

TIG SPOT GUN OPERATION MANUAL

OVERVIEW

TIG (GTAW) spot welding is a fusion welding process, which allows sheet metal gauge materials to be spot welded together from one side of the material unlike the resistance spot welding process, which requires access to both sides of the material. The equipment, procedures and techniques are exactly like the manual TIG weld process only the arc on time is precisely controlled by a spot weld timer in the power supply and the TIG spot gun replaces the manual TIG welding torch.

TIG SPOT WELDING MATERIALS

TIG spot welds are possible for most DCSP weldable materials. These include mild steel, low alloy steels and stainless steels. Cold rolled materials tend to TIG spot weld more readily than hot rolled materials. Aluminum, magnesium, copper and other high heat conducting materials are not suitable for TIG spot welding. Also, painted, coated, or galvanized materials cannot be TIG spot welded without removing the surface coating. Thin foils to heavier gauge materials can usually be spot-welded and some applications may require special fixtures or back-up plates.

EQUIPMENT

The TIG spot welding process requires a conventional TIG welding power supply capable of DC current output with high frequency arc starting, a weld timer control in the power supply and remote contractor (switch) control. Also required is the TIG spot gun, a water-cooled model (5000) for production applications or an air-cooled model (5505) for light duty occasional spot weld applications. Accessory items such as the tungsten chuck, ceramic insulator, locator body, locator tip and chuck wrench are needed and can be purchased as an accessory kit (652-00). To complete the spot gun set-up other normal TIG welding items will be required. These include; tungsten electrodes, argon gas cylinder, argon regulator-flowmeter, gas supply hose and power cable adapter. If a water-cooled spot gun is being used, a water circulator and supply hoses will be required to cool the spot gun assembly. A ground cable and clamp will complete the set-up. These items may be obtained from a local welding supply distributor.

SPOT GUN TRIGGER SWITCH CONNECTION

The switch cord from the spot gun trigger switch must be wired into the contractor control connector on the power supply. The spot gun switch is designed and rated for a maximum of 24 volt service. The connector receptacle on the power supply may be a multiple pin connector or a twist lock connector depending on the power supply. The spot gun switch cord contains two wires (black & white), which must be connected to the proper contactor control connector pins. **Do not connect** to the remote amperage connections. Consult the machine wire diagram for the proper connection pins. A qualified technician should do this procedure. When properly installed, pressing of the spot gun trigger switch will control the machine contactor closing through the adjustable spot time. The spot timer is essential for successful TIG spot welding operation.

GETTING STARTED

Once the spot gun has been connected to the power supply be sure all connections are tight. If the water-cooled spot gun (5000) is being used be sure water is flowing through the gun and that there are no leaks. The spot gun requires a flow of one (1) quart per minute at approximately of 50 psi. If you are using a water circulator to cool the spot gun, do not use the water solenoid valve on the power supply if it has one. Do not use a "on demand" type water cooler that shuts off the water flow when the spot gun is idle. Allow the water to flow through the spot gun hoses as long as the power supply is on.

SETTING UP THE SPOT GUN

Select the 3/32 size tungsten chuck and screw it into the front end of the spot gun head.

Do not tighten it until the tungsten electrode is in place. Next, slip the ceramic insulator onto the torch head nose taper giving it a slight twist to secure it in place. Now screw the chrome locator body and flat metal tip onto the ceramic insulator until it stops against the shoulder of the insulator. Prepare several 3/32" diameter tungsten electrodes by pointing the ends as normal for DCSP TIG welding current. Slide the electrode into the torch head through the locator and tip into the tungsten chuck until the end of tungsten is even with the outside edge of the metal tip. Using the chuck wrench tighten the chuck so the electrode is held just snug. Snug so you can pull or push the tungsten electrode back and forth with your fingers. Now push the electrode into the chuck so the pointed end is recessed approximately 1/16" inside the end of the metal tip. This is approximately the depth of the four gas slots on the outside edge of the metal tip. Now tighten the tungsten chuck with the wrench. You may need to practice this procedure several times until you get the feel of it. If the electrode is recessed more than 1/16 of an inch, the distance may be too long for the high frequency to jump the gap and establish an arc. If the recess is too short or if the electrode actually touches the work piece the arc may not start or, if it does start, the tungsten electrode may freeze in the weld puddle. In this case the electrode must be broken free and removed from the spot gun, repointed and re-installed in the torch chuck.

TESTING THE SET-UP

CAUTION: BE SURE YOU HAVE READ THE MACHINE INSTRUCTIONS AND SAFETY PRECAUTIONS AND UNDERSTAND THEM FULLY.

Prepare several test samples of the same material and gauge thickness you want to spot weld. Be sure they are clean, oil free and flat. The spot gun power cable and adapter should be connected to the "electrode" terminal of the power supply or the negative terminal mark (-). If connected to the electrode terminal, the power selector switch should be set to DCSP, sometimes marked DSEN. The ground cable will be connected to the "work" terminal or (+) terminal. The ground clamp is clamped to the work or metal bench upon which the test coupons are placed. Carefully "crack open" the argon cylinder valve until the regulator is pressurized then open the valve fully, set the argon flowmeter to 12-15 CFH flow rate. Allow argon gas to flow through the spot gun for a minute or so to purge all air from the lines. This will insure argon will be present in the metal locator and tip when the arc is started. This can be done by holding the spot gun away from the grounded work or the workbench and depress the trigger switch. This will cause the machine gas valve to open and allow the argon

gas to flow through the gun hoses and out the metal tip. The high frequency selector switch can be set to either "start" or "continuous" position for spot welding.

CAUTION: BEFORE ATTEMPTING TO MAKE A SPOT WELD YOU MUST WEAR DARK SAFETY GLASSES OR A WELDING HELMET WITH A LIGHT (2-5) FILTER LENS AND PROTECTIVE LEATHER GLOVES. DO NOT LOOK DIRECTLY AT THE ARC FLASH.

The machine amperage setting should be set at approximately 100 amps, and the spot timer set for 2 seconds. These are general settings, which should easily establish an arc and time out after two seconds. Adjustments can now be made to fine-tune the settings to get the desired results. Usually increasing amps (hotter arc) will require shorter arc time settings, and vice versa. The post flow timer on the power supply should be set to 8-10 seconds. Place the metal flat tip against the weld sample; the sample must be flat and one on top of the other. Applying a little downward pressure with the spot gun, depress the spot gun trigger switch. The arc should come on, the argon gas should flow and the arc should stay on until the weld timer has timed out and terminated the arc. Examine the spot weld to see if the melted nugget of material has penetrated into the bottom piece. If it has not, increase the amperage slightly and try again. DO NOT change the timer setting. Change the amperage or spot time separately so you can track the changes and results.

Adjust the amperage and timer settings, one at a time, until you get the penetration and fusion desire. If the weld nugget has melted through the bottom piece you have too hot an arc, reduce the amperage setting and also possibly the timer setting to get the desired results. After a few minutes of practice it should become routine to get a proper TIG spot-weld.

TROUBLE SHOOTING

If you do not get an arc when you activate the spot gun switch, check the following:

- 1) Power supply switch is on.
- 2) Amperage setting is not too low.
- 3) Torch cables are connected to proper terminals.
- 4) Ground cable and clamp are connected properly.
- 5) Test samples are properly grounded.
- 6) Tungsten electrode is recessed 1/16" inside metal tip end.
- 7) High frequency switch set to "on" and HF intensity level setting is not too low.
- 8) Spot gun trigger switch wires are connected to correct pins in the machine plug.
- 9) A melted or disintegrated tungsten electrode means the electrode is too small for the amperage setting, or the spot gun is connected to wrong machine terminal, or the selector switch was set to DCRP or DSEP setting. Spot gun must be connected so that the spot gun (tungsten electrode) is (-) negative and work piece is (+).
- 10) Discolored tungsten electrode means no argon gas flow or too low a flow setting. Be sure all air has been purged from torch lines.

SAFETY PRECAUTIONS

READ AND UNDERSTAND THE POWER SUPPLY OPERATING MANUAL FULLY BEFORE STARTING TO SPOT WELD.

KEEP THE WORK AREA CLEAN AND FREE OF COMBUSTIBLE MATERIALS. HAVE A PROPER TYPE FIRE EXTINGUISHER CLOSE BY.

SPOT WELD ONLY IN AREAS WITH GOOD VENTILATION.

NEVER SPOT WELD ON CONTAINERS WHICH HELD FLAMMABLE LIQUIDS, OR LIQUIDS OF AN UNKNOWN ORIGIN.

WEAR PROPER WELDING CLOTHING, LONG SLEEVE SHIRT, LEATHER GLOVES AND PROPER EYE PROTECTION TO GUARD AGAINST DEBRIS AND ARC FLASH BURNS.

SHUT OFF POWER SUPPLY AT WALL DISCONNECT BEFORE MAKING ANY ADJUSTMENTS TO THE SPOT GUN OR MACHINE CONNECTIONS.

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