OPERATOR'S HANDBOOK

TROUBLESHOOTING GAS METAL ARC WELDING PROCESSES AND EQUIPMENT

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INTRODUCTION

General

Problems that occur while using the Gas Metal Arc Welding (GMAW) process include electrical, mechanical, and process.

The following information is provided to help the operator troubleshoot basic problems.

It is assumed that the equipment did work before problems started. If equipment problems occur, follow the manufacturer's recommendations.

Metal Transfer Types

The two basic types of metal transfer are short circuit and spray.

In short circuit transfer, the wire short circuits to the workpiece and weld wire is transferred with each short circuit. Short circuit transfer uses smaller wire diameters at lower arc voltages and higher slope settings. See Figure 1.

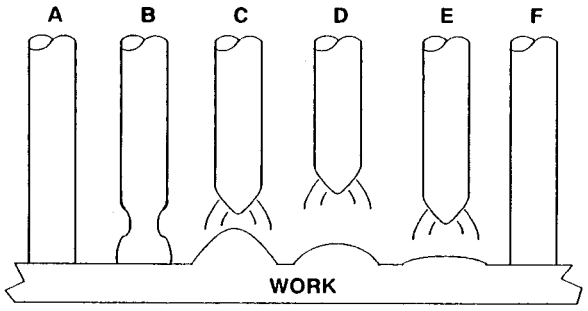

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Figure 1. Mechanics Of Short Circuiting Transfer

In spray transfer, a steady stream of small droplets of weld wire are transferred into the weld. Spray transfer uses larger diameter wires at higher arc voltages and lower slope settings. See Figure 2.

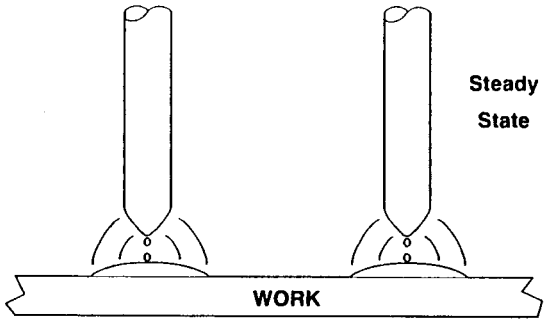

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Figure 2. Mechanics Of Spray Arc Transfer

Welding Power Sources

For short circuit transfer, a constant voltage welding power source is required. Adjustable slope and inductance are desirable. Slope slows the response rate of the welding power source and lowers maximum short circuit current. A constant speed wire feeder is recommended for short circuit transfer.

For spray transfer, either a constant voltage or constant current welding power source can be used. A voltage sensing wire feeder is recommended for spray transfer.

TROUBLESHOOTING

1. Welding wire stops feeding while welding.	
Power Source	Control circuit fuse, primary circuit fuse, or fuse at line disconnect switch has opened. Check and replace fuse.
	Contactor dropped out. Check contactor circuit for proper voltage.
Wire Feeder	Unit fuse has opened. Check and replace fuse.
	Wire feed motor circuit breaker open. Check wire feed system and reset circuit breaker.
	Adjust pressure, align, or replace drive rolls.
	Adjust wire spool hub tension nut so wire feeds freely.
	Reduce load on wire feed motor.
	Replace wire feed motor.
	Check and replace control relay.
Gun	Replace worn or clogged contact tip.
	Blow out gun liner and casing, and replace worn or damaged liner.
	Repair or replace gun trigger switch and interconnecting leads.

2. Welding wire feeds but is not energized; there is no welding arc.	
Power Source	Place contactor control switch in correct position.
	Check remote contactor control connections.
	Check weld cable connections at workpiece, wire feeder, and welding power source. Be sure workpiece connection has good metal-to-metal contact.
	Check connections between remote contactor control and welding power source.
	Check contactor points and coil.
Wire Feeder	Check contactor control connections.
	Check control relay.

3. Porosity in the weld.	
Process	Be sure metal is cleaned of oil, dirt, and mill scale.
	Be sure welding wire composition matches base metal.
	Use correct shielding gas at recommended flow rate.
	Be sure gas cylinder valve is open and regulator/flowmeter is not frozen.
	Check gas hose and connections.
	Check regulator/flowmeter.
	Check shielding gas for moisture and return cylinder to vendor.
	Move gun along weld at a slower speed.
	Hold gun at correct angle and closer to workpiece.
Wire Feeder	Reduce wire feed speed setting.
	Check and repair or replace gas hose and connections.
	Check and replace gas valve.
Gun	Check gun and conduit for air leaks. Repair or replace leaking parts.
	Contact tube should extend no more than 1/8 in. (3.2 mm) from nozzle.
	Be sure wire is centered in contact tube. Replace worn contact tube if necessary.

3. Porosity in the weld (Continued).	
Power Source	Reduce voltage setting.
	Adjust slope setting to lower short circuit current, if applicable.

4. Welding wire stubs into workpiece.	
Power Source	Increase voltage setting.
	Reduce slope setting, if applicable.
Wire Feeder	Reduce wire feed speed setting.

5. Excessive spatter while welding.	
Power Source	Reduce voltage setting
	Increase slope setting, if applicable.
Gun	Replace contact tube with one that extends no more than 1/8 in. (3.2 mm) from nozzle.
Process	Use correct shielding gas at recommended flow rate for application.
	Be sure welding wire composition matches base metal.

6. Small weld bead.	
Power Source	Increase voltage setting.
	Reduce slope setting (reduce the amount of droop), if applicable.
Wire Feeder	Increase wire feed speed setting.

7. Large weld bead.	
Power Source	Decrease voltage setting.
	Increase slope setting (increase the amount of droop), if applicable.

DATA CHARTS

General

The values in the following tables are a starting point for setting up a weld. Most settings can be varied while welding to fine tune the arc. For aluminum welding, welding wire composition must match base metal composition.

Table 1. Short Circuit Transfer For Mild And Low Alloy Steel*

Electrode Diameter	Amperage Range DCEP	Load Voltage	Recommended Power Source Within Rating
.030 in.	70-130	15-21	CP-200 CP-250TS CP-300 MC-300VS Deltaweld Series Maxtron 300 XMT 200 CC/CV XMT 300 CC/CV
.035 in.	80-190	16-22	CP-200 CP-250TS CP-300 MC-300VS Deltaweld Series Maxtron 300 XMT 200 CC/CV XMT 300 CC/CV
.045 in.	100-225	17-22	CP-200 CP-250TS CP-300 MC-300VS Maxtron 300 Deltaweld Series XMT 200 CC/CV XMT 300 CC/CV

*Using CO_2 shielding gas for mild steel and Argon-CO_2 for low alloy steel.

Table 2. Spray Transfer For Mild And Low Alloy Steel*

Electrode Diameter	Amperage Range DCEP	Load Voltage	Power Source
.030 in.	150-265	24-28	CV or CC
.035 in.	175-290	24-28	CV or CC
.045 in.	200-315	24-30	CV or CC
1/16 in.	275-500	24-32	CV or CC
3/32 in.	350-600	24-33	CV or CC

*Using Argon - 5% Oxygen shielding gas for mild and low alloy steel.

Table 3. Short Circuit Transfer For Stainless Steel 300 Series*

Electrode Diameter	Amperage Range DCEP	Load Voltage	Power Source
.030 in.	50-145	17-22	CV power source with
.035 in.	65-175	17-22	characteristics for short
.045 in.	100-210	17-22	circuiting transfer.

*Using tri-gas mixture – 90% He; 7-1/2% A; 2-1/2% CO_2 and flow rates of approximately 20 CFH.

Table 4. Spray Transfer For Stainless Steel 300 Series*

Electrode Diameter	Amperage Range DCEP	Load Voltage	Power Source
.030 in.	160-210	24-28	CV or CC
.035 in.	180-255	24-29	CV or CC
.045 in.	200-300	24-30	CV or CC
1/16 in.	215-325	24-32	CV or CC
3/32 in.	225-375	24-32	CV or CC

*Using Argon-Oxygen shielding gas. Oxygen percentage varies from 1 – 5%.

Table 5. Short Circuit Transfer For Aluminum And Aluminum Alloys*

Electrode Diameter	Amperage Range DCEP	Load Voltage	Power Source
.030 in.	45-120	15-18	CV power source with
.035 in.	50-150	17-19	characteristics for short
3/64 in.	60-175	16-20	circuiting transfer.

*Using Argon as the shielding gas.

Table 6. Spray Transfer For Aluminum And Aluminum Alloys*

Electrode Diameter	Amperage Range DCEP	Load Voltage	Power Source
.030 in.	90-150	22-28	CV or CC
.035 in.	100-175	22-28	CV or CC
3/64 in.	120-210	22-28	CV or CC
1/16 in.	160-300	24-30	CV or CC
3/32 in.	220-450	24-32	CV or CC

*Using Argon as the shielding gas.

Table 7. Flux Cored Arc*

Electrode Diameter	Amperage Range	Load Voltage
1/16 in.	200-425	24-29
5/64 in.	250-450	27-31
3/32 in.	300-500	29-33
7/64 in.	360-550	29-34
1/8 in.	425-650	29-34

*Using CO_2 as the shielding gas. Flow rates depend on nozzle diameter, surrounding air movement, and electrode extension♦. Welding in still air generally requires flow rates from 30 to 40 CFH. Drafty conditions or longer electrode extension may require higher flow rates.

♦Most manufacturers recommend an extension of 3/4 to 1-1/2 in. for gas shielded electrodes or 3/4 to 3-3/4 in. for self-shielded electrodes. Follow the electrode manufacturers recommendations.

NOTES

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