CLAIMS

1. Device (1) for controlling the tightness of at least one transport enclosure (2) for the conveyance and atmospheric storage of semiconductor substrates (3), said transport enclosure (2) comprising at least two ventilation ports (8, 9), characterized in that the control device (1) comprises at least one interface (20) configured to be coupled to the transport enclosure (2), the interface (20) comprising:
   - at least two connecting heads (23, 24), at least one connecting head being formed by a measurement head (23) configured to engage in a ventilation port (8) of the transport enclosure (2), the measurement head (23) comprising:
     - a projecting end piece (29), opening through at least one aperture (30), and
     - a peripheral sealing element (31) surrounding the end piece (29),
   - all the ventilation ports (8, 9) of the transport enclosure (2) being coupled to a connecting head (23, 24) of the interface (20).
2. Control device (1) according to the preceding claim, characterized in that at least one connecting head is formed by an obstructing head (24) comprising a blind sealing element (32) configured to close a ventilation port (9) of the transport enclosure (2), all the ventilation ports (8, 9) of the transport enclosure (2) being either engaged by a measurement head (23) or closed by an obstructing head (24).
3. Control device (1) according to any of the preceding claims, characterized in that the measurement head (23) is configured to engage in a ventilation port (8) of the transport enclosure (2), while pushing back the inlet check valve (11) if the ventilation port (8) is equipped with an inlet check valve (11).

4. Control device (1) according to any of the preceding claims, characterized in that the at least one peripheral sealing element (31) is resilient and at least partially compressed or deformed when the transport enclosure (2) is coupled to the interface (20).
5. Control device (1) according to any of the preceding claims, characterized in that the interface (20) comprises at least one securing means (22, 26) configured for securing the transport enclosure (2).
6. Control device (1) according to any of the preceding claims, characterized in that the measurement heads (23, 24) are movable, the interface (20) further comprising at least one head actuator (33) configured to move the connecting heads (23, 24) between a withdrawn position and a projecting position for controlling the tightness.
7. Control device (1) according to any of Claims 1 to 5, characterized in that the connecting heads (23, 24) are fixed and project from the interface (20).
8. Control device (1) according to any of the preceding claims, characterized in that the peripheral sealing element (31) comprises a suction cup.
9. Control device (1) according to Claim 2, characterized in that the interface (20) comprises two measurement heads (23) and two obstructing heads (24).
10. Control device (1) according to any of the preceding claims, characterized in that it comprises at least one measurement line (40) connected to an end piece (29) of a measurement head (23), the measurement line (40) comprising a flow rate control device (41) and/or a pressure sensor (42).
11. Control device (1) according to the preceding claim, characterized in that the measurement line (40) comprises at least one calibrated self-controlling aperture (46) fitted as a branch from the measurement head (23) and a three-way valve (47) for putting the flow rate control device

(41) and the pressure sensor (42) of the measurement line (40) into communication with the at least one calibrated self-controlling aperture (46) while they are isolated from the measurement head (23).

12. Control device (1) according to either of Claims 10 and 11, characterized in that it comprises a sampling line (49) connected to the end piece (29) of a measurement head (23), the sampling line (49) comprising a sampling pump (44).

13. Control device (1) according to any of Claims 10 to 12, characterized in that it comprises a calibration line (50) connected to the end piece (29) of a measurement head (23), the calibration line (50) comprising at least one calibrated calibration aperture (48).

14. Method (100) for controlling the tightness of at least one transport enclosure (2) for the conveyance and atmospheric storage of semiconductor substrates (3) by means of a control device (1) according to any of the preceding claims, wherein a transport enclosure (2) is coupled to an interface (20) of the control device (1) so that all the ventilation ports (8, 9) of the transport enclosure (2) are coupled to a connecting head (23, 24) of the interface (20), at least one connecting head (23) being formed by a measurement head (23) engaged in a ventilation port (8, 9) of the transport enclosure (2).

15. Control method (100) according to the preceding claim, wherein all the ventilation ports (8, 9) of the transport enclosure (2) are either engaged by a measurement head (23) or closed by an obstructing head (24) of the interface (20), at least one connecting head (24) formed by an obstructing head (24) closing a ventilation port (9) of the transport enclosure (2).

16. Control method (100) according to either of Claims 14 and 15, characterized in that the at least one peripheral sealing element (31) is at least partially compressed or deformed when the transport enclosure (2) is coupled to the interface (20).

17. Control method (100) according to any of Claims 14 to 16, characterized in that a controlled flow of gas is injected into a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20), after which the injection is stopped and the pressure drop in the measurement line (40) is measured.

18. Control method (100) according to any of Claims 14 to 17, characterized in that a constant flow of gas is injected into a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20), while the change in the pressure over time in the measurement line (40) is measured.

19. Control method (100) according to any of Claims 14 to 18, characterized in that it comprises a preliminary conditioning step (103) in which a predetermined initial pressure (P0) is established in a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20).

20. Control method (100) according to any of Claims 14 to 19, characterized in that it comprises a calibration step (102) in which a calibration line (50) is connected to the transport enclosure (2) by a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20) to generate a calibrated leak, and the pressure is measured in a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20).

21. Control method (100) according to any of Claims 14 to 20, characterized in that it comprises a self-controlling step (101) in which the pressure is measured in a measurement line (40) comprising a calibrated self-controlling aperture (46) fitted as a branch from the measurement head (23), the calibrated self-controlling aperture (46) being put into

communication with the flow rate control device (41) and the pressure sensor (42) of the measurement line (40), while being isolated from the measurement head (23).

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CLAIMS

1. Device (1) for controlling the tightness of at least one transport enclosure (2) for the conveyance and atmospheric storage of semiconductor substrates (3), said transport enclosure (2) comprising at least two ventilation ports (8, 9), characterized in that the control device (1) comprises at least one interface (20) configured to be coupled to the transport enclosure (2), the interface (20) comprising:

at least two connecting heads (23, 24), at least one connecting head being formed by a measurement head (23) configured to engage in a ventilation port (8) of the transport enclosure (2), the measurement head (23) comprising:

a projecting end piece (29), opening through at least one aperture (30), and a peripheral sealing element (31) surrounding the end piece (29),

wherein all the ventilation ports (8, 9) of the transport enclosure (2) is coupled to a connecting head (23, 24) of the interface (20),

wherein the control device (1) further comprises at least one measurement line (40) connected to an end piece (29) of a measurement head (23), the measurement line (40) comprising at least one of a flow rate control device (41) and a pressure sensor (42);

wherein the measurement line (40) comprises at least one aperture (46) fitted as a branch from the measurement head (23) and a three-way valve (47) for putting the flow rate control device (41) and the pressure sensor (42) of the measurement line (40) into communication with the at least one aperture (46) while they are isolated from the measurement head (23).

2. Control device (1) according to Claim 1, characterized in that at least one connecting head is formed by an obstructing head (24) comprising a blind sealing element (32) configured to close a ventilation port (9) of the transport enclosure (2), all the ventilation ports (8, 9) of the transport enclosure (2) being either engaged by a measurement head (23) or closed by an obstructing head (24).

3. Control device (1) according to claim 1 or 2, characterized in that the measurement head (23) is configured to engage in a ventilation port (8) of the transport enclosure (2), while pushing back the inlet check valve (11) if the ventilation port (8) is equipped with an inlet check valve (11).

4. Control device (1) according to claim 1 or 2, characterized in that the at least one peripheral sealing element (31) is resilient and at least partially compressed or deformed when the transport enclosure (2) is coupled to the interface (20).

5. Control device (1) according to claim 1 or 2, characterized in that the interface (20) comprises at least one securing means (22, 26) configured for securing the transport enclosure (2).

6. Control device (1) according to claim 1 or 2, characterized in that the connecting heads (23, 24) are movable, the interface (20) further comprising at least one head actuator (33) configured to move the connecting heads (23, 24) between a withdrawn position and a projecting position for controlling the tightness.

7. Control device (1) according to claim 1 or 2, characterized in that the connecting heads (23, 24) are fixed and project from the interface (20).

8. Control device (1) according to claim 1 or 2, characterized in that the peripheral sealing element (31) comprises a suction cup.

9. Control device (1) according to Claim 2, characterized in that the interface (20) comprises two measurement heads (23) and two obstructing heads (24).

10. Control device (1) according to Claim 1, characterized in that it comprises a sampling line (49) connected to the end piece (29) of a measurement head (23), the sampling line (49) comprising a sampling pump (44).

11. Control device (1) according to Claim 1, characterized in that it comprises a calibration line (50) connected to the end piece (29) of a measurement head (23), the calibration line (50) comprising at least one aperture (48).

12. Method (100) for controlling the tightness of at least one transport enclosure (2) for the conveyance and atmospheric storage of semiconductor substrates (3) by means of a control device (1) according to Claim 1,

wherein a transport enclosure (2) is coupled to an interface (20) of the control device (1) so that all the ventilation ports (8, 9) of the transport enclosure (2) are coupled to a connecting head (23, 24) of the interface (20), at least one connecting head (23) being formed by a measurement head (23) engaged in a ventilation port (8, 9) of the transport enclosure (2).

13. Control method (100) according to Claim 12, wherein all the ventilation ports (8, 9) of the transport enclosure (2) are either engaged by a measurement head (23) or closed by an obstructing head (24) of the interface (20), at least one connecting head (24) formed by an obstructing head (24) closing a ventilation port (9) of the transport enclosure (2).

14. Control method (100) according to Claim 12, characterized in that the at least one peripheral sealing element (31) is at least partially compressed or deformed when the transport enclosure (2) is coupled to the interface (20).

15. Control method (100) according to Claim 12, characterized in that a controlled flow of gas is injected into a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20), after which the injection is stopped and the pressure drop in the measurement line (40) is measured.

16. Control method (100) according to Claim 12, characterized in that a constant flow of gas is injected into a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20), while the change in the pressure over time in the measurement line (40) is measured.

17. Control method (100) according to Claim 12, characterized in that it comprises a preliminary conditioning step (103) in which a predetermined initial pressure (P0) is established in a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20).

18. Control method (100) according to Claim 12, characterized in that it comprises a calibration step (102) in which a calibration line (50) is connected to the transport enclosure (2) by a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20) to generate a calibrated leak, and the pressure is measured in a measurement line (40) connected to a measurement head (23) engaged in a ventilation port (8) of the transport enclosure (2) coupled to the interface (20).

19. Control method (100) according to Claim 12, characterized in that it comprises a self-controlling step (101) in which the pressure is measured in a measurement line (40) comprising an aperture (46) fitted as a branch from the measurement head (23), the aperture (46) being put into communication with the flow rate control device (41) and the pressure sensor (42) of the measurement line (40), while being isolated from the measurement head (23).