

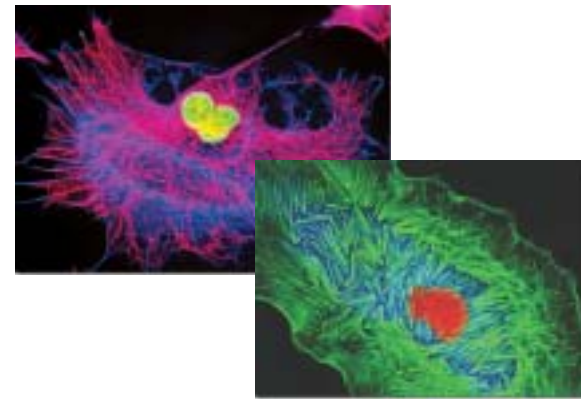


# DQC-F5

Ultrahigh-sensitivity EMCCD Camera  
for Microscopes



# High-performance CCD camera that can capture extremely weak fluorescence signals—perfect for an expansive range of bioscience applications



The DQC-FS offers very high sensitivity through the use of on-chip multiplication gain. A back-illuminated 512 x 512-pixel array (16 x 16- $\mu\text{m}$  pixels) enhances this sensitivity, while providing outstanding quantum efficiency and good field of view. The 16-bit, thermoelectrically cooled system can be operated at 10MHz for high-speed image visualization or more slowly for high-precision quantitative imaging.

- Primary Applications**
- Single-molecule fluorescence
  - High-speed, low-light imaging
  - Live-cell GFP imaging
  - Field Scanning Confocal SFC Microscopy
  - Microspectroscopy

## Sensational sensitivity

Thermoelectrically cooled to  $-30^{\circ}\text{C}$ , this 16-bit camera utilizes electron-multiplying CCDs (EMCCDs) to reduce background noise and deliver the exceptional sensitivity, resolution, and speed needed for today's ultra-low-light, live- and fixed-cell microscopy applications. The back-illuminated detection device boosts signal in an extended readout register via on-chip multiplication gain. The resultant improvement in signal-to-noise ratio yields unequalled sensitivity at low light levels. The DQC-FS is configured with dual readout amplifiers to ensure optimal performance not only for applications that demand tremendous low-light sensitivity (e.g., single-molecule fluorescence) but also for those requiring a combination of high quantum efficiency and wide dynamic range (e.g., calcium ratio imaging).

## Unbeatable performance

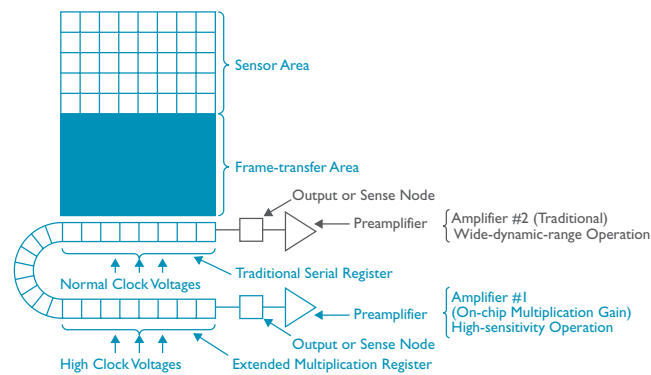
The DQC-FS represents a high-performance, low-noise alternative to intensified CCD (ICCD) cameras for many imaging applications. Unlike traditional intensified CCD cameras, the solid state detector of the DQC-FS does not use photocathodes or phosphor intensifiers. Thus, spatial resolution is not affected by the intensifier, and there is no danger of bright-light damage. A standard C-mount configuration allows easy attachment to microscopes, standard lenses, or other optical equipment.

## As quick as they come

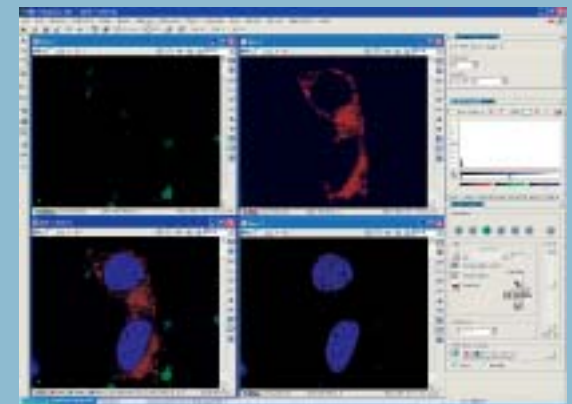
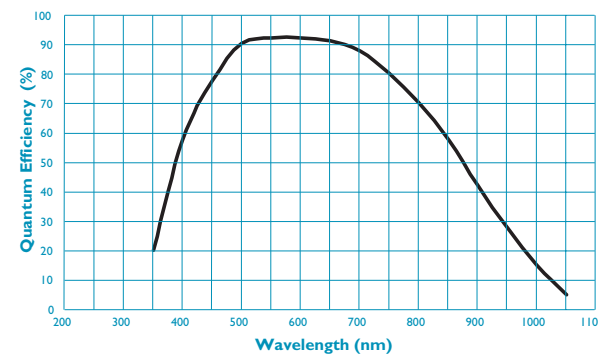
The DQC-FS is designed to maintain top-shelf performance at the highest speeds, so it can capture fast changes of live specimens.

- Fast features of the DQC-FS include:
- 100% duty cycle to enable continuous data collection
  - Supravideo frame rates, subregion readout, binning
  - No mechanical shutter needed (frame-transfer architecture)
  - Small parallel shift time to preserve optimal image quality
  - Real-time image updating during "focus"

The DQC-FS offers multiple speed settings (10, 5, or 1MHz), giving you the ability to tailor your system's operation for the fastest image visualization or the most precise quantitative imaging.



A second, "traditional" amplifier for slower pixel readout makes the DQC-FS more versatile by enabling the camera to be used for wide-dynamic-range applications like brightfield or fluorescence imaging.



Nikon offers the total software solution that covers image capture, archiving, and analysis

NIS-Elements is an integrated platform of imaging software developed by Nikon to achieve a comprehensive control of microscope image capture and document data management. NIS-Elements handles multidimensional imaging tasks flawlessly with support for capture, display, peripheral device control, and data management & analysis of images (up to six-dimensional images). The system also contributes to experiment efficiency with a database building feature developed to handle archiving, searching, and analysis of large numbers of multidimensional image files. Unified control of the entire imaging system offers significant benefits to users for cutting-edge research, such as live cell imaging.

The NIS-Elements suite is available in three distinct packages scaled to meet user needs and applications:

- Ar** NIS-Elements Advanced Research software  
For fully automated acquisition and device control through full 6D (X, Y, Z,  $\lambda$ , T, multi-point) acquisition and analysis
- Br** NIS-Elements Basic Research software  
For acquisition and device control through 4D acquisition (up to four selectable from X, Y, Z,  $\lambda$ , T, Multipoint)
- D** NIS-Elements Documentation software  
Superior workflow management and archiving capabilities, including basic measuring and reporting features

## Specifications

CCD image sensor	e2v CCD97; back-illuminated, frame-transfer CCD with on-chip multiplication gain	
CCD format	512 x 512 imaging pixels; 16 x 16- $\mu$ m pixels; 8.2 x 8.2-mm imaging area (optically centered)	
Linear full well Single pixel Output node	200 ke- 800 ke- ("on-chip multiplication gain" amplifier)	
Digitizer type	16 bits @ 10MHz, 5MHz, and 1MHz	
Input/Output trigger connection	DB26 high-density connector	
	<b>"On-chip multiplication gain amplifier" (port #1)</b>	<b>"Traditional" amplifier (port #2)</b>
Read noise	~45 e- rms @ 5MHz ~60 e- rms @ 10MHz Read noise effectively reduced to <1 e- rms with on-chip multiplication gain enabled	~10 e- rms @ 1MHz ~15 e- rms @ 5MHz
On-chip multiplication gain	1 to 500 x (guaranteed) 1 to 1,000 x (typical) Software controlled in 4,096 steps	Not applicable
Parallel (vertical) shift rate	2.0 $\mu$ sec/row	
CCD temperature	-30°C (regulated)	
Dark current	1.0 e-/p/s @ -30°C (0.5 e-/p/s @ -30°C typical)	
Binning	Flexible binning capabilities in parallel direction; 1 through 6 binning in serial direction	
Storage environment	-20°C to 60°C ambient, 0 to 90% relative humidity noncondensing	

		Region			
		512 x 512	256 x 256	128 x 128	64 x 64
Binning	1 x 1	29	54	95	155
	2 x 2	56	95	155	227
	4 x 4	98	155	227	295
	6 x 6	130	195	262	329

(Frames per second)

Note: Frame rates are measured at 10MHz with 0-second exposure times.

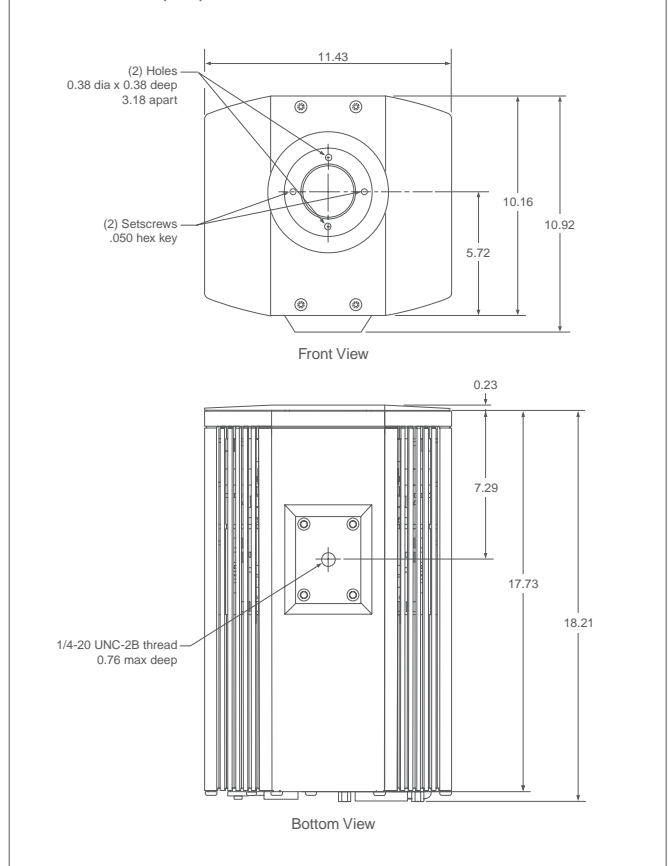
## Operating environment

Temperature	0 to 30°C ambient
Humidity	0 to 80% relative humidity noncondensing
Altitude	2000m max.
Pollution	Degree 2
Installation category	Category II
Electric shock protection	Class I (power supply), limited to indoor use only

DQC-FS is manufactured by Roper Scientific, Inc.

Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. June 2006 ©2006 NIKON CORPORATION

## Dimensions (cm)



**WARNING** TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING YOUR EQUIPMENT.



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