



INVERTER ARC WELDER

MODEL 130/150/190 GTS CC/TIG

- **STICK**
- **TIG - HIGH FREQUENCY**
- **LIFT START**

Operating Manual

February 15, 1996

Manual No. 0-2491

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Thermal Arc™ Model 130GTS CC/TIG, Model 150GTS CC/TIG, and
Model 190GTS CC/TIG Inverter Arc Welders
Instruction Manual Number 0-2491

Published by:
Thermal Dynamics Corporation
Industrial Park #2
West Lebanon, New Hampshire, USA 03784

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While the information contained in this instruction manual represents our
best judgement, Thermal Dynamics Corporation assumes no liability for
its use.

NOTES, CAUTIONS AND WARNINGS

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

NOTE

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

CAUTION

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



WARNING

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



WARNING IMPORTANT SAFETY PRECAUTIONS

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

Operators and personnel should be alerted to ALL possible hazards. To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.

FUMES and GASES



Fumes and Gases produced from the plasma process can be dangerous and hazardous to your health.

- Keep all fumes and gases from your breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if available ventilation cannot remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc 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 MSDS's 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 and related publications on page 6.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma 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.

IMPORTANT SAFETY PRECUATIONS (CONTINUED)

ELECRTCIC SHOCK



Electric Shock can injure or kill. The plasma arc 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, see page *iv*, item 9.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operators Manual.

FIRE AND EXPLOSION



Fire and Explosions can be caused by hot slag, sparks, or the plasma arc. The plasma arc process produces hot sparks, slag and metal which can ignite combustible material, or cause flammable vapors to explode.

- 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.

PLASMA ARC RAYS



Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc 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 the operators manual.

IMPORTANT SAFETY PRECAUTIONS (CONTINUED)

NOISE



Noise can cause permanent hearing loss. Plasma arc 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, page 6.

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

DECLARATION OF CONFORMITY

Manufacturer: Thermal Dynamics Corporation
Address: Industrial Park #2
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EU, as recently changed in Directive 93/68/EU) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements among them are:

- * CSA (Canadian Standards Association) standard C22.2 number 60-M1990 for Arc welding equipment.
- * UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- * CENELEC EN50199 EMC Product Standard for Arc Welding Equipment March 1995.
- * IEC 974-1 (BS 638-PT10) (EN 60 974-1) applicable to welding equipment and associated accessories.
- * Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process, to ensure the product is safe and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermal Dynamics has been manufacturing products that perform in a safe manner for more than 30 years and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative: David Ashworth
Vice President & Managing Director
Thermadyne Europe
Chorley England



STATEMENT OF WARRANTY

LIMITED WARRANTY: Thermal Dynamics Corporation (hereinafter "Thermal") warrants 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 products as stated below, Thermal shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal'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's sole option, of any components or parts of the product determined by Thermal to be defective.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Thermal shall not under any circumstances be liable for special or consequential damages, such as, but not limited to, damage or loss of purchased or replacement goods, or claims of customers of distributor (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal 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 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.

THIS WARRANTY BECOMES INVALID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL PRODUCT.

THIS WARRANTY IS INVALID IF THE PRODUCT IS SOLD BY NON-AUTHORIZED PERSONS.

The limited warranty periods for Thermal products shall be as follows: A maximum of three (3) years from date of sale to an authorized distributor and a maximum of two (2) years from date of sale by such distributor to the Purchaser, and with the following further limitations on such two (2) year period:

<u>PAK UNITS, POWER SUPPLIES</u>	<u>PARTS</u>	<u>LABOR</u>
MAIN POWER MAGNETICS	2 YEARS	1 YEAR
ORIGINAL MAIN POWER RECTIFIER	2 YEARS	1 YEAR
CONTROL PC BOARD	2 YEARS	1 YEAR
ALL OTHER CIRCUITS AND COMPONENTS	1 YEAR	1 YEAR
INCLUDING, BUT NOT LIMITED TO, STARTING CIRCUIT, CONTACTORS, RELAYS, SOLENOIDS, PUMPS, POWER SWITCHING SEMI-CONDUCTORS		
<u>CONSOLES, CONTROL EQUIPMENT, HEAT</u>	1 YEAR	1 YEAR
<u>EXCHANGES, AND ACCESSORY EQUIPMENT</u>		
<u>TORCH AND LEADS</u>	180 DAYS	180 DAYS
<u>REPAIR/REPLACEMENT PARTS</u>	90 DAYS	90 DAYS

Warranty repairs or replacement claims under this limited warranty must be submitted by an authorized Thermal Arc® repair facility within thirty (30) days of the repair. Authorized Thermal Arc® repair facilities are authorized distributors and authorized Thermal Arc® Service Centers. 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 customer. All returned goods shall be at the customer's risk and expense. This warranty supersedes all previous Thermal warranties.

1.1 SPECIFICATIONS

Description The Thermal Arc™ Model 130GTS, Model 150GTS, and Model 190GTS are single-phase DC arc welding power sources with Constant Current (CC) output characteristics. Each unit is equipped with a gas control solenoid, lift start TIG, and high-frequency arc starter for use with Gas Tungsten Arc Welding (GTAW). These units are designed for use with Shielded Metal Arc Welding (SMAW), Gas Tungsten Arc Welding -Lift Start (GTAW-LS) and Gas Tungsten Arc Welding -Pulsed (GTAW-P) -Sloped (GTAW-S) processes.

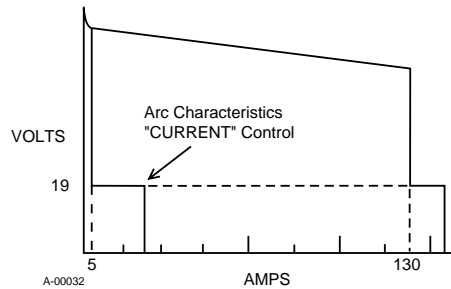


Figure 1. Model 130 GTS CC/TIG Volt-Ampere Curves

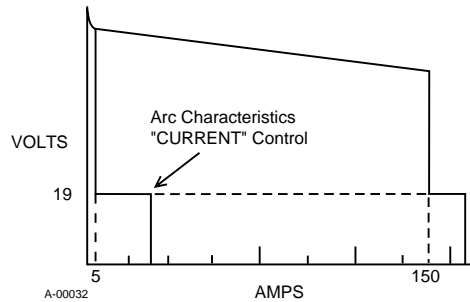


Figure 2. Model 150 GTS CC/TIG Volt-Ampere Curves

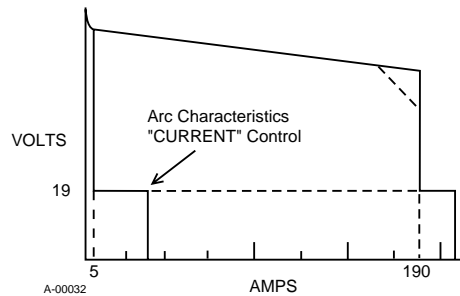


Figure 3. Model 190 GTS CC/TIG Volt-Ampere Curves

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

1.1 SPECIFICATIONS

Parameter/Model	Model 130 GTS CC/TIG		Model 150 GTS CC/TIG		Model 190 GTS CC/TIG	
Rated Output	@ 230 V	@ 115V	@ 230 V	@ 115V	@ 230 V	@ 115V
Amperes	130	85	150	85	190	95
Volts	15	13	16	13	18	13
Duty Cycle						
@ 230V Input	40% at 130 A/15 V 25% at 100 A/25 V		40% at 150 A/16 V 25% at 200 A/25 V		25% at 190 A/17 V 25% at 150 A/26 V	
@ 115V Input	40% at 85 A/13 V 25% at 85 A/23 V		40% at 85 A/13 V 25% at 85 A/23 V		40% at 95 A/14 V 25% at 95 A/24 V	
Range (Min. - Max.)						
Amperes						
@ 230V Input	5-130		5-150		5-190	
@ 115V Input	5-85		5-85		5-95	
Volts	10-25		10-26		10-28	
Over Current Voltage						
Maximum OCV	64 V		64 V		64 V	
Input Data	50/60 Hz		50/60 Hz		50/60 Hz	
Dimensions/Weight						
Width	5.1 in (130mm)		5.1 in (130mm)		5.1 in (130mm)	
Height	9.5 in (240mm)		9.5 in (240mm)		9.5 in (240mm)	
Length	11.8 in (300mm)		11.8 in (300mm)		11.8 in (300mm)	
Weight (with Cable)	18.7 lb.(8.5 kg.)		18.7 lb.(8.5 kg.)		18.7 lb.(8.5 kg.)	
Output At Rated Load						
Input data 50/60 Hz/Duty Cycle						
208 VAC 1-Phase	40% at 130 A/15 V 17.5 A / 3.6 KVA / 2.3 KV 25% at 100 A/24 V 21.5 A / 4.5 KVA / 2.8 KV		40% at 150 A/16 V 21.5 A / 4.5 KVA / 2.8 KV 25% at 120 A/25 V 27.0 A / 5.6 KVA / 3.5 KV		40% at 150A/17V 29.0 A / 6.0 KVA / 3.8 KV 25% at 150 A/26 V 35.0 A / 7.3 KVA / 3.5 KV	
230 VAC 1-Phase	40% at 130 A/15 V 16.0 A / 3.6 KVA / 2.3 KV 25% at 100 A/24 V 19.5 A / 4.5 KVA / 2.8 KV		40% at 150 A/16 V 19.5 A / 4.5 KVA / 2.8 KV 25% at 120 A/25 V 27.0 A / 5.6 KVA / 3.5 KV		40% at 150A/17V 26.0 A / 6.0 KVA / 2.8 KV 25% at 150 A/26 V 32.0 A / 7.3 KVA / 4.6 KV	
115 VAC 1-Phase	40% at 85 A/13 V 18.0 A / 2.1 KVA / 1.3 KV 25% at 85 A/23 V 32.0 A / 3.6 KVA / 2.3 KV		40% at 85 A/13 V 18.0 A / 2.1 KVA / 1.3 KV 25% at 85 A/23 V 32.0 A / 3.6 KVA / 2.3 KV		40% at 85 A/14 V 21.5 A / 2.5 KVA / 1.6 KV 25% at 95 A/24 V 37.0 A / 4.2 KVA / 2.7 KV	
Output At No Load						
Input data 50/60 Hz/Duty Cycle						
208 VAC 1-Phase	40% at 130 A/15 V 2.5 A / 0.5 KVA / 0.3 KV 25% at 100 A/24 V 2.5 A / 0.5 KVA / 0.3 KV		40% at 150 A/16 V 2.5 A / 0.5 KVA / 0.3 KV 25% at 120 A/25 V 2.5 A / 0.5 KVA / 0.3 KV		40% at 150 A/17 V 2.5 A / 0.5 KVA / 0.3 KV 25% at 150 A/26 V 2.5 A / 0.5 KVA / 0.3 KV	
230 VAC 1-Phase	40% at 130 A/15 V 2.0 A / 0.5 KVA / 0.3 KV 25% at 100 A/24 V 2.0 A / 0.5 KVA / 0.3 KV		40% at 150 A/16 V 2.0 A / 0.5 KVA / 0.3 KV 25% at 120 A/25 V 1.0 A / 0.5 KVA / 0.3 KV		40% at 150 A/17 V 1.0 A / 0.5 KVA / 0.3 KV 25% at 150 A/26 V 1.0 A / 0.5 KVA / 0.3 KV	
115 VAC 1-Phase	40% at 85 A/13 V 1.0 A / 0.5 KVA / 0.3 KV 25% at 85 A/23 V 1.0 A / 0.5 KVA / 0.3 KV		40% at 85 A/13 V 1.0 A / 0.5 KVA / 0.3 KV 25% at 85 A/23 V 1.0 A / 0.5 KVA / 0.3 KV		40% at 85 A/14 V 1.0 A / 0.5 KVA / 0.3 KV 25% at 95 A/24 V 1.0 A / 0.5 KVA / 0.3 KV	

1.2 TRANSPORTING METHODS

These units are equipped with one handle and a shoulder strap for carrying purposes.



WARNING

ELECTRIC SHOCK can kill.

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



WARNING

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Lift unit with handle or shoulder strap on top of case.
- Use hand cart or similar device of adequate capacity.
- If using a fork lift vehicle, place and secure unit on a proper skid before transporting.
- This unit has a built-in handle and shoulder strap on top of case for lifting. Be sure unit is lifted and transported safely and securely.

1.3 ELECTRICAL INPUT CONNECTIONS



WARNING

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

Electrical Input Requirements

- DO NOT TOUCH live electrical parts.
- SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures, wait 60-80 seconds, and measure voltage on input capacitors according to instruction manual before touching any parts. 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.

Operate the welding power source from a single-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

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

- Do not connect an input conductor to the ground terminal. European models have brown (line 1) and blue (line 2) conductors, all others have white (line 2) and black (line 1).
- Do not connect the ground conductor to an input line terminal. European models have yellow/green ground conductor, all others have green.

Refer to Figure 4 and:

- 1) Connect end of ground conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
- 2) Connect ends of line 1 and line 2 input conductors to a de-energized line disconnect switch.
- 3) Use Table 1 on Page 20 as a guide to select line fuses for the disconnect switch.

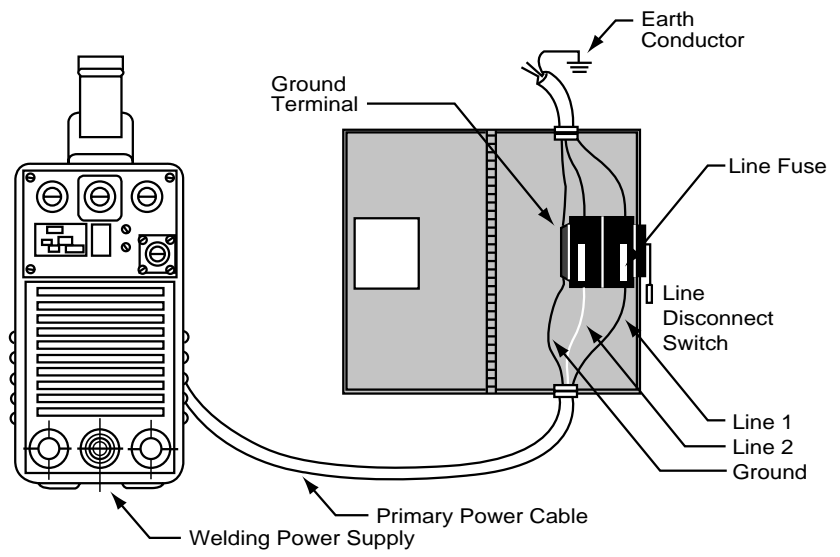


Figure 4. Electrical Input Connections

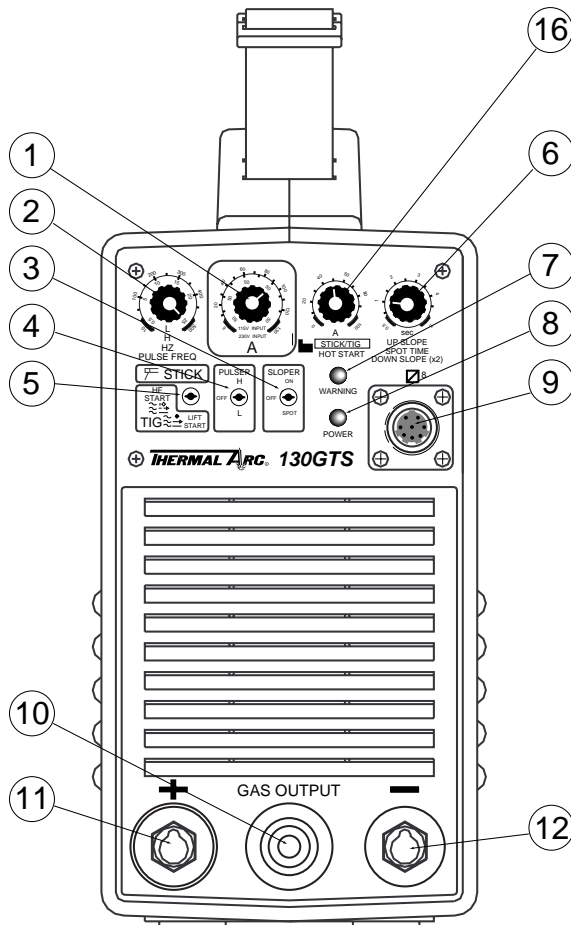
Voltage Selection

The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate.

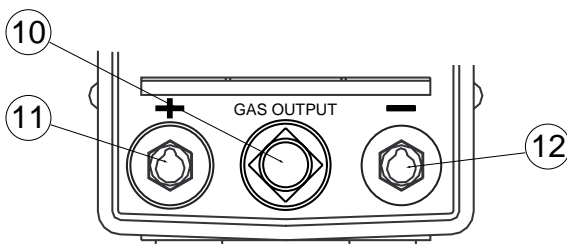
This power source incorporates a control circuit which automatically links the power source to the primary input voltage and adjusts it to allow for operation of the unit within the input rating on the input data tag. It is not necessary to manually switch (terminals or links) if the unit is moved to a new location and a different input power is selected.

- The surge current prevention circuit becomes activated when the PRIMARY POWER switch is turned ON.
- About two seconds after power on, the control circuit detects the input voltage and automatically selects the correct circuits for operation.
- The welding power source is ready for operation within five seconds after power is turned on.

2.1 OPERATOR CONTROLS



All Models Except European



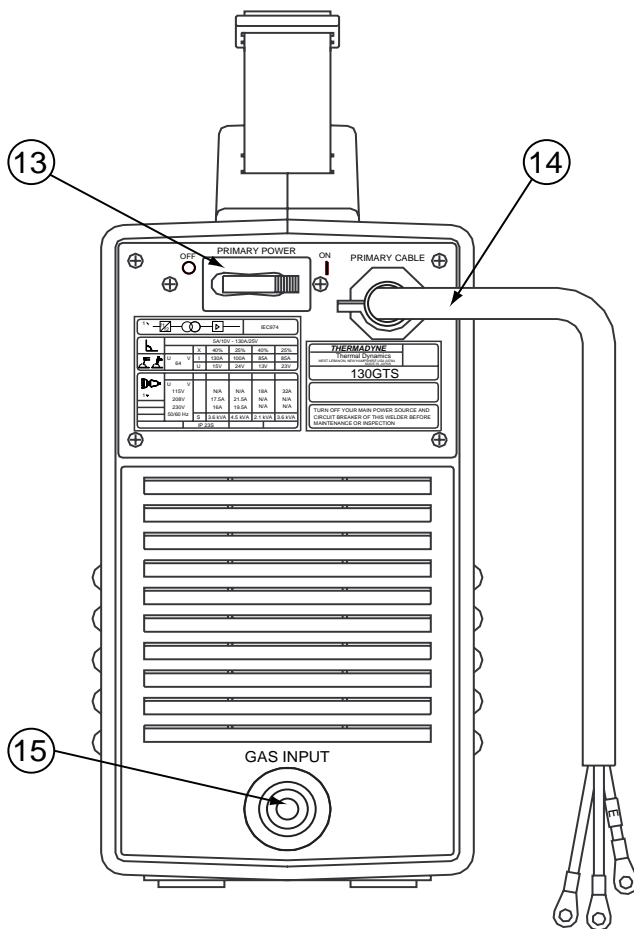
European Models

- ① **Amperage Control** - The Amperage Control selects the desired amperage within the entire range of the welding power source. Rotating this control in a clockwise direction increases the amperage output. The scale surrounding the amperage control represents approximate actual amperage values.
- ② **Pulse Frequency Control** - The Pulse Frequency control provides a means of selecting the pulse frequency when the Pulse switch is in the H (HIGH) or L (LOW) position. Rotating the control clockwise increases the pulse frequency. The two scales surrounding the control represent approximate actual values. The pulse frequency is adjustable from 0.5 to 25 Hz in LOW and 10 to 500 Hz in HIGH.
- ③ **Sloper Switch** - When in the OFF position the Sloper is inactive. Selecting the ON position activates the Sloper. Selecting the SPOT position activates the spot welding timer. The Slope sequence and spot modes are activated by a remote ON/OFF switch connected to the 8-pin receptacle. See the section on Slope sequence.
- ④ **Pulsers Switch** - When in the OFF position the Pulsers is inactive. Selecting H (HIGH) or L (LOW) will activate the TIG pulser. The Pulse Frequency can be adjusted by the Pulse Frequency control. Pulse width is fixed at 50%. Background current is fixed at 1/5th of the peak current.
- ⑤ **Process Selector Switch** - The Process Selector Switch allows the operator to select the STICK welding (SMAW) process, LIFT TIG (GTAW) or HF TIG (GTAW) process.
- ⑥ **Spot Time Up/Down Slope Control** - This control provides Spot, Up and Down slope time control. Rotating the control clockwise increases the time. The scale surrounding the control represents approximate actual values. The Spot and Up slope time is adjustable from 0.5 to 5 seconds. The Down slope time is twice the Up slope time at 0.5 to 10 seconds.
- ⑦ **Warning Indicator** - The Warning Indicator located on the front panel will become activated under the following conditions:
 - Input voltage is too low
 - Input voltage too high
 - Thermal overload
- ⑧ **AC Power Indicator** - The AC Power Indicator located on the front panel lights when the Primary Power Switch is in the ON position, indicating the unit is energized.
- ⑨ **8-pin Receptacle** - Used for remote contactor and amperage controls.
- ⑩ **Output Gas Fitting** - European Model Gas output fitting size 3/8" BSP for Monocable TIG Torch. All other models have 5/8"-18 unf female.

Figure 5a. Operator Controls -Front Panel

2.1 OPERATOR CONTROLS

- ⑪ **Positive Terminal** - 25mm DIN-style female receptacle.
- ⑫ **Negative Terminal** - 25mm DIN-style female receptacle.
- ⑬ **Primary Power Switch** - Placing the Primary Power Switch (circuit breaker) located on the rear panel to the ON position energizes the welding power source.
- ⑭ **Input Cable** - 10 feet; size 12/3 cable
- ⑮ **Input Gas Fitting** - The input gas connection is located on the bottom center of the rear panel. European models have 3/8" BSP fitting, all others have 5/8" -18 unf female.
- ⑯ **Hot Start Control** - The Hot Start Control operates in the STICK and HF TIG modes. The Hot Start time is approximately 0.01 seconds in TIG and 0.06 seconds in STICK. The current value is adjusted from 0 to 100 Amps over the determined weld current set by the Amperage Control. Rotating the control clockwise increases Hot Start current.



Gas Solenoid - The pre-flow is fixed at 150 ms. Post-flow is automatically adjusted from 1 to 15 seconds by the position of the welding Amperage Control.

Sloper Sequence -

- A. Remote ON/OFF switch closed** - Pre-flow starts to flow. In HF TIG mode HF and initial current is present after pre-flow. (In LIFT TIG mode HF is not present.) Initial current is 1/5th of the welding current.
- B. Remote ON/OFF switch opened** - Current increases to welding current at the rate set by the UP/DOWN Slope control. Welding current is set by the Amperage Control.
- C. Remote ON/OFF switch closed** - Current decreases to final current at twice the rate set for UP Slope. Final current is 1/5th of welding current.
- D. Remote ON/OFF switch opened** - Arc shuts off and post-flow time initiated.

Figure 5b. Operator Controls -Rear Panel

2.2 SETUP FOR OPERATION

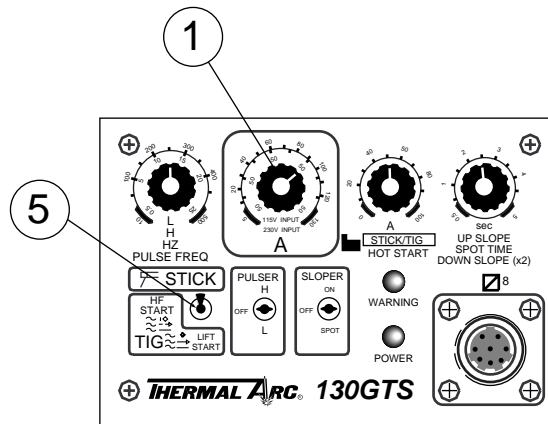
Shielded Metal Arc Welding (SMAW)



WARNING

Read and follow all safety precautions on pages 2-3 of this manual before proceeding with operation.

1. Install and connect unit according to the installation instructions in section 1.3 of this manual.
2. Wear dry insulating gloves and clothing.
3. Connect work clamp to clean, bare metal at workpiece.
4. Select proper electrode.
5. Refer to Operator Control section and set the controls per the following:
 - a. PROCESS SELECTOR switch [5] to STICK position.
 - b. Rotate the AMPERAGE control [1] to output current level desired.



6. Insert electrode into electrode holder.
7. Wear welding helmet with proper filter lens according to ANSI Z49.1.
8. Place the PRIMARY POWER switch [13] to ON.
9. Begin welding.

2.2 SETUP FOR OPERATION

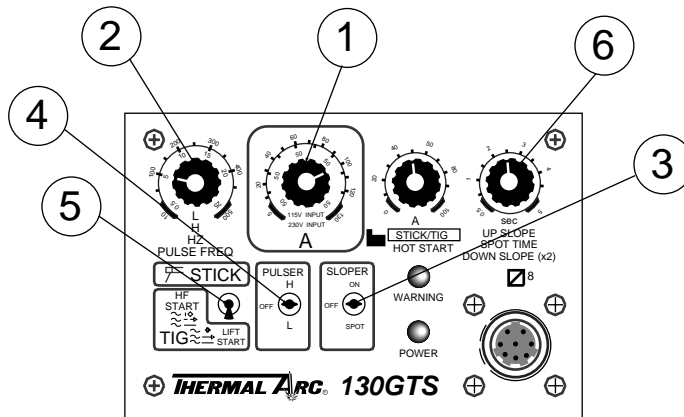
Gas Tungsten Arc Welding (GTAW) High Frequency/Lift Start



WARNING

Read and follow all safety precautions on pages 2-3 of this manual before proceeding with operation.

1. Install and connect unit according to the installation instructions in section 1.3 of this manual.
2. Connect TIG torch to proper output receptacle.
3. Select proper tungsten electrode (refer to Electrode Selection Table 2, Page 22).
4. Prepare tungsten electrode and insert into torch.
5. Wear dry insulating gloves and clothing.
6. Connect remote control device to 8-Pin receptacle.
7. Connect work clamp to clean, bare metal at workpiece.
8. Refer to Operator Control section and set the controls per the following:
 - a. PROCESS SELECTOR switch [5] to desired Gas Tungsten Arc Welding position. (LIFT or HF Start)
 - b. Rotate the AMPERAGE control [1] to output current level desired.



9. Turn on shielding gas.
10. Wear welding helmet with proper filter lens according to ANSI Z49.1.

11. Place the PRIMARY POWER switch [13] to ON.

NOTES

12. Activate remote control device.

- a. In LIFT TIG mode, touch electrode to work and lift to start arc.
- b. In HF TIG mode, high frequency will start, followed by welding arc.

13. Begin welding.



WARNING

HIGH CONCENTRATION OF SHIELDING GAS can impair health or kill. Shut off gas supply when not in use.

2.2 SETUP FOR OPERATION

Gas Tungsten Arc Welding -Pulsed (GTAW-P) -Sloped (GTAW-S) -TIG Spot

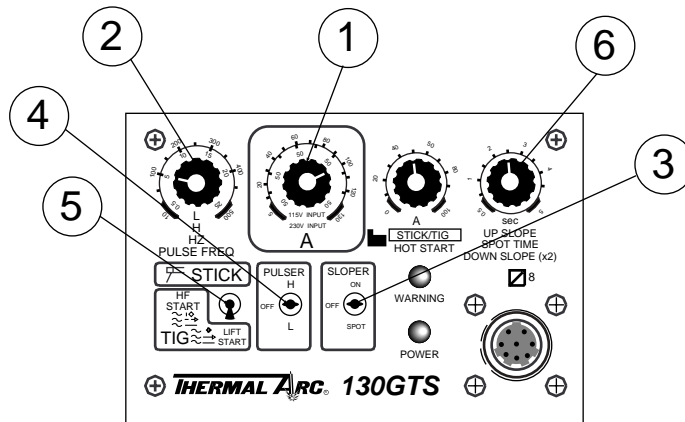


WARNING

Read and follow all safety precautions on pages 2-3 of this manual before proceeding with operation.

1. Install and connect unit according to the installation instructions in section 1.3 of this manual.
2. Select proper tungsten electrode (refer to Electrode Selection Table 2, Page 22).
3. Prepare tungsten electrode and insert into torch.
4. Wear dry insulating gloves and clothing.
5. Connect remote control device to 8-Pin receptacle.
6. Connect work clamp to clean, bare metal at workpiece.
7. Refer to Operator Control section and set the controls per the following:
 - I. PROCESS SELECTOR switch [5] to desired gas tungsten arc welding position. LIFT or HF TIG.
 - A. PULSE TIG welding
 1. PULSER SELECTOR switch [4] to desired frequency pulse of high or low.
 2. Rotate the AMPERAGE control [1] to desired output current level.
 3. Rotate PULSE FREQUENCY control [2] to desired frequency position.
 - B. SLOPE TIG welding
 1. SLOPER switch [3] to SLOPE position.
 2. Rotate AMPERAGE control [1] to desired welding current level.
 3. Rotate SPOT TIME UP/DOWN SLOPE control [6] to desired UP/DOWN slope time.
NOTE: Use a remote ON/OFF switch to control SLOPE sequence. See Operator Control section page 15.
 - C. SPOT TIG welding
 1. SLOPER switch [3] to SPOT position.
 2. Rotate AMPERAGE control [1] to desired spot welding current level.
 3. Rotate SPOT TIME UP/DOWN SLOPE control [6] to desired SPOT welding time.

2.2 SETUP FOR OPERATION



NOTES

8. Turn on shielding gas and water supplies as applicable.
9. Wear welding helmet with proper filter lens according to ANSI Z49.1.
10. Place the PRIMARY POWER switch [13] to ON.
11. Activate remote control device.
 - a. In LIFT TIG mode, touch electrode to work and lift to start arc.
 - b. In HF TIG mode, high frequency will start, followed by welding arc.
12. Begin welding.



WARNING

HIGH CONCENTRATION OF SHIELDING GAS can impair health or kill. Shut off gas supply when not in use.

Shutting Down

13. Stop welding.
14. Move the PRIMARY POWER switch [13] to the OFF position.
15. Turn off the shielding gas and water supplies if applicable.

Table 1 Fuse Size Selection			
Input Power/Input Voltage	Fuse Size (Amperes)		
Single-Phase	Model 130GTS	Model 150GTS	Model 190GTS
208-230VAC	30	30	40
115 VAC	25	25	30
NOTE	Continuous output on 115VAC/20 Amp circuit breaker for fuse: 92 Amps/13 Vdc (TIG), 51 Amps/23 Vdc (Stick)		
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)		

Table 2 Electrode Selection Table		
Electrode/Diameter	Amperage Range	
	DC-Argon Electrode Negative/Straight Polarity	DC-Argon Electrode Positive/Reverse Polarity
Pure Tungsten (Green Band)		
0.010 in. (0.25mm)	1-15	—
0.020 in. (0.51mm)	5-20	—
0.040 in. (1.02mm)	15-80	—
1/16 in. (1.59mm)	70-150	10-20
3/32 in. (2.38mm)	125-225	15-20
1/8 in. (3.18mm)	225-360	25-40
5/32 in. (3.97mm)	360-450	40-55
3/16 in. (4.76mm)	450-720	55-80
1/4 in. (6.35mm)	720-950	80-125
2% Thorium Alloyed Tungsten (Red Band)		
0.010 in. (0.25mm)	1-25	—
0.020 in. (0.51mm)	15-40	—
0.040 in. (1.02mm)	25-85	—
1/16 in. (1.59mm)	50-160	10-20
3/32 in. (2.38mm)	135-235	15-30
1/8 in. (3.18mm)	250-400	25-40
5/32 in. (3.97mm)	400-500	40-55
3/16 in. (4.76mm)	500-750	55-80
1/4 in. (6.35mm)	750-1,000	80-125

Table 3 Weld Cable Size		Maximum Total Cable Length in Weld Circuit							
Duty Cycle	Under 100 ft. (Under 30m)		150 ft. (45m)	200 ft. (60m)	250 ft. (70m)	300 ft. (90m)	350 ft. (105m)	400 ft. (120m)	
	100-60%	60-100%	10-100%						
Welding Amperes									
100	4	4	4	3	2	1	1/0	1/0	
150	3	3	2	1	1/0	2/0	3/0	3/0	
200	3	2	1	1/0	2/0	3/0	4/0	4/0	
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0	
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0	

2.3 OPERATION TROUBLESHOOTING

General | Troubleshooting and repairing this unit is a process which should be undertaken only by those familiar with high voltage, high power electronic equipment.



WARNING

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

Basic Troubleshooting

This manual covers a basic level of troubleshooting that requires limited disassembly and measurements. It is helpful for solving many of the common problems that can arise with the Inverter Arc Welder system.

If major complex subassemblies are faulty, the unit must be returned to an authorized service center for repair.

Follow all instructions as listed and complete each section in the order presented.

NOTE

For major troubleshooting and parts replacement procedures, please refer to the appropriate Inverter Arc Welder Service Manual:

Model 130GTS CC/TIG Service Manual 0-2493
Model 150GTS CC/TIG Service Manual 0-2493
Model 190GTS CC/TIG Service Manual 0-2493

How to Use This Guide

The following information is a guide to help you determine the most likely causes for various symptoms.

This guide is set up in the following manner:

- A. Symptom (Bold Type)
 - Any special instructions (Text Type)
 - 1. Cause (Italic Type)
 - a. Check/Remedy (Text Type)

Locate your symptom, check the cause(s) (the simplest or most likely is listed first), then perform the remedy given. Repair as needed being sure to verify that the unit is fully operational after any repairs.

Specific Problems

A. No weld output; unit is completely inoperative

1. Line disconnect switch is in OFF position
 - a. Place line disconnect switch in ON position.
2. Line fuse(s) open
 - a. Check and replace line fuse(s).
3. Improper electrical input connections
 - a. See Section 1.3 Electrical Input Requirements for proper input connections
4. PRIMARY POWER switch Main Circuit Breaker in OFF position
 - a. Check and reset Main Circuit Breaker if necessary.

2.3 OPERATION TROUBLESHOOTING

B. WARNING indicator is ON

1. Unit is in thermal shutdown mode
 - a. Allow cooling period of approximately five (5) minutes.

C. Erratic or improper weld output

1. Loose welding cable connections
 - a. Tighten all welding cable connections.
2. Incorrect welding cable size
 - a. Use proper size and type of cable (see Table 3, Page 23)
3. Improper input connections
 - a. Refer to Section 1.3 Electrical Input Requirements
4. Poor electrode condition
 - a. Replace electrode.

D. Wandering arc, poor control of arc direction

1. Wrong size tungsten electrode, typically larger than recommended
 - a. Use proper size electrode for amperage selected (see Table 2, Page 22)
2. Improperly prepared tungsten electrode
 - a. Prepare tungsten properly
3. Gas flow rate too high
 - a. Reduce flow rate.
4. Drafts blowing shielding gas away from tungsten electrode
 - a. Shield weld zone from drafts.
5. Loose gas fitting on regulator or gas line drawing air into weld zone
 - a. Check and tighten all gas fittings.
6. Water in torch
 - a. Refer to torch parts list in Service Manual for part(s) requiring replacement and repair torch as necessary.

E. No high frequency

1. PROCESS SELECTOR switch is not in the HF TIG position
 - a. Place switch in HF TIG position.
2. Drafts blowing shielding gas away from tungsten electrode
 - a. Shield weld zone from drafts
3. Insufficient postflow time
 - a. Increase postflow time.
4. Loose gas fitting on regulator or gas line drawing air into weld zone
 - a. Check and tighten all gas fittings.
5. Water in torch
 - a. Refer to torch parts list in Service Manual for part(s) requiring replacement and repair torch as necessary.
6. Tungsten condition is poor
 - a. Replace electrode.

F. Lack of high frequency; difficulty in establishing an arc

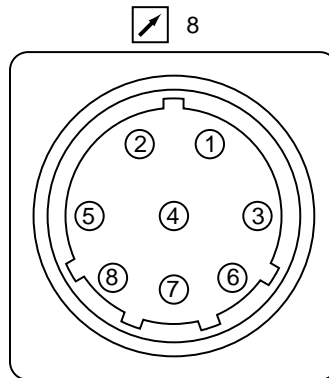
1. Dissipation of high frequency from torch cable or conductive gas hose
 - a. Be sure that the torch cable is not near any grounded metal. Do not use conductive gas hose.
2. Weld cable leakage
 - a. Check cables and torch for cracked or deteriorated insulation or bad connections. Repair or replace necessary parts.

2.4 REMOTE 8-PIN CONNECTIONS

The REMOTE 8-Pin receptable is used to connect any of the following equipment to the welding power source circuitry:

- Remote Hand Pendant
- Remote Foot Control
- Remote Contactor Control
- Remote Amperage Control

To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise. The socket information is included in the event the supplied cord is not suitable and it is necessary to wire a plug or cord to interface with the REMOTE 8-Pin receptacle.



Socket	Function
1	Chassis common
2	Remote contactor control when contact closure is provided between sockets 2 and 3 (GND)
3	Remote contactor control when contact closure is provided between sockets 2 and 3 (+24 V DC)
4	Remote amperage control when contact closure is provided between sockets 4 and 8 (+12 V DC)
5	Amperage remote control (MINIMUM); PC board common; use as return for remote control inputs/outputs
6	Amperage remote control (MAXIMUM) input command signal; +4 volts for maximum
7	Remote amperage reference signal (WIPER); 0 volts to +4 volts (peak current set by main rheostat)
8	Remote amperage control when contact closure is provided between sockets 4 and 8 (SIGNAL)

Figure 6. REMOTE 8-Pin Connections