InFocus
Wire & Cable

Connecting With Cables


Hybrid cables with many different ingredients


Pneumo-optical cable solution for materials-handling robots

Think about it — cables are everywhere. They keep the world connected and working.

"While wireless technologies such as Bluetooth are useful for many data applications, copper- and fiber-based cable systems are still the most reliable and widely used method of moving energy and data between components of electrical and electronic equipment," says Rich Buchicchio, vice president of Leoni Tailor-Made Cable in Fairfield, NJ. "For industrial automation, medical electronics, transportation systems, you name it, cables are vital."

Because cable technology is a relatively mature technology, designers often pay little attention to cabling during project planning. Buchicchio says the reason is they expect to find what they need closer to installation.

This usually works when power requirements, voltages, and currents are within normal parameters and when operating environments are relatively benign. "It may only be through operational experiences like high cable-failure rates that buyer remorse sets in," explains Buchicchio. "A custom cable designed for the wear and tear of this application would last a lot longer and prove over the long haul to be more cost-effective."

He says there are situations where standard just won't do. "Perhaps more of them than you think," he adds. Many installations require a high degree of precision and durability in the same cable, especially in industrial automation, where cables can be subjected to repetitive high-flex and torsional stresses. "Only the toughest custom cables can survive the impact of millions of flexing and twisting cycles — often in environments which also subject them to heat, vibration, corrosive chemicals, and/or frequent showers of hot welding sparks."

Custom cables are designed to meet operational specifications precisely. Everything must fit — stranding, cabling, binding, shielding, jacketing, and even the choice of primary conductors. This individualized design approach means the cable product can meet seemingly contradictory requirements. For example, it can be made to be fully EMI shielded yet be slim, flexible, and rugged — an unlikely combination for standard cables.

"Designing custom cables begins with a thorough application analysis. A great deal of product optimization is achieved through this process," says Buchicchio. By asking the right questions, the custom cablemaker can develop a complete profile of cable properties based on the mission and operating conditions. (See Sidebar: "Cable Selection: All Things Considered" for a detailed list of cable categories, requirements, and properties.)

For example, are particularly low or high currents to be transmitted? Will the cable be subjected to chemical attack or high temperatures? Will the cables do continuous movements? Are there safety or appearance issues? Is this product application for export?

"The most popular sub-species amongst specialty cables," says Buchicchio, "are hybrid designs that integrate primary conductors and signal lines and also include, as required, hoses to transport fluids and gases."

He says compact hybrid cable systems take up less space and are easier to terminate to the system than the melange of separate standard cables they replace. "In the long run, they tend to be more reliable than complex harnesses — a big plus in the 'total cost of ownership' comparison."

One example of this all-in-one approach is the patented pneumo-optical cable recently introduced by Leoni for materials-handling robots. "The all-inclusive hybrid comprises one 3/8 in. polyurethane pneumatic tube for the gripper, two optical fiber conductors for high-speed data transmission, and five conventional fine-stranded wires for power and control," says Buchicchio. "A tough outer jacket made of abrasion-resistant and flame-retardant PUR — the most popular thermoplastic elastomer for cables in industrial automation — protects the entire ensemble from wear and tear. A patented hybrid connector developed for this universal supply cable allows operators to connect and disconnect all components and media — power, air, and light — with a single click."

More information on cables is available by contacting Leoni Tailor-Made Cable, 271 U.S. Hwy. 46, Fairfield, NJ 07004, calling 866-536-6422, writing in *40* on our reader service card, visiting www.leoni-tailormadecable.com, or replying online at www.pddnet.com.

Cable Selection: All Things Considered

Designing custom cables should begin with a thorough application analysis. So says Rich Buchicchio, vice president of Leoni Tailor-Made Cable in Fairfield, NJ. By asking the right questions, the custom cablemaker can develop a complete profile of cable properties based on the mission and operating conditions.

Let's take a look below at a variety of considerations that should be examined:

Category	Requirement	Cable-Property
electrical characteristics	high currents	large conductors
	high power	high-quality conductors
		heat-resistant primary insulation
	low current	high-resistance insulation
	low power	effective shielding
		"low noise" provisions
	high voltages	high voltage withstand
		high test voltages
		Low corona / corona-free
impedance characteristics	high frequencies	defined transmission line
		low loss dielectric
safety requirements	approvals	UL, CSA, VDE, CE, etc.
materials	flammability	flame tests
		non-combustible
		self-extinguishing
	thermal load	non-flammable material
	toxicity and corrosiveness of combustion products	halogen-free materials
service life	flexure and torsion endurance, abrasion resistance	combination of design and materials selection
	environmental and climatic aspects	combination of design and materials selection
installation	flexibility	finely stranded conductors, soft plastics
handling characteristics	size	miniaturization
termination	compatibility with specialized connectors	specialized (hybrid) configurations