

CLAIMS

1. A substrate processing tool, comprising:
 - a vacuum transfer module; and
 - at least one process module comprising a plurality of processing stations, wherein the at least one process module is coupled to the vacuum transfer module, wherein the at least one process module includes a mechanical indexer, wherein the mechanical indexer includes, inside the at least one process module and external to the vacuum transfer module,
 - a first arm having a first end effector, a second end effector, and a first spindle, wherein the first arm is configured to rotate on the first spindle inside the at least one process module to (i) selectively position the first end effector of the first arm at each of the plurality of processing stations inside the at least one process module and (ii) selectively position the second end effector of the first arm at each of the plurality of processing stations inside the at least one process module, and
 - a second arm having a first end effector, a second end effector, and a second spindle, wherein the first spindle and the second spindle are coaxial, wherein the second arm is configured to rotate on the second spindle inside the at least one process module to (i) selectively position the first end effector of the second arm at each of the plurality of processing stations inside the at least one process module and (ii) selectively position the second end effector of the second arm at each of the plurality of processing stations inside the at least one process module, and wherein each of the first arm and the second arm is configured to be raised and lowered independently relative to the

plurality of processing stations inside the at least one process module,

wherein at least one of the plurality of processing stations corresponds to a load station of the at least one process module, and

wherein the first arm is configured to rotate independently of the second arm such that the first end effector or the second end effector of the first arm is positioned at the load station while the first end effector or the second end effector of the second arm is positioned one of above and below the first end effector or the second effector of the second arm at the load station.

2. The substrate processing tool of claim 1, wherein the second spindle is disposed within the first spindle.

3. The substrate processing tool of claim 1, wherein:

the first arm and the second arm are rotatable into a first configuration; and

in the first configuration, (i) the first end effector and the second end effector of the first arm are positioned at a first processing station and a third processing station, respectively, of the plurality of processing stations and (ii) the first end effector and the second end effector of the second arm are positioned at a second processing station and a fourth processing station, respectively, of the plurality of processing stations.

4. The substrate processing tool of claim 3, wherein:

the first arm and the second arm are rotatable into a second configuration; and

in the second configuration, (i) the first end effector and the second end effector of the first arm are positioned at the first processing station and the third processing station, respectively, of the plurality of processing stations and (ii) the first end effector and the second end effector of the second arm are positioned at the third processing station and the first processing station, respectively, of the plurality of processing stations.

5. The substrate processing tool of claim 4, wherein the first processing station corresponds to the load station of the substrate processing tool.

6. The substrate processing tool of claim 4, wherein (i) the first processing station and the third processing station are arranged at opposite corners of the substrate processing tool and (ii) the second processing station and the fourth processing station are arranged at opposite corners of the substrate processing tool.

7. The substrate processing tool of claim 1, wherein:

the first arm and the second arm are rotatable into a first configuration; and

in the first configuration, (i) the first end effector and the second end effector of the first arm are positioned at a first processing station and a fourth processing station, respectively, of the plurality of processing stations and (ii) the first end effector and the second end effector of the second arm are positioned at a second processing station and a third processing station, respectively, of the plurality of processing stations.

8. The substrate processing tool of claim 7, wherein:

the first arm and the second arm are rotatable into a second configuration; and

in the second configuration, (i) the first end effector and the second end effector of the first arm are positioned at the first processing station and the fourth processing station, respectively, of the plurality of processing stations and (ii) the first end effector and the second end effector of the second arm are positioned at the fourth processing station and the first processing station, respectively, of the plurality of processing stations.

9. The substrate processing tool of claim 8, wherein (i) the first processing station and the fourth processing station are arranged on a first side of the substrate processing tool and (ii) the second processing station and the third processing station are arranged on a second side of the substrate processing tool opposite the first side.

10. The substrate processing tool of claim 8, wherein the first processing station and the fourth processing station correspond to load stations of the substrate processing tool.

11. The substrate processing tool of claim 1, comprising:
a plurality of process modules coupled to the vacuum transfer module.

12. The substrate processing tool of claim 11, wherein the plurality of process modules includes first and second process modules coupled to a first side of the vacuum transfer module and third and fourth process modules coupled to a second side of the vacuum transfer module.

13. The substrate processing tool of claim 12, further comprising an adapter plate arranged between (i) the first side and (ii) the first and second process modules, wherein the adapter plate includes a planar side configured to interface with the first side of the vacuum transfer module and an angled side configured to interface with the first and second process modules.

14. The substrate processing tool of claim 12, wherein the first side and the second side of the vacuum transfer module are chamfered.

15. The substrate processing tool of claim 14, further comprising an adapter plate arranged between (i) the first side and (ii) the first and second process modules, wherein the adapter plate includes an angled side configured to interface with the first side of the vacuum transfer module and a planar side configured to interface with the first and second process modules.

16. A substrate processing tool, comprising:

a mechanical indexer located within a process module, wherein the process module includes a plurality of processing stations, and wherein the mechanical indexer includes

a first arm having a first end effector, a second end effector, and a first spindle, wherein the first arm is configured to rotate on the first spindle within the process module to (i) selectively position the first end effector of the first arm at each of the plurality of processing stations and (ii) selectively position the second end effector of the first arm at each of the plurality of processing stations, and

a second arm having a third end effector, a fourth end effector, and a second spindle, separate from the first spindle, wherein the first spindle and the second spindle are coaxial, wherein the second arm is configured to rotate on the second spindle within the process module to (i) selectively position the third end effector of the second arm at each of the plurality of processing stations and (ii) selectively position the fourth end effector of the second arm at each of the plurality of processing stations,

wherein the first arm is configured to be raised and lowered independently of the second arm via the first spindle, and wherein the first arm is further configured to rotate independently of the second arm via the first spindle.