

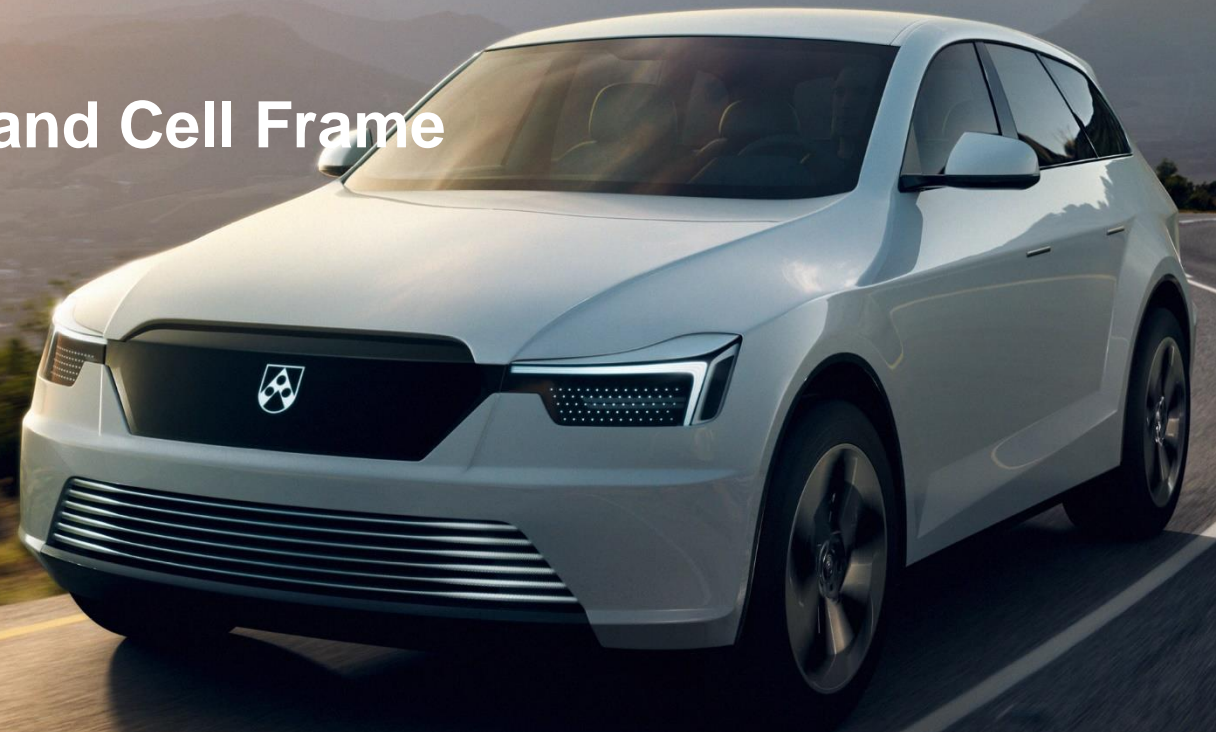
Röchling

Automotive

Battery Solutions

Battery Cover, Underrun protection and Cell Frame

19.11.2021 Richard Zhu

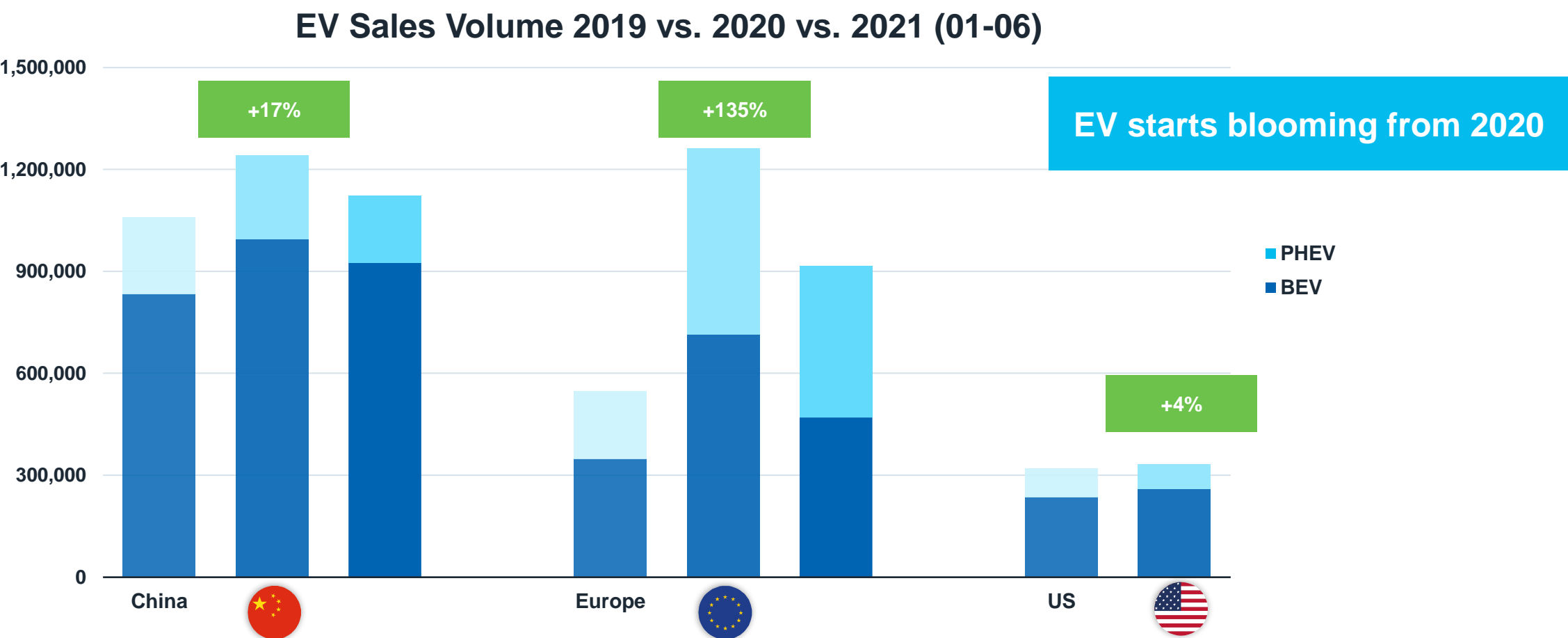


2020年

To C: 70%

To B: 30%

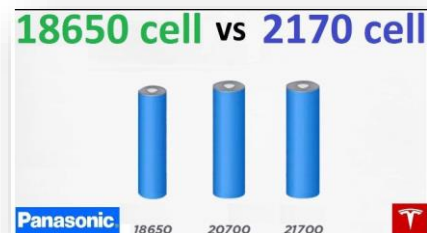
Blooming of EV Market



Source: Marklines & Center of automotive management, 2019.07.11

Battery System Need Lighter

Bigger Cell



Bigger module



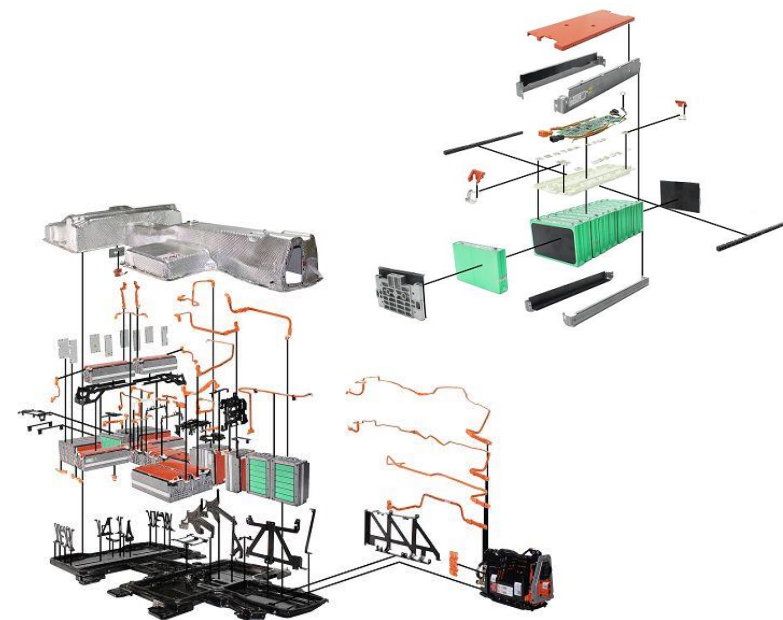
CTP: Cell to Pack



Energy density (Wh/kg)

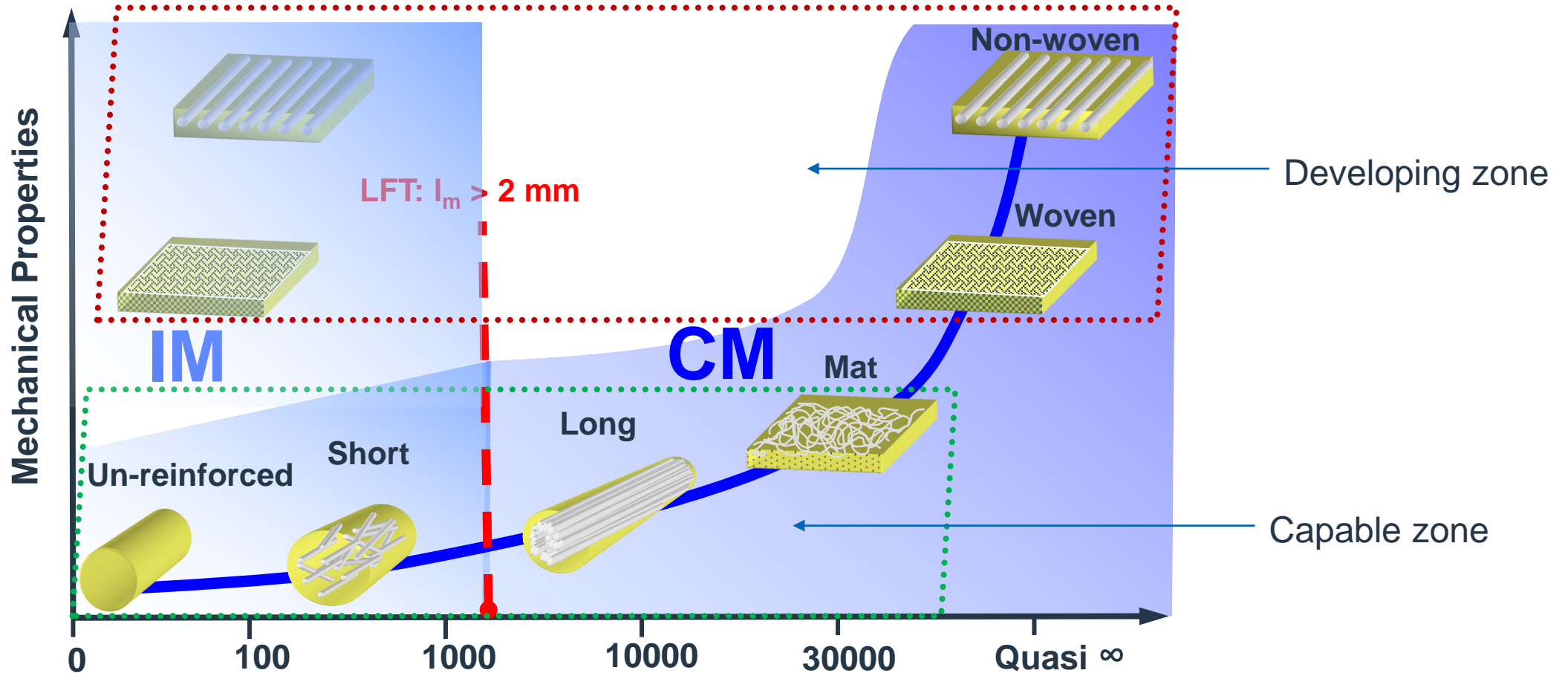
$$\text{Energy density (Wh/kg)} = \frac{\text{Capacity (Wh)}}{\text{Weight(kg)}}$$

RA provide plastic lightweight solutions to battery



Material and Processes

Fiber Length Changes Manufacturing Process



Röchling Battery Covers

Provide Multi-plastic Solutions for Customers

为客户提供不同解决方案

- ✓ Variety of materials and process available depending on size & design requirements
- ✓ Superior thermal runaway protection comparable to Al or Steel Covers
- ✓ Automated manufacturing
高自动化的生产能力



Röchling Battery Housing _ SMC

The SMC battery cover has high design freedom can give cost and weight benefit to battery system

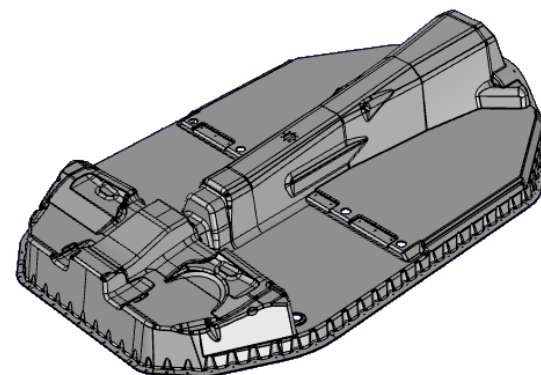
- Weight Comparison
重量对比：比钢轻，和铝相当

	Steel	Aluminum	SMC
Density(g/cm ³)	7.85	2.7	1.8
Thickness(mm)	1	1.5	2.5
Weight(kg/m ²)	7.85	4.05	4.5

- Cost comparison (the shown parts for reference)
成本对比：结构复杂的情况下SMC投资和成本都有竞争力

	Steel	Aluminum	SMC
Tooling cost	>2A	>2A	A
Part cost	~1.5-2.5B	~1.5-3B	B

High design freedom of SMC



Röchling Battery Housing

Project Summary 量产开发项目

BMW

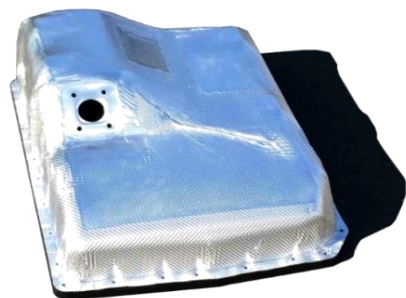
PHEV

DLFT

+ EM shielding, Compression limiter

2015

40000 / y



OEM 2

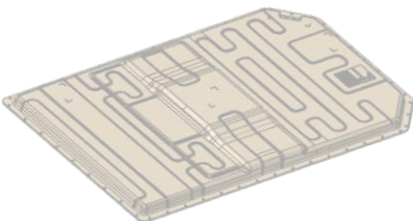
BEV

SMC

+ Degassing Unit,

2021

35000 / y



OEM 3

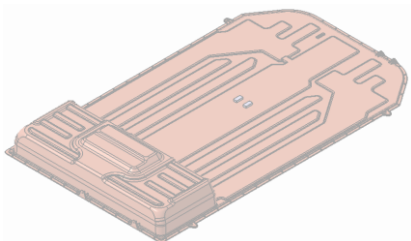
BEV

SMC

+ Degassing Unit, Acoustic Pads, Seal

2021

20000 / y



OEM 4

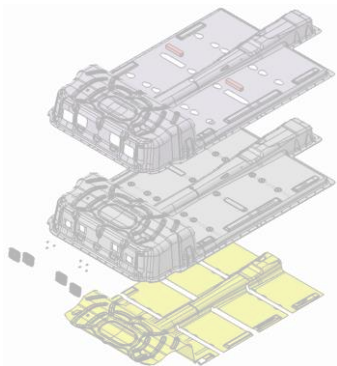
BEV

SMC

+ EM Shielding, Acoustic Pad, Acoustic Sealing, Degassing Unit, MICA sheet

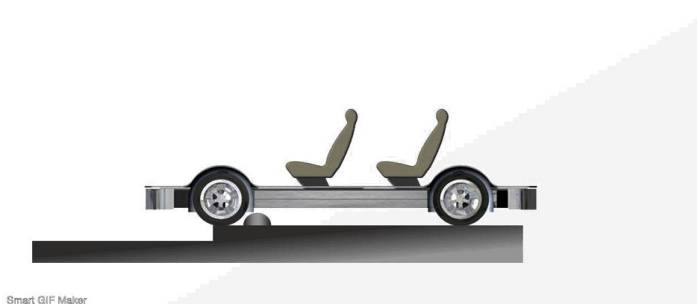
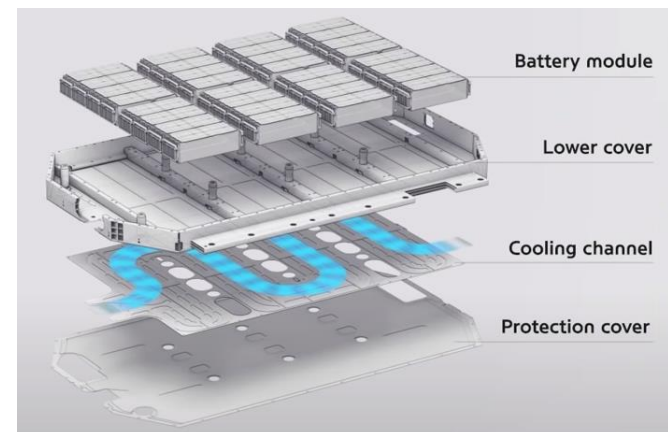
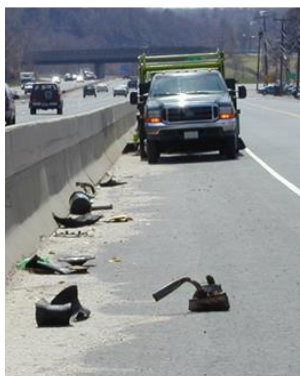
2022 / 2023

130000 / y



Battery System Underrun Protection 电池系统下防护

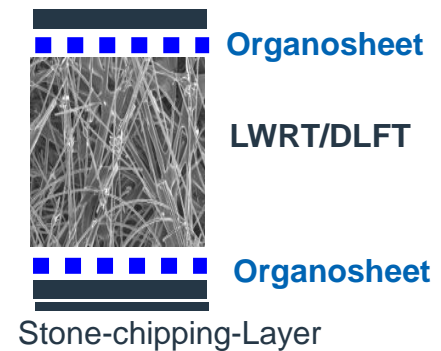
The cases of car fires caused by intrusion from underside of battery are very often, so a strong protected layer is needed to guarantee safety of battery



Discover the Possibilities!

Battery Pack Underside Protection

- Lightweight 3~4kg/m²
- NVH reduction
- Good thermal insulation
- Energy absorption in core layer LWRT
- Low cost comparing with Metal
- Adjustable layers and thickness

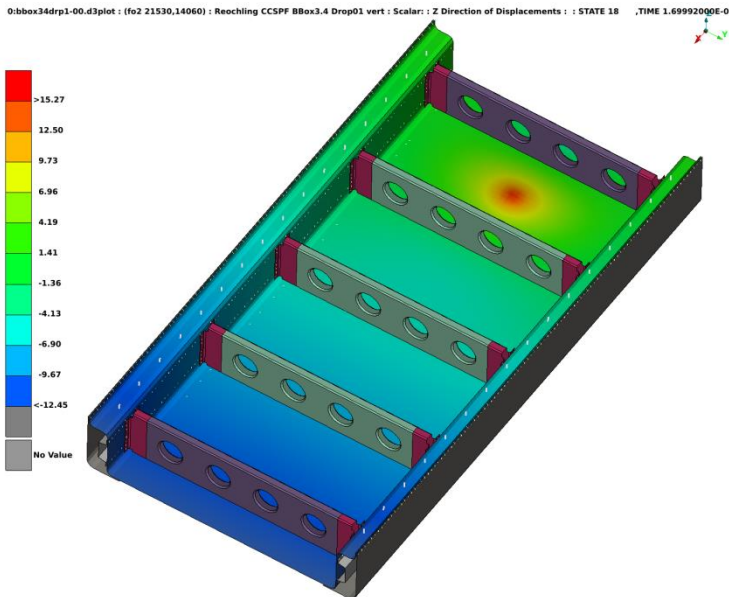


Battery System Underrun Protection

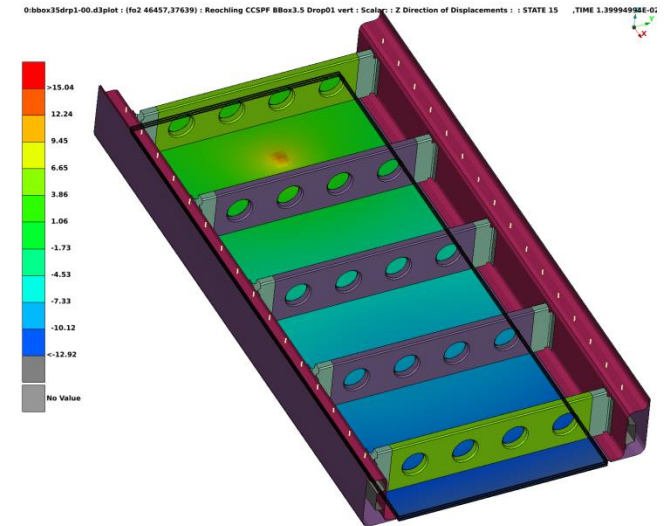
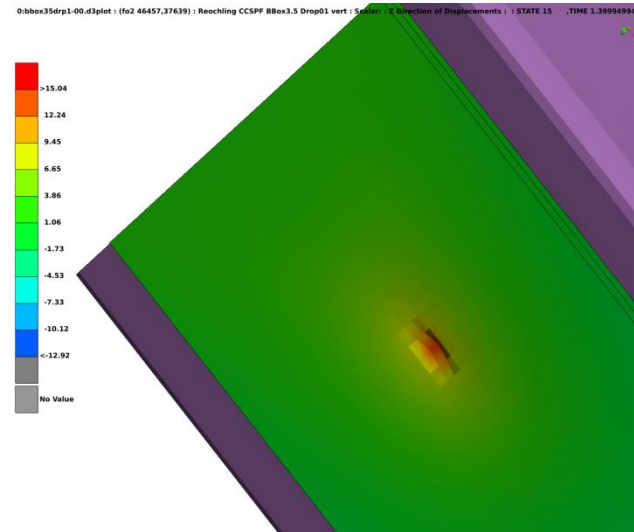
Intrusion test with battery pack

Battery of 565 kg drops from a height of 145 mm on a $\varnothing 100$ hemisphere

Steel 6 mm ($47,1 \text{ kg/m}^2$)
deflection: 15,27 mm



Stratura Hybrid 3 x 1 S 18 mm ($27,87 \text{ kg/m}^2$)
outside: 15,04 mm / inside: 9,45 mm

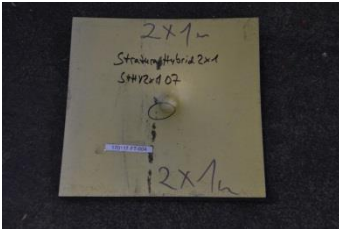
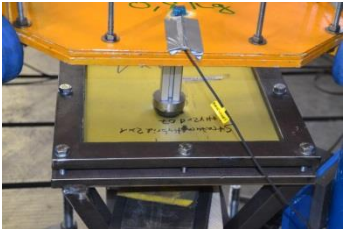
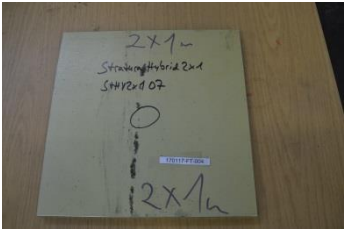
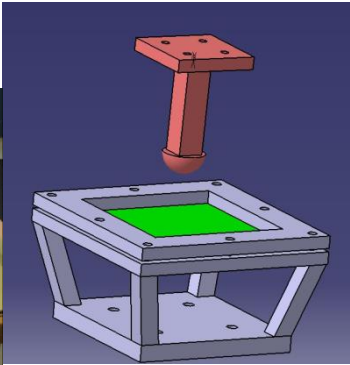
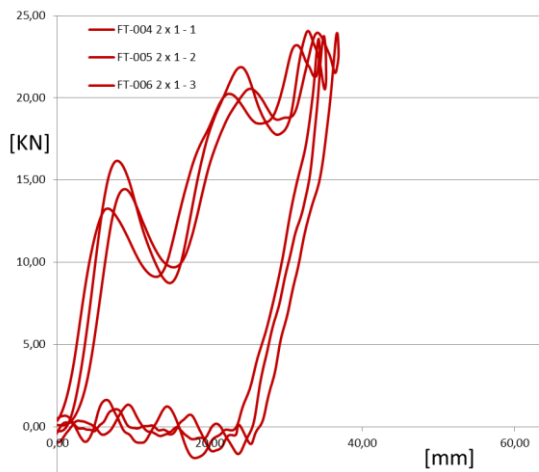


Battery System Underrun Protection

Intrusion test with specimen

Puncture trial Stratura hybrid 2 x 1

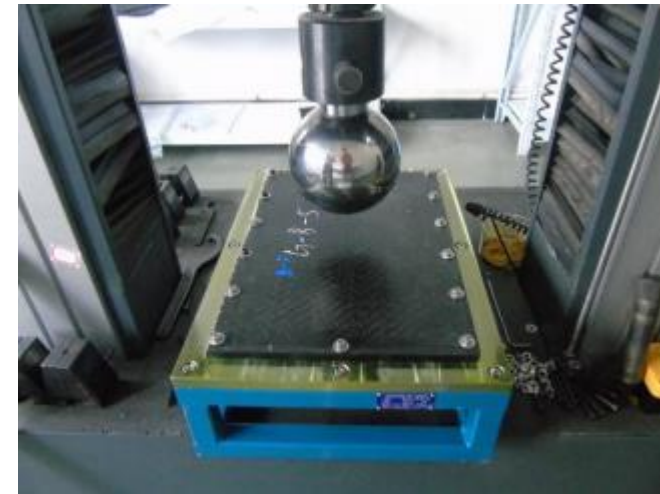
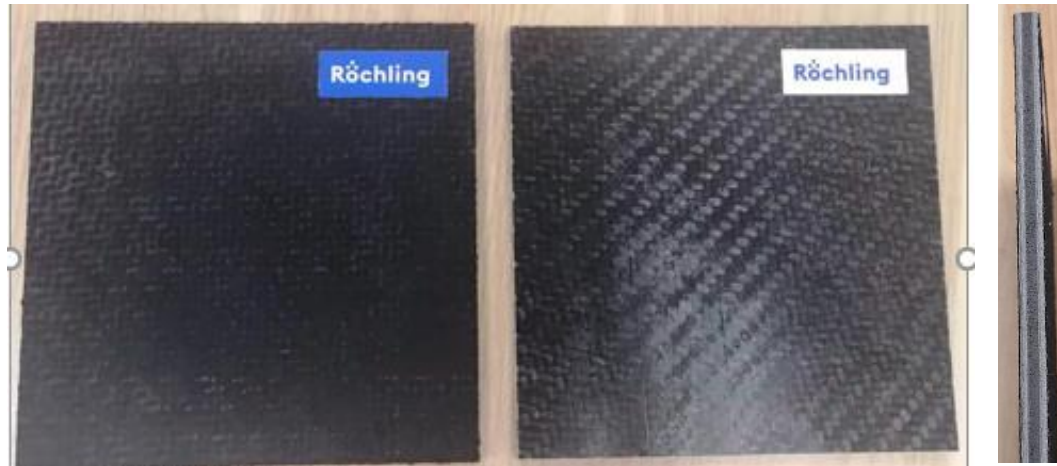
Impactor	13,5 kg
Sphere-diameter	60 mm
Falling speed	9 m/sec / height 4130 mm
Kinetic energy	547 J
Stopping distance	35 mm
Average breaking force	15,6 kN (1.5 吨)



Battery System Underrun Protection

Intrusion test with plates and pack level are on going

The different combinations of this material can meet different requirements of customer.

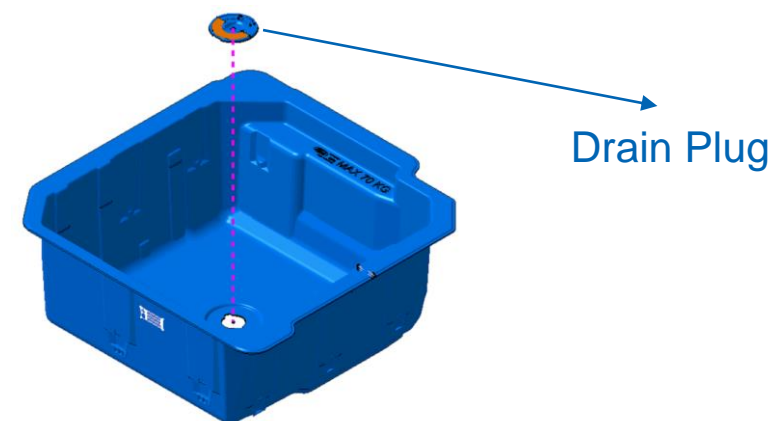


Ford Puma 2020 Innovation by Röchling: Mega Box

PPGF30 D-LFT (Direct Long Glass Fibre Reinforced Thermoplastic)



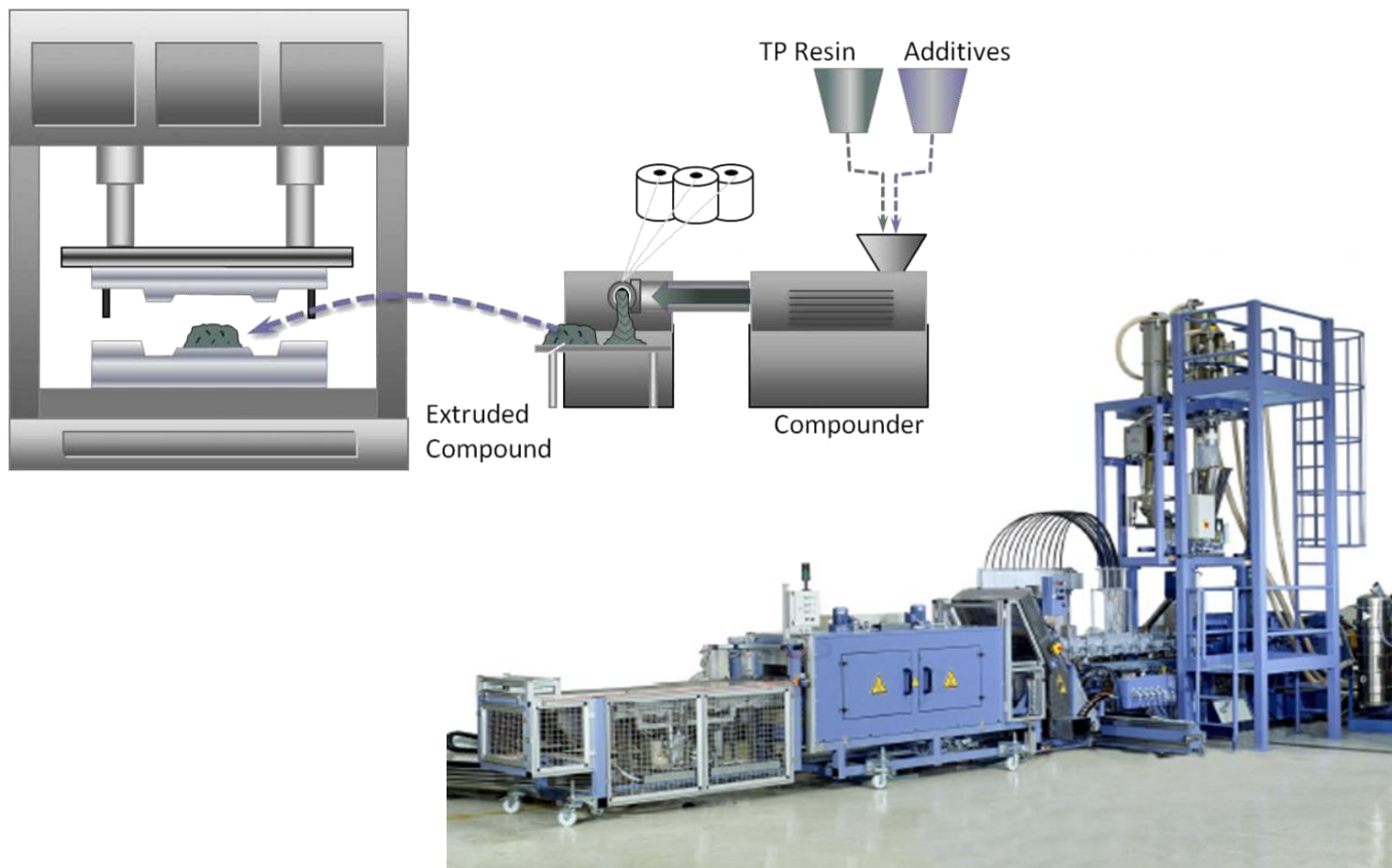
>4 kg weight saving



Recommend material for Frank / Trunk floor

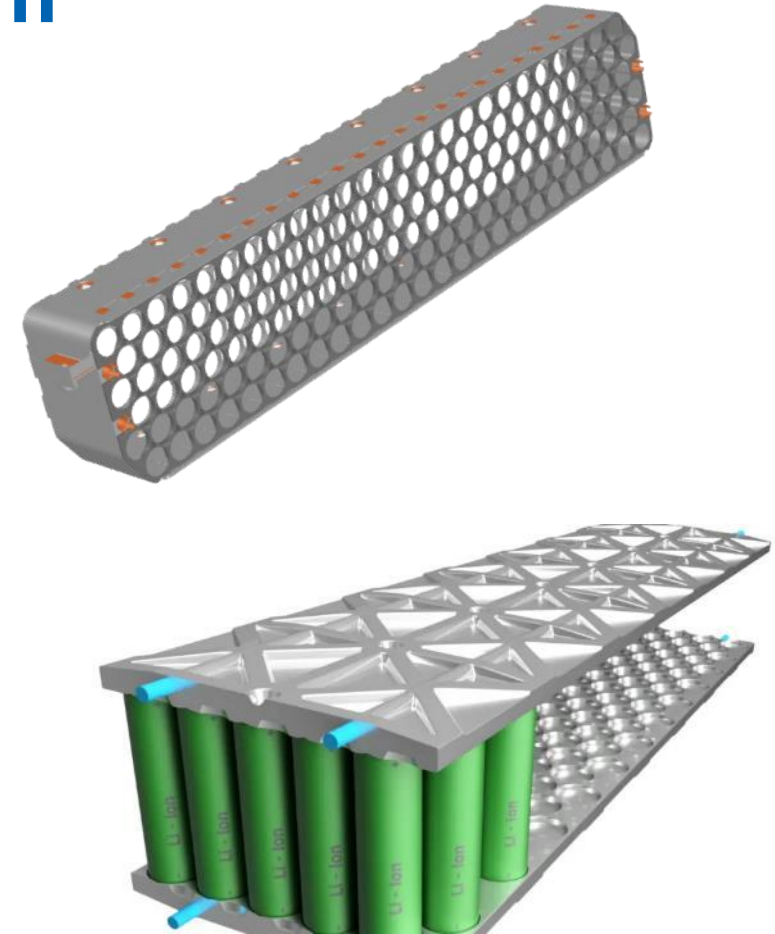
	Metal	IM	SMC	GMT	D-LFT	Hybrid materials
Material	Steel	PP-GF	UP-GF	PP-GF	PP-GF	PP-GF
Density [g/cm³]	7.8	1.12	1.8	1.12	1.12	1.2-1.6
Thickness	0.8~1.2	2~3	~3	2~3	2~3	4~6
Mechanical	very good	medium	good	medium	medium-good	Good
Design freedom	3~4pcs design	high 1pcs design	medium-high 1pcs design	medium-high 1pcs design	medium-high 1pcs design	Medium
Summary	<ul style="list-style-type: none"> High weight High investment NVH and rust issue Low cycle time 	<ul style="list-style-type: none"> Lighter design 	<ul style="list-style-type: none"> Medium weight and cycle time Less investment 	<ul style="list-style-type: none"> Lighter design Press and oven needed 	<ul style="list-style-type: none"> Lighter design Press and extruder needed 	<ul style="list-style-type: none"> Press, (extruder) and oven needed
		Frunk box		Trunk box		

D-LFT Process, Extruder and Press

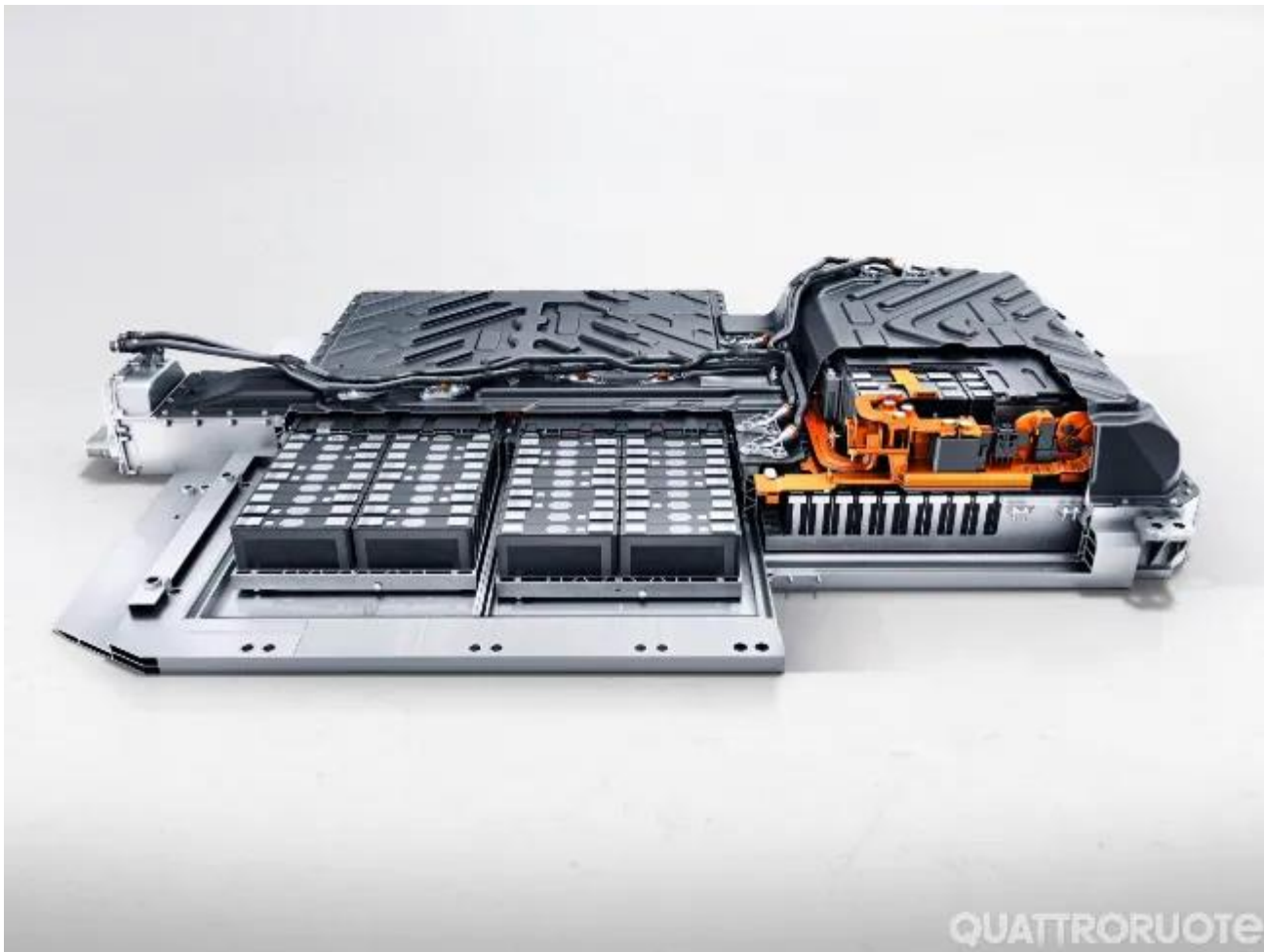


Round Cell Carrier / Contact System

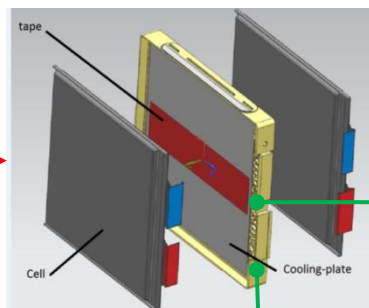
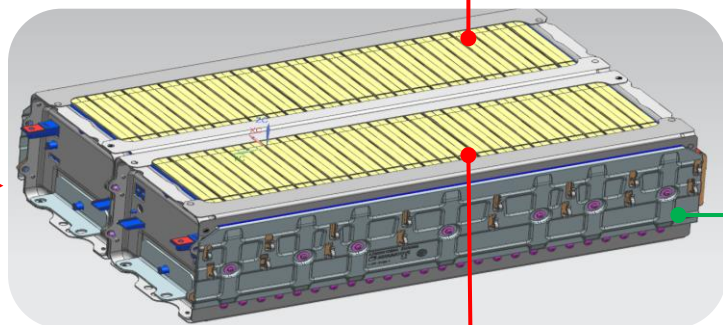
- ✓ Over-molded metal for cell-to-cell connection
- ✓ Thin walls for improved module energy density (≥ 0.8 mm walls)
- ✓ Large part capability (> 2 m in length)
- ✓ Wide variety of materials (PC no glass fill, PBTGF15-30, PPA/PPS)



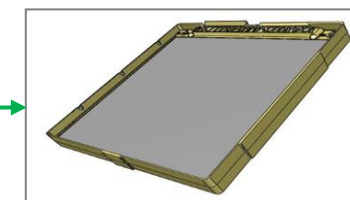
Pouch cell frame and module integration



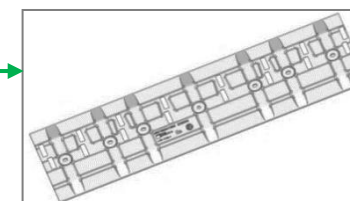
Pouch Cell Series Components



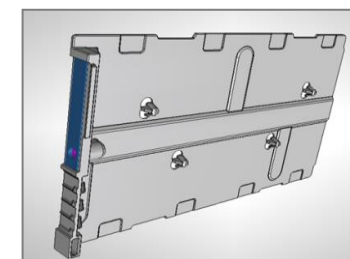
- Part name: **Insulation plate**
- Material: PP-TV20
- Process: injection molding
- Function: insulation
- Location: between cell frame and cell



- Part name: **Cell frame**
- Material: PP-LGF50+Aluminum
- Change from AL to Copper in 2019
- Process: over-molding
- Function: cooling and fixing cell



- Part name: **Side plate**
- Material: PP-GF20
- Process: injection molding
- Function: side fixation
- Location: side of module



- Part name: **Insulation plate (48V)**
- Material: PP-GF20
- Copper Busbar
- Process: injection molding
- Function: insulation and fixing cable
- Location: between end plate and cell

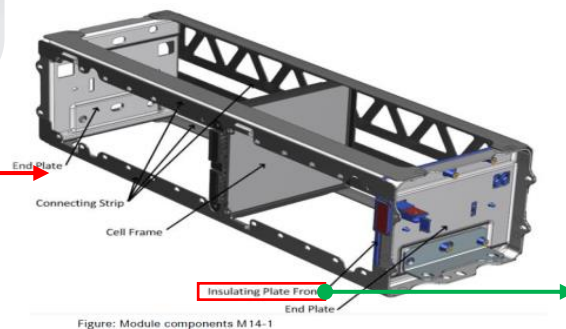


Figure: Module components M14-1

亚洲工厂



日本 东京
2016年成立合资公司
工厂建设中...

- 工程中心
- 生产工厂
- 客服中心
- 销售与工程支持

印度 古吉拉特
2019年设立客户服务办公室

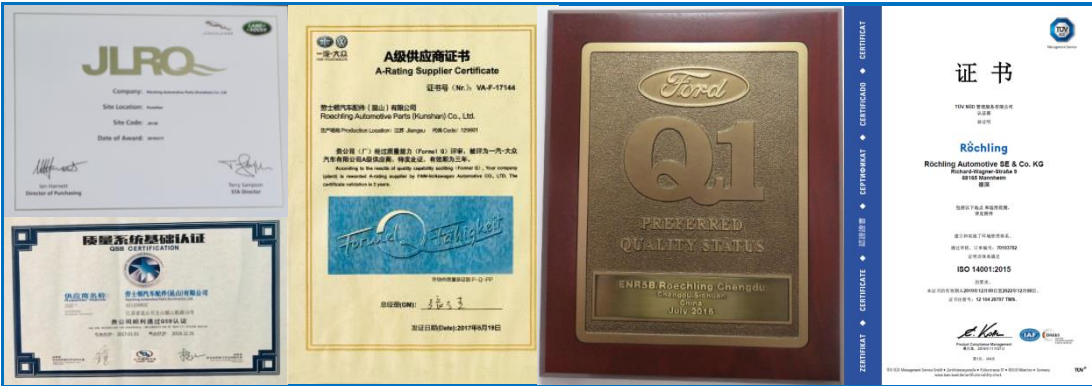
印度 普纳
工厂建设中...



昆山 (亚洲总部)
量产时间: 2014.03
工厂规模: 20,000m²

企业荣誉

亚洲工厂认证及奖项



- 福特Q1认证
- 通用中国/上汽通用BIQS认证
- 奇瑞捷豹路虎JLRQ
- VGC / 一汽大众A级供应商
- IATF 16949 认证 (TÜV SÜD)
- ISO 14001 认证 (TÜV SÜD)



- 通用汽车供应商优秀质量奖
- 上海大众动力总成优秀质量银奖
- 长安福特优秀供应商奖
- 上海大众动力总成优秀物流金奖
- 沃尔沃优秀质量奖

Conclusions

- ✓ Global footprint and local expertise
- ✓ Provide Multi-plastic Solutions for Customers
- ✓ Process competence lead to high quality
- ✓ Fully Automated Manufacturing



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