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# CL20 Rear Cooler

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# Agua Cooling



## New Generation Computer Room Cooling

Technical Data

# ColdLogik™

Perfect climate - Perfect control

## CL20 Rear Cooler

### Product Guide

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#### Disclaimer

Aqua Cooling shall not be liable for any damages resulting from misapplication or misuse of its products.

### General Statement

#### Quality Management System

Aqua Cooling is a registered company to ISO 9001:2008 Quality management standards. This standard covers all manufacturing areas and associated processes.

#### Product standards

Unless otherwise stated, products marketed and supplied by Aqua Cooling, when installed and operated in accordance with Aqua Cooling' instructions, conform to EMC directive and essential Health and Safety requirements of the Machinery Directive 91/368/EEC 93/44/EEC and 93/68/EEC. This includes the EMC compatibility directive 89/336/EEC.

As standard, units comply with an IP21 rating.

The standards are also met where compliance to CE, FCC and UL are specific market requirements attained for that product. The units are designed in accordance with TUV and CSA. The units conform to UL/CSA 61010-1.

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ColdLogik Rear Coolers are the award winning data centre cooling solution – recognised with the award of the UK's most prestigious business prize: the Queen's Award for Enterprise: Innovation, 2013.

And in the last 12 months, two major UK data centres, where ColdLogik is used exclusively, have won the BCS, The Chartered Institute for IT, Certified Energy Efficient Datacentre (CEEDA) award – one won Gold for best in class capability, the other Silver for advance

capability. The Gold winner also won the 2012 Project Excellence Award, an annual prize given to a public or private sector entrant for the most outstanding data centre project.

ColdLogik Rear Coolers are designed, developed and manufactured by Aqua Cooling in the UK, which markets them internationally. They replace the traditional approach to data centre cooling, allowing load removal of up to 58kW per cabinet.



### A New Approach

ColdLogik Rear Coolers replace the traditional approach to data centre cooling, allowing loads of up to 58kW per cabinet with the added benefit of removing real estate inherent with hot aisle cold aisle, in row cooling, CRAC cooling and aisle containment designs.

The waste heat generated by active equipment within a cabinet is removed at source using water cooling – without the risk of leakage – by deploying a unique, patented Leak Prevention System (LPS).

ColdLogik Rear Coolers allow supply water temperatures to rise from the traditional 6°C for CRAC systems to between 14 and 24°C, reducing chiller size and energy costs. They also increase the availability of energy efficient ‘free cooling’, delivering up to the ASHRAE maximum 27°C (2013) room temperature.

ColdLogik Rear Coolers utilise space far more efficiently than hot aisle cold aisle, in row cooling, CRAC cooling and aisle containment designs.



### Energy Saving

There are many energy metrics used within different industries – the air conditioning industry uses the energy efficiency ratio (EER) and data centres often refer to PUE (power usage effectiveness).

Another metric used within the air conditioning field is the estimated seasonal energy efficiency ratio (ESEER) which takes into account both part load and seasonal variance and focuses purely on cooling equipment and not other power consuming products in the data centre.

#### Cooling power consumption vs computer power

The tables give indicative percentage figures of cooling power consumption against computer power at full and partial cooling loads. These are more in line with ESEER calculations and a useful and accurate base for your data centre’s cooling system efficiency when planning a new build.

External ambient air	Part load	Full load
Max air temp	6.0%	6.0%
Min air temp	1.5%	1.5%
Average air temp	4.0%	2.25%

Examples: dry air coolers, adiabatic coolers, cooling towers

Naturally sourced water	Part load	Full load
Constant water temperature	1.5%	1.5%

Examples: boreholes, rivers, lakes, sea water

#### Power usage effectiveness (PUE)

The PUE may vary between 1.04 and 1.2 depending on the geographical location and external ColdLogik cooling solution chosen to pair with ColdLogik Rear Coolers, site conditions and architecture. Properly designed ColdLogik installations are between 1.04 and 1.08, even on part load.

### Overview And Principle

ColdLogik CL20 Rear Coolers are fitted to the back of an enclosure, typically being IEC 297 3 and EIA STD 310 compliant. The coolers ensure optimum thermal and energy performance by removing the heat generated by the active equipment directly at source, preventing hot exhaust air entering the data room.

Ambient air is pulled into the cabinet by the active equipment fans – the hot air produced by the equipment passes over a heat exchanger matrix, either by its own velocity or pulled through via EC centrifugal fans mounted in the CL 20 door. The heat is rejected to coolant and chilled air passed back into the room at a predetermined ambient temperature.

#### Active or passive models

CL20 Rear Coolers are available in passive and active models – the passive version relies upon the active

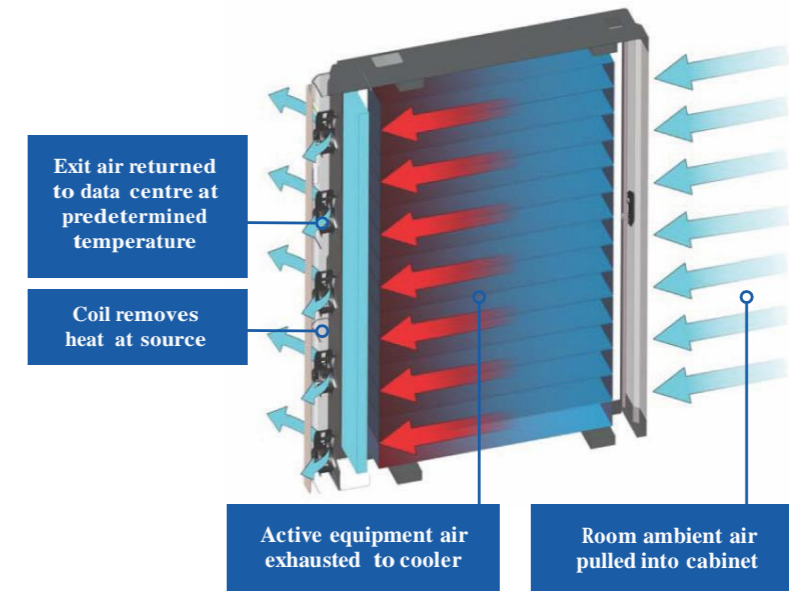
equipment fans to produce enough air volume and pressure to, in effect, ‘self cool’; active units for higher duties are fitted with EC fans.

The coolers can be sited within an existing data centre and work with existing computer room air-conditioning to provide high density cooling. They also reduce energy consumption, remove hot spots and can be retrofitted to existing or new build OEM cabinets using an interface frame or fitted directly to a ColdLogik compliant USpace cabinet.

#### Single source solution

To gain the optimum energy performance from ColdLogik, the coolers should be deployed as a single source – i.e. used to control the entire computer room/data centre without additional air conditioning, including retrofit scenarios.

#### How ColdLogik cools a data cabinet



Overview And Principle

ColdLogik Management System – CMS

The key element in controlling the room environment is the ColdLogik Management System (CMS). Each rear cooler is intelligently managed for optimum efficiency by embedded computers which continually adjust the operational parameters in response to the heat removal demands placed on the system. By making continual load adjustments, the CMS controllers maintain the room ambient temperature. There's more information about CMS on page 10.

ColdLogik Room Management System – RMS

The Room Management System (RMS) monitors and manages devices and plant on the ColdLogik network by best optimisation, ensuring the room environment is maintained in the most energy efficient way. RMS can be viewed remotely and locally and provide full access and control. There's more information about RMS on page 11.

Leak Prevention System – LPS

Another unique and important attribute of the ColdLogik solution is the option of a patented Leak Prevention System (LPS), which is incorporated within the Cooling Distribution Unit (CDU). As water is present in most data centres, they have the same inherent weaknesses – such as leak detection systems shutting down parts of the cooling system when moisture is detected. In the event of a pipework breach, the LPS – Leak Prevention System – stops water escaping from the pipework and allows the cooling system to continue running unimpaired, providing uptime, safety and system resilience. There's more information about LPS on page 9.

External cooling options

External cooling selection is less restrictive with a ColdLogik system – in many cases you do not have to rely on traditional mechanical cooling products such as chillers. This is primarily due to the design and control functions of the CL20 rear coolers – the rear coolers utilise much higher water supply temperatures compared to other forms of computer room air-conditioning to achieve the same room ambient temperature. Consequentially, free cooling can be obtained from a wider range of options – as outlined in our illustration. When all the facts are taken into account, our bold claim of 98% energy savings over and above standard computer room aircon systems is easily justified.



## CL20 Rear Cooler Range

### Product Definitions:

ColdLogik CL20 Rear Coolers are designed to run at optimum performance – even when not requiring high density cooling, they are the most energy efficient data centre cooling system.

#### CL20 C2 Rear Cooler (fan assist)

C2 coolers are capable of 6kW maximum and include as standard three EC fans. Two additional fans can be fitted to provide N+N. All fans have fixed or thermistor (temperature) speed control.

The cooler is not fitted with a CMS (ColdLogik Management System), but does include LED power indication. It works as part of a ColdLogik or existing system.

#### CL20 C3 Rear Cooler (active)

C3 coolers are capable of 8kW maximum and include as standard three EC fans. Two additional fans can be fitted with thermistor speed control to provide N+N. C3 coolers include CMS (ColdLogik Management System), working between two rear coolers.

The CMS is designed to run at optimum performance at all times, ensuring maximum energy savings. It tracks the air off the cooler into the room and water temperatures back to the cooling medium – by doing so, it is able make minor adjustments, thereby ensuring the room ambient temperature is maintained at all times. For more information about the CMS, see page 10.

The C3 cooler is designed to work as a co-locate ColdLogik system. The set point adjustment is controlled via a commissioning tool, alarm output and BMS signalling via Modbus/CAREL/BACnet RS485 connection option..



A ColdLogik Rear Cooler mounted on to a 1,200mm deep 19" USpace cabinet.



#### CL20 C4 Rear Coolers

Available in two variants, each C4 is capable of 20kW maximum 'sensible cooling'.

The performance of any coil relies on airflow passing over the coil matrix – in the case of C4 variants, which are supplied passive (i.e. no active fans fitted as standard), they are preconfigured to allow for fans to be retrofitted. For optimum performance, equipment should supply an airflow of 3,100m<sup>3</sup>/hr evenly spread over the coil.

#### CL20 C4nc Rear Cooler (passive)

The C4nc is the entry level version of the rear cooler and, being passive, has no fan management system, coolant control or communication protocol – however the retrofitting of thermostatically controlled fans does offer some degree of control; fixed speed EC fans can be factory or retro-fitted.

#### CL20 C4sc Rear Cooler (active)

The C4sc version comes with the full ColdLogik Management System (CMS) control. EC fans can be factory or retro-fitted. The CMS is designed to run at optimum performance at all times, ensuring maximum energy savings. It tracks the air off the cooler into the room and water temperatures back to the cooling medium – by doing so, it is able make minor adjustments, thereby ensuring the room ambient temperature is maintained at all times. For more information about the CMS, see page 10.

#### CL20 C8sc Rear Cooler (active)

The C8sc is capable of a maximum 35kW of 'sensible' cooling and is complete with the ColdLogik Management System (CMS) – as above – and five EC fans.

#### CL20 C12sc Rear Cooler (active)

The C12sc is capable of a maximum 45kW of 'sensible' cooling and is complete with the ColdLogik Management System (CMS) – as above – and five EC fans.

#### CL20 C14sc Rear Cooler (active)

The C14sc is capable of a maximum 58kW of 'sensible' cooling and is complete with the ColdLogik Management System (CMS) – as above – and five EC fans.



ColdLogik Rear Coolers can be run with water temperatures of 24°C

## Technical Information

Model	C2/C3	C4	C8	C12	C14
<b>General specification</b>					
Heights	<----- 42U and 48U ----->				
Widths	<----- 600/750/800 mm (Other sizes available on request) ----->				
Weight – dry	55 kg	63.4kg	63.4kg	65.8kg	70kg
Weight – wet	65 kg	76.0kg	76.0kg	78.0kg	85kg
Volume capacity	2.5 litres	5 litres	5 litres	7.4 litres	11 litres
Power requirement <sup>1</sup>	115V/10A and 230V/5A	115V/10A and 230V/5A	115V/10A and 230V/5A	115V/10A and 230V/5A	115V/10A and 230V/5A
Normal power consumption <sup>1-2</sup>	50W	50W	100W	200W	200W
<b>Fans</b>					
Backward Curved Centrifugal Fans incorporating EC technology, IP44 rated	3 fans	0 to 5 fans	0 to 5 fans	0 to 5 fans	0 to 5 fans
Current consumption, each fan	<----- 0.8A maximum ----->				
Air flow, each fan	<----- 1,075m <sup>3</sup> /hr ----->				
Noise level – 3 fans					
Full speed	60 dBA @ 1 metre	60 dBA @ 1 metre	73.6 dBA @ 1 metre	73.6 dBA @ 1 metre	73.6 dBA @ 1 metre
Normal running (30% fan speed)	45 dBA @ 1 metre	45 dBA @ 1 metre	47 dBA @ 1 metre	47 dBA @ 1 metre	47 dBA @ 1 metre
<b>Cooling Performance</b>					
Maximum duty (room 22 to 24°C)	12kW	25kW	35kW	45kW	58kW
Fluid flow	2.59m <sup>3</sup> /hr	3.5m <sup>3</sup> /hr	5.3m <sup>3</sup> /hr	5.0m <sup>3</sup> /hr	5.6m <sup>3</sup> /hr
Pressure drop	68kPa	52kPa	96kPa	57kPa	59kPa
Water supply	14°C				
Fan air flow	3,210m <sup>3</sup> /hr (60%)	3,100m <sup>3</sup> /hr (58%)	4,400m <sup>3</sup> /hr (82%)	5,100m <sup>3</sup> /hr (95%)	5,375m <sup>3</sup> /hr (100%)
Normal duty (room 22 to 24°C) <sup>2</sup>	6kW	15kW	18kW	35kW	48kW
Fluid flow	1.5m <sup>3</sup> /hr	3.5m <sup>3</sup> /hr	3.4m <sup>3</sup> /hr	4.6m <sup>3</sup> /hr	4.1m <sup>3</sup> /hr
Pressure drop	29kPa	52kPa	40kPa	36kPa	34kPa
Water supply	18°C				
Fan air flow	3,000m <sup>3</sup> /hr (56%)	2,500m <sup>3</sup> /hr (47%)	2,550m <sup>3</sup> /hr (47%)	4,350m <sup>3</sup> /hr (81%)	5,100m <sup>3</sup> /hr (95%)
ASHRAE Class 1 running (room 25 to 27°C)					
ASHRAE duty	5kW	12kW	17kW	35kW	45kW
Fluid flow	1.05m <sup>3</sup> /hr	2.1m <sup>3</sup> /hr	3.1m <sup>3</sup> /hr	4.8m <sup>3</sup> /hr	4.1m <sup>3</sup> /hr
Pressure drop	14kPa	23kPa	32kPa	36kPa	34kPa
Water supply	<----- 21°C ----->				
Fan air flow	3,000m <sup>3</sup> /hr (56%)	2,400m <sup>3</sup> /hr (45%)	2,800m <sup>3</sup> /hr (52%)	4,970m <sup>3</sup> /hr (92%)	5,370m <sup>3</sup> /hr (100%)
RDC Pipe Connections	28mm copper pipe flow and return tails				
Recommended fittings:	To suit negative pressure circuit – male BSP to quick release swivel coupler. To suit positive pressure circuit – male BSP or compression. NB. Site pipework connections normally 28mm male cone or female tapered BSP				

<sup>1</sup> Inclusive of CMS – see page 10 <sup>2</sup> At normal running.

## Leak Prevention System (LPS) With Cooling Distribution Unit (CDU)

The patented Leak Prevention System (LPS) with Cooling Distribution Unit (CDU) enables the flow and return water supply within the data centre – including all pipe work, hoses and rear coolers – to be put on a negative water circuit. This allows the system to operate without the fear of leaks or water damage to critical equipment or room infrastructure.

In the event of a breach in the water circuit, air is drawn into the system preventing leaks – the resulting air is taken back to the CDU/LPS or strategically placed vents in the circuit where it is vented out of the system and reported to the Room Management System (RMS).

Critically, this ensures that the system continues to operate without affecting the room ambient temperature and any remedial work can be carried out when convenient ensuring maximum uptime.

As with all aspects of ColdLogik, the LPS can be retrofitted to an existing circuit. It is modular and

scalable in design – as your data centre grows, so can the ColdLogik liquid cooling system.

In many cases it is necessary to tap off a chiller which already supplies chilled water to an existing systems within the same building but at much lower temperatures than are required by ColdLogik.

If chilled water from the primary circuit were to remain at this temperature, it would create condensation within the ColdLogik coolers. The CDU/LPS provides close control cooling to the rear coolers, eliminating the potential of condensate.

The process side, or secondary circuit, is a sealed pressurised system with the heat extracted from the coolers being rejected to a raw chilled water circuit via a stainless steel plate heat exchanger.

Unlike most CDU units however, our heat exchangers are much larger and can accept water up to 24°C while still maintaining the data centre below 27°C (ASHRAE 2013).

### ColdLogik Management System (CMS)

The ColdLogik Management System (CMS) lies at the heart of the ColdLogik solution.

The room ambient temperature is controlled locally at cabinet level by the CMS. It automatically adjusts the fan speed, water flow rate and, if necessary, the output water temperature from the cooling medium – the result is a consistent delivery of cooled air into the data centre, with no operator intervention.

The whole process can also be overseen and controlled at individual cabinet level, room level and remotely via any of the industry standard communication protocols.

The CMS is 2U high and can be rack mounted or fitted on top of the cabinet or under floor. It ensures all variants of the ColdLogik system operate on a 'sensible cooling' principle – 'water above dew point' – and the system remaining free of condensation.



The ColdLogik Management System (CMS) unit. It lies at the heart of the ColdLogik Rear Cooler solution.



The CMS commissioning tool is used to define all the required parameters at commissioning.

The ColdLogik Management System (CMS) is configurable to suit each installation and includes these:

- Coolant flow control (0 to 10V).
- Integral 24V AC motorised valve supply.
- 0 to 10V or 5V PWM EC fan control.
- Single or dual bank fan speed control.
- Fan periodic functionality test.
- Chiller regulation based on room values and set point.
- Industry standard thresholds and differentials on all user definable parameters.
- Valve (coolant) opening command monitoring.
- Return water temperature monitoring.
- Individual fan monitoring with the communication protocols Modbus,
- Transparent Local Area Network (TLAN) and fieldbus system options – other industry standards available.
- Full status monitoring via network.
- Network BMS or volt free contact connections for room monitoring, individual fan fail alarm and a common alarm.

- Local door alarm indicator – colour change on door logo.
- High and low temperature alarm.
- User definable periodic preventative maintenance alarms.
- Full alarm log (requires commissioning tool to access and reset).
- User definable time delays on alarm functions.

#### System Options

- Dual and single power supply change over.
- Power fail alarm on supply change over.
- Leak prevention detection alarm.
- Processor monitor fail safe.
- Leak detection.
- Programming key for simplistic transfer of commissioning data to another CMS.
- Local individual cabinet display screen.
- System display monitor and log up to 300 CMS via the RMS.
- Commissioning tool.

### Room Management System (RMS)

The ColdLogik Room Management System (RMS) is the complete and reliable solution for air management, monitoring and optimisation of data centres.

The ColdLogik Management System (CMS) has slots for a communication card – RS485 Modbus compliant option – allowing system monitoring via the RMS or the building's BMS. There are three units (light, medium and large) – all include a facility to email alarms (via a built in RJ45 port with IP address) and log system information.

The RJ45 port can be accessed from any PC, tablet or smart phone with internet access – it is password protected and allows remote viewing of monitored conditions on the ColdLogik CMS. It can also reset concluded CMS alarms.

#### ColdLogik RMS/light

This is the entry level ColdLogik RMS unit (right) with built in alarm management, data logging and email. It's compact, weatherproof and efficient with a touch screen display.

It is available in 14 languages and can monitor up to 50 devices (CMS units, chiller etc), with remote management via internet or phone line access.

It can display and log any number of the 169 parameters within each CMS unit – the number of units/plant depends on the number of parameters displayed for each, i.e. four per device = 63 units.



The entry level ColdLogik RMS monitor. It can monitor up to 50 devices.

#### ColdLogik RMS/medium and large (optional)

These are the professional-level units for monitoring and managing data centre air systems, with full optimisation, control and remote access to all devices in the system.

They feature a large (230 x 305mm, h x w) colour touch screen. The intuitive interface can be customised for displaying and configuring the system. The 'medium' unit can monitor and display up to 90 devices (ColdLogik units, chiller etc) on 2 x RS485 Modbus lines – the 'large' unit can monitor and display up to 300 devices.

They can log and display all 169 parameters within each CMS unit. 14 languages are available. User level access allows 'view only' or 'administrator level' – the administrator is able to modify individual or groups of CMS controllers.

Both these RMS units will monitor and control all the ColdLogik units in the data centre at all stages of their operation:

- Setup – centralised configuration of all the parameters for the units installed.
- Daily operation – system interface, data logging, reports, activity scheduling, automatic optimisation of operation.
- Maintenance – remote access, alarm management with automatic signals and actions.
- Site maps (optional) – can be uploaded with status indication on individual cabinets.
- Security – managed using sophisticated IT techniques.
- Complete tools – for reports and production of documents such as HACCP and system reports.



The ColdLogik RMS monitor – a professional-level unit for monitoring and managing data centre air systems. It can monitor up to 300 devices

## Zero Aisle Cooler

The CL20 Zero Aisle Cooler provides an alternative method to fitting a CL20 Rear Cooler on to a USpace cabinet or an OEM new or retrofit cabinet.

Safety, convenience and space saving are the key elements of this unique patent pending design – unlike a hinged door, which typically takes up 600/750/800mm of aisle space, the Zero Aisle Cooler moves from front to rear on an overhead system and

floor based wheels to take up no more than its original footprint.

When fully retracted, the distance between the back of the cabinet and the rear of the cooler is up to 1m of clearance – allowing for near unrestricted access and working space.

The runners can also be mounted to a mechanical infrastructure without fixing on top of the cabinet.



The CL20 Zero Aisle Cooler saves a huge amount of space – the door, running on caterpillar tracks at the top and wheels at the bottom, pulls out for rack access.

## CL20 Interface frame

One of the biggest advantages of the CL20 Rear Cooler is its ability to couple with either a new build or a retrofit on to an existing cabinet.

The interface frame is a universal product, so all standard and some nonstandard enclosures can be accommodated.

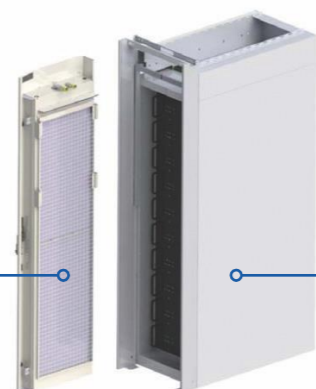
It allows a secure fixing of the rear cooler without transferring any additional weight to the existing cabinet.

The frame brings many of the benefits of the CL20

cooler family without the need to decommission old cabinets – or even entire data centres.

By working in harmony with the incumbent air conditioning system, many of the benefits of the ColdLogik system can be realised:

- Removal of hot spots.
- Increase cabinet kW density – and data centre density by housing more active equipment.
- Reduce carbon footprint.
- Save HVAC energy.
- Save energy costs.



The CL20 ColdLogik Rear Cooler

The CL20 interface frame fitted to a data cabinet

## CL20 Accessories And Cabinets

### Accessories

#### ColdLogik compliant hoses

ColdLogik compliant RDC silicone hoses are manufactured from a mix of galvanised wire, fabric, rubber and silicone – making them ultra-pliable and with a smaller bend radius than all other hoses. Their construction helps prevent twisting while still being extremely flexible.

They are suitable for positive pressure and leak prevention systems (LPS) and are supplied in pairs – one red and one blue in lengths of 1, 2, 3 or 4m. 28mm O/D, 19mm I/D – standard connections 28mm compression (coil) to coned 28mm male (pipe work) with coned male to tapered male BSP adaptor. They are also available with Zero Aisle overhead runner system components.

#### ColdLogik CL20 general options and accessories

- Commissioning valve.
- Flow control valve C3 and C4 up to 12kW.\*
- Flow control valve C4, C8 and C12 up to 30kW.\*
- Flow control valve C12 and C14 up to 58kW.\*

\*Modulated flow control valves for all SC rear coolers.

#### ColdLogik Room Management System (RMS)

- Includes monitors, screens and systems for up to 300 x CL20 coolers.
- RMS – medium/large BMS uplink conversion. Allows the RMS to be sub-slave, enabling the BMS master to monitor up to 1,000 parameters.
- ColdLogik RMS set up and programming – up to 300 coolers.

#### ColdLogik Management System (CMS) control box

- Single power supply (115 or 230V).
- Dual power supply (115 and 230V).
- LPS venting upgrade.
- CMS box rack mount kit.

#### ColdLogik miscellaneous electronic accessories

- Commissioning (set up) tool with RJ11 lead.
- Program key – pictured right.
- CMS Modbus RS485 comms card.
- CMS communications cards – TCP/IP, BACnet and SMS.
- CMS 0-10V converter.
- PCO fan and valve fail backup to pre-set value on a CMS failure.

- CL20 C4nc temperature probe kit.



ColdLogik compliant hoses are ultra-pliable.



### Cabinets

#### ColdLogik compliant cabinets

42U or 48U x 600/750/800mm wide, 1,000 or 1,200mm deep. These cabinets have a 200mm wide mounting post with drop-on hinges, special two-part top cover, AirTech Plus front door, internally locking side panels and front and rear mounting angles. Colour: light grey RAL 7035. They are also available with Zero Aisle overhead runner system components.

#### ColdLogik conversion kit

42U or 48U x 1,000mm deep conversion kit for retro-fitting ColdLogik Rear Coolers to an existing Aqua Cooling 6210 cabinet.

#### ColdLogik retro-fit adaptor frames for OEM cabinets

Retro-fit adaptor frame with mounting feet and top support plates for attaching a ColdLogik CL20 Rear Cooler to a third party OEM cabinet. Colour: light grey RAL 7035. Left or right hand hinges. Available in 39U/42U and 45U/48U 600/750/800mm wide formats. Other sizes available.

#### ColdLogik anti-recirculation sealing kits

and 48U 600/750/800mm wide cabinet to stop recirculation of airflow.



