

# Crimping the Way the Wire Processing Industry Really Wants It

Wire harness builders can be hard pressed to meet changing requirements in the industry. Their customers impose a work profile of higher mix, smaller jobs. Competition and the realities of tight cost control demand higher reliability and tooling uptime. Tyco Electronics, long-established as a leader in crimped terminals and tooling, has responded with the AMPOMATOR System III lead-maker, a flexible system built with components designed to meet these industry needs, including the revolutionary System III applicator.

## Evaluating the Need

Maintaining a competitive edge requires deployment of leading edge techniques to stay in synch with market demands. To this end, Tyco Electronics embarked on an intensive process to clearly hear the voice of the harness industry and to integrate customers into the process of defining the next generation of tooling.

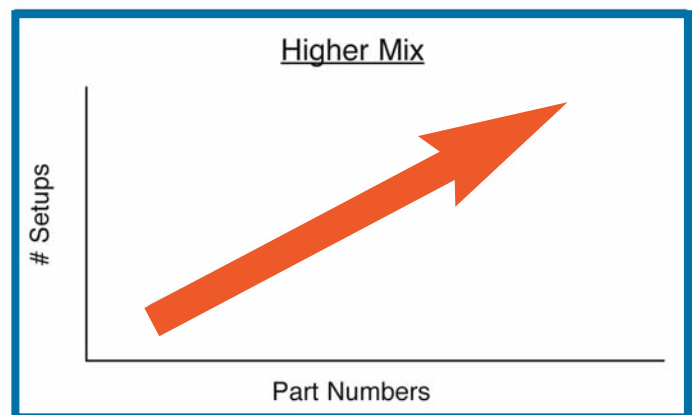
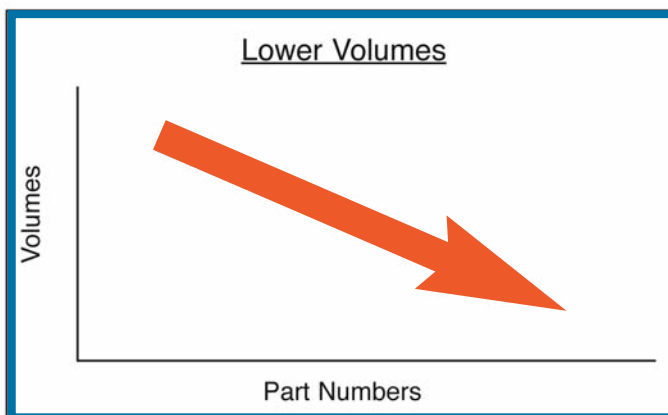
The Tyco Electronics design team conducted a KJ analysis, which is part of the Lean Design for Six Sigma methods being utilized throughout Tyco Electronics to drive innovation that has end value for its customers. This approach provides an internal cross-functional design team with new tools to integrate key customer needs and requirements into the design process.

As part of this project, Tyco Electronics personnel traveled to key customer sites to gather firsthand a list of customer needs and wants. With the involvement of over 100 customer personnel, including machine operators, plant managers, and individuals in various other functions, this process led to the conclusion that reducing feed position adjustments and improving the capability of the terminal feed system to accurately position terminals are keys to better productivity. Feed issues were specifically identified as a source of rejects and even tool breakage, leading to lower machine uptime and higher costs.

In a broader sense, the workload trends are toward higher mix and smaller jobs, with the resultant need for fast changeover and job setup. The feed modifications would reduce applicator changeover times and adjustments during production runs, significantly improving machine utilization.



*The high productivity AMPOMATOR System III leadmaker is designed throughout to meet industry demands for high uptime and fast, easy changeover for success in a high mix, short run manufacturing environment.*



*Inventory constraints have driven the wire processing industry to higher mixes and lower volumes, resulting in more setups per shift.*

## Reinventing the Crimping Process to Respond to the Need

Tyco Electronics responded to this need with development of the AMPOMATOR System III leadmaker. Based on the familiar, easy-to-use Komax platform with TopWin software, this system combines the familiar with the novel. New components include the servo-controlled AMP-O-LECTRIC ST III terminator and the System III applicator, which substantially reduces troublesome feed issues.

By basing the system on a well-established platform, Tyco Electronics protects manufacturers' investment by reducing operation and maintenance training requirements and spares inventories.

Other features increase efficiency, including an integrated scrap chopper that is programmable to cut the terminal carrier into various size pieces and optional automatic de-reeler and paper take-up.

Configurable with choices of other system components—crimp monitor and seal station—and support for legacy applicators, the AMPOMATOR System III leadmaker provides a flexible path to the future for wire processors.

### The System III Applicator—a Direct Answer to Manufacturers' Demands

The most significant component of the AMPOMATOR System III leadmaker is Tyco Electronics' new System III applicator, to be released in the first quarter of 2007. It will dramatically improve manufacturing processes and the time required to perform production changeovers. AMPOMATOR System III leadmaker systems installed before the release of the System III applicator will be upgraded to AMPOMATOR System III leadmakers, which support the new applicator and feeder, at no charge.

### Optimizing Applicator Functionality

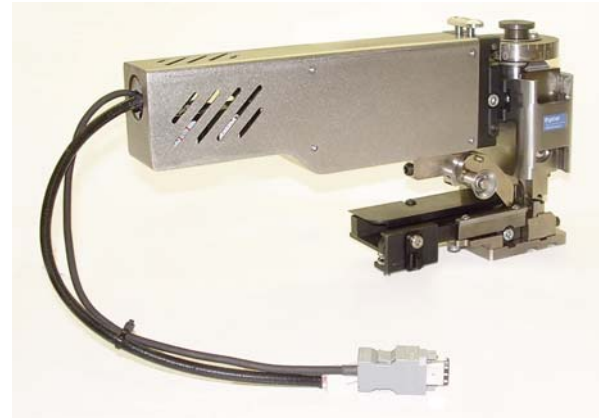
In the System III applicator, the traditional ram-driven mechanical feed is replaced by a separate, motorized feed unit. Crimp parameters, including the critical crimp height, are completely servo-controlled by the terminator.

Separating the feed from the applicator allows each of these components to be optimized for its own function and more effectively integrated to form a complete crimping system. Separation of function also simplifies and speeds applicator changeover, responding to this major industry requirement.

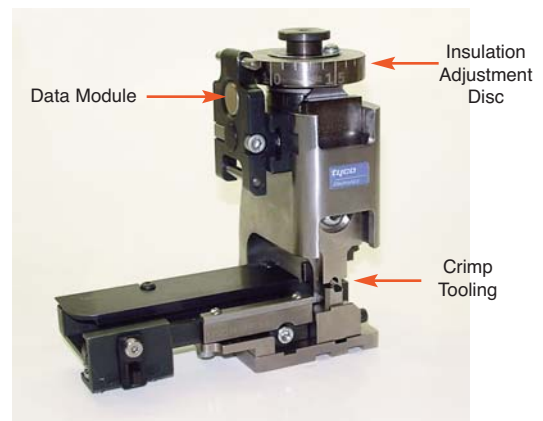
### Re-imagining the Applicator

Novel technology is applied to the design to make changeover and setup fast and easy. An electronic data storage module contains setup parameters, such as required crimp height, applicator identification, and feed specifications, and transmits the information to the terminator without a direct electrical connection. Control of crimp height and feed is automatic and entirely within the feed module and the terminator. Overhead and machine downtime associated with setup is minimized.

The simplified mechanical design allows a compact latching mechanism between applicator and terminator, so changing applicators is a tool-less, one-hand operation. The only manual mechanical adjustment is setting the insulation crimp height via the insulation disk, a tool-less adjustment.



*The new System III applicator, with separate crimp and feed modules, provides high feed accuracy and rapid changeover with virtually no manual adjustment.*



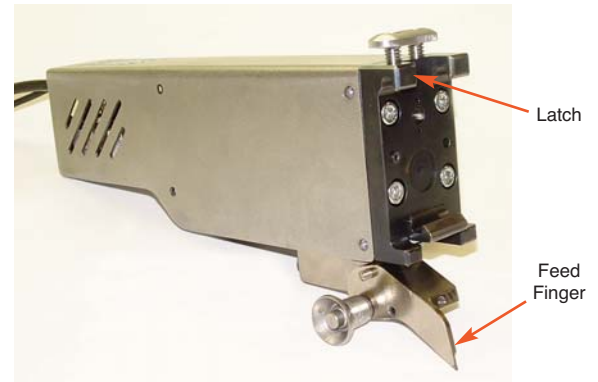
*With a simplified design and electronic data module, the System III applicator is easy to change — a major benefit in a high mix manufacturing environment.*

## Separating the Feed for More Accuracy and Faster Changeover

The servo-motor driven feed moves terminals accurately into position, no matter the spacing on the carrier strip. Since the feed is independent of the ram stroke, its timing and positioning can be optimized for the specific terminal. Feed is accurate and well-timed, so there is no need to slow down the operation to achieve correct feed, a fix that many users of conventional applicators had reported as necessary. Since feed positioning is more accurate, jams and even tool breakage caused by inaccurate feed are reduced. Of course, the limitations and adjustments associated with mechanical cam-driven feed are eliminated, as well.

Setup data is captured from the data module of the applicator and transferred to the terminator, part of eliminating mechanical setup with job change.

The simplified feed design also means that one feed finger accommodates up to 95% of terminals, with simple, tool-less change of the finger for those situations when it becomes necessary.



*The motorized feed module achieves maximum feed accuracy and supports one-handed, tool-less applicator changeover and feed finger replacement.*

## AMP-O-LECTRIC ST III Terminator—the Up-to-date Way to Drive an Applicator

As part of Tyco Electronics' fresh look at crimping, the AMP-O-LECTRIC ST III terminator completes a design approach that results in faster changeover and higher uptime. The terminator takes on all control functions, allowing automation of most crimping adjustment.

### Critical Element of Automated Adjustment for Rapid Setup and Changeover

The AMP-O-LECTRIC ST III terminator is specifically designed and built to provide the quality control demanded in today's marketplace. The main ram drive is servo-driven, enabling unprecedented crimping flexibility.

When used in conjunction with the revolutionary System III applicator, the terminator automatically adjusts initial crimp height, utilizing the parameters transmitted from the data module in the System III applicator and driven by an integrated stepper motor and mechanism. Whether using the System III applicator or legacy applicators, the enhanced control software allows fine adjustments of crimp height throughout a production run to be easily accomplished with the touch of a button. Driven by use of an advanced algorithm, the system zeros in on the final crimp height target with fewer attempts.

The terminator height (wire line adjustment) can automatically be adjusted in seconds via a stepper motor in the terminator base.

This feature eliminates the need for time-consuming wire transfer height adjustments, often required when changing terminals and applicators. After a specific terminal has been properly set up to run on the leadmaker the terminator height is automatically adjusted to the established wire line each time that terminal is run.

### Compatible with New or Legacy Applicators

While manufacturers will receive the maximum benefits of the AMP-O-LECTRIC ST-III terminator by using the System III applicator, to provide maximum flexibility for manufacturers, the terminator is compatible with a wide variety of applicators, including Tyco Electronics' heavy-duty mini (HDM) style applicator. Other styles of applicators, such as Delphi or JAM applicators, are accommodated with appropriate base plate adapters. An improved tool-less applicator latching system positively locks applicators in the press base.



*Complete electronic control of the crimping process, including crimp height, is incorporated in the AMP-O-LECTRIC ST II Terminator, automating adjustments for fast, easy setup.*

## Choices of Components for Additional Flexibility

The surveys revealed that wire processors wanted choices of other key elements of the system. The AMPOMATOR System III leadmaker open architecture provides for a choice between two different models of crimp monitors and two of seal applicators.

### Crimp Quality Monitoring

Quality is foremost in users' minds, relating both to the economic benefit of high yield processing and the ability to compete for business from quality-critical customers.

The SLE crimp quality monitor is seamlessly integrated into the AMPOMATOR System III leadmaker. The SLE CQM utilizes high resolution piezo-quartz sensor technology for precise identification of typical crimping faults, such as missing strands of wire, insulation in wire barrel, wrong crimp height, strands outside the terminal, and incorrect wire gauges due to setup and operator errors.

### Seal Stations

The PAWOMAT seal loading unit (SLU) is integrated to the AMPOMATOR System III leadmaker through an I/O interface. The SLU features a slim design, improved processing speed (< 300 ms), low total cycle time (approx. 800 ms), and a minimum space requirement. The kit changeover time is fast, simple, and tool-less.

The Komax mci761 seal applicator is integrated by the MCI interface for seamless operation. The straightforward OMI operator device provides information about the current processing status and easy controls with just two keys and a digital potentiometer. The Komax mci761 seal applicator can process all common types of seals up to 17 mm in diameter.

## AMPOMATOR System III Leadmaker — The High Uptime, High Mix Crimping Solution

Guided by the experience-based input of wire processing manufacturers, Tyco Electronics has developed the AMPOMATOR System III leadmaker to take a step forward in meeting the high mix, short run manufacturing needs of today and the future. As a fully integrated solution, including the revolutionary System III applicator and the AMP-O-LECTRIC ST III terminator, the system is designed for maximum flexibility, high uptime, and fast, easy job changeover.

### A Full Crimping Resource

Tyco Electronics offers the broadest combination of crimping and terminating equipment in the world. Not only does it design and manufacture application tooling and specify crimp requirements, it is a global leader in the design of terminals and connectors. This all results in a complete understanding of what is required to produce an acceptable termination.

In addition, Tyco Electronics offers premier field technical support through an extensive network of experienced and knowledgeable Field Service Engineers. These Service Engineers are located regionally and are familiar with the application tooling requirements of both the customers and their markets. Thereby, they are able to provide personalized and in-depth assistance for a broad range of application tooling needs.

As is the case with most other capital equipment available through Tyco Electronics, it offers sale, rental, and rent with an option to purchase programs for the AMPOMATOR System III leadmaker. Flexible financing products allow customers to select payment terms that best meet their organization's goals and requirements.



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