



# 3M Industrial Camera Cable Assemblies for Machine Vision



Authorized Distributor  
Electronics Solutions



# 3M Industrial Camera Cable Assemblies for Machine Vision

Choosing the right camera cable assembly for machine vision requires options that can fit a variety of specifications and applications. 3M™ Industrial Camera Cable Assemblies for Machine Vision have been engineered to ensure seamless connectivity while supporting optimal imaging system performance for industrial machine applications (Figure1). They include the necessary connectors, power cables, trigger cables, and extension cables, and they are available for the three most common industry standards (USB3® Vision, Camera Link, CoaXPress).



**Figure 1:** Machine vision requires interfaces between the camera and the rest of the system.

This white paper presents a review of the key considerations for choosing a cable assembly, followed by a discussion of 3M solutions and a brief discussion of the most common applications.





# Choosing a 3M™ Industrial Camera Cable Assembly

Selecting the appropriate camera cable assembly product requires evaluating several factors, including matching the camera interface standard, signal integrity, reliability, transmission speed, flexibility, and cable length limitations. The primary consideration is the camera interface standard that fits your application. 3M's industrial camera cable assemblies for machine vision solutions support the three major industry standards for high-speed, high-density I/O applications: USB3 Vision, Camera Link, and CoaXPress. Figure 2 offers a visual summary highlighting the differences between the cable assembly solutions for these three standards.

	USB3 Vision®	Camera Link®	CoaXPress®
Bandwidth	400 MB/s	225 MB/s (Base) 680 MB/s (Full)	600 MB/s (CXP6) 1.2 GB/s (CXP12)
Cable length	10m	8-10m	10-35m
Multiple camera connection	Excellent	Fair	Fair
Standard PC architecture	Yes	No	No
Need additional hardware (Frame Grabber Board)	No	Yes	Yes
Realtime triggering	Fair	Excellent	Excellent
Easiness of system integration	High	Low	Low
System cost	Low	High	High

**Figure 2:** Comparing the USB3 Vision®, Camera Link, and CoaXPress standards and their assembly solutions. [Source](#)

All the cable assemblies discussed in this white paper exhibit advantages such as signal integrity, and options with EMI shielding. They also exhibit low skew and consistent reliability, even in aggressive industrial environments where machine vision is often used.

### Image data throughput rates vary by the standard chosen:

- ▶ USB3 Vision: 400 MB/s
- ▶ Camera Link: 225 MB/s base, 680 MB/s full
- ▶ CoaXPress: 600 MB/s (CXP-6), 1.2 GB/s (CXP-12)

Another key consideration when selecting a cable solution is its physical flexibility, especially for dynamic applications where movement is expected. As to bending, 3M USB3



Authorized Distributor  
Electronics Solutions



Vision solutions have been designed to be highly flexible at up to 100 million cycles of bending movement. 3M CoaXPress solutions also exhibit outstanding repeated bending durability at over 45 million cycles, while 3M Camera Link flex cables have been tested to at least 10 million cycles.

The length of transmission is also critical, and while it varies from standard to standard it also carries from solution to solution. 3M's USB3 Vision Cable solutions offer a higher functional cable length that go beyond what is typical in the USB3 Vision standard, with over 10m for stationary cables (depending on system requirements) and up to 7m for cables tested to repetitive motion. 3M Camera Link supports 8 to 10m, and 3M CoaXPress supports between 10 and 35m.





# 3M™ Camera Link Cable Assemblies

3M was one of the originators of the Camera Link standard, so it comes as no surprise that they offer a truly broad selection of cable assembly solutions including 3M MDR (Miniature Delta Ribbon) and 3M SDR (Shrunk Delta Ribbon) board mount connectors and cables for Camera Link and Power over Camera Link (PoCL) cables (including PoCL and PoCL lite). Examples of the connector possession possibility are shown in Figure 3.

### Mini Camera Link 3M™ SDR 26 position



Straight

Low profile  
right angle

### Camera Link 3M™ MDR 26 position



Straight

Low profile  
right angle

Relay cable with  
junction connector

**Figure 3:** Straight and angled connector options. [Source 3M](#)

3M Camera Link Cable Assemblies are available in various options to support applications requiring midrange data rates and system costs and can meet almost any mechanical or electrical requirements. It can also be configured to meet needs for factors such as cable distance, transmission speed, signaling voltage, inter- and intra-device connections, signaling voltage, EMI shielding and more.

The **3M Camera Link Industrial Camera Cable Assembly, MDR, 14×26 Series** is an MDR-to-MDR assembly for camera-to-frame-grabber communications. It is available in PoCL and non-PoCL, motion and non-motion versions. Note that the MDR plug connector on the camera side comes in a wide variety of configurations to support both space savings and design flexibility.

The **3M Camera Link Industrial Camera Cable Assembly, MDR, 1WL26 Series** is an MDR-to-MDR assembly for Camera Link cable extension and is available in motion and non-motion versions. In addition, it features a Straight MDR plug connector on one end and, on another end, an MDR receptacle connector with an EMI shielded junction.



Authorized Distributor  
Electronics Solutions



The **3M Camera Link Industrial Camera Cable Assembly, MDR/SDR, 1Mx26-x5xx Series** is an MDR-to-SDR assembly for camera-to-frame-grabber communications. The plug connectors on the camera side are available in a number of different configurations to support the need for space spacings, while those on the frame grabber side feature Straight MDR/SDR connectors.

The **3M Camera Link Industrial Camera Cable Assembly, MDR/SDR, 1Mx26-xFxx Series** is an MDR-to-SDR assembly for Camera Link cable extension and features a Straight MDR receptacle connector with an EMI shield junction shell on one end and a Straight SDR plug connector on the other.

The **3M Camera Link Industrial Camera Cable Assembly, SDR, 1Sx26-x1xx Series** is an SDR-to-SDR assembly for camera-to-frame-grabber communications. To support highly reliable connections even in tight or complex spaces, the camera side SDR connector on this assembly is available in straight, upward and downward versions. Angled cable connectors help reduce stress on cables, especially on motion applications, and support space savings.



# 3M™ USB3 Vision Industrial Camera Cable Assemblies

USB Vision® is rapidly being adopted as a machine vision standard. It has been found extremely effective in applications with fixed or dynamic multi-camera configurations. However, its major limitation is relatively short transmission distances.

However, 3M USB3 Vision cable assemblies are some of the longest passive USB3 Type A to Micro-B cables available in the industry. Figure 4 summarizes the distances that are supported. They also provide reliable connections even in tight or complex spaces and offer space savings of up to a 50 mm footprint per connection. And, as a result of these features, exceed the performance of generic USB3 Vision cables.

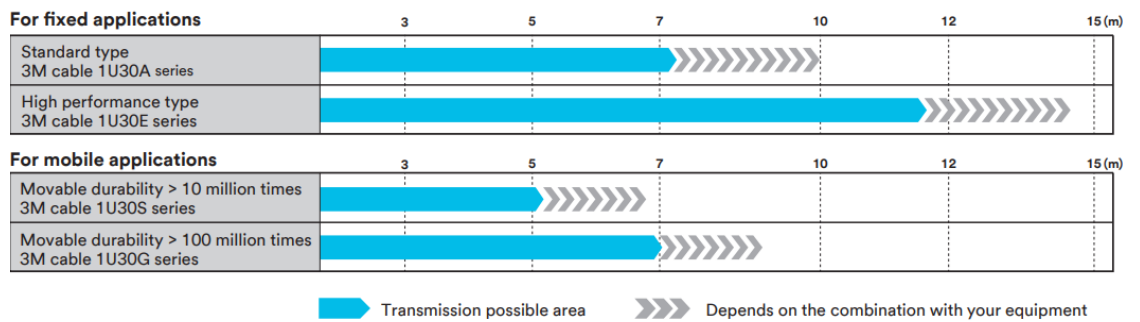


Figure 4: Figure 4. Connectable distance possible with 3M USB3 Vision cable assemblies. Source 3M

Angled Micro-B connectors in up, down, right, or left cable exits are available, as well as cable options with screw locks on the camera or host end of the cable for added connectivity confidence, even when used in moving applications. Also note these solutions have USB Micro B for end A and USB Standard A for end B.

The **3M USB3 Vision Industrial Camera Cable Assembly, 1U30G Series** is a high flex cable that works best for repetitive motion, and high-speed data transmission applications. This solution supports transmission distances up to 7m and beyond and has been tested at 100 million cycles.

The **3M USB3 Vision Industrial Camera Cable Assembly, 1U30E Series** is best for long transmission distance and high-speed data transmission applications. It supports a transmission distance up to 10m and beyond using a metal cable.



Authorized Distributor  
Electronics Solutions



The **3M USB3 Vision Industrial Camera Cable Assembly, 1U30A Series** works best for high-flexibility, and high-speed data transmission applications. It supports transmission distance up to 7m and beyond.

The **3M USB3 Vision Industrial Camera Cable Assembly, 1U30S Series** is also a flexible cable solution that is best for high-speed data transmission applications; excellent for repetitive motion applications. It has been tested at 10 million cycles.







## 3M™ CoaXPress Industrial Camera Cable Assemblies

CoaXPress (CXP) is expected to become the mainstream choice for interfacing high-bandwidth, high-speed camera interfaces for machine vision. 3M's cable assembly solution for CXP, shown in Figure 5, supports the output configuration standards CXP-6 (up to 6.25 Gbps) and CXP-12 (up to 12 Gbps per channel). They work well in both fixed and motion applications, from simple general purpose systems to high-performance applications that require not only long transmission distances but also very high bending durability.



**Figure 5:** Example of cable assembly for CXP. Source 3M

The **3M CoaXPress Industrial Camera Cable Assembly 1CXx-xx-OG Series** supports transmission distance up to 8m for CXP-12 and 11m CXP-6 and has been flexibility tested at 10 million cycles. The 3M CoaXPress Industrial Camera Cable Assembly 1CXx-xx-OS Series has longer transmission distances 10m CXP-12 and 13m for CXP-6 and has been tested at over 45 million cycles.

They work well when there is a need for long transmission distances, high-bandwidth applications, and a very durable cable flex life. In addition, the CoaXPress cable assembly solutions have easy-to-handle movable cables to support applications that require a high level of repetitive motion.



Authorized Distributor  
Electronics Solutions



## ⋮ Applications

These cable assemblies are ideal for achieving a reliable, high performance camera interface for adjusting about any application in machine vision including factory automation, medical imaging, and system integrators. From smart inspection platforms to smart delivery robots, these camera cable link assemblies support whatever industrial machine vision application being designed.

## 🔄 What's Next?

With cables, connectors, and cable assemblies from 3M, you can improve the performance, reliability, and robustness of your machine vision equipment — often at lower system costs.

If you are interested in implementing a 3M™ Industrial Camera Cable Assembly in your design, visit our website at [www.powell.com](http://www.powell.com) or contact a Powell representative at [3minfo@powell.com](mailto:3minfo@powell.com) or **(800) 776-8765** to learn more.



Authorized Distributor  
Electronics Solutions

