FusionModule1000A20 Prefabricated All-in-One Data Center
V200R003C10

Product Description (380 V)

Issue   01

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HUAWEI TECHNOLOGIES CO., LTD.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
           Bantian, Longgang
           Shenzhen 518129
           People's Republic of China

Website: https://e.huawei.com

About This Document

Purpose

This document describes the FusionModule1000A 20ft prefabricated all-in-one data center solution (pre-fab. module for short) for the CT scenario in terms of its overview, typical application scenarios, product architecture, and key technical specifications, helping readers to systematically understand the FusionModule1000A20.

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	Remarks
DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	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	Remarks
NOTE	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.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01(2019-07-15)

This issue is the first official release.

Contents

1 Overview

1.1 Positioning

Huawei has developed the FusionModule1000, a green data center solution, based on a thorough study on the reform and impact of the cloud computing to traditional data centers and the practical experience of dozens of global cloud computing centers. The solution features a flexible, hybrid, and modular design to help customers construct green infrastructure adapting to cloud computing.

The FusionModule1000, foundation for cloud computing in enterprise data centers, integrates power distribution, monitoring, cooling, racks, cable routing, and fire extinguishing. It is characterized by good waterproof and quakeproof performances. The FusionModule1000 helps enterprise telecom operators and Internet operators to rapidly deploy data centers and has unique advantages in the fields of disaster relief, military affairs, oil exploitation, survey, and enterprise data for its availability in outdoor environments.

The FusionModule1000, located at the bottom layer of a data center, provides basic physical construction for all services in the data center.

Figure 1-1 Data center architecture
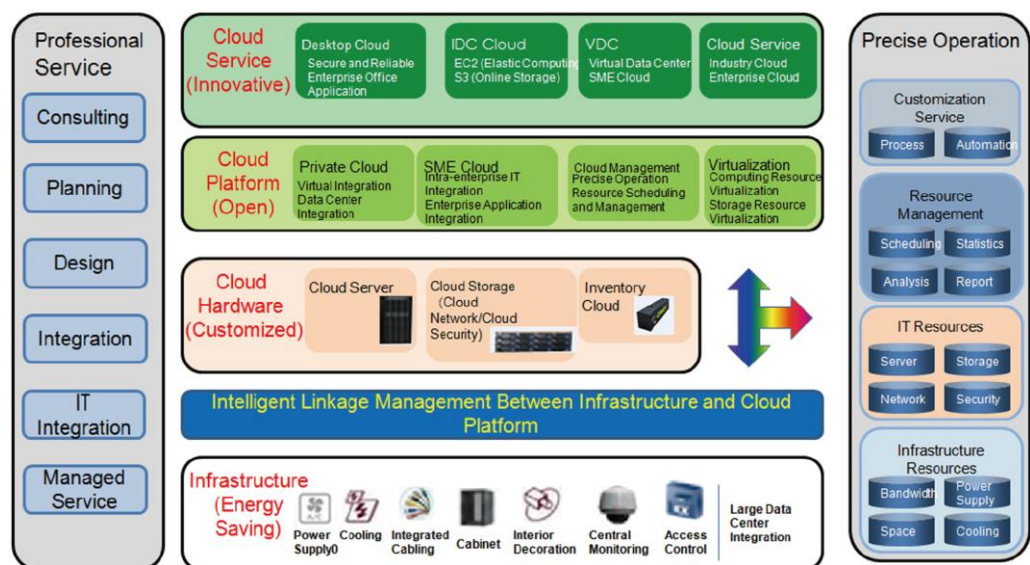
1.2 Features

The FusionModule1000A is a small-capacity prefabricated all-in-one data center that integrates the pre-fab. module mechanical structure, power supply and distribution system, cooling system, management system, fire extinguishing system, and integrated cabling system. It features high security and reliability, rapid deployment, low costs, high efficiency, and intelligent management.

Security and Reliability

- The pre-fab. module is properly grounded and resists electromagnetic interference. Its electromagnetic compatibility (EMC) meets class A requirements specified in the CISPR22/EN55022 standard.

- The data center uses International Organization for Standardization (ISO) standard 668 pre-fab. modules that provide IP65 protection (IP55 by default; IP65 available by changing the dustproof module at the air vent) as they are assembled by industry-leading welding technologies and well sealed to be waterproof and dustproof.

- Thanks to special coating for the pre-fab. modules, the pre-fab. modules pass the 1440-hour UL salt spray test, equivalent to a service life longer than 25 years. Based on corrosion definitions in ISO12944-2 and service life evaluation rules in ISO12944-1, a 720-hour salt spray test in the C4-high environment is equivalent to more than 15 years of service life, and the 1440-hour salt spray test is equivalent to 25 years of service life.

- The bullet-proof function can be provided for the pre-fab. modules if required. The pre-fab. modules pass the 10 m rifle test as they are armed with 4.2 mm bullet-proof steel plates on their sides and 2.4 mm bullet-proof steel plates on the top.

- The pre-fab. modules meet the operating requirements of the ambient temperature ranging from –20°C to +55°C.

- The pre-fab. modules meet NEBS zone 3 antiseismic requirements.

- The intelligent access control system and mechanical locks provide multifold security protection and meets class 3 theftproof requirements in EN 1627–EN 1630 or other standards.

- Optional: The fire extinguishing system is reliable, clean, insulating, and environment-friendly, and can put out a fire efficiently and safely without damaging equipment, thereby ensuring high equipment availability. The extinguishing agent is Heptafluoropropane. The CE version complies with the EU's CE certification.

📖 NOTE

The fire extinguishing system in standard configuration uses manual fire extinguishing.

Rapid Deployment

- Streamlined manufacturing, professional division of labor, and good work conditions ensure that modules and products of the FusionModule1000A are produced efficiently with strict quality control. The standard product manufacturing period is less than four to six weeks.

- Infrastructure equipment such as cooling equipment, power supply equipment, and racks are factory-installed. The customer needs only to provide network cables, power cables, and water pipes onsite for commissioning.

- System commissioning is completed in factories, and therefore onsite engineering and equipment room commissioning take less than one week.

- The pre-fab. modules can be easily migrated as it can be transported on level-3 roads and applies to various scenarios such as dynamic data service deployment, military affairs application, disaster relief, and field operations.

Cost-Effectiveness and High Energy Efficiency

- One pre-fab. module integrates the cooling system, power distribution system, monitoring system, fire extinguishing system, and security system that are installed and pre-commissioned before delivery. The FusionModule1000A goes through the trial run before delivery. You are welcome to check and try the product in factory.

- Civil engineering is simple when the FusionModule1000A is deployed outdoors. The FusionModule1000A starts to work after it is installed on a concrete column or podium and connects to the humidifier, water, mains supply, and networks.

- Mature delivery mode, modular structure, and low transportation costs of the pre-fab. modules ensure fast deployment of the FusionModule1000A, and simple and convenient expansion and upgrade.

- The energy efficiency and cooling efficiency are high.

Intelligent Management

- Centrally manages all infrastructures of the data center equipment room.

- O&M using the mobile app and remote unattended operations are available. Full WiFi coverage is implemented inside the pre-fab. modules using a WiFi converter. WiFi coverage outside the pre-fab. modules is implemented using a customer router gateway (optional).

- Monitors equipment efficiently in real time.

- Monitors the environment in real time to identify potential risks.

- Robust security management: A robust security mechanism is ready to protect equipment and ensure a secure environment.

- Standard network management system (NMS) interface: The management system provides Simple Network Management Protocol (SNMP) interfaces to communicate with third-party NMSs.

1.3 Standards Compliance

Table 1-1 Standards compliance

Standard Code	Standard Name
TIA-942-2012	Telecommunications Infrastructure Standard for Data Centers **NOTE** GB 50174-2017: Electronic Information System Equipment Room Design Specifications
IEEE 1100-2005	Recommended Practice for Powering and Grounding Electronic Equipment
IEC60364-5-52	Low-voltage electrical installations
IEC_60044-1	Current Transformers

Standard Code	Standard Name
EN 61000-4-11-2004	Testing and measurement techniques-Voltage dips, short interruptions and voltage variations immunity tests
EN 61439-1	Low-voltage Switchgear and Controlgear Assemblies
ASHRAE TC 9.9	Thermal Guidelines for Data Processing Environments-Expanded Data Center Classes and Usage Guidance
NFPA 72_2013	National Fire Alarm and Signaling Code
NFPA75	Standard for the protection of information technology equipment
NFPA2001	Standard on Clean Agent Fire Extinguishing Systems
UL_2755	OUTLINE OF INVESTIGATION FOR MODULAR DATA CENTERS
BS EN 15004	Fixed firefighting systems. Gas extinguishing systems
BS EN 54	Fire detection and fire alarm systems
BS EN 12094	Fixed firefighting systems _ Components for gas extinguishing systems
BS 6266_2011	Fire protection for electronic equipment installations
BS 5839-1-2002	Fire detection and fire alarm systems for buildings
BS ISO 14520-1-2006	Gaseous fire-extinguishing systems
BS EN 1363_2012	Fire resistance tests
ISO 668:1995	Series 1 freight container-Classification, dimensions and ratings
ISO 1161:1984	Series 1 freight container-Corner fittings-Specification, MOD
ISO 6346:1995	Freight container-Coding, identification and marking
TIA 942	Telecommunications Infrastructure Standard for Data Centers
IEC60297	Dimensions of mechanical structures of the 482.6 mm (19 in) series
GR-63-CORE	NEBS Requirements: Physical Protection
BS EN1363-1: 2012	Fire-resistance tests - Part 1: General requirements
IEC 60529:2013	Degrees of protection provided by enclosures (IP Code)
ISO 7253	Paints and varnishes - Determination of resistance to neutral salt Spray (fog), 2nd edition 1996-12-25
ISO 12944-6	Paints and varnishes - Corrosion protection of steel structures by protective paint systems Part 6: Laboratory performance test methods 1st edition 1998-05-15

2 Typical Application Scenarios and Typical Configuration

2.1 Typical Application Scenarios

The FusionModule1000 is applicable to fast deployment of outdoor small-sized CT equipment rooms for carriers. It can integrate standard and nonstandard mainstream CT equipment, and can be easily relocated.

Table 2-1 Typical application scenarios of the FusionModule1000

Wireless Site Equipment Room	Fixed Network Convergence Site Equipment Room	Submarine Cable Landing Site
• Based on the cloud radio access network (C-RAN) architecture, battery backup units (BBU) and other devices are centralized to implement BBU coordination for equipment room at the edge site. • High power (3 kW or higher), long backup power (≥ 4 hours), and various cabinet types (N63, N66, and N68)	• An equipment room at the CO site is responsible for access of optical transmission network terminals and for metro aggregation network transmission. • Small power (less than 1 kW), N63 is mainly used as a cabinet, and there is no mandatory requirement for the backup time.	• The equipment room is used for land connection of submarine optical cables. • N63 is mainly used as a cabinet, long backup power (≥ 4 hours), and applicable to class C environment

Distributed and mobile single-enclosure deployment applies to equipment room construction or modernization.

Figure 2-1 Mobile application scenario

DC01W00265

☐ NOTE

The FusionModule1000 cannot be transported with the CT equipment, power modules, and batteries.

The FusionModule1000 is the first choice when a data center needs to be quickly constructed and deployed due to urgent service requirements.

The FusionModule1000 supports distributed single-enclosure deployment in outdoor areas such as wilderness, mining areas, and deserts to meet application requirements of the harsh environment.

Figure 2-2 Application in harsh outdoor environments

DC01W00266

2.2 Typical Configurations

Table 2-2 Typical configurations

Category		System Components
Structural system		• There is no raised floor or CT cabinets (user-supplied). The supported CT cabinet dimensions (H x W x D) are 2200 mm x 600 mm x 800 mm, 2200 mm x 600 mm x 600 mm, and 2200 mm x 600 mm x 300 mm. • Cables and terminals for connecting the AC/DC power system to CT cabinets are not configured.
Power supply and distribution system		PDF (MCCB input and ATS input), AC/DC power system (TP48400B-N20B3 and TP48600B-N20B1 and TP481200B-N20B1), and battery (150 Ah and 190 Ah and 1000 Ah)
Cooling system		Intelligent heat exchanger (3 kW and 5 kW), Fresh air integrated unit (13.5 kW)
Monitoring system		ECC800, DC power module, smart ETH gateway, ETH converter, camera, SD card, T/H sensor, smoke sensor, access actuator, single-door magnetic lock, exit button, IC card reader, and IC card
Fire extinguishing system	Manual fire extinguishing	Emergency light, exit indicator, and hand-held fire extinguisher (purchased locally)
	CE automatic fire extinguishing (optional)	Photoelectric smoke detector, heat detector, fire alarm bell, fire alarm horn/strobe, emergency light, exit indicator, extinguishant control panel, external fire alarm horn/strobe, emergency shutdown button, gas release indicator, electrical actuator, pneumatic switch, nozzle, fire cylinder, and ASD

2.3 Key System Technical Specifications

Table 2-3 Key technical specifications

Item		Specifications				
System BOM number		21262910	21262910-001	21262910-002	21262910-003	21262911
Power supply and distribu	Power input	One 160 A input, three-phase four-wire+PE,	Two 250 A inputs, three-phase four-wire+PE,	One 160 A input, three-phase four-wire+PE,	Two 250 A inputs, three-phase four-wire+PE,	Two 250 A inputs, three-phase four-wire +

Item		Specifications				
tion		380 V AC/400 V AC/415 V AC, 50/60 Hz	380 V AC/400 V AC/415 V AC, 50/60 Hz	380 V AC/400 V AC/415 V AC, 50/60 Hz	380 V AC/400 V AC/415 V AC, 50/60 Hz	PE, 380 V AC/400 V AC/415 V AC, 50 Hz/60 Hz
	Surge protection level	Level 3 surge protection, nominal 20 kA (8/20 µs), maximum 40 kA (8/20 µs)				
	Supported device power	N+X scenario: ≤ 8 kW	2N scenario: ≤ 8 kW	N+X scenario: ≤ 16 kW	2N scenario: ≤ 16 kW	2N scenario: ≤ 24 kW
	Backup time	N+X scenario: 2 hours (in the initial state)	2N scenario: 6 hours (in the initial state)	N+X scenario: 1 hour (in the initial state)	2N scenario: 3 hours (in the initial state)	N+X scenario: 3 hours (in the initial state)
Cooling	Cooling capacity	8 kW (3+1 redundancy)		16 kW (4+1 redundancy)		24 kW (2+1 redundancy)
	Refrigerant	R134a				R134a
	Temperature control range	18°C to 30°C				18°C to 30°C
Fire extinguishing	Type	Manual fire extinguishing in standard configuration, and automatic fire extinguishing in the CE version.				
	Alarm	(Optional) Automatic monitoring and detection, and the fire alarm horn/strobe is supported.				
	Detection	(Optional) Gas is released when dual alarm conditions are met.				
	Extinguishant	(Optional) Heptafluropropane.				
Monitoring	IP camera	Dual-resolution IP cameras installed at the main entrance door				
	Management function	Monitors the internal temperature, humidity control system, fire detection and control system, access control system, cooling system, and power distribution system in real time.				
		O&M using the mobile APP, remote unattended control				
		(Optional) Supports monitoring over emails and Simple Network Management Protocol (SNMP) short messages.				
		All backup power sources are connected over programable dry contacts or fast Ethernet (FE) ports.				
Structure	Dimensions (H x W x D)	20ft standard ISO shipping pre-fab. module: 2896 mm x 2438 mm x 6058 mm				
	Thermal	Overall heat transfer coefficient of the pre-fab. module ≤ 0.59 W/(m^{2}K)				

Item		Specifications
	insulation	
	Fireproof performance	The pre-fab. module interior is decorated with B1 fire-resistant materials, and the enclosure structure uses the 50 mm A1 fire-resistant rock wool material, providing a fire resistance duration of 15 minutes. Requirements for higher fire resistance can be met by customization, which will change the pre-fab. module and its interior structure. **NOTE** The pre-fab. module exterior can be protected with customized fireproof panels, which can provide a fire resistance duration of 120 minutes as tested by the UL lab based on BS EN 1364-1:1999 and BS EN 1363-1:2012 standards.
	(Optional) Integrated cabling	The integrated cabling solution needs to be provided for project customization.
	IP rating	(Optional) IP55/IP65
	Installation mode	Directly installed on the ground **NOTE** The pre-fab. module can also be installed on a concrete platform, with four 300 mm high steel bases connected to the concrete platform using M16 bolts.
	Weight	Preinstallation weight before delivery: ≤ 7500 kg; maximum load bearing capacity: ≤ 10,000 kg
	Cabinet specifications	N63 cabinet: 600 x 300 x 2200 mm (air intake from front and air exhaust from top) N66 cabinet: 600 x 600 x 2200 mm (air intake from front and rear, air exhaust from top) N68 cabinet: 600 x 800 x 2200 mm (air intake from front and air exhaust at rear)
Environmental requirements	Ambient temperature	–20°C to +55°C **NOTE** T ≤ 35°C: not derated. The maximum load rate decreases by 7.5% each time when the temperature increases by 5°C.
	Storage temperature	–40 to +70°C
	Ambient humidity	5%–95% RH
	Environment corrosion requirements	Class C environments, more than 500 m away from the seashore
	Altitude	Maximum altitude: 3000 m (derated when the altitude > 1000 m) • Altitude ≤ 1000 m: not derated. Working at an altitude of less than 1000 m, and low pressure scenario are satisfied. • When the altitude exceeds 1000 m, the power of each 1000 m is derated by 5%.

> **NOTICE**
>
> - Do not leave the prefabricated data center power off for more than six months. If the data center will be idle for a long time, power it on and keep it operational for at least two hours every six months.
> - The battery storage temperature ranges from –20°C to +40°C.
> - Batteries can be stored without power-on for a maximum of 90 days. If the storage period exceeds 90 days, recharge the batteries promptly.
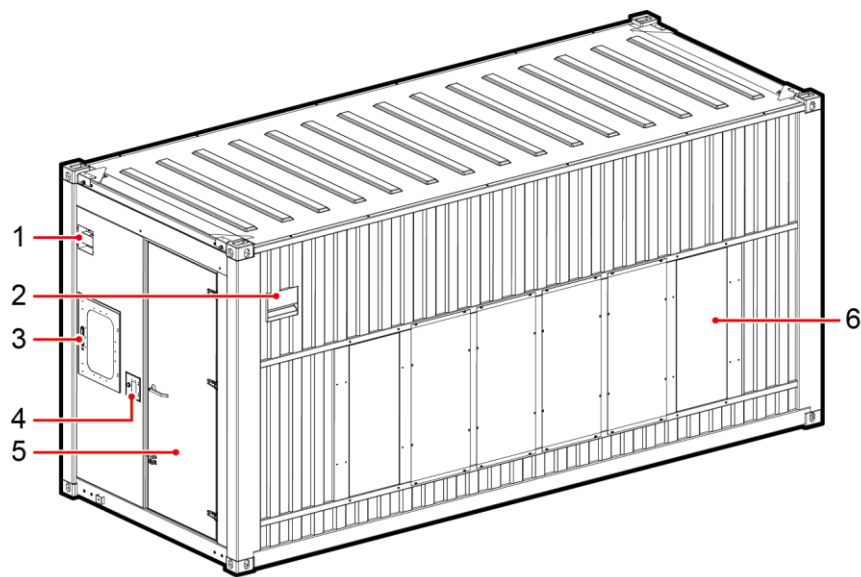
3 System Architecture

3.1 Pre-fab. Module Structural System

3.1.1 Pre-fab. Module

Figure 3-1 Appearance 1 (8 kW and 16 kW)

DC01W00221

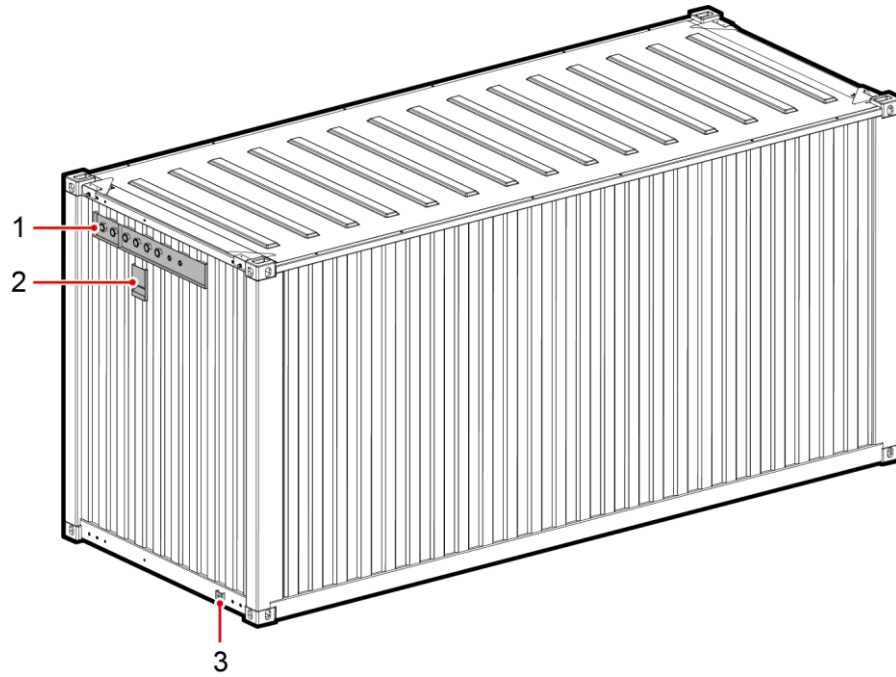|		
(1) External horn strobe (optional)	(2) Air exhaust window	(3) Fire control box (optional)
(4) Card reader	(5) Main entrance door	(6) Intelligent heat exchanger

Figure 3-2 Appearance 2 (8 kW and 16 kW)

DC01W00217

(1) Feeder window	(2) Air intake window	(3) Ground point

Figure 3-3 Appearance 1 (24 kW)
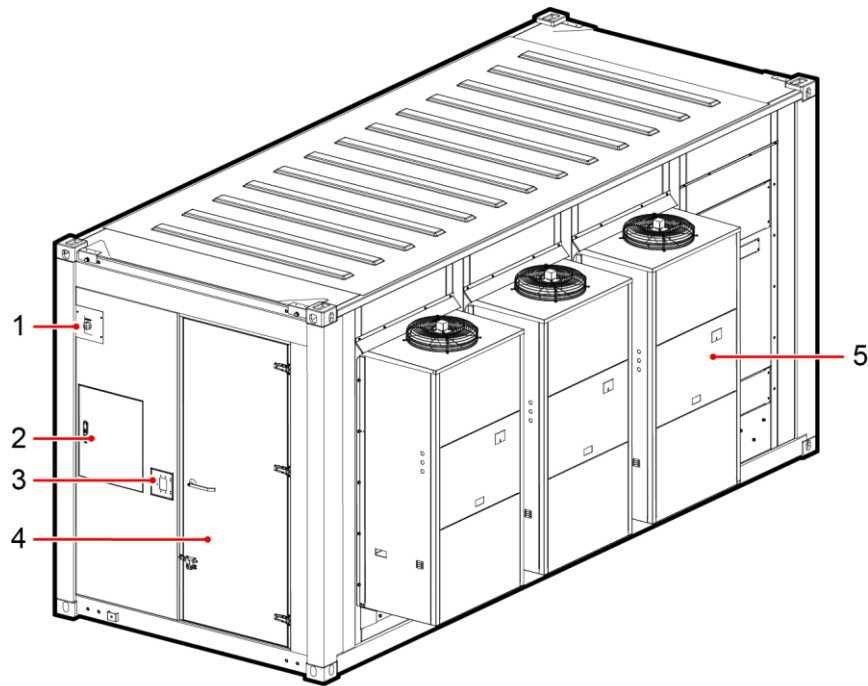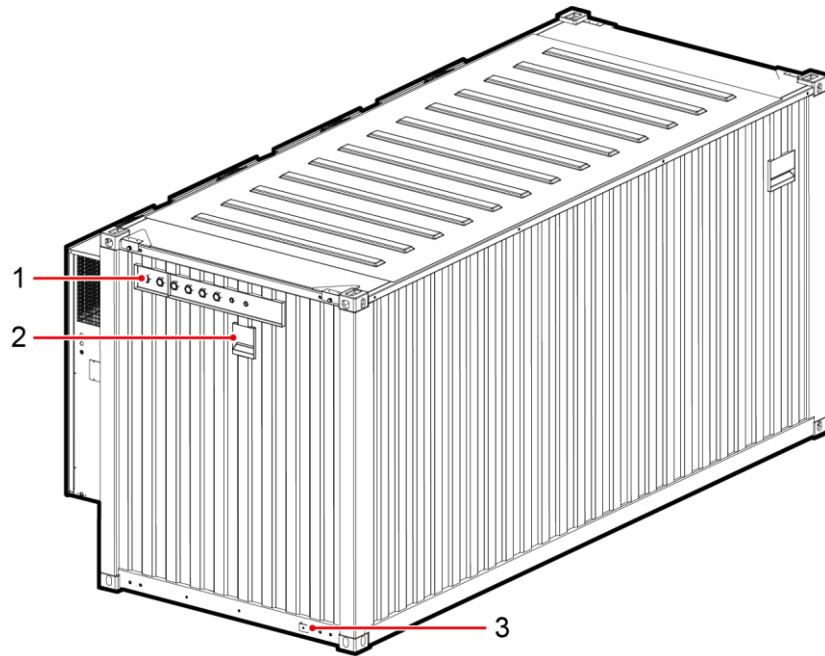

DC01W00245

(1) External horn strobe (optional)	(2) Fire control box (optional)	(3) Card reader

(4) Main entrance door   (5) Fresh air integrated unit

Figure 3-4 Appearance 2 (24 kW)
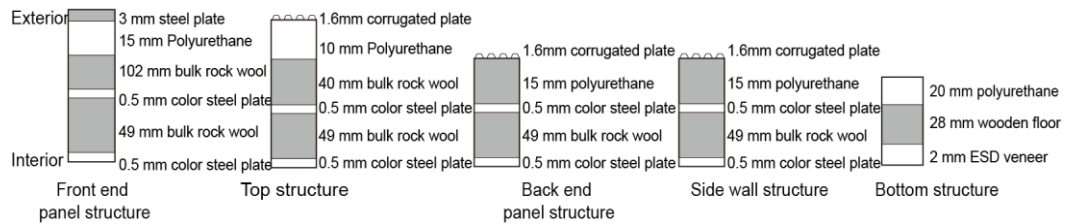

DC01W00238

(1) Feeder window   (2) Air intake window   (3) Ground point

3.1.2 Thermal Insulation Structure

The pre-fab. module is furnished with a thermal insulation layer composed of rock wool (density: 120 kg/m^3), and color steel plates.
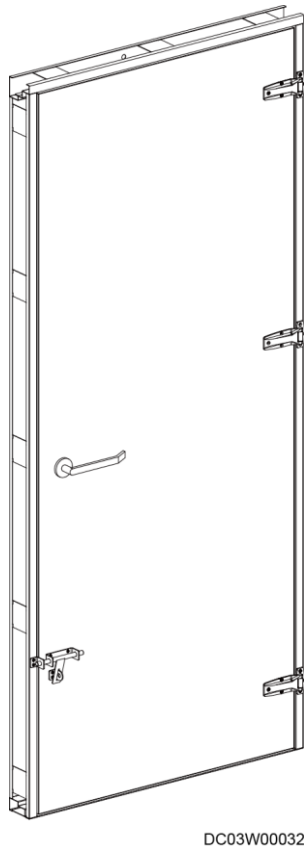
Figure 3-5 Thermal insulation structure

DC01W00219

3.1.3 Pre-fab. Module Door

Figure 3-6 Appearance

DC03W00032

Table 3-1 Main entrance door technical specifications

Item	Specifications
Width	1100 mm
Net width	950mm
Height	2420 mm
IP rating	IPX5
Theftproof	Class 3 (Optional)
Door opening angle	$\geq 120°$, the door closer is configured.
Bearing capacity	When the door is open, the door, door frame, and mechanical parts can withstand the door weight and will not deform permanently within 48 hours with a static load of 15 kg at any part.
Waterproof structure	The fireproof door uses rubber strips with a framework and composite adhesive to

Item	Specifications
	ensure the waterproof performance.
Door opening mode	Inward and outward

3.1.4 Pre-fab. Module Interior Layout

Figure 3-7 2N scenario 8 kW
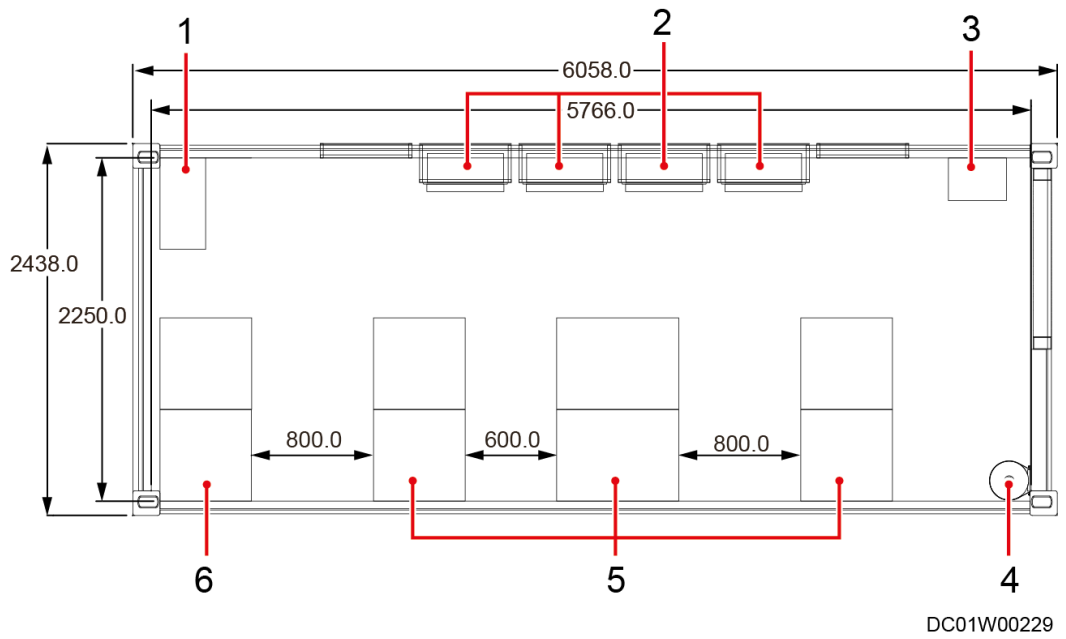
(1) Main input PDB   (2) Intelligent heat exchanger   (3) Dehumidifier (optional)

(4) Fire cylinder (optional)   (5) CT cabinet   (6) AC/DC power system

Figure 3-8 N+X scenario 8 kW
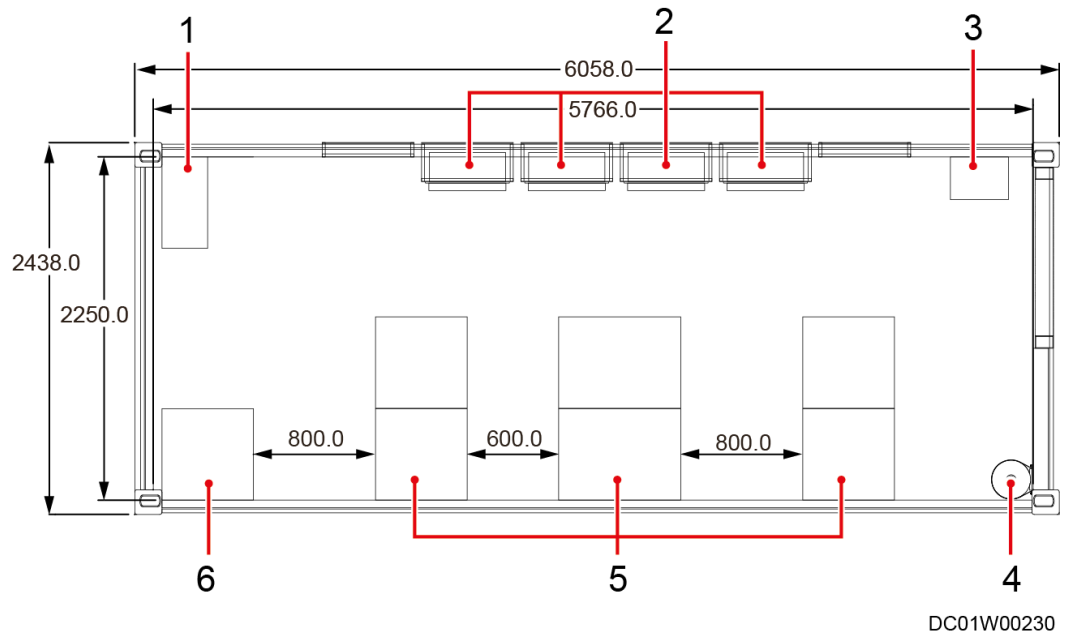
DC01W00230

(1) Main input PDB	(2) Intelligent heat exchanger	(3) Dehumidifier (optional)
(4) Fire cylinder (optional)	(5) CT cabinet	(6) AC/DC power system

Figure 3-9 2N scenario 16 kW

DC01W00231

(1) Main input PDB	(2) Intelligent heat exchanger	(3) Dehumidifier (optional)
(4) Fire cylinder (optional)	(5) CT cabinet	(6) AC/DC power system
(7) Battery cabinet		

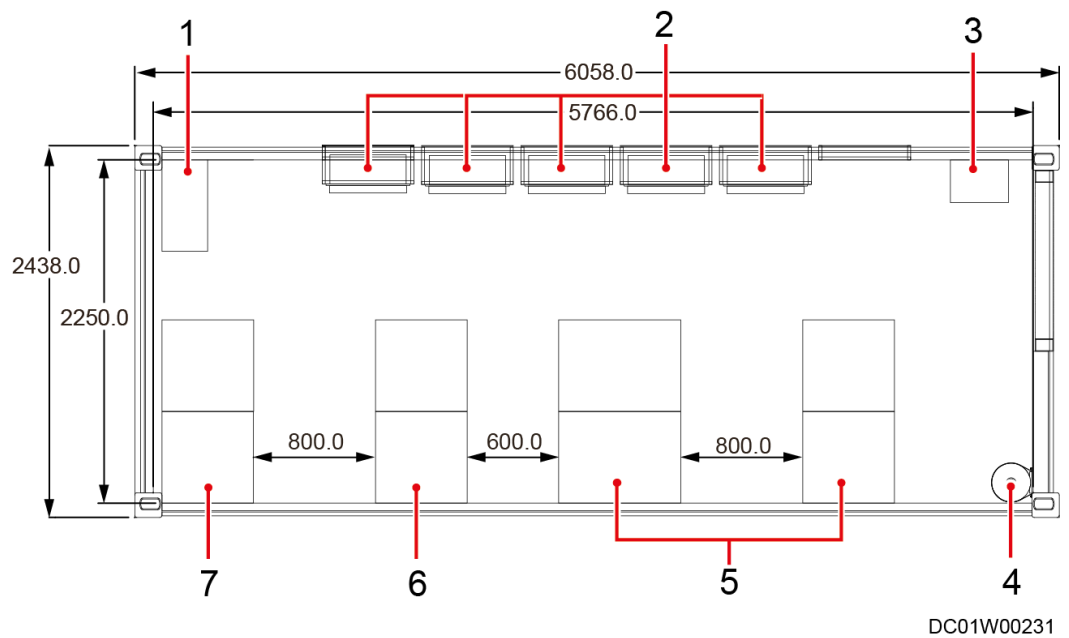**Figure 3-10** N+X scenario 16 kW

DC01W00232

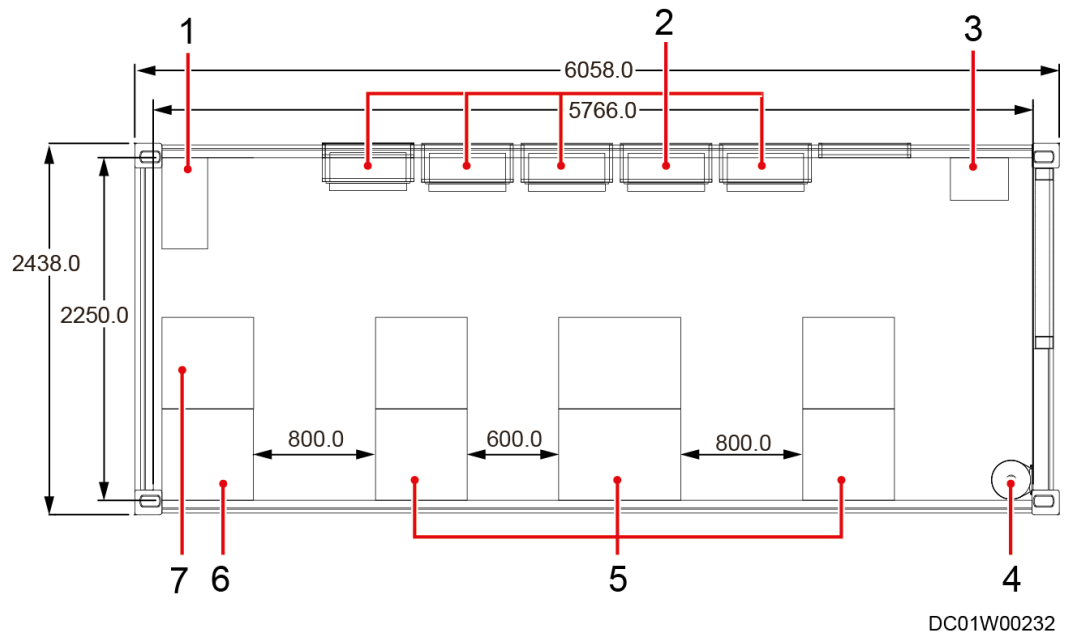|		
(1) Main input PDB	(2) Intelligent heat exchanger	(3) Dehumidifier (optional)
(4) Fire cylinder (optional)	(5) CT cabinet	6: Battery cabinet
(7) AC/DC power system		

Figure 3-11 N+X scenario 24kW
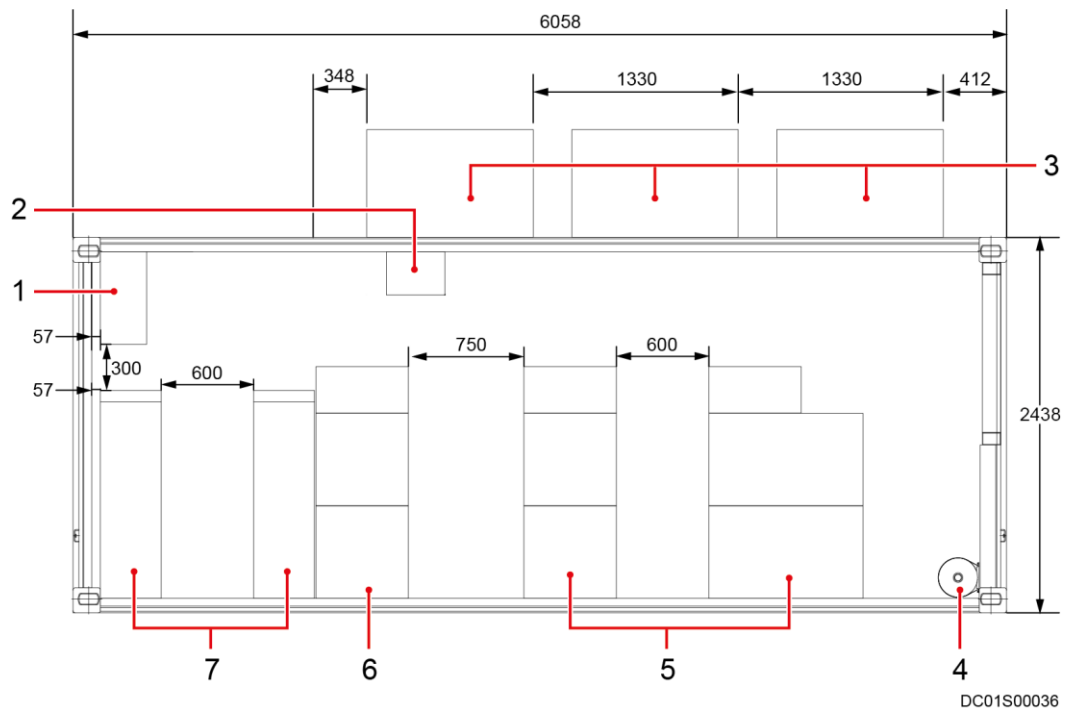
(1) Main input PDB	(2) Dehumidifier (optional)	(3) Fresh air integrated unit
(4) Fire cylinder (optional)	(5) CT cabinet	(6) AC/DC power system
(7) Battery rack		

3.1.5 Mesh Cable Tray

Cable tray dimensions (H x W): 50 mm x 200 mm

Figure 3-12 Overhead cable tray
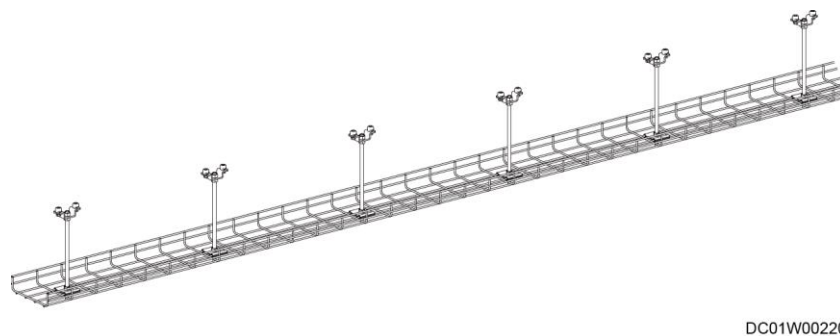
3.1.6 Pre-fab. Module Exterior Ports

The pre-fab. module provides optical and network ports. All ports provide good water
tightness and thermal insulation performance, meeting equipment compartment weather-tight

requirements and adapting to different configuration demands. Fire extinguishing devices outside the pre-fab. module meet sealing conditions.

Figure 3-13 Pre-fab. module exterior ports
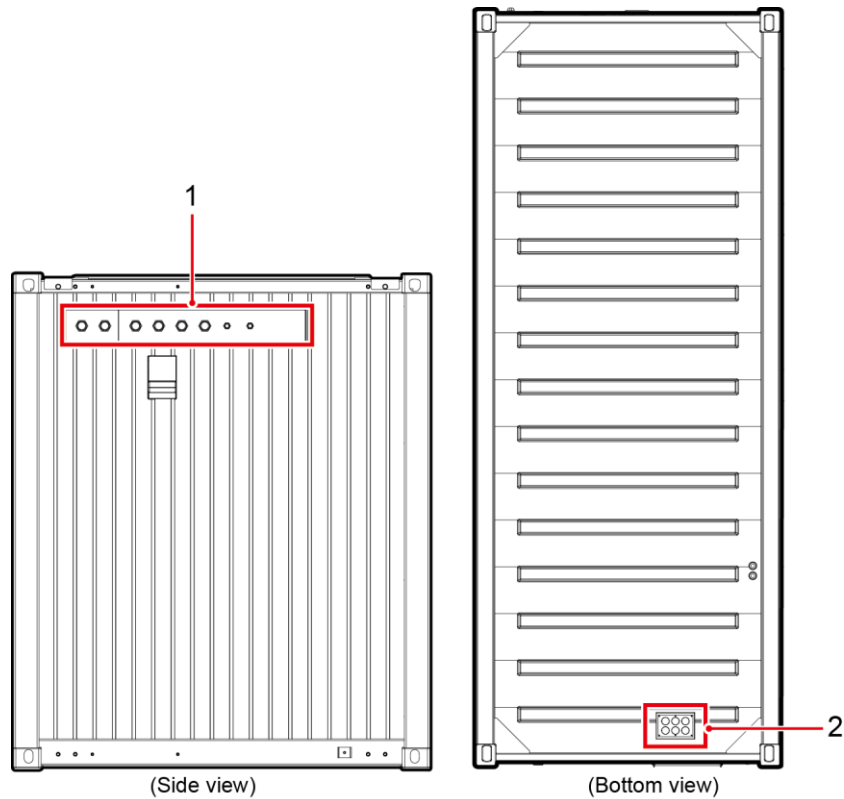
(1) Feeder window   (2) Bottom cable access hole

3.2 Power Supply and Distribution System

3.2.1 Overview

CT equipment and power equipment are powered separately.

- The intelligent heat exchanger or smart cooling product, lighting, AC/DC power system, and fire extinguishing system are provided by the main input power distribution box (PDB).
- The monitoring system is powered by the AC/DC power system.

Figure 3-14 System conceptual diagram (2N scenario, 8 kW)
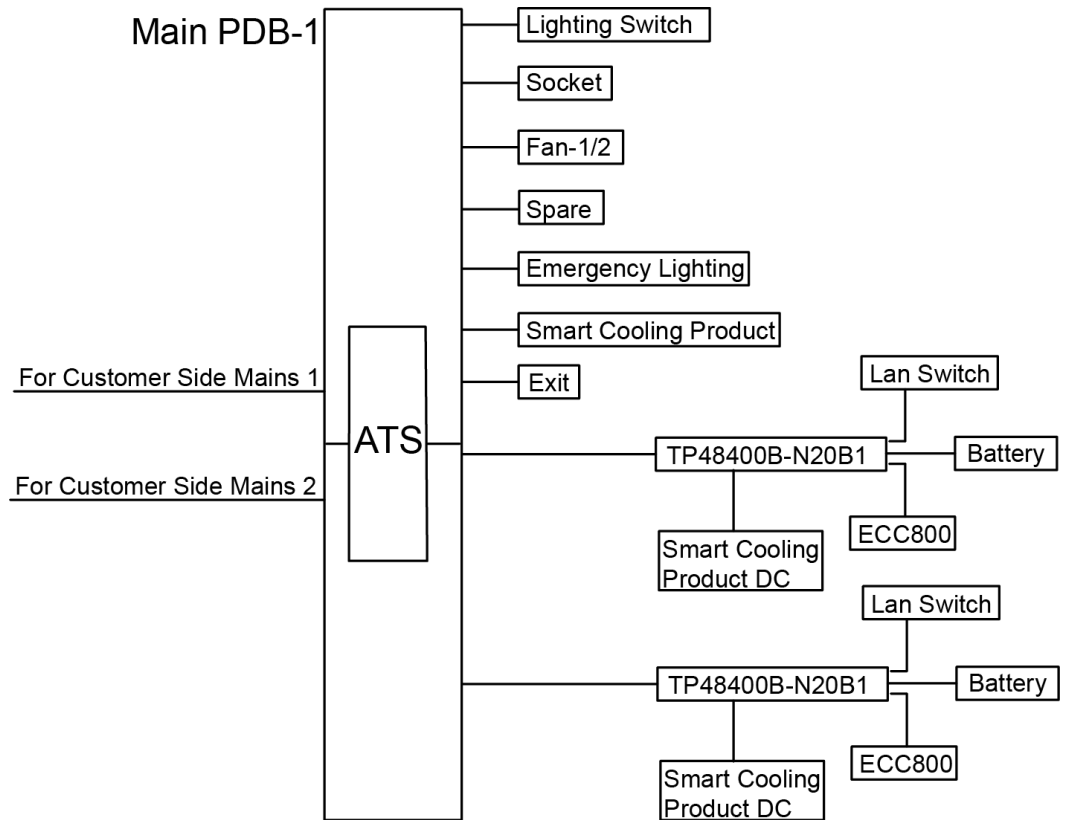
DP00P00019

Figure 3-15 Power supply and distribution component layout (2N scenario, 8 kW)
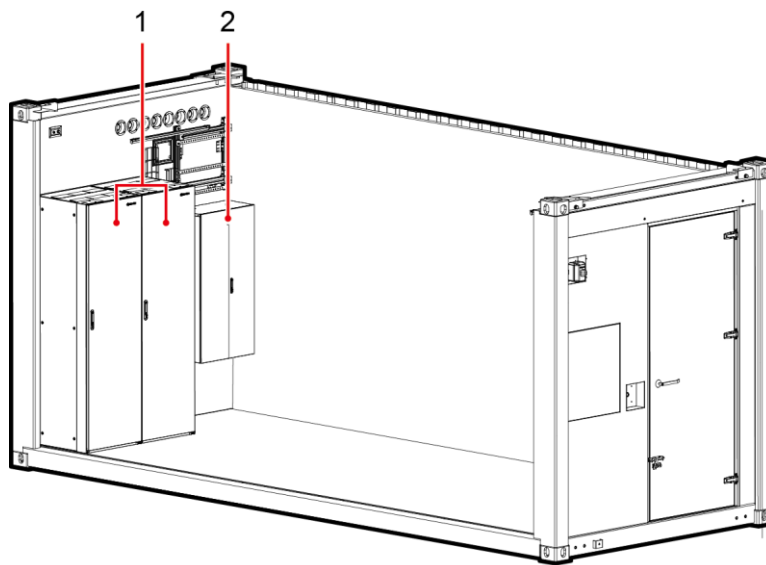
DC01W00222

(1) AC/DC power system   (2) Main input PDB

Figure 3-16 System conceptual diagram (N+X scenario, 8 kW)
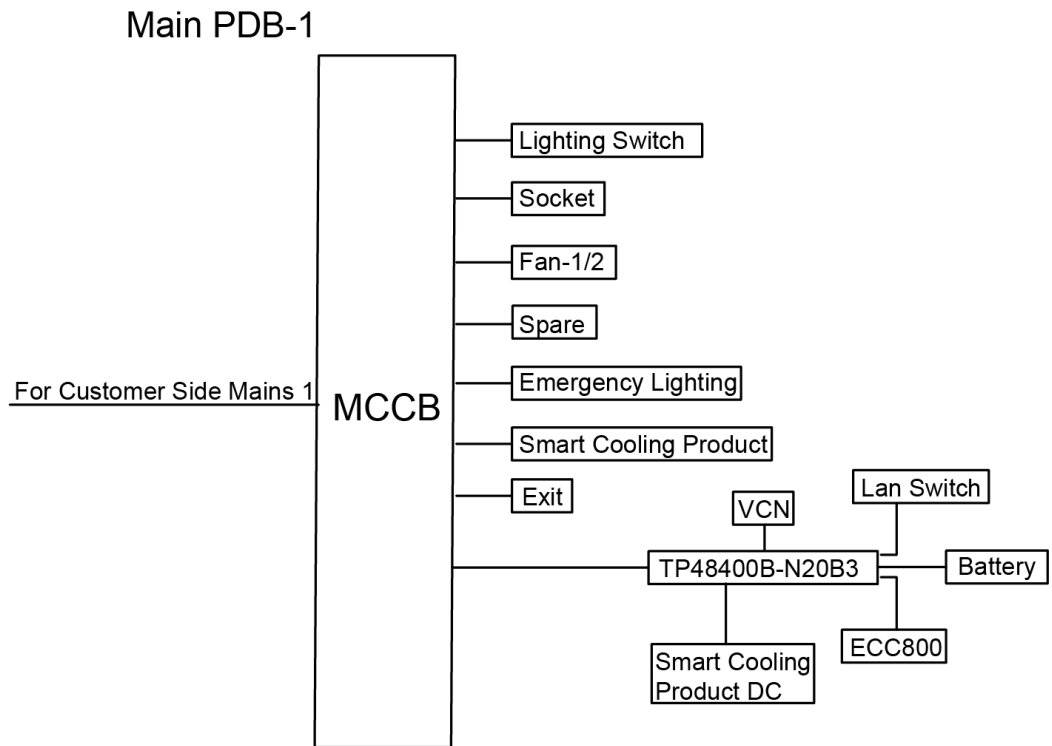
DP00P00024

Figure 3-17 System layout (N+X scenario, 8 kW)
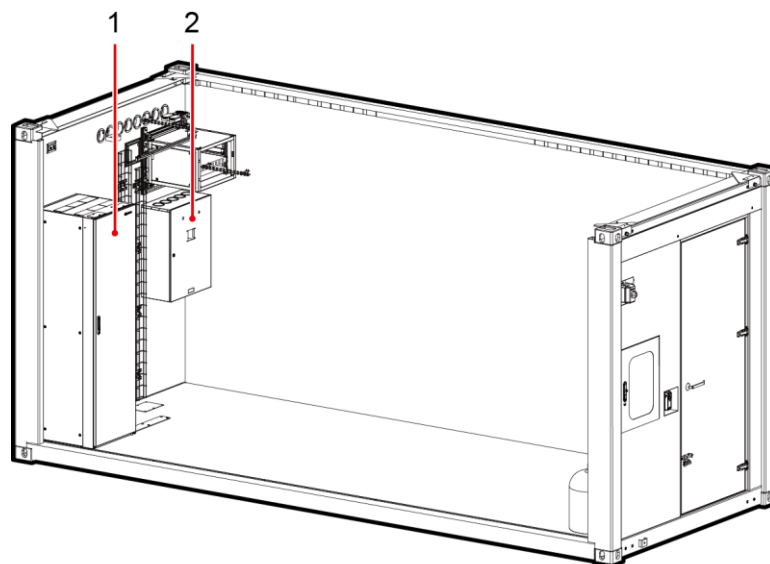
DC01W00223

(1) AC/DC power system   (2) Main input PDB

Figure 3-18 System conceptual diagram (2N scenario, 16 kW)
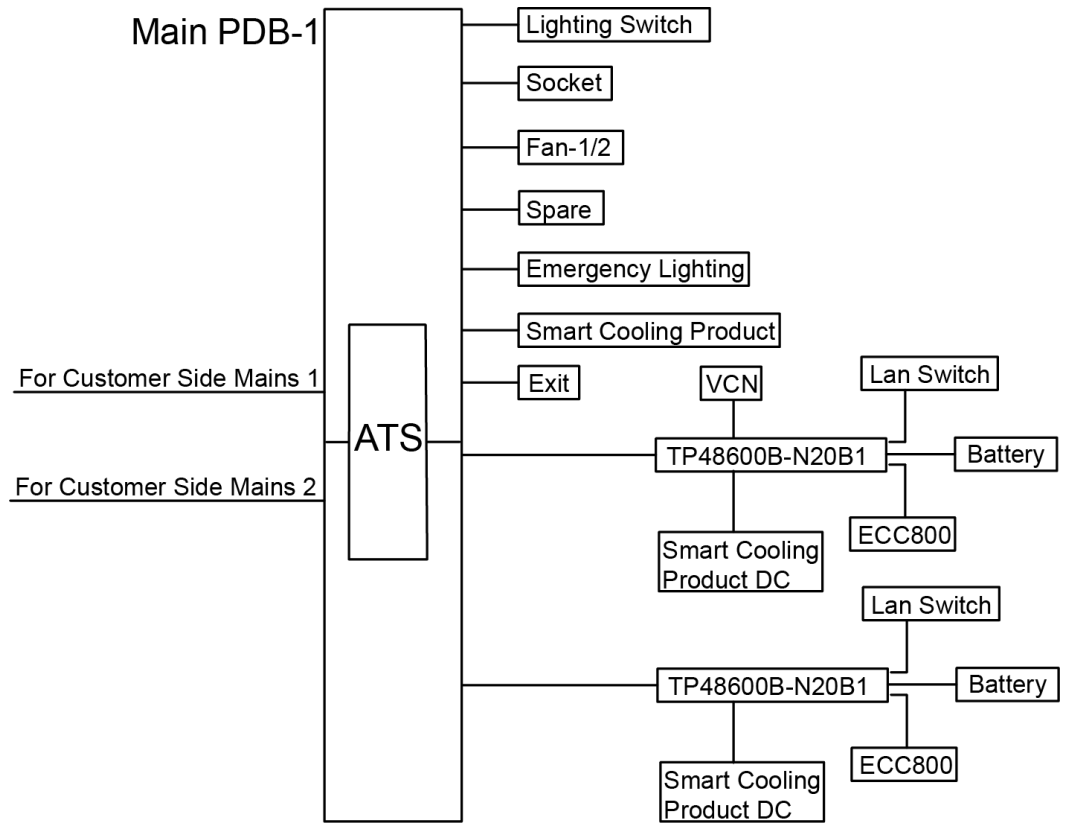
Figure 3-19 System layout (2N scenario, 16 kW)
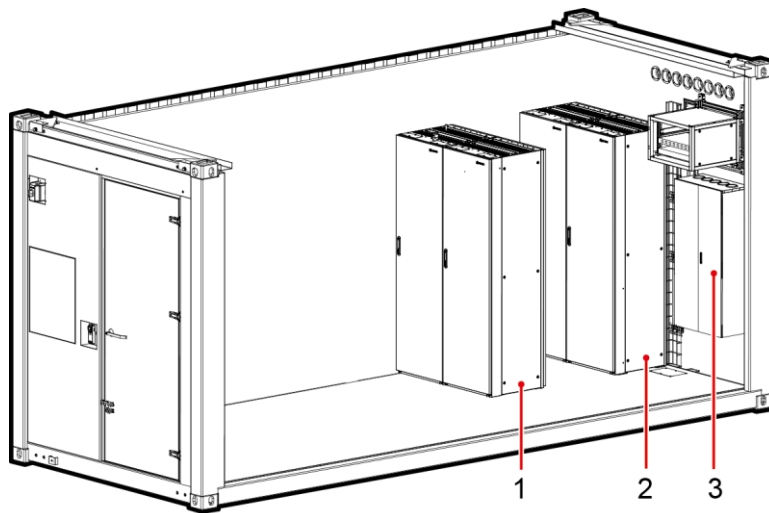
(1) AC/DC power system   (2) Battery cabinet   (3) Main input PDB

Figure 3-20 System conceptual diagram (N+X scenario, 16 kW)
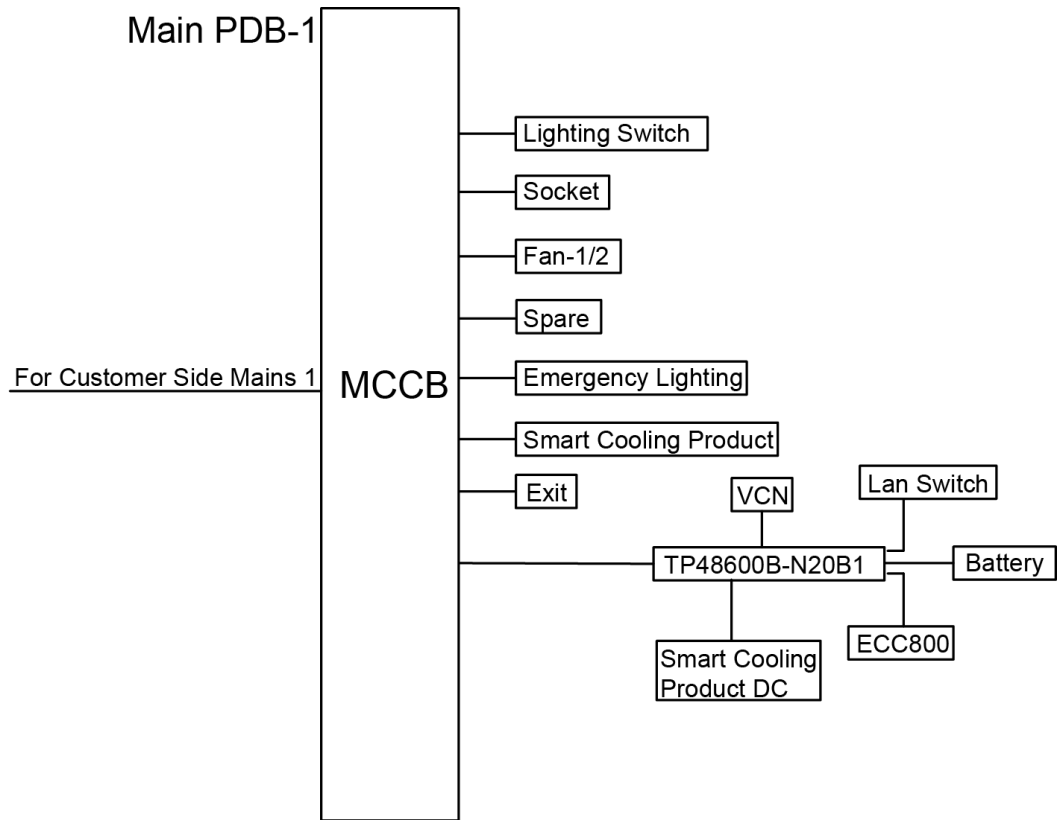
DP00P00022

Figure 3-21 System layout (N+X scenario, 16 kW)
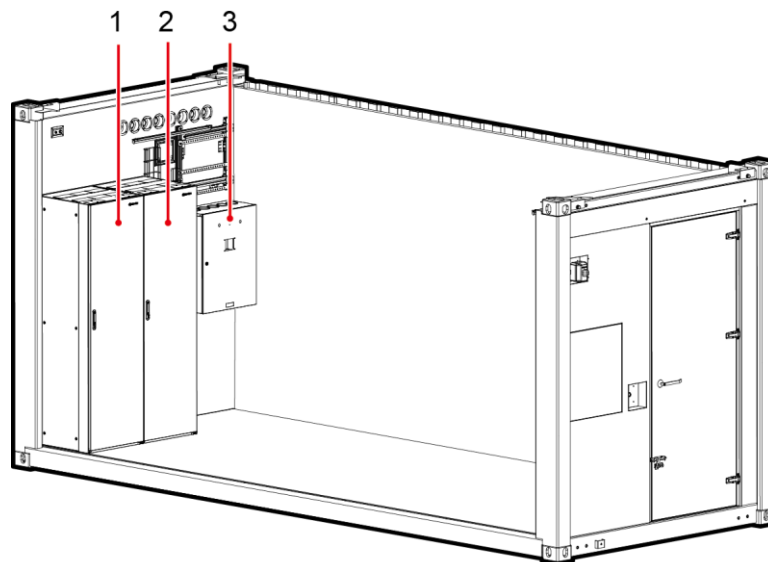
DC01W00228

(1) Battery cabinet	(2) AC/DC power system	(3) Main input PDB

Figure 3-22 System conceptual diagram (2 N scenario, 24 kW)
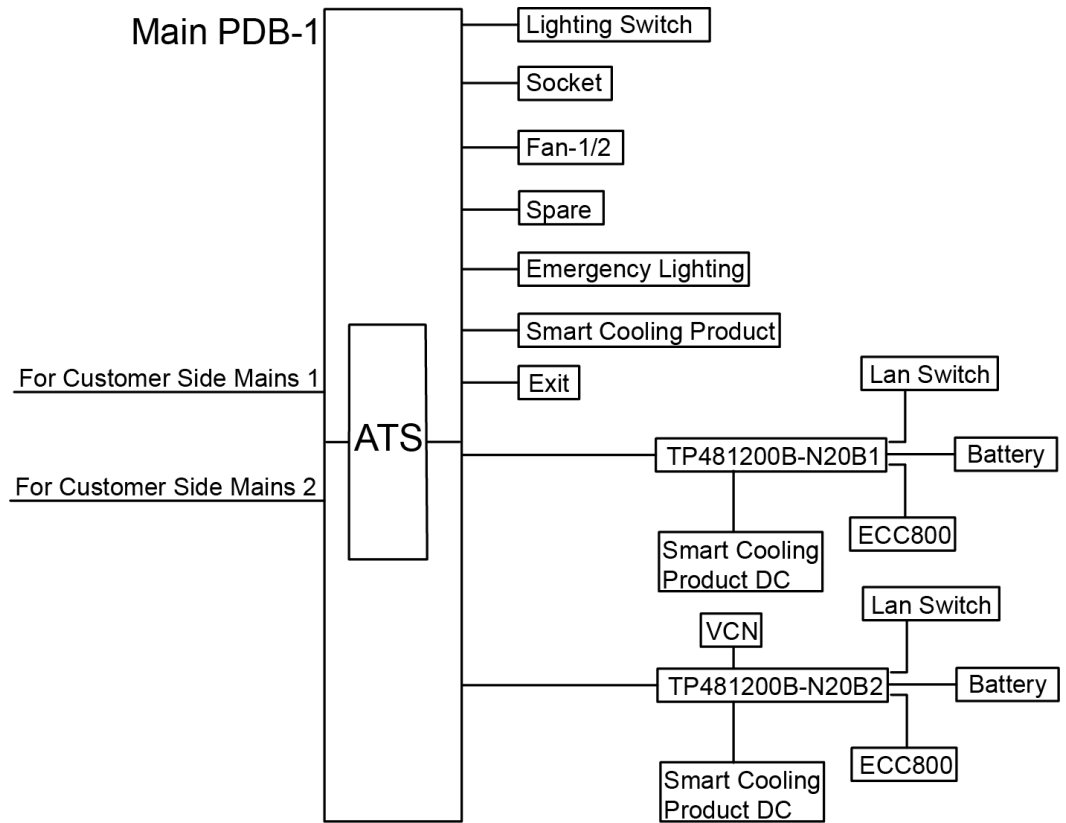
Figure 3-23 Power supply and distribution component layout (N+X scenario, 24 kW)
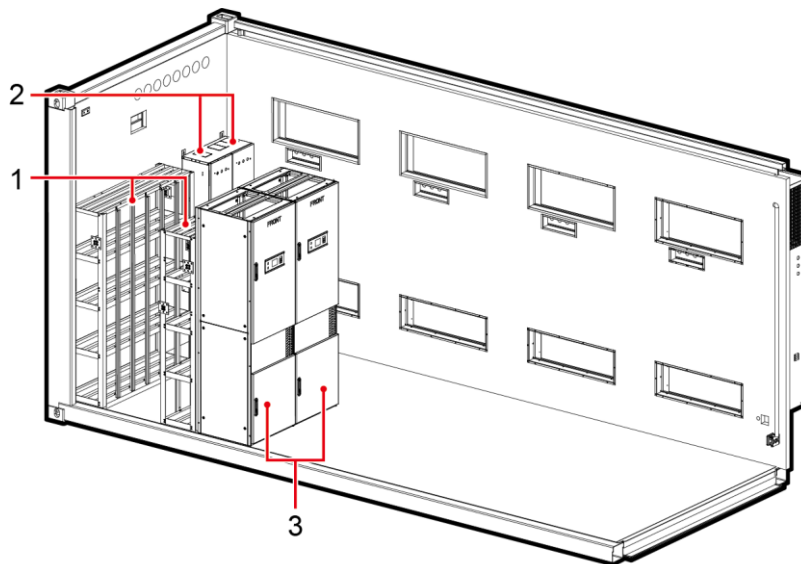
(1) Battery rack   (2) Main input PDB   (3) AC/DC power system

3.2.2 PDF (MCCB Input)

The PDF supplies power to loads such as intelligent heat exchangers, the fire extinguishing system, and the lighting system.

Figure 3-24 PDF

DC02P00007
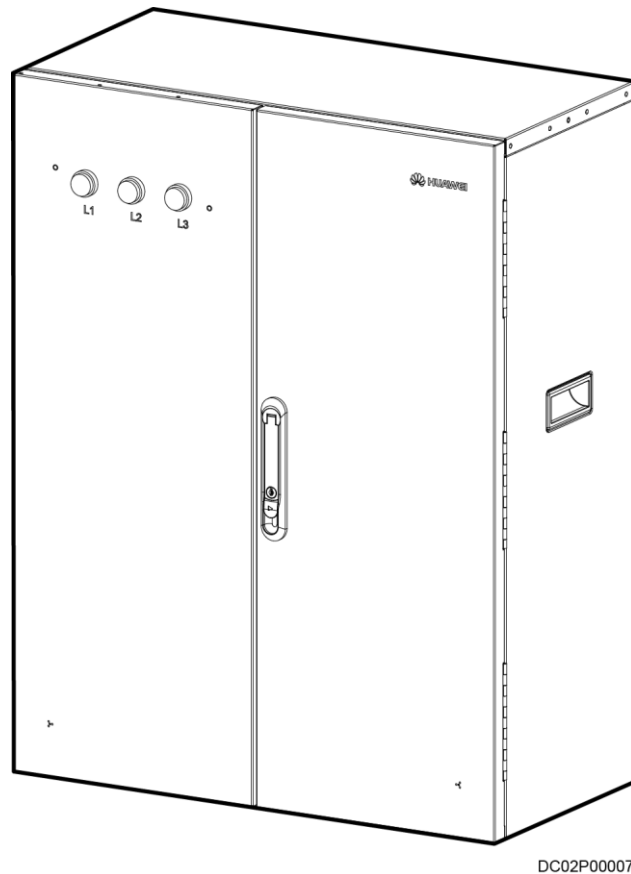
Table 3-2 Technical specifications

Item	Specifications
Dimensions (H x W x D)	800 mm x 600 mm x 300 mm
Rated operating voltage	380 V AC/400 V AC/415 V AC
Rated frequency	50 Hz or 60 Hz
Input switch	160 A/3P MCCB
Output switch	63 A/3P MCB x 2+25 A/2P MCB x 6+16 A/1P MCB x 1+10 A/1P MCB x 5+(10 A/1PMCB+AUX+YO) x 1+C16/0.03 RCD x 1
Operating temperature	–5°C to +40°C
Operating humidity	5%–95% RH

Item	Specifications
Installation mode	Wall-mounted
Cabling mode	Routed in from the top and out from the bottom or top
Monitoring	Main input PDB total input electricity display and measurement: three-phase voltage, current, reactive power, active power, and power factor. The meter supports standard RS485 serial communication with the host computer.
Whether hot swap is supported	Yes

3.2.3 PDF (ATS Input)

The PDF supplies power to loads such as intelligent heat exchangers, the fire extinguishing system, and the lighting system.

Figure 3-25 PDF
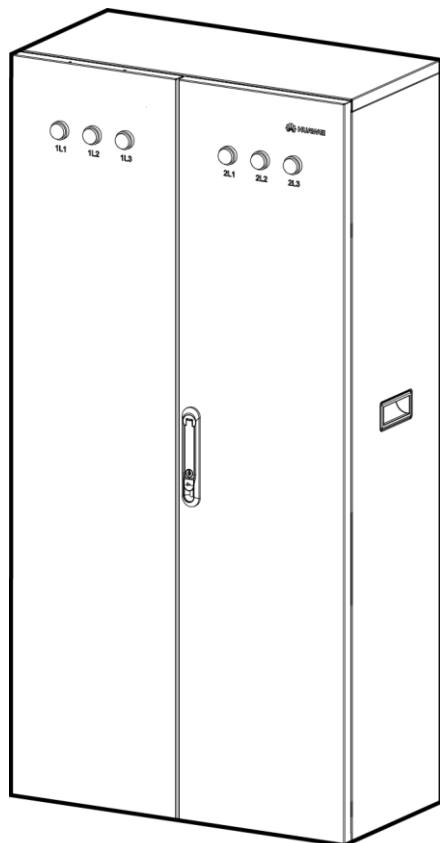
DC02P00006

Table 3-3 Technical specifications

Item	Specifications
Dimensions (H x W x D)	1200 mm x 600 mm x 300 mm
Rated operating voltage	380 V AC/400 V AC/415 V AC
Rated frequency	50/60 Hz
Input switch	250 A/4P ATS
Output switch	63 A/3P MCB x 2 + 40 A/1P MCB x 6 + 16 A/1P MCB x 1 + 10 A/1P MCB x 5 + (10 A/1P MCB + AUX + YO) x 1 + C16/0.03 RCD x 1
Operating temperature	–5°C to +40°C
Operating humidity	5%–95% RH
Installation mode	Wall-mounted
Cabling mode	Routed in from the top and out from the bottom or top
Monitoring	Main input PDB total input electricity display and measurement: three-phase voltage, current, reactive power, active power, and power factor. The meter supports standard RS485 serial communication with the host computer.

3.2.4 AC/DC Power System (TP48400B-N20B3)

Figure 3-26 Appearance (8 kW and 16 kW)
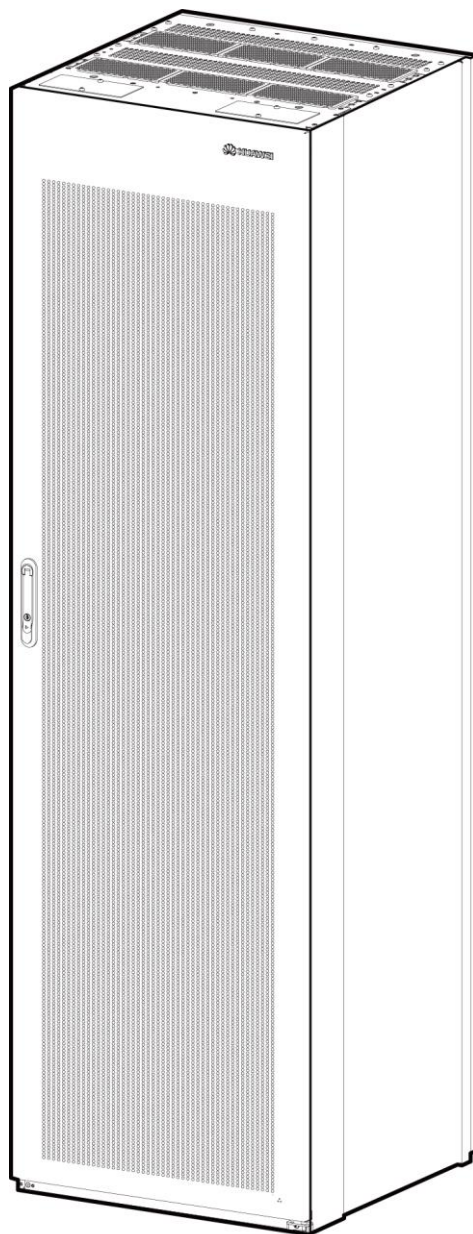
PI06WC0011

Table 3-4 Technical specifications

Item		Specifications
System	Dimensions (H x W x D)	2000 mm x 600 mm x 600 mm
	Installation mode	Floor-mounted (installed on the pre-fab. module floor or an ESD floor)

Item		Specifications
	Cabling mode	Routed in and out from the top
	Maintenance mode	Maintained from the front and located along a wall with a clearance of at least 100 mm
	IP rating	IP20
AC power distribution	Input mode	220/380 V AC three-phase four-wire
	Input voltage	85–300 V AC (L-N); rated voltage: 220 V AC
	Input capacity	1 x 63 A/3P
DC power distribution	Output voltage	–42 V DC to –58 V DC. The default output is –53.5 V DC.
	Battery route	4 x 125 A/2P
	BLVD route	Standard: four 1-pole 63 A circuit breakers, two 1-pole 16 A circuit breakers, and two 1-pole 10 A circuit breakers
	LLVD route	Standard: two 1-pole 100A circuit breakers, two 1-pole 63 A circuit breakers, and four 1-pole 32 A circuit breakers
	Surge protection	• AC surge protection: nominal lightning strike discharge current 20 kA (8/20 µs), maximum lightning strike discharge current 40 kA (8/20 µs) • DC surge protection: 10 kA in differential mode, 20 kA in common mode, 8/20 µs
R4850G2 rectifier	Efficiency	≥ 95% (230 V AC, 30%–100% load)
	Output power	• 3000 W (176–300 V AC) • 1250 W (linear derating at 85–175 V AC)
	Dimensions (H x W x D)	40.8 mm x 105 mm x 281 mm
	Weight	< 2 kg

3.2.5 AC/DC Power System (TP48600B-N20B1)

Figure 3-27 Appearance (8 kW and 16 kW)

PI03WC0059
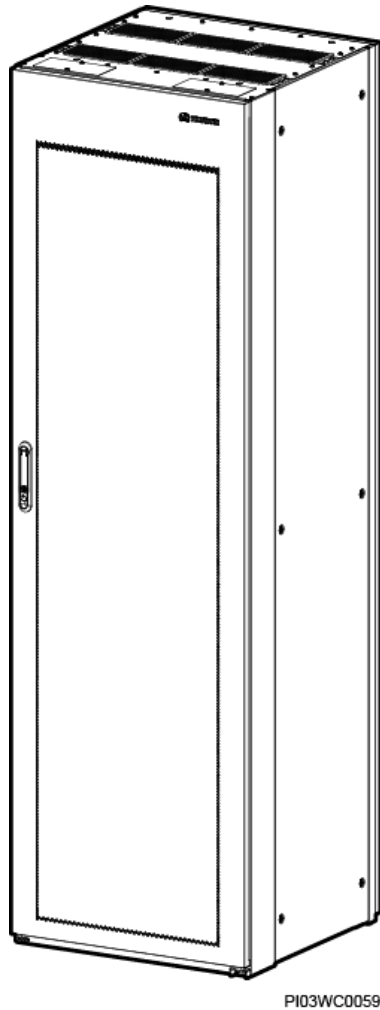
Table 3-5 Technical specifications

Item		Specifications
System	Dimensions (H x W x D)	2000 mm x 600 mm x 600 mm
	Installation mode	Floor-mounted (installed on the pre-fab. module floor or an ESD floor)
	Cabling mode	Routed in and out from the top
	Maintenance mode	Maintained from the front and located along a wall with a clearance of at least 100 mm
	IP rating	IP20
AC power	Input mode	220/380 V AC three-phase four-wire, compatible

Item		Specifications
distribution		with 220 V AC three-phase three-wire
	Input voltage	85–300 V AC (L-N); rated voltage: 220 V AC
	Input capacity	1 x 125 A/3P
DC power distribution	Output voltage	–42 V DC to –58 V DC. The default output is –53.5 V DC.
	Battery route	4 x 125 A/3P
	BLVD route	Standard: two 1-pole 63 A circuit breakers, two 1-pole 32 A circuit breakers, and two 1-pole 10 A circuit breakers
	LLVD route	• Output: two 1-pole 63 A circuit breakers, six 1-pole 32 A circuit breakers, and two 1-pole 10 A circuit breakers • Output fuse: 160 A x 4
	Surge protection	• AC surge protection: nominal lightning strike discharge current 20 kA (8/20 µs), maximum lightning strike discharge current 40 kA (8/20 µs) • DC surge protection: 10 kA in differential mode, 20 kA in common mode, 8/20 µs
R4850G2 rectifier	Efficiency	≥ 95% (230 V AC, 30%–100% load)
	Output power	• 3000 W (176–300 V AC) • 1250 W (linear derating at 85–175 V AC)
	Dimensions (H x W x D)	40.8 mm x 105 mm x 281 mm
	Weight	< 2 kg

3.2.6 AC/DC Power System (TP481200B-N20B1)

Figure 3-28 Appearance (24 kW)

PI03WC0059
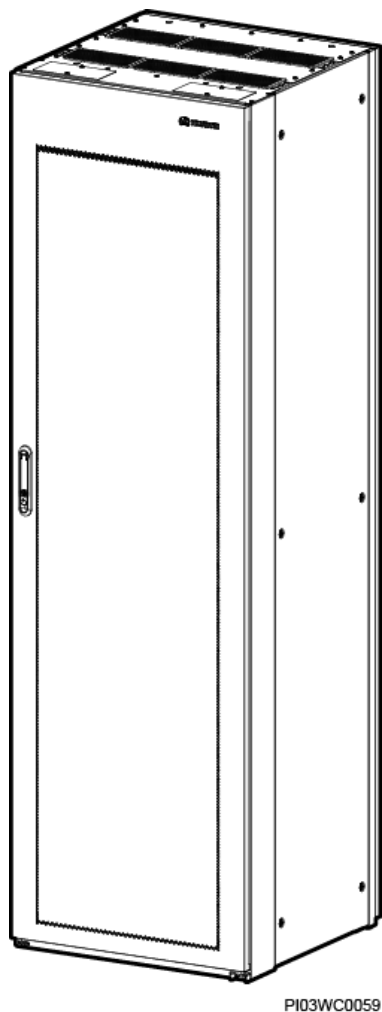
Table 3-6 Technical specifications

Item		Parameter
System	Dimensions (H x W x D)	2000 mm x 600 mm x 600 mm
	Installation mode	Floor-mounted (installed on the module floor or an ESD floor)
	Cabling	Routed in and out from the top
	Maintenance mode	Maintained from the front and installed on a wall (with a clearance of at least 100 mm)
	IP rating	IP20
AC	Input mode	220/380 V AC three-phase four-wire, compatible with 220 V

Item		Parameter
power distribution		AC three-phase three-wire
	Input voltage	85–300 V AC (L-N); rated voltage: 220 V AC
	Input capacity	1 x 125 A/3P
	Input frequency	45–66 Hz, rated value: 50 Hz/60 Hz
DC power distribution	Output voltage	42–58 V DC, 53.5 V DC by default
	Battery branch	2 x 1000 A (NT4)
	Load branch	4 x 500 (NT3), 2 x 400 A (NT2), 6 x 160 A (NT00), 6 x 100 A (NT00)
	Surge protection	20 kA/40 kA, 8/20 μs
Rectifier module	Efficiency	≥ 98%
	Output power	3000 W (176–300 V AC)
	Dimensions (H x W x D)	40.8 mm x 105 mm x 281 mm
	Weight	less than 2.5 kg
	Operating temperature	–40°C to +70°C
	Total harmonic distortion (THD)	≤ 5% (load ≥ 50%)
	Power factor	≥ 0.99 (load ≥ 50%)
Monitoring module	Alarm input	Four Boolean value inputs
	Alarm output	Eight dry contact outputs
	Communications port	Ethernet, RS485/232
	Alarm storage	10,000 alarms and system logs
	Display	LCD (dimensions: 73.2 mm x 54.8 mm; resolution: 160 x 240)

3.2.7 Battery

Batteries store electricity.

Table 3-7 Battery parameters (8 kW and 16 kW)

Specifications	Vendor and Model	Battery Voltage	Weight	Dimensions (H x W x D)
150 Ah	Shuangdeng IV 6-FMX-150B	12 V	48 kg	550 mm x 110 mm x 310 mm
190 Ah	Shuangdeng IV 6-FMX-200	12 V	58 kg	559 mm x 125 mm x 315 mm
1000 Ah	Shuangdeng-G FM-1000&240 20845	2 V	1392 kg	1350 mm x 394 mm x 1724 mm

3.3 Cooling System

3.3.1 Overview

The cooling system (8 kW and 16 kW) uses an intelligent heat exchanger that is embedded in a wall of a pre-fab. module. The intelligent heat exchanger supplies cooled air through the bottom of the intelligent heat exchanger to the far end of the intelligent heat exchanger. Heated air then returns to the air return vent at the upper-middle part of the intelligent heat exchanger. The indoor and outdoor heat exchangers are integrated and installed in a reserved opening in the pre-fab. module. The outdoor heat exchanger does not need to be separately installed.

When the outdoor temperature is suitable, the heat exchanger uses the heat pipe for heat exchange. Therefore, the indoor equipment can be cooled without starting the compressor, so as to save energy.

NOTICE

If the customer's actual load is lower than 25% of the planned total load, the humidity in the data center may be too high. This is not a quality issue. You are advised to add a dehumidifier in the data center.

Figure 3-29 Cooling system layout (8 kW and 16 kW)
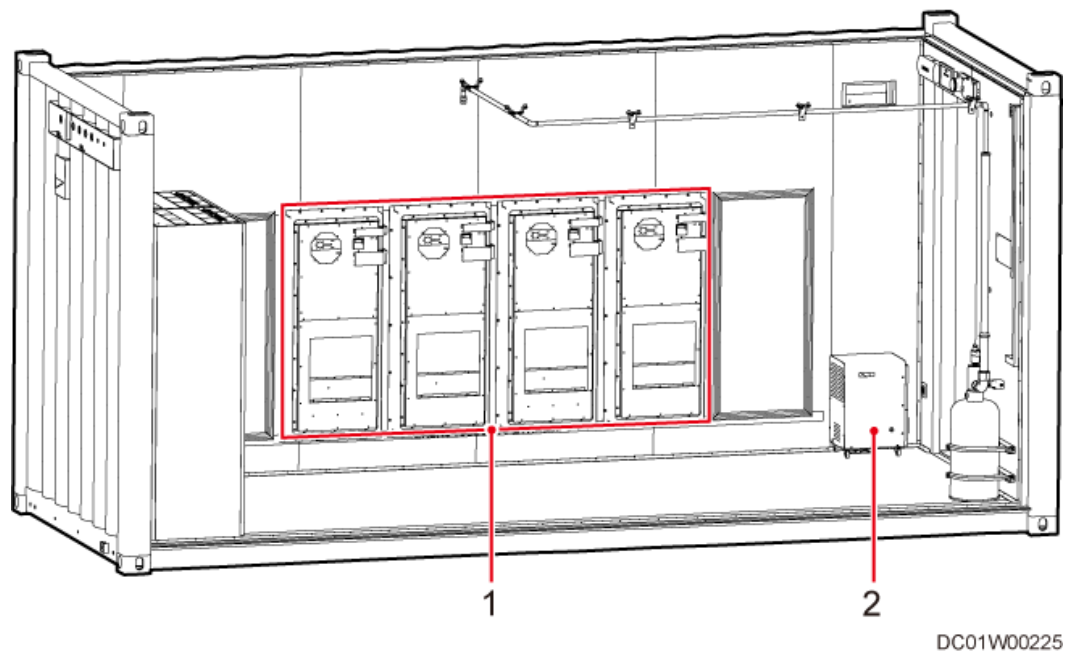
(1) Intelligent heat exchanger   (2) Dehumidifier (optional)

A cooling system (24 kW) uses a 13.5 kW fressmart cooling productd unit thatis installed at one end of a pre-fab. module. The fresmart cooling producted unit supplies cooled air through a ventilated steam distributor at the upper front along the middle or lower part of the pre-fab. module to the far end of the pre-fab. module. Heated air then returns to an air return vent at the middle and upper part of an smart cooling product. The indoor and outdoor heat exchangers are integrated and installed in a reserved opening in the pre-fab. module. The integrated heat exchanger can cool fresh air input from the outdoor environment, or directly exchange heat with the outdoor air.

When the ambient temperature is suitable for direct cooling, an air damper on the fresh air integrated unit opens to connect the indoor and outdoor environments. Fans absorb outdoor low-temperature air to cool devices. Heated air is then released to the ambient environment through the air exhaust vent of the smart cooling product.

Figure 3-30 Cooling system layout (24 kW)
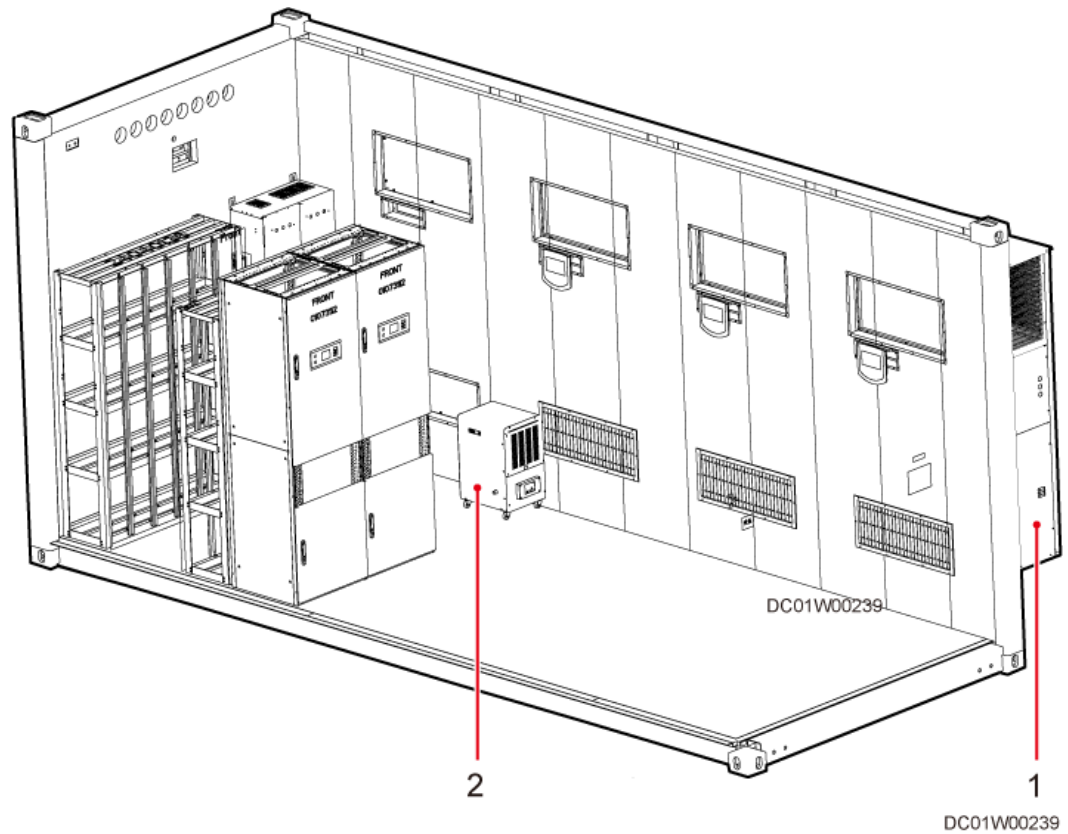
(1) Fresh air integrated unit   (2) Dehumidifier (optional)

3.3.2 3 kW Intelligent Heat Exchanger

Table 3-8 Technical specifications

Item	Parameter
AC power input	220 V AC, 50/60 Hz
DC input power	–48 V DC
AC input power @L35/L35	865 W
DC input power @L35/L35	200 W
Cooling capacity @L35/L35	3000 W
IP rating	IP55
Ambient environment range	–20ºC to +55ºC
Refrigerant	R134a
Dimensions (H x W x D)	1300 mm x 500 mm x 250 mm

3.3.3 5 kW Intelligent Heat Exchanger

Table 3-9 Technical specifications

Item	Specifications
Voltage range	–38 V DC to –58 V DC, 220 V AC±15%
Rated operating voltage (compressor)	220 V AC, 50/60 Hz
Rated operating voltage (fan, controller)	–48 V DC
AC input power @L35/L35	1700 W
DC input power @L35/L35	200 W
Cooling capacity @L35/L35	4750 W
IP rating	IP55
Noise level	65 dB (A)
Ambient environment range	–20ºC to +55ºC
Refrigerant	R134a
Dimensions (H x W x D)	1300 mm x 505 mm x 350 mm

3.3.4 13.5 kW Fresh Air Integrated Unit

Table 3-10 Technical Specifications

Item	Parameter
Voltage range	-42 to 57 VDV, (380 to 415) V ± 10%, 50/60±3Hz
Rated voltage	-48 V
Rated cooling capacity @L27/L35	1350 W
Cooling capacity @L27/L55	1000 W
Refrigerant	R134a
Operating temperature	–30ºC to +55ºC
Internal circulation air volume	3250 m³/h
Fresh air circulation volume	2800 m³/h
IP rating	IPX5
Noise level	70 dB(A)
Altitude	≤ 3000 m
Dimensions (H x W x D)	2020 mm x 1080 mm x 650 mm

3.3.5 (Optional) Dehumidifier

Table 3-11 Technical specifications

Item	Specifications
Power supply	220–240 V/50 Hz
Nominal dehumidification capacity	45 L/day
Rated input current	5.9 A
Rated input power	1250 W
Weight	30 kg
Dimensions (H x W x D)	598 mm x 410 mm x 491 mm

3.4 Management System

3.4.1 Overview

Figure 3-31 Management system networking diagram (8 kW and 16 kW)
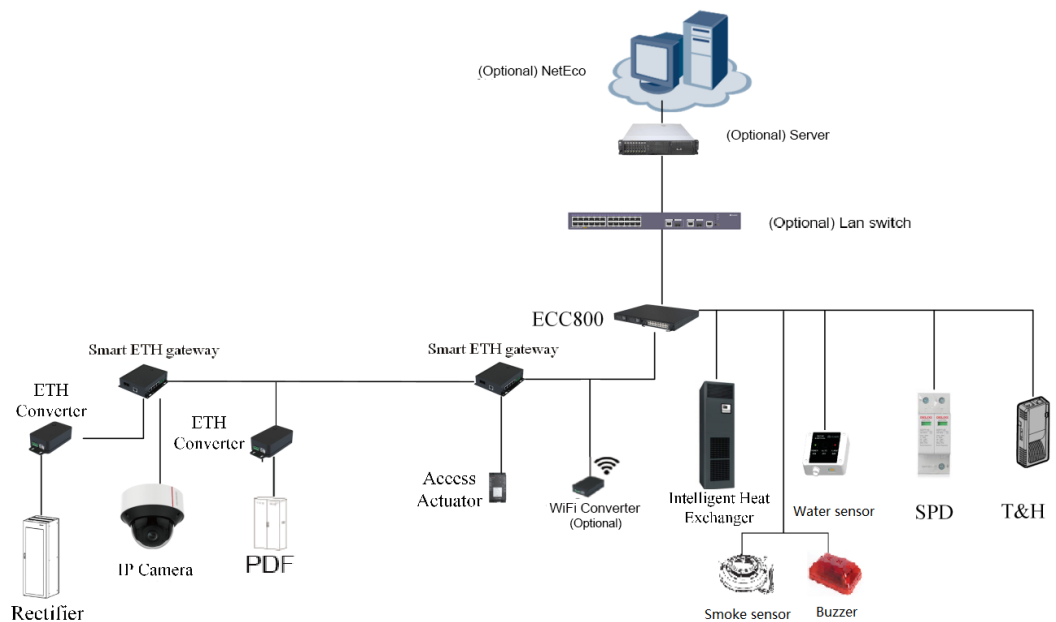
Figure 3-32 Management system networking diagram (24 kW)
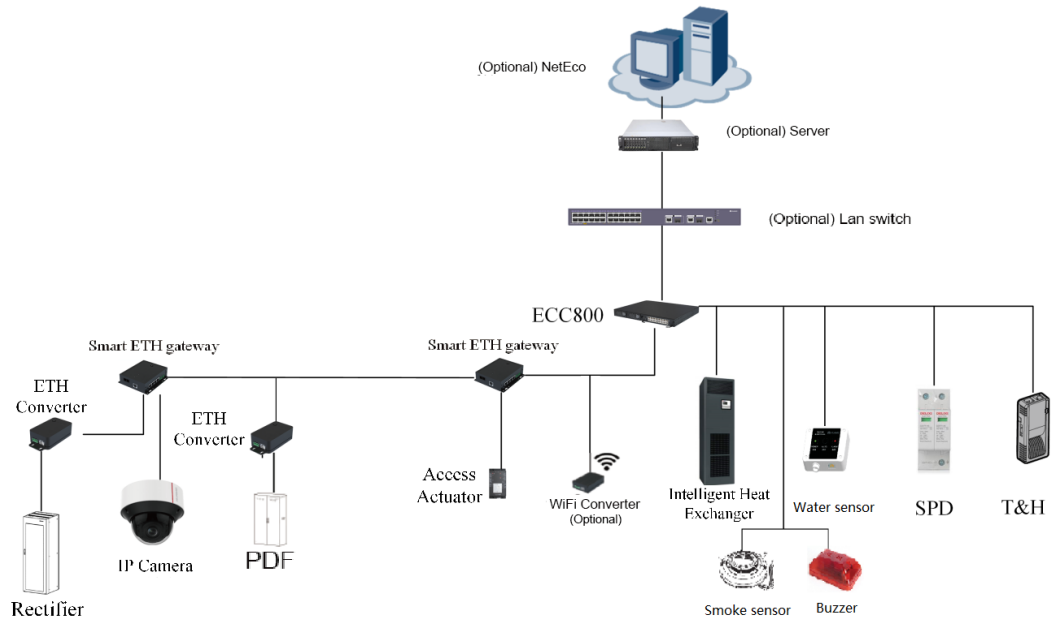
The management system contains the management hardware ECC800 and management software NetEco (Optional).

Video surveillance devices outside the module can be connected to the ECC800.

Table 3-12 Management system configurations

Function	ECC800	NetEco (Optional)
Client authorization	16 PCS	One license manages up to 25 smart nodes.
Work order management	No	Yes
Energy efficiency management	Yes	Yes
Capacity management	No	Yes
SNMP northbound device alarm	Yes	Yes
SNMP northbound device data monitoring	Yes	Yes
Mobile app O&M	Yes	Yes
NE data and alarm monitoring	Yes	Yes
Access management	Yes	Yes

Function	ECC800	NetEco (Optional)
Intelligent lighting	No	No
View presetting	Yes	No (manually drag)
Configuration principle	Standard configuration	Optional: • Single-module deployment: advise the customer not to configure. • Multiple-module deployment: advise the customer to configure for managing multiple sites through one port.
Hardware configuration	N/A	• LAN switch: The number of connected ports depends on the number of connected ECC800s. It usually occupies 1 U space. • Server: It is configured for the NetEco and usually occupies 2 U space. • 1 U cabling space

☐ NOTE

NetEco V600R009C00 or a later version is applicable to the FusionModule1000. The iManager NetEco configurator can be used for configuration.

Figure 3-33 Management system component layout (8 kW and 16 kW)
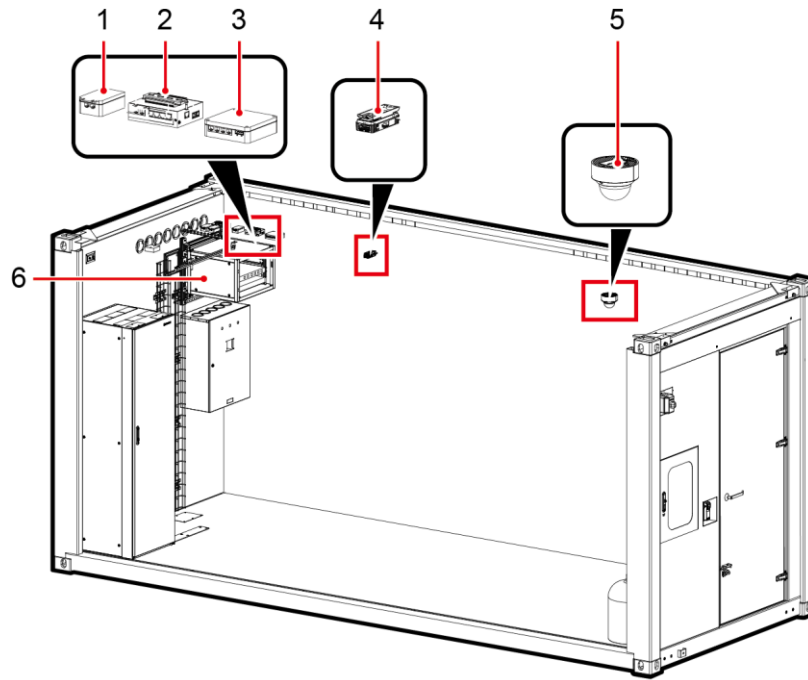
(1) ETH converter	(2) Smart ETH gateway	(3) Access actuator
(4) Temperature and humidity (T/H) sensor	(5) Camera	(6) Monitoring box

Figure 3-34 Management system component layout (24 kW)
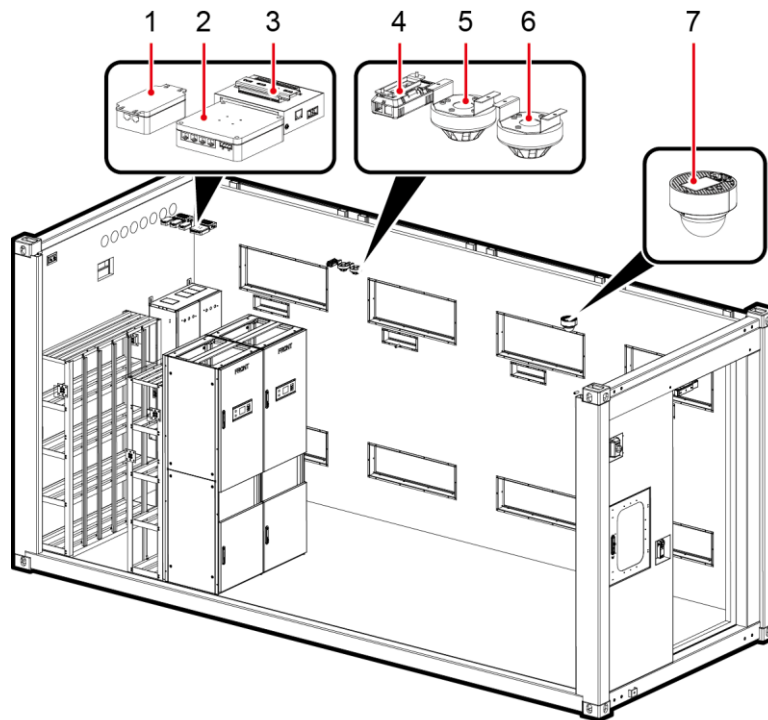
DC01W00243

(1) ETH converter	(2) Access actuator	(3) ETH gateway
(4) Temperature and humidity sensor	(5) Photoelectric smoke detector (optional)	(6) Heat detector (optional)
(7) Camera		

3.4.2 ECC800

3.4.2.1 Product Configuration

The ECC800 edge intelligent controller is used to monitor the devices and environment in the pre-fab. module. It consists of the power module and main control module. You can insert and remove the power module.

Typical configuration: one power module and one main control module

□ NOTE

In the typical configuration, install a filler panel in slot 2.

Figure 3-35 ECC800 collector in configuration 2
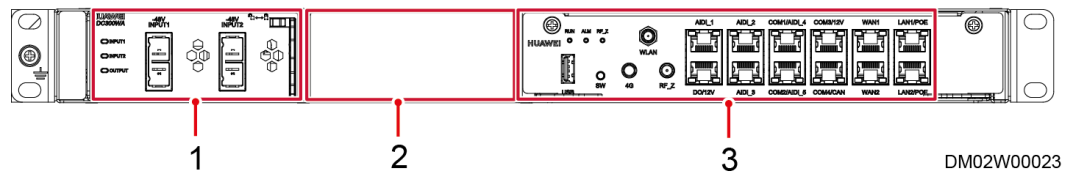
| (1) Slot 1: power modules | (2) Slot 2: power modules | (3) Slot 3: main control module |

Table 3-13 ECC800 environmental specifications

Item	Specifications
Working temperature	−20°C to +50°C
Storage temperature	−40°C to +70°C
Relative humidity	5%–95% RH (non-condensing)
Altitude	0–4000 m (When the altitude is between 3000 m and 4000 m, the temperature decreases by 1°C for each additional 200 m.)

Table 3-14 ECC800 structural specifications

Item	Specifications
Dimensions (L x W x H)	445 mm × 330 mm × 44 mm
Color	Black
Installation	Can be installed in a 1 U space in a standard 19-inch cabinet
Environmental protection	RoHS

Figure 3-36 ECC800 (rear view)
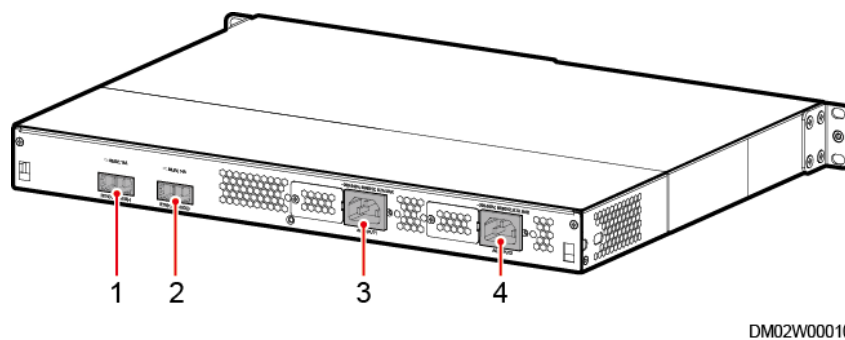
| (1) 53.5 V DC_OUT1 | (2) 53.5V DC_OUT2 | (3) AC_INPUT1 |

(4) AC_INPUT2

Communications Port

The ECC800 provides the following communications ports. Figure 3-37 shows the pins of the RJ45 port.

Figure 3-37 RJ45 port pins
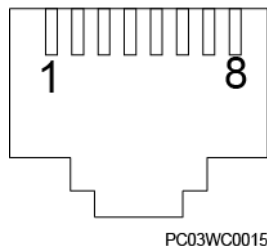
There are four FE ports, that is, two WAN ports (WAN_1 and WAN_2) and two LAN ports (LAN_1 and LAN_2). Table 3-15 provides the FE port pin definitions.

Table 3-15 FE port pin definitions

Item		Description
Pin sequence	Pin 1	TX+
	Pin 2	TX-
	Pin 3	RX+
	Pin 4	N/A
	Pin 5	N/A
	Pin 6	RX-
	Pin 7	N/A
	Pin 8	N/A
Indicator	Green indicator	Linked, steady on
	Yellow indicator	ACT data communication, blinking

Table 3-16 provides the RS485 port pin definitions.

Table 3-16 RS485 port pin definitions

Item		Description
Pin sequence	Pin 1	RS485+
	Pin 2	RS485–
	Pin 3	12 V DC_OUT
	Pin 4	RS485+
	Pin 5	RS485–
	Pin 6	N/A
	Pin 7	N/A
	Pin 8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

Table 3-17 provides the AI/DI port pin definitions.

◻ NOTE

- Pins 1, 2, 4, and 5 identify sensor types.
- Pin 3 and Pin 8 are power output ports.
- Pin 6 and Pin 7 collect sensor data. Pin 7 can detect current type sensors (4–20 mA). Pin 6 and Pin 7 can detect the output status of passive dry contact type sensors. Pin 3 and Pin 7 can detect temperature sensors.

Table 3-17 AI/DI port pin definitions

Item		Description
Pin sequence	Pin 1	Type_1
	Pin 2	Type_2
	Pin 3	12 V DC
	Pin 4	Type_3
	Pin 5	Type_4
	Pin 6	DI-
	Pin 7	DI+
	Pin 8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

There is one DO dry contact output. Table 3-18 provides the DO port pin definitions.

Table 3-18 DO port pin definitions

Item		Description
Pin sequence	Pin 1	N/A
	Pin 2	N/A
	Pin 3	12 V DC_OUT
	Pin 4	N/A
	Pin 5	N/A
	Pin 6	DO_NO
	Pin 7	DO_COM
	Pin 8	GND
Indicator	Green indicator	Power output indicator • Steady on: The 12 V DC output is normal. • Off: No 12 V DC output is provided.

Table 3-19 USB port pin definitions

Item		Description
Pin sequence	Pin 1	5 V
	Pin 2	DM
	Pin 3	DP
	Pin 4	GND

Power Ports

The ECC800 provides four power ports, including two AC input ports (AC_INPUT1 and AC_INPUT2) and two DC output ports (DC_OUTPUT1 and DC_OUTPUT2). Table 3-20 provides the power port pin definitions.

Table 3-20 Power port pin definitions

Port Type	Pin	Description
AC	Pin 1	L
	Pin 2	PE

Port Type	Pin	Description
	Pin 3	N
DC	Pin 1	48 V+
	Pin 2	48 V GND

3.4.2.2 Main Control Module

Figure 3-38 ECC800 collector main control module

DM02W00024
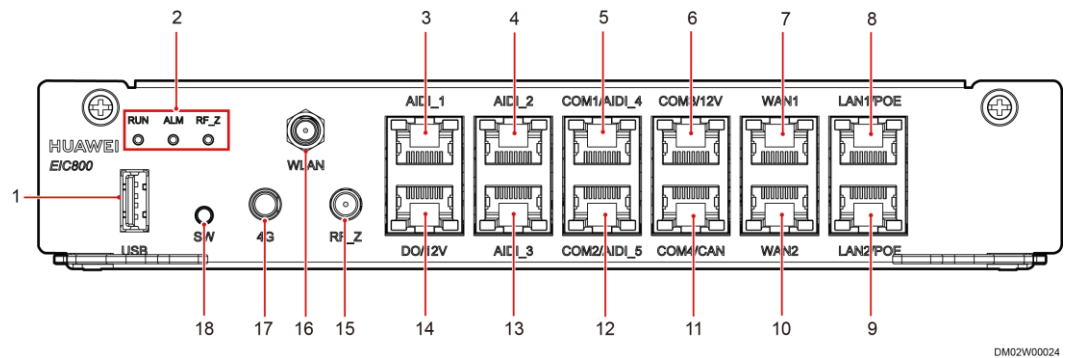
(1) USB	(2) Status indicator	(3) AIDI_1	(4) AIDI_2
(5) COM1/AIDI_4	(6) COM3/12V	(7) WAN1	(8) LAN1/POE
(9) LAN2/POE	(10) WAN2	(11) COM4/CAN	(12) COM2/AIDI_5
(13) AIDI_3	(14) DO/12V	(15) RF_Z	(16) WLAN
(17) 4G	(18) SW button		

Figure 3-39 ECC800 main control module (side view)

DM02W00025
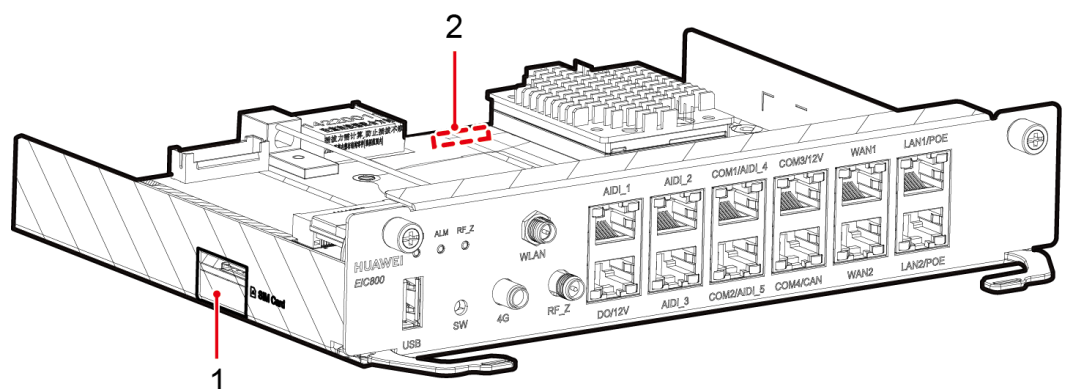
(1) SIM card slot	(2) Micro-SD card slot

Specifications

Table 3-21 Technical specifications of the ECC800 main control module

Item	Specifications
Power input	• Supports two DC inputs • Rated voltage: 48 V DC • Rated frequency: 50 Hz/60 Hz
Power output	Output voltage: 42–58 V DC (rated voltage: 53.5 V DC)
FE port expansion	Supports two WAN ports, two LAN ports, and 10/100M communications rate
RS485 serial port expansion	• Supports four RS485 ports with the default communications rate of 9600 bit/s. • COM1 - COM3 ports provide 12 V DC power with the rated current of 450 mA.
PoE expansion	Supports two PoE (GE) ports for expansion of the PoE bus, and supports network isolation and ring network.
AI/DI expansion (RJ45)	• Supports five AI/DI ports to connect to smoke sensors, water sensors, and temperature sensors. • Each port provides 12 V DC power with the rated current of 100 mA.
DO expansion (RJ45)	One DO port. Each port supports passive and active DO. • Supports passive (dry contact) DO ports with contact point capacity of 20 W, maximum withstand voltage of 60 V DC, and rated current of 500 mA. • Supports active DO ports with the output voltage of 12 V DC and output current of 450 mA.
WLAN	Supports WiFi AP (Access Point) with a communication range of 30 m. You can configure a power supply switch for the wireless module.
4G	Supports the 4G module. The ECC800 supports short message service (SMS) message sending and 4G communication (including full frequency), is compatible with 3G (WCDMA) and 2G (GSM) communication, and provides a standard SIM card slot. **NOTE** The prerequisite for using a SIM card is that the site has signal coverage.
USB	• Supports USB 2.0 and 5 V, 1 A power supply. • After installing the WiFi module, connect the WiFi module to the ECC800 using the app on the mobile phone or tablet computer to view the basic information about the smart module, such as layout, resources, energy efficiency, environment, and alarms. • Insert a USB flash drive to export historical data, device data, fault information, and configuration files, and import or export

Item	Specifications
	the device configuration data and historical data.
SW Button	• Restores to the default IP address. • Supports RF_Z networking.

Table 3-22 ECC800 RF_Z parameters

Item	Specifications
RF_Z Operation Frequency	2405 MHz–2480 MHz
RF_Z EIRP (max.)	5 dBm
4G Operation Frequency	LTE (FDD): BAND1, BAND3, BAND5, BAND8 LTE (TDD): BAND38, BAND39, BAND40, BAND41 DC-HSPA+/HSPA+/HSPA/UMTS:BAND1, BAND5, BAND8, BAND9 TD-SCDMA: BAND34, BAND39 GSM/GPRS/EDGE:900/1800MHz
4G EIRP (max.)	23 dBm
3G Operation Frequency	WCDMA BAND: 850 MHz–2100 MHz GSM: 850 MHz–1900 MHz
3G EIRP (max.)	36 dBm
Software version	V100

Indicators

Table 3-23 Indicators on the ECC800 main control module

Indicator	Color	Name	Status	Description
RUN	Green	Running status indicator	Steady on	The power supply is normal, the program is being loaded.
			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	The ECC800 does not register with the NetEco (the indicator

Indicator	Color	Name	Status	Description
			intervals	blinks at 5 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.
RF_Z	Green	Communication status indicator	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).

SW Button

Table 3-24 SW button description

Function Description	Operation Description	Indicator Status
Wireless network RF_Z (802.15.4) pairing	In non-wireless network (802.15.4) pairing mode, press and hold down the button for 3s 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 3s 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 8s to 20s to clear network parameters.	The RF_Z indicator is blinking at super short intervals.
IP address reset	Press and hold down the button for 60s to power on the ECC800. Then the IP addresses for the ECC800 WAN_1 and WAN_2 ports will restore to the default addresses.	None

3.4.2.3 Power Module

Table 3-25 PSU indicator description

| 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).
	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.

3.4.3 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.

Figure 3-40 Smart ETH gateway
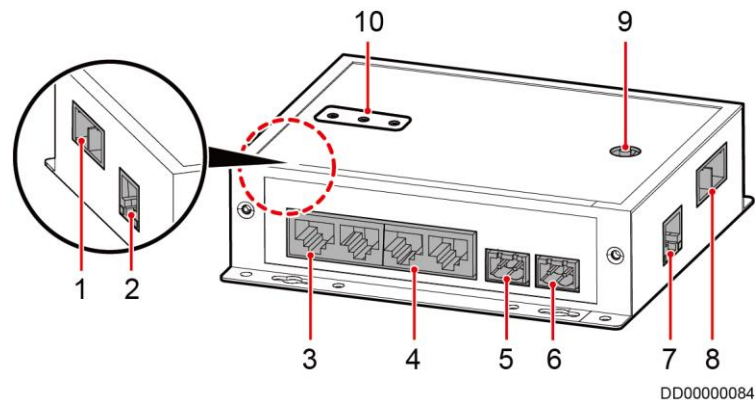
(1) PWR_IN cascading power port	(2) FE_1 cascading signal port	(3) PoE_1–2 ports	(4) PoE_3–4 ports
(5) 48V_OUT1 power output port	(6) 48V_OUT2 power output port	(7) FE_2 cascading signal port	(8) PWR_OUT cascading power port
(9) BLINK button	(10) Status indicator		

Specifications

Table 3-26 Technical specifications of a smart ETH gateway

Item	Specifications
Power input	PWR_IN D-type power input terminal, for power cascading, input voltage range: 45–55 V DC
Power output	• PWR_OUT D-type power output terminal, for power cascading, output voltage range: 45–55 V DC • 48V_OUT1 and 48V_OUT2, Phoenix terminal, output voltage range: 45–55 V DC
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 host
PoE port	Four PoE ports, RJ45 terminal with an indicator, 10/100M communications rate, complying with IEEE802.3at
BLINK button	If you press the BLINK button, the RUN indicator blinks intermittently at super short intervals (blinking at super short intervals for 0.5s and then off for 0.5s) for 10s.

3.4.4 ETH Converter

The ETH converter is used to convert the Modbus–RTU protocol or CAN protocol to the Modbus-MAC protocol for connecting to the POE bus.

Figure 3-41 ETH converter
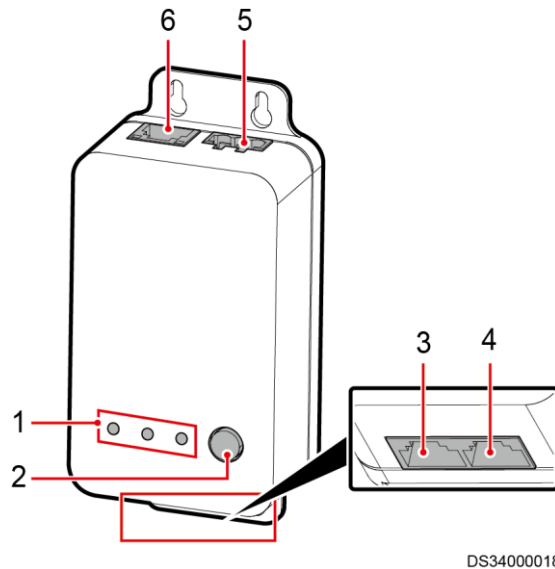
DS34000018

| (1) Status indicator | (2) BLINK button | (3) COM1 communications port |
| (4) COM2 communications port | (5) 48 V power port | (6) POE port |

Specifications

Table 3-27 ETH converter technical specifications

Item	Specifications
Power input	• DC input: Terminal, with input voltage of 36–60 V DC • POE power supply: One POE port, 10/100M communication rate, complying with IEEE802.3at
RS485 or control area network (CAN)	Provides two RS485/CAN ports. The default communications rate for the RS485 port is 9600 bit/s, and that for the CAN port is 125 kbit/s. Both ports match the RJ45 terminal shared by RS485 and CAN.
BLINK button	If you press the BLINK button, 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.
E-label	Supported

Indicators

Table 3-28 ETH converter indicators

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	Operating status indicator	Off	The power supply is abnormal.
			Blinking at long intervals	The ETH 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 communication fails or the ETH converter 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.

3.4.5 T/H Sensor (BOM number: 02310NBS)

Figure 3-42 Appearance

(1) Status indicator	(2) RS485_IN
(3) RS485_OUT	(4) Address DIP switch

The RS485 communications ports of the T/H sensor use RJ11 (6P6C) connectors.

Figure 3-43 Pins of an RJ11 connector
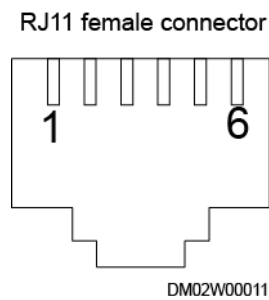
Table 3-29 Pin description of an RJ11 connector

Pin	Description
Pin 1 or Pin 2	GND
Pin 3	RS485-
Pin 4	RS485+
Pin 5 or Pin 6	12V

Table 3-30 Temperature and humidity sensor specifications

Item	Specifications
Temperature measuring range	–20°C to +70°C
Temperature accuracy	±1°C

Item	Specifications
Operating temperature	–10°C to +55°C
Operating voltage	9–16 V DC
Storage temperature	–40°C to +70°C
Output	RS485

3.4.6 Access Actuator

The access actuator is the control component for the aisle door in a smart module. It connects to the ECC800 controller over FE port, wireless networking (802.15.4). 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 3-44 Access actuator
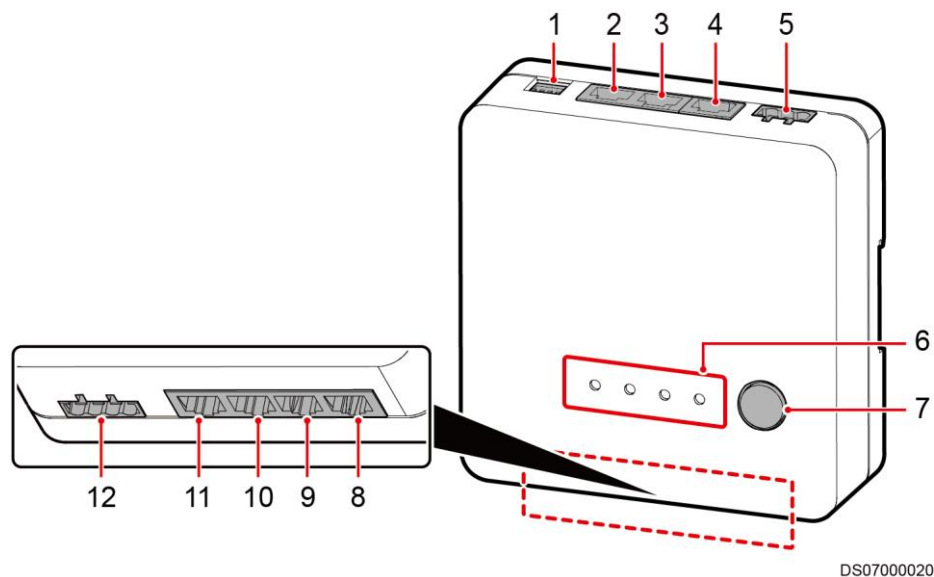
(1) 48 V power port	(2) POE port	(3) RS485 port COM2
(4) RS485 port COM1	(5) Address DIP switch	(6) Status indicator
(7) BLINK button	(8) WG_2 Wiegand interface	(9) WG_1 Wiegand interface
(10) AI/DI_2 dry contact (Reserved port for linkage control or third-party fire extinguishing system dry contacts)	(11) AI/DI_1 dry contact (Reserved port for exit button)	(12) LOCK/GND/GATE/COM door status or magnetic lock port

Specifications

Table 3-31 Access actuator technical specifications

Item	Specifications
Power input	• DC input: Terminal, with input voltage of 36–60 V DC • POE input: One POE port that complies with IEEE802.3at.
POE port	FE communication, 10/100M communications rate
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
DO output	One 12 V DC power output that controls magnetic locks, 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	• Press the button for less than 1 second to start blinking. • Hold down the button for 1–5 seconds to search for a network and start networking. • Hold down the button for more than 6 seconds to clear network parameters.
Address DIP switch	4-pin address DIP switch
E-label	Supported

Indicators

Table 3-32 Access actuator indicator description

Indicator	Color	Name	Status
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

Indicator	Color	Name	Status
			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). • 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

Indicator	Color	Name	Status
			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/COM). Table 3-33 lists the LOCK/GND/GATE/COM port pin definitions.

Table 3-33 LOCK/GND/GATE/COM port pin definitions

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

3.4.7 Network Camera (02352QPS)

The C302D-I-P (6 mm) camera is a 2-megapixel starlight infrared fixed dome camera that can be installed on the wall or ceiling.

The camera monitors the module interior in real time, records videos, and implements 7x24h storage.

Figure 3-45 Camera

DM08W00007

Table 3-34 Camera technical specifications

| Item	Parameter
Image sensor	1/2.7" 2-megapixel progressive scan CMOS
Focal length	6 mm±10%
Operating temperature	–30°C to +60°C. The illuminator cannot be enabled at an operating temperature higher than 40°C. If the illuminator is enabled in such environments, the camera is damaged or its service life is shortened.
Anti-corrosion class	Applicable to areas 1500 meters away from the seaside (far away from chemical industry or heavily polluted areas).
Power	12 V DC (±25%) (If the power supply is reversely connected, the device cannot be powered on). The -P model supports power over Ethernet (PoE).
Power consumption	Typical: 4 W; maximum: 8.4 W

3.5 Fire Extinguishing System

3.5.1 Overview

📖 NOTE

> Manual fire extinguishing is provided in standard configuration. The CE version can be used for automatic fire extinguishing. It is recommended that you purchase 2 kg hand-held carbon dioxide or clean gas fire extinguishers locally, 2 PCS for each pre-fab. module.

If a pre-fab. module catches fire, smoke and heat will trigger the smoke and heat detectors, which will send fire alarm signals to an extinguishant control panel. Upon receiving the fire alarm signals, the extinguishant control panel counts down and opens an electrical actuator on a fire extinguisher, so that the fire cylinder discharges extinguishing agent to the protected area. At the same time, the extinguishant control panel automatically reports alarms.

**Figure 3-46** Conceptual diagram of the CE fire extinguishing system
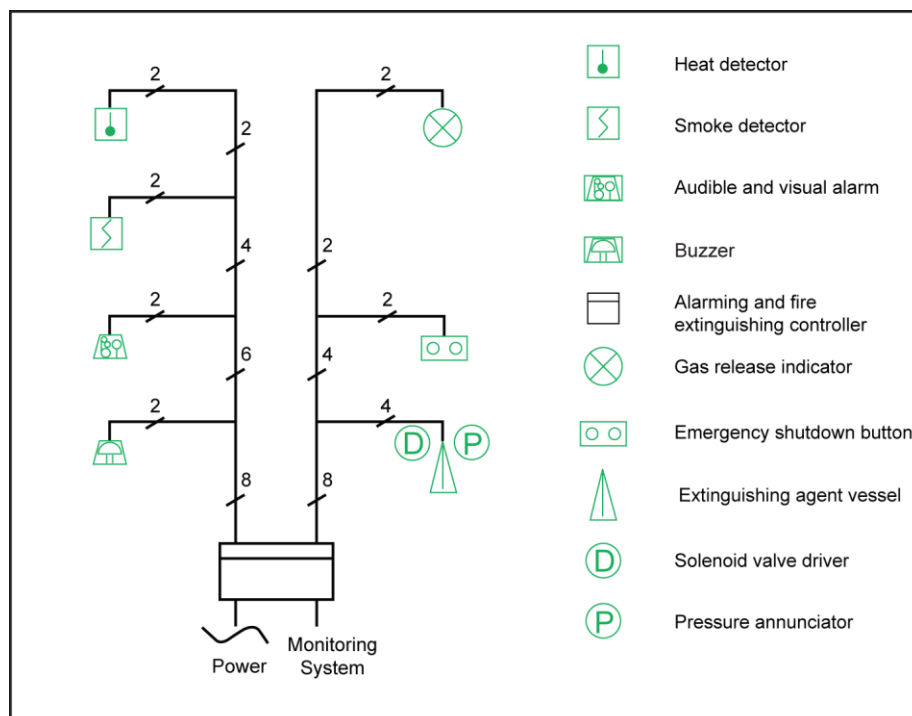
Figure 3-47 Fire extinguishing component layout (8 kW and 16 kW)
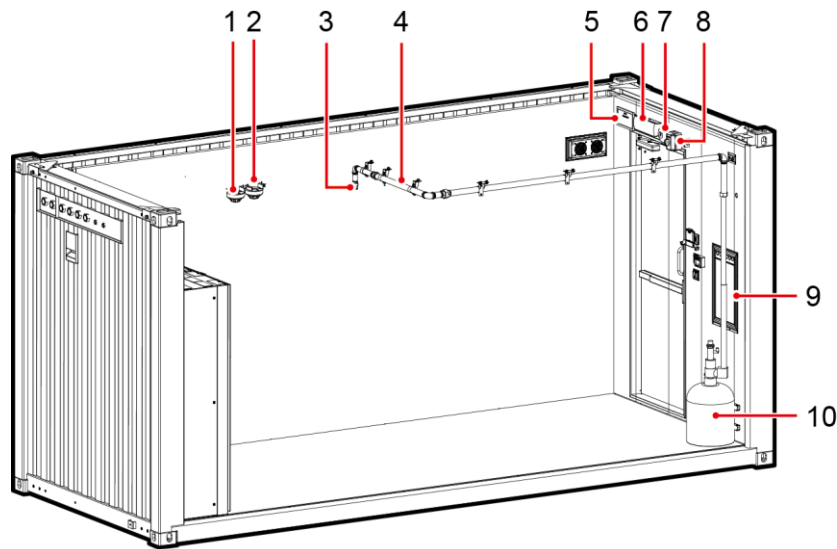
DC01W00226

(1) Photoelectric smoke detector (optional)	(2) Heat detector (optional)	(3) Nozzle (optional)
(4) Fire extinguishing pipe (optional)	(5) Exit indicator (optional)	(6) Emergency light (optional)
(7) Fire alarm bell (optional)	(8) Fire alarm horn/strobe (optional)	(9) Fire control box (optional)
(10) Fire cylinder (optional)		

Figure 3-48 Fire extinguishing component layout (24 kW)
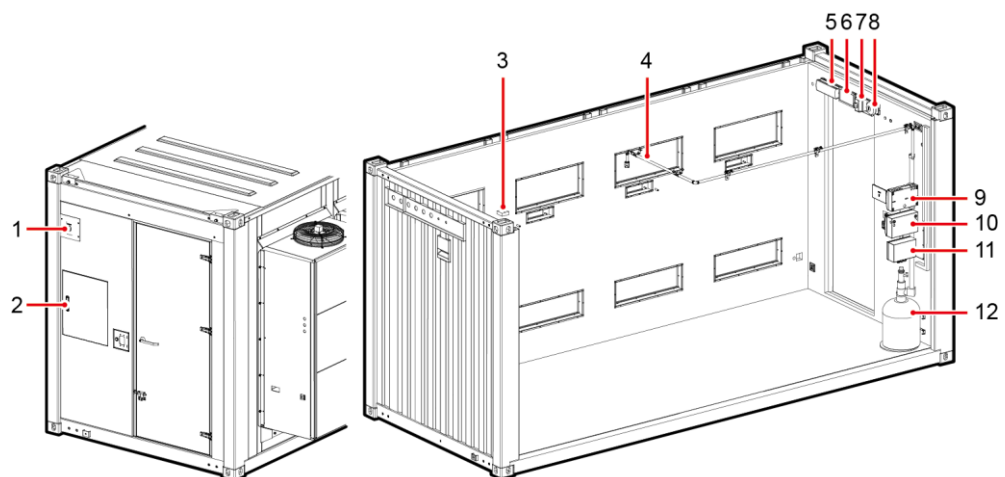
DC01W00244

(1) External fire alarm horn/strobe (optional)	(2) Fire control box (optional)	(3) Hydrogen detection probe (optional)
(4) Fire control pipe (optional)	(5) Emergency light	(6) Exit indicator

	(optional)	(optional)
(7) Internal fire alarm horn/strobe (optional)	(8) Fire alarm bell (optional)	(9) ASD host (optional)
(10) ASD power supply (optional)	(11) Hydrogen detection host (optional)	(12) Fire cylinder (optional)

3.5.2 (Optional) Extinguishant Control Panel

The extinguishant control panel provides the following functions:

- Two zones supported, a third zone configurable
- Serial status connection and timer display
- Programmable for I.S. barriers
- Standard exhaust fan control
- Hold activated indication and disablement indication
- Test mode
- Two first stage sounder outputs
- One second-stage audible and visual alarm output
- First- and second-stage relay contacts
- Auxiliary 24 V DC output
- Monitored manual release input and output
- Monitored release pneumatic switch input
- (Optional) Mode select key switch on the front panel
- (Optional) Manual release on the front panel

Figure 3-49 Extinguishant control panel

Table 3-35 lists the technical specifications of the extinguishant control panel.

Table 3-35 Extinguishant control panel specifications

Item		Specifications
Input		AC input frequency: ≤ 120 W
		AC input voltage and frequency: 230 V AC (tolerance ±10%), 50 Hz
		DC backup power voltage: 24 V DC
24 V power output		3 A
Capacity	Number of detection loops	Three loops. Loops 1 and 2 respectively connect to smoke detectors and heat detectors. Loop 3 is reserved by default.
	Number of detectors connected to each loop	≤ 24 PCS
Output loop current limiting		Output loop for the solenoid valve driver: 1 A Output loops for other drivers: 1 A

◪ NOTE

The extinguishant control panel is equipped with two 12 V batteries and the required cables.

3.5.3 (Optional) Heptafluoropropane Fire Extinguisher

When the FusionModule1000 catches fire, a lot of smoke is generated and the temperature rises sharply. The smoke detector and heat detector send fire alarm signals to the extinguishant control panel, which generates an electrical actuator start voltage to start the electrical actuator of the fire cylinder. Then the fire cylinder valve is opened, and extinguishant is released into the protected zone.

Heptafluoropropane (HFC-227ea) is a colorless, odorless, non-conductive, and secondary pollution-free gas extinguishant. It features cleanness, low toxicity, good electrical insulation, high fire extinguishing efficiency, zero threat to the ozonosphere (ODP = 0), and short residual time (ATL = 34Y).

Figure 3-50 Fire extinguisher

DF11W00022

Table 3-36 lists the technical specifications of the Heptafluoropropane fire extinguisher.

**Table 3-36** Heptafluoropropane fire extinguisher specifications

Item		Specifications
Dimensions (diameter x height)		300 mm x 706 mm
Startup current		0.6 A
Startup voltage		24 V DC
Startup mode		Electromagnetic startup
Maximum operating pressure		4.2 MPa
Storage pressure		20°C: 2.5 MPa
Cylinder volume		38 L
Ambient environment	Temperature	-22ºC to +55ºC
	Humidity	≤ 95% RH (40°C non-condensing)

3.5.4 (Optional) ASD

Composition

The aspirating smoke detector (ASD) consists of the detection unit (ASD531) and air sampling pipes with small holes.

Figure 3-51 ASD
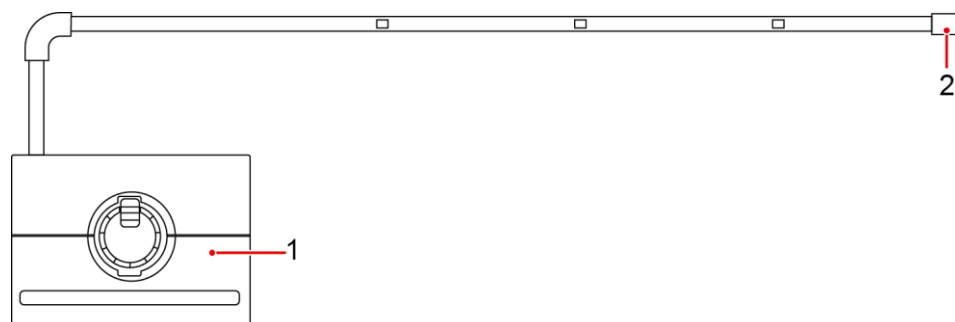
DF12W00006

(1) ASD detection unit   (2) Air sampling pipe plug

Working Principle

The detection unit includes the suction pump, filter, high-sensitive smoke detector, and precision electrical analyzer. The air detector of the ASD can detect fire in the initial phase and generates alarms at an early time.

The detection unit of the ASD sucks air samples from the monitored environment through the air sampling pipe to the smoke detector and works out the dust density in the air. If the dust

density exceeds the preset alarm threshold, the ASD blinks and sends an alarm signal to the monitoring module.

Features

- High sensitivity

  The ASD features extremely high sensitivity and wide sensitivity adjustment range (0.005%–20% obs/m). It can detect both potential fire in the early phase and particles released by the softened insulation layer of an overloaded power cable.

- Precise detection result

  The ASD works in active air sampling mode. The efficient aspirator continuously sends air samples from the protected area to the detection chamber for analysis. The detection result and response time are less influenced by air flow compared with a traditional fire detection method.

- Flexible installation

  The ASD detection unit is compact and easy to install. The air sampling pipes can be deployed depending on site requirements. The air sampling pipes are made of PVC and can be installed on or under the ceiling, under the floor, at air return vents of smart cooling products, and in locations that need special protection. For example, the sampling capillaries can be installed in a cabinet to monitor equipment in the cabinet.

- Convenient maintenance

  The ASD is equipped with a special filter that filters air for cleaning the laser measuring chamber. The filter can be easily maintained and replaced, and cleaned by blowing air into the air sampling pipes. Therefore, you do not have to replace any other components.

- Efficient auto-diagnosis system

  The ASD is designed with an efficient auto-diagnosis system for monitoring the working status of itself, the network, and the air sampling pipes in real time. If a fault is detected, the system generates an alarm and indicates the fault location for troubleshooting.

3.5.5 (Optional) Photoelectric Smoke Detector

Smoke detectors are used to detect the smoke density in the current environment.

Figure 3-52 Appearance
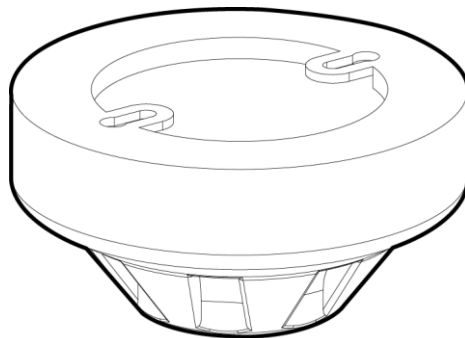
DF01W00006

Table 3-37 Technical Specifications

Item	Parameter

Item	Parameter
Dimensions	100 mm in diameter and 50 mm in height (with a base)
Weight	About 153 g (with a base)
Operating voltage	DC 24 V ($\pm$20%)
Operating current	• Monitoring state: 40 μA • Action state: About 52 mA (related to the loop current limiting resistance)
Operating temperature	–20°C to +60°C
Ambient humidity	$\leq$ 95% RH (non-condensing)
Installation height	$\leq$ 12 m
Protection area	About 60 m^2

3.6 Surge Protection and Grounding

3.6.1 Surge Protection

Surge Protection for Power Ports

- First-level surge protection: A class I SPD with the capacity I_{max} of at least 100 kA (8/20 μs) is deployed at the AC power inlet for a pre-fab. module.
- Second-level surge protection: An SPD with the recommended capacity I_{max} of 60 kA (8/20 μs) is deployed at the PDB.
- Third-level surge protection: An SPD with the recommended capacity I_{in} of 20 kA (8/20 μs) is deployed at the power input port of the downstream equipment such as the intelligent heat exchanger or UPS.

Surge Protection for Signal Ports

- Indoor signal ports comply with 1 kV surge protection in common mode.
- Signal ports for routing cables out of the pre-fab. module pass the 3 kA impulse current test.

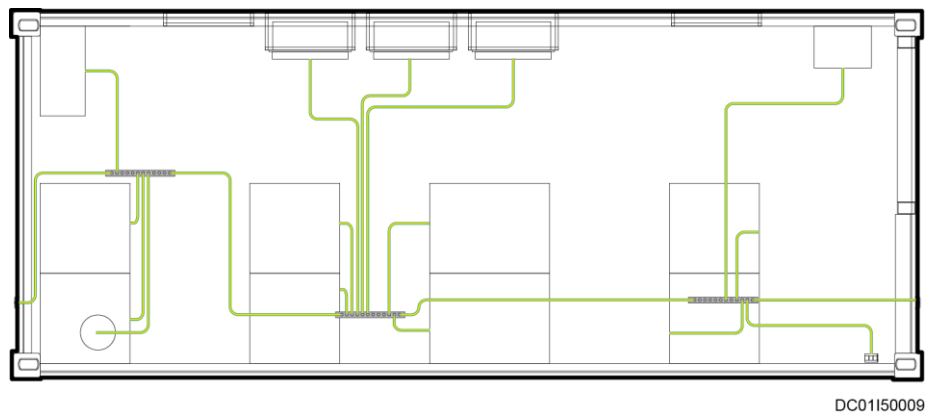## 3.6.2 Grounding

Internal Grounding

The main earthing terminal (MET) is installed in the pre-fab. module and connects to the external ground grid over ground downloads.

Equipment in the pre-fab. module connects to the ground busbar over ground cables and are insulated from other metal parts.

Figure 3-53 Internal grounding diagram (8 kW and 16 kW)

DC01I50005
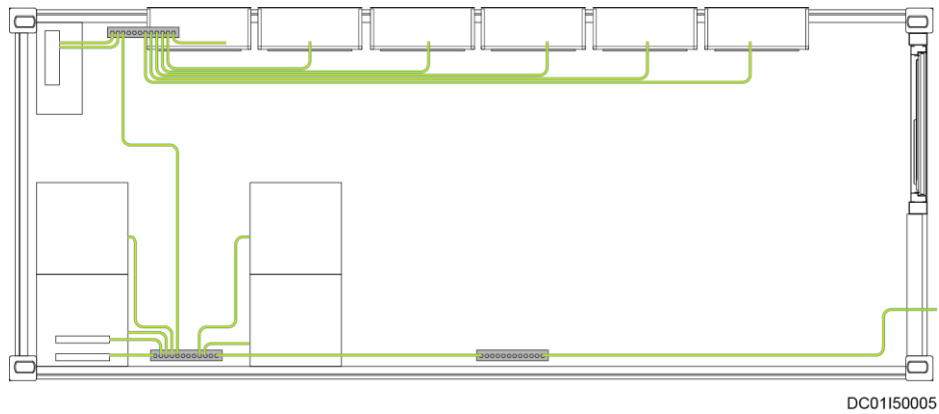
**Figure 3-54** Internal grounding diagram (24 kW)

DC01I50009

☐ NOTE

The actual cabling path varies depending on the site.

External Grounding

M12 bolt ground points are evenly located on the exterior of the pre-fab. module. Ensure that the two diagonal ground points are connected to the ground grid. There are two ground points on the exterior of the FusionModule1000. The ground resistance is less than or equal to 10 ohms.

Figure 3-55 Pre-fab. module ground points (8 kW and 16 kW) (unit: mm)
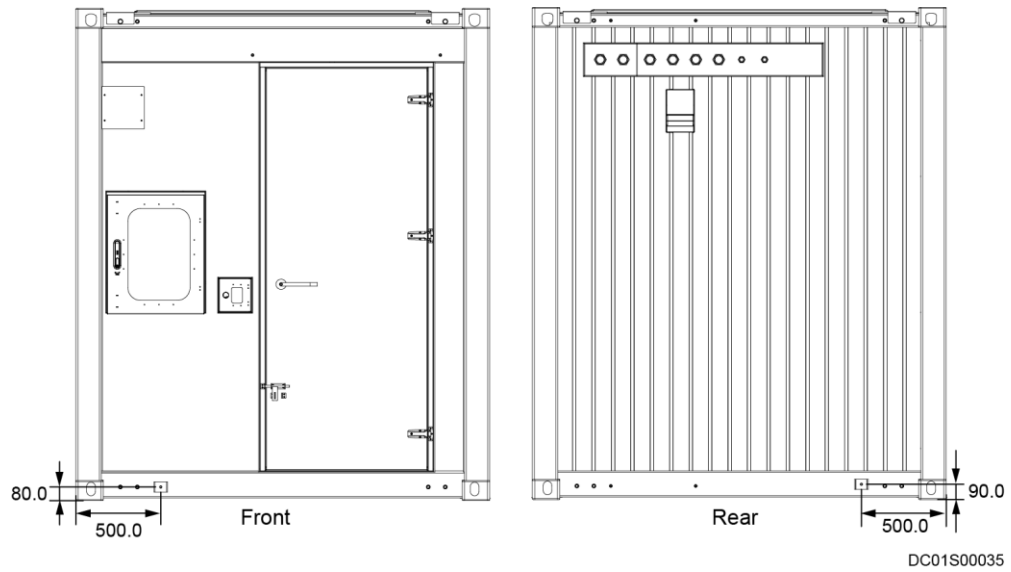
3.7 Integrated Cabling

Integrated cabling of the FusionModule1000 includes cable trays and various cables. Cable trays on the top of pre-fab. modules are separate from cabinets, and can be moved horizontally along the width direction on the tops of pre-fab. modules. Strong-current and weak-current cables are routed separately.
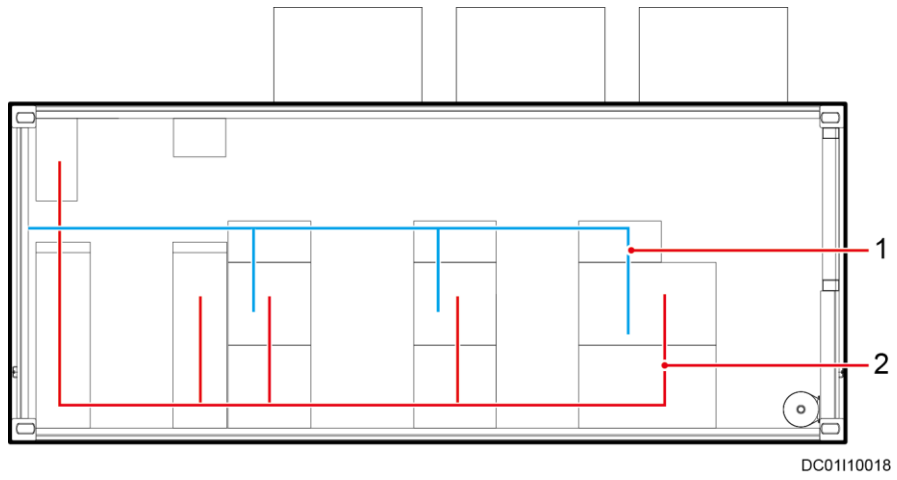
Figure 3-56 Cabling (8 kW and 16 kW)
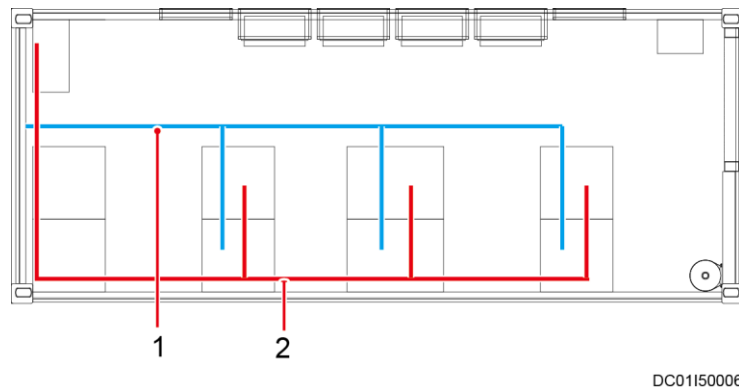
(1) Signal cable   (2) Power cable

Figure 3-57 Cabling (24 kW)

(1) Signal cable   (2) Power cable

4 Acronyms and Abbreviations

A

APP   application

ASD   aspirating smoke detector

ATS   automatic transfer switch

C

CE   Conformite Europende

I

ISO   International Organization for Standardization

IDC   integrated data center

IEC   International Electrotechnical Commission

M

MCB   miniature circuit breaker

MCCB   molded case circuit breaker

N

NetEco   network ecosystem

P

PUE   power usage effectiveness

R

RoHS   Restriction of the Use of Certain Hazardous Substances

REACH   Registration, Evaluation, Authorization and Restriction of Chemicals

S

SNMP   Simple Network Management Protocol

STS   static transfer switch

U

UPS   uninterruptible power system

V

VCN   video cloud node