

490 kW, Tier III, Chilled Water, Prefabricated, 697 m²



DESIGN OVERVIEW

Data Center IT Capacity

490 kW

Adaptable from 95 kW to 490 kW

Target Availability

Tier III

Annualized PUE at 100% Load

1.33 in Beijing, China

1.30 in Paris, France

1.41 in Singapore

Total Racks and Average Density

98 racks at 5 kW/rack

Data Center Overall Space

Min. 697 m²

Regional Voltage and Frequency

400V, 50Hz

ABOUT THIS DESIGN

- Highly scalable and adaptable with Prefabricated IT, Power, and Cooling Modules
- Integrated room-based air distribution
- Chilled water system using *Uniflair* air-cooled packaged chillers with variable-speed compressors to increase efficiency
- Redundant design for increased availability and concurrent maintenance

INTRODUCTION

The planning process of most projects can be iterative and thereby expensive. Data center projects are burdened with these challenges and can benefit greatly from simplification and time savings. Schneider Electric's data center reference designs help optimize the planning process by providing validated, proven, and documented data center physical infrastructure designs. The use of these designs has a positive impact on not just the project itself, but also on the performance, reliability, and efficiency of the data center over its lifetime.

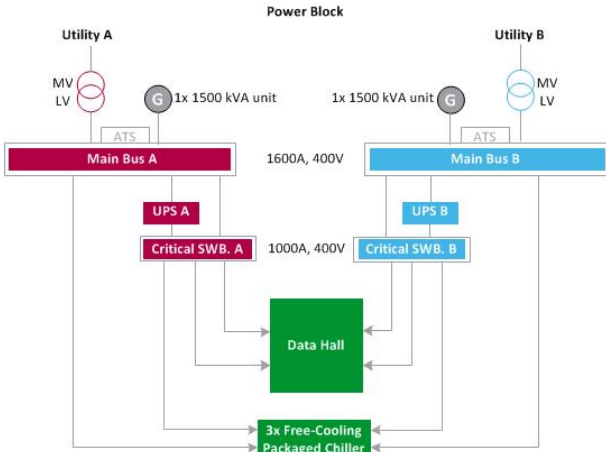
Reference Design 86 includes information for three spaces: facility power, facility cooling and IT space. This design is constructed of prefabricated modules, comprising the integrated power, cooling and structural systems required to meet its specifications in this overview document.

This design is Uptime Institute TIER-ready III compliant. This assures the design can be deployed onsite, and then quickly and cost-effectively certified by Uptime Institute for industry-standard TIER III reliability.



Facility Power

FACILITY POWER BLOCK DIAGRAM



The facility power system supplies power to the critical and non-critical components within the data center. In this Tier 3 design, power is supplied through two 500 kW power modules. The two modules provide 2N UPS power to the IT space, altogether backed up by a 2N generator configuration. Inside each power module, a 1600-amp main bus feeds a 625 kW *Galaxy VX* UPS with 5 minutes of runtime and a 1000-amp *Prisma* switchboard. The main bus also feeds three packaged chillers. The 2N power distribution architecture from the electrical room to the IT space utilizes a combination of LV panels and busways to the IT racks. To provide continuous cooling, the 2N UPS also feeds the computer room air handler (CRAH) units in the Data Hall and the chillers' control and on-board pumps.

The facility power system is designed to support integrated peripheral devices like fire panels, access control systems, and environmental monitoring and control devices. Power meters in the electrical path monitor power quality and allow for predictive maintenance & diagnostics of the system. These meters also integrate with *EcoStruxure Power Monitoring Expert*.

Every component in this design is built and tested to the applicable IEC or IEEE standards.

Further design details and schematics are available in the engineering package.

DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

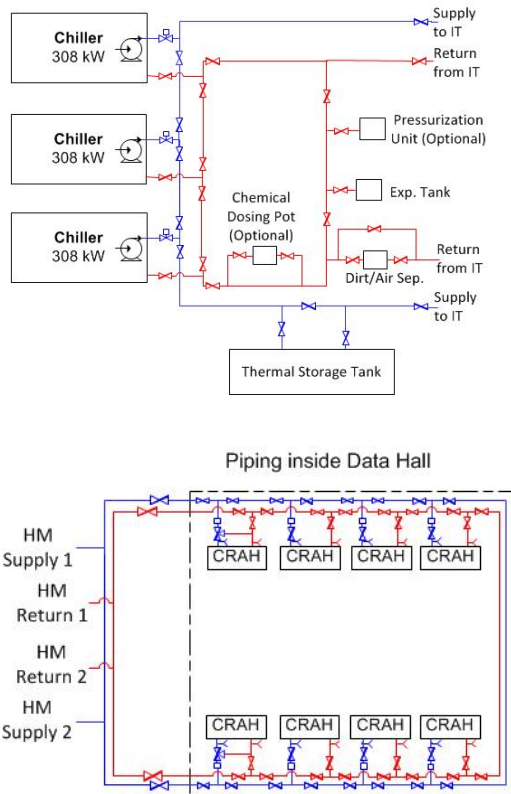
- Add *EcoStruxure Power Monitoring Expert*
- Provision for load bank
- Change UPS batteries
- Add/change standby generator options:
 - Location
 - Tank size
 - Fuel type

FACILITY POWER ATTRIBUTES

Name	Value	Unit
Total amps (main bus)	1600	A
Input voltage (main bus)	400	V
Switchboard kAIC	36	kA
Power path	Dual	
Generator redundancy	2N	
IT space UPS capacity	625	kW
IT space UPS redundancy	2N	
IT space UPS runtime @ rated load	5	minutes
IT space UPS output voltage	400	V
Facility cooling UPS capacity	N/A	kW
Facility cooling UPS redundancy	N/A	
Facility cooling UPS runtime @ rated load	N/A	minutes

Facility Cooling

FACILITY COOLING BLOCK DIAGRAM



The facility cooling design is comprised of a chilled water cooling system with dual path piping system, three *Uniflair TSAF* packaged chillers with free cooling capabilities and 8 *Uniflair LE* chilled water room-based computer room air handlers (CRAHs) that delivers clean and conditioned supply air to the IT and electrical rooms, in an N+1 configuration.

The *Uniflair TSAF* chillers leverage variable speed technology to all main components (compressors, pumps, etc.) and economization to achieve great efficiency. Economization is achieved with a dedicated free-cooling pump to pump water through special heat-exchange coils to be cooled by ambient temperature during favorable outdoor conditions. For applications where the use of antifreeze solutions is not allowed, Schneider Electric free-cooling chillers can be equipped with the glycol-free solution. This option permits only free-cooling circuits in units to be filled with a glycol/water mixture, leaving pure water on the other parts of the circuit. The unit is equipped with an onboard intermediate heat exchanger that isolates the principal hydraulic circuit and the free-cooling circuit.

The redundant piping system across the IT hall provides an alternate path for chilled water in case of cooling equipment failure. These CRAH units, and the chiller's controls and on-board pumps are also fed by 2N UPS power to provide continuous cooling. A thermal storage system is offered to provide 5 minutes of continuous cooling after a power outage or chiller restart. The *Uniflair TSAF* chillers can fully restart within 5 minutes.

More information on the CRAHs' configuration is provided in the IT space section of this document.

This design is instrumented to work with *EcoStruxure IT Expert*.

Further design details such as dimensions, equipment placement, temperature set points, pipe sizing, flow rates, and pressure drops are available in the engineering package.

DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

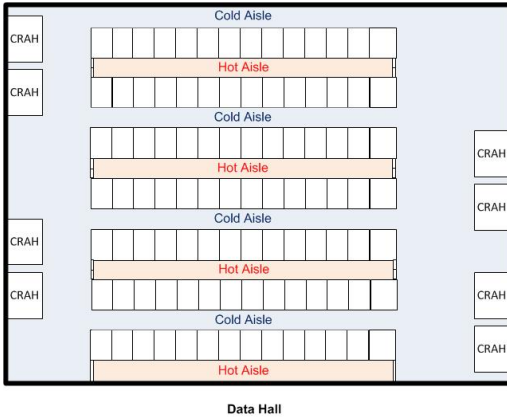
- Add *EcoStruxure IT Expert*
- Change storage tank size
- Use air-cooled version instead of free-cooling version for the chillers

FACILITY COOLING ATTRIBUTES

Name	Value	Unit
Total cooling capacity (N)	617	kW
Input voltage	400	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Packaged chiller with free-cooling	
Coolant supply temperature	15	°C
Coolant return temperature	20.6	°C
Storage tank size	8	m ³
Ride-through time	5	minutes
Outdoor ambient temperature range	-18.5 – 41.6	°C
Economizer type	Water-side	

IT Space

IT HALL LAYOUT



This data hall comprises of 7 modules and makes up the IT space of this design. The data hall is comprised of 7 rows of 14 racks reach for a total of 98 racks. Each rack is capable of an average of 5kW for a total of 490 kW of IT capacity.

The data hall is designed to be a scalable multi-module prefabricated solution for deployment of 50-200 racks; smaller starting loads can be supported by using fewer modules to make the data hall. Likewise, this design can be used as a baseline for larger loads by using a step and repeat approach to the design. This flexibility drives efficiency and defers capital expenditure until need.

Each rack is powered by having taps off redundant (2N) 160 A *Canalis KN* busway. Every rack is configured with redundant (2N) metered rack-mount PDU to enable remote monitoring of the units for efficiency and capacity management.

The data hall is cooled by N+1 redundant chilled water perimeter *Uniflair LE* CRAHs. The racks are placed to form alternating hot and cold aisles, where the hot air is contained and ducted back to the CRAHs. To ensure Tier 3 reliability, this design includes redundant valves and piping.

The security of the room is maintained at multiple points. At the rack level, access is controlled by a door lock and sensor. At the room level, security cameras are utilized for monitoring.

DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Add environmental and security management
- Change rack options (tall, wide, deep)
- Change power distribution options (rack PDU type: basic, switched)
- Change from 16A, 3-phase to 32A, 1-phase tap-off units to racks
- Add isolation transformer
- Add *EcoStruxure IT Expert*

IT SPACE ATTRIBUTES

Name	Value	Unit
IT load	490	kW
Input voltage	400	V
Supply voltage to IT	230	V
Average density	5	kW/rack
Number of racks	98	racks
IT floor space	244	m ²
Single or dual cord	Dual	
Heat rejection medium	Chilled water	
CRAC/CRAH type	Perimeter CRAH	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

Design Attributes

OVERVIEW	Value	Unit
Target availability	Tier 3	Tier
Annualized PUE at 100% load	1.33 / 1.30 / 1.41	
Data center IT capacity	490	kW
Data center overall space	697	m ²
Average density	5	kW/rack
FACILITY POWER	Value	Unit
Total amps (main bus)	1600	A
Input voltage (main bus)	400	V
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IT space UPS output voltage	400	V
Facility cooling UPS capacity	N/A	kW
Facility cooling UPS redundancy	N/A	
Facility cooling UPS runtime @ rated load	N/A	minutes
FACILITY COOLING	Value	Unit
Total cooling capacity (N)	617	kW
Input voltage	400	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Packaged chiller with free-cooling	
Coolant supply temperature	15	C
Coolant return temperature	20.6	C
Storage tank size	7.3	m ³
Ride-through time	5	minutes
Economizer type	Water-side	
IT SPACE	Value	Unit
IT load	490	kW
Input voltage	400	V
Supply voltage to IT	230	V
Average density	5	kW/rack
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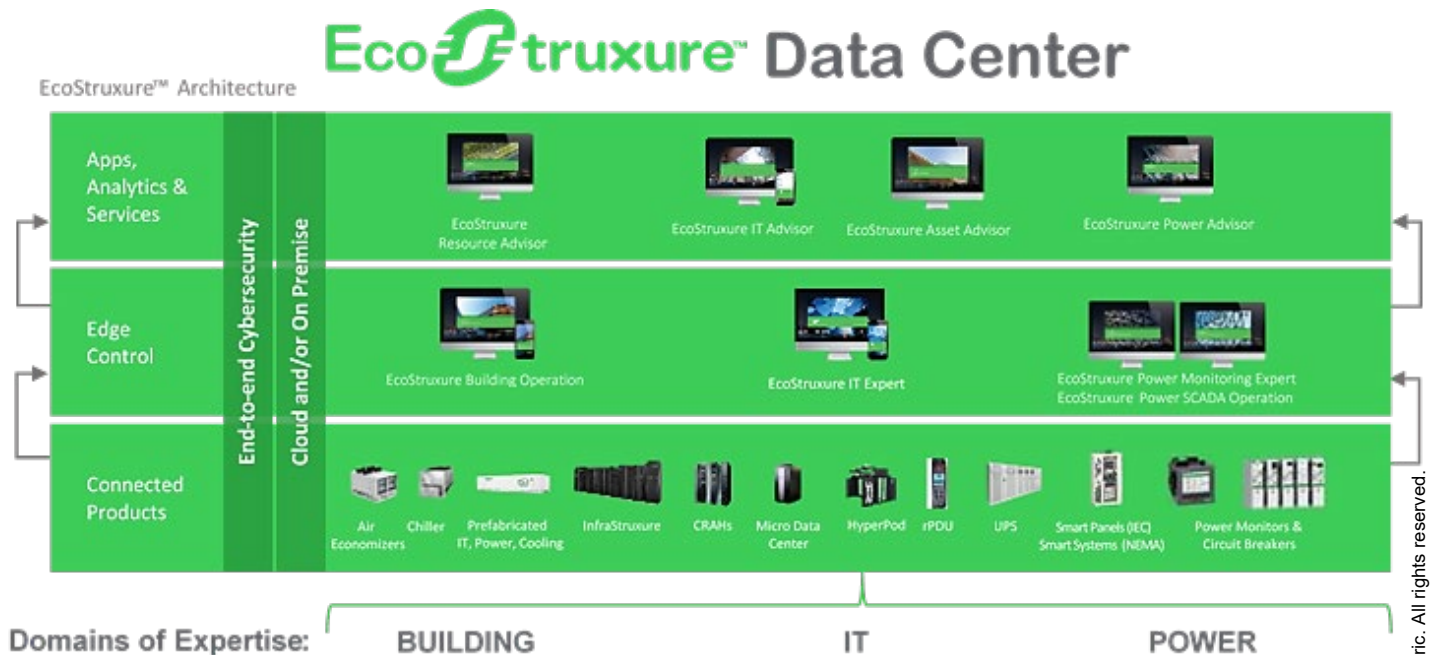
EcoStruxure Data Center

EcoStruxure™ is Schneider Electric’s open, interoperable, integrated Internet of Things (IoT)-enabled system architecture and platform. *EcoStruxure* delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers. *EcoStruxure* leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level. It consists of three layers: connected products, edge control, and applications, analytics, and services. This includes Connected Products, Edge Control, and Apps, Analytics & Services. *EcoStruxure™* has been deployed in 480,000+ sites, with the support of 20,000+ system integrators and developers, connecting over 1.6 million assets under management through 40+ digital services.

The connected products layer communicates with the edge control layer, which allows users to remotely monitor and control the connected products in real time. The edge control layer communicates with the application, analytics, and services, which will translate data into actionable intelligence and better business decisions. All three layers are secured with end-to-end cybersecurity. *EcoStruxure* can either be located on-premise (this will only consist of the connected products and edge control layers) or the cloud.

EcoStruxure Data Center is a combination of three domains of *EcoStruxure*: Power, Building, and IT. Each domain is focused on a subsystem of the data center: power, cooling, and IT. These three domains combined will reduce risks, increase efficiencies, and speed operations across the entire facility.

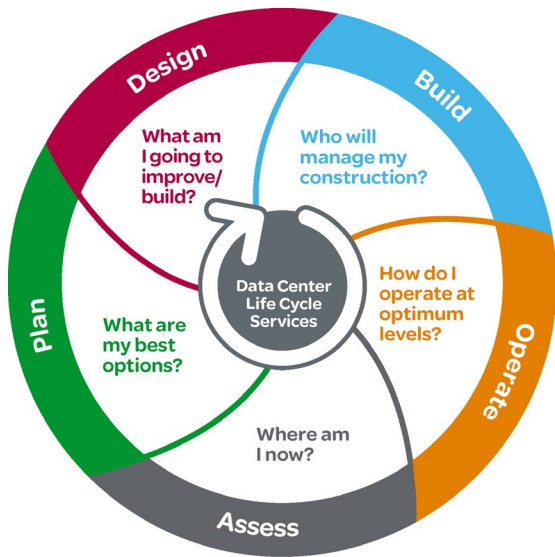
- *EcoStruxure Power* monitors power quality, generates alerts, while protecting and controlling the electrical distribution the electrical distribution system of the data center from the MV level to the LV level. It uses any device for monitoring and alerting, uses predictive analytics for increased safety, availability, and efficiency, while lowering maintenance costs.
- *EcoStruxure Building* controls cooling effectively while driving reliability, efficiency, and safety of building management, security, and fire systems. It performs data analytics on assets, energy use, and operational performance.
- *EcoStruxure IT* makes IT infrastructure more reliable and efficient while simplifying management by offering complete visibility, alerting and modelling tools. It receives data, generates alerts, predictive analytics, and system advice on any device to optimize availability and efficiency in the IT space.



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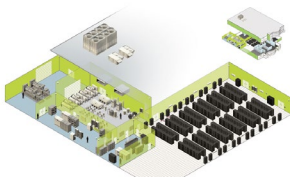
➤ Visit [EcoStruxure for Data Center](#) for more details.

Schneider Electric Life-Cycle Services

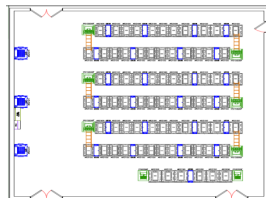


- 1** Team of **over 7,000 trained specialists** covering every phase and system in the data center
- 2** Standardized, documented, and validated **methodology** leveraging automation tools and repeatable processes **developed over 45 years**
- 3** Complete **portfolio of services** to solve your technical or business challenge, simplify your life, and reduce costs

Get more information for this design:



3D spatial views

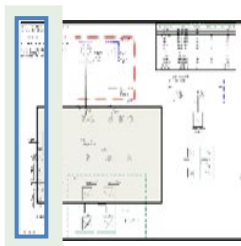


Floor layouts

Engineering Package

Every reference design is built with technical documentation for engineers and project managers. This includes engineering schematics (CAD, PDF), floor layouts, equipment lists containing all the components used in the design and 3D images showing real world illustrations of our reference designs.

Documentation is available in multiple formats to suit the needs of both engineers and managers working on data center projects.



One-line schematics



Bill of materials

> Email ReferenceDesigns@Schneider-Electric.com to receive the **Engineering Package** for this design