CLAIMS

1. A disinfection module comprising:

a housing having a transparent portion, the housing shaped and dimensioned to allow fluid to flow longitudinally therethrough, the transparent portion configured to allow a disinfection radiation to pass transversely therethrough;

a cover portion mountable on the housing; and

a radiation source attached to at least one of (i) the cover portion and (ii) an external surface of the transparent portion, wherein the radiation source comprises at least one UV-LED unit to generate the disinfection radiation, and wherein the at least one UV-LED unit comprises an optical lens configured to collimate the disinfection radiation;

wherein the disinfection module comprises a first end and a second end, the first end and the second end configured to be removably attached to at least one fluid conduit.

2. The disinfection module of claim 1, wherein the transparent portion is formed from or of quartz glass and the housing comprises a stainless-steel bracket shaped and dimensioned to receive the transparent portion; and/or

wherein the cover portion is formed from or of at least one of stainless steel and aluminium.

3. The disinfection module of any one of the preceding claims, wherein the fluid conduit is part of a hydroponics system, a swimming pool, a water purification system, or an air regulation system.

4. The disinfection module of any one of the preceding claims, wherein the cover portion has an internal surface layered with a reflective material comprising polished stainless steel, or wherein the internal surface is polished;

and/or

wherein at least one of the first end and the second end comprises a pipe reducer.

5. The disinfection module of any one of the preceding claims, further comprising at least one intensity sensor arranged to detect the intensity of the radiation.

6. The disinfection module of any one of the preceding claims, further comprising at least one dissolved oxygen sensor arranged to detect the amount of dissolved oxygen flowing through the disinfection module before and/or after disinfection.

7. The disinfection module of any one of the preceding claims, wherein the radiation source comprises a first row of UV-LED units and a second row of UV-LED units.

8. The disinfection module of claim 7, wherein at least one of the first row of UV-LED unit emits a UV-C radiation, or wherein at least one of the second row of UV-LED unit emits a UV-C radiation.

9. The disinfection module of any one of the preceding claims, wherein an inner surface of the transparent portion configured to contact the fluid flowing longitudinally therethrough is coated with at least one layer of Titanium dioxide.

10. A hydroponics system having at least one fluid conduit shaped and dimensioned to receive the disinfection module of any one of claims 1 to 9.

11. A water purification or treatment system having at least one fluid conduit shaped and dimensioned to receive the disinfection module of any one of claims 1 to 9.

12. An air regulation system having at least one fluid conduit shaped and dimensioned to receive the disinfection module of any one of claims 1 to 9.

13. An aquaculture system having at least one fluid conduit shaped and dimensioned to receive the disinfection module of any one of claims 1 to 9.

14. The system of any one of claims 10 to 13, wherein the at least one fluid conduit comprises at least one valve configured to control fluid flow through the pipe.

15. The system of any one of claims 10 to 14, further comprising a plurality of sensors arranged to detect an intensity of the emitted UV-C radiation from the radiation source.

16. A method of manufacturing a disinfection module, the method comprising the steps of: (a) forming a pipe having a transparent portion, the pipe configured to allow fluid to flow longitudinally therethrough, the transparent portion configured to allow a disinfection radiation to pass transversely therethrough;

(b) forming a cover portion, the cover portion mountable on the pipe;

(c) providing at least one slot on the cover portion or the pipe, the at least one slot shaped and dimensioned to receive a radiation source;

(d) providing at least one UV-LED unit to the radiation source to generate the disinfection radiation, and wherein the at least one UV-LED unit comprises an optical lens configured to collimate the disinfection radiation; and

(e) shaping a first end and a second end of the pipe to be removably attached to a portion of at least one fluid conduit.

17. The method of claim 16, further comprising a step of polishing an internal surface of the cover portion.

18. The method of claim 16 or 17, further comprising a step of layering an internal surface of the cover portion with a polished stainless steel or polished aluminium.

19. The method of any one of claims 16 to 18, further comprising a step of coating an inner surface of the transparent portion configured to contact the fluid flowing longitudinally therethrough with at least one layer of Titanium dioxide.

20. A device for disinfection comprising:

a first portion having an inlet portion operable to draw air;

a housing having a transparent portion, the housing shaped and dimensioned to receive drawn air from the inlet portion and allow the drawn air to flow longitudinally therethrough, the transparent portion configured to allow a disinfection radiation to pass transversely therethrough;

a cover portion mountable on the housing;

a radiation source attached to the cover portion or an external surface of the housing, wherein the radiation source comprises at least one UV-LED unit to generate the disinfection radiation, and wherein the at least one UV-LED unit comprises an optical lens configured to collimate the disinfection radiation; and

a second portion having an outlet portion to urge disinfected air out of the device; wherein the housing provides disinfection according to a function of flow rate of the air and intensity of radiation of the radiation source.