

Machine Vision Blog

Why Machine Vision Cable Selection is Critical to Machine Vision System Performance



An often-overlooked factor in optimizing machine vision system performance is cable quality. Where high quality output is required, using low-cost or consumer-grade cables that are not specifically manufactured to tolerate industrial applications and environments can degrade signal output and the resulting image quality.

There are inherent challenges in industrial environments that can potentially interfere with cable performance. For example, artificial lighting and ambient machine noise can create crosstalk – the unwanted transfer of signals between communication channels – which compromises the signal strength between the camera and the computer. In worst cases, the signal may never reach its destination.

Poor-quality cables not specifically designed to withstand industrial applications are particularly vulnerable to crosstalk because they do not have the proper cable shielding to insulate the signals from crossing.

Another factor to consider is that low-quality or consumer-grade cables are not designed for aggressive, repetitive bending and twisting motions. High-quality machine vision cables are equipped with industrial over-molding and angled connectors to allow for these types of repetitive actions over significantly longer periods of time before cable replacement is required. Additionally, high-quality machine vision cables that have been tested will allow you to cost-effectively plan system downtime to replace cables, minimizing the impact on your production schedule.



How to Determine Cable Quality

Machine vision cables should be built to withstand the challenges of industrial environments and applications to ensure reliability, accurate data transfer, and longer cable lifespan. Attributes to look for include, but are not limited to:

- High-quality outer jacket material
- Multi-layer shielding
- Proper connector reinforcement (Over-molding)
- 100% performance testing (not lot sampling)

As mentioned previously, an obvious indication of quality is a cable that has passed some form of performance testing. Although testing should include a minimum of near-end crosstalk (NeXT), far-end crosstalk, and return loss, there are several factors that give you a more complete picture of the cable's performance capabilities.

Performance Testing

Near-end crosstalk (NeXT): an error that can occur when a connector is attached to crossed or crushed wire pairs within a single link. Expressed in decibels (dB), the test measures noise occurring at the connector closest to the signal's point of origin in a test environment.

Far-end crosstalk (FeXT):

like NeXT, far-end crosstalk measures in dB noise occurring at the far end of the signal's point of origin in a test environment.

Return loss:

a measurement of how much signal is returned when traveling the length of a cable, and back, during testing.

Attenuation:

the noise factor that creates loss of signal strength.

The following are quality indicators that can help you to determine if a certain machine vision cable is appropriate:

Cable shielding:

quality cable shielding protects signal integrity during data transfer.

Over-molded and angled connectors:

angled cable connectors with over-molding connectors can prevent wire breakage.

Enhanced Durability:

for certain defense and military applications, Low Smoke Zero Halogen (LSZH) cable jacketing is durable enough to withstand the high temperatures of halogen.