Eaton xStorage energy storage systems and solution

xStorage Container - C20 BESS

All-in-one, ready-to-use containerized battery energy storage system



Powering Business Worldwide



Get ready for rising energy challenges

More and more residential houses, commercial buildings and industrial facilities connect to the grid around the world. How can we be sure there will still be power for our buildings or facilities when we need it?

Fossil fuels are phasing out. What will be your reliable energy supply in the future?

Renewable energy sources are good for the environment and you may already have solar panels, or a wind farm installed nearby. But how do you access clean energy when there is no sun or wind?

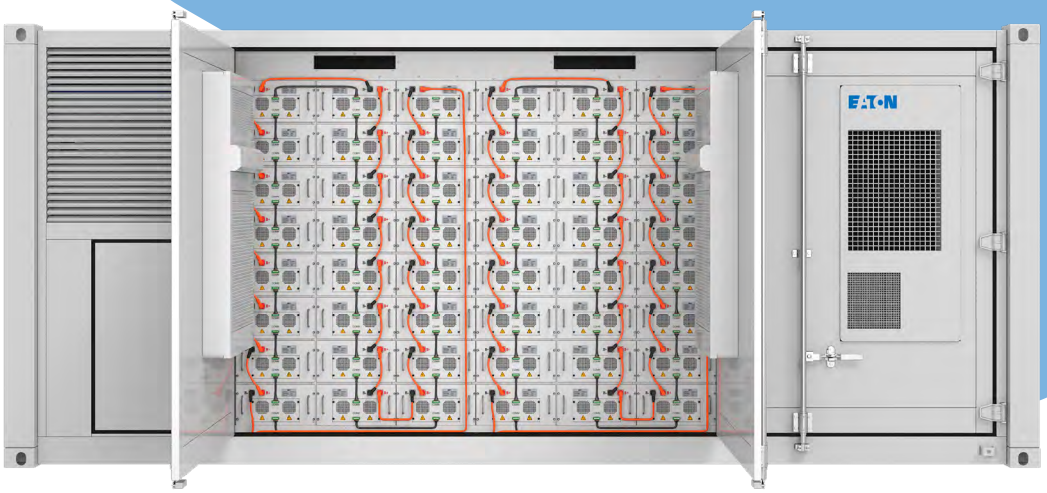


This is where Eaton can help

Eaton energy storage solution enables power plants, commercial and industrial facility managers and operators to store energy so that it can be used on demand to provide cleaner and more reliable power, as a back-up power source, or to participate in demand response programs selling energy back to the grid.

xStorage Container - C20 BESS

Eaton's xStorage™ Container C20 BESS **is series of 20GP containerized battery energy storage systems** suitable to use in large-scale utility applications and renewable energy power plants. The prefabricated system consisting of UL9540A approved lithium-ion battery strings, BMS, EMS, PCS, transformer, fire suppression system, and HAVC unit helps ensure your power continuity, optimize your energy bills by peak-shaving and load-shifting, and reduce your total cost of ownership by taking part to grid auxiliary service.



Core features

- On-grid and islanded mode supported
- Modular design
- Long-life discharge and stabilized discharge curve
- Third-party SCADA supported
- Cloud-based dispatch
- Eco mode operation
- Accurate and consistent balancing
- RTU-based control
- Protection rating: IP54

Application highlights

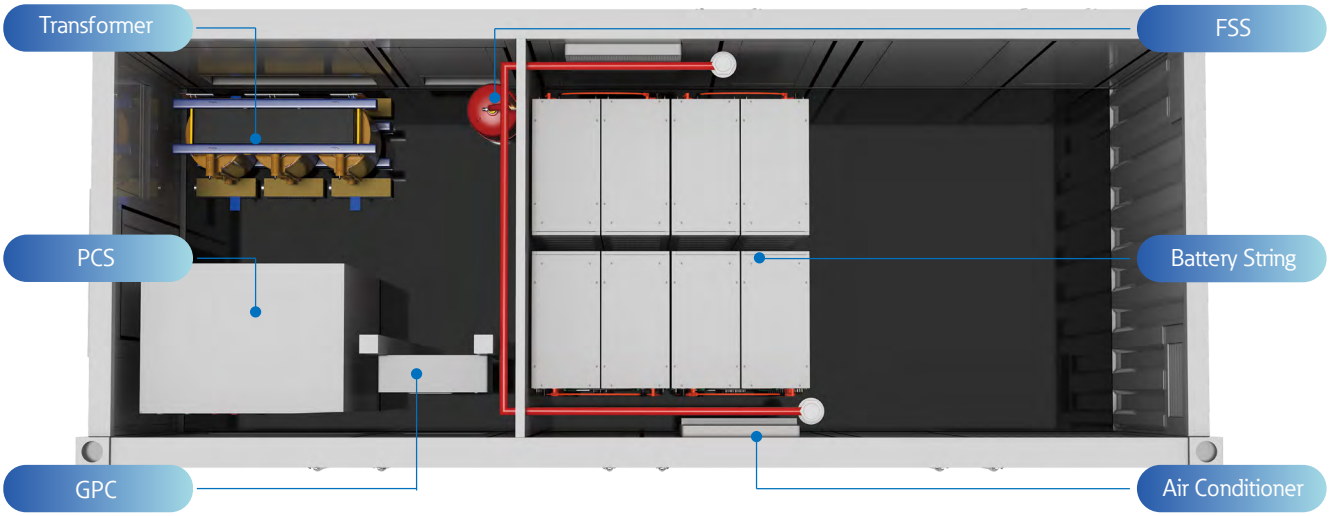
Industrial or manufacturing buildings - store renewable or off-peak cheap electricity to do peak shaving to avoid expensive energy tariff periods and together with a PV installation, increase solar self-consumption for additional savings.

Commercial buildings - meet decarbonization targets by increasing local production and consumption of renewables.

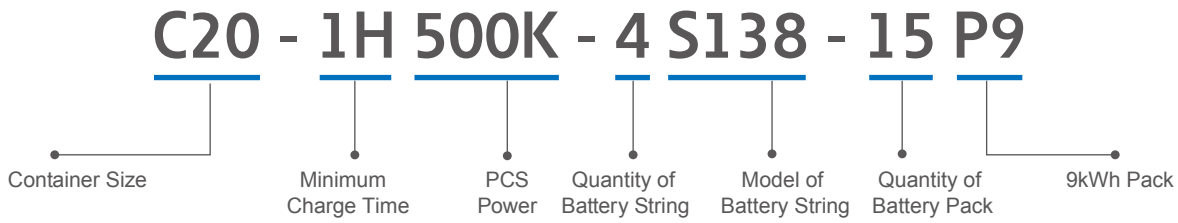
Buildings in remote area or with unreliable power - reduce dependence on fossil fuel supply and diesel generation.

Grid infrastructure - support infrastructure or defer investments by peak shaving or reducing the impact of loads on the grid.

System composition



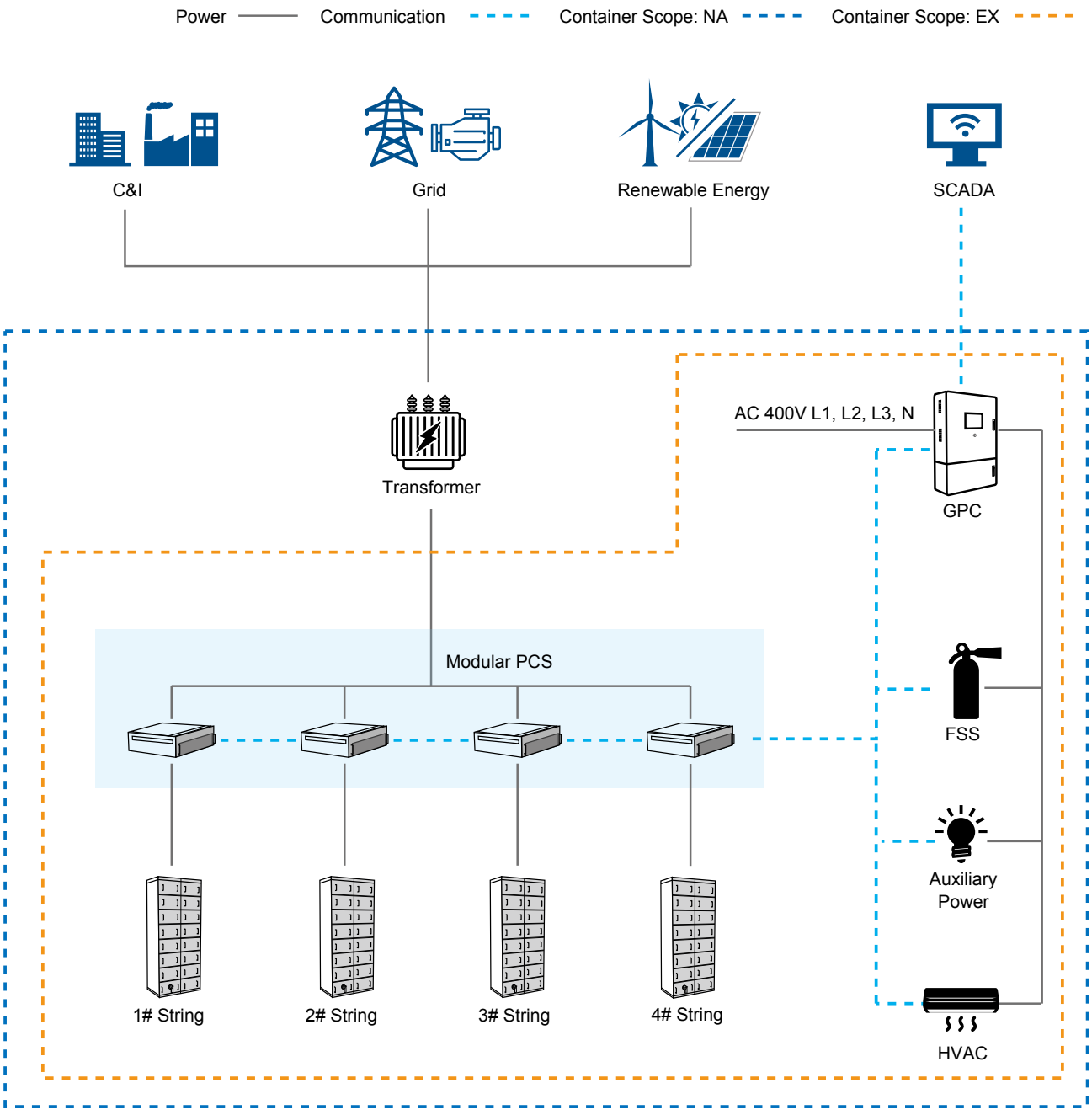
Nomenclature



Configuration

Product Model	Battery String Type	Rated Capacity	AC Connection	Isolation	Grid-Connected Voltage	Dimensions (L x W x H mm)
C20-1H500K-NA	S138-15P9	552kWh	3-Phase 4-Wire+PE	Built-in Transformer	480V	6,058x2,438x2,591mm
C20-1H500K-EX	S138-15P9	552kWh	3-Phase+PE	Non-Isolation	400V	6,058x2,438x2,591mm

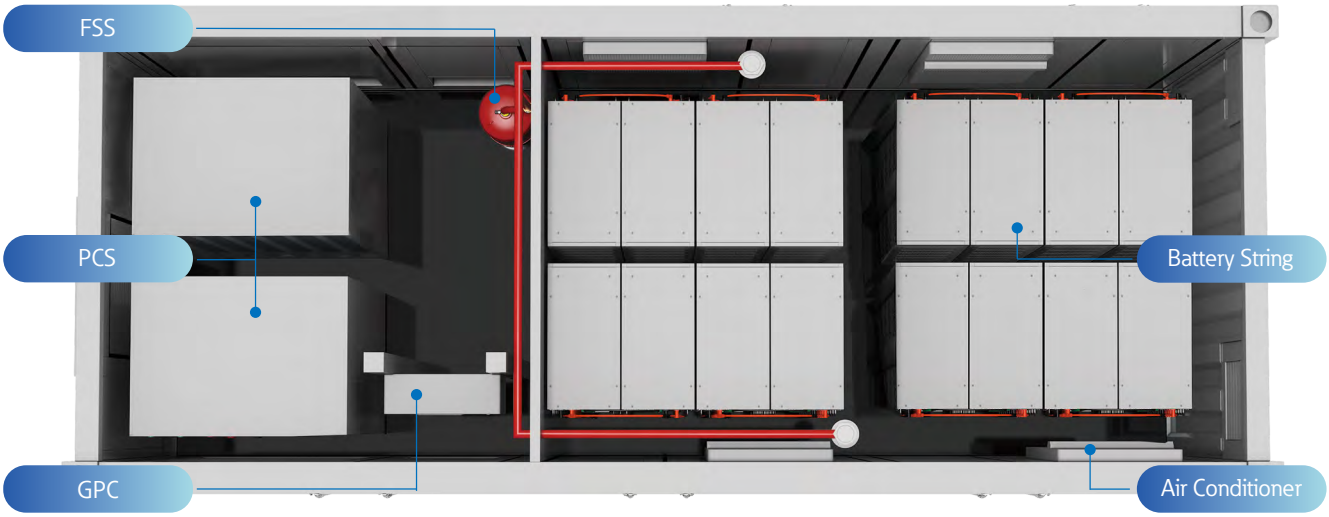
Topology


Power
Communication
Container Scope: NA
Container Scope: EX
C&I
Grid
Renewable Energy
SCADA
Transformer
AC 400V L1, L2, L3, N
GPC
Modular PCS
FSS
Auxiliary Power
1# String
2# String
3# String
4# String
HVAC

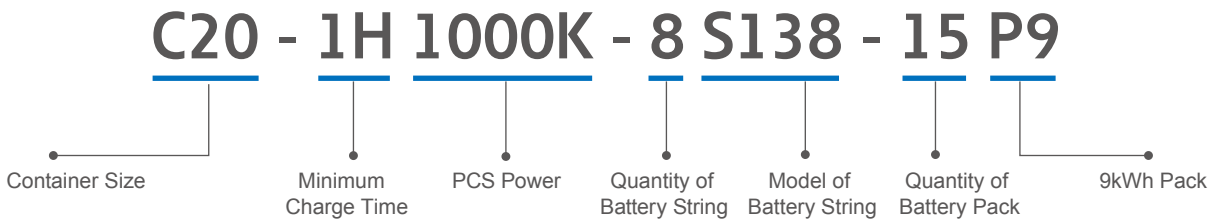
Specifications

Item	C20-1H500K-NA	C20-1H500K-EX
DC Data		
Battery Type	Lithium Iron Phosphate (LFP)	
Cell Life Cycle	80% Retention with 5,000 Cycles @ 1C 25°C	
Cell Spec	3.2V/90Ah	
String Configuration	2P240S	
Number of Strings	4	
Rated Energy Capacity	552kWh	
Rated Voltage	768V	
Voltage Range	672V~852V	
BMS Communication Interface	RS485, Ethernet	
BMS Communication Protocol	Modbus-RTU, Modbus-TCP	
AC Data		
Rated AC Power	500kW	
Maximum AC Power	550kW	
Rated Voltage	480V	400V
Grid Voltage Range	432~ 528V(Configurable)	342~418V(Configurable)
Rated AC Current	601.4A	721.7A
Output THDi	< 3%	
AC PF	0.1~1 Leading or Lagging (Controllable)	
AC Output	3-Phase 4-Wire+PE	3-Phase+PE
General Data		
Dimension (L x W x H)	6,058 x 2,438 x 2,591mm	
Weight	14.5t	13.2t
Degree of Protection	IP54	
Operating Temperature Range	-20~40ºC	
Relative Humidity	0~95% (Non-Condensing)	
Max. Operating Altitude	3,000m/10,000feet (> 2,000m/6,500feet Derating)	
Cooling Method	HVAC	
Fire Suppression System	NOVEC1230/FM-200	
Communication Interfaces	RS485, Ethernet, GPRS	
Certifications	UL9540, IEC62933, UN3536, etc	

System composition



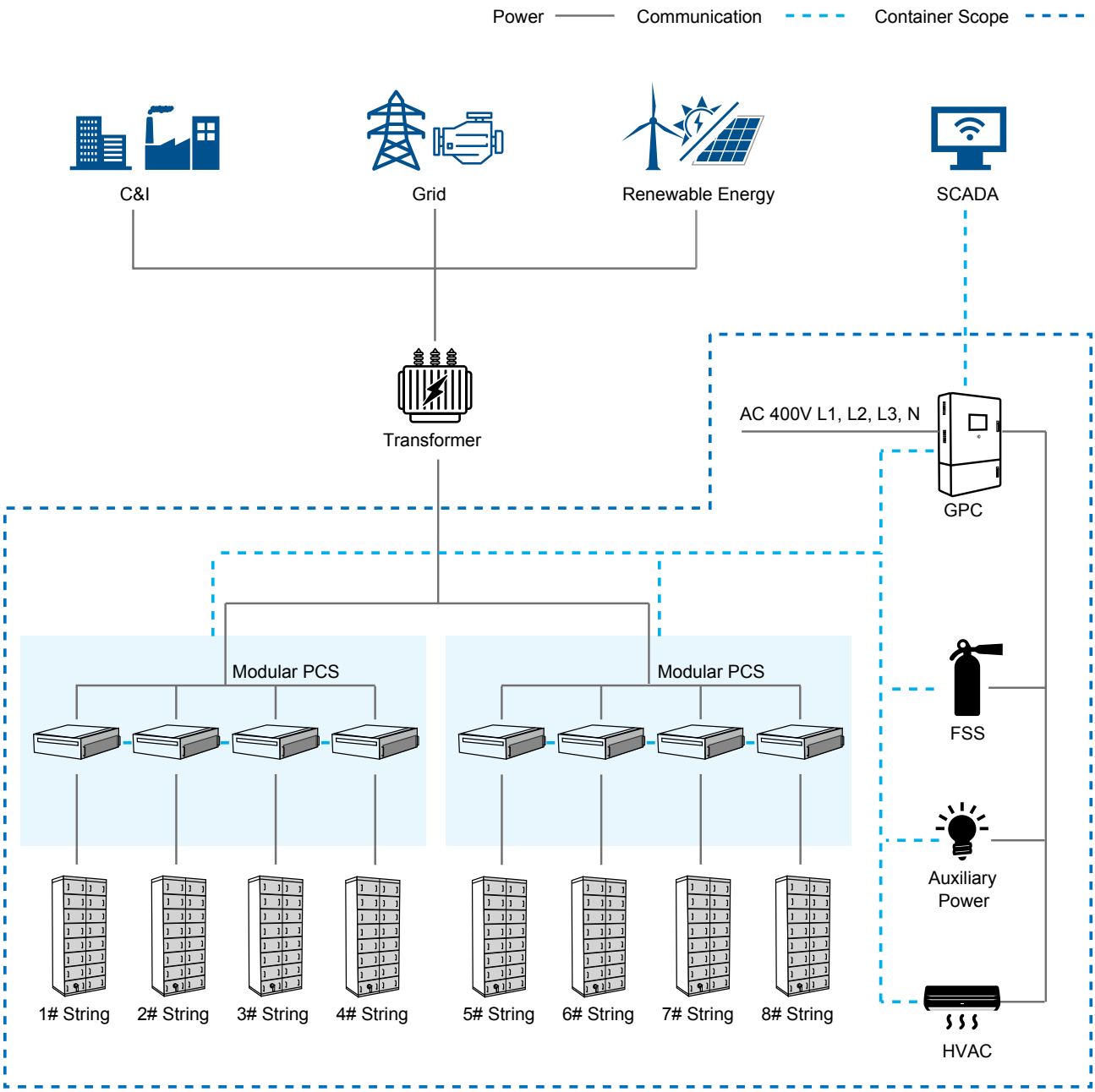
Nomenclature



Configuration

Product Model	Battery String Type	Rated Capacity	AC Connection	Isolation	Grid-Connected Voltage	Dimensions (L x W x H mm)
C20-1H1000K	S138-15P9	1,104kWh	3-Phase+PE	Non-Isolation	400V	6,058x2,438x2,591mm

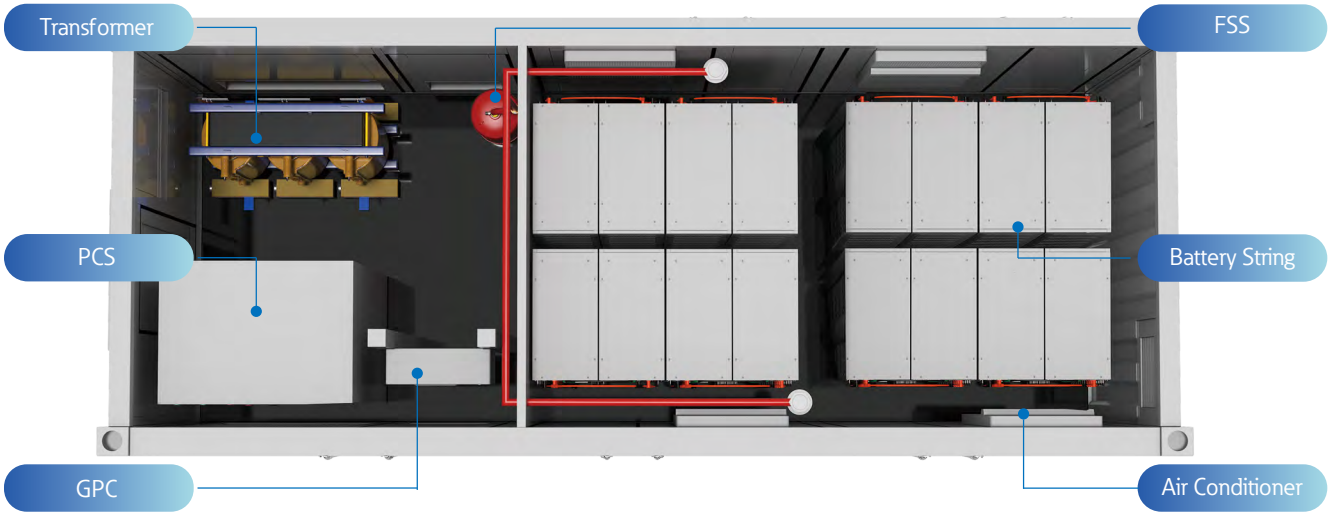
Topology


Power
Communication
Container Scope
C&I
Grid
Renewable Energy
SCADA
Transformer
AC 400V L1, L2, L3, N
GPC
Modular PCS
Modular PCS
FSS
Auxiliary Power
HVAC
1# String
2# String
3# String
4# String
5# String
6# String
7# String
8# String

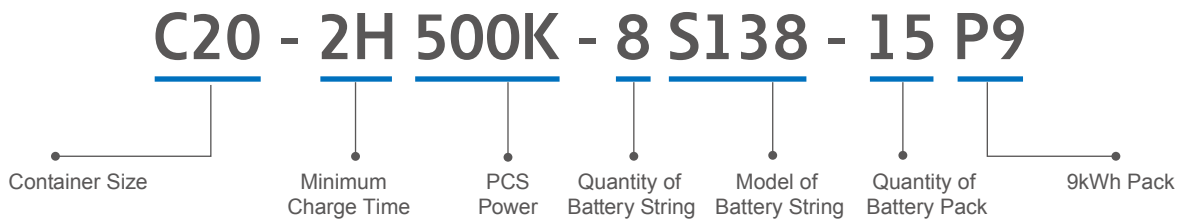
Specifications

Item	C20-1H1000K-NA	C20-1H1000K-EX
DC Data		
Battery Type	Lithium Iron Phosphate (LFP)	
Cell Life Cycle	80% Retention with 5,000 Cycles @ 1C 25°C	
Cell Spec	3.2V/90Ah	
String Configuration	2P240S	
Number of Strings	8	
Rated Energy Capacity	1.1MWh	
Rated Voltage	768V	
Voltage Range	672V~852V	
BMS Communication Interface	RS485, Ethernet	
BMS Communication Protocol	Modbus-RTU, Modbus-TCP	
AC Data		
Rated AC Power	1,000kW	
Maximum AC Power	1,100kW	
Rated Voltage	400V	
Grid Voltage Range	360~440V(Configurable)	342~418V(Configurable)
Rated AC Current	2 * 721.7A	
Output THDi	< 3%	
AC PF	0.1~1 Leading or Lagging (Controllable)	
AC Output	3-Phase+PE	
General Data		
Dimension (L x W x H)	6,058 x 2,438 x 2,591mm	
Weight	20t	
Degree of Protection	IP54	
Operating Temperature Range	-20~40ºC	
Relative Humidity	0~95% (Non-Condensing)	
Max. Operating Altitude	3,000m/10,000feet (> 2,000m/6,500feet Derating)	
Cooling Method	HVAC	
Fire Suppression System	NOVEC1230/FM-200	
Communication Interfaces	RS485, Ethernet, GPRS	
Certifications	UL9540, IEC62933, UN3536, etc	

System composition



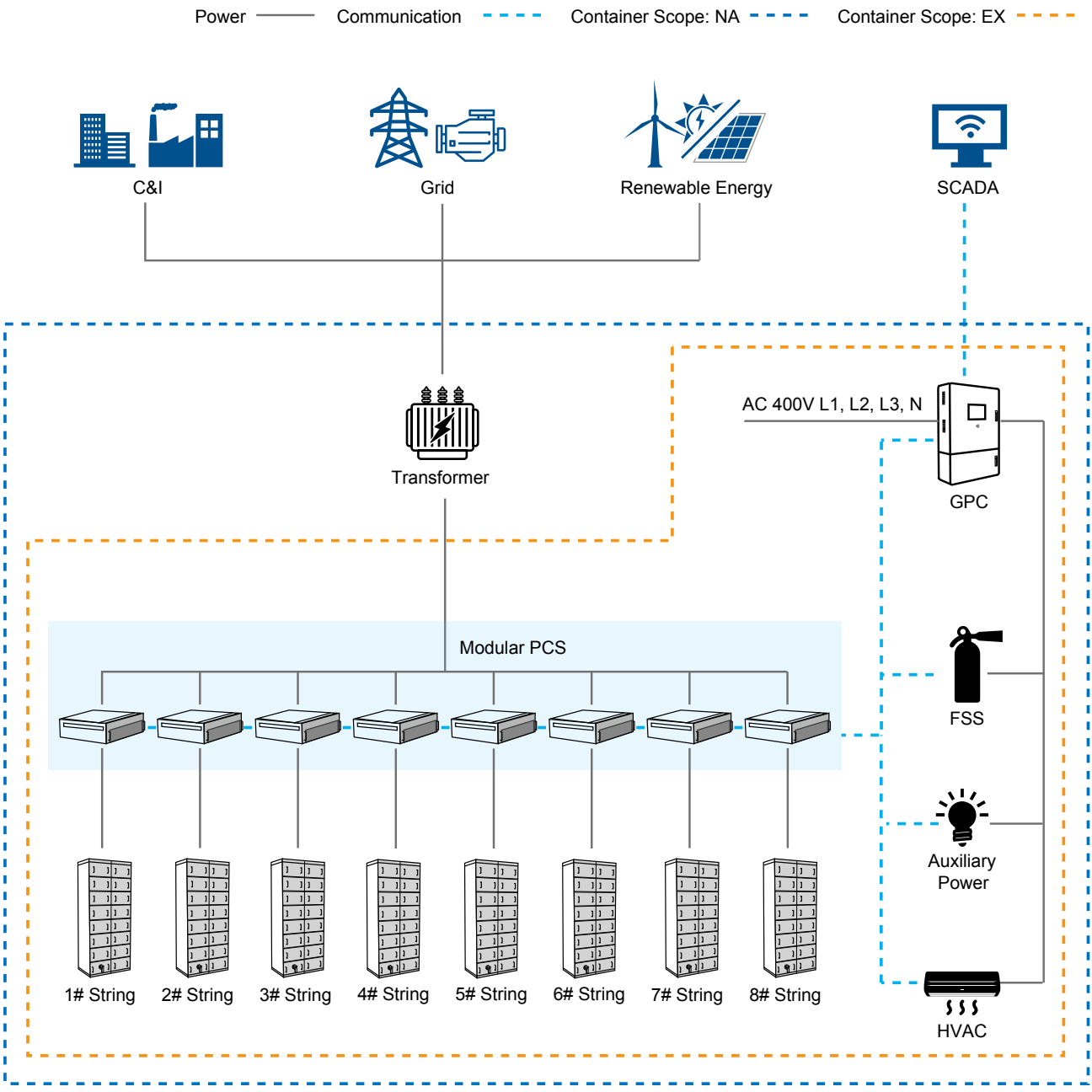
Nomenclature



Configuration

Product Model	Battery String Type	Rated Capacity	AC Connection	Isolation	Grid-Connected Voltage	Dimensions (L x W x H mm)
C20-2H500K-NA	S138-15P9	1,104kWh	3-Phase 4-Wire+PE	Built-in Transformer	480V	6,058x2,438x2,591mm
C20-2H500K-EX	S138-15P9	1,104kWh	3-Phase+PE	Non-Isolation	400V	6,058x2,438x2,591mm

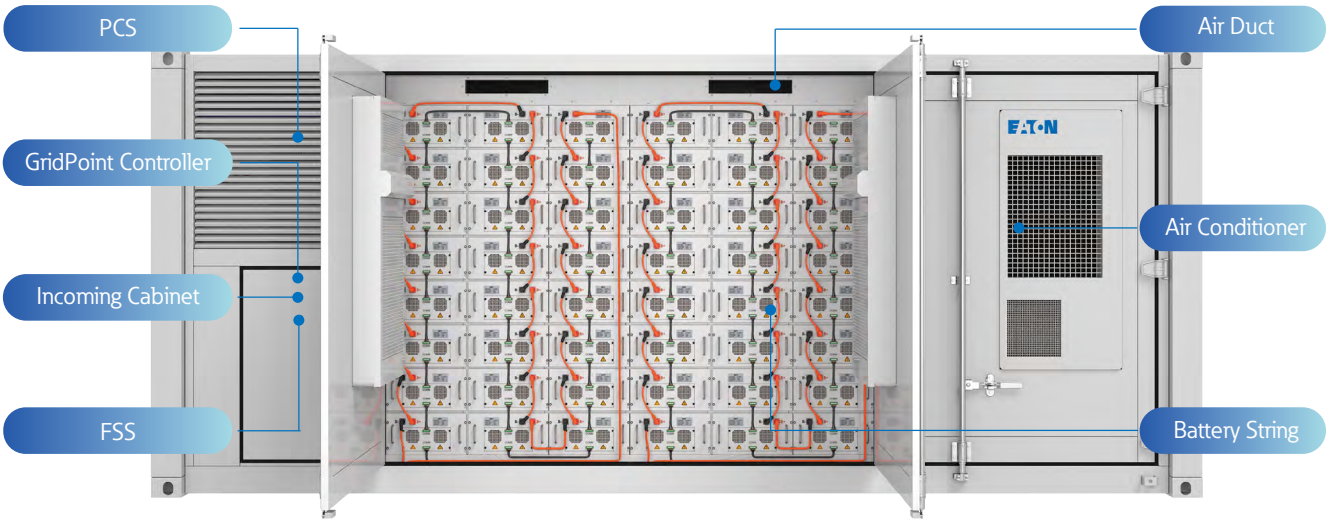
Topology


Power
Communication
Container Scope: NA
Container Scope: EX
C&I
Grid
Renewable Energy
SCADA
Transformer
AC 400V L1, L2, L3, N
GPC
Modular PCS
FSS
Auxiliary Power
HVAC
1# String
2# String
3# String
4# String
5# String
6# String
7# String
8# String

Specifications

Item	C20-2H500K-NA	C20-2H500K-EX
DC Data		
Battery Type	Lithium Iron Phosphate (LFP)	
Cell Life Cycle	80% Retention with 5,000 Cycles @ 1C 25°C	
Cell Spec	3.2V/90Ah	
String Configuration	2P240S	
Number of Strings	8	
Rated Energy Capacity	1,105kWh	
Rated Voltage	768V	
Voltage Range	672V~852V	
BMS Communication Interface	RS485, Ethernet	
BMS Communication Protocol	Modbus-RTU, Modbus-TCP	
AC Data		
Rated AC Power	500kW	
Maximum AC Power	550kW	
Rated Voltage	480V	400V
Grid Voltage Range	432~ 528V(Configurable)	342~418V(Configurable)
Rated AC Current	601.4A	721.7A
Output THDi	< 3%	
AC PF	0.1~1 Leading or Lagging (Controllable)	
AC Output	3-Phase 4-Wire+PE	3-Phase+PE
General Data		
Dimension (L x W x H)	6,058 x 2,438 x 2,591mm	
Weight	20t	18.7t
Degree of Protection	IP54	
Operating Temperature Range	-20~40°C	
Relative Humidity	0~95% (Non-Condensing)	
Max. Operating Altitude	3,000m/10,000feet (> 2,000m/6,500feet Derating)	
Cooling Method	HVAC	
Fire Suppression System	NOVEC1230/FM-200	
Communication Interfaces	RS485, Ethernet, GPRS	
Certifications	UL9540, IEC62933, UN3536, etc	

System composition



Nomenclature

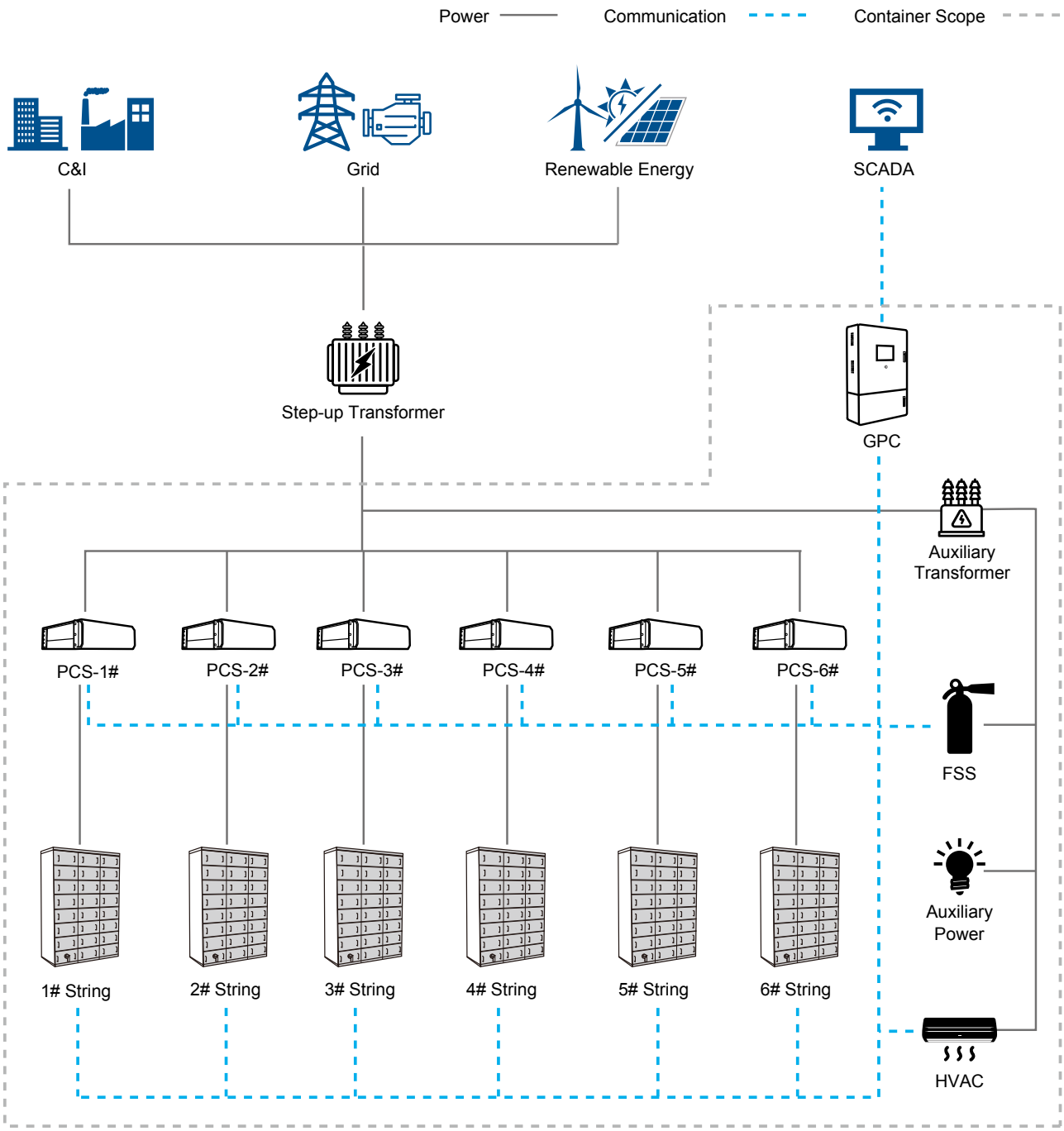
C20 - 2H 1000K - 6 S373 - 24 P14

C20	2H	1000K	6	S373	24	P14
Container Size	Minimum Charge Time	PCS Power	Quantity of Battery String	Model of Battery String	Quantity of Battery Pack	14kWh Pack

Configuration

Product Model	Battery String Type	String Qty	Rated Capacity	DC Voltage Range	Grid-Connected Voltage	Dimensions (L x W x H mm)
C20-2H800K	S373-24P14	5	1,720kWh	1,075.2V~1,363.2V	690V	6,058x2,438x2,591mm
C20-2H1000K	S373-24P14	6	2,064kWh	1,075.2V~1,363.2V	690V	6,058x2,438x2,591mm

Topology


Power
Communication
Container Scope
C&I
Grid
Renewable Energy
SCADA
Step-up Transformer
GPC
Auxiliary Transformer
PCS-1#
PCS-2#
PCS-3#
PCS-4#
PCS-5#
PCS-6#
FSS
Auxiliary Power
1# String
2# String
3# String
4# String
5# String
6# String
HVAC

Specifications

Item	C20-2H800K	C20-2H1000K
DC Data		
Battery Type	Lithium Iron Phosphate (LFP)	
Cell Life Cycle	90% Retention with 5,000 Cycles @ 0.5C 25°C	
Cell Spec	3.2V/280Ah	
String Configuration	1P384S	
Number of Strings	5	6
Rated Energy Capacity	1,720kWh	2,064kWh
Rated Voltage	1,228.8V	
Voltage Range	1,075.2V~1,363.2V	
BMS Communication Interface	RS485, Ethernet	
BMS Communication Protocol	Modbus-RTU, Modbus-TCP	
AC Data		
Nominal AC Power	800kW	1,000kW
Rated AC Power	1,000kW	1,200kW
Maximum AC Power	1,100kW	1,320kW
Rated Voltage	690V	
Grid Voltage Range	586.5~759V(Optional)	
Rated AC Current	669.4A	836.8A
Output THDi	< 3%	
AC PF	0.1~1 Leading or Lagging (Controllable)	
AC Output	3P+PE	
General Data		
Dimension (L x W x H)	6,058 x 2,438 x 2,591mm	
Weight	21t	24t
Degree of Protection - Battery Room	IP65	
Degree of Protection - PCS Room	IP66	
Degree of Protection - Control and Distribution Room	IP54	
Operating Temperature Range	-20~40°C	
Relative Humidity	0~95% (Non-Condensing)	
Max. Operating Altitude	4,000m/13,123ft	
Cooling Method	HVAC	
Fire Suppression System	NOVEC1230/FM-200	
Communication Interfaces	RS485, Ethernet, GPRS	
Certifications	UL9540, IEC62619, IEC62109, IEC62933, UN3536, etc	

Key components (C20-1H500K / C20-1H1000K / C20-2H500K)

Battery String-S138	Item	Data
	Battery Pack	S138-15P9
	Pack QTY	15
	Nominal Capacity	138.24kWh
	Rated Voltage	768V
	DC Voltage Range	672V~852V
	Pack Spec.	51.2V/180Ah@2P16S
	Communication	Ethernet, CAN, RS485
	Lifespan	> 5,000 Cycles@1C, 25°C
	Dimension (WxDxH)	800 x 750 x 2,050mm
	Weight	1,467kg
	Certification	UL1973, UL9540A, IEC62619, CE, UN38.3

- 1C charge/discharge;
- Scalable battery strings ;
- Easy configuration and maintenance.

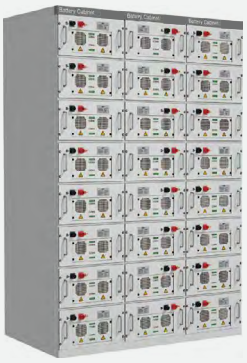
Power Conversion System	Item	PWS1-500KTL-NA	PWS1-500KTL-EX
	Battery Voltage Range	630~900V	600~900V
	DC Max. Current	873A	
	Rated AC Power	500kW	
	Max. AC Power	550kW	
	Rated Voltage	480V	400V
	Grid Voltage Range	432~ 528V	342~418V
	Rated AC Current	601.4A	721.7A
	Output THDi	≤3%	
	Adjustable PF	1(Leading)~1(Lagging)	
	Grid Frequency Range	60Hz(59.5~60.5Hz)	50/60±2.5Hz
	Isolation Method	Built-in Transformer	Non-Isolation
	Dimension (WxDxH)	2,200 x 800 x 2,160mm	1,100 x 800 x 2,160mm
	Weight	2,000kg	600kg

- Single-stage three-level modularization;
- Multi-branch input to simplify connection between battery series and parallels.

Power Conversion System (Eaton)	Item	93PCS-500-IEC	93PCS-630-IEC
	Battery Voltage Range	600~900V	600~900V
	Max. DC Current	1000A	1200A
	Rated AC Power	500kW	630kW
	Rated Voltage	400VAC	400VAC
	Grid Voltage Range	342~418V	342~418V
	Rated AC Current	724.6A	913.0A
	Output THDi	≤3%	
	Adjustable PF	1(Leading)~1(Lagging)	
	Grid Frequency Range	50/60±2.5Hz	50/60±2.5Hz
	Isolation Method	Non-Isolation	Non-Isolation
	Dimension (WxDxH)	600 x 800 x 2,000mm	600 x 800 x 2,000mm

- Single-stage three-level modularization;
- Multi-branch input to simplify connection between battery series and parallels.

Key components (C20-2H1000K)

Battery String-S373	Item	Data
	Battery Pack	S373-24P14
	Pack QTY	24
	Rated Capacity	344.06kWh
	Rated Voltage	1,228.8V
	DC Voltage Range	1,075.2V~1,363.2V
	Pack Spec.	51.2V/280Ah@1P16S
	Communication	Ethernet, CAN, RS485
	Lifespan	>5,000 Cycles@0.5C, 25°C
	Dimension (WxDxH)	1,440 x 750 x 2,150mm
	Weight	2,922kg
	Certification	UL1973, UL9540A, IEC62619, CE, UN38.3

- 0.5C charge/discharge;
- Scalable battery strings;
- Easy configuration and maintenance.

Power Conversion System	Item	C20-2H800K	C20-2H1000K
	DC Voltage Range	1000~1,500V	
	Max. DC Current	224.5A * 5	224.5A * 6
	Rated Output Power	200kW * 5	200kW * 6
	Rated Grid Voltage	690V	
	Grid Voltage Range	-15%~+10%	
	Grid Frequency	50Hz/60Hz	
	Max. AC Current	184.1A * 5	184.1A * 6
	AC PF	0.1~1 Leading or Lagging (Controllable)	
	Weight	100kg * 5	100kg * 6
	Certification	UL1741, IEEE1547, IEC62477-1, IEC61000	

- Single-stage three-level modularization;
- Multi-branch input to simplify connection between battery series and parallels;
- One-to-one management of battery string and PCS.

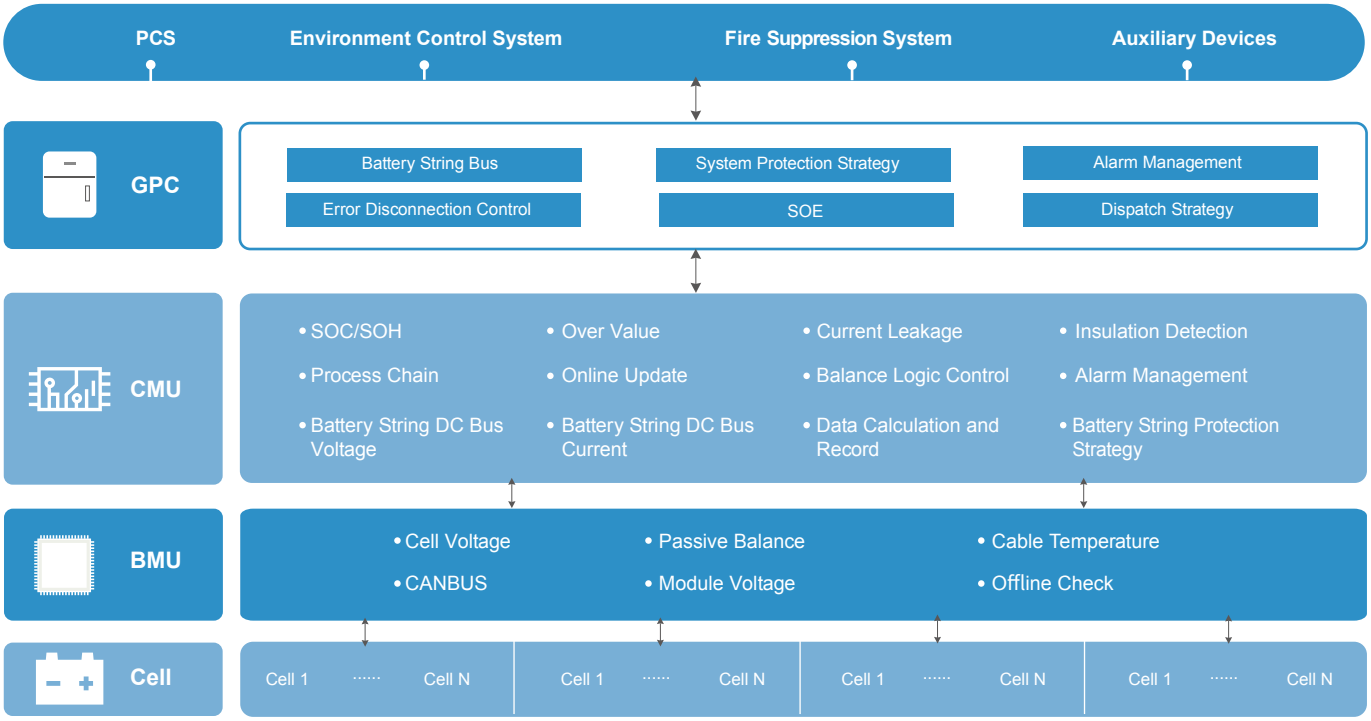
Key components

Grid Point Controller is applicable for all C20

GridPoint Controller (GPC)	Item	Data
	Power Interface	AC220V/DC24V
	Communication	Modbus-RTU, Modbus-TCP
	Relay	24 Stem Node Input / Output
	On-grid Application	Peak Shaving, Load Shifting, Frequency Regulation
	Off-grid Application	Backup Power, PV/DG/EV/ESS Integrated Microgrid Control

- All-round signal collection;
- Comprehensive logical control;
- Multilevel electric & control protection;
- Intelligent communication management;
- Easy configuration.

Battery management system (BMS) overview



BMU (Pack Level BMS)		CMU (String Level BMS)	
Cell Voltage Measurement Accuracy	±2.5 mV	Battery String Voltage Measurement Range	100~1,500V
Cell Voltage Monitoring Interval	≤500ms	Battery String Voltage Measurement Accuracy	±1%
Cell Temperature Measurement Accuracy	±2°C	Battery String Voltage Monitoring Interval	≤200ms
Cell Temperature Measurement Interval	≤3s	Battery String Current Measurement Range	±300A
Cell Current Balance	Passive Balance, 150mA MAX	Battery String Current Measurement Accuracy	≤1%
Cell Voltage Measurement Range	1~5 V	Battery String Current Monitoring Interval	≤50ms
Over-Current Protection	250A/1s	SOC Calculation Accuracy	≤8%
Short-Circuit Protection	500A/10ms	Input Insulation Resistance	≥10mΩ, 1,000VDC


Build resiliency
Optimize your energy
Enhance your green credentials

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September 2022

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