Receiving Means for Mounting of Wafers

The invention relates to a receiving means for receiving and mounting of wafers and 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, there is provided a device for alignment of a first wafer with a second wafer, the device including: a means for determining local alignment errors in form of a vector field with distortion vectors which local alignment errors have occurred due to strain or distortion of the first wafer relative to a second wafer, a receiving means for receiving and mounting of the wafers, the receiving means including: a mounting surface, mounting means for mounting of the wafer on the mounting surface, and compensation means including piezoelements for active, locally controllable, compensation of global distortions of the wafer, wherein the mounting surface can be stretched or shrunk for deforming the wafer accordingly, and alignment of the wafers with consideration of the vector field and simultaneous compensation by the compensation means.

According to a second aspect, there is provided a method for alignment of a first wafer with a second wafer, the method including the steps of: detecting a vector field with distortion vectors of the first wafer or a vector field with distortion vectors of the second wafer and evaluation of the vector field by evaluation means and determination of the local alignment errors, receiving one of the wafers on a receiving means for receiving and mounting of the wafers, the receiving means including: a mounting surface, mounting means for mounting of the wafer on the mounting surface, and compensation means including piezoelements for active, locally controllable, compensation of global distortions of the wafer, wherein the mounting surface can be stretched or shrunk for deforming the wafer accordingly, and alignment of the wafers with consideration of the vector field and simultaneous compensation by the compensation means.

Advantageous embodiments of the invention are also disclosed. All

Claims:

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

a means for determining local alignment errors in form of a vector field with distortion vectors which local alignment errors have occurred due to strain or distortion of the first wafer relative to a second wafer,

a receiving means for receiving and mounting of the wafers, the receiving means comprising:

a mounting surface (1o),

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

compensation means (3, 4, 5, 6) comprising piezoelements (4) for active, locally controllable, compensation of global distortions of the wafer,

wherein the mounting surface (1o) can be stretched or shrunk for deforming the wafer accordingly, and alignment of the wafers with consideration of the vector field and simultaneous compensation by the compensation means.

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

3. The device as claimed in claim 1 or 2, wherein the strain of the mounting surface (1o) can be locally influenced by arrangement of the piezoelements (4).

4. The device as claimed in claim 3, wherein the piezoelements (4) can be individually activated on a back side (1r) of the mounting surface (1o).

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

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

7. The device as claimed in claim 6, wherein the compensation means acts mechanically.

8. The device as claimed in claim 1 or 2, wherein the mounting surface (1o) can be locally exposed to pressure from the back (1r) of the mounting surface (1o) by the compensation means (3, 4, 5, 6).

9. The device as claimed in claim 1 or 2, wherein the compensation means (3, 4, 5, 6) as a plurality of active control elements (3, 4, 5, 6) in the receiving means.

10. The device as claimed in claim 9, wherein the active control elements are integrated into the mounting surface (1o).

11. The device as claimed in claim 9, wherein the active control elements are embedded into the mounting surface (1o).

12. The receiving means as claimed in claim 9, wherein each control element (3, 4, 5, 6) or groups of control elements (3, 4, 5, 6) can be activated separately.

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

detecting a vector field with distortion vectors of the first wafer or a vector field with distortion vectors of the second wafer and evaluation of the vector field by evaluation means and determination of the local alignment errors,

receiving one of the wafers on a receiving means for receiving and mounting of the wafers, the receiving means comprising:

a mounting surface (1o),

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

compensation means (3, 4, 5, 6) comprising piezoelements (4) for active, locally controllable, compensation of global distortions of the wafer,

wherein the mounting surface (1o) can be stretched or shrunk for deforming the wafer accordingly, and alignment of the wafers with consideration of the vector field and simultaneous compensation by the compensation means.

14. The method as claimed in claim 13, wherein the strain of the mounting surface (1o) can be locally influenced by the compensation means (3, 4, 5, 6).

15. The method as claimed in claim 13 or 14, wherein the strain of the mounting surface (1o) can be locally influenced by arrangement of the piezoelements (4).

16. The method as claimed in claim 15, wherein the piezoelements (4) can be individually activated on a back side (1r) of the mounting surface (1o).

17. The method as claimed in claim 13 or 14, wherein the shape of the mounting surface (1o) can be locally influenced by the compensation means (3, 4, 5, 6).

18. The method as claimed in claim 17, wherein the shape of the mounting surface (1o) can be locally influenced by the compensation means by action in a Z direction.

19. The method as claimed in claim 18, wherein the compensation means act mechanically.

20. The method as claimed in claim 13 or 14, wherein the mounting surface (1o) can be locally exposed to pressure from the back (1r) of the mounting surface (1o) by the compensation means (3, 4, 5, 6).

21. The method as claimed in claim 13 or 14, wherein the compensation means (3, 4, 5, 6) as a plurality of active control elements (3, 4, 5, 6) in the receiving means.

22. The method as claimed in claim 21, wherein the active control elements are integrated into the mounting surface (1o).

23. The method as claimed in claim 21, wherein the active control elements are embedded into the mounting surface (1o).

24. The method as claimed in claim 21, wherein each control element (3, 4, 5, 6) or groups of control elements (3, 4, 5, 6) can be activated separately.