## Overview

**Camera**  
VDS CCD1300

### Running modes

- **Freerunning**  
  - [x] Special settings necessary
- **Image On Demand**  
  - [x]

### Resolution

- **Horizontal**  
  - 1280 pixel
- **Vertical**  
  - 1024 pixel
- **Bits per Pixel**  
  - 12 bpp
- **Binning**  
  - []
- **Partial Scan**  
  - []

### Timings

- **Pixel clock**  
  - 21 MHz
- **Horizontal**  
  - 12.8 kHz
- **Vertical**  
  - 12.5 fps

**MATRIX VISION GmbH Frame Grabber**

### Typ

- **mvTITAN-DIG**

#### Line Enable by

- camera  
  - [x] Frame Grabber  
  - [ ] external  
- external  
  - [ ] Frame Grabber  
  - [ ]

#### Frame Enable by

- camera  
  - [x] Frame Grabber  
  - [x] external  
- external  
  - [ ] Frame Grabber  
  - [ ]

#### Trigger by

- external  
  - [ ] Frame Grabber  
  - [x]
- camera  
  - [ ] Frame Grabber  
  - [x]

#### Flash by

- camera  
  - [ ] Frame Grabber  
  - [x]
- external  
  - [ ] Frame Grabber  
  - [x]

**Software**

- **MVacquireControl**  
  - [X]
- **mvIMPACT Go!**  
  - [x]
- **Other**  
  - [ ]  
  - [e.g. LabView™, Halcon, etc.]
Freerunning Mode

Camera runs with its own timing and sends the image data, pixel clock, HD and VD to the mvTITAN-DIG.

mvTITAN-DIG cannot reset the camera in this mode but control the 2xGain and binning mode.

Signal map

Camera settings by hardware

Condition for this mode is to set the camera not to IOD mode by hardware. With the mvTITAN-DIG it isn’t possible to switch the IOD mode by a digital output of the mvTITAN-DIG. This must be done in the camera’s 15-pin jack. Pin 9 of the 15-pin jack of the camera must be open. You can check the correct setting on the backside of the camera. There are several LEDs. If the camera runs free the LED IOD must be dark and the LED Fout must burn.

Pin connection

<table>
<thead>
<tr>
<th>mvTITAN-DIG</th>
<th>Direction</th>
<th>VDS CCD1300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MSB(+)</td>
<td>16 GND</td>
</tr>
<tr>
<td>3</td>
<td>MSB -1 (+)</td>
<td>15 D11 (MSB)</td>
</tr>
<tr>
<td>4</td>
<td>MSB -2 (+)</td>
<td>14 D10</td>
</tr>
<tr>
<td>5</td>
<td>MSB -3 (+)</td>
<td>13 D9</td>
</tr>
<tr>
<td>6</td>
<td>MSB -4 (+)</td>
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</tr>
<tr>
<td>7</td>
<td>MSB -5 (+)</td>
<td>11 D7</td>
</tr>
<tr>
<td>8</td>
<td>MSB -6 (+)</td>
<td>10 D6</td>
</tr>
<tr>
<td>9</td>
<td>MSB -7 (+)</td>
<td>9 D5</td>
</tr>
<tr>
<td>10</td>
<td>MSB -8 (+)</td>
<td>8 D4</td>
</tr>
<tr>
<td>11</td>
<td>MSB -9 (+)</td>
<td>7 D3</td>
</tr>
<tr>
<td>12</td>
<td>MSB -10 (+)</td>
<td>6 D2</td>
</tr>
<tr>
<td>13</td>
<td>MSB -11 (+)</td>
<td>5 D1</td>
</tr>
<tr>
<td>14</td>
<td>MSB -10 (+)</td>
<td>4 D0 (LSB)</td>
</tr>
<tr>
<td>15</td>
<td>DigOut0 (+)</td>
<td>36 TREX +</td>
</tr>
<tr>
<td>16</td>
<td>DigOut1 (+)</td>
<td>19 Option: 25fps</td>
</tr>
<tr>
<td>17</td>
<td>Frame Ena. In (+)</td>
<td>3 FEN</td>
</tr>
<tr>
<td>18</td>
<td>Line Ena. In (+)</td>
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</tr>
<tr>
<td>19</td>
<td>Pixel Clock In (+)</td>
<td>1 PCLK</td>
</tr>
<tr>
<td>20</td>
<td>DigOut 2 (+) / Expose (+)</td>
<td>18 SV2 +</td>
</tr>
<tr>
<td>21</td>
<td>Ground</td>
<td>35 GND</td>
</tr>
<tr>
<td>22</td>
<td>MSB (-)</td>
<td>34 D11-</td>
</tr>
</tbody>
</table>
With this pinning it is possible to switch the 2xGain and the binning mode with GPout1 and GPout2.

Recommended cable for this mode from MATRIX VISION GmbH: KS55-0187 05.0 (including camera’s power supply by mvTITAN-DIG/P).

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**Cameradefinition**

/* ---------------- Vosskühler CCD-1300 12Bit ----------------------- */
/* SetInputPitch 1280 */
DefCamType *CCD1300* VM_DIG12 NONINTERLACED 8 9375 15000 PCLK_EXTERN
DefCamAcquireSetup *CCD1300* VSCAN INV_SYNC NEXT_FIELD
DefHorizontalUnit *CCD1300* PIXEL
DefCamHorizontalAcquire *CCD1300* 0L 1280L 1
DefVerticalUnit *CCD1300* LINES
DefCamVerticalAcquire *CCD1300* 0L 1024L 1

**Remarks to mvAcquireControl**

For opening the mvTITAN-DIG properly add the command SetInputPitch to the used INI-file (in general grabber.ini) to tell the mvTITAN-DIG the number of pixel clocks between two HD signals the camera sends.

Example:

```
[ mvTITAN ]
InitBoard
SetInputPitch 1280
```

In mvAcquireControl you have to choose the camera definition *CCD1300*. Activate the option *Greyscale* in register *Acquire* and set it to *12bit*.

Be sure the *Shutter Control* in register *Shutter* is deactivated. Otherwise you can get distortions in the acquired images.

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera wants active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this switch to register *Signals* and change the Bitmask of line *Integration Off* to ‘xxxxxxxxxxxxx11x’. The *Integration Off* bitmask is set automatically when opening the mvTITAN-DIG. If these outputs are not programmed their state is low.
If you have connected an external trigger signal to the mvTITAN-DIG you can activate the ext. Trigger in the register Trigger. With this setting the mvTITAN-DIG will acquire images only when a trigger signal was arrived on the external trigger input of the mvTITAN-DIG.

**Remarks to mvIMPACT Go! and mvIMPACT S**

Condition for proper images with mvIMPACT Go! and mvIMPACT S is the same as described in Remarks to mvAcquireControl.

Because mvIMPACT Go! and mvIMPACT S are using a double buffer method for the live preview mode it needs a size of the DMA buffer which is twice as great than one image. In 16 bit it will be about 2x 2,7MB = 5,4MB. The size after a standard installation is 4MB so you will have to increase the size to at least 6MB. To do this use in case of Windows NT4.0, Windows 2000 or Windows XP the file \windows\matrix\setdma.exe.

Additionally it is needed to tell mvIMPACT Go! and mvIMPACT S that the acquired images have a resolution of 12bpp. To do this open the menu item Tools / Options. Set the entry for Default bitshift for 16bit images to 4 (use for 12bit images).

**Remarks to programming**

For opening the mvTITAN-DIG properly add the command `SetInputPitch` to the used INI-file to tell the mvTITAN-DIG the number of pixel clocks between two HD signals the camera sends.

Example:
```
...[TITAN]
  InitBoard
  SetInputPitch 1280
...
```

Using the VDS CCD1300 and the mvTITAN-DIG in your own program you have to set at least the videomode to VM_DIG12 and the colormode to either COL_GREY or COL_GREY16. With COL_GREY you will get the image data as an 8bpp image in the DMA-buffer where the upper 8bit of the 12bit are used. With COL_GREY16 you will get the 12bit data LSB aligned in the 16bit. To vary the position of the MSB you can use the function `mvSetMSBDataPos()`.

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera expects active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this you can for example use the command `mvWriteDigIOBit (dev, 1,1)` and `mvWriteDigIOBit (dev, 2,1)`. If these outputs are not programmed their state is low.

More about programming the mvTITAN-DIG you will find in the mvTITAN-DIG’s manual.
Image On Demand (IOD) mode

Camera is reset by the mvTITAN-DIG. The camera integrates an image and sends the image and the needed signals for synchronization (pixel clock, HD and VD) to the mvTITAN-DIG. The integration time is nearly equal to the pulse length of the reset signal.

The mvTITAN-DIG can control the 2xGain and binning mode.

Signal map

Camera settings by hardware

Condition for this mode is to set the camera to IOD mode by hardware. With the mvTITAN-DIG it isn’t possible to switch the IOD mode by a digital output of the mvTITAN-DIG. This must be done in the camera’s 15-pin jack. Pin 9 of the 15-pin jack of the camera must be connected to ground. You can check the correct setting on the backside of the camera. There are several LEDs. If the camera runs in IOD mode the LED IOD must light.

The 2x gain and the binning mode can be set by digital outputs of the mvTITAN-DIG. We recommend to use the positive pins of DigOut1 and DigOut2.

Pin connection

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<td>MSB -5 (+)</td>
<td>10 D6</td>
</tr>
<tr>
<td>8</td>
<td>MSB -6 (+)</td>
<td>9  D5</td>
</tr>
<tr>
<td>9</td>
<td>MSB -7 (+)</td>
<td>8  D4</td>
</tr>
<tr>
<td>10</td>
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<td>26</td>
<td>Line Ena. In (+)</td>
<td>2  LEN</td>
</tr>
<tr>
<td>29</td>
<td>Pixel Clock In (+)</td>
<td>1  PCLK</td>
</tr>
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39  MSB -3 (-)  ←  31  D8-
40  MSB -4 (-)  ←  30  D7-
41  MSB -5 (-)  ←  29  D6-
42  MSB -6 (-)  ←  28  D5-
43  MSB -7 (-)  ←  27  D4-
44  MSB -8 (-)  ←  26  D3-
45  MSB -9 (-)  ←  25  D2-
47  MSB -10 (-)  ←  24  D1-
48  MSB -11 (-)  ←  23  D0-
51  DigOut0 (-)  →  17  TREX -
59  Frame Ena. In (-)  ←  22  FEN -
60  Line Ena. In (-)  ←  21  LEN -
63  Pixel Clock In (-)  ←  20  PCLK -

With this pinning the needed reset signal is transmitted through the pins DigOut0(+) and DigOut0(-).

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Camere Definition

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Example:

[ TITAN ]
InitBoard
SetInputPitch 1280

In mvAcquireControl you have to choose the camera definition CCD1300. Activate the option Greyscale in register Acquire and set it to 12bit.

To set up the reset signal go to register Shutter and enable shutter control.
The camera expects an active high signal on the TREX pins. So it is necessary to activate the checkbox High active.
Choose the shutter mode One Trigger Mode.
The Shuttertime defines the pulse length of the reset signal and so the integration time in the camera.

For the Shuttercontrol trigger signals are needed. If no
external trigger is supplied to the mvTITAN-DIG you must use the autotrigger mode. Do this setting in the register Trigger. The autotrigger is automatically activated when shuttercontrol is enabled.

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To define the needed reset signal and its pulse length use the function mvDefPulsSeq().
Trigger signals are needed for output pulse sequences. You have three possibilities for this trigger signals:
1. External Trigger: an external trigger signal is connected to the Ext. Trigger input of the mvTITAN-DIG. To activate this input use mvSelExtTrig(dev,1);
2. Autotrigger: the trigger signal is periodically simulated on the mvTITAN-DIG itself, so no external signal must be supplied. Use function mvSetTriggerPeriode(); to define the periode time of the simulated trigger signal
3. Single software trigger: single trigger signals can be done by software without supplying an external trigger signal with function mvWriteDigIOBit(dev,15,1);

Using the recommended connection it is possible to switch the 2xGain and the binning mode with digital output GPout1 and GPout2. Because the camera expects active high signals it is needed to set these two outputs to high state that the camera runs in normal mode. For doing this you can for example use the command mvWriteDigIOBit (dev, 1,1) and mvWriteDigIOBit (dev, 2,1). If these outputs are not programmed their state is low.

More about programming the mvTITAN-DIG you will find in the mvTITAN-DIG’s manual.
## Glossary

<table>
<thead>
<tr>
<th>Expression</th>
<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>
<tr>
<td>Bpp</td>
<td>Bits per pixel</td>
</tr>
</tbody>
</table>