Technical Details

Industrial Cameras: 23/33/Z12/Z30 Series - Trigger and I/O

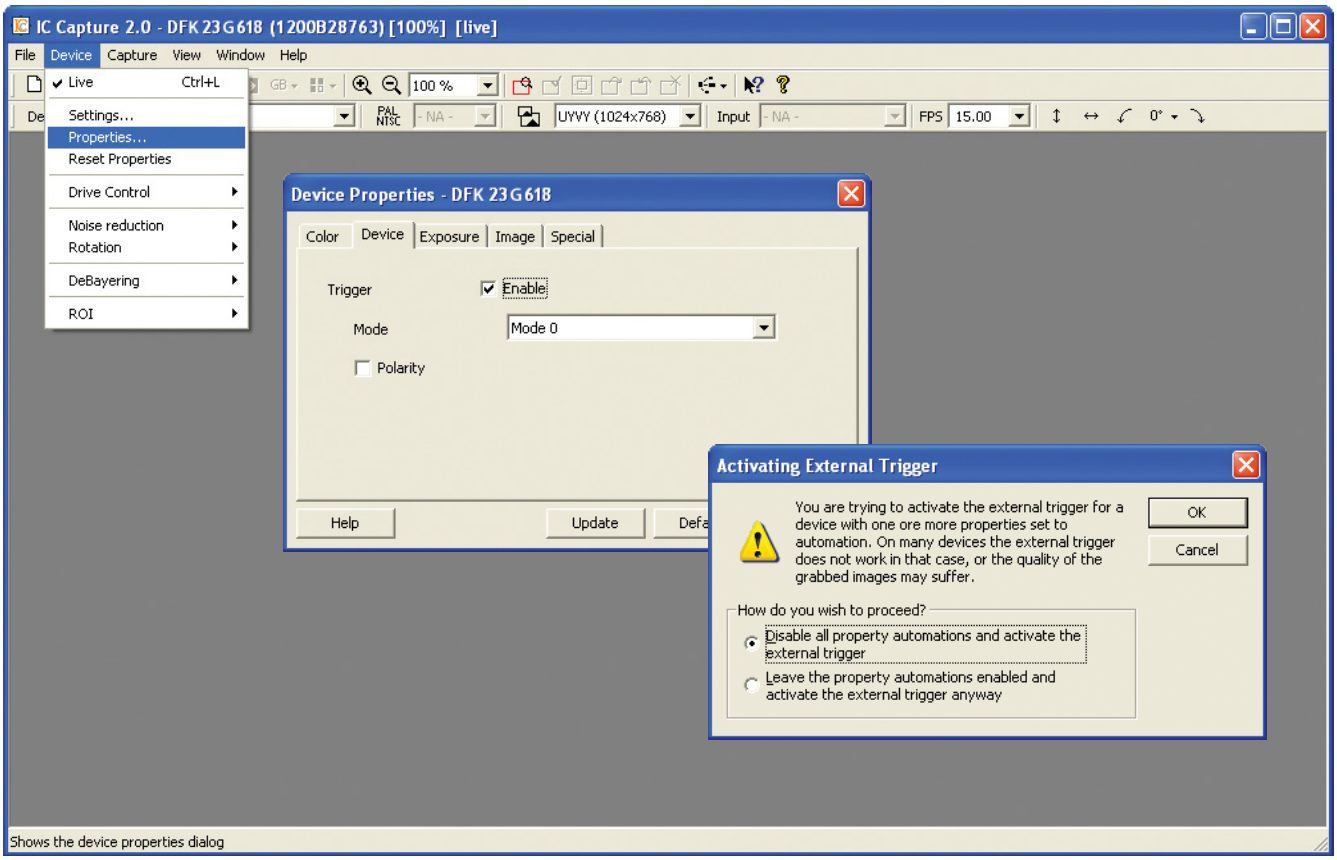
THE IMAGINGSOURCE
TECHNOLOGY BASED ON STANDARDS

Content

Getting started

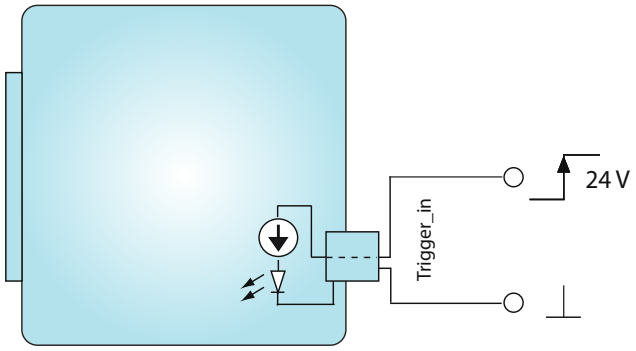
The following steps describe the use of the most commonly used digital input - the trigger input:

- Setup the camera as described in the Getting Started document that accompanies the camera.
- Install the software IC Capture as described in the Getting Started document.
- Make sure that the camera works correctly with IC Capture.
- Connect a trigger source that creates a positive pulse to the cameras Hirose connector. The height of the pulse may lie between 3.3 and 24 V (pls. see page 5 for details).
- Enable the trigger mode by clicking Device > Properties... > Device > Enable (please see the images below). If you see the dialog Activation External Trigger, please click "Disable all property automations..." Then, please set all camera parameters according to the requirements of your application. Please find these parameters in the Device Properties dialog (Device > Properties...):



Trigger input - hardware and timing

The trigger input of The Imaging Source GigE cameras is opto-coupled. It permits positive trigger pulses with any amplitude between 3.3 and 24 V (please note that it is not necessary to apply a series resistor).

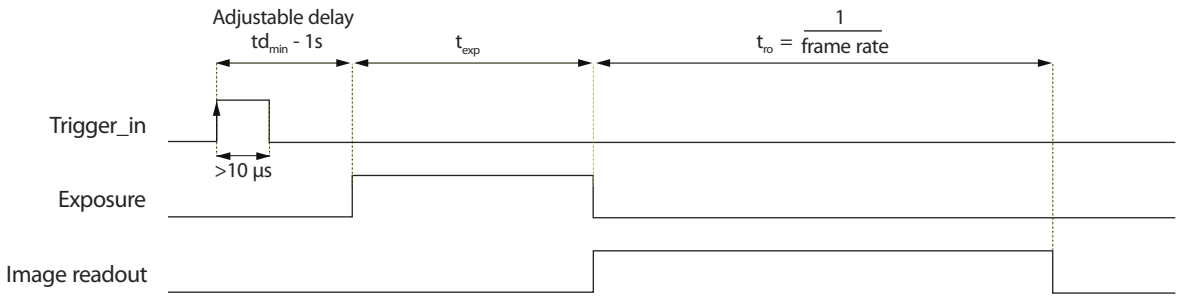


The Imaging Source GigE cameras offer two different modes of operation:

Free running: The cameras generate a stream of up to 150 images/s depending on their resolution. In this case the camera's clock generator determines the actual moment of exposure. Thus, it cannot be controlled externally. This mode of operation is called "free running".

Trigger: The cameras offer a trigger input to determine the moment of exposure. The exposure begins after the occurrence of a trigger pulse and an adjustable delay. Please note that the min delay (td_{min}) depends on the camera's sensor. The length of the exposure can also be set via software.

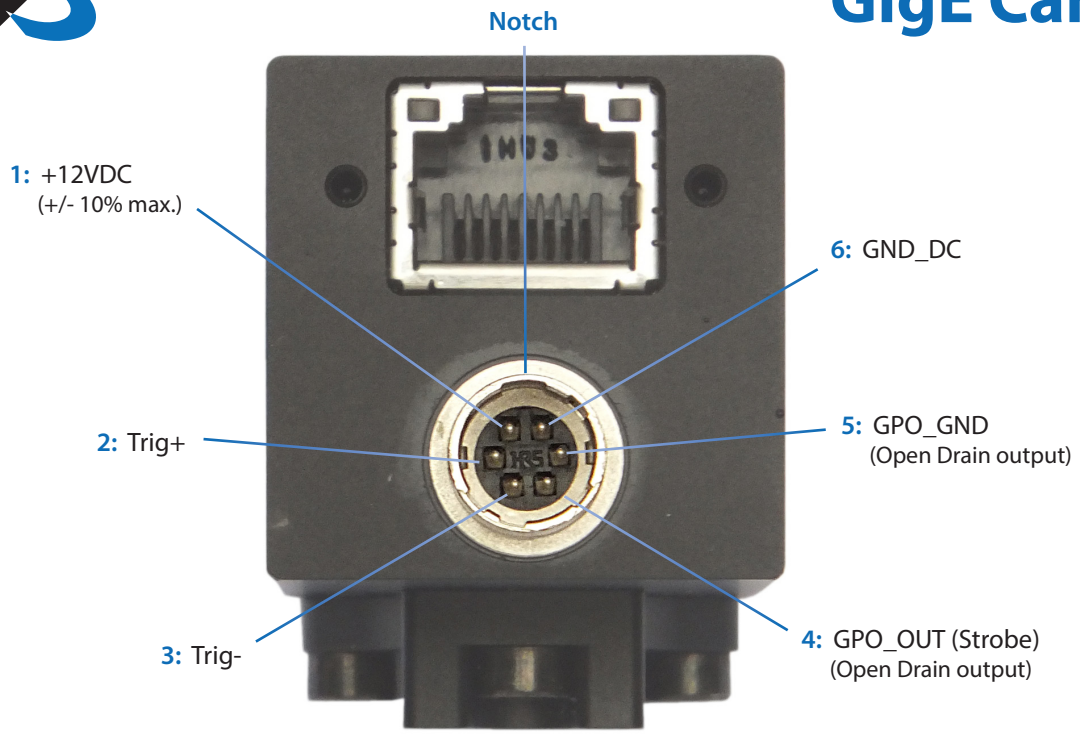
The duration of the image readout is the reciprocal of the current frame rate. Once the image readout has finished, the camera is able to accept a new trigger pulse at any time.



td_{min}

Dxx 23x V024:	9.4 µs (at max. frame rate)
Dxx 23x M021:	137 µs (at max. frame rate)
Dxx 23x P031:	rolling shutter
Dxx 23x 618:	4 µs (at max. frame rate)
Dxx 23x 445:	4 µs (at max. frame rate)
Dxx 23x 274:	4 µs (at max. frame rate)

Digital I/Os - GigE Cameras



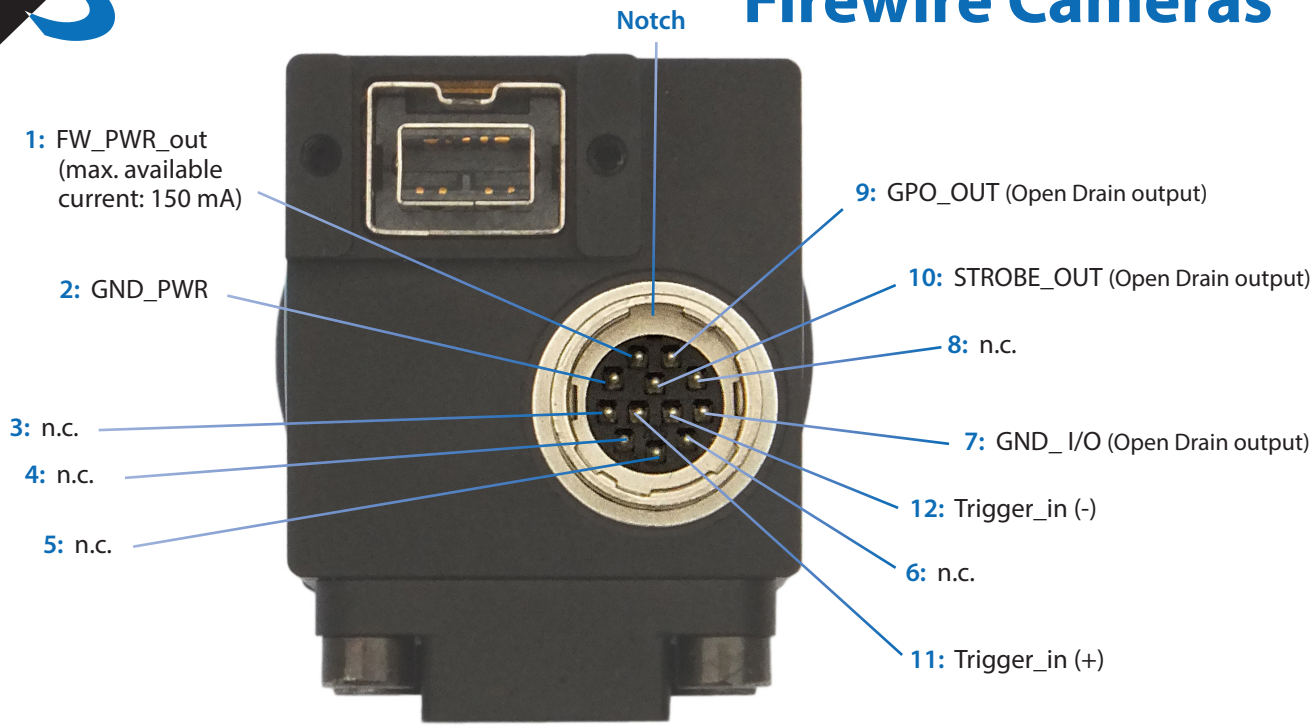
Connector	Signal	I/O	Remarks	Characteristics			
				Min	Typ	Max	Unit
Pin 1	GigE Power Supply	P		11.0	12.0	13.0	V
Pin 2	Trig +	I	Start of exposure (optocoupler signal)	3.3	-	24.0	V
Pin 3	Trig -	I	ditto (optocoupler ground)	-	-	-	-
Pin 4	GPO	O	General purpose output (open drain)**	-	-	24.0[1]	V
Pin 5	GPO_GND	G	Open drain ground	-	-	-	-
Pin 6	GND_DC	G	External ground (Power Supply)	-	-	-	-

Please note:
All specifications are subject to change without notice.
[1] max. 0.2 A (I_D) for open drain MOSFET!
** Can also beused as Strobe.

I/O pin legend:
G External Ground
I Input
O Output
P Power Supply

The part number of this Hirose connector is HR10A-7R-6P(73). To realize a trigger cable you need a Hirose connector HR10A-7P-6S(73).

Digital I/Os - Firewire Cameras



Connector	Signal	I/O	Remarks	Characteristics			
				Min	Typ	Max	Unit
Pin 1	FW_PWR_out	P	**Caution:** Directly connected to the power supply of the FireWire bus. Available **max. current** for external user applications: **150 mA**	8.0	12.0**	30.0	V
Pin 2	GND_PWR	G	External ground	-	-	-	-
Pin 3	n.c.		-	-	-	-	-
Pin 4	n.c.		-	-	-	-	-
Pin 5	n.c.		-	-	-	-	-
Pin 6	n.c.		-	-	-	-	-
Pin 7	GND_I/O	G	External ground	-	-	-	-
Pin 8	n.c.		-	-	-	-	-
Pin 9	GP_OUT	O	General purpose output (open drain)	-	-	24.0[1]	V
Pin 10	STROBE_OUT	O	Flash control (open drain)	-	-	24.0[1]	V
Pin 11	Trigger_in (+)	I	Start of expose (optocoupler signal)	3.3[2]	-	24.0[2]	V
Pin 12	Trigger_in (-)	I	ditto (optocoupler ground)	-	-	-	-

Please note:
All specifications are subject to change without notice.
[1] max. 0.2A (ID) for open drain MOSFET!
[2] min. 3.5 mA driver strength required!
** Determined by the power supply of the FireWire bus. This value may vary considerably.

I/O pin legend:
G External Ground
I Input
O Output
P Power Supply

The part number of this Hirose connector is HR10A-10R-12P(73). To realize a trigger cable you need a Hirose connector HR10A-10P-12S(73).

Digital I/Os - USB 23 Series Cameras

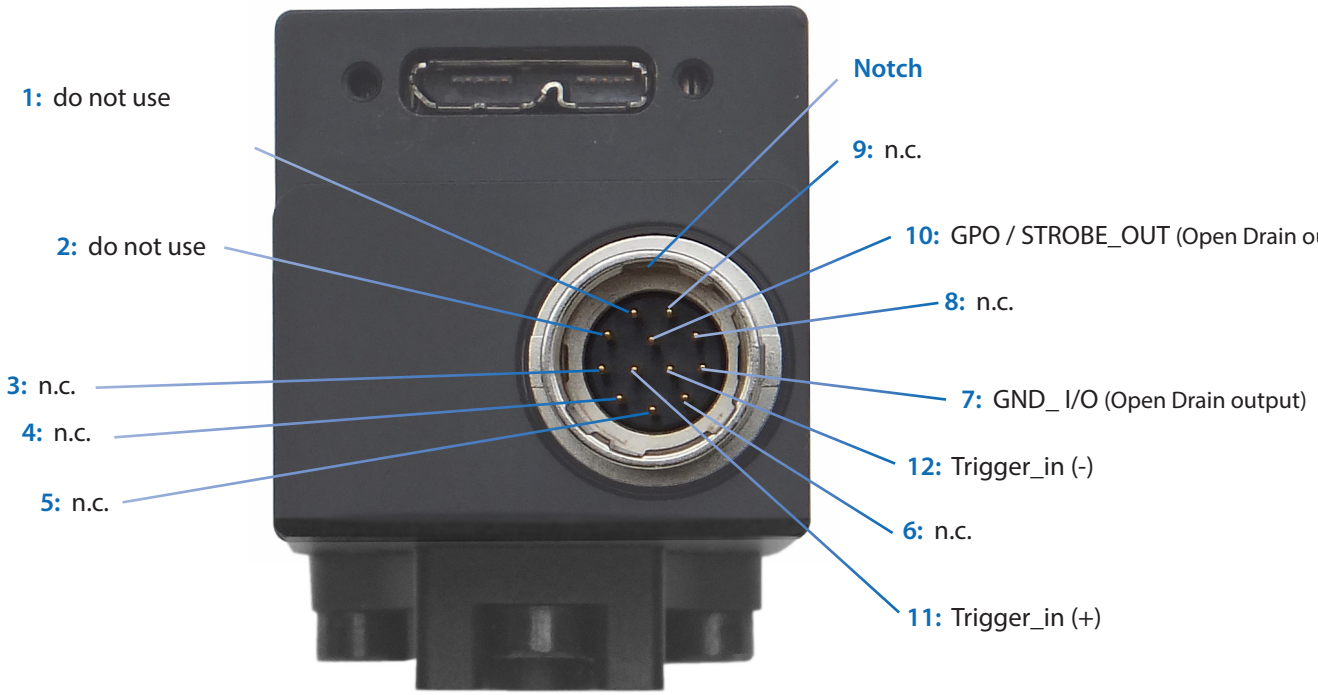
Connector	Signal	I/O	Remarks	Characteristics			
				Min	Typ	Max	Unit
Pin 1	+5V_USB_out	P	**Caution:** Directly connected to the power supply of the USB bus. Available **max. current** for external user applications: **50 mA @ USB 2.0 connection** **150 mA @ USB 3.0 connection**	4.75	5.0**	5.25	V
Pin 2	GND_PWR	G	External ground	-	-	-	-
Pin 3	n.c.		-	-	-	-	-
Pin 4	n.c.		-	-	-	-	-
Pin 5	n.c.		-	-	-	-	-
Pin 6	n.c.		-	-	-	-	-
Pin 7	GND_I/O	G	External ground	-	-	-	-
Pin 8	n.c.		-	-	-	-	-
Pin 9	GP_OUT	O	General purpose output (open drain)	-	-	24.0[1]	V
Pin 10	STROBE_OUT	O	Flash control (open drain)	-	-	24.0[1]	V
Pin 11	Trigger_in (+)	I	Start of expose (optocoupler signal)	3.3[2]	-	24.0[2]	V
Pin 12	Trigger_in (-)	I	ditto (optocoupler ground)	-	-	-	-

Please note:
All specifications are subject to change without notice.
[1] max. 0.2A (ID) for open drain MOSFET!
[2] min. 3.5 mA driver strength required!
** Determined by the power supply of the USB bus. This value may vary considerably.

I/O pin legend:
G External Ground
I Input
O Output
P Power Supply

The part number of this Hirose connector is HR10A-10R-12P(73). To realize a trigger cable you need a Hirose connector HR10A-10P-12S(73).

Digital I/Os - USB 33 Series Cameras



Connector	Signal	I/O	Remarks	Characteristics			
				Min	Typ	Max	Unit
Pin 1	do not use		-	-	-	-	-
Pin 2	do not use		-	-	-	-	-
Pin 3	n.c.		-	-	-	-	-
Pin 4	n.c.		-	-	-	-	-
Pin 5	n.c.		-	-	-	-	-
Pin 6	n.c.		-	-	-	-	-
Pin 7	GND_I/O	G	External ground	-	-	-	-
Pin 8	n.c.		-	-	-	-	-
Pin 9	n.c.		-	-	-	-	-
Pin 10	GPO / STROBE_OUT		General purpose output /Flash control (open drain)	-	-	24.0[1]	V
Pin 11	Trigger_in (+)	I	Start of expose (optocoupler signal)	3.3[2]	-	24.0[2]	V
Pin 12	Trigger_in (-)	I	ditto (optocoupler ground)	-	-	-	-

Please note:
All specifications are subject to change without notice.
[1] max. 0.2A (ID) for open drain MOSFET!
[2] min. 3.5 mA driver strength required!

I/O pin legend:
G External Ground
I Input
O Output
P Power Supply

The part number of this Hirose connector is HR10A-10R-12P(73). To realize a trigger cable you need a Hirose connector HR10A-10P-12S(73).

Programming examples with IC Imaging Control®

All The Imaging Source cameras are shipped with the **SDK IC Imaging Control®**. IC Imaging Control® removes a lot of programming effort, since it offers many ready-to-use basic procedures.

Below are brief examples in Visual Basic to give you an idea of how to use IC Imaging Control® to control the trigger and the digital I/Os. You can learn more about IC Imaging Control® and download sample source code at www.imagingcontrol.com. Additionally, our support department (support@imagingcontrol.com) has some more detailed programming examples available for you.

Using the trigger

The program begins by assigning the video `Device` (in this case the GigeWire camera DMK 23G618), defines a `VideoFormat` and sets the camera's operation mode to `DeviceTrigger`.
After the command `LiveStart`, the camera is ready to shoot: the camera now waits for a trigger pulse. `MemorySnapImage` instructs IC Imaging Control® to put the next image (which has been captured due to the trigger pulse) into a buffer (Memory) for further processing. Take as an example `MemorySaveImage`, which saves the content of this buffer to `Triggered.bmp`.

```
Private Sub Form_Load()
    ICImagingControl1.Device = "DMK 23G618"
    ICImagingControl1.VideoFormat = "Y800 (640x480)"
    ICImagingControl1.DeviceTrigger = True

    ICImagingControl1.LiveStart
    ICImagingControl1.MemorySnapImage

    ' Do something with the image - for instance:
    ICImagingControl1.MemorySaveImage "Triggered.bmp"
End Sub
```

Activating the strobe output

FireWire cameras typically have a set of properties such as "exposure time" or "gain". IC Imaging Control® makes these properties available in the class `VCDSimpleProperty`. The program begins by defining the variable `VCDProp` that will later contain these properties.

Secondly, the video Device is assigned (in this case the FireWire camera DMK 23G618) and then we define a `VideoFormat`. The function `GetSimplePropertyContainer` assigns the properties of the opened camera to the variable `VCDProp`.

The command `VCDProp.Switch(VCDID_Strobe) = True` activates the strobe output. Therefore, after having started the camera with `LiveStart`, pin 4 indicates the CCDs exposure.

```
Private Sub Form_Load()
    Dim VCDProp As VCDSimpleProperty
    ICImagingControl1.Device = "DMK 23G618"
    ICImagingControl1.VideoFormat = "Y800 (640x480)"
    VCDProp = GetSimplePropertyContainer(ICImagingControl1.VCDPropertyItems)

    VCDProp.Switch(VCDID_Strobe) = True
    ICImagingControl1.LiveStart
End Sub
```

Reading the digital input

The first three program lines are similar to those of the preceding example (Activating the strobe output). The main difference is to be found at the programs end: The command `VCDProp.OnePush VCDElement_GPIORead` reads the digital inputs state, while `Debug.Print VCDProp.RangeValue(VCDElement_GPIOIn)` indicates this state in terms of a debug output.

```
Private Sub Form_Load()
    Dim VCDProp As VCDSimpleProperty
    ICImagingControl1.Device = "DMK 23G618"
    VCDProp = GetSimplePropertyContainer(ICImagingControl1.VCDPropertyItems)

    VCDProp.OnePush VCDElement_GPIORead
    Debug.Print VCDProp.RangeValue(VCDElement_GPIOIn)
End Sub
```

Setting the digital output

The first three program lines are similar to those of the preceding example (Reading the digital input). The main difference is to be found at the end of the programs: The command VCDProp.`RangeValue` sets the variable `VCDElement_GPIOOut` to 0, whereupon `VCDProp.OnePush VCDElement_GPIOWrite` copies the content of this variable (0 in our case) to the digital output.

```
Private Sub Form_Load()
    Dim VCDProp As VCDSimpleProperty
    ICImagingControl1.Device = "DMK 23G618"
    VCDProp = GetSimplePropertyContainer(ICImagingControl1.VCDPropertyItems)

    VCDProp.RangeValue(VCDElement_GPIOOut) = 0
    VCDProp.OnePush VCDElement_GPIOWrite
End Sub
```

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All weights and dimensions are approximate. Unless otherwise specified the lenses shown in the context of cameras are not shipped with these cameras.