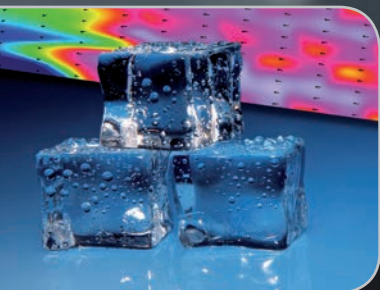


direct evaporation – get rid of your water loop!

two-phase cooling directly with the refrigerant



- ❄ eliminates water
- ❄ no corrosion/erosion
- ❄ high heat flux
- ❄ low mass flow
- ❄ small coolant lines



THERMAL
MANAGEMENT

waterless and effective cooling technology

With the functional principle of Two-Phase Direct Evaporation, AMS Technologies is promoting a new cooling approach for use in photonics and power electronics that offers significant potential savings in installation space, cost and energy consumption. Flexible refrigerant tubes connect the refrigerant circuit of the compressor directly with the application to be cooled, where the refrigerant is evaporated in a coil, an evaporator plate or directly in the macro or micro channels of laser diodes. This principle of Direct Evaporation therefore does completely without water, which in the case of commercially available recirculating chillers can lead to problems due to

erosion, corrosion or germination and even to water leakage with consequential damage to optics or electronics. Because the refrigerant used for direct evaporation (R134a) is inert, these effects cannot occur here.

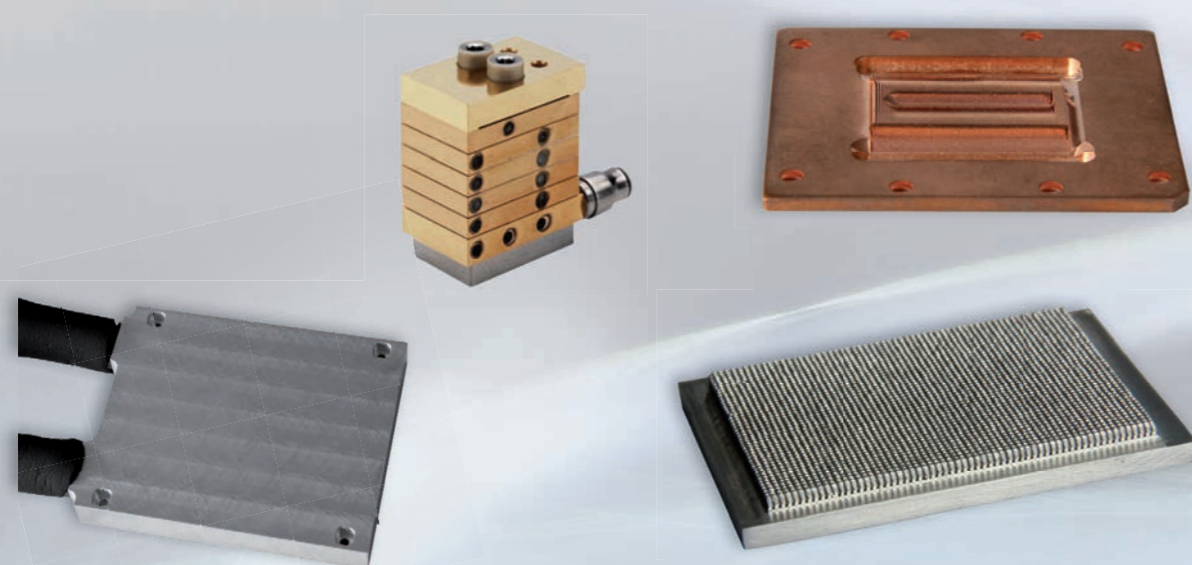
- no water pump
- no water tank
- no water level sensor
- no water filter
- no de-ionisation cartridge
- no germination

high temperature stability with linear compressors

Compared to water, the mass flow of the refrigerant is reduced to less than a quarter, which means that the technology can get by with smaller pipe diameters, among other things. However, the lack of water also means that its "buffering effect" is lost, so the reaction speed of the entire system must increase in order to guarantee reliable temperature stability. The use of Direct Evaporation technology, even for rapidly

changing loads of high power (such as laser diode stacks), is only possible with linear compressors that can be controlled within wide limits and, above all, practically without delay. In combination with microchannel geometries in the evaporator, which ensure particularly good heat transfer to the application, very precise temperature control within narrow limits can be achieved.

microchannel cold plate and laser diode stack examples



- Optical Technologies
- Power Technologies
- Thermal Management

Contact us 

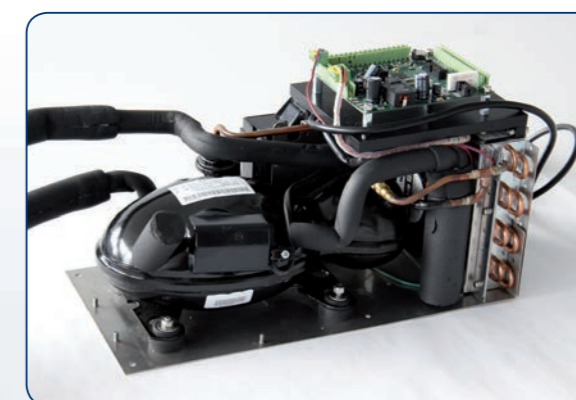
superior COP values, higher output

Direct Evaporation also offers COP values (Coefficient of Performance) that are two to three times higher than compressor-based recirculating chillers. Tests have shown that two-phase cooling in microchannels of a laser diode stack

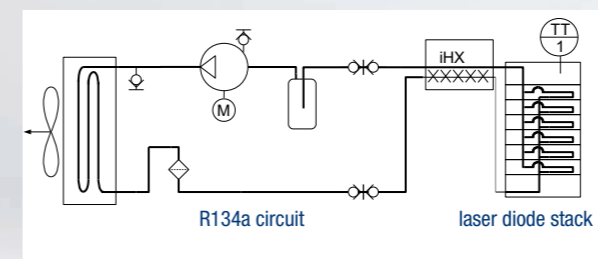
increases the solid-fluid heat transfer coefficient dramatically by around 100% - resulting in an optical output increase by approximately 20% compared to conventional single phase water cooling technology.

compressor / condenser unit for rapid prototyping

For Direct Evaporation applications in a cooling capacity range between 100 W and about 800 W, AMS Technologies has developed a unit based on an oil-free linear compressor. This unit (dimensions: 200 mm wide × 380 mm deep × 170 mm high without controller) is made up of a condenser, a fan, a filter-dryer, accumulator and a control board and can optionally be equipped with a high-pressure switch and suction gas heat exchanger. On the application side, AMS Technologies provides a broad portfolio of cold plates (tubed, roll-bond, friction stir welded, performance fin, microchannel), that can be used as evaporator plates.



process & instrumentation diagram



System with Direct Evaporation in a laser diode stack

- iHX Suction gas heat exchanger
- TT1 Temperature sensor on laser diode stack

optimum design of geometry and control required

Every application of Direct Evaporation technology must be optimally designed by experts. This applies not only to the selection of suitable components (compressor, condenser, fan, evaporator, etc.) and the design of the geometries in the cooling

circuit (including expansion valve or capillary), but also to the control of the entire cooling system. Here the AMS Technologies team with its many years of expertise is at your disposal – get in touch with us!

custom Direct Evaporation solutions tailored to your cooling challenge

Our experts are happy to develop direct evaporation refrigeration solutions and evaporator solutions that are tailored to the exact requirements of your refrigeration application. Our Thermal Design Center in Krakow, Poland, together with our manu-

facturing facility, will take care of turning your custom thermal solution into practice. Get in touch with us!

AMS Technologies – where technologies meet solutions



SOLUTIONS



enabling your ideas.

Optical, Power and Thermal Management Technologies

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