88 kW, Tier 1, Direct Expansion, 1637.5 ft^2 All-In-One Prefab Data Center Module - PDU

DESIGN OVERVIEW

Data Center IT Capacity
88 kW

Target Availability
Tier 1

Annualized PUE at 100% Load
1.64

Total Racks and Average Density
11 racks at 8 kW/rack

Data Center Overall Space
1637.6 ft^2

Regional Voltage and Frequency
480V, 60Hz

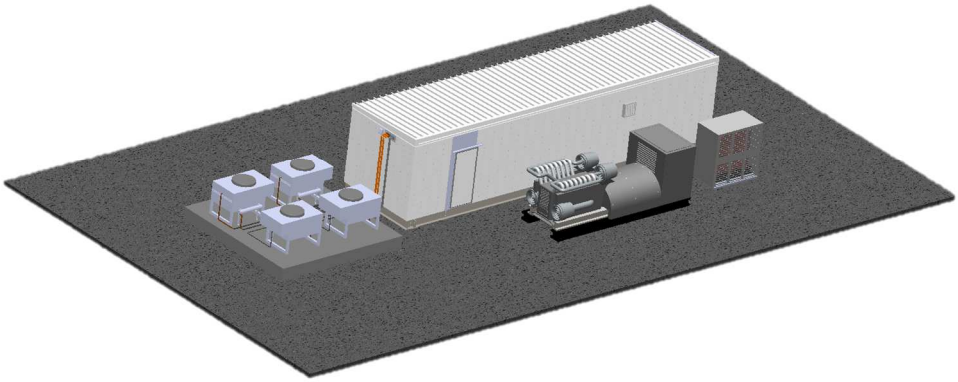
ABOUT THIS DESIGN

- **Direct expansion, close coupled cooling architecture**
- **Integrated row-based air distribution**
- **Hot aisle containment for increased cooling efficiency**
- **Highly scalable and adaptable**
- **Modular UPS**

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 customers optimize the planning process by providing them with 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.

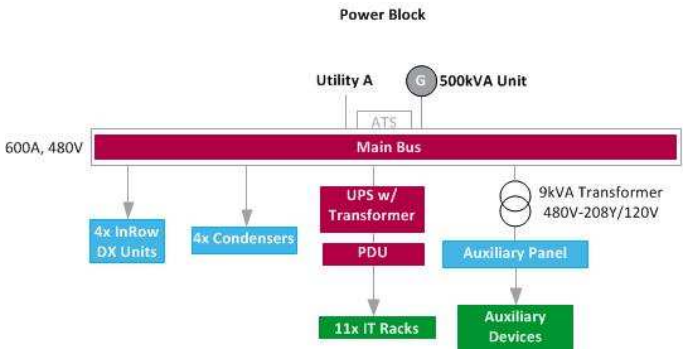
Reference Design 83 includes design information for three spaces: IT space, facility power, and facility cooling. The data center is constructed of a single pre-fabricated module with some external components, comprising the integrated power, cooling, and structural systems required to meet the design's specifications published in this overview document.



Schneider Electric

Facility Power

FACILITY POWER BLOCK DIAGRAM



The facility power system supplies power to the critical and non-critical components within the data center. The electrical architecture used in this Tier 2 data center design is a single path with UPS. The utility feed and generator in parallel delivers power to a 600 amp *I-Line* panelboard in the lobby, which then feeds the cooling equipment, auxiliary devices, and a 90kW *Symmetra PX* UPS that provides critical power to the IT room with 6.7 minutes of battery runtime. The *Symmetra PX* integrates a battery cabinet, a redundant 10kW module, and a modular power distribution unit, with maintenance bypass, that stand as part of the IT pod

The facility power system is designed to support additional 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 *StruxureWare Power Monitoring Expert*.

Every component in this design is built and tested to the applicable ANSI, NEMA, UL 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 *StruxureWare Power Monitoring Expert*
- Provision for load bank
- Change UPS batteries
- Add/change standby generator options:
  - Location
  - Tank size
  - Fuel type

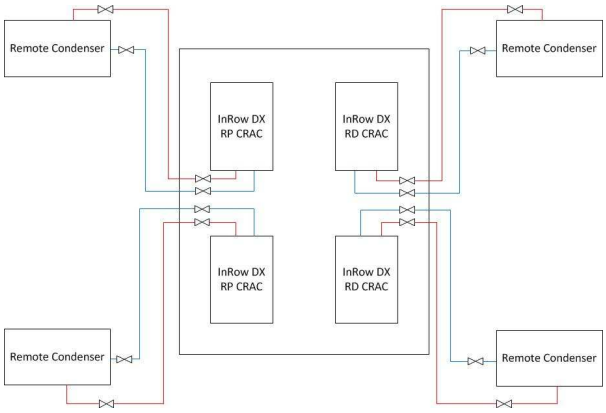
The switch gear in this design can be sized to 400A instead of 600A. However, due to 400A being a custom size for switchgear, this reference design uses the 600A module for the main bus.

FACILITY POWER ATTRIBUTES

Name	Value	Unit
Generator redundancy	N	
Total amps (main bus)	600	A
Input voltage (main bus)	480	V
Panelboard kAIC	65	kA
Power path	Single	
IT space UPS capacity	90	kW
IT space UPS redundancy	N+1	
IT space UPS runtime @ full load	6.7	minutes
IT space UPS output voltage	208 / 120	V
Facility cooling UPS capacity	None	
Facility cooling UPS redundancy	None	
Facility cooling UPS runtime @ full load	None	

Facility Cooling

FACILITY COOLING BLOCK DIAGRAM



The mechanical design utilizes direct expansion as the primary system for heat dissipation. The architecture consists of four *InRow DX* units four remote air-cooled condensers in an N+1 configuration. A direct expansion system can effectively cool this small facility environment, since the refrigerant has only a short distance to travel from CRAC to condenser.

The predictable performance of the row-based cooling architecture makes it well-suited for this medium density application. Furthermore, a hot aisle containment system minimizes the mixing of hot and cold air streams, increasing the cooling efficiency and performance.

This design is instrumented to work with *StruxureWare Cooling Monitoring 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:

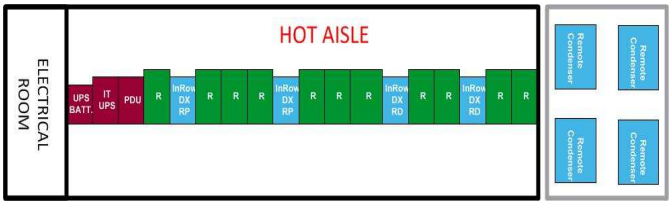
- Add *StruxureWare Cooling Monitoring Expert*
- *Location of external condensers:*
  - *Side of module*
  - *Back of module*

FACILITY COOLING ATTRIBUTES

Name	Value	Unit
Total net cooling capacity (N)	101.9	kW
Input voltage	480	V
Heat rejection medium	R-410A	
Mechanical redundancy	N+1	
Outdoor heat exchange	Remote air-cooled condensers	
Supply air temperature	68	°F
Return air temperature	98	°F
Storage tank size	None	
Ride-through time	None	
Economizer type	None	

IT Space

IT SPACE FLOOR LAYOUT



The IT capacity of this single-pod design is 88 kW. For deployments that require a small footprint, this design is ideal. Rather than require additional IT racks or pods, the rack density can be scaled up to 8kW per rack as computing demands increase to drive efficiency and defer capital expenditure until needed

The IT space design specifies all the physical infrastructure systems and respective spacing arrangements required to meet the overall design's performance attributes. This includes racks, PDUs, rack power distribution, cooling units, and the hot-aisle containment system.

The pod supports power densities up to 8 kW per rack, and the modular power distribution unit accompanying the 90kW *Symmetra PX* UPS supplies server-level voltage to the racks with N+1 redundancy from an additional 10kW power module. Each rack is configured with a metered rack-mount PDU to enable remote monitoring of the units for efficiency and capacity management.

InRow RD & RP units control the removal of heat by monitoring the temperature in the room and the pressure in the contained hot aisle.

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)
- Add *StruxureWare Data Center Expert*

IT ROOM ATTRIBUTES

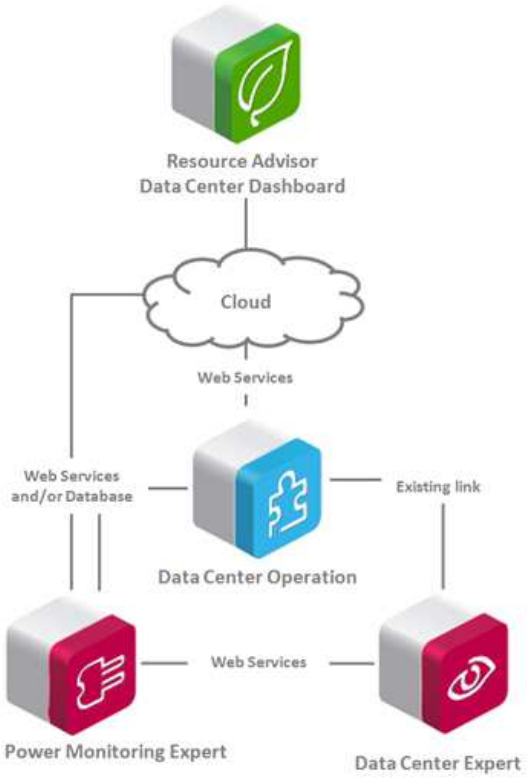
Name	Value	Unit
IT load	88	kW
Input voltage	480	V
Supply voltage to IT	208 / 120	V
Average density	8	kW/rack
Number of racks	11	racks
IT floor space	384.8	ft^2
Single or dual cord	Single	
Heat rejection medium	R-410A	
CRAC/CRAH type	Row-based DX CRACs	
CRAC/CRAH redundancy	N+1	
Containment type	Hot aisle	

Design Attributes

OVERVIEW	Value	
Annualized PUE at 100% load	1.64	
Data center overall space	1637.6 ft.^{2}	
FACILITY POWER	**Value**	**Unit**
Generator redundancy	N	
Total amps (main bus)	600	A
Input voltage (main bus)	480	V
Max. Input Current	400	A
Panelboard kAIC	65	kA
Power path	Single	
IT space UPS capacity	90	kW
IT space UPS redundancy	N+1	
IT space UPS runtime @ rated load	6.7	minutes
IT space UPS output voltage	208 / 120	V
Facility cooling UPS capacity	None	
Facility cooling UPS redundancy	None	
Facility cooling UPS runtime @ rated load	None	Minutes
FACILITY COOLING	**Value**	**Unit**
Total cooling capacity	101.9	kW
Input voltage	480	V
Heat rejection medium	R-410A	
Mechanical redundancy	N+1	
Outdoor heat exchange	Remote air-cooled condensers	
Refrigerant supply temperature	68	°F
Refrigerant return temperature	95	°F
Storage tank size	None	
Ride-through time	None	
Economizer type	None	
IT SPACE	**Value**	**Unit**
IT load	88	kW
Input voltage	480	V
Supply voltage to IT	208 / 120	V
Average density	8	kW/rack
Number of racks	11	Racks
IT floor space	384.8	ft^2
Single or dual cord	Single	
Heat rejection medium	R-410A	
CRAC/CRAH type	Row-based DX CRACs	
CRAC/CRAH redundancy	N+1	
Containment type	Hot aisle	

Data Center Infrastructure Management (DCIM) System

Good design and quality construction alone do not ensure a highly available & efficient data center. DCIM provides on-going monitoring and control to ensure the facility lives up to its design intent. *StruxureWare for Data Centers* is a software management suite designed to collect and manage data about a data center's assets, resource use, and operational status throughout the life cycle of the facility. This information is then distributed, integrated, and applied in ways that help managers optimize the data center's performance and meet IT, business, and service-oriented goals. From IT assets to racks, rows, rooms and buildings, *StruxureWare for Data Centers* delivers the right information to the right users at the right time.



Control level: Experts, on site or remotely, can control process performance and ensure business continuity in real time, while tracking energy consumption in a highly critical and secure environment.

Operations level: Functional managers can optimize operations, energy, and assets through smart analytical tools, often spanning multiple sites.

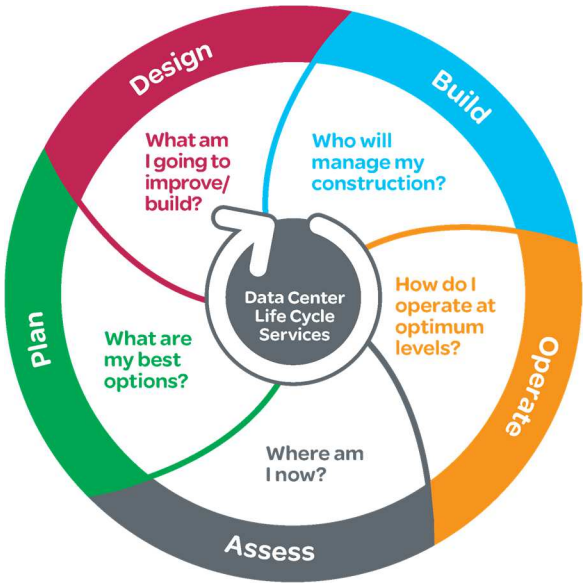
Enterprise level: C-level executives can drive their sustainability strategy efficiently, choosing the best scenario that meets their business objective to conserve enterprise-wide resources.

StruxureWare for Data Centers allows for flexibility when requirements and implementation strategies change over time. *StruxureWare* software applications and suites simplify integration time, improve reliability, enhance visibility to energy information, and streamline operational efficiency.

StruxureWare for data centers

> Demo:
> Visit *www.apc.com/software* to learn more about StruxureWare for Data Centers!

Schneider Electric Life-Cycle Services

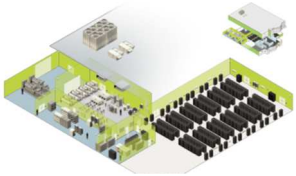


1 Team of over 7,000 trained specialists covering every phase and system in the data center

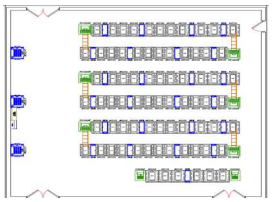
2 Standardized, documented, and validated methodology leveraging automation tools and repeatable processes developed over 45 years

3 Complete portfolio of services to solve your technical or business challenge, simplify your life, and reduce costs

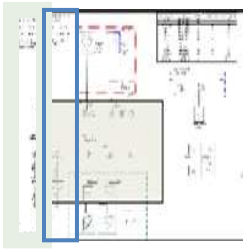
Get more information for this design:



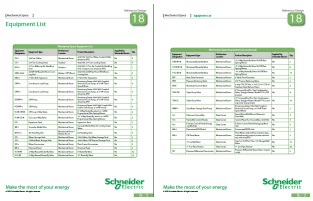
3D spatial views



Floor layouts



One-line schematics



Bill of materials

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.

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