

# SmartShelter Container

## 16kW/60Hz All In One Datacenter Module

### Technical Specification

Version 1.0



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# 1 Introduction

## 1.1 Context

The purpose of the document is to introduce and present the technical specification of the SmartShelter Container 16 kW All In One Datacenter Module offered by Schneider Electric.

SmartShelter Container solution provides a fully functional Data Center inside a regular ISO container with complete infrastructure including: cooling, power, structural protection, fire protection, monitoring, access control, etc., within a secure environment design, comprising a modular and flexible approach.

This solution consists of a constructive solution of equivalent quality to a proper room dedicated to IT, including the entire necessary infrastructure.

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 time to acquire and deploy

## 1.2 Main benefits

Prefabricated Datacenter Modules are the latest trend in the datacenter industry intended to decrease the time to acquire and deploy new datacenter capacity, improve the predictability and reliability of a new datacenter build and reduce upfront and ongoing capital expenditures.

All equipment in the proposed module are pre-installed and tested in our factories, reducing on-site construction risks and reducing time allocated for site works and commissioning.

Schneider Electric is a market leader in the data center business worldwide with complete integrated solutions including prefabricated modules, electrical distribution, cooling and IT space. Our installed base gives us a thorough knowledge of data center market evolution, future needs and an understanding of business challenges.

## 1.3 Scope of work

### **This proposal covers a complete prefabricated module**

This document mainly covers the following topics:

- Enclosure structure and design
- UPS
- Electrical distribution
- Cooling
- IT Infrastructure (Racks, rack and row level power distribution)
- Fire suppression and detection
- Monitoring (optional)

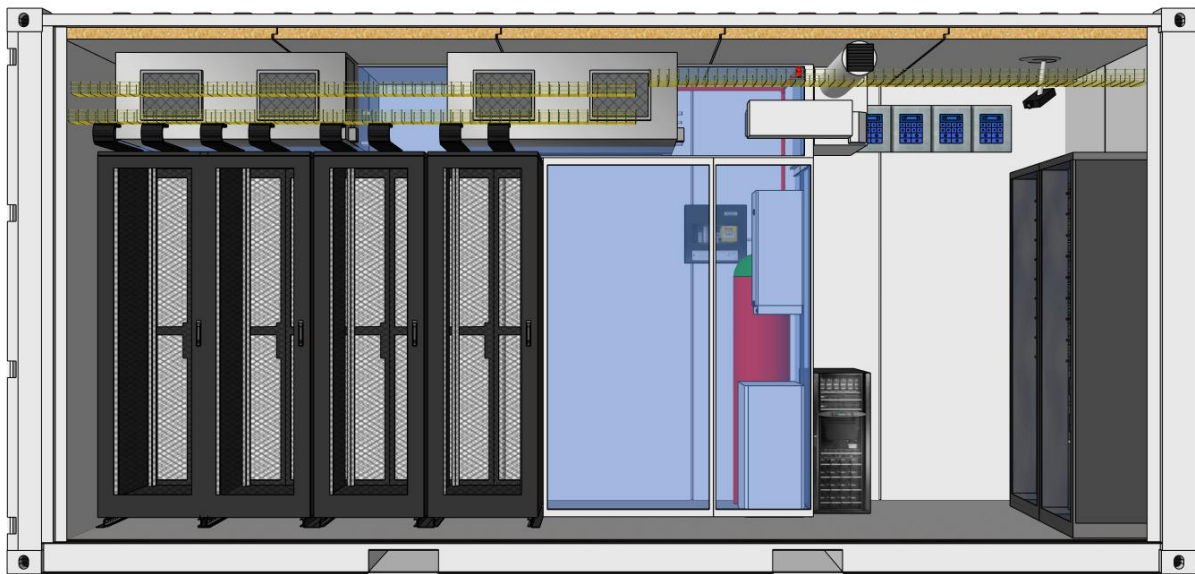
## 2 Prefabricated Datacenter Module

### 2.1 Introduction

The following proposal is for an All-In-One prefabricated IT Module that is a separate prefabricated structure. This module provides the complete functionality for a 16kW Datacenter environment providing power, cooling, and access for an IT environment.

### 2.2 Concept and Dimensions for Prefabricated Module

#### 2.2.1 Prefabricated Solution for 4 Racks with UPS



Solution for 4 racks includes:

- ISO Container:
  - 20' (6.0m) x 8' (2.4m) x 9.5' (2.9m) (LxWxH)
- Uninterruptible Power Supply:
  - Smart-UPS VT 30kVA, 208V with (2) battery modules
- Power Distribution:
  - 100A / 208V Panelboard, distributing power from UPS to each IT rack
  - Input Voltage 208 VAC, Output Voltage 208 VAC
- Electrical Configuration:
  - General power, lights and HVAC on non-critical power
  - IT racks on UPS power.
- Cooling:
  - (2) Overhead fancoils Mitsubishi Electric PEFY, N+1 configuration
  - (2) External condensers rated for -5°C to 46°C ambient
  - Optional low ambient temperature kit available temperatures down to -15 °C
  - Humidifier with controller
- Racks – NetShelter SX Enclosures
  - (4) AR3100 NetShelter SX, 600mm x 1070mm x 2000mm (WxDxH)
- Basic Rack PDU:
  - (4) AP7592 Rack PDU, Basic, Zero U, 5.7kW, 120V, (42) 5-20R
- Automatic Fire Extinguishing System

- Environmental Monitoring:
  - Netbotz 570 environmental monitoring system monitoring the following
    - Internal temperature
    - Internal humidity
    - Leak detection
    - External Door Status
    - Security camera monitoring
- Cable glands for power, refrigerant piping, and fiber entrance into the module

**Options:**

- Automatic transfer switch for generator input
- Struxureware DC Expert Basic for overall Datacenter Monitoring

## 2.3 Structural design

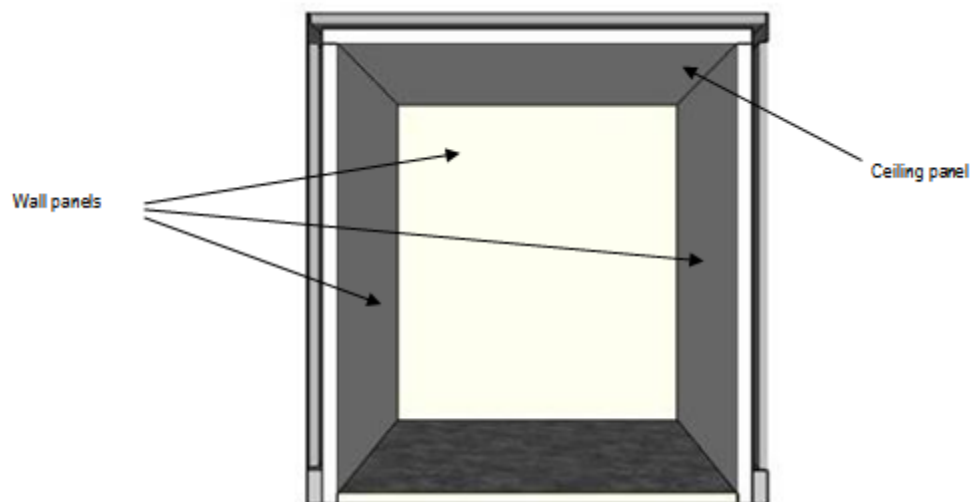
The SmartShelter Container is made of an external ISO 20' High Cube container and insulated panels inside. It combines the strength, resistance and protection of the ISO container with the special features of the insulated panels to have the right Data Center environment.

### 2.3.1 ISO shipping container

The ISO shipping container is a standard 20', durable closed steel box constructed for heavy loads that can be easily handled and moved. The external height of a Standard High Cube shipping container is 9 ft. 6 in. (2896mm). It has lockable double doors on one end.

### 2.3.2 Wall design

SmartShelter Container offers high levels of thermal and fire protection. Rockwool panels close the area inside the container providing a clean area proper for a DC.



Panels will be installed on the walls and ceiling and will be composed by a sandwich of materials with fire resistance and thermal insulating to resist high temperatures and provide a watertight enclosure.

**Main features:**

- Thickness: 60mm (2.36")
- Weight: 15.4 kg/m<sup>2</sup> (3.16 lb/ft<sup>2</sup>)
- Thermal resistance, K1 (panel): 0.592 W/m<sup>2</sup>K (0.104 BTU/h ft<sup>2</sup>R)
- K2 (container + panel): 0.402 W/m<sup>2</sup>K
- Fire resistance: EI60

Final Inner Dimensions <sup>(1)</sup>	
<b>Length</b>	5670mm (223.0")
<b>Width</b>	2200mm (87.0")
<b>Height</b>	2600mm (102.0")

<sup>(1)</sup> 2% tolerance

**2.3.3 Floor**

The 20' ISO container is equipped with 28.6 mm (1.125") thick marine plywood flooring on the interior. The finished floor is metal diamond plate.

**2.3.4 Doors**

The SmartShelter Container includes one EI 120 standard doors. Each door fulfills all regular and emergency exit requirements. It is made of steel and is painted and protected against rust.

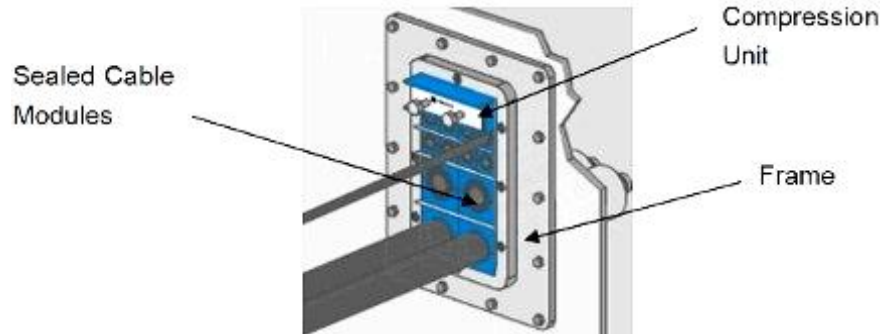
All Doors supplied with:

<b>LEAF</b>
Steel plate finishes: 1.3mm (0.05")
Fire Rated protection: UL 10C Classified 90 min FR
<b>Total thickness: 46mm (1.81")</b>
<b>FRAMEWORK</b>
Steel profile
Elastomeric weather seal
<b>FITTINGS &amp; MECHANISMS</b>
Steel bearing hinges: 3U
PVC & steel handle with lock door
Electric strike
Quick push panic bar
Self-closing system

<b>DIMENSIONS</b>	<b>Width</b>	<b>Height</b>
<b>External dimensions</b>	1105mm (43.5")	2184mm (86.0")
<b>Internal dimensions</b>	1035mm (40.8")	2116mm (83.3")

### 2.3.5 Cable Glands

Roxtec cable glands will be installed at all cabling and piping interface points that enter or exit the module. Cable glands provide thermal, fire, and water protection for the module. The cable gland is easily configurable to adapt to the number and dimensions of cables and pipes that enter the module since it uses a compression unit inside of frame.



### 2.3.6 Energy Recovery Ventilation (optional)

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 and UPS batteries are installed.

In order to provide the proper airflow, a blower intakes outside air, filters it, and supplies it to the IT space. In accordance with ASHRAE, IT spaces require air filtering (minimum MERV11).

Includes:

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





## 2.4 Technical Specifications

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

### 2.4.1 Shock-load

Building module units can withstand normal transportation conditions before installation on the site, without deformations or damage.

### 2.4.2 Wind load

The module can withstand non sustained wind speeds up to 111.5kph (69.3 mph) (Level 11).

### 2.4.3 Roof load

The module can withstand roof loads up to 145kg/m<sup>2</sup> (29.7 lbs/ft<sup>2</sup>).

### 2.4.4 Floor load

The module can withstand floor loads up to 1.000kg/m<sup>2</sup> (0.205 lbs/ft<sup>2</sup>) across the entire floor structure. Specific bracing for heavy components such as battery cabinets is provided.

### 2.4.5 External temperature range

Standard: -5°C to 46°C (23°F to 115°F)

With Optional Low Temperature Kit: -15°C to 46°C (5°F to 115°F)

### 2.4.6 Internal environmental conditions

The internal conditions will maintain ASHRAE 90.1 recommended temperature and humidity ranges.

### 2.4.7 Fire resistance

30 minute fire resistant construction for enclosure walls, roof, and doors is provided.

### 2.4.8 Painting

ISO 40' Enclosures 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.

## 2.5 Mounting Pad support

The module must be placed on a foundation with continuous support for the perimeter walls. The foundation must be level and engineered to support the final total load of the installed and operational module.

## 2.6 Lifting elements

Module is equipped with appropriate lifting points.

- Lift top corner fittings vertically by means of spreaders fitted with hooks, shackles or twist locks
- Lift at bottom corner fitting using slings with terminal fittings at any angles between vertical and 45 degrees to the horizontal.

## 3 Electrical System

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

### 3.1 Components

- **Main Input Panel:** (1) 208V three-phase electrical panel, TN-S type, construction. Panel incorporates 1 main input. The panel will feed all the equipment in the module as well as the condenser for the air conditioners located outside the module.
- **Uninterruptable Power System:** APC Smart-UPS VT 30kVA, 208V with (4) battery modules and internal maintenance bypass, Part # SUVTP30KF4B4S.
- **Panelboard Distribution:** NQ panel with Q0 breakers providing power distribution from the UPS to each rack.
- **Rack PDU:** (4) Basic rack PDU APC Single-phase, 120V, 5.7kW, 1 Phase power, part # AP7592.
- Main Power Cabling:
  - (1) Power line from Main Switch Panel to UPS input
  - Internal cabling for maintenance bypass
  - Connection to distribution panel from the UPS section
  - Power connection to the racks from breakers in NQ subpanel
  - (2) Power lines to overhead air conditioners
  - (2) Power lines to external condensers
  - Power lines to all internal support equipment
- Lighting:
  - Phillips Light Fixtures providing 300 lux are installed in each aisle in the rack space.
- Emergency lighting:
  - (1) Exit Sign/Emergency lighting block mounted above each door

### 3.2 Grounding

The module includes an integrated grounding system. The customer will 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 via the internal electrical system. The module is designed to connect to a TN-S type grounding system.

## 4 Fire Suppression System

The fire protection system is designed in other 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 a fire panel for release control and provide conventional fire detection, an optional ASD (Aspirating Smoke Detection) and a clean agent extinguishing system.

### 4.1 Fire Control Panel UL



The fire panel comprises at least two areas to be protected. Also consist of at least two levels of alarm so that, the second level is responsible for activating the extinction. Extinction can also be activated by a manual switch. If activated extinction, there will be a configurable timeframe to evacuate the room or activating countermeasures through a stop button. In addition to the necessary optical / thermal sensors, the panel includes two outer buttons (trigger / stop), an audible alarm, a neon sign outside indicating the gas released and at least three output signals indicating breakdown, Level 1 alarm and alarm level 2 (extinction triggered).

This solution will implement a Honeywell Notifier RP2002 fire panel with following features:

- Listed to UL Standard 864, 9th edition.
- FM Approved.
- Designed for agent releasing standards NFPA 12, 12A, 12B, and 2001.
- Meets International Building Code (IBC) seismic requirements
- Disable/Enable control per input zone and output zone.
- Extensive transient protection.
- Dual hazard operation.
- Adjustable pre-discharge, discharge and waterflow delay timers.
- Cross-zone (double-interlock) capability.
- Six programmable Style B (Class B) IDCs (Initiating Device Circuit).
- System Sensor i3 series detector compatible.
- Four programmable Style Y (Class B) output circuits - (special application power).
- Strobe synchronization:
  - System Sensor
  - Wheelock
  - Gentex
  - Faraday
  - Amseco
- Three programmable Form-C relays.
- 7.0 amps total 24 VDC output current.
- Resettable and non-resettable output power.
- Built-in Programmer.
- ANN-BUS connector for communication with optional devices (up to 8 total of any of the following):
  - N-ANN-80 Remote LCD Annunciator
  - N-ANN-I/O LED Driver
  - N-ANN-S/PG Printer Module
  - N-ANN-RLY Relay Module

– N-ANN-LED Annunciator Module

- 80-character LCD display (backlit).
  - Silenceable or Non-silenceable
  - Release Stage Sounder
- Compact and dual microprocessor
- Easy configuration via micro switches.
- Two conventional detection zones for detectors, and a third configurable for auto or manual trigger button
- Stop push button and extinction wait button
- Day / Night function with configurable delay (30 - 300 sec.) And inspection time (1 - 10 min.)
- Possible delays disabled from the keyboard
- Flow switch inputs, low pressure, monitoring door open
- Two extinction circuits, the extinction circuit 2 can be independent for pre-activation
- Countdown timer indicating the seconds left to extinction
- 40 LED display for quick identification the event
- Relays for: warning, alarm in the process of extinction, extinction canceled, extinction circuit failure, and fault relay
- Operating mode: automatic, manual, and canceled
- Dry contact input for remote programmable actions as: reset the system, evacuation, mute or delay On / Off
- Removable terminal blocks in all connections
- PC state visualization software with optional remote connection
- Complies with European standards EN54-2/4 and EN12094 / 1:2003
- CE marked
- Real-time clock/calendar with daylight savings time control
- History log with 256 event storage
- Piezo sounder for alarm, trouble and supervisory
- 24 volt operation
- Low AC voltage sense
- Outputs Programmable for:
  - Releasing Circuits or NACS
- NACs programmable for:
  - Silence Inhibit
  - Auto-Silence
  - Strobe Synchronization
  - Selective Silence (horn-strobe mute)
  - Temporal or Steady Signal
  - Silenceable or Non-silenceable
  - Release Stage Sounder
- (Additional control panels and features available upon request)

## 4.2 Smoke Detector

Notifier Model 2151 (photoelectric sensor) and model 2151T (photoelectric sensor with thermal) can be used with a variety of different adapter bases in several wiring configurations and voltages.

Other features include: low current draw, stable performance in high air velocities, built-in tamper resistant base design, remote LED option, removable cover, and built-in test switch.

It is designed to meet the performance criteria designated by UL. Its sensing chambers are sealed against back pressure air flow, dirt, and insects. This chamber is protected by a fine mesh screen which can be cleaned or replaced. Additional key features include a variety of mounting bases and a full line of accessories.

All photoelectric smoke detectors contain a unique optical sensing chamber designed to sense smoke particles produced by a wide range of combustion sources. A custom integrated circuit incorporates signal processing to reduce false alarms.

### 4.3 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.

#### 4.3.1 Novec 1230

Novec 1230 fluid is a fluoroketone that extinguishes via its cooling effect. It works as a gas but is a liquid at room temperature. Because it is not packaged under pressure, Novec 1230 fluid is easier to store and ship and requires less storage space than inert gas systems. (See Properties for additional information).

##### Features:

- Natural gas present in the atmosphere
- Suitable for occupied areas
- No toxic or corrosive decomposition products from agent
- Stored as a fluid
- Zero ozone depleting potential
- Global Warming Potential of 1
- Atmospheric lifetime – 5 days

##### Properties:

- Chemical formula:  $\text{CF}_3\text{CF}_2\text{C}(\text{O})\text{CF}(\text{CF}_3)_2$
- Molecular weight: 316.04
- Boiling point @ 1atm: 49.2°C (120.6°F)
- Freezing point: -108°C (-162.4°F)
- Density, sat. liquid, 25°C: 1.60 g/ml (99.9 lbm/ft<sup>3</sup>)
- Density, gas @ 1atm, 25°C: 0.0136 g/ml (0.851 lbm/ft<sup>3</sup>)
- Specific volume @ 1atm, 25°C: 0.0733 m<sup>3</sup>/kg (1.175 ft<sup>3</sup>/lb)
- Liquid viscosity @ 0°C/25°C: 0.56/0.39 centistokes
- Heat of vaporization @ BP: 88.0kJ/kg (37.9 BTU/lb)
- Solubility of H<sub>2</sub>O in Novec 1230 fluid: <0.001% by wt.
- Vapor pressure @ 25°C: 0.404 bar (5.85 psig)
- Relative dielectric strength @ 1atm (N<sub>2</sub>=1.0): 2.3

- Critical Pressure 602 psia (4,150 kPa)
- Critical Temperature 210.5°F ( 134.7°C)
- Relative Density compared to air 1.18

**Approvals (U.S. & Canada):**

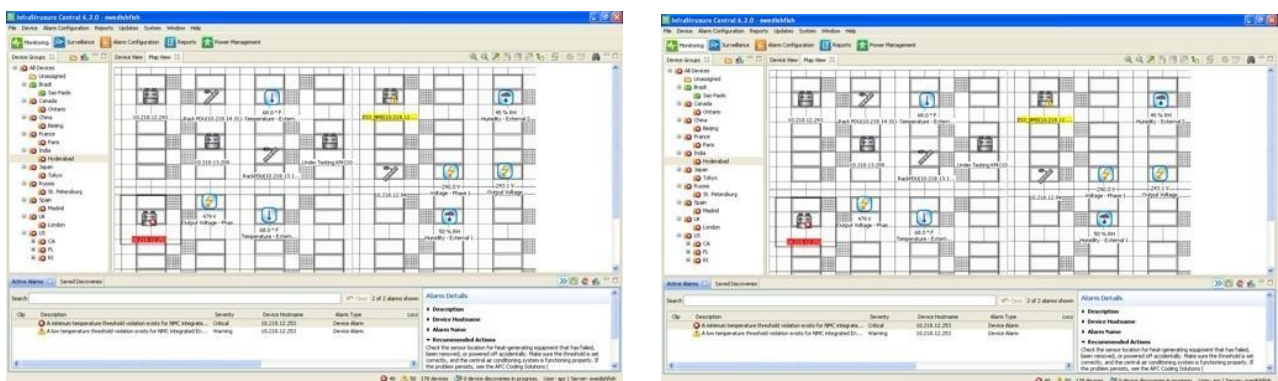
- TSCA: product complies with chemical notification requirements
- SNAP: approved for flooding (12/20/02) and streaming (1/23/03)
- CDSL: product complies with chemical notification requirements

## 5 Monitoring System (optional)

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.

### 5.1 Struxureware DC Expert (optional)

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.



### 5.2 Environmental Monitoring (optional)

Each Module can include a 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

## 6 Internal Module Components and Design

### 6.1 Uninterruptible Power Supply (UPS)

#### Smart UPS VT



Smart-UPS® VT offers centralized three-phase power protection with the reliability of the award winning Smart-UPS family. Ideal for small data centers, large retail stores, regional offices, and dense power requirements, the Smart-UPS VT includes dual-mains input, automatic and maintenance bypasses, and scalable runtime with hot-swappable batteries for increased availability. The rack mounted version maximizes valuable floor space by incorporating UPS, power distribution, and additional battery capacity in a single rack. Low cost of ownership is achieved

through best-in-class efficiency and a reduction in rating of electrical infrastructure - wires, transformers, and generators due the Smart-UPS VT's Soft Start feature. The APC Network Management Card with temperature monitoring provides remote monitoring and management through a simple Web/SNMP interface and provides integration with InfraStruXure® Manager. Serviceability is greatly enhanced by user-replaceable batteries, manageable extended run frames and included start-up and standard onsite warranty services. All these features make the Smart-UPS VT the easiest UPS in its class to deploy, manage and maintain.

### 6.2 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 support can adapt of any type of applications.





### 6.2.1 Cable Management

The solution includes all overhead cable management accessories (power and data cable). The module includes an E-chain system that manages the cables as they enter the equipment rack. The E chain system will move with the racks as they are moved on the rail system (described below). Wire mesh cable tray is also provided in the appropriate location to carry cable within the module.



The features of the e-chain are the following:

- Sideband and frame construction with large anti-friction single pin
- Frame opening from inner radius or from outer radius
- Vertical separators are available
- This standard 35 mm chain offers very high load capacities, despite its compact construction

### 6.2.2 Rack Power Distribution

APC Basic Rack PDUs provide reliable rack power distribution via a single input with multiple output receptacles and distributes power from low amperage single phase circuits to higher-power 3-phase solutions. Each module includes one Basic Rack PDU per rack to distribute power to all the necessary equipment. The PDU includes 42 outlets and can distribute up to 5.7 KW of power in each rack.



### 6.2.3 Rail System

Schneider Electric has designed a new option for its products allowing rack movement. Rack movement allows easier access to the front and rear of the rack and mounted equipment.



There are two rails per rack. The rail guide system main components are:

- Rack fixations
- Telescopic rail
- Floor fixation

Two wheels in the middle of the rack help the smooth movement of the rack. However, the weight is mainly supported by the telescopic rails. Two hasps fixed on each telescopic rail complete the system, setting the rack in its mid position.

Our standard rail system, with 2 telescopic rails, is designed for a maximum load of 800 kg (1780 lbs.).

### 6.3 Room Power Distribution

Room distribution is accomplished via a NQ panelboard. NQ Lighting panelboards have been designed to meet the evolving needs of customers with electrical lighting and distribution applications. With a 240Vac maximum rating, NQ panelboards are ideal for smaller sites where lighting and power distribution is needed. Ease of install, improved availability and greater installation flexibility are only some of the numerous benefits of using Square D lighting panelboards.



### 6.4 Cooling

Each module includes (4) Mitsubishi Electric PEFY fan coil cooling units. Each unit utilizes a DX refrigerant coil with an external condenser mounted on the exterior of the module. Refrigerant piping between the main unit and the condensers is provided. The unit is oriented above the equipment racks and takes hot air in from the rear of the racks and supplies cold air to the front.



## 7 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...)
- 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
- 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