Precision Pulse™ Weld Process Guide

Overview

Precision Pulse™ out performs Pulse*.

- **Improves Out of Position Welds**
- **Enhances Puddle Control**
- **Controlled Heat Input**
- **Improves Welds in Tight Joints**

Index

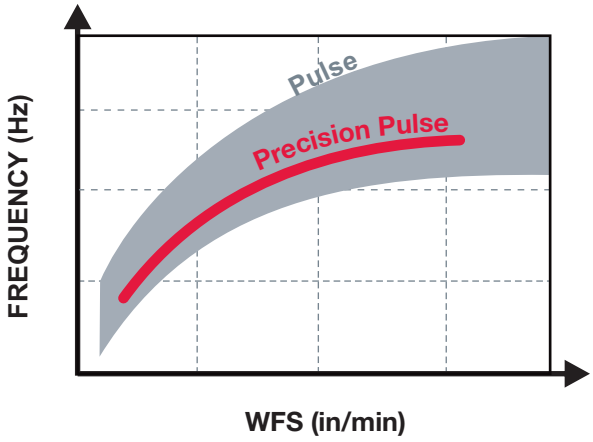
*Based on a side by side comparison of Precision Pulse™ and Pulse.

Precision Pulse™ Details

Process Description

Traditional Pulse welding consists of a peak and background current to deposit a molten droplet after each pulse. **Precision Pulse**™ functions similarly, but at a fixed frequency to create a more consistent droplet transfer. The waveform is capable of producing an extremely focused arc at a lower voltage.

Ideal for out of position welds, **Precision Pulse**™ gives the operator control over where the droplet transfers and how the puddle forms. A shorter, more focused arc increases puddle control and improves operator confidence compared to Pulse. Frequency adjustment changes the focus and droplet size increasing control of the weld puddle. The **Precision Pulse**™ waveform is ideally suited for out of position welds with enhanced puddle control.



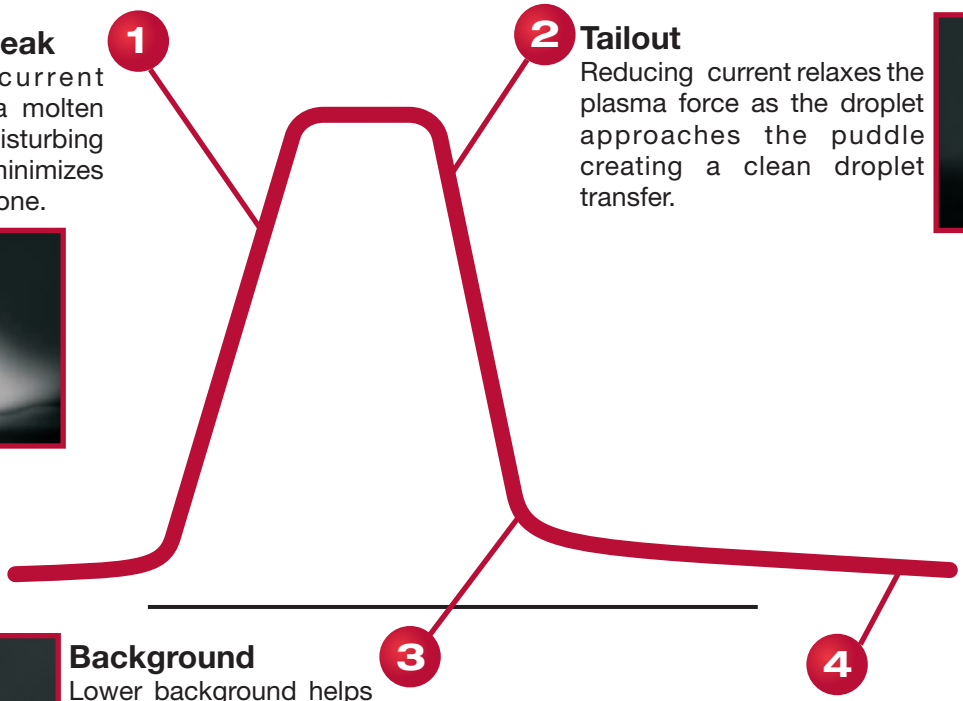
Waveform

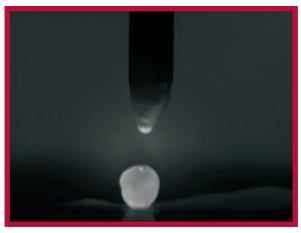
Pulse Ramp / Peak

A controlled current increase creates a molten droplet without disturbing the puddle and minimizes the size of the arc cone.

Tailout

Reducing current relaxes the plasma force as the droplet approaches the puddle creating a clean droplet transfer.



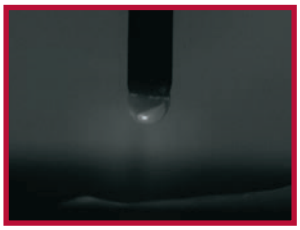


Background

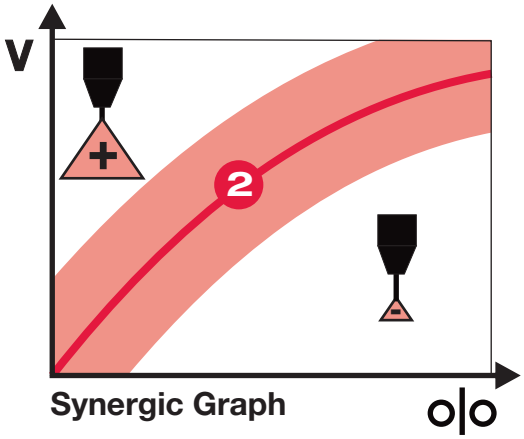
Lower background helps maintain control by minimizing the puddle heating.

Frequency

Frequency is a preset value. The UltimArc™ control allows the operator to fine tune the pulse frequency.

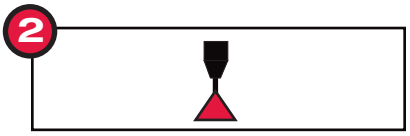


Synergic Welding

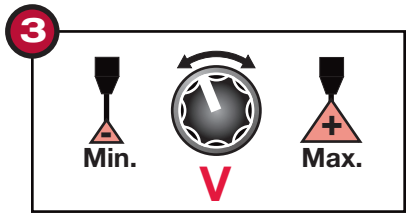


Precision Pulse™ waveforms are synergic weld modes. Based on the wire feed speed❶, set by the operator, a pre-programmed voltage is automatically selected❷. Fine tune the arc length using Voltage.

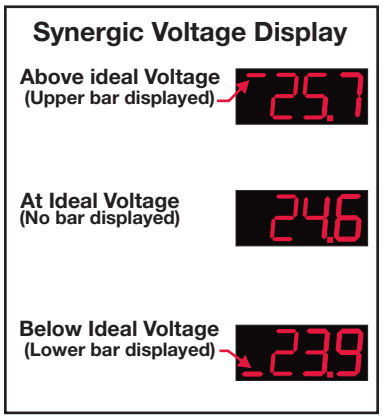
Adjust WFS to the desired setting. Refer to the Applications section for the recommended settings.



Based on WFS a pre-programmed nominal voltage is selected.



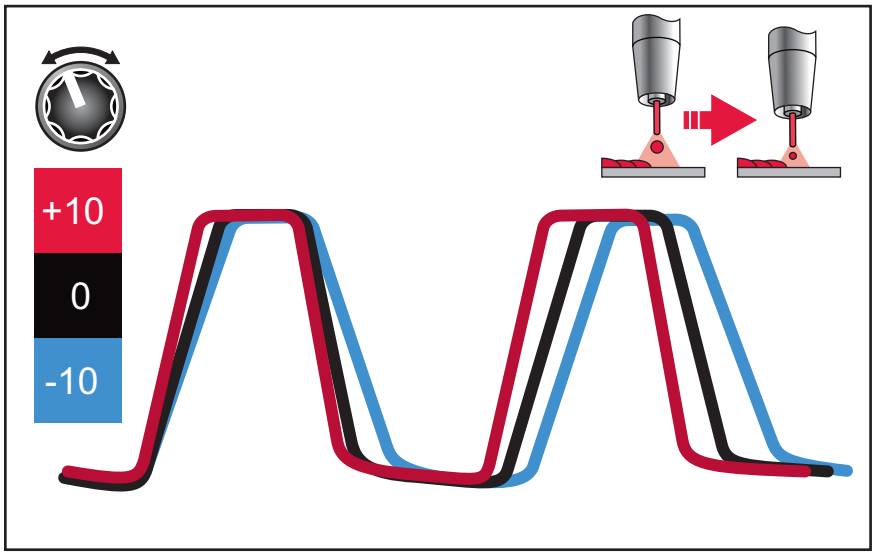
Adjusting voltage increases or decreases the arc length, allowing the user to fine tune arc characteristics.



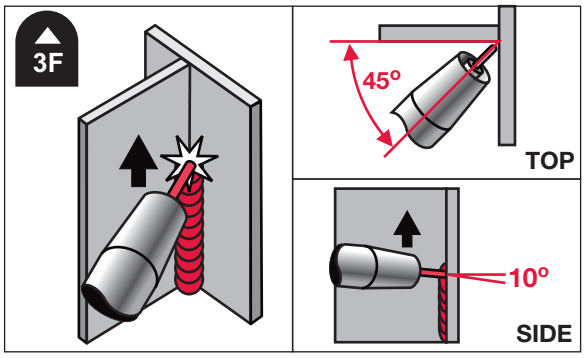
Synergic Weld modes improve the ease of set-up by pre-selecting an ideal voltage based on the selected WFS. The user can then fine tune their Voltage setting based on their personal preference and can easily see whether they are above or below the nominal setting.

UltimArc™ Control

The UltimArc™ control allows the user to make all the necessary adjustments to fine tune the frequency through a single dial. Increase (+) or decrease(-) this setting to optimize the focus and droplet transfer of the arc.



3F / PF



- Use a 10° drag angle.
- Use a 45° work angle.
- A weave is typically used.

90Ar / 10CO_2

1/2 in.

		in / min	V	A
SuperArc® L-56 0.035”	1/2 in.	250	21.0	130
	3/8 in.	210	20.0	110
	1/4 in.	175	19.5	95
	3/16 in.	150	19.0	85
	10 ga	125	18.0	70
SuperArc® L-56 0.040”	1/2 in.	200	20.5	120
	3/8 in.	175	20.0	108
	1/4 in.	150	19.5	95
	3/16 in.	125	19.0	80
	10 ga	100	18.5	70
SuperArc® L-56 0.045”	1/2 in.	150	20.0	120
	3/8 in.	130	19.5	110
	1/4 in.	110	19.0	95
	3/16 in.	90	18.0	70

See Customer Assistance Policy and Procedure Notes on page 9.

3F / PF Cont.

98Ar / 2CO_2

1/2 in.

		in / min	V	A
Blue Max® 308LSi 0.035”	1/2 in.	275	20.5	125
	3/8 in.	250	20.0	115
	1/4 in.	225	19.5	105
	3/16 in.	200	19.0	95
	10 ga	150	17.5	75
Blue Max® 308LSi 0.045”	1/2 in.	160	19.0	140
	3/8 in.	140	18.0	120
	1/4 in.	120	17.5	100
	3/16 in.	95	17.0	80
	10 ga	75	16.0	65

90He / 7.5Ar / 2.5CO_2

1/2 in.

		in / min	V	A
Blue Max® 308LSi 0.035”	1/2	250	26.0	105
	3/8	225	25.5	95
	1/4	200	25.0	85
	3/16	170	24.5	75
	10ga	130	23.5	60
Blue Max® 308LSi 0.045”	1/2	150	26.0	120
	3/8	135	25.5	110
	1/4	120	24.5	100
	3/16	100	24.0	80
	10ga	80	23.5	65

See Customer Assistance Policy and Procedure Notes on page 9.

3F / PF Cont.

Metric

80Ar / 20CO_2

12mm

	mm	m / min	V	A
SupraMig® 1.0mm	13	5.08	21.5	115
	10	4.45	21.0	105
	7	3.81	20.5	90
	5	3.18	20.0	80
	3	2.54	19.0	65
SupraMig® 1.2mm	13	3.56	21.0	120
	10	3.05	20.5	100
	7	2.54	19.5	85
	5	2.03	19.0	70

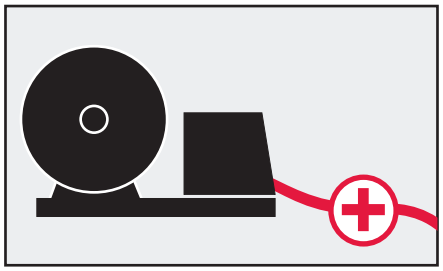
98Ar / 2CO_2

12mm

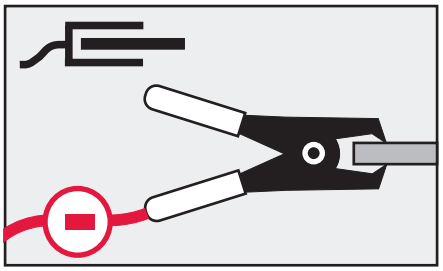
	mm	m / min	V	A
LNM 304LSi 1.0mm	13	5.72	19.5	125
	10	5.08	19.0	115
	7	4.45	18.5	100
	5	3.81	18.0	80
	3	3.05	17.5	70
LNM 304LSi 1.2mm	13	3.81	19.0	135
	10	3.30	18.5	115
	7	2.79	18.0	100
	5	2.29	17.0	80
	3	1.78	16.5	65

See Customer Assistance Policy and Procedure Notes on page 9.

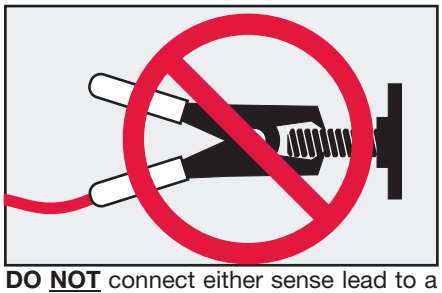
Sense Leads



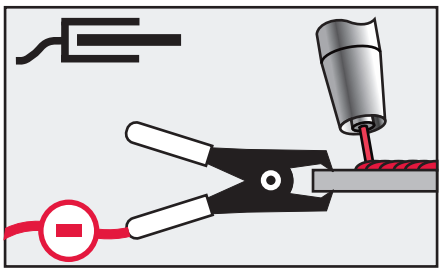
A positive (+) sense lead is required. This is a standard connection in an ArcLink® cable.



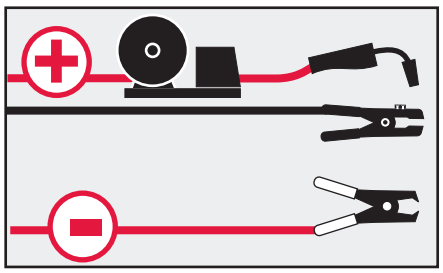
A negative sense lead (optional) is highly recommended for total welding cable lengths >50 ft. and should be connected directly to the workpiece.



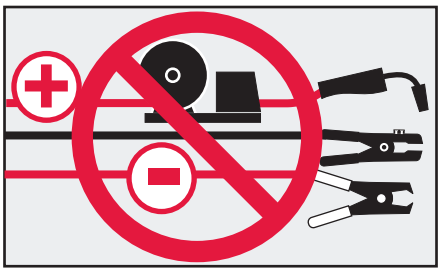
DO NOT connect either sense lead to a welding stud on the power source as this may result in erratic arc behavior.



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

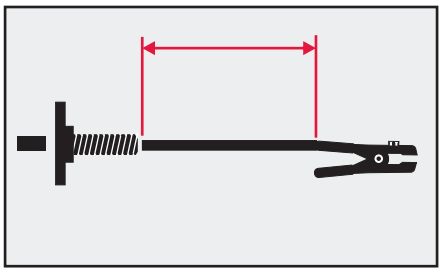


The negative sense lead should be separated away from welding cables to minimize interference.

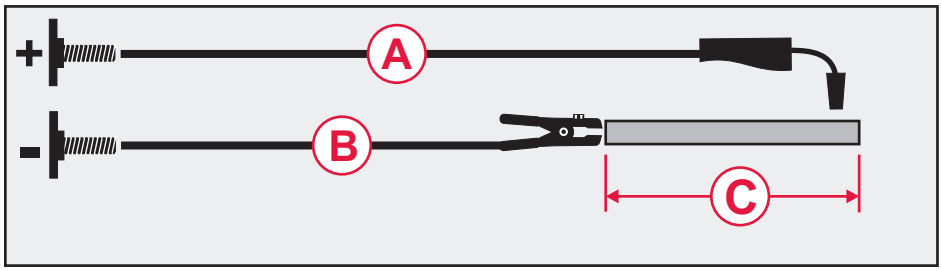


DO NOT route sense lead cable close to high current welding cables as this may distort the sense lead signal.

Work Leads

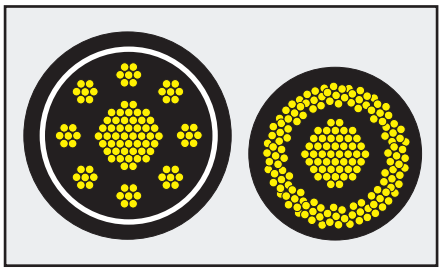


Connect the work lead to the negative stud on the power source and directly to the workpiece. Maintain the shortest connection length possible.

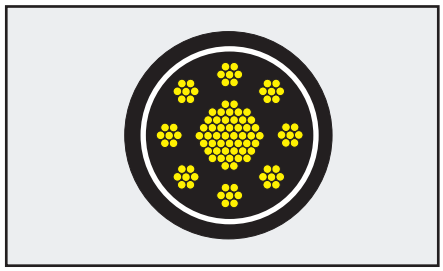


The total length of the welding current loop (A+B+C) should be minimized to reduce inductance.

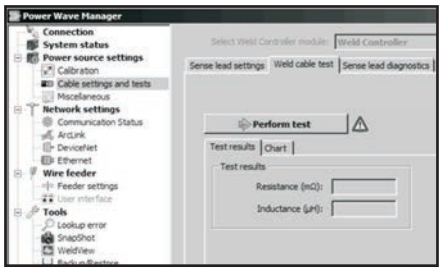
Route cables (A,B) close together to further reduce cable inductance.



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

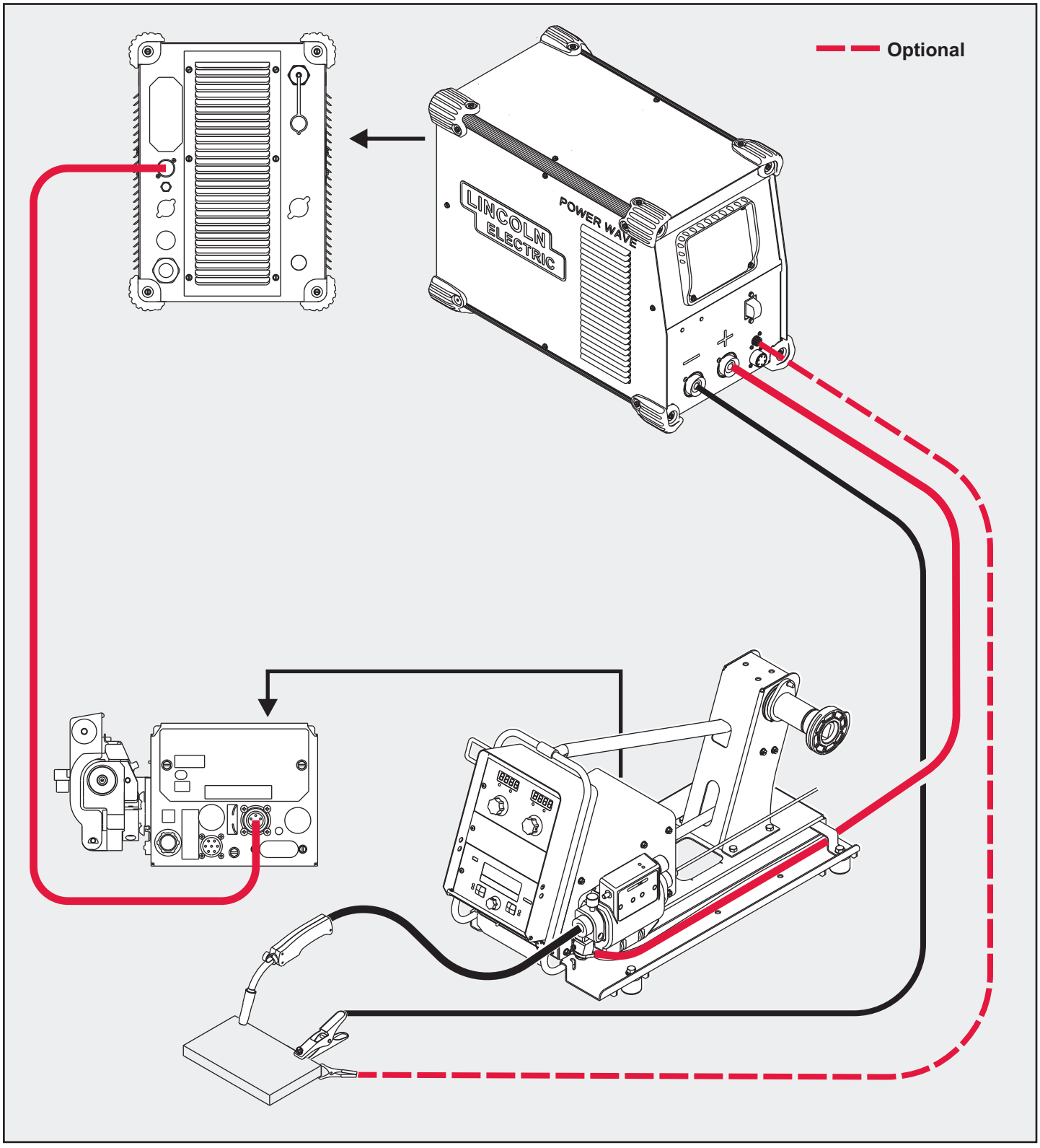


Lincoln Electric® coaxial cables combine the positive and negative welding leads into one cable to minimize cable inductance.



Test cable inductance levels using the Power Wave® Manager software exclusively from Lincoln Electric® Software is available at www.powerwavesoftware.com.

Connection Diagram



Troubleshooting

Problem

Solution

Solution \ Problem	Spatter	Erratic arc	Porosity	Under cut	Convex Bead	Concave Bead	Burnthrough	Poor Penetration
Volts	↑ !	↑		↓ !	↑	↓ !	↓	↓
Travel Speed	↓ !	↓ !		↓ !	↓ !		↑ !	↓ !
Wire Feed Speed	↓	↓		↓	↓ !	↑ !	↓ !	↑ !
Contact Tip to Work Distance	↓		↓		↓	↑	↑	↓
Push Angle	↓	↓		↑	↑	↓	↑	↓
Tip		Inspect & Replace						
Gas Coverage	Inspect & Replace		↑ !					
Surface Contaminants	Inspect & Replace	Inspect & Replace	Inspect & Replace !					
Proper Feeding		Inspect & Replace !						
Sense Lead	Inspect & Replace	Inspect & Replace						

↑ Increase ↓ Decrease Inspect & Replace ! Important

Icons

 Wire Type	 Gas	 Material Thickness	 Wire Feed Speed	 Travel Speed	V Volts	A Amps	 Contact Tip to Work Distance	 Arc Length	 Control Knob	 Stop / Avoid
 Weld Stud	 Torch	 Positive Sense Lead	 Negative Sense Lead	 Work Clamp	 Feeder	 Torch Nozzle	 Spatter (Minimal)	 Spatter	 Droplet Size (Large)	 Droplet Size (Small)

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 workpiece 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.

Refer to the included trouble-shooting guide for assistance in overcoming welding issues.

Customer Assistance Policy

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