Rapid X™ Weld Process Guide

Overview

Rapid X™ revolutionizes the productivity of welding*.

- **Increases Travel Speed by 40%**
- **Reduces Spatter by 30%**
- **Increases Penetration**
- **Reduces Heat Input**
- **Reduces Distortion**

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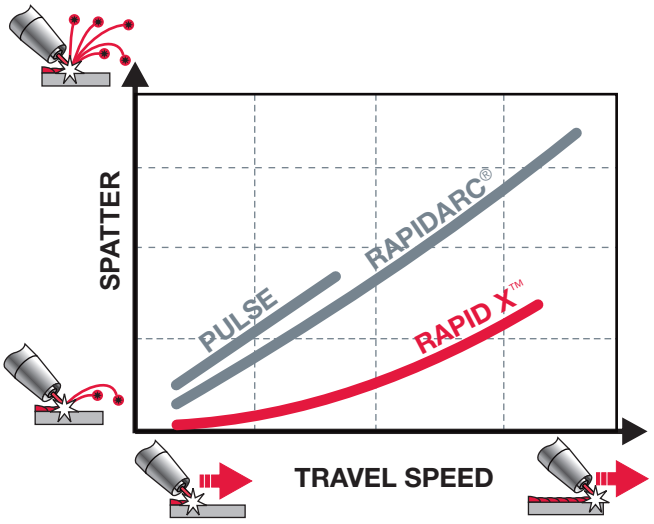
*Based on a side by side comparison of Rapid X™ and Pulse.

Rapid X™ Details

Process Description

Traditional Pulse welding consists of a peak and background current to deposit a molten droplet after each pulse. Patented RapidArc®, a breakthrough in Pulse welding, provides excellent arc stability at shorter arc lengths, resulting in a significant increase in travel speed.

Patent Pending **Rapid X**™ revolutionizes Pulse Welding. Inspired by RapidArc®, **Rapid X**™ also uses an extremely short arc length, but now with a significant reduction in spatter generation. Low current wet-in technology momentarily drops the current producing spatter-free welds. UltimArc™ and synergic precision controls complete the **Rapid X**™ revolution. The resulting **Rapid X**™ process provides extremely fast travel speeds and clean welds to deliver increased productivity.



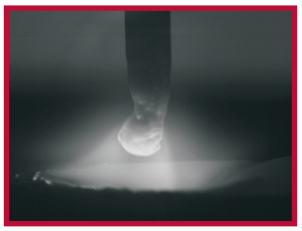
Waveform

1 Pulse Ramp / Peak

A rapid current increase creates a molten droplet.

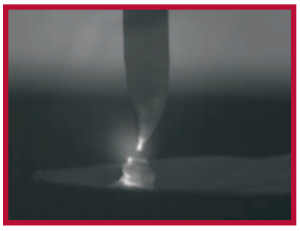
2 Tailout

Reduced current relaxes the plasma force as the droplet approaches the puddle.



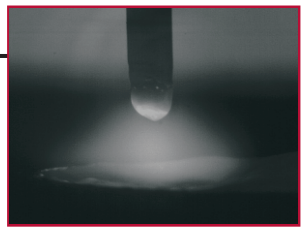
3 Wet-in

Proprietary hardware quickly reduces the current at the instant the droplet contacts the puddle, reducing spatter after the droplet detaches.

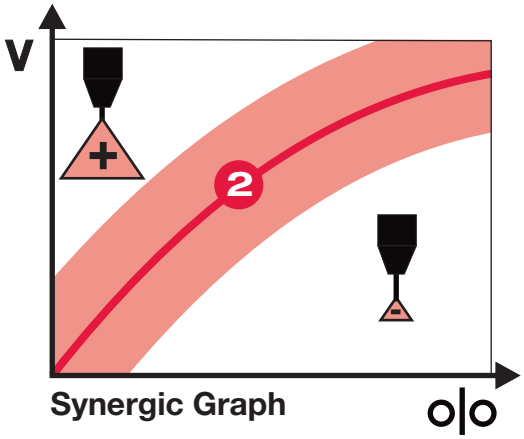


4 Puddle Repulsion

A plasma boost pushes the puddle away, creating separation and a stable rhythm of the weld pool.

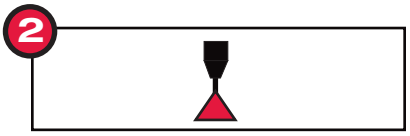


Synergic Welding

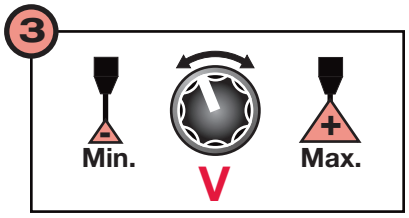


Rapid X™ waveforms are synergic weld modes. Based on the wire feed speed❶, set by the operator, a pre-programmed voltage is automatically selected❷. Fine tune the arc length using Voltage adjustment❸.

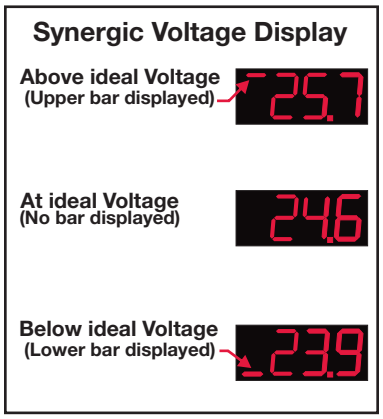
Adjust WFS to the desired setting. Refer to the Application section for the recommended settings.



Based on WFS a preprogrammed nominal voltage is selected.



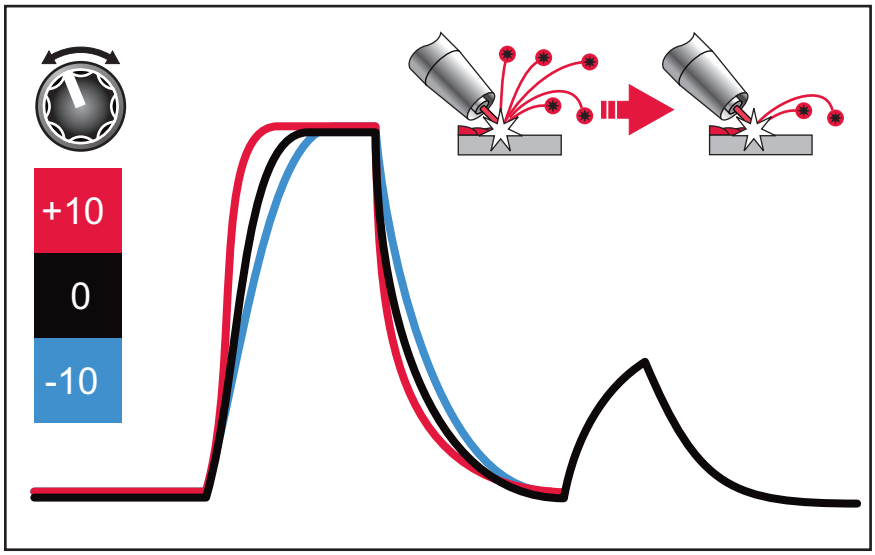
Adjusting voltage increases or decreases the arc length, allowing the user to fine tune arc characteristics.



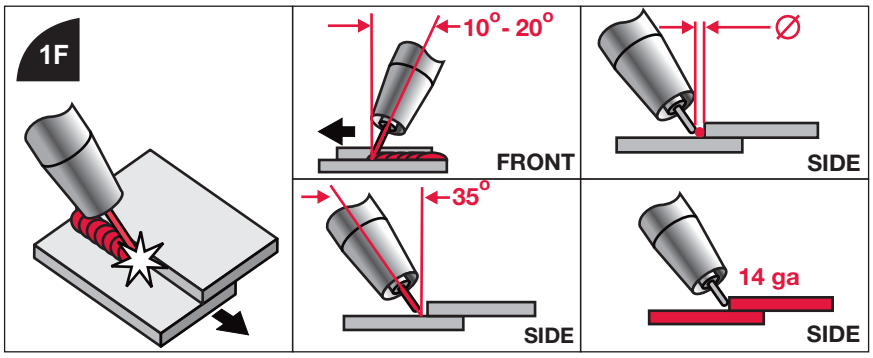
A note on Trim.
Lincoln Electric® developed Trim as a means to simplify the complexities of Arc Length control in advanced welding application set-up, such as Pulse. Now, Lincoln Electric® Synergic Weld modes improve the ease of set-up by preselecting an ideal voltage based on the selected WFS. The user can then fine tune their Voltage setting based on their personal preference and can easily see whether they are above or below the nominal setting.

UltimArc™ Control

The **UltimArc**™ control fine tunes the ramp and tailout rates with a single control. Increase (+) or decrease(-) this setting to minimize spatter levels.



1F / PA Lap



- Use a 10-20° push angle.
- Use a 35° work angle.
- Position the electrode approximately one electrode diameter outside the joint favoring the bottom leg.
- For 14ga applications position the electrode directly in the joint or slightly favoring the top edge. May require decreased work angle.

90Ar / 10CO_2

3/4 in.

		o|o		V	A
SuperArc® L-56 0.035”		in/min	in/min		
	1/4 in	800	30	25.0	260
	3/16 in.	800	40	24.5	260
	10ga	750	50	24.0	245
	12ga	700	60	24.0	235
	14ga	625	65	22.0	220
SuperArc® L-56 0.045”	1/4 in.	500	35	24.0	300
	3/16 in.	460	45	23.5	280
	10ga	450	50	22.0	260
	12ga	400	55	21.0	240
	14ga	375	60	20.0	235

See Customer Assistance Policy and Disclaimer Notice on page 9.

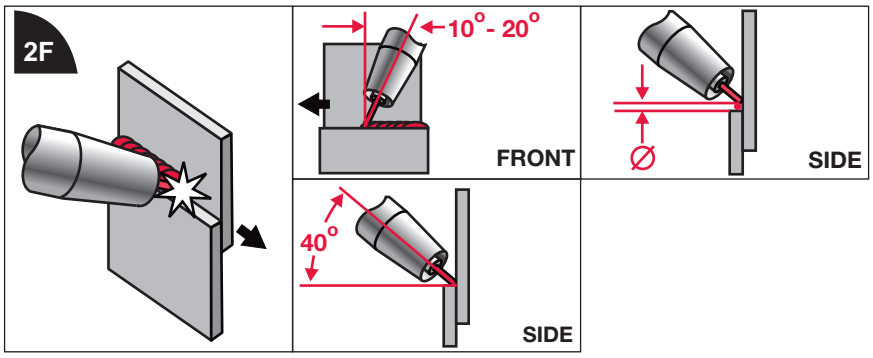
Metric

80Ar / 20CO_2

19 mm

		o|o		V	A
SupraMig® 1.0mm	mm	m/min	cm/min		
	6.4	18.4	90	24.5	265
	4.8	17.1	100	24.0	245
	3.4	15.2	115	23.5	235
	2.6	14.0	125	23.0	225
	1.9	12.0	140	22.8	200
SupraMig® 1.2mm	6.4	12.7	76	25.5	290
	4.8	11.4	101	24.5	270
	3.4	10.8	127	22.5	255
	2.6	9.5	140	21.5	235
	1.9	8.9	152	20.5	230

2F / PB Lap



- Use a 10 - 20° push angle.
- Use a 40° work angle.
- Position the electrode approximately one electrode diameter outside the joint favoring the top leg.

90Ar / 10CO_2
3/4 in.

		o|o		V	A
SuperArc® L-56 0.035”		in/min	in/min		
	1/4 in.	800	35	23.5	230
	3/16 in.	700	40	22.5	220
	10ga	700	60	22.5	215
	12ga	660	70	22.0	210
	14ga	615	80	20.5	200
SuperArc® L-56 0.045”	1/4 in.	500	35	23.0	270
	3/16 in.	475	45	22.0	260
	10ga	440	50	21.0	250
	12ga	400	55	19.5	235
	14ga	375	60	19.0	230

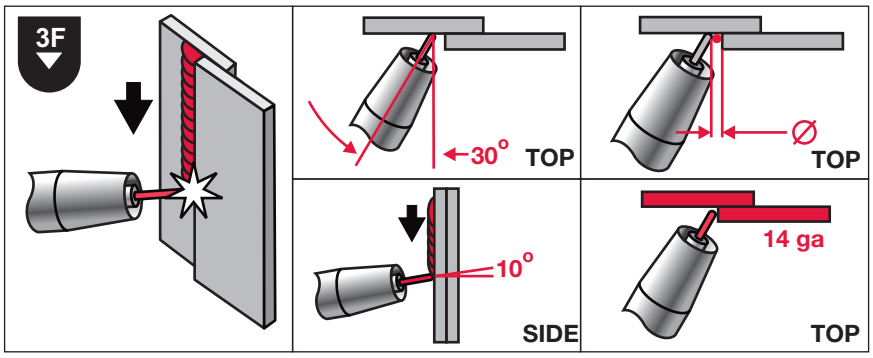
See Customer Assistance Policy and Disclaimer Notice on page 9.

Metric

80Ar / 20CO_2
19 mm

		o|o		V	A
SupraMig® 1.0mm	mm	m/min	cm/min		
	6.4	17.8	90	24.0	250
	4.8	16.5	100	23.5	245
	3.4	14.6	125	22.5	235
	2.6	14.0	140	22.0	220
	1.9	12.1	150	21.0	200
SupraMig® 1.2mm	6.4	12.0	76	24.5	280
	4.8	11.3	101	22.5	265
	3.4	10.5	127	21.5	250
	2.6	9.9	140	20.5	240
	1.9	8.9	152	20.0	230

3F / PG Lap



- Use a 10° drag angle.
- Use a 30° work angle.
- Position the electrode approximately one electrode diameter outside the joint favoring the bottom leg.
- For 14ga applications position the electrode directly in the joint or slightly favoring the edge.

90Ar / 10CO_2

3/4 in.

		o|o		V	A
SuperArc® L-56 0.035”		in/min	in/min		
	3/16 in.	780	50	24.0	260
	10ga	650	50	23.0	235
	12ga	650	60	22.5	235
	14ga	600	70	22.0	230
SuperArc® L-56 0.045”	3/16 in.	475	50	22.0	295
	10ga	400	50	21.0	260
	12ga	400	60	21.0	260
	14ga	360	70	19.5	240

See Customer Assistance Policy and Disclaimer Notice on page 9.

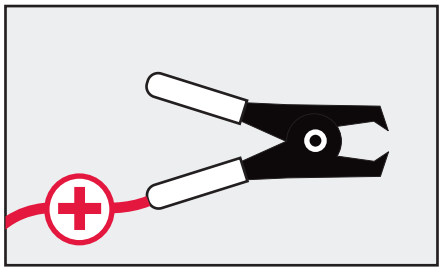
Metric

80Ar / 20CO_2

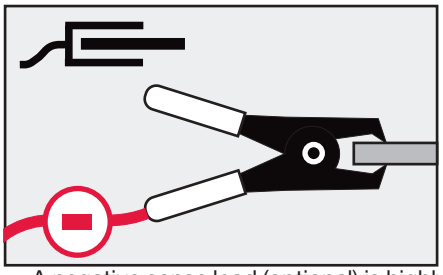
19 mm

		o|o		V	A
SupraMig® 1.0mm	mm	m/min	cm/min		
	4.8	15.9	125	24.0	240
	3.4	15.2	140	24.0	225
	2.6	14.0	152	23.3	220
	1.9	12.1	165	22.5	210
SupraMig® 1.2mm	4.8	11.4	127	23.0	280
	3.4	9.7	127	21.5	250
	2.6	9.7	152	21.5	250
	1.9	8.9	178	20.5	230

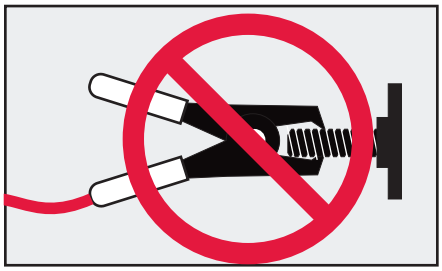
Sense Leads



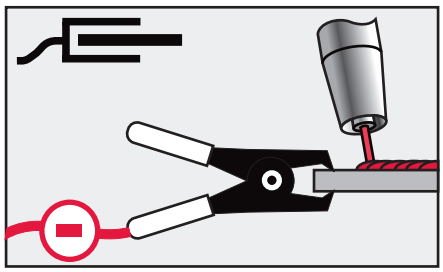
A positive (+) sense lead is required. This is a standard connection in an Arclink® cable.



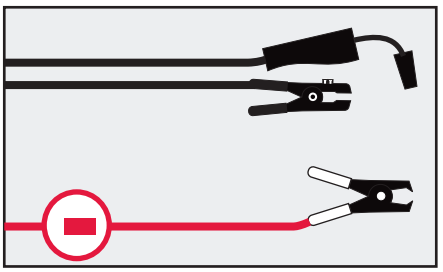
A negative sense lead (optional) is highly recommended for total welding cable lengths >50 ft. and should be connected directly to the workpiece.



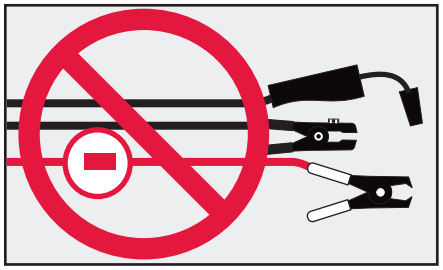
DO NOT connect either sense lead to a welding stud as this may result in erratic arc or increased spatter.



For best performance, connect the work sense lead close to the welding arc.

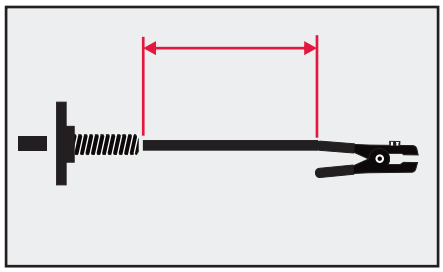


The negative sense lead should be separated away from welding cables to minimize interference.

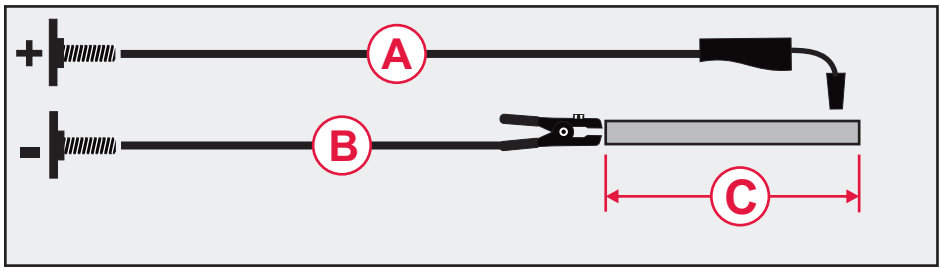


DO NOT route sense lead cable close to high current welding cables as this may distort the sense lead signal.

Work Leads

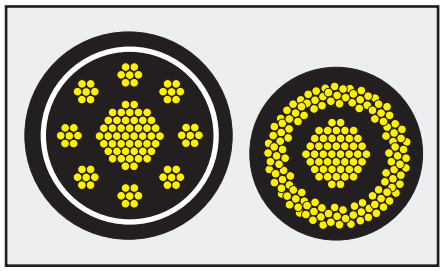


Connect the work lead to the negative stud on the power source and directly to the work piece. Maintain the shortest connection length possible.

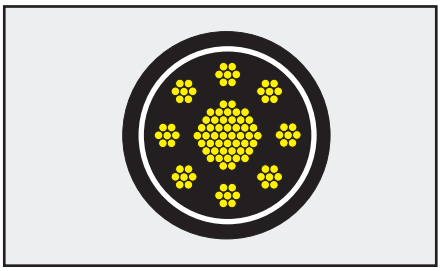


The total length of the welding current loop (A+B+C) should be minimized to reduce inductance.

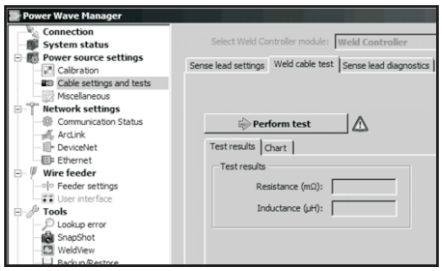
Route cables (A,B) close together to further reduce cable inductance.



For configurations with excessive inductance, use Lincoln Electric® patented coaxial welding cables.

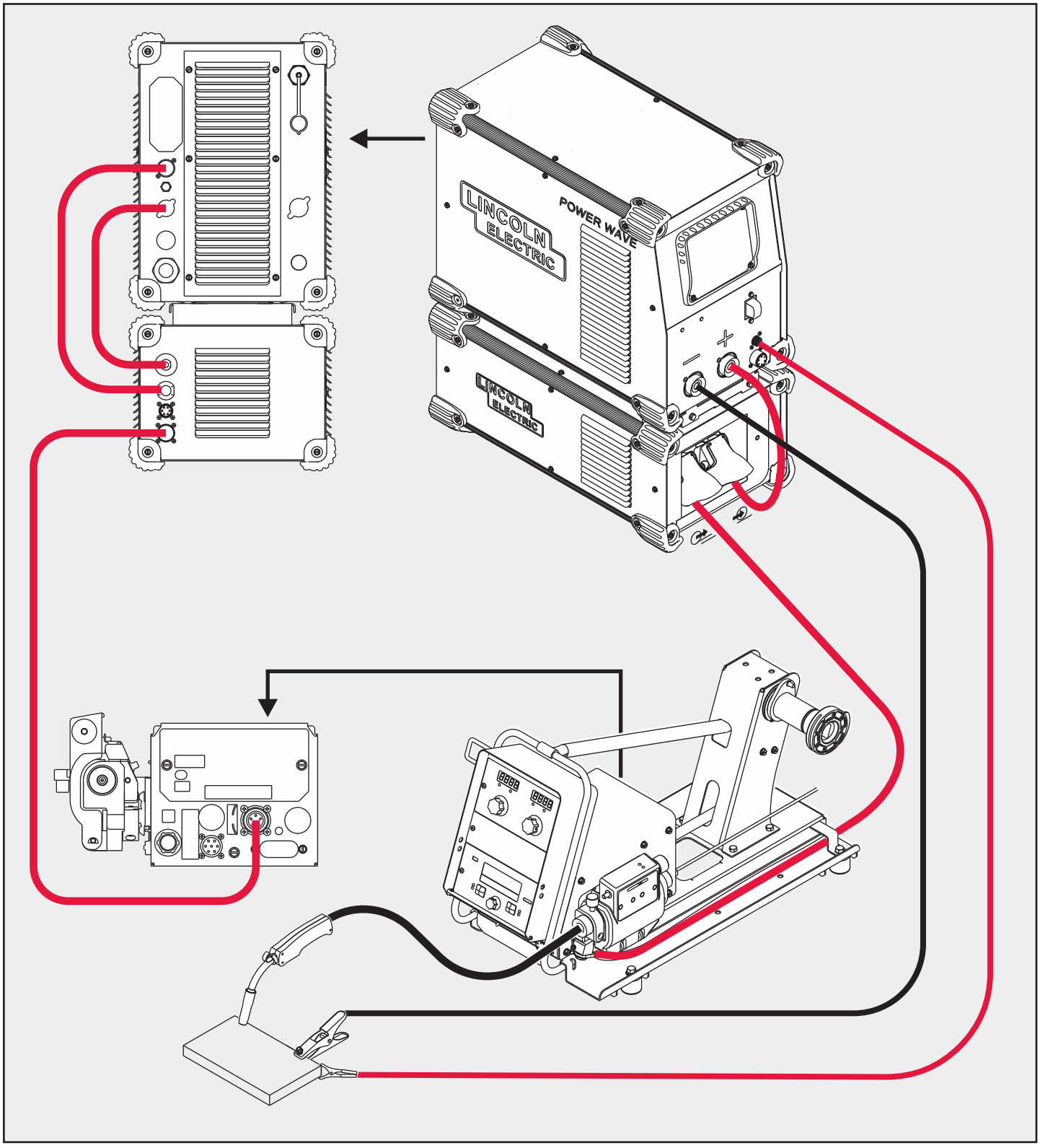


Lincoln Electric® coaxial cables combine the positive and negative welding leads into one cable to minimize cable inductance.



Test cable inductance levels using the Power Wave® Manager software exclusively from Lincoln Electric®.

Connection Diagram



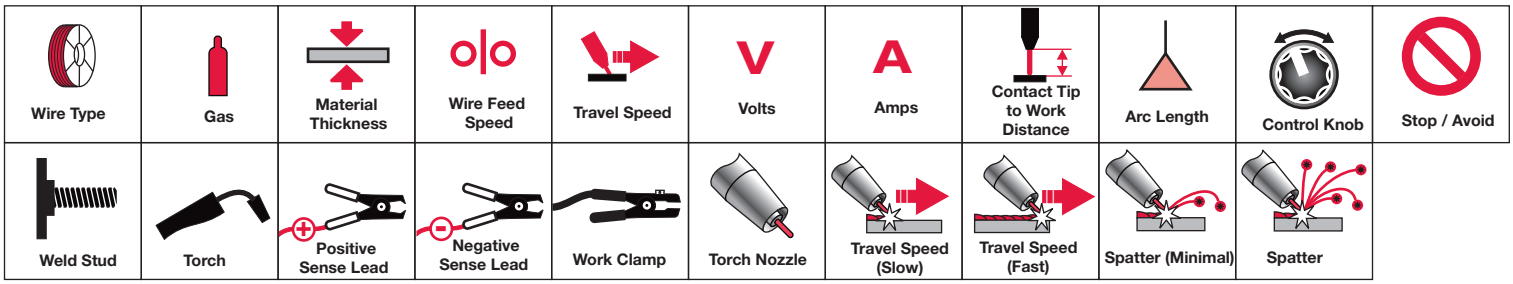
Troubleshooting

Problem

Solution	Spatter	Erratic Arc	Porosity	Under Cut	Convex Bead	Concave Bead	Burn Through	Poor Penetration
Volts	↑ !	↑		↓ !	↑	↓ !	↓	↓
Travel Speed	↓ !	↓ !		↓ !	↓ !		↑ !	↓ !
Wire Feed Speed	↓	↓		↓	↓ !	↑ !	↓ !	↑ !
Contact Tip to Work Distance	↓		↓		↓	↑	↑	↓
Push Angle	↓	↓		↑	↑	↓	↑	↓
Tip		🔧						
Gas Coverage	🔧		↑ !					
Surface Contaminates	🔧	🔧	🔧 !					
Proper Feeding		🔧 !						
Sense Lead	🔧	🔧						

↑ Increase ↓ Decrease 🔧 Inspect & Replace ! Important

Icons



Technical Terms

Cable Inductance — Resistance to change in current.

GMAW — Gas metal arc welding including metal inert gas (MIG) and metal active gas (MAG) welding.

Porosity — Gas entrapped in solidifying metal forms spherical or elongated pores in the weld.

Push Angle — The angle at which the electrode leads the weld pool relative to the direction of travel.

Synergic — A mode of control which automatically selects a preprogrammed nominal voltage based on the wire feed speed (WFS) set by the operator.

Work Angle — The angle of the electrode, off perpendicular, relative to the work piece surface.

Procedure Notes

All listed procedures are starting points and may require some adjustment depending on the specific application.

Torch angle, electrode placement, contamination, mill scale, joint fit up, and joint consistency are factors that may require special consideration depending on the specific application.

At higher travel speeds, joint fit up, wire placement, and contamination all become factors that are more significant.

The result of welding at higher travel speeds is a tendency to produce more spatter, less penetration, more undercut, and a less desirable bead shape. Depending on the limitations / requirements of the actual application, slower travel speeds and higher arc voltages may be required.

As the travel speed increases in fast follow applications (1/4" to 14 Gauge), a tighter and arc length must be maintained so that the puddle properly follows the arc. Operators typically reduce the arc length control (Trim) to achieve this.

At faster travel speeds, the bead-shape can become very convex (or ropy), and the weld will not "wet" well. There is a point at which the arc is set so short that the arc will become unstable and stubbing will occur. This forms a limitation of just how fast the travel speed can be raised.

It is ultimately the responsibility of the end user to ensure the proper weld deposition rate, bead profile, and structural integrity of a given weld application.

Customer Assistance Policy

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