

VENTEX CORPORATION
CANON FPA-2500i1 STEPPER INSTALLATION CHECK RESULTS

Customer : On Semiconductor	Machine S/N : 406352i1	Date : February 2011
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Classification	Item		Results	Standard	Judge
Exposure	Open Frame Check		Particle Free	To be particle-free	
Performance	Distortion (Including Magnification)		DX = 0.063 DY = -0.056	$0 \pm 0.08 \mu\text{m}$	
Illuminator Performance	Image Surface Illumination Intensity (Mode 1)		718	$\geq 600 \text{ mW} / \text{cm}^2$	
	Image Surface Illumination Uniformity (Mode 1)		1.6	$\leq 1.2 \%$	
	Light Integrator Control Accuracy		0.294	Overall $\leq 1.2 \%$	
	Masking Blade Accuracy (Excluding gray zone)		Max. = 15	$0 \pm 100 \mu\text{m}$	
Alignment Performance	ROC Measurement Stability		Max. = 0.005	$3 \sigma \leq 0.015 \mu\text{m}$	
	Reticle Rotation Accuracy		0.005	$0 \pm 0.02 \mu\text{m}$	
	Reticle Rotation Repeatability		0.01	Range $\leq 0.03 \mu\text{m}$	
	Defocus Characteristics	He-Ne TV (Mode 1)	Max. = -13	$0 \pm 20\text{mrad}$	
		B-B TV (Mode 4)	Max. = -14	$0 \pm 20\text{mrad}$	
	TOC Measurement Stability	He-Ne TV (Mode 1)	Max. = 0.01	$3 \sigma \leq 0.04 \mu\text{m}$	
		He-Ne TV (Mode 2)	Max. = 0.01	$3 \sigma \leq 0.04 \mu\text{m}$	
		B-B TV (Mode 4)	Max. = 0.01	$3 \sigma \leq 0.04 \mu\text{m}$	
	Baseline	He-Ne TV (Mode 1)	Max (Avg.) = -0.01 Max (3 σ) = 0.02	Avg. $\leq 0.05 \mu\text{m}$ 3 $\sigma \leq 0.05 \mu\text{m}$	
		B-B TV (Mode 4)	Max (Avg.) = 0.00 Max (3 σ) = 0.00	Avg. $\leq 0.05 \mu\text{m}$ 3 $\sigma \leq 0.05 \mu\text{m}$	
	AGA Accuracy (Resist to Resist)	He-Ne TV (Mode 1)	X = 0.036 Y = 0.071	mean + 3 $\sigma \leq 0.12 \mu\text{m}$	
		B-B TV (Mode 4)	X = 0.046 Y = 0.030	mean + 3 $\sigma \leq 0.12 \mu\text{m}$	
Auto Focus And Tilt Performance	Measurement Stability (Open drive)	Focus	0.055	$3 \sigma \leq 0.12 \mu\text{m}$	
		Tilt	X = 2.240 Y = 3.010	$3 \sigma \leq 10 \text{ ppm}$	
	Drive Repeatability (Open drive)	Focus	0.07	$3 \sigma \leq 0.15 \mu\text{m}$	
		Tilt	X = 3.67 Y = 3.80	$3 \sigma \leq 15 \text{ ppm}$	
X-Y Stage Performance	Stepping Accuracy (Tilt Off)		X = 0.068 Y = 0.055	$3 \sigma \leq 0.07 \mu\text{m}$	
	Stepping Repeatability (Tilt On)		X = 0.021 Y = 0.026	$3 \sigma \leq 0.07 \mu\text{m}$	
	Orthogonality		0.07	$0 \pm 1.0 \text{ ppm}$	
	Scaling		X = 0.18 Y = 0.19	$0 \pm 1.0 \text{ ppm}$	

Classification	Item		Results	Standard	Judge
Pre-alignment Performance	Mechanical Pre-alignment Accuracy	Average	X = 13.68 Y = 5.02	0 ±40 µm	
		3σ	X = 14.64 Y = 4.77 θ = 100	X,Y ≤ 40 µm θ ≤ 400 ppm	
	TV Pre-alignment Accuracy		X = 0.63 Y = 0.78	mean + 3σ ≤ 2.0 µm	
Throughput	He-Ne TV AGA (Mode 1) (Exposure 0.15 sec.) (D/DTilt Off)	4" (21s)		≥80 wfs. /hr	
		5" (32s)		≥67 wfs. /hr	
		6" (45s)	65.5	≥57 wfs. /hr	
Reliability	Wafer Feeding System		Trouble free	To be trouble-free	
	Reticle Loading System		Trouble free	To be trouble-free	

Comments:

- a. **Uniformity is slightly high on this tool. Number is brought into spec with a 3000 style 6% filter. Other i1 style filters ordered to try to bring down uniformity. Solution will be to create mount for 3000 style filter or use one of the ordered i1 style filters.**

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
LENS DISTORTION		☐
(INCLUDING MAGINFICATION)		

SPECIFICATION:

DX <= (+/-) 0.08 um
DY <= (+/-) 0.08 um

PERFORMANCE:

MODE 1		X	Y
MAX	um	0.035	0.063
MIN	um	-0.056	-0.027
MAG	ppm	-2.414	-1.324

DX (um)	-0.056	um
DY (um)	0.063	um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
IMAGE SURFACE ILLUMINATION		☐
INTENSITY & UNIFORMITY		

SPECIFICATION:

Intensity >= 600 mW / cm²
Uniformity <= 1.2%

PERFORMANCE:

UNIFORMITY	718	mW/cm2
INTENSITY	1.6	%

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
LIGHT INTEGRATOR ACCURACY		☐

SPECIFICATION:

Overall Accuracy <= 1.2%

PERFORMANCE:

OVERALL
ACCURACY

0.294

%

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☒ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
MASKING BLADE ACCURACY		☐
(EXCLUDING GRAY ZONE)		

SPECIFICATION:

Maximum Deviation <= (+/-) 100 um

PERFORMANCE:

SHOT SIZE(mm)	BU	BU	BR	BR	BD	BD	BL	BL
(+/-) 2.5	0	-0.015	0.01	-0.01	0.01	0	0.01	0
	0	-0.015	0.01	-0.01	0.01	0	0.01	0
(+/-) 5.5	0	-0.01	0.01	0.01	0	0	0	-0.005
	0	-0.01	0.01	0.01	0	0	0	-0.005
(+/-) 9.0	0	0	0	0	-0.005	-0.01	-0.01	-0.015
	0	0	0	0	-0.005	-0.01	-0.01	-0.015
Average	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01

MAX -0.015 um

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MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
FRA ROC MEASUREMENT STABILITY		☐

SPECIFICATION:

3 SIGMA X <= 0.01 um
3 SIGMA Y <= 0.01 um

PERFORMANCE:

	3σ	
XL	0.004	mm
YL	0.002	mm
XR	0.004	mm
YR	0.002	mm

MAX 3σ 0.004 um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☒ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
FRA RETICLE ROTATION ACCURACY & REPEATABILITY		☐

SPECIFICATION:

Rotation Accuracy <= (+/-) 0.02 um

Rotation Repeatability <= 0.03 um

PERFORMANCE:

Accuracy
Range

0.005
0.01

um
um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
DEFOCUS CHARACTERISTICS (MULTI-MARK)		☐

SPECIFICATION:

Defocus <= (+/-) 20 mrad

PERFORMANCE:

He-Ne (Mode 1)	Ka	Kb	Kc	
B-scope (Y)	-2	-3	0	mrad
C-scope (X)	-13	-13	0	mrad

He-Ne (Mode 2)	Ka	Kb	Kc	
B-scope (Y)	0	-1	0	mrad
C-scope (X)	2	1	0	mrad

B-B (Mode 3)	Ka	Kb	Kc	
B-scope (Y)	N/A	N/A	N/A	mrad
C-scope (X)	N/A	N/A	N/A	mrad

B-B (Mode 4)	Ka	Kb	Kc	
B-scope (Y)	-9	-11	0	mrad
C-scope (X)	0	4	2	mrad

MAX He-Ne
MAX B-B

-13
-6

mrad
mrad

VENTEX CORP.

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MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
TOC MEASUREMENT STABILITY (Multi-Mark)		☐

SPECIFICATION:

3 SIGMA X <= 0.04

3 SIGMA Y <= 0.04

PERFORMANCE:

		3σ	
He-Ne (Mode 1)	X	0.01	μm
	Y	0.01	μm
He-Ne (Mode 2)	X	0.01	μm
	Y	0.01	μm
B-B (Mode 3)	X	N/A	μm
	Y	N/A	μm
B-B (Mode 4)	X	0.01	μm
	Y	0.01	μm

Max He-Ne

Max B-B

0.01

0.01

um

um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
BASELINE STABILITY (Multi-Mark)		☐

SPECIFICATION:

AVERAGE <= (+/-) .05 um
 3 SIGMA <= (+/-) .05 um

PERFORMANCE:

		Average	3σ	
He-Ne (Mode 1)	X	-0.01	0	μm
	Y	-0.01	0	μm
He-Ne (Mode 2)	X	0	0	μm
	Y	0	0.02	μm
B-B (Mode 3)	X	N/A	N/A	μm
	Y	N/A	N/A	μm
B-B (Mode 4)	X	0	0	μm
	Y	0	0	μm

MAX He-Ne AVE	-0.01	um
MAX B-B AVE	0.02	um
MAX He-Ne 3σ	0.02	um
MAX B-B 3σ	0	um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
AGA ACCURACY RESIST TO RESIST		☐

SPECIFICATION:

ABSOLUTE (X Mean) + X 3 Sigma <= 0.12 um

ABSOLUTE (Y Mean) + Y 3 Sigma <= 0.12 um

PERFORMANCE:

		Mean	3σ	
He-Ne (Mode 1)	X	-0.006	0.03	μm
	Y	0.017	0.059	μm
He-Ne (Mode 2)	X	-0.007	0.0522	μm
	Y	0.003	0.0417	μm
B-B (Mode 3)	X	N/A	N/A	μm
	Y	N/A	N/A	μm
B-B (Mode 4)	X	-0.0186	0.0285	μm
	Y	-0.009	0.02116	μm

mode 1	X	0.036	um
	Y	0.076	um
mode 2	X	0.0592	um
	Y	0.0447	um
mode 3	X	#VALUE!	um
	Y	#VALUE!	um
mode 4	X	0.0471	um
	Y	0.03016	um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
FOCUS & TILT		☐
STABILITY & REPEATABILITY		

SPECIFICATION:

Stability Focus 3 SIGMA <= 0.12 um

Stability Tilt 3 SIGMA <= 10 ppm

Repeatability Focus 3 SIGMA <= 0.15 um

Repeatability Tilt 3 SIGMA <= 15 ppm

PERFORMANCE:

Measurement Stability	3σ		
	FOCUS (μm)	X (ppm)	Y (ppm)
# 1	0.049	2.17	2.42
# 2	0.055	2.24	2.2
# 3	0.048	1.82	3.01

Drive Repeatability	3σ		
	FOCUS (μm)	X (ppm)	Y (ppm)
# 1	0.07	3.56	3.8
# 2	0.06	3.67	2.94
# 3	0.07	3.2	2.85

STABILITY	MAX Focus	0.055	um
	MAX X	2.24	ppm
	MAX Y	3.01	ppm
REPEATABILITY	MAX Focus	0.07	um
	MAX X	3.67	ppm
	MAX Y	3.8	ppm

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MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
STEPPING ACCURACY (TILT OFF)		☐

SPECIFICATION:

3 SIGMA X <= 0.07

3 SIGMA Y <= 0.07

PERFORMANCE:

3σ			
	X	Y	
# 1	0.038	0.032	μm
# 2	0.029	0.026	μm
# 3	0.068	0.055	μm

MAX X
MAX Y

3σ
0.068
0.055

um
um

VENTEX CORP.

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MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
STEPPING REPEATABILITY (TILT ON)		☐

SPECIFICATION: _____

3 SIGMA X <= 0.07
3 SIGMA Y <= 0.07

PERFORMANCE: _____

3σ			
	X	Y	
# 1	0.021	0.026	μm
# 2	0.02	0.023	μm
# 3	0.021	0.023	μm

	3σ	
MAX X	0.021	um
MAX Y	0.026	um

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
XY STAGE PERFORMANCE ORTHOGONALITY & SCALING		☐

SPECIFICATION:

Orthogonality <= (+/-) 1.0 ppm

Scaling <= (+/-) 1.0 ppm

PERFORMANCE:

Ortho
X-Scaling
Y-Scaling

0.07
0.18
0.19

ppm
ppm
ppm

VENTEX CORP.

CUSTOMER : On Semiconductor	MODEL	☐ FPA1550 M4W
MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
MECHANICAL PRE-ALIGNMENT ACCURACY		☐

SPECIFICATION:

Average <= (+/-) 40 μ m
 3 SIGMA X,Y <= 40 μ m
 3 SIGMA THETA <= 400 ppm

PERFORMANCE:

	Average	3 σ	
X	13.68	14.64	μ m
Y	5.02	4.77	μ m
θ	100	100	ppm

VENTEX CORP.

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MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
TV PRE-ALIGNMENT ACCURACY		☐

SPECIFICATION:

ABSOLUTE (X Mean) + X 3 Sigma <= 2.0 um

ABSOLUTE (Y Mean) + Y 3 Sigma <= 2.0 um

PERFORMANCE:

	 mean + 3σ	
X	0.63	μm
Y	0.78	μm

VENTEX CORP.

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MACHINE S/N : 406352i1		☐ FPA2000 i1
DATE : February 2010		☐ FPA2500 i2
ENGINEER : BB/JF2		☐ FPA2500 i3
THROUGHPUT Tilt Off & Tilt On		☐

SPECIFICATION:

Wafer Size

21 shot
32 shot
45 shot

Tilt Off

80 wafers/hour
67 wafers/hour
57 wafers/hour

PERFORMANCE:

Tilt On
Tilt Off

65.5

wfrs/hr
wfrs/hr