

CLAIMS

5

1. A substrate handling device (10) for a wafer, comprising:

- an end effector (11),
- a straightening ring (12), and
- 10 - a suction cup (13),

wherein the suction cup (13) is arranged within the straightening ring (12) and ~~at least~~ the straightening ring (12) is releasably attached to the end effector (11),

wherein a first part of the suction cup (13) is connectable to a vacuum supply and a second part of the suction cup (13) is attachable to a substrate by means of reduced
15 pressure provided by the vacuum supply,

wherein the suction cup (13) projects from the straightening ring (12) in a normal pressure state, and

wherein the suction cup (13) is on the same level as the straightening ring (12) in a reduced pressure state, in which the substrate is held by the suction cup (13), so that
20 the straightening ring (12) contacts the substrate, and

wherein the suction cup (13) is releasably attached to the end effector (11).

~~2. Substrate handling device (10) according to claim 1, wherein also the suction cup (13) is releasably attached to the end effector (11).~~

25

~~3.2.~~ Substrate handling device (10) according to ~~one of the preceding claims 1~~, wherein the straightening ring (12) surrounds the suction cup (13) and restricts a radial deformation of the suction cup (13).

30 ~~4.3.~~ Substrate handling device (10) according to one of the preceding claims, wherein the suction cup (13) holds the substrate in the reduced pressure state in an essentially horizontal or an essentially vertical position relative to the ground.

~~5.4.~~ Substrate handling device (10) according to one of the preceding claims, wherein,

when the straightening ring (12) contacts the substrate and the substrate is non-planar, the straightening ring (12) at least partially straightens the non-planar substrate.

5 ~~6.5.~~ Substrate handling device (10) according to one of the preceding claims, wherein the suction cup (13) projects with a distance d from the straightening ring (12) in the normal pressure state, and wherein a distance d to size s of the substrate ratio is in the range between 30:1 and 800:1.

10 ~~7.6.~~ Substrate handling device (10) according to one of the preceding claims, wherein an outer circumference of the straightening ring (12) is larger than an outer circumference of the suction cup (13).

15 ~~8.7.~~ Substrate handling device (10) according to one of the preceding claims, wherein a substrate-contacting surface (14) of the suction cup (13) projects from the straightening ring (12) in the normal pressure state.

20 ~~9.8.~~ Substrate handling device (10) according to one of the preceding claims, wherein the straightening ring (12) is made of a material, which is more rigid than a cup material of the suction cup (13).

~~10.9.~~ Substrate handling device (10) according to one of the preceding claims, further comprising a plurality of suction cups (13) and preferably three suction cups (13).

25 ~~11.10.~~ Substrate handling device (10) according to the preceding claim, further comprising a plurality of straightening rings (12) and preferably three straightening rings (12) each surrounding one of the suction cups (13).

30 ~~12.11.~~ A substrate handling system for a wafer, comprising a substrate handling device (10) according to one of the preceding claims and a vacuum supply, which is connected to a first part of a suction cup (13) of the substrate handling device (10).

~~13.12.~~ Substrate handling system according to the preceding claim, further comprising at least a replacing straightening ring to replace a straightening ring (12) of the substrate handling device (10).

14.13. A method for substrate handling, comprising the following steps:

- providing a suction cup (13) arranged within a straightening ring (12),
wherein ~~at least~~ the straightening ring (12) is releasably attached to an end effector
(11),
wherein a first part of the suction cup (13) is connected to a vacuum supply and
wherein the suction cup (13) projects from the straightening ring (12) in a normal
pressure state,
- providing contact between a second part of the suction cup (13) and a
substrate, and
- providing a reduced pressure state by means of the vacuum supply so that the
substrate is held by the suction cup (13),
wherein the suction cup (13) is in the reduced pressure state on the same level as the
straightening ring (12), so that the straightening ring (12) contacts the substrate,
wherein also the suction cup (13) is releasably attached to the end effector (11).

15.14. Method according to the preceding claim, wherein the straightening ring (12) contacts
the substrate and, in case the substrate is non-planar, at least partially straightens the
substrate in the reduced pressure state.