

# FusionModule5000 Smart Modular Data Center V100R001

## Product Description

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# About This Document

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## Purpose

This document describes the smart modular data center (smart module for short) as well as its application scenarios and system architecture, providing the systemic information about the smart module.





## Intended Audience


This document is intended for:

- Sales engineers
- Technical support engineers
- System engineers

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 <b>DANGER</b>	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 <b>NOTICE</b>	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

Symbol	Description
 <b>NOTE</b>	Calls attention to important information, best practices and tips.  NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

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# 1 Overview

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## 1.1 Product Model

Table 1-1 shows the model of the smart module. Table 1-2 describes the model naming conventions.

**Table 1-1** Smart module model

Fusion Module	5000
1	2

**Table 1-2** Model naming conventions

No.	Category	Definition
1	Product name	Smart modular data center
2	Scenario	5000: using chilled water air conditioners

## 1.2 Positioning

The smart modular data center solution is designed for a medium- and large-sized data center that covers an area of 300 m<sup>2</sup> or more and uses chilled water for cooling. The solution applies to data centers for telecom, finance, government, energy, power, and traffic sectors, Internet service providers (ISPs), and large-sized enterprises.

## 1.3 Features

The smart modular data center features high integration, outstanding security and reliability, space saving, high energy efficiency, quick installation, optimal compatibility, fast and



flexible deployment, and excellent monitoring. It is a new-generation smart modular data center solution.

## Integration

- The smart module integrates a cabinet system, power supply and distribution system, cooling system, facility management system, surge protection and grounding system, fire extinguishing system, and integrated cabling system. It provides an overall solution.
- The integrated power supply and distribution system has an automatic transfer switch (ATS), and distributes power to uninterruptible power systems (UPSs), air conditioners, and IT equipment.



### NOTE

You are advised to deploy batteries independently when the input power is 380 V and more than four battery cabinets are configured or when the input power is 480 V.

## Security and Reliability

- The smart module supports optional aisle and cabinet access control, which prevents unauthorized personnel from entering the smart module and improves security.
- The auxiliary fire extinguishing system improves the equipment room security. It consists of the rotating skylight which starts automatically when fire occurs, and the emergency button which helps open the door in emergencies.
- The smart module supports two power inputs.
- Each UPS is equipped with a manual maintenance bypass switch. When the smart module is working properly, the switch is locked to prevent misoperations.
- Modular UPSs work in N+1 redundancy mode to improve the reliability of the smart module.
- Strong current and weak current cables, optical fibers, and network cables are routed separately to minimize electromagnetic interference.
- The positive temperature coefficient (PTC) electric heater of the air conditioner provides dual protection functions: automatic reset and auto-recovery disabling.

## Space Saving and Energy Efficiency

- The smart module can be placed in a room of an office building.
- The smart module can be directly installed on a concrete floor in a building, which simplifies engineering.
- Equipment room area  $\geq 300 \text{ m}^2$ .
- Aisle lighting is available, saving electric energy.
- The smart module is delivered within a few days and can be quickly installed onsite, which reduces cost.

## Quick Installation

- The design minimizes the workload of engineering.
- The standardized installation procedures reduce the installation time and workload.

## Optimal Compatibility

Modular power distribution allows for flexible expansion.

## **Fast and Flexible Deployment**

- The integrated design supports relocation of communications equipment with offices.
- Single-row cabinets or dual-row cabinets are deployed based on the equipment room size, power consumption of a single cabinet, and expansion requirements.
- IT cabinets are flexibly equipped with servers as well as storage and network equipment to meet enterprise requirements for web application and internal services.

## **Excellent Monitoring**

- Various sensors monitor modules in the data center in real time.
- The web-based monitoring system enables remote management of modules.

## **Stable Cooling**

The NetCol5000-C features efficient cooling, effective energy saving, high reliability, wide working conditions, wide power range, high compatibility, intelligent monitoring, and easy maintenance.

# 2 Typical Configurations

---

## 2.1 Typical Application Scenarios

Based on the product layout, there are three types of architecture: smart module A (with the battery cabinet in the aisle containment), smart module A (without the battery cabinet in the aisle containment) and smart module B.

- For smart module A (with the battery cabinet in the aisle containment), the UPS, air conditioners, and batteries are installed inside the module.
- For smart module A (without the battery cabinet in the aisle containment), the batteries are installed outside the module while the UPS and air conditioners are installed inside the module.
- For smart module B, the UPS and batteries are installed outside the module while the precision power distribution cabinet (PDC) or new main way is inside the module.



**NOTE**

This document uses the smart module A as an example.

## 2.2 Typical Configurations

The Smart Module is typically configured with the single-row or dual-row 1200 mm wide aisle containment.

## 2.2.1 Configurations for the Single-Row 1200 mm Wide Aisle Containment

**Figure 2-1** Single-row aisle containment (power supply and distribution cabinet)



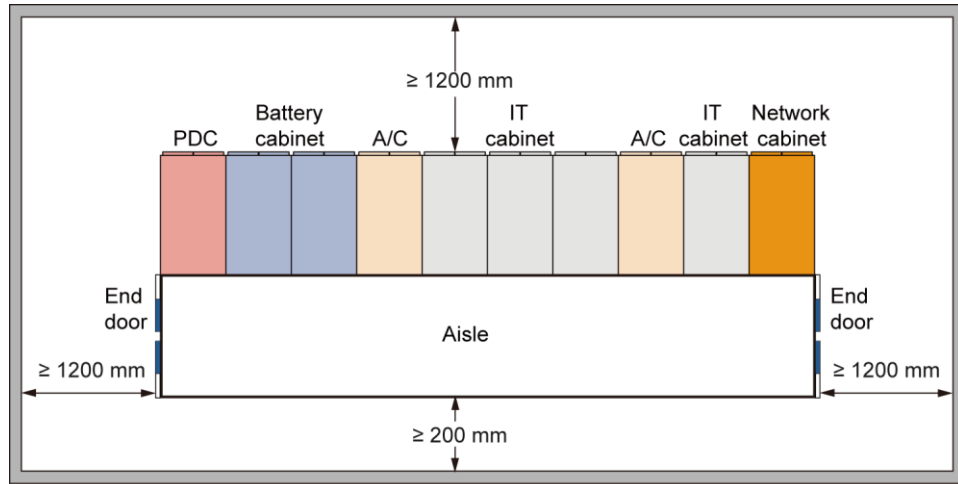
DM75000039

**Figure 2-2** Single-row aisle containment (new main way)



DC02W00110

**Figure 2-3** Floor plan of the single-row 1200 mm wide aisle containment (power supply and distribution cabinet)



DC00S00006



**NOTE**

The PDC refers to the precision PDC or integrated UPS cabinet.

Table 2-1 lists the key technical specifications of the single-row 1200 mm wide aisle containment.

**Table 2-1** Key technical specifications

Item	Technical Specifications
Number of IT cabinets	6 to 24 cabinets
Equipment room space	<ul style="list-style-type: none"> <li>In the scenario where the new main way is deployed, the minimum floor height is 3.0 m when 2.0 m high IT cabinets are deployed and is 3.2 m high when 2.2 m high IT cabinets are deployed.</li> <li>In the scenario where the new main way is not deployed, the minimum floor height is 2.6 m when 2.0 m high IT cabinets are deployed and is 2.8 m high when 2.2 m high IT cabinets are deployed.</li> </ul>
Cooling	NetCol5000-C 30 kW chilled water in-row precision air conditioner
Power distribution	<ul style="list-style-type: none"> <li>Smart module A: integrated UPS cabinet</li> <li>Smart module B: precision PDC or new main way</li> </ul>
Aisle	1200 mm wide single-row cold or hot aisle containment

## 2.2.2 Configurations for the Dual-Row 1200 mm Wide Aisle Containment

**Figure 2-4** Dual-row aisle containment (power supply and distribution cabinet)



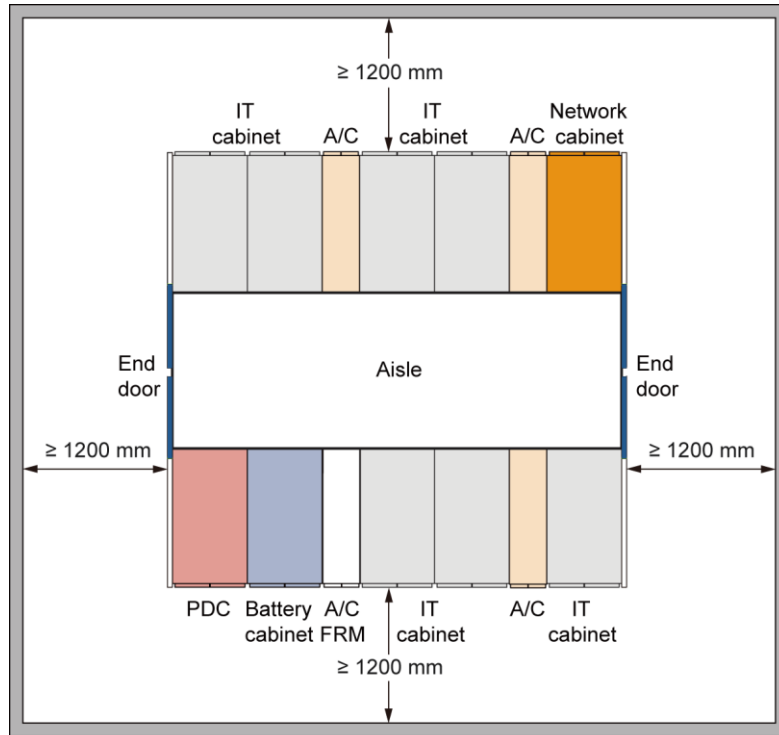
DM75000040

**Figure 2-5** Dual-row aisle containment (new main way)



DC02W00111

**Figure 2-6** Floor plan of the dual-row 1200 mm wide aisle containment (power supply and distribution cabinet)



**NOTE**  
 The PDC refers to the precision PDC or integrated UPS cabinet.

Table 2-2 lists the key technical specifications of the dual-row 1200 mm wide aisle containment.

**Table 2-2** Key technical specifications

Item	Technical Specifications
Number of IT cabinets	6 to 48 cabinets (max. 24 cabinets in the N+1 system; max. 48 cabinets in the 2N system; max. module length: 15 m)
Equipment room space	<ul style="list-style-type: none"> <li>In the scenario where the new main way is deployed, the minimum floor height is 3.0 m when 2.0 m high IT cabinets are deployed and is 3.2 m high when 2.2 m high IT cabinets are deployed.</li> <li>In the scenario where the new main way is not deployed, the minimum floor height is 2.6 m when 2.0 m high IT cabinets are deployed and is 2.8 m high when 2.2 m high IT cabinets are deployed.</li> </ul>
Cooling	NetCol5000-C 30 kW chilled water in-row precision air conditioner
Power distribution	<ul style="list-style-type: none"> <li>Smart module A: integrated UPS cabinet</li> <li>Smart module B: precision PDC or new main way</li> </ul>
Aisle	1200 mm wide dual-row cold or hot aisle containment

# 3 System Architecture

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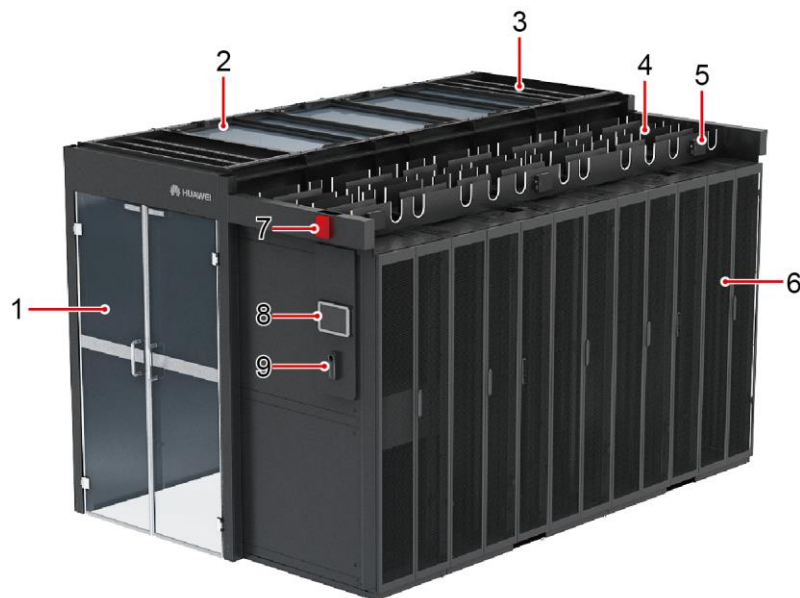
## 3.1 System Architecture

### 3.1.1 Components of the Single-Row 1200 mm Wide Aisle Containment

#### Overview

The single-row 1200 mm wide aisle containment can be a cold or hot aisle containment that involves the following components: IT cabinet, network cabinet, PDC (refer to the precision PDC or integrated UPS cabinet), air conditioner, battery cabinet, skylight, end door, and cable trough. Figure 3-1 shows the components of a cold aisle containment.

**Figure 3-1** Components of the single-row 1200 mm wide cold aisle containment (power supply and distribution cabinet)



DE00000184

(1) End door

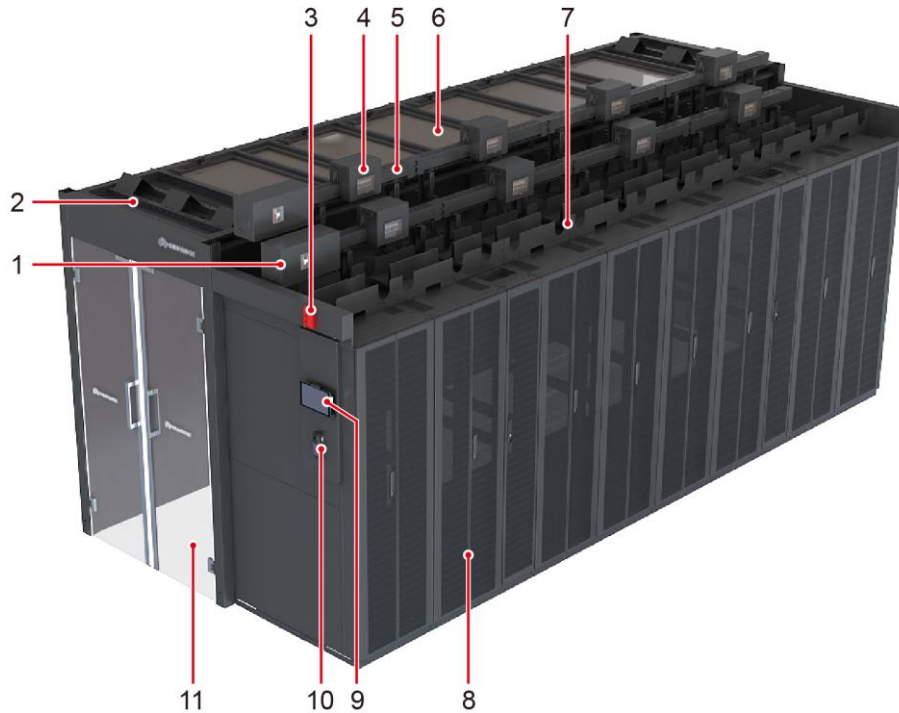
(2) Flat or rotating skylight

(3) Control skylight



- |                  |                       |                           |
|------------------|-----------------------|---------------------------|
| (4) Cable trough | (5) Smart ETH gateway | (6) Cabinet               |
| (7) Alarm beacon | (8) Pad               | (9) Access control device |

**Figure 3-2** Components of the single-row 1200 mm wide cold aisle containment (new main way)



DC02W00094

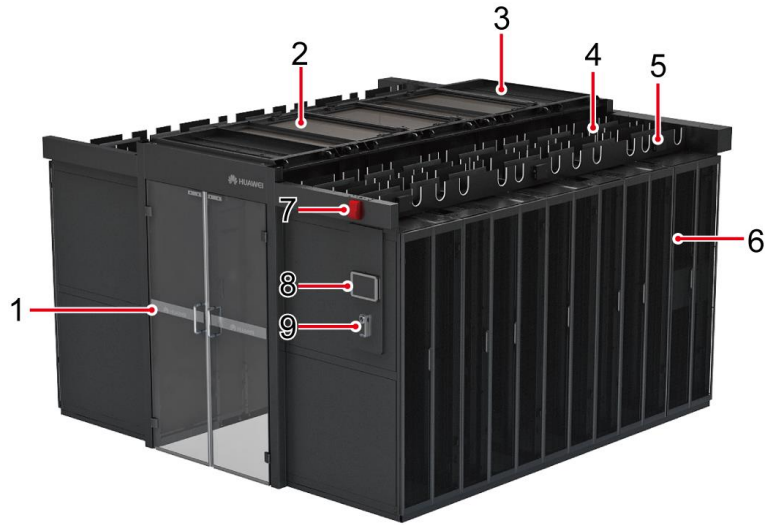
- |                             |                          |                               |
|-----------------------------|--------------------------|-------------------------------|
| (1) General input unit      | (2) Control skylight     | (3) Alarm beacon              |
| (4) Power distribution unit | (5) Busbar trunking unit | (6) Flat or rotating skylight |
| (7) Cable trough            | (8) Cabinet              | (9) Pad                       |
| (10) Access control device  | (11) End door            |                               |

## 3.1.2 Components of the Dual-Row 1200 mm Wide Aisle Containment

### Overview

The dual-row 1200 mm wide aisle containment can be a cold or hot aisle containment that involves the following components: IT cabinet, network cabinet, PDC (refer to the precision PDC or integrated UPS cabinet), air conditioner, battery cabinet, skylight, end door, and cable trough. Figure 3-3 shows the components of a cold aisle containment.

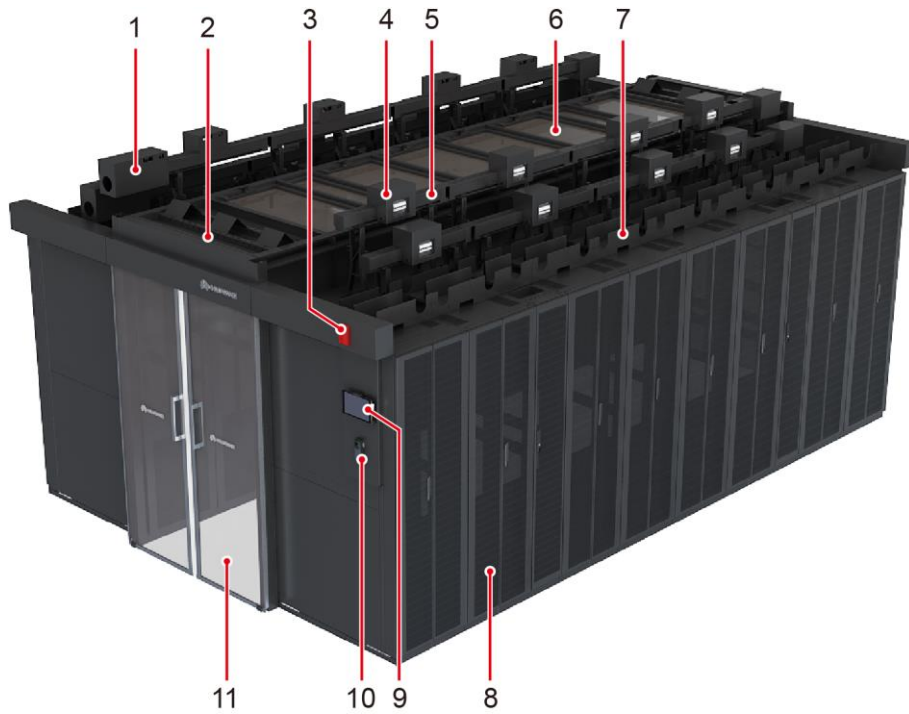
**Figure 3-3** Components of the dual-row 1200 mm wide cold aisle containment (power supply and distribution cabinet)



DE00000185

- |                  |                               |                           |
|------------------|-------------------------------|---------------------------|
| (1) End door     | (2) Flat or rotating skylight | (3) Control skylight      |
| (4) Cable trough | (5) Smart ETH gateway         | (6) Cabinet               |
| (7) Alarm beacon | (8) Pad                       | (9) Access control device |

**Figure 3-4** Components of the dual-row 1200 mm wide cold aisle containment (new main way)



DC02W00091

- |                        |                      |                  |
|------------------------|----------------------|------------------|
| (1) General input unit | (2) Control skylight | (3) Alarm beacon |
|------------------------|----------------------|------------------|

- |                             |                          |                               |
|-----------------------------|--------------------------|-------------------------------|
| (4) Power distribution unit | (5) Busbar trunking unit | (6) Flat or rotating skylight |
| (7) Cable trough            | (8) Cabinet              | (9) Pad                       |
| (10) Access control device  | (11) End door            |                               |

### 3.1.3 IT Cabinet

IT cabinets of the Smart Module comply with the International Electrotechnical Commission (IEC) 60297-1 standard, provide stable installation space for servers in the Smart Module, and ensure secure server running.

The cabinets have the uniform dimensions and provide front and rear ventilation channels. Figure 3-5 shows the cabinet exterior. Table 3-1 lists the technical specifications.

**Figure 3-5** IT cabinet appearance



DM14000088

An IT cabinet has the following features:

- The ventilation rate of the front and rear doors is greater than or equal to 70%.
- Two power distribution units (PDU2000s) can be vertically installed at the rear inside the cabinet.
- The position of each U is marked on the vertical mounting bars.
- The front and rear doors of the cabinet can be locked, and can be unlocked only by using dedicated keys.
- The cabinet has a door status sensor or electronic access control.

- Static load: 1500 kg

**Table 3-1** Cabinet technical specifications

Item	Specifications
Dimensions (H x W x D)	<ul style="list-style-type: none"> <li>• 2000 mm x 600 mm x 1100 mm</li> <li>• 2000 mm x 600 mm x 1200 mm</li> <li>• 2000 mm x 800 mm x 1100 mm</li> <li>• 2000 mm x 800 mm x 1200 mm</li> <li>• 2200 mm x 600 mm x 1200 mm</li> <li>• 2200 mm x 800 mm x 1200 mm</li> </ul>
Color	Black
Materials	High-intensity class A carbon cold rolled steel sheet and zinc-coated steel sheet
Ventilation channel	Front and rear ventilation channels
Installation space	<ul style="list-style-type: none"> <li>• A 2000 mm high cabinet provides 42 U installation space.</li> <li>• A 2200 mm high cabinet provides 47 U installation space.</li> <li>• The distance between the front and rear mounting bars can be adjusted for every 25 mm.                             <ul style="list-style-type: none"> <li>– For a 1200 mm deep cabinet: The maximum depth for installing devices inside the cabinet is 750 mm and by adjusting the mounting bars the maximum depth is 850 mm.</li> <li>– For a 1100 mm deep cabinet: The maximum depth for installing devices inside the cabinet is 700 mm and by adjusting the mounting bars the maximum depth is 750 mm.</li> </ul> </li> <li>• Positions for vertically installing two PDU2000s are provided at the rear of the cabinet.</li> </ul>
Installation mode	ESD floor, base, or concrete floor
Door opening mode	The front door is a single door, and the rear door is a double one.
Weight of an empty cabinet	<ul style="list-style-type: none"> <li>• The weight of a 2000 mm x 600 mm x 1200 mm cabinet is 128 kg.</li> <li>• The weight of a 2000 mm x 800 mm x 1200 mm cabinet is 153 kg.</li> <li>• The weight of a 2200 mm x 600 mm x 1200 mm cabinet is 137 kg.</li> <li>• The weight of a 2200 mm x 800 mm x 1200 mm cabinet is 164 kg.</li> <li>• The weight of a 2000 mm x 600 mm x 1100 mm cabinet is 110 kg.</li> <li>• The weight of a 2000 mm x 800 mm x 1100 mm cabinet is 135 kg.</li> </ul> <p>(The weight of an empty cabinet includes the weight of the front and rear doors.)</p>

Item	Specifications
Protection level	IP20

### 3.1.4 Network Cabinet

The network cabinet provides space for integrated cabling and cable management interface for the data center. For the network cabinet exterior, refer to the IT cabinet exterior. Table 3-2 lists the technical specifications of the network cabinet.

**Table 3-2** Network cabinet technical specifications

Item	Specifications
Dimensions (H x W x D)	<ul style="list-style-type: none"><li>• 2000 mm x 600 mm x 1200 mm</li><li>• 2000 mm x 800 mm x 1200 mm</li><li>• 2200 mm x 600 mm x 1200 mm</li><li>• 2200 mm x 800 mm x 1200 mm</li><li>• 2000 mm x 600 mm x 1100 mm</li><li>• 2000 mm x 800 mm x 1100 mm</li></ul>
Color	Black
Materials	High-intensity class A carbon cold rolled steel sheet and zinc-coated steel sheet
Ventilation channel	Front and rear ventilation channels
Installation space	<ul style="list-style-type: none"><li>• A 2000 mm high cabinet provides 42 U installation space.</li><li>• A 2200 mm high cabinet provides 47 U installation space.</li><li>• The distance between the front and rear mounting bars can be adjusted for every 25 mm. Positions for vertically installing two PDU2000s are provided at the rear of the cabinet.</li></ul>
Installation mode	ESD floor, base, or concrete floor
Door opening mode	The front door is a single door, and the rear door is a double one.

Item	Specifications
Weight of an empty cabinet	<ul style="list-style-type: none"> <li>• The weight of a 2000 mm x 600 mm x 1200 mm cabinet is 128 kg.</li> <li>• The weight of a 2000 mm x 800 mm x 1200 mm cabinet is 153 kg.</li> <li>• The weight of a 2200 mm x 600 mm x 1200 mm cabinet is 137 kg.</li> <li>• The weight of a 2200 mm x 800 mm x 1200 mm cabinet is 164 kg.</li> <li>• The weight of a 2000 mm x 600 mm x 1100 mm cabinet is 110 kg.</li> <li>• The weight of a 2000 mm x 800 mm x 1100 mm cabinet is 135 kg.</li> </ul> (The weight of an empty cabinet includes the weight of the front and rear doors.)
Protection level	IP20

### 3.1.5 Skylight

A skylight is used for sealing an aisle containment. There are three types of skylights: control skylight, rotating skylight, and flat skylight. Table 3-3 lists the technical specifications of skylights and the mapping between skylights and cabinets.

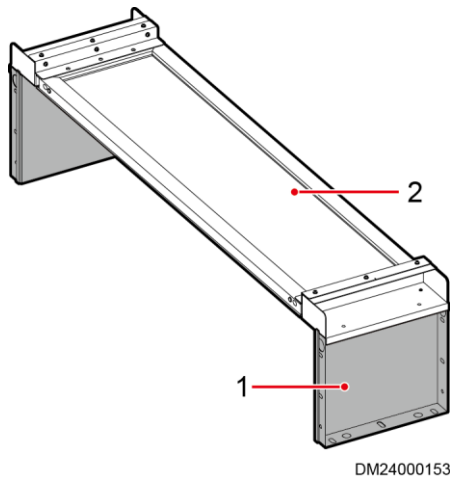
**Table 3-3** Technical specifications of skylights

Name	Dimensions (H x W x D)	Applicable Cabinet Dimensions (H x W x D)
Control skylight	341 mm x 605 mm x 1334 mm	<ul style="list-style-type: none"> <li>• 2000 mm x 600 mm x 1200 mm</li> <li>• 2000 mm x 600 mm x 1100 mm</li> <li>• 2200 mm x 600 mm x 1200 mm</li> </ul>
	341 mm x 805 mm x 1334 mm	<ul style="list-style-type: none"> <li>• 2000 mm x 800 mm x 1200 mm</li> <li>• 2000 mm x 800 mm x 1100 mm</li> <li>• 2200 mm x 800 mm x 1200 mm</li> </ul>

Name	Dimensions (H x W x D)	Applicable Cabinet Dimensions (H x W x D)
300 mm wide flat skylight	341 mm x 305 mm x 1334 mm	<ul style="list-style-type: none"> <li>• 2000 mm x 300 mm x 1200 mm</li> <li>• 2000 mm x 300 mm x 1100 mm</li> <li>• 2200 mm x 300 mm x 1200 mm</li> </ul>
600 mm wide flat or rotating skylight	341 mm x 605 mm x 1334 mm	<ul style="list-style-type: none"> <li>• 2000 mm x 600 mm x 1200 mm</li> <li>• 2000 mm x 600 mm x 1100 mm</li> <li>• 2200 mm x 600 mm x 1200 mm</li> </ul>
800 mm wide flat or rotating skylight	341 mm x 805 mm x 1334 mm	<ul style="list-style-type: none"> <li>• 2000 mm x 800 mm x 1200 mm</li> <li>• 2000 mm x 800 mm x 1100 mm</li> <li>• 2200 mm x 800 mm x 1200 mm</li> </ul>

Figure 3-6, Figure 3-7, Figure 3-8, and Figure 3-9 show the skylights.

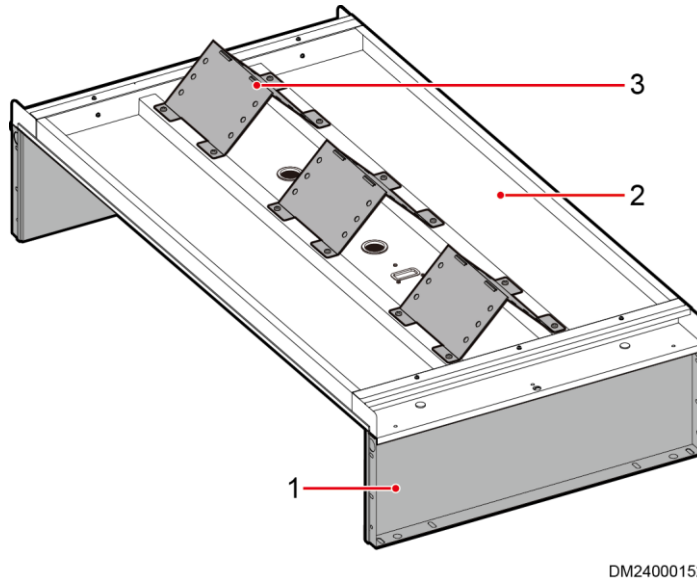
**Figure 3-6** 300 mm wide skylight



(1) Skylight connective plate

(2) Flat skylight panel

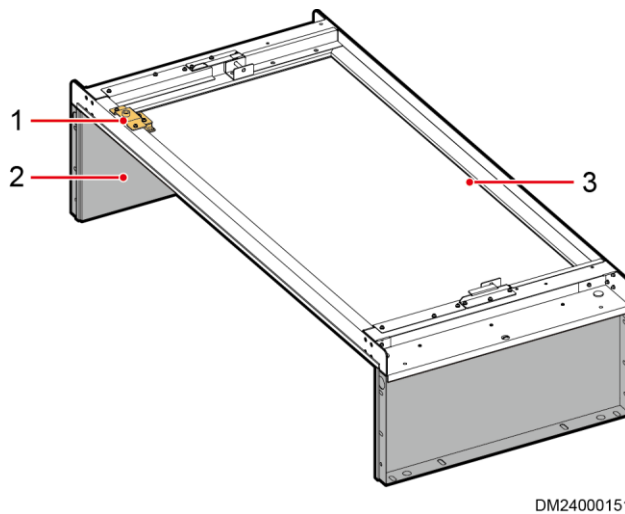
**Figure 3-7** 800 mm wide control skylight



DM24000152

- (1) Skylight connective plate    (2) Control skylight panel    (3) Cable separation panel

**Figure 3-8** 600 mm wide flat or rotating skylight

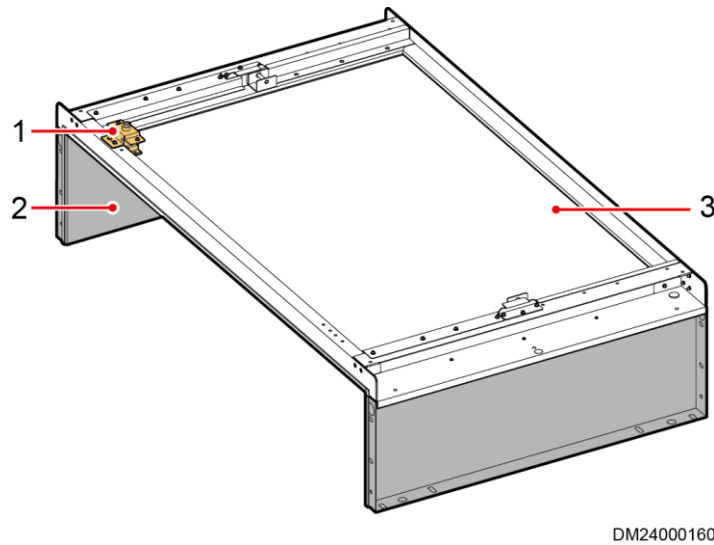


DM24000151

- (1) Magnetic lock fixing base    (2) Skylight connective plate    (3) Flat skylight panel



**Figure 3-9** 800 mm wide flat or rotating skylight



- (1) Magnetic lock fixing base      (2) Skylight connective plate      (3) Flat skylight panel



**NOTE**

A rotating skylight is designed with an eccentric structure. When the trigger is activated, a rotating skylight falls under gravity. The skylight is triggered by a magnetic lock. If a fire extinguishing system is installed inside a module, select flat skylights. If a module shares the fire extinguishing system of the equipment room, select rotating skylights.

### 3.1.6 End Doors for Aisles

End doors are classified into sliding doors and revolving doors. End doors are installed on both ends of the aisle containment, which makes the module independent, improves equipment efficiency, and helps onsite personnel or devices move into or out of the aisle containment.

#### Sliding Door

Figure 3-10 shows a sliding door.

**Figure 3-10** Sliding door



DM21000058

The dimensions (H x W x D) of a sliding door are as follows.

For a 2000 mm high cabinet, the dimensions of a sliding door are 2300 mm x 1400 mm x 54 mm.

For a 2200 mm high cabinet, the dimensions of a sliding door are 2500 mm x 1400 mm x 54 mm.



**NOTE**

Sliding doors can be opened only sideways, and therefore may involve risks in the case of a fire.

## Revolving Door

The double revolving door is an outward opening door with an opening angle of 90 degrees. It can ensure that the aisle containment is properly sealed and separated. Figure 3-11 shows a double revolving door.

**Figure 3-11** Double revolving door



DM46000104

The dimensions (H x W x D) of a double revolving door are as follows.

For a 2000 mm high cabinet, the dimensions of a double revolving door are 2300 mm x 1400 mm x 80 mm.

For a 2200 mm high cabinet, the dimensions of a double revolving door are 2500 mm x 1400 mm x 80 mm.

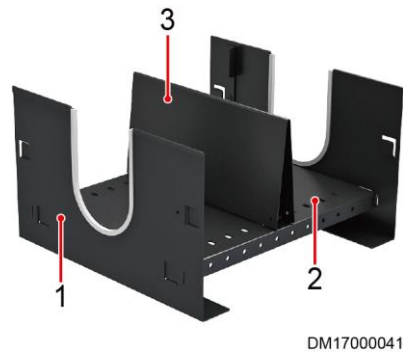
## 3.1.7 Cable Trough

Cabinet cable troughs are classified into signal cable troughs and power cable troughs, which are used to route signal cables and power cables respectively. This ensures that weak current cables are separated from strong current cables.

Cable troughs are clamped onto the cabinet top cover. A cable trough is assembled using two brackets, a pallet, and a baffles (used to separate weak current optical fibers from weak current network cables and strong current route A from strong current route B).

Figure 3-12 shows a 300 mm wide cable trough, and Figure 3-13 shows a 600 mm/800 mm wide cable trough.

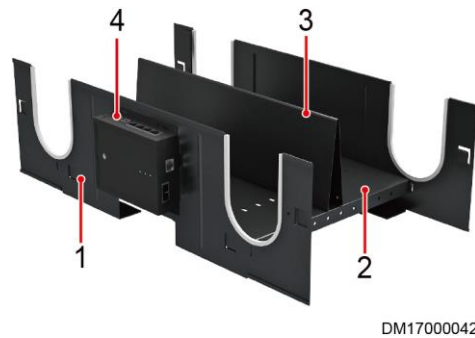
**Figure 3-12** 300 mm wide cable trough



- (1) Bracket
- (3) Baffle

- (2) Pallet

**Figure 3-13** 600/800mm wide cable trough



- (1) Bracket
- (2) Pallet
- (3) Baffle
- (4) Position for installing a smart ETH gateway

### 3.1.8 (Optional) Adaptive Frame

To meet requirements for cabinet height and depth in different scenarios, tail frames, top frames, and air conditioner adaptive frames can be installed to ensure that all cabinets in the smart module have the same height and depth and that the two rows of cabinets have the same length. Table 3-4 describes the frame specifications.

**Table 3-4** Adaptive frame specifications

Component	Width (mm)	Depth (mm)	Height (mm)	Remarks
PDC tail frame	600	100	2000/2200	Adapt to 1200 mm deep cabinets.
300 mm wide air conditioner top frame	300	1200	200	Adapt to 2200 mm high cabinets.

Component	Width (mm)	Depth (mm)	Height (mm)	Remarks
PDC top frame	600	1200	200	
300 mm air conditioner adaptive frame	300	1100	2000	Adapt to 1200 mm or 1100 mm deep cabinets. When there is an odd number of 300 mm air conditioners, use the adaptive frame to supplement the opposite position to ensure that the two rows of cabinets have the same length.
	300	1200	2000	

### 3.1.9 (Optional) Base

#### Adjustable Bases

The widths of adjustable bases for a Smart Module include 300 mm, 600 mm, and 800 mm. The minimum adjustment range is 1 mm.

Table 3-5 lists base specifications.

**Table 3-5** Base specifications

Type	Dimensions	Description
600 mm wide base	Width: 600 mm; height: 270 mm $\leq H \leq 410$ mm (adjustable); depth: 1000 mm, 1100 mm, or 1200 mm (adjustable)	Used to support an IT cabinet, network cabinet, battery cabinet, and PDC that are all 600 mm wide.
	Width: 600 mm; height (adjustable): 410 mm $\leq H \leq 700$ mm; depth (adjustable): 1000 mm, 1100 mm, or 1200 mm	
300 mm wide base	Width: 300 mm; height: 270 mm $\leq H \leq 410$ mm (adjustable); depth: 1000 mm, 1100 mm, or 1200 mm (adjustable)	Used to support a 300 mm wide air conditioner.
	Width: 300 mm; height: 410 mm $\leq H \leq 700$ mm (adjustable); depth: 1000 mm, 1100 mm, or 1200 mm (adjustable)	

Type	Dimensions	Description
800 mm wide base	Width: 800 mm; height: 270 mm $\leq H \leq 410$ mm (adjustable); depth: 1000 mm, 1100 mm, or 1200 mm (adjustable)	Used to support an 800 mm wide IT cabinet and 800 mm wide network cabinet.
	Width: 800 mm; height: 410 mm $\leq H \leq 700$ mm (adjustable); depth: 1000 mm, 1100 mm, or 1200 mm (adjustable)	

## Fixed Bases

Fixed bases for the smart module include cabinet bases (600 mm wide), air conditioner bases (300 mm wide), PDC bases (600 mm wide), and cabinet bases (800 mm wide).

Table 3-6 lists base specifications.

**Table 3-6** Base specifications

Type	Base dimensions (H x W x D)	Description
Cabinet base (600 mm wide)	250 mm x 600 mm x 1200 mm	Used to support an IT cabinet, battery cabinet, and network cabinet. (All the cabinets are 600 mm wide.)
Air conditioner base (300 mm wide)	250 mm x 300 mm x 1200 mm	Used to support a 300 mm wide air conditioner and air conditioner adaptive frame.
PDC base (600 mm)	250 mm x 600 mm x 1200 mm	Used to support a PDC.
Cabinet base (800 mm wide)	250 mm x 800 mm x 1200 mm	Used to support an 800 mm wide IT cabinet and 800 mm wide network cabinet.

## 3.2 Power Supply and Distribution System

### Features

- The smart module has an integrated and intelligent power supply and distribution system, and supports N+1 or 2N power distribution systems.
- The power distribution branch of the integrated power supply and distribution system can detect currents, voltages, active power, electricity, and temperatures.
- Battery management supports CIM (model: CIM01C2) and BIM (model: BIM01C3).

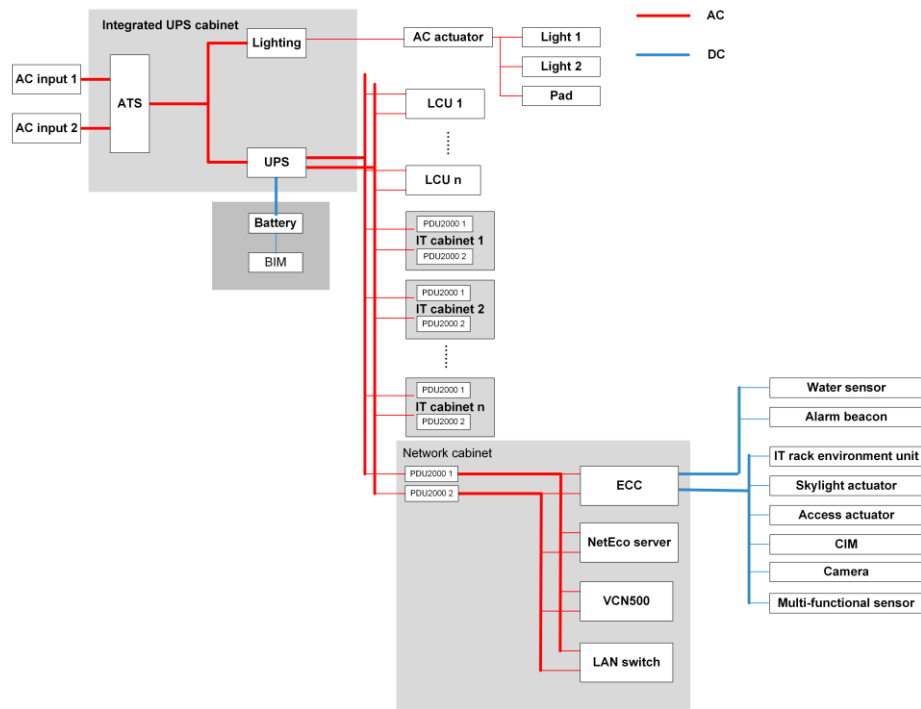
- The power supply and distribution system allows lead-acid batteries to power off automatically in the case of fire.

### 3.2.1 Power Supply and Distribution System of Smart Module A

#### N+1 System Power Distribution Diagram

Figure 3-14 shows the power distribution diagram for the N+1 system.

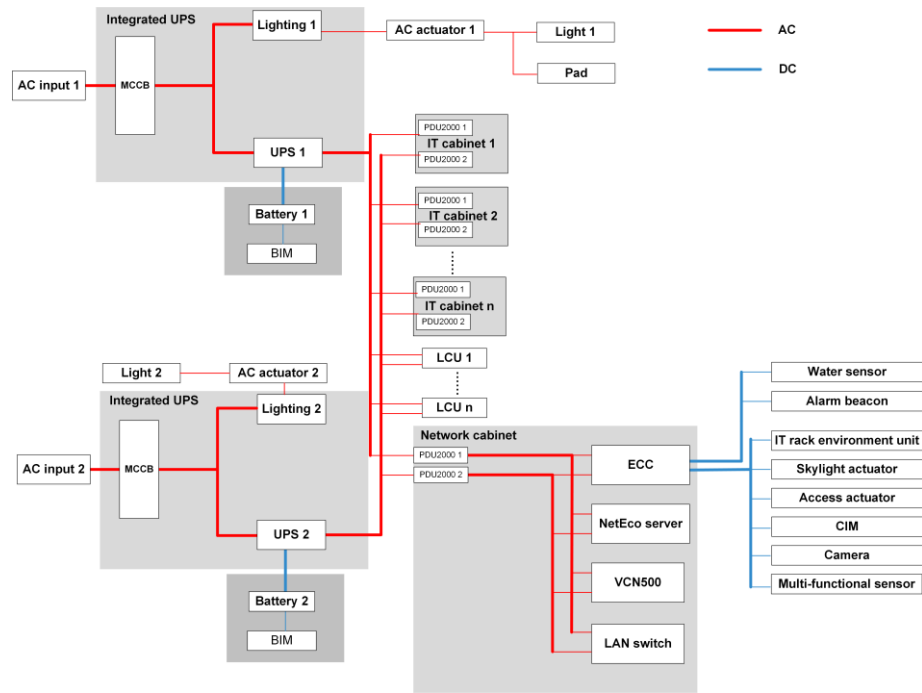
Figure 3-14 N+1 system power distribution diagram



#### 2N System Power Distribution Diagram

Figure 3-15 shows the power distribution diagram for the 2N system.

Figure 3-15 2N system power distribution diagram



### 3.2.2 Power Supply and Distribution System of Smart Module B

#### N+1 System Power Distribution Diagram

Figure 3-16 N+1 system power distribution diagram (precision PDC)

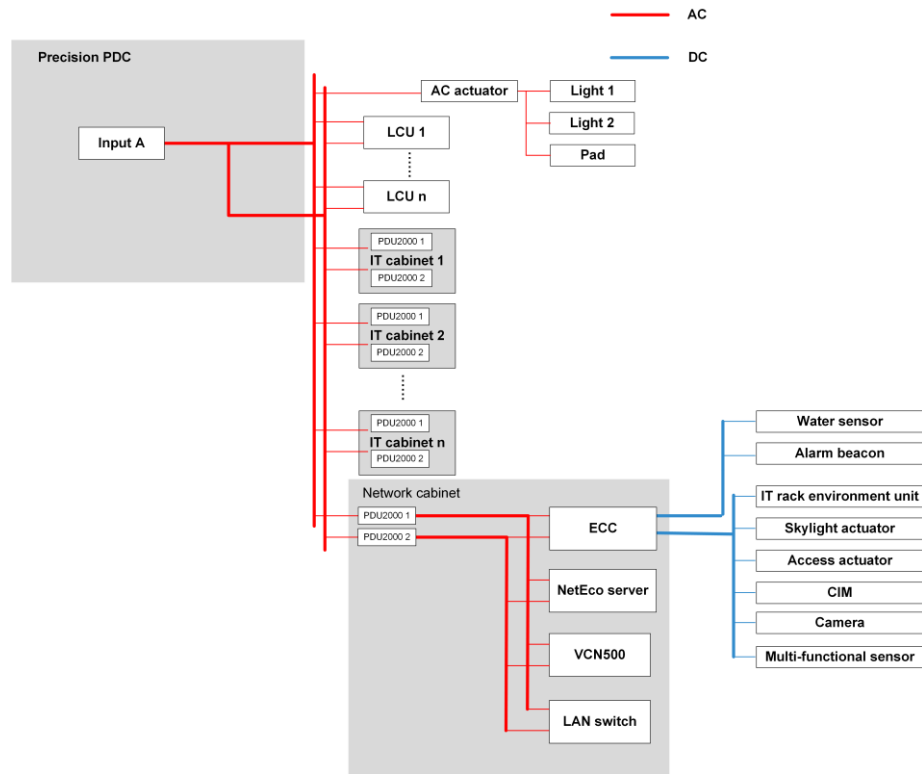


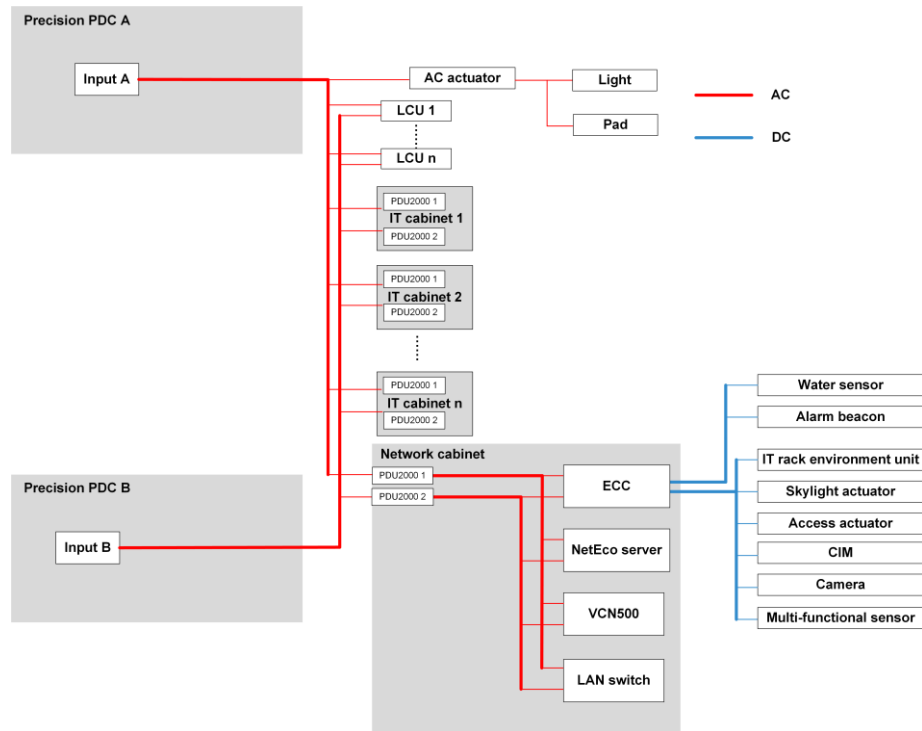
Figure 3-17 N+1 system power distribution diagram (new main way)



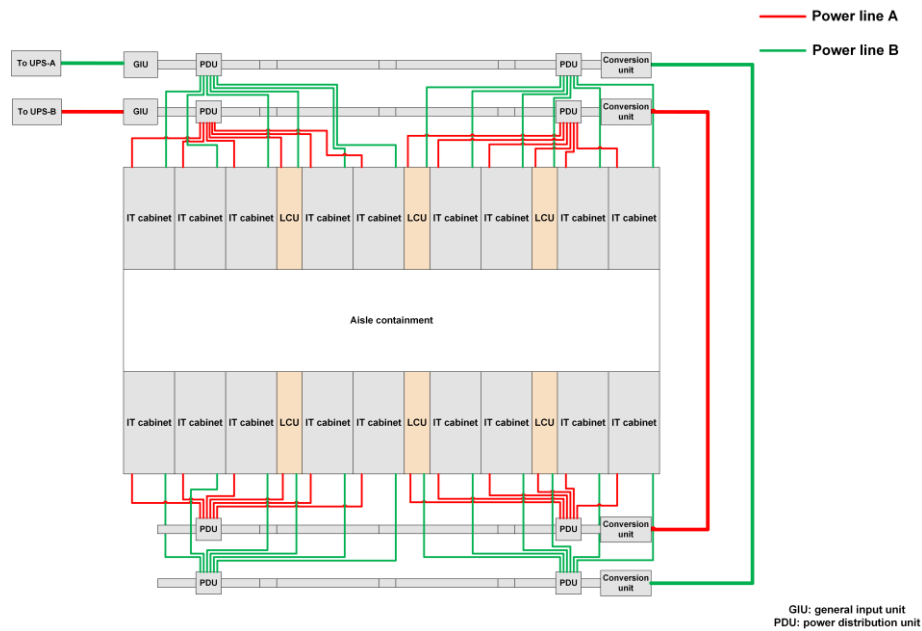


## 2N System Power Distribution Diagram

**Figure 3-18** 2N system power distribution diagram (precision PDC)



**Figure 3-19** 2N system power distribution diagram (new main way)



### 3.2.3 Integrated UPS Cabinet

The integrated UPS cabinet has the following features.

- Uses a unified architecture, and provides reliable quality, comprehensive functions, and consistent appearance.
- Integrates an ATS or MCCB and components for distributing power to IT equipment, air conditioners, lights, and UPSs.

Figure 3-20 shows an integrated UPS cabinet.

**Figure 3-20** Integrated UPS cabinet



DP05000042

Table 3-7 lists the configurations of an integrated UPS cabinet.

**Table 3-7** Structural specifications of an integrated UPS cabinet

Configuration	N+1 Scenario	2N Scenario
Input mode	Dual-route ATS 250 A	Single-route MCCB 250 A
Power distribution circuit breakers for air conditioners	40 A/1P x 18 (applicable to the air conditioners with only cooling function) 63 A/1P x 6 (applicable to the air conditioners with heating and humidification functions)	
Power distribution circuit breakers for lights	10 A/1P x 3	

<b>Power distribution circuit breakers for IT equipment</b>	40 A/1P x 18 x 2; 63 A/1P x 6 x 2
<b>Dimensions (H x W x D)</b>	2000 mm x 600 mm x 1100 mm 2000 mm x 600 mm x 1200 mm (with a tail frame) 2200 mm x 600 mm x 1200 mm (with a top frame and tail frame)

An integrated UPS cabinet works in 380 V, 400 V, or 415 V power mode, and features redundancy, high reliability, high efficiency, energy saving, environmental protection, and intelligent and easy operation.

Table 3-8 lists the technical specifications for the integrated UPS.

**Table 3-8** Technical specifications for the integrated UPS

Category	Item	Specifications
Input	Power system	Three phases
	Rated input voltage	380 V, 400 V, or 415 V AC, three-phase, four-wire, and PE
	Input voltage range	80–280 V AC (phase voltage) (When the input voltage ranges from 80 V AC to 176 V AC, loads are linearly derated.)
	Input frequency range	40–70 Hz
	Input power factor	> 0.99 (full load); > 0.98 (50% load)
	Rated input current	250A
Output	Rated voltage	380 V, 400 V, or 415 V AC, three-phase, four-wire, and PE
	Total harmonic distortion (THD) (linear load)	THD ≤ 1%
	Total harmonic distortion (THD) (non-linear load)	THD ≤ 4%
	Power factor	1
	Maximum peak factor for loads	3:1 (in compliance with IEC 62040-3 standard)
	Overload capability	60 min (105%–110% load) 10 min (111%–125% load) 1 min (125%–150% load)
Battery	Number of batteries	30 to 40 12 V batteries (32 batteries by default) Derated by 6% when 30 batteries are used

Category	Item	Specifications
	Battery string sharing	Battery strings are shared in the cabinet by default. There are no combined cabinets in the Smart Module.
	Charge voltage	Equalized charging voltage: 2.35 V/cell; float charging voltage: 2.25 V/cell The maximum battery capacity is 3,000 Ah. The charging current is limited based on the battery capacity.
System	Display	LCD+LED
	System efficiency	≥ 96%
	Current equalization	< 5% (in parallel mode)
	Number of combined cabinets	In a Smart Module, cabinets do not need to be combined.
	Cable connection	Routed in and out from the top
	Rated power	The integrated UPS supports the 3+1 working mode (three power modules and one redundant module) and supports up to 112 kW IT cabinet power. IT cabinet power can be 32 kW (1+1), 72 kW (2+1), or 112 kW (3+1).
	Noise	At atmospheric pressure (25°C) <ul style="list-style-type: none"> <li>• 25% load: 54 dB</li> <li>• 50% load: 58 dB</li> <li>• 75% load: 61 dB</li> <li>• 100% load: 65 dB</li> </ul>
Others	Maintenance mode	Maintained from the front or rear
	Surge protection	Level C SPD

## ATS (Optional)

Table 3-9 lists the specifications of an ATS.

**Table 3-9** ATS specifications

Item	Specifications
Input voltage range	187–264 V AC (phase voltage)
Input frequency range	40–70 Hz

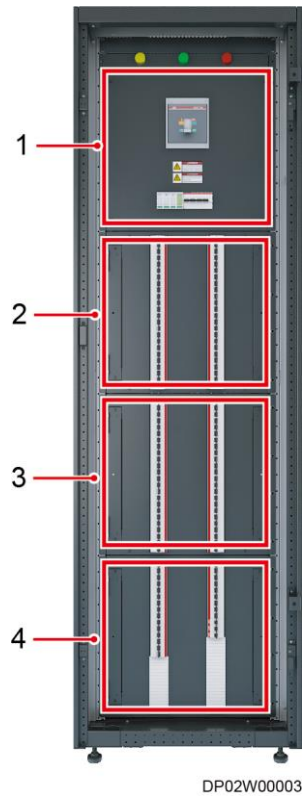
### 3.2.4 Precision PDC

The precision PDC provides the following features:

- Modular design, facilitating capacity expansion and backup
- Compatible with cabinets of low to high power density

Figure 3-21 and Figure 3-21 show the precision PDC with a single input.

**Figure 3-21** Precision PDC with a single input



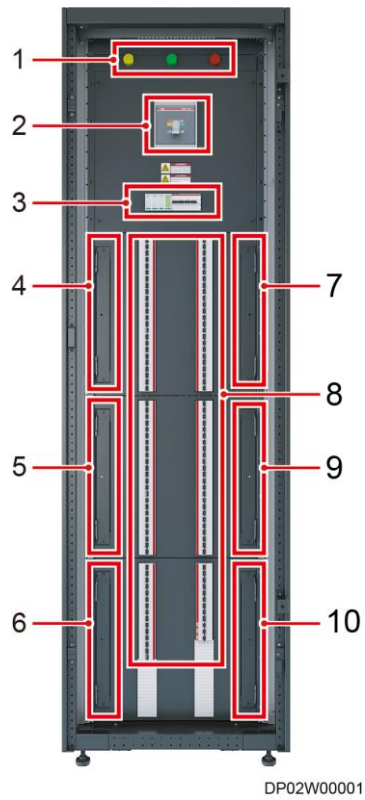
(1) Input module

(2) Output module 1

(3) Output module 2

(4) Output module 3

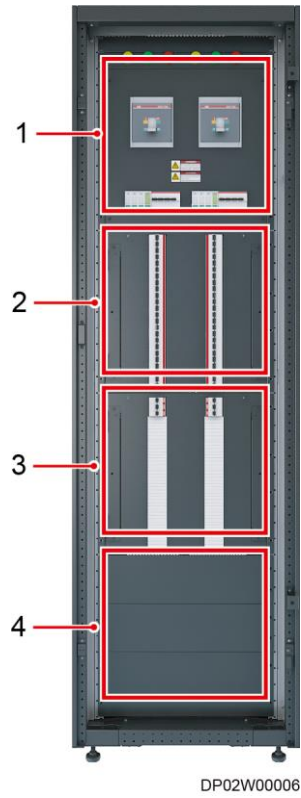
**Figure 3-22** Precision PDC with a single input



- |                                 |                                |
|---------------------------------|--------------------------------|
| (1) Indicators                  | (2) MCCB input circuit breaker |
| (3) SPD and SPD circuit breaker | (4) Monitoring board 1         |
| (5) Monitoring board 2          | (6) Monitoring board 3         |
| (7) Monitoring board 4          | (8) MCB output circuit breaker |
| (9) Monitoring board 5          | (10) Monitoring board 6        |

Figure 3-23 and Figure 3-23 show the precision PDC with two inputs.

**Figure 3-23** Precision PDC with two inputs



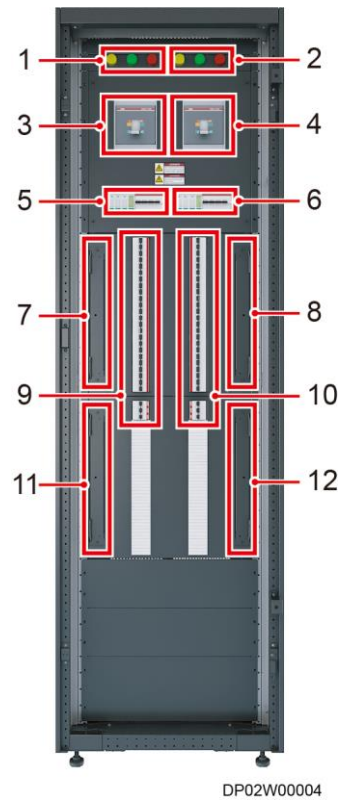
(1) Input module

(2) Output module 1

(3) Output module 2

(4) Output module 3

**Figure 3-24** Precision PDC with two inputs



- |  |   |
|--|---|
| (1) Indicator of route I                   | (2) Indicator of route II                   |
| (3) Input circuit breaker of route I       | (4) Input circuit breaker of route II       |
| (5) SPD and SPD circuit breaker of route I | (6) SPD and SPD circuit breaker of route II |
| (7) Monitoring board 1                     | (8) Monitoring board 3                      |
| (9) Output circuit breaker of route I      | (10) Output circuit breaker of route II     |
| (11) Monitoring board 2                    | (12) Monitoring board 4                     |

Table 3-10 lists the precision PDC specifications.

**Table 3-10** Technical specifications

Item	Technical Specifications
Dimensions (H x W x D)	<ul style="list-style-type: none"> <li>2000 mm x 600 mm x 1100 mm</li> <li>2000 mm x 600 mm x 1200 mm (with a tail frame)</li> <li>2200 mm x 600 mm x 1200 mm (with a top frame and a tail frame)</li> </ul>
Weight (kg)	< 350
Rated operating voltage (V)	208/220/380/400/415
Rated insulation voltage (V)	690



Item	Technical Specifications
Rated frequency (Hz)	50/60
Rated operating current (A)	400/250/160
Enclosure protection level	IP20
Output switch	Single-phase 40 A; maximum: 144 single-phase routes
Surge protection level	Level C
Cable routing	Routed from the top
Certification	CCC (GB 7251) and CE (IEC 60950)
Environmental friendliness	RoHS and REACH

### 3.2.5 New Main Way

#### Appearance



DC05W00002

#### Features

Feature	Description
High efficiency, economical, and rapid delivery	Space saving: saves the IT cabinet space.
	Easy maintenance: requires short maintenance duration, less than 10 minutes for replacing a single power distribution unit
	High scalability: Busbar trunking units can be added. Each busbar trunking unit connects to one power distribution unit.
	Long lifespan: over 35 years

Feature	Description
	Power saving: saves about 1600 kWh power each year in a typical scenario with 80 kW 50% loads.
Safe, reliable, and flexible O&M	Reliability: uses a foolproof structure with installation position marks and spacing measures.
	Easy O&M: can be easily maintained as the new main way is highly reliable and allows users to replace power distribution units.
	Easy installation: requires less than 10 man-hours to install the new main way (smart module R16 N+1 80 kW).
Intelligent monitoring and flexible management	Easy to network through an FE port to implement teleindication, telemetering, and teleadjusting.
	Flexible to manage and monitor the power usage effectiveness (PUE) and maintenance.
	Intelligently measures and monitors parameters such as electricity, currents, voltages, power factor, total active power, total apparent power, total reactive power, and neutral wire currents.

## Technical Specifications

Item	Technical Specifications
System type	TN-S supports three-phase five-wire input.
Rated operating voltage (Un)	380 V AC/400 V AC/415 V AC
Overtoltage type	III
Rated operating current (In) at 40°C	160 A/250 A
Input switch	<ul style="list-style-type: none"> <li>• One 160 A/3P MCCB</li> <li>• One 250 A/3P MCCB</li> </ul>
Output switch	Six 40 A/1P MCBs
Rated transient withstand current (Icw)	6 kA, 1s
Rated power frequency withstand voltage	2000 V AC, 1 min
Rated frequency	50 Hz/60 Hz
Protection level	IP30
Electric shock protection type	Type I

Item	Technical Specifications
Electromagnetic compatibility (EMC) environment	Class B
Cabling mode	Routed in from the end
Cable connection capacity	<ul style="list-style-type: none"><li>• 160 A rated current: 4 x 70 mm<sup>2</sup> + 1 x 35 mm<sup>2</sup></li><li>• 250 A rated current: 4 x 95 mm<sup>2</sup> + 1 x 50 mm<sup>2</sup></li></ul>

### 3.2.6 Battery Cabinet

The battery cabinet provides batteries, space for installing CIM, and space for routing cables for a data center. Figure 3-25 shows a battery cabinet.

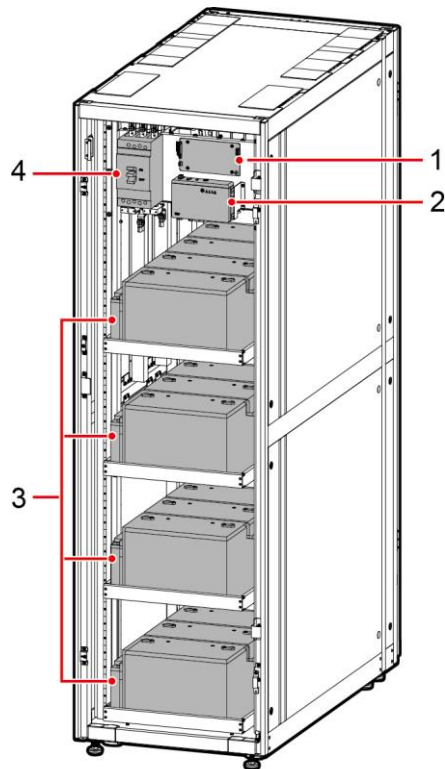
**Figure 3-25** Battery cabinet



DP15000040

The components of the battery cabinet are shown in Figure 3-26.

**Figure 3-26** Battery cabinet components



DP15000041

- (1) BIB
- (2) CIM
- (3) Batteries
- (4) Circuit breaker

Table 3-11 lists the technical specifications of a battery cabinet.

**Table 3-11** Battery cabinet technical specifications

Parameter	Specifications
Dimensions (H x W x D)	<ul style="list-style-type: none"> <li>• Basic dimensions: 2000 mm x 600 mm x 1100 mm</li> <li>• Basic dimensions: 2000 mm x 600 mm x 1200 mm</li> <li>• Dimensions after expansion: 2200 mm x 600 mm x 1200 mm (with the top frame)</li> </ul>
Color	Black
Materials	The materials are high-intensity class A carbon cold rolled steel sheet and zinc-coated steel sheet.
Ventilation channel	Front and rear ventilation channels
Installation space	Provides 42 U space
Installation mode	ESD floor or concrete floor

Parameter	Specifications
Door opening mode	The front door is a single door, and the rear door is a double one.
Weight	128 kg (excluding batteries)
Protection level	IP20

Table 3-12 lists the number of batteries with different capacity a single battery cabinet can house.



**NOTE**

Shoto and Enersys batteries are supported.

**Table 3-12** Maximum number of batteries in a single battery cabinet

Battery Capacity	Maximum Number of Batteries in a Single Battery Cabinet
26 Ah	40
40 Ah	
65 Ah	20
100 Ah	

**Table 3-13** Configuration scenario (The main battery cabinet and auxiliary battery cabinet are not differentiated.)

Battery Capacity	Cabinet Layer (from Top to Bottom)	Number of Batteries				
		40	38	36	34	32
-	-	40	38	36	34	32
26 Ah/40 Ah	The first layer	10	9	8	7	6
	The second layer	10	10	10	10	10
	The third layer	10	10	10	10	10
	The fourth layer	10	9	8	7	6

**Table 3-14** Configuration scenario (The main battery cabinet and auxiliary battery cabinet are differentiated.)

Battery Capacity	Cabinet Layer (from Top to Bottom)	Main Battery Cabinet	Auxiliary Battery Cabinet

Batte ry Capa city	Cabinet Layer (from Top to Bottom)	Main Battery Cabinet					Auxiliary Battery Cabinet				
		20	19	18	17	16	20	19	18	17	16
-	-	20	19	18	17	16	20	19	18	17	16
65 Ah/10 0 Ah	The first layer	5	4	3	2	1	5	4	3	2	1
	The second layer	5	5	5	5	5	5	5	5	5	5
	The third layer	5	5	5	5	5	5	5	5	5	5
	The fourth layer	5	5	5	5	5	5	5	5	5	5

### 3.2.7 PDU2000

Figure 3-27 and Figure 3-28 show PDU2000s.



**NOTE**

Figures provided in this document are for reference only.

**Figure 3-27** Full-height PDU2000



DP13000030

Table 3-15 describes the PDU2000 specifications.

**Figure 3-28** Half-height PDU2000



**Table 3-15** PDU2000 specifications

PDU2000 Type	PDU2000 Model	PDU2000 Output Port
Basic type	PDU2000-32-1PH-9/3-B1 (half height)	9 x C13 + 3 x C19

PDU2000 Type	PDU2000 Model	PDU2000 Output Port
	PDU2000-32-1PH-20/2-B1 (full height)	20 x C13 + 2 x C19
	PDU2000-32-3PH-12/9-B2 (full height)	12 x C13 + 9 x C19

### 3.2.8 Intelligent Battery Monitoring System

The intelligent battery monitoring system consists of the CIM (CIM01C2) and BIM (BIM01C3).

The communication interface module (CIM) is an intelligent battery management module that collects wireless communication data from the downstream battery interface module (BIM) groups, collects and analyzes the operating data of battery strings, calculates state of charge (SOC) and state of health (SOH) of batteries and battery strings and estimates the battery health status accordingly, supports battery tripping management, and uploads data to the management unit through COM or PoE ports.

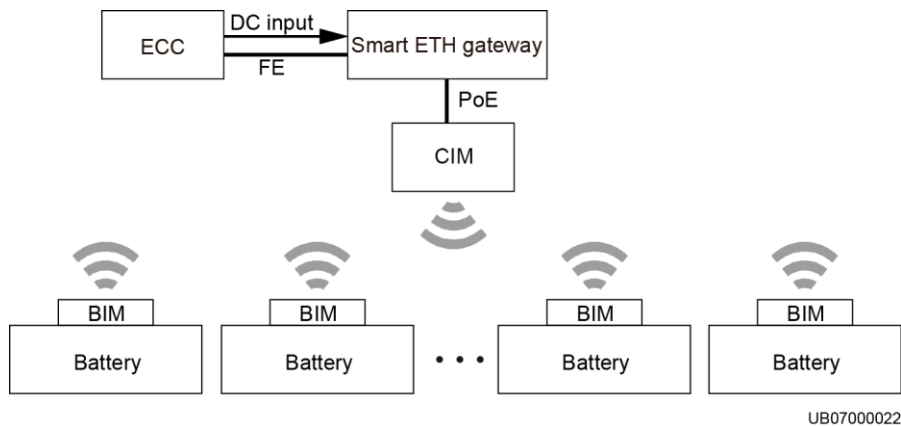
The BIM is a battery monitoring module that monitors the voltages, internal resistances, and pole temperatures of batteries.

 **NOTE**

- One CIM can support a maximum of 300 BIMs, and manage BIMs of a maximum of four battery strings.
- The BIM01C3 supports Shoto and Enersys batteries.

In the scenario with battery cabinets, the CIM is installed inside a smart module battery cabinet and the CIM communications cable connects to a smart ETH gateway. Figure 3-29 shows the CIM and BIM networking in the scenario with battery cabinets.

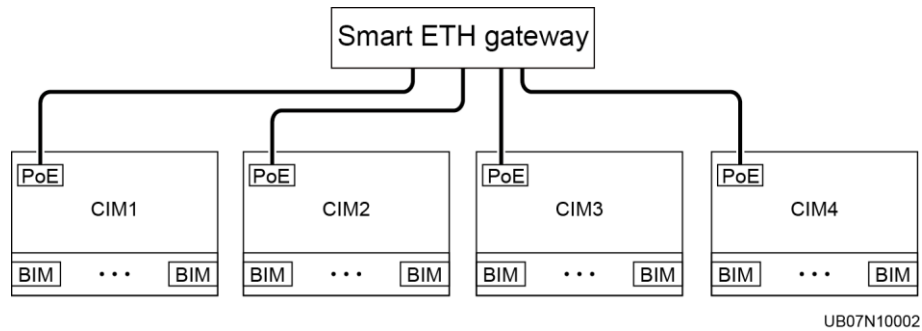
**Figure 3-29** CIM and BIM networking (in the scenario with battery cabinets)



UB07000022

If a battery system needs to be managed by multiple CIMs, CIMs can connect to northbound devices over straight-through cables (the ECC supports four parallel CIMs) without being cascaded, as shown in Figure 3-30.

**Figure 3-30** CIM communications cable connecting to a smart ETH gateway



### 3.2.8.1 CIM

CIM is a battery information collection module. It collects battery status data from the downstream BIM groups through wireless communication, and sends the data to the ECC, UPS, and the third-party network management system (NMS) through COM or PoE ports.

#### Features

- Collects battery data detected by the BIM through wireless communication.
- Each CIM can manage a maximum of four battery strings or 300 batteries.
- An external Hall effect sensor is connected to monitor the current of each battery string.
- Calculates the SOC and SOH of batteries and battery strings.
- Accurately identifies weak batteries in a battery string.
- Identifies loose battery terminals and battery terminal overtemperature, and controls battery switch tripping.
- Supports WebUI display, northbound communication over FE and RS485, and a third-party NMS.
- Supports CIM and BIM online upgrade on the monitoring system.



#### NOTE

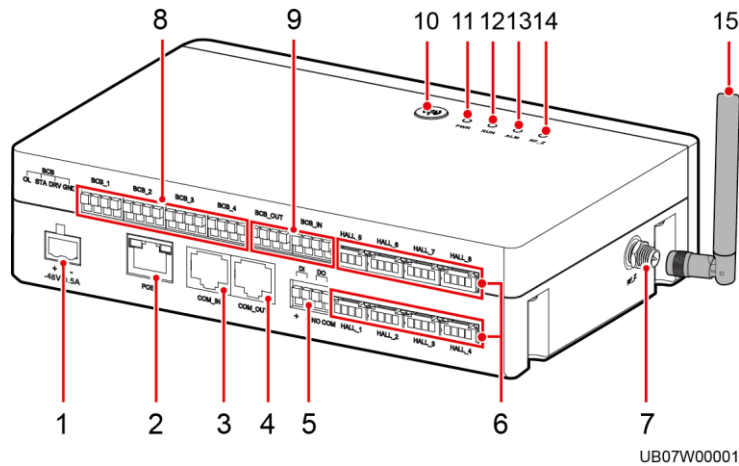
If the upgrade package is transmitted to the CIM within 30 minutes, the upgrade is complete. The BIM upgrade is finished through the CIM backend. The CIM ensures the successful upgrade of the BIM through retransmitting and flow control.

#### Appearance

Figure 3-31 and Figure 3-32 show the appearance of a CIM.



**Figure 3-31** CIM front view



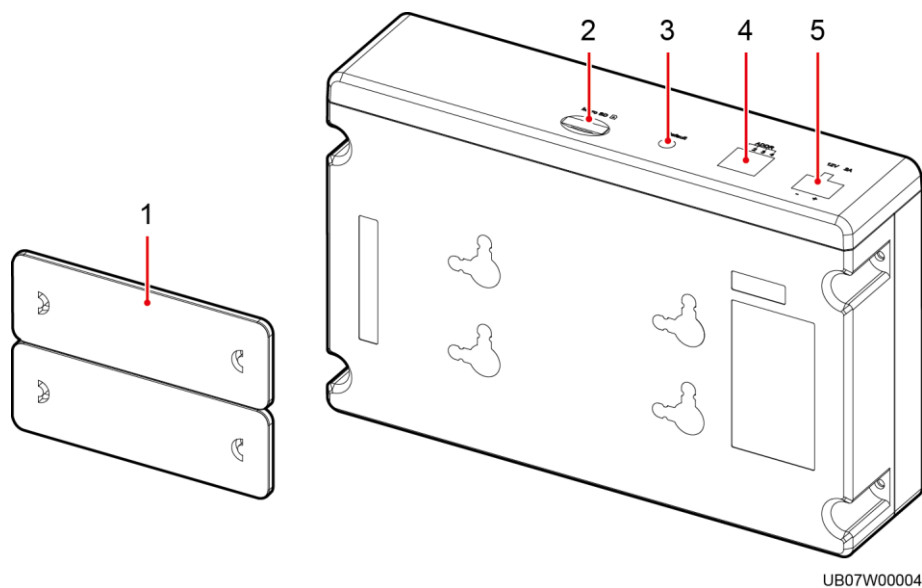
- |   |                       |   |
|---|-----------------------|---|
| (1) -48 V 0.5 A port (power input)            | (2) PoE port          | (3) COM_IN port (RS485 communication input) |
| (4) COM_OUT port (RS485 communication output) | (5) DI and DO ports   | (6) HALL_1–HALL_8 current monitoring ports  |
| (7) RF_Z antenna port                         | (8) BCB_1–BCB_4 ports | (9) BCB_OUT and BCB_IN ports                |
| (10) Networking switch                        | (11) PWR indicator    | (12) RUN indicator                          |
| (13) ALM indicator                            | (14) RF_Z indicator   | (15) Delivered antenna                      |



**NOTE**

Ports are protected by a security mechanism.

**Figure 3-32** CIM bottom view

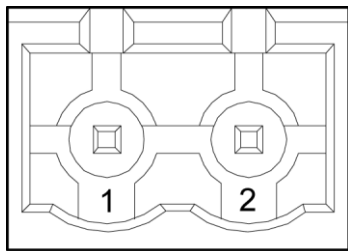


- |              |                        |
|--------------|------------------------|
| (1) Fastener | (2) Micro SD card slot |
|--------------|------------------------|

- (3) Default button (IP reset)
- (4) ADDR dual in-line package (DIP) switch (RS485 communications address)
- (5) 12V 2A port (power input)

## Power Port

**Figure 3-33** Power port pins



UB07000018

**Table 3-16** 12 V, 2 A port pin definitions

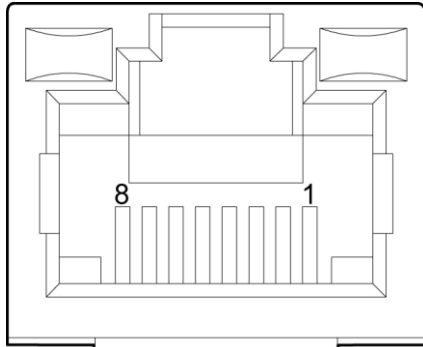
Pin	Definition	Description
1	-	In this scenario, an external power module is adopted to supply 12 V DC operating voltage.
2	+	

**Table 3-17** -48 V, 0.5 A port pin definitions

Pin	Definition	Description
1	+	The system provides 48 V DC operating voltage in this scenario.
2	-	

## PoE Port

**Figure 3-34** PoE port pins



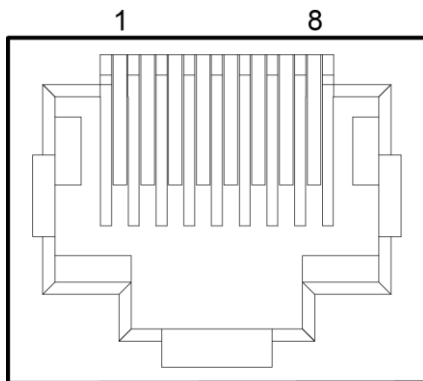
UB07000017

**Table 3-18** PoE port pin definitions

Pin	Definition	Description
1	TX+	Supports power supply through the PoE port. The terminal is an RJ45 terminal with an indicator.
2	TX-	
3	RX+	
4, 5	P45_P1	
6	RX-	
7, 8	P78_P1	

## COM Port

**Figure 3-35** COM port pins



UB07000033

**Table 3-19** COM port pin definitions

Pin	Signal	Description
1	RS485+	Two cascaded RS485 communication ports
2	RS485-	
3	NC	
4	RS485+	
5	RS485-	
6	GND	
7	NC	
8	NC	

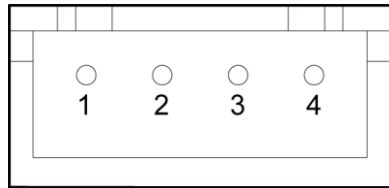
## DI and DO Ports

**Table 3-20** DI and DO port pin definitions

Pin	Definition	Signal Description	Status Description	Initial Status	Remarks
1	+	Dry contact input signal	<ul style="list-style-type: none"> <li>Open: The dry contact input is open.</li> <li>Closed: The dry contact input is closed.</li> </ul>	Open	Dry contact input and output signal
2	-				
3	NO	Dry contract output signal	<ul style="list-style-type: none"> <li>Open: The dry contact output is open.</li> <li>Closed: The dry contact output is closed.</li> </ul>	Open	
4	COM				

## Current Monitoring Port

**Figure 3-36** Current monitoring port pins



UB07W00002

**Table 3-21** Current monitoring port pin definitions

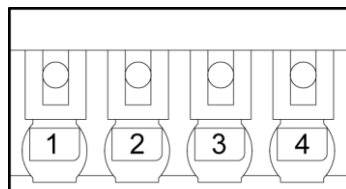
Pin	Definition	Description
1	+12 V	Detect the charge and discharge currents of four battery strings or eight battery routes.
2	-12 V	
3	AI	
4	GND	

 **NOTE**

- If the battery string is configured with the neutral wire, measure the currents of the positive and negative battery string cables. If the battery string is not configured with the neutral wire, measure the current of either the positive or negative battery string cable. The following uses the scenario where the battery string is configured with the neutral wire as an example.
- When a CIM manages multiple battery strings, first connect the Hall effect sensors on the positive and negative cables of battery string 1 respectively to the corresponding ports on the CIM. Then connect the Hall effect sensors on battery string 2 to the CIM in the same way, and so on.
- If the positive or negative battery string cable is too thick to be routed through the Hall effect sensor, or the measurement range of the Hall effect sensor is not enough, use multiple Hall effect sensors to monitor the current of one battery string. The CIM supports the sum of the monitoring results of multiple Hall effect sensors, which is set through **Multi-Hall cur. setting**.
- The value of **Multi-Hall cur. setting** equals the number of positive or negative Hall effect sensors in a single battery string and should be greater than or equal to 1.

## BCB Port

**Figure 3-37** BCB port pins



UB07000019

**Table 3-22** BCB\_1–BCB\_4 port pin definitions

Pin	Definition	Signal Description	Status Description	Initial Status	Remarks
1	OL	Monitors whether the BCB box is connected	<ul style="list-style-type: none"> <li>Grounded: BCB connected.</li> <li>Disconnected: BCB not connected.</li> </ul>	Disconnected	The four BCBs can separately manage tripping of four battery routes.
2	STA	Monitors the battery circuit breaker	<ul style="list-style-type: none"> <li>Grounded: The battery circuit breaker is ON.</li> <li>Disconnected: The battery circuit breaker is OFF.</li> </ul>	Disconnected	
3	DRV	Controls battery circuit breaker trip and outputs 12 V driving signals	<ul style="list-style-type: none"> <li>0 V: There is no driving signal for BCB tripping.</li> <li>12 V: There is a driving signal for BCB tripping.</li> </ul>	0 V	
4	GND	Secondary side ground			

**Table 3-23** BCB\_IN and BCB\_OUT cascading port pin definitions

Pin	Definition	BCB_IN Signal Description	BCB_OUT Signal Description	Status Description	Initial Status	Description
1	OL	Specifies whether the BCB connects to the signal output port.	Specifies whether the cascaded BCBs connect to the signal input port.	<ul style="list-style-type: none"> <li>Grounded: BCB connected.</li> <li>Disconnected: BCB not connected.</li> </ul>	Disconnected	Receives BCB commands sent by the UPS and supports

Pin	Definition	BCB_IN Signal Description	BCB_OUT Signal Description	Status Description	Initial Status	Description
2	STA	Signal output port for the battery circuit breaker status	Monitors whether the cascaded BCBs are connected to the input.	<ul style="list-style-type: none"> <li>Grounded: The battery circuit breaker is ON.</li> <li>Disconnected: The battery circuit breaker is OFF.</li> </ul>	Disconnected	BCB port cascading management.
3	DRV	Controls battery circuit breaker trip and receives 12 V driving signals		<ul style="list-style-type: none"> <li>0 V: There is no driving signal for BCB tripping.</li> <li>12 V: There is a driving signal for BCB tripping.</li> </ul>	0 V	
4	GND	Secondary side ground				

## DIP Switch

**Table 3-24** DIP switch description

No.	Definition	Description
1	ADDR_1	RS485 communications address setting
2	ADDR_2	
3	ADDR_3	
4	ADDR_4	

## Indicators

**Table 3-25** Indicator description

Indicator	Color	Meaning	Status	Description	Measure
-----------	-------	---------	--------	-------------	---------

Indicator	Color	Meaning	Status	Description	Measure
RF_Z	Green	Wireless communication status	Steady on	No network parameters exist. (A network is to be created.)	Requires no handling.
			Blinking at super short intervals	A network is being created (new nodes allowed).	
			Blinking at long intervals	Data is being transmitted (new nodes not allowed).	
RUN	Green	Northbound communication status	Blinking at long intervals	The communication is normal.	Requires no handling.
			Blinking intermittently at super short intervals	Blinking, lasting for 10s.	Requires no handling.
			Blinking at short intervals	Communication fails. (No legitimate northbound data has been received for 3 minutes.)	<ol style="list-style-type: none"> <li>1. Check whether the communication cable is loose.                             <ul style="list-style-type: none"> <li>• If yes, reconnect the communication cable.</li> <li>• If no, go to the next step.</li> </ul> </li> <li>2. Check whether the device is malfunctioning.                             <ul style="list-style-type: none"> <li>• If yes, replace the device.</li> <li>• If no, contact Huawei technical support.</li> </ul> </li> </ol>



Indicator	Color	Meaning	Status	Description	Measure
ALM	Red	Alarm indicator	Steady on	The actual number of online devices is less than the value of BIM number.	Check the value of BIM number, the BIM cable connection, and the BIM indicators.
			Off	The actual number of online devices equals the value of BIM number.	Requires no handling.
PWR	Green	Power indicator	Steady on	Board power indicator.	Requires no handling.



**NOTE**

- If an indicator blinks at long intervals, it is blinking at 0.5 Hz, that is, on for 1s and then off for 1s.
- If an indicator blinks at short intervals, it is blinking at 4 Hz, that is, on for 0.125s and then off for 0.125s.
- If an indicator blinks at super short intervals, it is blinking at 10 Hz, that is, on for 0.05s and then off for 0.05s.
- Blinking intermittently at super short intervals means an indicator blinks at super short intervals for 0.5s and then remains off for 0.5s.

## Networking Switch

**Table 3-26** Networking switch description

Name	Definition	Function
Button pressing	Press the button for less than 1s.	CIM blinking function
Button pressing	Press and hold the button for more than 1s but less than 5s.	Creates a network if no network has been created. Switches between network organization and data transmission if a network has been created.
Button holding down	Press and hold the button for more than 10s but less than 20s.	Clears the current network (including the network parameters of all the online BIMs).

## Default Button

**Table 3-27** Default button description

Name	Definition	Function
------	------------	----------

Name	Definition	Function
Default button	Hold down the button for more than 10 seconds.	Reset to the default IP address (192.168.0.10)

### 3.2.8.2 BIM

The BIM is a battery monitoring module that monitors the voltages, internal resistances, and pole temperatures of batteries and supports 12 V power.

#### Features

- Monitors the voltages, internal resistances, and pole temperatures of 12 V batteries.
- Supports the hibernation function. (When it detects that the battery voltage is low, it will enter the low-power mode.)
- Communicates with the CIM wirelessly.

#### BIM Appearance

Figure 3-38 shows a BIM.

**Figure 3-38** BIM



DD00000088

#### Indicators

**Table 3-28** Indicator description

Indicator	Color	Silk Screen	Status	Description
Running	Green	RUN	Off	Power consumption is low or the BIM is not powered on.
			Blinking at super short intervals	The networking has started but not completed.

Indicator	Color	Silk Screen	Status	Description
			Blinking at long intervals	The networking succeeds.
Alarm	Red	ALM	Off	The BIM is not faulty.
			Steady on	<ul style="list-style-type: none"> <li>The BIM is faulty.</li> <li>Communication with the CIM times out.</li> <li>No network is connected. (The BIM is waiting to connect to a network.)</li> </ul>
			Blinking at super short intervals	<ul style="list-style-type: none"> <li>Network parameters are being cleared.</li> <li>The BIM is blinking.</li> </ul>



**NOTE**

- If an indicator blinks at long intervals, it is blinking on for 1s and then off for 1s.
- If an indicator blinks at super short intervals, it is blinking at 10 Hz, that is, on for 0.05s and then off for 0.05s.

## Networking Switch

**Table 3-29** Networking switch description

Name	Definition	Function
Button pressing	Press the button for less than 5 seconds.	Searches for and joins a network if there is no network. Initializes the network parameters if there is a network.
Button holding down	Hold down the button for more than 5 seconds.	Clears the current network and resets the wireless module; disconnect the network.

## 3.3 Cooling System

### Features

- Supports L1/L2 linkage and teamwork control for the indoor units.
- Operates under T1 and T3 environment and extremely low temperature environment.

### 3.3.1 System Description

The cooling system uses chilled water in-row precision air conditioners and an aisle containment for cooling. The in-row precision air conditioners and equipment cabinets form an aisle containment as shown in Figure 3-39 to separate hot air from cold air.

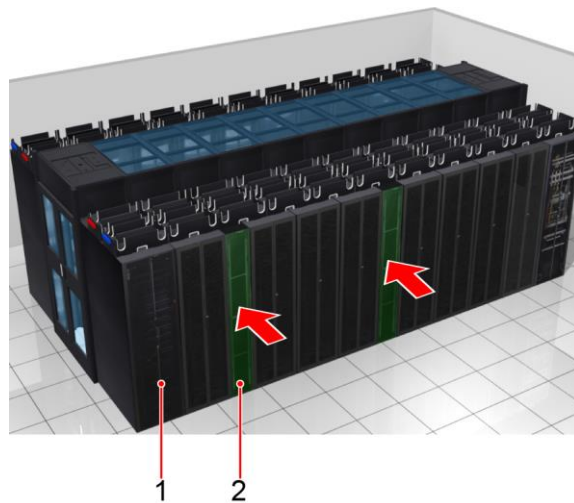
With the rapid development of data centers, power consumption of core equipment in a traditional equipment room has risen from 3-5 kW per cabinet to 10 kW per cabinet. This brings challenges of heat dissipation, energy saving, and environment protection to the traditional air cooling system.

The traditional air cooling system cannot meet the requirements of new-generation data centers. The new in-row air conditioners can solve heat dissipation problems caused by high-density deployment to lower the data center cooling power consumption and the PUE value. They can be installed beside cabinets thanks to good compatibility with standard cabinets.

The in-row air conditioners provide a high-heat-flux cooling solution that applies to high-density data centers or overheated areas in common data centers. High-heat-flux cooling solutions are classified into water-based or non-water-based solutions depending on the cooling medium. The NetCol5000-C in-row air conditioner is a water-based solution.

In-row air conditioners are close to heat sources, which shortens the air supply distance, reduces airflow pressure loss and cold air loss, and maximizes the use of cooling capacity.

**Figure 3-39** Aisle containment scenario



DS00000118

(1) Devices in the equipment room

(2) Air conditioners

NetCol5000-C 30 kW chilled water in-row precision air conditioners are used in this system.

### 3.3.2 NetCol5000-C 30 kW

This section describes the components, operating environment, and technical specifications of the NetCol5000-C 30 kW chilled water in-row precision air conditioner (NetCol5000-C in-row precision air conditioner for short).

**Figure 3-40** Appearance



### 3.3.2.1 Components

The NetCol5000-C consists of cooling components, the controller, and monitoring system.

#### 3.3.2.1.1 Cooling Components

The NetCol5000-C consists of the chilled water valve, electronic commutation (EC) fan, heat exchanger, air filter, condensate pump (optional), deflector (optional), electric heater (optional), and electrode humidifier (optional).

- Chilled water valve  
The brand name flow regulating valve is used, which features good environment adaptability, precise adjustment and temperature control, energy efficient, high reliability, long service life, and easy installation.
- EC fan  
The brand name fan features high reliability and long service life, and saves more energy than common fans by 30%.
- Heat exchanger  
The finned-tube heat exchanger with a zinc-plated layer adopts the computational fluid dynamics (CFD) to optimize the process design, which greatly improves the heat exchange efficiency.
- Air filter  
The air filter meets requirements for equipment room cleanness.
- Condensate pump (optional)

The drainage system uses dual floats and double water pumps, achieving higher reliability.

- Deflector (optional)

It controls the horizontal supply air flow direction.

- Electric heater (optional)

The positive temperature coefficient (PTC) heater automatically adjusts heating capacity and provides multiple protection mechanisms to ensure operating security and reliability. The electric heater features quick start, large heating capacity, and even heating.

- Electrode humidifier (optional)

The electrode humidifier provides stepless adjustment of humidification capacity and precise control of humidity in equipment room.

### 3.3.2.1.2 Controller

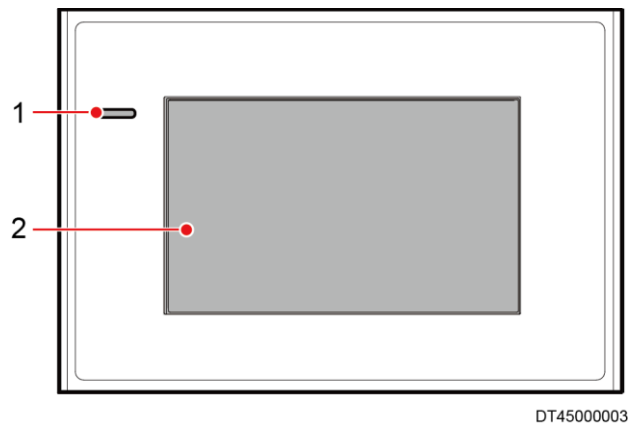
The controller of the NetCol5000-C consists of a liquid crystal display (LCD), main control board, and temperature and humidity collection board.

## LCD

The 7-inch true color-sensitive LCD offers a user-friendly interface for you to perform query, settings, monitoring, and maintenance.

Figure 3-41 shows an LCD.

**Figure 3-41** LCD



DT45000003

(1) Indicator

(2) Screen

## Functions

- When only one NetCol5000-C is running, the controller provides logic control of components in the NetCol5000-C to meet temperature and humidity requirements.
- The 7-inch true color-sensitive LCD allows you to set parameters for the NetCol5000-C and query its status.
- When multiple NetCol5000-Cs work cooperatively, the controller optimally distributes the heat load to reduce power consumption and provides backup to improve reliability.

## Features

- Provides a touchscreen with a compact interface.
- Controls the NetCol5000-C precisely and responds quickly.
- Uses a multi-level password protection mechanism to prevent misoperation.
- Protects the NetCol5000-C from power failures and water leaks, ensuring system reliability.
- Displays the operating status and time of the components in the NetCol5000-C in real time.
- Uses a fault diagnosis system to automatically display fault information, which facilitates maintenance.
- Provides abundant external ports such as FE ports, RS485 ports, and USB ports that are protected by a security mechanism.
- Stores a maximum of 500 historical alarms.

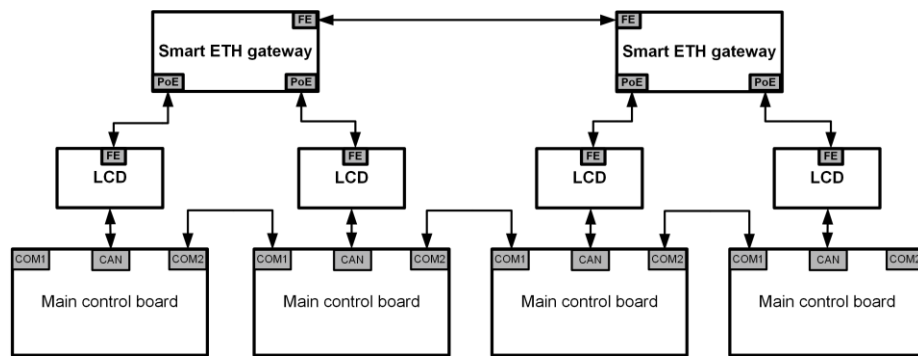
### 3.3.2.1.3 Monitoring System

The monitoring system provides logic control, data collection, control demand delivering, alarm reporting, data storage, user right management, and teamwork control. You can connect your monitoring system to the monitoring system of the NetCol5000-C over a northbound port (RS485 or FE) to perform remote management.

The NetCol5000-C can be networked over a controller area network (CAN) bus to perform the teamwork, which efficiently saves energy and prolongs the service life.

Figure 3-42 shows the network diagram of the monitoring system.

**Figure 3-42** Teamwork control network diagram



### 3.3.2.2 Working Conditions

#### Environment requirements

**Table 3-30** Environment requirements

Item	Environment Requirements
Environment	Class A environment in data centers
Operating temperature <sup>a</sup>	4°C to 55°C

Item	Environment Requirements
Operating humidity	≤ 95% RH
Altitude	0 m to 1000 m. The cooling capacity is derated when the altitude is above 1000 m. For details, see Figure 3-43.
Storage temperature	−40°C to +70°C
Storage humidity	≤ 95% RH
a: When the ambient temperature is below 0°C, the NetCol5000-C needs to increase certain concentration of ethylene glycol solution. For details, see <a href="#">Cooling Capacity Curve in Proportion to the Glycol Solution Density</a> .	

## Installation Requirements

**Table 3-31** Installation requirements

Item	Installation requirements
Room	The room can be sealed well.
	Width ≥ 0.9 m; height ≥ 2.3 m.
Main water inlet	<ul style="list-style-type: none"> <li>Water pressure is 0.4 MPa.</li> <li>Maximum water inlet temperature <sup>a</sup> is 20°C.</li> <li>A Y-shaped strainer needs to be installed on the water inlet pipe, 20 filtration pores. The pH value of chilled water is 7.0–9.0.</li> </ul>
Water supply of humidifier	<ul style="list-style-type: none"> <li>Water pressure ranges from 0.1 MPa to 0.7 MPa.</li> <li>Water temperature ranges from 1°C to 40°C.</li> <li>Transient flow is greater than or equal to 0.6 L/min.</li> <li>The quality of supplied water must meet the requirements listed in Table 3-32.</li> </ul>
Drain water	<ul style="list-style-type: none"> <li>The upper drainage height of the condensate pump should be 3.5 meters at most.</li> <li>The hose can be used in a environment whose temperature is higher than 85°C. (The requirement is only for the units with a humidifier.)</li> </ul>
Power	Earth leakage circuit breakers are not recommended for mains. If earth leakage circuit breakers are required by the customer or according to local regulations, use the residual current circuit breaker (RCCB) that is not sensitive to the single-phase direct current pulse and transient current pulse.
a: Adjust the alarm threshold because a high temperature alarm will be generated if the temperature is over 20°C.	



**Table 3-32** Water quality requirements

Name	Specifications	Unit
Hydrogenion	7–8.5	pH
Conductivity rate at 20°C ( $\sigma_{20}$ ) <sup>a</sup>	300–1250	$\mu\text{S/cm}$
a: When $\sigma_{20}$ is less than 300 $\mu\text{S/cm}$ , the first vapor exhausting duration of the humidifier is long; when $\sigma_{20}$ greater than 1250 $\mu\text{S/cm}$ , the humidifier service life is affected.		

### 3.3.2.3 Technical Specifications

Table 3-33, Table 3-34, and Table 3-35 describe the NetCol5000-C technical specifications.

**Table 3-33** NetCol5000-C technical specifications (1)

Item	NetCol5000-C030H6B2010020 E1	NetCol5000-C030H6B2010020 E0
Cooling capacity	30 kW <sup>a</sup>	30 kW <sup>a</sup>
Maximum power	1200 W	1200 W
Maximum current	6.5 A	6.5 A
Air supply mode	Horizontal flow	Horizontal flow
Power system	220 V AC, 1 Ph, 50 Hz/60 Hz Tolerance: –10% to +10% of rated voltage, rated frequency $\pm$ 3 Hz, one active power supply, and one standby power supply	220 V AC, 1 Ph, 50 Hz/60 Hz Tolerance: –10% to +10% of rated voltage, rated frequency $\pm$ 3 Hz, one active power supply, and one standby power supply
Fan type	EC fan	EC fan
Speed adjustment	Stepless	Stepless
Rated air volume	5100 m <sup>3</sup> /h	5100 m <sup>3</sup> /h
Maximum operating pressure	1.6 MPa	1.6 MPa
Configuration of a condensate pump	Yes	No
Configuration of an air deflector	No	<ul style="list-style-type: none"> <li>• For a 1000 mm deep model: no</li> <li>• For a 1200 mm deep model: optional</li> </ul>
Heating function	No	No
Humidification function	No	No

Item	NetCol5000-C030H6B2010020 E1	NetCol5000-C030H6B2010020 E0
External dimensions (H x W x D)	<ul style="list-style-type: none"> <li>• 2000 mm x 300 mm x 1000 mm</li> <li>• 2000 mm x 300 mm x 1200 mm</li> </ul>	<ul style="list-style-type: none"> <li>• 2000 mm x 300 mm x 1000 mm</li> <li>• 2000 mm x 300 mm x 1200 mm</li> </ul>
Package dimensions (H x W x D)	2200 mm x 760 mm x 1350 mm	2200 mm x 760 mm x 1350 mm
Net weight	≤ 165 kg	≤ 166 kg
Installation mode	On ESD floor	On ESD floor
Certification	RoHS and REACH	RoHS and REACH
a refers to the test condition (return air dry/wet bulb temperature: 37.8°C/20.8°C; chilled water inlet temperature: 10°C; water flow rate: 5.5 m <sup>3</sup> /h).		

**Table 3-34** NetCol5000-C technical specifications (2)

Item	NetCol5000-C030H7B201E12 E0	NetCol5000-C030H7B2010020 E1
Cooling capacity	30 kW <sup>a</sup>	30 kW <sup>a</sup>
Maximum power	<ul style="list-style-type: none"> <li>• Active route: 7050 W</li> <li>• Standby route: 1200 W</li> </ul>	1200 W
Maximum current	<ul style="list-style-type: none"> <li>• Active route: 26 A</li> <li>• Standby route: 6.5 A</li> </ul>	6.5 A
Air supply mode	Horizontal flow	Horizontal flow
Power system	208 V to 240 V, 1 Ph, 50 Hz/60 Hz  208 V rated voltage tolerance: -10% to +6%, 220 V and 240 V rated voltage tolerance: -10% to +10%, rated frequency tolerance: ±3 Hz, one active power supply, and one standby power supply	208 V to 240 V, 1 Ph, 50 Hz/60 Hz  208 V rated voltage tolerance: -10% to +6%, 220 V and 240 V rated voltage tolerance: -10% to +10%, rated frequency tolerance: ±3 Hz, one active power supply, and one standby power supply
Fan type	EC fan	EC fan
Speed adjustment	Stepless	Stepless
Rated air volume	5100 m <sup>3</sup> /h	5100 m <sup>3</sup> /h
Maximum operating pressure	1.6 MPa	1.6 MPa

Item	NetCol5000-C030H7B201E12 0E0	NetCol5000-C030H7B2010020 E1
Configuration of a condensate pump	No	Yes
Configuration of an air deflector	<ul style="list-style-type: none"> <li>For a 1000 mm deep model: no</li> <li>For a 1100 mm deep model: yes</li> <li>For a 1200 mm deep model: yes</li> </ul>	Yes
Heating function	Yes	No
Humidification function	Yes	No
External dimensions (H x W x D)	<ul style="list-style-type: none"> <li>2000 mm x 300 mm x 1000 mm</li> <li>2000 mm x 300 mm x 1100 mm</li> <li>2000 mm x 300 mm x 1200 mm</li> </ul>	<ul style="list-style-type: none"> <li>2000 mm x 300 mm x 1100 mm</li> <li>2000 mm x 300 mm x 1200 mm</li> </ul>
Package dimensions (H x W x D)	2200 mm x 760 mm x 1350 mm	2200 mm x 760 mm x 1350 mm
Net weight	≤ 174 kg	≤ 170 kg
Installation mode	On a concrete or ESD floor	On a concrete or ESD floor
Certification	RoHS and REACH	RoHS and REACH
a refers to the test condition (return air dry/wet bulb temperature: 37.8°C/20.8°C; chilled water inlet temperature: 10°C; water flow rate: 5.5 m <sup>3</sup> /h).		

**Table 3-35** NetCol5000-C technical specifications (3)

Item	NetCol5000-C030H7A201E12 0E0	NetCol5000-C030H7A201002 0E1
Cooling capacity	30 kW <sup>a</sup>	30 kW <sup>a</sup>
Maximum power	<ul style="list-style-type: none"> <li>Active route: 7050 W</li> <li>Standby route: 1200 W</li> </ul>	1200 W
Maximum current	<ul style="list-style-type: none"> <li>Active route: 26 A</li> <li>Standby route: 6.5 A</li> </ul>	6.5 A
Air supply mode	Horizontal flow	Horizontal flow

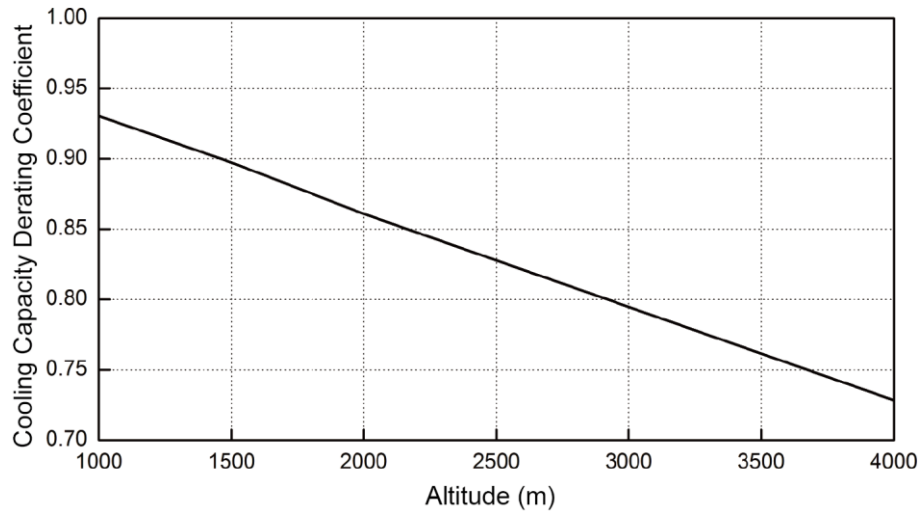
Item	NetCol5000-C030H7A201E12 0E0	NetCol5000-C030H7A201002 0E1
Power system	208 V to 240 V, 1 Ph, 50 Hz/60 Hz 208 V rated voltage tolerance: -10% to +6%, 220 V and 240 V rated voltage tolerance: -10% to +10%, rated frequency tolerance: $\pm 3$ Hz, one active power supply, and one standby power supply	208 V to 240 V, 1 Ph, 50 Hz/60 Hz 208 V rated voltage tolerance: -10% to +6%, 220 V and 240 V rated voltage tolerance: -10% to +10%, rated frequency tolerance: $\pm 3$ Hz, one active power supply, and one standby power supply
Fan type	EC fan	EC fan
Speed adjustment	Stepless	Stepless
Rated air volume	5100 m <sup>3</sup> /h	5100 m <sup>3</sup> /h
Maximum operating pressure	1.6 MPa	1.6 MPa
Configuration of a condensate pump	No	Yes
Configuration of an air deflector	No	No
Heating function	Yes	No
Humidification function	Yes	No
External dimensions (H x W x D)	2000 mm x 300 mm x 1000 mm	2000 mm x 300 mm x 1000 mm
Package dimensions (H x W x D)	2200 mm x 760 mm x 1350 mm	2200 mm x 760 mm x 1350 mm
Net weight	$\leq 171$ kg	$\leq 165$ kg
Installation mode	On a concrete or ESD floor	On a concrete or ESD floor
Certification	RoHS and REACH	RoHS and REACH
a refers to the test condition (return air dry/wet bulb temperature: 37.8°C/20.8°C; chilled water inlet temperature: 10°C; water flow rate: 5.5 m <sup>3</sup> /h).		

### 3.3.2.4 Performance Curves

Figure 3-43 and Figure 3-44 respectively show the cooling capacity derating coefficient curve in proportion to the altitude and the cooling capacity curve in proportion to the glycol solution density when the NetCol5000-C works under rated power and air flow.

## Cooling Capacity Derating Coefficient Curve in Proportion to the Altitude

**Figure 3-43** Cooling capacity derating coefficient curve in proportion to the altitude



NH04W00023



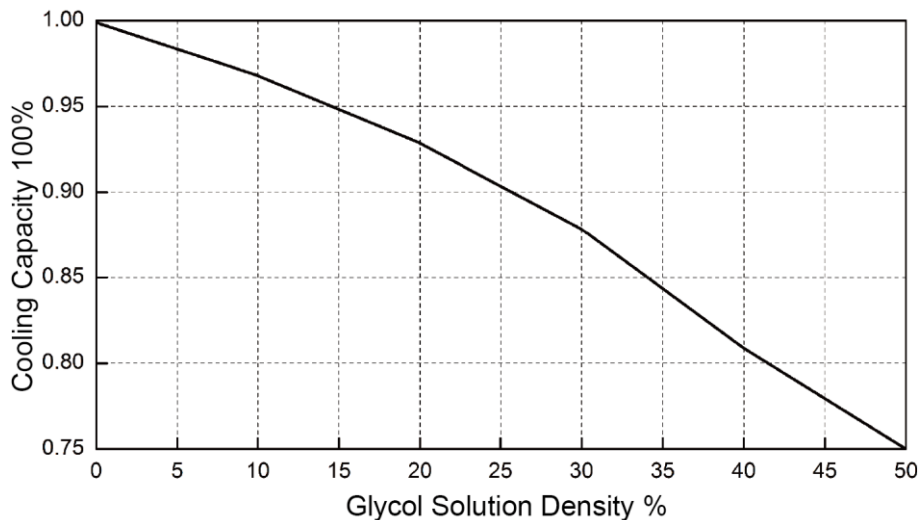
**NOTE**

When the altitude is within 1000 m, the cooling capacity deviation is in the tolerance range and can be ignored.

## Cooling Capacity Curve in Proportion to the Glycol Solution Density

The cooling capacity is obtained by multiplying the glycol solution density by the rated cooling capacity.

**Figure 3-44** Cooling capacity curve in proportion to the glycol solution density



NH04W00022

## 3.4 Management System

**Table 3-36** Management system configurations

Function	ECC800 WEB	ECC800 App	NetEco
Work order management	No	No	Yes
Energy efficiency management	No	No	Yes
PUE statistics	Yes	Yes	Yes
Capacity management	No	No	Yes
Generating alarms for SNMP northbound equipment	Yes	No	Yes
Monitoring data for SNMP northbound equipment	Yes	No	Yes
Mobile app O&M	Yes	Yes	Yes
Monitoring data/alarms for power supply and distribution equipment	Yes	Yes	Yes
Monitoring data/alarms for cooling equipment	Yes	Yes	Yes
Monitoring data/alarms for environment equipment	Yes	Yes	Yes
Monitoring data/alarms for fire extinguishing equipment	No	No	Yes
Access control management	Yes	Yes	Yes
Intelligent lighting	Yes	Yes	Yes
View presetting	Yes	Yes	No (manually drag)
Alarm notification by SMS or email	Yes	No	No

Function	ECC800 WEB	ECC800 App	NetEco
Battery monitoring	Optional	Optional	Optional
Log recording	Yes	Yes	Yes
Management range	A single smart module	A single smart module	Multiple smart modules
Configuration principle	Mandatory	Optional	Optional

### 3.4.1 System Description

The management system consists of the management software and other components. It implements data collection and management for various processes and infrastructure of the smart module.

The ECC800 provides the real-time status, alarms, and configuration information about the equipment inside the smart module for management. It also provides a graphical user interface (GUI) for ease of operating and maintaining equipment inside the smart module.

With a flexible structure and modular design, the NetEco can manage infrastructure of a single smart module or multiple smart modules in different areas in a centralized manner.

**Figure 3-45** Management system inside the smart module (power supply and distribution cabinet)

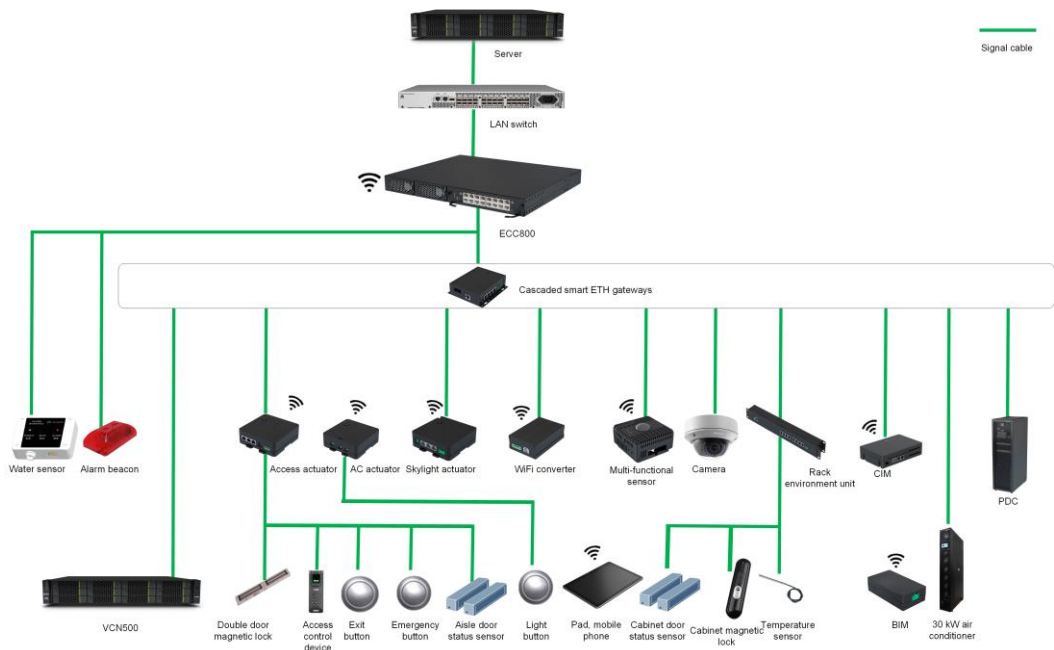
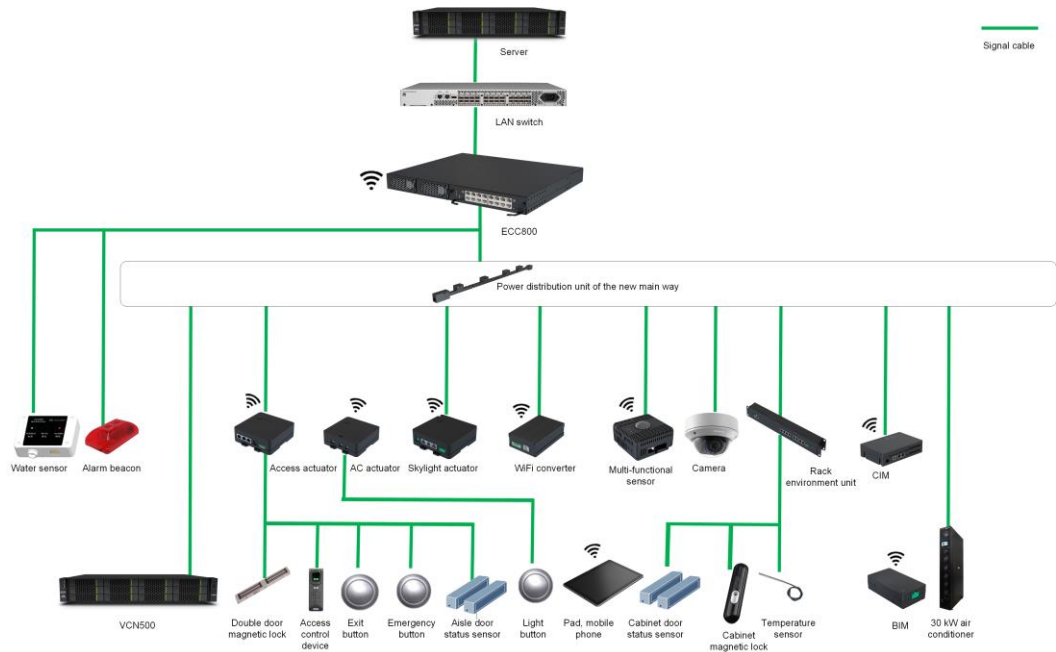


Figure 3-46 Management system inside the smart module (new main way)



The smart module provides the WiFi and RF\_Z wireless networking functions. The mobile app can be connected by wireless networking. Certain southbound components (such as the skylight actuator, AC actuator, multi-functional sensor, and access actuator) can be connected by RF\_Z wireless networking.

The management system provides a GUI to implement comprehensive management functions based on requirements. The system can monitor the following equipment:

- Power equipment, including precision air conditioners, UPSs, and ATSS
- Environment monitoring equipment, including multi-functional sensors (smoke, temperature, and humidity sensors) and water sensors
- Video equipment, including cameras and network video recorders VCN500.
- Access control equipment: A standard access management system is integrated to manage and monitor key information such as door status, card swiping, and permission setting.
- Standard network management interface: The NetEco provides SNMP interfaces to communicate with third-party NMSs. The system can be customized to support other protocols for the access from different devices.

## 3.4.2 Server

### Tecal RH2288V2 Server

The Tecal RH2288V2 rack server (RH2288V2 for short) of Huawei features large capacity and high performance and can meet customers' medium and long term requirements. It serves as the monitoring host of the NetEco and is responsible for data processing and analysis.

The RH2288V2 is 2 U high, and can be installed in a standard rack. Figure 3-47 shows an RH2288V2. Table 3-37 lists the specifications.



**Figure 3-47** RH2288V2 server



The RH2288V2 has the following features:

- It has powerful computing and storage capacity and scalability.
- It can be flexibly configured with value-added components and has multiple functions.

**Table 3-37** RH2288V2 specifications

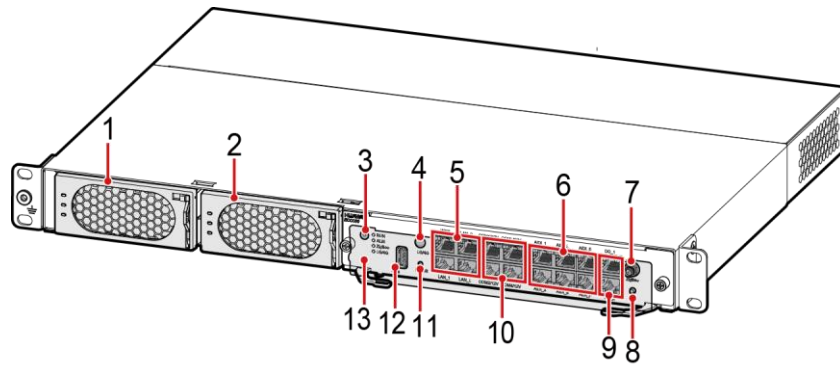
Item		Specifications
Structural design		2 U, H x W x D: 87.5 mm x 447 mm x 740 mm Can be installed in a standard 19-inch cabinet with the depth equal to or greater than 1000 mm
Main board	CPU	One or two
	CPU model	Supports Intel® Xeon® E5-2600 (Romely-EP) series 4C/6C/8C processors with a maximum power of 135 W. The maximum main frequency is 3.3 GHz, and a single CPU provides the L3 cache of 20 MB.
	Memory	Provides 24 DIMM slots, supports RDIMM/LRDIMM memory of DDR3 with a maximum capacity of 768 GB.
	Hard drive	Supports eight hot-swappable 6 Gbit/s SAS/SATA/SSD hard drives of 2.5 inches, or twelve hot-swappable 6 Gbit/s SAS/SATA hard drives of 3.5 inches and two hot-swappable 6 Gbit/s SAS/SATA/SSD hard drives of 2.5 inches.
	Expansion	Provides six expansion slots for PCIe 3.0 cards: one for PCIe3.0X16, four for PCIe3.0X8, and one for RAID.

### 3.4.3 ECC800

The ECC800 controller is mainly used for device and environment monitoring in a modular data center. It consists of two power supply units (PSUs) and one ECC800 monitoring module.

Figure 3-48 and Figure 3-49 show an ECC800 controller.

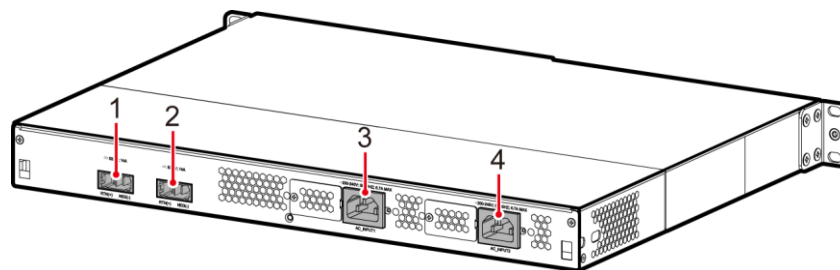
**Figure 3-48** ECC800 controller (front view)



DS34000020

- |  |                                 |                       |                        |
|--|---------------------------------|-----------------------|------------------------|
| (1) PSU                                    | (2) PSU                         | (3) Status indicator  | (4) 3G/4G antenna port |
| (5) FE ports (WAN_1–WAN_2 and LAN_1–LAN_2) | (6) AI/DI_1–6 sensor input port | (7) RF_Z antenna port | (8) SW button          |
| (9) DO_1–2 dry contact output              | (10) RS485 port (COM1–4/12V)    | (11) Default button   | (12) USB port          |
| (13) ECC800 monitoring module              |                                 |                       |                        |

**Figure 3-49** ECC800 controller (rear view)



DS34000021

- |                  |                  |               |
|------------------|------------------|---------------|
| (1) 53.5VDC_OUT1 | (2) 53.5VDC_OUT2 | (3) AC_INPUT1 |
| (4) AC_INPUT2    |                  |               |

## Specifications

Table 3-38 lists the ECC800 technical specifications.

**Table 3-38** ECC800 technical specifications

Item	Specifications
------	----------------

Item	Specifications
Power input	<ul style="list-style-type: none"> <li>• Supports two AC inputs</li> <li>• Rated voltage; 200–240 V AC/100–120 V AC</li> <li>• rated frequency; 50 Hz/60 Hz</li> <li>• Input current; 6.7 A</li> </ul>
Power output	<ul style="list-style-type: none"> <li>• rated voltage: 53.5 V DC</li> <li>• Output power of two power supplies: 2000 W (176–300 V AC); 940 W (linear derating at 85–175 V AC)</li> <li>• Output power of a single power supply: 1000 W (176–300 V AC); 470 W (linear derating at 85–175 V AC)</li> <li>• Output current: 14 A</li> </ul>
System memory	512 MB
Solid state disk	2 GB and 128 MB of storage space
FE port expansion	Supports two WAN ports, two LAN ports, and 10/100M communications rate
RS485 serial port expansion	<ul style="list-style-type: none"> <li>• Four RS485 ports with the default communications rate of 9600 bit/s</li> <li>• Each port provides 12 V DC power with the rated current of 450 mA.</li> </ul>
AI/DI expansion (RJ45)	<ul style="list-style-type: none"> <li>• Supports six AI/DI ports to connect to smoke sensors, water sensors, and temperature sensors.</li> <li>• Each port provides 12 V DC power with the rated current of 85 mA.</li> </ul>
DO expansion (RJ45)	<ul style="list-style-type: none"> <li>• Supports two expansion dry contacts with contact point capacity of 20 W, maximum withstand voltage of 60 V DC, and rated current of 0.5 A.</li> <li>• Supports the active DO port with an output voltage of 12 V DC and output current of 450 mA.</li> </ul>
Wireless communication	Supports wireless communication that complies with IEEE802.15.4.
3G	Supports 3G (WCDMA) communication and is compatible with 2G (GSM) communication. A standard SIM card slot is provided.  <b>NOTE</b> The prerequisite for using a SIM card is that the site has signal coverage.
USB	Provides a general USB port.
Button	<ul style="list-style-type: none"> <li>• SW: wireless network pairing button</li> <li>• Default: restores the default IP address</li> </ul>

## Indicators

Table 3-39 describes the indicators on the ECC800 monitoring module.



**Table 3-39** Indicators on the ECC800 monitoring module


Indicator	Color	Name	Status	Description
RUN	Green	Running status indicator	Steady on	The power supply is normal, the program is being loaded, or WiFi WPS is pairing.
			Off	The power supply is abnormal.
			Blinking at long intervals	The software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s) or the ECC800 registers with the NetEco successfully.
			Blinking at short intervals	The ECC800 does not register with the NetEco (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	The system is normal.
3G	Green	3G status indicator	Steady on	The 3G module is powered on.
			Off	The 3G module stops running, or no 3G module is configured.
			Blinking at long intervals	The 3G module succeeds in dial-up (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The 3G module registers with the operator network successfully (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
RF_Z	Green	Communication status indicator	Steady on	No network parameters exist, or a network is to be created.
			Blinking at long intervals	A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).

Indicator	Color	Name	Status	Description
			Blinking at super short intervals	A network is set up, and node access is allowed (the indicator blinks at 10 Hz, on for 0.05s and then off for 0.05s).

Table 3-40 describes the indicators on the PSU.

**Table 3-40** Indicators on the PSU

Indicator	Color	Name	Status	Description
	Green	Power indicator	Steady on	The converter has a power input.
			Off	The converter has no power input or is faulty.
			Blinking at long intervals	The converter is being queried (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The converter application program is being loaded (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
	Yellow	Alarm indicator	Steady on	The converter generates a forewarning indicating that power will be limited due to ambient overtemperature, or generates a protection shutdown alarm due to ambient overtemperature or undertemperature.
				Power input overvoltage or undervoltage protection
				Reverse DC input connection
				Slight current imbalance
				Output overvoltage
			Hibernation	
			Off	The converter generates no protection alarms.
Blinking at long intervals	The communication between the converter and the outside is interrupted (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).			

Indicator	Color	Name	Status	Description
	Red	Fault indicator	Steady on	The converter locks out due to output overvoltage.
				The converter delivers no output due to internal faults.
			Off	The converter is working properly.

## Wireless Network Pairing (SW) and IP Address Reset (Default) Buttons

Table 3-41 describes the wireless network pairing and IP address reset buttons.

**Table 3-41** Wireless network pairing and IP address reset buttons

Button Name	Function Description	Operation Description	Indicator Status
SW	Wireless network (802.15.4) pairing	In non-wireless network (802.15.4) pairing mode, press and hold down the button for 1.2s to 5s to enter the wireless network pairing mode.	The RF_Z indicator is blinking at super short intervals.
		In wireless network (802.15.4) pairing mode, press and hold down the button for 1.2s to 5s to exit the pairing mode; or the system automatically exits the pairing mode after 30 minutes without pressing the button.	The RF_Z indicator is blinking at long intervals.
		Press and hold down the button for more than 6s to clear network parameters.	The RF_Z indicator is on.

Button Name	Function Description	Operation Description	Indicator Status
	WiFi pairing button	In non-WiFi pairing mode, press the button for less than 1.2s to enter the WiFi pairing mode.	<ul style="list-style-type: none"> <li>• When the system enters the pairing mode, the RUN indicator is steady on.</li> <li>• After pairing succeeds, the RUN indicator blinks just as before WiFi pairing.</li> <li>• If pairing does not succeed for three minutes, the RUN indicator blinks just as before WiFi pairing.</li> </ul>
Default	IP address reset	Press and hold down the button for 3s. Then the IP address for the ECC800 WAN_1 port will restore to the default address 192.168.1.10.	None



**NOTE**

On the WebUI, restoring factory settings by one-click is supported. Click **Maintenance > Configuration File > Restore Factory Settings**.

- The monitoring module IP address restores to the default value.
- The video device IP address restores to the default value.
- Configuration parameters of each device restore to default values.
- The smart module plan view configuration is cleared.
- Alarm parameter configuration restores to default values.
- The NetEco communication parameters restore to default values.
- The smart module name restores to the default value.
- The WiFi function is disabled.
- The time and time zone restore to default values.

### 3.4.4 LAN Switch

Figure 3-50 shows an S5320 LAN switch.

**Figure 3-50** S5320 LAN switch



Table 3-42 describes parameters of the S5320 LAN switch.

**Table 3-42** Parameters of the S5320 LAN switch

Item	Parameter
Dimensions (H x W x D)	44.4 mm x 442 mm x 420 mm
Maximum power consumption (fully configured)	913 W (Power consumption: 173 W; PoE: 740 W)
Weight	≤ 8 kg
DC input voltage	Rated voltage: -48 V DC to -60 V DC
	Voltage range: -36 V DC to -72 V DC
AC input voltage	Rated voltage: 100-240 V AC
	Voltage range: 90-264 V AC
Temperature	<ul style="list-style-type: none"> <li>Operating temperature: 0°C to +50°C</li> </ul> <p><b>NOTICE</b>                      When the altitude ranges from 1800 m to 5000 m, the highest temperature decreases by 1°C for each additional 220 m.</p> <ul style="list-style-type: none"> <li>Storage temperature: -40°C to +70°C</li> </ul>
Relative humidity	5%-95% RH, non-condensing
Altitude	<ul style="list-style-type: none"> <li>Non-PoE device:                             <ul style="list-style-type: none"> <li>With DC power: 0–2000 m</li> <li>With AC power: 0–5000 m</li> </ul> </li> <li>PoE device: 0–5000 m</li> </ul>

## 3.4.5 Video System

The video system consists of the camera and VCN500, implementing real-time monitoring, video recording, and playback.

### 3.4.5.1 IP Camera

The existing network is equipped with the ECC800 that supports the Dynamic Host Configuration Protocol (DHCP). After the ECC800 and IPC6325 camera are powered on, the IPC6325 camera automatically obtains an IP address that is in the same network segment as



the ECC800 IP address. Therefore, the IPC6325 camera IP address should be reset before camera commissioning begins.

The IPC6325-WD-VR network camera (IPC6325 camera for short) is a two-megapixel wide dynamic infrared zoom dome camera that can be wall-mounted or ceiling-mounted.

**Figure 3-51** IPC6325 camera



DM08W00002

**Table 3-43** IPC6325 camera technical specifications

Item	Specifications
Image sensor	1/2.7" two-megapixel progressive scan CMOS
Lowest illuminance	<ul style="list-style-type: none"> <li>• Color: 0.01 lux (F1.4, AGC ON)</li> <li>• Black and white: 0.004 lux (F1.4, AGC ON)</li> <li>0 lux (infrared enabled)</li> </ul>
Wide dynamic range	120 dB
Focal length	2.8–12 mm manual zoom, 4.3x optical zoom
Video coding format	H.265/H.264/MJPEG
Maximum resolution	1920x1080
Intelligent video analysis	Supports tripwire detection, loitering detection, intrusion detection, abandoned object detection, removed object detection, target color recognition, classifications of people and vehicles, and metadata backhaul.
Power supply	PoE (802.3at/af), 24 V AC±25%, 24 V DC±25%, 12 V DC±25% (polarity-insensitive DC power supply), applicable to DC/AC adapter and PoE hot backup
Protection level	IP66; complying with IEC 60529
Explosion protection level	IK10; complying with IEC 62262

### 3.4.5.2 VCN500

Figure 3-52 shows a VCN500.

**Figure 3-52** VCN500



Table 3-44 lists the performance indicators of a VCN500.

**Table 3-44** Performance indicators of a VCN500

Item	Description
Video input	A single VCN500 connects to a maximum of 32 cameras and a maximum inbound bandwidth of 160 Mbit/s.
Video forwarding	A single VCN500 supports 32 cameras or the media forwarding capacity of 160 Mbit/s.
Storage performance	A single VCN500 stores a maximum of 32 cameras and a maximum inbound bandwidth of 160 Mbit/s.
Video playback and download	A single VCN500 supports 32 cameras or the media playback and download capacity of 160 Mbit/s.

Table 3-45 lists the hardware specifications of a VCN500.

**Table 3-45** Hardware specifications of a VCN500

Item	Description
Hard drive slot	12 slots for 3.5-inch hard drives
Type and number of supported hard drives	Twelve 4 TB SATA hard drives <b>NOTE</b> The VCN500 supports hard drives at enterprise and monitoring levels.
RAID controller card	The VCN500 does not have a RAID controller card on its mainboard.
Type and number of supported CPUs	One 1 GHz CPU, max. 10 MB cache
Memory capacity	2 GB
I/O ports	Two service network ports, with RJ45 connectors and LNK/ACT indicators

Item	Description
Power parameters	Single power supply only
	Maximum PSU power: 250 W
	AC power input voltage range: 100–240 V
	AC power frequency range: 50–60 Hz
Full configuration weight	≤ 20 kg
Typical power consumption (excluding hard drives)	40 W
Maximum power consumption (excluding hard drives)	70 W
Typical power consumption (including monitoring hard drives)	170 W
Maximum power consumption (including monitoring hard drives)	215 W
Typical power consumption (including enterprise hard drives)	200 W
Maximum power consumption (including enterprise hard drives)	250 W
Dimensions (H x W x D)	86.1 mm x 447.0 mm x 470.0 mm

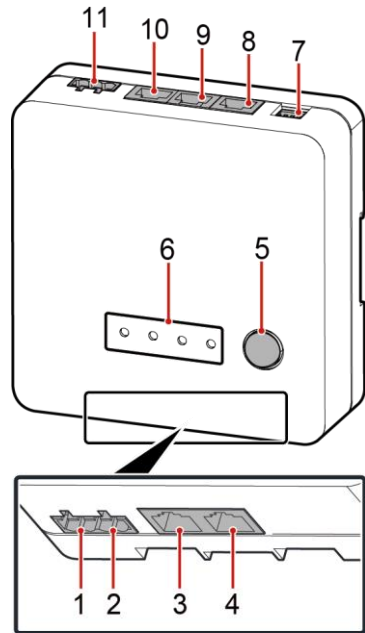
## 3.4.6 Skylight Control System

### 3.4.6.1 Skylight Actuator

The skylight actuator controls the rotating skylight on the aisle containment of the Smart Module through the alarm linkage information from the fire extinguishing system or the control information from the upper computer. The skylight actuator supports E-labels and wireless networking (802.15.4).

Figure 3-53 shows a skylight actuator.

**Figure 3-53** Skylight actuator



DS07000023

- |   |   |                               |                               |
|---|---|-------------------------------|-------------------------------|
| (1) LOCK/GND magnetic lock DO output port | (2) BUTTON/GND window open button DI input port | (3) AI/DI_1 sensor input port | (4) AI/DI_2 sensor input port |
| (5) BLINK button                          | (6) Status indicator                            | (7) Address DIP switch        | (8) COM1 RS485 port           |
| (9) COM2 RS485 port                       | (10) PoE port                                   | (11) 48 V power port          |                               |

## Specifications

Table 3-46 lists the skylight actuator environmental specifications.

**Table 3-46** Skylight actuator technical specifications

Item	Specifications
Power input	36–60 V DC input voltage, phoenix terminal
PoE port	<ul style="list-style-type: none"> <li>FE communication with the rate of 10/100M</li> <li>36–60 V DC power input</li> </ul>
Wireless communication	One wireless port that complies with IEEE802.15.4, mutual backup with FE communication
AI/DI port	Two AI/DI ports for detecting fire extinguishing linkage signals; smoke detection signals also supported

Item	Specifications
DO output	One 12 V DC power output for controlling the skylight magnetic lock; driving six skylight magnetic locks simultaneously
DI input	One DI input port for connecting to the window open button
BLINK button	<ul style="list-style-type: none"> <li>Hold down the button for less than 1 second to start blinking.</li> <li>Hold down the button for 1–5 seconds to search for a network and start networking.</li> <li>Hold down the button for more than 6 seconds to clear network parameters.</li> </ul>
Address DIP switch	4-pin address DIP switch
E-label	Supported

## Indicators

Table 3-47 describes the skylight actuator indicators.

**Table 3-47** Skylight actuator indicator description

Indicator	Color	Name	Status	Description
Power	Green	Power input status indicator	Steady on	The power input is normal.
			Off	There is no power input.
RUN	Green	Operating status indicator	Off	The power is abnormal or the board program is loading.
			Blinking at long intervals	The skylight actuator successfully registers with the ECC800 and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The communication fails or the skylight actuator fails to register with the ECC800 (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 10s.
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	No system alarm is generated.

Indicator	Color	Name	Status	Description
RF_Z	Green	Communication status indicator	Steady on	No network parameters exist, or a network is to be created.
			Blinking at long intervals	A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at super short intervals	A network is set up, and node access is allowed (the indicator blinks at 10 Hz, on for 0.05s and then off for 0.05s).
			Blinking intermittently at super short intervals	The skylight actuator is searching for a network (the indicator blinks at super short intervals for 0.5s and then turns off for 0.5s).

## Communications Ports

The skylight actuator provides one DO port (LOCK/GND) and one DI port (BUTTON/GND). Table 3-48 lists the LOCK/GND/BUTTON/GND port pin definitions.

**Table 3-48** LOCK/GND/BUTTON/GND port pin definitions

Item		Description
LOCK/GND pin sequence	LOCK	12V_OUT
	GND	GND
BUTTON/GND pin sequence	BUTTON	DI3
	GND	GND

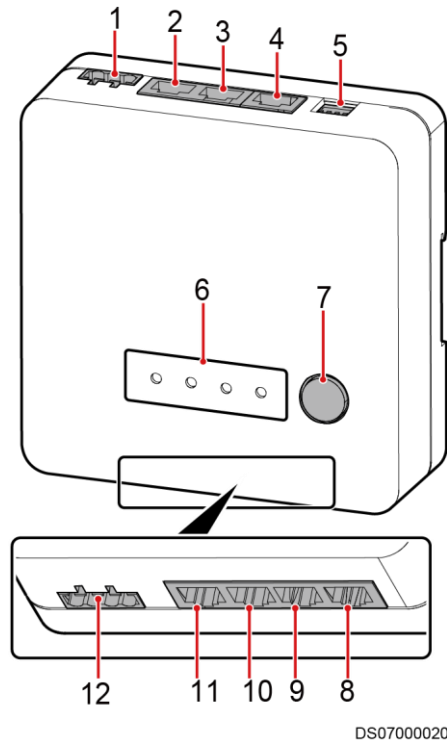
## 3.4.7 Access Control System

### 3.4.7.1 Access Actuator

The access actuator is the control component for the aisle door in a Smart Module. It connects to the ECC800 controller system over FE port, wireless networking (802.15.4), or RS485 port. It opens the magnetic lock by detecting the card swiping information of the card reader, door open button information, and fire linkage information. It has access right management, access event record, and alarm record functions.

Figure 3-54 shows an access actuator.

**Figure 3-54** Access actuator



- |                            |                          |                          |   |
|----------------------------|--------------------------|--------------------------|---|
| (1) 48 V power port        | (2) PoE port             | (3) RS485 port COM2      | (4) RS485 port COM1                                       |
| (5) Address DIP switch     | (6) Status indicator     | (7) BLINK button         | (8) WG_2 Wiegand interface                                |
| (9) WG_1 Wiegand interface | (10) AI/DI_2 dry contact | (11) AI/DI_1 dry contact | (12) LOCK/GND/GATE/GND/door status and magnetic lock port |

## Specifications

Table 3-49 lists the access actuator environmental specifications.

**Table 3-49** Access actuator technical specifications

Item	Specifications
Power input	36–60 V DC input voltage, phoenix terminal
PoE port	FE communication, 10/100M communications rate, 36–60 V DC power input
Wireless communication	One wireless communication port that complies with IEEE802.15.4, mutual backup with FE communication
AI/DI port	Two AI/DI ports, can connect to the fire alarm and exit button

Item	Specifications
DO output	One 12 V DC power output that controls magnetic locks, phoenix terminal
DI input	One DI input port for connecting to the door status switch
RS485 serial port expansion	Two RS485 ports (one route) with the default communications rate of 9600 bit/s, physical port cascading supported (reserved function)
Wiegand interface	Two Wiegand interfaces, 12 V DC card reader operating power output; two routes of card readers can operate at the same time.
BLINK button	<ul style="list-style-type: none"> <li>Press the button for less than 1 second to start blinking.</li> <li>Hold down the button for 1–5 seconds to search for a network and start networking.</li> <li>Hold down the button for more than 6 seconds to clear network parameters.</li> </ul>
Address DIP switch	4-pin address DIP switch
E-label	Supported

## Indicators

Table 3-50 describes the access actuator indicators.

**Table 3-50** Access actuator indicator description

Indicator	Color	Name	Status	Description
PWR	Green	Power input status indicator	Steady on	The power input is normal.
			Off	There is no power input.
RUN	Green	Communication status indicator	Off	The power is abnormal or the board program is loading.
			Blinking at long intervals	The access actuator successfully registers with the ECC800 and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The communication is disconnected or the access actuator fails to register with the ECC800 (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).



Indicator	Color	Name	Status	Description
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 10s.
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	No system alarm is generated.
RF_Z	Green	Wireless communication status indicator	Steady on	No network parameters exist, or a network is to be created.
			Blinking at long intervals	A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at super short intervals	A network is set up, and node access is allowed (the indicator blinks at 10 Hz, on for 0.05s and then off for 0.05s).
			Blinking intermittently at super short intervals	The access actuator is searching for a network (the indicator blinks at super short intervals for 0.5s and then turns off for 0.5s).

## Communications Ports

The access actuator provides one DO port (LOCK/GND) and one DI port (GATE/GND). Table 3-51 lists the LOCK/GND/GATE/GND port pin definitions.

**Table 3-51** LOCK/GND/GATE/GND port pin definitions

Item	Description	
LOCK/GND (control magnetic locks) pin sequence	LOCK	12V_OUT
	GND	GND
GATE/GND (door status) pin sequence	GATE	DI1
	GND	GND

### 3.4.7.2 Aisle Access Control

The aisle access control system applies to the aisle containment. It provides monitoring and data for devices and personnel moving into or out of the aisle containment. It can support the fingerprint and card reader with a password keyboard, fingerprint and card reader, and card reader with a password keyboard.

#### Fingerprint and Card Reader with a Password Keyboard

Figure 3-55 shows a fingerprint and card reader with a password keyboard.

**Figure 3-55** Fingerprint and card reader with a password keyboard



DS33000032

Table 3-52 lists the specifications of a fingerprint and card reader with a password keyboard.

**Table 3-52** Specifications of a fingerprint and card reader with a password keyboard

Item	Specifications
Dimensions (L x W x H)	156 mm x 53 mmx38mm
Operating voltage	Range: 10.8–13.2 V DC, rated voltage: 12 V DC
Operating current	Static standby current < 200 mA, dynamic card swiping operating current < 300 mA, minimum input current 500 mA at 12 V DC
Supported card	Mifare-1 S50 IC card
Authorized storage	A maximum of 3000 authorized users, a maximum of 6000 fingerprints
Communication mode	RS485 port, Wiegand port

Item	Specifications
Operating status	<ul style="list-style-type: none"> <li>• Standby: The blue indicator is on, and the green indicator on the fingerprint acquisition position is steady on</li> <li>• Acquiring fingerprints: The red indicator on the fingerprint acquisition position is on</li> <li>• Collecting fingerprints illegally: The buzzer beeps twice, and the red and blue indicators blink twice</li> <li>• Collecting fingerprints legally: The buzzer beeps once, and the red and blue indicators blink once</li> <li>• Swiping a card: The buzzer beeps once, and the red and blue indicators blink once</li> </ul>

## Fingerprint and Card Reader

Figure 3-56 shows a fingerprint and card reader.

**Figure 3-56** Fingerprint and card reader



DS33000025

Table 3-53 lists the specifications of a fingerprint and card reader.

**Table 3-53** Specifications of a fingerprint and card reader

Item	Specifications
Dimensions (L x W x H)	156 mm x 53 mmx38mm
Operating voltage	Rated 12 V DC±5%

Item	Specifications
Operating current	Rated 300 mA±5%
Supported card	IC card
Authorized storage	A maximum of 3000 authorized users, a maximum of 6000 fingerprints
Communication mode	RS485 port, Wiegand port
Operating status	<ul style="list-style-type: none"><li>Standby: The blue indicator is on, and the green indicator on the fingerprint acquisition position is steady on</li><li>Acquiring fingerprints: The red indicator on the fingerprint acquisition position is on</li><li>Collecting fingerprints illegally: The buzzer beeps twice, and the red and blue indicators blink twice</li><li>Collecting fingerprints legally: The buzzer beeps once, and the red and blue indicators blink once</li><li>Swiping a card: The buzzer beeps once, and the red and blue indicators blink once</li></ul>

## Card Reader with a Password Keyboard

Figure 3-57 shows a card reader with a password keyboard.

**Figure 3-57** Card reader with a password keyboard



DS33000031

Table 3-54 lists the specifications of a card reader with a password keyboard.

**Table 3-54** Specifications of a card reader with a password keyboard

Item	Specifications
Dimensions (L x W x H)	114mmx63mmx25mm
Operating voltage	Range: 10.8–13.2 V DC, rated voltage: 12 V DC
Operating current	Static standby current 80 mA, operating current during card swiping and button pressing 150 mA, minimum input current 300 mA at 12 V DC
Communication mode	RS485 port

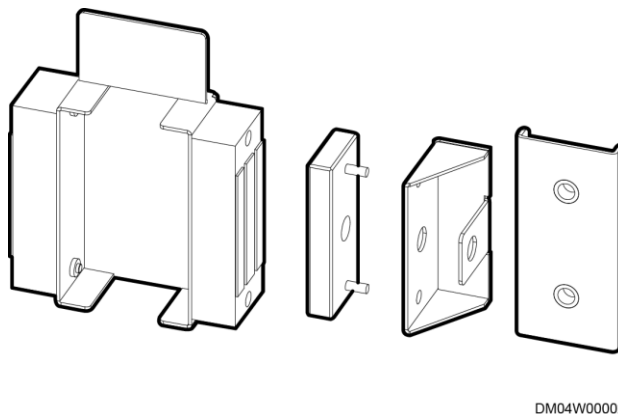
## Magnetic Double-door Lock

Figure 3-58 shows a magnetic double-door lock.

**Figure 3-58** Revolving door magnetic lock



**Figure 3-59** Sliding door magnetic lock



- The access control system applies to the equipment room, aisle containment, and cabinet doors.

- The access control system consists of the access controller (for double doors), fingerprint reader with a password keyboard, magnetic lock, and exit button.
- The emergency door release button can disconnect the power supply to the electronic lock to open the door in case of emergency.

### 3.4.7.3 (Optional) Cabinet Access Control System

The cabinet access control system applies to cabinets in the aisle containment to ensure data and device security.

#### Electronic Cabinet Lock

**Figure 3-60** Electronic Cabinet Lock



DM88000003

**Table 3-55** Electronic cabinet lock specifications

Item	Specifications
Rated input voltage	12–24 V DC
Rated current	200–300 mA
Unlock mode	Power on to unlock
Applicable card	IC card
Mechanically unlocking	Supported

Features:

- The IC card for the cabinet access control system can be used after being authorized with software.
- An IC card can be authorized for one electronic lock or all electronic locks.
- Door opening information can be recorded through a network.
- The system displays the status of cabinet doors and locks in real time, and generates alarms for unauthorized door opening.
- The system supports door opening using a remote NMS.

## Mechanical Lock

Figure 3-61 shows a mechanical lock.

**Figure 3-61** Mechanical lock



Functions and features:

- The cabinet door can be opened with only the key and without the password.
- The cabinet door can be opened with only the password and without the key.
- The user can set a password.
- A password should contain at least three digits.
- If a user forgot the password, he can reset it.

### 3.4.8 (Optional) Water Sensor

The water sensor monitors leak water on the floor in real time. When water intrusion is found, the water sensor generates an audible alarm and outputs dry contact signals to report the alarm.

Figure 3-62 shows the water sensor and water detection cable. Table 3-56 lists the technical specifications.

**Figure 3-62** Water sensor and water detection cable



DS05000013

**Table 3-56** Technical specifications of a water sensor

Item	Specifications
Operating voltage	12 V DC (9–16 V DC)
Output when no liquid exists	CLOSED
Output when liquid exists	OPEN
Insulation resistance	> 500 megohms
Operating temperature	–20°C to +70°C, 10%–80% RH (non-condensing)
Storage temperature	–40°C to +80°C, 10%–80% RH (non-condensing)
Default length of the water detection cable	5 m
Extensibility	The water detection cable can connect to the quick-connect terminal and can be extended flexibly to 50 m at most.
Reliability of the water detection cable	The water detection cable cannot be installed on the surface of metal.
Reliability	Failure rate: 800 fits
Power consumption	< 1 W

### 3.4.9 (Optional) Smoke Detector

Smoke detectors are used to detect smoke in the aisle containment.

Figure 3-63 shows a smoke detector. Table 3-57 lists its technical specifications.



**Figure 3-63** Smoke detector



**Table 3-57** Technical specifications of a smoke detector

Item	Specifications
Operating voltage	9–16 V DC
Quiescent current	< 8 mA
Alarm current	< 35 mA
Output mode	Relay output
Output contact capacity	3 A/120 V AC or 3 A/24 V DC
Operating temperature	–10°C to +50°C
Ambient humidity	≤ 95% RH
Dimensions	Diameter: 112 mm, height: 41 mm

### 3.4.10 (Optional) Temperature Sensor

Figure 3-64 shows a temperature sensor.

**Figure 3-64** Temperature sensor



Table 3-58 lists the temperature sensor specifications.

**Table 3-58** Temperature sensor specifications

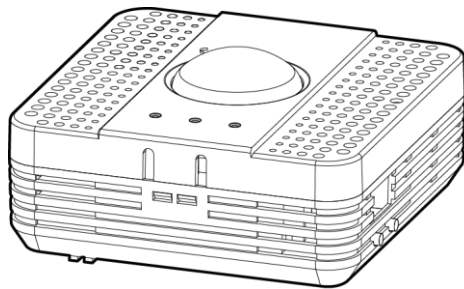
Item	Specifications
Measurement range	-20°C to +70°C
Measurement precision	±1°C
Operating temperature	-10°C to +55°C
Operating voltage	10-16 V DC
Storage temperature	-40°C to +70°C

### 3.4.11 Multi-Functional Sensor

A multi-functional sensor integrates the smoke sensor and temperature and humidity (T/H) sensor and can connect to the ECC800 controller system over PoE or wireless communication.

Figure 3-65 shows a multi-functional sensor.

**Figure 3-65** Multi-functional sensor



DS28000002

### Specifications

Table 3-59 lists the multi-functional sensor technical specifications.

**Table 3-59** Multi-functional sensor technical specifications

Item	Specifications
Temperature monitoring	-40°C to +80°C, precision ≤ ±0.5°C (0-50°C)
Humidity monitoring	0-100% RH, precision ≤ ±5% RH (25°C, 20%-80% RH)
Smoke monitoring	Complies with UI217. The smoke sensor generates an alarm when testing 3.2% weak dust for each foot.

Item	Specifications
PoE port	One PoE port that complies with IEEE802.3AT
RS485 port	Reserved
DI input	One DI input port, 12 V DC power input
BLINK button	Wireless communication: <ul style="list-style-type: none"> <li>• Press the button for less than 1s to start blinking.</li> <li>• Hold down the button for 1–5 seconds to search for a network and start networking.</li> <li>• Hold down the button for more than 6 seconds to clear network parameters.</li> </ul>
Smoke sensor test button	Supported
E-label	Supported

## Indicators

Table 3-60 describes the indicators on the multi-functional sensor.

**Table 3-60** Description of the indicators on the multi-functional sensor

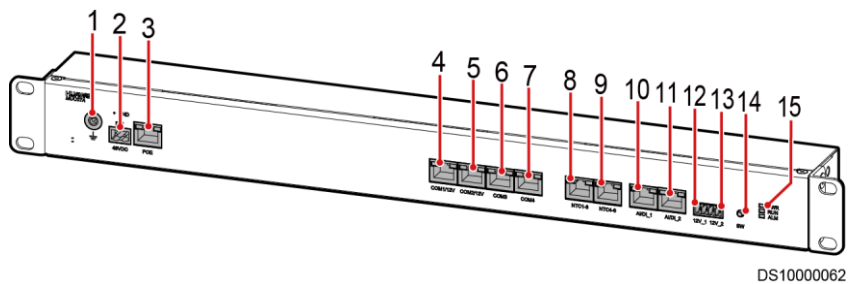
Indicator	Color	Name	Status	Description
RUN	Green	Module running status indicator	Steady on	The power supply is normal.
			Off	The power supply is abnormal.
			Blinking at long intervals	The multi-functional sensor successfully registers with the ECC800 and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The multi-functional sensor fails to register with the ECC800 or the communication fails (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 10s.
ALM	Red	Alarm indicator	Steady on	A system failure alarm or smoke alarm is generated.

Indicator	Color	Name	Status	Description
			Off	No system alarm is generated.
RF_Z	Green	Communication status indicator	Steady on	No network parameters exist, or a network is to be created.
			Blinking at long intervals	A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at super short intervals	A network is set up, and node access is allowed (the indicator blinks at 10 Hz, on for 0.05s and then off for 0.05s).
			Blinking intermittently at super short intervals	The multi-functional sensor is searching for a network (the indicator blinks at super short intervals for 0.5s and then turns off for 0.5s).

### 3.4.12 Rack Environment Unit

The rack environment unit collects and controls the environmental data of IT cabinets in the modular data center. Figure 3-66 shows a rack environment unit.

Figure 3-66 Rack environment unit



- |                   |                              |                       |                   |
|-------------------|------------------------------|-----------------------|-------------------|
| (1) Ground port   | (2) 48 V DC power input port | (3) PoE port          | (4) COM1/12V port |
| (5) COM2/12V port | (6) COM3 port                | (7) COM4 port         | (8) NTC1-3        |
| (9) NTC4-6        | (10) AI/DI_1 port            | (11) AI/DI_2 port     | (12) 12V_1 port   |
| (13) 12V_2 port   | (14) SW button               | (15) Status indicator |                   |

## Specifications

Table 3-61 lists the environment specifications for the rack environment unit.

**Table 3-61** Technical specifications for the rack environment unit

Item	Specifications
Power input	Phoenix terminal, with input voltage of 36–60 V DC
12 V power output	Two 12 V DC power outputs with the rated output current of 250 mA
PoE port	<ul style="list-style-type: none"> <li>FE communication with the rate of 10/100M</li> <li>36–60 V DC power input</li> </ul>
RS485 serial port expansion	<ul style="list-style-type: none"> <li>Four RS485 ports with the default communications rate of 9600 bit/s</li> <li>Among the four RS485 ports, two support 12 V DC, 400 mA power output.</li> <li>The other two are isolated, with the default communications rate of 9600 bit/s, and do not support power output.</li> </ul>
AI/DI input	Two active 12 V DC, 200 mA AI/DI input ports
Temperature sensor port	Provides two RJ45 ports to connect to six temperature sensors, each RJ45 port connecting to three temperature sensors.
BLINK button	Provides a BLINK button.

## Indicators

Table 3-62 lists the structural specifications for the rack environment unit.

**Table 3-62** Indicator description

Indicator	Color	Name	Status	Description
PWR	Green	Power input status indicator	Steady on	The power input is normal.
			Off	There is no power input.
RUN	Green	Module running status indicator	Off	The power is abnormal or the board program is loading.
			Blinking at long intervals	The software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	PoE communication fails (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).

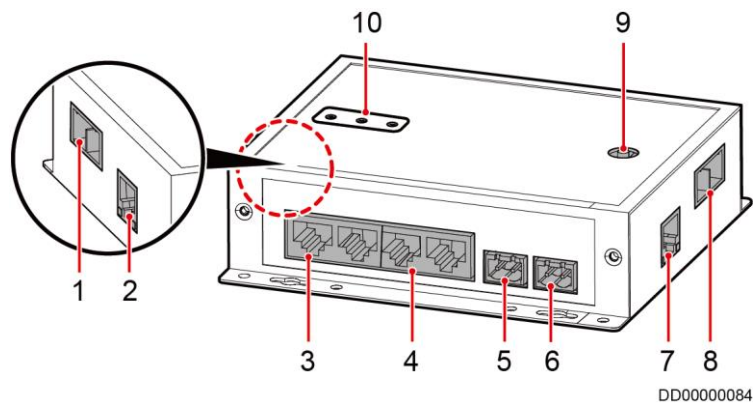
Indicator	Color	Name	Status	Description
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 10s.
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	No system alarm is generated.

### 3.4.13 Smart ETH Gateway

A smart ETH gateway allows the extension of the 53.5 V DC power supply and FE communication for the ECC800 and can be flexibly deployed in a modular data center.

Figure 3-67 shows a smart ETH gateway.

**Figure 3-67** Smart ETH gateway



- |                                 |                                |                                |                                  |
|---------------------------------|--------------------------------|--------------------------------|----------------------------------|
| (1) PWR_IN cascading power port | (2) FE_1 cascading signal port | (3) PoE_1-2 ports              | (4) PoE_3-4 ports                |
| (5) 48V_OUT1 power output port  | (6) 48V_OUT2 power output port | (7) FE_2 cascading signal port | (8) PWR_OUT cascading power port |
| (9) BLINK button                | (10) Status indicator          |                                |                                  |

### Specifications

Table 3-63 lists the environmental specifications for a smart ETH gateway.

**Table 3-63** Technical specifications for a smart ETH gateway

Item	Specifications
------	----------------

Item	Specifications
Power input	PWR_IN D-type power input terminal, for power cascading, input voltage range: 45–55 V DC
Power output	<ul style="list-style-type: none"> <li>• PWR_OUT D-type power output terminal, for power cascading, output voltage range: 45–55 V DC</li> <li>• 48V_OUT1 and 48V_OUT2, phoenix terminal, output voltage range: 45–55 V DC</li> </ul>
FE port	Two FE ports, RJ45 terminal with an indicator, 10/100M communication rate, for the cascading between smart ETH gateways and the communication with the upper computer
PoE port	Four PoE ports, RJ45 terminal with an indicator, 10/100M communications rate, 45–55 V DC of power output, complying with IEEE802.3at
BLINK button	If you press the BLINK button once, the RUN indicator blinks intermittently at super short intervals (blinking at super short intervals for 0.5s and then off for 0.5s) for 10 seconds. This indicates that the smart ETH gateway reports the Media Access Control (MAC) address and equipment serial number (ESN) to the ECC800.

## Indicators

Table 3-64 describes the indicators on a smart ETH gateway.

**Table 3-64** Indicators on a smart ETH gateway

Indicator	Color	Name	Status	Description
PWR	Green	Power input status indicator	Steady on	The power input is normal.
			Off	There is no power input.
RUN	Green	Module running status indicator	Off	The power supply is abnormal.
			Blinking at long intervals	The smart ETH gateway successfully registers with the ECC800 and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The smart ETH gateway does not register with the ECC800 (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 10s.

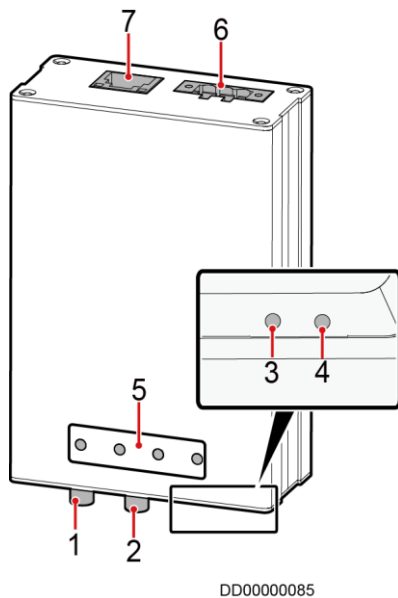
Indicator	Color	Name	Status	Description
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	No system alarm is generated.

### 3.4.14 WiFi Converter

The WiFi converter is used in a modular data center to convert PoE signals into WiFi signals for communicating with devices such as the pad and mobile phone.

Figure 3-68 shows the WiFi converter.

**Figure 3-68** WiFi converter



DD0000085

- (1) RF\_1 antenna port      (2) RF\_2 antenna port      (3) Reset button      (4) WPS button  
 (5) Status indicator      (6) 48 V power port      (7) PoE port

### Specifications

Table 3-65 lists the WiFi converter technical specifications.

**Table 3-65** WiFi converter technical specifications

Item	Specifications
Power input	One power input port with the 3-pin Phoenix terminal; input voltage range: 36–60 V DC



Item	Specifications
WiFi function	<ul style="list-style-type: none"> <li>2.4 GHz frequency, two antennas, supporting eight STA connections, 50 m WiFi coverage (no blockage)</li> <li>Support the WPS button</li> </ul>
PoE port	One PoE port, complying with IEEE802.3AT, 25.5 W
Reset button	Press and hold down the button for more than 5s to restore the factory settings of the WiFi converter.
WPS button	Support fast WiFi access by WPS



**NOTE**

WPS function: If you choose **Advanced settings > WPS connection** on the WLAN of the intelligent device and press the WPS button on the WiFi converter at the same time, the intelligent device will quickly connect to the WiFi hotspot of the micro-module.

## Indicators

Table 3-66 describes the indicators on the WiFi converter.

**Table 3-66** WiFi converter indicators

Indicator	Color	Name	Status	Description
RUN	Green	Running status indicator	Steady on	The power supply is normal.
			Off	The power supply is abnormal.
			Blinking at long intervals	The WiFi converter successfully registers with the ECC800 and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The WiFi converter fails to register with the ECC800 or the communication is disconnected (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	No system alarm is generated.
WiFi	Green	WiFi status indicator	Steady on	The WiFi converter is powered on but there is no data communication.
			Blinking	Data communication is in progress.
WPS	Green	WPS mode	Off	The WPS is normal.

Indicator	Color	Name	Status	Description
	n	indicator	Blinking	WPS matching mode. If the matching fails, the WPS indicator turns off after blinking for 2 minutes. If the matching is successful, the WPS indicator turns off.

### 3.4.15 Alarm Beacon

The alarm beacon is installed at the periphery of the aisle containment. When a fire occurs or smokes are generated in the micro-modular equipment room, the alarm beacon generates an audible signal and flashes to inform operators of fire and security risks.

Figure 3-69 shows an alarm beacon.

**Figure 3-69** Alarm beacon



DF05000028

Table 3-67 lists the structural specifications of an alarm beacon.

**Table 3-67** Structural specifications of an alarm beacon

Item	Specifications
Dimensions (L x W x H)	130 mm x 75 mm x 55 mm
Installation requirements	Installed on a wall
Protection level	IP50
Environmental requirements	RoHS, Reach
MTBF	≥ 100,000 hours

Table 3-68 lists the technical specifications of an alarm beacon.

**Table 3-68** Technical specifications of an alarm beacon

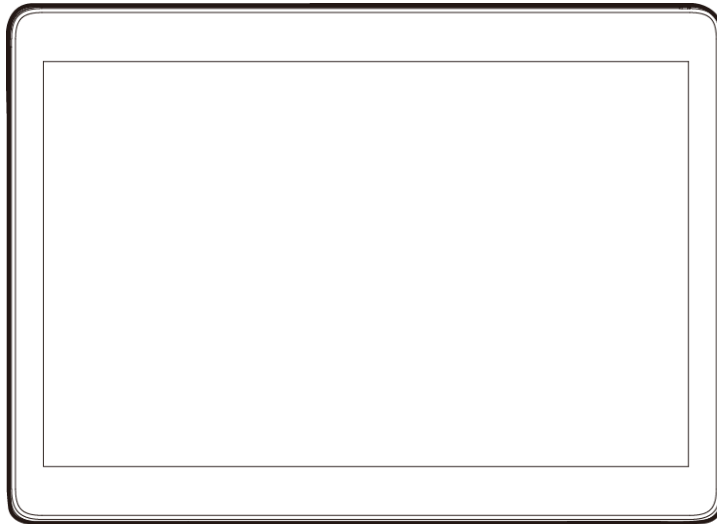
Item	Specifications
Power input	RJ45 port, input voltage 9–16 V DC, operating current $\leq 400$ mA
Sound pressure	$\geq 100 \pm 3$ dB/30 cm
Continuous operating time	$\geq 45$ min

### 3.4.16 PAD

The PAD allows the wireless access from the data center management system. You can monitor the equipment in the data center and environmental parameters in real time over the APP

Figure 3-70 shows a PAD.

**Figure 3-70** PAD



DM26000026

The PAD used in the micro-module is a capacitive touchscreen that supports multi-touch technology. Table 3-69 lists the PAD structural specifications.

**Table 3-69** PAD structural specifications

Item	Specifications
Dimensions (L x W x H)	248.5 mm x 150 mm x 8.3 mm
Weight	About 433 g

Table 3-70 lists PAD technical specifications.

**Table 3-70** PAD technical specifications

Item	Specifications
Touchscreen	9.6-inch, 1280x800 IPS full view, IPS screen, and capacitive five-point touch
Chip processor	MSM8916, quad-core A53, 1.2 GHz integrated chip
WLAN	802.11a/b/g/n@2.4GHz&5GHz
Store	<ul style="list-style-type: none"><li>• Machine: 16 GB</li><li>• Memory: 2 GB LPDDR3</li><li>• Extension card: microSD, a maximum of 64 GB supported</li></ul>
Button/Port	<ul style="list-style-type: none"><li>• Power switch and volume button</li><li>• 3.5 mm stereo headphones port</li><li>• Micro SD card port</li><li>• Micro-USB port that supports charging and synchronization with PC data</li></ul>
Battery	<ul style="list-style-type: none"><li>• Materials: Li-polymer</li><li>• Capacity: 4800 mAh</li><li>• WiFi connection/Web page browse time: about 6.5 hours</li><li>• Power adapter charge time: about 6 hours</li></ul>
Operating system	Android 4.4 (KitKat)+EMUI 3.0

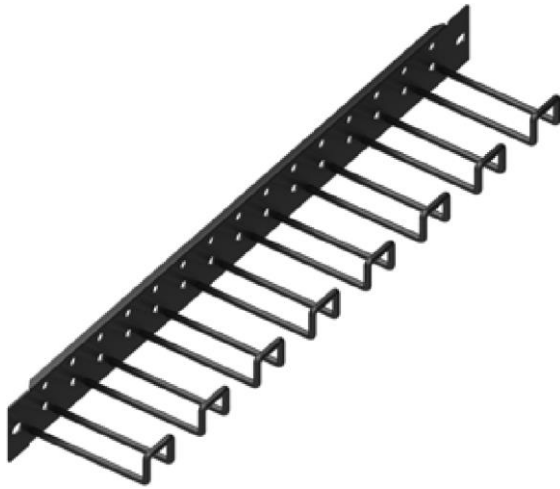
## 3.5 Cable Management

Cables inside cabinets are sorted by cable managers, cable rings, and cable trays. Cable managers route cables horizontally, cable rings on the cabinet side route cables vertically, and cable trays route cables from the cabinet front to cabinet rear.

### Cable Manager

A cable manager is used for horizontal cabling inside the cabinet.

**Figure 3-71** Cable manager



DC06W00015

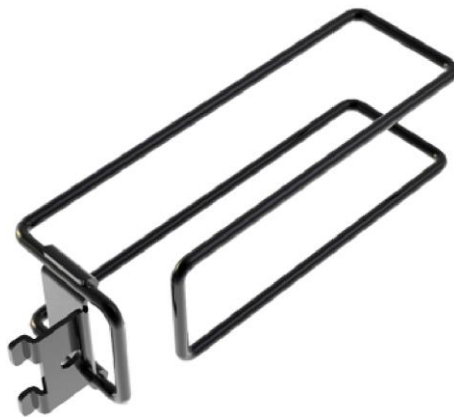
**Table 3-71** Cable manager specifications

Dimensions (H x W x D)	Weight	Space Occupied
43.6 mm x 482.6 mm x 91 mm	0.56 kg	1 U

## Cable Ring

A cable ring is installed on a side post in the cabinet to secure vertically routed cables.

**Figure 3-72** Cable ring



DC02W00080

**Table 3-72** Cable ring specifications

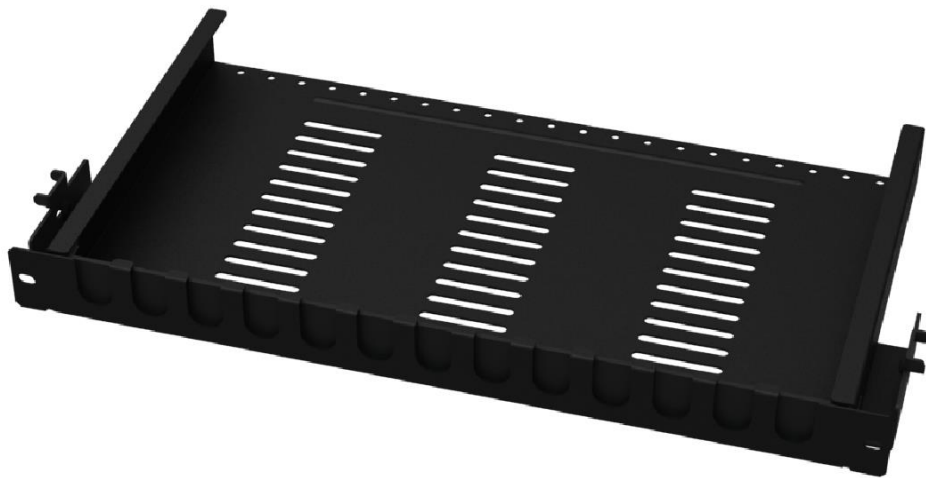
Name	Dimensions (H x W x D)	Weight
------	------------------------	--------

Name	Dimensions (H x W x D)	Weight
Standard cable ring	55 mm x 48 mm x 188.6 mm	0.163 kg
Small cable ring	55 mm x 48 mm x 44 mm	0.096 kg

## Cable Tray

A cable tray is used for forward and backward cabling. It uses mounting ears to facilitate device installation.

**Figure 3-73** Cable tray



DC06W00014

**Table 3-73** Cable tray specifications

Dimensions (H x W x D)	Weight	Space Occupied
43.6 mm x 482.6 mm x 250 mm	1.89 kg	1 U

## 3.6 Lighting System

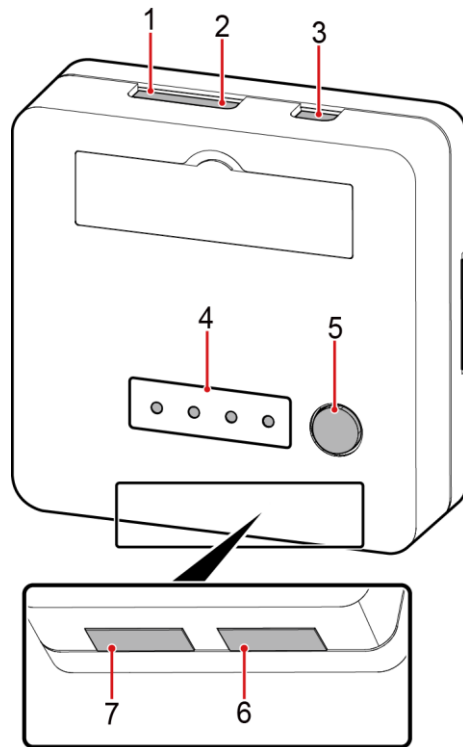
The lighting system consists of an AC actuator and aisle lights which can be configured based on the actual situation.

### 3.6.1 AC Actuator

The AC actuator is used in a smart module to control lights by receiving commands from a lighting button or access control device. The AC actuator can connect to the ECC800 controller by wireless networking (802.15.4).

Figure 3-74 shows an AC actuator.

**Figure 3-74** AC actuator



DS3400024

- (1) AC OUT2 port      (2) AC OUT1 port      (3) AC IN port      (4) Status indicator
- (5) BLINK button      (6) AI/DI dry contact      (7) COM1–2 RS485 port

## Specifications

Table 3-74 lists the AC actuator technical specifications.

**Table 3-74** AC actuator technical specifications

Item	Specifications
Power input	One AC input, 90–240 V AC
Power output	Two AC outputs, 90–240 V AC, maximum current 5 A
Wireless communication	One wireless communication port, complying with IEEE802.15.4
RS485 port	One route of dual RS485 ports, not isolated (reserved)
AI/DI detection	One AI/DI dry contact connects to the lighting switch, and the other is reserved.

Item	Specifications
BLINK button	<ul style="list-style-type: none"> <li>• Press the button for less than 1 second to start blinking.</li> <li>• Hold down the button for 1–5 seconds to search for a network and start networking.</li> <li>• Hold down the button for more than 6 seconds to clear network parameters.</li> </ul>

## Indicators

Table 3-75 describes the indicators on the AC actuator.

**Table 3-75** AC actuator indicators

Indicator	Color	Name	Status	Description
Power	Green	Power status indicator	Steady on	The power input is normal.
			Off	There is no power input.
RUN	Green	Running status indicator	Off	The power is abnormal or the board program is loading.
			Blinking at long intervals	The AC actuator successfully registers with the ECC800 and the software runs properly (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).
			Blinking at short intervals	The communication is disconnected or the AC actuator fails to register with the ECC800 (the indicator blinks at 4 Hz, on for 0.125s and then off for 0.125s).
			Blinking	The indicator blinks at super short intervals for 0.5s (blinking at 10 Hz, on for 0.05s and then off for 0.05s) and then turns off for 0.5s. The cycle lasts for 10s.
ALM	Red	Alarm indicator	Steady on	A system failure alarm is generated.
			Off	No system alarm is generated.
RF_Z	Green	Communication status indicator	Steady on	No network parameters exist, or a network is to be created.
			Blinking at long intervals	A network is set up, and no node access is allowed (the indicator blinks at 0.5 Hz, on for 1s and then off for 1s).



Indicator	Color	Name	Status	Description
			Blinking at super short intervals	A network is set up, and node access is allowed (the indicator blinks at 10 Hz, on for 0.05s and then off for 0.05s).
			Blinking intermittently at super short intervals	The AC actuator is searching for a network (the indicator blinks at super short intervals for 0.5s and then turns off for 0.5s).

### 3.6.2 Aisle Lights

Light emitting diode (LED) lights are used in aisles. LED lights are installed on the top at both ends of the aisles.

Figure 3-75 shows an LED light. Table 3-76 lists the technical specifications of an LED light.

**Figure 3-75** LED light



DJ02000043

**Table 3-76** Technical specifications of an LED light

Item	Specifications
Installation mode	Ceiling-mounted
Light holder requirement	The light holder and light are integrated
Protection level	IP20
Electric insulation class	Class I
Standards compliance	IEC 598
Rated operating voltage	220–240 V AC (working normally in the range of 176 V AC to 288 V AC)
Light color	Daylight color
Luminous flux	≥ 500 lx
Service life	≥ 30,000 hours
Power	12–16 W

## 3.7 Surge Protection and Grounding System

The surge protection and grounding system of the Smart Module consists of the surge protection solution and grounding solution.

### 3.7.1 Surge Protection Solution

Surge protection modules are installed in the integrated UPS cabinet and precision PDC.

### 3.7.2 Grounding Solution

#### Solution 1: M-shaped (Grid) Grounding (Recommended)

Figure 3-76 M-shaped (grid) grounding solution for a single-row aisle containment

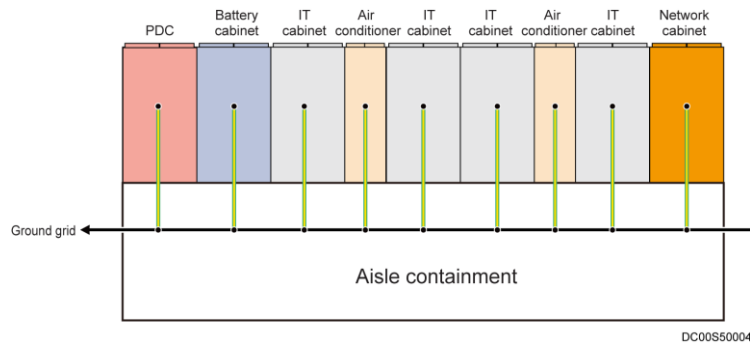
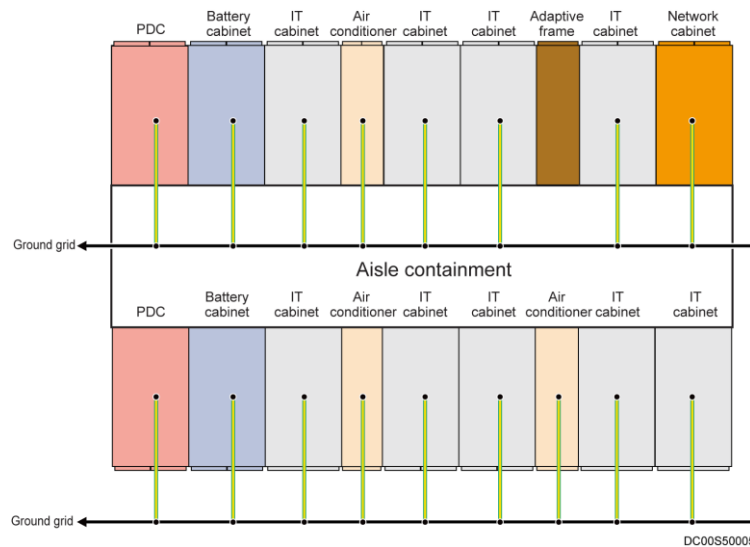


Figure 3-77 M-shaped (grid) grounding solution for a dual-row aisle containment





**NOTE**

The new main way is grounded over the ground point on the general input unit.

As shown in Figure 3-76 and Figure 3-77:

1. Each cabinet in the smart module connects to the nearest ground grid using ground cables with the minimum cross-sectional area of 16 mm<sup>2</sup>.
2. Use 100 x 0.3 copper foils or copper braids with a cross-sectional area of 25 mm<sup>2</sup> for the equipotential connection grid. Use 30 x 3 copper strips for the equipotential bonding bar based on the customer's configurations.

## Solution 2: S-shaped (Star) Grounding (Not Recommended)



**NOTE**

The S-shaped (star) grounding solution is not supported in the scenario where the new main way is deployed.

- A main ground bar is installed inside the PDC. A branch ground bar is installed inside the first battery cabinet or IT cabinet adjacent to the PDC. Ground terminals of cabinets inside the module are connected to the branch ground bar by ground cables with a minimum cross-sectional area of 16 mm<sup>2</sup>. The main ground bar connects to a floor earthing bar (FEB) or collective ground bar (copper bar with an area of 25 mm x 3 mm routed along a cable tray or wall in an equipment room).
- Metal components and parts of cabinets are properly connected. A structural connection area is protected and applied with antioxidants. A protected area should ensure that two metal components can be properly connected. The DC resistance is within 0.1 ohm between any two connected metal components. Use ground cables to connect two metal components that cannot be directly connected, such as cabinets and cabinet doors. A cable for connecting these two metal components has a minimum cross-sectional area of 6 mm<sup>2</sup>.
- A ground bar or general ground point is provided in each cabinet for equipment grounding. These ground bars are not insulated.
- A ground terminal is greater than or equal to M8 in dimensions. A yellow ground label

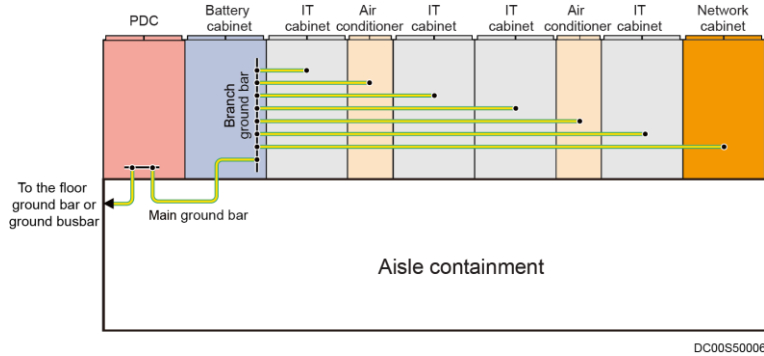


is attached close to the general ground terminal for cabinets.

Connect equipotential cables to metal components without carrying currents in the module, such as metal doors and windows, cable trays, and ESD floor supports. Each equipotential cable has a minimum cross-sectional area of 6 mm<sup>2</sup>.

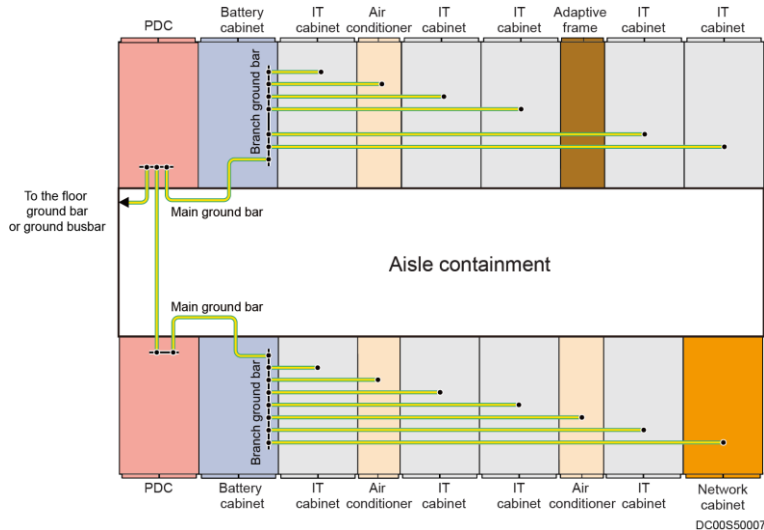
Figure 3-78 shows the equipotential bonding for cabinets in the single-row aisle containment.

**Figure 3-78** Equipotential cable connections for single-row cabinets



In a dual-row aisle containment, two branch ground copper bars are used. The general ground copper bar is in the PDC, and a branch ground copper bar is in the first IT cabinet near the PDC. See Figure 3-79.

**Figure 3-79** Equipotential cable connections for dual-row cabinets (two branch ground copper bars)



## 3.8 Integrated Cabling System

The integrated cabling system of the Smart Module includes cable routing devices and cables.

### 3.8.1 Cable Trough

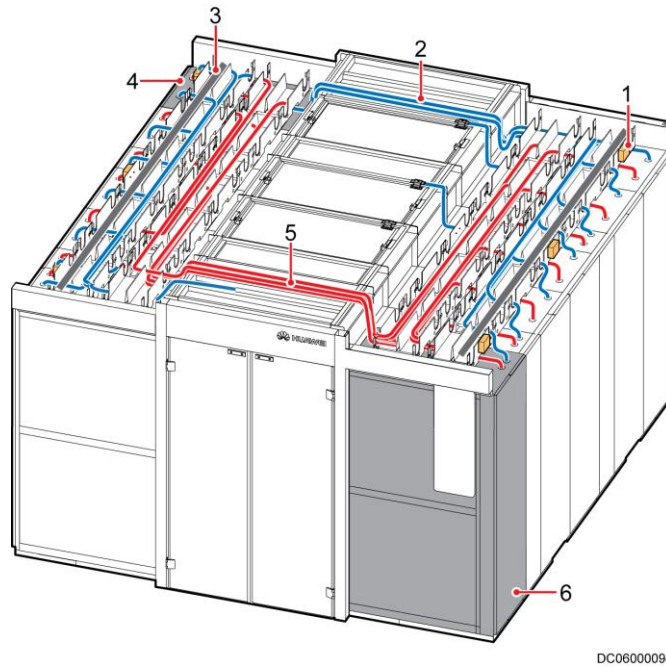
Cable troughs are installed on the top of cabinets for routing cables. Cable troughs include signal cable troughs and power cable troughs. They are used for routing signal cables and power cables respectively.

When a dual-row aisle containment is configured with one PDC and one network cabinet, the power cables are routed through the control skylight located on the top of the PDC to the

other end of the module, and the signal cables are routed through the control skylight located on the top of the network cabinet to the other end of the module.

Figure 3-80 shows how to route cables.

**Figure 3-80** Diagram for routing cables

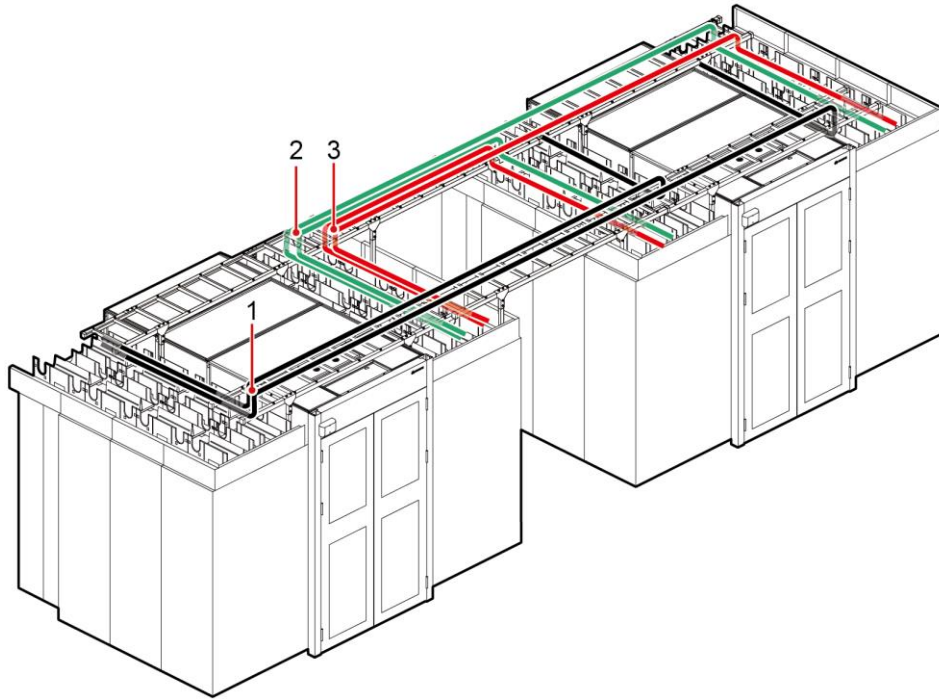


DC06000094

- |                       |                  |                   |
|-----------------------|------------------|-------------------|
| (1) Smart ETH gateway | (2) Signal cable | (3) Optical fiber |
| (4) Network cabinet   | (5) Power cable  | (6) PDC           |

When the distance between two modules is 1200 mm, the power cables are routed through the cable tray located on the top of the PDC to the other module, and the signal cable is routed through the cable tray located on the top of the network cabinet to the other module. Figure 3-81 shows how to route cables between modules.

**Figure 3-81** Diagram for routing cables between modules



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(1) Power cable

(2) Signal cable

(3) Optical fiber

### 3.8.2 Cable Routes for the Dual-Row Aisle Containment Scenario (New Main Way)

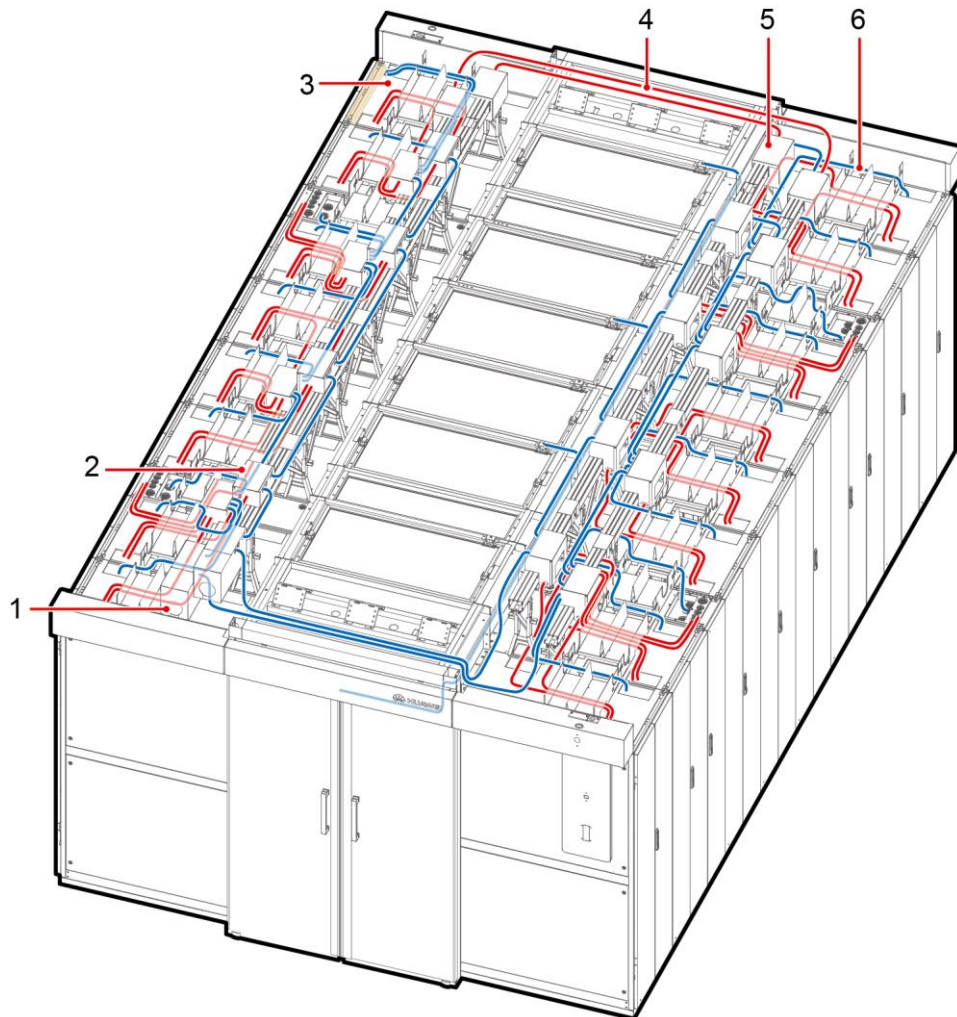
Figure 3-82 shows how cables are routed in the dual-row aisle containment scenario when you are configuring the new main ways.



## NOTICE

- Ensure that strong-current cables and weak-current cables are at least 100 mm away from each other.
  - Connect the power cables from the general input unit side to the smart module.
- 

**Figure 3-82** Routing power cables and network cables



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- |                        |                             |                     |
|------------------------|-----------------------------|---------------------|
| (1) General input unit | (2) Power distribution unit | (3) Network cabinet |
| (4) Power cable        | (5) Conversion unit         | (6) Signal cables   |

## **3.8.3 Cables**

### **Power Cable**

The power cables include power cables to UPSs, battery cabinets, air conditioners, and PDU2000s.

### **Ground Cable**

The ground cables include ground cables to PDU8000s, battery cabinets, and IT cabinets.

### **Monitoring Cable**

The monitoring cables include monitoring cables to air conditioners and UPSs, video cables, door status alarm cables, cables inside the network cabinet, and all sensor cables.

### **Fire Control Cable**

The fire control cables include alarm beacon cables and skylight actuator cables.



# **A** Acronyms and Abbreviations

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## **A**

<b>AC</b>	alternate current
<b>ATS</b>	Auto Transformer Switch

## **B**

<b>BCB</b>	Battery Circuit Breaker
<b>BIB</b>	Battery control I/O board
<b>BIM</b>	Battery Interface Module
<b>BSPP</b>	British Standard Pipe Parallel Thread

## **C**

<b>CAN</b>	Controller Area Network
<b>CE</b>	Conformité Européenne
<b>CFD</b>	Computational Fluid Dynamics
<b>CIM</b>	Communication Interface Module

## **D**

<b>DC</b>	direct current
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## **E**

<b>EC</b>	Electronic Commutation
<b>ECC</b>	Energy Control Center
<b>ETH</b>	Ethernet

**F**

**FE** Fast Ethernet

**I**

**iBAT** ibattery

**IC** Integrated Circuit

**IDC** Internet Data Center

**IT** Internet Technology

**L**

**LCD** Liquid Crystal Display

**LED** Light Emitting Diode

**M**

**MTBF** mean time between failures

**MTTR** mean time to repair

**N**

**NTC** negative temperature coefficient

**P**

**PDC** Power Distribution Cabinet

**PDU** Power Distribution Unit

**PE** Protective Earthing

**PoE** Power over Ethernet

**PUE** power usage effectiveness

**R**

**RCCB** Residual Current Circuit Breaker

**S**

**SD** Secure Digital Memory

**SIM** Subscriber Identity Module

<b>SNMP</b>	Simple Network Management Protocol
<b>SPD</b>	surge protective device
<b>U</b>	
<b>USB</b>	Universal Series Bus
<b>UPS</b>	uninterruptible power system
<b>V</b>	
<b>VCN</b>	Video Cloud Node
<b>W</b>	
<b>WiFi</b>	Wireless Fidelity