



System Performance Booklet



discover new ways of seeing™

System Overview

Description	Model	Serial Number
CCD Head ▽	D Z 9 36N - #BV	CCD-15685
TE Cooler performance (✓)	High	Ultra-high ✓
Power Supply Units	PS -29	PS -40
	✓	✓
Accessories	LM-	MFL-
Serial/Batch Number		
Other		

▽ Sensor types are defined in Table 1 using the last two letters in box Model Number.

CCD Details

Manufacturer / Model No.	Pixels	Serial Number
E2V CCD42-40	2048x2048, 13.5µm x 13.5µm	12082-16-01

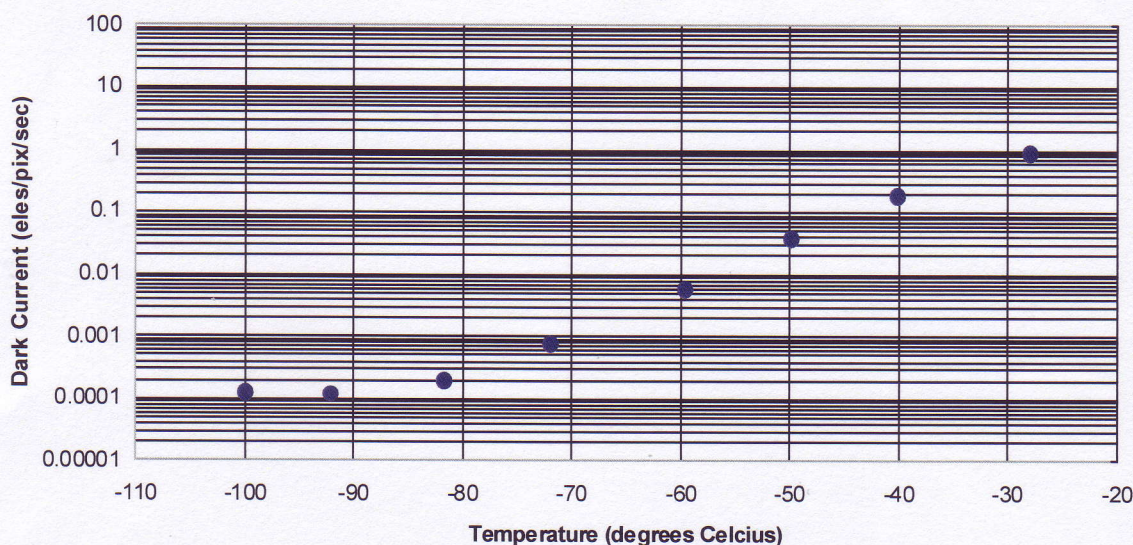
Special Features	(✓)	(✓)
NIMO		AR coated Window ✓
Fringe Suppression		Custom Cables
Shielded Anti-Blooming		Nikon F-mount with Shutter ✓
MgF ₂ Input		

Summary of System Test Data

Readout Noise \blacklozenge 1 and Base Mean Level \blacklozenge 2

A/D Rate MHz - all 16 bit	Preamp setting	CCD Sensitivity \blacklozenge 3		Single Pixel Noise		Base Mean Level	
		e- per A/D count		electrons rms		A/D counts	
		High Sensitivity Mode	High Capacity Mode	High Sensitivity Mode	High Capacity Mode	High Sensitivity Mode	High Capacity Mode
5.0	x1	7.8	21.0	47.6	31.7	1757	928
5.0	x2	4.4	11.7	39.0	81.3	2518	934
5.0	x4	2.1	5.9	27.9	63.5	3447	948
3.0	x1	3.8	13.2	19.2	67.4	1205	873
3.0	x2	2.0	6.8	15.8	39.4	1525	985
3.0	x4	1.1	3.7	10.6	32.9	1802	1108
1.0	x1	3.6	12.6	2.6	30.7	851	854
1.0	x2	2.0	6.5	7.8	23.2	860	867
1.0	x4	1.0	3.5	6.7	26.1	862	889
0.05	x1	3.7	13.4	4.3	14.3	883	889
0.05	x2	2.0	6.4	3.6	10.4	868	881
0.05	x4	1.0	3.3	3.4	10.3	841	866
Saturation Signal per pixel				88791		electrons	

CCD Dark Current



Minimum Dark Current Achievable \blacklozenge4	0.000128	electrons/pixel/sec		
@ Sensor Temperature of \blacklozenge5	-100.02	°C	16.0	°C cooling water
CCD Dark Current Uniformity better than \blacklozenge6	0.057185	electrons/pixel/sec		

Test Conditions

Readout Noise tested at	-90	°C with	16	°C water
Base Mean Level measured at	-90	°C with	16	°C water
Dark Current Uniformity tested at	-50	°C with	16	°C water
Blemishes tested at	-50	°C with	16	°C water

Custom Testing

Signed

C.KELZ

Date

System Passed for Shipping

26TH JUNE 2013

	HEADBOARD	FPGA
Hardware Version #	AE	20.12
	SOLIS	SDK
Shipping Software Version #	--	--
	SOLIS	SDK
Testing Software Version #	4.23.30003.0	2.95.30003.0

▽ **Table 1; Key code to define the meanings of the last two letters in the Model Number**

Sensor Options			
OE	Open electrode	BV	BI + VIS (550nm) optimised
FI	Front illuminated (FI)	BR	BI + NIR (850) optimised
UV	FI+UV coating	BR-DD	BI + NIR +deepdepletion
FO	FI + Fibre optic	BN	BI with no AR coating
FI-DD	FI + deep depletion	FK	Fast Kinetics (masked; 3011 only)
BU2	Back Illuminated (BI) + 250nm UV optimised	KT	Kodak FI coating
BU	BI + UV (350nm) optimised		

Performance Notes

- ◆1 Readout Noise is measured for both single pixel (SP) and fully vertically binned (FVB) with the CCD in darkness at temperature indicated and minimum exposure time. Noise values will change with pre-amplifier gain selection [PAG].
- ◆2 Average electronic DC offset for CCD in darkness at temperature indicated and minimum exposure time under dark conditions measured by single pixel (SP) for imaging systems and by (FVB) for spectroscopic systems.
- ◆3 Sensitivity is calculated in photoelectrons per A/D count from measurements of the Photon Transfer Curves.
- ◆4 Dark current falls exponentially with temperature. However, for a given temperature the actual dark current can vary by more than an order of magnitude from device to device. The devices are specified in terms of minimum dark current achievable rather than minimum temperature.
- ◆5 Minimum temperature achieved for thermoelectric (TE) cooler set to maximum value with water cooling
- ◆6 RMS (root mean square) deviation of dark current for fully binned operation for spectroscopic cameras, or full resolution image for imaging cameras, under dark conditions at temperature indicated (pixel/column defects not included). This variation is mainly cosmetic since it is fully subtractable without significant loss of performance.
- ◆7 Linearity is measured from a plot of Counts vs. Signal over the 16 bit dynamic range. Linearity is expressed as a %age deviation from a straight line fit. This quantity is not measured on individual systems.
- ◆8 RMS (root mean square) deviation from the average response of the CCD in fully binned operation for spectroscopic cameras, or full resolution image for imaging cameras, illuminated with uniform white light (defects not included).
- ◆9 A spot can be up to 3 pixels in size. White/black spots have signals >25% above/below the average (i.e >25% contrast) with uniform illumination across the sensor.
- ◆10 Columns whose signals have >10% contrast in binned operation with uniform illumination across the sensor for spectroscopic cameras, ≥ 10 black spots per column for imaging cameras.
- ◆11 Pixels which absorb charge as it is clocked through the defective area. When the light source is switched off, the signal from the trap appears to drop off more slowly than the signal from the surrounding pixels.
- ◆12 A spot can be up to 3 pixels in size. For Grade A devices, hot spots are counted if they exhibit >50 times the maximum specified dark current at the test temperature indicated.
- ◆13 A column is considered defective if >10 pixels are affected, or if the column exhibits >2 times the maximum specified dark current at the test temperature indicated.