

Bumhan Unisolution ESS/Standalone/EV/EM Battery Module & Pack

Lithium Ion Battery Pack for ESS & Standalone & EV



Global Leading Company in Green Energy

Bumhan
범한유니솔루션

Overview

Global leading Cy 전지셀 모듈 및 EV/ESS배터리 시스템 전문기업

Bumhan Unisolution

회사명	범한유니솔루션 주식회사
대표이사	박 기 욱
설립일	2017년 7월 31일 (합병일 2024년 3월 27일)
자본금	1,309,750,000원 (2023년 12월 기준)
임직원수	55명
본사주소	경기도 화성시 동탄산단 2길 7-8 (동탄사업장)
사업영역	ESS / EV / E-mobility 배터리 팩 및 모듈

EV/ESS/EM Battery

Global Leading Company
in Green Energy



신흥에스이씨 배터리 팩모듈 사업팀 → 신흥유니솔루션으로 독립 분사 → 범한그룹 편입 (2024년 1월)

신흥에스이씨

Since Aug., 2017

Pack
Module



Cylinder



CID
(Current Interrupt Device)

Prismatic



Cap Assembly

Polymer



Strip Terminal

CAN



UNISOLUTION

Since Sep., 2023

Electric
Vehicle
(xEV)
Battery



Energy
Storage
Device
(ESS)
Battery



Electric
Mobility
(EM)
Battery



Bumhan Unisolution

Since Jan., 2024

Unisolution
EV/ESS Battery



범한기술원 (서울 마곡) (주)범한



범한자동차
전기버스



범한파워시스템
ESS용 PCS



범한산업
공기압축기



범한케이블
케이블 (메트닉)



범한메카텍
리액터, 열교환기



범한퓨얼셀
수소연료전지, 수소충전소



Bumhan Group

2015년 EV Bus 모듈OEM계기로, 2018년 ESS / UPS배터리, E-mobility, 철도용/선박용 배터리 사업 전개

▶Product Portfolio



경기도 화성시 동탄 산업단지내 배터리 모듈 및 팩 공장 월 30MWh/M (1.5Mcells/M), 연간 300MWh급 배터리 팩 생산능력 보유



3rd Floor
Office / Pack R&D



2nd Floor
Module Factory
(>30MWh/M Capa)



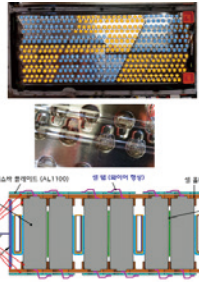
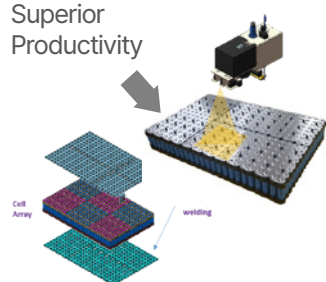
1st Floor
Pack Assy Line
(200pack/M, line)



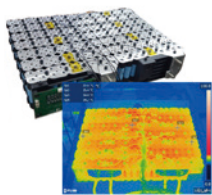
Advanced Battery Module Technology

■ 레이저 용접(Laser Welding) 기술 적용

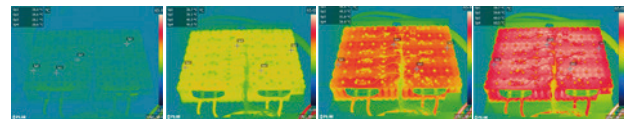
진화된 모듈 제작 기술로 우수한 모듈 밸런스 및 높은 신뢰성, 생산성 향상으로 제작비용 절감

Spot welding	Wire bonding	Laser welding
		
Ni tab (Cond.15%)	Al10 (Cond.60%, 230W/mK)	Al10 (Cond.60%, 230W/mK)
Material Price : (10times)	1/10	1/10
Productivity : 1.5sec/cell	1.5sec/cell	0.1~0.3sec/cell (>4times faster)
1S/4~32P large cell welding 6~12S/1~4P bolting connection	Uni body type module	Uni body type module ★열 균형과 긴 사이클 주기를 위한 최적의 배터리 팩 디자인★

▶Laser Welding Module의 특징점



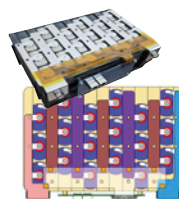
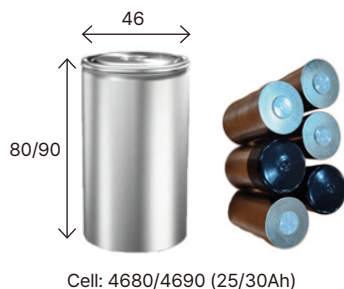
- 1.0t Al bus-plate의 one-body module
- 우수한 Voltage & Thermal balance,
- 높은 전기전도도, 발열성능, 진동신뢰성



Al Bus plate (230W/m.K)

전지셀의 발열이 Al tab 및 bus로 spread됨

■ 21700대비 5~6배 용량의 차세대 4680/4690전지 셀 모듈 개발



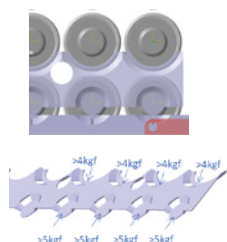
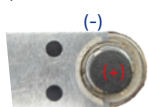
Module: 3.3kWh (37V/90Ah)
(체적에너지 밀도 상승)



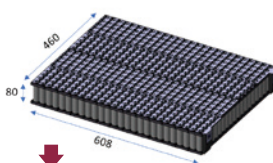
체적에너지 밀도 상승
(용량대비 모듈 사이즈 최소화)

■ 21700 셀 상단 음극부 레이저 용접 모듈 개발로 Cy모듈 기술 선도

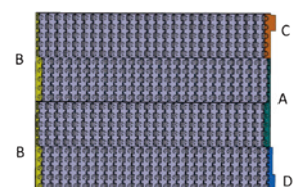
Cell: 21700 (5Ah)
(음극부 레이저 용접)



Module: 9.5kWh (383V/25Ah)



모듈상단 water cooling 효율증대



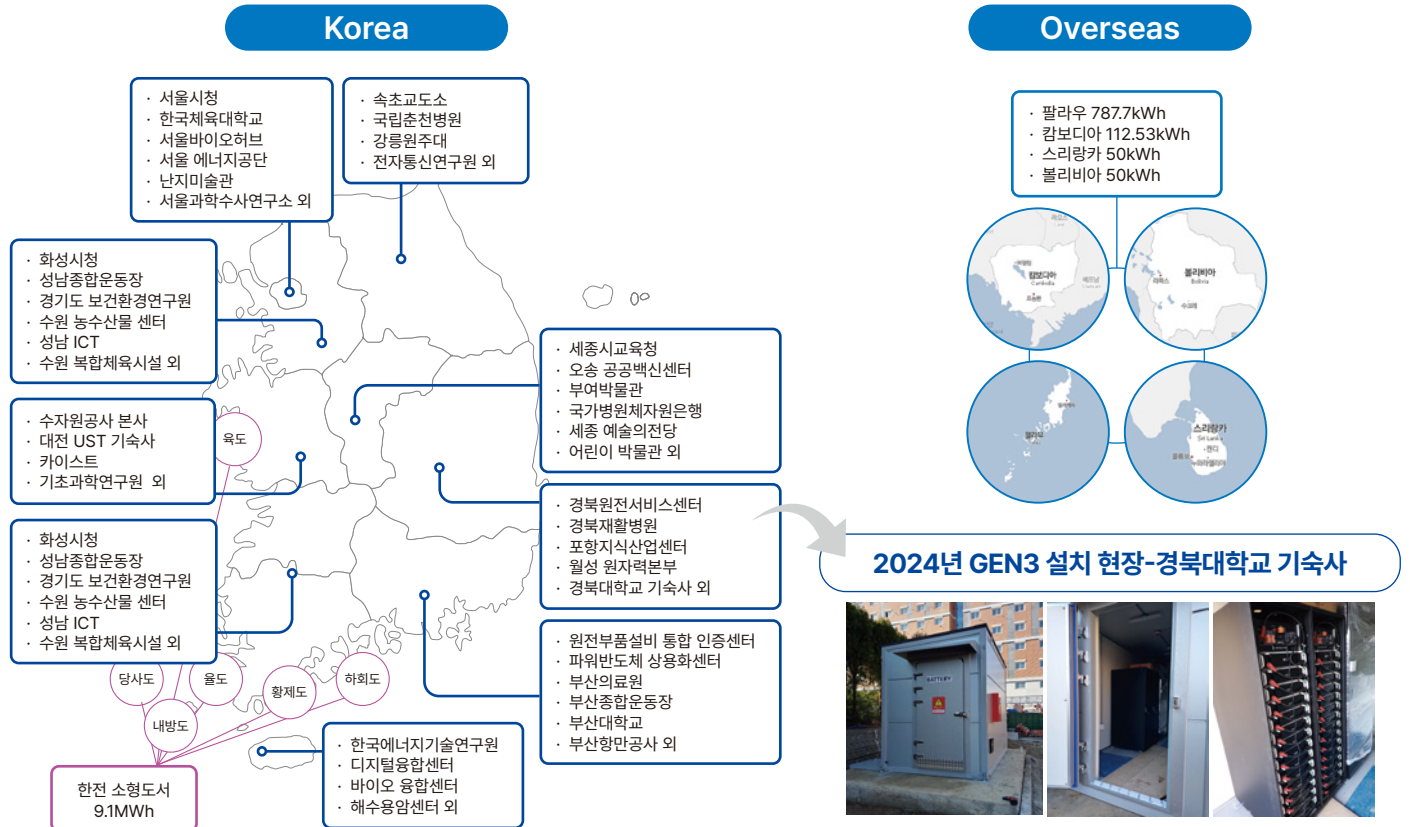
모듈상단 PPR안정성 증가

배터리 팩 및 모듈 납품실적

원통형셀을 AI Laser Welding Unibody 모듈 기술로 제작 → 고출력 모듈 및 원통형 수냉 모듈, 팩 납품실적

▶ESS용 배터리 실적- 약 50MWh

국내 공공기관 및 도서지역 135개소, 해외 신재생연계ESS 배터리 4개소



▶EV/EM 분야 원통형 배터리 모듈 및 팩 누적 실적- 약 120MWh (ESS포함)



21700 ESS & UPS

(Energy Storage System)

- Industrial ESS, Residential ESS
- EV Charger ESS
- UPS Battery



Industrial ESS

UNISOL ESS Product Generation



Since Aug., 2017



Since Sep, 2023

Bumhan
Unisolution

Gen 1
EOP

Gen 2
EOP

Gen 3
MP

LIB:LGC, INR18650-MH1



4종 모듈

2.9 / 5.7 / 7.0 / 8.2kWh

LGC M48 (21700)



4종 모듈

4.5 / 5.1 / 8.0 / 10.3kWh

LGC M50 (21700)



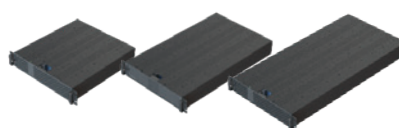
Quick connector 적용

3.8 / 4.9 / 7.5 kWh



5종 Rack

40 / 50 / 80 / 97kWh



6종 Rack

50 / 57 / 112 / 113 / 136 / 145kWh



Slim rack 5종

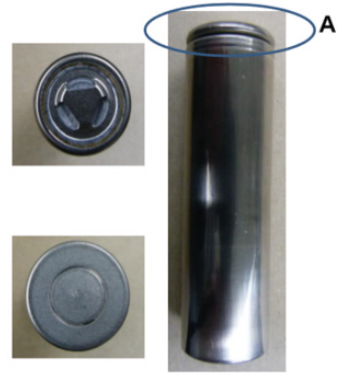
28 / 45 / 50 / 105.6 / 128.2kWh



Industrial ESS

Battery Cell – 4,950mAh (18.2Wh)의 고용량, 중출력 EV/ESS 배터리 셀 적용

LG Cylindrical Cell Information (M50L)



INR 21700 M50L		
0.2C Energy *	Nominal	18.2 Wh
	Minimum	17.6 Wh
Max. Charge Current		3,360mA @ RT
Max. Discharge Current		14,400mA @ RT
Dimensions without tubing	Diameter	Max. 21.15 mm
	Height	Max. 70.20 mm
	TTS (Top to Shoulder)	0 + 0.00/-0.55mm
Weight		67.2 ±1.0 g
Nominal Voltage		3.69 V
Initial Impedance	AC-Resistance(1kHz)	15±6 mΩ
	DC-Resistance	23±6 mΩ

* Charge : 1440mA, 4.20V, 50mA End-current (CC-CV)
Discharge : 960mA, 2.50V End-voltage (CC)

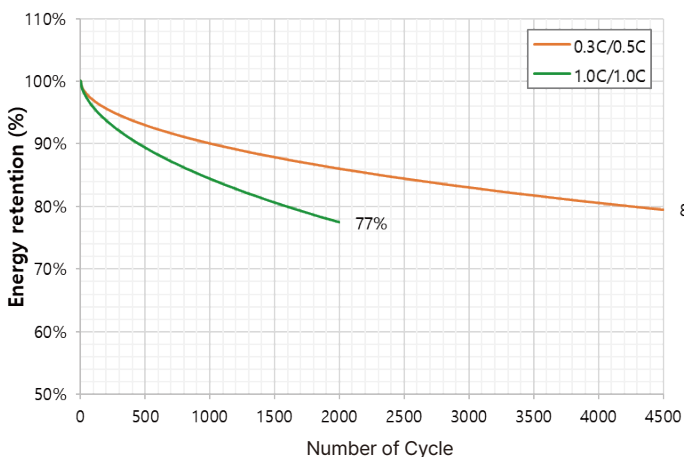
** DCR measurement : SOC50%, 0.5C, 10sec. Discharge Resistance

Long-term life expectancy

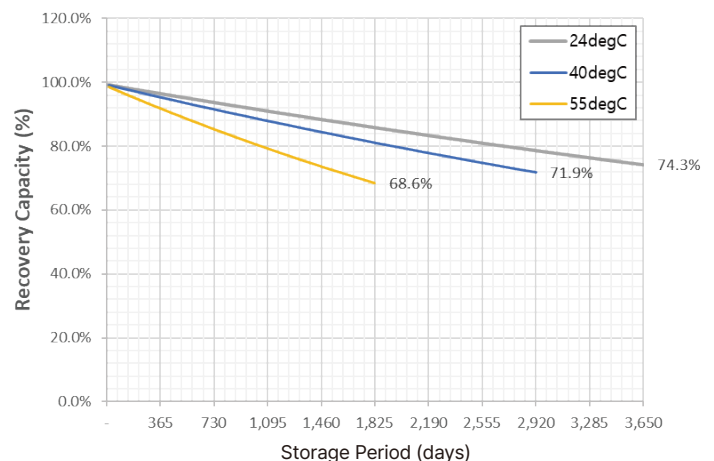
Cell Model : 21700-M50L

LG Energy Solution

M50L(T) Cycle Life @24degC
(4.1 - 3.0V/cell)



M50L(T) Storage Life Prediction
@ SOC100%



Industrial ESS

ESS Battery (21700-M50L) Rack Lineup

▶ Industrial ESS

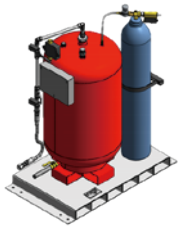
Rack	SM14S32P-M50		SM18S16P-M50
	QSR1000	QSR800	QLR800
Configuration (modules)	17S	14S	11S
Total Energy[kWh]	138.6	114.2	57.7
Rated Energy[kWh]	128.2	105.6	53.3(KC 50)
Usable Energy[kWh] (SOC 85% operation)	118.8	97.8	49.4
Rated Capacity[Ah]	147.2	147.2	73.6
Rated Voltage[V]	871.1	717.4	724.7
Voltage Range[V]	714~988	588~814	594~822
Usable Voltage Range[V] (SOC 85% operation)	750~975	618~804	624~812
Load Max(Chg /Dchg) [KW]	40 / 70	35 / 60	25 / 50
Dimension [WHD, mm]	510*2195*850	510*1895*850	510*1571*750
Weight[kg]	936	806	468

Rack	SM28S8P-M50
	HR700
Configuration (modules)	7S
Total Energy[kWh]	28.6
Rated Energy[kWh]	26.4
Usable Energy[kWh] (SOC 85% operation)	24.5
Rated Capacity[Ah]	36.8
Rated Voltage[V]	717.4
Voltage Range[V]	588~814
Usable Voltage Range[V] (SOC 85% operation)	618~804
Load Max(Chg /Dchg) [KW]	10 / 15
Dimension [WHD, mm]	510*1495*600
Weight[kg]	270

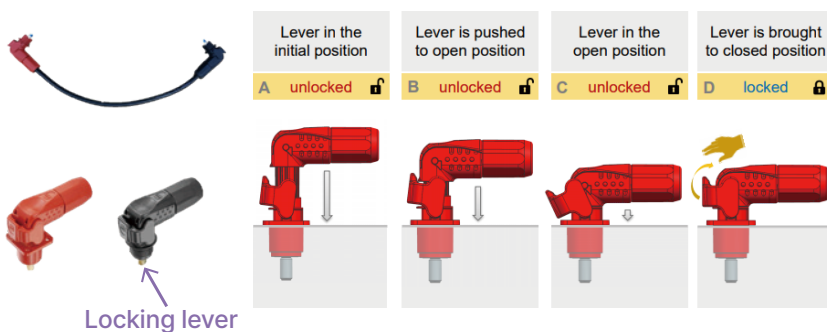
Quick connector



FSP system



설치가 간편한 Quick connector 적용



Industrial ESS

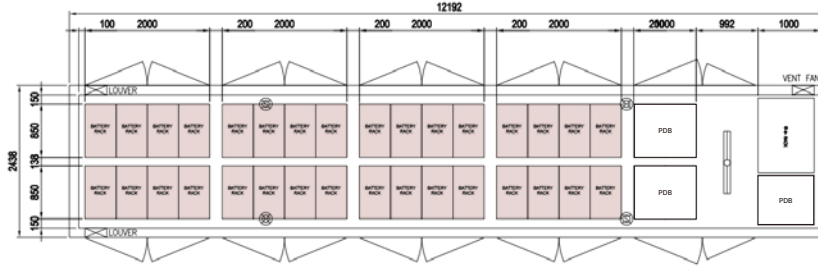
Industrial ESS (PV, Peak-Cut, Ancillary)

40ft container

QSR1000 (128kWh)
Voltage: 762~976V



40ft container (4.1MWh, 32Racks)



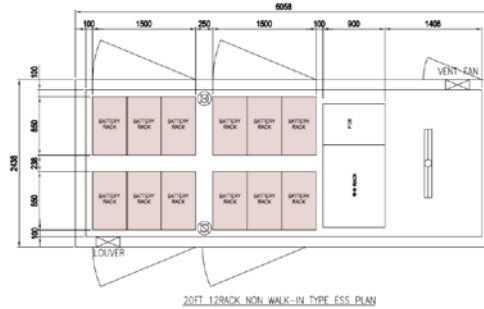
40FT 36RACK NON WALK-IN TYPE ESS PLAN

20ft container

QSR800 (106kWh)
Voltage: 627~804V

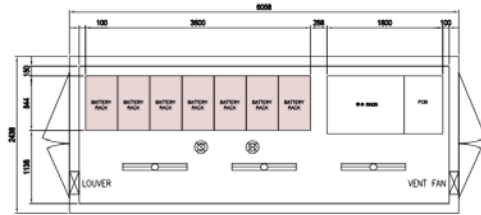


20ft container (1.27MWh, 12Racks)



20FT 12RACK NON WALK-IN TYPE ESS PLAN

20ft container (0.74MWh, 7Racks)



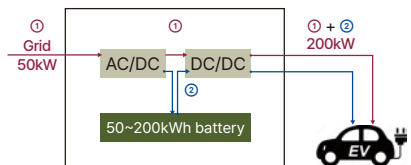
20FT 7RACK WALK-IN TYPE ESS PLAN

EV Charger ESS

EV Charger ESS Battery Rack

656Vdc, 50~200kW Dischargeable Battery Rack for Hybrid EV Charger

STATIONARY BATTERY



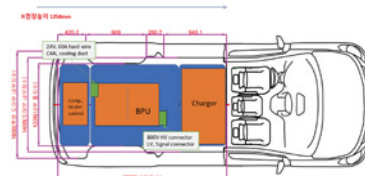
QSR800
(105.6kWh)



QLR800
(53kWh)



CARRIABLE BATTERY



QLR700 (52kWh)

24V, 2.6kW Chiller system 700V, 48.5kWh Battery System



QLR400 (29.07kWh)

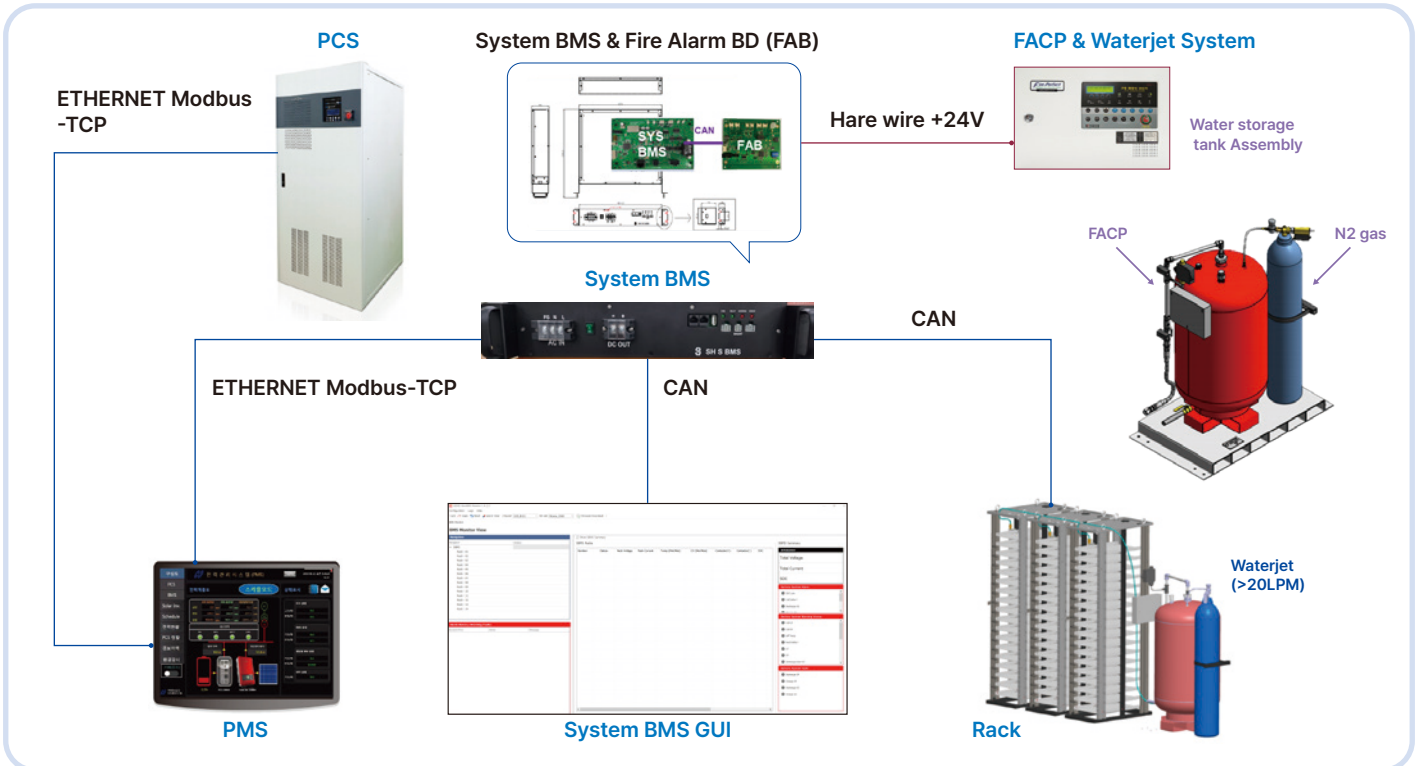


4.59kWh(51Vdc)
With 5kW inverter

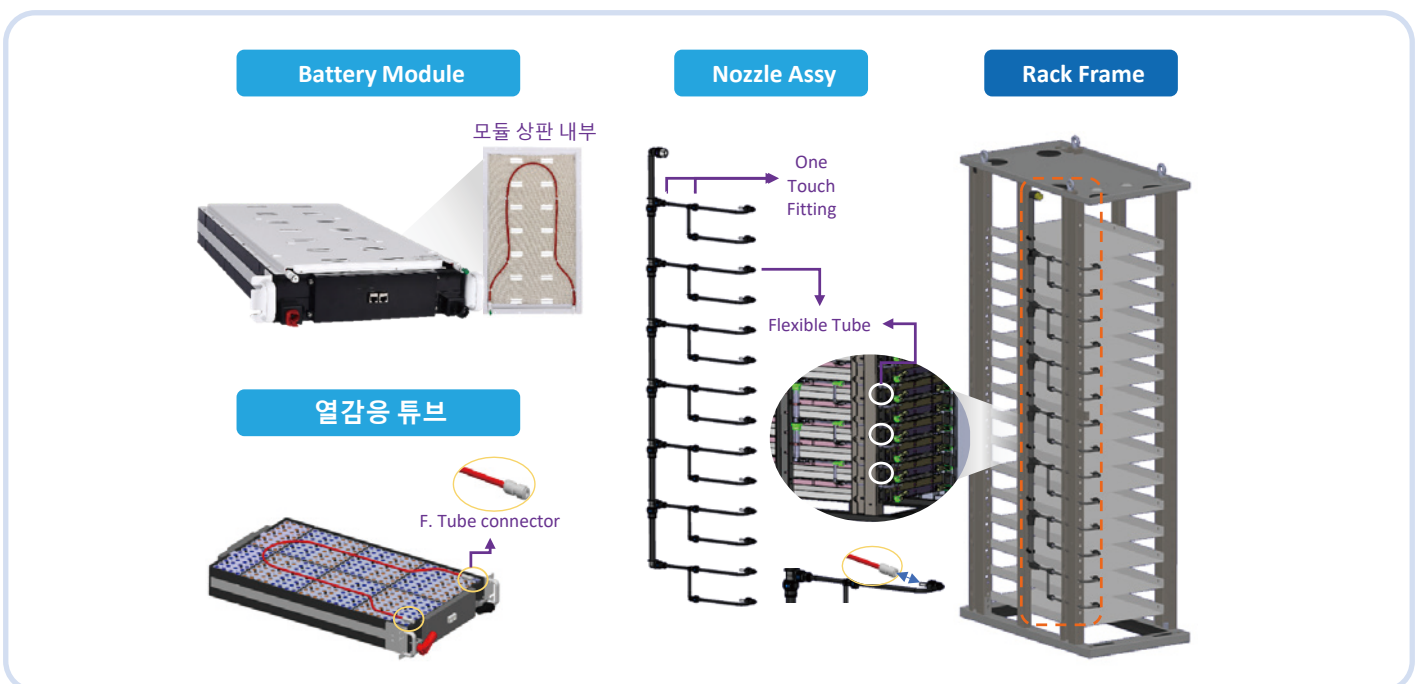
Industrial ESS

FSP시스템 구조 (NFSC 607 인증)

FACP Alarm (by gas sensing) → SYS BMS emergency activation → BPU MC/CB open
→ Waterjet system operate → Fire suppression



- 모듈내 삽입된 '열감응 tube'가 열 폭주 셀을 타겟팅 하여 소화액 분사 → 매우 신속한 화재억제
- Nozzle Assy 중앙부 위치해 배관연결을 위한 Rack 후면 간격확보 불필요 → 공간 효율성 증대



UPS Battery

높은 경제성 및 고성능의 10~15min backup 대응 고출력 배터리 랙 3종

500A max

USR600 77kWh(58kWh usable @4C)
USR500 65kWh(48kWh usable @4C)
USR400 52kWh(38kWh usable @4C)

SM14S32P-40S
Nom 6.45kWh
(50.4Vdc/128Ah)



Rack	SM14S32P-40S		
	USR600	USR500	USR400
Configuration	12 serial	10 serial	8 serial
Nom. Energy[kWh]	77.4	64.5	51.6
Usable Energy[kWh]	65 @1C	54 @1C	43 @1C
	62 @2C	52 @2C	42 @2C
	58 @4C	48 @4C	38 @4C
Nom. Capacity[Ah]	128	128	128
Usable Capacity [Ah]	106 @1C	106 @1C	106 @1C
	104 @2C	104 @2C	104 @2C
	99 @4C	99 @4C	99 @4C
Rated Voltage[V]	604.8	504	403.2
Usable Voltage [V]	504~688	392.0~574.0	313.6~459.2
Max (Chg) [KW]	70	58	46
Max (D.chg) [KW]	279	232	186
Dimension	496*1671*850	496*1671*850	496*1671*850
Weight[kg]	666	580	494

250A max

ULR600 37kWh(28kWh usable @4C)
ULR500 33kWh(25kWh usable @4C)
ULR400 29kWh(22kWh usable @4C)

SM18S16P-40S
Nom 4.15kWh
(64.8Vdc/64Ah)



Rack	SM18S16P-40S		
	ULR600	ULR500	ULR400
Configuration	9 serial	8 serial	7 serial
Nom. Energy[kWh]	37.4	33.2	29.1
Usable Energy[kWh]	32 @1C	28 @1C	25 @1C
	31 @2C	27 @2C	24 @2C
	28 @4C	25 @4C	22 @4C
Nom. Capacity[Ah]	64	64	64
Usable Capacity [Ah]	53 @1C	53 @1C	53 @1C
	52 @2C	52 @2C	52 @2C
	50 @4C	50 @4C	50 @4C
Rated Voltage[V]	583.2	518.4	453.6
Usable Voltage [V]	486~664	432~590	378~516
Max (Chg) [KW]	34	30	26
Max (D.chg) [KW]	134	120	105
Dimension	496*1471*750	496*1471*750	496*1471*750
Weight[kg] (TBD)	391	362	333

150A max

UHR500 16kWh(12kWh usable @4C)
UHR400 13kWh(10kWh usable @4C)
UHR300 10kWh(7kWh usable @4C)

SM28S8P-40S
Nom 3.23kWh
(100.8Vdc/32Ah)



Rack	SM28S8P-40S		
	UHR500	UHR400	UHR300
Configuration	5 serial	4 serial	3 serial
Nom. Energy[kWh]	16.2	12.9	9.7
Usable Energy[kWh]	14 @1C	11 @1C	8 @1C
	13 @2C	10 @2C	8 @2C
	12 @4C	10 @4C	7 @4C
Nom. Capacity[Ah]	32	32	32
Usable Capacity [Ah]	26 @1C	26 @1C	26 @1C
	25 @2C	25 @2C	25 @2C
	24 @4C	24 @4C	24 @4C
Rated Voltage[V]	504	403.2	302.4
Usable Voltage[V]	392.0~574.0	313.6~459.2	235.2~344.4
Max (Chg) [KW]	15	12	9
Max (D.chg) [KW]	58	47	35
Dimension	496*971*750	496*971*751	496*971*752
Weight[kg] (TBD)	240	218	196

Standalone Type ESS

- BTS Battery
- 가로등 ESS



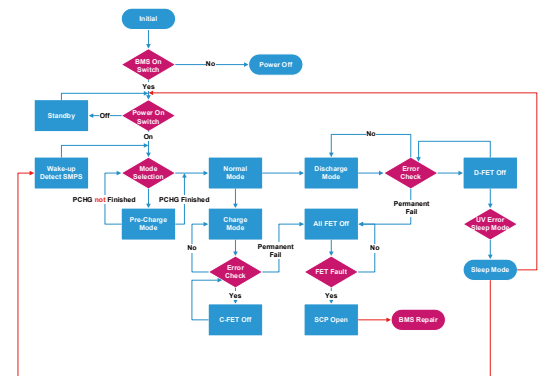
BTS Battery



21700 M50 - 51Vdc series BTS Battery

Models	SM14S/11P-M50	SM14S/16P-M50	SM14S/18P-M50
Total Energy[kWh]	2.80	4.08	4.59
Rated Energy[kWh]	2.59	3.77	4.24
Rated Capacity[Ah]	50.6	73.6	82.8
Rated Voltage[V]	51.5	51.5	51.5
Voltage Range[V]	42.0~58.1	42.0~58.1	42.0~58.1
Usable Voltage	44~57.4Vdc	44~57.4Vdc	44~57.4Vdc
Max. Chg Current	20A	30A	30A
Max. Dchg Current	40A	60A	60A
Dimension[WDH]	380*450*90	380*450*90	425*450*90
Weight[kg]	About 16	About 23	About 26
Protocol	CAN2.0A	CAN2.0A	CAN2.0A
Expandability	1 to 8trays	1 to 8trays	1 to 8trays

IEC60730,
functional safety certified
(이중화 보호)



Flexible Capacity configuration.



All-in-One Type (5kW PCS included)



PV 5kW (DC120~430V)
AC IN/Out 5kW (220/240V)



4.6kWh * 3~4modules (DC51V)



PCS efficiency: 95%
WHD = 700*1312*298mm

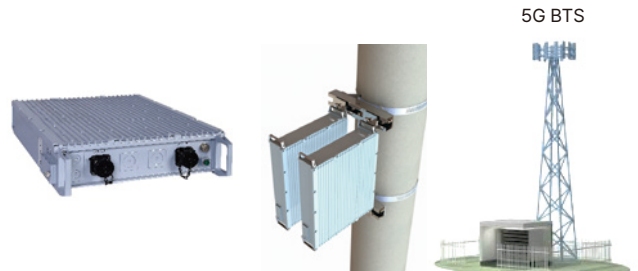
Rack Mount Type BTS Battery

2.8 / 4.59kWh for 1000~1800VA

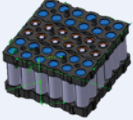
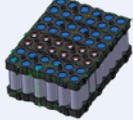
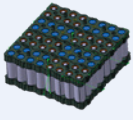


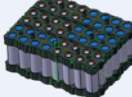
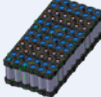
Enclosure Type BTS Battery

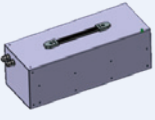
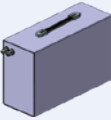
4.08kWh for 1200~1800VA



가로등 ESS

Configuration	3S12P	4S8P	4S12P	4S16P
Design				
Energy (kWh)	0.66	0.58	0.87	1.17
Capacity(Ah)	59.4	39.6	59.4	79.2
Nom. Voltage (Vdc)	11.0		14.7	
Voltage range (Vdc)	9.0 - 12.5	12.0 - 16.6	12.0 - 16.6	12.0 - 16.6
I _{max} (Adc)	20A	20A	20A	20A
Protection	PCM	PCM	PCM	PCM
Dimension	150*150*90	200*100*90	150*200*90	200*200*90

Configuration	6S6P	6S8P	6S12P
Design			
Energy (kWh)	0.66	0.87	1.31
Capacity(Ah)	29.7	39.6	59.4
Nom. Voltage (Vdc)		22.1	
Voltage range (Vdc)	18.0 - 24.9	18.0 - 24.9	18.0 - 24.9
I _{max} (Adc)	20A	20A	20A
Protection	PCM	PCM	PCM
Dimension	150*150*90	230*150*90	150*330*90

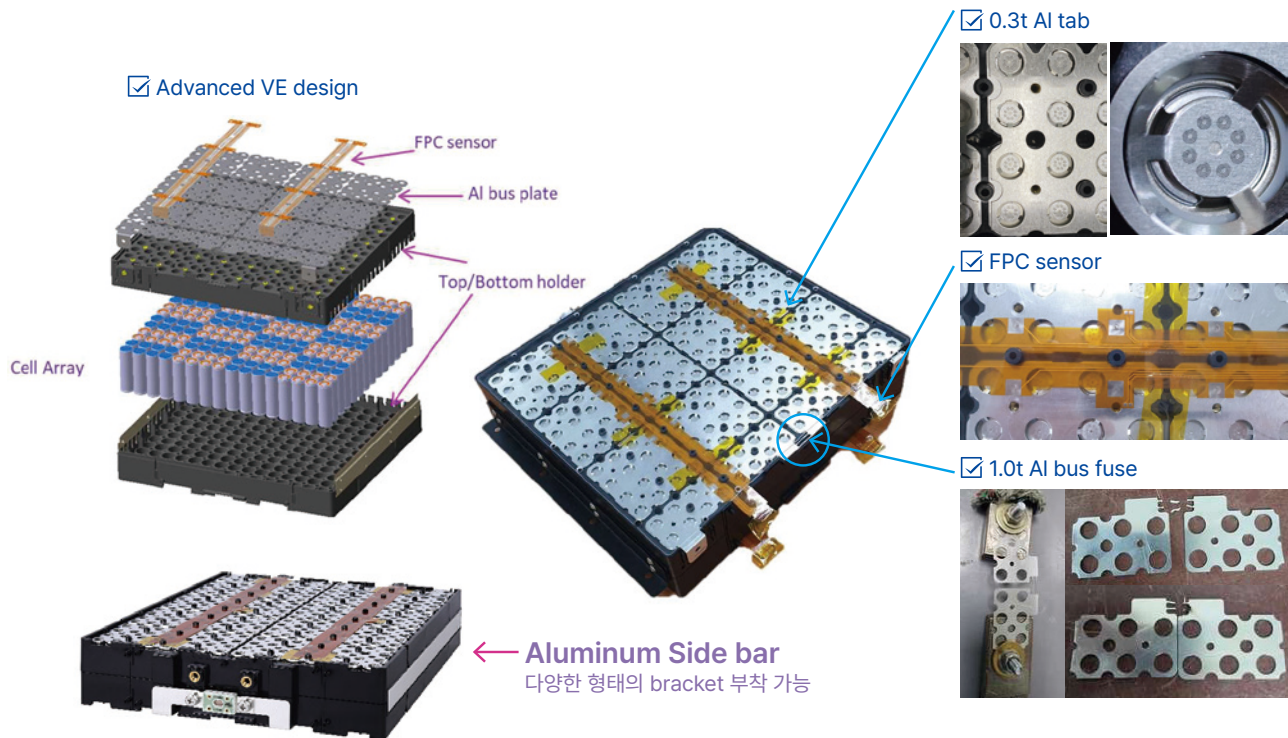
Configuration	7S10P	7S14P	7S16P	7S20P
Design				
Energy (kWh)	1.28	1.79	2.04	2.55
Capacity(Ah)	49.5	69.3	79.2	99
Nom. Voltage (Vdc)		25.8		
Voltage range (Vdc)	19.6 - 29.1	21.0 - 29.1	21.0 - 29.1	19.6 - 29.1
I _{max} (Adc)	20A	20A	20A	40A
Protection	PCM	PCM	PCM	PCM
Dimension(WDH)	150*400*141	196*370*88	200*220*220	150*400*230

Standard Module Lineup

EV, E-mobility



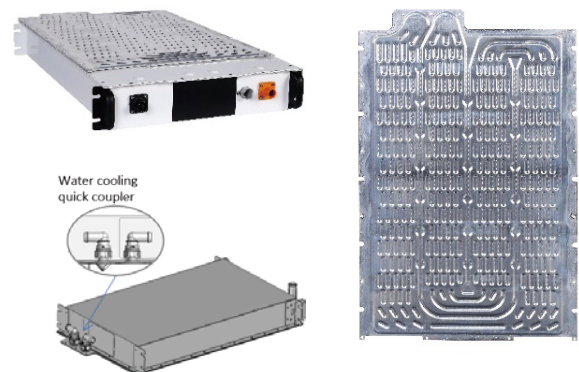
VE design, fusible AI bus, FPC sensor 적용



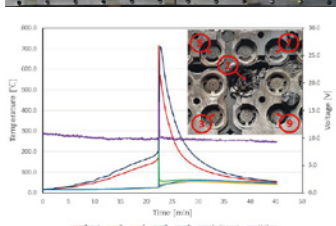
Cylindrical water cooling module (EV, Vessel)

수냉 모듈 Configuration '12S32P'

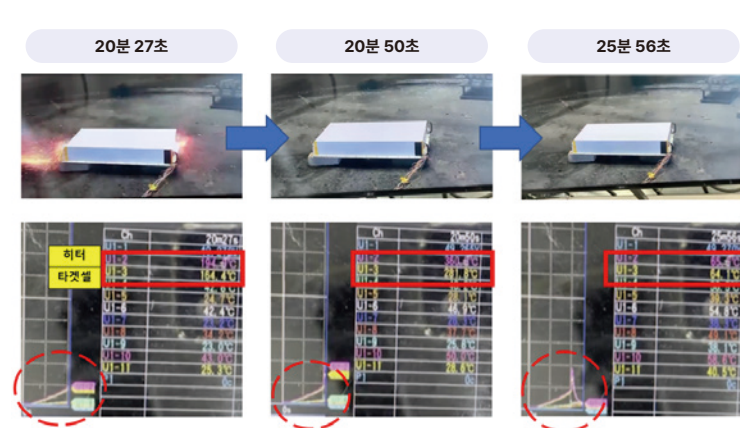
Config.	12S32P
Energy	6.99kWh (Usable 6.51kWh)
Capacity	158.4Ah (usable 148.9Ah)
Voltage range:	33.6 ~ 49.8Vdc
크기(W*D*H)	440*580(623_cooling)*90
중량(kg)	37(TBD)



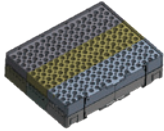
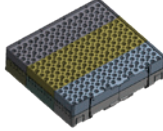
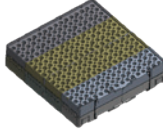
1차, 열폭주 시험(KTC-211223)

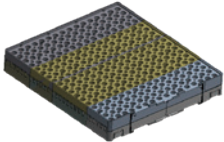
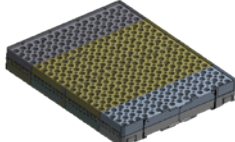
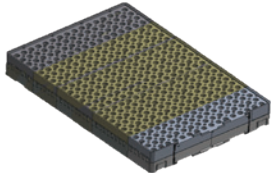
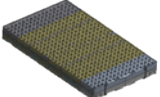


2차, 열폭주 시험(KERI-220223)

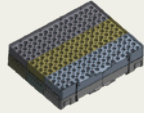
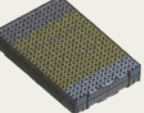
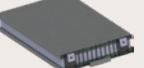
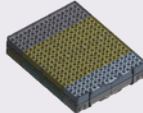
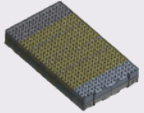


M50 Standard Module Lineup

Module	87.8Vdc	58.6Vdc	43.9Vdc	102.5Vdc	51.2Vdc	25.6Vdc	58.6Vdc	29.3Vdc
	SM24S8P-M50	SM16S12P-M50	SM12S16P-M50	SM28S8P-M50	SM14S16P-M50	SM7S32P-M50	SM16S16P-M50	SM8S32P-M50
Nominal / Rated Energy	3.49 / 3.23kWh			4.08 / 3.77kWh			4.66 / 4.31kWh	
Nominal / Rated Capacity	39.6 / 36.8Ah	59.4 / 55.2Ah	79.2 / 73.6Ah	39.6 / 36.8Ah	79.2 / 73.6Ah	158.4 / 147.2Ah	79.2 / 73.6Ah	158.4 / 147.2Ah
Rated Voltage[V]	87.8	58.6	43.9	102.5	51.2	25.6	58.6	29.3
Voltage Range[V]	72.0~99.6	48.0~66.4	36.0~49.8	84.0~116.2	42.0~58.1	21.0~29.1	48.0~66.4	24.0~33.2
Usable Voltage Range[V] (SOC 85% operation)	75.6~98.4	50.4~65.6	37.8~49.2	88.2~114.8	44.1~57.4	22.0~28.7	50.4~65.6	25.2~32.8
Design								
Dimension [WDH, mm]	368*305*88			368*350*88			368*396*88	
Weight[kg]	19			22			25	
Protocol	ISO-SPI			ISO-SPI			ISO-SPI	

Module	65.9Vdc	43.9Vdc	73.2Vdc	36.6Vdc	58.6Vdc	43.9Vdc	51.2Vdc
	SM18S16P-M50	SM12S24P-M50 / 24S12P	SM20S16P-M50	SM10S32P-M50	SM16S24P-M50	SM12S32P-M50	SM14S32P-M50
Nominal / Rated Energy	5.24 / 4.85kWh		5.82 / 5.39kWh		6.99 / 6.46kWh		8.15 / 7.54kWh
Nominal / Rated Capacity	79.2 / 73.6Ah	118.8 / 110.4Ah	79.2 / 73.6Ah	158.4 / 147.2Ah	118.8 / 110.4Ah	158.4 / 147.2Ah	158.4 / 147.2Ah
Rated Voltage[V]	65.9	43.9	73.2	36.6	58.6	43.9	51.2
Voltage Range[V]	54.0~74.7	36.0~49.8	60.0~83.0	30.0~41.5	48.0~66.4	36.0~49.8	42.0~58.1
Usable Voltage Range[V] (SOC 85% operation)	56.7~73.8	37.8~49.2	33.0~82.0	31.5~41.0	50.4~65.6	37.8~49.2	44.7~57.4
Design							
Dimension [WHD, mm]	368*442*88		368*487*88		368*578*88		368*668*88
Weight[kg]	28		32		38		43
Protocol	ISO-SPI		ISO-SPI		ISO-SPI		ISO-SPI

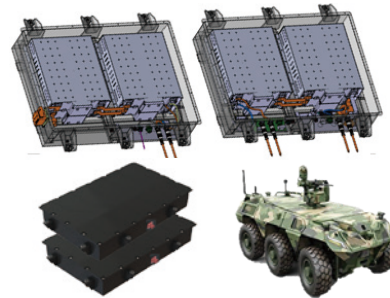
EV Applications

Module	SV24S8P-M50	SV12S16P-M50	SV12S24P-M50	SV12S32P-M50	SV12S36P-M50	SV20S16P-M50	SV10S32P-M50	SV7S64P-M50
Energy[kWh]	3.49	3.49	5.24	6.99	7.86	5.82	5.82	8.15
usable energy	3.25	3.25	4.87	6.5	7.31	5.42	5.42	7.58
Capacity[Ah]	39.6	79.2	118.8	158.4	178.2	79.2	158.4	316.8
Usable capacity	37.2	74.4	111.7	148.9	167.5	74.4	148.9	297.8
Nominal Voltage[V]	88.32	44.16	44.16	44.16	44.16	73.6	36.8	25.76
Voltage Range[V]	72~99.6	36~49.8	36~49.8	36~49.8	36~49.8	60~83	30~41.5	21~29.1
Design								
Dimension[WDH]	368*305*88		400*460*90	368*578*88	440*595*90	368*487*88		368*668*88
Weight[kg]	20		29	38	42	32		43
Pack Energy(kWh)	14.0 kWh	21.0 kWh	41.9 kWh	55.9 kWh	62.9 kWh	11.6 kWh	23.3 kWh	16.3 kWh
Configuration	4 modules	6 modules	8 modules	8 modules	8 modules	2 modules	4 modules	2 modules
Pack Voltage(Vdc)	353.3	353.3	353.3	353.3	353.3	147.2	147.2	51.5

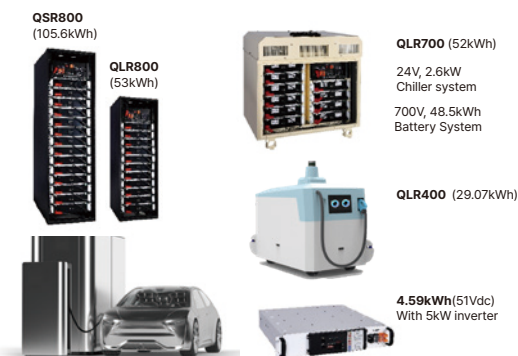
Truck Battery



Military Robot Battery



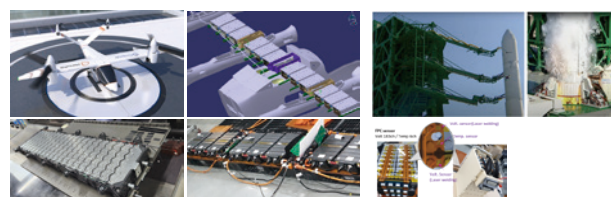
EV emergency charging battery



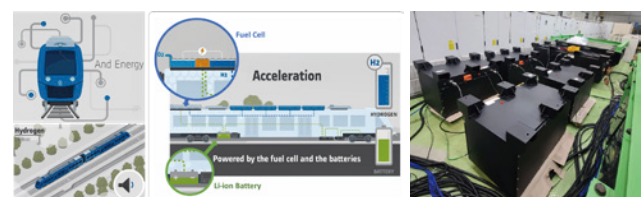
Battery modules for Electric Vessel



항공기 및 발사체 Battery

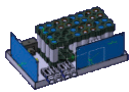
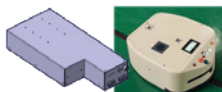
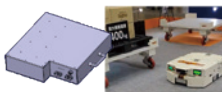


수소하이브리드 철도배터리



E-mobility Applications - AGV, CART, Industrial

21700-M50L-25Vdc series

Models	SP7S/4P-M50	SP7S/6P-M50	SP7S/8P-M50	SP7S/12P-M50	SP7S/16P-M50	SP7S/24P-M50	SP7S/32P-M50	SP7S/36P-M50	SP7S/64P-M50
Nom. Energy[kWh]	0.51	0.76	1.02	1.53	2.04	3.06	4.08	4.59	8.15
Capacity[Ah]	19.8	29.7	39.6	59.4	79.2	118.8	158.4	178.2	316.8
Nominal Voltage[V]	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8
Voltage Range[V]	21.0~29.0	21.0~29.0	21.0~29.0	21.0~29.0	21.0~29.0	21.0~29.0	21.0~29.0	21.0~29.0	21.0~29.0
Usable Voltage	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc	22~28.7Vdc
Max. Chg Current	10A	15A	20A	20A	35A	60A	60A	60A	100A
Max. Dchg Current	20A	50A	50A	50A	100A	150A	150A	200A	300A
Dimension[WDH]	155*325*90	230*580*90	230*480*90	300*385*90	370*385*90	638*148*84	380*470*175	638*201*84	183*470*470
Weight[kg]	About 6	About 7	About 8	About 11	About 13	About 19	About 24	About 24	About 45
Protocol	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A
Product	0.51kWh	0.76kWh / 1.02kWh	1.53kWh / 2.04kWh	3.06kWh	4.08kWh / 4.59kWh	8.15kWh			
									

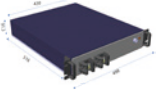
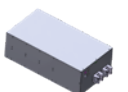
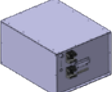
21700-M50L-48Vdc series

Models	SP13S/6P-M50	SP13S/12P-M50	SP13S/32P-M50
Nominal Energy[kWh]	1.42	2.84	7.57
Capacity[Ah]	29.7	59.4	158.4
Nominal Voltage[V]	47.8	47.8	47.8
Voltage Range[V]	39.0~53.6	39.0~53.6	39.0~53.6
Usable Voltage	41~53.3Vdc	41~53.3Vdc	41~53.3Vdc
Max. Chg Current	15A	30A	60A
Max. Dchg Current	50A	70A	150A
Dimension[WDH]	150*350*200	380*470*264	380*470*264
Weight[kg]	about 10	about 17	about 42
Protocol	CAN2.0A	CAN2.0A	CAN2.0A
Product	7~9 kWh (48Vdc) 	6~9 kWh for golf cart 	

21700-M50L-36Vdc series

Models	W10S/8P-M50	W10S/24P-M50
Nominal Energy[kWh]	1.46	4.37
Capacity[Ah]	39.6	118.8
Nominal Voltage[V]	36.8	36.8
Voltage Range[V]	30.0~41.5	30.0~41.5
Usable Voltage	30~41Vdc	30~41Vdc
Max. Chg Current	20A	60A
Max. Dchg Current	70A	200A
Dimension[WDH]	180*235*84	683*192*84
Weight[kg]	about 7	about 22
Protocol		
Product	2.9kWh for scooter (36Vdc*2S) 	

21700 M50L - 51Vdc series

Models	SP14S/18P-M50	SP14S/24P-M50	SP14S/32P-M50	SP14S/36P-M50	SP14S/64P-M50
Nominal Energy[kWh]	4.59	6.12	8.15	9.17	16.31
Capacity[Ah]	89.1	118.8	158.4	178.2	316.8
Nominal Voltage[V]	51.5	51.5	51.5	51.5	51.5
Voltage Range[V]	42.0~58.1	42.0~58.1	42.0~58.1	42.0~58.1	42.0~58.1
Usable Voltage	44~57.4Vdc	44~57.4Vdc	44~57.4Vdc	44~57.4Vdc	44~57.4Vdc
Max. Chg Current	40A	60A	60A	70A	120A
Max. Dchg Current	150A	150A	150A	180A	300A
Dimension[WDH]	430*516*90	300*516*264	380*470*264	TBD	425*800*264
Weight[kg]	about 26	about 40	about 45	about 50	about 90
Protocol	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A	CAN2.0A
Product	4.59 kWh 	6.12 kWh 	8.15 / 9.17 kWh 	16.3 kWh 	

LEV Battery Pack



LG에너지솔루션의 21700 M50L(4,950mAh) 원통형 배터리 셀 적용
유니솔루션의 특화된 기술력으로 고전도, 고방열, 고신뢰성의 배터리 팩 개발

Module	SP20S16P-M50	SP20S18P-M50	SP10S24P-M50	SP10S32P-M50	SP10S36P-M50	SP7S64P-M50
Energy[kWh]	5.82	6.55	4.37	6.01	6.55	8.15
usable energy	5.42	6.09	4.06	5.59	6.09	7.58
Capacity[Ah]	79.2	89.1	118.8	158.4	178.2	316.8
Usable capacity	74.4	83.8	111.7	148.9	167.5	297.8
Nominal Voltage[V]	88.32	88.32	36.8	36.8	36.8	25.76
Voltage Range[V]	60~83	60~83	30~41.5	30~41.5	30~41.5	21~29.1
Dimension[WDH]	400*504*90	440*504*90	440*413*90	440*504*90	440*504*90	400*690*90
Weight[kg]	31.8	35.4	24.6	31.8	35.4	43.3

Pack Energy(kWh)	11.6	26.2	17.5	12.0	13.1	16.3
Configuration	2 modules	4 modules	4 modules	2 modules	2 modules	2 modules
Pack Voltage(Vdc)	176.6	353.3	147.2	73.6	73.6	51.5

Module
SP20S16P



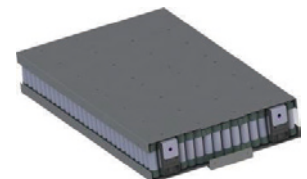
Module
SP20S18P



Module
SP10S32P



Module
SP7S64P



PACK 11 ~13 kWh (145.2 Vdc)

2modules
connected
in series



급속 PACK 26 kWh (290 Vdc)

4modules
connected
in series



PACK 12 kWh (73.6 Vdc)

2modules
connected
in series



PACK 16.3 kWh (51.5 Vdc)

2modules
connected
in series



Bumhan Unisolution

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