

This Issue Features:

- Cable Jacket Types 101
- Critical Attributes of Wire Prefeeder
- Molded Plugs for Pumps and RVs
- The Critical Value of Purposeful Work
- Two Key Components in Optimizing a Deal
- Solder Sleeves and Splicing Shields
- The Tiny Connector that Saved Christmas
- Motorsport Connectors Designed to Win the Race

NEW FEATURE

FOCUS: MIL✈AERO



Company Profile: Excel Connection

By Joe Tito
Wiring Harness News

It's great to be in the right place at the right time. It's even more important, however, to know what to do when you get there. Joe Marshall was in that situation in 1986. He listened to some advice, saw an opportunity in front of him, and started Excel Connection (originally MR Custom). I'm usually happy to speak with one or two individuals when I interview for the Profile. This time, I was able to speak with the entire management team, Joe Marshall, owner, Colleen Weber, Business Manager, Shaun McGuire, General Manager, Greg Harpster, Sales Manager, Andrew Hoffmeier, Quality Manager, Elizabeth Nunez, Marketing/Engineering and Steve Osterberg, Sales/Estimating.

Ten years prior to the inception

of his wire harness company, Joe had started another company called Marshall Erecting. The company did large scale machine and conveyor installation and moving. He did business with heavy manufacturers in the Midwest like General Electric and Allis-Chalmers. "We were growing, then we hit a downturn with Detroit and all the major manufacturing centers closing down, so I decided I better look for another business," Joe outlined.

One of his best customers was GE. Joe noticed they were offloading their entire harness manufacturing to Mexico. Like many companies, they were also about to gut their entire harness knowledge base. He always had a great relationship with the staff within the facilities he serviced and found out there might be an opportunity for prototype and small quantity harnesses. "I was approached by someone at GE who said, 'you've got a



Excel Harness for Mining Equipment

good reputation and if you can swing it financially, you could get some of these folks making harnesses,' so I thought it would be a good time to hire them."

Joe quickly employed two of the folks who had just been laid off, set up an area for them in the Marshall Erecting building in St. Francis, WI, and started building assemblies. "We began making feedthroughs which were simple connectors with wires running through, then sealed with epoxy," he described. These early products were for GE X-ray equipment, and they needed to be shielded from moisture. The small but savvy team quickly pivoted to other builds using similar feedthroughs technologies, along with other simple harnesses. "We did a lot of first articles and prototypes and eventually got into more companies like GE and Al-

lis-Chalmers," Joe remembered. These were many of his legacy customers with Marshall Erecting.

Through the years, their expertise grew, as did the breath and complexity of their product offering. As the Marshall Erecting footprint diminished, the Excel Connection side of the business took more and more of the facility. They eventually took over a space across the street, but even that proved too small. "I couldn't find a place in St. Francis where I could put up a building," Joe recalled, "so I found this brownfield in Milwaukee that had been vacant for ten years, and I decided to take on that battle in 1998."

The location was an old paint factory, and Joe had to remove endless truckloads of dirt in efforts to clean

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DoD's New Cybersecurity Registration

By Joe Tito
Wiring Harness News

If you've never heard of CMMC (Cybersecurity Maturity Model Certification) you are certainly not alone. It is, however, something you should be aware of should you wish to be a part of any Department of Defense (DoD) contracts. The CMMC is the DoD's new cybersecurity framework, and the final stages for its initial rollout are underway.

Brief Overview

It's no secret that the theft of intellectual property and sensitive data costs billions and is a threat to industry and defense. This threat is by no means limited to classified information. The loss of intellectual property and certain unclassified information from the DoD supply chain can thwart U.S. technical advantages and innovation, as well as significantly increase the risk to national security. To combat this, the Office of the Un-

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WHMA Annual Conference Goes Virtual

For nearly three decades, Wiring Harness Manufacturer's Association (WHMA) staff and Board members looked forward to connecting with attendees, exhibitors and speakers at its annual wire harness conference, but given escalating concerns with COVID-19 infection rates, event organizers have cancelled the 2021 WHMA 28th Annual Wire Harness Conference.

"Though our 2021 conference will no longer take place in the way we intended, we remain committed to the wire harness community and are planning a virtual event on February 17, complete with speakers who will present on wire harness industry economics, new technologies and more," said David Bergman, WHMA executive director.

Added Rick Bromm, WHMA chair, "Though not a replacement for the annual conference that so many

have come to rely on for their education and business needs, we hope the virtual event will still provide an opportunity for attendees to learn, grow, share, and discover new approaches to the many aspects of our dynamic industry. We will provide updates as progress is made on this virtual event. For those who desire an in-person event, WHMA/IPC are partnering with the Wisconsin Center to produce the 2021 Electrical Wire Processing Technology Expo (EW-PTE) in Milwaukee, Wisconsin. Workshops, conference and exhibition are planned for May 11-13."

WHMA Annual Conference dates for 2022 are still being finalized but event location and venue remains unchanged and will take place at the Westin La Paloma Resort & Spa in Tucson, Ariz. For additional information on the February 17 virtual event, visit www.whma.org.

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January/February 2021

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From the Editor

Greetings Readers,

Well, 2021 is finally here, and we have a couple of new features for you. You're reading one of them! I want to try harder to open up lines of communication, and I can't think of a better way than to speak to you directly.

Our second, and much more exciting feature, is Focus: Mil/Aero. We start off this feature with another great article from Michael Traskos, President of Lectromec. My hope is to expand this feature in future issues. Most of the information in Wiring Harness News is applicable across industries. As a wise industry sage always tells me, 'the wire doesn't know what it's in.' But as more and more of our readers are building assemblies for aerospace applications, we think it makes sense to begin to build more in-depth content surrounding EWIS. Look for articles in the next issue on harness testing and opportunities for our industry in the electrification of aircraft.



Joe Tito
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Although we write a great deal of the content on these pages, we simply cannot go it alone. We are ALWAYS looking for contributed content from you! If you are a harness manufacturer, please feel free to share your success stories, or other pertinent information, with your peers. If you are a supplier, your expert information is key to the growth of our industry. As always, I'm available to help with some of the heavy lifting, if writing isn't your thing. Got an idea? Give me a shout.

Here's to a happy and prosperous 2021!

Kindest Regards,

Joe

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DoD's New Cybersecurity Registration

Continued from page 1

der Secretary of Defense for Acquisition and Sustainment, in conjunction with DoD stakeholders have developed the new CMMC certification as a means to protect this information from a range of cyber threats.

Quick History

To help understand why and how the new certification has been established, Nicholas McBride, Cybersecurity Consultant at Ecuron, provided some history. "Currently, any prime or subcontractor who does business with the DoD, and handles Controlled Unclassified Information, should be self-certified to the NIST 800 171," he began. "But the problem with self-certification is, people aren't always as secure as they say they are." Realizing this shortcoming, the DoD decided they needed a more codified and robust framework requiring third-party assessment.

One of main problems with the NIST standard is it allows for a POA&M (plan of action and management). "This means that if you don't have a specified control in place, but you have a plan to put it in place over the next year or two, you are compliant," Nicholas explained. "Whereas, with the CMMC, there will be no POA&M as you are either compliant, or you're not. So in this regard, it is much more strict for anybody engaging in DoD work."

Defining the Framework

Before we explore the specifics of the framework and the various levels, it's a good idea to define three key terms, as they are important in determining what level, if any, of compliance you will need.

1. Federal Contract Information (FCI) - FCI is information provided by

or generated for the Government under contract not intended for public release.

2. Controlled Unclassified Information (CUI) - CUI is information that requires safeguarding or dissemination controls pursuant to and consistent with laws, regulations, and government-wide policies, excluding information that is classified.

3. Commercial Off The Shelf (COTS) - COTS products are sold on the public market without any modification.

The CMMC model measures cybersecurity maturity with five levels. Each of these levels, in turn, consists of a set of processes and practices which are characterized in Figure 1 - page 8. In order for an organization to achieve a specific CMMC level, it must also demonstrate achievement of the preceding lower levels.

Anybody who handles FCI through the supply chain needs to meet the minimum requirements for Level I. Anybody handling CUI needs to meet Level III minimum requirements. Those who sell COTS products do not need CMMC at all. "So, really, it's whether or not you handle FCI or CUI that will determine if you need Level I or III," Nicholas detailed. "The Wire Harness industry represents a very important niche to the defense industrial base ecosystem, and those products could possibly fall under CUI and require a Level III requirement."

If you are only handling FCI and CUI, you do not need to proceed to any additional levels in the framework to be CMMC registered. Levels IV and V are additional levels for contracts that will require more in-depth protections from Advanced Persistent Threats (APTs). "At this point I would

imagine levels IV and V will be for companies who handle extremely sensitive information that is not classified," Nicholas instructed. "The only companies I've talked to so far who need a Level IV or V are aerospace prime contractors with a focus on the Air Force and NASA."

Even though a wire harness could be used in a highly classified missile system, for example, Nicholas thinks it's unlikely those designs would extend beyond the CUI Level III. "I do understand wiring harnesses are used in advanced systems, but I imagine that Level III would be the highest level that most of your readers will need. That said, there could be changes down the road, so it's wise for any subcontractor to ask their prime if they expect they will need a Level IV or V for future contracts."

Rollout

The DoD is expected to implement the CMMC framework throughout its supply chain over the next several years. By 2026, every contract ordered by the DoD will have the CMMC requirement. Nicholas advised the rollout will be incremental. "Starting in 2021, 15 DoD contracts will

Continued on page 8

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DoD's New Cybersecurity Registration

Continued from page 6 _____

have the CMMC requirement. That includes the prime contractors, all the way down to subcontractors, and we estimate that will affect roughly 1000

businesses,” he advised. The DoD will add about 70 additional contracts requiring CMMC in 2022, and 400 in 2023. They will follow that trajectory through full implementation in 2026.

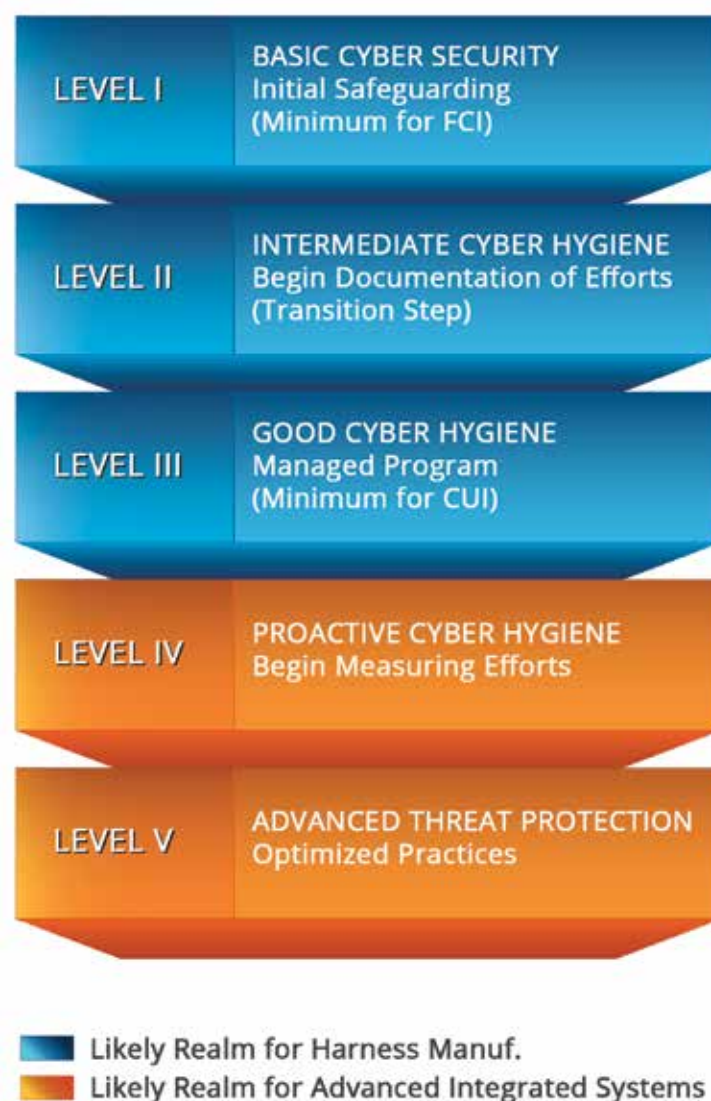


Figure 1. CMMC Levels and Processes.

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DoD's New Cybersecurity Registration

Where to Start

The interim rule on the CMMC has been published and is currently at the end of the 60-day public comment period. Since this could potentially affect harness suppliers in the very near future, Nicholas outlined a great strategy for preparation. “The first

step would be to identify whether they will need a Level I or III on the cyber security maturity model (Level II being a transition step to Level III). Should they wish to proceed on their own, they would need to chronicle what cybersecurity safeguards are already in place, and implement those that are missing.”

Nicholas suggested this might be a good time to bring in a consultant such as Ecuron. “We work well beyond a coaching capacity,” he outlined. “We would be writing all of the Level III documents required and directing the implementation of controls.” Ecuron doesn’t do the actual certification, as he indicated that would be a conflict of interest. A full list of third party certifies should be available on the CMMCab.org website by Q1 of 2021.

The next step, whether using a consultant or going it alone, would be to begin fulfilling the Level I requirements. That can be done by referring to the Federal Acquisition Regulation (search FAR 52.204-21). “There are 17 practices listed there,” Nicholas noted, “and basically, if they think they need a Level I, those practices will get them there.”

Should a company determine they will need to meet a Level III requirement, they should be referring to the document NIST SP 800-171, as 80-90% of the Level III CMMC require-

ment is taken directly from this publication. The additional 10-20% are controls to cover shortcomings the CMMC Advisory Board and DoD have identified with the NIST guidelines. “So, for any organization who wishes to jumpstart the process to Level III compliancy, the best thing to do is refer to the FAR practices and NIST requirements,” Nicholas advised.

“The thing to remember in all of this is there’s no telling which contracts the DoD will pick during the rollout period,” he warned. “A harness manufacturer could find themselves losing out on business that trickles down from one of those bids.” Thus, harness manufacturers doing defense work should focus on the CMMC as it will quickly become the gold standard for demonstrating security. It’s best to get on the train now and set up a clear implementation path.

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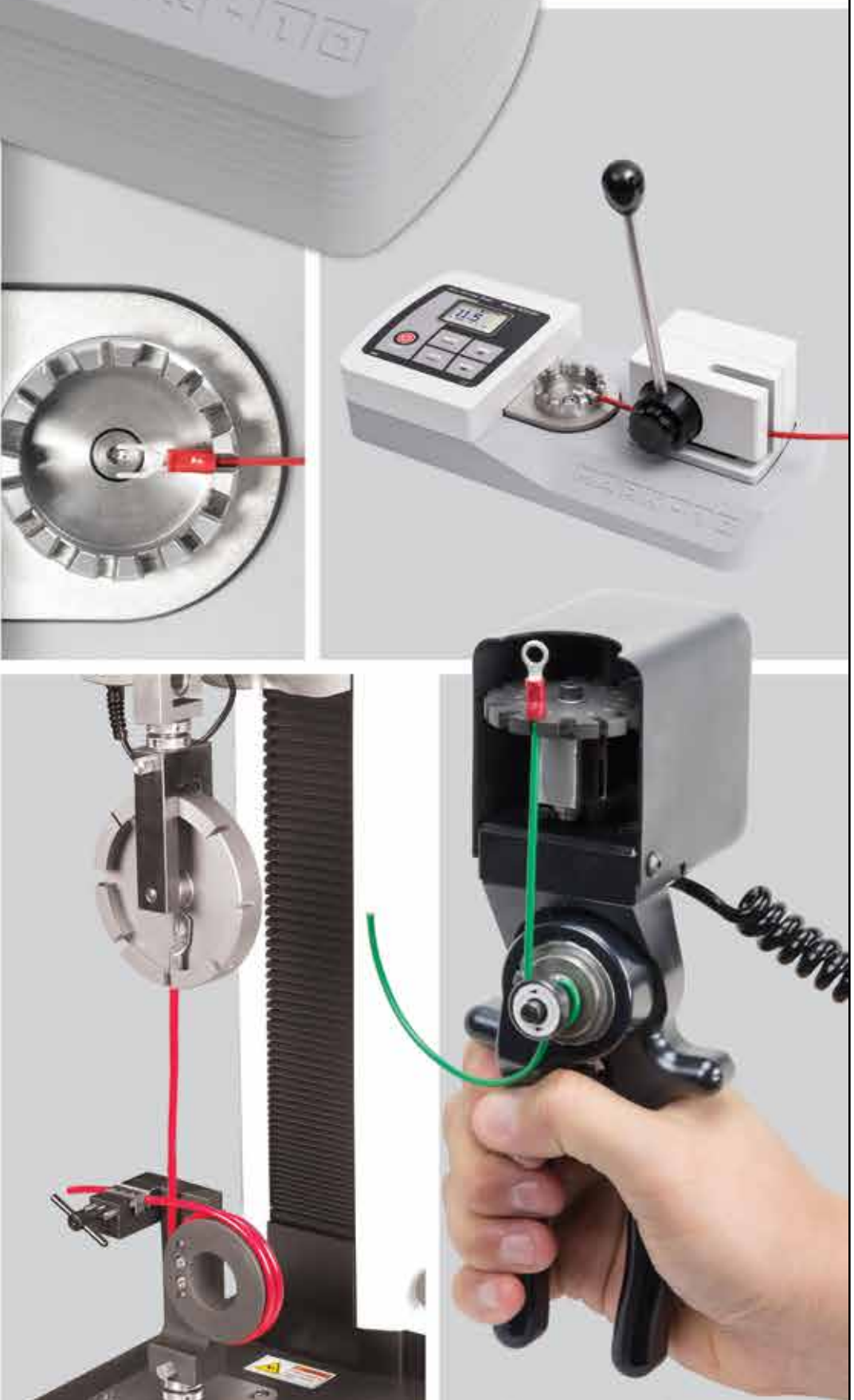


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M & A 101:
Lessons learned from decades of deals

Two Key Components in Optimizing a Deal

By Loren Smith

Valuation is, of course, the crux of the sale process, and within the valuation are two sometimes overlooked essentials: a detailed forecast and a detailed path to growth. Achieving clarity on these two related points boosts the seller's possibilities and lifts the comfort level of the buyer.

Sellers who invest time and effort in developing a precise forecast for their business are doing themselves a favor because a focus of the buyer's due diligence process is assessing downside risk. And assessment of downside risk can be described as determining the probability of future performance being equal to or greater than past performance, which makes a comprehensive forecast critical.

In my experience, buyers are always intent on growing a company they acquire, making a blueprint of how the next owner might pursue growth a crucial element of our CIM (confidential information memorandum). Historically, being able to emphasize this information has consistently made a material positive impact on valuation. On the flip side, I have seen many very qualified buyers looking at a harness company walk away because they could not see a way to grow the company.

In outlining the growth path there are, of course, no guarantees--especially because even the most well-conceived plan depends upon determined, effective execution. But the more strategic detail we can provide in the CIM, the higher the probability that a prospective buyer will incorporate this into his or her evaluation of the business. Predictably, I have been involved in a number of transactions where the multiple we achieved (valuation) was in large part driven by our ability to define a growth path in our CIM.

A backdrop for this discussion is a paradox: Forecasting can be consequential in the successful sale of a company, but I've observed that most harness company owners don't do forecasting as

a part of their methodology in running their business--just as it's also unusual for owners to spend much time thinking about a growth path. And this disconnect strikes me as logical since in most instances owners of closely held businesses see little benefit in devoting their limited time on formulating a forecast or growth strategy. They are too consumed with the demands of operating the business, optimizing their cost structure, and managing the natural growth that flows from the customers they already serve.

The level of cooperation we ob-

tain from sellers in developing a forecast or defining a growth path varies. In most cases, given the luxury of time, we are able to work through the details of preparing both a forecast and a growth plan. And when a seller simply can't carve out the time required to help us create these two projections, that generally does not prevent us from getting a deal done. But those two missing elements do make it much harder to achieve an optimal sale price.

Loren Smith can be reached at lms@blvcapital.com or www.bluevalleycapital.com.



Loren Smith CEO
Blue Valley Capital

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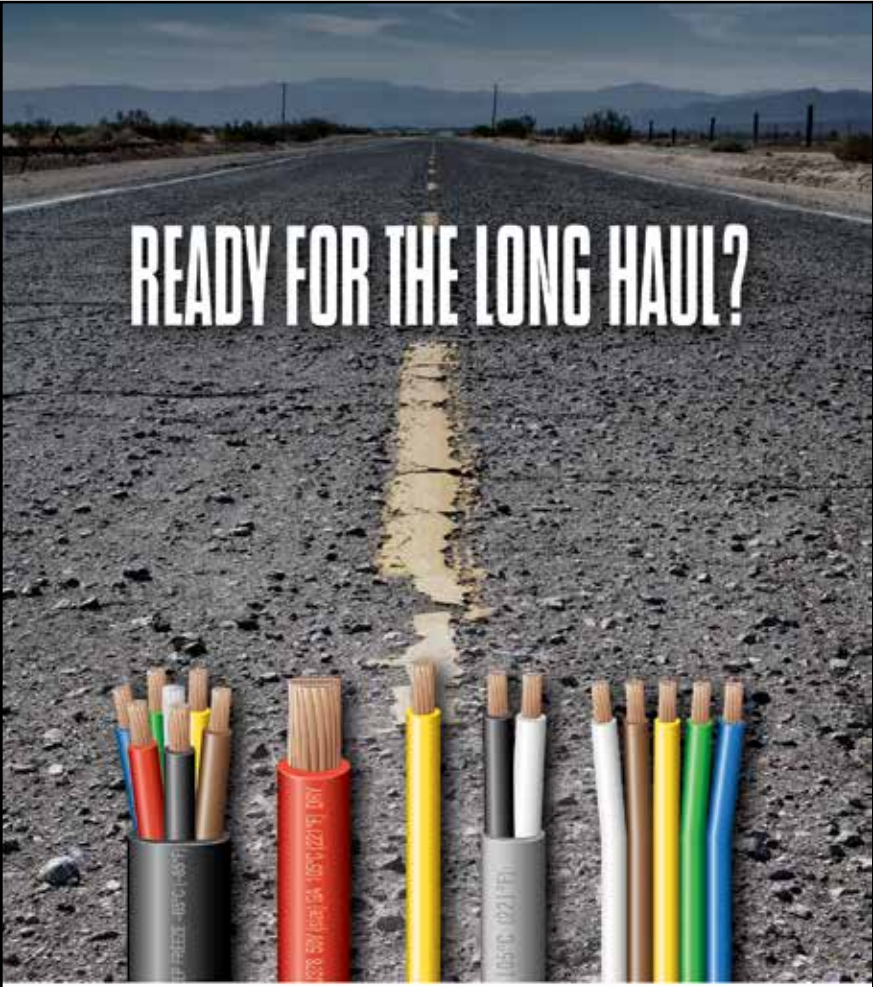
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Continued from page 1

up the facility. It took much more time and resources than expected. They continued to dig sample wells that came back with toxic results. “The cleanup was supposed to take five years - it took almost 20 to get full release paperwork. It was supposed to cost \$50,000 - it cost \$1.2 million,” he lamented. He managed to get some relief with state and federal grants tax credits, but those came with strings. “I had to put up a new building and employ 50 employees, and I only had a certain amount of time to get that done.” But Joe persevered, and Excel

_____ moved into the new facility in 2001.

The cleanup of the dilapidated old brownfield, and subsequent new building, was an incredible boost to the local landscape. “We’re actually located in a pretty nice neighborhood with houses right across the street and some other light industry on our side,” Colleen described. That commitment to the environment has transcended throughout Excel with a rigorous recycling program. “We recycle all of our wood pallets, plastic reels, and cardboard and are involved in a lot of community cleanup ef-

_____ Continued on page 16



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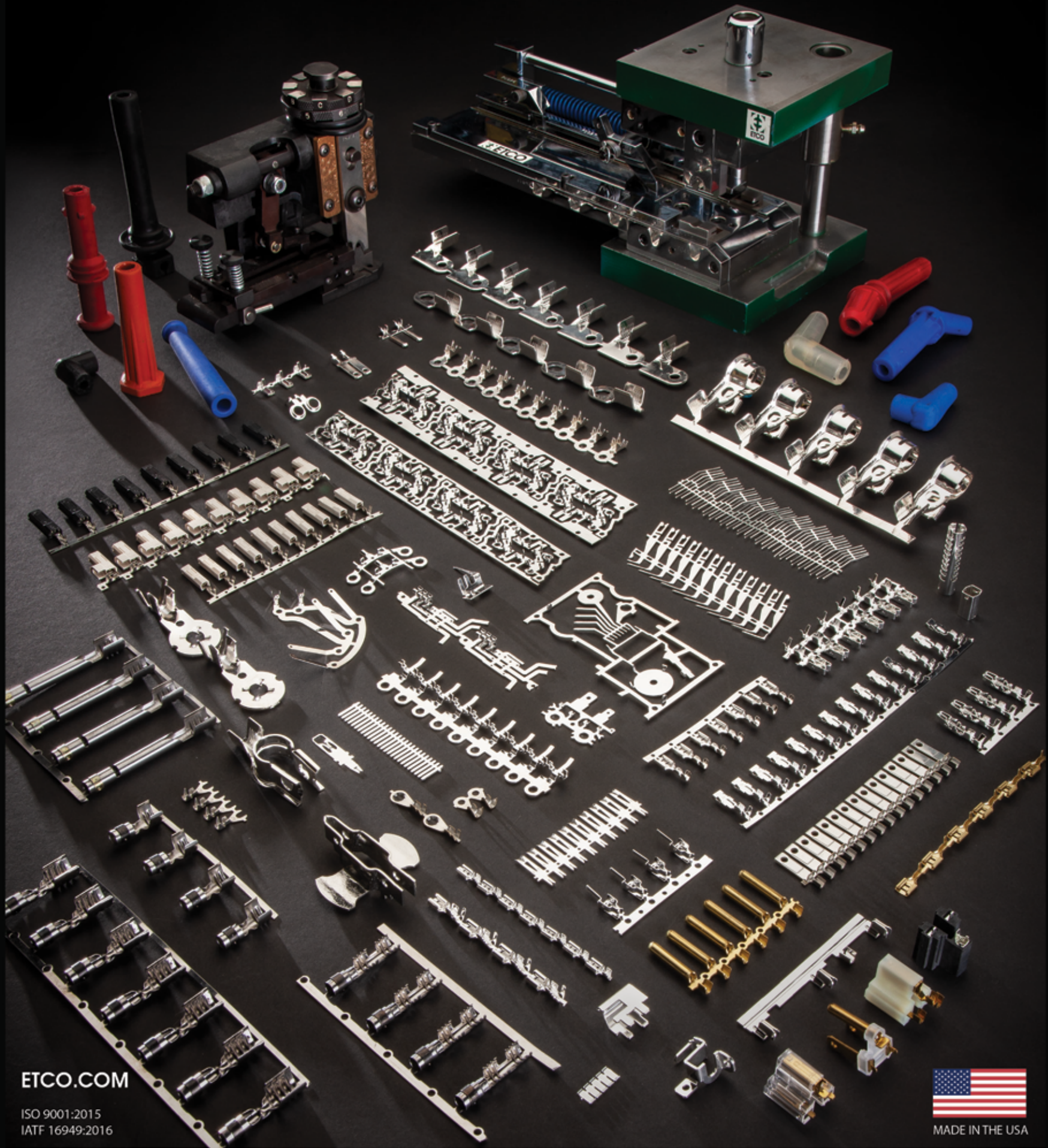


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Excel Connection

Continued from page 14

forts.”The company has even found a home for the larger wooden reels at a lion nature preserve.

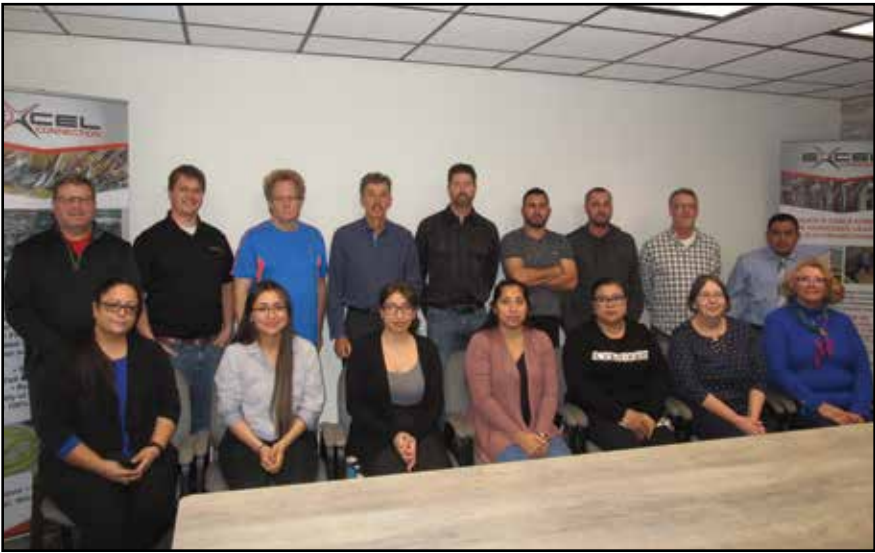
Shawn jumped into the conversation discussing the business when he entered in 2003. “I came onboard, and we were about a \$2.4 million company doing a lot of lead wires and small assemblies. At the request of our customers, we got into larger assemblies that required 100% continuity testing.” They began routinely processing four-gauge and two-gauge wire by 2005, but by 2008 they had requests for up to 500 MCM wire. Around this time frame, the company was also investing heavily in automation.

By 2012, they were fortunate to get business from a mining equip-

ment company that ceased in-house harness production, but that took some doing. “They weren’t sure they wanted us because we were a small company,” Shawn explained. “But Joe called a meeting with the decision makers and firmly asked, ‘If you thought we were too small, why did you ask us to quote the business?’” His frank nature and firm assurances won the day. They got the business and soon received four semi loads of raw materials from the company to go through to support their harness needs. “And that’s where we were able to use the Marshall Erecting expertise,” Joe advised. “Those spools weigh thousands of pounds, and we were able to build the frames and rigging to handle the spools and pull the heavy wire through conduits.”



Automated Wire Processing Stations



Excel Office Staff

Things progressed nicely, and by 2015, they had added automation and were building harnesses up to 50 feet long with 220 wires. But they began to be plagued by workflow issues. That’s when Colleen came in and implemented a new MRP/ERP system. It was the single biggest investment the company has made in the past 15 or so years, and it has paid off massively. “Our late orders went from 20% to 5%, and our overall efficiency went from 64% to 95%, so it’s been a huge savings and has helped grow the company,” Colleen mentioned. They were also able to reduce their temporary workforce, all through attrition. “Our old system was antiquated, and it took hours to get reports, and now they’re available at our fingertips in real time,” she said. “We’ve got monitors all over the shop that tell people

what jobs to work on, and they’re interactive so they can communicate with each other in different areas to get jobs done on time and in the right priority.”

This increased efficiency allowed the company to further differentiate itself from its competitors. They offered a Vendor Managed Inventory (VMI) program that helped them grow even more. “We actually go into our customers facilities once or twice a week and restock their bins so they can continue to operate seamlessly,” Colleen detailed. “They really like it because they don’t have to hold on to components or worry about stocking harnesses or lead wires; they just have to worry about getting their finished product out the door,” Shawn added.

Today, Excel is using about 30,000

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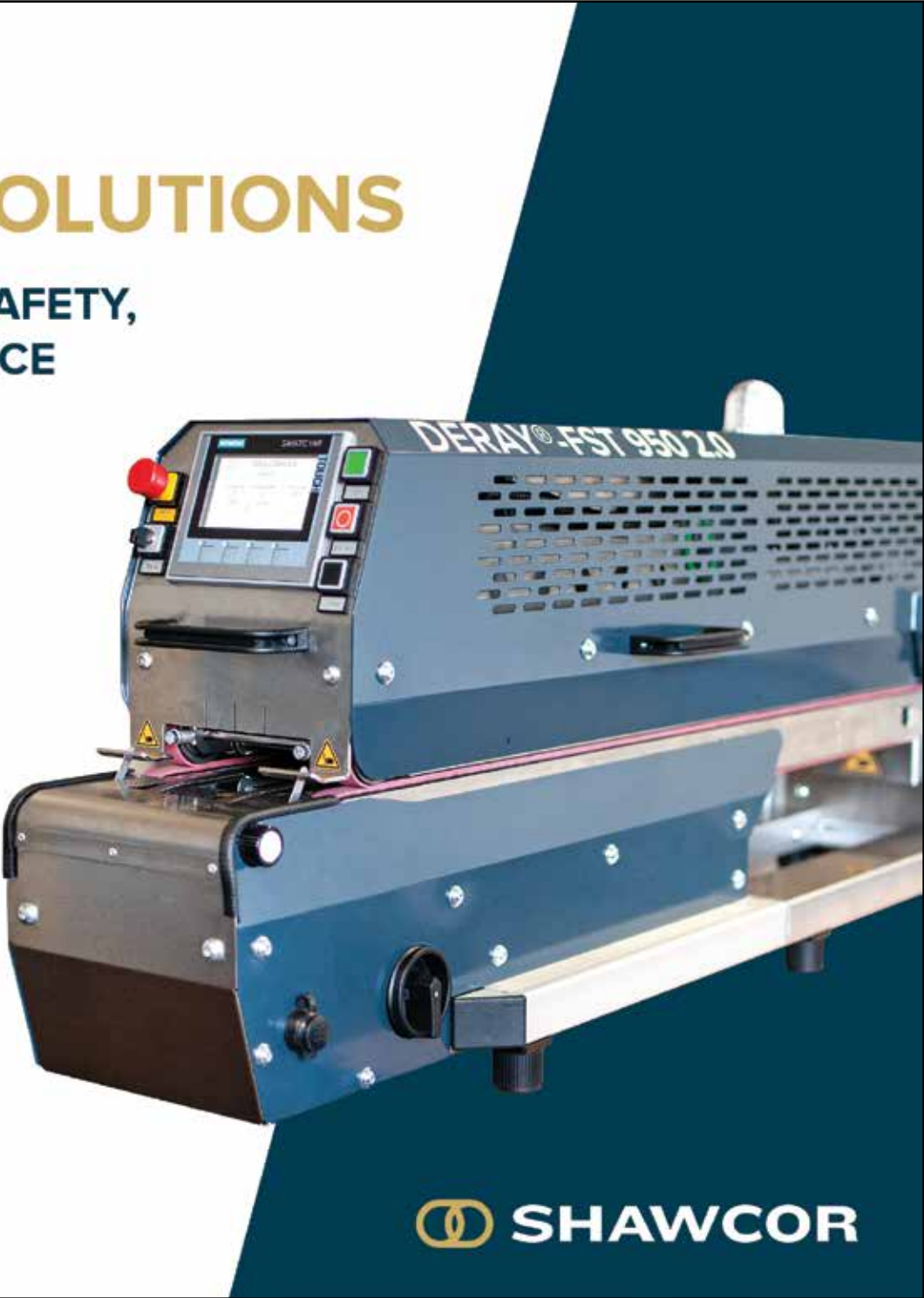
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Paul Marshall (left) and Joe Marshall

sq ft of manufacturing space, with about 76 employees. The current footprint includes an additional space they currently rent out to another company. “I have one more unit to use up, but we’re good for about another 3 1/2 years right here,” Joe assured. But he has other property should they need to expand beyond that.

Excel is ISO 9001 certified and builds to the WHMA/IPCA-620 specification. “We really strive in quality,” stressed Colleen. “We constantly monitor our internal processes and make improvements to make sure quality is brought to the forefront.”

I asked the crew what made them an unmistakable supplier to their customers. They all cited unparal-

leled quality and response time, but Shawn zeroed in on their knowledge of their customers specific products and processes. “I’m not joking when I say we know what they need before they do,” he proclaimed. “We’ll call them and say, ‘hey, we know you’re working overtime, tell us what lines so we can be prepared.’ Or we’ll see orders coming in for certain products and say, ‘well, those are medium voltage, so won’t you be needing some of these harnesses too?’”

It’s not just the scheduling and purchasing folks they work well with. They also work closely with their customers’ engineering staff. “About 60-70% of the drawings come in with some kind of issue we have to correct before we can build it.” Shawn

said. “Sometimes they’ll have a wire that is too large for the terminal, or they’ll specify tin plated terminals, but we know from experience that they need gold terminals for that application.” The team also does a lot of reverse engineering where a customer will provide a rough prototype and Excel will create a drawing and produce a first article harness.

So, what’s in the future for Excel? Shawn indicated they are looking at different markets that would fit their

capability. “We’ve been brainstorming, and we brought on a new salesperson who is really good at bringing on specialty automotive opportunities,” he noted. Joe chimed in to mention his son, Paul, has recently been named the company’s CEO. “His goal is to get the company to grow quite a bit, and financially we are able to do that within the space we have available and the years of experienced staff working in this industry.”

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LEADERSHIP

PUTTING INSIGHTS INTO ACTION

The Critical Value of Purposeful Work



By Paul Hogendoorn

How do you end up building a motorcycle in your family room? (It's not actually too difficult to explain).

My wife and granddaughter have kept me plenty busy the last 8 months. At first, I thought they were just creating projects to keep me sane, to keep me from going stir crazy, as I wasn't getting on airplanes, traveling to far away places, and doing what I love about work most – which is visiting plants and helping manufacturers make their companies stronger by connecting to their machines, and most importantly, with their people – in other words, by reconnecting meaning with work and dignity with labour.

The first project was my granddaughter's idea. We have a run down and dirty old pool shed, that in her minds eye, would make a great "she-shed". It started simply, by cutting in two windows, squaring up the frame, and painting it all fresh, inside and out. Then came the furniture, fridge, microwave, 42" smart LCD, and a Nespresso coffee maker. To protect that investment, a new roof was required. And an air conditioner.

The second project was necessitated by the first; I no longer had a pool shed for the chemicals, equipment and odds and ends associated with the pool. So, a small garden shed between our house and the neighbors had to be enlarged, but it was quickly determined that it had to be replaced. To replace it meant leveling the slope between the houses, which meant building a retaining wall, on a proper footing, with drainage considerations. The net result is a beautiful 16' X 6' secure storage area for everything that used to be in the pool shed (which is now the "she-shed").

Then came the upstairs bathroom. It too, started simple, but grew. What was going to be a new single sink and a paint job became a new vanity with double sinks, which meant upgrading the plumbing that was embedded in the walls. After a great start to the project, I encountered the first of several "expected unexpected" problems. After cutting into the main, I discovered that the house, built in the late 1960's, was plumbed using 1 ¼" ABS, not 1 ½" as has been the standard for a few decades, and my local Big Box had virtually nothing to couple into the now separated drain, with the family thanksgiving dinner only a days away. With classic "just in

time" execution, we managed to get the project done and avert a bottleneck at a critical family location.


In between those three projects was one that I have been picking away at for years – something I refer to as "wrench therapy". I've been deconstructing and reconstructing an early 80's motorcycle, more for the pleasure of wrenching than riding. It was a garage project until the reconstructed garden shed no longer had room for the snowblower and lawn mover, as the pool equipment and furniture was now in what was the garden shed. Moving the lawn and snow equipment into the garage forced me to move my motorcycle project, and the only place available was the family room. (Pretty rational explanation, right?)

But through it all, I learned a couple of very valuable lessons that are applicable to all manufacturers in these disruptive Covid times. The first lesson is that work has inherent human purpose, far more than just a means to earn a living. There is a tactile and palpable sense of satisfaction that comes from completing tasks that have tangible and visible results, that most people have an inherent need for, especially people that are drawn to manufacturing careers. Many workers lost their connection with this source of daily satisfaction, either temporarily because of short term shutdowns, or permanently because of job loss. The cost of this kind of loss is catastrophic and immeasurable financially.

The second lesson I learned is that periods such as these offer us all a chance to get things done that we would otherwise not have had a chance to do. I have encountered many companies that have taken intentional steps to make themselves better by adopting new technologies, executing and completing projects they initiated in previous years that were often delayed; by reskilling their workforce, or reigniting the energy in their work force by inviting suggestions and input, or by creative out-of-the-box thinking and planning. This was a time to do all of those things, but not everybody did them. Some chose to sit by, try to ride it out, and look forward for everything to return to normal.

The good news is, it's not too late to initiate, and complete, a few interesting and purposeful work projects. It's good for you, your company, and your people.


So, what's still on your project list?



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Characteristics of Molded Plugs for Pumps and RV's

By Joe Tito
Wiring Harness News

Characteristics of a Sufficient Molded Plug for Pumps

Plugs used to supply electrical service to a submerged pump come in a variety of shapes and sizes and

can have 3 or 4 wires. Most plugs use terminals for all of the electrical connections, but some have unique grounding requests. One commonality is that all use pliable plastic that resist compression set. Since the plug is submerged in water at all times, it is important for the molded plug to



Two-pin plug with grounding bracket in a two-cavity mold.

have a water-tight fit. This is to ensure no water gets into the contacts and causes it to malfunction, threatening the present usefulness and future longevity of the pump. What seems like a potentially frequent occurrence is one An-Mar easily curbs by using the thermoplastic elastomer. The material has similar characteristics as rubber and is malleable to the functions and

needs of various products, giving the molded plugs their water-tight characteristic. The company also uses a compression fitting method that integrates the soft and flexible material of the thermoplastic to get the proper seal.

A molded plug inside a submerged pump should be resistant to compression set when used in a compression application when exposed to agents in the water which can change the molecular structure of TPE and flexible PVC. When a plug hardens and loses its willingness to fight back against compression because of the effects of these agents, water leaks into the electrical connection, causing the connection to short out and fail the pump.

Plugs with these characteristics are often more sustainable than others, not only because of the endurance and longevity of the product the plug supports but because of the materials that make up the thermoplas-



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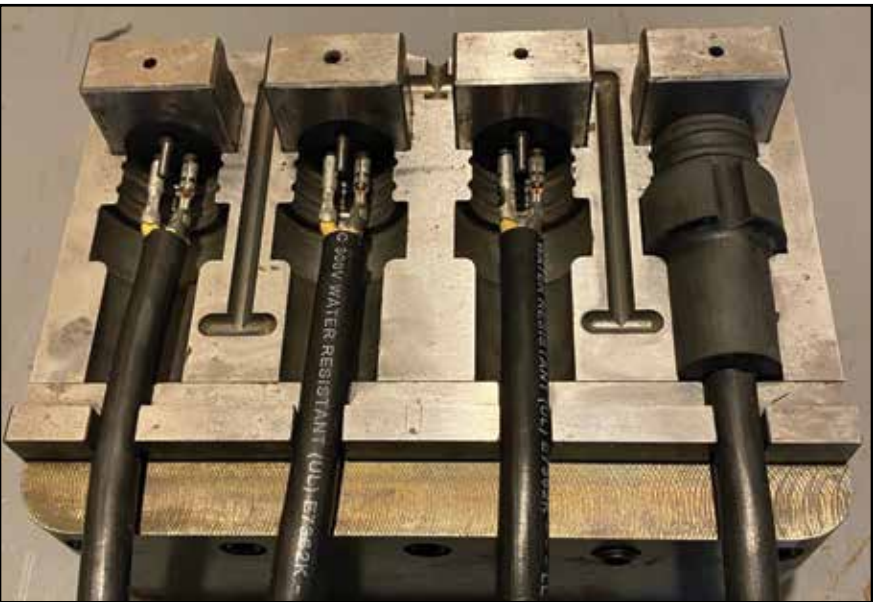
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Three-pin plug for submersible pump in a four-cavity mold.

tic elastomer material, which is often lighter in weight and goes through a more sustainable manufacturing and recycling process.

Characteristics of a Sufficient Molded Plug for Recreational Vehicles

Molded plugs used with recreational vehicles vary widely. An-Mar has made plugs and receptacles for both marine and ATV applications. The applications can require as few as two wires to as many wires as the customer requires. The wire themselves can even vary in the same application. A customer may need a high-current-type electrical connection along with “accessories” in the same molded product. This means a customer can have a couple of 6awg wires and many 18awg wires in the same molded product. It is important for the molded plugs to have UV stability and heat resistance as some may be exposed to many hours in the sun. The sun and heat can make soft plastics brittle and crack. Thermoplastic elastomers stay soft and pliable after many hours in the sun.

A matte finish is another attribute often requested by customers in the marine and ATV marketplace. Consumers have become accustomed and usually prefer a soft, slip resistant feel to the parts they handle. Thermoplastic elastomers, being mostly rubber, fit the bill for this request.

The thermoplastic elastomers An-Mar uses are measured against material certifications from the manufacturer of the compound that have been passed according to requirements of The American Society for

Testing and Materials. This means that the materials used not only meet the aesthetics of the consumer but also the mechanical, thermal, and electrical properties required by testing agencies to certify a safe product.

The methods and standards used to make the plugs for submersible pumps and recreational vehicles is something Craig is looking to transfer into a different industry he believes will be around for a while.

“I believe our experience with submersible pumps and recreational vehicles are beneficial to the solar and wind power industries who obviously have their electrical connections in rain, sleet, snow and other kinds of environments that would be as challenging as electrical connections in the submersible pump and recreational vehicle industries,” he said.

Both solar and wind power products require a makeup that are resistant to the unpredictable and drastic elements of the environment. With knowledge of the most efficient functioning and manufacturing of the product, Craig is confident the company can expand its horizons and reach customers in the environmental power sources field. Craig and the company are hoping to break into the solar and wind energy industry in 2021, on the cusp of a world shifting its focus even more seriously on how current generations can alter their energy usage habits in a way that keeps the planet secure for future generations to come.

For mor about An-Mar, see the Supplier Profile on page 49.



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Critical Attributes of Wire Prefeeder

A wire prefeeder is essential to maximizing the productivity of any automatic wire processing machine. The prefeeder accomplishes this by performing several important operations that ensure the wire entering the automatic wire processing machine is in the optimal state for cutting, stripping, or terminating.

This article discusses the critical pre-processing operations of a prefeeder. It then pivots to additional features you should consider when specifying this equipment for your operation. WHN sought the help of Bil DeGrace, Vice President of Mechtrix Corporation, for this article. Mechtrix manufacturers ancillary equipment and products for the harness industry, including prefeeders. However, the information put forward is a useful analysis without regard to the brand of prefeeder. Following are the critical operations of a prefeeder:

- **Removes the wire from the storage reel or barrel at a constant rate to minimize the stress on the insulation.** Basically, a prefeeder smooths out the process of pulling the wire from the source (typically a reel). Imagine pulling wire from a

large reel. Initially, it takes a higher amount of force to overcome inertia, and get the reel turning. A much lower force is needed to keep it turning. A prefeeder reduces the starting and stopping of the reel by pulling wire continuously as opposed to it being pulled directly by the wire processing machine. Otherwise, the resulting jerking motion can damage or stretch the insulation resulting in wire strip lengths outside acceptable tolerance parameters as the insulation creeps back after being cut.

- **Loads the wire into a controlled draw source to make more of the wire instantly available to the automatic wire processing machine during the wire feeding operation.** The draw source is a series of accumulation pulleys around which the operator wraps a sufficient length of wire before feeding it into the wire processor. This creates a buffer of wire between the reel and the wire processing machine.

- **Provides more consistent and controlled tension on the wire presented to the automatic**


Continued on page 25

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- 1 - MARKEM IMAJE 9040 Ink Jet Printer, 2009
- 1 - ONDAL Linear TaperS, 2016
- 1 - PANDUIT CP-881 Semi-Auto Ferrule Inserter w/Tool Kit
- 1 - PANDUIT PCP-10 (CPD-24-156F)
- 1 - RAMATECH Prefeed, Model ABW 800/300, 2005
- 1 - SCHLEUNIGER CC36SP CrimpCenter, 2019
- 1 - SCHLEUNIGER CC60 CrimpCenter w/TS60 Shuttle Rack, 6-Tooling Shuttles
- 2 - SCHLEUNIGER CC4000, CC500 CableCoilers
- 1 - SCHLEUNIGER CP1500 Heavy Duty Coiler
- 1 - SCHLEUNIGER CP1250 CoilerPans
- 1 - SCHLEUNIGER CenterStrip CSU
- 1 - SCHLEUNIGER EC3300 EcoCut w/PF2000 Prefeed, CC1400 Coiler
- 3 - SCHLEUNIGER PF4600, PF2000, PF1000 Prefeeds (PF1000 is refurbished)
- 1 - SCHLEUNIGER PS9500BF Power Stripper
- 1 - SCHLEUNIGER SC200 Stripper/Crimper
- 2 - SCHLEUNIGER US2015 Wire Strippers
- 1 - SPECTRUM Capris 50-300 Laser Wire Marker, 2005
- 3 - T&B Crimpers, Models 25000, 13500, 12050
- 1 - TE High Voltage Hydraulic Crimping Machine, P/N 528008-4, 2014
- 1 - TIE BOY Tyer, Model A206
- 1 - TRI-STAR TECHNOLOGIES Laser Marker, Model M-100L/FG-TT
- 1 - WDT Model GST-32/N Preyed
- 30 - AMP, SCHLEUNIGER, MECAL, KM USA Applicators



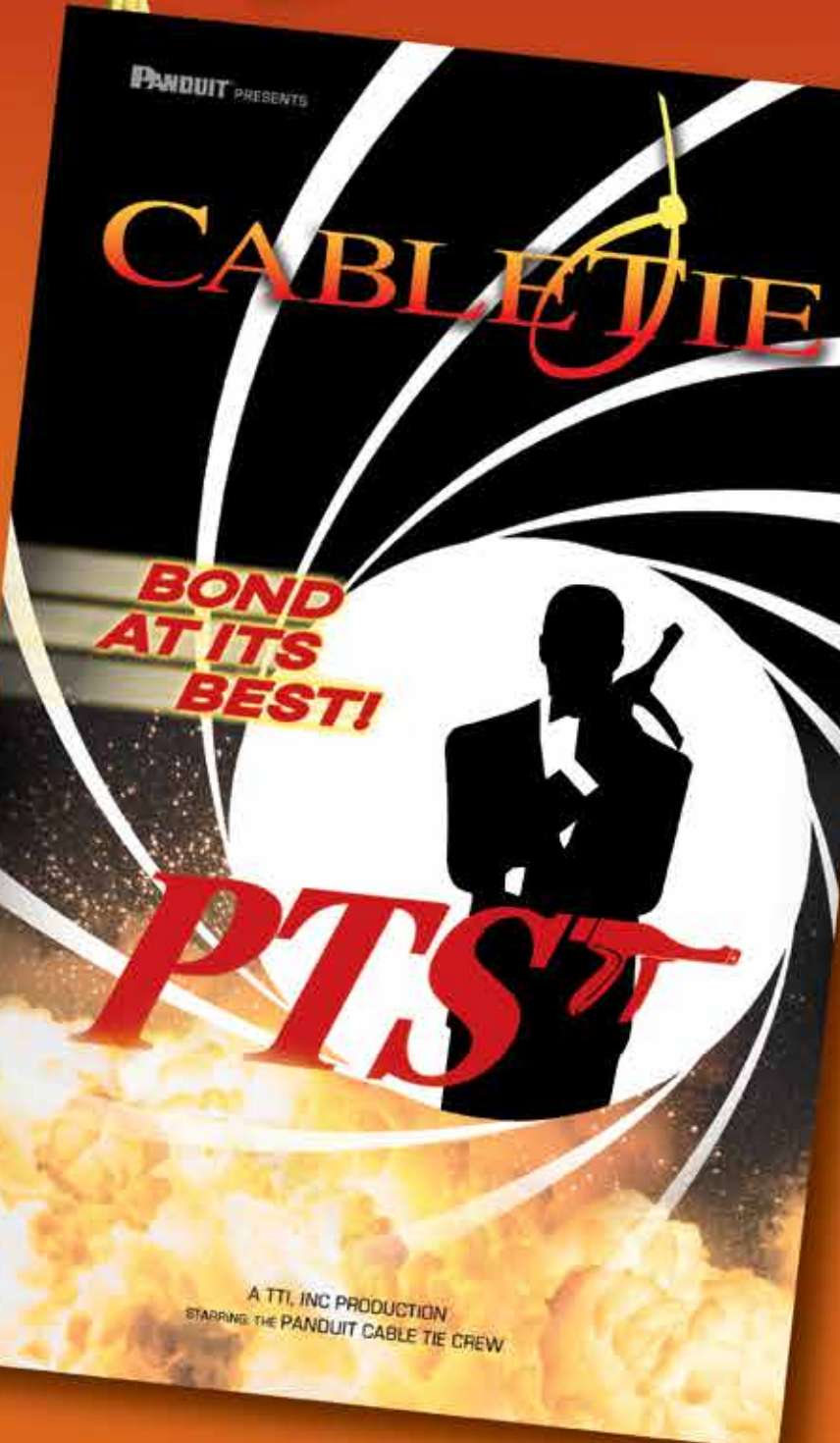
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Critical Attributes of Wire Prefeeder

Continued from page 23

wire processing machine. Because we deal mostly with stranded conductors in our industry, there can be a significant amount of stretch under extreme pulling loads. Variability in the pulling load from a reel can cause unacceptable variation in the overall wire length. The controlled back pressure provided by a prefeeder all but eliminates this inconsistency.

- **Reduces the coiled “memory” in the wire by routing it back and forth thru a series of pulleys to help straighten it for more efficient feeding by the automatic wire processing machine.** When wire sits on a reel or in a barrel for a length of time, it develops memory. It tends to retain a coiled shape. This can cause issues when cutting, stripping, and especially terminating the wire. By running the wire through a series of pulleys, the memory is reduced. Although most wire processing machines also have a series of straightening rollers, these alone are not always enough to overcome wire memory.

- **Prevents tangles or snags in the wire from damaging the automatic wire processing machine’s expensive feeding system by providing a signal to warn the machine that wire is not ready or available.** Many variables can cause tangles or snags in wire. A common situation results when a reel is partially used. After a production run, wire is often rewound back onto the reel, resulting in overlaps or tangles. Damage to the feeding mechanism on wire processing machines due to snags can be quite expensive. Smaller bench top units can actually pull themselves off the bench with catastrophic results. Ideally, the prefeeder sends a signal to the wire processing machine to stop if the wire is not available due to a snag or tangle.

Additional Features and Options for Consideration

Following are some equipment

features that you should look into when shopping prefeeders:

- **A mechanical system for safely lifting the heavy reels of wire into the prefeeder so only one person is needed to load or unload new reels of wire.** Many large reels can weigh up to 200 pounds and beyond. Even smaller reels can weigh 50 pounds and are generally awkward to maneuver. A reel stand with a lifting device makes loading heavy reels quick and safe.

- **A prefeeder properly sized for the speed and range of wires to be processed by the automatic wire processing machine.** Most shops in the low volume/high mix realm use many different wire gage sizes and cable configurations. This makes it prudent to choose a prefeeder that can handle this wide variety.

- **A communication interface to your automatic wire processing machine to prevent wire feeding errors.** An interface cable connected to the wire processing machines’ e-stop circuit will send a signal to stop both machines in case of a wire jam or other prefeeding error to prevent the likelihood of damage to either machine.

- **The ability or optional items required to run wire supplied in various configurations or formats such as small hanks of wire, various size barrels of wire and both small and large reels of wire.** Although most wire comes on reels, barrel or hanks (flat coiled bundles) are also used. It’s wise to choose a prefeeder that can handle any type of wire packaging.

- **The cost of replacement parts such as feed wheels, feed belts and replacement pulleys.** As with any equipment, it’s always good to have an idea of price and availability of consumable products like belts

Continued on page 27

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To learn more, call 1-800-322-3225 or request a free sample book at www.phoenixcontact.com/toolfox

Critical Attributes of Wire Prefeeder

Continued from page 23

and pulleys. (The only significant consumable on the Mechtrix equipment, for example, is the feed belt. They are readily available for about \$10)

- **The amount of routine and preventative maintenance required for the everyday operation of the prefeeder.** Routine Maintenance procedures and schedules of prospective machines should be reviewed and compared before investing in a prefeeder.

- **The amount of operator interaction or training required to properly use the prefeeder.** The goal should be to minimize the amount of operator adjustments necessary during equipment run time and at setups.

About Mechtrix:

Since 1982, the Mechtrix Corporation has specialized in the design and manufacture of tooling, technology, and equipment for the electrical wire processing industry. Mechtrix provides proven, innovative technical expertise in solving difficult wire



Mechtrix MPF-40 Wire Prefeeder

processing problems through their dedicated engineering support staff. They are driven by a commitment to find the right solution to unique wire applications.

Mechtrix has incorporated over 30 years of proven experience in developing wire prefeeders for the harness industry. Read about their newest generation, the MPF-40 Wire Prefeeder System in the News Plugs section.



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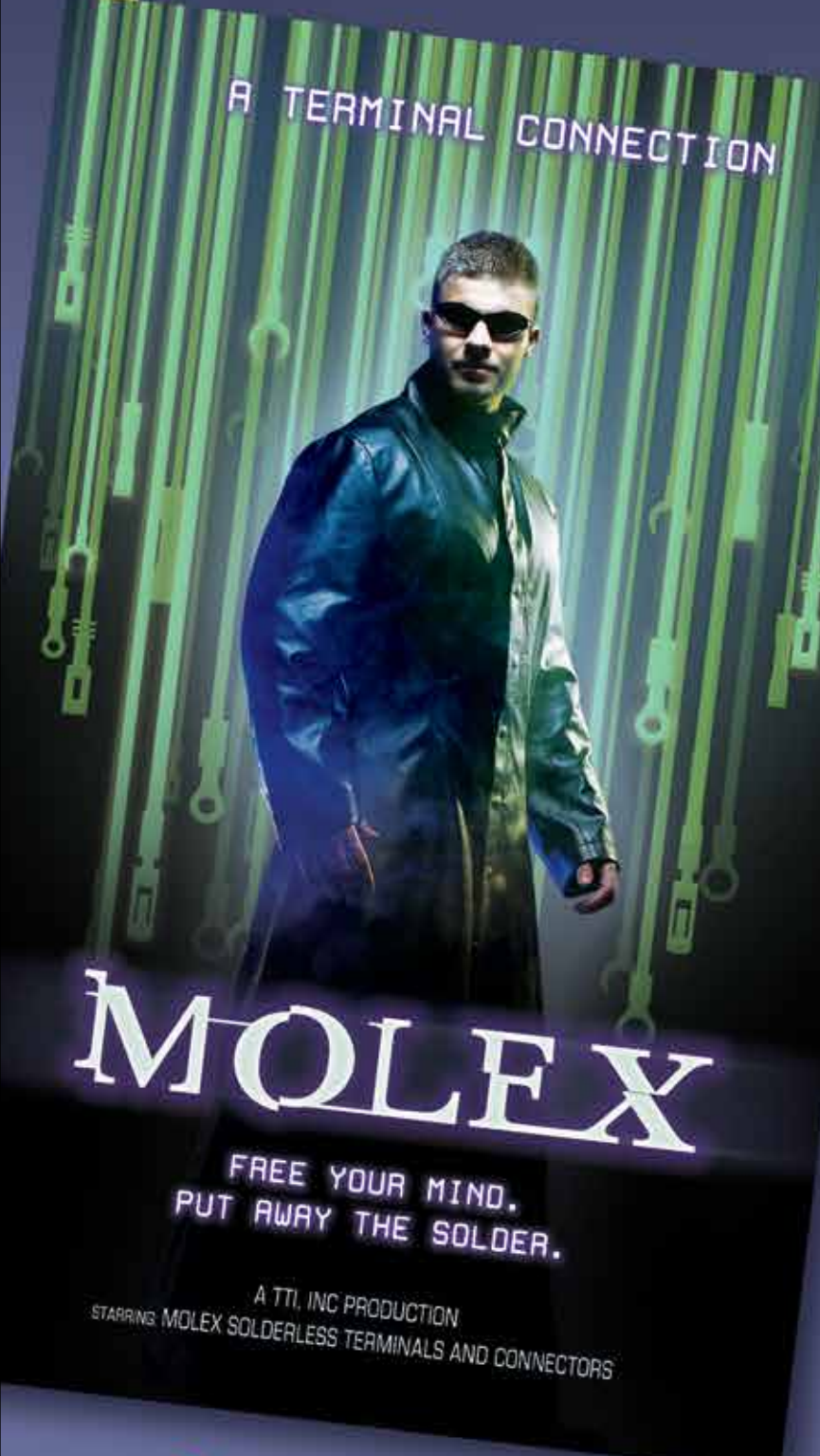




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Crimping Applicators

Applitek and all of it's employees are proud of the fact that we are one of the oldest independent applicator manufacturers in the United States. Our Company was founded on designing and manufacturing quality products using our in-house capabilities. To this day the tradition continues and we are prouder than ever to say "Still made in the USA"

Mini style applicators with mechanical feed mechanisms are supplied in a variety of feed configurations. Adaptable to most crimping presses.

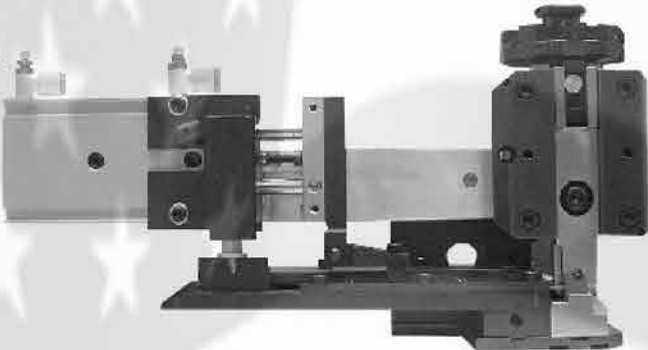


Model 1700

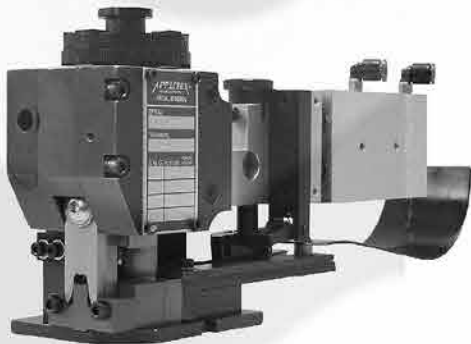


Model 2000

Pneumatic feed mini-style applicators can accommodate terminals with center to center distances up to 2 inches.

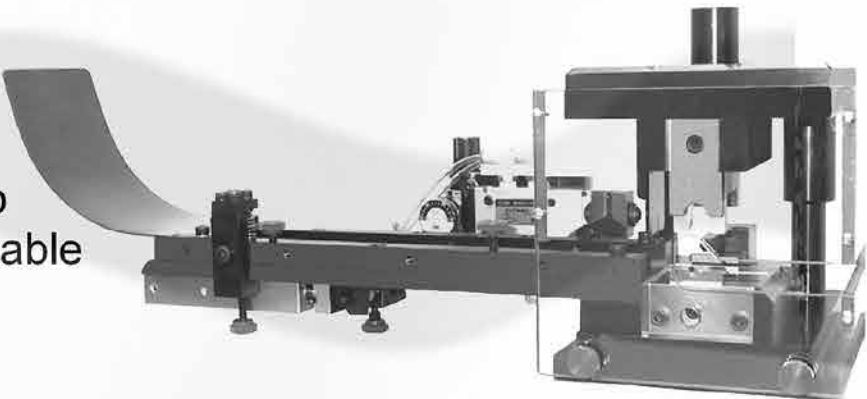


Model 1500



Model 2100

DSA applicators are designed for large terminals manufactured from heavy gage material with center to center distances up to 3 inches and widths to 3.5 inches. Available in left to right, right to left and rear feed configurations.



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NEWS PLUGS



Check out TTI's Library of Sensor Related White Papers

TTI, Inc., a leading specialty distributor of electronic components, has an extensive library of sensor related white papers located on the Sensor Resource Center. With today's technology trends demanding more data, sensors are a critical component to your next-gen applications. TTI has curated a number of white papers from top suppliers like Honeywell, TE Connectivity, Sensata, Amphenol and more. These articles cover topics ranging from humidity and environmental testing, factory automation, and even robotics.

To learn more, visit TTI's Sensors Resource Center

About TTI

TTI, Inc., a Berkshire Hathaway company, is an authorized, specialty distributor of electronic components. Founded in 1971, the emphasis on a broad and deep product portfolio, available-to-sell inventory and sophisticated supply chain programs have established TTI as a distributor of choice to manufacturers in the industrial, defense, aerospace, transportation, medical, and communications sectors worldwide. For more information about TTI, visit www.ttiinc.com

Multifunctional Cutting Tools

Cutfox electrician's scissors for industrial and trade applications

The new electrician's scissors from Phoenix Contact's Cutfox series have durable micro-serrated blades, so they can deliver high cutting performance. The new scissors are suitable for cutting copper (flexible), aluminum (flexible), glass, and Kevlar fibers, plastic, and braided shield.

Versions are available with stripping and crimping areas. With their nonslip soft-grip surface and ergonomic design, the specially shaped two-component handles ensure comfortable and safe handling. The light and compact scissors have screw joints and can be readjusted.

The Cutfox scissors are made from hardened tool steel and impact-resistant plastic. They have high corrosion resistance and durability, making them a reliable tool for industrial and trade environments.

Learn more at www.phoenixcontact.com/handtools.

About Phoenix Contact

Phoenix Contact develops and manufactures industrial electrical and electronic technology products that power, protect, connect, and automate systems and equipment for a wide range of industries. Phoenix Contact GmbH & Co. KG, Blomberg, Germany, operates 50 international subsidiaries, including Phoenix Contact USA in Middletown, Pa.

For more information about Phoenix Contact or its products, visit www.phoenixcontact.com, call technical service at 800-322-3225, or e-mail info@phoenixcon.com.

Steve Maucieri Named CEO of Genuine Cable Group

Leading wire and cable supplier Genuine Cable Group (GCG) has named Steve Maucieri its Chief Executive Officer. Maucieri brings a wealth of knowledge and industry experience to this role and will oversee all GCG targeted business segments, including the Telecom/Broadband, Factory Automation, Marine, Building Automation, Assembly and Infrastructure segments.

In his 27+ years in the wire and cable industry Steve has held a variety of positions and is known for building strong relationships with customers and vendors. His most recent position was Senior Vice President, NSS for U.S. and Canada with Anixter International where he grew their Network and Security Solutions business across the U.S. and Canada.




Steve Maucieri

"We have positioned GCG for growth by having teams that truly understand what our customers need, and delivering when they need it," said

Continued on page 30



Cutfox electrician's scissors



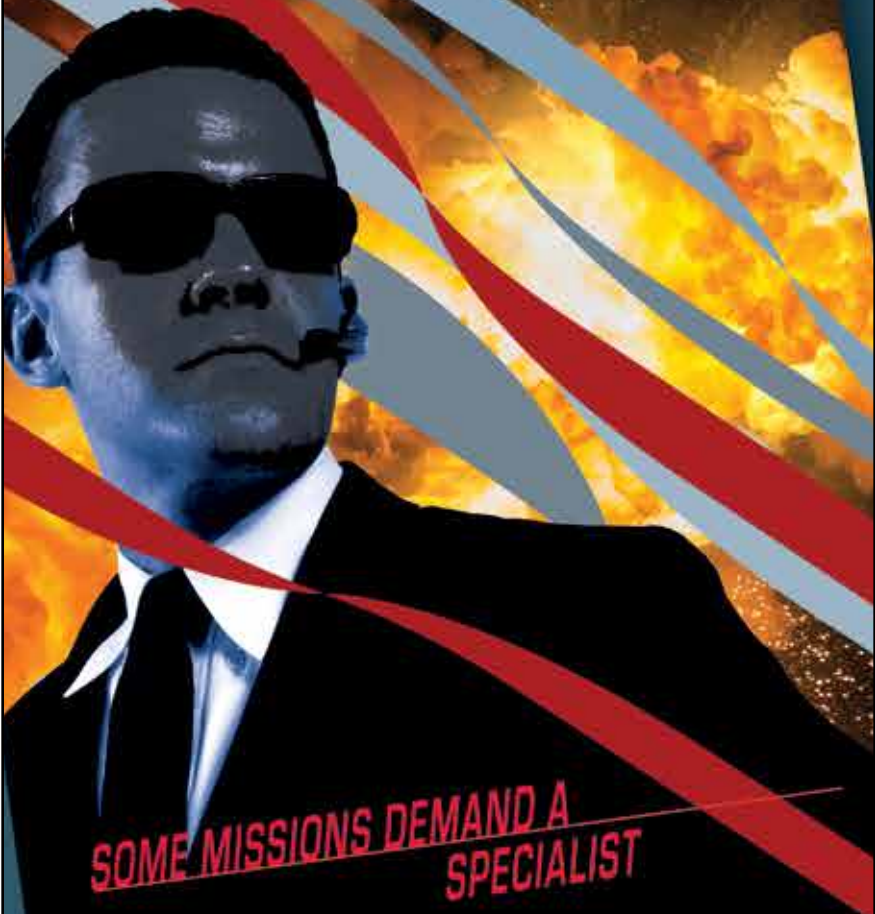
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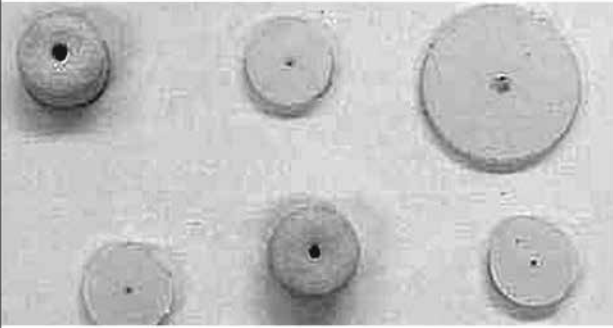
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NEWS PLUGS continued

Continued from page 29

John Gelp, Chairman of The GCG Board of Directors. "Steve will help us accelerate that growth through enhanced customer service and strategic acquisitions."

In 2019 GCG was purchased by Audax Group, a private-equity firm that recognized the strong marketplace demand for the wire, cable and related products supplied by the targeted GCG business segments. Since the purchase Audax has invested heavily to improve

GCG's ability to meet the needs of its customers.

"I am proud to join GCG at this important time in the company's history," said Steve. "The level of knowledge and expertise in each area of the business is unmatched and I plan to build on our focus on delivering exceptional service to every customer."

Genuine Cable Group (GCG) has segments meeting the wire and cable needs of customers across a wide spectrum of industries. GCG has well-respected segments including ElectroWire, Empire, Connect-Air and Seacoast. The company serves telephone, wireless and DAS customers as well as customers in rail and transit, factory

automation and building automation. GCG also has cable assembly operations and is proud to be a leading wire and cable provider to the U.S. Navy.

TE Connectivity Introduces AMPSEAL 16 High Temperature Connectors

These connectors are an extension of the popular AMPSEAL 16 series and offer greater temperature range and increased design options

As an extension of the well-proven and widely known AMPSEAL 16 series, TE Connectivity (TE), a world leader in connectivity and sensors, has introduced AMPSEAL 16 high temperature connectors. These new connectors offer greater temperature range and increased design options.

Compared to 125°C for the standard AMPSEAL 16 connectors, AMPSEAL 16 high temperature connectors allow for a 20 percent increased temperature range of up to 150°C. They also have a higher flammability rating of UL94 V-0 and two sealing options for SAE and ISO wires. Differentiated with a new gray colored housing, these high temperature variants can be easily identified, and the 4 discrete color polarization keys help prevent mis-mating. In combination with the fully assembled one-piece-design, AMPSEAL 16 high temperature connectors are a cost-effective, easy to handle and easy to assemble product line.

"Meeting the needs of our customers is paramount and continues to be top of mind for us," said Denis O'Sullivan, product manager at TE Connectivity. "Our new AMPSEAL 16 high temperature connectors offer a simple and reliable solution that enables customers to manage, purchase and efficiently stock supply chain."

AMPSEAL 16 connectors, targeted for truck and bus, off-road, heavy-duty industrial, recreational and agricultural industries, are the perfect solution for on-engine applications, after treatment systems and other high temperature applications increasing the design options throughout the vehicle or machine.

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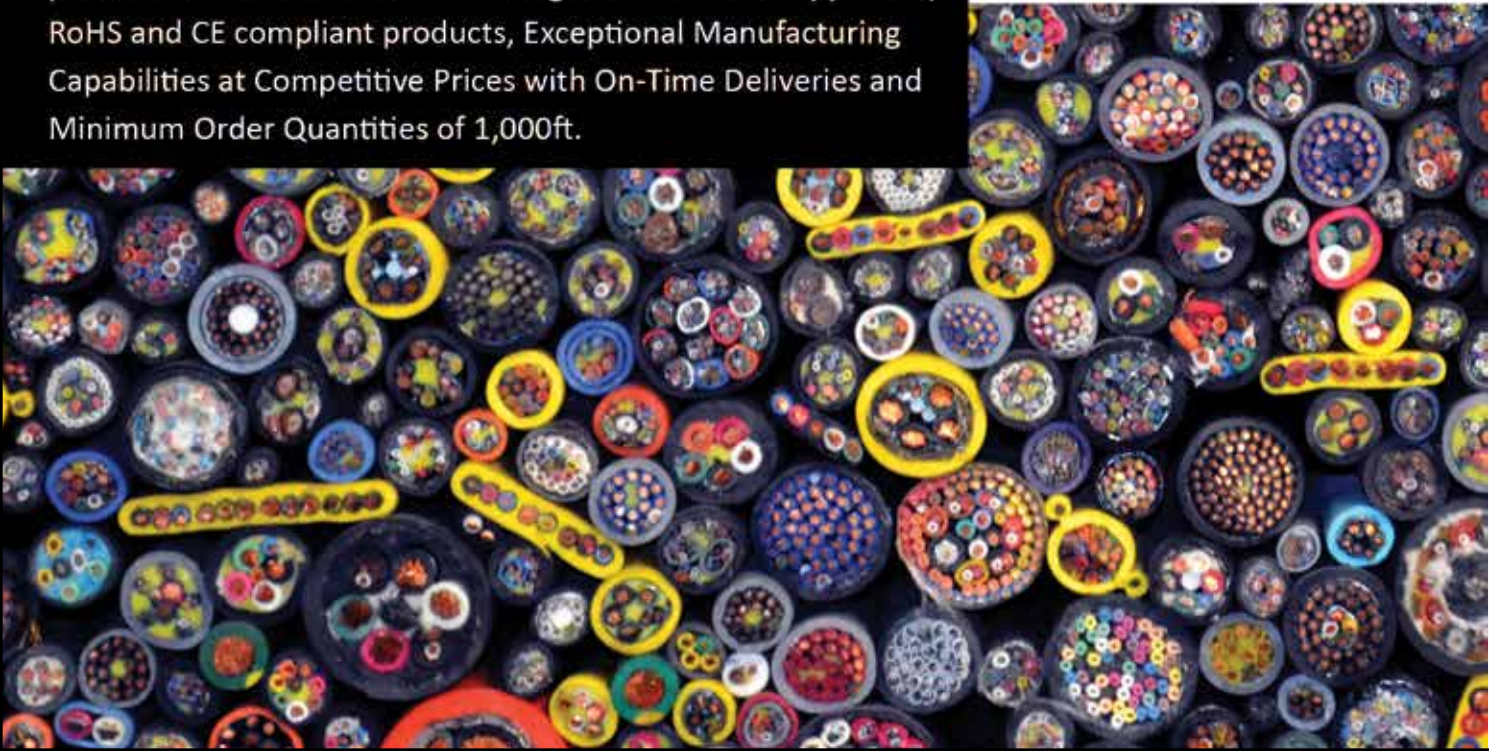
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(File photo prior to COVID-19)

Electrex® Mexico Awarded Health Security Protocol against COVID 19 Recognition

Electrex, Inc. Mexico is pleased to announce it has been recognized for its health security protocols against COVID 19 by the Instituto Mexicano del Seguro Social (Mexican Institute of Social Security). Electrex’s facility in Zacatecas, Mexico is a renowned manufacturing center of excellence, specializing in the production of electric harnesses and associated products for the construction, turf, utilities, agricultural, industrial, infrastructure, marine and specialty equipment markets.

The Electrex team demonstrated outstanding leadership in COVID safety, voluntarily achieving the highest standard recognized by the Instituto Mexicano del Seguro Social, being the first in Zacatecas to do so.

Operations Manager Genaro Ortega stated, “Electrex is committed to ensuring that our employees are provided with a work environment reflecting the best practices available with regard to health and safety. This is a well-earned recognition of that commitment by our team.”

About Electrex

As a leader in electrical system solutions since 1977, Electrex Inc has a wealth of knowledge and experience in everything related to the design and manufacture of wire harnesses, battery cables, and electrical panels.

With manufacturing capability in the U.S. and Mexico, we provide a variety

of industries with innovative, quality products. Our Engineering and Technical Service teams can re-engineer your product to reduce cost and update your components to the latest technology, providing your brand with improved field performance and enhanced brand equity. Web: <https://www.electrexinc.com/>

Switchcraft Micro-Con-X® Insta-Click Sealed Connectors In Stock at TTI

TTI, Inc., a leading specialty distributor of electronic components, announces the availability of Switchcraft’s Micro-Con-X® Insta-Click Sealed Connectors from stock at TTI.

The Micro-Con-X® from Conxall® has set the standard for harsh environment connectors, and the new Insta-Click™ product line adds several key improvements for even harsher environments. An all-new latching mechanism provides an automatic positive lock while improving the water resistance rating to IP68 (when used as part of a molded cable assembly). A high-quality new plastic offers UV resistance. Target markets include industrial sensors, security systems, outdoor signs and transportation, to name but a few. They are in stock and available today

To learn more, visit Switchcraft Micro-Con-X Insta-Click Sealed Connectors at TTI.

For more information about TTI, visit www.tti.com.



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- High-precision processing of discrete wires with cross sections up to 70 mm² (2/0 AWG), shielded cable and complex multiconductor applications
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The Mechtrix Corporation is introducing its' most versatile prefeeder to date, the MPF-40 Prefeeder. The MPF-40 has been designed and developed to handle the wire prefeeding needs of the newest generation of both benchtop and fully automatic wire processing machines.

Mechtrix has incorporated over 30 years of proven robust design features, enhancements and customer feedback in the new simple to operate prefeeder. The MPF-40 features the Mechtrix Auto-Tune™ motor speed control system that automatically sets the feed speed of the prefeeder so that the operator does not have to make any adjustments while running. A High/Low selector switch allows for the top speed of 6.5m/second to be reduced to 3.0m/second for more precise feeding control of shorter wires or for feeding benchtop wire processing machines.

WHN caught up with Bil DeGrace about some of the specifics of the new MPF-40. Bil had this to say:

At Mechtrix, we really specialize in designing and manufacturing complementary equipment and accessories that enhance the operation of our customers' existing machines. We're always looking for customer feedback and input into what they need and what they're looking for. Our customers have told us they would really like a single pre-theater that can handle either a bench top machine, or a fully automatic wire processing machine. So, rather than a machine specific prefeeder, we wanted to develop one that could be used with any piece of wire processing equipment. We managed to fold two of our existing designs together with some new and improved control logic into a prefeeder that's going to cover the entire market. Customers can move the MPF-40 from machine to machine as needed within their facilities.

The prefeeder has been designed to handle a wide range of wire reels up to 22" wide x 34" in diameter and weighing up to 400 lbs. The prefeeder is also perfect for pulling wire directly from a wire rack with multiple wire reels for even faster set-up and change over.

For more information contact Mechtrix directly at 262-255-6555 or visit their website www.mechtrix.com.

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In every issue of Wiring Harness News, Anixter will bring you informative articles about wire and cable technology.

Cable Jacket Types 101

Almost every cable has a jacket and for good reason: jackets help mechanically protect the insulation and conductor core of the cable. Without a jacket, cables are susceptible to abrasion, heat damage and oxidation damage, as well as weather-related damage. But not every jacket is created equal; it is imperative that each cable have the correct jacket type for each application in order for the cable to operate properly.

This Wire Wisdom will explore some of the different cable jacket types and provide an overview on the jackets’ mechanical and chemical properties.

What Is a Cable Jacket?

A jacket is the outermost layer of a cable. Its primary function is to protect the insulation and conductor core from external physical forces and chemical deterioration. The cable jacket is the first line of mechanical defense for a cable, protecting its inner components. Cable jackets offer mechanical, moisture, flame and chemical protection while also pro-

tecting the cable from damage during or after installation. It is important to note that the cable jacket has little to do with the electrical performance of the cable.

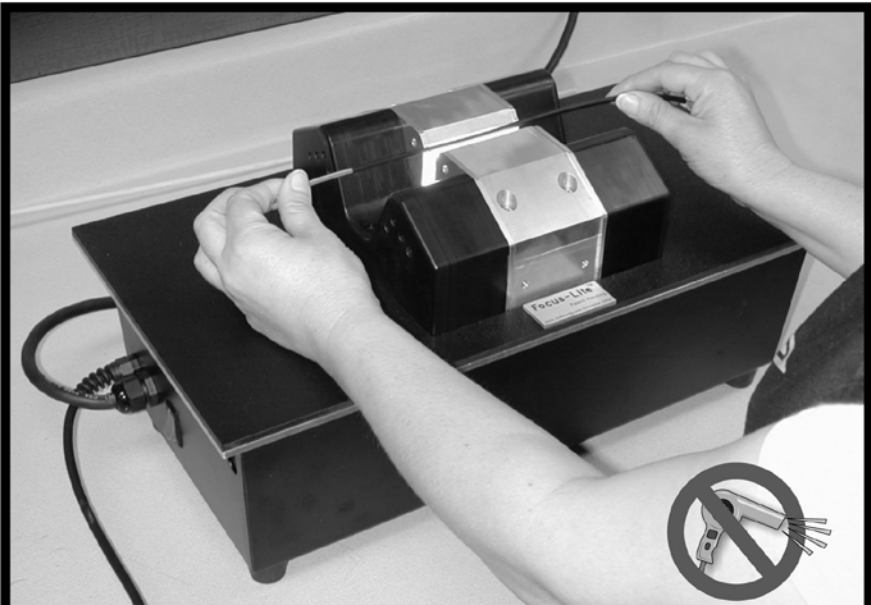
Thermoplastic Cable Jackets

Polyvinyl chloride (PVC) jackets, while not exhibiting a wide range of thermal characteristics, do have the ability to resist oils, acids, sunlight, heat, weathering and abrasion. By having such strong physical assets, PVC is an ideal jacket for cables that will be used for direct burial, street lighting and control cable. Since PVC is inherently flame retardant, it is the most common jacketing material for electronic cable.

Polyurethane (PUR) jackets have excellent oxidation, oil and ozone resistance, and when specially formulated, can also have good flame resistance. These types of jackets also have great “memory” properties, which make them ideal for retractile cords.

Chlorinated polyethylene (CPE) is one of the few polymers that is available as both a thermoplastic and a thermoset jacket (thermoset CPE would be a cross-linked version). The thermoplastic CPE jacket has excellent oxidation, heat, oil, weather/sun

Continued on page 36



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WIREwisdom™

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Continued from page 35

and flame resistance. Although the thermoset version has better high-temperature properties, the thermoplastic version contains other excellent properties.

Thermoset Cable Jackets

Neoprene is a synthetic rubber

that allows for a resilient jacket. By not embrittling at cold temperatures, resisting permanent deformation under heat, and resisting aging due to oxidation and sunlight, neoprene jackets are suitable for cables in rugged environments, such as mine trailing cables and dredge cables.

Ethylene propylene rubber (EPR), another form of synthetic rubber, is a

type of jacket that is a modified form of the EPR insulating compound. EPR jackets have excellent heat, abrasion and oxidation resistance and can also withstand cold temperatures down to -60°C. With fairly good high-temperature characteristics overall, when formulated correctly, EPR can be rather flame retardant as well.

Thermoset CPE (cross-linked) has excellent physical properties that make it suitable for many cable jacket applications. This polymer is resistant to ozone and ultraviolet degradation, and if properly compounded, can also withstand prolonged immersion in water. With strong resistance to most acids, bases and solvents, thermoset CPE jackets are well-suited for chemical plant use.

Properties of Cable Jackets

As stated earlier, jackets provide mechanical protection to the insulation and conductor core. In order to provide the best possible protection for the cable, a jacket can be modified

by the addition of fillers, plasticizers, activators and inhibitors to enhance a particular physical characteristic. Some of those physical characteristics are as follows:

- Toughness, tear and abrasion resistance
- Flexibility during cable installation, at low temperatures
- Stability over a range of temperatures
- Resistance to heat aging
- Resistance to cable deformation
- Flame resistance
- Oil resistance
- Low moisture absorption
- Resistance to abnormal concentrations of chemicals
- Weather and ultraviolet resistance

For help choosing the best cable jacket for your application, visit anixter.com/contact to get in touch with an expert.

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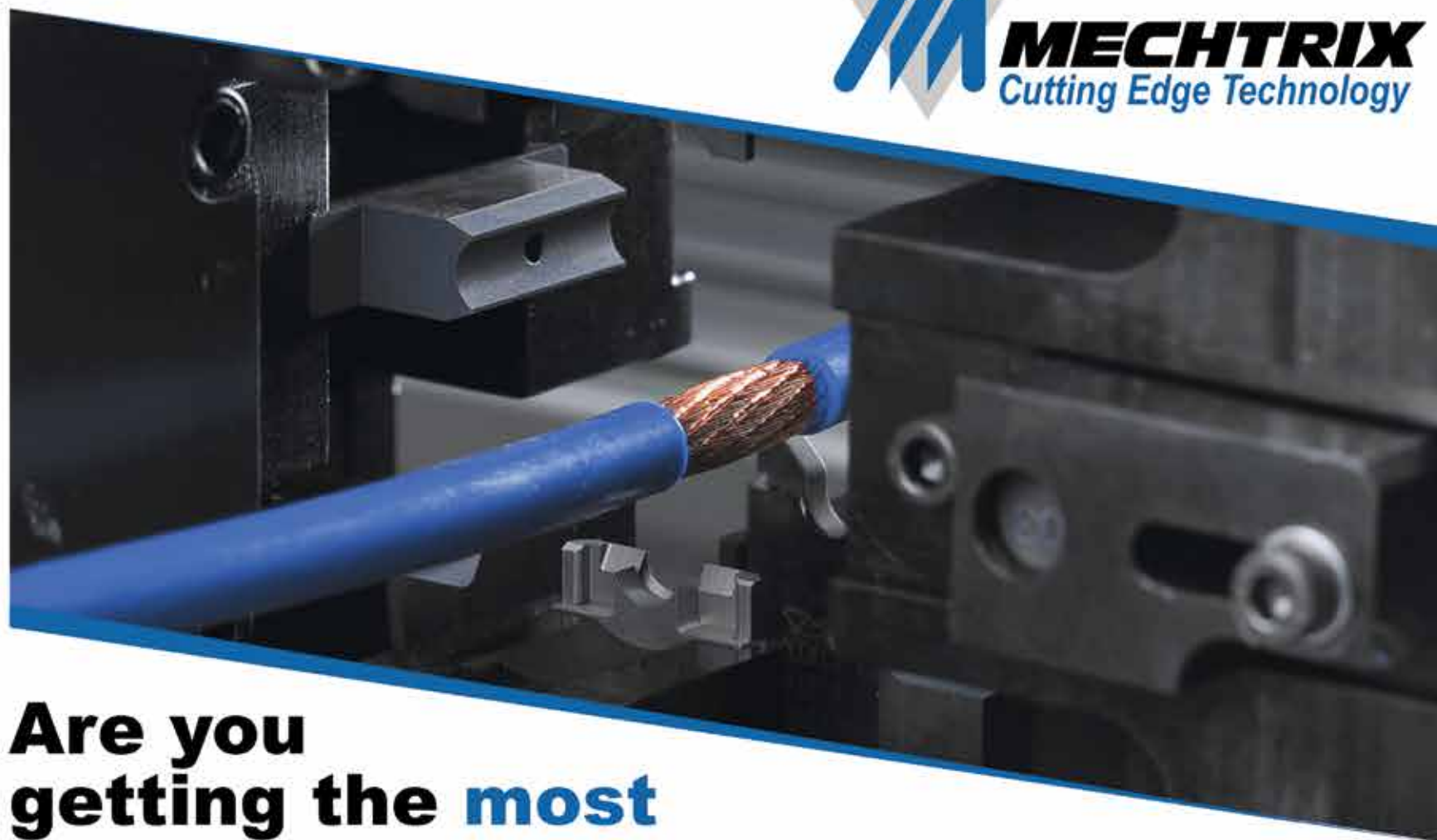
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	PVC	Polyurethane	CPE	Neoprene	EPR	CPE
Oxidation Resistance	Excellent	Excellent	Excellent	Good	Excellent	Excellent
Heat Resistance	Excellent	Good	Excellent	Good	Excellent	Excellent
Low-Temperature Flexibility	Poor to Good	Good	Excellent	Fair to Good	Good to Excellent	Fair
Weather/Sun Resistance	Good to Excellent	Good	Excellent	Good	Excellent	Excellent
Abrasion Resistance	Fair to Good	Outstanding	Excellent to Outstanding	Good to Excellent	Good	Good to Excellent
Flame Resistance	Excellent	Poor	Excellent	Good	Poor	Good
Water Resistance	Fair to Good	Poor to Good	Outstanding	Excellent	Good to Excellent	Good to Excellent
Underground Burial	Poor to Good	Good	Excellent to Outstanding	Good to Excellent	Excellent	Excellent

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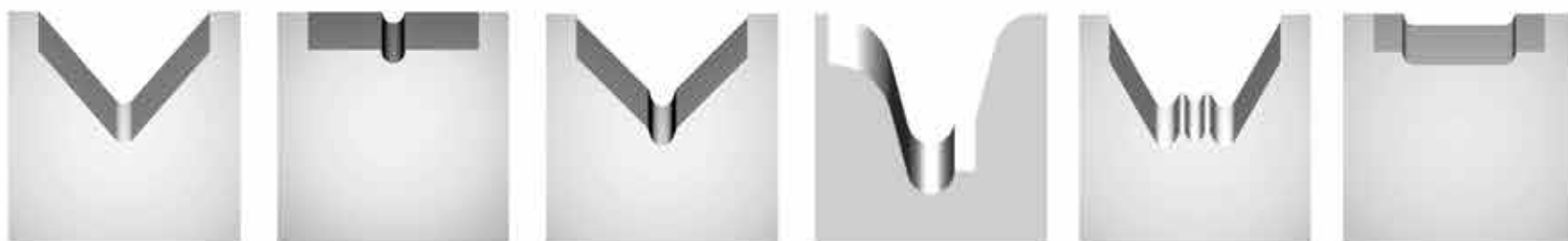
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Back to Basics

Motorsport Connectors Designed to Win the Race



In motorsport applications, every component (including an electrical connector) impacts speed and performance and can make or break a race where every 10th of a second counts. Due to their extreme nature, motorsports — whether motocross or auto racing — can present many challenges when looking for the right electrical connector. These applications require small and lightweight connectors due to significant weight and space constraints. At the same time, ensuring driver safety and component reliability is key. Fortunately, there are connectors on the market that meet the demands of these motorsport applications.

- Motorsport Application Requirements
- It's important to consider the following requirements when selecting the right connectors for motorsports:
- Vibration and shock-resistance
 - Watertight and dust resistance (usually IP68-rated)
 - Can withstand exposure to fluids (brake cleaner, in particular) and UV rays
 - Reliable performance even in high temperature operating environments

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Motorsport connectors typically use small amounts of aluminum, relying instead on primarily plastic components. While connectors and accessories may only count for a very small portion of the car’s total components, weight savings at every step can quickly add up to significant savings overall. The focus on lightweight connectors and small size have led to an increase in high-density connectors’ popularity. As more electronics are added to high-performance vehicles, miniaturized products are being used to optimize the use of available space.

A Look Inside and Outside the Vehicle

Connectors used inside the vehicle must be sealed against liquids and resistant to commonly used cleaning agents. Because panel space is minimal, mixed signal contact blocks (low/high voltage, coax, and fiber) are used. They make effective use of available space and reduce the time needed to disconnect/connect integrated communication equipment.

LEMO F-series connectors are ideal for this type of motorsport application. These lightweight, compact push-pull connectors were originally developed for racing in 1995 and are used in Formula 1 cars. These LEMO connectors provide a high-quality coupling system that is resistant to vibration and works exceptionally well for applications where EMC (electromagnetic compatibility) is vital. LEMO push-pull connectors, like the F-series, are commonly used for batteries, ECUs, fuel pumps, sensors, and communication systems.



Outside the vehicle lies the pit crew and members must be fully

armed with reliable headset equipment to communicate with others. An innovative product ideal for pit crew members is the Stingray Series from Amphenol LTD. These connectors are low profile, compact, and sealed to withstand exposure to rain, dust, dirt, and chemicals. They feature a magnetic, non-keyed mating system which allows for easy mating without the need for pre-alignment nor the operation of a coupling mechanism. This series is optimized for USB 2.0 & Ethernet protocols and is an excellent solution for audio, power or data signals, while it also sits flat against the body to prevent damage and snagging.

Data Acquisition

Data acquisition is key to achieving high performance and safety in motorsports, and data comes from multiple systems on the vehicle. That means that the vehicle data must have a very high signal quality, and the connectors and accessories must be both robust and reliable.


TE Connectivity Raychem Heat Shrink Boots are a cable accessory designed to handle harsh conditions while preserving the reliability and signal quality needed. Raychem heat-shrinkable boots provide long-term protection against extreme temperatures, corrosion, and mechanical damage, and are even rugged enough to be used in crash dummy tests. They also offer added electrical insulation as well as flame resistance, environmental sealing, and strain relief.

Engine Compartments

One of the harshest environments for motorsport applications is the engine compartment, where electrical connectors must handle extremely high temperatures, shock loads, extensive vibration, and mechanical oil.

The LEMO M-series micro-circular connectors are well adapted for use in high-performance, rugged environment engine compartments. Made

Continued on page 40



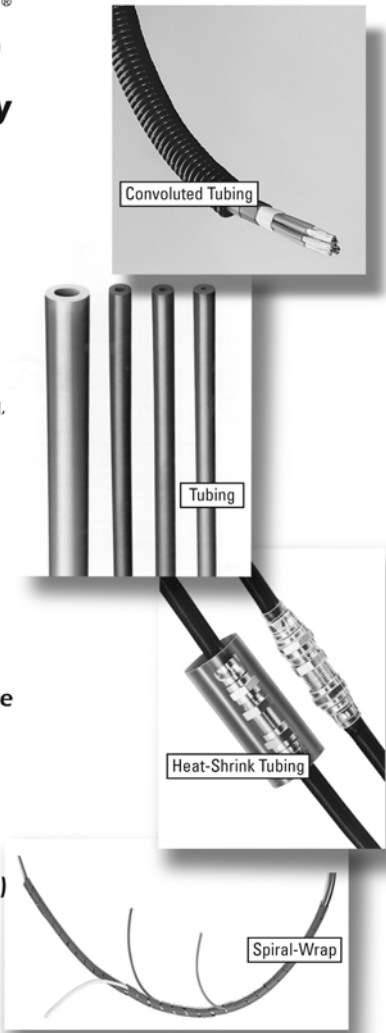
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Motorsport Connectors Designed to Win the Race

Continued from page 35

of high-strength aluminum, they are high vibration and shock resistant, oil and fuel resistant, sealed to IP68 when mated, and provide 360° screening for full EMC shielding. These lightweight M-series connectors can handle temperatures up to 200°C (392°F) and have a triple start ratchet coupling type with a one-grip ratchet screw system that enables a quick and secure coupling of the connectors. Additionally, the LEMO M-series connectors have an arctic grip that allows for simple, frustration-free manipulation of the connector while wearing gloves or when the connector is located in a difficult to access area.

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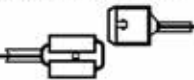
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One Million Reshoring Jobs Added 2010 to 2020

More than 1 million U.S. jobs added from 2010 to 2020: 1H2020 Reshoring Initiative Data Report

Despite the challenges of COVID-19, reshoring is up this year with 110,000 projected job announcements, which will bring the total to more than 1 million between 2010 and 2020. In 2021 and beyond, reshoring will continue to be essential to recovery in manufacturing and the U.S. economy.

More takeaways from the Reshoring Initiative Data Report:

- Because of the pandemic, U.S. reshoring is outpacing FDI for the first time since 2014. In response to uncertainty, companies are emphasizing operations in their home countries.
- The PPE, medical, tech, and defense industries should benefit most from national demand to shorten supply chains, close gaps for essential products and make the U.S. less vulnerable. Already, 60% of reshoring cases after March 2020 mention the pandemic as a factor in reshoring decisions.
- Efforts by MEPs, EDOs and states to enable reshoring continue to grow, and the Reshoring Initiative is deeply involved in these efforts. By year's end, we will be working with 50 or more companies to reshore approximately 100 products. As a measure of corporate interest, the demand for this ser-

vice in 2020 is more than 20X the rate in 2019. Companies are doing their best to reshore, and we are here to help.

- Going forward, Joe Biden will prioritize reshoring highly but apply different methods than President Trump.

For data on individual states, industries, regions and more, read the full Reshoring Initiative 1H2020 Data Report at <https://www.reshorennow.org>.

Heilind Electronics Introduces ecomate® RSSM (Rugged Superior Seal Metal) Connectors from Amphenol Sine Systems


Heilind Electronics, a leading global distributor of electronic components, has added Amphenol Sine Systems' ecomate® RSSM (Rugged Superior Seal Metal) series connectors to its selection of heavy-duty interconnects.



The circular, metal connectors provide a rugged, sealed connection for factory automation, industrial heavy equipment, transportation and harsh indoor or outdoor applications. Additionally, they are IP69K-rated in the mated condition and offer UV and corrosion resistance.

Modeled after MIL-DTL-26482 connectors, the ecomate® RSSM features

Continued on page 45



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What exactly are Incoterms?

“Incoterms” is an abbreviation for “international commercial terms”. They are a set of rules, published by the International Chamber of Commerce (ICC), that define the responsibilities of sellers and buyers for the delivery of goods under sales contracts. A trademark of the ICC, Incoterms is registered in countries all over the world, holding universal meaning for buyers and sellers across the globe. Incoterms is used by worldwide shippers to determine who is responsible for the shipping, insurance and tariffs on items that are shipped. These terms come in handy as they help to resolve trade disputes and misunderstandings that can occur between traders. As a manufacturer of goods, it’s important to understand Incoterms so that you can have

clear understandings of who is responsible for which charges. This will significantly improve customer satisfaction.

When were Incoterms last updated?

Although Incoterms® 2010 is still considered acceptable, Incoterms® 2020 came into effect at the beginning of this year. According to the ICC, “Incoterms® 2020 contains the ICC rules for use of the 11 Incoterms® trade terms. It takes into account the latest developments in commercial practice and updates the rules to make them more accessible and easier to use.” As of January 1st, the ICC stresses, all sales contracts should make reference to the Incoterms® 2020 rules. They are available on the ICC’s new e-commerce platform ICC Knowledge 2 Go in both print and digital formats.

“The 2020 edition is available in no fewer than 29 languages — from Estonian and German to Pashto and Spanish,” they report, “More than 250 launch events and training seminars are also being organized worldwide by ICC national committees. What’s more, there is even an online course and certificate program available from our educational arm, the ICC Academy.”

What are some important Incoterms considerations?

As outlined by Export.gov, it’s important to know who is responsible for paying all applicable tariffs and local taxes when you export goods to another country. Many companies require their buyers to make these payments. Buyers, however, generally wish to know the grand totals of their charges, including shipping and taxes,

when making their purchases. These total charges are known as “landed costs”. It’s important to be clear about your policy on tariffs. This is because you may not necessarily know what the landed costs are for your shipments before they are shipped. “The shipping companies you select often act as freight forwarders, helping you complete shipping documents, helping you estimate duties and taxes, pre-paying them for you, and then invoicing you,” explains Export.gov, “If you use the U.S. Postal Service for lighter weight shipments, its local partner in the buyer’s country will collect duties and taxes.” For more information about Incoterms and how Flux Connectivity makes it easy for you to accept our international shipments, please don’t hesitate to give us a call at 1-800-557-FLUX or email us at connect@fluxconnectivity.com.

Thanks to Flux Connectivity for contributing this article. Flux Connectivity is a Harness Manufacturer based in Calgary, Alberta, Canada, but with a global client base. The United States makes up a very large portion of those clients. Flux usually pays the costs associated with shipping and duties. But they also strictly adhere to Incoterms.

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NEWS PLUGS continued



Continued from page 43

a robust zinc-alloy body and a nickel-aluminum bayonet coupling system for a secure connection. This durable connector supports ratings of up to 45A and 600V for standard contacts and up to 300A and 630V for RADSOK® contacts. The ecomate® RSSM also offers a great deal of flexibility: It is available in 8 shell sizes with a choice of machined, stamped and formed, RADSOK® or PCB contacts in 32 insert arrangements.

Visit Heilind's website for more information about Amphenol Sine Systems' ecomate® RSSM metal circular connectors.

About Heilind Electronics

Heilind Electronics, Inc. (www.heilind.com) is one of the world's leading distributors of connectors, relays, sensors, switches, thermal management and circuit protection products, terminal blocks, wire and cable, wiring accessories and insulation and identification products. Founded in 1974, Heilind has locations throughout the U.S., Canada, Mexico, Brazil, Germany, Singapore, Hong Kong and China.

About Amphenol Sine Systems

Amphenol Sine Systems designs, manufactures and supplies high-performance industrial interconnect systems, including environmental and heavy-duty connectors. These products are used in factory automation, motion control, heavy equipment, and

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Find out more: <https://www.lemo.com/en/products/low-voltage-connector/b-connector>.



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NEWS PLUGS continued



Continued from page 45

ShowMeCables Releases New Line of M12 Cables Designed for Demanding Industrial Applications

ShowMeCables, an Infinite Electronics brand and a leading supplier of connectivity solutions, announced today that it now offers a comprehensive line of M12 cable assemblies from economy to premium models designed to address demanding indus-

trial networking applications where vibration, liquid and dust are a concern. These new L-com brand M12 cable assemblies were built to endure the harshest environments often found in factory automation, oil and gas, wastewater, process automation and other industrial networking applications where harsh conditions prevail. Each assembly utilizes a M12 connector that features a secure, screw-down connection to prevent the ingress of liquids and fine particulates that could cripple critical control networks. Options and features include straight wire, Cat5e and Cat6a rated assemblies in IP67, IP68 and IP69K ver-

sions. These assemblies are offered with male, female and right-angle connector combinations using A,D and X-coded connectors. Plus, this line includes M12 to M12, M12 to RJ45 and M12 to cut-end options, and even metal armored versions for the most demanding industrial applications. "Many of our customers are now requiring cable assemblies that can withstand the rigors of industrial networks. To fulfill this need, we have just launched our new lines of M12 cable assemblies that ensure the highest quality connectivity along with same-day shipping to address critical network uptime requirements," said Dustin Guttadauro, Product Line Manager. ShowMeCables new M12 cable assemblies are in-stock and available for immediate shipment. For inquiries, ShowMeCables can be contacted at +1-888-519-9505.

About ShowMeCables:

ShowMeCables is a leading eCom-merce brand that specializes in providing a large portfolio of in-stock IT, voice, video, and data network cables and connectivity products. Show-MeCables is the chosen supplier for network and IT infrastructure cable assemblies used by professional installers and consumers alike. Backed by a highly knowledgeable support staff of industry experts, the company offers its full inventory of in-stock products while also providing best-in-class customer and technical support. Show-MeCables is an Infinite Electronics company.

About Infinite Electronics: Based in Irvine, Calif., Infinite Electronics offers a broad range of components, assemblies and wired/wireless connectivity solutions, serving the aerospace/defense, industrial, government, consumer electronics, instrumentation, medical and telecommunications markets. Infinite's brands include Pasternack, Fairview Microwave, L-com, MilesTek, Aiconics, KP Performance Antennas, PolyPhaser, Transtector, RadioWaves, ShowMeCables, INC Installs and Integra Optics. Infinite Electronics serves a global engineering customer base with deep technical expertise and support, with one of the broadest inventories of products available for immediate shipment.

TE Connectivity Introduces AMPSEAL 16 High Temperature Connectors

These connectors are an extension of the popular AMPSEAL 16 series and offer greater temperature range and increased design options. As an extension of the well-proven and widely known AMPSEAL 16 series, TE Connectivity (TE), a world leader in connectivity and sensors, has introduced AMPSEAL 16 high temperature connectors. These new connectors offer greater temperature range and increased design options. Compared to 125°C for the standard AMPSEAL 16 connectors, AMPSEAL 16 high temperature connectors allow for a 20 percent increased temperature range of up to 150°C. They also have a

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higher flammability rating of UL94 V-0 and two sealing options for SAE and ISO wires. Differentiated with a new gray colored housing, these high temperature variants can be easily identified, and the 4 discrete color polarization keys help prevent miss-mating. In combination with the fully assembled one-piece-design, AMPSEAL 16 high temperature connectors are a cost-effective, easy to handle and easy to assemble product line.

“Meeting the needs of our customers is paramount and continues to be top of mind for us,” said Denis O’Sullivan, product manager at TE Connectivity. “Our new AMPSEAL 16 high temperature connectors offer a simple and reliable solution that enables customers to manage, purchase and efficiently stock supply chain.”

AMPSEAL 16 connectors, targeted for truck and bus, off-road, heavy-duty industrial, recreational and agricultural industries, are the perfect solution for on-engine applications, after treatment systems and other high temperature applications increasing the design options throughout the vehicle or machine.

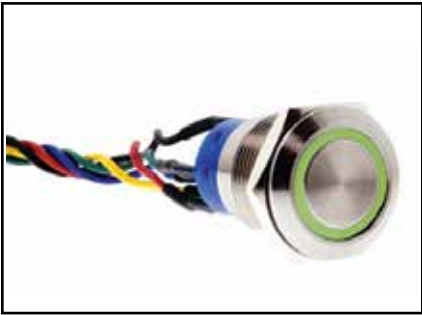
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E-Switch Anti-Vandal Switches with Wired Leads Now Available at Heilind Electronics

Heilind Electronics, a leading global distributor of electronic components and authorized distributor for E-Switch, has expanded its ULV anti-vandal switch series with three prewired options.

ULV series anti-vandal switches are designed for applications that are subjected to harsh use. These durable and robust push-button switches feature 19 mm (ULV4 series), 22 mm (ULV7 series), and 25 mm (ULV8 series) panel cutouts and multiple switch functions. The switch design offers tamper resistance and anti-jamming properties. In addition, the IP67-rated and UL-certified ULV series provides a long operating life of up to 1 million (momentary) and 500,000 (latching) cycles.

All ULV models feature a ring lens style, along with a variety of body and actuator finishes. The models also offer an array of LED color options, including bi-color choices and multiple illumination voltages.



Applications for anti-vandal and tamper-proof switches include audio-visual and security devices, industrial controls, marine and watercraft equipment, ticket kiosks, electrical appliances and medical equipment.

Visit Heilind’s website for more information about E-Switch Anti-Vandal Switches.

Follow Heilind on Facebook at [facebook.com/Heilind](https://www.facebook.com/Heilind) and on Twitter at twitter.com/Heilind.

About E-Switch

E-Switch has been delivering quality electromechanical switches to the telecom, high tech, medical, electronics, instrumentation, industrial, audio/visual, appliance and consumer mar-

kets since 1979. Products include tact, anti-vandal, pushbutton, rocker, toggle, slide, DIP, rotary, keylock, snap action, power and illuminated switches.

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THE

POWER WOMEN

OF THE WIRE HARNESS INDUSTRY

By Melissa Femia

This edition of The Power Women of the Wire Harness Industry features Lorena Martinez, an Industrial Engineer who works at Amphenol PCD in Beverly, Massachusetts. Although Lorena grew up in the Bronx, New York, her path to working as an engineer on the US East Coast was a convoluted one that took her out of the country for college. She was determined to return to the US, but faced a unique challenge in finding a position from another continent.

Lorena was born in the United States, where she attended elementary and secondary school. Her mother worked as a babysitter and was a stay-at-home mom while her dad owned two grocery stores in the Bronx. She did not derive from engineers nor does she recall having much STEM exposure in primary school. However, she first gained interest in engineering during middle school once she realized the neat activities that her cousin was working on as an engineer at a makeup company. At the time, her cousin was working on process improvements primarily aimed at increasing efficiency. Later in high school, Lorena contemplated being a veterinarian, considering engineering as her alternative plan.

After attending school in New

York, Lorena's family moved from the Bronx to the Dominican Republic when Lorena was 17 years of age. She and her younger sister relocated with the family to their retirement home, while Lorena's brother stayed in the USA as he was already attending college. Initially, Lorena did not prefer to move. She was a Junior in high school at the time. She was able to speak and write in Spanish, but assimilating in to a new environment left her lost for a while. Lorena finished her secondary education in The Dominican Republic. She specifically remembers one day when the school had visitors. One of the speakers, an Industrial Engineer, spoke interestingly of her profession and influenced Lorena to again consider engineering as a career. Lorena was not intrigued by going to college in the Dominican Republic because her mindset was on moving as quickly as possible back to the USA. However, since she lost her opportunities for US scholarships once she moved, she finally opted to attend the Pontificia Universidad Catolica Madre y Maestra in the Dominican Republic.

Lorena chose to major in Industrial Engineering. During her first year of the program, she toured a cement plant and a beer manufacturer. After those visits, she knew that she was destined to work in a manufacturing company in the area of quality. In college, Lorena advised that only about 10% of the engineering program population was comprised of females, though there were more females in Industrial Engineering than the other engineering disciplines. The instructors were male. She and the other females often studied together. They shared a common sentiment—they all felt like had to prove that they deserved to be included in the program. During college, Lorena worked at a call center for a company that made credit

card machines, Datavimenca. Post college, she remained at the company as a Quality Supervisor. However, she was looking for something a little different.

Lorena decided to start a job search in The United States of America, particularly in New York and Massachusetts since she had nearby family. At times, she was interested in an opportunity but the hiring company would not conduct a video-conference interview. Since she could not afford to travel for each interview, she missed some potential opportunities of interest. She was finally able to schedule multiple interviews during one week, which better justified her travel expenses. As a result of that week's visits, she was offered two jobs—one with Amphenol in MA and the other in NY. She opted to work at Amphenol even though she had only one contact in the state.

At Amphenol, Lorena started as a Quality Engineer. One of her main initial points of contact was another female Quality Engineer who was a strong, positive influence for Lorena. Others with whom she interfaced were also supportive and welcoming. After 1 ½ years with the company, Lorena became a Manufacturing Engineer in the cable area. In her first years, Amphenol intends to introduce her to various departments where she can gain exposure and experience.

Lorena mentioned that during her time in the Dominican Republic, she often attended school after her work day. In the office, she dressed professionally in skirts that were minimally of knee length. Then, she had to carry heavy books and sometimes cement blocks while in her work attire.



Melissa Femia

At times, her walk invoked comments from not only students but also a professor who teased her that 'one of the men could carry the block' for her. At times like these, she recognized that women faced inimitable challenges. Also in terms of obstacles, she struggled to find a job in the USA from outside of the country. When interviewed, some businesses were afraid to hire her because they did not understand the college system outside of the United States and were concerned that her university degree may not have been accredited or on par with degrees granted by US universities.

When I asked Lorena what advice she would provide to females considering a career in engineering, she stresses that they need to be dedicated because engineering is a little difficult. However, the career is satisfying and one in which she gained so much knowledge. She suggests that the individual find her tribe because it's more enjoyable and easier to travel the engineering journey with others.


Thank you, Lorena, for sharing your story.

If you are interested in sharing the stories but missed the original WHN distribution, the articles are available on the Jana Diversity Solutions website at www.janadiversity.com, or at wiringharnessnews.com.


If you know a female engineer who would make a great candidate to feature in the Power Women series, please direct them to me at melissa.femia@janadiversity.com



Lorena Martinez



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An-Mar Wiring Systems

When you first approach the building that An-Mar Wiring Systems, Inc. houses its production in, you probably would not guess that the building has been a manufacturing business for nearly four decades. The family-owned company, first established in the early 1980's, has been a prominent supporter for "Made in the USA" since its conception. Nestled in a suburban neighborhood on the edge of downtown Mishawaka, Indiana, a small town on the outskirts of Studebaker's South Bend, An-Mar has maintained the same dedication to its customers for 39 years.

With its central location in the Midwest and its proximity to larger cities like Chicago, Detroit, and Indianapolis, An-Mar is at the crossroads of major business and manufacturing hubs that position it as both connected to larger markets and rooted in the values and reliability customers come to associate with a small-town business. Over the years, An-Mar has developed a committed rapport with customers across the Midwest and the continental United States, with customers taking their products internationally.

An-Mar was founded in 1981 by Dean Johnson, who took a leap of faith when he resigned from his previous employer to start a business of his own. Getting off the ground took some time, making speed controls for massaging units and solenoids for mercury relay switches was the start. Then in 1984, An-Mar purchased its first molding machine and started molding NEMA5-15 plugs. An-Mar grew at a nice rate for its first 20 years in business. Things plateaued for the next few years until the housing bubble burst of 2008. When Dean retired in 2009, the company was taken over by his sons, Craig and Mike, who now run and work at the business alongside their small team of employees. Things have certainly changed in the world within and around An-Mar, and in the nearly 40 years the company has been in business, An-Mar is no stranger to confronting challenging times, both in the country and internationally. When standard power cords became a commodity item due to Chinese imports, An-Mar looked for more specialized plugs to mold. The company eventually found its niche in the submersible pump industry.

"When I obtained the company, the economic environment at the time was declining and led to incredibly challenging times to U.S. manufacturing. In particular, U.S. manufacturing that is not considered high-tech," Craig said.

As a shift in international policies ushered other countries into the World Trade Organization, changing the way companies in the United States looked at sources. Companies that had once considered "Made in the USA" the standard now felt that unless a company had at least some of their product made in Asia, they were not getting the best price. Therefore, much of the country outsourced across the globe looking for cheaper labor, and companies like An-Mar saw business as they knew it shift under the changing standards. This shift in labor practices caused An-Mar to lose about 40% of its customers, beckoning An-Mar to do whatever they could to ensure the customers who stayed knew they chose the right company to do business with.

An-Mar gives what many international companies cannot: an on-

the-ground, personable relationship with its customers. The business has a home-field advantage of being able to meet with its customers face-to-face and provide them with quality service and a loyal business relationship that many international entities can't promise. And despite these labor struggles throughout much of the 2000s and into the 2010s, and along with the challenges connected to the economic downturn in 2008, An-Mar has been able to maintain loyal customers, staying afloat with agreements and fulfilled promises of exceptional customer service, quick turnaround times, and affordable shipping options.

An-Mar most prominently advertises its use of thermoplastic elastomer and flexible PVC in its production of electrical molded plugs, for which the company produces roughly 100,000 units per year. These plugs are primarily used for the submersible pumps, which An-Mar has been producing since 1989, and recreational vehicles. An-Mar uses both thermoplastic elastomer and flexible PVC interchangeably, depending on customers' wants and needs. The motivation for choosing the correct material requires an analysis in the end user's product's various environmental factors, like UV, contaminants, and other elements which products of-

ten endure throughout their lifetime. Flexible PVC is more cost effective but thermoplastic elastomer is more resilient under certain environmental factors.

The company uses five 35-ton Autotectors in its facility, maximizing their resources to make the plugs. The process yields quality and consistent results, particularly for companies looking to protect their electrical connections for a reasonable price.

"I believe our experience with submersible pumps and recreational vehicles are beneficial to the solar and wind power industries who obviously have their electrical connections in rain, sleet, snow and other kinds of environments that would be as challenging as electrical connections in the submersible pump and recreational vehicle industries," Craig said.

An-Mar's primary goal is to help their customers be competitive in this extremely competitive global market. Craig tell his customers that he is always willing to visit with their engineers and resolve any difficulties they may have. When judging the sufficiency of plugs for products, there are a few characteristics An-Mar considers that are especially important to ensure the product will efficiently work for its maximum duration.

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Zuken USA Announces Partnership with Delta Sigma Company

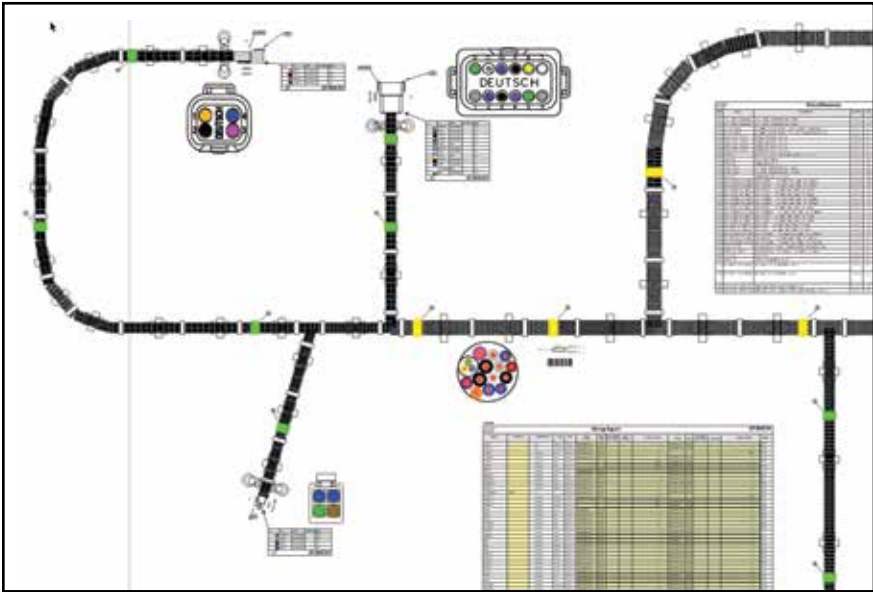
Zuken USA Inc., and Delta Sigma Company announced a partnership to bring enhanced manufacturing using augmented reality to the wire harness design and manufacturing process. Harness Builder for E3.series, part of Zuken’s popular electrical harness design suite of tools, now has the capability to drive Delta Sigma Company’s ProjectionWorks. This partnership falls under Zuken’s digital engineering initiative, providing a solution consistent with digital engineering practices by eliminating spreadsheets and manual processes.

ProjectionWorks, an award-winning manufacturing automation solution, uses projection-based augmented reality technology to provide step by step visual instructions for harness assembly. By visualizing the cable assembly connection points, routing, and instructions, manufacturing pro-

ductivity is dramatically improved.

“ProjectionWorks is the latest innovation in augmented reality technology, enabling smart manufacturing processes which save businesses time and money,” said Craig Cappai, president of Delta Sigma Company. “It is really exciting to work with Zuken to bring to market a new production process for wire harness design that has the potential to significantly boost productivity.”

Harness Builder for E3.series utilizes an extensive database of connectors, cables, wires, labels, clips, cable protection, and other harness accessories to design a complete wire harness. Using the seamless interface, detailed design information is passed to ProjectionWorks for the sequencing of tasks to build the physical harness. Wire and cable design data can also be sent directly to state-of-the-art wire cutting and labeling machines



Harness Builder for E3.series utilizes an extensive database of connectors, wires, and other harness accessories to design a complete wire harness.



Wire harness assembly with projected work instructions..

for automated processing. Using ProjectionWorks, working notes and part positioning are projected directly onto a formboard to facilitate accurate assembly of the harness. Once the harness has been created digitally, test data can be delivered directly from Harness Builder for E3.series to all major automated harness testing machines.

“As products become more and more complex, leveraging the latest technologies such as augmented reality for manufacturing is key to our success,” said Kent McLeroth, president of Zuken USA Inc. “Partnering with Delta Sigma combines the best in wire harness design and manufacturing that will ultimately boost our mutual customers’ productivity. We will continue to identify and collaborate with exceptional partners like Delta Sigma Company to deliver the latest in design and manufacturing solutions consistent with our digital engineering initiative.”

Harness Builder for E3.series supports the custom wire and cable harness market and is designed specifically for harness manufacturers for the accurate quotation and full creation of nail-board/peg-board docu-

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mentation. Harness manufacturers can save time while easily creating their harness documentation from drawings or a wirelist. Using Harness Builder for E3.series for digital design, combined with ProjectionWorks for assembly, it is now possible to make fast, accurate harness estimates, design the harness, and manufacture that harness in a highly productive manner.

The ProjectionWorks integration is available today in Harness Builder for E3.series 2020. Learn more by viewing this on-demand webinar: Augmented Reality Meets Harness Manufacturing <https://www.zuken.com/us/resource/webinar-augmented-reality-meets-harness-manufacturing/>

About Zuken

Zuken is a global provider of leading-edge software and consulting services for electrical and electronic design and manufacturing. Founded in 1976, Zuken has the longest track record of technological innovation and financial stability in the electronic design automation (EDA) software industry. The company's extensive experience, technological expertise and agility, combine to create world-class software solutions. Zuken's transparent working practices and integrity in all aspects of business produce long-lasting and successful customer partnerships that make Zuken a reliable long-term business partner.

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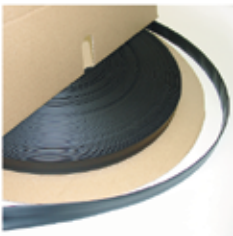
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Solder Sleeves and Splicing in Shields

By Michael Traskos

Shielded cables are necessary. They provide necessary EMI protection to ensure signal fidelity, and in some cables, such as coaxial cables, the shield is integral for signal transmission. Trying to use only non-shielded cables in any modern design would encounter such a significant impact on performance, it may not be possible except for a limited number of applications.

Because of this need for shielded cables, there is a wide range of components and supporting technologies to ensure proper use and reliable transmission of data. One of these technologies is a device to help with shield termination. Here, we review the need, use, and installation of solder sleeves.

Basics

If the cable's shield were simply cut back and not terminated, this would leave a gap in the EMI protection creating an opportunity for electromagnetic noise to disrupt

the signal integrity. Maintaining a continuous shield around the component conductors reduces the potential for EMI.

As a shielded cable arrive at connectors, if the connector is not designed for the termination of only that cable, it becomes vital for multiple cables to share the shielding to the connector shell. The shield termination at the connector becomes more complicated as the number of cables into a single connector increases (trying to properly terminate 10 shields at a single connector is not a trivial task). Solder sleeve products are designed to address the splicing and termination needs of shielded cables.

Installation

For installation, cable jacket is first stripped back to expose the shield. The length of this jacket removal is application dependent, but should be trimmed back enough that the shield and solder splice will not impact inserting component wires into the connector (this will likely be 1 – 5 inches depending on the number of wires into the

connector and the connector size). The cable's shield is then trimmed back away from the exposed cable end such that only a short segment of the shield remains exposed. The length of exposed shield will vary based on the cable size and solder sleeve combination and will range from 35 mils – 300 mils.




Using solder sleeves is a straightforward process that involves removing jacket, trimming back the shield, aligning the splice and applying heat.


The solder sleeve is then installed over the exposed jacket and shield. Here is where the magic of the solder sleeve comes in. The solder sleeve device itself is a heat-shrinkable thermoplastic sleeve that contains fluxed solder. When heated, the thermoplastic sealing ring at both ends of the splice contracts to provide an environmental seal. Furthermore, the thermoplastic sealing rings also act as strain relief on the solder sleeve – shield connection point by damping the impact of any cable flexing.

With further heating of the solder sleeve, the solder in the solder sleeve melts creating a bond with the cable shield. If the solder sleeve has a ground wire, the shield is now electrically bonded with the ground wire that can now be terminated to the connector backshell.

- Types**
- There are several types of splices that fall under the AS83519 standard for heat-shrinkable solder type shield terminations. These include:
- /1 that are supplied without a ground lead. This is so a solder sleeve can then have a ground wire added during installation. This device is classified as environmentally resistant. These also have a thermal indicator for indicating if sufficient heat has been applied to the solder-sleeve for the solder to wet and hopefully make a good connection with the ground wire.
 - /2 These are similar to the /1 type but they are supplied with a ground lead.
 - /3 These solder sleeves are supplied with a ground lead that is a shield braid. The shield braid enables improved termination in shielded harness applications. Whereas the ground wire from the /2 construction could be terminated in a connector contact, the shield braid is not intended for termination in contacts.
 - /4 These solder sleeves are designed to terminate multiconductor cables. The solder sleeve has multiple holes, one for each of the cable's component wires. A nice feature of these solder sleeves is that not every hole has to be filled; when heat is applied, the thermoplastic will seal any unused hole.
 - /5 These are like the /2 but are ROHS compliant.
- Testing**
- There are several tests that are defined in the AS8319 standard and may be employed as part of the solder sleeve's qualification and quality assurance. These include:
- Recovery of the Thermoplastic – verify that thermoplastic property contacts with the application of heat.
 - Longitudinal Change - verify the solder sleeve length does not change after the application of heat.
 - Copper Mirror Corrosion- verify the solder sleeve does not cause corrosion.
 - Voltage Drop - verify the millivolt drop across the sample is low.
 - Insulation Resistance – verify the solder sleeve's thermoplastic seal.
 - Dielectric Withstand Voltage – verify the solder sleeve's thermoplastic seal.
 - Tensile Strength - verify the quality of the solder sleeve – shield connection.



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 - Heat Aging – verify performance after high temperature exposure.
 - Flammability – verify meets aerospace flammability requirements.
 - Vibration – verify solder sleeve – shield electrical integrity after exposure to a vibrational environment.
- A much larger wire harness that creates additional stress on the wires
 - Because the wire harness has a larger circumference, the wires exiting the splice are likely to be at a tighter angle
 - May no longer fit into clamps and require a larger clamp to be installed

Splicing in a Conclusion

The use of shielded cables requires the use of additional components to ensure their reliable installation. In the cases where additional termination solutions are needed, the use of solder sleeves can be considered. The AS83519 (or military version M83519) solder splices may be used for this application. To ensure that you are using quality products is not easy. Lectromec’s ISO 17025 accredited lab can help with part performance verification, testing, and analysis to find out more, contact Michael Traskos at mtraskos@lectromec.com.

About the Author

Michael Traskos has been involved in wire degradation and failure assessments for more than a decade. He has worked on dozens of projects assessing the reliability and qualification of EWIS components. Michael is an FAA DER with a delegated authority covering EWIS certification and the chairman of the SAE AE-8A EWIS installation committee.

Installation Reminders

While many of the EWIS wires and cables now are rated for operation in temperatures at or over 200C, just like much of the supporting equipment, AS83519 shield terminations are only rated up to 150C. This does limit their use at lower temperature parts of the aircraft. When using these devices, just like with other splices, it is important they, as much as possible, are staggered. Failure to do so can have multiple negative impacts which include:

KEY TAKEAWAYS

- * To properly terminate shielded cables, the use of solder splices is sometimes needed.
- There are a variety of solder splice options to address an application’s specific needs.
- Solder splices go through a range of performance verification tests before qualification.

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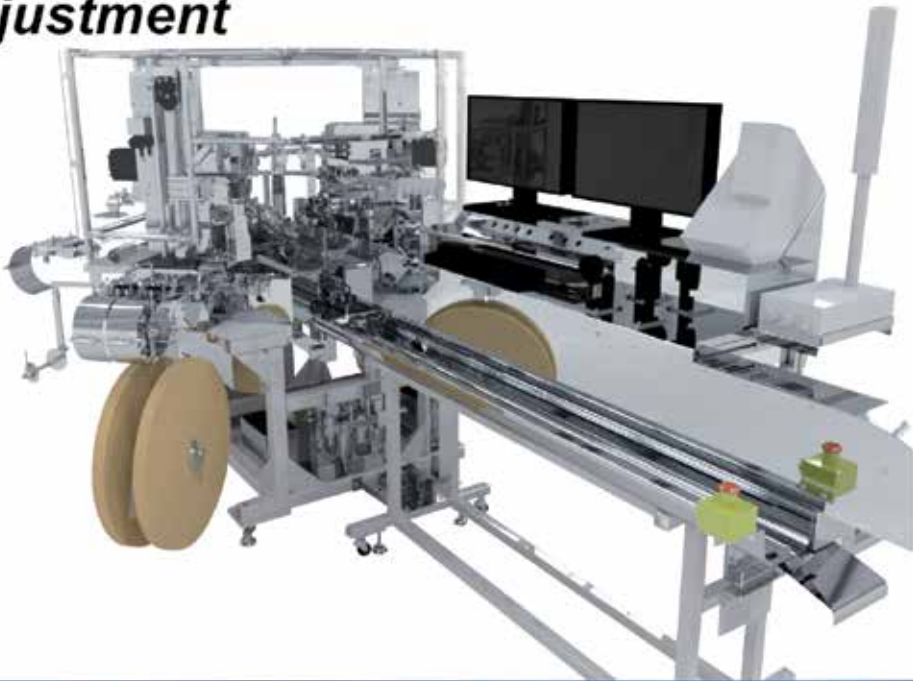
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IPC APEX EXPO 2021 will be offered virtually, March 8-12, 2021. "Given ongoing COVID-19 health and safety concerns and continued restrictions for large gatherings and events in California, it was not feasible to safely convene the nearly 9,000 expected participants at IPC APEX EXPO 2021," said IPC President and CEO John Mitchell. "The event will now take place in a safe, all-virtual format."

While the event is going virtual, IPC APEX EXPO will still be the place to connect, collaborate and learn as the event's virtual platform will allow attendees, exhibitors and speakers to easily navigate more than 100 technical conference sessions and professional development courses as well as product demonstrations, and schedule one-on-one meetings with exhibitors. As an added bonus, technical conference sessions will be available to registered attendees for replay, providing a unique opportunity to take advantage of education for 90 days after the event.

And rounding out the immersive experience, attendees can attend multiple keynotes, a "meet and greet" with IPC Hall of Famers and Emerging Engineers, participate in a virtual trivia event, and learn about cutting edge products and technologies during daily exhibitor new product introductions.

Mitchell added, "Be it in person or via an online platform, it is IPC's goal to maintain IPC APEX EXPO's position as the premier event for the electronics manufacturing industry, providing practical applications for learning - knowledge that attendees can immediately apply to their work and as well as far-reaching insights that can be applied toward implementing future technologies. Wherever in the world you may be located, IPC APEX EXPO 2021 is the place to be."

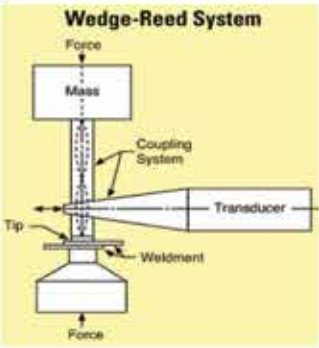
Registration for IPC APEX EXPO 2021 is expected to open December 17. To view schedule at a glance and exhibitor list, visit www.ipcapexexpo.org. IPC APEX EXPO will return to an in-person format in 2022 and will take place January 25-27, 2022 at the San Diego Convention Center.

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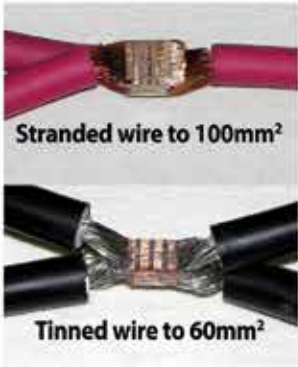
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The Tiny Connector that Saved Christmas

TE Connectivity, a \$12 billion global industrial technology leader whose connectors and sensors usually enable electric vehicles, medical devices, smart factories and other technology that makes the world safer, sustainable, productive and connected, is ensuring that the star atop the Rockefeller Center Christmas tree shines bright throughout the holiday season.

After dealing with some problematic connections last year, Rhode Island-based Orion, the fabrication partner responsible for ensuring that the star's 3 million Swarovski crystals remain fully lit at the top of the 75-foot tree, came to TE for a better solution.

At first, Sara Mulkey, inside sales representative for TE's Industrial and Commercial Transportation business, was confused why Orion, a company known for creating extravagant events and attractions, was reaching out to a team whose products generally can be found inside buses or construction equipment. But it made sense once Mulkey learned more about the problem.

"The connectors were failing, and they needed something much more robust," Mulkey said. "They saw our

sealed connectors on TE.com and after learning more about how our products are designed to perform flawlessly in harsh environments, they knew we were the perfect partner to reach out to for help."

They needed a strong and durable connector that would handle wintry weather conditions high above Manhattan and keep the 106,000-lumen star glowing over the city. (For comparison, a 100-watt light bulb clocks in at around 1,750 lumens.) The connector, to be used on the power supply cord to the star, needed to be waterproof and able to withstand high strain, as the connector would be put to the test as the star was hoisted to the top of the tree. They ended up selecting TE's DEUTSCH HD30 connectors for the treetop star, as well as its replica on the ground that allows visitors a close-up view.

Though the conditions at Rockefeller Center aren't as rough as what these connectors face in their more common applications on a city bus route or construction site, ensuring a reliable connection for the star is important, especially in 2020, when the tree acts as a beacon of hope at the end of a challenging year for everyone.



TE Connector brings Rockefeller Center Tree to light.
(Photo Courtesy of Diane Bondareff/AP Images for Tishman Speyer)

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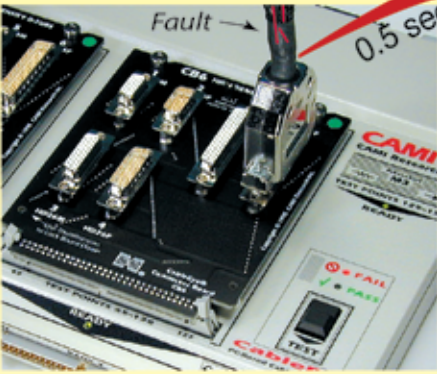
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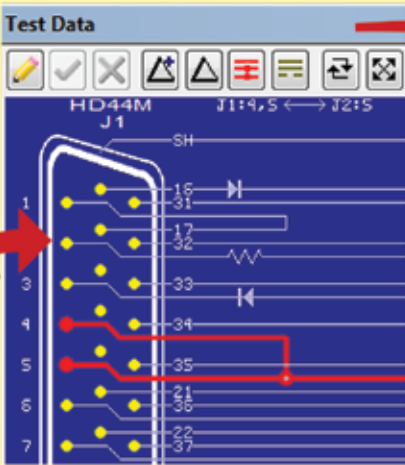
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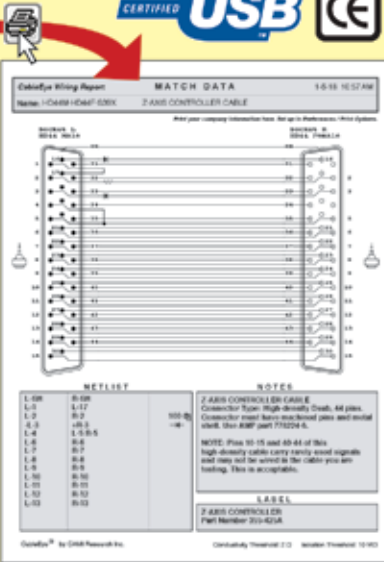
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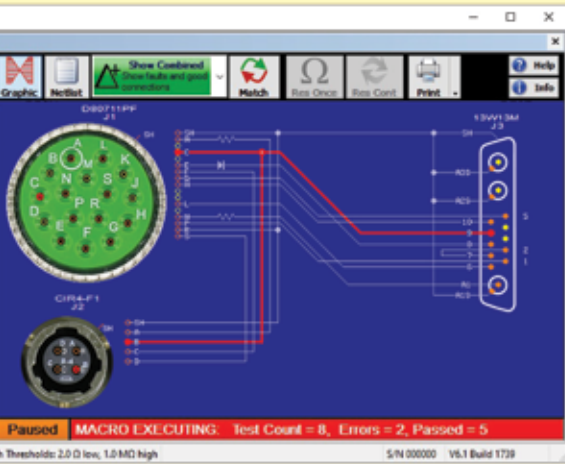
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Start the New Year by Harnessing the Power of TWO Industry Organizations with ONE Membership

By Christine Siebert

A little background on the WHMA organization first. The Wiring Harness Manufacturer's Association® (WHMA) was established in 1993 to serve and dedicate their resources to the global cable and wire harness industry. WHMA is the ONLY trade association exclusively representing the cable and

wire harness manufacturing industry including manufacturers, their suppliers and customers. The Wiring Harness Manufacturer's Association is dedicated to providing our members the technical support, access to leading edge technology, benchmarking and the ability to network with the leaders in wire processing equipment, services and manufacturing. As an affiliate with IPC since 2019, IPC brings additional benefits and

their expertise. IPC is the only trade association that brings together all the players in the electronics industry: designers, board manufacturers, assembly companies, suppliers, and original equipment manufacturers. WHMA's goal is to "LEAD", "EDUCATE" and "CONNECT" their members to resources that make them industry leaders. WHMA leads by providing members knowledge exchanges of best practices through partici-

pation at events, peer networking and sharing valuable information online. Educating the industry with the only industry-consensus standard for the Requirements and Acceptance of Cable and Wire Harness Assemblies, IPC/WHMA-A-A620. WHMA connects their members and promotes the value of building relationships throughout the year. The WHMA membership is currently comprised of over 200 manufacturing companies and over 55 supplier organizations.



"WHMA membership has provided our company the opportunity to share ideas, discuss challenges and innovate through networking opportunities. We have built relationships with colleagues, competitors, and industry specialists. Those relationships have been invaluable to our organization." Jason Zoubek, Absolute Quality Mfg., Inc.

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