Thermal resistance: "BoVersa enclosures featuring heatsink"

Technical background

The temperature of an electronic component is of critical importance for its service-life and reliability. The failure rate of electronic components increases exponentially as temperature rises. The temperature of electronic modules in an enclosure should therefore be kept as low as possible, as far as this is economically rational.

The temperature occurring in a component depends, inter alia, on the geometry of the structure (the surface area and wall thickness of the enclosure), on the thermally conductive materials used and on ventilation quality. A large surface area and good ventilation will generally favour the removal of heat. A structure with only a small surface area and poor ventilation will cause higher temperatures. Heatsinks, for example, are a suitable way of keeping component temperatures low.

Thermal resistance R_{th} makes it possible to determine the heat generation in a component for a known heat loss. R_{th} is stated in Kelvin per Watt (K/W). If R_{th} is, for example, 5 K/W, the component will heat up by 5 Kelvin per Watt of heat loss. This equates to heating up of 25 Kelvin at a heat loss of 5 Watt. The ambient temperature must also be added to this. Component temperature in service can be determined once all these factors are known.

Example of a requirement for an enclosure

Known variables	
Maximum component temperature	130°C
Ambient temperature	30°C ⇨ ΔT = 100°C, equivalent to 100 K
Component heat loss (manufacturer's information)	15 Watt
Calculation of maximum thermal resistance R_{th}:	
ΔT / component heat loss = 100 K / 15 Watt = 6.7 $^{K}/_{W}$	

Conclusion: An enclosure with a total thermal resistance of 6.7 $^{K}/_{W}$ is needed. Not only the enclosure itself, but also (for example) thermally conductive pastes, must be taken into account.

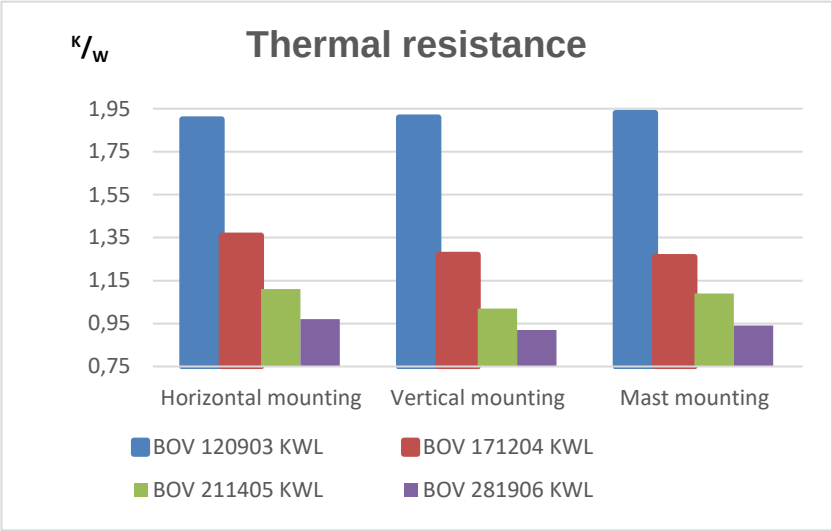
As a general rule: The lower the R_{th} of the enclosure, the better the heat is conducted out of the component!

Test: BoVersa enclosures (BOV…KWL)

The heatsink has a positive effect on the thermal resistance of the enclosure. When a vertical arrangement of the BoVersa housing is used, the value is slightly lower compared to a horizontal arrangement. This is due to the better flow of air through the cooling fins.

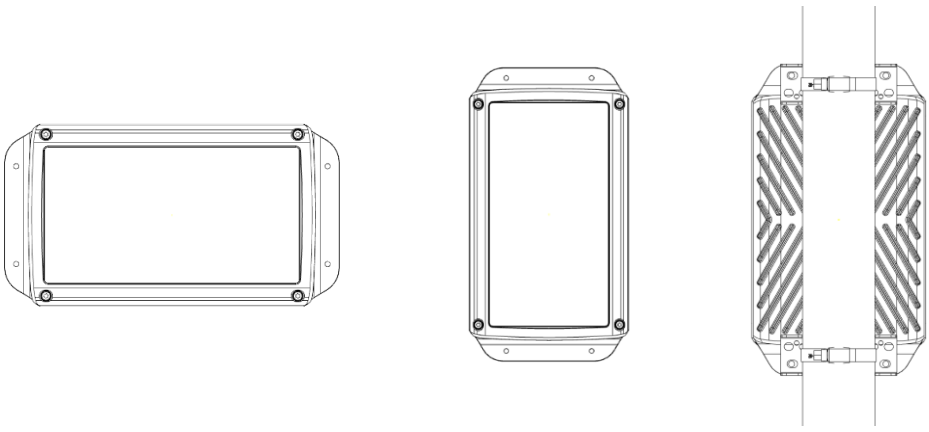
The precise data can be found in the following table:

Model	R_{th} of enclosure
Horizontal mounting	
BOV 120903 KWL	1,90 K/W
BOV 171204 KWL	1,36 K/W
BOV 211405 KWL	1,11 K/W
BOV 281906 KWL	0,97 K/W
Vertical mounting	
BOV 120903 KWL	1,91 K/W
BOV 171204 KWL	1,27 K/W
BOV 211405 KWL	1,02 K/W
BOV 281906 KWL	0,92 K/W
Mast mounting	
BOV 120903 KWL	1,93 K/W
BOV 171204 KWL	1,26 K/W
BOV 211405 KWL	1,09 K/W
BOV 281906 KWL	0,94 K/W



Test apparatus

During the test, the enclosure was mounted on a vertically arranged plastic plate simulating a mounting wall. A different orientation or a different substrate may improve or impair heat removal.



Please note!
All technical information stated here is provided to the best of our knowledge, but nonetheless in no way exempts the user from the duty to verify the suitability of the product for the intended application.