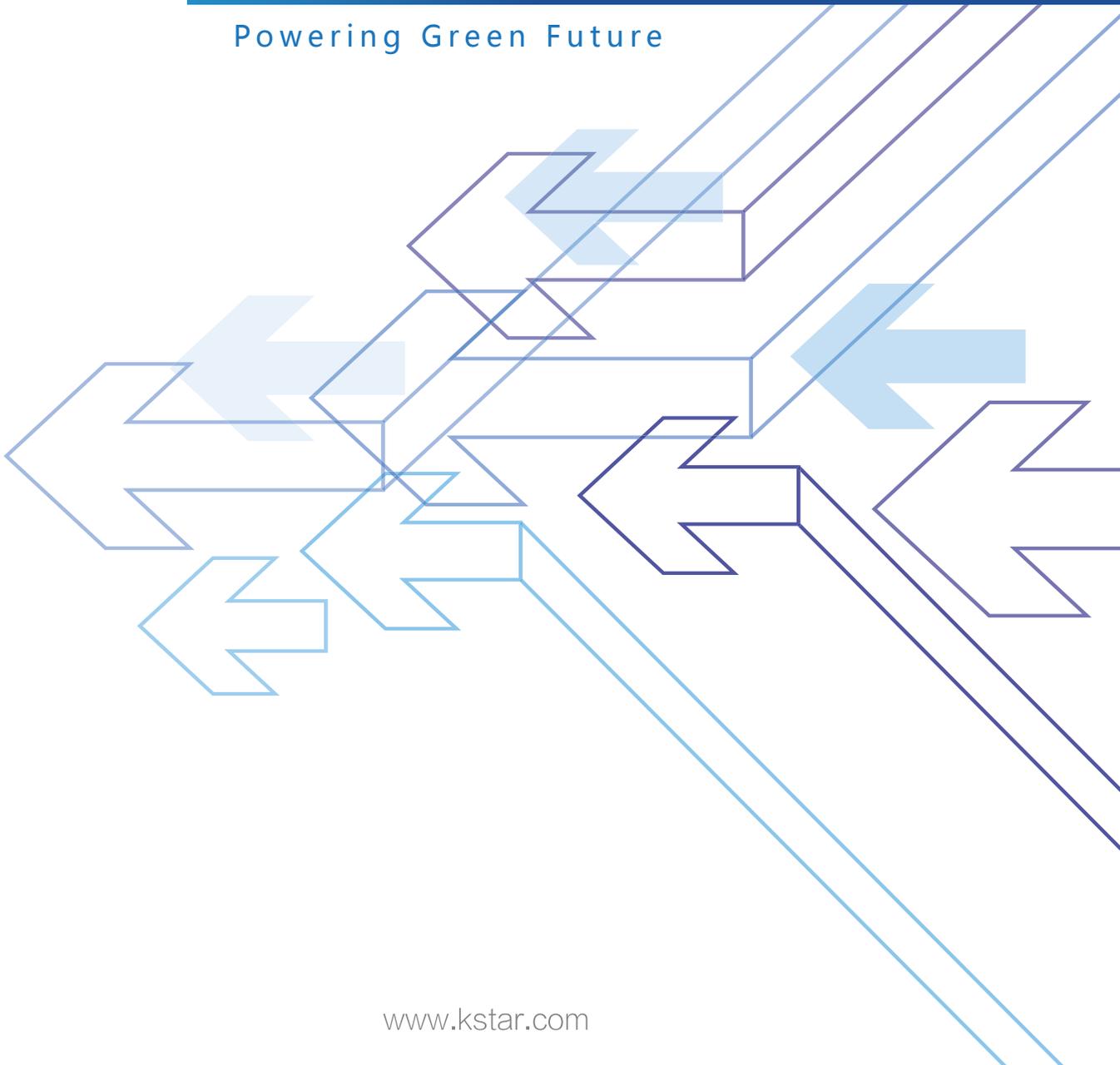


**KSTAR**

Stock code: 002518

# Energy Storage Solution

Powering Green Future



[www.kstar.com](http://www.kstar.com)

# About **KSTAR**

KSTAR, a leading global new energy solutions provider established in 1993, now boasts a history of 26 years dedicated to the R&D and manufacture of PV and ESS solutions. KSTAR products cover more than 100 countries for applications. We have more than 3000 employees and 600 R&D engineers. KSTAR is committed to innovation and technology based on global customer needs. Powering a Green Future.



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## Project Reference

# Global Service Network



Service Centers Spare Part Centers



7x24 Response and Support

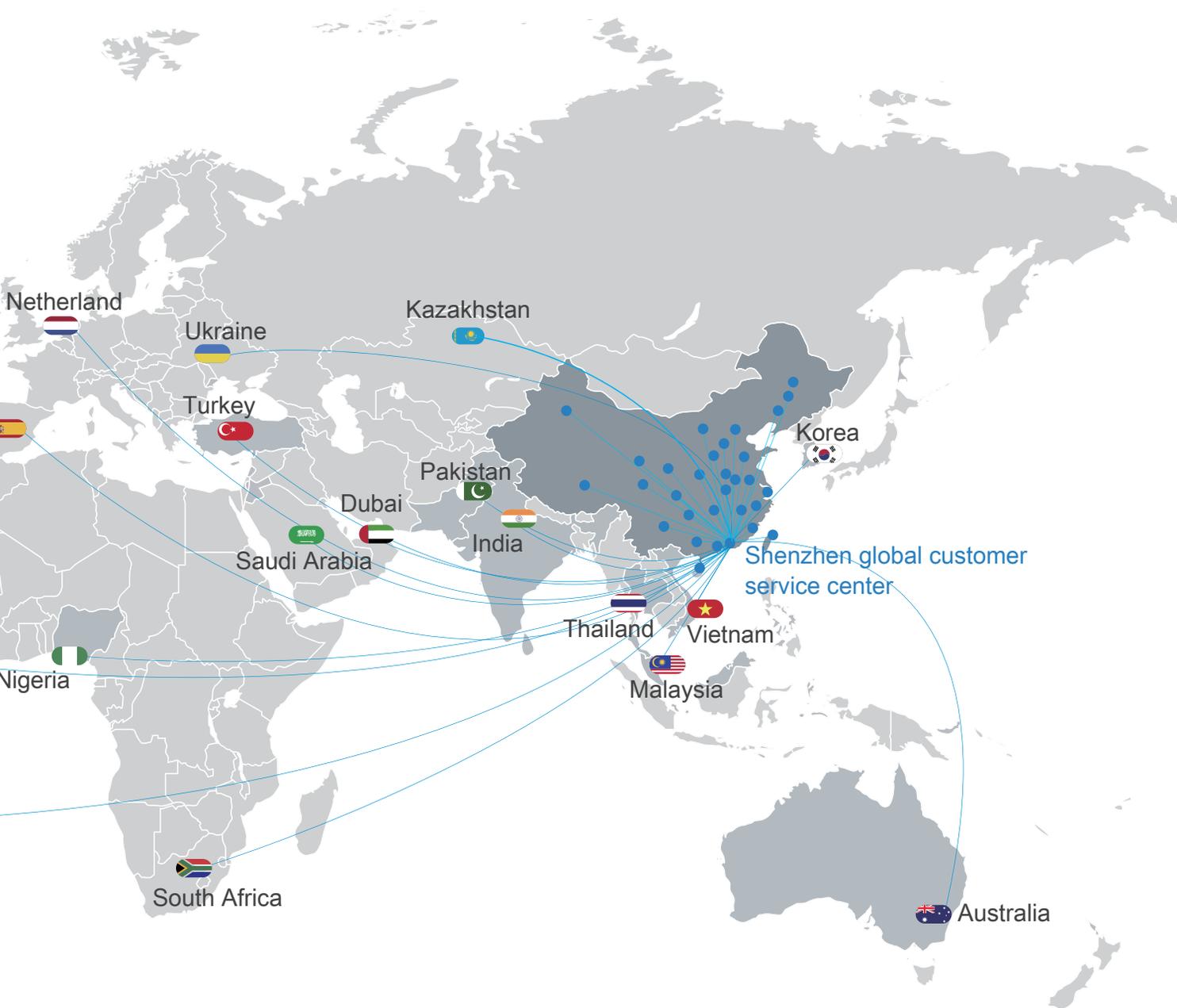


18 Overseas Technical Service Centers 40 Overseas Service Engineers



Global Service Network

**National Customer Service Hotline: C400-700-9662**



Brazil



South Africa



Spain



Saudi Arabia



Nigeria



Australia



Netherland



Ukraine



Pakistan



Thailand



Vietnam



Malaysia



Mexico



Dubai



Turkey



India



Korea



Kazakhstan

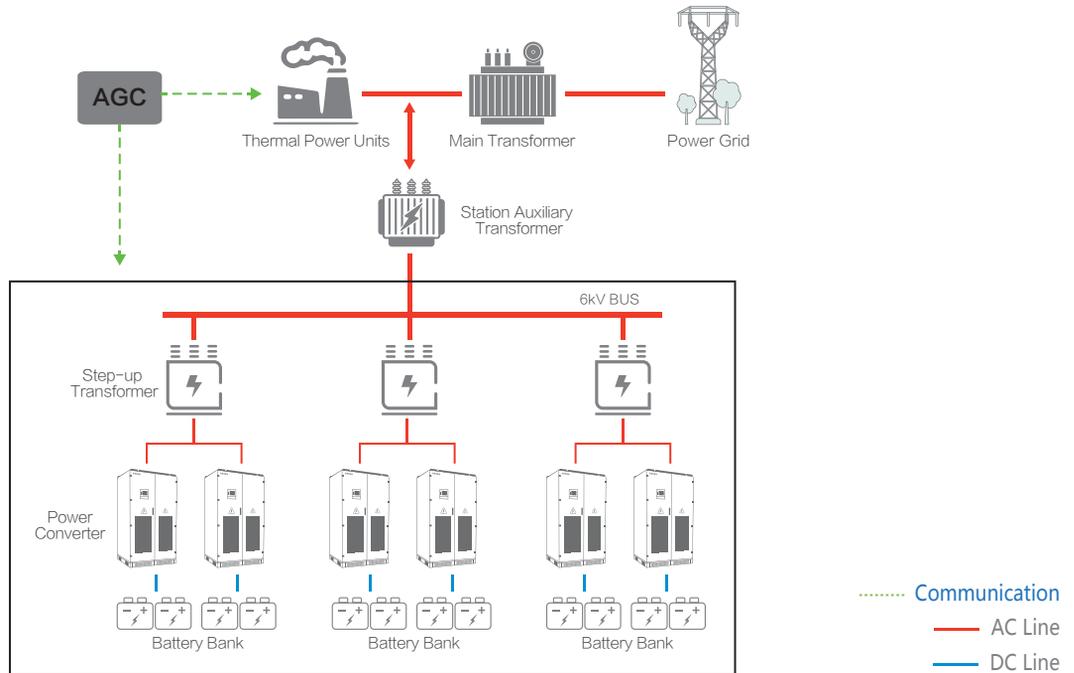


# Energy Storage Solution

P O W E R I N G   G R E E N   F U T U R E

# Generation and Energy Storage Solution

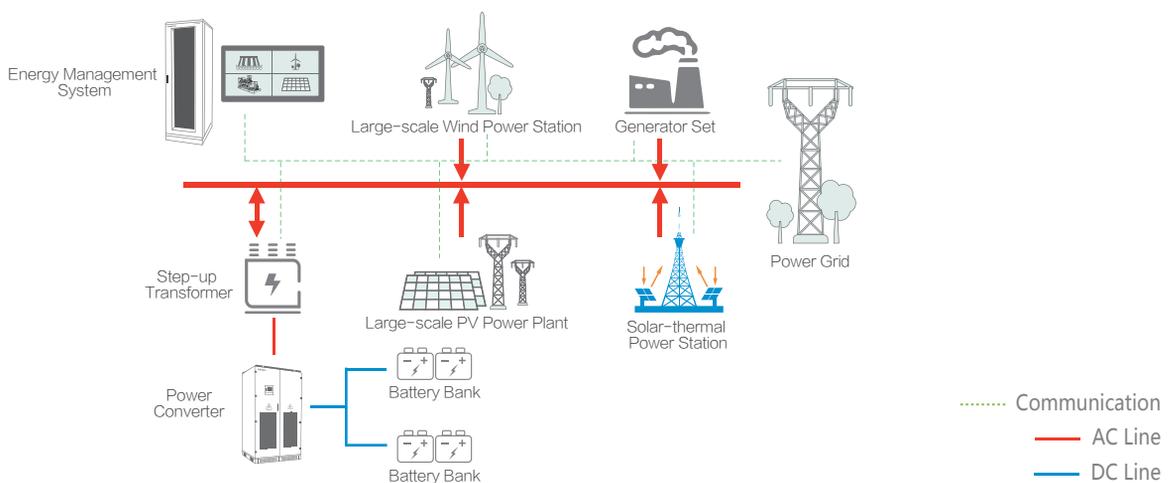
## Thermal Power Plant Frequency Regulation



### Typical Products:

- ◆ GSE0500,GSE0630,1500V power conversion system GSE1250 and the container-type PCS GSE-C series, MV turnkey solution GSE-MV series (500kW~5000kW)and supporting auxiliary equipment.

## Multi-energy Complement Project with ESS



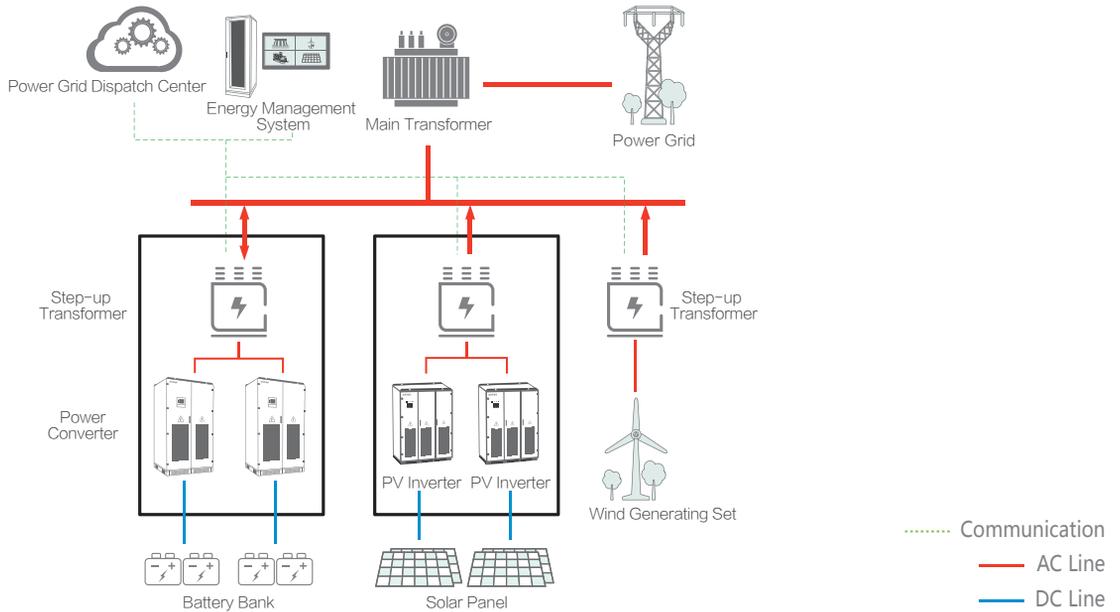
### Typical Products:

- ◆ GSE0500,GSE0630,1500V power conversion system GSE1250 and the container-type PCS GSE-C series, MV turnkey solution GSE-MV series (500kW~5000kW)and supporting auxiliary equipment.

# Generation and Energy Storage Solution

## Wind/PV Power Station with ESS

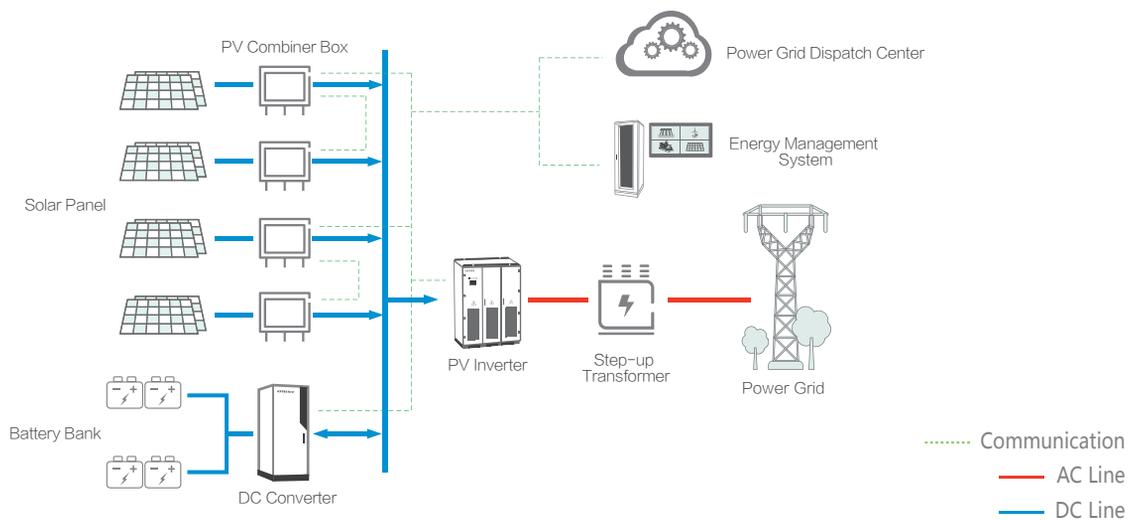
AC-coupled Solution:



Typical Products:

- ◆ GSE0500,GSE0630,1500V power conversion system GSE1250 and the container-type PCS GSE-C series, MV turnkey solution GSE-MV series (500kW~5000kW)and supporting auxiliary equipment.

DC coupled Solution:

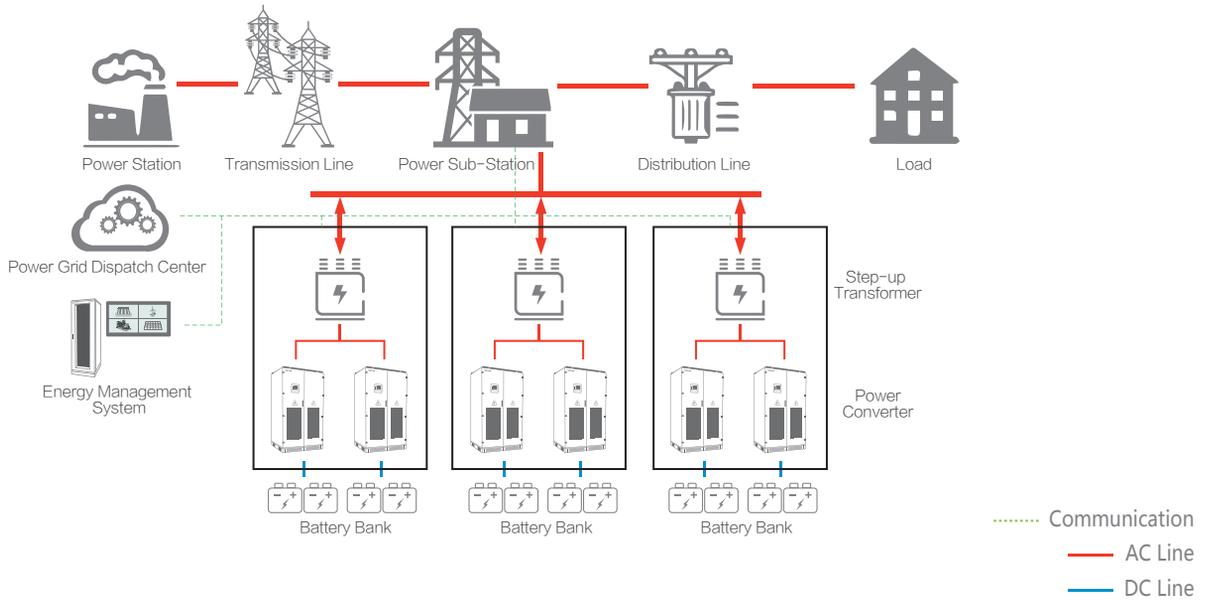


Typical Products:

- ◆ DC converter KDC50H series and supporting auxiliary equipment.

# Grid-scale Energy Storage Solution

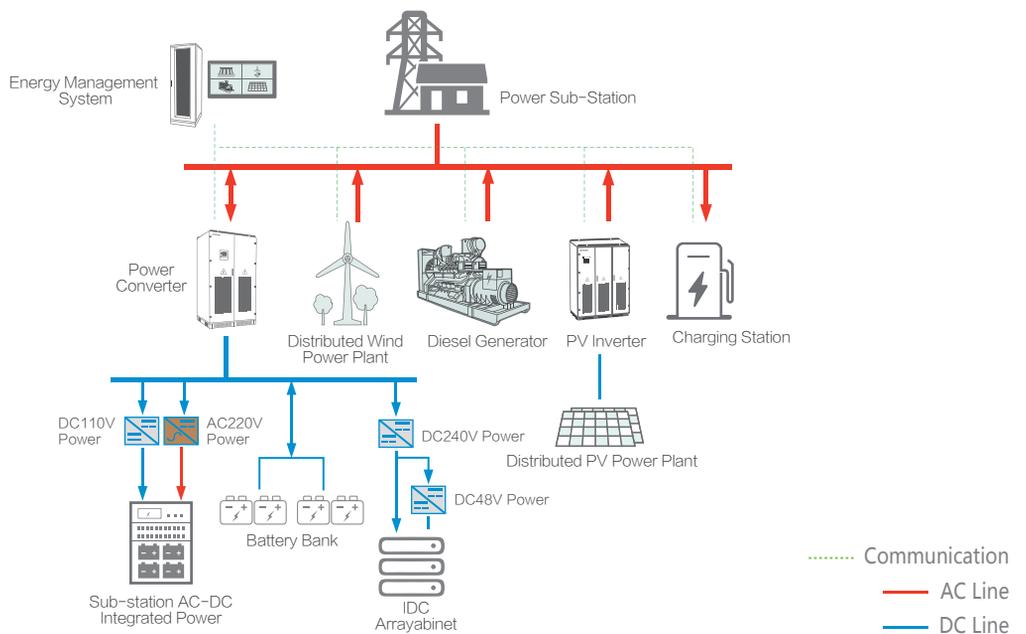
## Transmission and Distribution Energy Storage Solution



### Typical Products:

- ◆ GSE0500, GSE0630, 1500V power conversion system GSE1250 and the container-type PCS GSE-C series, MV turnkey solution GSE-MV series (500kW~5000kW) and supporting auxiliary equipment.

## Multi-station Integrated Energy Storage System

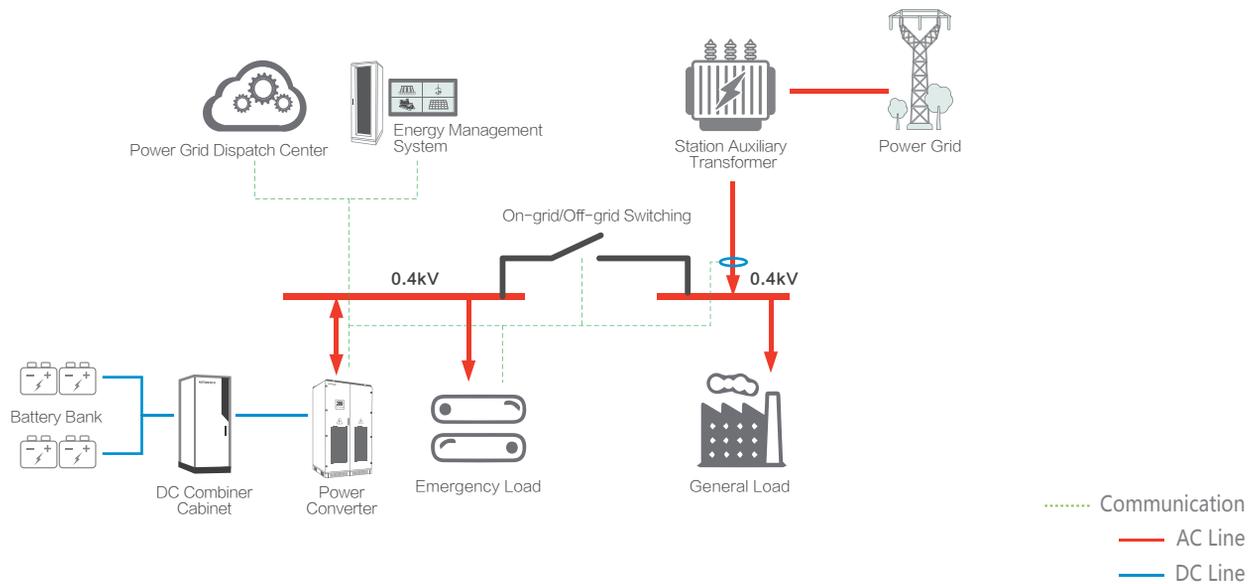


### Typical Products:

- ◆ Isolated-type power converter GSE-T series, the container-type power converter GSE-C series and supporting auxiliary equipment.

# Behind the Meter Energy Storage Solution

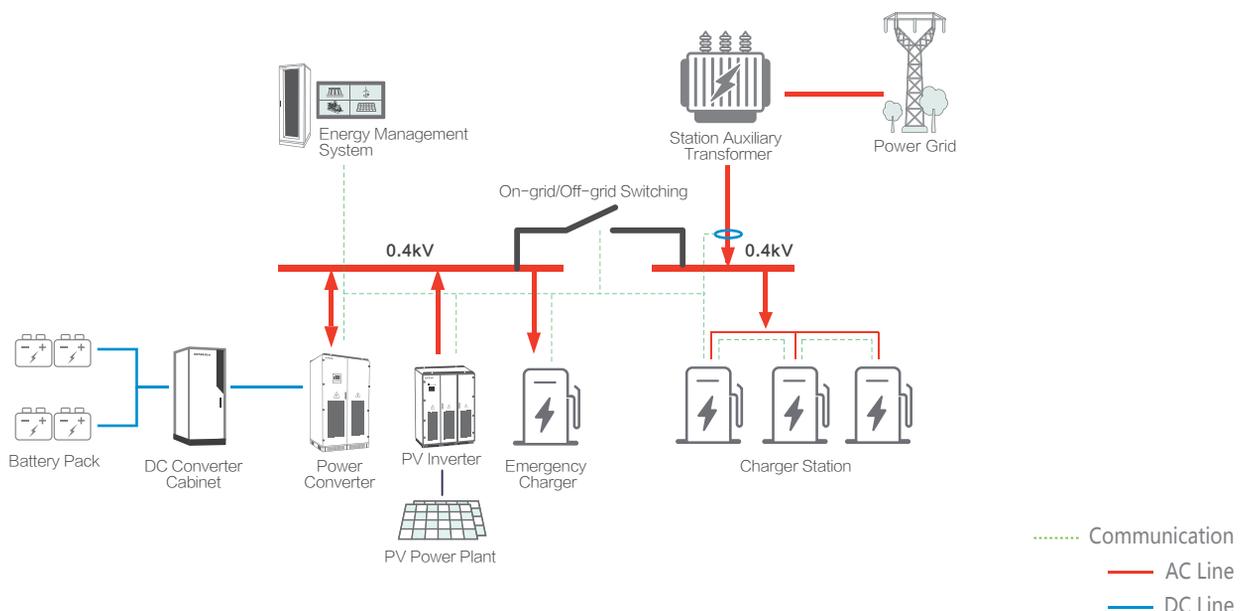
## Industrial and Commercial Energy Storage System



### Typical Products:

- ◆ Isolated-type power converter GSE-T series, container-type power converter GSE-C series and supporting auxiliary equipment.

## EV Charging Station with PV and ESS:



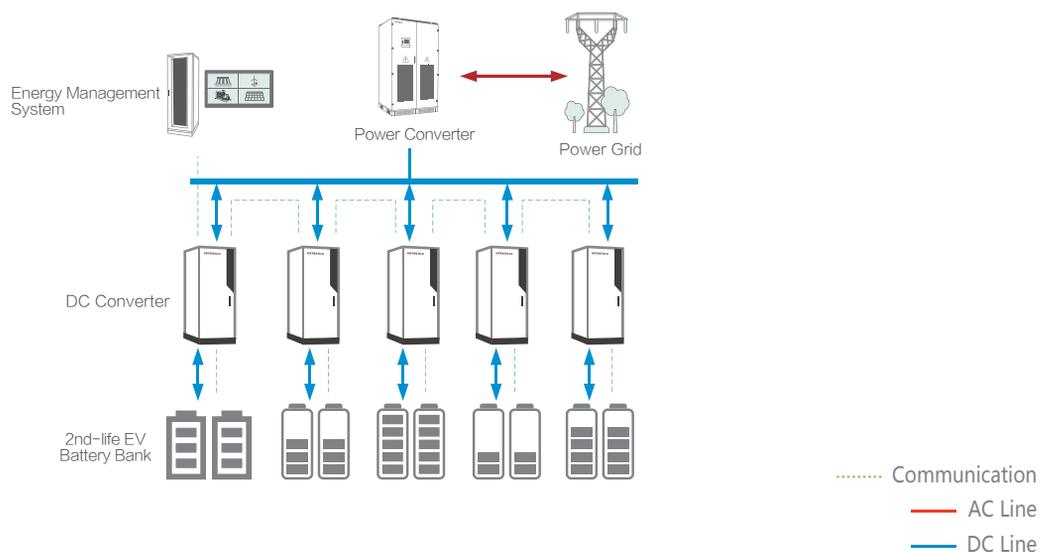
### Typical Products:

- ◆ Isolated-type power converters GSE-T series(50kW~500kW), container-type power converter GSE-C series and supporting auxiliary equipment.

# 2nd-life EV Battery Energy Storage Solution

## Multi-branch ESS Solution

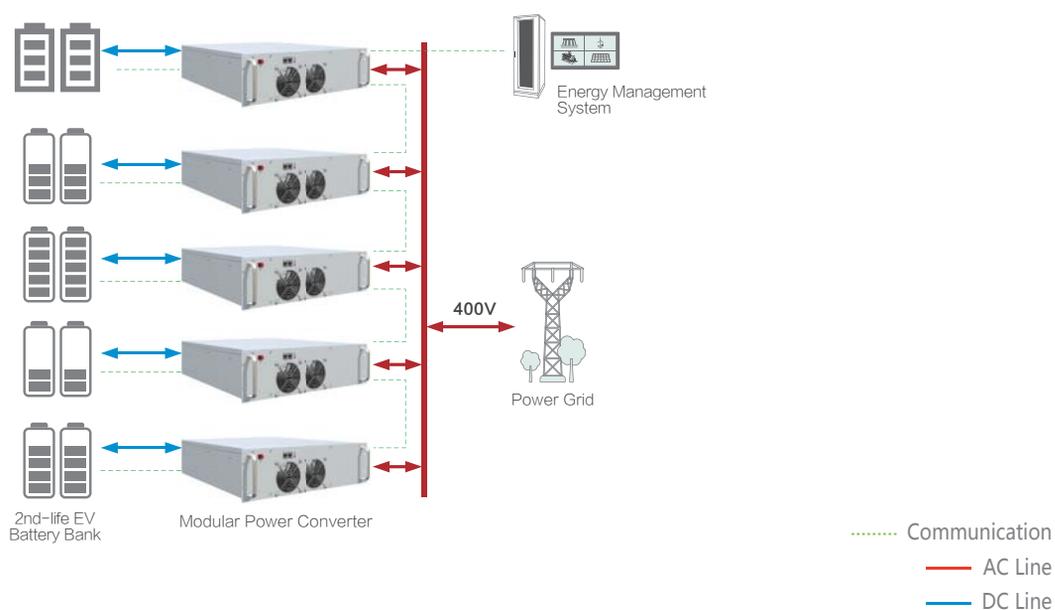
DC-coupled Solution:



Typical Products:

- ◆ Isolated-type power converter GSE-T series(50kW~500kW), container-type power converter GSE-C series, DC converter KDC50H series (50kW~300kW)and supporting auxiliary equipment.

AC-coupled Solution:

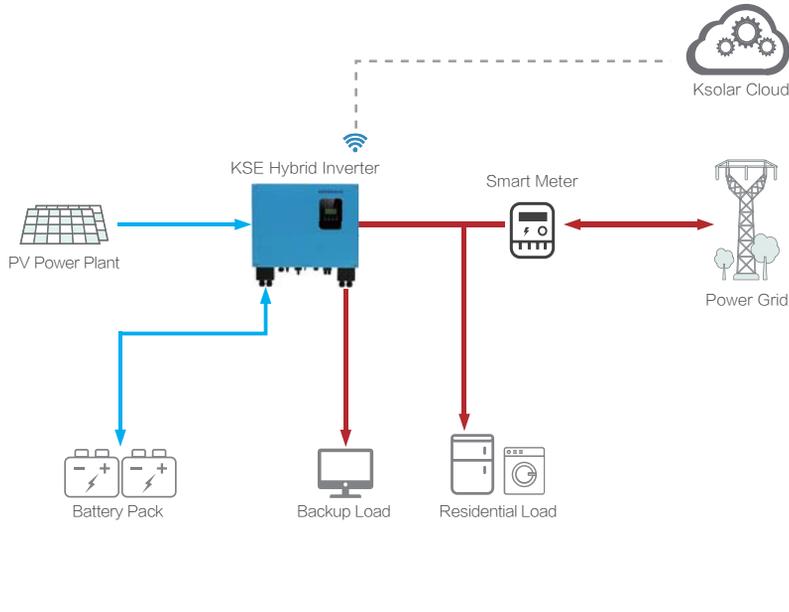


Typical Products:

- ◆ Modular power converter KSET50 series(50kW~600kW) and supporting auxiliary equipment.

# Micro-grid System Solution

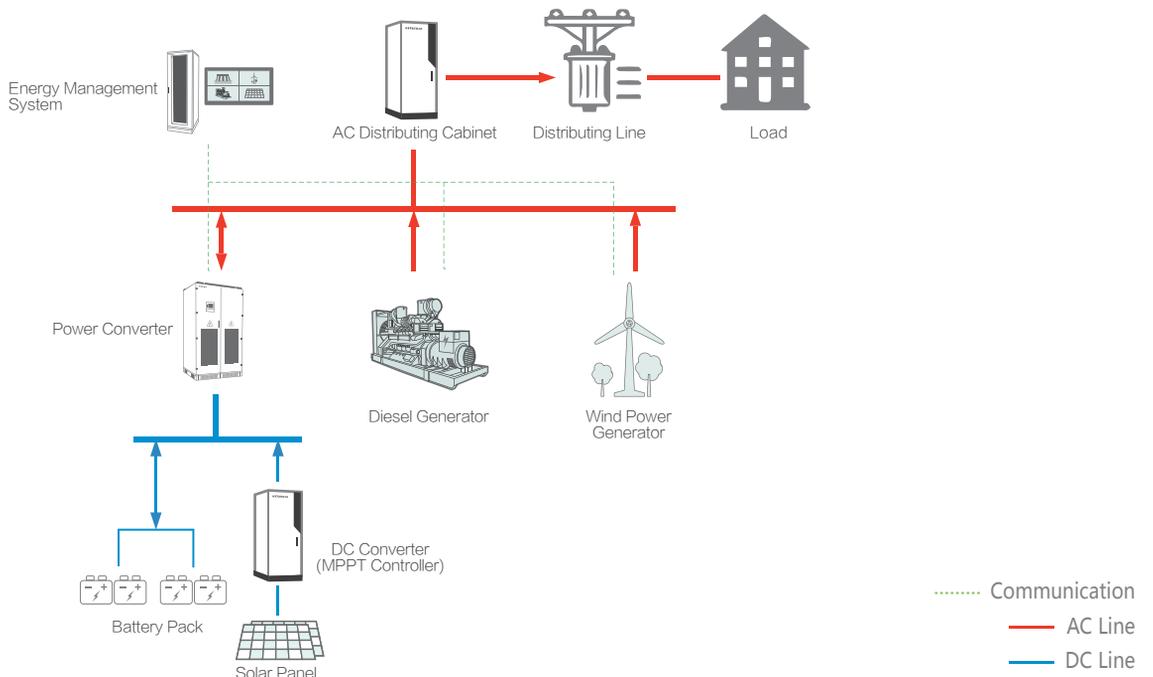
## Residential PV & Storage Solution



### Typical Products:

- ◆ Hybrid inverter KSE3.6K/4.6K/5K and supporting auxiliary equipment.

## Micro-grid System in Off-grid

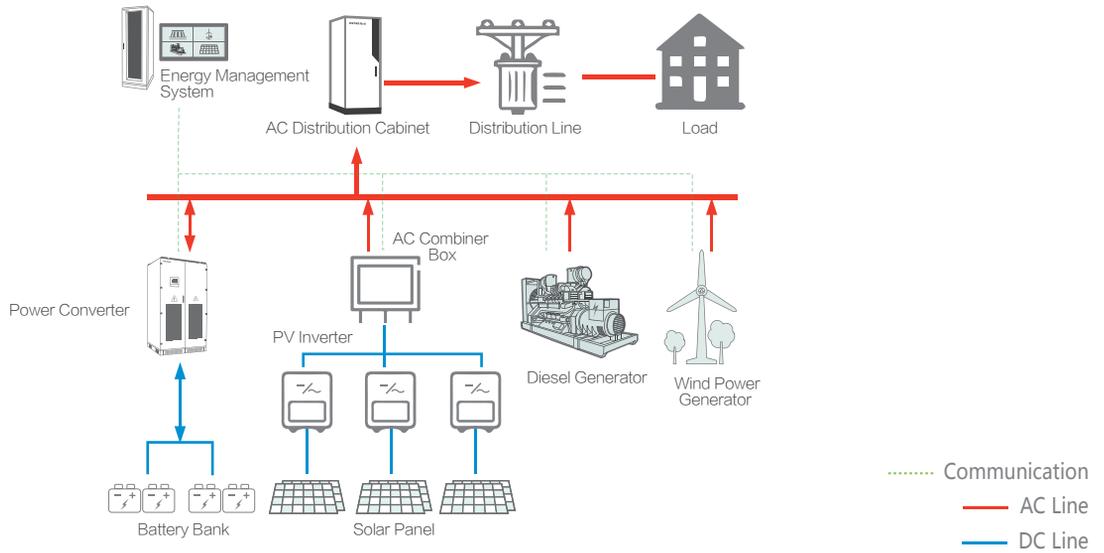


### Typical Products:

- ◆ Isolated-type power converter GSE-T series(50kW~500kW), container-type power converter GSE-C series, DC converter KDC50H (50kW~300kW)series and supporting auxiliary equipment.

# Micro-grid System Solution

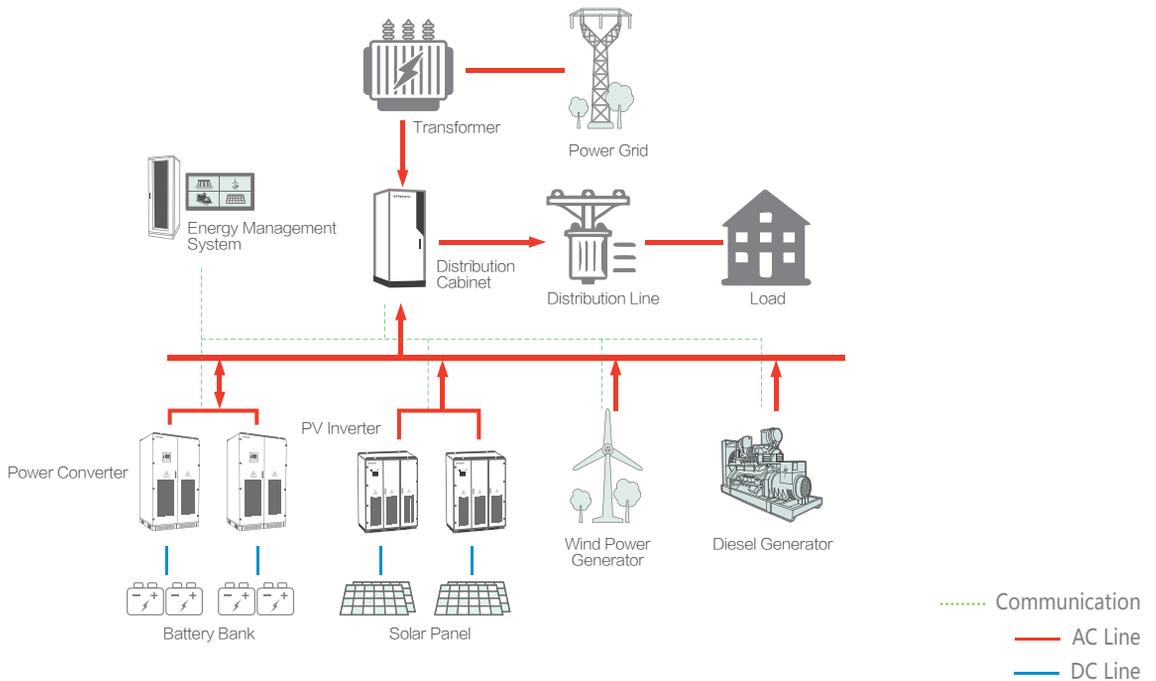
## Micro-grid System in AC Bus



### Typical Products:

- ◆ Isolated-type power converter GSE-T series(50kW~500kW), container-type energy storage converter GSE-C series, and supporting auxiliary equipment.

## Micro-grid System in On-grid



### Typical Products:

- ◆ Isolated-type power converter GSE-T series(50kW~500kW), container-type energy storage converter GSE-C series, and supporting auxiliary equipment.

# PRODUCTS



KSE Series  
Hybrid Inverter



GSE Series  
Power Converter



GSE-T Series  
Power Converter



KSET Series  
Modular Power Converter



KDC Series  
Modular DC Converter



Data Acquisition Controller



EMS Control Cabinet



EMS Cloud Platform



GSE-MV  
Turnkey Solution



KESS Series  
Integrated Storage System

# KSE Series Hybrid Inverter



## Easy I&M

- ◆ Wall mounted and rack installation (optional).
- ◆ Compact size, light weight, easy for installation on the site.
- ◆ For both new installation and renovation solar systems.



## Safe and Reliable

- ◆ Protection rating at IP65 (dust-proof and water-proof).
- ◆ Full automatic control, easy and simple operation.



## Friendly and Intelligent

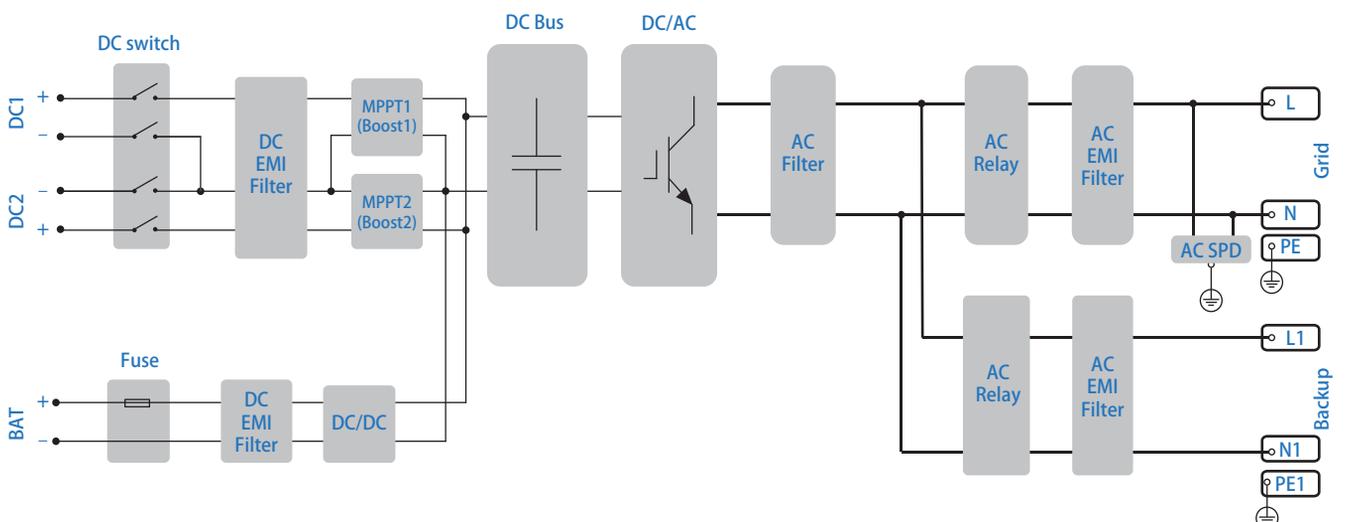
- ◆ Fast and easy commissioning via front panel LCD or App.
- ◆ Compatible with both lithium-ion and lead-acid batteries.
- ◆ Integrated advanced energy management system, battery usage strategies.



## Efficient Conversion

- ◆ Maximum efficiency: 97.6%.
- ◆ Ultra wide MPPT range: 120Vdc - 500Vdc.

## Circuit Diagram:



Model	KSE-2K-048S	KSE-3K-048S	KSE-3.6K-048S	KSE-5K-048S
<b>PV Input Data</b>				
Max. PV input power	2600W	3900W	4800W	6000W
Max. PV input voltage	550Vdc (*1)	550Vdc (*1)	550Vdc (*1)	550Vdc (*1)
MPPT voltage range	120~500Vdc	120~500Vdc	120~500Vdc	120~500Vdc
Rated input voltage	420Vdc	420Vdc	420Vdc	420Vdc
MPPT range for full load	236~500V	178~500V	219~500V	273~500V
No. of MPPTs	1	2	2	2
Max. PV input current	11A	11A*2	11A*2	11A*2
<b>AC Output Data(On-grid)</b>				
Rated output voltage	230Vac			
Output voltage range	150V~280V			
Output frequency range	50 / 60Hz (±5Hz)(adjustable)			
Max. current from utility grid	23A			
Max. apparent power from utility grid	5300VA			
Max. power output to utility grid	2000W	3000W	3680W	5000W(*2)
Max. current output to utility grid	9A	13.5A	16A	22A(*3)
AC output connection	L+N+PE, Transformerless			
Power factor (cos φ)	1(0.8 leading ~0.8 lagging) (adjustable)			
THDi	<3%			
<b>AC Output Data(Backup)</b>				
Rated output voltage	230Vac (Fluctuation range±2%)			
Rated output frequency	50/60Hz (Fluctuation range±0.2%)			
Rated output current	9A	13A		
Rated output power	2000W	3000W		
Max. output apparent power	2400VA	3300VA		
THDv	<2% (Linear load)			
Automatic switch time	<20ms			
<b>Battery Input</b>				
Battery type	Li-ion or lead-acid			
Rated battery voltage	48V			
Depth of discharging	Li-ion 90%DOD(10%~90% adjustable) / Lead-acid 50%DOD(10%~50% adjustable)			
Max. discharging current(*4)	65A			
Max. charging current(*5)	50A (5~50A adjustable)			
Max. discharging power	2200W	3200W		
Max. charging power	2000W	2500W		
<b>Efficiency</b>				
Max. conversion efficiency (from battery)	94.0%			
Max. conversion efficiency (from PV)	97.6%			
Euro efficiency	97.0%			
Protection function	Short Circuit Protection, AC Leakage Fault Protection, Grounding Fault Protection, Anti-islanding Protection, Overload Protection, Surge Protection, DC Polarity Protection			
<b>General</b>				
Cooling	Natural Convection			
DC switch	Optional			
Communication Interface	RS485/CAN2.0/WIFI			
Dimensions W x D x H (mm)	359x467x170			
Weight (Kg)	15	17		
Operating temperature range	-20 C ~+60 C (Rated Power@45 C )			
Humidity range	0~95% (No condensation)			
Altitude	≤2000m			
Protection	IP65			
<b>Certification &amp; Standard</b>				
Grid regulation	AS/NZS 4777.2, VDE-AR-N4105, VDE0126-1-1			
Safety regulation	IEC/EN 62109-1&2, IEC62040-1			
EMC	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4, EN61000-4-16, EN61000-4-18, EN61000-4-29			

\*1. Max. operating voltage is 530V .

\*2. It will be 4600W under the selection of VDE-AR-N4105 & VDE0126-1-1.

\*3. It will be 21.7A under the selection of AS 4777.2.

\*4. For Lead-acid batteries, the default discharging current limit is shown in the table, and Li-ion batteries discharging current is in accordance with BMS instructions, but not more than the value shown in the table.

\*5. For Lead-acid batteries, the default charging current is 0.1C. The default charging current can be set by APP as shown in the table, and the Li-ion batteries charging current is in accordance with BMS instructions, but not more than the value shown in the table.

# KSE Series Hybrid Inverter



## Easy I&M

- ◆ Wall mounted and rack installation (optional).
- ◆ Compact size, light weight, easy for installation on the site.
- ◆ For both new installation and renovation solar systems.



## Safe and Reliable

- ◆ Protection rating at IP65 (dust-proof and water-proof).
- ◆ Full automatic control, easy and simple operation.



## Friendly and Intelligent

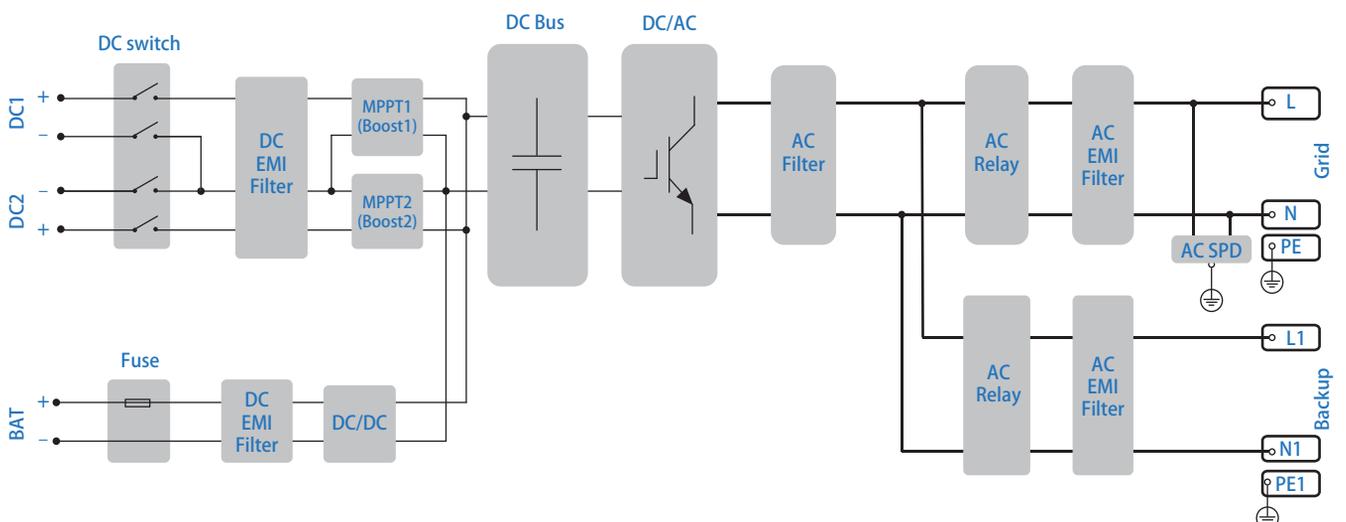
- ◆ Fast and easy commissioning via front panel LCD or App.
- ◆ Compatible with both lithium-ion and lead-acid batteries.
- ◆ Integrated advanced energy management system, battery usage strategies.



## Efficient Conversion

- ◆ Maximum efficiency: 97.6%.
- ◆ Ultra wide MPPT range: 120Vdc - 500Vdc.

## Circuit Diagram:



Model	KSE-3.6K-048	KSE-4.6K-048	KSE-5K-048
<b>PV Input Data</b>			
PV Max. power	4400W	6000W	6000W
Max. input voltage	550Vdc	550Vdc	550Vdc
MPPT voltage range	120~500Vdc	120~500Vdc	120~500Vdc
Nominal input voltage	420V	420V	420V
MPPT voltage range(for full-load)	184 ~ 500 V	230 ~ 500 V	230 ~ 500 V
No. of MPPTs	2	2	2
Max. PV input current	13A×2	13A×2	13A×2

<b>AC Output Data(On-grid)</b>			
Nominal AC output power	3680W	4600W	5000W
Max. AC output power	3680W	4600W	5000W
Nominal AC voltage	230Vac		
AC voltage range	180V~280V		
AC output type	L+N+PE, Transformerless (for solar)		
Grid frequency range	50 / 60Hz (±5Hz), Adjustable		
Max. output current	16A	20A	22A
Power factor	(cosΦ) 0.8 Leading ~0.8 Lagging		
THDi	<3 % (of nominal power)		

<b>AC Output Data(Backup)</b>			
Nominal output power	3680W	4600W	4600W
Nominal output voltage	230 (±2%)		
Nominal output frequency	50/60Hz (±0.2%)		
THDv	<2% (Linear Load)		
Transfer time	<10ms		
Over-load capacity	5520VA (150% 10s)	6900VA (150% 10s)	6900VA (150% 10s)

<b>Battery Data</b>	
Battery type	Li-ion battery / Lead-acid battery
Battery voltage range	40~58V
Battery AH	100~2000Ah
Depth Of Discharge	Li-ion 90%DOD(10%~90% adjustable) / Lead-acid 50%DOD(10%~50% adjustable)
Max. discharging current	100A
Max. charging current	80A(0~80A)

<b>Efficiency</b>	
Max. efficiency/Euro. efficiency	>97.6% / >97%

<b>General Data</b>	
Protection	Short circuit protection;AC leakage fault protection;Grounding fault protection;Anti-islanding protection;Overload protection;Surge protection;DC polarity protection;
Cooling method	Natural convection
DC switch (solar)	Optional
Communication	RS485, Wi-Fi , CAN, Ethernet ( Optional )

<b>Physical</b>			
Dimensions (W * D * H)mm	527x472x180		
Weight(kg)	25	25	26
Display	Graphic LCD		
Mounting method	Wall-mounting bracket		

<b>Environment</b>			
Operating temperature range	-20 C~+60 C (45 C in nominal power )		
Relative humidity range	0~95% (non-condensing)		
Operating altitude	≤2000m		
Noise emission	<35dB		
Ingress protection rating	IP65		
Certification	Safety I EC/EN62109-1,IEC/EN62109-2,VDE0126-1-1, VD E ARN4105,G83/59/EEG2012,AS3100/4777, CEI 0-21,etc, EMC EN61000-6-2,EN61000-6-3,EN61000-3-11,EN61000-3-1 2,etc		

# GSE Series Power Converter

## Non-isolated Type



### Battery Access Management

- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Charging of constant voltage with limited current in on-grid operation mode.
- ◆ Constant power charging and discharging control in on-grid operation mode.



### Grid Friendly

- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Stabilizing load voltage and frequency in off - grid mode.
- ◆ Adjusting the active and reactive power following dispatch order in on-grid mode.



### Safe and Reliable

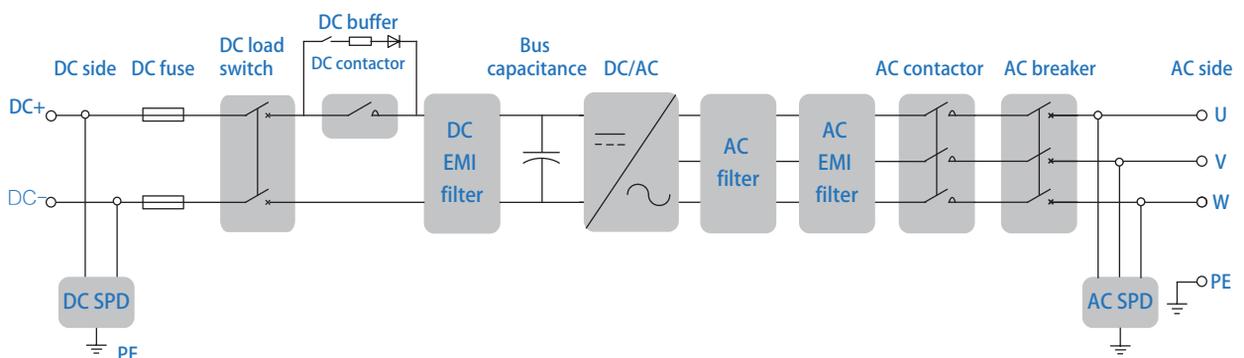
- ◆ Off-Grid independent operation, V/F control in off-grid operation.
- ◆ Effective forced air cooling, 1.1 overload capacity.
- ◆ Supporting multi-unit parallel connection function, expandable to MW power level.



### Easy I&M

- ◆ Modular design and components front accessible, easy for maintenance.
- ◆ High reliability power module design of main power loop.

## Circuit Diagram:



Model	GSE0500	GSE0630
<b>DC side</b>		
Max. DC voltage	1000V	1000V
DC voltage range for nominal power	500~850Vdc	600~850Vdc
Max. DC current	1117A	1173A
Auto-buffer function	Yes	Yes

<b>AC side (Grid)</b>		
AC output power	500 kW	630 kW
Max. AC power	550 kVA	690 kVA
Max. AC current	1008A	1111A
Nominal AC voltage	315Vac/400Vac, 3W+PE	360Vac/400Vac, 3W+PE
AC voltage range	315Vac/400Vac, (-20%~+15%)	360Vac/400Vac, (-20%~+15%)
Nominal grid frequency(Grid frequency range)	50 / 60Hz (±2Hz)	
AC current THD	<3%	
Power factor at nominal power/ Adjustable power factor	>0.99/1 Leading ~1 Lagging	
Adjustable reactive power	-100%~100%	

<b>AC side (Off-Grid)</b>		
Nominal AC voltage	315Vac/400Vac	360Vac/400Vac
AC voltage range	315Vac/400Vac, (-20%~+15%)	360Vac/400Vac, (-20%~+15%)
AC voltage THD	<3%(Linear load)	
Unbalance load capacity	100%	
Over-load capacity	110%~normal operation, 120%~1min	

<b>Efficiency</b>		
Max. efficiency	>98.5%	

<b>Protection</b>		
Over voltage protection	DC Type II / AC Type II	
Grid monitoring/Ground fault monitoring/Insulation monitoring	Yes/Yes/Yes	
Overheat protection	Yes	

<b>General Data</b>		
Dimensions (W * D * H)mm	1200x800x2000	
Weight(kg)	770kg	830kg
Isolation method	Transformerless	
Charge and discharge switching time	<40ms	
Ingress protection rating	IP21	
Operating ambient temperature range	-30~+55 ℃	
Relative humidity range	0~95% (no condensation)	
Cooling method	Intelligent forced air cooling	
Max. operating altitude	5000m (>3000m derating)	
Display	Touch screen	
Communication	RS485 / CAN 2.0 (to BMS), RS485 / Ethernet (to EMS)	
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control	

# GSE Series Power Converter

## 1500V Power Conversion System



### Battery Access Management

- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Constant power charging and discharging control in on-grid operation mode.
- ◆ Charging of constant voltage with limited current in on-grid operation mode.



### Safe and Reliable

- ◆ Off-Grid independent operation, V/F control in off-grid operation.
- ◆ Supporting multi-unit parallel connection function, expandable to MW power level.



### Grid Friendly

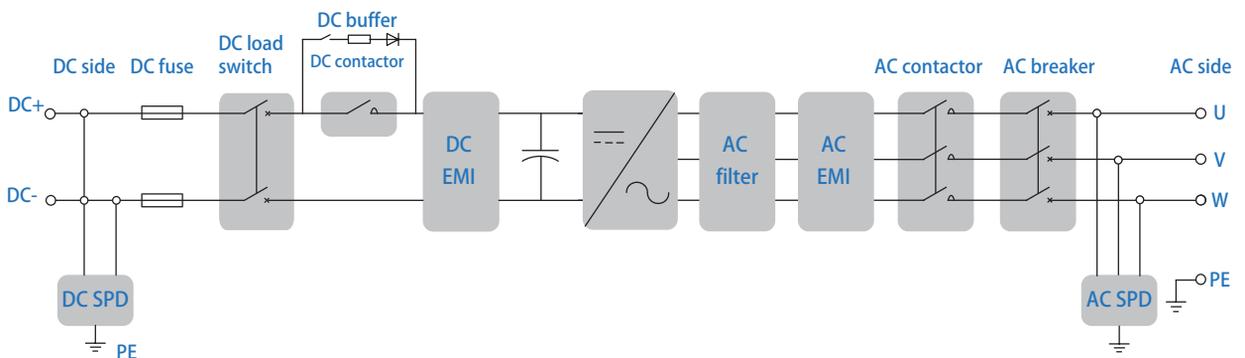
- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Stabilizing load voltage and frequency in off - grid mode.
- ◆ Adjusting the active and reactive power following dispatch order in on-grid mode.



### Easy I&M

- ◆ Modular design and components front accessible, easy for maintenance.
- ◆ High reliability power module design of main power loop.

## Circuit Diagram:



Model	GSE1250
<b>DC side</b>	
Max. DC voltage	1500V
DC voltage range for nominal power	800~1500Vdc
Max. DC current	1744A
Auto-buffer function	Yes
<b>AC side (Grid)</b>	
AC output power	1250 kW
Max. AC power	1375 kVA
Nominal AC current /Max. AC current	1312A/1443A
Nominal AC voltage	550Vac, 3W+PE
AC voltage range	550Vac, (-15%~+15%)
Nominal grid frequency(Grid frequency range)	50 / 60Hz (±2Hz)
AC current THD	<3%
Power factor at nominal power/ Adjustable power factor	>0.99/1 Leading ~1 Lagging
Adjustable reactive power	-100%~100%
<b>AC side (Off-Grid)</b>	
Nominal AC voltage	550Vac
AC voltage range	550Vac, (-15%~+15%)
AC voltage THD	<1%(Linear load)
Unbalance load capacity	<100%
Over-load capacity	110%~normal operation, 120%~1min
<b>Efficiency</b>	
Max. efficiency	>99%
<b>Protection</b>	
Over voltage protection	DC Type II / AC Type II
Grid monitoring/Ground fault monitoring/Insulation monitoring	Yes/Yes/Yes
Overheat protection	Yes
<b>General Data</b>	
Dimensions (W * D * H)mm	1600x750x2100
Weight(kg)	1500kg
Isolation method	Transformerless
Charge and discharge switching time	<40ms
Ingress protection rating	IP21
Operating ambient temperature range	-30~+55 C
Relative humidity range	0~95% (no condensation)
Cooling method	Intelligent forced air cooling
Max. operating altitude	4000m (>2000m derating)
Display	7"Touch screen
Communication	RS485 / CAN 2.0 (to BMS), RS485 / Ethernet (to EMS)
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control

# GSE-T Series Power Converter

## Isolated Type



### Battery Access Management

- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Constant power charging and discharging control in on-grid operation mode.
- ◆ Charging of constant voltage with limited current in on-grid operation mode.



### Safe and Reliable

- ◆ Off-Grid independent operation, V/F control in off-grid operation.
- ◆ Effective forced air cooling, 1.1 overload capacity.
- ◆ Supporting AC side short-circuit operation mode.



### Grid Friendly

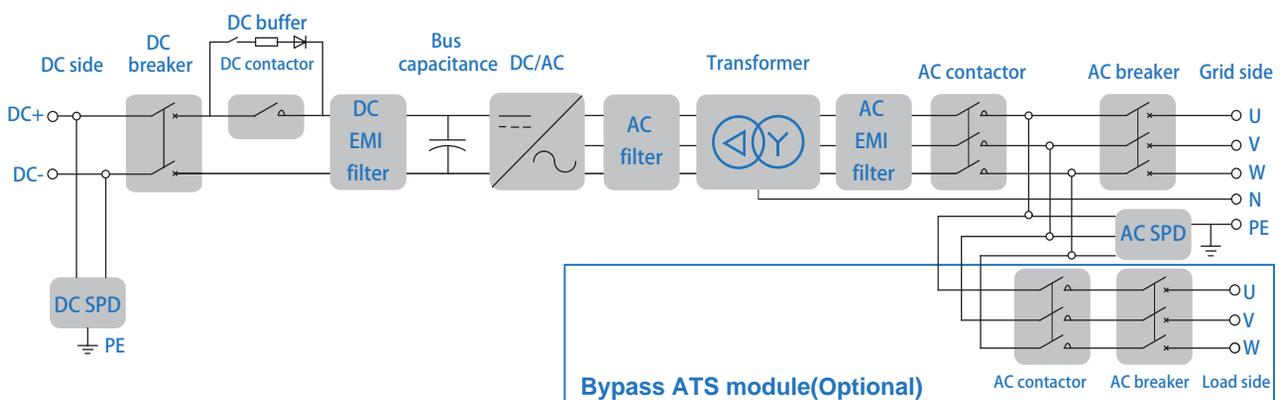
- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Adjusting the active and reactive power following dispatch order in on-grid mode.
- ◆ Stabilizing load voltage and frequency in off - grid mode.



### Easy I&M

- ◆ Modular design and components front accessible, easy for maintenance.
- ◆ High reliability power module design of main power loop.
- ◆ Optional for ATS function bypass module.

## Circuit Diagram:



Model	GSE0050T	GSE0100T	GSE0150T	GSE0250T	GSE0500T
<b>DC side</b>					
Max. DC voltage	1000V				
DC voltage range for nominal power	400~850Vdc		500~850Vdc		
Max. DC current	142A	283A	340A	565A	1128A
Auto-buffer function	Yes				
<b>AC side (Grid)</b>					
AC output power	50 kW	100 kW	150 kW	250 kW	500 kW
Max. AC power	55 kVA	110 kVA	165 kVA	275 kVA	550 kVA
Nominal AC current /Max. AC current	80A	160A	240A	400A	794A
Nominal AC voltage	400Vac, 3W+N+PE				
AC voltage range	400Vac, (-20%~+15%)				
Nominal grid frequency(Grid frequency range)	50 / 60Hz (±2Hz)				
AC current THD	<3%				
Power factor at nominal power/ Adjustable power factor	>0.99/1 Leading ~ 1 Lagging				
Adjustable reactive power	-100%~100%				
<b>AC side (Off-Grid)</b>					
Nominal AC voltage	400Vac, 3W+N+PE				
AC voltage range	400Vac, (-20%~+15%)				
AC voltage THD	<3%(Linear load)				
Unbalance load capacity	100%				
Over-load capacity	110%~normal operation, 120%~1min				
<b>Efficiency</b>					
Max. efficiency	>96.8%	>97.1%	>97.2%	>97.3%	>97.5%
<b>Protection</b>					
Over voltage protection	DC Type II / AC Type II				
Grid monitoring/Ground fault monitoring/Insulation monitoring	Yes/Yes/Yes				
Overheat protection	Yes				
<b>General Data</b>					
Dimensions (W * D * H)mm	750x700x1850	800x935x2000		1200x935x2000	1600x935x2000
Weight(kg)	550kg	850kg	930kg	930kg	2200kg
Charge and discharge switching time	<40ms				
Ingress protection rating	IP21				
Operating ambient temperature range	-30~+55 °C				
Relative humidity range	0~95% (no condensation)				
Cooling method	Intelligent forced air cooling				
Max. operating altitude	5000m (>3000m derating)				
Display	Touch screen				
Communication	RS485 / CAN 2.0 (to BMS), RS485 / Ethernet (to EMS)				
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control				
Isolation method	Transformer				
Bypass ATS module	Optional				No

\*If bypass ATS function is selected in the device, the corresponding model suffix is TS.

# KSET Series Modular Power Converter

## KSET50 Modular Power Converter



KSET0150F

KSET0300F

KSET0600F



### Battery Access Management

- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Constant power charging and discharging control in on-grid operation mode.
- ◆ Charging of constant voltage with limited current in on-grid operation mode.



### Flexible and Efficient

- ◆ Bidirectional power conversion system with full four-quadrant operation.
- ◆ High switching frequency, Low current ripple and high voltage quality.
- ◆ Max. efficiency up to 98.7%.



### Safe and Reliable

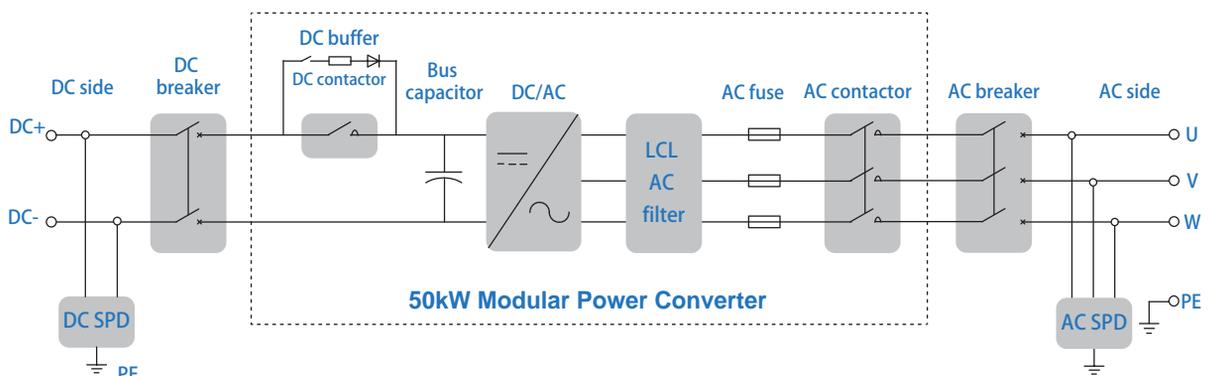
- ◆ Supporting CAN, 485 communication interface with BMS and EMS.
- ◆ Effective forced air cooling, 1.1 overload capacity.
- ◆ High reliability power module design of main power loop.



### Grid Friendly

- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Adjusting the active and reactive power following dispatching instruction in on-grid mode.

## Circuit Diagram:



System Model	KSET0150F	KSET0300F	KSET0600F
Module Model	KSET50		
Max. number of module	3	6	12

DC side			
Max. DC voltage	1000V		
DC voltage range	600~850Vdc		
Max. DC current	100A*3	100A*6	100A*12

AC side (Grid)			
AC output power	50 kW*3	50 kW*3	50 kW*12
Max. AC power	55 kVA*3	55 kVA*6	55 kVA*12
Max. AC current	80A*3	80A*6	80A*12
Nominal AC voltage	400Vac, 3W+PE		
AC voltage range	400Vac, (-20%~+15%)		
Nominal grid frequency(Grid frequency range)	50 / 60Hz (±2Hz)		
AC current THD	<3%		
Power factor at nominal power/ Adjustable power factor	>0.99 /1 Leading ~ 1 Lagging		
Adjustable reactive power	-100%~100%		

AC side (Off-Grid)	
Nominal AC voltage	400Vac, 3W+PE
AC voltage range	400Vac, (-20%~+15%)
AC voltage THD	<3%(Linear load)
Over-load capacity	110%~normal operation, 120%~1min

Efficiency	
Max. efficiency	>98.7%

Protection	
Over voltage protection	DC Type II / AC Type II
Grid monitoring/Ground fault monitoring/Insulation monitoring	Yes/Yes/Yes
Overheat protection	Yes

General Data			
Module Dimensions (W * D * H)mm	483x550x133		
Module Weight(kg)	26		
Cabinet Dimensions (W * D * H)mm	600x700x1200	600x730x2000	1200x700x2200
Cabinet Weight(kg)	85	160	260
Isolation method	Transformerless		
Charge and discharge switching time	<40ms		
Max. number of parallel module	20		
Ingress protection rating	IP21		
Operating ambient temperature range	-30~+55 C		
Relative humidity range	0~95% (no condensation)		
Cooling method	Intelligent forced air cooling		
Max. operating altitude	4000m (>3000m derating)		
Display	7"Touch screen		
Communication	RS485 / CAN / Ethernet		
Grid support	L/HVRT, L/HFRT		

# KDC Series Modular DC Converter

## KDC50H Modular DC Converter



KDC0150F



KDC0300F



### Advanced Technology

- ◆ Advanced parallel expansion technology, single /parallel system compatible.
- ◆ Modular design and components front accessible, easy for maintenance.
- ◆ Supporting MPPT operation mode.



### Safe and Reliable

- ◆ Supporting CAN, 485 communication interface with BMS and EMS.
- ◆ Effective forced air cooling, 1.1 overload capacity.
- ◆ High reliability power module design of main power loop.



### Flexible and Efficient

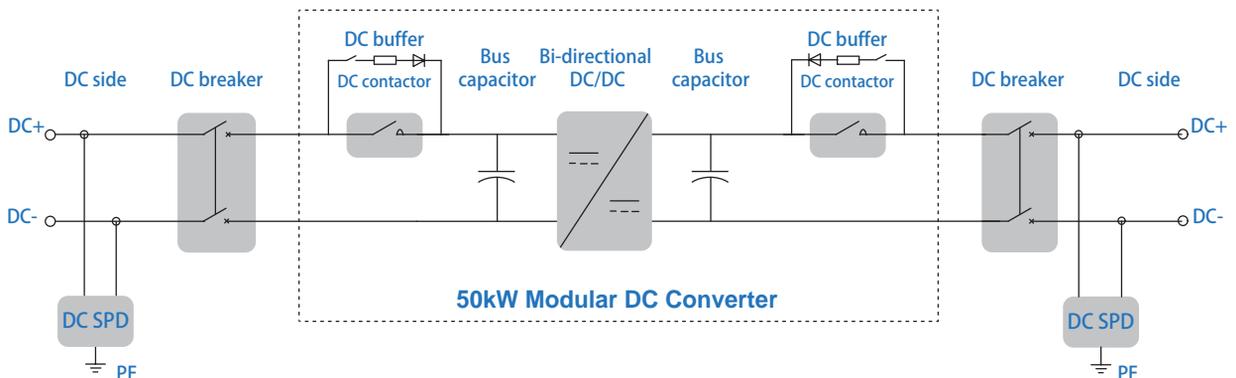
- ◆ Bi-directional energy flow, charge and discharge energy storage devices with one unit.
- ◆ Max. efficiency up to 99%.



### Battery Access Management

- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Constant power charging and discharging control.

## Circuit Diagram:



System Model	KDC0150F	KDC0300F
Module Model	KDC50H	
Max. number of module	3	6

Power Data		
Max. Input voltage	1100V	
DC voltage range for nominal power	450~1000Vdc	
Max. DC current	110A*3	110A*6
Nominal input power	50 kW*3	50 kW*6
Max. input power	55 kW*3	55 kW*6

Battery Data		
Max. DC voltage	1100V	
Battery voltage range for nominal power	450~1000Vac	
Max. DC current	110A*3	110A*6

Efficiency	
Max. efficiency	99%

Protection	
Bi-directional overvoltage protection	Yes
Bi-directional overcurrent protection	Yes
Bi-directional surge protection	Yes

System Data	
Voltage accuracy	1%
Current accuracy	1%
Max. number of parallel module	20
Hot-pluggable module	Yes
MPPT operation	Yes

General Data		
Module Dimensions (W * D * H)mm	483x550x133	
Module Weight(kg)	27.5	
Cabinet Dimensions (W * D * H)mm	600x725x1500	600x725x2000
Cabinet Weight(kg)	250	430
Charge and discharge switching time	<40ms	
Ingress protection rating	IP21	
Operating ambient temperature range	-30~+55 °C	
Relative humidity range	0~95% (no condensation)	
Cooling method	Intelligent forced air cooling	
Max. operating altitude	5000m (>3000m derating)	
Display	7" Touch screen	
Communication	RS485 / CAN / Ethernet	

# Energy Management System

## Data Acquisition Controller



### Product Features:

- ◆ Key information collection of PCS and battery system.
- ◆ Status collection of air conditioning, fire fighting and other peripheral equipment.
- ◆ Power distribution, fault warning and logic management under internal operation of the system.
- ◆ Provide data acquisition and control interface for third party EMS controller.

## Technical Specification

Specification	
Power supply	12V/2A
Ethernet port	10M/100M/1000M
4G wireless communication	Reserved 4G module expansion function
RS485	12 interfaces,with transceiver indicators and isolation device
RS232 serial port	1 interface for debugging only
Interface for SD card	Maximum supporting 32G bytes of storage, for the program of upgrading and saving
CAN	Reserved
AI	Reserved
DI/DO	Reserved,able to scale out
Operation system	Linux
Real-time clock	Supporting
IP rating	IP20
Operating ambient temperature range	-40 C ~+85 C
Dimensions (W*H*D)mm	440*2250*44mm,19-inch standard rack (1U)
Mounting method	Rack-mounted
Weight(kg)	3KG
Application	Micro-grid energy management system, peak-valley arbitrage, smooth new energy output, frequency and peak modulation

# Energy Management System

## EMS Control Cabinet



### Product Features:

- ◆ Time-division control ,data cloud intelligence analysis.
- ◆ Multiple complementary micro grid management.
- ◆ Multi-terminal access.
- ◆ Flexible energy management models (TOU,PDS, Frequency modulation,EPS,)

## Technical Specification

Electrical Data	
Input power	220Vac (single phase)
Output voltage of UPS	220Vac (single phase)
Capacity of UPS	2000VA / 1600W
Configuration Data	
Communication interface	Ethernet / Optical fiber
Ethernet configuration	10M/100M/1000M Network switch
Acquisition interface	RS485/RJ45
Reserved interface	CAN/4G communication/ AI
No. of RS485 interface	12 (isolation type)
No. of DI	16
No. of DO	16
Operation system	Linux
IP rating	IP20
Relative humidity range	0~95% (no condensation)
Display	7" touch screen
Protection class	CLASS I
Weight(kg)	60
Dimensions (W*H*D)mm	600*1500*600

# Energy Management System

## EMS Cloud Platform



### Friendly human interaction interface:

- ◆ Combined with comprehensive data acquisition and monitoring system functions.

### 24/7 real-time monitoring:

- ◆ Seamless accessing to the scheduling center, and receiving scheduling command.
- ◆ Realizing friendly data transmission between BMS and PCS devices.
- ◆ Real-time response fault alarm function.

### Flexible application scenarios:

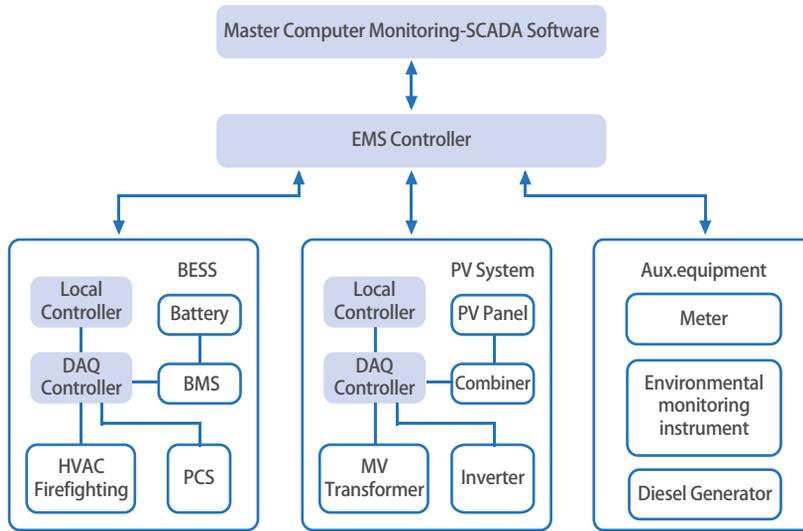
- ◆ Advanced control strategy to realize peak and frequency modulation, peak and valley arbitrage, demand management, etc.

## Function Presentation:

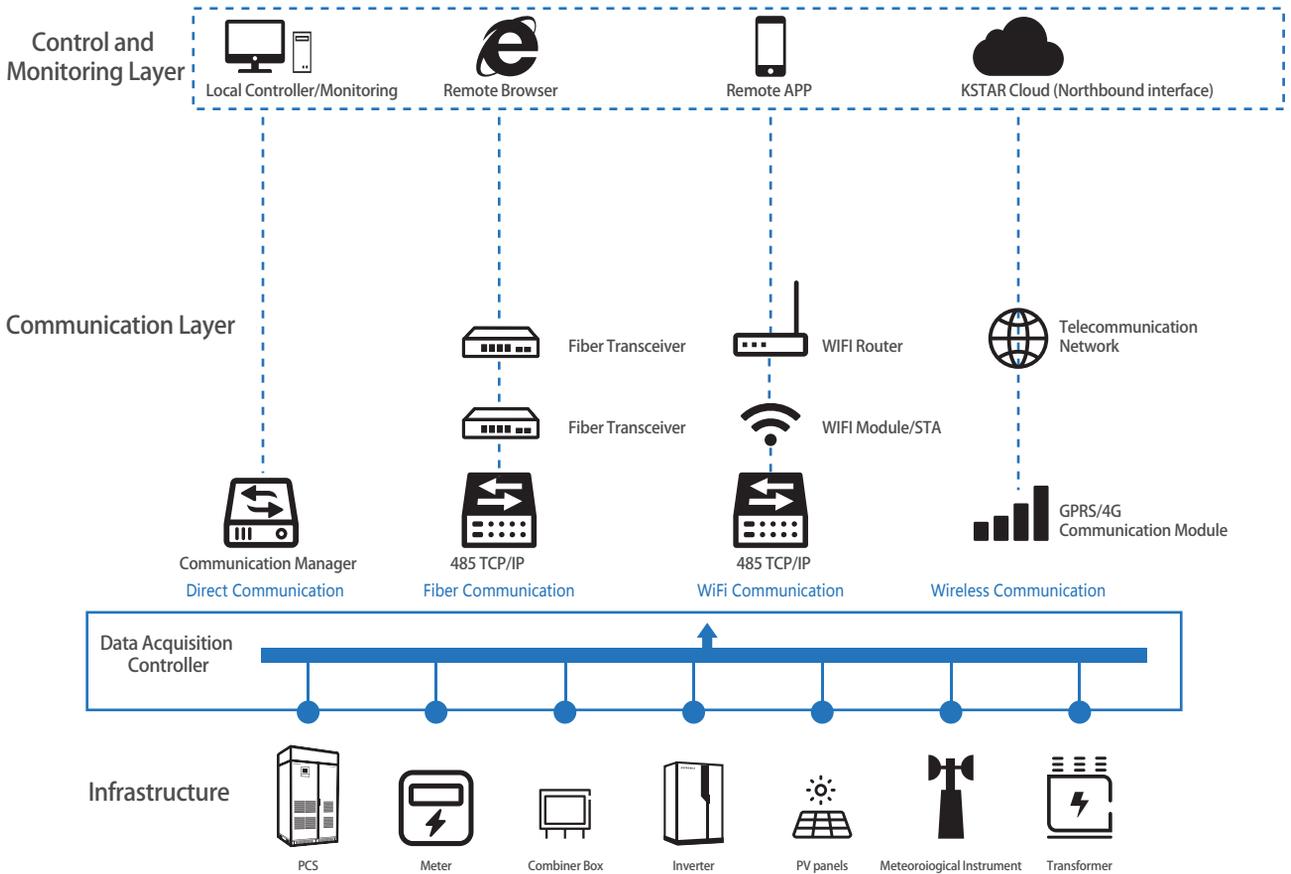
Platform Function	Detailed Presentation
Operation data acquisition and monitoring	EMS local controller collects the real-time information (i.e. PCS, BMS, transformer monitoring and control device), and the processed data (i.e. real-time values, historical statistics, trends, alarm events, etc.) can be displayed and forwarded in the monitoring screen, and saved to the historical data server.
Independent SOC control	When EMS cannot control operation of energy storage battery, PCS control charging and discharging of energy storage battery independently to keep SOC within reasonable range.
Smooth Output	Generation side - EMS control the charge and discharge of BESS or the output of other power generation to smooth power output by real-time monitoring of power generation User side - EMS control the charge and discharge of BESS to achieve peak shifting by real-time monitoring of power consumption.
Time-of-use price	EMS control the battery energy storage to perform different charging and discharging strategies at different time of use price, so that the user can realize peak-valley arbitrage.
Power distribution control	In the on-grid mode, EMS follows power grid dispatching orders and data acquisition(i.e. current SOC, SOH, charging and discharging state, and alarm data) to implement power distribution control.
Anti-power reversal control	when the microgrid access to power grid, EMS ensures the micro grid to meet load electricity consumption by increasing the energy storage charging power or reducing power generation output.
Power security boundary control	Due to the sudden load fluctuation in the micro-grid system (i.e. solar, wind), the system adopts emergency control measures to increase/decrease the system output to make it return to the safe operating range.

# Energy Management System

## Energy Management System



## Data Acquisition and Communication Structure



# GSE-MV Series Turnkey Solution



## Battery Access Management

- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Constant power charging and discharging control in on-grid operation mode.
- ◆ Charging of constant voltage with limited current in on-grid operation mode.



## Grid Friendly

- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Adjusting the active and reactive power following dispatching instruction in on-grid mode.
- ◆ Grid support including L /HVRT, black start, specified power factor control and reactive power support.



## Safe and Reliable

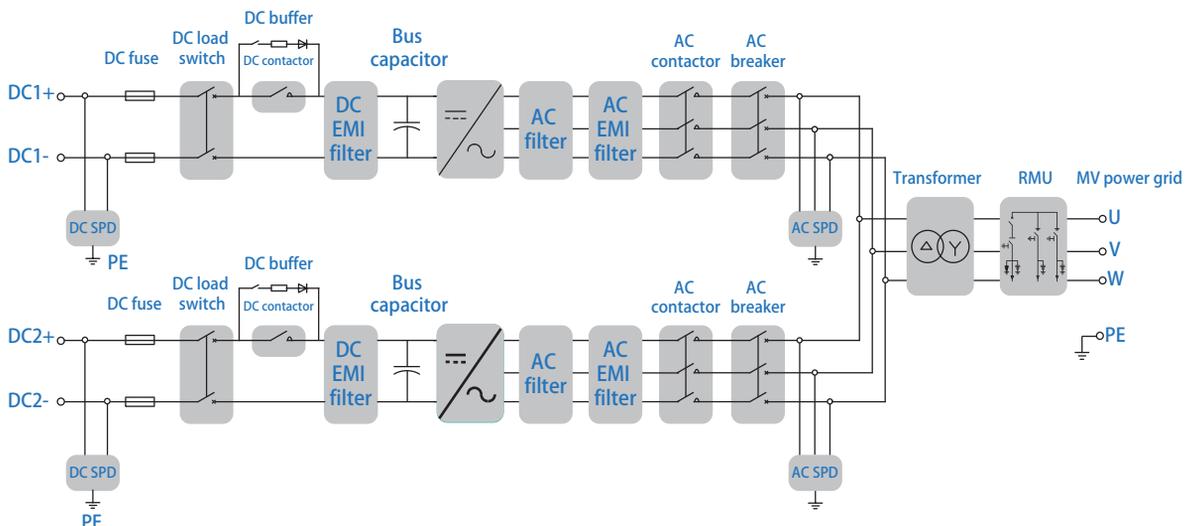
- ◆ Protection rating of IP54, suitable for extreme outdoor environment.
- ◆ Effective forced air cooling, 1.1 overload capacity.
- ◆ Supporting CAN, 485 communication interface with BMS and EMS.



## Highly Integrated

- ◆ Integrated converter, step-up transformer (10kV/35kV), with lower system losses.
- ◆ All-in-one design, easy for transportation, installation and maintenance.

## Circuit Diagram:



Model	GSE1000-MV	GSE1250-MV	GSE2000-MV	GSE2500-MV
<b>DC side</b>				
Max. DC voltage	1000V			
DC voltage range for nominal power	500~850Vdc	600~850Vdc	500~850Vdc	600~850Vdc
Max. DC current	1117A*2	1173A*2	1117A*4	1173A*4
No. of DC input	2	2	4	4
<b>AC side (On-Grid)</b>				
AC output power	500 kW*2	630 kW*2	500 kW*4	630 kW*4
Max. AC power	550 kVA*2	690 kVA*2	550 kVA*4	690 kVA*4
Max. AC current	1008A*2	1111A*2	1008A*4	1111A*4
Nominal AC voltage	10~35 kV			
Nominal grid frequency(Grid frequency range)	50/60Hz (±2Hz)			
AC current THD	<3%			
Adjustable power factor	>0.99(at nominal power)/1 leading-1 lagging			
Feed-in phases / Connection phases	3/3			
<b>AC side (Off-Grid)</b>				
PCS Nominal AC voltage	315Vac/400Vac	360Vac/400Vac	315Vac/400Vac	360Vac/400Vac
PCS AC voltage range	315Vac/400Vac (-20%~+15%)	360Vac/400Vac (-20%~+15%)	315Vac/400Vac (-20%~+15%)	360Vac/400Vac (-20%~+15%)
Nominal grid frequency (Grid frequency range)	50/60Hz (±2Hz)			
Unbalance load capacity	100%			
Over-load capacity	110% (long-term operation)			
<b>Transformer</b>				
Transformer rated power	1000 kVA	1250 kVA	2000 kVA	2500 kVA
Transformer Max. power	1100 kVA	1375 kVA	2200 kVA	2700 kVA
MV voltage	10~35kV			
Transformer type	Oil-filled or dry type (optional)			
<b>Efficiency</b>				
PCS Max. efficiency	>98.5%			
<b>Protection</b>				
Insulation monitoring	Yes			
Grid monitoring/Ground fault monitoring	Yes			
Overheat protection	Yes			
<b>General Data</b>				
Dimensions (W * D * H)mm	4800x2438x2896		6058x2438x2896	
Weight(kg)	About 10T		About 13T	
Ingress protection rating	IP54			
Operating ambient temperature range	-30~+55 °C			
Relative humidity range	0~95% (no condensation)			
Cooling method	Intelligent forced air cooling			
Max. operating altitude	2000m			
Display	Touch screen			
Communication	MODBUS-RTU/MODBUS-TCP/IEC 104			
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control			

# GSE-MV Series Turnkey Solution

## GSE5000-MV



### Highly Integrated

- ◆ Integrated converter, step-up transformer (10kV/35kV), with lower system losses.
- ◆ All-in-one design, easy for transportation, installation and maintenance.
- ◆ Integrated with DAQ controller, HVAC and Firefighting system to enable unified communication, ensure system safety and maximize system efficiency.



### Safe and Reliable

- ◆ Protection rating of IP54, suitable for extreme outdoor environment.
- ◆ Effective forced air cooling, 1.1 overload capacity.
- ◆ Supporting CAN, 485 communication interface with BMS and EMS.



### Battery Access Management

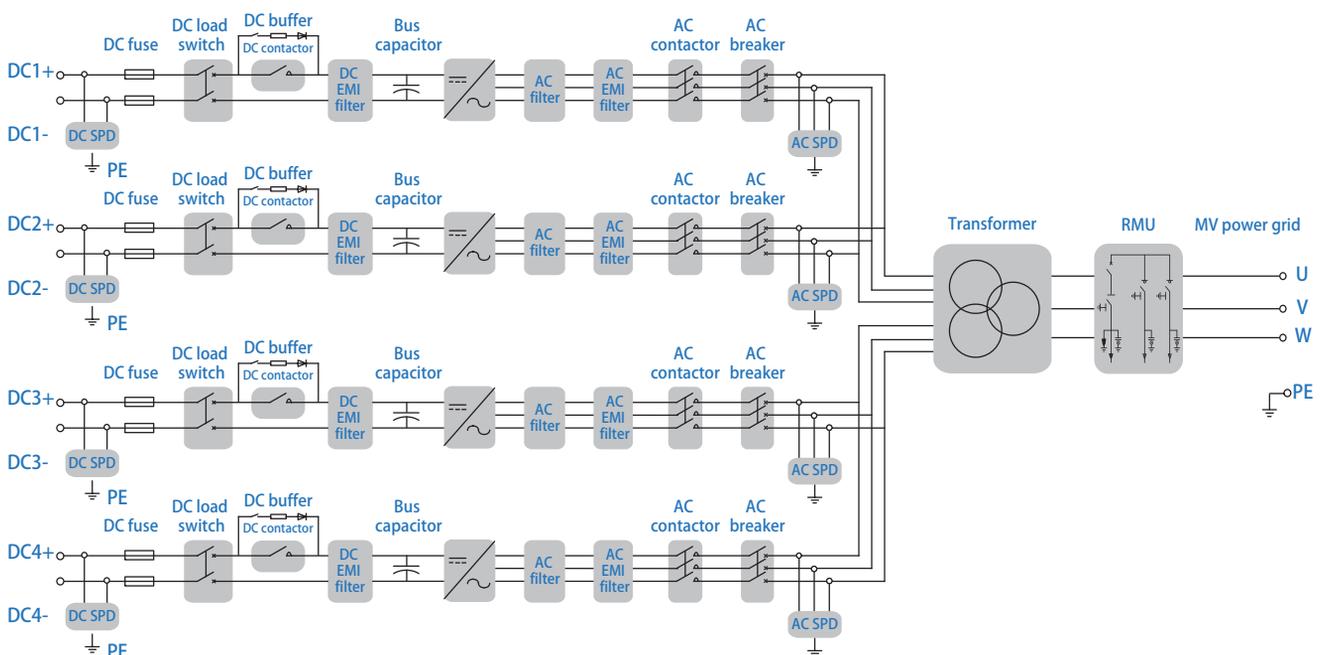
- ◆ Wide DC voltage operation range, flexible for battery configuration.
- ◆ Constant power charging and discharging control in on-grid operation mode.



### Grid Friendly

- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Adjusting the active and reactive power following dispatching instruction in on-grid mode.

## Circuit Diagram:



Model	GSE5000-MV
<b>DC side</b>	
Max. DC voltage	1500V
DC voltage range for nominal power	800~1500Vdc
Max. DC current	1744A*4
No. of DC input	4

<b>AC side (PCS)</b>	
AC output power	1250 kW*4
Max. AC power	5500 kVA
Max. AC current	1443A*4
Nominal AC voltage	550V
Nominal grid frequency(Grid frequency range)	50/60Hz (±2Hz)
AC current THD	<3%
Adjustable power factor	>0.99(at nominal power)/1 leading-1 lagging
Feed-in phases / Connection phases	3/3

<b>Transformer</b>	
Transformer rated power	5000 kVA
Transformer Max. power	5500 kVA
LV/MV voltage	0.55kV / 33kV
Transformer type	Oil-filled or dry type (optional)

<b>Efficiency</b>	
PCS Max. efficiency	>98.5%

<b>Protection</b>	
Insulation monitoring	Yes
Grid monitoring/Ground fault monitoring	Yes
Overheat protection	Yes

<b>General Data</b>	
Dimensions (W * D * H)mm	12192x2438x2896
Weight(kg)	About 31T
Ingress protection rating	IP54
Operating ambient temperature range	-30~+55 °C
Relative humidity range	0~95% (no condensation)
Cooling method	Intelligent forced air cooling
Max. operating altitude	4000m(>2000m derating)
Display	Touch screen
Communication	MODBUS-RTU/MODBUS-TCP/IEC 104
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control

# KESS Series Integrated Storage System



## Flexible and Efficient

- ◆ Intelligent temperature control at the cell level to improve system efficiency and battery cycle life.
- ◆ Modular parallel design, automatic balance management, easy for system expansion and overall control.
- ◆ Wide DC voltage operation range, flexible for battery configuration.



## Safe and Reliable

- ◆ Three-level BMS system monitoring, fully guarantee the safety of battery system.
- ◆ Supporting local and remote monitoring.
- ◆ Efficient vector control algorithm to realize decoupling control of active and reactive power.



## Grid Friendly

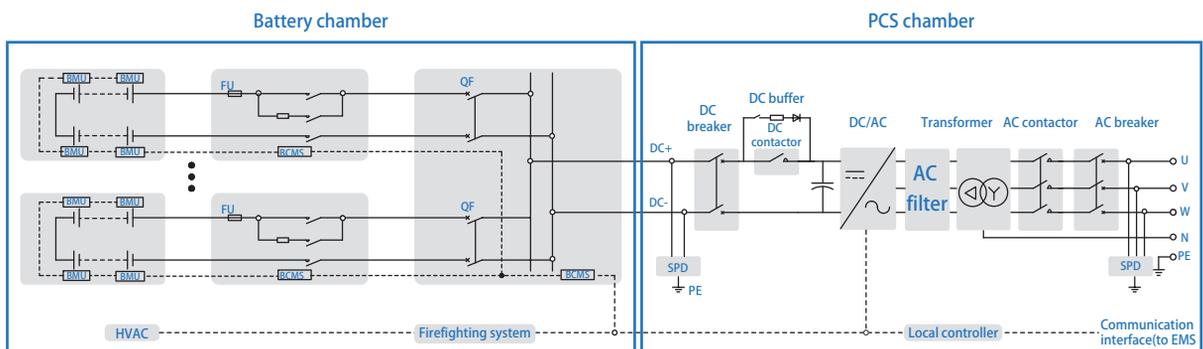
- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Adjusting the active and reactive power following dispatching instruction in on-grid mode.
- ◆ Grid support including L/HVRT, black start, specified power factor control and reactive power support.



## Highly Integrated

- ◆ Highly integrated energy storage system for easy transportation, installation and operation.
- ◆ Integrated with DAQ controller, HVAC and Firefighting system to enable smart communication, ensure system safety and facilitate EMS access.

## Circuit Diagram:



System Model	KESS500KW-1075KWH
<b>DC Data</b>	
Cell type	3.2V/280Ah
Battery pack	64V/280Ah(1P*20S); 17.92kWh
Battery rack	768V/280Ah((1P*20S)*12S) 215.04kWh
Battery capacity (Beginning of life)	1075.2kWh
Battery voltage range	672V ~ 864V
Rated Charge C-rate / Max. Charge C-rate	0.5C/1C

<b>AC Data</b>	
AC output power	500kW
Max. AC power	550kVA
Max. AC current	794A
Nominal AC voltage	400Vac, 3W+N+PE
AC voltage range	400Vac, (-20%~+15%)
Grid frequency (Grid frequency range)	50/60Hz (±2Hz)
AC current THD	<3%
Power factor / Adjustable power factor	>0.99(at nominal power)/1 leading-1 lagging
Adjustable reactive power	-100%~100%

<b>AC side (Off-Grid)</b>	
Nominal AC voltage	400Vac, 3W+N+PE
AC voltage range	400Vac, (-20%~+15%)
AC voltage THD	<3% (linear load)
Unbalance load capacity	100%
Over-load capacity	110% (long-term operation)

<b>Efficiency</b>	
Max. efficiency	>97.5%

<b>Protection</b>	
Overvoltage protection	DC Type II / AC Type II
Grid monitoring / Ground fault monitoring / Insulation monitoring	Yes / Yes / Yes
Overheat protection	Yes

<b>General Data</b>	
Dimensions (W * D * H)mm	6058x2438x2896
Weight(kg)	17T
Isolation method	Transformer
Ingress protection rating	IP54
Operating ambient temperature range	-30~+55 °C
Relative humidity range	0~95% (no condensation)
Cooling method of battery chamber	Heating, Ventilation and Air Conditioning
Cooling method of PCS chamber	Intelligent forced air cooling
Firefighting system of battery bank	FM-200 extinguishment system
Operating altitude	2000m
Display	Touch screen
Communication interfaces	RS485 / Ethernet
Communication protocols	MODBUS-RTU/MODBUS-TCP/IEC 104
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control

# KESS Series Integrated Storage System



## Flexible and Efficient

- ◆ Intelligent temperature control at the cell level to improve system efficiency and battery cycle life.
- ◆ Modular parallel design, automatic balance management, easy for system expansion and overall control.
- ◆ Wide DC voltage operation range, flexible for battery configuration.



## Safe and Reliable

- ◆ Three-level BMS system monitoring, fully guarantee the safety of battery system.
- ◆ Supporting local and remote monitoring.
- ◆ Efficient vector control algorithm to realize decoupling control of active and reactive power.



## Grid Friendly

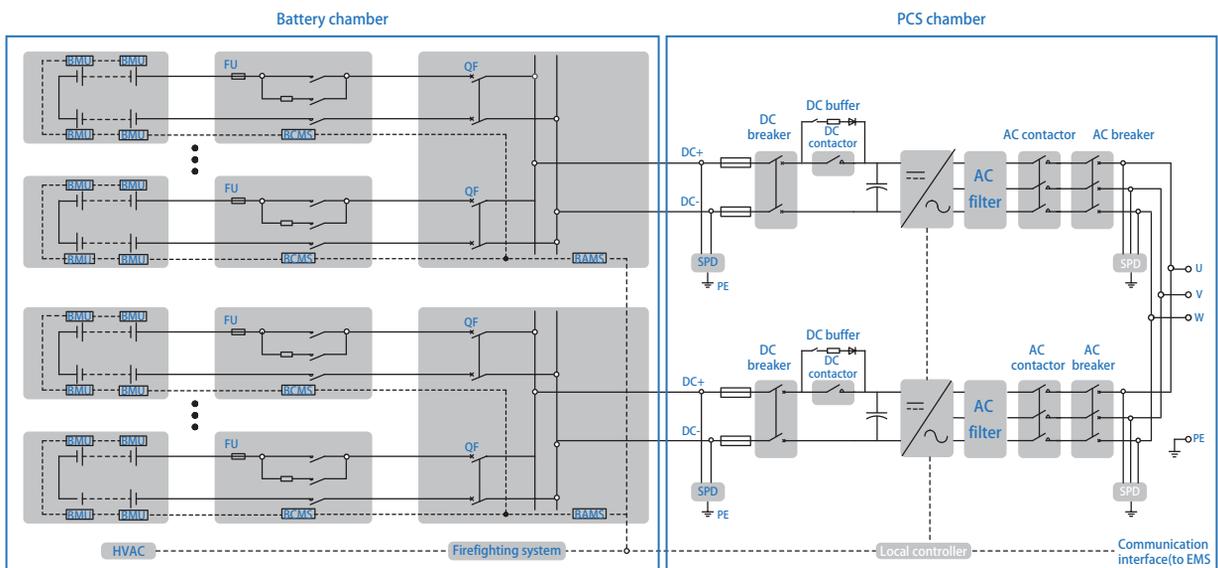
- ◆ Advanced active and passive combined islanding detection technology.
- ◆ Adjusting the active and reactive power following dispatching instruction in on-grid mode.
- ◆ Grid support including L /HVRT, black start, specified power factor control and reactive power support.



## Highly Integrated

- ◆ Highly integrated energy storage system for easy transportation, installation and operation.
- ◆ Integrated with DAQ controller, HVAC and Firefighting system to enable smart communication, ensure system safety and facilitate EMS access.

## Circuit Diagram:



System Model	KESS1000KW-2580KWH	KESS1250KW-2580KWH
<b>DC Data</b>		
Cell type	3.2V/280Ah	
Battery pack	64V/280Ah(1P*20S);17.92kWh	
Battery rack	768V/280Ah((1P*20S)*12S) 215.04kWh	
Battery capacity (Beginning of life)	2580.48kWh	
Battery voltage range	672V ~ 864V	
Rated Charge C-rate / Max. Charge C-rate	0.5C/1C	

<b>AC Data</b>		
AC output power	500KW*2	630kW*2
Max. AC power	550KW*2	690kW*2
Max. AC current	1008A*2	1111A*2
Nominal AC voltage	315Vac/400Vac, 3W+PE	360Vac/400Vac, 3W+PE
AC voltage range	315Vac/400Vac, (-20%~+15%)	360Vac/400Vac, (-20%~+15%)
Grid frequency (Grid frequency range)	50/60Hz (±2Hz)	
AC current THD	<3%	
Power factor / Adjustable power factor	>0.99(at nominal power)/1 leading-1 lagging	
Adjustable reactive power	-100%~100%	

<b>AC side (Off-Grid)</b>		
Nominal AC voltage	315Vac/400Vac, 3W +PE	360Vac/400Vac, 3W +PE
AC voltage range	315Vac/400Vac (-20 %~+15%)	360Vac/400Vac (-20 %~+15%)
AC voltage THD	< 3 % (Linear load)	
Unbalance load capacity	100%	
Over-load capacity	110%( long-term operation)	

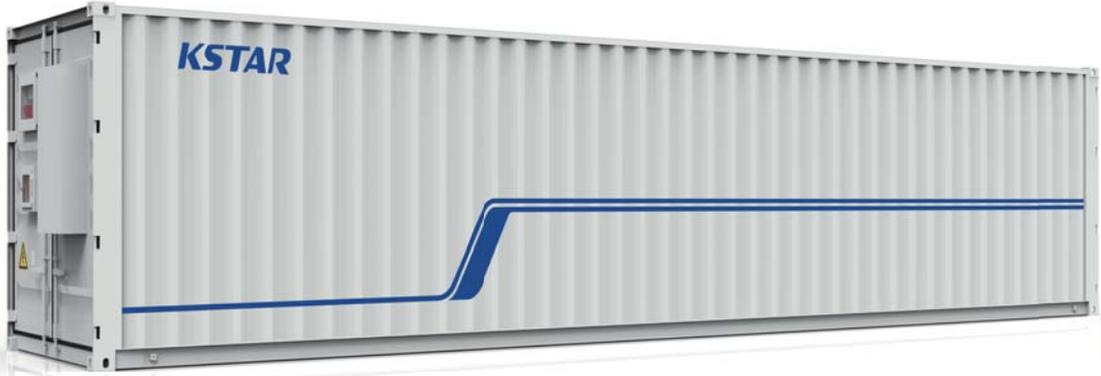
<b>Efficiency</b>	
Max. efficiency	>98.5%

<b>Protection</b>	
Overvoltage protection	DC Type II / AC Type II
Grid monitoring / Ground fault monitoring / Insulation monitoring	Yes / Yes / Yes
Overheat protection	Yes

<b>General Data</b>	
Dimensions (W * D * H)mm	12192x2438x2896
Weight(kg)	34T
Isolation method	Transformerless
Ingress protection rating	IP54
Operating ambient temperature range	-30~+55 °C
Relative humidity range	0~95% (no condensation)
Cooling method of battery chamber	Heating, Ventilation and Air Conditioning
Cooling method of PCS chamber	Intelligent forced air cooling
Firefighting system of battery bank	FM-200 extinguishment system
Operating altitude	2000m
Display	Touch screen
Communication interfaces	RS485 / Ethernet
Communication protocols	MODBUS-RTU/MODBUS-TCP/IEC 104
Grid support	L/HVRT, L/HFRT, active & reactive power control and power ramp rate control

# KESS Series Integrated Storage System

## KESS-LFP Series



### Flexible and Efficient

- ◆ Intelligent temperature control at the cell level to improve system efficiency and battery cycle life.
- ◆ Modular parallel design, automatic balance management, easy for system expansion and overall control.



### Safe and Reliable

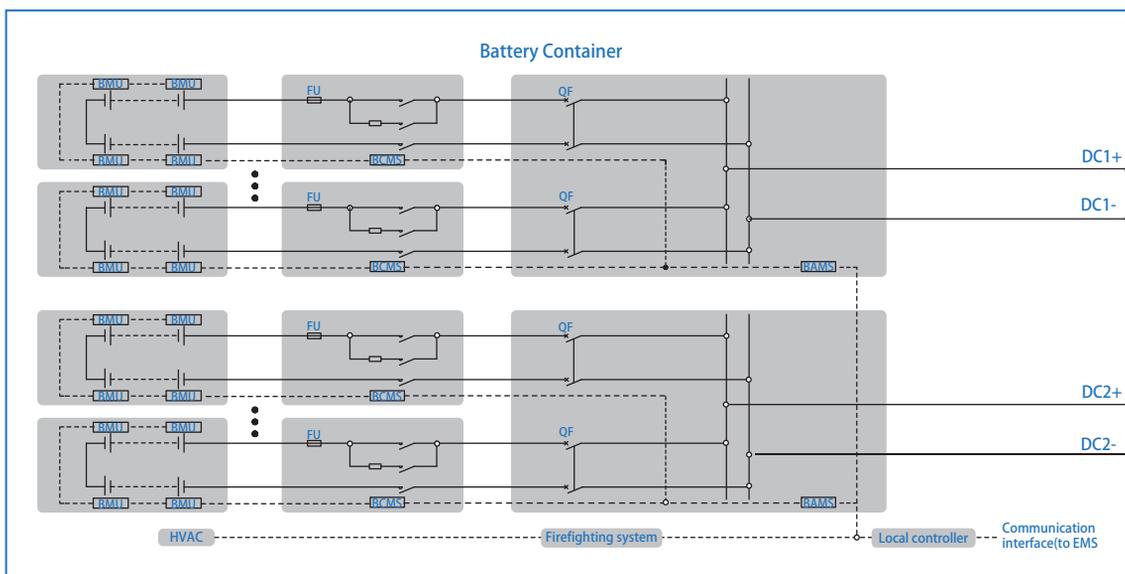
- ◆ Three-level BMS system monitoring, fully guarantee the safety of battery system.
- ◆ Supporting local and remote monitoring.



### Highly Integrated

- ◆ Highly integrated energy storage system for easy transportation, installation and operation.
- ◆ Integrated with DAQ controller, HVAC and Firefighting system to enable smart communication, ensure system safety and facilitate EMS access.

## Circuit Diagram:



System Model	KESS 3010KWH-LFP
<b>Battery Data</b>	
Cell type	3.2V/280Ah
Battery pack	64V/280Ah(1P*20S); 17.92kWh
Battery rack	768V/280Ah((1P*20S)*12S) 215.04kWh
Battery capacity (Beginning of life)	3010.56kWh
Nominal battery voltage	768V
Battery voltage range	672V~864V
Rated Charge C-rate / Max. Charge C-rate	0.5C / 1C

<b>General Data</b>	
Dimensions (W * D * H)mm	12192x2438x2896
Weight(kg)	37T
Ingress protection rating	IP54
Operating ambient temperature range	-30~+55 °C
Relative humidity range	0~95% (no condensation)
Cooling method of battery chamber	Heating, Ventilation and Air Conditioning
Firefighting system of battery bank	FM-200 extinguishment system
Operating altitude	2000m
Display	Touch screen
Communication interfaces	RS485 / Ethernet
Grid support protocols	MODBUS-RTU/MODBUS-TCP

System Model	KESS 4265KWH-LFP
<b>Battery Data</b>	
Cell type	3.2V/280Ah
Battery pack	64V/280Ah(1P*20S); 17.92kWh
Battery rack	1088V/280Ah((1P*20S)*17S) 304.64kWh
Battery capacity (Beginning of life)	4264.96kWh
Nominal battery voltage	1088V
Battery voltage range	952V~1224V
Rated Charge C-rate / Max. Charge C-rate	0.5C / 1C

<b>General Data</b>	
Dimensions (W * D * H)mm	12192x2438x2896
Weight(kg)	47T
Ingress protection rating	IP54
Operating ambient temperature range	-30~+55 °C
Relative humidity range	0~95% (no condensation)
Cooling method of battery chamber	Heating, Ventilation and Air Conditioning
Firefighting system of battery bank	FM-200 extinguishment system
Operating altitude	2000m
Display	Touch screen
Communication interfaces	RS485 / Ethernet
Grid support protocols	MODBUS-RTU/MODBUS-TCP

## Project Reference



### ▶▶ 100kW/300kWh Micro-grid system in Padan, Thailand



### ▶▶ 100kW/300kWh Micro-grid system in Mae Sa-gae, Thailand



**▶▶▶ 100kW/300kWh Micro-grid system in Pong Phang, Thailand**



**▶▶▶ 500kWh Multi-energy Complementary Project of Beike Industrial Park**



**▶▶▶ 300kW/2.16MWh BESS of Off-grid in Sudan**

## Project Reference



► 50kW/200kWh BESS for EV Charger Station in Hebei



► 3MW/12MWh BESS Demonstration Project in Shenzhen



► 300kWh Storage Project of Brazilian Military Antarctic Research Station



▶▶▶ Mobile Energy Storage Vehicle of OptimumNano Energy Company



▶▶▶ 1MW/2MWH Storage and PV Project in Jiangsu



▶▶▶ BESS for EV Charger Station in Harbin

# KSTAR

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