Overview

Camera  Basler A102K with mvTITAN-CL

Running modes
- Freerunning  [X]
- ExSync mode  [X]  Level-controlled or programmable

Resolution
- Horizontal  1392 pixel
- Vertical   1040 pixel
- Bits per Pixel  8 or 10 bpp
- Binning       []
- Partial Scan  []

Timings
- Pixel clock   28 MHz
- Horizontal   [h. freq.] kHz
- Vertical     14.8 fps

MATRIX VISION GmbH Frame Grabber
- Typ  mvTITAN-CL
- Line Enable by  camera  [X]  Frame Grabber  []  external  []
- Frame Enable by  camera  [X]  Frame Grabber  []  external  []
- Trigger by  external  []  Frame Grabber  []  Frame Grabber  [X]
- Flash by  camera  []  Frame Grabber  []  external  []

Software
- MVacquireControl  [X]
- mvIMPACT Go!  [X]
- Other  []  [e.g. LabView™, Halcon, etc.]

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This document requires the general knowledge of the usage and the technical data of the used frame grabber, camera and application.
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Windows95™, Windows98™, Windows98se™, WindowsNT4.0™, Windows2000™, WindowsXP™ are trademarks of Microsoft, Corp. All other trademarks are the property of their respective holders.
**Freerunning Mode**

Camera generates its own timing and sends images and signals for synchronization continuously to the frame grabber.

**Signal map**

![Signal Map Diagram]

**Camera settings set by software**

For setting up the camera the Camera Configuration Tool (CCT+) is needed. You can download the latest version of this tool from the homepage of Basler AG ([www.baslerweb.de](http://www.baslerweb.de)).

Install this tool and open the mvTITAN-CL before starting CCT+. This is necessary because the serial port of the CameraLink™ connection is only available if the mvTITAN-CL is initialized.

Be sure parameter *Exposure Time Control Mode* is set to *Free-run, programmable*.

Using output with 8 Bit set *Video Data Output Mode* to *Single 8 Bit*. Further you have to set the videomode to *VM_DIG8* in your program or better in the used camera definition.

Using output with 8 Bit set *Video Data Output Mode* to *Single 10 Bit*. Further you have to set the videomode to *VM_DIG10* in your program or better in the used camera definition.

All settings concerning exposure and shutter time must be set as application requires.

**Pin connection (CameraLink™ base standard)**

<table>
<thead>
<tr>
<th>MDR 26 pin</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>inner Shield</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Tx Data 0-</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Tx Data 1-</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Tx Data 2-</td>
</tr>
<tr>
<td>Pin 5</td>
<td>XCLK-</td>
</tr>
<tr>
<td>Pin 6</td>
<td>Tx Data 3-</td>
</tr>
</tbody>
</table>
**Camereadefinition**

For Single output with 8 Bit:

```c
/* -------------------------- Basler A102k ------------------------------------
DefCamType              "A102k" VM_DIG8 NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup      "A102k" VSCAN NOT_INV NEXT_FIELD
DefHorizontalUnit       "A102k" PIXEL
DefVerticalUnit         "A102k" LINES
DefCamHorizontalAcquire "A102k" 0L 1392L 1
DefCamVerticalAcquire   "A102k" 0L 1039L 1
*/
```

For Single output with 10 Bit:

```c
/* -------------------------- Basler A102k ------------------------------------
DefCamType              "A102k" VM_DIG10 NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup      "A102k" VSCAN NOT_INV NEXT_FIELD
DefHorizontalUnit       "A102k" PIXEL
DefVerticalUnit         "A102k" LINES
DefCamHorizontalAcquire "A102k" 0L 1392L 1
DefCamVerticalAcquire   "A102k" 0L 1039L 1
*/
```

**Remarks to programming with standard SDK**

Using the Basler A102k in your own program you have to set the following:

**Single output 8 bit:**

Set videomode to Dig8 with `mvSetVideoMode(dev, VM_DIG8);` and colormode to greyscale 8bit with `mvSetColorMode(dev, COL_GREY);`.

With these settings you will get images with a resolution of 8bpp in memory.

**Single output 10 bit:**

Set videomode to Dig10 with `mvSetVideoMode(dev, VM_DIG10);` and colormode to greyscale 8bit with `mvSetColorMode(dev, COL_GREY16);`.

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<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>SerTC+</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>SerTFG-</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>CC1-</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
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<td>CC3-</td>
<td>16</td>
</tr>
<tr>
<td>12</td>
<td>CC4+</td>
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</tr>
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<td>17</td>
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<td>23</td>
<td>CC2-</td>
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<tr>
<td>24</td>
<td>CC3+</td>
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<tr>
<td>25</td>
<td>CC4-</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>inner Shield</td>
<td>1</td>
</tr>
</tbody>
</table>

Recommended cable for this mode from MATRIX VISION GmbH:

- KSCL 03.0, length 3 meters
- KSCL 05.0, length 5 meters
- KSCL 10.0, length 10 meters
With these settings you will get images with a resolution of 16bpp in memory. If nothing special is set the 10bpp are stored LSB aligned in the 16 bit. This means LSB is bit 0 and MSB is bit 9. The remaining bits are undefined.

**Remarks to mvAcquireControl**

**Using camera with single output 8 bit**
Load camera definition A102k in register camera.
Activate Greyscale in register Acquire and set it to 8 bit.

**Using camera with single output 10 bit**
Load camera definition A102k in register camera and switch to videomode VM_DIG10 in dialog advanced feature settings of Select Camera.
Activate Greyscale in register Acquire and set it to 10 bit.

**Remarks to mvIMPACT Go!**
Set up the mvAcquireControl so that you get proper images. Close mvAcquireControl or mvCONFIG and start mvIMPACT Go!. If will automatically use the settings made in the Default configuration.

**Using camera with single output 8 bit**
Set mvAcquireControl to single output 8bit as described above. mvIMPACT Go! will use these settings and you will get proper 8 bpp images in mvIMPACT Go! without any further settings.

**Using camera with single output 10 bit**
Set mvAcquireControl to single output 10bit as described above. mvIMPACT Go! will acquire 10bpp image be the display will be wrong. So you have to tell the display to display 10 bpp images instead of 16 bpp. For that open menu item Tools / Options. Choose 2 (use for 10 bit images) in line Default bitshift for 16 bit images.
ExSync mode

Camera is reset by the mvTITAN-CL and sends the video data and all synchronization signals to the
mvTITAN-CL after Restart/Reset signal. The camera can be used with a predefined exposure time or an
exposure time defined by the Restart/Reset signal.

Signal map

Camera settings set by software

For setting up the camera the Camera Configuration Tool (CCT+) is needed. You can download the
latest version of this tool from the homepage of Basler AG (www.baslerweb.de).

Install this tool and open the mvTITAN-CL before starting CCT+. This is necessary because the serial
port of the CameraLink™ connection is only available if the mvTITAN-CL is initialized.

Exposure Time predefined in camera

Be sure parameter Exposure Time Control Mode is
set to ExSync, level-controlled.

Using output with 8 Bit set Video Data Output Mode
to Single 8 Bit. Further you have to set the videomode
to VM_DIG8 in your program or better in the used
camera definition.

Using output with 8 Bit set Video Data Output Mode
to Single 10 Bit. Further you have to set the videomode to VM_DIG10 in your program or better
in the used camera definition.

Now the camera must be reset externally to acquire
and send images. If no Restart/Reset signal is sent to
the camera the LED on the backside lights 3 times
periodically.

You can define the wanted exposure time in line Exposure Time [µsec]. So the pulse length of the
Restart/Reset signal doesn’t influence the integration time.
Please note that the exposure time influences the maximum possible frame rate.
Exposure Time defined by pulse width of Restart/Reset signal

Be sure parameter Exposure Time Control Mode is set to ExSync, level-controlled.

Using output with 8 Bit set Video Data Output Mode to Single 8 Bit. Further you have to set the videomode to VM_DIG8 in your program or better in the used camera definition.

Using output with 8 Bit set Video Data Output Mode to Single 10 Bit. Further you have to set the videomode to VM_DIG10 in your program or better in the used camera definition.

Now the camera must be reset externally to acquire and send images. If no Restart/Reset signal is sent to the camera the LED on the backside lights 3 times periodically.

In this mode the exposure time is equal to pulse length of the Restart/Reset signal. Please note that the exposure time influences the maximum possible frame rate.

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Cameras definition

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DefCamHorizontalAcquire "A102k" 0L 1392L 1
DefCamVerticalAcquire   "A102k" 0L 1039L 1
```

For Single output with 10 Bit:
```
DefCamType              "A102k" VM_DIG10 NONINTERLACED 15 15625 28000 PCLK_EXTERN
DefCamAcquireSetup      "A102k" VSCAN NOT_INV NEXT_FIELD
DefHorizontalUnit       "A102k" PIXEL
DefVerticalUnit         "A102k" LINES
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Remarks to programming with standard SDK

Using the Basler A102k in your own program you have to set the following:

**Single output 8 bit:**
Set videomode to Dig8 with `mvSetVideoMode(dev, VM_DIG8)`; and colormode to greyscale 8bit with `mvSetColorMode(dev, COL_GREY)`.
With these settings you will get images with a resolution of 8bpp in memory.

**Single output 10 bit:**
Set videomode to Dig10 with `mvSetVideoMode(dev, VM_DIG10)`; and colormode to greyscale 8bit with `mvSetColorMode(dev, COL_GREY16)`.
With these settings you will get images with a resolution of 16bpp in memory. If nothing special is set the 10bpp are stored LSB aligned in the 16 bit. This means LSB is bit 0 and MSB is bit 9. The remaining bits are undefined.

**Generating Restart/Reset signal**
To generate the needed Restart/Reset signal the following calls are necessary:

1. Define the Restart/Reset signal
   Use command `mvDefPulseSeq(dev, output, startvalue, pulse)` to define the signal.
   - output: 0, must be 1st output (CC1)
   - startvalue: 1, because camera expects active high signals
   - The used array (`pPulse`) should be like that:
     - element [0]: pulse width in number of lines
     - element [1]: -1, end of array

2. Define the way the output of the Restart/Reset signal is controlled.
   Decide whether you want to control the output frequently by a predefined period or by an external signal.
   If you decide to output the signal frequently set the period time with `mvSetTriggerPeriod(dev, time)`. Where time is given in milliseconds [ms]. If necessary deactivate the external trigger input with `mvSelExtTrig(dev, 0)`
   If you want to output the Restart/Reset signal synchronized to an external trigger signal activate the input on the mvTITAN-CL by `mvSelExtTrig(dev, 1)` and provide the `Trigger In` pin of the mvTITAN-CL with the external trigger signal.

You will find more about the shutter control in the mvTITAN-CL’s manual in chapter 3 Sequence programming.
Remarks to mvAcquireControl

Using camera with single output 8 bit
Load camera definition A102k in register camera. Activate Greyscale in register Acquire and set it to 8 bit.

Using camera with single output 10 bit
Load camera definition A102k in register camera and switch to videomode VM_DIG10 in dialog advanced feature settings of Select Camera. Activate Greyscale in register Acquire and set it to 10 bit.

Setting up Restart/Restart signal
The Restart/Reset signal is set up with the shutter control of the mvAcquireControl. Switch to this register and activate the shutter control. Be sure the following is set in the Shutter register:

- Enable Shutter Control: Enabled
- High active: Enabled
- Start acquisition after pulse seq.: Enabled
- Shutter Mode must be set to One Trigger Mode
- Shuttertime defines the pulse width of the Restart/Reset signal. Depending on the camera mode this width defines the integration time or not. The width is defined in number of lines.

Switch to register Trigger and set the trigger method fitting to your application.

Set autotrigger if you want to output the Restart/Reset signal frequently without using an external trigger signal. You define the frequency by setting up the Autotrigger period.

If you want to synchronize the output of the Restart/Reset signal with an external trigger signal choose ext. trigger. Now you have to supply the external trigger signal to the Trigger In input of the mvTITAN-CL.
Remarks to mvIMPACT Go!

Set up the mvAcquireControl so that you get proper images. Close mvAcquireControl or mvCONFIG and start mvIMPACT Go!. If will automatically use the settings made in the Default configuration.

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<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD</td>
<td>Vertical drive, signal is sent to signalize next field (noninterlaced) or frame (interlaced). Also called Frame Enable, VSync or frame start signal.</td>
</tr>
<tr>
<td>HD</td>
<td>Horizontal drive, signal is sent to signalize next line. Also called Line Enable, HSync or line start signal.</td>
</tr>
</tbody>
</table>