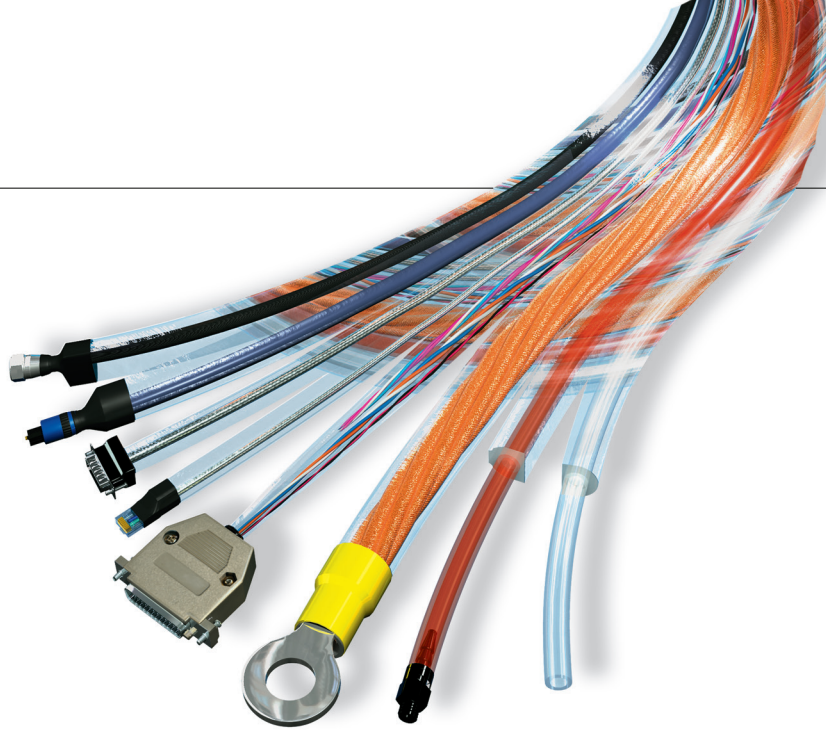


# InterConnect



A supplement of Design World • December 2013

**2013 Handbook**  
A look at cable, wire, cable  
carrier and connector  
technologies



# Flat Cables

**Three common types of flat, flexible cables exist**—extruded Flexx-Sil, Polytetrafluoroethylene (PTFE), and molded flat cables. They all have their history from ribbon cables, which were developed for early mainframe computers in 1956 by Cicoil. Like a piece of thin band cloth ribbon, a ribbon cable is a type of cable that is flat, wide and is easy to work with. They feature parallel conducting wires and are encased in a protective material; however, they are not manufactured to withstand constant, repetitive motion and flexing, so new designs were developed.

Flexible, flat cables are used in place of round cables for easy cable management, especially in high-flex applications. They usually take up less space than round cables, often offering better EMI/RFI suppression and eliminating wire coupling issues. In addition, because the wires are protected individually and not wrapped many times over by different materials as round cables are, they are lighter in weight and offer greater flexibility. In addition, Flexx-Sil and molded flat cables can be easily custom-shaped to fit tight, unusual system requirements.

Flat cables are suited to a variety of applications, most especially in those with continuous flexing, tight routing and repetitive motion, such as robots, festoon and

automated processing equipment. But as noted above, they are also suitable to a variety of other applications, particularly in military, aerospace, medical and clean room systems.

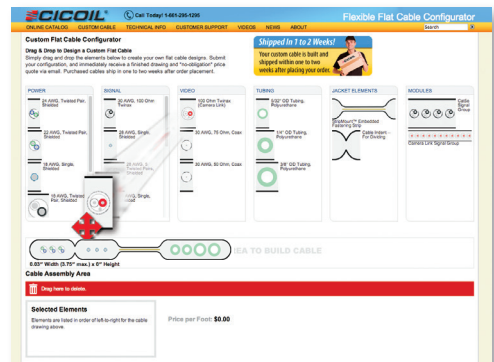
## **Flexx-Sil**

Cicoil developed an exclusive material ideally suited to high-flex, high-performance flat cable applications. Called Flexx-Sil, this advanced cable jacketing material combines the best aspects of the silicone rubber polymer with its patented extrusion process. This design is manufactured only by Cicoil, in which the cables are produced in continuous lengths. It allows multiple elements to be combined into single, flat cable, including single and shielded conductors, tubing, Ethernet, FireWire, Fiber Optics, and Coax and Twinax. In addition, high-flex wire used in this design features more finer base strands (66 × 42 AWG base strands vs. 19 × 36 in other flexible wire and 7 × 32 in

# Design. Click. Get!

Design Your Own Flexx-Sil™ Flat Cable Online.  
We'll Ship It In Just Two Weeks!

- **Drag & Drop Simplicity:** Couldn't be easier. Choose from Power, Signal, Video, Tubing, and Specialty Modules. Drag elements to the build area and watch your cable take shape.
- **Instant Pricing:** Real time dimensions and pricing as you design.
- **Engineering Drawing Supplied:** Complete your design and we email you an engineering drawing of your cable with pricing and a custom part number for ordering.
- **Ships In 2 Weeks:** We will manufacture and ship your custom cable in 2 weeks or less. Try us!



## Try It.

[Cicoil.com/design](http://Cicoil.com/design)

**CICOIL**<sup>®</sup>  
Flexible Flat Cables

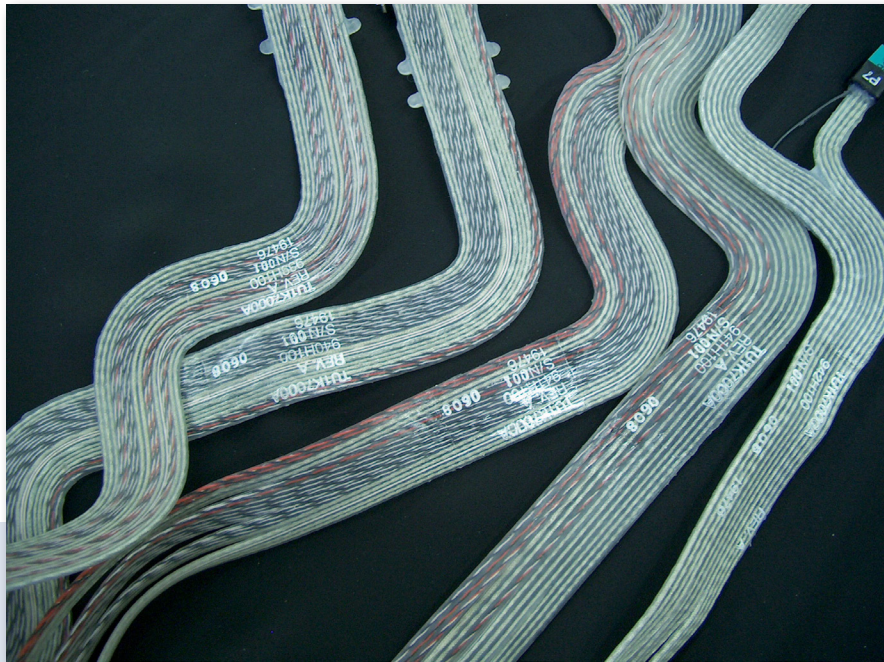
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» **Flat cables, such as Cicoil's Flexx-Sil designs,** allow for compact, unique shapes (right) and various connector types (left) to be used for data, power, and networking cables and even pneumatic tubing.

standard wire designs). This allows for greater flexibility and bendability. Because each cable is surrounded completely by the one-piece construction, Flexx-Sil offers high EMI shielding and resistance to extreme temperatures ranging from  $-65^{\circ}$  to  $260^{\circ}\text{C}$ . Finally, Cicoil's Flexx-Sil compound is self-healing from small punctures and will not wear, crack or deform due to long term exposure to vibration, water, ice, weld spark, steam, humidity, ozone, UV light, autoclave and many chemicals.

### PTFE designs


PTFE flat cables use a two-piece construction, in which two PTFE shell halves are bonded together to produce a flat cable jacket for the bundles of electrical and pneumatic wires, simplifying cable management. Clamping devices hold the wires in place. This design is available from only a handful of manufacturers, including W.L. Gore & Associates, which was the first to use PTFE to insulate cable and wires. This design reduces outgassing and particles, which is ideal for use in cleanrooms. In addition, PTFE offers an extremely high dielectric withstanding voltage and operates in temperatures ranging from cryogenic to  $260^{\circ}\text{C}$  without losing flexibility. Unlike the silicone design, PTFE is not very resistant to



abrasion and cut-through. To combat this, PTFE can be altered to enhance electrical or mechanical attributes without changing its properties.

### Molded designs

Molded flat cables are manufactured by stretching wires between pins in a mold and pouring liquid silicone or polyurethane and additives over the wires. Multiple pours are used to obtain the desired

thickness; curing takes anywhere from 24-48 hours. Because the cured cable must be cut and removed from the pins, the holes must be filled in by hand, which requires curing again. Like all flat cables, molded designs offer high flexibility, thin, compact packages, and the ability to meet or exceed electrical and environmental requirements. Molded designs can be manufactured in curves, bends and other unique shapes. They save space and weight, but their biggest advantage is that they are the lowest cost designs of the three. 



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