CLAIMS

1. A thermal cycler system comprising:

a sample block having a first surface and an opposing second surface, wherein the first surface is configured for receiving a plurality of reaction vessels; and

a drip pan, wherein the drip pan is configured to surround an upper perimeter of the sample block;

three or more thermal modules, each thermal module comprising,

a thermoelectric device operably coupled to the second surface of the sample block, wherein each thermoelectric device is coupled to a different region of the sample block;

a thermal sensor configured to monitor temperature of one of the different regions of the sample block; and

a thermal control unit comprising a computer processing unit, an electrical current source and an electrical interface portion configured to connect the electrical current source to the thermoelectric device by way of an electrical cable wherein the thermal control unit is located away from the thermoelectric device;

wherein each thermal module provides independent thermal control of the region of the sample block in thermal contact with the thermoelectric device;

a heat sink, wherein the heat sink is in thermal contact with the thermoelectric devices of the three or more thermal modules; and

one or more seals, wherein the one of more seals are configured to isolate at least the thermoelectric device of each of the three or more thermal modules from ambient conditions.

2. The thermal cycler system of claim 1 wherein the sample block comprises a metal.

3. The thermal cycler system of claim 2 wherein the first surface comprises depressions for receiving a sample support device.

4. The thermal cycler system of claim 2 wherein the first surface is planar.

5. The thermal cycler system of claim 1 wherein the electrical current supply is adjustable.

6. A method for controlling thermoelectric devices, in a thermal cycler system the method comprising:

providing a thermal cycler system, the apparatus comprising:

one or more thermal blocks each thermal block having a first surface and a second surface, wherein the first surface is configured for receiving a sample support device;

three or more thermoelectric devices each thermoelectric device operably coupled to the second surface of at least one thermal block, wherein each of the three or more thermoelectric devices is coupled to a different region of the one or more thermal blocks;

three or more thermal sensors, wherein each of the three or more thermal sensors is configured to monitor temperature of a different region for the one or more thermal blocks; and

three or more thermal control units, each thermal control unit configured to control a single thermoelectric device, wherein each of the thermal control units is located away from the three or more thermoelectric devices, and wherein each thermal control unit is electrically connecting a unique thermal control unit to one of the thermoelectric devices by way of an electrical cable;

a heat sink, wherein the heat sink is in thermal contact with the three or more thermoelectric devices;

one or more seals, wherein the one of more seals are configured to isolate the three or more thermoelectric devices from ambient conditions; and

independently controlling the temperature of the different regions of the one or more thermal blocks by independently controlling the three or more thermoelectric devices.

7. The method of claim 6 wherein the sample block comprises a metal.

8. The method of claim 6 wherein the first surface comprises depressions for receiving a sample support device.

9. The thermal cycler system of claim 1, wherein the thermal control units are located in a different plane than the thermoelectric devices.

10. The thermal cycler system of claim 1, wherein the one or more seals include a seal configured to close a gap between an upper surface of the heat sink and a lower surface of the drip pan.

11. The thermal cycler system of claim 1, wherein the one or more seals include a seal configured to close a gap between the upper perimeter of the sample block and a lower surface of the drip pan.

12. The thermal cycler system of claim 1, wherein the one or more seals include a seal configured to close a gap around the electrical cable connecting the thermoelectric device to the thermal control unit of each of the three or more thermal modules.

13. The thermal cycler system of claim 1, wherein the electrical cable of the three or more thermal modules includes one or more electrical conductors, wherein the one or more electrical conductors have insulation, and wherein the one or more seals include a seal configured to close a gap between the one or more electrical conductors and the insulation.

14. The thermal cycler system of claim 1, wherein the one or more seals are configured to close:
(i) a first gap between an upper surface of the heat sink and a lower surface of the drip pan; and

(ii) a second gap between the upper perimeter of the sample block and the lower surface of the drip pan.

15. The method of claim 6, wherein the three or more thermal control units are located in a different plane than the three or more thermoelectric devices.

16. The method of claim 6, wherein the one or more seals include a seal configured to close a gap between an upper surface of the heat sink and a lower surface of the drip pan.

17. The method of claim 6, wherein the one or more seals include a seal configured to close a gap between the upper perimeter of the sample block and a lower surface of the drip pan.

18. The method of claim 6, wherein the one or more seals include a seal configured to close a gap around the electrical cable connecting one of the three or more thermoelectric devices to one of the three or more thermal control units.

19. The method of claim 6, wherein the electrical cable connecting one of the three or more thermoelectric devices to one of the three or more thermal control units includes one or more electrical conductors, wherein the one or more electrical conductors have insulation, and wherein the one or more seals include a seal configured to close a gap between the one or more electrical conductors and the insulation.

20. The method of claim 6, wherein the one or more seals are configured to close:
(i) a first gap between an upper surface of the heat sink and a lower surface of the drip pan; and
(ii) a second gap between the upper perimeter of the thermal block and the lower surface of the drip pan.