

Description

The HVDUO-14M is a one-piece digital color camera capable of acquiring accurate, high-resolution color images using the Foveon® X3™ 14M CMOS color image sensor. The HVDUO-14M features 24-bit digital color output, real-time color processing, support for all sensor scan modes and a CameraLink interface. The HVDUO-14M is compatible with a wide range of standard optics and includes an automatic internal dark-frame shutter and controls for synchronized illuminators. The HVDUO-14M is well suited for industrial, scientific, cinema, medical and communications applications requiring high-quality color images.

Features

14 million photo detectors in a 2652 x 1768 x 3 matrix matches 3-chip color performance

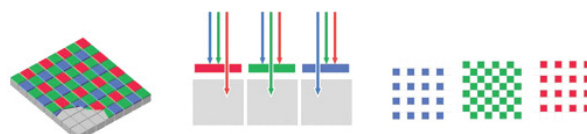
- 7.8 micron square pixels accommodate an extensive selection of optics
- Flexible scanning methods support selection of resolution, raster size and speed from full resolution at >4 fps
- Single-shot or continuous acquisition with selectable exposure offer optimum performance for still and motion images
- Camera control and image viewing software for Windows® facilitates rapid setup and acquisition
- Internal automatic shutter provides trouble-free dark frame acquisition
- 24-bit RGB output easily connects to a wide variety of framegrabbers
- A compact housing, single power supply and diverse mounting options simplify installation

Sensor

The HVDUO-14M camera provides true color performance through the use of the Foveon X3 F13 CMOS color image sensor, which incorporates the exclusive Foveon X3 color separation technology. Unlike color filter mosaic sensors, the Foveon X3 F13 image sensor detects full color at every pixel location.

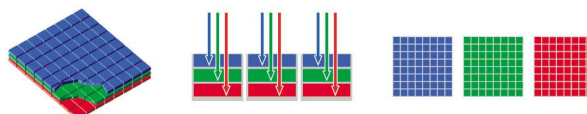


In a typical mosaic sensor, each pixel is supplied with a filter that passes only one color band. One-half of the pixels detect green and only one-quarter detect red or blue. This wastes light and creates gaps in the color data, producing offsets among the color detection positions and artifacts when the missing data are estimated.



Old Filter Array Technology

In image sensors using the Foveon X3 technology, three layers of photodetectors provide every pixel location with three stacked photodetectors so that every pixel location detects full color. No light is lost in filters and the detection locations for all three colors are coincident.



New Foveon X3 Technology

HVDUO-14M Digital Color Camera

To make best use of the superior color detection capability of the X3 technology, the Foveon X3 F13 image sensor also includes an extensive set of scan control registers to support scanning of selected rectangular regions of interest, grouping of pixels in both rows and columns and selective scanning of every n th line to facilitate higher frame repetition rates.

The HVDUO-14M camera takes full advantage of these powerful sensor features by incorporating real-time color processing, full control of scan modes and three-channel, 12-bit video digitization.

Shutter Mode Control

The HVDUO-14M provides two shutter modes to accommodate a broad variety of still and motion imaging applications. In either mode, scanning may be set to run continuously or triggered frame by frame on demand.

Still Shot – The still shot mode provides superior image quality in applications where the illumination can be externally timed. This includes the use of strobe or pulsed LED illumination or external shuttering.

Rolling Shutter – The rolling shutter mode is used where the illumination is continuous either for acquisition of single images or for video operation. Exposure time may be set from one line to one second.

Image Processing

Three-channel analog video from the sensor is digitized to 12 bits to maximize dynamic range. After digitization, the image data is processed in real time to produce accurate color output. Control is provided for two important video processing steps.

Dark Frame – The HVDUO-14M acquire a new dark frame whenever any setting is changed that invalidates the previous stored data by sending software command. New dark frames may also be acquired manually at any time. An automatic internal dark frame shutter assures that the sensor is covered during the acquisition.

Color Matrix – Five color conversion tables for various lighting types are permanently stored in the camera. In addition, user-generated tables may be sent to the camera for special lighting or image processing situations.

Image Timing

The HVDUO-14M operates from an internal crystal-controlled clock. Data is transmitted at constant frequency after a $7 \mu\text{s}$ recharge period at the beginning of each line.

Pixel Clock

24 MHz

Frame Rate

The frame rate depends on the exposure settings. These are maximums for the rolling shutter mode with the exposure shorter than the frame time. Many more scan combinations are possible than these shown. Values are in frames per second.

Pixel Matrix	24 MHz Clock
2652 x 1768	4.4 fps
1920 x 1080	9.4 fps
1280 x 720	19.24 fps

Individual images may be acquired by triggered scanning. The precise scan and exposure timing and delay depend on mode, number of scan lines and exposure settings. The triggering can be done either via the frame grabber's trigger board or by sending trigger signal to the camera's trigger connector.

Sensor Characteristics

Pixel Geometry

Pixel Locations – 2652 columns x 1768 rows x 3 layers active

Spacing – $7.8 \times 7.8 \mu\text{m}$ square

Raster Area – 20.68 mm (H) x 13.79 mm (V) active

Fill Factor – approximately 92% with microlens

HVDUO-14M Digital Color Camera

Spectral Response

The spectral characteristics of the sensor in the HVDUO-14M camera are determined by the absorption properties of silicon and are not subject to aging, bleaching or wear of filter materials.

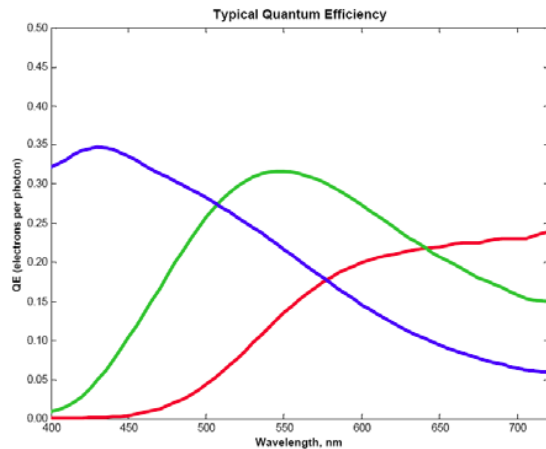


Image performance

(At 25C, 0db gain)

Specification	Value
PRNU	$\pm 3 \text{ DN}_8$ (after dark subtraction)
FPN	$\pm 3 \text{ DN}_8$ (Row) $\pm 2 \text{ DN}_8$ (Column)
S/N Ratio	Limited by A/D converter
Dynamic Range	Limited by A/D converter
Sensitivity	Equivalent to ISO 100
Anti-blooming	100x

Environmental Tolerance

Operating Temperature – 0 to +40C
Humidity – 10 to 90%, non-condensing
Storage Temperature – -20 to +60C

Software

The camera includes a CD-ROM with all software necessary for setup and control through the framegrabber serial port. Framegrabbers may require additional control and setup software. All HanVision software requires a Matrox Meteor 2 framegrabber with MIL-Lite 7.5

Viewer Software - The HanVision Viewer software supplies basic image acquisition and analysis functions (NeGUS2)

- Runs under Windows 2000/ XP
- Save image, format: BMP
- Line profile display
- Zoom in and out
- Simple image processing: brightness, contrast and geometric transform
- Single and continuous grab
- Control Software: The HanVision Camera Control Tool (HVCC)

Electrical Interface

Power

5 volts DC at 2 amps maximum
Connector -
Optional AC adapter

Digital Output

8 bit x 3 RGB, CameraLink Base
LVAL and HVAL data control
Pixel clock
Bidirectional serial control

Light Source Control – The HVDUO-14M camera provides output and optoisolated input connections for synchronization with pulsed illuminators or external shutters.

Options

Special Windows

Sensors may be ordered with plain glass windows, removable windows (without warranty), fused silica windows or custom windows at modest extra cost.

Other Interfaces

The modular construction of the HVDUO-10M-CL facilitates implementation of different interfaces. Parallel LVDS models are also available.

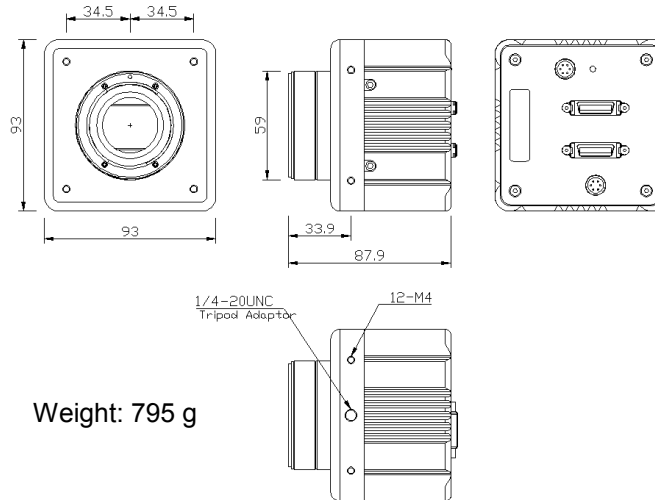
Custom Interfaces

The modular construction of the HVDUO-14M facilitates implementation of custom interfaces.

HVDUO-14M Digital Color Camera

Mechanical Configuration

- Image Size: 20.68 mm (H) x 13.79 mm (V) active
- Sensor Window: Visible pass (frontside), Visible anti-reflectance (backside)
- Lens Mount: Nikon "F" mount with internal filter holder
- Sensor Alignment: ± 0.01 mm (H & V), ± 2 mrad (rotation), ± 0.01 mm (flatness)

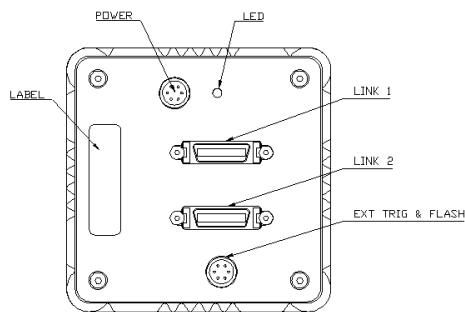


Weight: 795 g

Optical Configuration

- Image Size: 20.68 mm (H) x 13.79 mm (V) active
- Sensor Window: Visible anti-reflectance (frontside and backside)
- Lens Mount: Nikon "F" mount with internal filter holder
- Sensor Alignment: ± 0.01 mm (H & V), ± 2 mrad (rotation), ± 0.01 mm (flatness)

Rear Panel Connections



- Power: Connector - 6-pin Hirose HR-10A, male
Input - 5 VDC $\pm 5\%$, 1A max, AC adapters available for all countries
Consumption - 4 W (typical)
Indicator - Green LED
- Digital Video Out: Format - 24 bit RGB, CameraLink Base
Connector - 2- MDR-26P (only Link 1 is used)
- External Triggering: Signals - Frame trigger in, Flash sync out
Connector - 6-pin Hirose HR-10A, female

Ordering Information

The HVDUO-14M is available in the following configurations

HVDUO-14M Configuration	
Part No.	Window
3331-0007-01-00	HVDUO-14M Camera - grade 1 sensor w/AR-AR window; removable IR filter, CL, 24 MHz
3331-0007-02-00	HVDUO-14M Camera - grade 1 sensor w/temp window; removable IR filter, CL, 24 MHz

See the current price list for cables, AC adapters and other options.

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Local Representative

HanVision reserves the right to make changes in configuration and specifications without prior notice to support improvements in components, performance or compatibility. Specifications are representative of camera performance but may not represent sensor limits.

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