

PURPOSE

The LDM-49800 series of high power fiber-coupled laser diode mounts with case temperature control option use thermoelectric modules (TECs) to achieve a wide temperature range. This technical note describes temperature control range of the LDM-49840T and LDM-49860T.

BACKGROUND

The LDM-49860T is designed for 2-pin fiber-coupled high power laser diodes. This mount is designed for thermal loads up to 40W, which is sufficient for laser diodes up to 20A drive current. The LDM-49840T is designed for high power butterfly package laser diodes up to 12A, some of which contain internal TECs. The combination of device heating and heat generated by the internal TEC require a higher power rating of 60W. The LDM-49840T uses a higher performance TEC to handle the additional thermal load. Both mounts have a specified temperature range of 15°C - 85°C at their respective power ratings with 20°C cooling water. Temperatures lower than 15°C can be reached, depending on heat load and circulating water temperature. As long as water temperature is $\geq 10^\circ\text{C}$, a mount temperature of 85°C can be reached regardless of thermal load.

MEASUREMENT SETUP

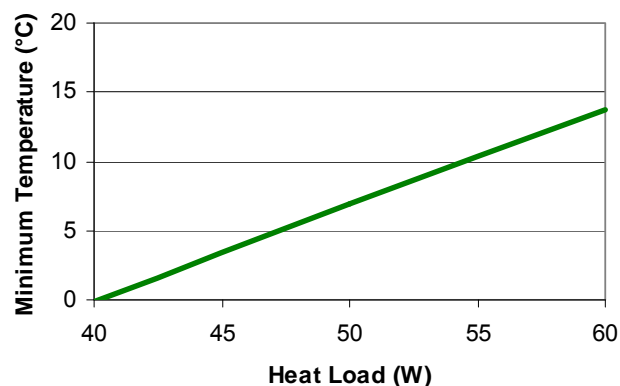
The mounts were connected to facility water with flow rate set to 1.0 GPM. Water inlet temperature was monitored with a calibrated 10k Ω thermistor. Resistive dummy loads were installed in each mount. Drive current was provided by an LDX-36000 high power laser diode driver. Temperature control of the mount was achieved using an LDT-5980 high power precision temperature controller. The power applied to the resistive dummy load was varied and minimum stable temperature

under full cooling effort at each power level was recorded.

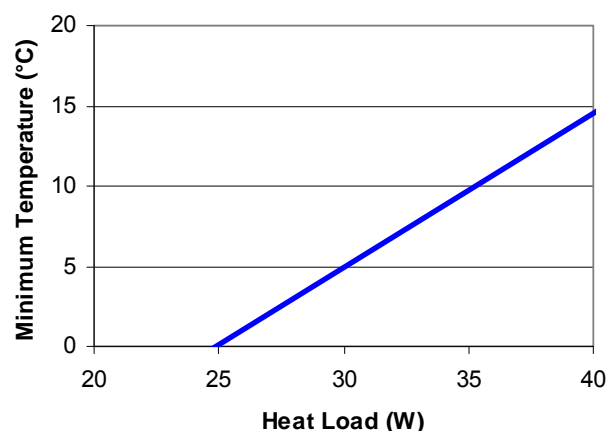
RESULTS

The following graphs show minimum temperature versus heat load.

Minimum temperature vs. heat load, LDM-49840T,
20°C water, 1.0 GPM



Minimum temperature vs. heat load, LDM-49860T,
20°C water, 1.0 GPM



The results confirm that both mounts can reach 15°C at their maximum rated heat loads. The LDM-49840T can reach 0°C at heat loads less than 40W. The LDM-49860T can reach 0°C at heat loads less than 25W¹.

The graphs above are valid for 20°C circulating water. Minimum temperature will shift with water temperature. For example, if at a given power level a minimum temperature of 10°C can be reached with 20°C circulating water, then the minimum mount temperature with 15°C water would be 5°C. The equation below describes this relationship:

$$T_{mx} = T_{m20} - (20 - X)$$

where:

T_{mx} = minimum mount temperature at given
power and user water temperature

X = user water temperature

T_{m20} = minimum mount temperature at given
power and 20°C water (from graph)

CONCLUSIONS

The LDM-49840T and LDM-49860T mounts can achieve a temperature range of 15°C - 85°C at their respective maximum rated heat loads. At lower heat loads and/or water temperatures, mount temperatures as low as 0°C can be reached. With water temperature $\geq 10^\circ\text{C}$, device heating is not required to reach the high temperature limit of 85°C.

NOTES

1. Mount temperatures lower than the ambient dew point temperature can cause undesirable condensation on and around the heater plate. It is recommended that mount temperature set point is always set above dew point temperature.