



SG3125_3400HV-MV-20-SEN-Ver19-202001

SG3125HV-MV-20/SG3400HV-MV-20

MV Turnkey Station System Manual

SUNGROW

Contents

1 About This Manual 1
1.1 Validity 1
1.2 Content 1
1.3 Target Group 1
1.4 Symbols Explanation 2
1.5 How to Use this Manual 3
1.6 Terminology 3
2 Safety Instructions 4
2.1 Intended Usage 4
2.2 Important Safety Instructions 4
2.2.1 General Safety Rules 5
2.2.2 Manual Storage 5
2.2.3 PV Arrays Hazards 6
2.2.4 Ground Fault Protection 6
2.2.5 Live Line Measurement 6
2.2.6 Measuring Instrument 6
2.2.7 Volt-free Operations 7
2.2.8 Danger from Electric Arc 7
2.2.9 ESD Protection 8
2.2.10 LCD Parameter Setting 8
2.2.11 Sand and Moisture Protection 8
2.2.12 Symbols on the Device Body 8
2.2.13 Safety Warning Signs 9
2.2.14 Daily Operation and Maintenance 9
2.2.15 Disposal of Waste 10
2.2.16 Manual Description 10
3 Product Description 11
3.1 Brief Introduction 11
3.2 Overall Design of the MV Station 11
3.3 External Design of the MV Station 12
3.3.1 MV Station Views 12

3.3.2 Mechanical Parameter 13
3.3.3 Ventilation Design 14
3.4 Internal Design of the MV Station 14
3.4.1 Internal Components 14
3.4.2 Cable Entry Design 15
3.4.3 Internal Devices of the MV Station 16
3.4.4 Instruction for the Load Switch 17
4 Delivery 20
4.1 Scope of Delivery 20
4.2 Identifying the MV Station 21
4.3 Checking for Transport Damages 21
4.4 Storage of the MV Station 22
5 Mechanical Installation 23
5.1 Transport 23
5.2 Hoisting the MV Station 24
5.2.1 Safety Precautions 24
5.2.2 Hoisting 25
5.2.3 Fastening of Connectors 26
5.3 Foundation 27
5.3.1 Selection of Installation Site 27
5.3.2 Foundation Requirements 27
5.3.3 Recommended Foundation Construction Method 28
5.3.4 Install Oil Tray 29
5.3.5 Other Precautions 30
5.4 Fixing the MV Station 31
5.5 Removing Sealing Tapes and Sealing Plates 32
6 Electrical Installation 33
6.1 Safety Instructions 33
6.1.1 Generals Rules 33
6.1.2 Five Safety Rules 35
6.2 Parts for Cabling 35
6.2.1 Copper Wire Connection 36
6.2.2 Aluminum Wire Connection 36
6.3 Preparation before Electrical Connections 36
6.3.1 Installation Tools 37
6.3.2 Opening the MV Station Door 37

6.3.3 Checking the Cables 37
6.3.4 During Connection 38
6.4 Circuit Diagram and Cable Connection 38
6.4.1 Circuit Diagram 38
6.4.2 Cable Specifications 38
6.5 Ground Connection 39
6.6 AC Connection 41
6.6.1 Safety Notices 41
6.6.2 AC Cable Connection 41
6.7 DC Connection 42
6.7.1 Checking before Connection 42
6.7.2 DC Cable Connection 42
6.8 Communication Connection 45
6.9 External 3-phase Power Supply (Optional) 46
6.9.1 External Power Supply Mode 46
6.9.2 Internal Power Supply Mode 47
6.10 Finishing Electrical Connection 48
7 Commissioning 49
7.1 Safety Instructions 49
7.2 Requirements of Commissioning 50
7.3 Checking before Commissioning 50
7.3.1 Checking the Cable Connection 50
7.3.2 Checking the Module 50
7.3.3 Checking PV Array 51
7.3.4 Checking Grid Voltage 51
7.4 Preparation before Starting 52
7.5 Starting the Device 52
7.6 LCD Parameter Setting 53
7.7 Completing Commissioning 53
8 Disconnecting and Reconnecting the MV Station 54
8.1 Power Connection Point Overview 54
8.2 Disconnecting the MV Station 55
8.2.1 Disconnecting the Inverter 55
8.2.2 Disconnect Power Supply of the Inverter 57
8.2.3 Disconnecting the MV Transformer 57
8.2.4 Disconnecting the PV Combiner Box 57

8.3 Reconnecting the MV Station 57
8.3.1 Reconnecting the MV Transformer 58
8.3.2 Reconnecting the PV Combiner Box 58
8.3.3 Reconnecting the Inverter 58
9 Starting/Stopping 60
9.1 Starting 60
9.1.1 Inspection before Starting 60
9.1.2 Start Steps 60
9.2 Stopping 61
9.2.1 Normal Stop 61
9.2.2 Stop in Case of Fault 61
10 LCD Menu Operation 63
10.1 LCD Touch Screen 63
10.2 Default Screen 63
10.2.1 Initialization 63
10.2.2 Default Screen Introduction 64
10.2.3 Backlight and Screensaver 64
10.3 Overview of LCD Menu and Icon 65
10.3.1 Overview of Submenu and Icon 65
10.3.2 Layout of the submenus 65
10.4 Entering Password 66
10.5 Setting Language 67
10.5.1 Conventional Way 67
10.5.2 Shortcut 68
10.6 Setting Date and Time 68
10.7 Energy Output Deviation Adjustment 69
10.8 Checking Running Information 69
10.9 Checking History Information 70
10.9.1 Checking History Event 70
10.9.2 Checking History Data 71
10.9.3 Checking History Fault 71
10.9.4 Checking History Alarm 72
10.10 Checking Present Fault Information 72
10.11 Starting/Stopping 73
10.12 Load Default 74
10.13 Checking Firmware Version 74
10.14 Parameters of LCD 75

10.14.1 Communication Parameters 75
10.14.2 Running Parameters 76
10.14.3 Protection Parameter 82
11 Main Functions 91
11.1 Operation Mode 91
11.1.1 Mode Change 91
11.1.2 Operation Mode Description 91
11.2 Complete Control Strategy(Optional) 93
11.3 Active Power Limitation 93
11.3.1 Introduction to Active Power Limitation 93
11.3.2 How to Realize Power Limitation 94
11.4 Reactive Power Adjustment 94
11.5 Low Voltage Ride Through (LVRT) 95
11.6 High Voltage Ride Through (HVRT) 96
11.7 Temperature Derating 97
11.8 MPPT 97
11.9 Intelligent Temperature-Control Technology 98
11.10 Anti-PID Effect Function (Optional) 98
11.10.1 Introduction to PID Effect 98
11.10.2 Anti-PID Function Setting 98
11.10.3 PID Repair 99
11.11 Insulation Monitoring Function 100
11.11.1 Introduction 100
11.11.2 Simple Troubleshooting 100
11.12 Emergency Stop Button functions 101
11.13 Tripping Functions of the DC Main Switches 101
11.14 Protection Function 101
11.14.1 DC Over-voltage Protection 101
11.14.2 AC Over/under-voltage Protection 102
11.14.3 Frequency Anomaly Protection 102
11.14.4 Islanding Protection 102
11.14.5 Overload Protection 102
11.14.6 Ground Protection 102
11.14.7 Module Over-temperature Protection 102
11.14.8 Internal Over-temperature Protection 103
11.15 Firefighting 103
11.15.1 General Introduction 103

11.15.2 Smoke Detector 103
11.15.3 Fire Emergency Lights 103
12 Troubleshooting 104
12.1 Safety Instructions 104
12.2 Checking Fault 104
12.3 Fault and Troubleshooting on the Inverter 105
12.4 Fault and Troubleshooting on the MV Transformer 115
12.5 Other Fault and Troubleshooting 117
13 Routine Maintenance 118
13.1 Safety Instructions 118
13.1.1 General Safety Rules 118
13.1.2 Five Safety Rules 119
13.2 Maintenance 119
13.2.1 Introduction 119
13.2.2 Maintenance Interval 119
13.3 Cleaning the MV Station 124
13.3.1 Introduction 124
13.3.2 Cleaning Interval 124
13.3.3 Cleaning the Internal Dust 125
13.3.4 Cleaning the Foundation 125
13.3.5 Checking and Cleaning the Filter 125
13.3.6 Cleaning the Surface of the MV Station 126
13.3.7 Checking the Lock and Hinge 126
13.3.8 Checking the Sealing Strip 126
13.4 Painting Make-up Measures 126
13.5 Replacement of the Electrical Components 130
13.5.1 Safety Instructions 130
13.5.2 Replace DC Fuses 130
14 Appendix 134
14.1 System Parameter 134
14.2 Tightening Torques 136
14.3 Exclusion of Liability 136
14.4 Contact Information 137

1 About This Manual

1.1 Validity

This manual is intended for the following product

- SG3125HV-MV-20
- SG3400HV-MV-20

Hereinafter it will be referred to as " MV Station" unless otherwise specified.

1.2 Content

This manual contains the following information:

Content	Description
Safety instruction	Safety instructions concerning the installation, operation, maintenance and troubleshooting of the MV Station
Product Description	The appearance and internal components of the MV Station
Delivery	Delivery and inspection after receiving the MV Station
Installation	Mechanical transport, installation, and electrical connection of the MV Station
Commissioning	Safety notices and commissioning process when the MV Station is powered on for the first time
Start/Stop	Steps to start and stop the MV Station internal devices during normal maintenance or troubleshooting
Operation of LCD Display	Function and use of the MV Station HMI
Functions	Descriptions of the MV Station main functions
Troubleshooti-ng	Simple troubleshooting of the MV Station
Daily operation	Instructions and guide of the daily operation of the MV Station

1.3 Target Group

TThis manual is for technical personnel who are responsible for the transport, installation and other operations of the MV Station. Only qualified personnel can perform the installation, maintenance and troubleshooting of the MV Station. Unauthorized

persons should not perform any operation on the MV Station and should be away from the MV Station to avoid potential hazards. Qualified personnel are:

- Equipped with certain electrical, electrical wiring and mechanical knowledge and familiar with electrical and mechanical principle diagram.
- Familiar with the construction and working principle of the PV grid-connected power generation system.
- Familiar with the construction and working principle of the MV Station upstream and downstream equipment.
- Trained specifically for electrical device installation and commissioning.
- Equipped with the ability to cope with the dangerous and emergency situations during installation and commissioning.
- Familiar with the country/regional standards and specifications.
- Familiar with this manual.

1.4 Symbols Explanation

This manual contains important safety and operational instructions that must be accurately understood and respected during the installation and maintenance of the equipment.
To ensure the optimum use of this manual, note the following explanations of the symbols used.

⚠ DANGER

DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE indicates a situation which, if not avoided, could result in equipment or property damage.

NOTE indicates additional information, emphasized contents or tips to help you solve problems or save time.

The symbols below may be found on the electrical parts of the inverter. Make sure to read the following symbols and fully understand them before installing the equipment.

Symbol	Explanation
	Lethal voltage inside! Do not touch!
	Hot surface! Do not touch the hot surface of the device.
	Protective earth. Earthing securely to ensure personal safety.

1.5 How to Use this Manual

Read this manual and other related documents before transporting and installing the inverter. Documents must be stored at hand and available at all times.

All rights reserved including the pictures, markings and symbols used. Any reproduction or disclosure, even partially, of the contents of this manual is strictly forbidden without prior written authorization of Sungrow.

The contents of the manual will be periodically updated or revised due to the product development. It is probably that there are changes of manual in the subsequent module edition.

1.6 Terminology

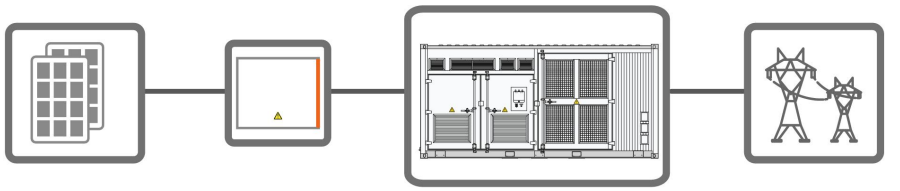
Name	For short
MV Turnkey Station	MV Station
Module unit/ Inverter unit	Inverter
Intelligent power distribution cabinet	Intelligent PMD or PMD

The foregoing devices are expressed in the abbreviation form in this document unless otherwise specified.

2 Safety Instructions

2.1 Intended Usage

The MV Station, designed and manufactured by Sungrow, is mainly applied to large-and-medium PV power stations. The MV Station can meet the requirements of modular design and quick installation for large-and-medium PV power stations, and can ensure long-term, reliable, and safe feed-in operation.



No.	Name
A	PV Array
B	PV Array Combiner Box
C	MV Station
D	Utility Grid

⚠ WARNING

Installation of the Station not in compliance with the description in this manual or installation or modification of the device without authorization from Sungrow may lead to personal injuries or device damages and may void pertinent warranty claims from Sungrow.

2.2 Important Safety Instructions

Read the safety instructions carefully before installing the MV Station. Refer to corresponding manuals for the safety instructions on the internal devices.

2.2.1 General Safety Rules

DANGER

Touching of the terminals or contactors connected to the grid may lead to electric shock hazards!

- Do not touch the terminals or conductors connected to the grid.
- Respect all safety instructions on the grid connection.

DANGER

Lethal voltages are present inside the device!

- Pay attention and follow the warning signs on the device.
- Respect all safety instructions in this manual and other pertinent documents.

DANGER

Electric shock or fire may occur due to the device damage or system fault.

- Visual inspect for device damages or other hazards
- Check if the external devices and circuit connections are safe.
- Only operate the device when it is safe to do so.

WARNING

All installations and operations on the Station must be in full accordance to the national and local regulations and standards.

2.2.2 Manual Storage

Product manuals are indispensable part of the product. Very important information about the transport, installation, maintenance and troubleshooting of the MV Station is included in this manual. All the descriptions in this manual, especially those safety-related items, must be complied with. Read all the instructions thoroughly prior to any operation work on the MV Station.

- Transport, install, maintain and service the MV Station by strictly following the descriptions in this manual. Device damage, personal injury, or property loss may be caused if otherwise
- This manual and relevant documents should be available for relevant persons at all times.

2.2.3 PV Arrays Hazards

DANGER

DC high voltage! Electric shock hazards!

When exposed to sunlight, PV array will produce voltage, which is very high in large-scale power stations.

Death from burning and electric shock due to touching the PV array

During installation, maintenance and troubleshooting of the device, ensure:

- Station is disconnected from the PV array.
- Necessary warning signs are in place to prevent accidental reconnection.Necessary warning signs are in place to prevent accidental reconnection.

2.2.4 Ground Fault Protection

DANGER

If a ground fault occurs in the PV system, some parts that are supposedly voltage-free may carry lethal voltage. Accidental touch may cause serious damage. Make sure there is no system ground fault before operation and take proper protection measures.

2.2.5 Live Line Measurement

DANGER

High voltages are present inside the device. Death resulting from burning and electric shock upon touching the live components of the Station. During live line measurement,

- **wear suitable protective equipment, for example dielectric gloves, and**
- **accompany by other persons.**

2.2.6 Measuring Instrument

Instrument for measurement of the electrical parameters should meet the requirements listed below:

WARNING

- **Instrument for measurement of the electrical parameters should be high quality instrument with sufficient measuring range.**
- **Make sure the connection and use of the instrument are correct to avoid arc and other dangerous situations.**
- **Use suitable protective equipment, for example dielectric gloves if live line measurement is required.**

2.2.7 Volt-free Operations

Perform operations on the MV Station only when all devices inside the MV Station, esp. the modules are completely voltage free.

- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate measurement instrument
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid accidental contact.
- Ensure sufficient escape room.
- Wait at least 10 minutes to have the capacitors discharge completely before performing operations on internal components.

2.2.8 Danger from Electric Arc

⚠ DANGER

To avoid personal injury or device damage, perform operations on the Station as described in this manual. Incorrect operations may cause electric arcs or even fires, explosion, and other dangers. Sungrow shall not be held liable for such damage due to violations of warning labels or description in this manual.

The following improper operations may result in the electric arc, fire, explosion, or other dangers. Once the faults occur, only qualified personnel can perform related operations for improper operation may worsen the situation.

- Plug/Unplug live HV fuse on the Station DC side
- Touch possibly live cable end on which insulation processing is not performed
- Touch copper bars, terminals, or other internal components that may carry voltage
- The power cable is not securely connected
- Spare parts, such as screws, are left inside the power module
- Improper operations performed by untrained or unqualified personnel

Evaluate in advance whether the electric arc is likely to occur in the operation area before performing operations on the device. If there is the risk, it is required that:

- The operator must have received related safety training
- Identify the specific electric arc area as far as possible
- Wear protective equipment that meets the requirement before performing operations in the area

Electric Arc Risk on the MV Side

⚠ WARNING

- Electric arcs can be caused by fault in the switchgear during operation. This electric arc may cause personal injury
- If arc faults occur in the switchgear, the (SF6) gas evacuates under the compartment of the switchgear.
- Only perform operation on the switchgear when it is voltage-free.
- Keep a safe distance from the switchgear when performing switching operations on the switchgear.
- Only qualified personnel can perform the switching operation. Wear required protective equipment before the operation.
- Ensure the escape route inside the switchgear room is freely accessible at all times without any blocks or obstructions. Remove the blocks or obstructions if necessary.

2.2.9 ESD Protection

⚠ CAUTION

Devices may be damaged irreversibly by electrostatic discharge (ESD).

- Avoid unnecessary touching of the PCB.
- Observe all the ESD-related safety instructions. Wear proper PPE, such as safety glasses, safety footwear, and safety gloves.

2.2.10 LCD Parameter Setting

Some settable parameters on the LCD are closely related to the operations of the Turnkey Station and internal devices. Therefore these parameters can only be set after reliable evaluation of the system.

⚠ WARNING

- Improper parameter setting may affect the functionality of the device.
- Only qualified personnel can set the parameters.

2.2.11 Sand and Moisture Protection

Do not open the Station door in sand storm, thunderstorm, strong wind or hail days or when the ambient humidity is above 95%.

2.2.12 Symbols on the Device Body

Symbols on the devices body contain important information on the safe operation of the Station and its internal devices. Do not tear or damage them!

NOTICE

Do not damage or tear the symbols.

- **All symbols on the device body must be clearly visible.**
- **Replace the symbols once any damaged or unclearness is detected.**

2.2.13 Safety Warning Signs

During transport, installation, maintenance and troubleshooting of the Station, keep non-related persons away.

- Post warning signs near the Station upstream and downstream switches to prevent accidental connection.
- Place necessary warning signs or barriers near the on-site operation areas.

2.2.14 Daily Operation and Maintenance

Make sure the Station doors are closed and locked during daily operation to prevent internal devices from damages by rain or rodents.
Routine check and maintain the Station and internal devices to ensure long and reliable operation of the Station.

⚠ WARNING

Take proper insulation protection measures during live line operation. At least two persons are required until the operation is performed.
Proper field rescue facilities are required since most PV stations are installed in places far away from the urban areas.

NOTICE

The pressure relief valve of the transformer must be open before the running of switchgear.

Take the followings into consideration during daily operation and maintenance:

- The nameplate is pasted on the Station body. It contains very important parameter information about the devices. Protect the nameplate during all operations.
- Heating components may exist inside the Station. When the device stops, the heating components may still be hot. Wear proper glove when working on them.
- Wear proper PPE, such safety glasses, safety footwear and safety gloves if necessary.
- Necessary auxiliary measures are recommended to ensure personal and device safety.

2.2.15 Disposal of Waste

When the Station or internal devices is end of life, it cannot be disposed of together with household wastes. Some components inside can be recycling and some components can cause environment pollution.

Contact the local authorized collection point.

2.2.16 Manual Description

For user's convenience, there are a large number of pictures in this manual. These pictures are indicative only. For details about the device, refer to the actual product you receive.

Keep this manual at a convenience place near the device for future reference during installation, operation, maintenance and troubleshooting of the device.

All the descriptions in this manual are based on the standard Turnkey Station, and the actual product you receive may differ. If necessary, specify your requirements when placing the order.

This manual may not cover all possible situations. Should a specific problem occur that is not explained in this manual, contact Sungrow.

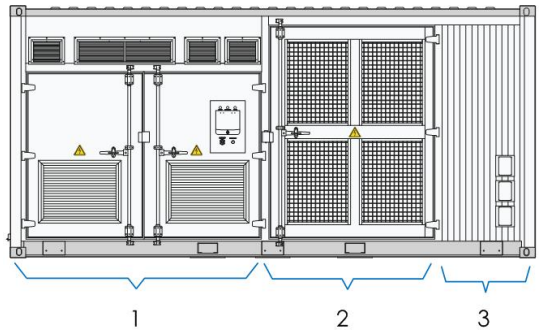
3 Product Description

3.1 Brief Introduction

The MV Station mainly applies to medium and large-scale PV generation systems. Based on standard-sized outdoor container, the MV Station integrates inverter, transformer, switchgear, power distribution unit, monitoring unit, security system and firefighting equipment to meet with the requirements of modular design and fast installation of the PV systems. The MV Station converts DC current generated from the PV array into grid-compatible AC current, which can be directly fed into the medium voltage grid.

3.2 Overall Design of the MV Station

The MV Station is made up of the following three parts:



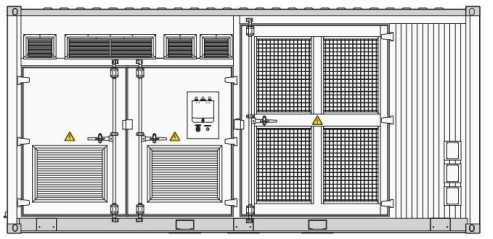
No.	Name	Description
1	Module room	Convert the DC current generated from the PV array into AC current.
2	Transformer room	Integrate one transformer*. Convert low voltage from the inverter into grid-compatible medium voltage.
3	Switchgear room	Integrate one switchgear*. This is connection point of the MV Station and grid and also the main protection device for the connection and disconnection between the MV Station and the grid.

Note: * is optional.

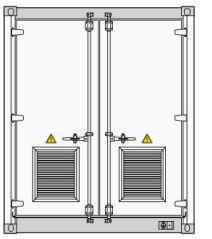
3.3 External Design of the MV Station

3.3.1 MV Station Views

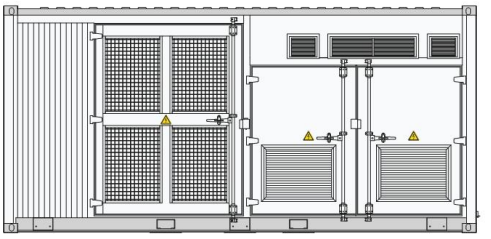
Four views of the MV Station are as follows:



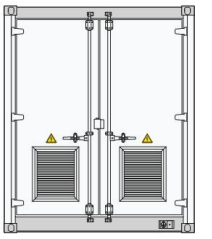
Front



Left



Back



Right

Control and Monitoring Window

The Control and Monitoring window is located on the front door of the MV Station.

As shown in the figure below, the LED indicators are at the upper part, the color liquid crystal (LCD) touchscreen is at the middle part, and the emergency stop button and start/stop button are at the lower part.

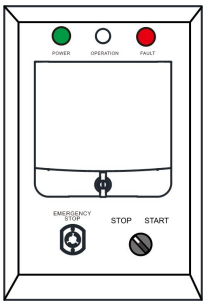


figure 3-1 Control and Monitoring window

The LEDs at the upper side of the Control and Monitoring Window: POWER indicates power-on state; OPERATION indicates normal operation; and FAULT indicates the occurrence of faults.

The working status of the MV Station can be acquired through these LEDs.

LED	Color	Description
POWER	Green	The control circuit power supply is supplying power.
OPERATIO-N	White	MV Station is in stop mode.
	Green	MV Station is in grid-connected run mode.
	Yellow	MV Station is in alarm run mode.
FAULT	Red	A fault occurs and has not been removed. The indicator will be off when the fault is cleared.

The EMERGENCY STOP Button

When an emergency occurs, press the emergency stop button to disconnect the DC and AC circuit breakers immediately.

The Start/Stop Button

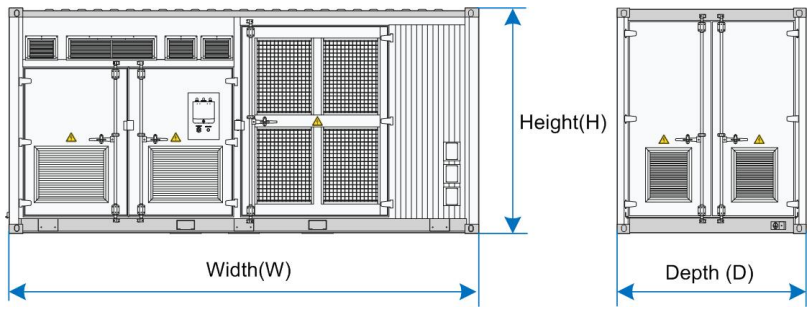
This button is used to start/stop the MV Station.

The cover plate of the LCD can only be opened with the key. Remove the key and store it properly after use.

3.3.2 Mechanical Parameter

Dimensions

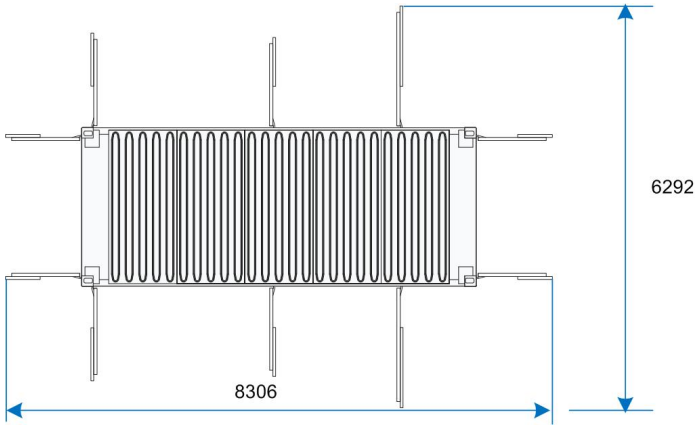
External dimensions (without the flashings) are shown in figure below.



Width	Height	Depth
6,058 mm	2,896 mm	2,438 mm

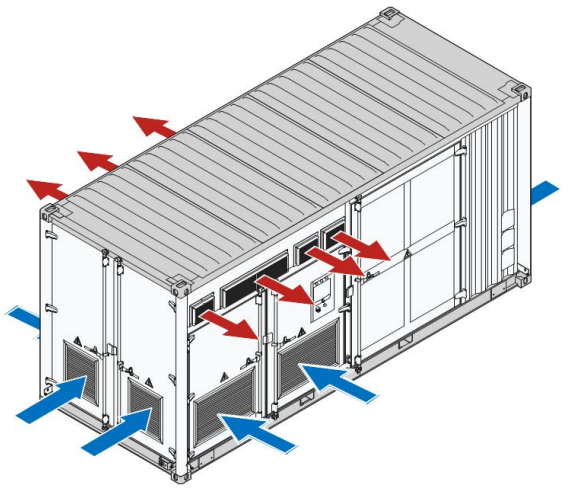
The Clearance Space

The clearances around the MV Station should be sufficient for the doors to be opened at 90 ° and 180 ° .



3.3.3 Ventilation Design

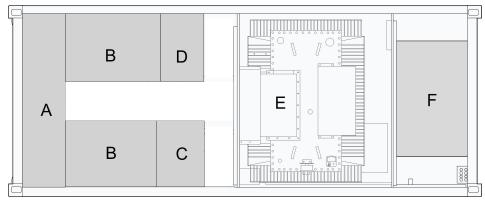
The ventilation system is designed as the cool air comes inside from the bottom of the MV Station and hot air gets outside from the top of the MV Station.



3.4 Internal Design of the MV Station

3.4.1 Internal Components

Figure below shows the top view of the major electrical components inside the MV Station:



No.	Device	Description
A	DC cabinet	That includes fuses and DC switches. Cooper bars at the bottom of the DC cabinet are used for DC-side cable connections.
B	Inverter cabinet	It converts the DC current into the AC current.
C	Intelligent PMD	The upper part of the cabinet integrates monitor function and the lower part of the cabinet integrates AC power distribution function.
D	AC cabinet	That includes AC contactors and AC switches. Cooper bars at the bottom of the AC cabinet are used for AC-side cable connections.
E	Transformer*	Convert low-voltage AC current output from the inverter into grid-compatible medium-voltage current.
F	Switchgear*	This is connection point of the MV Station and grid and also the main protection device for the connection and disconnection between the MV Station and the grid.

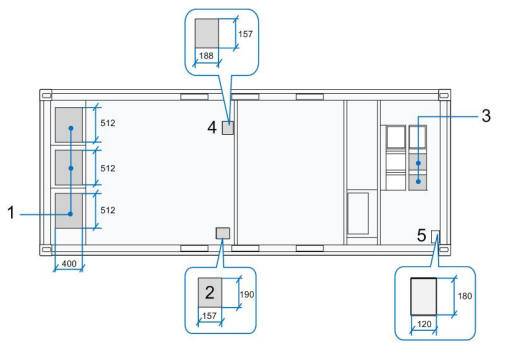
Note: * is optional.

3.4.2 Cable Entry Design

For easier onsite cable connection, all cables between the internal devices have been connected before delivery.

All cables between the MV Station and the external are routed through the bottom of the MV Station.All cables coming into or out of the MV Station should be protected properly, for example, use cable pipe to prevent damage by rodents. After cable connection, all cable entries should be sealed by fireproof mud or other appropriate materials.

The MV Station bottom cable entries are shown below.

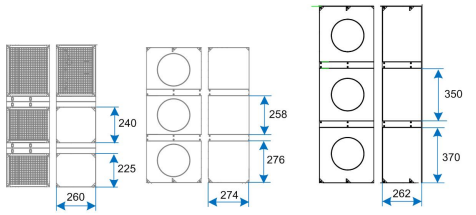


Function of each opening is shown below:

No.	Name	Description
1	DC cable inlet	DC cables connect to the DC cabinet through these holes
2	Communication & Power distribution cable entry	Communication & Power distribution cables of the intelligent PMD come inside the MV Station through this hole
3	AC cable outlet	AC cables connect to the switchgear through these holes.
4	Grounding cable hole	Grounding cables connect to the MV Station through this hole.
5	Reserved	Communication cables come inside the MV Station through this hole

Dimensions of AC Cable Outlet

Dimensions of the cable outlet shown by "3" in the figure above may vary with the type and voltage level of the selected switchgear. Specific dimensions are shown in the following figures.



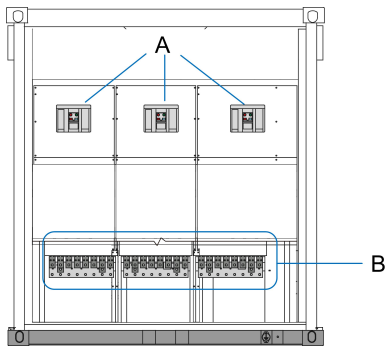
Manufacturer of the MV switchgear	Grid voltage	Dimensions
Siemens	24kV	Refer to the figure A
ABB	24kV	Refer to the figure B
ABB	40.5kV	Refer to the figure C

3.4.3 Internal Devices of the MV Station

MV Station mainly contains the DC cabinet, the module cabinet, and the PMD. The DC cabinet, and the PMD are all equipped with wiring terminals and operation switches.

DC cabinet

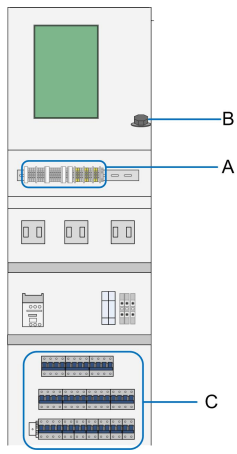
The DC cabinet is located on the left side of the MV Station, which is shown in the following figure.



No.	Name	Description
A	DC switches	Control the connection/disconnection on the DC side of the MV Station.
B	DC cable connection area	The upper part of the copper bar is for positive cable connection area while the lower part is for negative cable connection.

Intelligent PMD

The internal device of the intelligent PMD is shown in the following figure.

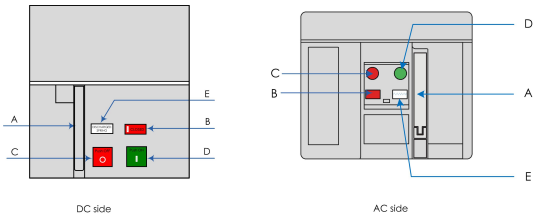


No.	Name
A	RS485 communication port
B	Ethernet port
C	Micro circuit breaker and corresponding wiring terminal

Note: * Micro circuit breaker in the figure is for reference only and may differ from the actual product.

3.4.4 Instruction for the Load Switch

This Station is equipped with electrically-controlled air load switch on the DC and AC sides. The appearance of the circuit breaker panels are shown in the figure below.



No.	Name	Description
A	Manual energy storage handle	When the load switch has no energy, you can manually store energy through this button.
B	State indicator	Display the present state of the load switch, OPEN or CLOSED
C	PUSH OFF button	The load switch is switched off when pressing this button
D	PUSH ON button	The load switch is switched on when pressing this button
E	Energy storage state indicator	Display the present energy storage state, CHARGED SPRING or DISCHARGE SPRING

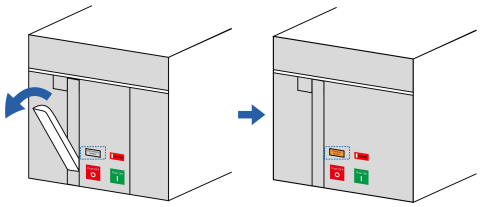
The load switch can be used together with a micro-motor. When there is power supply in the AC side of the MV Station, the energy can be stored to the load switch through this motor;. When there is no power supply on the AC side of the MV Station, manually store the energy through the manual energy storage handle.

Proceed as follows to operate the load switch.

Switch On

Press the Push On button on the panel to switch on the load switch.

Before switching on the load switch, you need to check if the energy storage state displayed on the panel is CHARGED SPRING. If the display is DISCHARGED SPRING, you need to store the energy manually by turning the manual energy storage handle down until the panel displays CHARGED SPRING.



After the load switch is switched on, the panel displays CLOSED.

DANGER

Never manually connect the AC circuit breaker when the AC side carries voltage.

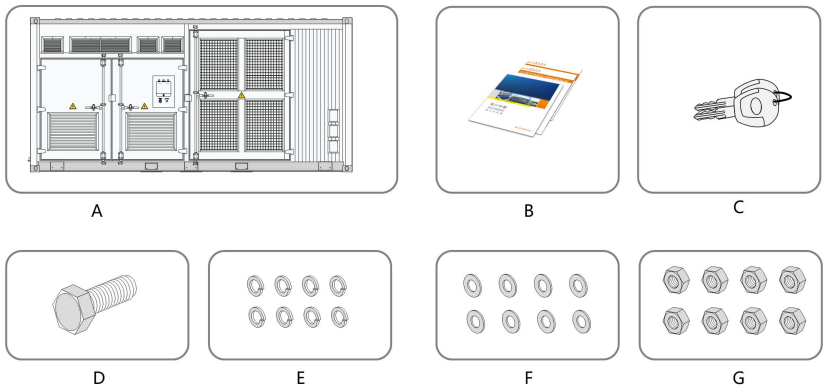
Switch Off

Press the Push OFF button on the panel to switch off the load switch.

After the load switch is switched off, the panel displays OPEN.

4 Delivery

4.1 Scope of Delivery



No.	Device	Quantity	Note
A	MV Station	1	-
B	Enclosed documents	1	System manual, delivery inspection report, certification, and warranty card
C	Door keys of MV Station	1	-
	Keys to monitor window	1	-
	Keys to the emergency stop button	1	-
D	Bolt	55	M16 × 55
		75	M6 × 20
		25	M5 × 16
E	Flat washer	110	φ16
F	Spring washer	55	M16
G	Nut	55	M16

The foregoing components and their quantities are based on the standard MV Station, and those of the actual product may differ. Specifically, refer to the enclosed packing list.

4.2 Identifying the MV Station

Identify the MV Station via its nameplate. The nameplate contains the following information: MV Station model, major technical parameters, marks of conformity, origins, and serial number which are available and recognized by Sungrow.

⚠ WARNING

Very important technical parameters and MV Station related parameters are contained in the nameplate.
Protect the nameplate at all times!

4.3 Checking for Transport Damages

The MV Station has been strictly inspected and tested before delivery. Despite robust packaging, the container or inside devices may be damaged during transport. Therefore, once receiving the MV Station, perform a detailed inspection
If any damage is found, contact the shipping company or Sungrow immediately.

- Check the scope of delivery described in "4.1 Scope of Delivery"for completeness.
- Check that the MV Station and internal devices match the models included in the original order.
- Check thoroughly the MV Station and internal devices for any possible damages caused during transport.

⚠ WARNING

Install and commission the MV Station only when it is technically faultless! Make sure before installing the MV Station that

- **MV Station is intact without any damage;**
- **all devices inside the MV Station are intact without any damages.**

4.4 Storage of the MV Station

If it is not to be installed immediately after delivery, store the MV Station appropriately:

- Store the MV Station indoors, for example large warehouse or workshop to prevent possible condensation or damp.If the MV Station has to be stored outdoors, elevate the MV Station base according to the field geological and ambient conditions. And when the ambient temperature is too low, heat the MV Station internal devices.
- Temperature: -40 ° C~+70 ° C; Relative humidity: 0 ~95%, non-condensation

  Store the MV Station in a dry, clean and solid ground with sufficient load capacity. The ground should be flat without water, bumps or plantings.
- Lock the MV Station internal devices and the MV Station during storage.
- Take proper protection method to prevent the water and dust penetrating inside the MV Station internal. At least protect the MV Station air inlets and outlets.
- Consider the 8 support feet of the MV Station when selecting the temporary storage platform. For the positions of the support feet, refer to "5.3 Foundation"
- Regularly check the MV Station and internal devices, at least once every half a month.

5 Mechanical Installation

⚠ WARNING

Respect all local standards and requirements during mechanical installation.

5.1 Transport

All devices are installed inside the Station before delivery. The Station should be transported as a whole. Transport the Station by crane with sufficient load capacity.

The Station is delivered to the user by a forwarding company. After unloading, the Station will be transported to the installation site by the plant staff.

⚠ WARNING

Local standards and regulations on the container transport and loading & unloading, especially those safety instructions, should be observed at all times.

- **All the accessory appliances to be used during transport should be maintained beforehand.**
- **The transport of the Station must be performed by qualified personnel. Qualified personnel are those who have been trained, especially in safety operation.**

NOTICE

Keep in mind the dimensions and total weight of the Station at all times!

Ensure that the following requirements are met:

- All the doors are locked.
- Choose appropriate crane or hoist to transport the Station. The crane or hoist must be sufficient to bear the weight of the Station.
- An additional traction vehicle may be required for uphill/downhill road transport.
- Anything, which may hinder the transport, like trees, cables (or similar), should be removed.
- Transport the MV Station on fine weather days as far as reasonably possible.
- Warning signs or barriers must be posted near the transport areas to avoid accidental injuries.

Additionally, the following should be met when the Station is placed on the ground:

- Place the Station carefully and gently. Do not pull or push the Station on any surface.
- The place should be firm and flat, has good drainage and has no obstacles or outshoots. The Station should be placed and supported by the four feet.

5.2 Hoisting the MV Station

5.2.1 Safety Precautions

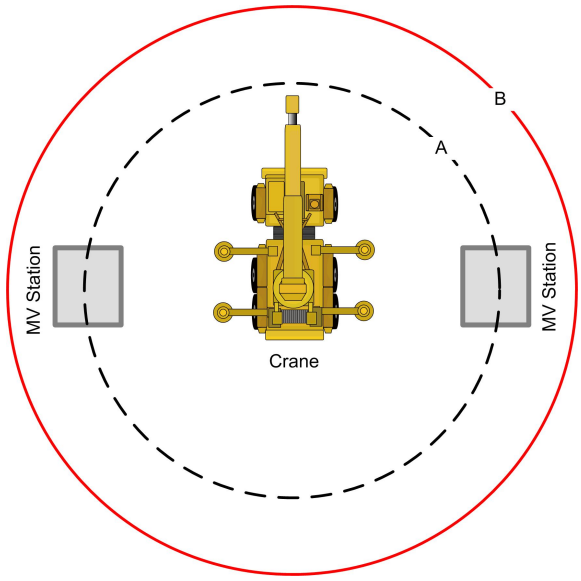
⚠ WARNING

- **Observe the safety operating rules of the crane at all times.**
- **Standing within 5 to 10 meters of the hoisting areas is strictly forbidden! Anybody standing under the boom or Station is strictly forbidden in the whole hoisting process.**
- **The hoisting work must be stopped in violent weather days. For example, in strong wind, heavy rain, or thick fog conditions.**

Carefully observe the following items:

- All safety requirements must be met.
- A professional instructor is needed in the whole hoisting process.
- All the slings used must have the load-bearing capacity of at least 10t.
- The crane should have sufficient arm length and radius of gyration.
- All the connection point must be firmly connected.
- The length of the slings can be adjusted appropriately according to on-site conditions.
- Transport the MV Station in a level, smooth and steady way.
- Transport the MV Station by connecting the four top corner fittings.
- Some accessories may be needed to ensure the hoisting safety.

The following figure illustrates the hoisting operations. Circle A indicates the work areas of the crane. Anybody standing inside the circle B is forbidden for safety considerations.

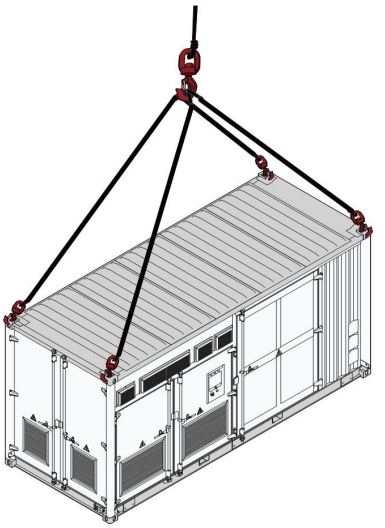


5.2.2 Hoisting

In the whole hoisting process, observe following rules:

- Hoist the MV Station in a vertical manner. Do not drag or drop the MV Station on any surface.
- When the MV Station has been hoisted for about 300mm from the ground, stop to check if all the connections are still firm. After confirmation, continue hoisting the MV Station.
- When transported to the final location, the MV Station should be put down slowly and steadily.
- The final location should be firm, level, and well-drained. The MV Station is supported by four bottom fittings on the ground.

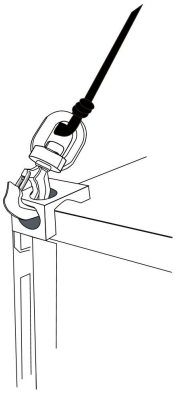
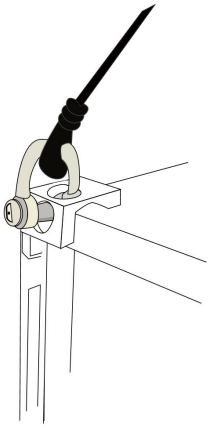
The MV Station should be hoisted by using four top corner fittings as shown in the following figure.



5.2.3 Fastening of Connectors

Use slings with hooks or U-hooks to hoist the MV Station.

The lifting devices should be connected correctly to the MV Station.

Lifting device	Hook	U-hook
Connections		
Notice	Insert the hook from inside to outside.	Lateral pin of the U-hook should be tightened.

⚠ WARNING

- **National and local safety rules should be observed at all times.**
- **Regardless of relevant safety rules may void pertinent warranty claims from Sungrow.**

5.3 Foundation

5.3.1 Selection of Installation Site

When selecting the installation site, consider at least the following requirements:

- Ambient and geological conditions, such as stress wave emissions, the level of underground water table, etc. should be taken into account.
- The ambient environment should be dry, well ventilated, and far away from inflammable materials.
- The ground at the installation site must be compacted enough. Relative compaction of the ground should be equal or greater than 98%. take proper methods to strengthen the ground if otherwise.

5.3.2 Foundation Requirements

⚠ WARNING

Pay attention to the heavy weight of the MV Station. Check thoroughly the conditions of the installation site (mainly the geographical and environmental conditions). Then design and construct the foundation.

Improper foundation construction may affect the place of the MV Station, open & close of the door and later maintenance of the MV Station. Therefore, the foundation must be designed and constructed according to related standard. The dimensions, weight of the MV Station, the cable route and later maintenance should be considered at all times.
The following conditions must be fulfilled:

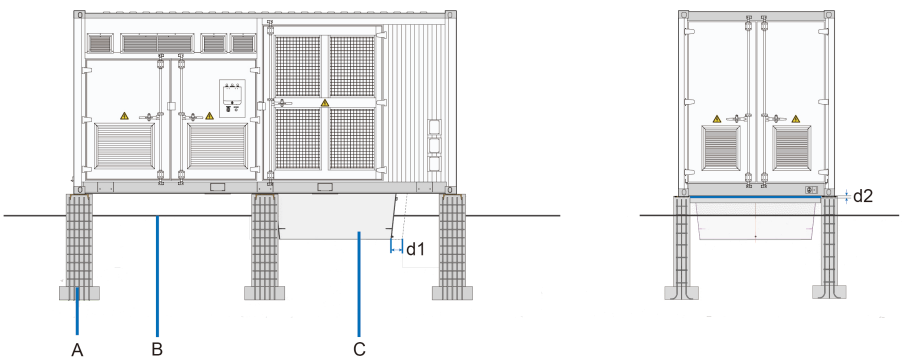
- The bottom of foundation should be firm enough.
- The foundations must be suitable for the weight of the MV Station.
- The foundation should be at least 100mm higher than the solid ground on site to avoid the rain damaging the base or the inside of the MV Station.
- In foundation construction, take appropriate drainage measures according to local geological conditions.
- Sufficient cross-sectional area and depth of the foundation should be maintained. The depth is designed according to local soil conditions.
- Cable route should be taken into account.

According to the cable design of MV Station and for easy electrical connection, establish cable trenches on bottom of the MV Station, i.e. reserve the cable trenches inside the foundation and pre-bury the wire pipes.

The material dug out should be cleared immediately.

5.3.3 Recommended Foundation Construction Method

The overall diagram is shown in the following figure, unit: mm.



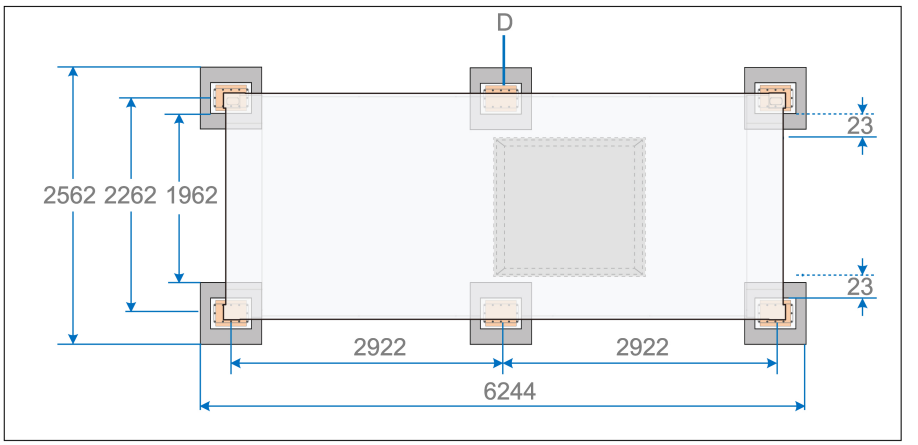
No.	Name
A	Foundation
B	Solid ground, e.g. gravel
C	Oil tray*
d1	176mm. Reserve certain clearance for ease of pulling out the oil tray or other opetations.
d2	10mm. The space between the foundation and the MV Station base, need to be blocked

Note: * The oil tray is an optional component.

Skip performing the installation step if the oil tray is not purchased. Related operations such as transportation, installation, and grounding connection can be performed according to the corresponding design documents.

Foundation

The recommended construction plan is shown as below.



No.	Name
D	Pre-embedded 30# channel steel

NOTICE

The foundation plan described in this chapter is for reference only. Consult on-site professional personnel before construction.

5.3.4 Install Oil Tray

The views of the oil tray are as follows:

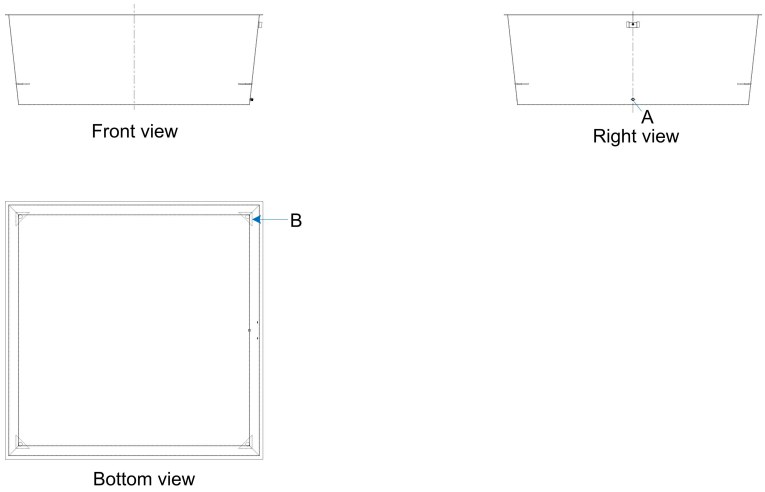


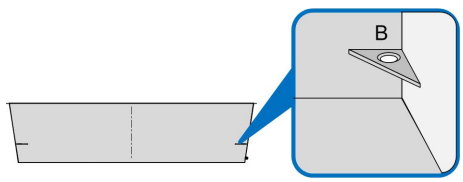
figure 5-1 The views of the oil tray

No.	Name
A	Installation hole for drain valve
B	Lifting rings

The position marked in the figure is for reference only, and it may vary with actual onsite conditions.

Transport the Oil Tray

Hoist the oil tray and transport it to the target location via the lifting rings at four corner of the oil tray (shown by "B" in the figure below). The hoisting device should be suitable for the weight of the oil tray.



Installation Hole

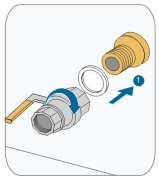
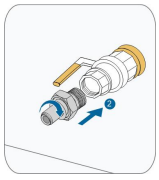
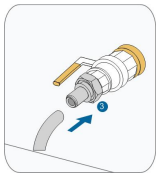
The hole for installing the drain valve is reserved on the oil tray.

For ease of future operation, the drain valve should be appropriately oriented according to onsite conditions.

Install the Drain Valve

Install the drain valve on site. During installation, the following components may be used.

- Ball valve (in the scope of delivery)
- Connector(in the scope of delivery)
- Sealing ring(in the scope of delivery)
- Oil tube(beyong the scope of delivery)

Figure	Step
	1. The left figure shows the oil tray before delivery.
	2. First fix the sealing ring and then the ball valve onto the oil tray.
	3. Insert the connector into the ball valve, as shown in the left figure.
	4. Install the oil tube.

The oil tray collects oil which can leak from the transformer under fault conditions.

It is recommended to install an oil-water separator in the oil tray, to prevent rainwater penetration reducing the oil storage capacity.

5.3.5 Other Precautions

The MV Station can reach IP54 protection degree only when at least the following conditions are met:

- The MV Station is located on an even foundation.
- Some protective measures have been taken for the drainage hole, such as installing a safety mesh to prevent rodents from entering.

NOTICE

Take corresponding protection measures over the oil tray to prevent the entry of sands and other debris.
For the convenience of future operations, such as cleaning and maintenance, it is recommended to reserve specific maintenance space around the oil tray.

NOTICE

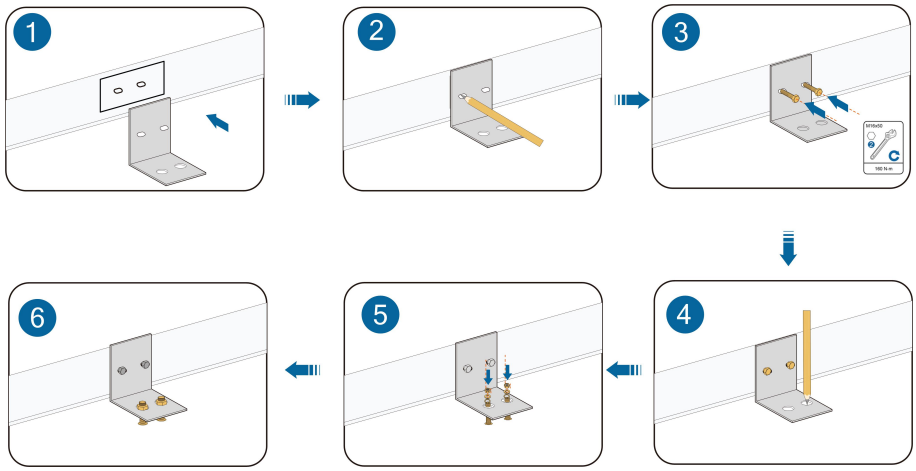
Do not plant any trees near the installation site to prevent the MV Station from being damaged by tree leaves or stems.

5.4 Fixing the MV Station

If the foundation is constructed as the above plan, the MV Station needs to be hoisted to the desired location and welded. If the foundation is not constructed as the above plan, it is necessary to fix the fixing point at the bottom of the MV Station (shown as A below) with the existing operating platform using L mounting parts.



The steps to fixing the L mounting parts is shown in the following figure.



5.5 Removing Sealing Tapes and Sealing Plates

To prevent sea-water or moisture penetrating into the MV Station during ship transport, sealing tapes are attached to the air inlets and outlets of the MV Station, and sealing plates are installed onto the outside door of the transformer room.

The positions of the sealing tapes and sealing plates are shown by "A" and "B" in the following figure respectively.



Before commissioning of the MV Station, make sure all the sealing tapes and sealing plates are removed away. Otherwise, the internal devices of the MV Station may operate abnormally due to lack of sufficient fresh air.

6 Electrical Installation

6.1 Safety Instructions

6.1.1 Generals Rules

DANGER

High voltage! Electrical shock hazards!

- Do not touch the live components of the device.
- Make sure the AC and DC sides are voltage-free before installation.
- Never put flammable materials in the vicinity of the MV Station.

DANGER

If a ground fault occurs in the PV system, some parts that are supposedly voltage-free may carry lethal voltage. Accidental touch may cause serious damage. Make sure there is no system ground fault before operation and take proper protective measures.

WARNING

- Observe all the country-specific standards and regulations.
- Connect the MV Station to public grid only after receiving authorization from the local network operator.

WARNING

Only professional electricians can perform the operations described in this chapter.
Observe all the instructions during electrical connection.

WARNING

Disconnect all AC and DC switches before electrical connection.

⚠ WARNING

Sand and moisture penetration may affect the performance of electric devices inside the MV Station!

- Do not perform electrical connection in sandy season or when the ambient relative humidity is above 95%.
- Perform electrical connection at fine weather days.

⚠ WARNING

Improper torque used may cause fire to the connection point!
Strictly observe the torque requirements in this manual during electrical connection.

⚠ WARNING

Too small bending radius or excessive intertwine may damage the fiber!
When selecting fiber as the communication cable, follow the related requirements of the fiber manufacturer about the min. permissible bending radius.

⚠ WARNING

Only professional electricians can perform the electrical connection.
Professional electricians should meet the related requirements listed in 2 Safety Instructionsin this manual. Sungrow shall not be held liable for any personal injury or property loss caused by ignorance of the safety instructions.

⚠ WARNING

Ensure the electrical insulation meets requirements before laying the cables.
Follow the EMC regulation and lay the power cable and communication cable in different layers. Provide support and protection to the cables to reduce the stress of the cables when necessary.

⚠ WARNING

Strictly follow all the instructions when connecting the cables.

⚠ WARNING

- The installation and design of the MV Station must fulfill national and local standards and regulations.
- Sungrow shall not be held liable for the MV Station or system fault caused by ignorance of the description in this manual.

Select optical fibers as the external communication cable to lower the signal interference.

6.1.2 Five Safety Rules

During electrical connections and other operations on the inside device, observe the following Five Safety Rules:

- Disconnect all the external connections and disconnect the MV Station internal power supply.
- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate measurement instrument.
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid accidental contact.

6.2 Parts for Cabling

WARNING

Incorrect connection of power cables will cause fires. Follow the sequence when connecting the power cables.
Ensure the fastness of the connection parts. Poor contact or oxidation of the contact surface may cause fire.

NOTICE

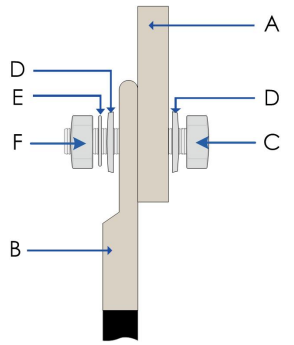
- **Long bolts may affect the insulation and may cause short circuit.**
- **Remove the heat-shrinkable tubing between the cable lug and the copper bar if necessary. Poor contact or over-heating may follow if otherwise.**

Clean the connection terminals before cable connection. Do not touch the terminal after cleaning.

Spare parts required for power cables connection like the screws are within the scope of delivery. Respect the description in this chapter during connection.

6.2.1 Copper Wire Connection

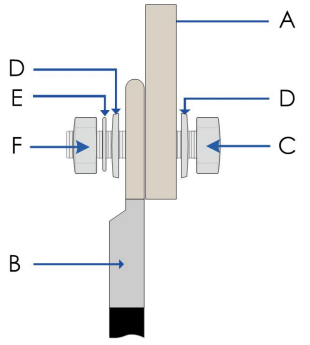
If copper wires are used, connect the spare parts as described below:



No.	Name	No.	Name
A	Copper Bus	D	Flat washer
B	Cable Lug	E	Spring washer
C	Bolt	F	Nut

6.2.2 Aluminum Wire Connection

When the aluminum wire is selected, a copper-aluminum adapter terminal is required, as shown below:



No.	Name	No.	Name
A	Copper Bus	D	Flat washer
B	Copper-aluminum adapter terminal	E	Spring washer
C	Bolt	F	Nut

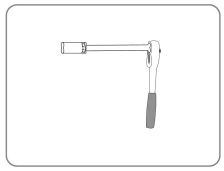
6.3 Preparation before Electrical Connections

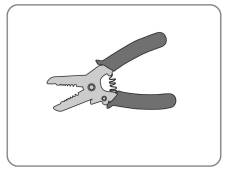
Electrical connections between devices inside the MV Station have been performed before delivery. On site, the connections between the MV Station and external devices

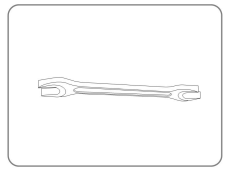
need to be performed, including DC connection, AC connection and communication connection.

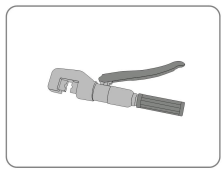
6.3.1 Installation Tools

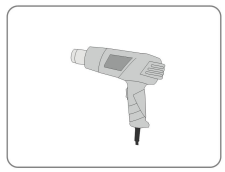
Installation tools include but are not limited to the following recommended ones, and other auxiliary tools or components can be used on site when necessary.

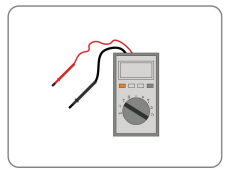

Torque wrench

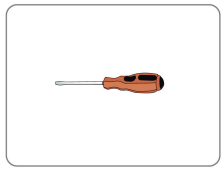

Wire stripper


Allen wrench
for terminal fixing


Terminal crimper


Heat blower


Megger and multimeter


Screwdriver

6.3.2 Opening the MV Station Door

All the MV Station doors are standard container doors. Open the doors before cable connection.

6.3.3 Checking the Cables

⚠ WARNING

Check to ensure the intactness and insulation of all cables before electrical connection. Poor insulation or damages in the cables may cause hazards. Replace them if necessary.

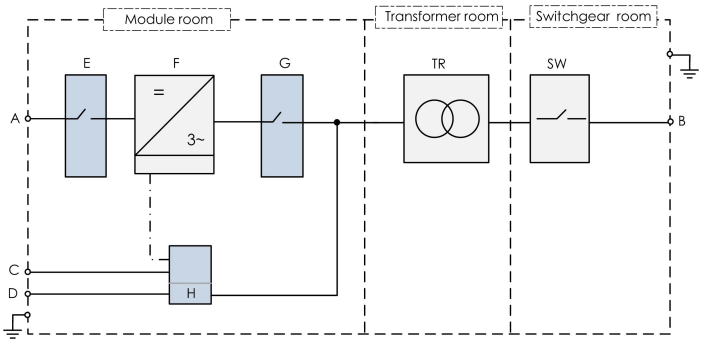
6.3.4 During Connection

WARNING

- Make sure the DC cables are correctly routed before connection.
- Do not pull the cables hard during connection.
- Make sure there is enough wire bending space for all connection cables.
- Take proper methods to reduce the stress of cables.
- Check carefully to ensure the correctness and fastness of the connections.

6.4 Circuit Diagram and Cable Connection

6.4.1 Circuit Diagram



Devices in the above figure are:

No.	Name
A	DC input
B	AC output
C	External communication port
D*	External 3-pahse power supply
E	DC cabinet
F	Inverter cabinet
G	AC cabinet
H	Intelligent PMD
TR	Transformer*
SW	Switchgear*

Note: * is optional.

6.4.2 Cable Specifications

Choose cables according to the rules below:

- All the cables must have sufficient ampacity. The ampacity of the conductor can at least be influenced by environmental conditions, conductor insulation materials, laying, wire materials, cross-sectional areas, etc.
- All the cables must be chosen according to the maximum current of the module.
- Cables for one polarity or phase should be of the same type and specification.
- Flame retardant and fire resistant cables are recommended.

⚠ WARNING

Overloading operation of cables is strictly forbidden.

6.5 Ground Connection

Brief Introduction

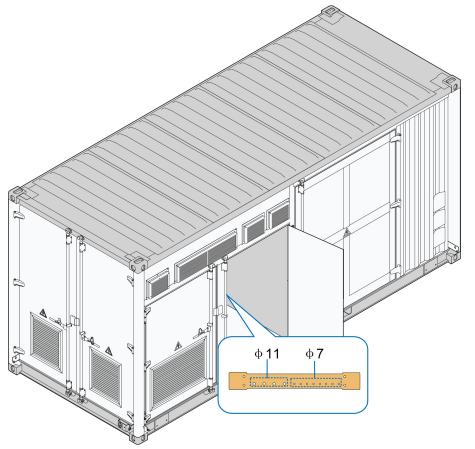
⚠ WARNING

Observe the country-specific regulations and standards at all times!

Generally, the ground connection can be divided into three parts, equipotential connection of MV Station internal devices, MV Station external grounding and the grounding of the oil tray.

Equipotential Connection of MV Station Internal Devices

All electrical devices inside the MV Station should be connected equipotentially through the total equipotential connection copper bar inside the module room, i.e. the grounding terminal of all the main electrical devices should connect to the total equipotential connection copper bar.

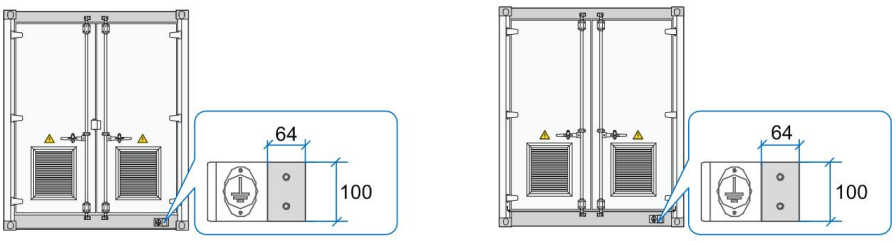


The connection of the internal main electrical devices to the ground copper bar has been finished before delivery.

On site, if grounding connection is required, the 16mm^2 cable is recommended.

External Grounding

For ease of onsite cable connection, two grounding points are designed at the exterior of the MV Station, as shown in the figure below. On site, reliably connect both or either of the two grounding points according to actual conditions.



The external grounding points of the MV Station can be grounded in the following two manners:

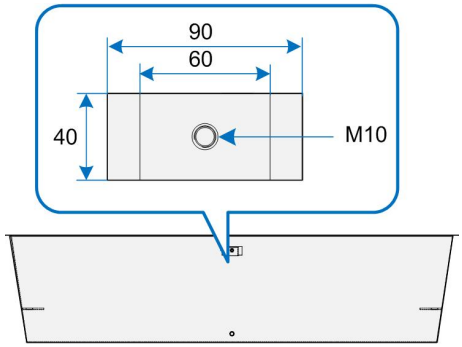
- Connect the grounding cable to the external grounding points with M10 bolts, where the recommended cable is of 50 mm^2 to 95 mm^2.
- Weld the grounding steel flat onto the external grounding point, after which anti-corrosion processing needs to be performed.

Perform the external grounding according to the on-site situation and the instructions of the plant staff.

The grounding resistance should be no more than 4Ω. It is recommended that two points of the MV Station should be connected to the ground system of the PV plant.

Grounding of the Oil Tray

A grounding point is designed on the enclosure the oil tray. The location and size of the grounding point are shown in the figure below.



The grounding resistance should be obtained from local standards and regulations.

⚠ WARNING

If you have any problems in relation to the ground cable connection, contact the related technical personnel in time. Any installations not following the standards or the installation and alternation without permission may lead to safety incidents or damage to the devices. Sungrow shall not be held liable for the damages caused.

6.6 AC Connection

6.6.1 Safety Notices

⚠ WARNING

Incorrect AC connection may cause damages to the MV Station.

⚠ WARNING

Electrical shock hazards!

- Do not touch the live components.
- Disconnect the AC switches and ensure all terminals are voltage-free.
- The connections to the downstream devices must be carried out only after receiving approval from the distribution utility as required by national and state interconnection regulations.

⚠ WARNING

Strictly follow all the instructions when connecting.

Strictly follow all device internal instructions when closing/opening the AC switches.

6.6.2 AC Cable Connection

The standard MV Station mainly includes the following devices inside: inverter, MV transformer, and switchgear.

However, the MV Station may include only two or three devices due to the requirements of different projects. Correspondingly, the location of external AC cable connection terminals and cable connection schemes may differ.

Specific correspondence between project configuration and cable connection scheme is shown in the table below.

Configuration	Terminals location	Connection scheme
Includes only inverter & MV transformer	Transformer	AC cable connection on the MV transformer side
Includes inverter , MV transformer ,and switchgear	Switchgear	AC cable connection on the switchgear side

AC Connection on the Transformer Side

Refer to the corresponding manual of the MV transformer to perform AC cable connection.

AC Connection on the Switchgear Side

Refer to the corresponding manual of the switchgear to perform AC cable connection.

6.7 DC Connection

6.7.1 Checking before Connection

Check the following items before cable connections.

- Check the open-circuit voltage of the PV array to ensure the open-circuit voltage is less than the max. DC voltage of the module.
- Mark the negative and positive polarity of the cable.
- Check the PV modules for possible ground fault.

⚠ WARNING

- **Open-circuit voltage of the PV array should not exceed the max. DC voltage of the module. The module may be damaged if otherwise.**
- **If a ground fault is detected, remove it before performing any DC connection.**

⚠ WARNING

Strictly follow all the instructions when connecting the cables.

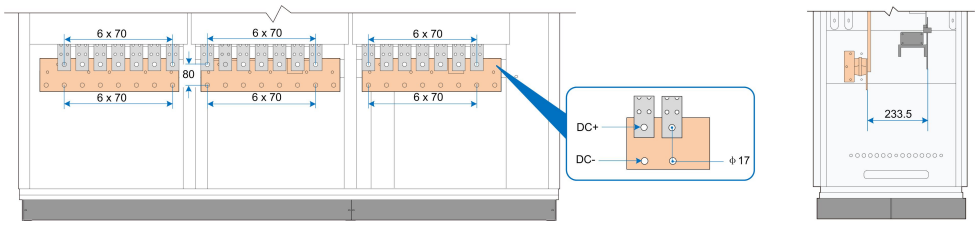
⚠ WARNING

Observe all the safety rules specified by the PV array manufacture.

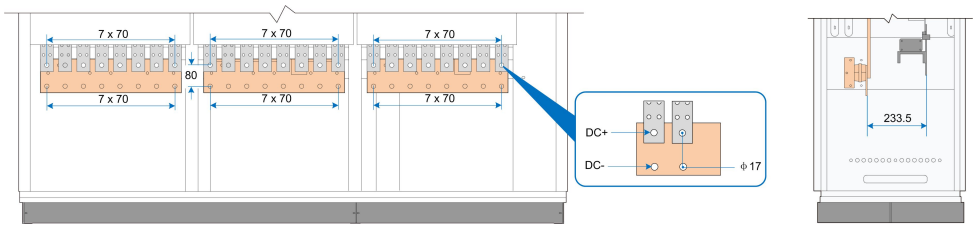
Start DC connection only when all checks and measurements meet requirements.

6.7.2 DC Cable Connection

Connection area for 21 inputs is shown in the following figure.



Connection area for 24 inputs is shown in the following figure.



No.	Description
DC+	DC positive cable connection area
DC-	DC negative cable connection area

Cable Requirements

- The maximum cross-sectional area of the aluminum/ copper cable is 750kcmil.
- Fasten the wiring terminal with the bolts in the scope of delivery. And the torques are shown in following table.

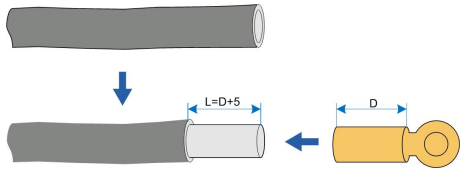
Bolt	Torque(N.m)
M16×55	119~140

Cable Connection Steps

Proceed as follows to connect the DC cables:

step 1 Make sure the switch upstream of the combiner box is in the OFF position.

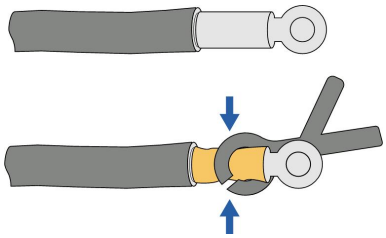
step 2 Strip off the insulation cover of the cable with the tripped length of 5mm longer than the depth of the cable lug.



step 3 Crimp the cable lug. It is advisable to select DT-××（××is the cable cross-sectional area) cable lug.

1 Put the stripped cable inside the cable lug.

2 Tighten the cable lug with relevant tools. Crimp it at least twice.

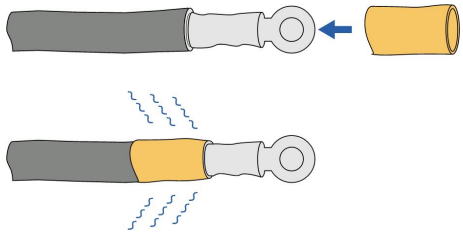


step 4 Wrap the heat-shrink tubing.

1 A tubing with length 2cm longer than the depth of the cable lug is recommended.

2 Wrap the cable lug with the heat-shrink tubing.

3 Shrink the tubing with hot air blower.



Cable protectors are advisable in the cable crosses if the multi-core cables are used.

step 5 Connect the cable.

1 Select bolts matching with the cable lug.

2 Attach the cable lug to the DC connection copper bar.

3 Fasten the bolts with screwdriver or spanner.

step 6 Confirm that all cable connections are secure.

- - End

WARNING

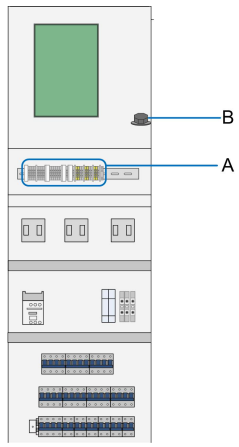
- **Incorrect connection sequence may cause fire. Pay maximum attention to the connection sequence.**
- **Ensure the firmness of the cable connection. Poor connection or oxidation of the surface may cause over-heating or fire.**

NOTICE

- **Long bolts may affect the insulation and may cause short circuit.**
- **Remove the heat-shrink tubing between the cable lug and the copper bar if necessary. Poor contact or over-heating may follow if otherwise.**

6.8 Communication Connection

The cable connection areas inside the intelligent power distribution cabinet are shown in the figure below.



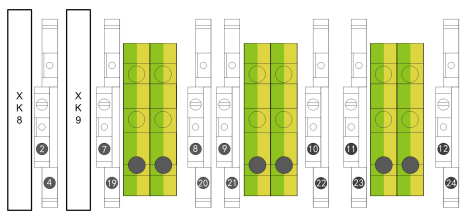
Note: This figure is for standard power distribution cabinet, and the actual product may differ.

No.	Description
A	RS485 communication port
B	Ethernet port

On site, perform cable connection according to internal terminal markings.

RS485 Ports Defination

RS485 communication ports are as follows:



Connected device	Terminal definition
Transformer oil temperature alarm(IN)	Connected to the transformer oil temperature alarm signal node
Program computer RS485(client)	7:RS485-A
	19: RS485-B
	GND: Shielding layer
PV combiner box	GND: Shielding layer
	8: RS485-A
	20: RS485-B
Environment data monitor RS485	9: RS485-A

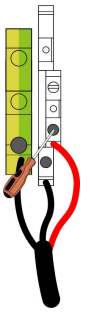
Connected device	Terminal definition
	21: RS485-B
	GND: Shielding layer
Electrical parameter meter RS485	GND: Shielding layer
	10:RS485-A
	22: RS485-B
Isolation transformer RS485	11:RS485-A
	23:RS485-B
	GND: Shielding layer
Reserved RS485	GND: Shielding layer
	12: RS485-A
	24: RS485-B

The foregoing terminal sequence is based on the standard version. Actual terminal sequence of the device purchased may slightly differ.

The foregoing terminal identifiers are recommended definitions and may be adjusted according to onsite conditions.

Cable Connection Method

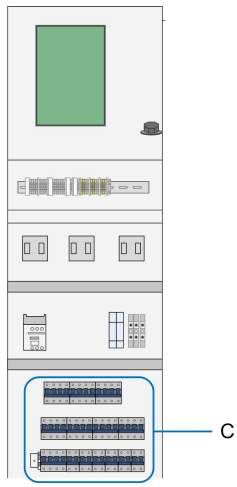
The method for communication cable connection is briefly described in this chapter by using PV combiner box as an example.



6.9 External 3-phase Power Supply (Optional)

6.9.1 External Power Supply Mode

The power distribution area, including the wiring terminal and the micro circuit breaker, is located at the bottom of the PMD. The internal power distribution area of the PMD is shown in the following figure.



Note: The foregoing terminal locations are based on the intelligent PMD with standard configuration, and the actual product may differ.

The external auxiliary power supply needs to be the three-phase 380V AC current, and the cross-sectional area of the connected cable is 6.6mm².

The maximum distribution power of the PMD is 15kW.

No.	Description	Description
C	Port of the external three-phase power supply	Corresponding micro circuit breaker

Operation before Cable Connection

⚠ WARNING

Disconnect the protection fuse at the bottom of the PMD before closing the external power supply switch.

NOTICE

The MV Station will activate protection function to disconnect external loads from power supply in case the grid voltages get abnormal.

6.9.2 Internal Power Supply Mode

Cables for the internal power supply have been connected before delivery.

During normal operation of the MV Station, the control switch of the internal power supply mode automatically connects and disconnects without manual operations.

⚠ WARNING

In the internal power supply mode, close the protection fuse at the bottom of the PMD.

6.10 Finishing Electrical Connection

⚠ WARNING

After the electrical connection, check the connections of all cables for correctness and firmness.

After checking that all connections are correct and firm,

- Close the cable entries on the bottom of the module by following the reversed procedure in opening the cable entries.
- The gap at the cable inlet/outlet at the bottom and right of the MV Station should be sealed with fireproof mud.
- Water-proof treatment should be performed on the foundation of the MV Station.

7 Commissioning

7.1 Safety Instructions

DANGER

High voltage! Electric shock!

- Wear proper protection equipment before all operations on the device.
- Do not touch the live terminals or conductors.
- Respect all safety instructions attached on the device and described in this manual.
- Respect all safety instructions prescribed by the manufacturer of devices connected to the MV Station.

WARNING

Grid-connection of the MV Station can be performed only after receiving approval from the local utility grid company and by qualified personnel.

WARNING

After the MV Station is operating, make sure there are no flammable materials at least 5 meters around the installation site.
Local/national standards about the min. electric clearance around the MV Station should be respected.

CAUTION

Make sure the installation is correct and no spare parts or tools are left inside the device.

NOTICE

Close the doors of the MV Station and the internal devices if the commissioning process is stopped.

7.2 Requirements of Commissioning

Before commissioning, installation of the modules and the intelligent PMD inside the MV Station should be checked thoroughly.

- Ensure all cables are connected securely and all bolts are fixed properly.
- Ensure DC side voltage meets module requirements and the polarity is correct.
- Ensure AC side voltage meets module requirements.
- Ensure all cable connections meets related standards and requirements.
- Ensure the system is properly grounded. Ground resistance is important for the whole system so that before commissioning, make sure the ground resistance is less than 4Ω.

⚠ WARNING

Make sure the emergency stop button inside the monitoring window is released, all AC & DC switches are disconnected and all micro-circuit breakers inside the intelligent PMD are disconnected before commissioning.

NOTICE

All commissioning operations must be performed only by qualified personnel.

Commission the device when it is sunny and the environmental conditions are stable to ensure the successful commissioning.

7.3 Checking before Commissioning

7.3.1 Checking the Cable Connection

- Check cables for any possible damages or cracks.
- Check that all cables are connected securely according to the cable connection diagram. Adjust the cable connection if necessary.
- Ensure all cable connections are firmly enough. Fix the bolts if necessary.
- Check the PE equipotential connection. Ensure the module AC side PE ground copper bar has connected to the equipotential connection point in the electrical room and properly grounded. The ground resistance should be no more than 4Ω.

7.3.2 Checking the Module

- Ensure that the DC and AC switches are in the “OFF” position.
- Check whether the electric switches and buttons of the MV Station and its upstream and downstream devices can be operated flexibly.

7.3.3 Checking PV Array

⚠ WARNING

Ensure the measuring devices are connected and used correctly. Otherwise, there will be electric arc.

⚠ WARNING

DC side voltage should be no more than the max. DC input voltage of the MV Station.
Too high DC voltage may damage the module even cause safety incident.

To ensure system reliability and device operation, PV cells on the DC side of the MV Station should be from the same manufacturer and the number of PV cells in each string should be the same.

Check the PV arrays before grid-connection. The voltage of each DC main cables should be the same and no more than the max. permissible DC voltage. Check carefully the polarity of each DC main cable. Once the polarity in one DC main cable is incorrect, the PV arrays may be damaged.
Make sure the environmental condition is stable since the voltage of PV array may change with the solar radiation and the temperature of the PV cells. Record the PV array status via the U-I curve. Commission the device when the PV array output situation is stable.

The PV field circuit fault (module fault or module numbers deviation in certain array), cable damages or connection looseness may cause the voltage deviation exceeding 3% under stable environmental conditions.

- Record the environmental parameters (temperature, radiation, etc.).
- Measure the resistance of cables (between the terminal box and the module).
- Record accurately all the measured datas.

7.3.4 Checking Grid Voltage

- Measure accurately the grid 3-phase line-to-line voltages: L1-L2, L1-L3, and L2-L3. The voltages should not exceed the grid permissible voltage, and the three phases are in balance.

Adjust the transfer ratio of the transformer by qualified personnel if the grid voltage deviation is serious.

- Measure and record the grid frequency. Measured datas should not exceed the grid permissible frequency.
- Measure the THD and check the curve if possible. Module will stop running if the THD is serious.
- Record accurately all the measured datas.

7.4 Preparation before Starting

- Place the disassembled protection grills to their original positions and ensure the connection is secure.
- Close and lock the cabinet door.
- Clean the device site. Make sure the position is clean without flammable or explosive materials.
- Ensure the ventilation of the installation place.
- Recheck and ensure whether module and switches upstream and downstream can meet the requirements flexiblely .

7.5 Starting the Device

If all tests and measurements have been performed, and all measured values lie within the acceptable range, the device can be switched on for the first time. Proceed as follows to start the MV Station:

step 1 Close the upstream and downstream switches of the MV Station.

step 2 Manually close the auxiliary power supply switch inside the MV Station and wait the touch screen to power on.

step 3 Stop the MV Station through the touch screen.

step 4 Turn off “Trip Enable” and “Door-protect enable” through the touch screen.

step 5 Manually close all DC switches inside the DC cabinet.

step 6 Perform the start operation through the touch screen, and the MV Station starts grid-connected operation.

- - End

To ensure the MV Station operates normally for the first time, measure the DC input voltage beforehand. When the DC side voltage meets the start-up requirement, i.e., the DC voltage is steadily higher than the DC start-up voltage, start the MV Station for the first time.

7.6 LCD Parameter Setting

When the LCD is on, set the display language, date and time, communication parameters, active power limitation, etc. according to Chapter "10 LCD Menu Operation"in this manual; and view the running information and perform related operation.

7.7 Completing Commissioning

If all the start-up procedures have been performed, check the operating condition of the MV Station.

- Check whether there are anomalies of the module: abnormal noise, overheating, smoking or unusual odor.
- Check that the grid-connected voltage, current, and THD of the MV Station are stable.
- Check the grounding of the module enclosure.
- Check the functionality of the LCD display.
- Record accurately the module operation data during commissioning.

The duration of commissioning depends on the plant scale, plant location, on-site environmental conditions and so on. Usually, if the in-site condition is good, the commissioning can last for 1 week, i.e. 168 hours.
The commissioning of the module is completed. Module operates normally.
The duration of commissioning depends on the plant scale, plant location, on-site environmental conditions and the like. Usually, if the on-site conditions are favorable, the commissioning can last for 1 week, i.e. 168 hours.

⚠ WARNING

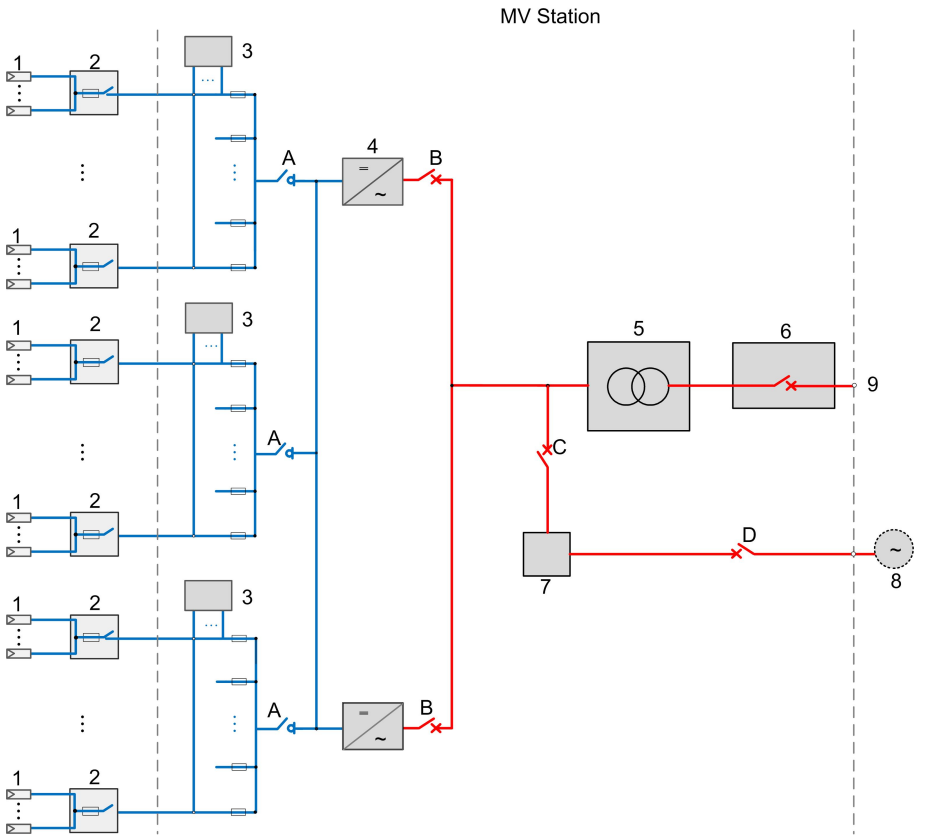
After successful commissioning, the MV Station will be put into operation. Local/national standards about the min. electric clearance around the MV Station should be respected.

NOTICE

MV Station needs no manual control in daily operation. Open the cabinet door only for maintenance or troubleshooting and by qualified personnel only.
Keep the door closed and locked and store the keys of the door by appointed personnel during normal operation.

8 Disconnecting and Reconnecting the MV Station

8.1 Power Connection Point Overview

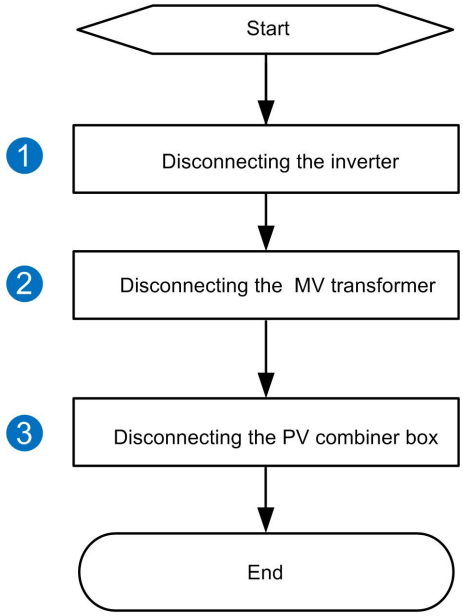


No.	Device	No.	Switch
1	PV array	A	Load Switch
2	PV combiner box	B	AC breaker
3	Branch board	C	Control switch
4	Inverter	D	Control switch
5	MV transformer	-	-
6	MV switchgear	-	-
7	Intelligent PMD	-	-
8*	External Power Supply	-	-
9	Grid	-	-

Note: * is optional.

8.2 Disconnecting the MV Station

The following figure shows the steps of disconnecting the MV Station.



No.	Step	Reference
1	Disconnecting the inverter	"8.2.1 Disconnecting the Inverter"
2	Disconnecting the MV transformer	"8.2.3 Disconnecting the MV Transformer"
3	Disconnecting the PV combiner box	"8.2.4 Disconnecting the PV Combiner Box"

8.2.1 Disconnecting the Inverter

8.2.1.1 Switching off the Inverter

step 1 Stop the inverter in any one of the following manners.

- Tap "Start/Stop" -> "Stop" on the LCD screen to stop the inverter.



- Rotate the Start/Stop button to the "STOP" position.



- Press down the emergency stop button.

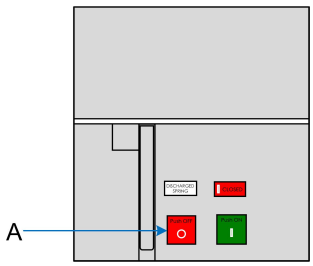


step 2 Remove the keys on the monitoring window to avoid inadvertent reconnection.

- - End

8.2.1.2 Disconnect DC Side of the Inverter

step 1 Disconnect all the load switches （figure A）of the inverters.



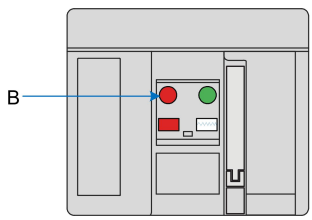
step 2 Ensure that the DC side of the inverters are voltage-free.

step 3 Ensure that the DC wiring terminals and other to-be-operated areas of the inverters are voltage-free with a multimeter.

- - End

8.2.1.3 Disconnect AC Side of the Inverter

step 1 Disconnect the AC breakers （figure B）of the inverters.



step 2 Ensure that the AC side of the inverters are voltage-free.

step 3 Ensure that the AC wiring terminals and other to-be-operated areas of the inverters are voltage-free with a multimeter.

- - End

8.2.2 Disconnect Power Supply of the Inverter

step 1 Disconnect the internal power supply control switch **Q1** of the inverters.

step 2 Disconnect the external power supply control switch **Q2** of the inverters if there any.

step 3 Ensure that the power supply wiring terminal of the inverter is voltage-free with a multimeter.

- - End

8.2.3 Disconnecting the MV Transformer

step 1 Refer to "8.2.1 Disconnecting the Inverter" to disconnect the inverters.

step 2 Wait 10 minutes to have the internal capacitors discharge completely, and then open the doors of the MV Station.

step 3 Perform the following operations on circuit breakers inside the MV Switchgear, where reference can be made to the manual of the Switchgear.

1 Disconnect the circuit breaker.

2 Disconnect the switch disconnector.

3 Connect the earthing-switch.

- - End

8.2.4 Disconnecting the PV Combiner Box

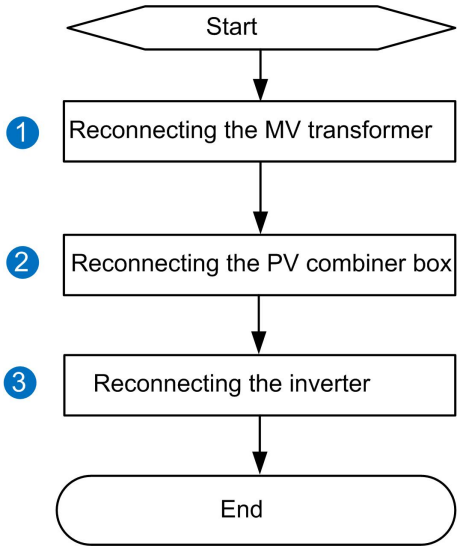
step 1 Refer to "8.2.1 Disconnecting the Inverter"to disconnect the inverters.

step 2 Disconnect the all the DC switches of the upstream PV combiner boxes connected to the inverter.

- - End

8.3 Reconnecting the MV Station

The following figure shows the steps of reconnecting the MV Station.



No.	Step	Reference
1	Reconnect the MV transformer	"8.3.1 Reconnecting the MV Transformer"
2	Reconnecting the PV combiner box	"8.3.2 Reconnecting the PV Combiner Box"
3	Reconnect the inverter	"8.3.3 Reconnecting the Inverter"

8.3.1 Reconnecting the MV Transformer

Perform the following operations on the circuit breaker cabinet inside the MV Switchgear, where reference can be made to the manual of the Switchgear.

step 1 Disconnect the earthing switch.

step 2 Connect the switch disconnector.

step 3 Connect the circuit breaker.

- - End

8.3.2 Reconnecting the PV Combiner Box

Connect DC switches of all upstream combiner boxes of the inverter.

8.3.3 Reconnecting the Inverter

Proceed as follows to reconnect the inverter: reconnecting the AC side of the inverter, reconnecting the DC side of the inverter and restarting the inverter.

8.3.3.1 Reconnecting the AC side of the Inverter

step 1 Connect the external power supply control circuit breaker **Q1** of the inverter.

step 2 Connect the AC breakers of the inverters.

- - End

8.3.3.2 Reconnecting the DC side of the Inverter

step 1 Connect the DC switches of the PV combiner boxes.

step 2 Connect the load switches of the inverters.

- - End

8.3.3.3 Restarting the Inverter

Start the inverters in either of the following manners:

step 1 Rotate the Start/Stop button to the "START" position.

step 2 Tap "Start/Stop" - > "Start" on the LCD screen to start the inverters.

- - End

9 Starting/Stopping

9.1 Starting

9.1.1 Inspection before Starting

After the maintenance or service work, inspect the following items, and then start the MV Station,

- All connections are performed by strictly following the installation manual and circuit diagram.
- The coverings of the internal devices are fixed and secured.
- The cabinet door is closed.
- The emergency stop button is released and the Start/Stop switch is in the "Stop" position.
- Make sure, by using suitable instruments, that there is no ground fault in the PV array.
- Measure the DC and AC voltages with a multi-meter to check if the start-up conditions are met, and ensure no overvoltage hazard.

⚠ WARNING

After longtime storage, a thorough and professional test is necessary before starting the MV Station.

9.1.2 Start Steps

When the abovementioned conditions are fulfilled, proceed as follows to start the MV Station:

step 1 Close the upstream and downstream switches of the MV Station.

step 2 Manually close the auxiliary power supply switch inside the MV Station and wait the touch screen to power on.

step 3 Stop the MV Station through the touch screen.

step 4 Turn off "Trip Enable" and "Door-protect enable" through the touch screen.

step 5 Manually close all DC switches inside the DC cabinet.

step 6 Perform the start operation through the touch screen, and the MV Station starts grid-connected operation.

- - End

After startup, the MV Station will automatically check if parameters of the DC and AC side meet the grid-connection requirements. If so and the set time have been reached,

the MV Station will turn to the OPERATION mode and feed the generated AC current to the grid.

⚠ WARNING

- **MV Station needs no manual control in daily operation. Only qualified personnel are allowed to open the cabinet door for maintenance or troubleshooting.**
- **Keep the door closed and locked and store the keys of the door by appointed personnel during normal operation.**

9.2 Stopping

Stop the MV Station when maintenance and service work is required or a fault occurs.

9.2.1 Normal Stop

Proceed as follows to stop the MV Station during normal maintenance and service work as follows:

step 1 Stop the MV Station through the stop instruction on the LCD panel.

step 2 Disconnect the DC side and auxiliary power supply switches.

step 3 Disconnect the MV Station downstream switches.

step 4 Disconnect the MV Station upstream switches.

step 5 MV Station stops running.

- - End

⚠ WARNING

Never disconnect the AC or DC switch during normal operation.
Otherwise, the MV Station as well as the switch may be damaged.

9.2.2 Stop in Case of Fault

Proceed as follows to stop the MV Station when a fault or emergency occurs as follows:

step 1 Press the emergency stop button.

step 2 Disconnect the auxiliary power supply switches.

step 3 Disconnect the MV Station downstream switches.

step 4 Disconnect the MV Station upstream switches.

step 5 MV Station stops running.

- - End

⚠ WARNING

- Press the emergency stop button only when emergency or a fault occurs. Under normal conditions, stop the MV Station via the stop instruction on the LCD panel.
- Press the emergency stop button immediately in case of emergency to make a timely response.

⚠ WARNING

The emergency stop button will stay in lock state once you press it. Release it with the key.

10 LCD Menu Operation

10.1 LCD Touch Screen

The eye-level LCD touchscreen inside the monitoring window on the front side of the MV Station is used to view data and set parameters.

The LCD as shown in the following figure. User can check or set related data by touching the icons on the LCD display.

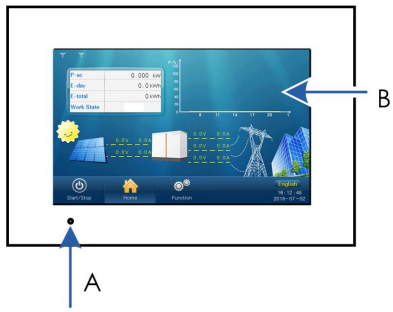


figure 10-1 Location and Appearance of the LCD Display

No.	Description
A	Running state indicator, it is red when powered on and turns to green during normal operation
B	Data display and operation area

For user convenience, a large number of pictures of the LCD interface are provided in this chapter. The parameters and other details in those pictures are indicative only. The actual product you receive may differ.

If the time shown on the LCD panel is different from the actual local time after time calibration, check and replace the button cells on the back of the LCD panel.

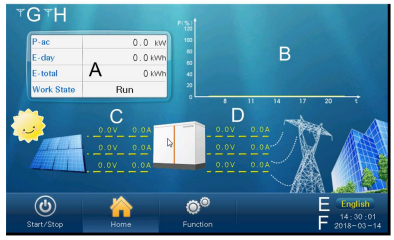
10.2 Default Screen

10.2.1 Initialization

The LCD is initialized when the intelligent PMD is power on and then enters into the starting menu.

Appears every time the MV Station is energized. After initialization, the default screen follows.

10.2.2 Default Screen Introduction



No.	Description
A	Yield data. The first line on the top indicates the present active power; work state is the transient state of the MV Station.
B	Today's active power curve to indicate the power percentage (power value divides the MV Station nominal power value).
C	DC side voltage and current of the MV Station respectively.
D	AC side line-to-line voltage and phase current.
E	Language selection button. Click to change among English, Chinese and the like.
F	Present date and time.
G	Success rate of the MV Station internal communication.
H	Success rate of communication between the MV Station and PC.

Enter the following submenus from the default menu.

WARNING

LCD screen contains lots of parameters pertinent to the MV Station operation. All parameter configurations must be performed by appointed personnel. Do not modify any parameters without full understanding of the relevant action or without consulting Sungrow Customer Support.

10.2.3 Backlight and Screensaver

If no operation has been performed on the screen for more than 5 minutes, the backlight will go off. Tap the screen to activate the backlight so that the latest interface reappears.

10.3 Overview of LCD Menu and Icon

10.3.1 Overview of Submenu and Icon

There are three buttons on the lower left side of the touch panel: "**Start/Stop**" 

, "**Home**" 

, "**Function**" 

. The user can perform related operations via these buttons.

Main Menu	First sub-menu	Second sub-menu	Third sub-menu
Start/Stop	Start	—	—
	Stop	—	—
Home	—	—	—
Function	Run-information	Real Time Data	—
		Power curve	—
		E-histogram	—
	History-information	His-event	—
		His-fault	—
		His-data	—
		His-alarm	—
	Start/Stop	Start	—
		Stop	—
	Set-parameter	Sys-parameter	Language & Firmware Ver.
			Time
			Remote/Local control
			E-adjust
			Load default
		Run-parameter	—
		Pro-parameter	—
		Com-parameter	Serial port param.
			Network param.

10.3.2 Layout of the submenus

The layout of submenus is the same as that shown below except for the default menu.



No.	Description
A	Title bar The first line from the top is the present success rate of communication. The left side of the second line is the name of the present page, while the right side is the present date and time.
B	Data display or parameter configuration.
C	From left to right, there are three main icons and a return button which is used to return to the previous menu.

For convenience's sake, the operations on the menus are referred to as the menu name with quotation marks. For example, the 

menu will be referred to as "Set-parameter".

10.4 Entering Password

MV Station parameters are protected by password. User can enter into the "Set-parameter" sub-menu only after entering the correct password. Proceed as follows to enter the password:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter" and the password entering window pops up.



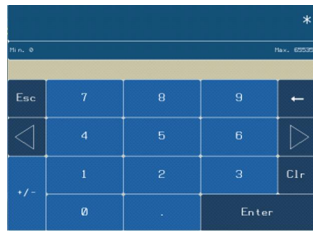
step 3 Tap the white edit box and a keypad pops up.

step 4 Enter the password 1111 through the keypad.

If the entered password is correct, the parameter setting page pops up, and the user can set system parameters, running parameters, protection parameters, and communication parameters.

Button	Function
←	Backspace key, delete the digit input
Clr	Clear the digitals input
Esc	Escape and close the keypad

Button	Function
Enter	Confirm the password entered
Max./Min.	The maximum and minimum value can be input; digital outside this range is invalid



If the input password is 1111, user can enter into the normal parameter setting page and set the system parameters, running parameters, protection parameters and communication parameters.

step 5 Press "Enter" to confirm the password entered.

step 6 If the password is incorrect, an "Error password" window will appear. Tap "Enter" and re-enter the password.



- - End

10.5 Setting Language

User can set the language by either of the following two ways:

10.5.1 Conventional Way

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Language & Firmware Ver." and enter into the language and firmware version sub-menu.



The figure is indicative only and actual interface may differ.

step 5 Select the desired language.

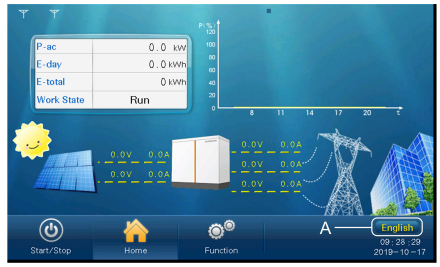
-- **End**

10.5.2 Shortcut

The language setting shortcut (shown by A) is in the lower right corner of the Home menu. Select either language by tapping the language button.

By tapping the button, the language will switch among English, Chinese and the like.

Language on the button is the present display language of the display.



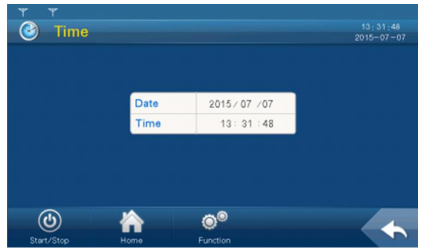
10.6 Setting Date and Time

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Time" and enter into the date and time setting sub-menu.



step 5 Set the "Year", "Month", "Date", "Hour", "Minute" and "Second". Tap the corresponding field and the keypad will appear.

step 6 Set the time and date by tapping the keypad and confirm setting by tapping "Enter".

-- **End**

10.7 Energy Output Deviation Adjustment

Energy output deviation adjustment is useful when the total power output displayed in LCD (E-total) is different from the reading value of the external power measuring device. (Energy-adj value)= (Real measured value)-(E-tot reading value).

To adjust the date or time, proceed as follow:

step 1 Tap "Function" from the default menu;

step 2 Tap "Set-parameter";

step 3 Tap "Sys-parameter" after entering the correct password;

step 4 Tap "E-total adjust" and enter into the energy output deviation adjustment sub-menu;



Tap the cell below the "Compensation" and the keypad appears. Enter the energy compensation by tapping the keypad;

step 5 Tap "Enter" to confirm the setting.

--End

10.8 Checking Running Information

Running information contains all data related to the operation of the MV Station:

Real-time Data

The real time running information of the 4 modules can be checked.

The output power, DC voltage & current, power factor, reactive power, efficiency, daily/monthly/annual power yields, internal temperature, positive/negative insulation resistance to the ground, running time, amount of CO_2 reduction, grid frequency, AC phase/line voltage, module temperature, AC & DC switches states, bypass switches/fuse state, power supply mode are included.

Power Curve

The output power curve shows the power yield on that particular day in percentage of the nominal power. The data is updated every several seconds and all the diagram data will be cleared at the beginning of a new day.

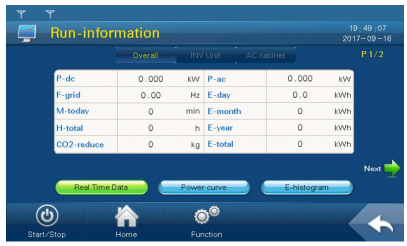
E-histogram

The histogram shows the power yields of the present day.

Proceed as follow to view the running information:

step 1 Tap "Function" from the default menu.

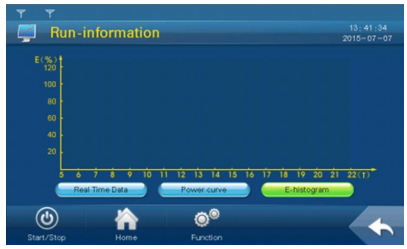
step 2 Tap "Run-information" and switch among "Real Time Data", "Power curve" and "E-histogram". The default display is "Real Time Data".



step 3 Tap "Power curve" and enter into the power curve sub-menu.



step 4 Tap "E-histogram" and enter into the electricity histogram sub-menu.



The value displayed is indicative only and cannot be used as a basis for billing.

- - End

10.9 Checking History Information

There are four kinds of history information: History event, history fault, history data and history alarm.

10.9.1 Checking History Event

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "His-event" and enter into the history event sub-menu.



History events can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total number of the current event records. Tap "Prev" or "Next" to turn pages up or down.

- - End

10.9.2 Checking History Data

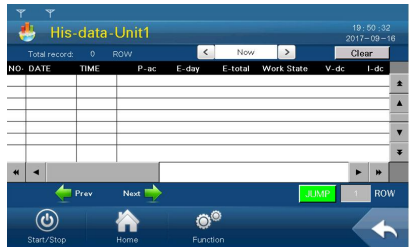
System can record the MV Station running information for the latest 90 days with the records updated every 15 minutes per day.

History data displays the data related to the power yields and the electric quantity of the MV Station. Proceed as follows to check the history information:

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "His-data" and enter into the history data sub-menu.



Tap "Prev" or "Next" to turn pages up or down.

- - End

10.9.3 Checking History Fault

When a fault occurs, the user can view the fault and the history fault records via the LCD screen, and the steps are as follows:

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "His-fault" and enter into the history fault sub-menu.



History faults can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total number of the current fault records. Tap "Prev" or "Next" to turn pages up or down.

- - End

10.9.4 Checking History Alarm

Proceed as follows to check the history warn information:

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "his-alarm" and enter into the history alarm sub-menu.

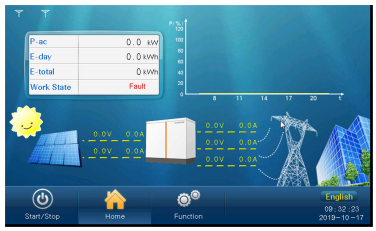


History alarms can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total numbers of the current warn records. Tap "Prev" or "Next" to turn pages up or down.

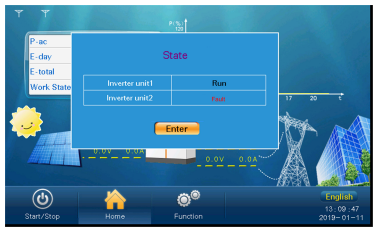
- - End

10.10 Checking Present Fault Information

There may be one or more than one fault occurs to one or more than one module inside the MV Station at the same time which can be viewed through the LCD screen. Follow the description in this chapter to view the fault information when faults occur.



If there is a fault, the “Work State” will show “Fault”. Tap the “Fault” cell.



The state column of the module that has fault will display “Fault. As shown in the left figure, a fault occurs to module unit 2. Tap the fault cell of module unit 2 to check the present fault.



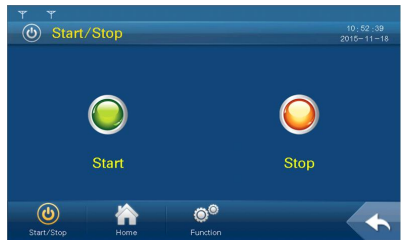
The fault interface of module unit 2 will appear with the fault item in red.

10.11 Starting/Stopping

Usually, the MV Station will start automatically when the grid-connected requirements are met.

Start/stop the MV Station through the LCD screen in either of the following manners:

- Tap “Start/Stop” from the default menu.
- Tap “Start/Stop” from the Function menu.



By tapping the start/stop button on the screen, all the MV Station will start or stop at the same time. A confirm operation interface will appear after tapping the corresponding buttons. The instruction takes effect after confirmation; or the user can cancel the operation by tapping “Cancel”.

10.12 Load Default

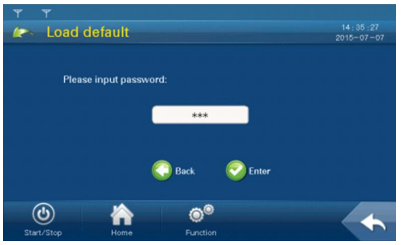
Proceed as follows to restore factory defaults:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Load default" and the password inputting window appears.



Tap "Load default" and the password inputting window appears;

- - End

10.13 Checking Firmware Version

User can view the firmware version of LCD and DSP as follows:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Language & Firmware Ver." and enter into the language and firmware version sub-menu.



The figure is indicative only and actual interface may differ.

step 5 The firmware versions of LCD and DSP are displayed at the bottom of the page.

- - End

10.14 Parameters of LCD

10.14.1 Communication Parameters

⚠ WARNING

Improper communication parameter configuration may lead to communication failure!
Follow strictly the instructions of the plant staff in configuring the communication parameters.

There are the RS485 communication and Network communication. User can set the communication address and protocol through the LCD screen when the hardware connection is complete and the device is energized.

Proceed as follows to set the communication parameters:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Com-parameter" after entering the correct password.

- Set parameter from the Serial Port Parameter interface for RS485 serial communication;
- Set parameter from the Network Parameter interface for Network communication



- - End

Serial Port Parameter Setting

Click "Serial port param" to enter the following interface.



Two parameters pertinent to RS485 serial port communication can be set according to the parameter range shown on the display.

"Address" is prescribed by the plant staff and the address for each device must be unique when there is more than one device. "Baud" is selected according to the communication method adopted on-site.

Network Parameter Setting

Click Network Parameter to enter the following interface.



Six parameters pertinent to the Network communication can be set. DNS address 1 and DNS address 2 can be set to the default value. Other parameters are assigned by plant staff.

Set parameter with the aid of the pop-up keypad.

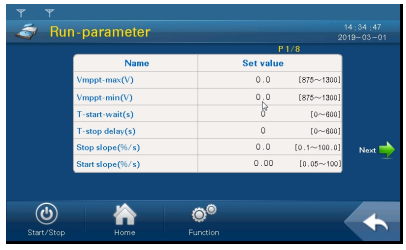
10.14.2 Running Parameters

Setting Running Parameters

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Run-parameter" after entering the correct password.



step 4 Set the running parameter by tapping the pop-up keypad and tap ENTER to confirm setting. Tap "Prev" or "Next" to turn pages up or down.

- - End

table 10-1 Description of Running Parameters

Parameter	Description
Vmppt-max (V)	Maximum MPPT voltage
Vmppt-min (V)	Minimum MPPT voltage
T-start-wait (s)	Time interval between the moment at which the AC/DC parameters meet the grid-connection requirements and the moment at which the MV Station begins to generate power

Parameter	Description
T-stop-delay (s)	Time interval between the moment at which the stop command is sent via the LCD display or the PC and the moment at which the MV Station executes the stop command
Stop slope (%/s)	Active power decline rate over the time from the moment at which the MV Station executes stop command to the moment at which the MV Station stops
Start slope (%/s)	Active power rise rate over the time from the moment at which the MV Station executes the start command to the moment at which the MV Station starts
Limit Power (%)	Percentage of the active power output to the nominal output power (%)
Pf	cos φ
Q-limit (%)	Percentage of the reactive power rise to the nominal power (%)
Q-adjust switch	-
Power-off saved (Pf)	If the power factor setting can be saved when the LCD screen is powered off
Power-off saved (P-limited)	If the limit power(%) setting can be saved when the LCD screen is powered off
SVG switch	If the reactive power compensation is activated or deactivated
T-recover (s)	Automatic recovery time when fault occurs
P-rise rate (%/s)	Rate of rise of the active power
P-decline rate (%/s)	Rate of decline of the active power
Q-rise rate (%/s)	Rate of rise of the reactive power
Q-decline rate (%/s)	Rate of decline of the reactive power
Trip Enable	Trip the DC main switches of the MV Station
FW func enable	To enable/Disable the FW function
FW output change base	The standard of active power change caused by frequency change
OF decrease start(Hz)	Refer to f1i in "figure 10-2 The relation curve between the active power and the frequency".
OF decrease end(Hz)	Refer to f2i in "figure 10-2 The relation curve between the active power and the frequency"
OF power recover frq (Hz)	When the grid frequency is lower than the overfrequency recovery frequency, the active power returns to the power before derating.

Parameter	Description
OF decrease slope	Refer to K1 in "figure 10-2 The relation curve between the active power and the frequency"
OF decrease limit (%)	Refer to ΔP1 in "figure 10-2 The relation curve between the active power and the frequency"
FW input type	The input frequency type of the FW function. The max./min value of the real-time frequency or during frequency change
FW enable power(%)	After the FW function is enabled, the FW function is started when the percentage of the actual output active power is greater than the set value
UF increase start(Hz)	Refer to f1s in "figure 10-2 The relation curve between the active power and the frequency"
UF increase end(Hz)	Refer to f2s in "figure 10-2 The relation curve between the active power and the frequency"
UF power recover frq(Hz)	When the grid frequency is higher than the value, the inverter resumes normal operation
UF increase slope	Refer to K2: in "figure 10-2 The relation curve between the active power and the frequency"
UF increase limit(%)	Refer to ΔP2 in "figure 10-2 The relation curve between the active power and the frequency"
QU enable power(%)	In QU mode, the QU function will be enabled when the actual output active power percentage is greater than the set value
QU operation mode	In QU reactive power mode, the method to set the reactive power value
QU input type	QU function input voltage type; the max./min value of the real-time grid voltage or during grid voltage change
QU ind var limit (%)	Refer to Q1 in "figure 10-3 The relation curve between the reactive power and the voltage"
QU cap var limit (%)	Refer to Q2 in "figure 10-3 The relation curve between the reactive power and the voltage"
QU PF start(%)	Refer to the power factor corresponding to Q3 in"figure 10-3 The relation curve between the reactive power and the voltage"
QU PF end(%)	Refer to the power factor corresponding to Q1 or Q2 in"figure 10-3 The relation curve between the reactive power and the voltage"

Parameter	Description
QU volt rise start(%)	Refer to U1i in "figure 10-3 The relation curve between the reactive power and the voltage"
QU volt rise end(%)	Refer to U2i in "figure 10-2 The relation curve between the active power and the frequency"
QU volt drop start(%)	Refer to U1s in "figure 10-3 The relation curve between the reactive power and the voltage"
QU volt drop end(%)	Refer to U2s in "figure 10-3 The relation curve between the reactive power and the voltage"
V auto-adj ref(%)	When the reactive regulation switch is V auto-adj, the grid regulation reference is set according to the percentage of nominal voltage
V auto-adj hysteresis(%)	When the reactive regulation switch is V auto-adj, the permissible plus or minus error of the regulation voltage and it is set according to the percentage of nominal voltage
Q(P) upper PF	Power factor of point P1 in "figure 10-4 Q(P) mode curve "
Q(P) lower PF	Power factor of point P2 in "figure 10-4 Q(P) mode curve "
Q(P) upper power(%)	Output power of point P2 in "figure 10-4 Q(P) mode curve "
Q(P) lower power(%)	Output power of point P1 in "figure 10-4 Q(P) mode curve "
P-closed-loopswitch	The active power regulation switch of the inverter can be set to enabled or disabled state. When it is enabled, the output active power of the inverter will be regulated according to actual situation; and when it is disabled, the output active power will not be regulated.
Q-closed-loopswitch	The reactive power regulation switch of the inverter can be set to enabled or disabled state. When it is enabled, the output reactive power of the inverter will be regulated according to actual situation; and when it is disabled, the output reactive power will not be regulated.

The relation curve between the active power and the frequency is shown in the figure below.

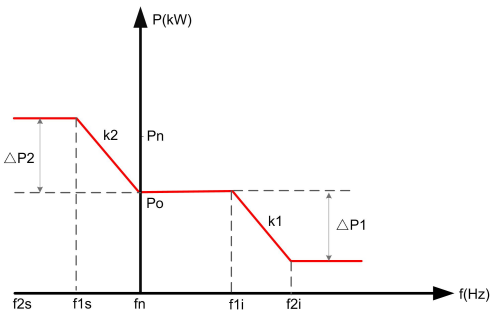


figure 10-2 The relation curve between the active power and the frequency

The relation curve between the reactive power and the voltage is shown in the figure below.

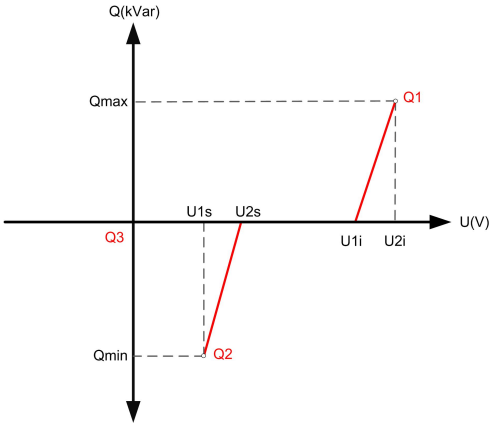


figure 10-3 The relation curve between the reactive power and the voltage

Q(P) mode curve is shown in following figure.

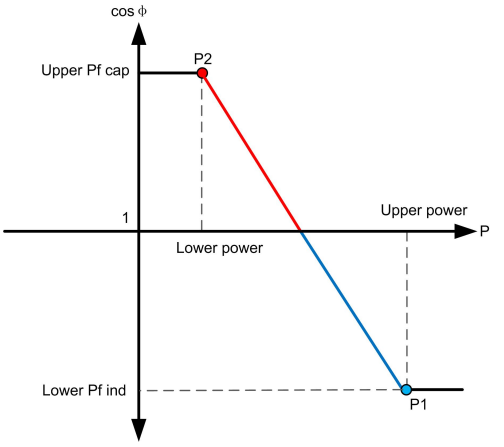


figure 10-4 Q(P) mode curve

Running parameter range and default value are shown in the following table.

table 10-2 Running parameter range and default value

Parameter	Range	Default
Vmppt-max (V)	875~1300	1300
Vmppt-min (V)	875~1300	875
T-start-wait (s)	0~600	60
T-stop-delay (s)	0~600	0
Stop slope (%/s)	0.1~100	100
Start slope (%/s)	0.05~100	10
Limit Power (%)	0~115	110
Pf	-0.8~-1/0.8~1	1
Q-adjust switch	Close/Pf/Q-limit/QU mode/ V auto-adj/QP mode	Pf
Q-limit (%)	-104.5~104.5	0
Power-off saved (Pf)	Save/Not save	Save
Power-off saved (P-limited)	Save/Not save	Not save
SVG switch*	Enable/Disable	Disable
T-recover (s)	20~600	60
P-rise rate (%/s)	0.01~100	10
P-decline rate (%/s)	0.01~100	10
Q-rise rate (%/s)	0.01~100	10
Q-decline rate (%/s)	0.01~100	10
Trip Enable	Enable/Disable	Disable
FW func enable	Enable/Disable	Disable
FW output change base	Rated-P/Pre-derate-P	Rated-P
OF decrease start(Hz)	50~55/60~65	Country-specific
OF decrease end(Hz)	50~55/60~65	Country-specific
OF power recover frq(Hz)	50~55/60~65	Country-specific
OF decrease slope	0~2	Country-specific
OF decrease limit (%)	0~115	Country-specific
FW input type	RT-freq/Record- freq	Country-specific
FW enable power(%)	0~115	0
UF increase start(Hz)	45~50/55~60	Country-specific
UF increase end(Hz)	45~50/55~60	Country-specific
UF power recover frq(Hz)	45~50/55~60	Country-specific
UF increase slope	0~2	Country-specific

Parameter	Range	Default
UF increase limit(%)	0~115	Country-specific
QU enable power(%)	0~115	0
QU operation mode	Var PCT adj/ TanPhi adj/ CosPhi.adj	Var PCT adj
QU input type	RT volt/Record volt	RT volt
QU ind var limit (%)	0~100	50
QU cap var limit (%)	0~100	50
QU PF start (%)	0.8~1	Country-specific
QU PF end (%)	0.8~1	Country-specific
QU volt rise start(%)	100~110	Country-specific
QU volt rise end(%)	100~110	Country-specific
QU volt drop start(%)	90~100	Country-specific
QU volt drop end(%)	90~100	Country-specific
V auto-adj ref(%)	90~110	100
V auto-adj hysteresis(%)	0~10	1
Q(P) upper PF	0.9~1	1
Q(P) lower PF	0.9~1	0.9
Q(P) upper power(%)	50~100	100
Q(P) lower power(%)	0~50	50
P-closed-loop-switch	Enable/Disable	Enable
Q-closed-loop-switch	Enable/Disable	Enable

* at night when the MV Station enters standby mode (but does not enter the deeper standby mode with lower power consumption), the SVG function needs to be activated. First, stop the MV Station via the button on the LCD, then start it, and set the SVG switch to “Enable”.

The SVG is an optional function of this MV Station.

Specific setting ranges of these parameters are displayed on the LCD.

Contact SUNGROW to obtain specific value of the parameter country-specific.

10.14.3 Protection Parameter

Setting Protection Parameter

step 1 Tap “Function” from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Pro-parameter" after entering the correct password.



Set the protection parameter by tapping the pop-up keypad and tap ENTER to confirm setting. Tap "Prev" or "Next" to turn pages up or down.

- - End

Description of Protection Parameters

Parameter	Description
I _Vgrid-max(%)	Set the grid over-voltage protection I value. Protection is activated when voltage exceeds this value.
II _Vgrid-max(%)	Set the grid over-voltage protection II value. Protection is activated when voltage exceeds this value.
III _Vgrid-max(%)	Set the grid over-voltage protection III value. Protection is activated when voltage exceeds this value.
IV _Vgrid-max(%)	Set the grid over-voltage protection IV value. Protection is activated when voltage exceeds this value.
V _Vgrid-max(%)	Set the grid over-voltage protection V value. Protection is activated when voltage exceeds this value.
Recover_Vgrid-max(%)	The MV Station recovers normal operation when grid voltage is below this value
I _T-Vhigh trip(ms)	Grid over-voltage protection I trip time
II _T-Vhigh trip(ms)	Grid over-voltage protection II trip time
III _T-Vhigh trip(ms)	Grid over-voltage protection III trip time
IV _T-Vhigh trip(ms)	Grid over-voltage protection IV trip time
V _T-Vhigh trip(ms)	Grid over-voltage protection V trip time
I _Vgrid-min(%)	Set the grid under-voltage protection I value. Protection is activated when voltage is below this value.
II _Vgrid-min(%)	Set the grid under-voltage protection II value. Protection is activated when voltage is below this value.
III _Vgrid-min(%)	Set the grid under-voltage protection III value. Protection is activated when voltage is below this value.

Parameter	Description
Ⅳ_Vgrid-min(%)	Set the grid under-voltage protection Ⅳ value. Protection is activated when voltage is below this value.
Ⅴ_Vgrid-min(%)	Set the grid under-voltage protection Ⅴ value. Protection is activated when voltage is below this value.
Recover_Vgrid-min(%)	The MV Station recovers normal operation when grid voltage is above this value
Ⅰ_T-Vlow trip(ms)	Grid under-voltage protection Ⅰ trip time
Ⅱ_T- Vlow trip(ms)	Grid under-voltage protection Ⅱ trip time
Ⅲ_T- Vlow trip(ms)	Grid under-voltage protection Ⅲ trip time
Ⅳ_T- Vlow trip(ms)	Grid under-voltage protection Ⅳ trip time
Ⅴ_T- Vlow trip(ms)	Grid under-voltage protection Ⅴ trip time
Ⅰ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅰ value. Protection is activated when frequency exceeds this value
Ⅱ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅱ value. Protection is activated when frequency exceeds this value
Ⅲ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅲ value. Protection is activated when frequency exceeds this value
Ⅳ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅳ value. Protection is activated when frequency exceeds this value
Ⅴ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅴ value. Protection is activated when frequency exceeds this value
Recover_Fgrid-max(Hz)	The MV Station recovers normal operation when grid frequency is below this value
Ⅰ_T-Fhigh trip(ms)	Set the grid over-frequency Ⅰ tripping time
Ⅱ_T-Fhigh trip (ms)	Set the grid over-frequency Ⅱ tripping time
Ⅲ_T-Fhigh trip(ms)	Set the grid over-frequency Ⅲ tripping time
Ⅳ_T-Fhigh trip (ms)	Set the grid over-frequency Ⅳ tripping time
Ⅴ_T-Fhigh trip(ms)	Set the grid over-frequency Ⅴ tripping time
Ⅰ_Fgrid-min(Hz)	Set the grid under-frequency protection Ⅰ value. Protection is activated when frequency exceeds this value

Parameter	Description
Ⅱ _Fgrid-min(Hz)	Set the grid under-frequency protection Ⅱ value. Protection is activated when frequency exceeds this value
Ⅲ _Fgrid-min(Hz)	Set the grid under-frequency protection Ⅲ value. Protection is activated when frequency exceeds this value
Ⅳ _Fgrid-min(Hz)	Set the grid under-frequency protection Ⅳ value. Protection is activated when frequency exceeds this value
Ⅴ _Fgrid-min(Hz)	Set the grid under-frequency protection Ⅴ value. Protection is activated when frequency exceeds this value
Recover_Fgrid-min(Hz)	The MV Station recovers normal operation when grid frequency is above this value
Ⅰ _T-Flow trip(ms)	Set the grid under-frequency Ⅰ tripping time
Ⅱ _T-Flow trip (ms)	Set the grid under-frequency Ⅱ tripping time
Ⅲ _T-Flow trip(ms)	Set the grid under-frequency Ⅲ tripping time
Ⅳ _T-Flow trip (ms)	Set the grid under-frequency Ⅳ tripping time
Ⅴ _T-Flow trip (ms)	Set the grid under-frequency Ⅴ tripping time
LVRT switch	Enable or disable the LVRT switch
LVRT T1(ms)	Parameters related to the LVRT.
LVRT T2(ms)	
LVRT T3(ms)	
LVRT T4(ms)	
LVRT T5(ms)	
LVRT voltage1(%)	
LVRT voltage2(%)	
LVRT voltage3(%)	
LVRT voltage4(%)	
LVRT voltage5(%)	
LVRT dynamic Var Kf factor	Ratio of reactive power compensation and voltage dropping depth during LVRT
HVRT switch	Enable or disable the HVRT switch
HVRT T1(ms)	Parameters related to the HVRT.
HVRT T2(ms)	
HVRT T3(ms)	
HVRT T4(ms)	

Parameter	Description
HVRT T5(ms)	
HVRT voltage1(%)	
HVRT voltage2(%)	
HVRT voltage3(%)	
HVRT voltage4(%)	
HVRT voltage5(%)	
Recover T-grid(ms)	The grid under-/over-voltage and under-/over-frequency protection is enabled. When the grid turns normal and the set time is reached, the fault will be removed.
Active Islanding	Enable or disable the islanding protection function
I leakage-pro(A)	Leakage current protection setting value
Door-protect enable	Enable or disable the door control protection
Fault manual restart	Manual fault restart. If this function is enabled, the MV Station can reconnect to the grid only after the fault is removed manually.
Negative Vgrid protect value(V)	Protection value of negative voltage to ground
Grid_V-unbalanced protect value(%)	3-phase grid voltage unbalance protection threshold value
Grid_V-unbalanced protect time(S)	3-phase grid voltage unbalance time reaches to the set value. Protection is activated
Anti-PID mode	If Anti-PID mode is enabled, you may set the Anti-PID mode (Invalid, Suppression and Repair)
Ins monitor measure time (S)	Insulation monitoring time
Ins monitor protect threshold(K)	Insulation monitoring protection threshold value
Ins monitor Vdc-start(V)	Insulation monitoring startup voltage. When the DC voltage reaches to this set value, the insulation monitoring enables.

Parameter	Description
Ins fault enable	Insulation fault enabling. • When it is enabled, the inverter will display fault information once the negative/positive insulation resistance to earth is lower than the "Insulation monitoring protection threshold". • When it is disabled, the inverter will display alarm information once the negative/positive insulation resistance to earth is lower than the "Insulation monitoring protection threshold", and display fault information once the negative/positive insulation resistance to earth is lower than 10KΩ. (Note: The foregoing alarm/fault information can be viewed on the LCD display by tapping "Home"-"Work state")
Floating mode	Floating mode. • When it is enabled, the negative to earth contactor of the inverter will be disconnected. • When it is disabled, the negative to earth contactor of the inverter will not be disconnected.

table 10-3 Protection parameters and default value

Parameter	Range	Default
I _Vgrid-max(%)	105~150	Country-specific
II _Vgrid-max(%)	105~150	Country-specific
III _Vgrid-max(%)	105~150	Country-specific
IV _Vgrid-max(%)	105~150	Country-specific
V _Vgrid-max(%)	105~150	Country-specific
Recover_Vgrid-max(%)	105~150	Country-specific
I _T-Vhigh trip(ms)	40~36000000	Country-specific
II _T-Vhigh trip(ms)	40~36000000	Country-specific
III _T-Vhigh trip(ms)	40~36000000	Country-specific
IV _T-Vhigh trip(ms)	40~36000000	Country-specific
V _T-Vhigh trip(ms)	40~36000000	Country-specific
I _Vgrid-min(%)	10~95	Country-specific
II _Vgrid-min(%)	10~95	Country-specific
III _Vgrid-min(%)	10~95	Country-specific
IV _Vgrid-min(%)	10~95	Country-specific
V _Vgrid-min(%)	10~95	Country-specific

Parameter	Range	Default
Recover_Vgrid-min(%)	10~95	Country-specific
Ⅰ_T-Vlow trip(ms)	40~36000000	Country-specific
Ⅱ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅲ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅳ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅴ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅰ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅱ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅲ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅳ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅴ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Recover_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅰ_T-Fhigh trip(ms)	40~36000000	Country-specific
Ⅱ_T-Fhigh trip (ms)	40~36000000	Country-specific
Ⅲ_T-Fhigh trip(ms)	40~36000000	Country-specific
Ⅳ_T-Fhigh trip (ms)	40~36000000	Country-specific
Ⅴ_T-Fhigh trip(ms)	40~36000000	Country-specific
Ⅰ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅱ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅲ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅳ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅴ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Recover_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅰ_T-Flow trip(ms)	40~36000000	Country-specific
Ⅱ_T-Flow trip (ms)	40~36000000	Country-specific
Ⅲ_T-Flow trip(ms)	40~36000000	Country-specific
Ⅳ_T-Flow trip (ms)	40~36000000	Country-specific
Ⅴ_T-Flow trip (ms)	40~36000000	Country-specific
LVRT switch	Enable/Disable	Country-specific
LVRT T1(ms)	40~36000000	Country-specific
LVRT T2(ms)	40~36000000	Country-specific
LVRT T3(ms)	40~36000000	Country-specific
LVRT T4(ms)	40~36000000	Country-specific
LVRT T5(ms)	40~36000000	Country-specific
LVRT voltage1(%)	5~90	Country-specific
LVRT voltage2(%)	5~90	Country-specific

Parameter	Range	Default
LVRT voltage3(%)	5~90	Country-specific
LVRT voltage4(%)	5~90	Country-specific
LVRT voltage5(%)	5~90	Country-specific
LVRT dynamic Var Kf factor	0~4	Country-specific
HVRT switch	Enable/Disable	Enable
HVRT T1(ms)	40~36000000	Country-specific
HVRT T2(ms)	40~36000000	Country-specific
HVRT T3(ms)	40~36000000	Country-specific
HVRT T4(ms)	40~36000000	Country-specific
HVRT T5(ms)	40~36000000	Country-specific
HVRT voltage1(%)	110~140	110
HVRT voltage2(%)	110~140	Country-specific
HVRT voltage3(%)	110~140	130
HVRT voltage4(%)	110~140	130
HVRT voltage5(%)	110~140	130
HVRT dynamic Var kf factor	0~4	Country-specific
Recover T-grid(ms)	1000~36000000	10000
Temperature settings(℃)	−5~10	0
Humidity settings(%RH)	70~100	80
Active Islanding	Enable/Disable	Disable
I leakage-pro(A)	1~10	5
Door-protect enable	Enable/Disable	Disable
Fault manual restart	Enable/Disable	Disable
Negative Vgrid protect value(V)	20~200	50
Grid_V-unbalanced protect value(%)	3~20	5
Grid_V-unbalanced protect time(S)	0.1~600	60
Anti-PID mode	Invalid/Suppression/ Repair	Invalid
PID Repair	Enter(Enable) / Cancel(Disable)	—
Ins monitor measure time (S)	30/150/300/600	150

Parameter	Range	Default
Ins monitor protect threshold(K)	15~100	50
Ins monitor Vdc-start(V)	220~780	220
Ins fault enable	Enable/Disable	Enable
Floating mode	Enable/Disable	Disable
Ins monitor manual	Enter(Enable) / Cancel(Disable)	—

Contact SUNGROW to obtain specific value of the parameter Country-specific.

WARNING

Improper parameter configuration may affect the normal operation of the MV Station!
Only authorized personnel can configure these parameters.
If there is any question or doubt, contact Sungrow.

Refer to the LCD screen for the specific setting ranges of these parameters.

11 Main Functions

11.1 Operation Mode

11.1.1 Mode Change

After being energized, the MV Station switch among different modes as shown in the figure below.

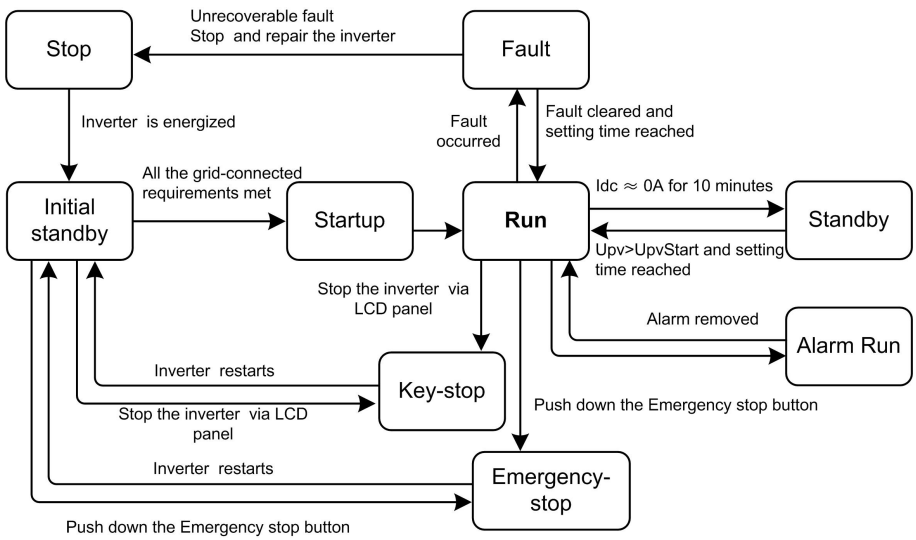


figure 11-1 Operation modes change

> $U_{pv}$is the DC input voltage of the module.
>
> U_{pv}Start is the module DC side startup voltage.

11.1.2 Operation Mode Description

Stop

This is the initial state of the module. The module DC and AC switches are in the "OFF" position; the upstream and downstream connections are disconnected. The module is therefore electricity-free.

Initial Standby

When the module upstream and downstream connections are connected and the AC & DC switches are in the "ON" position, the module turns to the **Initial Standby** mode. Module will continuously check if the PV array and the grid meet the grid-connection requirements. If the module DC input voltage is higher than the module startup voltage and the startup time is reached, whilst the requirements of the grid side parameter are satisfied, module will turn from the **Initial Standby** mode into the **Startup** mode.

Startup

This is the transient process between the **Initial Standby** mode and the **Run** mode. Once the **Startup** mode is complete, module will start powering the grid.

Run

In this mode, module converts the DC energy into AC energy and feeds it to the grid by way of MPPT.

Module tracks the PV arrays' maximum power point (MPP) to maximum the output energy.

Standby

In **Run** mode, module will enter into the **Standby** mode if the DC side current is as low as 0A for a while.

Module will continuously check if the PV array meets the grid-connection requirements. If the module DC startup voltage and the startup time are reached, module will turn into the **Run** mode.

Fault

If a fault occurs during operation, module will enter into the **Fault** mode. LCD panel will display the fault type with the "Fault" indicator on until the fault is removed. After the fault is removed, the MV Station reverts to **Run** mode.

During this period, if you want to start the module manually, first confirm the stop clear protection program from the LCD panel and then start the module.

If the fault is unrecoverable, stop the MV Station and perform maintenance work. Module will automatically check if the fault is recoverable.

⚠ WARNING

When a DSP fault or a module fault occurs, never restart the MV Station through the LCD. Perform a power-off check before reenergizing the MV Station. Otherwise, the module may be damaged.

Emergency-stop

Stop the module by pressing the emergency stop button inside the monitoring window when a fault or emergency occurs.

If the module is stopped by the emergency stop button, the AC switches of the MV Station trip off immediately and the modules will disconnect from the grid. To restart the modules, release the emergency stop button, push the AC switches to the OFF position, and then operate according to the normal start process.

Key-stop

When maintenance or service work is required, the MV Station turns from the **Run** mode to the **Key-stop** mode after the user sends a stop instruction via the LCD panel.

Alarm Run

In **Alarm Run** mode, module can keep running but send alarm signal. User can check the present alarm information through the Working state on the LCD default screen or check the latest history alarm information through "Function"->"History information"->"his alarm". Module automatically turns to **Run** mode when the alarm is removed.

11.2 Complete Control Strategy(Optional)

The following three control strategies are provided for user to perform control functions and configure relevant parameters.

- "Remote": The control codes can be sent only by the remote control machine.
- "Local": The control codes can be sent only by the LCD screen.
- "Remote/Local": Both "Remote" and "Local" codes are effective.

Proceed to set the control strategy on the LCD screen as follows:

step 1 Tap "Function" from the default menu;

step 2 Tap "Set-parameter";

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Remote/Local control" and enter into the Remote/Local control sub-menu.

step 5 Select the control method through the pull-down list.

--End

11.3 Active Power Limitation

11.3.1 Introduction to Active Power Limitation

Cases in which power limitation is required are as follows:

- Potential threatens to the MV Station safety operation
- Over-load of the grid branch connected to the MV Station
- Islanding
- Factors affecting the stability of the stable grid status and dynamic grid status
- Frequency rising affects the system stability
- Grid maintenance
- Grid management

11.3.2 How to Realize Power Limitation

⚠ WARNING

Improper parameter configuration may affect the normal operation of the MV Station!
Only authorized personnel can configure these parameters.
Should any question or doubt occurs, contact Sungrow.

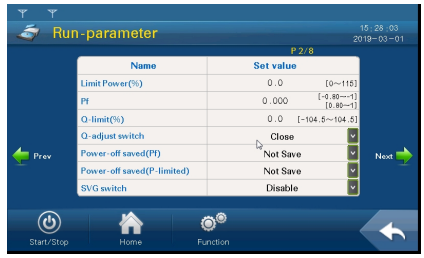
User can adjust the MV Station active power output through the LCD display:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Run-parameter" after entering the correct password.

step 4 Set the "Limit Power (%)" parameter by tapping the pop-up keypad.



step 5 Tap "Enter" to confirm setting.

- - End

Parameters related to power limitation "P-rise rate (%/s)" and "P-decline rate (%/s)" are also included in the running parameter setting sub-menu and can be set accordingly.

11.4 Reactive Power Adjustment

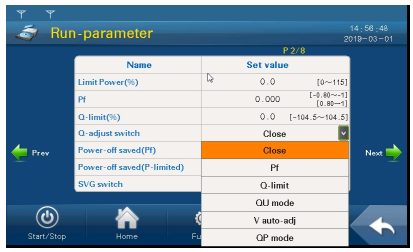
MV Station can provide reactive power output. User can open or close the reactive power adjustment switch and set the reactive power output through the LCD screen.

Reactive power limitation is performed through the running information sub-menu as follows:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Run-parameter" after entering the correct password.



step 4 Turn the page down to select the "Q-adjust switch". Tap the pull-down list and there are three options:

- Close: reactive power cannot be adjusted
- Pf: adjust the reactive power by setting power factor
- Q-limit: adjust the reactive power by setting reactive power percentage

step 5 If Pf is selected, the power factor can be set in the "Run-information" sub-menu;

if "Q-limit" is selected, the "Q-limit (%)" can be set in the "Run-information" sub-menu.

- - End

⚠ WARNING

Improper parameter configuration may affect the normal operation of the MV Station!
Only authorized personnel can configure these parameters.
Should any question or doubt occurs, contact Sungrow.

11.5 Low Voltage Ride Through (LVRT)

Technical Requirements for Connecting Photovoltaic Power Station to Power System requires medium-and-large PV plant should be equipped with Low Voltage Ride Through (LVRT) ability.

LVRT requires: PV plant can operate normally within certain voltage drop range and duration when the voltage of the grid-connected point drops due to the power system failure or disturbance; PV plant can provide the dynamic reactive power support during the period.

Active Power Recovery

If the power station still connects to the grid during power system failure, the active power will recover from the moment the fault is removed at the speed of at least 30% nominal power/second.

Dynamic Reactive Current Support

During LVRT, power station should feed reactive current to the power system as per requirements. For a station whose 500kV or 750kV voltage is stepped up from the

220kV or 330kV voltage and then connects to the power station group, it should feed reactive current to the grid when a short-circuit occurs and the voltage drops.

Zero Voltage Ride Through

When the grid-connection point voltage drops to zero, power station can operation normally for 0.25 second.

Note: U_T is the grid-connection point voltage; Upu is the grid-connection point nominal voltage.

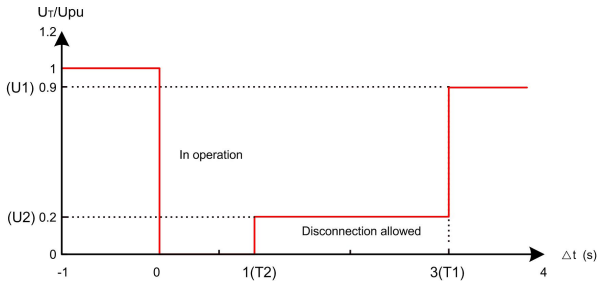


figure 11-2 Lower voltage withstand requirements

Note: T1, T2, U1, and U2 are all settable parameters.

Sungrow's MV Station meets the abovementioned requirements.

11.6 High Voltage Ride Through (HVRT)

Technical Requirements for Connecting Photovoltaic Power Station to Power System requires PV plant should be able to operate as required within certain voltage range.

Grid-connection pint voltage	Requirements
$1.1U_{pu}<U_T<1.2U_{pu}$	Operate for at least 10s
$1.2U_{pu}\leqslant U_T\leqslant 1.3U_{pu}$	Operate for at least 0.5s

Note: U_T is the grid-connection point voltage;

U_{pu} is the grid-connection point nominal voltage.

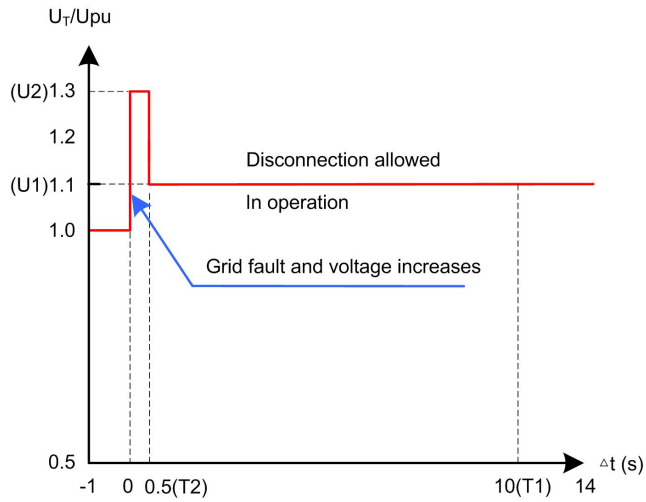


figure 11-3 High voltage withstand requirements

Note: T1, T2, U1, and U2 are all settable parameters.

Sungrow's MV Staion meets the abovementioned requirements.

11.7 Temperature Derating

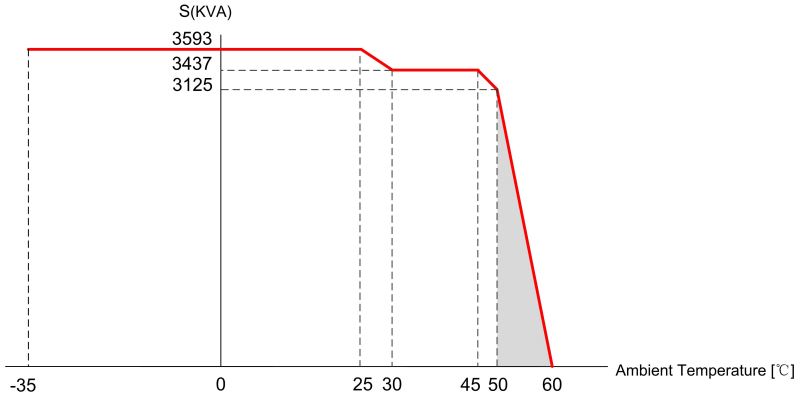


figure 11-4 Temperature derating function

11.8 MPPT

Maximum Power Point Tracking (MPPT) is a technique that the MV Station uses to get the maximum power from the PV arrays. PV arrays have a complex relationship between solar irradiation, temperature and total resistance that produces a non-linear output efficiency known as the I-V curve.

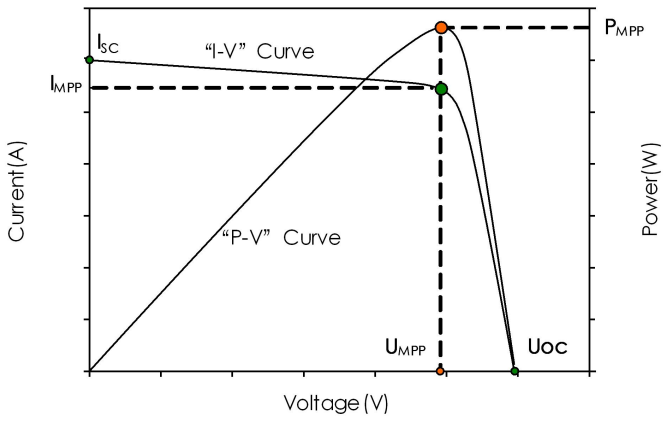


figure 11-5 MPPT

11.9 Intelligent Temperature-Control Technology

MV Station will continuously detect the IGBT temperature and adjust the fan speed accordingly. When the module temperature is low, MV Station will decrease the fan speed to lower the device noise and decrease the device operation consumption. As the module temperature increases, the MV Station will increase the fan speed for better heat dissipation.

The intelligent temperature-control technology can synchronize the speed of fan and temperature of the IGBT module and thus optimize the module temperature and other conditions.

11.10 Anti-PID Effect Function (Optional)

11.10.1 Introduction to PID Effect

Potential Induced Degradation (PID) of the solar module is a performance degradation caused by high negative voltage. The PID effect can occur with all crystalline silicon solar cells that are embedded in glass-foil modules, leakage currents can result under unfavorable conditions (accelerated by high humidity and temperature) where the module joins with the frame and causes short-circuits that lower the overall performance of the system.

This MV Station is equipped with optional anti-PID function to effectively prevent the PID.

11.10.2 Anti-PID Function Setting

⚠ WARNING

For MV Station with optional anti-PID function, the enable and disable of this function can only be performed by personnel from Sungrow. Contact Sungrow if you need to switch this function.

Proceed as follows to set the mode if the Anti-PID mode is enabled:

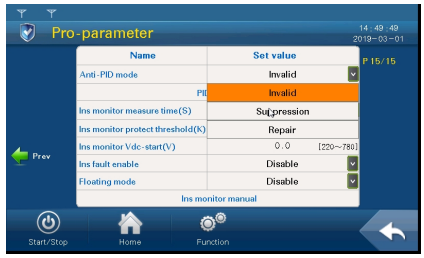
step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Pro-parameter" after entering the correct password.

step 4 Click Next to find the page with "Anti-PID mode" and select the mode by the drop-down list (Suppression/Repair).

Select according to the on-site situation.



- - End

11.10.3 PID Repair

WARNING

Make sure the "Anti-PID mode" in the protection parameter of the MV Station is "Repair" when enabling the PID repair function.

If the MV Station is in deep standby state or the repair process is interrupted, user can enable the repair function manually from the LCD as follows:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Pro-parameter" after entering the correct password.

step 4 Click Next to find the page with "PID repair" and click to enable the manual repair.

If this function is enabled, the Work state in the main screen will show "Repair PV". User may find the "Negative Vgnd" is about 500V from "Function->Run-information->Real Time Data".

- - End

If there is Key stop or Emergency stop or a device fault during the repair process, the repair process will automatically stop.

11.11 Insulation Monitoring Function

11.11.1 Introduction

Insulation resistance is a parameter important for safety operation. If the insulation resistance is low, the direct contact protection and indirect contact protection may be failed; meanwhile the fault current against the ground and the short circuit caused by low insulation resistance may lead to electric fire, device damage or even physical hazards. Sungrow's MV Station is equipped with insulation resistance monitoring function to detect the system insulation resistance in real time. If the resistance is detected to be low, it will send alarm at the first time to remind the user and prevent potential hazards.

Insulation monitoring can be enabled by two modes, described below:

- Automatic mode: Upon first power-on, the equipment will be in negative pole grounding mode. After transfer from operating mode to standby mode, in the morning of the second day, when DC voltage exceeds insulation monitoring starting voltage, the equipment will exit negative pole grounding mode and enter insulation monitoring mode. If abnormal resistance is monitored, the equipment will report "insulation resistance" fault, and monitoring of resistance will continue till it becomes normal. If monitored resistance is normal, the equipment will exit insulation monitoring mode and negative pole grounding mode will be restored.
- Manual mode: Without shutdown conditions of the equipment, on the touch screen parameters setup interface, enable "manual insulation monitoring". If current DC voltage exceeds insulation monitoring starting voltage, the equipment will exit negative pole grounding mode and enter insulation monitoring mode. If abnormal resistance is monitored, the equipment will report "insulation resistance" fault. If monitored resistance is normal, the equipment will exit insulation monitoring mode and enter negative pole grounding mode again. Upon pressing of shutdown key during manual monitoring, if current resistance is normal, the equipment will exit insulation monitoring mode and enter negative pole grounding mode again.

11.11.2 Simple Troubleshooting

Regardless of the MV Station setting, when the insulation resistance is below the threshold (settable from the LCD display), MV Station will send alarm signal and the Operation LED will turn to yellow. After receiving the "low insulation resistance" alarm signal, user should stop the device and check the specific insulation resistance from the LCD screen "Function" -> "Run-information" -> "Real time data".

- If the insulation resistance recovers to normal, the fault loop is in the AC side.
- If the insulation resistance is still low, the fault loop is in the DC side.
- Whether the fault is on the DC side or AC side, switch off the system and perform a thorough checking and troubleshooting.

11.12 Emergency Stop Button functions

The emergency stop button is located inside the monitoring window.
In emergency situation, open the monitoring window, press down the emergency stop button to stop all the inverters inside the MV Station immediately.
This operation also can trip the switch inside the medium voltage switchgear, to disconnect the connection between high voltage side of transformer and switchgear.

11.13 Tripping Functions of the DC Main Switches

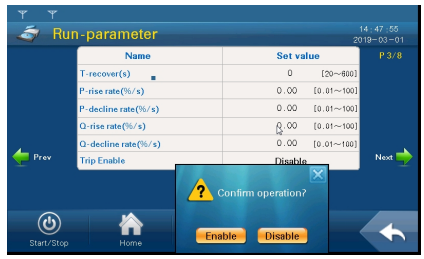
There are two selections (Enable/Disable) for the parameter ‘Trip Enable’ in the running parameter of the LCD touch screen. If the ‘Enable’ options is chosen, all DC main switches of MV Station will trip immediately. If required, observed the following steps.

step 1 Tap “Function” from the default menu.

step 2 Tap “Set-parameter”.

step 3 Tap “Run-parameter” after entering the correct password.

step 4 Click Next to find the page with “Trip Enable” and select “Enable”.



Before the MV Station is put into operation again, set the parameter “Trip Enable” as “Disable” first, then close all the DC main switches of the MV Station.

- - End

11.14 Protection Function

MV Station has complete protection functions to protect itself when input voltage or grid is abnormal until the anomaly is removed and the MV Station can operate normally.

11.14.1 DC Over-voltage Protection

When the DC voltage of the PV array exceeds the max. DC voltage, MV Station will stop operating, send warning signal and display the fault type on the LCD screen.
MV Station can detect the abnormal voltage and respond quickly.

11.14.2 AC Over/under-voltage Protection

When the MV Station AC output voltage exceeds the permissible range, MV Station will stop feeding the grid, send warning signal and display the fault type on the LCD screen. MV Station can detect the abnormal voltage and respond quickly.

11.14.3 Frequency Anomaly Protection

When the grid frequency exceeds the permissible range, MV Station will stop feeding the grid, send warning signal and display the fault type on the LCD screen.
MV Station can detect the abnormal frequency and respond quickly.

11.14.4 Islanding Protection

Islanding is a condition that can occur if the utility grid is disconnected while the MV Station is operating and the local load of the MV Station is similar to the present output power.
“Islanding” is a potential threaten to devices and operators.

- In the event of grid outage, if the MV Station still feeds power to the public grid, death or injury may occur to the maintainers during maintenance.
- In the event of grid fault, if the MV Station still feeds power to the public grid, a surge current may occur and damage devices once the grid resumes.

MV Station is equipped with anti-islanding protection function.

⚠ WARNING

In anti-islanding protection state, high voltage is still present. Disconnect the main switch and wait the device to discharge completely before testing or maintenance.

11.14.5 Overload Protection

When the PV array output power exceeds the MV Station permissible maximum input power, MV Station will limit the power yield at maximum AC power point. If the temperature exceeds the permissible value, MV Station will automatically stop operating unless the condition resumes normal.

11.14.6 Ground Protection

The grounding cables are equipped with the leakage current sensor. When the leakage current is detected to exceed the setting value, system will send instruction to stop the module and display the fault type on the LCD screen.

11.14.7 Module Over-temperature Protection

IGBT modules inside the MV Station uses thermal sensor with high-precision to monitor the real-time module temperature. Once the module temperature is detected to be high, DSP will send direction to stop the MV Station or derate the output.

11.14.8 Internal Over-temperature Protection

The MV Station is equipped with high-precision thermal sensor to monitor the internal temperature of the MV Station. Once the over-temperature is detected, the DSP will send an instruction to stop the MV Station and keep safe operation.

11.15 Firefighting

11.15.1 General Introduction

Respect the national and local firefighting rules and regulations.
Periodically check and maintain the firefighting devices.

11.15.2 Smoke Detector

Smoke detector, located on roof of the MV Station, is a device that detects smoke, typically as an indicator of fire. When smoke is detected, detector will issue a local audible or visual alarm and a warning signal. The installation of smoke detector can protect the electrical devices and maintainers and operators.
The warning signal can connect to the fire alarm system of the PV system directly.

11.15.3 Fire Emergency Lights

Fire emergency lights, an external power supply-backed lighting device, will come on automatically when the MV Station experiences a power outage, convenient for the personnel to check or maintain the MV Station.

12 Troubleshooting

12.1 Safety Instructions

DANGER

Lethal voltages are present inside the MV Station when a fault occurs.

- Only qualified personnel can perform the troubleshooting described in this chapter. Qualified means that the operator has received professional training on devices troubleshooting.
- Do not perform any troubleshooting other than that specified in this manual.
- Respect all safety instructions during troubleshooting.

WARNING

The electrical components inside the MV Station must be replaced by components from the same manufacturer.
The model number can be acquired from the marking of the MV Station or the component itself. If otherwise, contact Sungrow.

WARNING

If the field work needs to replace the components with products from other manufacturer or with different model number, a prior analysis and confirmation by Sungrow is needed.
Failure to follow this procedure may lead to physical injury or death and void all warranty from Sungrow.

WARNING

Disconnect all AC and DC Switches before troubleshooting.

12.2 Checking Fault

If any power output anomaly is detected, check the following items before contacting Sungrow.

- Open-circuit voltage of the PV arrays
- State of the emergency stop button
- Power limitation state

If there is any questions or doubts that are not covered by this manual, contact us.
With the following information provided, Sungrow shall diagnose and solve the problem more easily:

- Type and serial number of the MV Station and internal devices
- Manufacturer, model, and configuration of the PV arrays and upstream & downstream combiner devices connected to the MV Station
- MV Station communication solution
- Fault and brief description of the fault phenomenon
- A picture of the fault if necessary

12.3 Fault and Troubleshooting on the Inverter

The fault information of the inverter can be viewed on the home page of the LCD screen. Specifically, refer to the chapter "10.10 Checking Present Fault Information "
Fault severities of the inverter are defined as follows:

- Major: The MV Station shuts down and stops feeding power into the grid.
- Minor: Some components are faulty, but the MV Station can still feed power to the grid.
- Warning: Functions of the MV Station are normal, but the output power drops due to external factors.

The fault severity of fault names and their corresponding solutions are shown in the following table.

Fault name	Explanation	Fault severity	Measures
PDP-pro	The drive board is faulty or hardware overcurrent occurs.	Major	1. Check whether the AC/DC side of the module is short-circuited. 2. Check whether the grid is normal. 3. Check whether the appearances of modules inside the inverter are normal.
Cntr-flt	The contactor is faulty.	Major	Disconnect the AC and DC switches of the module, allow the module capacitors to discharge completely, and then check whether the appearance of the AC contactor is normal.
Mism-lac	The AC current is unbalanced.	Major	Check whether the grid is normal or whether phase loss occurs.

Fault name	Explanation	Fault severity	Measures
L over-temp	The reactor temperature is excessively high.	Major	1. Check, with a thermodetector, whether the present ambient temperature is within the permissible range of the module. 2. Check that the air inlets of the MV Station are not obstructed. Replace the filters when necessary. 3. Check, in the **Stop** mode, whether fans inside the module are clogged by foreign materials.
Temp control cabinet flt	Faults occur due to excessively high temperature inside the control cabinet.	Major	1. Check the grid voltage, and inspect whether the grid voltage harmonic is normal. 2. Check whether the fans operate normally. 3. Check the AC filtering system, and inspect whether the AC filter capacitor is damaged, for example, cracked. Check whether the 3-phase current of the capacitor is in balance when necessary.
Vdc-Low	The DC input voltage is excessively low.	Major	1. Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured. 2. In the event of inconsistency, check whether the circuits on the DC side are short-circuited or connected incorrectly.
Bus undervo-ltage	The DC bus voltage is excessively low.	Major	Refer to the measures for "Vdc-Low".

Fault name	Explanation	Fault severity	Measures
V-midpoint offset	Neutral point potential shifting occurs on the DC side of the module.	Major	1. Check whether the DC side of the module is short-circuited, the input voltage falls beyond the permissible range, and the grid voltage is normal. 2. Check the history fault screen of the LCD to ensure whether faults such as DC overvoltage/undervoltage, PDP, and AC overcurrent exist at the same time. If so, refer to the corresponding measures.
Temp-flt	The fault occurs when the temperature at the air inlet is higher than the protective threshold.	Major	1. Ensure the ambient temperature. Check, with a thermodetector, whether the present ambient temperature is within the permissible range of the module. 2. Check that the air inlets of the MV Station are not obstructed. Replace the filters when necessary. 3. Check, in the **Stop** mode, whether fans inside the module are clogged by foreign materials.
DC cabinet over-temp	The temperature in the DC cabinet is excessively high.	Major	Refer to the measures for "Temp-flt".
Vac-high	The grid voltage is higher than the set protective threshold.	Major	1. Tap "Set-parameters" -> "Pro-parameters" on the LCD to check whether the protection parameter is in compliance with the local standards and regulations. 2. Disconnect the AC switches, and check whether the actual grid voltage is within the normal range. 3. Check, in the **Stop** mode, whether the grid voltage displayed on the LCD is consistent with the voltage actually measured.

Fault name	Explanation	Fault severity	Measures
Vac-low	The grid voltage is lower than the set protective threshold.	Major	Refer to the measures for "Vac-high".
F-fault	The grid frequency is abnormal.	Major	1. Tap "Set-parameters" -> "Pro-parameters" on the LCD to check whether the Protection parameter is in compliance with the local standards and regulations. 2. Check, in the **Stop** mode, whether the grid frequency displayed on the LCD is consistent with the actual grid frequency.
Island/ No grid	Grid blackout occurs or AC transient voltage exceeds the protective threshold.	Major	1. Check whether the grid is normal. 2. Check whether power outage occurs on the AC side. 3. Check whether the AC circuit breakers of the module are connected.
Ctrol power supply flt	The control power supply is abnormal.	Major	1. Check whether the control switches of both the internal and external power supply are in the ON or OFF positions. If all switches are in the ON position, disconnect a switch. If all switches are in the OFF position, connect a switch. 2. Check whether the internal and external power supply terminals are loose or poorly contacted. Fasten the terminals when necessary.
Vdc-samp-flt	The fault of DC voltage sampling occurs.	Major	Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured.
Soft start-flt	Failed to start the inverter.	Major	Check whether the grid is normal, for example, whether the grid harmonic and grid voltage are balanced.

Fault name	Explanation	Fault severity	Measures
DC-SPD flt	The SPD on the DC side of the module is faulty.	Major	The state window of the SPD is as follows: 1. When the window colour is turned red from green, it indicates that the SPD is damaged (perhaps, due to thunderstorms). In this case, measure the AC and DC parameters, including positive and negative pole voltages to ground, and replace the SPD when the parameters recover to normal value. 2. When the window is in normal colour, the fault may be caused by poor contact between the SPD and its base. In this case, reinstall the SPD to ensure good contact.
AC SPD flt	The SPD on the AC side of the module is faulty.	Major	1. Refer to the measure for "DC-SPD flt". 2. Check whether the micro circuit breaker connected in series to the SPD is disconnected. 3. If the micro circuit breaker is disconnected, measure the AC and DC parameters. If the values measured are normal, reconnect the micro circuit breaker.
Vdc-high	The DC voltage of the module exceeds the protective threshold.	Major	1. Disconnect the DC switches of the module, and check whether the open-circuit voltage of the PV array is normal. If it is abnormal, the alarm may result from PV array configuration. 2. Ensure that the LV side of the transformer is connected in the Y type, and the neutral point is not grounded. 3. Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured.

Fault name	Explanation	Fault severity	Measures
PV pol-rev	Polarity on the DC input side is reserved.	Major	Check whether the polarity on the DC of the module is correct.
Hardwa-re-flt	Interior hardware of the module is faulty.	Major	Measure the DC voltage of the MV Station, to check whether short circuit occurs inside the MV Station.
Iac-high	AC current of the inverter is excessively high.	Major	1. Check whether the AC and DC cables of the inverter are firmly in place. 2. Check the insulation of the cables for intactness. 3. Check whether the wiring terminals are short-circuited to ground.
Overloa-d-pro	Output overload occurs.	Major	Refer to the measures for "Iac-high".
I leakage-pro	The sampling value of the AC leakage currents exceeds the protective threshold.	Major	1. Check whether the AC cables are damaged. 2. If the LV side of the transformer is connected in the Y type, ensure that the neutral point is unconnected.
PM-high	The temperature of modules inside the module room is excessively high.	Major	1. Check the air inlets. 2. Check whether the air outlets of the MV Station are obstructed by foreign materials. Replace the filters when necessary. 3. Check whether the fans function normally during the operation of the MV Station.
Fan1-flt/ Fan2-flt	Fan 1 or fan 2 inside the inverter is faulty.	Major	1. Check whether the grid voltage is normal. Measure the grid voltage with a multimeter, and check whether phase loss occurs. 2. Check whether the fans are normally supplied with power. Measure the three-phase power source with a multimeter to ensure the nominal input voltage is 400 Vac.

Fault name	Explanation	Fault severity	Measures
Gnd-flt	Grounding fault.	Major	1. Check the DC cables. Check whether positive DC cables connected to the ground are damaged. Check whether the impedance to ground of the DC cable is normal. 2. Check the AC cables. Check whether voltages to ground of all the three phases are the same. In addition, check whether SPDs on the inverter side and transformer side are damaged.
AC Switch flt/ AC breaker flt	The AC switches are faulty.	Major	1. Check whether AC switches have tripped. 2. Check whether AC switches are damaged. 3. Check whether AC switches are connected/disconnected normally. 4. Check AC switches for conductivity with a multimeter.
Radiator over temp	The temperature of the heat sink inside the inverter is excessively high.	Major	Check whether the fans are normal. If the fans are normal, check whether the air ducts are obstructed.
DC fuse flt	DC fuses are abnormal.	Major	Refer to the measures for "DC fuse-abnomal".
GFDI pro	DC grounding protection is abnormal.	Major	1. The negative pole of the MV Station is not securely grounded. 2. Check whether the negative grounding fuses blow.
AC fuse flt	AC fuses are abnormal.	Major	Check the AC fuses.
Grid_V_ unbalan-ced	Grid voltage is unbalanced.	Major	Measure the grid voltage, and check whether grid voltage unbalance exists.

Fault name	Explanation	Fault severity	Measures
Current2 Unbalanced/ Current3 Unbalanced	AC current unbalance	Major	Measure the grid voltage, to check whether phase loss occurs.
AC switch breaking	AC switch is disconnected.	Major	Connect the AC switch, after which the alarm is cleared.
AC cabinet overtemp	The temperature in the AC cabinet exceeds the protective threshold.	Major	1. Check whether fans in the AC cabinet function normally. 2. Check whether air inlets of the AC cabinet are obstructed. 3. Check whether filters at the air inlets of the AC cabinet are dusty. Replace the filters when necessary.
Anti-PID power fit	Anti-PID power supply is abnormal.	Minor	1. Check the insulation of AC cables. 2. Check AC SPD. 3. Check the neutral point on the LV side of the transformer and ensure it is not grounded.
External power supply	External power supply of the MV Station is abnormal.	Minor	Measure the external power supply voltage with a multimeter to check whether the voltage is within the normal range.
Branch breaker flt	Circuit breakers on DC branch circuits are abnormal.	Minor	Check whether all the branch circuit breakers are closed, and check whether the circuit breaker state displayed on the Run-Information screen of the LCD is " ON/Closed ".
CT Unbalanced	The three-phase grid current is unbalanced.	Minor	Check, via the LCD, whether the AC three-phase current is in balance.

Fault name	Explanation	Fault severity	Measures
Ground Fuse flt	Grounding fuse is abnormal.	Minor	Wait the capacitor to discharge completely, and then remove the negative grounding fuse. Check whether the fuse has blown. If so, check whether the neutral point of the transformer is unconnected, and whether the neutral point of the PT/CT on the LV side of the transformer is grounded.
Meter-com-flt	Communication of the energy meter is abnormal.	Minor	1. Check whether communication cables connected to the energy meter and metering board are damaged. 2. Check whether communication terminals of the energy meter and metering board are securely fastened.
DC fuse-abnorm-al	DC fuses of the inverter are abnormal.	Minor	Check whether the DC fuse have blown. If so, contact Sungrow and replace the fuses.
Branch Fuse flt	Branch fuses of the inverter are abnormal.	Minor	Refer to the measures for "DC fuse-abnomal".
RISO flt	The insulation resistance is excessively low.	Minor	1. Check whether insulation layers of positive and negative DC cables to ground are damaged. 2. Check the insulation resistance to ground of AC three phases. 3. Check the connection of the neutral point on LV side of the transformer to ensure the neutral point is not grounded.
Freq shift Watt adj	The active power of the inverter is adjusted according to the change of grid frequency.	Warning	Check, via the LCD, whether the overfrequency derating function is enabled. If the function is enabled, it indicates overfrequency occurs during the operation.

Fault name	Explanation	Fault severity	Measures
Volt shift Var adj	The reactive power of the inverter is adjusted according to the change of grid voltage.	Warning	Tap "Set-parameters" -> "Running parameter" -> "Q-adjust switch" on the LCD, to check whether the "Q-adjust switch" is in the "QU mode".
GFRT Run	When a grid fault occurs, the inverter can ride through the time interval.	Warning	Check whether the grid voltage exceeds the HVRT or LVRT threshold.
DC breaker flt/ DC switch abnorm-al	DC switches of the inverter are abnormal.	Minor	Refer to the measures for "Branch breaker flt". Check whether the DC switch is connected.
I leakage-pro	The sampling value of the AC leakage currents exceeds the protective threshold.	Major	1. Check whether the AC cables are damaged. 2. If the LV side of the transformer is connected in the Y type, ensure that the neutral point is unconnected.

If the fault still exists, contact Sungrow Service.

If the following fault occurs, immediately contact Sungrow Service. (referred to as "-Sungrow" hereinafter).

Fault name	Explanation	Fault severity	Measures
Carrier synch flt	The transmission of carrier communication signals is abnormal.	Major	Contact Sungrow.
Drive board fault	Interior drive board of the inverter is faulty.	Major	Contact Sungrow.

Fault name	Explanation	Fault severity	Measures
Com-Failure	Internal communication of the inverter is abnormal	Major	Contact Sungrow.
Encoding repeat	Addresses of the interior modules are repeated.	Major	Contact Sungrow.
Backfeed Supply fault	Reverse charging device is out of service.	Major	Contact Sungrow.
IDM-com-flt	The communication of the tributary board inside the inverter is abnormal.	Minor	Contact Sungrow.
DC Sensor-err	DC sensors of the inverter are abnormal.	Minor	Contact Sungrow.
Branch fwd-Idc-high	Branch forward current is excessively high.	Minor	Contact Sungrow.
Branch rev-Idc-high	Branch reverse current is excessively high.	Minor	Contact Sungrow.
T&H-com-flt	The communication of the temperature & humidity board is abnormal.	Minor	Contact Sungrow.
DSP-com-flt	The communication between control board and metering board inside the inverter is abnormal.	Minor	Contact Sungrow.

12.4 Fault and Troubleshooting on the MV Transformer

Successively tap "Function" -> "Run-information"-> "Transformer" on the LCD screen to view the fault information of the MV transformer.

Fault name	Explanation	Fault severity	Measures
Trans-oil-T trip	The temperature in the oil tank of the transformer is abnormal, and tripping occurs.	Major	Contact Sungrow.
Pressure release valve trip	The pressure relief valve of the transformer is faulty.	Major	Contact Sungrow.
Low oil level trip	The oil level of the transformer is excessively low, and tripping occurs.	Major	Contact Sungrow.
Heavy gas trip	The gas is excessively high, and tripping occurs.	Major	Contact Sungrow.
Trans-oil-T-alarm	The temperature in the oil tank of the transformer is abnormal, and an alarm is triggered.	Minor	Contact Sungrow.
Heavy gas alarm	The gas is excessively high, and an alarm is triggered.	Minor	Contact Sungrow.
Pressure release valve alarm	The pressure relief valve of the transformer sends alarm signals.	Minor	Contact Sungrow.
Low oil level alarm	The oil level of the transformer is excessively low, and an alarm is triggered.	Minor	Contact Sungrow.

Note: For more troubleshooting information of the MV transformer, refer to the enclosed manual.

12.5 Other Fault and Troubleshooting

Fault	Possible Reason	Measures
The MV Station shuts down shortly after start-up.	DC input voltage just reaches the MV Station start-up voltage. Voltage will decrease and the MV Station will stop when it is under load.	Design the serial and parallel connection in accordance with the open circuit voltage; increase the input DC voltage; avoid adopting the critical voltage
Failure to start or stop the MV Station via the LCD.	Communication malfunction between the LCD display and the DSP; LCD power supply malfunction	Check the connection between the LCD display and the DSP when the MV Station is voltage-free
Failure to communicate with PC.	Possible reasons are various. Refer to the "Measures".	Check if the address and the Baud rate of the LCD are the same as those of PC. Check to ensure the circuits are properly connected and if the RS485 communication is adopted, the A and B ports are connected correctly. Check if the communication converters are matched. Communicate again after replacing the converter. The monitor software is installed incorrectly. It is recommended to reinstall the software. If all the above-mentioned items are correct and this fault continues, contact Sungrow.

13 Routine Maintenance

13.1 Safety Instructions

Due to the effect of ambient temperature, humidity, dust and vibration, the MV Station and the internal components will age and wear. To ensure the system safety and maintain the efficiency of the MV Station, it is necessary to carry out routine and periodic maintenance.

All measures, which can help the MV Station in good working conditions, are within the maintenance scope.

The minimum maintenance distance around the MV Station should be reserved at all times.

13.1.1 General Safety Rules

⚠ WARNING

Lethal voltage inside the MV Station!
Wait at least 10 minutes after MV Station stops before opening the cabinet door.
Make sure the device internal is completely voltage free before any work on the MV Station.

⚠ WARNING

Only qualified personnel can perform the work described in this chapter.
Do not leave any screws, washers or other metallic parts inside the module to avoid damages to the module.

⚠ WARNING

Sand and moisture penetration may affect the performance of electric devices inside the MV Station!

- **Do not perform electrical connection in sandy season or when the ambient relative humidity is above 95%.**
- **Perform electrical connection at fine weather days.**

WARNING

Disconnection of the AC & DC switches in no way implies that there is no voltage of the cable connection terminals inside the AC and DC cabinet. To avoid the risk of electric shock before maintenance work,

- **Disconnect the AC & DC switches;**
- **Disconnect the upstream and downstream switches of the module.**

13.1.2 Five Safety Rules

Respect the following five rules in maintaining or servicing the MV Station.

- Disconnect the module from all the external connections and internal power supplies.
- Ensure that the module will not be started accidentally.
- Verify that the module interior is discharged completely with a multimeter.
- Perform necessary ground and short circuit connection.
- Cover the adjacent electrical components with insulation cloth during operation.

13.2 Maintenance

13.2.1 Introduction

With IP54 protection degree, the MV Station can be installed outdoors. Harsh environment condition or long-time operation, however, may cause age and damage of the MV Station. Check and maintain the MV Station periodically and replace the aged components can effectively enlarge the service life and increase the device performance inside the MV Station.

Unscheduld maintenance is also required, esp., when the system performance is poor.

13.2.2 Maintenance Interval

Maintain the Station and internal electric devices periodically to ensure the good performance of the Station.

The maintenance interval described in this chapter is indicative only. The actual interval depends on the on-site environment condition. If the Station is located in harsh environment places, for example desert arrears, the maintenance interval shall be shortened. Particularly, cleaning and anti-corrosion processing should be performed more frequently.

If the Station is located in desert areas, it is advisable to check thoroughly the Station inside and outside and clean completely after the sand storm.

⚠ WARNING

Check the module fans inside the Station periodically and the fans on top of the cabinet for abnormal operation and abnormal noise. If so, there may be dust penetrating inside the module. Stop the module and clean the dust.
Wait at least 5 minutes after the module discharge completely. Before cleaning, make sure, with multimeter, the module internal is discharged completely to avoid electric shock.

⚠ WARNING

Before performing maintenance, remove the internal protective grid. Make sure to reassembly the grid and fasten all the screws after the maintenance work. Make sure all bolts are securely fixed.

⚠ WARNING

Repair immediately any anomalies found during routine maintenance. If any doubts arise, contact Sungrow.

Maintenance (once every three years)

Check item	Check method
Transformer monitoring protection devices	• Oil thermometer: alarm 85 ℃; tripping 95 ℃ • Pressure relief device contact check • Oil level device: Oil level is filled to the normal level • Pressure gauge: Pressure gauge are at the normal level.
Transformer Leakage check	• Off-load tap-changer • Pressure relief device • Pressure gauge • Oil level device • Temperature pocket • Bushings • Drain valve and oil sample • Welding seams

Maintenance (once every two years)

Check item	Check method
System status and cleaning	Check the following items and make corrections if necessary: • Check whether the Station and its internal devices are damaged or deformed. • Check whether the device makes abnormal noise or sound during operation. • Check whether the interior temperature or enclosure temperature of the Station is excessively high. • Check whether the humidity and dust inside the Station are within normal ranges, and dust the Station if necessary. • Check whether the air inlet and outlet are blocked.
Warning labels and marks	Check whether the warning labels and marks are firmly attached and clearly legible. Replace them if necessary.
Shield ground wires	Check whether the shield ground wires are in good contact with the insulating sleeves and ground copper bars.
Connection between splice box and Ethernet switch*	Check whether the splice box and the Ethernet switch are correctly connected.
Lightning proof device and fuses	Check whether the lightning proof device and fuses are in good status and can be used.
Corrosion	Check whether the interior of the Station is corroded or oxidized.

Maintenance (once every year)

Check item	Check method
Container exterior	Check the following items and make corrections if necessary: • Check whether there are any inflammable or combustible materials and other threats around or on the top of the Station that may affect the normal operation. • Check whether the Station and the steel plate are firmly welded, and whether there is any corrosion. • Check whether any mechanical damage, painting damage, oxidation, or the like occurs on the enclosure of the Station. • Check whether the monitoring window and the doors close and open flexibly. • Check whether the sealing strip is firmly in place.
Container interior	Check whether there is any dust, foreign objects, dirt, or condensation inside the container.
Air inlet/outlet	Check whether the air inlet filters and ventilation ducts of the Station and its internal devices are normal, and clean or replace the filters if necessary.
Cable connection and routing	• Check the Station when the internal devices are completely voltage-free! Make corresponding corrections once any anomaly is founded. • Check whether all cables and wires are properly routed and without short circuit. Make corrections if case of any anomaly. • Check whether all cable entries are sealed properly. • Check whether there is water leakage inside the Station. • Check whether the power cable is firmly connected. If necessary, refasten the cable with the torque specified in this manual. • Check whether the power cable and control cable are damaged, especially if the surface contacting the metal is cut. • Check if the insulation tape on the power cable terminal is damaged or invalid

Check item	Check method
Grounding and equipotential connections	• Check whether the grounding connection is performed properly and the grounding resistance is less than 4Ω. • Check whether the equipotential connections inside the Station are performed properly. • Check whether the equipotential connection of the oil tray is performed properly.
Fan	• Check the running status of the fans. • Check whether the fan blades have cracks. • Check whether the fan makes abnormal noise during running.
Screws	Check all screws inside the Station.

Maintenance (once every 6 months to a year)

Check item	Check method
Safety function	• Check the stop functions of the emergency stop button and the LCD. • Simulate shutdown • Check the warning labels and other device symbols for completeness and legibility, and replace them in time if necessary.
Software maintenance	Inspect all parameter settings.
Module cleanness	• Check the temperature and cleanness of the radiator. If necessary, clean the radiator with a vacuum. • If necessary, replace the filter. • Note: Check the ventilation performance of the air inlet. Otherwise, a fault may occur in the module due to overheat caused by poor ventilation.

Check item	Check method
LCD time display	• Check whether the time displayed on the LCD is correct. • After calibration, if the time is still incorrect, replace the button cell on the back of the LCD.
Component maintenance	• Regularly check whether the metal components are corroded (once every 6 months). • Annually check the contactors (auxiliary switch and micro switch) to ensure normal operation. • Check the running parameters (especially the voltage and insulation)

Note: * indicates optional.

The frequency of maintenance operations could be increased according to the environmental conditions of the place where the Station is suited, plant capacity and on-site situations.

The maintenance interval should be shortened if the sand or dust deposition around the operation site is serious.

13.3 Cleaning the MV Station

13.3.1 Introduction

The cleaning of the MV Station surrounding areas and the MV Station interior is important for the maintenance of the MV Station.

Due to ambient temperature, humidity, dust and vibration, there may be dust deposition inside the MV Station blocking the air entries and penetrating inside the MV Station internal devices. This may cause damage to the internal devices of the MV Station, shorten the service life, and reduce power yields.

During device normal operation, check and clean the device periodically to make sure the internal devices are in a comparatively good condition to a certain degree.

13.3.2 Cleaning Interval

The cleaning interval depends on the operation conditions of the MV Station, for example, the weather condition and etc. it is necessary make sure the MV Station exterior and interior areas are clean. If the operation conditions are severe, in desert area for instance, the cleaning interval shall be every half a month or even shorter. The cleaning of the MV Station inside devices and the air inlet and outlet shall be more frequent.

13.3.3 Cleaning the Internal Dust

Use a vacuum cleaner instead of a broom to clean the dust inside the MV Station.

> The vacuum cleaner can get power supply from the backup socket inside the intelligent power distribution cabinet. For the marking of the backup socket, refer to the circuit diagram inside the cabinet door of the intelligent power distribution cabinet.

13.3.4 Cleaning the Foundation

The foundation is designed with maintenance entry. Enter the foundation to check the cleanness periodically. Use a vacuum cleaner to clean the foundation if necessary.

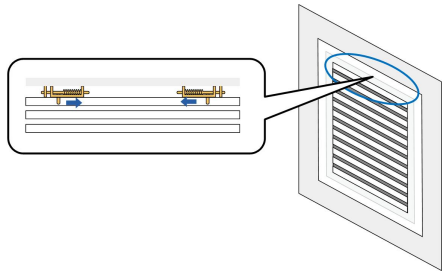
13.3.5 Checking and Cleaning the Filter

> The maintenance interval should be shortened to once every three months or shorter if the dust deposition is heavy.

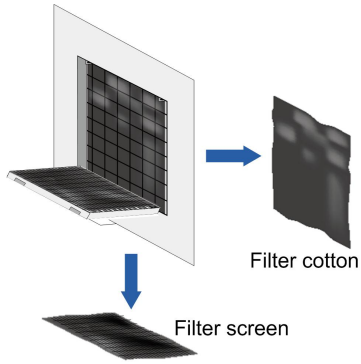
The air inlets located on the front and back sides of the MV Station are entrances of cool air. Periodically clean and replace the filter cotton and filter screen to ensure the air circulation and proper temperature inside the MV Station.

Clean and replace the air inlet window outside the MV Station:

step 1 Push the two spring lock catches toward the middle of the air inlet window to open the outside shutters of air inlet window.



step 2 Remove the air filter cotton inside the air inlet window , and shake the dust off.



step 3 Clean the filter screen with warm water and degreaser and then dry it in the air if necessary.

step 4 If the filter is broken, replace it. Put a proper new one when the old filter is removed.

step 5 When the filter cotton and screen are clean and dry, reassemble them in reverse order.

- - End

Do not pull hard during cleaning and replacing of the filter cotton and filter screen. The cotton and the screen may be damaged if otherwise.

Contact Sungrow to order the filter. You can cut proper filters out of the larger filter.

13.3.6 Cleaning the Surface of the MV Station

If there is corrosion on the surface of the MV Station, clean it with abrasive paper or brush.

If the dust deposition is serious on the surface of the MV Station, use mop or big rag to clean the surface of the MV Station. It is recommended to clean the top before cleaning the side. Alternatively, clean it with or without water.

13.3.7 Checking the Lock and Hinge

Check the functionality and state of the lock and hinge of the MV Station after the cleaning work. Lubricate the lock and hinge if necessary.

13.3.8 Checking the Sealing Strip

The sealing strip is used to prevent the water penetrating insider the MV Station. Check it carefully for damage. Replace the faulty lighting devices in time.

13.4 Painting Make-up Measures

Check for the damages of the MV Station appearance:

Situation 1: smudginess on the surface caused by water and dust that can be cleaned

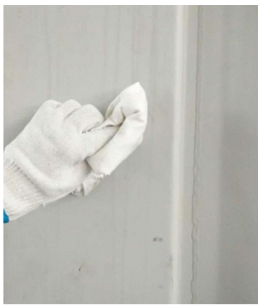
Situation 2: smudginess on the surface & damage to the finishing coat that cannot be cleaned

Situation 3: the undercoat is damaged and the primer is revealed

Maintenance and Operation Steps for Situation 1:

Materials:

- Cleaning cloth
- Water
- Alcohol or other non-corrosiveness detergent

Figure	Step
	1. Clean the smudginess on the surface by using a cleaning cloth (or other cleaning tool) with water. 2. If the smudginess cannot be cleaned by water, use 97% alcohol until the surface is clean enough to accept. (Or try other local frequently-used non-corrosiveness detergent)

Maintenance and Operation Steps for Situation 2:

Materials:

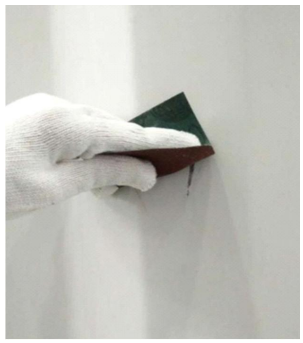
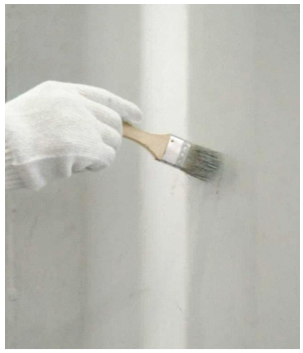
- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Hairbrush
- Paint RAL7035 / Munsell color JN-82 N8.2

Figure	Step
	1. Polish the rough paint surface or the scratched parts by abrasive paper until the surface is smooth.
	2. Clean the target parts by cleaning cloth with water or use 97% alcohol.
	3. When the surface is clean and dry, paint the scratched parts of the paint by banister brush and make sure the painting is as uniform as possible

Maintenance and Operation Steps for Situation 3:

Materials:

- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Zinc primer
- Hairbrush
- Paint RAL7035 / Munsell color JN-82 N8.2

Figure	Step
	1. Polish the damaged parts of the paint to remove the surface rust or other roughness.
	2. Clean the target parts by cleaning cloth with water or use 97% alcohol to clean the surface dust and dirty.
	3. When the surface is clean and dry, paint the base material revealed parts with zinc primer (or other local primers with the same function) for protection. The paints should cover the revealed primer completely.
	4. Paint the scratched parts by banister brush when the primer is dry, and make sure the painting is as uniform as possible.

Check the protective paint on the module surface for peeling off. re-paint the MV Station surface if necessary.

Re-spray the protective paint every 5 years to the MV Station surface.

13.5 Replacement of the Electrical Components

13.5.1 Safety Instructions

⚠ WARNING

The electrical components inside the MV Station must be replaced by components from the same manufacturer.
The model number can be acquired from the marking of the MV Station or the component itself. If otherwise, contact Sungrow.

⚠ WARNING

If the field work needs to replace the components with products from other manufacturer or with different model number, a prior analysis and confirmation by Sungrow is needed.
Failure to follow this procedure may lead to physical injury or death and void all warranty from Sungrow.

13.5.2 Replace DC Fuses

⚠ WARNING

Strictly observe the instructions in this chapter to replace the fuse.
Any personal injury or property damage caused by the disobedience of this chapter may void pertinent warranty claims from Sungrow.

⚠ WARNING

Only qualified technical persons who have fully understood the description in this chapter can perform the operations in this chapter.

⚠ WARNING

The fuse must be replaced with one of the same model and from the same manufacturer.
Obtain the model from the marking on the fuse. Contact us if otherwise.

WARNING

Without our confirmation, do not replace the fuse with the one from another manufacturers or of a different model.
Otherwise, Sungrow shall not be responsible for any possible personal injury or property damage.

13.5.2.1 DC Fuse Area

The DC cabinet inside the MV Station is equipped with DC fuses.
Before replacing the fuses, remove protective grid installed at the DC fuse area at the bottom of the DC cabinet.

13.5.2.2 Operations before Replacement

Follow the procedure below to replace the fault fuse.

step 1 Stop the MV Station via the stop instruction on the LCD screen.

step 2 Disconnect DC output switches of all PV array combiner boxes upstream.

step 3 Disconnect the DC and AC side switches of the MV Station and auxiliary power supply switches, and perform Step 4 about 5 minutes later when the capacitor inside the machine discharges completely.

step 4 Use a multimeter with a measuring range of 1500Vdc to check whether voltages of the connection terminal on the DC side of the MV Station are zeros, where the voltages include the voltage between the positive and negative poles, the positive to ground voltage, and the negative to ground voltage.

step 5 Open the left door with the key and remove the protective grid in the DC fuses area.

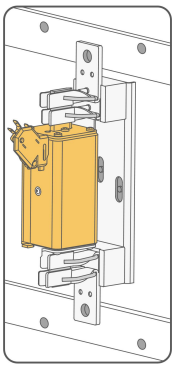
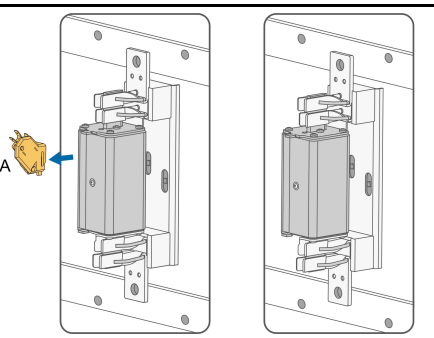
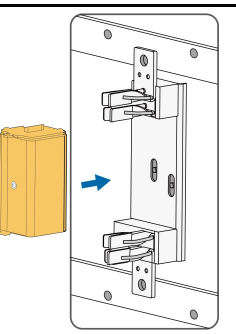
step 6 Measure each DC input voltage by using the multimeter, and perform the next step after ensuring the wiring terminal is completely voltage-free.

step 7 Replace the fault fuse.

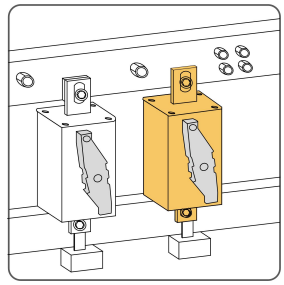
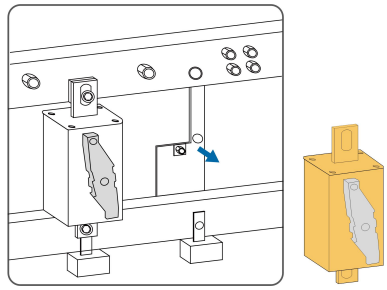
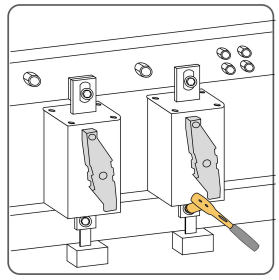
- - End

On site, replace the fuse according to the fuse model. Two replacement schemes are recommended:

Scheme 1: For the Holder Type

Descriptions	Figure
1. As shown in the right figure, identify the faulty fuse.	
2. Remove the micro-switch (A in the figure) attached to the fuse and use the fuse extractor (not in the scope of delivery) to remove the fuse.	
3. Mount the new fuse.	

Scheme 2: For the Bolt-fastening Type

Descriptions	Figure
1. Unscrew fastening bolt of the to-be-replaced fuse with a socket spanner.	
2. Remove the fuse.	
3. Use M8 × 30 bolt to fasten new fuse with a socket spanner. Fastening torque:18~23N.m.	

14 Appendix

14.1 System Parameter

Input (DC)	SG3125HV-MV-20	SG3400HV-MV-20
Max. PV input voltage	1500V	
Min. PV input voltage	875 V	
Startup input voltage	915 V	
MPP voltage range for nominal power	875 ~ 1300 V	
No. of independent MPP inputs	1	
No. of DC inputs	21 (optional: 24 negative grounding or floating; 28 negative grounding)	
Max. PV input current	4178 A	
Output (AC)		
AC output power	3593 kVA@ 25 ˚C	3593 kVA@ 25˚C
	3437 kVA@ 45 ˚C	3437 kVA@ 45˚C
	3125 kVA@ 50 ˚C	—
AC voltage range	10 ~40.5 kV	
Max. AC output current	Refer to "Correspondence Between AC Voltage and Max. AC Output Current".	
Nominal grid frequency	50 Hz / 60 Hz	
Grid frequency range	45 ~55 Hz / 55 ~ 65 Hz	
THD	< 3 % (at nominal power)	
DC current injection	< 0.5 % In	
Power factor at nominal power	0.99	
Adjustable power factor	0.8 leading ~0.8 lagging	
Feed-in phases	3	
Connection phases	3	
Efficiency		
Inverter Max. efficiency	99.0 %	
Inverter Euro. efficiency	98.7 %	
Transformer		
Transformer rated power	3125 kVA	3437 kVA
Transformer max. power	3593 kVA	
LV / MV voltage	0.6 kV / 10 ~40.5 kV	
Transformer vector	Dy11	

Input (DC)	SG3125HV-MV-20	SG3400HV-MV-20
Transformer cooling type	ONAN (Oil Natural Air Natural)	
Oil type	Mineral oil (PCB free) or degradable oil on request	
Protections & Functions		
DC input protection	Load break switch + fuse	
Inverter output protection	Circuit breaker	
AC MV output protection	Circuit breaker	
Overvoltage protection	DC Type I + II / AC Type II	
Grid monitoring / Ground fault monitoring	Yes / Yes	
Insulation monitoring	Yes	
Overheat protection	Yes	
Q at night	Yes	
Anti-PID function	Optional	
General Data		
Dimensions (W x H x D)	6058 × 2896 × 2438 mm	
Weight	18 T	
Degree of protection	IP54 (IP55 optional)	
Auxiliary power supply	415 V, 15 kVA (Optional: max. 40 kVA)	
Operating ambient temperature range	-35 to +60˚C (> 50 ˚C derating)	-35 to +60 ˚C(> 45 ˚C derating)
Permissible relative humidity range	0 ~95 % (non-condensing)	
Cooling method	Temperature controlled forced air cooling	
Max. operating altitude	1000 m (standard) / > 1000 m (customized)	
Display	Touch screen	
Communication	Standard: RS485, Ethernet; Optional: optical fiber	
Compliance	CE, IEC 62109, IEC 62116, IEC 61727	
Grid support	Q at night function, L/HVRT, active & reactive power control and power ramp rate control	

Correspondence Between AC Voltage and Max. AC Output Current

AC Voltage	Max. AC Output Current	AC Voltage	Max. AC Output Current
10 kV	Approx. 207.4 A	22 kV	Approx. 94.3 A
11 kV	Approx. 188.6 A	24kV	Approx. 86.4 A
12 kV	Approx. 172.9 A	34.5 kV	Approx. 60.1 A
13.8 kV	Approx. 150.3 A	35 kV	Approx. 59.3 A
15 kV	Approx. 138.3 A	37 kV	Approx. 56.1 A
15.4 kV	Approx. 134.7 A	40.5 kV	Approx. 51.2 A
20 kV	Approx. 103.7 A	—	—

For more voltages and currents, refer to the nameplate.

14.2 Tightening Torques

Tighten the cable with proper torque shown below to prevent the poor contact, high contact resistance, or fire caused by the looseness of cable lugs:

Screw	Torque (N · m)	Screw	Torque (N · m)
M3	0.7~1	M8	18~23
M4	1.8~2.4	M10	34~40
M5	4~4.8	M12	60~70
M6	7~8	M16	119~140

Secure the cable in proper place to reduce pressure of cable lug.

14.3 Exclusion of Liability

The content of these documents is periodically checked and revised where necessary. Call us or check our website **www.sungrowpower.com** for the latest information. No guarantee is made for the completeness of these documents. Contact our company or distributors for the latest version.

Guarantee or liability claims for damages of any kind are excluded if they are caused

- Improper or inappropriate use or install of the product
- Install or operate the product in unintended environment
- Install or operate the product without observing relevant safety regulations in the deployment location
- Ignore the safety warnings or instructions contained in all documents relevant to the product
- Install or operate the product under incorrect safety or protection conditions
- Alter the product or supplied software without authority
- Product malfunctions due to operation attached or neighboring devices running out of the allowed limit values
- Unforeseen calamity or force majeure

The use of supplied software produced by Sungrow Power Supply Co., Ltd. is subject to the following conditions:

- Sungrow Power Supply Co., Ltd. assumes no liability for direct or indirect damages arising from the use of Software. This also applies to the provision or non-provision of support activities.
- Software used for commercial purposes is prohibited.
- Decompiling, decoding or destroying the original program, including Software and the embedded software, is prohibited.

14.4 Contact Information

We need the following information to provide you the best assistance:

- Type of the device
- Serial number of the device
- Fault code/name
- Brief description of the problem

China (HQ) Sungrow Power Supply Co., Ltd Hefei +86 551 65327834 service@sungrowpower.com	Australia Sungrow Australia Group Pty. Ltd. Sydney +61 2 9922 1522 service@sungrowpower.com.au
Brazil SungrowDo Brasil Sao Paulo +55 11 2366 1957 latam.service@sa.sungrowpower.com	France Sungrow France – Siege Social Paris service.france@sungrow.co
Germany Sungrow Deutschland GmbH M ü nchen +49 89 324 914 761 service.germany@sungrow.co	Greece Service Partner – Survey Digital +30 2106044212 service.greece@sungrow.co
India Sungrow (India) Private Limited Gurgaon +91080412013 50 service@in.sungrowpower.com	Italy Sungrow Italy Milano service.italy@sungrow.co
Japan Sungrow Japan K.K. Tokyo + 81 3 6262 9917 japanservice@jp.sungrowpower.com	Korea Sungrow Power Korea Limited Seoul +827077191889 service@kr.sungrowpower.com

Malaysia Sungrow SEA Selangor Darul Ehsan +6019897 3360 service@my.sungrowpower.com	Philippines Sungrow Power Supply Co., Ltd Mandaluyong City +639173022769 service@ph.sungrowpower.com
Thailand SungrowThailand Co., Ltd. Bangkok +66891246053 service@th.sungrowpower.com	Spain Sungrow Ib é rica S.L.U. Navarra service.spain@sungrow.co
Romania Service Partner - Elerex +40 241762250 service.romania@sungrow.co	Turkey Sungrow Deutschland GmbH Turkey Istanbul Representative Bureau Istanbul +90 2127318883 service.turkey@sungrow.co
UK Sungrow Power UK Ltd. Milton Keynes +44 (0) 0908 414127 service.uk@sungrow.co	U.S.A, Mexico Sungrow USA Corporation PhoenixArizona +1833 7476937 techsupport@sungrow-na.com
Vietnam Sungrow Vietnam Hanoi +84 918 402 140 service@vn.sungrowpower.com	