KATRICK®
TECHNOLOGIES

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PASSIVE COOLING

Data Sheet

Version One

ABOUT US

Katrick Technologies is a fast-growth IP-based business. Our business is based on a patent-protected technology platform from which we are developing a suite of products. With a considerable upside in applying our technology in different markets & applications, our products deliver market-leading zero carbon performance and returns. Katrick Technologies is now a leading innovator in the zero-carbon market, designing products that will significantly contribute to decarbonisation at a lower cost to the end-user than the current carbon-based incumbents.

WE ARE A ZERO-CARBON TECH BUSINESS.
Our products are based on ten years of research & development. We have designed and patented two leading products, each of which addresses a defined market opportunity with significant operating performance and financial returns.

WE ARE AN IP BUSINESS.
Our business is based on a patent-protected technology platform from which we are developing a suite of products. We are not a manufacturing business. Our technology will be licenced to partner Original Equipment Manufacturers (OEMs) for manufacturing, sales, and distribution.

WE ARE FAST-GROWTH.
We are focused on stimulating critical sectors to demonstrate demand and revenue. We are successfully engaging major blue-chip clients which will underpin our profitability. We already have five live partnerships and over 20 scalable open opportunities.

INTRODUCTION

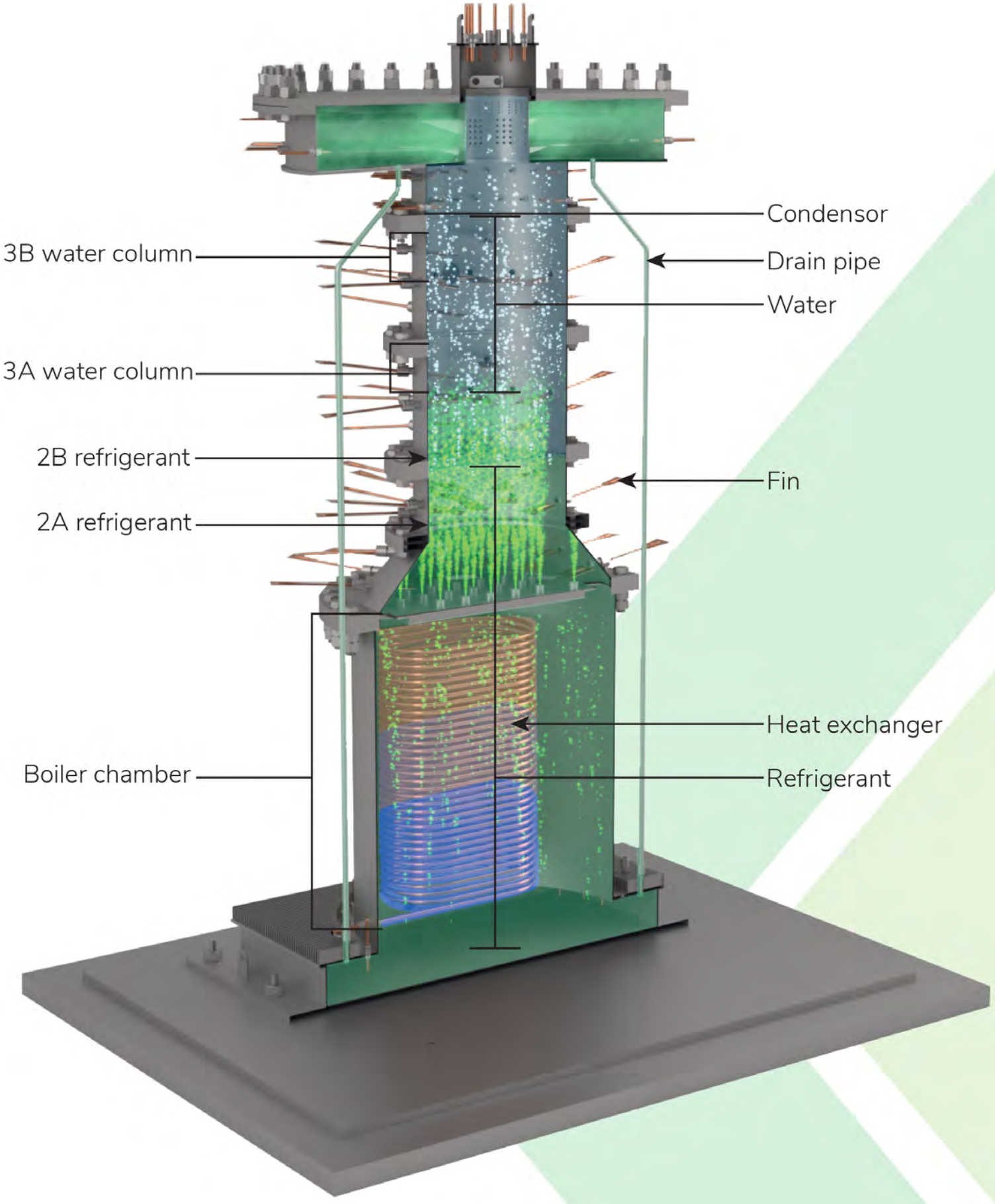
Revolutionising the cooling of data centres

A world-first, our Passive Cooling technology uses mechanical vibrations to remove heat from data centre server rooms.

Our patented Passive Cooling system consists of a chamber filled with bi-fluids of different densities and thermal properties. When heat enters the thermal vibrational bell (TVB) chamber, a phase change occurs with one of the fluids, which interacts with the second fluid to create dynamic movement between them, converting thermal energy from the heat into fluid vibrations. An array of fins protruding internally and externally within the TVB capture the fluid vibrations and converts them into mechanical vibrations. The resultant effect oscillates fins to passively dissipate the unwanted heat by moving ambient air around it. This motion enables our technology to provide the necessary and narrow temperature range for data centre servers to operate effectively.

TECHNICAL SPECIFICATIONS

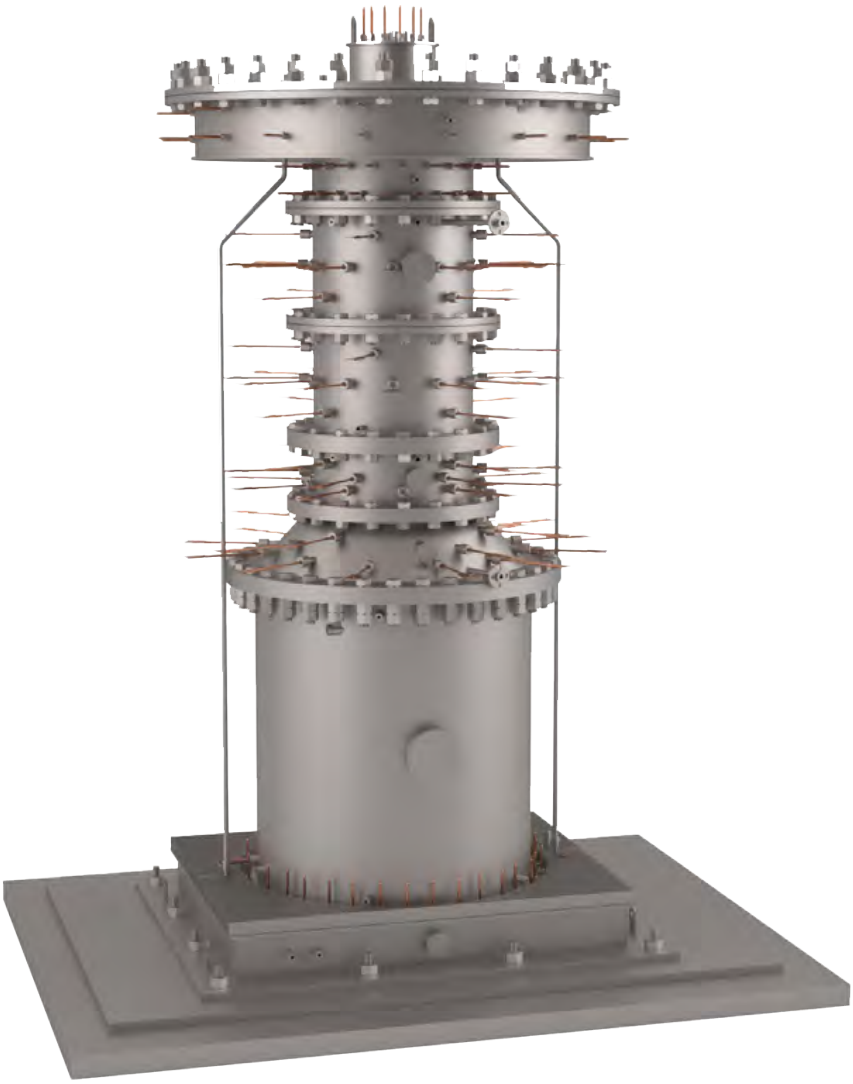
OUR THERMAL VIBRATIONAL BELL



OPERATIONAL SPECIFICATIONS

Operation Modes: There are two operation modes representing how the cooling system operates. During cold conditions the system runs 100% passively, only requiring a small pump to circulate fluid. In hotter conditions a variable-speed compressor slightly increases the temperature of the TVB to maintain the required cooling - without wasting excess energy.

An ambient temperature threshold is set to represent the upper limit of a 'cold weather' day. The system is designed to operate efficiently by switching between both modes when this threshold and the other control logic conditions are reached. Energy is conserved by a precision delivery of compressor power during hot weather only.



Dynamic Control/Logic for Efficiency:

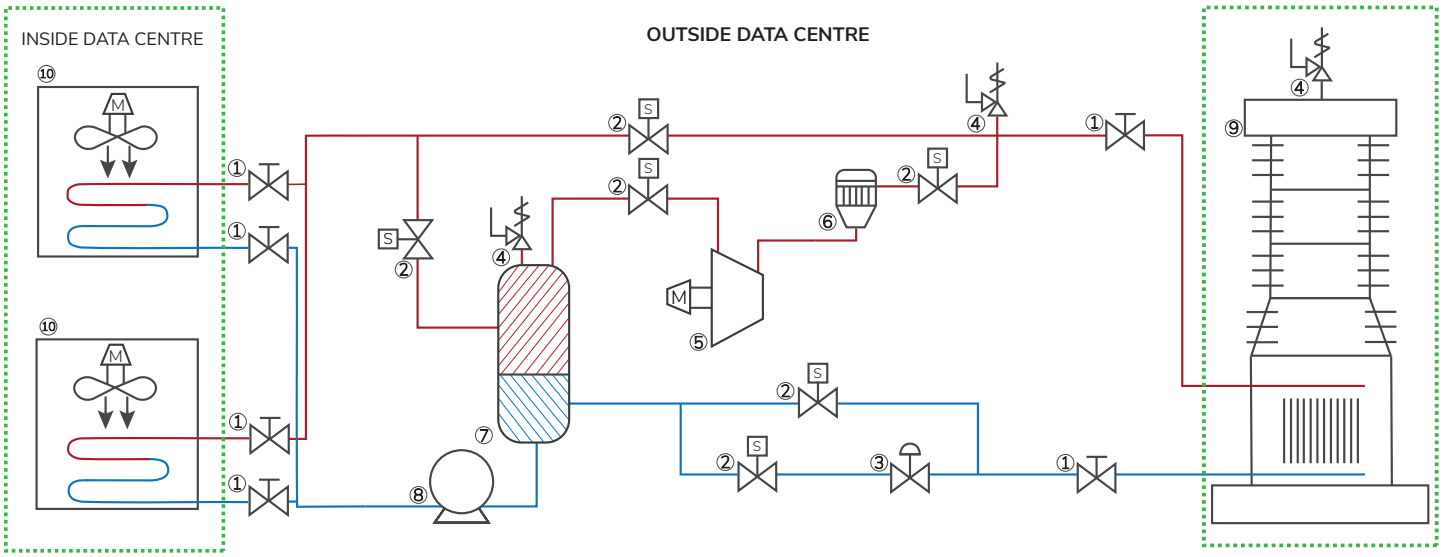
There are three main power-consuming components in KT's cooling solution; the CRAH unit fan, pump, and hot weather compressor. The dynamic control system analyses the ambient temperature, computer room, actual and design temperatures to maintain the design room conditions by controlling the compressor speed, its power consumption and that of the back-up compressor.

Refrigerants: Our Passive Cooling technology is designed as a closed loop circuit with an immiscible bi-fluid domain consisting of de-mineralised water and a denser refrigerant (R1336mzz(E)), with a global warming potential (GWP) value of less than 20.

In use the refrigerant's vapour passes through the de-mineralised water, as only a small amount of it will be soluble in water. The solubility amount is based on the solubility of the refrigerant selected. For R1336mzz(E), the solubility factor in de-mineralised water is 0.7789gr/litre. Which, in this case is negligible.

The F-gas regulations come in when placing refrigerants under European law and GB Law			
No.	Regulation	Not Applicable	Reason
1	European F- gas Regulation Annex I	R1336MZZE	GWP of 9
		R1233ZD	GWP of 4.5
2	New products and equipment: Fgas Ban summary HFO - with GWP>150	R1336MZZE	GWP of 9
		R1233ZD	GWP of 4.5

COMMERCIAL LAYOUT



Legend

① Gate valve (6)

② Solenoid valve (6)

③ Expansion valve (1)

④ Pressure relief valve (3)

⑤ Compressor (1)

⑥ Oil Separator (1)

⑦ Liquid Receiver (1)

⑧ Pump (1)

⑨ TVB (1)

⑩ CRAH unit (2)

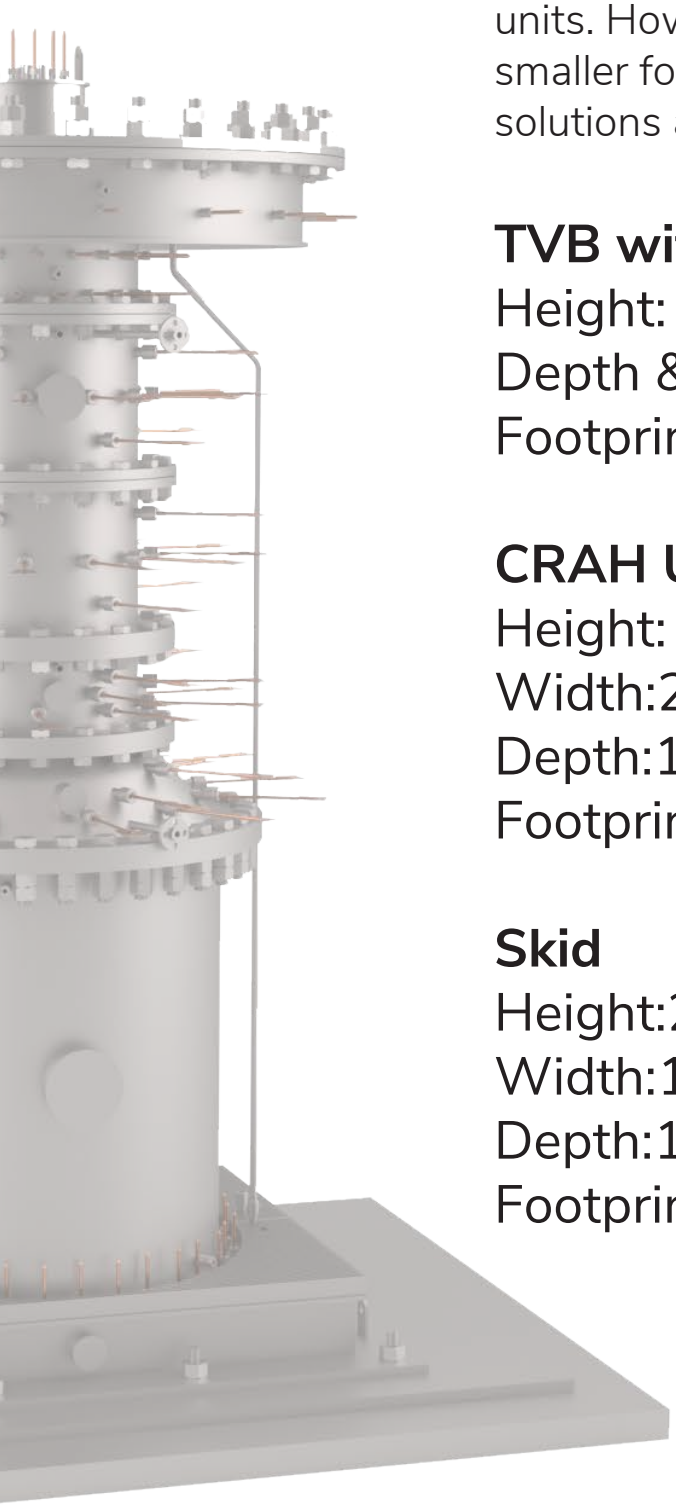
Vapour

Liquid

Power Rating

- Compressor (20kW)
- Pump (0.25kW)
- CRAH units (50kW each)
- TVB (120kW)

MEASURMENTS



The size of the system in the data centre is designed to match the footprint of typical existing cooling units. However, our cooling solution requires a smaller footprint when compared to existing solutions and can be scaled up via its height.

TVB with Casing:
Height: 4m
Depth & Width: 2m
Footprint: 4m^2

CRAH Units
Height: 1.75m
Width:2.95m
Depth:1.23m
Footprint 3.63m^2

Skid
Height:2.6m
Width:1.1m
Depth:1.1m
Footprint: 1.21m

OPERATING PARAMETERS

Operating temperature range*	-10°C to 40°C
Server room temperature	22°C
Free cooling (100%)	10°C
TVB heat capacity	120kW
Design TVB temp	12°C
Design refrigerant in	14°C (vapour)
Design refrigerant out	14°C (liquid)
Refrigerant pump	1.00kWe
CRAH Fans	1.85kWe
CRAH Unit duty	6kWth
Compressor kick-in temperature	10°C ambient
Maximum duty	60kW
Average power required	10.09kW
COP	5.95

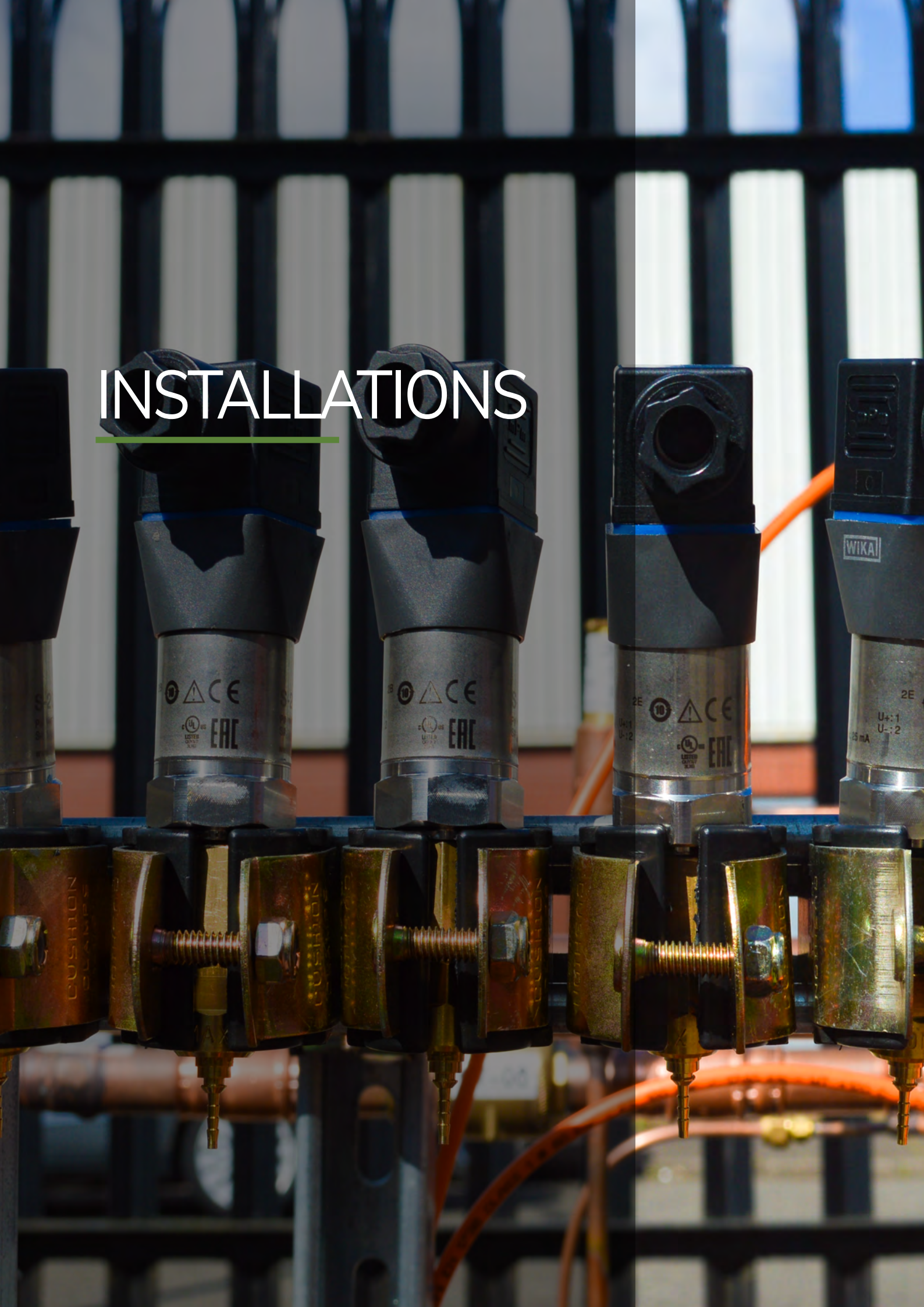
*Within the standard European operating range.

PRODUCT COMPARISON

When compared to contemporary technologies across top data centre market geographies our Passive Cooling technology outperforms in average power consumption and PUE performance.

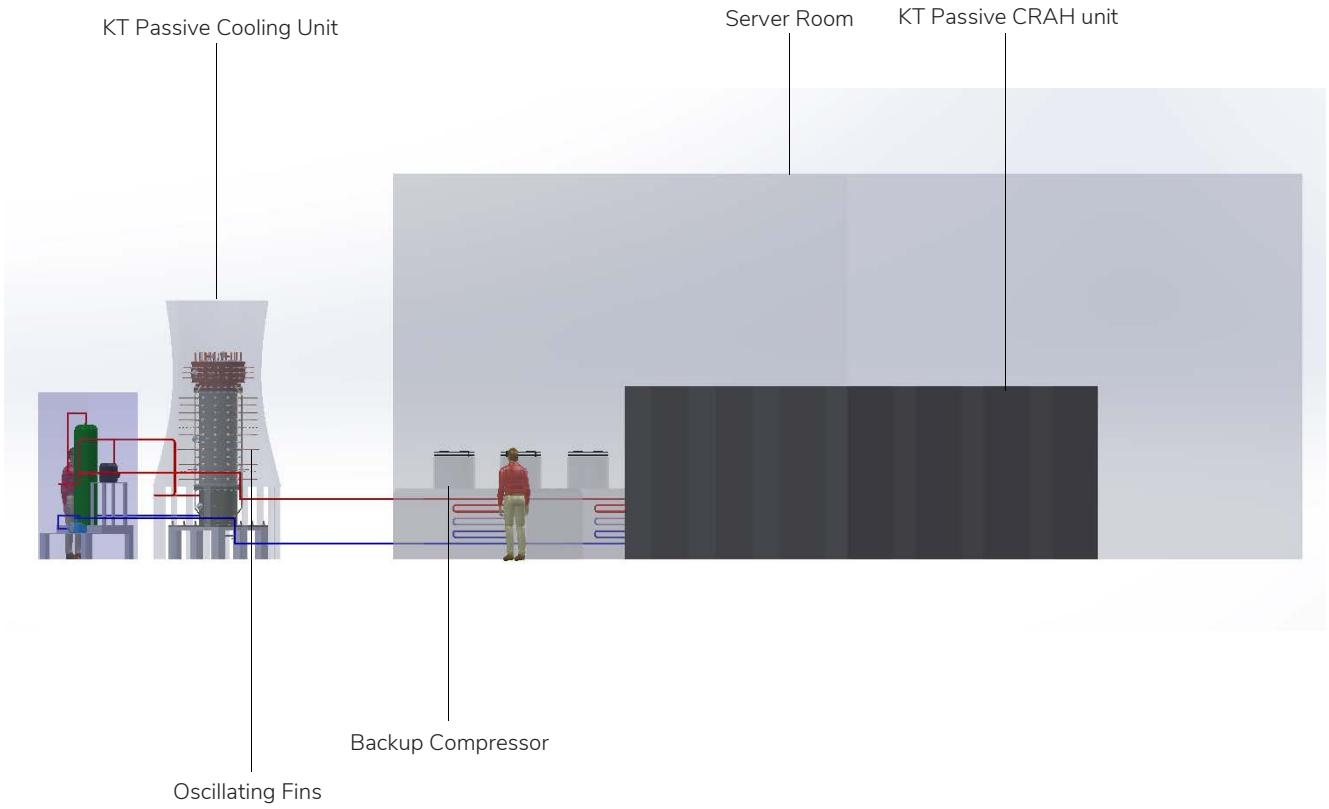
Average Power (kW)				
Location	Conventional	Air-cooled Condenser	Parallel Water Cooling System	Katrick TVB*
Glasgow	120	72	47	19
Sterling, Virginia	121	102	57	24
Shanghai	121	130	68	31
Cooling (Power Usage Effectiveness)				
Location	Conventional	Air-cooled Condenser	Parallel Water Cooling System	Katrick TVB*
Glasgow	1.61	1.36	1.24	1.10
Sterling, Virginia	1.61	1.52	1.29	1.12
Shanghai	1.62	1.66	1.34	1.16

INSTALLATIONS



Our Passive Cooling technology has a flexible layout and can be installed into existing or new data centre layouts.

Both installations would consist of: CRAH unit installation inside the server room, installation of skid housing to contain a backup compressor, TVB installation outside, pipe work to connect the components inside the server room to the ones outside, electrical work and control system installation, charging and pressure testing of all relevant components and commissioning of the system.



CONTACT US

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