

Laser Cooling

Precise temperature control and high reliability

- Heat sinks for actively and passively cooled light sources
- Thermoelectric recirculating chillers
- Compressor based recirculating chillers
- Cabinet coolers



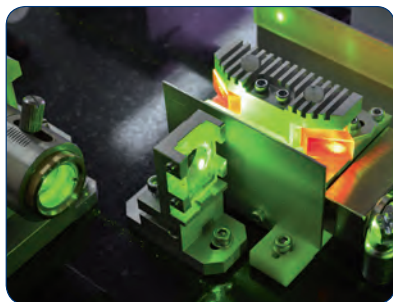
THERMAL
MANAGEMENT

■ Laser Cooling

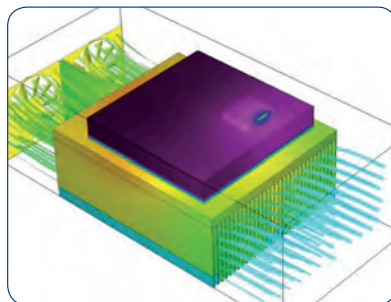
Lasers run better and longer when they are cooled properly. Stable operational conditions with a continuous power supply and precise temperature control guarantee a stable wavelength. Cooling to low operating temperatures stands for higher efficiencies and longer life of your laser source.

This brochure highlights some of AMS Technologies laser cooling solutions including heat sinks for actively and passively cooled light sources, thermoelectric and compressor based recirculating chillers from 150 W to 95 kW and cabinet cooling for laser equipment.

The engineers at AMS Technologies will assist you to select appropriate products, develop a custom design or set up your equipment to guarantee trouble-free operation.



precise
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■ Heat sinking at light source

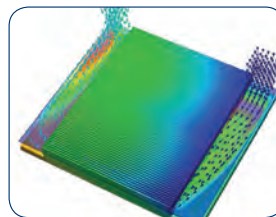
Effective heat sinking at the light source allows for higher light output, improves the ecological footprint as it reduces the chiller cooling demand and/or increases the lasers operational range without condensation to occur.

When we develop your light source specific heat sink we take thermo and fluid dynamics as well as our manufacturer's expertise into account.

Micro channel heat sinks for most challenging single or two-phase flow heat transfer



Micro channels 180 μ m gap

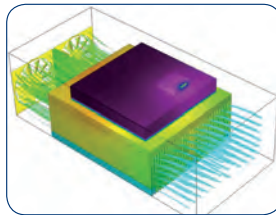


Thermo and fluid dynamic simulation

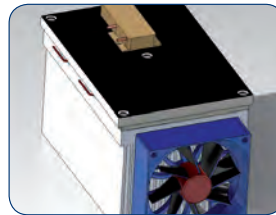


Proof of concept micro channels as evaporator

Passively cooled light sources with peltier modules



Computer fluid dynamic simulation

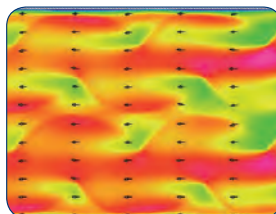


CAD drawing

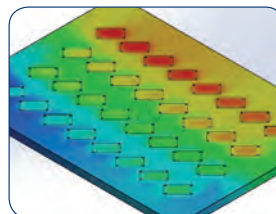


Peltier cooling assembly

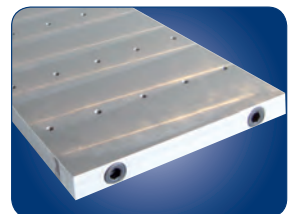
Fiber coupled diode modules in arrays



Flow field underneath diode module



Thermo and fluid dynamic simulation of array



Water cooler plate



precise temperature control and high reliability



■ Recirculating Chillers – precise temperature control and high reliability

We offer the entire range of recirculating chillers with cooling capacities from 150 W to 95 kW. All types feature precise temperature control and high reliability. They are available with thermoelectric and compressor engines, in standard, configurable or customizable versions.

Thermoelectric recirculating chillers are available from 150 W to 950 W of cooling capacity and deliver precise temperature control to $\pm 0.005^{\circ}\text{C}$ in compact enclosures. Its thermoelectric modules with life times exceeding 200.000 hours are powered by a variable voltage source that consumes energy only when needed. The thermoelectric chillers feature worldwide power compatibility with its universal power input. A variety of pump, fluid compatibility, whisper-quiet, vibration-free, safety and monitoring and other options are available.

Compressor based recirculating chillers are available from 300 W to 95 kW of cooling capacity. They achieve temperature stabilities of $\pm 0.1^{\circ}\text{C}$ and are designed to guarantee trouble-free operation of laser equipment. A wide range of options is available including pumps, fluid compatibility, controllers with safety and monitoring features, rack mount, stand alone and mini enclosures, quiet operation including active noise control, low vibration, start-up heating and many more. We also offer customized chillers to meet specific requirements.



■ Thermoelectric Recirculating Chillers

Stand alone chillers 200 – 400 W

These stand alone thermoelectric recirculating chillers offer extremely precise temperature control for laser cooling and other sensitive equipment. Thermoelectric modules provide cooling and heating for an operating range of -5°C to $+65^{\circ}\text{C}$. The chillers feature quiet operation, with a whisper quiet option of as low as 48 dBA. Various pumps are available with options for vibration free operation or pressure heads up to 3.5 bars for higher pressure applications

- Compact size, 31x28x28 cm
- Temperature stability to $\pm 0.005^{\circ}\text{C}$ (even near ambient)
- DI-water, water-glycol, alcohol, Fluorinert, PAO compatibility options
- Universal power supply 85 – 265 VAC, 50 and 60 Hz
- High reliability



Ultra compact chiller 160 – 190 W

Our ultra compact thermoelectric chillers offer precise temperature control in a size that easily fits inside your equipment or on your table top. They provide cooling for applications like low-light CCD cameras, diode lasers, medical equipment or point-of-use temperature control. They can be operated directly from a 13.5 VDC source or with a laptop style power supply.

- Ultra compact size, 13x19x18 cm
- Temperature stability $\pm 0.1^{\circ}\text{C}$ (even near ambient)
- 27% propylene glycol – water preferred
- Magnetic gear pump 0.5 l/min at 0.5 bar



Rack mount chillers 300 – 800 W

With the rack mount thermoelectric recirculating chillers you get very precise temperature control, quiet operation and high reliability. They were designed to operate its thermoelectric modules in the most energy efficient range. The chillers feature quiet operation and are available with virtually vibration free pumps.

- Temperature stability $\pm 0.05^{\circ}\text{C}$ (even near ambient)
- Rack mount 19" 4u & 6u – 300/400/800 W
- Universal voltage power supply 85-265 VAC, 50 and 60 Hz
- Magnetic gear and centrifugal pumps 1, 2 or 3 l/min at 2-3 bar
- Quiet and virtually vibration free operation



■ Compressor based Recirculating Chillers

Rack mount chillers 200 – 3000 W

The rack mount compressor based recirculating chillers offer precise temperature control for sensitive equipment. Configurable and customizable rack mount chillers come in 4-12u high enclosures and are available with cooling capacities from 200 to 3000 W. The coolant fluid circuit is designed for de-ionized water. Different pumps deliver flow rates from 0.5 to 22 lpm. A lower cost version with 2.8 kW of cooling capacity is available for applications that do not require DI water.

- Compact size, 4 -12 u high 19" rack mount
- Temperature stability $\pm 0.1^{\circ}\text{C}$
- High reliability, low maintenance
- Additional safety and monitoring options
- Low noise and vibration



Stand alone chillers 0.7 – 95 kW

Our stand alone compressor based recirculating chillers offer precise temperature control and reliable operation for a wide range of applications such as laser cooling (CO_2 , diode or fiber lasers), medical and analytical equipment, printers, tooling machines and many more. Chillers are available in standard, configurable and customizable configurations. A wide variety of pumps, controllers and additional safety and monitoring features is available to meet specific requirements.

- Customizable stand alone chiller (1-18kW)
- Extreme high capacity chiller (21-95kW)
- Extreme temperatures chiller (-85°C .. $+200^{\circ}\text{C}$)
- Standard configurable chiller (1-11kW)



Mini chillers 300 – 950 W

Mini compressor recirculating chillers are the ideal solution when cooling capacities of 300 to 950 W are needed in a compact size. The extremely powerful mini compressors achieve high cooling capacities even at high temperature differences between ambient coolants. The linear speed control offers precise temperature control to $\pm 0.1\text{K}$. All 24 VDC electric components allow for easy integration into customer systems.

- Stand alone 35x20x33 cm: 350 W at $\Delta T=0\text{K}$
140 W at $\Delta T=20\text{K}$
- Rack mount 19" 4u: 400/600/950 W at $\Delta T=0\text{K}$
140/200/520 at $\Delta T=20\text{K}$
- Multi voltage power supply 100-240 VAC
- Centrifugal pump 4 lpm at 1 bar
- Highest efficiency

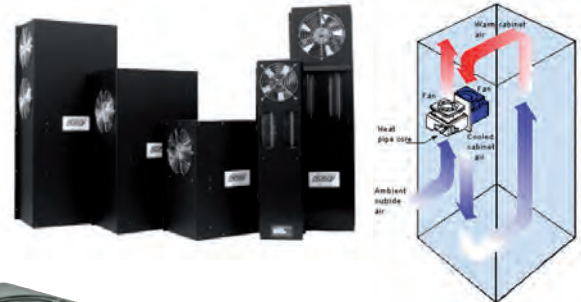


■ Cabinet Cooling

Laser equipment inside hermetically sealed outdoor cabinets typically requires heat removal and/or temperature control. We offer standard and customized cabinet coolers with heat pipes and thermoelectric and compressor based engines.

Heat Pipe cabinet coolers

- Most compact, reliable and energy efficient
- Up to 1000 W heat removal for 10°C temperature rise inside cabinet



Thermoelectric cabinet coolers

- Cooling capacities 30 to 300 W nominal
- IP65 rated



Micro compressor cabinet coolers

- Cooling capacities 0,4 to 1 kW
- Custom solutions



Custom high light

Extreme temperature outdoor cabinet cooler guarantees trouble-free operation of sensitive Lidar equipment

Meteorology, climate change tracking, air traffic control and wind energy generation rely on Lidar – light detection and ranging – equipment. Placed inside a hermetically sealed rugged outdoor cabinet it must work in extreme conditions from -20°C to +55°C at a constant temperature within ± 0.1 °C. Heat dissipation of electronics, opto-electronics, electro-mechanics as well as heat gain through irradiation needed to be determined empirically.

Internal space was limited to 80 mm in depth which made AMS Technologies design a very flat split cooling unit integrated into the cabinet door. The 24 VDC mini compressors are driven by a linear speed control that guarantees a temperature stability of ± 0.1 °C and minimizes the vibration level. The cooling capacity exceeds 600 W at 55°C ambient and 35°C internal temperature.





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enabling your ideas.

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