



# Narrow Gap Welding Process

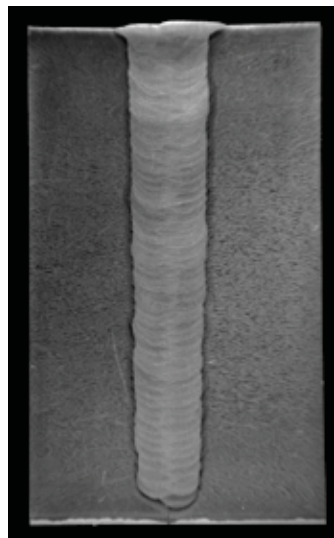
## Tandem Submerged Arc

The Lincoln Electric Narrow Gap Welding Process is designed to meet the quality, mechanical properties and overall cost requirements of heavy wall fabrication. It is a submerged arc process designed to weld thick walled steel plate [from 2 in. up to 13.8 in. (51 mm up to 350 mm)] using a nearly parallel-sided, narrow gap plate preparation. The process is appropriate for both flat and circumferential welding.

A multi-layer (two passes per layer) technique is recommended in place of one large pass per layer. This minimizes undercut, trapped or mechanically locked slag and concave weld profiles. The Narrow Gap Process produces a multi-layer weld with uniform side wall penetration, maintaining low parent metal dilution and low heat input.

The outstanding results of the Narrow Gap Process are made possible by several new submerged arc flux/electrode combinations and a specially designed deep groove nozzle assembly. Only the recommended flux/electrode combinations should be used. When properly selected to meet the job requirements, these flux/electrode combinations will deliver excellent welding characteristics and mechanical properties. When following the recommended procedures, very good bead shape and self-releasing slag will result.

The Narrow Gap Process results in lower cost welding by reducing the volume of weld metal required for heavy plate thicknesses. The cost of consumables, welding time and preparation time is reduced when compared to more conventional methods.



### INDUSTRY APPLICATIONS

- Power Generation
- Petrochemical
- Shipbuilding
- Heavy Fabrication
- Nuclear

### BENEFITS

- Minimum joint preparation, minimum joint volume.
- Good mechanical properties.
- Low heat input.
- Low parent metal dilution, small heat affected zone.
- High quality weld—without turning plate.
- Simple “off-the-shelf” equipment solution.
- Low distortion.





## AN UNBEATABLE SOLUTION: POWER WAVE® TECHNOLOGY

### Increase Productivity, Quality and Flexibility

The Power Wave® AC/DC 1000® SD delivers Waveform Control Technology® to submerged arc welding. Choose constant current or constant voltage operation and set variable frequency and amplitude. Software driven AC, DC positive or DC negative output allows the user to control the deposition rate and penetration. The result over conventional power sources is increased weld speeds, consistently higher quality welds and improved efficiencies in a single or multi-arc environment.

## NARROW GAP WELDING SYSTEM FEATURES

**Programmable Sidewall Offset**—The combination of accurate laser tracking and precision wire servo tilt nozzles allow the system to be programmed to maintain a specific sidewall offset. If enabled, the controller also allows this offset to be overridden by the operator during welding.

**Multi-Pass Sequencing**—The number of passes, as well as the control of pass transition, overlap positions and durations, are all completely programmable.

**Adaptive Fill**—The laser scanning system is also capable of joint volume measurements. This information, combined with control of the welding parameters and travel rate, can be used to automatically adjust to maintain even fill.

**Independently Adjustable Torch Tilt**—The lead and trail arcs are programmed with independent tilt angles to more accurately and consistently control bead placement.

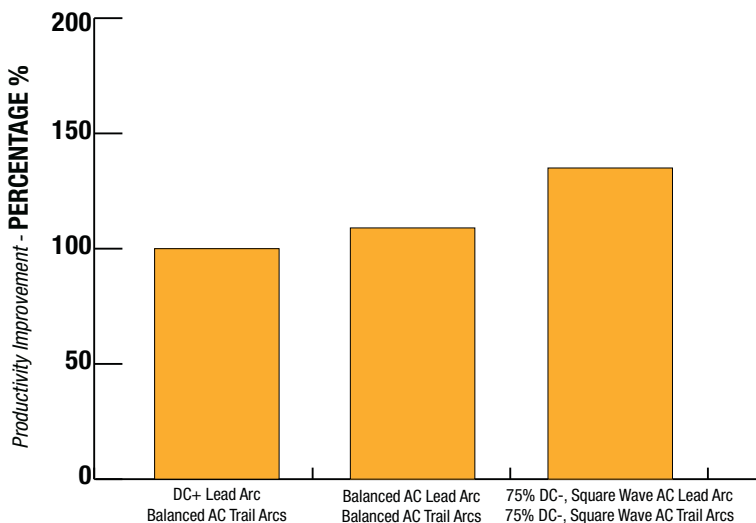
**Programmable Pass Overlap**—Positioning of the pass overlap is programmable to allow the pass transitions to be staggered.

**Scanning Laser Tracking Sensor**—Precision sensor for reliable sidewall offset and height control.

## WELDING HEAD FEATURES

- Maximum groove depth—13.8 in./350 mm
- Head width—0.5 in./13 mm
- Individual precision tandem torch tilting:
  - Servo motor control with precision gearbox
  - Adjustable range—3 degrees inclusive
- Precision X-Z weld head motion controls:
  - Horizontal stroke—6 in./150 mm
  - Vertical stroke—17.7 in./450 mm
  - Precision servo controls for automatic standoff and seam tracking controls
- Adjustable spacing between torches—adjusting range 1.2 in./30 mm

- Manual angle setting device for adjustable cross seam tilt of entire weld head. Adjustable range 3 degrees inclusive
- Non-conductive torch body for lead or trail torches
- 2-axis wire straighteners for both lead and trail torches
- Tandem wire feeders with 55 lb./25 kg wire spool mounting—other wire delivery options available
- Integrated color viewing camera with work lamp
- Flux delivery and recovery nozzle, hopper and mounting



Scanning laser tracking



Narrow welding head

## LINCOLNWELD® WIRE AND FLUX

With over 70 years of experience in flux design and manufacturing, and a full line of solid and cored wires for subarc welding, Lincoln Electric is your best source for submerged arc welding consumables. Better chemistry control and better manufacturing systems result in flux and wire of consistently superior quality—time after time. With over 100 wire and flux combinations to choose from, there's a great Lincolnweld® combination for whatever your job demands.

For more information, request publication C1.10 Consumables Catalog.



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