

# Battery Enclosure Overview

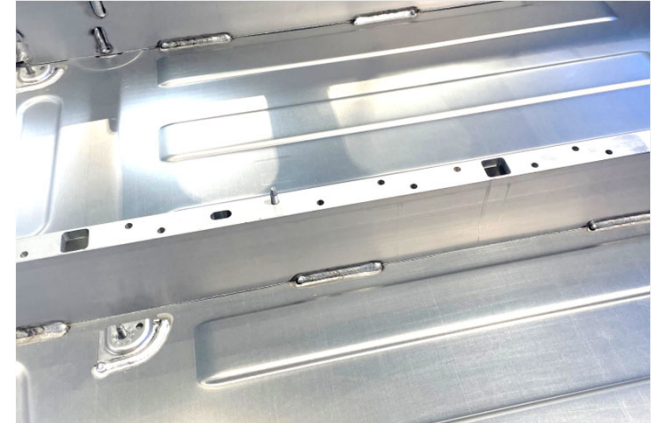
Magna provides comprehensive battery enclosure production and engineering solutions, offering a range of materials such as steel, aluminum, and lightweight composites, to contribute to the structural integrity, safety, and protection of high-voltage batteries in the body-in-white.

## Purpose

- Provide comprehensive solutions for the production and engineering of battery enclosures.

## Value Proposition

- Industry leader since 2011
- Advanced forming and integration projects are underway within Magna
- Global engineering production footprint



## Technical Description

- The battery enclosure plays a crucial role in the structural integrity and safety of the body-in-white.
- Protects high-voltage batteries from damage and water.
- These complex assemblies are designed to meet the specific requirements of different applications.

## Next Steps / Timeframe

- In production



# Aluminum Battery Enclosure

Magna's engineering and manufacturing capabilities for complex aluminum assemblies enable them to provide comprehensive global support for customer needs in aluminum battery enclosures, delivering solutions of the highest quality from concept development to high-volume mass production.

## Purpose

- Houses high-voltage batteries and contributes to the structural and safety elements of the vehicle's frame, while protecting components from potential impact, heat and water

## Value Proposition

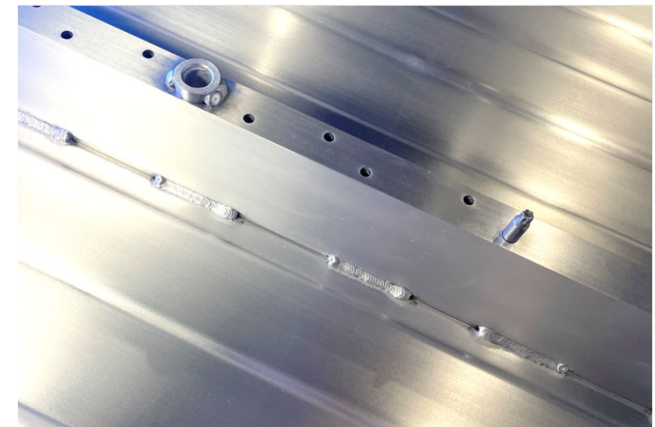
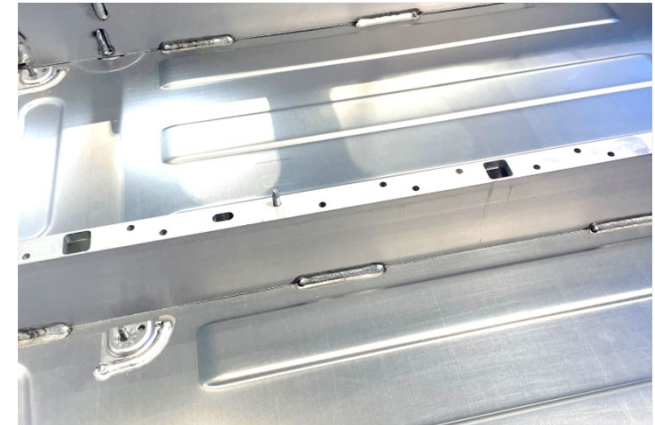
- 20% lighter than comparable steel designs
- Aluminum designs offer light weighting and high-scalability to produce different enclosure sizes for different vehicles on one production line
- Designed as an assembly of extrusions, castings, and stampings

## Technical Description

- Constructed of aluminum extrusions and stampings
- Joined using a combination of laser hybrid and cold metal transfer welding ensuring a leak-tight seal
- Leak-tight requirements were achieved using 9.5 meters of laser hybrid weld, pre-weld machining and washing, and helium gas testing

## Next Steps / Timeframe

- In production



# Steel Battery Enclosure

With Magna's broad expertise in engineering and various steel forming and joining capabilities, we offer the complete development and production of steel battery enclosure solutions.

## Purpose

- Houses high-voltage batteries and contributes to the structural and safety elements of the vehicle's frame, while protecting components from potential impact, heat and water

## Value Proposition

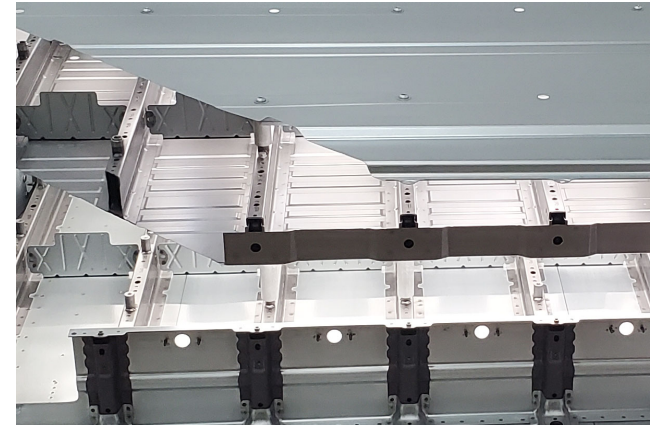
- Steel battery enclosures combine the structural advantage of higher-grade steel and the lower material cost compared to aluminum or fiber reinforced plastic
- Large one-piece stampings offer improved leak tightness, are safety-critical, and reduce complexity
- Optimized battery space utilization using advanced forming processes

## Technical Description

- Joined using various welding techniques all meeting a tolerance of .3 mm or less
- Comprised of 258 components
- Vertical support crossbars are held to a tolerance of +/- 0.35 mm, or that of a needle point

## Next Steps / Timeframe

- In production



# One-Piece Tub Battery Enclosure

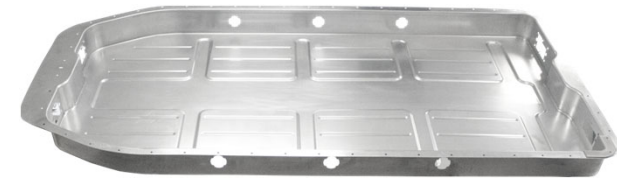
Magna has achieved a significant breakthrough by developing a stamping process that creates a battery enclosure with near-rectangular corners and sidewalls, eliminating failure modes and increasing available space for battery components by at least 6%.

## Purpose

- Manufacture a battery enclosures with near-rectangular corners and sidewalls
- Eliminate failure modes and increase available space for battery components, ultimately improving the efficiency and performance of the battery system

## Value Proposition

- Eliminate complex joining solutions that drive manufacturing costs and high risks to meet sealing performance
- Increases volume for battery cells by at least 6%
- Non-structural steel battery enclosure is 18kg lighter vs baseline aluminum structural battery enclosure
- Designed within BIW to absorb the crash load energy
- Cost effective solution



## Technical Description

- The battery enclosure in a vehicle refers to a protective housing or container that is specifically designed to house and secure the vehicle's battery pack
- Magna's latest projects focus on near-vertical walls, tight-radius corners, and functional integrations of the complete battery system

## Next Steps / Timeframe

- Preparing for full-scale series production

