# Tencor FLX – 2320
# Thin film Stress Measurement System
**(Only accept 4" wafer now)**

**Getting Started**:

1) Start program by double click [**WIN FLX**] icon.
2) In **Login User Name** frame, either create your own **User Account** by clicking on [**New**] or choose your created User Account.
3) Click [**OK**].

**Pre-Film-Deposition Deflection Measurement:**

4) Turn **Main-Power-Switch** on and check to make sure the lasers are on (by turning the key to the vertical position), **Heater** button is off, **Fan** button is on, and the temperature displayed at up-left corner of the instrument front is at room temperature.
5) Open the instrument door, make sure that the big notch on the inner side of the retaining ring points to 12 o'clock position (otherwise, rotate the ring), place a substrate wafer with "face up" inside of the retaining ring with the major flat against the notch, and close the door.
6) Click **Edit** menu, then, **Process program** to open **Process Program** frame.
7) In **Process Program** frame, enter the values into **Maximum scan points** (e.g., 50), and **Low intensity alarm** (e.g., 0.2), Choose **Elastic modulus** [e.g., for Si (100): 1.805] by click drop-down button, input the values into **Substrate thickness** (you need to measure the thickness of the substrate wafer)**, Wafer diameter** (e.g., 90 mm), and **Hole diameter** (e.g., 0 if no hole on wafer). Also, check the boxes of **Save Scan** & **Auto Scan** (x appears inside of those boxes), choose the unit of stress: in either **MPa** or **Dyne/cm2**. In **Laser selection** section, choose **Automatic**.
8) Save the process program into your user directory (c:\winflx\user name) for loading next time.
9) Click **Measure** menu, then, **First (no film)** to open **First measurement** frame.
10) In F**irst measurement** frame, enter a **File** name, wafer **ID** (e.g., 1), wafer **Orientation** of 0, and some **Comment** if you want.
11) Click **Measure** button to start the measurement [Graph of Deflection (μm) vs. Distance (mm), etc. show up on screen after that].
12) After done and if you want to do wafer stress mapping measurements, open the instrument door, get the wafer out, rotate the retaining ring clockwise with certain degrees (e.g., $30^o$) (one small notch unit on outer side of the retaining ring is $15^o$), , place the wafer again inside of the ring with the wafer major-flat against the big notch, close the door,
13) Enter the new orientation (e.g., 30) in **Orientation** of the frame, and click **Measure** button to start another measurement (there is a pop-up message: "**Duplicate First measurement ID Click YES to Continue or NO to re-enter**", you need to click **YES** button below).
14) Repeat steps 12 and 13 until you finish all wafer mappings (e.g., 0, 30, 60, 90, 120, and $150^o$).
15) After finishing all measurements, click [**Cancel**] button in the **First Measurement** frame to exit the frame, then, click "-" button at up-left corner of screen, then, **Close** button to quit **WIN FLX** program.
16) Remove your wafer from instrument and turn the **MAIN-Power-Switch** off.

**Post-Film-Deposition Deflection Measurement:**

17) Start program by double click [**WIN FLX**] icon.
18) In **Login User Name** frame, choose your User Account, and click [**OK**].
19) Measure the thickness of the film deposited on the substrate wafer.

20) Turn **Main-Power-Switch** on and check to make sure the lasers are on (by turning the key to the vertical position), **Heater** button is off, **Fan** button is on, and the temperature displayed in up-left corner of the instrument front is at room temperature.
21) Open the instrument door, make sure that the big notch on the inner side of the retaining ring points to 12 o'clock position (otherwise, rotate the ring), place the wafer with "film-side-up" inside of the retaining ring with the major flat against the big notch, and close the door.
22) Click **Measure** menu, then, **Single** to open **Single stress** frame.
23) In **Single stress** frame, click **File** button, then, choose the file you created previously, then, click **OK** button.
24) Back to **Single stress** frame, enter the same **ID** as before (e.g., 1), choose wafer **Orientation** of 0 (there is a list of orientations, you used during the pre-deposition deflection measurements, when clicking the drop-down button), enter some **Comment** if you want, and the **Film thickness** (you need to figure out the film thickness).
25) Click **Measure** button to start the measurement [Graph of Deflection (μm) vs. Distance (mm), etc., show up on screen after that].
26) After done, open the instrument door, get the wafer out, rotate the retaining ring clockwise to the next orientation (e.g., $30^{o}$) that you used in the pre-deposition deflection measurements (one small notch unit on outer side of the retaining ring is $15^{o}$), place the wafer again inside of the ring with the wafer major-flat against the big notch, close the door.
27) In **Orientation** section of **Single stress** frame, click the drop-down button to select the next orientation (e.g., 30), and click **Measure** button to start another measurement.
28) Repeat steps 26 and 27 until you finish all wafer mappings (e.g., 0, 30, 60, 90, 120, and $150^{o}$).
29) After finishing all measurements, click [**Cancel**] button in the **Single stress** frame to exit the frame.
30) Remove your wafer from instrument and turn the **MAIN-Power-Switch** off.

**Stress Map Plotting**

31) Click **Analysis** menu, then, **3D Plotting** at the bottom.
32) Click **File** menu, then, **New** menu, then, **STRESS Document**, then, **OK** button.
33) Click the drop-down button to select the data file.
34) Double click the box under **Start Rec** in $1^{st}$ column (left side) on $1^{st}$ row ("F" should appear insider of the box after that).
35) Double click the box under **Start Rec** in $1^{st}$ column (left side) on $2^{nd}$ Row ("S" should appear insider of the box after that).
36) Click **OK** button.
37) A 3D stress mapping plot is displayed on screen (click "^" button at up-right corner to get a full-screen plot).
38) The values of average, minimum, and maximum film stress, as well as standard deviation are given on the right side.
39) If you want to save this plot, press the button of "**Print Screen SysRq**" at up-right corner of the keyboard.
40) Quit the **WIN FLX** program.
41) Click **Accessories** icon, then, **Paintbrush** icon, then, click "^" button at up-right corner to get a full screen,
42) Click **Edit** menu, then, **Paste,** the 3D stress mapping plot appears on screen.
43) Click **File** menu at up-left corner of screen, then, **Save As. S**ave the plot in a bmp file for later usage.

**Operational Notes**

- If you get an error for reading temperature, close the program and retry. If you get the same error again, reboot the PC.