Technical manual

NKON ESS Eco - 51.2V 16.1kWh

OUR PRODUCTS ARE ALWAYS EVOLVING, SO THE UNIT DEPICTED BELOW MAY DIFFER SLIGHTLY FROM THE UNIT YOU RECEIVE.

Contents

Disclaimer

This unit is heavy

This unit tips the scales at 119.5KG, please ensure you have adequate lifting / manoeuvring equipment in place. Before setting it up, make sure children and your (best) friends are not nearby.

- Do no disassemble the product without our express permission, otherwise the warranty will be voided Wear proper safety gear such as gloves and eye protection
- Do not reverse polarity
- Do not connect with any batteries in series
- Ensure the system is properly grounded
- Always use insulated tools
- Do not work on battery with it turned on or with the grid turned on
- Do not connect battery to solar wiring directly
- Make sure all fasteners are properly torqued
- Ensure your chargers/inverters are appropriately programmed
- Use only on 48v nominal systems, do not connect with other batteries
- Ensure the installation follows applicable local, national and all legal electric stipulations
- Installation should be done by a qualified and knowledgeable person
- Make sure proper cable sizes and overcurrent protection are utilised
- Ensure the system is installed in a location suitable for electronics
- Keep the battery within safe operational temperatures
- Do not put the battery in a hazardous, hot or flammable environment
- Install your equipment in a location where children and pets are not present
- Do not paint, or spray paint the battery
- If there are any electrical smells or excessive heat, use your breaker switch and contact your local fire station
- Only clean the battery with a dry cloth - do not use any liquids, spray cleaners, aerosols or any type of solvents.

Datasheet

Specificatie	Waarde
Battery configuration	1P16S
Rated voltage	51.2V
Operating voltage range	43.2V ~ 58.4V
Rated capacity	314Ah
Rated	16.0768 kWh
Continuous charge/discharge current	157A / 157A @ 25±2℃
Maximum charge/discharge current	200A / 200A @ 25±2℃
Operating ambient temperature	0 ~ 40℃ (Charge) -20 ~ 40℃ (Discharge)
Storage temperature & humidity	-10℃ ~ 35℃ (≤1 month) 25±2℃ (≤3 months) 65% ±10% RH
Size (L x W x H)	(739) × (410) × (250) mm
Weight	119.5 kg ±3 kg
Cycle life	6000 cycles @ 25℃, 157A charge/discharge current, 80% DOD
IP rating	IP20
Communication method	CAN & RS485
Altitude	0 – 3000 m
Humidity range	5 – 75%

Inverter settings (if applicable)

Function / Stage	Purpose	Settings
Battery Type	Selects manual lithium profile	User-defined ($LiFePO_4$)
Nominal Voltage	Base system voltage	51.2 V
Bulk / Absorption Voltage	Full-charge voltage (≈ 100 % SOC)	57.6 V
Float Voltage	Maintains full charge without stress	55.2 V
Absorption Time	Duration at bulk voltage for balancing	20 – 30 min
Re-bulk / Charge Return Voltage	Triggers recharge after drop	52.8 V
Low DC Cut-off Voltage	Protects cells from over-discharge	43.2 V
Low DC Restart Voltage	Allows discharge again after recovery	48.0 V
Equalization	Not used for $LiFePO_4$	Disabled
Temperature Compensation	Prevents incorrect voltage shifts	0 mV / °C
Tail Current / Charge End Current	Defines charge completion	2 % of C
Dynamic Cut-off / Protection	Avoids deep discharge under load	Enabled (ESS)
Max Charge Current	Limits BMS and inverter stress	200A
Max Discharge Current	Limits output & BMS protection	200A
Over-Voltage Alarm	Prevents over-charge	58.0 V
Under-Voltage Alarm	Early warning before cut-off	46.4 V

Product Packing List

1 .	16kWh Battery	1 PCS	
2	1.5m Power cables (+ & -) 50mm² (M8)	2 PCS	
3	1.8m Computer connection cable	1 PCS	
4	1.5m Communication cable	1 PCS	
5	Manual	1 PCS	

Functional Introduction

Battery Voltage Calculation:

Voltage Sampling: The battery's voltage is measured with a deviation of ±20mV over a 32-sample battery test.

Temperature Sensors:

The system has 2 temperature sensors monitoring the battery temperature.

- 1 sensor for ambient (surrounding) temperature.
- 1 sensor for the temperature of the MOS (Metal-Oxide-Semiconductor) components. Temperature
- Deviation: The deviation in temperature readings is ±2°C.

Battery Capacity and Cycle Count:

Capacity Calibration: To determine the actual battery capacity, a full charge/discharge cycle is completed.
Remaining Capacity Estimation: The system estimates the remaining capacity with a deviation of ±5%.

Communication Interface:

Monitoring and Control: Use a PC to monitor the battery pack, control operations, and adjust settings remotely.

Historical Data Recording and Management:

Data Recording: When abnormalities arise, the status and alarm information are recorded and saved. Fault Data: The system can store up to 500 historical fault records.

Battery Management System (BMS) Parameter Settings:

The BMS allows the configuration of various parameters, including:

- Battery overvoltage/undervoltage
- Total battery voltage overvoltage/undervoltage
- Charge/discharge overcurrent
- Battery high/low temperature thresholds
- Battery capacity
- Operational mode
- Charge/discharge limit currents.

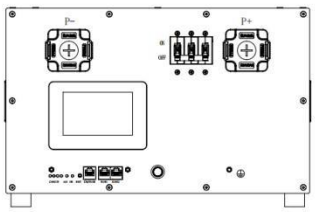
These settings can be adjusted within the battery monitoring system.

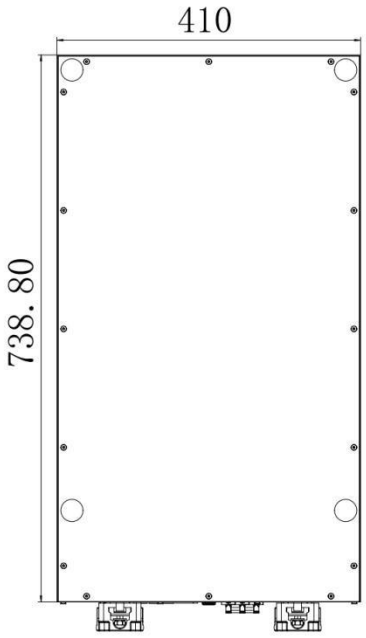
Multiple Protection Functions:

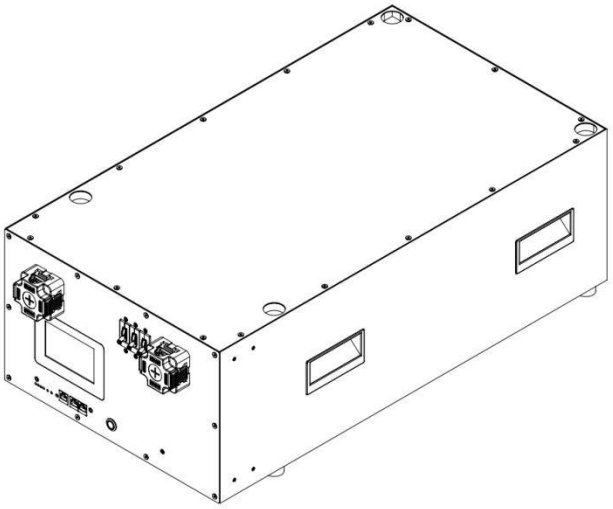
The battery has several protective features to prevent damage, including:

- Hardware protection
- Battery protection
- High/low temperature protection
- Output short-circuit protection

Dimensions



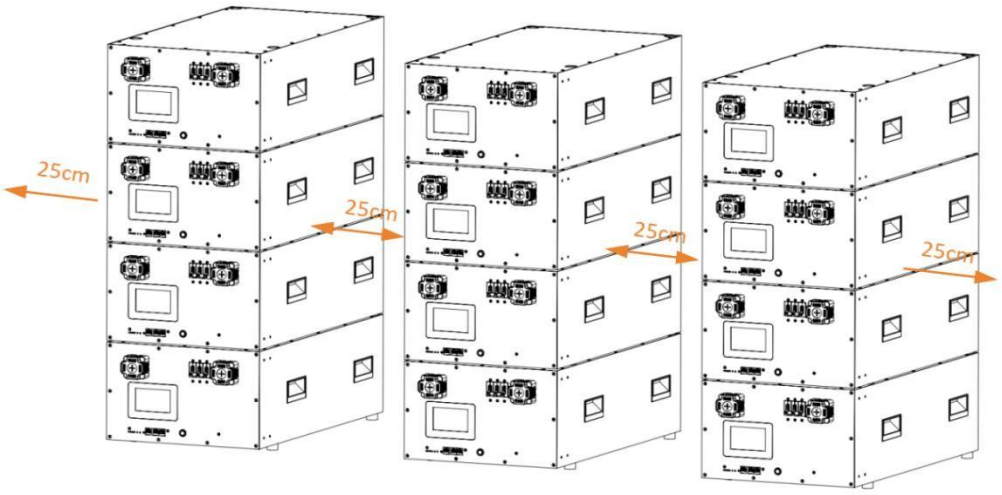




Choose a suitable installation location

- Do not place the battery on flammable building materials
- The temperature should be between 10℃ and 30℃ to maintain optimal operation。
- It is recommended to place the battery on a level surface.
- There should be some free space around the battery to dissipate heat (as shown below)

Suitable for placement on concrete or other non-flammable surfaces



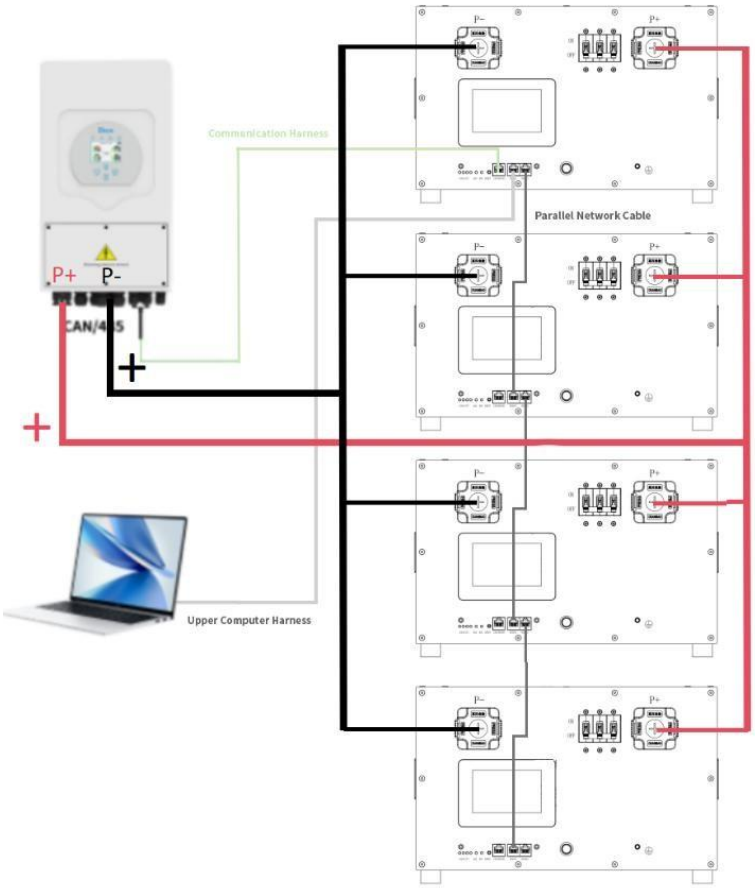
Batteries should be powered off before

Wiring connection

The battery should be powered off before connecting.

BMS has the function of automatically assigning addresses (the reserved DIP switch on the BMS is just for decoration, in order to be compatible with the original battery chassis port design, the DIP address is optional and does not affect the automatic address assignment of BMS);

When paralleling, just use a regular network cable. Any first RS485B is connected to the second RS485A (the first one is the host, the host CAN/485 is connected to the inverter communication), the second RS485B is connected to the third RS485A, and the next ones are all slaves. The following figure shows an example:



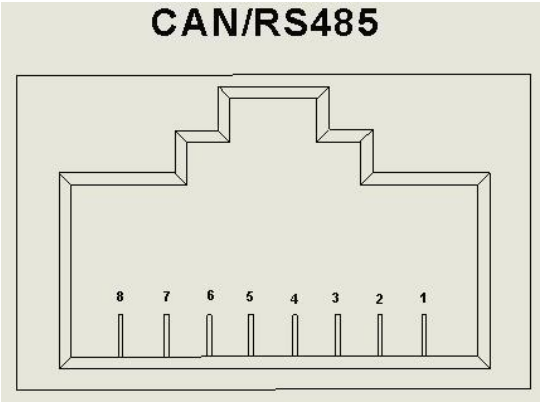
Only same model of battery is compatible. You can't mix it with other models / brands

Communication Instructions

Communication

Matching inverter communication

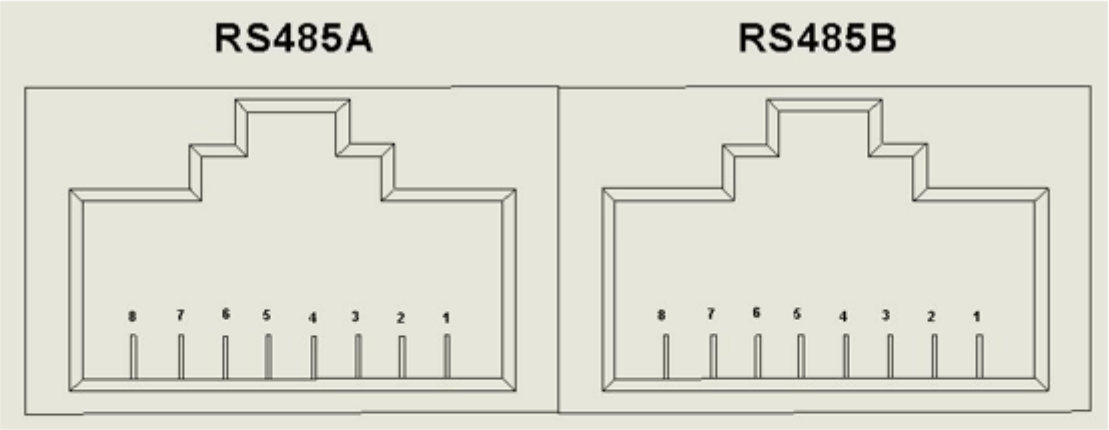
The BMS communication interface is defined according to each inverter communication interface. The definition of the special inverter communication port is inconsistent with the BMS communication port definition, so you need to make your own network cable. If you use a regular network cable, the BMS may automatically start or fail to shut down. Generally, you can use a regular network cable for communication.。



CAN/RS485	
Pin	**Definition description**
1、8	RS485-B
2、7	RS485-A
4	CAN-H
5	CAN-L
3、6	GND

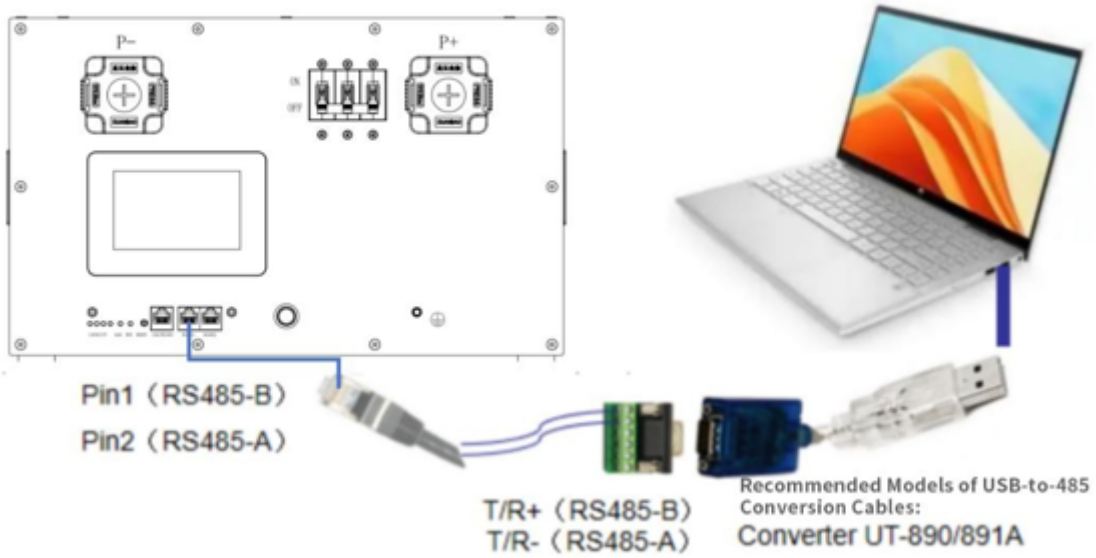
Internal Communications

Select the corresponding port for BMS internal communication and 19200 baud rate



RS485A	
Pin	**Definition description**
1、8	RS485-B
2、7	RS485-A
3	Master flag enable
4	Autocode address 2
5	GND
6	GND

RS485B	
Pin	**Definition description**
1、8	RS485-B
2、7	RS485-A
3	GND
4	Autocode address 1
5	GND
6	Salve flag enable



Basic working mode

Charging Mode

When the BMS detects that the charger is connected and the external charging voltage is greater than the internal battery voltage by more than 0.5V, it turns on the charging MOSFET for charging. When the charging current reaches the effective charging current, it enters the charging mode. In the charging mode, both the charging and discharging MOSFETs are closed.

Discharge mode

The BMS enters the discharge mode when it detects that the load is connected and the discharge current reaches the effective discharge current.

Standby mode

When neither of the above two modes is satisfied, it enters the standby mode.

Shutdown Mode

After 48 hours of normal standby, battery triggers undervoltage protection, key shutdown or external switch shutdown, the BMS enters shutdown mode.
Wake-up conditions for shutdown mode: 1. Charging activation; 2. 48V voltage activation; 3. Key startup.

LED light indication

LED light sequence

1 running light, 1 warning light, 4 capacity indicator lights

Capacity indicator

Status		Charge				Discharge			
Capacity indicator		L4●	L3●	L2●	L1●	L4●	L3●	L2●	L1●
	0～25%	OFF	OFF	OFF	Blink	OFF	OFF	OFF	Green
	25～50%	OFF	OFF	Blink	Green	OFF	OFF	Green	Green
	50～75%	OFF	Blink	Green	Green	OFF	Green	Green	Green
	≥75%	Blink	Green	Green	Green	Green	Green	Green	Green
Running indicator light●		Green				Flash			

Flashing Description

Flashing mode	Bright	off
Flash 1	0.25s	3.75s
Flash 2	0.5s	0.5s
Flash 3	0.5s	1.5s

Status Indicator

System status	**Running status**	**RUN**	**ALM**	**SOC**				**Illustrate**
		●	●	●	●	●	●	
Power off	Sleep	Off	Off	Off	Off	Off	Off	All off
Standby	Normal	Flashing	Off	Off	Off	Off	Off	Standby mode
Charging	Normal	Solid on	Off	According to the power indicator				Maximum LED flash 2
	Overcurrent alarm	Solid on	Flash 2	According to the power indicator				Maximum LED flash 2
	Overvoltage protection	Flash 1	Off	Off	Off	Off	Off	
	Temperature, overcurrent protection	Flash 1	Off	Off	Off	Off	Off	
Discharging	Normal	Flash 3	Off	According to the power indicator				According to the constant light indicator
	Alarm	Flash 3	Flash 3					
	Temperature, overcurrent, short circuit, etc. protection	Off	Still on	Off	Off	Off	Off	Stop discharging, when the mains is offline, it will be forced to sleep after 48 hours without any action
	Undervoltage protection	Off	Off	Off	Off	Off	Off	Stop discharge

Battery protection parameters

Function Name	Function settings	Project List	Setting Value	Setting Range
Single cell voltage alarm	Enabled	Single cell high pressure alarm	3500mV	Single cell high voltage recovery~Single cell overvoltage protection
		Single cell high pressure recovery	3370mV	3000mV~Single cell high voltage voltage
	Enabled	Single cell low pressure alarm	2900mV	Single cell undervoltage protection~Single cell low voltage recovery
		Single cell low pressure recovery	3100mV	Single cell low voltage alarm~3100mV
Single overvoltage protection	Enabled	Single cell overvoltage protection	3650mV	Single high voltage alarm ~ 3850mV
		Single cell overvoltage recovery	3400mV	Single high voltage recovery ~ Single overvoltage voltage
		Overvoltage recovery conditions	1. The cell voltagedrops to the overvoltage recovery point 2. The remaining capacity is lower than 96% of the intermittent charging capacity Two conditions must be met for recovery	
			The battery discharge current is detected to be >1A	
Single cell undervoltage protection	Enabled	Undervoltage protection voltage	2700mV	2500mV~ Single cell undervoltage recovery

		Undervoltage recovery voltage	3100mV	Single cell undervoltage protection~ Single cell low voltage alarm

		Monomer undervoltage shutdown	After undervoltage protection, the device shuts down and maintains communication for 1 minute. Charging current is detected (≥1A).	
		Undervoltage recovery conditions	After undervoltage protection, the device shuts down and maintains communication for 1 minute. Charging current is detected (≥1A).	
Battery total pressure alarm	Enabled	Total high alarm	56.0V	Total voltage high voltage recovery ~ total voltage overvoltage protection
		Total h i g h v o l t a g e r e c o v e r y	54.0V	51.0V ~ total voltage high voltage
	Enabled	Total low voltage alarm	46.4V	Total voltage undervoltage protection ~ total voltage low voltage recovery
		Total low voltage recovery	48.0V	Total voltage low voltage alarm ~ 49.0V

Total pressure overvoltage protection	Enabled	Total overvoltage protection	57.6V	Total voltage high voltage alarm ~ 58.0V
		Total overvoltage recovery	54.0V	Total voltage high voltage recovery ~ Total voltage overvoltage
		Overvoltage recovery conditions	1. The cell voltagedrops to the overvoltage recovery point 2. The remaining capacity is lower than 96% of the intermittent charging capacity Two conditions must be met for recovery	
			The battery discharge current is detected to be >1A	
Total voltage undervoltage protection	Enabled	Total voltage undervoltage protection	43.2V	40.0V~Total voltage undervoltage recovery
		Total voltage undervoltage recovery	48.0V	Total voltage undervoltage protection~Total voltage low voltage alarm
		Total voltage undervoltage shutdown	After undervoltage protection, shut down and maintain communication for 1 minute	
		Undervoltage recovery conditions	Charging current (≥1A) is detected	

Battery cell temperature prohibits charging	Enabled	Charging high temperature alarm	50℃	Charging high temperature recovery~charging over-temperature protection
		Charging high temperature recovery	47℃	40℃~charging high temperature warning
		Charging overtemperature protection	55℃	Charging over-temperature recovery~65℃
		Charging overtemperature recovery	50℃	Charging high temperature recovery~charging over-temperature protection
		Charging low temperature alarm	2℃	Charging under-temperature protection~charging low temperature recovery
		Charging low temperature recovery	5℃	Charging low temperature warning~10℃
		Charging undertemperature protection	-10℃	-20℃~charging under-temperature recovery
		Charging undertemperature recovery	0℃	Charging under-temperature protection~charging low temperature recovery

Battery core temperature is prohibited	Enabled	Discharge high temperature alarm	55℃	Discharge high temperature recovery ~ discharge over temperature protection
		Discharge high temperature recovery	60℃	45℃ ~ discharge high temperature alarm
		Discharge overtemperature protection	60℃	Discharge over temperature recovery ~ 65℃
		Discharge overtemperature recovery	55℃	Discharge high temperature recovery ~ discharge over temperature protection
		Discharge low temperature alarm	-10℃	Discharge under temperature protection ~ discharge low temperature recovery
		Discharge low temperature recovery	3℃	Discharge low temperature alarm ~ 10℃
		Discharge undertemperature protection	-15℃	-15℃ ~ discharge under temperature recovery
		Discharge undertemperature recovery	0℃	Discharge under temperature protection ~ discharge low temperature recovery

Ambient temperature protection	Enabled	High ambient temperature alarm	50℃	Ambient high temperature recovery~Ambient over-temperature protection
		High ambient temperature recovery	47℃	45℃~Ambient high temperature alarm
		Over-temperature protection	60℃	Ambient over-temperature recovery~65℃
		Over-temperature recovery	55℃	high temperature recovery~over temperature protection

		Low ambient temperature alarm	0℃	under-temperature protection~ recovery
		Low ambient temperature recovery	3℃	low temperature alarm till 10℃
		Ambient under-temperature protection	-10℃	-15℃ to temperature recovery
		Ambient under-temperature recovery	0℃	Under temperature protection to low temperature

Power temperature protection	Enabled	Power high temperature alarm	95℃	Power high temperature recovery ~ Power over-temperature protection
		Power high temperature recovery	85℃	45℃ ~ Power high temperature alarm
		Power over temperature protection	110℃	Power high temperature alarm ~ 110℃
		Power over temperature recovery	85℃	Power high temperature recovery ~ Power over-temperature protection
Charging current limit	Disabled	Active current limiting	10A	When the charger current is greater than 10A, turn on current limiting
	Enabled	Passive current limiting	205A	Charger current is greater than the charging overcurrent alarm （Value can be set，Enable） current limiting

		Charging current limiting delay	5 minutes	After the current limit is turned on, recheck whether the current limit is turned on after 5 minutes

Charging overcurrent alarm	Enabled	Charging overcurrent alarm Charging overcurrent recovery	205A	Charge overcurrent recovery~Charge overcurrent protection
		Charging overcurrent alarm Charging overcurrent recovery	203A	0A~Charge overcurrent alarm
Charging overcurrent protection	Enabled	Charging overcurrent protection	300A	0A~300A
		Charging overcurrent delay	300mS	Can be set
		Overcurrent recovery conditions	Discharge is restored automatically after 60 seco	immediately, or nds
Effective charging current	Charge entry current Charge exit current		500mA	
	Charge entry current Charge exit current		400mA	

Discharge overcurrent alarm	Enabled	Discharge overcurrent alarm	-205A	Discharge overcurrent protection~discharg e to overcurrent recovery
		Discharge to overcurrent recovery	-203A	Discharge overcurrent alarm~0A
Discharge overcurrent protection	Enabled	Discharge overcurrent protection	-210A	Transient overcurrent protection ~0A

		Discharge overcurrent delay	10S	Can be set
		Overcurrent recovery conditions	Charging resumes immediately or automatically after 60 seconds	
Secondary overcurrent protection	Enabled	Transient overcurrent protection	-350A	Discharge overcurrent protection value To 350A
		Transient overcurrent delay	300mS	Can be set
		Transient overcurrent recovery	Charging resumes immediately, or automatically resumes after 60 seconds	
	Disabled	Transient overcurrent lock	Continuous secondary overcurrent, exceeds overcurrent lock times	
		Overcurrent lock times	5 times	
		Transient lock release	Connect charger	

Output short circuit protection	Enabled (Currently does not support turning off settings)	Short circuit protection current and delay	（Not configurable） Writing Program
		Short circuit protection recovery	Charging resumes immediately, or automatically resumes after 60 seconds
	Enabled	Short circuit protection lock	Continuous output short circuit, exceeds overcurrent lock times
		Short circuit lock times	5 times
		Short circuit lock release	Connect charger
Effective discharge current	Discharge entry current		-500mA
	Discharge exit current		-400mA
Cell balancing function	Enabled	Standby balance	No charge and discharge state, start balancing

		Standby balance time	10 hours	Can be set
	Enabled	Charge balance	Enable balancing in charging and floating charging states	
	Turn on voltage condition	Balanced start voltage	3400mV	Can be set
		Balanced start voltage difference	50mV	
		Balanced end voltage difference	30mV	
	Enabled	Balanced temperature	Balanced shutdown temperature range according to (ambient alarm temperature	

		limit	determination)	
		Balanced high temperature prohibited	50℃	Can be set
		Balanced low temperature prohibited	0℃	
Battery failure alarm	Enabled	Battery cell failure pressure difference	150mV	Can be set
		Battery cell recovery pressure difference	100mV	
Battery capacity setting	Battery rated capacity		314Ah	5Ah to 314A
	Battery remaining capacity		Estimated based on cell voltage	h Can be set
	Cycle cumulative capacity		20%	Cycle times（Can be set）
	Enabled	Remaining capacity warning	10%	
	Enabled	Remaining capacity protection	2%	Turning off output

<table>
<tr><td rowspan="2">Reset button</td><td colspan="2">Power on/activate</td><td colspan="2">When the BMS is in sleep mode, press the reset button for 1S, the BMS is activated, the LED indicators light up in sequence, and then it enters normal working mode;</td></tr>
<tr><td colspan="2">Power off/sleep</td><td colspan="2">When the BMS is in standby or working mode (except charging), press the reset button for 3S, the BMS is in sleep mode, the LED indicators light up in sequence, and then it enters sleep mode;</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>Pre-charge function</td><td>3000ms</td><td>0~5000ms can be set</td><td colspan="2">BMS starts pre-charging function instantly</td></tr>
<tr><td>BMS power consumption management</td><td>Enabled</td><td>Maximum standby time</td><td colspan="2">48h (charger is not present and there is no effective discharge current)</td></tr>
<tr><td rowspan="3">Low temperature heating of battery cells</td><td rowspan="3">Disabled</td><td>Battery cell low temperature heating</td><td>0℃</td><td rowspan="2">Can be set</td></tr>
<tr><td>Battery cell heating recovery</td><td>10℃</td></tr>
<tr><td>Heating start logic</td><td colspan="2">When the charger is online and the battery cell temperature reaches the start-up condition, heating is turned on. No heating is performed in standby and discharge states.</td></tr>
<tr><td>External switch</td><td>Enabled</td><td colspan="3">When the BMS is in standby mode, the external switch can be operated to turn the BMS off and on</td></tr>
<tr><td>LCD screen</td><td>Enabled</td><td colspan="3">Simplified monitoring software to view data such as battery cells, temperature, current, etc.</td></tr>
<tr><td>Manual charging activation</td><td>Enabled</td><td>1 minute</td><td>After undervoltage protection, the BMS shuts down. Press the button manually to activate and clear the undervoltage</td><td>Can be set</td></tr>
</table>

			protection to force output.	
Impedance compensation	Connect fault impedance	10mΩ	Default is between 8 and 9	Battery connection line impedance compensation
	Compensation point 1	0mΩ	9	Can be set
	Compensation point 2	0mΩ	13	

Package

Packaged in a dry, dust and moisture proof packaging box. Package the product with plastic film/EPE and package it in a wooden box.
Specifications: 825mm*480mm*425mm Package quantity 1 unit Weight: 128kg

Getting in touch

Should you encounter a problem with your NKON ESS Pro unit it is important you contact our Customer Services team first and foremost. This gives us an opportunity to help you resolve the issue before any problems arise. By coming directly to us, before posting on forums or groups, we can help you resolve any issues or concerns quickly and efficiently.

Please send any images or screenshots, along with a description of your issue to cs@nkon.nl. If your issue is urgent and you need to talk with a member of the tech team immediately, please call +31403690600.