Owner's Manual

PVMate Grid Connected

PV Inverter

PVMate 10NE/12NE/15NE/17NE

MOTECH

Modern Technology for a Sustainable World

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1 About this instruction

General notes

Thank you for choosing a MOTECH inverter!

MOTECH inverter converts the direct current from your solar system into grid-compliant alternating current.

When you choose MOTECH inverter, you opt for reliable and powerful technology.

1.1 Validity

This instruction describes the installation, startup and maintenance of MOTECH PVMate 10NE/12NE/15NE/17NE.

1.2 Target group

The inverter can only be installed by qualified electricians who will register you with the utility company and have your photovoltaic installation approved by the grid operator. If you encounter any problems, read this instruction at first before calling the service.

1.3 Retention of the instruction

All documentation and accessories must be kept and available at all times.

1.4 Index of installation and startup

1. Safety instructions and regulations: see 1.1, 1.2, 2.1, 2.2, 2.3
2. All the included accessories: see 3.1
3. Inspection of transport damage: see 3.2
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1.5 Regulations

Type	Normative reference
PVMate 10NE/12NE/15NE/17NE	VDE 0126-1-1, VDE-AR-N 4105, BDEW, G59/2, G83/1, RD 1663, ENEL Guide, EN 50438, AS4777.2/.3, EN 62109-1

1.6 Safety rules

The safety precautions and general information as follows are used in this instruction:

DANGER!

Failure to observe a warning indicated in this instruction will result in serious injury or death.

WARNING!

Failure to observe a warning indicated in this instruction may result in serious injury or death.

CAUTION!

Failure to observe a warning indicated in this instruction may result in minor or moderate injury.

NOTICE!

Failure to observe a warning indicated in this instruction may result in property damage.

Information

Information provides tips which are valuable for the optimal installation and operation of the inverter.

2 Safety instructions and regulations

2.1 Technical rules

Installation must be suited to the on-site conditions and comply with local regulations and technical rules.

2.2 Intended use

The inverter is designed according to the safety rules. However, improper use, move, personal maintenance or modification may result in injury, death and property damage. MOTECH is not responsible for the loss and invalidate these warranty claims.

2.3 Accident prevention regulations

1. Only qualified electricians who have read and fully understood all safety information contained in the instructions can install, maintenance and repair the inverter.
2. The inverter must only be operated with PV generator. Do not connect any other source of energy to it.
3. Be sure that the inverters connect to the ground in order to protect property and personnel safety.
4. Before opening the housing, the inverter must be disconnected with the grid and PV generator; while you must wait at least five minutes to allow the energy stored in capacitors to be fully discharged.
5. It is not possible to ground any of the terminals of the PV modules. However, it is compulsory to ground all conductive materials, e.g. the mounting system to comply with the general codes for electrical installations.
6. Password protection is given for protection function U >, (According to VDE 4105, cl. 6.3).

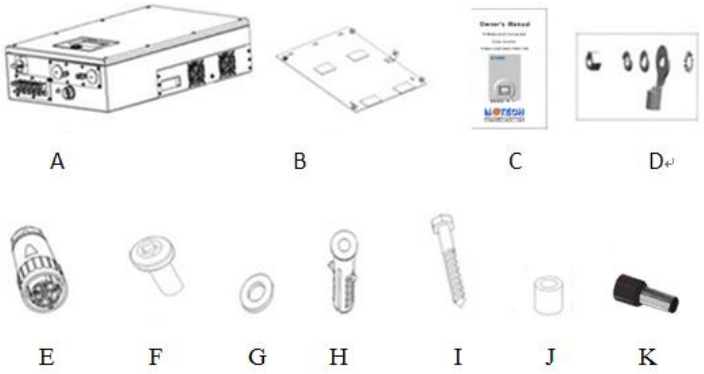
2.4 Symbols Used

Icon	Explanation
	Beware of high electrical voltage and high operating current. The inverter operates at high voltage and current. All work on the inverter must only be carried out by skilled and authorized electricians.
	Beware of hot housing. The housing of the inverter may become hot. Avoid contact with it during operation.
	CE mark. The inverter complies with the fundamental requirements of the Guideline Governing Low-Voltage and Electromagnetic Compatibility.
	Certified safety The inverter fulfills the requirements of the Equipment and Product Safety Act in Europe.
	Capacitor discharge. Do not disconnect DC input or AC output connectors until 5 minutes after the disconnection of all power sources.
	Refer to the instruction which accompanies the inverter.
	Caution, risk of danger Important information, failure to observe them indicated in this instruction may result in injury or death.

3 Unpacking

3.1 Scope of delivery

Fittings List of PVMate 10NE/12NE/15NE/17NE		
Object	Description	Quantity
A	MOTECH inverter	1 pcs
B	Mounting rail	1 pcs
C	Installation and operation instruction	1 pcs
D	Grounding parts	1 Set
E	AC female connector	1 pcs
F	Screw M5×12	1 pcs
G	Washer φ6	6 pcs
H	Wall plug	5 pcs
I	Screw ST6×50	5 pcs
J	Sealing insert	3 pcs
K	Cord end terminal	5 pcs



3.2 Check for transport damage

Thoroughly inspect the packaging upon delivery, if you detect any damage to the packaging which indicates the inverter may be damaged, inform the responsible transport company immediately. We will be glad to assist you if required.

4 Installation

4.1 Select an appropriate place

DANGER!

Danger to life due to fire or explosion.

Despite careful construction, electrical equipment may cause fire.

Do not mount the inverter on flammable materials.

Do not install the inverter in areas where there store highly flammable materials.

Do not install the inverter in areas where there is a risk of explosion.

CAUTION!

The housing may become hot during operation. Risk of burns!

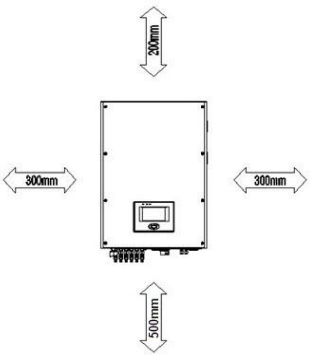
Mount the inverter in areas where it cannot be touched unintentionally.

Wait approx. 30 minutes until the housing has cooled down before proceed to disassembly the inverter.

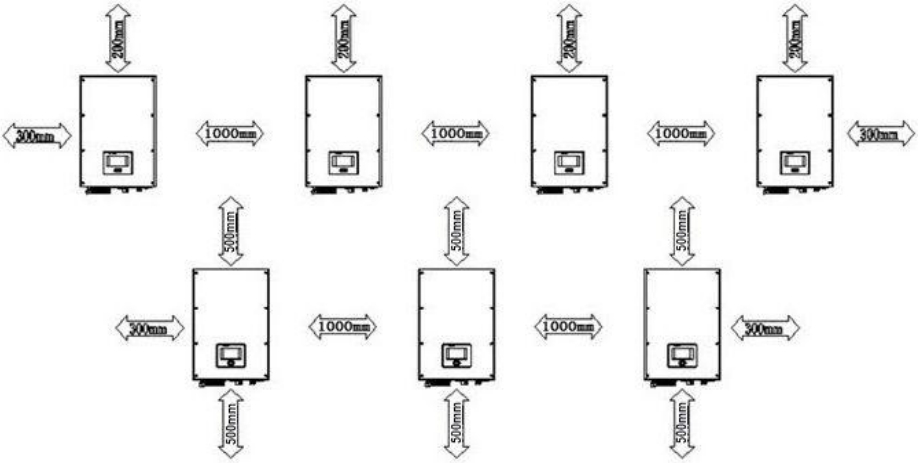
4.2 Ambient conditions

1. The area where the inverter mounted is as dry as possible.
2. Ensure good access to the inverter for installation and possible service purposes.
3. Be sure that inverter is out of the children's reach.
4. Provide better ventilation for the inverter to ensure that heat is dissipated quickly.
5. Ensure the following minimum clearance around it:

Direction	Minimum clearance（mm）
above	200
below	500
sides	300



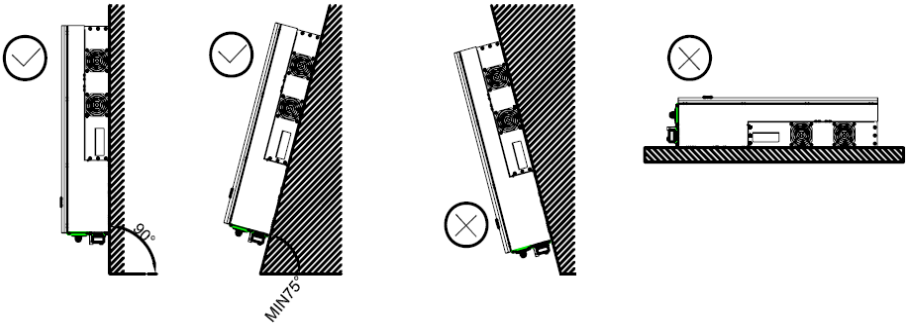
ambient dimensions of one inverter



ambient dimensions of a series of inverters

6. When installing the inverter on the wall of a building, please ensure the wall is a concrete wall and not wooden wall. In the event that inverter must be mounted on wooden wall, please add the heat insulation material between the inverter and the wooden wall.
7. If you have to install the inverter on the wooden wall, we don't recommend self-tapping screws and wall plugs; instead, please use the M6 bolt, nut, spring washer each 5pcs. The bolt should be 10mm longer than thickness of wooden board for nut fixing. The wooden board should be above 15mm and of log material to meet the strength requirement when hanging.
8. Do not expose the inverter to direct sunlight, in order to avoid power reduction caused by excessive heating. The ambient temperature keeps below 45℃ will guarantee the inverter working in optimal status.
9. Don't put any things on the inverter. Do not cover the inverter.
10. Before cleaning, disconnect the inverter separately with the grid by cutting off the AC breaker and with the PV generator by cutting off the DC breaker in order to exclude the danger of electric shock. Using a soft, dry cloth to clean it. Never use corrosive, solvent-containing or abrasive cleaners or polishes.

4.3 Mounting position

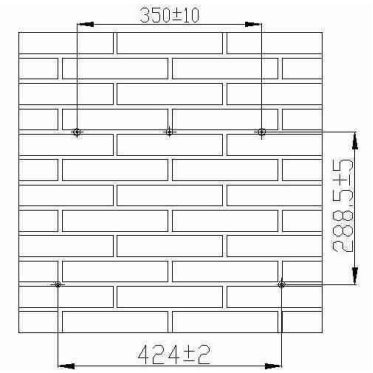


1. Mount the inverter vertically or tilted backward by Max. 15°.
2. Never mount the inverter forwards.
3. Never mount the inverter horizontally.
4. Never install the inverter with a sideways tilt.
5. Mount at eye level to makes it easier to operate and read the display.
6. The electrical connection area must point downwards.

4.4 Installation procedure

a) **Drilling holes**

Drill five holes (φ10) at the selected installation position. The space of the holes is shown as following figure. Keep drill vertical to the wall, and don't shake the drill to avoid holes tilt. The depth of the holes must be the same and in the range of 55 ~ 60mm. After removing dust in the five holes, measure the net depth.



WARNING!

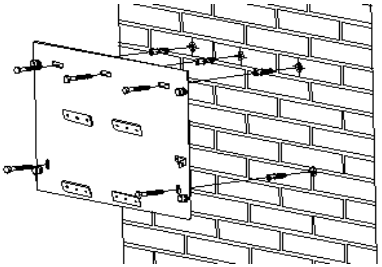
Risk of injury due to the incorrect mounting holes.

Before inserting wall plugs, measure the depth and distance of the holes.

If the measure values don't meet the installation requirement, redrill the holes.

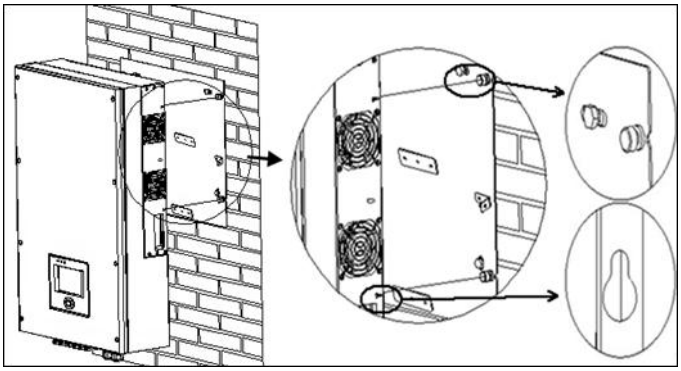
b) **Mounting bracket**

After drilling holes in the wall, place five wall plugs into the holes vertically. Put washers through the self-tapping screws that came with the inverter, and then attach the mounting rail to the wall.



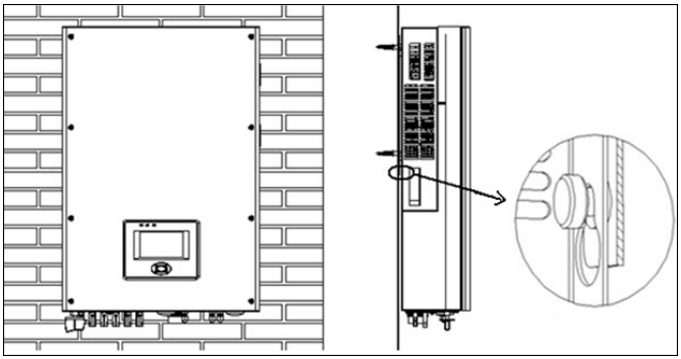
c) **Hanging the inverter**

Hang the four holes of the inverter onto the four hooks of the mounting rail downwards slightly as following figure.



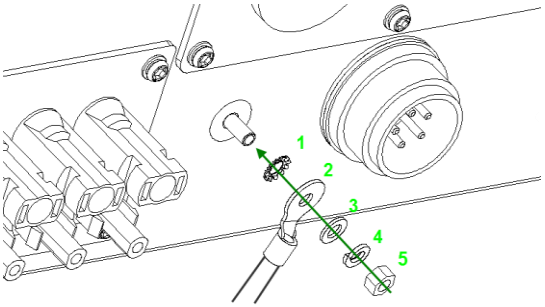
d) **Positioning check**

After the inverter is hung on the mounting rail, check whether the four holes of the inverter match the four hooks of the mounting rail reliably. If there is anything wrong, please dismount the inverter and relocate.



e) **Grounding**

Take out Grounding parts from the package and connect the wire to the grounding terminal, then tighten them as shown in the following figure.

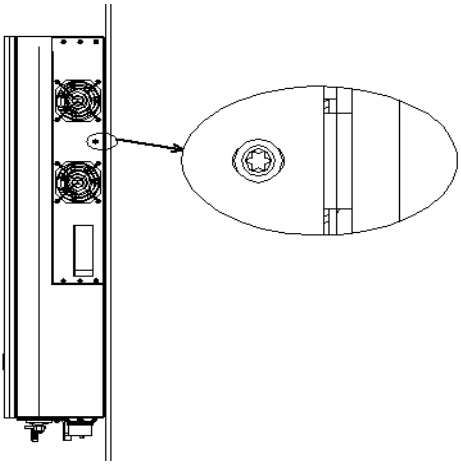


Grounding parts information：

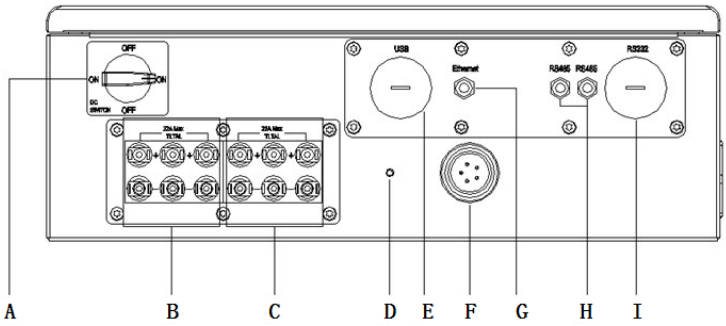
No	Description	Quantity(pcs)
1	Serrated lock washer	1
2	Cable socket M5	1
3	Washer φ5	1
4	Lock washer M5	1
5	Nut M5	1

f) **Anti-theft device**

After confirming the inverter is fixed reliably, put M5 screw with φ6 washer and tighten it firmly with screw-driver Torx 25.



4.5 Electrical connection



component	Description
A	DC-switch
B	DC Input terminal of route A
C	DC Input terminal of route B
D	Grounding
E	USB interface (only for updating PCU firmware)
F	Grid connection interface
G	Ethernet interface
H	RS485 interface
I	RS232 interface (only for updating MCU firmware)

Information:

1. After the inverter has been mounted firmly, the electrical connection can begin.
2. Make sure Max. Open circuit voltage and short circuit current of the PV modules accord with input spec of the inverter.
3. Choose the appropriate cable model; see “8.4 Cable requirements”.
4. Before doing the electrical connection, both AC and DC end must be disconnected with all power sources.

4.5.1 Connection to the grid (AC output)

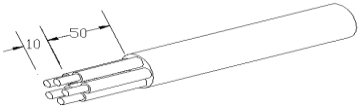
DANGER!

Danger to life due to high voltages in the inverter.

You must safeguard each inverter with an individual AC breaker in order that the inverter can be disconnected safely.

Connection Procedure:

1. Switch off the AC breaker secure against being inadvertently switched back on.
2. Strip the cable as shown in the following figure：



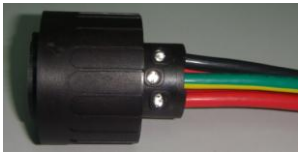

3. AC female connector includes the following components:

Terminals adapter body screw cap

Put the wires through screw cap, adapter body of the AC female connector.

Keep the wire N, R,S, T, PE corresponding to 1、2、3、4、⏚ of the AC female connector correctly.

Match table of wire & hole：

1 ⟺ N	Wire N	
2 ⟺ R	Wire R	
3 ⟺ S	Wire S	
4 ⟺ T	Wire T	
⏚ ⟺ PE	Wire PE	

CAUTION!

Please ensure the corresponding relationship between the polarity of the wire and the hole of the terminal is correct.

4. Screw these components tightly after connecting the wires.

Finally, connect AC female connector to AC male connector on the inverter and then screw them together.

Residual current protection

Residual current detection and monitoring unit inside, it’s not necessary to install a RCD or RCM outside

Risk of DC injection high

Pull the PE and N wires to the corresponding holes of the AC female connector and tighten them reliably, or the error of DC injection high happens.

4.5.2 Connection of the PV generator (DC input)

DANGER!

Danger to life due to high voltages in the inverter.

Before connecting the PV generator, ensure the DC breaker is switched off and that it cannot be reactivated.

Do not disconnect the DC connectors under load.

NOTICE!

The inverter can be destroyed by overvoltage.

If the voltage of the PV modules exceeds the Max. Input voltage of the inverter, it can be destroyed due to overvoltage. All warranty claims become void.

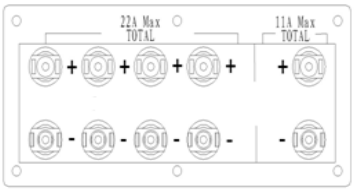
Do not connect strings with an open circuit voltage higher than the Max. Input voltage of the inverter.

Check the design of the PV plant.

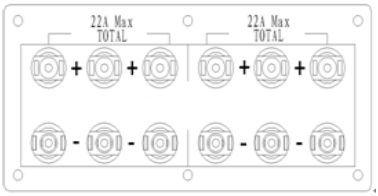
There are two MPP trackers (A & B route) provided by the PVMate 10NE/12NE/ 15NE/17NE, and each MPP tracker provides multiple DC input interface. Strings per MPP input for each route are shown as below.

	PVMate 10NE/12NE		PVMate 15NE/17NE	
	Route A	Route B	Route A	Route B
Max. input current	22A	11A	22A	22A
Strings per MPP input (A/B)	4	1	3	3

Before connecting PV modules to the inverter, please make sure the polarity of the DC input connectors is correct.



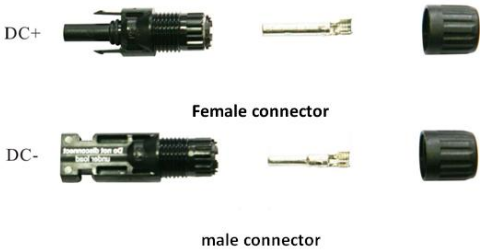
PVMate 10NE/12NE



PVMate 15NE/17NE

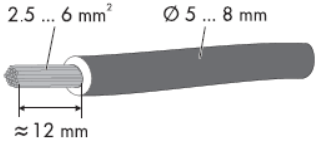
Connection procedure by MC4:

Connect the PV modules and the inverter using MC4 connectors as shown below. Connect the positive and negative terminals from the PV modules to positive (+) terminals and negative (-) terminals on the inverter.



Connection Procedure:

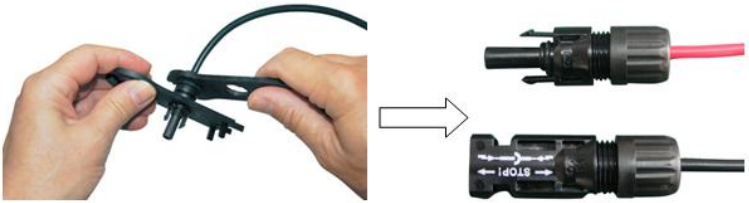
1. Switch off the DC breaker and secure against being inadvertently switched back on.
2. Strip the cable as shown in following figure.



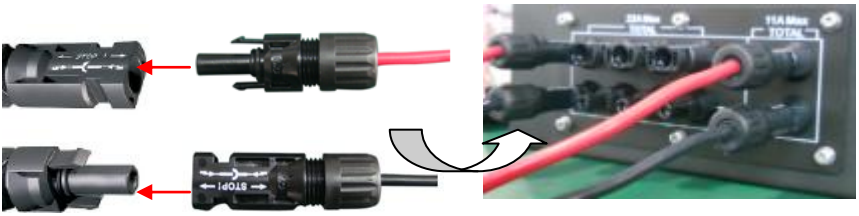
3. Insert striped cable into contact barrel and insure all conductor strands are captured in the contact barrel.
4. Crimp contact barrel by using a hex crimping die. Put the contact barrel with striped cable in the corresponding crimping notch and crimp the contact.

5. Insert contact cable assembly into back of the male and female connector. A "click" should be heard or felt when the contact cable assembly is seated correctly.

6. Wrest the cap by using the torque of 2.6~2.9N.m.

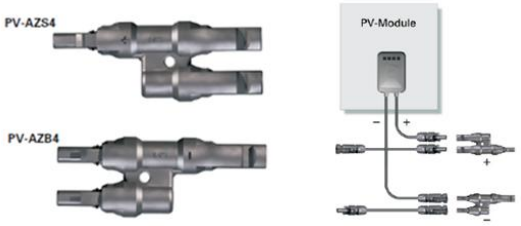


7. After wrest the cap tightly, align the 2 half connectors and connect them together by hand until a "click" sound is heard or felt.



8. When the separation of the DC connector is necessary, please use the specified wrench tool. Please make sure the wedge side of the fingers face the male connector and push the tool down. Then separate the connector by hand. See the figure below.

9. If input connector is not enough, adopt“ Y ”connector (optional) just as below:



10. Please use sealing caps for tight sealing of unplugged PV connectors.

If using H4 connector, the operating procedure is similar to that of MC4 connector.

DANGER!

DANGER to life due to potential fire or electric shock.

NEVER connect or disconnect the DC connectors under load.

5 Start-up

After finishing mechanical and electrical installation, you can start up the inverter.

5.1 Start-up procedure

Switch on AC breaker and the PV-load breaker. Then, the inverter starts up automatically when DC power from the PV generator is sufficient.

There are three normal states during operation:
Waiting: When DC voltage of the PV modules is greater than 250V (Min. input voltage) but lower than 300V (initial input voltage), the inverter waits for sufficient power. At this time, the inverter doesn't work and feed power into the grid.

Checking: When DC voltage of the PV modules exceeds 300V, the inverter will check feeding conditions at once. If there is anything wrong during checking, the inverter will turn into the "Fault" state.

Normal: After checking, the inverter will operate normally and the green LED will light up at the same time. Meanwhile, it will feed power into the grid and show current power on the display.

5.2 Set key parameters

Set language and safety regulations

The default language showed on the display is "English". Please set the language and safety regulations when you start the inverter for the first time and you will find how to set the parameters in the ninth chapter.

Set date and time

When you start the inverter for the first time or it doesn't work for more than one week or longer, please reset the date and time to ensure right records.

5.3 Automatic shutdown / startup

When sunlight weakens gradually, DC voltage of the PV modules is less than shutdown voltage(220V), the inverter itself will stop working and won't feed power into the grid; when sunlight strengthens gradually, DC voltage of the PV modules exceeds 250V, the inverter will automatically startup with the following steps "waiting, checking, normal".

Normally, the inverters will start-up in the morning and shutdown at the evening.

Information:

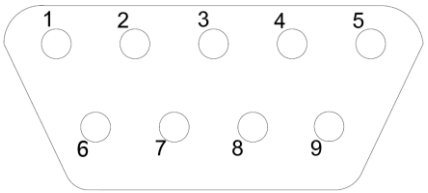
If the inverter is in "**Fault**" state, refer to the FAQ part in the tenth chapter.

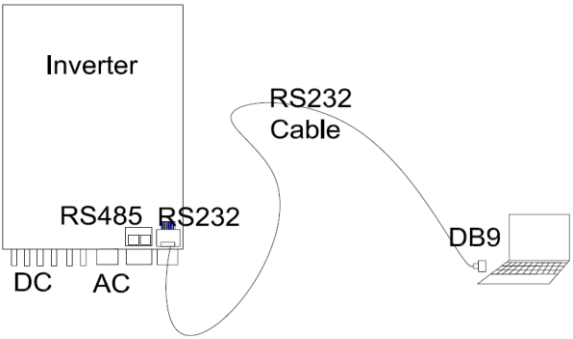
6 Communication

6.1 Communication through RS232

The RS232 interface of the PVMate 10/NE/12NE/15NE/17NE is only for maintenance engineer when updating the MCU firmware. The Max. Length of RS232 cable is 10m.

Definition of the pins of RS232:

Pin1--------NC	
Pin2--------TX	
Pin3--------RX	
Pin4--------NC	
Pin5--------GND	
Pin6--------NC	Pin8--------NC
Pin7--------NC	Pin9--------NC

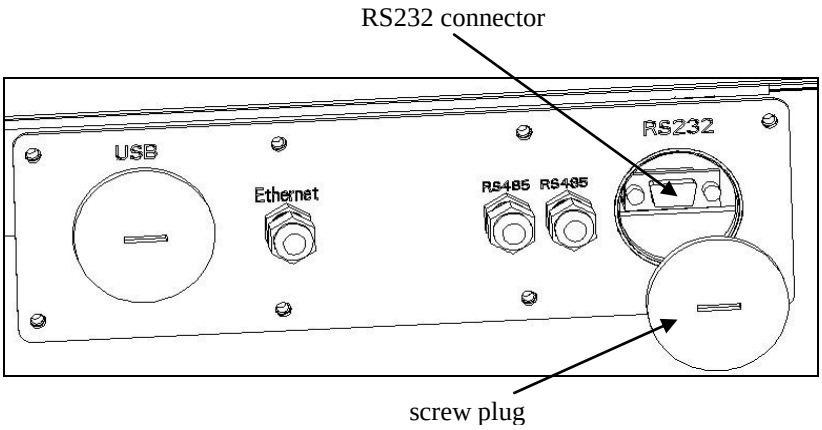


Connection graph of RS232 communication

Information：
If your computer doesn't have DB9 communication interface, you can use RS232-USB cable to realize this function.

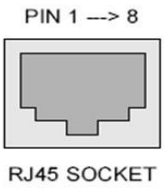
Procedure of using RS232 communication as below:

1. Screw off the screw plug as following figure and RS232 interface will show up;
2. Connect the corresponding RS232 wire to it and then start to update the MCU firmware; after finishing, take off RS232 wire and screw the screw plug;



6.2 Communication through RS485

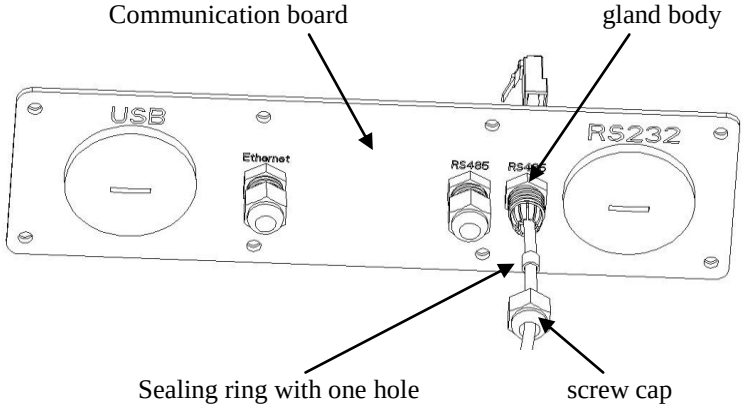
RS485 is used for multipoint communication. The Max. Length of RJ45 cable should not surpass 1000m. The pin assignment of RJ45 socket on inverter is as below:

Pin1------- TX_RS485A	
Pin2-------TX_RS485B	
Pin3-------RX_RS485A	
Pin4-------GND	
Pin5-------GND	
Pin6-------RX_RS485B	
Pin7-------+7V	
Pin8-------+7V	

For pin assignment of RJ45 cable for RS485 connection, please check the user manual of the data logger for details. (General suggestion is to cross connecting TX_RS485A to RX_RS485A….and so on.)

Connection procedure of RJ45 cable:

a. Take off 8pcs screws on the communication board with screw driver Torx 20;
b. Twist off the screw cap of the M12 cable gland;
c. Eject out the sealing ring without hole, and insert the sealing ring with one hole;
d. Put RJ45 cable through the components according to following sequence: screw cap, sealing ring with one hole, gland body, communication board; compress the RJ45 plug on the site and insert RJ45 plug into the corresponding interface;

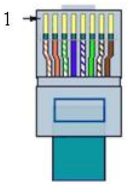


e. Cover the communication board, tighten 8pcs screws and screw the cap by hand;

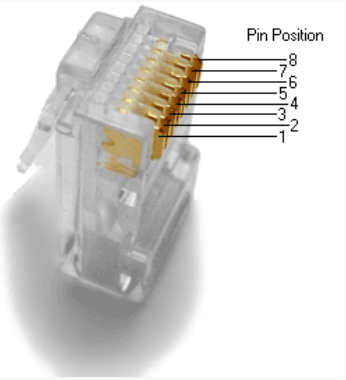
Notes: there're two kinds of sealing ring, one has no hole, the other has one hole; if no communication required, there's no need to operate as above procedures; instead, just keep the original state.

Operating procedure of RJ45 cable as shown below:

1. A RJ45 cable is composed by eight wires with different color. Cut off outside envelope to reveal the eight wires. Then make the end of every wire straight, and put them in order.



2. Current pin assignment for RJ45 cable is following the EIA/TIA 586 standard as follows. Please refer and apply it for physical implementation as needed.

Pin	T568A Color	T568B Color	Pins on plug face (socket is reversed)
1	white/green stripe	white/orange stripe	
2	green solid	orange solid	
3	white/orange stripe	white/green stripe	
4	blue solid	blue solid	
5	white/blue stripe	white/blue stripe	
6	orange solid	green solid	
7	white/brown stripe	white/brown stripe	
8	brown solid	brown solid	

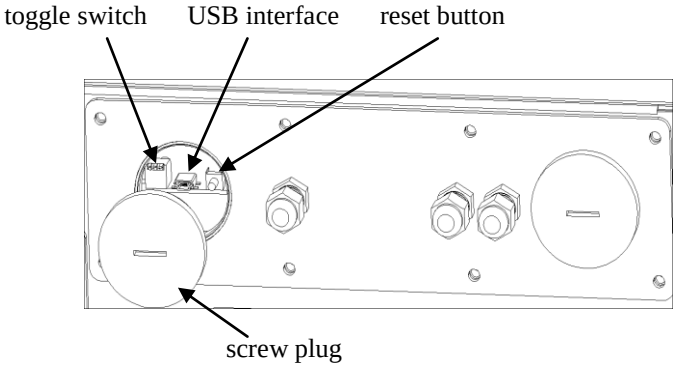
3. Insert the eight wires to corresponding slots of the RJ45 plug at the same time, and then press them together by a professional tool.

4. Connect the other end of the network cable to the RJ45 plug by repeating the procedures 1～3.

6.3 USB

USB interface is specially designed for maintenance engineer to burn and update of PCU firmware. Operation procedure is as below:

1. Twist off the screw plug;
2. Connect USB cable;
3. Dial switch downwards;
4. Press reset button;
5. Dial switch upwards;
6. Start to update the PCU firmware;
7. Pull out USB cable;
8. Re-press reset button;
9. Twist on the screw plug;



7 Safety protection

We provide the following safety protection for you:

1) Overvoltage, undervoltage protection;

2) Overfrequency, underfrequency protection;

3) Over temperature monitoring;

4) Residual current monitoring;

5) Isolation fault detection;

6) Anti-islanding protection;

7) DC injection monitoring;

8 Technical data

8.1 AC output data

Type		PVMate 10NE	PVMate 12NE
Main voltage / range		400 V x 3 / 320 V ~ 460 V	400 V x 3 / 320 V ~ 460 V
Grid frequency, nominal		50 Hz	50 Hz
Main frequency / range		50 / 45~55; 60 / 55~65	50 / 45~55; 60/ 55~65
Nominal output power		10kW	12kW
Maximum AC apparent power		10 kW	12 kW
Maximum output current		16 A	19.2 A
Waveform		True sine	True sine
Power factor	VDE-AR-N 4105	0.85ind - 0.85cap	
	Other safety	>0.97 at 20% load, >0.99 at 100% load	
Total harmonic distortion at 100% load		< 4%	

Type		PVMate 15NE	PVMate 17NE
Main voltage / range		400 V x 3 / 320 V ~ 460 V	400 V x 3 / 320 V ~ 460 V
Grid frequency, nominal		50 Hz	50 Hz
Main frequency / range		50 / 45~55; 60 / 55~65	50 / 45~55; 60 / 55~65
Nominal output power		15 kW	17 kW
Maximum AC apparent power		15 kW	17 kW
Maximum output current		24 A	25.8 A
Waveform		True sine	True sine
Power factor	VDE-AR-N 4105	0.85ind - 0.85cap	
	Other safety	>0.97 at 20% load, >0.99 at 100% load	
Total harmonic distortion at 100% load		< 4%	

8.2 Input data

Type	PVMate 10NE	PVMate 12NE
Maximum input power	10.3 kW	12.5 kW
Operating voltage range	270 ~ 900 VDC	270 ~ 900 VDC
MPP voltage range	270 ~ 780 VDC	270 ~ 780 VDC
Maximum input voltage	900 VDC	900 VDC
PV start voltage	290 VDC	290 VDC
Maximum input current	22 A/11A	22/11 A
Number of input strings	5	5
Number of MPPT	2	

Type	PVMate 15NE	PVMate 17NE
Maximum input power	15.5 kW	17.6 kW
Operating voltage range	270 ~ 900 VDC	270 ~ 900 VDC
MPP voltage range	270 ~ 780 VDC	270 ~ 780 VDC
Maximum input voltage	900 VDC	900 VDC
PV start voltage	290 VDC	290 VDC
Maximum input current	2 × 22 A	2 × 22 A
Number of input strings	6	6
Number of MPPT	2	

8.3 General data

Efficiency	PVMate 10NE/12NE/15NE/17NE
Maximum efficiency	97.8%
European efficiency	97.4%
Operating (standby) consumption	< 25W
Night consumption	< 0.6 W
Environment	
Operating temperature range	-20℃ ~ +60℃
Maximum full power operating temperature without derating	45℃
Relative humidity	Maximum 98%
Maximum operating altitude above mean sea	2000 m
Mechanical data	
Electronics protection rating	IP65
Cooling	Controlled forced ventilation
Inverter weight	50 kg
Noise level	< 50 dB(A)
Dimensions (H × W × D)	760 × 500 × 180 mm
Features	
Topology	TL
Communication	RS485
USB	no
Built-in DC disconnect	yes
Display	5.9” LCD
Certifications	VDE 0126-1-1, VDE-AR-N 4105, G59/2, G83/1, EN 50438, AS4777.2/.3, EN 62109-1
Warranty	5 years

8.4 Cable requirement

Object	AC conductor cross-section area	Max. recommended cable length (cables power loss of 1% rated output power)
PVMate 10NE Wire(R, S, T, N)	4 mm^2	27.4m
	6 mm^2	38.4m
PVMate 12NE Wire(R, S, T, N)	4 mm^2	22.8m
	6 mm^2	32m
PVMate 15NE Wire(R, S, T, N)	4 mm^2	18.3m
	6 mm^2	25.6m
PVMate 17NE Wire(R, S, T, N)	4 mm^2	17.9m
	6 mm^2	25.1m
PE	at least as phase cables	

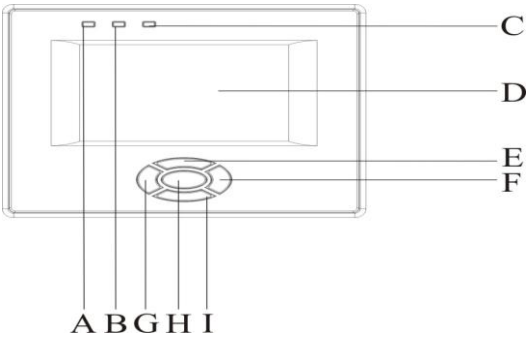
For AC cable, make sure the inside wire must be flexible and the each cross-section not less than above 6mm^2.

Avoiding too much power loss due to inappropriate cable model of DC input, please Choose AWG12 (4mm^2, 4.75Ω/km) or AWG10 (6mm^2, 3.39Ω/km).
MC4 connector is compatible with 4mm^2/6mm^2 wires.

9 Operating

Info provided here mainly includes LEDs, display, function keys and display fault etc.

9.1 Overview



Object	Description
A	Working normally (Green LED)
B	Fault (Red LED)
C	Communication (Yellow LED)
D	LCD display
E	Up (Function key)
F	Right (Function key)
G	Left (Function key)
H	ENTER (Function key)
I	Down (Function key)

All function including parameter review, setting, and malfunction info etc. can be realized at this interface.

9.2 LEDs

The inverter is equipped with three LEDs including “green”, “yellow” and “red” which provide information on the operating status of this device.

Green LED:

The green LED lighting indicates that the inverter is active and working normally. Normally, this LED begins to light up in the morning when the sunshine intensity is enough and goes out when it gets dark.

Yellow LED:

The yellow LED blinks during the inverter communicating with other devices such as PC through RJ45 and goes out after the communication finishes. The yellow LED keeps on lighting during updating the firmware.

Red LED:

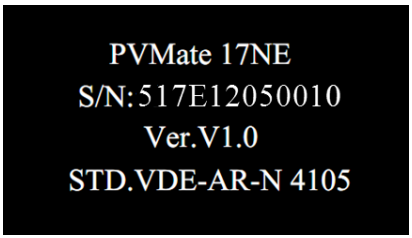
The red LED lighting indicates the inverter has stopped feeding power into the grid because of fault, and the corresponding faulty information will be shown on the display at the same time. The faults in the following table will activate the red LED.

LED	Display messages	Detailed message
Red	GFCI Failure	The GFCI detection circuit is abnormal.
	AC HCT Failure	The AC output sensor is abnormal.
	Consistent Fault： DC inj. differs for M-S	Different measurements between Master and Slave for DC output current
	Consistent Fault： Ground I differs for M-S	Different measurements between Master and Slave for GFCI
	High DC Bus	DC Bus voltage is too High
	Utility Loss	No grid voltage detected
	Ground I Fault	Residual current is too high
	Over Temperature in	The temperature inside exceeds the

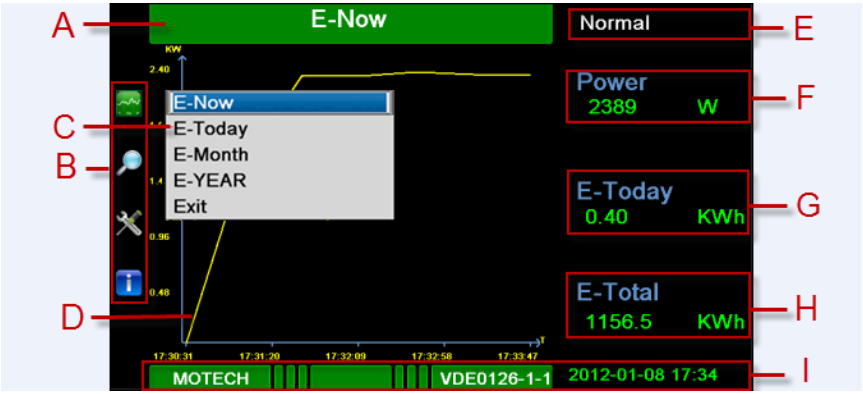
Red	Inverter	specification of this inverter.
	PV Over Voltage	The voltage of the PV modules exceeds the Maximum Input voltage of the inverter.
	Fan Lock	Fan malfunction
	AC Voltage Out of Range	The voltage of the grid is out of range.
	Isolation Fault	The resistance of PV generator to earth is too low.
	DC Injection High	The DC injection to the grid is too high
	Consistent Fault： Fac differs for M-S	Different measurements between Master and Slave for grid frequency
	Consistent Fault： Vac differs for M-S	Different measurements between Master and Slave for grid voltage
	AC Relay-Check Fail	AC relay malfunction
	M-S Version Unmatched	Different CPU firmware version
	Fac Failure： Fac Out of Range	The frequency of the grid is out of range.
	EEPROM R/W Fail	Reading or writing of EEPROM fails
	SPI Failure： Communication Fails between M-S	Communication between microcontrollers fails

9.3 Display

The following interface including model name, serial number, firmware version and safety standard will appear on the display when the inverter starts up; it will switch to the main screen 5s later.



The parameters showed on the display can be set through function key. There are four menu icons on the left of the display, showing parameters of power, input & output parameters, parameter setting, device and malfunction info. The middle area is for showing parameter info or oscillogram etc. under each menu. On the right, it always shows working state, current output power, E-today, and E-total from top down. At the bottom of the display, brand, certificate, date and time will be shown.



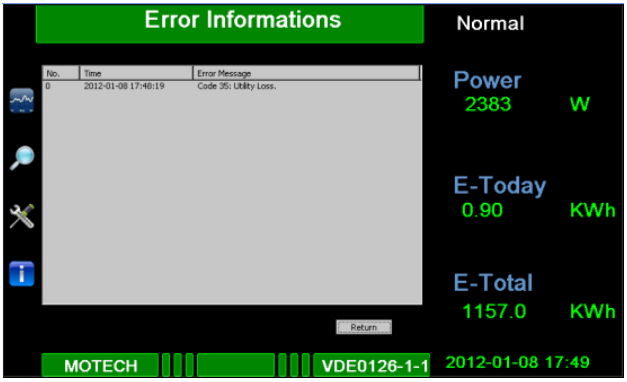
Object	Description
A	The current menu
B	Main menu: generated power parameters, input & output parameters, parameter setting, device & malfunction info
C	Pull-down menu under main menu
D	Display area of specific parameters, curve
E	Working state of the inverter
F	Current output power
G	The energy generated today (kWh)
H	The energy generated since the inverter started (kWh)
I	Display field of the brand, certificate, date & time

Content of menu

Menu icons	Function	Content
	Generated power parameters	E-Now
		E-Today
		E-Month
		E-Year
		Exit
	Input & output parameters	AC Parameter
		DC Parameter
		Exit
	Parameter setting	Language and Time
		Safety Parameters
		Clear Data
		Exit
	Device & malfunction info	Device Info
		Error Info
		Exit

Fault display:

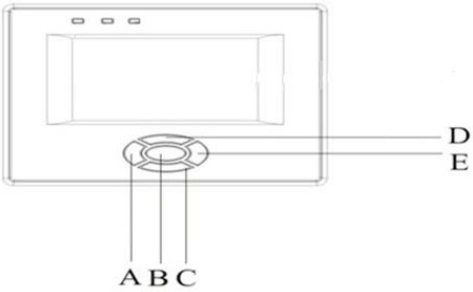
When fault happens, the specific faulty information will show in a floating window on the display. At the same time, the red LED lights up and the green LED goes out. The following figure indicates that the fault “Utility Loss” happened.



After you click “OK”, the floating window disappears. If you enter into  , faulty information of the latest 20 pieces can be reviewed.

9.4 Function keys

There are five function keys, by which users can choose menus on the display and realize parameter reviewing & setting etc.



“Left” Key (A):

You can move the cursor to the left or to the last parameter by pressing the “Left” key.

“ENTER” key (B):

The key is for confirming the menu or the parameters you selected.

“Down” Key (C):

You can move the cursor downwards or to the next parameter or to do numerical subtraction by pressing the “Down” key.

“Up” key (D):

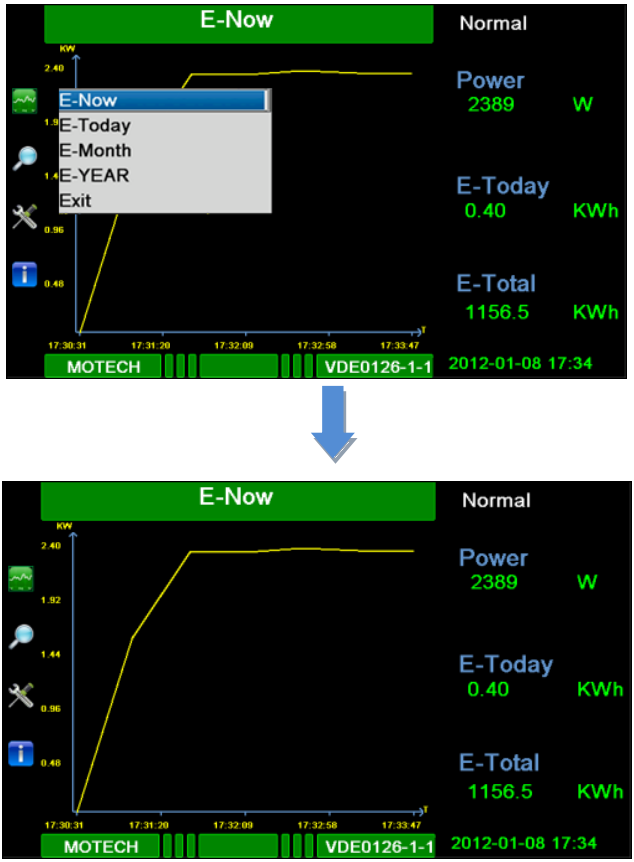
You can move the cursor upwards or to the last parameter or to do numerical increase by pressing the “Up” key.

“Right” key (E):

You can move the cursor to the right or to the next parameter by pressing the “Right” key.

9.4.1 Check parameters of the generated energy

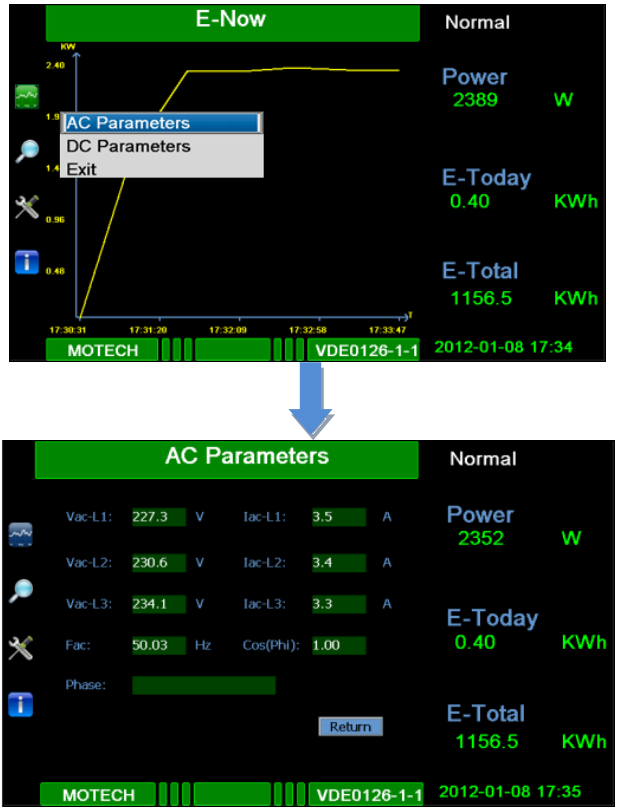
Move the cursor to  by pressing the “up” or “down” key; press the “ENTER” key, and then you will find a pull-down menu. Please move the cursor to “E-Now” by pressing the “up” or “down” key, then press “ENTER”, the relevant information will be shown. (E-Now is default state)



Using the same operating procedures, you can check “E-today”, “E-Month”, and “E-Year” and so on. You can also choose “Exit” in the pull-down menu, and you will exit this interface.

9.4.2 Check parameters at AC and DC side

Move the cursor to by pressing the “up” or “down” key; press the “ENTER” key, and then you will find a pull-down menu. Please move the cursor to “AC Parameters” by pressing the “up” or “down” key, and then press “ENTER”, the related information at AC side will be shown. If you press “ENTER” once more, you can exit this interface.



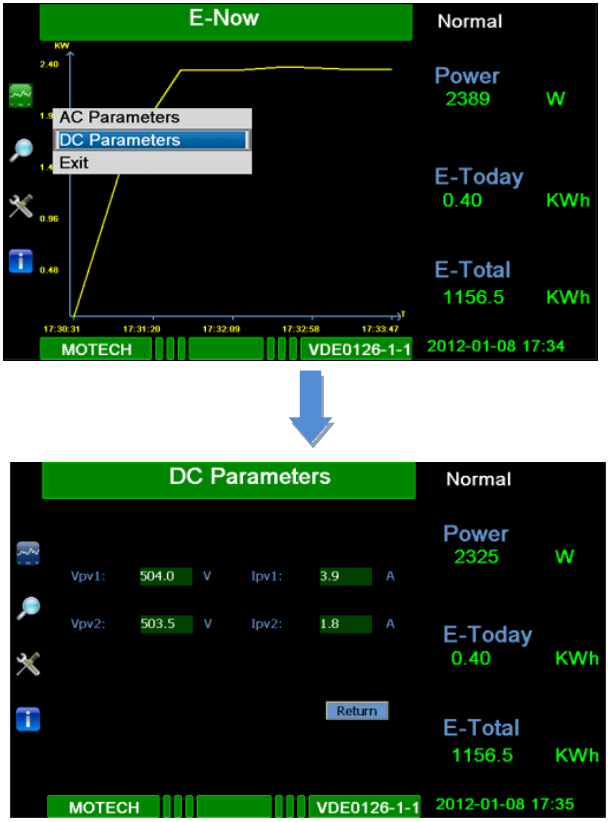
Both “phase” and “Cos(phi)” indicate the corresponding value if “BDEW” was selected as the installation location.

“Cos(phi)” indicates power factor, “phase” indicates the phase difference between voltage and current.

While failing to meet BDEW regulation, “Cos(phi)” shows 1.00, and “phase” value is unavailable

PVMate 10NE/12NE/15NE/17NE complies with regulations of BDEW and EEG.

Move the cursor to  by pressing the “up” or “down” key, press the “ENTER” key, and then you will find a pull-down menu. Please move the cursor to “DC Parameters” by pressing the “up” or “down” key, and then press “ENTER”, the relevant information at DC side will be shown, including input voltage & current of route A and B. If you press “ENTER” once more, you can exit this interface.

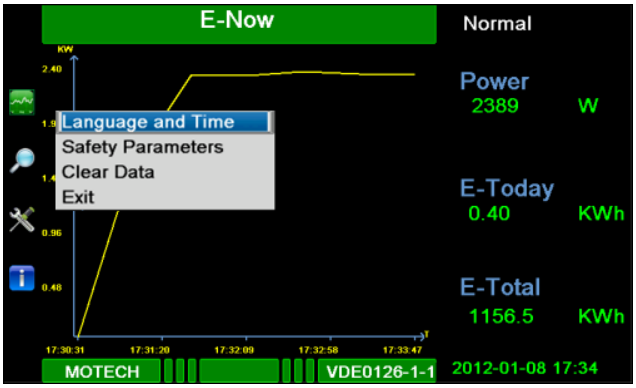


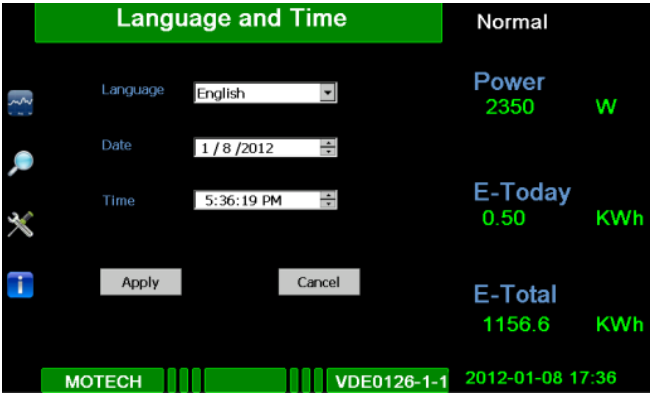
If you want to exit “input & output parameter” menu, please choose “Exit” in pull-down menu.

9.4.3 Parameter setting

9.4.3.1 Language and Time

Move the cursor to by pressing the “up” or “down” key; press the “ENTER” key, and then you will find a pull-down menu. Please move the cursor to “Language and Time” by pressing the “up” or “down” key, and then press “ENTER”; you can set the language, date and time.





Language setting

When the cursor is at the “Language” column, you can choose “Chinese”, “English” or “German” etc. Then press “ENTER”, you come to set the next parameter ---- “Date”.

Date setting

When the cursor is at the “Date”, at first you can set the “Year” by pressing the “up” and “down” keys. After finishing setting “Year”, please press the “right” key and set “Month” and “Date”. Then, press “ENTER”, you come to set the next parameter ---- “Time”.

Time setting

When the cursor is at the “Time”, at first you can set “Hour” by pressing the “up” and “down” keys. After finishing setting “Hour”, please press the “right” key to “Minute” and “second”. Finally, please press “ENTER” and the window “Apply” will appear.

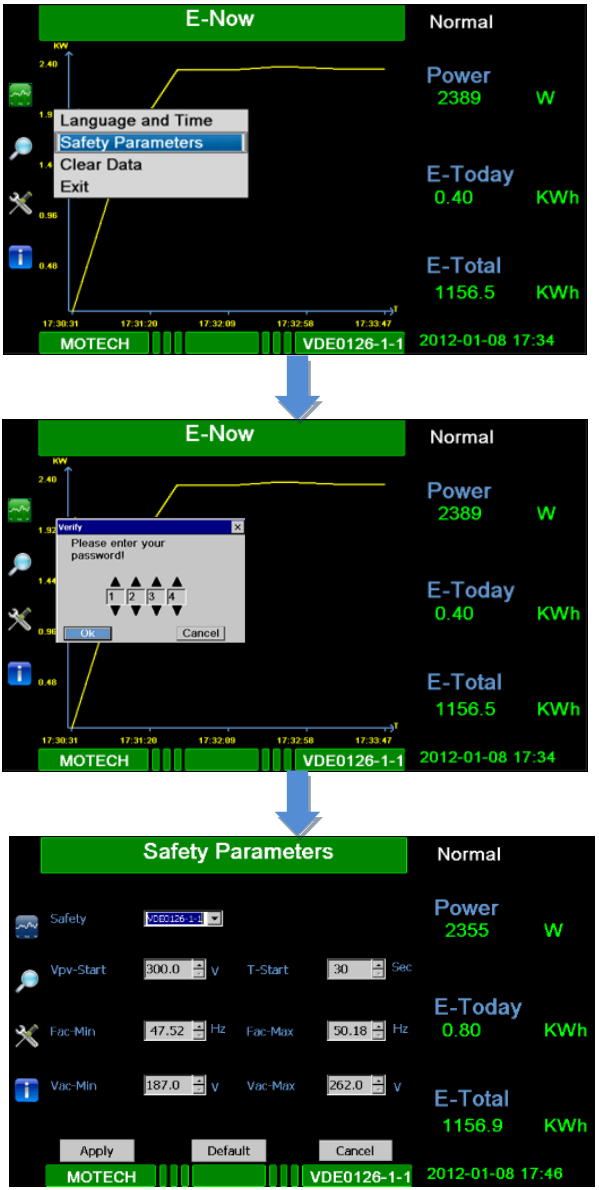
Information:
After setting the “Language”, “Date” and “Time”, the window “Apply” will appear and you can choose the “Apply” or “Cancel” by pressing the “left” and “right” keys. If you choose “Apply”, the parameters just selected will be saved; if you choose “Cancel”, the parameters will not be changed and remain the original status.

9.4.3.2 Safety Parameters Setting

Move the cursor to  by pressing the “up” or “down” key; when pressing the “ENTER” key, you will find a pull-down menu. Please move the cursor to “Safety Parameters” menu by pressing the “up” or down” key, and then press “ENTER”, you will come to the interface for “Device Parameter setting”. At this interface, you can choose the last or the next parameter, and do numerical subtraction or increase. These parameters contain “Safety Type”, “Vpv-start”, “T-start”, “Fac-Min”, “Fac-Max”, “Vac-Min”, “Vac-Max” and so on. Among the parameters, Safety Type contain “VDE-AR-N 4105”, “VDE 0126-1-1”, “G59/2”, “G83/1” , “AS4777” , “EN50438” etc. You can choose any one by pressing the “up” or “down” key, taking “VDE 0126-1-1” for example。

NOTICE!

The default safety settings comply with the local regulations.
Don’t change the safety parameters before consulting with the local DNO!
This operation requires password，please inform MOTECH if you need.



After that, you can choose “Apply”, “Default” or “Cancel” to confirm parameter change, restore original data or cancel the setting. Press “ENTER” and exit this interface to enter main menu.

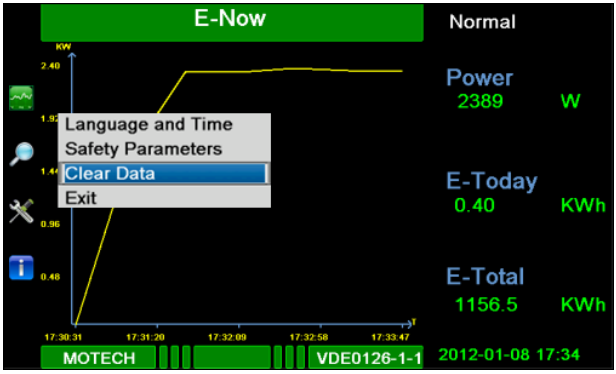
9.4.3.3 Clear Data menu

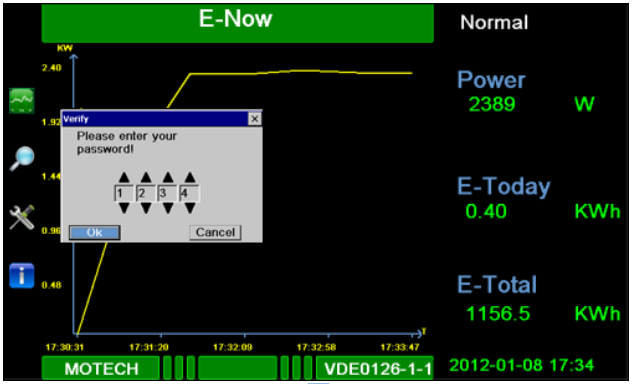
Move the cursor to  by pressing the “up” or “down” key; after pressing the “ENTER” key, you will find a pull-down menu. Choose “Clear Data” and press “ENTER” to get into data clearing state. In this menu, pressing “ENTER” to clear all the data in the memory, and if choosing “Cancel”, exit this interface.

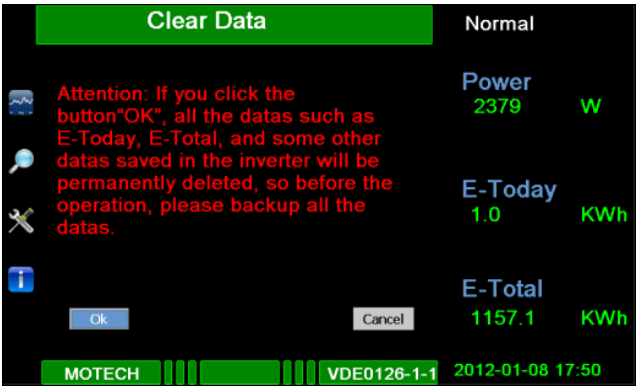
Notes:

①This operation requires password (default value: 1234).

②If this operation is done, all the data in the memory will be cleared, so backup of all the data before clear is recommended.







9.4.3.4 Exit key

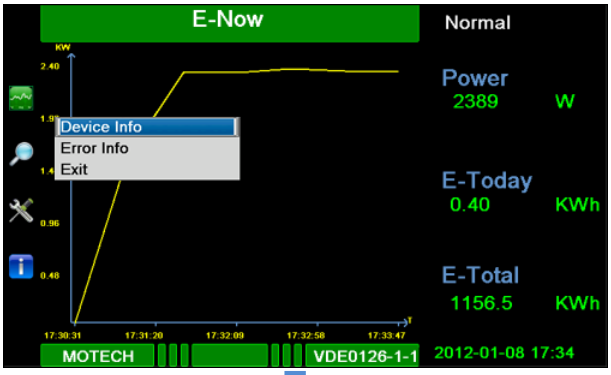
If you are at the pull-down menu of "parameter setting" and don't want to do any settings, please choose "Exit" and press "ENTER" to enter main menu.

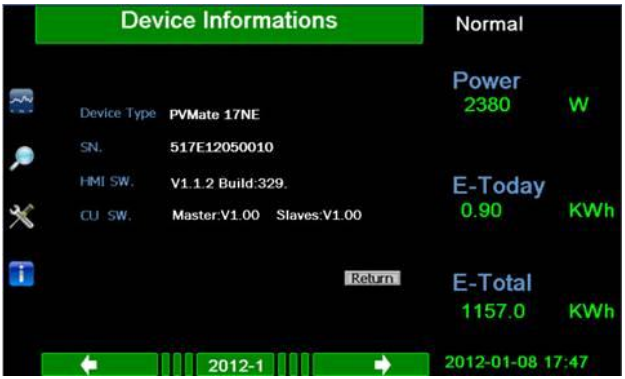
9.4.4 Device and Error Info

Move the cursor to  by pressing the "up" or "down" key, press the "ENTER" key and you will find a pull-down menu. Please move the cursor to the parameters which you want to check by pressing the "up" or down" key, and then press "ENTER", you will find all information of the selected parameter.

Device Info

Move the cursor to "Device Info" by pressing the "up" or "down" key, and then press the "ENTER" key, you will find the information of "Device Type", "SN", "HMI/SW", "CU/SW" etc. Press the "ENTER" key once more and exit this interface.

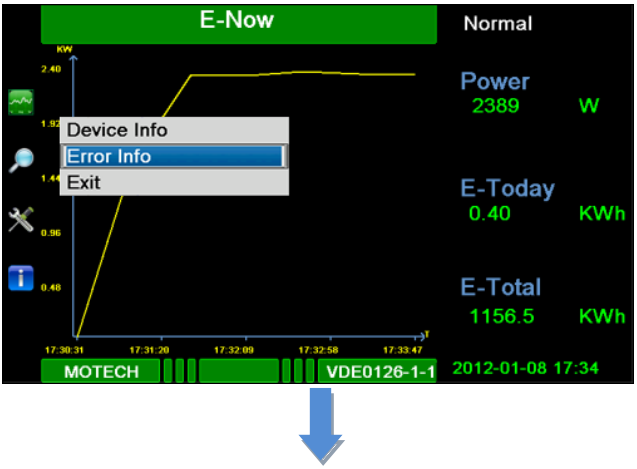


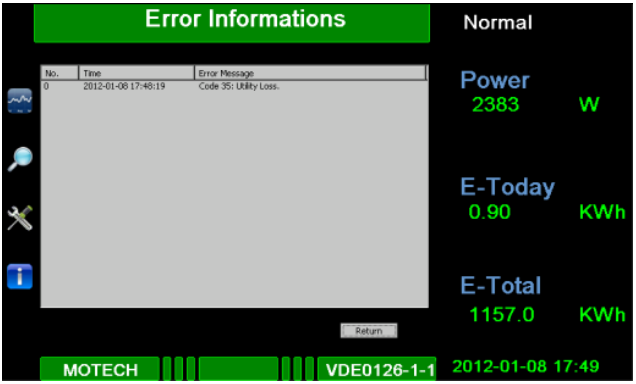


Error Info

Move the cursor to “Error Info” by pressing the “up” or “down” key, then press the “ENTER” key, you will find the Error information column, including the time when fault happened and fault info. Press the “ENTER” key once more and exit this interface.

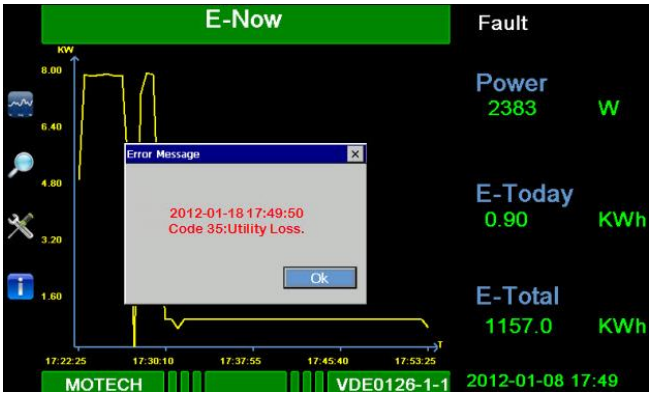
“Error Info” contains Error information of the latest 20 times.





9.5 Display of fault

The last 5 dated failure reports on the NS protection can be read. An interruption in the supply voltage of ≤ 3s does not result in any loss of failure reports. (According to VDE-AR-N 4105, cl. 6.5.1) .When the inverter cannot work normally and the fault has not been solved, the specific fault information will show in a floating window on the display, showing when the fault happened and the error information. At the same time, the red LED lights up and the green LED goes out. The following figure indicates that the fault "Utility Loss" happened.



Under "Fault"state, when you click "ENTER", the floating window disappears; while the red LED will keep on lighting until the trouble has been solved. Now if you want to review the fault info, you can find "Error Info" under  menu.

10 FAQ (Frequently asked questions)

When the PV plant doesn't work normally, we recommend the following solutions for quick troubleshooting. If there is a fault, the red LED will light up.
Following info can help the technician to understand the problem and take action.

	Display messages	Possible actions
Resumable Fault	Isolation Fault	1. Check the resistance of the PV generator's PV (+) terminals & PV (-) terminals with the ground, both of them must be greater than 2MΩ. 2. Check whether the ground wire of AC output cable has been grounded reliably. If this fault still occurs often, please call service.
	Ground I Fault	The residual current is too high. 1. After cutting off the AC end connection, and unplug the inputs from the PV generator, then check the connection of AC side. 2. After the cause is cleared, re-plug the PV inputs and AC connector, and check the inverter state.
	Grid Fault Fac Over Range Vac Over Range	1. Wait for 5 minutes, if the grid returns to normal, the inverter restarts automatically. 2. Make sure grid voltage and frequency meet the local specifications.
	Utility Loss	1. Grid is not connected. 2. Check grid connection cables. 3. Check grid usability. 4. If the grid is ok and the problem remains, maybe the fuse is broken, please call the service.
	Over Temperature	The temperature inside exceeds the Spec. of the inverter. 1. Find a way to reduce the ambient temperature. 2. Move the inverter to the cooler environment.

Resumable Fault	PV over Voltage	1. Check the open circuit voltage of the PV modules; see if it is greater than or too close to the Max. Input voltage of the inverter. 2. If the open circuit voltage of the PV modules is less than the Max. Input voltage of the inverter, and the problem still remains, please call the service.
Permanent Fault	Consistent Fault	Firstly, disconnect the PV modules with the inverter; secondly, reconnect them after a while. If the problems remain, please call the service.
	Relay-Check Fail	
	DC INJ High	
	EEPROM R/W Fail	
	SCI Failure	
	AC HCT Fault	
	GFCI Failure	

The safety information in this instruction must be fully observed in the installation and operation of this product.

During periods of little or no sunlight, the inverter may continuously startup and shutdown. This is due to insufficient power generated by the PV generator. If the problem remains, please call the service.

Except the frequent problems as stated above, if you still have any problems which cannot be solved, please call the service.

11 Service and maintenance

MOTECH grants a warranty of 60 months as standard, starting from the date of the purchase invoice date marked. MOTECH will only perform warranty services when the faulty unit is returned back together with a copy of the invoice and warranty card which were issued by the dealer to the user. And the unit should be returned in its original or equivalent packaging, please preserve the original packaging. The cost for new packaging and shipment is paid by the customer. In addition, the S/N label on the unit must be fully legible. If these requirements are not fulfilled, MOTECH reserves the right to deny warranty services.

Warranty claims are excluded for direct or indirect damages due to:

1. Beyond warranty date, without warranty card or serial number;
2. Improper use, operation and refitting;
3. Transport damage;
4. Non-observance to the relevant safety instruction and work in the severe environment out of the recommended ones in this instruction;
5. Beyond installation and use areas of the relevant international standards;
6. Influence of abnormal environment disaster and force majeure (earthquake, fire, flood etc.).

12 Contact

If you have any technical problems about our product, you can contact us via:

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