Configuration Specifications Freescale Steppers FPA-2000i1:

1. **Reticle:**
   - Size: 5 inch.

2. **Wafer:**
   - Size: 6 inch.
   - Semi Standard (JEIDA).
   - Wafer Chuck: ceramic Pin chuck installed.

3. **Wafer Feeding:**
   - Carrier: double cassette.
   - In-Line: yes , with TEL Mark7 Coater/Developer.
   - Type 4 AF , Left hand Side Sytem.

4. **Reticle Changer:**
   - Capacity: 14 reticles.
   - Bar Code Reader Option available: Yes.

5. **Others:**
   - Optical Edge Bead Removal installed: Yes.
   - Console Software version installed: VS5.28A.
   - SECS2 Interface should be available.
   - Electrical supply: 3 x 200V 50 Hz.
   - CE Marking: Yes.

Performance Specifications Freescale Steppers FPA-2000i1:

1. **Illuminator:**
   - Intensity: Spec: > 600 mW/cm2
     Result: 600 mW/cm2.
   - Uniformity: Spec: < 1.2 %.
     Result: 1,1 %.
   - Light Integrator accurarcy: Spec: < 1.2 %.
   - Masking blades accuracy: Spec: < +/- 100 µ.
     Result: Test is Passed.

2. **Auto Focus system:**
   - Focus repeatability(3-Sigma): Spec: < 0.12 µ.
     Results: Wafer nr1: 0.043 µ.
     Wafer nr2 : 0.032 µ.
     Wafer nr3 : 0.036 µ.
     Wafer nr4 : 0.041 µ.
     Wafer nr5 : 0.043 µ.

3. **Die by Die Leveling:**
   - Die by Die leveling repeatability – X (3-Sigma): Spec: < 10 ppm.
     Results: Wafer nr1: 2.18 ppm.
     Wafer nr2 : 1.62 ppm.

Wafer nr3 : 1.08 ppm
Wafer nr4 : 1.53 ppm
Wafer nr5 : 1.24 ppm

- Die by Die leveling repeatability – Y (3-Sigma): Spec: < 10 ppm.

Results: **Wafer nr1: 2.21 ppm.**
Wafer nr2 : 2.44 ppm.
Wafer nr3 : 1.43 ppm.
Wafer nr4 : 1.68 ppm.
Wafer nr5 : 2.00 ppm.

- Global leveling repeatability – X (3-Sigma): Spec: < 10 ppm.

Results: **Wafer nr1: 4.21 ppm.**
Wafer nr2 : 3.70 ppm.
Wafer nr3 : 3.89 ppm.
Wafer nr4 : 4.19 ppm
Wafer nr5 : 5.11 ppm.

- Global leveling repeatability – Y (3-Sigma): Spec: < 10 ppm.

Results: **Wafer nr1: 5.66 ppm.**
Wafer nr2 : 4.98 ppm.
Wafer nr3 : 6.12 ppm.
Wafer nr4 : 5.79 ppm
Wafer nr5 : 5.47ppm.

4. Auto Alignment accuracy:

- Reticle rotation accuracy (Y-Mean): Spec: < +/- 0.02 µ.

Results: **Wafer nr1 : Y= -0,002 µ.**
Wafer nr2 : Y= -0,008 µ.
Wafer nr3 : Y= 0,002 µ.

TEST IS PASSED.

- Reticle rotation repeatability (Range): Spec: < +/- 0.03 µ.

Results: **Wafer nr1 : Y= 0,017 µ.**
Wafer nr2 : Y= 0,029 µ.
Wafer nr3 : Y= 0,027 µ.

TEST IS PASSED.

- AGA accuracy Mode1 (resist on resist) –X: Spec: mean+3-sigma < +/- 0.08 µ.

Results:
Wafer1: MeanX = 0,010 µ; 3-SigmaX= 0,042 µ ; Mean+3-Sigma= 0,052 µ.
Wafer2: MeanX = 0,017 µ; 3-SigmaX= 0,055 µ ; Mean+3-Sigma= 0,072 µ.
Wafer3: MeanX = 0,004 µ; 3-SigmaX= 0,051 µ ; Mean+3-Sigma= 0,059 µ.
Wafer4: MeanX = 0,002 µ; 3-SigmaX= 0,047 µ ; Mean+3-Sigma= 0,049 µ.
Wafer5: MeanX = 0,007 µ; 3-SigmaX= 0,045 µ ; Mean+3-Sigma= 0,054 µ.
TEST IS PASSED.

- AGA accuracy Mode1 (resist on resist) –Y: Spec: mean+3-sigma < +/- 0.08 µ.

Results:
Wafer1: MeanY = 0,001 µ; 3-SigmaY= 0,046 µ ; Mean+3-Sigma= 0,047 µ.
Wafer2: MeanY = 0,002 µ; 3-SigmaY= 0,048 µ ; Mean+3-Sigma= 0,050 µ.
Wafer3: MeanY = 0,009 µ; 3-SigmaY= 0,043 µ ; Mean+3-Sigma= 0,052 µ.
Wafer4: MeanY = -0,013 µ; 3-SigmaY= 0,051 µ ; Mean+3-Sigma= 0,064 µ.
Wafer5: MeanY = -0,006 µ; 3-SigmaX= 0,046 µ ; Mean+3-Sigma= 0,052 µ.
TEST IS PASSED.

- AGA accuracy Mode2 (resist on resist) –X: Spec: mean+3-sigma < +/- 0.08 µ.

Results:
Wafer1: MeanX = 0,023 µ; 3-SigmaX= 0,040 µ ; Mean+3-Sigma= 0,063 µ.

Wafer2: MeanX = -0,002µ; 3-SigmaX= 0,073 µ ; Mean+3-Sigma= 0,075 µ.
Wafer3: MeanX = -0,011 µ; 3-SigmaX= 0,041 µ ; Mean+3-Sigma= 0,052 µ.
Wafer4: MeanX = 0,002 µ; 3-SigmaX= 0,071 µ ; Mean+3-Sigma= 0,073 µ.
Wafer5: MeanX = 0,000 µ; 3-SigmaX= 0,042 µ ; Mean+3-Sigma= 0,042 µ.
TEST IS PASSED.

- AGA accuracy Mode2 (resist on resist) –Y: Spec: mean+3-sigma < +/- 0.08 µ.

Results:
Wafer1: MeanY = 0,008 µ; 3-SigmaY= 0,029 µ ; Mean+3-Sigma= 0,037 µ.
Wafer2: MeanY = -0,026µ; 3-SigmaY= 0,048 µ ; Mean+3-Sigma= 0,074 µ.
Wafer3: MeanY = -0,003µ; 3-SigmaY= 0,044 µ ; Mean+3-Sigma= 0,047 µ.
Wafer4: MeanY = 0,000 µ; 3-SigmaY= 0,047 µ ; Mean+3-Sigma= 0,047 µ.
Wafer5: MeanY = -0,002 µ; 3-SigmaX= 0,034 µ ; Mean+3-Sigma= 0,036 µ.
TEST IS PASSED.

- AGA accuracy Mode4 (resist on resist) –X: Spec: mean+3-sigma < +/- 0.08 µ.

Results:
Wafer1: MeanX = 0,003 µ; 3-SigmaX= 0,073 µ ; Mean+3-Sigma= 0,076 µ.
Wafer2: MeanX = 0,009 µ; 3-SigmaX= 0,064 µ ; Mean+3-Sigma= 0,073 µ.
Wafer3: MeanX = 0,008 µ; 3-SigmaX= 0,062 µ ; Mean+3-Sigma= 0,070 µ.
Wafer4: MeanX = -0,008 µ; 3-SigmaX= 0,055 µ ; Mean+3-Sigma= 0,063 µ.
Wafer5: MeanX = 0,002 µ; 3-SigmaX= 0,059 µ ; Mean+3-Sigma= 0,061 µ.
TEST IS PASSED.

- AGA accuracy Mode4 (resist on resist) –Y: Spec: mean+3-sigma < +/- 0.08 µ.

Results:
Wafer1: MeanY = 0,008 µ; 3-SigmaY= 0,050 µ ; Mean+3-Sigma= 0,058 µ.
Wafer2: MeanY = -0,026 µ; 3-SigmaY= 0,050 µ ; Mean+3-Sigma= 0,076 µ.
Wafer3: MeanY = -0,022 µ; 3-SigmaY= 0,057 µ ; Mean+3-Sigma= 0,079 µ.
Wafer4: MeanY = -0,017 µ; 3-SigmaY= 0,055 µ ; Mean+3-Sigma= 0,072 µ.
Wafer5: MeanY = -0,027 µ; 3-SigmaX= 0,051 µ ; Mean+3-Sigma= 0,078 µ.
TEST IS PASSED.

- Total overlay Mode1(to ONSEMI ref wafer) – X: Spec: mean+3-sigma < +/- 0.14 µ.

Results:
Wafer1: MeanX = 0,015 µ; 3-SigmaX= 0,031 µ ; Mean+3-Sigma= 0,046 µ.
Wafer2: MeanX = 0,002 µ; 3-SigmaX= 0,039 µ ; Mean+3-Sigma= 0,041 µ.
Wafer3: MeanX = 0,015 µ; 3-SigmaX= 0,028 µ ; Mean+3-Sigma= 0,043 µ.
Wafer4: MeanX = 0,015 µ; 3-SigmaX= 0,034 µ ; Mean+3-Sigma= 0,049 µ.
Wafer5: MeanX = 0,004 µ; 3-SigmaX= 0,025 µ ; Mean+3-Sigma= 0,029 µ.
TEST PASSED.

- Total overlay Mode1(to ONSEMI ref wafer) – Y: Spec: mean+3-sigma < +/- 0.14 µ.

Wafer1: MeanY = -0,012 µ; 3-SigmaY= 0,051 µ ; Mean+3-Sigma= 0,063 µ.
Wafer2: MeanY = -0,031 µ; 3-SigmaY= 0,034 µ ; Mean+3-Sigma= 0,065 µ.
Wafer3: MeanY = 0,008 µ; 3-SigmaY= 0,060 µ ; Mean+3-Sigma= 0,068 µ.
Wafer4: MeanY = -0,009 µ; 3-SigmaY= 0,044 µ ; Mean+3-Sigma= 0,053 µ.
Wafer5: MeanY = -0,004µ; 3-SigmaY= 0,055 µ ; Mean+3-Sigma= 0,059 µ.
TEST PASSED.

- Total overlay Mode2(to ONSEMI ref wafer) – X: Spec: mean+3-sigma < +/- 0.14 µ.

Results:
Wafer1: MeanX = 0,034 µ; 3-SigmaX= 0,030 µ ; Mean+3-Sigma= 0,064 µ.
Wafer2: MeanX = -0,012µ; 3-SigmaX= 0,047 µ ; Mean+3-Sigma= 0,059 µ.
Wafer3: MeanX = -0,014µ; 3-SigmaX= 0,031 µ ; Mean+3-Sigma= 0,045 µ.
Wafer4: MeanX = -0,009µ; 3-SigmaX= 0,034 µ ; Mean+3-Sigma= 0,043 µ.

Wafer5: MeanX = -0,033µ; 3-SigmaX= 0,028 µ ; Mean+3-Sigma= 0,061 µ.
TEST IS PASSED.

- Total overlay Mode2(to ONSEMI ref wafer) – Y: Spec: mean+3-sigma < +/- 0.14 µ.
  Wafer1: MeanY = -0,017 µ; 3-SigmaY= 0,070 µ ; Mean+3-Sigma= 0,087 µ.
  Wafer2: MeanY = -0,015 µ; 3-SigmaY= 0,047 µ ; Mean+3-Sigma= 0,062 µ.
  Wafer3: MeanY = 0,041 µ; 3-SigmaY= 0,059 µ ; Mean+3-Sigma= 0,100 µ.
  Wafer4: MeanY = 0,018 µ; 3-SigmaY= 0,070 µ ; Mean+3-Sigma= 0,088 µ.
  Wafer5: MeanY = -0,005µ; 3-SigmaY= 0,055 µ ; Mean+3-Sigma= 0,060 µ.
  TEST PASSED.
- Total overlay Mode4(to ONSEMI ref wafer) – X: Spec: mean+3-sigma < +/- 0.14 µ.
  Results:
  Wafer1: MeanX = 0,009 µ; 3-SigmaX= 0,039 µ ; Mean+3-Sigma= 0,048 µ.
  Wafer2: MeanX = -0,003 µ; 3-SigmaX= 0,029 µ ; Mean+3-Sigma= 0,032 µ.
  Wafer3: MeanX = 0,020 µ; 3-SigmaX= 0,031 µ ; Mean+3-Sigma= 0,051 µ.
  Wafer4: MeanX = -0,019 µ; 3-SigmaX= 0,029 µ ; Mean+3-Sigma= 0,048 µ.
  Wafer5: MeanX = -0,025 µ; 3-SigmaX= 0,036 µ ; Mean+3-Sigma= 0,061 µ.
  TEST IS PASSED.

- Total overlay Mode4(to ONSEMI ref wafer) – Y: Spec: mean+3-sigma < +/- 0.14 µ.
  Results:
  Wafer1: MeanY = 0,011 µ; 3-SigmaY= 0,052 µ ; Mean+3-Sigma= 0,063 µ.
  Wafer2: MeanY = -0,013 µ; 3-SigmaY= 0,098 µ ; Mean+3-Sigma= 0,111 µ.
  Wafer3: MeanY = 0,049 µ; 3-SigmaY= 0,059 µ ; Mean+3-Sigma= 0,108 µ.
  Wafer4: MeanY = 0,014 µ; 3-SigmaY= 0,039 µ ; Mean+3-Sigma= 0,053 µ.
  Wafer5: MeanY = -0,008 µ; 3-SigmaY= 0,058 µ ; Mean+3-Sigma= 0,066 µ.
  TEST IS PASSED.

5. Exposure performance:

- Resolution : Spec: 0.5 µ, 0.8 µ and 1.0 µ linewidths are resolved in both the Vertical and Horizontal Directions at all nine points within the 20 x 20 mm image field.
- CD Depth of Focus @ 0.50 µ L&S: Spec: > 1.30 µ Range.
- Image Field Deviation @ 0.50 µ L&S: Spec : < 0.50 µ.
- CD Uniformity within Field @ 0.50 µ L&S:
  Spec:Total range(H&V,9 points) < 0.05 µ
- Lens Distortion (Deviation from Ideal Cartesian Grid)
  (Including Magnification) : Spec : within +/- 0.080 µ.
  Results:
  Wafer1: MAX X = 0,073 µ; MAX Y= 0,066 µ ; MAG= -0,525 ppm.
  Wafer2: MAX X = 0,070 µ; MAX Y= 0,055 µ ; MAG= -0,764 ppm.
  Wafer3: MAX X = 0,075 µ; MAX Y= 0,062 µ ; MAG= -0,639 ppm.
  Wafer4: MAX X = 0,061 µ; MAX Y= 0,069 µ ; MAG= -0,565 ppm.
  Wafer5: MAX X = 0,067 µ; MAX Y= 0,066 µ ; MAG= -0,609 ppm.
  TEST IS PASSED.
- Distortion Matching to ONSEMI Silicon Ref Wafer (Including Magnification):
  Spec: < +/- 2 ppm.
  Results:
  Wafer1: Magnification= 0,680 ppm ; Rotation = -0,380 ppm.
  Wafer2: Magnification= 0,520 ppm ; Rotation = 0,210 ppm.
  Wafer3: Magnification= 1,250 ppm ; Rotation = 0,580 ppm.
  Wafer4: Magnification= -1,539 ppm ; Rotation = 0,725 ppm.

Wafer5: Magnification= -1,019 ppm ; Rotation = 1,076 ppm.
TEST IS PASSED.

- Open Frame: Spec: no foreign matter should be observed at inspection after development of the wafer.
  TEST IS PASSED.

6. XY-Stage performance:

- Scaling – X (reference wafer): Spec: < +/- 1.0 ppm.
  Results: **Wafer nr1 = 0,19 ppm.**
  Wafer nr2 = 0,03 ppm.
  Wafer nr3 = 0,02 ppm.
  Wafer nr4 = 0,55 ppm.
  Wafer nr5 = 0,08 ppm.
- Scaling – Y (reference wafer): Spec: < +/- 1.0 ppm.
  Results: **Wafer nr1 = 0,25 ppm.**
  Wafer nr2 = 0,03 ppm.
  Wafer nr3 = 0,14 ppm.
  Wafer nr4 = 0,61 ppm.
  Wafer nr5 = -0,04 ppm.
- Orthogonality (reference wafer): Spec: < +/- 1.0 ppm.
  Results: **Wafer nr1 = 0,06 ppm.**
  Wafer nr2 = 0,13 ppm.
  Wafer nr3 = -0,02 ppm.
  Wafer nr3 = 0,90 ppm.
  Wafer nr5 = 0,11 ppm.
- Stepping accuracy check (NSTEP) - X-X (3-Sigma): Spec: < 0.070 µ.
  Results: **Wafer nr1 = 0,031 µ.**
  Wafer nr2 = 0,038 µ.
  Wafer nr3 = 0,023 µ.
  Wafer nr4 = 0,027 µ.
  Wafer nr5 = 0,025 µ.
- Stepping accuracy check (NSTEP - Y-Y (3-Sigma): Spec: < 0.070 µ.
  Results: **Wafer nr1 = 0,038 µ.**
  Wafer nr2 = 0,036 µ.
  Wafer nr3 = 0,027 µ.
  Wafer nr4 = 0,033 µ.
  Wafer nr5 = 0,027 µ.
- Stepping Repeatability X and Y (3-Sigma): Spec: < 0.070 µ.
  Results: **Wafer nr1 ; X = 0,026 µ ; Y= 0,025 µ.**
  Wafer nr2 ; X = 0,032 µ ; Y= 0,024 µ.
  Wafer nr3 ; X = 0,028 µ ; Y= 0,024 µ.
  Wafer nr4 ; X = 0,030 µ ; Y= 0,024 µ.
  Wafer nr5 ; X = 0,0 µ ; Y= 0,0 µ.
- AUX XYP-check X and Y (3-Sigma): Spec: < 0.060 µ.
  Results: **Wafer nr1 ; X = 0,020 µ ; Y= 0,028 µ.**
  Wafer nr2 ; X = 0,020 µ ; Y= 0,028 µ.
  Wafer nr3 ; X = 0,021 µ ; Y= 0,032 µ.
  Wafer nr4 ; X = 0,0 µ ; Y= 0,0 µ.
  Wafer nr5 ; X = 0,0 µ ; Y= 0,0 µ.

7. Pre-Alignment:

- Mechanical prealignment accuracy (3-Sigma): Spec: < 40 µ.

  Result: Xl = 16 µ.
  Yl = 10 µ.
  Xr = 16 µ.
  Yr = 11 µ.

8. Throughput:

- HeNe AA Mode1 , 45 shots , 20 mm x 20 mm step size , expo-time: 160 msec , AGA Sub4 Main 8: TILT ON: Spec: > 50 wph.
  TILT OFF: Spec: > 57 wph.

9. Reliability:

- Wafer feeding OFF-LINE: 500 wafers cycled AGA without any error.
  Result: 1050 wafers cycled with 0 errors. Test Passed.
- Wafer feeding IN-LINE: 500 wafers cycled AGA without any error.
  Result: **500 wafers cycled with 0 errors . Test Passed.**
- 75 Times reticle loading/unloading without any error.

10. Contamination:

- Spec: < 10 particles/wafer > 0.3 µ
  < 3 particles/wafer > 0.5 µ

11. Additional Machine Performance checks:

- Basic machine performance of the machine should be confirmed at the following location: xxxx. The test should be done with ONSEMI 6 inch JEIDA wafers.
- Lens performance data should be confirmed by xxxxx and should be approved by a ONSEMI Proces and a Equipment Engineer.
- The Stepper Lens Magnification Correction system should be able to compensate , at the ONSEMI Site Oudenaarde Belgium, any Lens Magnification error under the following conditions: a minimum air pressure of 980 mbar and a maximum pressure of 1035 mbar.
  Result: Test Passed.

12. EBR-system:

- Edge Bead Removal Accuracy Edge: Spec: < +/- 0.2 mm.
  Result: EBR width checked on Box 230 Basis-check: Test Passed.
- Edge Bead Removal Accuracy Flat: Spec: < +/- 0.3 mm.
  Result: EBR width checked on Box 230 Basis-check: Test Passed.
- Edge Bead Removal Capability: Spec: 0 – 6 mm.
  Result: EBR width checked on Box 230 Basis-check: Test Passed.

13. Compact Chamber:

- Temperature settings: Booth:21°C ; Stage: 23°C.
- Temperature control: within +/- 0.1 °C.