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BASLER VISION COMPONENTS

RS-644 INTERFACE

Basler cameras with an RS-644 interface have three connectors as shown. Input power is usually supplied by a small external power supply. Typically, a cable is used to attach the 44-pin connector to a frame grabber. The connector on the frame grabber end of the cable is specific to the type of frame grabber you are using. Basler can supply cables with connectors compatible with many common frame grabbers and can also supply cables that are unterminated on the frame grabber end. The 9-pin plug is used for an RS-232 connection between the camera and your host PC. This connection is used to parameterize the camera. Any standard null modem cable can be used between this connector and your PC. A simple, Windows® based configuration tool can be installed on your computer and used to parameterize the camera via the RS-232 connection.

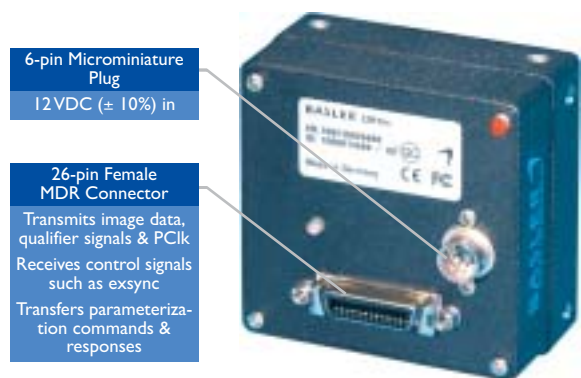


For cameras with an RS-644 interface, a frame grabber configuration file is usually needed in the PC to configure the frame grabber so that it will work with the specific type of camera attached to the grabber. These configuration files are most often available from the frame grabber manufacturer's web site.

CAMERA LINK

CAMERA LINK INTERFACE

Basler cameras with a Camera Link interface have at least two connectors with functionality as described in the labels on the camera photo. Input power is usually supplied by a small external power supply. One major advantage of the Camera Link interface is its extremely high data rates. In its base configuration, Camera Link can transmit up to 24 bits of image data and 4 bits of



qualifier data (such as line valid, frame valid, and data valid) per clock cycle at clock speeds of up to 85 MHz. Due to its multiplexing characteristics, it does this using only ten of the pins in the 26-pin connector. Camera Link also specifies a medium configuration that can transmit up to 48 bits of image data per cycle and a full configuration that can transmit up to 64 bits. A camera that uses Camera Link's base configuration will have a single 26-pin connector as shown in the photo. A camera that uses the medium or full configuration will have two 26-pin connectors. Perhaps the best aspect of Camera Link is that it is a standard electrical interface developed by a group of leading camera and frame grabber manufacturers. This means that you can use a standard Camera Link cable to connect a Camera Link compliant camera to a Camera Link compliant frame grabber. And when you do, there is no need to worry about pin-outs or signal level compatibility. Camera Link cameras can normally work with cables up to approximately 20 meters long. If you need longer cable lengths for your system, you can combine a Camera Link camera with the Basler giga-BIC for cable lengths up to 100 meters. You will

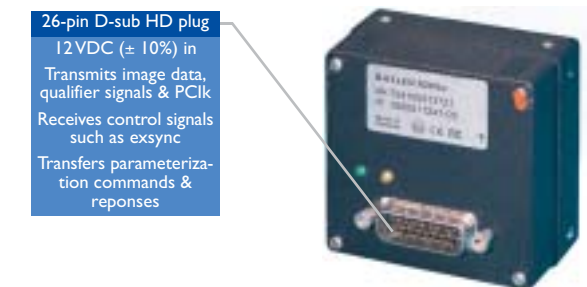
find information on the giga-BIC in the Interface Converter section of this brochure. The Camera Link interface includes four standard inputs to the camera that can be used for external sync or similar signals. It also includes a bi-directional RS-644 serial connection that can be used to transmit parameterization commands from the host PC via the frame grabber to the camera and to receive replies from the camera. A user-friendly, Windows® based configuration tool can be installed on your computer and used to parameterize the camera via this connection.

Basler cameras with a Camera Link interface usually include a "k" as part of the camera name. For example, the Basler A202k and the Basler L104k are Camera Link cameras. A frame grabber configuration file is usually needed in the PC to configure the frame grabber so that it will work with the specific type of Camera Link camera attached to the grabber. These configuration files are most often available from the frame grabber manufacturer's web site.

CHANNEL LINK

CHANNEL LINK INTERFACE

Basler cameras with a Channel Link interface have one connector with functionality as described in the label on the camera photo. The Basler Channel Link interface essentially uses the same technology as the Camera Link interface base mode. Because the Basler Channel Link interface was developed and sold before the Camera Link standard was finalized, it uses a different connector and has different pinouts than Camera Link. The Channel Link interface also uses an RS-232 serial connection for camera parameterization rather than an RS-644 connection as in Camera Link. The best news is that when a Channel Link camera is used with a simple adapter cable supplied by Basler, Channel Link cameras are completely compatible with Camera Link Frame grabbers. The cable photo shows the connectors on an adapter cable. On the camera end of the cable, there



is a single connector that plugs into the Channel Link camera. On the PC end, there are three connectors. One connector plugs into a Camera Link frame grabber in the host PC. A second connector plugs into the RS-232 serial port on the PC. The third connector is for input power. Input power can come from a small external power supply if desired. An alternative is to install a simple bracket with a connector and a jumper to the PC power supply in any open slot in the back of the PC. In this case, the camera can be powered directly from the PC and many of our customers find this to be an attractive alternative. Basler cameras with a Channel Link interface usually include a "b" as part of the camera name. For example, the Basler A201b and the Basler L104b are Channel Link Cameras. A frame grabber configuration file is usually needed in the PC to configure the frame grabber so that it will work with the specific type of Channel Link camera attached to the grabber. These configuration files are most often available from the frame grabber manufacturer's web site.

BASLER INTERFACE

BASLER INTERFACE CONVERTERS (BICS)

Some Basler customers want to take advantage of the extended capabilities available on our newer Camera Link and Channel Link cameras but need an interface that matches our earlier RS-644 cameras. The Basler k-BIC for Camera Link cameras and b-BIC for Channel Link cameras meet this need.

Another type of converter, the giga-BIC, converts the output from our Camera Link cameras to a giga-Bit Ethernet format. This converter allows transmission of image data over longer distances using a standard network connection.

k-BIC

The Basler k-BIC is a small, stand-alone unit that takes the output from a Camera Link camera and converts it to a format similar to the output on our RS-644 cameras.

The k-BIC has four connectors (two on the front and two on the rear) with functionality as described in the labels on the k-BIC photo. Power is usually supplied by a small external power supply. The k-BIC does not supply power to the Camera Link camera; a separate 12VDC power source is needed for the camera. The k-BIC connects to the camera with a standard Camera Link cable.

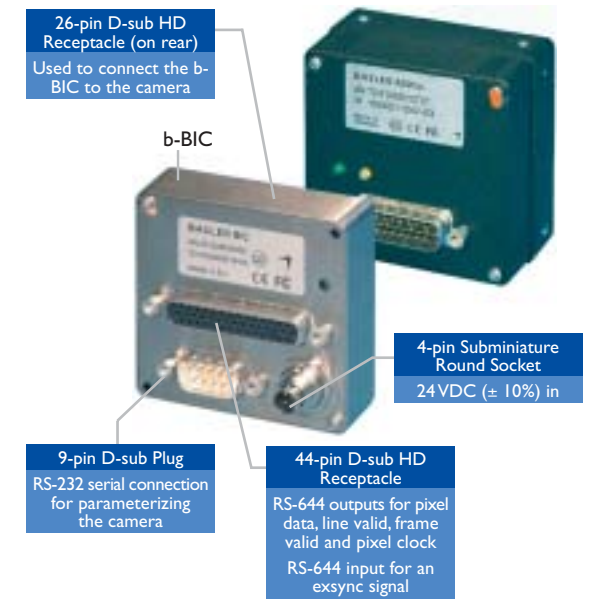
The functionality of the 9-pin and 44-pin connectors on the k-BIC directly matches the corresponding connectors on our RS-644 cameras. This makes the k-BIC ideal for users who want the advantages of our newer Camera Link cameras but need to interface to systems designed around the older RS-644 interface.

b-BIC

The Basler b-BIC takes the output from a Channel Link camera and converts it to an RS-644 interface identical to the one on our RS-644 cameras.

The b-IC has four connectors (three on the front and one on the rear) with functionality as described in the labels on the b-BIC photo. Power is usually supplied by a small external power supply and the 24VDC input on the b-BIC supplies power to both the b-BIC and the camera. The b-BIC can connect to the camera with a cable available from Basler or it can be attached directly to the back of a Channel Link camera.

The functionality of the 4-pin, 9-pin and 44-pin connectors on the b-BIC directly matches the corresponding connectors on our RS-644 cameras. This makes the b-BIC ideal for users who want the advantages of our newer Channel Link cameras but need to interface to systems designed around the older RS-644 interface.



k-BIC

b-BIC

giga-BIC



giga-BIC

The Basler giga-BIC is a small, stand-alone unit that takes the output from a Camera Link camera and converts it to a Gigabit Ethernet format.

The giga-IC has four connectors (three on the front and one on the rear) with functionality as described in the labels on the giga-BIC photo. Power is usually supplied to the giga-BIC with a small external power supply. The giga-BIC does not supply power to the Camera Link camera; a separate 12VDC power source is needed for the camera. The giga-BIC is designed for use with standard Gigabit Ethernet LAN components and is also compatible with common 10/100 LANs (an Intel 83540 based network card is recommended on Gigabit LANs for best performance). Basler's Camera Interface Application software simplifies the task of configuring the giga-BIC to work with your camera and your network.

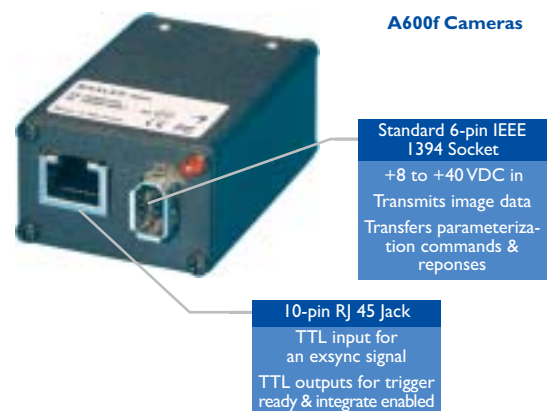
A major advantage of the giga-BIC is its ability to transfer data at high rates. But a more exciting feature for the average user is its ability to transmit data with low latency at distances up to 100 meters per network hop using a standard category five network cable. Long distance camera data transmission is finally available with standard components at a reasonable price.

IEEE 1394 INTERFACE

IEEE 1394 is basically a high-speed networking standard designed to transfer packetized video data and control signals between multimedia devices (such as digital cameras) and a PC. The IEEE 1394 standard specifies connectors, cables, and several other types of compatible electrical devices.

Basler cameras with an IEEE 1394 interface have two connectors with functionality as described in the labels on the camera photos. One connector is a standard, 6-pin IEEE 1394 socket and the other is a common 10-pin RJ-45 jack.

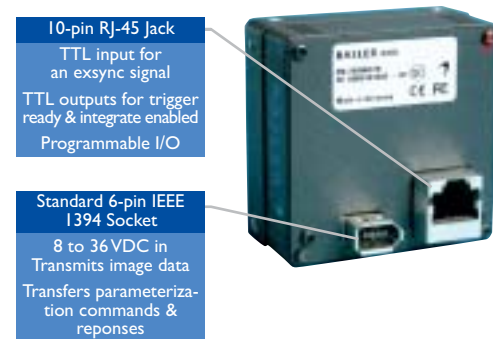
One major advantage of IEEE 1394 is that a frame grabber is not required in the PC. A simple, inexpensive IEEE 1394 adapter board allows IEEE 1394 devices to be connected to the PC. Many adapter cards contain multiple



ports allowing several cameras to be connected to a single adapter. And because IEEE 1394 is a bus system, a hub can also be used to connect multiple cameras as shown in the hub drawing. The ability to connect multiple cameras with inexpensive, standard cables, hubs and adapter cards makes IEEE 1394 very cost effective. Cameras can receive input power through the standard cable either from a powered hub or from the adapter card. (If multiple cameras are attached to an adapter card, a connection between the card and the PC power supply is necessary to supply sufficient power to the cameras.)

When you are working with industrial digital cameras that use the IEEE 1394 interface, there is another critical element to keep in mind: the *1394 Trade Association Digital Camera Specification* (or DCAM spec for short). This specification defines an extensive set of standard capabilities for industrial digital video cameras including gain, brightness,

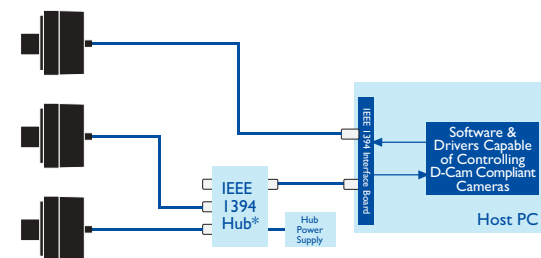
A100f or A300f Cameras



shuttering, balancing and filtering. It also defines standard image formats and standard methods for transmitting image data and

control signals between the camera and the PC. The DCAM spec is important because it allows PC software and camera drivers to be designed so that they can control the standard capabilities on any DCAM compliant camera. All Basler IEEE 1394 cameras are DCAM compliant and Basler can supply a Windows® based software/driver package specifically designed for use with DCAM compliant cameras.

The combination of standard electrical components, DCAM compliant cameras, and DCAM compliant software gives the IEEE 1394 interface another unique advantage – it is essentially plug and play. There is no need to worry about matching connectors or finding configuration files for a particular brand of frame grabber.



* When a powered hub is used with A100f or A300f cameras, the hub must supply +12VDC (± 10%). With A600f cameras, the hub must supply a voltage between +8 and +40 VDC.

BASLER INTERFACE

BASLER INTERFACE OVERVIEW

Basler is on the leading edge of interface development and we have cameras available with Camera Link, Channel Link, IEEE 1394 and RS-644 interfaces. We even offer devices that will convert the output from our newer Camera Link and Channel Link cameras to an RS-644 format or from Camera Link to Gigabit Ethernet format. From the simplicity of IEEE 1394 and the high data rates of Camera Link to the long cable lengths of Gigabit Ethernet, a Basler solution is available to meet your interface needs.

The chart below gives a quick overview of the basic characteristics of the interface types we offer. On the other pages of this brochure, you will find more detailed information about each interface.



Specification	RS-644	Camera Link	Channel Link	IEEE-1394	Gigabit Ethernet ^[1]
Topology	Link	Link	Link	Bus	Network
Adapter	Frame Grabber	Frame Grabber	Frame Grabber	Standard PC Adapter	Standard PC Adapter
Input Power	24VDC (± 10%)	12VDC (± 10%)	12VDC (± 10%)	12VDC (± 10%) or 8 to 36VDC depending on camera model	4.5VDC or 16VDC
Standard Cables and Connectors	No	Yes	No	Yes	Yes
Video Data Bandwidth	~ 17 to 60 ^[2] MBytes/s	~ 19 to 645 ^[2] MBytes/s	~ 19 to 60 ^[2] MBytes/s	~ 37.5 MBytes/s (per adapter)	~ 128 MBytes/s
Max Cable Length	~ 20 m @ 20 MHz ^[3] ~ 10 m @ 40 MHz ~ 7 m @ 66 MHz	~ 20 m @ 20 MHz ^[3] ~ 10 m @ 40 MHz ~ 7 m @ 66 MHz	~ 20 m @ 20 MHz ^[3] ~ 10 m @ 40 MHz ~ 7 m @ 66 MHz	~ 4.5 meters	~ 100 meters
Parameter Port Type	RS-322 port on the host PC	RS-644 port via the frame grabber	RS-232 port on the host PC	Via the bus	Via the network
Parameter Port Bandwidth	~ 1 kByte/s	≥ 1 kByte/s	~ 1 kByte/s	~ 8 MBytes/s	≥ 1 kByte/s
Configuration File Required	Yes	Yes	Yes	No	No

[1] This interface is available when a Camera Link camera is used with a giga-BIC converter.

[2] Bandwidth range for Basler products with this type of interface.

[3] The MHz number is the pixel clock speed of the camera.