



# DirectArc System

ARC POSITIONING FOR PRECISE SHAPING OF THE WELD BEAD

Lincoln Electric's DirectArc Systems use controlled magnetic fields to position, weave and stabilize the welding arc in any pattern you require. This powerful technology is perfect for thick-to-thin joints, high speed TIG, drawing out impurities and creating cosmetic finishes.

## DIRECTARC FEATURES:

- Multiple controls and probes offer precise solutions to various weldment challenges.
- Water Cooled Probe
- Controls heat distribution on thick-to-thin material
- Minimizes undercut
- Reduces porosity
- Improves penetration
- Stirring the weld puddle to refine grain structure



## BENEFITS

- 1. Easy to Integrate**  
Probe attaches to multiple TIG torches.
- 2. Easy to Operate**  
Simple control is easy to operate.
- 3. Instant Rewards**  
Low-cost automation, faster production, reduced production costs, improves quality.

## IDEAL FOR WELDING

- Tube Mills
- Thick-to-Thin Joints
- High-Purity TIG Welds
- High-Precision TIG Welds



**LINCOLN**  
**ELECTRIC**

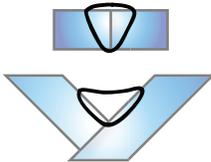
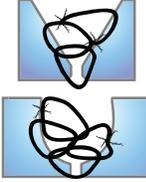
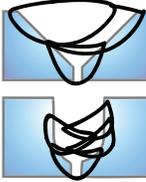
*DirectArc System includes Water-Cooled Probe, Control Unit, Probe Mounting Brackets and Cables.*



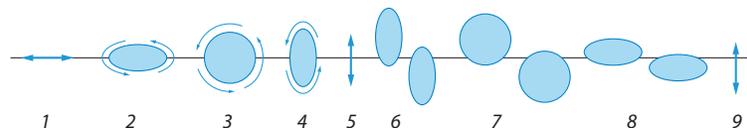
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## PROBLEM SOLVER

Lincoln Electric's DirectArc Systems solve the five main areas of automatic arc welding. The sound welds achieved by magnetic arc control are particularly essential when fabricating exotic alloys, and when the end product is subjected to elevated temperature, high pressure, and unusual stress or vibration.

Problem	Solution
 <p>Arc blow or wander causes misplaced bead and lack of penetration.</p>  <p>Large gap causes excessive drop-through and root-side undercut.</p>	  <p>Uniform penetration achieved with magnetic arc control.</p> <p>Magnetic arc control directs and shapes the arc, controlling heat distribution and penetration between segments being joined to yield consistent, uniform welds.</p>
 <p>Sharp crevices in butt weld.</p>  <p>Flat fillet with sharp crevices on both members.</p>	 <p>Minimized undercutting with magnetic arc control.</p> <p>Magnetic arc control sweeps the arc back and forth across the weld line, directing the required amount of heat to the weld edges, and both widening and flattening the head.</p>
 <p>Lack of fusion in V and U-grooves.</p>	 <p>Uniform sidewall fusion achieved with magnetic arc control.</p> <p>In multi-pass groove joints, magnetic arc control oscillates the arc in the groove, directing the heat to the desired position for uniform sidewall fusion.</p>
 <p>Typical porosity caused by gases generated in melted base metal.</p>	 <p>Sound welds achieved with magnetic arc control.</p> <p>Magnetic arc control stirs the arc, helping to eliminate bubbles and porosity in the weld.</p>
 <p>Insufficient heat or thick member prevents proper penetration and fusion to thin member.</p>	 <p>Uniform penetration on thick and thin members, no undercutting with magnetic arc control.</p> <p>With magnetic arc control, you can specify the proportion of time the arc spends on either side of the weld seam. When joining members of different cross sections, magnetic arc control makes it easy to place the arc exactly where it is needed - penetrating the thick wall adequately while preventing undercutting on the thin wall.</p>

The DirectArc MA-40 Control Unit and MP-4 Probe provide the ability to shift the entire arc pattern relative to the weld seam with two axes, as shown below.



1. Straight line oscillation along seam
2. Elliptical pattern along seam – symmetrical
3. Circular pattern – symmetrical
4. Elliptical pattern across seam – symmetrical
5. Straight line oscillation across seam
6. Elliptical pattern across seam – offset
7. Circular pattern – offset
8. Elliptical pattern along seam – offset
9. Straightline oscillation along seam – offset



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## MAGNETIC PROBES AND CONTROLS

All probes include simple, secure mounting brackets and quickly attach to most welding torches. Water-cooling hoses (where required) and probe cables are part of each probe assembly.



### MP-1 Probe

The MP-1 is a single-tip, water-cooled probe that adapts to conventional torches. The MP-1 works well in tight clearances and is primarily used to weave the arc across the seam or to stabilize the arc.



### MP-2 Probe

The dual-tip MP-2 slips over a conventional TIG torch and can be used either for cross-seam weaving or in-line weaving. In-line weave is primarily used in tube mills to preheat the tube, giving increased weld travel speeds.



### MP-4 Probe and the MA-40 Control

With four independently controlled magnetic coils, the MP-4 probe is the most flexible for weld bead profiling. It is used with the MA-40 control unit only. The Arc Products MA-40 Control Unit and MP-4 Probe provide the ability to shift the entire arc pattern relative to the weld seam with position controls, as shown on the bottom of the previous page.



### MP-100 Probe

The MP-100 probe incorporates the latest magnetic technologies. Though similar to the MP-1 probe, the new MP-100 probe has a much higher gauss strength and three times the efficiency of the MP-1. The MP-100 features connections for optional water cooling, but does not require water cooling. For added convenience and flexibility, it also features a detachable control cable. Single-axis probe adapts to conventional torches. A variety of return rings and tips are available for different configurations.



### MA-40 ARC PATTERN CONTROL

This unit adds a new dimension to magnetic arc control: pattern control. With the MA-40, the welding arc can be shaped, widened or narrowed as required. The rapid, controlled motion of the arc stirs the molten puddle for a noticeable reduction in porosity and improvement of the grain structure in the weld. The MA-40 Control Unit provides two-axis magnetic arc control with independent amplitude and position control for each axis. A stabilize mode with amplitude and position control adjustments is also incorporated for single-axis oscillation.



### MA-20 ARC CONTROL

Our most popular controller, the MA-20 features a PWM power supply and adjustable oscillation speeds of up to 50 per second. Independently controlled left and right dwell settings create a weave effect, allowing maximum flexibility when working with an uneven work piece. A Stabilize/Oscillate switch allows you to disable the speed and dwell controls while the position and amplitude controls remain operative. Final Taper gradually reduces magnetic field during welding down-slope to feather out the weld bead.



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## FIELD APPLICATIONS



### Tube Mill

Multiple DirectArc and AVC-5 units work in unison to increase welding speed and quality.

### Precision Fitting

Difficult thin-wall welding is made easy with the arc control capabilities of DirectArc systems.



## WORLD-CLASS WELDING AND AUTOMATION EXPERTISE

Lincoln Electric San Diego has been designing and manufacturing automated welding equipment since 1980. Our off-the-shelf and custom systems increase weld quality, improve the working environments, and lower production costs. We can offer our current and future customers unparalleled automation and weld processes expertise.

## EXCEPTIONAL CUSTOMER SERVICE

Lincoln Electric provides a global network of facilities and people to provide quick response and personalized attention. No matter where your welding operations are located today, no matter where they will be tomorrow, Lincoln Electric welding experts can provide local support, ready to create and implement solutions that fit your needs.

## VALUABLE CUSTOM AND TURN KEY SOLUTIONS

While Lincoln Electric offers a wide spectrum of pre-engineered systems, we also offer the ability to modify or completely customize our equipment to meet your needs. Furthermore, through the Lincoln Electric facilities across the globe we offer completely customized turn-key systems designed to meet your precise needs. Contact us today!

### The Lincoln Electric Company

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Compatible Probes	MA-20			MA-40
	MP-1	MP-100	MP-2	MP-4
Probe Tips	1	1	2	4
Axes	1 (curved)	1 (curved)	1 (straight)	2 (straight)
Oscillation Strength	300 max	600 max	300 max	300 max
Oscillation Per Second	60			60
Final Taper	0-15 sec			0-15 sec
Input Power	115 or 230V 50/60 Hz			

For best welding results with Lincoln Electric® equipment, always use Lincoln Electric consumables. Visit [www.lincolnelectric.com](http://www.lincolnelectric.com) for more details

#### CUSTOMER ASSISTANCE POLICY

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