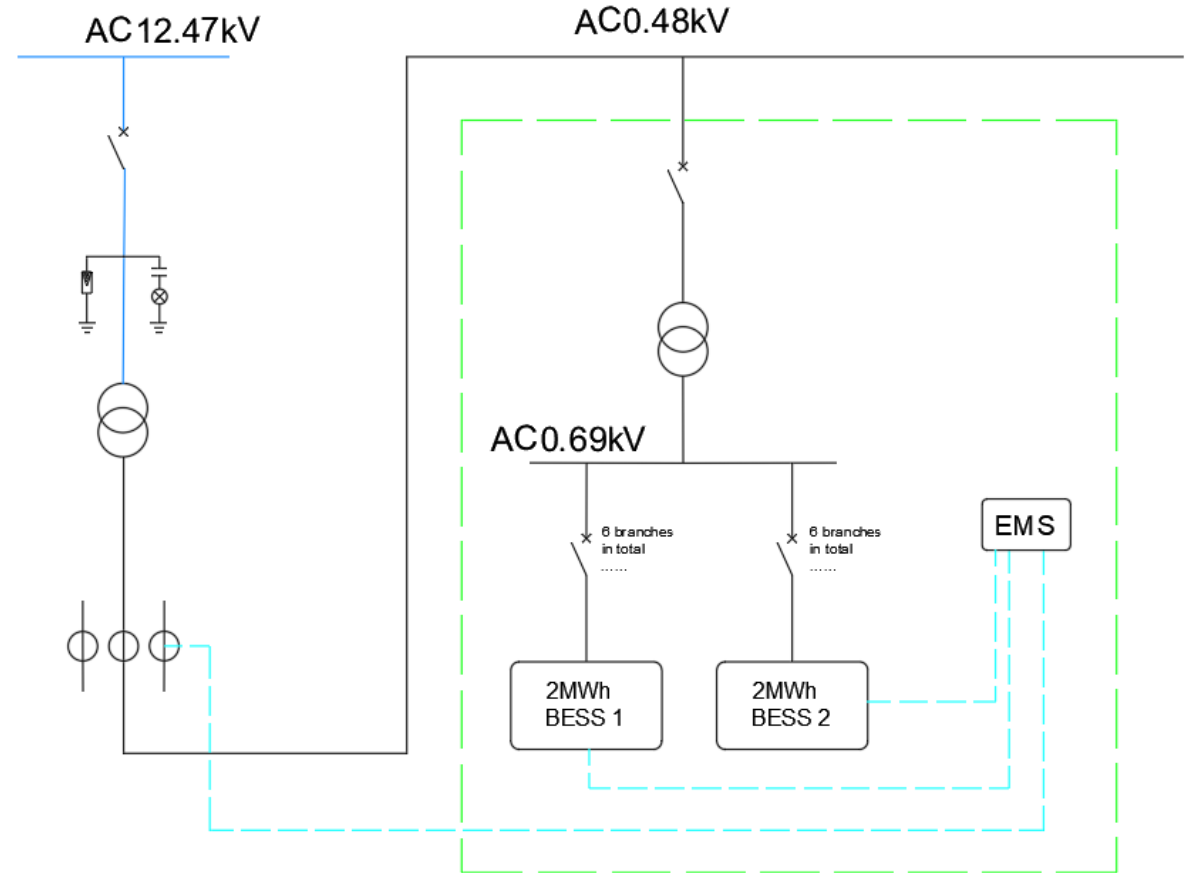


2.4MW/4.14MWh BESS California

In this solution, two 2MWh energy storage systems are connected to a 0.69kV/0.48kV transformer, which is then interconnected to the Martis Valley Substation via a 12.47kV/0.48kV transformer to provide peak-shaving services for increasing the available electrical capacity at the Point of Interconnection (POI).

Scope of supply: two 2MWh energy storage systems (including battery, PCS, BMS, fire suppression system, thermal management system, etc.), 0.69kV/0.48kV isolation transformer, EMS.



Example of Peak-shaving

A	B	C	D	E
Date / Time	Existing Hourly Peak (kWh)	Proposed Charge/Discharge (kWh)	Proposed Hourly Peak (kWh)	
2020/12/31 1:00	6032.07	0	6032.07	
2020/12/31 2:00	5465.75	0	5465.75	
2020/12/31 3:00	5144.66	435.815	5580.475	
2020/12/31 4:00	4791.17	435.815	5226.985	
2020/12/31 5:00	4700.24	435.815	5136.055	
2020/12/31 6:00	4795.76	435.815	5231.575	
2020/12/31 7:00	4793.12	435.815	5228.935	
2020/12/31 8:00	4805.15	435.815	5240.965	
2020/12/31 9:00	5032.76	435.815	5468.575	
2020/12/31 10:00	5432.42	435.815	5868.235	
2020/12/31 11:00	5750.51	0	5750.51	
2020/12/31 12:00	5842.37	0	5842.37	
2020/12/31 13:00	5885.52	0	5885.52	
2020/12/31 14:00	6059.41	0	6059.41	
2020/12/31 15:00	6123.41	0	6123.41	
2020/12/31 16:00	6124.89	0	6124.89	
2020/12/31 17:00	6023.81	0	6023.81	
2020/12/31 18:00	5818.89	0	5818.89	
2020/12/31 19:00	5958.69	0	5958.69	
2020/12/31 20:00	6444.18	-871.63	5572.55	
2020/12/31 21:00	6822.32	-871.63	5950.69	
2020/12/31 22:00	6687.83	-871.63	5816.2	
2020/12/31 23:00	6638.34	-871.63	5766.71	
2021/1/1 0:00	6333.46	0	6333.46	
2021/1/1 1:00	6069.93	0	6069.93	
2021/1/1 2:00	5707.7	0	5707.7	

The data in columns C and D are predictions, and the actual operation of the BESS should be controlled by the EMS which has the capability to refine its peak shaving strategy through real-time information and historical data.

Configuration table

S/N	Product Name	Specification	Qty	Unit	Remarks
1	Battery Energy Storage System	2MWh battery energy storage system	2	Set	
1.1	20 Feet High Container	6058*2438*2896mm、 Including prefabricated cabin body, safety passage, nameplate and indication sign, lighting (including exterior) and power distribution, etc.	1	Set	
1.2	Battery Cluster	1152V, 345.6kWh, Includes battery racks, 20 battery modules, 1 control box, power and communication harness	6	Set	
1.3	BMS (Battery Management System)	Three-tier architecture, including BMU and acquisition harness, high-voltage box with BCU and inter-box communication power harness, control cabinet with BAU and display screen including communication power harness to the high-voltage box	1	Set	
1.5	Temperature And Humidity Control System	Contains 6 industrial air conditioners, air ducts, temperature sensors, etc.	1	Set	
1.6	Fire Fighting System	Includes aerosol fire extinguishing device, controller, fire detection (smoke, temperature) alarm, including flammable gas detection	1	Set	
1.7	Auxiliary System	Includes auxiliary materials for container interior installation	1	Set	
1.8	PCS	200kW, 690Vac	6	Set	
2	Isolation Transformer	2000kVA, 0.69kV/0.48kV	1	Set	
3	EMS	Monitor and control the charging and discharging of the battery system, manage power flows to and from substation bus, and optimize energy usage based on demand and grid conditions (incorporate algorithms for peak shaving)	1	Set	



2MWh BESS--Basic Parameters

System Parameters	
Cell	3.2V/100Ah, LFP
System battery configuration	3P18S-20S-6P, 2.073MWh
Battery voltage range	1008V ~ 1278V (Cell 2.8 ~ 3.55V)
Rated discharge power	6*200kW
Container Parameters	
Dimension	L6058*W2438*H2896mm
Protection level	IP54
Operating environment temperature range	-30°C ~ 50°C
Working altitude	≤2000m (>2000m will be customized separately)
Battery thermal management system	air cooling
Weight	27.5t
Communication mode	Ethernet、RS485
Fire Fighting System	Fire extinguishing system (aerosol), explosion-proof exhaust system and emergency water sprinkler
List of certification standards	UL1973,UL 1642, UL9540A, IEC62619, IEC62620, UN38.3, UN3536 UL 9540(under testing)

2MWh BESS--Battery system configuration

Cell	
Rated capacity	100Ah
Rated voltage	3.2V
Rated charge/discharge current	50A

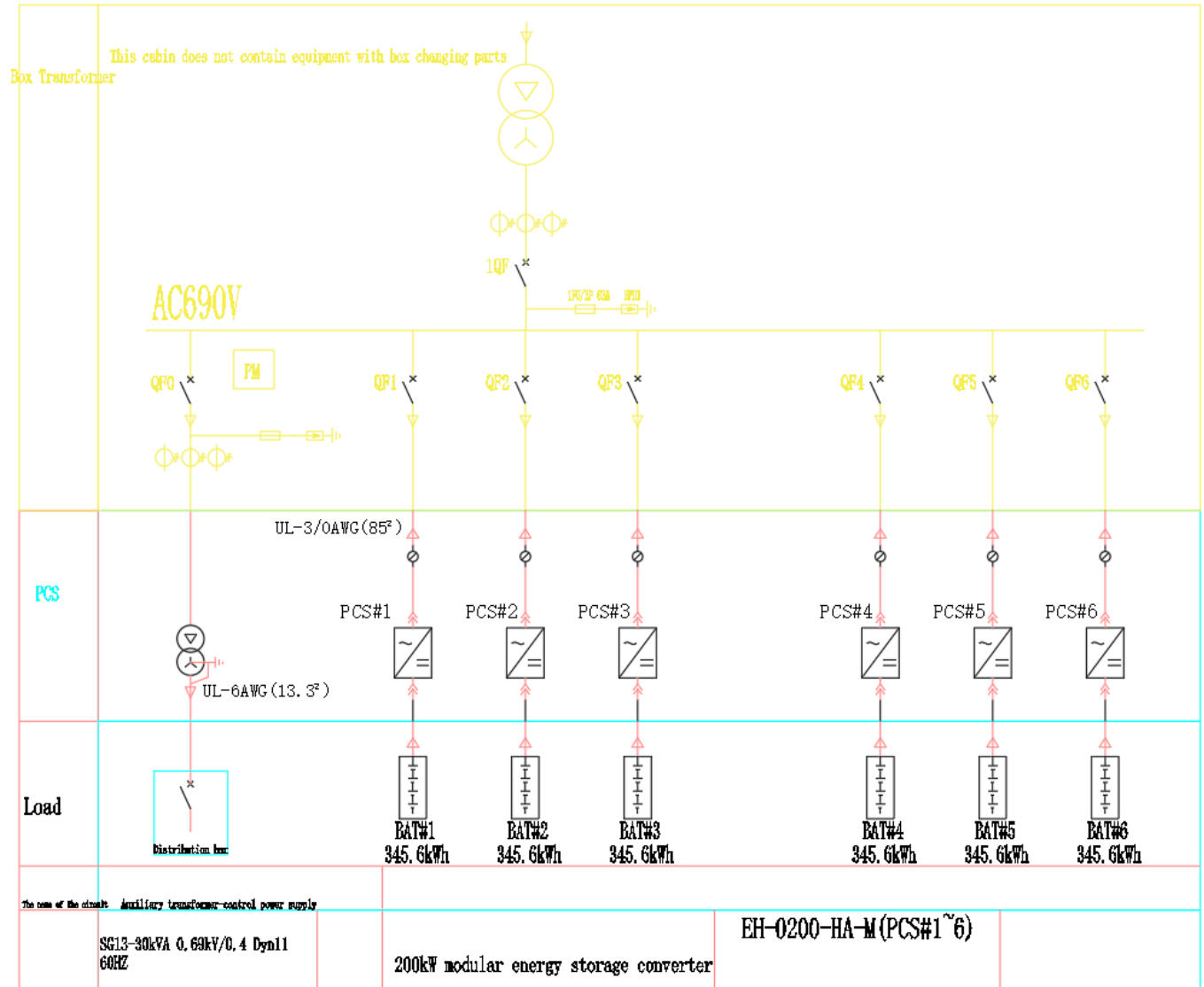


Battery Module	
Grouping method	3P18S
Rated capacity (Ah)	300
Rated energy (kWh)	17.28
Nominal voltage (V)	57.6

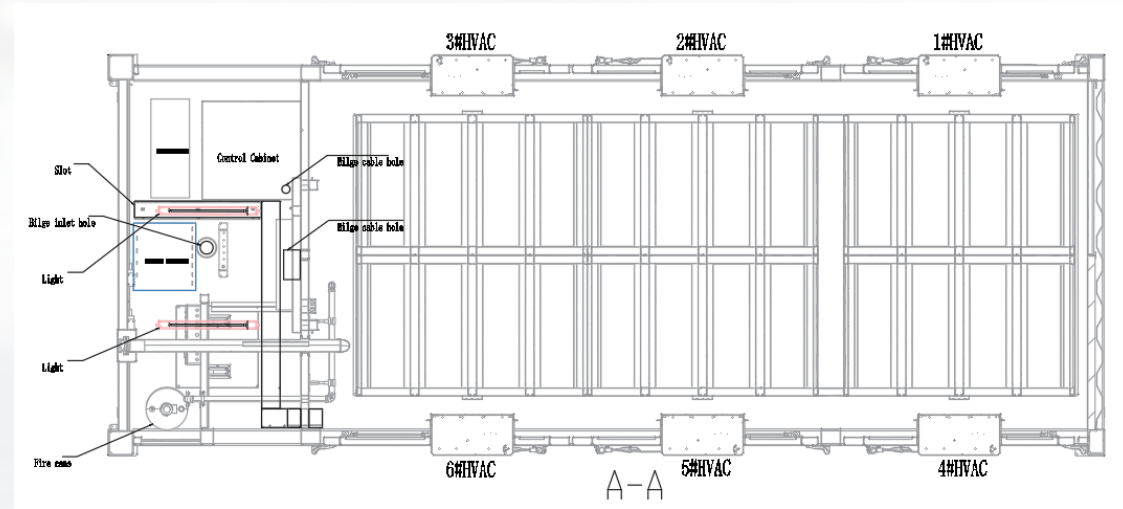
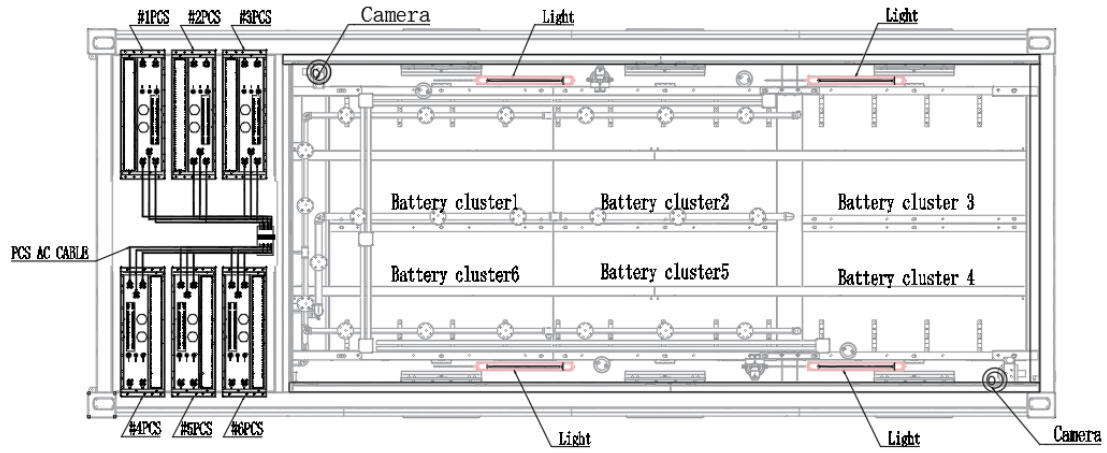


Battery Cluster		
Grouping method	3P360S	@20 battery modules
Rated capacity (Ah)	300	
Rated energy (kWh)	345.6	
Nominal voltage (V)	1152	
Operating voltage range (V)	1008V ~ 1278V	(cell 2.8 ~ 3.55)
Rated charge discharge current (A)	150	0.5C

2MWh BESS--Appearance and Topology



2MWh BESS--Layout drawing

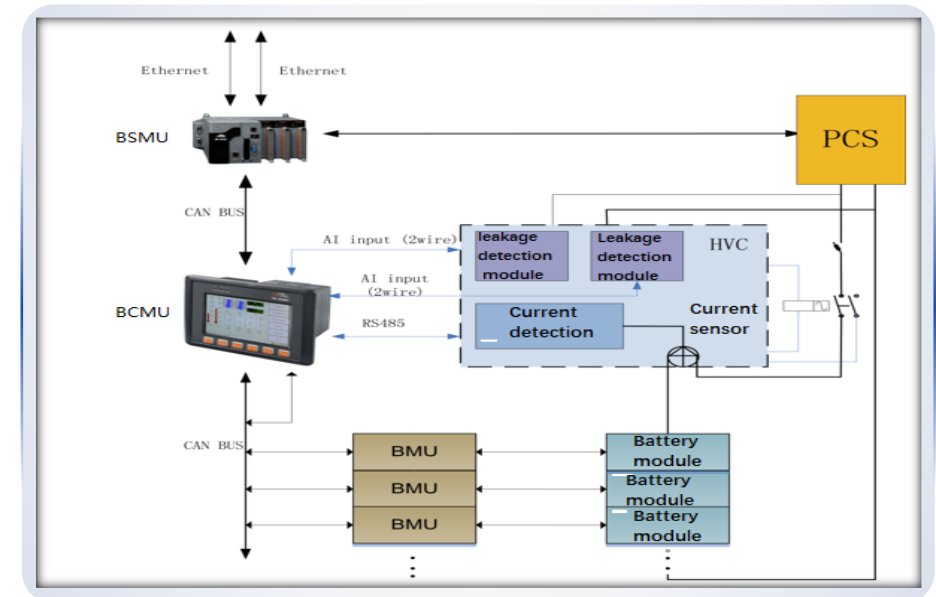


Battery Management System (BMS)

Function: BMS consists of the battery module management unit (BMU), battery string management system (BCMU), battery stack management system (BSMU), and high voltage control box. The BMS system has the functions of analogue signal high-precision detection and reporting, fault alarm, upload and storage, battery protection, parameter setting, passive/active balancing, battery SOC calibration and information interaction with other devices.

- Analog Measurement
- Passive Equalization
- Battery System Running Alarm
- Battery System Protection
- Self-diagnosis Function
- Operation Parameter Setting
- Local Running Status Display
- Event And Historical Data Recording
- Communication Function

BMS Three-level Topology



- Batteries generate heat during operation.
- An industrial air conditioner maintains a controlled temperature range (above 0°C and below 35°C).
- Precise air ducts ensure even cooling for each battery cluster, with additional heat dissipation between batteries and side ventilation.
- A front fan and exhaust system further optimize temperature control.

Air Conditioning System

- Under the function of the control system, the air conditioning system can cool, heat, and dehumidify the container.

Ventilation System

- Ventilation systems can achieve forced ventilation cooling, refrigerant phase change cooling, heating, dehumidification, and other functions.

Control System

- The control system automatically controls and coordinates the cooling and heating of multiple air conditioners based on the temperature and humidity of indoor return air.

Communication Management

- The air conditioner uploads running and alarm information to the EMS monitoring system over the RS485 port.

Optimum Condition

- The temperature control system ensures that the ambient temperature in the battery cabin is 18-30 °C and the humidity is 50%-70%.

Fire fighting system offers automatic features:

- **Fire detection and alarm:** The system automatically detects fires and triggers an alarm.
- **Automatic extinguishing:** The system automatically activates the extinguishing agent upon fire detection.

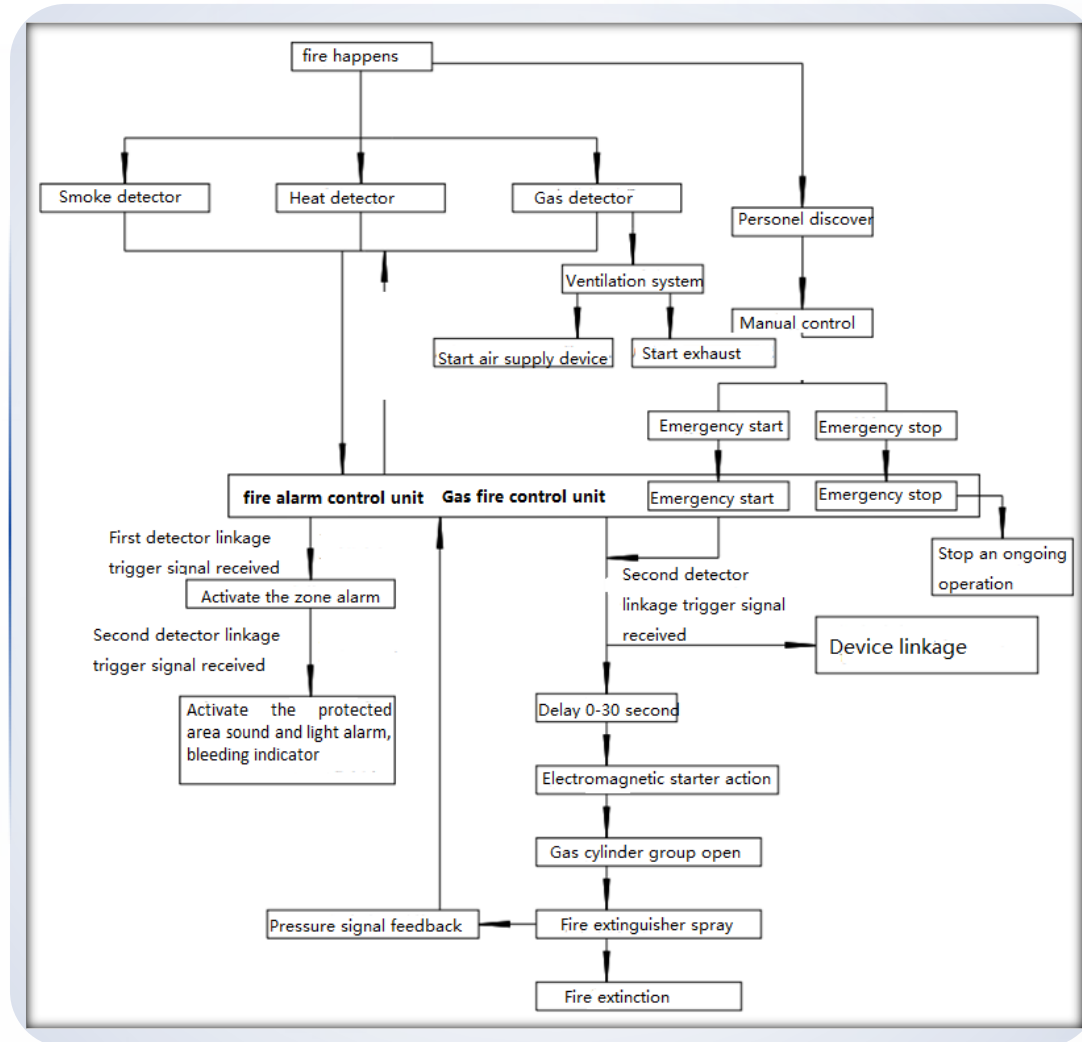
Additionally, the system provides flexible control options:

- **Automatic control:** The system operates autonomously.
- **Manual control:** Users can manually activate the system.
- **Emergency operation:** A dedicated mechanism allows for manual emergency operation, independent of other controls.

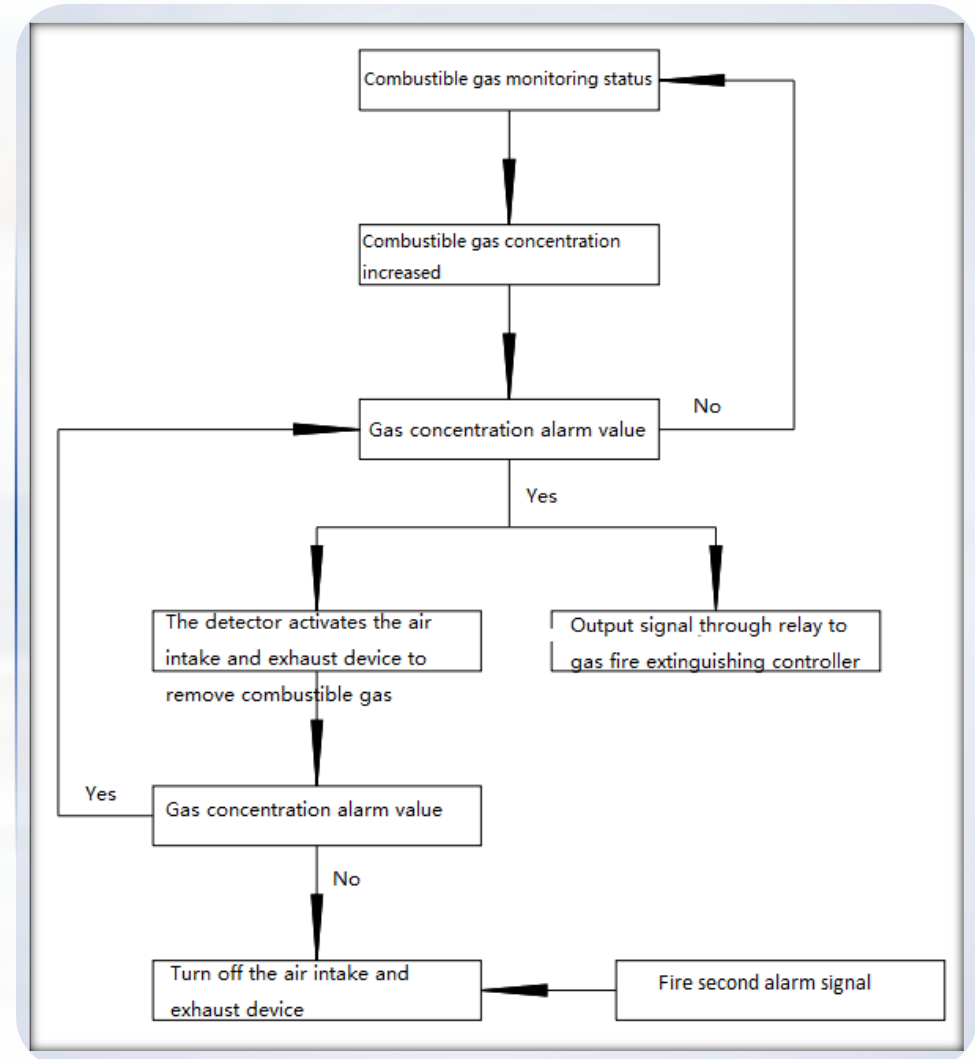
Furthermore, the system includes comprehensive safety features:

- **Audiovisual alarms:** Alarm bells and flashing lights signal fire and extinguishing agent release.
- **Self-testing and monitoring:** The system performs regular self-tests, automatically checks for faults, and raises alarms in case of any issues.

Gas Extinguishing Flow Chart



Flow Chart of Combustible Gas Detection and Ventilation System



Power Conversion System (PCS)-Parameters

Name	Unit	Value	Description	Unit	Value
Rated Output Power	kW	200	Operating Ambient Temperature Range		-40 ~ +60°C
Max Output Power	kVA	220kVA@35°C, 200kVA@45 °C, 133kVA@50°C	Working Environment Humidity Range (Rated Power Operation)		0 ~ 95%
Output Voltage Range	Vac	607~759V (Adjustable)	Altitude (Rated Power Operation)	m	4000
Max DC Input Voltage	Vdc	1500	Capacity Reduction Factor (For High Altitude)		Over 4000 meters, every 100 meters, 1% reduction in capacity
Max Output Current	A	224.5	Cooling Method		Intelligent Speed Regulation Forced Air Cooling
Minimum Starting Voltage (Stable Operation)	V	586.5	Certifications		UL 1741, IEEE 1547
Low Voltage Crossing Function		Available	Appearance Dimensions (W× H× D)	mm	880×865×275
Mean Time Between Failures	h	200000	Weight	kg	< 100
Power Regulation Range (Energy Management Platform)	kW	0 ~ 220	Protection Level		IP66
Max Efficiency		98.80%	Communication Interface		RS485、 CAN、 Ethernet
System Allowed Input Voltage Range	V	1000~1500	Product Certification		CQC、 TUV
DC Input Channels		1 Channel	Voltage Fluctuation Range (relative Nominal Voltage)		-20%~+15%
Power Factor Adjustment Range		1(lead) ~-1 (lag)	Standby Loss	W	<100
No-load Loss	W	<460	Running Noise	dB	<75

