

xPack

The superior battery standard



One standard, many benefits

Basic battery formats



Horizontal batteries
with the handle on the long edge



Vertical battery
with the handle on the short edge



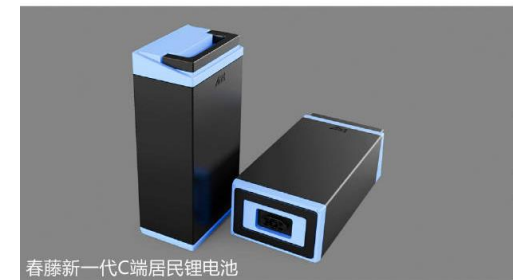
Vertical batteries dominate the market

51Huandian



Vertical batteries dominate the market

Smart Moss



Vertical batteries dominate the market

Simachuxing



Vertical batteries dominate the market

QishiHuandian



Vertical batteries dominate the market



Kymco



Torrot



Kumpan



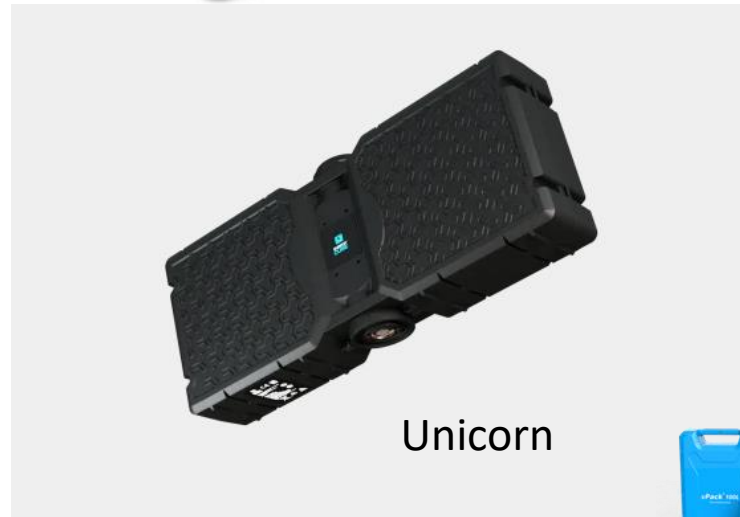
Honda



There are still very few horizontal battery models



AES



Unicorn



A comparison of battery formats

Vertical batteries are widespread, but they significantly reduce the stowage space under the seat on electric scooters



Having a horizontal battery in the footwell leaves plenty of stowage space under the seat, which is a key advantage in the eyes of the customer



A comparison of battery formats

Vertical batteries cannot be easily integrated into light or heavy motorbikes either. The design simply feels clumsy.

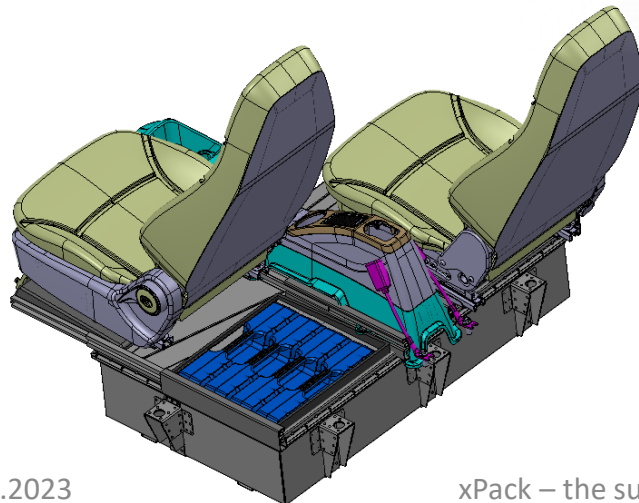


In contrast, horizontal batteries allow for an elegant design of both light and heavy motorbikes.

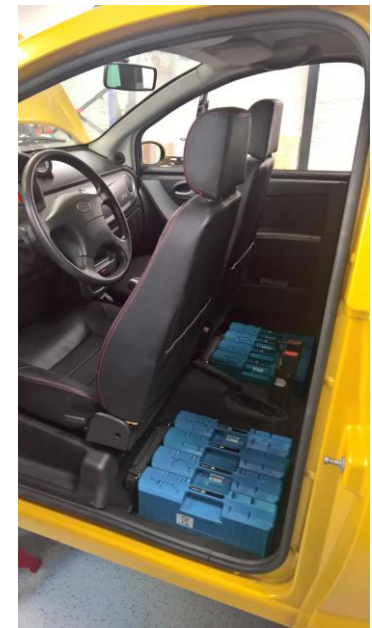


A comparison of battery formats

**Vertical batteries do not fit under the car seat.
They are simply too long.**



**Horizontal batteries fit under a car's seats.
In small, light cars, the best place for replaceable
batteries is under the seats.
Only horizontal batteries allow for the same battery
type to be used in single-track and two-track LEVs.**



A comparison of battery formats

kickTrike



Cargo scooter



Light motorcycle
P-series



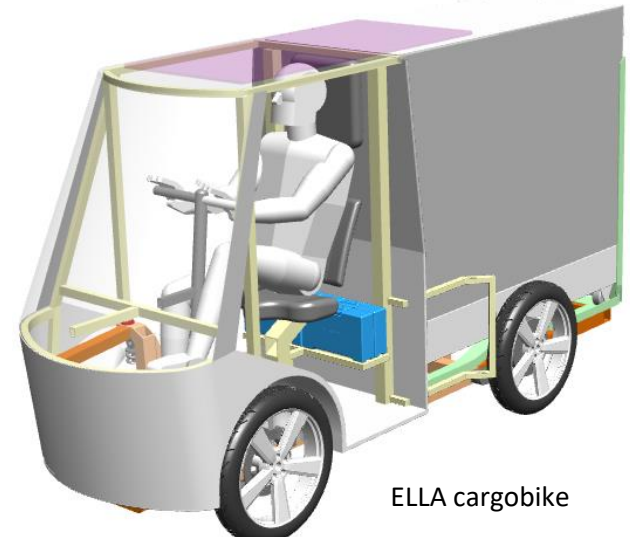
Heavy motorcycle
V-series



The horizontal xPack100 battery is the perfect fit, offers the user many benefits and is suitable for all common light vehicle types



ELLA car



ELLA cargobike



A comparison of battery formats

Conclusion

**The horizontal xPack100 battery is superior to vertical batteries in terms of integration in vehicles.
It offers more – and greater – design freedom than a vertical battery.**



Easily integrated

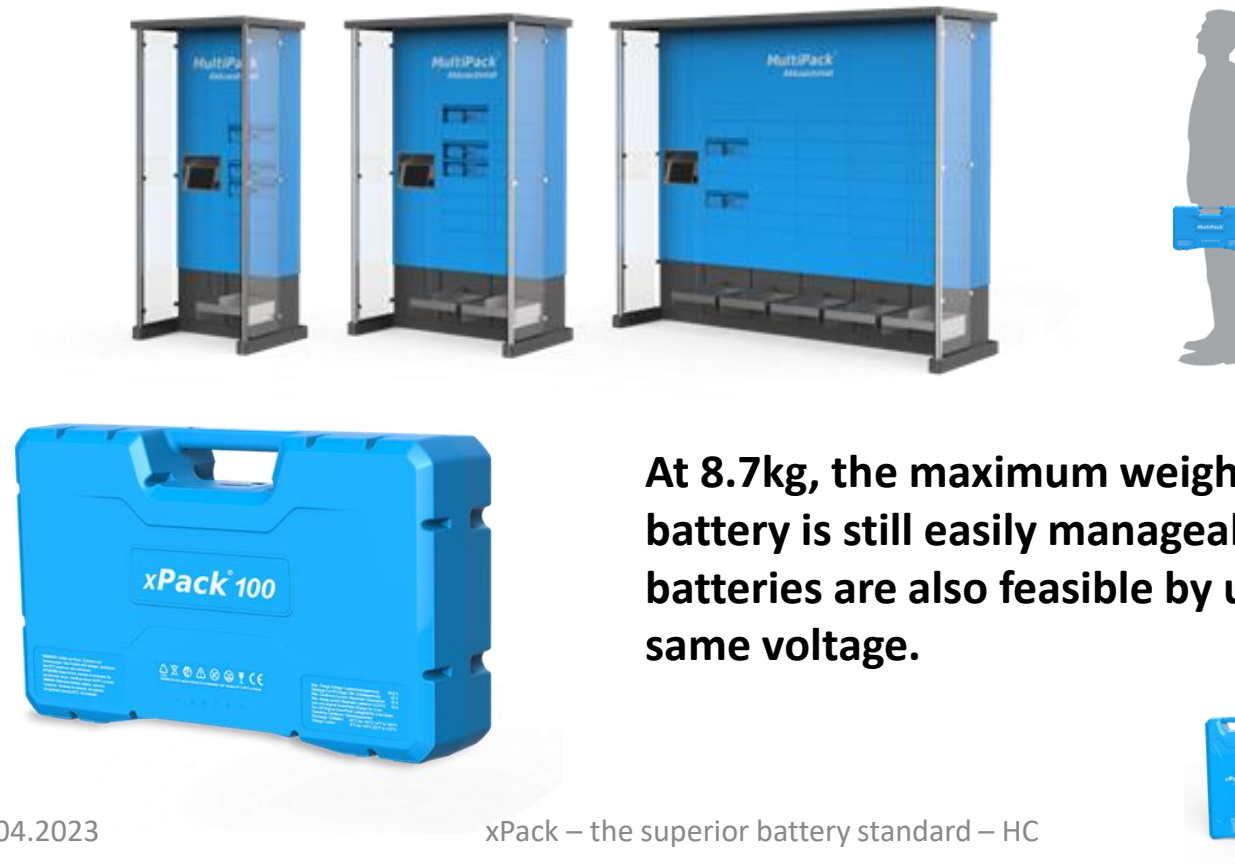


Difficult to integrate



Weight and handling xPack100

A horizontal battery's centre of gravity is close to the handle. This makes it easier to handle than a vertical battery, especially when it comes to battery replacement at swapping stations, but also generally wherever it needs to be placed horizontally.



At 8.7kg, the maximum weight of an xPack100 battery is still easily manageable. Lighter xPack100 batteries are also feasible by using fewer cells at the same voltage.

The xPack battery family

To ensure maximum design freedom, the xPack battery family includes three horizontal battery formats and three vertical battery formats.

The preferred format is the xPack100.



The xPack battery family

A range of plastic and metal casings are available for different applications and cell types. As they dissipate heat better, metal casings are essential in applications that draw a lot of power.

Licensees can create their own design within the xPack standard, and can use software to prevent the use of other xPack batteries in applications that specifically use their bespoke xPack batteries.



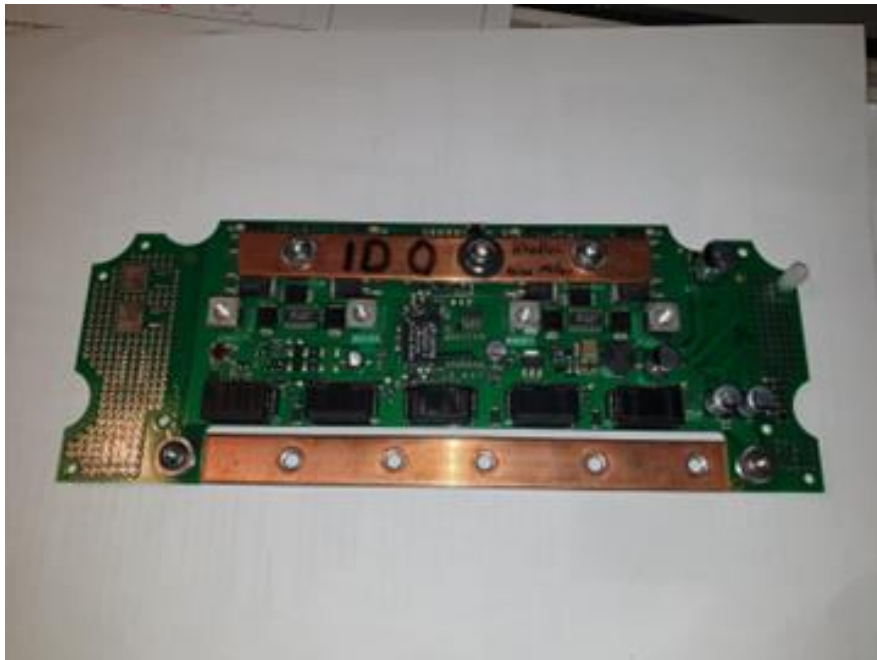
MultiPack - Akku Familie - Designentwurf
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CONSTIN
design + innovation

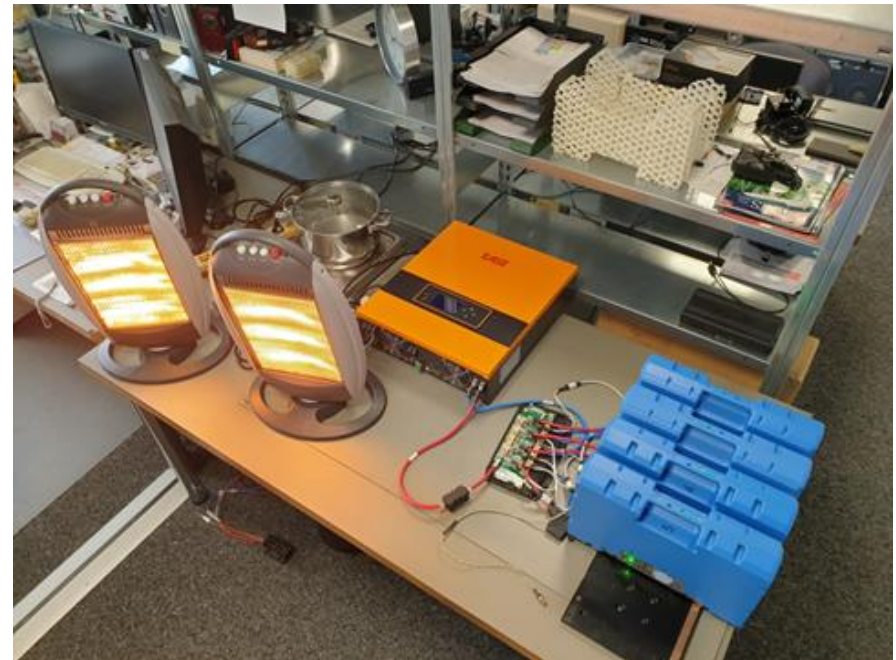


Using a cluster management system (CMS) to connect xPack batteries in parallel

A cluster management system (CMS) allows xPack100 batteries to be connected in parallel and thus cover a range of outputs at the same 48V voltage.



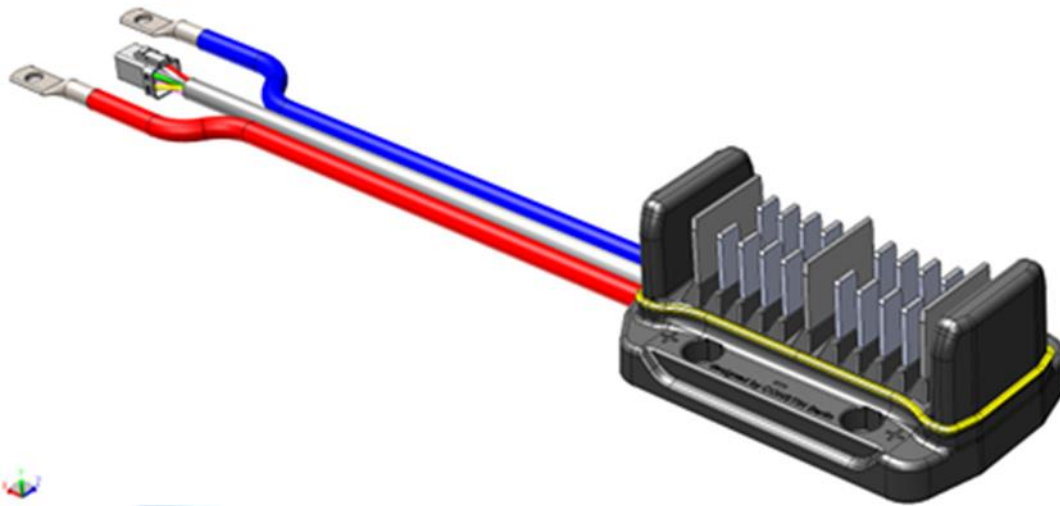
xPack CMS for four xPack100 batteries



xPack100 batteries in a cluster connected to a bidirectional inverter



xPack plug



The raised, upward-facing pins are protected when the battery is put down in dirty environments or immersed in water



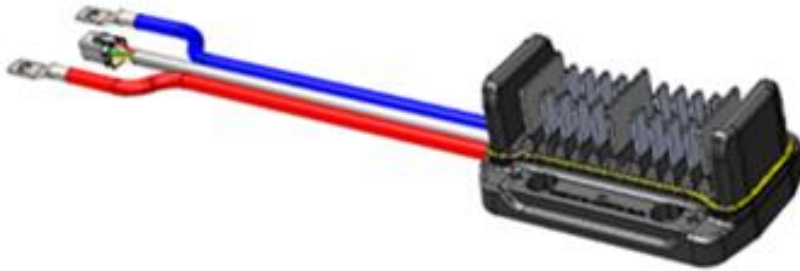
The robust xPack plug centres the xPack100 completely at the bottom, only requiring pressure from above to hold the battery securely in place.



The design of the plug dispenses with guides on the sides, allowing for battery formats other than the xPack100 to be used with the same plug.



xPack plug



The xPack plug can be connected the other way around, i.e. turned by 180°, which prevents damage to the plug

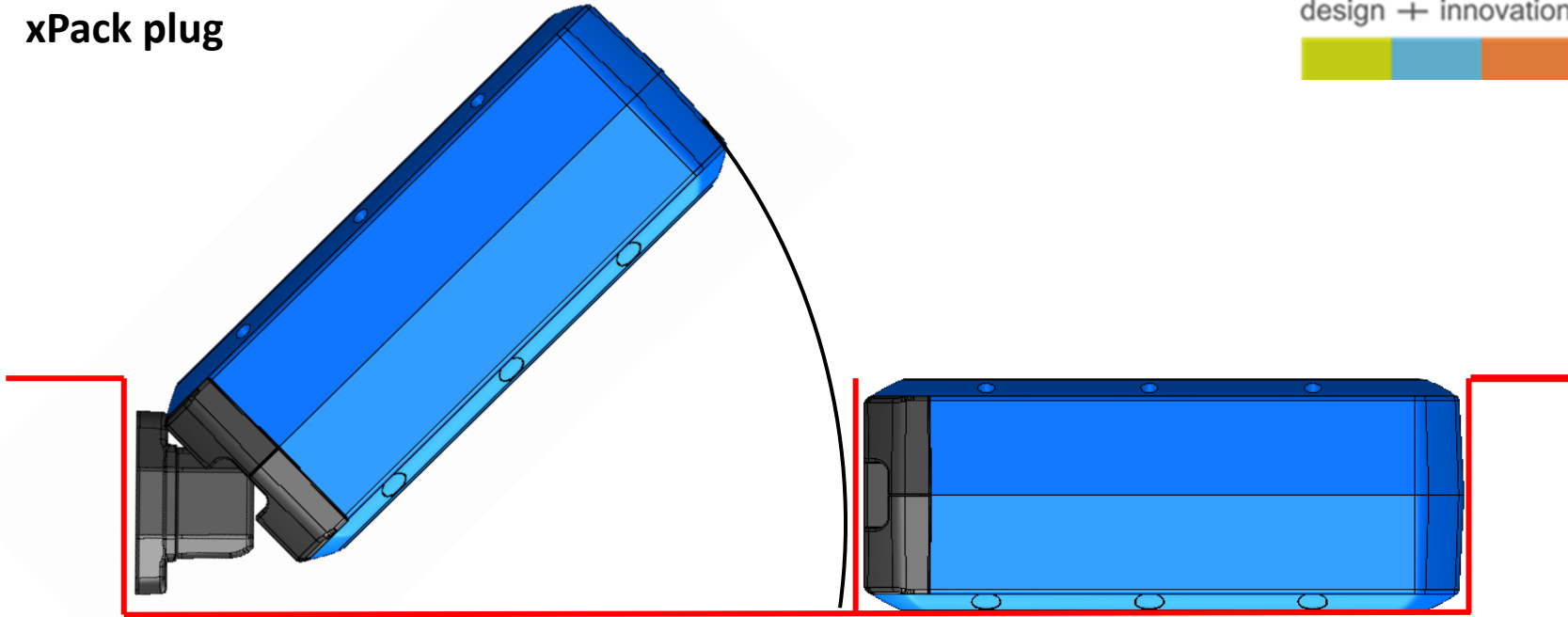


**Its thickness of 84mm
allows for 18650 cells and
21700 cells to be
integrated.**

Other cell formats can also be integrated as long as the system voltage of 48V is achieved.



xPack plug



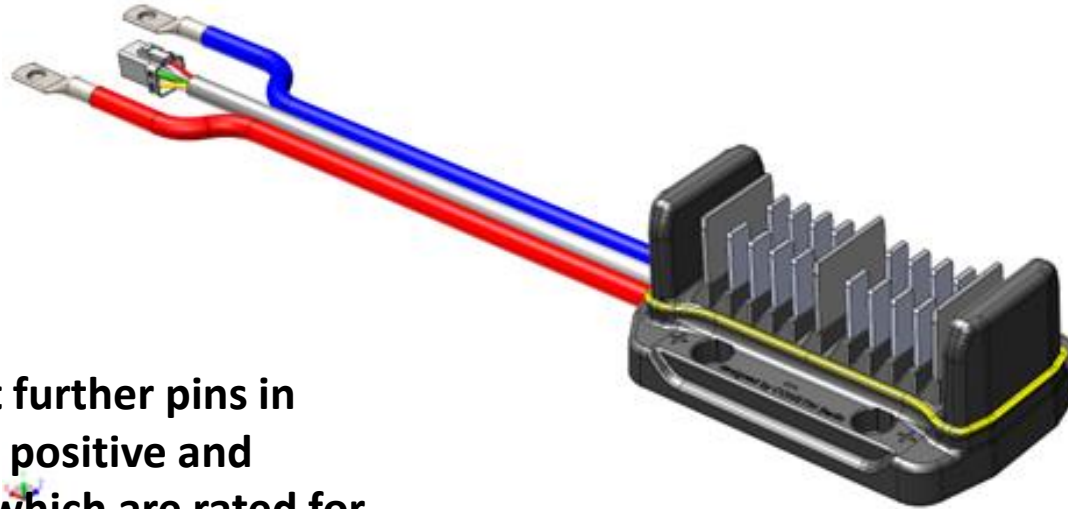
Thanks to the parallel arrangement of the flat pins, it is possible to swing the battery in sideways.

Placing the battery on the plug by swinging it in sideways is necessary in many applications where the plug is installed in a box-shaped container and the battery cannot be removed or inserted straight up or down.

This useful feature cannot be achieved with round pins.



xPack plug



There are eight further pins in addition to the positive and negative pins, which are rated for 48V and 60A continuous current.

By using the safety features associated with this and designing the batteries accordingly, xPack batteries can be deployed in environments where there is a risk of explosion.

Simple applications do not require all eight additional pins to be used.

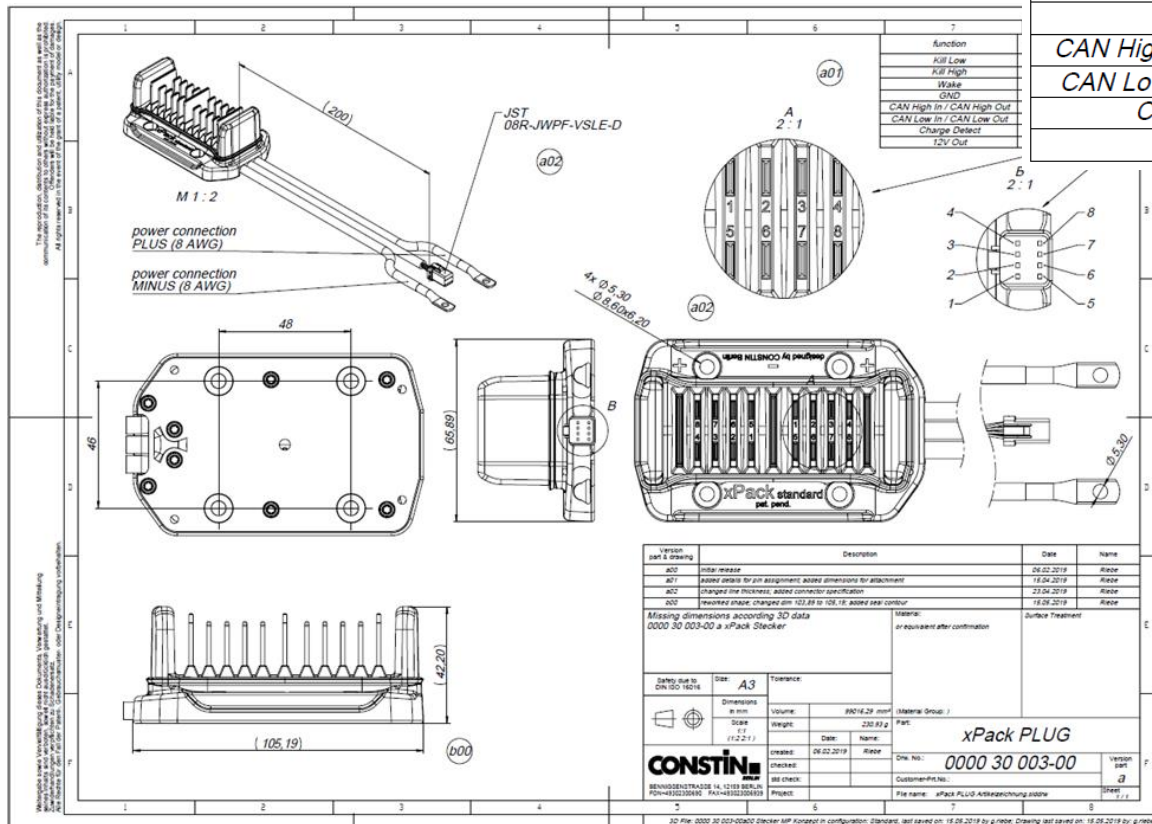
The xPack plug's free-standing pins make it easy to check whether they are dirty, and make them easy to clean if required.

There are no voids in which dirt, sand or liquids can accumulate. The xPack plug is so robust and watertight that it can centre the battery on its own and keep any damaging micro-movement away from the pins.



xPack plug

There are eight further pins in addition to the positive and negative pins, which allow the xPack battery to be used in a range of applications.

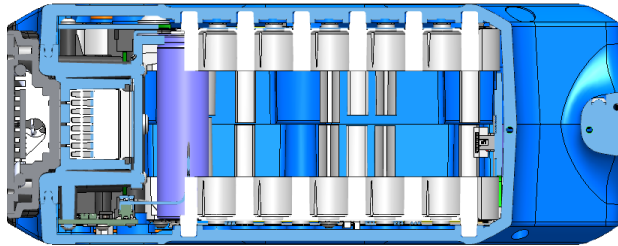


The communication protocol conforms to CANopen454 (EnergyBus)

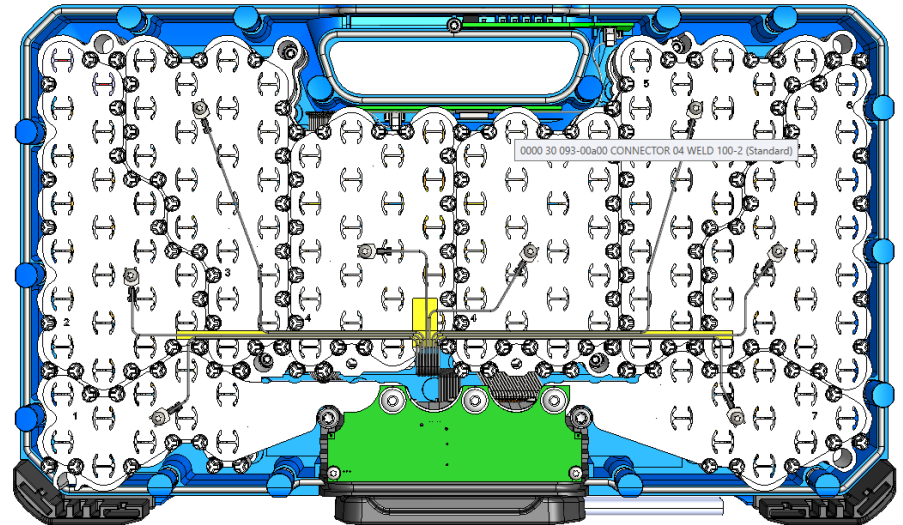


Internal structure of xPack batteries

By joining the components laterally and largely dispensing with wiring, the internal structure of xPack batteries has been designed for automated assembly and, in the event of repair, disassembly.



The arrangement of the battery electronics (BMS) above and below the plug socket leaves maximum space for the cells and provides thermal separation of BMS and cells.

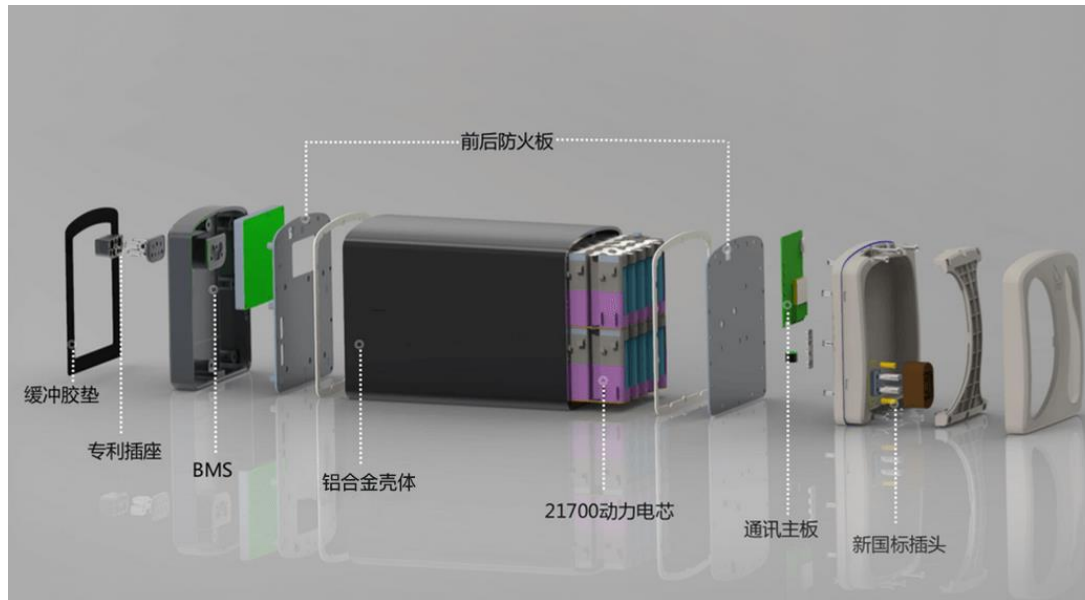


That is why xPack batteries offer the best volume to energy ratio (highest energy density), and cell life is not negatively impacted by partial heating of the cells by the BMS.



Internal structure of xPack batteries

The internal structure of many vertical batteries has not been designed for automated manufacture. The concentric shape makes heat dissipation and automated assembly and disassembly more difficult.



Key technical data of xPack batteries

Key technical specifications of the xPack100 in the variant with 140 cells in the 18650 format (Samsung S29E):

Standard voltage: 48V

Continuous current: 30 to 60A depending on type of enclosure and heat management

Continuous output: approx. 0.5 to 3 kW

Energy: 0.5 to 2.5 kWh

Communication : CANopen 454 (EnergyBus)

Dimensions: 368x217x84 (xPack100)



Conclusion

**xPack batteries,
particularly the xPack100,**



have many advantages over other vertical batteries on the market, such as a robust plug, a compact internal structure, the ability to automate production, and considerable design freedom for integrating them into all kinds of applications. As the modules communicate intelligently with each other and the application using the standardised CAN protocol, xPack batteries with different cell chemistries and cell types can be connected in parallel via the CMS. Secure communication via CAN and accurate measurement of physical variables enables the administration of large fleets of xPack batteries from different manufacturers for SOH analysis and the linking of swarm energy storage.



The full range of applications for xPack batteries

Light electric vehicles



xPack light electric cars



xPack e-scooters and e-motorcycles



xPack trikes



xPack bicycles and cargo bikes



xPack boats



The xPack battery family

Energy storage



xPack battery-swapping stations



xPack solar energy and home energy storage systems



Mobile devices



xPack handyman tools and gardening tools and much more

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