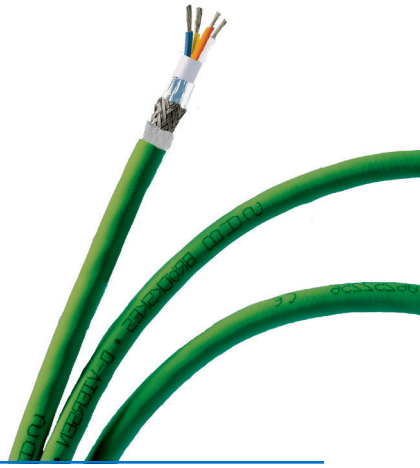
FAQs

Ethernet Cables for Industrial Applications



Where are Ethernet cables used?

For many non-industrial users, Ethernet is still synonymous with static cables built into building infrastructure to connect computers to a local area network (LAN) or perform other data transfer tasks. However, Ethernet cables are becoming an integral part of industrial machinery.

Today's industrial equipment requires the same kind of data transfer capability as your desktop computer. Ethernet cables can now be found in robotic arms and within cable tracks bringing power and data to other moving equipment. These applications require industrial Ethernet cables that can stand up to more challenging environments, more intense motion and, in some cases, mobile applications like rail cars.

What do industrial Ethernet cables need to resist?

For traditional Ethernet cables safely encapsulated in building walls, flame resistance was paramount. These cables, therefore, had a solid copper core encased in polyvinyl chloride (PVC). Industrial Ethernet cables need greater flexibility as well as resistance to a variety of chemicals, including hydraulic and lubricating oils, process chemicals, and coolants. For these reasons, cables designed specifically for industrial Ethernet usually feature oil-resistant polyvinyl chloride (PVC), thermoplastic elastomer (TPE), or polyurethane (PUR, TPU, or TMPU) jacket materials.

In many industrial applications, cables are subjected to high ambient temperatures. Jacket materials like fluorinated ethylene polypropylene (FEP) and silicone are designed to withstand these hotter environments.

What about mechanical stresses?

Industrial Ethernet cables are exposed to a wide variety of mechanical hazards not experienced by infrastructure cables. In the industrial environment, cable jacketing materials are more susceptible to being accidentally cut or run over by moving equipment or worn down by rubbing and abrasion.

Engineers also need to ensure that cables servicing moving equipment can withstand repeated and continuous motion. Ethernet cables installed in cable tracks, for example, need to be rated for continuous flexing. These more flexible cables have a different internal design than cables used in infrastructure, featuring 19 strands per conductor instead of solid conductors, for instance.

Other industrial Ethernet cables are rated for torsion to support the complex motion of industrial robots. Cables rated for reeling applications are designed to stand up to the higher tension placed upon cables during reeling and unreeling.

Are there special considerations for mobile applications?

Rail cars and ships also increasingly feature Ethernet cabling. These mobile applications are specifically concerned with preventing the ignition and propagation of flames and with preventing corrosion in outdoor and underwater environments.

Engineers specifying cables for both rail cars and ships look for cables that are flame-retardant and non-corrosive (FRNC) with low smoke and halogen-free characteristics. Rail applications must meet DIN standards while the American Bureau of Shipping (ABS) rates cables as compatible with marine and offshore applications.

How are Ethernet cables specified?

Engineers specifying industrial Ethernet cables need to take into account a variety of factors, including the flexibility required. For instance, type A cables are for stationary applications, type B cables are flexible, and type C cables are rated for continuous flexing. Additional manufacturer-specific ratings are available for torsion and reeling applications.

Cables are also labeled with the industry-specific approvals they have garnered. Common approvals include CSA Group (CSA), Underwriters' Laboratories (UL), European Union (CE and RoHS), and American Bureau of Shipping (ABS). In addition to all these specs, cables are also marked with a CAT designation indicating how they perform their data transfer function.

What do the CAT designations mean?

CAT refers to the "category" of data transfer performance from CAT3 through CAT7A. CAT3 cables are unshielded twisted pair cables that exist in older stationary wiring, but are all but obsolete in new construction. They can support a frequency of 16 MHz.

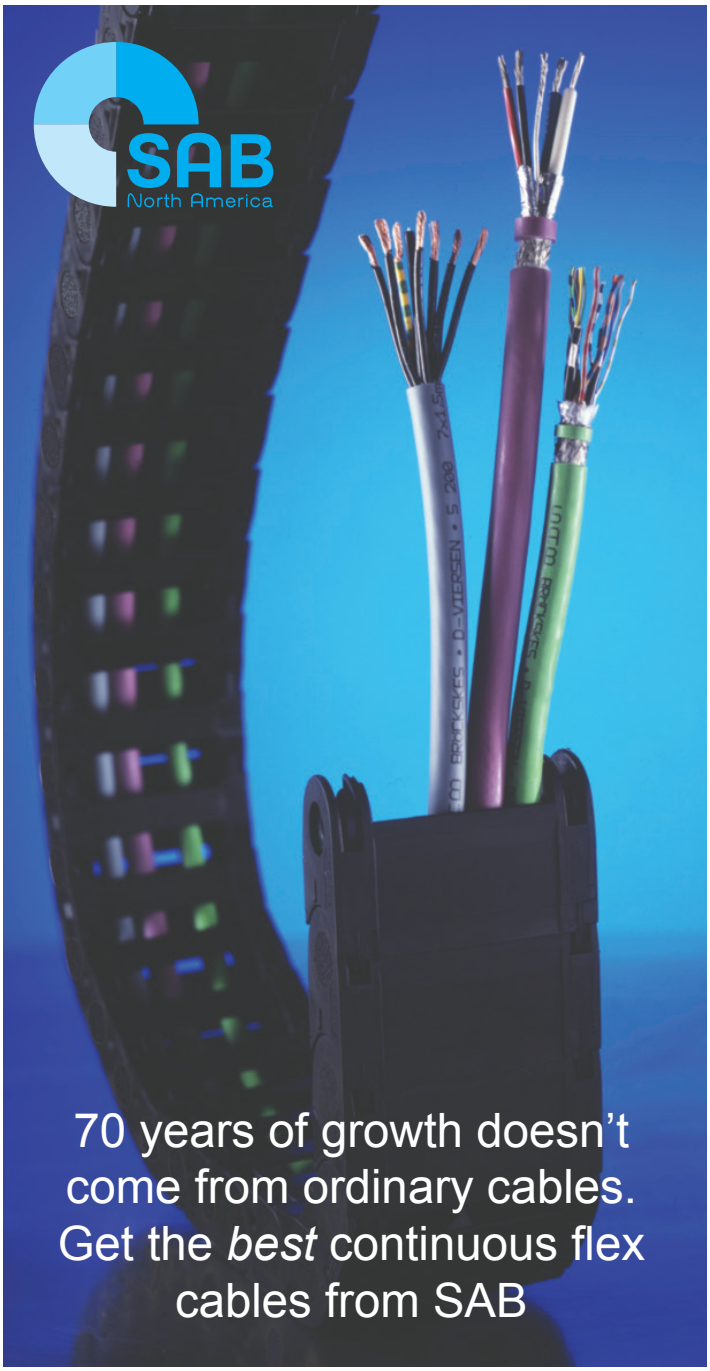
CAT4 was quickly superseded by CAT5, which features 100-MHz bandwidth by doubling the number of conductors. Enhanced CAT5 (CAT5e) uses shielded twisted pairs to reduce crosstalk and achieve 1 Gbps data speeds.

Most new equipment today is using CAT6 or CAT6A cabling. CAT6 supports 250-MHz bandwidths. CAT6A can achieve a 500-MHz bandwidth in general over distances up to 100 m in fixed installations. The admissible cable length is mostly determined by the signal attenuation.

What's next in Ethernet cable development?

CAT 7 and CAT7A are on the horizon for industrial equipment manufacturers and infrastructure builders alike per European standards (EN and IEC). These cables promise 600-MHz (CAT7) and 1,000-MHz (CAT7A) bandwidths over runs up to 100 m. However, their widespread deployment depends upon standardization of connectors and terminations.

CAT8 cables promise 2,000-MHz bandwidths but are restricted to the shorter cable run of 30 m. Manufacturers like SAB are currently developing the next generation of cables.



What if I need more help choosing the right cable?

The array of Ethernet cables offered for industrial applications can be dizzying, especially when you take into account all the factors involved–including mechanical, environmental, and data transfer capabilities. Many cable suppliers have internet resources, like SAB North America's Industrial Ethernet brochure, that can help you determine which cable you need. In addition, engineers at cable experts like SAB are available to help you find the perfect product for your application.