



# Step-up Transformer Station for BESS

Catalogue 2024



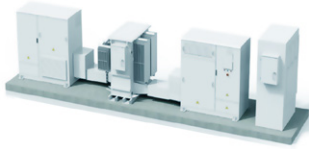
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Step-up transformer skid station



Step-up transformer skid station

## Function

The step-up transformer skid station converts low-voltage AC power generated by the power conversion system (PCS) into medium-voltage AC power and feeds the power into the power grid.

The step-up transformer skid station integrates the ring main unit, transformer, power converter system, and auxiliary power supply into a steel-structure container or skid. This provides a highly integrated power transformation and conversion solution for energy storage plants in medium-voltage grid-tied applications.

## Features

### Intelligent

- Detects the operating status of the ring main unit, transformer, and PCS in real time;
- Displays power parameters online, with accurate current and voltage detection;
- Supports remote access to the running information of the complete step-up station;
- Enables remote control of the circuit breaker for the PCS and ring main unit (RMU).

### Manufacture

- Internal equipment is selected and installed;
- 20-foot container of skid structure facilitates easy transportation and installation.

### Reliable

- Solid and reliable structure design;
- IP54 rating of medium-voltage RMU room and PCS.

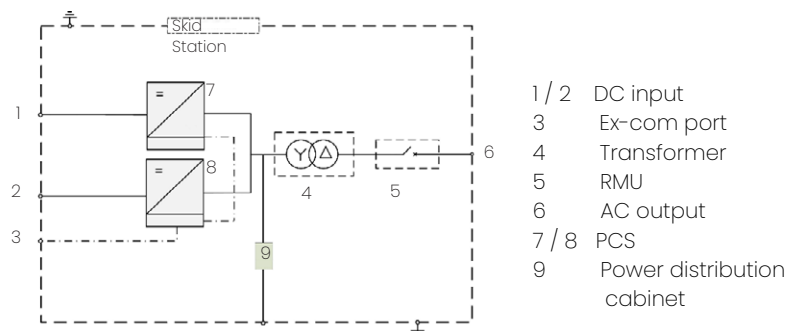
### Fast

- Fast deployment can be implemented;
- Only the PCS needs to be routed in, and medium-voltage cables need to be routed out, on site.

## Application

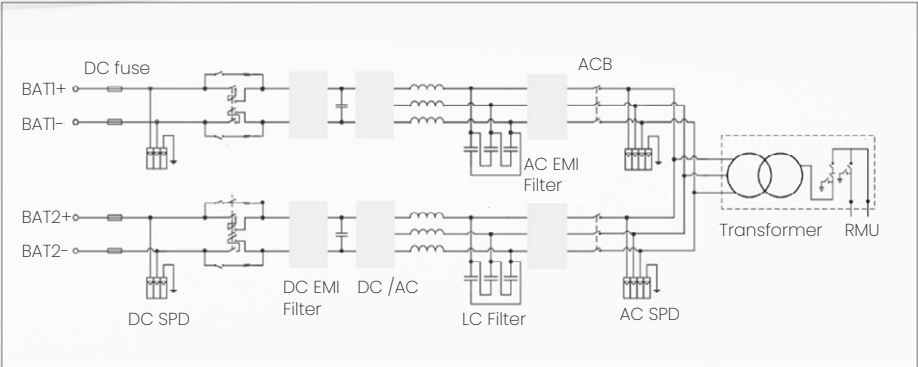
The step-up transformer skid station to the grid-tied systems in large BESS plants.

## Network application

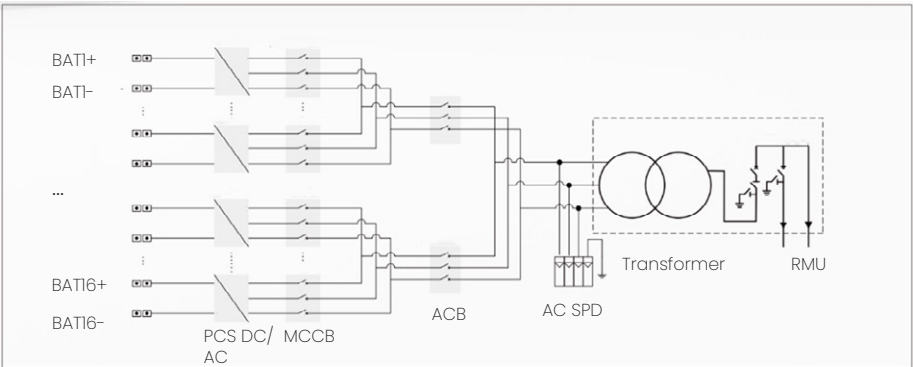
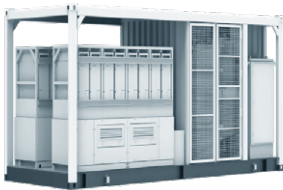


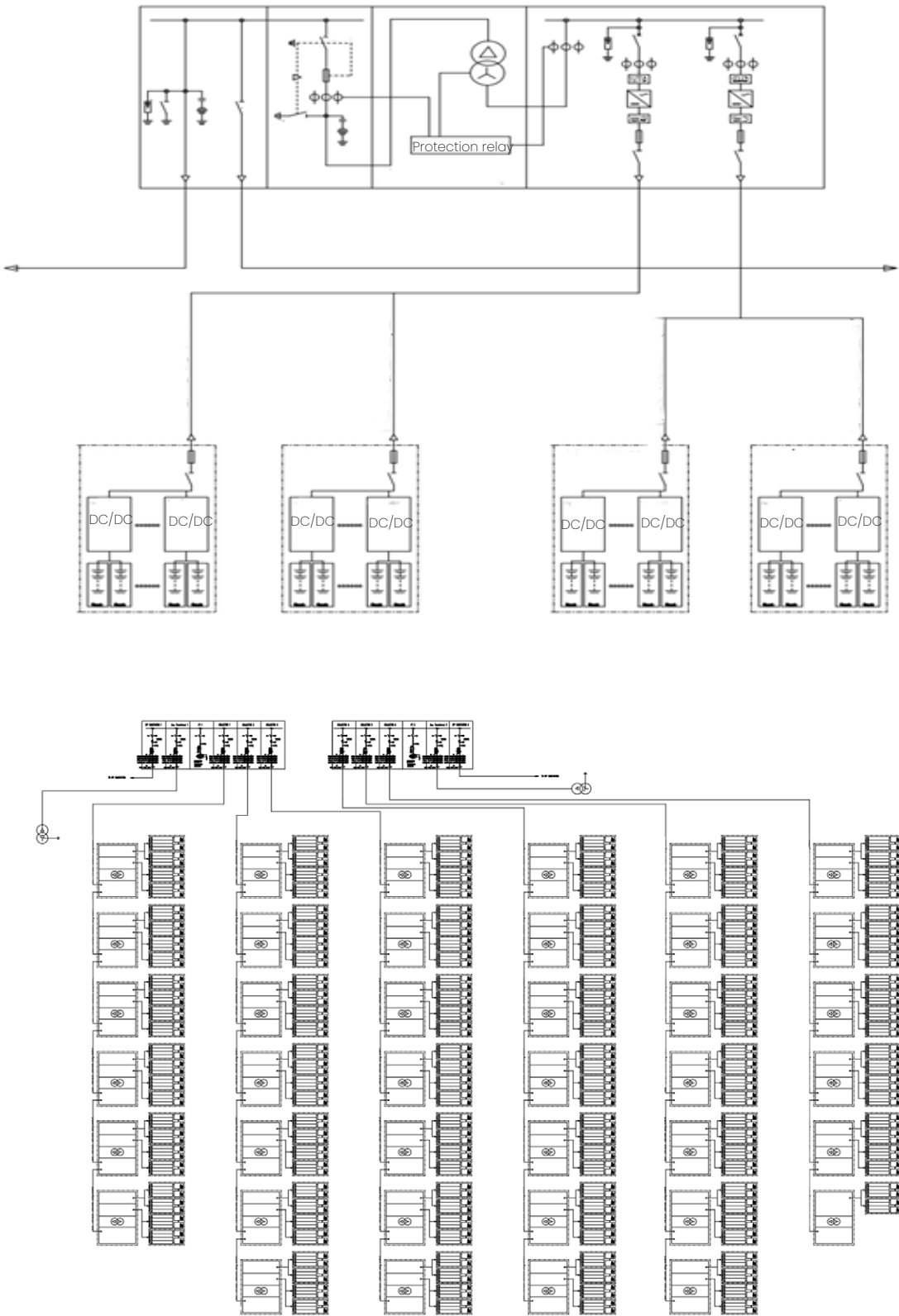


Example for step-up transformer station with central PCS



Example for step-up transformer station with string PCS





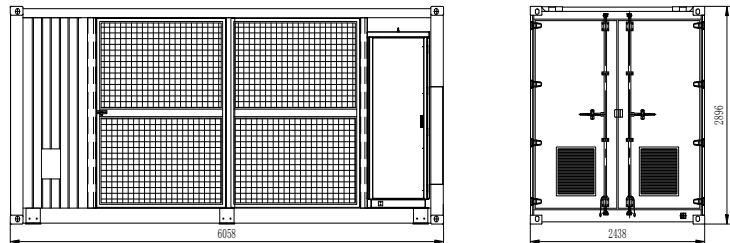
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## Appearance

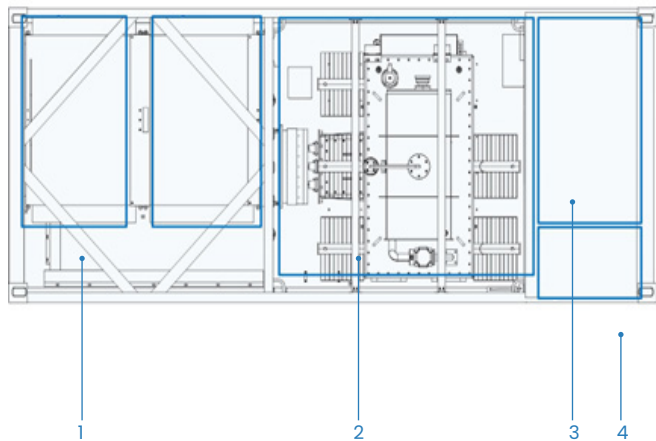


## Exterior dimensions



For ease of transportation, the station has the same dimensions as a 20-foot container: W 6,058mm \* H 2,896mm \* D 2,438mm.

## Internal composition



1. PCS
2. Transformer
3. RMU
4. Power distribution cabinet



Type	3,000kVA	5,000kVA
Transformer		
Transformer type	Oil Transformer	
Rated power	3,000 kVA @ 40°C <sup>1</sup>	5,000 kVA @ 40°C <sup>1</sup>
Max. power	3,400 kVA @ 30°C	5,500 kVA @ 30°C
Vector group	Dyll	DyllYll
LV / MV voltage	0.8 kV / 20 – 35 kV	0.8kV/0.8 kV / 20 – 35 kV <sup>2</sup>
Maximum input current at nominal voltage	2,500 A * 1	2,500 A * 2
Frequency	50Hz	
Tapping on HV	0, ±2×2.5%	
Efficiency	≥99%	
Cooling type	ONAN (Oil Natural Air Natural)	ONAN (Oil Natural Air Natural)
Impedance	6.5% (±10%)	6.5% (±10%)
Oil type	Mineral oil (PCB free)	
Winding material	Al / Al	
Insulation class	A	
MV switchgear		
Insulation type	Gas SF6-free	
Rate voltage	24 – 36 kV <sup>2</sup>	
Rate current	630 A	
Internal arcing fault	IAC AFLR 31.5 kA / 1s	
Qty. of feeder	2-3 feeders	
MV surge arrester for VCB	Optional <sup>3</sup>	
PCS		
DC side	800V-1500V, 1935A*2	1300V-1500V, 2154A*2, 2 inpus
AC side	3000kVA / 690V	5000kVA / 900V
Protection		
AC input protection	Circuit breaker	
Transformer protection	Oil-temperature, oil-level, oil-pressure	
Relay protection	50/5I, 50N/5IN	
LV overvoltage protection	AC Type II (optional: AC Type I + II)	
Anti-rodent Protection	C5-Medium	
General data		
Dimensions(W*H*D)	6,058mm x 2,896mm x 2,438mm	
Approximate weight	≤ 5 T	≤ 22 T
Operating temperature range	-25°C ~ 60°C <sup>4</sup>	
Auxiliary power supply	100 KVA / 400V	
2kVA UPS	Optional <sup>3</sup>	
Degree of protection	IP54	
Allowable relative humidity range (non-condensing)	0 – 95 %	
Operating altitude	1,000 <sup>5</sup> m (standard) / > 1,000 m (optional)	
Communication	RS485, Ethernet, Optical fiber	
Compliance	IEC 60076, IEC 62271-200, IEC 62271-202, IEC 61439-1, EN 50588-1	

1. More detailed AC power, please refer to the de-rating curve.

2. Rated output voltage from 20 kV to 36 kV, more available upon request

3. Extra expense needed for optional features which standard product doesn't contain, more options upon request.

4. When ambient temperature ≥55°C, extension roof shall be equipped for station on site by customer.

5. For higher operating altitude, please consult with Brunstock.



A step-up transformer station consists of three parts: PCS, transformer room, and medium-voltage room. This is mounted on a metal pad (a skid) or inside an enclosure that is the same size as a standard shipping container.

#### PCS

The PCS cabinet, located in the container or on the skid (metal pad), is used to converge the DC power to AC power and feed it into the MV grid. It can be a central or string type of PCS, according to customer specifications. The size of each PCS shall influence the overall layout of the container or skid station.



#### Medium voltage room

The medium voltage room contains a Brunstock Gas-insulated Secondary ring main unit and a circuit breaker. This transformer protection is mainly achieved through the relay protection device. When the transformer is overloaded or short-circuited, the circuit breaker can be reliably disconnected. When the transformer experiences an over-temperature fault, heavy gas fault, or oil over pressure fault, the circuit breaker trips and the system is quickly protected.

The medium voltage room also contains a communication box and a power distribution cabinet.

#### Medium-voltage switchgear

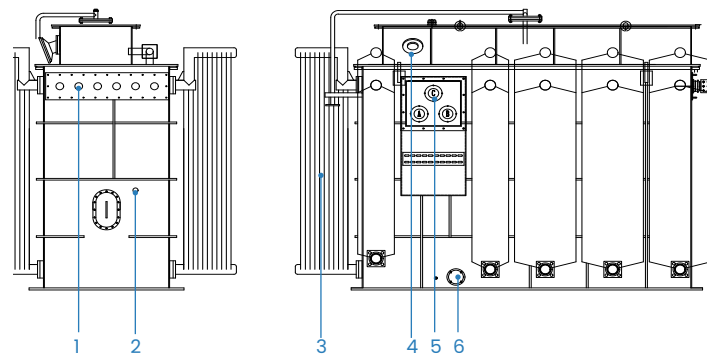
Type		RMU
Rated voltage	kV	BGS-40.5
Rated frequency	Hz	50
1 min power frequency withstand voltage (RMS) (phase to phase, to earth/across isolating distance)	kV	95/118
Lightning impulse withstand voltage (RMS) (phase to phase, to earth/across isolating distance)	kV	185/215
Rated busbar current	A	630/1,250
Rated short-circuit breaking current	kA	31.5
Rated short-time withstand current/ duration	kA/s	31.5/4
Protection degree of gas-filled compartment	IP	67
Protection degree of switchgear	IP	4X
Panel dimension without top box (W x D x H)	mm	500x980/1,000x1,900
Functional panel weight	kg	650-700
Extension		Top ( Lateral optional)
Internal arc classification	kA/s	AFLR 31.5/1



## Transformer room

The transformer room mainly includes a transformer inside, it is used to convert the low-voltage AC power into medium-voltage AC power.

The transformer integrates accessories such as a pressure relief valve, tap changer, oil level indicator, pressure gauge, oil temperature indicator, oil filling valve and oil drain valve.



1. LV bushing
2. Tap changer
3. Heat sink
4. Oil level meter
5. HV bushing
6. Oil drain valve

The structure of 4,600kVA is shown in the figure as an example. The oil-cooled transformer adopts natural heat dissipation, and the top is not covered.

Step-up transformer			
Items			4,600/33, 3 windings, oil immersed
Rated output		kVA	4,600
Vector group			Dy11y11
Type of cooling			ONAN
Rated voltage	HV	kV	33
	LV	kV	0.8
	Voltage variation		±10%
Rated current	HV	A	154
	LV1	A	3,248
	LV2	A	3,248
Number of phases			3
Rated frequency		Hz	50
Frequency variation		%	±5
Conductor materials	HV		Aluminum
	LV		Aluminum
Tap changer	LV		Off circuit
	HV		±2x2.5%
Insulation level	HV	kV	LI 170/AC 70
	LV	kV	AC 5

Note: For more transformer ratings please consult with your Brunstock rep.

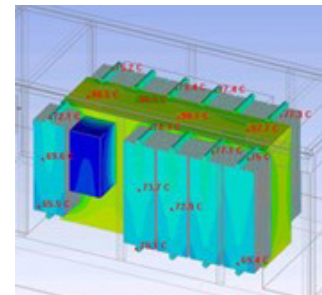
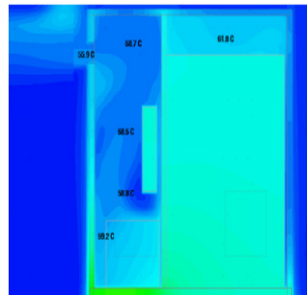
## Thermal design

Considering different working conditions and requirements for each compartment and component, Brunstock's step-up stations adopt different cooling methods for different compartments:

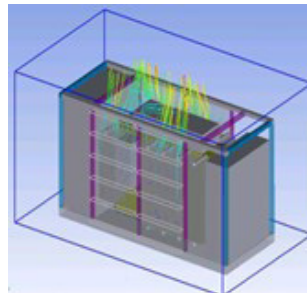
- The ingress protection level of the PCS cabinet is high, so it uses an forced cooling to take away the PCS cabinet indoor heat;
- The MV transformer adopts ONAN mode;
- The MV switchgear and the communication & power distribution cabinet adopt the method of natural cooling via vents, air intake from the bottom and air extraction by the fan above.

Our science-based cooling structure design ensures cooling efficiency and effectively extends the service life of internal components and the entire container.

Flow field analysis of step-up station

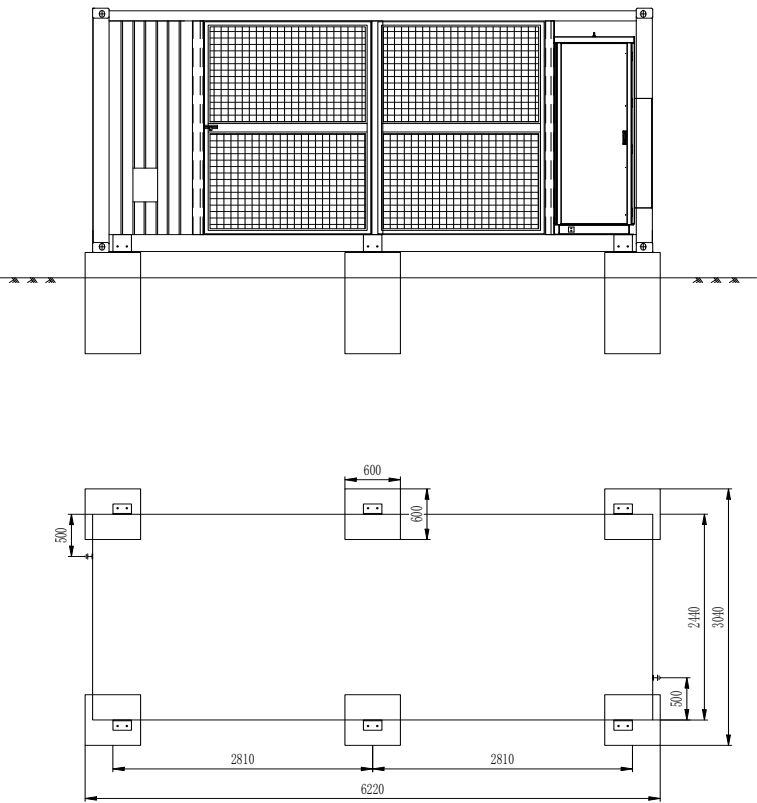


Temperature field analysis of step-up station



Foundation

Construct a foundation of the correct dimensions based on the site design drawing. This figure is for reference only.



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