

CLAIMS

Claim 1:

A CMP wafer cleaning equipment, characterized in that, comprising a cleaning input unit, a megasonic cleaning unit, a number of scrubbing units, and a spin-drying unit arranged in sequence, in addition, it also includes a transfer robot located above the cleaning equipment, comprising a horizontal movement axis, a vertical movement axis and a number of wafer grabbing devices, which can transport wafers between the units, the wafer grabbing device near the side of the spin-drying unit can grab and flip the wafers with own wafer flipping function.

Claim 2:—

The CMP wafer cleaning equipment of claim 1, characterized in that, a polishing wafer channel is located between the cleaning input unit and the megasonic cleaning unit, so that the wafer to be subjected to chemical-mechanical polishing can pass through the cleaning equipment when it enters the polishing area.

Claim 3:—

The CMP wafer cleaning equipment of claim 2, characterized in that, both the polished wafer channel and the wafer bracket in the cleaning input unit can be moved out simultaneously or separately to facilitate wafer loading.

Claim 4:—

The CMP wafer cleaning equipment of claim 1, characterized in that, it also includes a buffer unit, which is located in front of the cleaning input unit and can temporarily store

a number of wafers.

Claim 5:—

The CMP wafer cleaning equipment of claim 4, characterized in that, a water injector
5 is installed in the buffer unit to prevent the wafers from being dried without being cleaned.

Claim 6:—

The CMP wafer cleaning equipment of claim 1, characterized in that, the wafers are in
the vertical direction during cleaning and brushing, and in the horizontal direction during
10 spin drying.

Claim 7:—

The CMP wafer cleaning equipment of claim 1, characterized in that, the wafers are in
the vertical direction during cleaning, brushing, and spin drying.

Claim 8:—

The CMP wafer cleaning equipment of claim 1, characterized in that, the transfer robot
includes the first wafer grabbing device and the second wafer grabbing device.—

Claim 9:

The CMP wafer cleaning equipment of claim 1, characterized in that, the CMP wafer
cleaning equipment also includes an independent flipping robot that is designed to eliminate
the need for the wafer grabbing device close to the spin drying unit to turn the wafers.

Claim 10:

A wafer transfer robot used to transfer ~~the~~ wafers in ~~the~~ a cleaning module of ~~the~~ a chemical mechanical planarization equipment, to take out the wafers that have been cleaned in ~~the~~ a cleaning unit of the cleaning module in a vertical state, and to flip over and place them horizontally into ~~the~~ a drying unit of the cleaning module, ~~characterized in that,~~ the wafer transfer robot comprising:

a horizontal transfer shaft only located on one side of the cleaning unit;

a horizontal transfer carriage that is arranged on the horizontal transfer shaft and ~~can~~ is configured to move laterally along the horizontal transfer shaft;

~~the~~ a first vertical lifting shaft that is arranged on ~~the~~ a lateral transfer pallet and ~~can~~ is configured to perform vertical movement on ~~the~~ a lateral transfer carriage;

a rotating platform arranged on the first vertical lifting shaft;

~~the~~ a first jaw clamping arm which is connected to ~~the~~ a rotating table and is configured to be driven by the rotating platform to make rotational movement for wafer grabbing and placement.

Claim 11:

The wafer transfer robot of claim 10, ~~characterized in that,~~ wherein each of the cleaning unit and the drying unit is installed with switchable doors for automatic opening or closing when the wafer transfer robot grabs and places wafers.

Claim 12:

The wafer transfer robot of claim 10, ~~characterized in that,~~ wherein the cleaning unit includes a pre-drying unit and other units of the cleaning module, which are located on both sides of the pre-drying unit; the pre-drying unit is configured to works in a vertical direction;

the wafers in the pre-drying unit are transferred to the drying unit by the first jaw clamping arm; preferably the other units of the cleaning module ~~may be~~include one or more of the wafer transition unit, megasonic cleaning unit, and scrubbing unit.

5 Claim ~~134~~:

The wafer transfer robot of claim ~~123~~, ~~characterized in that, the wafer transfer robot~~ further ~~includes~~comprising: at least one second vertical lifting shaft, which is arranged on the lateral transfer carriage and ~~can be~~is configured to perform vertical movement on the lateral transfer carriage; the first vertical lifting shaft is located between the second vertical
10 lifting shaft and the drying unit; each of the second vertical lifting shafts is also provided with a second claw clamping arm that ~~can be used~~is configured to transfer wafers from the other units of the cleaning module to the pre-drying unit in combination with the first claw clamping arm.

15 Claim ~~145~~:

A wafer flipping method by a wafer transfer robot of claim ~~12-3~~ or ~~134~~, ~~characterized in that, the method includes~~ comprising performing a wafer placement and robot returning, wherein;

the wafer placement ~~of wafer~~ includes the following steps: after taking out ~~the~~a wafer
20 from the pre-drying unit of the cleaning unit, the first jaw clamping arm performs interactive or non-interactive actions in three movement directions: horizontal, vertical, and rotation, flips the wafer from ~~the~~a vertical state to ~~the~~a horizontal state, and places it in the drying unit;

the robot returning includes the following steps: after placing the wafer in the drying
25 unit, the first jaw clamping arm restores from the horizontal state to the vertical state through

interactive or non-interactive actions in three movement directions: horizontal, vertical, and rotation, and returns to ~~the~~an original position.

Claim ~~45~~6:

5 The wafer flipping method ~~by wafer transfer robot of claim 145, characterized in that,~~wherein the wafer placement of wafer includes the following steps:

after taking out the wafer from the pre-drying unit, the first jaw clamping arm moves in the following three directions simultaneously: the horizontal transfer carriage drives the first jaw clamping arm to make transverse motion in ~~the~~a direction away from the drying unit; the rotating platform drives the first jaw clamping arm to rotate to ~~the~~a side close to the drying unit until the wafer reaches a~~the~~ horizontal state, and the first vertical lifting shaft drives the first jaw clamping arm to move vertically to a certain position ;

then the horizontal transfer carriage drives the first jaw clamping arm to move laterally towards the drying unit until the wafer is positioned above the drying unit; the first vertical lifting shaft drives the first jaw clamping arm to move vertically downwards until the wafer is positioned on ~~the~~a designated mechanism inside the drying unit; the first jaw clamping arm releases the wafer so that the wafer is positioned on the designated mechanism inside the drying unit.

20 Claim ~~46~~7:

The wafer flipping method ~~by wafer transfer robot of claim 145, characterized in that,~~wherein the wafer placement of wafer specifically includes the following steps: after the first jaw clamping arm takes out the wafer from the pre-drying unit, the horizontal transfer carriage drives the first jaw clamping arm to make transverse motion away from the drying unit; the rotating platform drives the first jaw clamping arm to rotate to ~~the~~a side

close to the drying unit until the wafer reaches atthe horizontal state, and the first vertical lifting shaft drives the first jaw clamping arm to move vertically to a certain position; then the horizontal transfer carriage drives the first jaw clamping arm to move laterally towards the drying unit until the wafer is positioned above the drying unit; the first vertical lifting shaft drives the first jaw clamping arm to move vertically downwards until the wafer is positioned on ~~the~~a designated mechanism inside the drying unit; the first jaw clamping arm releases the wafer so that the wafer is positioned on the designated mechanism inside the drying unit.

Claim ~~178~~179:

The wafer flipping method ~~by wafer transfer robot of claim 145, characterized in that,~~wherein the wafer placement of wafer specifically includes the following steps: after the first jaw clamping arm takes out the wafer from the pre-drying unit, the horizontal transfer carriage drives the first jaw clamping arm to make transverse motion away from the drying unit; the rotating platform drives the first jaw clamping arm to rotate to ~~the~~a side close to the drying unit until the wafer reaches atthe horizontal state, and then the horizontal transfer carriage drives the first jaw clamping arm to move laterally towards the drying unit until the wafer is positioned above the drying unit; the first vertical lifting shaft drives the first jaw clamping arm to move vertically downwards until the wafer is positioned on ~~the~~a designated mechanism inside the drying unit; the first jaw clamping arm releases the wafer so that the wafer is positioned on the designated mechanism inside the drying unit.

Claim ~~189~~190:

The wafer flipping method ~~by wafer transfer robot of claim 145, characterized in that,~~wherein the wafer placement of wafer specifically includes the following steps: after

the first jaw clamping arm takes out the wafer from the pre-drying unit, the rotating platform drives the first jaw clamping arm to rotate to ~~the~~ a side close to the drying unit until the wafer reaches a horizontal state, and then the horizontal transfer carriage drives the first jaw clamping arm to move laterally towards the drying unit until the wafer is positioned above the drying unit; the first vertical lifting shaft drives the first jaw clamping arm to move vertically downwards until the wafer is positioned on ~~the~~ a designated mechanism inside the drying unit; the first jaw clamping arm releases the wafer so that the wafer is positioned on the designated mechanism inside the drying unit.

10 Claim ~~19~~10:

The wafer flipping method ~~by wafer transfer robot~~ of claim ~~14~~5, ~~characterized in that,~~wherein the robot returning specifically includes the following steps: the first jaw clamping arm moves in the following three directions simultaneously when the wafer is positioned at the drying unit: the horizontal transfer carriage drives the first jaw clamping arm to make transverse motion away from the drying unit; the rotating platform drives the first jaw clamping arm to rotate downward ~~unit~~ until the latter is in a vertical state, and the first vertical lifting shaft drives the first jaw clamping arm to move up vertically to a certain position.

20 Claim ~~20~~11:

The wafer flipping method ~~by wafer transfer robot~~ of claim ~~14~~5, ~~characterized in that,~~wherein the robot returning specifically includes the following steps: when the wafer is positioned at the drying unit, the first vertical lifting shaft drives the first jaw clamping arm to move up vertically to a certain position; the horizontal transfer carriage drives the first jaw clamping arm to make transverse motion to a certain position away from the drying unit;

and then the rotating platform drives the first jaw clamping arm to rotate downward ~~unit~~
until the latter is in ~~a~~the vertical state.

Claim ~~24~~12:

5 The wafer flipping method ~~by wafer transfer robot of claim 145, characterized in~~
~~that,~~wherein the robot returning specifically includes the following steps: when the wafer is
positioned at the drying unit, the horizontal transfer carriage drives the first jaw clamping
arm to make transverse motion to a certain position away from the drying unit; the first
vertical lifting shaft drives the first jaw clamping arm to move up vertically to a certain
10 position; and then the rotating platform drives the first jaw clamping arm to rotate downward
~~unit~~ until the latter is in thea vertical state.