Operation and Installation Manual

DASSTECH Photovoltaic Grid-Connected Inverter

(Grid connected type Photovoltaic Inverter)

DASS 125i Series

DSP-33125K-OD-HV

DASS Tech

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1. Precautions for safety

1.1 Basics

Precautions for safety aim for safe and correct operation of the product by preventing accidents or hazards in advance, so please follow them.

- The meanings of the symbols used in the products and the operation and installation manual are described as follows.

It means that you should be careful because risks could take place under certain conditions.

It means that you should be careful because you could be shocked under certain conditions.

- The precausions are divided into 'Warning' and 'Caution' and their meanings are described as follows.

WARNING : If you violate instructions, you could die or be seriously injured.

CAUTION : If you violate instructions, you could be slightly or seriously injured.

- After reading the operation and installation manual, please keep it in a place that people can read anytime.

- Please be well-informed of the manual to fully and safely use the functions of the DSP series inverter.

1.2 Precautions while Operating

WARNING

- Do not operate the product when the front cover is opened.
  It can cause electric shock as the high-voltage terminals or live parts can be exposed.

- Do not operate the switch with wet hands.
  It can cause electric shock.

- Do not open the cover when power is already on or during operation.
  It can cause electric shock

- Even if power is not on, do not open the front cover except for regular inspection time.
  Even under off-power, voltage can be charged in the internal capacitor of the inverter, which can cause electric shock.

- Please check whether the direct current (DC) voltage of the inverter is discharged using a measurement tool such as volt-ohm-milliampere (VOM) after 20 min or longer from power off when wiring work or regular inspection is performed.
  Since high voltage can be charged in the internal capacitor of the inverter, it can cause electric shock

- Do not use the product if the sheath of the cable is damaged.
  It can cause electric shock.

- Do not place a heavy object that gives excessive stress on the cable while using.
  It can cause electric shock due to the damage on the sheath of the cable.

- Do not supply power even if the installation is complete when part of the inverter is damaged.
  It can cause electric shock.

CAUTION

- Do not install the product near the flammable materials.
  If the product is installed with flammable materials or attached near flammable substance, it can cause a fire.

- Disconnect the input power (solar cells) and output power (AC system power) in the inverter during inverter failure.
  If the power is not disconnected, it can cause a fire due to the secondary accident.

- Do not touch the front and upper surface of the inverter enclosure during inverter operation.
  The front and upper surface of the enclosure can be hot, which can cause a burn.

- Do not touch the inverter while power is connected or within 30 min after power is disconnected.
  Since the product is on a high-temperature, it can cause a burn when the product is contacted with human body.

- Do not supply power even if the installation is complete when the inverter is damaged.
  It can cause electric shock and additional part damage.

- Do not have foreign substances such as screws, metal parts, water and oil get into the inside of the inverter.
  It can cause a fire.

- Keep the distance of at least 30 cm from the inverter.
  It can risk health due to the emission effect.

2. Product Overview

2.1 Basics

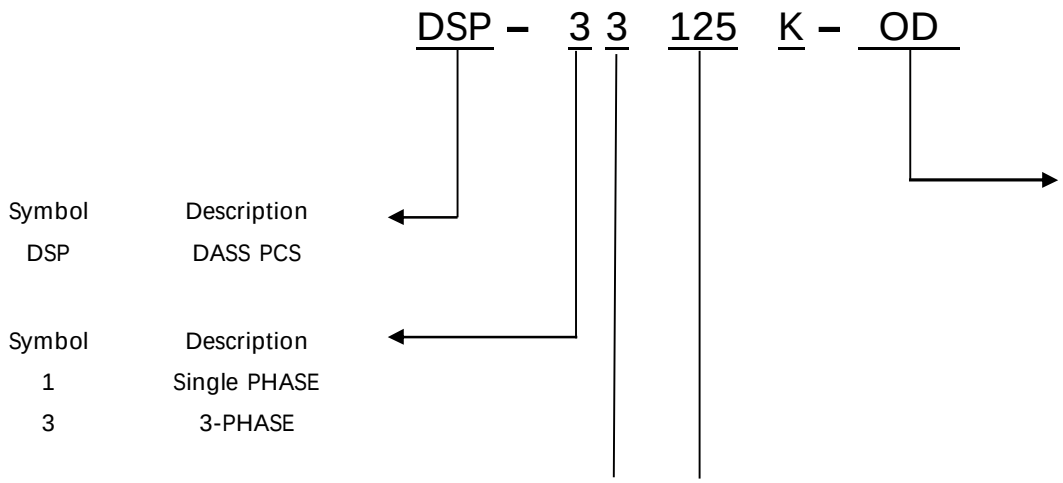
If the inverter is operated incorrectly, it can prevent normal operation or reduce a lifespan of the product. In the worst case, the inverter can be broken or incur fatal damage to human bodies. Thus, please read carefully and understand thoroughly the operation and installation manual prior to the use.

2.2 Appearance of the Product

2.3 Verification of the Product

Please check the name plate at the side of the main product body whether inverter type and rated output are matched with the ordered product details once the inverter is taken out of the packaging box. In addition, check whether there is any damage during transportation.

- Inverter Type



- Accessories

- Please contact the office if there are some missing accessories such as the operation and installation manual, fixed bracket, bracket fixing bolt, etc. or the product is damaged.

- Depending on the operation field, necessary tools can be different and shall be prepared well as ne cessary. (e.g.: Multi-tester to check voltage and wiring, electric tools to install a fixed bracket, etc.)

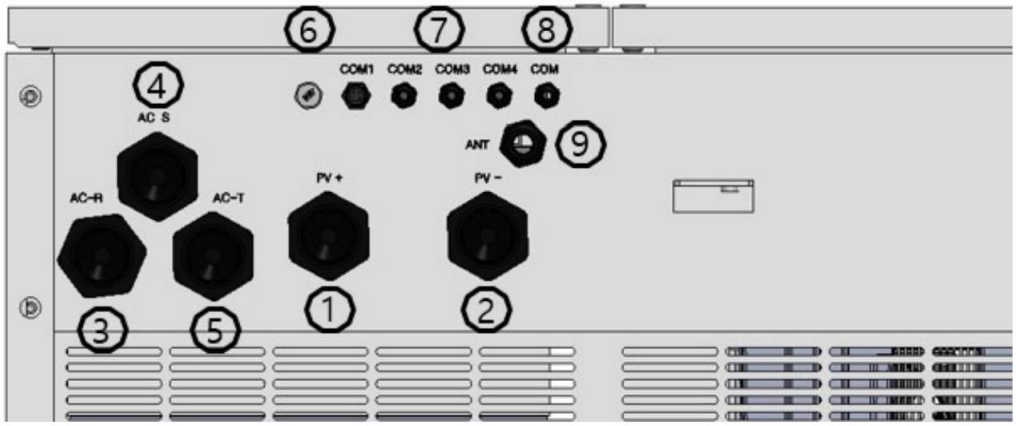
2.4 Configuration of the Product

- Front View

- Side View

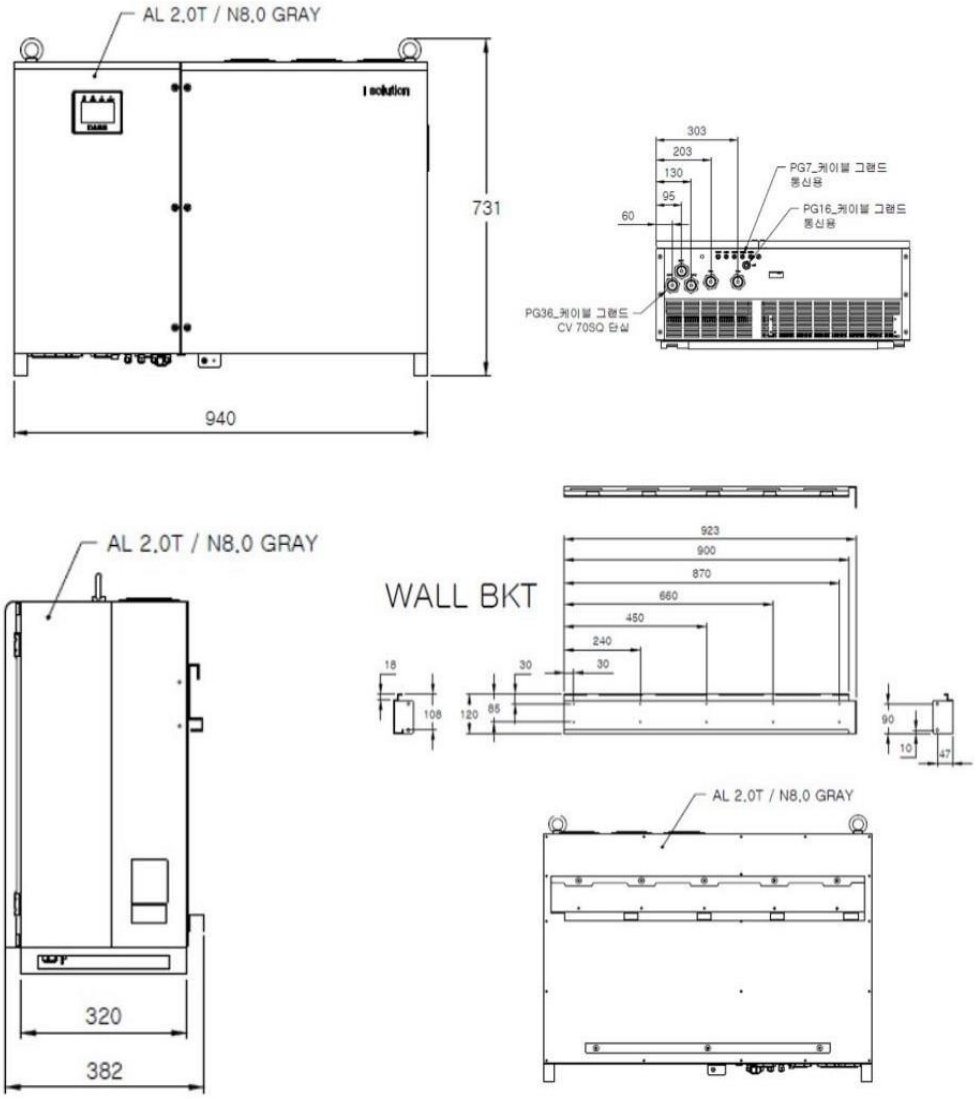
- Rear View

- Bottom View



Item	Name	Description
①	PV(+) input port	Input PV (+) Cable Grand
②	PV(-) input port	Input PV (-) Cable Grand
③	AC Output Port (U Phase)	Output AC Cable Grand
④	AC Output Port (V Phase)	Output AC Cable Grand
⑤	AC Output Port (W Phase)	Output AC Cable Grand
⑥	Protective Vent	Equalization Vent
⑦	COM1, COM2, COM3, COM4	485 Communication Cable Grand
⑧	COM	WIFI / Bluetooth Connector
⑨	ANT	DASS LORA

2.5 Dimensions of the Product



2.6 Configuration of the Photovoltaic System

Under the conditions that proper peripherals are selected, the inverter shall be connected well. The wrong system configuration and connection can cause abnormal operation or reduce a lifespan of the product seriously. In the worst case, the inverter can be damaged, so please use the product properly according to the contents and precautions in the manual.

2.7 Features of the Product

- High-efficiency power conversion (PWM)
  PWM method with IGBT semi-conductor device is applied and the high-efficiency of 98% or higher can be achieved at the rated power.

- Digital control
  The system is controlled more conveniently through the high-performance digital control and it can be checked through LCD keypad. And it monitors and displays the operation, input and output status of the inverter and the upset condition of the inverter and stops the inverter under the upset condition. Also, by detecting a module voltage in the solar cell, it is operated or stopped automatically.

- Transformer-less inverter
  As the outdoor type inverter is a transformer-less type, it is suitable for distributed power systems designed for a commercial generation.

- Distributed power system and economic feasibility
  The photovoltaic system can be installed anywhere where the sunlight is available. Thus, distributed power can be constructed at a level of building, house, or solar power plant, which can be used economically.

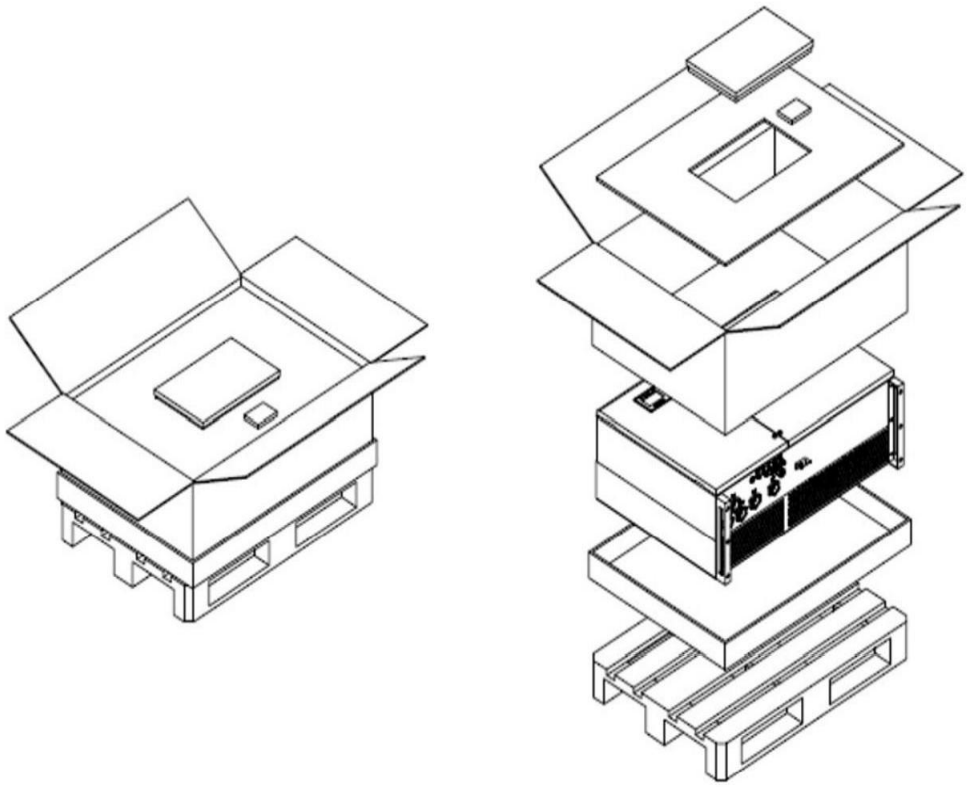
- Maximum Power Point Tracking (MPPT)
  Since the output characteristic of the solar cell is to generate nonuniform DC depending on temperature, humidity, climate, environment, and insolation, the inverter controls the solar cell module to maintain the maximum power point through the Maximum Power Point Tracking (MPPT).

- Easy parallel operation
  Once the capacity of the solar cell module is increased, the capacity can be easily increased by adding and connecting the inverter in parallel without additional equipment.

- Simplicity of installation and operation
  It is designed to display the inverter status in real time through the front LCD screen.

3. Installation

3.1 Transportation



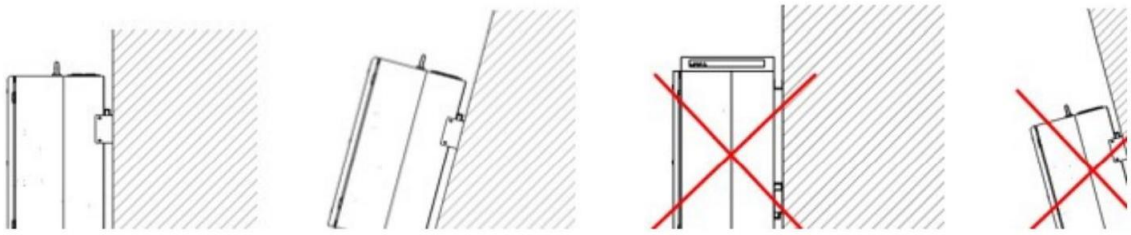
- Please transport the products correctly according to their weight.
- Do not stack the products in a multistage way beyond the restricted limit.
- The weights of the inverter and packaging box are 120 kg and 10 kg. So please carry the products with more than four persons.
- Do not open the front cover during the transportation of the products.
- Please check whether the products are damaged externally.
- Do not drag or throw the inverter.
- Since the inverter is a precise apparatus, do not drop the inverter or give any strong impact on it.

3.2 Installation Place

Please install the product at a place where the following conditions are met.

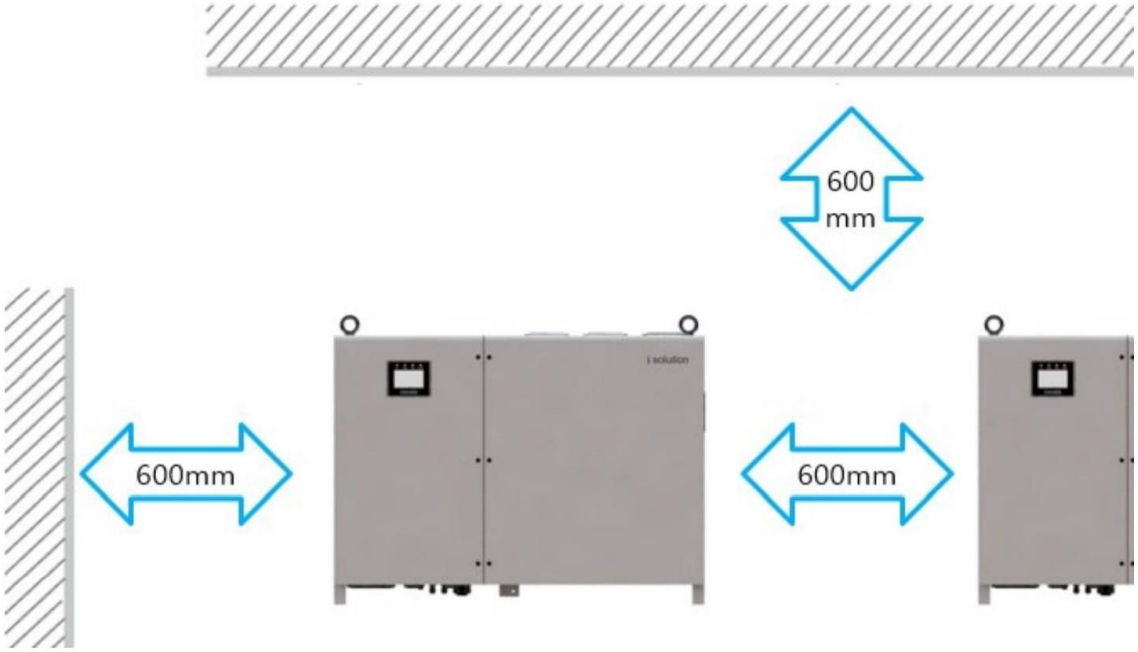
- Install the inverter at a place where there is no direct sunlight considering installation direction or surrounding space, etc. to prevent reduction in lifespan or performance degradation.
- The product can be installed at an indoor or outdoor place.
- Make it well-ventilated if it is installed indoors.
- Do not install the product at a vibrated place.
- Do not install the product at the concrete wall as much as possible.
- A lifespan of the inverter is greatly affected by ambient temperature. Please make sure the ambient temperature at the installed place does not exceed the preservation temperature (-25 ~ 50℃).
- Please avoid a place with high temperature and humidity (Less than 90% of relative humidity, No dew formation)
- As the inverter is a high-temperature heating element, please install the inverter on the surface with the quality of the material which is not flame retarding.
- Please install the product to give off heat smoothly by securing space near the inverter.
- Please avoid a place where there are oil mist, flammable gas, fiber dust, dust, moisture, etc.
- Please install the product at a place without salinity. (In particular, if the product is installed near the coastal area, product corrosion can occur. Thus, please avoid contact with salinity by installing a separate case, installing it indoors, etc.)

3.3 Precautions during Installation



- Please install the product according to the contents in the manual.
- The connecting part (the bottom surface of the inverter) should be directed to the bottom.
- Do not install the product horizontally.
- Please install the product at a place without humidity or dust and far away from direct sunlight or a high-temperature heat-generating part. Overheating can reduce electricity.
- The installation work must be directly done by a professional technician.
- Do not place a heavy object on the product.
- Do not spray or place flammable substances near the product.
- The installation direction must be followed in accordance with the standards in the operation manual.
- Since the inverter is a precise apparatus, do not drop the inverter or give any strong impact.
- The inverter requires 3-type (200V grade) or special 3-type(400 V grade) grounding work.
- Do not use other electronic appliances near the product. Failure or noise in the electronic appliances may occur.
- The workers must install the product at a place they can access on foot for follow-up management and inspection. For the following cases, service could be limited for their safety.

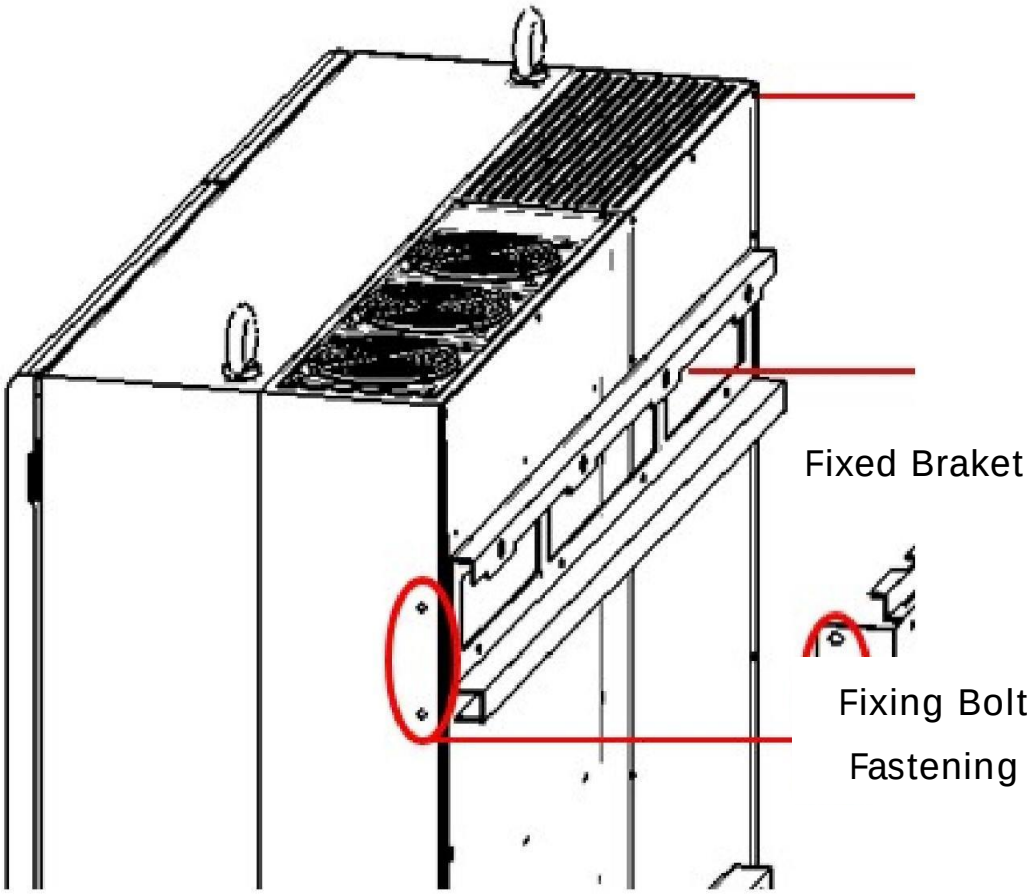
- Sites that workers can access only by using separate equipment including a ladder, a crane, etc.
- Places that workers cannot access for the reason of safety.
- Sites that materials and facilities needed for inspection should not be transported and moved in
- Other sites that workers could be in serious danger of safety. (a fall, an electric shock, etc.)



- Please use the exclusive bracket and be careful of sharp parts.
- Prior to the installation of the inverter, DC switch installed at the inside of the inverter should be OFF. If it is ON, it can be a cause of a failure during installation. Upon installation completion, the inverter should be ON then, make the inverter operated.
- Please secure the space of at least 60cm at the top and bottom and on the left and right of the inverter when it is installed outdoors.
- Please secure the space of at least 60cm from the ground when it is installed indoors and outdoors.
- Please secure the space over 60cm between inverters when they are installed in parallel.

3.4 Installation Method

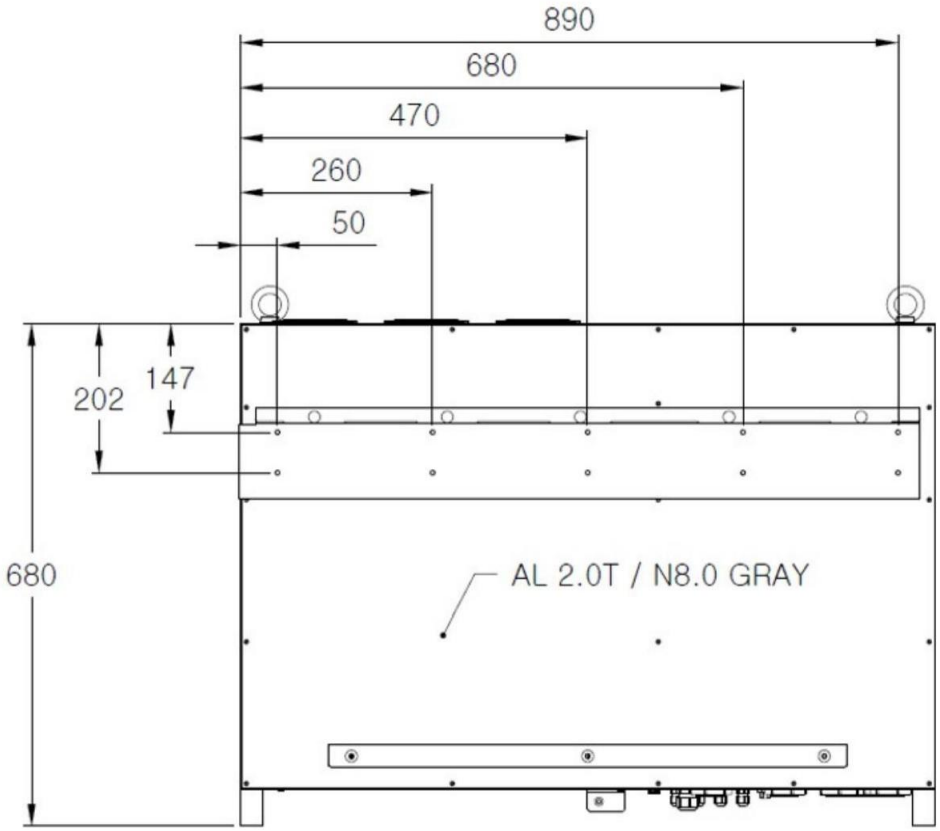
- Please refer to the below photo for the installation method.
- After the fixing bracket is installed, the inverter is hung on the fixing bracket and fastened by captive bolts.



- At least four persons must work when carrying or fixing the inverter to the bracket.
- Since the product is heavy, please install it with equipment including a lift or a crane, etc. as much as possible.
- Since a weight of the inverter is more than 100 kg, please be careful not to drop it.

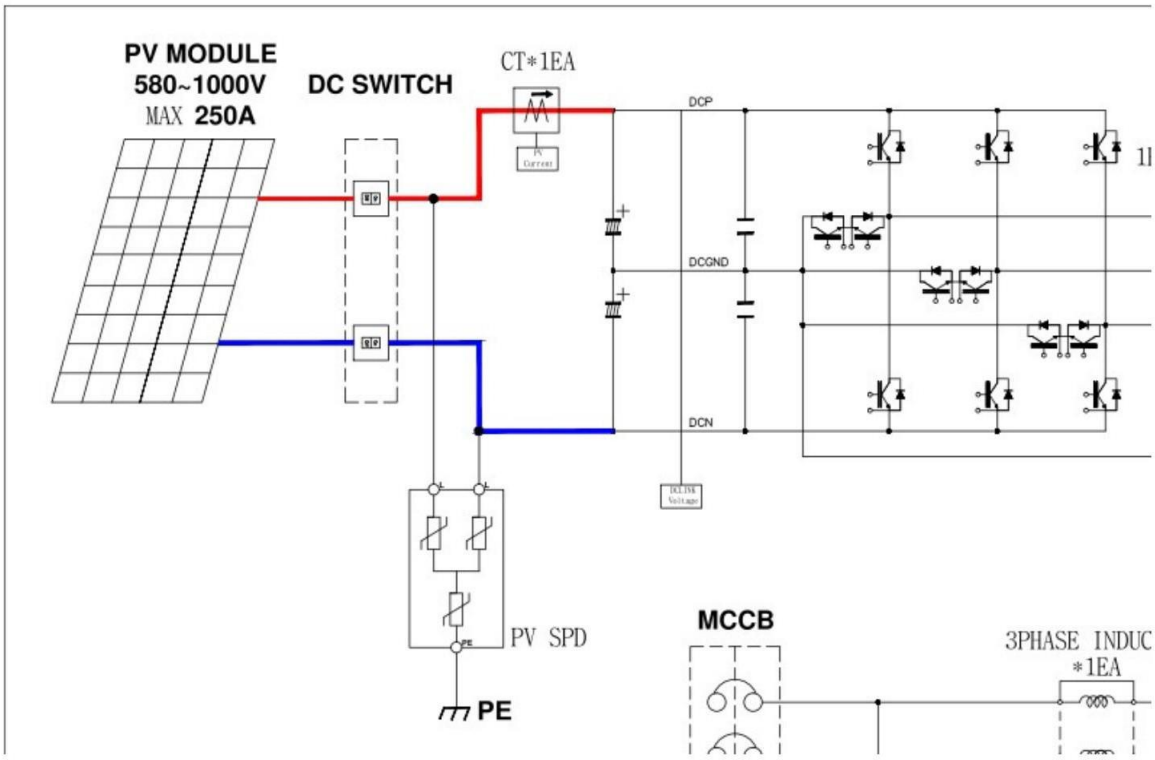
- Mark the locations of drill holes by using a fixing bracket (inner wall bracket) and bracket drawings provided along with the inverter.

- Please refer to the drawing as below to make holes (3 points) on the location for fixing a bracket.



- Fix the bracket by using bolts and nuts.
- After lifting the inverter, hang the inverter on the location of a bracket in the back.
- Fix the inverter and bracket (1 point).

3.5 Block Diagram



<DSP-33125K-OD-HV Block Diagram>

3.6 Precautions during Wiring

- Incorrect terminal connection can cause damage to the inverter.
- Please be careful for polarity (+/-) during DC connector connection.
- Please be careful to avoid reverse connection during AC connection.
- The wiring work or inspection should be directly done by professional technicians.
- Wiring work should be done after installing the main body of the inverter.
- Cables are not be separately provided.
- If wiring is changed as a result of inappropriate events, check whether the keypad LCD of the main body is turned off prior to wiring work. It is dangerous immediately after power is

disconnected since the capacitor inside the inverter is charged with high voltage.

- The inverter must be grounded with special 3-type (grounding resistance is 10 Ω or less) to prevent electric shock.

- Please connect the inverter to the external connection terminal.

- For grounding wires, use dedicated grounding wires. Connect the grounding points to the inverter as close as possible. Use wires whose thickness is over the dimension as mentioned and do wiring as shortly as possible.

- For grounding wires, use copper wires.

Capacity	**Grounding wire dimension (mm^2)**
1.5 – 3 kW	4.0
5 kW or higher	6.0
100 kW or higher	25.0

- Please check the maximum input voltage of the inverter and the output voltage of the solar cell array. If the output voltage of the solar cell array exceeds the maximum input voltage of the inverter, critical damage can occur in the inverter.

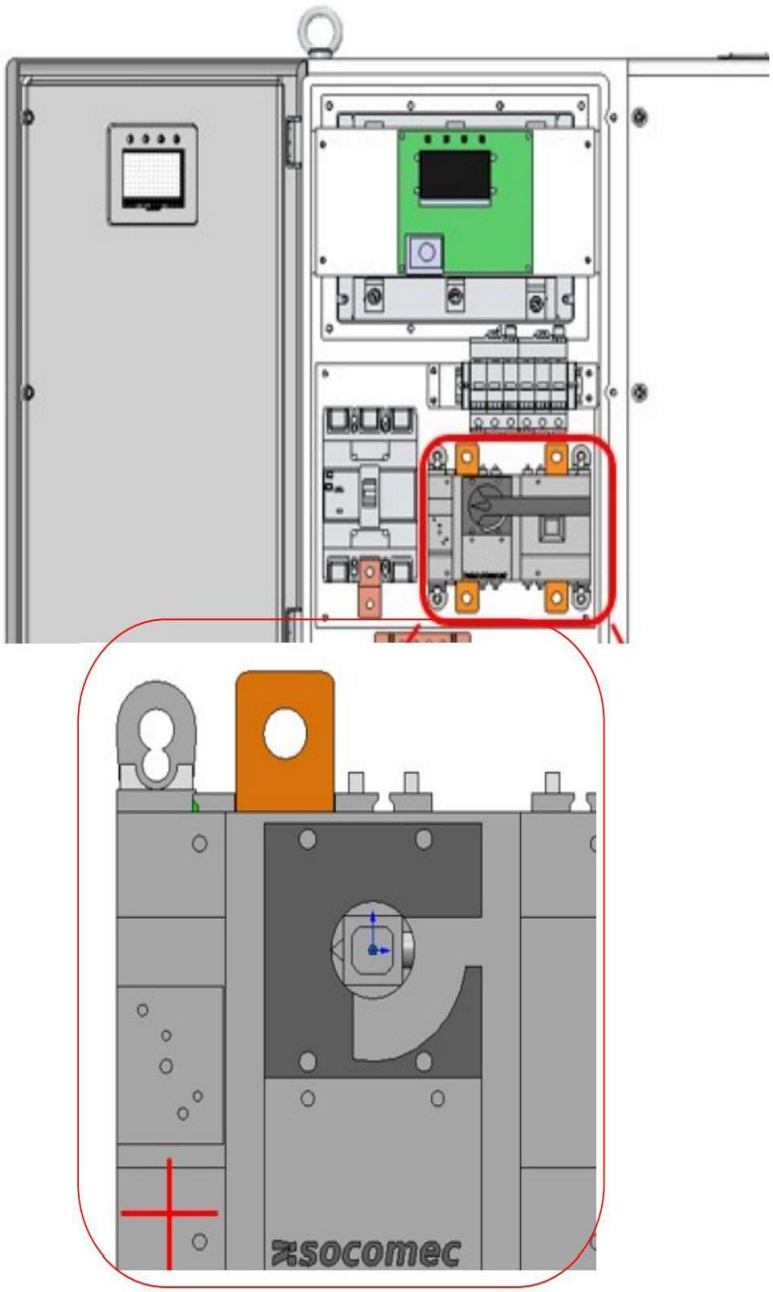
- The output voltage must be set in consideration of temperature coefficient during wiring of the solar cell module. If the output voltage of the solar cell array is set without consideration of temperature coefficient, input over-voltage or low-voltage in the inverter can occur according to an ambient temperature.

3.7 DC Connection

① The cover can be opened when 3 bolts on the left side of the inverter are loosened.

② Please connect (+) of PV to the left side and (-) of PV to the right side of the DC circuit breaker located in the lower-right corner when the right cover of the inverter is opened.

③ During DC wiring, plse use wires with over 95SQ. (change the thickness of wires according to the length of wiring)



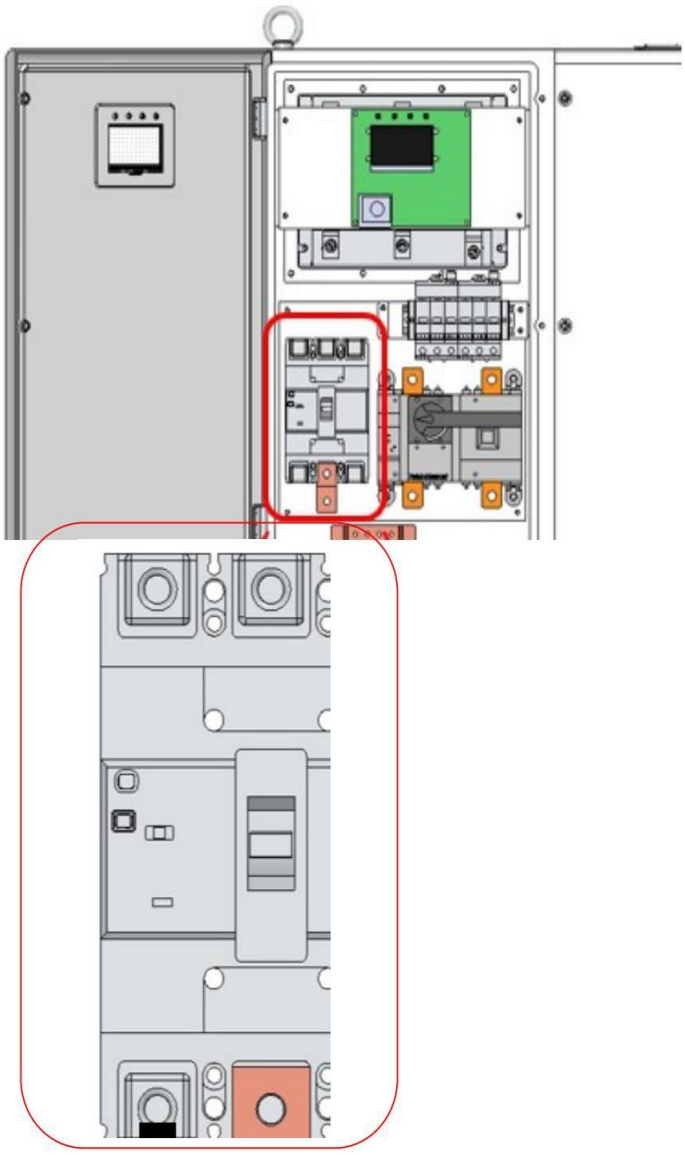
3.8 AC Connection and Ground Connection

- AC Connection

① The cover can be opened when 3 bolts on the left side of the inverter are loosened.

② If you open the left cover of the inverter, you can see AC circuit breaker in the lower-right corner. Please do wiring as shown in the picture.

③ During AC wiring, plse use wires with over 70SQ. (change the thickness of wires according to the length of wiring)



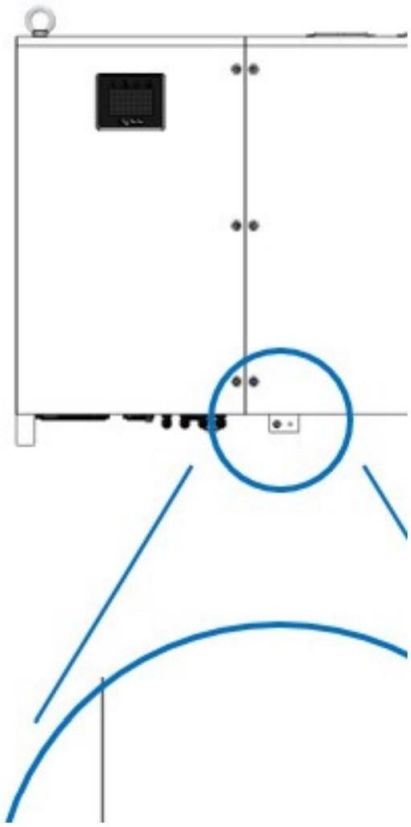
④ The order of the AC circuit breaker is R, S, T from the left side.

⑤ Please use a dedicated screw connected to the AC circuit breaker.

⑥ When wires are connected to the AC circuit breaker, please note that the cable and terminal do not have a phase-to-phase short-circuit among R, S and T.

In case of negative phase, a letter of PHASE REVERSE appears at the right upper end of the LCD in the keypad when PV power and AC power are applied and it is not counted.
For safety reasons, all power is disconnected and AC cables are re-wired.

- Grounding Connection



① Please use dedicated grounding wires during grounding wire.
② Please use copper wires for grounding cables.
③ Please use 16SQ or more for grounding cables.
④ Please press a terminal against the grounding wires and connect it to the grounding connection terminal at the bottom of the inverter.
⑤ A rated dimension of the terminal is 5 Ø.
⑥ Please connect the grounding points to a location as close to the inverter as possible.
⑦ The inverter must be grounded with special 3-type grounding (grounding resistance is 10 Ω or less) to prevent electric shock.

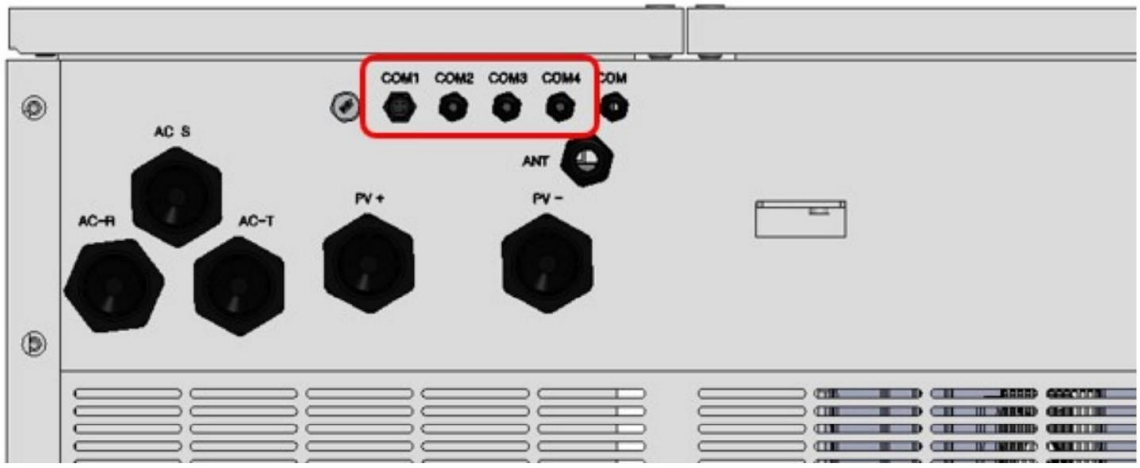
3.9 RS485 Communication Connection

Please check out whether BUS+ and BUS- cables are properly connected. If wiring is changed, communication is unavailable. The specifications on the cable BSU+ and BUS- may be changed per manufacturer.

- RS485 Cable

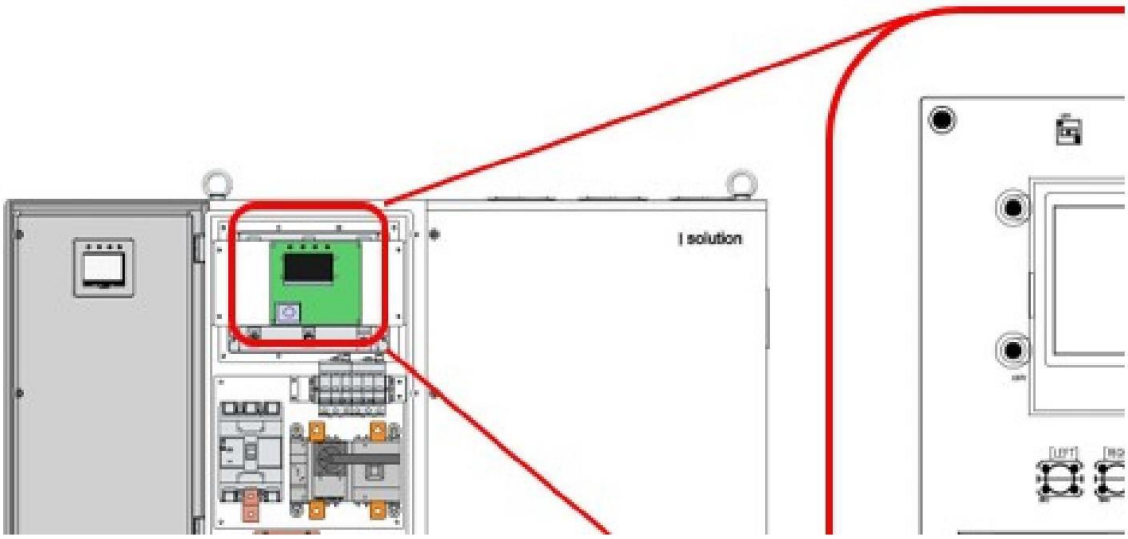
Maximum Length of RS485 Cable	The maximum allowable length of RS485 cables is 1200m. This length is available only under the optimum conditions. Generally, if the length of a cable exceeds 500m, a repeater or a hub is needed.
Maximum Number of Connections	DRTU : 8 i-PLUG : 32 (inverter, sensor box, system connection board) External Devices : Used after checking out the standards
Data Cable	Recommendations : - Use twisted pairs and shield cables - Installed on the outside and ground : Black LI2YCYv (stranded cables) - Installed in the dry or damp indoor space : Gray LI2YCY (stranded cables)

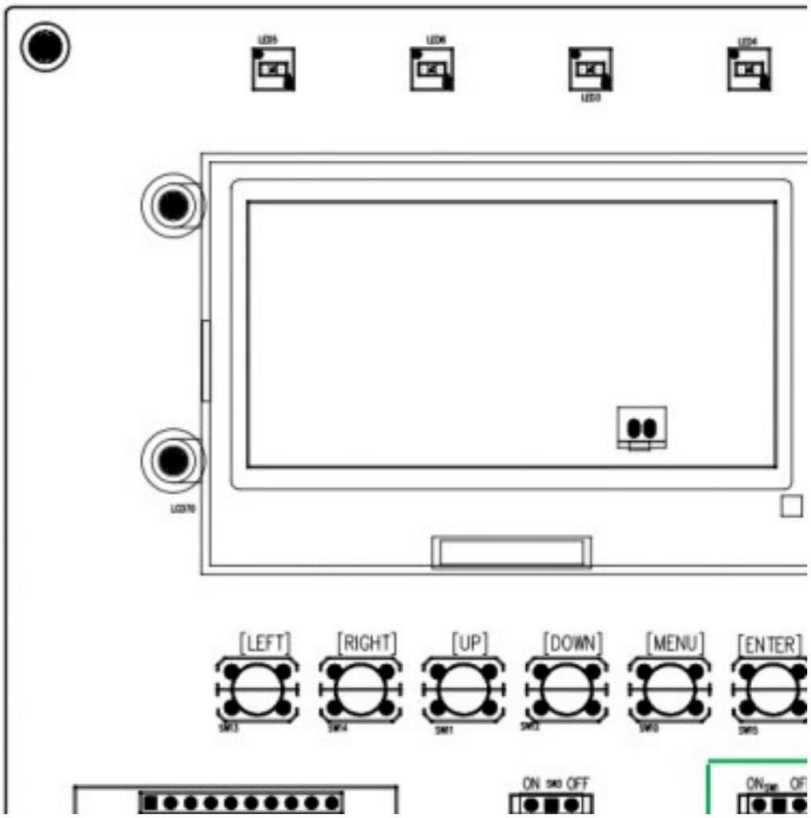
Please check out the following matters to prevent interference during data transmission
Check out the cable pairing when BUS+ and BUS- are connected
Do not install RS485 cables with DC or AC power cables together
When connecting BUS + and BSU -, precisely connect them to the corresponding terminal and fix it
Activate the terminating resistance (Switch) of the terminal inverter in case of parallel connection



① When connecting the inverter in parallel, please use two communication cable glands.

② Please open the left cover of the inverter.





③ After the communication power line (3~6.5mm) is passed through the cable gland, please connect communication lines [+] and [-] to the BUS+ and BUS- of the RS485 connector at the left upper end of the inverter as shown in the above picture.

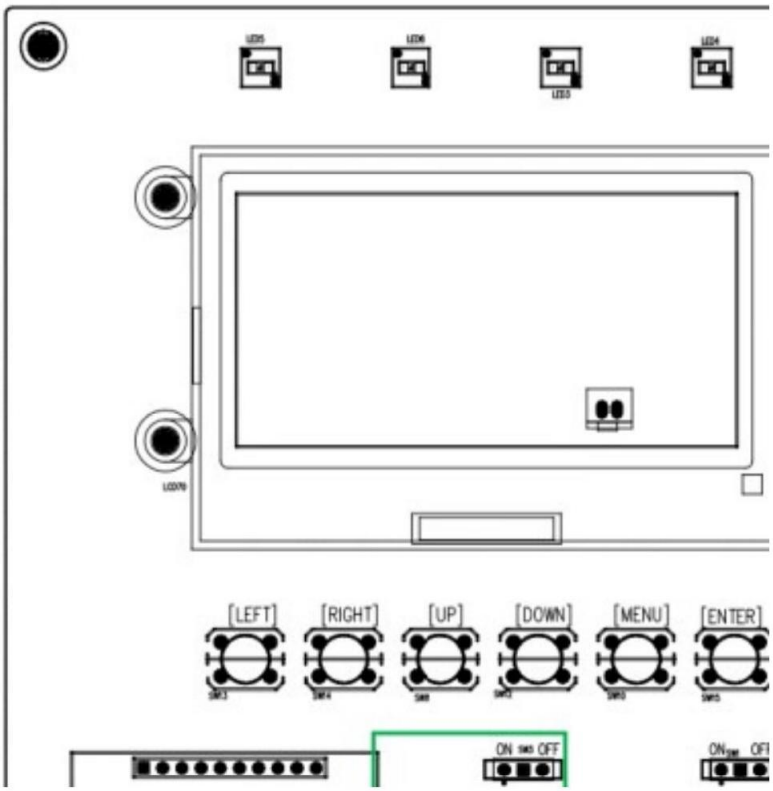
④ In case of the parallel connection of the inverter, please connect RS485 communication in parallel by using 485 IN and OUT.

① In case of connecting the parallel operation of the inverter and the monitoring, please turn on the terminal switch of the inverter (the above picture) alone at the end of the 485 communication.

⑥ System ID Number should be set according to the below method while using the communication. When ID is not assigned, a default value is set to 0.
(Menu button – ETC Set – System ID Number – assigning the ID Number to be used)

⑦ Once the communication setup is finished, a plug of the communication cable grand is fastened.

3.10 Setting of Active Voltage Control



- Use of KDN Equipment (DER-AVM) from KEPCO

① System ID Number should be set according to the below method while using the communication. When ID is not assigned, a default value is set to 0.
(Menu button – ETC Set – System ID Number – assigning the ID Number to be used)

② Communication lines are connected to DER-AVM and PORT for the active voltage control of the inverter.

- Used Independently

① Communication ID is assigned as above.

② The active voltagae control mode is set.

(Menu botton - Factory Setting - AVR Control (setting a mode KEPCO wants between Reactive Power Mode or Power Factor Mode)

Ⅰ. Reactive Power Mode : Set the value of ACR Control V1/V2/V3/V4/TIME/Q(+)/Q(-)

Ⅱ. Power Factor Mode : Set the value of Power Factor Ref.

Parameter	Setting Range	Default	Setting Value	Explanation and Comparison
Control Selection	Disable/PF Control/V Control	Disable	Default	Set the active voltage control mode
Power Factor	-90.00~90.00%	100 [%]	Default	Set the reference Valu of the power factor
V1(start_intuct)	100~110%	102 [%]	Default	Set the inductive start voltage of reactive power control
V(start_cap)	90~100%	98 [%]	Default	Set the capacitive start voltage of reactive power control
V3(end_intuct)	100~110%	104 [%]	Default	Set the inductive finish voltage of reactive power control
V4(end_cap)	90~100%	96 [%]	Default	Set the capacitive finish voltage of reactive power control
Qmax_inductive	0~48.4%	48.4 [%]	Default	Set the inductive maximum of reactive power control
Qmax_capacitive	-48.4~0%	-48.4 [%]	Default	Set the capacitive maximum of reactive power control
Normal Voltage	Related line voltage	380 [V]	Default	Connect the related line voltage value of calibration set
Tq(Response Time)	0~60sec	60 [sec]	Default	Time to reach the maximum reference value of reactive power contro

4. Design Guideline for High-tension Transformer for Central Inverter (Necessary)

The new energy should be gauranteed only for high-tension transformer installed according to the guidelines provied in this application note.

The solar photovoltaic inverters are classified into two types, a transformer type and a transformerless type.
Unlike a transformer-type inverter, a transformerless-type inverter has not transformer in the inverter, so the intermediate transfomer should be dsigned according to the guidelines when it is connected to the external high-tension transformer.

4.1 Technial Fearues

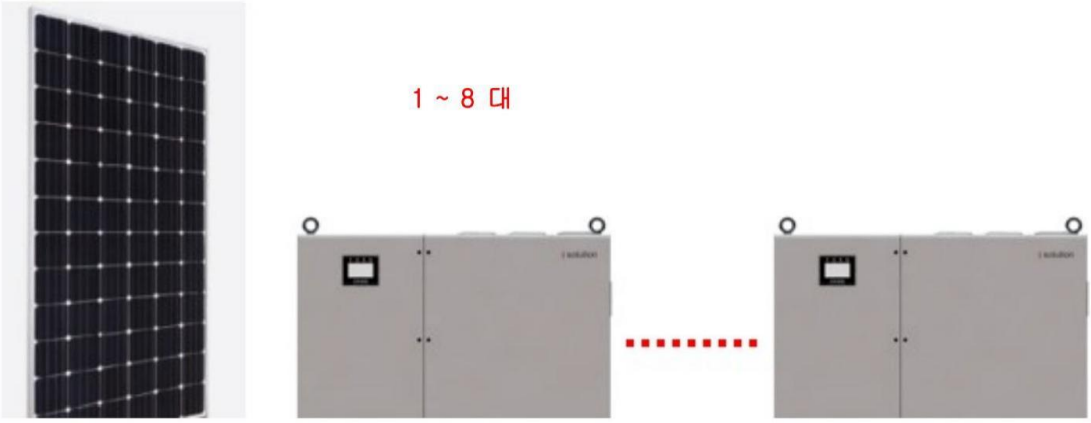
The intermediate voltage transformer connected to a transformerless-type solar hotovoltaic inverter should follow the following technical specifications.

1. The transformer should be suitable for PWM (Pulse Width Modulation). The transformer should be designed so that magnetic flux is not saturated despite 1% of DC current on the low voltage winding. In addition, transformer should be designed and tested according to the standards for ANSI / IEEE, NEMA, IEC and Department of Energy.
2. The transformer should be designed considering voltage caused during the pulse operation of the inverter. The voltage can reach the maximum of ± 1400V for the ground. The maximum effective value of the voltage reference for grounding is 700V.
3. The low voltage winding of the transformer should be designed for voltage available for the rate of rise in the voltage dV / dt of the maximum 500V / μs for grounding. The phase-to-phase voltage is sine wave.
4. The screened winding grounded to the tank is needed between low voltage winding and high voltage winding. This screened plate should be designed to protect heat caused by eddy current arising from the flux of low voltage winding and high voltage winding. It plays a role as an additional dV/dt filter.
5. The transformer should have 110% of the current loading capacity at the air temperature of the maximum 50℃.
6. The load curve and surrounding conditions of each installation site should be considered during thermal rating.
7. It is recommended that the voltage level of the medium voltage grid be adjusted by using a transformer with a high-tension tab switchboard.
8. The grid frequency per country should be considered.
9. The effective standards per country should be considered.

10. The current of the sine wave filter capacity should be measured during commissioning. If necessary, it has an authority to optimize the entire system.

4.2 Requirements on Intermediate Power Transformer connected to the Central Inverter (1~8)

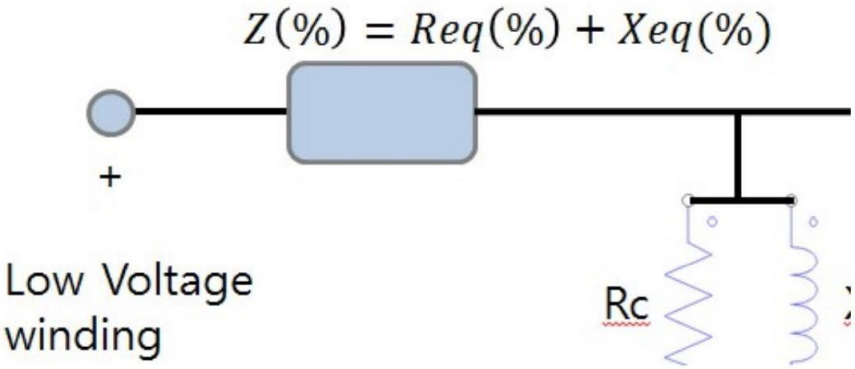
The low voltage part is connected to the central inverter with the 380V of rated output voltage and the high voltage part is connected to the 22kV of the high-tension system. But, other high voltage can be used. : 10 kV, 15kV, 20kV, 25kV, 27kV, 30kV, 34.5kV or 35kV, etc.



This transformer should follow the following technical specifications.

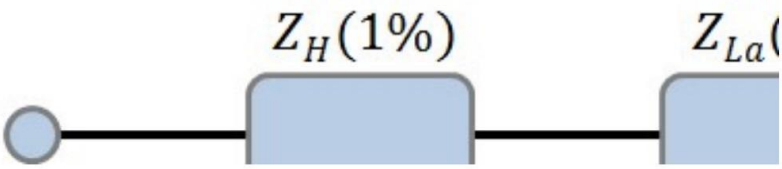
- Equivalent series impedance between low voltage and high voltage winding :

The equivalent series impedance Z(%) of the transformer should be 6%. The 5.4%~6.6% of the impedance voltage acceptance criteria should be kept. This value can be decided when the voltage of other low voltage winding increases until the high voltage winding causes a short circuit and the nominal current flows.

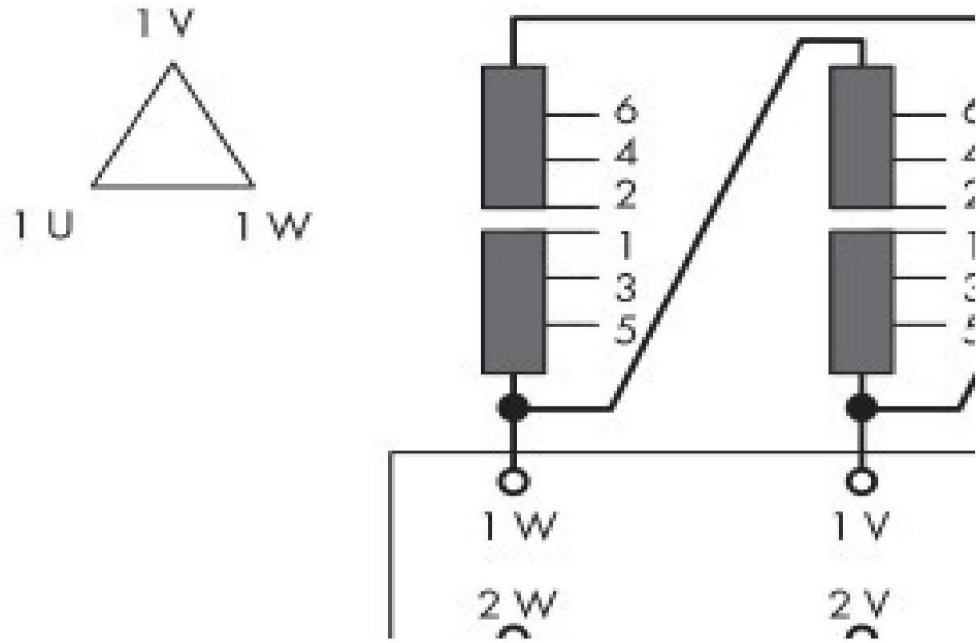


- Equivalent Series Impedance Z(%) of Double Winding Transformer :

The equivalent series impedance Z(%) of double winding transformer can be shown as follows. ZL is the equivalent series impedance of the low voltage winding and ZH is the equivalent series impedance of the high voltage winding.

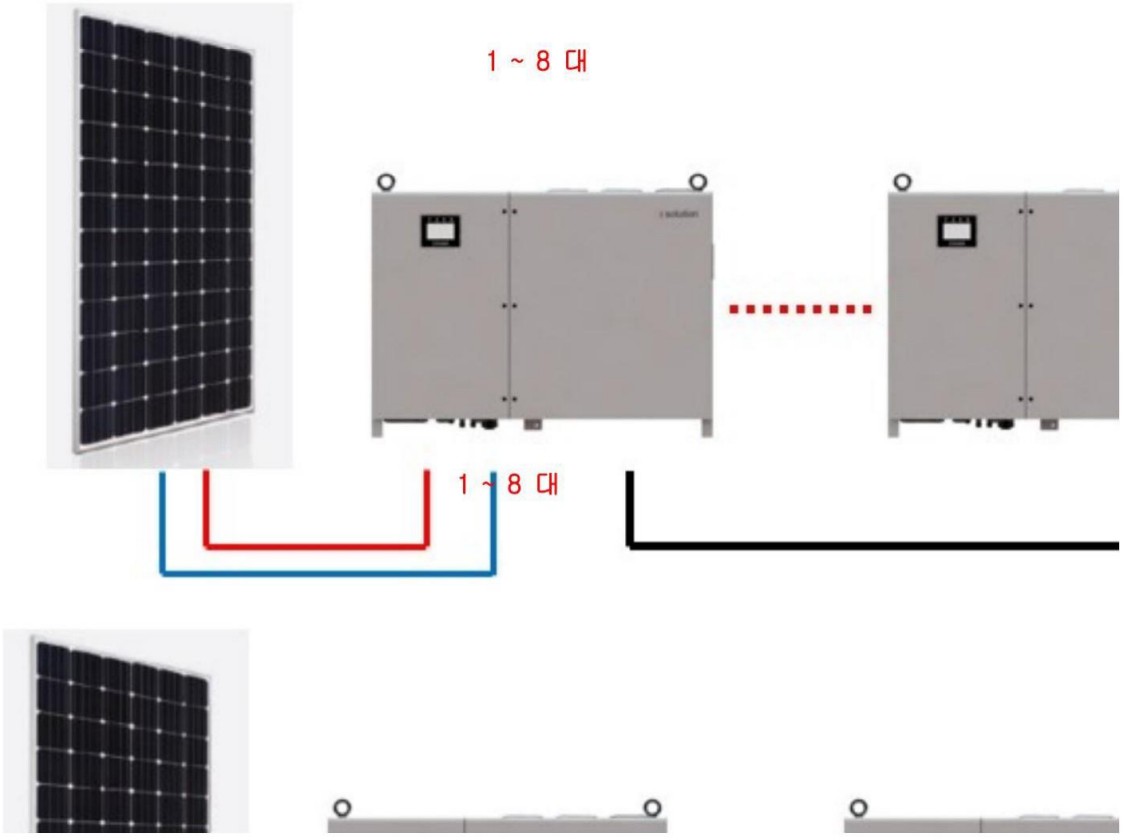


- The neutral point is not necessary for the low voltage part. Nevertheless, if the neutral point is on the low voltage part, this neutral point should not be connected or grounded.
- The double winding transformer that winding is changed on the high voltage part and low voltage part respectively can be used. For example, YNd11, YNd5, YNd1 or Dy11, Dy5, Dy1 has a non-grounding neutral point on the low voltage part.



4.3 Requirements on Intermediate Power Transformer connected to the Central Inverter (1~16)

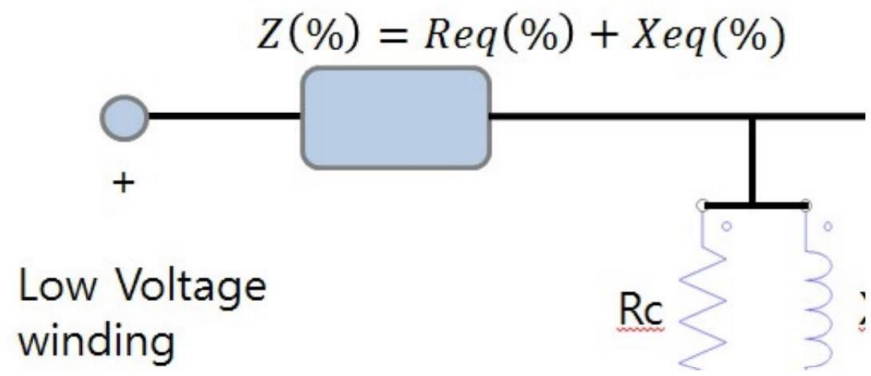
The diagramed transformer is allowable only for the double-laminated (4 winding) transformer and 3 winding transformers with LHL winding. In this MV transformer, the high voltage winding is located between 2 low voltage windings.



This transformer should follow the following technical specifications.

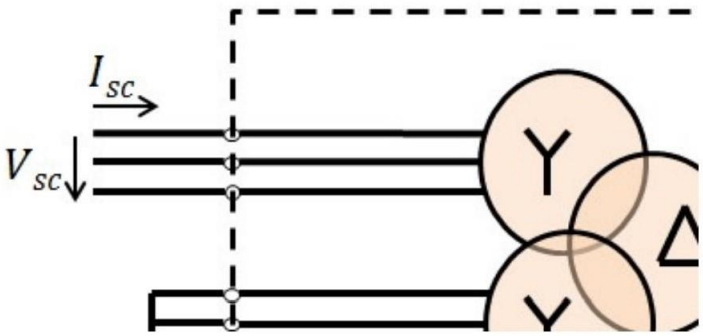
- Equivalent series impedance between low voltage and high voltage winding :

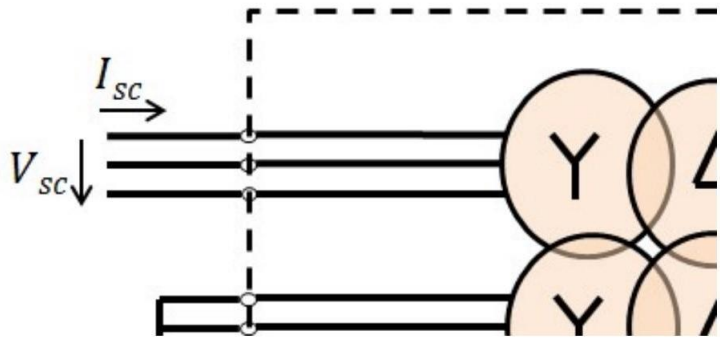
The equivalent series impedance Z(%) of the transformer should be 6% per each inverter. The 5.4%~6.6% of the impedance voltage acceptance criteria should be kept. This value can be decided when the voltage of other low voltage winding increases until the high voltage winding causes a short circuit and the nominal current flows. At the same time, other low voltage winding is in the idle state.



- Equivalent series impedance between low voltage windings :

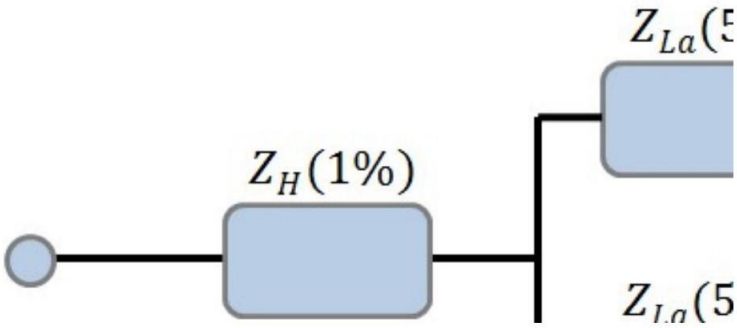
The equivalent series impedance Z(%) of two low voltage windings should be 10%. The limit of the allowable effor of this impedance voltage should be kept between 9% ~ 11%. This value can be decided until one of the low voltage windings causes a short circuit and the voltage of other low voltage winding increases until the nominal current flows. At the same time, the high voltage winding is unloaded.



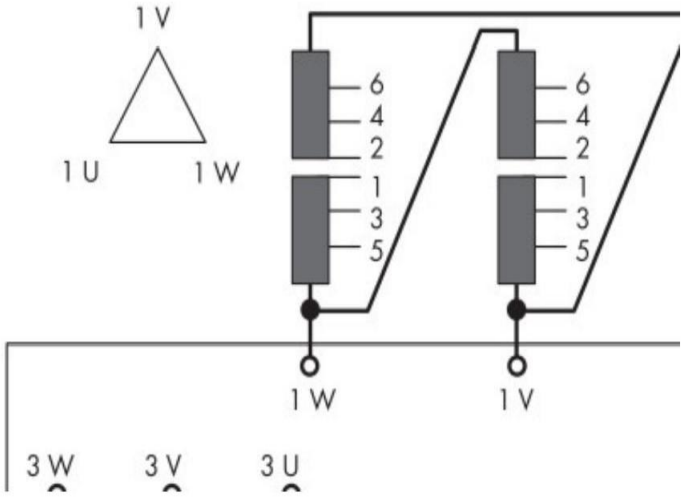


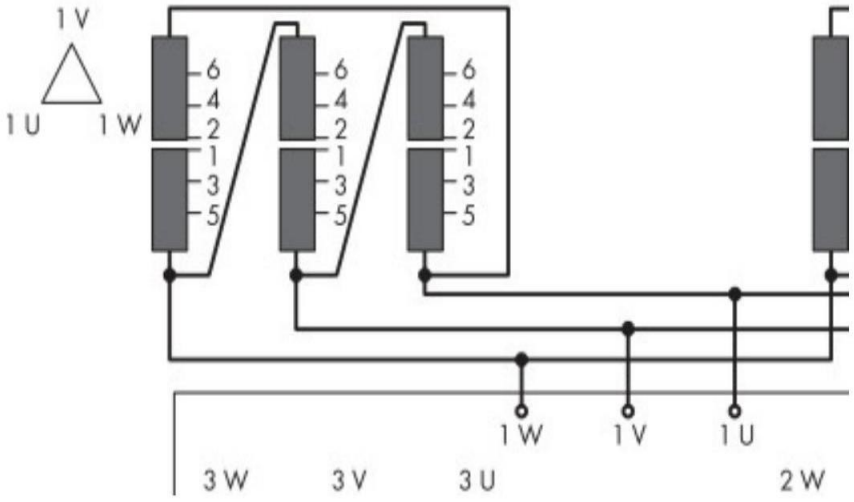
- Equivalent Series Impedance Z(%) of Double-laminated (4 winding) Transformer :

The equivalent series impedance Z(%) of the double-laminated (4 winding) transformer can be shown as follows. ZL is the equivalent series impedance of the low voltage winding and ZH is the equivalent series impedance of the high voltage winding.



- The neutral point is not necessary for the low voltage part. Nevertheless, if the neutral point is on the low voltage part, this neutral point should not be connected or grounded.
- The double-laminated(4 winding) transformer has various windings on the high voltage part and low voltage part respectively can be used. For example, YNd11d11, YNd5d5, YNd1d1 or Dy11y11, Dy5y5, Dy1y1 has a non-grounding neutral point on the low voltage part.


1 V
1 U
1 W
6
4
2
1
3
5
6
4
2
1
3
5
1 W
1 V
3 W
3 V
3 U

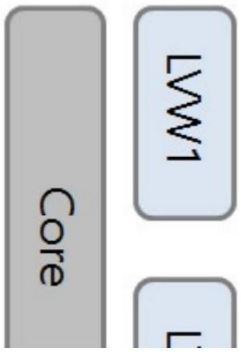

1 V
1 U
1 W
6
4
2
1
3
5
6
4
2
1
3
5
6
4
2
1
3
5
1 W
1 V
1 U
3 W
3 V
3 U
2 W

4.4 Winding Skill

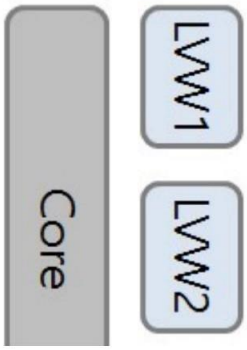
The intermediate voltage transformer connected to the solar photovoltaic inverter without the transformer should be designed by a section winding transformer.

● Section Winding Transformer

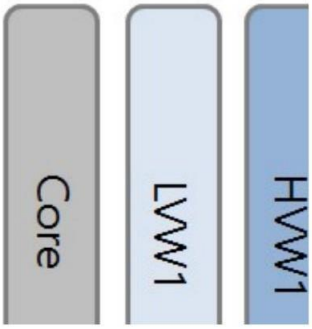
Case 1. Double-layer



Case 2. Triple-layer



Case 3. Triple-layer (LHL)

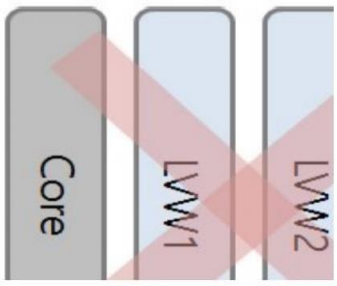


LVW : Low voltage winding

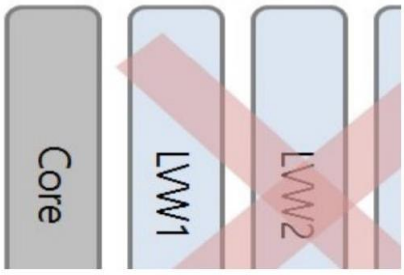
HVW : High voltage wingding

● Multi-layer Winding Transformer

Case 1. LLH

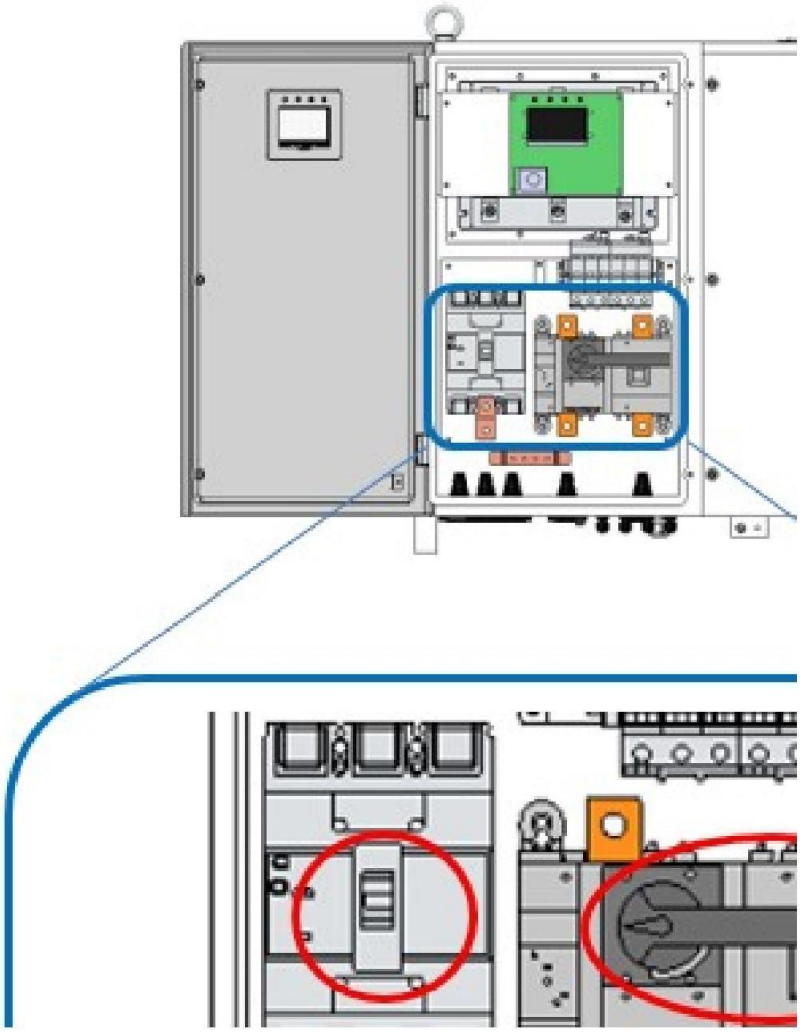


Case 2. LLLH



5. Operation

5.1 Check Points before Operation



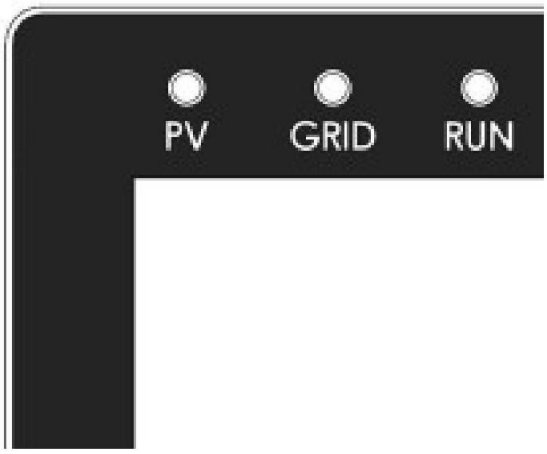
① If PV cables and AC cables are connected, the inverter is ready to operate.

② DC switch at the bottom of the inverter is turned on. And then, AC switch is moved to ON. The product is shipped Off.

③ If AC is on, the inverter counts 300 seconds for automatic operation. The count time can be checked at the right upper of the external LCD.

④ After 300 seconds, the inverter is automatically operated and if it is less than working voltage, the inverter is automatically stopped.

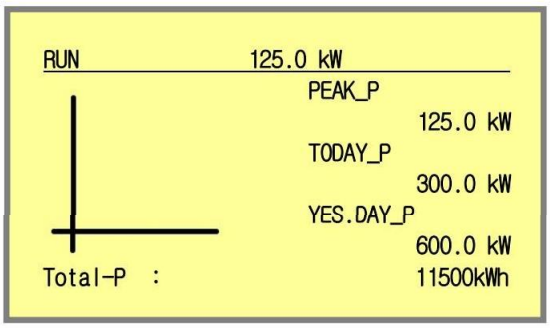
5.2 Appearance and Functions of Display Window



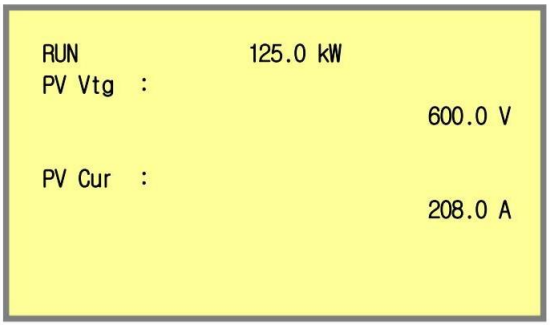
Status LED	Description
PV	Display the input status from the solar cell module.
GRID	Display when the grid is under normal
RUN	Display when the inverter runs normally.
FAULT	Display when an error in the inverter occurs

- The LCD of display is 128x64 GRAPHIC LCD.
- When power is ON in the inverter, the display is converted in every 10 sec automatically.

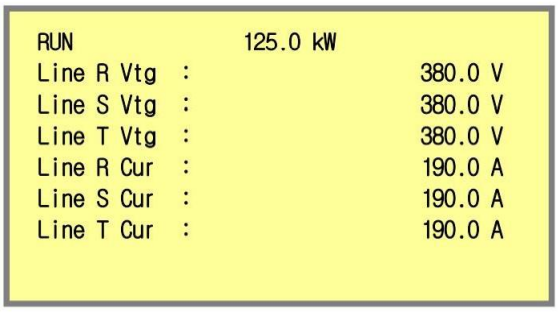
5.3 Display Window Screen



- RUN : Current Operating Status
- Graph : Power Generation per Time (Percent)
- PEAK_P : Highest Power Generation Today
- TODAY_P : Cumulative Power Generation Today
- YES.DAY_P : Total Power Generation Yesterday
- Total Po : Total Power Generation



- RUN : Current Operating Status
- PV Voltage, Current



- RUN : Current Operating Status
- System Voltage, Current

5.4 Operation Method

● Check points before operation

Check wiring and installation status of inverter.
Especially, check whether the input polarity of solar cell is correctly connected and whether the grid line is correctly connected.
Supply DC power of solar cell to inverter. After the DC power is supplied, the Inverter automatically checks whether AC power is normal or not, and then automatically operates after counting down to 300 seconds.
Check ON / OFF of the DC switch at the bottom of the inverter.

● Automatic Operation

The initial setting is the automatic operation mode when it is shipped from the factory.
When the module voltage of solar cell increases above seting value due to sunrise, the inverter starts to operate automatically.
When the module voltage of solar cell decreases above seting value due to sunset, the inverter stops to operate automatically. It always monitors the system power and in case of abnormality, it automatically stops operation.

● Stop while Operating

In case that the inverter needs to stop while driving, stop operating by turning off the DC switch or cutting off the system.

The pictorial description in the operation and installation manual has some parts without the front cover or the circuit breaker for a detailed exploration, but please operate according to the User & Installation Manual after installing the front cover and the circuit breaker, etc. in accordance with the regulations when operating the product.

6. Function

6.1 Description of Functions

- Grid Monitoring

Normal or fault status in the grid voltage is determined by the voltage difference from normal voltage (Fault high voltage and Fault low voltage), and stop the inverter if the difference value is larger or less than the preset value. Stop the inverter if the frequency of the grid voltage is deviated from the preset value (line frequency) by more than fault high frequency and fault low frequency.

Operate by grid after passing the Line Transfer Time in order to start power generation under the normal grid condition. The frequency of the grid voltage can be set according to the grid frequency.

- MPPT(Maximum Power Point Tracking) control and Total Power Generation

Since the output of the solar cell module varies depending on ambient temperature, humidity, and sunlight, the MPPT algorithm should be run smoothly. The method applied to the product is that the inverter is stopped when there is little current pulsation, and stop the inverter when operating the inverter is impossible because the solar cell is reached up to PV stop voltage.

The total power is memorized by accumulating, so that total power can be checked.

- Occurrence of Fault

When fault that stops the inverter occurs, the system re-runs after passing the line transfer time under the condition that the abnormal cause is eliminated after displaying the relevant message. If the same symptom occurs or the system is not re-run, please contact the main office.

- Verification of Fault

The fault scan has stored 300 faults from No. 0 to No. 299 in the order of occurrence in the past. The latest fault becomes No. 0.

The variables or status of fault in the past can be checked using an up and down key on the internal keypad of the inverter.

- Modification of set values

Parameter values can be modified using the internal keypad during inverter stop.

Please contact the main office if you need to modify parameter values.

- Initialization

There are two initializations: parameter and fault initializations. Parameter initialization sets all parameters and optional functions to factory default values while fault initialization removes all fault records in the past and make the system to ready-state.

If the internal keypad is manipulated arbitrarily, it can cause malfunction of the inverter.
Please contact the main office.

6.2 Symptoms of warning and fault

- If a warning occurs in the product, this is displayed in the screen.
- The product displays a system fault if occurring, and then stops the operation.
- The product displays a grid fault if occurring, and then stops the operation.
- When a fault occurs, red color is displayed at Fault LED of the display window.
- When a fault occurs, fault detail is displayed in the keypad window of the display window LCD.
- If the inverter is damaged and becomes out of control, the machine may be neglected as a dangerous state. In order to prevent such circumstance, safety devices such as over-current breaker should be installed additionally.

6.3 Types of Main Faults

- Input over-voltage protection

If a solar cell voltage exceeds the regulated voltage, the system is stopped to protect the inverter.

- Output over-current protection

If over-current occurs due to the fault condition of the output current in the inverter, the system is stopped to protect the inverter.

- Inverter overheat protection

If an internal temperature in the inverter exceeds the standard, the system operation is stopped to prevent overheating. If an internal temperature in the inverter is returned to a normal temperature, the system is operated normally after reset.

- Negative phase

In case of negative phase, the inverter does not count for running.

- Grounding fault protection

If a leakage current occurs due to grounding fault, the system is stopped.

- Grid fault protection

Upon the fault occurrence in the grid power, the system is stopped.

(Grid over-voltage protection, grid under-voltage protection, grid over-frequency protection, and grid under-frequency protection)

- Abnormality of PWM Control

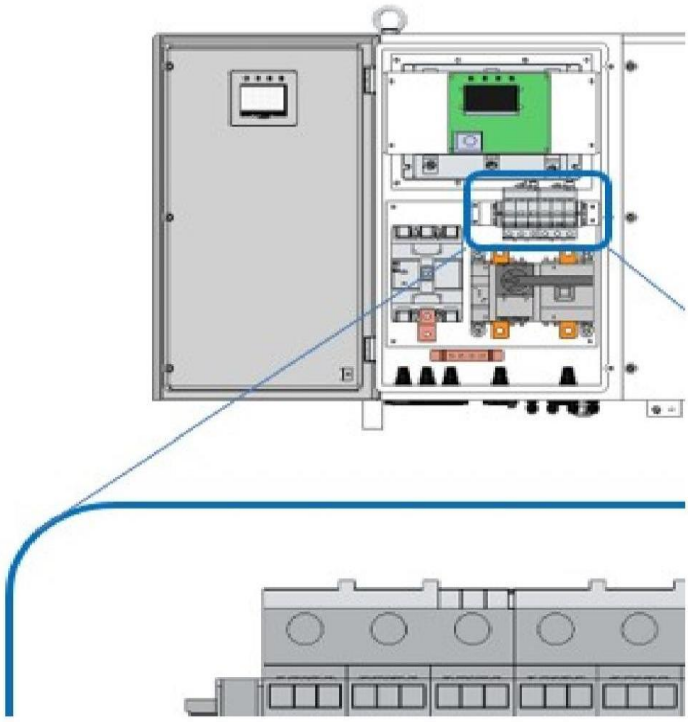
Stop the system when occurring abnormality of PWM Control inside the inverter.

- PWM control fault

If PWM control fault occurs in the inside of the inverter, the system is stopped.

- Display of SPD

A display at the upper of SPD is changed in red and gives a warning.



6.4 Types of Faults and Corrective Actions

Order	Cause of the Fault	Display	Cause of occurrence	Corrective actions
1	DC_LINK overvoltage	InsDC-Link OV, AvgDC-Link OV	DCP, DCN, DC_LINK In case of overvoltage	Contact the service center.
2	DC_LINK Undervoltage	AvgDC-Link UV	DCP, DCN, DC_LINK In case of undervoltage	Contact the service center.
3	Input overvoltage	AvgPV OV	If the solar cell voltage exceeds the set voltage	After inspecting the solar cell module, the inverter is operated. If the system cannot be rerun, please contact the service center.
4	Input undervoltage	AvgPV UV	If the solar cell voltage is below the set voltage	It can occur during sunrise and sunset. If it occurs frequently, the solar cell module is inspected and the inverter is operated.
5	Input over-current	InsPV OC, AvgPV OC	If the solar cell current exceeds the set current	After inspecting the solar cell module, the inverter is operated. If the system cannot be rerun, please contact the service center.
6	Output over-current	InsLine x OC, AvgLine x OC	If output of the inverter is in over-current state,	Contact the service center.
7	PWM FAULT	Line x OC2, x UVLO	Inverter internal fault	Contact the service center.
8	Relay FAULT	Relay_Open Relay_Short	Relay fuse and failure	Contact the service center.
9	Communication FAULT	Comm. Error	MMI communication fault	Contact the service center.

10	Temperature FAULT	Over Heat1	Over-temperature fault	Contact the service center.
11	Output current FAULT	Balance Current	Output current imbalance	Contact the service center.
12	HARDWARE FAULT	Hardware OC	Output Over Current	Contact the service center.
13	INSULATION FAULT	PV Insulation	Insufficient insulation resistance	Contact the service center.
14	HARDWARE OH	Over Heat2	Hardware overheat	Contact the service center.
15	RCMU FAULT	Residual OC	If leakage current exceeds the standard	Contact the service center.
16	Overvoltage between grid lines	InsLine xx OV, AvgLine xx OV	If the grid voltage exceeds the set voltage	Contact the installation company and then call the service center.
17	Grid line Undervoltage	AvgLine xx UV	If the grid voltage is below the set voltage	Contact the installation company and then call the service center.
18	Grid frequency fault	Over Frequency, Under Frequency	Grid frequency fault	Contact the installation company and then call the service center.
19	Output DC detection	x DC Current	DC output is introduced to the grid	Contact the service center.
20	Negative phase	PHASE REVERSE	Negative phase	Contact the service center.

21	Inverter (phase) overvoltage	InsLine xN OV, AvgLine xN OV	Inverter R, S, and T phase overvoltage	Contact the service center.
22	Grid (phase) Undervoltage	AvgLine xN UV	Inverter R, S, and T phase Undervoltage	Contact the service center.

6.5 Types of Warnings and Corrective Actions

Order	Cause of the failure	Display	Cause of the occurrence	Corrective actions
1	Warning of life limit	LIFE_W	Life warning of main parts	Contact the service center.
2	Output current warning	LIMIT_O	Maximum output current limit notice	Current could be limited when the grid voltage decreases to exceed the maximum output current of the inverter.
3	Input current warning	LIMIT_I	Maximum input current limit notice	Contact the service center.
4	Temperature Current Limit	LIMIT_D	Output limit notice according to temperature	Contact the service center.
5	FAN warning	FAN_W	FAN failure notice	Contact the service center.
6	PV Module power shortage	PV Low Power	PV Module power shortage	Please wait until PV power gets to exceed the minimum power.
7	PV SPD FAULT	PV SPD Error	PV SPD Fault	Contact the service center.
8	GRID SPD FAULT	AC SPD Error	GRID SPD Fault	Contact the service center.

6.6 Failure Repair

- Check whether or not the inverter has a fault.
- Check the date, time, and failure display description when the product is broken.
- The following items are checked and service repair is requested.

1) Model name
2) Manufacture No.
3) Purchase place
4) Purchase year
5) Warranty
6) Failure details

6.7 Disposal

- Please dispose the product as general industrial waste.

7. Maintenance and Cleaning

7.1 General Maintenance

- The solar inverter starts automatically when the voltage higher than the voltage to start the operation is applied, but stops automatically when the voltage falls below the range of the operating voltage due to the decrease of solar radiation. In case of temporary fault(temporary power failure, etc.), it starts to re-run automatically when its cause is eliminated. Thus, the routine check is not necessary basically, but continuous monitoring and regular check are necessary for the cope with unexpected failures and operating the efficient inversion system.

7.2 Maintenance Item and Inspection Cycle

- The items and cycle of inspection can differ depending on the environment of installation and use.

Inspection Items	Inspection Cycle	Inspection Method	Remarks
Power Generation/ Operation Status	Everyday	Check display or monitoring system	
Exterior	3 months	Visually check the damage & contamination of the exterior	Dust/Fraction/ Moisture
Connector	3 months	Fixing and connecting status of connector	Heating Check
Wire	3 months	Check the status of sheath, heating, contact condition of I/O Wire	Heating Check
FAN	6 months	Check the condition of fan operation and noise	
Ground Condition	12 months	Connecting, ground resistance status of ground wire	Below 10Ω
Input Breaker	12 months	Check the operating status of DC circuit breaker	On/Off Check
Display Screen	12 months	Check the discoloration and deformation of display LCD	Visual Check

Control Power	12 months	Check the power status of internal SMPS	Voltage Check
Relay/MC	12 months	Check the operating status of relay or MC	On/Off Check
Capacitor	12 months	Check the distortion and expansion of capacitors	Visual Check
Other Checks	12 months	Check the internal damage or abnormality of inverter	Visual Check
Internal Cleaning	6/12 months	Remove internal dust (IP44: 6 months/IP65: 12 months)	Filter (Applicable Products)

7.3 Maintenance Method for Inverter

- All inspections, except for the items possible for checking only when inverter power is applied such as check for operating status, control power, and display screen, etc., shall cut off both the input power(solar cell) and output power(AC grid) after stopping the inverter, and then shall be performed after waiting for 30 minutes or more until the voltage charged in the internal capacitor is completely discharged. When checking while the inverter power is on, there is a risk of electric shock.

- The items for inspection except for daily inspection such as check for power generation/operating status shall be checked by a professional maintenance company. It can be an electrical safety manager, manufacturer, maintenance company, etc.

- Cautions before Inspection
  - ① Prepare measuring instruments(a multi tester, etc.), tools, and safety equipment as required.
  - ② Cut off the output power(AC grid power) of the inverter.
  - ③ Cut off the input power(solar cell) of the inverter. Turn the DC switch at the bottom of the inverter OFF. (refer to 4. Operation)
  - ④ Wait at least 30 minutes after the display power turns off completely.
  - ⑤ Check that the voltage is 0V by measuring the internal input/output power terminal

block in the inverter with a multi-tester.

⑥ Start to inspect.

- Cautions after Inspection

① Check whether the process is completed or whether any worker is still working.

② Check that all measuring instruments, tools, fixtures, etc. used in the work are removed.

③ Check if any parts have been disassembled for the work or if it is assembled as it was before the work.

④ Check the tightness of the bolt or if foreign matters remain inside the product.

⑤ Check if the inverter operates normally by referring to 4. Operation, after turning on the input power and output power under being assembled as it was and inputting input power and output power.

7.3.1 Inspection of Power Generation/Operation

① Inspect the power generation depending on solar radiation.

② The current/previous/cumulative power generation shall be displayed on the display, and the current generation and error may be checked.

③ The current/past history may be conveniently checked remotely when installing a solar monitoring system.

7.3.2 Exterior

① Inspect whether there is any peeling off of the coating, crushing, damage outside the inverter.

② Inspect whether there is any abnormality in the contact parts of the current carrying part due to occurrence of corrosion.

③ Inspect the fixed status of the inverter by checking the status of welding part of the dedicated holder of wall fixing, screw fastening, etc.

④ Remove dust by using the compressed air or a vacuum cleaner in case that there is a lot of dust and mote inside the inverter after confirming that it is under adusty or mote environment. But, it is prohibited to use volatile substances such as benzene, thinner, etc.

⑤ If corrosion occurs, it may be a moist or salty environment. It shall be necessary to establish a plan to deal with moisture or salt, and contact the manufacturer when a problem occurs.

7.3.3 Connector

① Inspect whether the input DC connector is damaged or deformed.

② Refer to 3. Installation Items. There is a possibility of burnout due to contact resistance in case of occurring poor compression, assembly failure, etc. without following the working process.

7.3.4 Wire

① Inspect whether the sheath of the cable is stripped or disconnected.

② Check the compression and fastening status of the used part of the compression terminal.

7.3.5 FAN

① Inspect the status of FAN operation on the upper of the inverter.

② FAN starts and stops automatically according to the internal temperature of the inverter. Please inspect it by referring to the internal temperature of the inverter because the FAN can stops normally.

③ In case of occurring abnormal noise other than normal operation sound, check the presence of foreign matters inside.

7.3.6 Ground Status

① Check the connection or disconnection status of ground wire

② Check the types of grounding work when installing for the first time, and measure the grounding resistance according to the applicable grounding construction specifications.

7.3.7 Input Breaker

① Check the status of lever operation, damage of DC switch at the bottom of the inverter.

② Check if the power is OFF when the lever is OFF, and check if the power is ON when the lever is ON.

7.3.8 Display Screen

① Check if display composition of ths display is the same as the items of 4.4 display screen.

② Check whether LCD window is discolored.

7.3.9 Control Power

① There is SMPS circuit for operation inside the inverter.

② In case that SMPS is abnormal, the inverter shows warning or error code and stops operating.

③ When SMPS inspection or error occurred, please contact the manufacturer.

7.3.10 Relay / MC

① The Relay/MC (Varying by model) inside the inverter control output by On/Off according to the operating status of the inverter.

② When the inverter stops/starts, check whether the starting sound(clicking sound) of Relay/MC error occurs. The error, such as Relay Short/Open, MC Error, etc. occurs when the error occurs, and stop the inverter.

7.3.11 Capacitor

① A capacitor is equipped inside the inverter.

② Beware of electric shock when inspecting, because a large amount of power can remain in the capacitor although the inverter stops.

③ Check whether the capacitor is damaged or distorted with the naked eye.

④ In case that the electrolyte inside the capacitor leaks out, please contact the manufacturer immediately.

7.3.12 Other Inspections

① Inspect the damage and contamination of circuit board (PCB) and components inside the inverter.

② Check the circuit board contacts, connector connections, parts deformity and burnout with the naked eye.

③ When a problem of the circuit board or internal parts occurs, please contact the manufacturer.

7.3.13 Cleaning

① The inverters of the company are designed for indoor and outdoor by model.

② Clean the inside every 6 months for the model under IP44 and every 12 months for that under IP65.

③ But, the cleaning cycle should be adjusted depending on the external environment.

8. Product Specifications

Model Name		DSP-33125K-0D-HV
DC Input	Operating Voltage Range	580 ~ 980V
	MPPT Voltage Range	580 ~ 800V
	Rated Voltage	650V
	Operating Start Voltage	650V
	Control Mode	Maximum Power Point Tracking Control(MPPT)
	Maximum Input Current	226A
	Input Count of Independent MPP	1

Model Name		DSP-33125K-0D-HV
AC Output	Rated Power, 380V, 50Hz	125,000W
	Rated Voltage	380 Vac
	Rated Frequency	50Hz
	Rated Current	190Arms
	Constant	Three-phase Three-line (Transformerless Type)
	Power Factor	More than 0.98
	Current Distortion	Less than 3% Total
	(Current THD)	Less than 2% Each
	Control Mode	PWM Mode
	Prevention of Single Operation	within 0.5 sec
	Overload	110%
	Efficiency	More than 98%

Model Name		DSP-33125K-0D-HV
Structure	Cooling Method	Forced Air Cooling
	Protection Structure	IP 65

	Device Noise	Less than 70 dB
	Outer Dimension (W x H x D)	940 x 680 x 381 (W*H*D)
	Overall Weight	120kg
	External Interface	RS485 / WIFI, Bluetooth, Lora (option)
Protection Function	Inverter	Input Overvoltage
		Output Short Circuit
		DC over-voltage protection
		Insulation Monitoring
		Inverter Overheat Protection
		Relay Failure Detection
	Grid	Prevention of Single Operation
		Short Circuit Current Control
		Grid Overvoltage, Low Voltage Protection
		Grid Overfrequency, Low Frequency Protection
		Reactive Power Control
		Residual Current Monitoring
Use Environment	Ambient Temperature	-25℃ ~ 50℃
	Holding Temperature	-25℃ ~ 65℃
	Ambient Humidity	Less than 90% RH of Relative Humidity (No Dewdrops)
	Altitude · Vibration	1,000 m or lower, 5.9m/sec²(=0.6g) or lower
	Ambient Environment	No corrosive gas, flammable gas, oil mist, and Dust, etc.

9. Warranty

Warranty

DASS Tech

Product name		Grid-connected Photovoltaic Inverter (PCS)
Model name		
Purchase date		
Warranty period		Five(5) years from the purchase date
Customer	Name	
	Address	
	Contact	
Purchase place	Name	
	Address	
	Contact	

- The warranty of the product does not cover safety-related accidents and failures occurred due to the use that violates the specifications or consumer's fault.
- The specifications and outer design of the product may be modified without notice.
- The warranty is only applied to the Republic of Korea.
- The warranty is not re-issued. Please store this at a secured place along with the operation manual.

◀Information about free-of-charge service▶

If failures of the product occur within the warranty period while using the product at normal use conditions, free-of-charge repair service is provided.

◀Information about paid service▶

The following cases should use paid services.

- Failure of the product occurred due to user's fault or carelessness.
- Failure of the product due to the bad connected devices as a result of use power fault.
- Failures due to natural disasters.
- Product is modified or repaired by service centers which are not authorized by us.
- Product without DASSTECH name plate.
- Failures occurred due to disassembly, repair, or replacement by users arbitrarily.
- Consumable parts are replaced due to the end of life.
- In case that personnel who are not authorized service a[illegible] modify or repair the product.
- When free-of-charge service period is passed.

www.**dasstech**.com

Customer service center	1588-7468
Contact number of main office	+82-43-218-5670
(FAX)	+82-43-218-5671
E-mail	webmaster@dassteh.com

The specifications of the product may be changed without notice due to quality improvements. Please contact us if you like to purchase the product.

Main office: (28118) 81, Yangcheongsong daegil, Ochang-eup, Cheongwon-gu, Cheongju-si, Chungcheongbuk-do (inside the Ochang Science Complex)

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Ver. 1.0