

CLAIMS

1. A fluid routing module for a vacuum pumping system, the fluid routing module comprising:

a first fluid inlet;

a second fluid inlet;

a fluid outlet;

a first fluid line coupled between the first fluid inlet and the fluid outlet;

a second fluid line coupled between the second fluid inlet and the fluid outlet;

a first restrictor configured to restrict a flow of the fluid therethrough, the first restrictor being disposed along the first fluid line;

a vacuum pump disposed along the second fluid line;

one or more valves configured to selectably direct a fluid flow through either the first fluid line or the second fluid line;

a second restrictor configured to restrict a flow of the fluid therethrough, the second restrictor being disposed along the second fluid line;

a bypass line arranged in parallel with the second restrictor whereby to allow a flow of fluid to bypass the second restrictor; and

one or more further valves configured to selectably direct a fluid flow through either the second restrictor or the bypass line.

2. The fluid routing module of claim 1, wherein:

the one or more valves comprises:

a first valve; and

a second valve;

the first valve is disposed along the first fluid line; and

the second valve is disposed along the second fluid line.

3. The fluid routing module of claim 1 or 2, wherein the second restrictor and the bypass line are disposed along the second fluid line between the vacuum pump and the fluid outlet.

4. The fluid routing module of claim 1, 2 or 3, wherein the one or more further valves comprises a three-way valve disposed between the vacuum pump and the second restrictor and the bypass line.

5. The fluid routing module of any of claims 1 to 4, wherein the vacuum pump is a turbopump.

6. The fluid routing module of any of claims 1 to 5, further comprising a valve controller configured to control operation of the one or more valves.

7. The fluid routing module of any of claims 1 to 6, further comprising:

one or more further first fluid inlet;

one or more further second fluid inlets;

one or more further fluid outlets;

one or more further first fluid lines, each further first fluid line coupled between a respective further first fluid inlet and a further fluid outlet;

one or more further second fluid lines, each further second fluid line coupled between a respective second fluid inlet and a further fluid outlet;

one or more further first restrictors configured to restrict a flow of the fluid therethrough, each further first restrictor being disposed along a respective further first fluid line;

one or more further vacuum pumps, each further vacuum pump being disposed along a respective further second fluid line; and

one or more further valves configured to selectably direct a fluid flow through either a further first fluid line or a further second fluid line.

8. The fluid routing module of claim 7, further comprising a fluid line manifold, wherein the fluid outlet and the one or more further fluid outlets are fluidly coupled to the fluid line manifold.

9. A system comprising:

a semiconductor processing tool comprising a processing chamber;

the fluid routing module of any of claims 1 to 8, wherein the first fluid inlet and the second fluid inlet are fluidly coupled to the processing chamber; and

a pump operatively coupled to the fluid outlet.

10. The system of claim 9, wherein:

the semiconductor processing tool further comprises one or more further processing chambers;

the system further comprises one or more further fluid routing modules, each further fluid routing modules being a fluid routing module in accordance with any of claims 1 to 8, wherein the first fluid inlet and the second fluid inlet of each further fluid routing module are fluidly coupled to a respective further processing chamber;

the system further comprises a fluid line manifold, wherein the fluid outlet of the fluid routing module and each of the fluid routing modules are fluidly coupled to the fluid line manifold; and

the pump is operatively coupled to the fluid line manifold.

11. A method for operating a fluid routing module for a vacuum pumping system, the fluid routing module being in accordance with any of claims 1 to 8, the method comprising:

controlling the one or more valves to direct a fluid flow through the first fluid line and to prevent or oppose fluid flow through the second fluid line; and,

responsive to one or more conditions being satisfied, controlling the one or more valves to allow a fluid flow through the second fluid line and to prevent or oppose fluid flow through the first fluid line, and pumping, by the vacuum pump, the fluid through the second fluid line.

12. The method of claim 11, wherein the one or more conditions comprises a condition that a pressure in a chamber fluidly coupled to the first fluid input and the second fluid inlet is below a first threshold pressure.

13. The method of claim 11 or 12, wherein:

the fluid routing module is in accordance with any of claims 1 to 8; and

the method further comprises:

controlling the one or more further valves to direct a fluid flow through the second restrictor and to prevent or oppose fluid flow through the bypass line; and,

responsive to one or more further conditions being satisfied, controlling the one or more further valves to allow a fluid flow through the bypass line and to prevent or oppose fluid flow through the second restrictor.

14. The method of claim 13, wherein the one or more further conditions comprises a condition that a pressure in a pumping chamber of the vacuum pump is below a second threshold pressure.