Ultra-compact Thermoelectric Cooler
ucTEC115 – Thermoelectric Air-to-Plate Cooling Development Platform

- for precise cooling of medical and industrial lasers
- minimization of power loss
- for excellent temperature stability
- up to 115 W nominal cooling capacity
- low vibration, low noise
- lightweight, very compact
- easy to integrate
The ultra-compact thermoelectric air-to-plate cooling unit was developed for precise temperature control of laser diode modules and direct heat transfer to the ambient air. The highly efficient, solid state unit reaches a nominal cooling capacity of 112 W for 24 V supply voltage and 20°C ambient temperature and the use of two 60 mm fans.

**Specifications, TECs operated at nominal 24 VDC @ 8.3A**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Fans 24 VDC</th>
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<tbody>
<tr>
<td>Noise [dB(A)]*</td>
<td>max. 49</td>
</tr>
<tr>
<td>Power consumption per fan [W]*</td>
<td>6</td>
</tr>
<tr>
<td>Nominal cooling capacity [W]</td>
<td>112</td>
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<tr>
<td>Coefficient of performance</td>
<td>0.57</td>
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</table>

*manufacturers data

The thermoelectric air-to-plate cooling unit can be customized for different laser diode modules, such as drill pattern, cooling capacity, packaging or weight. Mounting of a laser diode module to the cooling unit shall be done with special care. As thermal interface material thermal grease or graphite foils are suitable. It is recommended to apply a pressure between 400 kPa and 600 kPa which corresponds to a torque of 0.9 to 1.4 Nm per screw (4 screws M3).

**Electrical Wiring**

Picture given for nominal 12V @ 16.6 A supply to 4 parallelly connected TECs.

For nominal 24V @ 8.3A supply both of the two TEC-pairs have to be connected in series.
AMS-115 – Performance curve for $P_{el} = 24\, V \times 8.3\, A$

Performance is given below for 24 V supply voltage and 199 W power supply to TECs. Performance was measured with 6 heat sources of each 12x10 mm² mounted on top of a 70 mm x 70 mm x 8 mm copper spreader plate and is given for the temperature taken from one sensor in the center of the aluminum mounting plate.

![Graph showing cooling capacity vs. temperature difference between mounting plate and ambient temperature](image)

2 Fans, 24 V 100% duty cycle, 49 dB(A)

Performance Test Setup

[Image of the test setup with sensor position indicated]
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