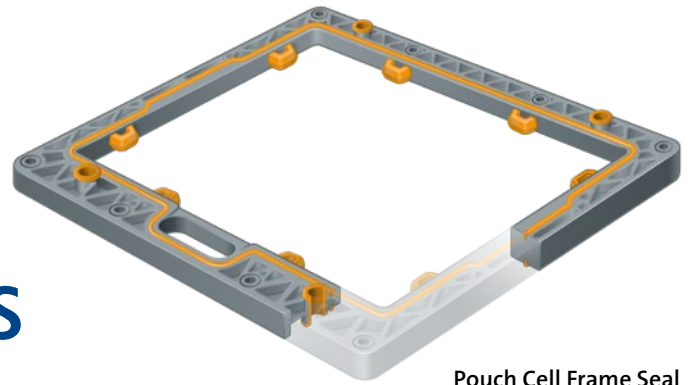


FIXATION ELEMENTS FOR POUCH CELLS



Pouch Cell Frame Seal

Freudenberg Sealing Technologies produces Pouch Cell fixation elements to safely embed Pouch Cells inside a lithium-ion battery system. Such battery systems are used in a variety of applications, both stationary and mobile.

Pouch Cells are placed in either a fixed frame, or are surrounded by cell profiles. Both types of products provide a secure, reliable, and protective embedding of the cell within the battery system.

A comparison of fixation elements:

Pouch Cell Frame Seal (LC Integrated Precision Solutions):

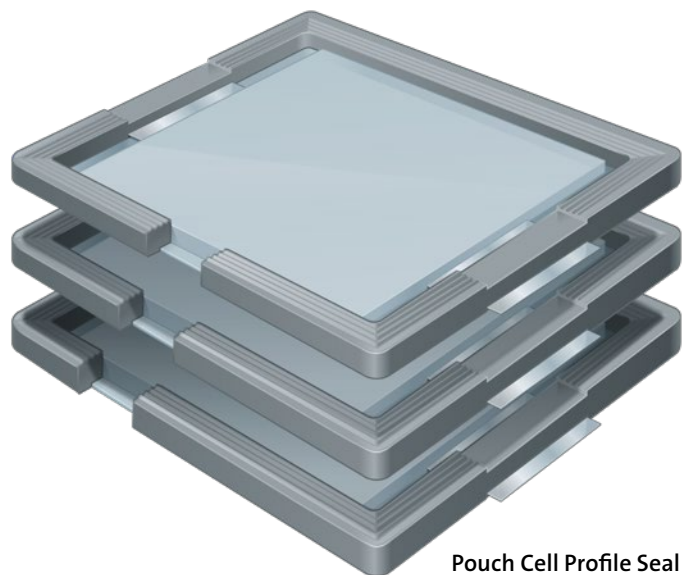
- Best value for harsh operating conditions (vibration, etc.)
- Thermoplastic frame with integrated sealing function (direct bonding of seal - no assembly effort)
- Customized design to be realized
- Proven functionality in a development vehicle
- Active battery cooling can be realized

Pouch Cell Profile Seal (AC SSI):

- A good product for normal applications (automotive, stationary batteries, etc.)
- Low investment in tool acquisition
- Fast realization of new dimensions (ca. two months)
- A “Value Engineered” product
- Customers must cut and assemble the profile
- A cost-reduced fixation/sealing solution
- “No limitation” in production volumes
- Freudenberg Sealing Technologies patent pending

VALUES FOR THE CUSTOMER

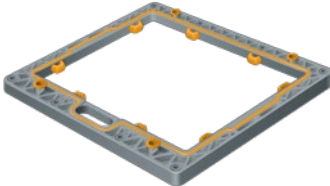
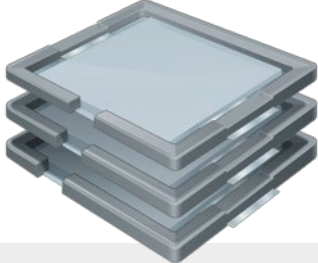
- Because the “soft” cells are mounted in the housing process-specific thickness changes of the cell can be tolerated
- In both Frames and Profiles, an elastomer stays in direct contact to the surrounding cell sealed seam. This “soft fixation” results in an improved reliability of the embedding (superior to the currently-used “hard” deadlock of plastic frames)
- The protruding electrical cell connectors are also embedded and thus protected
- One of our main USPs is safety. Usually, in the event of a malfunction of the cell (e.g., an internal short circuit), gas is formed inside the cell (electrolyte decomposition—typical gas volumes are 20-100 liters; the gas is toxic and combustible). The resulting inner overpressure forces open the surrounding sealed seam at a non-predictable location. Subsequently, if the gas comes in contact with electrical parts, it is a potential fire hazard. Freudenberg Sealing Technologies’ seals compress the sealed seam – except at one defined location. If the cell opens, the location of gas emission is identified and the gas emission can be exhausted safely.
- Both design concepts allow the integration of additional functionality, e.g., cooling elements



Pouch Cell Profile Seal

FEATURES & BENEFITS

A comparison of the Pouch Cell Frame Seal and the Pouch Cell Profile Seal

Sealing Parameter	Pouch Cell Frame Seal	Pouch Cell Profile Seal
		
Cell embedding	++	+
Adjust/distance between cells	++	++
Vibration protection	++	+
Assembly time	+	0
Implementation of cooling	++ liquid + indirect 0 air	- liquid + indirect + air
Exhaust gas handling	++	0/+
Adaption to different designs	-	++
Development investment	2 months	2 months
Typical volumes (cells)	no limitation	1 – > 1.000.000 p/a

The information contained herein is believed to be reliable, but no representation, guarantees or warranties of any kind are made to its accuracy or suitability for any purpose. The information presented herein is based on laboratory testing and does not necessarily indicate end product performance. Full scale testing and end product performance are the responsibility of the user.

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