PARQUE SOLAR
FOTOVOLTAICO ON GRID
1779,4 KWP

MEMORIA DESCRIPTIVA

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martes, 8 de abril de 2025

Sres. Grupo Conarpesa.

Estimados:

Nos complace dirigimos a Uds. adjuntando nuestra Propuesta Técnica por la provisión y puesta en marcha de un parque solar fotovoltaico (PSFV) de 1779,4 kWp.

Esta propuesta ha sido realizada en función de la documentación técnica, aclaratorias recibidas y de la experiencia de nuestra empresa en la provisión de sistemas similares.

Quedamos a su entera disposición por cualquier consulta que deseen realizar.

Sin otro particular, les saluda muy atentamente.

Ing. Emiliano Tolari
Ing. Fernando Codutti
Energías Renovables
Proyección Electroluz SRL

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1. OBJETO

El presente documento contiene una breve descripción del Proyecto para la construcción de 1 (un) parque solar fotovoltaicos en la Planta de Conarpesa situada en la localidad de Puerto Madryn, provincia de Chubut, Argentina.

El parque tendrá una potencia pico de 1779,4 kWp, nominales logrados por 5 inversores de 330 kW y 2832 paneles fotovoltaicos de 620 Wp cada uno.

2. DESCRIPCIÓN GENERAL DE ALCANCES

La propuesta incluye la provisión e instalación del equipamiento siguiente:
La generación de energía la realizarán alrededor de 2832 paneles solares de 620 Wp cada uno, instalados en estructuras de inclinación fijas hincadas en suelo. La energía generada en corriente continua se trasmitirá a través de cables tipo solar hasta tableros de corriente continua en el cual se instalarán las protecciones contra sobrecarga, cortocircuito y sobretensiones transitorias. El cableado de salida de estos tableros se conectará a los inversores mediante conectores solares MC4. La corriente continua se convertirá en corriente alterna mediante el uso de 5 inversores de 330 kWac de potencia máxima cada uno, trifásico, 800 Vac de salida.

La energía de salida de los inversores se transportará mediante cable subterráneo hasta un centro de transformación compacto de 3000 kWac que albergará las protecciones contra sobrecarga, cortocircuito y sobretensiones transitorias. Luego, la salida del centro de transformación se inyectará a la red de MT 33KV en el punto de inyección ubicado a 350 metros de la ubicación del PSFV. La vinculación en MT (33kv) a la RED desde el STS (centro de Transformación), será con conductores subterráneos de AL unipolares de 1x70mm2 directamente enterrado dispuesto en cama de arena con protección mecánica y malla de indicación de Peligro.

La tecnología, diseño y selección de materiales a utilizar para la generación de energía es de la marca Huawei, firma de primer nivel en la industria.
Se considera que el parque será operado en forma remota para lo cual se contemplan sistemas de control, y comunicaciones denominado “SmartLogger” que permita su supervisión y operación total en forma remota. Desde este sistema es posible acceder a la información sobre las variables de generación e incluso actuar sobre el inversor.

Nota:
Toda la instalación de transformación (STS – 3MVA), como todas las instalaciones contiguas que transportan la energía a la RED (conductores y sistemas de protección y Seccionamiento) están sobredimensionados, preparadas para una ampliación del Parque Solar actualmente de 1.7MVA, mediante el agregado de Paneles Fotovoltaicos e Inversores para poder entregar una generación de hasta 3MVA.

3. EMPLAZAMIENTO

3.1. Localización.

El terreno destinado a la construcción se ubica en la localidad de Puerto Madryn, provincia de Chubut, Argentina. En la siguiente imagen se observa la ubicación seleccionada para la instalación del generador fotovoltaico.

Figura 1: Ubicación del proyecto

4. TECNOLOGÍA Y ESQUEMA DE GENERACIÓN

4.1. Sistema Generador

El sistema generador estará formado por 118 grupos de 24 módulos fotovoltaicos conectados en serie cada uno para conseguir un nivel de tensión aproximado de 1080 V por string. Cada grupo será conectado y canalizado con cable fotovoltaico de 4mm2 de doble aislación hasta los inversores multi string que estarán ubicado en campo.

El inversor fotovoltaico convierte la energía en corriente continua generada por los paneles, en energía en corriente alterna con el nivel de tensión y frecuencia adecuadas para ser introducida a la red.

Los paneles se instalarán sobre estructuras fijas.

La energía del inversor, será evacuada mediante cable subterráneo directamente enterrado hasta el centro de transformación.

4.2. Dimensionamiento

El sistema generador estará conformado por los siguientes componentes:

- 2832 fotovoltaicos monos cristalinos de 620 Wp
- Inversores multi string con tecnología MPPT de 330 kW marca **Huawei**
- Protecciones de sobretensiones transitorias, sobrecargas y cortocircuitos.
- Estructuras fijas de Hº G en caliente para soporte de paneles fotovoltaicos.

4.3. Características de los equipos principales

4.3.1. Módulos fotovoltaicos

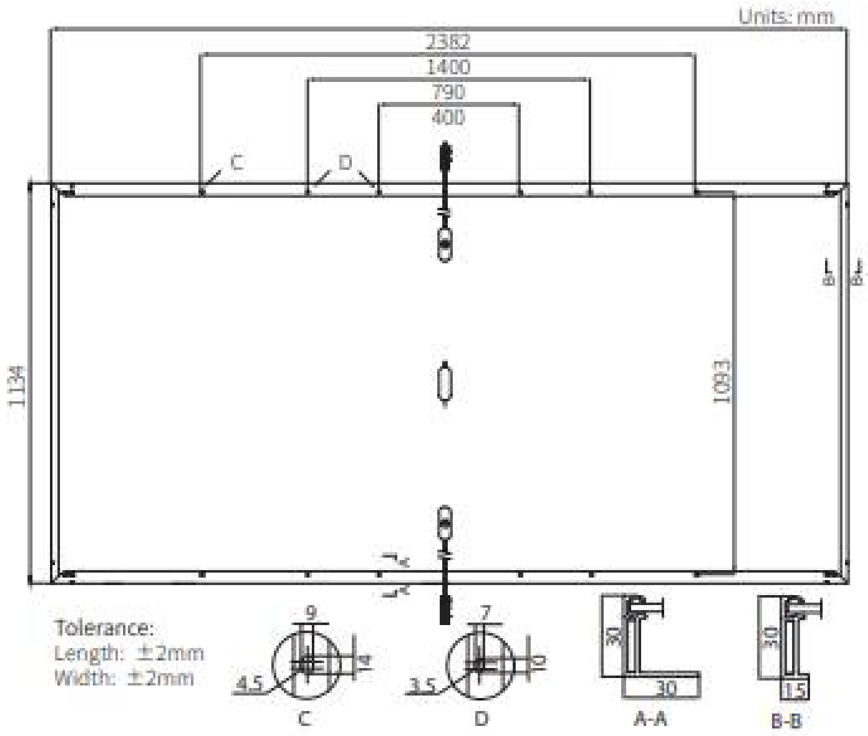
Para este proyecto está prevista la utilización de 2832 módulos fotovoltaicos monocristalinos de 620 Wp. Las principales características técnicas de estos módulos son las siguientes:

Electrical Characteristics STC : AM1.5 1000W/m² 25°C NOCT : AM1.5 800W/m² 20°C 1m/s Test uncertainty for Pmax: ±3%

Module Type	LR7-72HTH-600M		LR7-72HTH-605M		LR7-72HTH-610M		LR7-72HTH-615M		LR7-72HTH-620M	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	600	448.4	605	452.1	610	455.9	615	459.6	620	463.4
Open Circuit Voltage (Voc/V)	52.12	48.93	52.27	49.17	52.42	49.22	52.57	49.36	52.72	49.59
Short Circuit Current (Isc/A)	14.68	11.85	14.74	11.91	14.80	11.59	14.87	12.01	14.93	12.06
Voltage at Maximum Power (Vmp/V)	43.88	40.04	44.03	40.18	44.18	40.32	44.33	40.46	44.48	40.59
Current at Maximum Power (Imp/A)	13.68	11.20	13.75	11.26	13.81	11.31	13.88	11.36	13.94	11.42
Module Efficiency(%)	22.2		22.4		22.6		22.8		23.0	

Mechanical Parameters

Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm², +400, -200mm/±1400mm length can be customized
Glass	Single glass, 3.2mm coated tempered glass
Frame	Anodized aluminum alloy frame
Weight	28.5kg
Dimension	2382×1134×30mm
Packaging	36pcs per pallet / 180pcs per 20' GP / 720pcs per 40' HC



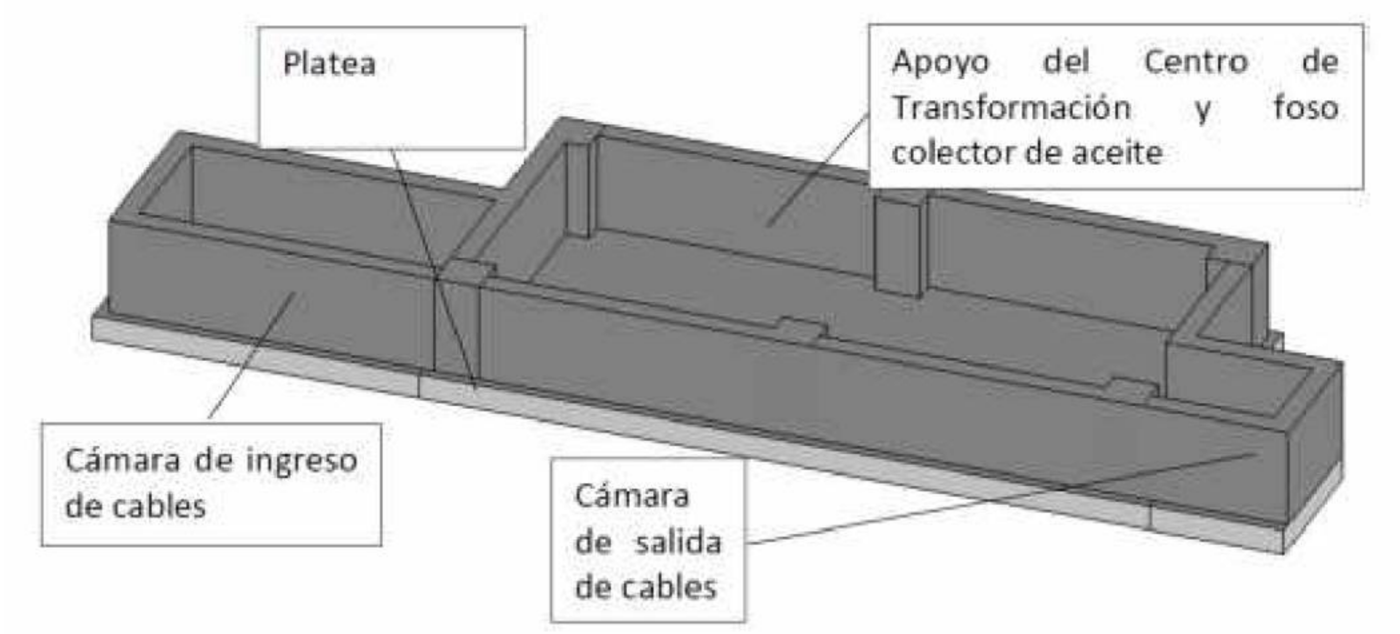
5. OBRAS CIVILES

5.1. Limpieza y acondicionamiento del terreno

La limpieza del terreno contempla la extracción de hierbas, raíces, sustancias putrescibles, como así también, todos los materiales que se encuentren en el terreno y que entorpezcan u obstruyan los trabajos a ejecutar y depositándolos en lugares autorizados.

5.2. Fundaciones de subestaciones transformadoras

Consistirá en una platea de hormigón construida para tal fin, cuyas características constructivas se definirán en ingeniería de detalles, según las indicaciones del fabricante del centro de transformación, la experiencia previa del consultor en ingeniería y en cumplimiento de los requerimientos de los Reglamentos CIRCSOC 201: Reglamento Argentino de estructuras de Hormigón y AEA 95402: Reglamentación para Estaciones Transformadoras.

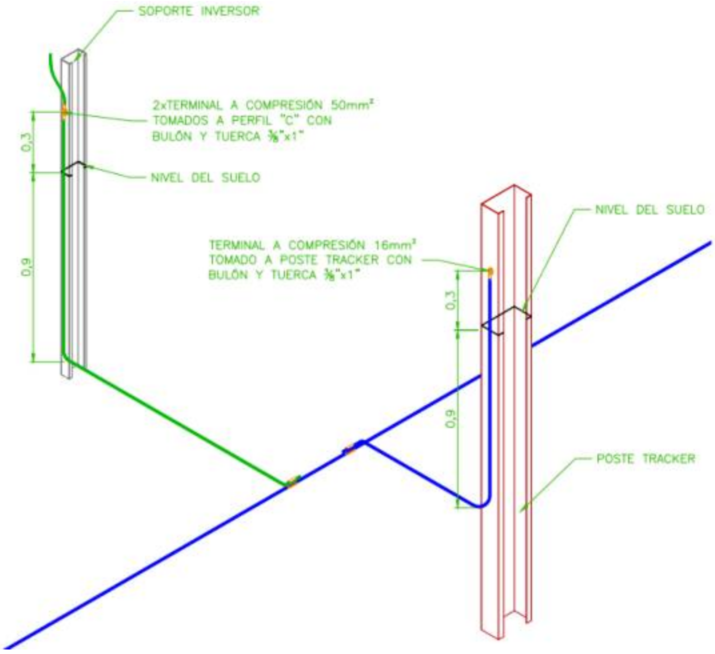


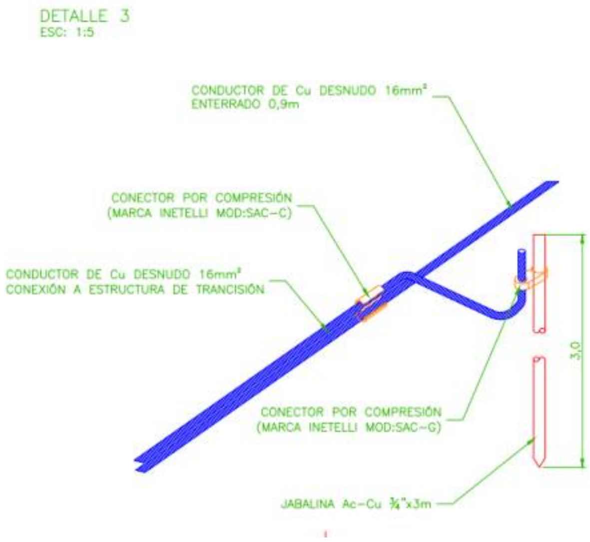
5.3. Sistemas de PAT

El sistema de puesta a tierra se instalará de manera que limite el efecto de gradientes de potencial a tierra a tales niveles de voltaje y corriente que no ponga en peligro la seguridad de las personas o equipos en condiciones normales y de falta. El sistema también garantizará la continuidad del servicio. El sistema de electrodos de tierra tendrá la forma de una red con conductores enterrados horizontalmente, complementado por una serie de jabalinas de tierra verticales conectado a la malla o rejilla. Los conductores horizontales (rejilla) son muy eficaces en la reducción de las altas tensiones de paso y contacto en la superficie de la tierra.

Las jabalinas serán de acero-cobre de 16 mm de diámetro y 3 m de longitud. En caso que sea necesario reforzar el sistema de puesta a tierra, se considerará el uso de jabalinas de 6 m de longitud acoplables

El sistema de tierra de la planta generadora será totalmente independiente al sistema de tierra de la red.





5.3.1. Estructura soporte

La estructura soporte de los paneles serán de acero galvanizado en caliente e inclinación fija de 30 grados. Las mismas se hincarán sobre el terreno previamente desmalezado.

5.3.2. Inversores fotovoltaicos

El inversor convierte la corriente continua (CC) de los paneles en corriente alterna (CA) con el nivel de tensión y la frecuencia de la red a la que se conecta. Un circuito interno de control realiza el seguimiento del punto de máxima potencia del inversor (MPP). Para ello, selecciona en cada instante el punto de trabajo del panel en la curva de tensión-intensidad de forma que la potencia sea máxima. Con ello el inversor extrae la potencia máxima que los paneles pueden generar en función de la irradiancia que reciben y de su temperatura de operación.

Los inversores que proveeremos cumplen con todos los requisitos técnicos y de seguridad necesarios para su interconexión a la red de baja tensión, así como las directivas de la UE en materia de seguridad eléctrica y compatibilidad electromagnética.

Se utilizarán inversor cumpliendo con los requerimientos de los 1779,4 kWp. Los inversores comunicarán los datos de generación al Smart Logger. Las características de los inversores a proveer son los siguientes:

SUN2000-330KTL-H1

Technical Specifications

Efficiency	
Max. Efficiency	≥ 99.0%
European Efficiency	≥ 98.8%
Input	
Max. Input Voltage	1,500 V
Number of MPP Trackers	6
Max. Current per MPPT	65 A
Max. Short Circuit Current per MPPT	115 A
Max. PV Inputs per MPPT	4/5/5/4/5/5
Start Voltage	550 V
MPPT Operating Voltage Range	500 V ~ 1,500 V
Nominal Input Voltage	1,080 V
Output	
Nominal AC Active Power	300,000 W
Max. AC Apparent Power	330,000 VA
Max. AC Active Power (cosϕ=1)	330,000 W
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	216.6 A
Max. Output Current	238.2 A
Adjustable Power Factor Range	0.8 LG ... 0.8 LD
Total Harmonic Distortion	THD_i < 1% (Rated)
Protection	
Smart String-level Disconnection (SSLD)	Yes
Smart Connector-level Detection (SCLD)	Yes
AC Overcurrent Protection	Yes
DC Reverse-polarity Protection	Yes
PV-array String Fault Detection	Yes
DC Surge Arrester	Type II
AC Surge Arrester	Type II
DC Insulation Resistance Detection	Yes
Residual Current Detection Unit	Yes

Communication	
Display	LED Indicators, WLAN + APP
USB	Yes
MBUS	Yes
RS485	Yes
General	
Dimensions (W x H x D)	1,048 x 732 x 395 mm
Weight (with mounting plate)	≤ 112 kg
Operating Temperature Range	-25°C ~ 60°C
Cooling Method	Smart Air Cooling
Max. Operating Altitude without Derating	4,000 m
Relative Humidity	0 ~ 100% (Non-condensing)
DC Connector	HH4SMM4TMSPA / HH4SFM4TMSPA
AC Connector	Support OT / DT Terminal (Max. 400 mm²)
Protection Degree	IP 66
Anti-corrosion Protection	C5-Medium
Topology	Transformerless
Standards Compliance	
IEC 62109-1/-2, IEC 62920, IEC 60947-2, EN 50549-2, IEC 61683, etc.	

5.4. Subestación transformadora

El centro de transformación será del tipo integrado contenerizado, con 16 entradas en baja tensión, proveniente de los inversores en campo de 330KW cada uno, y una salida en 3,2MW en 33 KV, apto para su interconexión a la red.
Dicho contenedor será albergado sobre una platea de hormigón construida para tal fin, cuyas características constructivas se definirán en ingeniería de detalles.
El sistema prefabricado y probado, no necesita cableado interno en el sitio. El diseño del contenedor es compacto de 20' HC para fácil transporte.
El transformador es de alta eficiencia para mayores rendimientos y menor autoconsumo.
El sistema es un diseño robusto contra entornos hostiles.
Una vez generada la energía a través de los módulos fotovoltaicos y rectificada en los inversores a valores de tensión, corriente y frecuencia de red, la misma será llevada hasta un transformador de 3,2MVA, que estará montado en la subestación integrada. Dicho equipo se encargará de elevar la tensión de 800Vca a 33 kVca, para así poder transportar la energía a través de una línea de media tensión.
Las características técnicas del centro de transformación a proveer son:

Input	
Máximum LV AC Inputs	22
AC Power	6,600 kVA @40℃ / 6,050 kVA @50℃ 1
Rated Input Voltage	800 V
LV Main Switches	ACB (2,900 A / 800 V / 3P, 2 x 1 pcs), MCCB (400 A / 800 V / 3P, 2 x 11 pcs)

Output	
Rated Output Voltage	33 kV
Frequency	50 Hz
Transformer Type	Oil-immersed, Conservator Type
Transformer Cooling Type	ONAN
Transformer Tappings	± 2 x 2.5%
Transformer Oil Type	Mineral Oil (PCB Free)
Transformer Vector Group	Dy11-y11
Transformer Min. Peak Efficiency Index	In Accordance with EN 50588-1
RMU Type	SF6 Gas Insulated
RMU Transformer Protection Unit	MV Vacuum Circuit Breaker Unit
RMU Cable Incoming / Outgoing Unit	Direct Cable Unit or Cable Load Break Switch Unit
Auxiliary Transformer	Dry Type Transformer, 5 kVA, Single-phase, li0
Output Voltage of Auxiliary Transformer	230 / 127 Vac

Protection	
Transformer Monitoring & Protection	Oil Level, Oil Temperature, Oil Pressure and Buchholz
Protection Degree of MV & LV Room	IP 54
Internal Arcing Fault Classification of STS	IAC A 20 kA 1s
MV Relay Protection	50/51, 50N/51N
LV Overvoltage Protection	Type I+II
Anti-rodent Protection	C5-Medium in accordance with ISO 12944

General	
Dimensions (W x H x D)	6,058 x 2,896 x 2,438 mm (20' HC Container)
Weight	< 23 t
Operating Temperature Range	-25℃ ~ 60℃ 4 (-13°F ~ 140°F)
Relative Humidity	0% ~ 95%
Max. Operating Altitude	1,000 m 5
MV-LV AC Connections	Prewired and Pretested, No Internal Cabling Onsite
LV & MV Room Cooling	Smart Cooling without Air-across for Higher Availability
Communication	Modbus-RTU, Preconfigured with Smartlogger3000B
Applicable Standard	IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1

6. OBRAS ELECTROMECÁNICAS

6.1. Conexión de equipos y tableros

Todos los equipos, estructuras y tableros eléctricos, estarán debidamente conectados a tierra mediante cable desnudo y terminales adecuados.
Cada tablero o gabinete contará con una bornera interna exclusiva para la conexión a tierra de todos los elementos.
Todos los chasis de los inversores y estructura soporte de los mismos serán conectados al sistema de PAT.

6.2. Montaje y conexionado de paneles solares

Se proporcionará en la etapa de ingeniería el detalle y cómputo de tornillería, grampas de fijación y accesorios estándares recomendados por el fabricante de los paneles fotovoltaicos y el fabricante de las estructuras fijas.

6.3. Traza, tendidos y conexionados tramo I DC: string – inversor.

El cableado de corriente continua desde los strings hasta los inversores se realizará con conductores unipolares de cobre de 4mm2 o 6mm2 de sección y nivel de aislación de 1500 VDC construidos y ensayados bajo normas TUV 2PfG 1169/08.2007 EN 50618.
Las dimensiones de los conductores serán verificadas durante el desarrollo de la ingeniería de detalle, de manera que en los tramos de corriente continua no exista caída de tensión superior al1.5%.
La canalización en CC entre las cadenas y los inversores se realizará en parte soportando los cables sobre la estructura con precintos resistentes a radiación UV. Luego al llegar al extremo de la estructura, los conductores de strings acometerán hacia los inversores a través de cañeros enterrados de polipropileno negro de sección conveniente.
Todas las canalizaciones serán debidamente dimensionadas siguiendo los requerimientos de la AEA para instalaciones de distribución de baja tensión directamente enterradas.

6.4. Cableado de baja tensión CA

Para la vinculación eléctrica entre los inversores y el tablero concentrador de C.A. se utilizarán cables subterráneos baja tensión con aislación en HF de 1,1kV.

6.5 Centro de protección monitoreo y maniobra (CPMyM) de Servicoop

La oferta incluye la provisión, montaje y puesta en marcha de:

- Una (1) envolvente prefabricada de hormigón armado vibrado, de maniobra interior, estructura equipotencial, monobloque, con red de puesta a tierra integral prefabricada, accesorios, iluminación interior, cerraduras, enclavamientos y ventilación natural con ensayos de:

o Arco interno

o Calentamiento

o Sismicidad

o Resistencia mecánica

En conformidad con las recomendaciones que emanan de la norma IEC 62271-202.

- Una (1) celda modelo cgm.3-v, en conformidad a las normas IEC 62271-100/102/103 provista de un interruptor-seccionador bajo carga de tres posiciones (conectado seccionado-tierra), para función de seccionamiento y puesta a tierra y de un interruptor automático para maniobra y protección, con aislación integral en gas y corte en vacío.

El comando del interruptor será motorizado y dotado de bobinas de cierre y apertura.

La protección electrónica será marca Ormazabal, modelo ekor.rpa-220-v, digital, comunicable, de control integrado, con medición de Corriente, Tensión, Potencia activa / reactiva / aparente, Energía (P+,

P-, Q1,…, Q4), Angulo Phi (ɸ), registro de eventos, según IEC 60255, funciones 50-51-51 - 50N-51N

51N - 50Ns-51Ns 46 46BC 67 67N 67Ns 49 27 59 59N 81O 81U 86, 50BF, Bloqueo por segundo armónico, Carga fría, integrada a la celda de fábrica. Además, la protección cuenta con Supervisor de bobina de desenganche sano.

- Una (1) celda modelo cgm.3-m, destinada a medición, en conformidad a las normas IEC 62271-200 provista de tres transformadores de corriente y tres de tensión.

Una (1) celda modelo cgm.3-l, de aislación integral en gas, provista de un interruptor seccionador bajo carga de tres posiciones (conectado-seccionado-tierra), en conformidad a las normas IEC 62271-102/103 apta para función entrada-salida de cables.

6.6 LAMT 33 KV

Provisión y Montaje de 350 metros de Línea Aérea de Media Tensión en 33KV, desde el CPMyM hasta el punto de inyección conformado con postación de hormigón coplanar vertical, cable Al 70 mm. Para servicios auxiliares, se propone la provisión y tendido de 350 metros de cable preensamblado 3x95/50 Al, utilizando la misma postación de hormigón de línea de MT antes descripta.

7. SISTEMA DE CONTROL

La oferta contempla la provisión de:

Sistema de enlace de comunicación entre el parque solar y el predio de Conarpesa:

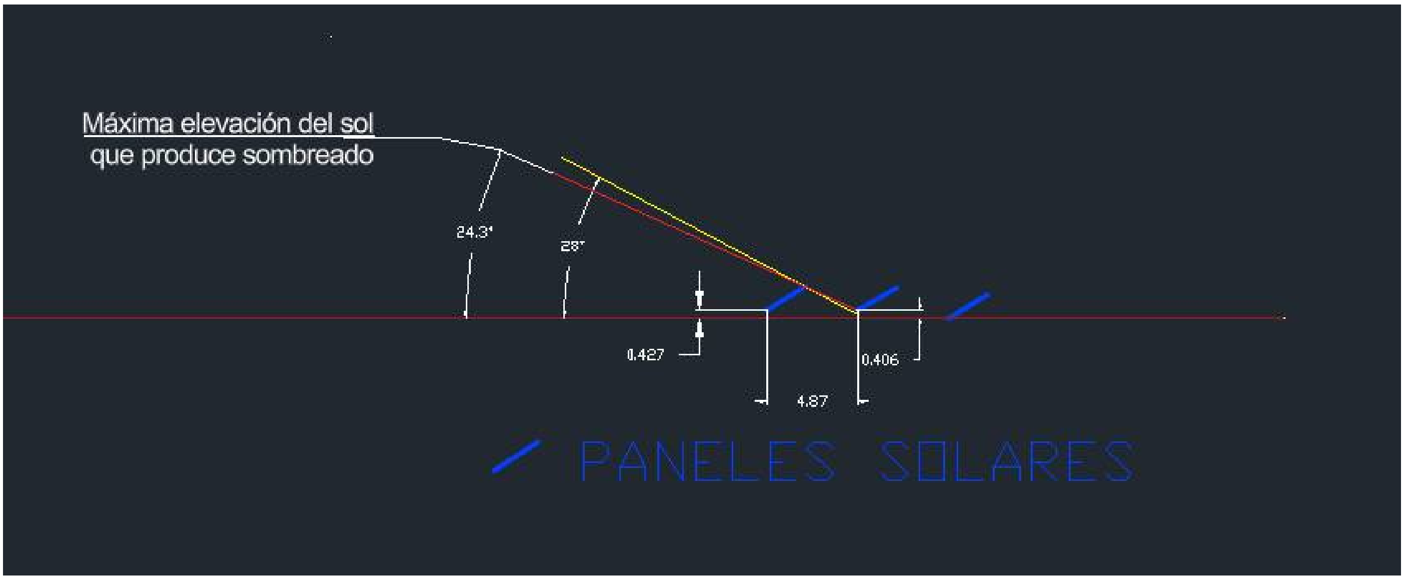
La oferta incluye además del sistema de visualización propio de Huawei, la provisión de una PC, con monitor, y la elaboración de un sistema Scada Tia Portal, para el monitoreo y control de todo el parque solar. Este sistema se instalará en la sala de control en el predio de Conarpesa. Para esto será necesario la provisión por parte del cliente de una acometida con internet al ingreso del PSFV.

8. EXCLUSIONES

No incluye Estudio de suelo.
No incluye Matriz de impacto ambiental
No incluye Cerco perimetral
No incluye Iluminación total del predio. Si se proveerá iluminación en centro de transformación.
No incluye sistema de conexión con CAMMESA (SOTR, SCOM, SMEC, etc.)

9. PÉRDIDAS POR SOMBREADO

La producción del parque solar, será de 2553MW/H al año.
Se observa en el informe de PVsyst pérdidas por sombreado de un 5.2%.
Estas pérdidas se deben a los siguientes factores:
Después de haber realizado un relevamiento preliminar del terreno, se ha detectado una pendiente de aproximadamente 5% hacia el sector sureste, que ocasiona el efecto del sombreado.
En el siguiente gráfico se muestra el efecto de sombreado combinado con la pendiente natural del terreno, el cual disminuye la producción.



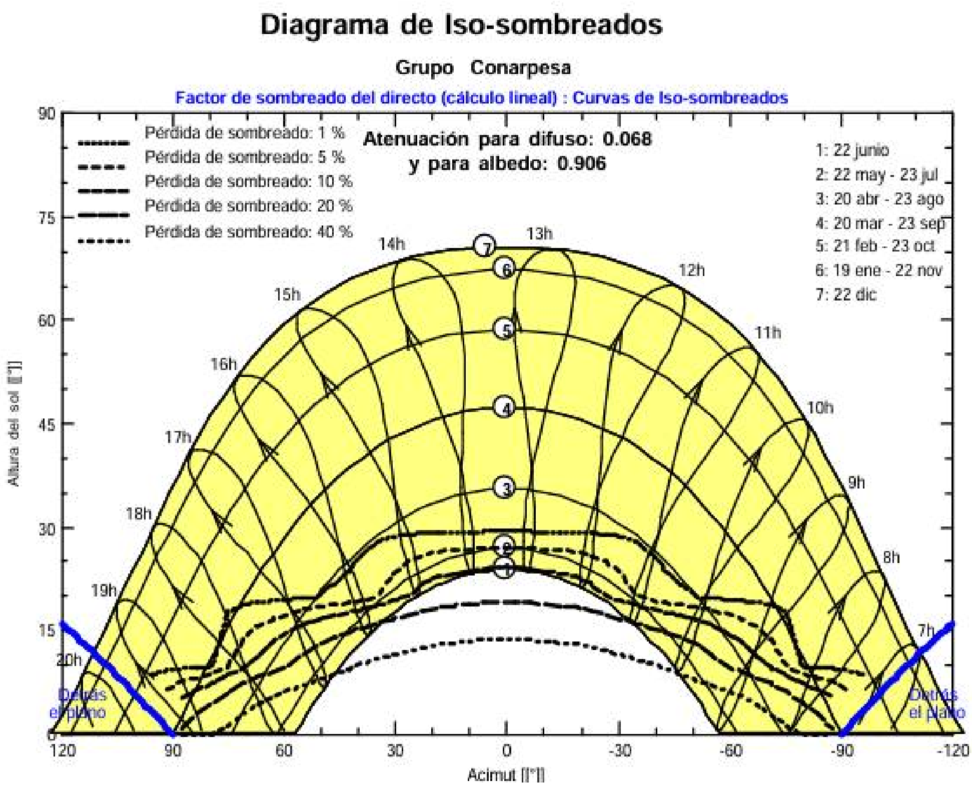
La línea amarilla, representa una elevación de ejemplo del sol, de 28°, donde ya no se produce sombra.

El ángulo de 24° donde se empieza a producir sombra, se ha determinado gráficamente, para fines de visualizar el efecto.

En la posición del planeta en que se encuentra este proyecto, al determinar este ángulo a partir de programas de simulación, en este caso el PVsyst, ese ángulo puede variar levemente, pero se ha utilizado este gráfico para visualizar el concepto.

Una descripción detallada se observa en el documento de la simulación de producción de la opción B: 3227-00-X-IN-02_A - Conarpesa.VCS-Report_Opción B.

En la figura siguiente se observa el gráfico de sombreado de dicha simulación:



PÁGINA EN BLANCO

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ESQUEMA UNIFILAR INYECCION FOTOVOLTAICA CONARPESA

Rev.	Fecha	Nombre	Observaciones
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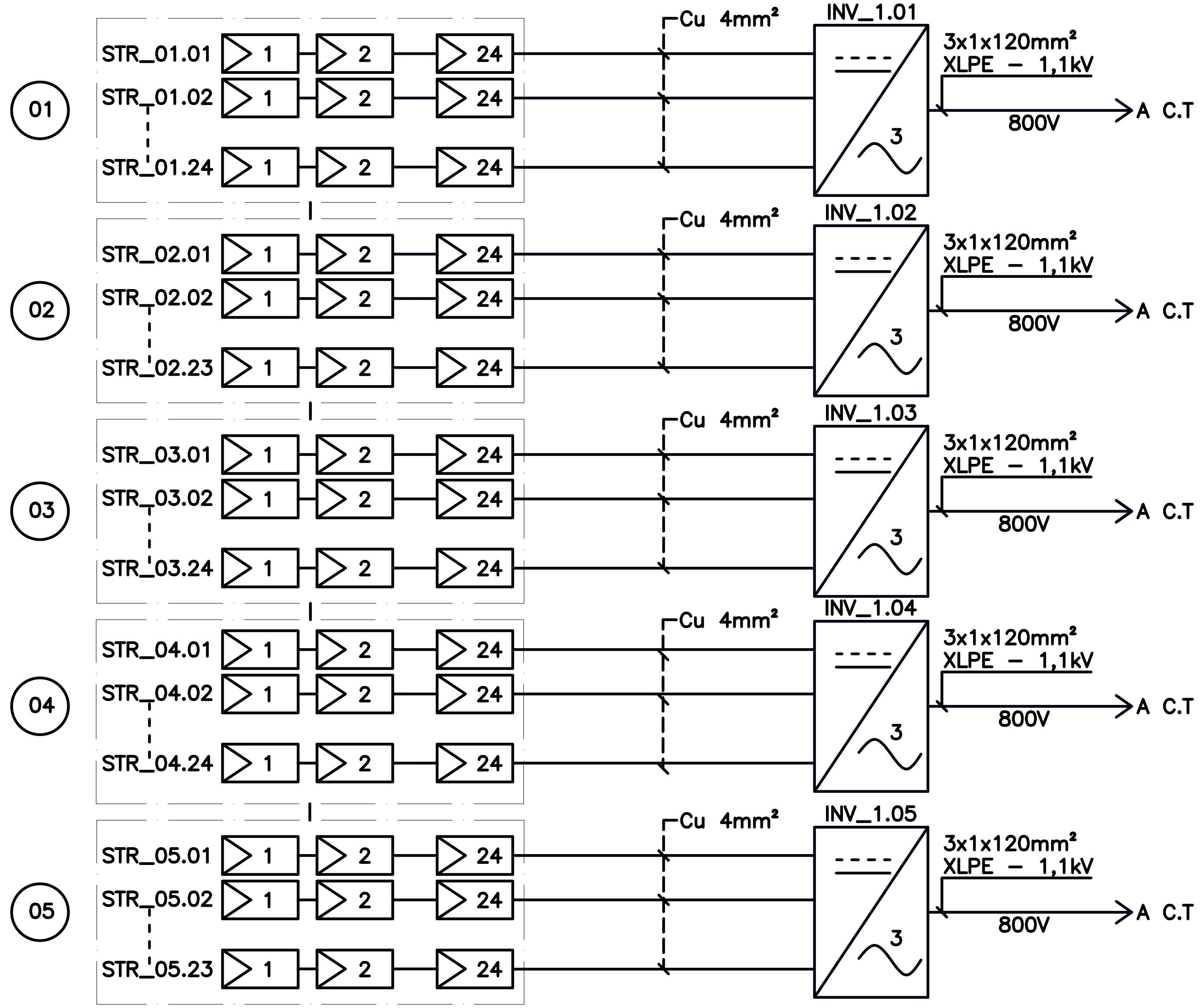
A	1/2/25	E.A.T.	PARA APROBACIÓN

	Fecha	Nombre
Dibujó	23/01/2025	E.A.T
Revisó	23/01/2025	F.M.C.
Aprobó		

Cliente: CONARPESA Obra: PSFV Puerto Madryn	N° de Obra: 3227	Hoja N°: 1-2
Denominación: ESQUEMA UNIFILAR B.T.	N° de Plano Cliente: —	Rev.N°
	N° de Plano: 3227-00-E-EU-01	Rev.N° A

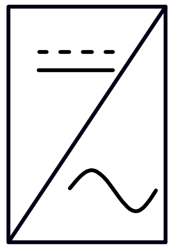


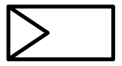
INV_X.XX: Inversor 300[kW]
STR_XX.XX: Cadena (String)

Especificaciones de Módulos	
LONGi LR7-72HTH-620M – (Cant. 2832)	
STC Rating	620 W
Vmp	44,33 V
Imp	13,88 A
Voc	54,57 V
Isc	14,87 A

Especificaciones de Inversores	
SUN2000-330KTL-H1 (Cant. 5)	
Max AC Power Rating	330 kW
Voltage range mpp	500-1500 V
Max Input Voltage	1.500 V
Out Voltage	800 Vac

Referencias de simbología


Inversores


Módulos fotovoltaicos

Rev.	Fecha	Nombre	Observaciones
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.	.	.	.
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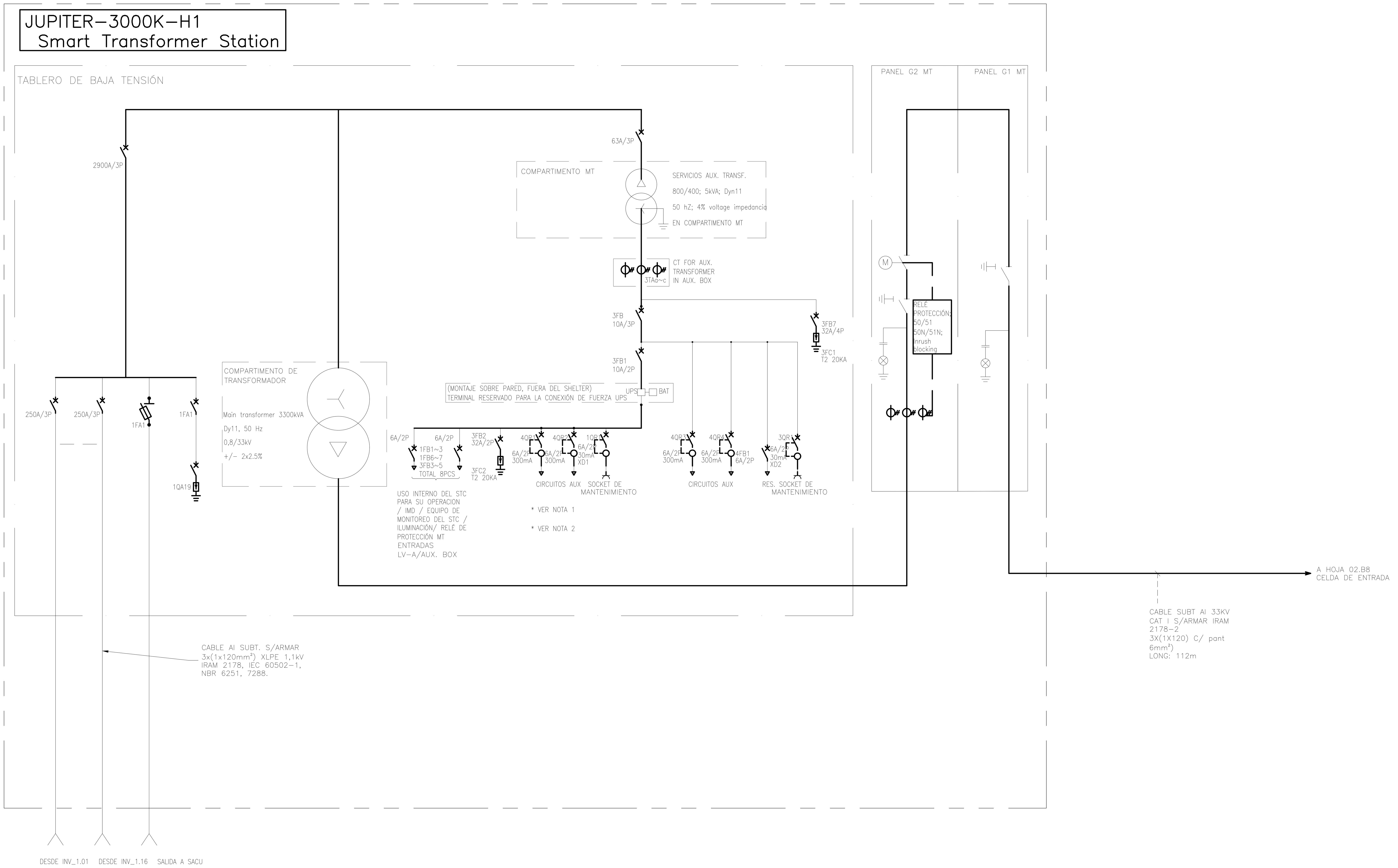
A	1/2/25	E.A.T.	PARA APROBACIÓN

	Fecha	Nombre
Dibujó	23/01/2025	E.A.T
Revisó	23/01/2025	F.M.C.
Aprobó		

PROYECCION Electroluz S.R.L.

Cliente: CONARPESA
Obra: PSFV Puerto Madryn
Denominación: ESQUEMA UNIFILAR B.T.

N° de Obra: 3227
Hoja N°: 2-2
N° de Plano Cliente: –
Rev.N°:
N° de Plano: 3227-00-E-EU-01
Rev.N°: A



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* NOTA 2:

LAS MARCAS Y MODELOS DE LOS INTERRUPTORES Y DEMÁS EQUIPOS DE LOS TABLEROS DE BT. Y MT. SERÁN DEFINIDOS CON LA ING. DE DETLLES DEL FABRICANTE.

REV. N°	FECHA	NOMBRE	OBSERVACIONES
A	5/2/25	E.A.T.	PARA APROBACIÓN

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	Fecha	Nombre
Dibujó	5/02/25	E.A.T
Revisó	5/02/25	F.M.C.
Aprobó	5/02/25	F.M.C.

Escala:

Tolerancia

Rugocidad

Cliente: CONARPESA

Obra: PSFV_Pto_Madrin

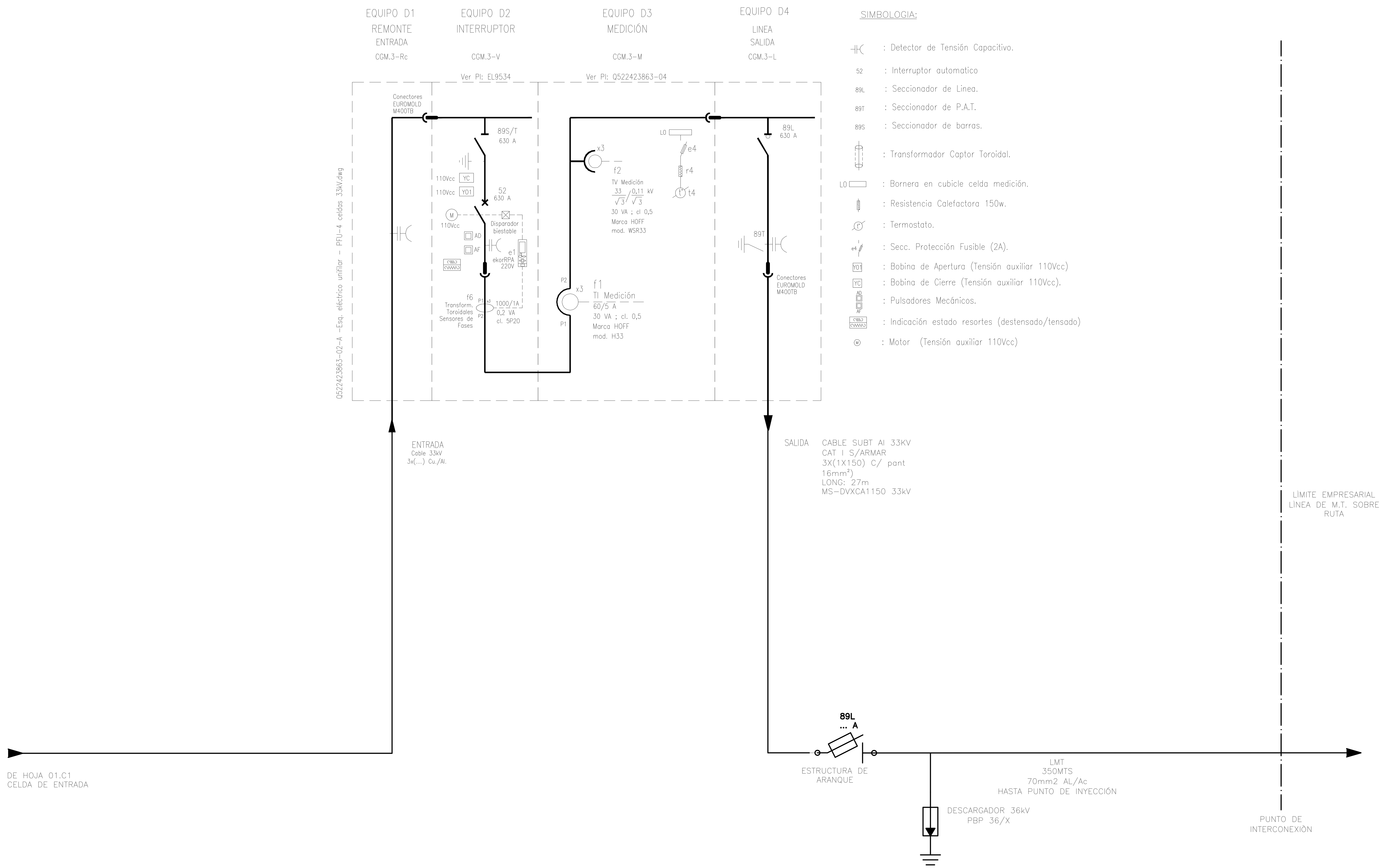
Denominación: ESQUEMA UNIFILAR DE MT

N° de Plano Cliente: Hoja 1 de 2 | Rev.

N° de Obra: 3227

N° de Plano: 3227-0-E-EU-02 | Rev. A

ESQUEMA ELÈCTRICO UNIFILAR– CMyM PFU–4 CELDAS 33kV



				PROYECCION Electroluz S.R.L.		Fecha	Nombre	Cliente: CONARPESA
					Dibujó	5/02/25	E.A.T	
					Revisó	5/02/25	F.M.C.	
					Aprobó	5/02/25	F.M.C.	Obra: PSFV_Pto_Madrin
				RECONQUISTA - STA. FE CASA CENTRAL Patricio Diez 175 Tel.:03482–421940 (Rot.) Fax:03482–421944 www.electroluz.com.ar PLANTA INDUSTRIAL Parque Industrial – Rqta. Telefax:03482–429810(Rot.) Email:fabrica@electroluz.com.ar	Escala:	Denominación: ESQUEMA UNIFILAR DE MT		Nº de Plano Cliente: Hoja 2 de 2 — Rev.
								Nº de Obra: 3227
A	5/2/25	E.A.T.	PARA APROBACIÓN		Tolerancia			Nº de Plano: 3227-0-E-EU-02 — Rev. A
REV. Nº	FECHA	NOMBRE	OBSERVACIONES		Rugocidad			

SUN2000 Smart PV Inverter

Short-Circuit Current

Issue V7.0

Date 2022-10-19

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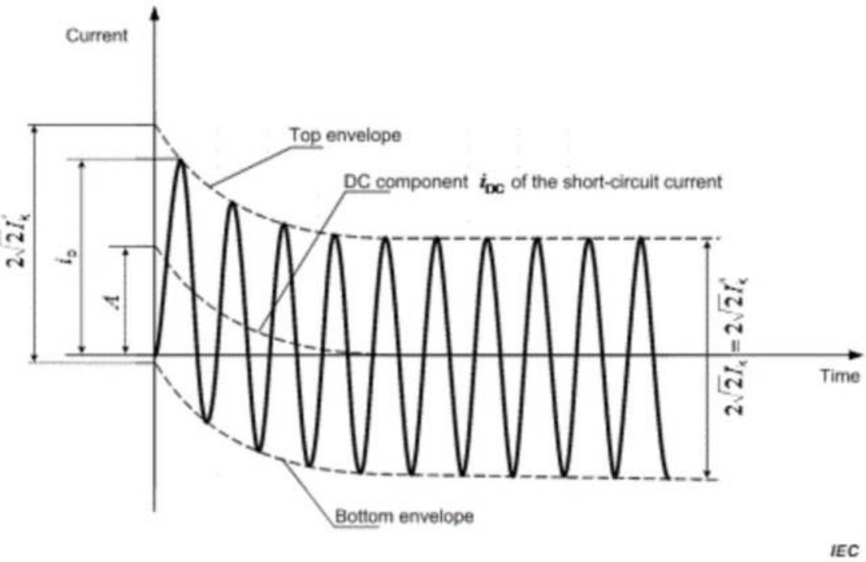
Content

1 Short-Circuit Current Definition

According to IEC60909-0:2016 (shown as Fig.1 below), the definitions of I_p, I''_k and I_k is used for calculation of maximum short-circuit current of power generators.



Key

I''_k initial symmetrical short-circuit current

i_p peak short-circuit current

I_k steady-state short-circuit current

Fig. 1-Short-circuit current definition as per IEC60909-0:2016

Where:

I_k is the steady-state short-circuit current which could be measured for 5 cycles (100ms). It is RMS value of the short-current which remains after the decay of the transient phenomena.

For inverters, I_k is the max output current (I_{ACmax}), because during faults, the max reactive current is I_{ACmax} which is controlled by the firmware. Normally short circuit contribution means I_k.

I''_k is the initial symmetrical short circuit current. It is RMS value of AC symmetrical component of a prospective short circuit current applicable at the instant of short circuit if the impedance remains at zero-time value.

In the inverter we take the first 20ms RMS value as I''_k.

I_p is the peak short-circuit current. It is maximum possible instantaneous value of the prospective short-circuit current.

2 Short-Circuit Current

According to IEC 60909-0:2016, the short-circuit current of SUN2000 Smart PV Inverters are declared as below:

Inverter Type	SUN2000-185KTL-H1	SUN2000-105KTL-H1
Max. AC Apparent Power	185 kVA	116 kVA
Rated Output Voltage (line voltage)	800 V	800 V
Short circuit contribution (I_k) (5 cycles or 100ms)	134.9 A	84.6 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	202.4 A	126.9 A
Peak Short-Circuit current (I_p)	419.6 A	263.2 A

Inverter Type	SUN2000-196KTL-H0	SUN2000-196KTL-H3
Max. AC Apparent Power	215 kVA	215 kVA
Rated Output Voltage (line voltage)	800 V	800 V
Short circuit contribution (I_k) (5 cycles or 100ms)	155.2 A	155.2 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	232.8 A	232.8 A
Peak Short-Circuit current (I_p)	482.8 A	482.8 A

Inverter Type	SUN2000-200KTL-H2	SUN2000-215KTL-H0
Max. AC Apparent Power	215 kVA	215 kVA
Rated Output Voltage (line voltage)	800 V	800 V
Short circuit contribution (I_k) (5 cycles or 100ms)	155.2 A	155.2 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	232.8 A	232.8 A
Peak Short-Circuit current (I_p)	482.8 A	482.8 A

Inverter Type	SUN2000-200KTL-H3	SUN2000-215KTL-H3
Max. AC Apparent Power	215 kVA	215 kVA
Rated Output Voltage (line voltage)	800 V	800 V
Short circuit contribution (I_k) (5 cycles or 100ms)	155.2 A	155.2 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	232.8 A	232.8 A
Peak Short-Circuit current (I_p)	482.8 A	482.8 A

Inverter Type	SUN2000-100KTL-M1		
Max. AC Apparent Power	110 kVA		
Rated Output Voltage (line voltage)	380 V	400 V	480 V
Short circuit contribution (I_k) (5 cycles or 100ms)	168.8 A	160.4 A	133.7 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	253.2 A	240.6 A	200.6 A
Peak Short-Circuit current (I_p)	525.1 A	499.0 A	415.9 A

Inverter Type	SUN2000-60KTL-M0		
Max. AC Apparent Power	66 kVA		
Rated Output Voltage (line voltage)	380 V	400 V	480 V
Short circuit contribution (I_k) (5 cycles or 100ms)	100 A	95.3 A	79.4 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	150.0 A	143.0 A	119.1 A
Peak Short-Circuit current (I_p)	311.1 A	296.5 A	247.0 A

Inverter Type	SUN2000-330KTL-H1	SUN2000-330KTL-H2
Max. AC Apparent Power	330 kVA	330 kVA
Rated Output Voltage (line voltage)	800 V	800 V
Short circuit contribution (I_k) (5 cycles or 100ms)	238.2 A	238.2 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	357.3 A	357.3 A
Peak Short-Circuit current (I_p)	741.0 A	741.0 A

Inverter Type	SUN2000-300KTL-H0
Max. AC Apparent Power	330 kVA
Rated Output Voltage (line voltage)	800 V
Short circuit contribution (I_k) (5 cycles or 100ms)	238.2 A
Initial Short Circuit Current (I''_k) (1 cycles or 20ms)	357.3 A
Peak Short-Circuit current (I_p)	741.0 A

SUN2000-330KTL-H1 ARGENTINA
Grid Standard Inverter PSSE Model User Manual

Author	Reviewer	Date	Version
Ruiying Li 821866 Congyuan Wang 352102	Zhangping Shao 355608	2023/03/30	V1.0

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About This Document

Purpose

This document describes how to use the PSS/E dynamic model PV_330_GC29_V100 for Huawei SUN2000-330KTL-H1 inverter.

The first chapter introduces the model. Chapter 2 describes the model functions and control block diagram. Chapter 3 introduces the model's capacity setting. Chapter 4 describes the interface between the inverter model and PPC model. Chapter 5 gives the datasheet for dynamic model.

Intended Audience

This document is intended for photovoltaic (PV) plant and power grid personnel.

Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

V1.0 (2023-03-30)

This issue is used for first office application.

Contents

1 Introduction

This document provides a guide to potential users of the Huawei SUN2000-330KTL-H1 inverter dynamic model for dynamic power system studies.

This revision of the releasable user manual relates to version 1.0 of the model source code files, titled PV_330_GC29_V100_psse.for and PV_330_GC29_V100_model.f90, or the compiled object files or library file for PSS/E version 32~35.

This document has assumed that the reader is conversant with PSS/E and understands some of the PSS/E terms that are used throughout this document.

2 Model Description

2.1 General

The Huawei SUN2000-330KTL-H1 three-phase string inverters are designed for solar power plants to draw power from photovoltaic (PV) arrays, convert it to alternating current, and transfer it to the utility grid on demand. The inverter is represented by the user written model "PV_330_GC29_V100" for dynamic simulation in PSS/E. The model consists of the following components:

1. Phase locked loop and signals measurement
2. PV panel, DC voltage controller, and maximum power point tracker
3. Active and reactive current controller
4. VRT grid support
5. Over / Under Voltage and Over / Under Frequency Protections
6. Frequency Response Control
7. Inverter main circuit breaker open and reclose control

The overall PV_330_GC29_V100 model inputs and outputs are illustrated in Figure 1. Note that VOLT is the inverter terminal voltage in complex value containing the magnitude of the terminal voltage and phase angle relative to swing bus.

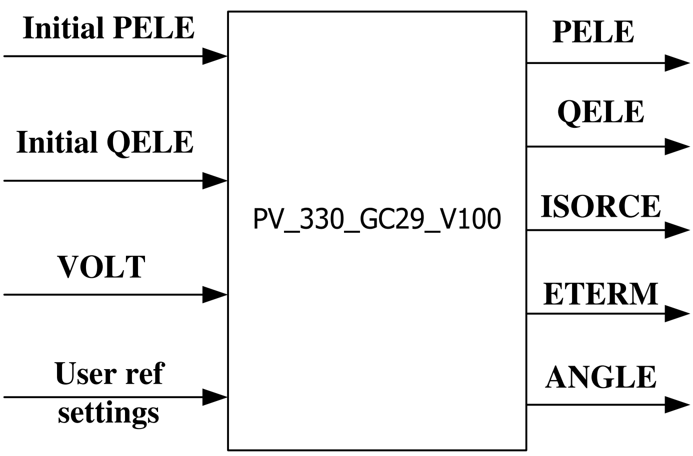

Figure 1 – Model input and output signals

The PV_330_GC29_V100 model is suitable for a balanced RMS simulation with a 1 to 5ms integration step size. The step size should not be changed during simulation.

Next, we will introduce the function of the model in several subsections.

2.2 Active Power Management

In the inverter model, there are four active power management modes. In Mode 0, the active power setpoint Pref (percentage based on single inverter rated output power Sn) is set by VAR(L+1) with over-frequency control disabled. In Mode 1, the active power follows MPPT but is limited by an external limit set by VAR(L+2) with over-frequency control disabled. In Mode 2, the active power setpoint Pref (percentage based on single inverter rated output power Sn) is set by VAR(L+1) with over-frequency control enabled. In Mode 3, the active power follows MPPT but is limited by an external limit set by VAR(L+2) with over-frequency control enabled.

In the dynamic PSS/E model, the four modes can be set with ICON(M+0). The active power is limited to a minimum and maximum value set in CON(J+10) and CON(J+11) as the operating value set by a single inverter. In addition, please note that the output capacity of active power is also affected by VARs(L+0) solar irradiance settings.

Following any setting change the active power output will ramp based on the active ramp rate setting. This ramp rate is set in CON(J+84) with a unit of %/s, its percentage basis is the maximum active power of a single inverter in CON(J+11).

2.2.1 Over frequency derating

Figure 2 shows the block diagram and interface of active power control with over-frequency control.

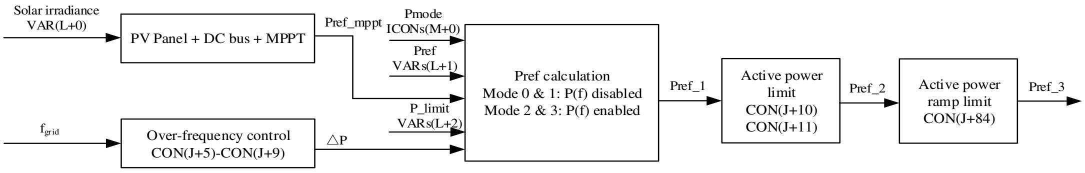

Figure 2: Active power management with over-frequency control

The active power management also includes a separate grid over-frequency (OF) response control. This over-frequency response is not limited by the active power ramp rate but instead it will respond based on a power to frequency rate of change entered by the user. The over-frequency control can be switched on or off with ICON(M+0) where a value of 0 or 1 is off and a value of 2 or 3 is on.

The ICON(M+1) parameter determines whether there is a hysteresis when the over-frequency occurs. The value 0 indicates that there is no hysteresis, and the value 1 indicates that there is a hysteresis. If there is a hysteresis, the active power decreases but does not increase during the over-frequency until the frequency is restored to a value lower than the frequency recovery frequency.

The over-frequency control will operate once the frequency is detected to be above a trigger threshold set in CON(J+5) as a Hz value. If the frequency exceeds the cut-off frequency set in CON(J+6) then the power is dropped to P at stop frequency set in CON(J+7). The CON(J+7)'s percentage basis is the value of active power at the moment when the frequency exceeds the trigger threshold. The over-frequency control will reset when the frequency recovers to within the recovery point set in CON(J+8).

The active power recovers to the active power reference based on the gradient set by CON(J+9) with a unit of %/min, its percentage basis is the maximum active power of a single inverter in CON(J+11).

The following describes the control of active power reduction in the case of overfrequency. For details, see Figure 3.

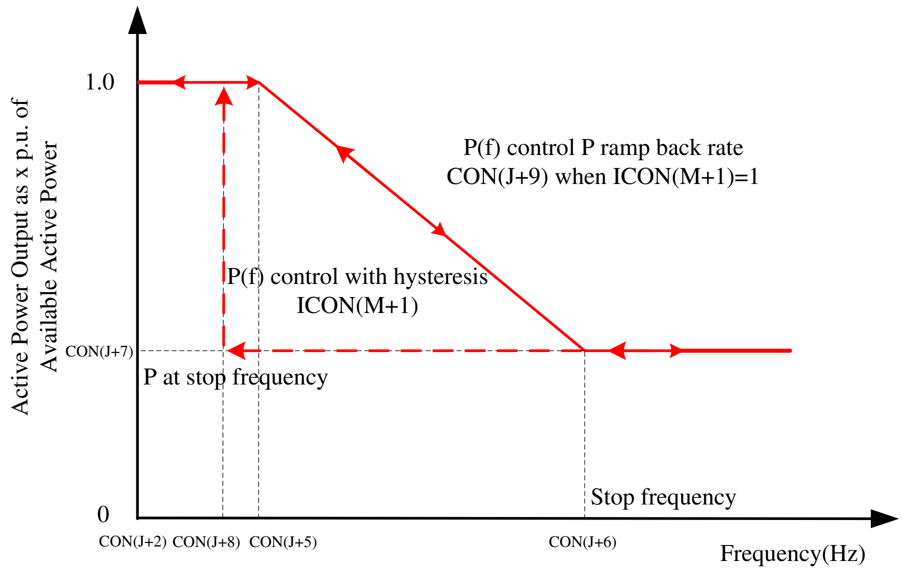

Figure 3: Over-frequency control

2.2.2 Frequency sensitive mode(FSM) and Under frequency boost power

In addition to the over-frequency derating function, this model also has the FSM and under-frequency boost power functions.

Frequency Sensitive Mode (or 'FSM') means the operating mode of a power-generating module or HVDC system in which the active power output changes in response to a change in system frequency, in such a way that it assists with the recovery to target frequency. There are 5 setup parameters associated with it in the model:

- ICON(M+10) is its switch setting. When it is set to 0, it means not enabled, and when it is set to 1, it means enabled. If it is set to disable, then the settings of the following 4 parameters will not be enabled. That is, this function is turned off.
- CON(J+198) is its response dead zone, which adds and subtracts the frequency value above and below the rated frequency(Fn). In the resulting frequency range, the FSM function does not work. For example, if the rated frequency is 50Hz, this value is set to 1Hz. Then the FSM function will not work between 49Hz~51Hz.
- CON(J+199) is the differential rate setting interface of the FSM function. It is a percentage value. Fn*CON(J+199) gets a frequency value(Δf). This frequency value corresponds to the power change *Pmax* (maximum active power value of the single inverter). Then through *Pmax* / Δf, the power adjustment capability represented by the differential rate can be calculated, that is, how much active power per Hz.

• CON(J+200) is the interface for setting the gradient of the active power change in the FSM function. Its unit is %/min, which is the percentage per minute. The reference for the percentage here is *Pmax*.

• CON(J+201) is the power change limit interface in the FSM function. Its unit is %. The reference for the percentage here is *Pmax*. For example, if it is set to 10%, it means that under the action of the FSM function, the active power can change within the range of plus or minus 10%**Pmax* of the current active power. In addition, this plus or minus 10% interval needs to be within the maximum power range that the inverter can generate.

Through the description of the above settings, we can understand the function of FSM: when the frequency of the inverter is greater than [Fn + CON(J+198)], the active power output by the inverter is reduced. When the frequency of the inverter is lower than [Fn - CON(J+198)], the active power output by the inverter increases. The changing power gradient and range need to refer to the settings of the above parameters.

Similarly, under-frequency boost power function means that when the port frequency of the inverter decreases, the active power output by the inverter increases. It also has the following 5 interface settings:

• ICON(M+11) is its switch setting. When it is set to 0, it means not enabled, and when it is set to 1, it means enabled. If it is set to disable, then the settings of the following 4 parameters will not be enabled. That is, this function is turned off.

• CON(J+202) is the start frequency setting interface of this function, that is, the trigger frequency. When the inverter port frequency is lower than this frequency, the under-frequency boost power function starts to work.

• CON(J+203) is the recovery frequency setting interface of the function. That is, when the inverter port frequency is greater than this value, the inverter exits this function.

• CON(J+204) is the stop frequency setting interface of the function. When the inverter port frequency is lower than this value, this function will no longer respond to increasing active power.

• CON(J+205) is the power limit percentage setting interface of the function. Its unit is %. The reference for the percentage here is *Pmax*. For example, if it is set to 100%, it means that under the action of this function, the active power can rise up to *Pmax*.

Similar to the over-frequency derating function, the under-frequency boost power function can calculate the rising value of the active power when the frequency changes through the above setting values. The following formula can calculate how much power (ΔP) changes per Hz:

$$\Delta P/_{Hz} = \frac{Pmax * CON(J+205)}{CON(J+202) - CON(J+204)}$$

2.3 Reactive Power Management

There are four control modes where the reference for the reactive power management ICONs(M+2) Qmode can be set:

• In Mode 0 to a fixed Qref (percentage based on single inverter rated output power Sn). It is set for a single inverter, and its range should be between Qmin/Sn and Qmax/Sn. Here Qmin and Qmax correspond to the settings in CON(J+12) and CON(J+13), Sn is CON(J). The initial reactive power is calculated from the load flow solution. The user can change the reactive power reference (Qref) by changing the VAR(L+3) to the desired value when performing the dynamic studies.

• In Mode 1 to a fixed power factor value. The initial power factor is calculated from the load flow solution. The user can change the reference power factor by changing the VAR(L+4) to the desired value when performing the dynamic studies.

• In Mode 2 to a fixed power factor value defined from the look up curve of the power factor value to active power percentage value. The initial power and power factor are calculated from the load flow solution. The user can change the PF curve set by CONs from CON(J+118) to CON(J+137).

• In Mode 3 to a reactive power per-unit value based on the maximum active power of a single inverter in CON(J+11) to voltage (Q(U)) droop curve. The Q(U) curve is set by CONs from CON(J+138) to CON(J+157). The reactive power reference will change as voltage changes according to the Q(U) curve.

For each of the modes, the changes in the reference will result in the reactive power response ramping at rate specified in CON(J+85) as input to the current regulator module. This ramp rate setting is a unit of %/s, its percentage basis is the maximum reactive power of a single inverter in CON(J+13).

The reactive power is limited to a minimum and maximum value set in CON(J+12) and CON(J+13) as fixed value of a single inverter.

Figure 4 shows the reactive power control block diagram and interface. There are four control modes that can be switched.

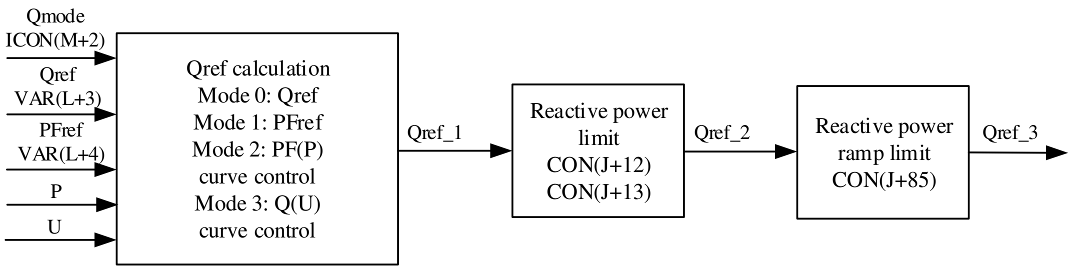

Figure 4: Reactive power management

2.4 Inverter current regulator

The inverter current regulator converts the Pref and Qref into the reference of Id and Iq by dividing them by the inverter terminal voltage. The IdRef and IqRef then check the limits, which are set as a per-unit of the maximum current according to whether the active power or reactive power output is set as the power management priority.

Figure 5 shows the current control block diagram and interface.

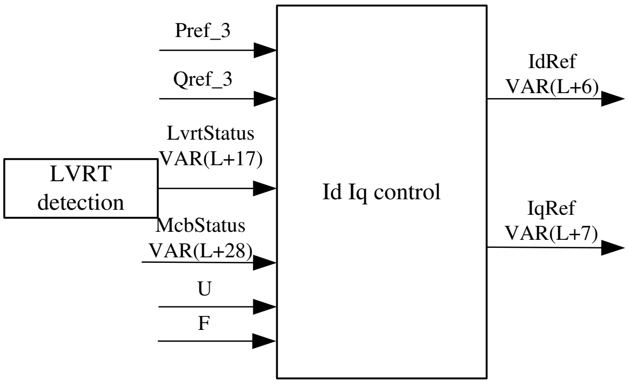

Figure 5: Inverter current regulator

2.5 Voltage ride through

When the voltage is lower than the LVRT threshold, the LVRT mode is triggered. The default threshold can be set by CON (J+15). When the voltage is greater than the sum of the LVRT threshold and hysteresis voltage, the LVRT mode exits and restores to the normal mode. The default hysteresis voltage is 0.05*Vn under this grid code, which can set the hysteresis voltage by CON (J+16).

For HVRT, its logic is similar to LVRT. When the voltage is greater than the HVRT threshold, the HVRT mode is triggered. The default threshold can be set by CON (J+86). When the voltage is lower than the difference of the HVRT threshold and hysteresis voltage, the HVRT mode exits and restores to the normal mode. The default hysteresis voltage is 0.05pu under this grid code, which can set the hysteresis voltage by CON (J+16).

When in VRT (LVRT or HVRT) mode, the inverter current control command is given by the fault ride through management module. The fault ride through will override the active and reactive power management control and inject Id and Iq according to the following strategies:

1. VRT active current control strategies

When ICONs(M+9) selects 0, that is, the reactive power priority model is used during VRT. The inverter adopts the reactive current priority method, and at the same time keeps the active power unchanged as much as possible. The minimum value of the active current Idref during VRT is 0.1*In. The default maximum Idref during VRT is 1.0*In. It can be set via interface CON(J+22). Therefore it satisfies the following formula.

$$\mathrm{Idref} = \mathrm{sqrt}(\mathrm{In}^2 - \mathrm{Iqref}^2\ )$$

$$\mathrm{Idref} = \mathrm{Min}\left\{\mathrm{Idref}, \frac{\mathrm{P}}{\mathrm{U}}\right\} \qquad (0.1\mathrm{In} \le \mathrm{Idref} \le I_N).$$

When ICONs(M+9) selects 1, that is, the active power priority model is used during VRT. The inverter adopts the active current priority method. The minimum value of the active current Idref during VRT is 0.1*In. The default maximum Idref during VRT is 1.0*In. It can be set via interface CON(J+22). In this mode, the active current during VRT remains the same as before the fault. Therefore it satisfies the following formula.

$$\mathrm{Idref} = Idpre \qquad (0.1\mathrm{In} \le \mathrm{Idref} \le I_N).$$

The *Idpre* is the 1.0s average value of the active current before the VRT mode.

When the VRT mode exits, the active current recovers based on the gradient. The default gradient is set through CON(J+24).

2. VRT reactive current control strategies

When ICONs(M+9) selects 0, that is, the reactive power priority model is used during VRT. The reactive current Iqref behaves according to the following formula.

$$\text{Iqref} = \Delta\text{Iq} + \text{Iq0}$$

The Iq0 is the 1.0s average value of the reactive current before the VRT mode; ΔIq represents the additional reactive current, as shown in the following formula:

$$\Delta I_q = k \times (U0 - U_{pu}) \times I_N$$

The U0 is the 1.0s average value of the grid voltage before the VRT mode. k represents the factor that reflects the ratio of additional reactive current and the grid voltage drop value, and is set through CON(J+25) or CON(J+87); I_N represents the nominal current of the inverter; Upu represents the grid voltage during VRT mode.

In addition, the default maximum reactive current during LVRT is 1.0*In, which can be set through CON(J+20). Under this grid code, it is limited to 0pu during HVRT.

When ICONs(M+9) selects 1, that is, the active power priority model is used during VRT. The inverter adopts the active current priority method. Then its reactive current is subject to the following restrictions after the above calculation formula:

$$\text{Iqref} = \text{Min}\{\text{Iqref}, \text{Sqrt}(\text{Imax} * \text{Imax} - \text{Idref} * \text{Idref})\}$$

Here Idref= *Idpre*, Imax is the maximum current value of this model. Its value can refer to the setting of CONs(J+21).

There are two models for the recovery of reactive current after VRT mode. It can be set via ICONs(M+8). Under the current grid code, this value does not support configuration. If mode 0 is selected, the reactive current will first reach 0, and then return to the reactive current value before VRT according to the gradient. The default gradient is set through CON(J+24). If mode 1 is selected, the reactive current will immediately return to the pre-voltage drop value and there's no limitation on the rate of change of the reactive current during this period.

One point needs to be explained. In order to maintain the stable operation of the inverter, its active power and reactive power output will remain unchanged within 5s after the fault is restored.

Ten points (T0, U0) to (T9, U9) can be set on the LVRT characteristic curve. The curve determines the operating duration of the inverter when the voltage drops to different depths. Values of T0 to T9 and U0 to U9 can be set by using CONs from CON(J+158) to CON(J+177).

Figure 6 shows the curves and interfaces for low voltage ride through.

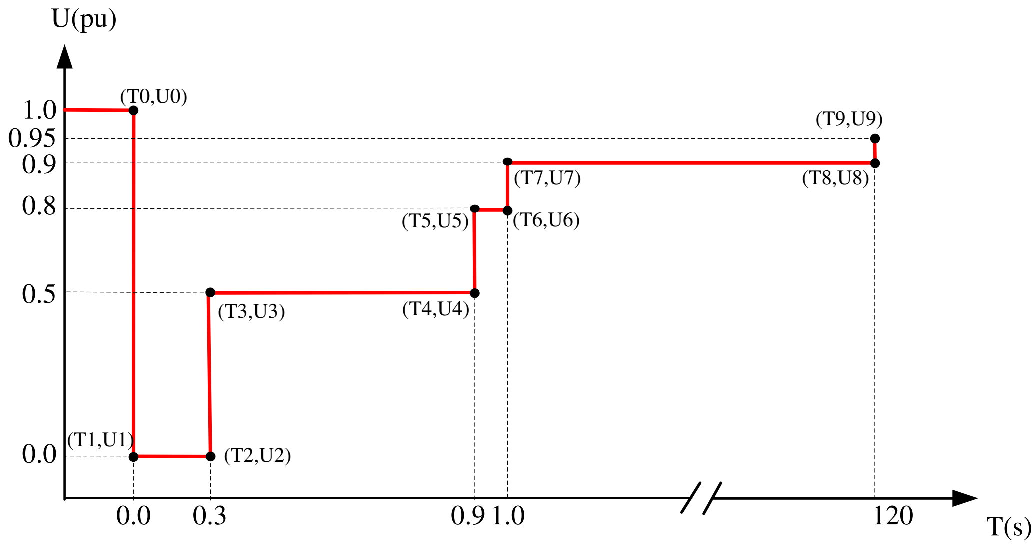

Figure 6: LVRT curve

After entering the LVRT mode, the inverter will find the corresponding time point on the LVRT curve according to the dropped voltage value. Thus, the corresponding protection time is obtained.
In addition, it should be noted that in LVRT mode, the inverter running time will be 500ms longer than the query LVRT curve protection time. If ICONs(M+7) is set to 0, then entering the LVRT mode, the inverter will shield the under-voltage protection function. If you want to test the under-voltage protection separately, you can turn off the LVRT switch (set ICONs(M+4) to 0).

Similarly, the 20 points of the HVRT curve can be set by CONs from CON(J+178) to CON(J+197). Under the current grid code, these values does not support configuration. HVRT curves have simpler logic than LVRT curves. It does not look up time points on the HVRT curve based on voltage values. Its logic is closer to the protection point setting model. After entering the HVRT mode, the inverter will find the closest set point for the current voltage value (the voltage value greater than or equal to the set point). The protection time of the set point is the protection time of the current voltage value in HVRT mode.
Likewise, the inverter running time will be 500ms longer than the query HVRT curve protection time. If ICONs(M+7) is set to 0, then entering the HVRT mode, the inverter will shield the over-voltage protection function. If you want to test the over-voltage protection separately, you can turn off the HVRT switch (set ICONs(M+6) to 0).

2.6 Over/under frequency and voltage protections

The inverter will be tripped if the frequency or voltage exceed the limits, and persist longer than the time delay, set in CON(J+26) to CON(J+67). The following set points are available for:
- Overvoltage protection: 5 set points (between 1.0 to 1.5*Vn and 50 to 7200000ms)

- Undervoltage protection: 4 set points (between 0.05 to 1.0*Vn and 50 to 7200000ms)

- Overfrequency protection: 5 set points (between 1 to 1.2*Fn and 50 to 7200000ms)

- Under frequency protection: 7 set points (between 0.8 to 1.0*Fn and 50 to 7200000ms)

3 Load flow file setting

The inverter model can be used to simulate a single Huawei SUN2000-330KTL-H1, or an aggregation of a number of SUN2000-330KTL-H1 inverters. For all CONs, STATEs, and VARs of the dyr file, they are all for single inverter parameter setting. The MBASE of the renewable generator model should equal to the total nominal capacity of the lumped generator represents. For example, single inverter's Sn = 200kVA, Pmin = 0kW, Pmax = 220kW, Qmin = -132kvar, Qmax = 132kvar (It's a general case, corresponding to SUN2000-330KTL-H1 CON(J+0) and CON(J+10)~CON(J+13) .) , if there are 100 inverters, then the machine's Mbase = 100*0.2 = 20MVA, Pmin = 100*0 = 0MW, Pmax = 100*0.22 = 22MW, Qmin = 100*(-0.132) = -13.2Mvar, Qmax = 100*(0.132) = 13.2Mvar, as shown in Figure 7.

The PSS/E dynamic model PV_330_GC29_V100 is automatically initialised from the load flow file and has no requirement for a model user to provide further input data for the initial active power and reactive power dispatched. And the initial irradiance is set to the maximum value.

The inverter is modelled as a current source and therefore, the source impedance (ZSORCE) is suggested to be set to a large value, e.g., 1000.0 + j1000.0 (pu, MBASE).

The PSS/E dynamic model PV_330_GC29_V100 is renewable generator model type, so the machine's Control Mode should be 1-Standard QT,QB limits, as shown in Figure 7.

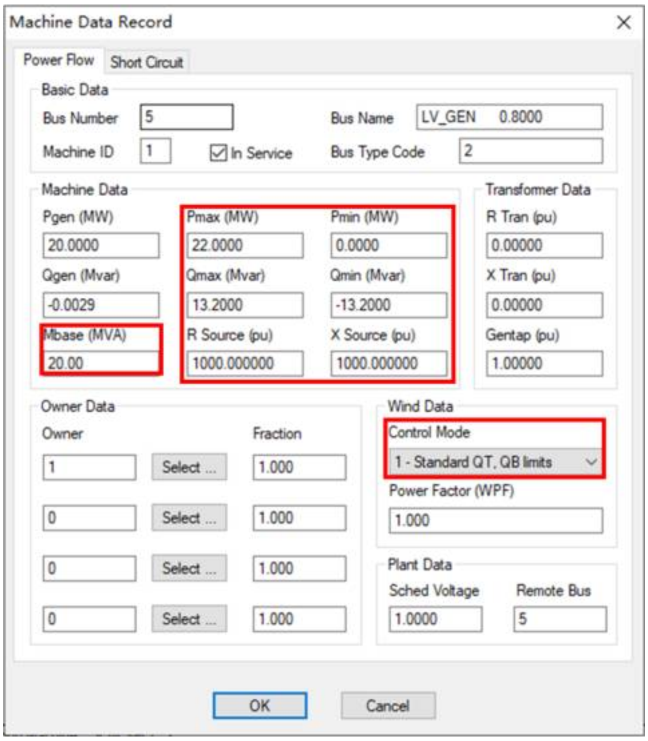

Figure 7: Machine setting

4 Interface with Power Plant Controller (PPC)

The active power reference (PREF) and reactive power reference (QREF) from PPC are written into two reserve variables, VAR(L+1) and VAR(L+3) respectively. When operated with a PPC the inverter active power management will be Pref control mode and the reactive power management will be Qref set by external control mode.

The ICON(M+0) Pmode is set to 0 or 2 and ICON(M+2) Qmode is set to 0 for operation with an external PPC model.

It should be noted that the scheduling instructions received here are for a single inverter. The active power setpoint Pref is percentage based on single inverter rated output power Sn. The reactive power setpoint Qref is percentage based on single inverter rated output power Sn. When one model is equivalent to multiple inverters in parallel, you can refer to the explanation in the previous chapter to convert the corresponding output power through MBASE.

5 Model parameters and variables

5.1 Sample PSS/E dynamic file data entry

A sample PSS/E dynamic file data entry for the PV_330_GC29_V100 inverter model is shown below, based on implementation of the converter at bus <BUSNUM> with ID <ID>.

PV_330_GC29_V100 dyr sample:

```
<BusID> 'USRMDL' <MachID>   'PV_330_GC29_V100' 101 1 12 206 7 111
   0   1   0   0   1   0   1   0   1   0   0   0
   300.000   800.000    50.000     0.990     9.000    50.200    51.500    48.000    50.150    10.000
     0.000   330.000  -198.000   198.000     1.100   680.000    40.000     0.010     0.010     0.000
   100.000   110.000   100.000     0.000    50.000     2.000   960.000   800.000   960.000   800.000
   960.000   800.000   960.000   800.000   960.000   800.000   720.000 1200000.000 400.000  1000.000
   400.000  1000.000   400.000  1000.000    51.000 100000.000   51.500 25000.000    52.000 15000.000
    55.000   500.000    55.000   500.000    49.000 100000.000   48.500 25000.000    48.000 15000.000
    45.000   500.000    45.000   500.000    45.000   500.000    45.000   500.000     3.000   600.000
    20.000    20.000     0.800    11.961    73.003     1.400     0.600     0.000     0.318     1.400
     0.600     0.003     0.006     0.006   125.000   125.000   960.000     0.000   100.000   200.000
   300.000   400.000   500.000   600.000   700.000   800.000   900.000  1000.000     0.120     0.250
     0.380     0.520     0.660     0.810     0.950     1.100     1.250     1.360  1000.000  1007.500
  1015.000  1022.500  1030.000  1037.500  1045.000  1052.500  1060.000  1070.000    10.000    20.000
    30.000    40.000    50.000    60.000    70.000    80.000    90.000   100.000     1.000     1.000
     1.000     1.000     1.000    -0.980    -0.960    -0.940    -0.920    -0.900    80.000    90.000
    92.000    98.000   102.000   106.000   110.000   115.000   120.000   136.000     0.310     0.310
     0.310     0.310     0.000    -0.310    -0.310    -0.310    -0.310    -0.310   100.000     0.000
     0.000    50.000    50.000    80.000    80.000    90.000    90.000    95.000     0.000     0.000
   300.000   300.000   900.000   900.000  1000.000  1000.000 120000.000 120000.000  120.000   110.000
   105.000   105.000   105.000   105.000   105.000   105.000   105.000   105.000     0.000   300.000
 120000.000 120000.000 120000.000 120000.000 120000.000 120000.000 120000.000 120000.000 0.050  4.000
   600.000    10.000    49.500    49.500    44.500   100.000/
```

5.2 Parameters and variables

For all CONs, STATEs, and VARs of the model, the default configuration value and settable range of each parameter will be given below.

5.2.1 PV_330_GC29_V100 ICONs and settings

- Table 1 – PV_330_GC29_V100 ICONs and settings

ICONs	Symbol	Description	Default setting for SUN2000-330KTL-H1	Settable range
M+0	Pmode	P control mode: 0=Follow Pref (set by VAR(L+1)) without frequency control (P(F) control); 1=Follow MPPT and capped by a limit set by VAR(L+2), without P(F) control; 2= Follow Pref (set by VAR(L+1)), with P(F) control; 3=Follow MPPT, with P(F) control.	0	0~3
M+1	HystEna	P(F) control hysteresis is enable. 0=disabled 1=enabled	1	0~1
M+2	Qmode	Q control mode: 0=Qref fixed value set by external 1=PowerFactor ref set by external 2=PowerFactor(P) curve control 3=Q(U) curve control	0	0~3
M+3	FastReclose	Fast reclose mode: 0=fast reclose disabled 1=fast reclose enabled	0	0~1
M+4	LVRTswitch	LVRTswitch: 0 = LVRT function disabled 1 = LVRT function enabled	1	0~1
M+5	SmartQUswitch	Smart QU switch: 0 = SmartQU function disabled 1 = SmartQU function enabled	0	0~1

M+6	HVRTswitch	HVRTswitch: 0 = HVRT function disabled 1 = HVRT function enabled	1	0~1
M+7	ProtectionPriority	Protection Priority switch: 0 = disabled 1 = enabled	0	0~1
M+8	LVRTIqMode	LVRTIqMode. 0=Iq set zero at lvrt recovery moment, 1=Iq set the value before lvrt at lvrt recovery moment.	1	None
M+9	LVRTMode	LVRTMode. 0=Reactive Power Priority Mode, 1=Active Power Priority Mode.	0	0~1
M+10	FSM	Frequency sensitive mode(FSM),0=disabled, 1=enabled	0	0~1
M+11	UFRP	Under-frequency rise power (under frequency boost power) control, 0=disabled, 1=enabled	0	0~1

5.2.2 PV_330_GC29_V100 CONs and settings

Table 2 – PV_330_GC29_V100 CONs and settings

CONs	Symbol	Units	Description	Default setting for SUN2000-330KTL-H1	Settable range
J+0	Sn	kVA	Nominal apparent capacity	300	None
J+1	Vn	V	Nominal voltage (line to line voltage)	800	None
J+2	Fn	Hz	Nominal frequency	50	None
J+3	InverterEfficiency	-	Inverter efficiency factor	0.99	None
J+4	MpptSpeed	V/s	MPPT tracking speed	9	None
J+5	HzStr	Hz	P(F) control start frequency	50.2	0.80*Fn~ 1.20*Fn
J+6	PfreqStopF	Hz	P(F) control stop frequency	51.5	0.80*Fn~ 1.20*Fn

J+7	PfreqStopP	%	P(F) control P at stop frequency, as percentage of availabe power Pm, between 0% and 100%	48	0.0~100.0
J+8	HzStop	Hz	P(F) control hysteresis recovery frequency	50.15	0.80*Fn~ 1.20*Fn
J+9	PfreqRampBackRate	%/min	P(F) control P ramp back rate,percentage benchmark is Pmax	10	1~6000
J+10	PQ_curve_Pmin	kW	PQ curve Pmin when voltage is 1pu	0	None
J+11	PQ_curve_Pmax	kW	PQ curve Pmax when voltage is 1pu	330	None
J+12	PQ_curve_Qmin	kVar	PQ curve Qmin when voltage is 1pu	-198	-0.6* Pmax
J+13	PQ_curve_Qmax	kVar	PQ curve Qmax when voltage is 1pu	198	0.6* Pmax
J+14	PQ_curve_Radius	pu	PQ curve Radius when voltage is 1pu	1.1	Pmax/Sn
J+15	LvrtThres	V	LVRT voltage threshold	680	0.5*Vn~1.0* Vn
J+16	LvrtHyster	pu	LVRT hysteresis voltage	40	0.02* Vn ~0.1* Vn
J+17	LvrtPickTime	s	LVRT pick up time (s)	0.01	None
J+18	LvrtIqRampTime	s	time for Iq ramping from pre-fault to LVRT target Iq	0.01	None
J+19	ReservedParam01	-	Reserved parameter 01	0	None
J+20	LvrtMaxIq	%	maximum reactive current percentage during LVRT based on rated current	100	0~120
J+21	NormalMaxI	%	normal max current percentage based on rated current	110	None

J+22	LvrtMaxId	%	LVRT time max active current percentage based on rated current	100	10~120
J+23	ReservedParam02	-	Reserved parameter 02	0	None
J+24	PostLvrtPRampRate	%/s	Active power ramping rate after exiting LVRT status, percentage benchmark is Sn	50	1~10000
J+25	LvrtIqK	[-]	LVRT Iq factor K	2	0~10
J+26	OvVolt1V	V	over voltage protection 1 - voltage	960	1.0*Vn ~1.5*Vn
J+27	OvVolt1T	ms	over voltage protection 1 - time	800	50~7200000
J+28	OvVolt2V	V	over voltage protection 2 - voltage	960	1.0*Vn ~1.5*Vn
J+29	OvVolt2T	ms	over voltage protection 2 - time	800	50~7200000
J+30	OvVolt3V	V	over voltage protection 3 - voltage	960	1.0*Vn ~1.5*Vn
J+31	OvVolt3T	ms	over voltage protection 3 - time	800	50~7200000
J+32	OvVolt4V	V	over voltage protection 4 - voltage	960	1.0*Vn ~1.5*Vn
J+33	OvVolt4T	ms	over voltage protection 4 - time	800	50~7200000
J+34	OvVolt5V	V	over voltage protection 5 - voltage	960	1.0*Vn ~1.5*Vn
J+35	OvVolt5T	ms	over voltage protection 5 - time	800	50~7200000
J+36	UnVolt1V	V	under voltage protection 1 - voltage	720	0.05*Vn ~1.0*Vn
J+37	UnVolt1T	ms	under voltage protection 1 - time	1200000	50~7200000
J+38	UnVolt2V	V	under voltage protection 2 - voltage	400	0.05*Vn ~1.0*Vn

J+39	UnVolt2T	ms	under voltage protection 2 - time	1000	50~7200000
J+40	UnVolt3V	V	under voltage protection 3 - voltage	400	0.05*Vn ~1.0*Vn
J+41	UnVolt3T	ms	under voltage protection 3 - time	1000	50~7200000
J+42	UnVolt4V	V	under voltage protection 4 - voltage	400	0.05*Vn ~1.0*Vn
J+43	UnVolt4T	ms	under voltage protection 4 - time	1000	50~7200000
J+44	OvFreq1F	Hz	over frequency protection 1 - frequency	51	1.0*Fn~ 1.2*Fn
J+45	OvFreq1T	ms	over frequency protection 1 - time	100000	50~7200000
J+46	OvFreq2F	Hz	over frequency protection 2 - frequency	51.5	1.0*Fn~ 1.2*Fn
J+47	OvFreq2T	ms	over frequency protection 2 - time	25000	50~7200000
J+48	OvFreq3F	Hz	over frequency protection 3 - frequency	52	1.0*Fn~ 1.2*Fn
J+49	OvFreq3T	ms	over frequency protection 3 - time	15000	50~7200000
J+50	OvFreq4F	Hz	over frequency protection 4 - frequency	55	1.0*Fn~ 1.2*Fn
J+51	OvFreq4T	ms	over frequency protection 4 - time	500	50~7200000
J+52	OvFreq5F	Hz	over frequency protection 5 - frequency	55	1.0*Fn~ 1.2*Fn
J+53	OvFreq5T	ms	over frequency protection 5 - time	500	50~7200000
J+54	UnFreq1F	Hz	under frequency protection 1 - frequency	49	0.8*Fn~ 1.0*Fn
J+55	UnFreq1T	ms	under frequency protection 1 - time	100000	50~7200000
J+56	UnFreq2F	Hz	under frequency protection 2 - frequency	48.5	0.8*Fn~ 1.0*Fn

J+57	UnFreq2T	ms	under frequency protection 2 - time	25000	50~7200000
J+58	UnFreq3F	Hz	under frequency protection 3 - frequency	48	0.8*Fn~ 1.0*Fn
J+59	UnFreq3T	ms	under frequency protection 3 - time	15000	50~7200000
J+60	UnFreq4F	Hz	under frequency protection 4 - frequency	45	0.8*Fn~ 1.0*Fn
J+61	UnFreq4T	ms	under frequency protection 4 - time	500	50~7200000
J+62	UnFreq5F	Hz	under frequency protection 5 - frequency	45	0.8*Fn~ 1.0*Fn
J+63	UnFreq5T	ms	under frequency protection 5 - time	500	50~7200000
J+64	UnFreq6F	Hz	under frequency protection 6 - frequency	45	0.8*Fn~ 1.0*Fn
J+65	UnFreq6T	ms	under frequency protection 6 - time	500	50~7200000
J+66	UnFreq7F	Hz	under frequency protection 7 - frequency	45	0.8*Fn~ 1.0*Fn
J+67	UnFreq7T	ms	under frequency protection 7 - time	500	50~7200000
J+68	LongFaultTime Thres	s	Only used when FastReclose is enabled. A fault is a long fault if fault time is longer than the value.	3	0.5~20
J+69	LongFaultWait Time	s	MCB relcosing wating time after fault clearance if the fault is long fault	600	0~7200
J+70	LongFaultPRa mpTime	s	Time for P limit ramping from 0 to PQ_curve_Pmax after long fault	20	1~1800
J+71	ShortFaultPRa mpTime	s	Time for P limit ramping from 0 to PQ_curve_Pmax after short fault	20	1~1800

J+72	ReclsQrampTime	s	Time for Q limit ramping from 0 to PQ_curve_Qmax after reclosure	0.8	None
J+73	Kp_ang	-	Phase PLL Kp	11.961	None
J+74	Ki_ang	-	Phase PLL ki	73.003	None
J+75	Fupper_ang	Pu	Phase PLL max freq	1.4	None
J+76	Flower_ang	Pu	Phase PLL min freq	0.6	None
J+77	FmeasT	s	Frequency measurement lag time	0	None
J+78	FctrlT	s	P(F) control frequency filter time	0.318	None
J+79	Fupper_freq	Pu	Frequency PLL max freq	1.4	None
J+80	Flower_freq	Pu	Frequency PLL min freq	0.6	None
J+81	UmeasT	s	voltage measurement lag time	0.003	None
J+82	PmeasT	s	P measurement lag time	0.006	None
J+83	QmeasT	s	Q measurement lag time	0.006	None
J+84	NormalPRampRate	%/s	P ramp rate during normal operation, percentage benchmark is Pmax	125	0.1~5000
J+85	NormalQRampRate	%/s	Q ramp rate during normal operation, percentage benchmark is Qmax	125	0.1~5000
J+86	HvrtThres	V	HVRT voltage threshold	960	1.0*Vn~1.36*Vn
J+87	HvrtIqK	-	HVRT Iq factor K	0	0.0~10.0
J+88	Irradiance0	W/m2	Irradiance/DcPower/Vdc lookup table Irradiance0	100	None
J+89	Irradiance1	W/m2	Irradiance/DcPower/Vdc lookup table Irradiance1	200	None

J+90	Irradiance2	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance2	300	None
J+91	Irradiance3	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance3	400	None
J+92	Irradiance4	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance4	500	None
J+93	Irradiance5	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance5	600	None
J+94	Irradiance6	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance6	700	None
J+95	Irradiance7	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance7	800	None
J+96	Irradiance8	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance8	900	None
J+97	Irradiance9	W/m 2	Irradiance/DcPower/Vdc lookup table Irradiance9	1000	None
J+98	DcPower0	pu	Irradiance/DcPower/Vdc lookup table DcPower0	0.12	None
J+99	DcPower1	pu	Irradiance/DcPower/Vdc lookup table DcPower1	0.25	None
J+100	DcPower2	pu	Irradiance/DcPower/Vdc lookup table DcPower2	0.38	None
J+101	DcPower3	pu	Irradiance/DcPower/Vdc lookup table DcPower3	0.52	None
J+102	DcPower4	pu	Irradiance/DcPower/Vdc lookup table DcPower4	0.66	None

J+103	DcPower5	pu	Irradiance/DcPower/Vdc lookup table DcPower5	0.81	None
J+104	DcPower6	pu	Irradiance/DcPower/Vdc lookup table DcPower6	0.95	None
J+105	DcPower7	pu	Irradiance/DcPower/Vdc lookup table DcPower7	1.1	None
J+106	DcPower8	pu	Irradiance/DcPower/Vdc lookup table DcPower8	1.25	None
J+107	DcPower9	pu	Irradiance/DcPower/Vdc lookup table DcPower9	1.36	None
J+108	MppVdc0	V	Irradiance/DcPower/Vdc lookup table MppVdc0	1000	None
J+109	MppVdc1	V	Irradiance/DcPower/Vdc lookup table MppVdc1	1007.5	None
J+110	MppVdc2	V	Irradiance/DcPower/Vdc lookup table MppVdc2	1015	None
J+111	MppVdc3	V	Irradiance/DcPower/Vdc lookup table MppVdc3	1022.5	None
J+112	MppVdc4	V	Irradiance/DcPower/Vdc lookup table MppVdc4	1030	None
J+113	MppVdc5	V	Irradiance/DcPower/Vdc lookup table MppVdc5	1037.5	None
J+114	MppVdc6	V	Irradiance/DcPower/Vdc lookup table MppVdc6	1045	None
J+115	MppVdc7	V	Irradiance/DcPower/Vdc lookup table MppVdc7	1052.5	None
J+116	MppVdc8	V	Irradiance/DcPower/Vdc lookup table MppVdc8	1060	None
J+117	MppVdc9	V	Irradiance/DcPower/Vdc lookup table MppVdc9	1070	None
J+118	PF_Curve_P0	%	PowerFactor(P) curve control P0/Sn(%)	10	0~100

J+119	PF_Curve_P1	%	PowerFactor(P) curve control P1/Sn(%)	20	0~100
J+120	PF_Curve_P2	%	PowerFactor(P) curve control P2/Sn(%)	30	0~100
J+121	PF_Curve_P3	%	PowerFactor(P) curve control P3/Sn(%)	40	0~100
J+122	PF_Curve_P4	%	PowerFactor(P) curve control P4/Sn(%)	50	0~100
J+123	PF_Curve_P5	%	PowerFactor(P) curve control P5/Sn(%)	60	0~100
J+124	PF_Curve_P6	%	PowerFactor(P) curve control P6/Sn(%)	70	0~100
J+125	PF_Curve_P7	%	PowerFactor(P) curve control P7/Sn(%)	80	0~100
J+126	PF_Curve_P8	%	PowerFactor(P) curve control P8/Sn(%)	90	0~100
J+127	PF_Curve_P9	%	PowerFactor(P) curve control P9/Sn(%)	100	0~100
J+128	PF_Curve_PF0	-	PowerFactor(P) curve control PF0	1.0	（-1,-0.8]∪[0.8,1]
J+129	PF_Curve_PF1	-	PowerFactor(P) curve control PF1	1.0	（-1,-0.8]∪[0.8,1]
J+130	PF_Curve_PF2	-	PowerFactor(P) curve control PF2	1.0	（-1,-0.8]∪[0.8,1]
J+131	PF_Curve_PF3	-	PowerFactor(P) curve control PF3	1.0	（-1,-0.8]∪[0.8,1]
J+132	PF_Curve_PF4	-	PowerFactor(P) curve control PF4	1.0	（-1,-0.8]∪[0.8,1]
J+133	PF_Curve_PF5	-	PowerFactor(P) curve control PF5	-0.98	（-1,-0.8]∪[0.8,1]
J+134	PF_Curve_PF6	-	PowerFactor(P) curve control PF6	-0.96	（-1,-0.8]∪[0.8,1]
J+135	PF_Curve_PF7	-	PowerFactor(P) curve control PF7	-0.94	（-1,-0.8]∪[0.8,1]
J+136	PF_Curve_PF8	-	PowerFactor(P) curve control PF8	-0.92	（-1,-0.8]∪[0.8,1]

J+137	PF_Curve_PF9	-	PowerFactor(P) curve control PF9	-0.9	（-1,-0.8]∪[0.8,1]
J+138	QU_Curve_U0	%	Q(U) curve control U0/Vn(%)	80	80~136
J+139	QU_Curve_U1	%	Q(U) curve control U1/Vn(%)	90	80~136
J+140	QU_Curve_U2	%	Q(U) curve control U2/Vn(%)	92	80~136
J+141	QU_Curve_U3	%	Q(U) curve control U3/Vn(%)	98	80~136
J+142	QU_Curve_U4	%	Q(U) curve control U4/Vn(%)	102	80~136
J+143	QU_Curve_U5	%	Q(U) curve control U5/Vn(%)	106	80~136
J+144	QU_Curve_U6	%	Q(U) curve control U6/Vn(%)	110	80~136
J+145	QU_Curve_U7	%	Q(U) curve control U7/Vn(%)	115	80~136
J+146	QU_Curve_U8	%	Q(U) curve control U8/Vn(%)	120	80~136
J+147	QU_Curve_U9	%	Q(U) curve control U9/Vn(%)	136	80~136
J+148	QU_Curve_Q0	pu	Q(U) curve control Q0/PQ_curve_Pmax	0.31	-0.6~0.6
J+149	QU_Curve_Q1	pu	Q(U) curve control Q1/PQ_curve_Pmax	0.31	-0.6~0.6
J+150	QU_Curve_Q2	pu	Q(U) curve control Q2/PQ_curve_Pmax	0.31	-0.6~0.6
J+151	QU_Curve_Q3	pu	Q(U) curve control Q3/PQ_curve_Pmax	0.31	-0.6~0.6
J+152	QU_Curve_Q4	pu	Q(U) curve control Q4/PQ_curve_Pmax	0.0	-0.6~0.6
J+153	QU_Curve_Q5	pu	Q(U) curve control Q5/PQ_curve_Pmax	-0.31	-0.6~0.6
J+154	QU_Curve_Q6	pu	Q(U) curve control Q6/PQ_curve_Pmax	-0.31	-0.6~0.6

J+155	QU_Curve_Q7	pu	Q(U) curve control Q7/PQ_curve_Pmax	-0.31	-0.6~0.6
J+156	QU_Curve_Q8	pu	Q(U) curve control Q8/PQ_curve_Pmax	-0.31	-0.6~0.6
J+157	QU_Curve_Q9	pu	Q(U) curve control Q9/PQ_curve_Pmax	-0.31	-0.6~0.6
J+158	LC_Curve_U0	%	LVRT curve U0/Vn(%)	100	0~100
J+159	LC_Curve_U1	%	LVRT curve U1/Vn(%)	0	0~100
J+160	LC_Curve_U2	%	LVRT curve U2/Vn(%)	0	0~100
J+161	LC_Curve_U3	%	LVRT curve U3/Vn(%)	50	0~100
J+162	LC_Curve_U4	%	LVRT curve U4/Vn(%)	50	0~100
J+163	LC_Curve_U5	%	LVRT curve U5/Vn(%)	80	0~100
J+164	LC_Curve_U6	%	LVRT curve U6/Vn(%)	80	0~100
J+165	LC_Curve_U7	%	LVRT curve U7/Vn(%)	90	0~100
J+166	LC_Curve_U8	%	LVRT curve U8/Vn(%)	90	0~100
J+167	LC_Curve_U9	%	LVRT curve U9/Vn(%)	95	0~100
J+168	LC_Curve_T0	ms	LVRT curve T0	0.0	0~180000
J+169	LC_Curve_T1	ms	LVRT curve T1	0.0	0~180000
J+170	LC_Curve_T2	ms	LVRT curve T2	300	0~180000
J+171	LC_Curve_T3	ms	LVRT curve T3	300	0~180000
J+172	LC_Curve_T4	ms	LVRT curve T4	900	0~180000
J+173	LC_Curve_T5	ms	LVRT curve T5	900	0~180000
J+174	LC_Curve_T6	ms	LVRT curve T6	1000	0~180000
J+175	LC_Curve_T7	ms	LVRT curve T7	1000	0~180000
J+176	LC_Curve_T8	ms	LVRT curve T8	120000	0~180000
J+177	LC_Curve_T9	ms	LVRT curve T9	120000	0~180000
J+178	HC_Curve_U0	%	HVRT curve U0/Vn(%)	120	None
J+179	HC_Curve_U1	%	HVRT curve U1/Vn(%)	110	None

J+180	HC_Curve_U2	%	HVRT curve U2/Vn(%)	105	None
J+181	HC_Curve_U3	%	HVRT curve U3/Vn(%)	105	None
J+182	HC_Curve_U4	%	HVRT curve U4/Vn(%)	105	None
J+183	HC_Curve_U5	%	HVRT curve U5/Vn(%)	105	None
J+184	HC_Curve_U6	%	HVRT curve U6/Vn(%)	105	None
J+185	HC_Curve_U7	%	HVRT curve U7/Vn(%)	105	None
J+186	HC_Curve_U8	%	HVRT curve U8/Vn(%)	105	None
J+187	HC_Curve_U9	%	HVRT curve U9/Vn(%)	105	None
J+188	HC_Curve_T0	ms	HVRT curve T0	0	None
J+189	HC_Curve_T1	ms	HVRT curve T1	300	None
J+190	HC_Curve_T2	ms	HVRT curve T2	120000	None
J+191	HC_Curve_T3	ms	HVRT curve T3	120000	None
J+192	HC_Curve_T4	ms	HVRT curve T4	120000	None
J+193	HC_Curve_T5	ms	HVRT curve T5	120000	None
J+194	HC_Curve_T6	ms	HVRT curve T6	120000	None
J+195	HC_Curve_T7	ms	HVRT curve T7	120000	None
J+196	HC_Curve_T8	ms	HVRT curve T8	120000	None
J+197	HC_Curve_T9	ms	HVRT curve T9	120000	None
J+198	FDZ	Hz	FSM dead zone	0.05	0~0.2*Fn
J+199	DroopFSM	%	FSM control Droop, The default is 4% and the formula is 4%*Fn for Pamx~0.	4	1~20
J+200	FSMRampRate	%/min	FSM control ramp rate during FSM operation, percentage benchmark is Pmax	600	0~6000
J+201	FSMPowerLim	%	FSM control power limit value, percentage benchmark is Pmax	10	0~100

J+202	UFRPstr	Hz	Under frequency boost power control start frequency	49.5	0.8*Fn ~1.2*Fn
J+203	UFRPrecov	Hz	Under frequency boost power control recovery frequency	49.5	0.8*Fn ~1.2*Fn
J+204	UFRPstop	Hz	Under frequency boost power control stop frequency	44.5	0.8*Fn ~1.2*Fn
J+205	UFRPpowerLim	%	Under frequency boost power control power limit percentage, percentage benchmark is Pmax	100	0~100

5.2.3 PV_330_GC29_V100 STATEs

- Table 3: PV_330_GC29_V100 STATEs

STATEs	Symbol	Unit	Description
K+0	xpllp1	rad/s	First state of phase PLL
K+1	xpllp2	rad	Second state of phase PLL
K+2	xF	pu	Frequency measurement
K+3	xF_Fctrl	pu	Frequency filter for P(F) control
K+4	xP	pu	Active power measurement
K+5	xQ	pu	Reactive power measurement
K+6	xU	pu	Terminal voltage measurement

5.2.4 PV_330_GC29_V100 VARs

- Table 4: PV_330_GC29_V100 VARs

VARs	Unit	Description
L+0	W/m^2	solar irradiance
L+1	pu	P reference set by external
L+2	pu	P limit set by external

L+3	kVar	Q reference fixed value set by external
L+4	-	Power factor reference set by external
L+5	0 or 1	P Q priority set by external. 0=Q has higher priority, 1=P has higher priority
L+6	pu	active current reference
L+7	pu	reactive current reference
L+8	W/m^2	solar irradiance in previous solving time step
L+9	V	DC bus voltage
L+10	V	DC bus voltage reference
L+11	pu	P reference set by MPPT
L+12	pu	P reference before PQ curve limit
L+13	0, 1, or 2	The inverter status in P(f) control: 0=free run, 1=decreased P, 2=ramping up from decreased P. Used only when P Mode is 2.
L+14	pu	Q reference before PQ curve limit
L+15	pu	P reference after PQ curve limit
L+16	pu	Q reference after PQ curve limit
L+17	0 or 1	1 for in LVRT status, otherwise 0
L+18	0 or 1	LVRT status of previous solving time step
L+19	s	LVRT timer to determine whether the time in low voltage is long enough to set LVRT status to 1
L+20	s	Timer for ramping Iq from pre-LVRT value to LVRT target Iq value
L+21	pu	Pref before applying P(f) ctrl
L+22	pu	Actual P just before P(f) reducing P due to high Freq
L+23	pu	0.5s moving average of voltage when it is not in LVRT
L+24	pu	0.5s moving average of reactive current when it is not in LVRT
L+25	pu	delayed voltage by 0.5s when it is not in LVRT
L+26	pu	delayed reactive current by 0.5s when it is not in LVRT

L+27	s	post LVRT ramping timer
L+28	0 or 1	MCB status. 1=Closed, 0=opened
L+29	0 or 1	1=long fault, otherwise 0
L+30	s	MCB reclose timer
L+31	pu	P limit set by protection and reclose
L+32	pu	Q limit set by protection and reclose
L+33	pu	P ref for Id Iq control
L+34	pu	Q ref for Id Iq control
L+35	Hz	measured frequency
L+36	rad	measured phase angle
L+37	s	Over voltage protection timer 1
L+38	s	Over voltage protection timer 2
L+39	s	Over voltage protection timer 3
L+40	s	Over voltage protection timer 4
L+41	s	Over voltage protection timer 5
L+42	s	Under voltage protection timer 1
L+43	s	Under voltage protection timer 2
L+44	s	Under voltage protection timer 3
L+45	s	Under voltage protection timer 4
L+46	s	Over frequency timer 1
L+47	s	Over frequency timer 2
L+48	s	Over frequency timer 3
L+49	s	Over frequency timer 4
L+50	s	Over frequency timer 5
L+51	s	Under frequency timer 1

L+52	s	Under frequency timer 2
L+53	s	Under frequency timer 3
L+54	s	Under frequency timer 4
L+55	s	Under frequency timer 5
L+56	s	Under frequency timer 6
L+57	s	Under frequency timer 7
L+58	0 or 1	tripped by Over voltage protection 1
L+59	0 or 1	tripped by Over voltage protection 2
L+60	0 or 1	tripped by Over voltage protection 3
L+61	0 or 1	tripped by Over voltage protection 4
L+62	0 or 1	tripped by Over voltage protection 5
L+63	0 or 1	tripped by Under voltage protection 1
L+64	0 or 1	tripped by Under voltage protection 2
L+65	0 or 1	tripped by Under voltage protection 3
L+66	0 or 1	tripped by Under voltage protection 4
L+67	0 or 1	tripped by Over frequency 1
L+68	0 or 1	tripped by Over frequency 2
L+69	0 or 1	tripped by Over frequency 3
L+70	0 or 1	tripped by Over frequency 4
L+71	0 or 1	tripped by Over frequency 5
L+72	0 or 1	tripped by Under frequency 1
L+73	0 or 1	tripped by Under frequency 2
L+74	0 or 1	tripped by Under frequency 3
L+75	0 or 1	tripped by Under frequency 4
L+76	0 or 1	tripped by Under frequency 5

L+77	0 or 1	tripped by Under frequency 6
L+78	0 or 1	tripped by Under frequency 7
L+79	0 or 1	tripped by any protection
L+80	-	first memory slot
L+81	-	last memory slot
L+82	s	post LVRT P ramp up count down timer
L+83	s	LVRT Curve related timer
L+84	s	LVRT Curve related time
L+85	0 or 1	LVRT Curve related , tripped by LVRT Curve,0 or 1
L+86	s	post LVRT Q ramp up count down timer
L+87	pu	DC bus current,it uses In as the benchmark
L+88	pu	Active current,it uses In as the benchmark
L+89	pu	Reactive current,it uses In as the benchmark
L+90	0 or 1	OverVolFlg,1 for in OverVol status, otherwise 0
L+91	pu	TrigUpThres, Over voltage logic thres used in smart QU
L+92	0 or 1	LvrtIneffeFlg, 1 for in Ineffective LVRT status, otherwise 0
L+93	s	LvrtEffeTimer, timer for LVRT status
L+94	0 or 1	UnderVolFlg, 1 for in UnderVol status, otherwise 0
L+95	s	TrigDnThres, Under voltage logic thres used in smart QU
L+96	s	LvrtLongTimer, timer for LVRT long status
L+97	0 or 1	LvrtLongState, 1 for LVRT long status, otherwise 0
L+98	0 or 1	ZvrtFlg, 1 for in ZVRT status, otherwise
L+99	0 or 1	trip_HvrtCurve, HVRT Curve related , tripped by HVRT Curve
L+100	s	HvrtCurve_Timer, HVRT Curve related timer
L+101	s	HvrtCurve_Time, HVRT Curve related time

L+102	s	HvrtTimer, HVRT timer to determine whether the time in high voltage is long enough to set VRT status to 2
L+103	0 or 1	VrtRecovFlg, 1 for 5s delay after the end of the VRT Flg, otherwise 0
L+104	s	VrtRecovFlgTimer, timer for VrtRecovFlg status
L+105	pu	AvgIdPreLvrt, 1.0s moving averge of active current when it is not in VRT
L+106	pu	iddelay, delayed active current by 1.0s when it is not in VRT
L+107	0 or 1	FSMStatus, FSM status
L+108	pu	PmFSM, Actual P when trigger FSM
L+109	pu	FSMPtarget, FSM target Power
L+110	pu	PmUF, Actual P when trigger UFRP

Appendix A –Description: About the naming rules of model.

Model name: **PV_330_GC29_V100**

Explanation of words:

PV: PV inverter

330: power level of the product

GC29: No.29 grid code. This is the ordering of the modeled grid code.

V100: Version 1.0.0

SUN2000-330KTL-H1

Output Charateristics Curve

Huawei Technologies Co.,Ltd

Version	Created by	Date	Remarks
01	Huawei	08/22/2022	preliminary

1. Description

This document describes output characteristics curve of the SUN2000-330KTL-H1, including the P-Q curve, temperature derating curve, and high altitude derating curve.

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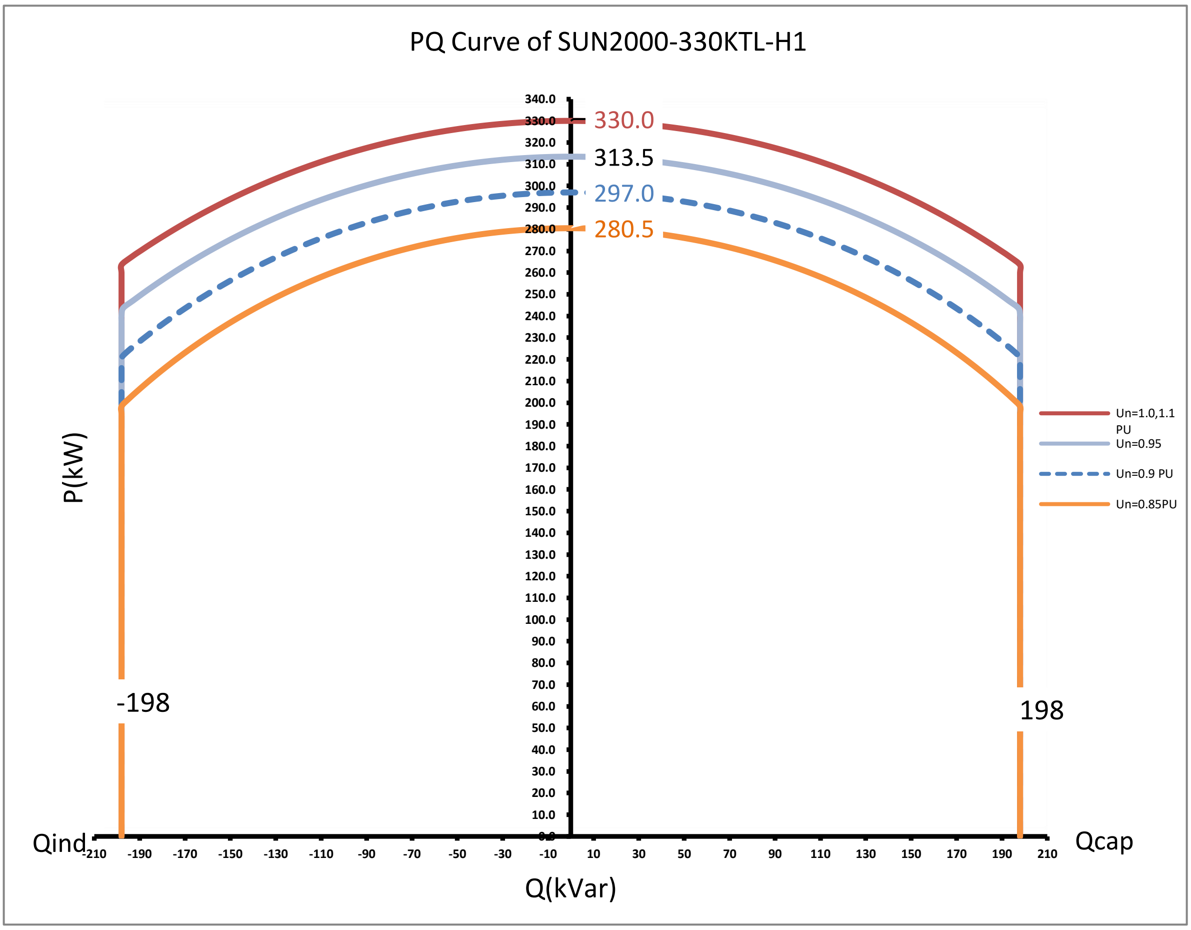
2. Output Charateristics Curve

2.1 P-Q curve

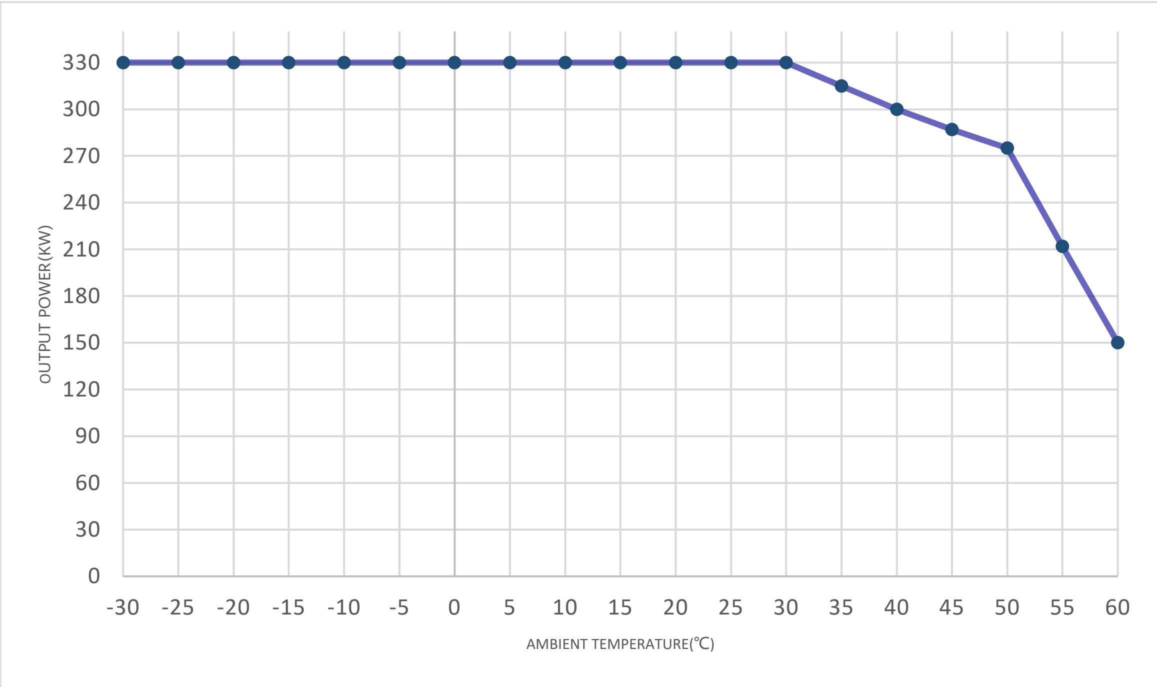


For SUN2000-330KTL-H1 inverter, its rated AC active power is 300kW and maximum AC active power is 330kW, maximum apparent active power is 330kVA,maximum reactive power range is -198kVar~+198kVar.

2.2 Power De-rating Curve VS. Ambient Temperature

When the ambient temperature is high, the inverter reduces the output power to ensure product safety and service life. The following figure shows the temperature derating curve of the SUN2000-330KTL-H1.

Power De-rating Curve VS. Ambient Temperature of SUN2000-330KTL-H1



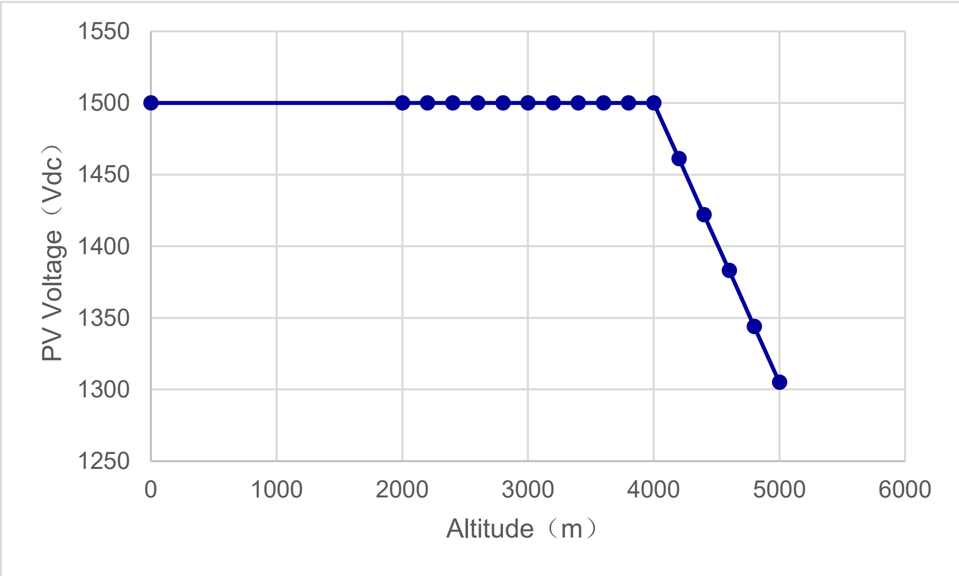
Grid Voltage:800Vac,PF=1

Model	-30°C	-25°C	-20°C	-15°C	-10°C	-5°C	0°C	5°C	10°C	15°C
SUN2000-330KTL-H1	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW
	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	
	330 kW	330 kW	330 kW	315 kW	300 kW	287 kW	275 kW	212 kW	150 kW	

2.3 DC Voltage Curve VS. Altitude

As the altitude increases, the air density decreases and the heat dissipation effect of the inverter decreases. In addition, the air density decreases, the free travel of electrons increases, the kinetic energy increases which may cause easier breakdown and ionization. Therefore, to ensure product safety, the maximum input voltage of the inverter needs derating. In actual applications, PV modules should be properly configured in high-altitude scenarios to prevent improper high voltage at the DC side of the inverter. The altitude derating curve is as follows:

DC Voltage Curve VS. Altitude of SUN2000-300KTL-H1



Power Consumption
When Q at Night Test Data

Huawei Technologies Co., Ltd.

Prepared by：	Zhan Lichao/00465286	Date	2023-04-21
Reviewed by：	Cao Zhen/00545484		
	Fanghongmiao/00493854	Date	2023-04-25
Approved by:	Su Yutian/00670074	Date	2023-04-25

Power Consumption When Q at Night

SUN2000-330KTL-H1，@25℃		
Reactive Power Percentage	P (W)	Q (Var)
0%	-437.9	-54.5
10%	-495.7	33031.9
20%	-809.5	66353.2
30%	-1164.5	99646.1
40%	-1609.4	132961.4
50%	-2188.1	166213.4
60%	-2774.4	199512.8
-10%	-552.1	-33327.6
-20%	-880.0	-66659.7
-30%	-1285.7	-99997.2
-40%	-1754.3	-133253.3
-50%	-2337.4	-166525.8
-60%	-3062.8	-199848.7

SUN2000-330KTL-H2，@25℃		
Reactive Power Percentage	P (W)	Q (Var)
0%	-612.0	-27.1
10%	-505.9	33145.0
20%	-816.2	66587.7
30%	-1177.9	100063.8
40%	-1637.1	133439.5
50%	-2219.4	166848.7
60%	-2875.8	200194.1
-10%	-551.5	-33424.3
-20%	-895.7	-66847.1
-30%	-1275.5	-100344.6
-40%	-1778.1	-133661.9
-50%	-2367.3	-167073.7
-60%	-3093.3	-200424.0

JUPITER-3000K-H1
Smart Transformer Station

Simple

Prefabricated and Pre-tested, No Internal Cabling Needed Onsite
Compact 20' HC Container Design for Easy Transportation

Efficient

High Efficiency Transformer for Higher Yields
Lower Self-consumption for Higher Yields

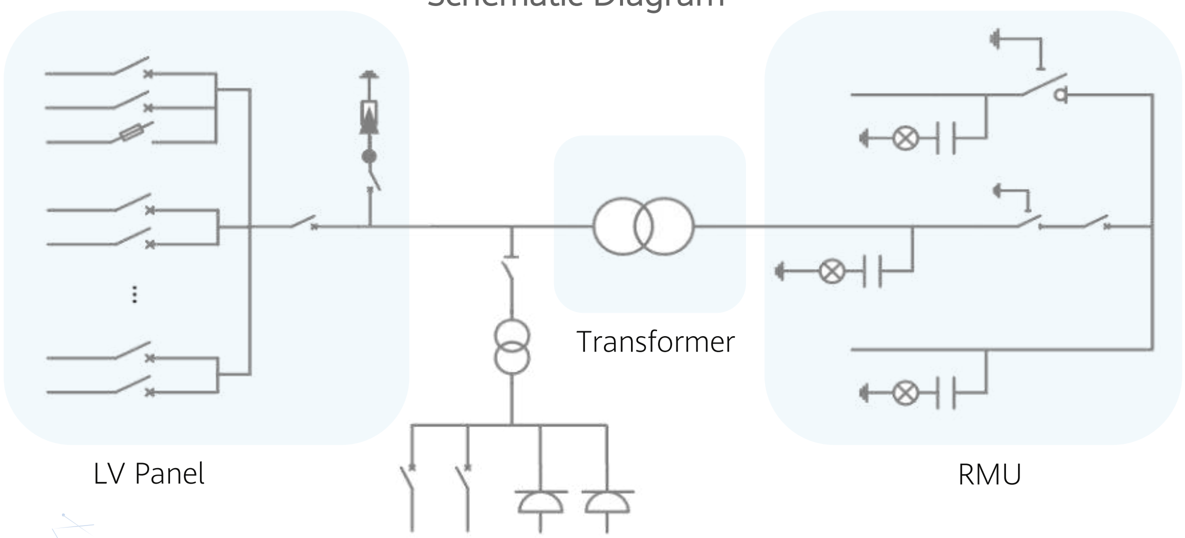
Smart

Real-time Monitoring of Transformer, LV Panel and RMU
High Precision Sensor of LV Electricity Parameters
Remote Control of ACB and MV Circuit Breaker

Reliable

Robust Design against Harsh Environments
Optimal Cooling Design for High Availability and Easy O&M
Comprehensive Tests from Components, Device to Solution

Schematic Diagram



JUPITER-3000K-H1

Technical Specifications

Input		
Available Inverters / PCS	SUN2000-330KTL-H1 / SUN2000-330KTL-H2	
Maximum LV AC Inputs	11	
AC Power	3,300 kVA @40℃ / 3,025 kVA @50℃ [1]	
Rated Input Voltage	800 V	
LV Main Switches	ACB (2,900 A / 800 V / 3P, 1 x 1 pcs), MCCB (400 A / 800 V / 3P, 11 pcs)	
Output		
Rated Output Voltage	10 kV, 11 kV, 13.2 kV, 15 kV, 20 kV, 22 kV, 23±10% kV, 30 kV, 33 kV, 34.5 kV, 35 kV [2]	13.8 kV, 33 kV, 34.5 kV [2]
Frequency	50 Hz	60 Hz
Transformer Type	Oil-immersed, Conservator Type	
Transformer Cooling Type	ONAN	
Transformer Tappings	± 2 x 2.5%	
Transformer Oil Type	Mineral Oil (PCB Free)	
Transformer Vector Group	Dy11	
Transformer Min. Peak Efficiency Index	In Accordance with EN 50588-1	
RMU Type	SF_6 Gas Insulated	
RMU Transformer Protection Unit	MV Vacuum Circuit Breaker Unit	
RMU Cable Incoming / Outgoing Unit	Direct Cable Unit or Cable Load Break Switch Unit	
Auxiliary Transformer	Dry Type Transformer, 5 kVA, Single-phase, li0	
Output Voltage of Auxiliary Transformer	230 / 127 Vac	
Protection		
Transformer Monitoring & Protection	Oil Level, Oil Temperature, Oil Pressure and Buchholz	
Protection Degree of MV & LV Room	IP 54	
Internal Arcing Fault Classification of STS	IAC A 20 kA 1s	
MV Relay Protection	50/51, 50N/51N	
LV Overvoltage Protection	Type I+II	
Anti-rodent Protection	C5-Medium in accordance with ISO 12944	
Features		
2 kVA UPS	Optional [3]	
MV Surge Arrester for Transformer	Optional [3]	
General		
Dimensions (W x H x D)	6,058 x 2,896 x 2,438 mm (20' HC Container)	
Weight	< 15 t	
Operating Temperature Range	-25℃ ~ 60℃ [4] (-13°F ~ 140°F)	
Relative Humidity	0% ~ 95%	
Max. Operating Altitude	1,000 m [5]	
MV-LV AC Connections	Prewired and Pretested, No Internal Cabling Onsite	
LV & MV Room Cooling	Smart Cooling without Air-across for Higher Availability	
Communication	Modbus-RTU, Preconfigured with Smartlogger3000B	
Applicable Standards	IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1	

1 - More detailed AC power of STS, please refer to the de-rating curve.
2 - Rated output voltage from 10 kV to 35 kV, more available upon request
3 - Extra expense needed for optional features which standard product doesn't contain, more options upon request.
4 -When ambient temperature ≥55℃, awning shall be equipped for STS on site by customer.
5- For higher operating altitude, pls consult with Huawei.

Smart Transformer Station
De-rating Curve
JUPITER-3000K-H1 Series

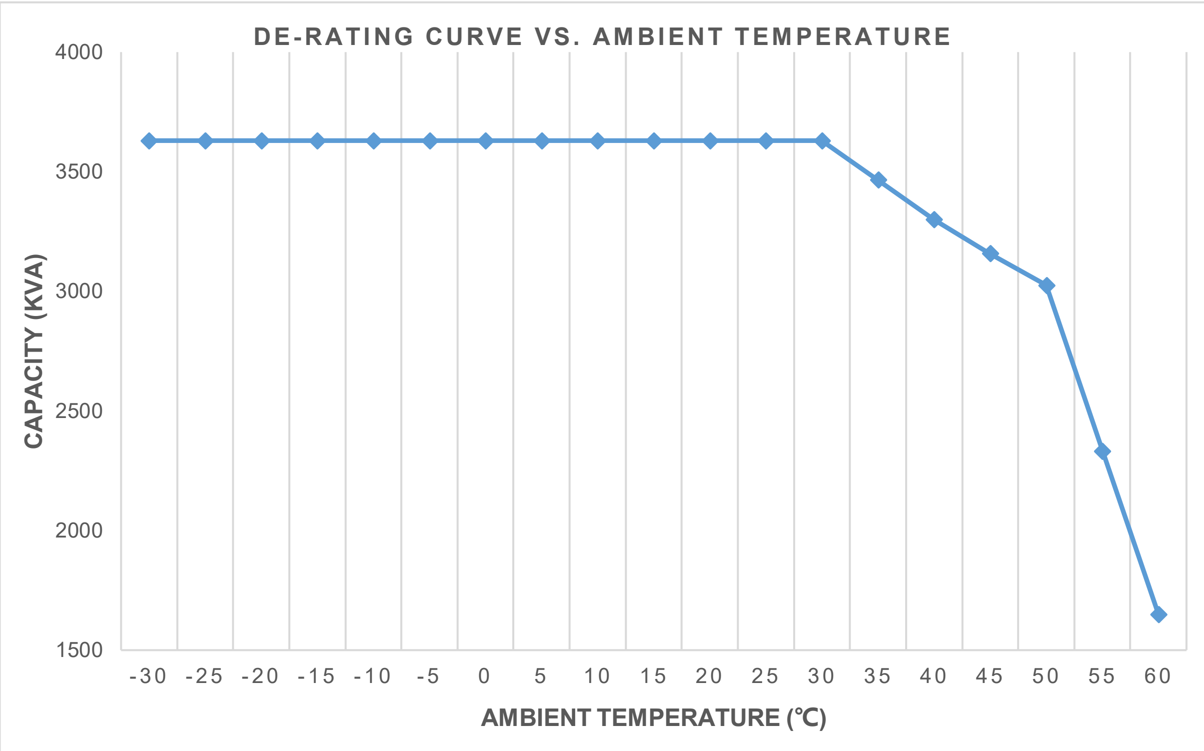
Preliminary

Huawei Technologies Co., Ltd.

Version	Created by	Date	Remarks
V1.0	Wangwei	2022.8.26	Preliminary

De-rating Curve VS. Ambient Temperature

De-rating curve VS. ambient temperature of smart transformer station JUPITER-3000K-H1 series



Model	Type	-25 °C	30 °C	35 °C	40 °C[1]	45 °C	50 °C[2]	55 °C	60 °C
JUPITER-3000K-H1	Rated	3,630 kVA	3,630 kVA	3,465 kVA	3,300 kVA	3,157 kVA	3,025 kVA	2,332 kVA	1,650 kVA

Note:

[1] at Ambient temperature max./monthly (hottest month)/annual average (°C) 40 / 30 / 20

[2] at Ambient temperature max./monthly (hottest month)/annual average (°C) 50 / 40 / 30

[3] Altitude 1000 m

JUPITER-(3000K, 6000K, 9000K)-H1 Smart Transformer Station

User Manual

Issue 04

Date 2024-04-30

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About This Document

Purpose

This document describes the appearance, transportation, storage, human-machine interaction, and system maintenance of the JUPITER-3000K-H1, JUPITER-6000K-H1, and JUPITER-9000K-H1 Smart Transformer Stations (STSs). Before installing and operating an STS, read through this document to understand the safety precautions and get familiar with the functions and features of the STS.

Figures provided in this document are for reference only.

Intended Audience

This document is intended for photovoltaic (PV) plant operators and qualified electricians.

Symbol Conventions

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

Symbol	Description
⚠ DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could 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	Description
NOTE	Supplements the important information in the main text. 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 updates made in earlier issues.

Issue 04 (2024-04-30)

Added **2.4.5.4 (Optional) Expansion Module**.

Added **6.8.23 Replacing Online Temperature Monitoring Devices in the MV Room**.

Updated **1.2 Electrical Safety**.

Updated **1.4 Transportation Requirements**.

Updated **1.5 Storage Requirements**.

Updated **2.4.2.1 JUPITER-3000K-H1**.

Updated **2.4.2.2 JUPITER-6000K-H1**.

Updated **2.4.2.3 JUPITER-9000K-H1**.

Updated **2.4.4 MV Room**.

Updated **4.1.1 Equipment Check**.

Updated **4.1.2.1 Insulation Test on the Transformer MV Side and the Ring Main Unit**.

Updated **6.8.15 Replacing a Main Control Module**.

Issue 03 (2024-03-08)

Added **3 Installation Environment Requirements**.

Added **A.6 How Do I Clean the Heat Exchanger?**.

Added **B Contact Information** and **C Digital Power Customer Service**.

Updated **1.4 Transportation Requirements**.

Updated **4.1.2.2 Insulation Test on the Transformer LV Side**.

Updated **4.5.1 (Optional) Unlocking Air Circuit Breakers in the LV Room**.

Updated **6.5 Routine Maintenance**.

Updated **6.7 Alarm List**.

Updated **6.8.15 Replacing a Main Control Module**.

Updated **6.8.16 Replacing Measurement and Control Modules**.

Issue 02 (2023-09-30)

Added the low-voltage (LV) coupling scenario where the inverter and PCS are connected to the same MCCB.

Added **Inverter and PCS Status Check (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)**.

Added **Powering On Inverters, PCSs, and the DTS (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)**.

Added **6.6 Maintaining Inverters and PCSs (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)**.

Added the LV coupling scenario where the inverter and PCS are connected to the same MCCB in **2.1 Overview**.

Added the exterior of the JUPITER-(3000K,6000K,9000K)-H1 in the LV coupling scenario where the inverter and PCS are connected to the same MCCB in **2.2 Appearance**.

Added the networking and component configuration description in the LV coupling scenario where the inverter and PCS are connected to the same MCCB in **2.5 Scenario-based Configurations**.

Updated **6.8.3 Replacing an SPD**.

Issue 01 (2023-01-30)

This issue is used for first office application (FOA).

Contents

1 Safety Information

Statement

Before transporting, storing, installing, operating, using, and/or maintaining the equipment, read this document, strictly follow the instructions provided herein, and follow all the safety instructions on the equipment and in this document. In this document, "equipment" refers to the products, software, components, spare parts, and/or services related to this document; "the Company" refers to the manufacturer (producer), seller, and/or service provider of the equipment; "you" refers to the entity that transports, stores, installs, operates, uses, and/or maintains the equipment.

The **Danger**, **Warning**, **Caution**, and **Notice** statements described in this document do not cover all the safety precautions. You also need to comply with relevant international, national, or regional standards and industry practices. **The Company shall not be liable for any consequences that may arise due to violations of safety requirements or safety standards concerning the design, production, and usage of the equipment.**

The equipment shall be used in an environment that meets the design specifications. Otherwise, the equipment may be faulty, malfunctioning, or damaged, which is not covered under the warranty. The Company shall not be liable for any property loss, personal injury, or even death caused thereby.

Comply with applicable laws, regulations, standards, and specifications during transportation, storage, installation, operation, use, and maintenance.

Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.

The Company shall not be liable for any of the following circumstances or their consequences:

- The equipment is damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- The equipment is operated beyond the conditions specified in this document.

- The equipment is installed or used in environments that do not comply with international, national, or regional standards.
- The equipment is installed or used by unqualified personnel.
- You fail to follow the operation instructions and safety precautions on the product and in the document.
- You remove or modify the product or modify the software code without authorization.
- You or a third party authorized by you cause the equipment damage during transportation.
- The equipment is damaged due to storage conditions that do not meet the requirements specified in the product document.
- You fail to prepare materials and tools that comply with local laws, regulations, and related standards.
- The equipment is damaged due to your or a third party's negligence, intentional breach, gross negligence, or improper operations, or other reasons not related to the Company.

1.1 Personal Safety

DANGER

Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will cause electric arcs, sparks, fire, or explosion, which may result in personal injury.

DANGER

Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.

DANGER

Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

DANGER

During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

⚠ WARNING

During operations, wear personal protective equipment such as protective clothing, insulated boots, safety helmets with face shields, and insulated gloves.

General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment.
- If there is a likelihood of personal injury or equipment damage during operations, immediately stop, report the case to the supervisor, and take feasible protective measures.
- Do not power on the equipment before it is installed or confirmed by professionals.
- Do not touch the power supply equipment directly or with conductors such as damp objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to ensure that there is no risk of electric shock.
- Do not touch operating equipment because the enclosure is hot.
- Do not touch a running fan with your hands, components, screws, tools, or boards. Otherwise, personal injury or equipment damage may occur.
- In the case of a fire, immediately leave the building or the equipment area and activate the fire alarm or call emergency services. Do not enter the affected building or equipment area under any circumstances.

Personnel Requirements

- Only professionals and trained personnel are allowed to operate the equipment.
  - Professionals: personnel who are familiar with the working principles and structure of the equipment, trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, maintenance
  - Trained personnel: personnel who are trained in technology and safety, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Personnel who plan to install or maintain the equipment must receive adequate training, be able to correctly perform all operations, and understand all necessary safety precautions and local relevant standards.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will perform special tasks such as electrical operations, working at heights, and operations of special equipment must possess the required local qualifications.
- Only certified high-voltage electricians are allowed to operate medium-voltage equipment.

- Only authorized professionals are allowed to replace the equipment or components (including software).
- Only personnel who need to work on the equipment are allowed to access the equipment.

1.2 Electrical Safety

DANGER

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

DANGER

Non-standard and improper operations may result in fire or electric shocks.

DANGER

Prevent foreign matter from entering the equipment during operations. Otherwise, equipment short-circuits or damage, load power derating, power failure, or personal injury may occur.

DANGER

When you power on the system for the first time or perform operations on the main loop with power on, wear arc protection clothes.

DANGER

When the system is running, do not open the cabinet doors or sealing plates in the energized area.

WARNING

For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.

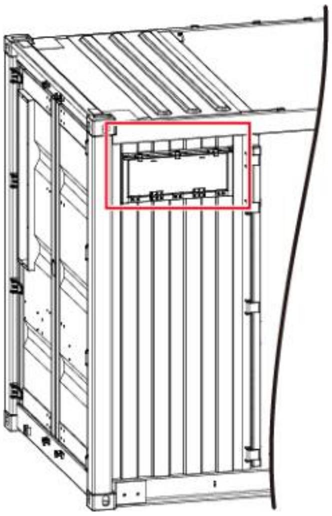
CAUTION

Do not route cables near the air intake or exhaust vents of the equipment.

CAUTION

- For the equipment with arc fault venting at the bottom, install the equipment according to the equipment foundation diagram and ensure that the gap between the medium-voltage room and the foundation is sealed.
- For the equipment with arc fault venting at the top, ensure that the vent is closed, as shown in **Figure 1-1**.

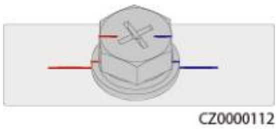
Figure 1-1 Arc fault vent closed



General Requirements

- Follow the procedures described in the document for installation, operation, and maintenance. Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission.
- Obtain approval from the national or local electric utility company before connecting the equipment to the grid.
- Observe the power plant safety regulations, such as the operation and work ticket mechanisms.
- Install temporary fences or warning ropes and hang "No Entry" signs around the operation area to keep unauthorized personnel away from the area.
- Before installing or removing power cables, turn off the switches of the equipment and its upstream and downstream switches.
- If any liquid is detected inside the equipment, disconnect the power supply immediately and do not use the equipment.
- Before performing operations on the equipment, check that all tools meet the requirements and record the tools. After the operations are complete, collect all of the tools to prevent them from being left inside the equipment.

- Before installing power cables, check that cable labels are correct and cable terminals are insulated.
- When installing the equipment, use a torque tool of a proper measurement range to tighten the screws. When using a wrench to tighten the screws, ensure that the wrench does not tilt and the torque error does not exceed 10% of the specified value.
- Ensure that bolts are tightened with a torque tool and marked in red and blue after double-check. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm that the bolts are tightened and then mark them in red. (The marks must cross the edges of the bolts.)



- After the installation is complete, ensure that protective cases, insulation tubes, and other necessary items for all electrical components are in position to avoid electric shocks.
- Keep the key to the medium-voltage equipment properly. The key can be used only by authorized personnel.
- Use instruments and meters in accordance with the regulations to avoid electric arcs, short circuits, or other risks.
- When operating the control panel of the ring main unit, ensure that you stand on an insulated stool or ladder.
- When the transformer is running with power on, do not operate the no-load voltage regulating switch, do not remove the high/low-voltage tubes, and do not connect cables or copper bars.
- After the equipment stops running, wait for at least 10 minutes to ensure that the voltage is in the safe range. Before maintenance or repair, ensure that the transfer switch is turned to the ground position, the potential indicator is off, the grounding switch of cabinet V in the ring main unit is turned on, and the low-voltage cabinet is grounded.
- During maintenance, turn off the air circuit breaker on the low-voltage side and the switch on the high-voltage side of the equipment, and place warning signs indicating that the switches must not be turned on. If the equipment supports the automatic mode, disable the automatic mode to ensure that the equipment will not be powered on unexpectedly.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- Before maintaining a downstream electrical or power distribution device, turn off the output switch on the power supply equipment.
- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.
- If fault diagnosis and troubleshooting need to be performed after power-off, take the following safety measures: Disconnect the power supply. Check whether the equipment is live. Install a ground cable. Hang warning signs and set up fences.

- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.
- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.
- For the equipment that uses a three-pin socket, ensure that the ground terminal in the socket is connected to the protective ground point.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated, and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- If a cable is routed into the cabinet from the top, bend the cable in a U shape outside the cabinet and then route it into the cabinet.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- When cable connection is completed or paused for a short period of time, seal the cable holes with sealing putty immediately to prevent small animals or moisture from entering.
- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.

- When routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.
- When the temperature is low, violent impact or vibration may damage the plastic cable sheathing. To ensure safety, comply with the following requirements:
  - Cables can be laid or installed only when the temperature is higher than 0°C. Handle cables with caution, especially at a low temperature.
  - Cables stored at below 0°C must be stored at room temperature for more than 24 hours before they are laid out.
- Do not perform any improper operations, for example, dropping cables directly from a vehicle. Otherwise, the cable performance may deteriorate due to cable damage, which affects the current-carrying capacity and temperature rise.

1.3 Environment Requirements

DANGER

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

DANGER

Do not store any flammable or explosive materials in the equipment area.

DANGER

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheat may damage the equipment or cause a fire.

WARNING

Install the equipment in an area far away from liquids. Do not install it under areas prone to condensation, such as under water pipes and air exhaust vents, or areas prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.

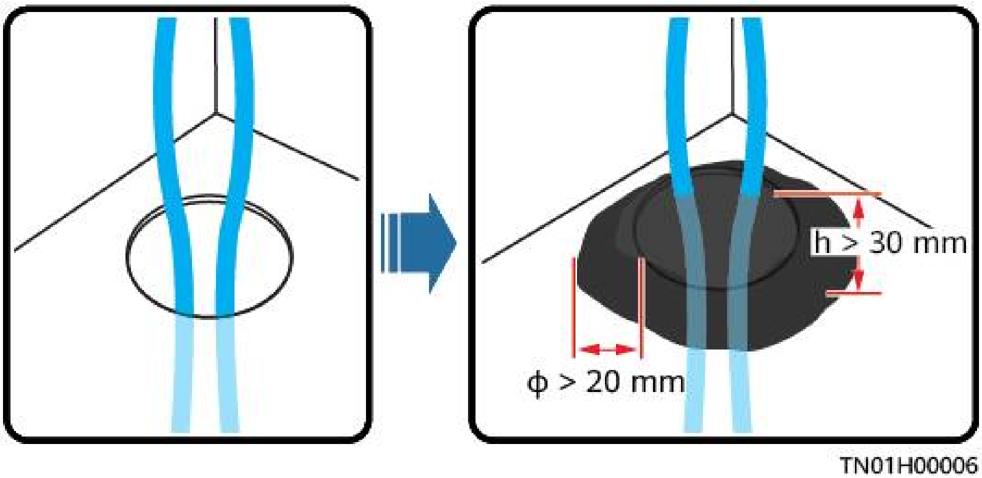
WARNING

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Ensure that the equipment is stored in a clean, dry, and well ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.
- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install the equipment in an area conducive to the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference. The equipment shall be installed in an environment with a magnetic field strength less than 4 Gauss. If the magnetic field strength is greater than or equal to 4 Gauss, the equipment may fail to work properly. If the magnetic field strength is high, for example, in a smeltery, you are advised to use a gauss meter to measure the magnetic field strength of the equipment installation position when the smelting equipment is running normally.
- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land prone to water or snow accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel.
- Before opening doors during the installation, operation, and maintenance of the equipment, clean up any water, ice, snow, or other foreign objects on the top of the equipment to prevent foreign objects from falling into the equipment.

- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- All cable holes must be sealed. Seal the used cable holes with sealing putty. Seal the unused cable holes with the caps delivered with the equipment. The following figure shows the criteria for correct sealing with sealing putty.



- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.4 Transportation Requirements

WARNING

For all projects involving international road transport over a distance of more than 1000 km, perform a road survey prior to transportation, use air-ride suspension vehicles, and follow speed limits.

NOTICE

- Choose sea or roads in good conditions for transportation. Do not transport the equipment by railway or air. Avoid tilt or jolt during transportation.
- Requirements for road transportation: Before transporting, conduct road survey to identify any obstacles in the transportation route to ensure that the vehicle can pass through the route safely. Survey information: road condition, height limit, actual height, width limit, actual width, weight limit, traffic restrictions, and obstacles.
- On normal roads, comply with the road speed limit and local regulations. On roads with poor conditions, the driving speed shall be limited to below 60 km/h in the case of slight cracks, potholes, raveling, upheavals/bumps and shall be reduced to below 10 km/h in the case of obvious potholes, cracks, and upheavals/bumps.
- Properly plan the transportation route. Even and fault-free roads are recommended for transportation. If poor road conditions cannot be avoided, comply with the preceding speed limit requirements.
- Driver fatigue is prohibited. Check that containers are secured. If oil leakage is found during the inspection, report the issue to the carrier to seek assistance.
- Do not stow the product in the bay with guide rails.

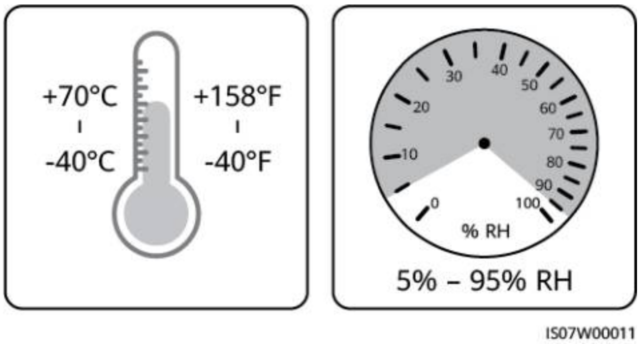
- Select proper transportation tools according to the dimensions and weight of the product.
- Transportation and storage service providers must have the qualifications for dangerous goods operations required by local laws, regulations, and standards. Rigid box trucks shall be used for transportation and pickup trucks are prohibited.
- The packing case must be solid and strong. Handle the packages with care and take moisture-proof measures during loading, transportation, and unloading. Do not place the packages on one side or upside down. Bind the packages securely to avoid displacement. Ensure that the dangerous goods labels are visible.
- When stacking containers, determine the maximum number of stacking layers based on the specifications on the containers. Place the containers neatly to prevent personal injury or equipment damage caused by toppling.
- Place the product horizontally during transportation.
- Prevent the product from colliding or scratching.
- Requirements for waterway transportation: The waterway must meet the requirements of full-load voyage.
- Tilt angle during transportation: ≤ 15°.

1.5 Storage Requirements

- Do not store the equipment in areas prone to contact with seawater.
- You are advised to store the equipment on the concrete ground or lay isolation materials under the transformer room to avoid the risk of soil pollution caused by potential transformer oil leakage.

- If the transformer leaks oil, contact the Company's technical support.
- The container doors are closed tightly.
- The equipment is placed horizontally during storage.
- The temperature and humidity of the storage environment are proper. Otherwise, the equipment may be damaged.

Figure 1-2 Storage temperature and humidity



- The storage environment must be clean and dry.
- For extended periods of storage, place silica gel moisture absorbent packs in the medium-voltage room and low-voltage room based on the site environment, and check and replace the silica gel moisture absorbent packs on a regular basis.
- After extended periods of storage, test the equipment in accordance with local laws and regulations and applicable standards before use.

1.6 Mechanical Safety

DANGER

When working at heights, wear a safety helmet and safety harness or waist belt and fasten it to a solid structure. Do not mount it on an insecure moveable object or metal object with sharp edges. Make sure that the hooks will not slide off.

WARNING

Ensure that all necessary tools are ready and inspected by a professional organization. Do not use tools that have signs of scratches or fail to pass the inspection or whose inspection validity period has expired. Ensure that the tools are secure and not overloaded.

WARNING

Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.

WARNING

When pulling equipment out of a cabinet, be aware of unstable or heavy objects in the cabinet to prevent injury.

WARNING

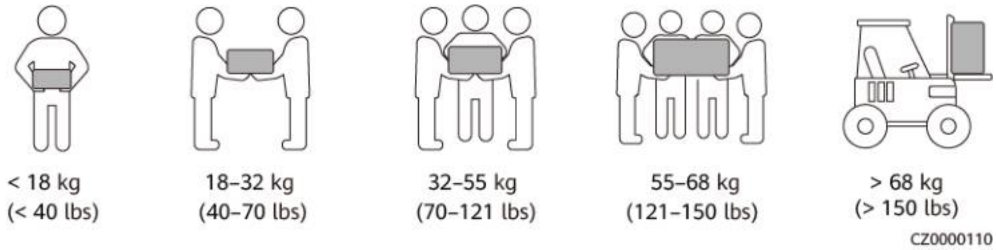
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches must not be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.
- Do not install other devices on the top of the equipment without evaluation by the Company.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.

- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea or roads in good conditions for transportation. Do not transport the equipment by railway or air. Avoid tilt or jolt during transportation.

Working at Heights

- Any operations performed 2 m or higher above the ground shall be supervised properly.
- Only trained and qualified personnel are allowed to work at heights.
- Do not work at heights when steel pipes are wet or other risky situations exist. After the preceding conditions no longer exist, the safety owner and relevant technical personnel need to check the involved equipment. Operators can begin working only after safety is confirmed.
- Set a restricted area and prominent signs for working at heights to warn away irrelevant personnel.
- Set guard rails and warning signs at the edges and openings of the area involving working at heights to prevent falls.
- Do not pile up scaffolding, springboards, or other objects on the ground under the area involving working at heights. Do not allow people to stay or pass under the area involving working at heights.
- Carry operation machines and tools properly to prevent equipment damage or personal injury caused by falling objects.
- Personnel involving working at heights are not allowed to throw objects from the height to the ground, or vice versa. Objects shall be transported by slings, hanging baskets, aerial work platforms, or cranes.
- Do not perform operations on the upper and lower layers at the same time. If unavoidable, install a dedicated protective shelter between the upper and lower layers or take other protective measures. Do not pile up tools or materials on the upper layer.
- Dismantle the scaffolding from top down after finishing the job. Do not dismantle the upper and lower layers at the same time. When removing a part, ensure that other parts will not collapse.

- Ensure that personnel working at heights strictly comply with the safety regulations. The Company is not responsible for any accident caused by violation of the safety regulations on working at heights.
- Behave cautiously when working at heights. Do not rest at heights.

Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Do not use single ladders.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the ladder is securely positioned and held firm.

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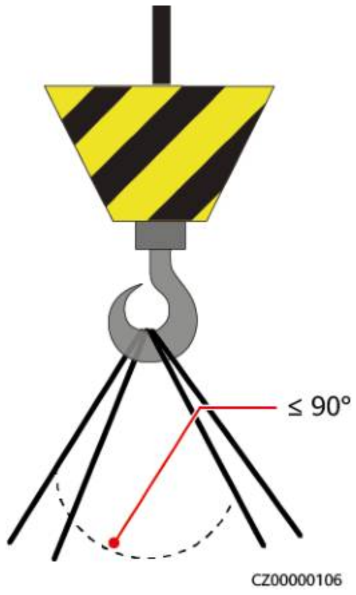
- When a step ladder is used, ensure that the pull ropes are secured.
- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.

Hoisting

- Only trained and qualified personnel are allowed to perform hoisting operations.
- Install temporary warning signs or fences to isolate the hoisting area.
- Ensure that the foundation where hoisting is performed on meets the load-bearing requirements.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a fixed object or wall that meets the load-bearing requirements.
- During hoisting, do not stand or walk under the crane or the hoisted objects.
- Do not drag steel ropes and hoisting tools or bump the hoisted objects against hard objects during hoisting.
- Ensure that the angle between two hoisting ropes is no more than 90 degrees, as shown in the following figure.



Drilling Holes

- Obtain consent from the customer and contractor before drilling holes.
- Wear protective equipment such as safety goggles and protective gloves when drilling holes.
- To avoid short circuits or other risks, do not drill holes into buried pipes or cables.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings.

2 Product Description

2.1 Overview

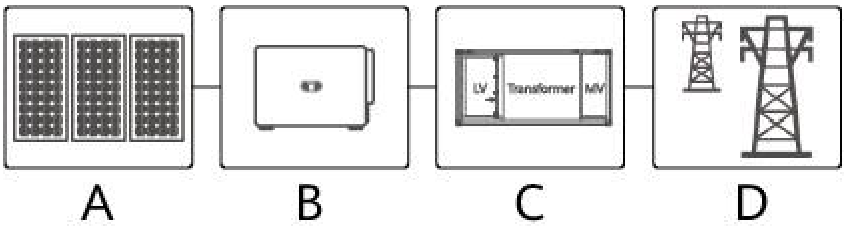
Functions

An STS converts LV AC power generated by solar inverters into medium-voltage (MV) AC power and feeds it into a power grid.

It is a steel-structure container that houses devices including the LV panels, transformer, ring main unit, and auxiliary power supply to provide a highly integrated power transformation and distribution solution for utility-scale PV plants in MV grid-connection scenarios.

Networking Application

Figure 2-1 PV-only scenario



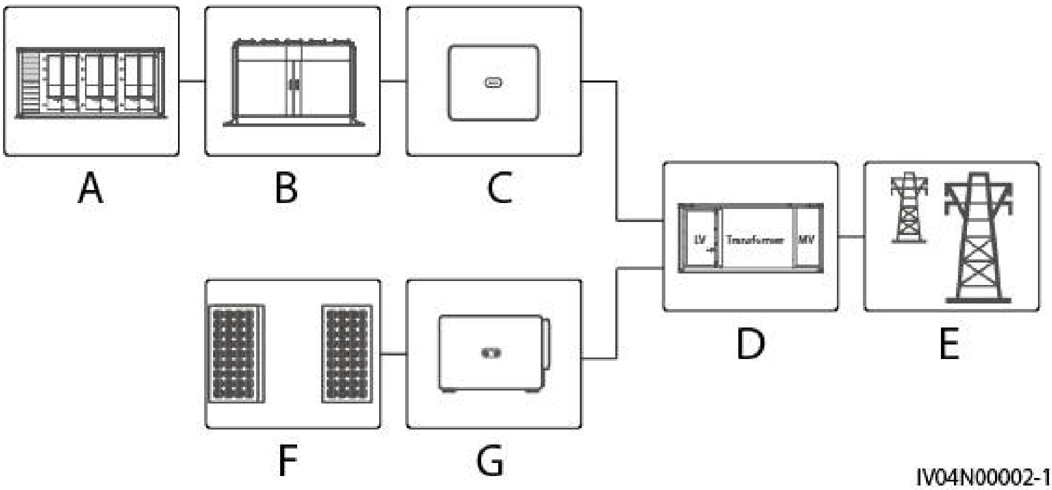
(A) PV string

(B) SUN2000 inverter

(C) STS

(D) Power grid

Figure 2-2 LV coupling scenario where the inverter and PCS are connected to the same MCCB



(A) Smart String ESS
(B) (Optional) DC LV Panel
(C) Smart PCS
(D) STS
(E) Power grid
(F) PV string
(G) SUN2000 inverter

2.2 Appearance

PV-Only Scenario

Figure 2-3 JUPITER-3000K-H1 exterior (PV-only scenario)

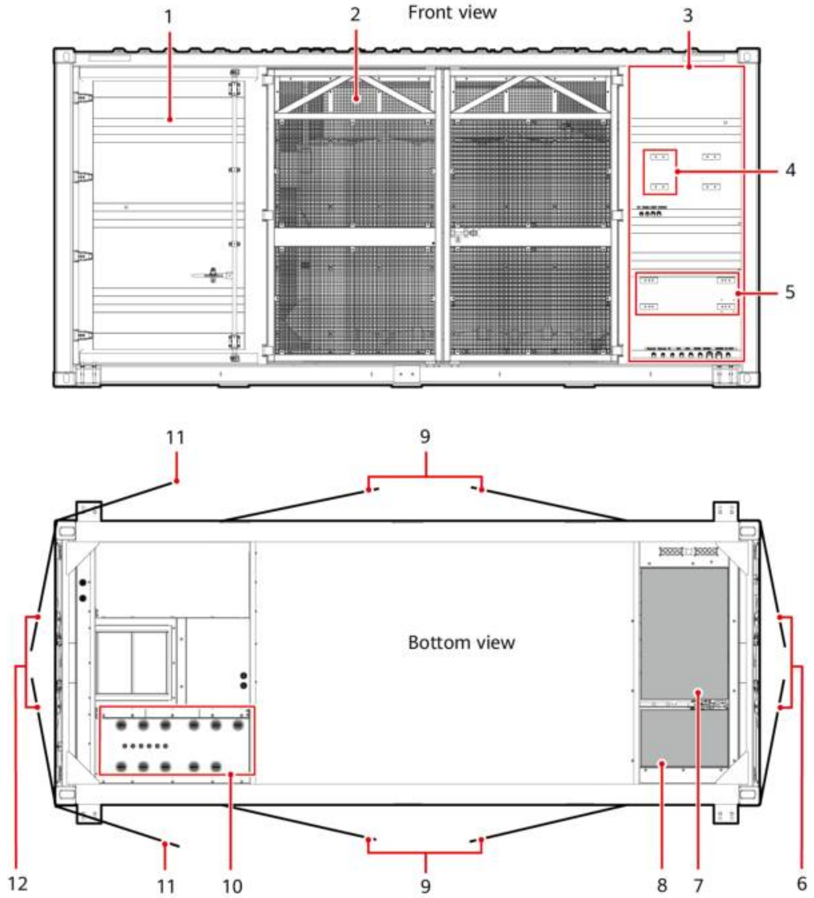


Figure 2-4 JUPITER-6000K-H1 exterior (PV-only scenario)

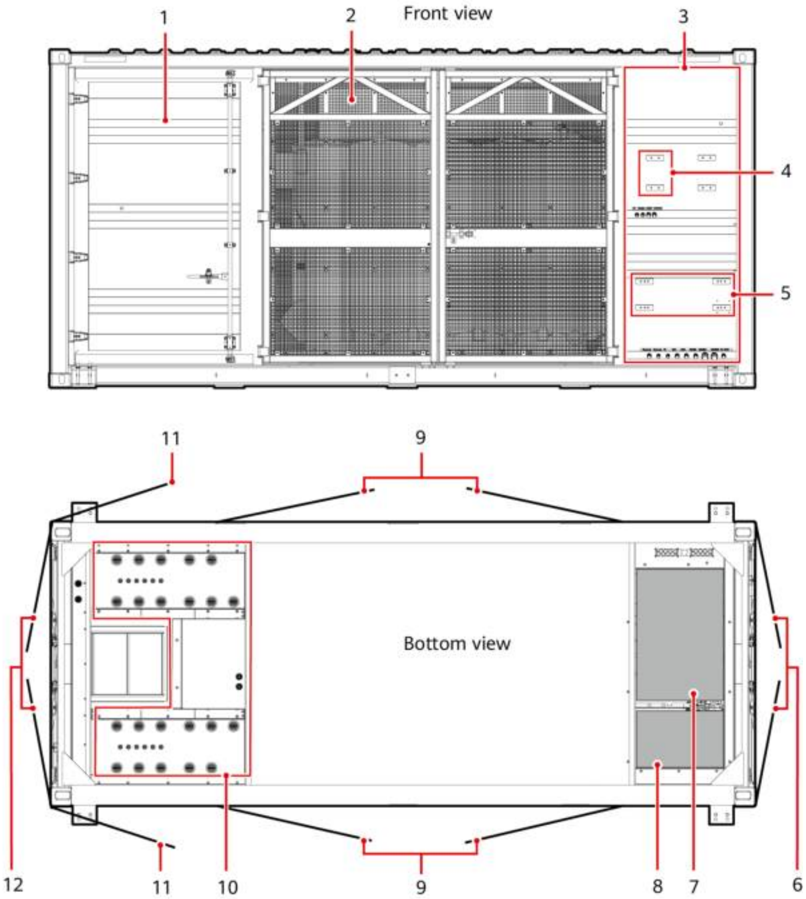
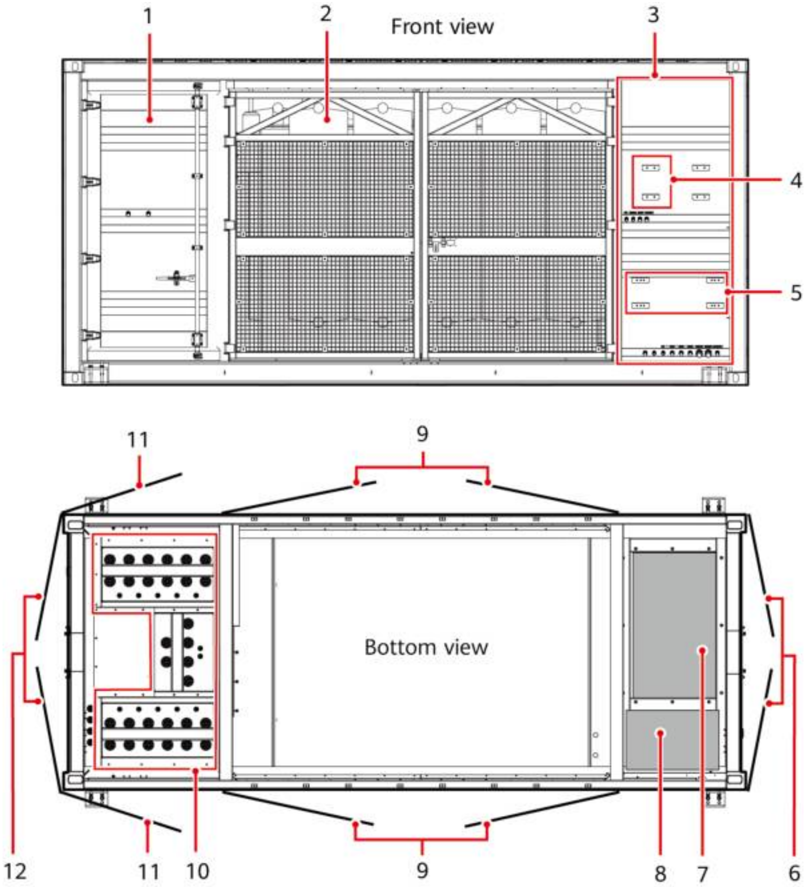


Figure 2-5 JUPITER-9000K-H1 exterior (PV-only scenario)



(1) Low-voltage room (LV)	(2) Transformer room (TR)	(3) Medium-voltage room (MV)
(4) Installation position for the distributed power supply (UPS)	(5) Installation position for the Smart Array Controller (SACU)	(6) Double-swing door for the MV room
(7) Ring main unit	(8) Auxiliary transformer	(9) Double-swing screen door for the TR room
(10) Holes for AC input power cables	(11) Single-swing door for the LV room	(12) Double-swing door for the LV room

LV Coupling Scenario Where the Inverter and PCS Are Connected to the Same MCCB

Figure 2-6 JUPITER-3000K-H1 exterior (LV coupling scenario where the inverter and PCS are connected to the same MCCB)

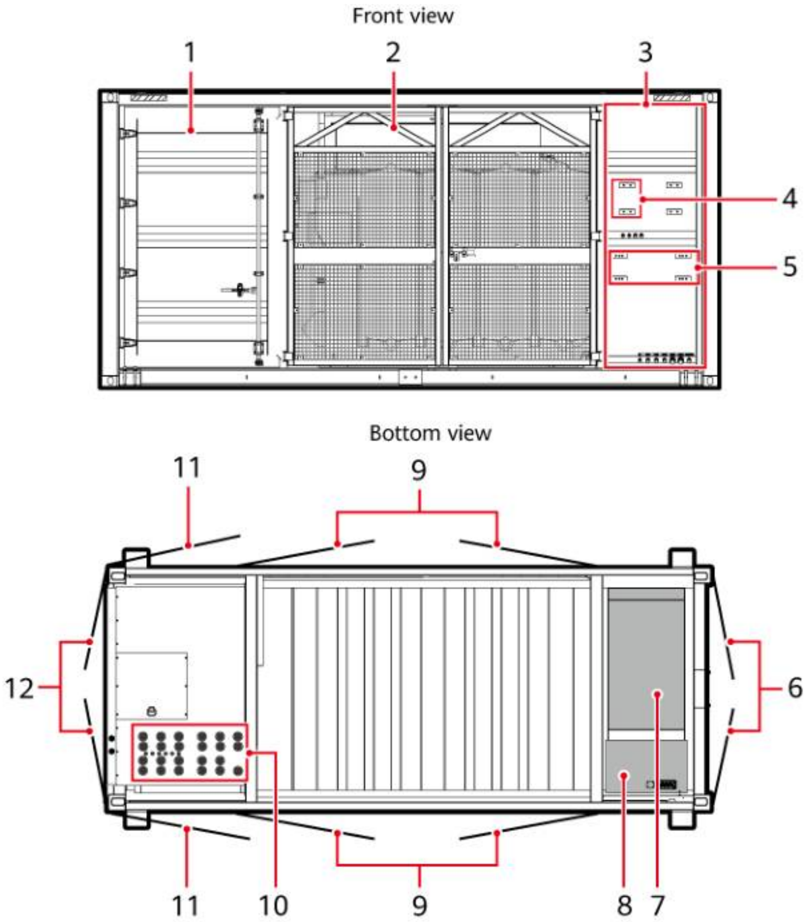


Figure 2-7 JUPITER-6000K-H1 exterior (LV coupling scenario where the inverter and PCS are connected to the same MCCB)

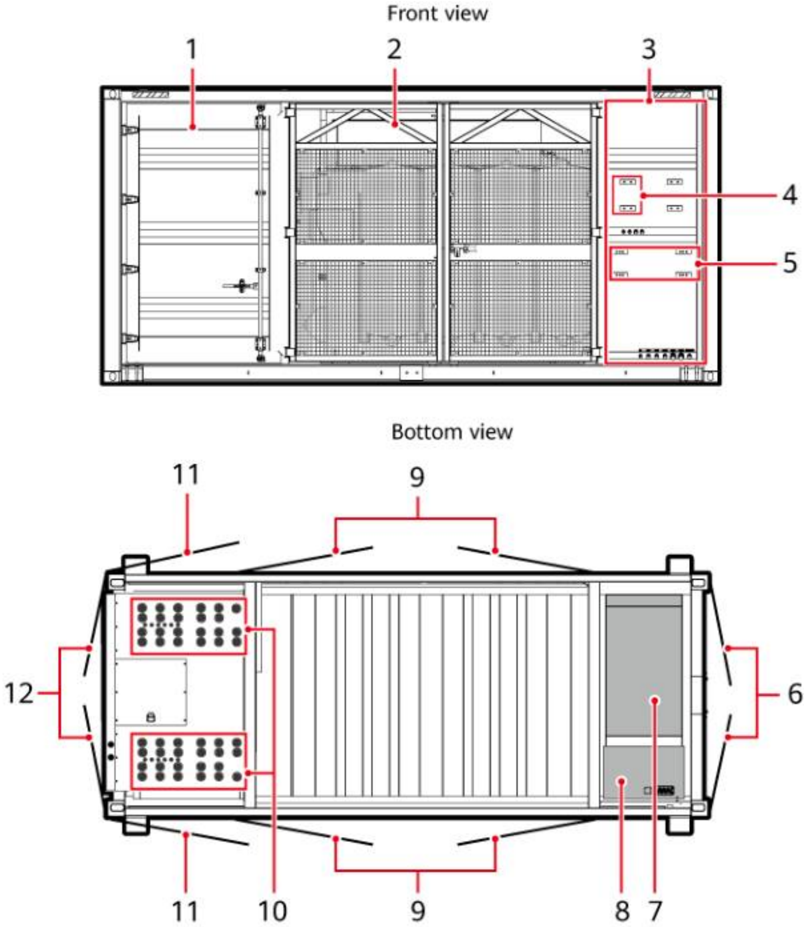
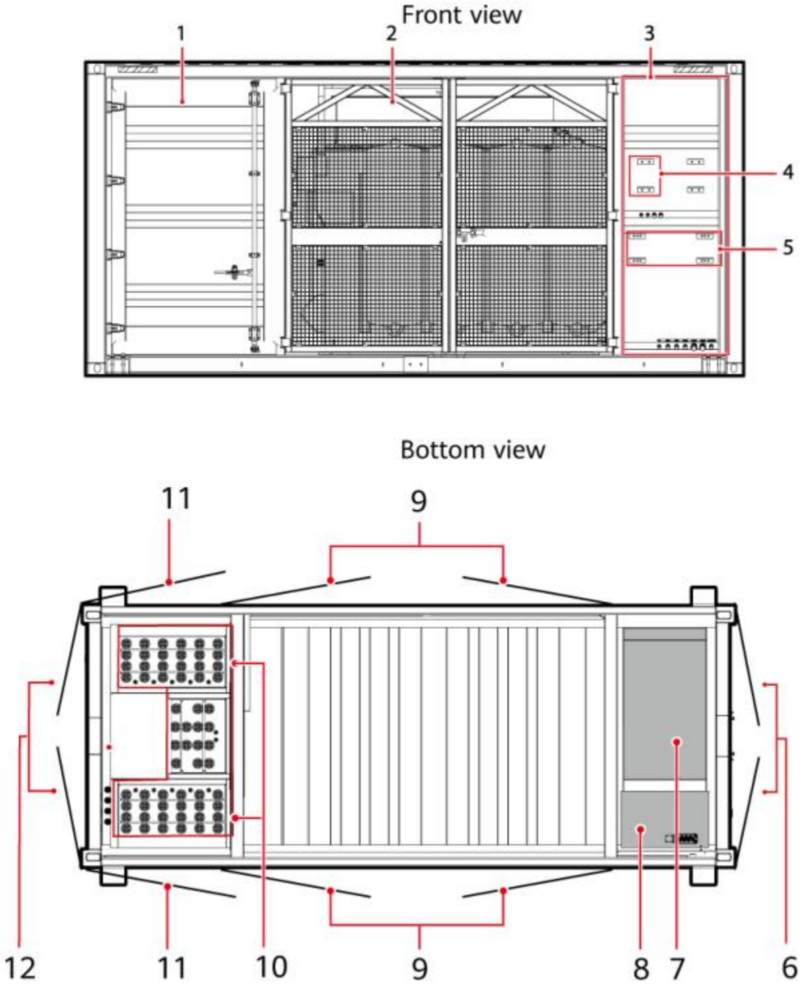


Figure 2-8 JUPITER-9000K-H1 exterior (LV coupling scenario where the inverter and PCS are connected to the same MCCB)



(1) Low-voltage room (LV)	(2) Transformer room (TR)	(3) Medium-voltage room (MV)
(4) Installation position for the distributed power supply (UPS)	(5) Installation position for the Smart Array Controller (SACU)	(6) Double-swing door for the MV room
(7) Ring main unit	(8) Auxiliary transformer	(9) Double-swing screen door for the TR room
(10) Holes for AC input power cables	(11) Single-swing door for the LV room	(12) Double-swing door for the LV room

Container Dimensions

Figure 2-9 Container dimensions

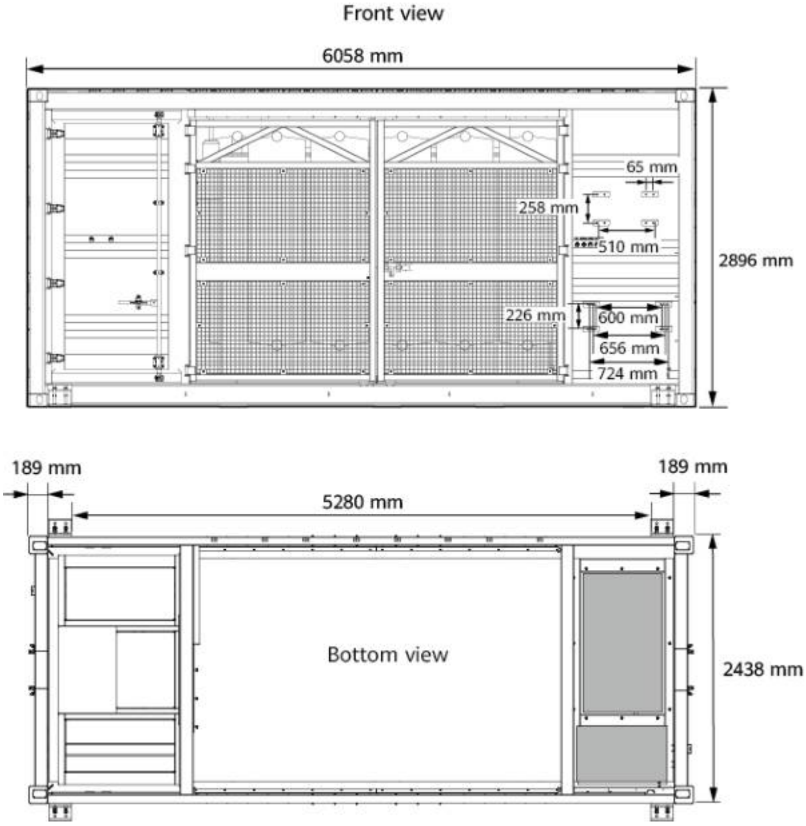
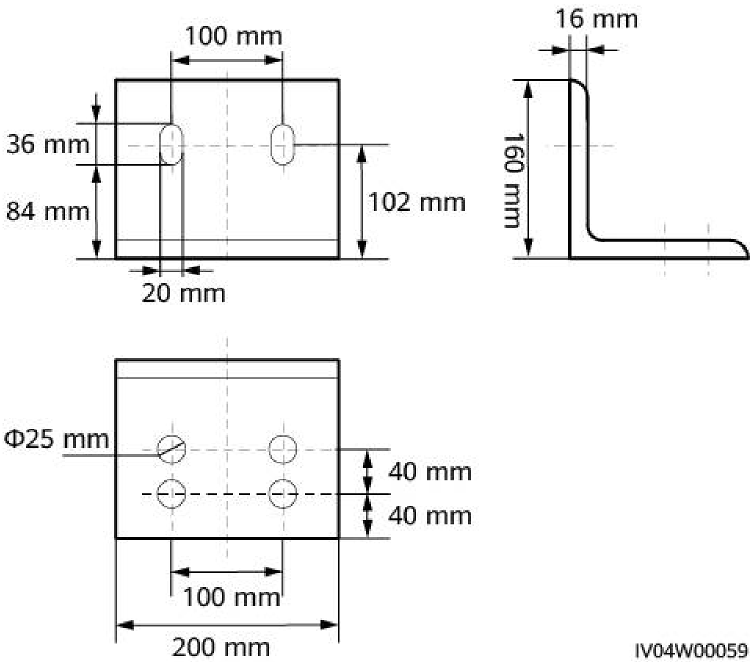


Figure 2-10 Dimensions of an anchor pad



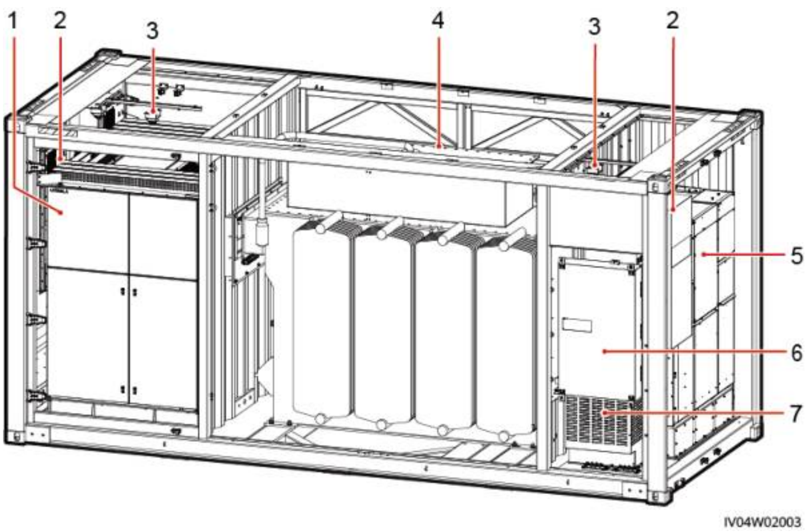
2.3 Label Description

Symbol	Name	Meaning
	Electric shock warning	High voltage exists after the equipment is powered on. Only qualified and trained electrical technicians are allowed to operate the equipment.
	Grounding	Indicates the position for connecting the protective earthing (PE) cable.
	Height	The equipment is high. You may need tools such as an insulated stool or ladder to facilitate operations.
HW*U 000000 0	Container number	Indicates the equipment container number.

2.4 Components

2.4.1 Cabinet Description

Figure 2-11 STS components (JUPITER-3000K-H1)

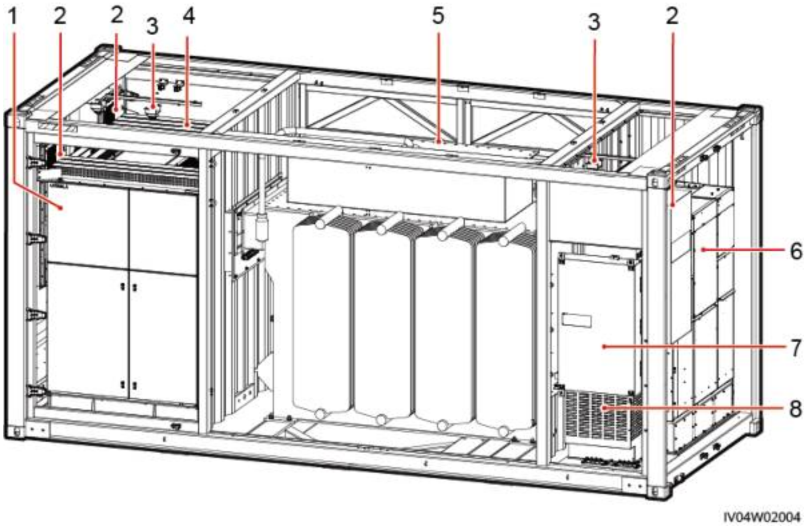


(1) LV PANEL A (2) Heat exchanger (3) Smoke sensor

(4) Transformer (5) Ring main unit (6) Power distribution box

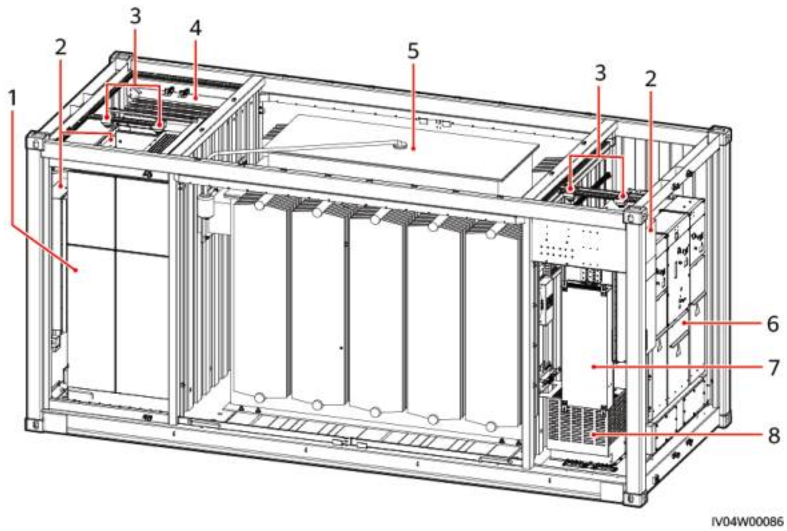
(7) Auxiliary transformer

Figure 2-12 STS components (JUPIETR-6000K-H1)



(1) LV PANEL A	(2) Heat exchanger	(3) Smoke sensor
(4) LV PANEL B	(5) Transformer	(6) Ring main unit
(7) Power distribution box	(8) Auxiliary transformer	

Figure 2-13 STS components (JUPITER-9000K-H1)



(1) LV PANEL A	(2) Heat exchanger	(3) Smoke sensor
(4) LV PANEL B	(5) Transformer	(6) Ring main unit
(7) Power distribution box	(8) Auxiliary transformer	

NOTE

In energy storage scenarios, the auxiliary transformer is optional.

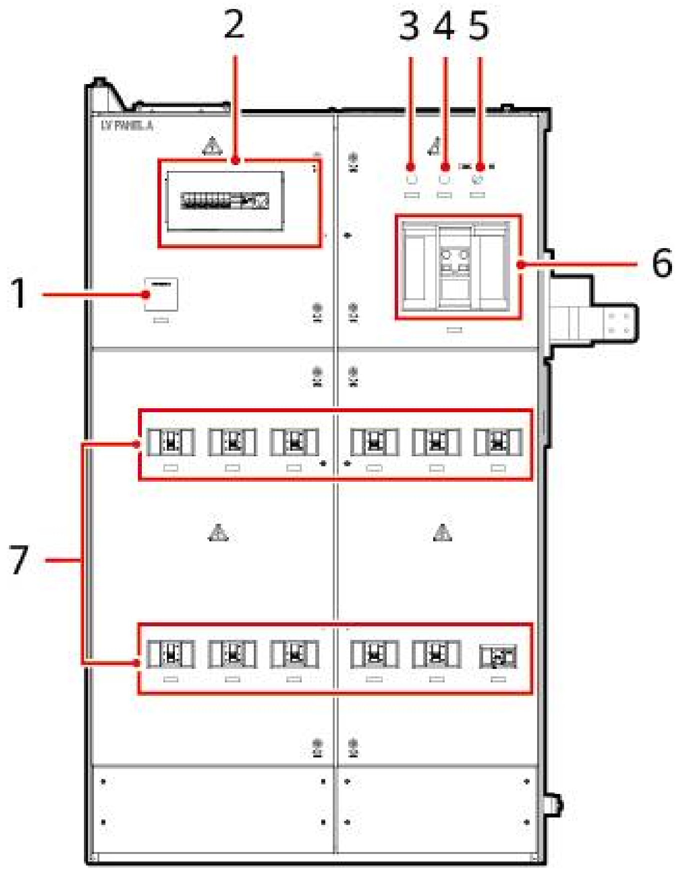
2.4.2 LV Room

This section shows only the components. The actual product appearance may vary.

2.4.2.1 JUPITER-3000K-H1

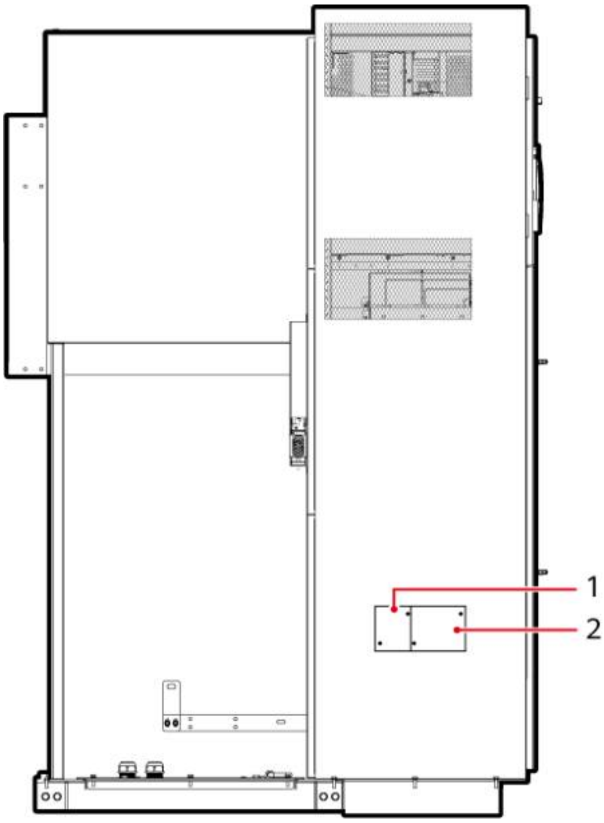
The LV room is a single-sided cabinet structure. To perform any operation, you only need to open the cabinet door of the LV room without entering the STS.

Figure 2-14 Front view of an LV panel



(1) Multimeter (MULTIFUNCTION METER, optional)	(2) Miniature circuit breaker	(3) Off button (PUSH TO OPEN ACB)
(4) On button (PUSH TO CLOSE ACB)	(5) Transfer switch (REMOTE/ LOCAL SWITCH)	(6) Air circuit breaker (ACB)
(7) AC input switches		

Figure 2-15 Side view of the LV room



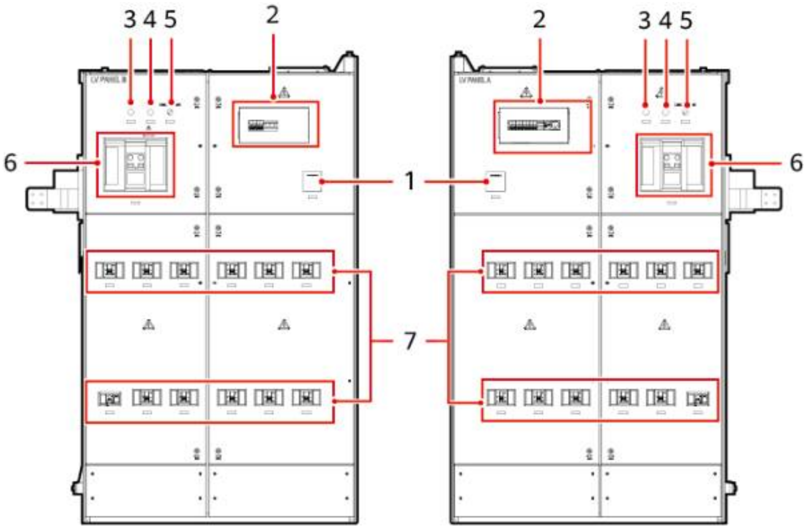
(1) Cable connection position for the Distribution Transformer (DTS-200K-D0)

(2) Cable connection position for the DC LV Panel (DCBOX-9/5-H0)

2.4.2.2 JUPITER-6000K-H1

The LV panels adopt a single-sided structure and consist of LV PANEL A and LV PANEL B. Each LV panel can connect to a maximum of 24 MCCBs. To perform operations or maintenance, you can open the cabinet door of the LV room or enter the STS.

Figure 2-16 Front view of an LV panel



(1) Multimeters (MULTIFUNCTION METER, optional)

(2) Miniature circuit breakers

(3) Off buttons (PUSH TO OPEN ACB)

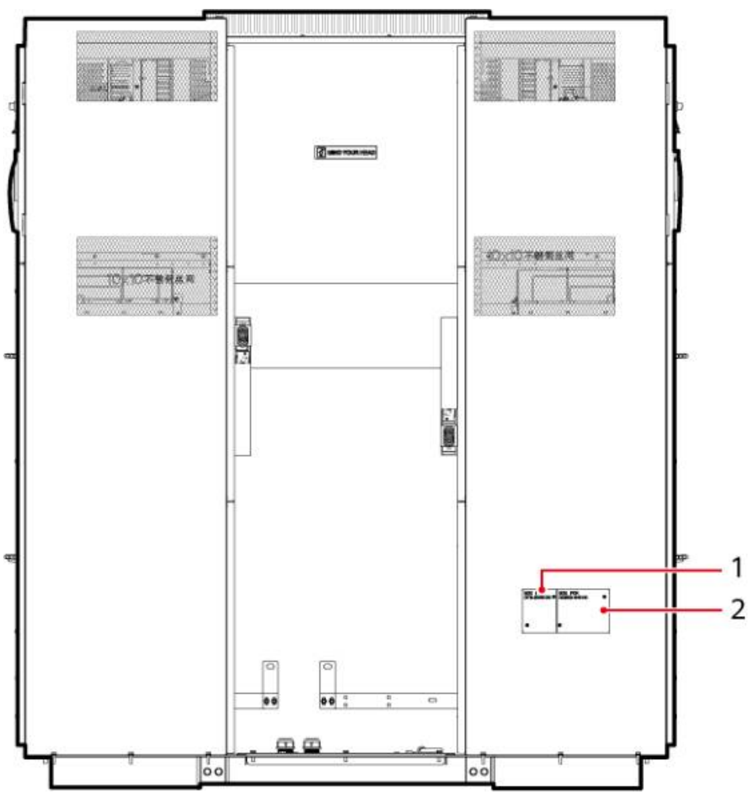
(4) On buttons (PUSH TO CLOSE ACB)

(5) Transfer switches (REMOTE/LOCAL SWITCH)

(6) ACBs

(7) AC input switches

Figure 2-17 Side view of the LV room



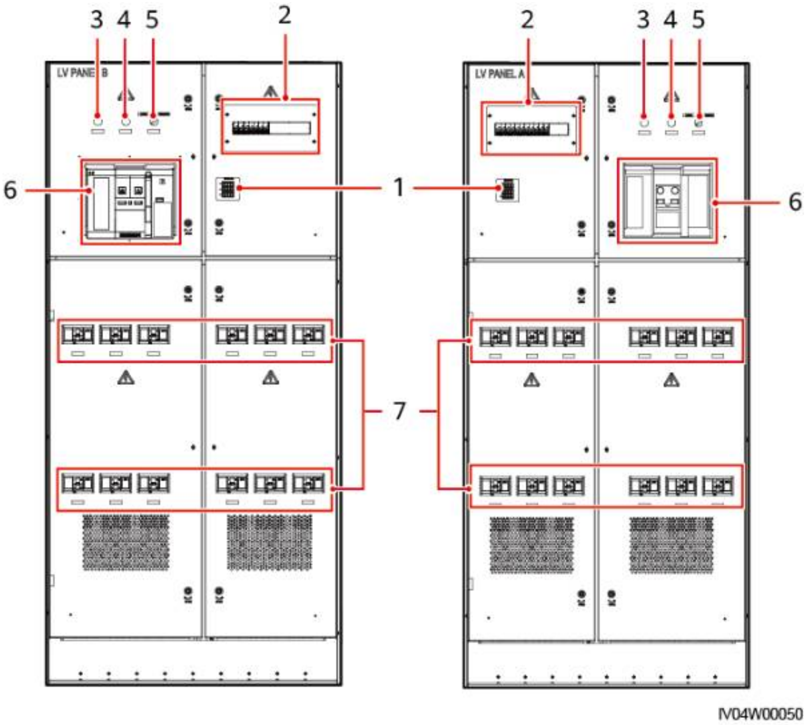
(1) Cable connection position for the Distribution Transformer (DTS-200K-D0)

(2) Cable connection position for the DC LV Panel (DCBOX-9/5-H0)

2.4.2.3 JUPITER-9000K-H1

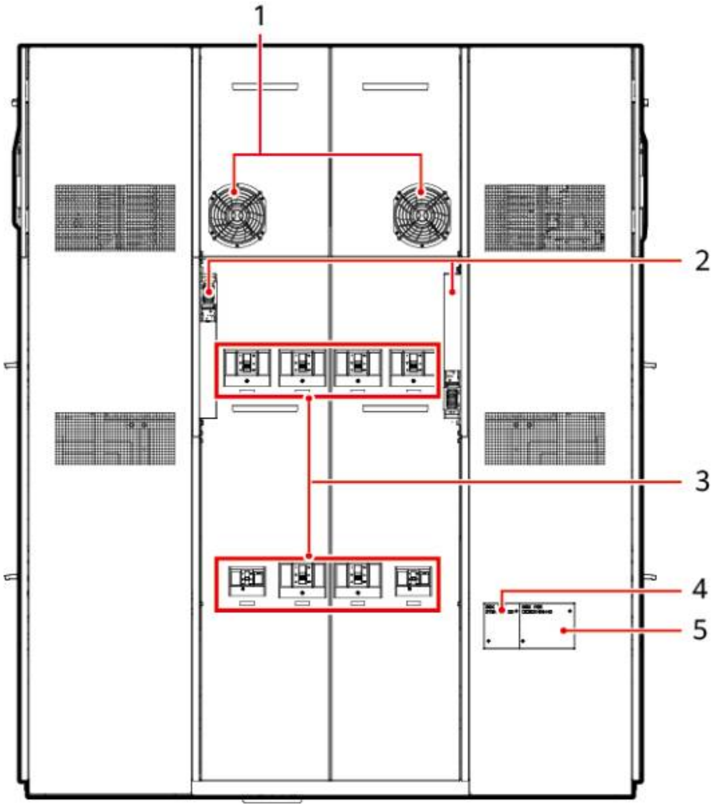
The LV panels adopt a single-sided structure and consist of LV PANEL A and LV PANEL B. Each LV panel can connect to a maximum of 32 MCCBs. To perform operations or maintenance, you can open the cabinet door of the LV room or enter the STS.

Figure 2-18 Front view of LV panels



(1) Multimeters (MULTIFUNCTION METER, optional)	(2) Miniature circuit breakers	(3) Off buttons (PUSH TO OPEN ACB)
(4) On buttons (PUSH TO CLOSE ACB)	(5) Transfer switches (REMOTE/LOCAL SWITCH)	(6) Air circuit breaker (ACB)
(7) AC input switches		

Figure 2-19 Side view of LV panels



(1) Mixed-flow fans

(2) STS measurement and control modules

(3) AC input switches

(4) Cable connection position for the Distribution Transformer (DTS-200K-D0)

(5) Cable connection position for the DC LV Panel (DCBOX-9/5-H0)

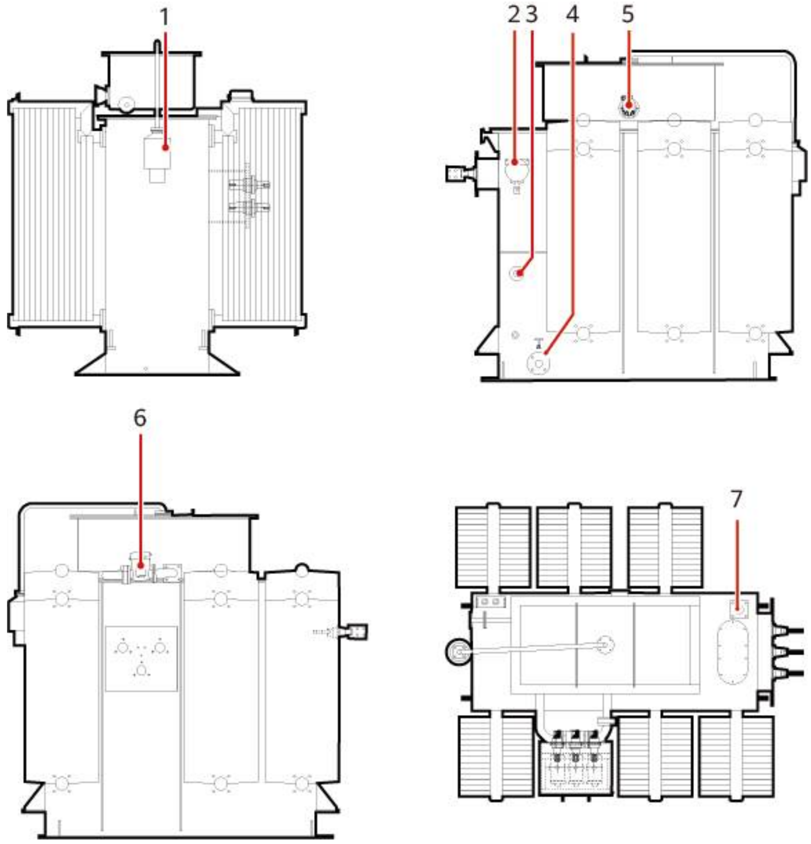
2.4.3 Transformer Room

Transformer (3000K)

The transformer room converts the LV AC power into the MV AC power. The main equipment is a transformer configured with gas, oil temperature, pressure, and oil level protection devices. At the same time, a comprehensive protection device is configured in the MV room for the transformer.

This document uses one type of transformer as an example. The appearance of transformers of different models may vary.

Figure 2-20 Transformer



No.	Item	Function	Description
1	Dehydrating breather	-	The insulation oil in the conservator is connected to the atmosphere through a dehydrating breather with silica gel to absorb moisture and impurities in the air and maintain the performance of the insulation oil.
2	Oil temperature indicator	Measures and controls the temperature of the top layer of transformer oil.	Displays the top layer of transformer oil in real time and issues alarms and trip signals through the built-in temperature control switch.
3	Off-load tap changer	Regulates the voltage.	There are five levels. Level 1 indicates the maximum tapping value, level 3 indicates the rated tapping value, and level 5 indicates the minimum tapping value.
4	Oil feed and drain valve	Refills or drains oil.	• Oil refilling: Refills the transformer oil using an uncontaminated metal or non-rubber hose and oil injection equipment. (Note: Prevent air from entering.) • Oil draining: Leads the transformer oil to a container using an uncontaminated metal or non-rubber hose.
5	Oil level gauge	Indicates the oil level.	Indicates the oil level of the transformer oil cabinet and reports the alarms of high and low oil levels.

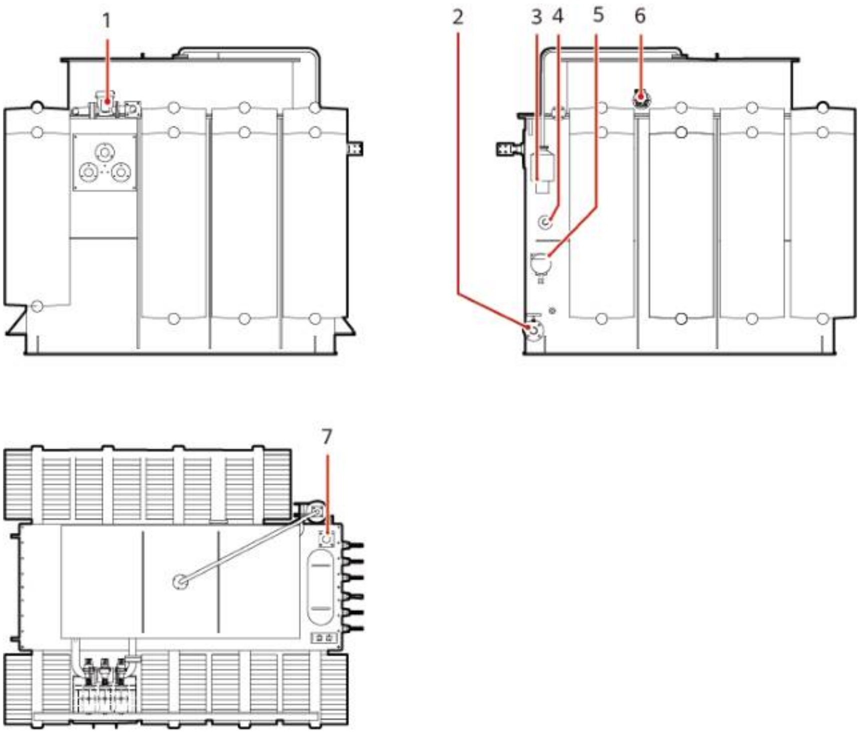
No.	Item	Function	Description
6	Gas relay	Generates a gas accumulation alarm or an oil flow trip.	• When a minor fault occurs on the transformer, the oil of the transformer generates gas. The gas will rise and enter the gas relay. In this case, the reed switch contact for gas accumulation will be closed to send signals. When there is too much gas, it can be released through the gas nozzle of the gas relay. • When there is a strong gas flow in the transformer, the reed switch contact for oil flow will be closed and the circuit breaker of the ring main unit will trip.
7	Pressure relief valve	Relieves pressure.	If a transformer is faulty, a large amount of gas is generated, and the pressure of the insulation oil increases sharply. When the certain threshold is reached, the transformer oil is discharged and the internal pressure of the transformer decreases to a normal value. At the same time, a signal is sent to trip the circuit breaker in the ring main unit.

Transformer (6000K)

The transformer room converts the LV AC power into the MV AC power. The main equipment is a transformer configured with gas, oil temperature, pressure, and oil level protection devices. At the same time, a comprehensive protection device is configured in the MV room for the transformer.

This document uses one type of transformer as an example. The appearance of transformers of different models may vary.

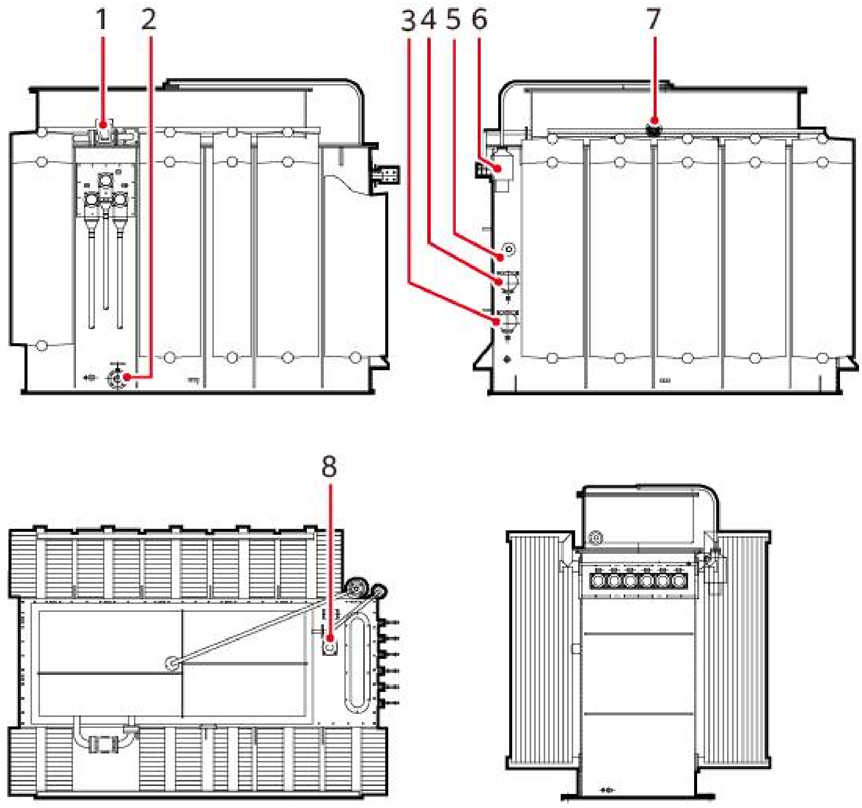
Figure 2-21 Transformer



No.	Item	Function	Description
1	Gas relay	Generates a gas accumulation alarm or an oil flow trip.	● When a minor fault occurs on the transformer, the oil of the transformer generates gas. The gas will rise and enter the gas relay. In this case, the reed switch contact for gas accumulation will be closed to send signals. When there is too much gas, it can be released through the gas nozzle of the gas relay. ● When there is a strong gas flow in the transformer, the reed switch contact for oil flow will be closed and the circuit breaker of the ring main unit will trip.
2	Oil feed and drain valve	Refills or drains oil.	● Oil refilling: Refills the transformer oil using an uncontaminated metal or non-rubber hose and oil injection equipment. (Note: Prevent air from entering.) ● Oil draining: Leads the transformer oil to a container using an uncontaminated metal or non-rubber hose.
3	Dehydrating breather	-	The insulation oil is isolated from the atmosphere through the airbag in the conservator. The airbag is connected to the atmosphere through the dehydrating breather. The dehydrating breather contains silica gel to absorb moisture and impurities in the air and maintain good performance of the insulation oil.
4	Off-load tap changer	Regulates the voltage.	There are five levels. Level 1 indicates the maximum tapping value, level 3 indicates the rated tapping value, and level 5 indicates the minimum tapping value.
5	Oil temperature indicator	Measures and controls the temperature of the top layer of transformer oil.	Displays the top layer of transformer oil in real time and issues alarms and trip signals through the built-in temperature control switch.
6	Oil level gauge	Indicates the oil level.	Indicates the oil level of the transformer oil cabinet and reports the alarms of high and low oil levels.
7	Pressure relief valve	Relieves pressure.	If a transformer is faulty, a large amount of gas is generated, and the pressure of the insulation oil increases sharply. When the certain threshold is reached, the transformer oil is discharged and the internal pressure of the transformer decreases to a normal value. At the same time, a signal is sent to trip the circuit breaker in the ring main unit.

Transformer (9000K)

Figure 2-22 Transformer (9000K)



No.	Item	Function	Description
1	Gas relay	Generates a gas accumulation alarm or an oil flow trip.	• When a minor fault occurs on the transformer, the oil of the transformer generates gas. The gas will rise and enter the gas relay. In this case, the reed switch contact for gas accumulation will be closed to send signals. When there is too much gas, it can be released through the gas nozzle of the gas relay. • When there is a strong gas flow in the transformer, the reed switch contact for oil flow will be closed and the circuit breaker of the ring main unit will trip.
2	Oil feed and drain valve	Refills or drains oil.	• Oil refilling: Refills the transformer oil using an uncontaminated metal or non-rubber hose and oil injection equipment. (Note: Prevent air from entering.) • Oil draining: Leads the transformer oil to a container using an uncontaminated metal or non-rubber hose.

No.	Item	Function	Description
3	Oil surface temperature controller	Measures and controls the temperature of the top layer of transformer oil.	Displays the top layer of transformer oil in real time and issues alarms and trip signals through the built-in temperature control switch.
4	(Optional) Winding thermostat	Measures and controls the transformer winding temperature through thermal simulation by measuring the top oil temperature.	The transformer winding temperature is displayed through **thermal simulation** technology, and the alarm and trip signals are transmitted through the temperature control switch.
5	Off-load tap changer	Regulates the voltage.	There are five levels. Level 1 indicates the maximum tapping value, level 3 indicates the rated tapping value, and level 5 indicates the minimum tapping value.
6	Dehydrating breather	-	The insulation oil is isolated from the atmosphere through the airbag in the conservator. The airbag is connected to the atmosphere through the dehydrating breather. The dehydrating breather contains silica gel to absorb moisture and impurities in the air and maintain good performance of the insulation oil.
7	Oil level gauge	Indicates the oil level.	Indicates the oil level of the transformer oil cabinet and reports the alarms of high and low oil levels.
8	Pressure relief valve	Relieves pressure.	If a transformer is faulty, a large amount of gas is generated, and the pressure of the insulation oil increases sharply. When the certain threshold is reached, the transformer oil is discharged and the internal pressure of the transformer decreases to a normal value. At the same time, a signal is sent to trip the circuit breaker in the ring main unit.

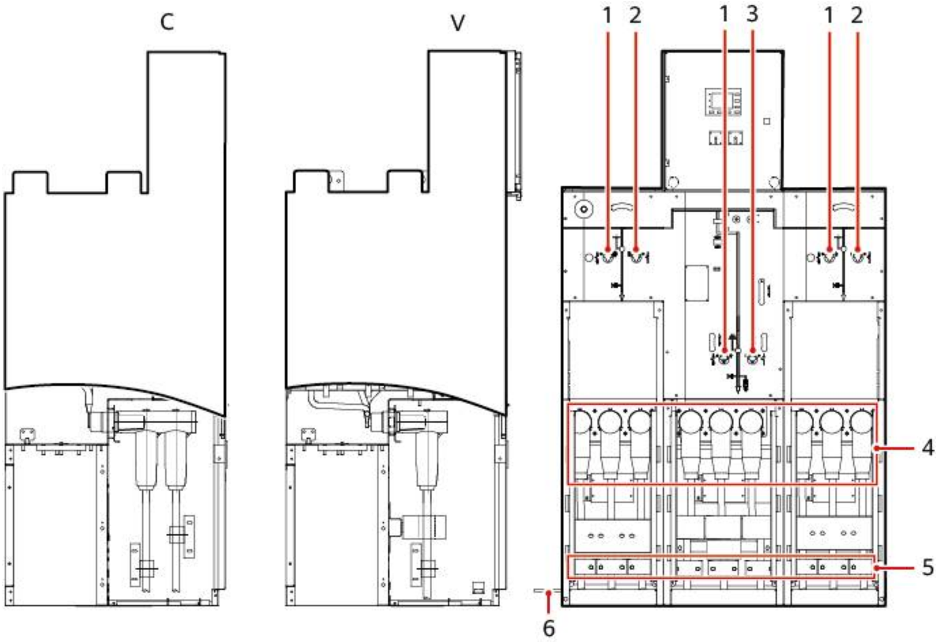
2.4.4 MV Room

2.4.4.1 DQS-12/24 (CVC)

NOTE

No cable connector is installed in cabinet G1 or G3. The cable connectors in the figure are for reference only. The actual position and dimensions may vary.

Figure 2-23 Appearance



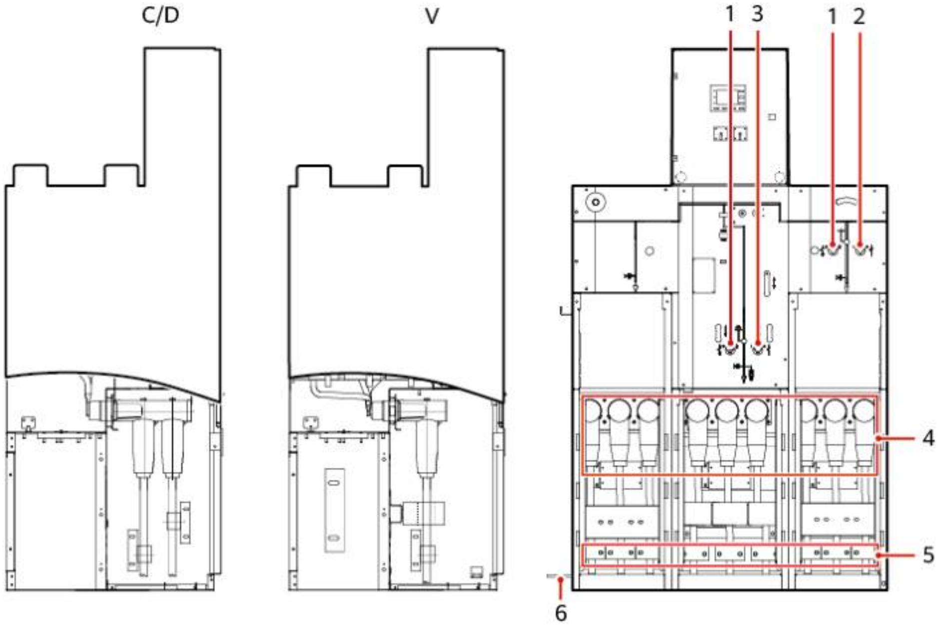
(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Disconnector operation hole
(4) Cable connector	(5) Cable clip	(6) Ground bar

2.4.4.2 DQS-12/24 (DVC)

NOTE

No cable connector is installed in cabinet G1 or G3. The cable connectors in the figure are for reference only. The actual position and dimensions may vary.

Figure 2-24 Appearance



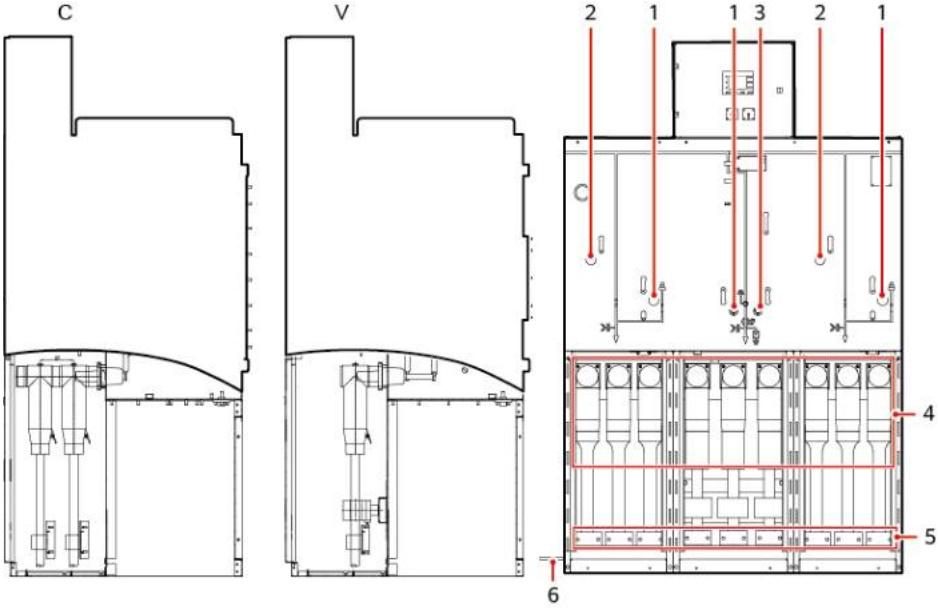
(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Disconnector operation hole
(4) Cable connector	(5) Cable clip	(6) Ground bar

2.4.4.3 DQS-36, DQS-38, and DQS-40.5 (CVC)

NOTE

No cable connector is installed in cabinet G1 or G3. The cable connectors in the figure are for reference only. The actual position and dimensions may vary.

Figure 2-25 Appearance



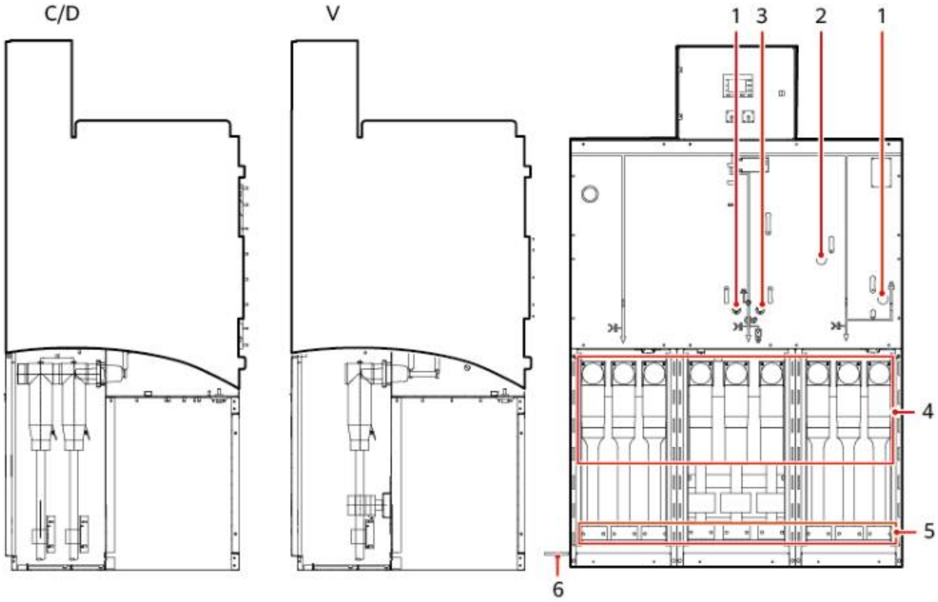
(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Disconnector operation hole
(4) Cable connector	(5) Cable clip	(6) Ground bar

2.4.4.4 DQS-36, DQS-38, and DQS-40.5 (DVC)

NOTE

No cable connector is installed in cabinet G1 or G3. The cable connectors in the figure are for reference only. The actual position and dimensions may vary.

Figure 2-26 Appearance



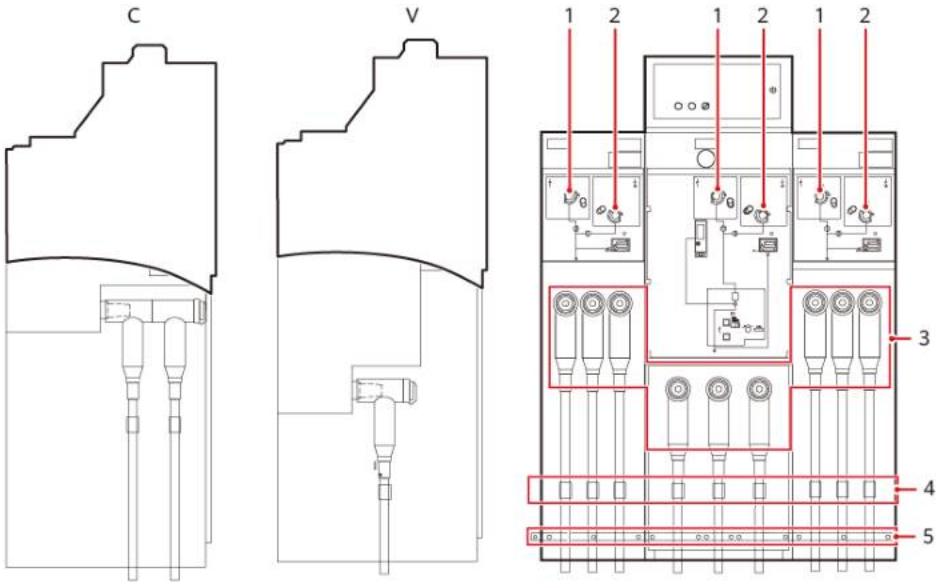
(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Disconnector operation hole
(4) Cable connector	(5) Cable clip	(6) Ground bar

2.4.4.5 CGM.3 (CVC)

NOTE

No cable connector is installed in cabinet G1 or G3. The cable connectors in the figure are for reference only. The actual position and dimensions may vary.

Figure 2-27 Appearance



(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Cable connector

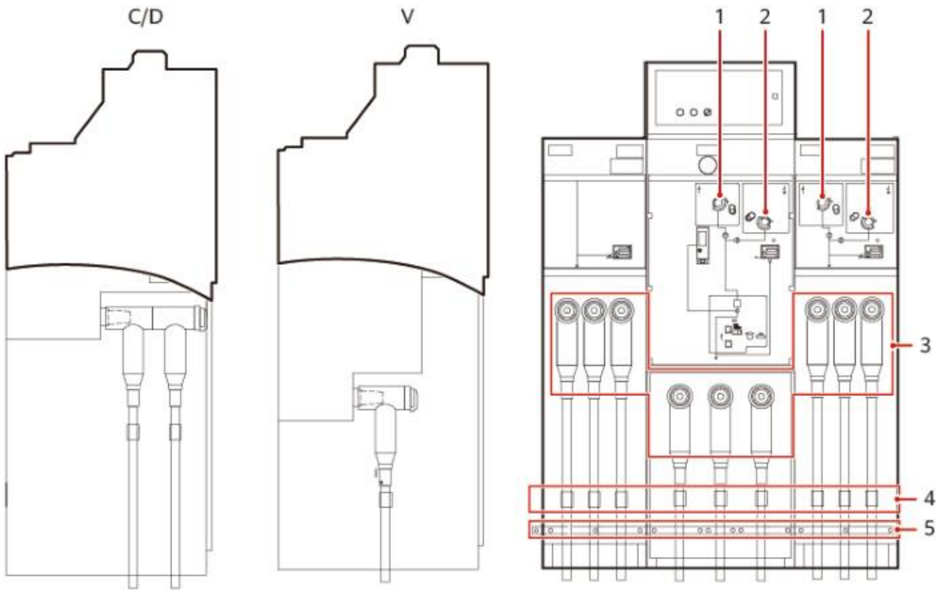
(4) Cable clip (5) Ground bar

2.4.4.6 CGM.3 (DVC)

NOTE

No cable connector is installed in cabinet G1 or G3. The cable connectors in the figure are for reference only. The actual position and dimensions may vary.

Figure 2-28 Appearance



(1) Earthing switch operation hole (2) Load switch operation hole (3) Cable connector

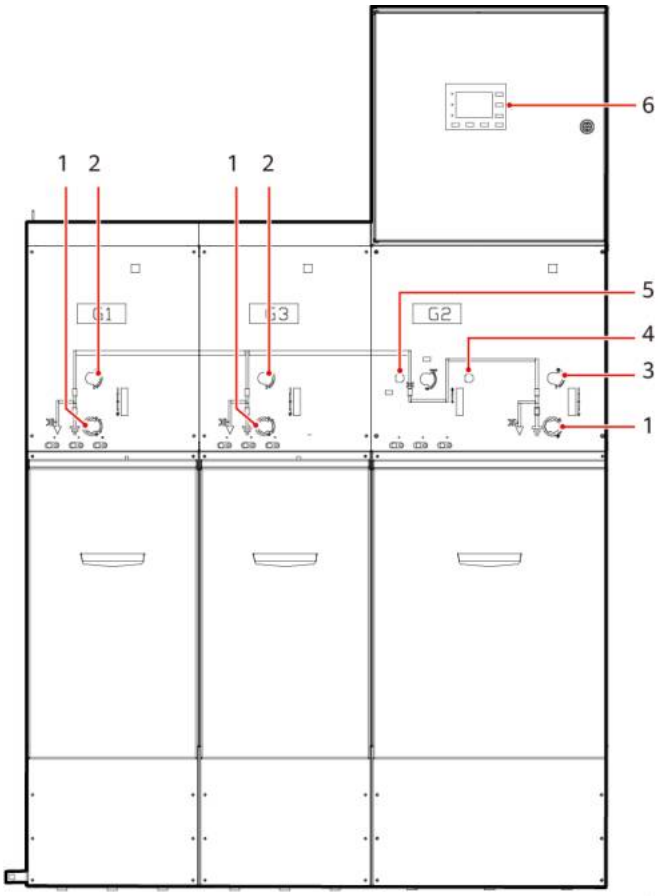
(4) Cable clip (5) Ground bar

2.4.4.7 8DJH Up to 24 (CCV)

NOTE

- The CCV ring main unit includes a circuit breaker cabinet and two load switch cabinets.
- The secondary room of the ring main unit cannot be opened when the power is on.

Figure 2-29 Appearance



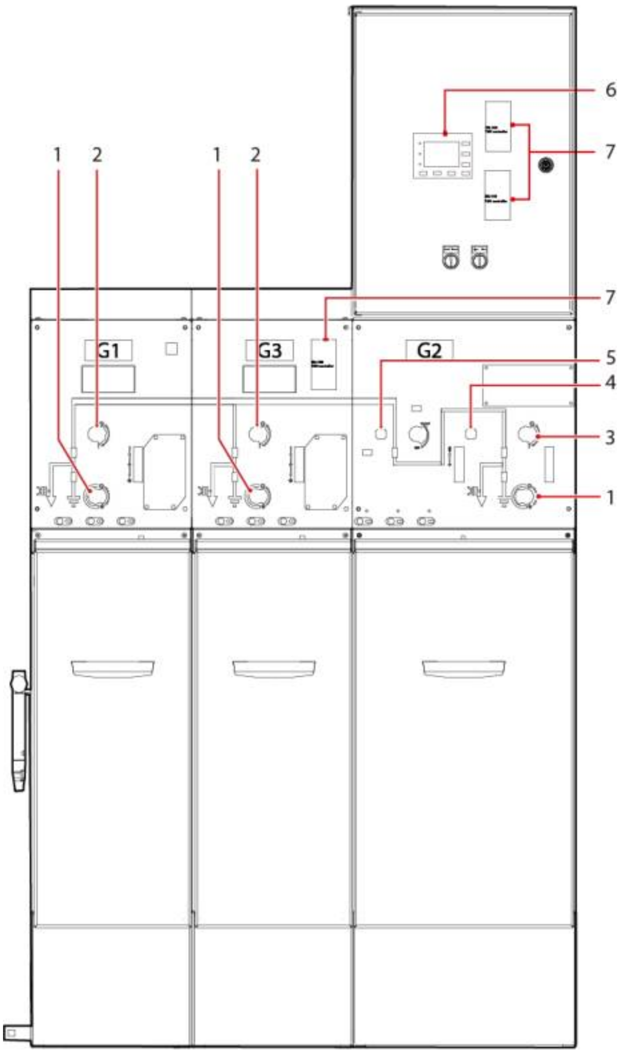
(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Disconnector operation hole
(4) Circuit breaker for manual switch-off	(5) Circuit breaker for manual switch-on	(6) Relay

2.4.4.8 8DJH 36 and 8DJH 38 (CCV)

NOTE

- The CCV ring main unit includes a circuit breaker cabinet and two load switch cabinets.
- The secondary room of the ring main unit cannot be opened when the power is on.

Figure 2-30 Appearance



(1) Load switch operation hole (2) Earthing switch operation hole (3) Disconnector operation hole

(4) Circuit breaker for manual switch-off (5) Circuit breaker for manual switch-on (6) Circuit breaker electrical control switch

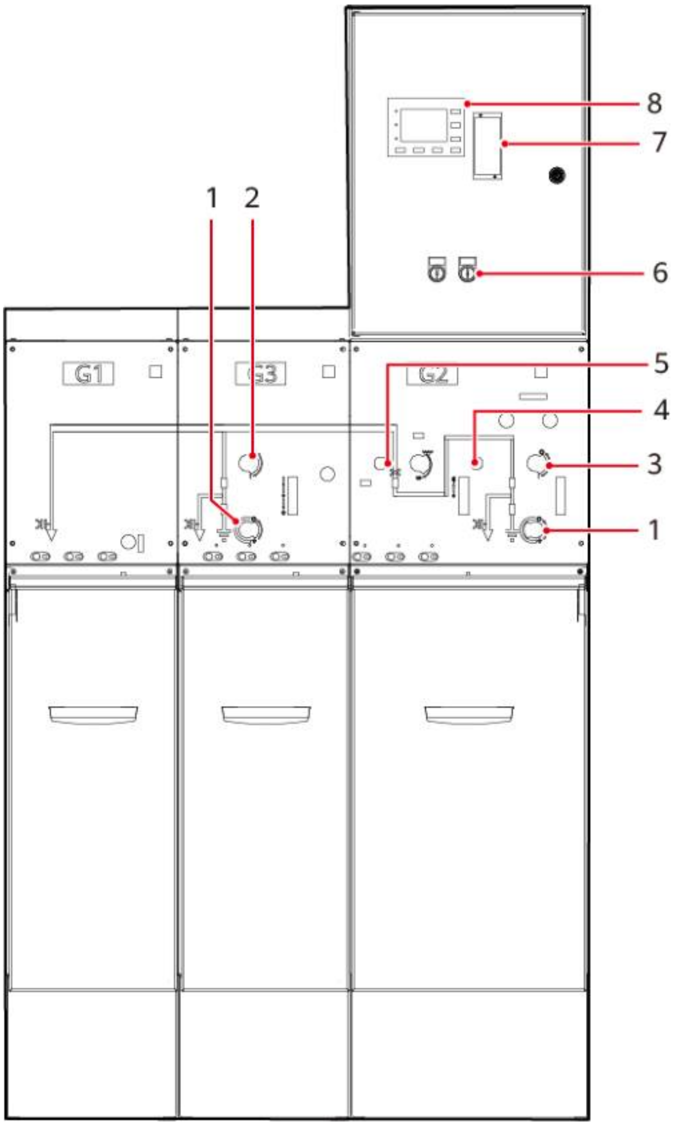
(7) Relay

2.4.4.9 8DJH Up to 24 (DCV)

NOTE

- The DCV ring main unit includes a direct cable entry cabinet, a load switch cabinet, and a circuit breaker cabinet.
- The secondary room of the ring main unit cannot be opened when the power is on.

Figure 2-31 Appearance



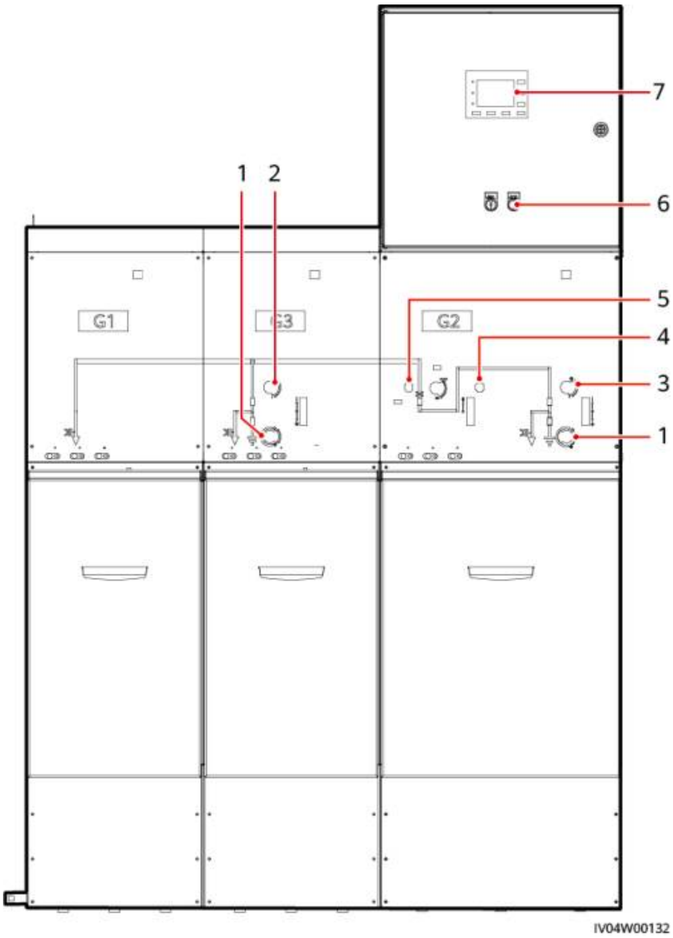
(1) Earthing switch operation hole	(2) Load switch operation hole	(3) Disconnector operation hole
(4) Circuit breaker for manual switch-off	(5) Circuit breaker for manual switch-on	(6) Circuit breaker electrical control switch
(7) Temperature and humidity controller (optional)	(8) Relay	

2.4.4.10 8DJH 36 and 8DJH 38 (DCV)

NOTE

- The DCV ring main unit includes a direct cable entry cabinet, a load switch cabinet, and a circuit breaker cabinet.
- The secondary room of the ring main unit cannot be opened when the power is on.

Figure 2-32 Appearance



(1) Earthing switch operation hole

(2) Load switch operation hole

(3) Disconnector operation hole

(4) Circuit breaker for manual switch-off

(5) Circuit breaker for manual switch-on

(6) Circuit breaker electrical control switch

(7) Relay

2.4.5 STS Measurement and Control System

2.4.5.1 Main Control Module

The STS is configured with one main control module, which is located in LV PANEL A. The main control module communicates with the STS measurement and control modules and sends the data of the measurement and control modules to the SACU, which then sends the data to the management system through network switches.

Figure 2-33 Position of a main control module (JUPITER-3000K,6000K,9000K-H1)

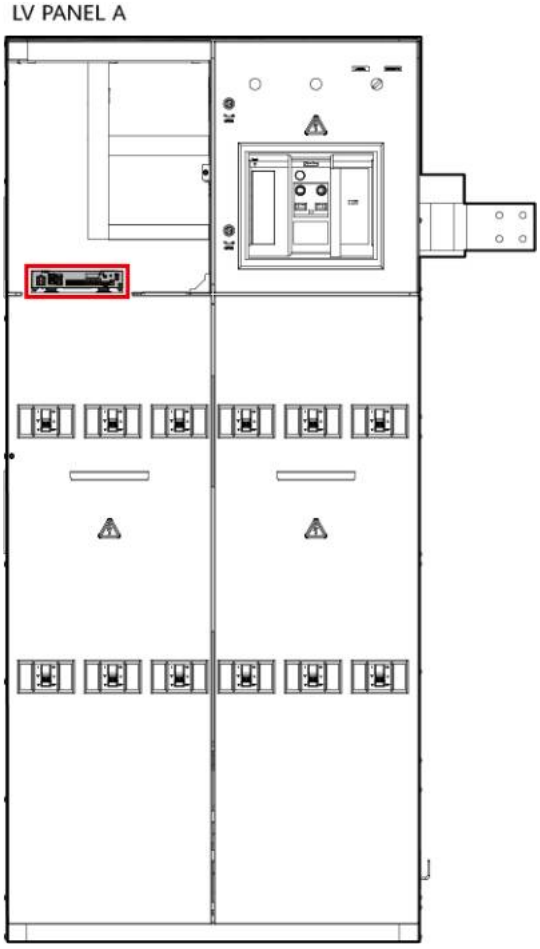
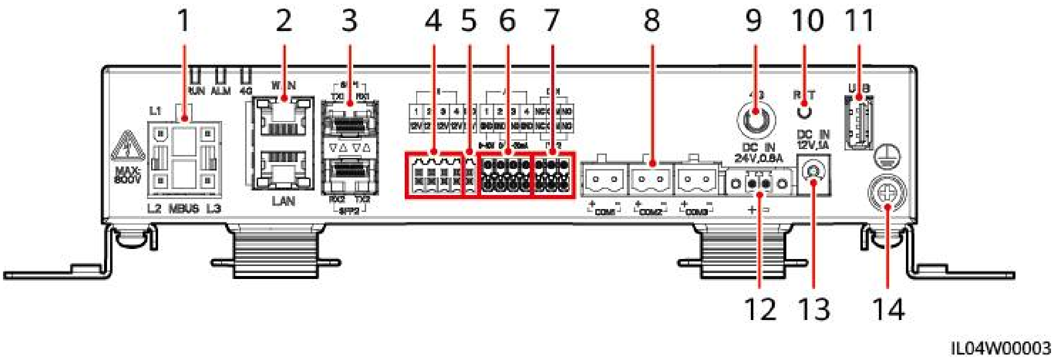


Figure 2-34 Main control module (SmartMonitorA02)



(1) MBUS ports	(2) Ethernet ports	(3) SFP ports
(4) DI ports	(5) 12 V output power port	(6) AI ports
(7) DO ports	(8) COM ports	(9) 4G antenna port
(10) RST button	(11) USB port	(12) 24 V DC input port
(13) 12 V input power port	(14) Ground point	

Table 2-1 Port description

No.	Silk Screen	Item	Description
1	MBUS L1/L2/L3	MBUS ports	MBUS ports are not enabled.
2	WAN	Ethernet ports	Provide one WAN port and one LAN port, supporting 10/100/1000 Mbit/s auto-negotiation.
	LAN		
3	SPF 1/2	SFP ports	Support 100M and 1000M optical modules, SFP and eSFP optical modules, and automatic identification of optical module rates. Wavelength supported by the optical modules: 1310 nm (single-mode); transmission distance: 12 km.
4	DI1–DI4	DI ports	Provide four universal DI ports.
5	-	12 V output power port	Supports 12 V DC output.
6	AI1–AI4	AI ports	● AI1 is a voltage-type signal input port, supporting a voltage range of 0–10 V. ● AI2–AI4 are current-type signal input ports, supporting current ranges of 0–20 mA and 4–20 mA.
7	DO1–DO2	DO ports	NO COM normally open contact; NC COM normally closed contact. Support a maximum of 12 V signal voltage.
8	COM1–COM3	COM ports	Connect the RS485 cables.
9	4G	4G antenna port	-
10	RST	Restart button	Hold down the button for 3s to 10s to power on and restart the WLAN module. Hold down the button for more than 10s to restore to the default IP address (192.168.0.10). The restored IP address is valid for 5 minutes. Within 3 minutes after power-on and restart, hold down the button for more than 60s to restore to factory settings.
11	USB	USB port	After a USB flash drive is inserted into the USB port, you can use the app to perform local maintenance operations on the main control module, such as firmware upgrade and data export.

No.	Silk Screen	Item	Description
12	DC_IN 24V, 0.8A	24 V DC input port	Provides a 2-pin cord end terminal, supporting 24 V DC input.
13	DC_IN 12V, 1A	12 V DC input port	Supports 12 V DC input.

Table 2-2 Indicator description

<table>
<tr><th>Indicator</th><th colspan="2">Status</th><th>Description</th></tr>
<tr><td rowspan="3">Running indicator (RUN)</td><td colspan="2">Off</td><td>The module is not powered on.</td></tr>
<tr><td colspan="2">Blinking green slowly (on for 1s and then off for 1s)</td><td>The communication between the module and the management system is normal.</td></tr>
<tr><td colspan="2">Blinking green fast (on for 0.125s and then off for 0.125s)</td><td>The communication between the module and the management system is interrupted or the module is not registered with the network management system.</td></tr>
<tr><td rowspan="8">Alarm/ Maintenance indicator (ALM)</td><td rowspan="4">Alarm state</td><td>Off</td><td>No system alarm is raised.</td></tr>
<tr><td>Blinking red slowly (on for 1s and then off for 4s)</td><td>The system raises a warning alarm.</td></tr>
<tr><td>Blinking red fast (on for 0.5s and then off for 0.5s)</td><td>The system raises a minor alarm.</td></tr>
<tr><td>Steady red</td><td>The system raises a major alarm.</td></tr>
<tr><td rowspan="4">Maintenance state</td><td>Off</td><td>No local maintenance is in progress.</td></tr>
<tr><td>Blinking green slowly (on for 1s and then off for 1s)</td><td>Local maintenance is in progress.</td></tr>
<tr><td>Blinking green fast (on for 0.125s and then off for 0.125s)</td><td>Local maintenance fails or the connection to the app is to be set up.</td></tr>
<tr><td>Steady green</td><td>Local maintenance is successful.</td></tr>
</table>

NOTE

- Local maintenance refers to operations such as full data import and export by connecting a USB flash drive to the USB port on the main control module.
- For details about local maintenance operations (such as importing and exporting all data and exporting logs using a USB flash drive), see the app user manual.
- If an alarm and local maintenance happen concurrently, the alarm/maintenance indicator shows the local maintenance state first. After local maintenance ends, the indicator shows the alarm state.

2.4.5.2 Measurement and Control Modules

The JUPITER-3000K-H1 is configured with two measurement and control modules, and the JUPITER-6000K-H1 and JUPITER-9000K-H1 are configured with three, respectively. The measurement and control modules are located in the LV room and MV room, collecting signals in their corresponding areas. The measurement and control modules provide teleindication, telemetering, and telecontrol functions, collect switch status, measure analog voltage and current, and control and adjust fan speeds.

Figure 2-35 Positions of measurement and control modules in the LV room of the JUPITER-3000K-H1

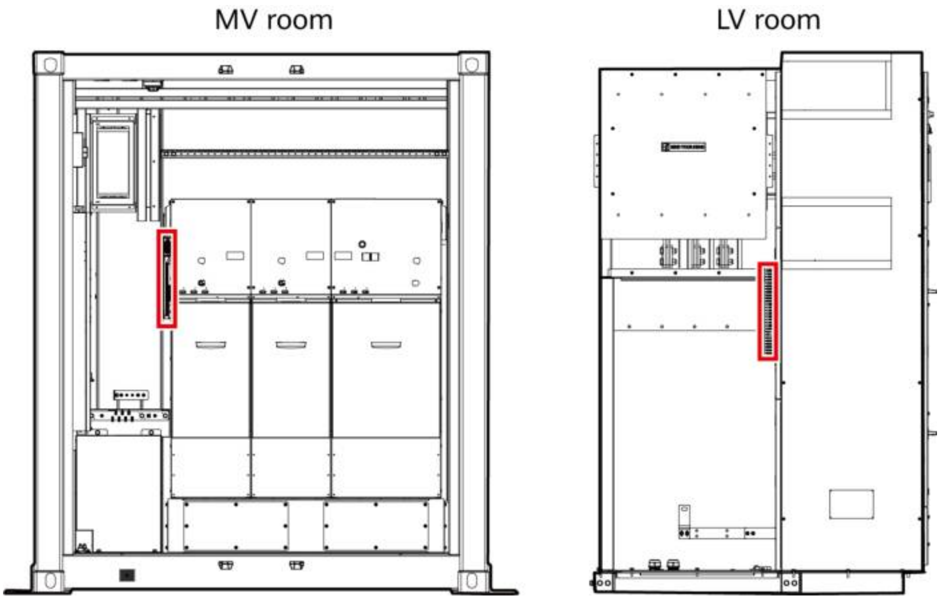
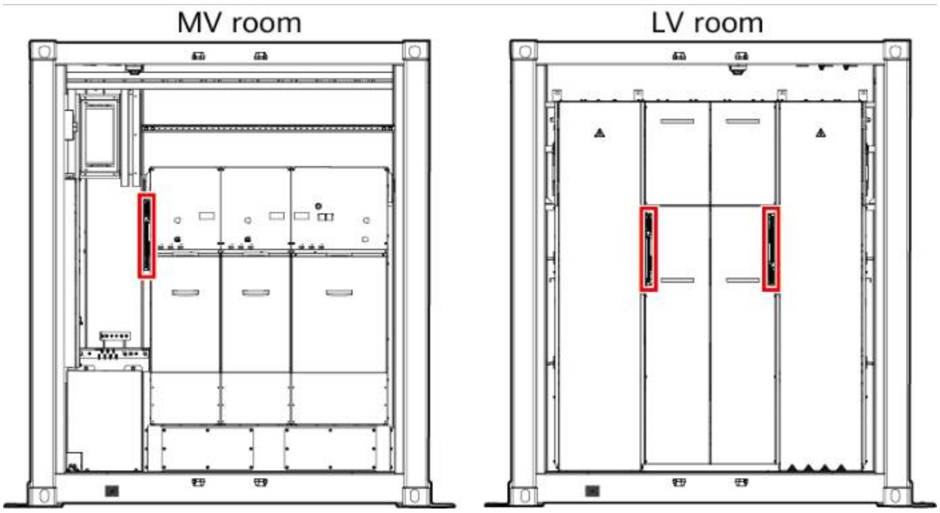


Figure 2-36 Positions of measurement and control modules in the LV room of the JUPITER-6000K-H1/JUPITER-9000K-H1



The following figure shows the position of the measurement and control module in the MV panel using 8DJH36 (DCV) as an example.

Figure 2-37 Position of the measurement and control module in the MV panel

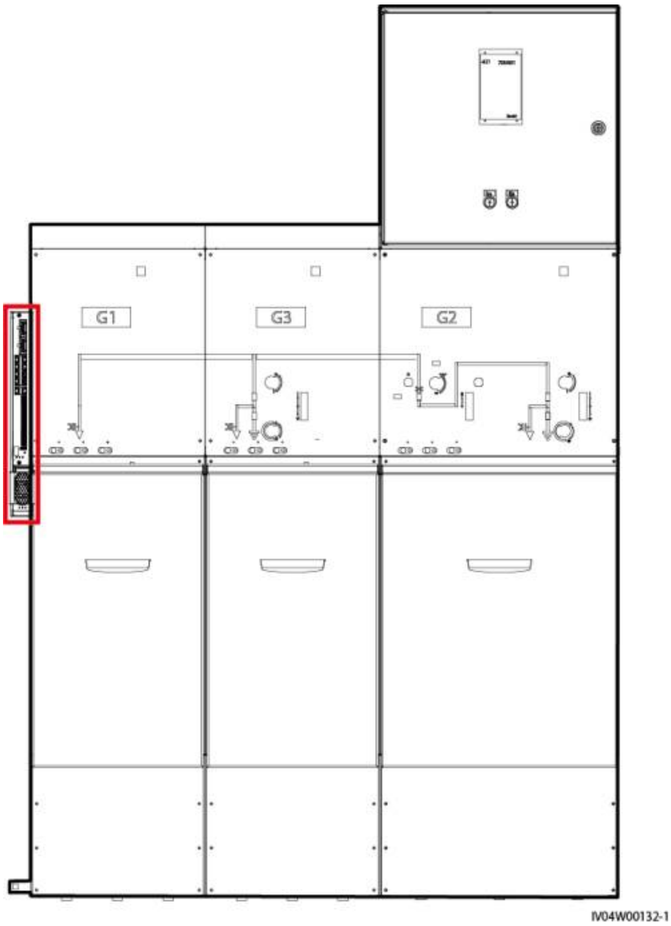
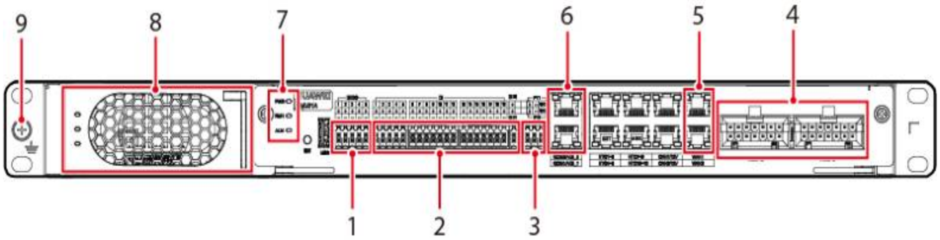


Figure 2-38 Front view of a measurement and control module (SmartModule1000B01)

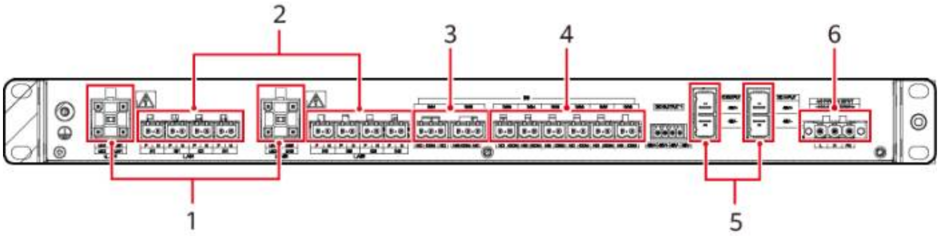


(1) DI/DO ports
(2) DI ports
(3) PT ports
(4) Fan ports
(5) Ethernet ports
(6) COM ports
(7) Indicators
(8) Power supply unit (PSU)
(9) Ground point

Table 2-3 Port description (front)

No.	Silk Screen	Item	Description
1	DI1/DO1–DI5/DO5	DI/DO ports	Provide five dry contact outputs (normally open dry contacts) and inputs.
2	DI1–DI21	DI ports	Provide 21 dry contact inputs.
3	PT1	PT ports	Provide two ports for PT100 temperature sensors.
	PT2		
4	FAN1–FAN3	Fan ports	Provide six ports for supplying DC power to and controlling fans, and support fan speed detection and adjustment. The maximum power of each fan is 130 W.
	FAN4–FAN6		
5	WAN1	Ethernet ports	Provide two WAN ports, each of which supports 10/100 Mbit/s auto-negotiation.
	WAN2		
6	COM1	RS485 communications ports	Provide two isolated RS485 communications ports to connect to temperature and humidity sensors.
	COM2		

Figure 2-39 Measurement and control module (rear)



(1) AC voltage detection ports
(2) AC current detection ports
(3) DO1 and DO2 ports
(4) DO3–DO8 ports
(5) DC power cascading port
(6) PSU AC input power port

Table 2-4 Port description (rear)

No.	Silk Screen	Item	Description
1	U_AC1	AC1 voltage detection port	Detects AC voltage input, supporting single-phase and three-phase voltage detection.
	U_AC2	AC1 voltage detection port	
2	I_AC1	AC1 current detection port	Detects AC current input.
	I_AC2	AC2 current detection port	
3	DO1, DO2	DO output ports	Provide normally closed (NC) and normally open (NO) contacts.
4	DO3–DO8	DO output ports	Provide NO contacts.
5	DC_OUTPUT2	DC power cascading port	Supports 53.5 V DC output.
	DC_INPUT		Supports 53.5 V DC input.
6	AC POWER INPUT	PSU AC input power port	Supports 200–240 V, 50 Hz/60 Hz AC input.

Table 2-5 Indicator description

Silk Screen	Color	Function Definition	Status	Description
RUN	Green	Running status indicator	Blinking at 0.5 Hz	Communication with the main control module is normal.

Silk Screen	Color	Function Definition	Status	Description
			Blinking at 2.5 Hz	Communication with the main control module failed.
			Off	The program is not running properly.
PWR	Green	Power indicator	Steady on	The power supply is normal.
			Off	The power supply is abnormal.

2.4.5.3 (Optional) MBUS CCOs

The JUPITER-9000K-H1 is configured with one MBUS CCO, which is located in LV PANEL A.

Figure 2-40 Positions of the MBUS CCO

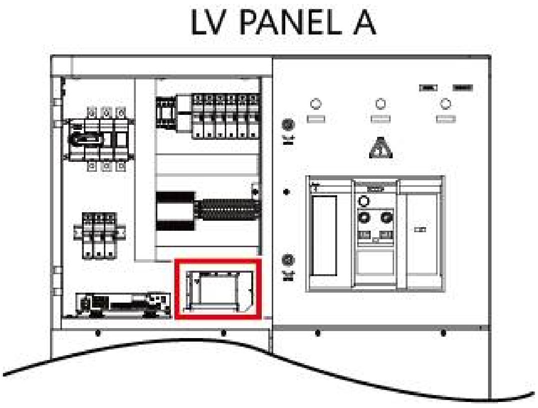
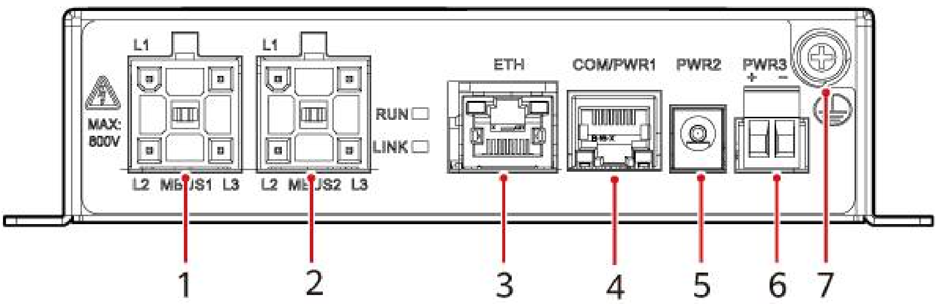


Figure 2-41 Appearance of the MBUS CCO



(1) AC power cable port 1	(2) AC power cable port 2	(3) FE communications port	(4) RS485 communications port
(5) Power port	(6) Power port	(7) Ground point	-

Table 2-6 Indicator description

Silk Screen	Color	Function Definition	Status	Description
RUN	Green	Running status indicator	Steady on	Running properly
			Off	No power supply
LINK	Green	Communication status indicator	Steady on or blinking	Receiving or transmitting data
			Off	No communication

2.4.5.4 (Optional) Expansion Module

The expansion module is installed in LV PANEL A.

Figure 2-42 Position of an expansion module

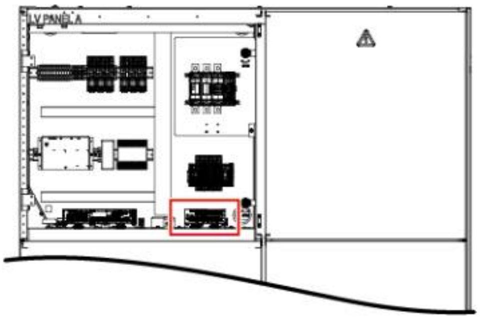
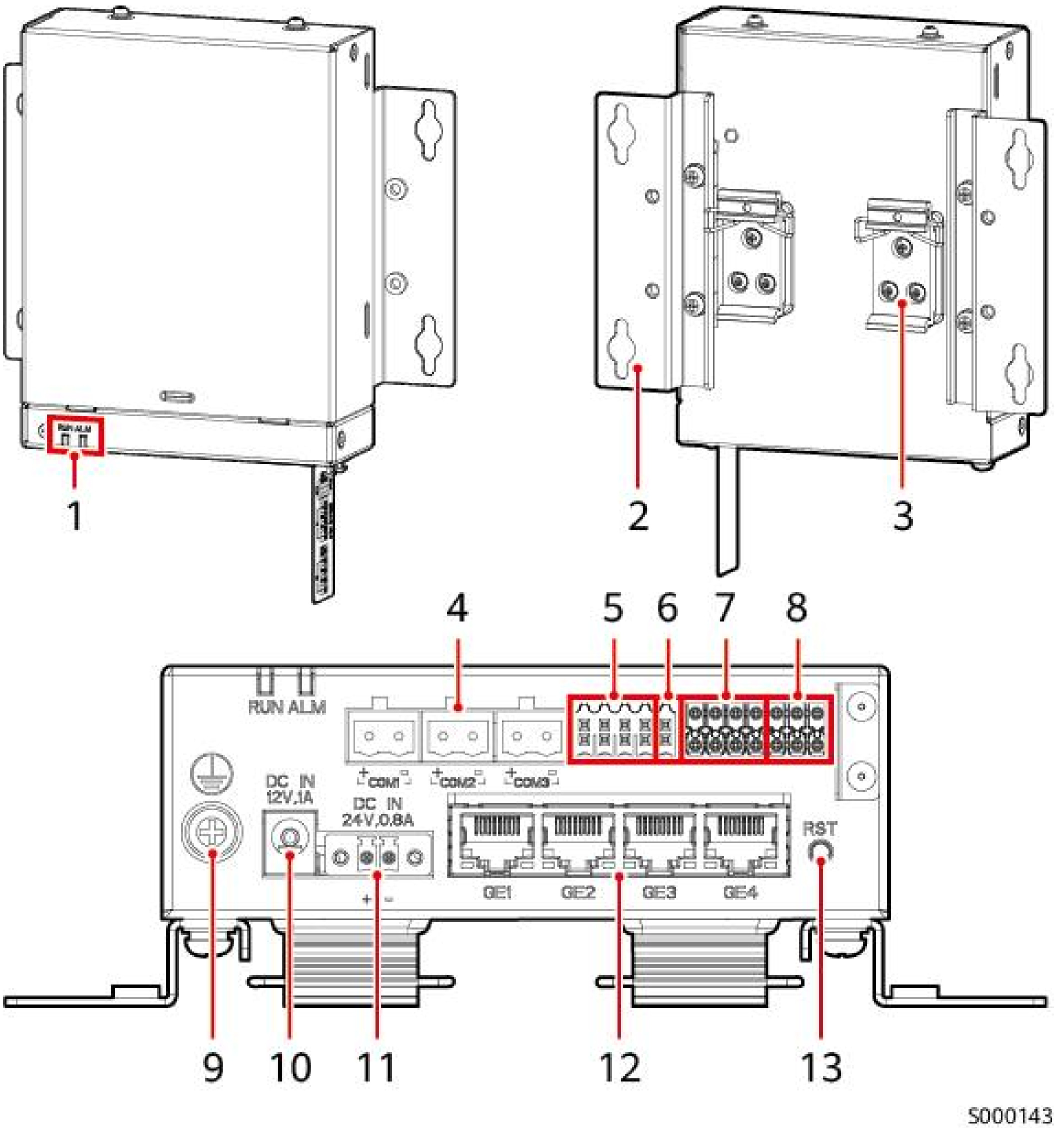


Figure 2-43 Exterior of an expansion module



(1) LED indicators	(2) Mounting ear	(3) Guide rail clamp
(4) COM ports	(5) DI ports	(6) 12 V output power port
(7) AI ports	(8) PT ports	(9) Protective earthing (PE) point
(10) 12 V input power port	(11) 24 V input power port	(12) GE ports
(13) RST button	-	-

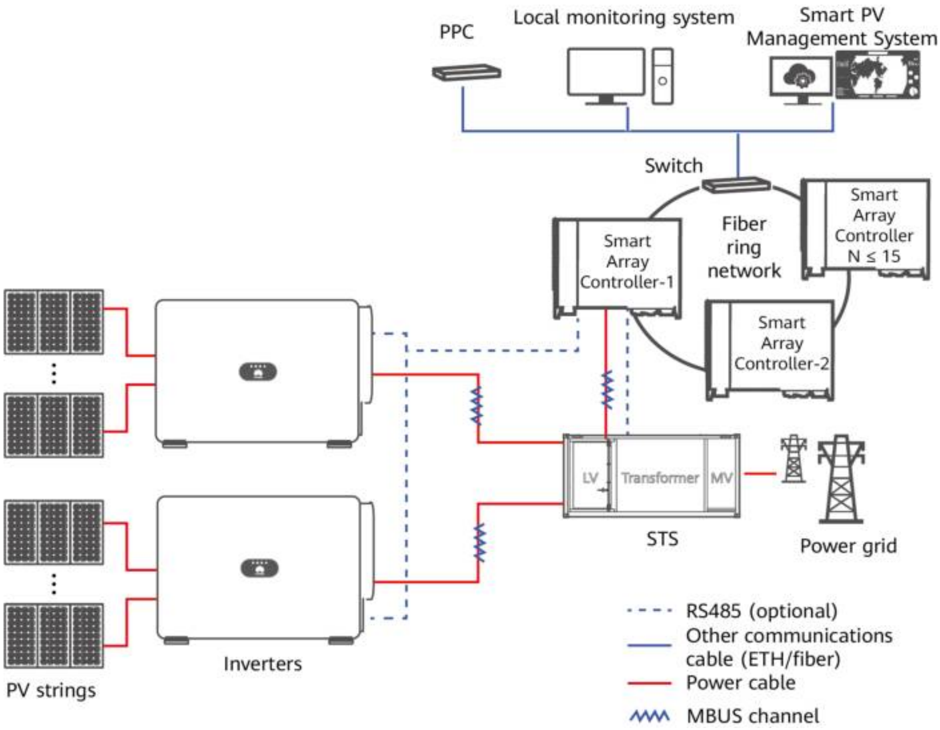
Table 2-7 Indicator description

<table>
<tr><th>Indicator</th><th colspan="2">Status</th><th>Description</th></tr>
<tr><td rowspan="3">Running indicator (RUN)
</td><td colspan="2">Off</td><td>The module is not powered on.</td></tr>
<tr><td colspan="2">Blinking green slowly (on for 1s and then off for 1s)</td><td>The communication with the SmartLogger is normal.</td></tr>
<tr><td colspan="2">Blinking green fast (on for 0.125s and then off for 0.125s)</td><td>The communication with the SmartLogger is interrupted.</td></tr>
<tr><td rowspan="4">Alarm/ Maintenance indicator (ALM)
</td><td rowspan="4">Alarm state</td><td>Off</td><td>No alarm is generated for the SmartModule.</td></tr>
<tr><td>Blinking red slowly (on for 1s and then off for 4s)</td><td>The SmartModule runs and ignores digital certificate expiration.</td></tr>
<tr><td>Blinking red fast (on for 0.5s and then off for 0.5s)</td><td>The SmartModule digital certificate is invalid.</td></tr>
<tr><td>Steady red</td><td>Reserved</td></tr>
</table>

2.5 Scenario-based Configurations

PV-Only Scenario

Figure 2-44 PV-only networking (including the MV direct grid connection scenario)

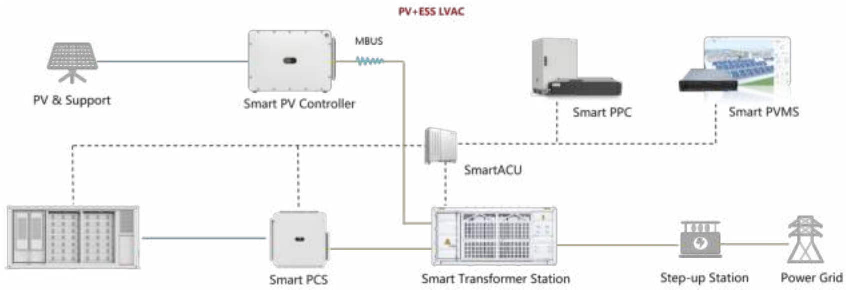


Component		Description
PV string		A PV string consists of PV modules connected in series.
SUN2000 inverter	Rated capacity of the JUPITER-9000K-H1: 9000 kVA at 40°C	Models: SUN2000-185KTL-H1 (≤ 3 x 2) SUN2000-200KTL-H1 (≤ 3 x 2) SUN2000-200KTL-H3 (≤ 3 x 2) SUN2000-215KTL-H0 (≤ 3 x 2) SUN2000-215KTL-H3 (≤ 3 x 2) SUN2000-330KTL-H1 (≤ 15 x 2) SUN2000-330KTL-H2 (≤ 15 x 2)
	Rated capacity of the JUPITER-6000K-H1: 6000 kVA at 40°C	Models: SUN2000-330KTL-H1 (≤ 11 x 2) SUN2000-330KTL-H2 (≤ 11 x 2)

Component		Description
	Rated capacity of the JUPITER-3000K-H1: 3000 kVA at 40°C	Models: SUN2000-330KTL-H1 (≤ 11 x 1) SUN2000-330KTL-H2 (≤ 11 x 1)
STS		Models: JUPITER-3000K-H1, JUPITER-6000K-H1, or JUPITER-9000K-H1
SACU	JUPITER-3000K-H1	Model: SmartACU2000D-D-01
	JUPITER-6000K-H1	Model: SmartACU2000D-D-03
	JUPITER-9000K-H1	Model: SmartACU2000D-D-03
Plant management system		Model: iMaster NetEco NetEco software version: iMaster NetEco V600R022C00SPC120 or later

PV+ESS Scenario Where the Inverter and PCS Are Connected to the Same MCCB

Figure 2-45 LV AC coupling grid connection in PV+ESS scenarios



Component	Model	Remarks
PV inverter	HA V5 series	None
Smart String ESS	LUNA2000-2.0MWH-4H1 LUNA2000-2.0MWH-2H1 LUNA2000-2.0MWH-1H1 LUNA2000-1.0MWH-4H1	The 1C/0.5C/1C half-container solution and hybrid use solution were launched in Q2 of 2023.
PCS	LUNA2000-200KTL-H1	None
DTS	DTS-200K-D0	None

Component	Model	Remarks
STS	JUPITER-3000K-H1 JUPITER-6000K-H1 JUPITER-9000K-H1	Developed based on the shared MCCB solution in PV-only scenarios.
SACU	SACU2000D	The inverter and ESS are connected to the same SmartLogger. Double-winding transformer: SmartACU2000D-D-01 (configured with an expansion module and a five-port LAN switch) Double-split transformer: SmartACU2000D-D-03 (configured with a five-port LAN switch)

3 Installation Environment Requirements

The equipment is installed outdoors. The site selection requirements are as follows:

- The equipment is heavy. Ensure that the installation surface is solid enough to bear the weight of the equipment.
- The site is not located in a low-lying land. The ground level of the site is above the highest water level of that area in history.
- The ground is solid without spongy or soft soil, and is not prone to water accumulation or subsidence.
- The site is located in a well-ventilated area.
- The site is far away from sources of strong variation, loud noises, and strong electromagnetic interference.
- The site is not above any underground facilities.
- The site must be a class C or higher environment (not a class D or E environment).
- The site is far away from dust, cooking fume, harmful gases, and corrosive, flammable, or explosive objects.
- The site is in an open area and at least 10 m away from any obstacles in all directions.
- The site is at least 50 m away from residential areas.
- The site temperature is within the range of –25°C to +60°C. If the temperature exceeds 55°C, the equipment must be installed in a shaded area.
- If the equipment is installed in a place with dense vegetation, in addition to routine weeding, harden the ground under the equipment to prevent weeds from growing.

NOTE

- Class C environment: Outdoor areas more than 500 m away from the sea. If a site is near a pollution source, it is 1500–3000 m away from heavy pollution sources, such as smelteries, coal mines, and thermal power plants; 1000–2000 m away from medium pollution sources such as chemical factories, rubber plants, and electroplating factories; or 500–1000 m away from light pollution sources, such as packing houses, tanneries, boiler rooms, slaughterhouses, landfill sites, and sewage treatment plants.
- Class D environment: Sea environments or outdoor areas within 500 m away from the sea. If a site is near a pollution source, it is within 1500 m away from heavy pollution sources such as smelteries, coal mines, and thermal power plants, within 1000 m away from medium pollution sources such as chemical, rubber, and electroplating industries, or within 500 m away from light pollution sources such as packing houses, tanneries, boiler rooms, slaughterhouses, landfill sites, and sewage treatment plants.
- Class E environment: Special environments, such as underground or underwater environments.

Foundation Requirements

Before installation, build concrete platforms and trenches on the selected ground. The foundation construction requirements are as follows:

- The foundation shall meet the installation and load-bearing requirements of the container.
- The foundation must be above the highest water level of the local area in history and at least 300 mm above the ground.
- The overall flatness of the foundation is less than or equal to 10 mm.
- Bury a grounding grid and reserve a ground copper bar at the ground position of the container. One end of the copper bar must be connected to the buried grounding grid, and the other end must be connected to the main ground point of the container. When burying a grounding grid, reserve sufficient length for the ground copper bar to connect to the main ground point of the container.
- The transformer station adopts bottom cabling. Cables shall be buried under the LV room and MV room in advance.
- The inner diameter of the protective tube shall be greater than or equal to 1.5 times the outer diameter of the cable (including the protective layer).
- Construct drainage facilities based on the local geological conditions and municipal drainage requirements to ensure that no water will accumulate at the equipment foundation. The foundation construction must meet the local drainage requirements for the maximum historical rainfall. The drained water must be disposed of in accordance with local laws and regulations.
- Reserve pressure relief channels for the ring main unit, and add protective measures to prevent high temperature gas from burning nearby personnel during pressure relief.
- The insulated ladder shall not block the inlets or outlets of the LV or MV cables. You are advised to put the insulated ladder in front of the door during maintenance.
- According to the IEC 61936 standard, an oil-immersed transformer that uses mineral oil as the insulation liquid must be equipped with an oil tray to prevent groundwater or soil pollution caused by insulation liquid leakage.

Users must strictly comply with the standard. The Company shall not be liable for any environmental pollution or violation of local laws and regulations caused by lack of oil trays.

- If the oil tray is at the bottom of the container, ensure good ventilation on the top of the oil tray. Otherwise, the moisture from the oil tray will enter the container, resulting in condensation inside the container due to high humidity. As a result, short circuits may occur, causing the STS failure.
- The site foundation must be designed by professional technical personnel such as those from a design institute. The technical personnel can refer to the foundation drawings of the Company. Contact the product manager of the Company to obtain the drawings.

Check Items

No.	Check Item	Acceptance Criteria
1	Platform space	● If the height of the platform is less than or equal to 0.2 m, the distance between the container and the platform outline is 0.1 m to 0.2 m. ● If the height of the platform is 0.2 m to 0.5 m, the distance between the container and the platform outline is greater than or equal to 0.8 m. ● If the height of the platform is greater than 0.5 m, the distance between the container and the platform outline is greater than or equal to 1.3 m.
2	Cabling space at the bottom	● If there is no maintenance space at the bottom, it is recommended that the cabling space at the bottom of the container be greater than or equal to 1.2 m high. ● If there is maintenance space at the bottom, it is recommended that the cabling space at the bottom of the container be greater than or equal to 1.5 m high.
3	Cable	● The bending radius of the LV and MV cables is greater than or equal to 15 times the cable diameter. ● The voltage drop of the farthest loop does not exceed 5%. ● The sensitivity, voltage level, and thermal stability of the cables meet the local design specifications. ● The MV cable connector matches the size of the cables used in the project. A sealing tube is used to prevent dust, condensation, and arcing that may damage the cable connector.
4	Pressure relief channel	A pressure relief channel is reserved under the MV room. It is recommended that the STS be built on posts. The distance between the bottom of STS and the ground is greater than or equal to 300 mm.

4 Power-On

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.
- During operations, wear personal protective equipment such as protective clothing, insulated boots, safety helmets with face shields, and insulated gloves.

DANGER

- Only professional O&M personnel are allowed to operate in the STS to avoid personal injury caused by improper operations.
- Before power-on, ensure that the STS is installed securely, all its internal components are installed, and the check before power-on is complete.
- Immediately stop any operation when an exception occurs. Proceed with the operation only after the exception is rectified.
- Before power-on, place insulation pads under the operation positions.

CAUTION

- The transformer must be powered on by two persons. One person operates the transformer, and the other uses the insulation rescue hook to hold the operator. In the case of any exceptions, the operator shall be quickly pulled away from the equipment.
- STSs are interlocked and must be configured based on the STS installation sequence.
- Only O&M personnel can perform operations, and other personnel must stay more than 10 m away from the STS.

NOTICE

Before the equipment is put into operation for the first time, ensure that the parameters are set correctly by professional personnel. Incorrect parameter settings may result in noncompliance with local grid connection requirements and affect the normal operations of the equipment.

NOTICE

- When operating the transformer, ensure that it is in the no-excitation state, that is, the high and low voltage sides of the transformer are not powered on.
- Perform insulation tests on the medium-voltage side of the transformer and the ring main unit before connecting incoming cables and sealing cable holes.
- Before the insulation tests, ensure that no lightning arrester is installed in cabinet G2 because high voltage may damage the lightning arrester during the tests.
- During insulation tests on the medium-voltage side and the ring main unit, ensure that the grounding switch of the ring main unit is turned off, and that the load switch and disconnector are turned on.

NOTE

This document uses a three-STS system as an example to describe power-on operations.

4.1 Check Before Power-On

4.1.1 Equipment Check

General Inspection

No.	Check Item	Acceptance Criteria
1	Equipment exterior	• The equipment is intact and free from rust and paint flake-off. If the paint flakes off, repair the damaged paint. • The labels on the equipment are clear. Damaged labels must be replaced.
2	Cable exterior	• Cable sheathings are intact and not damaged. • Cable hoses are intact.
3	Cable connection	• Cables are connected in the designed positions. • Terminals are prepared as required and securely connected. • Labels on both ends of each cable are clear and specific, and attached in the same direction.

No.	Check Item	Acceptance Criteria
4	Cable routing	● Electrical and extra low voltage (ELV) cables are routed separately. ● Cables are neat and tidy. ● Cable tie joints are evenly cut without burrs. ● Cables are placed properly with slack at bending points to avoid stress. ● Cables are routed neatly without twists or crossovers in the cabinet.
5	Container cleanness	The container is clean and tidy inside, without any unnecessary cables, cable ends, terminals, or tools. No garbage is found outside the equipment.

Container Check

No.	Check Item	Acceptance Criteria
1	Installation	● The installation meets the design requirements. ● The container is level, and each door opens normally.
2	Exterior	The container surface is free from cracks, dents, and scratches. If the paint flakes off, repair the damaged paint.
3	Accessory	The quantity and positions of external accessories installed meet design requirements.
4	Label	All labels are correct, clear, and complete.

LV Panel Check

No.	Check Item	Acceptance Criteria
1	Circuit breaker	The ACBs and MCCBs are turned off. The settings of the circuit breakers must match that provided by the user.
2	Copper bar	The copper bars are not deformed, and no foreign objects are placed on the copper bars.
3	Fuse switch-disconnector	Measure the fuse resistance. The resistance of three phases should be small and their resistance should be close.

No.	Check Item	Acceptance Criteria
4	Surge protective device (SPD)	The SPD indicator is green.
5	(Optional) Multimeter	The multimeter has no reading.
6	Cable	The bolts for installing the cables are tightened and the cables are not loose.
7	Cable hole sealing	Cable holes are sealed.
8	Component	All components are intact.
9	Foreign object	Foreign objects in the LV panels, such as tools and remaining materials, are removed.
10	Residual current circuit breaker	Use the test button to verify that the circuit breaker works properly.

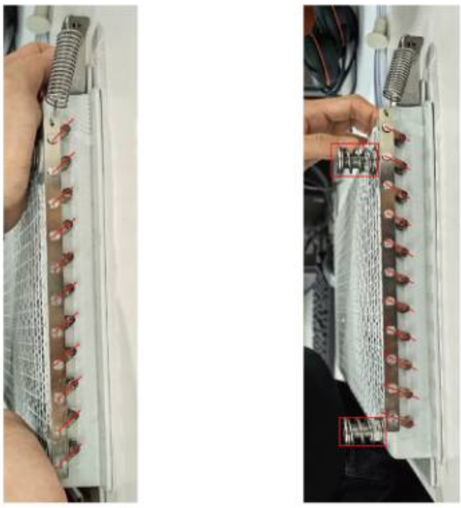
Checking a Louver in an LV Panel

Check that a louver in an LV panel can be opened and closed properly.

1. Press the two buttons on a louver. The buttons work properly.
2. When the door is closed, the louver is opened properly. (Close the end door on one side and observe from the side that the connecting rods of the louver face downward, as shown in **Figure 4-1**.)
3. When the door is opened, the louver is closed properly.

If all the preceding conditions are met, the louver is normal.

Figure 4-1 Status of connecting rods of a louver



Connecting rods face downward when the louver is opened

Connecting rods face upward when the louver is closed

Transformer Check

No.	Check Item	Acceptance Criteria
1	Exterior	The transformer surface is free from cracks, dents, and scratches.
2	Oil leakage	No oil leakage occurs on the transformer surface.
3	Oil temperature	The reading of the transformer oil temperature indicator is close to the ambient temperature. The cover of the oil temperature indicator is installed securely. The surface is clean and the glass is not damaged. The temperature measurement loop is complete and intact.
4	Oil level	The reading of the transformer oil level gauge is consistent with the oil level and temperature curves.
5	Pressure relief valve	The fuse link of the pressure relief valve has been removed, and the pressure relief valve takes no action.
6	Gas relay	• There is no gas inside the gas relay. If there is a small amount of gas, the air can be exhausted through the gas release plug. • The butterfly valve is open.
7	Dehydrating breather	• The silica gels are dry. • If more than half of the silica gels have changed in color, replace the silica gels. Silica gels can be reused after being exposed to the sun or dried at high temperature.

No.	Check Item	Acceptance Criteria
8	Off-load tap changer	• The off-load tap changer is set according to the requirements of the user. If there is no special requirement, set it to the rated level (level 3). • When setting the level, open the handle. After adjusting the level, close the handle to the slot. • After the check is complete, tighten the protective cover for the level switch.
9	Foreign object	There are no packing materials on the transformer, and there are no foreign objects in the transformer room.
10	Oil drain	The oil drain of the transformer room is not blocked.
11	Screen door	The double-swing screen door of the transformer room is closed and locked.

Ring Main Unit Check

No.	Check Item	Acceptance Criteria
1	Exterior	The cabinet surface is free from cracks, dents, and scratches.
2	SF_6 barometer	The pointer of the SF_6 barometer is in the green area and is at a certain distance from the yellow or red area.
3	Protective device	If there is a relay protection tester or current source, check the value settings of the protective device, including the set value, control word, and software logic. The set value must match that provided by the user.
4	Cable room door	The cable room door is closed.
5	Power supply in the cabinet	The auxiliary AC power circuit breaker in the cabinet is turned on.
6	Foreign object	Foreign objects in the ring main unit, such as tools and remaining materials, are removed.

Inverter and PCS Status Check (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)

No.	Check Item	Acceptance Criteria
1	Inverter power-on check	Perform a power-on check on the inverter. For details, see sections "Check Before Power-On" and "Power-On and Commissioning" in **SUN2000-(250KTL, 280KTL, 300KTL, 330KTL) Series User Manual**.
2	Cable connection between the inverter and the STS	Ensure that the cable connection between the inverter and the STS is correct and reliable. For details, see section "Connecting AC Input Power Cables" in **JUPITER-(3000K, 6000K, 9000K)-H1 Smart Transformer Station Installation Guide**.
3	PCS power-on check	Perform a power-on check on the PCS. For details, see sections "Checking Before Power-On" and "Power-On and Commissioning" in **LUNA2000-200KTL-H1 Smart Power Control System User Manual**.
4	Cable connection between the PCS and the STS	Ensure that the cable connection between the PCS and the STS is correct and reliable. For details, see section "Connecting AC Input Power Cables" in **JUPITER-(3000K, 6000K, 9000K)-H1 Smart Transformer Station Installation Guide**.
5	DTS power-on check	Ensure that the cable connection to the DTS is correct and reliable. For details, see **DTS-200K-D0 Distribution Transformer User Manual - Huawei**.
6	Cable connection between the DTS and the STS	Ensure that the cable connection between the DTS and the STS is correct and reliable. For details, see section "Connecting AC Input Power Cables" in **JUPITER-(3000K, 6000K, 9000K)-H1 Smart Transformer Station Installation Guide**.

4.1.2 Insulation Test

4.1.2.1 Insulation Test on the Transformer MV Side and the Ring Main Unit

NOTE

- Perform insulation tests on the medium-voltage side of the transformer and the ring main unit before connecting incoming cables and sealing cable holes.
- Before the insulation tests, ensure that no lightning arrester is installed in cabinet G2 because high voltage may damage the lightning arrester during the tests.
- During insulation tests on the medium-voltage side and the ring main unit, ensure that the grounding switch of the ring main unit is turned off, and that the load switch and disconnector are turned on.
- The methods for performing the insulation test on the CVC/CCV/DVC/DCV ring main units are the same.
- This document uses the CVC ring main unit as an example.

Step 1 Adjust the switch of the ring main unit to be consistent with that in the test schematic diagram.

Step 2 Use a temporary ground cable to ground phase A, B, or C of LV PANEL A and LV PANEL B.

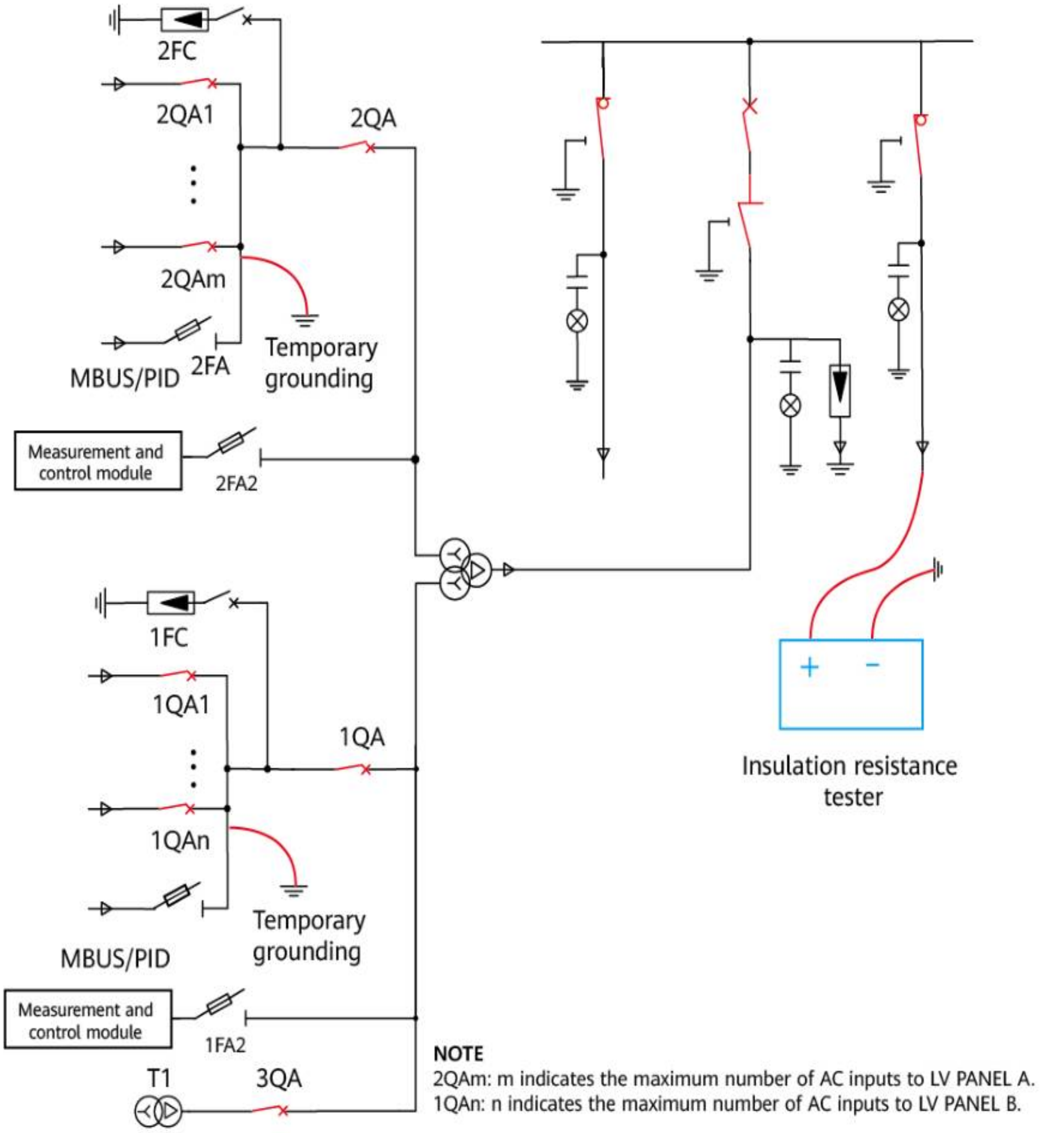
Step 3 Turn off the load switch in cabinet G1 or G3, turn on the earthing switch, and open the door of the cable room.

Step 4 Route the cable of the insulation resistance tester into the cable room from the bottom of cabinet G1 or G3. Connect the positive pole to the bushing and the negative pole to the ground.

Step 5 Close the door of the cable room, turn off the earthing switch, turn on the load switch, and perform the test.

Step 6 Maintain the test voltage of the insulation resistance tester at 2500 V for 1 minute. Record the insulation resistance at 10s, 30s, and 60s, respectively. The insulation resistance must be greater than 100 MΩ.

Figure 4-2 Test schematic diagram (LV PANEL A)



Step 7 After the test is complete, shut down the insulation resistance tester.

Step 8 Turn off the load switch, turn on the earthing switch, and open the door of the cable room. Discharge the test loop by contacting the high-voltage bushing with the ground cable.

Step 9 Remove the test cables and temporary ground cable, and close the door of the cable room.

----End

4.1.2.2 Insulation Test on the Transformer LV Side

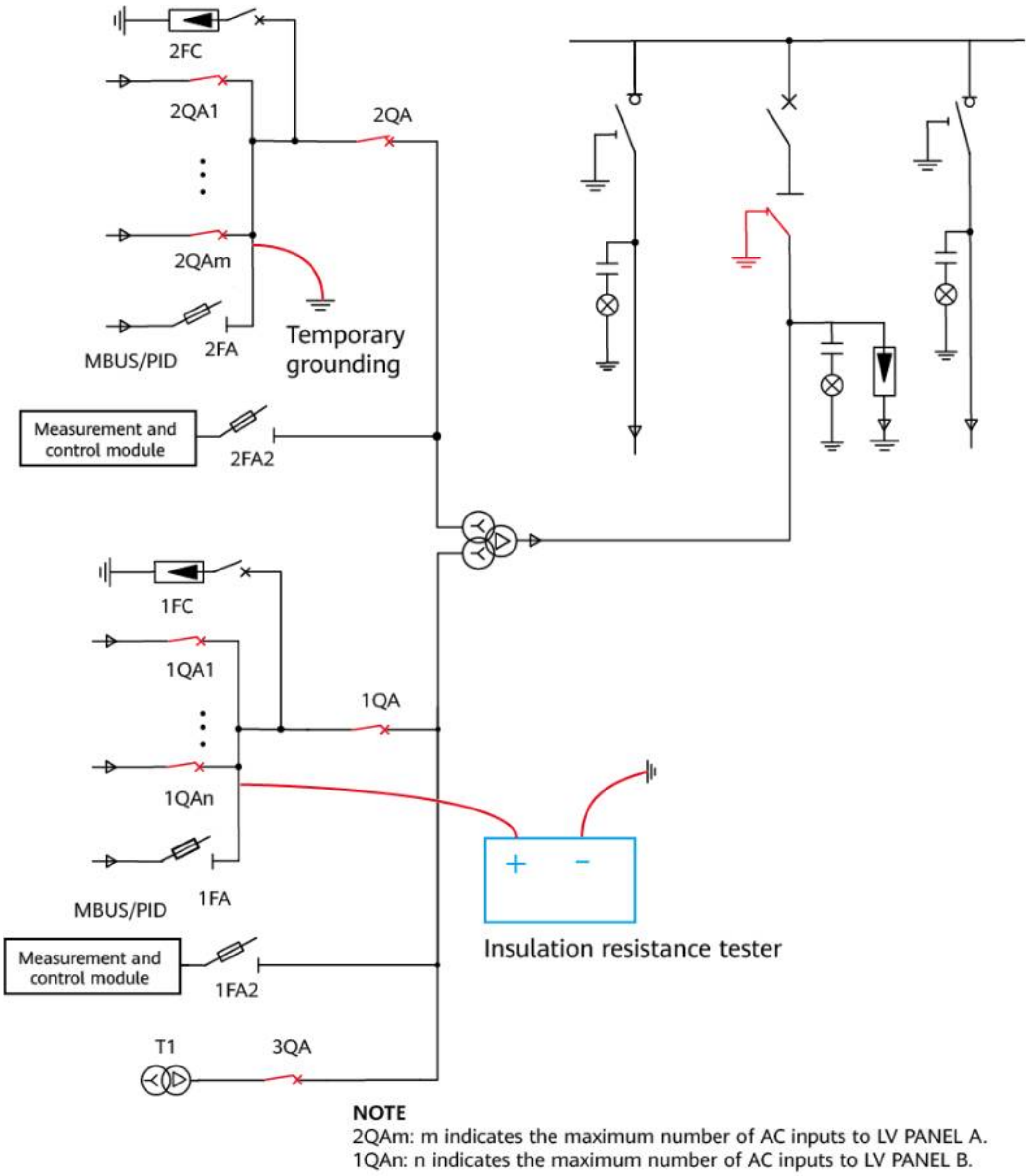
Step 1 Adjust the positions of the switches, as shown in the test schematic diagram. (If LV incoming cables are connected, turn off all the MCCBs for the incoming cables. If the SACU has been installed, turn on the knife fuse switch of the SACU and turn off the three-phase switch inside the SACU.)

Step 2 Use a temporary ground cable to ground phase A, B, or C of LV PANEL B. Skip this step if LV PANEL B is not configured.

Step 3 Connect the positive pole of the insulation resistance tester to phase A, B, or C of LV PANEL A, and connect the negative pole to the ground.

Step 4 Maintain the test voltage of the insulation resistance tester at 1000 V for 1 minute. Record the insulation resistance at 10s, 30s, and 60s, respectively. The insulation resistance must be greater than 10 MΩ.

Figure 4-3 Test schematic diagram (LV PANEL A)



Step 5 Test the insulation resistance of LV PANEL B by referring to steps 3 and 4. Skip this step if LV PANEL B is not configured.

Step 6 After the test is complete, shut down the insulation resistance tester.

Step 7 Discharge the test loop by contacting the test points with the ground cable.

Step 8 Remove the test cables and temporary ground cable.

----End

4.2 Powering On the Ring Main Unit in the MV Room

NOTE

- The cable connection mode and interlocking configuration of the ring main unit vary with projects.
- The layouts of cabinets and switches vary with ring main unit suppliers.
- The combination modes of STSs vary with projects. This document uses three STSs as an example.

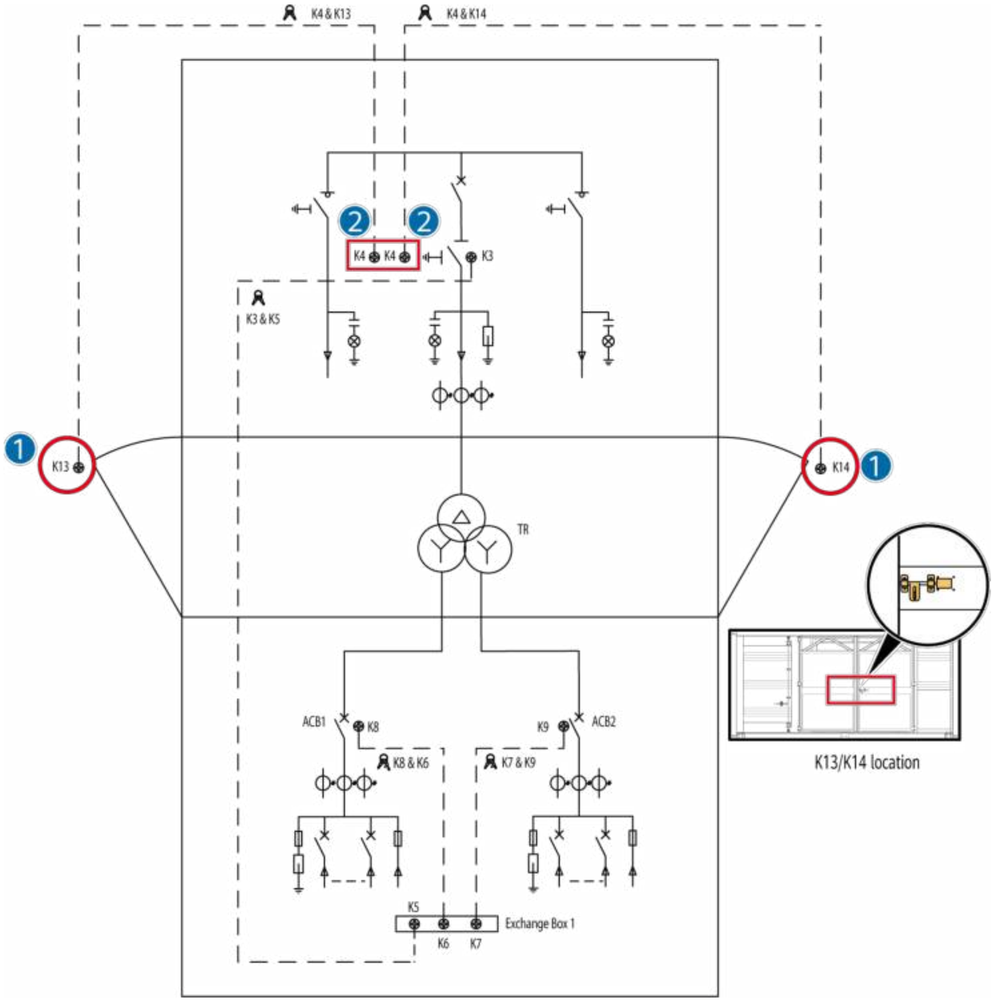
4.2.1 (Optional) Unlocking Air Circuit Breakers in the MV Room

NOTE

- The cable connection mode and interlocking configuration of the ring main unit vary with projects.
- The layouts of cabinets and switches vary with ring main unit suppliers.
- The combination modes of STSs vary with projects. This document uses three STSs as an example.

Method 1

Figure 4-4 Interlock inside the MV room (method 1)



Unlock procedure:

Step 1 Close the transformer screen door, lock it, and take out keys K4 & K13 or K4 & K14.

Step 2 Insert the two keys K4 into the lock holes of the earthing switch in the MV room and rotate the keys to unlock.

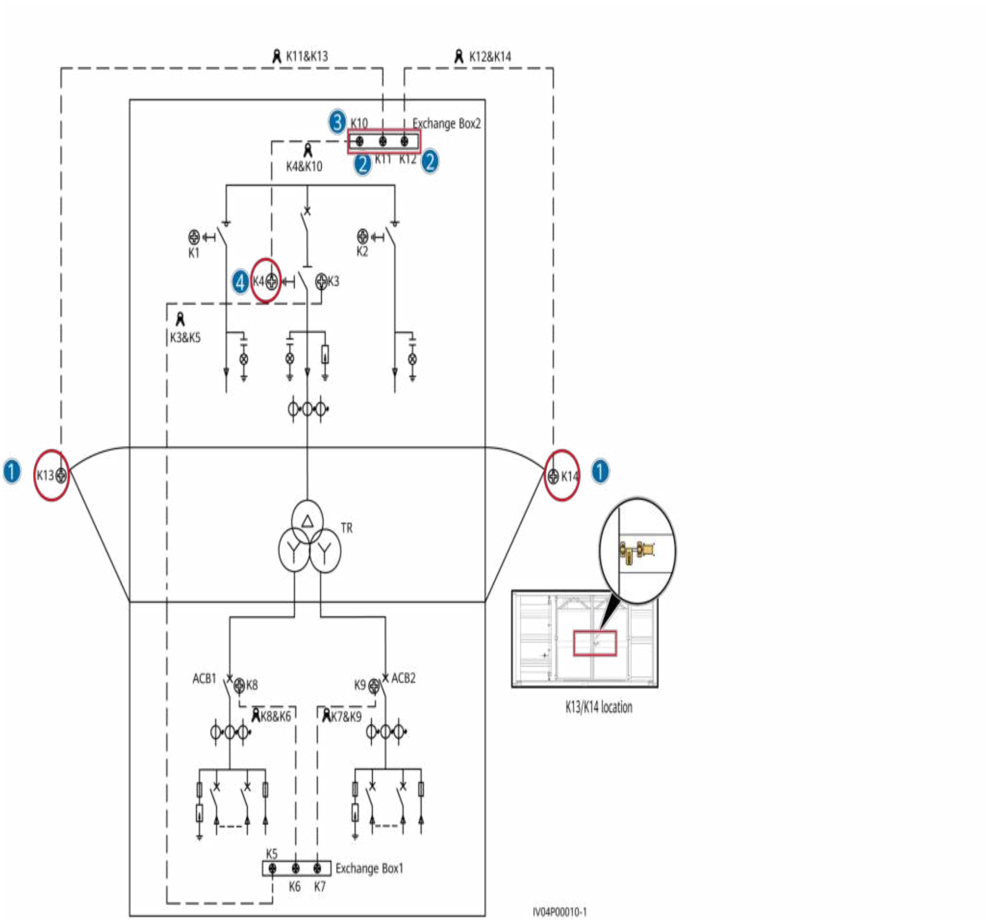
----End

NOTE

- The earthing switch of cabinet G2 can be operated only when the two keys K4 are inserted. The keys K4 can be pulled out only after the earthing switch is turned on.
- Keys K13 and K14 can be removed only after the transformer screen door is closed and locked.

Method 2

Figure 4-5 Interlock inside the MV room (method 2)



Unlock procedure:

Step 1 Close the transformer screen door, lock it, and take out keys K11 & K13 or K12 & K14.

Step 2 Insert key K11 into the K11 interlock hole of the key distribution box Exchange Box 2 in the MV room and rotate the key to unlock.

Step 3 Insert key K12 into the K12 interlock hole of Exchange Box 2 in the MV room and rotate the key to unlock.

Step 4 Take out keys K4 & K10 from Exchange Box 1, insert key K4 into the lock hole of the earthing switch in the MV room, and rotate the key to unlock.

----End

NOTE

- Keys K13 and K14 can be removed only after the transformer screen door is closed and locked.
- On the Exchange Box 2, key K10 can be removed only after keys K11 and K12 are inserted and rotated to unlock. Keys K11 and K12 can be removed only after key K10 is inserted and rotated to unlock.
- The earthing switch of cabinet G2 can be operated only when key K4 is inserted. Key K4 can be pulled out only after the earthing switch is turned on.

4.2.2 Status Check Before Power-On

NOTE

Before checking the switch status of the ring main unit, check the protection function of the relay of the ring main unit. Go to the parameter setting interface of the relay according to the factory setting table. Check that the protection function is enabled and **Protection parameter** is properly set.

Ring Main Units in CVC/CCV Mode (DQS Series and 8DJH Series)

Step 1 Check the status of STS 1, STS 2, and STS 3.

1. Check cabinet G1, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door.
2. Check cabinet G2, turn on the earthing switch, turn off the disconnector, turn off the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door.

Step 2 Check Sub-Station Line 1, turn on the earthing switch, turn off the disconnector, and turn off the circuit breaker.

Figure 4-6 Networking diagram of ring main units in CVC mode (DQS series)

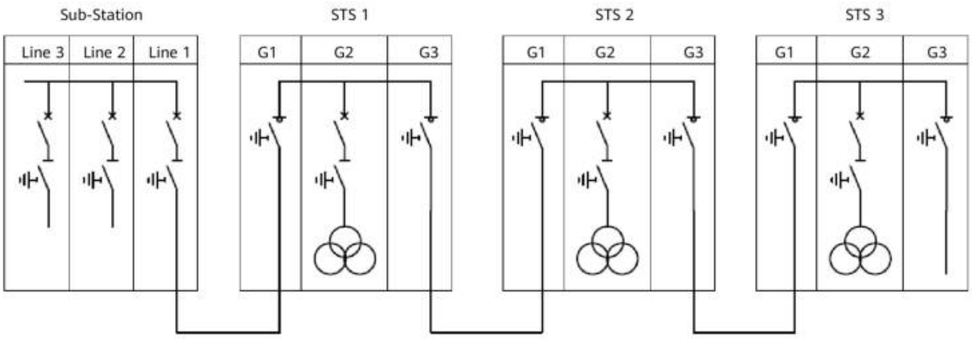
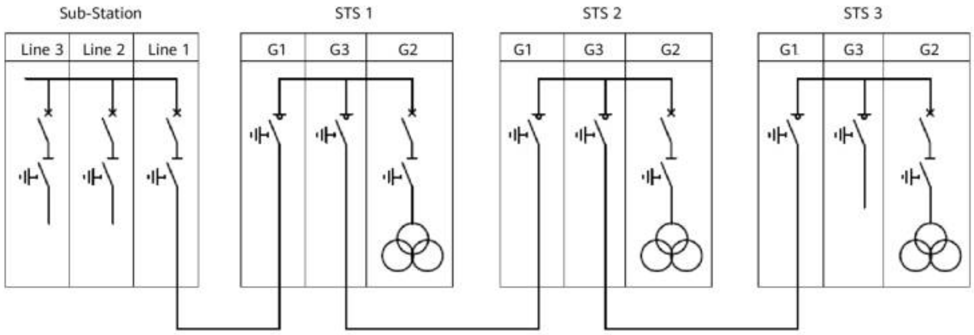


Figure 4-7 Networking diagram of ring main units in CCV mode (8DJH series)



----End

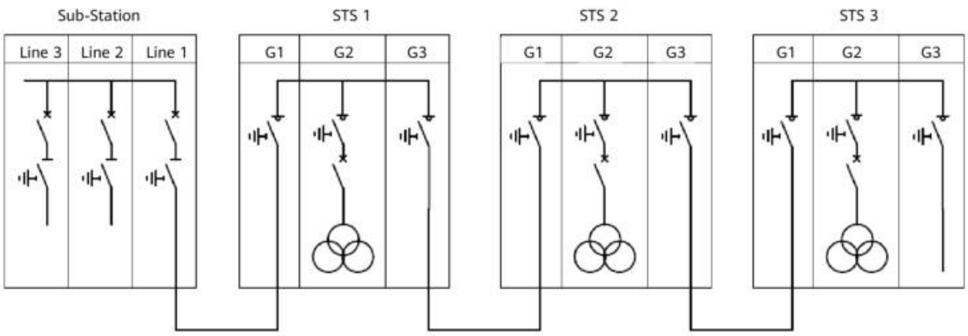
Ring Main Units in CVC Mode (CGM Series)

Step 1 Check the status of STS 1, STS 2, and STS 3.

1. Check cabinet G1, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door.
2. Check cabinet G2, turn on the earthing switch, turn off the disconnector, turn off the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door.

Step 2 Check Sub-Station Line 1, turn on the earthing switch, turn off the disconnector, and turn off the circuit breaker.

Figure 4-8 Networking diagram of ring main units in CVC mode (CGM series)



----End

Ring Main Units in DVC/DCV Mode (DQS Series and 8DJH Series)

⚠ CAUTION

STSs are interlocked and must be configured based on the STS installation sequence.

Step 1 Check the status of STS 3 and configure interlocking between STSs.

1. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the earthing switch, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G3 earthing switch of STS 3), and store the key properly.
2. Check cabinet G2, turn on the earthing switch, turn off the disconnector, turn off the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G1, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the cable room door, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G1 cable room door of STS 3), and take this key to STS 2.

Step 2 Check the status of STS 2 and configure interlocking between STSs.

1. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the earthing switch, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G3 earthing switch of STS 2). Put this key and the key to the cabinet G1 cable room door of STS 3 in one chain to complete the interlocking configuration between STS 2 and STS 3, and insert the key into the lock hole of the earthing switch.
2. Check cabinet G2, turn on the earthing switch, turn off the disconnector, turn off the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G1, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the cable room door, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G1 cable room door of STS 2), and take this key to STS 1.

Step 3 Check the status of STS 1 and configure interlocking between STSs.

1. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the earthing switch, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G3 earthing switch of STS 1). Put this key and the key to the cabinet G1 cable room door of STS 2 in one chain to complete the interlocking configuration between STS 1 and STS 2, and insert the key into the lock hole of the earthing switch.
2. Check cabinet G2, turn on the earthing switch, turn off the disconnector, turn off the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G1, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the cable room door, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G1 cable room door of STS 1), and take this key to Sub-Station.

NOTE

- The earthing switch of cabinet G3 can be operated only when the key is inserted. The key can be pulled out only after the earthing switch is turned on.
- The cable room door of cabinet G1 can be opened only when the key is inserted. The key can be pulled out only after the cable room door is closed.

Step 4 Check the status of Sub-Station Line 1.

1. Check Line 1, turn on the earthing switch, turn off the disconnector, and turn off the circuit breaker.
2. Put the earthing switch interlocking key and cabinet G1 cable room door key of STS 1 in one chain to complete the interlocking configuration between Sub-Station Line 1 and STS 1, and insert the key into the lock hole of the earthing switch.

Figure 4-9 Networking diagram of ring main units in DVC mode (DQS series)

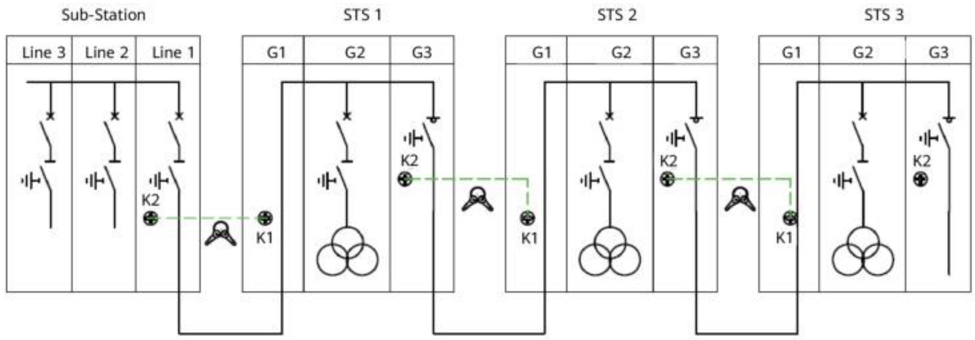
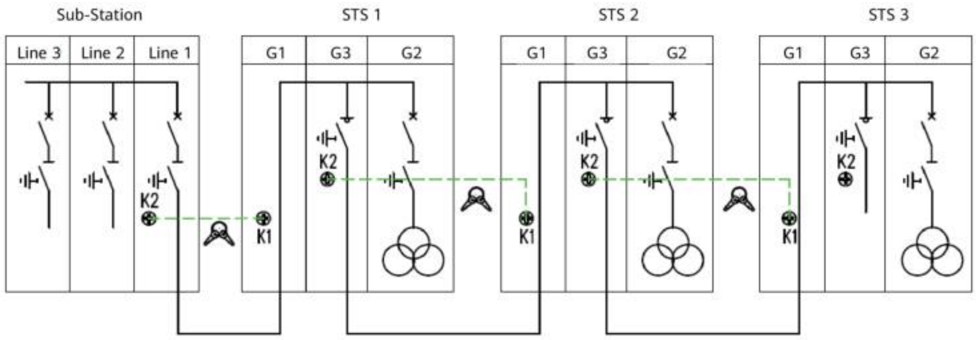


Figure 4-10 Networking diagram of ring main units in DCV mode (8DJH series)



NOTE

- The earthing switch of Line 1 can be operated only when the key is inserted. The key can be pulled out only after the earthing switch is turned on.
- If the earthing switch of Line 1 does not have the interlocking function, store the cabinet G1 cable room door key of STS 1 properly.

----End

Ring Main Units in DVC/DCV Mode (CGM Series)

> ⚠ **CAUTION**
>
> STSs are interlocked and must be configured based on the STS installation sequence.

Step 1 Check the status of STS 3 and configure interlocking between STSs.

1. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the earthing switch, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G3 earthing switch of STS 3), and store the key properly.
2. Check cabinet G2, turn on the earthing switch, turn off the disconnector, turn off the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G1, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the cable room door, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G1 cable room door of STS 3), and take this key to STS 2.

Step 2 Check the status of STS 2 and configure interlocking between STSs.

1. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the earthing switch, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G3 earthing switch of STS 2). Put this key and the key to the cabinet G1 cable room door of STS 3 in one chain to complete the interlocking configuration between STS 2 and STS 3, and insert the key into the lock hole of the earthing switch.
2. Check cabinet G2, turn on the earthing switch, turn off the load switch, turn on the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G1, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the cable room door, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G1 cable room door of STS 2), and take this key to STS 1.

Step 3 Check the status of STS 1 and configure interlocking between STSs.

1. Check cabinet G3, turn on the earthing switch, turn off the load switch, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the earthing switch, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G3 earthing switch of STS 1). Put this key and the key to the cabinet G1 cable room door of STS 2 in one chain to complete the interlocking configuration between STS 1 and STS 2, and insert the key into the lock hole of the earthing switch.

2. Check cabinet G2, turn on the earthing switch, turn off the load switch, turn on the circuit breaker, open the cable room door, check the cable connections, lightning arrester, and cable sealing, and then close the cable room door.
3. Check cabinet G1, open the cable room door, check the cable connections and sealing, and then close the cable room door. Pull out the key from the cable room door, mark the STS and ring main unit numbers on the key (for example, the key to the cabinet G1 cable room door of STS 1), and take this key to Sub-Station.

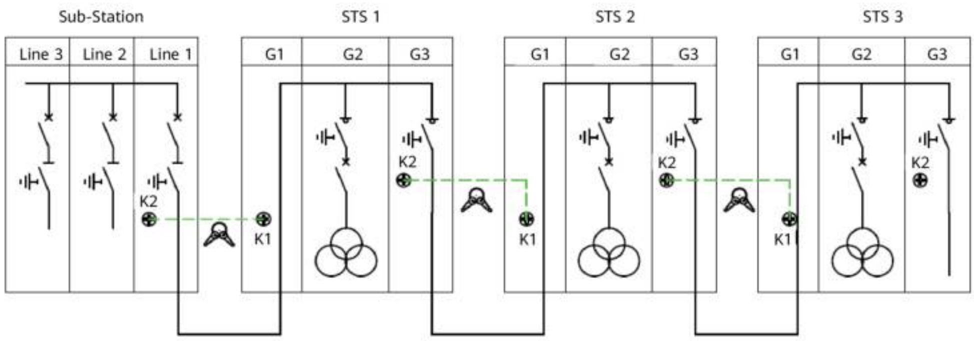
NOTE

- The earthing switch of cabinet G3 can be operated only when the key is inserted. The key can be pulled out only after the earthing switch is turned on.
- The cable room door of cabinet G1 can be opened only when the key is inserted. The key can be pulled out only after the cable room door is closed.

Step 4 Check the status of Sub-Station Line 1.

1. Check Line 1, turn on the earthing switch, turn off the disconnector, and turn off the circuit breaker.
2. Put the earthing switch interlocking key and cabinet G1 cable room door key of STS 1 in one chain to complete the interlocking configuration between Sub-Station Line 1 and STS 1, and insert the key into the lock hole of the earthing switch.

Figure 4-11 Networking diagram of ring main units in DVC mode (CGM series)



NOTE

- The earthing switch of Line 1 can be operated only when the key is inserted. The key can be pulled out only after the earthing switch is turned on.
- If the earthing switch of Line 1 does not have the interlocking function, store the cabinet G1 cable room door key of STS 1 properly.

----End

4.2.3 Powering On Ring Main Units

CAUTION

- Only O&M personnel can perform operations, and other personnel must stay more than 10 m away from the STS.
- Immediately stop any operation when an exception occurs. Proceed with the operation only after the exception is rectified.

4.2.3.1 Operating Ring Main Unit Switches

Ring Main Units in CVC/CCV Mode (DQS Series and 8DJH Series)

Step 1 Operate STS 3 ring main unit switches.

1. Cabinet G3: No operation is needed and keep the earthing switch on.
2. Cabinet G2: Turn off the earthing switch and turn on the disconnector.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.

Step 2 Operate STS 2 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch and turn on the disconnector.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.

Step 3 Operate STS 1 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch and turn on the disconnector.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.
4. Keep all personnel more than 10 m away from the STS and send the STS operation completion message to the booster station.

Step 4 Power on Sub-Station Line 1.

1. Line 1: Turn off the earthing switch and turn on the disconnector.
2. Line 1: Turn on the circuit breakers.
3. Inform the personnel at the STSs to check the ring main units after the power-on is complete.

----End

Ring Main Units in CVC Mode (CGM Series)

Step 1 Operate STS 3 ring main unit switches.

1. Cabinet G3: No operation is needed and keep the earthing switch on.
2. Cabinet G2: Turn off the earthing switch, turn off the circuit breaker, and turn on the load switch.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.

Step 2 Operate STS 2 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch, turn off the circuit breaker, and turn on the load switch.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.

Step 3 Operate STS 1 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch, turn off the circuit breaker, and turn on the load switch.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.
4. Keep all personnel more than 10 m away from the STS and send the STS operation completion message to the booster station.

Step 4 Power on Sub-Station Line 1.

1. Line 1: Turn off the earthing switch and turn on the disconnector.
2. Line 1: Turn on the circuit breakers.
3. Inform the personnel at the STSs to check the ring main units after the power-on is complete.

----End

Ring Main Units in DVC/DCV Mode (DQS Series and 8DJH Series)

Step 1 Operate STS 3 ring main unit switches.

1. Cabinet G3: No operation is needed.
2. Cabinet G2: Turn off the earthing switch and turn on the disconnector.

Step 2 Operate STS 2 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch and turn on the disconnector.

Step 3 Operate STS 1 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch and turn on the disconnector.
3. Keep all personnel more than 10 m away from the STS and send the STS operation completion message to the booster station.

Step 4 Power on Sub-Station Line 1.

1. Line 1: Turn off the earthing switch and turn on the disconnector.
2. Line 1: Turn on the circuit breakers.
3. Inform the personnel at the STSs to check the ring main units after the power-on is complete.

----End

Ring Main Units in DVC/DCV Mode (CGM Series)

Step 1 Operate STS 3 ring main unit switches.

1. Cabinet G3: No operation is needed.
2. Cabinet G2: Turn off the earthing switch, turn off the circuit breaker, and turn on the load switch.

Step 2 Operate STS 2 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch, turn off the circuit breaker, and turn on the load switch.
3. Cabinet G1: Turn off the earthing switch and turn on the load switch.

Step 3 Operate STS 1 ring main unit switches.

1. Cabinet G3: Turn off the earthing switch and turn on the load switch.
2. Cabinet G2: Turn off the earthing switch, turn off the circuit breaker, and turn on the load switch.
3. Keep all personnel more than 10 m away from the STS and send the STS operation completion message to the booster station.

Step 4 Power on Sub-Station Line 1.

1. Line 1: Turn off the earthing switch and turn on the disconnector.
2. Line 1: Turn on the circuit breakers.
3. Inform the personnel at the STSs to check the ring main units after the power-on is complete.

----End

4.2.3.2 Power-On Check for Ring Main Units

Step 1 Check the potential indicators.

- STS 1: The potential indicators of cabinets G1 and G3 blink, and that of cabinet G2 is off.
- STS 2: The potential indicators of cabinets G1 and G3 blink, and that of cabinet G2 is off.
- STS 3: The potential indicator of cabinet G1 blinks, and those of cabinets G2 and G3 are off.

Step 2 Check that the sounds of ring main units are normal.

NOTE

Untightened cable bolts or improperly installed cable connectors may cause arcs, which may generate sizzling arc sound.

----End

4.3 Powering On the TR Room

CAUTION

- Only O&M personnel can perform operations, and other personnel must stay more than 10 m away from the STS.
- O&M personnel must wear professional protective clothing, insulation boots, helmets with face protection, and insulation gloves.
- The transformer must be powered on by two persons. One person operates the transformer, and the other uses the insulation rescue hook to hold the operator. In the case of any exceptions, the operator shall be quickly pulled away from the equipment.

Power on the transformers of STS 1, STS 2, and STS 3 in sequence.

Step 1 Use the charging lever to manually charge the circuit breaker in cabinet G2. After the charging is complete, switch on the circuit breaker in cabinet G2.

Step 2 Check that the potential indicator of cabinet G2 blinks.

Step 3 Check that the sounds of ring main units are normal.

Step 4 Check that the sound of the transformer is normal.

----End

NOTE

- Untightened cable bolts or improperly installed cable connectors may cause arcing, which may generate sizzling arcing sound.
- When the transformer is powered on, a loud buzz will be generated. Then the buzz is weakened rapidly and becomes stably low after about 5 seconds.

4.4 Powering On the Auxiliary Loop

4.4.1 Turning On the SPDs of the LV and the Auxiliary Loops

Step 1 Turn on switch 1QA12 of the 800 V SPD in LV PANEL A.

Step 2 Turn on switch 2QA12 of the 800 V SPD in LV PANEL B.

Step 3 Turn on knife fuse switches 3FA1.1 and 3FA1.2 (in the auxiliary power distribution cabinet of the MV room).

----End

4.4.2 (Optional) Powering On the Auxiliary Transformer

NOTE

- If an auxiliary transformer is configured, perform the following operations to power on the auxiliary loop.
- Perform the following power-on operations based on the specifications of the auxiliary transformer.

5 kVA Auxiliary Transformer

Step 1 Ensure that the fuse is in the ON position.

Step 2 Turn on the disconnector 1QS on the power supply side of the auxiliary transformer to power on the auxiliary transformer.

----End

CAUTION

Turn off the disconnector before powering off the auxiliary transformer.

4.4.3 Powering On the Auxiliary Loop

Step 1 Turn on the auxiliary power supply switch.

Step 2 Turn on the power supply switch of the UPS and low-power auxiliary equipment.

NOTE

- When a UPS is configured, the UPS transfers from the discharging state to the normal running state. Check the indicators on the power supply unit (PSU) and energy storage modules (ESMs). Ensure that the green indicators are blinking fast (4 Hz) and that the yellow and red indicators are off.
- Some auxiliary loops have been powered on before the transformer is powered on.

Step 3 Turn on the smoke sensor and lighting switch in the auxiliary power distribution box in the MV room.

NOTE

The smoke sensor is started. The smoke sensor indicator is blinking slowly and no alarm is generated. The light is on. After the container door of the MV room is closed, the light is off.

Step 4 Turn on the power switch and the switch of the energy storage loop in cabinet G2 of the ring main unit. The operating mechanism of the circuit breaker starts charging. The charging is complete after about 10s.

NOTE

The switch numbers of ring main units may vary depending on the manufacturer. Operate the switches according to the drawing.

Step 5 Turn on the ACB in LV PANEL A. The operating mechanism of the ACB starts charging.

Step 6 Turn on the switch of the measurement and control module and the switch of the insulation monitoring device (IMD, optional) in LV PANEL A.

NOTE

The IMD starts and performs self-check first. The running sequence is as follows:

1. Conducts measurement on the negative pole for 4 seconds. The **HM** LED indicator is blinking fast. The indicators on the LED light strip are lit in sequence, and the internal circuit is detected.
2. Conducts measurement on the positive pole for 4 seconds. The **HM** LED indicator is blinking slowly. The indicators on the LED light strip are lit in sequence, and the internal circuit is detected.
3. Checks the insulation if no fault is found.
4. The normal running status is as follows: The green **WR** LED indicator is on, the yellow LED light strip is on with the eight LED indicators showing the insulation resistance (10 kΩ to 2 MΩ), and the **HM** LED indicator is blinking slowly or fast.

Step 7 Turn on the lighting and smoke sensor switch in the low-voltage room.

NOTE

After the smoke sensor starts, the indicators of the smoke sensors in the LV room and transformer room are blinking slowly and no alarm is generated. The light is on. After all container doors of the LV room are closed, the light is off.

Step 8 Turn on the ACB in LV PANEL B. The operating mechanism of the ACB starts charging.

Step 9 Turn on the switch of the measurement and control module and the switch of the IMD (optional) in LV PANEL B.

NOTE

The IMD starts and performs self-check first. The running sequence is as follows:

1. Conducts measurement on the negative pole for 4 seconds. The **HM** LED indicator is blinking fast. The indicators on the LED light strip are lit in sequence, and the internal circuit is detected.
2. Conducts measurement on the positive pole for 4 seconds. The **HM** LED indicator is blinking slowly. The indicators on the LED light strip are lit in sequence, and the internal circuit is detected.
3. Checks the insulation if no fault is found.
4. The normal running status is as follows: The green **WR** LED indicator is on, the yellow LED light strip is on with the eight LED indicators showing the insulation resistance (10 kΩ to 2 MΩ), and the **HM** LED indicator is blinking slowly or fast.

Step 10 Turn on the UPS auxiliary socket switch and ensure that the socket is energized. Turn on the common power socket switch and ensure that the socket is energized.

----End

4.4.4 Powering On the SACU

Step 1 Turn on switch 3FB3 for the power supply to the SACU in the power distribution cabinet of the MV room.

Step 2 Open the door of the SACU and turn on the **QF03** single-phase input switch. The running indicator of the SmartLogger starts blinking after 30 seconds.

----End

4.5 Powering On the LV Loop

4.5.1 (Optional) Unlocking Air Circuit Breakers in the LV Room

NOTE

- The interlock inside the STS is optional. Two interlock methods are supported, and the ACBs in the LV room can be unlocked in the same way.
- The procedures for unlocking ACBs for different models of ring main units are the same. This section uses the CVC model as an example.
- The STS can be equipped with a single-cabinet or dual-cabinet LV room. The unlock methods for the LV rooms are different. Select an appropriate unlock method based on site requirements.

Unlocking ACBs in the LV Room (Dual LV Panels)

Figure 4-12 Interlock inside the LV room (method 1)

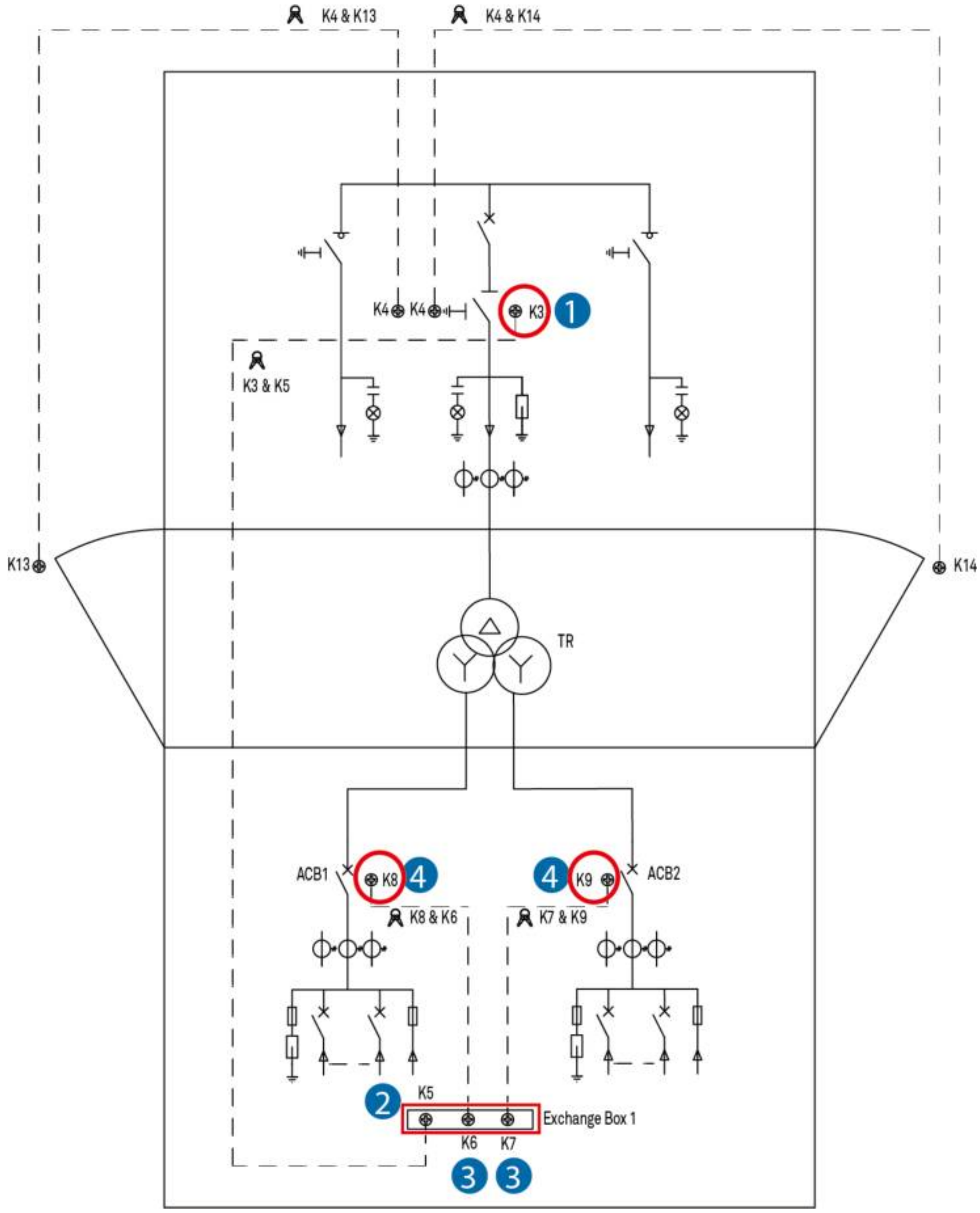
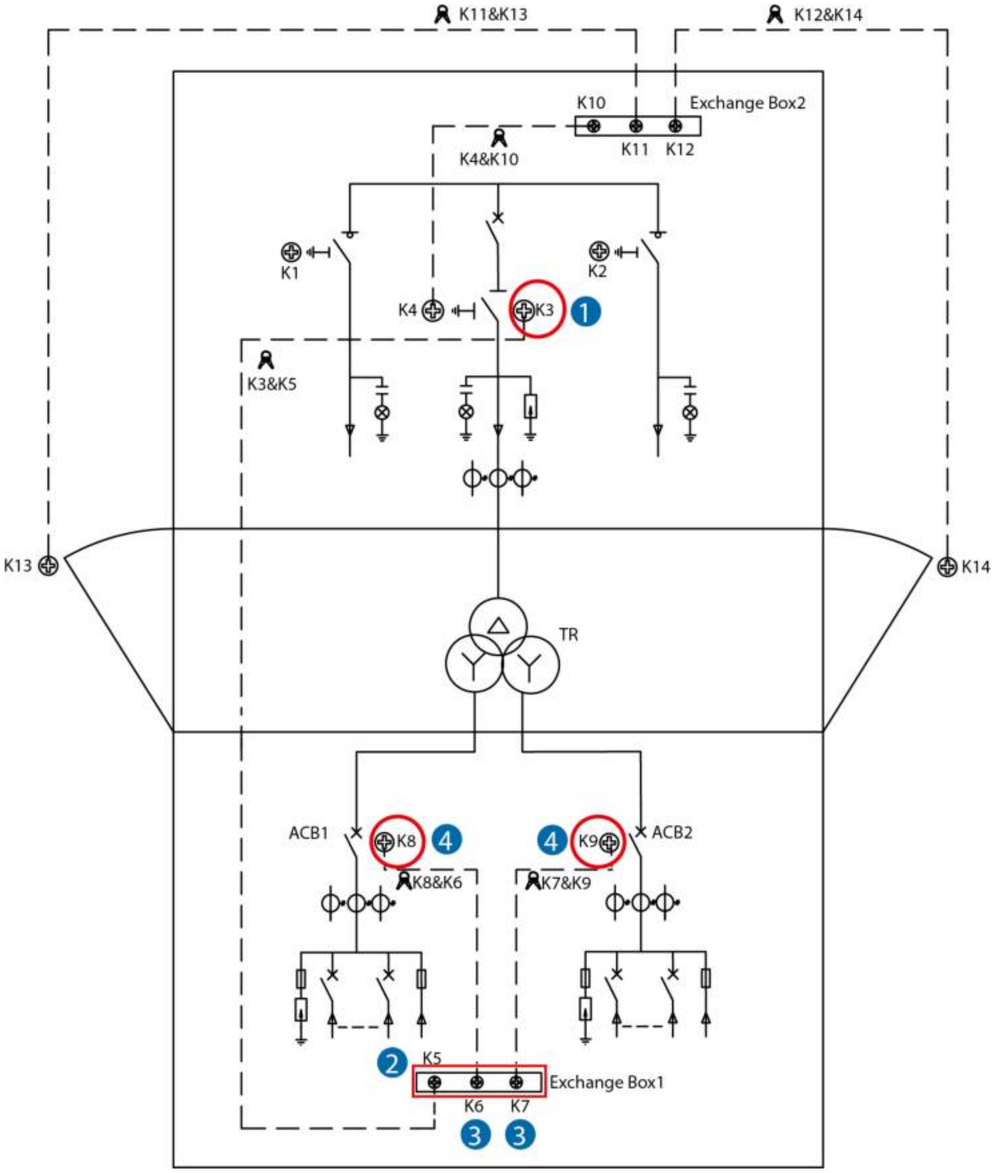


Figure 4-13 Interlock inside the LV room (method 2)



Unlock procedure:

Step 1 Take out keys K3&K5 from the disconnector (also referred to as load switch) of cabinet G2 in the ring main unit. Insert key K5 into hole K5 of the key distribution box Exchange Box 1 in the LV room and rotate the key to unlock.

Step 2 Take out keys K6&K8 from Exchange Box 1. Insert key K8 into the interlocking hole of the ACB in LV PANEL A and rotate the key to unlock.

Step 3 Take out keys K7&K9 from Exchange Box 1. Insert key K9 into the interlocking hole of the ACB in LV PANEL B and rotate the key to unlock.

----End

NOTE

- The disconnector of cabinet G2 can be operated only when key K3 is inserted. Key K3 can be removed only after the disconnector is turned on.
- On the Exchange Box 1, key K5 can be removed only after keys K6 and K7 are inserted and unlock. Keys K6 and K7 can be removed only after key K5 is inserted and unlocks.
- The ACB in LV PANEL A can be turned on only after key K8 is inserted and unlocks. Key K8 can be removed only after the ACB in LV PANEL A is turned off.
- The ACB in LV PANEL B can be turned on only after key K9 is inserted and unlocks. Key K9 can be removed only after the ACB in LV PANEL B is turned off.

Unlocking ACBs in the LV Room (Single LV Panel)

Figure 4-14 Interlock inside the LV room (method 1)

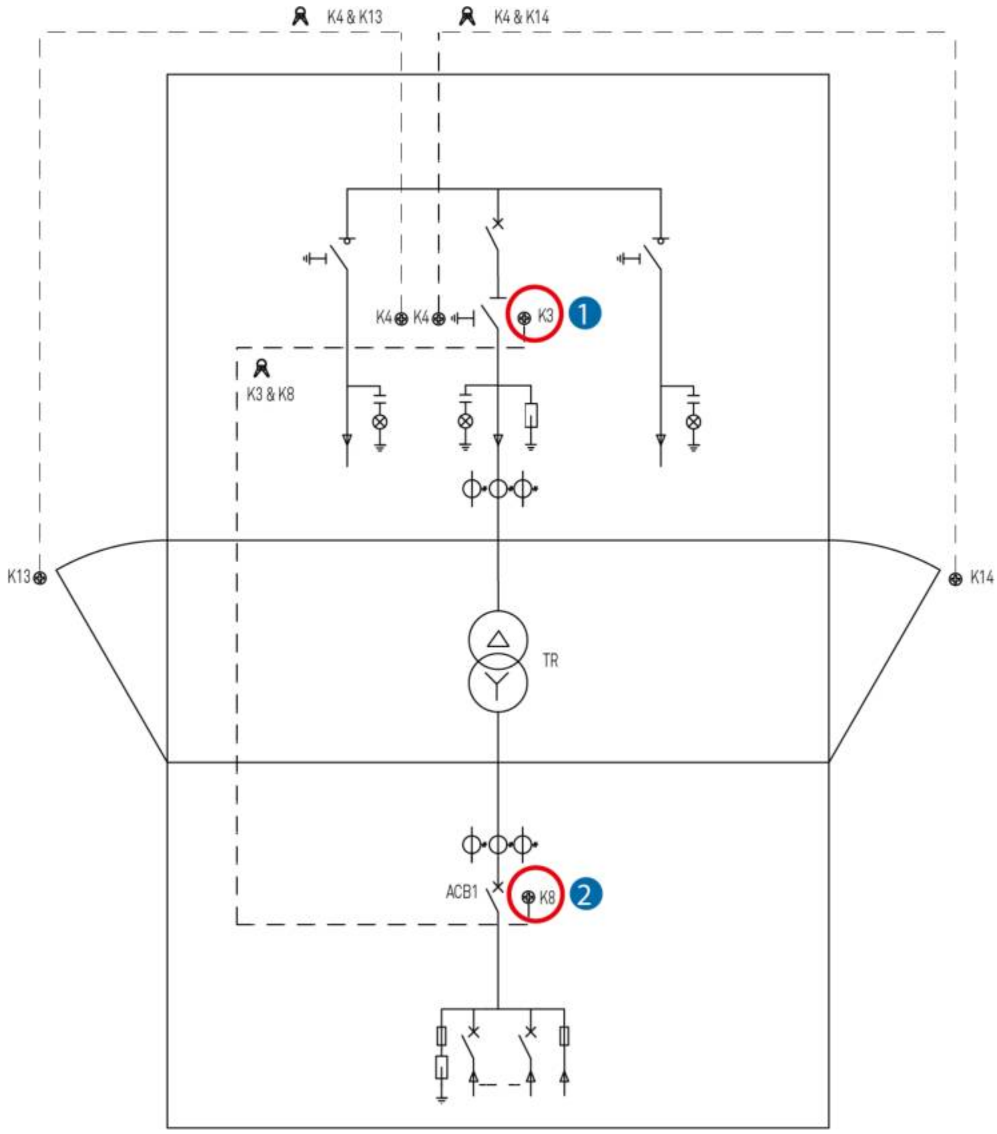
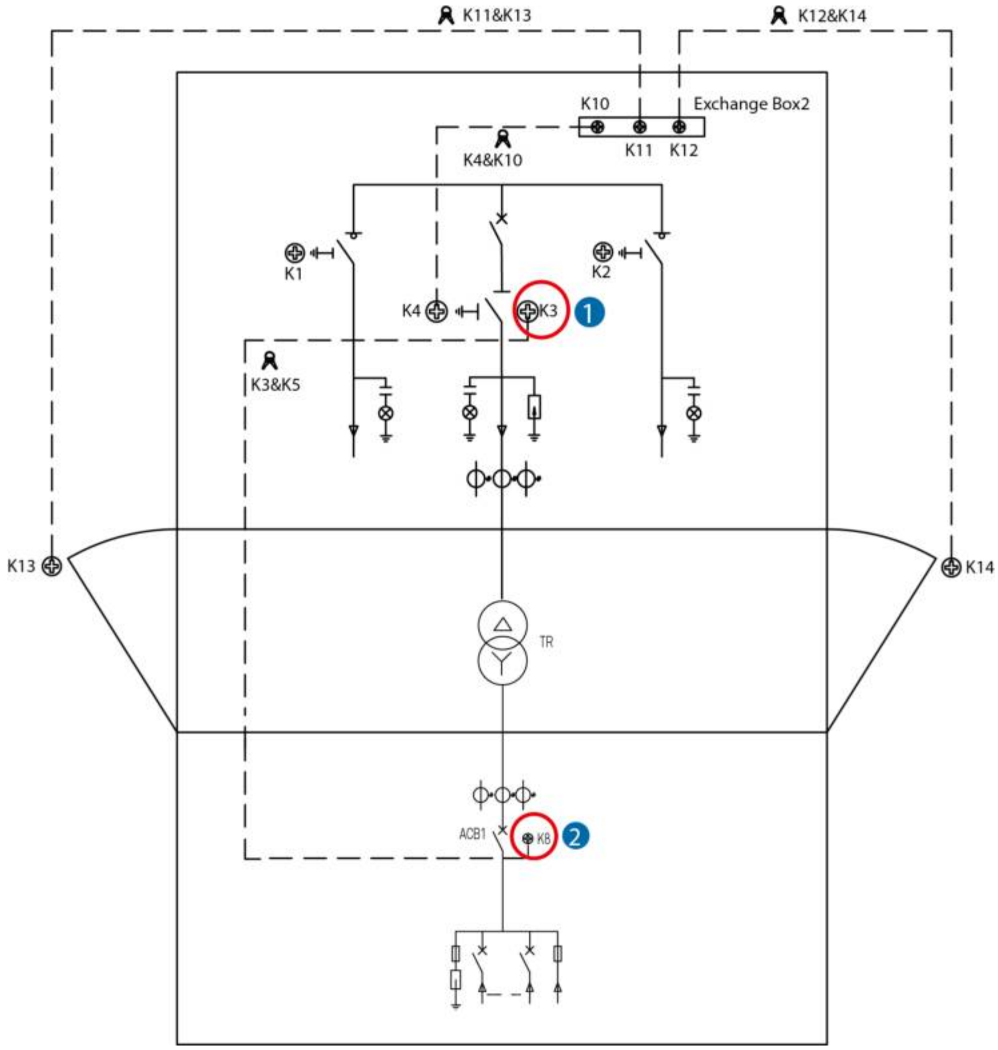


Figure 4-15 Interlock inside the LV room (method 2)



Unlock procedure:

Step 1 Take out keys K3&K8 from the disconnector (also referred to as load switch) of cabinet G2 in the ring main unit.

Step 2 Insert key K8 into the interlocking hole of the ACB in LV PANEL A and rotate the key to unlock.

----End

NOTE

- The disconnector of cabinet G2 can be operated only when key K3 is inserted. Key K3 can be removed only after the disconnector is turned on.
- The ACB in LV PANEL A can be turned on only after key K8 is inserted and unlocks. Key K8 can be removed only after the ACB in LV PANEL A is turned off.

4.5.2 Powering On LV PANEL A

Powering On the Bus

Step 1 Set the remote/local switch (1SAC1) of the ACB in LV PANEL A to the local position.

Step 2 Press the On button to switch on the circuit breaker, and then the circuit breaker stores energy.

Step 3 Set the remote/local switch (1SAC1) to the remote position.

----End

(Optional) Powering On the Voltage Sampling Loop

Step 1 Turn on the fuse switch disconnector (1FA2) in LV PANEL A. The voltage sampling loop is energized.

Step 2 Check the current operating voltage on the app or SmartLogger WebUI.

NOTE

If a multimeter is configured, you can check the voltage on it.

Note: If the multimeter is PD21-3HD3L or PD21-3D3L, the three rows of numbers displayed on the multimeter are not three-phase power when you switch to the power display page. The multimeter adopts 2-element metering. The sum of the numbers in the first and third rows is the total three-phase power.

----End

(Optional) Powering On the MBUS Loop

Step 1 Turn on the fuse switch disconnector (1FA1) in LV PANEL A.

Step 2 Turn on the three-phase switch (FU01) in the SACU.

Step 3 (Optional) If a PID module is configured, turn on the PID switch (QF01) of the SACU.

----End

4.5.3 Powering On LV PANEL B

Powering On the Bus

Step 1 Set the remote/local switch (2SAC1) of the ACB in LV PANEL B to the local position.

Step 2 Press the On button to switch on the circuit breaker, and then the circuit breaker stores energy.

Step 3 Set the remote/local switch (2SAC1) to the remote position.

----End

(Optional) Powering On the Voltage Sampling Loop

Step 1 Turn on the fuse switch disconnector (2FA2) in LV PANEL B. The voltage sampling loop is energized.

Step 2 Check the current operating voltage on the app or SmartLogger WebUI.

NOTE

If a multimeter is configured, you can check the voltage on it.

----End

(Optional) Powering On the MBUS Loop

Step 1 Turn on the fuse switch disconnector (2FA1) in LV PANEL B.

Step 2 Turn on the three-phase switch (FU02) in the SACU.

Step 3 (Optional) If a PID module is configured, turn on the PID switch (QF02) of the SACU.

----End

4.6 STS Running Without Loads

After the preceding power-on steps are complete, it is recommended that the STS run without loads for 24 hours.

NOTE

The time for the STS to run without loads is subject to the local acceptance specifications.

4.7 STS Running with Loads

NOTE

Observe the STS for 24 hours after it is powered on and running with loads. For details, see **Checking the STS Running Status**.

Powering On Inverters (Applicable to PV-Only Scenarios)

Step 1 Turn on all MCCBs of the 800 V incoming cables on the LV side of the STS.

Step 2 Turn on all switches of the combiner boxes (if any) of the array and the DC switches of the inverters.

NOTE

If the insulation of the LV array is measured before power is supplied, the switches of the combiner boxes can be turned on.

Step 3 Connect a PC to the SmartLogger, search for inverters, assign inverter addresses, and update the SmartLogger and inverter software versions.

Step 4 Check that the inverters are running and supplying current.

----End

Powering On Inverters, PCSs, and the DTS (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)

DANGER

Before powering on the inverters and PCSs, ensure that the power-on conditions are met. For details, see **Inverter and PCS Status Check (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)**.

Step 1 Turn on all MCCBs of the 800 V incoming cables on the LV side of the STS, including the MCCB connected to the DTS.

Step 2 Turn on the DC switches of the inverters.

Step 3 Turn on the DC switches of the PCSs.

- If a DC LV Panel is configured, turn on the switch of the PCS DC LV Panel corresponding to the MCCB.
- If no DC LV Panel is configured, turn on the PCS switch in the ESS corresponding to the MCCB.

Step 4 Connect a PC to the SmartLogger, search for inverters and PCSs, assign inverter and PCS addresses, and update the SmartLogger, inverter, and PCS software.

Step 5 Send a startup command to the PCS and inverter connected to the same MCCB.

Step 6 Check that the inverters and PCSs are running and supplying current.

NOTE

Before startup, check that the power of the PCSs is 0.

----End

Powering On PID Modules (When IMDs Are Configured)

Step 1 Disable IMD access for PID1. After PID1 starts, check that the **HM** LED indicator on the IMD in LV PANEL A turns off.

Step 2 Enable IMD access for PID1, and set the periodic runtime for the IMD and PID module. (You can set the periodic runtime to 60 minutes for the IMD and PID module.)

Step 3 Observe the running status of the IMD in LV PANEL A within the IMD running period (the running status of the PID module and IMD can be switched through the SmartLogger).

NOTE

The normal running status of the IMD is as follows:

- The green **WR** LED indicator is steady on.
- Yellow LED light strip: Eight LED indicators show the actual insulation resistance (10 kΩ to 2 MΩ).
- The **HM** LED indicator blinks slowly or fast.

Step 4 Disable IMD access for PID2. After PID2 starts, check that the **HM** LED indicator on the IMD in LV PANEL B turns off.

Step 5 Enable IMD access for PID2, and set the periodic runtime for the IMD and PID module. (You can set the periodic runtime to 60 minutes for the IMD and PID module.)

Step 6 Observe the running status of the IMD in LV PANEL B within the IMD running period (the running status of the PID module and IMD can be switched through the SmartLogger).

----End

Checking the STS Running with Loads

Step 1 Check the current displayed on the multimeter of LV PANEL A and on the electronic tripper of the ACB. The currents of the three phases should be equal or close.

Step 2 Check the current displayed on the multimeter of LV PANEL B and on the electronic tripper of the ACB. The currents of the three phases should be equal or close.

Step 3 Check the current displayed on the protection device of the MV panel. The currents of the three phases should be equal or close.

----End

4.8 Checking the STS Running Status

Step 1 Set up communication with the SACU on the WebUI or app. (For details, see the installation guide.)

Step 2 Check that the displayed current, voltage, active power, reactive power, temperature, and switch positions of the STS are consistent with the actual conditions.

Step 3 Check for alarms. No alarm should be generated normally.

----End

5 Human-Machine Interaction

For details about the time and protection parameters of the microcomputer protection relay, see the user manual delivered with the product.

5.1 (Optional) Modifying Relay Parameters

NOTE

- If high-configuration relay protection is used for the STS, set the relay parameters by referring to this section.
- You can view the STS number on its nameplate. For details, see **A.4 Where Can I Find the STS Nameplate?**.

Context

If the power grid recovers from a power failure, the STS automatically delays the switch-on. To prevent the switch in the booster station from tripping due to excessive surge current when multiple STSs are switched on at the same time, you need to change the delay time for automatic switch-on on the LCD of the relay so that the STSs are switched on one by one.

Figure 5-1 Multiple STSs (CCV/DCV)

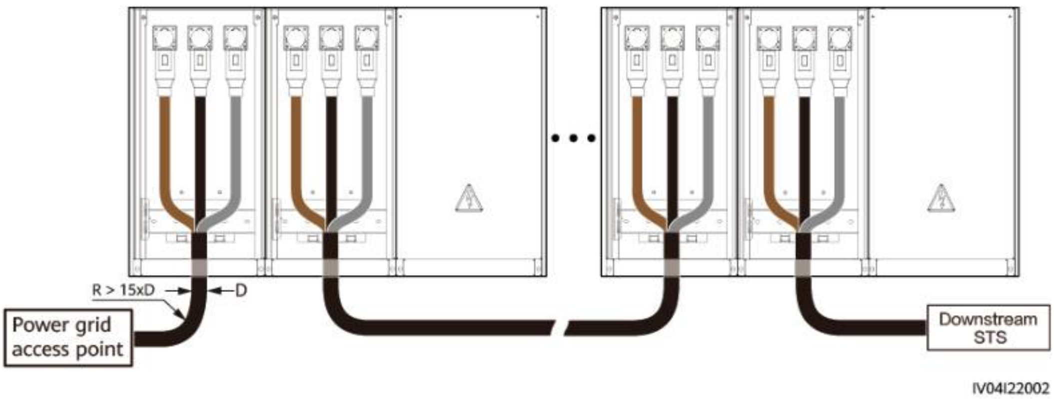
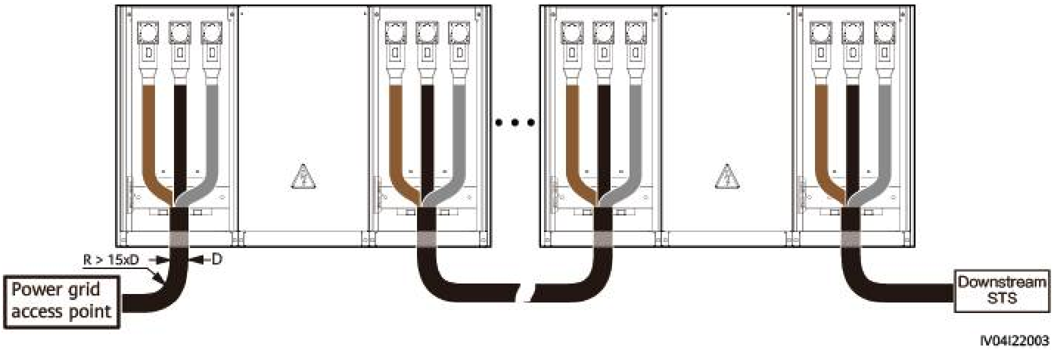


Figure 5-2 Multiple STSs (CVC/DVC)



Procedure (DQS Series and 8DJH Series)

On the LCD of the relay, choose **05.Settings > 52.Settings** to set the value of **Auto ReClose T**.

Parameter	STS1 Value (s)	STS*n* Value (s)
Auto ReClose T	15	15 + 2 x (n-1)

NOTE

- **n** indicates the number of STSs connected to the same main transformer.
- For details about how to operate on the LCD of the relay, see the user manual of the PA620 delivered with the product.

Procedure (CGM.3 Series)

On the LCD of the relay, choose **1.4.2 VOLTAGE_PRESENCE_ABSENCE > VOLTAGE_PRESENCE_ABSENCE** to set the values of **Presence_Time** and **Auto ReClose T**.

Parameter	STS1 Value (s)	STS*n* Value (s)
Presence_Time	15	15 + 2 x (n-1)
Auto ReClose T	15	15 + 2 x (n-1)

NOTE

- **n** indicates the number of STSs connected to the same main transformer.
- For details about how to operate on the LCD of the relay, see the user manual of the RPA-220 delivered with the product.

5.2 Preparations and WebUI Login

Prerequisites

- The operating system of Windows 7 or later is supported.
- Browser: Chrome 52, Firefox 58, or Internet Explorer 9, or a later version is recommended.
- It is recommended that a maximum of two users log in to the WebUI at the same time.

Procedure

Step 1 Connect the network cable between the network port of the PC and the WAN or LAN port of the SmartLogger. It is recommended that the PC be connected to the LAN port of the SmartLogger.

Step 2 Set the IP address for the PC on the same network segment as the SmartLogger IP address.

Connected Port	Item	SmartLogger Default Value	Example PC Setting
LAN port	IP address	192.168.8.10	192.168.8.11
	Subnet mask	255.255.255.0	255.255.255.0
	Default gateway	192.168.8.1	192.168.8.1
WAN port	IP address	192.168.0.10	192.168.0.11
	Subnet mask	255.255.255.0	255.255.255.0
	Default gateway	192.168.0.1	192.168.0.1

NOTE

- When the IP address of the WAN port is in the network segment from 192.168.8.1 to 192.168.8.255, set the default gateway to 192.168.8.1 and the IP address of the LAN port to 192.168.3.10. If the connected port is a LAN port, you need to adjust the network configuration of the PC.
- It is recommended that the PC be connected to the LAN port of the SmartLogger or the GE port of the SmartModule. When the PC is connected to the GE port of the SmartModule, adjust the network configuration of the PC to the configuration mode when the PC is connected to the LAN port of the SmartLogger.

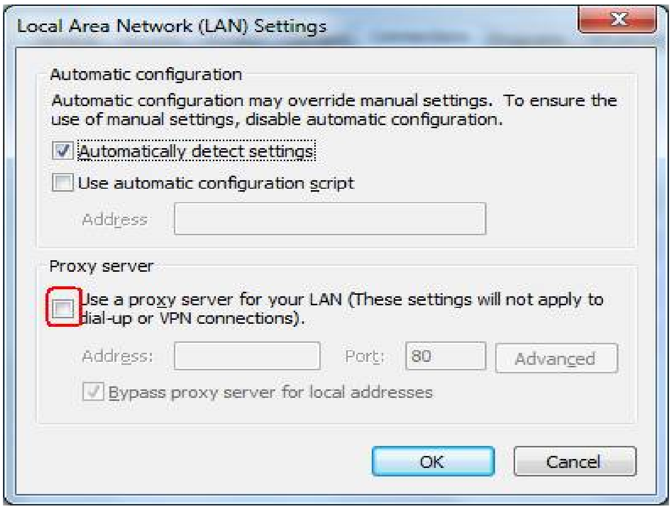
Step 3 Set LAN parameters.

NOTICE

- If the SmartLogger is connected to a LAN and a proxy server has been configured, you need to cancel the proxy server configurations.
- If the SmartLogger is connected to the Internet and the PC is connected to the LAN, do not cancel the proxy server configurations.

1. Open Internet Explorer.
2. Choose **Tools** > **Internet Options**.
3. Click the **Connections** tab and then click **LAN settings**.
4. Clear **Use a proxy server for your LAN**.

Figure 5-3 LAN settings



5. Click **OK**.

Step 4 Log in to the SmartLogger WebUI.

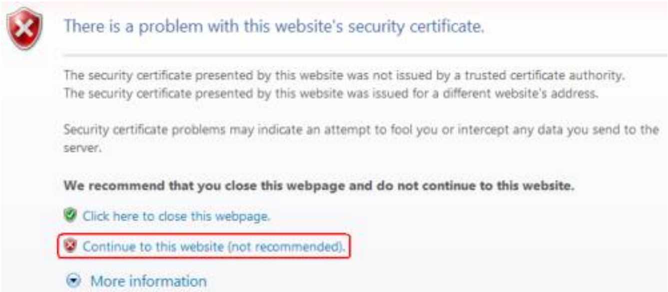
1. In the address box of a browser, enter **https://XX.XX.XX.XX** (*XX.XX.XX.XX* is the IP address of the SmartLogger) and press **Enter**. The login page is displayed.

   If you log in to the WebUI for the first time, a security risk warning is displayed. Click **Continue to this website** to log in to the WebUI.

NOTE

- It is recommended that users use their own certificates. If the certificate is not replaced, the security risk warning will be displayed during each login.
- After logging in to the WebUI, you can import a certificate under **Maintenance** > **Security Settings** > **Network Security Certificate**.
- The imported security certificate needs to be bound to the SmartLogger IP address. Otherwise, the security risk warning will still be displayed during login.
- If an error message "ERR_INSUFFICIENT_RESOURCES" is displayed for the browser during login, the browser resources are insufficient. Clear the cache and restart the browser.
- If an error message "ERR_CONNECTION_TIMED_OUT" is displayed for the browser during login, perform the following troubleshooting operations:
  - Check whether the browser proxy is abnormal. If yes, set the browser proxy according to step 3.
  - Check whether the IP address of another device conflicts with that of the SmartLogger. If yes, assign a new IP address.

Figure 5-4 Security risk warning



2. Select a desired language.
3. Select **User Name** and enter **Password** according to the following table, and then click **Log In**.

If...	Then...
On the login page, **User Name** is **admin** by default.	1. Enter the initial password **Changeme** in **Password** and click **Log In**. 2. Change the initial password as prompted and use the **admin** user name and new password to log in again.
On the login page, **User Name** is empty by default.	Select **installer** in **User Name**, set the login password as prompted, and click **Log In**.

NOTE

- Update the SmartLogger software as required.
- To ensure account security, protect the password by changing it periodically, and keep it secure. Your password might be stolen or cracked if it is left unchanged for extended periods. If you lose the password, the device must be restored to its factory settings. In these cases, the Company shall not be liable for any loss caused to the plant.
- You will be locked out for 10 minutes after five consecutive failed password attempts in 5 minutes.
- A dialog box with recent login information is displayed after login. Click **OK**.
- If the password of a non-administrator account is lost, you must reset the password using an administrator account. The administrator resets the password and enters the initial password. The non-administrator user logs in to the system using the initial password provided by the administrator. After the login, the user is forced to change the password.
- If the password of an administrator account is lost, hold down the RST button on the SmartLogger for 10–20s to enter the safe mode. After the SmartLogger enters the safe mode, the device parameter settings are retained. Personal privacy and sensitive data, including login passwords and email addresses, will deleted. SmartLogger V300R023C00 and later versions support this function.

4. Choose **Monitoring** > **Logger(Local)** > **About** to view the SmartLogger software version and check whether software upgrade is needed.
5. (Optional) To upgrade the SmartLogger software version, contact the Company's engineers to obtain the upgrade package and guide and complete the upgrade accordingly.

NOTE

- After the software upgrade is complete, the SmartLogger automatically restarts. Log in to the SmartLogger WebUI again 3 minutes later.
- If the SmartLogger is upgraded from V300R001C00 to V800R021C00, the original administrator **admin** becomes an advanced user, and the login password remains unchanged. If administrator rights are required, log in to the SmartLogger as **installer**. The password is the same as that for logging in to the mobile app. If the SmartLogger is upgraded from V800R021C00 to V300R023C00, the login passwords of the advanced user **admin** and administrator **installer** remain unchanged.
- If the SmartLogger is upgraded from V300R001C00 to V300R023C00, the original administrator **admin** becomes an advanced user, and the login password remains unchanged. If administrator rights are required, log in to the SmartLogger as **installer** and set the login password as prompted.

----End

Follow-up Procedure

If any page is blank or a menu cannot be accessed after you log in to the WebUI, clear the cache, refresh the page, or log in again.

5.3 Upgrading the SmartLogger

Checking the SmartLogger Software Version

Step 1 Choose **Monitoring** > **Logger(Local)** > **About** that the software version is SmartLogger V300R023C00SPC110 or later.

Figure 5-5 Checking the version

----End

Upgrading the SmartLogger

NOTE

- If the SmartLogger software version is not SmartLogger V300R023C00SPC110 or later, upgrade the SmartLogger.
- Obtain the SmartLogger upgrade package from the Company.

Step 1 Choose **Maintenance** > **Software Upgrade**, upload the SmartLogger upgrade package, select the target device, and upgrade the SmartLogger.

Figure 5-6 Upgrading the SmartLogger

Step 2 After the software upgrade is complete, the SmartLogger automatically restarts. Log in to the SmartLogger WebUI again 3 minutes later.

- Method 1: Log in as **admin** using your new password.
- Method 2: Log in as **installer** using your app login password (the initial password is 00000a).

----End

5.4 Connecting the STS

Choose **Maintenance** > **Connect Device** > **Auto. Search** and connect the STS.

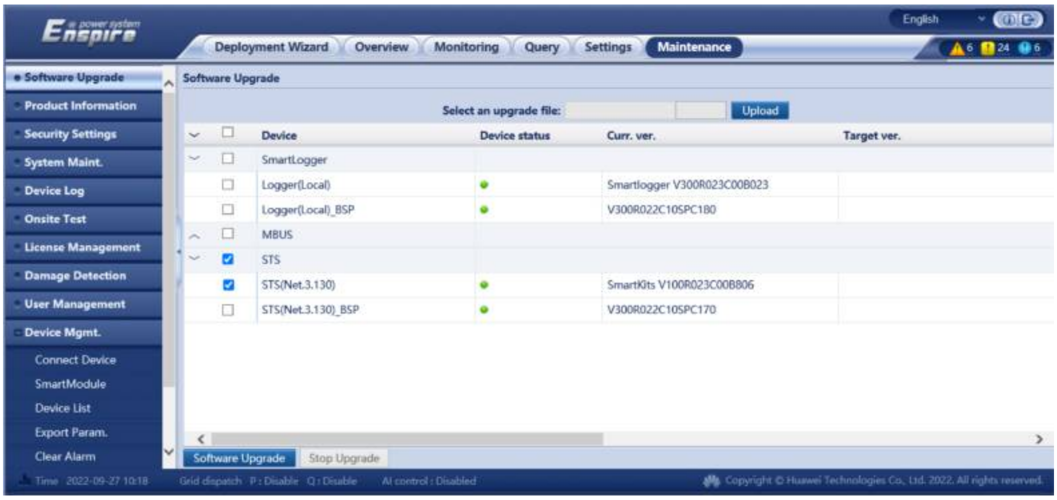
5.5 Upgrading the STS

NOTE

You are advised to upgrade the STS to the latest version. Obtain the STS upgrade package from the Company.

Step 1 Choose **Maintenance** > **Software Upgrade**, upload the STS upgrade package, select the target device, and upgrade the STS.

Figure 5-7 Software upgrade



Step 2 After the software is upgraded, the STS automatically restarts. Check the software in 3 minutes.

----End

5.6 Setting STS Parameters

NOTE

- Some STS signals are not displayed on the SmartLogger WebUI by default. They will be displayed after you select them by referring to this section.
- The WebUI screenshots are for reference only.

Adding Reserved Signals

Step 1 Choose **Monitoring** > **STS** > **User-Defined Parameters**, and select the target reserved signal based on the signal address.

Step 2 Set parameters.

Parameter	Description
Signal Name	Enter a user-defined signal name.

Parameter	Description
(Optional) Display	Select this option if the user-defined signal needs to be displayed on the **Teleindication** page.
(Optional) Reverse flag	Select this option if reverse display is required.
(Optional) Signal association	Select this option if telecontrol signals need to be associated. After selecting this option, set the following parameters: ● **Associate with telecontrol signal source**: Set the physical location of the associated telecontrol signal measurement and control module. ● **Associate with telecontrol IO signal**: Set the port number of the associated telecontrol signal. ● **Association policy**: Set the conditions for triggering command execution on the DO port.

Figure 5-8 Setting user-defined parameters

----End

5.7 WLAN Wakeup

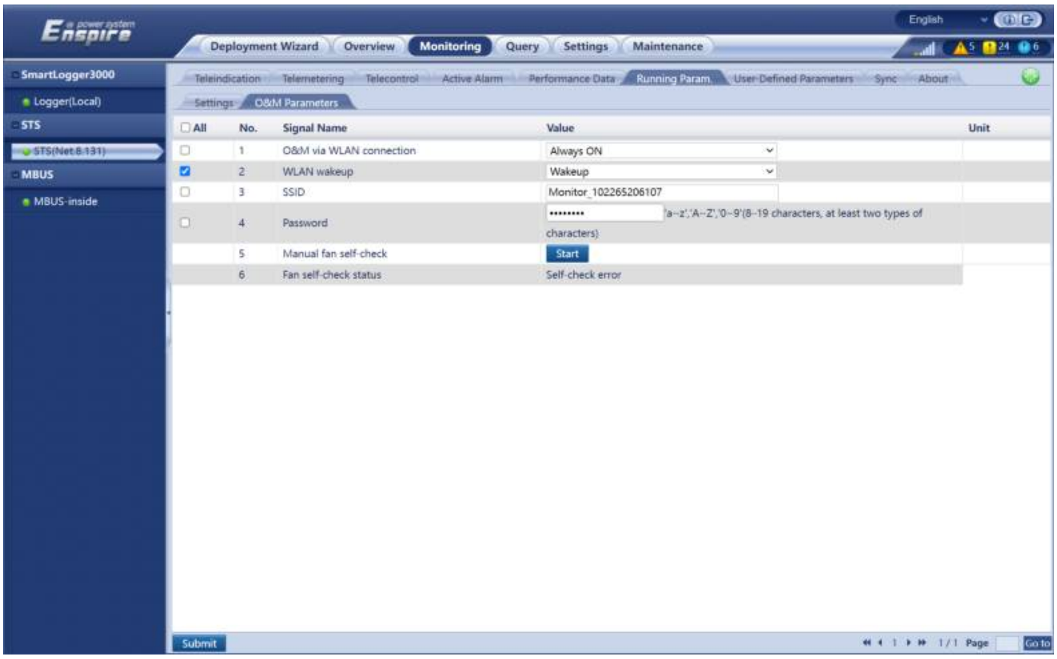
This section describes how to enable the built-in WLAN module of the main control module.

Step 1 Choose **Monitoring** > **STS** > **Running Param.** > **O&M Parameters**.

Step 2 Ensure that **O&M via WLAN connection** is **Always ON**.

Step 3 Set **WLAN wakeup** to **Wakeup**.

Figure 5-9 Parameter settings



----End

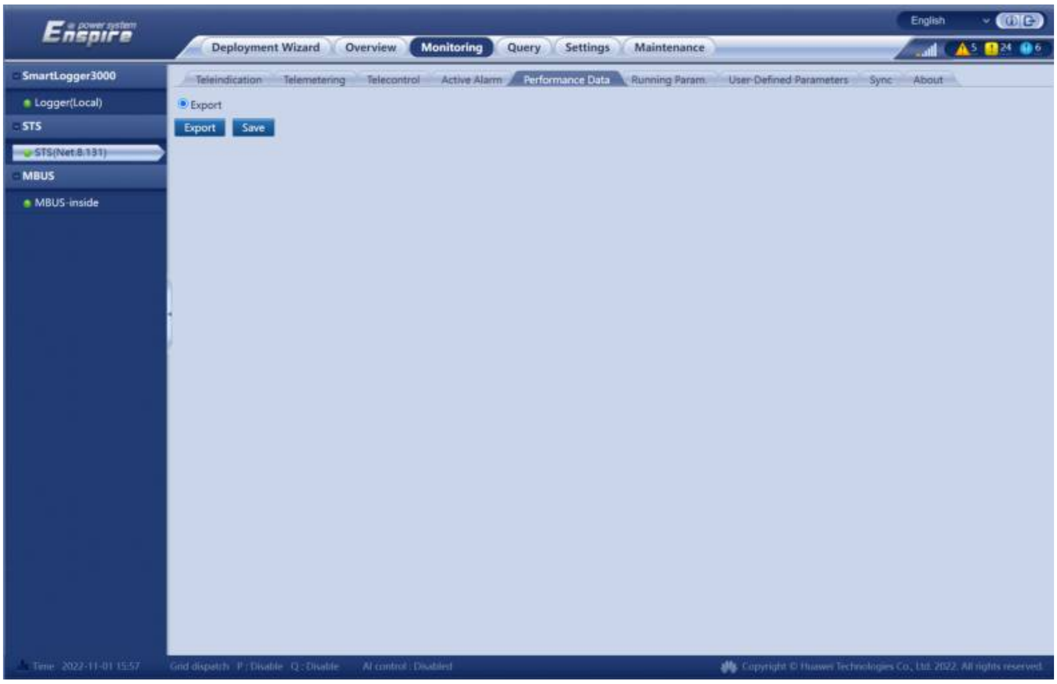
5.8 Exporting Logs

During fault locating, you need to export and send related logs to Huawei engineers for analysis.

Performance Data

Use the **Monitoring** > **STS** > **Performance Data** and export the 5-minute performance data.

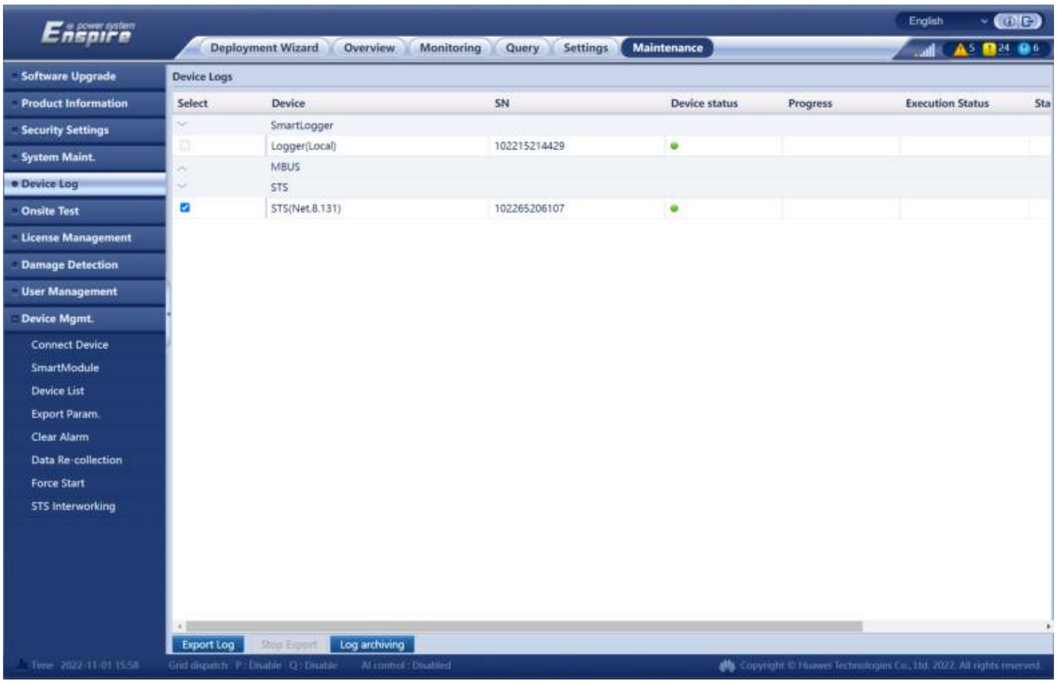
Figure 5-10 Performance data



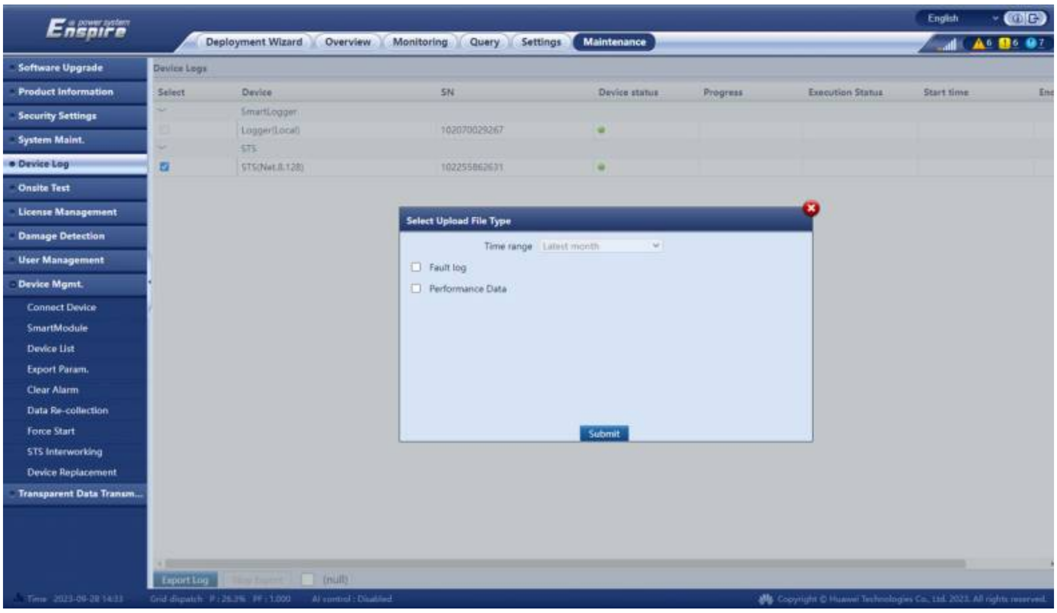
Device Log

Step 1 Choose **Maintenance** > **Device Log**, select the corresponding STS, and click **Export Log**. The **Select Upload File Type** dialog box is displayed.

Figure 5-11 Device log



Step 2 Select **Fault log** and export the logs.


English
Deployment Wizard
Overview
Monitoring
Query
Settings
Maintenance
Software Upgrade
Product Information
Security Settings
System Maint.
Device Log
Onsite Test
License Management
Damage Detection
User Management
Device Mgmt.
Connect Device
SmartModule
Device List
Export Param.
Clear Alarm
Data Re-collection
Force Start
STS Interworking
Device Replacement
Transparent Data Transm...
Device Logs
Select
Device
SN
Device status
Progress
Execution Status
Start time
SmartLogger
Logger(Local)
102070029267
STS
STS(Net.0.128)
102255862631
Select Upload File Type
Time range
Latest month
Fault log
Performance Data
Submit
Export Log
(null)

----End

6 System Maintenance

6.1 Precautions

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.
- Do not use wet cloth to clean exposed copper bars or other conductive parts.

DANGER

Before replacing the monitoring and control device, ensure that the secondary side of the current transformer (CT) is short-circuited and the secondary side of the potential transformer (PT) is open-circuited.

WARNING

- Prior to maintenance, power off the equipment.

CAUTION

Safety requirements in maintenance and repair:

- Before connecting or removing cables, turn off the protection switch of the corresponding loop.
- Place a warning sign indicating that the switch must not be turned on at the position where the switch resides.
- Use an electroscope of a proper voltage level to check whether the equipment is energized and ensure that the equipment is completely powered off.
- If charged bodies are found nearby, block or wrap them with insulation plates or insulation tapes.
- Before performing maintenance or repair, securely connect the loop to be repaired to the main ground loop using a ground cable.
- After the maintenance or repair is complete, remove the ground cable between the loop that has been maintained and the main ground loop.

NOTICE

- After the equipment stops running, wait for at least 10 minutes to ensure that the voltage is in the safe range. Before maintenance or repair, ensure that the transfer switch is turned to the ground position, the potential indicator is off, the grounding switch of cabinet V in the ring main unit is turned on, and the low-voltage cabinet is grounded.
- During maintenance, turn off the air circuit breaker on the low-voltage side and the switch on the high-voltage side of the equipment, and place warning signs indicating that the switches must not be turned on. If the equipment supports the automatic mode, disable the automatic mode to ensure that the equipment will not be powered on unexpectedly.
- Use a detergent to clean the insulation surface of the lightning arrester. After the detergent is volatilized, evenly apply the silicon grease.
- If protection actions (such as pressure relief, gas protection, and emergency stop) are triggered on the equipment, O&M personnel need to visit the site and perform the following steps:
  1. Set the REMOTE/LOCAL SWITCH of LV PANEL A, LV PANEL B, and ring main unit to the LOCAL position.
  2. If the ring main unit is configured with a transfer switch for automatic mode, set it to OFF or exit the AUTO mode.
  3. Locate and rectify the fault.
  4. Reset the fault signal sources of the STS (such as the emergency stop button, relay protection, and pressure relief valve).
  5. Set the REMOTE/LOCAL SWITCH to the REMOTE position. If this operation cannot be performed, reset all preceding fault signal sources. Then, set the REMOTE/LOCAL SWITCH to REMOTE, LOCAL, and REMOTE in sequence, and wait for at least 2 minutes between each position. The measurement and control module is now reset and you can enable the telecontrol function.

NOTICE

- Maintain the equipment with sufficient knowledge of this document and using proper tools and testing equipment.
- Place temporary warning signs or install fences to prevent unauthorized access to the maintenance site.
- If the equipment is faulty, contact your vendor.
- The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.
- Do not open STS doors for maintenance in sand and dust storms.
- In areas such as deserts, install 18 cm x 25 cm dustproof bags for dust-sensitive devices such as smoke sensors and T/H sensors with climbing devices and seal the bags with seal tape before maintenance. After the maintenance is complete, remove the dustproof bags and close the cabin doors.
- Upon completion of each maintenance, you are advised to use cordless vacuum cleaners to remove sand, dust, catkins, and insects inside the equipment. Once the cleaning is complete, close the cabin doors.

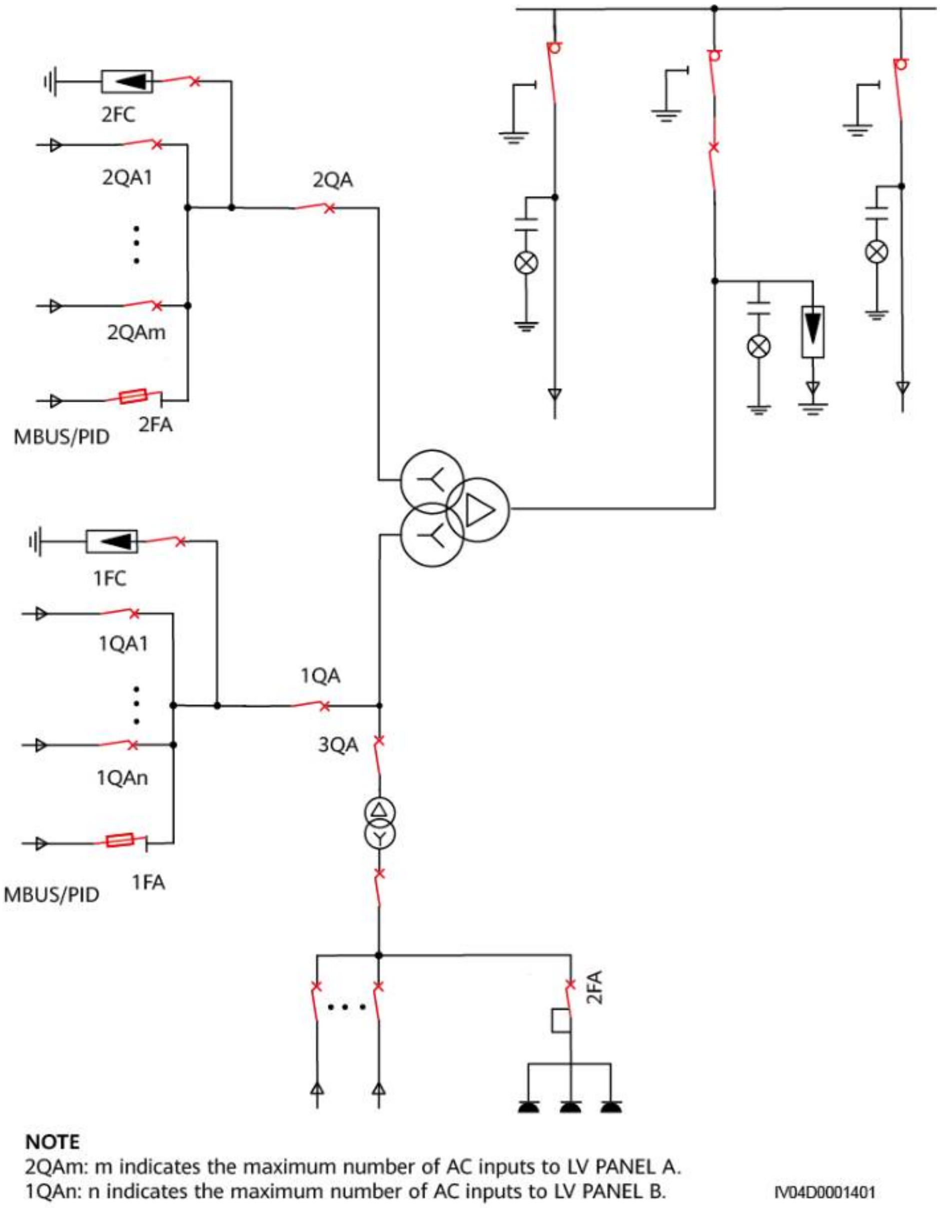
6.2 Shutdown and Power-Off

To power off the equipment system, perform the following operations:

1. Follow the relevant power operation procedure. Wear high-voltage insulated gloves, insulated shoes, and safety helmets, and use operation levers.
2. Turn off AC input switches in the LV panel.
3. After checking that all the AC input switches in the LV panel are turned off, turn off the air circuit breaker and the switch for the PT loop.
4. After confirming that the air circuit breaker is turned off, turn off the circuit breaker of cabinet V of the ring main unit. Then turn off the disconnector.
5. If the power indicator indicates no power supply, ensure that cabinet V is grounded according to operation instructions on the panel of the ring main unit.
6. To facilitate the power-off and maintenance of the STS, turn off the load switch of the upstream cabinet G3. Ensure that the power supply is off, turn off the load switch of cabinet G1, turn on the earthing switch of cabinets G3 and G1, and then check and repair the ring main unit. If the MV side is a DVC/DCV cabinet, to facilitate the power-off and maintenance of the STS, turn off the load switch of the upstream cabinet G3. Ensure that the power supply is off, turn on the earthing switch of cabinet G3, and then check and repair the ring main unit.

6.2.1 Powering Off the Transformer for Overhaul (Upper Isolation Structure of the Ring Main Unit, CGM)

Figure 6-1 Running status before overhaul



Procedure

Step 1 Remotely turn off the ACB in LV PANEL A.

Step 2 Remotely turn off the ACB in LV PANEL B.

Step 3 Remotely turn off the circuit breaker of cabinet G2 in the ring main unit.

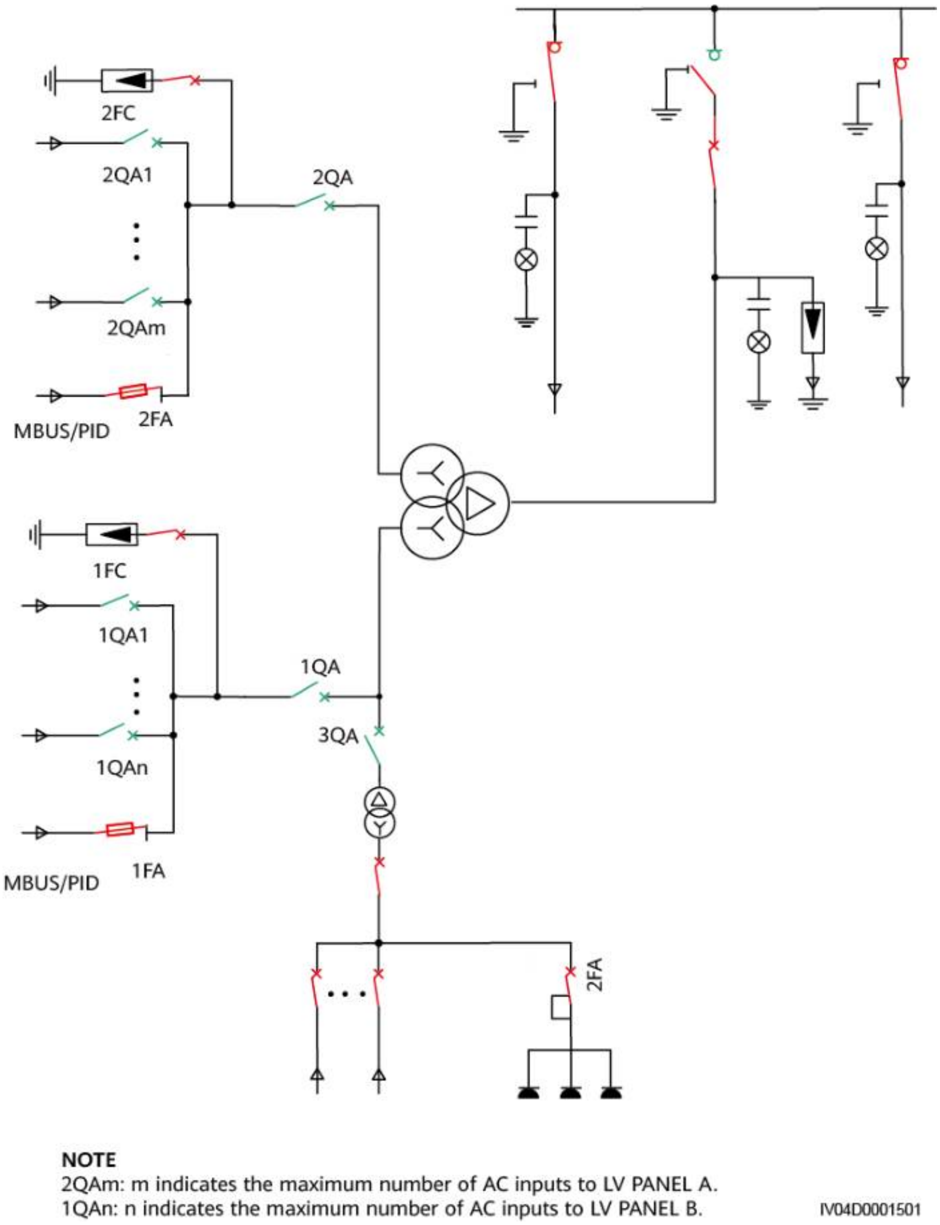
Step 4 Manually turn off the disconnector of cabinet G2 in the ring main unit.

Step 5 Manually turn on the circuit breaker of cabinet G2 in the ring main unit.

Step 6 Manually turn on the ground knife switch of cabinet G2 and lock the operation hole. Install a sign to forbid any operation.

Step 7 Manually turn off all MCCBs of the incoming cables and discharge the busbar of the LV panel using a ground cable.

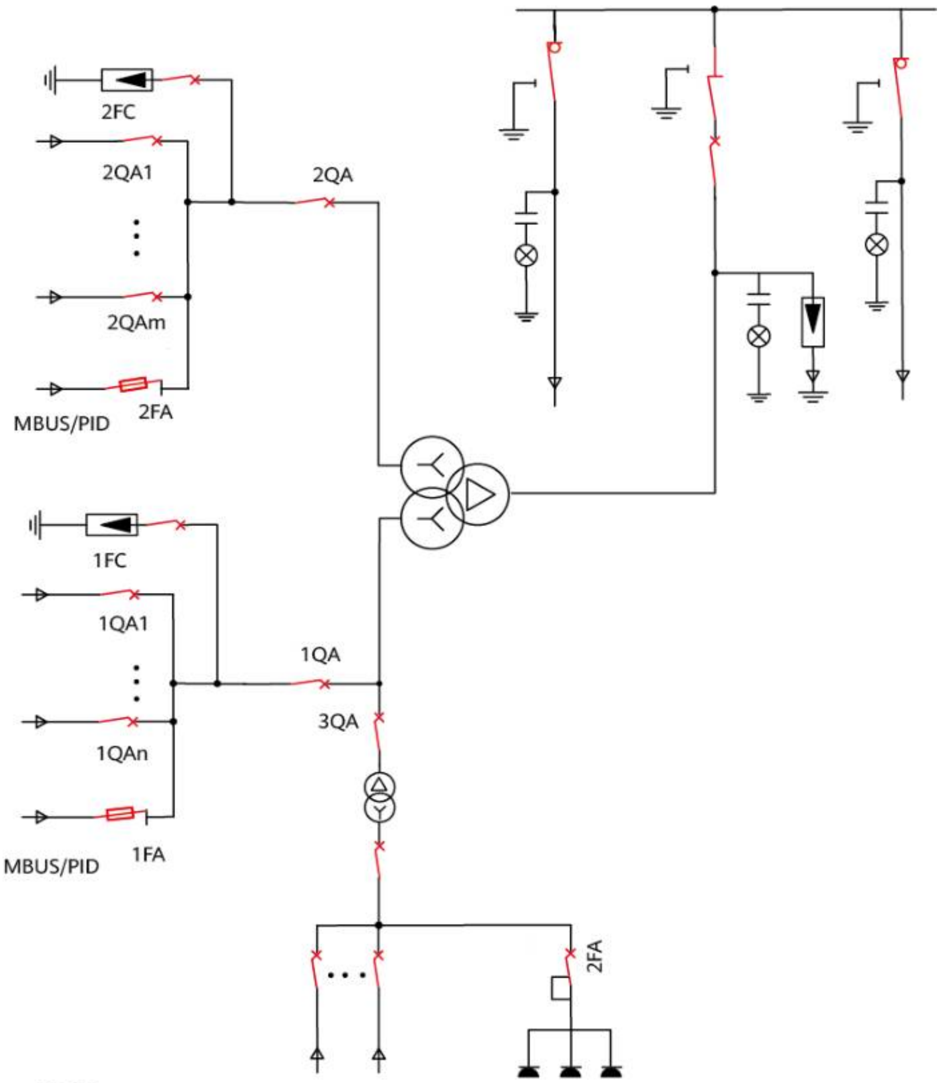
Figure 6-2 Status of the switches after overhaul



----End

6.2.2 Powering Off the Transformer for Overhaul (Lower Isolation Structure of the Ring Main Unit, DQS and 8DJH)

Figure 6-3 Running status before overhaul



NOTE
2QAm: m indicates the maximum number of AC inputs to LV PANEL A.
1QAn: n indicates the maximum number of AC inputs to LV PANEL B.

Procedure

Step 1 Remotely turn off the ACB in LV PANEL A.

Step 2 Remotely turn off the ACB in LV PANEL B.

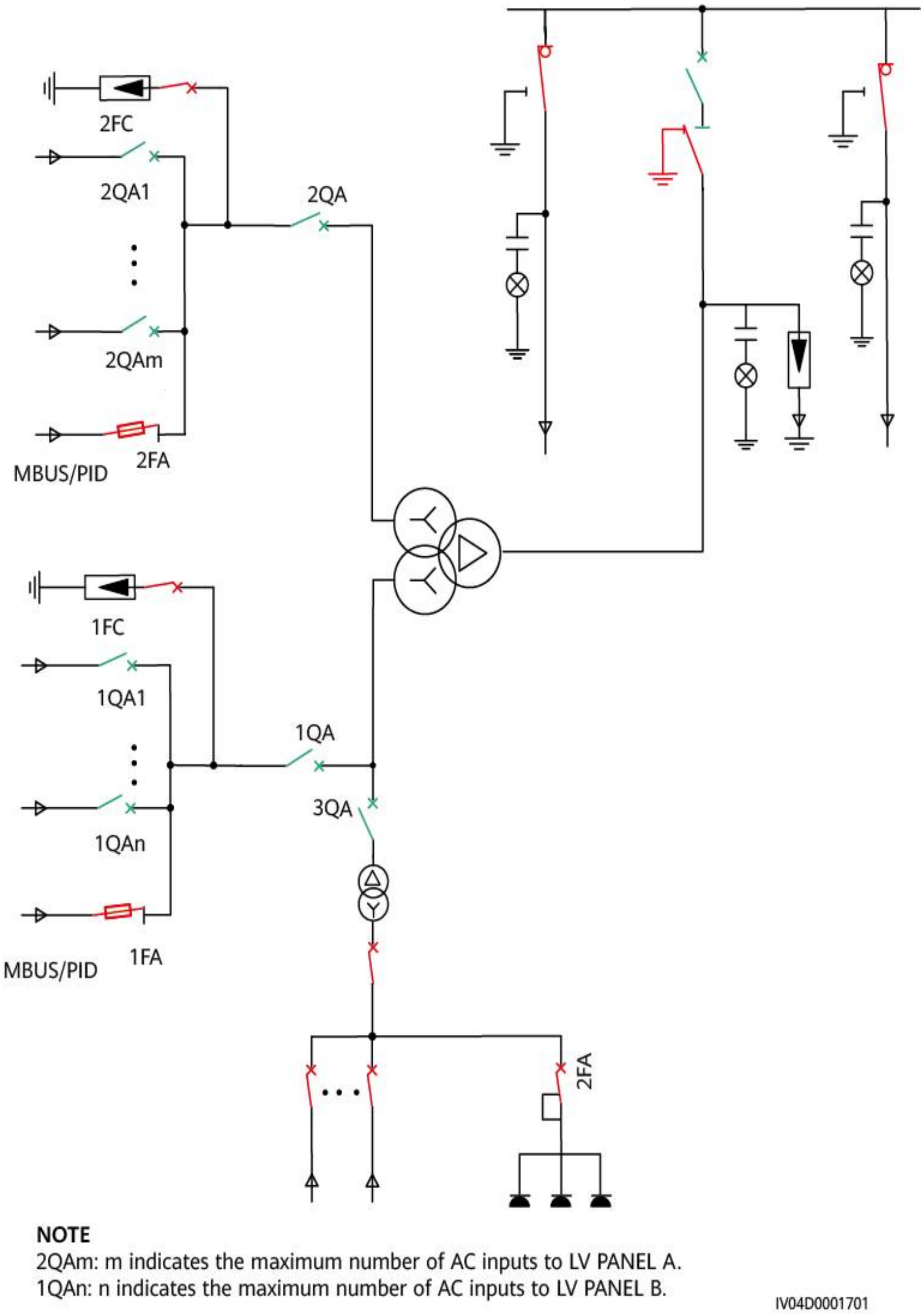
Step 3 Remotely turn off the circuit breaker of cabinet G2 in the ring main unit.

Step 4 Manually turn off the disconnector of cabinet G2 in the ring main unit.

Step 5 Manually turn on the ground knife switch of cabinet G2 and lock the operation hole. Install a sign to forbid any operation.

Step 6 Manually turn off all MCCBs of the incoming cables and discharge the busbar of the LV panel using a ground cable.

Figure 6-4 Status of the switches after overhaul



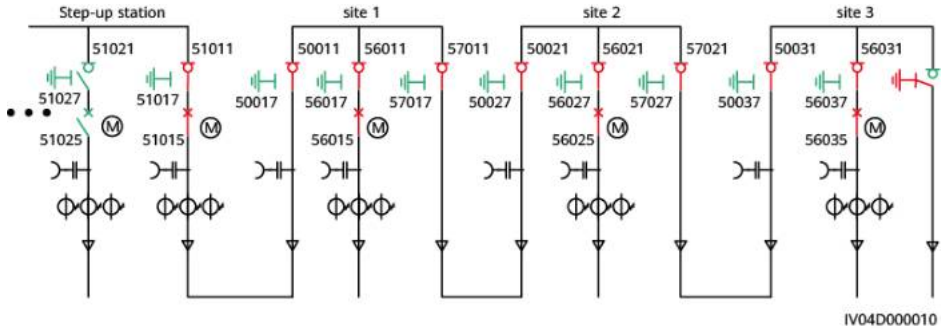
----End

6.2.3 Powering Off the Ring Main Unit for Overhaul

NOTE

- The overhaul procedures for CGM and DQS ring main units are the same. The overhaul procedures for DVC and CVC are the same.
- This section uses CGM CVC ring main unit at site 2 as an example.

Figure 6-5 Status of the switches before overhaul



Procedure

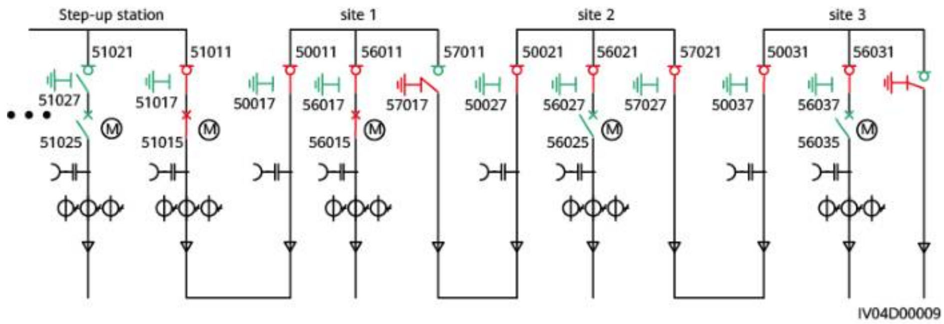
Step 1 Disconnect the STS loads at site 3 and turn off circuit breaker 56035 at site 3.

Step 2 Disconnect the STS loads at site 2 and turn off circuit breaker 56025 at site 2.

Step 3 Turn off load switch 57011 of cabinet G3 at site 1. After the potential indicator of cabinet G3 stops blinking, turn on earthing switch 57017 of cabinet G3 (pull out the mechanical interlock key to earthing switches 57017 and 50027). Install a sign to forbid any operation.

Step 4 The main loop of the ring main unit at site 2 has been powered off and safety measures have been taken for overhaul.

Figure 6-6 Status of the switches during overhaul



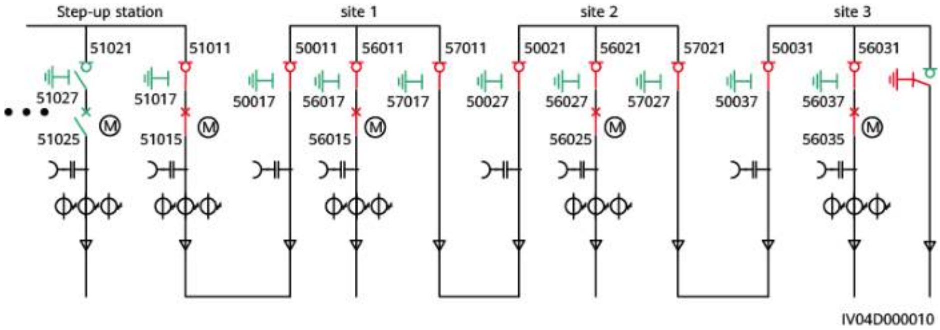
----End

6.3 Overhauling Cables Between STSs (CVC)

NOTE

- For CVC ring main units, the cable overhaul procedures for CGM and DQS are the same.
- This section uses the CGM CVC ring main unit (between site 1 and site 2) as an example.

Figure 6-7 Status of the switches before overhaul



Procedure

Step 1 Disconnect the STS loads at site 3 and turn off circuit breaker 56035 at site 3.

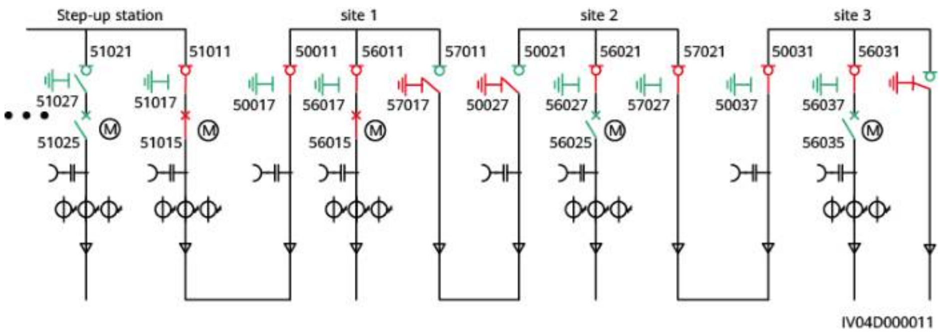
Step 2 Disconnect the STS loads at site 2 and turn off circuit breaker 56025 at site 2.

Step 3 Turn off load switch 57011 of cabinet G3 at site 1. After the potential indicator of cabinet G3 stops blinking, turn on earthing switch 57017 of cabinet G3 (pull out the mechanical interlock key to earthing switches 57017 and 50027). Install a sign to forbid any operation.

Step 4 Turn off load switch 50021 of cabinet G1 at site 2. (Insert the mechanical interlock key to earthing switches 57017 and 50027.) Turn on earthing switch 50027 of cabinet G1. Install a sign to forbid any operation.

Step 5 Both ends of the cables between site 1 and site 2 are grounded, safety measures are taken, and the cable compartment doors at both ends are unlocked.

Figure 6-8 Status of the switches during overhaul



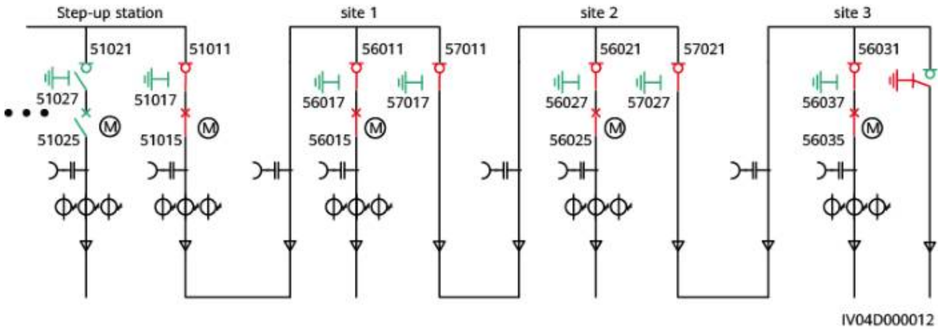
----End

6.4 Overhauling Cables Between STSs (DVC)

NOTE

- For DVC ring main units, the cable overhaul procedures for CGM and DQS are the same.
- This section uses the CGM DVC ring main unit (between site 1 and site 2) as an example.

Figure 6-9 Status of the switches before overhaul



Procedure

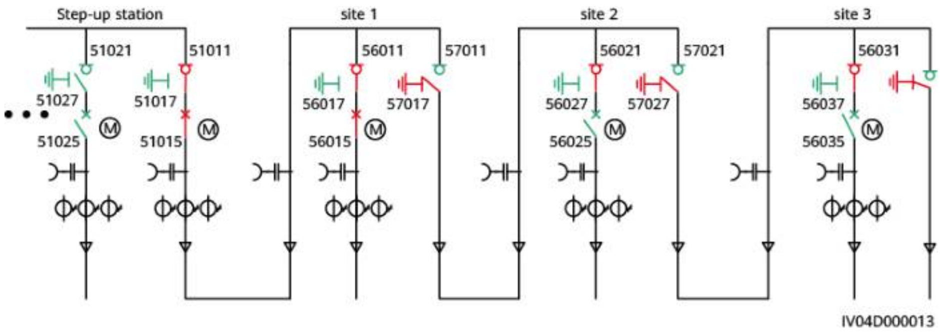
Step 1 Disconnect the STS loads at site 3 and turn off circuit breaker 56035 at site 3.

Step 2 Disconnect the STS loads at site 2 and turn off circuit breaker 56025 at site 2.

Step 3 Turn off load switch 57011 of cabinet G3 at site 1. After the potential indicator of cabinet G3 stops blinking, turn on earthing switch 57017 of cabinet G3 (pull out the mechanical interlock key to the cable room of cabinet G1 at site 2 and earthing switch 57017). Install a sign to forbid any operation.

Step 4 One end of the cables between site 1 and site 2 is grounded and safety measures are taken. The door of the cable room at site 1 is unlocked. The door of the cable room at site 2 can be unlocked by inserting the mechanical interlock key.

Figure 6-10 Status of the switches during overhaul



----End

6.5 Routine Maintenance

Routine inspection and maintenance must comply with relevant regulations of the electric utility.

The inspection, maintenance, and repair can only be performed by trained personnel who are familiar with the equipment. The personnel must be certified and comply with the safety regulations issued by the electric utility.

CAUTION

To check, maintain, and repair the system with power-off, you must ensure that:

- The high-voltage power supply is disconnected.
- There is no possible feedback power supply at the high-voltage cable outlet.
- There is no operation at the high-voltage cable outlet.
- All auxiliary power supplies are disconnected, and will not be connected again.

Table 6-1 Maintenance checklist

No.	Check Item	Check Method	Recommended Maintenance Interval	System Powered Off or Not
1	System running status and cleanliness	Check that the appearance and internal components of the equipment are not damaged or deformed.	Once a month	Yes
		Check that there is no abnormal sound when the equipment is running.		No
		Check that the warning labels are clear. If the labels are dirty or damaged, replace them in a timely manner.		No
		Check for condensation inside the equipment. If there is visible condensation, ventilate and dehumidify the equipment.		Yes
		Check the equipment for corrosion or paint peeling, and repaint the damaged area.		No
		Check whether the air intake vent is blocked by foreign objects and whether there is sand and dust accumulation. If so, clean the air intake vent. Clean out the accumulated foreign objects in harsh scenarios such as sand and dust storms and catkins.		No

No.	Check Item	Check Method	Recommended Maintenance Interval	System Powered Off or Not
	LV panel	Check that the voltage and current multimeter and switch-on/off indicator of the low-voltage incoming cable cabinet are normal. If their readings are abnormal, replace them in a timely manner.		No
		Check that the SPD indicator is normal. If the indicator is red, the SPD is faulty and needs to be replaced.		No
	Transformer	Check that there is no oil leakage around the pressure relief valve. If there is, tighten the valve or replace the faulty parts.		Yes
		Check that there is no oil leakage on the bushings of each phase at the high-voltage and low-voltage sides. If there is, tighten the bushings or replace the faulty parts.		Yes
		Check that there is no oil leakage at the connection point between the transformer heat sink and the oil tank flange. If there is, tighten the connection point or replace the faulty parts.		Yes
		Check that the sound of the transformer is normal during operation. If there are abnormal noises, power off the transformer and repair it.		Yes
		Check that the color of the desiccant inside the dehydrating breather does not change. If the color changes from blue to pink or from orange to dark green, replace the desiccant in a timely manner.		No
		Check that the transformer oil in the oil cup of the dehydrating breather is clean. If it is dirty, replace the transformer oil in a timely manner.		No
		If the water volume in the oil tray exceeds 50% of the oil tray volume, drain water in a timely manner.		No
	Ring main unit	Check that the L1/L2/L3 potential indicator is normal. If not, replace it.		Yes

No.	Check Item	Check Method	Recommended Maintenance Interval	System Powered Off or Not
	Heat exchanger	Check whether the DC power cable, AC power cable, alarm cable, and communications cable of the heat exchanger are normal.		Yes
		Check whether the heat exchanger works properly and whether there is any abnormal sound (caused by the friction between the air duct ring and the fan).		Yes
		Check whether the air intake vent of the external circulation system is blocked by dust, catkins, or other foreign objects. If so, clean the air intake vent.		Yes
		Check that the L1/L2/L3 potential indicator is normal. If not, replace it.		Yes
2	Heat exchanger	In harsh scenarios such as deserts and catkins, periodically clean the air intake vent and core of the heat exchanger to ensure that there is no blockage or dust accumulation. Heat exchangers used on plains and highways can be cleaned up once every six months.	Once every three months	Yes
3	LV panel	Perform the switch-on and switch-off test on the ACB of the LV panel.	Once every six months	Yes
		Perform a leakage simulation test on the residual current circuit breaker. Press the test button to verify that the circuit breaker works properly.		Yes
	Transformer	Check that the real-time temperature of the oil temperature indicator is normal. If the difference between the temperature and the temperature displayed on the SmartLogger exceeds ±2°C, the oil temperature indicator is faulty and needs to be repaired in a timely manner.		Yes
	Ring main unit	Check the SF_6 gas pressure gauge to see that the pointer is in the green range. If the pointer is close to red, stop running the ring main unit in a timely manner and perform a refill.		Yes

No.	Check Item	Check Method	Recommended Maintenance Interval	System Powered Off or Not
4	Heat exchanger	Check that the heat exchanger produces no abnormal sounds during operation.	Six months after the first commissioning and once every 6–12 months after that	No
5	Transformer	Test the transformer oil (chromatography analysis, dielectric voltage withstand test, and micro water test).	Once a year	Yes
		Clean the surface of the transformer oil tank, conservator, and heat sink, and tighten the bolts of the anchors, grounding circuit, and main circuit.		Yes
	Ring main unit	Perform manual operation tests on the operation mechanism to check its flexibility. If it fails to be closed or opened, repair the operation mechanism in time.		Yes
	Smoke sensor	Periodically blow smoke to the smoke sensor to check that the sensor generates alarms properly.		No
6	Cable connection	Check that power cables and signal cables/copper bars are securely connected. If not, properly connect them according to specified torques.	Six months after the first commissioning and once every two years after that	Yes
		Check that cable holes are properly sealed. Ensure that there is no gap.		Yes
		Check that power cables and control cables are not damaged and that the cable exterior in contact with the metallic surface is not scratched.		Yes
		Check that the insulation binding tapes on the wiring terminals of power cables are intact.		Yes
7	LV panel	Check the polyurethane foam at the air intake vent of the LV panel. If the foam is damaged, take a new foam out of the fitting bag, cut and install it using adhesive to fill the gap between the air intake vent and the door of the container LV room to avoid air leakage. This ensures good heat dissipation of the LV panel.	Once every 10 years	No

NOTE

For details about how to maintain equipment in the STS, see the corresponding documents.

6.6 Maintaining Inverters and PCSs (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)

DANGER

In the LV coupling scenario where the inverter and PCS are connected to the same MCCB, when maintaining the inverter and PCS, ensure that the DC switches of the PCS and inverter connected to the same MCCB are turned off.

In the LV coupling scenario where the inverter and PCS are connected to the same MCCB, ensure that the power-on conditions are met before powering on the inverter and PCS. For details, see **Inverter and PCS Status Check (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)**.

Powering Off Inverters

Step 1 Send a shutdown command to the inverter and PCS connected to the same MCCB.

Step 2 Turn off the DC switches of the inverters.

Step 3 Turn off the upstream DC switches of the PCSs.

- If a DC LV Panel is configured, turn off the switch of the PCS DC LV Panel corresponding to the MCCB.
- If no DC LV Panel is configured, turn off the PCS switch in the ESS corresponding to the MCCB.

Step 4 Disconnect the corresponding MCCBs in the STS.

----End

Powering Off PCSs

Step 1 Send a shutdown command to the inverter and PCS connected to the same MCCB.

Step 2 Turn off the upstream DC switches of the PCSs.

- If a DC LV Panel is configured, turn off the switch of the PCS DC LV Panel corresponding to the MCCB.
- If no DC LV Panel is configured, turn off the PCS switch in the ESS corresponding to the MCCB.

Step 3 Turn off the DC switches of the inverters.

Step 4 Disconnect the corresponding MCCBs in the STS.

----End

Powering On Inverters and PCSs (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)

For details, see **Powering On Inverters, PCSs, and the DTS (Applicable to LV Coupling Scenarios Where the Inverter and PCS Are Connected to the Same MCCB)**.

6.7 Alarm List

For details about the alarm reference, see **Smart Transformer Station Alarm Reference**.

6.8 Common Parts Replacement

NOTICE

- For details about how to replace components inside the STS, see the corresponding component installation guide.
- Before replacement, check that a spare component of the same model is available and functional.
- When replacing the component, disconnect the power supply. High voltage is dangerous. Do not perform operations with power on.
- The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.
- Replace components not listed in this document following the manufacturer's instructions.
- The appearances of the components listed in this document are for reference only. For details, see the documents provided by the manufacturer.
- Dispose of faulty components in accordance with the local disposal act for waste electrical equipment.

6.8.1 (Optional) Replacing a Lightning Arrester

Context

If a lightning arrester is faulty and cannot be repaired during maintenance, power it off and replace it.

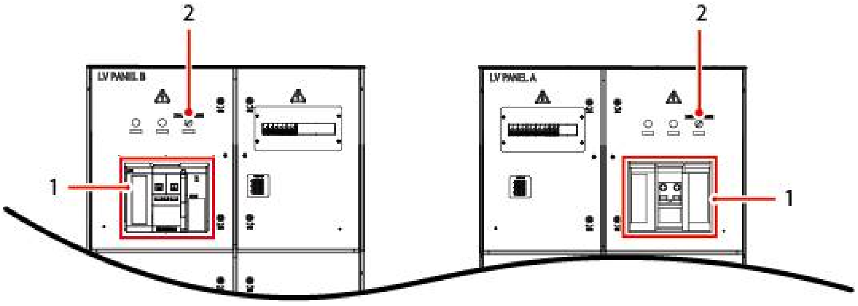
This operation is optional and applies to the scenario where a lightning arrester has been installed.

Power-Off

1. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
2. Set the remote/local switch of the LV panel to the local position.
3. Set the remote/local switch of cabinet G2 in the ring main unit to the local position.
4. Turn off the local on/off switch (VCB) of cabinet G2 in the ring main unit.
5. Turn off the disconnector of cabinet G2 in the ring main unit.
6. Turn on the earthing switch of cabinet G2 in the ring main unit.

The following figure shows the positions of the switches.

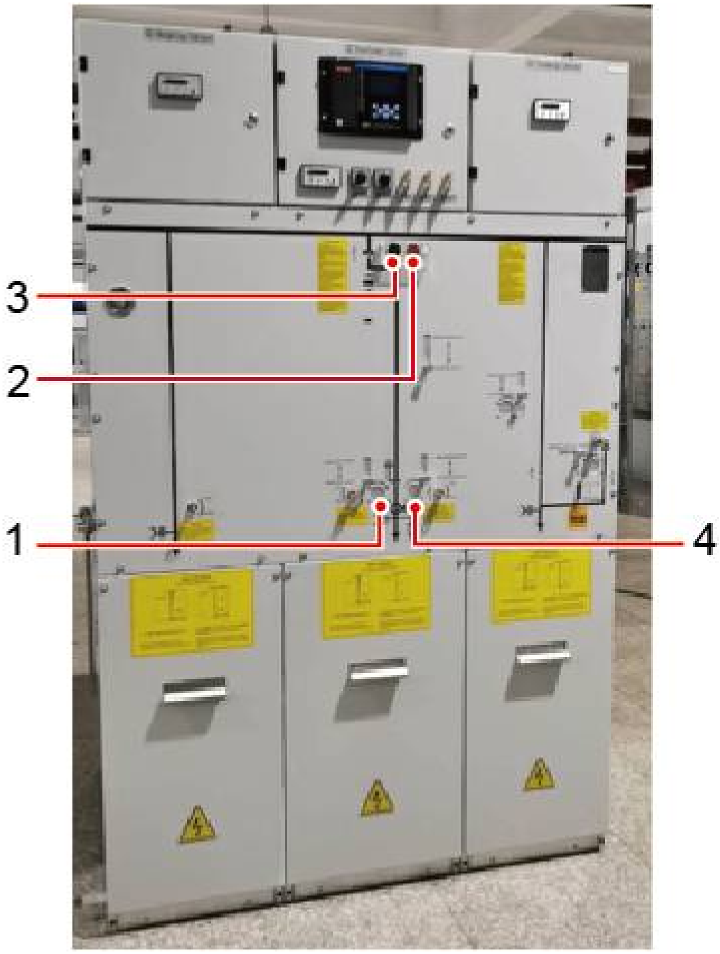
Figure 6-11 Positions of the LV panel switches



(1) ACB	(2) Remote/Local switch

The following figure shows the positions of the ring main unit switches.

Figure 6-12 Positions of the ring main unit switches (using the DVC as an example)



(1) Earthing switch of cabinet G2	(2) Local on/off switch (VCB) of cabinet G2
(3) Remote/Local switch of cabinet G2	(4) Disconnector operation hole of cabinet G2

DANGER

Do not replace a lightning arrester during a thunderstorm.

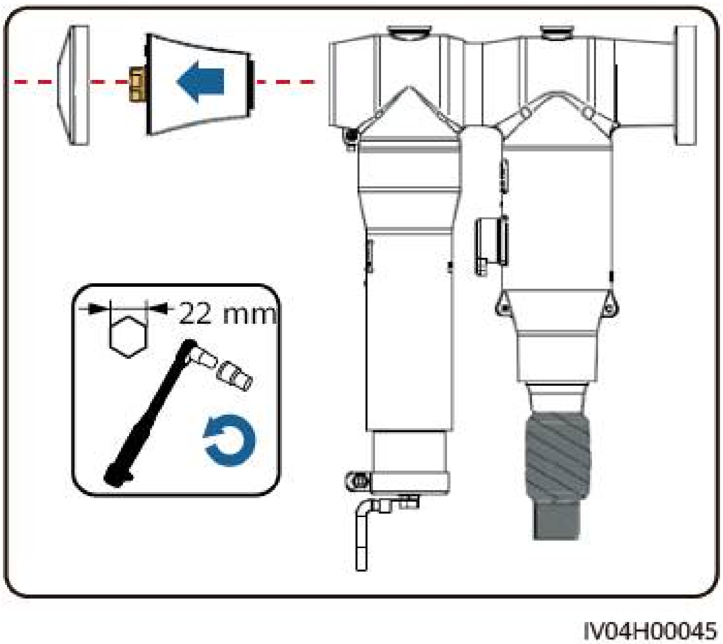
Procedure

Step 1 Loosen the fixing components of the lightning arrester to be replaced.

Step 2 Remove the ground cable connected to the lightning arrester.

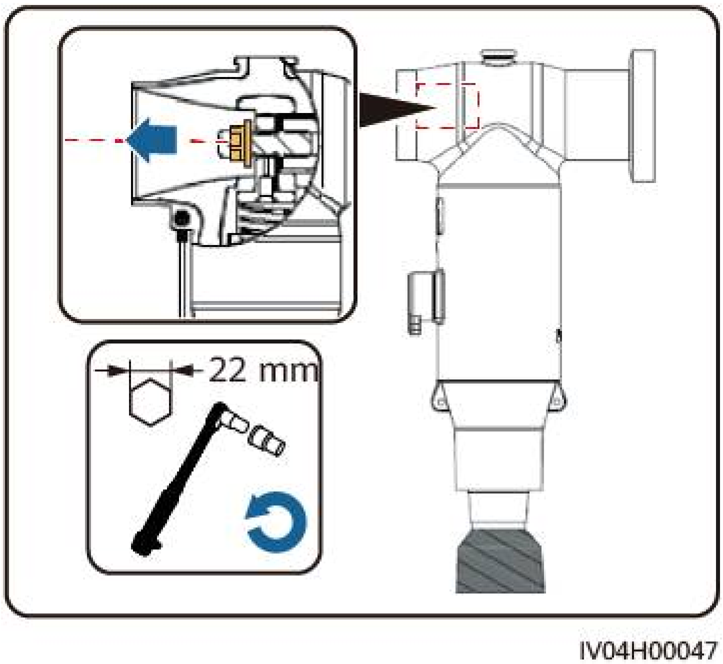
Step 3 Remove the rubber cap and insulation plug from the lightning arrester.

Figure 6-13 Removing the rubber cap and insulation plug from the lightning arrester



Step 4 Remove the nut from the conductive pole assembly.

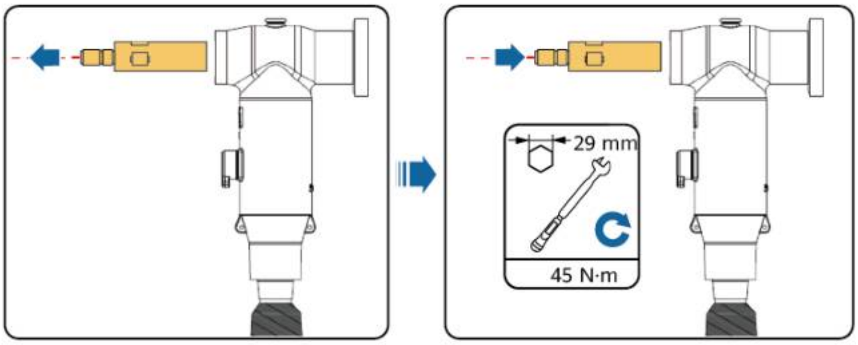
Figure 6-14 Removing the nut



Step 5 Remove the faulty lightning arrester.

Step 6 Replace the conductive pole assembly with a new one.

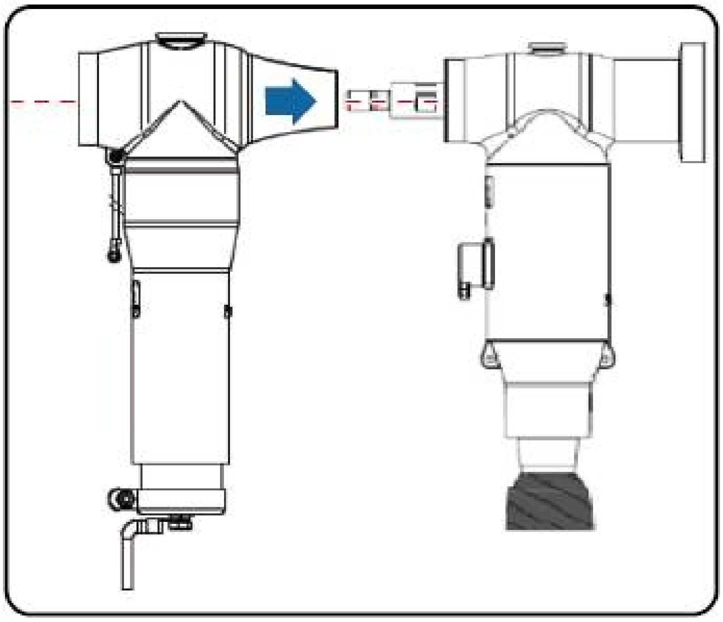
Figure 6-15 Removing the conductive pole assembly



IV04H00049

Step 7 Install a new lightning arrester.

Figure 6-16 Installing a new lightning arrester



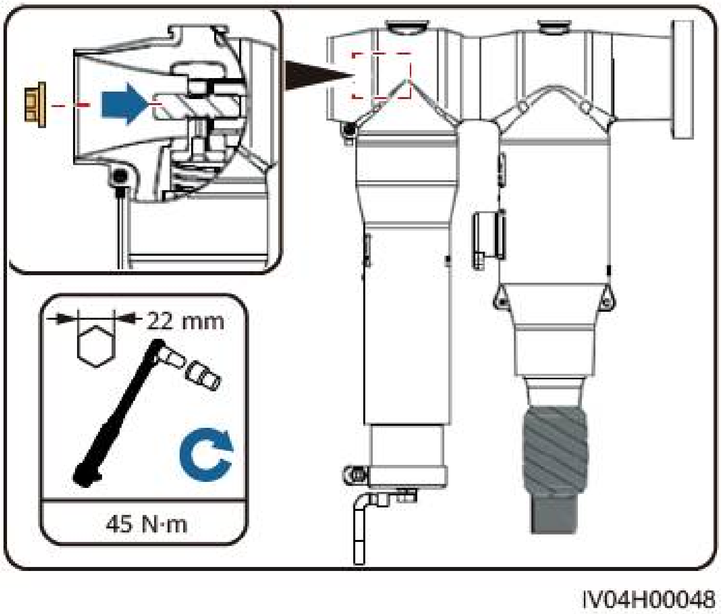
IV04H00053

NOTE

Use a detergent to clean the insulation plug. After the detergent is volatilized, evenly apply the silicon grease.

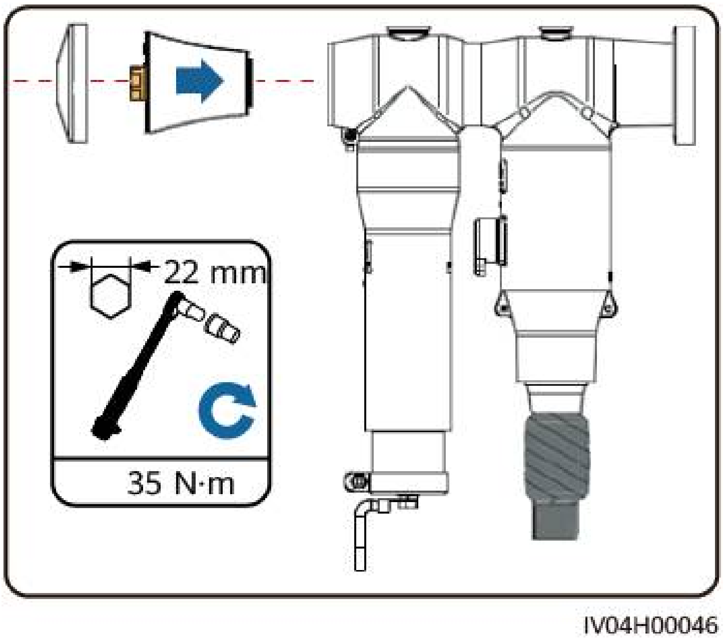
Step 8 Tighten the nut on the conductive pole assembly.

Figure 6-17 Tightening the nut



Step 9 Install the insulation plug and rubber cap.

Figure 6-18 Installing the insulation plug and rubber cap



NOTE

Use a detergent to clean the insulation plug. After the detergent is volatilized, evenly apply the silicon grease.

Step 10 Reinstall the ground cable.

Step 11 Secure the fixing components of the lightning arrester.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

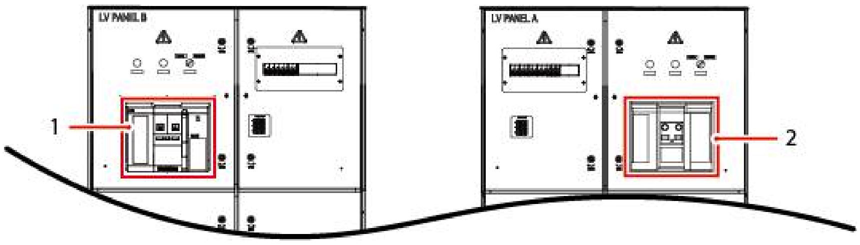
6.8.2 Replacing an ACB

Context

If an ACB is faulty and cannot be repaired during maintenance, power it off and replace it.

The following figure shows the position of the ACB.

Figure 6-19 Position of the ACB



(1) ACB of LV PANEL B	(2) ACB of LV PANEL A

Power-Off

1. Turn off all MCCBs in the LV panel.
2. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
3. Turn off the VCB in the MV room.
4. (Optional) Shut down the UPS inverter 3UI. Perform this operation when the UPS has been installed.
5. Use a multimeter (measurement range > 800 V) to check whether the downstream port of the MCCB is completely powered off.

DANGER

Ensure that the equipment is powered off and set the ACB to OFF.

There are 44 MCCBs, as shown in the following figures.

Figure 6-20 MCCBs on the front of the LV panel

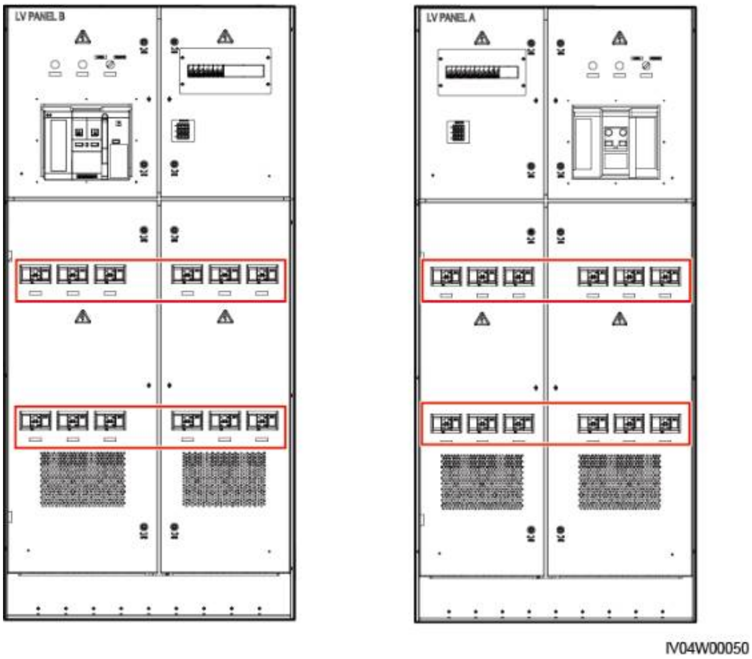


Figure 6-21 MCCBs on the side of the LV panel

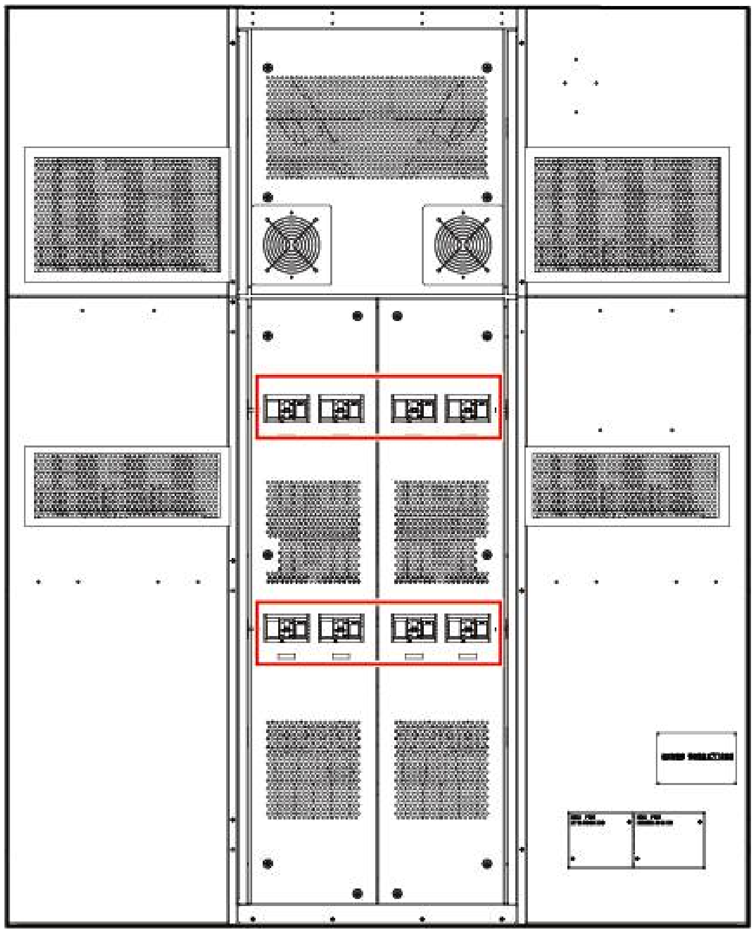
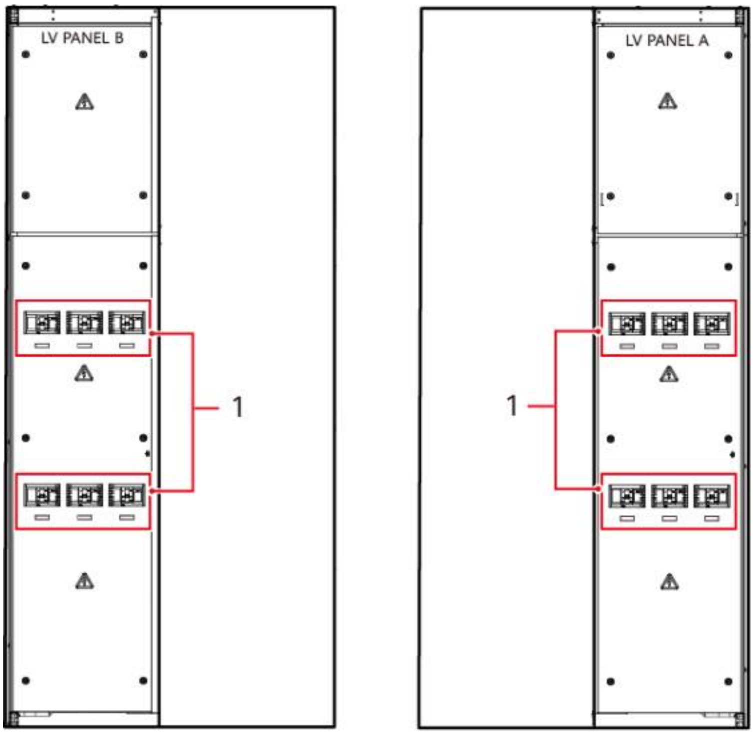


Figure 6-22 MCCB on the rear of the LV panel



Procedure

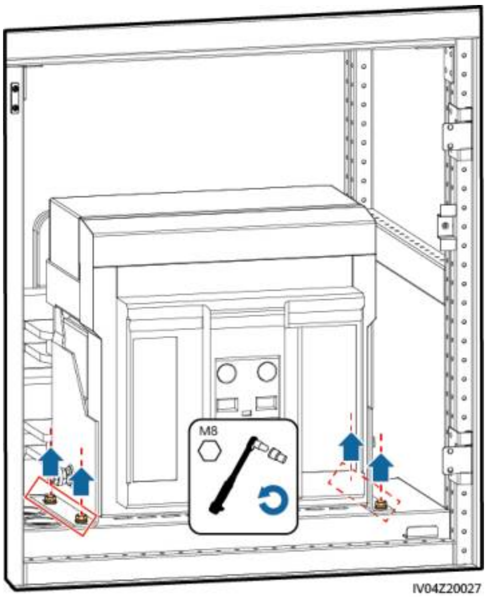
Step 1 Remove the sealing plates from the LV PANEL A.

Step 2 Remove the copper bar connected to the rear of the ACB.

Step 3 Remove the signal cable and ground cable from the ACB and record the cable connections.

Step 4 Remove the screws from the ACB.

Figure 6-23 Removing the screws



Step 5 Install a new ACB and tighten the screws on both sides.

Step 6 Reinstall the ground cable, signal cable, and copper bar.

Step 7 Reinstall the sealing plates in sequence.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.3 Replacing an SPD

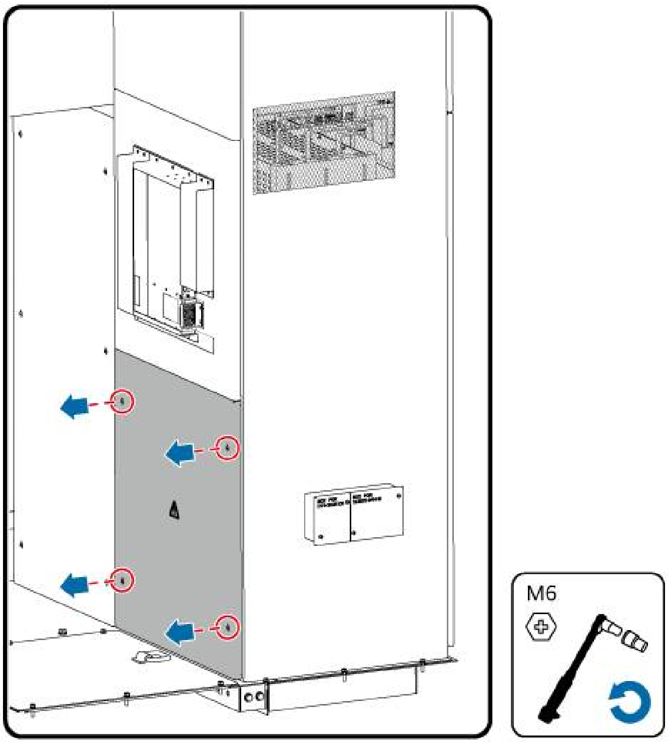
Context

If a surge protective device (SPD) is faulty and cannot be repaired during maintenance, power it off and replace it.

Procedure

Step 1 Remove the sealing plate for the SPD. The following uses the JUPITER-9000K-H1 as an example.

Figure 6-24 Removing the sealing plate



Step 2 Remove the cables from the SPD and record the cable connections.

Step 3 Remove the SPD.

Figure 6-25 Removing the SPD from the JUPITER-6000K-H1

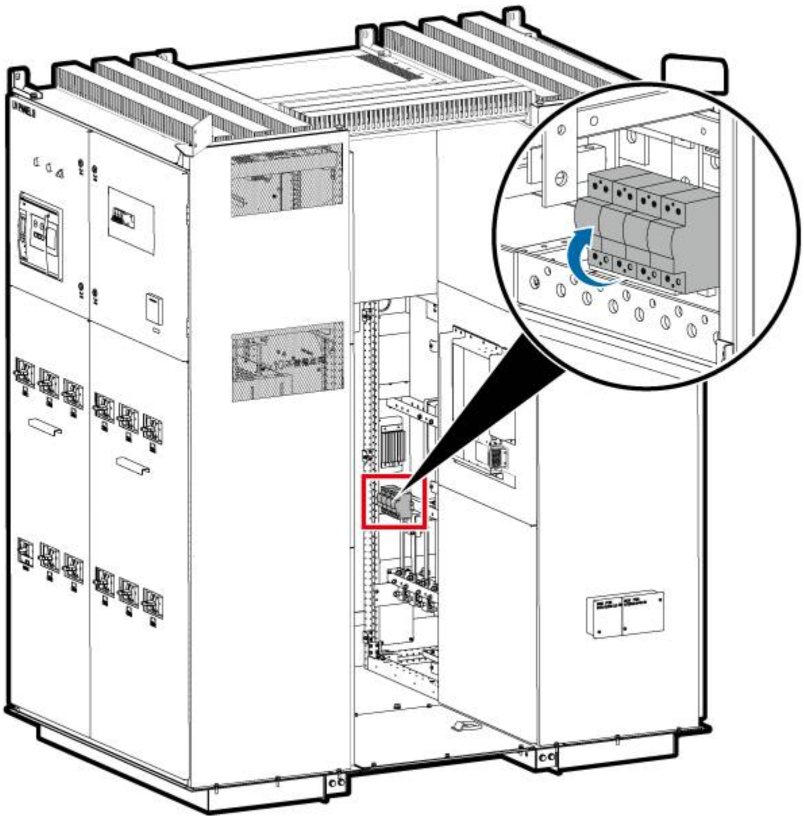
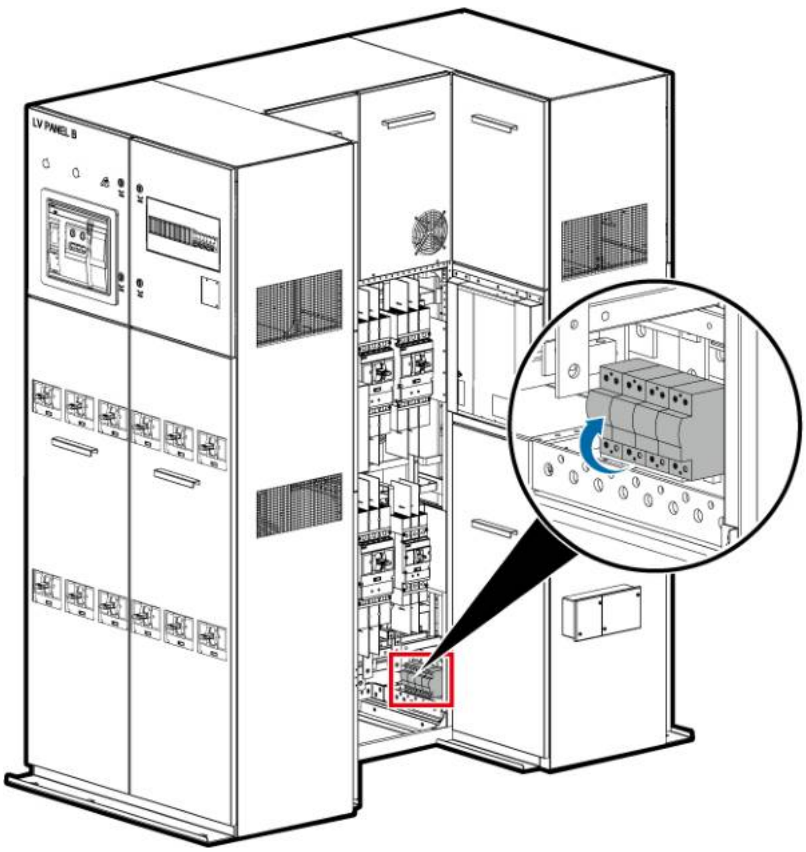


Figure 6-26 Removing the SPD from the JUPITER-9000K-H1



NOTE

The JUPITER-3000K-H1 does not have LV PANEL B. The heater position in LV PANEL A is the same as that of the JUPITER-6000K-H1.

Step 4 Install a new SPD.

Step 5 Reinstall the cables.

----End

6.8.4 Replacing an MCCB

Context

If an MCCB is faulty and cannot be repaired during maintenance, power it off and replace it.

- If the short-circuit current of the MCCB is less than or equal to Icu (ultimate short-circuit breaking capacity), the MCCB needs to be replaced after one occurrence of short circuit.
- If the short-circuit current of the MCCB is less than or equal to Ics (service breaking capacity), the MCCB needs to be replaced after three occurrences of short circuit.

DANGER

Ensure that the equipment is powered off and set the MCCB to OFF.

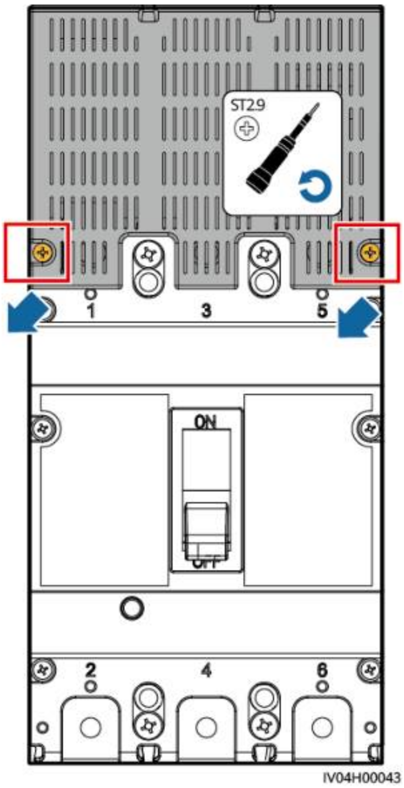
Power-Off

1. Ensure that the inverter and PCS connected to the downstream port of the MCCB are not energized (for example, shut down the inverter or PCS).
2. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
3. Turn off the VCB in the MV room.

Procedure

Step 1 Remove the terminal cover from the MCCB.

Figure 6-27 Removing the cover

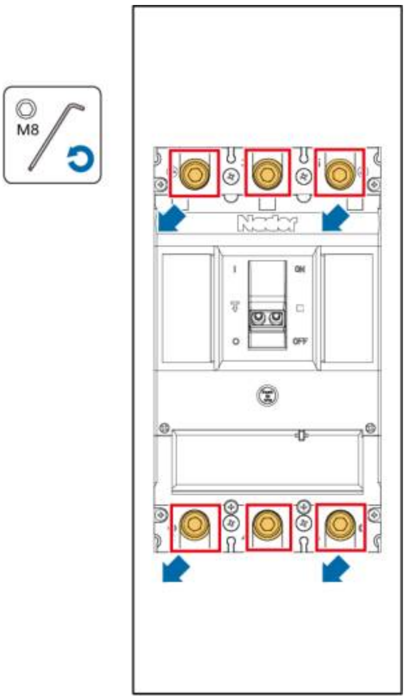


Step 2 Remove the cables from the MCCB and record the cable connections.

NOTE

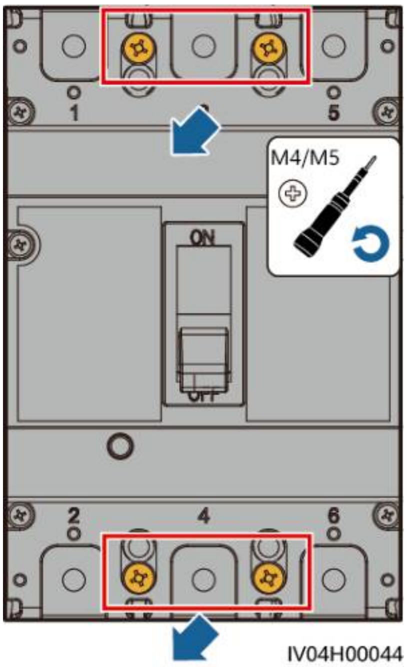
The hex key used for removing cables needs to be prepared by the customer.

Figure 6-28 Removing cables



Step 3 Remove the screws from the MCCB and remove the MCCB.

Figure 6-29 Removing the screws

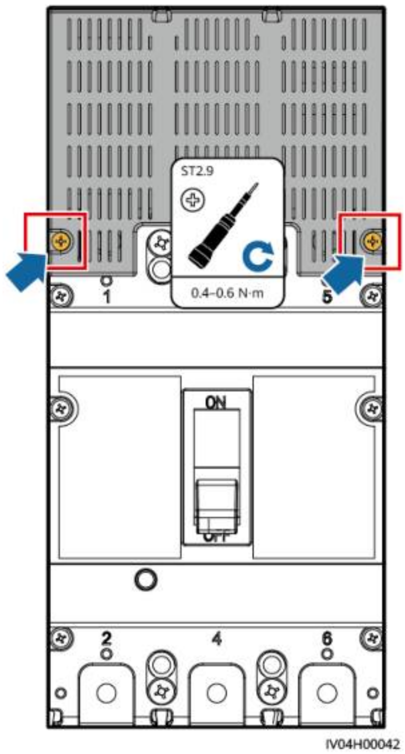


Step 4 Install a new MCCB.

Step 5 Reinstall the cables.

Step 6 Install the cover on the upper part of the MCCB.

Figure 6-30 Installing the cover



----End

Power-On

Perform operations in the reverse order of the power-off operations.

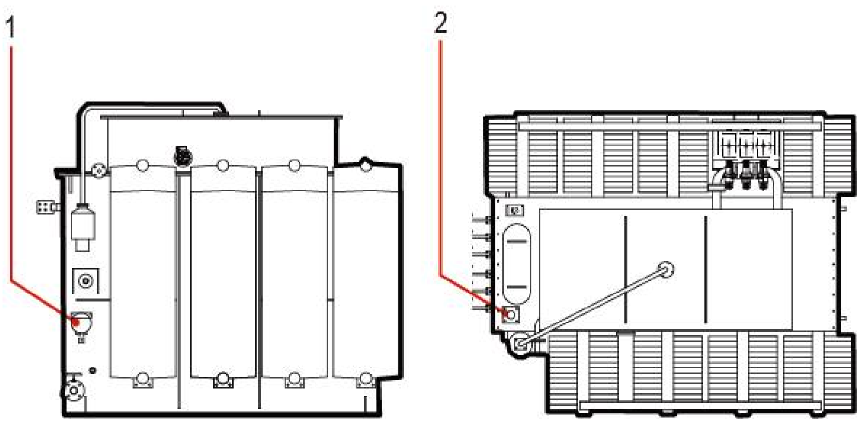
6.8.5 Replacing an Oil Surface Temperature Controller

Context

If an oil surface temperature controller is faulty and cannot be repaired during maintenance, power it off and replace it.

The oil surface temperature controller is located in the transformer room and its position varies according to the model.

Figure 6-31 Position of the oil surface temperature controller



(1) Oil surface temperature controller	(2) Pressure relief valve (thermo-bulb position)

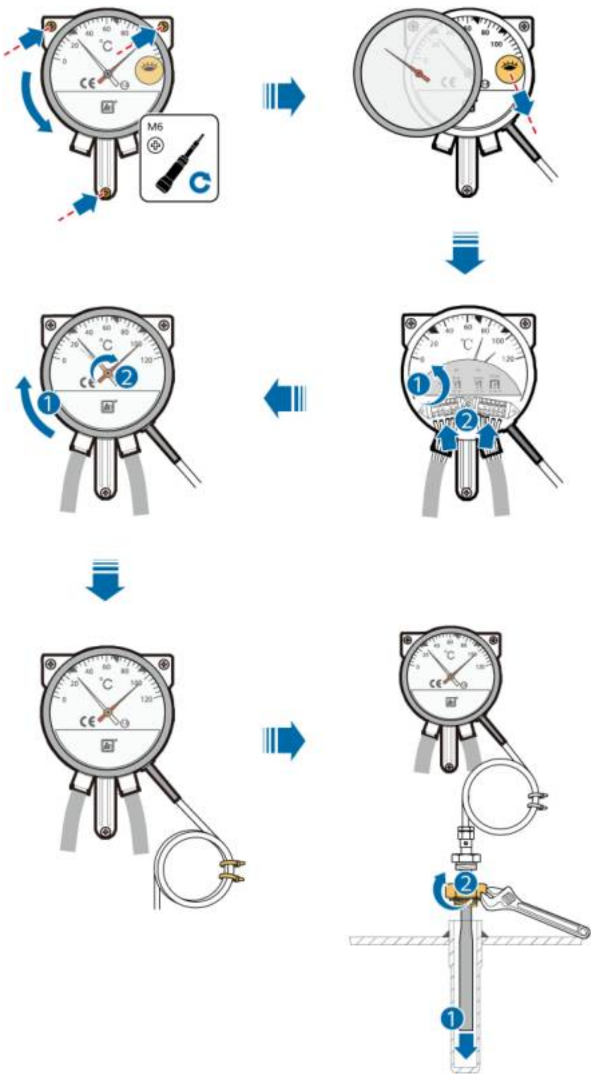
Power-Off

1. (Optional) Shut down the UPS inverter 3UI. Perform this operation when the UPS has been installed.
2. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
3. Turn off the VCB in the MV room.

Procedure

Step 1 Install the oil surface temperature controller, as shown in the figure.

Figure 6-32 Installing the oil surface thermometer



NOTE

When installing the cover clockwise, ensure that the white pin is on the left and the red pin is on the right.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

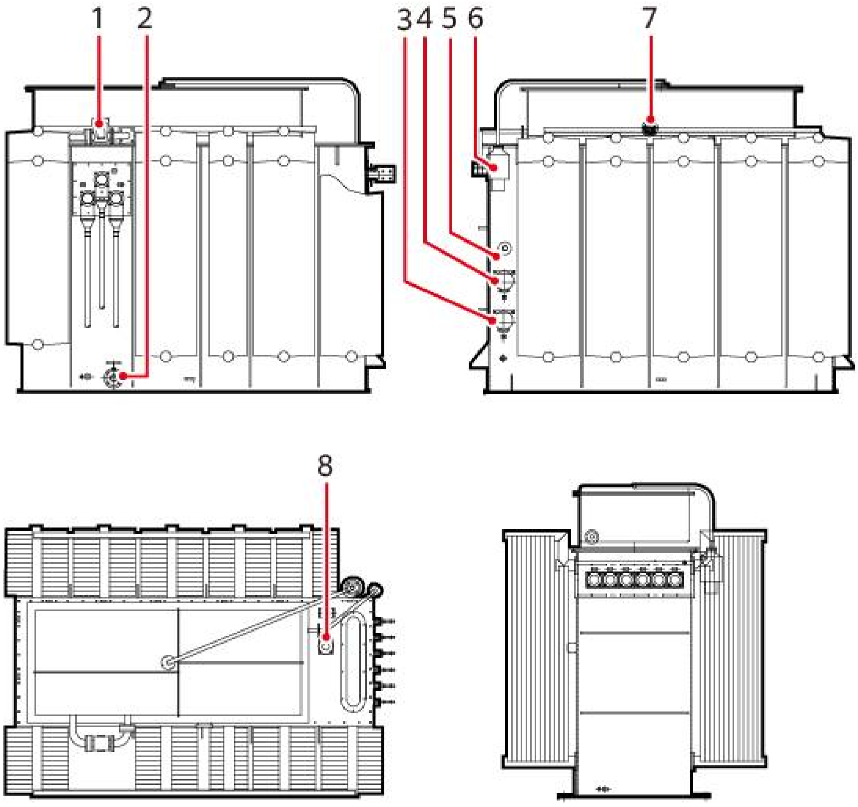
6.8.6 (Optional) Replacing a Winding Thermostat

Context

If a winding thermostat is faulty and cannot be repaired during maintenance, power it off and replace it.

The winding thermostat (marked by 4 in the figure) is located in the TR room.

Figure 6-33 Transformer



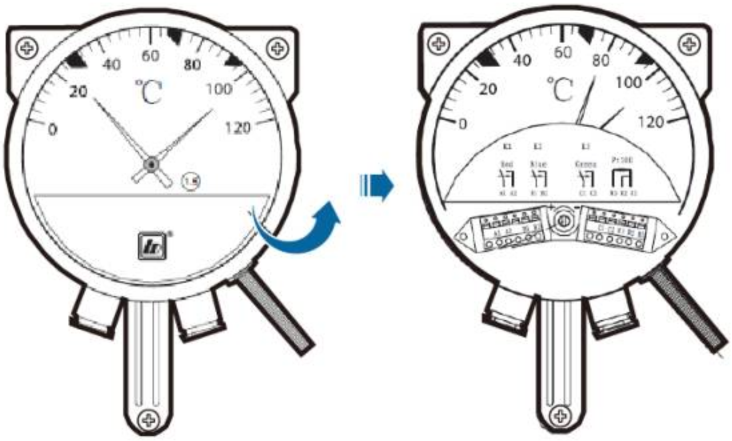
Power-Off

1. (Optional) Shut down the UPS inverter 3UI. Perform this operation when the UPS has been installed.
2. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
3. Turn off the VCB in the MV room.

Procedure

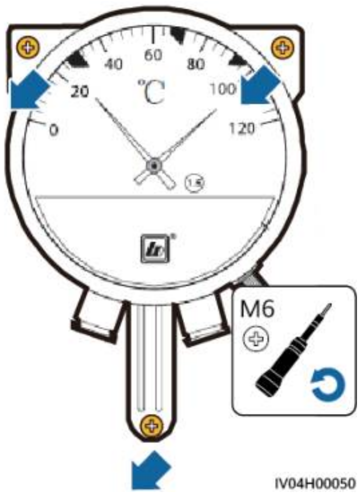
Step 1 Use both hands to rotate the outer metal ring of the winding thermostat counterclockwise, remove the outer metal ring and glass plate, remove the cables from the winding thermostat, and mark the cable.

Figure 6-34 Removing cables



Step 2 Remove the screws from the winding thermostat.

Figure 6-35 Removing screws



Step 3 Install a new winding thermostat.

Step 4 Reinstall the cables.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

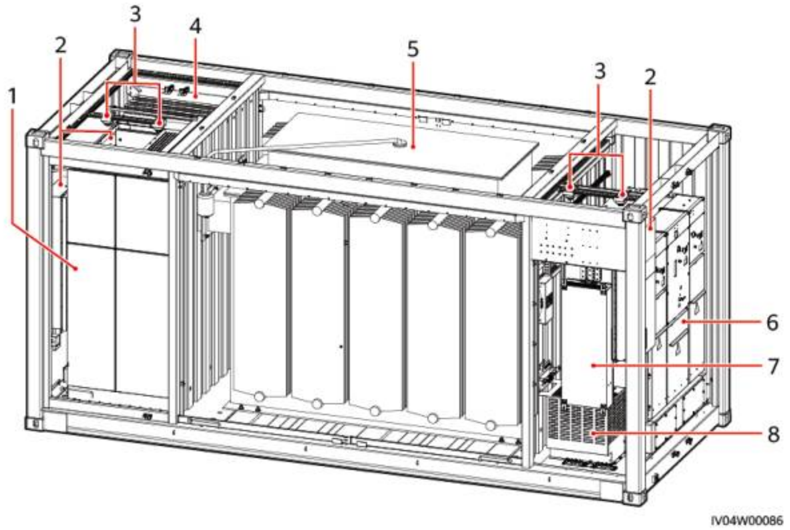
6.8.7 Replacing a Heat Exchanger

Context

If a heat exchanger is faulty and cannot be repaired during maintenance, power it off and replace it.

The JUPITER-9000K-H1 is configured with two heat exchangers, one in LV PANEL A and the other in LV PANEL B.

Figure 6-36 STS components



(1) LV PANEL A	(2) Heat exchangers	(3) Smoke sensor
(4) LV PANEL B	(5) Transformer	(6) Ring main unit
(7) Power distribution box	(8) Auxiliary transformer	

Power-Off

1. LV PANEL A: Turn off CK1 power switch 1FB3.
2. LV PANEL B: Turn off CK2 power switch 2FB2.
3. MV room: Turn off CK3 power switch 2FB2.
4. Use a multimeter (measurement range > 800 V) to check whether the downstream port of the MCCB is completely powered off.

DANGER

After the preceding switches are turned off, the upstream port is still energized. Exercise caution when performing this operation.

Procedure

Step 1 Remove cables from the heat exchanger.

Step 2 Remove the screws from the heat exchanger, and remove the front panel and heat exchanger.

Step 3 Install a new heat exchanger and the front panel, and tighten the screws.

Step 4 Power on the heat exchanger.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.8 (Optional) Replacing a Power Meter

Context

If a power meter is faulty and cannot be repaired during maintenance, power it off and replace it.

Power-Off

1. Turn off all MCCBs in the LV panel.
2. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
3. Turn off the VCB in the MV room.
4. (Optional) Shut down the UPS inverter 3UI. Perform this operation when the UPS has been installed.
5. Use a multimeter (measurement range > 800 V) to check whether the downstream port of the MCCB is completely powered off.

Procedure

Step 1 Remove cables from the power meter.

Step 2 Remove screws from the power meter and remove the power meter.

Step 3 Install a new power meter and tighten the screws.

Step 4 Secure the power meter cables.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.9 Replacing an MCB

Context

If an MCB is found faulty during maintenance, power it off and replace it.

Power-Off

1. LV PANEL A: Turn off 1QA23, 1QA24, and 1QS. 1QA24 and 1QS are optional.
2. LV PANEL B: Turn off 2QA23, 1QA24, and 1QS. 1QA24 and 1QS are optional.
3. (Optional) Shut down the UPS inverter 3UI. Perform this operation when the UPS has been installed.

DANGER

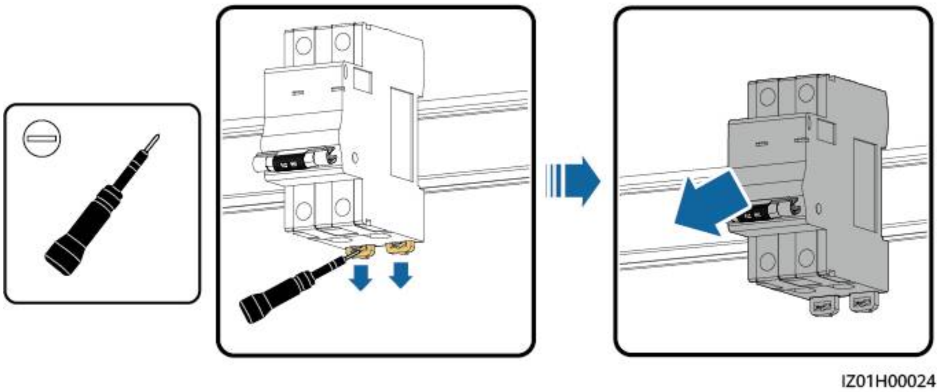
After the preceding switches are turned off, the upstream port is still energized. Exercise caution when performing this operation.

Procedure

Step 1 Remove the cables from the faulty MCB.

Step 2 Remove the faulty MCB.

Figure 6-37 Removing the faulty MCB



Step 3 Install a new MCB.

Step 4 Install the cables to the MCB.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.10 Replacing a Light

Context

If a light is found damaged during maintenance, power it off and replace it.

Power-Off

1. LV room: Turn off 1FB2.

2. MV room: Turn off 3FB4.

DANGER

After the preceding switches are turned off, the upstream port is still energized. Exercise caution when performing this operation.

Procedure

Step 1 Remove the faulty light.

Step 2 Install a new light in the original position.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

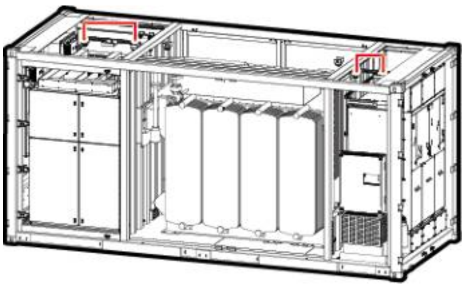
6.8.11 Replacing a Smoke Sensor

Context

If a smoke sensor is found damaged during maintenance, power it off and replace it.

The two smoke sensors (marked by 3 in the figure) are located on the top of the LV room and MV room, respectively.

Figure 6-38 Position of the smoke sensor



Power-Off

1. LV room: Turn off 1FB2.
2. MV room: Turn off 3FB4.

DANGER

After the preceding switches are turned off, the upstream port is still energized. Exercise caution when performing this operation.

Procedure

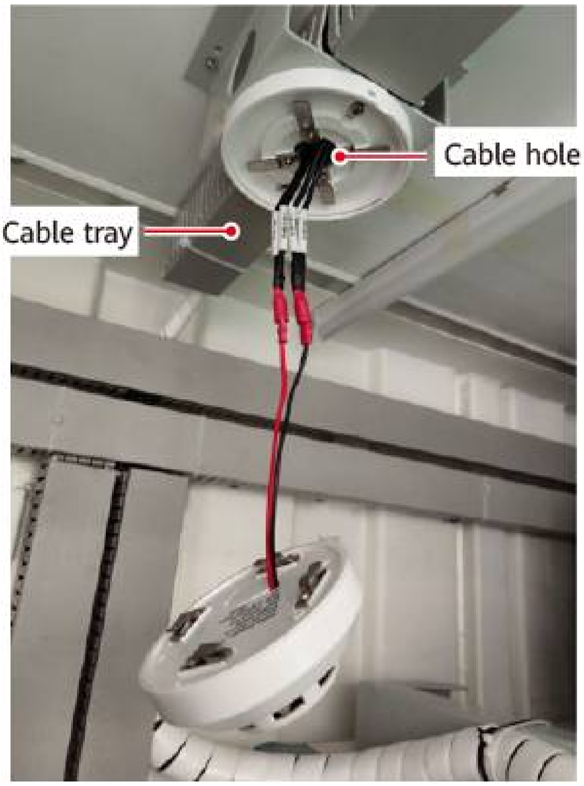
Step 1 Hold the smoke sensor, and rotate it counterclockwise to remove it from the base.

Step 2 Remove the smoke sensor cables.

Step 3 Connect the new smoke sensor cables.

Step 4 (Optional) If a smoke sensor with the BOM number BRJ-301ALG is configured, insert the cables into the cable tray through the cable hole in the base after connecting the cables.

Figure 6-39 Connecting cables of the BRJ-301ALG smoke sensor



Step 5 Insert the smoke sensor into the base and turn it clockwise until it locks in.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.12 (Optional) Replacing an Alarm Beacon

Context

If an alarm beacon is found damaged during maintenance, power it off and replace it.

Power-Off

1. LV room: Turn off 1FB2.
2. MV room: Turn off 3FB4.

DANGER

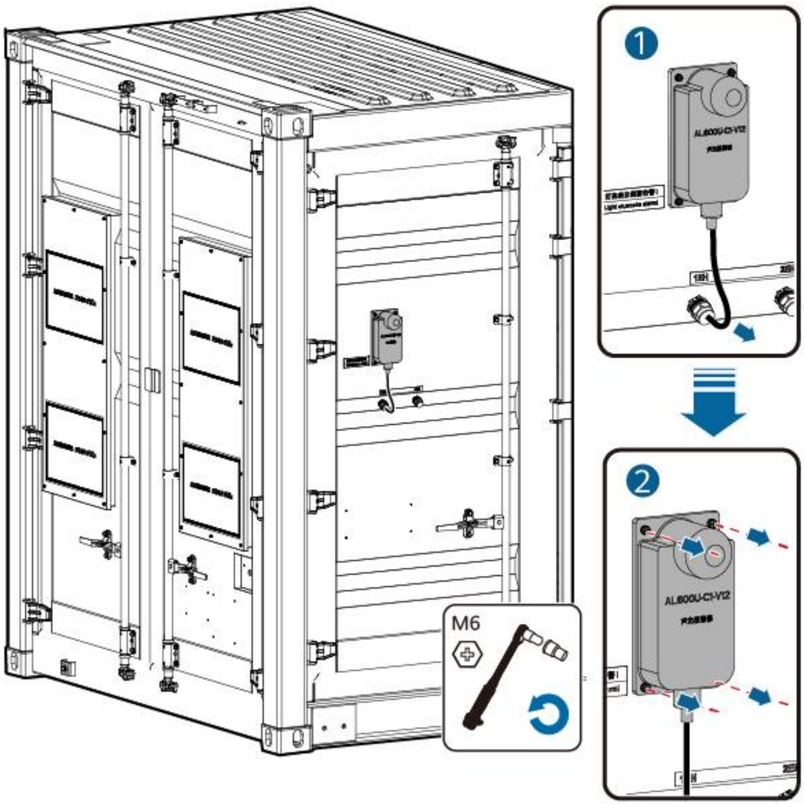
After the preceding switches are turned off, the upstream port is still energized. Exercise caution when performing this operation.

Procedure

Step 1 Remove the cable from the alarm beacon and record the position.

Step 2 Remove the faulty alarm beacon.

Figure 6-40 Removing a faulty alarm beacon



Step 3 Install a new alarm beacon.

Step 4 Reconnect the cable to the alarm beacon based on the recorded position.

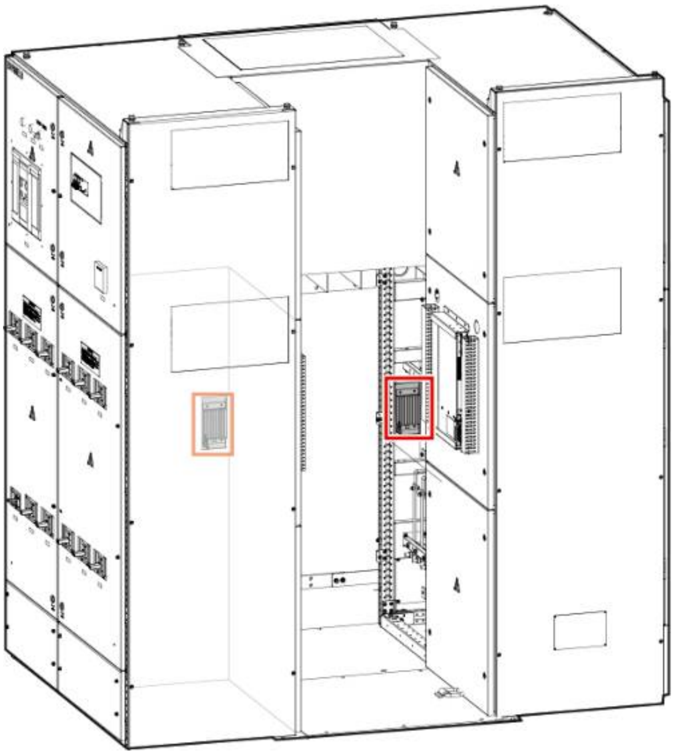
----End

6.8.13 (Optional) Replacing an LV Panel Heater

Context

If a heater is found damaged during maintenance, power it off and replace it.

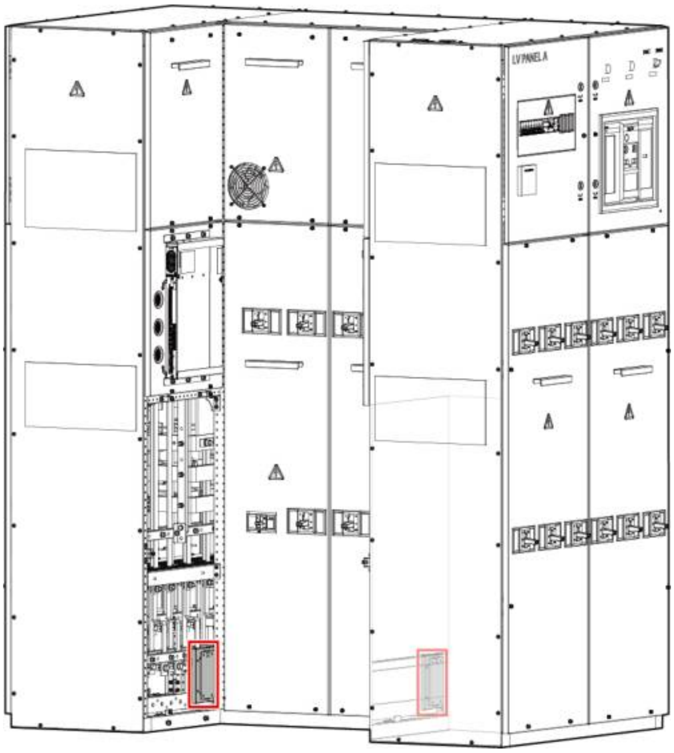
Figure 6-41 Position of the JUPITER-6000K-H1 heater



NOTE

The JUPITER-3000K-H1 does not have LV PANEL B. The heater position in LV PANEL A is the same as that of the JUPITER-6000K-H1.

Figure 6-42 Position of the JUPITER-9000K-H1 heater



Power-Off

1. Ensure that the inverter and PCS connected to the downstream port of the MCCB are not energized (for example, shut down the inverter or PCS).
2. Turn off 1FB4.
3. Turn off the ACB.

Procedure

Step 1 Unscrew and remove the sealing plate inside the LV panel.

Figure 6-43 Screws on the sealing plate of the JUPITER-3000K-H1/JUPITER-6000K-H1 LV panel

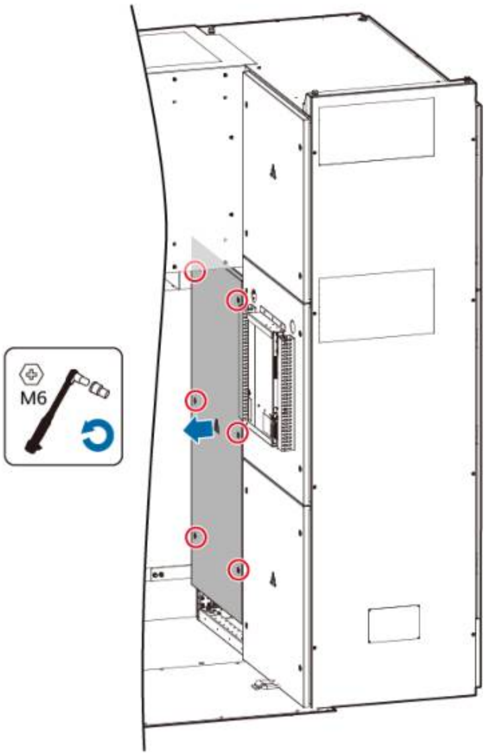
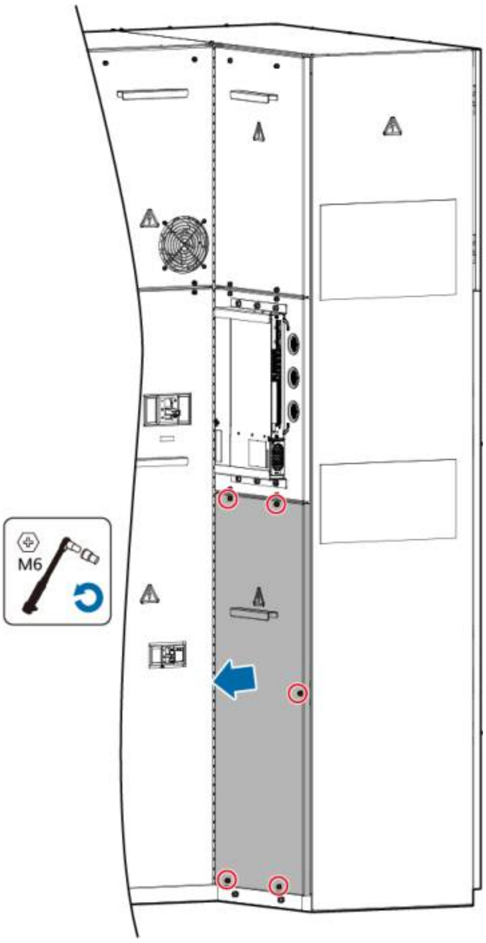


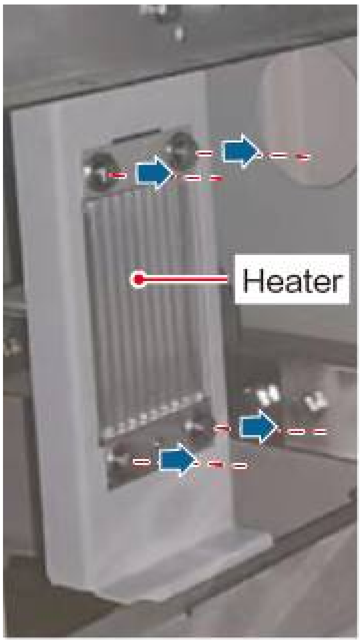
Figure 6-44 Screws on the sealing plate of the JUPITER-9000K-H1 LV panel



Step 2 Record the positions of cables connected to the heater, and disconnect the cables.

Step 3 Remove the heater.

Figure 6-45 Removing the heater



Step 4 Install a new heater in the original position. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

Step 5 Reconnect the cables to the new heater based on the cable connection records. Use an M3 Phillips screwdriver and tighten the screws to a torque of 0.5 N·m.

Step 6 Reinstall the sealing plate to the LV panel. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

Step 7 Power on the heater in the reverse order of powering off the heater.

----End

6.8.14 Replacing T/H Sensors

6.8.14.1 Replacing a T/H Sensor in the LV Panel

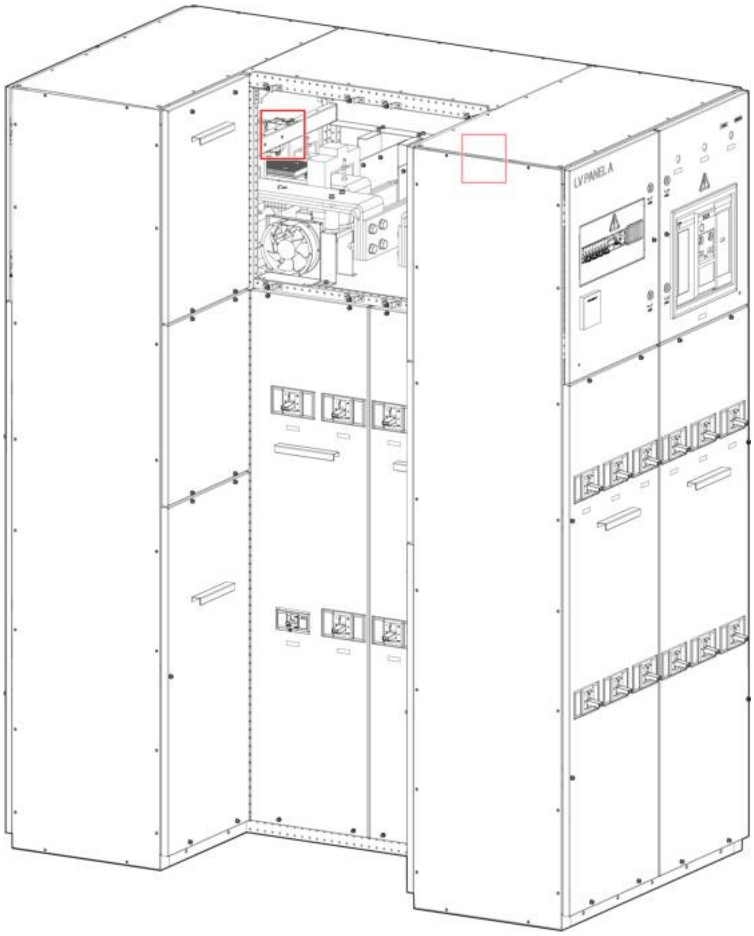
Context

If a T/H sensor is found damaged during maintenance, power it off and replace it.

NOTE

The appearance of the STS varies with the model, but the installation positions of T/H sensors are the same. This section uses one type of appearances as an example.

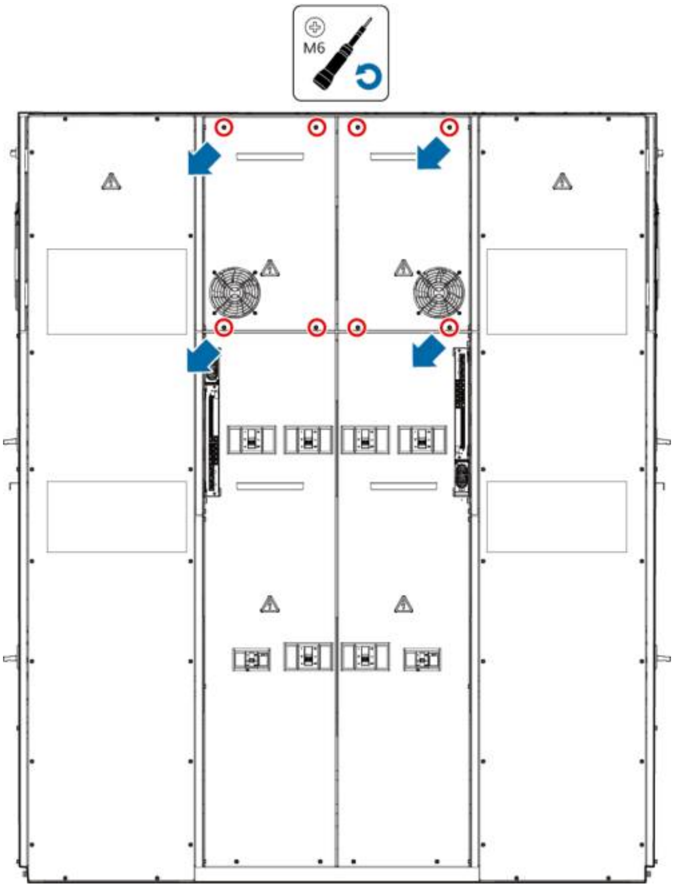
Figure 6-46 Positions of T/H sensors



Procedure

Step 1 Open the LV panel doors.

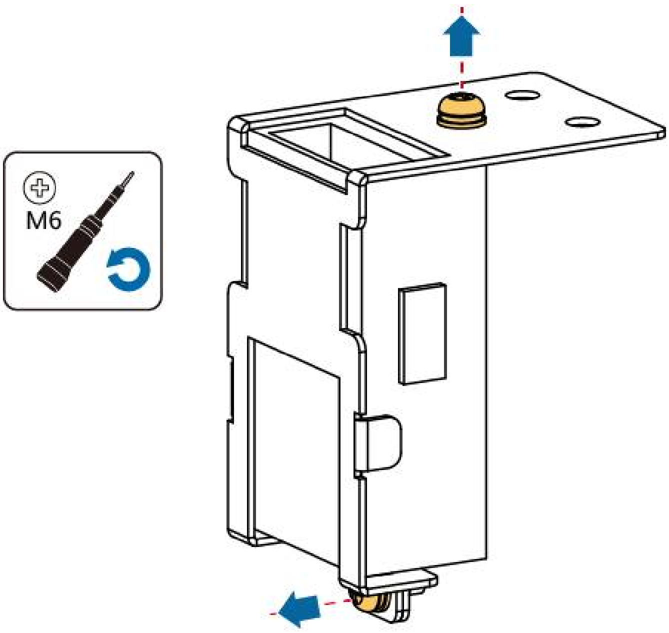
Figure 6-47 Removing doors



Step 2 Remove the cables from the T/H sensor and record their positions.

Step 3 Remove the T/H sensor together with the base.

Figure 6-48 Removing the T/H sensor



Step 4 Set the DIP switch on the new T/H sensor.

Table 6-2 DIP switch settings

Toggle Switch 1	Toggle Switch 2	Toggle Switch 3	Toggle Switch 4	Toggle Switch 5	Toggle Switch 6	Toggle Switch 7
ON	OFF	OFF	OFF	OFF	OFF	OFF

Step 5 Install a new T/H sensor on the base, and install them in the original position.

Step 6 Reconnect the cables to the new T/H sensor based on the cable connection records.

Step 7 Close the doors.

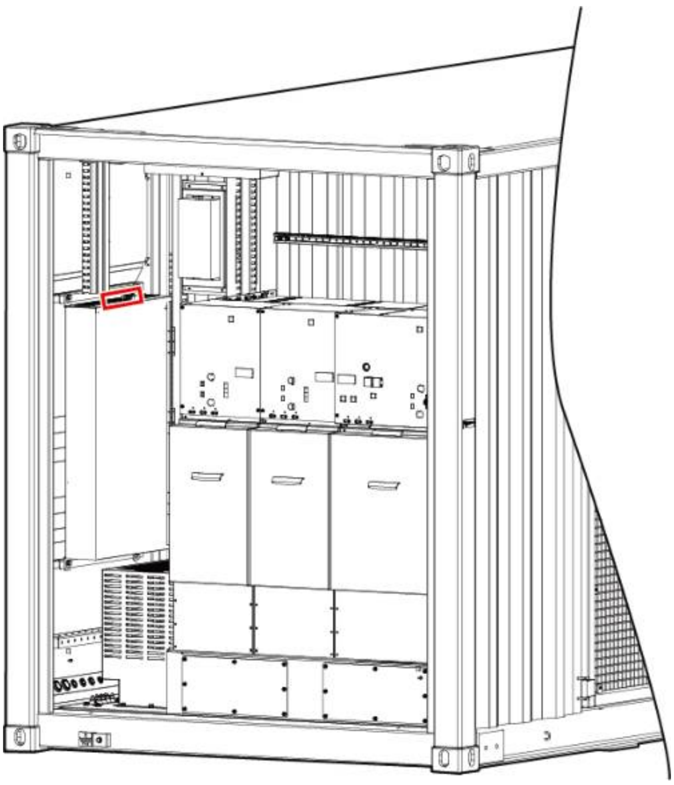
----End

6.8.14.2 Replacing a T/H Sensor in the MV Panel

Context

If a T/H sensor is found damaged during maintenance, power it off and replace it.

Figure 6-49 Position of the T/H sensor

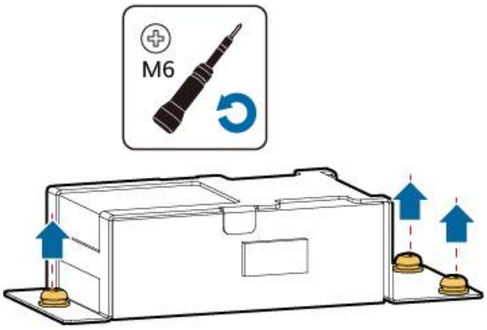


Procedure

Step 1 Remove the cables from the T/H sensor and record their positions.

Step 2 Remove the T/H sensor together with the base.

Figure 6-50 Removing the T/H sensor



Step 3 Set the DIP switch on the new T/H sensor.

Table 6-3 DIP switch settings

Toggle Switch 1	Toggle Switch 2	Toggle Switch 3	Toggle Switch 4	Toggle Switch 5	Toggle Switch 6	Toggle Switch 7
ON	OFF	OFF	OFF	OFF	OFF	OFF

Step 4 Install a new T/H sensor on the base, and install them in the original position.

Step 5 Reconnect the cables to the new T/H sensor based on the cable connection records.

Step 6 Close the doors.

----End

6.8.15 Replacing a Main Control Module

Context

An STS main control module is found damaged during maintenance.

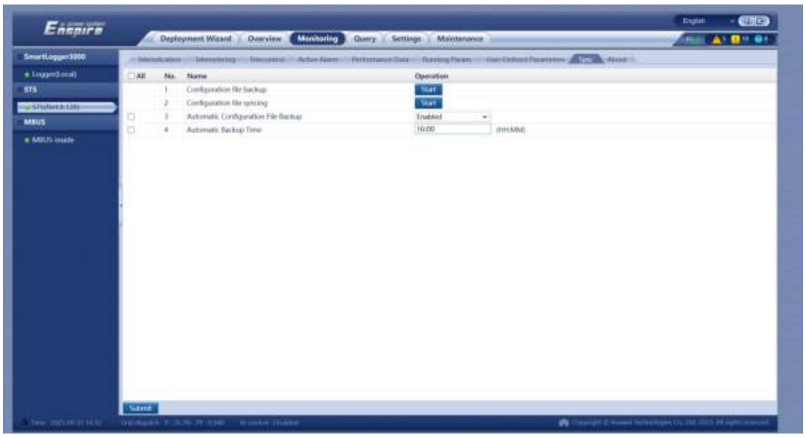
Step 1 Perform manual configuration file backup.

NOTE

- If the main control module cannot communicate with the SmartLogger, skip this step. After replacing the main control module with a new one, set factory parameters.
- If the function of automatic configuration file backup has been enabled for the STS, skip this step.

1. Log in to the SmartLogger, choose **Monitoring** > **STS**, click the **Sync** tab, and click **Start** in the **Configuration file backup** row to manually back up the configuration file.

Figure 6-51 Configuration file backup



2. After the export is successful, click **Confirm**.

Step 2 Tools: Phillips insulated torque screwdriver and insulated torque socket wrench

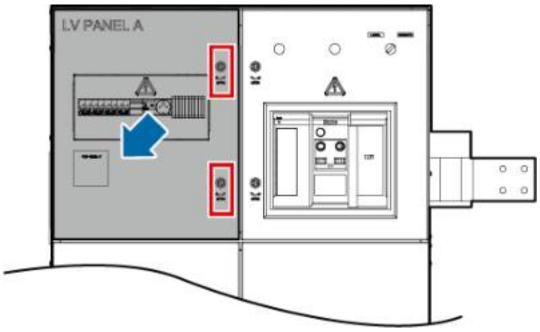
Step 3 Power-off: Turn off 1FB3.

----End

Procedure

Step 1 Open the sealing plate of LV PANEL A based on the silk screen.

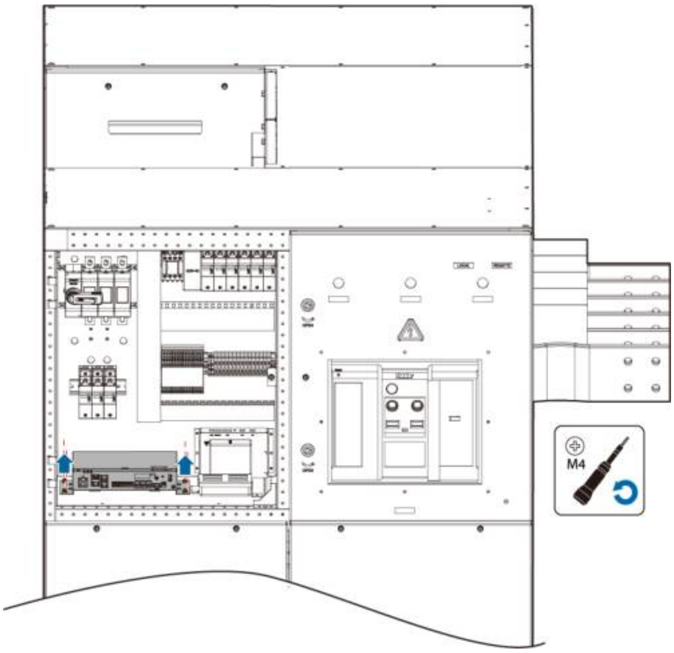
Figure 6-52 Opening the sealing plate of LV PANEL A



Step 2 Remove the cables from the main control module and record their positions.

Step 3 Remove the old main control module.

Figure 6-53 Removing a main control module



Step 4 Install a new main control module in the original position. Use an M4 Phillips screwdriver and tighten the screws to a torque of 1.2 N·m.

Step 5 Reconnect the cables to the new main control module based on the cable connection records.

Step 6 Reinstall the sealing plate of LV PANEL A.

----End

Follow-up Procedure

Step 1 Turn on 1FB3.

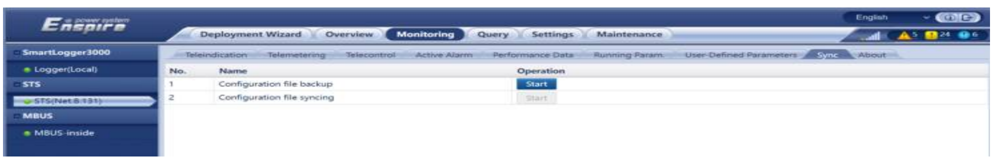
Step 2 Log in to the SmartLogger to check that the communication is normal and that no related alarm is generated.

Step 3 Check the running status of the system and ensure that the functions are restored.

Step 4 (Optional) If the configuration file has been backed up before the device replacement, log in to the SmartLogger and import the backup configuration file to the new device. Otherwise, skip this step.

1. Choose **Monitoring** > **STS** > **Sync** to synchronize the configuration file.

Figure 6-54 Configuration file synchronization



Step 5 (Optional) If the configuration file is not backed up before the device replacement, set the STS running parameters as follows.

1. Log in to the SmartLogger, choose **Monitoring** > **STS** > **Running Param.** > **Settings**, and set related parameters.
2. Choose **Monitoring** > **STS** > **Teleindication** and check the teleindication signals.
3. Choose **Monitoring** > **STS** > **Telemetering** and check the telemetering signals.

Figure 6-55 Running parameters

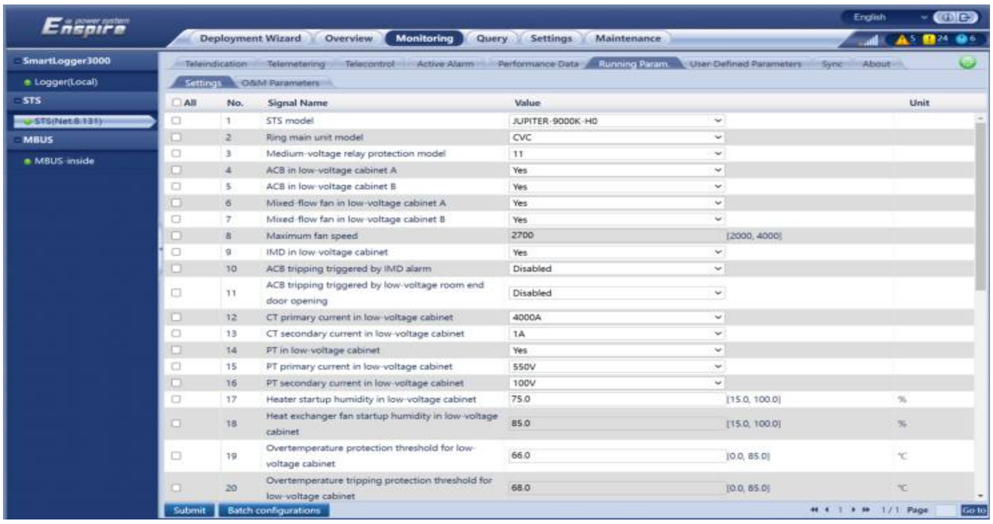


Figure 6-56 Viewing teleindication signal parameters

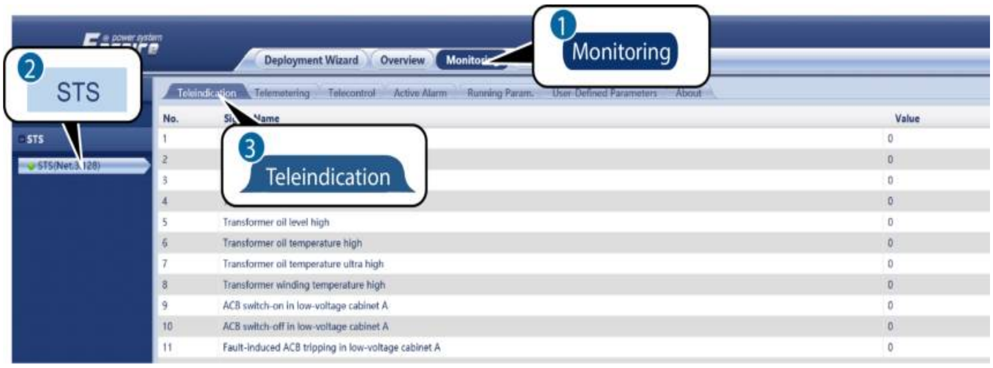


Figure 6-57 Viewing telemetering signal parameters

Table 6-4 Running parameters and associated telemetering/teleindication signals

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
1	STS model	Ensure that the configured STS model is correct.	-	-
2	Ring main unit model	Set this parameter based on the actual configuration.	– Switch-on/Switch-off of load switch of ring main unit/incoming line cabinet G1 – Switch-on/Switch-off of earthing switch of ring main unit/incoming line cabinet G1 – Switch-on/Switch-off of load switch of ring main unit/incoming line cabinet G3 – Switch-on/Switch-off of earthing switch of ring main unit/incoming line cabinet G3	-

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
3	Medium-voltage relay protection model	Set this parameter based on the actual configuration.	High-configuration relay protection power loss alarm (associated with the high-configuration relay protection model) **NOTE** The main control teleindication signal uploaded by the relay protection is associated with the relay protection model.	**NOTE** The main control telemetering signal uploaded by the relay protection is associated with the relay protection model.
4	ACB for low-voltage cabinet A	Set this parameter based on the actual configuration.	– ACB switch-on/switch-off in low-voltage cabinet A – Fault-induced ACB tripping in low-voltage cabinet A – Remote operation of ACB in low-voltage cabinet A	-
5	ACB for low-voltage cabinet B	Set this parameter based on the actual configuration.	– ACB switch-on/switch-off in low-voltage cabinet B – Fault-induced ACB tripping in low-voltage cabinet B – Remote operation of ACB in low-voltage cabinet B	-

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
6	Mixed-flow fan for low-voltage cabinet A	Select **Yes** or **No** based on the actual configuration.	-	-
7	Mixed-flow fan for low-voltage cabinet B	Select **Yes** or **No** based on the actual configuration.	-	-
8	Maximum fan speed	Set this parameter based on the actual configuration.	-	-
9	IMD for low-voltage cabinet	Select **Yes** or **No** based on the actual configuration.	– IMD Warning in Low-Voltage Cabinet A – IMD Alarm in Low-Voltage Cabinet A – IMD Warning in Low-Voltage Cabinet B – IMD Alarm in Low-Voltage Cabinet B	-
10	ACB tripping triggered by IMD alarm	– This parameter is displayed when **IMD for low-voltage cabinet** is set to **Yes**. – Disable or Enable this parameter as required.	-	-
11	ACB tripping triggered by low-voltage room end door opening	Disable or Enable this parameter as required. **NOTE** The STS supports the function of **ACB tripping triggered by low-voltage room end door opening**. You can choose **Monitoring** > **STS** > **Running Param.** > **Settings** on the SmartLogger to set this parameter to **Enabled** or **Disabled**.	-	-
12	Primary current of CT for low-voltage cabinet	Current range: 2500 A/3000 A/ 3500 A/4000 A	-	-

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
13	Secondary current of CT for low-voltage cabinet	Current range: 1 A/5 A		
14	PT for low-voltage cabinet	Select **Yes** or **No** based on the actual configuration.	-	-
15	Primary voltage of PT for low-voltage cabinet	– This parameter is displayed when **PT for low-voltage cabinet** is set to **Yes**. – Voltage range: 480 V/550 V/800 V/1000 V	-	-
16	Secondary voltage of PT for low-voltage cabinet	– This parameter is displayed when **PT for low-voltage cabinet** is set to **Yes**. – Voltage range: 100 V/400 V	-	-
17	Heater startup humidity in low-voltage cabinet	Humidity range: 15% to 100%	-	-
18	Heat exchanger fan startup humidity in low-voltage cabinet	Humidity range: 15% to 100%	-	-
19	Alarm threshold for high temperature in low-voltage cabinet	Temperature range: 0°C–85°C	-	-
20	Tripping threshold for high temperature in low-voltage cabinet	– Temperature range: 0°C–85°C – The setting must be greater than or equal to the alarm threshold for high temperature.	-	-
21	Heat exchanger in medium-voltage room	Select **Yes** or **No** based on the actual configuration.	-	-
22	Heat exchanger fan startup humidity in medium-voltage room	This parameter is displayed when **Heat exchanger in medium-voltage room** is set to **Yes**.	-	-
23	Alarm threshold for high temperature in medium-voltage room	Temperature range: 0°C–85°C	-	-

<table>
<tr><th>No.</th><th>Running Parameter</th><th>Description</th><th>Associated Teleindication Signal</th><th>Associated Telemetering Signal</th></tr>
<tr><td>24</td><td>Tripping threshold for high temperature in medium-voltage room</td><td>– Temperature range: 0°C–85°C
– The setting must be greater than or equal to the alarm threshold for high temperature.</td><td>-</td><td>-</td></tr>
<tr><td>25</td><td>Auxiliary transformer type</td><td>Select Single-phase for the 3 kVA and Three-phase for the 50 kVA.</td><td>-</td><td>-</td></tr>
<tr><td>26</td><td>Auxiliary transformer CT</td><td>Select Yes or No based on the actual configuration.</td><td rowspan="3">-</td><td rowspan="3">– Auxiliary transformer current Ia
– Auxiliary transformer current Ib
– Auxiliary transformer current Ic
– Auxiliary transformer active power P
– Auxiliary transformer reactive power Q
– Auxiliary transformer power factor cosφ
– Positive active energy of auxiliary transformer
– Positive reactive energy of auxiliary transformer
– Negative reactive energy of auxiliary transformer</td></tr>
<tr><td>27</td><td>Primary current of auxiliary transformer CT</td><td>– This parameter is displayed when Auxiliary transformer CT is set to Yes.
– Current range: 5 A/10 A/15 A/20 A/25 A/50 A/100 A/150 A/200 A/250 A/300 A</td></tr>
<tr><td>28</td><td>Secondary current of auxiliary transformer CT</td><td>– This parameter is displayed when Auxiliary transformer CT is set to Yes.
– Current range: 1 A/5 A</td></tr>
</table>

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
29	Maintenance-free dehumidifier	Select **Yes** or **No** based on the actual configuration.	– Maintenance-free dehumidifier heating – Maintenance-free dehumidifier fault	Humidity in transformer cabinet
30	Humidity threshold for dehumidifier to start heating	This parameter is displayed when the **Maintenance-free dehumidifier** is set to **Yes**.		
31	Interval for dehumidifier to start heating			
32	Heating duration of dehumidifier			
33	Temperature rise threshold for starting dehumidifier			
34	Temperature drop threshold for starting dehumidifier			
35	Transformer winding temperature indicator	Select **Yes** or **No** based on the actual configuration.	– Transformer high winding temperature – Transformer ultra-high winding temperature	Transformer winding temperature
36	Automatic mode of circuit breaker for transformer cabinet G2	Select **Yes** or **No** based on the actual configuration.	Automatic mode of circuit breaker for transformer cabinet G2	-
37	Harmonic monitoring for low-voltage cabinet	Enable or Disable this parameter as required.	-	This parameter is associated with the total harmonic and single harmonic data.
38	Frequency level	50 Hz/60 Hz	-	-
39	Overfrequency/ Underfrequency alarm	Enable or Disable this parameter as required. It is enabled by default.	-	-

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
40	Overfrequency alarm margin	Set this parameter based on the actual configuration.	-	-
41	Overfrequency alarm delay	This parameter is displayed when Overfrequency/ Underfrequency alarm is enabled. Set this parameter based on the actual configuration.		
42	Underfrequency alarm margin	Set this parameter based on the actual configuration.	-	-
43	Underfrequency alarm delay	This parameter is displayed when Overfrequency/ Underfrequency alarm is enabled. Set this parameter based on the actual configuration.		
44	ACB tripping caused by overfrequency/ underfrequency	Disable or Enable this parameter as required. It is disabled by default.	-	-
45	Overfrequency trip margin	Set this parameter based on the actual configuration.		
46	Overfrequency trip delay	This parameter is displayed when ACB tripping caused by overfrequency is enabled. Set this parameter based on the actual configuration.		
47	Underfrequency trip margin	Set this parameter based on the actual configuration.		
48	Underfrequency trip delay	This parameter is displayed when ACB tripping caused by underfrequency is enabled. Set this parameter based on the actual configuration.	-	-
49	UPS	Select **Yes** or **No** based on the actual configuration.	– UPS AC power failure alarm – Other UPS alarms	-
50	DC LV Panel	Select **Yes** or **No** based on the actual configuration.	DC LV Panel door opening	-

No.	Running Parameter	Description	Associated Teleindication Signal	Associated Telemetering Signal
51	Quantity of distribution transformers	Set this parameter based on the actual configuration.	– Switch-on of MCCB for distribution transformer n – Distribution transformer n heat exchanger fault – Distribution transformer cabinet door opening	-

----End

6.8.16 Replacing Measurement and Control Modules

The JUPITER-3000K-H1 is configured with two measurement and control modules. Measurement and control module 1 is located in LV PANEL A, and measurement and control module 3 is located in the MV room.

The JUPITER-6000K-H1 and JUPITER-9000K-H1 are configured with three measurement and control modules. Measurement and control module 1 is located in LV PANEL A, measurement and control module 2 is located in LV PANEL B, and measurement and control module 3 is located in the MV room.

6.8.16.1 Replacing a Measurement and Control Module in the LV Room

Context

If a measurement and control module is found damaged during maintenance, power it off and replace it.

The positions of measurement and control modules in an STS vary with the model, but the replacement procedures are the same. This section uses the replacement of the measurement and control module in LV PANEL A as an example.

Power-Off

Replace measurement and control module 1 (CK1).

1. Turn off switch 1FB3 in measurement and control module 1.
2. Turn off the ACB (1QA) of LV PANEL A.
3. If there is a UPS, shut down the UPS inverter.
4. Turn off the vacuum circuit breaker (VCB) in the MV room.

Replace measurement and control module 2 (CK2).

1. Turn off switch 2FB2 in measurement and control module 2.
2. Turn off the ACB (2QA) of LV PANEL B.
3. If there is a UPS, shut down the UPS inverter.
4. Turn off the VCB in the MV room.

DANGER

Before replacing the measurement and control module, ensure that the secondary side of the current transformer (CT) is short-circuited and the secondary side of the potential transformer (PT) is open-circuited.

Procedure

Step 1 Remove the screws from the cable boxes on both sides of the measurement and control module, and remove the cable boxes.

Step 2 Remove the screws from the PSU positioning kit and remove the PSU positioning kit.

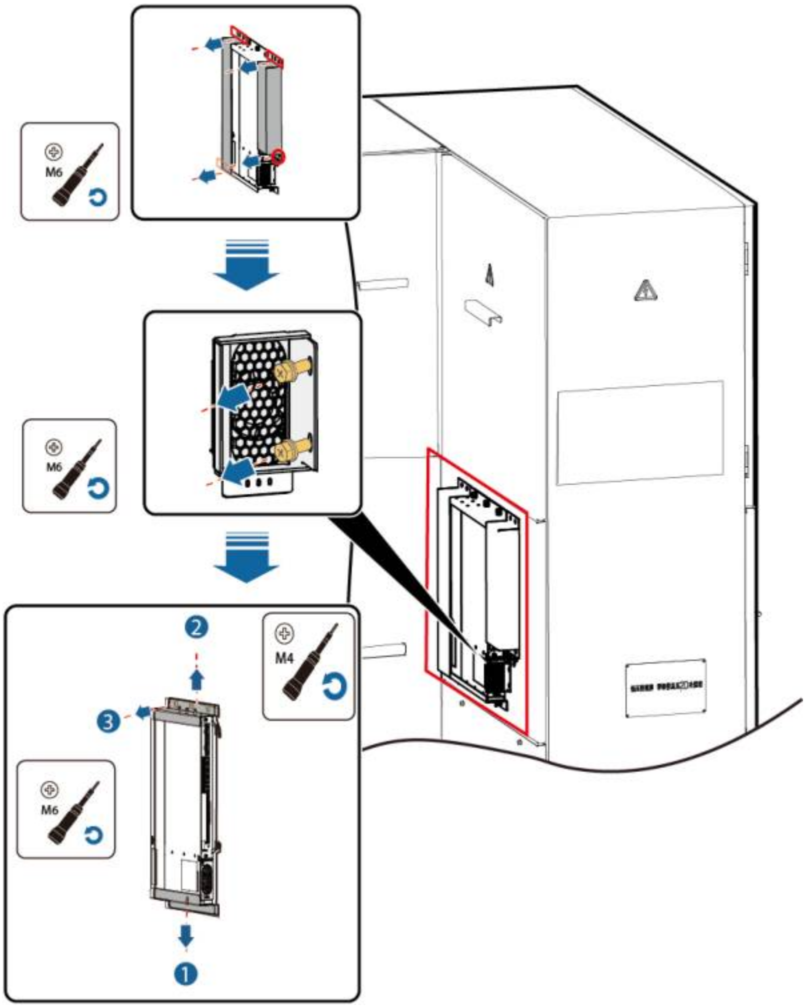
Step 3 Record the positions of cables connected to the measurement and control module, and disconnect the cables.

Step 4 Remove the PSU (to be reused) of the measurement and control module. For details, see **6.8.17 Replacing a PSU of the STS Measurement and Control Module**.

Step 5 Remove the screws from the bracket of the measurement and control module.

Step 6 Remove the bracket above the measurement and control module and take out the measurement and control module.

Figure 6-58 Removing the measurement and control module



Step 7 Install a new measurement and control module in the original position.

Step 8 Reinstall the bracket above the measurement and control module. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

Step 9 Secure the new measurement and control module to the bracket. Use an M4 Phillips screwdriver and tighten the screws to a torque of 1.2 N·m.

Step 10 Reinstall the PSU and positioning bracket. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

Step 11 Reconnect the cables to the new measurement and control module based on the cable connection records.

Step 12 Reinstall the cable boxes on both sides of the measurement and control module. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

Step 13 Power on the measurement and control module in the reverse order of the power-off operations.

----End

Follow-up Procedure

The measurement and control modules support two networking topologies: chain and ring topologies. A SmartModule is configured for the ring topology, but not for the chain topology. When replacing a measurement and control module, you need to perform different subsequent procedures depending on the networking topology.

Chain topology:

Step 1 Log in to the SmartLogger WebUI, choose **Maintenance** > **Software Upgrade**, upload the STS upgrade package, select the device, and upgrade the STS to ensure that the STS version is the same as the other STS version displayed on the SmartLogger WebUI. If they are inconsistent, upgrade the software version to ensure that no alarm indicating inconsistent measurement and control module software versions is generated.

----End

Ring topology:

Step 1 Log in to the SmartLogger WebUI, choose **Maintenance** > **Software Upgrade**, upload the STS upgrade package, select the device, and upgrade the STS to ensure that the STS version is the same as the other STS version displayed on the SmartLogger WebUI. If they are inconsistent, upgrade the software version to ensure that no alarm indicating inconsistent measurement and control module software versions is generated.

Step 2 Before performing location detection, disconnect cables from the COM1 and COM2 ports of the measurement and control module in the MV room, and short-circuit the COM1 and COM2 ports using a network cable.

Step 3 On the SmartLogger WebUI, choose **Monitoring** > **STS** > **Running Param.** > **O&M Parameters**, and click **Start** in the row of **Controller location detection** to detect the location of the measurement and control module.

Step 4 Choose **Monitoring** > **STS** > **Running Param.** > **O&M Parameters**, and check that **Detection succeeded** is displayed in the row of **Controller location detection status** and that no related alarm is generated.

Step 5 After the detection is complete, remove the network cable that short-circuits the COM1 and COM2 ports from the measurement and control module in the MV room, and reconnect the cables to the COM1 and COM2 ports.

----End

NOTE

- Contact the Company's service engineers to obtain the STS software package.
- When you remove a measurement and control module under the ring topology, an alarm indicating abnormal measurement and control communication will be generated. After a new measurement and control module is connected, the alarm generated by the original measurement and control module will not be cleared until the physical location detection is completed.

6.8.16.2 Replacing a Measurement and Control Module in the MV Room

Power-Off

1. Turn off the general 800 V switch.
2. Turn off the general circuit breaker 3FB of the auxiliary loop.
3. Turn off the inverter switch used by the UPS. (This step is optional. Perform this step when configuring the UPS. Skip this step when only maintaining the UPS.)

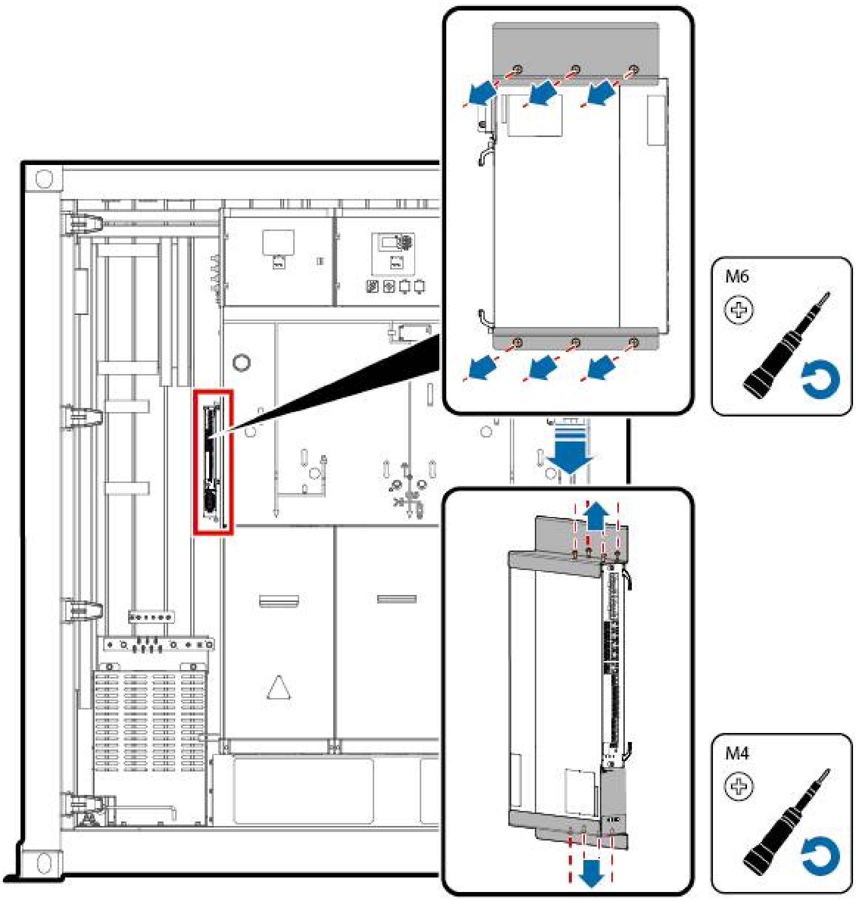
Procedure

Step 1 Open the end door of the MV room.

Step 2 Remove the cables from the measurement and control module and record their positions.

Step 3 Remove the old measurement and control module in the MV room.

Figure 6-59 Removing the old measurement and control module in the MV room



Step 4 Install a new measurement and control module in the original position. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

Step 5 Secure the new measurement and control module to the bracket. Use an M4 Phillips screwdriver and tighten the screws to a torque of 1.2 N·m.

Step 6 Reconnect the cables to the new measurement and control module based on the cable connection records.

Step 7 Power on the measurement and control module in the reverse order of the power-off operations.

----End

Follow-up Procedure

The measurement and control modules support two networking topologies: chain and ring topologies. A SmartModule is configured for the ring topology, but not for the chain topology. When replacing a measurement and control module, you need to perform different subsequent procedures depending on the networking topology.

Chain topology:

Step 1 Log in to the SmartLogger WebUI, choose **Maintenance** > **Software Upgrade**, upload the STS upgrade package, select the device, and upgrade the STS to ensure that the STS version is the same as the other STS version displayed on the SmartLogger WebUI. If they are inconsistent, upgrade the software version to ensure that no alarm indicating inconsistent measurement and control module software versions is generated.

----End

Ring topology:

Step 1 Log in to the SmartLogger WebUI, choose **Maintenance** > **Software Upgrade**, upload the STS upgrade package, select the device, and upgrade the STS to ensure that the STS version is the same as the other STS version displayed on the SmartLogger WebUI. If they are inconsistent, upgrade the software version to ensure that no alarm indicating inconsistent measurement and control module software versions is generated.

Step 2 Before performing location detection, disconnect cables from the COM1 and COM2 ports of the measurement and control module in the MV room, and short-circuit the COM1 and COM2 ports using a network cable.

Step 3 On the SmartLogger WebUI, choose **Monitoring** > **STS** > **Running Param.** > **O&M Parameters**, and click **Start** in the row of **Controller location detection** to detect the location of the measurement and control module.

Step 4 Choose **Monitoring** > **STS** > **Running Param.** > **O&M Parameters**, and check that **Detection succeeded** is displayed in the row of **Controller location detection status** and that no related alarm is generated.

Step 5 After the detection is complete, remove the network cable that short-circuits the COM1 and COM2 ports from the measurement and control module in the MV room, and reconnect the cables to the COM1 and COM2 ports.

----End

NOTE

- Contact the Company's service engineers to obtain the STS software package.
- When you remove a measurement and control module under the ring topology, an alarm indicating abnormal measurement and control communication will be generated. After a new measurement and control module is connected, the alarm generated by the original measurement and control module will not be cleared until the physical location detection is completed.

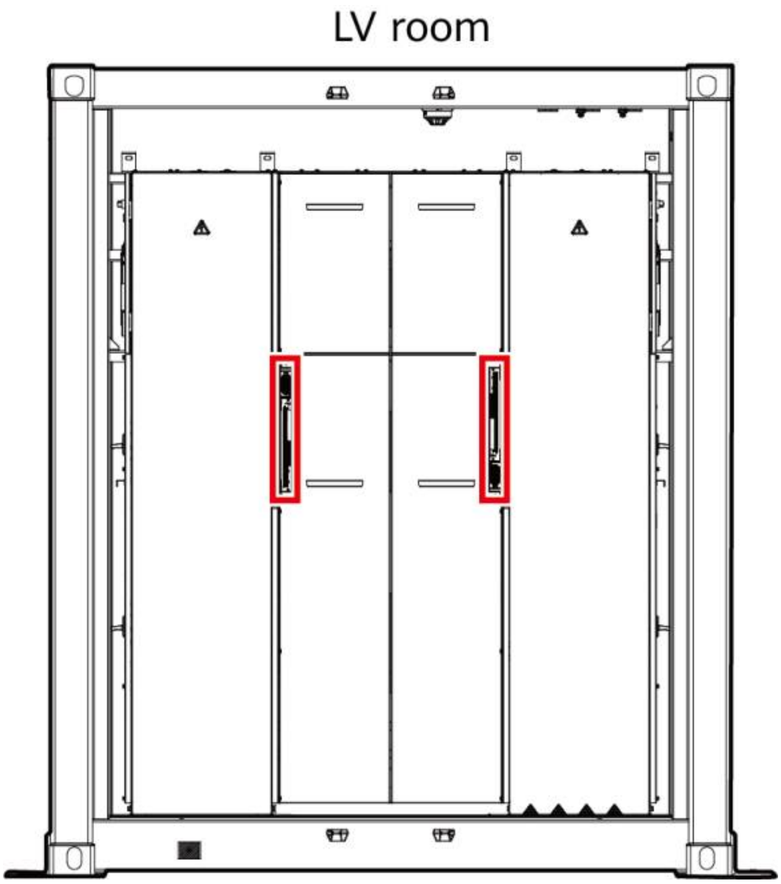
6.8.17 Replacing a PSU of the STS Measurement and Control Module

Context

NOTE

The appearance of the STS varies with the model, but the installation positions of measurement and control modules are the same. This section uses one type of appearances as an example.

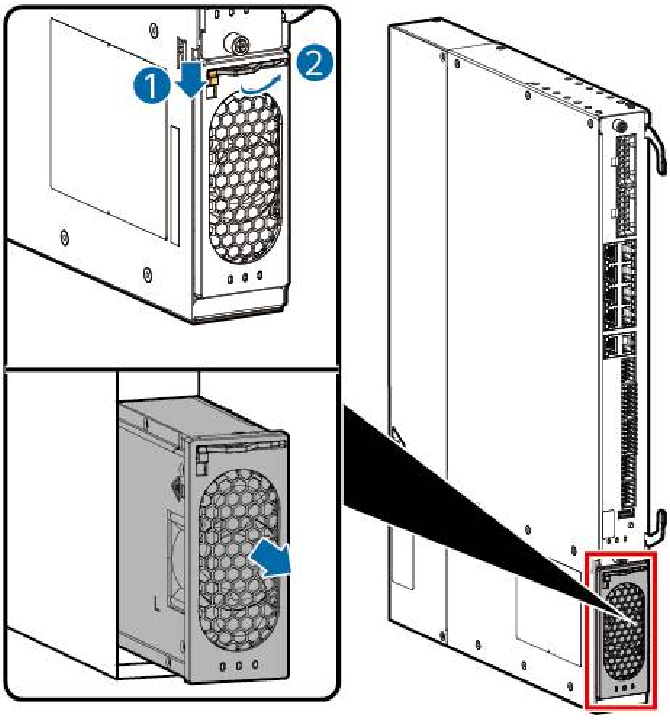
Figure 6-60 Positions of measurement and control modules



Procedure

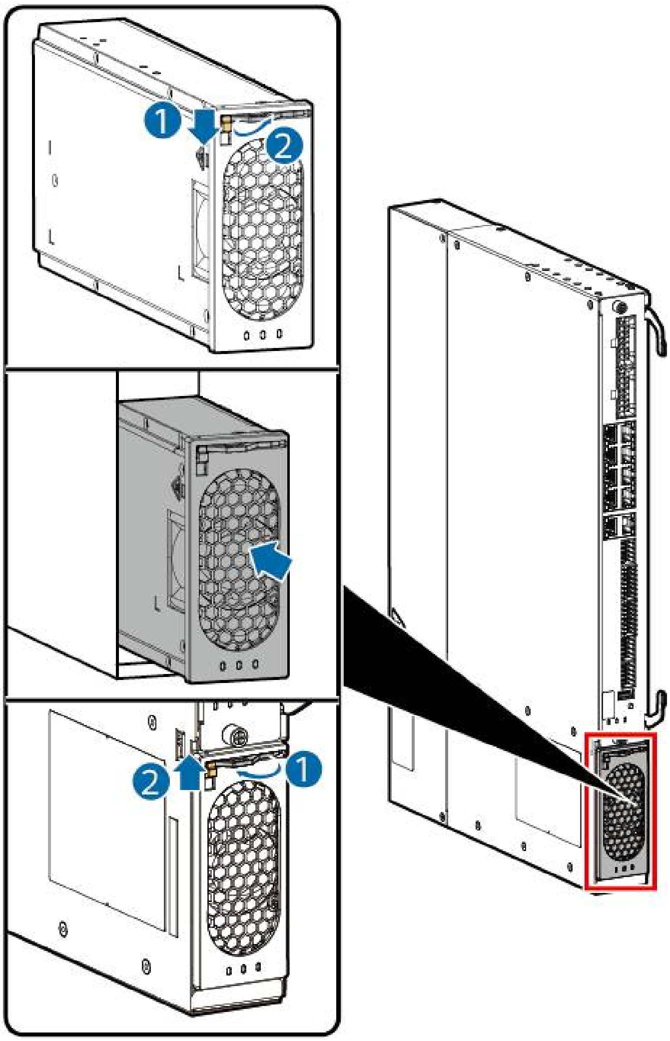
Step 1 Remove the old PSU.

Figure 6-61 Removing a PSU



Step 2 Install a new PSU.

Figure 6-62 Installing a PSU



----End

6.8.18 Replacing a Fuse

Context

If a fuse cannot be used during maintenance, power it off and replace it.

Power-Off

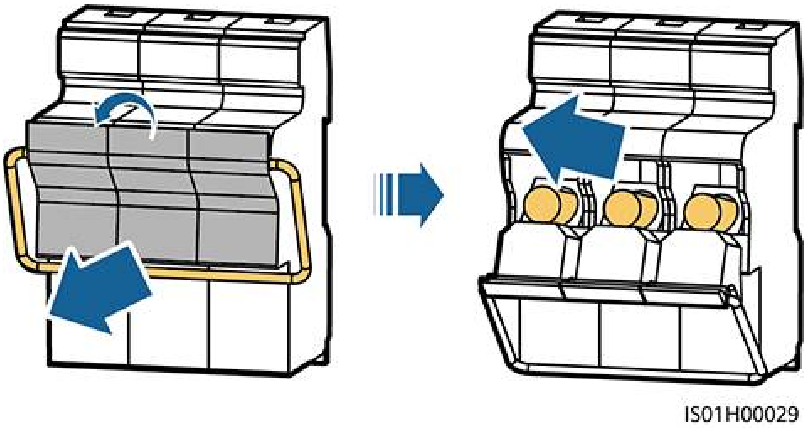
1. 1FA fuse: Turn off 1QS.
2. 1FA1/1FA2/2FA1/2FA2: If no current flows, open the fuse box to replace the fuse.

Procedure

Step 1 Open the fuse switch box.

Step 2 Remove the faulty fuse.

Figure 6-63 Removing the faulty fuse



Step 3 Install a new fuse and close the fuse switch box.

----End

Power-On

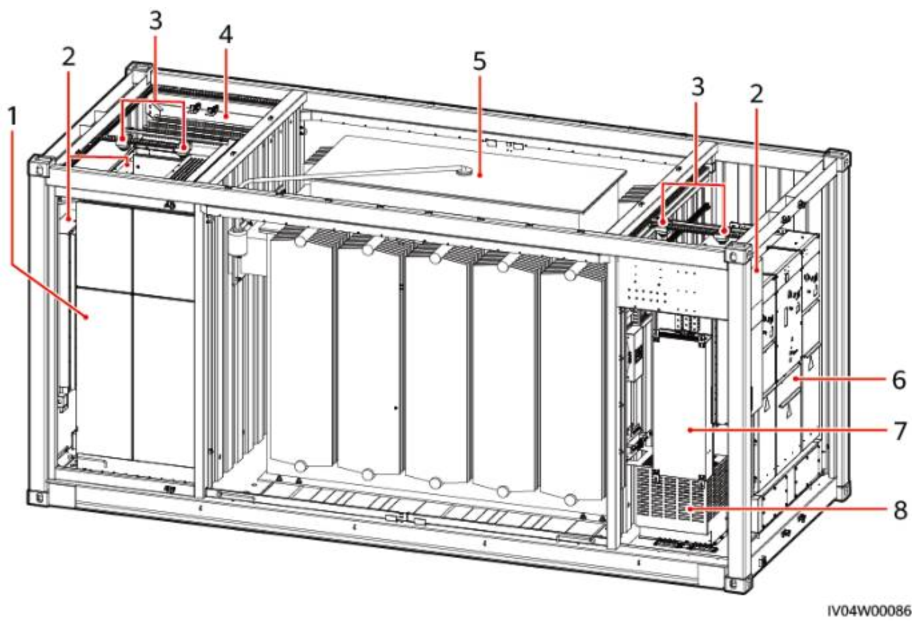
Perform operations in the reverse order of the power-off operations.

6.8.19 Replacing a Ring Main Unit

Context

The ring main unit is located in the MV room (marked by 7 in the figure). For details about the ring main unit, see **2.4.4 MV Room**.

Figure 6-64 STS components



(1) LV PANEL A	(2) Heat exchangers	(3) Smoke sensor

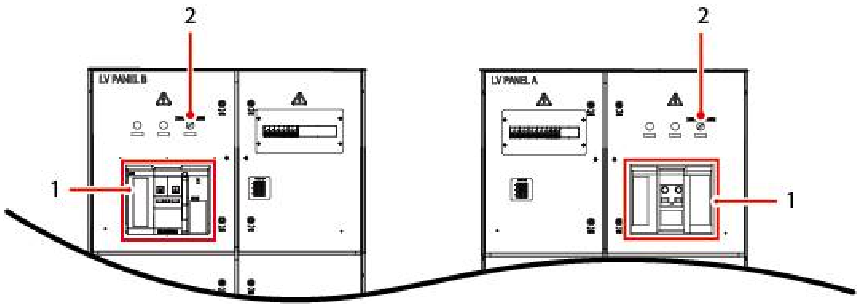
(4) LV PANEL B	(5) Transformer	(6) Ring main unit
(7) Power distribution box	(8) Auxiliary transformer	-

Power-Off

1. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
2. Set the remote/local switch of the LV panel to the local position.
3. Set the remote/local switch of cabinet G2 in the ring main unit to the local position.
4. Turn off the local on/off switch (VCB) of cabinet G2 in the ring main unit.
5. Turn off the disconnector of cabinet G2 in the ring main unit.
6. Turn on the earthing switch of cabinet G2 in the ring main unit.
7. Turn off the general switches of the control loop, heating loop, and energy storage loop of the ring main unit. For details about the switch silk screen, see the circuit diagram.
8. Go to the upper-level STS to turn off the load switch of cabinet G3 and turn on the earthing switch of cabinet G3.
9. For the STS at this level, turn off the load switch of cabinet G1 and turn on the earthing switch of cabinet G1. (Skip this step for cabinet D.)
10. For the STS at this level, turn off the load switch of cabinet G3 and turn on the earthing switch of cabinet G3.

The following figure shows the positions of the switches.

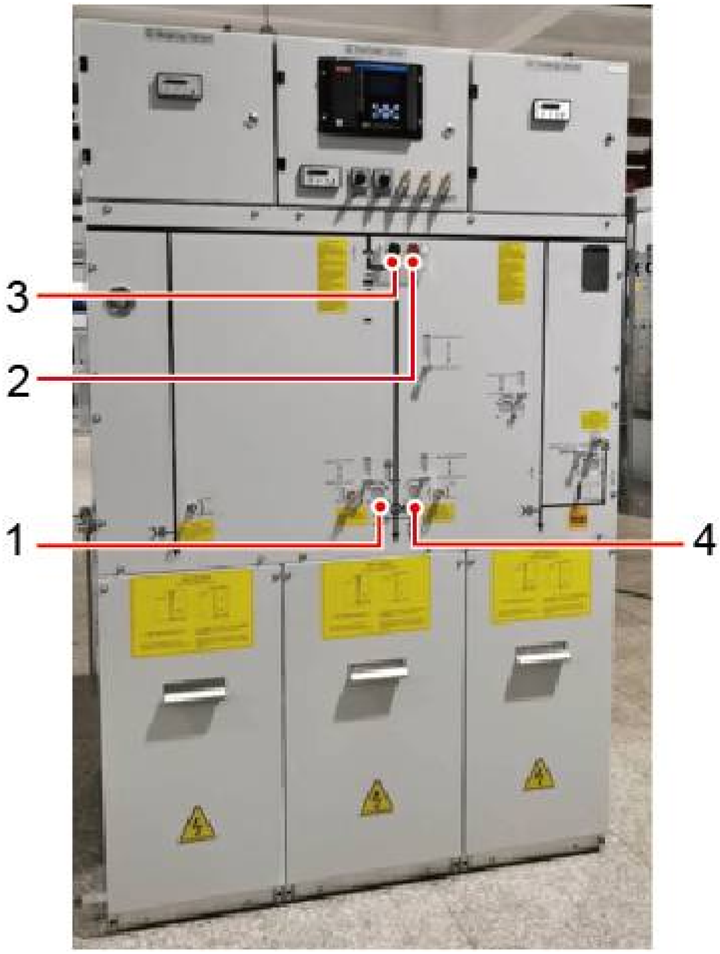
Figure 6-65 Positions of the LV panel switches



(1) ACB	(2) Remote/Local switch

The following figure shows the positions of the ring main unit switches.

Figure 6-66 Positions of the ring main unit switches (using the DVC as an example)



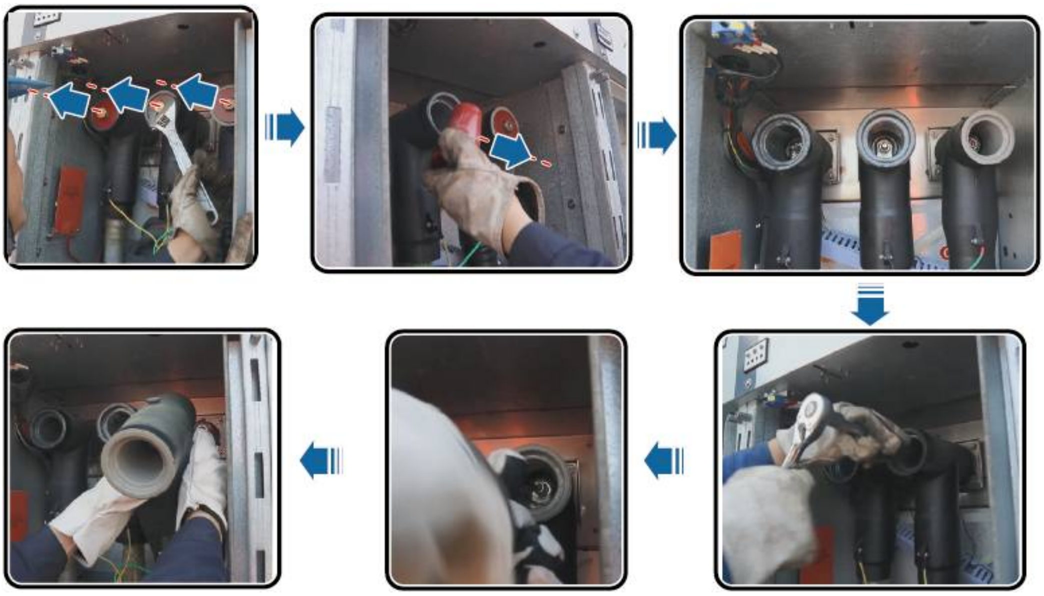
(1) Earthing switch of cabinet G2	(2) Local on/off switch (VCB) of cabinet G2
(3) Remote/Local switch of cabinet G2	(4) Disconnector operation hole of cabinet G2

Procedure

Step 1 Ensure that the STS has been powered off and the new ring main unit has been transported to the site.

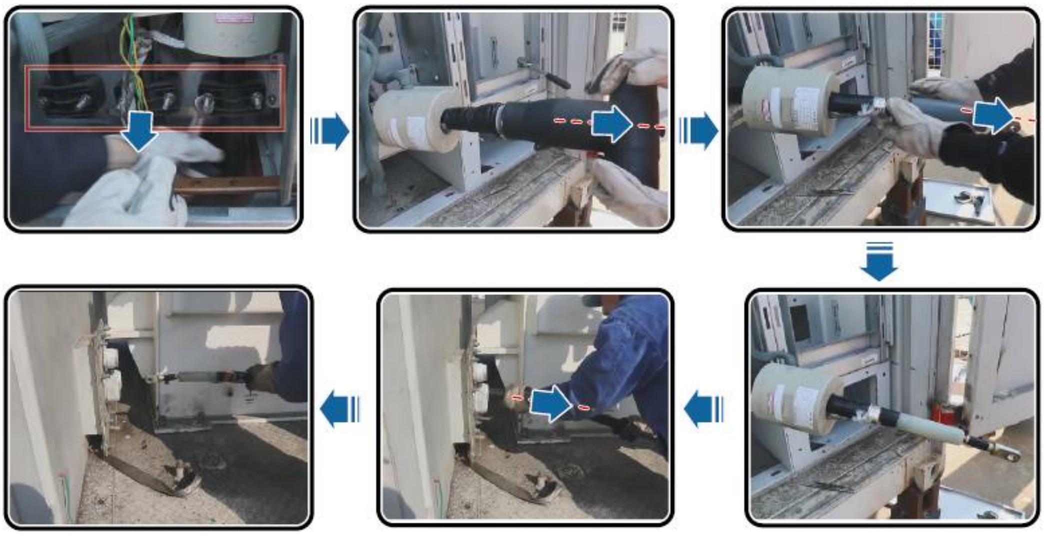
Step 2 Remove AC power cable connectors and wrap the connectors with a clean plastic bag to keep the connectors clean.

Figure 6-67 Removing AC power cable connectors



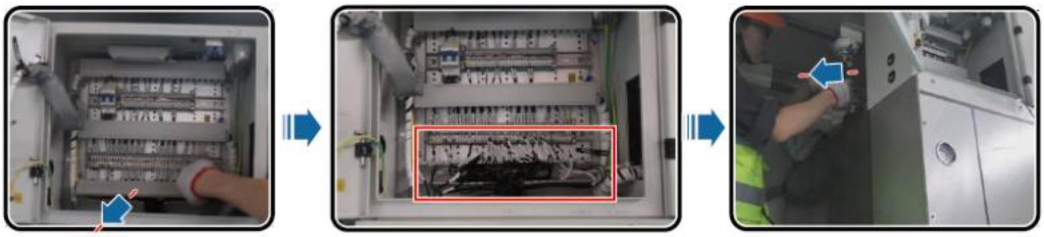
Step 3 Pull AC power cables out of the transformer room.

Figure 6-68 Pulling out AC power cables



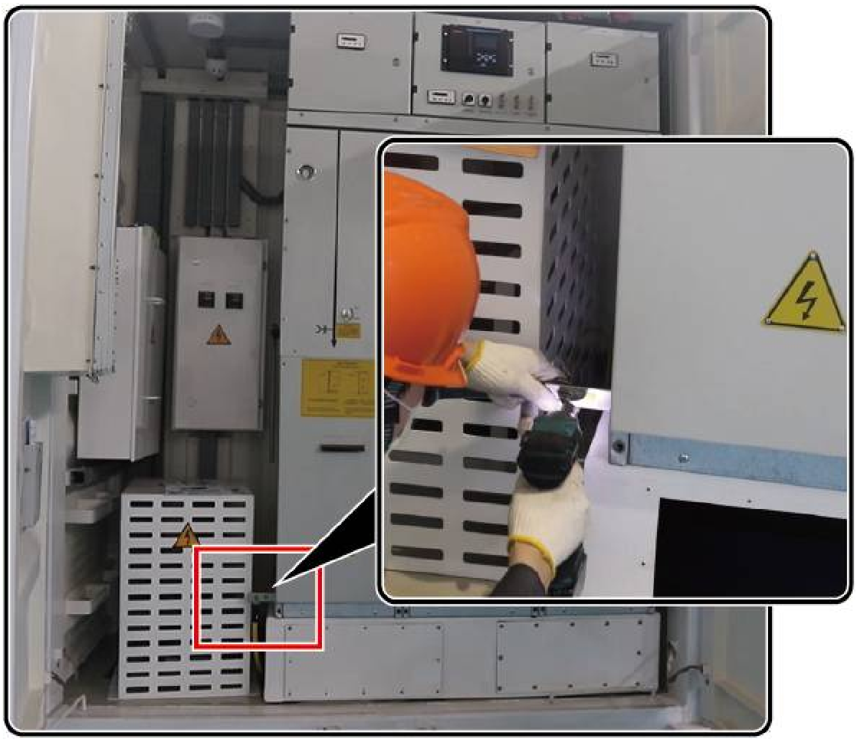
Step 4 Remove cables from the secondary room of the ring main unit and take out the cables from the secondary room.

Figure 6-69 Removing cables from the secondary room of the ring main unit



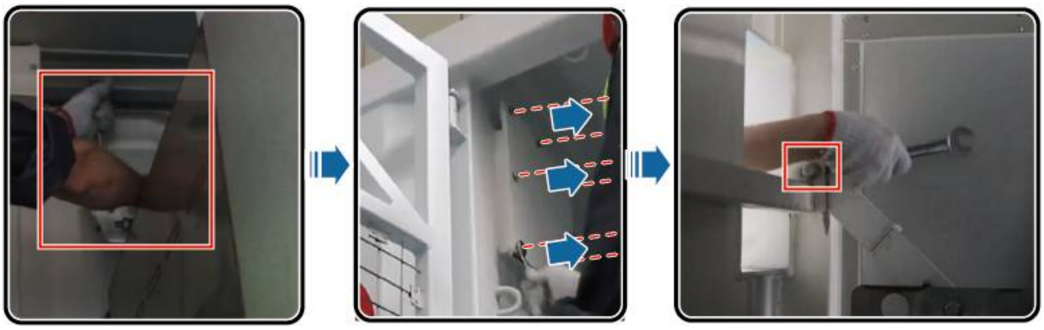
Step 5 Remove the ground cable from the ring main unit.

Figure 6-70 Removing the ground cable



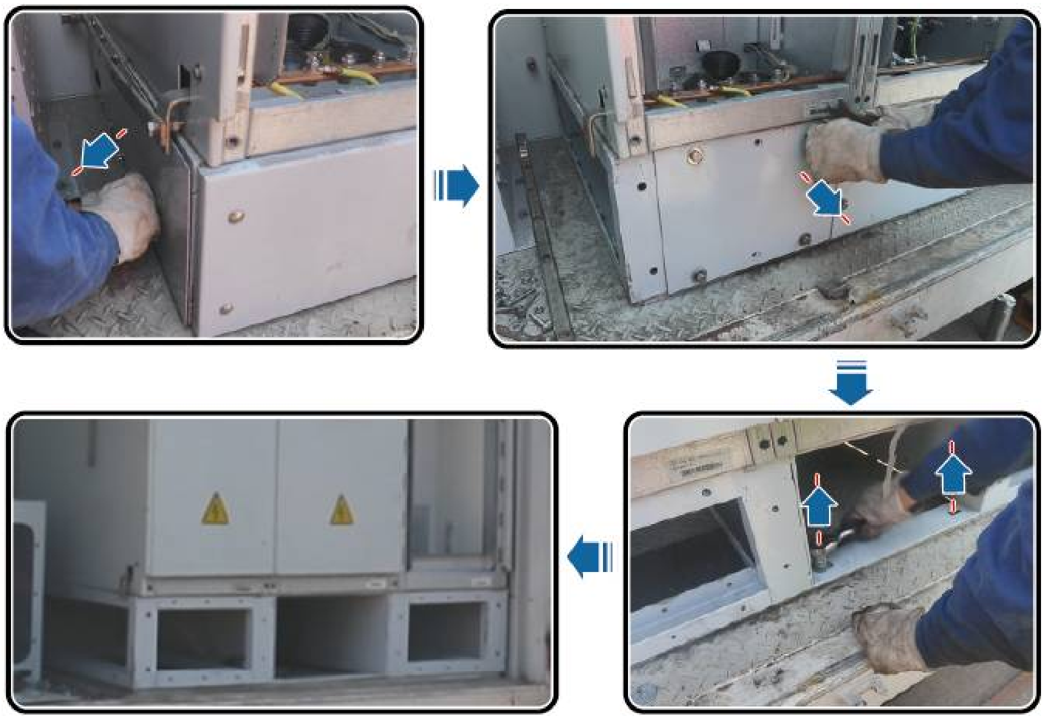
Step 6 Remove screws from the top of the ring main unit.

Figure 6-71 Removing screws from the top of the ring main unit



Step 7 Remove screws from the bottom of the ring main unit.

Figure 6-72 Removing screws from the bottom of the ring main unit



Step 8 Remove the old ring main unit using a forklift.

NOTICE

Use a forklift to move the ring main unit horizontally, and then pull out the ring main unit.

Figure 6-73 Removing the old ring main unit

Step 9 Separate the ring main unit from the base, and remove the old ring main unit using a crane.

Figure 6-74 Removing the old ring main unit

Step 10 Install the new ring main unit in the MV room of the STS. (The installation procedure is in the reverse order of the removal. Only text description is provided here.)

1. Place the new ring main unit on the base using a crane, and secure the ring main unit to the base.
2. Move the ring main unit to the MV room of the STS using a forklift.
3. Tighten the screws at the bottom and top of the ring main unit.
4. Connect the ground cable of the ring main unit and cables of the secondary room, and install AC power cable connectors.

Step 11 Check that cables are securely connected, the environment is clean and tidy, and there are no foreign objects inside the STS. Then close the door of the STS.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.20 Replacing a Disconnector

Context

If the disconnector in the LV room is faulty during maintenance, power it off and replace it.

Power-Off

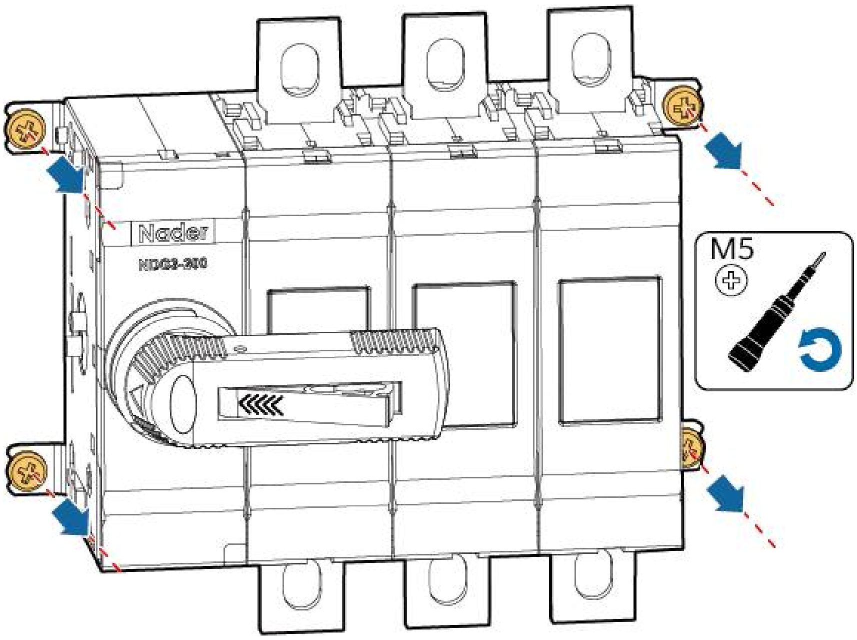
1. (Optional) Shut down the UPS inverter 3UI. Perform this operation when the UPS has been installed.
2. Ensure that the inverter or PCS is shut down and not energized.
3. Turn off the ACB (1QA) of LV PANEL A in the LV room.
4. Turn off the VCB in the MV room.

Procedure

Step 1 Disconnect cables from the disconnector and label the cables.

Step 2 Remove the faulty disconnector.

Figure 6-75 Removing the disconnector



Step 3 Install a new disconnector and tighten it with a torque of 3 N·m.

Step 4 Connect cables to the disconnector.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

6.8.21 Replacing an Inverter Module

Context

The STS uses two models of inverter modules, one with cord end terminal power cables and the other with socket power cables. When replacing an inverter module, choose a corresponding replacement method. The following are four different replacement scenarios that may occur:

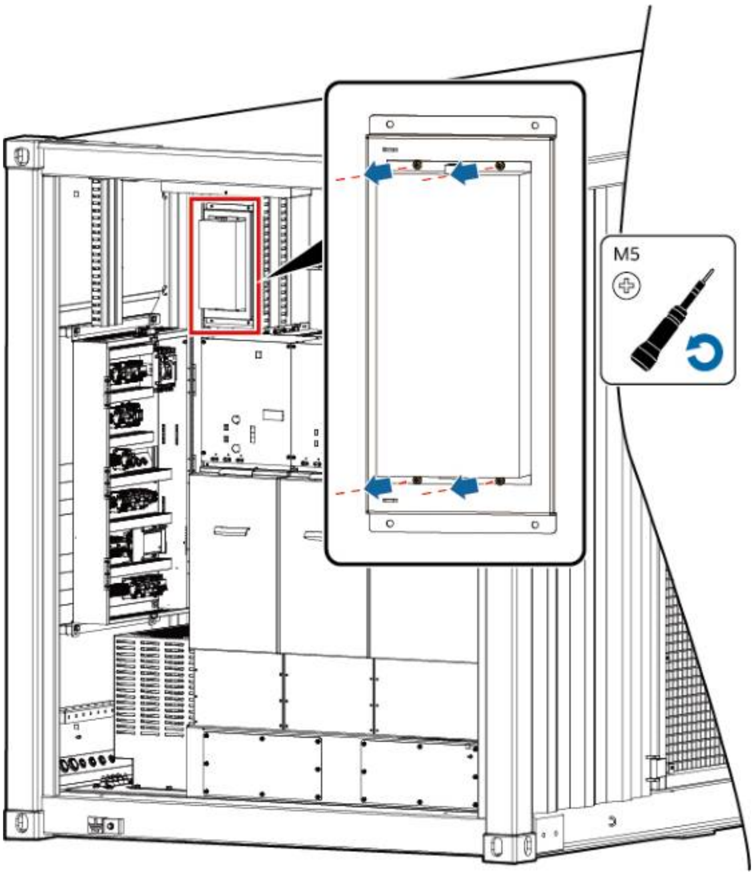
- Socket type - socket type: The old and new inverter modules are the same model, and both use socket power cables.
- Cord end terminal type - cord end terminal type: The old and new inverter modules are the same model, and both use cord end terminal cables.
- Cord end terminal type - socket type: The old inverter module uses cord end terminal power cables, and the new inverter module uses a socket power cable.
- Socket type - cord end terminal type: The old inverter module uses a socket power cable, and the new power module uses cord end terminal power cables.

Socket Type - Socket Type

Step 1 Remove cables from the inverter module.

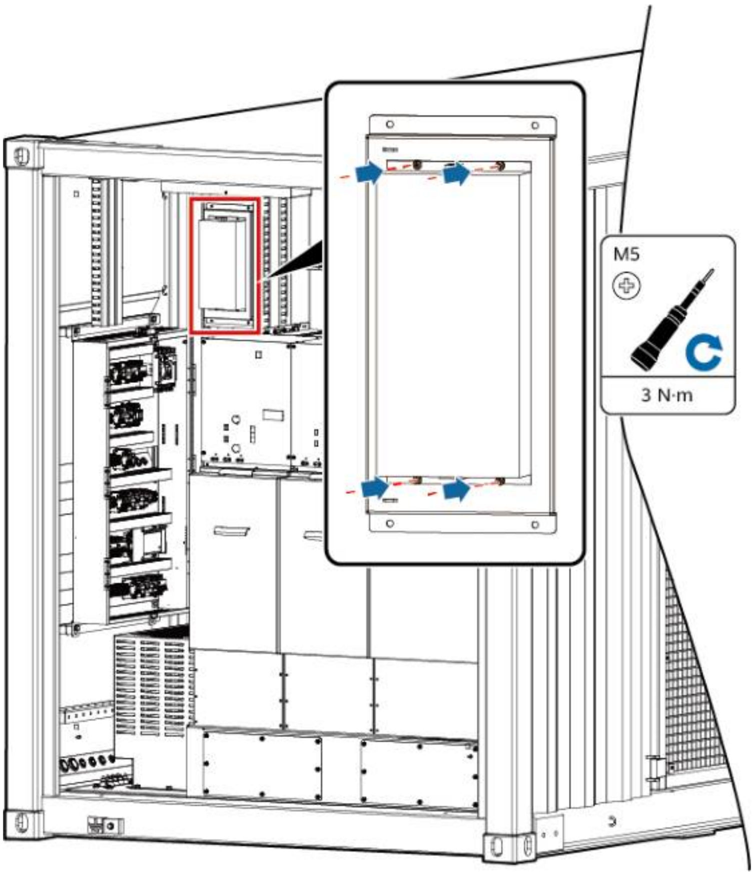
Step 2 Remove the inverter module.

Figure 6-76 Removing the inverter module



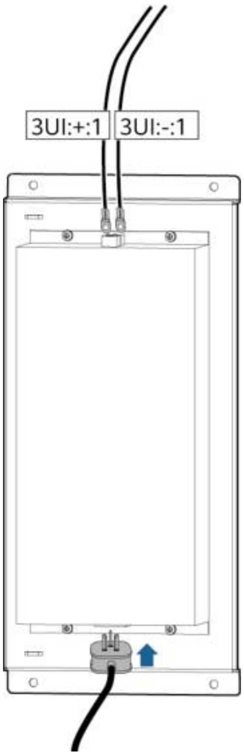
Step 3 Install a new inverter module.

Figure 6-77 Installing an inverter module



Step 4 Connect the cables to the inverter module.

Figure 6-78 Connecting cables



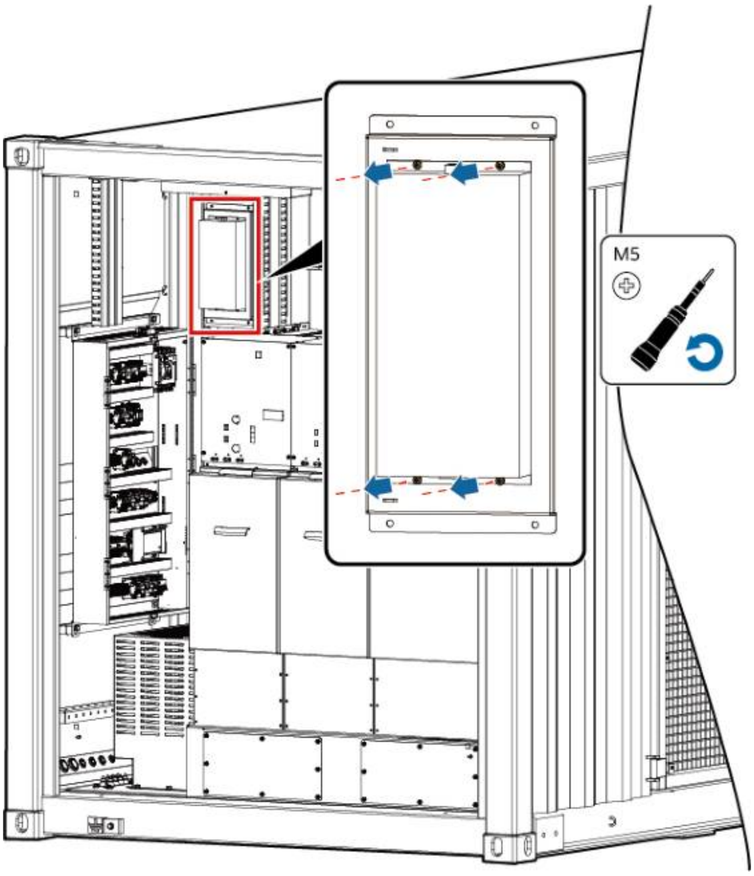
----End

Cord End Terminal Type - Cord End Terminal Type

Step 1 Remove cables from the inverter module.

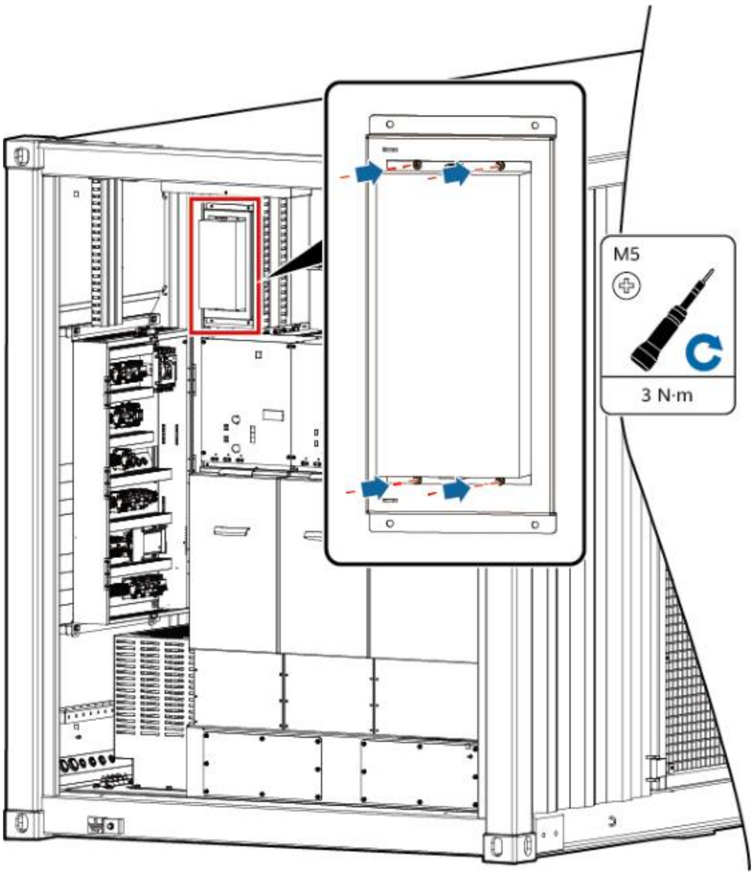
Step 2 Remove the inverter module.

Figure 6-79 Removing the inverter module



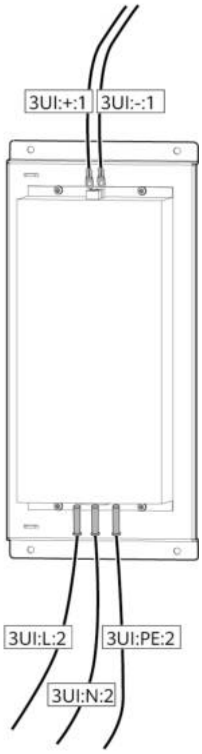
Step 3 Install a new inverter module.

Figure 6-80 Installing an inverter module



Step 4 Connect the cables to the inverter module.

Figure 6-81 Connecting cables



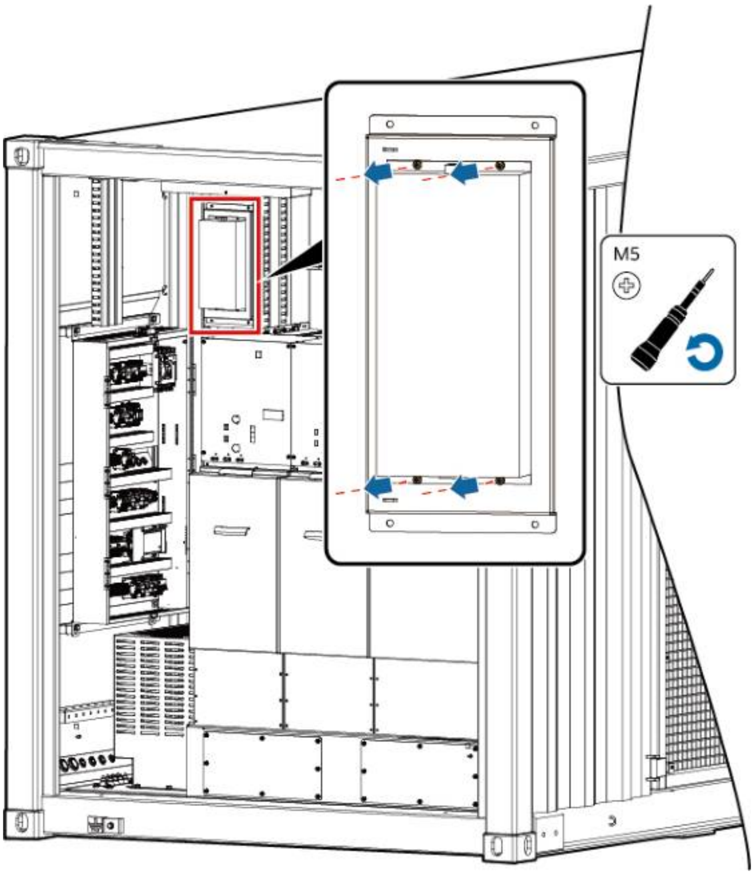
----End

Cord End Terminal Type - Socket Type

Step 1 Remove cables from the inverter module.

Step 2 Remove the inverter module.

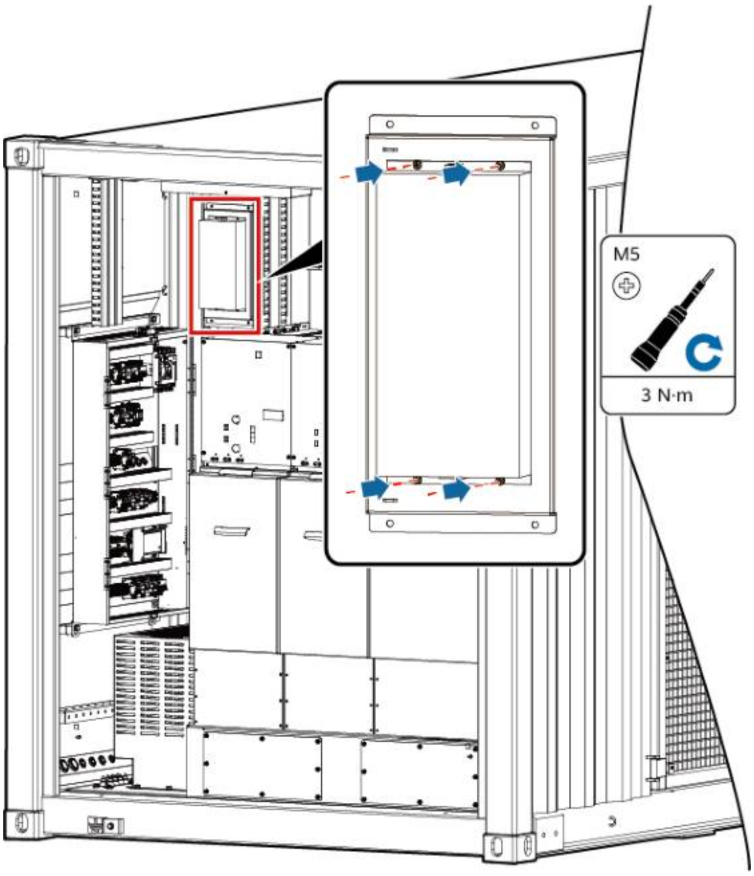
Figure 6-82 Removing the inverter module



Step 3 Record the cable routes and remove cables 3UI:L:2, 3UI:N:2, and 3UI:PE:2 from the STS.

Step 4 Install a new inverter module.

Figure 6-83 Installing an inverter module

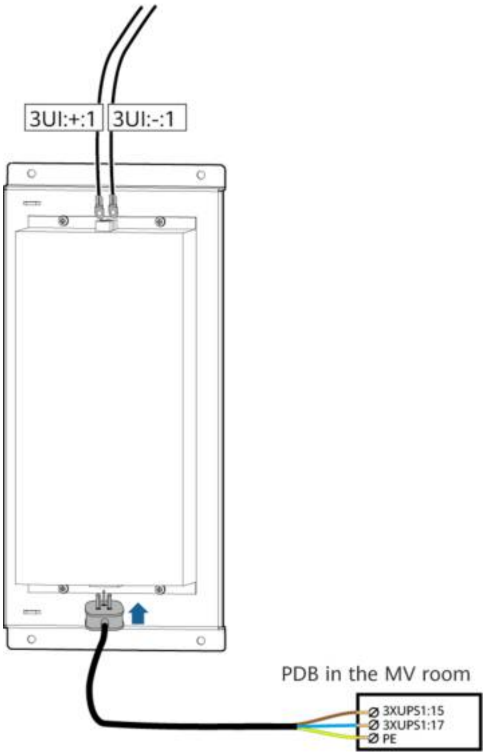


Step 5 Connect the socket cable to the new inverter module and bind the cable along the original route.

NOTE

The socket cable is delivered with the inverter module. Connect the end without a plug to terminals 15 (brown), 17 (blue), and PE (yellow-green) on 3XUPS1.

Figure 6-84 Connecting cables to the inverter module



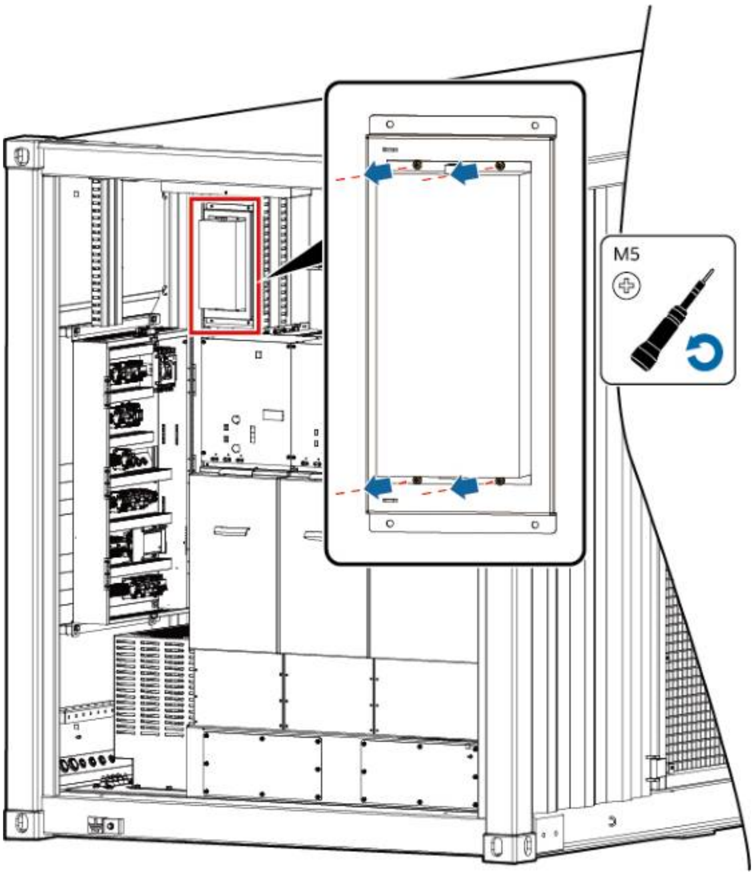
----End

Socket Type - Cord End Terminal Type

Step 1 Remove cables from the inverter module.

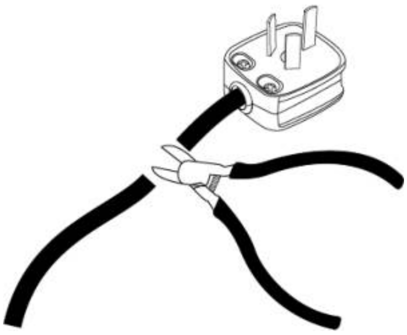
Step 2 Remove the inverter module.

Figure 6-85 Removing the inverter module



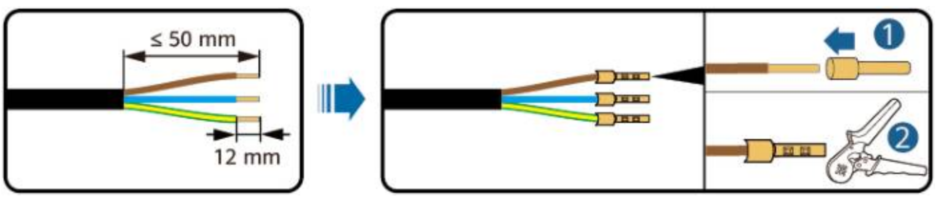
Step 3 Cut off the cable plug.

Figure 6-86 Cutting off the cable plug



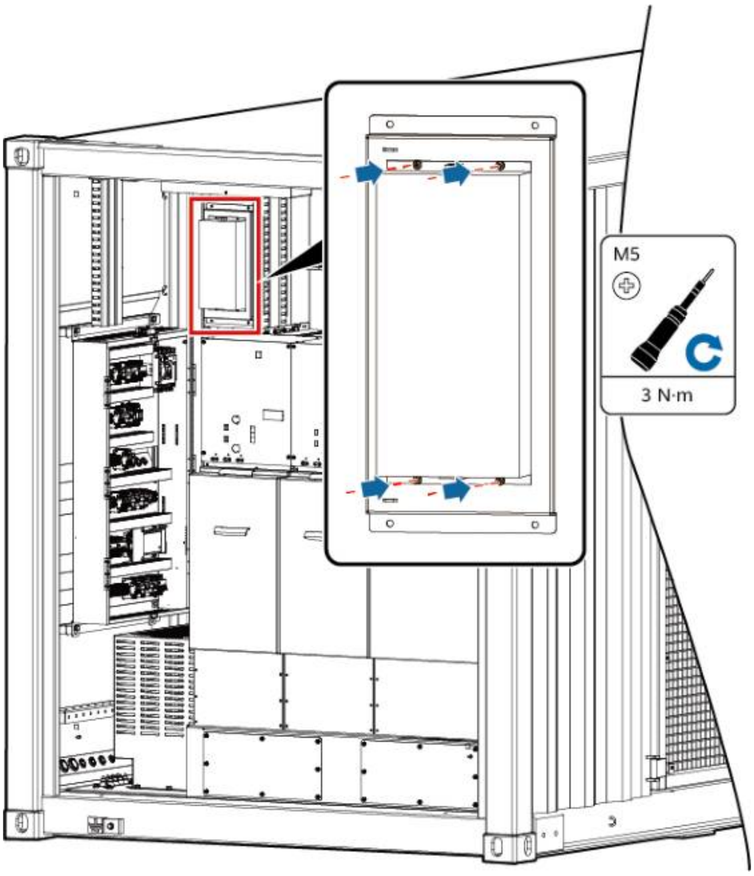
Step 4 Prepare cord end terminals.

Figure 6-87 Preparing cord end terminals



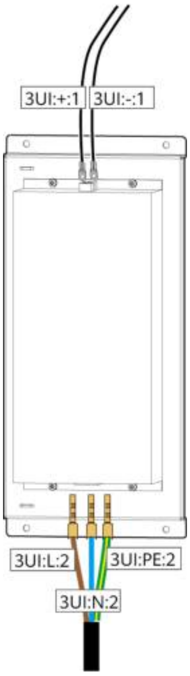
Step 5 Install a new inverter module.

Figure 6-88 Installing an inverter module



Step 6 Connect the cables to the inverter module.

Figure 6-89 Connecting cables



----End

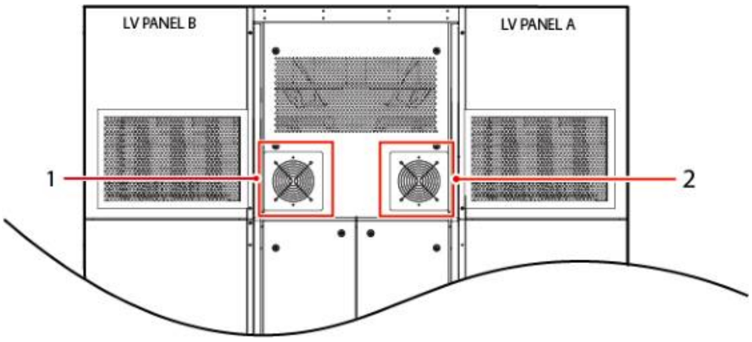
6.8.22 Replacing a Mixed-flow Fan

Context

The JUPITER-9000K-H1 is configured with two mixed-flow fans, but the JUPITER-(3000K,6000K)-H1 is not configured with mixed-flow fans.

The JUPITER-9000K-H1 is configured with two mixed-flow fans, but the JUPITER-(3000K,6000K)-H1 is not configured with mixed-flow fans.

Figure 6-90 Positions of the mixed-flow fans



(1) Mixed-flow fan for LV PANEL B	(2) Mixed-flow fan for LV PANEL A

Power-Off

1. Ensure that the inverter and PCS connected to the downstream port of the MCCB are not energized (for example, shut down the inverter or PCS).
2. Turn off the ACB (1QA) of LV PANEL A or the ACB (2QA) of LV PANEL B.
3. Turn off the VCB in the MV room.

Procedure

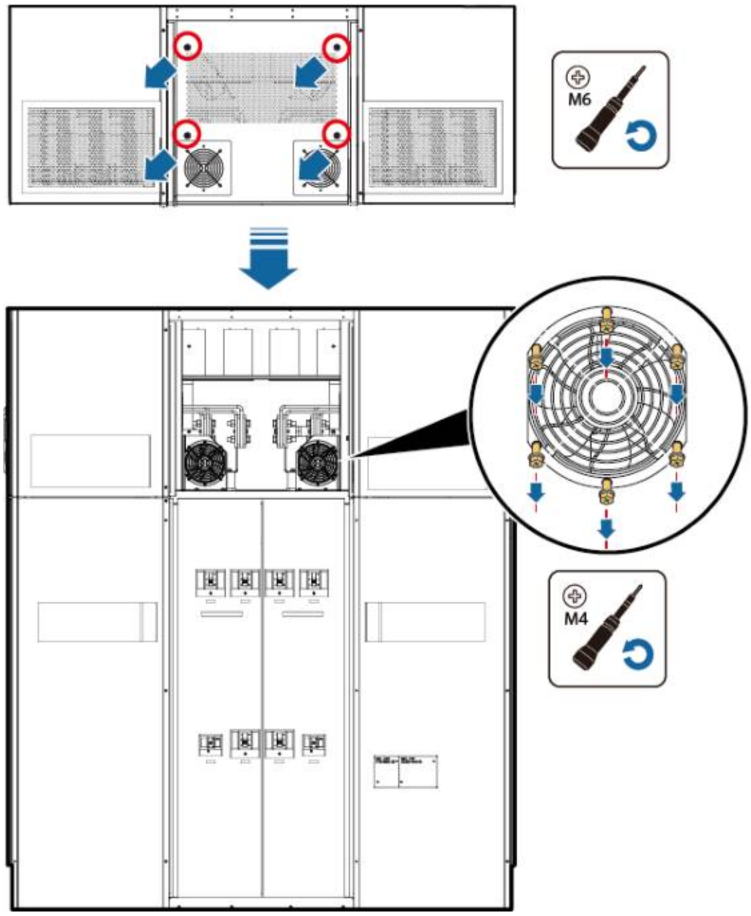
Step 1 Remove the sealing plate from cabinet C.

Step 2 Remove the screws that secure the mixed-flow fan.

Step 3 Record the positions of cables connected to the mixed-flow fan and disconnect the cables.

Step 4 Remove the old mixed-flow fan.

Figure 6-91 Removing the mixed-flow fan



Step 5 Reconnect the cables to the new mixed-flow fan based on the cable connection records.

Step 6 Install the new mixed-flow fan in the original position. Use an M4 Phillips screwdriver and tighten the screws to a torque of 1.2 N·m.

Step 7 Reinstall the sealing plate on cabinet C. Use an M6 Phillips screwdriver and tighten the screws to a torque of 5 N·m.

----End

Power-On

Perform operations in the reverse order of the power-off operations.

Follow-up Procedure

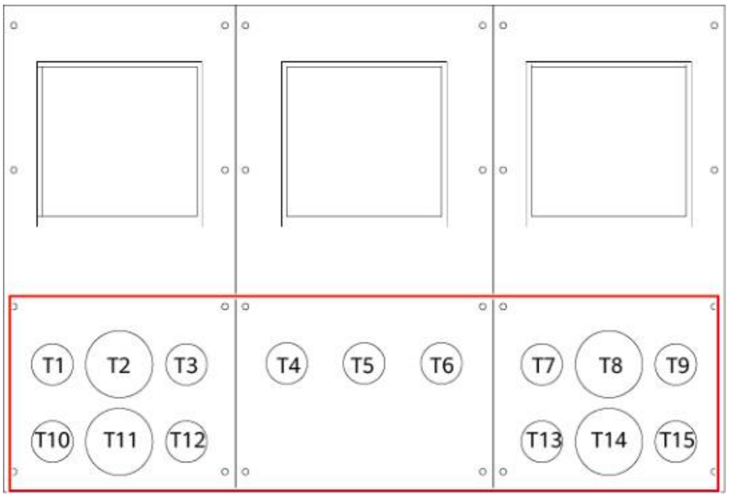
Check the fan self-check status: After power-on, wait about 5 minutes, and choose **Monitoring** > **STS** > **Running Param.** > **O&M Parameters** on the SmartLogger WebUI to check that the fan self-check status is **Normal**.

6.8.23 Replacing Online Temperature Monitoring Devices in the MV Room

Context

If the **2402 Communication anomaly of MV cable temperature monitoring device** alarm is generated, replace the sensors or the host according to the handling suggestions. Power off the equipment before the replacement.

Figure 6-92 Positions of the 15 cables (bottom view of the ring main unit)



Replacing the Host

Step 1 Power off the equipment.

1. Turn off the circuit breaker and the disconnector of cabinet G2, and turn on the earthing switch of cabinet G2.
2. Open the door of the secondary chamber in the LV panel and turn off the MCB 6FB22.

Step 2 Remove the L and N wires of the power cable from the host. Tool: M2.5 flat-head screwdriver

Step 3 Remove the RS485 communications cables A1 and B1 from the host.

Step 4 Remove the host from the panel.

Step 5 Install the new host and connect cables. Tool: M2.5 flat-head screwdriver; torque: 0.4 N·m.

Step 6 Power on the equipment.

1. Turn on the MCB 6FB22.
2. Turn off the earthing switch of cabinet G2, and turn on the disconnector and circuit breaker of cabinet G2.

----End

NOTICE

After replacing the host, set the codes of the sensors on the new host. For details, see **Setting the Sensor Code (HZSUPER)** and **Setting the Sensor Code (Peaks)**.

Replacing Sensors

Step 1 Power off the equipment.

- Replacing sensors in cabinet G1
  a. Turn off the load switch and turn on the earthing switch of cabinet G3 in the upstream STS.
  b. Turn off the load switch and turn on the earthing switch of cabinet G1 in this STS.
- Replacing sensors in cabinet G2
  a. Turn off the circuit breaker and the disconnector of cabinet G2, and turn on the earthing switch of cabinet G2.
- Replacing sensors in cabinet G3
  a. Turn off the load switch and turn on the earthing switch of cabinet G3 in this STS.

Step 2 Open the door of the cable room.

Step 3 Open the buckle on the sensor strap and remove the old sensor.

Step 4 Open the buckle of a sensor strap, wrap the strap around the cable, and tighten the strap.

NOTE

Ensure that the metal surface of the sensor is closely fitted to the cable connector.

Figure 6-93 Installing an online temperature monitoring device in the MV room

Step 5 Close the door of the cable room.

Step 6 Power on the equipment.

- Replacing sensors in cabinet G1
  a. Turn off the earthing switch and turn on the load switch of cabinet G1 in this STS.
  b. Turn off the earthing switch and turn on the load switch of cabinet G3 in the upstream STS.
- Replacing sensors in cabinet G2
  a. Turn off the earthing switch of cabinet G2, and turn on the disconnector and circuit breaker of cabinet G2.
- Replacing sensors in cabinet G3
  a. Turn off the earthing switch and turn on the load switch of cabinet G3 in this STS.

----End

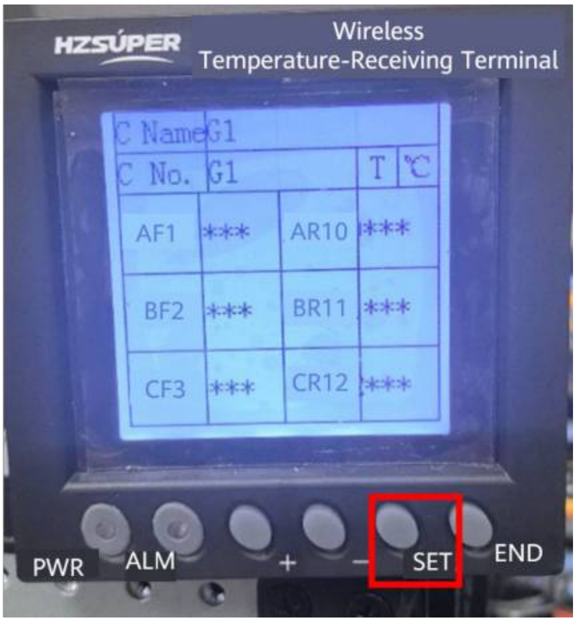
NOTICE

- After replacing the sensor, change the code of the old sensor to that of the new sensor on the host. For details, see **Setting the Sensor Code (HZSUPER)** and **Setting the Sensor Code (Peaks)**.
- Before changing the code, ensure that the code of the old sensor is the same as that of the sensor to be replaced on the host.

Setting the Sensor Code (HZSUPER)

Step 1 Press and hold **SET**, enter the password **A1111111**, and press **END**. The setting screen is displayed.

- Press **+** or **-** to add or subtract a digit.
- Press **SET** to edit the next digit.



Step 2 Select **SET Node Info** and press **END**.

Step 3 Press **END** again and set the sensor code in **S Code**.

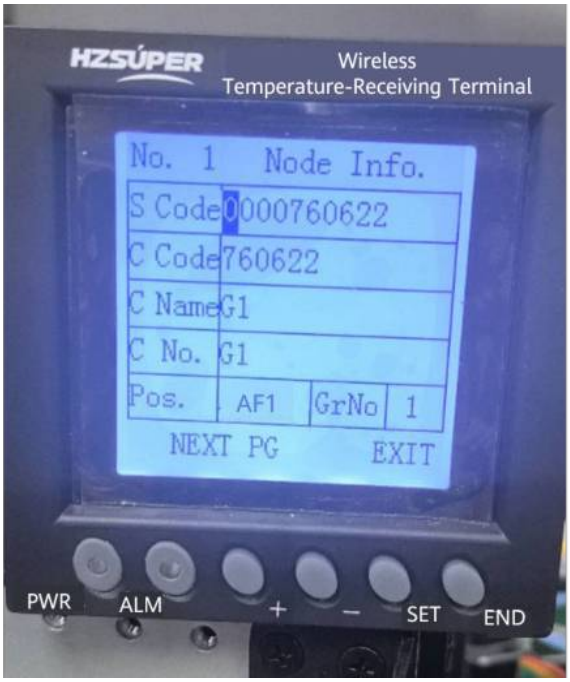
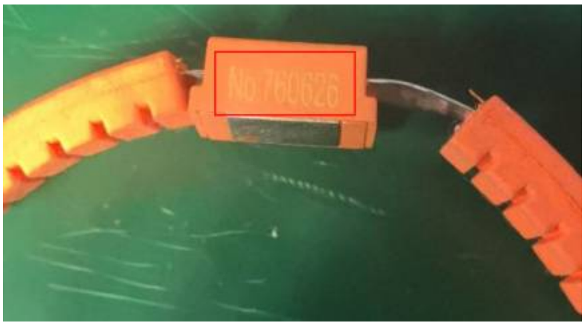
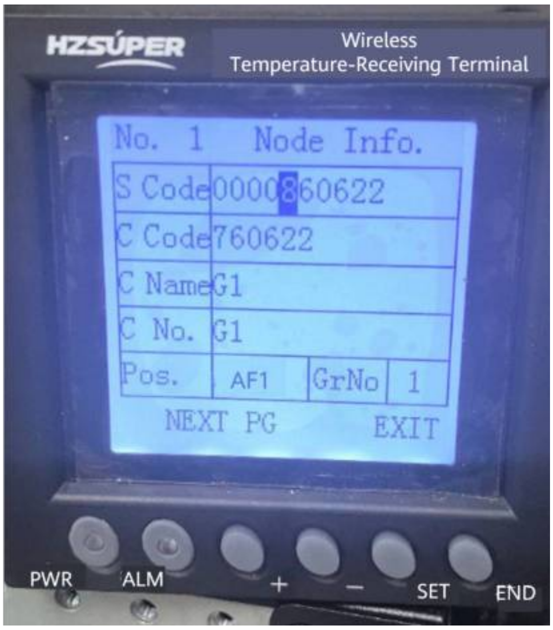


Figure 6-94 Sensor code

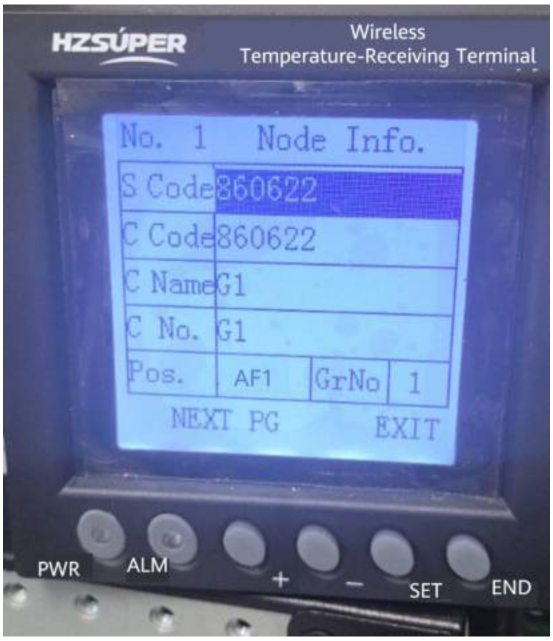


1. Press **SET** to edit the next digit.

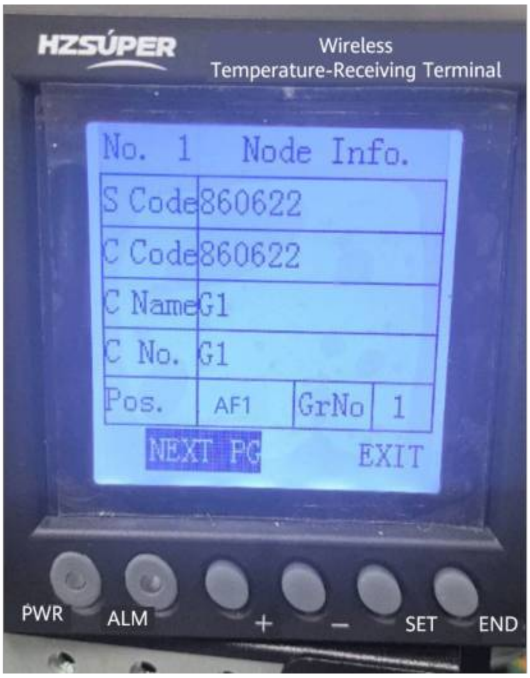
2. Press **+** or **-** to add or subtract a digit.



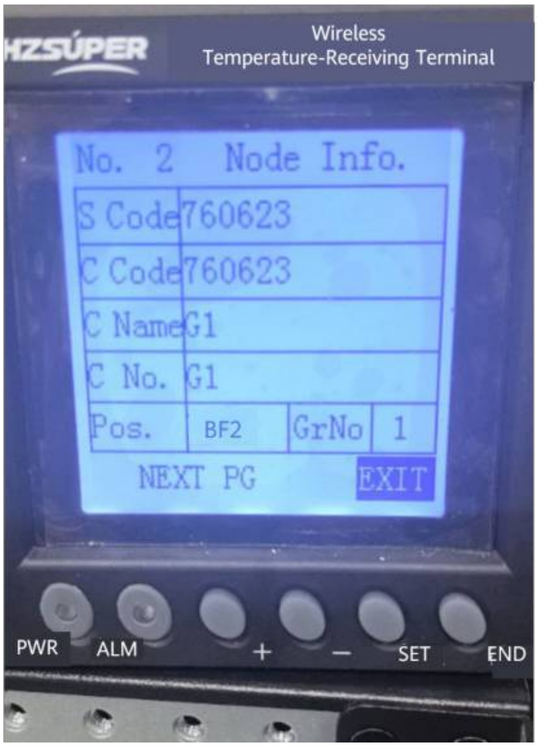
3. After the setting is complete, press **END**.



Step 4 Press **SET** to select **NEXT PG**. Press **END** to edit the next code.



Step 5 After the setting is complete, press **SET** to select **EXIT**. Press **END** and exit.

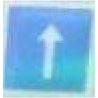
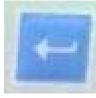


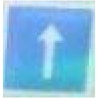
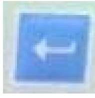
----End

Setting the Sensor Code (Peaks)

NOTE

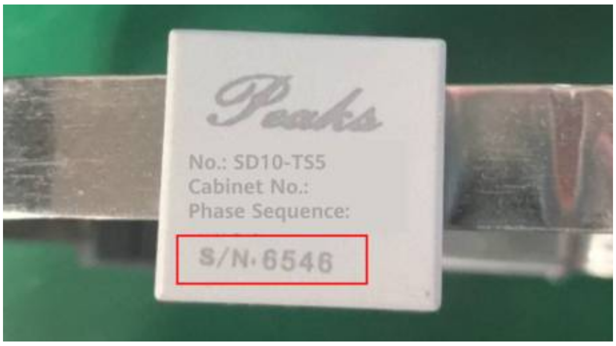
- G1F A corresponds to the sensors connected to the phase A cable connectors in the front row of cabinet G1, G1B A corresponds to the sensors connected to the phase A cable connectors in the rear row of cabinet G1, and so on.

Step 1 Press  or  until the **SETUP** screen is displayed. Press  and enter the password **A1111111** to access the setting screen.

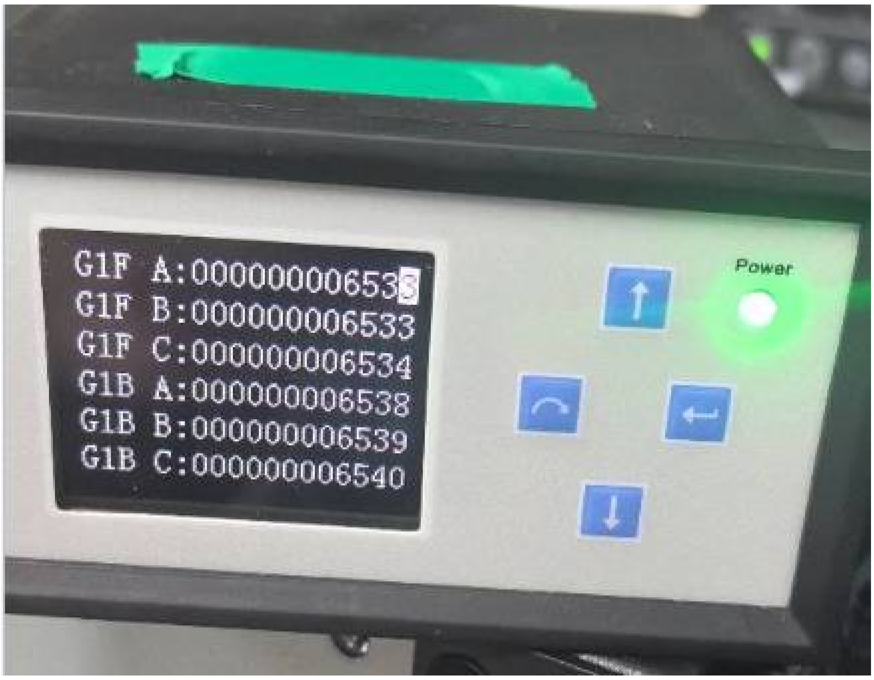
- Press  or  to add or subtract a digit.
- Press  to set the next digit.

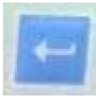
Step 2 Set the sensor code.

Figure 6-95 Sensor code



1. Press  or  to add or subtract a digit.



2. Press  to set the next digit.

Step 3 After the setting is complete, press  to exit.


G1F A:000000006543
G1F B:000000006533
G1F C:000000006534
G1B A:000000006538
G1B B:000000006539
G1B C:000000006540
Power

----End

7 Disposing of the STS

If the STS has reached its service life, dispose of it according to the local disposal act for waste electrical appliances.

8 Technical Specifications

NOTE

Some parameters involve two or more types of cabinets. For details, see the nameplates of the equipment.

Input

Item	JUPITER-3000K-H1	JUPITER-6000K-H1	JUPITER-9000K-H1
AC power	3300 kVA at 40°C	6600 kVA at 40°C	9000 kVA at 40°C
Rated input voltage	800 V		
Rated frequency	• 10 kV/11 kV/13.2 kV/15 kV/20 kV/22 kV/23 kV±10%/30 kV/33 kV/34.5 kV/35 kV: 50 Hz • 13.8 kV/33 kV/34.5 kV: 60 Hz		
Maximum input current at rated voltage	2381.6 A at 40°C	2 x 2381.6 A at 40°C	2 x 3247.7 A at 40°C

Transformer

Item	JUPITER-3000K-H1	JUPITER-6000K-H1	JUPITER-9000K-H1
Rated output voltage and frequency	• 10 kV/11 kV/13.2 kV/15 kV/20 kV/22 kV/23 kV±10%/30 kV/33 kV/34.5 kV/35 kV: 50 Hz • 13.8 kV/33 kV/34.5 kV: 60 Hz		
Tapping range	±2 x 2.5%		

Item	JUPITER-3000K-H1	JUPITER-6000K-H1	JUPITER-9000K-H1
Impedance characteristics	Full crossing impedance: 7.8% (±10%)	• Full crossing impedance: 8.6% (±10%) • Semi-crossing impedance: 14.0% (0% to +10%) • Splitting impedance: 23% (±15%)	• Full crossing impedance: 11.5% (±10%) • Semi-crossing impedance: 19.0% (0% to +10%) • Splitting impedance: 32% (±15%)

Protection

Item	JUPITER-3000K-H1	JUPITER-6000K-H1	JUPITER-9000K-H1
IP ratings of the MV and LV rooms	IP54		
Surge protection	Type I + II		

General Specifications

Item	JUPITER-3000K-H1	JUPITER-6000K-H1	JUPITER-9000K-H1
Dimensions (W x H x D)	6058 mm x 2896 mm x 2438 mm		
Weight	< 15 t	< 23 t	< 28 t
Operating temperature	–25°C to +60°C		
Relative humidity	0%–95% RH		
Rated operating altitude	1000 m		

Feature Parameters

Item	JUPITER-3000K-H1	JUPITER-6000K-H1	JUPITER-9000K-H1
Transformer type	Oil-immersed		
Transformer cooling type	ONAN		
Transformer oil type	Mineral oil		
Transformer vector group	Dy11	Dy11-y11	
MV switchgear	SF_6, 12–40.5 kV, 630 A, 50 Hz/60 Hz, three feeders (CVC/CCV or DVC/DCV), 20 kA/3s, 50/51, 50N/51N, 50BF (optional), 50G/51G (optional)		
LV room	1 x ACB (4000 A/800 V/3P), 11 x MCCB (400 A/800 V/3P)	2 x ACB (4000 A/800 V/3P), 22 x MCCB (400 A/800 V/3P)	2 x ACB (4000 A/800 V/3P), 30 x MCCB (400 A/800 V/3P)
Auxiliary transformer	Specifications • 5 kVA, Ii0, 800 V/230 V/127 V • 50 kVA, Dyn11, 800 V/400 V • 50 kVA, Dyn11, 800 V/220 V		

9 Certificate Management and Maintenance

Preconfigured Certificate Risk Disclaimer

The Huawei-issued certificates preconfigured on Huawei devices during manufacturing are mandatory identity credentials for Huawei devices. The disclaimer statements for using the certificates are as follows:

- Preconfigured Huawei-issued certificates are used only in the deployment phase, for establishing initial security channels between devices and the customer's network. Huawei does not promise or guarantee the security of preconfigured certificates.
- The customer shall bear consequences of all security risks and incidents arising from using preconfigured Huawei-issued certificates as service certificates.
- A preconfigured Huawei-issued certificate is valid from the manufacturing date until November 2041.
- Services using a preconfigured Huawei-issued certificate will not be interrupted when the certificate expires.
- It is recommended that customers deploy a PKI system to issue certificates for devices and software on the live network and manage the lifecycle of the certificates. To ensure security, certificates with short validity periods are recommended.

Application Scenarios of Preconfigured Certificates

File Path and Name	Scenario	Replacement
/mnt/home/cert/preset/ca.crt	Backing up a root certificate	The app supports certificate replacement. Using a preconfigured Huawei-issued certificate is not recommended, and customers are advised to replace it with a certificate issued by themselves. For details about how to replace a certificate, contact technical support engineers to obtain the corresponding security maintenance manual.
/mnt/home/cert/preset/tomcat_client.crt	Backing up a local certificate	
/mnt/home/cert/preset/tomcat_client.my	Backing up a private key file	
/mnt/home/cert/north/ca.crt	Root certificate for northbound communication	
/mnt/home/cert/north/tomcat_client.crt	Local certificate for northbound communication	
/mnt/home/cert/north/tomcat_client.my	Private key file for northbound communication	
/mnt/home/cert/app/ca.crt	Root certificate for local O&M	
/mnt/home/cert/app/tomcat_client.crt	Local certificate for local O&M	
/mnt/home/cert/app/tomcat_client.my	Private key file for local O&M	
/mnt/home/cert/south/ca.crt	Controller root certificate	
/mnt/home/cert/south/tomcat_client.crt	Controller local certificate	
/mnt/home/cert/south/tomcat_client.my	Controller private key file	

A FAQ

A.1 How to Operate a Transformer

NOTICE

When operating the transformer, ensure that it is in the no-excitation state, that is, the high and low voltage sides of the transformer are not powered on.

A.1.1 Adjusting the Off-Load Tap Changer

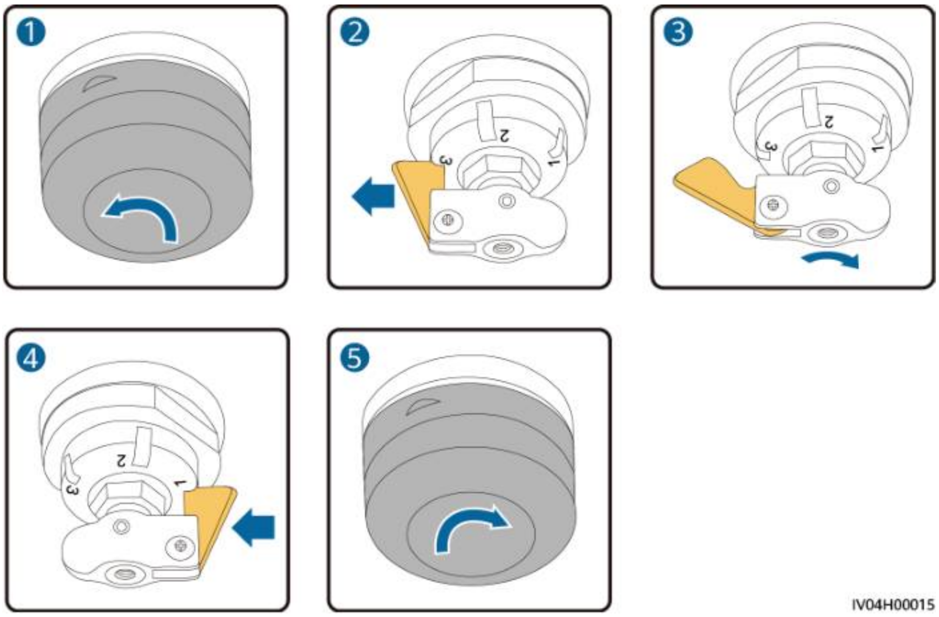
The off-load tap changer can be used to adjust the transformer output voltage. When operating a changer, ensure that the transformer is in the no-excitation state, that is, the high and low voltage sides of the transformer are not powered on.

When the voltage at the low-voltage side remains unchanged, the output voltages at the high-voltage side at different levels are as follows:

- Level 1: standard voltage x 1.05
- Level 2: standard voltage x 1.025
- Level 3: standard voltage
- Level 4: standard voltage x 0.975
- Level 5: standard voltage x 0.95

Step 1 Adjust the off-load tap changer to the level you need.

Figure A-1 Adjusting the off-load tap changer (to level 1 for example)



----End

A.1.2 Releasing Gas in the Gas Relay

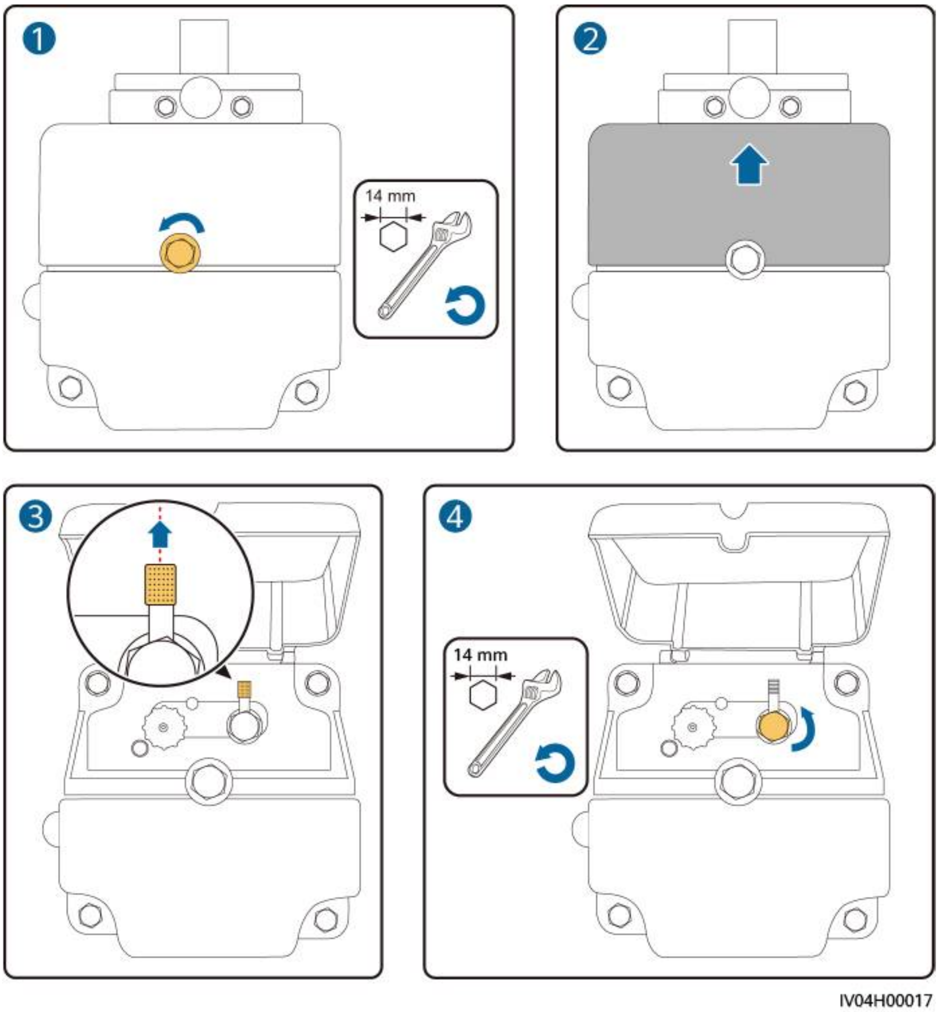
When you see the oil level surface through the glass window of the gas relay, you need to release the gas.

Step 1 Open the cover of the gas relay.

Step 2 Remove the nut from the bleeder plug.

Step 3 Loosen the bleeder plug bolt. The gas gradually runs out until the oil overflows.

Figure A-2 Releasing the gas in the gas relay



Step 4 Tighten the bleeder plug bolt, and reinstall the nut and the cover of the gas relay.

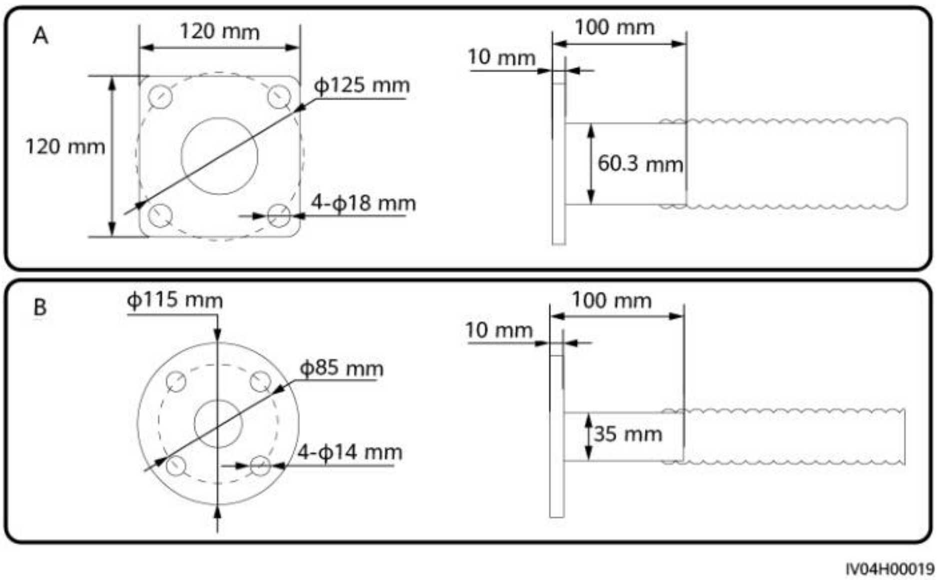
----End

A.1.3 Draining Oil from the Transformer

Check whether the transformer is filled with too much oil based on the oil temperature-oil level curve. If the oil level exceeds the threshold, drain some transformer oil.

Prepare the following materials and tools: a clean steel hose, a 200-liter oil tank, a rag, a wrench (16–18, 17–19, and 22–24), an adjustable wrench (300 mm x 38 mm), a hose connector for oil draining, and a hose clip.

Figure A-3 Hose connector for oil draining



(A) For the hose with a 60 mm inner diameter (oil drain valve)

(B) For the hose with a 35 mm inner diameter (oil drain/feed valve of the conservator tank)

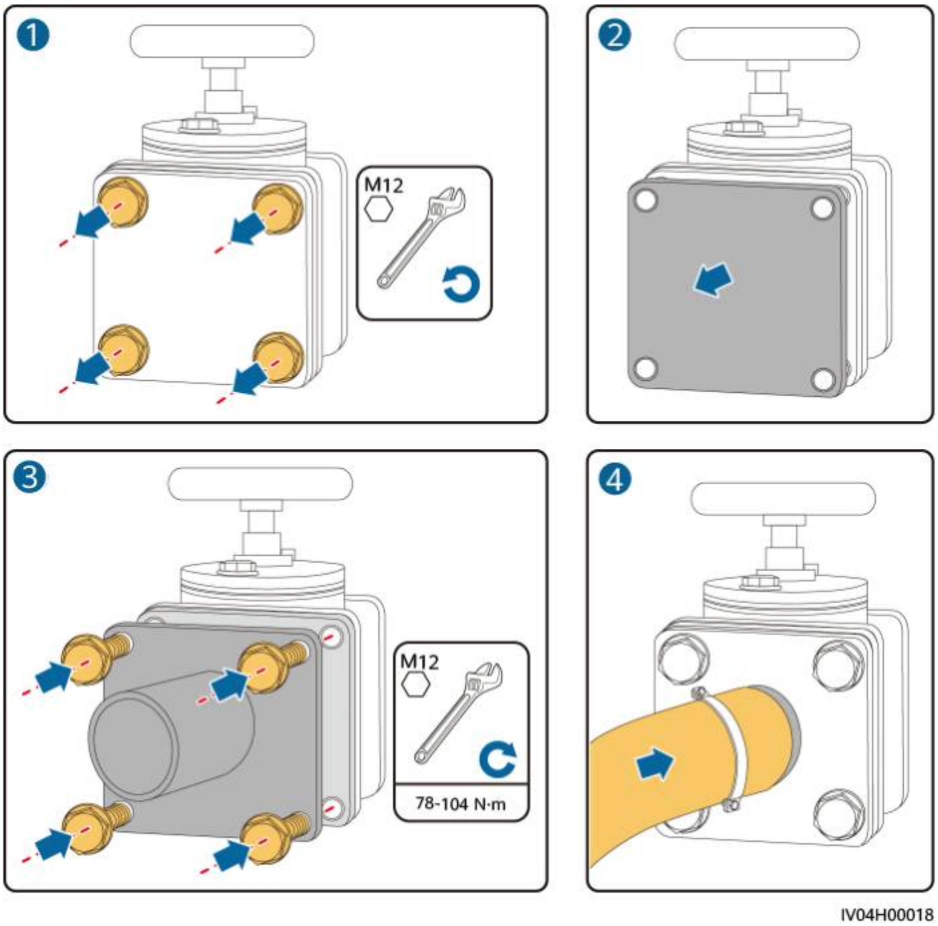
The transformer has two oil drain valves: DN50 oil drain valve at the bottom of the transformer and DN25 oil drain/feed valve at the bottom of the conservator tank.

Step 1 Ensure that the oil drain valve is closed.

Step 2 Remove the cover from the oil drain valve.

Step 3 Secure the hose connector. Connect one end of the steel hose to the hose connector and the other end to the oil tank.

Figure A-4 Connecting a hose connector



Step 4 Open the oil drain valve to let the oil slowly move from the transformer to the oil tank.

Step 5 Check the target reading of the oil level gauge according to the local ambient temperature and the oil level and temperature curve. When the transformer oil drops to the target reading, stop draining oil.

Step 6 Close the oil drain valve and remove the hose connector and hose.

Step 7 Reinstall the cover on the oil drain valve.

----End

A.2 How Do I Repair Paint Damage?

Prerequisites

- Do not apply paint in bad weather, such as rain, snow, strong wind, and sandstorm, when there is no shelter outdoors.
- You have prepared the required paint that matches the color palette delivered with equipment.

Paint Repair

The container shall be intact. If paint has flaked off in a specific area, repaint that area.

NOTE

Check the paint damage on the container and prepare appropriate tools and materials. The number of materials depends on site requirements.

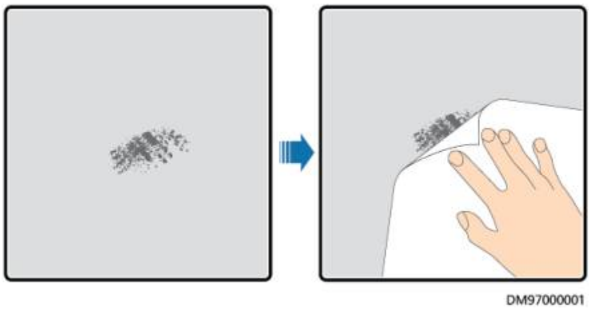
Table A-1 Paint repair

<table>
<tr><th>Paint Damage</th><th>Tool and Material</th><th>Procedure</th><th>Description</th></tr>
<tr><td>Slight scratch (steel base material not exposed)</td><td rowspan="2">Spray paint or paint, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, and paint sprayer (required for repainting a large area)</td><td rowspan="2">Steps 1, 2, 4, and 5</td><td rowspan="5">For the color of the top coat (acrylic acid paint), see the delivered color palette and Pantone number specified on it.
For a few smudges, scratches, or rust, a spray paint or brush is recommended.
For many scratches or large-area smudges and rust, use a paint sprayer.
The paint coating shall be thin and even. Paint drops are prohibited on the coating. The surface shall be smooth.
Leave the repainted area for about 30 minutes before performing any further operation.</td></tr>
<tr><td>Smudges and rust that cannot be wiped off</td></tr>
<tr><td>Deep scratch (primer damaged, steel base material exposed)</td><td>Spray paint or paint, zinc-rich primer, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, and paint sprayer (required for repainting a large area)</td><td>Steps 1, 2, 3, 4, and 5</td></tr>
<tr><td>Logo and pattern damage</td><td colspan="2">If a logo or pattern is damaged, provide the logo size and color number. Seek help from a local supplier of advertisement coatings to formulate a repair solution based on the logo size, color, and damage.</td></tr>
<tr><td>Dent</td><td colspan="2">If a dent is less than 100 mm^2 in area and less than 3 mm in depth, fill the dent with Poly-Putty base and then perform the same operations as those for processing deep scratches.
If a dent is greater than 100 mm^2 in area or greater than 3 mm in depth, ask the local supplier for an appropriate repainting solution.</td></tr>
</table>

Procedure

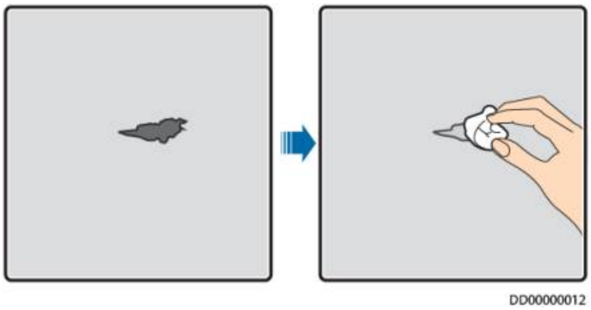
Step 1 Gently polish the damaged areas using fine sandpaper to remove smudges or rust.

Figure A-5 Polishing a damaged area using sandpaper



Step 2 Dip a piece of cotton cloth into anhydrous alcohol and wipe the polished or damaged area to remove the dirt and dust. Then wipe off the alcohol with a clean and dry cotton cloth.

Figure A-6 Wiping a polished or damaged area using anhydrous alcohol



Step 3 Paint zinc-rich primer on the damaged coat using a brush or paint sprayer.

NOTICE

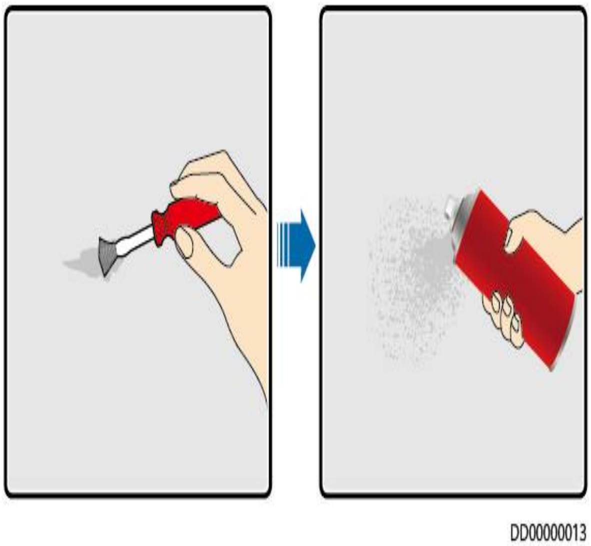
- If the base material is exposed in the area to be repaired, apply epoxy zinc-rich primer, wait until the paint has dried, and then apply acrylic acid top coat.
- Select epoxy zinc-rich primer or acrylic acid top coat with a color the same as the surface coating color of the equipment.

Step 4 Apply paint evenly to the damaged area based on the damage degree of the paint using a spray paint, brush, or paint sprayer until all damage traces are invisible.

NOTICE

- Ensure that the painting is thin, even, and smooth.
- In the case that a container pattern has different colors, to prevent undamaged areas and those with different colors as the damaged area from being polluted during repainting, cover such areas using white paper and adhesive tape before repairing paint.

Figure A-7 Repainting a damaged area



Step 5 Wait for 30 minutes and check whether the painting meets the requirements.

NOTE

- The color of the repainted area must be consistent with that of the surrounding area. Use a colorimeter to measure the color difference (ΔE), which shall be less than or equal to 3. If a colorimeter is unavailable, ensure that there is no visible edge between the repainted area and the surrounding area. The paint shall also be free of bulges, scratches, flaking, or cracks.
- If you choose spray painting, it is recommended that you spray paint three times before checking the result. If the color does not meet the requirements, paint more times until the painting meets the requirements.

----End

Paint Supply Information

Table A-1 STS paint requirements

Item	Requirement	Item	Requirement
Primer thickness	40 μm	Primer type	Epoxy zinc-rich paint
Intermediate coat thickness	100 μm	Intermediate coat type	Zinc-rich paint
Top coat thickness	40 μm	Color number of the top coat	Obtain the color number based on the color palette delivered with the product.

NOTE

The following is a paint model list provided by Huawei. The list may be updated irregularly and is for reference only. The price of paint and technical services shall be subject to local price standards.

Supplier	Purpose	Paint Model
Hempel	Container coating	Zinc-rich primer for pretreatment: HEMPADUR ZINC (shopprimer) 1536C/19830 Zinc-rich primer for the entire container: HEMPADUR ZINC (on line) 1536C/19830 Intermediate coat: HEMPADUR FAST DRY 15560/12170 Top coat: HEMPATHANE 55210/17630 (RAL9003)
	Logo	Red: HEMPATHANE 55210/57200 (RAL3020) Black: HEMPATHANE 55210-19990 (RAL9005)
CMP	Container coating	Zinc-rich primer for pretreatment: EPICON ZINC SC B-2 M (SHOP PRIMER) Zinc-rich primer for the entire container: EPICON ZINC SC B-2 M (ON LINE ZINC) Intermediate coat: EPICON SC PRIMER GREY CSC-9107 Top coat: UNYMARINE SC FINISH WHITE CSC-9205 (RAL-9003)
	Logo	Red: UNYMARINE SC MARKING RAL-3020 Black: UNYMARINE SC MARKING RAL-9005

A.3 How Do I Use the Emergency Stop Button?

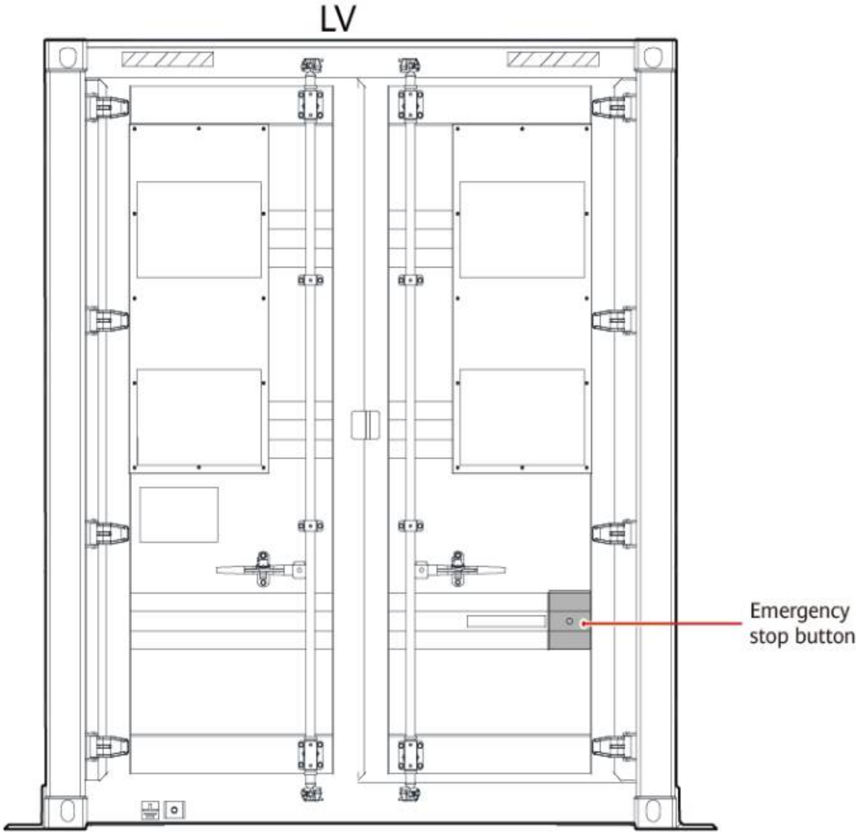
In case of an emergency, such as a fire or an electric shock, press the emergency stop button to power off the STS. After you press the emergency stop button, the LV and MV sides are powered off.

DANGER

Pressing the emergency stop button will interrupt services. Exercise caution when performing this operation in non-emergency situations.

Step 1 Press the emergency stop button.

Figure A-8 Pressing the emergency stop button

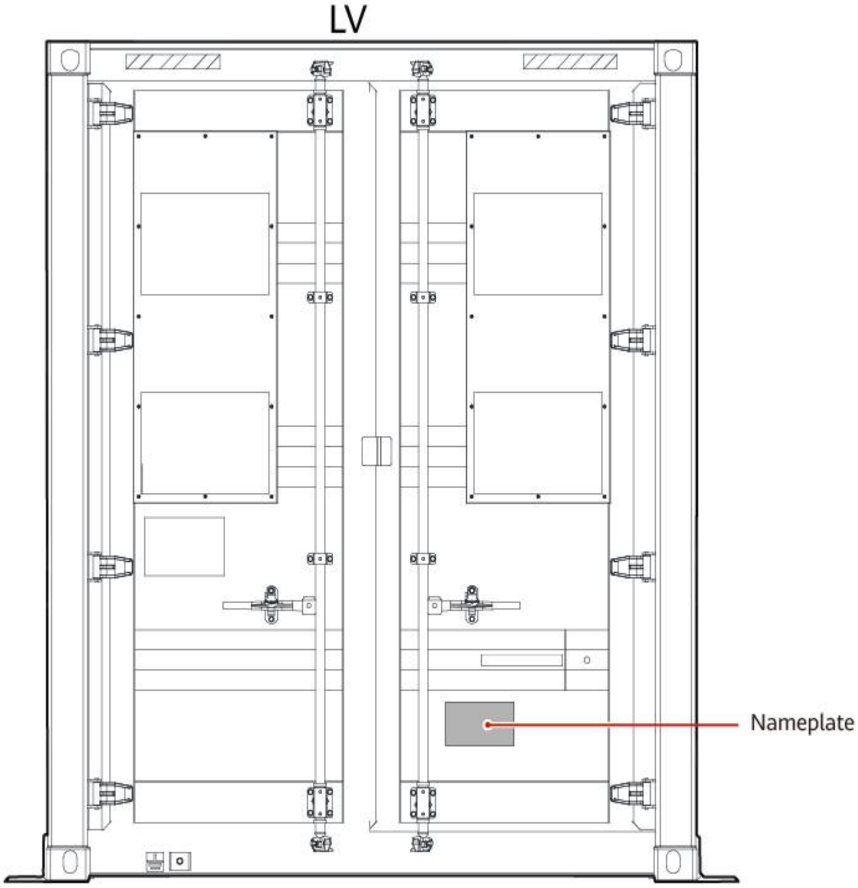


----End

A.4 Where Can I Find the STS Nameplate?

You can check the STS information on its nameplate, which is located outside the double-swing door of the LV panel, as shown in the following figure.

Figure A-9 Position of the nameplate



A.5 How Do I Repair the Temperature Control System?

Step 1 Check whether the wiring terminals of the heat exchanger are damaged. If yes, replace the heat exchanger. For details, see **6.8.7 Replacing a Heat Exchanger**.

Step 2 Check whether the fan of the heat exchanger is damaged. If yes, replace the fan.

Step 3 Check whether any T/H sensors in the LV room or MV room are damaged. If yes, replace the T/H sensors. The methods for replacing T/H sensors in different positions are the same. For details, see **6.8.14 Replacing T/H Sensors**.

Step 4 Check whether the RS485 cables of the T/H sensors are damaged. If yes, replace the cables.

----End

A.6 How Do I Clean the Heat Exchanger?

Periodically clean the air intake vent and core of the heat exchanger to ensure that the heat exchanger is not blocked by foreign objects such as accumulated sand and dust. You can select spray cleaning or dry cleaning based on the site requirements.

- Spray cleaning: Use a high-pressure foam spray kettle to spray cleaning agents to clean up stains.

- Dry cleaning: Perform water-free cleaning in environments such as deserts.

NOTICE

- Clean the heat exchanger in spray cleaning mode. Ensure that the cabinet door is closed to prevent cleaning agents from entering the cabinet.
- The figures are for reference only about the position of the heat exchanger.

Spray Cleaning (STS)

Step 1 Open the side door of the container, power off the measurement and control module of the heat exchanger, and measure the voltage using a multimeter to ensure that the power supply has been disconnected.

Figure A-10 Location of the heat exchanger power supply

Step 2 Close the side door of the container.

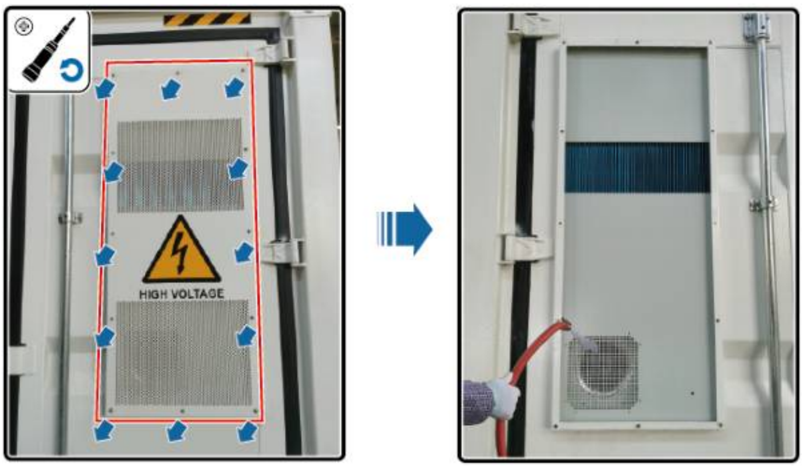
Step 3 Inject a cleaning agent into a high-pressure foam sprayer. Use a liquid soap detergent or water with 5% ammonia solution as the cleaning agent.

Step 4 Remove the external baffle plate from the heat exchanger.

Step 5 Stand 1 m away from the cabinet and use the high-pressure spray gun to spray toward the air intake vent and air exhaust vent of the external fan of the heat exchanger.

Step 6 Wash the heat exchanger with tap water for about 3 to 5 minutes.

Figure A-11 STS spray cleaning



Step 7 Open the side door of the container, power on the heat exchanger, and start the fan.

Step 8 After the fan rotates at full speed for about 1 minute, power off the heat exchanger, use a multimeter to measure the voltage to ensure power-off, and close the side door of the container.

Step 9 Continue to wash for about 3 to 5 minutes until no dirty water flows out.

Step 10 Reinstall the external baffle plate for the heat exchanger.

Step 11 Open the side door of the container, power on the heat exchanger, and check that the equipment runs properly.

Step 12 Close the side door of the container.

----End

Dry Cleaning (STS)

Step 1 Open the side door of the container, power off the measurement and control module of the heat exchanger, and measure the voltage using a multimeter to ensure that the power supply has been disconnected.

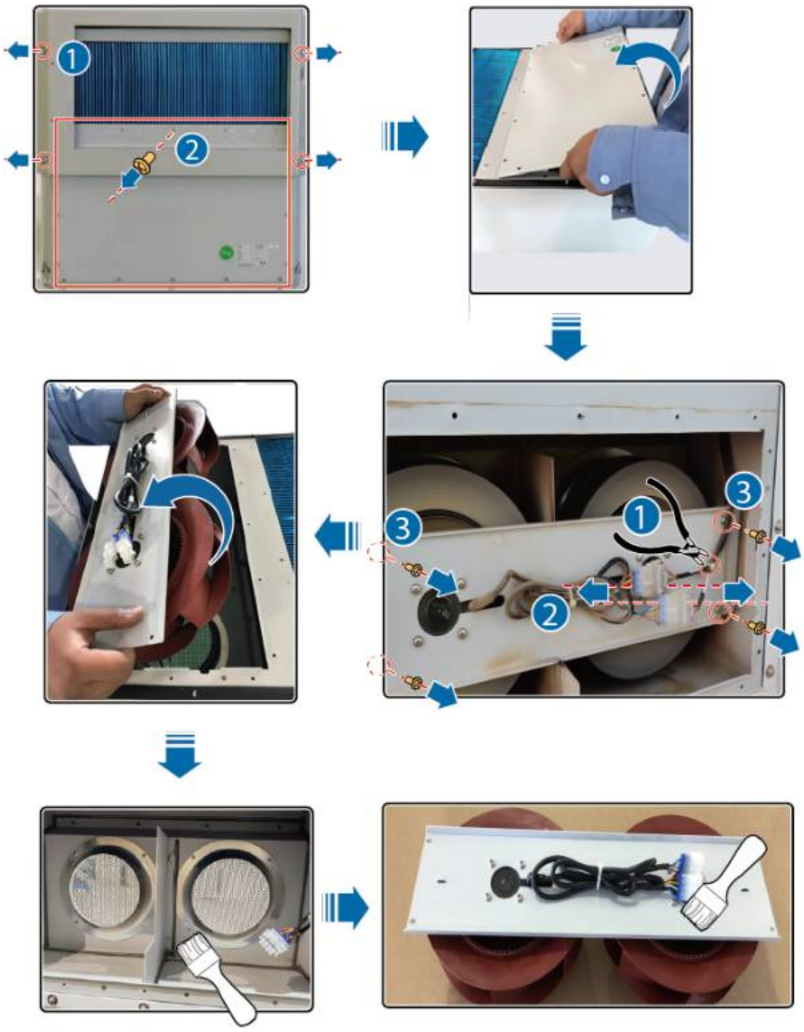
Figure A-12 Location of the heat exchanger power supply

Step 2 Open the end door of the container.

Step 3 Remove the external circulation cover, cable connector, and external fan assembly from the heat exchanger.

Step 4 Use a detergent, brush, and scouring cloth or cleaning towel to clean up sand, catkins, and other foreign objects from the external fan compartment and fan surface.

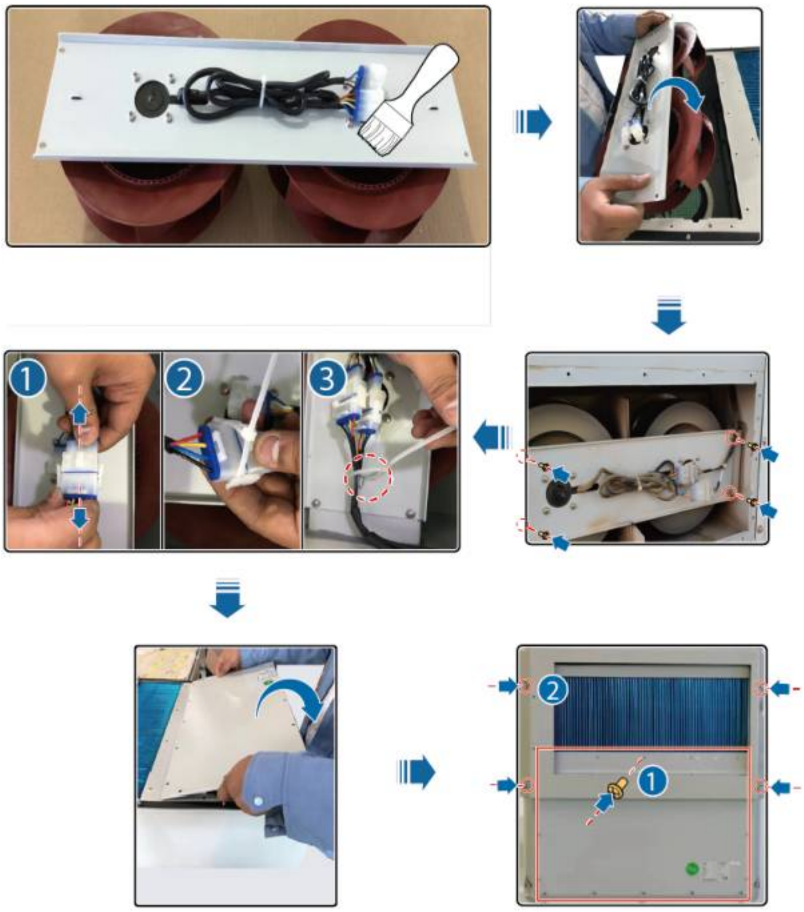
Figure A-13 Dry cleaning



Step 5 Reinstall the external fan assembly for the heat exchanger, connect the external fan terminal to the fan extension cable, and secure the fan terminal and fan cable using cable ties.

Step 6 Reinstall the external circulation cover for the heat exchanger.

Figure A-14 Reinstalling the external circulation cover and external fan assembly



Step 7 Power on the heat exchanger and check that the equipment runs properly.

Step 8 Close the side and end doors of the container.

----End

B Contact Information

If you have any questions about this product, please contact us.

https://digitalpower.huawei.com

Path: **About Us** > **Contact Us** > **Service Hotlines**

To ensure faster and better services, we kindly request your assistance in providing the following information:

- Model
- Serial number (SN)
- Software version
- Alarm ID or name
- Brief description of the fault symptom

NOTE

EU Representative Information: Huawei Technologies Hungary Kft.

Add.: HU-1133 Budapest, Váci út 116-118., 1. Building, 6. floor.

Email: hungary.reception@huawei.com

C Digital Power Customer Service

https://digitalpower.huawei.com/robotchat/

D Acronyms and Abbreviations

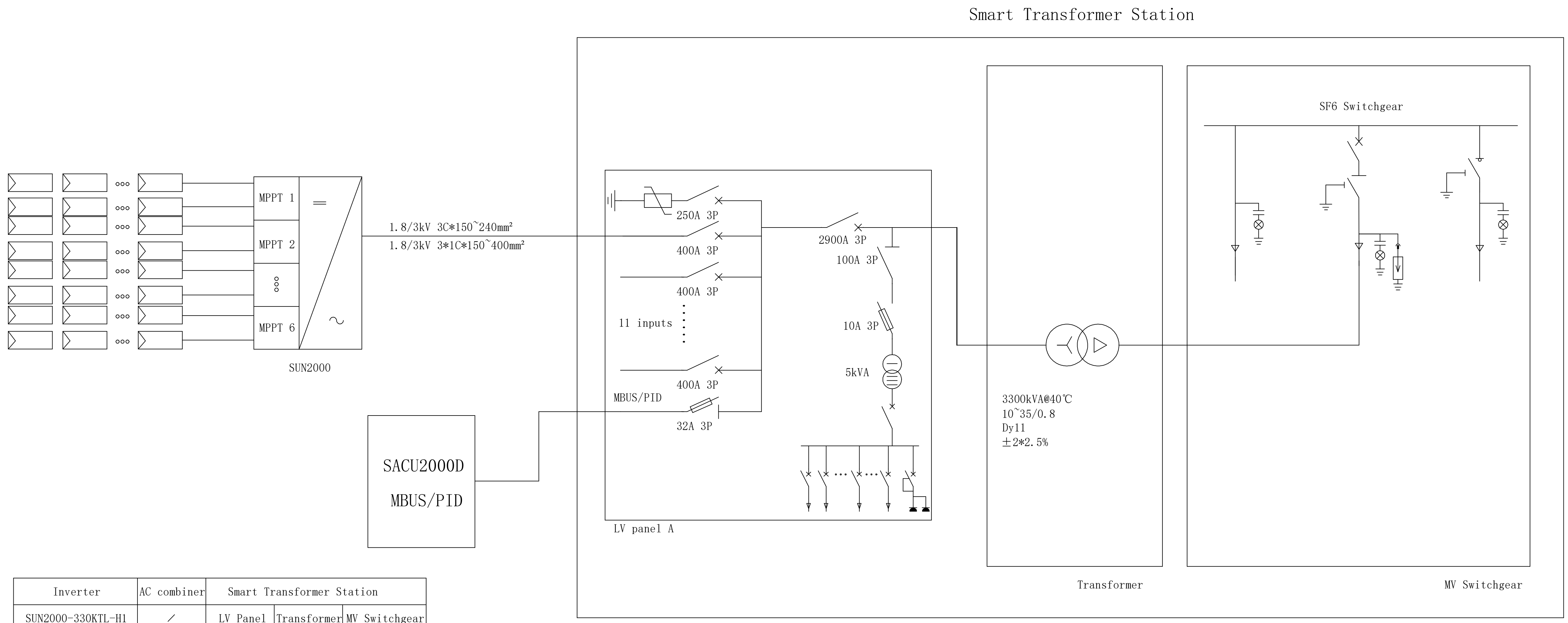
A	
ACB	air circuit breaker
C	
COM	communication
CCO	central coordinator
I	
IMD	insulation monitoring device
L	
LV	low voltage
M	
MBUS	monitoring bus
MCCB	molded case circuit breaker
MV	medium voltage
P	
PID	potential induced degradation
PSU	power supply unit
S	
SACU	Smart Array Controller
STS	Smart Transformer Station
T	

TR transformer

U

UPS uninterruptible power system

REV.	ECO No.	DESCRIPTION



Inverter	AC combiner	Smart Transformer Station		
SUN2000-330KTL-H1	/	LV Panel	Transformer	MV Switchgear
11	/	1	1	1

RELEASE LEVEL: Production Release

FILE NAME:

.X			HUAWEI TECHNOLOGIES Co.LTD		TITLE: JUPITER-3000K-H1 Standard Solution SLD		
.XX							
.XXX	ANG	DRAW: HUANGYUMING	DATE: 20221115	UNIT'S:	DWG NO.:		
		CHKD: ZHOUPENG	DATE: 20221115	FINISH:			
		STAD:	DATE:	MASS(Kg):	PART NO.:	REV	
		APPD:	DATE:	SCALE:		A	
		PRODUCT: 09021568		SHEET: 1 OF 1	MAT'L:		

SmartACU2000D Smart Array Controller

User Manual (with PID Modules)

Issue 01

Date 2020-02-14

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About This Document

Purpose

This document describes the SmartACU2000D smart array controller (SACU for short), which is an outdoor cabinet, in terms of its installation, electrical connections, commissioning, and maintenance. Before installing and operating an SACU, closely read this manual to get familiar with the functions and features of the device as well as the precautions.

Figures used in this document are for reference only.

Intended Audience

This document is intended for photovoltaic (PV) plant operators and qualified electricians.

Symbol Conventions

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

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could 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.
NOTE	Supplements the important information in the main text. **NOTE** is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

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

Issue 01 (2020-02-14)

This issue is used for first office application (FOA).

Contents

1 Safety Precautions

1.1 General Safety

Statement

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "CAUTION", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Huawei will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting equipment malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

Huawei will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document
- Installation or use in environments which are not specified in relevant international or national standards
- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Equipment damage due to force majeure, such as earthquakes, fire, and storms
- Damage caused during transportation by the customer
- Storage conditions that do not meet the requirements specified in this document

General Requirements

DANGER

Do not work with power on during installation.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not scrawl, damage, or block any warning label on the equipment.
- Tighten the screws using tools when installing the equipment.
- Understand the components and functioning of a grid-tied PV power system and relevant local standards.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.

Personal Safety

- If there is a probability of personal injury or equipment damage during operations on the equipment, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.
- Use tools correctly to avoid hurting people or damaging the equipment.
- Do not touch the energized equipment, as the enclosure is hot.

1.2 Personnel Requirements

- Personnel who plan to install or maintain Huawei equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

NOTE

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance

- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

1.3 Electrical Safety

Grounding

- For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is securely grounded.

General Requirements

DANGER

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.
- Ensure that the cables you prepared meet local regulations.
- Use dedicated insulated tools when performing high-voltage operations.

AC and DC Power

DANGER

Do not connect or disconnect power cables with power on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.

- Before making electrical connections, switch off the disconnector on the upstream device to cut off the power supply if people may contact energized components.
- Before connecting a power cable, check that the label on the power cable is correct.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

Cabling

- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.

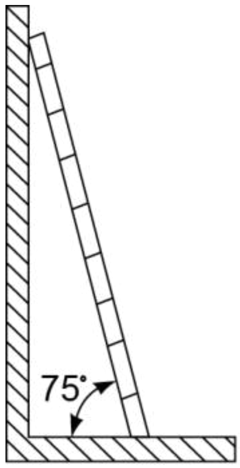
1.4 Installation Environment Requirements

- Ensure that the equipment is installed in a well ventilated environment.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

1.5 Mechanical Safety

Using Ladders

- Use wooden or fiberglass ladders when you need to perform live working at heights.
- When a step ladder is used, ensure that the pull ropes are secured and the ladder is held firm.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the wider end of the ladder is at the bottom, or protective measures have been taken at the bottom to prevent the ladder from sliding.
- Ensure that the ladder is securely positioned. The recommended angle for a ladder against the floor is 75 degrees, as shown in the following figure. An angle rule can be used to measure the angle.



PI02SC0008

- When climbing a ladder, take the following precautions to reduce risks and ensure safety:
  - Keep your body steady.
  - Do not climb higher than the fourth rung of the ladder from the top.
  - Ensure that your body's center of gravity does not shift outside the legs of the ladder.

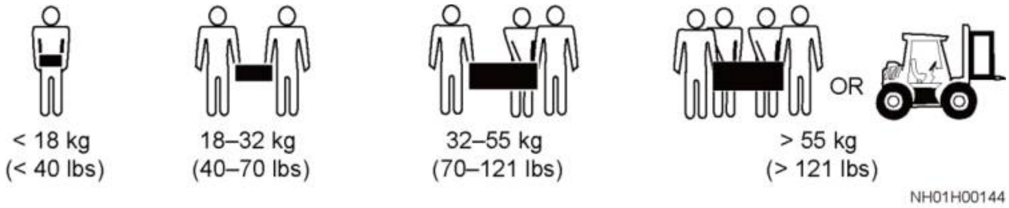
Drilling Holes

When drilling holes into a wall or floor, observe the following safety precautions:

- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.



- When moving the equipment by hand, wear protective gloves to prevent injuries.

1.6 Commissioning

When the equipment is powered on for the first time, ensure that professional personnel set parameters correctly. Incorrect settings may result in inconsistency with local certification and affect the normal operation of the equipment.

1.7 Maintenance and Replacement

DANGER

High voltage generated by the equipment during operation may cause an electric shock, which could result in death, serious injury, or serious property damage. Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents.

- Maintain the equipment with sufficient knowledge of this document and using proper tools and testing equipment.
- Prior to maintenance, power off the equipment.
- Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.

- If the equipment is faulty, contact your dealer.
- The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.

2 Overview

2.1 Model

Model Description

This document covers the following product models:

- SmartACU2000D-D-01
- SmartACU2000D-D-03

Figure 2-1 Model identifiers

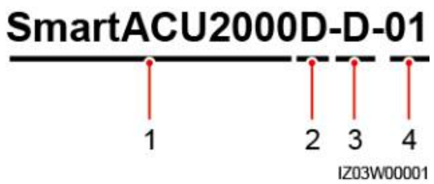


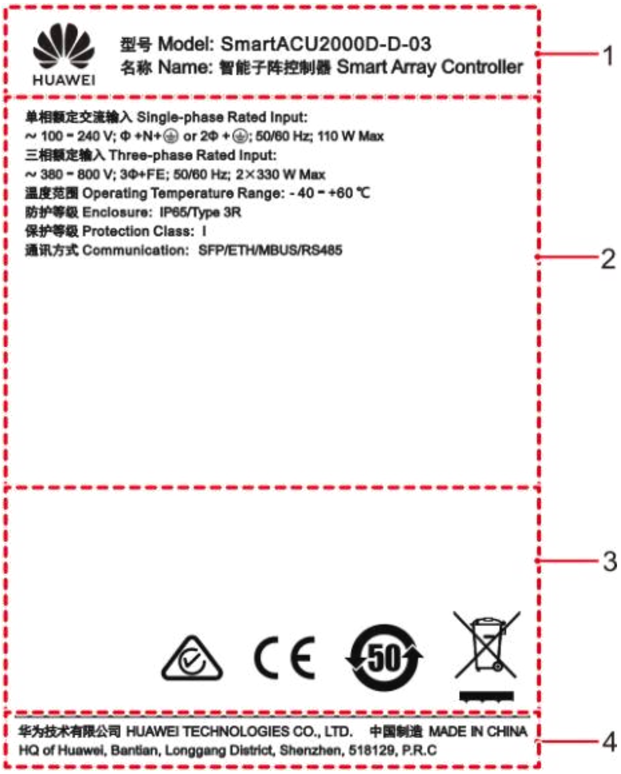
Table 2-1 Model description

No.	Meaning	Description
1	Series	SmartACU2000: smart array controller
2	Hardware	D: version D
3	Voltage level	D: ≤ 800 V three-phase AC input
4	Configuration	• 01: one MBUS route and one SmartPID2000 (referred to as PID module hereinafter) • 03: two MBUS routes and two PID modules

Model Identification

You can view the SACU model on its nameplate.

Figure 2-2 Nameplate (SmartACU2000D-D-03 as an example)



(1) Trademark and model (2) Key technical specifications

(3) Compliance symbols (4) Company name and country of origin

NOTE

The nameplate figure is for reference only.

2.2 Product Introduction

Functions

The SACU is an outdoor cabinet that houses the SmartLogger3000 (SmartLogger for short), SmartModule1000 (SmartModule for short), PID module, SmartMBUS CCO module, Ethernet switch, access terminal box (ATB), and power over Ethernet (PoE) module.

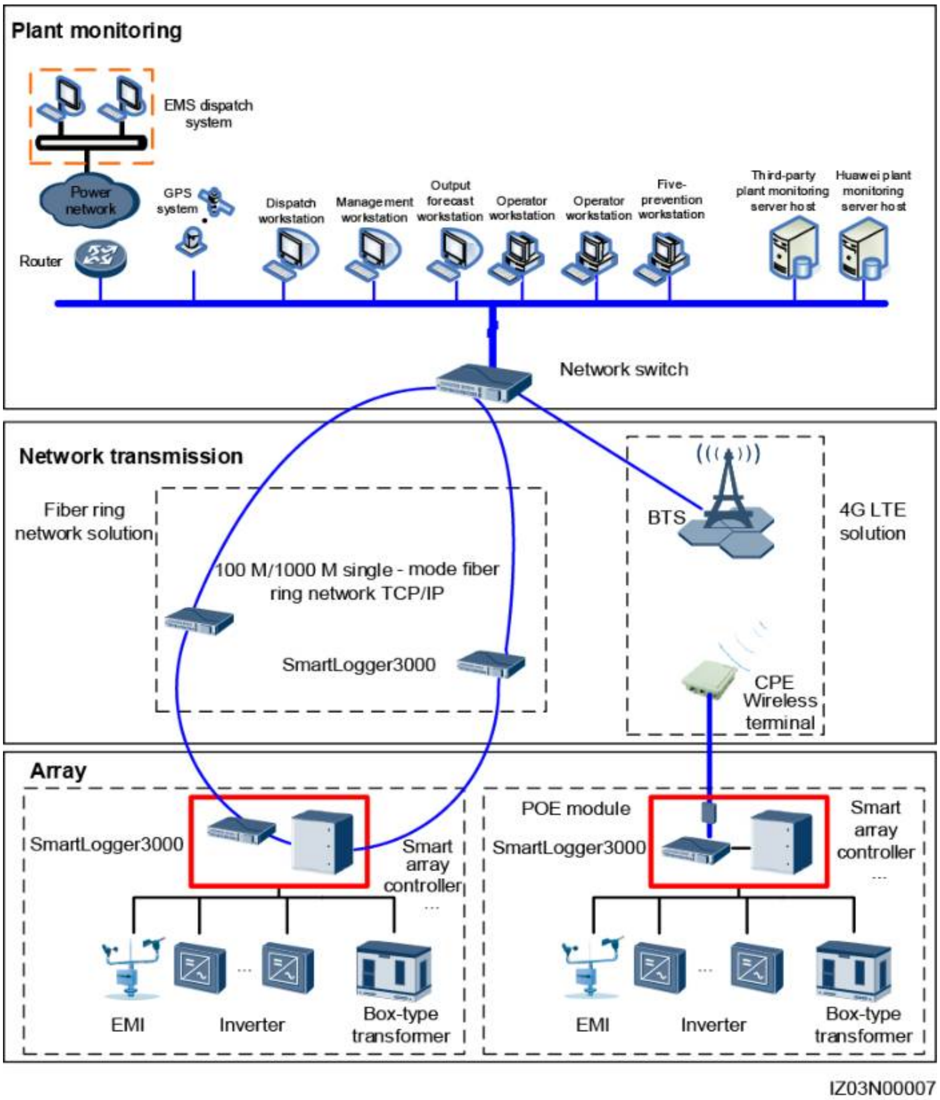
- The SmartLogger monitors and manages PV power systems. It converges ports, converts protocols, and centrally monitors and maintains the devices in PV power systems.
- The SmartModule monitors and manages PV power systems. It converges ports, and converts protocols for devices in PV power systems. It extends ports for the SmartLogger.
- The PID module effectively prevents the potential induced degradation (PID) effect of PV modules, thereby increasing the energy yield and revenue of the PV plant.

- The SmartMBUS CCO module connects to the SUN2000 solar inverters that support the monitoring bus (MBUS) function to transmit data over power cables, implementing MBUS networking.

Features

- Intelligent and flexible: Connects to a maximum of 150 solar inverters and supports one-click commissioning.
- Easy to use: Supports wizard-based settings, facilitating parameter settings and device connection.
- Stable and reliable: Has a built-in surge protection module. The industrial application is secure and reliable.

Networking



- Wired network: fiber ring network solution

NOTE

- A maximum of 15 SmartLoggers can be connected to form an optical fiber ring network. Each SmartLogger can connect to devices such as solar inverters, environmental monitoring instruments (EMIs), and power meters.
- Multiple optical fiber ring networks can be connected to the management system over an Ethernet switch.

- Wireless network: 4G LTE solution

NOTE

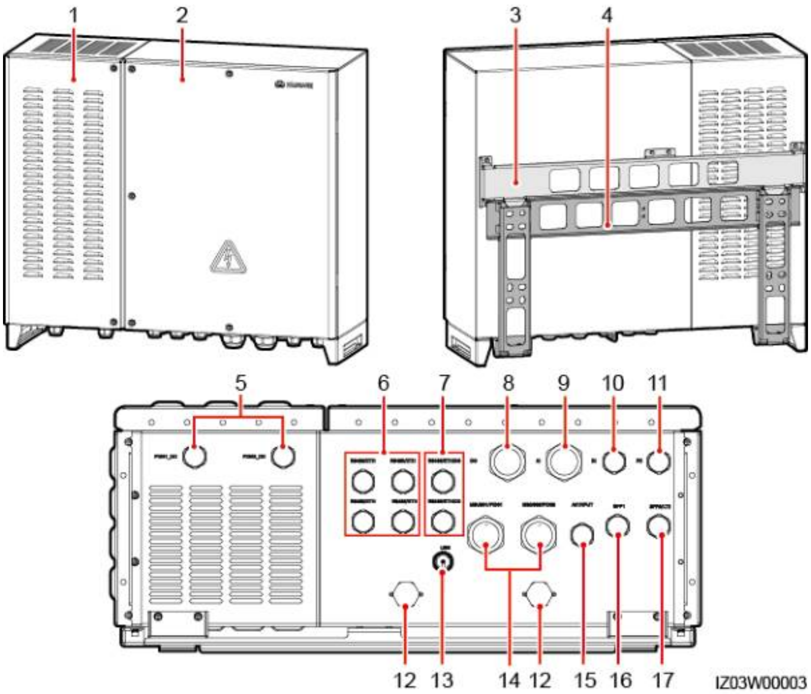
The IP address of the SmartLogger and that of the customer-premises equipment (CPE) must be on the same network segment.

2.3 Appearance

2.3.1 Product Appearance

Appearance

Figure 2-3 Appearance



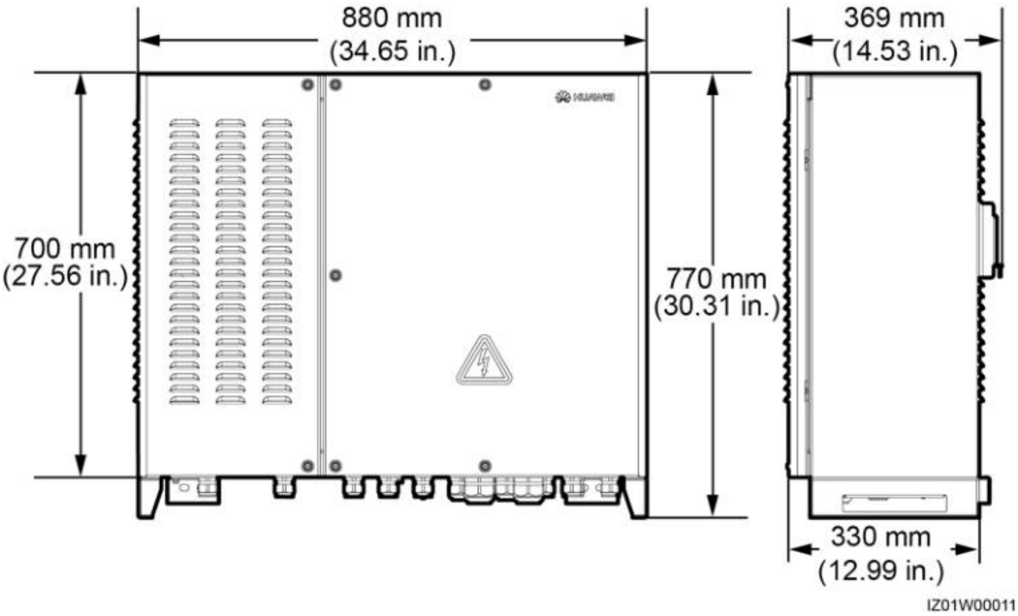
No.	Component	Description
1	PID cabinet door	The PID cabinet is only for PID modules. Do not install third-party devices in the cabinet.
2	Main cabinet door	-

No.	Component	Description
3	Mounting plate	-
4	Mounting bracket	-
5	Waterproof connectors for the PID DO signal cable (PID01_DO, PID02_DO)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)
6	Waterproof connectors for the RS485 communications cable or network cable (RS485/ETH)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)
7	Waterproof connectors for the RS485 communications cable, network cable, or DC input and output power cable (RS485/ETH/DC)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)
8	Waterproof connector for the DO signal cable (DO)	Specifications: 5/4 in. Inner diameter: 20–32 mm (0.79–1.26 in.)
9	Waterproof connector for the AI signal cable (AI)	Specifications: 5/4 in. Inner diameter: 20–32 mm (0.79–1.26 in.)
10	Waterproof connector for the DI signal cable (DI)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)
11	Waterproof connector for the protective earthing cable (PE)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)
12	Ventilation valve	-
13	USB port (USB)	The USB port is used only for maintenance (such as upgrade and data export). Ensure that the USB cover is tightened when the port is idle.
14	Waterproof connectors for the three-phase AC power cable (including the functional earthing wire) (MBUS01/PID01, MBUS02/PID02)	• Specifications: 1 in. • Inner diameter: 18–25 mm (0.71–0.98 in.)
15	Waterproof connector for the single-phase AC power cable (AC INPUT)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)

No.	Component	Description
16	Waterproof connector for the optical cable (SFP1)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)
17	Waterproof connector for the optical cable or network cable (SFP2/LTE)	• Specifications: 3/4 in. • Inner diameter: 13–18 mm (0.51–0.71 in.)

Dimensions

Figure 2-4 Cabinet dimensions



2.3.2 Enclosure Signs

Symbol	Name	Meaning
	Warning symbol for electric shocks	High voltage exists after the device is powered on. Only qualified and trained electrical technicians are allowed to install and operate the device.
	Warning label for multiple power inputs	This device has more than one power input. Before maintenance, ensure that the upstream switch is OFF.

Symbol	Name	Meaning
	Warning label for cable connection	Do not connect a three-phase input power cable to a single-phase input switch. Do not connect a single-phase input power cable to a three-phase input switch. Otherwise, the device will be damaged.
	Warning label for PID functional earthing (FE)	Do not connect a PE cable to the PID FE bar.
	Warning label for surge protection module operation	Do not remove or install an energized surge protection module.
	Weight label	The SACU is heavy and needs to be moved with auxiliary tools or by more than one person.

2.4 Product Composition

NOTE

For simplicity purposes, the following figure shows only the components that you need to operate and reserved installation positions.

Figure 2-5 SmartACU2000D-D-03 Components

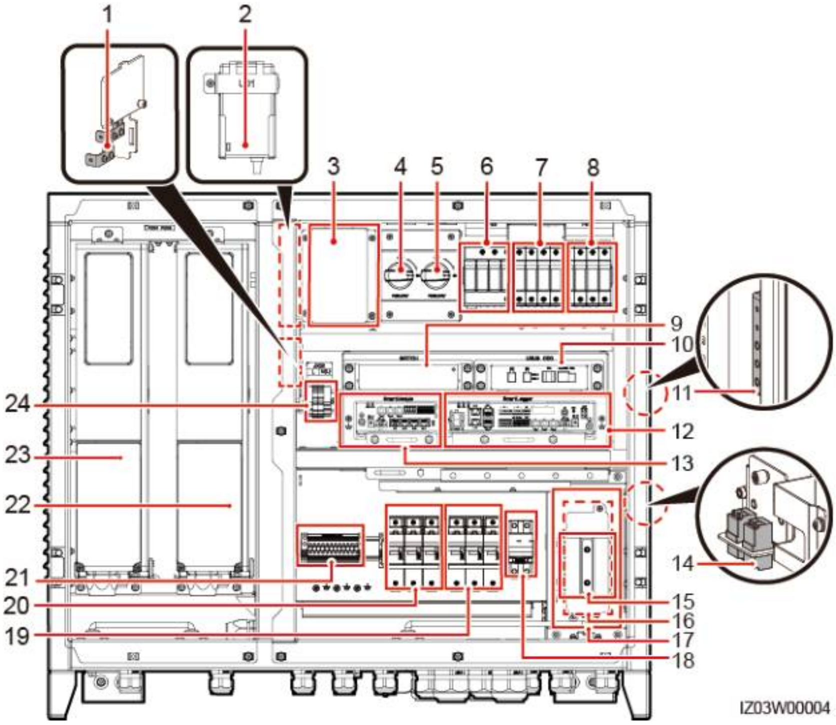


Table 2-2 Components and reserved installation positions

No.	Name	Specifications	Quantity
1	PID FE bar (FE01, FE02)	-	1
2	SmartLogger power adapter (U01)	• AC input: 100–240 V, 50 Hz/60 Hz • DC output: 12 V/2 A	1
3	Position for the 24 V DC power module (U02)	• AC input: 100–240 V, 50 Hz/60 Hz • DC output: 12 V DC, 60 W (maximum); 24 V DC, 30 W (maximum) **NOTE** • If an external 24–28 V DC input is used, the DC output voltage ranges from 21.5 V to 25.2 V. • The 24 V DC power module is optional. Its installation position is reserved in the cabinet.	1
4	PID01 input switch (QF01)	AC: 1 A/3P	1
5	PID02 input switch (QF02)	AC: 1 A/3P	1
6	Single-phase surge protective device (SPD) (F03)	U_c = 385 V AC; 20 kA/40 kA; 8/20 μs; 4P	1
7	Three-phase SPD 1 (F01)	U_c = 680 V AC; 20 kA/40 kA; 8/20 μs; 1P	4
8	Three-phase SPD 2 (F02)	U_c = 680 V AC; 20 kA/40 kA; 8/20 μs; 1P	4

No.	Name	Specifications	Quantity
9	Position for the Ethernet switch (SWITCH)	-	1
10	SmartMBUS CCO (MBUS CCO)	SmartMBUS CCO01A	1
11	Protective earthing (PE) bar	-	1
12	SmartLogger3000 (SmartLogger)	SmartLogger3000	1
13	SmartModule1000A01 (SmartModule)	SmartModule1000A01	1
14	Fiber adapter (OFA01: TX1 RX1; OFA02: TX2 RX2)	2LC/PC-2LC/PC-4	2
15	Position for the SPD of the power over Ethernet (PoE) module	-	1
16	Position for the PoE module (POE)	-	1
17	ATB (Access Terminal Box)	-	1
18	Single-phase input switch (QF03)	32 A/2P	1
19	Three-phase input switch 2 (FU02)	25A/3P	1
20	Three-phase input switch 1 (FU01)	25A/3P	1
21	RS485 communications terminal	12P; supports the wires with a cross-sectional area ranging from 1 mm^2 to 2.5 mm^2 (or 18–14 AWG)	1
22	SmartPID module (PID02)	SmartPID2000	1
23	SmartPID module (PID01)	SmartPID2000	1
24	AC input terminal of the 24 V power module (JX02)	220 V/2P, supports the wires with a cross-sectional area ranging from 0.2 mm^2 to 10 mm^2 (or 24–8 AWG)	1

Figure 2-6 SmartACU2000D-D-01 Components

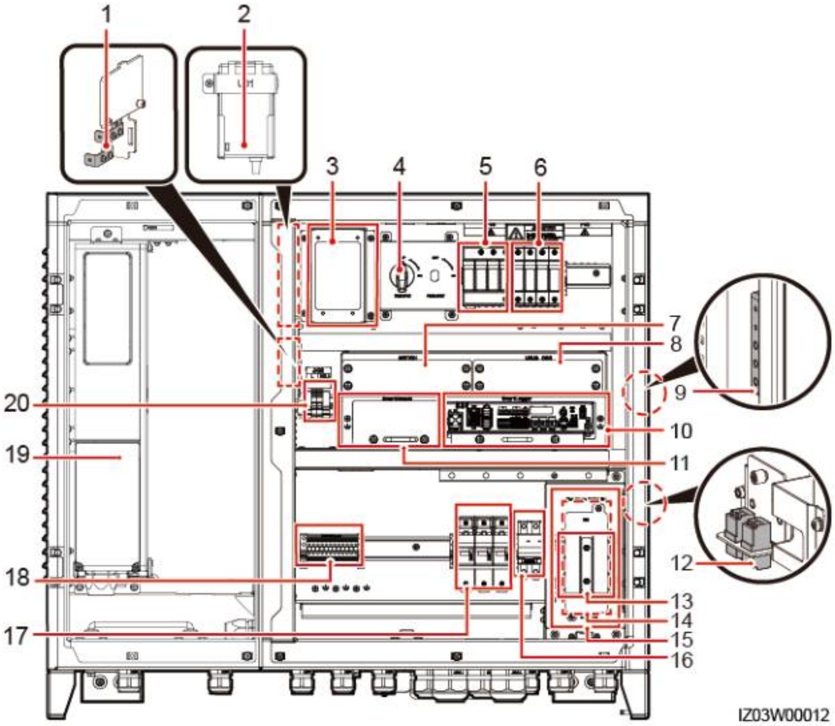


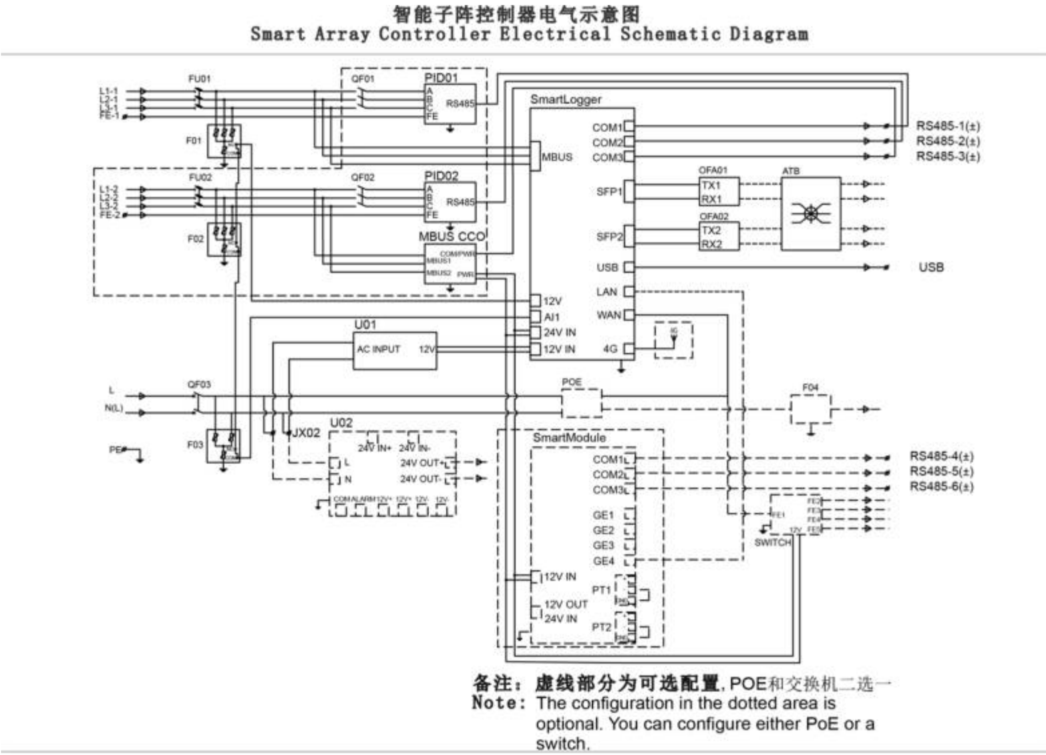
Table 2-3 Components and reserved installation positions

No.	Name	Specifications	Quantity
1	PID FE bar (FE01, FE02)	-	1
2	SmartLogger power adapter (U01)	• AC input: 100–240 V, 50 Hz/60 Hz • DC output: 12 V/2 A	1
3	Position for the 24 V DC power module (U02)	• AC input: 100–240 V, 50 Hz/60 Hz • DC output: 12 V DC, 60 W (maximum); 24 V DC, 30 W (maximum) **NOTE** • If an external 24–28 V DC input is used, the DC output voltage ranges from 21.5 V to 25.2 V. • The 24 V DC power module is optional. Its installation position is reserved in the cabinet.	1
4	PID01 input switch (QF01)	AC: 1 A/3P	1
5	Single-phase surge protective device (SPD) (F03)	U_c = 385 V AC; 20 kA/40 kA; 8/20 μs; 4P	1
6	Three-phase SPD (F01)	U_c = 680 V AC; 20 kA/40 kA; 8/20 μs; 1P	4
7	Position for the Ethernet switch (SWITCH)	-	1

No.	Name	Specifications	Quantity
8	Position for the SmartMBUS CCO (MBUS CCO)	-	-
9	Protective earthing (PE) bar	-	1
10	SmartLogger3000 (SmartLogger)	SmartLogger3000	1
11	SmartModule1000A01 (SmartModule)	-	1
12	Fiber adapter (OFA01: TX1 RX1; OFA02: TX2 RX2)	2LC/PC-2LC/PC-4	2
13	Position for the SPD of the power over Ethernet (PoE) module	-	1
14	Position for the PoE module (POE)	-	1
15	ATB (Access Terminal Box)	-	1
16	Single-phase input switch (QF03)	32 A/2P	1
17	Three-phase input switch (FU01)	25 A/3P	1
18	RS485 communications terminal (JX01)	12P; supports the wires with a cross-sectional area ranging from 1 mm^2 to 2.5 mm^2 (or 18–14 AWG)	1
19	SmartPID module (PID01)	SmartPID2000	1
20	AC input terminal of the 24 V power module (JX02)	220V/2P, supports the wires with a cross-sectional area ranging from 0.2 mm^2 to 10 mm^2 (or 24–8 AWG)	1

2.5 Working Principles

Figure 2-7 Electrical conceptual diagram



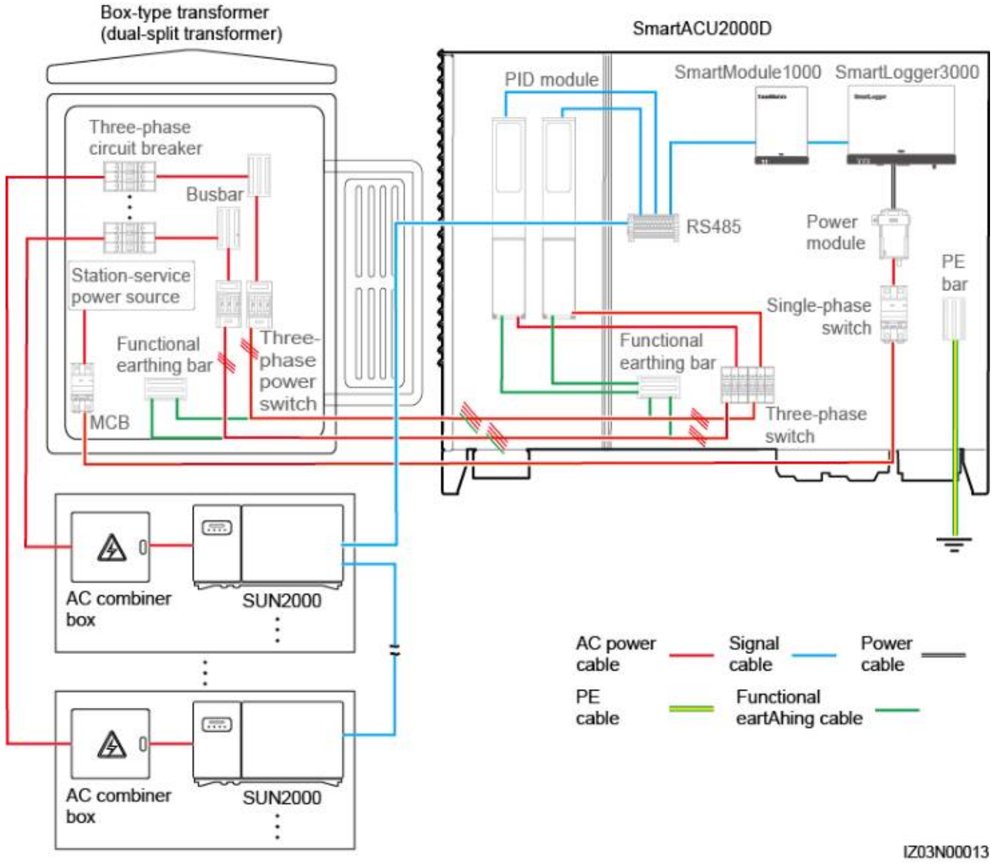
The SACU communicates with devices in a PV array over RS485, MBUS, or Ethernet.

NOTE

When the SACU communicates with solar inverters over MBUS, log in to the embedded WebUI of the SmartLogger3000, choose **Monitoring** > **MBUS** > **Networking Settings**, and set **Networking** to **Enable** (default value). When the SACU communicates with the solar inverters over RS485, set **Networking** to **Disable**. For details, see the *SmartLogger3000 User Manual*.

- RS485 communication mode

Figure 2-8 RS485 communication mode



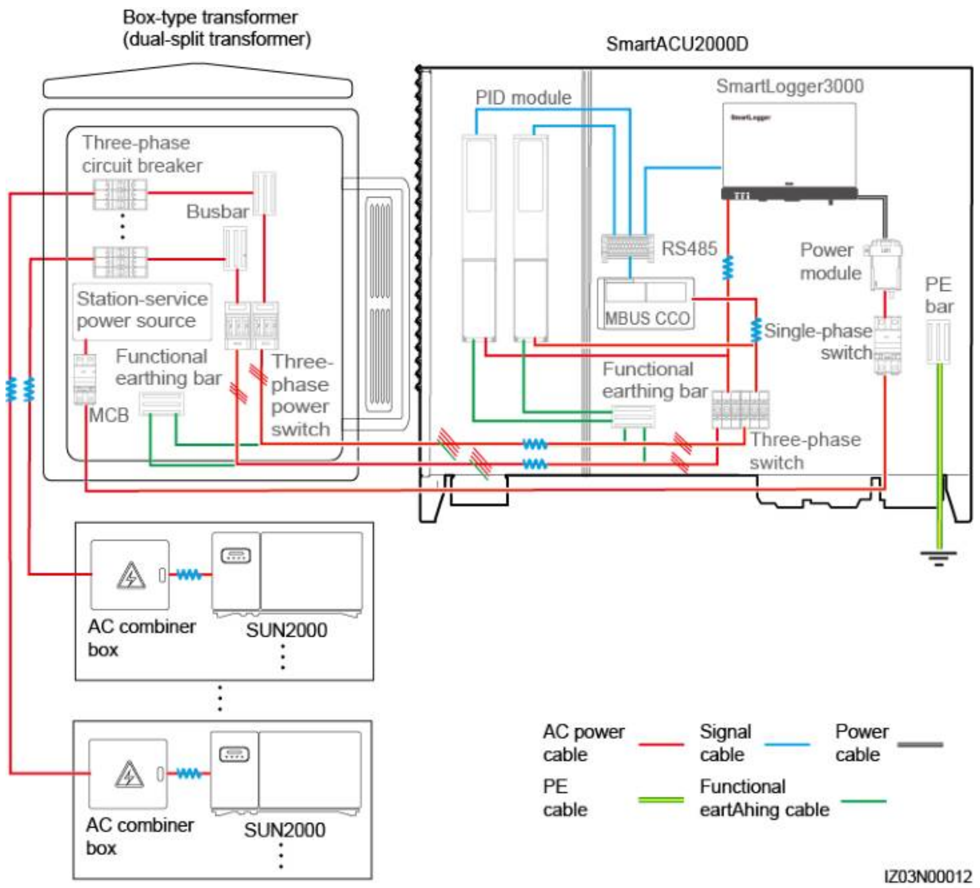
- All SACU models support the RS485 communication mode.
- The SmartLogger connects to the transformer station, power meter, solar inverter, PID module, MBUS CCO module, and other devices that support RS485 communication over COM ports.

NOTE

- The SmartModule is installed before delivery only for the SmartACU2000D-D-03.
- The figure displays only major components and cables and is for reference only.

- MBUS communication mode

Figure 2-9 MBUS communication mode



- If a double-column transformer is used, use the SACU that supports the access of one MBUS route.
- If a dual-split transformer is used, use the SACU that supports the access of two MBUS routes.
- The SmartLogger has embedded MBUS. It connects to the solar inverters that support MBUS communication over the three-phase AC power cable.
- In the SACU that supports the access of two MBUS routes, the MBUS CCO module connects to the solar inverters that support MBUS communication over the three-phase AC power cable.

NOTE

- The MBUS CCO is installed before delivery only for the SmartACU2000D-D-03.
- The figure displays only major components and cables and is for reference only.

- Ethernet communication mode
  - All SACU models support the Ethernet communication mode. The cabinet reserves a position for installing an Ethernet switch.
  - The SmartLogger has a 10M/100M/1000M Ethernet electrical port (WAN), and the SmartLogger connecting to an Ethernet switch has five 10M/100M/1000M Ethernet electrical ports.

The SACU communicates with the plant monitoring system over a fiber ring network or 4G LTE network.

- Over a fiber ring network
  - All SACU models support a fiber ring network.
  - The SmartLogger connects to the plant monitoring system by optical fibers through an ATB.
- Over a 4G LTE network
  - All SACU models support the 4G LTE communication mode. The cabinet reserves positions for installing the PoE module and PoE SPD.
  - The SmartLogger connects to the plant monitoring system by 4G LTE through CPE.

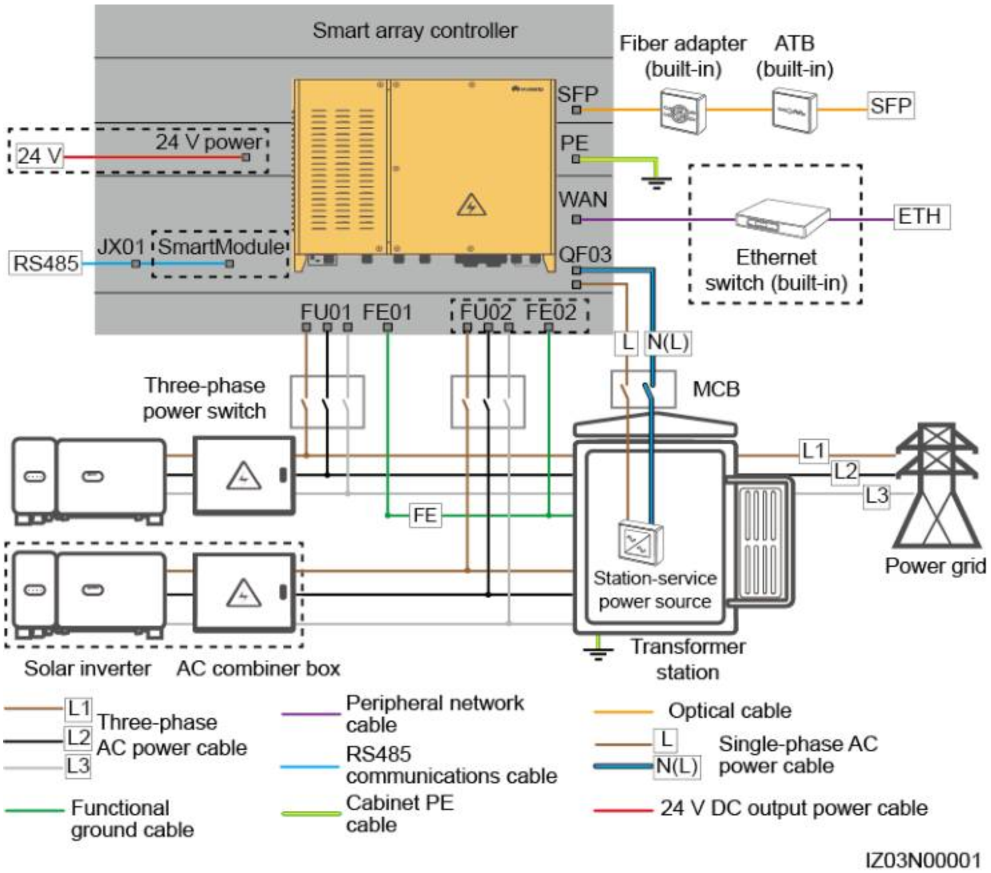
The PID module factory-installed in the SACU can change the voltage between the neutral point on the AC side and the ground to change the voltage between the positive or negative electrode of PV modules and the ground, so as to prevent PID effect on PV modules.

- If a double-column transformer is used, use the SACU with one PID module.
- If a dual-split transformer is used, use the SACU with two PID modules.

2.6 Configuration in Different Scenarios

2.6.1 Fiber Ring Network

Figure 2-10 Networking diagram



NOTE

- Components in dashed-line boxes are optional. To highlight the involved area, the figure does not show all factory-installed components and cables.
- The SmartModule is installed on the SmartACU2000D-D-03 before delivery, and you do not need to perform any operations on the SmartModule. If RS485 ports are required for the SmartACU2000D-D-01, the SmartModule can be optionally installed.

Table 2-4 Components required in the fiber ring network scenario

<table>
<tr><th>Position</th><th colspan="2">Component</th><th>Recommended Model or Specifications</th><th>Component Source</th><th>Quantity</th></tr>
<tr><td rowspan="5">SACU</td><td colspan="2">(Optional) SmartModule</td><td>SmartModule1000A01</td><td rowspan="5">Purchased from Huawei</td><td>1</td></tr>
<tr><td colspan="2">(Optional) Ethernet switch</td><td>UT-H605 or ES1000</td><td>1</td></tr>
<tr><td colspan="2">(Optional) 24 V power supply</td><td>-</td><td>1</td></tr>
<tr><td rowspan="2">Fitting bag for optical ring switching[a]</td><td>Optical module</td><td>-</td><td>2</td></tr>
<tr><td>Optical jumper</td><td>-</td><td>8</td></tr>
<tr><td rowspan="2">Transformer station</td><td colspan="2">Miniature circuit breaker (MCB)</td><td>Recommended rated current: 32 A; number of poles: 2</td><td rowspan="2">Prepared by the customer</td><td>1</td></tr>
<tr><td>Three-phase power switch</td><td>Knife fuse switch</td><td>• When the rated AC voltage on the LV side of the transformer station is less than or equal to 500 V, the rated voltage of the knife fuse switch should be greater than or equal to 600 V.
• When the rated AC voltage on the LV side of the transformer station is greater than 500 V and less than or equal to 800 V, the rated voltage of the knife fuse switch should be greater than or equal to 800 V.
• Recommended rated current of the fuse: 32 A; rated current of the knife fuse switch box: ≥ 32 A; number of poles: 3 (three fuses for each knife fuse switch box)</td><td>• Scenario with a double-column transformer: 1
• Scenario with a dual-split transformer: 2</td></tr>
<tr><td colspan="6">Note a: There are two types of fitting bags for fiber ring switching: with 100M optical modules or with 1000M optical modules. You can purchase a fitting bag based on the specifications of the optical modules used on the fiber channel (FC) switch.</td></tr>
</table>

NOTE

- Components listed in the table need to be installed onsite.
- Models of the components inside the transformer station are specified by the transformer station vendor.

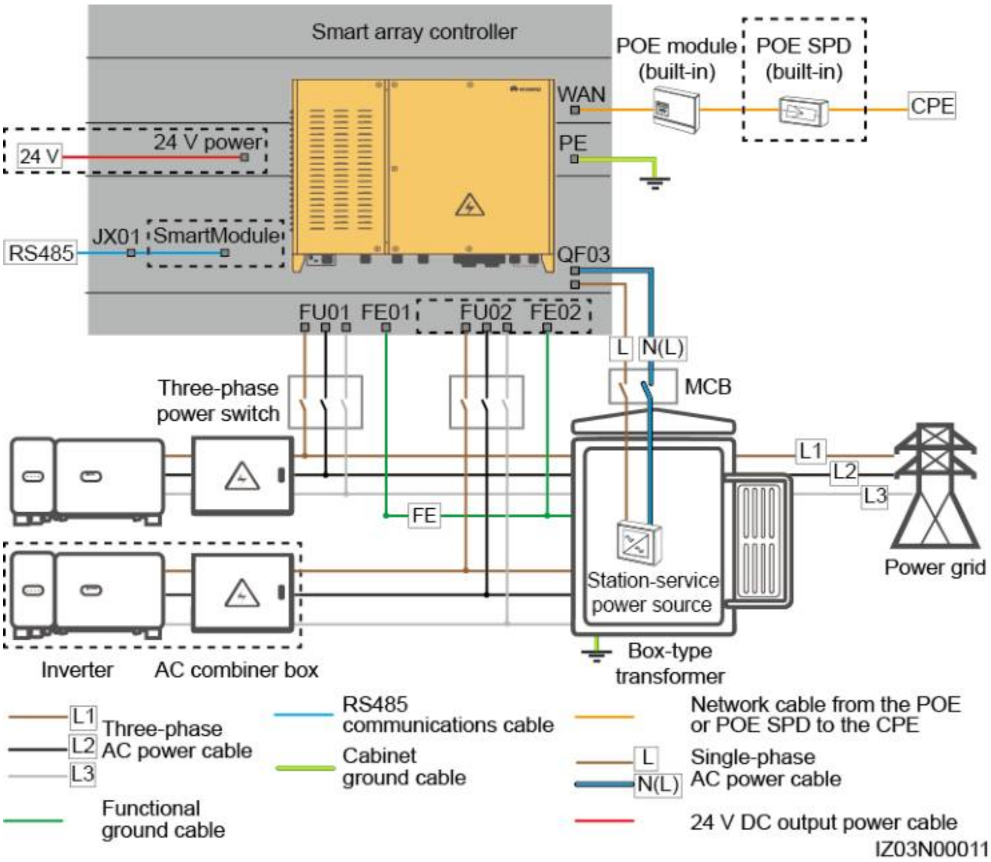
Table 2-5 Cables to be prepared in the fiber ring network scenario

No.	Cable	Recommended Model or Specifications	Cross-sectional Area Range of the Cable (Recommended Value)
1	Three-phase AC power cable	• Four-core (L1, L2, L3, and FE) outdoor armored copper cable and OT-M4 terminals (FE) • When the rated AC voltage on the LV side of the transformer station is less than or equal to 500 V, the operating voltage between the three-phase AC power cable and the ground should be greater than or equal to 600 V. • When the rated AC voltage on the LV side of the transformer station is greater than 500 V and less than or equal to 800 V, the operating voltage between the three-phase AC power cable and the ground should be greater than or equal to 1000 V.	• 8–10 mm^2 (10 mm^2) • 8 AWG
2	(Optional) Peripheral network cable	Cat 5e outdoor shielded network cable with an outer diameter of less than 9 mm (0.35 in.) and internal resistance of less than or equal to 1.5 ohms/10 m (1.5 ohms/32.81 ft), as well as shielded RJ45 connectors	-
3	Peripheral RS485 communications cable	Computer cable (DJYP2VP2-22 2x2x1) or armored shielded twisted pair that can be used outdoors, as well as OT-M4 terminals	• 0.5–1 mm^2 (1 mm^2) • 20–18 AWG (18 AWG)
4	Cabinet PE cable	Outdoor copper cable and OT-M6 terminals	• 6–16 mm^2 (16 mm^2) • 10–6 AWG (6 AWG)
5	Optical cable	Four-core or eight-core single-mode armored optical cable with a transmission wavelength of 1310 nm and an outer diameter of less than or equal to 18 mm (0.71 in.)	-
6	Single-phase AC power cable	• Standard connection: two-core outdoor armored copper cable • Connection through a tube: single-core outdoor copper cable • Operating voltage to the ground ≥ 300 V	• 4–6 mm^2 (4 mm^2) • 12–10 AWG (12 AWG)

No.	Cable	Recommended Model or Specifications	Cross-sectional Area Range of the Cable (Recommended Value)
7	(Optional) 24 V DC output power cable	• Standard connection: two-core outdoor armored copper cable • Connection through a tube: single-core outdoor copper cable • Operating voltage to the ground ≥ 300 V	• 2.5–4 mm^2 (2.5 mm^2) • 14–12 AWG (14 AWG)

2.6.2 4G LTE

Figure 2-11 Networking diagram



NOTE

- Components in dashed-line boxes are optional. To highlight the involved area, the figure does not show all factory-installed components and cables.
- The SmartModule is installed on the SmartACU2000D-D-03 before delivery, and you do not need to perform any operations on the SmartModule. If RS485 ports are required for the SmartACU2000D-D-01, the SmartModule can be optionally installed.

Table 2-6 Components required in the 4G LTE network scenario

<table>
<tr><th>Position</th><th colspan="2">Component</th><th>Recommended Model or Specifications</th><th>Component Source</th><th>Quantity</th></tr>
<tr><td rowspan="4">SACU</td><td colspan="2">(Optional) SmartModule</td><td>SmartModule1000A01</td><td rowspan="5">Purchased from Huawei</td><td>1</td></tr>
<tr><td colspan="2">(Optional) 24 V power supply</td><td>-</td><td>1</td></tr>
<tr><td rowspan="3">Fitting bags for the PoE module and CPE</td><td>PoE module</td><td>-</td><td>1</td></tr>
<tr><td>PoE SPD[a]</td><td>-</td><td>1</td></tr>
<tr><td>Outside the SACU and transformer station</td><td>CPE</td><td>-</td><td>1</td></tr>
<tr><td rowspan="2">Transformer station</td><td colspan="2">MCB</td><td>Recommended rated current: 32 A; number of poles: 2</td><td rowspan="2">Prepared by the customer</td><td>1</td></tr>
<tr><td>Three-phase power switch</td><td>Knife fuse switch</td><td>When the rated AC voltage on the LV side of the transformer station is less than or equal to 500 V, the rated voltage of the knife fuse switch should be greater than or equal to 600 V.
When the rated AC voltage on the LV side of the transformer station is greater than 500 V and less than or equal to 800 V, the rated voltage of the knife fuse switch should be greater than or equal to 800 V.
Recommended rated current of the fuse: 32 A; rated current of the knife fuse switch box: ≥ 32 A; number of poles: 3 (three fuses for each knife fuse switch box)</td><td>• Scenario with a double-column transformer: 1
• Scenario with a dual-split transformer: 2</td></tr>
<tr><td colspan="6">Note a: If the CPE model is EG860, a PoE SPD is required.</td></tr>
</table>

NOTE

- Components listed in the table need to be installed onsite.
- Models of the components inside the transformer station are specified by the transformer station vendor.

Table 2-7 Cables to be prepared in the 4G LTE network scenario

No.	Cable	Recommended Model or Specifications	Cross-sectional Area Range of the Cable (Recommended Value)
1	Three-phase AC power cable	• Four-core (L1, L2, L3, and FE) outdoor armored copper cable and OT-M4 terminals (FE) • When the rated AC voltage on the LV side of the transformer station is less than or equal to 500 V, the operating voltage between the three-phase AC power cable and the ground should be greater than or equal to 600 V. • When the rated AC voltage on the LV side of the transformer station is greater than 500 V and less than or equal to 800 V, the operating voltage between the three-phase AC power cable and the ground should be greater than or equal to 1000 V.	• 8–10 mm^2 (10 mm^2) • 8 AWG
3	Peripheral RS485 communications cable	Computer cable (DJYP2VP2-22 2x2x1) or armored shielded twisted pair that can be used outdoors, as well as OT-M4 terminals	• 0.5–1 mm^2 (1 mm^2) • 20–18 AWG (18 AWG)
4	Cabinet PE cable	Outdoor copper cable and OT-M6 terminals	• 6–16 mm^2 (16 mm^2) • 10–6 AWG (6 AWG)
5	Network cable from the PoE module or PoE SPD to the CPE	20 m (65.62 ft) long network cable delivered with the Huawei CPE (If the cable is not long enough, prepare a Cat 5e outdoor shielded network cable with an outer diameter of less than 9 mm (0.35 in.) and internal resistance of less than or equal to 1.5 ohms/10 m (1.5 ohms/32.81 ft), as well as shielded RJ45 connectors.)	-
6	Single-phase AC power cable	• Standard connection: two-core outdoor armored copper cable • Connection through a tube: single-core outdoor copper cable • Operating voltage to the ground ≥ 300 V	• 4–6 mm^2 (4 mm^2) • 12–10 AWG (12 AWG)
7	(Optional) 24 V DC output power cable	• Standard connection: two-core outdoor armored copper cable • Connection through a tube: single-core outdoor copper cable • Operating voltage to the ground ≥ 300 V	• 2.5–4 mm^2 (2.5 mm^2) • 14–12 AWG (14 AWG)

3 Storage Requirements

The following requirements should be met when the SACU needs to be stored prior to installation:

- Do not unpack the SACU. Check the packing materials periodically. If any rodent bites are found, replace the packing materials immediately.
- Store the SACU in a place with appropriate temperature and humidity to protect the SACU from dust and water vapor corrosion.
- To avoid personal injury or device damage, stack SACUs neatly so that they will not fall over.
- If the SACU has been stored for a long time, it needs to be inspected by professionals before it is put into use.

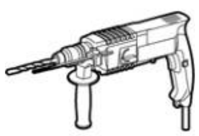
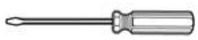
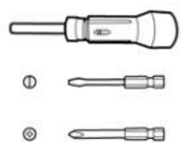
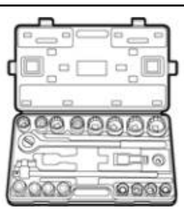
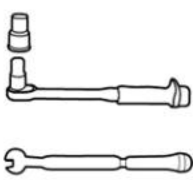
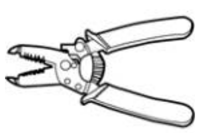
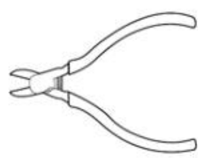
Huawei shall not be liable for any consequence caused by violation of the storage requirements specified in this document.

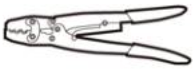
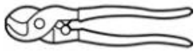
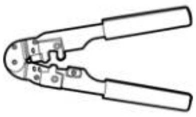
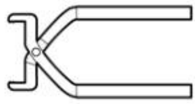
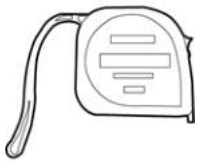
4 System Installation

4.1 Checking Before Installation

Item	Acceptance Criteria
Outer package	The outer package is intact and tidy. If it is damaged or abnormal, do not unpack it, and contact your dealer.
Exterior	The exterior is intact. If any damage is found, do not use the device, and contact your dealer as soon as possible.
Deliverables	Check the number of deliverables against the packing list in the packing case. If any deliverables are missing or damaged, contact your dealer.

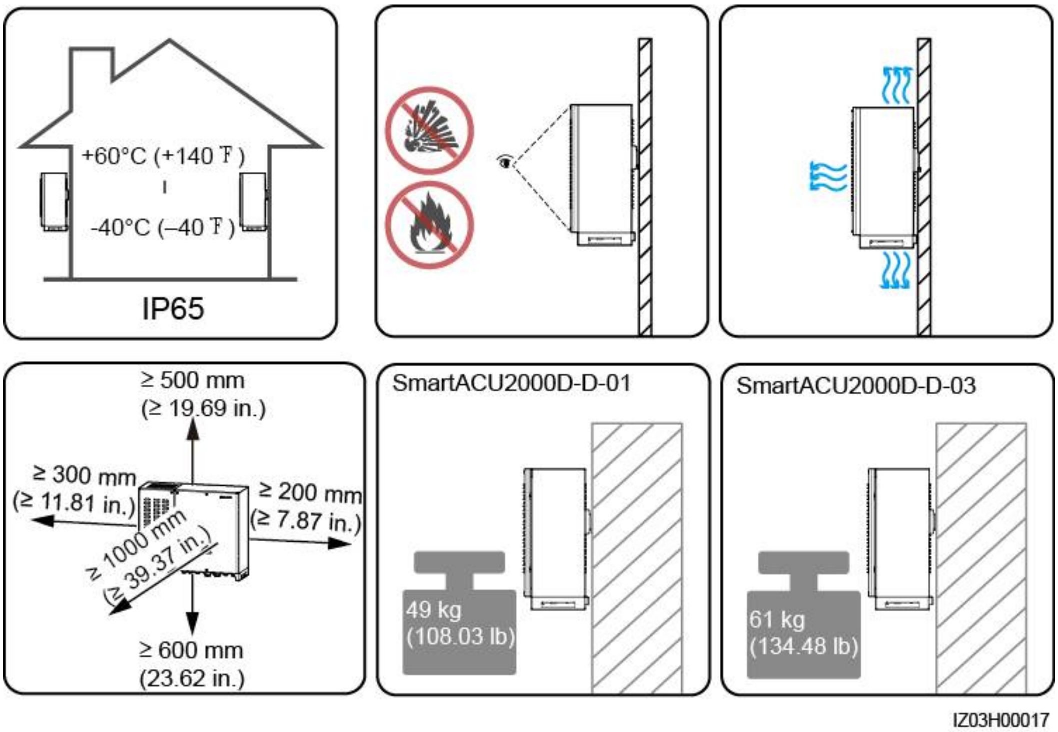
4.2 Tools

Category	Tool			
Installation	 Hammer drill. Drill bit: Φ14 mm (0.55 in.) and Φ16 mm (0.63 in.)	 Adjustable wrench. Open end: 32 mm (12.59 in.)	 Flat-head screwdriver. Head: 3 mm x 150 mm (0.12 in. x 5.91 in.)	 Torque screwdriver. (Flat head: M3; cross-shaped head: M3, M4, and M6)
	 Socket wrench set	 Torque wrench	 Wire strippers	 Diagonal pliers

Category	Tool			
	 Rubber mallet	 Crimping tool	 Cable cutter	 Utility knife
	 RJ45 crimping tool	 Network cable tester	 Multimeter	 SPD extracting tool
	 Heat shrink tubing	 Heat gun	 Vacuum cleaner	 Marker
	 Measuring tape	 Level	 Cable tie	-
Personal protective equipment (PPE)	 Safety gloves	 Safety goggles	 Anti-dust respirator	 Safety boots

4.3 Installation Requirements

Figure 4-1 Installation requirements

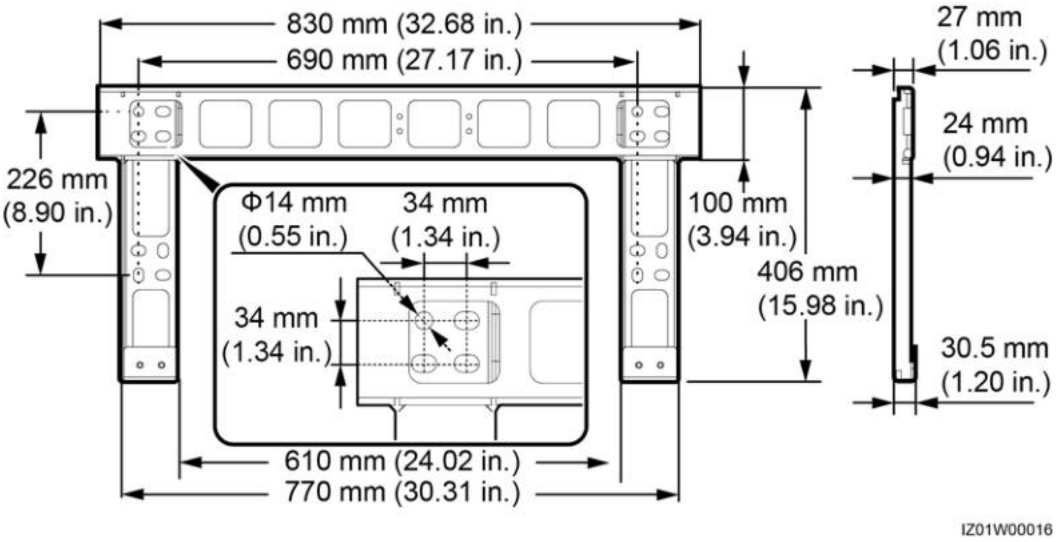


4.4 Installing the Cabinet

4.4.1 Installing the Mounting Bracket

A mounting bracket has four groups of tapped holes, each group containing four tapped holes. Mark any hole in each group based on site requirements and mark four holes in total. Two round holes are preferred to secure the mounting bracket.

Figure 4-2 Mounting bracket dimensions



Wall-mounted Installation

WARNING

Avoid drilling holes into the water pipes and power cables buried in the wall.

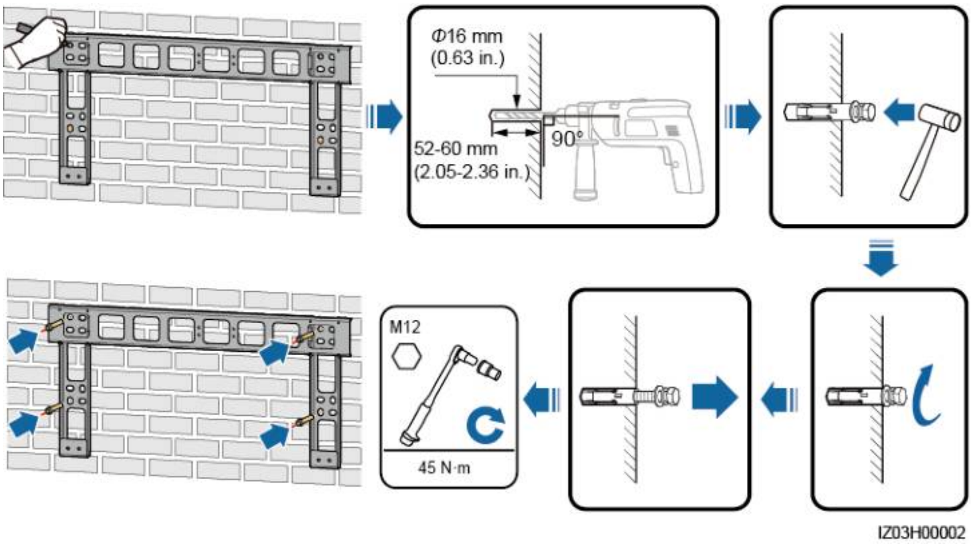
NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Wipe away any dust in or around the holes and measure the hole distances. If the holes are inaccurately positioned, drill holes again.
- Level the head of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the wall.

Step 1 Prepare expansion bolts (M12x60 stainless steel expansion bolts are recommended).

Step 2 Install a mounting bracket.

Figure 4-3 Installing a mounting bracket



NOTE

When determining the positions for drilling holes, level the hole positions using a level, and mark the positions using a marker.

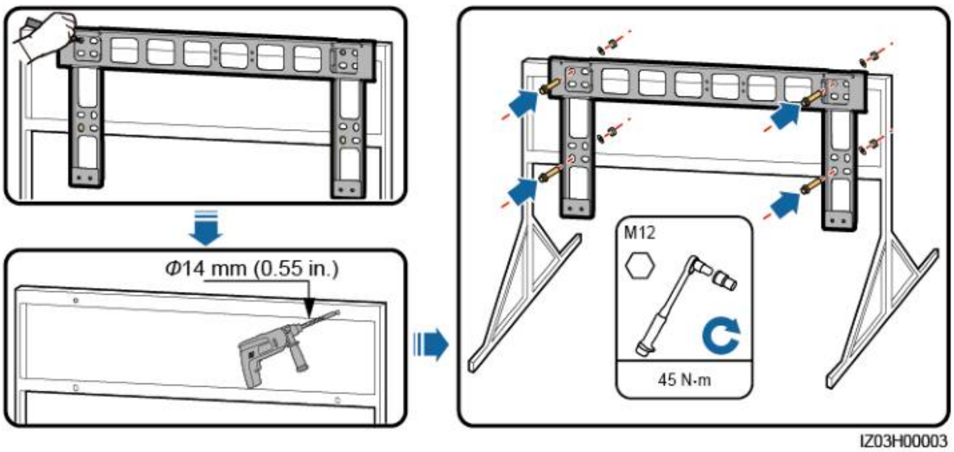
----End

Support-mounted Installation

Step 1 Obtain the M12x40 bolt assemblies from the packing case. (If the length does not meet the installation requirements, prepare M12 bolt assemblies by yourself and use them together with the supplied M12 nuts.)

Step 2 Install a mounting bracket.

Figure 4-4 Installing a mounting bracket



NOTE

When determining the positions for drilling holes, level the hole positions using a level, and mark the positions using a marker.

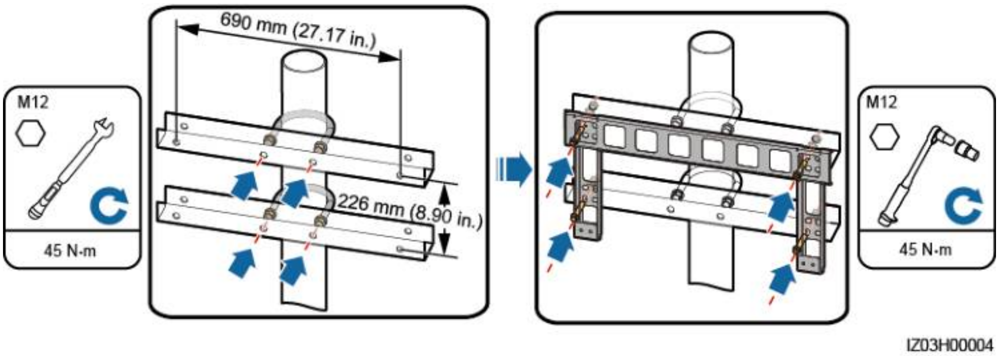
----End

Pole-mounted Installation

Step 1 Prepare pole-mounting brackets by yourself. You are advised to use M12 U-shaped bolts to secure the pole-mounting brackets.

Step 2 Install a mounting bracket.

Figure 4-5 Installing a mounting bracket



NOTE

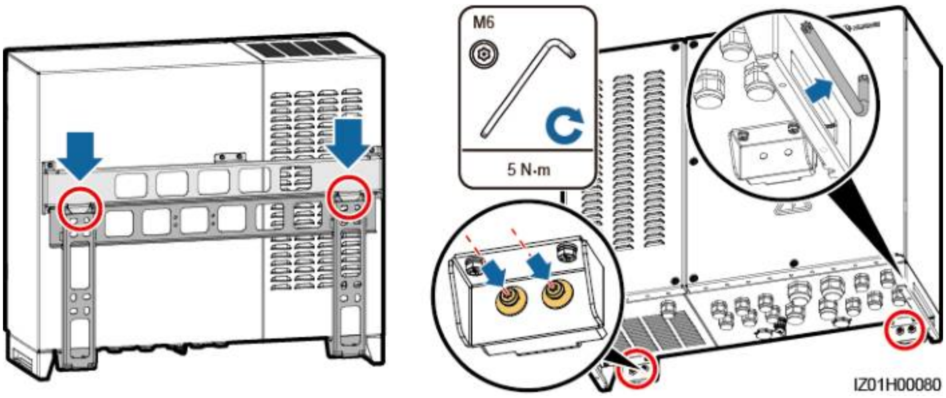
Figures provided in this section are for reference only. The actual poles and pole-mounting brackets prevail.

----End

4.4.2 Mounting the Cabinet

Step 1 Lift the cabinet, mount it onto the mounting bracket, and secure it using security Torx screws.

Figure 4-6 Mounting a cabinet



----End

4.5 Installing the Components

Install the components based on 2.6 Configuration in Different Scenarios.

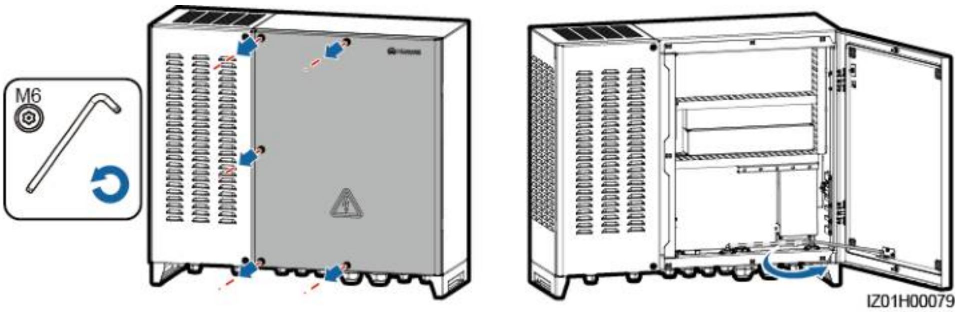
4.5.1 Opening the Main Cabinet Door

NOTICE

- Before opening the main cabinet door, turn off all upstream switches for the SACU to power off the SACU. After that, wait at least 3 minutes and operate the SACU. If you have to operate an energized SACU, wear insulation gloves and take preventive measures.
- If you need to open the main cabinet door on rainy or snowy days, take protective measures to prevent rain or snow from entering the cabinet. If it is impossible to take protective measures, do not open the main cabinet door on rainy or snowy days.
- Do not leave unused screws in the cabinet.

Loosen the screws on the main cabinet door, open the cabinet door, and adjust the support bar.

Figure 4-7 Opening a cabinet door



NOTE

To highlight the involved area, the figure does not show certain components. This is applicable to all other similar figures.

4.5.2 (Optional) Installing the SmartModule

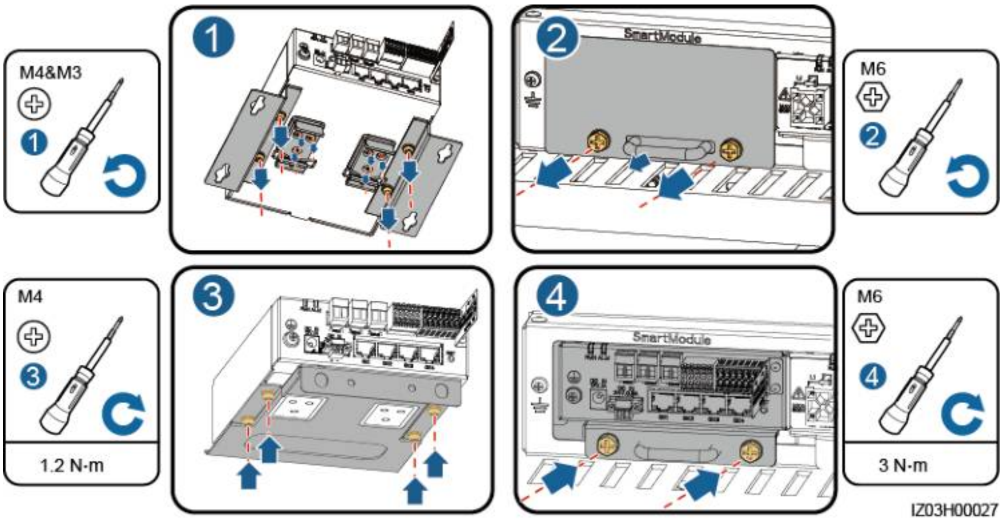
Step 1 Remove the mounting ears and guide rail–mounting kit from the SmartModule.

Step 2 Remove the panel at the position where the SmartModule is to be installed from the cabinet and take out the mounting kit.

Step 3 Secure the mounting bracket to the SmartModule.

Step 4 Install the SmartModule.

Figure 4-8 Installing a SmartModule

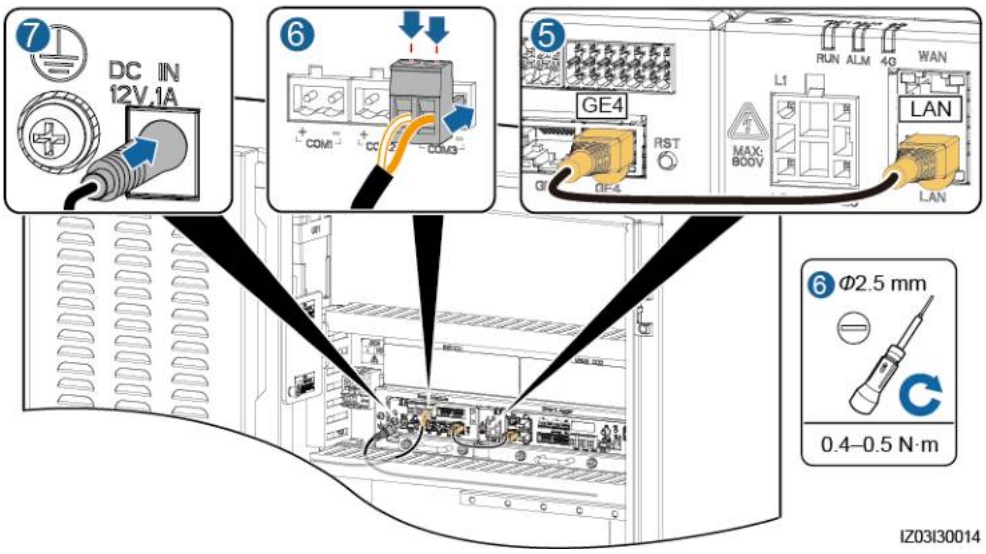


Step 5 Connect the GE4 port on the SmartModule to the LAN port on the SmartLogger using the network cable delivered with the SmartModule.

Step 6 Connect the preinstalled RS485 cable to the COM port on the SmartLogger based on the label.

Step 7 Connect the preinstalled power cable to the 12V 1A port on the SmartModule based on the cable label.

Figure 4-9 Connecting a cable



----End

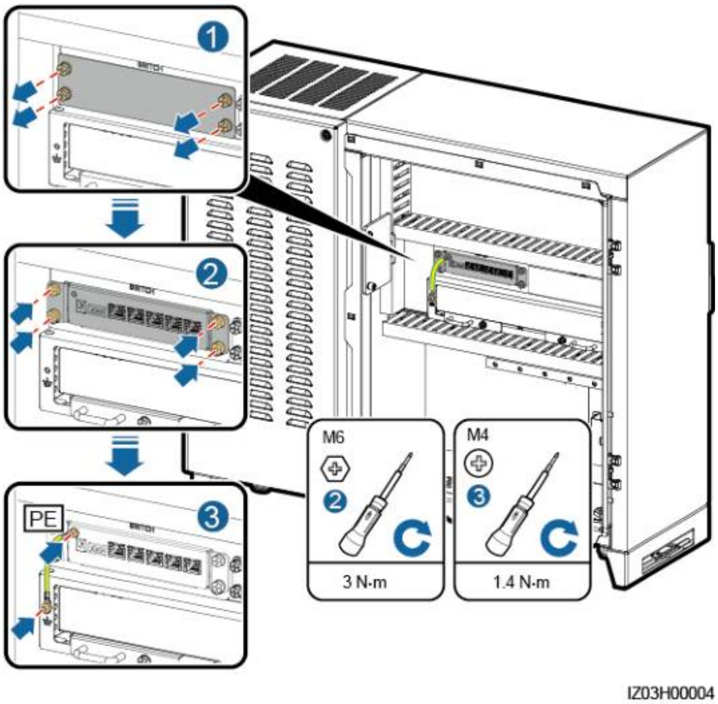
4.5.3 (Optional) Installing the Ethernet Switch

Step 1 Remove the panel behind which an Ethernet switch will be installed.

Step 2 Secure the Ethernet switch.

Step 3 Connect a PE cable to the Ethernet switch.

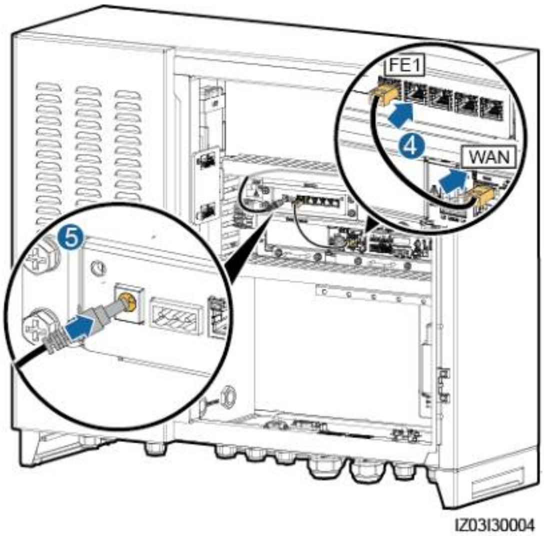
Figure 4-10 Installing an Ethernet switch



Step 4 Connect the FE1 port on the Ethernet switch to the WAN port on the SmartLogger using the network cable delivered with the Ethernet switch.

Step 5 Connect the preinstalled power cable to the power port on the Ethernet switch based on the label.

Figure 4-11 Connecting an Ethernet switch cable



----End

4.5.4 (Optional) Installing the 24 V Power Module

Step 1 Remove the mounting bracket of the 24 V power module from the cabinet.

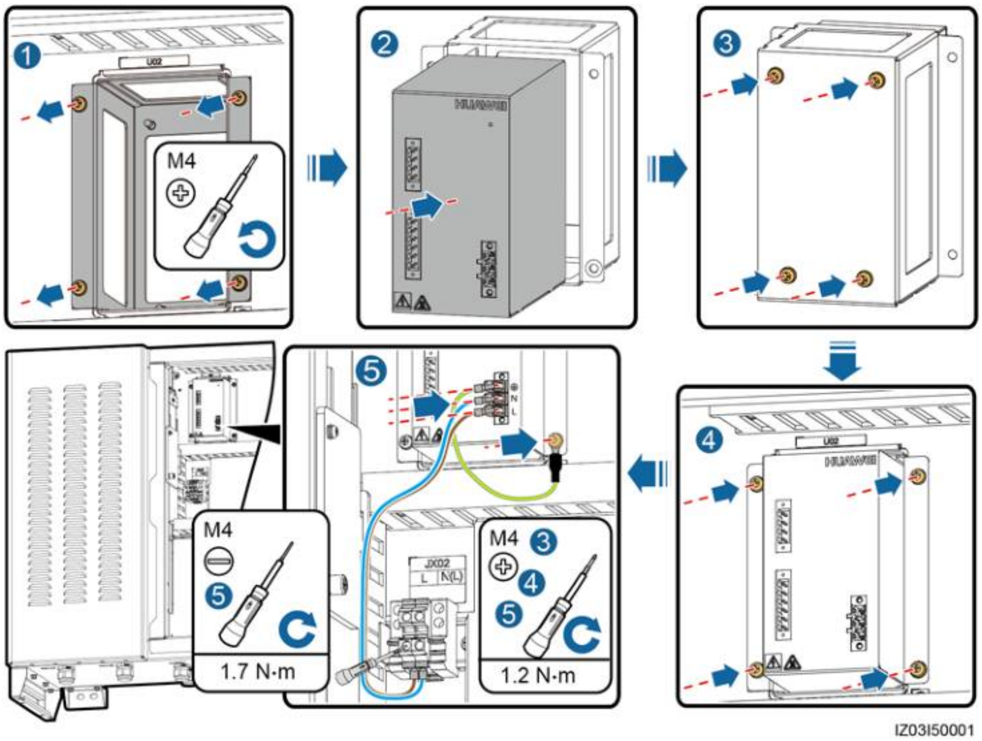
Step 2 Install the 24 V power module in the mounting bracket.

Step 3 Secure the 24 V power module to the mounting bracket using the screws (delivered with the 24 V power module).

Step 4 Install the 24 V power module in the cabinet.

Step 5 Connect the AC input power cable (delivered with the SACU) to the 24 V power module based on the cable label.

Figure 4-12 Installing a 24 V power module



----End

4.5.5 Installing the PoE Module

Step 1 Loosen screws (do not remove the screws) and remove the mounting board.

Step 2 Remove screws from the PoE module installation position.

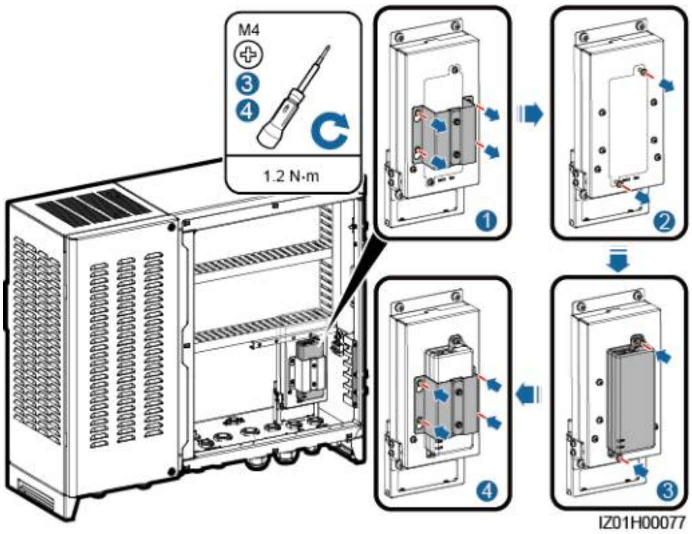
Step 3 Place the PoE module at the installation position and align the mounting holes. Then secure the PoE module.

NOTE

Indicators should be in the lower left corner.

Step 4 Secure the mounting board.

Figure 4-13 Installing a PoE module



----End

4.5.6 (Optional) Installing the PoE SPD

Step 1 Loosen the nuts on the PoE SPD mounting board. (Do not remove the nuts.)

Step 2 Replace and secure the PoE SPD mounting bracket.

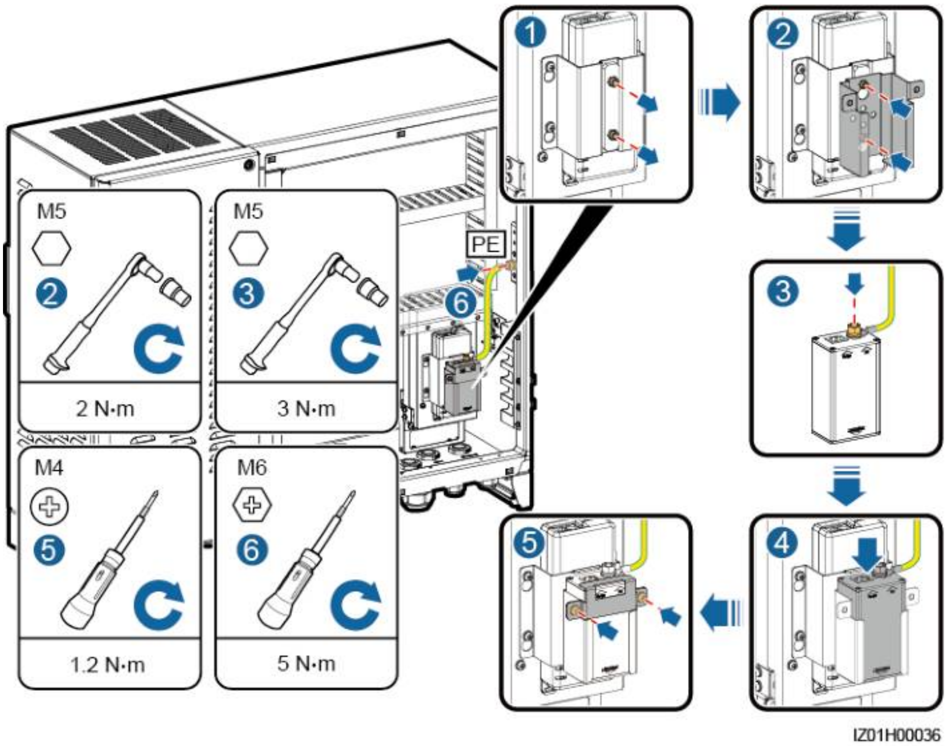
Step 3 Connect one end of the ground cable to the PE point on the PoE SPD, and secure the ground nut.

Step 4 Place the PoE SPD in the mounting bracket. Ensure that the PE point faces upwards and the surface marked PE faces outwards.

Step 5 Secure the PoE SPD fastener.

Step 6 Connect the other end of the ground cable to the PE bar.

Figure 4-14 Installing a PoE SPD



----End

5 Electrical Connections

NOTICE

- Only certified electricians are allowed to connect cables.
- Wear proper PPE at all time when connecting cables.
- Before connecting cables to ports, leave enough slack to reduce the tension on the cables and prevent poor cable connections.
- Connect cables in strict accordance with the operation description and precautions provided in the document. Do not connect signal cables, single-phase AC power cables, and three-phase AC power cables reversely or mix them up. Otherwise, the caused equipment damage is not covered under any warranty or service agreement.
- For simplicity purposes, cables described in this chapter are those to be connected onsite, rather than factory-installed cables. The cabling routes are for reference only.
- The cable colors shown in the electrical connection diagrams provided in this chapter are for reference only. Select cables in accordance with local cable specifications (green-and-yellow cables are only used for protective earthing).

5.1 Selecting a Connection Mode

You can connect a peripheral cable to the SACU in common mode or through a tube based on site requirements.

NOTICE

- To prevent poor cable connection due to overstress caused by ground subsidence, you are advised to bend the cable inside the cabinet for a slack of 20–30 mm (0.79–1.18 in.) before connecting the cable to the appropriate port.
- If a cable has a jacket, ensure that the jacket is in the cabinet.
- This section describes how to connect a peripheral cable to the RS485/ETH/DC waterproof connector in common mode and through a tube, and provides a reference for connecting peripheral cables to other waterproof connectors.

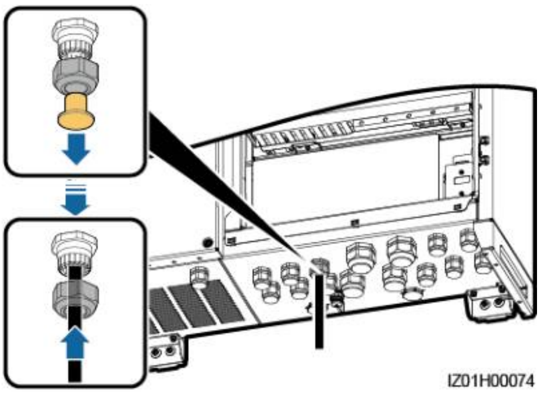
5.1.1 Common Connection

If you choose common connection, ensure that an appropriate cable is available.

Step 1 Remove the locking cap and plug from the waterproof connector.

Step 2 Route the cable through the locking cap and then the waterproof connector.

Figure 5-1 Routing a cable



Step 3 Connect the cable and tighten the locking cap.

Step 4 Check that the cable is connected correctly and securely. Seal the waterproof connector and cable hole using the supplied firestop putty.

Step 5 Clear foreign matter from the cabinet.

----End

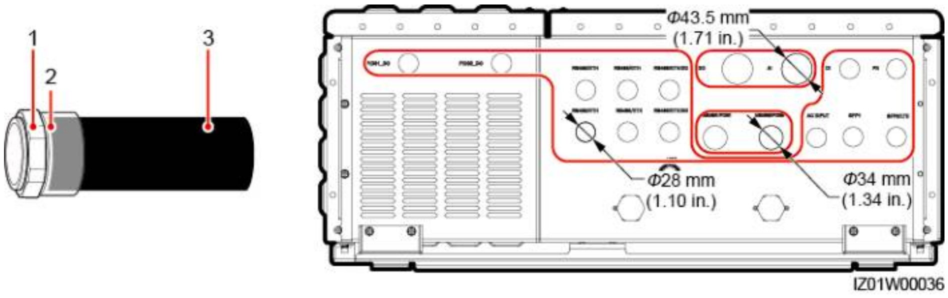
5.1.2 Connection Through a Tube

If you choose connection through a tube, ensure that an appropriate cable and a tube are available.

NOTE

- Prepare an appropriate tube based on the diameter of the cable holes at the bottom. It is recommended that the tube specifications comply with the waterproof connector specifications. For example, for a 3/4 in. waterproof connector, a 3/4 in. tube is recommended.
- The tube appearance is for reference only. The actual tube prevails. This is applicable to all other similar figures.

Figure 5-2 Tube and the diameter of cable holes at the bottom

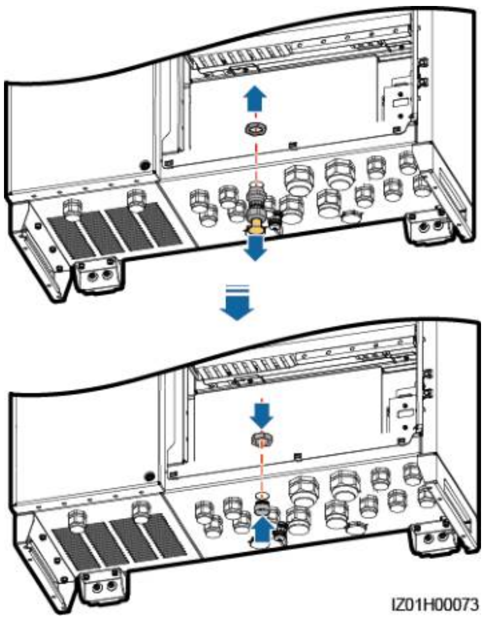


(1) Nut (2) Fitting (3) Conduit

Step 1 Remove the locking cap and plug from the waterproof connector, and remove the waterproof connector.

Step 2 Secure the tube fitting using the nut delivered with the tube.

Figure 5-3 Installing a tube fitting



Step 3 Route the cable through the tube conduit and then the fitting, and connect the cable.

Step 4 Secure the fitting to the conduit.

Step 5 Check that the cable is connected correctly and securely. Then take appropriate measures to ensure that the tube conduit and fitting are secured reliably, and seal the cable hole using supplied firestop putty.

Step 6 Clear foreign matter from the cabinet.

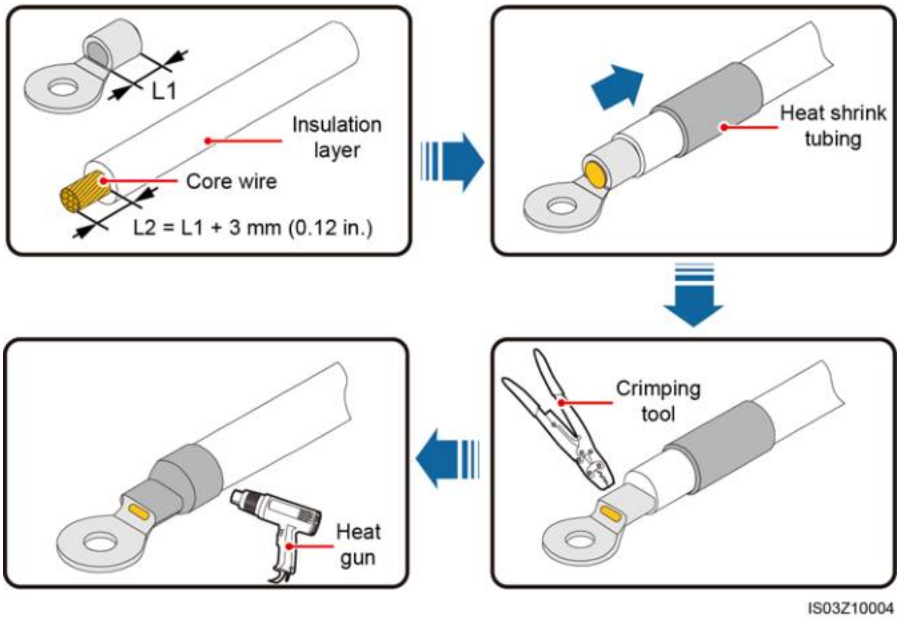
----End

5.2 Crimping an OT Terminal

NOTICE

- Avoid scratching the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrinkable tubing or PVC insulation tape. The heat shrink tubing is used as an example.
- When using a heat gun, protect the devices from being scorched.

Figure 5-4 Crimping an OT terminal

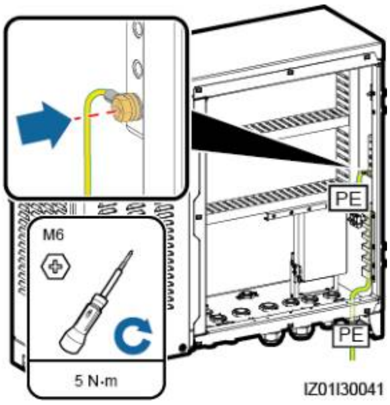


5.3 Connecting the PE Cable

NOTICE

- Connect a PE cable to the nearest ground point or the ground bar in the transformer station.
- To enhance the corrosion resistance of a ground terminal, you are advised to apply silica gel or paint on it after connecting the ground cable.

Figure 5-5 Connecting a PE cable



5.4 Connecting the Communications Cables for the Fiber Ring Network

Connecting the Optical Jumpers

Step 1 Obtain optical modules from the fitting bag for optical ring switching.

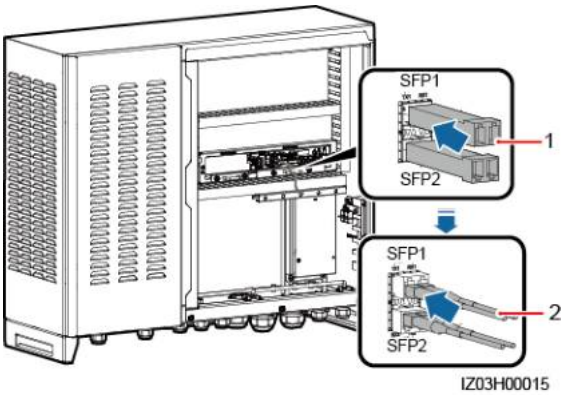
Step 2 Insert an optical module into the SFP1 or SFP2 port. If there are two modules, insert one into each port.

NOTICE

- Pay attention to the directions of the optical modules. When inserting an optical module into the SFP1 port, ensure that the side with a label faces upward. When inserting an optical module into the SFP2 port, ensure that the side with a label faces downward.
- Snap the optical module into place. Then pull it back to ensure that it is secure.

Step 3 Connect the optical jumpers delivered with the optical modules to the ports on the optical modules.

Figure 5-6 Connecting optical jumpers



(1) Optical module (2) Optical jumper

----End

Connecting the Cables to the ATB

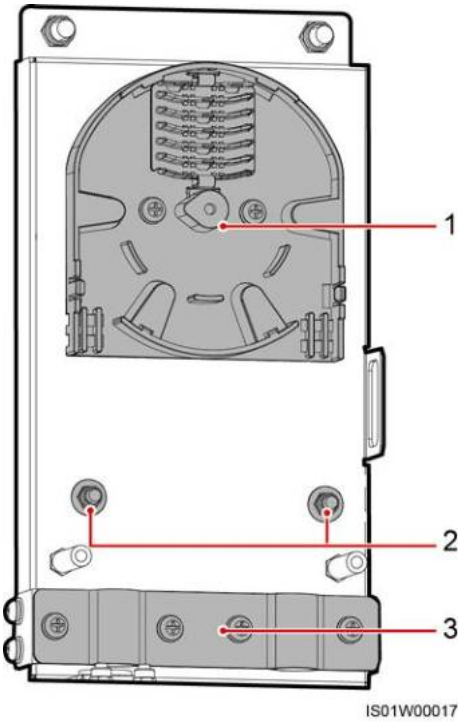
NOTICE

- As optical cables are hard, prepare optical cables before routing them into the SACU.
- Only professionals are allowed to connect optical cables.

NOTE

Connect two optical cables in a ring optical network, and connect one optical cable in a star optical network.

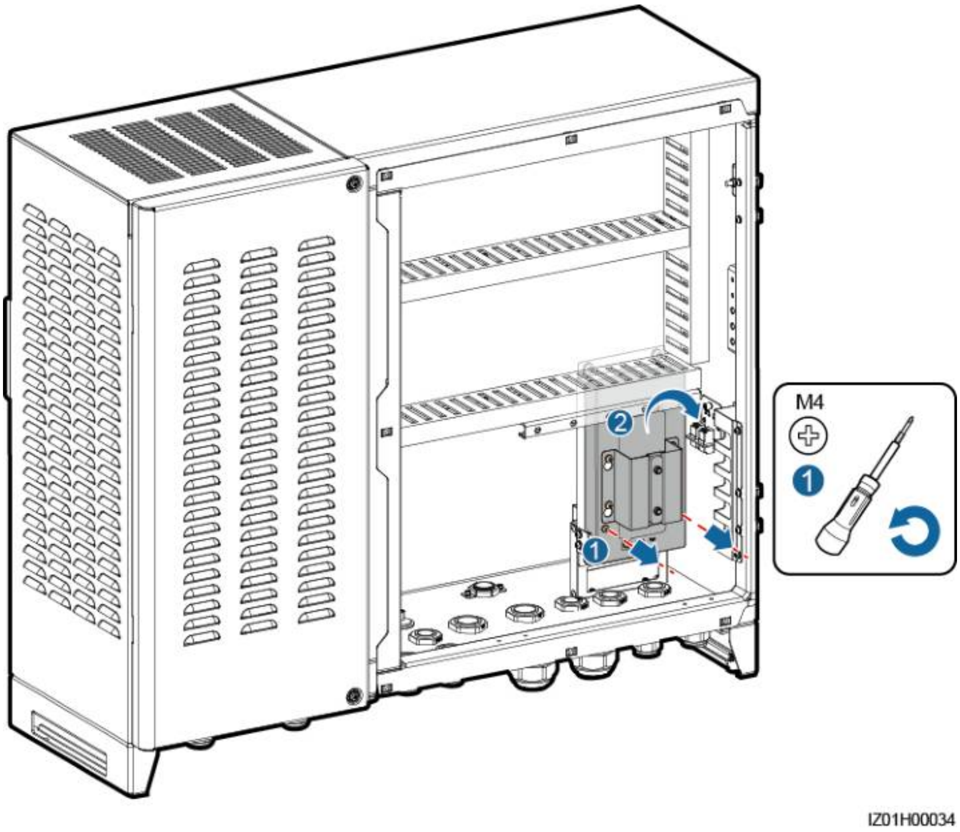
Figure 5-7 ATB interior



(1) Fiber spool (2) Fixing points for internal steel wires of optical cables (3) Cable clip

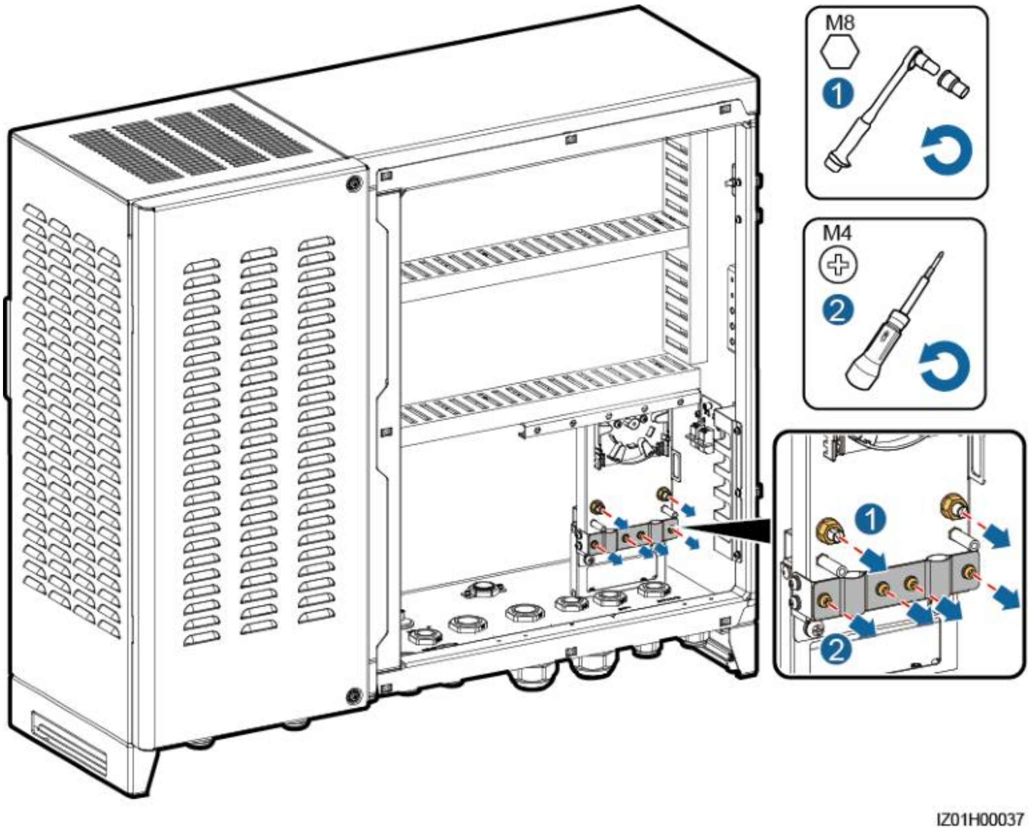
Step 1 Remove the external mechanical parts from the ATB.

Figure 5-8 Removing external mechanical parts



Step 2 Remove the optical cable fastener.

Figure 5-9 Removing a fastener



Step 3 Connect one end of the optical jumper to the fiber adapter.

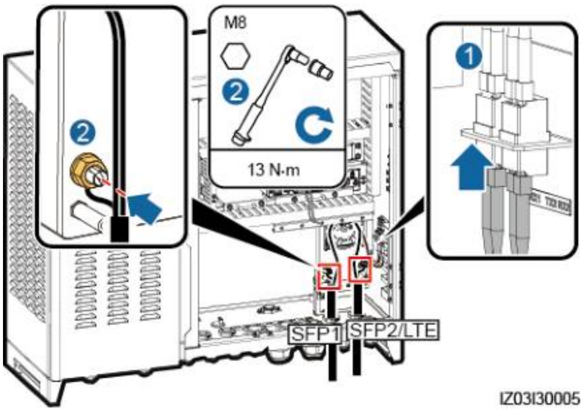
Step 4 Route the other end of the optical jumper through the cable hole on the side of the ATB, and connect the cable to the ATB.

Step 5 Connect the peripheral optical cable to the ATB, splice the optical cable and the optical jumper, and wind the spliced cable around the fiber spool on the ATB.

NOTICE

Only professionals are allowed to splice fibers.

Figure 5-10 Connecting optical cables



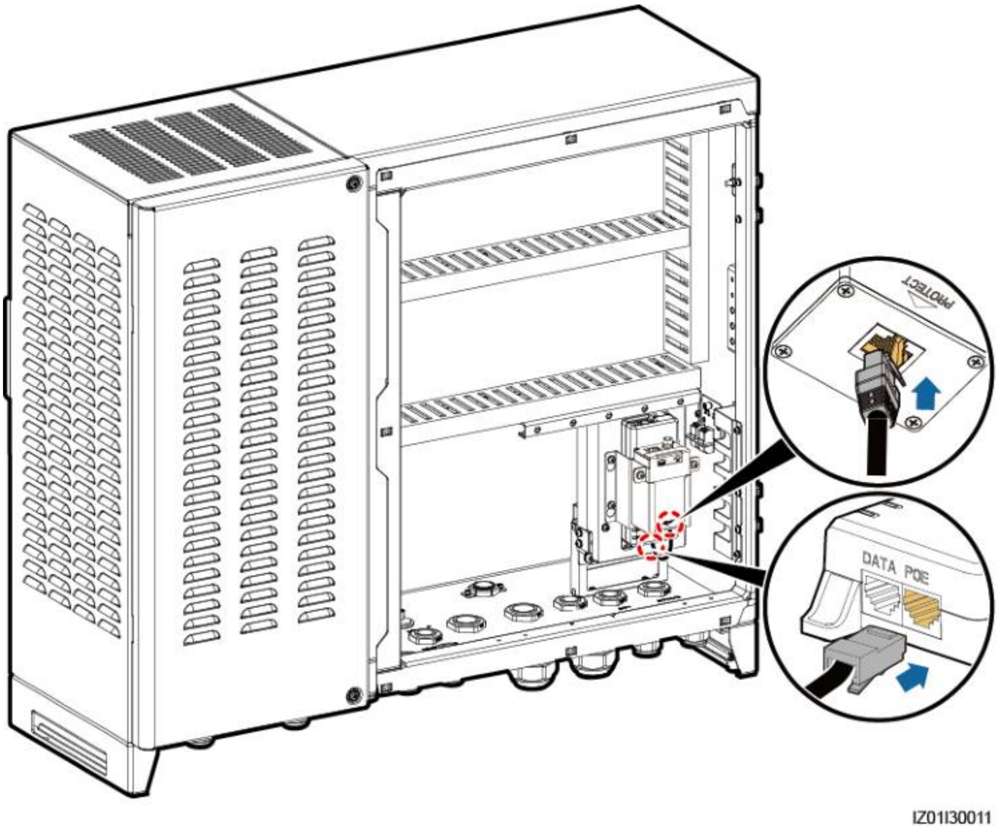
Step 6 Check that the cables are connected correctly and securely. Then reinstall the optical cable fastener and external mechanical parts.

----End

5.5 Connecting the 4G LTE Cable (with a PoE SPD)

Step 1 Connect the POE port on the PoE module to the PROTECT port on the PoE SPD using the network cable delivered with the PoE SPD.

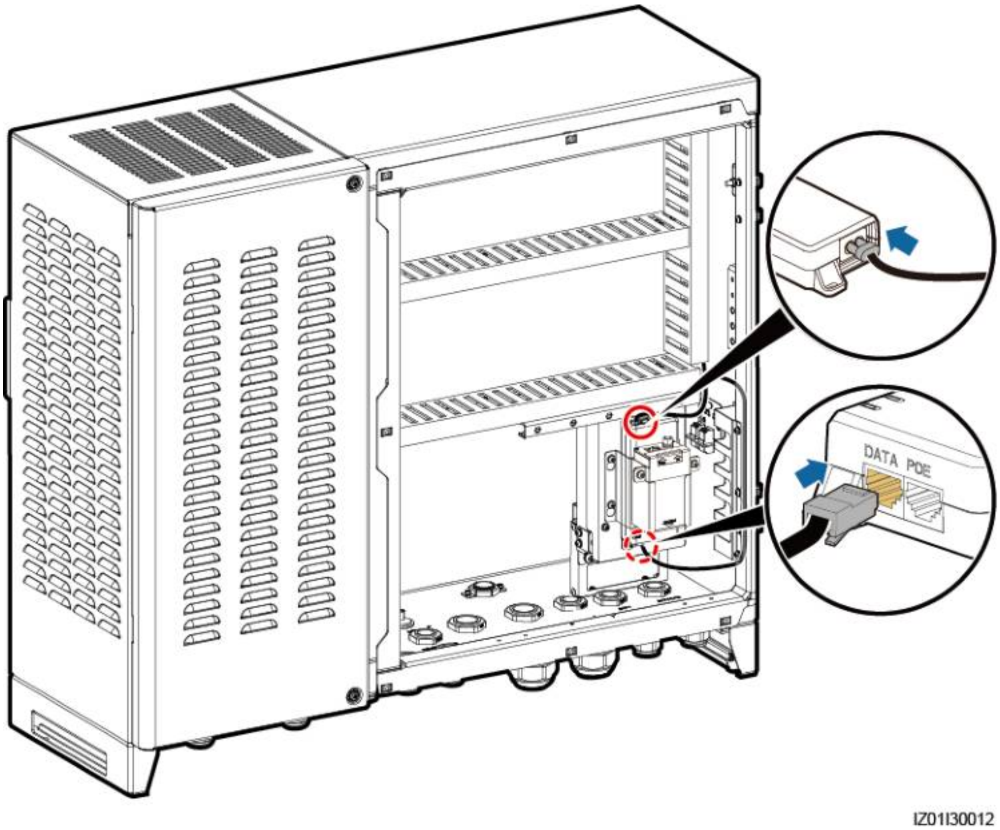
Figure 5-11 Connecting a PoE module to a PoE SPD



Step 2 Connect the factory-installed network cable on the SmartLogger to the DATA port on the PoE module.

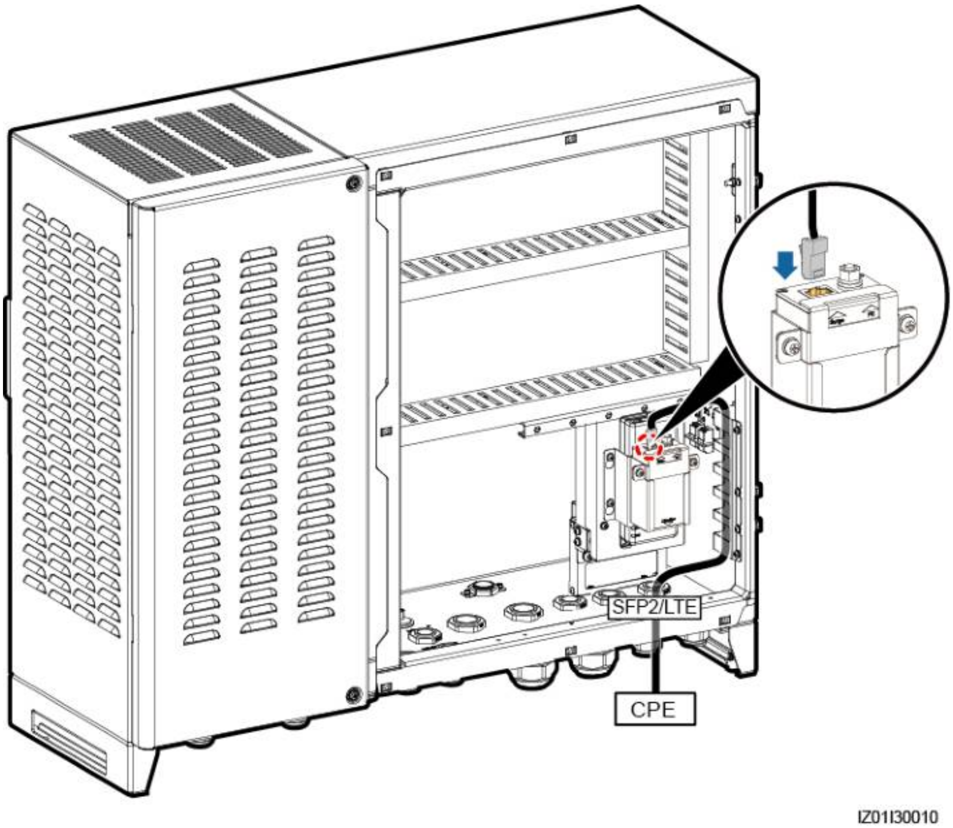
Step 3 Connect the factory-installed power cable on the SmartLogger to the PoE module.

Figure 5-12 Connecting cables to the PoE module



Step 4 Connect the network cable delivered with the CPE to the Surge port on the PoE SPD.

Figure 5-13 Connecting the CPE network cable



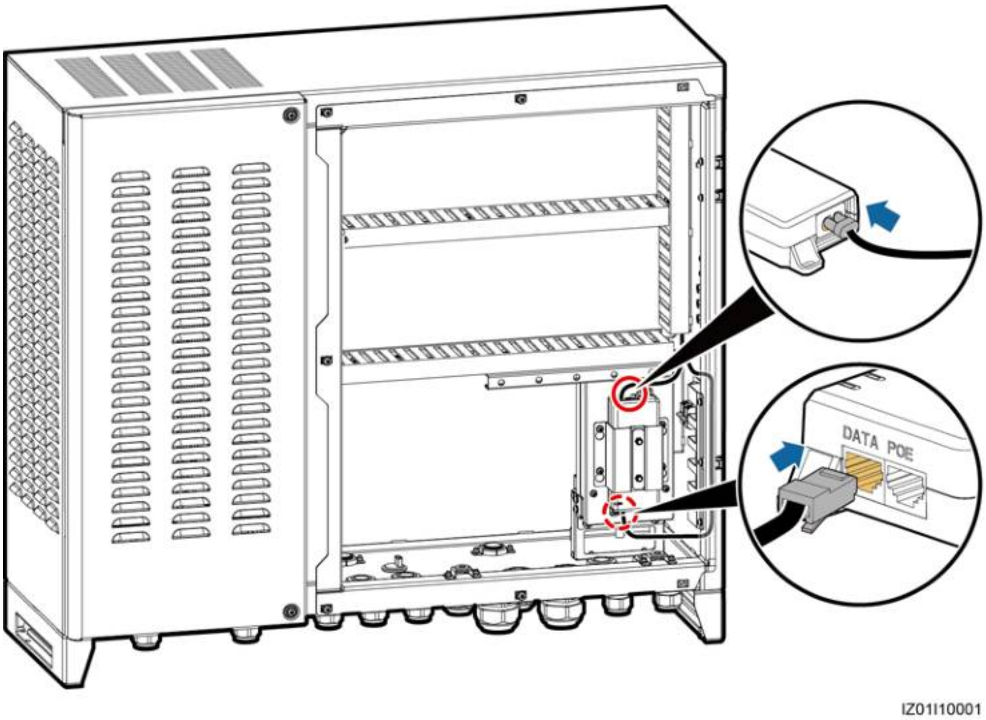
----End

5.6 Connecting the 4G LTE Cable (Without a PoE SPD)

Step 1 Connect the factory-installed network cable on the SmartLogger to the DATA port on the PoE module.

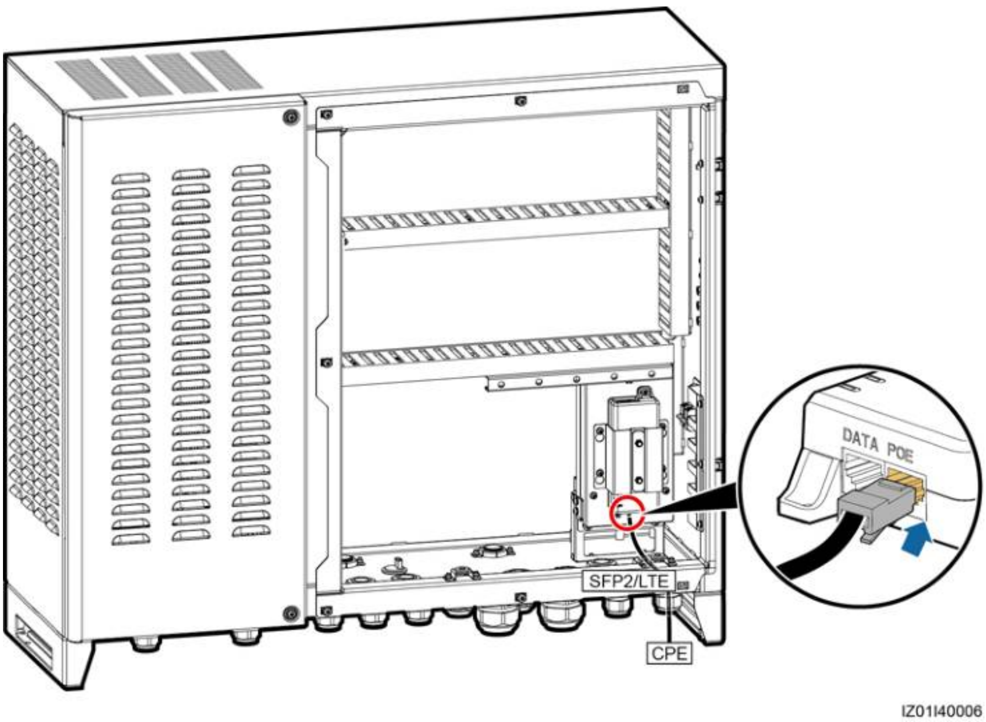
Step 2 Connect the factory-installed power cable on the SmartLogger to the PoE module.

Figure 5-14 Connecting cables to the PoE module



Step 3 Connect the network cable delivered with the CPE to the PoE port on the PoE module.

Figure 5-15 Connecting a CPE network cable



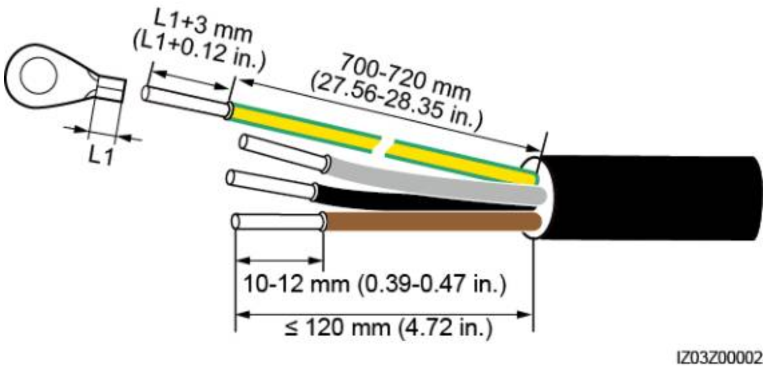
----End

5.7 Connecting the Three-Phase AC Power Cable

- For the SACU that houses one PID module, connect the three-phase AC power cable to the FU01 switch, and the FE wire to FE01 on the FE bar.
- For the SACU that houses two PID modules, connect the three-phase AC power cable of the first route to the FU01 switch, and the corresponding FE wire to FE01 on the FE bar. Connect the three-phase AC power cable of the second route to the FU02 switch, and the corresponding FE wire to FE02 on the FE bar.
- This section describes how to connect three-phase AC power cables for the SACU with two PID modules. For details about the single PID module situation, refer to the way of connecting the first route of three-phase AC power cable.

Step 1 Prepare a cable.

Figure 5-16 Length for cable stripping



Step 2 Crimp an OT terminal.

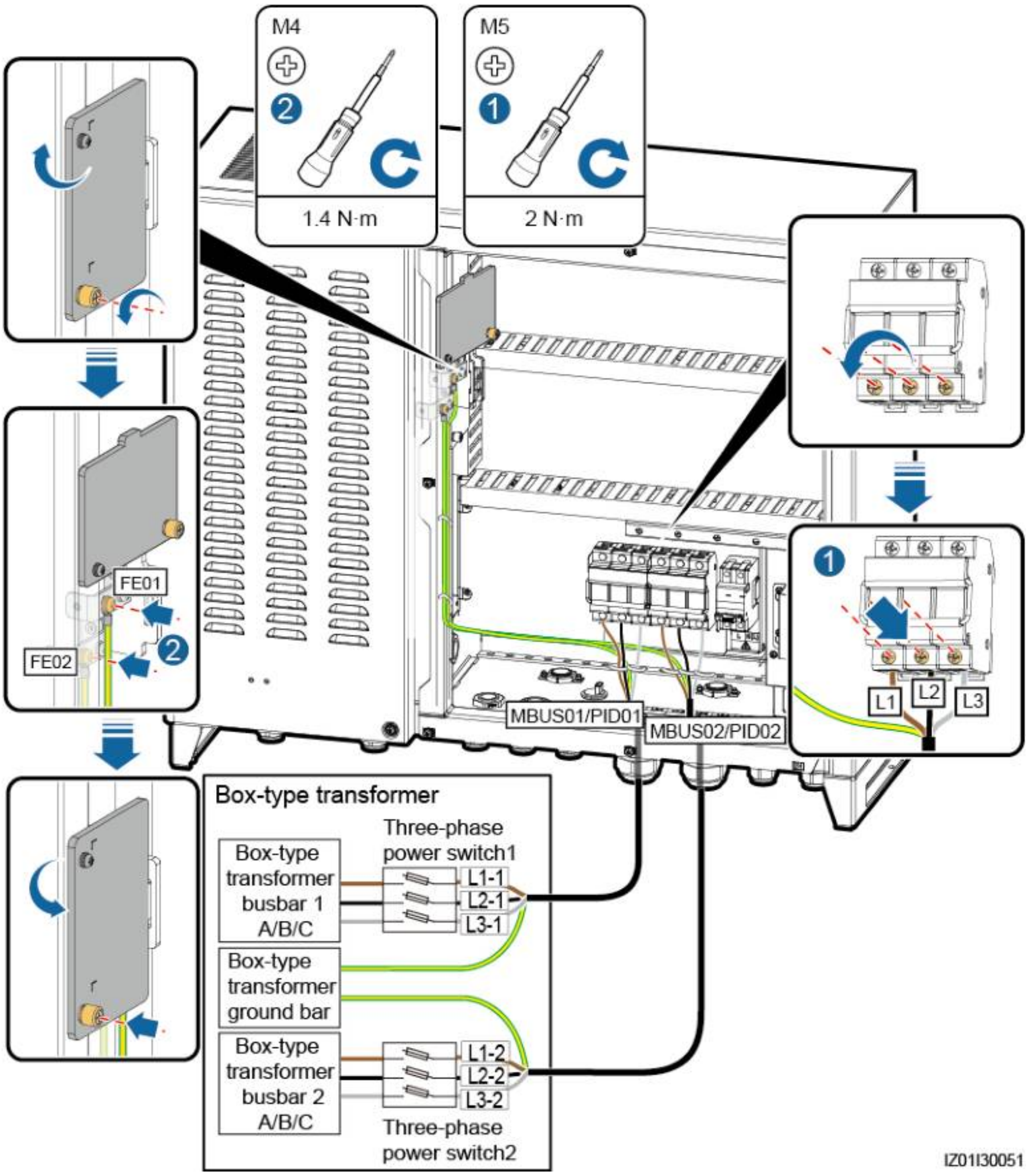
Step 3 Connect the L1, L2, and L3 wires to the three-phase input switch, and the FE wire to the FE bar.

NOTICE

- Connect the L1-1, L2-1, and L3-1 wires from the FU01 switch respectively to ports A, B, and C on the transformer station busbar 1 over a three-phase power switch.
- Connect the L1-2, L2-2, and L3-2 wires from the FU02 switch respectively to ports A, B, and C on the transformer station busbar 2 over a three-phase power switch.
- Connect the FE wire for the PID module to the ground bar in the transformer station.
- Ensure that the L1, L2, and L3 wires are connected in correct phase sequence.
- Do not mix up the wire to the FE01 port with the wire to the FE02 port.

Step 4 Bind the cable.

Figure 5-17 Connecting a cable



----End

5.8 Connecting the Peripheral RS485 Communications Cables

Connect peripheral RS485 communications cables to the JX01 terminal block. All RS485 communications cables are connected in the same way. This section describes how to connect two RS485 communications cables.

Table 5-1 Definition of the JX01 terminal block

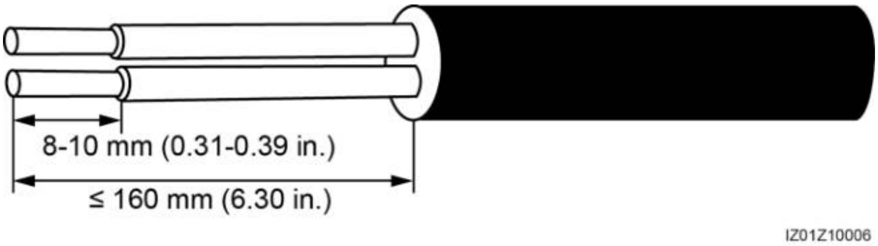
No.	Port on the JX01 Terminal Block	Definition
1	RS485-1 (+)	RS485A, RS485 differential signal+
2	RS485-1 (–)	RS485B, RS485 differential signal–
3	RS485-2 (+)	RS485A, RS485 differential signal+
4	RS485-2 (–)	RS485B, RS485 differential signal–
5	RS485-3 (+)	RS485A, RS485 differential signal+
6	RS485-3 (–)	RS485B, RS485 differential signal–
7	RS485-4 (+)	RS485A, RS485 differential signal+
8	RS485-4 (–)	RS485B, RS485 differential signal–
9	RS485-5 (+)	RS485A, RS485 differential signal+
10	RS485-5 (–)	RS485B, RS485 differential signal–
11	RS485-6 (+)	RS485A, RS485 differential signal+
12	RS485-6 (–)	RS485B, RS485 differential signal–

NOTICE

- For the SmartACU2000D-D-01, do not connect a peripheral RS485 communications cable to the RS485-1 port (ports 1 and 2 on the JX01 terminal block), because the PID01 communications cable has been connected to this port.
- For the SmartACU2000D-D-03, do not connect a peripheral RS485 communications cable to the RS485-1 and RS485-2 ports, because the PID01 communications cable has been connected to the RS485-1 port (ports 1 and 2 on the JX01 terminal block) and the PID02 communications cable has been connected to the RS485-2 port (ports 3 and 4 on the JX01 terminal block).
- For the SmartACU2000D-D-03, do not connect a peripheral RS485 communications cable to the RS485-3 port (ports 5 and 6 on the JX01 terminal block) because the communications cable of the MBUS CCO module has been connected to this port.
- JX01 ports 7, 8, 9, 10, 11, and 12 on the SmartACU2000D-D-03 can be connected to the RS485 cable.
- JX01 ports 7, 8, 9, 10, 11, and 12 on the SmartACU2000D-D-01 can be connected to the RS485 cable only after the SmartModule is installed.

Step 1 Prepare the communications cable.

Figure 5-18 Length for cable stripping

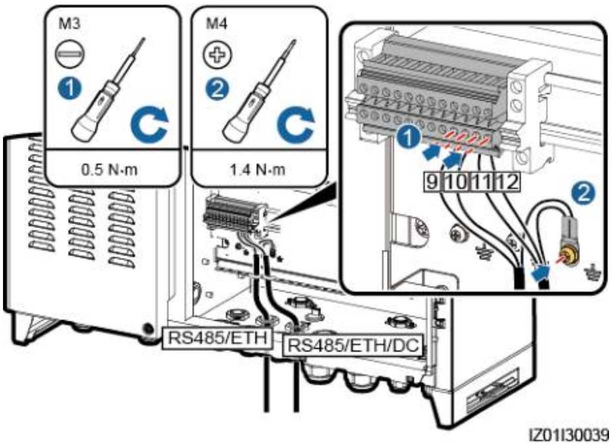


Step 2 Connect the communications cable to the JX01 terminal block.

Step 3 Crimp an OT terminal on the shield layer, and connect the shield layer to the cabinet ground point.

Step 4 Bind the communications cable.

Figure 5-19 Connecting RS485 communications cables



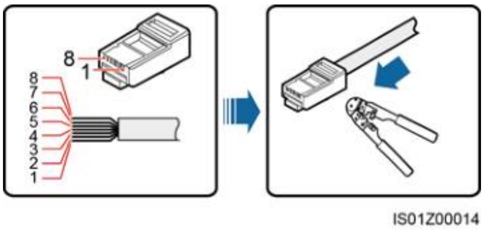
----End

5.9 (Optional) Connecting the Peripheral Network Cable

Connect peripheral network cables to ports FE2 to FE5 on the Ethernet switch. All network cables can be connected in the same way.

Step 1 Prepare a network cable.

Figure 5-20 Wiring sequence of an RJ45 connector



(1) White-and-orange	(2) Orange	(3) White-and-green	(4) Blue
(5) White-and-blue	(6) Green	(7) White-and-brown	(8) Brown

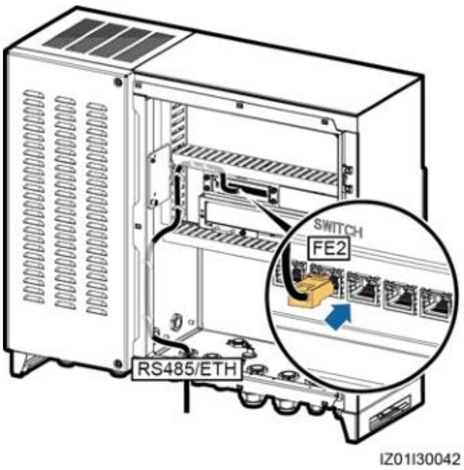
NOTE

Verify that the network cable functions properly using a network cable tester.

Step 2 Connect the peripheral network cable to the FE2 port on the Ethernet switch.

Step 3 Bind the network cable.

Figure 5-21 Connecting a network cable

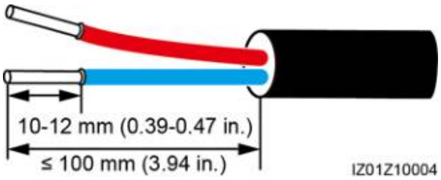


----End

5.10 (Optional) Connecting the DC Output Power Cable to the 24 V Power Module

Step 1 Prepare a cable.

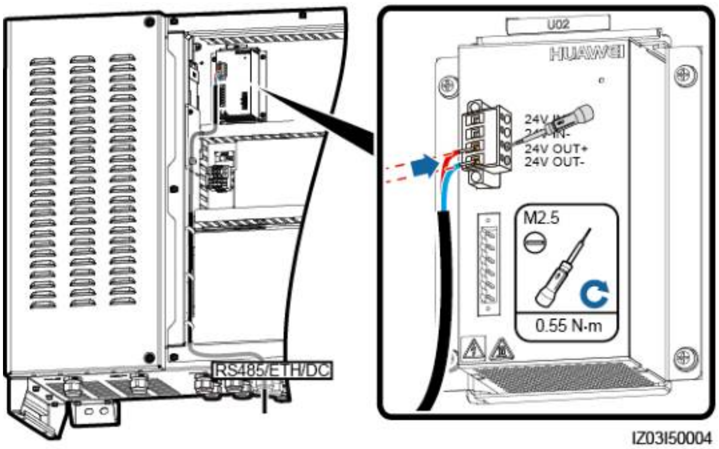
Figure 5-22 Length for cable stripping



Step 2 Connect the cable to the 24V OUT+ and 24V OUT- ports on the power module.

Step 3 Bind the cable.

Figure 5-23 Connecting a DC output power cable to the 24 V power module

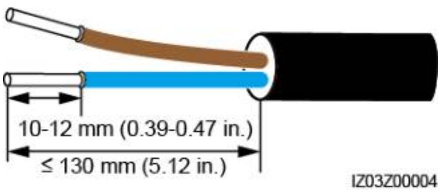


----End

5.11 Connecting the Single-Phase Power Cable

Step 1 Prepare a cable.

Figure 5-24 Length for cable stripping



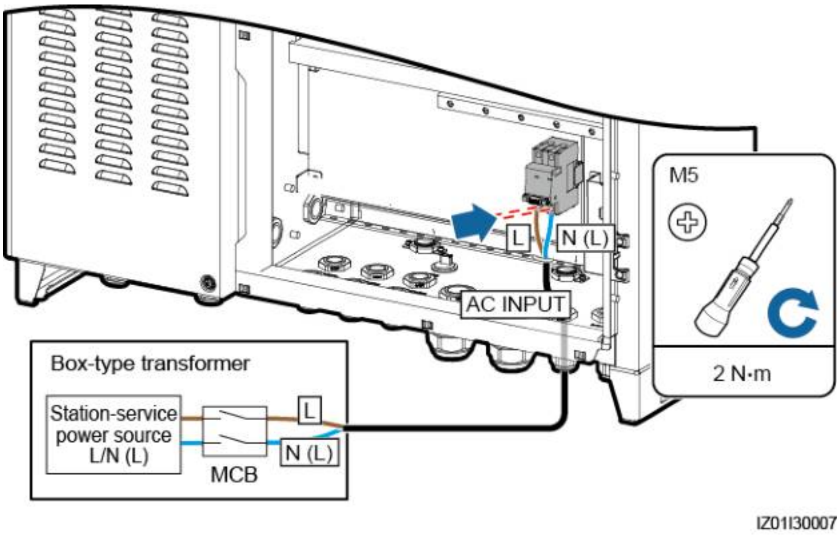
Step 2 Connect the cable to the single-phase input switch.

NOTICE

Connect the L and N (L) wires to the L and N (L) terminals of the station-service power source for the transformer station through an MCB.

Step 3 Bind the cable.

Figure 5-25 Connecting a cable



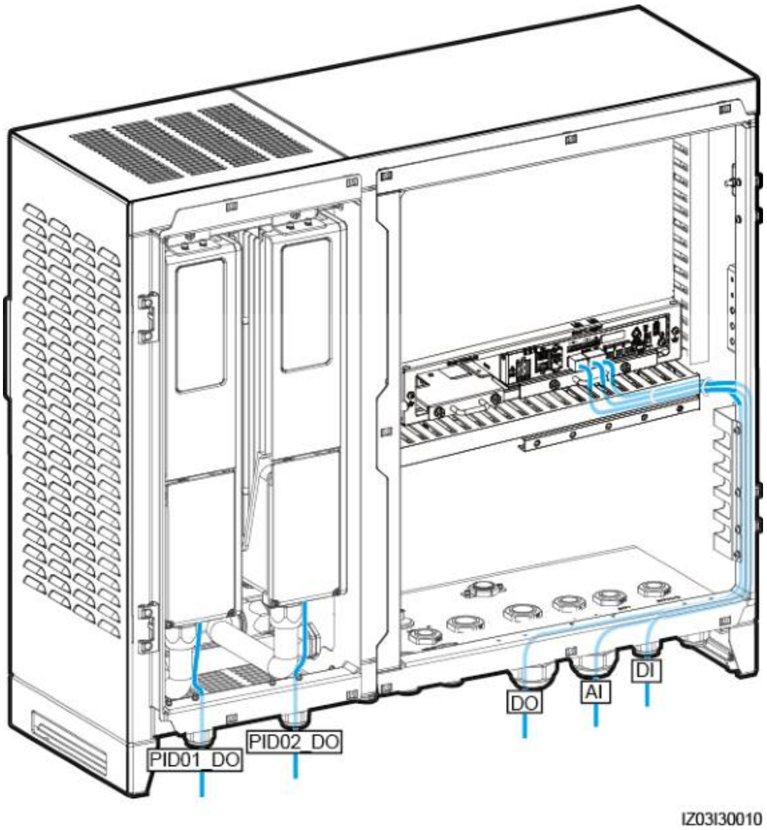
----End

5.12 Connecting DO/DI/AI Cables

The SACU reserves the waterproof connectors for the PID01_DO, PID02_DO, DO, DI, and AI cables. Cabling routes are provided for the signal cables.

For details about how to prepare and connect the cables, see the *SmartPID2000 User Manual* and *SmartLogger3000 User Manual*.

Figure 5-26 Cabling routes



6 System Commissioning

6.1 Checking Before Power-On

No.	Acceptance Criteria
1	The cabinet and all components are installed properly.
2	All upstream switches for the cabinet and all switches inside the cabinet are OFF.
3	All cables are connected correctly and securely, without exposed metal.
4	Cables are bound neatly, and cable ties are secured evenly and properly in the same direction.
5	Routing for the power cables and signal cables meets the requirements for routing strong-current and weak-current cables and complies with the cable routing plan.
6	The locking caps of the used waterproof connectors are tightened and sealed. Idle waterproof connectors are plugged and the locking caps are tightened.
7	The cabinet interior is clean, without dust, dirt, or foreign matter.
8	The paint on the cabinet exterior is intact. If paint flakes off, repaint that area to prevent corrosion.

6.2 Powering On the System

- You have completed the power-on check.
- You have put on proper PPE.
- Ensure that the power voltage of the SACU is within the operating voltage range, and the three-phase input voltage is within the operating voltage range of the SmartMBUS and PID module.

Procedure

Step 1 Turn on the single-phase power switch that controls the power supply from the remote transformer station to the SACU.

Step 2 Turn on the three-phase power switch that controls the power supply from the remote transformer station to the SACU.

Step 3 Check that the input voltages of all switches of the SACU are within appropriate operating voltage ranges using a multimeter.

Step 4 Turn on the QF03 single-phase input switch in the SACU.

Step 5 Turn on the PID switch in the SACU.

- Turn on QF01 for the SmartACU2000D-D-01.
- Turn on QF01 and QF02 for the SmartACU2000D-D-03.

Step 6 Turn on the three-phase input switch in the SACU.

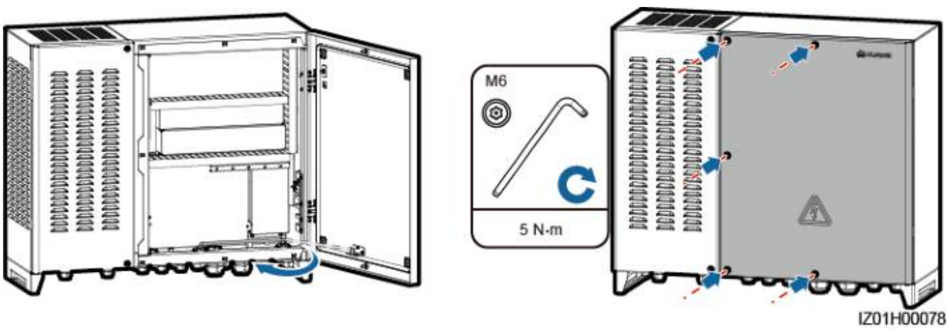
- Turn on FU01 for the SmartACU2000D-D-01.
- Turn on FU01 and FU02 for the SmartACU2000D-D-03.

----End

6.3 Closing the Cabinet Door

Retract the support bar, close the cabinet door, and tighten the screws.

Figure 6-1 Closing the main cabinet door



6.4 Powering Off the System

Step 1 Turn off the single-phase power switch that controls the power supply from the remote transformer station to the SACU.

Step 2 Turn off the three-phase power switch that controls the power supply from the remote transformer station to the SACU.

Step 3 Turn off the QF03 single-phase input switch in the SACU.

Step 4 Turn off the three-phase input switch in the SACU.

- Turn off FU01 for the SmartACU2000D-D-01.
- Turn off FU01 and FU02 for the SmartACU2000D-D-03.

Step 5 Turn off the PID switch in the SACU.

- Turn off QF01 for the SmartACU2000D-D-01.
- Turn off QF01 and QF02 for the SmartACU2000D-D-03.

----End

7 System Maintenance

7.1 Routine Maintenance

DANGER

- Before cleaning the system, connecting cables, and maintaining the grounding reliability, power off the system to ensure that the SACU is de-energized and will not cause personal injury.
- If you need to open the cabinet door on rainy or snowy days, take protective measures to prevent rain or snow from entering the cabinet. If it is impossible to take protective measures, do not open the cabinet door on rainy or snowy days.

Table 7-1 Maintenance checklist

Check Item	Check That	Maintenance Interval
Cabinet	• The SACU exterior is not damaged or deformed. • There is no dust or dirt in the SACU.	Once every twelve months
System running status	• All devices in the SACU operate properly. • The SPD works properly.	Once every six months
Electrical connections	• Cables are secured. • Cables are intact and especially the parts touching the metallic surface are not scratched. • Idle waterproof connectors are plugged and the locking caps are tightened. • The cover on the USB port is tightened.	Once every twelve months
Grounding reliability	All ground cables are reliably connected.	Once every twelve months

7.2 Troubleshooting

Symptom	Cause	Troubleshooting
The three-phase input switch of the SACU is not powered on.	1. The power supply to the upstream transformer station of the three-phase input switch is abnormal. 2. The three-phase input switch is faulty.	1. Use a multimeter to check whether the power supply to the upstream transformer station of the three-phase input switch is normal. 2. Replace the three-phase input switch.
The input switch (QF01 or QF02) of the PID module is not powered on.	1. The input switch of the PID module is faulty. 2. The cable between the three-phase input switch and the input switch of the PID module is loose or disconnected.	1. Replace the input switch of the PID module. 2. Check the cable between the three-phase input switch and the input switch of the PID module. If the cable is loose or disconnected, secure it.
The PID module of the SACU is not powered on.	1. The grid three-phase input ports for the PID module are disconnected from cables or loosely connected to cables. 2. The power grid is disconnected from power. 3. The PID module is faulty.	1. If the cable is loose or disconnected, secure it. 2. Check whether power is available to the power grid. 3. Contact the dealer or Huawei technical support.
The single-phase input switch of the SACU is not powered on.	1. The power supply to the upstream transformer station of the single-phase input switch is abnormal. 2. The single-phase input switch is faulty.	1. Use a multimeter to check whether the power supply to the upstream transformer station of the single-phase input switch is normal. 2. Replace the single-phase input switch.
The PoE module is not powered on.	The power cable of the PoE module is loose or disconnected.	If the cable is loose or disconnected, secure it.
The power adapter or 24 V DC power module fails to supply power.	1. The input and output power cables of the 24 V DC power module are loose or disconnected. 2. The power adapter or 24 V DC power module is faulty.	1. If the cable is loose or disconnected, secure it. 2. Replace the power adapter or 24 V DC power module.

Symptom	Cause	Troubleshooting
The SmartLogger in the SACU is not powered on.	1. The DC output power cable for the power adapter does not connect to the 12V IN port on the SmartLogger. 2. The power cable is not connected to the AC power receiving port on the power adapter. 3. The AC input power cable is not connected to the AC socket. 4. The power adapter is faulty. 5. The SmartLogger is faulty.	1. Check the power adapter and connect the DC output power cable for the power adapter to the 12V IN port on the SmartLogger. 2. Check whether the power cable is connected to the AC power receiving port on the power adapter. 3. Check whether the power cable is connected to the AC socket. 4. Replace the power adapter. 5. Contact the dealer or Huawei technical support.
No communication between the SmartLogger and the Ethernet switch	1. The network cable between the SmartLogger and the Ethernet switch is not properly connected. 2. The IP address of the SmartLogger is not configured or is not in the LAN.	1. Check whether the network port indicators on the SmartLogger and Ethernet switch blink properly. If not, connect the network cable to another FE port on the Ethernet switch or replace the network cable and try again. 2. On the SUN2000 app, check whether the IP address of the SmartLogger is correctly set. If not, set the IP address again. 3. Log in to the SmartLogger WebUI over the LAN port (default IP address of the LAN port: 192.168.8.10) and check whether the IP address of the SmartLogger is correct. If not, set the IP address again. 4. Connect the PC to the Ethernet switch and ping the IP address of the SmartLogger. If the communication is abnormal, replace the network cable and try again.

Symptom	Cause	Troubleshooting
No communication between the SmartLogger and the SmartModule	1. The network cable between the SmartLogger and the SmartModule is not properly connected. 2. The communication certificate has expired.	1. Check whether the network port indicators on the SmartLogger and SmartModule blink properly. If not, connect the network cable to another GE port on the SmartModule or replace the network cable and try again. 2. Log in to the SmartLogger WebUI or SUN2000 app and check whether a communication certificate expiration alarm is generated. If yes, reload the certificate. 3. Contact the dealer or Huawei technical support.

7.3 Component Replacement

NOTICE

- Do not perform operations with power on because high voltage exists during the running of the device.
- Before replacing a component, ensure that a spare component of the same model is available and functional.
- Before replacing a component, power off the SACU. Wait at least 3 minutes after the power-off to ensure that the SACU is de-energized.
- After replacing a component, check the SACU before powering it on to ensure that the new component works properly.
- Dispose of faulty components in accordance with the local disposal act for waste electrical equipment.

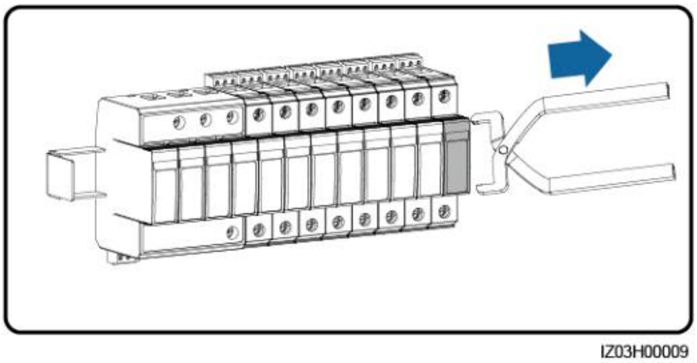
7.3.1 Replacing the Single/Three-Phase SPD

NOTE

- An SPD consists of a surge protection module and a base.
- If an SPD is damaged or its indication window is displayed in red, the SPD is deemed unavailable and needs to be replaced.
- A single-phase SPD is replaced in the same way as a three-phase SPD. This section describes how to replace a single-phase SPD.

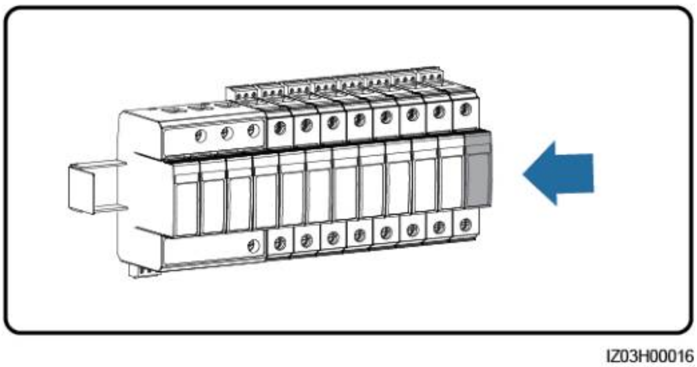
Step 1 Remove the faulty surge protection module from the SPD.

Figure 7-1 Removing a faulty surge protection module



Step 2 Install a new surge protection module.

Figure 7-2 Installing a new surge protection module



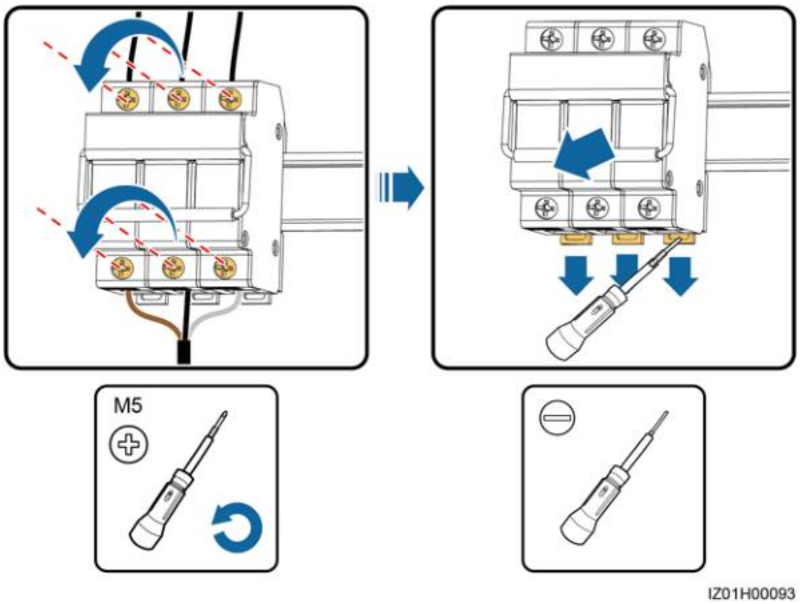
----End

7.3.2 Replacing the Knife Fuse Switch

Step 1 Disconnect the cables from the knife fuse switch and label the cables.

Step 2 Remove the faulty knife fuse switch.

Figure 7-3 Removing a faulty knife fuse switch



Step 3 Install a new knife fuse switch.

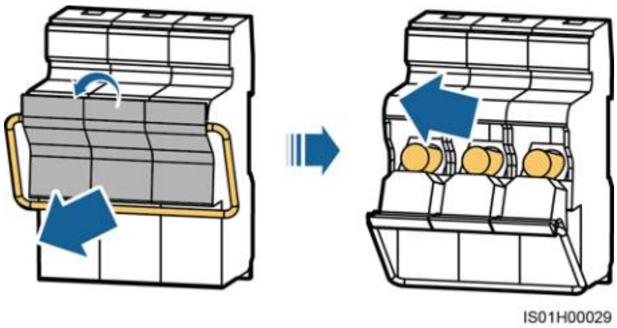
Step 4 Connect the cables based on their labels.

----End

7.3.3 Replacing the Fuse of a Knife Fuse Switch

Step 1 Open the knife fuse switch box and remove the faulty fuse.

Figure 7-4 Removing a faulty fuse



Step 2 Install a new fuse and close the knife fuse switch box.

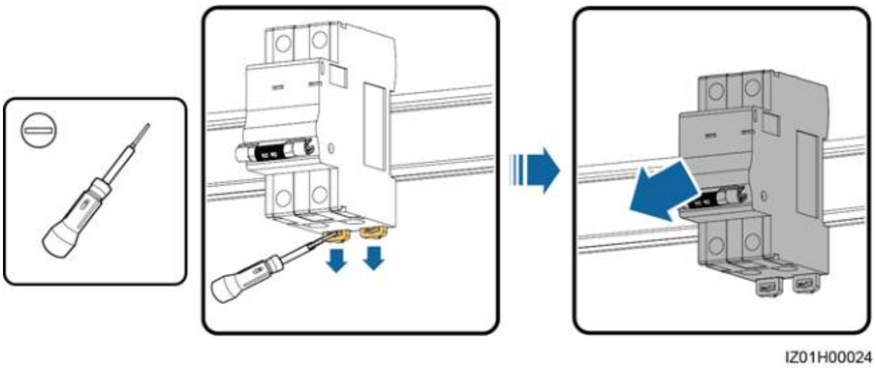
----End

7.3.4 Replacing the Single-Phase Input Switch

Step 1 Disconnect the cables from the single-phase input switch and label the cables.

Step 2 Remove the faulty single-phase input switch.

Figure 7-5 Removing a faulty single-phase input switch



Step 3 Install a new single-phase input switch.

Step 4 Connect the cables based on their labels.

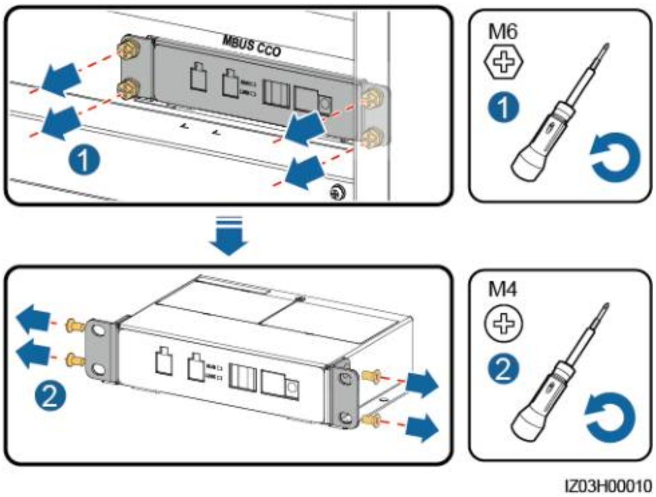
----End

7.3.5 Replacing the SmartMBUS CCO Module

Step 1 Disconnect the cables from the SmartMBUS CCO module and label the cables.

Step 2 Remove the faulty SmartMBUS CCO module and its mounting ears.

Figure 7-6 Replacing a faulty SmartMBUS CCO module



Step 3 Install the mounting ears on a new SmartMBUS CCO module.

Step 4 Installing a new SmartMBUS CCO module

Step 5 Connect the cables based on their labels.

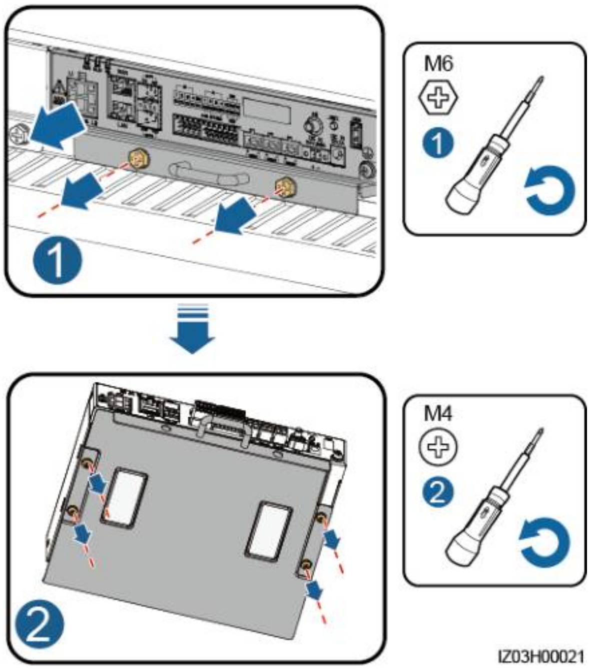
----End

7.3.6 Replacing the SmartLogger

Step 1 Disconnect the cables from the SmartLogger and label the cables.

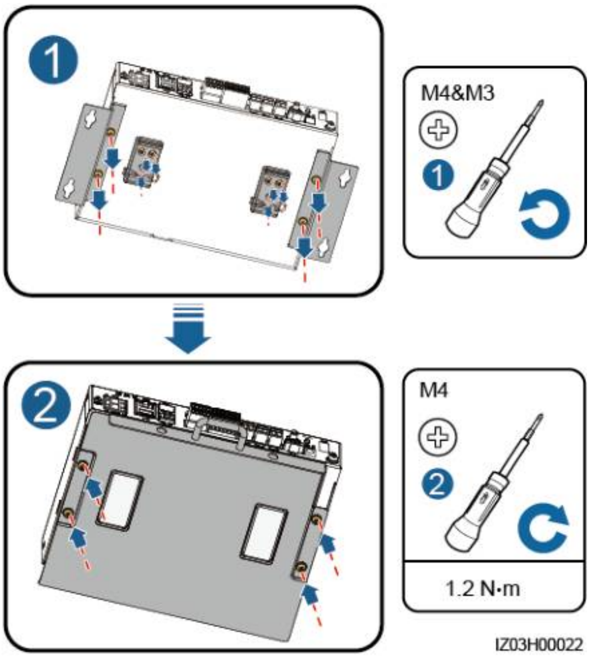
Step 2 Remove the faulty SmartLogger and its cabinet-mounting kit.

Figure 7-7 Removing a faulty SmartLogger



Step 3 Remove the mounting ears and guide rail–mounting kit from a new SmartLogger, and install the cabinet-mounting kit.

Figure 7-8 Replacing a SmartLogger



Step 4 Install the new SmartLogger in the cabinet.

Step 5 Connect the cables based on their labels.

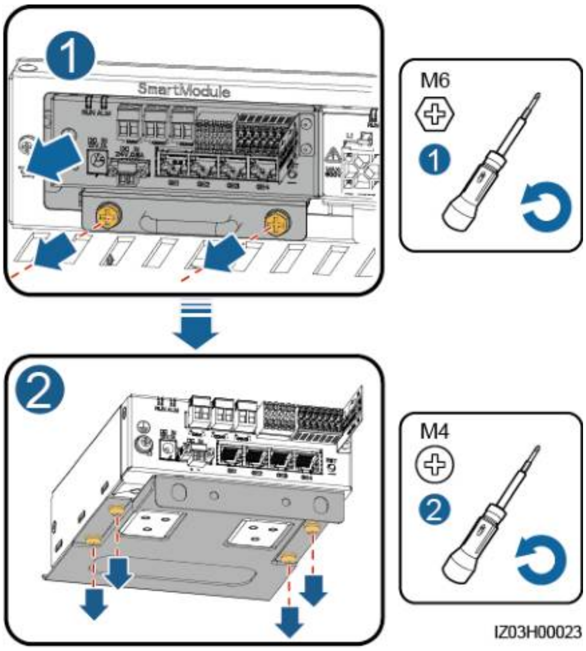
----End

7.3.7 Replacing the SmartModule

Step 1 Disconnect the cables from the SmartModule and label the cables.

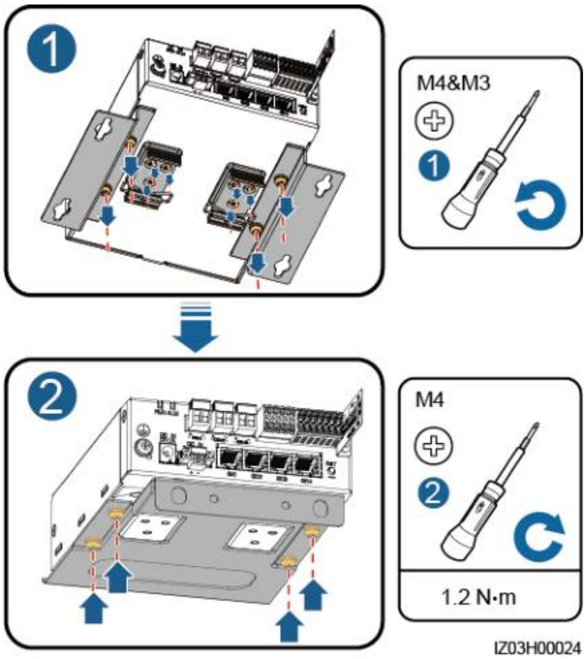
Step 2 Remove the faulty SmartModule and its cabinet-mounting kit.

Figure 7-9 Removing a faulty SmartModule



Step 3 Remove the mounting ears and guide rail–mounting kit from a new SmartModule, and install the cabinet-mounting kit.

Figure 7-10 Replacing a SmartModule



Step 4 Install the new SmartModule in the cabinet.

Step 5 Connect the cables based on their labels.

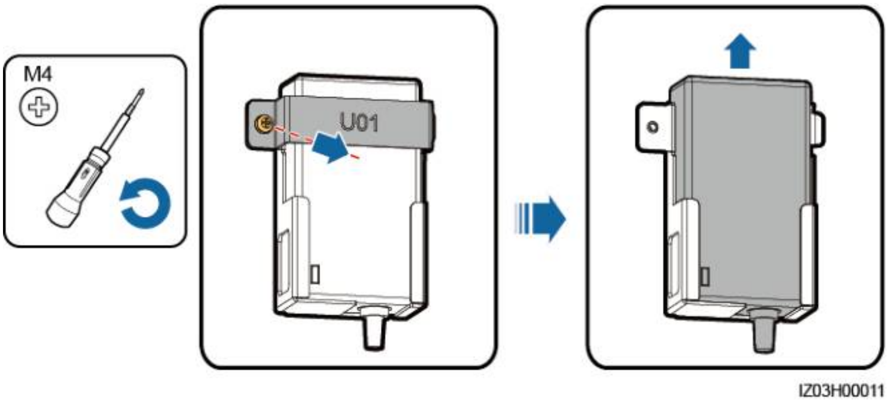
----End

7.3.8 Replacing the Power Adapter

Step 1 Disconnect the cables from the power adapter and label the cables.

Step 2 Remove the faulty power adapter.

Figure 7-11 Removing a faulty power adapter



Step 3 Install a new power adapter.

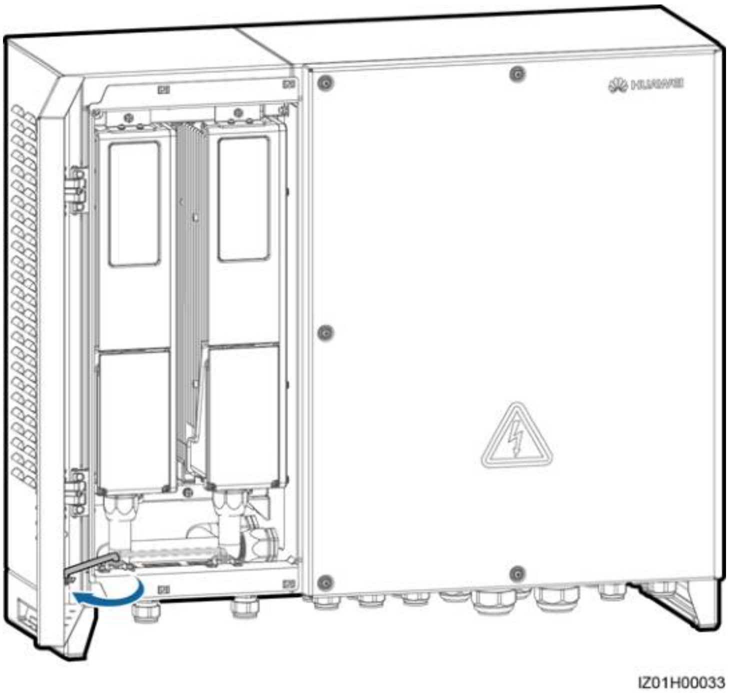
Step 4 Connect the cables based on their labels.

----End

7.3.9 Replacing the PID Module

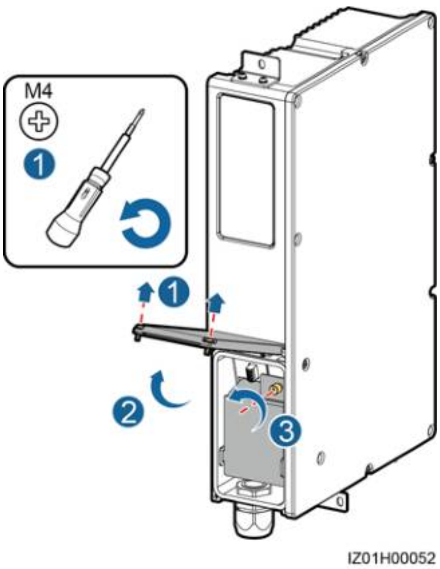
Step 1 Open the PID cabinet door and adjust the support bar.

Figure 7-12 Adjusting a support bar



Step 2 Open the maintenance compartment door of the PID module, and remove the cover from the connection box.

Figure 7-13 Removing the cover from a connection box

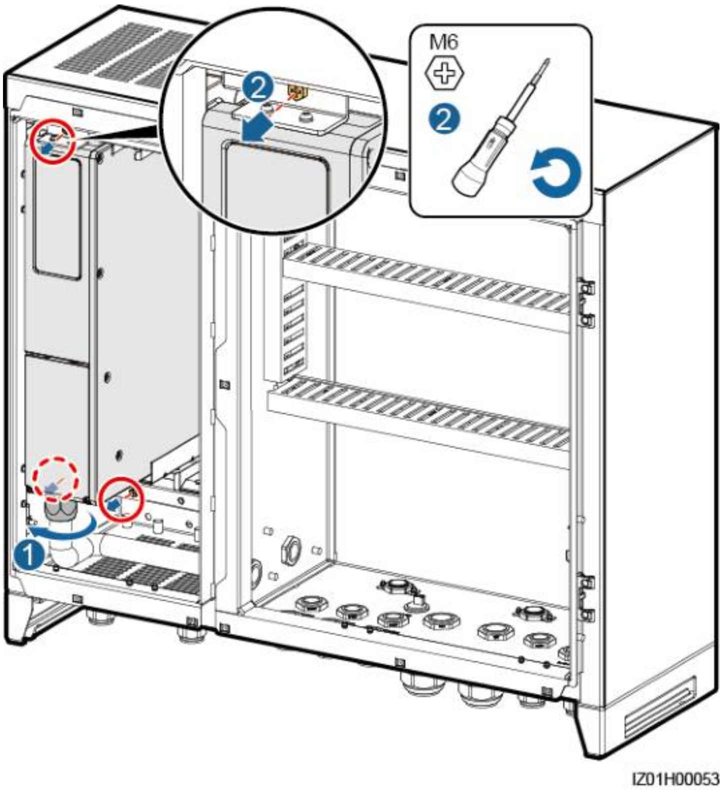


Step 3 Disconnect cables from the faulty PID module, and label the cables.

Step 4 Remove the pipe connector from the faulty PID module.

Step 5 Remove the faulty PID module.

Figure 7-14 Removing a faulty PID module



Step 6 Install a new PID module.

Step 7 Open the maintenance compartment door of the PID module, and remove the cover from the connection box.

Step 8 Connect the removed cables to the new PID module based on the cable labels.

Step 9 Secure the pipe connector to the PID module.

Step 10 Reinstall the connection box cover and close the maintenance compartment door of the PID module.

Step 11 Retract the support bar and close the PID module cabinet door.

NOTE

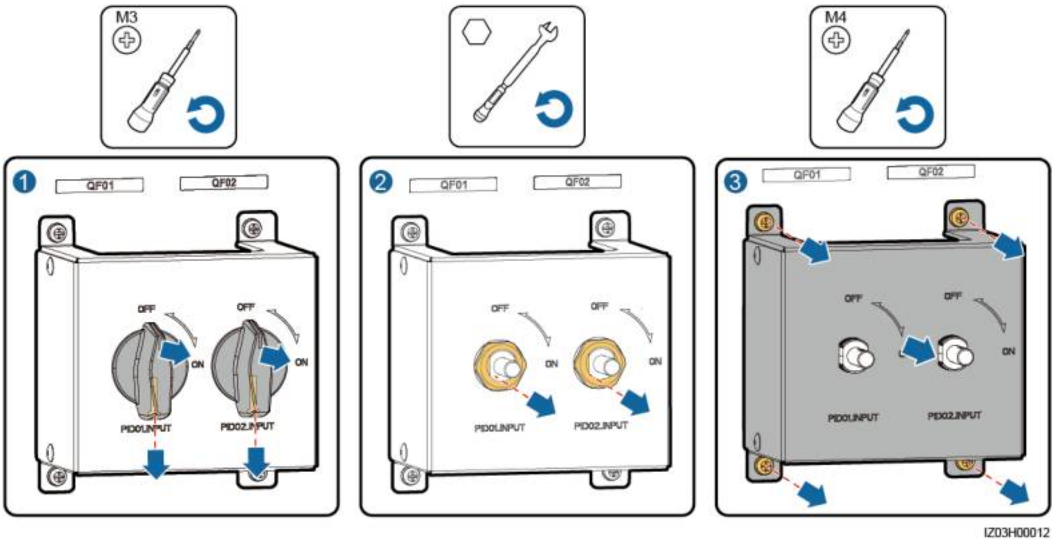
After ensuring that the PID module is powered on, set parameters by referring to the *SmartLogger3000 User Manual*.

----End

7.3.10 Replacing the PID Module Switch

Step 1 Remove the switch of the faulty PID module.

Figure 7-15 Removing the switch of the faulty PID module



Step 2 Disconnect cables from the switch of the faulty PID module, and label the cables.

Step 3 Connect the cables to a new PID module based on the cable labels.

Step 4 Installing a new PID module switch

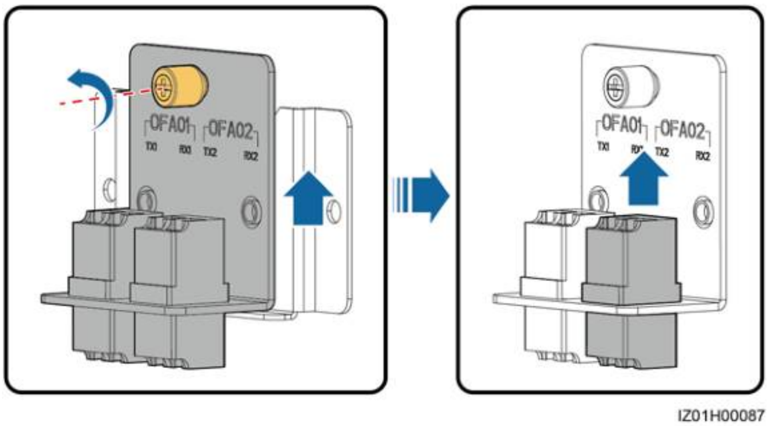
----End

7.3.11 Replacing the Fiber Adapter

Step 1 Disconnect the cables from the fiber adapter and label the cables.

Step 2 Remove the faulty fiber adapter.

Figure 7-16 Removing a fiber adapter



Step 3 Install a new fiber adapter.

Step 4 Connect the cables based on their labels.

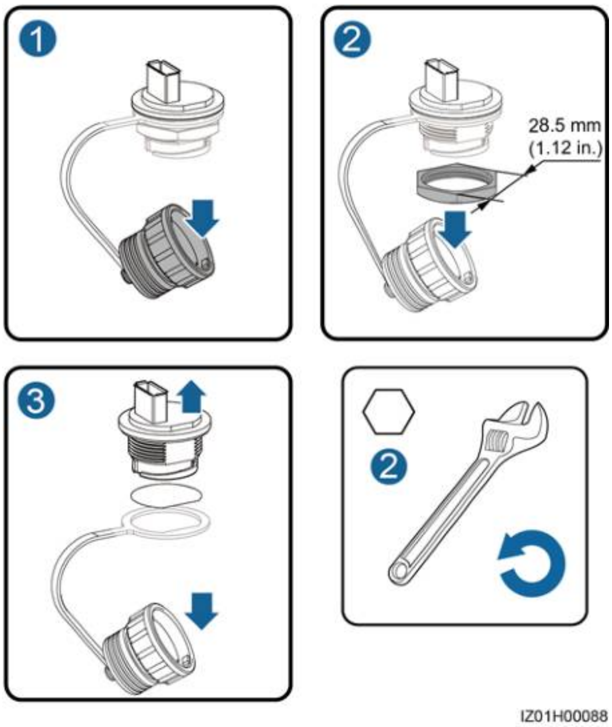
----End

7.3.12 Replacing the USB Port

Step 1 Disconnect the cable from the USB port, and label the cable.

Step 2 Remove the faulty USB port.

Figure 7-17 Removing a USB port



Step 3 Ensure that the rubber ring is on the inner side of the cabinet when installing a new USB port.

Step 4 Connect the cables based on their labels.

----End

8 Technical Specifications

Item	SmartACU2000D-D-01	SmartACU2000D-D-03
Communications mode	SFP/ETH/RS485/MBUS	
Number of MBUS routes	1	2
MBUS input (AC)	380–800 V; three-phase	
Number of PID routes	1	2
PID input (AC)	380–800 V; three-phase+FE	
Three-phase input power	480 W (maximum)	2 x 330 W (maximum)
Single-phase operating voltage[a]	AC input: 100–240 V	
Single-phase input power	110 W (maximum)	
Frequency	50 Hz/60 Hz	
Cable routing mode	Routed in and out from the bottom	
Operation and maintenance mode	Operated and maintained from the front	
Operating environment	Indoor and outdoor	
Maximum operating altitude	4000 m (13123.36 ft)	
Installation mode	Installed on a support, pole, or wall	
Dimensions (H x W x D, including the mounting plate)	770 mm x 880 mm x 369 mm (30.31 in. x 34.65 in. x 14.53 in.)	

Item	SmartACU2000D-D-01	SmartACU2000D-D-03
Net weight (including firestop putty, screws, and the mounting plate)	About 49 kg (108.03 lb)	About 61 kg (134.48 lb)
Enclosure ingress protection (IP) rating	IP65/Type 3R	
Operating humidity	4%–100% RH	
Operating temperature	–40°C to +60°C (–40°F to +140°F)	
Storage temperature	–40°C to +70°C (–40°F to +158°F)	
Note a: Supports a 24 V power system. DC input and output: 24–28 V DC; 70 W (maximum)		

A Acronyms and Abbreviations

A

AC	alternating current
AI	analog input
APP	application
ATB	access terminal box

C

CAT 5E	Category 5 enhanced
CCO	central controller
CPE	customer-premises equipment

D

DC	direct current
DI	digital input
DO	digital output

E

EMI	environmental monitoring instrument
ETH	Ethernet

L

LTE	Long Term Evolution

M

MBUS	monitoring bus

P

PE	protective earthing
PID	potential induced degradation
PoE	power over Ethernet

R

RH	relative humidity

S

SFP	small form-factor pluggable
SPD	surge protective device

W

WEEE	waste electrical and electronic equipment

Sistema Conectado a la Red: Parámetros de la simulación

Proyecto : **Grupo Conarpesa**

Lugar geográfico	**Puerto Madrin**		País	**Argentina**
Ubicación	Latitud	-42.71° S	Longitud	-65.03° W
Hora definido como	Hora Legal	Huso hor. UT-3	Altitud	17 m
	Albedo	0.20		
Datos climatológicos:	**Puerto Madrin**	Meteonorm 7.2, Sat=100% - Síntesis		

Variante de simulación : **2832-30--2-**

Fecha de simulación 22/01/25 16h37

Parámetros de la simulación	Tipo de sistema	**Sheds on ground**		
Orientación Plano Receptor	Inclinación	30°	Acimut	0°
Sheds configuration	N° de ramas	114	Identical arrays	
	Sheds spacing	4.88 m	Ancho receptor	2.40 m
Ángulo límite de sombreado	Limit profile angle	23.2°	Factor de ocupación (GCR)	49.2 %
Modelos empleados	Transposición	Perez	Difuso	Perez, Meteonorm
Perfil obstáculos	Sin perfil de obstáculos			
Sombras cercanas	Sombreado lineal			

Características generador FV

Módulo FV Si-mono	Modelo	**LR7-72HTH-620M**		
Custom parameters definition	Fabricante	Longi Solar		
Número de módulos FV	En serie	24 módulos	En paralelo	118 cadenas
N° total de módulos FV	N° módulos	2832	Pnom unitaria	620 Wp
Potencia global generador	Nominal (STC)	**1756 kWp**	En cond. funciona.	1826 kWp (50°C)
Caract. funcionamiento del generador (50°C)	V mpp	1085 V	I mpp	1683 A
Superficie total	Superficie módulos	**7650 m²**		

Inversor	Modelo	**SUN2000-330KTL-H1**		
Custom parameters definition	Fabricante	Huawei Technologies		
Características	Tensión Funciona.	500-1500 V	Pnom unitaria	300 kWac
Banco de inversores	N° de inversores	5 unidades	Potencia total	1500 kWac
			Relación Pnom	1.17

Factores de pérdida Generador FV

Factor de pérdidas térmicas	Uc (const)	20.0 W/m²K	Uv (viento)	0.0 W/m²K / m/s
Pérdida Óhmica en el Cableado	Res. global generador	19 mOhm	Fracción de Pérdidas	3.0 % en STC
LID - "Light Induced Degradation"			Fracción de Pérdidas	0.4 %
Pérdida Calidad Módulo			Fracción de Pérdidas	1.5 %
Pérdidas Mismatch Módulos			Fracción de Pérdidas	1.0 % en MPP
Strings Mismatch loss			Fracción de Pérdidas	0.10 %
Efecto de incidencia, parametrización ASHRAE	IAM =	1 - bo (1/cos i - 1)	Parám. bo	0.05

Necesidades de los usuarios : Carga ilimitada (red)

Sistema Conectado a la Red: Definición del sombreado cercano

Proyecto : **Grupo Conarpesa**

Variante de simulación : **2832-30--2-**

Parámetros principales del sistema	Tipo de sistema	**Sheds on ground**		
Sombras cercanas	Sombreado lineal			
Orientación Campos FV	inclinación	30°	acimut	0°
Módulos FV	Modelo	LR7-72HTH-620M	Pnom	620 Wp
Generador FV	N° de módulos	2832	Pnom total	**1756 kWp**
Inversor	Modelo	SUN2000-330KTL-H1	Pnom	300 kW ac
Banco de inversores	N° de unidades	5.0	Pnom total	**1500 kW ac**
Necesidades de los usuarios	Carga ilimitada (red)			

Perspectiva del campo FV y situación del sombreado cercano

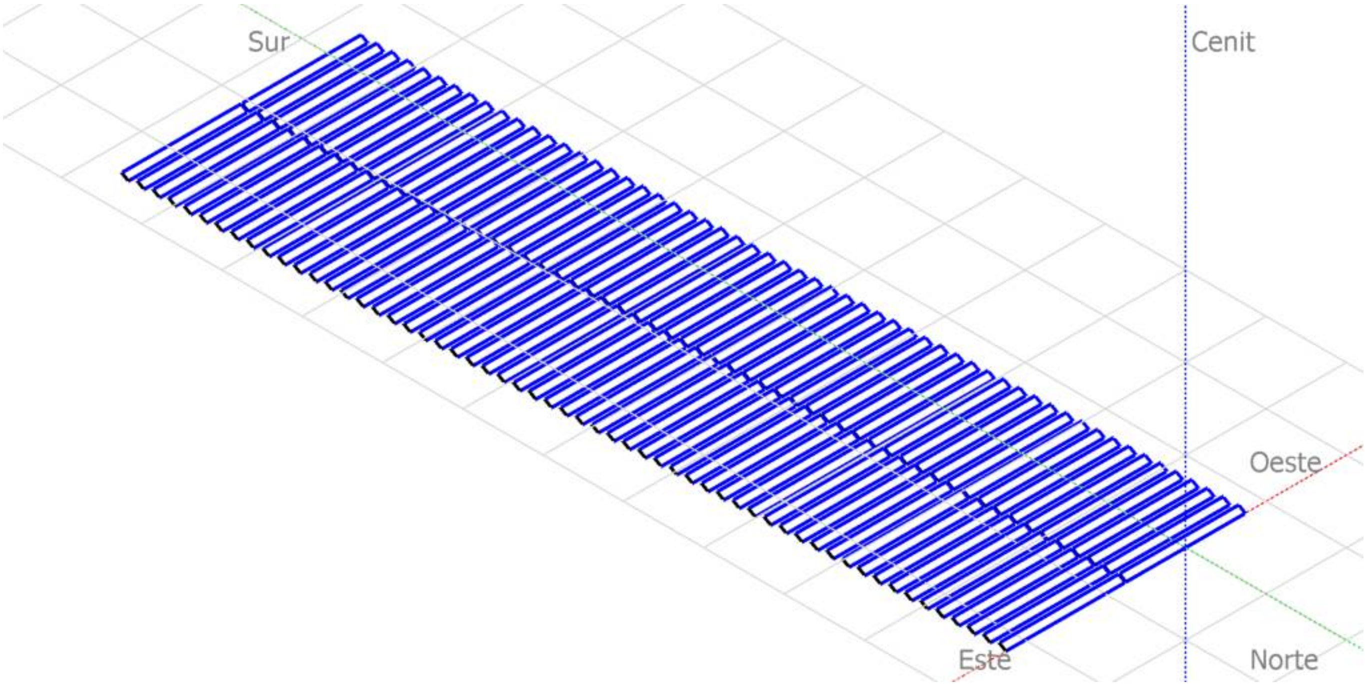
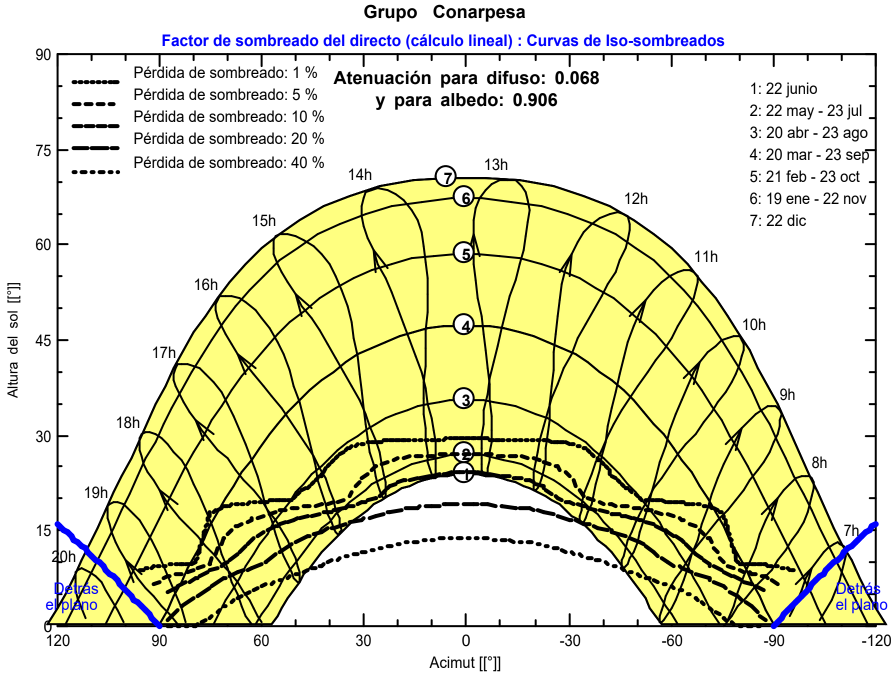


Diagrama de Iso-sombreados



Sistema Conectado a la Red: Resultados principales

Proyecto : **Grupo Conarpesa**

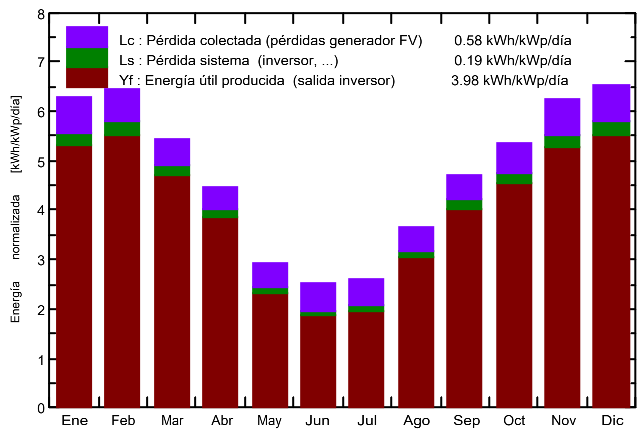
Variante de simulación : **2832-30--2-**

Parámetros principales del sistema	Tipo de sistema	**Sheds on ground**		
Sombras cercanas	Sombreado lineal			
Orientación Campos FV	inclinación	30°	acimut	0°
Módulos FV	Modelo	LR7-72HTH-620M	Pnom	620 Wp
Generador FV	N° de módulos	2832	Pnom total	**1756 kWp**
Inversor	Modelo	SUN2000-330KTL-H1	Pnom	300 kW ac
Banco de inversores	N° de unidades	5.0	Pnom total	**1500 kW ac**
Necesidades de los usuarios	Carga ilimitada (red)			

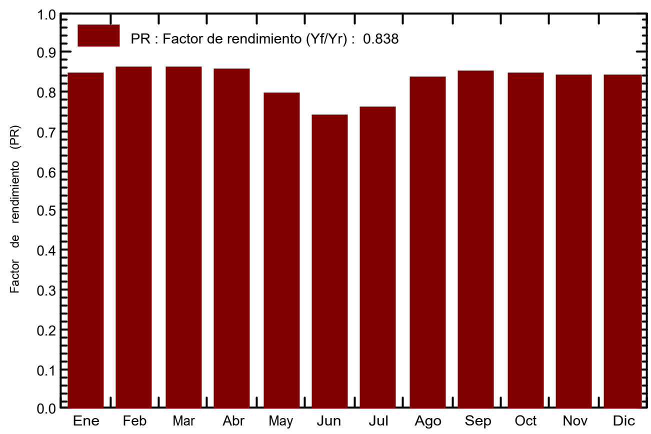
Resultados principales de la simulación

Producción del Sistema	**Energía producida**	**2553 MWh/año**	Produc. específico	1454 kWh/kWp/año
	Factor de rendimiento (PR)	83.78 %		

Producciones normalizadas (por kWp instalado): Potencia nominal 1756 kWp



Factor de rendimiento (PR)



2832-30--2-

Balances y resultados principales

	GlobHor kWh/m²	DiffHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
Enero	196.4	86.63	21.61	194.4	180.1	302.1	288.2	0.844
Febrero	166.9	72.55	20.45	180.3	168.1	284.8	272.1	0.860
Marzo	138.9	62.14	18.18	168.5	157.6	266.9	255.5	0.864
Abril	94.7	37.09	13.61	134.5	125.9	211.7	202.7	0.858
Mayo	55.0	24.39	9.14	90.8	80.0	133.1	126.5	0.793
Junio	43.1	21.09	6.47	75.5	63.1	103.6	98.3	0.741
Julio	47.6	22.81	5.82	80.3	68.6	113.0	107.0	0.759
Agosto	75.1	32.34	7.80	113.2	104.1	173.6	165.9	0.835
Septiembre	109.4	44.90	10.44	141.8	133.0	222.4	212.5	0.853
Octubre	149.0	70.52	14.23	165.8	154.4	258.5	246.8	0.847
Noviembre	185.3	80.06	16.33	187.4	174.6	290.6	277.0	0.842
Diciembre	210.9	88.07	19.84	202.7	188.1	314.7	300.1	0.843
Año	1472.3	642.58	13.63	1735.3	1597.6	2675.0	2552.5	0.838

Leyendas:	GlobHor	Irradiación global horizontal	GlobEff	Global efectivo, corr. para IAM y sombreados
	DiffHor	Irradiación difusa horizontal	EArray	Energía efectiva en la salida del generador
	T Amb	Temperatura Ambiente	E_Grid	Energía reinyectada en la red
	GlobInc	Global incidente plano receptor	PR	Factor de rendimiento

Sistema Conectado a la Red: Diagrama de pérdidas

Proyecto : **Grupo Conarpesa**

Variante de simulación : **2832-30--2-**

Parámetros principales del sistema	Tipo de sistema	**Sheds on ground**		
Sombras cercanas	Sombreado lineal			
Orientación Campos FV	inclinación	30°	acimut	0°
Módulos FV	Modelo	LR7-72HTH-620M	Pnom	620 Wp
Generador FV	N° de módulos	2832	Pnom total	**1756 kWp**
Inversor	Modelo	SUN2000-330KTL-H1	Pnom	300 kW ac
Banco de inversores	N° de unidades	5.0	Pnom total	**1500 kW ac**
Necesidades de los usuarios	Carga ilimitada (red)			

Diagrama de pérdida durante todo el año