referencing with the **Parts List** or **Troubleshooting** sections, please be aware of the following format to assist you in understanding the wiring diagrams' organization:

- Sheet numbers are located in the lower right-hand corner.
- Page-to-page referencing is done in the following manner:





Destination and **Source Coordinates** refer to letters A-D on the Y-axis of each sheet and numbers 1-4 on the X-axis of each sheet. Lining up the coordinates will bring you to the source or destination blocks (similar to a road map).

Wiring Diagram Symbols

Wiring diagram symbols and their identification precede the system wiring diagrams in this section.

Battery

Cap, polarized

Cap, non-polarized

Cap, feed-thru

Circuit breaker

Coax shield

Current Sensor

Current sensor

DC supply

Diode

Door interlock

Fan

Feedthru LC

Filter, AC

Fuse

Ground Clamp

Ground, Chassis

Ground, Earth

IGBT

Inductor

LED

Light

MOV

Pin

Plug

PNP Transistor

Potentiometer

Push Button, Normally Closed

Push Button, Normally Open

Receptacle

Relay, Coil

Relay, Normally Closed

Relay, Normally Open

Relay, Solid State, AC

Relay, Solid State, DC

Relay, Solid State, Dry

Resistor

SCR

Shield

Shunt

Spark Gap

Switch, Flow

Torch Symbols

Electrode

Nozzle

Shield

Torch

Torch, HyDefinition™

Switch, Level, Normally Closed

Switch, Pressure, Normally Closed

Switch, Pressure, Normally Open

Switch, 1 Pole, 1 Throw

Switch, 1 Pole, 2 Throw

Switch, 1 Pole, 1 Throw, Center Off

Switch, Temperature, Normally Closed

Switch, Temperature, Normally Open

Terminal Block

Time Delay Closed, NC/Off

Time Delay Open, NO/Off

Time Delay Open, NC/On

Time Delay Closed, NO/Off

Transformer

Transformer, Air Core

Transformer Coil

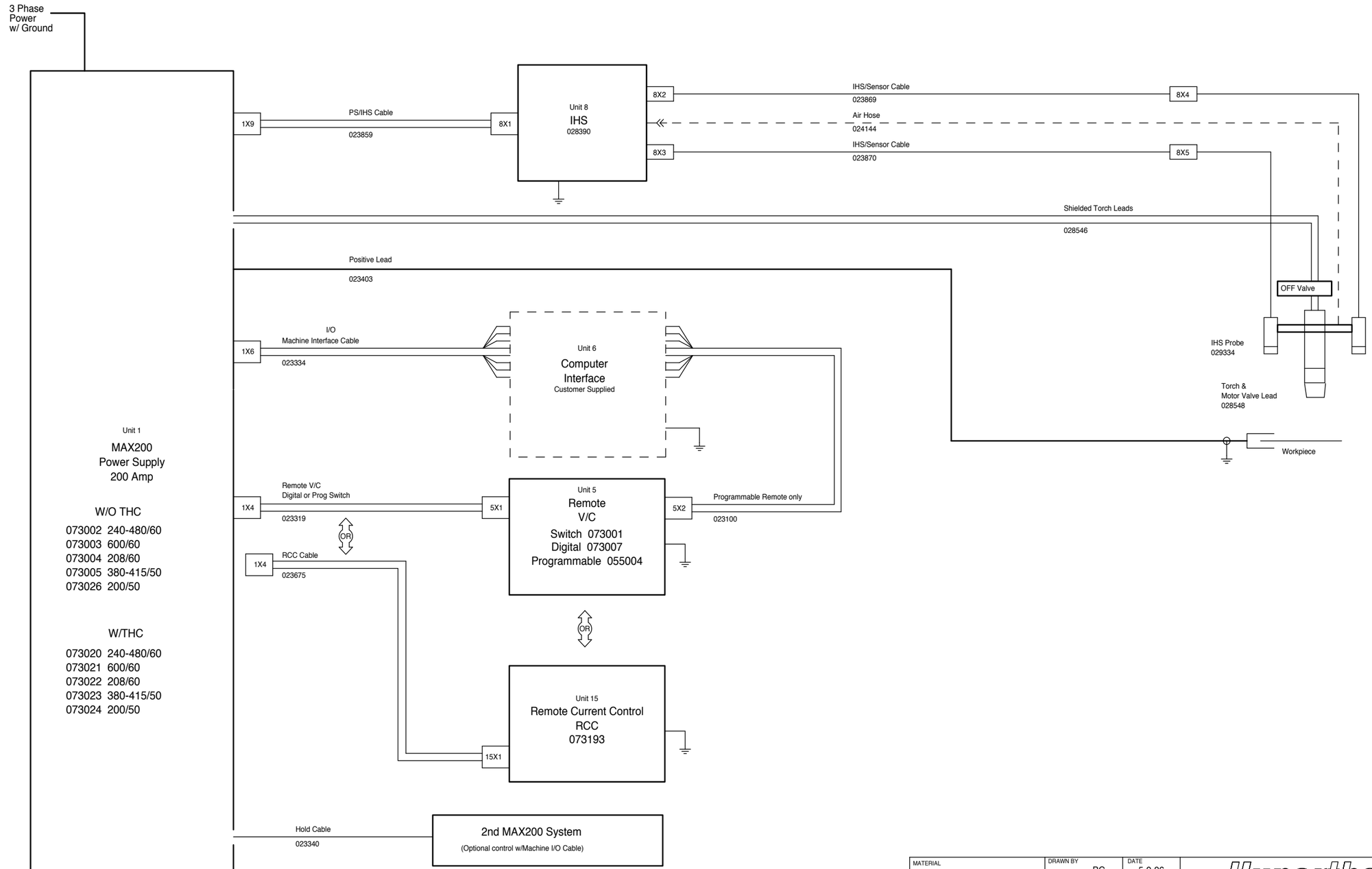
Triac

VAC Source

Valve, Solenoid

Voltage Source

Zener Diode



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	APP. BY	DATE	
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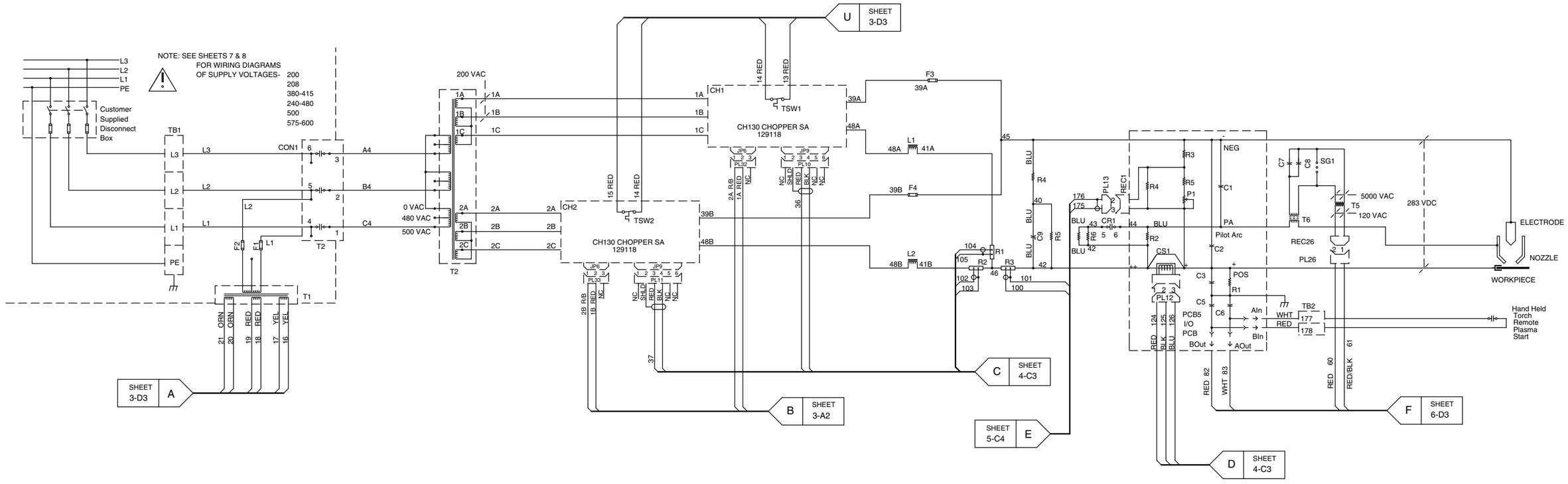
	SCALE: N/A	MODEL: MAX200	SHEET: 1 OF 9



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A — SHEET 2-B4

U — SHEET 2-D2

G — SHEET 4-D3

H — SHEET 4-B3

J — SHEET 6-C4

K — SHEET 6-C2

L — SHEET 5-C4

M — SHEET 4-B4

B — SHEET 2-B2

24 VAC
115 VAC
240 VAC

ORN 20 · RED 18 · ORN 21 · RED 19 · YEL 17 · YEL 16

PB1 · PB2 · Remote Machine STOP

TS1 · LS1 · PS2 · PS1 · TS2 · FS1 · PS3 · LT1 · V4

PL1 · PL3 · REC1 · REC3

F1 F2 F3 F4 · H1 H2 H3 H4 · MOV1 MOV2 MOV3

D8 · U1 · R1 R2 R3 · C8 C9 · D9

J1 J2 · CR1 CR2 CR3

CR4 CR5 CR6 CR7 CR8 CR9 CR10

POWER DISTRIBUTION
PCB ASSY: 041534

REC4 PL1.4

REC5 · REC2 · PL19 · PL2

V7 · M1 · PL21

PB1 · PB2 · M2 · M4 · M3 · PL31 · REC31 · HX1 · M5 M6 M7 M8

PCB: 041535
ASSY: 041536

023354

REC1 · REC2

LED7 LED6 LED5 LED4 LED3 LED2 LED1

RN2A RN2B RN2E RN2F RN2G RN2H RN1A RN1B RN1C RN1D RN1F RN1E RN1H RN1G

U2A U2C U2D U1A U1B U1C U1D

D7 D6 D5 D4 D3 D2 D1

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	APP. BY	DATE

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TOLERANCES ARE:
2 PL DECIMAL ±.01
3 PL DECIMAL ±.005
FRACTIONS ±1/64
ANGULAR ±.5°
PART MUST BE FREE OF BURRS AND SHARP EDGES. BREAK SHARP EDGES IF NECESSARY WITH CHAMFER OR RADIUS .015.

DESCRIPTION: ELEC/GAS SCHEM: MAX200 (V)

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SCALE	MODEL	SHEET
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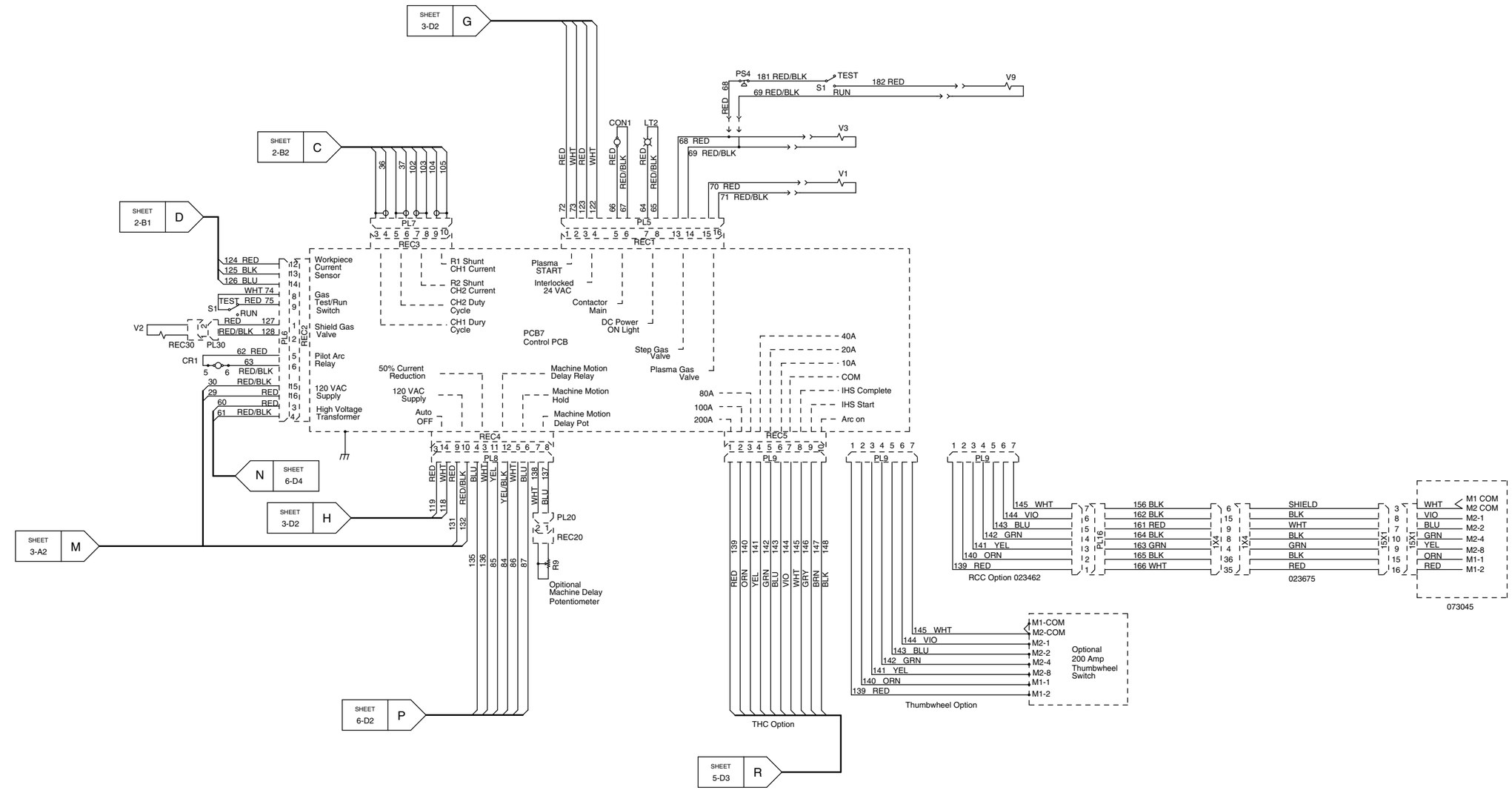

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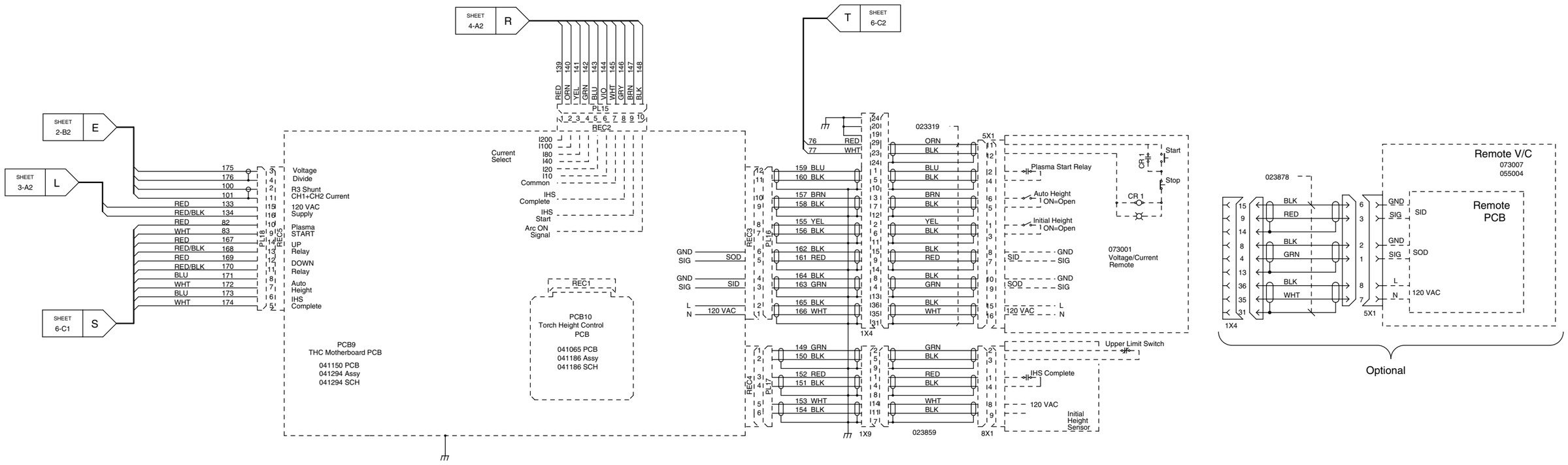

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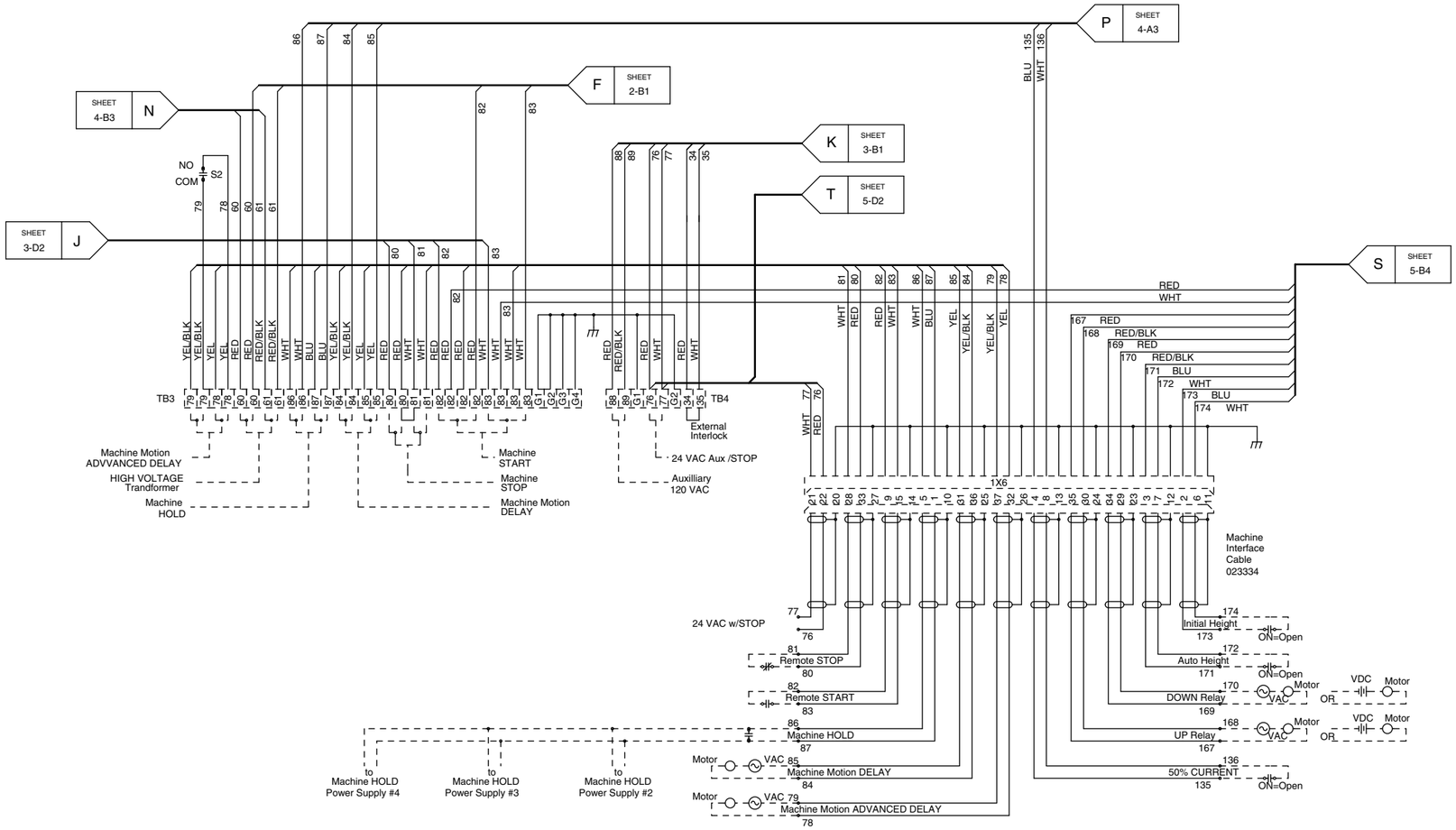

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	CHECKED BY	DATE	Box-5010 Hanover, NH 03755-5010 603/643-3441
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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
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3 PL DECIMAL ±.005
FRACTIONS ±1/64
ANGULAR ±.5=
PART MUST BE FREE OF BURRS AND SHARP EDGES. BREAK SHARP EDGES IF NECESSARY WITH CHAMFER OR RADIUS .015.

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SCALE	MODEL	SHEET
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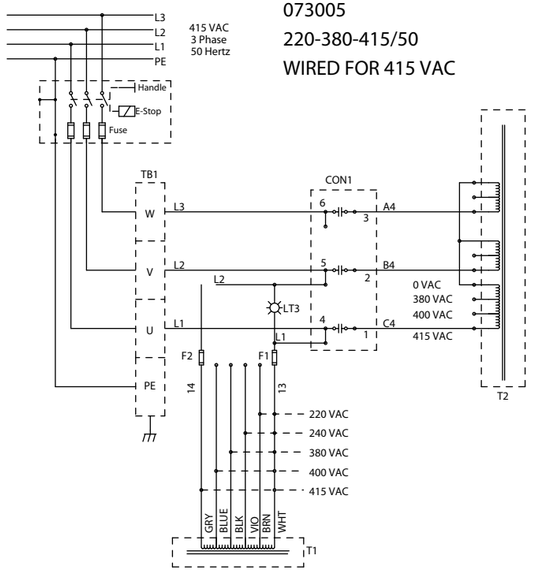
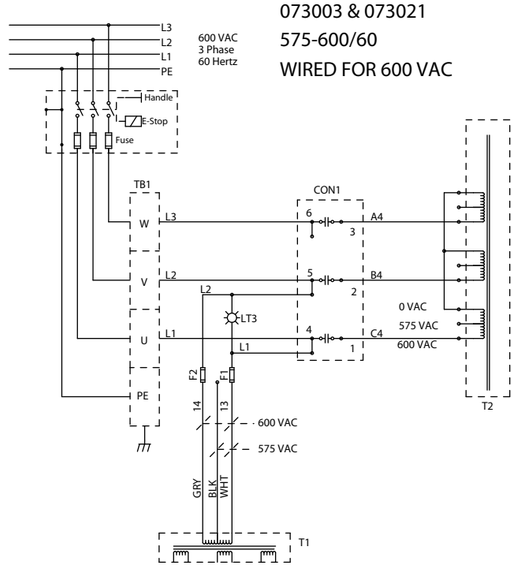
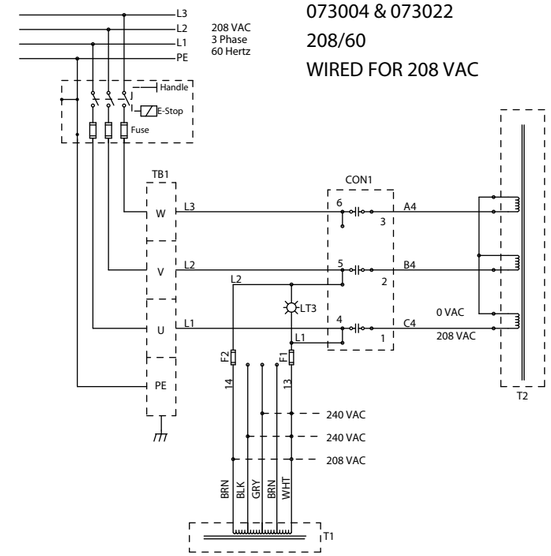


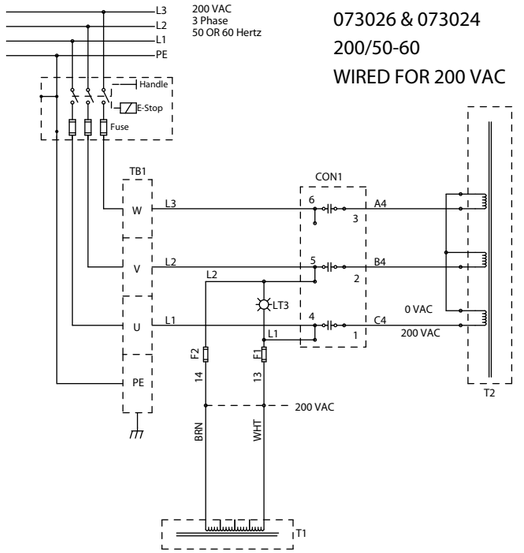
073005
220-380-415/50
WIRED FOR 415 VAC



073003 & 073021
575-600/60
WIRED FOR 600 VAC



073004 & 073022
208/60
WIRED FOR 208 VAC



073026 & 073024
200/50-60
WIRED FOR 200 VAC

MATERIAL	DRAWN BY: BC	DATE: 5-9-96	Hypertherm
	CHECKED BY	DATE	Box-5010 Hanover, NH 03755-5010 603/643-3441
	APP. BY	DATE	DESCRIPTION: ELEC/GAS SCHEM: MAX200 V
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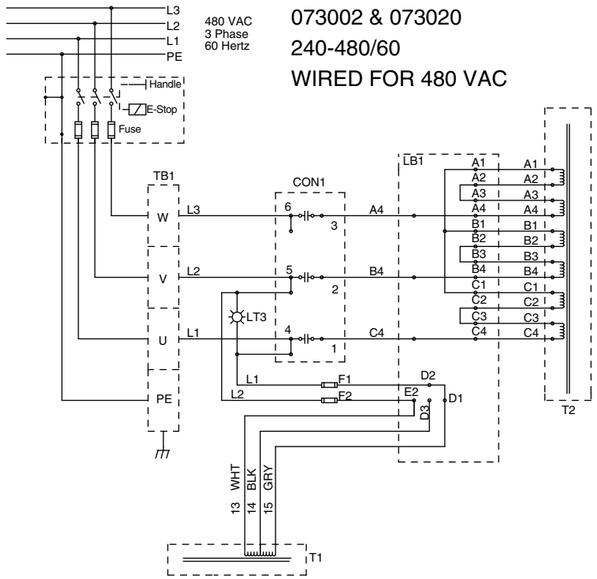
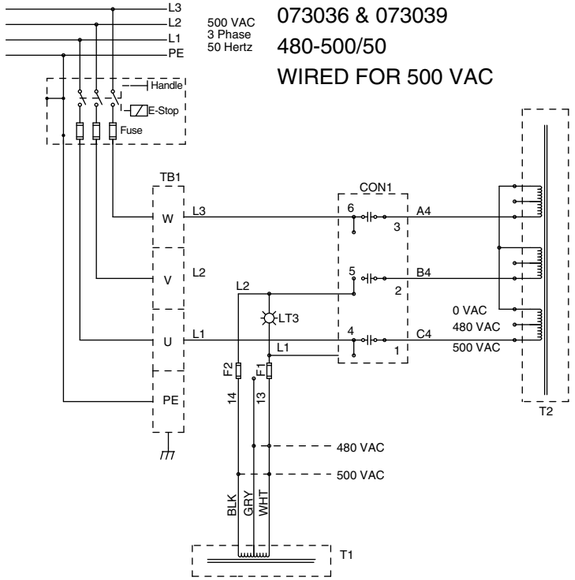
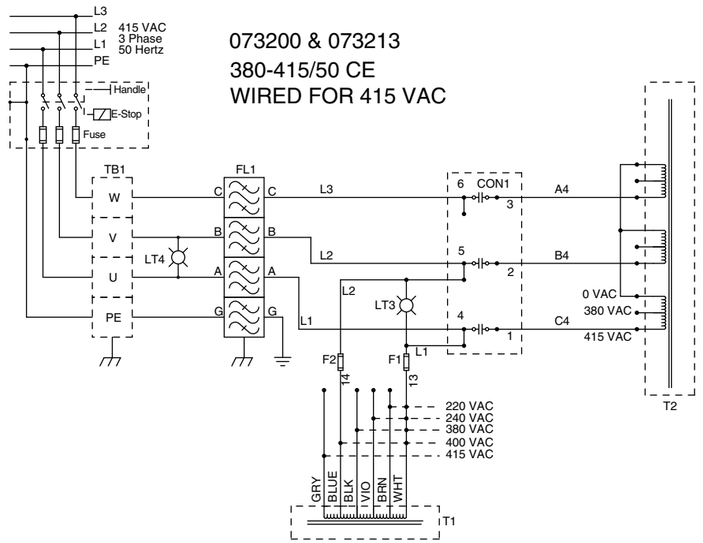


073002 & 073020
240-480/60
WIRED FOR 480 VAC



073036 & 073039
480-500/50
WIRED FOR 500 VAC



073200 & 073213
380-415/50 CE
WIRED FOR 415 VAC

MATERIAL	DRAWN BY: BC	DATE: 5-9-96	Hypertherm Box-5010 Hanover, NH 03755-5010 603/643-3441
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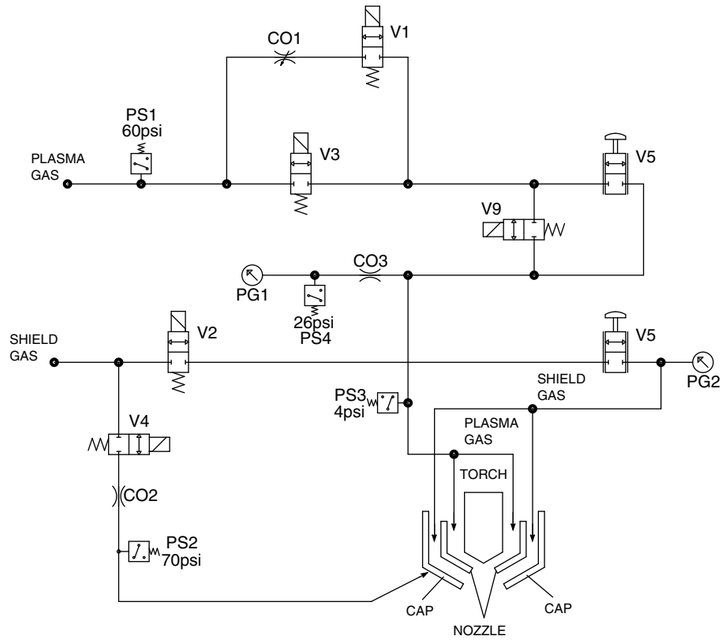
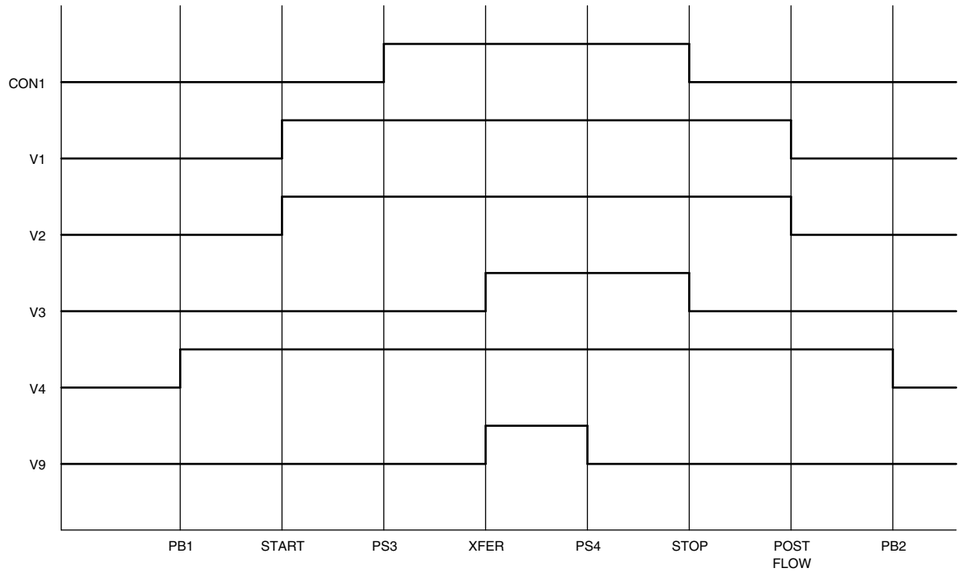


GAS FLOW DIAGRAM



TIMING CHART MAX200

MAX200 TIMING CHART	
CON1	MAIN CONTACTOR
V1	PLASMA PRE/POST FLOW SOLENOID VALVE
V2	SHIELD GAS SOLENOID
V3	PLASMA STEP GAS SOLENOID VALVE
V4	CAP-ON-SENSE SOLENOID VALVE
V9	PLASMA CHARGING VALVE
PB1	POWER ON SWITCH
PB2	POWER OFF SWITCH
PS3	PLASMA GAS OUTLET PRESSURE SWITCH. N.O. SWITCH THAT CLOSES WHEN THE PLASMA GAS PRESSURE EXCEEDS 3 psi
PS4	QUICK CHARGE PRESSURE SWITCH. N.C. SWITCH THAT OPENS WHEN PLASMA GAS REACHES 26 psi
START	PLASMA START SIGNAL FROM CNC
STOP	PLASMA STOP SIGNAL FROM CNC
XFER	ARC TRANSFER
POST-FLOW	1 SECOND GAS FLOW AT END OF CYCLE

NOTES:
1. IN TEST MODE, V1, V2, AND V3 ARE THE ONLY VALVES THAT ARE ACTIVE.
2. WHEN V1 BECOMES ACTIVE AFTER START, 10 TO 15 psi WILL BE REGISTERED AT PG1.
3. THE HV TRANSFORMER IS ACTIVATED 2 SECONDS AFTER THE PLASMA START SIGNAL. IT WILL STAY ACTIVE FOR 5 SECONDS OR UNTIL THE ARC TRANSFERS TO THE WORK PIECE, WHICH EVER HAPPENS FIRST.

GAS SYSTEM DESIGNATOR

MATERIAL	DRAWN BY: BC	DATE: 5-9-96
	CHECKED BY	DATE
	APP. BY	DATE

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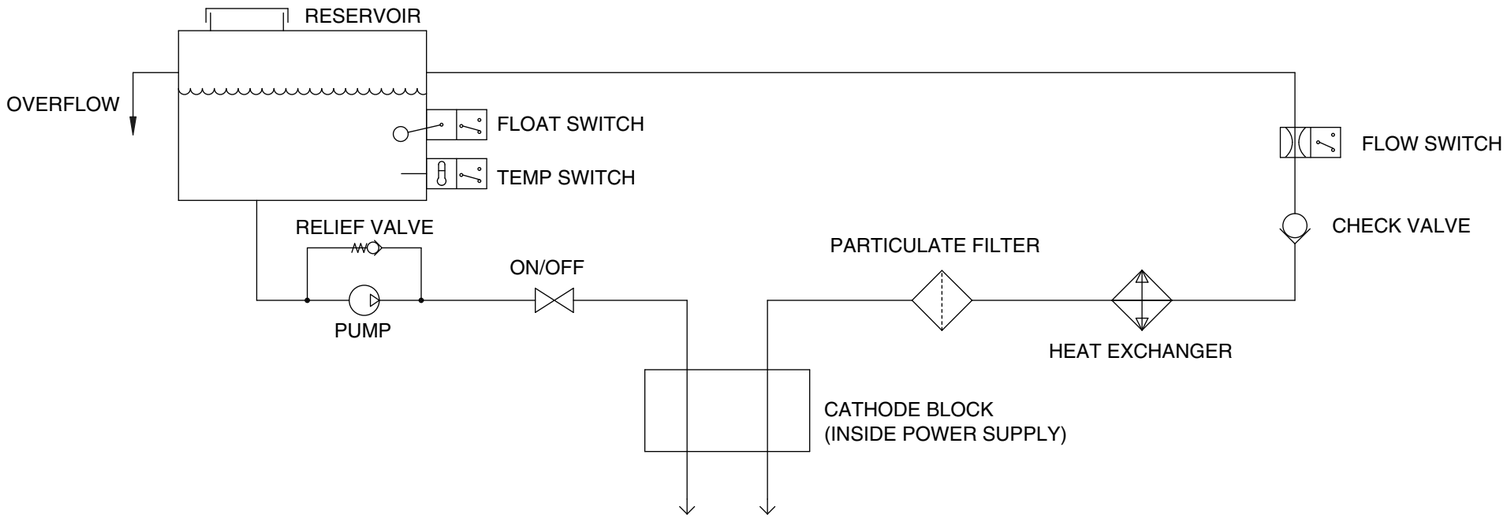
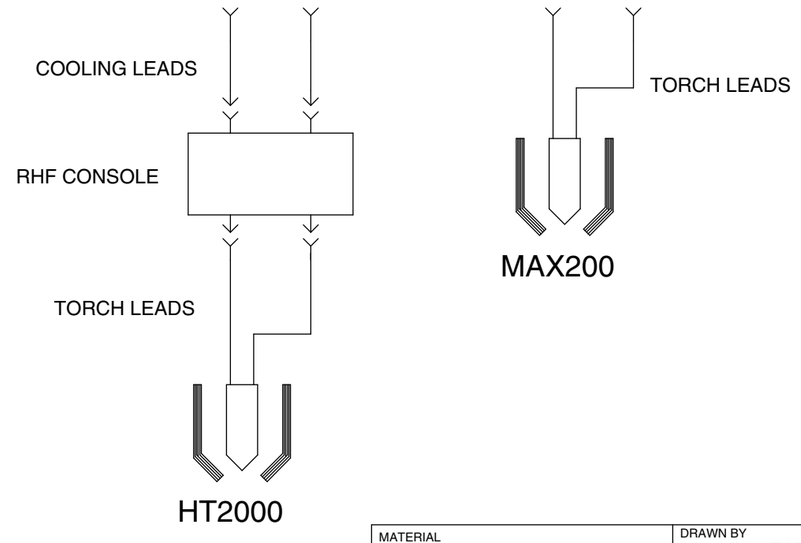
TOLERANCES ARE:
2 PL DECIMAL ±.01
3 PL DECIMAL ±.005
FRACTIONS ±1/64
ANGULAR ±.5=
PART MUST BE FREE OF BURRS AND SHARP EDGES. BREAK SHARP EDGES IF NECESSARY WITH CHAMFER OR RADIUS .015.

Hypertherm
Box-5010 Hanover, NH 03755-5010 603/643-3441

DESCRIPTION: ELEC/GAS SCHEM: MAX200			V
ITEM NO.: 013179	DRAWING NO.: 013-2-179	FILE NAME: 013179B9	
SCALE: N/A	MODEL: MAX200	SHEET: 9 OF 9	





MATERIAL	DRAWN BY: BMD	DATE: 8-13-90	Hypertherm Box-5010 Hanover, NH 03755-5010 603/643-3441
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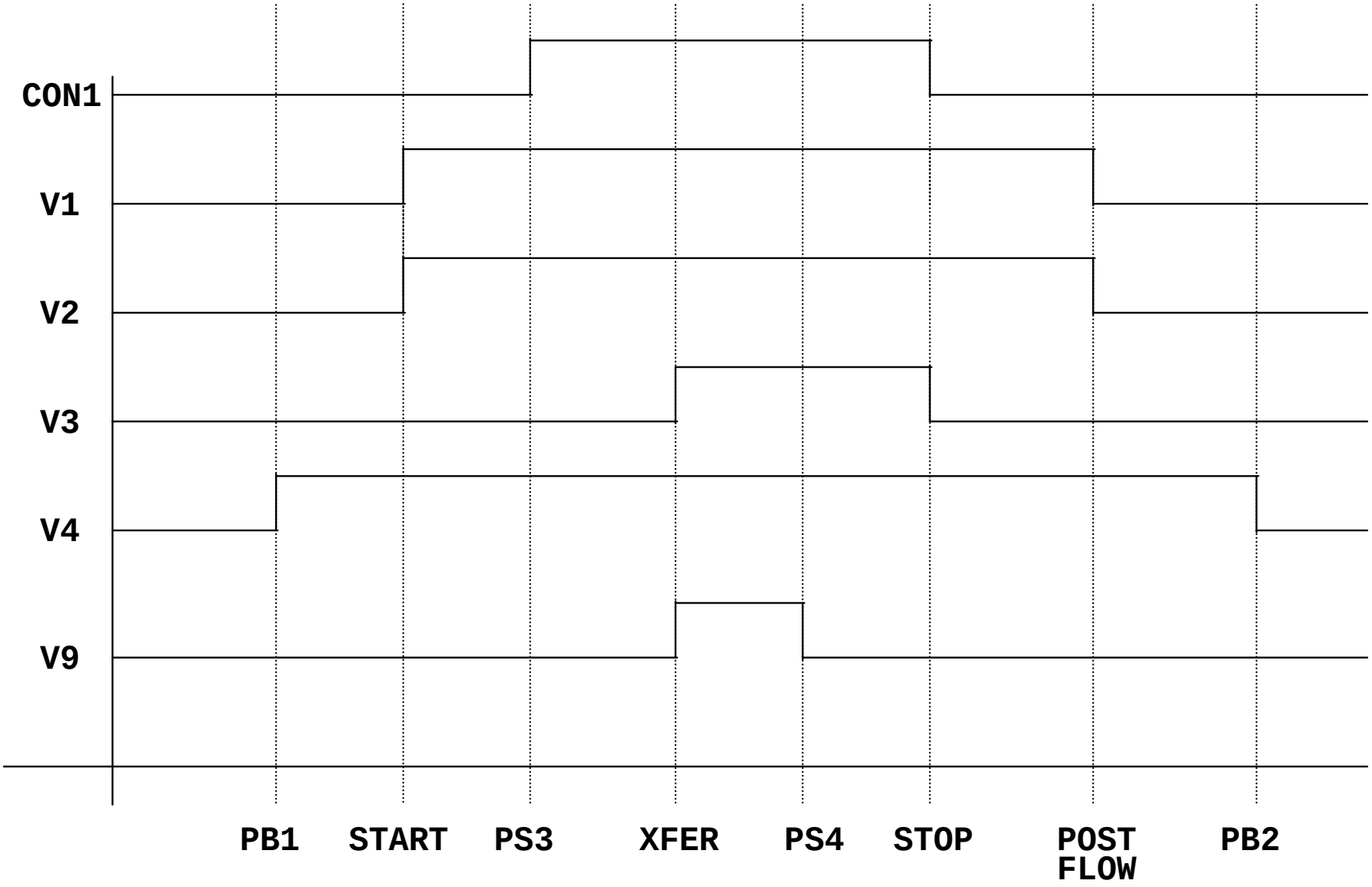
TIMING CHART MAX200



Max200 Timing Chart

Con1	Main Contactor
V1	Plasma Pre/Post flow solenoid valve
V2	Shield gas solenoid
V3	Plasma step gas solenoid valve
V4	Cap-On-Sense solenoid valve
V9	Plasma charging valve
PB1	Power On switch
PB2	Power Off switch
PS3	Plasma gas outlet pressure switch. N.O. switch that closes when the plasma gas pressure exceeds 3 psi.
PS4	Quick charge pressure switch. N.C. switch that opens when plasma gas reaches 26 psi.
Start	Plasma start signal from CNC
Stop	Plasma stop signal from CNC
Xfer	Arc Transfer
Post-Flow	1 second gas flow at end of cycle.

Note:

1. In test mode, V1, V2, and V3, are the only valves that are active.
2. When V1 becomes active after start, 10 to 15 psi will be registered at PG1.
3. The HV transformer is activated 2 seconds after the plasma start signal. It will stay active for 5 seconds or until the arc transfers to the work piece, which ever happens first.

Hypertherm

Appendix A

FILTERS

In this section:

HANKISON®
CENTRIFLEX®
Compressed Air Separator/Filter

DESIGNED FOR PERFORMANCE BUILT TO LAST

Efficient Separation and 3 Micron Filtration in One Compact Housing

SEPARATION—

The First Stage

A unique stainless steel separator core, using the principles of centrifugal force and impaction, is 99% efficient in removing particles 10 microns in size and larger.

The reusable cartridge type separator is completely removable for easy cleaning.

FILTRATION—

The Second Stage

A replacement filter sleeve, which fits over the separator core, assures absolute removal of solids and liquids 3 microns and larger in size.

Solids removal — finer filtration at less cost

The filter sleeve, constructed of an in-depth arrangement of glass fibers, has a high percentage of void spaces, allowing it to accumulate 3 to 4 times more particulates than coarser surface (pore) type filter element materials such as porous metal and plastic. Also the in-depth arrangement of fibers resists clogging due to gummy residues and sticky lacquers which are frequently present in compressed air systems and readily adhere to and foul surface type filters. This ability to accumulate large amounts of solid particles and resist clogging means that there is only a gradual increase in pressure drop across the filter, resulting in a long operating life and less operating cost.

Liquids removal — higher efficiencies from no flow to full flow

By using coalescence to force small droplets to form into larger droplets, the filter media continually collects all liquid droplets 3 microns in size and larger, as well as a portion of smaller droplets. This means that 99% of water droplets and 40% of oil aerosols are collected and discharged from the system.

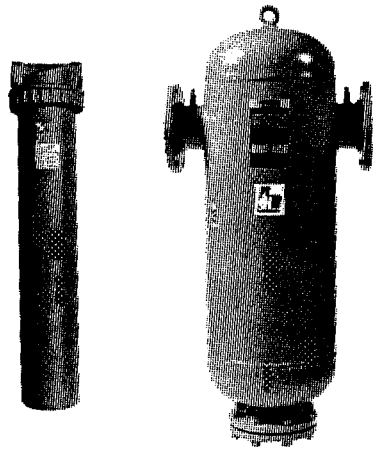
The combination of filter sleeve and separator core ensures high efficiency liquid separation over a full range of flows. There is no reduction in efficiency at less than rated flows, a common occurrence in purely centrifugal separators.

FEATURES:

- High efficiency separation — removes 99% of water droplets, 40% of oil aerosols.
- Combination of separator core and filter sleeve maintain high efficiency from no flow to full flow.
- Replaceable filter sleeve removes 100% of particles 3 microns and larger in size — while giving long sleeve life.

Housing design — features easy installation and maintenance

The in-line, inlet and outlet connection design reduces installation time and expense. Additional piping to maintain alignment is not required. Cartridge replacement is made easy by removable bowls for models C15 through C300 and by use of a convenient bottom access for models C400 and larger.



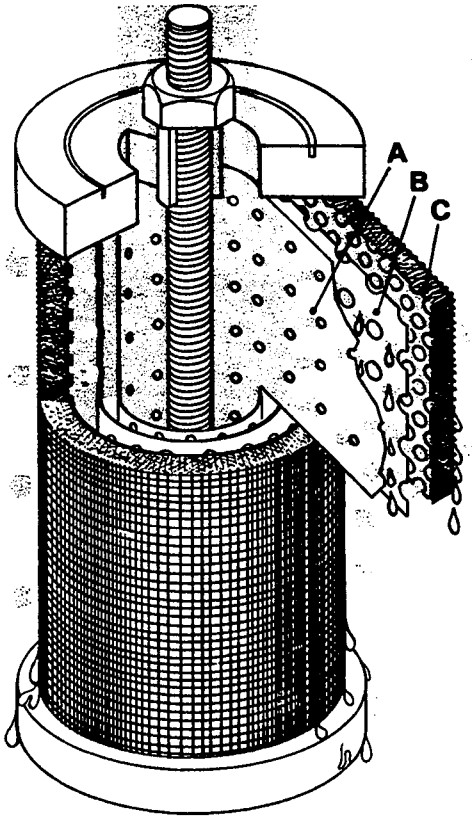
MODEL C150 MODEL C6600

OPERATION

Air enters the top of the Centriflex separator/filter and flows down through the center of the separator core and radially outward. The air is subjected to a strong centrifugal force as it passes through the separator core which is constructed of a pair of stainless steel perforated tubes. The orifices in the first tube (**A**) are staggered in relation to those in the second (**B**). This causes particles 10 microns and larger to continue in a straight course after leaving the inner tube, impacting and impinging on the inside of the outer tube where they form a film which drains to the bottom of the separator core.

The air then passes into the filter sleeve (**C**) which is composed of an in-depth bed of resin impregnated glass fibers. Solid particles (to 3 microns absolute) are captured and retained here. Liquid aerosols are coalesced on the glass fibers forming large droplets which move downward to the bottom of the cartridge where they drain by gravity into the filter housing and are removed from the air system.

This combination of separation and coalescence allows the Centriflex separator/filter to handle large inlet liquid loads (up to 25,000 ppm w/w) while removing 99% of water droplets and 40% of oil aerosols over a full range of flow conditions.



OPERATING CONDITIONS

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

EXAMPLE:

Choose a Centriflex® separator/filter to handle 705 scfm at 150 psig. From Table 1 pick a C600 with an air flow of 600 scfm @ 100 psig. Multiply 600 scfm by the correction factor 1.43 for 150 psig from Table 2 (600 x 1.43 = 858). A C600 has ample capacity for this requirement.

CAUTION:

Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

Pressure Drop:

Initial pressure drop (dry) is less than 1 psi. Increases in pressure drop above this point occur as the cartridge is loaded with solid contaminants. It is recommended that filter cartridge(s) be replaced when pressure drop exceeds 10 psi.

OPTIONS

Automatic Drains

Hankison drains automatically discharge liquids collected in the filter sump from the compressed air system. They are available with the drain mechanism mounted internally on smaller models or in their own housings for external mounting on larger models.

Differential Pressure Alarms

(Optional on models C15 thru C600; standard on models C1200 and larger.) The Hankison differential pressure alarm signals both audibly and visually when a 10 psi differential pressure has been reached, indicating the need for cartridge replacement.

Stainless Steel Cartridges

Cartridges may be ordered with stainless steel materials for use in systems where corrosive fumes are present in the compressed air system.

TABLE 1
Maximum Air Flow (scfm*) @ 100 psig

MODEL	C15	C35	C55	C100	C150	C200	C300	C400	C600	C1200	C1800	C2400	C3000	C4800	C6600	C8400	C11400
FLOW	15	35	55	100	150	200	300	400	600	1200	1800	2400	3000	4800	6600	8400	11400

*Convert scfm to metric units as follows: 1 scfm = 1.736 m^3_n/h

TABLE 2
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

PHYSICAL DESCRIPTION

Model Number		Housing Type	Maximum Operating Pressure (psig)		Maximum Operating Temperature	Air Inlet/ Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge	
with Manual Drain	with Internal Auto Drain		with Manual Drain	with Internal Auto Drain					No.	Qty. Reqd.
C15-03F-8P	—	8 oz. polycarbonate (2)	150	—	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5/8	0734-1	1
C15-03F-16P	C15-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0734-1	1
C15-03F-16M	C15-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0734-1	1
C15-04F-16P	C15-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0734-1	1
C15-04F-16M	C15-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0734-1	1
C35-03F-16P	C35-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0734-2	1
C35-03F-16M	C35-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0734-2	1
C35-04F-16P	C35-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0734-2	1
C35-04F-16M	C35-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0734-2	1
C55-08F-48	C55-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0734-3	1
C100-08F-48	C100-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0734-3	1
C150-12F-100	(1)	100 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 23 1/4	13 1/4	0734-4	1
C200-12F-205	(1)	205 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0734-5	1
C300-12F-205	(1)	205 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0734-6	1
C400-16M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	2" NPTM (4)	10 1/4 x 40 7/8	36	0734-7	1
C600-24M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	3" NPTM (4)	10 1/4 x 40 7/8	37	0734-7	1
C1200-24M-8L	(1)	8" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 x 48	86	0734-7	2
C1800-24M-10L	(1)	10" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 1/4 x 49	131	0734-7	3
C2400-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	179	0734-7	4
C3000-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4.	182	0734-7	5
C4800-6FL-16L	(1)	16" pressure vessel	225 (3)	—	120°F	6" flange (5)	24 x 54 5/8	271	0734-7	8
C6600-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	518	0734-7	11
C8400-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	527	0734-7	14
C11400-8FL-24L	(1)	24" pressure vessel	225 (3)	—	120°F	8" flange (5)	33 x 69 1/8	709	0734-7	19

(1) Drain port is provided. Use externally mounted Hankison® automatic drain. For models C150 thru C600 use a model 505 Trip-L-Trap®. For models C1200 and larger use a model 506 Trip-L-Trap. Models C400 and C600 may also be supplied with an internal drain.
(2) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.
(3) Units with higher maximum working pressures are available. Models C1200 and larger are ASME code constructed and stamped.
(4) Flanges and couplings are available.
(5) Optional flange sizes are available.

HANKISON DIVISION OF HANSEN INC.
CANONSBURG, PA 15317 U.S.A. TEL.: (412) 745-1555
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HANKISON®
AEROLESCER®
Coalescing Type Oil Removal Filters

99.999+% efficient in removing oil aerosols from compressed air lines.

Why remove oil?

Compressor oil downstream — it can contaminate the end product, decrease the efficiency of the production process by ruining paint jobs, gumming up air tools, motors, etc., or clog the tiny orifices in instruments or fluid logic components. Oil from a lubricated compressor is subjected to high temperatures during the compression cycle. This alters its characteristics so that it does not adequately lubricate downstream pneumatic components. It's best to take this oil out of the system and add the proper lubricant at the point of use.

Are special filters required to remove oil?

In a typical 90 psig air system 72% by weight of the oil aerosols present are less than 5 microns in size. 50% are below 1 micron in size. Droplets of this size blow right through a mechanical separator. Air line filters (particulate filters e.g. a 5 micron filter) can't trap the bulk of the aerosols either. To adequately remove oil, a special filter is required. The Hankison Aerolescer filter has been designed to remove oil by means of coalescence.

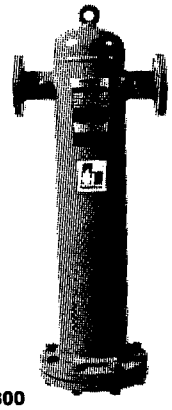
The result — an oil free compressed air system

The Hankison Aerolescer filter, when used within its rated design conditions, will eliminate the oil aerosols contained in a compressed air stream. Exhaustive tests verify a liquid oil removal efficiency of 99.999+%. In most instances, this means that the filtered air will contain less than .1 ppm of oil by weight. It assures virtually oil free air without the expense and maintenance headaches of non-lubricated compressors.

Features:

- Unique continuously stabilized filter media plus outer foam sleeve ensures 99.999+% efficiency for the life of the cartridge
- Removes: 100% of particles .025 micron and larger in size; some particles as small as .01 micron
- Cartridge replacement made easy by removable bowls or convenient bottom flange opening
- Rugged thru-bolt cartridge construction

MODELS from 10 SCFM to 6000 SCFM



MODEL A300

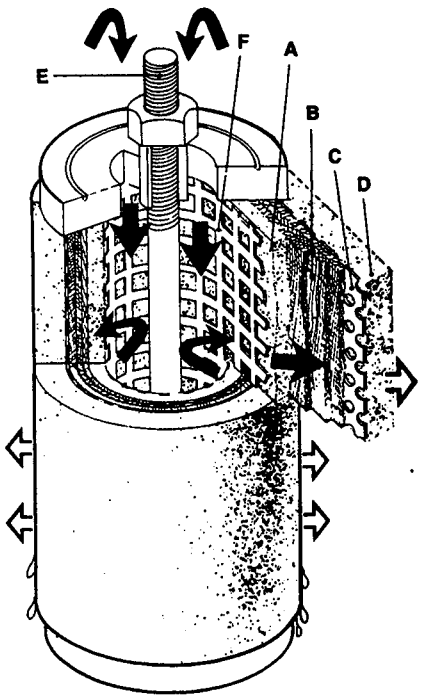
MODEL A900

The Patented* AEROLESCER Cartridge — designed for 99.999+% efficiency and long life

OPERATION

Oil aerosols moving through the filtering media (B), a maze of submicronic glass fibers with specific densities and diameters, are concentrated and coalesced into large droplets. High efficiency is achieved by stabilizing the filtering media between a rigid perforated cylinder (C) and an inner foam sleeve (A), which compensates for fluctuating flow rate and aerosol concentration. This design assures uniform distribution of oil aerosols which prevents liquid pocketing, fiber clotting, and subsequent air channelling. The coalesced oil droplets are collected by the outer foam sleeve (D). Having an enormous non-absorbing surface area, this sleeve allows oil droplets to drain to the bottom of the sleeve and then drop to the bottom of the housing for removal from the air system. When removing oil the life of the cartridge is indefinite.** The cartridge continuously coalesces and separates oil aerosols from your system.

Thru bolt construction (E) assures structural strength and prevents liquid bypassing of the filter media. There is no reliance on adhesives to hold the unit together. An inside support (F) offers positive protection in case flow is accidentally reversed through the cartridge.



*U.S. Patent No. 3,802,160

**Excessive solid matter accumulation will limit life. Prefilters are available to prolong life. Request Bulletin 3100 covering HANKISON 3100 Series Air Line Filters.

Operating Conditions

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

EXAMPLE:

Choose an Aerolescer filter to handle 705 scfm at 150 psig. From Table 1 pick an A500 with an air flow of 500 scfm @ 100 psig. Multiply 500 scfm by the correction factor 1.43 for 150 psig from Table 2 (500 x 1.43 = 715). An A500 has ample capacity for this requirement.

CAUTION:

Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

Pressure Drop:

Initial pressure drop (dry) is less than 1 psi. As the cartridge collects and coalesces liquid droplets a working pressure drop of 3 to 5 psi will develop. Increases in pressure drop above this point occur as the cartridge is loaded with solid contaminants. It is recommended that filter cartridge(s) be replaced when pressure drop exceeds 10 psi.

OPTIONS

Automatic Drains

Hankison drains automatically discharge liquids collected in the filter sump from the compressed air system. They are available with the drain mechanism mounted internally on smaller models or in their own housings for external mounting on larger models.

Differential Pressure Alarms

(Optional on models A10 thru A320; standard on models A500 and larger.) The Hankison differential pressure alarm signals both audibly and visually when a 10 psi differential pressure has been reached, indicating the need for cartridge replacement.

Stainless Steel Cartridges

Cartridges may be ordered with stainless steel materials for use in systems where corrosive fumes are present in the compressed air system.

TABLE 1
Maximum Air Flow (scfm*) @ 100 psig

MODEL	A10	A20	A50	A100	A200	A250	A300	A320	A500	A600	A900	A1300	A1600	A2500	A3500	A4400	A6000
FLOW	10	20	50	100	200	250	300	320	500	632	948	1264	1580	2528	3476	4424	6004

*Convert scfm to metric units as follows: 1 scfm = 1.736m^3_n/h

TABLE 2
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

PHYSICAL DESCRIPTION

Model Number		Housing Type	Maximum Operating Pressure (psig)		Maximum Operating Temperature	Air Inlet/ Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge	
with Manual Drain	with Internal Auto Drain		with Manual Drain	with Internal Auto Drain					No.	Qty. Reqd.
A10-03F-8P		8 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5/8	0713-2	1
A10-03F-16P	A10-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0713-2	1
A10-03F-16M	A10-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0713-2	1
A10-04F-16P	A10-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0713-2	1
A10-04F-16M	A10-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0713-2	1
A20-03F-16P	A20-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0713-3	1
A20-03F-16M	A20-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0713-3	1
A20-04F-16P	A20-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0713-3	1
A20-04F-16M	A20-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0713-3	1
A50-08F-48	A50-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0713-4	1
A100-08F-100	(1)	100 oz. metal	300		120°F	1" NPTF	4 9/16 x 23 1/4	13 1/4	0713-5	1
A200-12F-205	(1)	205 oz. metal	300		120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0713-6	1
A300-12F-381	(1)	381 oz. metal	300		120°F	1 1/2" NPTF	5 1/4 x 36 3/8	29 1/4	0713-7	1
A250-16M-5L	(1)	5" pressure vessel	300 (3)		120°F	2" NPTM (4)	10 1/4 x 40 7/8	36	0713-12	1
A320-16M-5L	(1)	5" pressure vessel	300 (3)		120°F	2" NPTM (4)	10 1/4 x 40 7/8	37	0713-11	1
A500-24M-8L	(1)	8" pressure vessel	225 (3)		120°F	3" NPTM (4)	16 x 48	86	0713-12	2
A600-24M-8L	(1)	8" pressure vessel	225 (3)		120°F	3" NPTM (4)	16 x 48	86	0713-11	2
A900-24M-10L	(1)	10" pressure vessel	225 (3)		120°F	3" NPTM (4)	16 1/4 x 49	131	0713-11	3
A1300-4FL-12L	(1)	12" pressure vessel	225 (3)		120°F	4" flange (5)	20 x 52 1/4	179	0713-11	4
A1600-4FL-12L	(1)	12" pressure vessel	225 (3)		120°F	4" flange (5)	20 x 52 1/4	182	0713-11	5
A2500-6FL-16L	(1)	16" pressure vessel	225 (3)		120°F	6" flange (5)	24 x 54 5/8	271	0713-11	8
A3500-6FL-20L	(1)	20" pressure vessel	225 (3)		120°F	6" flange (5)	28 x 62 9/16	518	0713-11	11
A4400-6FL-20L	(1)	20" pressure vessel	225 (3)		120°F	6" flange (5)	28 x 62 9/16	527	0713-11	14
A6000-8FL-24L	(1)	24" pressure vessel	225 (3)		120°F	8" flange (5)	33 x 69 1/8	709	0713-11	19

(1) Drain port is provided. Use externally mounted Hankison automatic drain. For models A100 thru A1600 use a model 504 Snap-Trap® (175 psig MWP); for models A2500 thru A6000 use a model 505 Trip-L-Trap®. Models A250 and A320 may also be supplied with an internal drain.
(2) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.
(3) Units with higher maximum working pressures are available. Models A500 and larger are ASME code constructed and stamped.
(4) Flanges and couplings are available.
(5) Optional flange sizes are available.

HANKISON®
HYPERSORB®
Activated Carbon Adsorbent Filters

Eliminates undesirable oily smell/taste from compressed air. Removes oil vapor. Ends product contamination.

The final step in oil free air.

The Hypersorb filter is a final stage filter which adsorbs oil vapor (gaseous oil) present in compressed air. The Hypersorb filter will also remove various other gaseous hydrocarbons normally adsorbable by activated carbon. It is designed to be used after a coalescing filter (Hankison Aerolescer®) which removes liquid oil aerosols. The liquid oil aerosols must be removed from the air stream before the air enters the Hypersorb in order to prevent saturating of the activated carbon and premature reduction of the adsorptive capacity of the filter.

How oil free is air that has been filtered by an Aerolescer/Hypersorb Filter System?

At rated flow conditions and reasonable filtration temperatures (50°F to 100°F), the oil concentration in your air system, after being filtered, will be less than .01 ppm w/w. This means that the amount of oil left in your system is lower than the saturation level of oil vapor in atmospheric air (expanded condition) so that even a large drop in temperature downstream will not cause oil vapor to condense and foul your product.

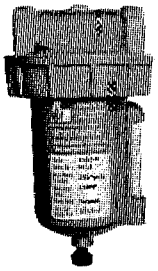
These low concentrations of oil vapor are well below the level where they can be detected by smell or taste.

Designed for long life.

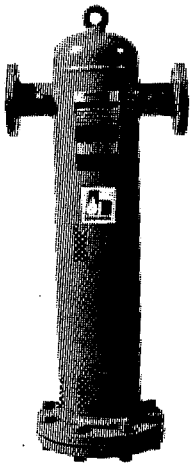
In contrast to most carbon filters that contain only a bed of carbon particles, the Hypersorb filter contains both a bed of finely divided activated carbon particles and a secondary section of multi-layered fibers to which microfine activated carbon particles are bonded. It is designed to operate for a minimum of 1500 hours at rated capacity without requiring replacement of the cartridge.

FEATURES:

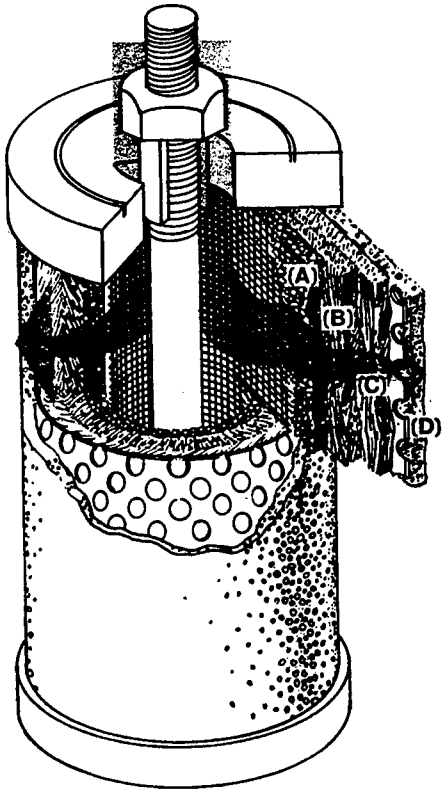
- Protects end processes from gaseous oil contamination and rids compressed air exhausted into worker environments of offensive oily smell
- Removes hydrocarbons for analytical instrument use
- Fine filter media traps 100% of any carbon dust or other particles as small as .025 micron — Ideal as an afterfilter for desiccant dryers
- Cartridge replacement made easy by removable bowls or convenient bottom access.



MODEL H10



MODEL H600



Elimination of carbon dust carryover.

Layers of microglass fibers prevent any possible carryover of carbon dust or other fine particulate matter and subsequent product contamination. Also, an outer porous foam sleeve provides protection against filter fiber migration.

Rugged construction resists vibration, prevents in-line failure.

A thru bolt and rigid metal perforated cylinder provide solid cartridge design that does **not** rely on an adhesive for structural strength. This minimizes the possibility of the filter media being by-passed.

OPERATION

Compressed air which has been treated by an air dryer and filtered to remove liquid contaminants enters the inner core of the Hypersorb filter cartridge and moves radially outward. It first passes through a bed of finely divided activated carbon particles (**A**) where 95% of the oil vapor contained in the air is adsorbed. The air then moves through layers of fibers (**B**) to which microfine activated carbon particles are bonded by a patented process and the remaining oil vapor is adsorbed. The virtually oil free air then continues through layers of microglass fibers (**C**) where all solid particles .025 microns in size and larger are captured. This prevents any possible carry over of carbon dust or other fine particulate matter. Finally the air exits through a porous foam outer sleeve (**D**) which provides protection against fiber migration.

OPERATING CONDITIONS

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

EXAMPLE:
Choose a Hypersorb filter to handle 705 scfm at 150 psig. From Table 1 pick an H500 with an air flow of 500 scfm @ 100 psig. Multiply 500 scfm by the correction factor 1.43 for 150 psig from Table 2 (500 x 1.43 = 715). An H500 has ample capacity for this requirement.

CAUTION:
Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

Pressure Drop:

The Hypersorb® filter has an initial nominal pressure drop of 1 psi (0.07 bar) which should not change appreciably during the life of the cartridge.

Cartridge Replacement:

Periodic checks of filtered air should be conducted. A detectable odor indicates that the cartridge should be replaced. The Hypersorb is designed to give a minimum life of 1500 hours of continuous operation at rated capacity.

OPTIONS

Stainless Steel Cartridges
Cartridges may be ordered with all stainless steel materials for use where harmful vapors are present in the compressed air system. To order, add -S to unit or cartridge model number.

TABLE 1
Maximum Air Flow (scfm*) @ 100 psig

MODEL	H10	H20	H50	H100	H200	H250	H300	H320	H500	H600	H900	H1300	H1600	H2500	H3500	H4400	H6000
FLOW	10	20	50	100	200	250	300	320	500	632	948	1264	1580	2528	3476	4424	6004

*Convert scfm to metric units as follows: 1 scfm = 1.736 m^3_n/h

TABLE 2
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

PHYSICAL DESCRIPTION

Model Number	Housing Type	Maximum Operating Pressure (psig)	Maximum Operating Temperature	Air Inlet/ Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge No.	Replacement Filter Cartridge Qty. Reqd.
H10-03F-8P	8 oz. polycarbonate (1)	150	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5/8	0715-2	1
H10-03F-16P	16 oz. polycarbonate (1)	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0715-2	1
H10-03F-16M	16 oz. metal	300	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0715-2	1
H10-04F-16P	16 oz. polycarbonate (1)	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0715-2	1
H10-04F-16M	16 oz. metal	300	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0715-2	1
H20-03F-16P	16 oz. polycarbonate (1)	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0715-3	1
H20-03F-16M	16 oz. metal	300	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0715-3	1
H20-04F-16P	16 oz. polycarbonate (1)	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0715-3	1
H20-04F-16M	16 oz. metal	300	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0715-3	1
H50-08F-48	48 oz. metal	300	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0715-4	1
H100-08F-100	100 oz. metal	300	120°F	1" NPTF	4 9/16 x 23 1/4	13 1/4	0715-5	1
H200-12F-205	205 oz. metal	300	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0715-6	1
H300-12F-381	381 oz. metal	300	120°F	1 1/2" NPTF	5 1/4 x 36 3/8	29 1/4	0715-7	1
H250-16M-5L	5" pressure vessel	300 (2)	120°F	2" NPTM (3)	10 1/4 x 40 7/8	36	0715-12	1
H320-16M-5L	5" pressure vessel	300 (2)	120°F	2" NPTM (3)	10 1/4 x 40 7/8	37	0715-11	1
H500-24M-8L	8" pressure vessel	225 (2)	120°F	3" NPTM (3)	16 x 48	86	0715-12	2
H600-24M-8L	8" pressure vessel	225 (2)	120°F	3" NPTM (3)	16 x 48	86	0715-11	2
H900-24M-10L	10" pressure vessel	225 (2)	120°F	3" NPTM (3)	16 1/4 x 49	131	0715-11	3
H1300-4FL-12L	12" pressure vessel	225 (2)	120°F	4" flange (4)	20 x 52 1/4	179	0715-11	4
H1600-4FL-12L	12" pressure vessel	225 (2)	120°F	4" flange (4)	20 x 52 1/4	182	0715-11	5
H2500-6FL-16L	16" pressure vessel	225 (2)	120°F	6" flange (4)	24 x 54 5/8	271	0715-11	8
H3500-6FL-20L	20" pressure vessel	225 (2)	120°F	6" flange (4)	28 x 62 9/16	518	0715-11	11
H4400-6FL-20L	20" pressure vessel	225 (2)	120°F	6" flange (4)	28 x 62 9/16	527	0715-11	14
H6000-8FL-24L	24" pressure vessel	225 (2)	120°F	8" flange (4)	33 x 69 1/8	709	0715-11	19

(1) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.
(2) Units with higher maximum working pressures are available. Models H500 and larger are ASME code constructed and stamped.
(3) Flanges and couplings are available.
(4) Optional flange sizes are available.

HANKISON DIVISION OF HANSEN INC.
CANONSBURG, PA 15317 U.S.A. TEL.: (412) 745-1555
PRICE AND ORDERING INFORMATION FROM

Energy Machinery
10 RESERVOIR PARK DRIVE
P.O. BOX 363
ROCKLAND, MA 02370

HANKISON®
1500-7

COMPRESSED AIR AND GAS INSTITUTE CAGI
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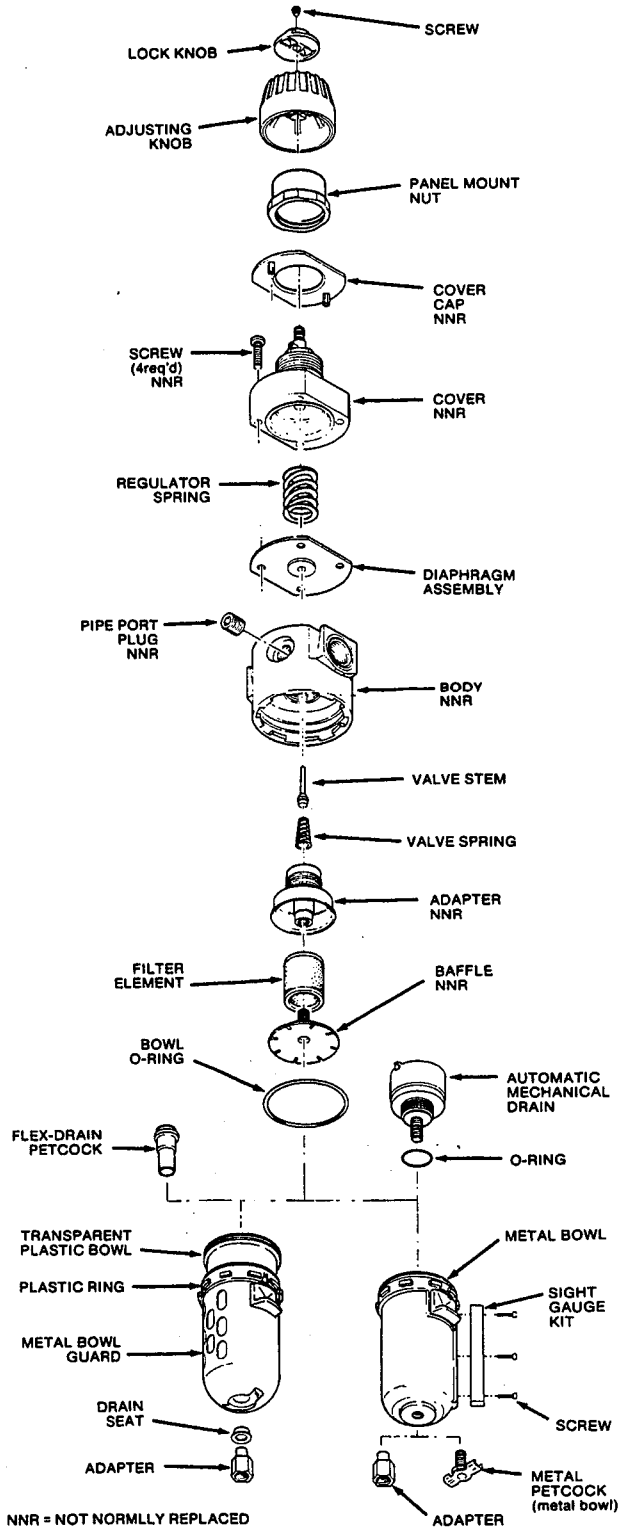
WILKERSON®
CORPORATION • ENGLEWOOD, CO 80150

PRECISION AIR PRESSURE REGULATOR TYPE PC6 FILTER/REGULATOR



INSTALLATION

Install the Filter/Regulator as close as possible to the application. The inlet port is marked with an arrow cast into the body to indicate the direction of flow. Gauge ports (¼") are provided in either side of the body for installation of a gauge or use as an additional outlet port. Plug unused port(s). System piping should be same size as regulator porting. In systems with a cyclic demand, the regulator should be located upstream of cycling device.

OPERATION

Maximum pressure and temperature ratings are: for transparent plastic bowls, 150 psig (10 bar) and 125°F (52°C); and for metal bowls, 250 psig (17 bar) and 175 °F (79°C).

Before turning on the supply air pressure, turn the adjusting knob counterclockwise until there is no load on the regulating spring. Turn on the supply air pressure and then turn the adjusting knob clockwise until the desired secondary pressure is reached. To avoid minor readjustment after making a change in pressure setting, always approach the desired pressure from a lower pressure. When reducing from a higher to a lower setting, first reduce to some pressure less than that desired and then increase to the desired pressure.

CAUTION

EXCEPT as otherwise specified by manufacturer, this product is specifically designed for compressed air service, and use with any other fluid (liquid or gas) is a misapplication. For example, use with or injection of certain hazardous liquids or gases in the system (such as alcohol or liquid petroleum gas) could be harmful to the unit or result in a combustible condition or hazardous external leakage. Manufacturer's warranties are void in the event of misapplication and manufacturer assumes no responsibility for any resulting loss.

The relief flow capacity of relieving type regulators is limited. Under some operating conditions, the secondary (outlet) pressure could increase above the initial setting. If over-pressure conditions could cause malfunction or failure of downstream equipment, additional external pressure relief devices of suitable capacity must be installed.

Before using with fluids other than air for non-industrial applications or for life support systems, consult Wilkerson Corporation for approval.

SEE REVERSE SIDE FOR LIST OF MATERIALS
UNSUITABLE FOR USE WITH POLYCARBONATE BOWLS

MAINTENANCE

1. The regulator can be disassembled for servicing without removal from line.
2. DEPRESSURIZE UNIT BEFORE REMOVING GUARD AND/OR BOWL.
3. TO DISASSEMBLE: shut off air to unit and vent air line on both sides of unit. Turn adjusting screw counterclockwise to relieve spring compression. Remove knob, cover cap, screws, cover, and spring. Diaphragm assembly can now be removed.
4. To remove valve from bottom of unit, remove bowl. Remove baffle and filter element exposing hex nut on adapter assembly. Remove adapter assembly, valve and spring.
5. If it is a plastic bowl unit, inspect daily to detect crazing, cracking, damage, or other deterioration. Immediately replace any crazed, cracked, damaged, or deteriorated bowl with a metal bowl or a new plastic bowl and metal bowl guard.
6. a. If unit has a rigid (felt) filter element, clean periodically by removing from filter, tapping on surface, and blowing off with air blow gun.

   1b. If unit has soft cloth element, replace with a new one at least every six months, or sooner if it looks dirty or causes excessive pressure drop (10 psi or more at rated flow).

(continued on reverse side)

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7. a. If unit is equipped with a manual petcock, drain bowl at least once per work shift.
   b. If unit is equipped with a float in the bowl, clean the bowl each time the element is cleaned or changed by turning the bowl upside down and tapping onto tabletop. Blow clean with blow gun.
8. If bowl is crazed, cracked, or otherwise damaged or deteriorated, replace bowl and use manufacturer's approved bowl seal.
9. IF UNIT WILL NOT REGULATE TO REQUIRED PRESSURE, OR IF PRESSURE BECOMES EXCESSIVE follow instructions (see 4.) for removal of valve. Remove valve and spring. Clean and check valve stem and valve seat for wear or damage and replace if required.
10. Before placing unit is service, make sure that bowl and bowl guard are reinstalled and securely locked in place.

REPAIR KITS AND REPLACEMENT PARTS

SELF-RELIEVING REPAIR KIT (includes self-relieving diaphragm assy, valve stem, valve spring, filter element, and bowl o-ring)	**PRP-95-025**
Regulating Springs:	
0-30 psi	**RRP-95-916**
0-50 psi	**RRP-95-222**
0-120 psi	**RRP-95-224**
Self-Relieving Diaphragm Kit	**PRP-95-960**
Valve Assembly (valve stem, valve spring)	**PRP-95-959**
Filter Element Assembly (includes element and bowl o-ring)	**FRP-95-034**
Transparent Bowl Assemblies:	
with flexible drain	**FRP-95-017**
with bowl guard, Auto Drain	**FRP-95-015**
with bowl guard, flexible drain	**FRP-95-014**
Bowl O-Ring Kit (10 per kit)	**GRP-95-009**
Bowl Guard Kit	**GRP-95-013**
Metal Bowl Assemblies:	
with metal petcock	**FRP-95-178**
with Sight Gauge, metal petcock (for units with "G" in model no.)	**GRP-95-133**
Drains:	
Auto Drain Kit (includes o-ring, spacer, nut)	**GRP-95-714**
Brass Petcock (for metal bowls)	**GRP-95-182**
Flex Drain Kit (for plastic bowls)	**FRP-95-610**
Adjusting Knob Kit	**RRP-95-007**

NOTE: All bowl kits include bowl o-ring

ACCESSORIES

Wall Mounting Bracket with Panel Mount Nut	**GPA-95-011**
Wall Mounting Bracket	**GPA-95-012**
Panel Mount Nut	**GPA-95-032**
Tamper Resistant Kit	**RPA-95-006**
Viton Valve Assembly	**PPA-95-067**
Gauges:	
0-30 psig	**PPA-95-107**
0-60 psig	**PPA-95-106**
0-120 psig	**PPA-95-108**

WARNING: IF YOUR UNIT HAS A PLASTIC BOWL

1. **DO NOT** use plastic bowl units without a metal bowl guard installed. Plastic bowl units are sold only with metal bowl guards to minimize the danger of flying fragments in the event of bowl failure.
2. **DO NOT** install the unit where it will be subjected to temperatures higher than 125°F (51 ,7°C).
3. **DO NOT** install the unit where it will be subjected to pressure higher than 150 psig (10,3 bar).
4. **CAUTION:**
   Certain compressor oils, household cleaners, chemicals, solvents, paints and fumes will attack plastic bowls and can cause plastic-bowl failure. See manufacturer's list below. Do not use near these materials.
5. **WHEN BOWL** becomes dirty, replace bowl or wipe only with a clean, dry cloth.
6. **DO NOT** install on a compressed air line where the compressor is lubricated with, or the air contains, a material that will attack plastic bowls.
7. **DO** inspect plastic bowls daily to detect crazing, cracking damage, or other deterioration. Immediately replace any crazed, cracked, damaged, or deteriorated bowl with a metal bowl or a new plastic bowl and metal bowl guard.

WARNING: IF YOUR UNIT HAS A METAL BOWL

1. **DO NOT** install unit where it will be subjected to temperatures higher than 175°(80°C).
2. **DO NOT** install the unit where it will be subjected to pressure higher than 250 psi (17 bar).

SOME OF THE MATERIALS THAT WILL ATTACK POLYCARBONATE PLASTIC BOWLS

Acetaldehyde	Chlorobenzene	Methylene chloride
Acetic acid (conc.)	Chloroform	Methylene salicylate
Acetone	Cresol	Milk of lime (CaOH)
Acrylonitrile	Cyclohexanol	Nitric acid (conc.)
Ammonia	Cyclohexanone	Nitrobenzene
Ammonium fluoride	Cyclohexene	Nitrocellulose lacquer
Ammonium hydroxide	Dimethyl formamide	Phenol
Ammonium sulfide	Dioxane	Phosphorous hydroxy chloride
Anaerobic adhesives & sealants	Ethane tetrachloride	Phosphorous trichloride
	Ethyl acetate	Propionic acid
Antifreeze	Ethyl ether	Pyridine
Benzene	Ethylamine	Sodium hydroxide
Benzoic acid	Ethylene chlorohydrin	Sodium sulfide
Benzyl alcohol	Ethlene dichloride	Styrene
Brake fluids	Ethlene glycol	Sulfuric acid (conc.)
Bromobenzene	Formic acid (conc.)	Sulphural chloride
Butyric acid	Freon (refrigerant & propellant)	Tetrahydronaphthalene
Carbolic acid		Thiophene
Carbon disulfide	Gasoline (high aromatic)	Toluene
Carbon tetrachloride	Hydrazine	Turpentine
Caustic potash solution	Hydrochloric acid (conc.)	Xylene
Caustic soda solution	Lacquer thinner	Perchlorethylene and others
	Methyl alcohol	

TRADE-NAMES OF SOME COMPRESSOR OILS, RUBBER COMPOUNDS AND OTHER MATERIALS THAT WILL ATTACK POLYCARBONATE PLASTIC BOWLS

Atlas "Perma-Guard"	National Compound #N11
Buna N	"Nylock" VC-3
Cellulube #150 and #220	Parco #1306 Neoprene
Crylex #5 cement	* Permabond 910
* Eastman 910	Petron PD287
Garlock #98403 (polyurethane)	Prestone
Haskel #568-023	Pydraul AC
Hilgard Co.'s hil phene	Sears Regular Motor Oil
Houghton & Co. oil #1120, #1130 and #1055	Sinclair oil "Lily White"
Houosafe 1000	Stauffer Chemical FYROUEL #150
Kano Kroil	Stillman #SR 269-75 (polyurethane)
Keystone penetrating oil #2	Stillman #SR 513-70 (neoprene)
* Loctite 271	Tannergas
* Loctite 290	Telar
* Loctite 601	Tenneco anderol #495 and #500 oils
* Loctite Teflon-Sealant	Titon
Marvel Mystery Oil	* Vibra-tite
Minn. Rubber 366Y	Zerex

* When in raw liquid form

WE CANNOT POSSIBLY LIST ALL HARMFUL SUBSTANCES. SO CHECK WITH A MOBAY CHEMICAL OR GENERAL ELECTRIC OFFICE FOR FURTHER INFORMATION ON POLYCARBONATE PLASTIC.

Hypertherm

Appendix B

PROPYLENE GLYCOL SAFETY DATA
BENZOTRIAZOLE SAFETY DATA

In this appendix:

MATERIAL SAFETY DATA SHEET

SECTION 1 -- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME	HYPERTHERM TORCH COOLANT

PRODUCT CODE	

ISSUE DATE	11-22-96

EMERGENCY TELEPHONE NUMBERS

MANUFACTURER	**HYPERTHERM**	**Transportation: (703) 527-3887 ***
STREET ADDRESS	**Etna Rd.**	*** For spill, leak, fire or transport accident emergencies.**
CITY, STATE, ZIP	**Hanover, NH 03755**	**Product Information: (603) 643-5638**

SECTION 2 -- COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS No.	% by wt.	EXPOSURE LIMITS OSHA PEL	ACGIH TLV	NIOSH REL
Propylene glycol	0057-55-6	< 50	None Established	None Established	None Established

SECTION 3 -- HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW	Can cause eye and skin irritation. Harmful if swallowed..

POTENTIAL HEALTH EFFECTS	
INGESTION	Can cause irritation, nausea, stomach distress, vomiting and diarrhea.
INHALATION	May cause mild irritation of nose, throat, and respiratory tract.
EYE CONTACT	Causes eye irritation.
SKIN CONTACT	Prolonged or repeated contact may cause skin irritation.

SECTION 4 -- FIRST AID MEASURES

INGESTION	DO NOT induce vomiting, but give one or two glasses of water to drink and get medical attention.
INHALATION	No specific treatment is necessary, since this material is not likely to be hazardous by inhalation.
EYE CONTACT	Immediately flush eye with cool running water for 15 minutes. If irritation persists, get medical attention.
SKIN CONTACT	Wash with soap and water. If irritation develops or persists, get medical attention.
NOTE TO PHYSICIAN	Treatment based on judgment of the physician in response to reactions of the patient.

SECTION 5 -- FIRE FIGHTING MEASURES

FLASH POINT / METHOD	None / N.A.	FLAMMABLE LIMITS	Not flammable or combustible
EXTINGUISHING MEDIA	If involved in a fire, use foam, carbon dioxide or dry chemical extinguisher. Water may cause frothing.		
SPECIAL FIRE FIGHTING PROCEDURES	None		
FIRE AND EXPLOSION HAZARDS	None		

SECTION 6 -- ACCIDENTAL RELEASE MEASURES

RESPONSE TO SPILLS	Small spills: Flush into a sanitary sewer. Mop up residue and rinse area thoroughly with water. Large spills: Dike or dam the spill. Pump into containers or soak up on inert absorbent.

SECTION 7 -- HANDLING AND STORAGE

HANDLING PRECAUTIONS	Keep container in upright position.
STORAGE PRECAUTIONS	Store in a cool dry place. Keep from freezing.

SECTION 8 -- EXPOSURE CONTROLS / PERSONAL PROTECTION

HYGIENIC PRACTICES	Normal procedures for good hygiene.
ENGINEERING CONTROLS	Good general ventilation should be sufficient to control airborne levels. Facilities using this product should be equipped with an eyewash station.

PERSONAL PROTECTIVE EQUIPMENT

X	**RESPIRATOR**	Recommended for prolonged use in confined areas with poor ventilation
X	**GOGGLES / FACE SHIELD**	Recommended; goggles should protect against chemical splash
	APRON	Not necessary
X	**GLOVES**	Recommended; PVC, Neoprene or Nitrile acceptable
	BOOTS	Not necessary

SECTION 9 -- PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Clear liquid	BOILING POINT	160 deg F
ODOR	Not Appreciable	FREEZING POINT	Not established
pH	4.6-5.0(100% concentrate)	VAPOR PRESSURE	Not applicable
SPECIFIC GRAVITY	1.0	VAPOR DENSITY	Not applicable
SOLUBILITY IN WATER	Complete	EVAPORATION RATE	Not determined

SECTION 10 -- STABILITY AND REACTIVITY

CHEMICAL STABILITY		**STABLE**	X		**UNSTABLE**	
CONDITIONS TO AVOID	No special precautions beyond standard safe industrial practices.					
INCOMPATIBILITY	Avoid contact with strong mineral acids and strong oxidizers, including chlorine bleach.					
HAZARDOUS PRODUCTS OF DECOMPOSITION	Carbon monoxide may be formed during combustion.					
POLYMERIZATION		**WILL NOT OCCUR**	X		**MAY OCCUR**	
CONDITIONS TO AVOID	Not applicable					

SECTION 11 -- TOXICOLOGICAL INFORMATION

CARCINOGENICITY

	THIS PRODUCT CONTAINS A KNOWN OR SUSPECTED CARCINOGEN
X	**THIS PRODUCT DOES NOT CONTAIN ANY KNOWN OR ANTICIPATED CARCINOGENS ACCORDING TO THE CRITERIA OF THE NTP ANNUAL REPORT ON CARCINOGENS AND OSHA 29 CFR 1910, Z**

OTHER EFFECTS

ACUTE	Not determined
CHRONIC	Not determined

SECTION 12 -- ECOLOGICAL INFORMATION

BIODEGRADABILITY		CONSIDERED BIODEGRADABLE	X		NOT BIODEGRADABLE	
BOD / COD VALUE	Not established					
ECOTOXICITY	No data available					

SECTION 13 -- DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD	Product that cannot be used according to the label must be disposed of as a hazardous waste at an approved hazardous waste management facility. Empty containers may be triple rinsed, then offered for recycling or reconditioning; or puncture and dispose of in a sanitary landfill.							
RCRA CLASSIFICATION	NO							
RECYCLE CONTAINER		YES	X		CODE	2 - HDPE		NO

SECTION 14 -- TRANSPORT INFORMATION

DOT CLASSIFICATION		HAZARDOUS			NOT HAZARDOUS	X
DESCRIPTION	Not applicable					

SECTION 15 -- REGULATORY INFORMATION

USA REGULATORY STATUS

	EPA REGISTERED (UNDER FIFRA)	
	FDA REGULATED	
	KOSHER	
	SARA TITLE III MATERIAL	
	USDA AUTHORIZED	

SECTION 16 -- OTHER INFORMATION

NFPA CLASSIFICATION

1	BLUE	HEALTH HAZARD
1	RED	FLAMMABILITY
0	YELLOW	REACTIVITY
--	WHITE	SPECIAL HAZARD

Information contained in this MSDS refers only to the specific material designated and does not relate to any process or use involving other materials. This information is based on data believed to be reliable, and the Product is intended to be used in a manner that is customary and reasonably foreseeable. Since actual use and handling are beyond our control, no warranty, express or implied, is made and no liability is assumed by Hypertherm in connection with the use of this information.

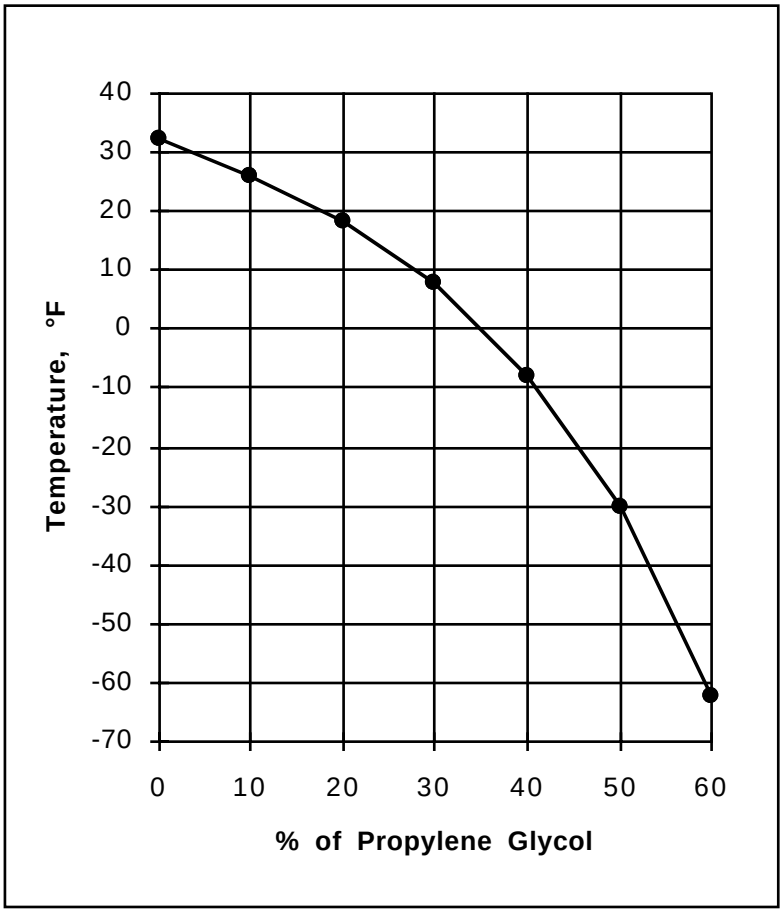

Figure b-1 Freezing Point of Propylene Glycol Solution

MATERIAL SAFETY DATA SHEET COBRATEC™ 99 Powder

SECTION I

MANUFACTURER:	PMC SPECIALTIES GROUP, INC.
ADDRESS:	501 Murray Road Cincinnati, OH 45217
EMERGENCY TELEPHONE:	(513) 242-3300
FOR TRANSPORTATION EMERGENCY:	(800) 424-9300
CHEMICAL NAME AND SYNONYMS:	1-H Benzotriazole, Benzotriazole
TRADE NAMES AND SYNONYMS:	COBRATEC® 99 Powder
CHEMICAL FAMILY:	Triazole
FORMULA:	$C_6H_5N_3$
DOT SHIPPING DESCRIPTION:	Not Regulated (Benzotriazole)
PRODUCT NUMBER:	X18BT5585

NFPA BASED RATINGS: Health: 1, Flammability: 1, Reactivity: 0
HMIS RATINGS: Health: 2, Flammability: 0, Reactivity: 0, PPE: E
WHMIS CLASSIFICATION: D-2-(B)

SECTION II INGREDIENTS

Material	CAS No.	Wt. %	Exposure Limits
Benzotriazole	95-14-7	>99	None Established

SECTION III PHYSICAL DATA

BOILING POINT:	>350° C
FREEZING POINT:	94-99° C
SPECIFIC GRAVITY:	1.36 (solid)
VAPOR PRESSURE AT 20° C:	0.04 mm Hg
VAPOR DENSITY (air=1):	4.1 (calculated)
SOLUBILITY IN WATER % BY WT at 20° C:	2.0
% VOLATILES BY VOLUME:	None
EVAPORATION RATE (Butyl Acetate = 1):	Non-volatile
APPEARANCE AND ODOR:	Off white powder. Slight characteristic odor.

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:	340° F. (CC)
AUTOIGNITION TEMPERATURE:	Not Available
FLAMMABLE LIMITS IN AIR:	LOWER: Dust MEC. 0.03 oz/(cu. ft.)
	UPPER: Not Available

EXTINGUISHING MEDIA: Carbon Dioxide, Dry Chemical, Foam

SPECIAL FIRE FIGHTING PROCEDURES: Full protective equipment including self-contained breathing apparatus should be used. Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat. During emergency conditions, overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Get medical attention.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Airborne dust is rated a severe explosion hazard at a minimum concentration of 0.03 ounce per cubic feet (30 grams per cubic meter).

SECTION V HEALTH HAZARD DATA

OSHA AIR CONTAMINANTS: Due to its dusting nature during handling, exposure to dust must comply with OSHA's particulate not otherwise regulated limits for total and respirable dust.

EFFECTS OF OVEREXPOSURE: Contact with the eyes is likely to cause severe irritation. Detailed information about the effects of overexposure in the human being is unavailable. Experience thus far has not provided any example of obvious overexposure with resultant symptoms. Animal studies have indicated an effect on the central nervous system. An NCI bioassay showed no convincing evidence of carcinogenicity (NCI-CG-TR-88). Bacterial mutagenicity data exists. Experts consider the data inconclusive. (Environmental Mutagenesis, Vol. 7, Suppl. 5: 1-248 (1985) and references in RTECS #DM1225000).

EMERGENCY AND FIRST AID PROCEDURES: IF INHALED: If affected, remove from exposure. Restore breathing. Keep warm and quiet. IF ON SKIN: Wash affected area thoroughly with soap and water. IF IN EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention. IF SWALLOWED: Never give anything by mouth to an unconscious person. Give several glasses of water. If vomiting is not spontaneous, induce vomiting. Keep airway clear. Get medical attention.

TOXICITY DATA:

Oral LD_{50} (rat)	560 mg/Kg
Primary skin Irritation (rabbit)	Not a primary skin irritant
Dermal LD_{50}	>2000 mg/Kg
Eye irritation (rabbit)	caused severe eye irritation
Bluegill Sunfish (96 hr. Tlm)	28 mg/l
Minnow (96 hr. Tlm)	28 mg/l
Trout (96 hr. LC_{50})	39 mg/l
Algae (96 hr. EC_{50})	15.4 mg/l
Daphnia magna (48 hr. LC_{50})	141.6 mg/l

SECTION VI REACTIVITY DATA

STABILITY: Stable
INCOMPATIBILITY: Oxidizing Agents
HAZARDOUS DECOMPOSITION PRODUCTS: BY FIRE: Carbon Dioxide, Carbon Monoxide Nitrogen oxides, HCN in reducing atmospheres
HAZARDOUS POLYMERIZATION: Will Not occur

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE THE MATERIAL IS SPILLED OR RELEASED: If local high concentration of airborne dust occurs, dampen spill with water and ventilate to disperse dust laden air. Sweep up spill and reclaim or place in a covered waste disposal container.
WASTE DISPOSAL METHOD: Sanitary landfill or incinerate in approved facilities in accordance with local, state, and federal regulations. Do not heat or incinerate in closed containers.

SECTION VIII SPECIAL PROTECTIVE INFORMATION

RESPIRATORY PROTECTION: If personal exposure cannot be controlled below applicable exposure limits by ventilation, wear respiratory devices approved by NIOSH/MSHA for protection against organic vapors, dusts, and mists.

VENTILATION: Local exhaust recommended for dust control.
PROTECTIVE GLOVES: Recommended to avoid skin contact, Rubber, Vinyl
EYE PROTECTION: Use safety goggles where airborne dust is a problem.
OTHER PROTECTIVE EQUIPMENT: Safety shower, eye wash

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store in a cool, dry area. Keep containers tightly closed when not in use. Avoid creating airborne dust concentrations which could constitute a potential dust explosion hazard. Avoid contact with skin, eyes, and clothing. Avoid inhalation of dust and vapor. DO NOT TAKE INTERNALLY. Clean up spills immediately.

SECTION X REGULATORY STATUS

Benzotriazole (CAS No. 95-14-7) is contained on the following chemical lists:

1. TSCA Section 8(a)/40CFR 712 Preliminary Assessment Information Rule
2. TSCA Section 8(d) Health and Safety Data Rule
3. NTP Testing Program
4. Massachusetts Substance List
5. Canadian Domestic Substance List
6. WHMIS Ingredient Disclosure List
7. TSCA Inventory List

PREPARED: August 28, 1995
SUPERSEDES: May 25, 1994

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Appendix C

AERATION MANIFOLD

In this section:

Aeration Manifold for Plasma Cutting Aluminum

Introduction

When plasma arc cutting aluminum, free hydrogen gas may be generated by the cutting process. The high temperature of the plasma process causes disassociation of oxygen and hydrogen from the water in the water table. The hot aluminum, which has a high affinity for oxygen, then combines with the oxygen leaving free hydrogen.

An effective means of avoiding free hydrogen buildup is to install an aeration manifold on the floor of the water table to replenish the oxygen content of the water.

Making an Aeration Manifold – Figure c-1

Make an **Aeration Manifold** with two-inch (50 mm) PVC tubing with one-inch (25 mm) **Distribution Lines** connected to it. Drill 1/8 inch (3 mm) holes every six inches (150 mm) in the distribution lines. Cap the ends of the distribution lines and install the lines so that oxygen is delivered to all parts of the cutting area.

Connect the manifold to a shop air line. Set a pressure regulator to obtain a steady stream of bubbles.

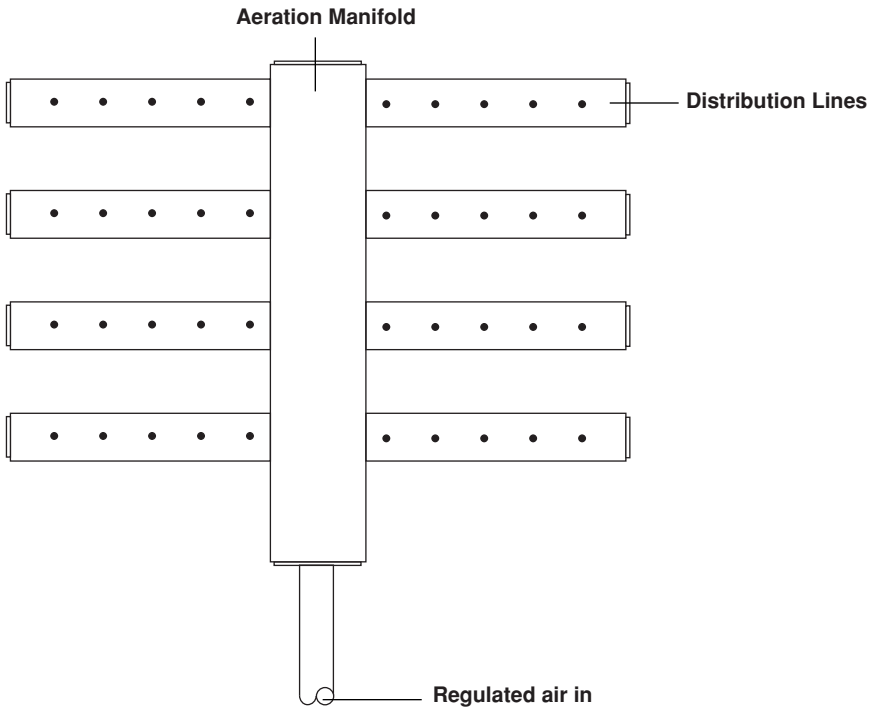

Figure c-1 Aeration Manifold

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Appendix D

PAC200T (65°) CUTTING TORCH

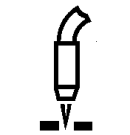
In this section:

PAC200T (65°) Cutting Torch Consumables, Torch Assemblies& Torch Leads

The PAC200T (65°) trigger hand torch is option available from Hypertherm. Along with the torch, the associated conumables, consumable parts kit and torch lead assemblies are described.

Consumables

The consumables listed below are used in the 65° trigger torch for the *Cut Charts* on the listed pages. Operating (Cut Chart) parameters are also the same for PAC200T (90°) and PAC200E (gouging) hand torches. Refer to page d-3 for the consumable parts kit.

	Metal	Amps	Plasma Gas/ Shield Gas	Shield	Retaining Cap	Nozzle	Swirl Ring	Electrode	Page
	Mild Steel	**200**	Air / Air	020918	020915	020608	020607	220021	**4-19**
		100	Air / Air	020919	020915	020611	020607	120547	**4-20**
		40	Air / Air	020917	020915	020689	020613	220021	**4-21**
		200	O_2 / Air	020918	020915	020605	020604	220021	**4-22**
		100	O_2 / Air	020919	020915	020616	020617	120547	**4-23**
		200	N_2 / CO_2	020918	020915	020608	020607	020415	**4-24**
 CUTTING	**Stainless Steel**	**200**	Air / Air	020918	020915	020608	020607	220021	**4-25**
		100	Air / Air	020919	020915	020611	020607	120547	**4-26**
		40	Air / Air	020917	020915	020689	020613	220021	**4-27**
		200	N_2 / Air	020918	020915	020608	020607	020415	**4-28**
		200	N_2 / CO_2	020918	020915	020608	020607	020415	**4-29**
		200	H35 / N_2	020920	020915	020608	020607	020415	**4-30**
		100	H35 / N_2	020919	020915	020611	020607	020415	**4-31**
	Aluminum	**200**	Air / Air	020918	020915	020608	020607	220021	**4-32**
		100	Air / Air	020919	020915	020611	020607	120547	**4-33**
		40	Air / Air	020917	020915	020689	020613	220021	**4-34**
		200	N_2 / Air	020918	020915	020608	020607	020415	**4-35**
		200	N_2 / CO_2	020918	020915	020608	020607	020415	**4-36**
		200	H35 / N_2	020918	020915	020608	020607	020415	**4-37**
		100	H35 / N_2	020919	020915	020611	020607	020415	**4-38**
	Mild Steel	**200**	Air / Air	020891	020882	020615	020607	220021	**4-39**
		200	H35/Air	020891	020882	020934	020607	020933	**4-40**
 GOUGING	**Stainless Steel**	**200**	H35 / N_2	020891	020882	020934	020607	020933	**4-41**
	Aluminum	**200**	H35 / N_2	020891	020882	020934	020607	020933	**4-42**

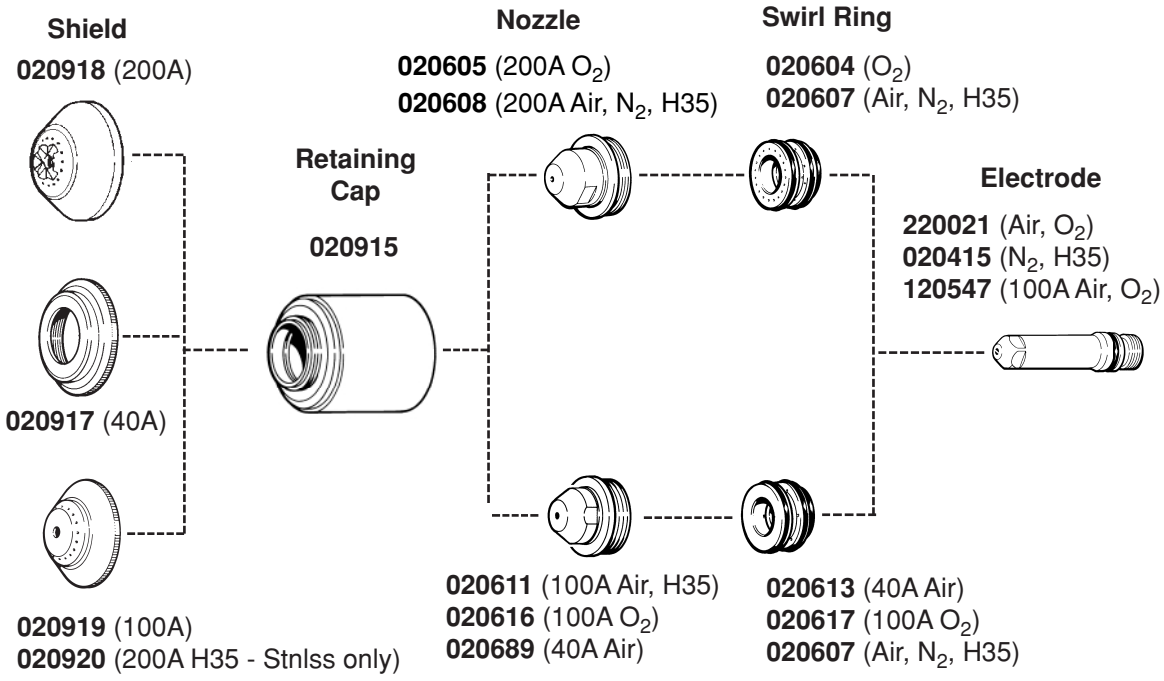


Figure d-1 PAC200T (65°) Cutting Trigger Torch Consumable Parts

Consumable Parts Kit 028750

Part Number	Description	Qty
028750	**Parts Kit: PAC200T**	
001067	Box:Gray Plastic	1
015015	Adapter:1/4NPT X #6 Male 90 Brass	1
015193	Cap:#6 Brass	1
220021	Electrode:MAX200 Air/Oxy	5
020415	Electrode:MAX200 N2/H35	5
020918	Shield:PAC200T Hand Torch 200A	5
020604	Swirl Ring:MAX200 Oxy	1
020605	Nozzle:MAX200 .082 200A Oxy	5
020607	Swirl Ring:MAX200 Air/N2/H35	1
020608	Nozzle:MX200 .086 200A Air/N2	5
027055	Lubricant:Silicone 1/4-Oz Tube	1
027194	Nozzle Wrench:MAX200/HT2000	1
044027	O-Ring:BUNA 70DURO 1.301X.070	2
027347	Tool:Water Tube Replacement	1

Torch Assembly with Torch Lead, 25 Ft

Item	Part Number	Description	Qty
	073110	**PAC200T (65°) Cutting Torch Assembly 25 ft**	1
1	002244	Safety Trigger: PAC120/200T/E Tch	1
2	001440	Handle: PAC200T/E 65 Deg Hand Torch	1
3	001217	Boot: PAC200T/E Torch	1
4	**020907**	**PAC200T (65°) Torch Main Body**	1
	020963	Water Tube:PAC200T Electd Cool	1
5	044027	O-Ring:Buna 1.301X.070	2
6	027254	Spring, Trigger, PAC120/200T/E Torch	1
7	075365	P/S, #6X3/4, PH, Pan	6
8	**029865**	**Leads SA:PAC200T/E Torch/PS 25 ft**	**1**
	120667	Electrode: MAX200 Air/Oxygen	1
	020607	Swirl Ring: MAX200 Air/N2/H35	1
	020608	Nozzle: MAX200 .086 200A Air/N2/H35	1
	020915	Shield Cap: PAC200T Cutting Torch	1
	020918	Shield: PAC200T 200A	1

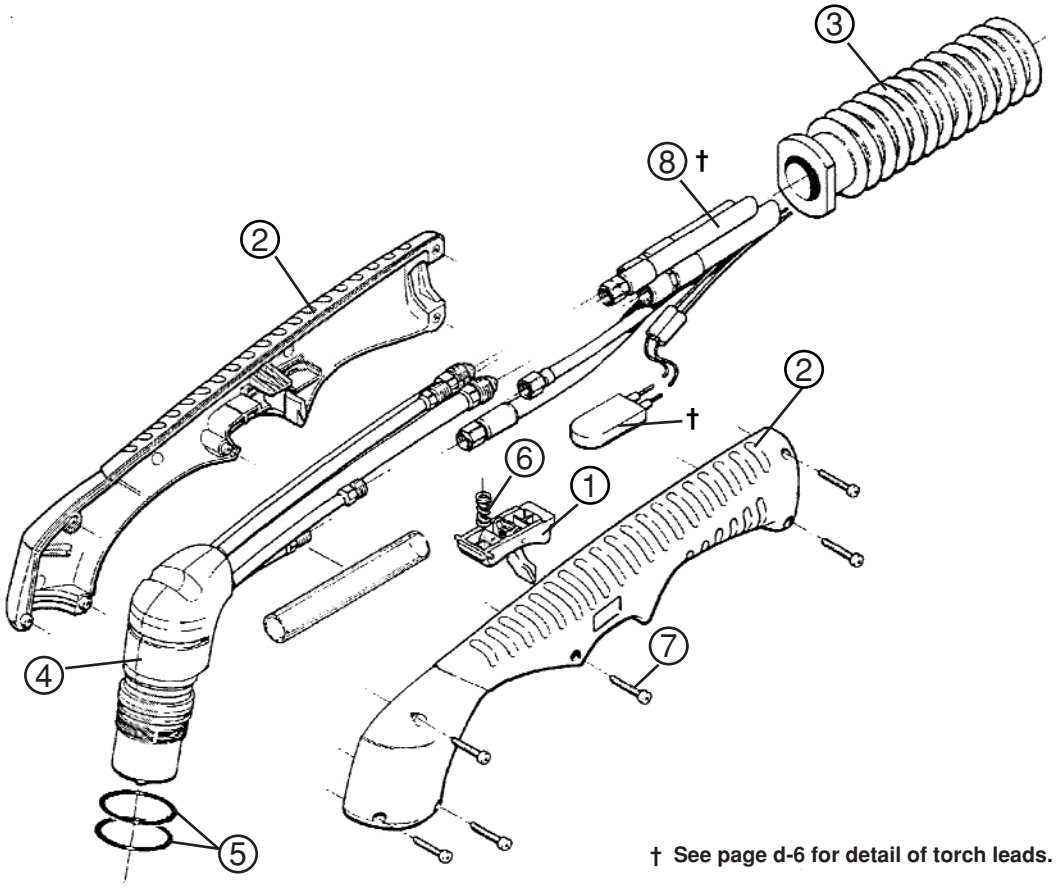


Figure d-2 PAC200T (65°) Cutting Torch Assembly

Torch Lead Assembly, 25-Ft (Torch to Power Supply)*

Item	Part Number	Description	Qty
	029865	**Leads SA:PAC200T/E Trch/PS 25 ft**	1
1	024375	Hose:200T/E Cap Sensor Trch/PS	1
2	024194	Hose Assy:3/16 Red LH	1
3	023714	Cable: 200T/E Water Cooled Blue	1
4	023716	Cable: 200T/E Water Cooled Red	1
5	023715	Cable: 200T/E Shield Gas	1
6	047203	Cable, 16-1 Pair	1
7	005094	Push Button Switch: Torch	1
8	024197	Sheath: MAX200 Hand Torch Leads 25'	1
9	046065	Tube 9/16 ID X .03 WL Nat Tef	.333 ft

* Note: If leads longer than 25 feet are needed, use extended leads (see page d-7).

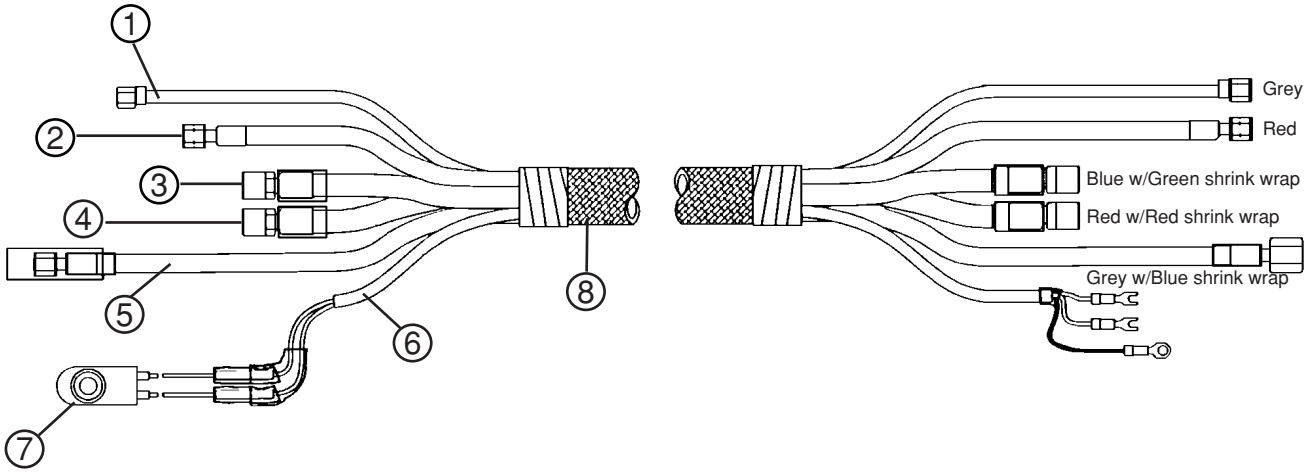


Figure d-3 PAC200T/E Trigger Torch Lead Assemblies

Extended Leads

Part Number	Description	Qty	Length
028715	**PAC200T/E Torch Leads Ext 50'**	**1**	**50 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029867	Leads SA:PAC200T/E XBT-PS 25'	1	
001313	Box:Torch Leads Ext (one half)	1 pair	
028716	**PAC200T/E Torch Leads Ext 75'**	**1**	**75 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029594	Leads MAX200 Hand Torch XT 50' PS End	1	
001313	Box:Torch Leads Ext	1 pair	
028717	**PAC200T/E Torch Leads Ext 100'**	**1**	**100 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029593	Leads MAX200 Hand Torch XT 50' CTRSC	1	
029867	Leads SA:PAC200T/E XBT-PS 25'	1	
001313	Box:Torch Leads Ext	2 pair	
028718	**PAC200T/E Torch Leads Ext 125'**	**1**	**125 ft**
029866*	Leads SA:PAC200T/E TCH-XBT 25'	1	
029593	Leads MAX200 Hand Torch XT 50' CTRSC	1	
029594	Leads MAX200 Hand Torch XT 50' PS End	1	
001313	Box:Torch Leads Ext	2 pair	
028719	**PAC200T/E Torch Leads Ext 150'**	**1**	**150 ft**
029866*	Leads SA:PAC200T/E Torch-XBT 25'	1	
029593	Leads MAX200 Hand Torch XT 50' CTRSC	2	
029867	Leads SA:PAC200T/E XBT-PS 25'	1	
001313	Box:Torch Leads Ext	3 pair	

Notes: *See page d-8 for detail.

Torch Lead Assembly, 25-Ft (Torch to Extension Box)

Item	Part Number	Description	Qty
	029866	**Leads SA:PAC200T/E Torch-Ext. Box 25'**	1
1	024376	Hose:200T/E Cap Sensor Torch/Box	1
2	024379	Hose Assy:3/16 Red LH'A' 25'1"	1
3	023714	Cable: 200T/E Water Cooled Blue	1
4	023716	Cable: 200T/E Water Cooled Red	1
5	023717	Cable: 200T/E Shield Gas Torch/Box	1
6	047203	Cable, 16-1 Pair	1
7	005094	Push Button Switch: Torch	1
8	024197	Sheath: MAX200 Hand Torch Leads 25'	1
9	015036	UN: Right Hand 'A' Male Brass	2
10	015049	UN: AC'A' Male Brass	1
11	015208	Adapter: #5 Male X #5 Male Brass	2
12	074067	Term 22-18 .25 Male QC Insul	3
13	046065	Tube 9/16 ID X .03 WL Nat Tef	.333 ft

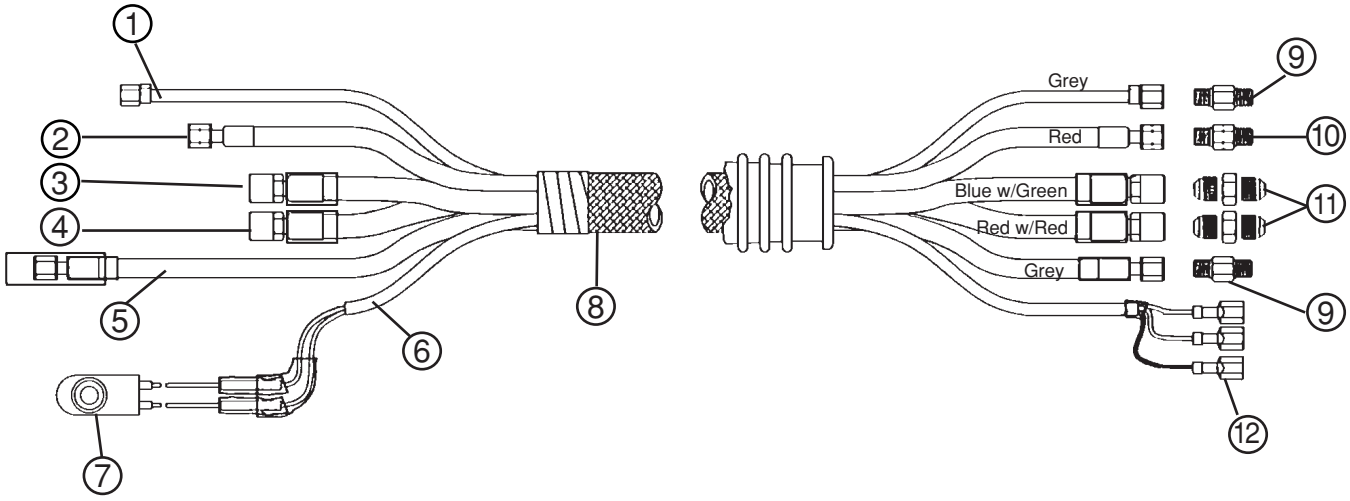


Figure d-4 #029866 – Leads SA:PAC200T/E Torch to Extension Box – 25'

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Appendix E

ELECTROMAGNETIC COMPABILITY (EMC)

In this section:

EMC INTRODUCTION

This plasma cutting equipment has been built in compliance with standard EN50199. To ensure that the equipment works in a compatible manner with other radio and electronic systems, the equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN50199 may not be adequate to completely eliminate interference when the affected equipment is in close proximity or has a high degree of sensitivity. In such cases it may be necessary to use other measures to further reduce interference.

This plasma equipment should be used only in an industrial environment. It may be difficult to ensure electromagnetic compatibility in a domestic environment.

INSTALLATION AND USE

The user is responsible for installing and using the plasma equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the cutting circuit, see *Earthing of Workpiece*. In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

ASSESSMENT OF AREA

Before installing the equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:
a. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.
b. Radio and television transmitters and receivers.
c. Computer and other control equipment.
d. Safety critical equipment, for example guarding of industrial equipment.
e. Health of the people around, for example the use of pacemakers and hearing aids.
f. Equipment used for calibration or measurement.
g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.
h. Time of day that cutting or other activities are to be carried out.

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

METHODS OF REDUCING EMISSIONS

Mains Supply

Cutting equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed cutting equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the cutting mains supply so that good electrical contact is maintained between the conduit and the cutting power source enclosure.

Maintenance of Cutting Equipment

The cutting equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the cutting equipment is in operation. The cutting equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Cutting Cables

The cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential Bonding

Bonding of all metallic components in the cutting installation and adjacent to it should be considered. However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example, ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitances selected according to national regulations.

Note. The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC TC26 (sec)94 and IEC TC26/108A/CD Arc Welding Equipment Installation and Use.

Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire plasma cutting installation may be considered for special applications.

General

This appendix will enable a qualified electrician to install the power cable to the EMI filter on 400V CE power supplies 073200 (without THC) and 073213 (with THC) for hand torch systems.

Power Cable

The power cable is **customer supplied**. See *Power Cable* on pages 3-6 for recommended cable sizes. Final specification and installation of the power cord should be made by a licensed electrician and according to applicable national or local codes. See also *Mains Supply* on page e-2 for further power (supply) cable shielding recommendations.

Connect power cable

Connect one end of the power cable to the EMI filter first and then connect the other end to the line disconnect switch.

Power Supply

1. Locate the EMI filter on the top rear of the power supply (see Figure e-1).

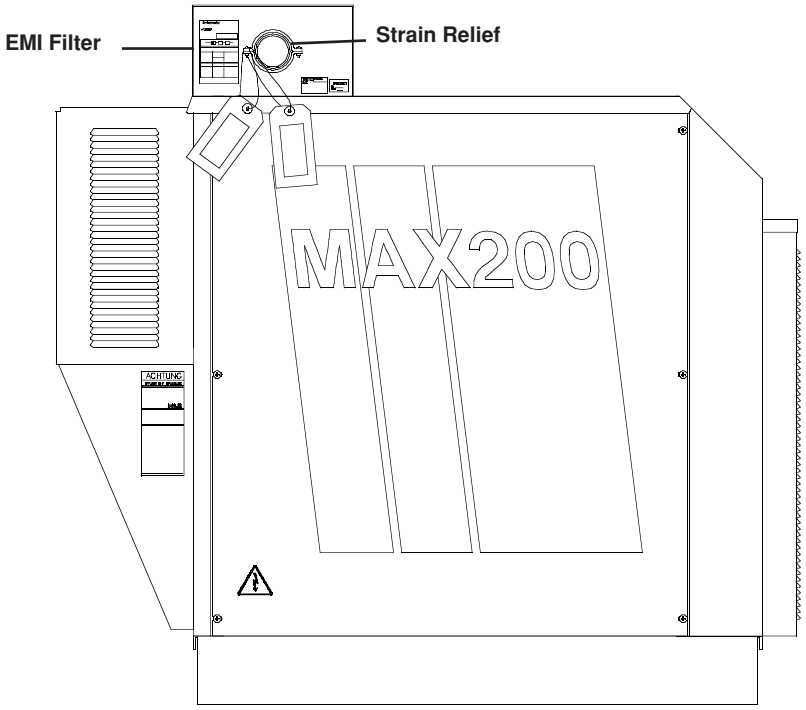

Figure e-1 MAX200 Power Supply with EMI Filter – Side View

2. Unscrew the four filter cover screws and remove cover to access input voltage connections at TB1 (see Figure e-2).

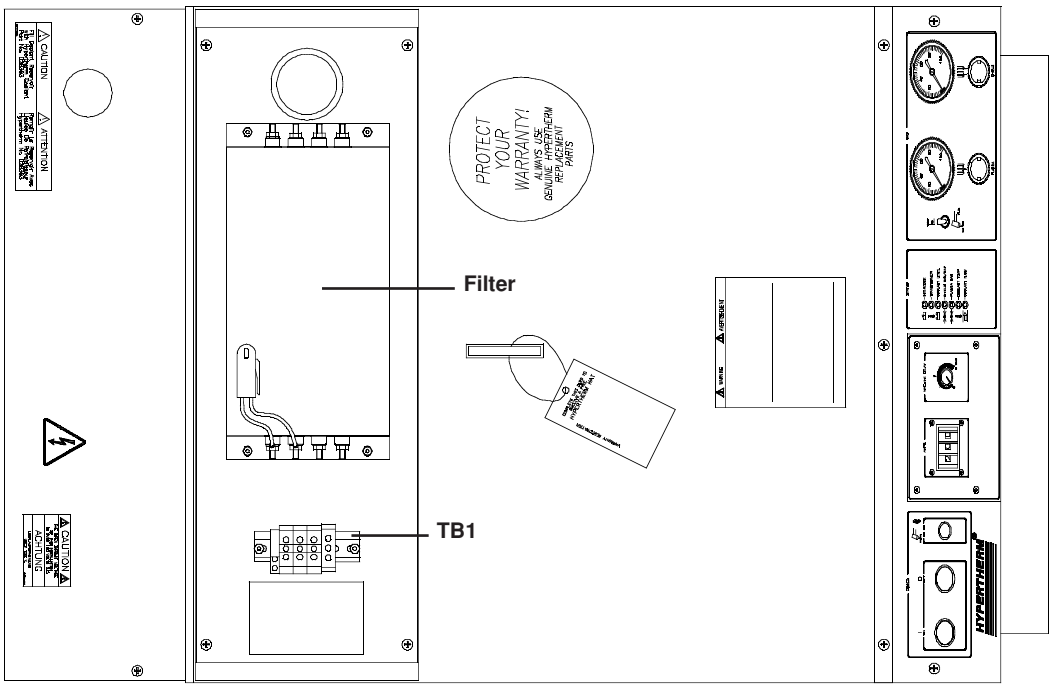

Figure e-2 MAX200 Power Supply with EMI Filter Cover Off – Top View

3. Insert the power cable through the strain relief (see Figure e-1).

4. Connect leads L1 to U, L2 to V, and L3 to W terminals of TB1 (see Figure e-3). Ensure that all connections are tight to avoid excessive heating.

5. Connect the ground lead to terminal marked PE at TB1 (see Figure e-3).

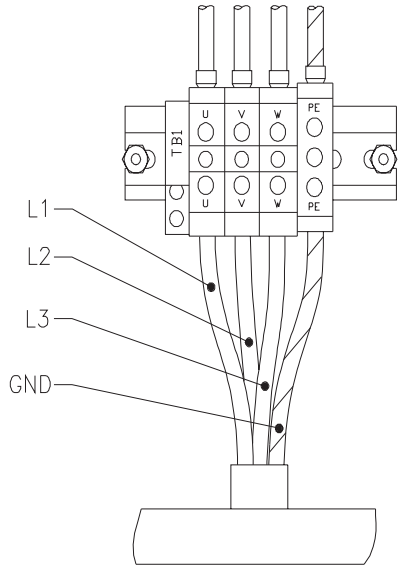

Figure e-3 Power Cable Connections to TB1

WARNING

The neon light attached to the line filter will turn ON as soon as the line disconnect switch is ON. This indicator is a warning that there is line voltage at the filter even if the ON (1) pushbutton on the MAX200 power supply has not been pressed. As a common safety practice, ALWAYS verify that the line disconnect switch is in the OFF position before installing, disconnecting or servicing in this area.

Line Disconnect Switch

Connecting the power cable to the line disconnect switch must conform to national or local electrical codes. This work should be performed only by qualified, licensed personnel. See *Power Requirements* and *Line Disconnect Switch* on page 3-6.

EMI Filter Parts List

Item	Part Number	Description	Qty.
	001557	Cover: 200/2000-CE Electronic Filter Enclosure	1
1	001558	Enclosure: 200/2000-CE Electronic Filter	1
2	001559	Cover: 200/2000-CE Top	1
3	008489	Bushing: 1.97 ID X 2.5 Hole Black-Snap	1
4	008610	Strain Relief: 1-1/2NPT 1.5ID 2-Screw	1
5	029316	TB1 Input-Power SA: 200/2000/4X00/HD	1
6	109036	Filter: 60A 440VAC 3PH 2-Stage Electronic	1
7	109040	Filter Mounting Bracket for 109036	1
8	129033	Pilot Light SA: 200/2000-CE Fitler	1

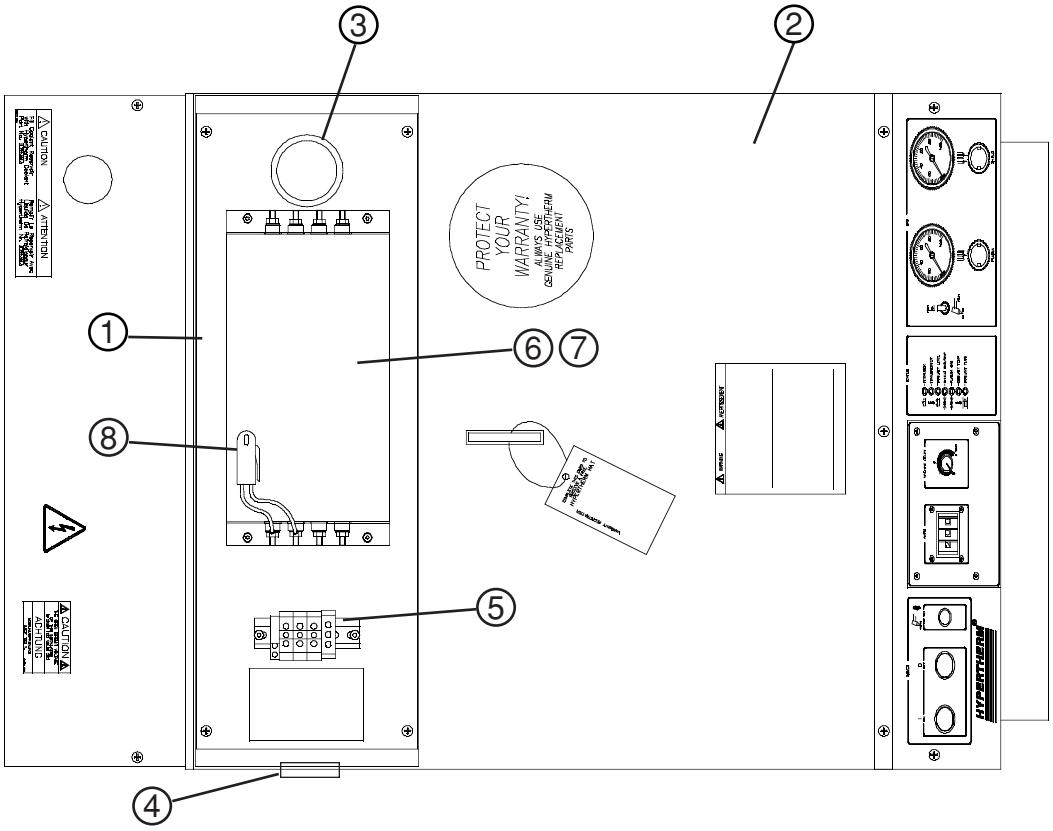

Figure e-4 MAX200 EMI Filter Parts