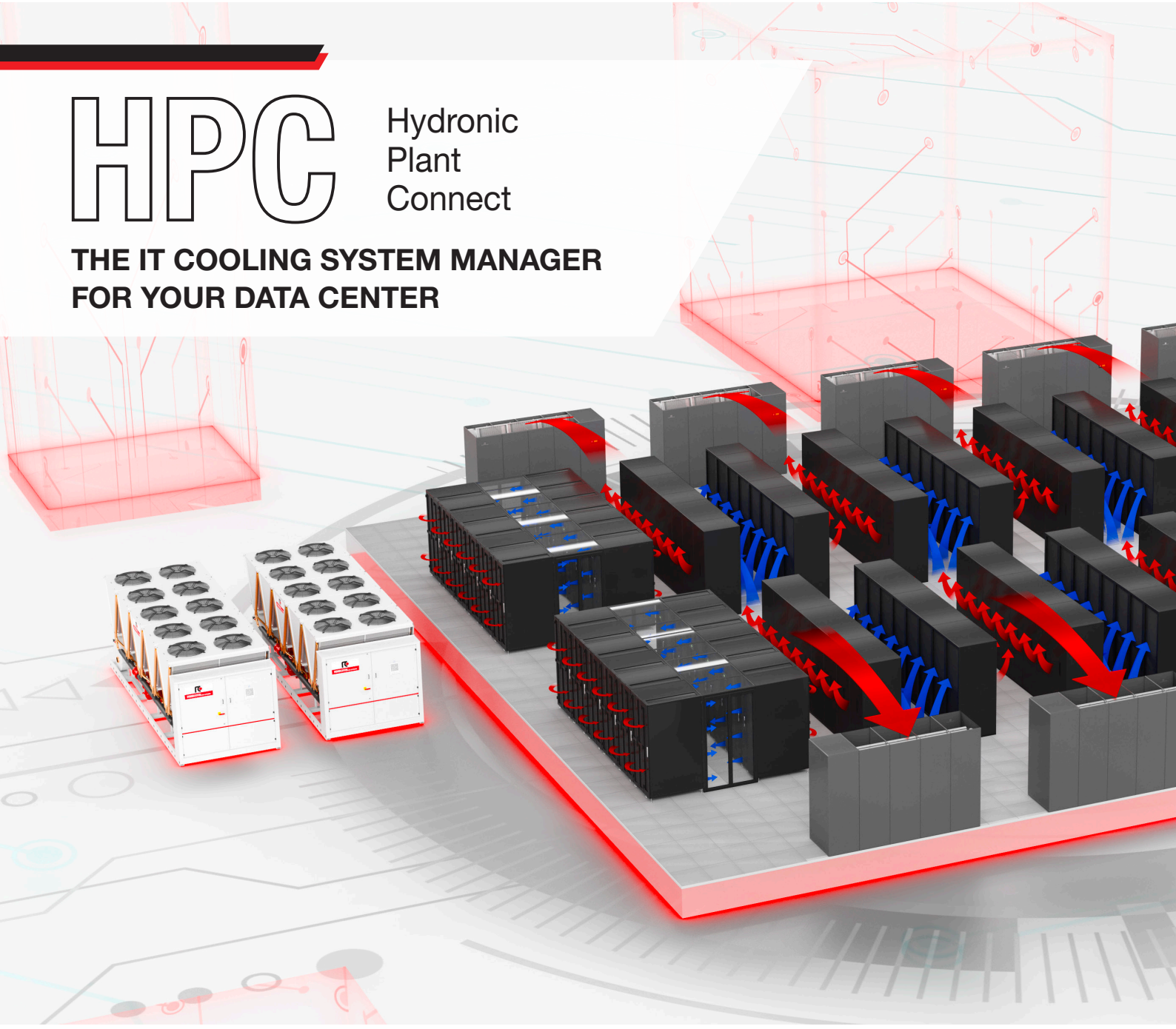
MITSUBISHI ELECTRIC
HYDRONICS & IT COOLING SYSTEMS S.p.A.

HPC

Hydronic
Plant
Connect

THE IT COOLING SYSTEM MANAGER FOR YOUR DATA CENTER



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HPC

Hydronic Plant Connect

Data Centers are designed to be fully operational all year long and to provide maximum dependability.
Those drivers are applied to all the devices that make up a Data Center and therefore to the cooling equipment.

Keeping the cooling system performing at its best is a key factor in modern Data Centers; cooling solutions need to be reliable and save energy.
Therefore, Mitsubishi Electric is pleased to announce HPC, the new fully integrated optimizer for hydronic Data Center systems.

Fully developed in-house, HPC perfectly matches the need for cooling, reliability, and energy savings, guaranteeing excellent performances while fully respecting the required IT cooling demands.

EASY CONTROL FROM YOUR DEVICE

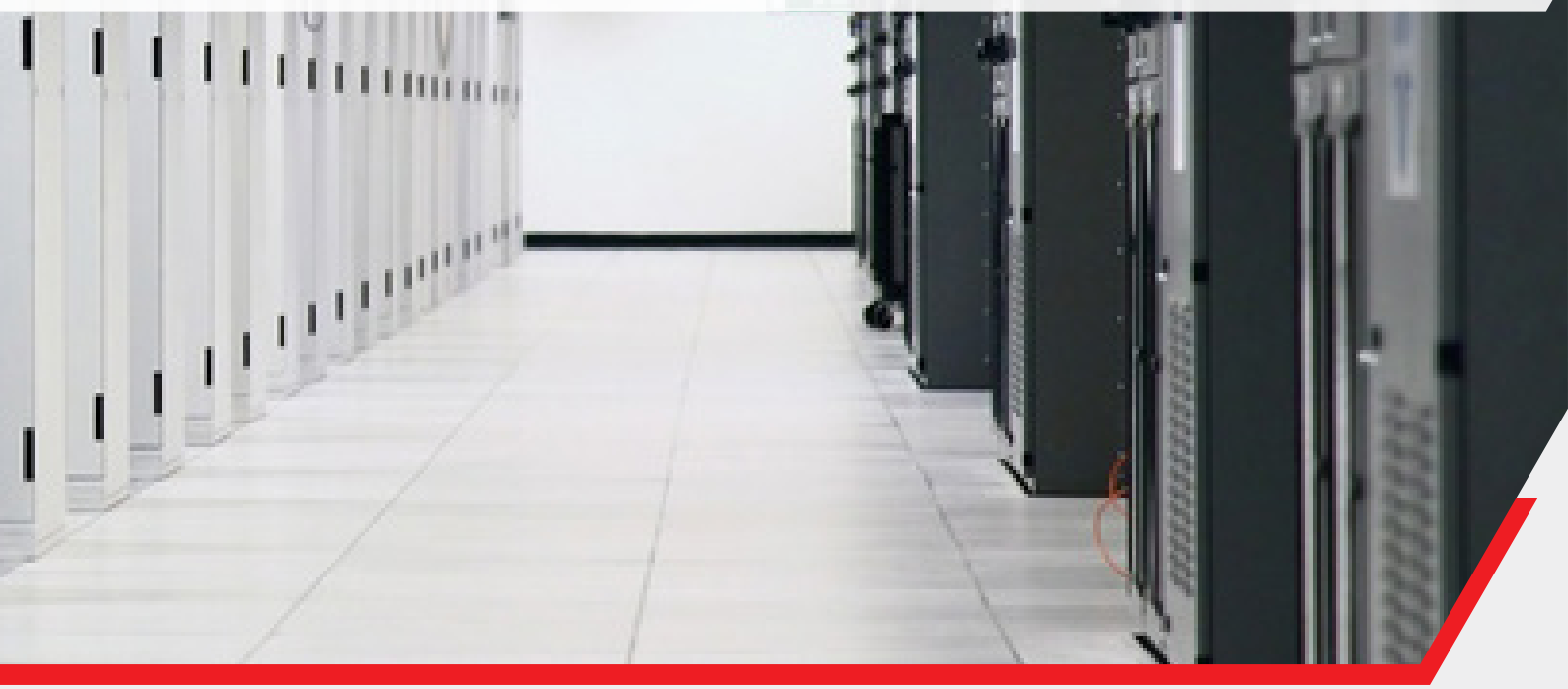
SCALABLE SYSTEM

The cooling equipment works together as one system

HPC constantly analyzes the operating conditions of the system and regulates the operational parameters so that the internal and external units perform at their best, in full synergy and complete reliability.

Thanks to the collaboration between research centers in Italy and Japan, and the result of the **deep-seated know-how of the Mitsubishi Electric Group,** the new data center management software can be combined with any IT Cooling chillers and chilled water precision air conditioners.

Moreover HPC perfectly suits future expansions thanks to its plug & play infrastructure and operating logics, making it the best choice for your scalable Data Center.



COMPLETELY AUTOADAPTIVE

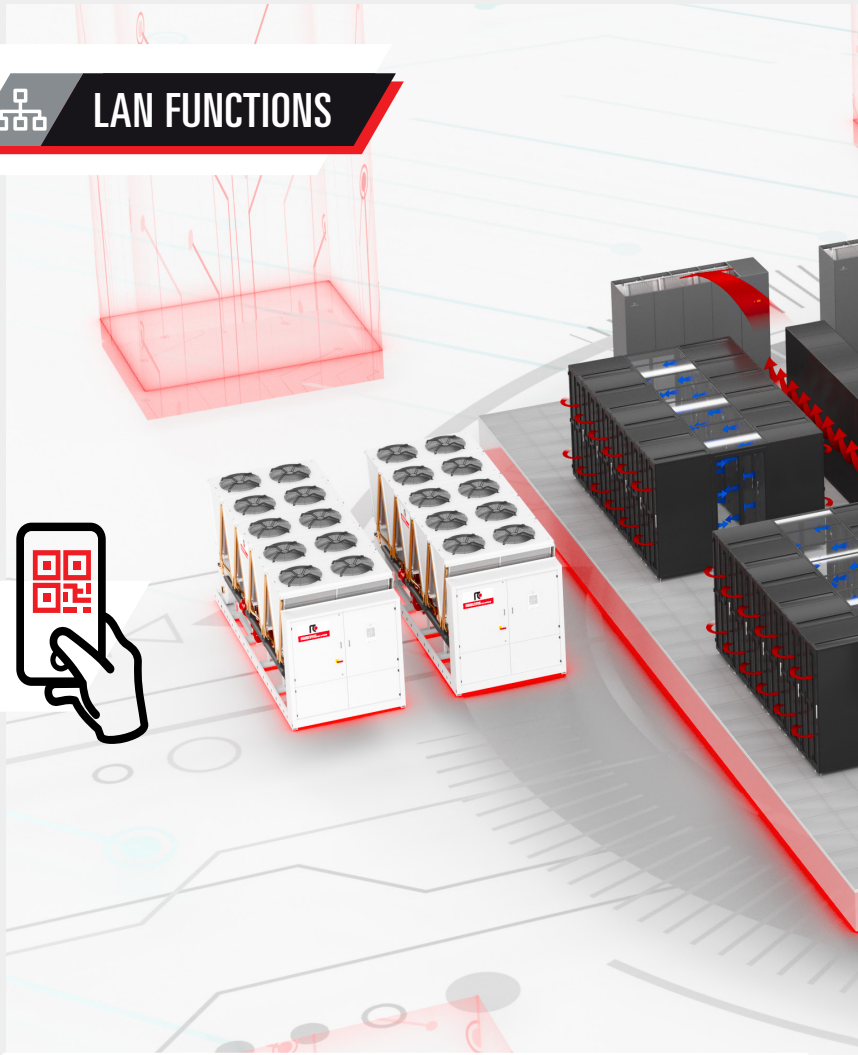
REDUCED OPERATING COSTS

HPC: HYDRONIC PLANT CONNECT

ONE NETWORK TO CONNECT CHILLERS WITH INDOOR UNITS

LAN FUNCTIONS

Thanks to its advanced algorithm, outdoor chillers (air cooled, free cooling, or water cooled) and indoor chilled water units are managed to optimize their operation and enhance the system's efficiency in any condition.



CONTROL YOUR COOLING PLANT DIRECTLY FROM YOUR DEVICE

Accessibility to the units is possible directly from your mobile device, via Local Area Network or via VPN network.

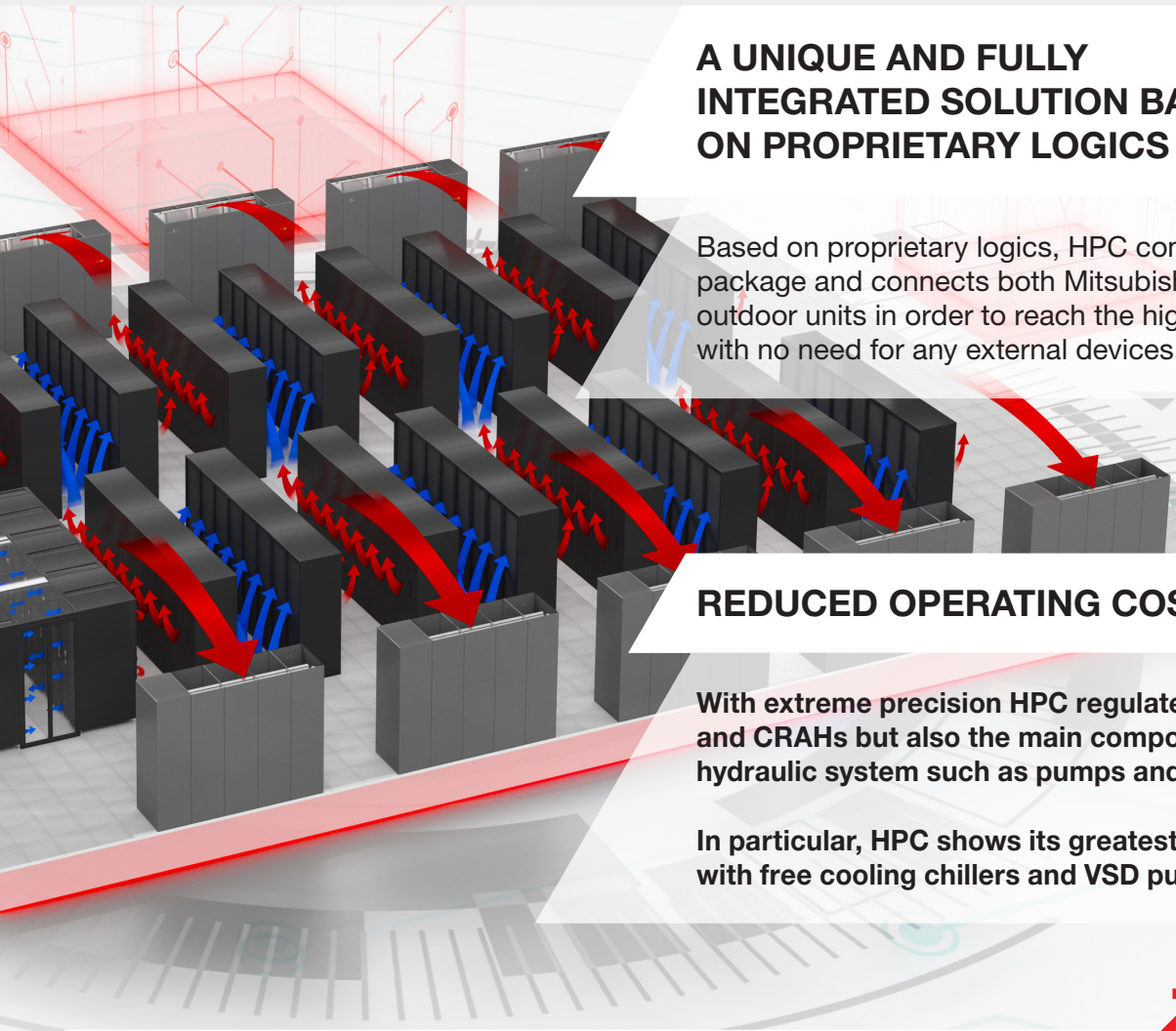
COMPLETELY AUTOADAPTIVE

HPC is based on an autoadaptive algorithm that instantly detects and analyzes the operating conditions of the plant, and consequently optimizes it to perform at its best.

HARNESS THE FULL POTENTIAL OF ACTIVELY REDUNDANT SYSTEMS N+1

HPC performs best in data centers featuring one or more redundant units.
This advanced logic optimizes the plant instantly in part load conditions, increasing efficiency.

The must-have tool for today and tomorrow's chilled water data centers.



A UNIQUE AND FULLY INTEGRATED SOLUTION BASED ON PROPRIETARY LOGICS

Based on proprietary logics, HPC completes the cooling package and connects both Mitsubishi Electric indoor and outdoor units in order to reach the highest efficiency values with no need for any external devices.

REDUCED OPERATING COSTS

With extreme precision HPC regulates not only chillers and CRAHs but also the main components of the hydraulic system such as pumps and valves.

In particular, HPC shows its greatest benefits with free cooling chillers and VSD pumps.

FREE COOLING

VPF VAR.PRIM.FLOW

IDEAL SOLUTION FOR SCALABLE DATA CENTERS

Thanks to its plug & play philosophy, HPC is prefect for those Data Centers that are built to be fully occupied gradually, in different phases, making it the ideal solution for your business development.

HPC

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HOW IT WORKS

The HPC control logics enhance the system efficiency leveraging on partial loads, redundant units, and favourable ambient conditions.
HPC bases its operation on proprietary logics and devices:

INDOOR LAN GROUPS

LAN MULTI MANAGER

LAN GROUP CONTROL

KIPLINK

KIP LINK
Keyboard In your Pocket

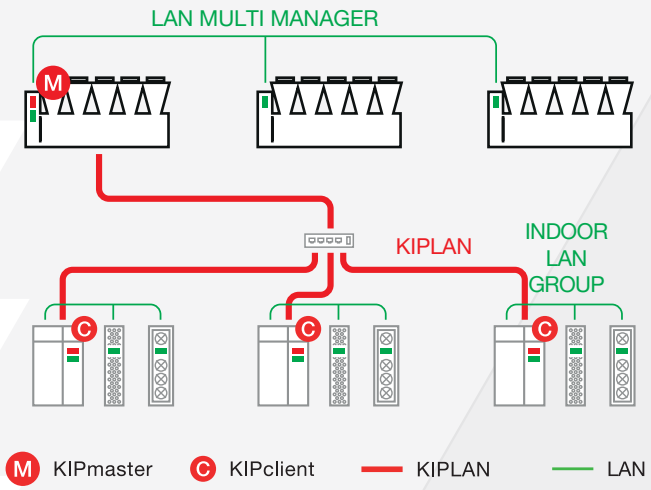
HPC INFRASTRUCTURE

One group of external chillers (up to 8 units) is connected to up to 20 groups of indoor chilled water units (up to 15 units per group).

Communication between indoor and outdoor units is achieved by KIPLAN, the ethernet cabled network that links each LAN group with the others.

KIPLAN is managed by the KIP Master chiller, which collects information from the KIP client of each indoor LAN group.

HPC analyzes the data and the optimized parameters are sent to all connected units.



HPC Logics

HPC PUSHES THE BOUNDARIES ON INTEGRATED CONTROL LOGICS

HPC manages chillers, CRAHs, and pumps, optimizing the entire chilled water system. Starting from the operating conditions of each single component, HPC adjusts the working parameters to maximize the overall efficiency. Optimization is always done with cooling dependability in mind, making HPC safe to use in any type of conditions the data center faces.

IT cooling load satisfaction is paramount.
HPC always gives priority to cooling dependability.
Therefore, actions are taken on the basis of the indoor unit groups' status.

1. Reset
2. Reduction
3. Optimization on
4. No action

There are 4 operating modes:

PRIORITY	COOLING LOAD		MODE	ACTION
●	Suddenly increases	↑	RESET	HPC contribution is reset and the system immediately increases the cooling capacity.
●	Slightly increases	↗	REDUCTION	HPC contribution is reduced. The system increases the cooling capacity.
●	Stable or decreases	→	OPTIMIZATION ON	HPC actively optimizes the system.
○	Stable or decreases	→	NO ACTION	HPC has already pushed the system to the best performance possible in current conditions. No further action is taken.

HPC acts on time intervals and the main variables taken into consideration are:

- Cooling demand of each indoor unit group (room temperature, fans' speed, valve opening)
- Chilled water temperature
- Pumps' speed
- Chillers' group operating status (outdoor air temperature, FC availability)

LAN MULTI MANAGER

LAN FUNCTIONS

HPC relies on proprietary and chiller integrated LAN Multi Manager logics.

LAN Multi Manager allows one to create a single group of chillers (up to 8 units) managing the units as one, performing several group functions and providing system dependability.

CHILLER LAN FUNCTIONS

- Dynamic Master
- Load distribution or saturation
- Stand-by management with automatic or forced rotation
- Resource priority management
- Group fast restart
- Pump management
- Auxiliary inputs

DYNAMIC MASTER

If the master unit becomes disconnected, the Dynamic Master logic automatically elects a new master from the other units, allowing the chillers to continue working.

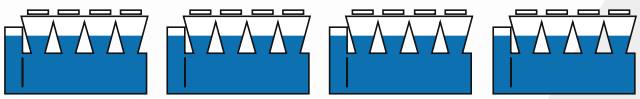
Candidate master units with different succession priority can be set by the client.

LOAD MANAGEMENT

Cooling loads are smartly managed according to the data center's needs

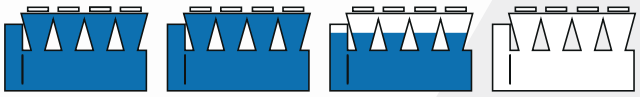
1. DISTRIBUTION

The load is distributed equally among the active units of the group.



2. SATURATION

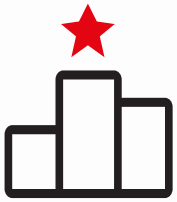
Units are exploited at their maximum; only the ones necessary work.



RESOURCE PRIORITY MANAGEMENT

The outdoor group is set to exploit the most advantageous cooling technology. Free cooling chillers will have the highest working priority, if free cooling operation is available.

Furthermore, when units with different compressor technologies are in the same system, it is possible to set different working priorities exploiting the most advantageous and efficient one.



STAND-BY UNIT MANAGEMENT WITH AUTOMATIC OR FORCED ROTATION

- Automatic or manual rotation of units according to the restart priority and running hours equalization;
- Immediate activation in case of a unit failure, disconnection, or emergency load levels.

GROUP FAST RESTART

This function allows the IT facility manager to set a configurable start up sequence on the basis of priority and working hours.

- No simultaneous start-ups of different unit compressors.
- Always the most advantageous cooling technology. If free cooling operation is available, it is given the highest priority.

PUMP AND AUXILIARY INPUT MANAGEMENT

HPC Multi Manager not only manages the correct operation of the chillers, but it also controls pumps and auxiliary input management.

- Pump controls are available both for individual and centralized pump group configurations (on/off, VPF, 2PS, etc.)
- Auxiliary inputs are applied at a group level (group set-point adjustment, group demand limit, etc)

INDOOR LAN GROUPS

LAN FUNCTIONS

HPC works on the basis of proprietary and CRAH unit integrated LAN logics

Indoor LAN allows one to create a group of CRAHs (up to 15 units) managing the units as one, performing several group functions and providing system dependability.

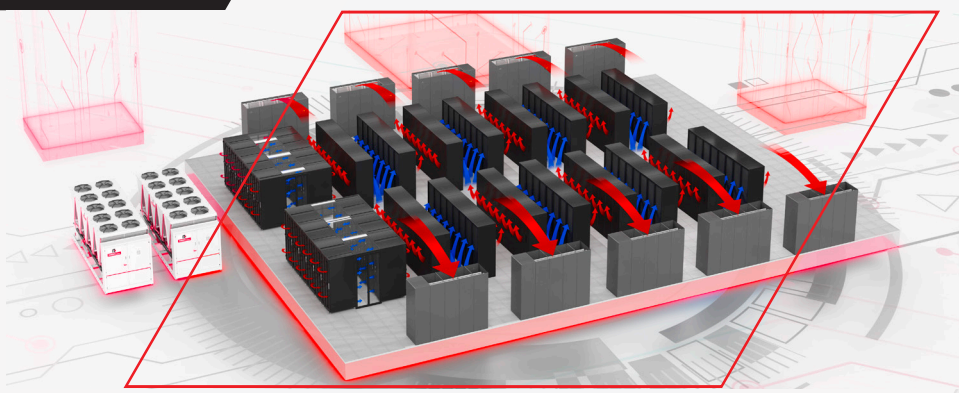
INDOOR LAN FUNCTIONS

- Dynamic Master
- Stand-by and back up unit management
- Active Fan on Stand-by
- Active Distribution Load
- T&H average management and Local T Protection
- Active Pressure Load and Local Pressure Protection

DYNAMIC MASTER

The Dynamic Master logics automatically elect a new Master from all other units connected in the same LAN when the master unit fails.

Thus, the group will continue to operate.

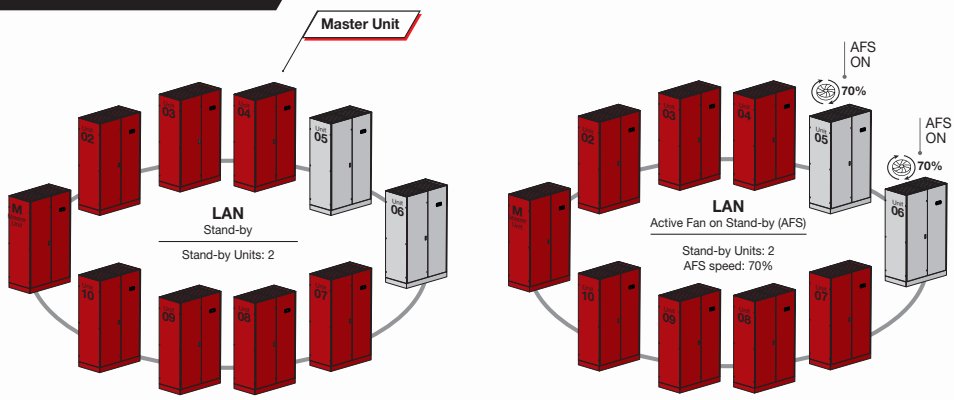


STAND-BY AND BACK UP UNIT MANAGEMENT

The rotation of the stand-by units can be automatically managed according to specific time bands, alarms, and cooling load variations.
In the event of a unit breakdown or disconnection from the LAN, stand-by units are forced to activate.

ACTIVE FANS ON STAND-BY UNITS

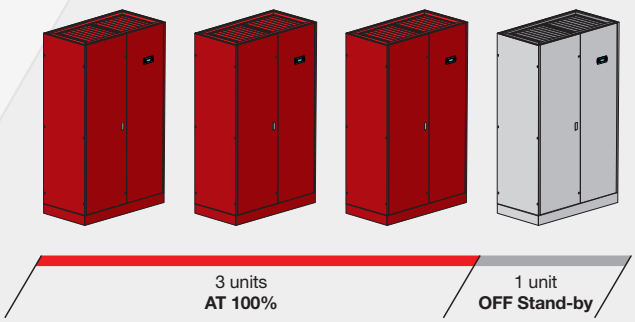
In stand-by, reserve units do not turn off their fans, but keep them running at the speed set by the parameters.
Fans continous operation always provides air flow, maintaining the desired pressure value. This means that the unit is ready to start up if necessary.



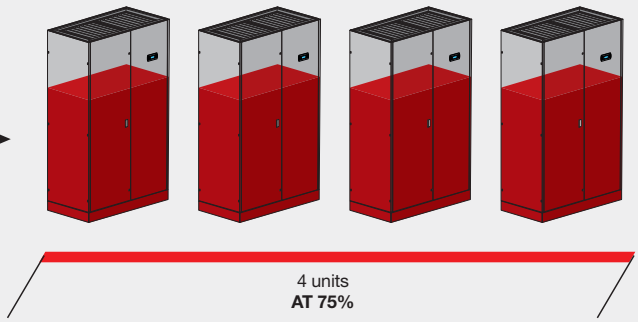
ACTIVE DISTRIBUTION LOAD

Instead of running a few units close to their maximum load, it distributes the thermal load required among all units making them work at partial loads thus increasing efficiency. In case of a unit failure, its cooling load is shared among other operating units thus increasing the system's reliability.

PASSIVE REDUNDANCY



ACTIVE REDUNDANCY



T&H AVERAGE MANAGEMENT AND LOCAL PROTECTION

The LAN connection can be exploited to manage units according to the average humidity and temperature values, making all units work at uniform conditions.
Hot and cold spots are monitored and locally/automatically managed by each single unit.

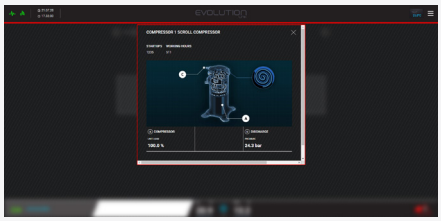
ACTIVE PRESSURE LOAD AND LOCAL PROTECTION

The LAN connection allows the units to automatically adjust the fans' speed according to average pressures read by each unit.
High and low pressure spots are monitored and locally/automatically managed by each single unit.

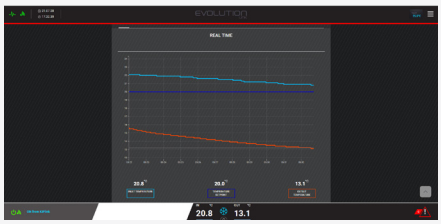
KIPlink: LOCAL AND REMOTE MONITORING FUNCTIONS

KIPlink is an exclusive product of Mitsubishi Electric Hydronics & IT Cooling Systems. You can monitor, control, and have full access to the unit from any device (PC, laptop, mobile phone) thanks to the Wi-Fi generated by KIPlink and the ethernet connection.

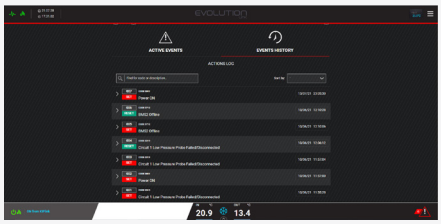
EASIER ON-SITE OPERATION



REAL-TIME GRAPHS AND TRENDS



DATA LOGGER FUNCTION



3 REMOTE MONITORING

Exploiting the LAN connection, it is possible to connect to the unit from everywhere through your VPN.

Full access and control of the unit is done via WEB browser.

Customer VPN
Secure accessibility to LAN
(cyber security in charge of customer)

4 KIPLAN

Proprietary protocol communication between all Mitsubishi Electric Hydronics & IT Cooling Systems units.

WHY DO YOU NEED A KIPLAN?

- To have a single entry point of HMI for several units.
- To allow the Mitsubishi Electric Hydronics & IT Cooling Systems indoor and outdoor units to communicate with the HPC.

Infrastructure – KIPlink

2 LOCAL MONITORING

The unit is controlled locally by means of an ethernet connection. Full access and control of the unit is done via WEB browser.

1 PROXIMITY SMART KEYBOARD

Full access and control to the unit via Wi-Fi, thanks to the Mitsubishi Electric Hydronics & IT Cooling Systems app.

Ethernet

WHAT KINDS OF NETWORKS ARE POSSIBLE?

Full WI-FI network

Used when the units are very close (about 10 m).

Hybrid network

Some units connected in wi-fi mode, some others connected with ethernet cable.

Full ethernet cabled

HPC
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Cable network configuration used when there is significant distance between unit and when HPC is present.

HPC

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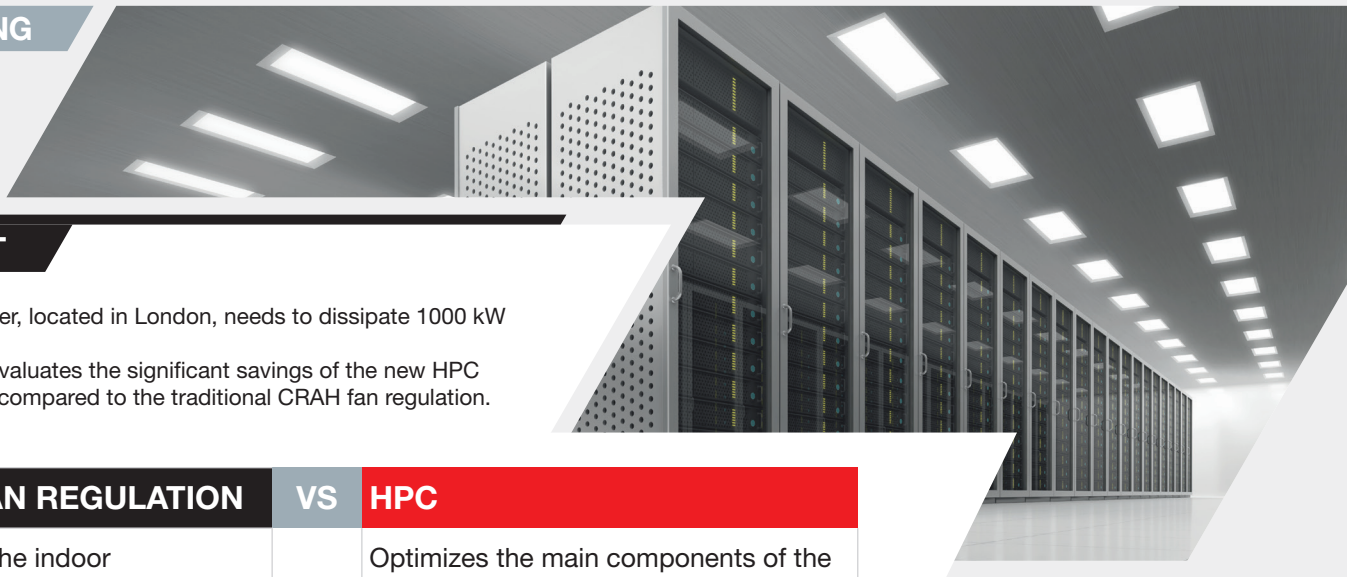
ENERGY ANALYSIS

Simulation software tested and validated in Mitsubishi Electric laboratories.

IT COOLING



PROJECT

This data center, located in London, needs to dissipate 1000 kW from servers.
The analysis evaluates the significant savings of the new HPC control logics compared to the traditional CRAH fan regulation.

CRAH FAN REGULATION	VS	HPC
Optimizes the indoor unit fan speed.		Optimizes the main components of the system: chiller, CRAHs, and pumps.

PLANT CONFIGURATION

3 x **NR-FC-Z /A /0594**

Cooling capacity: 547 kW
(25/18°C, 42°C)

EER: 3,31
(25/18°C, 42°C)

Length: 7430 mm

11x **w-NEXT HD UK U 170 E10**

Cooling capacity: 118 kW
(30°C, 40%RH, 39600 m³/h)

EER: 17
(30°C, 40%RH, 39600 m³/h)

Width: 3510 mm

The plant consists of 3 free cooling chillers (one redundant) and 11 CRAHs (one redundant). Each chiller has been equipped with a pump controlled by VPF logics. The chiller choosen is a free cooling unit equipped with scroll compressors, an optimum solution for the climate and the Data Center size.
The CRAH unit selected fulfills the requirements for capacity and unit number, at the same time providing good performances.

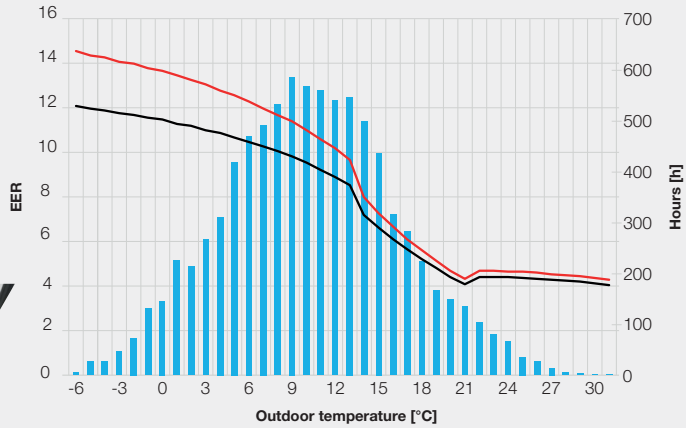
Plant operating conditions

Operating schedule: 7 days/week, continous operation
Return/deliver water set point: 25/18 °C

Economic conditions

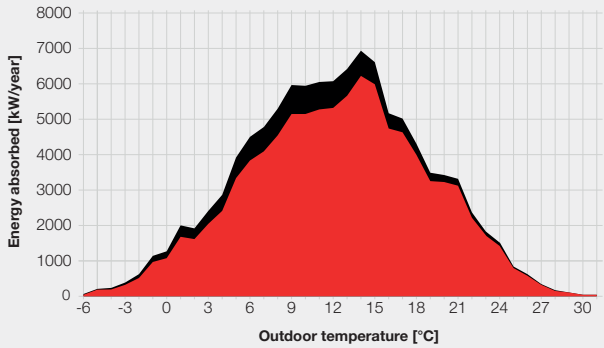
Energy cost: 0,16 €/kWh
Interest rate: 6% Inflation rate: 3%

ANNUAL ENERGY EFFICIENCY AND CONSUMPTION COMPARISON



Electrical Energy
KWh/Year

CRAH fan regulation: 100%
HPC: 88.7%%



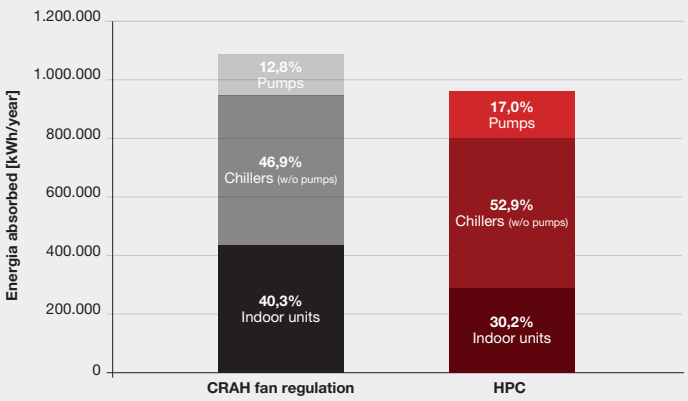
Energy Consumption **-11.3%**

Results

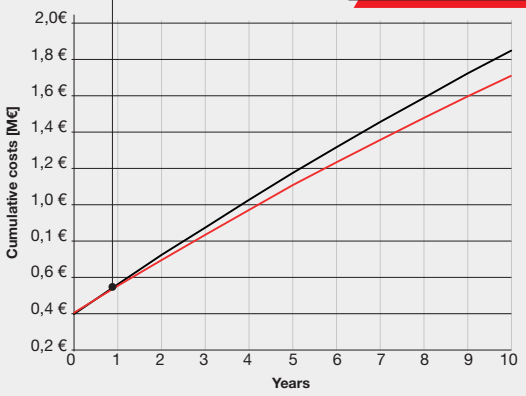
The results obtained comparing HPC and CRAH fan regulation. The overall amount of energy saved by HPC logics is significant. HPC reduces the energy consumption by 11.3%. The main differences involves the CRAH units and the pumps.

Instead of wasting energy in the two-way valve, HPC acts on the setpoint, reduces the energy absorbed by the indoor unit and slightly increases pump consumption.
The advanteges of HPC control logics are particular impressive in mid-to-low temperatures where the free cooling technology is exploited at its maximum.

Moreover, payback values show a really interesting return on investment of 10 months making HPC a really remarkable solution for optimizing Data Centers' cooling systems.



10 MONTHS ≃-16800 €/year



AT A GLANCE

Power input saving	CO_2 saved per year	Payback period	Annual energy efficiency
122.634 kWh per year	674.48 tons	10 months	+13 %

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MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.

Head Office: Via Caduti di Cefalonia 1 - 36061 Bassano del Grappa (VI) - Italy
Tel (+39) 0424 509 500 - Fax (+39) 0424 509 509
www.climaveneta.com
www.melcohit.com