CHROMA C4-DSP user manual

September 2013

# CONTENTS

4
6
6
7
8
16
17
20
21
22
24
25
26
27

# INTRODUCTION







CHROMA C4-DSP is the result of 15 years of experience in scientific imaging.

This model is the fourth-generation model of the CHROMA CCD cameras in production for more than 10 years and it brings together all advantages deriving from direct experience in the field. The series is characterized by high sensitivity, fast image downloading, reduced weight and dimensions.

The key to its great performances is related to the use of CCD sensors with high quantum efficiency and a proprietary technology able to use the sensor to achieve maximum intrinsic performance.

Some of the main features:

- 1) 16-bit electronics at very low noise (std <1)
- 2) High read-out speed 4 Mpix/s
- 3) CCD soft hyperdrive, advanced sensor management technique able to exploit maximum intrinsic characteristics
- 4) High sensor temperature stabilization (± 0.1 °C) to provide a high reproducibility of the sensor's performances.

The camera also allows great performances at many imaging applications at different spectral bands (RGB, Multi-spectral) thanks to the use of an integrated internal 8-position filter-wheel for 25 mm diameter filters.

The instrument is completed by the presence of integrated peripherals that allow the realization of complex imaging techniques, all available on the AUX user port:

- 1) 16-bit bidirectional parallel port
- 2) Signals for the shutter total
- 3) 2 x 32-bit pulse generators
- 4) 1 x 32-bit delay generator
- 5) IN/OUT Trigger
- 6) 4 x 12 bit A/D channels

CHROMA C4 is connected to the personal computer by USB 2.0 and can easily be used at a distance up to 30 meters.

It mounts KAF CCD sensors, displaying a wide range of resolutions and pixels dimensions. The sensors are front-illuminated, supported by an excellent Quantum Efficiency, with optional antiblooming protection or enhanced performance (ITO).

All sensors (except those with the optional anti-blooming) offer a 100% fill factor, allowing to shoot marvellous images.

The main application fields are: Biology, Astronomy, Plasma Physics, Semiconductor Physics.

# PERSONAL COMPUTER MINIMUM REQUIREMENTS

- ▲ CPU Dual-Core 3 GHz
- ▲ 1 Gb RAM
- ▲ Microsoft Windows XP SP3
- A Hard Disk with at least 200 Mb of available disk space

# PERSONAL COMPUTER RECOMMENDED REQUIREMENTS

- ▲ CPU Quad-Core 3 GHz or higher
- 🔺 1 Gb RAM
- ▲ 22" colour monitor
- ▲ Microsoft Windows 7

### SOFTWARE INSTALLATION PROCEDURE

When you use the camera for the first time, you need to install the ViSTA software.

Insert the ViSTA 3 CD-ROM, provided with the camera, into the CD-ROM reader, wait a few seconds for the PC to load the "QUICK INSTALL" menu.

Click on ViSTA 3 and QUICK INSTALL will start and guide you through the software installation process.

The default settings will install the complete software package and all options.

You may need to reboot the PC if certain files in use by Windows need to be updated.



# CONNECTING THE CHROMA C4-DSP CCD CAMERA

To install your hardware platform on the PC, follow the steps below:

- Connect the power supply cable (supplied with a standard length of 2,5 m) to the CHROMA C4-DSP CCD camera.







- Carefully insert the connector to the power supply to prevent damage.





- Connect the USB cable (supplied with a standard length of 1.8 m) to the corresponding port of the PC.
- Turn on the camera.

### Attention:

- Do not touch the motor when it is working, because it can reach high temperatures. At a room temperature of 20 °C, the standard operating temperature of the motor is 55 °C.



- The lateral sides of the camera and the power supply must be free to enable the correct functioning of the ventilation system.

Now, you can install the drivers for the USB connection.

## INSTALLATION OF THE DRIVERS

When you use the camera for the first time, you will be asked to specify where the available drivers are located.

In the following, you will find the sequence of operations to be carried out.

An example with WINDOWS XP Operating System will be shown below. The operations are similar for the other Operating Systems.

Follow the steps on the basis of your Operative System, taking into consideration the fact that this procedure has to be carried out for two USB Serial converters, A and B.

#### WINDOWS XP

Once you have connected the camera to the PC following the instructions reported on the previous page, a screen (as shown on the right) will appear, informing you that new hardware has been detected.



# Found New Hardware Wizard

Welcome to the Found New Hardware Wizard Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission). Read our privacy policy	Then, a screen will appear (as shown on the left), where you will be asked to connect for Windows
Can Windows connect to Windows Update to search for software? Yes, this time only Yes, now and every time I connect a device No, not this time	update. Select: "No, not at this time" and click on "Next" to continue the installation.
Click Next to continue.	
< Back Next > Cancel	

Select the option "Install from a list or specific location (Advanced)" (recommended choice). Then click on "Next" to continue the installation.



Found New Hardware Wizard
Please choose your search and installation options.
<ul> <li>Search for the best driver in these locations.</li> <li>Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.</li> <li>Search removable media (floppy, CD-ROM)</li> <li>Include this location in the search:         <ul> <li>E:\</li> <li>Browse</li> </ul> </li> <li>Onn't search. I will choose the driver to install.</li> <li>Choose this option to select the device driver form a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.</li> </ul>
< Back Next> Cancel

Check the functions selected as shown as in the screen on the left, including the folder containing the drivers you are looking for, by using the Browse function (in this example, E:\ indicates the CD-Rom drive). It opens the screen

on the next page.

÷

Select the folder that contains the ? Browse For Folder drivers for USB hardware according to the Operative System: Select the folder that contains drivers for your hardware. Windows 98/Me2000/XP: select <u>Windows</u> 🞯 Desktop 🗄 📋 My Dacuments Windows XP Professional x64: 🖃 🧕 My Camputer select XPx64 (as in the image below) 🗄 🍓 3½ Floppy (A:) 🗄 🥯 Local Disk (C:) 🗄 🥝 DVD/CD-RW Drive (D:) Then, click on OK and it will start searching the drivers. 🖃 🥝 CD Drive (E:) 🚞 Catalog 🖃 🚞 Drivers 🚞 FDL-PCI 🖃 🚞 USB 🛅 Windows Found New Hardware Wizard Please wait while the wizard searches... FDL-USB < Back Next > Cancel

.

At this point, a window like the one on the right appears, click on "Continue Anyway" to go on with the installation and wait while the wizard installs the software (just few seconds).





When the installation has been completed, a screen like the one shown on the right will appear. Click on: "Finish" to close the wizard.



Now, the same procedure will be carried out for the installation of the drivers of USB Serial Converter B.

At the end of the installation process, restart the PC (recommended choice).

# DETAIL OF THE CHROMA LOWER PANEL CONNECTORS

On the bottom side of the CHROMA you will find the connectors required to connect the camera to the PC, to the power supply and to mount it on a photographic tripod (in the middle upside).



Starting from the left, the following connectors are shown:

- **USER PORT**: 26-pin connector which implements an 8-bit parallel communication, bidirectional and programmable.
- **44-pin high-density connector**: for power supply and USB connection.

# 44 PIN PARALLEL PORT CONNECTOR



1	AGND	2	AGND	3	VDD	4	NOT USED	5	VSS
6	PWR	7	PWR	8	PWR	9	GND	10	+ 5V OUT
11	TDI	12	GND	13	GND	14	GND	15	USB +
16	AGND	17	AGND	18	VDD	19	NOT USED	20	VSS
21	PWR	22	PWR	23	PWR	24	+ 65V	25	+ 3.3V OUT
26	ТСК	27	GND	28	GND	29	GND	30	USB -
31	AGND	32	AGND	33	VDD	34	NOT USED	35	VSS
36	PWR	37	PWR	38	PWR	39	GND	40	TDO
41	TMS	42	GND	43	GND	44	GND	-	-

\* Typical value, that may vary according to the camera model.

- A AGND: Analogical Ground
- ▲ **VDD:** + 19V \*
- **▲ VSS:** -17V \*
- PWR: Power supply
- ▲ GND: Ground
- ▲ TDO/TDI/TCK/TMS: JTAG signals for I/O Processors

Note: All signals are LVTTL compatible, except the analogical ones.

# 26 PIN USER PORT CONNECTOR



1	3.3V OUT	2	РАО	3	PA1
4	PA2	5	PA3	6	PA4
7	PA5	8	PA6	9	PA7
10	РВО	11	PB1	12	PB2
13	PB3	14	PB4	15	PB5
16	PB6	17	PB7	18	IN AD0
19	IN AD1	20	IN AD2	21	IN AD3
22	SHUTTER IN	23	TRIGGER INPUT	24	TRIGGER OUTPUT
25	SHUTTER OUTPUT	26	GND	-	

A **PA[0:7]**: Bidirectional parallel port reserved for user.

▲ **PB[0:7]**: bidirectional parallel port reserved for user.

IN AD[0:3]: Analogical Input 2.5V

**GND:** Ground

Note: All signals are LVTTL compatible, except the analogical ones.

# MOUNTING OR REPLACING FILTERS

CHROMA optionally manages a set of 6 or 8 filters with 25mm diameter and max. 5mm thickness. In addition to the filters on the wheel, a ninth filter can be directly mounted on the external adapter. This filter is generally used to block Infra-Red emission.

The following diagram shows the line the light follows before reaching the sensor.



To gain access to any of the internal filters the first thing you need to do is to remove the photographic adapter.



After removing the adapter, take out (if present) the Infra-Red stop. Then get hold of the perforation and, with an upward movement, pull out the plug. Now you should have access to the internal filters.



Use a small screwdriver to remove a filter, being careful not to damage the filter.

In order to mount a new filter in the wheel, you first need to remove the three clamping screws. You can then place the filter in its proper place and tighten the screws again with the o-ring. In order to execute this operation, we strongly recommend the use of "stamp" tweezers with a hooked end, holding the screw in the tweezers in one hand and the screwdriver in the other hand.



#### We advise you to loosely fit the screw to avoid deformation of the O-Ring.

We also suggest using a clean, well-lit table and, if possible, fine lattice gloves or similar to avoid leaving fingerprints on the mechanical or optical parts of the camera.

Latex gloves



When you need to dust the filters we advise using filtered compressed air made specifically for the cleaning and maintenance of cameras; alternatively, you may use a special photographer's brush.

In order to remove fingerprints or stains, use Kodak lens cleaning paper.



# OPTICAL WINDOW CLEANING

Both the optical window and the CCD cleaning are carried out in the clean room through a 30-magnifying power microscope.

This procedure removes any dust which may cause spots to appear on the images you have taken. These spots increase in particular when the focal ratio gets wider.

In other words, an image may not show any marks at f/5.6, which, however, can be clearly noted at f/32 because of a geometrical problem of projection.

Due to the shutter elapsed time, the external surface of the optical window may gather dust particles that can be easily removed.

In order to do so, we recommend the use of a compressed air cylinder designed specifically for optical cleaning.

<u>Attention !!!</u> There are similar products that, instead of using compressed air, use fluids containing liquefiable gases : at ambient pressure they quickly gassify, thus causing a compressed air effect.

Absolutely do **NOT** use these products : they may cause persistant marks or rings on the windows.



A product we recommend is DUST-OFF by EDMUND-OPTICS.

Thanks to DUST-OFF (or other similar products) it is very easy to remove microparticles : keep the shutter open for a few seconds (via the camera control program) and spray some air blast. We kindly advise <u>against</u> using cloths, optical paper and cleaning liquids because the dirt will only mix up or even increase, which may cause damage to the coating of the optical window !

# **SPECIFICATIONS**

MODEL	ARRAY FORMAT (HxV)	PIXEL (HxV) mm	SIZE (HxV) mm	FWC ke <sup>-</sup>	DARK CURRENT e <sup>-</sup> /pixel-s@- 5°C	QE @ 450, 550, 650 nm	FILL FACTOR %
C035	768x512	9x9	6.9x4.6	100	0.5	55, 67, 82	100
C100	512x512	20x20	10.2x10.2	500	12.5	35, 55, 58	100
C130	1536x1024	9x9	13.8x9.2	100	0.6	50, 67, 75	100
C150	2184x1472	6.8x6.8	14.85x10.26	55	0.5	60, 75, 82	100
C250	3326x2504	5.4x5.4	17.96x13.52	25.5	3.5	45, 57, 48	100
C500	3072x2048	9x9	27.65x18.48	100	0.5	40, 55, 64	100

The Quantum Efficiency, Full Well Capacity and Dark Current values are to be considered typical.

Readout speed	4 Mpix/s	Integrated filt	ter-wheel (op	ot) **	6-8 positions
A/D Converter	16 bit	Max	total	noise	(typ)
		15e <sup>-</sup>			
Partial CCD reading	Programmable	Binning		from 1x1 to 8	3x8 o arbitrary
Interface	USB 2.0	Mount			42x0.75
Spectral response	350 – 1000 nm	Backfocus			25.2 mm
Cooling	40°C DT	Shutter		electr	omechanical
Exposure time	from 10 ms to 9999 s	CCD temper	ature control		± 0.01°C
Optical window *	Fused silica, 1 mm	Weight			1800 g
Power supply	230 V	Max absorpti	on		60 W
Dimension	155 x 134 x 62 mm	Auxiliary port			yes

\* With double coating. On request, it can mount coating and/or double coating windows with non parallel faces and windows in Beryllium with X-ray scintillator screen

\*\* According to the model.

#### The standard system for CHROMA C4-DSP series includes:

- > assembled unit in light alloy with threaded 42x0.75 input;
- ➤ 1,8m USB link cable;
- software for image grab and processing under Windows XP/VISTA/7;
- 230/115 V power supply;
- case, manual with test report and 24 months warranty period.

#### Optionals:

RGB	RGB interferential filters set, filters of 25 mm diameter
WEL	8-positions integrated filter wheel (6-positions for C500 model), filter $ m  ilde{\phi}$ 25 mm
NIK-C	Adapter for Nikon lens
MIN-C	Adapter for 42x1 mm lens
ΠС	Adapter from 42x0.75 to C mount
СРА	Front panel with C mount and back focus (the filter wheel cannot be placed)

# **TYPICAL SPECTRAL RESPONSE**

The figure below shows the typical spectral response versus the wavelength (expressed in nm) for the different CHROMA C4-DSP models.



### Quantum efficiency of C035 model

standard version, version with micro-lens



# Quantum efficiency of C100 model

Wavelength (nm)



# Quantum efficiency of C130 model

standard version, version with micro-lens



wersion with micro-lens



# Quantum efficiency of C250 model



# Quantum efficiency of C500 model

# INDEX

2 26 PIN USER PORT CONNECTOR	17
4 44 PIN PARALLEL PORT CONNECTOR	16
C CONNECTING THE CHROMA C4-DSP CCD CAMERA	8
D DETAIL OF THE CHROMA'S LOWER PANEL CONNECTORS	15
I INSTALLATION OF THE DRIVERS INTRODUCTION	10
M MOUNTING OR REPLACING FILTERS	18
O OPTICAL WINDOW CLEANING	20
P PERSONAL COMPUTER MINIMUM REQUIREMENTS PERSONAL COMPUTER RECOMMENDED REQUIREMENTS	6
Q Quantum efficiency of C035 model Quantum efficiency of C100 model	
Quantum efficiency of C130 model Quantum efficiency of C150 model	
Quantum efficiency of C500 model	
SOFTWARE INSTALLATION PROCEDURE	7 
T TYPICAL SPECTRAL RESPONSE	22

CHROMA C4-DSP user manual

Page intentionally left blank.

# CONTACT

For further information, please contact us at:

 Email:
 info@digitaltechnologyart.com

 Web:
 www.digitaltechnologyart.com

 Tel.:
 +39 050 711126

 Fax:
 +39 050 715347