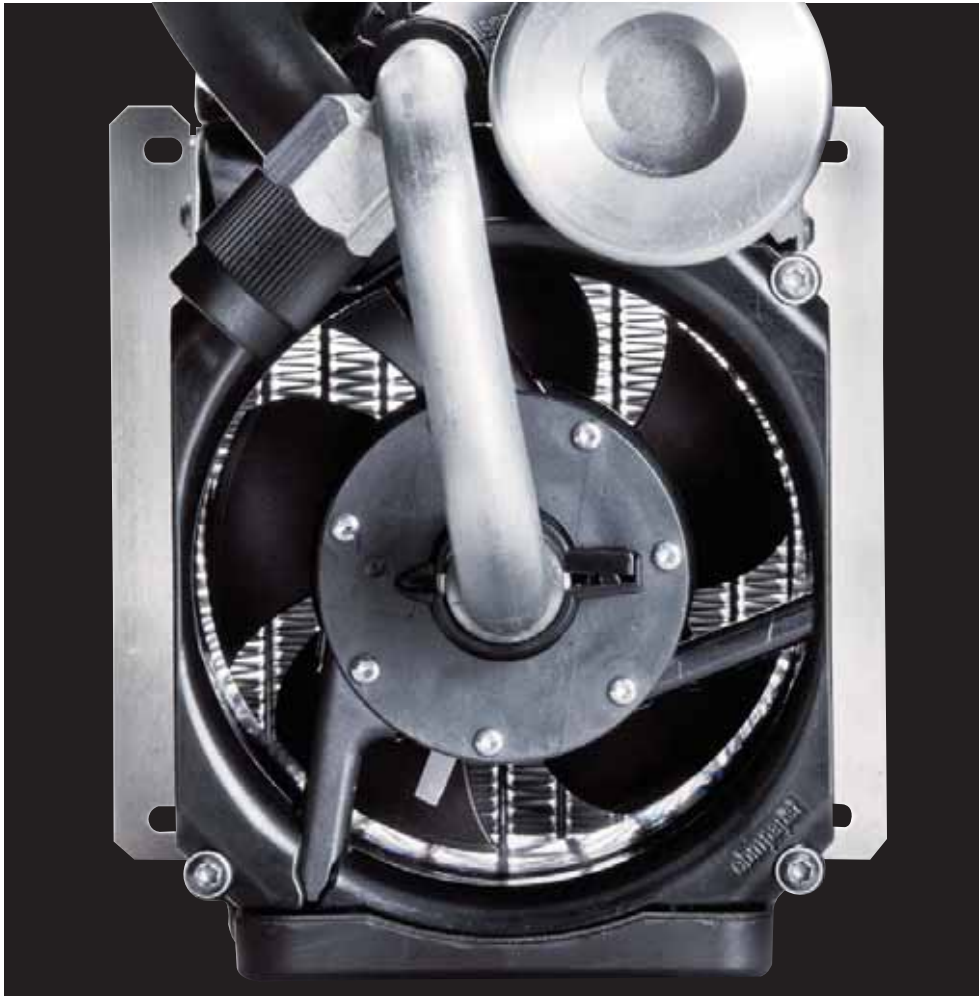


ebm-papst AquaCube®
High Performance Liquid Cooling for
Electronics



HotSpots of the Future

Revolutionary liquid cooling technology

Compacter, more powerful and as a result hotter: Despite the increased efficiency of the components, trends are moving towards more compact and more powerful devices. In many applications they are difficult and complicated to cool using conventional cooling systems. Considerably more efficient ways of dissipating heat from the heat source that are both faster and quieter are offered by the highly efficient and safe liquid cooling system. In precisely this respect, ebm-papst Aqua Cube sets new standards in terms of cooling capacity, leakage-proofness and mechanical robustness.

Why liquid cooling

- More densely packed heat sources/ higher energy density
- Hot-spot cooling
- Cooling by means of a fan or heat-pipe is inadequate
- Noise reduction required

A compact unit. For the most demanding applications!

That's revolutionary! The AquaCube is a fully encapsulated, ready-toinstall system; completely filled, maintenance-free and guaranteed leakage-proof. The AquaCube is primarily designed for OEMs that require a high performance cooling system for high heat density. The system can be adapted to meet the requirements of all applications, even the most demanding, thanks to its modular construction.

Uncompromising when it comes to quality: Thanks to 100%-inspection

The great advantage of a pre-assembled system that is delivered directly to the OEM completely filled and pre-wired is its outstanding quality. Every single Aqua Cube is subject to not only a leakage test but also to a cooling capacity test at the final inspection. Not until these test series have been successfully completed, is the system packed and released for delivery.

To associate liquid cooling with PCs only is a grave underestimation of the use of the AquaCube.

Thanks to the high reliability and the industrially suitable construction, the Aqua Cube can be used in the following applications:

- Cinema and large venue projectors: Cooling of DLP and DMD chips
- Medical lasers: Cooling of laser diodes
- Industrial lasers: Cooling of laser diodes
- Power electronics: Cooling of IGBT and other power semi-conductors
- Workstations, Gaming PC and Server: Cooling of several CPUs and several GPUs
- Display panels: Cooling of LEDs and DLP chips
- Rear projection screens: Cooling of LEDs and DLP chips



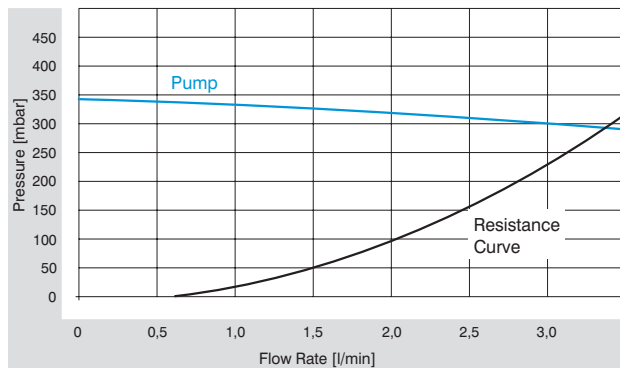


AquaCube highlights

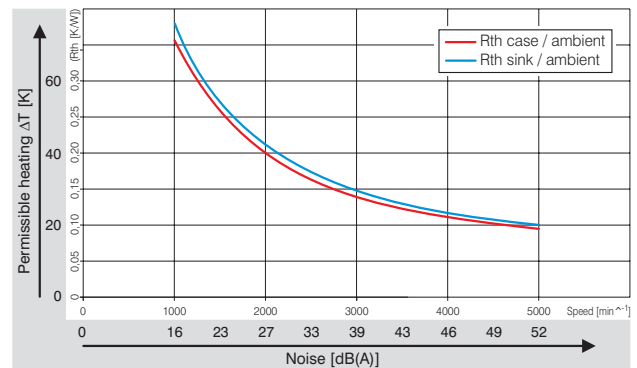
- Cooling capacity: Up to 1000 W
- $R_{th\ c-a} < 0.10\ K/W$
- Series and parallel switching of heat absorbers
- Connection of up to 4 heat absorbers
- Maximum hose length 2.5m
- Compact highly integrated core unit: 165mm high, 100mm wide, 143mm deep
- Professional, industrial design
- High reliability, 5 years maintenance-free
- Random installation position
- Innovation by ebm-papst: Property rights pending

Technical data

- Dimensions: 350x155x100 (incl. heat absorber)
- Operating voltage: 12 V DC
- Function monitoring: Open Collector / Tacho Signal
- $R_{th\ c-a}$: 0,10 K/W (39 mm x 39 mm heater)
- Speed: 1000-5000 min⁻¹, PWM controlled 2 - 28kHz PWM
- Flow rate: max. 80m³/h
- Pump flow rate: max. 3.3 l/min
- Pump pressure: max. 340mbar
- Noise Lp(A): 16 dB @ 1000 min⁻¹; 52 dB @ 5000 min⁻¹
- Power input: 1.4 W at 1000 min⁻¹, 13 W, at 5000 min⁻¹
- Temperature range: -10 to 50°C
- Direction of flow: Via heat exchanger (exhaust)
- Service life: 5 years without refilling (Tu = 40°C, Pv = 200W)



Pump curve: The resistance curve is based on 0.5 m hose and 2 couplings



R_{th} vs. nominal speed @ 200 W

CPU compatibility

- Intel
 - i7, i5, i3 (Socket LGA1156, LGA1366)
 - Pentium (Socket LGA775/T, LGA715/H)
 - Core 2 Duo/Quad (Socket M. P)
- AMD
 - Athlon 64, 64 FX, ... (Socket 939, 940)
 - Socket A, AM2, AM2+, AM3

Definition R_{th} (Thermal resistance)

R_{th} gdefines the Difference of temperature between 2 sides of a body at a heat capacity of 1 Watt.

$$R_{th} = \Delta T / P_v \quad \text{Unit: K/W}$$

ΔT – Temperature-Difference P_v – Heat flow

$R_{th\ c-a}$ = Thermal resistance between housing of the heat and ambient conditions

$R_{th\ s-a}$ = Thermal resistance between the heat sink mounted to the heat source an ambient conditions

ebm-papst AquaCube: The system and its modules

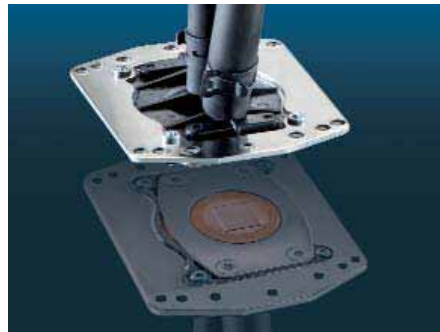
*The Aqua Cube is delivered as a complete, ready-to-install system..
It comprises the following modules for adaptation to specific applications:*



Liquid Cooling Cube

This is the core component of the AquaCube. In addition to the heat exchanger, the new, patented pump and fan unit is integrated in this cube. The pump is driven by the fan motor with magnetic coupling, thus eliminating leakage. The motor is a highly efficient EC-motor driven by sinusoidal commutation (free from solid-borne sound). The impeller features the winglet technology that is renowned for quiet operation.

The air performance is so high, however that the fan has no difficulty in dissipating the heat and there is no need for an additional fan to cool the electronics. For application-specific requirements, various forms of fixing are possible.



Heat absorber:

Enables the AquaCube to be operated in any mounting position. It also avoids the formation of air bubbles in the system and the thus reduced output and service life. The AquaCube can also be turned during operation and can be used in mobile applications with fluctuating temperature and pressure conditions. The volume equalization ensures that constant pressure is present in the system which in turn ensures a constant cooling performance.



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Coolant lines:

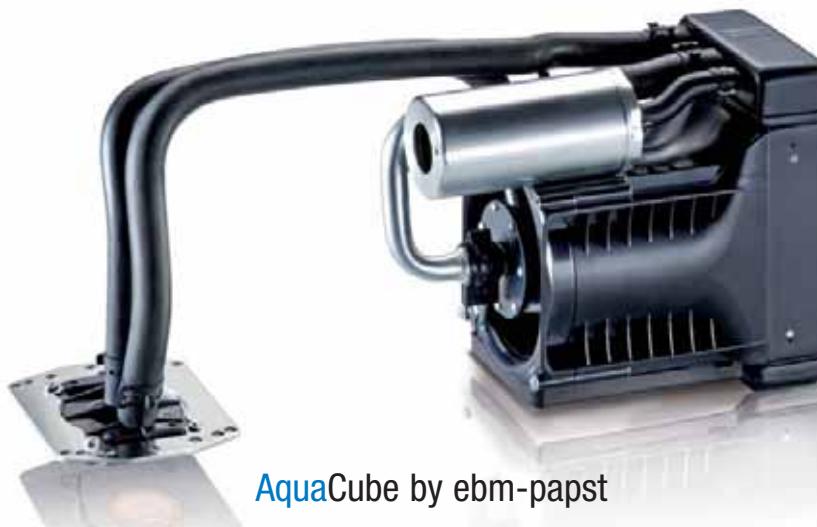
Instead of the usual single-walled hoses, the ebm-papst AquaCube is equipped with multi-layer coolant hoses that not only achieve minimum permeation rates for coolants but also contribute significantly to keeping the system maintenance-free as the oxygen input into the system is minimal. Of course, the coolant lines can also be adapted to the geometry and conditions of the relevant application.



Quick-connect couplings:

For simple installation in the customer's application and for additional flexibility, we offer the AquaCube also with special quick-connect couplings. These permit the integration of further heat absorbers and hose pieces in the system or removal for maintenance purposes on site. Additional components are filled by the customer or ebm-papst.

Thanks to the high cooling capacity, the AquaCube is expandable: Several heat absorbers can be integrated and thus allow cooling of several heat sources with only one AquaCube.



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