STT® Pipe Root Pass Weld Process Guide

TE12.014 07/15

Overview

STT™ – Fill any open root, anywhere.

- **2 times faster than SMAW**
- **4 times faster than GTAW**
- **Requires less operator skill**
- **Meets low Hydrogen requirements**

Index

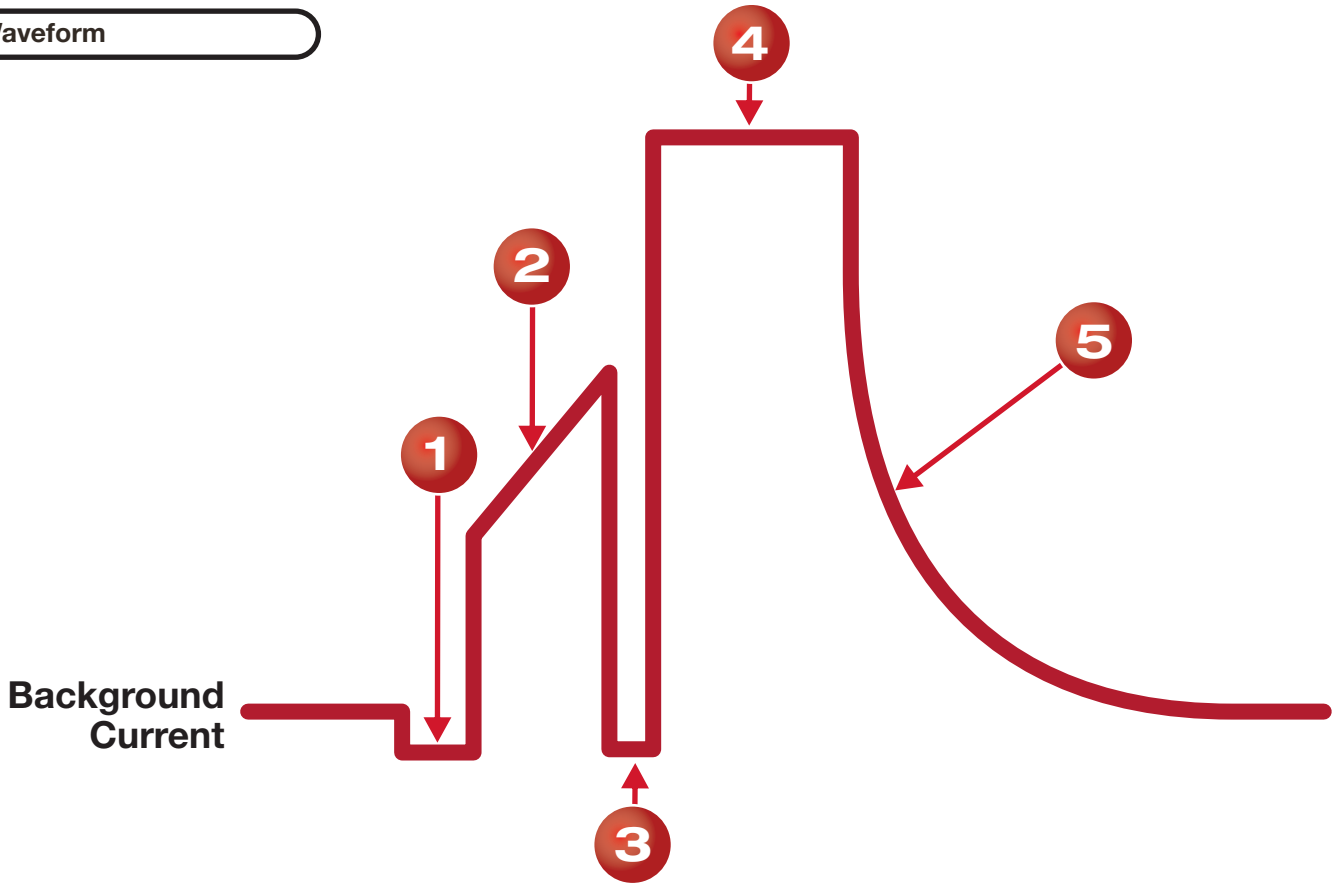
STT® Pipe Root Pass Details

TE12.014 07/15

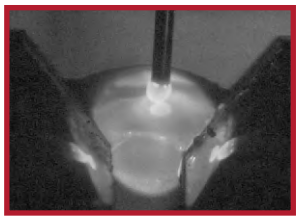
Process Description

The patented **STT®** (Surface Tension Transfer) is a modified GMAW short circuit welding process, designed for open root welding. This unique process simplifies open root welding, requiring less operator experience to implement. **STT®** is a proven pipeline process, produces excellent quality welds, and improves productivity over more traditional SMAW & GTAW root welding methods. These results are due to the patented design of this process, eliminating common problems such as burn-through and lack of fusion commonly associated with standard short-circuit transfer.

Waveform

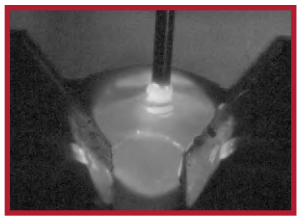


Wet-in



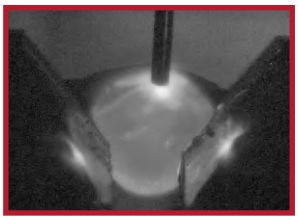
1. Molten ball makes initial contact with weld pool and current is instantly reduced.

Pinch Current



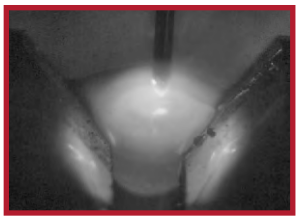
2. As the wire necks down, special circuitry determines that the short is about to break.

Detachment



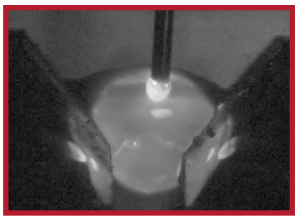
3. The STT Switch quickly reduces the current at the instant the droplet detaches, reducing spatter.

Peak Current



4. Peak Current sets a pre-defined arc length.

Tail-Out



5. Background regulation maintains a consistent molten ball size.

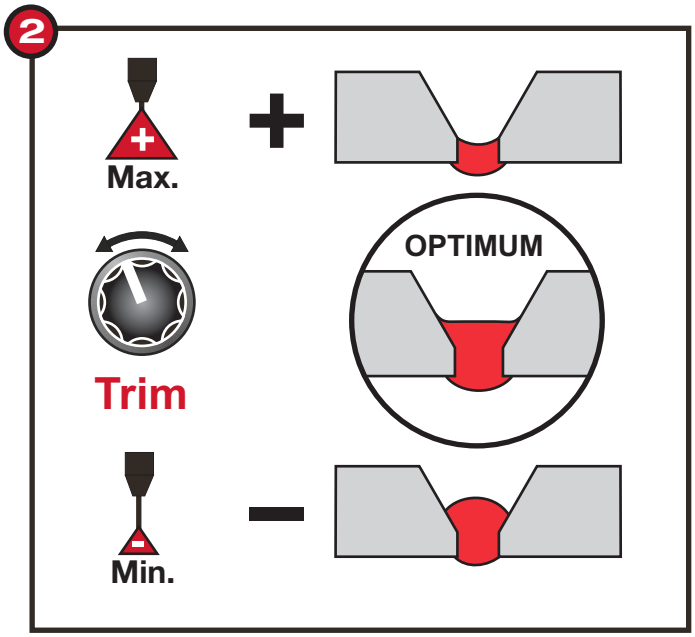
Synergic Welding

1 Adjust WFS to the desired setting. Based on WFS a preprogrammed nominal voltage is selected. Refer to the Application section for the recommended settings.

Trim And Ultimarc™

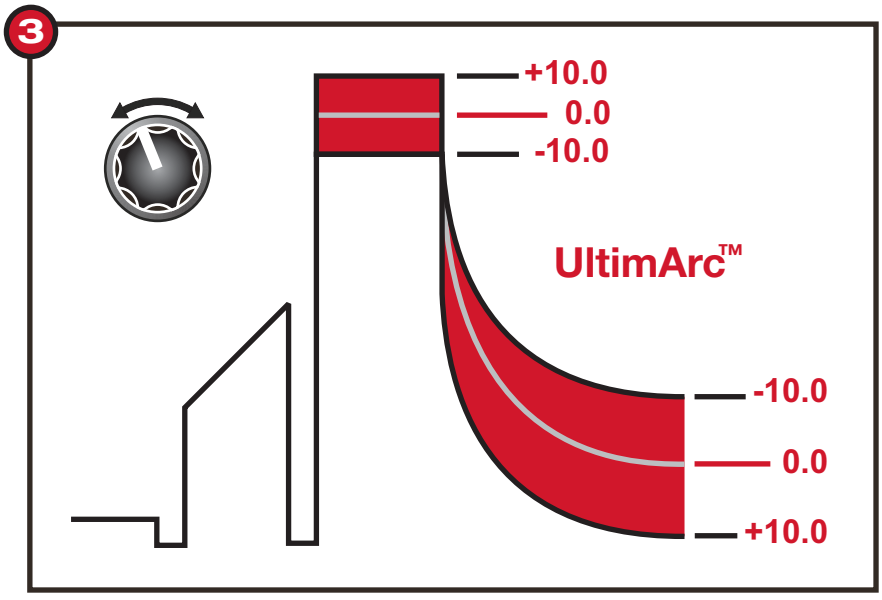
2 Trim: Regulates voltage by adjusting Peak, background, and tailout.

- When the the arc voltage is increased, the shorting frequency lowers, the ball size increases, giving a softer arc with more energy.
- When the arc voltage is lowered, the shorting frequency increases, the ball size decreases, giving a more focused arc with less energy.



3 UltimArc™: Fine adjustment of the arc.

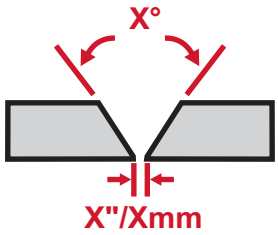
- In the positive direction it will produce a more focused arc by raising the peak, and lowering the background.
- In the negative direction, it will produce a more fluid and softer transfer by lowering the peak, and increasing background.



Joint Preparation

NO LAND (Knife Edge)

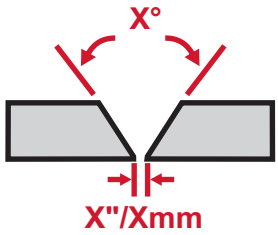
100% CO_2



1G ONLY

Included Angle	Gap	Land
60° - 75°	.080" - .100" 2.0mm - 2.5mm	⊘

ARGON / MIX

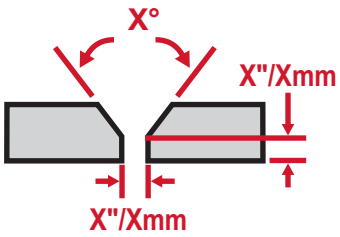


1G ONLY

Included Angle	Gap	Land
60° - 75°	.100" - .125" 2.5mm - 3.2mm	⊘

LAND

100% CO_2



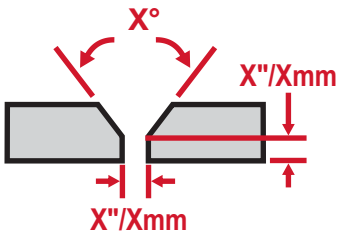
1G

Included Angle	Gap	Land
60° - 75°	.100" - .125" 2.5mm - 3.2mm	.060" - .125" 1.5mm - 3.2mm

2G, 5G, 6G

Included Angle	Gap	Land
60° - 75°	.100" - .125" 2.5mm - 3.2mm	.060" - .080" 1.5mm - 2.0mm

ARGON / MIX



1G

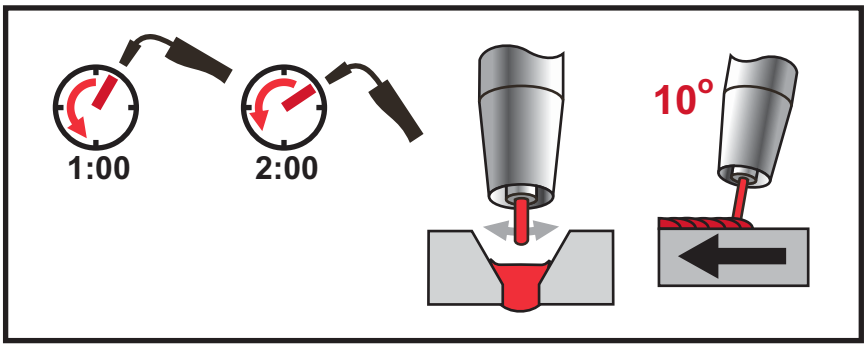
Included Angle	Gap	Land
60° - 75°	.125" - .156" 3.2mm - 4.0mm	.060" - .125" 1.5mm - 3.2mm

2G, 5G, 6G

Included Angle	Gap	Land
60° - 75°	.125" - .156" 3.2mm - 4.0mm	.060" - .080" 1.5mm - 2.0mm

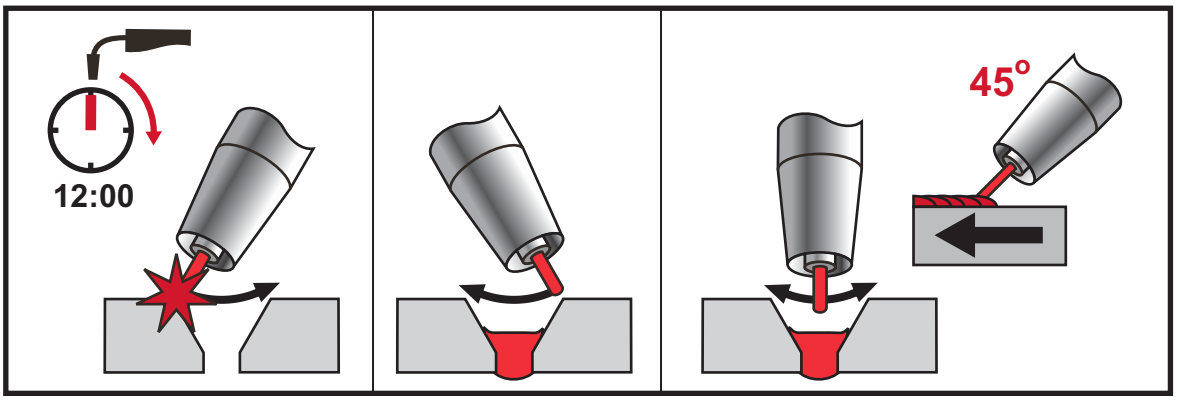
See Customer Assistance Policy and Disclaimer Notice on page 9.

Welding (1G)



If the pipe is rotated in the 1G position, the torch should be positioned off the top center of the pipe at the (1:00-2:00) position.

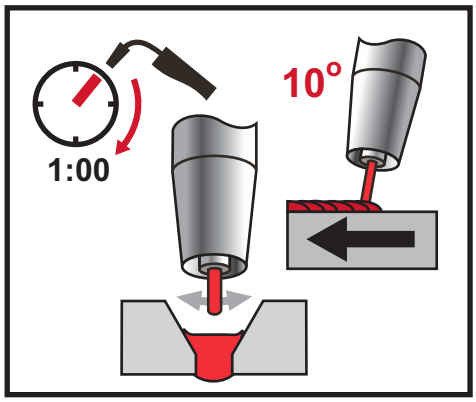
Welding (5G)



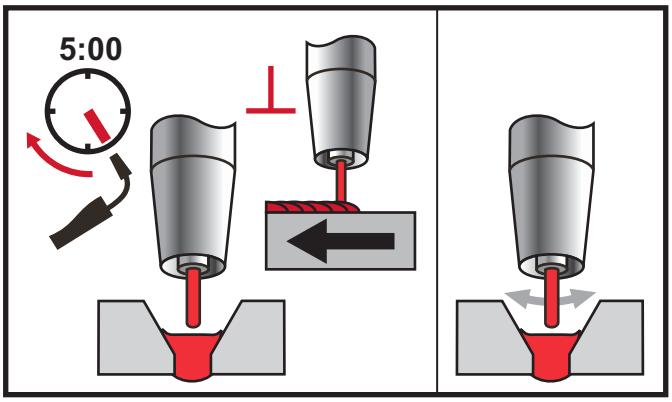
At the top (12:00), strike the arc on the side wall and smoothly move across the gap to other side, using a slight half-moon motion.

Then move back to the first side using the same slight half-moon motion, repeat.

Use a fairly steep drag angle of approx. 45° at the top of the pipe. Continue the half-moon motion with minimal pause on each side.

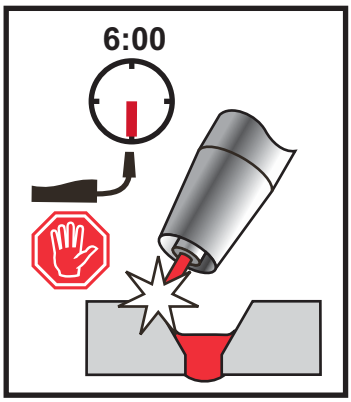


At the 1:00 position, weaving may be decreased or stopped. A straight progression down the center of the joint may now be used.



At the 5:00 position, reposition the torch to be perpendicular to the pipe.

It may be necessary to weave, depending on the joint fit-up.

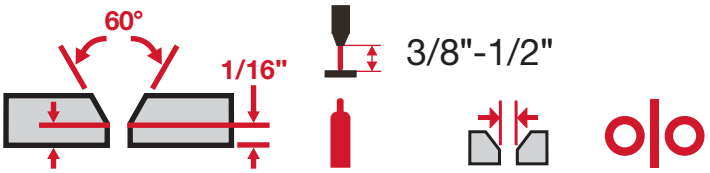


Stop the arc on the sidewall to avoid pinholes.

Synergic Procedures

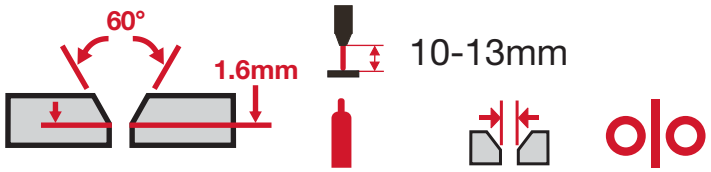
Carbon and Low-Alloy Steel

English



		inches	in/min
SuperArc® L-56 0.035"	100% CO_2	.080"- .100"	150-200
	75% Ar/25 CO_2	.100"- .125"	150-225
	90% Ar/10 CO_2	.100"- .125"	150-225
SuperArc® L-56 0.040"	100% CO_2	.080"- .100"	140-200
	75% Ar/25 CO_2	.100"- .125"	140-225
	90% Ar/10 CO_2	.100"- .125"	140-225
SuperArc® L-56 0.045"	100% CO_2	.080"- .100"	120-160
	75% Ar/25 CO_2	.100"- .125"	120-160
	90% Ar/10 CO_2	.100"- .125"	120-160

Metric

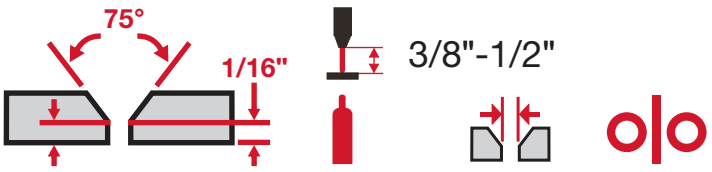


		mm	mm/min
SupraMig® 1.0mm	100% CO_2	2.0 - 2.5	3.4 - 4.6
	75% Ar/25 CO_2	2.5 - 3.2	3.4 - 5.1
	90% Ar/10 CO_2	2.5 - 3.2	3.4 - 5.1
SupraMig® 1.2mm	100% CO_2	2.0 - 2.5	2.8 - 3.8
	75% Ar/25 CO_2	2.5 - 3.2	3 - 4
	90% Ar/10 CO_2	2.5 - 3.2	3 - 4

Trim and Ultimarc should be used at the nominal settings. Adjust to application settings.

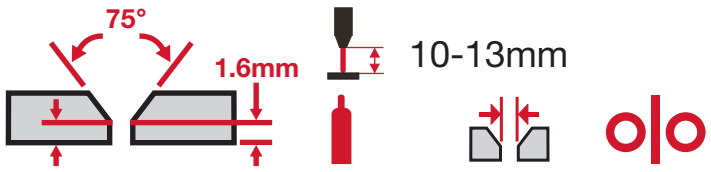
Stainless Steel

English



		inches	in/min
Blue Max® 308LSi 0.035"	He/Ar Blends	.100"- .125"	150-200
	98% Ar/2% CO_2	.125"- .156"	150-225
	98% Ar/2% O_2	.125"- .156"	150-225
Blue Max® 308LSi 0.045"	He/Ar Blends	.100"- .125"	110-150
	98% Ar/2% CO_2	.125"- .156"	120-160
	98% Ar/2% O_2	.125"- .156"	120-160

Metric



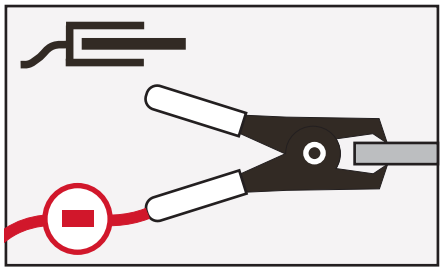
		mm	mm/min
LNM 308LSi 1.0mm	He/Ar Blends	2.5 - 3.2	3.4 - 4.6
	98% Ar/2% CO_2	3.2 - 4.0	3.4 - 5.1
	98% Ar/2% O_2	3.2 - 4.0	3.4 - 5.1
LNM 308LSi 1.2mm	He/Ar Blends	2.5 - 3.2	2.8 - 3.8
	98% Ar/2% CO_2	3.2 - 4.0	3 - 4
	98% Ar/2% O_2	3.2 - 4.0	3 - 4

Trim and Ultimarc should be used at the nominal settings. Adjust to application settings.

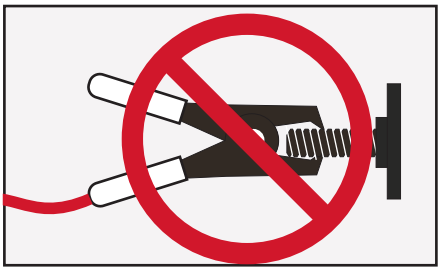
For additional assistance, call the Lincoln Electric Application Engineering Group staffed by experienced engineers, technologists and technicians in Cleveland, Ohio, USA at (866) 635-4709.

See Customer Assistance Policy and Disclaimer Notice on page 9.

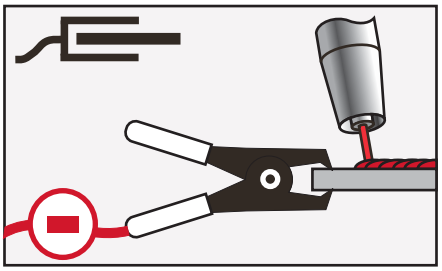
Sense Leads



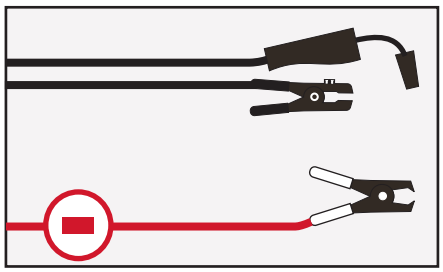
A work (-) sense lead is required and should be connected directly to the workpiece without being in the path of current flow.



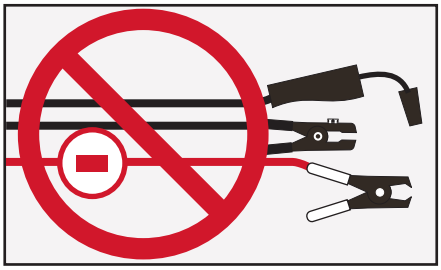
DO NOT connect either sense lead to a welding stud as this may result in erratic arc or increased spatter.



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



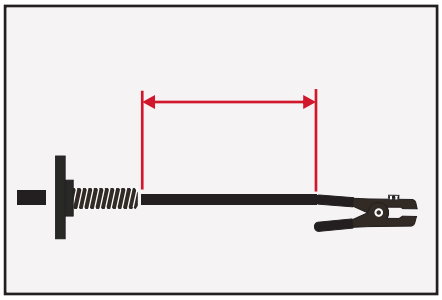
The work (-) sense lead should be separated away from welding cables to minimize interference.



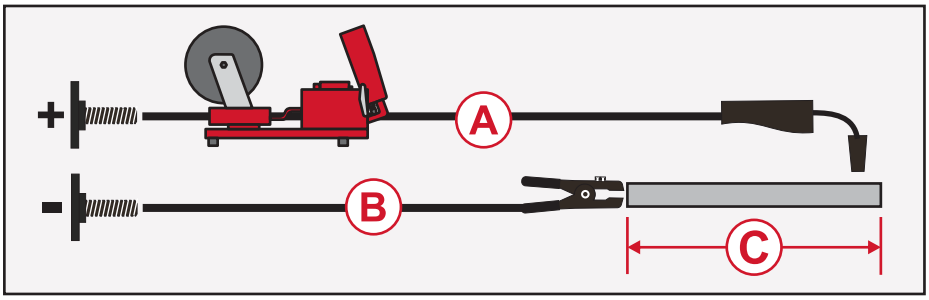
DO NOT route sense lead cable close to high current welding cables as this may distort the sense lead signal.

For non-Lincoln Electric Power Feeders assistance, call the Lincoln Electric Application Engineering Group staffed by experienced engineers, technologists and technicians in Cleveland, Ohio, USA at (866) 635-4709.

Work Leads

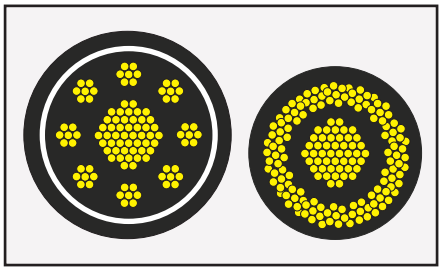


Connect the work lead to the negative stud on the power source and directly to the work piece. Maintain the shortest connection length possible.

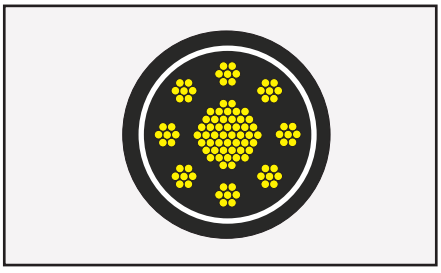


The total length of the welding current loop (A+B+C) should be minimized to reduce inductance.

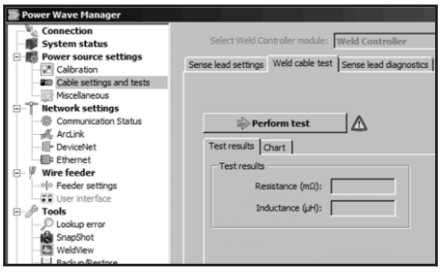
Route cables (A,B) close together to further reduce cable inductance.



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

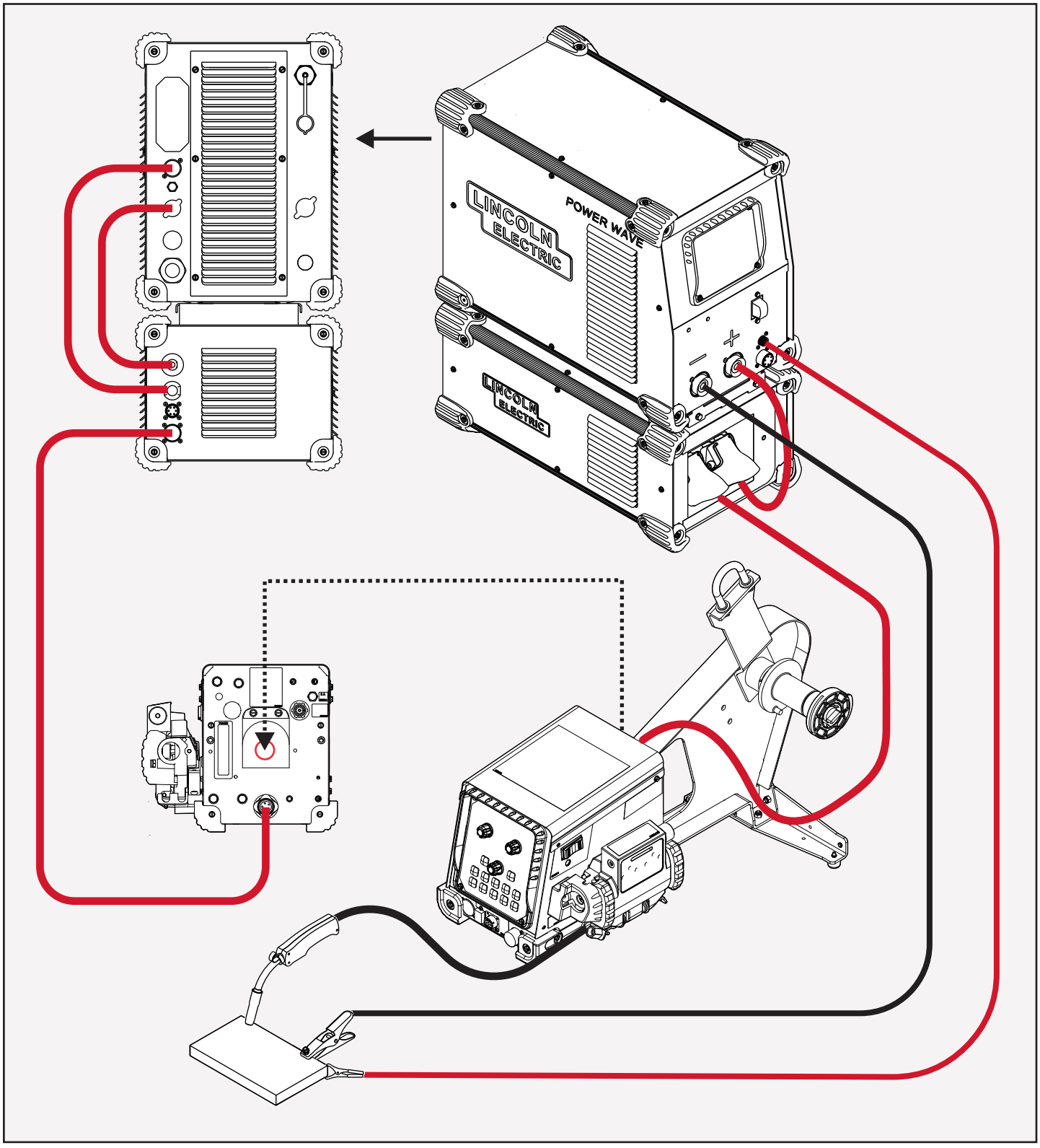


Lincoln Electric® coaxial cables combine the positive and negative welding leads into one cable to minimize cable inductance.

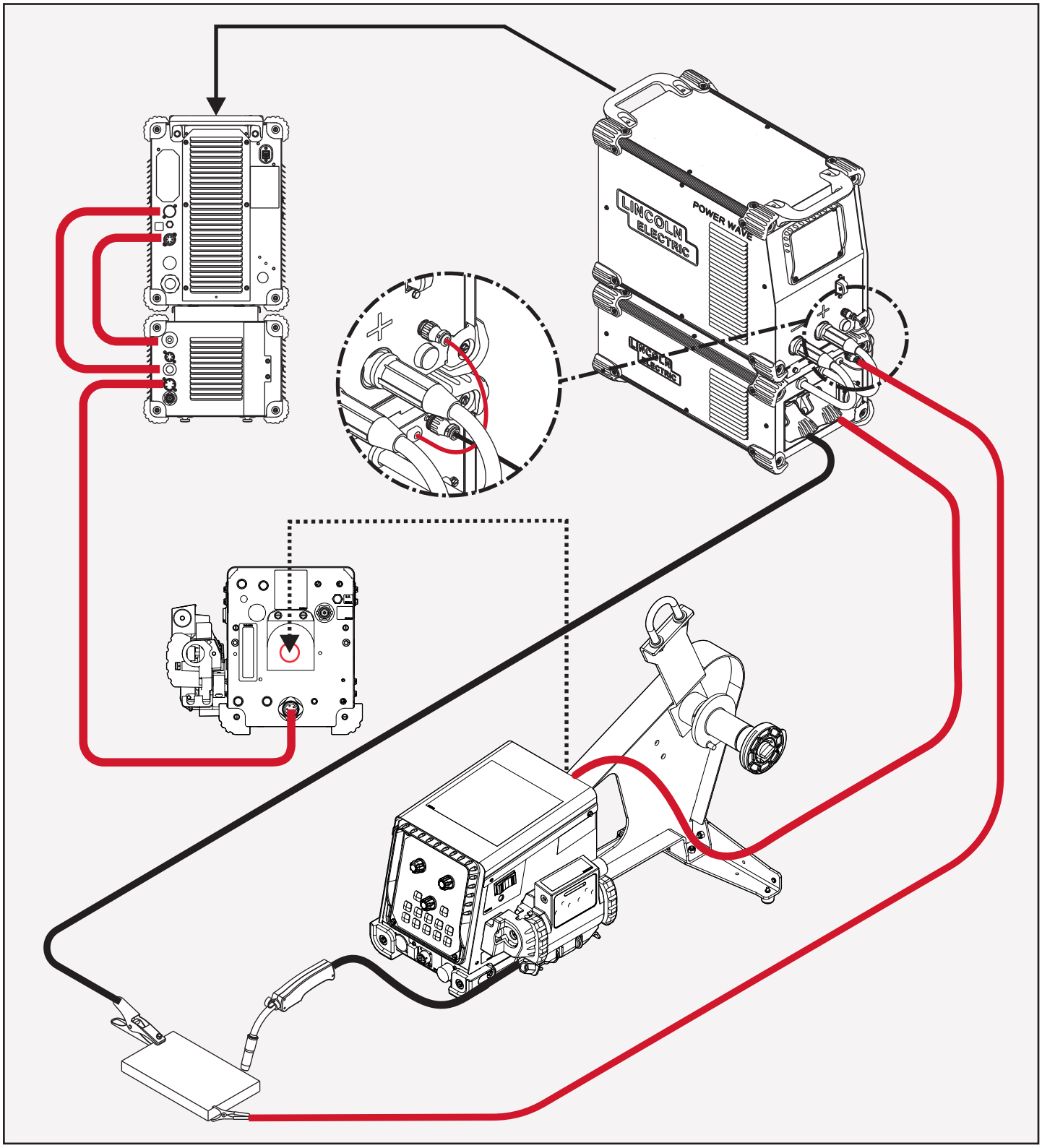


Test cable inductance levels using the Power Wave® Manager software exclusively from Lincoln Electric®.

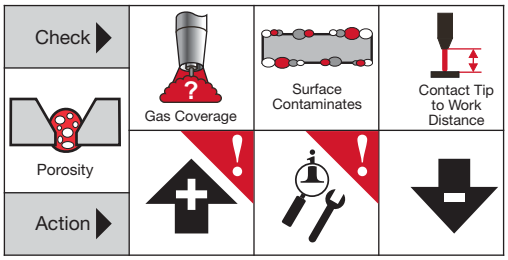
Connection Diagram – STT Module

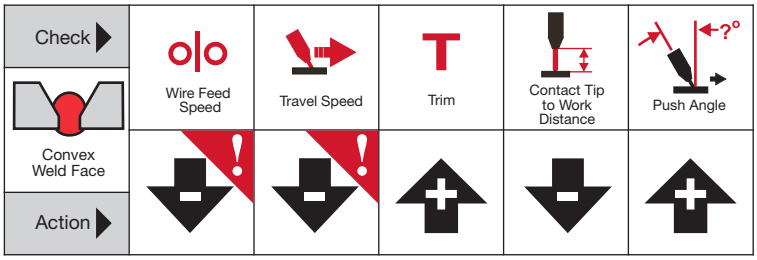


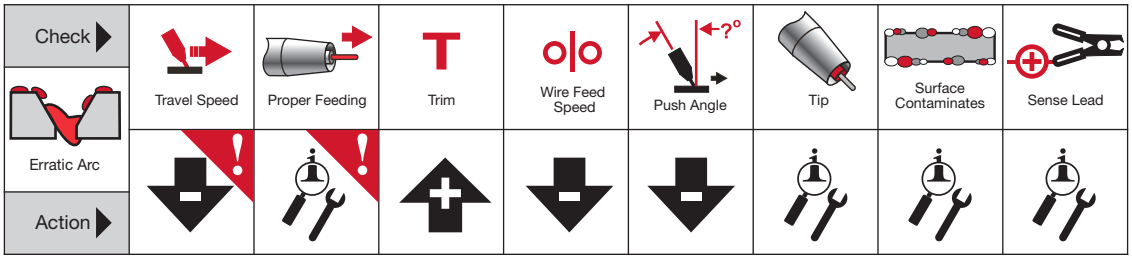
Connection Diagram – Advanced Module

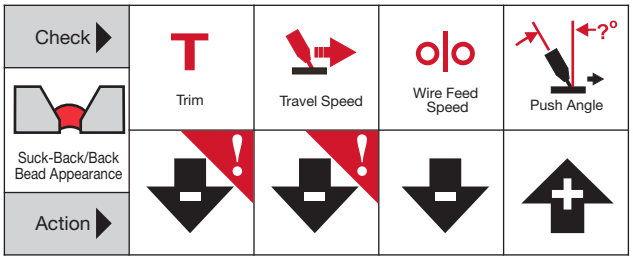


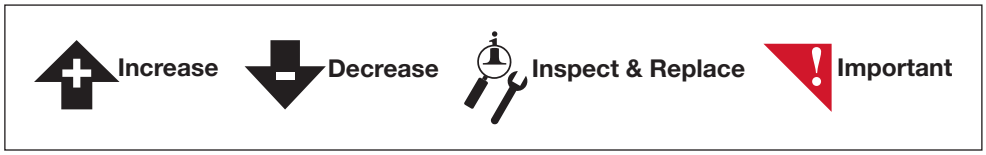
Troubleshooting







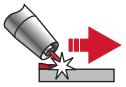




STT® Pipe Root Pass Glossary

TE12.014 07/15

Icons

 Wire Type	 Gas	 Material Thickness	 Wire Feed Speed	 Travel Speed	T Trim	A Amps	 Ultimarc
 Stop / Avoid	 Contact Tip to Work Distance	 Arc Length	 Control Knob	 Weld Stud	 Torch	 Electrode Sense Lead	
 Work Sense Lead	 Work Clamp	 Torch Nozzle	 Travel Speed (Slow)	 Travel Speed (Fast)	 Spatter (Minimal)	 Spatter	

Technical Terms

Cable Inductance Resistance to change in current. Should not exceed 150 µH.

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.

Customer Assistance Policy

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customer and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirement. Subject to change.

This information is accurate to the best of our knowledge at the time of printing. Please refer to **www.lincolnelectric.com** for any updated information.