It's no trick...
it's a vision system

Vision Components

The Smart Camera People

VC4XXX Hardware Manual

Hardware Specifications for VC40XX and VC44XX Smart Cameras

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Foreword and Disclaimer

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References

Since the VC40XX smart camera family employs a TI processor, the programming environment and functions for the VC20XX cameras can be used for this camera.

Please also consult the following resources for further reference:

"**Support News**" for an overview of latest updates and support information

"**Knowledge Base / FAQ**" for a searchable data base of SW and HW questions / answers

Description	Title on Website	Download Area
Quick start Manual for VC camera set up and programming	Getting Started VC Smart Cameras with TI DSP	Public Download Area ▸Getting Started VC SDK Ti
Schnellstart VC – deutsche Version of „Getting Started VC".	Schnellstart VC Smart Kameras	Customer Area ▸Getting Started VC20XX and VC40XX Cameras
Introduction to VC Smart Camera programming	Programming Tutorial for VC20XX and VC40XX Cameras	Customer Area ▸Getting Started VC20XX and VC40XX Cameras
Demo programs and sample code used in the Programming Tutorial	Tutorial_Code	Customer Area ▸Getting Started VC20XX and VC40XX Cameras
VC40XX Hardware Manual	VC40XX Smart Cameras Hardware Documentation	Public Download Area ▸Hardware Documentation VC Smart Cameras
VCRT Operation System Functions Manual	VCRT 5.0 Software Manual	Registered User Area ▸Software documentation VC Smart Cameras
VCRT Operation System TCP/IP Functions Manual	VCRT 5.0 TCP/IP Manual	Registered User Area ▸Software documentation VC Smart Cameras
VCLIB 2.0 /3.0 Image Processing Library Manual	VCLIB 2.0/ 3.0 Software Manual	Registered User Area ▸Software documentation VC Smart Cameras

- The Light bulb highlights hints and ideas that may be helpful for a development.
- This warning sign alerts of possible pitfalls to avoid. Please pay careful attention to sections marked with this sign.

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Table of Contents

1 General Information

Standard and short VC4XXX housing

VC4XXX Smart Camera series rear view

The new VC4XXX Smart Camera generation from Vision Components succeeds the VC20XX product line. The model variety of the VC20XX range has been extended further – from formerly 6 different models to 12 (not counting color camera versions or doubling VC20XX serial / Ethernet versions).

In contrast to the VC20XX generation, the VC4XXX cameras are based on 3 different hardware platforms with different processor performance, interfaces and programming features. This allows even more to select the right smart camera for every application. The following section includes a feature overview for all cameras for easier product selection.

The proven industrial housing and connectors of the VC20XX series has been kept for the new model line. Together with the almost complete software compatibility this will aide the upgrade of existing applications. For the new “entry level range” it was possible to shorten the camera housing even further, offering a complete vision system with a very small form factor.

Responding to customer demand, the VC40XX features both – 100 Mbit Ethernet and an additional V24 (RS232) Interface. The RS232 interface connects to the Trigger socket. For this reason the trigger input had to be slightly modified – existing trigger input circuits requires therefore adjustment.

From July 2006 all standard and high end models feature a incremental encoder input allowing accurate synchronization of image acquisition with moving machinery for instance conveyor belts.

Please refer to section 6.2 for details. All other interfaces have remained unchanged.

2 Feature Overview

This manual describes 3 different Smart Camera families:

1. **Entry level range:**
   VC4018 and VC4016 Smart Cameras that are based on the VCSBC Hardware. These models feature an even more compact housing than the standard VC Smart Camera range. Although the VC4016 and VC4018 cameras omit features like the VGA output, they still incorporate a powerful 400 MHz DSP, opto-isolated digital SPS IO's, a high speed trigger as well as 100 Mbit Ethernet and an additional RS232 serial interface. Both cameras are also available with color sensor (Bayer filter).
   In summary: The VC4018 and VC4016 are a very cost efficient solution if certain features are not required.

2. **Standard range:**
   The VC4038 to VC4068 include all the standard features of a typical VC Smart Camera and more. These models offer the largest variety of sensor resolutions, frame rates, shutter values and interfaceability. The latest example is the new high speed encoder interface, that allows accurate image synchronization with moving equipment. The standard VC40XX range also supports a number of new software features like internal events.
   In summary: The variety and versatility of the standard VC40XX range offers a solution for almost every application.

3. **High end range:**
   The VC44XX feature the 1 GHz Ti C644X processor with 8000MIPS – made for applications that require the maximum calculation power available in a vision system today. Further additional features compared with the standard range are: 64 Mbyte DRAM memory, CCD resolutions of up to 2 mega pixel and frame rates of up to 250 fps (500 fps in binning mode).

The high speed trigger input of all VC4XXX family allows jitter free taking – even when inspecting fast moving objects. As the previous generation the VC4XXX also includes 24 V digital IO's and the standard and high end cameras incorporate a direct video output.

As with all VC Smart Cameras with Texas Instruments DSP, the operation system VCRT allows multi-tasking. This means for instance that user interface commands can execute in parallel without stopping the inspection process. It is also possible to transfer live images via TCP/IP using a background task.

Image acquisition can be done in the camera background. The VC4XXX allow to perform the three tasks of image capture, image transfer and image processing in parallel, greatly increasing the amount of processed images per second.

The 1GHz TMS320C64 DSP is one of the fastest DSPs available. It features a RISC-like instruction set, up to 8 instructions can be executed in parallel, two L1 cache memories (32 Kbytes each) and a 2 Mbytes L2 cache on chip. Its high speed 64-channel DMA controller gives additional performance. The DSP uses fast external SDRAM as main memory. A flash EPROM provides non-volatile memory.

Feature comparison of VC4XXX Smart Camera Ranges:

Features	Entry Level Range VC4018 and VC4016	Standard Range VC4038 to VC4068	High End Range VC4458 to VC4472
Processor	400MHz TMS320C64 DSP 32bit, 3200 MIPS	400MHz TMS320C64 DSP 32bit, 3200 MIPS	1GHz TMS320C64 DSP 64 bit, **8000 MIPS**
Memory Bandwidth (useable bandwidth)	400 Mbyte / sec	400 Mbyte / sec	800 Mbyte / sec
SDRAM	32 Mbyte	32 Mbyte	64 Mbyte
Flash Memory	4 Mbyte	4 Mbyte	4 Mbyte
SD card		✔ 128 MB	✔ 512 MB
VGA Output	No Live image transfer to PC via Ethernet	✔ SVGA / SXGA Video output integrated	✔ SVGA / SXGA Video output integrated
Digital IO's	4 Inputs / 4 Outputs up to 4x 400mA **NOT** separated fom power supply	4 Inputs / 4 Outputs up to 4x 500mA Galvanically separated fom power supply	Inputs / 4 Outputs up to 4x 500mA Galvanically separated fom power supply
Supply Voltage	12…24V	24V	24V
High Speed Shutter	Down to 36µsec	Down to 5µsec	Down to 5µsec
Frames per Second	Up to 32	Up to 63	Up to 250
Binning Mode		✔ 2 times	✔ 2 times
Hardware Trigger Input (jitter free)	✔	✔	✔
High-speed Encoder Interface		✔	✔
100 Mbit Ethernet	✔	✔	✔
RS232 Serial Interface	✔	✔	✔
Real time clock		✔	✔
Temperature sensor		✔	✔
Trigger Event		✔	✔
Programmable Input Lookup Table		✔	✔

Refer to the **Appendix A and B** for hardware structure diagrams of Entry Level and Standard / High End Smart Cameras.

3 Technical Specifications “Entry Level Range”

3.1 Technical Specifications VC4018

Component / Feature	Specification
CCD Sensor:	1/3" SONY ICX424AL - also available with color sensor (Bayer Filter)
eff. no. of pixels:	640(H) x 480(V)
Pixel size:	7.4(H) x 7.4(V) µm
Chip size:	5.79(H) x 4.89(V) mm
High-speed shutter:	33.3, 95.7, 158.1 microseconds, increasing with steps of 62.4 microseconds (full-frame shutter)
Low-speed shutter:	up to 2 sec. adjustable integration time
Integration:	full-frame
Picture taking:	program-controlled, trigger controlled (interrupt); full-frame / 32 frames per second, external high speed trigger
Clamping:	zero offset digital clamping
A/D conversion:	12.5 MHz / 10 bit, only the 8 most significant bits used for grey values
Input LUT	none
Image Display	Via 100 Mbit Ethernet onto PC
Processor:	Texas Instruments 400 MHz TMS320 C64 DSP
RAM:	32 Mbytes SDRAM (synchronous dynamic RAM)
Memory capacity:	Up to 100 full-size images in format 640x480
Flash EPROM:	4 Mbytes flash EPROM (nonvolatile memory) for programs and data, in-system programmable, 3 MB available to user
MMC:	Not available
Process interface:	2 inputs / 4 outputs, outputs 4x400 mA
Trigger Input	Fast 5 V TTL input and output, jitter free image acquisition
Serial Interface:	115,200 bd serial RS232 communication port
Ethernet interface:	100 Mbit
Video output	No direct video output / download of live images via Ethernet possible
CE certification:	CE Certification from Vision Components
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non condensing.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply	12V… 24V
Power Consumption	≈3 W (current drawn from PLC outputs additional)

3.2 Technical Specifications VC4016

Component / Feature	Specification
CCD Sensor:	1/3" SONY ICX204 AL - also available with color sensor (Bayer Filter)
eff. no. of pixels:	1024 (H) x 768 (V)
Pixel size:	4.65 (H) x 4.65 (H) µm
Chip size:	5.80(H) x 4.92(V) mm
High-speed shutter:	From 46.7, 122.9, 199.1 microseconds, increasing with steps of 76.2 microseconds (full-frame shutter)
Low-speed shutter:	up to 2 sec. adjustable integration time
Integration:	full-frame
Picture taking:	program-controlled, trigger controlled (interrupt); full-frame / 16.7 frames per second, external high speed trigger
Clamping:	zero offset digital clamping
A/D conversion:	16.7 MHz / 10 bit, only the 8 most significant bits used for grey values
Input LUT	none
Image Display	Via 100 Mbit Ethernet onto PC
Processor:	Texas Instruments 400 MHz TMS320 C64 DSP
RAM:	32 Mbytes SDRAM (synchronous dynamic RAM)
Memory capacity:	Up to 100 full-size images in format 1024x768
Flash EPROM:	4 Mbytes flash EPROM (nonvolatile memory) for programs and data, in-system programmable, 3 MB available to user
MMC:	Not available
Process interface:	2 inputs / 4 outputs, outputs 4x400 mA
Trigger Input	Fast 5 V TTL input and output, jitter free image acquisition
Serial Interface:	115,200 bd serial RS232 communication port
Ethernet interface:	100 Mbit
Video output	No direct video output / download of live images via Ethernet possible
CE certification:	CE Certification from Vision Components
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non condensing.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply	12V… 24V
Power Consumption	≈3 W (current drawn from PLC outputs additional)

4 Technical Specifications “Standard Range”

4.1 Technical Specifications VC4038

Component / Feature	Specification
Sensor:	1/3 “ SONY ICX424AL
eff. no. of pixels:	640(H) x 480(V)
Pixel size:	7.4 µm (H) x 7.4 µm (V)
Chip size:	5.79mm (H) x 4.89mm (V)
Integration:	full-frame
Picture taking:	program-controlled or triggered externally; full-frame / 63 frames per second
Binning	2 times binning, 126 frames/s, 640(H) x 240(V)
Shutter	5µs, 10 µs, 15 µs, 19 µs, … + steps of 31 up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 25 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments 400 MHz TMS320 C64 DSP
RAM:	32 MByte
Flash EPROM:	4 MByte
SD card	128 MByte (initially formatted to 16Mbyte)
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100Mbit Ethernet
Serial Interface:	115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 800x600, horizontal / vertical frequency: 48.08 / 72.19 Hz, pixel frequency: 50 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5 W, digital IO’s supplied additional

4.2 Technical Specifications VC4065

Component / Feature	Specification
Sensor:	1/2" SONY ICX415AL
eff. no. of pixels:	782(H) x 582(V)
Pixel size:	8.3(H) x 8.3(V) µm
Chip size:	7.48(H) x 6.15(V) mm
Integration:	full-frame progressive scan
Picture taking:	program-controlled or triggered externally; full-frame / 55 frames per second
Binning	2 times binning, 110 frames / s, 782(H) x 291(V)
Shutter	5µs, 10 µs, 15 µs, … + steps of 30.5 up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 33 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8 Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments 400 MHz TMS320 C64 DSP
RAM:	32 MByte
Flash EPROM:	4 MByte
SD card	128 MByte (initially formatted to 16Mbyte)
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100 Mbit Ethernet
Serial Interface:	115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 800x600, horizontal / vertical frequency: 48.08 / 72.19 Hz, pixel frequency: 50 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5 W, digital IO's supplied additional

4.3 Technical Specifications VC4066

Component / Feature	Specification
Sensor:	1/3" SONY ICX204AL
eff. no. of pixels:	1024(H) x 768(V)
Pixel size:	4.65(H) x 4.65(V) µm
Chip size:	5.8(H) x 4.92(V) mm
Integration:	full-frame progressive scan
Picture taking:	program-controlled or triggered externally; full-frame / 30 frames per second
Binning	2 times binning, 60 frames/s, 1024(H) x 384(V)
Shutter	10 µs, 15 µs, 20 µs, …+ steps of 42.3 up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 33 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8 Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments 400 MHz TMS320 C64 DSP
RAM:	32 MByte
Flash EPROM:	4 MByte
SD card	128 MByte (initially formatted to 16Mbyte)
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100Mbit Ethernet
Serial Interface:	115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 1280x1024, horizontal / vertical frequency: 63.98 / 60.02 Hz, pixel frequency: 108 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5 W, digital IO's supplied additional

4.4 Technical Specifications VC4068

Component / Feature	Specification
Sensor:	1/2" SONY ICX205A
eff. no. of pixels:	1280(H) x 1024 (V)
Pixel size:	4.65(H) x 4.65(V) µm
Chip size:	7.6mm (H) x 6.2 (V)
Integration:	full-frame progressive scan
Picture taking:	program-controlled or triggered externally; full-frame / 14 frames per second
Binning	2 times binning, 28 frames/s, 1280(H) x 1024(V)
Shutter	5 µs, 10µs, 15 µs,20 + steps of67 up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 25 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8 Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments 400 MHz TMS320 C64 DSP
RAM:	32 MByte
Flash EPROM:	4 MByte
SD card	128 MByte
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100Mbit Ethernet
Serial Interface:	Additionna 115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 1280x1024, horizontal / vertical frequency: 63.98 / 60.02 Hz, pixel frequency: 108 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5 W, digital IO's supplied additional

5 Technical Specifications “High End Range”

5.1 Technical Specifications VC4465

Component / Feature	Specification
Sensor:	1/2" SONY ICX415AL
eff. no. of pixels:	782(H) x 582(V)
Pixel size:	8.3(H) x 8.3(V) µm
Chip size:	7.48(H) x 6.15(V) mm
Integration:	full-frame progressive scan
Picture taking:	program-controlled or triggered externally; full-frame / 55 frames per second
Binning	2 times binning, 110 frames / s, 782(H) x 291(V)
Shutter	5µs, 10µs, 15µs, … + steps of 30.5µs up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 33 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8 Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments **1 GHz, 8000 MIPS** TMS320 C64 DSP
RAM:	64 MByte
Flash EPROM:	4 MByte
SD card	512 MByte
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100 Mbit Ethernet
Serial Interface:	115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 800x600, horizontal / vertical frequency: 48.08 / 72.19 Hz, pixel frequency: 50 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5.5 W, digital IO’s supplied additional

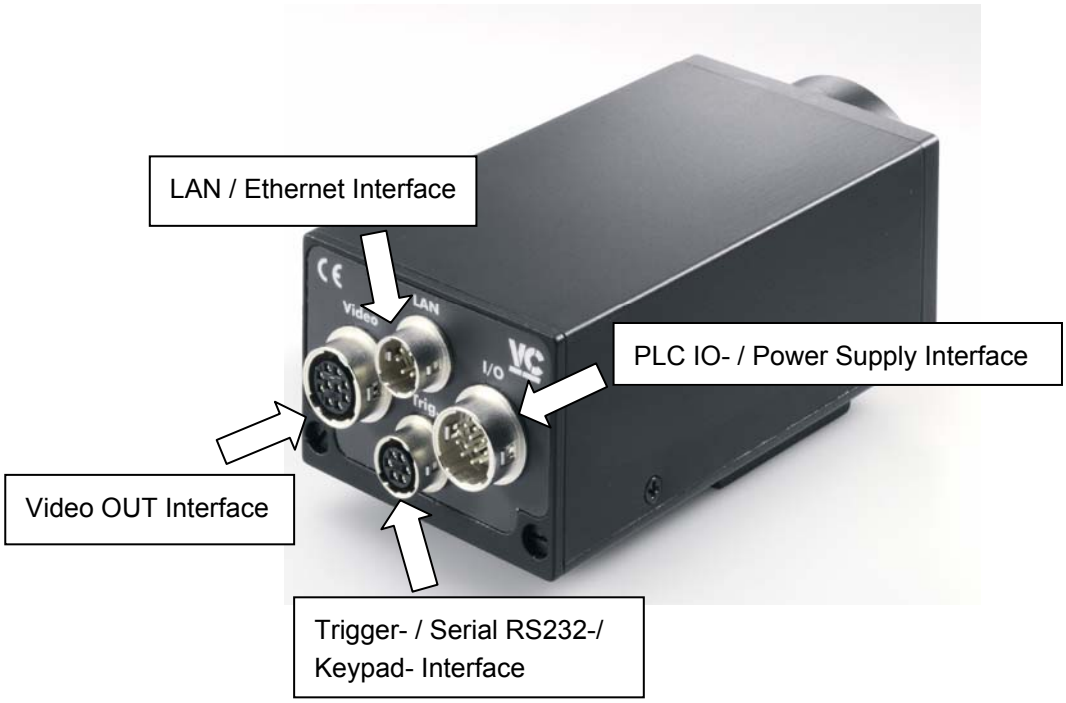
5.2 Technical Specifications VC4466

Component / Feature	Specification
Sensor:	1/3" SONY ICX204AL
eff. no. of pixels:	1024(H) x 768(V)
Pixel size:	4.65(H) x 4.65(V) µm
Chip size:	5.8(H) x 4.92(V) mm
Integration:	full-frame progressive scan
Picture taking:	program-controlled or triggered externally; full-frame / 30 frames per second
Binning	2 times binning, 60 frames/s, 1024(H) x 384(V)
Shutter	10 µs, 15 µs, 20 µs, …+ steps of 42.3 up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 33 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8 Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments **1 GHz, 8000 MIPS** TMS320 C64 DSP
RAM:	64 MByte
Flash EPROM:	4 MByte
SD card	512 MByte
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100Mbit Ethernet
Serial Interface:	115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 1280x1024, horizontal / vertical frequency: 63.98 / 60.02 Hz, pixel frequency: 108 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5.5 W, digital IO's supplied additional

5.3 Technical Specifications VC4468

Component / Feature	Specification
Sensor:	1/2" SONY ICX205A
eff. no. of pixels:	1280(H) x 1024 (V)
Pixel size:	4.65(H) x 4.65(V) µm
Chip size:	7.6mm (H) x 6.2 (V)
Integration:	full-frame progressive scan
Picture taking:	program-controlled or triggered externally; full-frame / 14 frames per second
Binning	2 times binning, 28 frames/s, 1280(H) x 1024(V)
Shutter	5 µs, 10µs, 15 µs,20 + steps of67 up to 20s
Clamping:	zero offset digital clamping
A/D conversion:	1 x 33 MHz / 10 bit
Input LUT	1024x8 bit (10bit → 8 bit)
Image display:	black-and-white, Pseudo Color from color lookup table 3x8 Bit RGB, live image, still image, graphics
Overlay:	8-bit overlay with LUT, maskable
Processor:	Texas Instruments **1 GHz, 8000 MIPS** TMS320 C64 DSP
RAM:	64 MByte
Flash EPROM:	4 MByte
SD card	512 MByte
Process interface:	4 inputs / 4 outputs, optically decoupled 24 V, outputs 4x500 mA
Trigger input:	Fast 5 V TTL input and output, jitter free image acquisition
Ethernet interface:	100Mbit Ethernet
Serial Interface:	Additional 115,200 bd serial RS232 communication port
Video output (VESA Standard):	Resolution: 1280x1024, horizontal / vertical frequency: 63.98 / 60.02 Hz, pixel frequency: 108 MHz, RGB, 3x75 Ohm, 1 Vpp, SVGA output, HSYNC, VSYNC separate
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non cond.
Operating Conditions	Temperature: 0… +45 deg C (surrounding temperature), Max. humidity: 80%, non condensing.
Power Supply / Consumption	24V / max 5.5 W, digital IO's supplied additional

6 VC4XXX Camera Interfaces



The VC40XX Smart Camera incorporates the following connector interfaces:

1. LAN / Ethernet Interface
2. Trigger- Serial V24 (RS232), Keypad and incremental encoder Interface
3. PLC IO and Power Supply Interface
4. Video Output Interface (not available with VC4018 and VC4016 cameras)

The pin assignments, electrical specifications as well as available accessories are shown for each interface connector in the following sections.

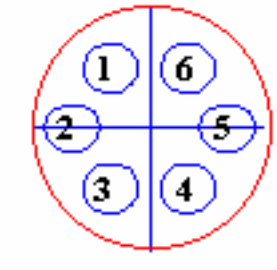
Please also refer to the **Product/Hardware/ Order Numbers for VC40XX Accessories/Cables page** for an up to date list of cables and further information available.

6.1 LAN / Ethernet Interface

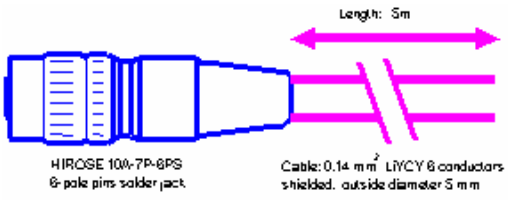
6.1.1 Pin Assignments LAN / Ethernet Interface

Signal	Pin
T+	2
T-	1
R+	6
R-	5
-	3
-	4

rear view camera socket:



6.1.2 Available Accessories for LAN / Ethernet socket



Signal	Pin (to cam.)	Pin (to PC)	Cable Color 20m patch cable	Cable Color 10m patch cable
T+	2	1	yellow	white/pink
T-	1	2	orange	pink
R+	6	3	white/green	white/green
R-	5	6	green	green
-	3	NC	-	-
-	4	NC	-	-

Refer to section 7.2 for a list of available cables with order numbers.

6.2 Trigger-/ V24- (RS232)-/ Keypad- / Encoder Interface

The trigger interface now incorporates 4 different functions:

1. Image trigger input for hardware controlled image acquisition.
2. Encoder image trigger input (from July 2006 – cameras with S/N XX1XXXX).
3. Serial RS232 interface (can not be used at the same time as the encoder interface).
4. Keypad interface (uses the serial input of the serial interface).

Note the following important changes from the VC20XX series:

- The serial interface of the VC4XXX cameras now connects to the trigger interface – a new cable is required and the pin allocation is different from VC20XX serial cameras.
- The "TrigIN –" trigger input form the VC20XX has been omitted. The trigger input signal "TrigIN" level now has to be 2.4 to 5V TTL relative to the trigger interface ground, pin 3. Existing trigger circuits for VC20XX cameras have to be adjusted to the VC4XXX, or the camera may be damaged. Sample circuits are provided in section 6.2.5.
- The trigger input is no longer opto-isolated – use own protection if required.
- The first VC40XX cameras had no integrated pull down resistor as shown in section 6.2.5. Since the trigger input is floating in this case, provide own external pull up resistor or connect TTL push/ pull sensor.
- A new keypad is required – the VC20XX keypad is not compatible with VC4XXX cameras! Refer to the "7.2" section for details.

Note the following important changes from the VC40XX cameras shipped until July 2006:

- New serial number for all VC4XXX with encoder input – XX1XXXX instead of XX0XXXX.
- New models now boot with serial output inactive to protect connected encoder. Refer to section 8 for information on enabling the serial input.
- The camera operating systems of both hardware versions are not compatible. Do not install an incompatible OS, as the camera hardware might get damaged!
- The following table shows the last OS version for XX0XXX cameras and the first OS Version for XX1XXXX cameras:

Camera models	Latest VCRT Versions for XX0XXXX cameras (without encoder interface)	First VCRT Versions for XX1XXXX cameras (with encoder interface)
VC4038	VCRT 5.23	VCRT 5.24-8
VC4065	VCRT 5.24-3	VCRT 5.24-8
VC4066	VCRT 5.23	VCRT 5.24-8
VC4068	-	VCRT 5.24-11
VC4466	VCRT 5.24-3	VCRT 5.24-8
VC4468	-	VCRT 5.24-13

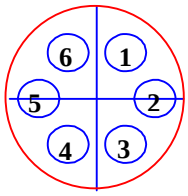
Multiple use of the trigger interface:

A "Y" adaptor cable is available for connecting several components to the trigger interface – refer to section 6.2.4 for details. The use of the serial input and the encoder interface is not possible at the same time.

6.2.1 Pin Assignments Trigger-/ V24 (RS232)-/ Keypad/ - Encoder Interface

Pin	Signals RS232 / Standard Trigger	Signals Encoder Interface Trigger
1	V24 TxD Out	0+ (Zero Pulse Encoder)
2	+ 5V Out	+ 5V Out (Power Supply TTL Encoder)
3	GND	GND (Power Supply TTL Encoder)
4	V24 RxD In / Keypad in	B+ (encoder input signal B+)
5	Trigger Out	Trigger Out
6	Trigger In	A+ (encoder input signal A+)

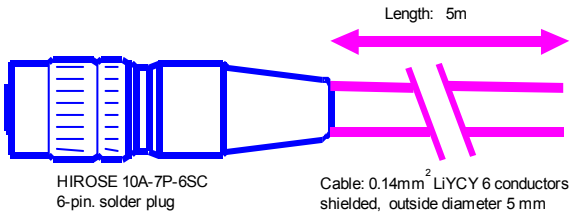
rear view camera socket:



Compared with the VC20XX Trigger interface, the former “Trigin –“ Interface has been replaced with a “V24 TxD Out” signal allowing the use of a bidirectional serial RS232 Interface (refer to section 8 for programming details). This means when replacing a VC20XX camera with a VC40XX the trigger input circuit needs to be modified, or the camera can be damaged! See the Electrical specifications in section 6.2.5 for details.

Read the introduction of section 6.2 explaining important modifications of this interface in order to avoid damaging the camera!

6.2.2 Trigger Cable

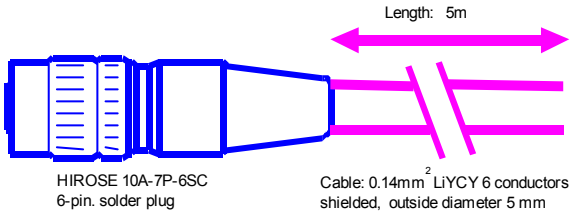


Pin	Signal	Cable Color[1]
1	V24 TxD Out	green
2	+ 5V Out	brown
3	GND	white
4	V24 RxD In	pink
5	Trigger Out	grey
6	Trigger In	yellow

Equipped on one end with a Hirose plug, length 5m, 10m or 25m
Refer to section 7.2 for a list of available cables with order numbers.

[1] Note that the color coding for both cables has been chosen according to the VC20XX core colors. For this reason the core colors of serial and trigger cables do not correspond to the same pin!

6.2.3 V24 (RS232) serial Cable



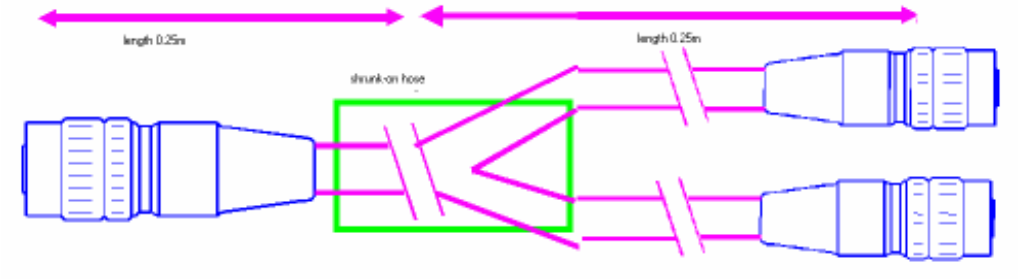
Pin	Signal	Cable Color
1	V24 TxD Out	brown
2	+ 5V Out	pink
3	GND	grey
4	V24 RxD In	white
5	Trigger Out	NC
6	Trigger In	NC

Equipped on one end with a Hirose plug, length 5m, 10m or 25m and on the other end with a 9 pin D-sub connector. This cable can also be ordered without the D-sub connector.

Refer to section 7.2 for a list of available cables with order numbers.

Refer to section 8.1 for information on programming the serial interface.

6.2.4 Y-Cable



Connectors:

1x HR10A-7P-6P, male connector **2x HR10A-7J-6S, female socket**

Cable length: 0.5m

The color coding of this cable corresponds to the Trigger Cable described above.
All cables are connected through – from the camera output to both extension sockets. Beware of possible undesired electrical contacts for instance when switching between encoder and serial input and connecting both at the same time.

Refer to section 7.2 for a list of available cables with order numbers.

6.2.5 Electrical Specifications of Trigger- / Serial-/ Keypad / Encoder Interface

The trigger interface features a dedicated fast TTL trigger input (for use as image capture trigger) and a fast TTL trigger output (as strobe-light trigger). Since both signals are fast at a very low noise margin, it is recommended to keep the cable as short as possible. Use shielded cable for this purpose.

Neither the trigger input nor the trigger output has an inbuilt-in photo coupler[2]. Please ensure that the electrical specifications of this section are met and provide galvanic isolation to trigger input and output if necessary.
Please note that input and output are not protected against over current. The output is neither protected against short circuit nor reverse voltage spikes from inductive loads.
The trigger input assures constant delay without jitter.

Technical data of trigger input:

input voltage:	2.4 - 5 V (TTL, CMOS)
input current:	3mA @ 3V / 5mA @ 5V
limiting resistor:	none
pull down resistor 1 kΩ	Included in later models
Opto- isolation:	none
reverse voltage protection:	none
switching delay:	Max. 2µsec + interrupt latency
Capture delay	Approx 40µsec (constant), for jitter free operation

Note the modified circuit of the trigger input, due to the additional RS232 interface. Old trigger input circuits need to be modified in order to prevent damaging the trigger input of the VC40XX camera. See the introduction of section 6.2 for details. The use of a transistor in the trigger input circuit is recommended as shown in the following figures. These are sample circuits only – please check the final circuit layout as this depends largely on the sensor / equipment connected.

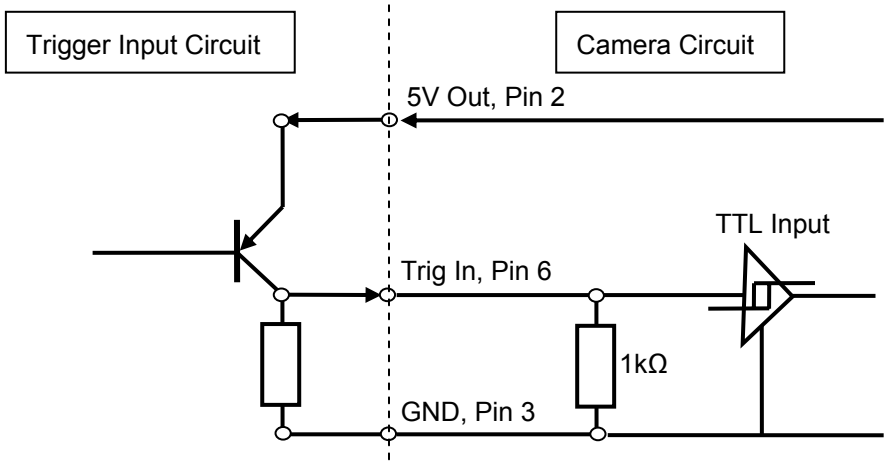
Please also note that the GND of the Trigger/ RS232 interface is not identical with the Power Supply/ PLC GND, GND IN com. (refer to section 6.3).

Selection of a suitable TTL encoder for direct connection to the trigger interface
A suitable TTL encoder can be connected directly to the encoder interface. The encoder power supply can be done using the 5V and GND outputs of the trigger interface. The 0+, A+, B+ encoder signals can be connected according to section 6.2.1 An encoder with “push- pull” output characteristic can save a pull down resistor on the trigger input.
Do not exceed the current rating of **50 mA** for the 5V out, pin 2 (keypad, encoder power supply).
The input voltage of the trigger input needs to be at least 2.4V (maximum Voltage: 5V).

Tested incremental encoder:
- 2420 range of miniature encoders, TTL, Ub = 5-24V, Signal Level = Ub -2.5V, push pull, manufacturer: Kübler GmbH, **www.kuebler.com**
- Siemens 1XP8001-2, TTL, Ub = 5-10V, for 3 phase 220V asynchrone motor, size H58 Din 332

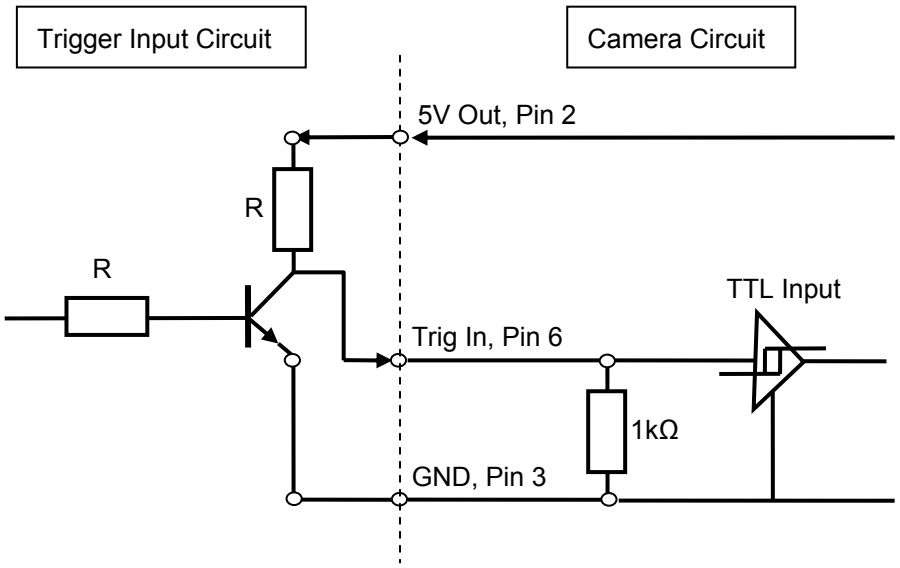
[2] The entry level camera range VC4018 and -16 incorporate opto coupler on trigger in and out.

Suggested Trigger Input Circuit PNP

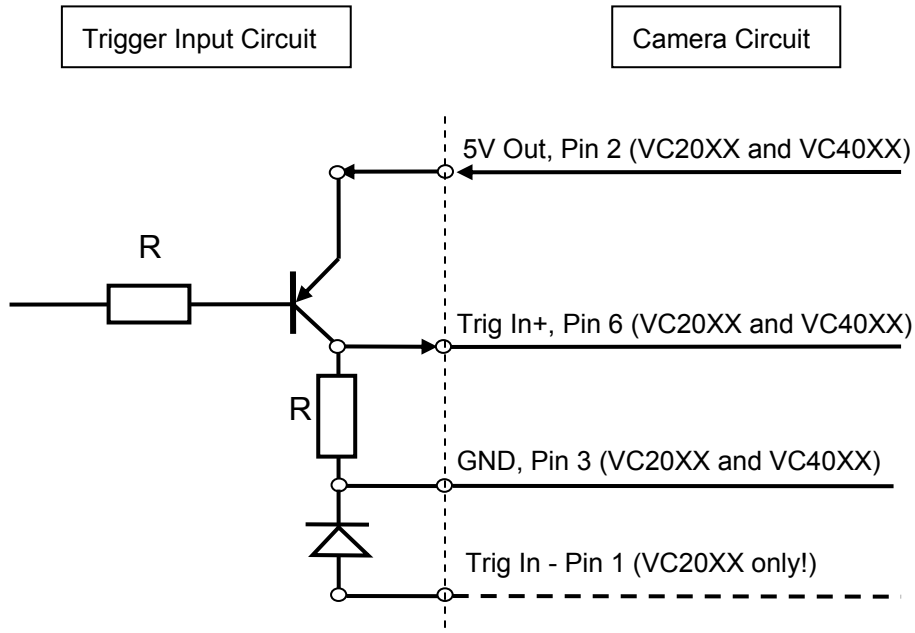


The 1kΩ internal pull down resistor is not included in the initial hardware release (delivery until end of 2005). Please provide external pull down resistor in case the trigger input stays high.

Suggested Trigger Input Circuit NPN



Trigger Input Circuit compatible to VC20XX and **VC40XX cameras:**

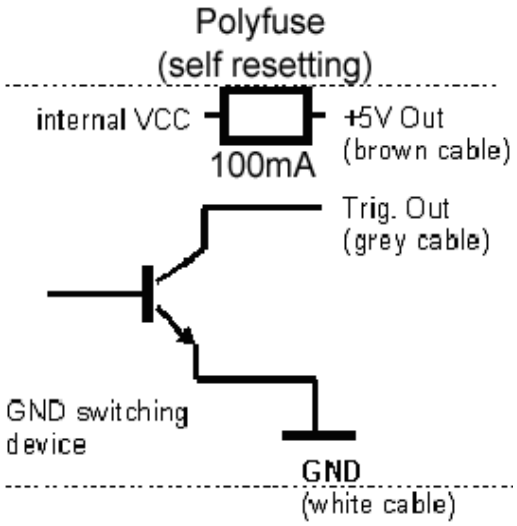


The trigger input circuit shown above can be used to connect both – the VC20XX and VC40XX smart camera families.

Technical data of trigger output:

output voltage:	max. 7V
output curent:	max. 50mA
pull-up resistor:	none, external resistor required

Note that the 100 Ω Resistor protecting the TTL trigger output Pin 5 from the VC20XX has been replaced with a self resetting poly fuse (see the following drawing). The trigger output is switching to ground (active low). The behavior of the output signal however can be programmed high or low during exposure (see the “Programming Tutorial” or the “Trigin.c” demo program).



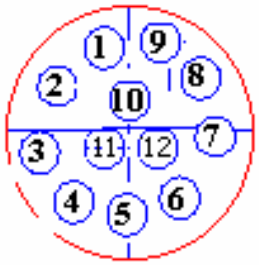
6.3 Power Supply and IO Interface

This connector includes the camera Power Supply and digital PLC IOs.

6.3.1 Pin assignments Power Supply and IO Interface

Pin	Signal
1	12-24V PLC
2	(12-[3]) 24V IN Cam
3	GND IN com.
4	INP 1
5	OUT 3
6	OUT 2
7	OUT 1
8	OUT 0
9	12-24V PLC
10	INP 3
11	INP 2
12	INP 0

rear view camera socket:



6.3.2 Electrical specifications Power Supply Camera

Power must be connected to the 12pin I/O connector. Note, that the voltage is 24V.
Camera power is regulated and galvanically separated inside the camera, so only an unregulated power source of 24 V +/- 20% is required.
The camera is, however, very sensitive to power supply interruption. Please make sure, that the voltage never exceeds the limits of +/- 20% even for a short period of time. In case of unstable power supply it is recommended to backup the power supply by a capacitor or a battery large enough to prevent power interruptions.
The camera has several internal circuits to detect and protocol power failures. Used correctly, these internal flags can be used to perform a correct shutdown and close all open buffers (see below). This feature is for emergency only and is not designed to handle frequent interruptions.

Note that the PLC output circuit of the VC4018 and VC4016 is connected to the camera power supply! This means it is not possible with these cameras to connect a different PLC output volltage (via Pin 2 and Pin 9) to the PLC outputs.

[3] Entry level cameras VC4018 and VC4016 only.

6.3.2.1 Single voltage, with or without PLC signals, no shutdown:

Signal	Pin No.	color	connect to
24V IN Cam	2	red/blue	24V power supply
12- 24V PLC	1	red	24V power supply
12- 24V PLC	9	blue/pink	24V power supply
GND IN com.	3	black	GND power supply

This option does not provide shutdown. Programmer must implement their own procedures for fail-safe operation.

6.3.2.2 Dual voltage, with or without PLC signals, shutdown

Signal	Pin No.	color	connect to
24V IN Cam	2	red/blue	24V backup supply
24V PLC	1	red	24V power supply
24V PLC	9	blue/pink	24V power supply
GND IN com.	3	black	GND power supply

Here, the PLC voltage (24V PLC) is connected directly to the power supply. If a power failure occurs or if power is switched off, the camera will detect this signal not being present. The internal flag generated can be utilised to shut down the camera correctly and resume operation after a power failure. The following procedures can be performed:

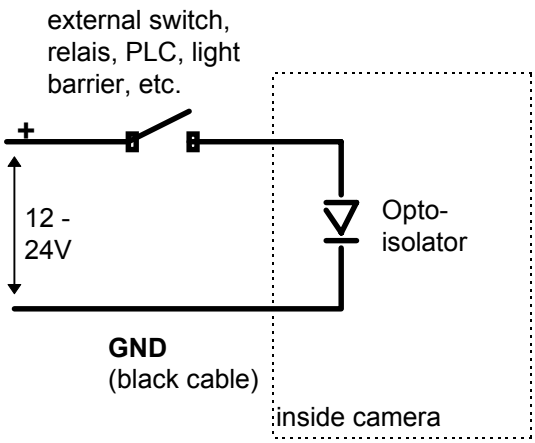
1. Stopping the operation of all programs and interrupts (no pictures will be taken any longer).
2. Saving all buffers (to multi-media card or flash EPROM).
3. Protocol time and date of the shutdown.
4. The procedure then waits for the backup voltage to disappear or main power to re-establish. If the latter happens the program might be able to continue where it has stopped. (In this case there may be some lost images = some parts not checked correctly)

The backup voltage must be able to supply specified voltage for a period of at least 100 msec.

6.3.3 Electrical Specifications digital PLC IO Interface

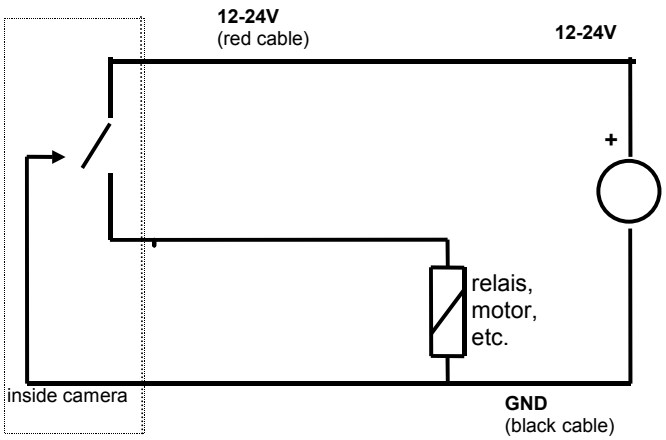
The VC40XX series Smart Camera features optically isolated inputs and outputs that allow for instance direct input of light barriers signals or the control of pneumatic valves.
Please observe the current and voltage ratings specified in the following sections.
The two “12-24V PLC” pins (pin 1 and pin 9) serve as power supply for the PLC outputs. These contacts are internally connected – it is recommended to supply the output voltage to both pins when the total current of all outputs exceeds 0.5 A. This represents the maximum current rating for one PLC output. The maximum combined current of all outputs should not exceed 1 A.

6.3.3.1 Connection of Inputs



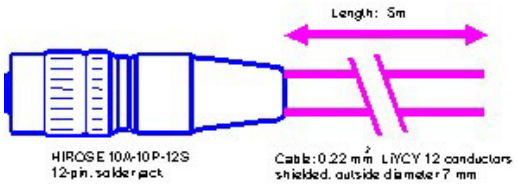
- 4 opto- isolated digital Inputs
- Operating Voltage 12 to 24 V
- Threshold Voltage 8V (input high for signals greater 8V)
- Maximum Voltage: 28V
- Reverse voltage protection
- Input Current 1mA @ 24V
- Signal debouncing hardware: 2.5 µs (signals up to 2.5 µs length are ignored)
- Signal Debouncing Software: 40 µs waiting time until a signal change is acknowledged

6.3.3.2 Connection of Outputs



- 4 opto- isolated digital outputs
- Operating Voltage 12 to 24 V
- current per output: 500 mA (total current all outputs < 1000 mA)
- Connect both 12-24 V PLC
- bit = 1 output will switch positive voltage
- short-circuit and over- temperature protection (2A)

6.3.4 Available Accessories / Cables for Power Supply and IO Interface



Signal	Pin No.	Cable color
OUT0	8	white
OUT1	7	brown
OUT2	6	green
OUT3	5	yellow
IN0	12	grey
IN1	4	pink
IN2	11	blue
IN3	10	purple
24V IN Cam	2	red/blue
GND IN com.	3	black
24V PLC	1	red
24V PLC	9	grey /pink

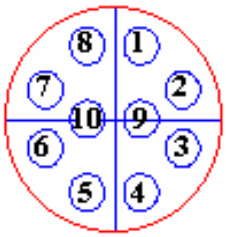
Equipped on one end with a Hirose plug jack, length 5m, 10m or 25m
Refer to section 7.2 for a list of available cables with order numbers.

6.4 Video Output Interface

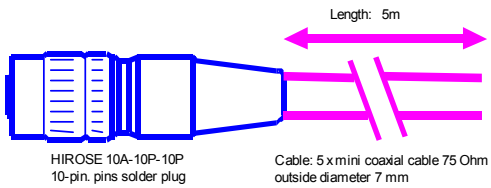
6.4.1 Pin Assignment of Video Output Interface

Pin	Signal
1	G GND
2	G Out
3	R GND
4	R Out
5	VS GND
6	VS Out
7	HS GND
8	B GND
9	B Out
10	HS Out

rear view camera socket:



6.4.2 Available Accessories / Cables for Video Output Interface



Signal	Pin No.	Connection
R Out	4	red signal
R GND	3	red shield
G Out	2	green signal
G GND	1	green shield
B Out	9	blue signal
B GND	8	blue shield
HS Out	10	white signal
HS GND	7	white shield
VS Out	6	gray signal
VS GND	5	gray shield

Equipped on one end with a Hirose plug, length 5m, 10m and 25m.
Please order "with 2nd connector", if you need a DSUB15 connector at the other end.
Refer to section 7.2 for a list of available cables with order numbers. The video interface is not available for the entry Level cameras VC4016 and VC4018.

7 Order Numbers Cameras and Accessories

7.1 Order numbers of all available VC4XXX Camera Models:

7.1.1 Order Numbers “Entry Level Range” Models:

Article Description	Order Number
VC4018	VK000258
VC4018C	VK000267
VC4016	VK000257
VC4016C	VK000268

7.1.2 Order Numbers “Entry Level Range” Models:

Article Description	Order Number
VC4038	VK000230
VC4065	VK000249
VC4066	VK000250
VC4068	VK000269

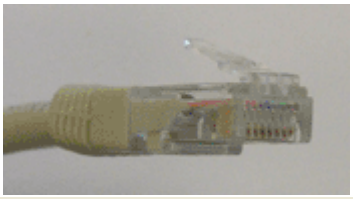
7.1.3 Order Numbers “High End” Models:

Article Description	Order Number
VC4466	VK000272
VC4468	VK000300

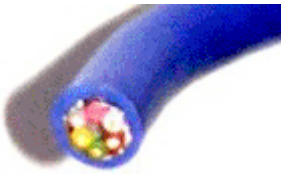
7.2 Order numbers of all available VC4XXX Accessories

For interface cables and connectors available also consult the corresponding section in chapter 6 of this manual as well as the "***VC Smart Camera Accessories***" section – under the "Product" section on our website **www.visoin-comp.com** .

Ethernet Cables (Refer to section 6.1.2):

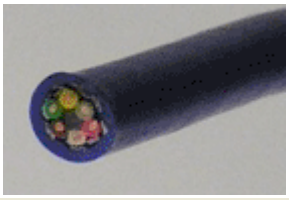
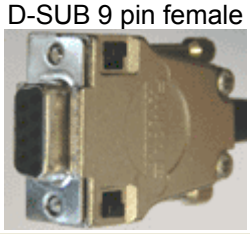
Article Description	Order Number	Camera Connector	Second Connector
5m LAN-C6-Cable	VK000149	HRS connector female 6 pin 	RJ45 
10m LAN-C6-Cable	VK000150	HRS connector female 6 pin	RJ45
20m LAN-C6-Cable	VK000151	HRS connector female 6 pin	RJ45
Ethernet Cross Module	VK000156	 RJ45	RJ45 female socket

Trigger Cables (Refer to section 6.2.2):

Article Description	Order Number	Camera Connector	Second Connector
5m Trigger-Cable / C6	VK000115	HRS connector male 6 pin 	without connector 
10m Trigger-Cable / C6	VK000164	HRS connector male 6 pin	without connector
25m Trigger-Cable / C6	VK000153	HRS connector male 6 pin	without connector

V24 (RS232) Serial Cable (Refer to section 6.2.3):

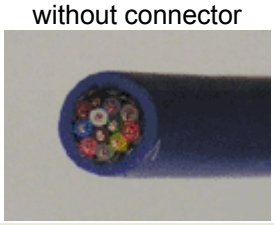

These cables differ from the serial VC20XX C6 cables!

Article Description	Order Number	Camera Connector	Second Connector
5m V24 cable	VK000243	HRS male 6 pin 	without connector 
5m V24 cable with DSUB	VK000244	HRS male 6 pin 	D-SUB 9 pin female 
10m V24 cable	VK000239	HRS male 6 pin	without connector
10m V24 cable with DSUB	VK000240	HRS male 6 pin	D-SUB 9 pin female
25m V24 cable	VK000241	HRS male 6 pin	without connector
25m V24 cable with DSUB	VK000242	HRS male 6 pin	D-SUB 9 pin female

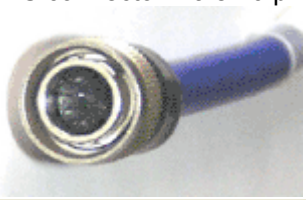
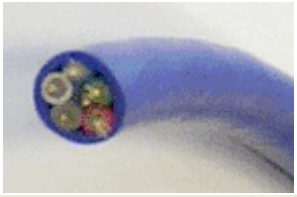
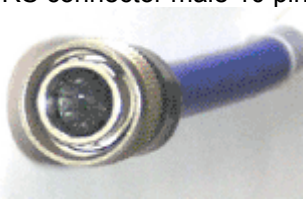
Y-Cable for connecting several cables to the Trigger / Serial Interface (Refer to section 6.2.4):

Article Description	Order Number	Camera Connector	Second Connector
0.5m Y adapter cable	VK000124	HRS male 6 pin 	2 HRS female 6 pin 

Power Supply and IO Interface Cables (refer to section 6.3.4):

Article Description	Order Number	Camera Connector	Second Connector
5m Power / PLC-Cable C6	VK000008	HRS female 12 pin 	without connector 
10m Power / PLC-Cable C6	VK000114	HRS female 12 pin	without connector
25m Power / PLC-Cable C6	VK000161	HRS female 12 pin	without connector

VGA Video Output Cable (refer to section 6.4.2):

Article Description	Order Number	Camera Connector	Second Connector
5m SVGA-cable	VK000006	HRS connector male 10 pin 	without connector 
5m SVGA-cable with DSUB	VK000083	HRS connector male 10 pin 	HD-SUB 15 pin male 
5m SVGA-cable with DSUB	VK000079	HRS connector male 10 pin	HD-SUB 15 pin female
10m SVGA-cable	VK000061	HRS connector male 10 pin	without connector
10m SVGA-cable with DSUB	VK000133	HRS connector male 10 pin	HD-SUB 15 pin male
10m SVGA-cable with DSUB	VK000080	HRS connector male 10 pin	HD-SUB 15 pin female
25m SVGA-cable	VK000065	HRS connector male 10 pin	without connector
25m SVGA-cable with DSUB	VK000098	HRS connector male 10 pin	HD-SUB 15 pin male
25m SVGA-cable with DSUB	VK000082	HRS connector male 10 pin	HD-SUB 15 pin female

Further Accessories:

Article Description	Order Number	Camera Connector
Power Adapter C6 24V, with 12 pins conn. 3m	VK000119	HRS connector female 12 pin 
Power adapter for rail mounting, Input Voltage 100 - 240VAC 50/60 Hz, Output Voltage DC 24V +/-5%, max. 300 mA (7.5 W), Equipped with connecting clamps for AC input and 24V output, CE cert.	VK000036	
VCSKBC4 Keypad (different from VCSKBC6 for VC20XX cameras!)	VK000238	
IR cut filter (camera is shipped with this filter mounted) refer to Appendix E	EK000625	
Clear glass filter (replaces IR Cut filter)	EK000624	

Flex cables for detached Camera Head mounting:

30mm length,20 core [4]	EK000321
80 mm length,20 core [2]	EK000322
200 mm length,20 core [2]	EK000629

[4] The feasibility of remote head mouting depends on working conditions (electrical noise, electro magnectic rediation emitted from the camera, voltage drop over sensor cable, etc.). VC's CE certification is valid only for the standard camera set up.

8 Programming VC40XX Smart Cameras

This section contains special programming features for the VC40XX smart camera series. Standard software functions are described in following manuals:

Type of resource	Name of file	Download location www.vision-comp.com
SW manual OS functions	VCRT5.pdf	**Support->Reg. User Area->SW Manuals**
SW manual Image Processing Functions	VCLIB_300.pdf	**Support->Reg. User Area->SW Manuals**

Please also check the “Getting Started VC” (Schnellstart VC Smart Kameras) as well as the “Support News” and the “Knowledge Base / FAQ” on our website (see the “References” section on the very first Page of this manual).

8.1 Programming the additional Serial Interface

The following program shows the programming of the VC40XX serial interface (refer to section 6.2):

With the new encoder interface, it is required to initialize the serial interface prior to its use with the following macro:

```
INTERFACE_MODE(SERIAL);

void sertest(void)
{
FILE *tty;
//unsigned xbaud=115200;
unsigned xbaud=9600;
char c=0;

print("\nSerial Interface Test press <ESC> to abort\n\n");

INTERFACE_MODE(SERIAL);

tty = fopen("kbd:", (void *)0);       /* open serial device */

print("Set baudrate=%d\n",xbaud);
io_ioctl(tty,IO_IOCTL_SERIAL_SET_BAUD,&xbaud);
xbaud=0;
io_ioctl(tty,IO_IOCTL_SERIAL_SET_FLAGS,&xbaud);

print("\nWriting 'abcdefg' to serial device !\n");
write(tty,"abcdefg",7);

print("\nAny typed char on serial device will be echoed!\n");
print("\nPress ESC on serial terminal to exit!\n");

while(c != 0x1b && rbempty()==-1)
{
  if(io_fstatus(tty)) // test if there are some chars in in buffer
  {
        c=io_fgetc(tty);
        print("c=0x%x\n",c);
```

```
  if(c!=0x1b)
        {
          {
                io_fputc(c, tty);
          }
        }
  }
}

fclose(tty);   /* close serial device */


fclose(tty);        /* close RS485   */

}
```

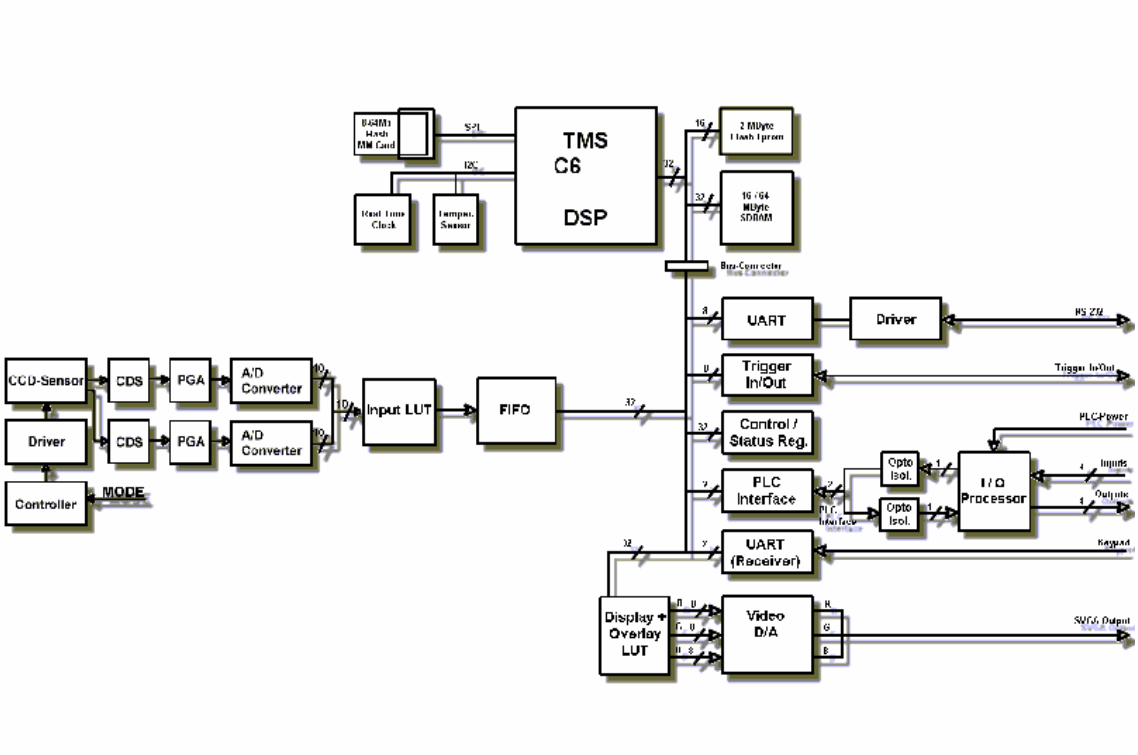
8.2 Programming the Encoder Interface

Refer to section 6.2 for details on this new interface!

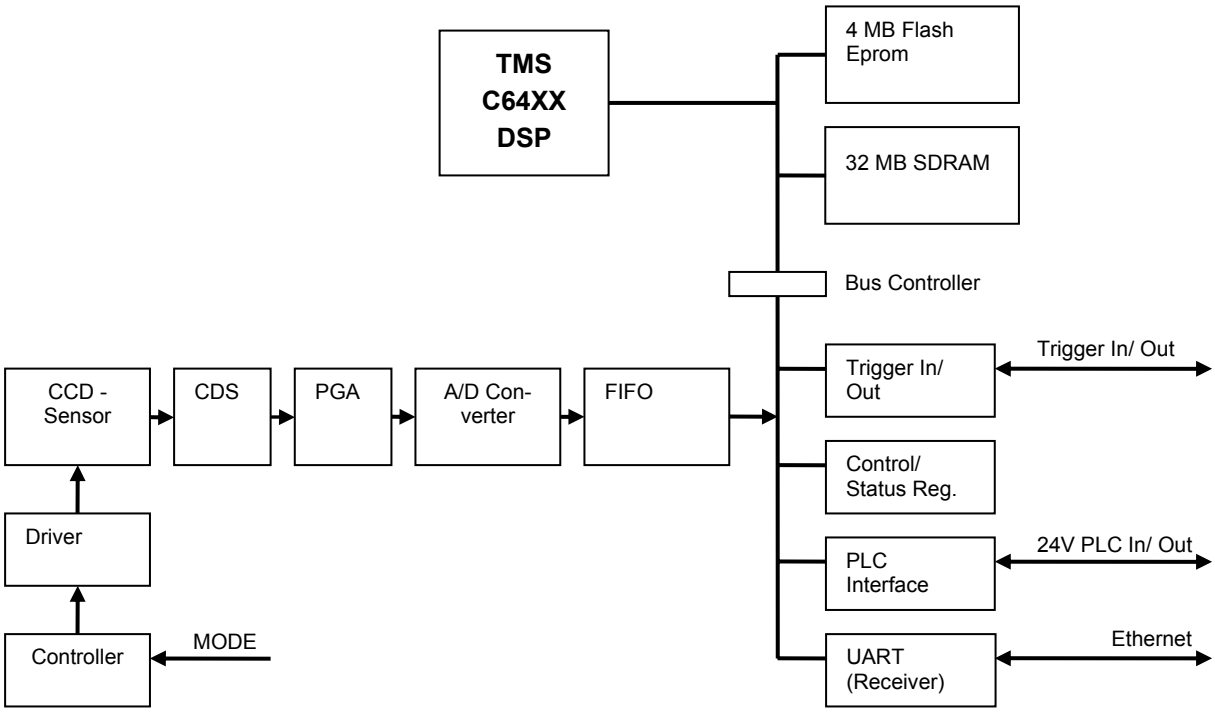
The encoder interface needs to be enabled prior to it's use:

```
INTERFACE_MODE(ENCODER); // Encoder mode (RS232 disabled)

}

void enctest(void)
{
  int Run=1,i=0;
  char c;
  print("\nEncoder Interface Test, press <ESC> to abort\n\n");
  TRIGINP_NEG() ;              // turning direction anti clockwise
  tpict();                     // take image to end live mode
  INTERFACE_MODE(ENCODER);     // Encoder mode (RS232 disabled)
  ENC_DISABLE_CNT();           // disable counter
  //ENC_WAIT_N();              // wait one time for next 0+ pulse
  ENC_WAIT_N_TRIG();           // wait every time for next 0+ pulse
  ENC_ENABLE_CNT();            // enable inputs
  ENC_WRITE_CNT(506);          // set Counter value
  ENC_WRITE_RELOAD(256);       // set Reload value
  while(Run)
  {
    tenable();                 // wait for external trigger and take picture
    while(!trdy())             // wait for image completion
    {
         if(kbhit())           // check for keyboard input
               {
                c=rs232rcv();
                    if(c==0x1B) // check for "ESC"
                       {
                       while(cancel_capture_rq());
                       Run = 0;  // deleting last capture request
                       }
               }
             printf("encodervalue is: %08d \r",ENC_READ_CNT());
             wait(0,50);       //      waiting time to slow printing
              }
print("************* exposure ************* (%u)\n",i++);
     }
  INTERFACE_MODE(SERIAL);      // Serial mode (RS232 enabled)
  vmode(0);                    // swtiching camera back to live mode
}
```

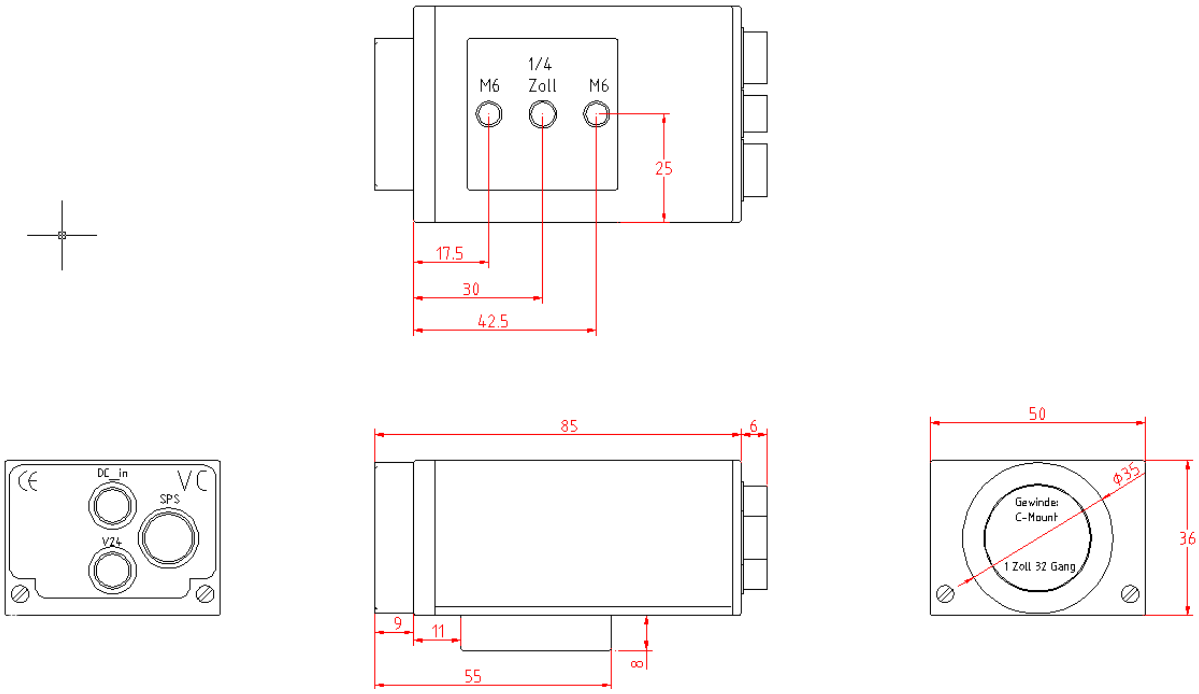
Appendix A: Block diagram VC40XX Smart Cameras



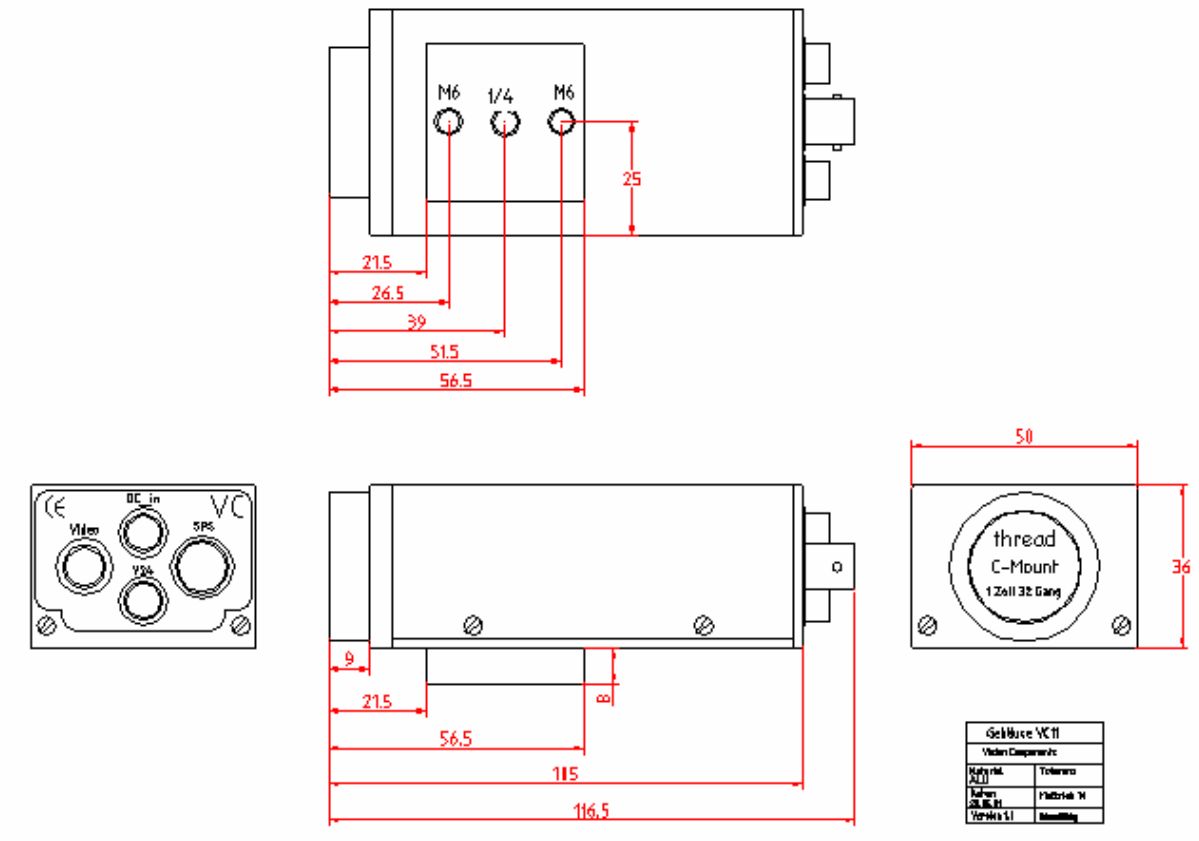
Appendix B: Block diagram VC4018/ -16 Smart Cameras



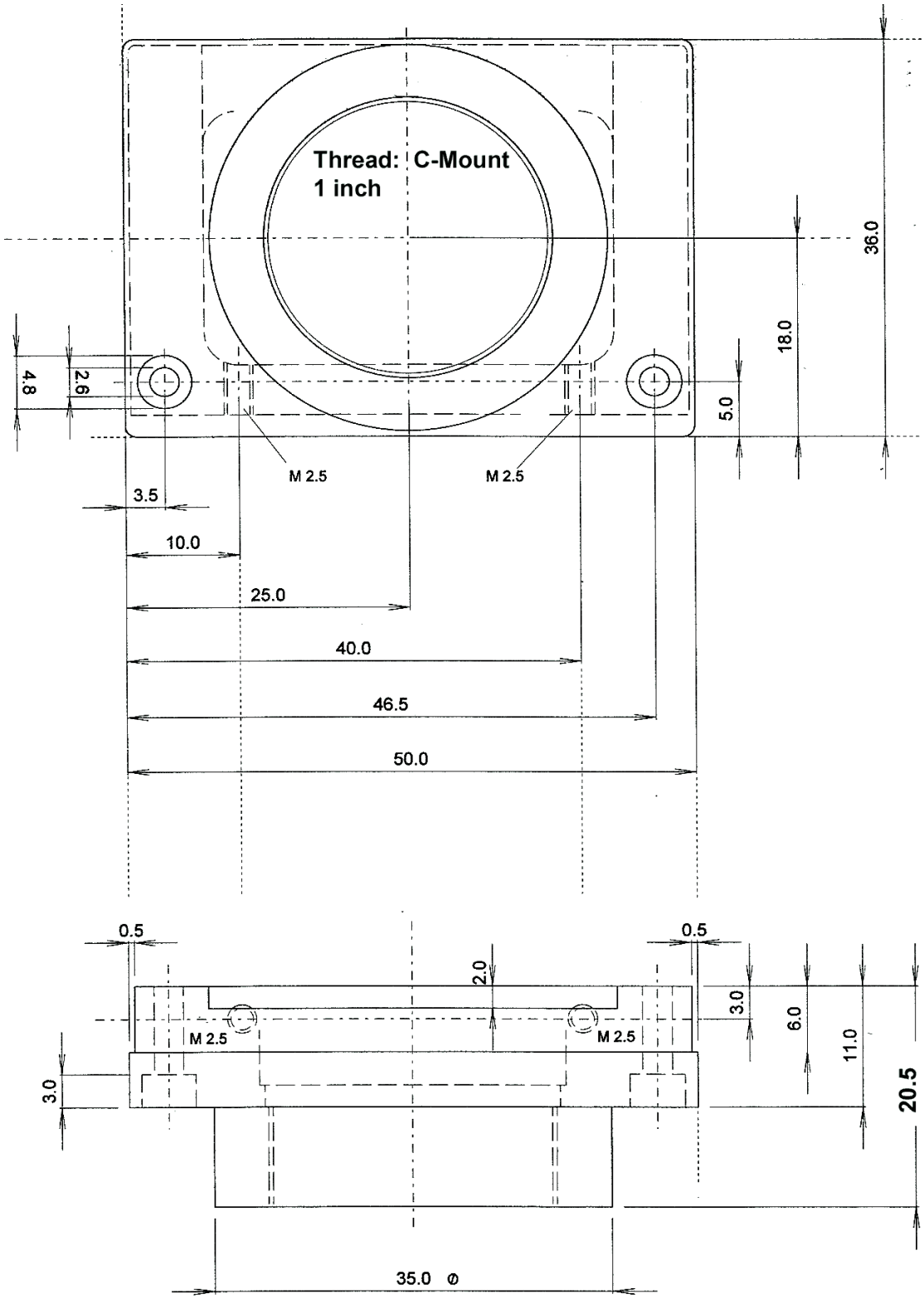
Appendix C: Overall Dimensions Housing VC4018/ -16



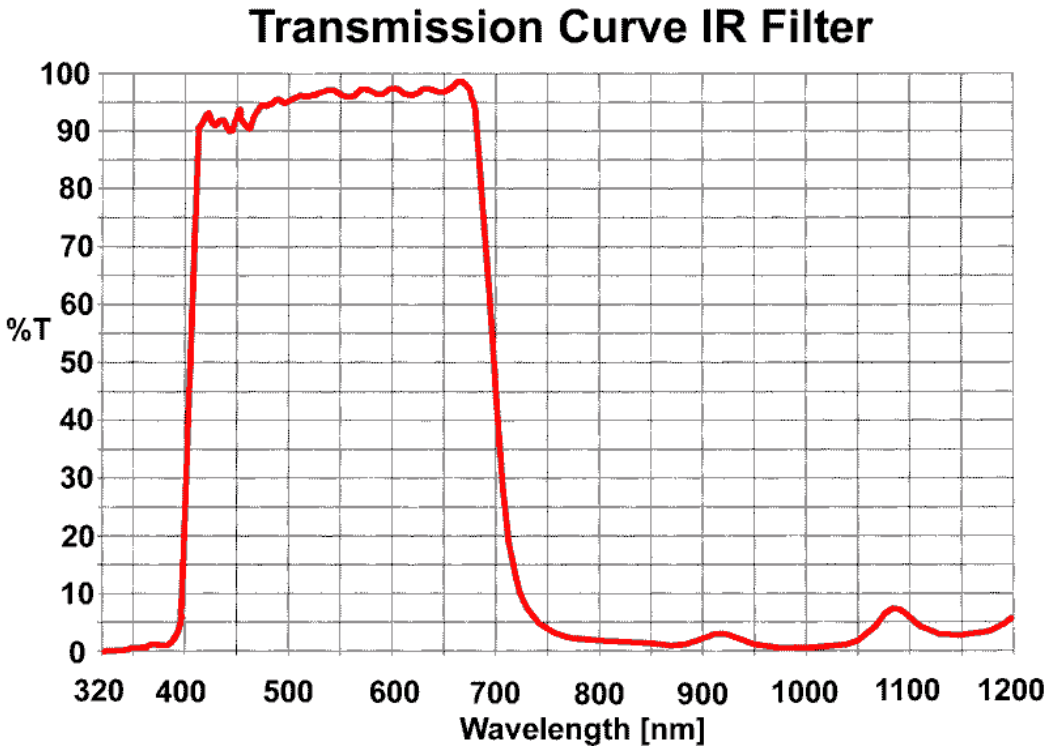
Appendix D: Overall Dimensions Housing VC40XX



Appendix E: Drawing Camera Head VC40XX



Appendix F: Spectral Transmission of IR Filter



Note:

This IR cut filter is incorporated in every VC40XX camera. The IR filter can be removed if required without loosing Vision Component's manufacturer's warranty. In this case, special care must be taken not to damage the CCD sensor.

If the camera is used without IR filter it is important to replace it by a clear glass filter of the same size. The C-mount flange distance from the CCD is accurately adjusted for the use of the IR filter – removing the filter decreases the length of the optical path and it may become impossible to focus some lenses to a larger working distance.

If the IR filter is not to be used, please order your camera with a clear glass filter or contact Vision Components for obtaining a glass filter.

The order numbers for the clear glass filter is:	EK000624
The order number for the IR cut filter (standard) is:	EK000625

Appendix G: Macros for new Encoder Interface

These macros are included from the new VCRT 5.25 VCLIB 3.02 release, due to be released in August 2006. Please insert these macros at the end of the vcrt.h (and VCRT_301.h) in C:\ti\C6000\cgtools\include until the release of the VCRT5.25, replacing the existing encoder macros in this header file. A text version of these macros are attached to the corresponding Knowledge base entry (search keyword : “encoder”).

```
/*
 * new for VCRT 5.25:
 *
 * VC4x Encoder Macros (Revision 12.06.2006)
 *
 ************** IMPORTANT!!!
*******************************************************
 * Encoder Macros do require VCRT Camera OS Version > 5.24.7
 * and new camera hardware with serial number S/N XX1XXXX !
 * AND PWR PCB Hardware Revision 1.4
 * AND FPGA file dated after 02.04.2006 !!!
 ************** IMPORTANT!!!
*******************************************************/

/* bits */

/* Ctrl_reg */
#define USE_ENCODER          (uint_32)(1<<24)

/* CAM_enc_ctrl write only */
#define ENC_WR_TO_RELOAD     (uint_32)(1<<31) /* write to comparator*/
#define ENC_WR_TO_CNT        (uint_32)(1<<30) /* write to counter*/
#define ENC_SET_N_MODE       (uint_32)(1<<29) /* set N mode*/
#define ENC_RESET_N_MODE     (uint_32)(1<<28) /* reset N mode*/
#define ENC_CLR_TIL_N_ONCE   (uint_32)(1<<27) /* clear counter immediately
until N pulse for one time */
#define ENC_RESET_ENC        (uint_32)(1<<26) /* reset encoder*/
#define ENC_DIS_ABN          (uint_32)(1<<25) /* disable inputs ABN*/
#define ENC_ENA_ABN          (uint_32)(1<<24) /* enable  inputs ABN*/
                                              /* bits 23:0 counter value*/

#define ENC_CNT_MASK         (uint_32)(0xFFFFFF) /* counter or comparator
                                                    bits 23:0 */

/* CAM_enc_status read only */
#define ENC_ENABLED          (uint_32)(1<<31) /* 0=RS232 enabled 1=encoder
                                                 in use   */
#define ENC_CNT_CLEAR        (uint_32)(1<<30  /* 0=nowait        1=wait for
                                                 N pulse */
#define ENC_N_MODE           (uint_32)(1<<29) /* 0=N mode off, 1=N mode on/
#define ENC_LOCKED           (uint_32)(1<<28) /* 0=unlocked 1=locked */
#define ENC_ABN_ENABLED      (uint_32)(1<<27) /* 0=ABN disabled 1=ABN
                                                 enabled */
                                              /* bits 26:24 not used */
                                              /* bits 23:0 counter value*/
```

```
/* helpers */
#define set_enc_reg(x)       (*(volatile uint_32 *)VIRTX_TDIV = x)
#define get_cnt_reg()        (*(volatile uint_32 *)VIRTX_TCNT)

#define ENC_GP10_0()         {  disints(); \
*((volatile int *)(GPEN))  &= ~(1<<10); /* dis GP10 = 0 */ \
*((volatile int *)(GPVAL)) &= ~(1<<10); /* set GP10 = 0 */ \
*((volatile int *)(GPDIR)) |=  (1<<10); /* set GP10 as output */ \

set_ctrl_reg( USE_ENCODER ); \
enaints(); }

#define ENC_GP10_1()         {  disints(); \
*((volatile int *)(GPEN))  |=  (1<<10); /* ena GP10 = 1 */ \
*((volatile int *)(GPVAL)) |=  (1<<10); /* set GP10 = 1 */ \
*((volatile int *)(GPDIR)) |=  (1<<10); /* set GP10 as output */ \
res_ctrl_reg( USE_ENCODER ); \
enaints(); }

/* functions */

#define ENCODER (0)
#define SERIAL  (1)
#define INTERFACE_MODE(x)     { switch(x) \
                                { case SERIAL:  ENC_GP10_1(); break; \
                                  case ENCODER: ENC_GP10_0(); break; } \
                                }

/* set */
#define ENC_DISABLE_CNT()     set_enc_reg( ENC_DIS_ABN )
#define ENC_ENABLE_CNT()      set_enc_reg( ENC_ENA_ABN )
#define ENC_WAIT_N()          set_enc_reg( ENC_CLR_TIL_N_ONCE )
#define ENC_WAIT_N_TRIG()     set_enc_reg( ENC_SET_N_MODE )
#define ENC_NOWAIT_N_TRIG()   set_enc_reg( ENC_RESET_N_MODE )
#define ENC_RESET()           set_enc_reg( ENC_RESET_ENC )

/* write */
#define ENC_WRITE_CNT(x)      set_enc_reg( ENC_WR_TO_CNT    | (x &
ENC_CNT_MASK) )
#define ENC_WRITE_RELOAD(x)   set_enc_reg( ENC_WR_TO_RELOAD | (x &
ENC_CNT_MASK) )

/* read  */
#define ENC_READ_CNT()            (get_cnt_reg() & ENC_CNT_MASK)
#define ENC_WAITING_FOR_N_PULSE() (get_cnt_reg() & ENC_CNT_CLEAR)

#ifdef __cplusplus
}
#endif

#endif

/* EOF */
```

Index

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