

PROCESS

WAVEFORM CONTROL TECHNOLOGY™

Tandem MIG™

It has been said that two heads are better than one. The same logic can be applied to arc welding. If a single arc is not achieving the speed and deposition required, why not try two?

Tandem MIG™ is a dual wire, high-speed GMAW welding process that uses Waveform Control Technology™ to coordinate two separately generated arcs. Equipped with two power sources, wire feeders, and a specially designed Tandem torch, Tandem MIG substantially increases productivity and lowers production costs.

Designed for either robotic or hard automation applications, Tandem MIG provides unparalleled weld quality and performance for high speed or high deposition welds.



The Tandem MIG process uses Waveform Control Technology to operate two separately generated arcs in close proximity. Each power source maintains its own independent control of its welding arc.



a d v a n t a g e s

EXCEPTIONAL TRAVEL SPEEDS

Tandem MIG often doubles the speed of conventional single-wire GMAW processes.

Depending on application requirements, Tandem MIG has achieved travel speeds in excess of 200 inches per minute (5.08 meters/min)

HIGH WELD METAL DEPOSITION RATE

The Tandem MIG dual wire procedures often exceed 35 pounds (15.9 kg) of metal per hour.

SUPERIOR WELD QUALITY

- Reduced heat input
- Resists burn-through on thin materials
- Maintains low spatter levels
- Produces good penetration on thick materials
- Improves bead wetting at weld toes
- Resists undercut

BEAD PROFILE CONTROL

Lead arc provides control of penetration, while the trail arc controls bead appearance.



Tandem MIG™

What

Is Tandem MIG?

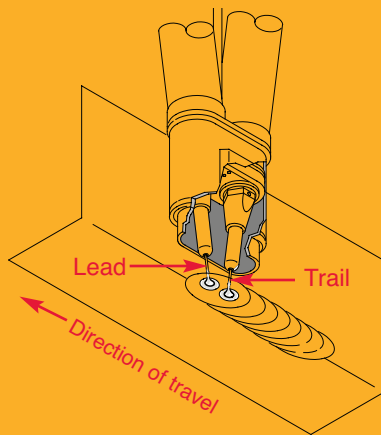
Tandem MIG is a dual-wire, GMAW automated process that increases the application range of traditional single-wire GMAW processes. The process uses a true tandem configuration of two power sources and two wire feeders to generate two separate welding arcs. The output of the two power sources are coordinated by either a robot controller for robotic applications, or by a Tandem MIG interface for dedicated hard automated work cells. The two arcs are positioned to operate in a common weld puddle by a specially designed high amperage welding torch. Operation of the welding arcs in the close proximity of a common weld puddle is made possible by the use of high-speed Waveform Control Technology to create a special power source output coordinating the interaction of the welding arcs.

This unique operating arrangement promotes productivity, often greater than two separate wire electrodes, while providing the operating convenience of a single torch process. Tandem MIG establishes a means for increasing both the travel speed and deposition rate without compromising the weld quality. The ability of the process to control heat input and bead wetting further enhances weld quality and minimizes weld repair associated with burn-through on thin components, or distortion on thick members.

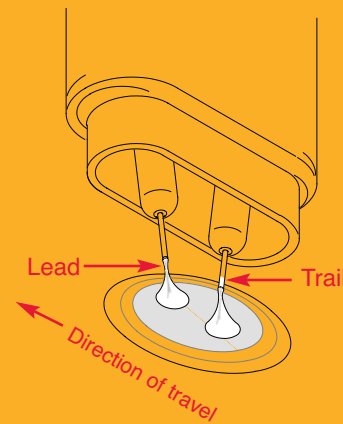
Any way you look at it, **Tandem MIG cuts costs.**

How Does

Tandem MIG Work?

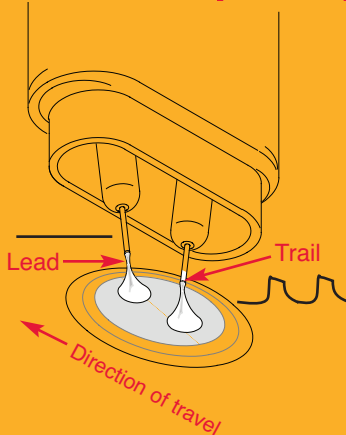


Two wire electrodes are positioned in line, in the direction of travel. The first electrode, the "lead", controls deposition rate and penetration. The second electrode, the "trail", controls weld bead appearance.



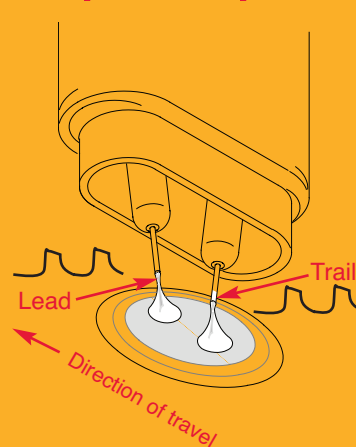
Both electrodes' arcs contribute to a common weld puddle, but each is independently controlled by its respective power source. Depending on application requirements, the lead and trail electrodes may exhibit different operating modes.

Standard Operating Mode



The lead arc performs in the DC (+) Constant Voltage (CV) mode, while the trail arc operates in the DC (+) pulse mode. Using a CV lead arc maximizes penetration and travel speed. The pulsed trail arc reduces heat input and minimizes electromagnetic arc interference between the two arcs. Additionally, the trail arc cools the molten weld puddle.

Optional Operating Mode



In this configuration, both the lead and trail arcs operate in a (+) DC pulsed mode. This configuration is typically used to manage total process heat input on thin gauge material and other heat sensitive applications. To use this set-up, the pulse frequency of both electrodes must be synchronized so that the peak of each pulse occurs on the background of the other arc.

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Use Tandem MIG

For High Travel Speeds

Why Tandem MIG?

- The ability to distribute the needed welding current over two welding wires allows the lead wire to generate needed penetration while the trail wire rides on the back edge of the lead weld puddle. This creates added fill as well as an additional force that pushes the lead puddle for better follow and wetting characteristics.
- Improved gap filling capabilities are of particular value to industries processing high volumes of stamped or formed parts.
- The Tandem MIG process employs unique output waveforms engineered for exceptional weld puddle control and arc interaction. The process features controlled heat input and follow characteristics, which produce exceptional travel speeds on sheet metal components ranging in thickness from 0.030 to 0.250 in. (0.76 to 6.35 mm). Travel speeds often double that of single wire processes have been achieved on a variety of fabricated assemblies. These assemblies range from small 2 in. (50 mm) diameter round-abouts to long, longitudinal seams.

When to use Tandem MIG?

Automotive

- Wheels
- Frames
- Suspension parts
- Torque Converters

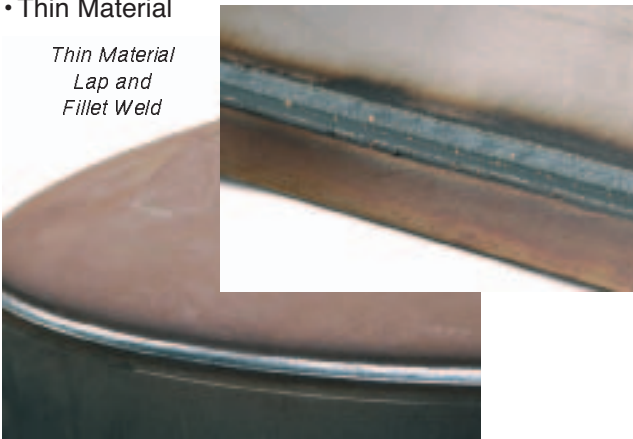
Industrial and Consumer Products

- Cylinders
- Tanks
- Water Heaters
- Lawn and Garden Equipment

Structural and Building components

- Gussets and Stiffeners
- Thin Material

Thin Material
Lap and
Fillet Weld



Use Tandem MIG

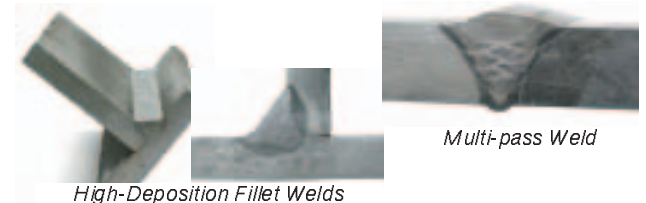
For High Deposition Rates

Why Tandem MIG?

- Tandem MIG achieves a 40 to 80% increase in deposition rate compared to conventional single-wire processes.
- Tandem MIG uses smaller diameter electrodes than those typically used for high deposition single wire procedures. Higher welding currents are applied to the smaller diameter electrodes and the electrode melt-off rate rises, providing improved production throughput. The lower heat input can be used effectively to reduce plate distortion and time between passes when controlling inter-pass temperature on multi-pass welds.
- Utilization of welding capacity, up to 655 amps at 100% duty cycle per welding arc, enables this process to achieve deposition rates in excess of 35 pounds (15.9 kg) per hour. Variable wire spacing and independent drag angle adjustment allows precise control of penetration and bead appearance.

When to use Tandem MIG?

- Heavy Equipment
- ASME Tanks
- Structural Fillet and Groove Welds
- Joggle Joints
- Pipe and Tubular Components



High-Deposition Fillet Welds

Multi-pass Weld

Lincoln Tandem MIG Torch Options

900 Amp Torch

Designed for high amperage/high duty cycle applications. The straight barrel torch is rated 900 A and 100% duty cycle and is ideal for the machine or hard automated application where duty cycle and welding amperage are at their highest.



800 Amp Torch

Streamline long reach profile ideal for robotic use. The 22-degree bend "gooseneck" provides needed torch access to restricted joint areas. Torch is rated for 800 A at 60% duty.

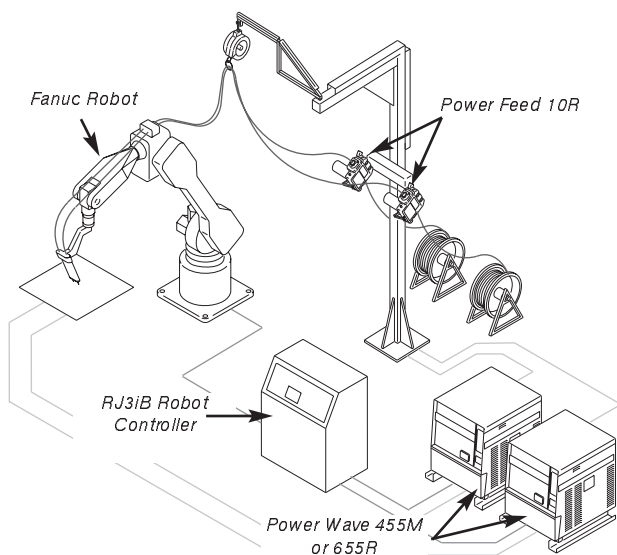
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Lincoln Tandem MIG Welding Systems

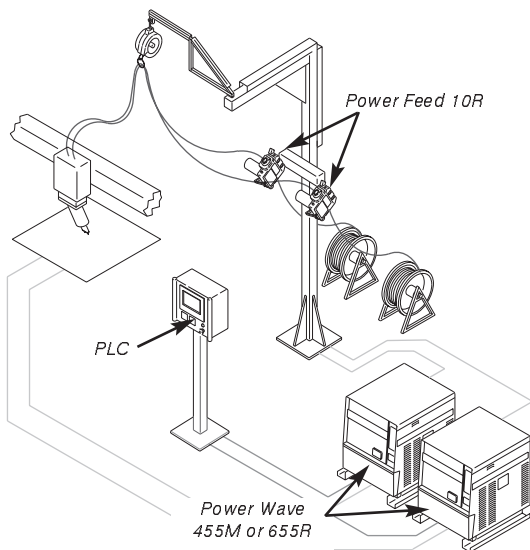
Tandem MIG Robotic System

Equipped with ArcLink digital communications, Lincoln Electric takes your Tandem MIG process into a fully automated robotic environment to offer speed, reliability, and precision. The simple purchase of an Ethernet/DeviceNet gateway board for the Tandem MIG power source offers all of the benefits of networking equipment, including remote monitoring tools and advanced diagnostics.



Tandem MIG Hard Automation

The Tandem MIG power source can also be used for hard automation with a Programmable Logic Controller. Contact Lincoln Electric Automation Division at 216-383-2667 for more information.



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.

WHAT IS NEXTWELD?

The challenges facing industrial fabricators today are increasingly difficult. Rising labor, material, and energy costs, intense domestic and global competition, a dwindling pool of skilled workers, more stringent and specific quality demands.

Through our commitment to extensive research and investments in product development, Lincoln Electric has established an industry benchmark for applying technology to improve the quality, lower the cost and enhance the performance of arc welding processes. Advancements in power electronics, digital communications and Waveform Control Technology™ are the foundation for many of the improvements.

NEXTWELD brings you a series of Process, Technology, Application and Success Story documents like this one. NEXTWELD explains how technologies, products, processes and applications are linked together to answer the important questions that all businesses face:

- How can we work faster, smarter, more efficiently?
- How can we get equipment and people to perform in ways they've never had to before?
- How do we stay competitive?

NEXTWELD is the future of welding but its benefits are available to you today. Ask your Lincoln Electric representative how to improve the flexibility, efficiency and quality of your welding operations to reduce your cost of fabrication.



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