Fanless Computers

Fanless computers are used in dusty environment or in places that have from toxic elements in the air such as particles of chlorine, sulfur, oil, etc. These chemicals combine with copper of the PCB traces and pulverize them to dust. This is a common problem in the municipal water treatment plants that use chlorine and tire manufacturing plants because of the high content of sulfur in the rubber dust.

Fanless computers work great in open air but they must never operate in the closed quarters. It is a common myth that because computer does not have air fan it can operate in the enclosed cabinet or a drawer. Sometimes we are asked a question why the computer stops but it starts again when the door of the cabinet is opened? This is because the temperature inside cabinet was too high and internal processor temperature protection circuit shut it down.

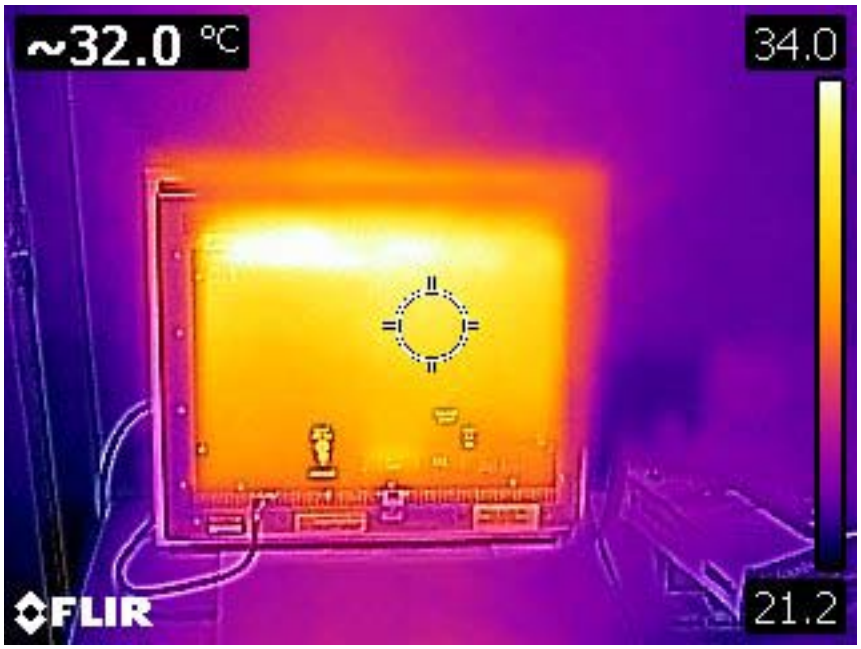
There is tendency to request fast processors in the fanless computers, which is wrong. If you want reliable fanless computer use the lowest processor speed you can. Transduction will not supply processors that need more than 5W of power in fanless versions because they will run too hot. If you need more powerful processor half fanless is the proper design. It eliminates fragile processor fan.

All computers dissipate heat according to the laws of thermodynamics. This heat must be removed either with cooling fans or convection air flow. Fanless computers are supplied with heavy ribbed heatsinks for convection air flow. They must be installed vertically so that heatsink ribs benefit from the hot air rising to the top, which is the principal of the convection air flow. For this reason always install fanless computer outside not inside of the cabinet wall.

You can do a simple experiment - place fanless computer in horizontal position for one hour on the table and with your hand feel the temperature - the surface of the heatsink will be quite hot due the stationary hot air bubble over computer. Next place this computer vertically on the edge of the table to benefit from the convection air flow and if you touch the heat sink after one hour you will notice that it is considerably cooler.

Typical operating range of temperature of the industrial computers is 0 to 60C but it must be remembered that time is a factor. Prolonged operation at high temperature causes premature aging of the internal components and it should be avoided. Some papers recommend 35C as the ideal operating temperature in the air conditioned control cabinets. The reason is that moisture content in the air at 35C is quite low. Hot summers cause many failures related to higher temperature in the enclosed control cabinets and shorten useful life of the computer. Computers subjected to prolonged high temperatures become unreliable and need to be replaced often.

Properly designed and installed fanless or half-fanless computer should operate for 10 years without fail.



Thermal image of the TR-5197 half fanless computer demonstrates convection air flow with heat rising to the top.