THERMAL ARC®

A THERMADYNE® Company

INVERTER
ARC
WELDER

MODEL 300TSW AC/DC CC

STICK

TIG - Lift Start

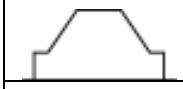
HF Start

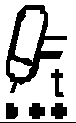
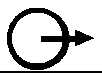
OPERATING MANUAL

October 10, 2003 Manual No. 430429-511

CONTENTS

SYMBOL LEGEND

A	**Amperage**
V	**Voltage**
Hz	**Hertz (frequency)**
SEC	**Seconds**
%	**Percent**
⎓	**DC (Direct Current)**
∿	**AC (Alternating Current**
	**Standard Function**
	**Slope Function**
	**Slope W/Repeat Function**
	**Spot Function**
	**Impulse Starting (High Frequency GTAW)**
	**Touch Start (Lift Start TIG circuit GTAW)**

	**STICK (Shielded Metal Arc SMAW)**
	**Pulse Current Function**
	**Spot Time (GTAW)**
	**Remote Control (Panel/Remote)**
	**Remote Function**
	**Arc Control (SMAW)**
	**Gas Post-Flow**
	**Gas Pre-Flow**
VRD	**Voltage Reduction Device Circuit**
	Negative
	**Positive**
	**Gas Input**
	**Gas Output**

STATEMENT OF WARRANTY

LIMITED WARRANTY: Thermal Arc®, Inc., A Thermadyne Company, hereafter, "Thermal Arc" warrants to customers of its authorized distributors hereafter "Thermal; Arc" that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Thermal Arc products as stated below, Thermal Arc shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal Arc's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal Arc's sole option, of any components or parts of the product determined by Thermal Arc to be defective.

THERMAL ARC MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHERS, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Thermal Arc shall not under any circumstances be liable for special, indirect or consequential damages, such as, but not limited to, lost profits and business interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal Arc with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal Arc whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based. No employee, agent, or representative of Thermal Arc is authorized to change this warranty in any way or grant any other warranty.

PURCHASER'S RIGHTS UNDER THIS WARRANTY ARE VOID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH IN THERMAL ARC'S SOLE JUDGEMENT MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL ARC PRODUCT.

PURCHASER'S RIGHTS UNDER THIS WARRANTY ARE VOID IF THE PRODUCT IS SOLD TO PURCHASER BY NON-AUTHORIZED PERSONS.

The warranty is effective for the time stated below beginning on the date that the authorized distributor delivers the products to the Purchaser. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date Thermal Arc delivered the product to the authorized distributor.

POWER SUPPLIES	**POWER SUPPLIES & WIRE FEEDERS**	**LABOR**
MAIN POWER MAGNETICS (STATIC & ROTATING)	3 YEAR	3 YEAR
ORIGINAL MAIN POWER RECTIFIER	3 YEAR	3 YEAR
POWER SWITCHING SEMI-CONDUCTORS & CONTROL PC BOARD	3 YEAR	3 YEAR
ALL OTHER CIRCUITS AND COMPONENTS INCLUDING BUT NOT LIMITED TO, CONTACTORS, RELAYS, SOLENOIDS, PUMPS, SWITCHES, MOTORS	1 YEAR	1 YEAR

ENGINES: ENIGINES ARE NOT WARRANTED BY THERMAL ARC, ALTHOUGH MOST ARE WARRANTED BY THE ENGINE MANUFACTURER, SEE THE ENGINE MANUFACTURES WARRANTY FOR DETAILS.

CONSOLES, CONTROL EQUIPMENT, HEAT EXCHANGES, AND ACCESSORY EQUIPMENT	1 YEAR	1 YEAR
PLASMA TORCH AND LEADS, AND REMOTE CONTROLS	180 DAYS	180 DAYS
REPAIR/REPLACEMENT PARTS	90 DAYS	90 DAYS

Warranty repairs or replacement claims under this limited warranty must be submitted to Thermal Arc by an authorized Thermal Arc repair facility within thirty (30) days of purchaser's notice of any Warranty Claim. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the Purchaser. All returned goods shall be at the Purchaser's risk and expense. This warranty supersedes all previous Thermal Arc warranties.

Effective April 1, 2002

1.0 GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

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

NOTE

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

CAUTION

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

WARNING

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

1.02 Important Safety Precautions

WARNING

OPERATION AND MAINTENANCE OF ARC WELDING EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-800-462-2782 or your local distributor if you have any questions.

GASES AND FUMES

Gases and fumes produced during the Arc welding/cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the arc welding/cutting depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Arsenic	Cobalt	Nickel
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	
Vanadium		

- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft welding/cutting tables, to capture fumes and gases.
- Do not use the welding torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.

ELECTRIC SHOCK

Electric Shock can injure or kill. The arc welding process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically "live" or "hot."
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.

- Install and maintain equipment according to NEC code, refer to item 4 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.


FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the arc weld.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. **DO NOT** cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.


NOISE

Noise can cause permanent hearing loss. Arc welding/cutting processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.


ARC WELDING RAYS

Arc Welding/Cutting Rays can injure your eyes and burn your skin. The arc welding/cutting process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as recommended in Subsection 1.03, item 4.

1.03 Publications

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018

6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.04 Note, Attention et Avertissement

Dans ce manuel, les mots “note,” “attention,” et “avertissement” sont utilisés pour mettre en relief des informations à caractère important. Ces mises en relief sont classifiées comme suit :

NOTE

Toute opération, procédure ou renseignement général sur lequel il importe d’insister davantage ou qui contribue à l’efficacité de fonctionnement du système.

ATTENTION

Toute procédure pouvant résulter l’endommagement du matériel en cas de non-respect de la procédure en question.

AVERTISSEMENT

Toute procédure pouvant provoquer des blessures de l’opérateur ou des autres personnes se trouvant dans la zone de travail en cas de non-respect de la procédure en question.

1.05 Precautions De Securite Importantes

AVERTISSEMENT

L’OPÉRATION ET LA MAINTENANCE DU MATÉRIEL DE SOUDAGE À L’ARC AU JET DE PLASMA PEUVENT PRÉSENTER DES RISQUES ET DES DANGERS DE SANTÉ.

Il faut communiquer aux opérateurs et au personnel TOUS les dangers possibles. Afin d’éviter les blessures possibles, lisez, comprenez et suivez tous les avertissements, toutes les précautions de sécurité et toutes les consignes avant d’utiliser le matériel. Composez le +1-800-462-2782 ou votre distributeur local si vous avez des questions.


FUMÉE et GAZ

La fumée et les gaz produits par le procédé de jet de plasma peuvent présenter des risques et des dangers de santé.

- Eloignez toute fumée et gaz de votre zone de respiration. Gardez votre tête hors de la plume de fumée provenant du chalumeau.

- Utilisez un appareil respiratoire à alimentation en air si l'aération fournie ne permet pas d'éliminer la fumée et les gaz.
- Les sortes de gaz et de fumée provenant de l'arc de plasma dépendent du genre de métal utilisé, des revêtements se trouvant sur le métal et des différents procédés. Vous devez prendre soin lorsque vous coupez ou soudez tout métal pouvant contenir un ou plusieurs des éléments suivants:

antimoine	cadmium	mercure
argent	chrome	nickel
arsenic	cobalt	plomb
baryum	cuivre	sélénium
béryllium	manganèse	
vanadium		

- Lisez toujours les fiches de données sur la sécurité des matières (sigle américain "MSDS"); celles-ci devraient être fournies avec le matériel que vous utilisez. Les MSDS contiennent des renseignements quant à la quantité et la nature de la fumée et des gaz pouvant poser des dangers de santé.
- Pour des informations sur la manière de tester la fumée et les gaz de votre lieu de travail, consultez l'article 1 et les documents cités à la page 5.
- Utilisez un équipement spécial tel que des tables de coupe à débit d'eau ou à courant descendant pour capter la fumée et les gaz.
- N'utilisez pas le chalumeau au jet de plasma dans une zone où se trouvent des matières ou des gaz combustibles ou explosifs.
- Le phosgène, un gaz toxique, est généré par la fumée provenant des solvants et des produits de nettoyage chlorés. Eliminez toute source de telle fumée.

CHOC ELECTRIQUE

Les chocs électriques peuvent blesser ou même tuer. Le procédé au jet de plasma requiert et produit de l'énergie électrique haute tension. Cette énergie électrique peut produire des chocs graves, voire mortels, pour l'opérateur et les autres personnes sur le lieu de travail.

- Ne touchez jamais une pièce "sous tension" ou "vive"; portez des gants et des vêtements secs. Isolez-vous de la pièce de travail ou des autres parties du circuit de soudage.
- Réparez ou remplacez toute pièce usée ou endommagée.
- Prenez des soins particuliers lorsque la zone de travail est humide ou moite.
- Montez et maintenez le matériel conformément au Code électrique national des Etats-Unis. (Voir la page 5, article 9.)
- Débranchez l'alimentation électrique avant tout travail d'entretien ou de réparation.
- Lisez et respectez toutes les consignes du Manuel de consignes.

INCENDIE ET EXPLOSION

Les incendies et les explosions peuvent résulter des scories chaudes, des étincelles ou de l'arc de plasma. Le procédé à l'arc de plasma produit du métal, des étincelles, des scories chaudes pouvant mettre le feu aux matières combustibles ou provoquer l'explosion de fumées inflammables.

- Soyez certain qu'aucune matière combustible ou inflammable ne se trouve sur le lieu de travail. Protégez toute telle matière qu'il est impossible de retirer de la zone de travail.
- Procurez une bonne aération de toutes les fumées inflammables ou explosives.
- Ne coupez pas et ne soudez pas les conteneurs ayant pu renfermer des matières combustibles.
- Prévoyez une veille d'incendie lors de tout travail dans une zone présentant des dangers d'incendie.
- Le gas hydrogène peut se former ou s'accumuler sous les pièces de travail en aluminium lorsqu'elles sont coupées sous l'eau ou sur une table d'eau. NE PAS couper les alliages en aluminium sous l'eau ou sur une table d'eau à moins que le gas hydrogène peut s'échapper ou se dissiper. Le gas hydrogène accumulé explosera si enflammé.

RAYONS D'ARC DE PLASMA

Les rayons provenant de l'arc de plasma peuvent blesser vos yeux et brûler votre peau. Le procédé à l'arc de plasma produit une lumière infra-rouge et des rayons ultra-violets très forts. Ces rayons d'arc nuiront à vos yeux et brûleront votre peau si vous ne vous protégez pas correctement.

- Pour protéger vos yeux, portez toujours un casque ou un écran de soudeur. Portez toujours des lunettes de sécurité munies de

parois latérales ou des lunettes de protection ou une autre sorte de protection oculaire.

- Portez des gants de soudeur et un vêtement protecteur approprié pour protéger votre peau contre les étincelles et les rayons de l'arc.
- Maintenez votre casque et vos lunettes de protection en bon état. Remplacez toute lentille sale ou comportant fissure ou rognure.
- Protégez les autres personnes se trouvant sur la zone de travail contre les rayons de l'arc en fournissant des cabines ou des écrans de protection.
- Respectez le teint de lentille recommandé dans le article 4, page 5.
- Hydrogen gas may be present under aluminum workpieces during the cutting process when being cut underwater or using a water table. DO NOT cut aluminum underwater or on a water table unless the hydrogen gas can be eliminated as the hydrogen gas may detonate.

 BRUIT

Le bruit peut provoquer une perte permanente de l'ouïe. Les procédés de soudage à l'arc de plasma peuvent provoquer des niveaux sonores supérieurs aux limites normalement acceptables. Vous dú4ez vous protéger les oreilles contre les bruits forts afin d'éviter une perte permanente de l'ouïe.

- Pour protéger votre ouïe contre les bruits forts, portez des tampons protecteurs et/ou des protections auriculaires. Protégez également les autres personnes se trouvant sur le lieu de travail.
- Il faut mesurer les niveaux sonores afin d'assurer que les décibels (le bruit) ne dépassent pas les niveaux sûrs.
- Pour des renseignements sur la manière de tester le bruit, consultez l'article 1, page 5.

1.06 Documents De Reference

Consultez les normes suivantes ou les révisions les plus récentes ayant été faites à celles-ci pour de plus amples renseignements :

1. OSHA, NORMES DE SÉCURITÉ DU TRAVAIL ET DE PROTECTION DE LA SANTÉ, 29CFR 1910, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. Norme ANSI Z49.1, LA SÉCURITÉ DES OPÉRATIONS DE COUPE ET DE SOUDAGE, disponible auprès de la Société Américaine de Soudage (American Welding Society), 550 N.W. LeJeune Rd., Miami, FL 33126
3. NIOSH, LA SÉCURITÉ ET LA SANTÉ LORS DES OPÉRATIONS DE COUPE ET DE SOUDAGE À L'ARC ET AU GAZ, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. Norme ANSI Z87.1, PRATIQUES SURES POUR LA PROTECTION DES YEUX ET DU VISAGE AU TRAVAIL ET DANS LES ECOLES, disponible de l'Institut Américain des Normes Nationales (American National Standards Institute), 1430 Broadway, New York, NY 10018
5. Norme ANSI Z41.1, NORMES POUR LES CHAUSSURES PROTECTRICES, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
6. Norme ANSI Z49.2, PRÉVENTION DES INCENDIES LORS DE L'EMPLOI DE PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
7. Norme A6.0 de l'Association Américaine du Soudage (AWS), LE SOUDAGE ET LA COUPE DE CONTENEURS AYANT RENFERMÉ DES PRODUITS COMBUSTIBLES, disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
8. Norme 51 de l'Association Américaine pour la Protection contre les Incendies (NFPA), LES SYSTEMES À GAZ AVEC ALIMENTATION EN OXYGENE POUR LE SOUDAGE, LA COUPE ET LES PROCÉDÉS ASSOCIÉS, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. Norme 70 de la NFPA, CODE ELECTRIQUE NATIONAL, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

10. Norme 51B de la NFPA, LES PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

11. Brochure GCA P-1, LA MANIPULATION SANS RISQUE DES GAZ COMPRIMÉS EN CYLINDRES, disponible auprès de l'Association des Gaz Comprimés (Compressed Gas Association), 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202

12. Norme CSA W117.2, CODE DE SÉCURITÉ POUR LE SOUDAGE ET LA COUPE, disponible auprès de l'Association des Normes Canadiennes, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada, M9W 1R3

13. ivret NWSA, BIBLIOGRAPHIE SUR LA SÉCURITÉ DU SOUDAGE, disponible auprès de l'Association Nationale de Fournitures de Soudage (National Welding Supply Association), 1900 Arch Street, Philadelphia, PA 19103

14. Norme AWSF4.1 de l'Association Américaine de Soudage, RECOMMANDATIONS DE PRATIQUES SURES POUR LA PRÉPARATION À LA COUPE ET AU SOUDAGE DE CONTENEURS ET TUYAUX AYANT RENFERMÉ DES PRODUITS DANGEREUX , disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126

15. Norme ANSI Z88.2, PRATIQUES DE PROTECTION RESPIRATOIRE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018

2.0 INTRODUCTION AND DESCRIPTION

2.01 Description

The Thermal Arc™ Model 300TSW is a single/three-phase AC/DC arc welding power sources with Constant Current (CC) output characteristics. This unit is equipped with a Digital Volt/Amperage Meter, gas control valve, built in Sloper and Pulser, lift arc starter, and high-frequency arc starter for use with Gas Tungsten Arc Welding (GTAW), Gas Tungsten Arc Welding-Pulsed (GTAW-P) Gas Tungsten Arc Welding-Sloped (GTAW-S), and Shielded Metal Arc Welding (SMAW) processes. The source is totally enclosed in an impact resistant, flame resistant and non-conductive plastic case.

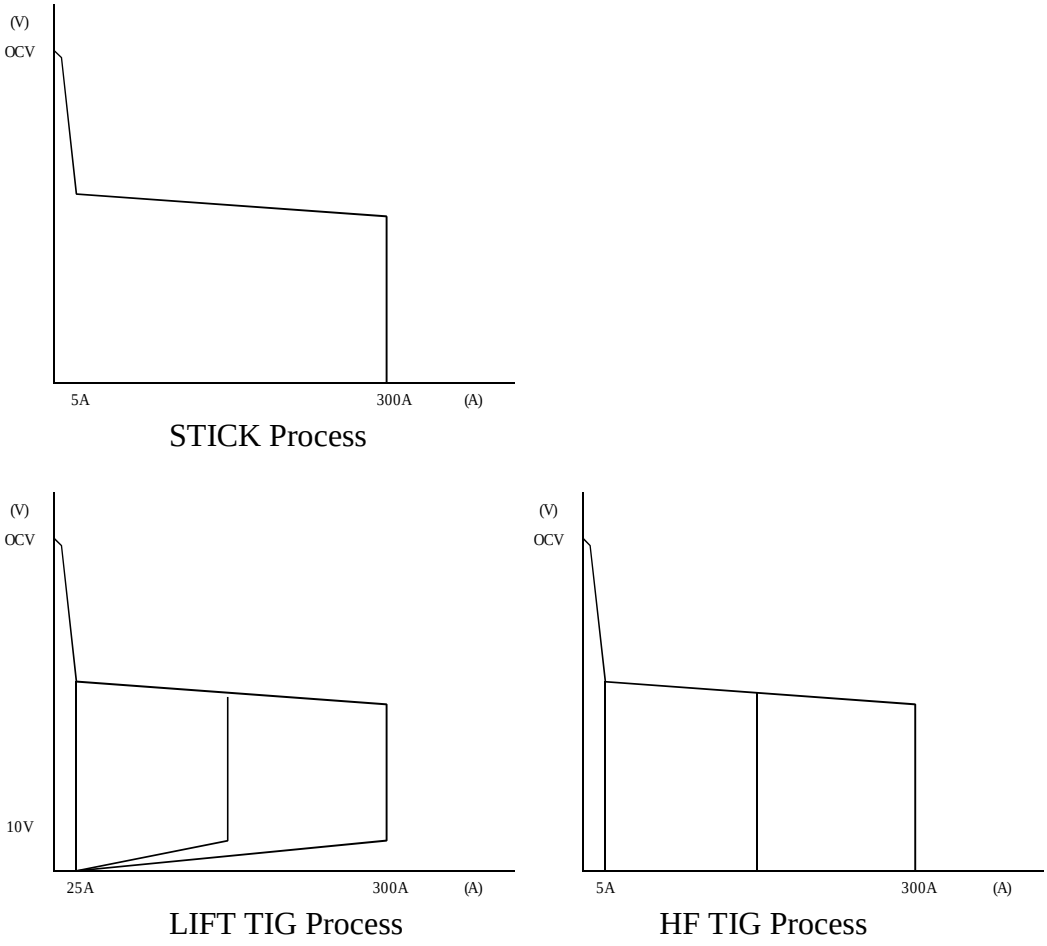


Figure 1. Model 300TSW volt-ampere curve

Note 1

Volt-Ampere curves show the maximum Voltage and Amperage output capabilities of the welding power source. Curves of other settings will fall between the curves shown.

2.02 Functional Block Diagrams

Figure 2 illustrates the functional block diagram of the 300TSW-power supply.

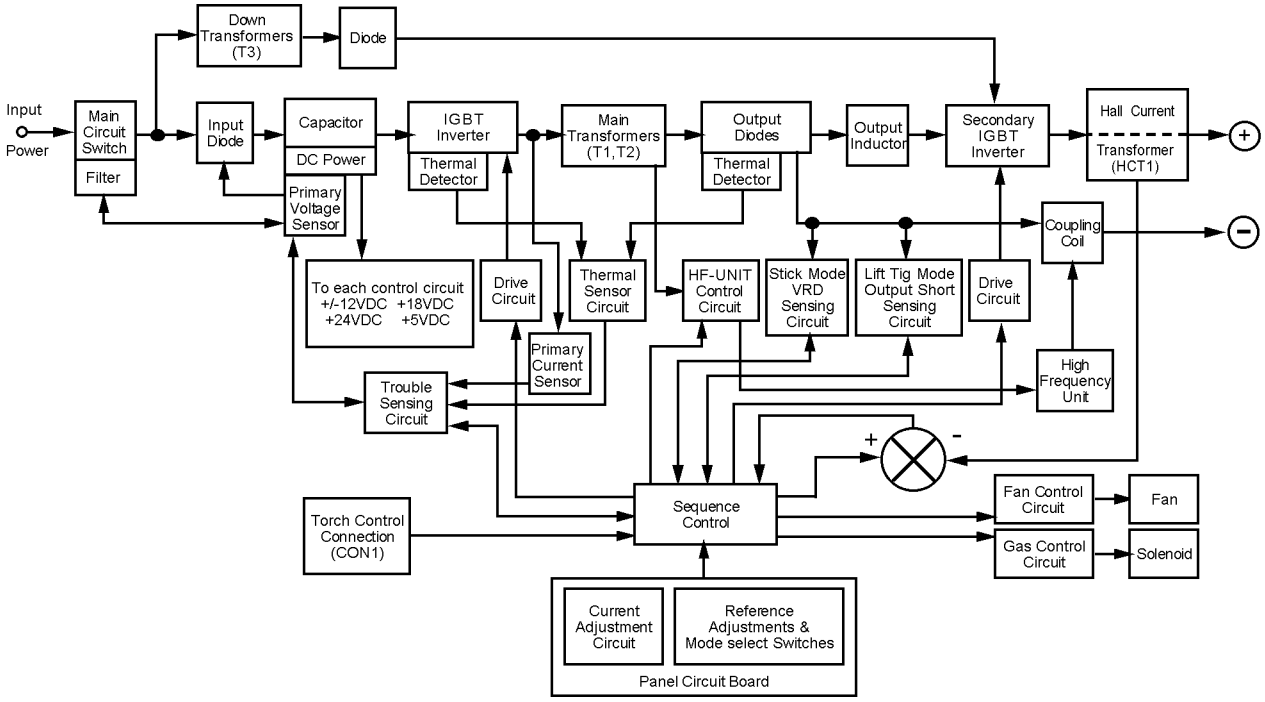


Figure 2. 300TSW Functional Block Diagram

2.03 Transporting Methods

These units are equipped with a handle for carrying purposes.

WARNING 1

ELECTRIC SHOCK can kill. DO NOT TOUCH live electrical parts. Disconnect input power conductors from de-energized supply line before moving the welding power source.

WARNING 2

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

Lift unit with handle on top of case.
Use handcart or similar device of adequate capacity.
If using a fork lift vehicle, place and secure unit on a proper skid before transporting.

3.0 Installation Recommendations

3.01 Environment

The Pro-Wave 300TSW is designed for use in hazardous environments.

Examples of environments with increased hazardous environments are -

a. In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts;

b. In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator, or

c. In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.

Environments with hazardous environments do not include places where electrically conductive parts in the near vicinity of the operator, which can cause increased hazard, have been insulated.

3.02 Location

Be sure to locate the welder according to the following guidelines:

- *In areas, free from moisture and dust.*
- *Ambient temperature between 0 degrees C to 40 degrees C.*
- *In areas, free from oil, steam and corrosive gases.*
- *In areas, not subjected to abnormal vibration or shock.*
- *In areas, not exposed to direct sunlight or rain.*
- *Place at a distance of 12" (304.79mm) or more from walls or similar that could restrict natural airflow for cooling.*

WARNING 3

Thermal Arc advises that this equipment be electrically connected by a qualified electrician.

3.03 Electrical Input Connections

WARNING 4

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.

DO NOT TOUCH live electrical parts.
SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures. Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

3.03.01 Electrical Input Requirements

Operate the welding power source from a single or three-phase 50/60 Hz, AC power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and inspection required.

The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

Note 2

These units are equipped with a three-conductor with earth power cable that is connected at the welding power source end for single or three-phase electrical input power.

Do not connect an input (WHITE, BLACK or RED) conductor to the ground terminal.

Do not connect the ground (GREEN) conductor to an input line terminal.

Refer to figure 3 and:

1. Connect end of ground (GREEN) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. Connect ends of line 1 (BLACK) and line 2 (WHITE) and line 3 (RED) input conductors to a de-energized line disconnect switch.
3. Use Table 1 and Table 2 as a guide to select line fuses for the disconnect switch.

   NOTE: For Single-Phase operation, connect the GREEN, BLACK and WHITE input conductors. Insolate the RED Conductor, it is not used for Single-phase operation.

Input Voltage	Fuse Size
208 VAC	100 Amps
230 VAC	90 Amps
460 VAC	25 Amps

Table 1 Electrical Input Connections

NOTE: Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

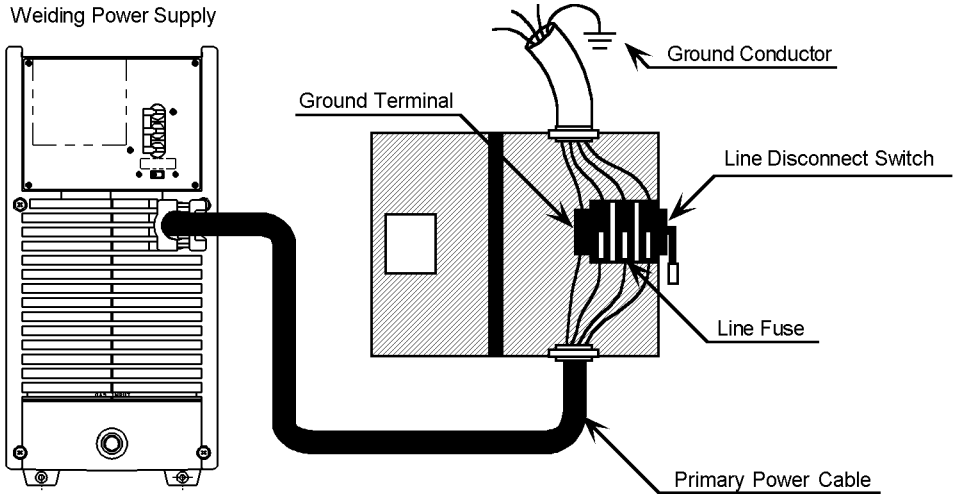


Figure 3. Electrical input connections

3.03.02 Input Power

Each unit incorporates an INRUSH circuit and input voltage sensing circuit. When the MAIN SWITCH is turned on, the inrush circuit provides a pre-charging of the input capacitors. SCR's in the Power Control Assembly (PCA) will turn on after the input capacitors have charged to full operating voltage (after approximately 5 seconds).

Note 3

Note the available input power. Damage to the PCA could occur if 575VAC or higher is applied.

The following Primary Current recommendations are required to obtain the maximum welding current and duty cycle from this welding equipment:

Model	Primary Supply Lead Size	Minimum Primary Current Circuit Size (Vin/Amps)		Current & Duty Cycle	
				TIG	STICK
PRO-WAVE 300TSW	8/4 AWG minimum (Factory Fitted)	3 ϕ	208/31	300A @ 25%	-
			230/28		-
			460/14		-
			208/47	-	300A @ 25%
			230/43	-	
			460/21	-	
	8/3 AWG minimum	1 ϕ	208/67	300A @ 25%	-
			230/60		-
			208/96	-	300A @ 25%
			230/87	-	

Table 2 – Primary Current Circuit sizes to achieve maximum current

3.03.03 High Frequency Introduction

The importance of correct installation of high frequency welding equipment cannot be over-emphasized. Interference due to high frequency initiated or stabilized arc is almost invariably traced to improper installation. The following information is intended as a guide for personnel installing high frequency welding machines.

Warning

Explosives

The high frequency section of this machine has an output similar to a radio transmitter. The machine should NOT be used in the vicinity of blasting operations due to the danger of premature firing.

Computers

It is also possible that operation close to computer installations may cause computer malfunction.

3.03.04 High Frequency Interference

Interference may be transmitted by a high frequency initiated or stabilized arc-welding machine in the following ways:

Direct Radiation

Radiation from the machine can occur if the case is metal and is not properly grounded. It can occur through apertures such as open access panels. The shielding of the high frequency unit in the Power Source will prevent direct radiation if the equipment is properly grounded.

Transmission via the Supply Lead

Without adequate shielding and filtering, high frequency energy may be fed to the wiring within the installation (mains) by direct coupling. The energy is then transmitted by both radiation and conduction. Adequate shielding and filtering is provided in the Power Source.

Radiation from Welding Leads

Radiated interference from welding leads, although pronounced in the vicinity of the leads, diminishes rapidly with distance. Keeping leads as short as possible will minimize this type of interference. Looping and suspending of leads should be avoided where possible.

Re-radiation from Unearthed Metallic Objects

A major factor contributing to interference is re-radiation from unearthed metallic objects close to the welding leads. Effective grounding of such objects will prevent re-radiation in most cases.

3.04 Specifications

Parameter		300TSW	
Rated Output Amperes Volts Duty Cycle		 300 32 25%	
Duty Cycle	TIG	300A / 22V @ 25% 190A / 17V @ 60% 150A / 16V @ 100%	
	STICK	300A / 32V @ 25% 190A / 27V @ 60% 150A / 26V @ 100%	
Output Current Range	TIG	5 – 300 (DC) 5 – 300 (AC) @ 60Hz, 50% Cleaning	
	STICK	5 – 300 (DC) 5 – 300 (AC) @ 60Hz, 50% Cleaning	
Open Circuit Voltage		69V	
Dimensions Width Height Length		 8.27” (210mm) 16.89” (420mm) 17.72” (450mm)	
Weight		63.8 lb. 29 kg	
Output @ Rated Load Output Amperes Output Volts Duty Cycle KVA KW		Three-phase 300A 32V 25% 17 12.8	Single-phase 300A 32V 25% 20 12
Output @ No Load KVA KW		 0.5 0.13	
Input Volts Single Phase 208V 230V		Amperage Draw @ Rated Load 96 87	No Load Amps 2.5 1.8
Input Volts Three Phase 208V 230V 460V		 47 43 21	 1.4 1.1 0.7

Thermal Arc continuously strives to produce the best product possible and therefore reserves the right to change, improve or revise the specifications or design of this or any product without prior notice. Such updates or changes do not entitle the buyer of equipment previously sold or shipped to the corresponding changes, updates, improvements or replacement of such items.

3.05 Duty Cycle

The duty cycle of a welding power source is the percentage of a ten (10) minute period that it can be operated at a given output without causing overheating and damage to the unit. If the welding amperes decrease, the duty cycle increases. If the welding amperes are increased beyond the rated output, the duty cycle will decrease.

WARNING 5

Exceeding the duty cycle ratings will cause the thermal overload protection circuit to become energized and shut down the output until the unit has cooled to normal operating temperature.

CAUTION 1

Continually exceeding the duty cycle ratings can cause damage to the welding power source and will void the manufactures warranty.

NOTE 4

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

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4.0 OPERATOR CONTROLS

4.01 Pro-Wave 300TSW Controls

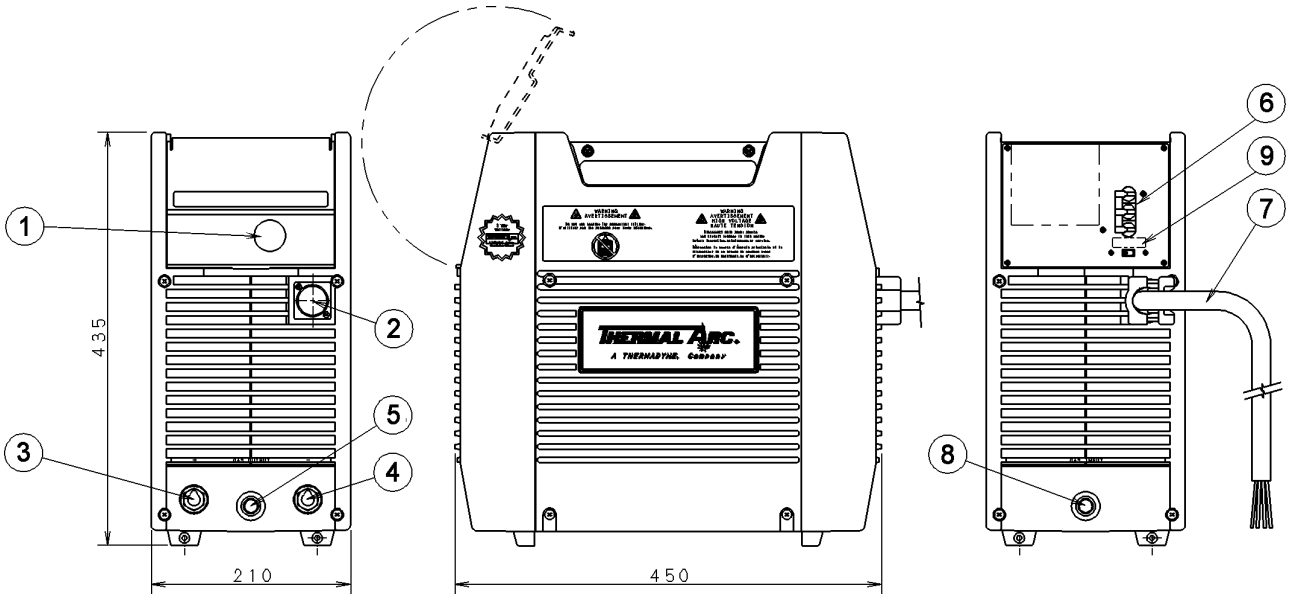


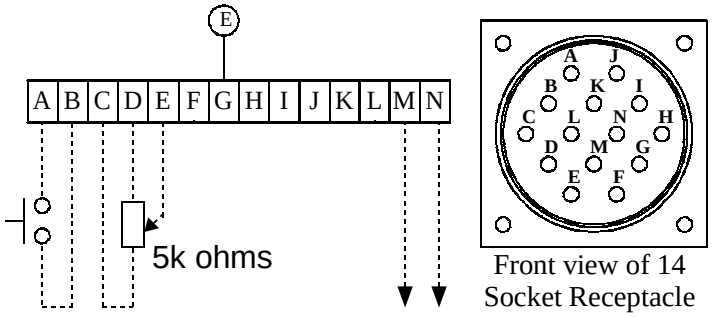
Figure 4 – Pro-Wave 300TSW Power Source

1 *Control Knob*

This control sets the selected weld parameter, rotating it clockwise increases the parameter and is indicated on the digital meter. Pushing the knob in previews the actual welding voltage while welding.

2 *Remote Control Socket*

The 14 pin Remote Control Socket is used to connect remote current control devices to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.



Front view of 14 Socket Receptacle

Socket Pin	Function
A	Torch Switch Input (24V) to energize weld current. (connect pins A & B to turn on welding current)
B	Torch Switch Input (0V) to energize weld current (connect pins A & B to turn on welding current)
C	5k ohm (maximum) connection to 5k ohm remote control potentiometer
D	Zero ohm (minimum) connection to 5k ohm remote control potentiometer
E	Wiper arm connection to 5k ohm remote control potentiometer
G	Mains Earth
F,H,I,J,K,L	Not Used F and L used to manually set current control to REMOTE
M	OK to move current detect signal for robotics applications
N	OK to move current detect signal for robotics applications

3 *Positive Terminal*

Welding current flows from the Power Source via heavy duty Dinse type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

4 *Negative Terminal*

Welding current flows from the Power Source via heavy duty Dinse type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

CAUTION 2

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal and/or melting of the housing (case).

5 *Gas Outlet*

The Gas Outlet is a 5/8 18 UNF female gas fitting.

6 *ON/OFF Switch*

This switch connects the Primary supply voltage to the inverter when in the ON position. This enables the Power Supply.

WARNING 6

When the welder is connected to the Primary supply voltage, the internal electrical components maybe at 500V potential with respect to earth.

7 *Input Cable*

The input cable connects the Primary supply voltage to the equipment.

8 *Gas Inlet*

The Gas Inlet is a 5/8 18 UNF female gas fitting.

4.02 Weld Process selection for Pro-Wave 300TSW

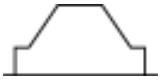
	Weld Mode			
Weld Process Selection	**STICK**	**HF TIG**	**LIFT TIG**	**Description**
 *STD*	Yes	Yes	Yes	2T operation in TIG Modes using remote devices to control contactor & current
 *SLOPE*	No	Yes	Yes	4T operation in TIG Modes with crater fill using a remote contactor device to control sequence.
 *REPEAT*	No	Yes	Yes	4T operation in TIG Modes with repeat operation and crater fill using a remote contactor device.
 *SPOT*	No	Yes	No	2T operation spot welding in HF TIG using a remote contactor device.
 *PULSE* ON/OFF	No	Yes	Yes	Pulse operation in TIG Modes
	Yes	Yes	Yes	Selects AC or DC weld current

Table 3 – Weld Process selection verses Weld Mode for Pro-Wave 300TSW

4.03 Weld Parameter Descriptions for Pro-Wave 300TSW

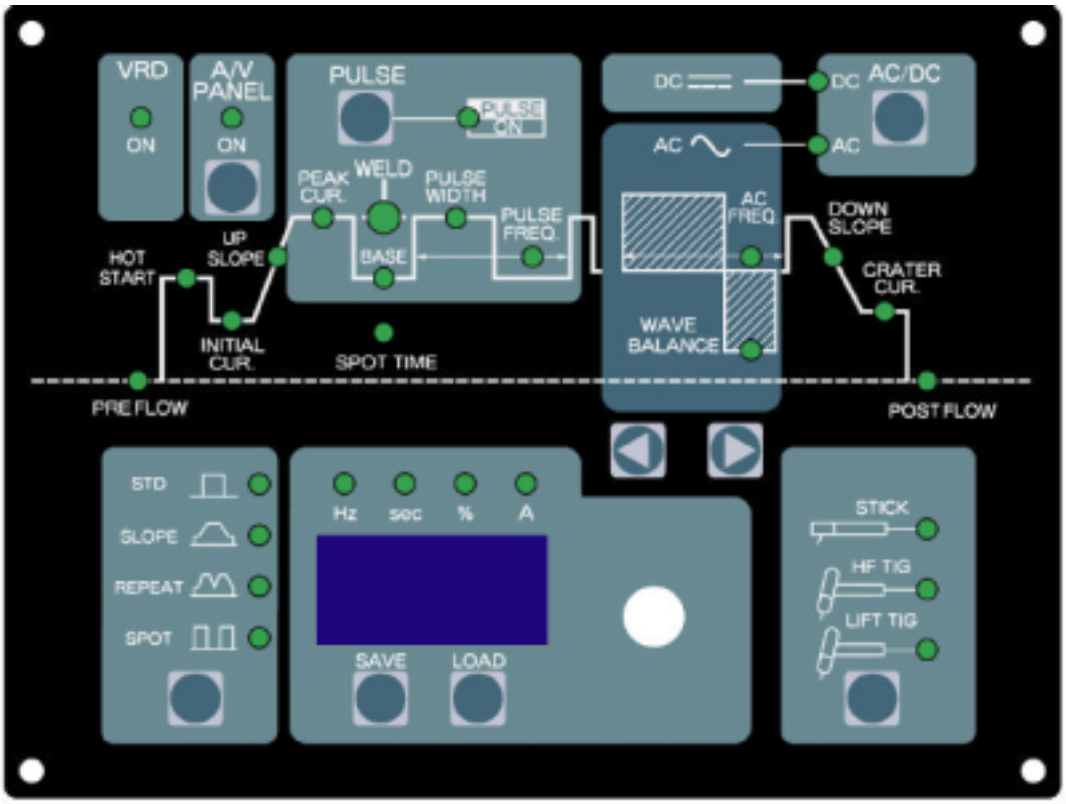


Figure 5Pro-Wave 300TSW Front Panel with Parameter Description

Parameter	Description
 *PRE-FLOW*	This parameter operates in TIG modes only and is used to get gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.
HOT START	This parameter operates in all weld modes except Lift TIG mode and is used to heat up the weld zone in TIG modes or improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the *BASE (WELD)* current. e.g. *HOT START* current = 130 amps when *BASE (WELD)* = 100 amps & *HOT START* = 30 amps
INITIAL CUR.	This parameter operates in *SLOPE* or *REPEAT* (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.
UP SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from INITIAL CUR to PEAK or BASE current
PEAK CUR.	This parameter sets the PEAK weld current when in *PULSE* mode
WELD	This parameter sets the TIG WELD current in *STD*, *SLOPE*, *REPEAT* and *SPOT* modes when *PULSE* is off. This parameter also sets the STICK weld current.

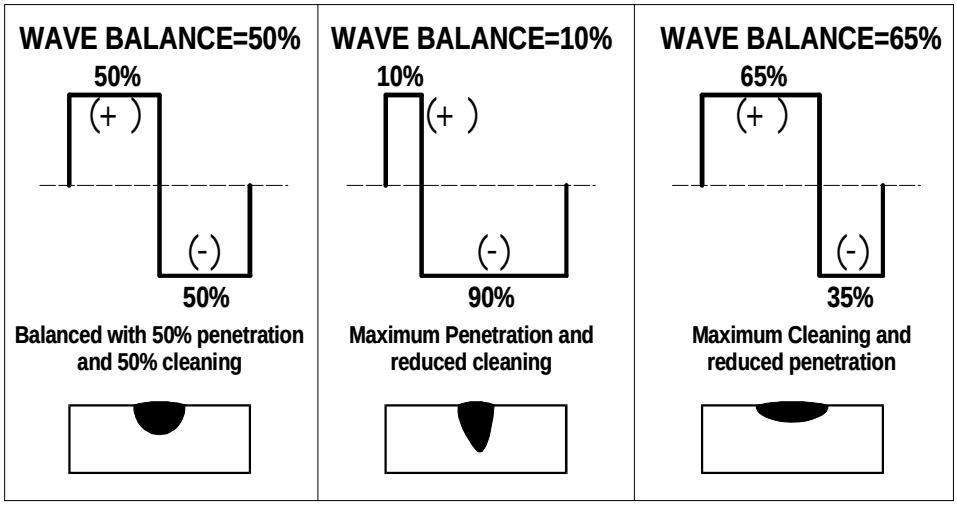
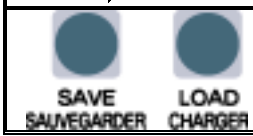
Parameter	Description
BASE (Background Current)	This parameter sets the Background current when in Pulse TIG mode.
SPOT TIME	This parameter sets the duration of the *SPOT TIME* in *HF TIG* mode only
PULSE WIDTH	This parameter sets the percentage on time of the *PULSE FREQUENCY* for PEAK weld current when the *PULSE* is on.
PULSE FREQ.	This parameter sets the *PULSE FREQUENCY* when the *PULSE* is on.
AC FREQUENCY	This parameter operates in AC mode only and is used to set the frequency for the AC weld current.
WAVE BALANCE	This parameter is used for aluminum AC TIG mode and is used to set the penetration to cleaning action for the AC weld current. Generally *WAVE BALANCE* is set to 50% for AC *STICK* welding. The *WAVE BALANCE* control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the *WAVE BALANCE* control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the *WAVE BALANCE* control is set to 65%. 
DOWN SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed, to *CRATER CUR.* This control is used to eliminate the crater that can form at the completion of a weld.
CRATER CUR.	This parameter operates in *SLOPE* or *REPEAT* (4T) TIG modes only and is used to set the finish current for TIG. The CRATER Current remains on until the torch trigger switch is released after it has been depressed.
POST-FLOW 	This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.
	The SAVE/LOAD buttons are used to save and retrieve a total number of 5 programs into the 300TSW memory.

Table 4 – Weld Parameter Descriptions for Pro-Wave 300TSW

4.04 Weld Parameters for Pro-Wave 300TSW

Weld Parameter	Parameter Range	Factory Setting	Incremental Unit	Weld Mode		
				STICK	HF TIG	LIFT TIG
PRE-FLOW	0.0 to 1.0 sec	0.1 sec	0.1 sec	No	Yes	Yes
HOT START	0 to 70A	20A	1A	Yes	Yes	No
INITIAL CUR.	5 to 300A	30A	1A	No	Yes	Yes
UP SLOPE	0 to 15 sec	1 sec	0.1 sec	No	Yes	Yes
PEAK CUR.	5 to 300A	120A	1A	No	Yes	Yes
WELD CUR (TIG)	5 to 300A	80A	1A	No	Yes	Yes
WELD CUR (STICK)	5 to 300A	80A	1A	Yes	No	No
SPOT TIME	0.5 to 5.0 sec	2 sec	0.1 sec	No	Yes	Yes
PULSE WIDTH	15 to 80%	50%	1%	No	Yes	Yes
PULSE FREQ.	0.5 to 500Hz	100.0Hz	See Table 6	No	Yes	Yes
AC FREQUENCY	15 to 150Hz	50Hz	1Hz	Yes	Yes	Yes
WAVE BALANCE	10 to 65%	50%	1%	Yes	Yes	Yes
DOWN SLOPE	0 to 25 sec	3 sec	0.1 sec	No	Yes	Yes
CRATER CUR.	5 to 300A	30A	1A	No	Yes	Yes
POST-FLOW	0.0 to 60 sec	10 sec	0.1 sec	No	Yes	Yes

Table 5 – Weld Parameters for Pro-Wave 300TSW

***PULSE FREQ.* Range**	**Incremental Unit**
0.5 to 20Hz	0.1Hz
20 to 100Hz	1Hz
100 to 500Hz	5Hz

Table 6 – *PULSE FREQ.* Range and Incremental Units

4.05 Power Source Features

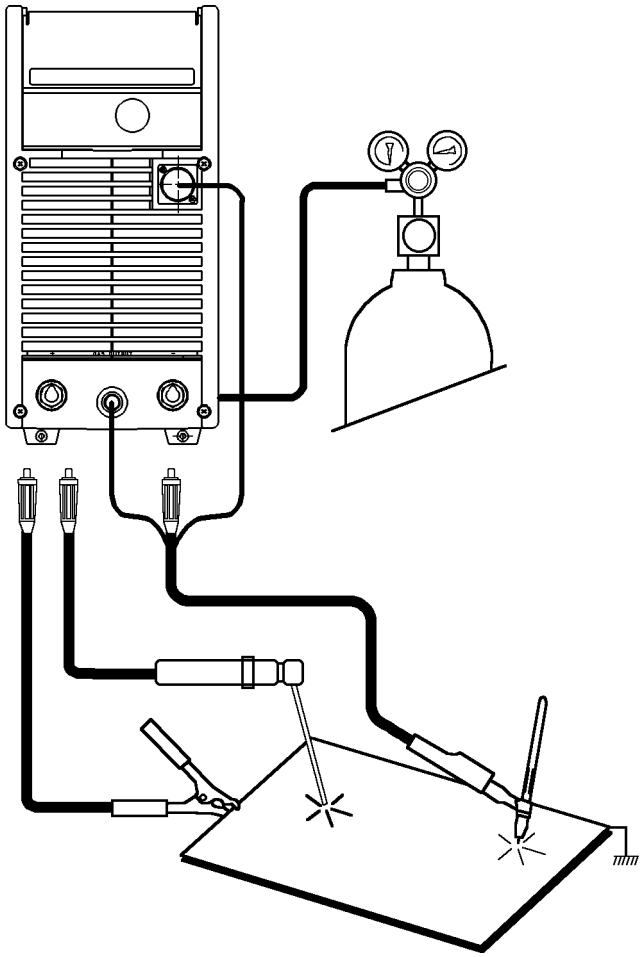
Feature	Description
New Digital Control	• Almost all welding parameters are adjustable.
Touch Panel Switches	• Touch switches eliminate mechanical damage.
Front Control Cover	• Protects front panel controls.
Digital Meter	• Displays selected weld parameter value. • Displays weld current when welding. • Displays weld current for 20 seconds after weld has been completed. • A selected weld parameter value can be adjusted at any time even while welding.
Intelligent Fan Control	• The intelligent cooling system is designed to reduce dust and foreign material build-up, whilst providing optimum cooling. • Fan speed reduces approximately 30 seconds after machine is turned on. • Fan speed increases when internal components reaches operating temperature.
ON/OFF switch	• Primary voltage Supply ON/OFF switch located on rear panel.
Voltage Reduction Device (VRD)	Reduces the OCV when the power supply is not in use. Eliminates the need for add on voltage reducers and has no effect on arc starting. • VRD fully complies to IEC 60974-1 • When Stick mode is selected the green VRD light is ON when not welding and red when welding. • When in TIG modes VRD is off.
Control Knob	• For the selected weld parameter, rotating the knob clockwise increases the parameter. • Rotating the knob counterclockwise decreases the parameter. • A selected weld parameter value can be adjusted at any time even while welding. • Pushing the knob in displays actual arc voltage.
Self Diagnosis Using Error Codes	• An error code is displayed on the *Digital Meter* when a problem occurs with Primary supply voltage or internal component problems. Refer to troubleshooting guide.
Save/Load function	• A total number of 5 programs can be saved into the 300TSW memory. ***SAVE* the Current Weld Parameters into Memory** • Press the *SAVE* button • Select a memory location by rotating the control

Feature	Description
	knob, 1 to 5 is displayed on the meter. • After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters from the control panel are saved. ***LOAD* (retrieve) a Program to Control Panel** • Press the *LOAD* button. • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters are loaded onto the control panel.

5.0 SET-UP FOR SMAW (STICK) AND GTAW (TIG)

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to work piece and electrode lead is used to hold electrode. Wide safety margins provided by the coil design ensure that the Welding Power Source will withstand short-term overload without adverse effects. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrodes, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide, then finally adjust the current setting to suit the application.

Figure 6 – 300TSW AC/DC Set-up



WARNING 7

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the Primary power supply is switched off.

CAUTION 3

Remove any packaging material prior to use. Do not block the air vents at the front or rear or sides of the Welding Power Source.

CAUTION 4

DO NOT change the Weld Mode or Weld Process Mode until after POST-FLOW time has finished.

6.0 SEQUENCE OF OPERATION

NOTE: Scroll Buttons are used to select the parameters to be set. The LED's show which function is being adjusted on the weld sequence graph. Refer to Symbols Table located in the front of the manual for Symbol descriptions.

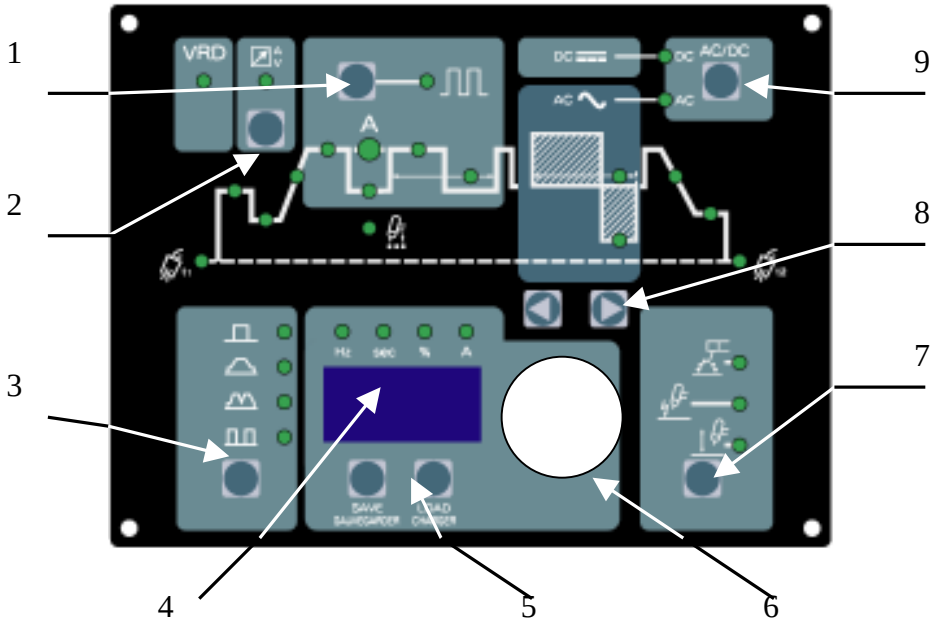


Figure 7 - 300TSW Front Panel

1. Pulse function – Pressing this button enables the TIG current pulse functions.
2. Remote Current function – Pressing this buttons enables remote current functions.
3. TIG Mode Functions – Pressing this button scrolls through the output TIG function modes (Standard, Slope, Slope w/repeat, Spot).
4. Digital LED display – Welding amperage and parameter values are displayed in this window. Internal warnings such as over temperature, low or high input voltage applied are signaled to the operator by a warning sound and error message on the screen.
5. Save/Load Buttons – by using the Save & Load buttons the operator can easily save up to 5 welding parameter programs.
6. Control knob – allows the operator to adjust the output amperage within the entire range of the power source and sets each parameter value.
7. Process Button – This button selects between STICK, HF TIG and Lift TIG mode.
8. Scroll Buttons – used to select the parameters to be set. The LED's show which function is being adjusted on the Sequence Graph.
9. AC/DC Button – Selects between AC or DC welding output.

6.01 Stick Welding

- Connect work lead to negative terminal
- Connect electrode lead to positive terminal
- Switch machine on
- Set *AC* or *DC* weld current. If *AC* is selected then set *AC FREQ* to 60Hz & *WAVE BALANCE* to 50%.
- Connect remote control device if required

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

- Set *HOT START*
- Set *WELD* current

Commence welding

6.02 AC or DC HF TIG Welding

Connect work lead to positive terminal

- Connect TIG torch to negative terminal
- Switch machine on
- Set *AC* or *DC* weld current. If *AC* is selected then set *AC FREQ* & *WAVE BALANCE*
- Connect a remote control device. A remote control device is required for use during LIFT TIG and HF TIG operation. See section 4.01, section 2 "*Remote Control Socket"*, for complete details of the remote device.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

- Set *PRE-FLOW* time
- Set *HOT START* current
- Set *POST-FLOW* time
- Set *WELD* current
- Set *POST-FLOW* time

Slope Mode Parameters if required

- Set *INTIAL CUR* current
- Set *UP SLOPE* time
- Set (WELD) *PEAK CUR* current
- Set *BASE* current
- Set *DOWN SLOPE* time
- Set *CRATER CUR* current

Pulse Mode parameters if required

- Set *PULSE WIDTH* % for *PEAK CURRENT*
- *Set PEAK CURRENT*
- Set *PULSE FREQ*

Commence welding

6.02.01 Save-Load Operation

A total number of 5 programs can be saved into the 300TSW memory

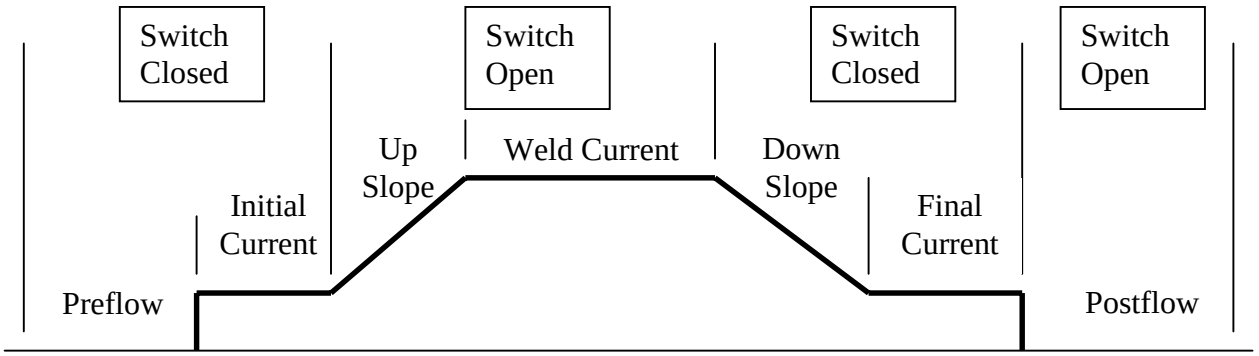
SAVE the Current Weld Parameters into Memory

- Press the *SAVE* button
- Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter
- After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters from the control panel are saved.
-

LOAD **(retrieve) a Program to Control Panel**

- Press the *LOAD* button
- Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine give a beep to confirm the weld parameters are loaded onto the control panel

6.02.02 Slope Mode Sequence



Note 5

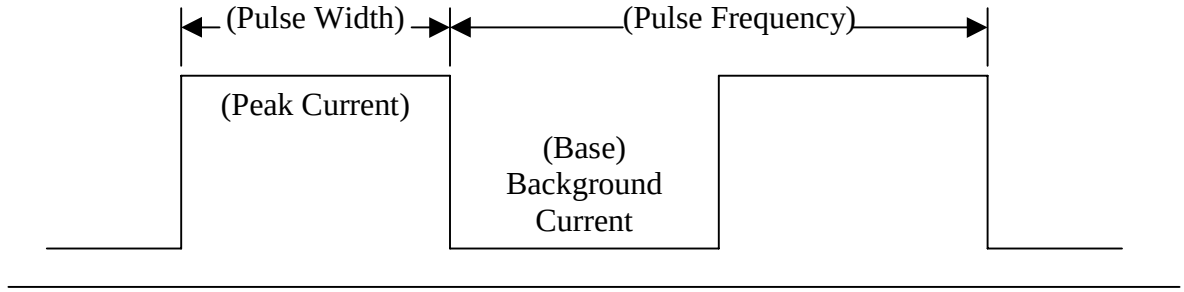
Slope function operates with a Remote ON/OFF device only.

1) To start Slope sequence Close remote switch contacts. Once the welding arc is established the Power Source will maintain initial current setting as long as the remote switch contacts are closed.
   a) In the HF TIG mode, after Preflow time High Frequency is present at the torch. When the torch is positioned close to the work the welding current will transfer to the work and establish the arc at the initial current setting.
   b) In the Lift TIG mode, after preflow time Lift Start current is present at the torch. When the electrode is touched to the work and lifted off, the welding arc is established at the initial current setting.
2) Open Remote Switch – current increases to weld current. Once welding arc has reached weld current the power source will maintain weld current as long as the remote switch contacts are open.
3) Close Remote Switch – Welding current decreases to final current setting. Once final welding current is reached the power source will maintain final current setting as long as the remote switch contacts are closed.
4) Open Remote Switch – Welding arc stops and post flow begins.

6.02.03 Slope Mode with repeat sequence

The repeat function is operated during the down slope cycle of the Slope Sequence and is active through the down slope period only. During the down slope period by opening the Remote Switch contacts the current will increase back to weld current. Within the Down Slope period the repeat function can be operated as many times as desired. To continue slope cycle and end slope sequence close remote switch contacts and allow weld current to reach final current setting. Once final current setting is reached opening the Remote Switch again will turn off the welding arc and post flow begins.

6.02.04 Pulse Controls



The Pulse controls are used primarily to control heat input. Pulse offers a number of advantages as follows:

1) Control puddle – size and fluidity (especially out of position).
2) Increase penetration
3) Travel speed control
4) Better consistent quality
5) Distortion on lighter or thinner materials.

Pulse-current provides a system in which the welding current continuously changes between two levels. During the periods of Peak current, heating and fusion takes place, and during the background (base) current periods, cooling and solidification take place. Pulse Width is the time in one cycle the current stays at the peak current setting. Pulse Frequency measured in Hertz is the number of cycles per second the current travels between peak and background current settings. It is as if the foot rheostat were moved up and down to increase and decrease the welding current on a regular basis. The faster you moved the foot rheostat up and down the faster the frequency.

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7.0 BASIC TIG WELDING GUIDE

7.01 Explanation of "Fluttery Arc" when AC TIG Welding on Aluminum

The following will assist in understanding the phenomenon of Arc Flutter, also referred to as Arc Rectification.

The basic thesis is that the fluttering is caused by lack of oxide in the weld pool.

The oxide layer on the plate reduced the energy for electron emission. Electron emission from the weld pool (DC+) causes the oxide layers to be disrupted, the so-called "cleaning action". However once the cleaning action has produced a mirror surface weld pool the effect of the oxide is limited because the oxide layer has disappeared. This makes electron emission from the weld pool more difficult and increases the chance of arc instability.

This idea is supported by the observation that once fluttering starts it can be made to stop by working the arc away from the mirror weld pool to an area of oxide coated material. As soon as this is done the arc settles back to a stable condition. So while the arc is "consuming" oxide coated plate the instability does not occur. But once the arc is stationary, the pool thoroughly "cleaned" by election emission, the fluttering begins.

Tests conducted on various types of AC TIG power sources, Fluttery Arc is not confined to one type of power source or it's design, both conventional and inverter types suffer from the same problem.

AC TIG on aluminum

The Problem: Arc appears unstable and pulses or flutters. ie. appears to rapidly change welding current.

Conditions that accentuate arc flutter:	**Conditions that minimizes arc flutter:**
• Cold work piece,	• Preheat the work piece,
• Very short arc length,	• Increase the arc length,
• Weld pool crater about 0.39" to 0.47" (10 to 12mm) diameter,	• Introduce filler rod material to the weld pool which introduces oxides.
• Arc field in one spot to produce "mirror" clean weld pool,	• Move the weld pool around to introduce oxides to the weld pool.
• Increased cleaning action. ie. Prolonged oxide emission from a stationary weld pool increases the likelihood of arc flutter,	• Decrease the cleaning action by turning the *WAVE BALANCE* to below 50% or move the weld pool around.
• Accentuated when tungsten running near its current capacity, ie. Molten ball on end.	• Use a larger tungsten electrode.

Table 7 – Reduction of Arc Flutter

Conclusion: Fluttery arc in AC TIG is a physical phenomenon independent of machine design.

7.02 Electrode Polarity

Connect the TIG torch to the - / *TORCH* terminal and the work lead to the + / *WORK* terminal for direct current straight polarity. Direct current straight polarity is the most widely used polarity for DC TIG welding. It allows limited wear of the electrode since 70% of the heat is concentrated at the work piece.

7.03 Tungsten Electrode Current Ranges

Electrode Diameter	AC Current (Amps)	DC Current (Amps)
0.040” (1.0mm)	30 – 70	30 – 60
1/16” (1.6mm)	60 – 95	60 – 115
3/32” (2.4mm)	125 – 150	100 – 165
1/8” (3.2mm)	130 – 225	135 – 200
5/32” (4.0mm)	190 – 280	190 – 280
3/16” (4.8mm)	250 – 340	250 – 340

Table 8 – Current ranges for varies tungsten electrode sizes

7.04 Tungsten Electrode Types

Electrode Type (Ground Finish)	Welding Application	Features	Color Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, Long life, High current carrying capacity.	Red
Zirconated 1%	High quality AC welding of aluminium, magnesium and their alloys.	Self cleaning, Long life, Maintains balled end, High current carrying capacity.	White
Ceriated 2%	AC & DC welding of mild steel, stainless steel, copper, aluminium, magnesium and their alloys	Longer life, More stable arc, Easier starting, Wider current range, Narrower more concentrated arc.	Grey

Table 9 – Tungsten electrode types

7.05 Guide for Selecting Filler Wire Diameter

Filler Wire Diameter	AC Current Range (Amps)	DC Current Range (Amps)
1/16” (1.6 mm)	30-95	20 - 90
3/32” (2.4 mm)	125-160	65 - 115
1/8” (3.2 mm)	180-240	100 - 165
3/16” (4.8 mm)	220-320	200-350

Table 10 – Filler wire selection guide

NOTE 6

The filler wire diameter specified in the above table is a guide only, other diameter wires may be used according to the welding application

7.06 Shielding Gas Selection

Alloy	Shielding Gas Argoshield is a registered trademark of BOC Gases Limited.
Aluminium & alloys	Welding Argon, Argoshield 80T, 81T
Carbon Steel	Welding Argon
Stainless Steel	Welding Argon, Argoshield 71T, 80T, 81T
Nickel Alloy	Welding Argon, Argoshield 71T
Copper	Welding Argon, Argoshield 81T
Titanium	Welding Argon, Argoshield 80T, 81T

Table 11 – Shielding gas selection

7.07 TIG Welding Parameters for Low Carbon & Low Alloy Steel Pipe

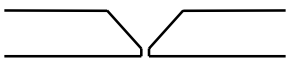
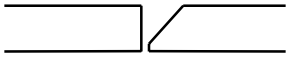
Electrode Type & Diameter	Current Range DC Amperes	Filler Rod for Root Pass	Joint Preparation
Thoriated 2% 3/32” (2.4 mm)	120 - 170	Yes	
Thoriated 2% 3/32” (2.4 mm)	100 - 160	Yes	
Thoriated 2% 3/32” (2.4 mm)	90 - 130	No	

Table 12 – TIG welding parameters for low carbon & low alloy steel pipe

7.08 Welding Parameters for Aluminum

Base Metal Thickness	AC Current for Aluminum	Tungsten Electrode Diameter	Filler Rod Diameter (if required)	Argon Gas Flow Rate Litres/min	Joint Type
0.040” 1.0mm	30-45 35-50	0.040” 1.0mm	1/16” 1.6mm	5-7	Butt/Corner Lap/ Fillet
0.045” 1.2mm	40-60 45-70	0.040” 1.0mm	1/16” 1.6mm	5-7	Butt/Corner Lap/ Fillet
1/16” 1.6mm	60-85 70-95	1/16” 1.6mm	1/16” 1.6mm	7	Butt/Corner Lap/ Fillet
1/8” 3.2mm	125-150 130-160	3/32” 2.4mm 1/8” 3.2mm	3/32” 2.4mm	10	Butt/Corner Lap/ Fillet
3/16” 4.8mm	180-225 190-240	1/8” 3.2mm	1/8” 3.2mm	10	Butt/Corner Lap/ Fillet
¼” 6.4mm	240-280 250-320	3/16” 4.8mm	3/16” 4.8mm	13	Butt/Corner Lap/ Fillet

Table 13 – AC TIG welding parameters

7.09 Welding Parameters for Steel

Base Metal Thickness	DC Current for Mild Steel	DC Current for Stainless Steel	Tungsten Electrode Diameter	Filler Rod Diameter (if required)	Argon Gas Flow Rate Liters/min	Joint Type
0.040” 1.0mm	35-45 40-50	20-30 25-35	0.040” 1.0mm	1/16” 1.6mm	5-7	Butt/Corner Lap/ Fillet
0.045” 1.2mm	45-55 50-60	30-45 35-50	0.040” 1.0mm	1/16” 1.6mm	5-7	Butt/Corner Lap/ Fillet
1/16” 1.6mm	60-70 70-90	40-60 50-70	1/16” 1.6mm	1/16” 1.6mm	7	Butt/Corner Lap/ Fillet
1/8” 3.2mm	80-100 90-115	65-85 90-110	1/16” 1.6mm	3/32” 2.4mm	7	Butt/Corner Lap/ Fillet
3/16” 4.8mm	115-135 140-165	100-125 125-150	3/32” 2.4mm	1/8” 3.2mm	10	Butt/Corner Lap/ Fillet
¼” 6.4mm	160-175 170-200	135-160 160-180	1/8” 3.2mm	5/32” 4.0mm	10	Butt/Corner Lap/ Fillet

Table 14 – DC TIG welding parameters

8.0 Basic Arc Welding Guide

8.01 Electrode Polarity

Stick electrodes are generally connected to the '+' terminal and the work lead to the '–' terminal but if in doubt consult the electrode manufacturers literature.

8.02 Effects of Stick Welding Various Materials

High tensile and alloy steels

The two most prominent effects of welding these steels are the formation of a hardened zone in the weld area, and, if suitable precautions are not taken, the occurrence in this zone of under-bead cracks. Hardened zone and under-bead cracks in the weld area may be reduced by using the correct electrodes, preheating, using higher current settings, using larger electrodes sizes, short runs for larger electrode deposits or tempering in a furnace.

Manganese steels

The effect on manganese steel of slow cooling from high temperatures is to embrittle it. For this reason it is absolutely essential to keep manganese steel cool during welding by quenching after each weld or skip welding to distribute the heat.

Cast Iron

Most types of cast iron, except white iron, are weldable. White iron, because of its extreme brittleness, generally cracks when attempts are made to weld it. Trouble may also be experienced when welding white-heart malleable, due to the porosity caused by gas held in this type of iron.

Copper and alloys

The most important factor is the high rate of heat conductivity of copper, making preheating of heavy sections necessary to give proper fusion of weld and base metal.

Types of Electrodes

Arc Welding electrodes are classified into a number of groups depending on their applications. There are a great number of electrodes used for specialized industrial purposes which are not of particular interest for everyday general work. These include some low hydrogen types for high tensile steel, cellulose types for welding large diameter pipes, etc. The range of electrodes dealt with in this publication will cover the vast majority of applications likely to be encountered; are all easy to use and all will work on even the most basic of welding machines.

9.0 ROUTINE MAINTENANCE

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment.

WARNING 8

Disconnect primary power at the source before opening the enclosure. Wait at least two minutes before opening the enclosure to allow the primary capacitors to discharge.

To clean the unit, open the enclosure (please refer to the 'Opening the Enclosure' section in the 300TSW Service Manual P/N 430429-517) and use a vacuum cleaner to remove any accumulated dirt and dust. The unit should also be wiped clean, if necessary; with solvents that are recommended for cleaning electrical apparatus.

CAUTION 5

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

10.0 BASIC TROUBLESHOOTING

WARNING 9

There are extremely dangerous voltages and power levels present inside this product. Do not attempt to open or repair unless you are an Accredited Thermal Arc Service Agent and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an Accredited Thermal Arc Service Agent for repair.

The basic level of troubleshooting is that which can be performed without special equipment or knowledge.

10.01 TIG Welding Problems

Weld quality is dependent on the selection of the correct consumables, maintenance of equipment and proper welding technique.

Description	Possible Cause	Remedy
1 Excessive beard build-up or poor penetration or poor fusion at edges of weld.	Welding current is too low.	Increase weld current and/or faulty joint preparation.
2 Weld bead too wide and flat or undercut at edges of weld or excessive burn through.	Welding current is too high.	Decrease weld current.
3 Weld bead too small or insufficient penetration or ripples in bead are widely spaced apart.	Travel speed too fast.	Reduce travel speed.
4 Weld bead too wide or excessive bead build up or excessive penetration in butt joint.	Travel speed too slow.	Increase travel speed.
5 Uneven leg length in fillet joint.	Wrong placement of filler rod.	Re-position filler rod.

	Description	Possible Cause	Remedy
6	Electrode melts when arc is struck.	A Electrode is connected to the '+' terminal.	A Connect the electrode to the '–' terminal.
		B *WAVE BALANCE* is greater than 50%.	B Reduced *WAVE BALANCE* to below 50% or increase the electrode size.
7	Dirty weld pool.	A Electrode contaminated through contact with work piece or filler rod material.	A Clean the electrode by grinding off the contaminates.
		B Gas contaminated with air.	B Check gas lines for cuts and loose fitting or change gas cylinder.
8	Electrode melts or oxidizes when an arc is struck.	A No gas flowing to welding region.	A Check the gas lines for kinks or breaks and gas cylinder contents.
		B Torch is clogged with dust.	B Clean torch.
		C Gas hose is cut.	C Replace gas hose.
		D Gas passage contains impurities.	D Disconnect gas hose from torch then raise gas pressure and blow out impurities.
		E Gas regulator turned off.	E Turn on.
		F Torch valve is turned off.	F Turn on.
		G The electrode is too small for the welding current.	G Increase electrode diameter or reduce the welding current.
		H *WAVE BALANCE* is set above 50%.	H Reduced *WAVE BALANCE* to below 50% or increase the electrode size.
9	Poor weld finish.	Inadequate shielding gas.	Increase gas flow or check gas line for gas flow problems.
10	Arc flutters during TIG welding.	A Tungsten electrode is too large for the welding current.	A Select the right size electrode. Refer to Basic TIG Welding guide.
		B Absence of oxides in the weld pool.	B Refer Basic TIG Welding Guide for ways to reduce arc flutter.
11	Welding arc can not be established.	A Work clamp is not connected to the work piece or the work/torch leads are not connected to the right welding terminals.	A Connect the work clamp to the work piece or connect the work/torch leads to the right welding terminals.
		B Torch lead is disconnected.	B Connect it to the '–' terminal.

Description	Possible Cause	Remedy
Welding arc can not be established. (Cont.)	C Gas flow incorrectly set, cylinder empty or the torch valve is off.	C Select the right flow rate, change cylinders or turn torch valve on.
12 Arc start is not smooth.	A Tungsten electrode is too large for the welding current.	A Select the right size electrode. Refer to Basic TIG Welding Guide.
	B The wrong electrode is being used for the welding job.	B Select the right electrode type. Refer to Basic TIG Welding Guide.
	C Gas flow rate is too high.	C Select the correct rate for the welding job. Refer to Basic TIG Welding Guide.
	D Incorrect shielding gas is being used.	D Select the right shielding gas. Refer to Basic TIG Welding Guide.
	E Poor work clamp connection to work piece.	E Improve connection to work piece.

10.02 Stick Welding Problems

Description	Possible Cause	Remedy
1 Gas pockets or voids in weld metal (Porosity).	A Electrodes are damp.	A Dry electrodes before use.
	B Welding current is too high.	B Reduce welding current.
	C Surface impurities such as oil, grease, paint, etc.	C Clean joint before welding.
2 Crack occurring in weld metal soon after solidification commences	A Rigidity of joint.	A Redesign to relieve weld joint of severe stresses or use crack resistance electrodes.
	B Insufficient throat thickness.	B Travel slightly slower to allow greater build up in throat.
	C Cooling rate is too high.	C Preheat plate and cool slowly.
3 A gap is left by failure of the weld metal to fill the root of the weld.	A Welding current is too low.	A Increase welding current
	B Electrode too large for joint.	B Use smaller diameter electrode.
	C Insufficient gap.	C Allow wider gap.
	D Incorrect sequence.	D Use correct build-up sequence.

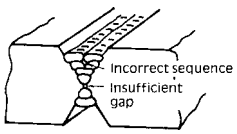


Figure 8 – Example of insufficient gap or incorrect sequence

4 Portions of the weld run do not fuse to the surface of the metal or edge of the joint.	A Small electrodes used on heavy cold plate.	A Use larger electrodes and pre-heat the plate.
	B Welding current is too low.	B Increase welding current.
	C Wrong electrode angle.	C Adjust angle so the welding arc is directed more into the base metal.
	D Travel speed of electrode is too high.	D Reduce travel speed of electrode.
	E Scale or dirt on joint surface.	E Clean surface before welding.

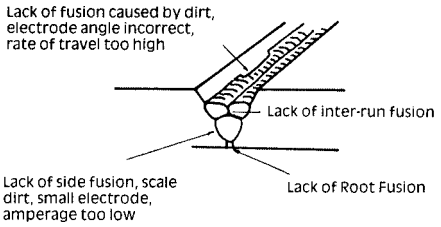


Figure 9 – Example of lack of fusion

5 Non-metallic particles are trapped in the weld metal (slag inclusion).	A Non-metallic particles may be trapped in undercut from previous run.	A If bad undercut is present, clean slag out and cover with a run from a smaller diameter electrode.
	B Joint preparation too restricted.	B Allow for adequate penetration and room for cleaning out the slag.
	C Irregular deposits allow slag to be trapped.	C If very bad, chip or grind out irregularities.
	D Lack of penetration with slag trapped beneath weld bead.	D Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from corners.
	E Rust or mill scale is preventing full fusion.	E Clean joint before welding.
	F Wrong electrode for position in which welding is done.	F Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.

Figure 10 – Examples of slag inclusion

10.03 Power Source Problems

Description	Possible Cause	Remedy
1 The welding arc cannot be established	A The Primary supply voltage has not been switched ON. B The Welding Power Source switch is switched OFF. C Loose connections internally.	A Switch ON the Primary supply voltage. B Switch ON the Welding Power Source. C Have an Accredited Thermal Arc Service Agent repair the connection.
2 Maximum output welding current can not be achieved with nominal Mains supply voltage.	Defective control circuit	Have an Accredited Thermal Arc Service Agent inspect then repair the welder.
3 Welding current reduces when welding	Poor work lead connection to the work piece.	Ensure that the work lead has a positive electrical connection to the work piece.
4 No gas flow when the torch trigger switch is depressed.	A Gas hose is cut. B Gas passage contains impurities. C Gas regulator turned off. D Torch trigger switch lead is disconnected or switch/cable is faulty.	A Replace gas hose. B Disconnect gas hose from the rear of Power Source then raise gas pressure and blow out impurities. C Turn gas regulator on. D Reconnect lead or repair faulty switch/cable.

Description	Possible Cause	Remedy
5 Gas flow won't shut off	A Weld Mode (*STD*, *SLOPE*, *REPEAT* or *SPOT*) was changed before *POST-FLOW* gas time had finished.	A Strike an arc to complete the weld cycle. OR Switch machine off then on to reset solenoid valve sequence.
	B Gas valve is faulty.	B Have an Accredited Thermal Arc Service Agent replace gas valve.
	C Gas valve jammed open.	C Have an Accredited Thermal Arc Service Agent repair or replace gas valve.
	D *POST-FLOW* control is set to 60 sec.	D Reduce *POST-FLOW* time.
6 The TIG electrode has been contaminated due to the gas flow shutting off before the programmed *POST-FLOW* time has elapsed	The Weld Process Mode (STICK, HF TIG or LIFT TIG) was changed before *POST-FLOW* gas time had finished.	Do not change Weld Process Mode before the *POST-FLOW* gas time had finished.

11.0 Voltage Reduction Device (VRD)

11.01 VRD Specification

Description	Pro-Wave 300TSW	Notes
VRD Open Circuit Voltage	15.3 to 19.8V	Open circuit voltage between welding terminals
VRD Resistance	148 to 193 ohms	The required resistance between welding terminals to turn ON the welding power
VRD Turn OFF Time	0.2 to 0.3 seconds	The time taken to turn OFF the welding power once the welding current has stopped

11.02 VRD Maintenance

Routine inspection and testing (power source)

An inspection of the power source, an insulation resistance test and an earth resistance test shall be carried out.

a) For transportable equipment, at least once every 3 months; and

b) For fixed equipment, at least once every 12 months.

The owners of the equipment shall keep a suitable record of the periodic tests.

Note 7

A transportable power source is any equipment that is not permanently connected and fixed in the position in which it is operated.

In addition to the above tests and specifically in relation to the VRD fitted to this machine, the following periodic tests should also be conducted by an accredited Thermal Arc service agent.

Description	IEC 60974-1 Requirements
VRD Open Circuit Voltage	Less than 20V; at Vin=230V or 460V
VRD Turn ON Resistance	Less than 200 ohms
VRD Turn OFF Time	Less than 0.3 seconds

If this equipment is used in a hazardous location or environments with a high risk of electrocution then the above tests should be carried out prior to entering this location.

12.0 Power Source Error Codes

Description	Possible Cause	Remedy	Remarks
1 E01 error code displayed Temperature sensor TH1 (protects IGBTs) is greater than 80ºC for about 1 second.	A The Welding Power Source's duty cycle has been exceeded. B Fan ceases to operate. C Air flow is restricted by vents being blocked.	A Let Power Source cool down then keep within its duty cycle. B Have an Accredited Thermal Arc Service Agent investigate. C Unblock vents then let Power Source cool down.	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E01 resets when TH1 decreases to 70ºC for about 30 seconds.
2 E02 error code displayed Temperature sensor TH2 (protects secondary diodes) is greater than 80ºC for about 1 second.	A The Welding Power Source's duty cycle has been exceeded. B Fan ceases to operate. C Air flow is restricted by vents being blocked.	A Let Power Source cool down then keep within its duty cycle. B Have an Accredited Thermal Arc Service Agent investigate. C Unblock vents then let Power Source cool down.	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E02 resets when TH1 decreases to 70ºC for about 30 seconds.
3 E03 error code displayed Primary (input) current too high.	A Primary current is too high because welding arc is too long. B Mains supply voltage is more than 10% below nominal voltage.	A Reduce length of welding arc. B Have an Accredited Thermal Arc Service Agent or a qualified electrician check for low Mains voltage.	Weld current ceases. Buzzer sounds constantly. Switch machine off then on to reset E03 error.
4 E04 error code displayed Output voltage exceeds the secondary voltage specification.	TIG torch cable and/or work lead are too long or leads are coiled.	Reduce the length of the TIG torch cable and/or work lead or un-coiled leads.	Weld current ceases. Buzzer sounds constantly. Switch machine off then on to reset E04 error.

	Description	Possible Cause	Remedy	Remarks
5	E11 error code displayed Over Primary supply (input) voltage at primary capacitors is exceeded for one second.	Primary supply voltage is greater than the nominal voltage plus 10%	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Primary voltage.	Weld current ceases. Buzzer sounds constantly. Error code E11 automatically will reset when the voltage reduces.
6	E14 error code displayed Under mains supply (input) voltage warning primary capacitors is reduced for one second.	Mains supply voltage is less than the nominal operating voltage less 10%.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage.	Weld current available. Buzzer sounds intermittently. Error code E14 automatically will reset when the voltage increases.
7	E12 error code displayed Under mains supply (input) voltage primary capacitors is reduced for one second.	Mains supply voltage is down to a dangerously low level.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage	Weld current ceases. Buzzer sounds constantly. Error code E12 automatically will reset when the voltage increases.
8	E81 error code displayed Wrong Primary supply (input) voltage connected.	When 3 phase machine is first turned on with the wrong Primary supply (input) voltage connected.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage.	No weld current is available. Buzzer sounds constantly. Switch machine off.
9	E82 error code displayed Link switch plug not connected.	Link switch plug not connected.	Have an Accredited Thermal Arc Service Agent check connector plug on input PCB.	No weld current is available. Buzzer sounds constantly. Switch machine off.
10	E83 error code displayed CPU checks mains supply (input) voltage when the on/off switch on rear panel of machine is turned ON.	The Primary supply (input) voltage fluctuates and is not stable.	Have an Accredited Thermal Arc Service Agent check connector plug on input PCB and the Mains voltage	No weld current is available. Buzzer sounds constantly. Switch machine off then on to reset E83 error.

Description	Possible Cause	Remedy	Remarks
11 E93 error code displayed Memory chip (EEPROM) on control PCB can not read/write weld parameters.	Memory chip (EEPROM) error.	Have an Accredited Thermal Arc Service Agent check the control PCB.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
12 E94 error code displayed Temperature sensor TH1 for IGBTs or sensor TH2 for secondary diodes are open circuit.	The Welding Power Source's temperature sensors have malfunctioned.	Have an Accredited Thermal Arc Service Agent check or replace the temperature sensors.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
14 E99 error code displayed Mains supply (input) voltage has been turned off but control circuit has power from the primary capacitors.	A Main on/off switch on machine has been turned off. B Mains supply (input) voltage has been turned off	A Turn on/off switch on. B Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage and fuses.	Weld current ceases. Buzzer sounds constantly. Must switch machine off then on to reset E99 error.

13.0 PARTS LIST

DWG. No.	Description	Type & Rating	QTY.	Code No.	Order No.
CC	Coupling Coil	F2A677800 CC	1	F2A677800	10-6767
CON1	Remote Socket	MS3102A20-27S	1	U0A727700	10-6768
CT1	Current Sensor	HC-TN200V4B15M 200A 4V	1	11251003000	10-5003
D1	Diode	DFA100BA160	1	454180160	10-6769
D2	Diode	DBA200UA60	1	4583A0060	10-6629
D3	Diode	DBA200UA60	1	4583A0060	10-6629
D4	Diode	DBA200UA60	1	4583A0060	10-6629
D5	Diode	DBA200UA60	1	4583A0060	10-6629
D6	Diode	DBA200UA60	1	4583A0060	10-6629
D6	Diode	DBA200UA60	1	4583a0060	10-6629
FAN	Fan	109E5724H507 DC 24V 16.8W (with Wire)	1	U0A738200	10-6770
FCH	Inductor	F2A677600 FCH	1	F2A677600	10-6771
HF.UNIT	HF. Unit	HF.UNIT (WK-4840 U02)	1	U0A632200	10-6632
	HF. Gap	U0A601100	1	U0A601100	10-6633
L105	Inductor	1615MRE RING CORE	1	63200006500	10-6538

13.0 PARTS LIST Continued

DWG. No.	Description	Type & Rating	QTY.	Code No.	Order No.
PCB1	Printed Circuit Board	WK-4961 U01 MAIN PCB (with Cable EBA521700) with Thunder Label	1	U0A681600	10-6772
PCB2	Printed Circuit Board	WK-4983 U01 CTL.SOURCE	1	P0A498301	10-6773
PCB3	Printed Circuit Board	WK-4819 U01 DETECT PCB	1	P0A481901	10-6635
PCB4	Printed Circuit Board	WK-4984 U01 IGBT DRIVER	1	P0A498401	10-6774
PCB5	Printed Circuit Board	WK-5157 U05 AC CONTROL	1	P0A515705	10-6846
PCB6	Printed Circuit Board	WK-5037 U02 AC TIG PANEL	1	P0A503702	10-6775
PCB9	Printed Circuit Board	WK-4917 U04 FILTER 480V	1	P0A491704	10-6740
PCB10	Printed Circuit Board	WK-4970 U01 START.PCB	1	P0A497001	10-6776
PCB11	Printed Circuit Board	WK-4963 U01 2 IGBT PCB	1	P0A496301	10-6777
PCB14	Printed Circuit Board	WK-5100 U01 DISCHARGE PCB	1	P0A510001	10-6778
PCB15	Printed Circuit Board	WK-5246 U01 DI. SNUBBER with Thunder Label	1	U0A764000	10-6852
PCB16	Printed Circuit Board	WK-5040 U01 C TYPE RELAY	1	P0A504001	10-6780
PCB17	Printed Circuit Board	WK-5248 U01 GATE PCB-2	1	P0A524801	10-6853
PCB18	Printed Circuit Board	WK-5248 U01 GATE PCB-2	1	P0A524801	10-6853
PCB19	Printed Circuit Board	WK-5249 U01 RESISTOR PCB	1	U0A771100	10-6876
Q1	Transistor	CM100DUS12F-1 600V 100A (with WK-5247 U01)	1	U0A764100	10-6856
Q2	Transistor	CM100DUS12F-1 600V 100A (with WK-5247 U01)	1	U0A764100	10-6856
Q3	Transistor	GCA200CA60 (with WK-3367 U04)	1	U0A705400	10-6643
Q4	Transistor	GCA200CA60 (with WK-3367 U04)	1	U0A705400	10-6643

13.0 PARTS LIST Continued

DWG. No.	Description	Type & Rating	QTY.	Code No.	Order No.
R2	Resistor	ERF20HMJ151 20W 150Ω	1	40310211500	10-5081
R3	Resistor	JG23V101J 68W 100Ω	2	40511000200	10-5137
S1	Switch	DCP-103SR100C-480V 3P	1	25850003700	10-6857
S2	Switch	SDKGA4-A-1-A	1	24704531400	10-6781
SOL	Solenoid Valve	5505NBR1.5 DC24V 11VA/10W (with Gas Inlet and PC4-02)	1	U0A705700	10-6645
T1	Transformer	F2A705700 MTR	1	F2A705700	10-6782
T2	Transformer	F2A705700 MTR	1	F2A705700	10-6782
T3	Transformer	F2A869300 300A AC/DC DT	1	F2A869300	10-6877
TH1,2	Thermistor	ERTA53D203 (Two-piece group)	1	U0A733300	10-6784
	Front Panel	E0D004800	1	E0D004800	10-6785
	Rear Panel	E0D004900	1	E0D004900	10-6786
	Side Panel	E0D006200	2	E0D006200	10-6787
	Front Control Cover	J4B570500	1	J4B570500	10-6788
	Rear Control Cover	JDA173300	1	U0A728000	10-6789
	Protection Cover	E0C299200	1	E0C299200	10-6790
	Encoder Cover	EBA514400	1	EBA514400	10-6791
	PCB Cover	E1B547900	1	E1B547900	10-6792

13.0 PARTS LIST Continued

DWG. No.	Description	Type & Rating	QTY.	Code No.	Order No.
	Name Label	N4A056400	2	N4A056400	10-6793
	Side Label	N4A009200	2	N4A009200	10-6657
	VRD Label	N4A155900	1	N4A155900	Ref. Only
	Warranty Label	N4A155800	1	N4A155800	Ref. Only
	Warning Label 1	N0B891300	1	N0B891300	10-5497
	Warning Label 2	N0B476400	1	N0B476400	10-5496
	Output Terminal Label	N4A040600	1	N4A040600	10-6794
	Gas Input Label	N4A040700	1	N4A040700	10-6733
	Gas Outlet	E5A925600(with PC4-02)	1	U0A705800	10-6659
	C-Ring		2	53003000600	10-5184
	Output Terminal (female)	TRAK-BE35-70S	2	26999025900	10-6660
	Input Cable	SOOW AWG8X4C L=3.4m	1	U0A722400	Ref. Only
	Input Cable Clamp	EBA156800	1	EBA156800	10-6795
	Heatsink	E1B548900 FIN 1	1	E1B548900	10-6796
	Heatsink	E1B549000 FIN 2	1	E1B549000	10-6797
	Knob	2628603	1	50990001650	10-6798
	Knob Cap	3028104	1	50990003400	10-6799
	Control Cover Sheet	N0B882700	1	N0B882700	10-6800
	Flat Cable	EAA547301	1	EAA547301	10-6668

13.0 PARTS LIST Continued

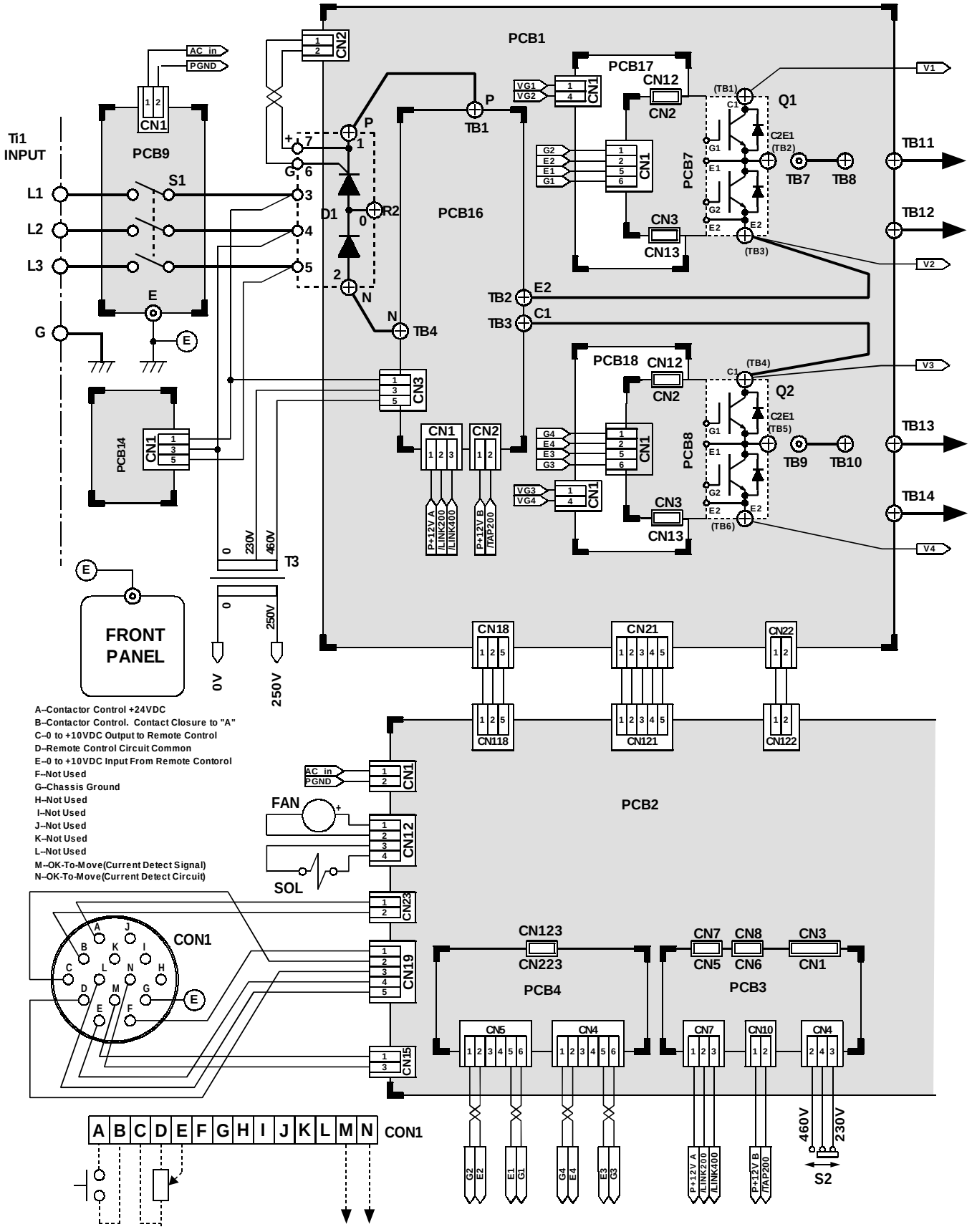
DWG. No.	Description	Type & Rating	QTY.	Code No.	Order No.
	Post11 (S1)	EBA643600 (M5-M5) 9	3	EBA643600	10-6751
	Post2 (Q4)	EBA425000 (M5)11.4	3	EBA425000	10-6801
	Post3 (D1,Q1,Q2)	EBA425100 (M5-M5)23	9	EBA425100	10-6802
	Post421 (D2-6)	BSB421 (M4)7.0	8	53602020600	10-6803
	Post410	4SQ10	4	53602011500	10-6867
	S1 Bus Bar	ECA321000	3	ECA321000	10-6868
	Transformer Bus Bar 1	EBA365600	1	EBA365600	10-6804
	Q2,3 Bus Bar 1	EBA429000	2	EBA429000	10-6806
	Q2,3 Bus Bar 2	EBA429100	1	EBA429100	10-6807
	Q-(+) Bus Bar	EBA501200	1	EBA501200	10-6808
	D Bus Bar 2	EBA364800	1	EBA364800	10-6810
	D Total Bus Bar 1	ECA129100 D Total Bus Bar 1	1	ECA129100	10-6870
	D Total Bus Bar 3	ECA129300 D Total Bus Bar 3	1	ECA129300	10-6871
	D Total Bus Bar 4	ECA129400 D Total Bus Bar 4	1	ECA129400	10-6872
	D Total Bus Bar 5	ECA129600A D Total Bus Bar 5	1	ECA129600	10-6878
	D Total Bus Bar 6	ECA129700 D Total Bus Bar 6	1	ECA129700	10-6879

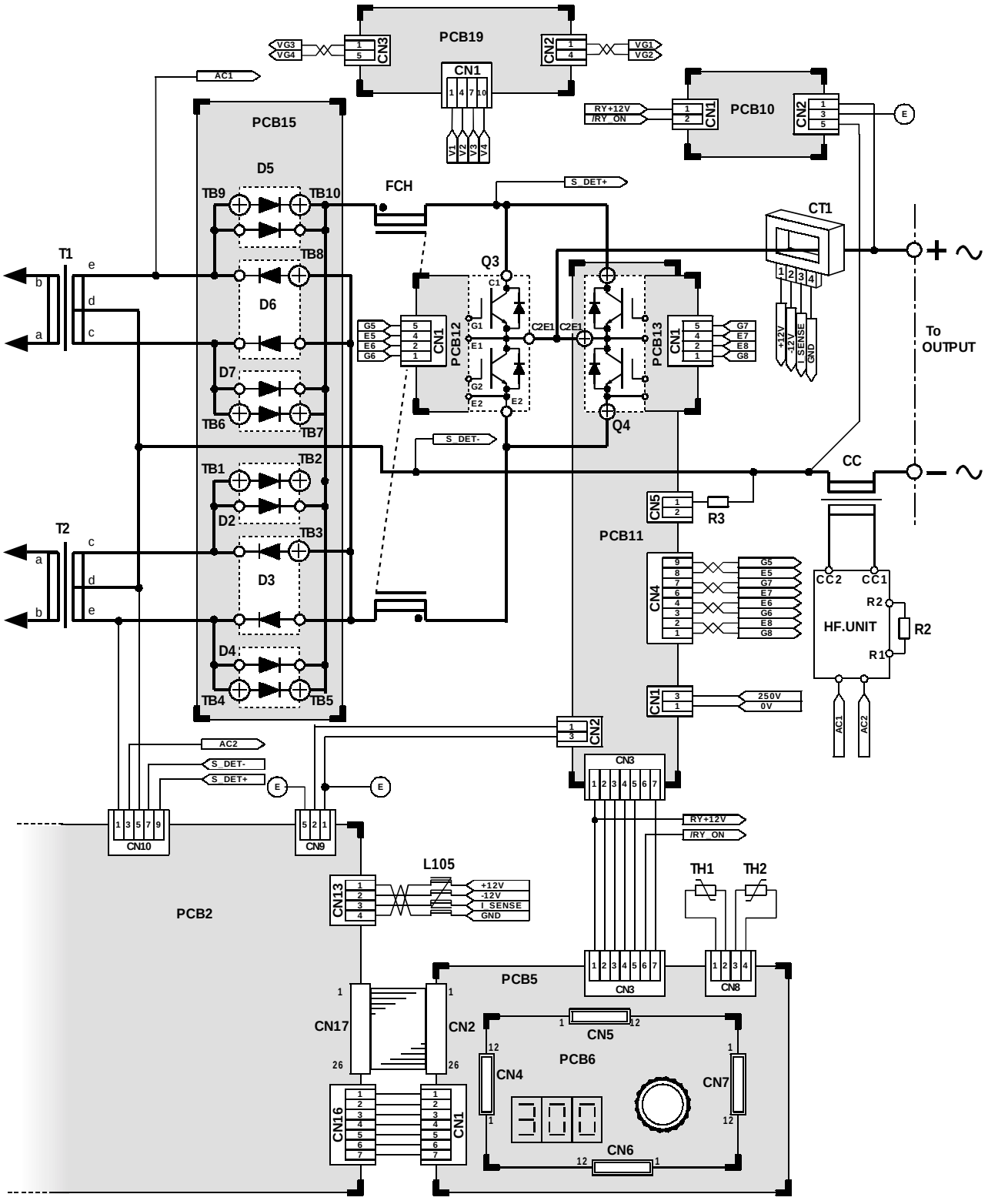
13.0 PARTS LIST Continued

DWG. NO.	Description	Type & Rating	QTY.	Code No.	Order No.
	Clip	#74 NATURAL (Plastic Tab)	4	606024220	10-5259
	Right Chassis	J2C977100	1	J2C977100	10-6814
	Left Chassis	J2C976800	1	J2C976800	10-6815
	PCB10 Chassis	JDA013400	1	JDA013400	10-6816
	Transformer Chassis 2	JDA024800	1	JDA024800	10-6817
	Transformer Chassis 1	JDA026000	1	JDA026000	10-6818
	Transformer Hold Chassis 2	JDA064300	1	JDA064300	10-6819
	Transformer Sheet	EBA460900	2	EBA460900	10-6820
	14-Pin Con Cover Set	1070500-20 (with String and Clip)	1	U0A728200	10-6821
	Nylon Hose	T0425B Nylon Hose L=0.5m	1	U0A706000	10-6681
	Output Terminal (male)	TRAK-SK50	2	26999025800	10-2020
	Operating Manual	K1A208900 300TSW	1	K1A208900	430429-511
	Service Manual		1		430429-517

APPENDIX A

INTERCONNECT DIAGRAM

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CN1
CN2
CN3
VG3
VG4
VG1
VG2
V1
V2
V3
V4
AC1
PCB15
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TB9
TB10
TB8
D6
D7
TB6
TB7
TB1
TB2
D2
TB3
D3
D4
TB4
TB5
T1
T2
FCH
S_DET+
S_DET-
Q3
Q4
PCB12
PCB13
C1
G1
E1
G2
E2
C2E1
G5
E5
E6
G6
G7
E7
E8
G8
CT1
+12V
-12V
I_SENSE
GND
To OUTPUT
CC
PCB11
CN5
R3
CN4
CC2
CC1
R2
HF.UNIT
R1
250V
0V
AC2
CN10
CN9
L105
CN13
PCB2
RY+12V
/RY_ON
TH1
TH2
PCB5
CN17
CN16
PCB6
CN6
CN7
CN8