Receiving Means for Mounting of Wafers

The invention relates to a receiving means for receiving and mounting of wafers, a device and a method for aligning a first wafer with a second wafer using the receiving means.

These receiving means or sample holders or chucks are available in diverse versions and a flat receiving surface or mounting surface is decisive for the receiving means, so that the structures which are becoming smaller and smaller can be correctly aligned and bonded on wafer surfaces which are larger and larger over the entire wafer surface. This is especially important when a so-called prebonding step which joins the wafers to one another by means of a separable interconnection is carried out before the actual bond process. High alignment accuracy of the wafers to one another is especially important as soon as an alignment accuracy or especially distortion values of < 2 μm are to be achieved for all structures located on one or both wafers. In the vicinity of the alignment marks this succeeds especially well in the indicated receiving means and devices for alignment, so-called aligners, especially bond aligners. With increasing distance from the alignment marks, controlled and perfect alignment with alignment accuracies or especially distortion values better than 2 μm, especially better than 1 μm and even more preferably better than 0.25 μm cannot be achieved.

Embodiments of this invention improve generic receiving means such that more accurate alignment can be achieved with them.

According to a first aspect of the present invention, there is provided a device for alignment of a first wafer with a second, said device including: means for detecting position or strain maps of the first wafer or the second wafer and for determining local alignment errors which have occurred due to strain or distortion of the first wafer relative to the second wafer when the first wafer is joined to the second wafer, receiving means for receiving and mounting of the first and second wafers with : a) a mounting surface, b) mounting means for mounting of the wafer on the mounting surface, and c) compensation means for active compensation of global distortions of the wafer, wherein the compensation is controllable by temperature, strain, compressive force or pressure, alignment means for alignment of the wafers with compensation by the compensation means, and means for checking the alignment success and means for self-calibration of the device by means of the acquired data.

According to a second aspect of the present invention, there is provided a method for alignment of a first wafer with a second wafer, said method including the steps of: determining local alignment errors which have occurred due to strain or distortion of the first wafer relative to a second wafer when the first wafer is joined to the second wafer, receiving one of the wafers on the above device and aligning the wafers with compensation by the compensation means.

All

Claims

1. A device for alignment of a first wafer with a second, said device comprising:

means for detecting position or strain maps of the first wafer or the second wafer and for determining local alignment errors which have occurred due to strain or distortion of the first wafer relative to the second wafer when the first wafer is joined to the second wafer,

receiving means for receiving and mounting of the first and second wafers with :

a) a mounting surface (1o),

b) mounting means for mounting of the wafer on the mounting surface (1o), and

c) compensation means (3, 4, 5, 6) for active compensation of global distortions of the wafer, wherein the compensation is controllable by temperature, strain, compressive force or pressure,

alignment means for alignment of the wafers with compensation by the compensation (3, 4, 5, 6) means, and

means for checking the alignment success and means for self-calibration of the device by means of the acquired data.

2. The device as claimed in claim 1, wherein the compensation means (3, 4, 5, 6) partially compensates the global distortions of the wafer

3. The device as claimed in claim 1 or 2, wherein temperature of the mounting surface (1o) can be locally influenced by the compensation means (3, 4, 5, 6).

4. The device as claimed in one of the preceding claims, wherein as active control elements a plurality of heating/cooling elements are provided.

5. The device as claimed in one claims 1 to 3, wherein as active control elements a plurality of exclusively heating elements are provided.

6. The device as claimed in claim 5, wherein the heating elements are Peltier elements.

7. The device as claimed in one of the preceding claims, wherein shape of the mounting surface (1o) can be locally influenced by the compensation means (3, 4, 5, 6).

8. The device as claimed in one of claims 1 to 6, wherein shape of the mounting surface (1o) can be locally influenced by the compensation means (3, 4, 5, 6) by action in a Z direction.

9. The device as claimed in claim 8, wherein the compensation means (3, 4, 5, 6) acts mechanically.

10. The device as claimed in one of the preceding claims, wherein the mounting surface (1o) can be locally exposed to pressure from the back side (1r) of the mounting surface (1o) by the compensation means (3, 4, 5, 6).

11. The device as claimed in claim 10, wherein the pressure is applied hydraulically and/or pneumatically to the mounting surface.

12. The device as claimed in one of the preceding claims, wherein the compensation means (3, 4, 5, 6) are provided as a plurality of active control elements (3, 4, 5, 6) in the receiving means.

13. The device as claimed in claim 12, wherein the active control elements (3, 4, 5, 6) are integrated embedded into the mounting surface (1o).

14. The device as claimed in claim 12, wherein the active control elements (3, 4, 5, 6) are embedded into the mounting surface (1o).

15. The device as claimed in claim 12, wherein each control element (3, 4, 5, 6) or groups of control elements (3, 4, 5, 6) can be activated separately.

16. A method for alignment of a first wafer with a second wafer, said method comprising the steps of:

determining local alignment errors which have occurred due to strain or distortion of the first wafer relative to a second wafer when the first wafer is joined to the second wafer,

receiving one of the wafers on the device as claimed in one of claims 1 to 15, and

aligning the wafers with compensation by the compensation means.