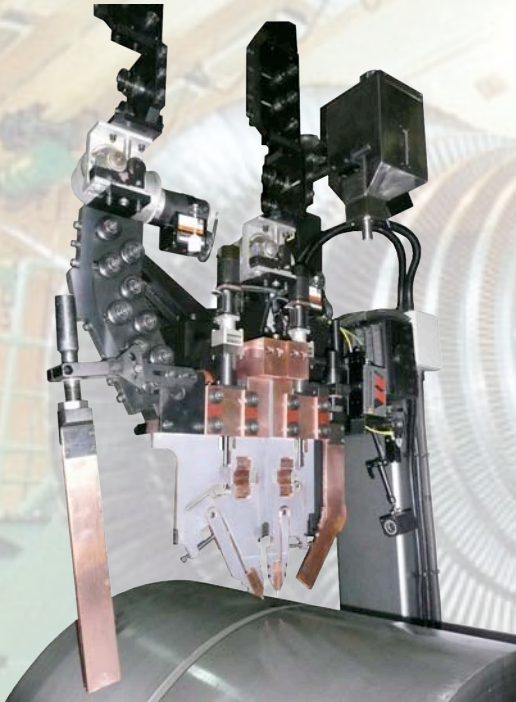


# AMET

## NARROW GAP TANDEM SUBMERGED ARC WELDING SYSTEMS



AMET combines the latest technologies to produce the ultimate system for ***Tandem Submerged Arc Narrow Gap Applications***

AMET Precision "Industrial" Tandem Head

AMET Advanced XM Controller for complete control of all positioning equipment, power supplies, and sensors



**LINCOLN**  
**ELECTRIC**  
THE WELDING EXPERTS®

**Lincoln Electric**  
Advanced – Digitally controlled  
AC/DC Power Wave SD Supplies

**Meta Vision System**  
Scanning Laser  
Tracking Sensor

**META**  
Welding with Vision for 25 years



# AMET

Advanced Manufacturing Engineering Technologies

# Narrow Gap Tandem Sub Arc Systems

## NGTS Series

### NGTS Product Information

#### Introduction

The nuclear power, petrochemical, shipbuilding, and other heavy industries have continue to pursue advenace processes that would efficiently weld very thick components while ensuring that critical properties are achieved.

The Narrow Gap Submerged Arc process has been utilized for over 3 decades with limited success, especially the tandem (two torch/arc) method. Although the advantages of significantly reduced welding times, reduced potential for defects, and improved “as welded” properties have been demonstrated with tandem submerged arc process; the positioning equipment, power supply performance, process controls, and tracking methods have not been able to achieve the necessary precision while maintaining the robustness and repeatability required for these long duration welds. The process and quality advantages have unfortunately not been completely realized.....until now.

For over 2 decades AMET has been developing and producing advanced systems for critical nuclear, aerospace, medical, automotive, and heavy industry applications. AMET’s Digital Signal Processor (DSP) based controls have led the industry in the digital control of welding processes. Now, with the newly released Lincoln AC/DC 1000 Power Waves and Meta’s advanced sensors, AMET has utilized its digital Arc Link interface and controls to provide robust and precision systems for GMA and Submerged Arc applications.



#### The Team

AMET has teamed with Lincoln Electric and Meta Vision Systems to develop and produce an advanced system specifically addressing the performance and reliability needs of the narrow gap process:

- Ensure that the wire, power, and flux are accurately and repeatability controlled and precisely delivered during each pass of the process.
- Provide the operator and engineer powerful tools in a simple interface to program, control, monitor, verify, and document the process.

To this end, AMET’s NGTS system has incorporated all the recent advances in precision digital process control, Arc Link communications, advanced power supplies, and laser tracking of deep grooves, with its own robust and precision servo controlled tandem submerged arc head to produce the most advanced narrow gap system available.

***AMET provides complete integrated Narrow Gap Tandem Systems including manipulators, turning rolls, and flux delivery/recovery systems with the following major components:***

**AMET Precision Narrow Gap Tandem Submerged Arc Weld Head**

- Massive head designed for both precision and industrial robustness

**AMET Advanced XM Control System**

- Complete control system to program, control, and record all aspects of the NGTS process

**Lincoln Electric AC/DC 1000SD Power Wave Supplies**

- Powerful, accurate, reliable, and very efficient digitally controlled supplies

**Meta Vision Systems NG Scanning Laser Sensor**

- Precision Sensor for reliable sidewall offset and height control

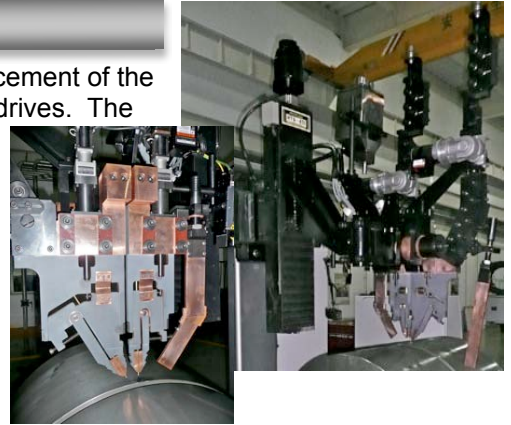
# Narrow Gap Tandem Submerged Arc Welding Systems - NGTS Series

## AMET NG Head

Successful narrow gap welding must begin with the head. The accurate placement of the wire in the groove requires a rigid head driven by precision servo controlled drives. The head must also be able to dissipate the heat from long continuous welds at high currents. The head must also smoothly and accurately transition and position the torches from side to side during each pass.

The head includes the following features to achieve these requirements:

- Massive frame for rigidity, current transfer, and heat dissipation
- Servo controlled torch angle drives for programmable precision torch placement and smooth transitions from pass to pass
- Redundant, off-set wire straightening to ensure wire is straight for consistent and accurate placement
- Servo controlled X and Z slides for precise, smooth height and cross-seam (tracking) control



## AMET NG Controls

Process repeatability, minimizing operator setup and control errors, ease of programming, reliable process verification and data acquisition are all associated with the quality and design of the control system.

The AMET XM control system is the culmination of 20 years of designing, producing, and supporting multi-processor, network based, digital welding control systems. The XM uses its CANBUS network to coordinate each of the Digital Signal Processor (DSP) powered modules that are dedicated to controlling each positioning or welding task. This architecture allows all tasks to be easily programmed and controlled from a single controller. As a network based system it naturally includes



Ethernet to transfer programs, data, and provide system and performance information over your LAN.

All Power Wave parameters including mode (AC, CC, CV, etc), all servo axes including the torch angle (in degrees), all Meta Laser Parameters (sidewall offset, etc), and all travel parameters can be programmed for each pass and controlled by a single, powerful, and flexible XM controller.

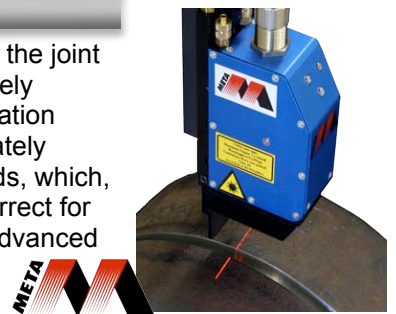
## Power Wave Power Supplies

The Power Wave 1000SD is simply the industry's most advance power supply. With input current requirements reduced by up to 50% for its new inverter-based system, customers consistently report significant energy savings over traditional submerged arc welding equipment. But the real advantage of these digitally controlled supplies is the ability, with the XM controller, to change the mode and parameters by pass (position). This, combined with precision head and part position control, allows continuous automated welding, and in-process verification, from root to cap. This digital combination also provides a true tandem arc without arc interference and enables running ac/ac mode to further lower heat input and distortion.



## Meta DLS Sensor

Meta has developed a scanning laser sensor specifically to accurately characterize the joint profile of deep, narrow grooves. AMET and Meta have jointly developed a completely integrated interface to communicate all profile and position information. This integration allows our NGTS system to determine where the wire and part intersect and accurately maintain sidewall offsets. Meta has also developed advanced joint profiling methods, which, combined with the XM control, allow for the travel rate to be modified and hence correct for joint variations and maintain a consistent fill. There are also options where these advanced systems can even compensate for varying root gaps.



# Narrow Gap Tandem Sub Arc Systems

**NGTS Series**

## System Features

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

**Multi Pass Sequencing** – Since the XM controls all aspects of the system, the number of passes, the speed and position of pass transition, and the positions and durations of the overlaps are all completely programmable.

**Adaptive fill** – The Meta Laser Tracking system is also capable of joint volume measurements. This information combined with XM's control of the welding parameters and travel rate can be used to automatically adjust the welding parameters to maintain an even fill.

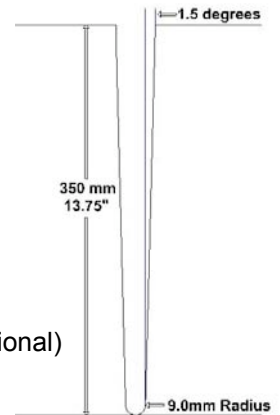
**Independently Adjustable Torch Tilt** – The tilt angle of the Lead and Trail torches are independently programmed, each with servo-motor and encoder to accurately and consistently control bead placement.

**Torch Tilt Slew Rate Control** -- During pass transitions, the slew rate is also programmable to allow for smoother transitions from sidewall to sidewall.

**Programmable Pass Overlap** – Since the XM controls the rotational and linear velocity and position of the equipment the pass overlap is therefore programmable to allow the pass transitions to be staggered.

## Head Specifications

- Maximum Groove Depth – 350mm
- Groove Bevel - typical 1.5 degrees (min. 1.2 degrees)
- Head Width 13mm - Head Weight - 280kg, X-Y Slide Weight - 250kg, Total - 530kg
- 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 – 150mm
  - Vertical stroke – 450mm
  - Precision Servo Controls for automated standoff, and seam tracking controls
- Adjustable spacing between torches – adjusting range 30mm
- Manual adjustment to tilt entire weld head, +/- 10 degrees from center (motorized optional)
- Non-conductive torch body for lead and trail torches
- 2-axis wire straighteners for both lead and trail torches
- Tandem wire feeders with 25Kg wire spool mounting – other wire delivery options available
- Integrated color viewing camera with work lamp and color display
- Flux delivery and recovery nozzle, hopper, and mounting
- Head Weight - 280kg, X-Y Slide Weight - 250kg, Total - 530kg
- Many options regarding slide lengths, head tilting, and torch angles are available upon request



## Support

AMET is providing and supporting systems worldwide. AMET has manufacturing, integration, and support facilities in the US, Asia, and Europe. We have established history of developing long-term relationships with our customers. Please contact us and allow us to show you the benefits of our automation solutions.



# AMET

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