IEEE 1394 INTERFACE

IEEE 1394 is basically a high-speed serializing standard designed to transfer packetized video data and control signals between multimedia devices such as digital cameras and PCs. IEEE 1394 specifies standard connectors, cables, and several other types of compatible electronic devices. Basler cameras are IEEE 1394 interface-based cameras connected as shown. One is a standard 6-pin IEEE 1394 socket and the other is either a 9-pin micro-D plug or a 10-pin RJ-45 jack depending on the camera model. One major advantage of IEEE 1394 is that an IEEE 1394 interface is cost required in the PC A singl, 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.

The ability to connect multiple cameras with inexpensive, standard cables, hubs and adapter cards makes IEEE 1394 very cost effective. Camera vendors receive power input through the standard cable rather than from a powered hub or from the adapter card (if multiple cameras are attached to one adapter card, a connection between the adapter card and the PC power supply is a necessary step to supply sufficient power to the camera). When you are working with industrial digital cameras that use the IEEE 1394 interface, there is another critical element to keep in mind the IEEE-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, shuttering, balancing and filtering. It also defines standard image formats and standard methods for transferring image data and control signals between the camera and the PC. The DCAM spec is important to keep in mind when designing to ensure that the standard capabilities defined in the DCAM specification are fulfilled. All Basler IEEE 1394 cameras are DCAM compliant and Basler can supply a Windows-based software/package specifically designed for use with DCAM compliant cameras.

The combination of standard electrical components, DCAM compliant camera 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. This simplifies system design and streamlines the design process, which is especially useful in industrial applications where time-to-market is critical.

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

<table>
<thead>
<tr>
<th>Interface</th>
<th>IEEE 1394</th>
<th>Camera Link</th>
<th>Channel Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typology</td>
<td>Link</td>
<td>Link</td>
<td>Link</td>
</tr>
<tr>
<td>Adapters</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Topology</td>
<td>~7 m @ 66 MHz</td>
<td>~7 m @ 66 MHz</td>
<td>~7 m @ 66 MHz</td>
</tr>
<tr>
<td>Standard Cable</td>
<td>~10 m @ 40 MHz</td>
<td>~10 m @ 40 MHz</td>
<td>~10 m @ 40 MHz</td>
</tr>
<tr>
<td>Power</td>
<td>-18 to +48 VDC</td>
<td>-18 to +48 VDC</td>
<td>-18 to +48 VDC</td>
</tr>
<tr>
<td>Max Frame Size</td>
<td>~179 to 645</td>
<td>~179 to 645</td>
<td>~179 to 645</td>
</tr>
<tr>
<td>Frame Rate</td>
<td>~1 kFrame/s</td>
<td>~1 kFrame/s</td>
<td>~1 kFrame/s</td>
</tr>
<tr>
<td>Memory Bandwidth</td>
<td>~8 MBytes/s</td>
<td>~8 MBytes/s</td>
<td>~8 MBytes/s</td>
</tr>
<tr>
<td>Frame Size</td>
<td>~19 to 60</td>
<td>~19 to 60</td>
<td>~19 to 60</td>
</tr>
<tr>
<td>Power Supply</td>
<td>24 VDC</td>
<td>12 VDC</td>
<td>12 VDC</td>
</tr>
<tr>
<td>Frame Grabber</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Frame Grabber</td>
<td>2 MBytes/s</td>
<td>2 MBytes/s</td>
<td>2 MBytes/s</td>
</tr>
</tbody>
</table>

*Hub*
Basler cameras with an RS-644 interface have three connectors as shown; input power is usually supplied by a small external power supply. A typical cable is used to connect 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. Cables are available from many common frame grabber manufacturers and can also supply cables that are unterminated on the frame grabber end. The 9-pin plug is used for an RS-122 connection between the frame grabber and your host PC. This connection is used to communicate with 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.

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.

The Channel Link interface also uses an RS-232 serial interface similar to the one on our RS-644 cameras. The Channel Link interface essentially uses the same philosophy as the Channel Link interface’s RS-232 standard. Because the Basler Channel Link interface was developed and used before the Camera Link standard was finalized, it uses a different connector and has different pinouts than Camera Link. The Basler Interface Converter (BIC) essentially uses the same connector as shown.

The Basler 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 Basler BIC can connect to a Channel Link camera with a cable available from Basler or it can be attached directly to the back of a Channel Link camera. When the BIC is used with a Channel Link camera, the camera does not require a separate power supply. The 24 VDC input on the BIC supplies power to both the BIC and the camera.

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 of our RS-644 cameras. The k-BIC has four connectors (two on each end).

A 26-pin sub-D HD plug is used for input power. The input power level is 12 VDC (± 10%) and power is usually supplied by a small external power supply. A 26-pin female HD plug is used to connect the 26-pin HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber. A 44-pin D-sub HD receptacle is used to transmit image data and control signals to a frame grabber and to receive external sync or similar signals from the camera. A 9-pin D-sub HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber.

The BIC can connect to a Channel Link camera with a cable available from Basler or it can be attached directly to the back of a Channel Link camera. When the BIC is used with a Channel Link camera, the camera does not require a separate power supply. The 24 VDC input on the BIC supplies power to both the BIC and the camera.

For cameras with a Camera Link interface, a configuration file is usually needed in the PC to configure the camera. Any standard null modem cable can be used between the BIC and the camera. A simple WindosWise® based configuration tool can be installed on your computer and used to parameterize the camera via the PC.

The Channel Link interface (C2K) 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 of our RS-644 cameras. The C2K has four connectors (two on each end). A 26-pin sub-D HD plug is used for input power. The input power level is 12 VDC (± 10%) and power is usually supplied by a small external power supply. A 26-pin female HD plug is used to connect the 26-pin HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber. A 44-pin D-sub HD receptacle is used to transmit image data and control signals to a frame grabber and to receive external sync or similar signals from the camera. A 9-pin D-sub HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber.

The Basler C2K has four connectors (two on each end). A 26-pin sub-D HD plug is used for input power. The input power level is 12 VDC (± 10%) and power is usually supplied by a small external power supply. A 26-pin female HD plug is used to connect the 26-pin HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber. A 44-pin D-sub HD receptacle is used to transmit image data and control signals to a frame grabber and to receive external sync or similar signals from the camera. A 9-pin D-sub HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber.

The Basler C2K has four connectors (two on each end). A 26-pin sub-D HD plug is used for input power. The input power level is 12 VDC (± 10%) and power is usually supplied by a small external power supply. A 26-pin female HD plug is used to connect the 26-pin HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber. A 44-pin D-sub HD receptacle is used to transmit image data and control signals to a frame grabber and to receive external sync or similar signals from the camera. A 9-pin D-sub HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber.

The Basler C2K has four connectors (two on each end). A 26-pin sub-D HD plug is used for input power. The input power level is 12 VDC (± 10%) and power is usually supplied by a small external power supply. A 26-pin female HD plug is used to connect the 26-pin HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber. A 44-pin D-sub HD receptacle is used to transmit image data and control signals to a frame grabber and to receive external sync or similar signals from the camera. A 9-pin D-sub HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber. A 44-pin D-sub HD receptacle is used to transmit image data and control signals to a frame grabber and to receive external sync or similar signals from the camera. A 9-pin D-sub HD plug on one end and a connector specific to the frame grabber on the other end is used between this connector and the frame grabber.
The RS-644 interface has three connectors in shown in the diagram. It 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 48 bits of image data and control signals per cycle and a full frame rate of up to 85 Mpix. Due to its multiplexing capability, it does not require any of the pins in the 26-pin connector.

Camera Link also specifies a second configuration that can transmit up to 48 bits of image data per cycle and a full frame rate of up to 85 Mpix. This configuration includes 16 RS-644 output pairs for pixel data, one RS-644 input pair for pixel data, and up to 32 RS-644 output pairs for control signals. This configuration is similar to the full frame rate of Camera Link. camera.

The 4-pin subminiature round plug is used for input power. A 4-pin subminiature round plug can be used for external sync or similar requirements. The photo below shows how the cable works.

BICs (BICs) meet this need. The Basler BIC takes the output from a Channel Link camera and converts it to an RS-644 interface. A BIC has four connectors that can be used with a Channel Link camera and aframe grabber.

The BIC is used with a Channel Link camera for power supply and signals. When the BIC is used with a Channel Link camera, the camera does not require a separate power supply.

A 24 VDC input on the BIC supplies power to both the BIC and the camera.
Basler cameras with an RS-644 interface have three connectors: an input power connector, a signal connector, and a power connector. 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.

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.

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 and your host PC. Any standard RS-232 modem cable can be used between this connector and your PC. A simple Winmodem based configuration tool can be installed on your computer and used to parameterize the camera via the RS-232 connection.

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 40-pin pins that Cameras Link cameras do not use. A Channel Link interface can be used between this connector and 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.

The Camera Link interface includes four standard outputs 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 receive replies from the camera. A simple Winmodem based configuration tool can be installed on your computer and used to parameterize the camera via the connection.

BASLER INTERFACE CONVERTERS

The Basler K-BIC does not supply power to the Camera Link camera; a separate 12 VDC power source is needed for the camera.
The Basler BIC takes the output from a Channel Link camera and converts it to an RS-644 interface identical to the one on RS-644 cameras. The BIC connects to a Camera Link camera with a cable available from Basler or it can be attached directly to the back of a Channel Link camera. When the BIC is used with a Channel Link camera, the camera does not require a separate power supply. The 12 VDC input on the BIC supplies power to both the BIC and the camera.
IEEE 1394 INTERFACE

IEEE 1394 is a high-speed serial bus that was developed for use as a bus for multimedia applications. It is primarily used for connecting digital cameras, camcorders, and other multimedia devices to a computer. The 1394 Trade Association manages the standard for the interface.

### IEEE 1394 Interface Details

- **Typology:** A600f or A300f Cameras
- **Transfers:** Transmits image data
- **10-pin RJ 45 Jack:** Transfers parameterization commands & responses
- **+8 to +40 VDC in**
  - +8 and +40 VDC
  - 12 VDC (± 10%)
  - 24 VDC
- **9-pin Micro D Plug:** Tranfers parameterization commands & responses
- **+8 and +40 VDC.**
  - 12 VDC (± 10%)
  - 24 VDC

### IEEE 1394 Interface Specifications

- **Bandwidth Range:**
  - ~ 10 m @ 40 MHz
  - ~ 20 m @ 20 MHz
- **Max Cable Length:**
  - ~ 4.5 meters
  - ~ 10 m @ 40 MHz
  - ~ 20 m @ 20 MHz
- **Video Data Bandwidth:**
  - ~ I kByte/s
  - ~ I kByte/s
  - ~ 8 MBytes/s
- **Input Power:**
  - 24 VDC
  - 12 VDC
  - 12 VDC
  - 12 VDC (± 10%) or 8 to 40 VDC depending on camera model
- **Topology:**
  - Link
  - Link
  - Link
  - Link Bus
- **Cables and Connectors:**
  - Standard Cables and Connectors
  - D-Cam Compliant
  - Connecting Cable
  - Frame Grabber Frame Grabber Frame Grabber Frame Grabber
  - Standard PC Adapter
  - Frame Grabber
  - Frame Grabber
  - Frame Grabber
- **Configuration Files Required:**
  - Yes
  - Yes
  - Yes
  - No

### Additional Information

IEEE 1394 is a versatile interface that supports a wide range of devices and is commonly used in various applications. Its flexibility allows for easy integration with other systems and provides a reliable method for transmitting data. With the growth of multimedia technology, IEEE 1394 continues to evolve, offering improved performance and capabilities for a variety of devices.
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. It is a PC based interface that uses standard connectors, cables, and several other types of compatible electronic devices. Basler cameras with an IEEE 1394 interface have two connectors as shown. One is a standard 6-pin IEEE 1394 socket and the other is either a 9-pin micro D plug or a 10-pin RJ 45 jack (depending on the camera model).

One major advantage of IEEE 1394 is that it is a frame-grabber and/or controller peripheral bus that allows multiple cameras to be connected to a single adapter. With A100f or A300f cameras, the hub must supply +12 VDC (±10%). With A600f cameras, the hub must supply a voltage between +8 and +40 VDC.

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 because it allows PC software and camera drivers to be re-used for other devices.

IEEE 1394 INTERFACE OVERVIEW

Basler is at the leading edge of interface development and we have camera models with RS-644, Camera Link, Channel Link, and IEEE 1394 interfaces. We even offer devices that will connect the output from our newer Camera Link and Channel Link cameras to an RS-644 format. From the simplicity of IEEE 1394 to the high data rates of Camera Link, a Basler camera 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 this page of the brochure, you will find more detailed information about each interface.

<table>
<thead>
<tr>
<th>Interface</th>
<th>RS-644</th>
<th>Camera Link</th>
<th>Channel Link</th>
<th>IEEE 1394</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typology</td>
<td>Link</td>
<td>Link</td>
<td>Link</td>
<td>Bus</td>
</tr>
<tr>
<td>Max.</td>
<td>~20 MBytes/s</td>
<td>~19 to 645 MBytes/s</td>
<td>~37.5 MBytes/s</td>
<td>~7 M @ 66 MHz</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>~18 MBytes/s</td>
<td>~15 MBytes/s</td>
<td>~8 MBytes/s</td>
<td>~7 M @ 66 MHz</td>
</tr>
<tr>
<td>Standard Cables and Connectors</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No. Cables</td>
<td>~19 to 60</td>
<td>~19 to 60</td>
<td>~19 to 60</td>
<td>~20 to 20 MBytes/s</td>
</tr>
<tr>
<td>Parameter Port</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Parameter Port Bandwidth</td>
<td>~1 MBytes/s</td>
<td>~1 MBytes/s</td>
<td>~1 MBytes/s</td>
<td>~8 MBytes/s</td>
</tr>
<tr>
<td>Max. Cable Length</td>
<td>~200 meters</td>
<td>~200 meters</td>
<td>~200 meters</td>
<td>~200 meters</td>
</tr>
<tr>
<td>Video Data Bandwidth</td>
<td>~37.5 MBytes/s</td>
<td>~37.5 MBytes/s</td>
<td>~37.5 MBytes/s</td>
<td>~7 M @ 66 MHz</td>
</tr>
<tr>
<td>Input Power</td>
<td>24 VDC</td>
<td>12 VDC</td>
<td>12 VDC</td>
<td>(± 10%) or 8 to 40 VDC depending on camera model</td>
</tr>
<tr>
<td>Frame Grabber</td>
<td>IEEE 1394 Adapte Card</td>
<td>Basler Camera Solution</td>
<td>Basler Camera Solution</td>
<td>IEEE 1394 Adapte Card</td>
</tr>
<tr>
<td>Bus Type</td>
<td>Frame Grabber</td>
<td>Frame Grabber</td>
<td>Frame Grabber</td>
<td>Standard PC Adapter</td>
</tr>
</tbody>
</table>

And because IEEE 1394 is a bus system, a hub can also be used to connect multiple cameras as shown below. The ability to connect multiple cameras with inexpensive, standard cables, hubs and adapter cards makes IEEE 1394 very cost effective. Camera users receive input power through the standard cables 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 camera.

When you are working with industrial digital cameras that use the IEEE 1394 interface, there is another critical element to keep in mind: the IEEE 1394 trade association standard DCAM specs (for DCAM as per short). This specification defines an extensive set of standard capabilities for industrial digital video cameras including gain, brightness, 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 a important because it allows cameras designed to keep the cost of these capabilities down. All Basler IEEE 1394 cameras are DCAM compliant and Basler can supply a Windows based software 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.