

**ATTACHMENT F: SAMPLE EQUIPMENT
SPECIFICATIONS**



SolBank 2.0

Energy Storage System

S-3328-2h-NA | S-3328-4h-NA

e-STORAGE is a leading company specializing in the design, manufacturing, and integration of battery energy storage systems for utility-scale applications. At the core of the e-STORAGE platform is SolBank, a self-manufactured, lithium-iron phosphate chemistry-based battery engineered for utility-scale applications.

Through our innovative solutions, we aim to optimize grid operations, promote clean energy integration, and foster a more resilient and sustainable energy landscape.

Together, we are building a brighter, greener future for all.

e-STORAGE SolBank 2.0 is a modular, flexible, and cost-effective battery energy storage product. Multiple units could be connected in parallel. SolBank 2.0 is designed to meet energy storage needs for today and for the future.

PRODUCT CERTIFICATES*

UL1973, UL9540, UL9540A, UN38.3 / UN3536

*The specific certificates applicable to each market, and not all certifications listed herein will simultaneously apply to the products you order or use. Please contact your local e-STORAGE sales representative to confirm the specific certificates applicable in the regions in which the products will be used.

KEY FEATURES



Cost-effective and long service life



314Ah LFP cell leads to high energy density



Active balancing BMS on pack and rack level, releases more energy and extends the life of the system



Liquid cooling technology with cell temperatures being controlled within the optimal operating range



Battery pack IP65 seal grade, avoid dust, moisture, and water condensation



Multi-stage thermal spread technology, effectively prevents battery heat spread and improves safety

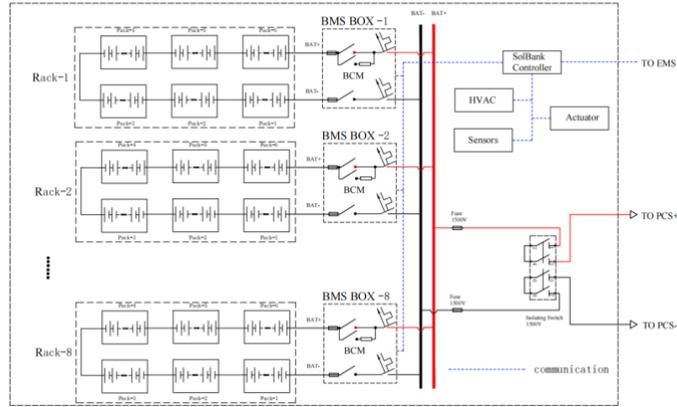


Multi-level fire detection, monitor early thermal runaway of cells



All internal components including battery packs assembled in factory, reducing on-site installation costs

CIRCUIT DIAGRAM



SYSTEM PARAMETER

	CSI-SolBank-S-3328-2h-NA	CSI-SolBank-S-3328-4h-NA
Battery Chemistry	Lithium Iron Phosphate (LFP)	
Pack Configuration	1P69S (69 Cells)	
Rack Configuration	1P414S (6 Packs)	
System Configuration	8P414S (8 Racks)	
DC Voltage (Nominal)	1324.8 V	
DC Voltage Range ¹	1159.2 V ~ 1490.4 V	
Rated DC Power ²	1545 kW	780 kW
Usable Energy Capacity (FAT) ³	3095 kWh	3130 kWh
Max. Short Circuit Current	75 kA	70 kA
Charging/Discharging Mode	0.5 P / 0.5 P	0.25 P / 0.25 P
Duration @Rated Power	2 hrs	4 hrs
DC Round Trip Efficiency (RTE) ⁴	93%	94%
Aux Load (Standby/Peak)	1.25 kVA / 30 kVA	1.25 kVA / 20 kVA
Auxiliary Power Interface	AC480 V / 60 Hz, 3P5W	
Thermal Management System	Liquid cooling/heating for battery system, air cooling for electrical components and humidity control	
Control Backup	2-hrs UPS for control system including BMS, installed in the container	
Operating Temperature (Ambient)	-30 °C to 55 °C	
Relative Humidity	≤95% (non-condensing)	
Communication Interface	Ethernet, RS485, CAN	
Communication Protocol	Modbus TCP/IP, Modbus RTU, CAN 2.0	
Certifications	UL1973, UL9540, UL9540A, UN38.3/UN3536	
Design Standards/Codes	NFPA69, NFPA70, NFPA855, IEC62619	
Enclosure	20ft. high-cube container	
Dimensions (L*W*H)	6058*2438*2896 mm (238.50*95.98*114.02 in)	
Weight (Battery Included)	30,200 kg (66,580 lbs)	
Altitude	≤ 2000 m (derating between 2000 m and 4000 m)	
Enclosure Ingress Rating	IP55 / NEMA 3R	
Painting/Coating	RAL9003	
Seismic Parameter	Zone 4	
Noise Level	≤ 75 dB @1m distance	
Fire Detection and Alarm	Fire alarm panel, heat and smoke detection, alarm bell and strobe with 24 hours UPS backup	
Explosion Prevention	Combustible gas detection with active ventilation	
Fire Suppression	Optional aerosol-based suppression system, dry pipe suppression system	
Emergency Stop/Shut-off	Local and remote	

1. Unit is rated at 1159.2V~1490.4V for optimized product performance, maximum voltage range for battery system is 1055.7V~1490.4V
2. The rated operating power of a single unit subject to a maximum of 3 units connected in parallel
3. Usable Energy Capacity is measured at FAT, contact e-STORAGE for estimate at COD
4. RTE is measured with rated DC Power for full cycle at BOL, refer to the warranty document for complete procedure

* The technical parameters contained in this technical data document may deviate slightly, and e-STORAGE does not guarantee that they are completely accurate. Due to continuous innovation, research and development and product improvement, e-STORAGE reserves the right to adjust the information in this technical parameter document at any time without prior notice. Customer should obtain the latest version of the technical parameter document when signing the contract and make it an integral part of the binding contract signed by both parties.

The utility-scale MV battery inverters

Freemaq

PCSM & Multi PCSM

Robust and durable

Prepared for
the most
extreme
environments.



REFERENCES		FP4200M	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4200	
	AC Output Power (kVA/kW) @50°C ^[1]	3900	
	Operating Grid Voltage (kV)	34.5kV ±10%	13.8kV ±10%
	Operating Grid Frequency (Hz)	60Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging	
	Reactive Power Compensation	Four quadrant operation	
DC	DC Voltage Range ^[3]	934V - 1500V	
	Maximum DC Voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC Continuous Current (A)	4590	
	Max. DC Short Circuit Current (kA)	250 kA with a time constant of 3ms	
	Battery Technology	All type of batteries (BMS required)	
EFFICIENCY	Efficiency (Max) (η) (preliminary)	97.80% including MV transformer	
	Euroeta (η) (preliminary)	97.51% including MV transformer	
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2	
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2	
	Weight (lbs)	30865	
	Weight (kg)	14000	
	Type of Ventilation	Forced air cooling	
ENVIRONMENT	Degree of Protection	NEMA 3R	
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active Power derating	
	Relative Humidity	4% to 100% non-condensing	
	Max. Altitude (above sea level) ^[5]	2000m	
CONTROL INTERFACE	Communication Protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported.	
	Keyed ON/OFF Switch	Standard	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity Control	Active heating	
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)	
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]	
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)	
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16	
	Utility Interconnect ^[7]	IEEE 1547:2018 / UL 1741 SB	

NOTES

[1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.

[2] Consult P-Q charts available: $Q(\text{kVAr}) = \sqrt{(S(\text{kVA}))^2 - P(\text{kW})^2}$

[3] Consult Power Electronics for derating curves.

[4] Optional available for temperatures down to -35°C

[5] Consult Power Electronics for altitudes above 1000m.

[6] Battery short circuit disconnection must be done on the battery side

[7] Consult Power Electronics for other applicable standards / grid codes

REFERENCES	FP4200MH	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4200
	AC Output Power (kVA/kW) @50°C ^[1]	3900
	Operating Grid Voltage (kV)	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging
	Reactive Power Compensation	Four quadrant operation
DC	DC Voltage Range ^[3]	934V - 1500V
	Maximum DC Voltage	1500V
	DC Voltage Ripple	< 3%
	Max. DC Continuous Current (A)	4590
	Max. DC Short Circuit Current (kA)	250 kA with a time constant of 3ms
	Battery Technology	All type of batteries (BMS required)
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) (preliminary)	97.80% including MV transformer
	Euroeta (η) (preliminary)	97.51% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIRONMENT	Degree of Protection	IP55
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active Power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level) ^[5]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional. Third party SCADA systems supported.
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	Insulation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (2L+V)
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]
	Overtoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	IEC 62477-2

NOTES

- [1] Values at 1.00-Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.
 [2] Consult P-Q charts available: $Q(\text{kVar}) = \sqrt{(S(\text{kVA}))^2 - P(\text{kW})^2}$.
 [3] Consult Power Electronics for derating curves.
 [4] Optional available for temperatures down to -35°C
 [5] Consult Power Electronics for altitudes above 1000m.
 [6] Battery short circuit disconnection must be done on the battery side.

REFERENCES		FP4105M	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4105	
	AC Output Power (kVA/kW) @50°C ^[1]	3810	
	Operating Grid Voltage (kV)	34.5kV ±10%	13.8kV ±10%
	Operating Grid Frequency (Hz)	60Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging	
	Reactive Power Compensation	Four quadrant operation	
DC	DC Voltage Range ^[3]	913V - 1500V	
	Maximum DC Voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC Continuous Current (A)	4590	
	Max. DC Short Circuit Current (kA)	250 kA with a time constant of 3ms	
EFFICIENCY	Battery Technology	All type of batteries (BMS required)	
	Efficiency (Max) (η) (preliminary)	97.76% including MV transformer	
CABINET	Euroeta (η) (preliminary)	97.50% including MV transformer	
	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2	
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2	
	Weight (lbs)	30865	
	Weight (kg)	14000	
ENVIRONMENT	Type of Ventilation	Forced air cooling	
	Degree of Protection	NEMA 3R	
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active Power derating	
	Relative Humidity	4% to 100% non-condensing	
CONTROL INTERFACE	Max. Altitude (above sea level) ^[5]	2000m	
	Communication Protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported.	
PROTECTIONS	Keyed ON/OFF Switch	Standard	
	Ground Fault Protection	Insulation monitoring device	
	Humidity Control	Active heating	
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)	
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]	
CERTIFICATIONS & STANDARDS	Overtoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)	
	Safety	UL 1741 / CSA 22.2 No.107.1-16	
	Utility Interconnect ^[7]	IEEE 1547:2018 / UL 1741 SB	

NOTES

- [1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.
- [2] Consult P-Q charts available: $Q(kVAR) = \sqrt{(S(kVA))^2 - P(kW)^2}$.
- [3] Consult Power Electronics for derating curves.
- [4] Optional available for temperatures down to -35°C
- [5] Consult Power Electronics for altitudes above 1000m.
- [6] Battery short circuit disconnection must be done on the battery side.
- [7] Consult Power Electronics for other applicable standards / grid codes.

REFERENCES	FP4105MH	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4105
	AC Output Power (kVA/kW) @50°C ^[1]	3810
	Operating Grid Voltage (kV)	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging
	Reactive Power Compensation	Four quadrant operation
DC	DC Voltage Range ^[3]	913V - 1500V
	Maximum DC Voltage	1500V
	DC Voltage Ripple	< 3%
	Max. DC Continuous Current (A)	4590
	Max. DC Short Circuit Current (kA)	250 kA with a time constant of 3ms
Battery Technology	All type of batteries (BMS required)	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) (preliminary)	97.76% including MV transformer
	Euroeta (η) (preliminary)	97.50% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIRONMENT	Degree of Protection	IP55
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active Power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level) ^[5]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional. Third party SCADA systems supported.
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	Insulation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]
	Oversvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	IEC 62477-2

NOTES

[1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.

[2] Consult P-Q charts available: $Q(kVAr) = \sqrt{(S(kVA))^2 - P(kW)^2}$.

[3] Consult Power Electronics for derating curves.

[4] Optional available for temperatures down to -35°C

[5] Consult Power Electronics for altitudes above 1000m.

[6] Battery short circuit disconnection must be done on the battery side.

REFERENCES	FP4010M		
AC	AC Output Power (kVA/kW) @40°C ^[1]	4010	
	AC Output Power (kVA/kW) @50°C ^[1]	3720	
	Operating Grid Voltage (kV)	34.5kV ±10%	13.8kV ±10%
	Operating Grid Frequency (Hz)	60Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging	
	Reactive Power Compensation	Four quadrant operation	
DC	DC Voltage Range ^[3]	891V - 1500V	
	Maximum DC Voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC Continuous Current (A)	4590	
	Max. DC Short Circuit Current (kA)	250 kA with a time constant of 3ms	
EFFICIENCY	Battery Technology	All type of batteries (BMS required)	
	Efficiency (Max) (η) (preliminary)	97.75% including MV transformer	
	Euroeta (η) (preliminary)	97.48% including MV transformer	
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2	
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2	
	Weight (lbs)	30865	
	Weight (kg)	14000	
	Type of Ventilation	Forced air cooling	
ENVIRONMENT	Degree of Protection	NEMA 3R	
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating	
	Relative Humidity	4% to 100% non-condensing	
	Max. Altitude (above sea level) ^[5]	2000m	
CONTROL INTERFACE	Communication Protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported.	
	Keyed ON/OFF Switch	Standard	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity Control	Active heating	
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)	
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]	
	Oversvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)	
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16	
	Utility Interconnect ^[7]	IEEE 1547:2018 / UL 1741 SB	

NOTES

[1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.
 [2] Consult P-Q charts available: $Q(kVAr) = \sqrt{(S(kVA))^2 - P(kW)^2}$.
 [3] Consult Power Electronics for derating curves.

[4] Optional available for temperatures down to -35°C
 [5] Consult Power Electronics for altitudes above 1000m.
 [6] Battery short circuit disconnection must be done on the battery side.
 [7] Consult Power Electronics for other applicable standards / grid codes.

REFERENCES	FP4010MH	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4010
	AC Output Power (kVA/kW) @50°C ^[1]	3720
	Operating Grid Voltage (kV)	34.5kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging
	Reactive Power Compensation	Four quadrant operation
DC	DC Voltage Range ^[3]	891V - 1500V
	Maximum DC Voltage	1500V
	DC Voltage Ripple	< 3%
	Max. DC Continuous Current (A)	4590
	Max. DC Short Circuit Current (kA)	250 kA with a time constant of 3ms
	Battery Technology	All type of batteries (BMS required)
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) (preliminary)	97.75% including MV transformer
	Euroeta (η) (preliminary)	97.48% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIRONMENT	Degree of Protection	IP55
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level) ^[5]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional. Third party SCADA systems supported.
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	Insulation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (2L+V)
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]
	Oversvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	IEC 62477-2

NOTES

- [1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves
- [2] Consult P-Q charts available: $Q(kVAr) = \sqrt{(S(kVA))^2 - P(kW)^2}$.
- [3] Consult Power Electronics for derating curves.
- [4] Optional available for temperatures down to -35°C
- [5] Consult Power Electronics for altitudes above 1000m.
- [6] Battery short circuit disconnection must be done on the battery side.

Freemaq Multi PCSM



REFERENCES	FP4200M2	FP4200M4
AC	AC Output Power (kVA/kW) @40°C ^[1]	4200
	AC Output Power (kVA/kW) @50°C ^[1]	3900
	Operating Grid Voltage (kV)	34.5kV ±10% 13.8kV ±10% 34.5kV ±10% 13.8kV ±10%
	Operating Grid Frequency (Hz)	60Hz
	Current Harmonic Distortion (THDi)	< 3% per IEEE519
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging
	Reactive Power Compensation	Four quadrant operation
DC	DC Voltage Range ^[3]	934V - 1500V
	Maximum DC Voltage	1500V
	DC Voltage Ripple	< 3%
	Max. DC Continuous Current per Input (A)	2295 1148
	Max. DC Short Circuit Current per Input (kA)	250 kA with a time constant of 3ms
EFFICIENCY	Battery Technology	All type of batteries (BMS required)
	Number of Separate DC Inputs	2 4
EFFICIENCY	Efficiency (Max) (η)	97.80% including MV transformer
	Euroeta (η)	97.51% including MV transformer
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2
	Weight (lbs)	30865
	Weight (kg)	14000
	Type of Ventilation	Forced air cooling
ENVIRONMENT	Degree of Protection	NEMA 3R
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating
	Relative Humidity	4% to 100% non-condensing
	Max. Altitude (above sea level) ^[5]	2000m
CONTROL INTERFACE	Communication Protocol	Modbus TCP
	Power Plant Controller	Optional. Third party SCADA systems supported.
	Keyed ON/OFF Switch	Standard
PROTECTIONS	Ground Fault Protection	Insulation monitoring device
	Humidity Control	Active heating
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16
	Utility Interconnect ^[7]	IEEE 1547:2018 / UL 1741 SB

NOTES

- [1] Values at 1.00 Vac nom and cosφ=1.
Consult Power Electronics for charging mode and derating curves.
[2] Consult P-Q charts available: $Q(kVAr) = \sqrt{(S(kVA))^2 - P(kW)^2}$.
[3] Consult Power Electronics for derating curves.
[4] Optional available for temperatures down to -35°C

- [5] Consult Power Electronics for altitudes above 1000m.
[6] Battery short circuit disconnection must be done on the battery side.
[7] Consult Power Electronics for other applicable standards / grid codes.

Freemaq Multi PCSM



REFERENCES	FP4200MH2	FP4200MH4	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4200	
	AC Output Power (kVA/kW) @50°C ^[1]	3900	
	Operating Grid Voltage (kV)	34.5kV ±10%	
	Operating Grid Frequency (Hz)	60Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging	
	Reactive Power Compensation	Four quadrant operation	
DC	DC Voltage Range ^[3]	934V - 1500V	
	Maximum DC Voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC Continuous Current per Input (A)	2295	1148
	Max. DC Short Circuit Current per Input (kA)	250 kA with a time constant of 3ms	
	Battery Technology	All type of batteries (BMS required)	
	Number of Separate DC Inputs	2	4
EFFICIENCY	Efficiency (Max) (η)	97.80% including MV transformer	
	Euroeta (η)	97.51% including MV transformer	
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2	
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2	
	Weight (lbs)	30865	
	Weight (kg)	14000	
	Type of Ventilation	Forced air cooling	
ENVIRONMENT	Degree of Protection	IP55	
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating	
	Relative Humidity	4% to 100% non-condensing	
	Max. Altitude (above sea level) ^[5]	2000m	
CONTROL INTERFACE	Communication Protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported.	
	Keyed ON/OFF Switch	Standard	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity Control	Active heating	
	General AC Protection & Disconn.	MV switchgear (2L+V)	
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]	
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)	
CERTIFICATIONS & STANDARDS	Safety	IEC 62477-2	

NOTES

- [1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.
 [2] Consult P-Q charts available: $Q(kVAr) = \sqrt{(S(kVA))^2 - P(kW)^2}$.
 [3] Consult Power Electronics for derating curves.
 [4] Optional available for temperatures down to -35°C
 [5] Consult Power Electronics for altitudes above 1000m.
 [6] Battery short circuit disconnection must be done on the battery side.

Freemaq Multi PCSM



REFERENCES	FP4105M2	FP4105M4			
AC	AC Output Power (kVA/kW) @40°C ^[1]		4105		
	AC Output Power (kVA/kW) @50°C ^[1]		3810		
	Operating Grid Voltage (kV)	34.5kV ±10%	13.8kV ±10%	34.5kV ±10%	13.8kV ±10%
	Operating Grid Frequency (Hz)	60Hz			
	Current Harmonic Distortion (THDi)	< 3% per IEEE519			
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging			
	Reactive Power Compensation	Four quadrant operation			
DC	DC Voltage Range ^[3]		913V - 1500V		
	Maximum DC Voltage		1500V		
	DC Voltage Ripple		< 3%		
	Max. DC Continuous Current per Input (A)	2295	1148		
	Max. DC Short Circuit Current per Input (kA)	250 kA with a time constant of 3ms			
EFFICIENCY	Battery Technology		All type of batteries (BMS required)		
	Number of Separate DC Inputs	2	4		
EFFICIENCY	Efficiency (Max) (η)		97.76% including MV transformer		
	Euroeta (η)		97.50% including MV transformer		
CABINET	Dimensions [WxDxH] (ft)		21.3 x 6.5 x 7.2		
	Dimensions [WxDxH] (m)		6.5 x 2.0 x 2.2		
	Weight (lbs)		30865		
	Weight (kg)		14000		
	Type of Ventilation		Forced air cooling		
ENVIRONMENT	Degree of Protection		NEMA 3R		
	Permissible Ambient Temperature ^[4]		-25°C to +60°C, >50°C / Active power derating		
	Relative Humidity		4% to 100% non-condensing		
	Max. Altitude (above sea level) ^[5]		2000m		
CONTROL INTERFACE	Communication Protocol		Modbus TCP		
	Power Plant Controller		Optional. Third party SCADA systems supported.		
	Keyed ON/OFF Switch		Standard		
PROTECTIONS	Ground Fault Protection		Insulation monitoring device		
	Humidity Control		Active heating		
	General AC Protection & Disconn.		MV switchgear (20 or 25 kA)		
	General DC Protection & Disconn.		DC switch-disconnectors ^[6]		
	Overvoltage Protection		Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)		
CERTIFICATIONS & STANDARDS	Safety		UL 1741 / CSA 22.2 No.107.1-16		
	Utility Interconnect ^[7]		IEEE 1547:2018 / UL 1741 SB		

NOTES

[1] Values at 1.00 Vac nom and cosφ=1.

[2] Consult Power Electronics for charging mode and derating curves.

[3] Consult P-Q charts available: $Q(kVAr) = \sqrt{(S(kVA))^2 - P(kW)^2}$.

[4] Consult Power Electronics for derating curves.

[5] Optional available for temperatures down to -35°C

[6] Consult Power Electronics for altitudes above 1000m.

[7] Battery short circuit disconnection must be done on the battery side.

[8] Consult Power Electronics for other applicable standards / grid codes.

Freemaq Multi PCSM



REFERENCES	FP4105MH2	FP4105MH4	
AC	AC Output Power (kVA/kW) @40°C ^[1]	4105	
	AC Output Power (kVA/kW) @50°C ^[1]	3810	
	Operating Grid Voltage (kV)	34.5kV ±10%	
	Operating Grid Frequency (Hz)	60Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging	
	Reactive Power Compensation	Four quadrant operation	
DC	DC Voltage Range ^[3]	913V - 1500V	
	Maximum DC Voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC Continuous Current per Input (A)	2295	1148
	Max. DC Short Circuit Current per Input (kA)	250 kA with a time constant of 3ms	
EFFICIENCY	Battery Technology	All type of batteries (BMS required)	
	Number of Separate DC Inputs	2	4
	Efficiency (Max) (η)	97.76% including MV transformer	
CABINET	Euroeta (η)	97.50% including MV transformer	
	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2	
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2	
	Weight (lbs)	30865	
	Weight (kg)	14000	
ENVIRONMENT	Type of Ventilation	Forced air cooling	
	Degree of Protection	IP55	
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating	
	Relative Humidity	4% to 100% non-condensing	
CONTROL INTERFACE	Max. Altitude (above sea level) ^[5]	2000m	
	Communication Protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported.	
PROTECTIONS	Keyed ON/OFF Switch	Standard	
	Ground Fault Protection	Insulation monitoring device	
	Humidity Control	Active heating	
	General AC Protection & Disconn.	MV switchgear (2L+V)	
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]	
CERTIFICATIONS & STANDARDS	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)	
	Safety	IEC 62477-2	

NOTES

- [1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.
- [2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA))^2-P(kW)^2}$.
- [3] Consult Power Electronics for derating curves.
- [4] Optional available for temperatures down to -35°C
- [5] Consult Power Electronics for altitudes above 1000m.
- [6] Battery short circuit disconnection must be done on the battery side.

Freemaq Multi PCSM



REFERENCES	FP4010M2	FP4010M4			
AC	AC Output Power (kVA/kW) @40°C ^[1]		4010		
	AC Output Power (kVA/kW) @50°C ^[1]		3720		
	Operating Grid Voltage (kV)	34.5kV ±10%	13.8kV ±10%	34.5kV ±10%	13.8kV ±10%
	Operating Grid Frequency (Hz)	60Hz			
	Current Harmonic Distortion (THDi)	< 3% per IEEE519			
	Power Factor (cosine phi) ^[2]	0.5 leading ... 0.5 lagging			
	Reactive Power Compensation	Four quadrant operation			
DC	DC Voltage Range ^[3]		891V - 1500V		
	Maximum DC Voltage		1500V		
	DC Voltage Ripple		< 3%		
	Max. DC Continuous Current per Input (A)	2295	1148		
	Max. DC Short Circuit Current per Input (kA)	250 kA with a time constant of 3ms			
	Battery Technology	All type of batteries (BMS required)			
EFFICIENCY	Number of Separate DC Inputs	2	4		
	Efficiency (Max) (η)	97.80% including MV transformer			
	Euroeta (η)	97.51% including MV transformer			
CABINET	Dimensions [WxDxH] (ft)	21.3 x 6.5 x 7.2			
	Dimensions [WxDxH] (m)	6.5 x 2.0 x 2.2			
	Weight (lbs)	30865			
	Weight (kg)	14000			
	Type of Ventilation	Forced air cooling			
ENVIRONMENT	Degree of Protection	NEMA 3R			
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating			
	Relative Humidity	4% to 100% non-condensing			
	Max. Altitude (above sea level) ^[5]	2000m			
CONTROL INTERFACE	Communication Protocol	Modbus TCP			
	Power Plant Controller	Optional. Third party SCADA systems supported.			
	Keyed ON/OFF Switch	Standard			
PROTECTIONS	Ground Fault Protection	Insulation monitoring device			
	Humidity Control	Active heating			
	General AC Protection & Disconn.	MV switchgear (20 or 25 kA)			
	General DC Protection & Disconn.	DC switch-disconnectors ^[6]			
	Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)			
CERTIFICATIONS & STANDARDS	Safety	UL 1741 / CSA 22.2 No.107.1-16			
	Utility Interconnect ^[7]	IEEE 1547:2018 / UL 1741 SB			

NOTES

[1] Values at 1.00 Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.
 [2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA))^2-P(kW)^2}$.
 [3] Consult Power Electronics for derating curves.
 [4] Optional available for temperatures down to -35°C

[5] Consult Power Electronics for altitudes above 1000m.
 [6] Battery short circuit disconnection must be done on the battery side.
 [7] Consult Power Electronics for other applicable standards / grid codes.

Freemaq Multi PCSM



REFERENCES	FP4010MH2	FP4010MH4	
AC	AC Output Power (kVA/kW) @40°C ^[1]		
	4010		
	AC Output Power (kVA/kW) @50°C ^[1]		
	3720		
	Operating Grid Voltage (kV)		
	34.5kV ±10%		
	Operating Grid Frequency (Hz)		
60Hz			
Current Harmonic Distortion (THDi)			
< 3% per IEEE519			
Power Factor (cosine phi) ^[2]			
0.5 leading ... 0.5 lagging			
Reactive Power Compensation			
Four quadrant operation			
DC	DC Voltage Range ^[3]		
	891V - 1500V		
	Maximum DC Voltage		
	1500V		
	DC Voltage Ripple		
	< 3%		
	Max. DC Continuous Current per Input (A)	2295	1148
Max. DC Short Circuit Current per Input (kA)	250 kA with a time constant of 3ms		
Battery Technology	All type of batteries (BMS required)		
Number of Separate DC Inputs	2	4	
EFFICIENCY	Efficiency (Max) (η)		
	97.80% including MV transformer		
	Euroeta (η)		
	97.51% including MV transformer		
CABINET	Dimensions [WxDxH] (ft)		
	21.3 x 6.5 x 7.2		
	Dimensions [WxDxH] (m)		
	6.5 x 2.0 x 2.2		
	Weight (lbs)	30865	
	Weight (kg)		
	14000		
	Type of Ventilation		
	Forced air cooling		
ENVIRONMENT	Degree of Protection		
	IP55		
	Permissible Ambient Temperature ^[4]	-25°C to +60°C, >50°C / Active power derating	
	Relative Humidity	4% to 100% non-condensing	
Max. Altitude (above sea level) ^[5]	2000m		
CONTROL INTERFACE	Communication Protocol		
	Modbus TCP		
	Power Plant Controller	Optional. Third party SCADA systems supported.	
Keyed ON/OFF Switch	Standard		
PROTECTIONS	Ground Fault Protection		
	Insulation monitoring device		
	Humidity Control		
	Active heating		
	General AC Protection & Disconn.	MV switchgear (2L+V)	
General DC Protection & Disconn.	DC switch-disconnectors ^[6]		
Overvoltage Protection	Type 2 protection for AC and DC (optionally, Type 1+2 for DC side)		
CERTIFICATIONS & STANDARDS	Safety	IEC 62477-2	

NOTES

[1] Values at 1.00·Vac nom and cosφ=1. Consult Power Electronics for charging mode and derating curves.

[2] Consult P-Q charts available: $Q(kVar)=\sqrt{S(kVA)^2-P(kW)^2}$.

[3] Consult Power Electronics for derating curves.

[4] Optional available for temperatures down to -35°C

[5] Consult Power Electronics for altitudes above 1000m.

[6] Battery short circuit disconnection must be done on the battery side.

SC2750UD-MV/SC3150UD-MV/ SC3450UD-MV

Power Conversion System



HIGH YIELD

- Advanced three-level technology, max. efficiency 99%
- Effective forced air cooling, no derating up to 45°C
- Wide DC voltage operation window, full power operation at 1500V



SMART O&M

- Modular design, easy for maintenance
- IP65 protection degree, easy for outdoor installation
- Optional C5 anti-corrosion degree, adjust to applications close to the sea



FLEXIBLE APPLICATION

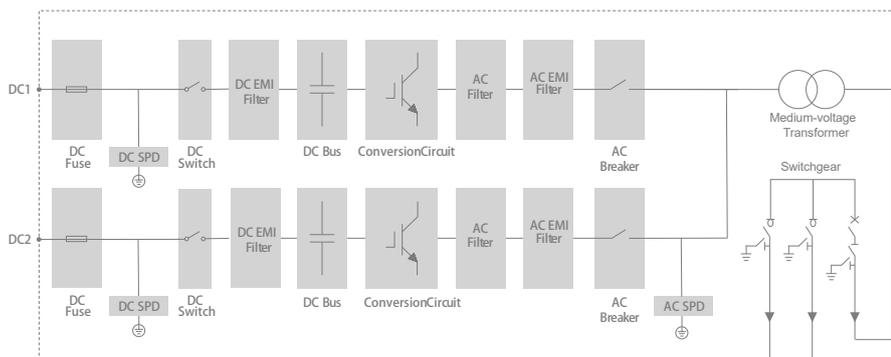
- Bidirectional power conversion system with full four-quadrant operation
- Compatible with high voltage battery system, low system cost
- Battery charge & dis-charge management and black start function integrated



GRID SUPPORT

- Compliant with CE, IEC 62477, IEC 61000 and grid regulations
- Fast active/reactive power response
- L/HVRT, L/HFRT, soft start/stop, specified power factor control and reactive power support

CIRCUIT DIAGRAM



System Type	SC2750UD-MV	SC3150UD-MV	SC3450UD-MV
DC side			
Max. DC voltage		1500 V	
Min. DC voltage	800 V	915 V	1000 V
DC voltage range	800 – 1500 V	915 – 1500 V	1000 – 1500 V
Max. DC current		1935 A * 2	
No. of DC inputs		2	
AC side (Grid)			
AC output power	2750 kVA @ 45 °C 3025 kVA @ 30 °C	3150 kVA @ 45 °C 3465 kVA @ 30 °C	3450 kVA @ 45 °C 3795 kVA @ 30 °C
Max. AC output current		3174 A	
Nominal AC voltage	550 V	630 V	690 V
AC voltage range	484 – 605 V	554 – 693 V	607 – 759 V
Nominal grid frequency / Grid frequency range		50 Hz / 45 – 55 Hz, 60 Hz / 55 – 65 Hz	
Harmonic (THD)		< 3 % (at nominal power)	
Power factor at nominal power / Adjustable power factor		>0.99 / 1 leading – 1 lagging	
Adjustable reactive power range		-100 % – 100 %	
Feed-in phases / AC connection		3 / 3-PE	
AC side (Off-Grid)			
Inverter port nominal AC voltage	550 V	630 V	690 V
Inverter port AC voltage range	484 – 605 V	554 – 693 V	607 – 759 V
AC voltage distortion		< 3 % (Linear load)	
DC voltage component		< 0.5 % Un (Linear balance load)	
Unbalance load capacity		100%	
Nominal Voltage frequency / Voltage frequency range		50 Hz / 45 – 55 Hz, 60 Hz / 55 – 65 Hz	
Efficiency			
Inverter Max. efficiency		99.0 %	
Transformer			
Transformer rated power	2750 kVA	3150 kVA	3450 kVA
Transformer max. power	3025 kVA	3465 kVA	3795 kVA
LV / MV voltage	0.55 kV / (20 – 35) kV	0.63 kV / (20 – 35) kV	0.69 kV / (20 – 35) kV
Transformer vector		Dy11	
Transformer cooling type		ONAN	
Oil type		Mineral oil (PCB free) or degradable oil on request	
Protection			
DC input protection		Load break switch + fuse	
Inverter output protection		Circuit breaker	
AC output protection		Circuit breaker	
Surge protection		DC Type II / AC Type II	
Grid monitoring / Ground fault monitoring		Yes / Yes	
Insulation monitoring		Yes	
Overheat protection		Yes	
General Data			
Dimensions (W*H*D)		6058*2896*2438 mm	
Weight		16000 kg	
Degree of protection		IP54 (Inverter: IP65)	
Operating ambient temperature range		-35 to 60 °C (> 45 °C derating)	
Allowable relative humidity range		0 – 100 %	
Cooling method		Temperature controlled forced air cooling	
Max. operating altitude		1000 m (Standard) / > 1000 m (Optional)	
Display		LED, WEB HMI	
Communication		RS485, CAN, Ethernet	
Compliance		CE, IEC 62477-1, IEC 61000-6-2, IEC61000-6-4	
Grid support		L/HVRT, L/HFRT, active & reactive power control and power ramp rate control, Volt-var, Volt-watt, Frequency-watt	



Grid transformation for the world's largest energy projects

- Best-in-class energy density and round-trip efficiency
- Industry-leading power electronics and thermal system performance
- Rapid and cost-effective deployment with factory-assembled and pre-tested solution

Scaled and rigorously tested product safety and reliability

- Comprehensive in-house reliability testing by the leading experts in the industry
- Engineered for safety and performance at every level
- Continuous improvement based on large-scale operational experience

Designed with flexibility and configurability in mind

- Modular architecture that allows for a range of configurations across multiple applications
- Industry experts available to identify site-specific needs
- Integrated solution that allows for battery augmentation over time



POWER AND ENERGY

Megapack duration is configurable. Standard configurations are 2-Hour and 4-Hour durations. Nominal energy is specified at 25°C (77°F).

	AC Power per Megapack	Energy per Megapack
2-Hour	1927 kW	3854 kWh
4-Hour	979 kW	3916 kWh

ELECTRICAL

Nominal AC Voltage	480 V AC 3-phase	
Nominal Frequency	50 or 60 Hz	
Inverter Power per Megapack¹	2-Hour Max:	2400 kVA
	4-Hour Max:	1320 kVA
Round-Trip Efficiency²	2-Hour:	92.0%
	4-Hour:	93.5%

¹ Scalable from 400 kVA minimum in increments of 50 kVA

² Full-depth cycle including all power conversion and thermal system losses, at 25°C (77°F)

WARRANTY

Coverage	All-inclusive, equipment and energy retention
Term	15 years standard, extendable to 20 years

PART NUMBER

1848844-XX-Y Where X is a number between 0-9 and Y is a letter

MECHANICAL AND MOUNTING

Ingress Ratings	IP66/NEMA 3R (Main Enclosure) IP20 (Thermal System)	
Enclosure Dimensions	Width:	8800 mm (346 ½ in)
	Depth:	1650 mm (65 in)
	Height:	2785 mm (110 in)
Maximum Weight	38,100 kg (84,000 lb)	
Operating Ambient Temperature	-30°C to 50°C (-22°F to 122°F)	

REGULATORY

System is compliant to grid codes and safety standards of all major markets.

System	NRTL listed to UL 1973, UL 9540, UL 9540A, UL 1741 SB, IEC 62619, IEEE 1547	
Cells	NRTL listed to UL 1642	

CONTROLS AND COMMUNICATIONS

Protocols	Modbus TCP / DNP3 / REST API	
Core Control Modes	Direct Real Power	Ramp Rate Control
	Direct Reactive Power	Site Control
	Frequency Support	Power Factor Control
	Virtual Inertia	Voltage Control

MONITORING

Powerhub	Free-to-use cloud monitoring portal
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ST5015kWh-2500kW-2h-US

PowerTitan 2.0 Liquid Cooled Energy Storage System

Preliminary



OPTIMAL COST

- Intelligent liquid-cooled temperature control system to optimize the auxiliary power consumption
- System is delivered pre-assembled and complete, no need for onsite battery module handling on site



SAFE AND RELIABLE

- Electrical safety management, overcurrent fast breaking and arc extinguishing protection
- The electrical cabinet and battery cabinet are separated to prevent thermal runaway



EFFICIENT AND FLEXIBLE

- High-efficiency heat dissipation will increase battery life and system discharge capacity
- Front single-door design, supporting back-to-back & side-by-side layout
- System commissioning in advance, reduce commissioning work on site, accelerate COD process.



INTELLIGENT O&M

- One-click system upgrade
- Intelligent automatic rehydration reduces manual rehydration
- Online intelligent monitoring to reduce manual inspections frequency

Product Name	ST5015kWh-2500kW-2h-US
DC side (Standard one battery container)	
Cell Type	3.2V / 314 Ah
Battery Configuration	416S12 P
Nominal Capacity	5015 kWh
Nominal Voltage Range	1123.2 V - 1497.6 V
AC side	
Nominal AC power	210 kVA * 12
AC Current Distortion Rate	< 3% (Nominal Power)
DC Component	< 0.5%
Nominal AC voltage	690 V
Termination (LV)	352A*3Phase*6
AC Voltage Range	621~759V
Power Factor	> 0.99 (Nominal Power)
Adjustable Range of Reactive Power	-100%~100%
Nominal Frequency	60Hz
Topology	Transformerless
System Parameter	
Battery Container Size(W * H * D)	6058*2896*2438 mm
Battery Container Weight	42,500kg
Degree of Protection	Type 3R
Operation Temperature Range	-30~50□ (>45□ De-rating)
Operation Humidity Range	0%-100% (Non-condensing)
Highest Altitude	3000m
Temperature Control Method	Intelligent Liquid Cooling
Fire Suppression System	NFPA 68 compliance deflagration panel+smoke and temperature detectors+ Mini FACP(Default) Integrated dry pipe sprinklers, Audible and visual alarm, NFPA 69 compliance ventilation system (requires flammable gas detector), Flammable Gas detector (Optional)
Communication Interface	Ethernet
Communication protocol	Modbus TCP
Compliance and Reports	UL 9540 A, NFPA 855, NFPA 68, NFPA69 (with optional purchase)
Certification	IEEE1547:2018, UL1973,UL1741SB, UL9540