

# Invertig 200 AC/DC

## Owner's Manual



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## **Manufacturer's Warranty**

It is expressly agreed that there are no warranties, expressed or implied, made by either the Salesman, Dealer, or HTP America, Inc. on products or parts furnished hereunder, except the Manufacturer's Warranty against defective materials or workmanship as follows:

HTP America, Inc. warrants each new welding machine to be free from defects in material and workmanship under normal use and service for three years after delivery to the original purchaser. HTP America, Inc. will repair and replace, at its factory, any part or parts thereof, products to be returned to HTP America, Inc. with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been thus defective. This warranty being expressly in lieu of all other warranties, expressed or implied, and all other obligations or liabilities on its part and it neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of its machines.

This warranty shall not apply to any welding machine which has been repaired or altered by unauthorized service departments in any way so as in the judgment of HTP America, Inc. to affect its stability and reliability, nor which has been subjected to misuse, negligence or accident.

HTP America, Inc. shall not be liable in any event, unless HTP America, Inc. receives notice of alleged breach of warranty within not more than 30 days after the discovery, actual or construction alleged breach of warranty specifying the claimed defect.

HTP America, Inc. has reserved the right to make change in design or add any improvements to its products at any time without incurring any obligation to install same on equipment.

This warranty is void unless warranty card is sent to HTP America, Inc. within 15 days from date of purchase.

Note:

Exclusions to Warranty:

1. The Tig Welding Torch is warranted for a period of ninety (90) Days against defects in material and workmanship.
2. The tungsten, collet, collet body, ceramic nozzles are consumable items, WHICH CARRY NO WARRANTY.

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## Safety Suggestions

Electric arc welding produces ultra-violet rays, which are harmful to skin and eyes. Ultra-violet radiation can penetrate lightweight clothing, reflect from light colored surfaces, and burn the skin and eyes. Wear flameproof welding gloves which are not oily or greasy. The oil or grease on the gloves may ignite. Wear a heavy, pocket-less, long sleeve shirt, cuffless trousers, and high-topped work shoes. Wear a full-face welding helmet with a number eight or darker lens and a cap. These precautions will protect eyes, hair, face, and skin from arc rays and hot material.

- To avoid fire, do not weld on wood, plastic tile, or carpeted floors. Concrete or masonry floors are safest.
- Do not weld on drums, barrels, tanks or other containers until they have been cleared as described in AWS Standard A6.01.
- Provide adequate ventilation in the welding area at all times. Do not weld on galvanized zinc, cadmium or lead beryllium materials unless POSITIVE sufficient ventilation is provided. These materials produce toxic fumes.
- Do not weld in areas close to degreasing or spraying operations. Chlorinated hydrocarbon vapors may react with the ultra-violet rays and form highly toxic phosgene gas.
- If you develop momentary eye, nose or throat irritation during welding, stop welding immediately. This is an indication that ventilation is not adequate. Do not continue to weld until ventilation is improved.
- Exposed, electrically hot conductors or other bare metal in the welding circuit, or ungrounded electrically hot equipment can fatally shock a person whose body becomes a conductor. Do not stand, sit, lie, lean on or touch a wet surface when welding.
- Frequently inspect cables for wear, cracks, and damage. Replace those with excessively worn insulation to avoid a possible lethal shock from bared cable.

For more information, refer to the following standards and comply as applicable.

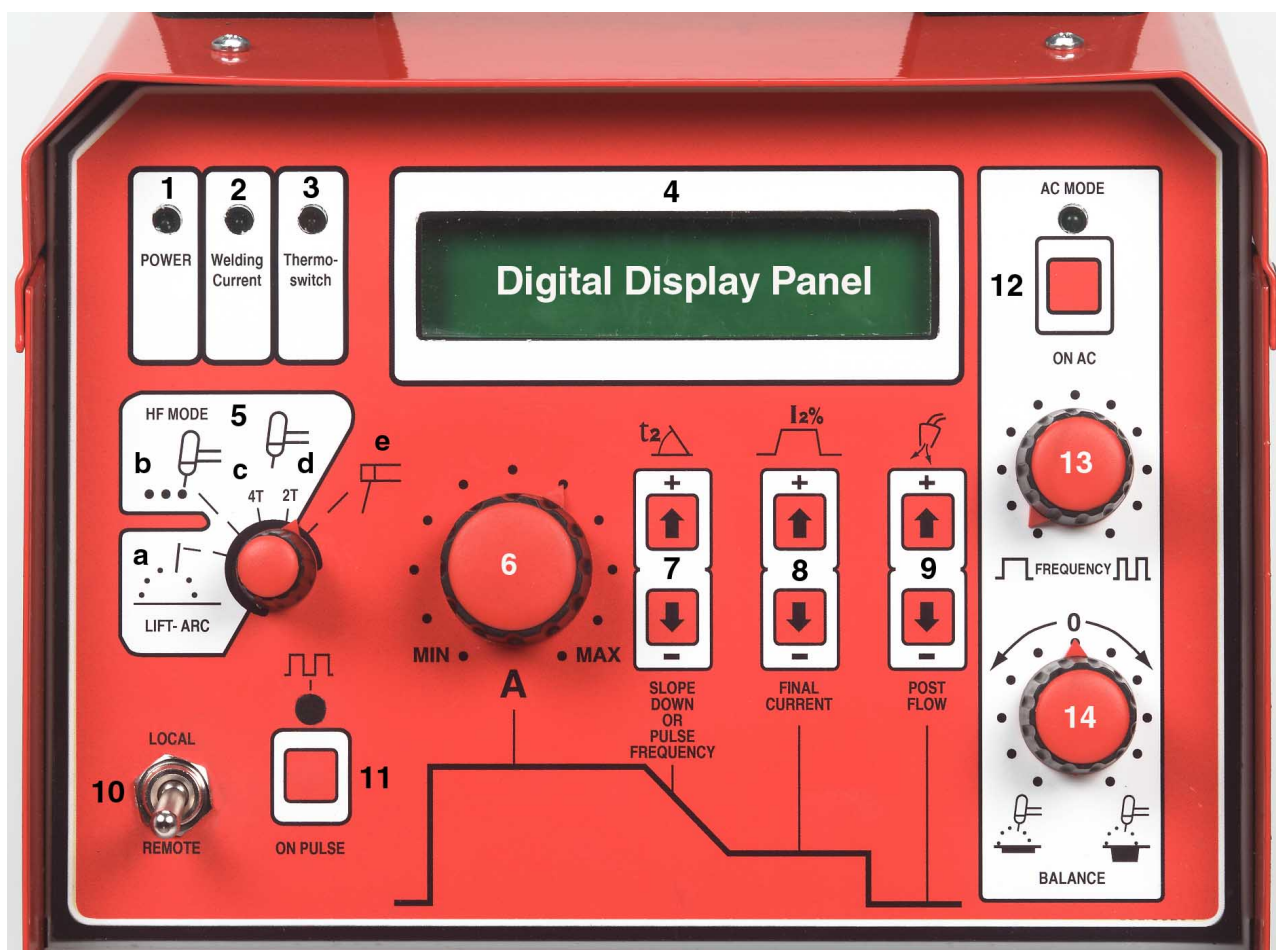
1. ANSI Standard Z49.1 SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 2051 NW 7th St., Miami, FL 33125.
2. ANSI Standard Z87.1 SAFE PRACTICE FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018.
3. America Welding Society Standard A6.0 WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable same as item 1.
4. NFPA STANDARD 51. OXYGEN-FUEL GAS SYSTEMS FOR WELDING AND CUTTING, obtainable from the National Fire Protection Assoc., 470 Atlantic Avenue, Boston, MA 02210.
5. NFPA Standard 51B. CUTTING AND WELDING PROCESSES, obtainable same as item 4.
6. CGA PAMPHLET P-1. SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
7. OSHA Standard 29 CFR, Part 1910, Subpart Q WELDING, CUTTING AND BRAZING.

## Electrical Connection

Your Invertig 200 AC/DC operates on single-phase 230 volt power [(+/- 15%) 195.5 to 264.5 volts]. The machine is not shipped with a plug. The input power cord has 3 wires. The yellow-green wire is ground, and the blue and brown wires are the hot leads.

Input power and will require a 25-amp circuit when operating at 200 amps.

All electrical connections should be performed by a qualified electrician in accordance with the National Electrical Code and local codes and ordinances.



(Fig. 1)

## Front Panel Controls (See Fig. 1)

### 1. Power Indicator Lamp

This lamp is illuminated when the On-Off switch on the back of your Invertig 200 is turned to the 1 or "On" position, indicating the unit is correctly connected to 220 volt AC power.

### 2. Welding Current Indicator Lamp

When either the foot pedal or the trigger switch on the TIG torch is depressed, welding current will be applied to the welding torch and the Welding Current Indicator Lamp will be illuminated.

If your Invertig 200 AC/DC is in the stick-welding mode, the welding current indicator lamp will be illuminated all the time.

### 3. Thermoswitch Indicator Lamp

The thermoswitch indicator lamp will light up when the duty cycle of your Invertig 200 AC/DC has been exceeded. When this lamp is illuminated, the machine will no longer weld because the machine has overheated. Leave the machine plugged in and turned on so the cooling fans can cool the unit down. Allow the machine to cool for 15 to 30 minutes, the thermoswitch should reset automatically and your Invertig will be ready to weld.

### 4. Digital Display Panel

The Digital Display Panel allows you to see what your welding parameters are. For example, the normal display is the welding amperage. As you depress the foot pedal, you will see the actual welding amperage.

When you press the "AC on" button (#12) when the machine is in the AC Welding Mode, the digital display panel will display the AC Frequency and the AC balance.

When the machine is in the 2T welding mode (5d), and you press either the T2 button (#7) or the Post Flow Button (#9) the digital display will display the Slope Down Time (T2) in seconds and the Post gas flow in seconds.

When the machine is in the 4T welding mode (5c), and you press either the T2 button (#7), the Final Current Button (#8), or the Post Flow Button (#9) the digital display will display the Slope Down Time (T2) in seconds, the Final Current (I2) in percent of base current, and the Post Gas Flow in seconds.

When the machine is in the Pulse Welding Mode and you depress the "On Pulse" button (#11) the digital display panel will display the pulse frequency in hertz (cycles per second).

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## 5. Welding Mode Switch

The welding mode switch selects the welding mode of your Invertig 200 AC/DC.

A) *Lift Arc Mode* – the lift arc mode allows you to initiate the welding arc without high frequency. This is important in any environment where the high frequency arc will cause interference with sensitive electrical components or computers. A good example of this would be stainless steel or aluminum repair in hospitals. The Lift Arc mode works for both AC and DC welding.

To TIG Weld using the Lift Arc Mode, simply touch the tungsten to the workpiece, activate the torch trigger or depress the foot pedal and lift off. When the tungsten breaks contact with the work, the arc will start. You can also use this method for Stick welding with the added benefit of being able to vary your amperage with the foot pedal.

B) *Spot Welding Mode* – the spot welding mode allows you to weld for between 0.1 and 10 seconds and then the unit will automatically stop. This would be a good selection if you were performing a series of repetitive tack welds.

To select the spot welding time, adjust the T2 buttons up or down to select a time between 0.1sec and 10.0 sec.

C) *4T mode* – This is like a lock on trigger on a drill or grinder. We suggest using this mode with the hand amperage control, which is mounted on the torch. When you depress the trigger on the torch, your Invertig 200 will start welding. When you release the trigger, it will continue to weld until you depress the trigger again and release it at which time the arc will extinguish.

When using the hand amperage control, it allows you to weld without having to keep the trigger depressed, allowing you to now operate the amperage control.

It is not suggested to use the 4T mode with the foot pedal.

D) *2T mode* – With the torch trigger or foot pedal depressed, your Invertig 200 will start the arc. When the trigger is released, the unit will stop. Select this welding mode for operation with the foot pedal.

E) *Arc Welding* – this mode is used when arc welding. The electrode will always be hot and the gas solenoid will not operate.

## 6. Amperage Adjustment Knob

This knob determines the welding amperage. The amperage on your Invertig 200 can be adjusted from 5 to 200 amps. The amperage is displayed in the digital display panel (#4) when the local/remote switch (#10) is in the local position.

When using a remote amperage control, the amperage adjustment knob is used to select the maximum amperage for your particular welding application. For example, when welding .050" 6061 alloy aluminum, I adjusted the amperage knob to 100 amps with the local/remote switch in the local position. This is about 20% more power than I will be welding the aluminum with. I then placed the local/remote switch in the remote position and the digital display showed the minimum amperage of 5 amps. If I were to depress the foot pedal completely, the maximum amperage would now be 100 amps.

Setting the machine so the maximum amperage is 100 amps vs the maximum output of the machine of 200 amps, the pedal is less sensitive. More of a movement in the pedal results in a smaller variance of the amperage, making it easier to control the heat and therefore easier to control your puddle.

## 7. T2 buttons

The T2 buttons are multi-function buttons. The function depends on which welding mode the welding mode selector is in.

*Lift-Arc, 4T, and 2T Welding Modes* – the T2 buttons controls the slope down time. The slope down time is adjustable from 0.1 sec to 10.0 sec in 0.1 sec increments. Different slope down times can be set for each of the three welding modes. For example, it is possible to have the slope down time set to 0.1 sec in the 2T mode, 3 sec in the 4T mode and 5 sec in the lift arc mode. Your Invertig 200 will remember the slope down time for each welding mode.

If you are using a torch mounted remote amperage control or a foot pedal, it is advisable to set the slope down time to 0.1 sec, as you are controlling the slope down manually with your remote amperage control or foot pedal.

*Spot Welding Mode* – the T2 buttons adjust the spot welding time from 0.1 sec to 10.0 sec in 0.1 sec increments.

*Pulse mode on* – depressing the Pulse button when the pulse mode is on will display the pulsing frequency in Hz. Use the T2 button to adjust the pulse frequency from 0.4 Hz to 2.0 Hz in the AC mode and from 0.4 Hz to 300 Hz in the DC mode.

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## 8. I2 buttons

The I2 buttons control the Final Current. This is only applicable when your Invertig 200 is set in the 4T welding mode. The final current is adjustable from 1% to 99% of the base current that is set by the amperage adjustment knob (#5). For example, if the amperage adjustment knob is set to 100 amps, and the final current is set to 15%, the final current will be 15 amps.

This is achieved by the following: with the welding mode in the 4T position, depressing the torch trigger starts the pre-gas flow. The pre-gas cycle will continue until the trigger is released, at which time the arc will ignite. The unit will weld at the base current that is set by the amperage adjustment knob (#5). Depressing the torch trigger again will reduce the current to the final current value. The slope down time (T2) determines the amount of time in which the current goes from the base current to the final current. The machine will continue to weld at the final current until the trigger is released. Once the trigger is released, the post gas cycle will start.

## 9. Post Gas Flow

The post gas flow is adjustable from 2 sec to 20 sec in 0.2 sec increments. Post gas flow is necessary because after the arc is extinguished; if the gas stopped flowing immediately, there is a possibility the molten weld puddle would come in contact with the atmosphere, causing weld defects. Additionally it prevents the tungsten from becoming contaminated by the atmosphere. The gas flow should run long enough to allow the orange color of the tungsten to disappear. It is important to remember not to remove the TIG torch from the weld until the post gas cycle has been completed. A good starting point for the post gas flow is 5.0 sec. If you are welding at higher amperages or on more critical alloys it may be necessary to increase the post gas flow to a higher value.

## 10. Local/Remote switch

When in the Local position, the amperage will be adjusted by the amperage adjustment knob (#5) on the front of the welder. The amperage adjustment knob can also be used to limit the maximum output of your Invertig 200.

When in the remote position, the amperage is infinitely adjustable by either the foot pedal or the torch mounted amperage control. To limit the maximum amperage of the machine to 100 amps, with the foot pedal plugged in, flip the local/remote switch to the local position. Using the amperage adjustment knob (#5) adjust the amperage to 100 amps. Flip the local/remote switch to the remote position. The digital display panel should read 5 amps. Now, when you fully depress the foot pedal, the amperage displayed should be 100 amps. This makes the foot pedal less sensitive and makes it easier to control your puddle.

## 11. Pulse Mode

By depressing the Pulse Mode button, the green light will illuminate indicating your Invertig 200 is in the pulse mode. At this time the display will show the pulsing frequency. To turn off the pulse mode, depress button 11 for at least 3 seconds until the green pulse light goes off.

To adjust the pulsing frequency, depress the Pulse Mode button (#11) until the frequency is displayed in the digital display panel (#4). Now use the T2 button to adjust the pulse frequency from 0.4 to 2.0 Hz in the AC mode, and from 0.4 to 300 Hz in the DC mode.

The pulsing base current is fixed at 25% of the maximum current and the pulsing duty cycle is fixed at 50%.

## 12. AC Welding Mode

Depressing the AC welding mode button will illuminate the green light indicating your Invertig 200 is in the AC welding mode. When the AC Welding Mode button is depressed and released, the digital display will indicate the AC Welding Frequency and the AC Welding Balance.

To turn the AC Welding Mode off, depress the AC Welding Mode button for at least 3 seconds until the green AC welding mode light goes out.

## 13. AC Frequency Knob

The AC frequency knob adjusts the length of the AC square wave. It can be adjusted from 20 Hz to 200 Hz without any loss in welding output. Conventional transformer machines have their AC frequency fixed at 60 Hz. It is beneficial to run the machine at the higher frequencies (150 to 100hz) for the following reasons:

- A) Produces a more focused arc that results in a narrower bead.
- B) Heat is more concentrated, minimizing the heat affected zone.
- C) Allows you to weld aluminum with a 2% thoriated tungsten or 2% cerriated tungsten sharpened to a point. Arc is much more stable and is less likely to wander.

#### 14. AC Balance Knob

The AC Balance Knob lets you adjust the "balance" of the positive part of the AC wave with respect to the negative part of the AC wave. When the AC balance is set to 50%, the positive part of the AC wave and the negative part of the AC wave are equal. Your Invertig 200 allows you to adjust the AC balance from 10% to 90%, a substantially greater range than is possible with conventional transformer units (40% to 60%)

Setting the AC balance to a higher percentage (51 to 90 %) increases the electrode negative portion of the wave (torch or tungsten is negative, work piece is positive – the electrons flow from the torch to the workpiece). This increases penetration, lengthens the tungsten life, but reduces the cleaning portion of the wave.

Setting the AC balance to a lower percentage (49 to 10%) increases the electrode positive portion of the wave (torch or tungsten is positive, work piece is negative – the electrons flow from the workpiece to the torch). This increases the amount of heat that builds up in the torch and shortens tungsten life, decreases penetration, but increases the cleaning portion of the wave.

## Front Panel Connections

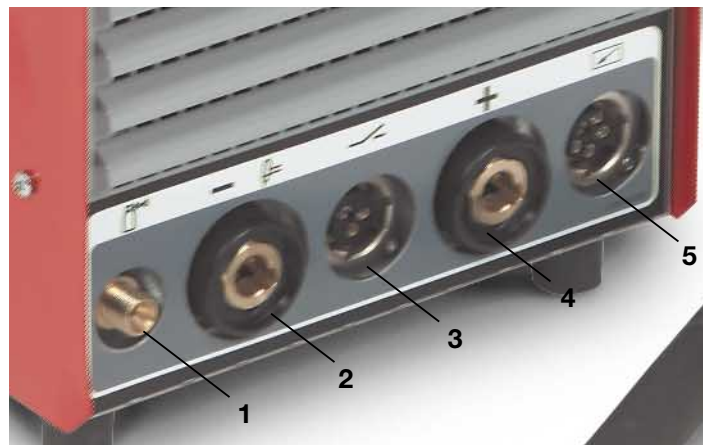
**1. Gas Output Connection** – this is where you connect the gas fitting from the TIG Torch. The gas output is controlled by the solenoid valve, which is mounted inside the welder.

**2. Negative Output Receptacle** – When TIG welding, this is where the TIG Torch connects to your Invertig 200 Welder. That's right, we said the TIG Torch. This is called straight polarity, with the torch negative and the work positive. When using your Invertig Welder to TIG weld, all work will be done in straight polarity.

When Stick Welding Direct Current Electrode Negative (DCEN), the optional electrode holder will be plugged into the negative output receptacle. When Stick Welding Direct Current Electrode Positive (DCEP), the ground cable will be plugged into the negative output receptacle

To install a cable into the negative output receptacle, insert the male end of the cable into the negative output receptacle and twist clockwise until snug.

**3. 3 Pin Trigger connection** – this connection is used with TIG torches, which have on/off triggers on the torch. Your Invertig 200 comes standard with a footpedal which has the on/off function built into the pedal, so an on/off trigger on the TIG torch is not necessary. Therefore, this connection is not used.



**4. Positive Output Receptacle** – When TIG welding, this is where the ground cable connects to the front of the TIG Adapter. That's right, we said the ground cable. This is called straight polarity, with the torch negative and the work positive.

When Stick Welding Direct Current Electrode Negative (DCEN), the ground cable will be plugged into the positive output receptacle. When Stick Welding Direct Current Electrode Positive (DCEP), the electrode holder will be plugged into the positive output receptacle.

To install a cable into the positive output receptacle, insert the male end of the cable into the positive output receptacle and twist clockwise until snug.

**5. 5 pin Footpedal Connection** – this is where the footpedal connects to the Invertig 200. Insert the connection into the machine and twist the lock ring to lock into place.

## Rear Panel Controls

### 1. On-Off Switch

This switch controls the input power to your Invertig Welder. 0 is off and 1 is on. When you turn the machine on, an indicator lamp will be illuminated inside the On-Off Switch. This is an indication your Invertig is on and ready for use.

## Shield Gas

TIG welding requires a shield gas of 100% Argon. A shield gas is used to keep the surrounding atmosphere from coming in contact with the molten weld puddle. The correct flow rate is enough gas to shield the molten weld puddle and protect the tungsten electrode. Any greater flow rate is a waste of shield gas. Usually, the flow rate will be set anywhere between 15 and 30 cubic feet per hour (cfh).

Use a gas regulator such as HTP Part #12020 which is compatible with Argon cylinders and has a barbed fitting for the delivery hose. Connect a gas hose to the gas fitting at the rear of the machine and to the barbed fitting on the regulator.

Your Invertig welder comes with a gas hose that connects the TIG welder to the 12020 gas regulator. The input gas fitting is located in the back of the welder.

If you will be welding thick aluminum castings such as an aluminum cylinder head, high purity helium can be used. When welding thick aluminum sections like this and using helium, to achieve added penetration it should be welded in DC.

## Tungsten Electrodes

With conventional transformer Tig welders, the general rule of thumb is to use a pure tungsten (identified by a green tip) for AC welding, and a 2% thoriated tungsten (identified by a red tip) for DC welding. However, with an inverter Tig welder, the ability to control the frequency and balance over a much wider range allows you to use a 2% thoriated tungsten for both AC and DC welding.

The electrode should be sharpened to a point with a fine grinding wheel. If the stone used for sharpening the electrode is not clean, contaminants could lodge in the electrode and dislodge when welding. The grinding wheel used for tungsten electrodes should not be used for any other materials. When grinding the electrode to a point, a 15 to 30 degree angle is desired. The grinding marks should run lengthwise with the point, opposed to in the direction of the diameter.

### General Welding Parameters

Following are some "rule of thumb" welding parameters tungsten diameters and amperage settings for welding different thicknesses of aluminum and steel. Keep in mind these are general settings and the specific application may require more or less power to get the job done.

#### Aluminum

Thickness	Tungsten Diameter	Machine Amperage	Welding Amperage	Filler Diameter
.030"	1/16"	50	30-40	1/16"
.050"	1/16"	70	50-60	1/16"
.062" (1/16")	1/16"	80	65-75	1/16"
.093" (3/32")	3/32"	120	105-115	1/16"
.125" (1/8")	3/32"	150	125-135	3/32"
.187" (3/16")*	1/8"	170	150-160	3/32"
.250" (1/4")*	1/8"	200	180	3/32"
.312" (5/16")*	1/8"	200	200	3/32"

\* May require beveling – depends on joint

#### Steel

Thickness	Tungsten Diameter	Machine Amperage	Welding Amperage	Filler Diameter
.030"	1/16"	50	30-40	.035"
.050"	1/16"	70	45-55	.035"
.062" (1/16")	1/16"	80	55-65	1/16"
.093" (3/32")	1/16"	110	80-90	1/16"
.125" (1/8")	1/16"	130	110-120	1/16"
.187" (3/16")*	1/16"-3/32"	150	130-140	1/16"
.250" (1/4")*	3/32"	170	150-160	3/32"
.312" (5/16")*	3/32"-1/8"	200	170-180	3/32"
.375" (3/8")*	1/8"	200	200	3/32"

\* May require beveling – depends on joint



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## Quick Set Up

1. Welding Mode in 2T for foot pedal. Welding Mode in 4T for hand amp control.
2. Steel welding AC off – Aluminum Welding AC on
3. Slope down – 0.1 seconds
4. Final Current –1%
5. Post Gas Flow – 5 Sec
6. Frequency – 200 Hz for aluminum. Not applicable for steel.
7. Balance – 60% for aluminum. Not applicable for steel.
8. Local/Remote switch in Remote
9. Pulse off

## Filler Wire

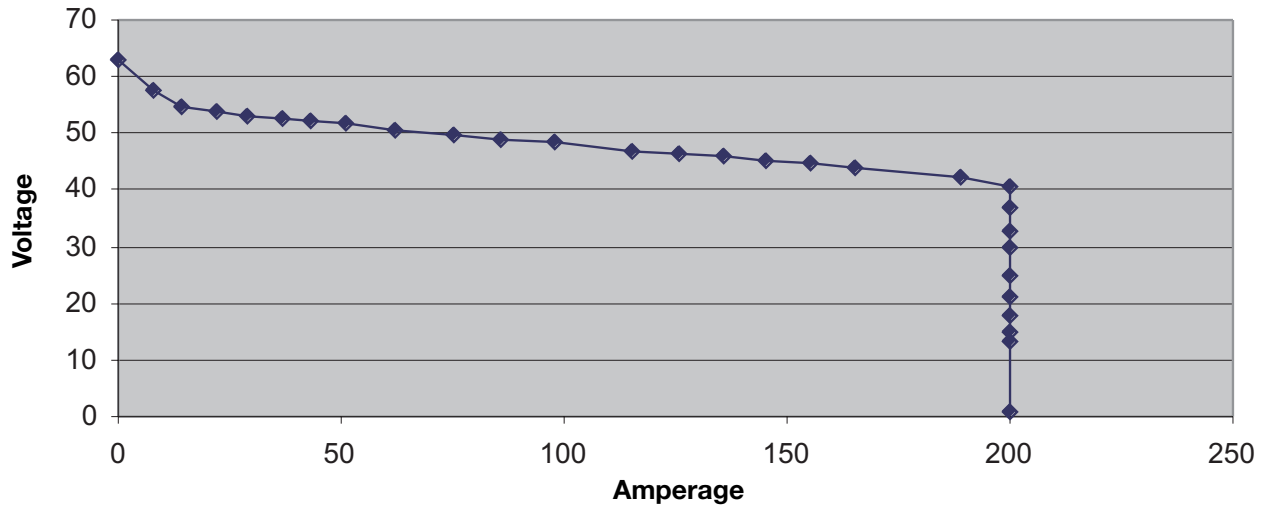
Like MIG welding, Tig welding generally requires the use of a filler wire. Unlike Mig welding, this filler wire is fed into the molten weld puddle by hand. The filler wire must be chosen to correctly match the material and alloy you will be welding.

The diameter of the filler wire is based on the thickness of the material you will be welding. For example, if you are welding something which is 1/16" thick, then you would probably want to use a filler wire which is 1/16" thick. If you are welding something 1/4" thick, then you would want to use a larger diameter filler wire than you used when welding 1/16" material, say 1/8" to 5/32".

HTP has the following filler wire available in 1 lb tubes which are sealed to prevent oxidation.

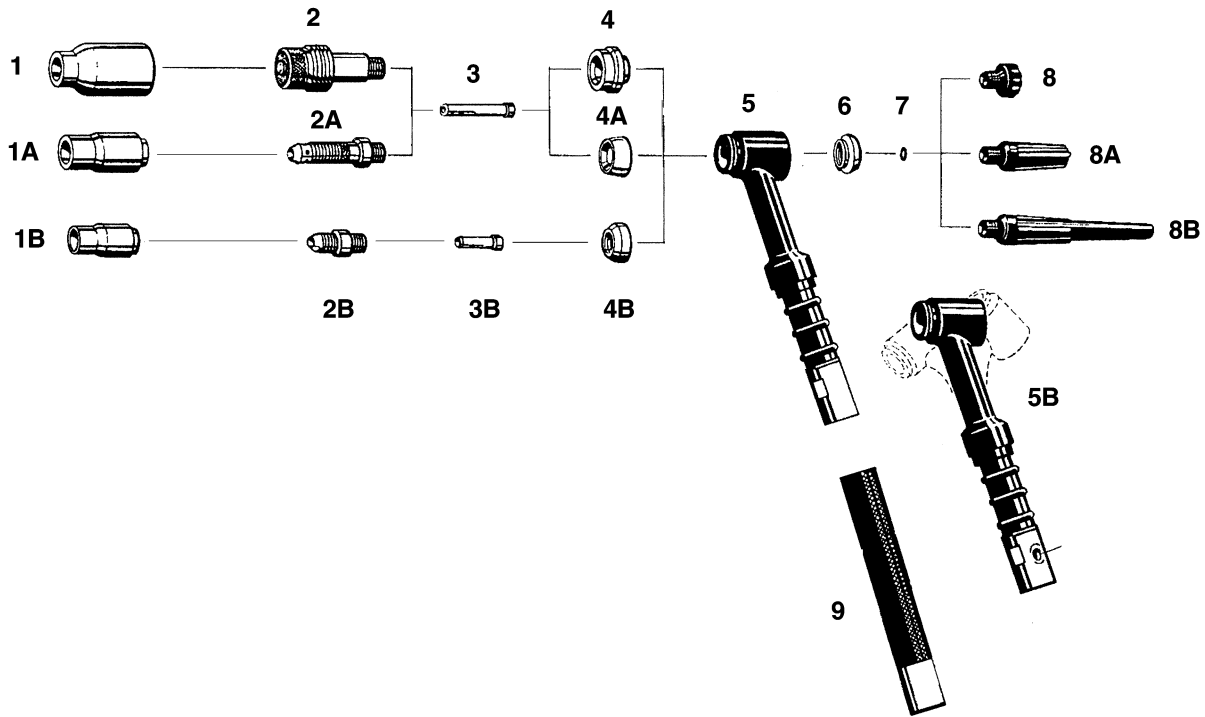
4043-1/16-1	4043 Alloy Aluminum Wire 1/16" diameter x 36' length	1 lb Tube
4043-3/32-1	4043 Alloy Aluminum Wire 3/32" diameter x 36' length	1 lb Tube
5356-1/16-1	5356 Alloy Aluminum Wire 1/16" diameter x 36' length	1 lb Tube
5356-3/32-1	5356 Alloy Aluminum Wire 3/32" diameter x 36' length	1 lb Tube
308L-1/16-1	308L Alloy Stainless Steel Wire 1/16" diameter x 36" length	1 lb Tube
70S6-1/16-1	ER70S-6 Steel Wire 1/16" diameter x 36" length	1 lb Tube
80SD2-1/16-1	ER80SD-2 Steel Wire 1/16" diameter x 36" length	1 lb Tube

## Voltage/Amp Curve HTP Invertig 200



<u>(A)</u>	<u>(V)</u>	<u>(A)</u>	<u>(V)</u>
0	63	145	45.1
8	57.6	155	44.6
14	54.8	165	44
22	53.8	189	42.2
29	53.2	200	40.5
37	52.7	200	36.8
43	52.3	200	32.8
51	51.6	200	29.7
62	50.6	200	24.9
75	49.7	200	21.2
86	49	200	17.7
98	48.3	200	14.8
115	47	200	13.1
126	46.5	200	0.8
136	45.9		

# SR-17 Air-Cooled Tig Torch Parts Breakdown

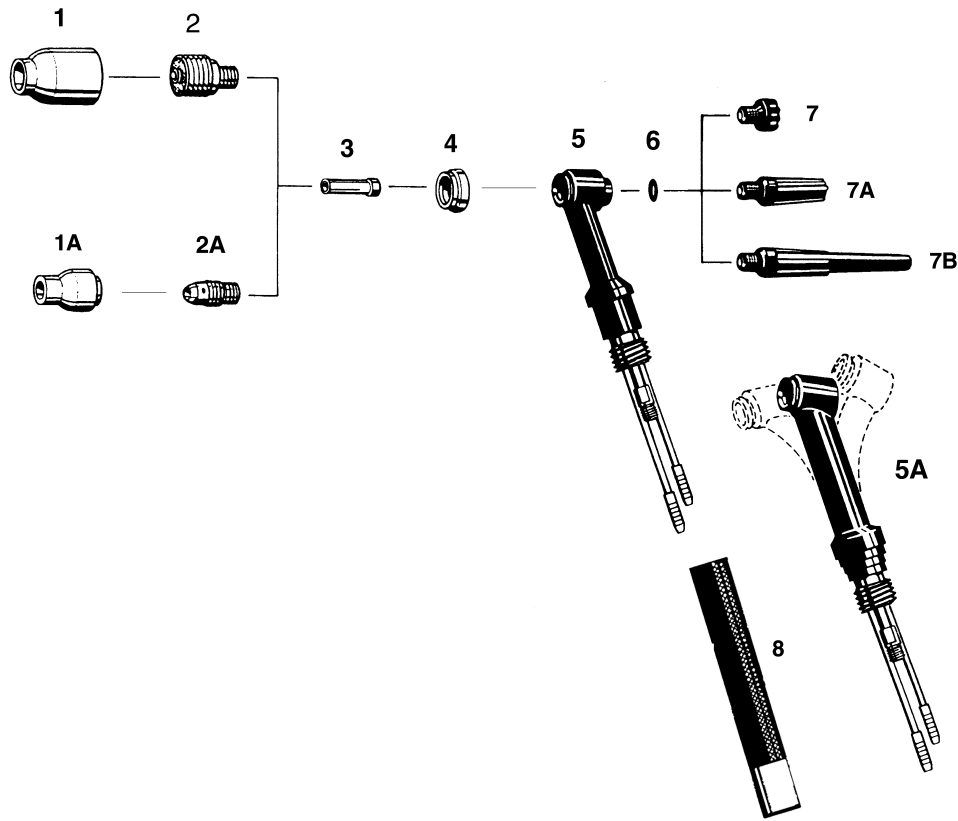


Illus #	Description	Tungsten Diameter			
		.040" (1.0mm)	1/16" (1.6mm)	3/32" (2.4mm)	1/8" (3.2mm)
<b>Standard Configuration</b>					
1A	Alumina Nozzle	10N49	10N48	10N47	10N46
2A	Collet Body	10N30	10N31	10N32	10N28
3	Collet	10N22	10N23	10N24	10N25
4A	Cup Gasket	18GC	18GC	18GC	18GC
<b>Medium Gas Lens Configuration</b>					
1	Alumina Nozzle	54N17	54N16	54N15	54N14
2	Gas Lens Collet Body	45V24	45V25	45V26	45V27
3	Collet	10N22	10N23	10N24	10N25
4	Cup Gasket	54N01	54N01	54N01	54N01
<b>Stubby Configuration</b>					
1B	Alumina Nozzle	13N09	13N10	13N11	
2B	Collet Body	17CB20	17CB20	17CB20	
3B	Collet	10N22S	10N23S	10N24S	
4	Cup Gasket	18GC20	18GC20	18GC20	

The following items fit all diameters of tungstens:

5	Torch Head	17
5A	Flexible Torch Head	17F
6	Back Gasket	18-7
7	O-Ring	98W18
8	Short Back Cap	57Y04
8A	Medium Back Cap	300M
8B	Long Back Cap	57Y02
9	Handle	H100

# SR-20 Water-Cooled Tig Torch Parts Breakdown



Illus #	Description	Tungsten Diameter			
		.040" (1.0mm)	1/16" (1.6mm)	3/32" (2.4mm)	1/8" (3.2mm)
<b>Standard Configuration</b>					
1	Alumina Nozzle	13N09	13N10	13N11	13N12
2	Collet Body	13N26	13N27	13N28	13N29
3	Collet	13N21	13N22	13N23	13N24
<b>Small Gas Lens Configuration</b>					
1A	Alumina Nozzle	53N59	53N60	53N61	53N61S
2A	Gas Lens Collet Body	45V42	45V43	45V44	45V45
3	Collet	13N21	13N22	13N23	13N24

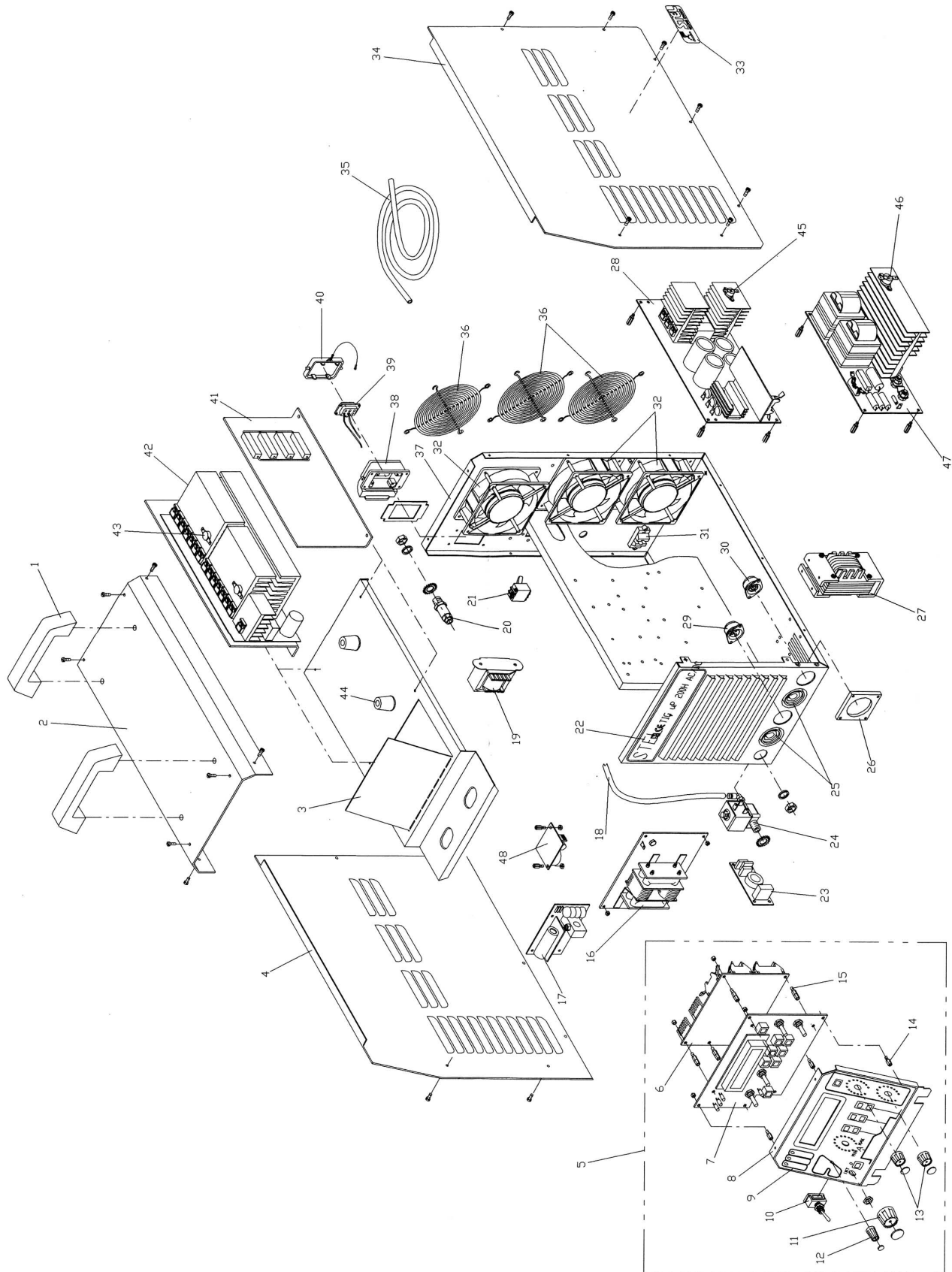
The following items fit all diameters of tungstens:

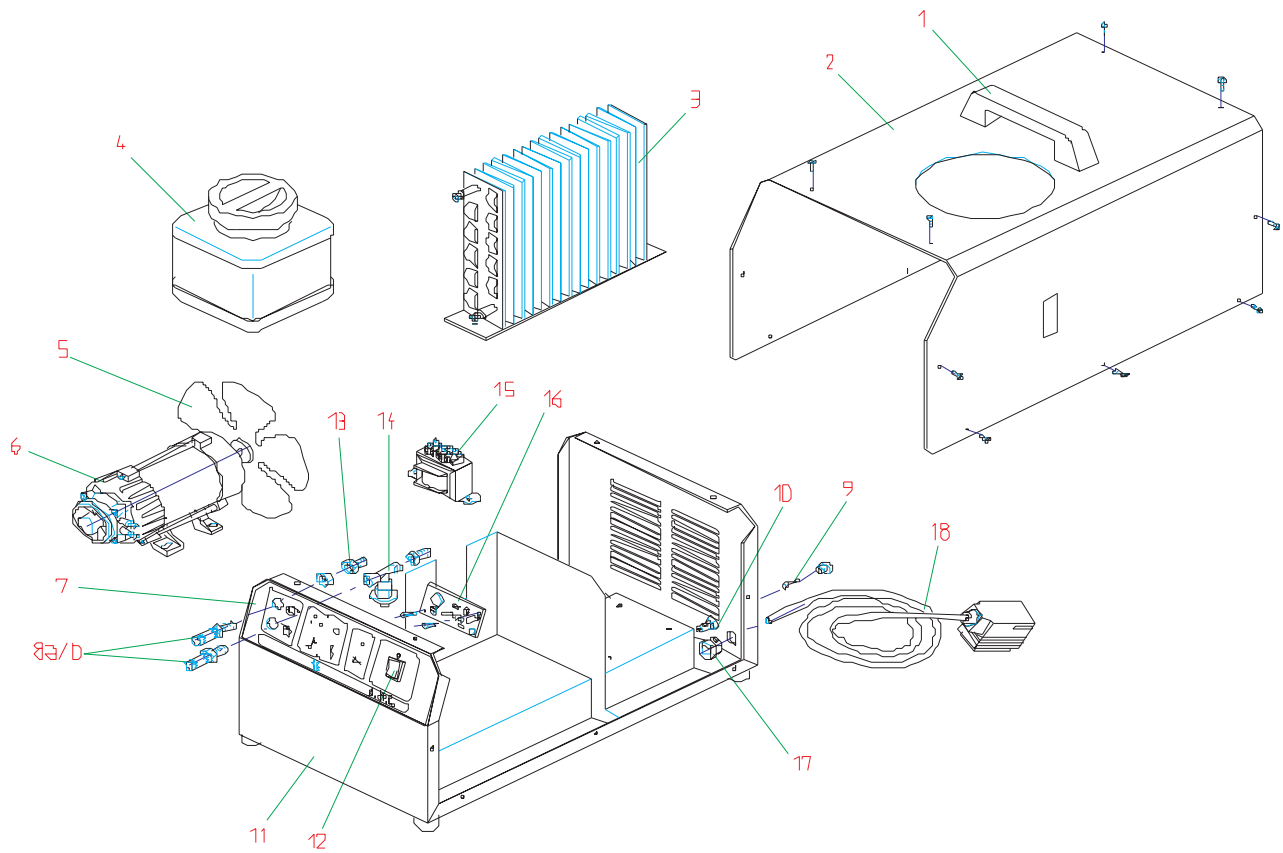
4	Cup Gasket	598 882
5	Torch Head	20
5A	Flexible Torch Head	20F
6	O-Ring	98W77
7	Short Back Cap	41V33
7A	Medium Back Cap	41V35
7B	Long Back Cap	41V24
8	Handle	53N06

## HTP Invertig 200 Spare Parts List

Illus #	Part #	Description	Illus #	Part #	Description
1	66109	HANDLE	25	64274	SOCKET
2	62500	LID	26	66797	INSULATING PLATE
3	62483	INTERMEDIATE PANEL	27	61457	INDUCTANCE
4	62349	SIDE PANEL	28	61981	PRIMARY POWER ASSEMBLY
5	61230	FRONT PANEL ASSEMBLY	29	61620	3 WAY ANPHENOL CONNECTOR
6	61941	LOGIC PCB $\mu$ P	30	61623	5 WAY ANPHENOL CONNECTOR
7	61894	FRONT PANEL PCB	31	66061	CORE HITCH
8	62482	FRONT PANEL	32	64182	MOTOR POWER FAN
9	66254	FRONT PLATE	33	66293	SIDE PLATE
10	64156	SWITCH INT/EXT	34	62349	SIDE PANEL
11	66208	KNOB d.29	35	61650	POWER SUPPLY CABLE
12	66081	KNOB d.15	36	66098	GRID
13	66121	KNOB d.22	37	62481	BASE
14	63131	BRASS SUPPORT M4 X 15mm	38	64518	ILME CONNECTOR
15	63130	BRASS SUPPORT M4 X 10mm	39	64519	6 WAY ILME
16	61950	FILTER PCB FOR HF	40	64520	PLUG
17	61895	HF PCB	41	61732	CLIPPING RESISTANCES
18	66160	PIPE	42	61896	CONVERTER PCB
19	65997	AUXILIARY TRANSFORMER	43	64215	THERMAL SWITCH 70°C
20	61702	COUPLING	44	66501	FOOT
21	64053	ON/OFF SWITCH	45	65776	THERMAL SWITCH 60°C
22	66265	LOGO PLATE	46	65774	THERMAL SWITCH 80°C
23	61733	LINE FILTER PCB	47	61959	SECONDARY POWER PCB
24	61703	SOLENOID VALVE	48	61049	PCB FILTER SWITCH

# HTP Invertig 200 Parts Breakdown

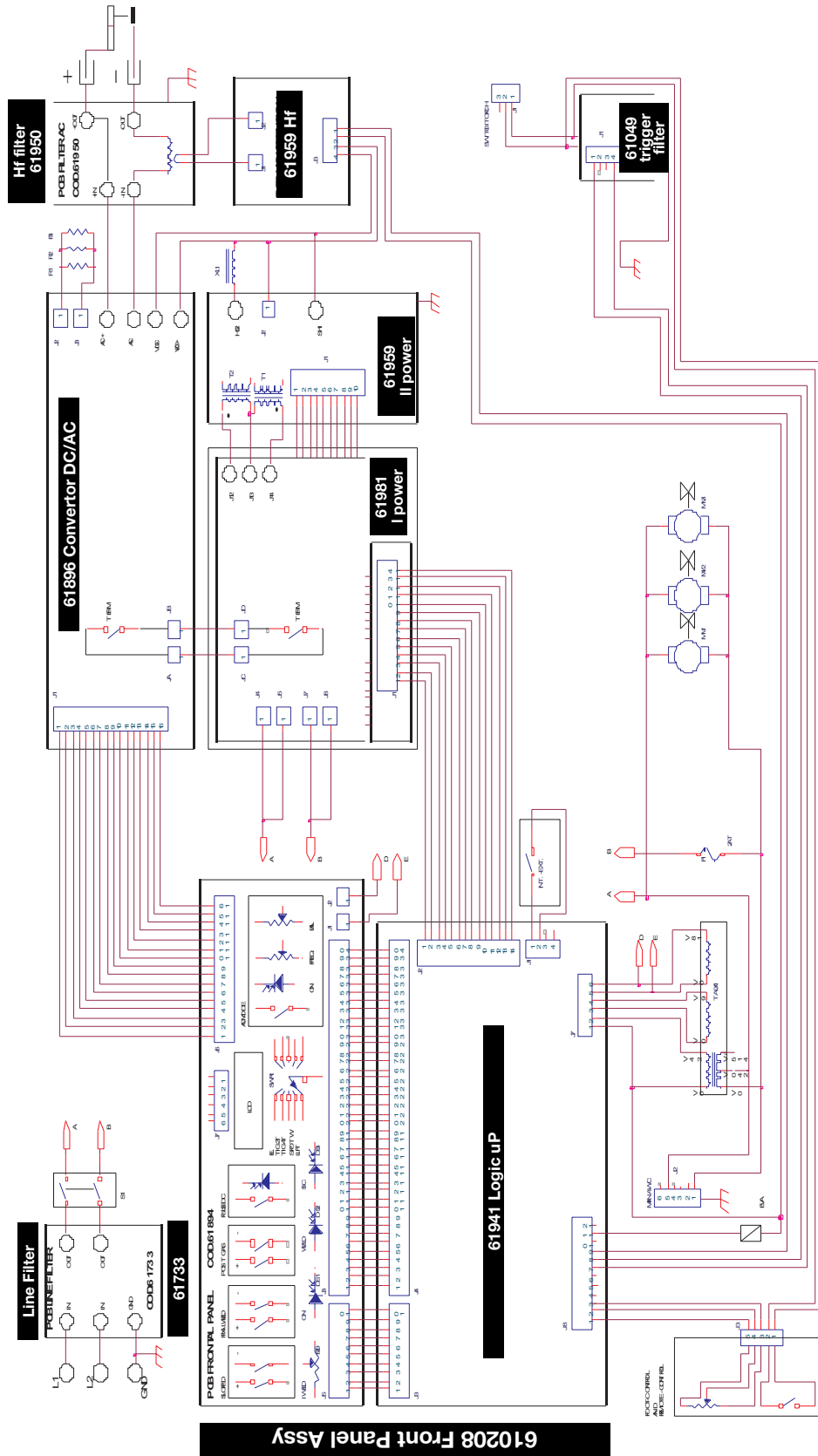




### Water Cooler Parts Breakdown

1	HANDLE	66184
2	COVER	62015
3	RADIATOR	63143
4	TANK	66302
5	FAN	66303
6	POMP	64150
7	FRONT LABEL	66935
8a	RED QUICK ADAPTOR	63147
8b	BLUE QUICK ADAPTOR	63144
9	FUSE	64207
10	FUSE HOLDER	64180
11	BASE	62016
12	ON / OFF SWITCH	64056
13	BLUE QUICK ADAPTOR	63145
14	PRESSURE SWITCH	63146
15	AUX TRANSFORMER	64637
16	PCB	61952
17	CHOCK	66505
18	POWER CABLE m2,5	61783

# HTP Invertig 200 - Wiring Diagram





# HTP Invertig 200 AC/DC Troubleshooting Guide

