On-Grid PV Inverter

Afore

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Installation and Operation Manual

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1.About This Manual 1.1 Scope of Validity

This manual describes the installation, commissioning, operation and maintenance of the following on-grid PV inverters produced by Afore New Energy:

Three-Phase

BNT036KTL BNT040KTL

Please keep this manual all the time available in case of emergency.

1.2 Target Group

This manual is for qualified personnel. The tasks described in this manual must only be performed by qualified personnel.

1.3 System Diagram

The typical connection diagram for the entire PV system is on-grid.





Circuit Breaker and Surge Protector Recommendation:

Туре	Max AC Current [A]	Rate current of AC breaker[A]
BNT036KTL	56	100
BNT040KTL	61	100

• SPD: Lightning protection system, refer to the following options:

• AC side, nominal discharge current 20KA, second grade lightning protection, protection voltage 2.5KV

• DC side, nominal discharge current 20KA, second grade lightning protection, protection voltage 2.5KV

• The wiring distance between the inverter and the distribution box should be at least 5 meters.



Note:

The Inverter can be only connected to low-voltage grid. (380/400/415Vac, 50/60Hz).

2.Safety & Symbols

2.1 Safety Precautions

- 1. All work on the inverter must be carried out by qualified electricians.
- 2. The device may only be operated with PV panels.
- 3. The PV panels and inverter must be connected to the ground.

4. Do not touch the inverter cover until 5 minutes after disconnecting both DC and AC power supply.

5. Do not touch the inverter enclosure when operating, keep away from materials that may be affected by high temperatures.

6. Please ensure that the used device and any relevant accessories are disposed of in accordance with applicable regulations.

 Afore inverter should be placed upwards and handled with care in delivery. Pay attention to waterproof. Do not expose the inverter to water, rain, snow or spray.
 Alternative uses, modifications to the inverter not recommended. The warranty can become void if the inverter was tampered with or if the installation is not in accordance with the relevant installation instructions.





2.2 Explanations of Symbols

Afore inverter strictly comply with relevant safety standards. Please read and follow all the instructions and cautions during installation, operation and maintenance.



Danger of Electric Shock. The inverter contains fatal DC and AC power. All work on the inverter must be carried out by qualified personnel only.



Beware of hot surface. The inverter's housing may reach uncomfortably hot 60°C (140°F)under high power operation.Do not touch the inverter enclosure when operation.



Residual power discharge Do not open the inverter cover until 5 minutes after disconnection both DC and AC power supply



Important notes Read all instructions carefully. Failure to follow these instructions, warnings and precautions may lead to device malfunction or damage.



Do not dispose of this device with the normal domestic waste.



Without Transformer. This inverter does not use transformer for the isolation function.



CE mark. The inverter complies with the requirements of the applicable CE guidelines.

Refer to manual before service.



3.Installation

3.1 Package

Unpacking

On receiving the inverter, please check to make sure the packing and all of the components are not missing or damaged. Please contact your dealer directly for supports if there is any damage or missing components.

Package List

Open the package, please check the packing list shown as below.



No.	Qty	Items	No.	Qty	Items
1	1	Solar Inverter	8	3	Mounting Bracket Screw
2	1	Certificate Of Inspection	9	1	Security Screw
3	1	Quick Installation Instructions	10	1	Screwdriver For Security Screw
4	1	Warranty Card	11	8	DC Connector Sets
5	1	Wall Mounting Bracket	12	1	Monitor Module
6	1	Grounding Terminal	13	1	Zero-Injection Connector(Optional)
7	3	Plastic Expansion Tube	14	1	Monitor User Manual





3.2 Product Overview



Overview of the Connection Area

The following figures show the assignment of the individual connection areas on the bottom of the inverter.





No.	Items
1	DC Switch
2	DC Connectors (+) For PV Strings
3	DC Connectors (-) For PV Strings
4	AC Connector
5	Monitor Module Port
6	Zero-Injection Port (Optional)

3.3 Mounting Location

The inverters are designed for indoor and outdoor installation (IP65), to increase the safety, performance and lifespan of the inverter, please select the mounting location carefully based on the following rules:

• The inverter should be installed on a solid surface, far from flammable or corrosion materials, where is suitable for inverter's weight and dimensions.

• The ambient temperature should be within -25 ${\mathbb C}$ ~ 60 ${\mathbb C}$ (between -13 °F and 140°F).

• The installation of inverter should be protected under shelter. Do not expose the inverter to direct sunlight, water, rain, snow, spray lightning, etc.







• The inverter should be installed vertically on the wall, or lean back on plane with a limited tilted angle. Please refer to below picture.



• Leave the enough space around inverter, easy for accessing to the inverter, connection points and maintenance.





3.4 Installation On-grid PV Inverter



9 Installation



3.5 Electrical Connection

3.5.1 PV Connection

The inverter is equipped with 2 MPPT channels, and each channel contains 4 PV string inputs. For best results, make sure to connect each MPPT channel to the PV string separately. Otherwise, the inverter will activate voltage or automatic current protection.

 \cdot The open-circuit voltage and short-circuit current of PV string must not exceed inverter's range

- \cdot The isolation resistance between PV string and ground must exceed 10 k $\!\Omega$
- · The polarity from PV strings are correct
- \cdot Use the DC plugs in the accessory
- · The lightning protector should be equipped between PV strings and inverter
- · Disconnect all of the PV (DC) switch during wiring



Warning:

The fatal high voltage may on the DC side, please comply with electric safety when connecting.

Please make sure the correct polarity of the cable connected with inverter, otherwise inverter could be damaged.













Note :

It is strongly recommended to connect by 8 strings of panels for models of 8 sets of DC connectors.





3.5.2 Grid Connection

The three-phase on-grid PV inverters work with grid (380/400/415/440 Vac, 50/60 Hz).

The external AC switch should be installed between inverter and grid to isolate from grid. Please make sure below requirements are followed before connecting AC cable to the inverter.

- · The AC (grid) voltage must not exceed inverter's range
- · The phase-line from AC distribution box are correctly connected
- · Use the AC plugs in the accessory
- · The surge protector should be equipped between grid and inverter
- · Disconnect the AC (grid) switch during wiring



Warning:

The fatal high voltage may on the AC side, please comply with electric safety when connecting.

Please make sure the right line of AC grid connected with inverter, otherwise inverter could be damaged.

Step 1



Sectional Area > 10mm²

Remove the waterproof cap at the AC wiring under the inverter, pass the cable through the cap, and open the inverter cover.





Step 2



Unscrew the row of screws, insert the wire harness into the W,U,V,N caps one by one, and tighten the screws



The user must connect a protective earth (PE) terminal to prevent electric shock. And make sure this PE terminal is properly grounded.







Step 4



Step 5







3.5.3 Communication Connection

The monitoring module could transmit the data to the cloud server, and display the data on the PC, tablet and smart-phone.

Install the WIFI / Ethernet / GPRS / RS485 Communication

WIFI / Ethernet / GPRS / RS485 communication is applicable to the inverter. Please refer to "Communication Configuration Instruction" for detailed instruction.



Step 2









Install the Zero Injection Smart Meter(optional)

The Smart Meter is used for monitoring the power consumption of home electricity, the inverter will active export power limit function based on the monitoring data. Please refer to "Zero injection Smart Meter Instruction" for detailed instruction.

Step 1









4.0peration 4.1 Control Panel







4.2 Menu Structure

	Second Level	lenu		Three Level M	enu		Fourth Level Menu
	DC Input	DC Input					Language
	U(V)	I(A) P(W)]	Language	Etotal Reset		中文
	PV1 xx	XX XX		Date&Time	Clear ErrRecord		English
	PV2 xx	XX XX		Country	Clear RunRecord		Polish
	P(%)	Power 40.000KW		EnergyK	Factory Reset		
		EDay 15.6 KWh		System		7	Date&Time
	50	EAII 497000KWh		Language	Etotal Reset	1	
		State RUNNING		Date&Time	Clear ErrRecord	-	Date: Dd-Mm-2020
	5 8 11 14 1720 23	28/8/2020 11:00		Country	Clear RunRecord		Time: Hh:Mm:Ss
	ISO Test]	EnergyK	Factory Reset		
	Pa	xxW				-	
I	— Pb	XXW		System		-	Enter User Password
	Pc	xxW		Language	Etotal Reset		
Wifi Info	ISONGB	xx		Date&Time	Clear ErrRecord		XXXX
Version	Bup Info			Country	Clear RunRecord		
System Info	Run Inio			EnergyK	Factory Reset		
	Modiotomp			System		1	EnrgyK
	ScreenTemp	XX C		Language	Etotal Reset	1	55
	Goreennemp	~~~		Date&Time	Clear ErrRecord		EnrgyK xxx%
	Run Info			Country	Clear RunRecord		
	Bus+	xx V		EnergyK	Factory Reset		
	Bus-	xx V			,		
	RunTime	xx Hr		System			Etotal Reset
	SumTime	xx Hr		Language	Etotal Reset		
				Date&Time	Clear ErrRecord		Etotal: xxx KWh
		Ja Ub Uc		Country	Clear RunRecord		
	Vac(V)	x xx xx		EnergyK	Factory Reset		
		la Ib Ic		Questions		-	
	lac(A)	x xx xx		System		-	Clear Enrecord
	Factor(Hz)	XX		Language	Etotal Reset		2000
				Date&Time	Clear ErrRecord		XXXX
Wifi Info	Err Record		ı –	Country	Clear RunRecord		
Version	No Error			EnergyK	Factory Reset]
System Info	No	Error		System		7	Enter User Password
			, 	Language	Etotal Reset	1	
				Date&Time	Clear ErrRecord		xxxx
	SET			Country	Clear RunRecord		
	System			EnergyK	Factory Reset	1	
	Running					-	Entra Hara Darras
Wifi Info	Protection			System		-	Enter User Password
Version	Communicati	on		Language	Etotal Reset		Mag
System Info				Date&Time	Clear ErrRecord		XXXX
,				Country	Clear RunRecord		
	SET		1	EnergyK	Factory Reset		
	Suptom						
	System			Enter User Pa	assword		
	Protection				~~		
	Communication	on		××	^^		
	Communicatio]				

First Level Menu

Main Menu Run Info

Err Record

Main Menu Run Info

Err Record

SET

ON/OFF

SET ON/OFF

Main Menu	
Run Info	Wifi Info
Err Record	Version
SET	System Info
ON/OFF	





Second Level Menu **Three Level Menu** SET Enter User Password System Running XXXX Protection **First Level Menu** Communication Fourth Level Menu Main Menu Communciate Para View Para Adj Run Info Wifi Info COM1 Address: 01 Address: 01 Err Record Version COM1 Protocol RS485 Protocol: RS485 SET System Info COM2 Address: 01 Baud rate 9600 ON/OFF COM2 Protocol ModBus SET Communciate Para View Para Adj System COM1 Address: 01 Address: 01 Running COM1 Protocol RS485 Protocol: RS485/Meter/ModBus Protection COM2 Address: 01 Baud rate 9600 Communication COM2 Protocol ModBus Communciate Para View Para Adj COM1 Address: 01 Address: 01 COM1 Protocol RS485 Protocol: ModBus PQD LOAD Main Menu COM2 Address: 01 Baud rate 9600 Run Info Wifi Info COM2 Protocol ModBus Pal 0 Err Record Version Pbl 0 SET System Info Communciate Para View Para Adj Pcl 0 ON/OFF COM1 Address: 01 Address: 01 COM1 Protocol RS485 Protocol: ModBus/RS485/Meter COM2 Address: 01 Baud rate 9600 Wifi Info Main Menu COM2 Protocol ModBus Run Info Wifi Info SN: xxxxxxxx Err Record Version SET System Info IP: xxxxxxxx ON/OFF Version Main Menu Run Info Wifi Info DSP:xxxx Err Record Version HMI:xxxx SET System Info SN:Txxxxxxxx ON/OFF Build:00.0.000.000 Main Menu System Info Run Info Wifi Info Rated Power:Blad SPI Err Record Version Safety:china System Info Rated Voltage:380V SET ON/OFF Rated Current:xxKW-3





Explanation of LCD Display Content

Nouns	Explanation
Run Info	Check the grid connection status of the inverter
Error Record	Check the error list of inverter including date and time
SET	Set the protection parameter of inverter
ON/OFF	Development function, unavailable
Wifi Info	View WIFI SN and IP address
Version	Check the software version of the control board and display board
System Info	View the inverter information:Voltage,current,power and so no

4.3 Startup Setting







5.Commissioning

Before starting up commissioning at site, please make sure below procedures and requirements are fully meet.

 \cdot Mounting location is meet the requirements.

· All of the electrical wiring is firmly connected, including PV wiring, Grid wiring and Earth wiring.

• The inverter setting has been finished accordingly to local standards or regulations.

Commissioning Procedures

- · Turn on the AC switch between inverter grid output and the public grid;
- · Turn on the DC switch on the inverter;
- \cdot Turn on the PV switch of the system.

LED Indication



Sign	Power	Color	Explanation
	On	Green	Power On
POWER	Off		No Power
	On	Green	Inverter is feeding power
RUN	Off		Inverter is not feeding power at the moment
	On	Green	Normal grid connection
GRID	Off		Non grid
FAULT	On	Red	Fault occurred
	Off		No fault

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6.Shut Down & Restart the Inverter

6.1 Shut Down Procedures

- · Turn off the DC switch on the inverter;
- · Turn off the PV switch of the system;
- \cdot Turn off the AC switch between inverter output and the public grid.



The inverter will be operable after minimum 5 minutes.

6.2 Restart the inverter

Follow the procedures below when the inverter needs to be restarted.

- · Follow the Shut Down Procedures of Article 6 to shut down inverter;
- \cdot Follow the Commissioning Procedures of Article 5 to turn on the inverter.

7.Maintenance&Trouble Shooting

7.1 Maintenance

The inverter needs maintenance periodically, the following details should be noticed.

PV connection: check the PV connection twice a year AC connection: check the AC connection twice a year Earth connection: check the Earth connection twice a year Heat sink: clean the heat sink once a year with dry towel

7.2 Fault Code and Trouble Shooting

The LCD and LED will report the fault when the error occurs, please follow thetrouble shooting list to solve the problem.





Trouble-Shooting List

Error Display	Error Message	Possible Fault	Correctie Measure	
EepromErr	Storage device fault	low start up power under low light conditons, inverter self-check procedure cannot be complete	The inverter will restart automatically when the start up power is enough	
GFCI.Err	Ground Fault Circuit Interrupter fault	1.ground leakage current high 2.PV(+) or PV(-) earthed	1. check the AC output wring and restart the inverter 2. check PV array wiring	
GridF.OutLim	Grid Frequency fault	1. grid fluctuate 2. grid frequency out of setting range	for the normal, the inverter will restart automatically check inverter frequency setting range correct s. check the AC output wiring well connected	
GridV.OutLim	Grid voltage fault	1. grid fluctuate 2. grid voltage unbalance between phase to phase	1. grid back to the normal, the inverter will restart automatically 2. check each phase's voltage via inverter LCD	
IntFaultB	Internal fault B	Bus voltage out of range	 check PV input voltage (not bigger than 900Vdc per channel) check the AC output wiring well connected 	
IntFaultD	Internal fault D	Software over current fault	 check PV array confirguration is correct fluctuate on grid, wait for the grid back to the normal, the inverter will restart automatically 	
IntFaultE	Internal fault E	Over current fault	grid back to the normal, the inverter will restart automatically	
IntFaultG	Internal fault G	DCI high	1.check each PV array's confirguration is correct 2check the voltage difference between BUS+ and BUS- is too high	
IntFaultK	Internal fault K	Bus voltage fault	1.check the AC output wring well connect.Use stranded copper cable 2.check PV array confirguration is correct 3.check the voltage difference between BUS+ and BUS- is too high	
IntFaultM	Internal fault M	Bus voltage fault	1.check the AC output wring well connect.Use stranded copper cable 2.check PV array confirguration is correct 3.check the voltage difference between BUS+ and BUS- is too high	
IntFaultN	Internal fault N	Hardware fault	check the AC out put wring well connect. Use stranded copper cable	
IntProtectA	Internal protection A	Bias current protection	1. turn off AC, then DC circuit breaker, restart the inverter 2. replace the control board	
IntProtectB	Internal protection B	Relay fault	turn off AC, then DC circuit breaker, restart the inverter	
IntProtectC	Internal protection C	Inverter current protection	turn off AC, then DC circuit breaker, restart the inverter, check the each phases' AC voltage is correct through LCD	
IntProtectD	Internal protection D	Boost current protection	turn off AC, then DC circuit breaker, restart the inverter	
IntProtectG	Internal protection G	Bus voltage protection	1.check the AC output wring well connect.Use stranded copper cable 2.check PV array confirguration is correct 3.check the voltage difference between BUS+ and BUS- is too high	
IntProtectl	Internal protection I	Bus voltage protection	1.check the AC output wring well connect.Use stranded copper cable 2.check PV array confirguration is correct 3.check the voltage difference between BUS+ and BUS- is too high	
IntProtectK	Internal protection K	Bus over voltage protection	check the AC output wring well connect.Use stranded copper cable	
IntProtectN	Internal protection N	Inverter over current protection	fluctuate on grid, wait for the grid back to the normal, the inverter will restart automatically	
IntProtectP	Internal protection P	Frequency fault protection	frequency abnormal of grid, wait for the grid back to the normal, the inverter will restart automatically	
IntProtectQ	Internal protection Q	DCI protection	1.1.check PV array confirguration is correct 2.check the voltage difference between BUS+ and BUS- is too high	
IntProtectR	Internal protection R	DCI circuit protection	1.turn off AC, then DC circuit breaker, restart the inverter 2. replace the control board	
IntProtectT	Internal protection T	PV over current protection	turn off AC, then DC circuit breaker, restart the inverter	
IsolationErr	Insulation resistance fault	Insulation resistance low	check the resistance between PV(+) and ground, PV(-) and ground bigger than $2M\Omega.$	
PVVoltOver	PV voltage high	PV over voltage	check PV array confirguration is correct	
SPICommErr	SPI fault	SPI communication fault	check the RS485 cable is well connect	
TempOver	Over temperature	Over temperature	 turn off the inverter still the temperature down to the normal. Or install the inverter at a well ventilated site. check the heat sink and the fans is working 	
TempSensorErr	Temperature sensor fault	Temperature sensor fault	1. turn off AC, then DC circuit breaker, restart the inverter 2. replace the temperature sensor	





8.Specifications

PV Input Data	BNT036KTL	BNT040KTL			
Max. DC Power (W)	54000	56000			
Max. DC Voltage (V)	1000	1000			
MPPT Voltage Range (V)	200-950	200-950			
MPPT Full Power Voltage Range (V)	500-850	500-850			
Rated Input Voltage (V)	620	620			
Start-up Voltage (V)	200	200			
Max. Input Current (A)	36 x 2	40 x 2			
Max. Short Current (A)	45 x 2	50 x 2			
No. of MPP Tracker / No. of PV String	2/8	2/8			
Input Connector Type	MC4	MC4			
AC Output Data	BNT036KTL	BNT040KTL			
Max. Output Power (W)	39600	44000			
Nominal Output Power (W)	36000	40000			
Max. Output Current (A)	56	61			
Nominal Output Voltage (V)	3P+N+PE /3P	+PE 230/400			
Grid Voltage Range	260-519 (according	to local standard)			
Nominal Output Frequency (Hz)	50,	/60			
Grid Frequency Range	45-55/55-65(accord	ing to local standard)			
Output Power Factor	1 default (adjustable from	0.8 leading to 0.8 lagging)			
Output Current THD	<3	%			
Efficiency	BNT036KTL	BNT040KTL			
Max. Efficiency	98.65%	98.65%			
Euro Efficiency	98.20%	98.25%			
Protection	BNT036KTL	BNT040KTL			
PV Reverse Polarity Protection	YES	YES			
PV Insulation Resistance Detection	YES	YES			
AC Short Circuit Protection	YES	YES			
AC Over Current Protection	YES	YES			
AC Over Voltage Protection	YES	YES			
Anti-Islanding Protection	YES	YES			
Residual Current Detection	YES	YES			
Over Temperature Protection	YES	YES			
Integrated DC switch	YES	YES			
Surge Protection	Integrated	d (Type III)			
General Data	BNT036KTL	BNT040KTL			
Dimensions (W x H x D, mm)	750 x 465 x 222				
Weight (kg)	46				
Protection Degree	IP65				
Enclosure Material	Aluminum				
Ambient Temperature Range (*C)	-25~+60				
Humidity Range	0-100%				
Communication Interface	Transformerless				
Continuincation interface	RS485 / WiFi / Wire Ethernet / GPRS (optional)				
Cooling Concept	Intelligent Fan Cooling				
Noise Emission (db)	<51				
Night Power Consumption (W)	<1				
Max. Operation Altitude (m)					
certifications and Standards					
EIVIL Standard	EN/IEC 61000-6-2, EN/IEC 61000-6-3, EN61000-3-2, EN61000-3-3, EN61000-3-11, EN61000-3-12				
Sarety Standard	EN/IEC 62109-1/-2 ,UL1547,IEC 60068-2				
Grid-connection	EN50549-1,EN50438 ,RD 1699,UNE 217001,RD 413 ,IEC61727,IEC62116,IEC61683,VDE4105, UI 1741 VDE0126 AS4777.2 NB/T 32004-2013				