Model ST-402ME
ST-1603ME and ST-3200ME
CCD Imaging Cameras

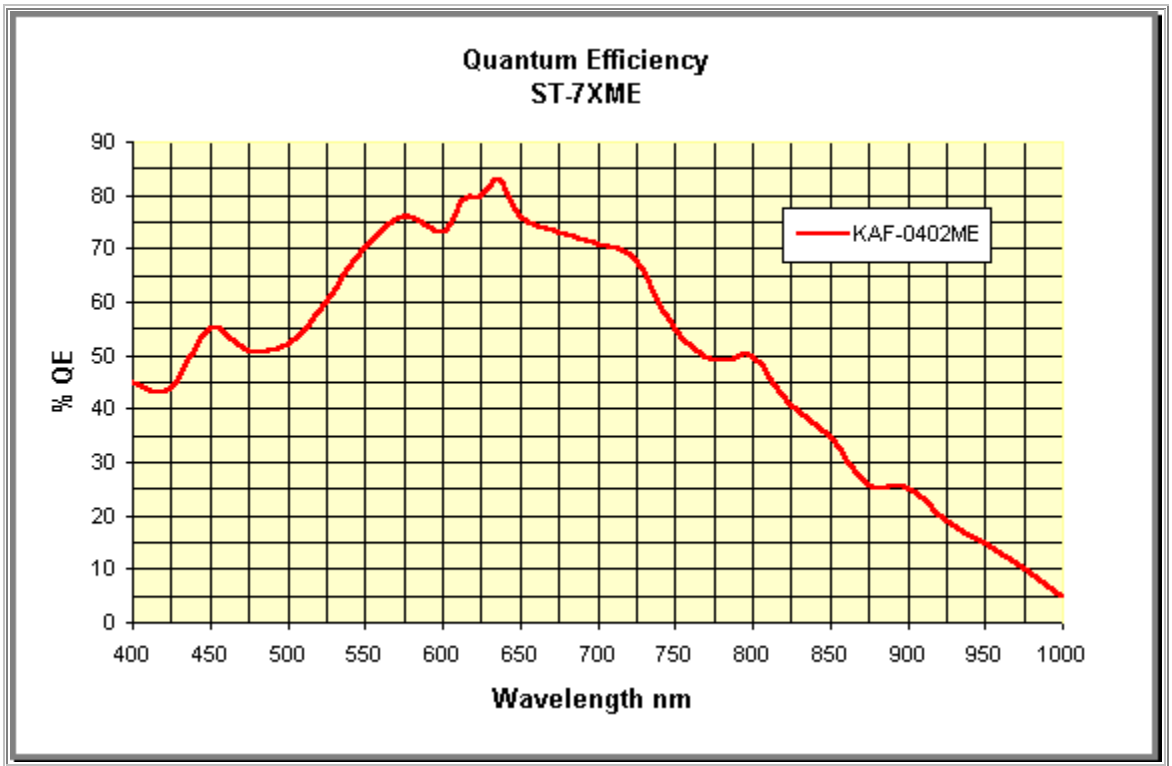
SBIG

ASTRONOMICAL
INSTRUMENTS

Model ST-402ME
Simple and Powerful:

ST-402ME CCD IMAGING CAMERA

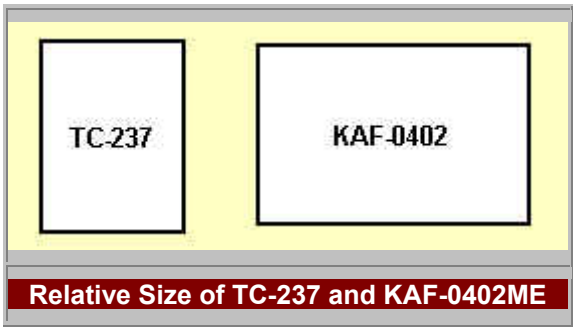
These were the design goals for the ST-402ME camera: We wanted something simple and easy to use yet powerful enough to carry the "ST" model prefix. The new ST-402ME is seen at right equipped with the optional T-thread to C-mount adapter ring and lens. For use at the telescope, a 1.25" nosepiece screws into the T-threads of the front plate.The small size and light weight makes this camera very easy to handle and set up. A custom internal filter wheel and shutter lets you take dark frames and tri-color images automatically. Best of all, the low noise and extraordinary QE of the KAF-0402ME CCD makes this one of the most sensitive CCD cameras available to amateurs at any price. Simply put, there is nothing that can touch it in its class, except of course the dual sensor, self-guiding ST-7XME camera. The same technology that is used to achieve such high quantum efficiency in the KAF-3200ME CCD is also used with the same effectiveness in the KAF-0402ME CCD. With a peak QE of nearly 85%, this camera bows its head to no other when it comes to recording faint detail in dim objects.



The ST-402ME has the same high QE as the ST-7XME, ST-8XME and ST-10XME

Similarities to the former ST-237A:

Like its predecessor, the ST-237A, this single sensor camera is designed for light weight, low cost and high performance. The camera uses a monochrome CCD with an optional internal filter wheel and custom filters enabling it to do both high sensitivity B&W imaging and RGB/LRGB color imaging with the same camera. The CCD is centered in the camera body and is correctly spaced for Celestron telescopes having Fastar or Hyperstar optics. The camera body is all metal construction (black hard anodized aluminum). Single stage, regulated, thermoelectric cooling with fan are standard. At 4 x 5 inches, the camera head is somewhat wider than the ST-237A, but it is only 1.8 inches deep with electrical connections on the side. This gives the camera the shortest possible protrusion from the rear of the telescope to allow maximum clearance when imaging objects in the north with a fork-mounted telescope. This size and shape also makes it possible to put the filter wheel inside the camera, even though the KAF-0402ME CCD requires larger filters than the ST-237A. Electronic relays provide typical autoguider output from the RJ-11 jack, so the camera can be used as a highly sensitive autoguider with a larger field of view than most other autoguiders. While somewhat wider than the ST-237A, this new camera is still fine for all Fastar equipped telescopes. The additional width will not affect its use as a Fastar camera in the slightest.

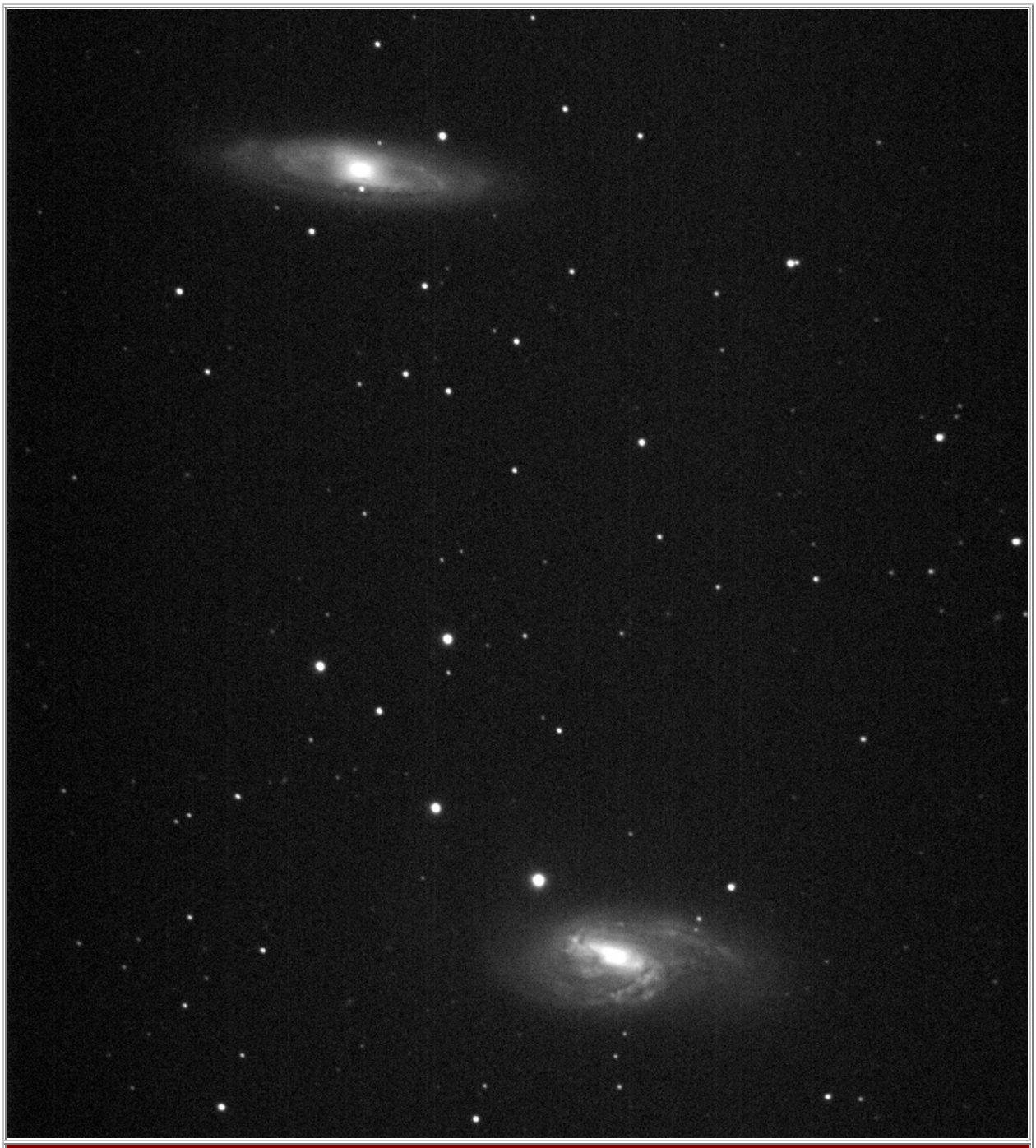


Relative Size of TC-237 and KAF-0402ME

Differences from the ST-237A:

The KAF-0402ME Imaging CCD is about 75% larger than the TC-237. It also has slightly better read noise, much lower dark current, significantly greater dynamic range and higher QE than the TC-237. All of these factors combine to make a more sensitive detector with greater field of view. The KAF-0402E/ME CCD is available only in NABG. For fast systems such as the Fastar, the KAF-0401LE (ABG) version is also available as an option. All new electronics are contained entirely in the camera head. There is no separate CPU box. The computer interface is USB 2.0 (USB 1.1 compatible). The high-speed readout rate is approximately 2 Mega pixels per second. With some overhead, a full frame, high-resolution image will download in approximately 0.8 seconds using USB2.

A regulated power supply is built into the camera so you can operate directly from a 12V battery or other unregulated 12VDC source. A universal power supply is included for operation from 100 to 240VAC.



Object: **M65 and M66**
Exposure: **67 seconds - Single TDI Exposure taken with KAF-0402E CCD**
Scope: **C-8 at F/4.8** ***Image size:*** ***765 x 874***
Processing: **No dark frame, log scaled with CCDOPS** ***Alan Holmes / SBIG***

ST-402ME Typical Specifications

CCD Specifications	
CCD	Kodak KAF-0402ME
Pixel Array	765 x 510 pixels, 6.9 x 4.6 mm
Total Pixels	390,000
Pixel Size	9 x 9 microns
Full Well Capacity (ABG)	~50,000 e-
Full Well Capacity (NABG)	~100,000 e-
Dark Current	$1e^-$/pixel/sec at 0° C
Antiblooming	NABG standard, ABG Optional (specify at time of order)

Readout Specifications	
Shutter	Electromechanical
Exposure	0.04 to 3600 sec., 10ms resolution
Correlated Double Sampling	Yes
A/D Converter	16 bits
A/D Gain	1.5e- / ADU unbinned, 2.0e- binned
Read Noise	17e- RMS
Binning Modes	1 x 1, 2 x 2, 3 x 3
Pixel Digitization Rate	Up to 800,000 pixels per second
Full Frame Acquisition	less than 1 second

System Specifications	
Cooling - standard	Single Stage Thermoelectric, Active Fan, -20 C from Ambient Typical
Temperature Regulation	±0.1°C
Power	12 VDC at 2 amps, power supply included
Computer Interface	USB 2.0 (USB 1.1 compatible)
Computer Compatibility	Win 98/2000/Me/XP/Mac OS-X

Physical Dimensions	
Optical Head	4 x 5 x 1.8 inches
Weight	1.5 pounds, 0.7kg
CPU	All electronics integrated into Optical Head, No CPU
Mounting	T-Thread 1.25" nosepiece included
Backfocus	0.69 inches / 2.7 cm

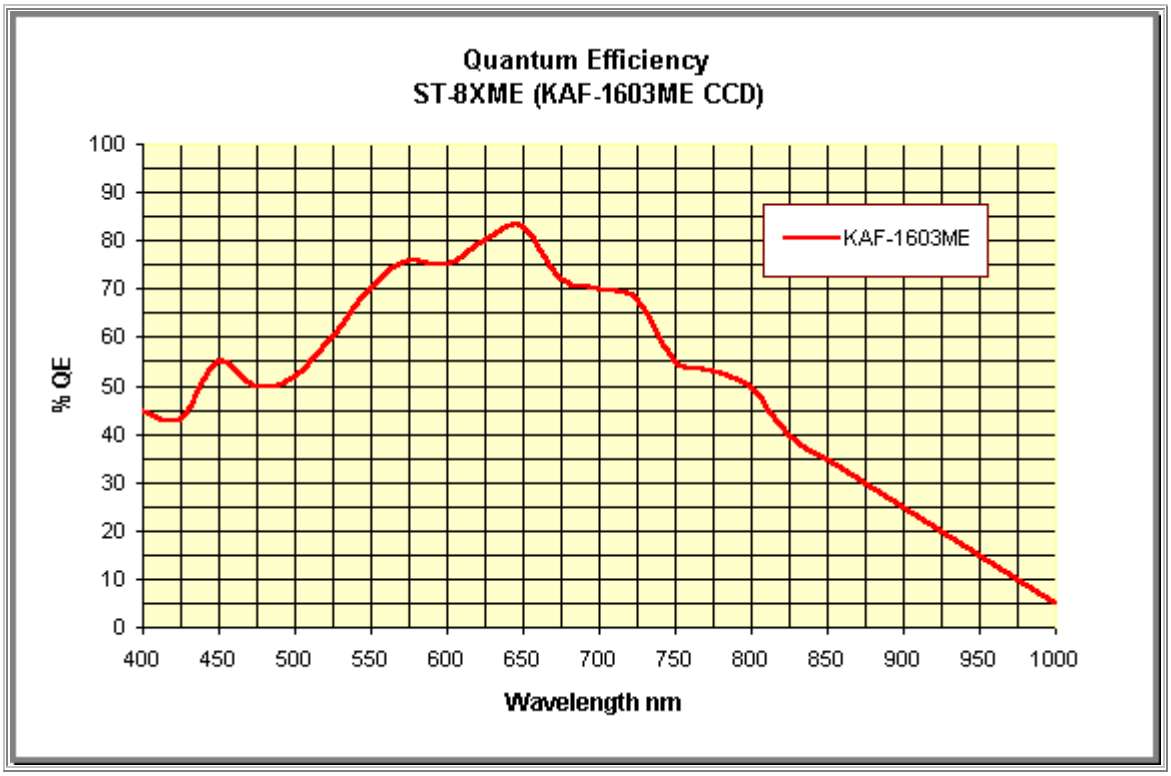
Prices and specifications are subject to change without notice

MODEL ST-1603ME
CCD IMAGING CAMERA

ST-1603ME CCD IMAGING CAMERA

The ST-1603ME is the same as the ST-402ME, with the exception of the imaging CCD. The ST-1603ME uses the KAF-1603ME CCD, the same sensor we use in the ST-8XME. This CCD is 1530 x 1020 pixels at 9 microns. However, due to the size of the array, the CFW-402 internal color filter wheel cannot be used. For color or photometric applications the CFW10-SA with standard 1.25" filters can be used instead, controlled via the computer's serial port.

The ST-1603ME, like it bigger brother, the ST-3200ME, is intended primarily for industrial and life science applications where a faster download rate is more important than maximum cooling or self-guiding. Of course it will also perform very well for astronomical applications, particularly where an external guider is already available. For astronomical applications where greater cooling and lower read noise performance is more important than the somewhat faster download rate, we



also offer the ST-8XMEI single sensor camera, and ST-8XME dual sensor, self-guiding camera, with the KAF-1603ME imaging CCD and USB 1.1 electronics.

Comparison of ST-1603ME and ST-8XMEI:

ST-1603ME vs. ST-8XMEI Comparison Chart		
	ST-1603ME	**ST-8XMEI**
High QE (>80% Peak) "ME" CCD	KAF-1603ME	KAF-1603ME
Class of CCD in standard camera	Class 2	Class 2
Column Defects Allowed	None	None
High Speed USB Interface	USB 2.0	USB 1.1
Full Frame Download Rate	800kps	425kps
Full Frame Download Time	~2 sec	~4 sec
Internal shutter for automatic dark frames	Yes	Yes
AUX port for CFW8A control	No	Yes
I2C Port for CFW10	No	Yes
Upgradeable to self-guiding model	No	Yes
Read Noise	17e-	15e-
Cooling	-20 C	-35 C
Water Cooling Heat Exchanger	No	Optional
Power requirements	12VDC Unregulated	12VDC and 5VDC Regulated
Current requirements	~ 2A	~3A
Power supply included	Yes	Yes
Size	5 x 4 x 1.8" (12.7x10.2x4.6 cm)	5 x 5 x 3" (12.7x12.7x7.6cm)
Weight	20 oz. (0.6kg)	32oz. (0.9kg)

Since both the ST-1603ME and the ST-8XMEI cameras are single sensor models using the KAF-1603ME CCD, a brief comparison is in order to distinguish the features of each:

Both cameras use the same Class of CCD in the standard price. A Class 1 is available in both models for the same additional charge. The ST-1603ME will download a full frame image in approximately 2 seconds. The ST-8XMEI takes just under 4 seconds. However, the ST-8XMEI has lower read noise and better cooling performance, and it is upgradeable to a self-guiding model by adding an internal TC-237H guiding CCD. The ST-1603ME has no provision for a second CCD, so it cannot be upgraded to a self-guiding camera.

In both cases, all new electronics are contained entirely in the camera head. There is no separate CPU box. The computer interface is USB 2.0 for the ST-1603ME and USB 1.1 for the ST-8XMEI. The ST-1603ME camera can be used on USB 1.1 at a slower download rate. The USB 2.0 transfer rate is approximately 800kps.

A regulated power supply is built into the ST-1603ME camera so it can be operated from any 12VDC source. The ST-8XMEI requires our desktop supply or our 12VDC supply.

The ST-8XMEI is capable of controlling either the matching CFW8A or replacement CFW10. The ST-1603ME must use an external filter wheel that it cannot control directly, like the CFW10-SA (Stand Alone) version.

The bottom line is that for astronomy the ST-8XMEI is a better choice albeit at a slightly higher price. The ST-1603ME is a good choice for industrial and life science applications where the light can be controlled and download rate is a more significant factor.

ST-1603ME Typical Specifications

CCD	
CCD	Kodak KAF-1603ME
Pixel Array	1530 x 1020 pixels
CCD Size	13.8 x 9.2 mm
Total Pixels	1.56 million
Pixel Size	9 x 9 microns
Full Well Capacity	~100,000 e-
Dark Current	$1e^-$/pixel/sec at 0° C
Antiblooming	Optional
Readout Specifications	
Shutter	Electromechanical
Exposure	0.04 to 3600 seconds
Correlated Double Sampling	Yes
A/D Converter	16 bits
A/D Gain	1.5e-/ADU unbinned, 2.0 e- binned
Read Noise	$17e^-$ RMS
Binning Modes	1 x 1, 2 x 2, 3 x 3
Full Frame Download Rate	**USB 2**: Up to 800,000 pixels / sec.
Full Frame Download Time	~2 seconds with USB 2.0
System Specifications	
Cooling - standard	Single Stage Thermoelectric, Active Fan, -20 C from Ambient
Temperature Regulation	±0.1°C
Power	12VDC Power supply included
Computer Interface	USB 2.0 (USB 1.1 compatible)
Computer Compatibility	Win 98/2000/Me/XP/Mac OS-X
Physical Dimensions	
Optical Head	5 x 4 x 1.8 inches
CPU	All electronics integrated into Optical Head, No CPU
Mounting	T-Thread, 1.25" nosepieces included
Weight	Approx. 20 oz. (0.6kg)
Backfocus (C-mount compatible)	0.69 inches

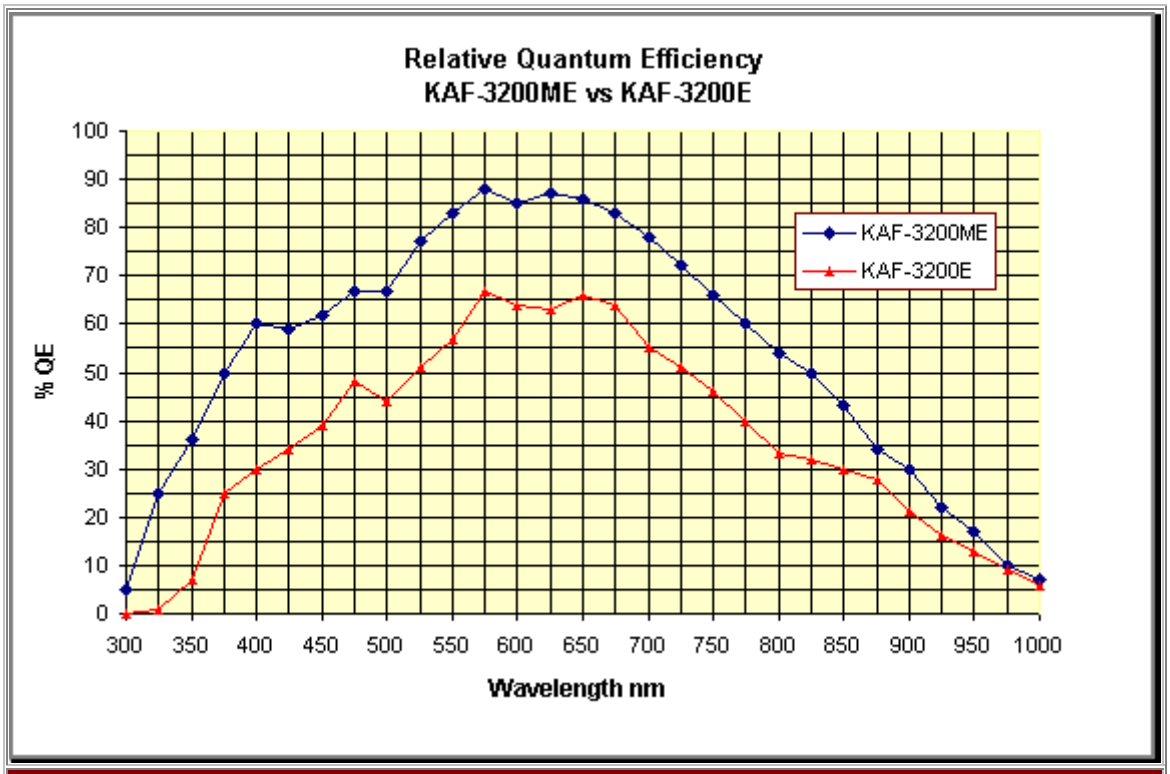
Specifications are subject to change without notice

MODEL ST-3200ME
CCD IMAGING CAMERA

The ST-3200ME is essentially the same camera as the ST-402ME except that the imaging CCD is over 4X larger and it has more than 8X the number of pixels. The ST-3200ME uses the KAF-3200ME CCD, the same sensor we use in the ST-10XME. This CCD is 2184 x 1472 pixels at 6.8 microns. However, due to the size of the array, the internal filter wheel cannot be used. For color or photometric applications the CFW10-SA can be used instead, with standard 1.25" filters.

ST-3200ME CCD Camera Body with Optional C-mount Adapter and Lens

The ST-3200ME, like the ST-1603ME, is intended primarily for industrial and life science applications where a faster download rate is more important than maximum cooling or self-guiding. Of course it will also perform very well for astronomical applications, particularly where an external guider is already available. For astronomical applications where greater cooling and lower read noise performance is more important than the somewhat faster download rate, we also offer the ST-10XMEI single sensor camera, and ST-10XME dual sensor, self-guiding camera, with the KAF-3200ME imaging CCD and USB 1.1 electronics.



The ST-3200ME has the same high QE as the ST-10XME

Comparison of ST-3200ME and ST-10XMEI:

Since both the ST-3200ME and the ST-10XMEI cameras are single sensor models using the KAF-3200ME CCD, a brief comparison is in order to distinguish the features of each:

Both cameras use the same Class of CCD in the standard price. A Class 1 is available in both models for an additional charge. The ST-3200ME will download a full frame image in approximately 4 seconds. The ST-10XMEI takes just under 8 seconds. However, the ST-10XMEI has lower read noise and better cooling performance, and it is upgradeable to a self-guiding model by adding an internal TC-237H guiding CCD. The ST-3200ME has no provision for a second CCD, so it cannot be upgraded to a self-guiding camera.

In both cases, all new electronics are contained entirely in the camera head. There is no separate CPU box. The computer interface is USB 2.0 for the ST-3200ME and USB 1.1 for the ST-10XMEI. The ST-3200ME camera can be used on USB 1.1 at a slower download rate. The USB 2.0 transfer rate is approximately 800kps. A regulated power supply is built into the ST-3200ME camera so it can be operated from any 12VDC source. The ST-10XMEI requires our desktop supply or our 12VDC supply. The ST-10XMEI is capable of controlling either the matching CFW8A or replacement CFW10. The ST-3200ME must use an external filter wheel that it cannot control directly, like the CFW10-SA (Stand Alone) version.

ST-3200ME vs. ST-10XMEI Comparison Chart		
	ST-3200ME	**ST-10XMEI**
High QE (>80% Peak) "ME" CCD	KAF-3200ME	KAF-3200ME
Class of CCD in standard camera	Class 2	Class 2
Column Defects Allowed	None	None
High Speed USB Interface	USB 2.0	USB 1.1
Full Frame Download Rate	800kps	425kps
Full Frame Download Time	~4 sec	~8 sec
Internal shutter for automatic dark frames	Yes	Yes
Internal ROM for CFW8A control	No	Yes
I2C Port for CFW10	No	Yes
Upgradeable to self-guiding model	No	Yes
Read Noise	17e-	15e-
Cooling	-20 C	-35 C
Water Cooling Heat Exchanger	No	Optional
Power requirements	12VDC Unregulated	12VDC and 5VDC Regulated
Current requirements	~ 2A	~3A
Power supply included	Yes	Yes
Size	5 x 4 x 1.8" (12.7x10.2x4.6 cm)	5 x 5 x 3" (12.7x12.7x7.6cm)
Weight	20 oz. (0.6kg)	32oz. (0.9kg)

The bottom line is that for astronomy the ST-10XMEI is a better choice albeit at a slightly higher price. The ST-3200ME is a good choice for industrial and life science applications where the light can be controlled and download rate is a more significant factor.

ST-3200ME Typical Specifications

CCD	
CCD	Kodak KAF-3200ME
Pixel Array	2184 x 1472 pixels
CCD Size	14.9 x 10 mm
Total Pixels	3.21 million
Pixel Size	6.8 x 6.8 microns
Full Well Capacity	~77,000 e-
Dark Current	<1e^-/pixel/sec at 0° C
Antiblooming	N/A (NABG Only)
Readout Specifications	
Shutter	Electromechanical
Exposure	0.04 to 3600 seconds, 10ms resolution
Correlated Double Sampling	Yes
A/D Converter	16 bits
A/D Gain	0.8e-/ADU unbinned, 1.2e- binned
Read Noise	10e^- RMS
Binning Modes	1 x 1, 2 x 2, 3 x 3
Full Frame Download Rate	**USB 2**: Up to 800,000 pixels per second
	USB 1: Up to 400,000 pixels per second
Full Frame Download Time	~4 seconds with USB 2.0
System Specifications	
Cooling - standard	Single Stage Thermoelectric, Active Fan, -20 C from Ambient Typical
Temperature Regulation	±0.1°C
Power	12VDC Power supply included
Computer Interface	USB 2.0 (USB 1.1 compatible)
Computer Compatibility	Win 98/2000/Me/XP/Mac OS-X