SmartShelter™ Data Hall

500kW/60Hz IT Module

Technical Guide

Version 1.0

Schneider Electric

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1 Safety Information

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this signal word.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

All electrical modification and maintenance to and within the Data Hall must be performed by a licensed electrician, and must follow all applicable local and national codes.

All cooling system modifications and maintenance to and within the Data Hall must be performed by a certified HVAC technician who is approved to work with refrigerant and water lines. All work must comply with local and national codes.

Refer to the safety instructions for each component of the Data Hall for specific safety requirements of said component. The instructions are provided with the Data Hall, and can also be found online.

The Data Hall is not intended for occupancy except for short-duration maintenance access.

No user-serviceable parts are behind panels that require tools to open.

Consult your local planning office for applicable codes and to review necessary permitting and guidelines for your specific site.

The Data Hall must not be installed near open flame per local codes and ASHRAE specifications.

2 Introduction

2.1 Context

The purpose of the document is to introduce and present the technical specification of the SmartShelter™ Data Hall Prefabricated Datacenter offered by Schneider Electric.

SmartShelter™ Data Hall solution provides a fully functional datacenter consisting of several prefabricated modules joined together in a way that maximizes the efficiency of the system components, thus providing the optimum value to the datacenter owner. The system includes a complete datacenter infrastructure including: cooling, power, enclosures, cable management, fire protection, monitoring, access control, etc., within a secure environment, comprising a modular and flexible approach.

The environment has been designed to provide the following qualities:
- Usability for IT and technical operations
- Security: Mechanical, Electrical, Cooling
- High quality, robust structure
- Reduced acquisition and deployment time

2.2 Main benefits

Prefabricated Datacenter Modules are the latest trend in the datacenter industry. They are intended to decrease deployment time, reduce cost, and improve the predictability and reliability of a new datacenter build.

All equipment in the Data Hall are pre-installed and tested in the factory, reducing field work and risk. The Data Hall does not include IT servers, switches, etc.

Schneider Electric is a worldwide market leader in the datacenter business. Schneider Electric's portfolio of integrated solutions includes prefabricated modules, UPS, power distribution, cooling, software, monitoring, and enclosures. Our installed base gives us a thorough knowledge of data center market evolution, future needs, and an understanding of business challenges. The goal of Schneider Electric is to earn your respect and become your trusted partner in the datacenter market.

2.3 Scope of work

This document covers the following topics:

- Module structure and design
- Electrical distribution
- Cooling
- IT Infrastructure (Enclosures, Power Distribution)
- Fire suppression and detection
- Monitoring

3 Prefabricated Datacenter Module

3.1 General Specifications

Solution for 500kW with chilled water perimeter cooling includes:

- External Structure
  - 7 IT modules - final assembled dimension after baying together to form a single room:
  - 13.70m (45.0') x 18.04m (59.2') x 3.58m (11.8') (LxWxH)
  - Individual module dimensions:
  - (2) 13.70m (45.0') 3.2m (126') x 3.58m (11.8') (LxWxH)
  - (5) 13.70m (45.0') 2.4m (94.5"') x 3.58m (11.8') (LxWxH)
- Power Distribution:
  - (2) 1200A / 480V I-line Panelboard, distributing power from the UPS protected input source to Modular Power Dsitribution uits located in the row
  - (2) 600A/ 480V I-Line Panelboard, distributing power to (2) air conditioners, ATS panel, and house loads
  - (1) 250A / 480V I-line Panelboardwith automatic transfer pair input breakers distribution power to (6) air conditionsd
  - (8) Modular Power Dsitribution Units, Part # PDPM175G6H distributing power to IT enclosures in row
  - (6) Modular Remote Power Panels, Part # PDPM277H distributing power to IT enclosures in row
  - (194) AP8881 Rack PDU 2G, Metered, Zero U, 11kW, 230V, (36) C13, and (6) C-19
  - Input Voltage 480 VAC 3 Phase,415 VAC 3 phaseVoltage supplied to IT Enclosures
- Cooling:
  - (8) CRAH (Computer Room Air Conditioner) Perimeter Chilled Water units, TDCV2500G in an N+1 configuration
  - Cooling capacities are nominally rated for 14 degree C differential between hot and cold aisles, performance may vary based on load conditions.
  - Cooling Capacity is calculated based on 15 degree C water temperature and 35% glycol
  - Humidification included within two of the CRAC units
  - Chillers not included
- Racks – NetShelter™ SX Enclosures
  - (88) AR3300 NetShelter™ SX, 600mm x 1200mm x 2000mm (WxDxH)
  - (9) AR3350 NetShelter™ SX, 750mm x 1200mm x 2000mm (WxDxH)
- Automatic Fire Extinguishing System – Novec 1230 Extinguishing Agent
- Environmental Monitoring:
  - Netbotz 570 environmental monitoring system monitoring the following
    - Internal temperature
    - Internal humidity
    - Leak detection
    - External Door Status
    - Security camera monitoring
    - Fire System Status
    - Ventilation System status

- Cable seals for power, piping, and data cable entries
- StruxureWare™ DC Expert Basic for overall Datacenter Monitoring
- Cable management: A single run of cable tray is provided above each row of racks with 2 perpendicular cross runs on each end running the length of the data hall

3.2 Structural design

The SmartShelter™ Data Hall Structural framework will be made of steel with a fully welded design frame to support the installed equipment. The walls and the roof will be constructed from modular insulated panels fit to size for the frame. The total solution will be constructed from 7 individual modules assembled together on site.

3.2.1 Steel Frame design

The frame consists of fully welded structural steel members. The base frame will be a box frame with cross member for additional stiffness. The roof of the frame will have a truss system that facilitates drainage off the roof.

3.2.2 Wall design

Prefabricated wall and roof panels enclose the Data Hall, providing an ideal space to house a datacenter. Wall panels use rock wool insulation bonded to metal facings on both sides, and are suitable for fire rated applications. Roof panels use a polyisocyanurate core bonded to metal facings on both sides.

Final Inner Dimensions [1]	
Length	527.6” (13400mm)
Width	700.8” (17800mm)
Height	92.5” (2349mm)

[1] 2% tolerance

3.2.3 Floor

The Data Hall is equipped with 1.5”(nominal) thick marine plywood flooring finished with vinyl tile.

3.2.4 Doors

The SmartShelter™ Data Hall includes four standard doors. Dimensions of the doors are 3' wide x 7' High. Door construction meets requirements of ANSI A250.8-2003 (SOi l 00).

The doors should be positioned per the detail drawing specification. Door and door frame to accommodate optional electronic entry system. The door core will include insulation to provide minimum R-6 thermal insulation.

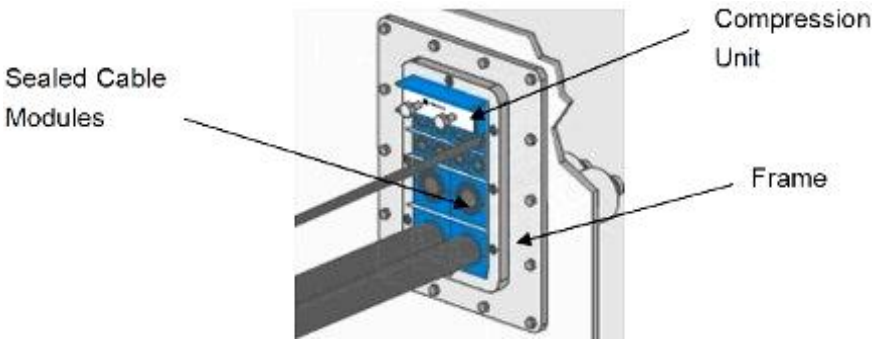
Optional constructions with 1 hour fire rated walls will require that the door assembly be ¾ hour minimum fire rated. It shall be tested to NFPA- 252 as verified and listed per UL10C..

All Doors supplied with

- external locking mechanism
- frame and threshold
- gasket
- door closer hardware
- Aluminum panic bar

3.2.5 Cable Seals

Roxtec cable seals are installed at all cable and pipe penetration points. Cable seals provide thermal, fire, and water protection for the module. The cable seal is easily configurable to adapt to the number and size of cables and pipes that enter the module.



3.2.6 Energy Recovery Ventilation)

The Energy Recovery Ventilation (ERV) is a ventilation unit designed to meet air renovation requirements to comply with local regulations in containerized Data Centers where IT equipment is installed. 3 units are provided to accommodate the total volume of the air in the final solution

The ERV draws outside air through a filter and supplies it to the IT space in accordance with ASHRAE standards.

Includes:

- ERV unit with ducting

- (2) Washable core filters
- Electronic control with LCD screen

3.3 Technical Specifications

The module is designed to provide a controlled environment suitable for equipment and temporary personnel. The units are capable of delivery and installation on site without any permanent deformation or failure.

3.3.1 Shock-load

Data Hall module units can withstand normal transportation conditions without deformation or damage.

3.3.2 Wind load

The module can withstand wind speeds up to 130 mph. as defined by BS6399 1997 Part 2 ‘Loading for Buildings – Code of Practice for Wind Loads

3.3.3 Roof load

The module can withstand roof loads up to 50 lbs/ft^2.

3.3.4 Floor load

The module can withstand floor loads up to 250psf across the entire floor structure. Specific bracing for heavy components such as battery cabinets are provided.

3.3.5 Internal environmental conditions

The internal conditions will be maintained at ASHRAE 90.1 recommended temperature and humidity ranges.

3.3.6 Fire resistance

1 hour fire resistant construction for enclosure walls, and doors is provided as an option.

3.3.7 Painting

Data Hall frames have two primer epoxy and two final polyurethane coats in a RAL 9003 standard color. This surface treatment provides C4 corrosion protection with high durability (>15 years).

According to the ISO 12944 standard, a C4 protection works well in industrial and coastal areas as well as near chemical processing plants.

3.4 Lifting elements

Lift at the top corner fittings within 30deg of vertical (in the direction of the long side) by means of spreaders fitted with hooks, shackles or twist locks.

4 Electrical System

Following is the description of the electrical system provided inside the module.

4.1 Components

- Main Input Panel: (2) 480V, 1200A I-Line three-phase electrical panel, TN-S type construction fed from a UPS protected source. Each main panel will feed all the critical IT equipment in the module. The IT enclosures are fed from both panels in a 2N configuration.
- Non-Critical Input Panel: (2) 480V, 600A I-Line three-phase electrical panel, TN-S type construction fed from a utility source These panles feed 2 air conditioners, WTS panel and house loads. House loads includes, lighting, convenience wall outlets, fire suppression, and other auxiliary systems.
- ATS Panel – (1) 250 A I-Line three phase electrical panel with (2) 250A input breakers controlled by an automatic transfer switch controller. This panel feeds (6) air conditioners

- Automatic Transfer Switch Controller: ATS control is provided to the main switch input panel from a wall mounted Woodward brand controller.
- Rack PDU: (210) Metered rack PDU, SKU# AP8881. It has an input rating of 16A 3 Phase at 230V. Power is output through IEC 320 C13 (36) and C19 (6) outlets**.**
- Main Power Distribution: (8) Modular power distribution unit part # PDPM175G6H providing power distribution from each UPS protected input to each rack. The Modular Power Distribution unit accepts 480V and transforms input power to 415V before feeding power to the rakcks.
- Remote Power Panel (6) Remote power panels, part # PDPM277H are fed by (6) of the Main PDUS to provide additional distribution to some of the racks in each row..
- Lighting: Light Fixtures providing 300 lux are installed in each aisle in the rack space.
- Emergency lighting: (4) Exit Sign/Emergency lighting block mounted above each door. Additioanl emergency lights are provided in each module.

4.2 Grounding

The module includes an integrated grounding system. The customer must supply a ground from the external system to a grounding bar on the outside of the module. All internal components will be grounded to this bar. The module is designed to connect to a TN-S type grounding system.

5 Fire Suppression System

The fire protection system is designed to prevent, detect and extinguish possible fires inside the rooms. This will be an automatic system innocuous for people, goods and friendly environment. It will include the following equipments:

- Fire Control Panel
- Smoke Detection System
- Fire extinguishing system based on Novec1230.

5.1 Fire Control Panel

The fire panel controls the fire detection and extinguishing system. The panel can monitor two distinct areas, can trigger at least 2 levels of alarms, and incorporate a delay to evacuate the room before activating the extinguishing system. The system can also be activated by a manual switch attached to the panel.

This solution will implement an ANSUL AutoPulse 542R fire panel with following features:

- Suitable for multiple types of Suppression: Clean Agent, Carbon Dioxide, Pre-Action Sprinkler/Deluge, and Watermist Systems
- Microprocessor based with hardware and software integration designed to guarantee reliability
- Cross zone, sequential manual release, abort, water flow and supervisory detection types
- Three Class B, Style Y notification appliance circuits rated for 2. 0 amps @ 24VDC
- Dedicated release circuits compatible with agent release or solenoid actuation
- Five Class B, Style B initiating circuits
- Optional Class A modules for notification appliances/releasing circuits and initiating circuits
- Alpha-numeric LED display for status and troubleshooting
- Programmable pre-discharge and discharge timers
- Resettable and continuous auxiliary output power
- Small surface or flush mount enclosure with removable door
- Approved for releasing device service and sprinkler supervisory
- Built-in Gentex and System Sensor synch protocol
- Steel enclosure 19” x 16.65” x 5.25”
- • Enclosure equipped with .50” wide lip for flush mounting
- **(Additional control panels and features available upon request)**

5.2 Smoke Detector

Smoke Detection is achieved by photoelectric smoke detectors mounted to the roof of the enclosure and spaced evenly among the enclosure. All sensors will be wired to create a single detection circuit wired back to the fire panel.

5.3 Extinguishing system

The automatic fire extinguishing system will be able to extinguish the fire quickly using clean extinguishing agents that don't damage the equipment to be protected. The gas release will be ordered by the fire panel at the second alarm level and once the timeframe expires. A description of the system is provided below

DESCRIPTION

Ansul Clean Agent Containers are used in fire extinguishing systems to store the Clean Agent until a fire develops and the agent must be released. The Clean Agent is retained in the container by an solenoid and an Electric Actuator Assembly. An electric signal initiates the actuator and the Clean Agent is released. The actuator is can be controlled both electrically and manually.

Ansul Clean Agent Containers have passed extensive testing by Factory Mutual and Underwriters Laboratory. Clean Agent containers can be filled in 1 pound (0.5 kg) increments to their maximum capacity.

SPECIFICATION

- Fill Range: 116 to 280 lbs/ft3 (630 to 1121 kg/m3)
- Fill Increments: 1.0 lbs (0.5 kg)
- Valve requirements in accordance with DOT regulations
- Container Construction: Carbon Steel Alloys
- Paint Options: Red (default)
- Container Ratings: DOT 4BW450
- Actuation Methods: Electric/Manual/Pneumatic (capable but used for multiple containers)

APPROVALS

- UL/cUL Listed
- FM Approved

Gas, pipe, pipe fittings, bottle fittings, chrome steel diffusers, stainless diaphragms, manual pulls, system abort button, and protected local labels will be included.

6 Access and Security

All doors are protected with a key-operated lock. Doors are also equipped with a panic bar on the inside for easy egress.

Optional biometric or proximity card access systems are available by customer request.

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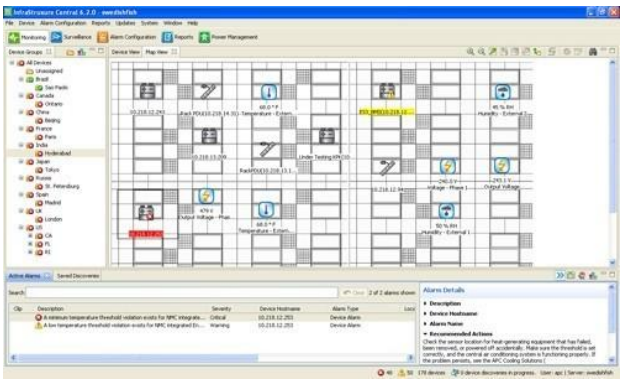
7 Monitoring System

The Data Center Module can be provided with an integrated monitoring system that will monitor the status of the module and report the overall health and any alarms associated with the equipment inside the module.

7.1 StruxureWare™ DC Expert

The module can include one StruxureWare™ DC expert appliance and the associated cabling and switches to communicate with all equipment in the module. StruxureWare™ Data Center Expert provides an efficient way for organizations to monitor their company-wide multi-vendor physical infrastructure: power, cooling, security, and environment. Real-time monitoring, user-defined reports and graphs, and instant fault notification and escalation enable quick assessment and resolution of critical infrastructure events that can adversely affect IT system availability. This centralized repository of critical information can be accessed by multiple users from anywhere on the network, creating a consolidated view of the physical data center infrastructure. This open and flexible architecture expands with changing business needs through additional device licenses, add-on surveillance, capacity management and change management modules, and through integration with enterprise and building management systems.



7.2 Environmental Monitoring

Each Module can include (4) Netbotz 570 rack mounted appliance that will monitor the environment and provide security monitoring for the module. The Netbotz 570 is a scalable system which will allow additional sensors and devices to be added to the system to scale to the final needs of the user.

The Netbotz 570 system will monitor the following information inside the module:

- (1) Temperature point mounted on the front of each rack
- (1) Humidity level in the cold aisle
- Status of all the external doors
- Security cameras at each external door location
- Dry contact alarm status on the fire panel and ERV system

8 Internal Module Components and Design

8.1 Racks

NetShelter™ SX

APC NetShelter™ rack enclosure maximizes flexibility with a progressive, non-proprietary feature-set as well as an extensive line of scalable accessory products to address current needs and adapt to future technology trends. APC NetShelter™® rack systems provide a progressive feature-set available in a vendor-neutral rack environment while allowing the user the flexibility to quickly adapt to emerging trends. Available in a variety of heights and widths, NetShelter™ racks and enclosures can adapt to many applications.

8.2 Rack Power Distribution

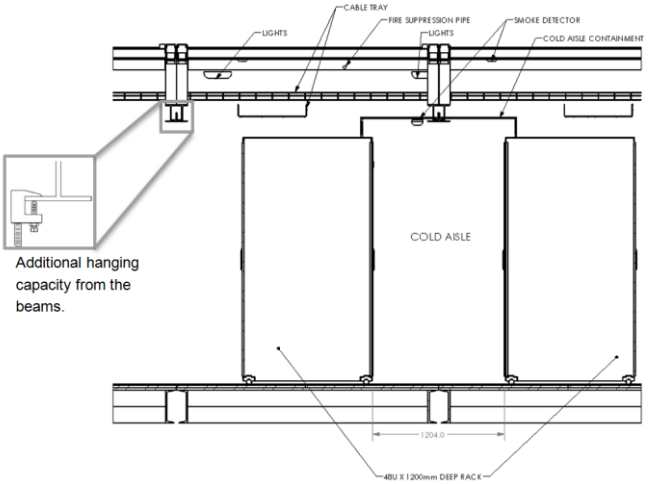
APC Metered Rack Power Distribution Units (PDUs) provide active metering to enable energy optimization and circuit protection. User-defined alarm thresholds mitigate risk with real-time local and remote alerts to warn of potential circuit overloads. Metered Rack PDUs provide power utilization data to allow Data Center Managers to make informed decisions on load balancing and right sizing IT environments to lower total cost of ownership. Metered Rack PDUs include real power monitoring, a temperature/humidity sensor port, locking IEC receptacles, and ultra low profile circuit breakers. Users can access and configure Metered Rack PDUs through secure Web, SNMP, or Telnet Interfaces which are complimented by StruxureWare™ Centralized Management platforms.

8.3 Modular Power Distribution

Modular Power Distribution mitigates the need to predict the future requirements and configurations of your data center. This visionary power distribution system is agile enough to match the needs of your data center today and enable rapid expansion or reconfiguration in the future. Power distribution management is simplified by output metering, branch current/circuit monitoring and auto-detection by the StruxureWare™ suite of management options. When demand rises and expansion becomes necessary, simply plug in new Power Distribution Modules. The factory-assembled modules, which include circuit breaker, power cord, and power connection, can be installed in mere minutes. There are multiple power ratings and power cord lengths for low to high power, guaranteeing compatibility and quick, easy, and convenient installation.

8.4 Cable Management

Cable management trays are provided for both data and power cables. If additional cable management is needed, the Data Hall is designed so the customer can hang additional hardware from the roof trusses. The cable management trays are of the wire-mesh variety. See below for an example of a beam clamp for hanging additional cable management from the beams.



8.5 Cooling

The Data hall includes (8) Uniflair Chilled Water Perimeter Cooling Units. The cooling units provide leading edge precision cooling solutions specifically designed to maintain temperature and humidity within extremely tight tolerances. Perfect for racked and non-racked IT loads, these products meet the diverse requirements of any data center environment. These intelligent units monitor the status of components and environmental parameter to ensure correct functionality during all modes of operation. When combined with hot or cold aisle containment solutions, the Uniflair LE products can further improve efficiency and achieve higher densities.

8.6 Air Containment System

The Data hall comes equipped with an air containment system that maximizes the efficiency and capacity of the cooling system. The sytem encloses the cold aisles with a ceiling panel system. The hot aisles are enclosed with doors on each end of the aisle and a return duct back to the perimeter air conditioning units. The system achieves complete separation of the hot and cold aisles.

9 Exclusions

The following list gives the limit of our scope of supply. All works listed hereafter are excluded from this proposal.

General:

- Any item not specifically listed in the proposal
- Freight to the final site
- Unloading of the module into its final position
- Project management services

Civil works:

- Any outdoor and indoor civil works (e.g. trenches, preparation of foundations, concrete slabs, fireproof walls, doors, holes, stairs, piping…)
- Any opening or drilling in the building existing walls and roof
- Any scaffolding, builders work or allied tradesman work
- Any ceiling or overhead plenum
- Installation of condensers on external slab
- Attachment of piping between condensers and module
- Chiller
- Any steps or ramps required for doorways

Data cabling:

- Any IT cabling and fiber optics installation

Electrical cabling:

- Any electrical installation work outside the prefabricated building solution
- Any digging, trenches and soil preparation for fuel tank and piping network installation
- The supply and installation of the incoming LV electrical supply from the gensets
- The supply and installation of the incoming LV electrical supply from the normal source

Electrical equipment:

- Emergency gensets including fuel tanks

Others

- Specific compliance to any unique local building codes unless expressly noted
- Compliance to Title 24 Part 6 California Energy Code unless expressly noted in section 2

10 Appendix – Data Hall Layout

The layout image below is taken from the PFMIEA500C2N097A drawing PDF.