

# Xpand Battery Solution

For Transportation Application



# Electrifying Transport

Xpand Battery System is designed for use in commercial truck, bus, tram, and heavy duty transportation. The system can be integrated in parallel and in series to create very high energy and high voltage systems. Furthermore, the “Variable Bulkhead” design allows to customize the packs’ electrical and cooling interfaces without having to retool the entire systems.

## Superior Lithium Ion Battery

- High power performance
- Safe and wide range of operating temperature

## Compact and High Reliability Battery Packs

- Efficient direct liquid cooling
- Ease of installation
- Customizable solution
- IP67 Compliant (with connectors mated)

## State-of-the-Art Battery Management Systems

- ISO-26262 compatible RTOS
- Highly configurable for any chemistry
- 12V and 24V compatible
- Designed for system voltages up to 1,000V

## Complete System Design and Component Selection

- Battery disconnect unit, System controller, Master controller
- Controls up to 300 cells in series; 24 strings in parallel

## Extensive R&D, Engineering, and Test & Validation Resources

# Xpand Modular Pack

For High Performance E-Mobility

## Customizable Design



Single Unit



Scalable Modular Design

## Features

- Variable bulkhead design
- Advanced liquid cooling system
- New BMS, BDU and MCU
- A function to prevent spreading a fire out of the pack in case of internal fire
- Advanced ultrasonic welding of cell tabs to busbars
- Durable and safe under the toughest conditions
- Available with high energy or high power cells
- All external connections at front panel
- Low and stable impedance



	XMP 76P	XMP 111E
Cell Configuration	43HP - 2P24S	63UHE - 2P24S
Discharge Energy (kWh)	7.6kWh (Rated @ C/2)	11.1kWh (Rated @ C/10)
Specific Energy (Wh/kg)	≥99	≥144
Capacity (Ah)	86 (Rated @ C/2)	126 (Rated @ C/10)
Voltage (Nominal; V)	88.8	88.3
Mass (kg)	76.8	77.0
Dimensions (L x W x H)	753 x 303 x 282 (mm)	
Certification	ISO 12405, ISO 20653, ISO 16750, GMW 16390, UNDOT 38.3, ECE R100 8E, IEC 62281, J2929, UN 38.3	

# Xpand EV Battery System

Certified & Guaranteed

## Advantages

- Easy to customize high voltage, low voltage and cooling interfaces to each application
- All connections at front panel; rear access not needed for installation
- Designed for use in very large strings and pack combinations (Up to 1,000V per string, and up to 24 strings in parallel)
- Allows upgrades to connector styles, fuses, VTBs without tooling entire pack
- Robust, highly serviceable BDU with integrated SCU; standalone MCU
- Available with or without internal fuse (tested both ways for safety)
- Highly robust tab-to-busbar joint survives the harshest vibration & shock environments while maintaining ultra-low DCIR
- Direct cooling to cell face; 50-75% less mass than competing technology; maximizes volumetric efficiency
- Enhanced cell separator eliminates the need for thermal barriers

## EV Battery Pack Validation

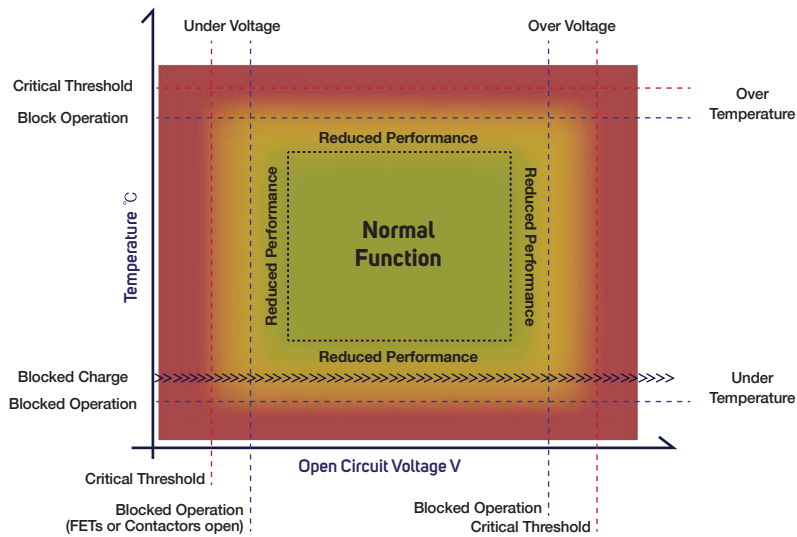
Test	Conditions	Reference
Ingress Protection	Mated: IP67, IPXXD, Unmated IPXXB	ISO 20653
Mechanical Shock (XMP76P)	50G, 6ms, 3 axis, 10 each	ISO 12405
Mechanical Shock (XMP111E)	20.7G, 11ms, 3 axis, 10 each	ISO 12405
Vibration	Random, 3 Axis, 21 hr/axis	ISO 12405
Composite Heat & Humidity	RH 93%, 25°- 65°C, 28 day	ISO 16750
Thermal Shock	85°C to-40°C within 30 min	ISO 12405
UNDOT	UN T1, T2, T3, T4, T5	UN 38.3
Housing Load	Knee 150kN/m <sup>2</sup> ; Foot 356kN/m <sup>2</sup>	GMW16390
External Fuel Fire	130 sec over fuel fire	ECE R100 8E
Drop Test	1.2m onto cement on corner	IEC 62281
Unbalanced Overcharge	1 cell @ 200% forced overcharge	
Forced Internal Coolant Leak	Rotate and hold around each axis	
External Short Circuit, Fused	5mΩ, 100 mΩ	J2929, UN 38.3
External Short Circuit, Unfused	5mΩ	J2929



Fully Automated Production Line  
From Manufacturing Cells to Pack Assembly



# Xpand EV Battery System-based Safety



## Certified & Guaranteed Cell (43Ah HP & 63Ah UHE)



The cell incorporates ceramic coated separator and builds upon proven NMC chemistry. The tests cells, modules and systems were tested in its own test labs or in certified regional test agency labs. Development and test of battery systems are done according to the following standards :

## Integrated, multiple layers of protection : Passive and active safety

### Passive safety per many industry standards :

- ECE R100, R17; FMVSS; ISO 6469; UNDOT 38.3 Ellicert / INERIS Safety Tests (French Automotive Consortium), ISO 12405-2 / EN 60068-2 / ISO 20653 / ISO 11452-2

### Active safety follows methods defined in ISO 26262 and IEC 61508 :

- Develop, execute, and maintain, safety plan through the entire product lifecycle
- Strategies, activities, and procedures for achieving product safety
- Utilize tools, methods, and procedures from relevant industry standards, regulations, and best known practices of industry

## Obtained Additional Test & Certifications

UN transport test	ST/SG/AC.10/11/Rev.6
Crush	UN 38.3 T6, QC/T 743, GBT**, SAE J2464**
Nail penetration	SAE J2464, QC/T 743, GBT**
Thermal stability	SAE J2464
Analysis of hazardous substances during cell opening without thermal runaway	USABC (SAND2005-3123)**
Analysis of hazardous substances during cell opening with thermal runaway	USABC (SAND2005-3123)**
FTIR analysis of escaping gases in free space	USABC (SAND2005-3123)**

\*\* testing performed on similar chemistry cells having non ceramic coated separator

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