

Hot Stamping Experience and Tech Tour



November 20-21, 2024
Charleston, SC

PHS Giga Stamping at Gestamp

PRODUCED BY **MetalForming** Magazine **PMA** PRECISION METALFORMING ASSOCIATION



TECHNOLOGY DEVELOPMENT

WIDE RANGE OF TECHNOLOGIES ADDRESSING THE INDUSTRY REQUIREMENTS TO ACHIEVE THE RIGHT BALANCE BETWEEN:



SAFETY



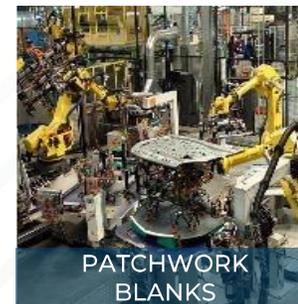
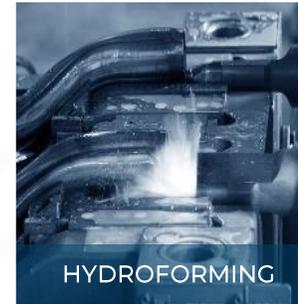
PERFORMANCE



WEIGHT



COST



GESTAMP GLOBAL FOOTPRINT Industrial Plants

13

R&D Centers



115*

Industrial Plants

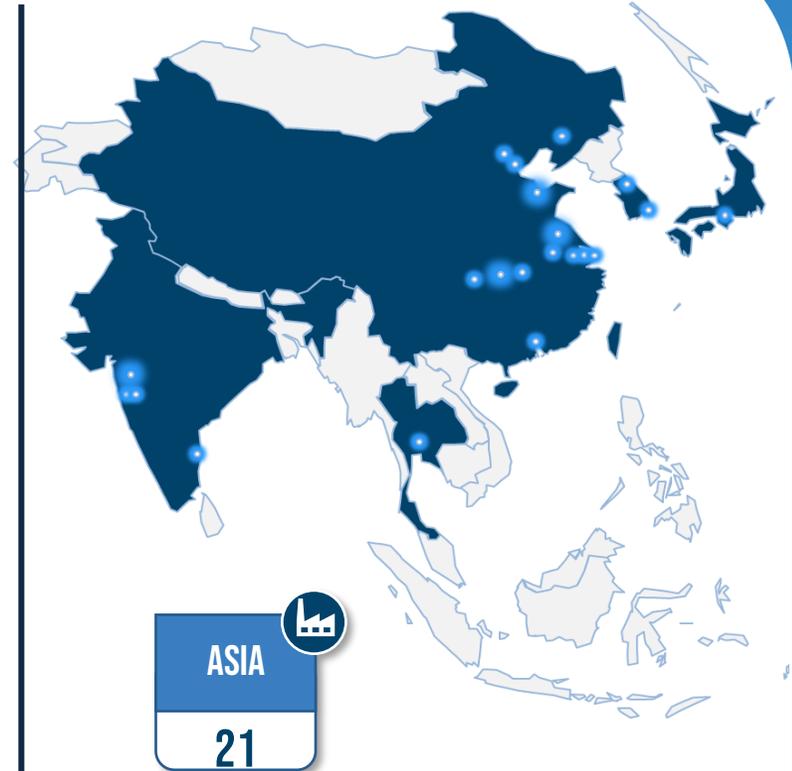
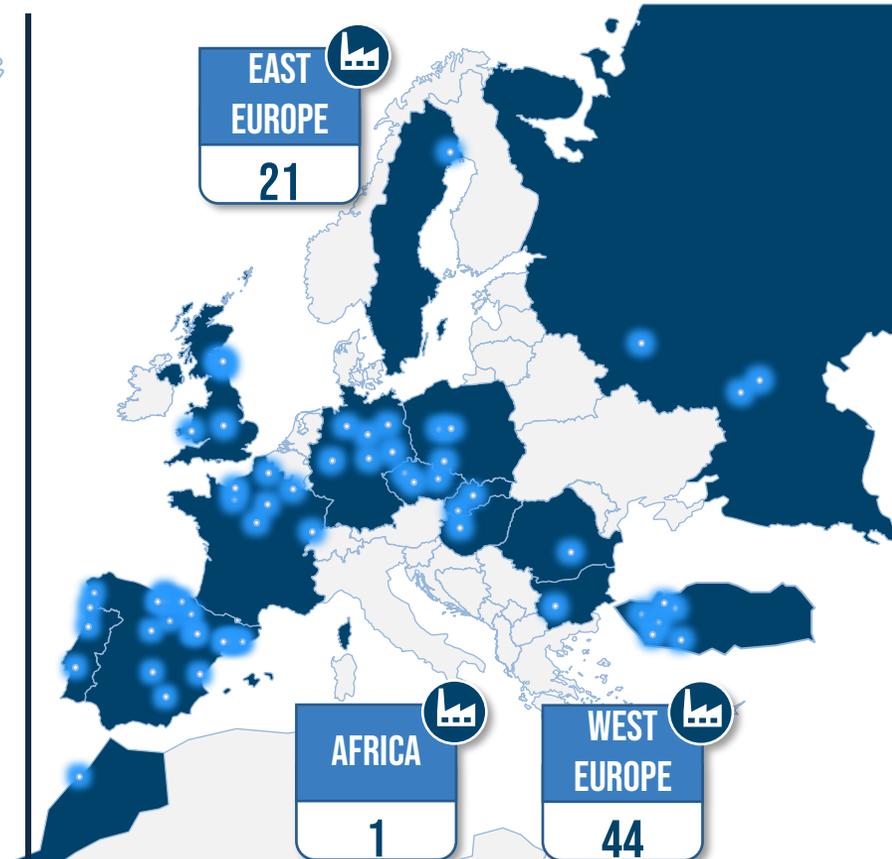
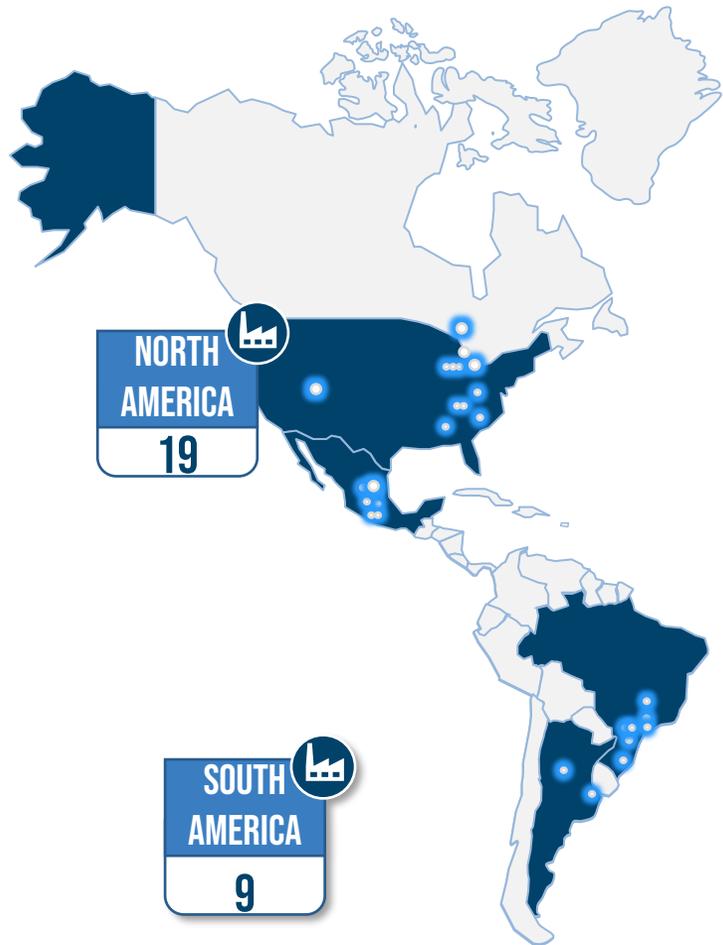


24

Countries



Gestamp



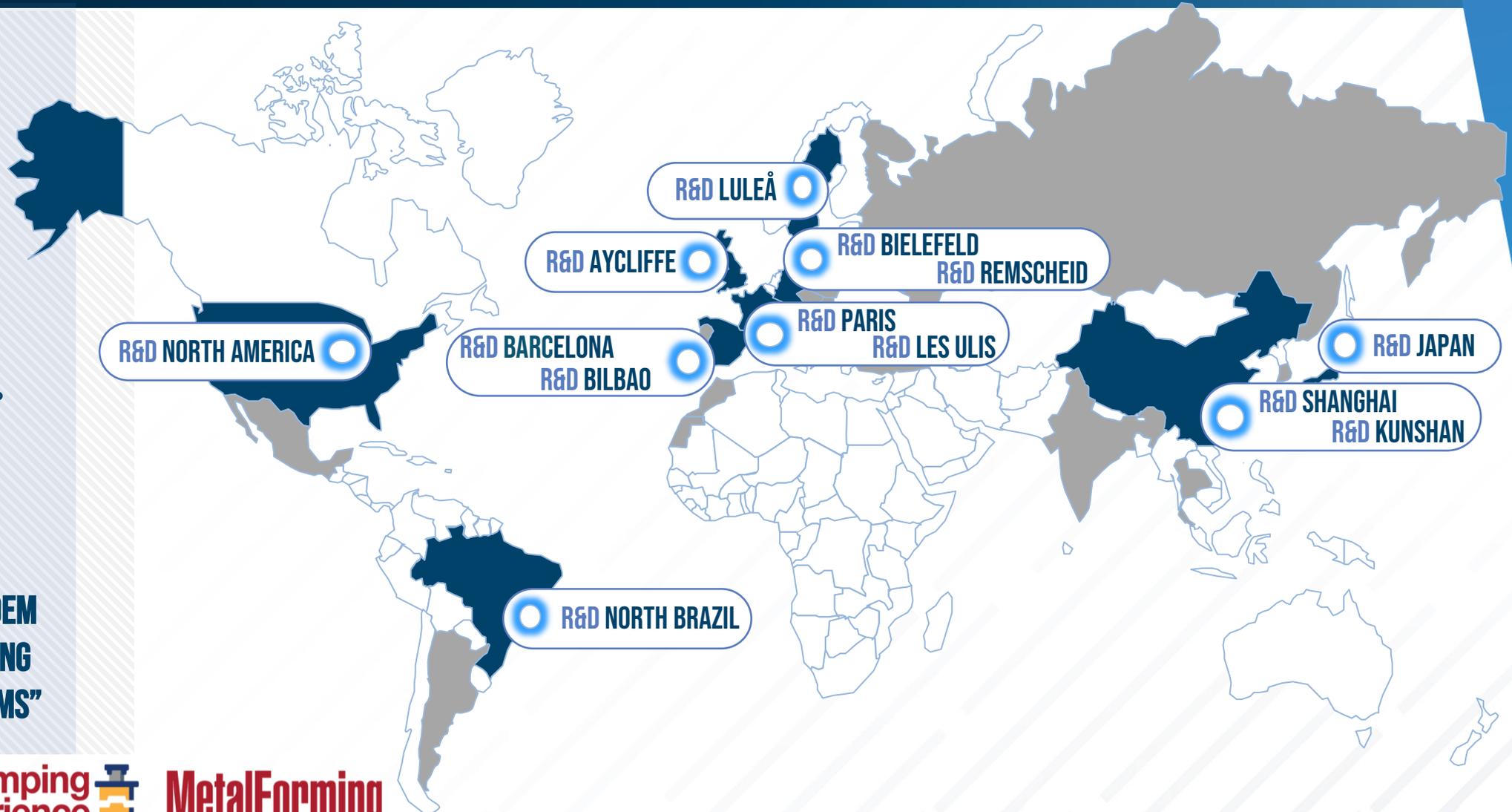
* 5 PLANTS UNDER CONSTRUCTION

Hot Stamping
Experience
and Tech Tour

MetalForming
Magazine

November 20-21, 2024 | Charleston, SC

GESTAMP GLOBAL FOOTPRINT/R&D CENTERS



13

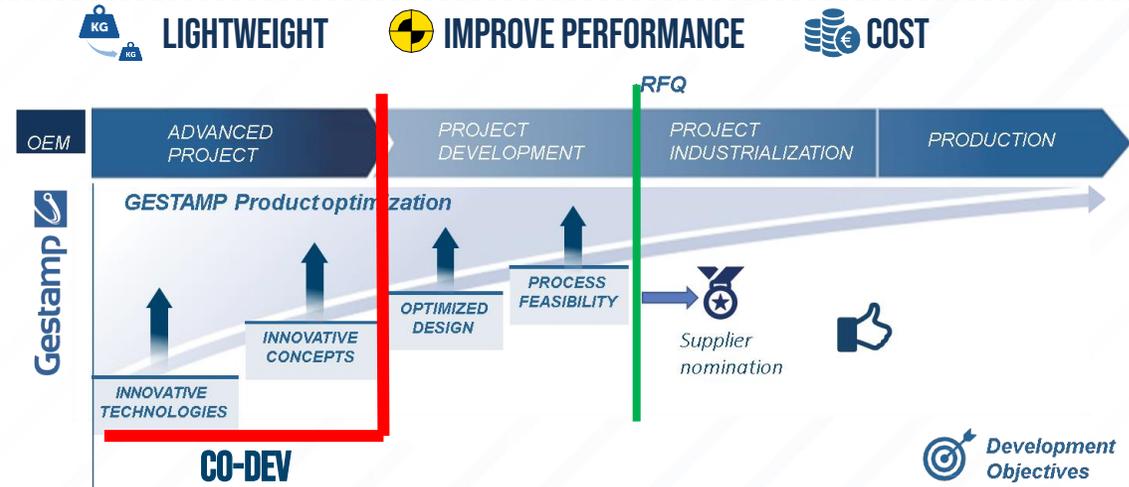
CLOSE TO OEM
ENGINEERING
"HOMEROOMS"

GESTAMP'S VIRTUAL EV FAMILY

GLAB PROGRAM
A WIDE RANGE OF NUMERICAL DEMONSTRATORS...



CO-DEVELOPMENT CONCEPT



PRODUCT NUMERICAL VALIDATION



VEHICLE BUILD TIME

OEM Assembly Time Reduction

US OEM

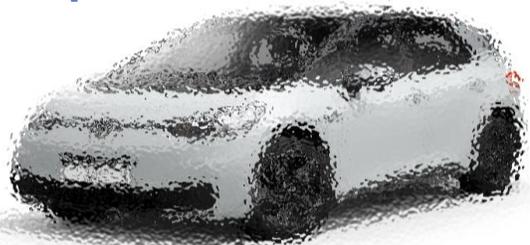


PRODUCTION TIME



10H

European OEM



30H



15H

Reduce build time → Utilize big assemblies



- 2 GIGA CASTINGS + 1 MID UNIT MODULE
- INNER & OUTER, DOUBLE DOOR RINGS

GESTAMP STRATEGY: GIGA STAMPING

Giga-stamping: What does it mean?

GOAL:

1 DELIVER BIG ASSEMBLIES

2 HIGH PART INTEGRATION



Answer:

PHS PARTS

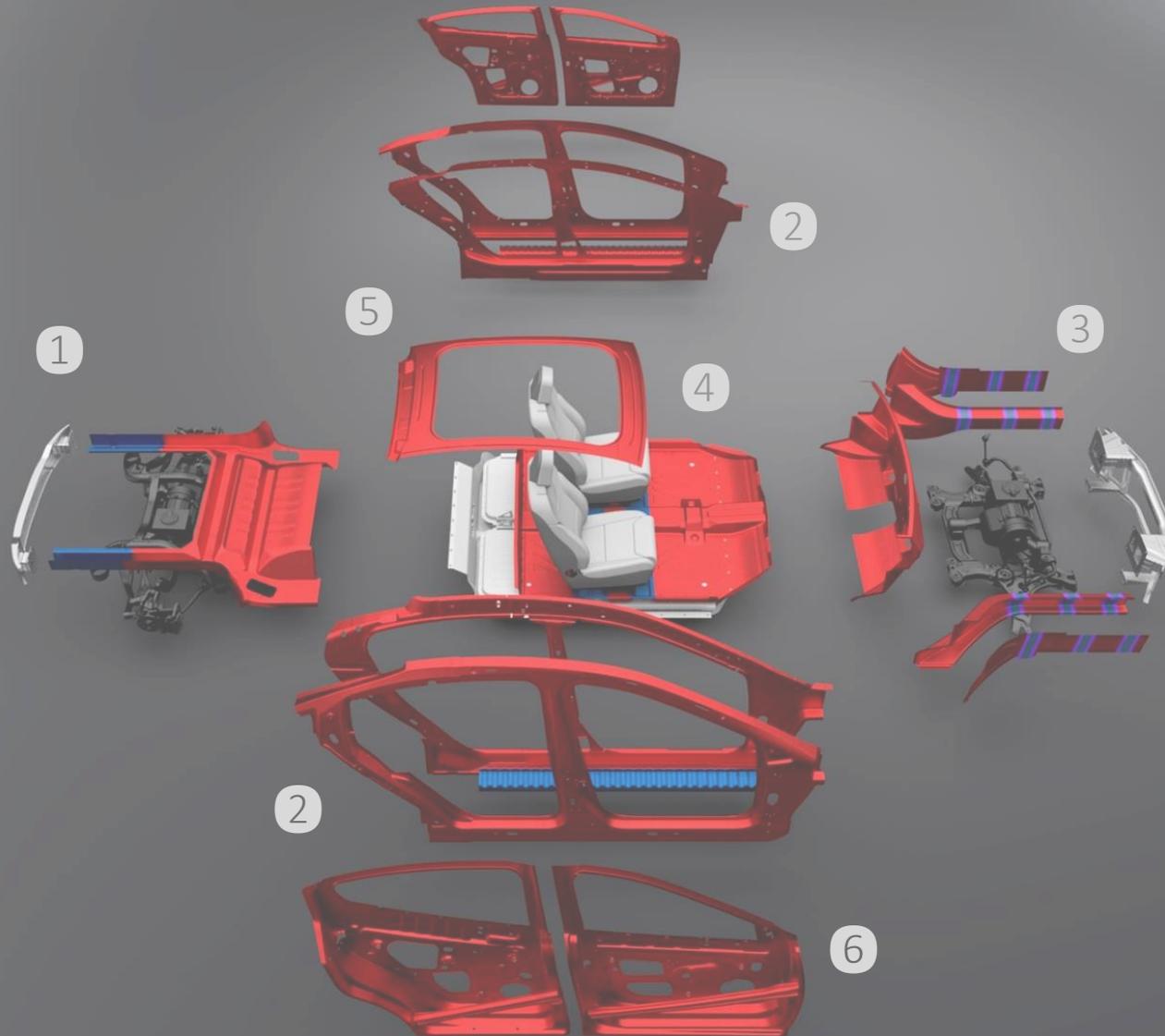
PATCH STRATEGY

BLANK WELDING

EXISTING CAPITAL

GESTAMP POTENTIAL – EXTREME-SIZE PARTS

Engineered Solutions



1 - REAR MODULE

- BUMPER
- ONE PIECE REAR FRAME
- REAR SUBFRAME

2 - SIDE MODULE

- DOUBLE DOOR RING INNER
- DOUBLE DOOR RING OUTER
- DIW SOLUTIONS (IIHS 2.0)
- ROCKER REINFORCEMENTS

3 - FRONT MODULE

- DASHBOARD
- RAILS
- BUMPER
- SUBFRAME
- LCA'S

4 - MID UNIT

- ONE PIECE FLOOR
- ENERGY UNITS

5 - TOP UNIT

- ONE PIECE ROOF

6 - OPENINGS

- DIW SOLUTIONS

EV TREND – IMPACT ON COST/STRUCTURE

1. REAR MODULE



PHS1000 (8MnB7)

PHS1500 (22MnB5)

PHS2000 (34MnB5)

BUMPER BEAMS

- MONOBLOCK DESIGN (w/crash box integration)
- PHS USAGE
 - PHS1000 MPa crash box
 - PHS1500 MPa beam, PHS2000 MPa Patch
- Roll forming MS1500 / MS1700 MPa

REAR SUBFRAME & REAR LINKS

- Low cost lightweight HSLA steel Multilink subframe design
- AHSS Hydroform rails and crossmembers
- Topology and material optimization for lightweighting
- Single piece simple links
- Two-piece Spring Link or UHSS Inverted Single piece

ONE-PIECE REAR FRAME

- HIGH part integration with Overlap/TWB technology
- Optimized thickness distribution for crash and NVH
- PHS1000 / 1500 / 2000 MPa grades
- 5 -10% cost / weight / CO₂ savings

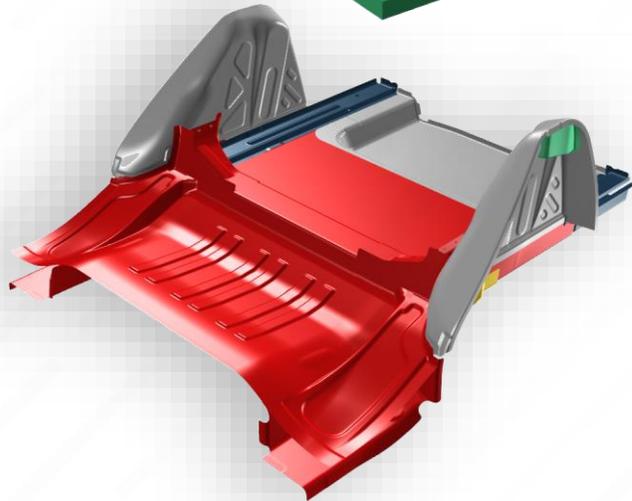
EV TREND – IMPACT ON COST/STRUCTURE

1.3 REAR MODULE: One-piece rear frame



HIGH PRESSURE DIE CASTING

- High part integration
- Outstanding NVH performance
- High CapEx & Tooling Cost
- Single material –varying properties
- Reparability?
- Scrap rate?



ONE-PIECE HOT STAMPING SOLUTION

- Right material in the right place (PHS1000/1500/2000 MPa)
- Wide range of thicknesses
- Reduced CO₂ compared to HPDC
- Standard reparability
- Low scrap rate / High material utilization

EV TREND – IMPACT ON COST/STRUCTURE

1.3 REAR MODULE: One-piece rear frame

Material combination: Ductile and fully hardened PHS material



2000 MPa
1500 MPa
1000 MPa

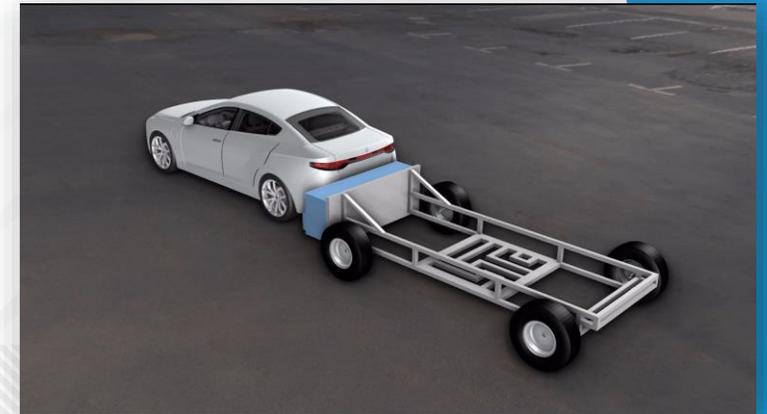
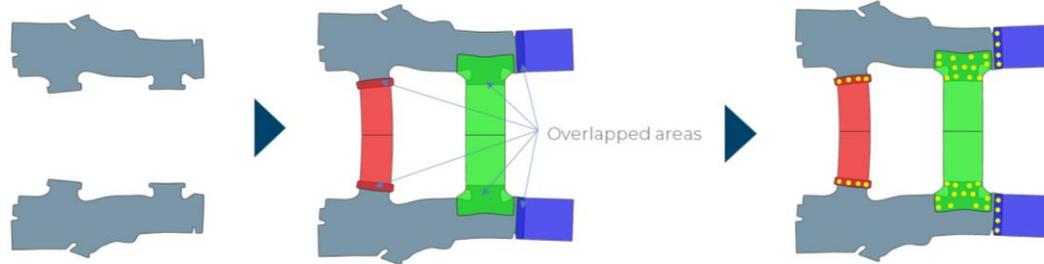
Designed to meet stringent NVH and crash specifications

Adjustable to varying vehicle lengths



Assembly: Overlap blank welding process (RSW)

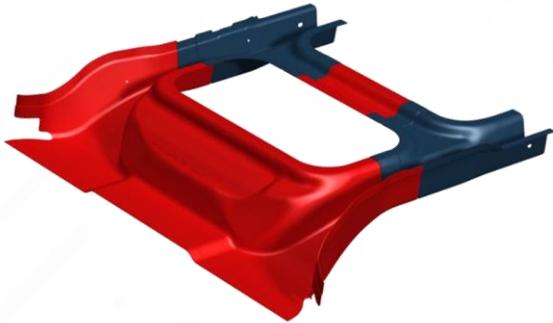
PATCH OVERLAP BLANKING WELDING PROCESS DESCRIPTION



EV TREND – IMPACT ON COST/STRUCTURE

1.3 REAR MODULE: One-piece rear frame

Material combination: Ductile and fully hardened PHS material



2000 MPa
1500 MPa
1000 MPa

Designed to meet stringent NVH and crash specifications

Adjustable to varying vehicle lengths



Assembly: Overlap blank welding process (RSW)

EV TREND – IMPACT ON COST/STRUCTURE

2. SIDE MODULE



OUTER DOOR RING

- Double ring design
- PQS500 MPa, PHS1000 / 1500/ 2000 MPa grades
- Overlap technology / TWB / Monolithic
- 5 -10% cost / weight / CO₂ savings

INNER DOOR RING

- Double ring design
- PQS500 MPa, PHS1000 / 1500 / 2000 MPa grades
- Overlap technology / TWB / Monolithic
- 5 -10% cost / weight / CO₂ savings

ROCKER REINFORCEMENT (WAVE DESIGN)

- PHS1000 / 1500/ 2000 MPa grades
- Overlap technology
- High energy absorption

PQS450/550 (6Mn3/6Mn6)

PHS1000 (8MnB7)

PHS1500 (22MnB5)

PHS2000 (34MnB5)

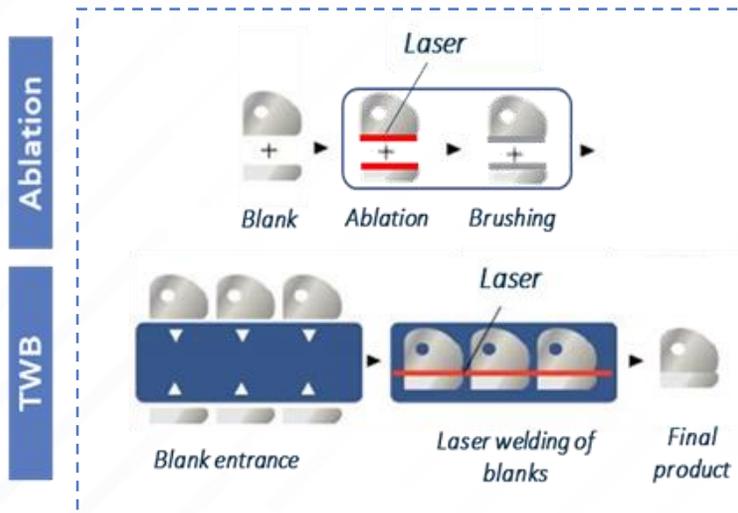
EV TREND – IMPACT ON COST/STRUCTURE

2.1 DOOR RING: From TWB to Overlap

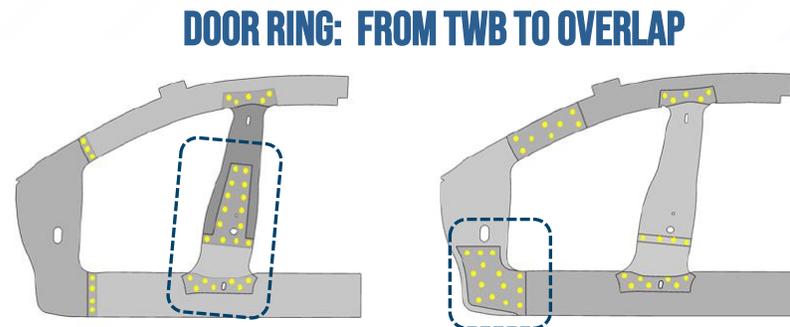


Key idea: Alternative door ring blank design by simple resistance spot welding

TWB SOLUTION



GESTAMP OVERLAP PATCH SOLUTION



OVERLAP JOINTS DEVELOPED TO
STRUCTURAL REQUIREMENTS



Ablation needed
Laser welded -precise
cut blanks required

Ablation not required
In-house spot welding
Easy welding adjustments

10-15% Cost Reduction
vs Multi Piece & TWB

EV TREND – IMPACT ON COST/STRUCTURE

2.1 DOOR RING: From TWB to Overlap



EV TREND – IMPACT ON COST/STRUCTURE

2.1 DOOR RING: Serial Nominations

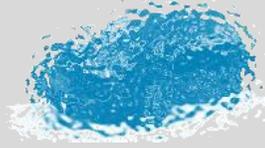


ROBUSTNESS:
Assured quality with
6 years' experience

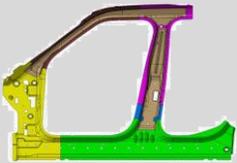
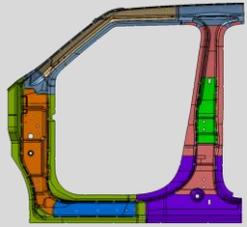
EXPERIENCE:
More than 4 Million
produced worldwide

EV TREND – IMPACT ON COST/STRUCTURE

2.1 DOOR RING: Serial Nominations



13 awarded Door Rings
with more than 48 projects
since January 2023



OVERLAP

SOP 2024



SOP 2026



SOP 202X



SOP 202X



EV TREND – IMPACT ON COST/STRUCTURE

2.1 DOOR RING: Overlap Blank Welding Solutions



OVERLAP & PATCH TECHNOLOGY

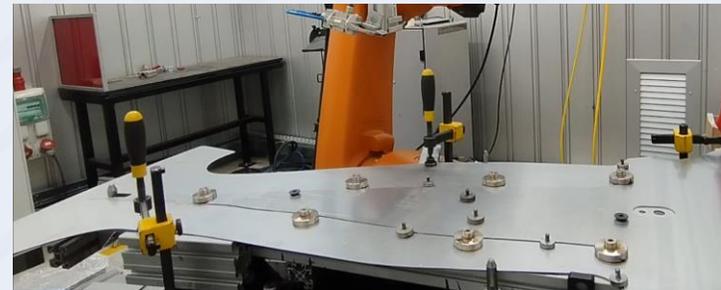
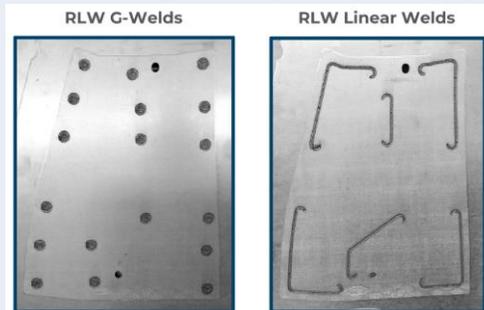
**OVERLAP
RSW**

Gestamp solution to improve cost



RLW as a solution to optimize cycle time

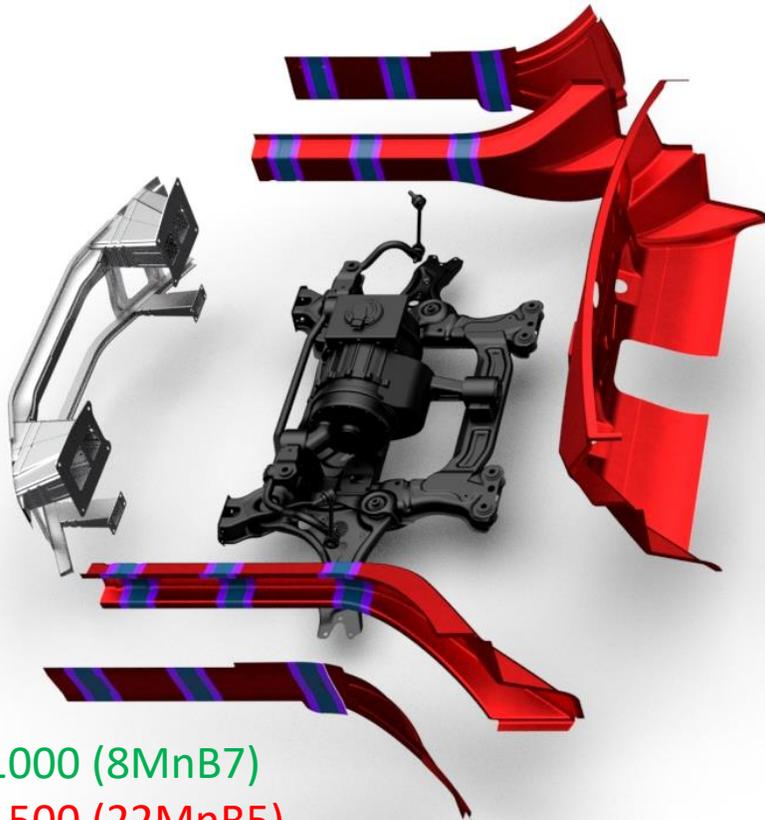
**REMOTE LASER
WELDING**



PATENT PENDING

EV TREND – IMPACT ON COST/STRUCTURE

3. FRONT MODULE



PHS1000 (8MnB7)

PHS1500 (22MnB5)

PHS2000 (34MnB5)

ONE-PIECE DASHBOARD

- BEV Specific Design
- Overlap Technology (gage distribution for SORB)

FRONT RAILS

- PHS1000 / 1500 / 2000 MPa material grades
- In furnace soft zones (Crush/Bend control)

FRONT BUMPER BEAM

- 3rd load path
- Small overlap features

SUBFRAME & LCA

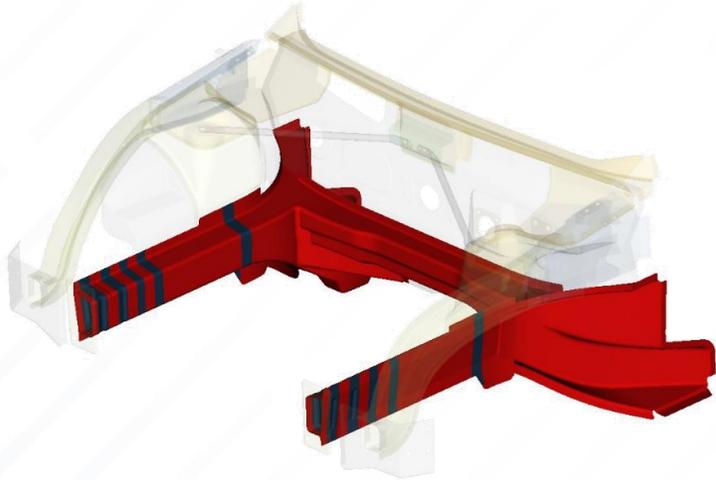
- E-Motor integration into front frame
- Low-cost HSLA steel crossmember design
- Tower body mount crash break-away feature
- UHSS single shell or HSLA double shell steel designs

EV TREND – IMPACT ON COST/STRUCTURE

3.2 FRONT MODULE: Front Rails

MATERIAL COMBINATION:

Ductile and fully hardened PHS material combinations

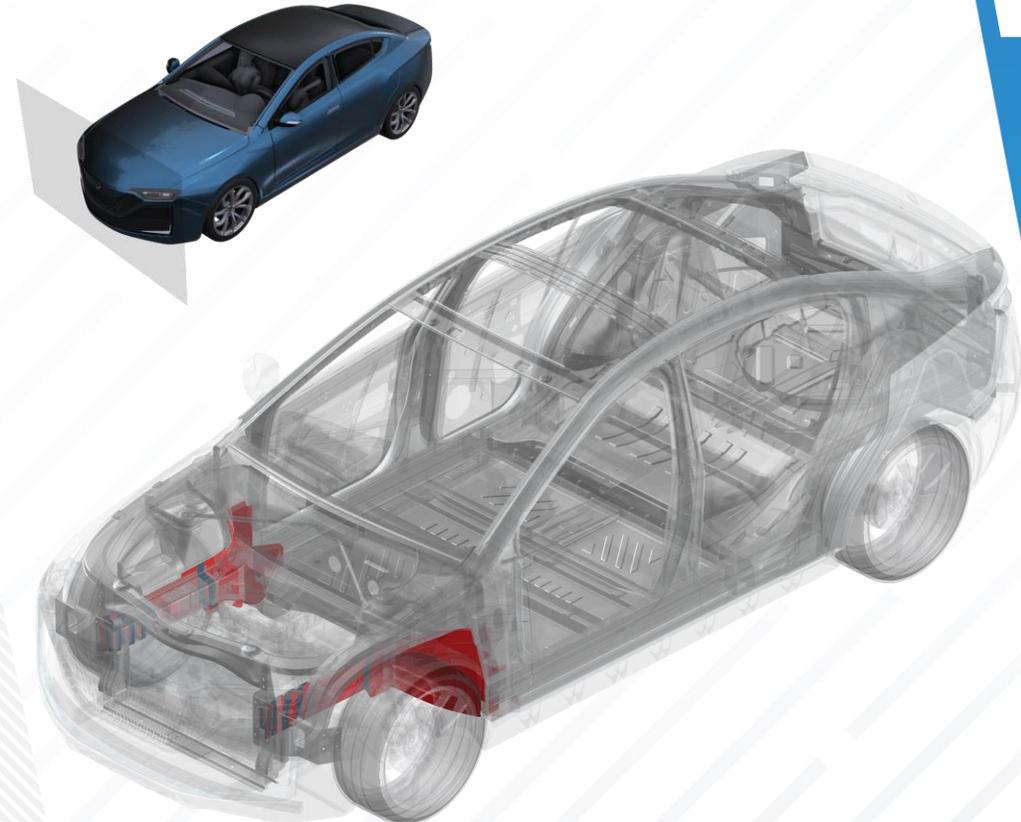


- In-line Softzone
- Laser Softzone
- Optimize energy absorption and deformation

FLEXIBILITY:

- Tune-able to new engine position and front crash strategy
- Synergies with new EV chassis designs

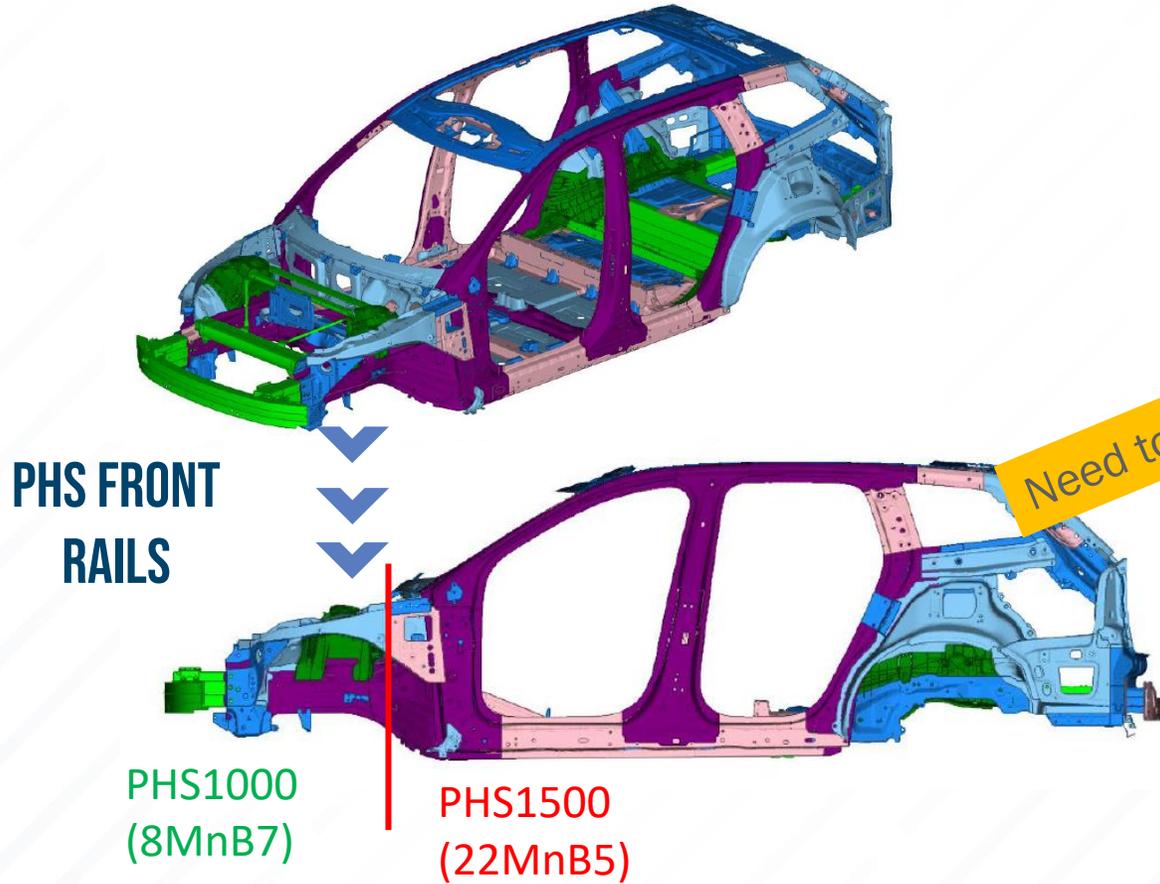
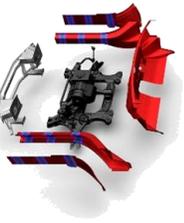
CHALLENGE WITH NEW EV ENGINES AND FRONT AREA DESIGN:



EV TREND – IMPACT ON COST/STRUCTURE

3.2 FRONT MODULE: Front Rails

2025 VOLVO EX90 -HIGH SAFETY EXPECTATIONS



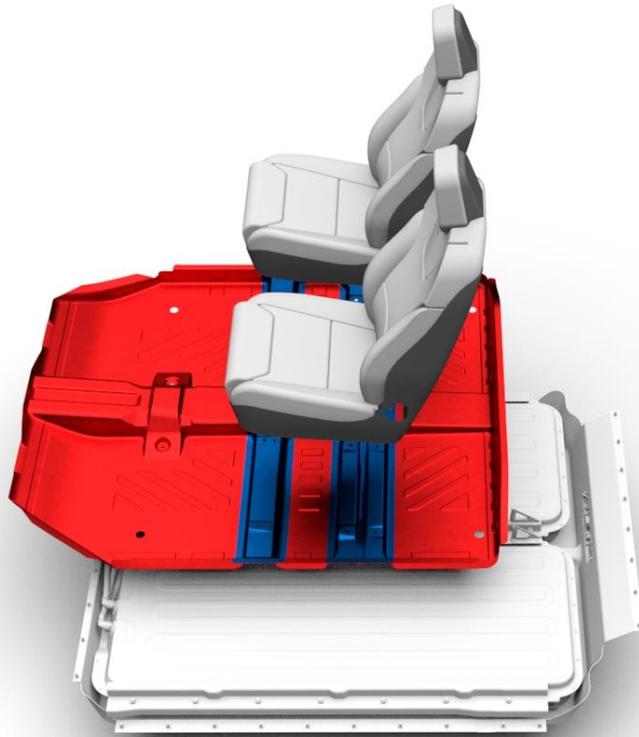
EXTREME SIZE PART STUDY (IN-PROCESS)

Need to add a reference (ECB2023?)

- 5 Rail parts into 2
- Patch/TWB Blanks – Part integration
- Custom Softzones for absorption/kinematics
- Time to build reduced

EV TREND – IMPACT ON COST/STRUCTURE

4.1 MID UNIT: One-Piece Floor



PHS1000 (8MnB7)

PHS1500 (22MnB5)

PHS2000 (34MnB5)

ONE-PIECE FLOOR

- PHS500 / 1000 / 1500 / 2000 MPa grades
- Thickness as low as 0.8mm possible
- Overlap technology
- Cross members integrated with patch

ADDITIONAL CROSS MEMBERS (IF NOT INTEGRATED)

- UHSS rollforming > MS1500 MPa
- Open or closed sections

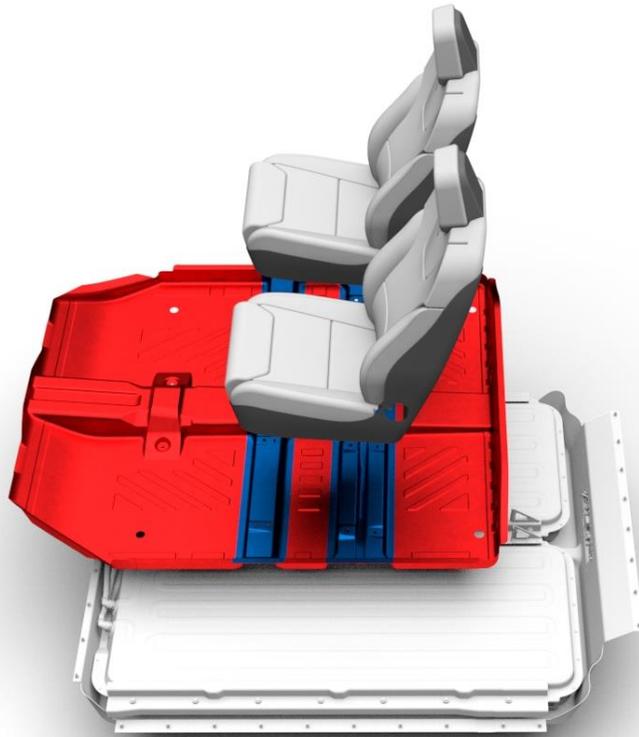
BATTERY BOX

- Cold stamping tray
- Simpler design due to body reinforcement
- Rollforming crossmembers

**PHS floor as part of the Side Crash Management.
Integration of functions with patches**

EV TREND – IMPACT ON COST/STRUCTURE

4.1 MID UNIT: One-Piece Floor



PHS1000 (8MnB7)

PHS1500 (22MnB5)

PHS2000 (34MnB5)

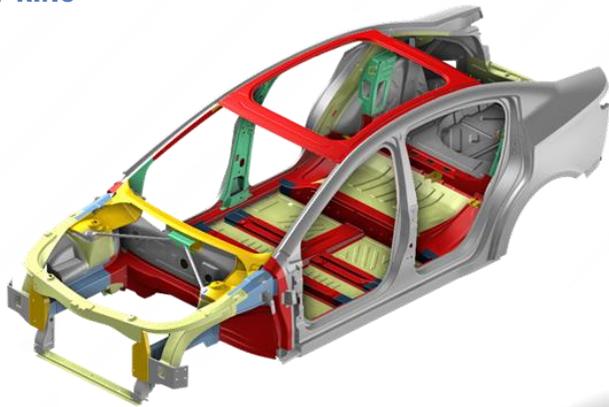


**PHS floor as part of the Side Crash Management.
Integration of functions with patches**

EV TREND – IMPACT ON COST/STRUCTURE

5. TOP UNIT: Roof Ring

PHS ROOF RING



HIGH INTEGRATION IN 1 PHS PART:

- Integration of Bows/Headers/Roof Longitudinals
- Concept flexible with overlapping technology
- Tight tolerances in comparison with big assemblies

SAVINGS:

- 5% Part price and tooling vs. multi part solution
- 5% weight reduction vs multi part
- ~5% CO₂ reduction

B_PILLAR LESS ARCHITECTURES



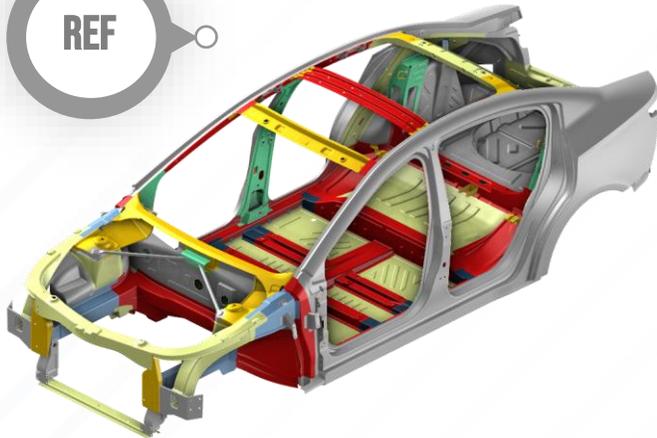
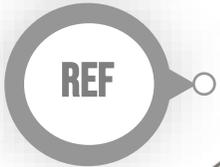
PERFORMANCE

- Roof crush improvement –B Pillar'less concept
- Side crash improvement
- Best fit for sunroof architectures
- Processed in Assy Plant same as Bows/Headers



EV TREND – IMPACT ON COST/STRUCTURE

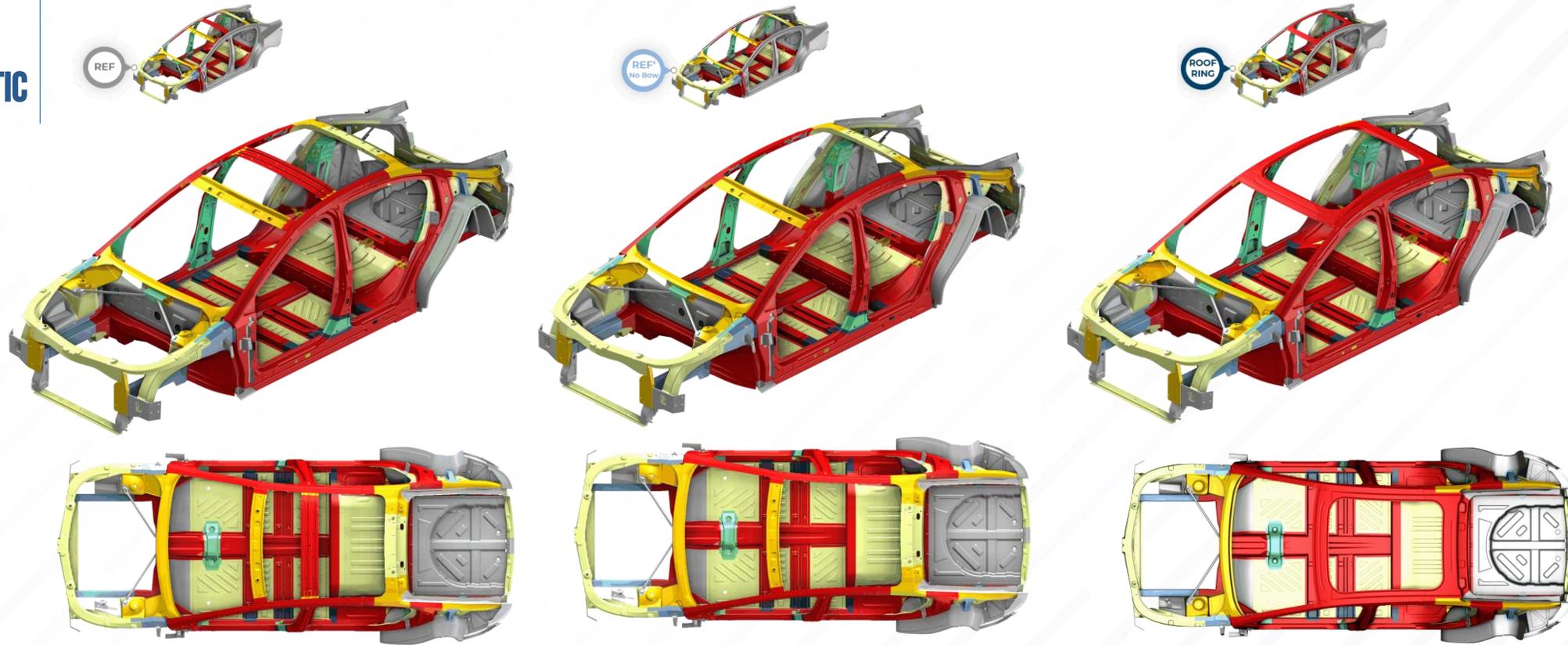
5.1 TOP UNIT: GLAB G3 Roof Versions



EV TREND – IMPACT ON COST/STRUCTURE

5.1 TOP UNIT: IIHS Side Crash

BIW
KINEMATIC

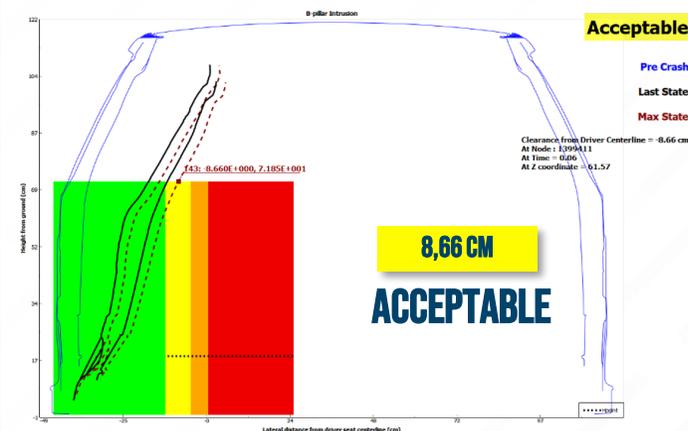
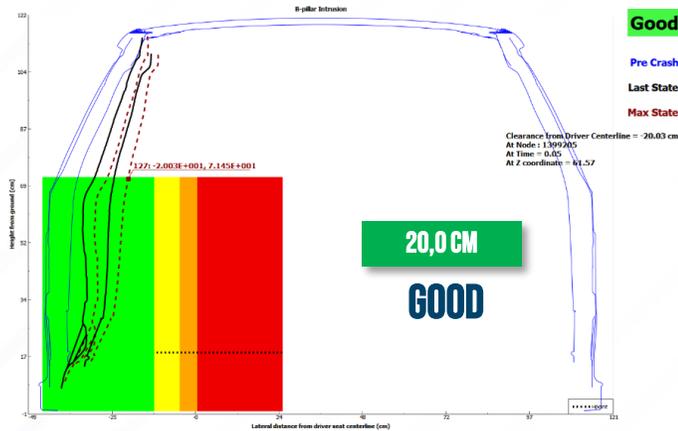


Roof Ring: An effective solution to limit intrusion without a center Roof Bow

EV TREND – IMPACT ON COST/STRUCTURE

5.1 TOP UNIT: IIHS Side Crash 2.0

IIHS CRITERIA



Boundary line	Good	Acceptable	Marginal	Poor
B-pillar to driver seat centerline distance (cm)	12.5	5.0	0.0	
Structural failures	Downgrade structural rating by one category			

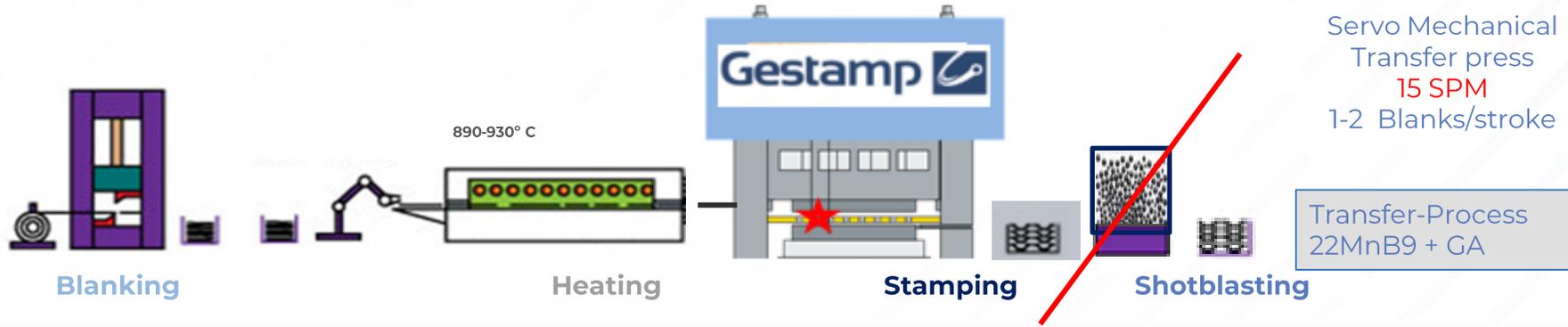
IIHS = “Good”

Roof Ring: An effective solution to limit intrusion without a center Roof Bow

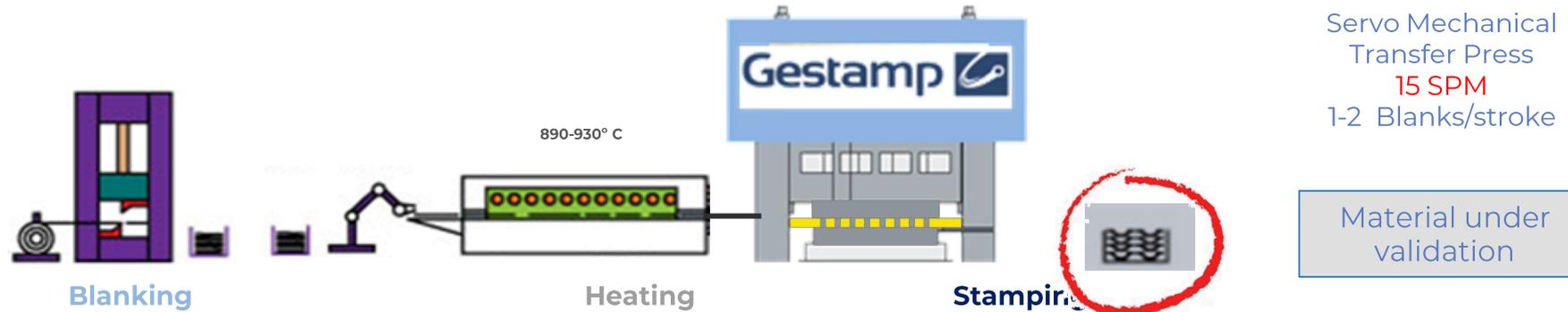
EV TREND – IMPACT ON COST/STRUCTURE

GES-MULTISTEP® The all-new 2nd Generation!

**ZN
COATED
MATERIAL**



**ALSI
COATED
MATERIAL**



- 1.FORM
- 2.TRIM
- 3.PIERCE

EV TREND – IMPACT ON COST/STRUCTURE

GES-MULTISTEP® The all-new 2nd Generation!

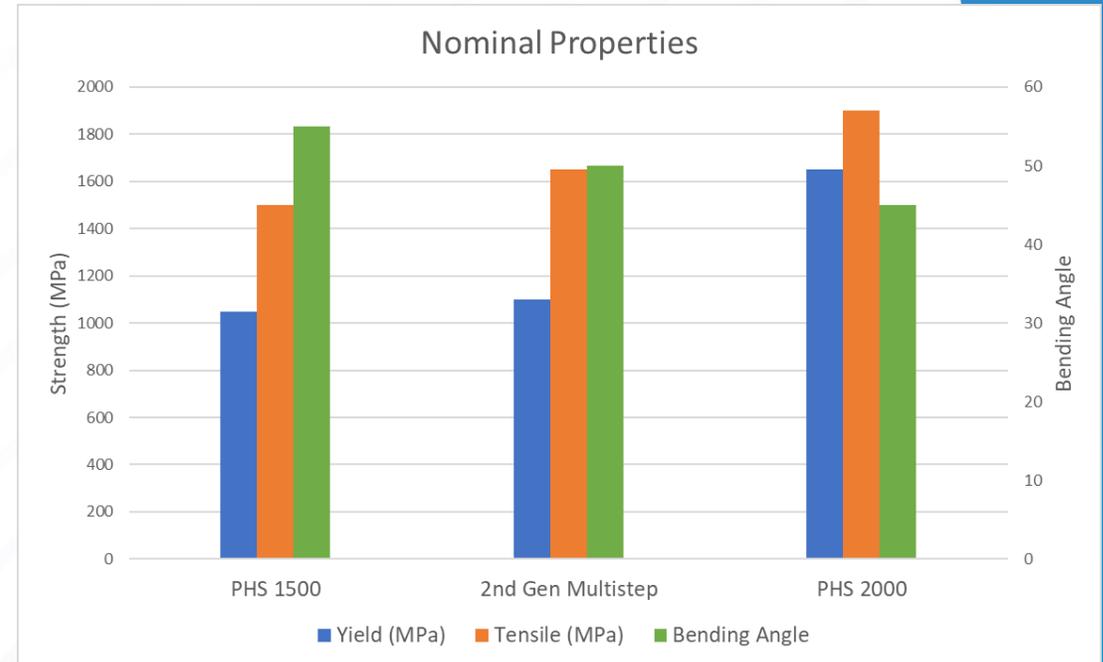
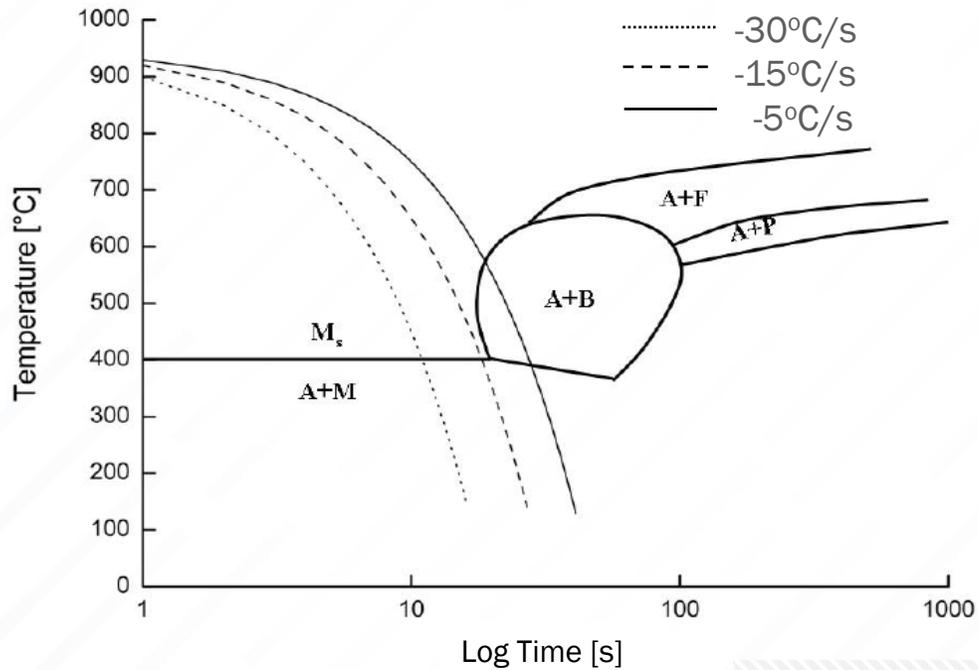


EV TREND – IMPACT ON COST/STRUCTURE

GES-MULTISTEP® The all-new 2nd Generation!

34MNB4 – PHASE TRANSFORMATION BEHAVIOR

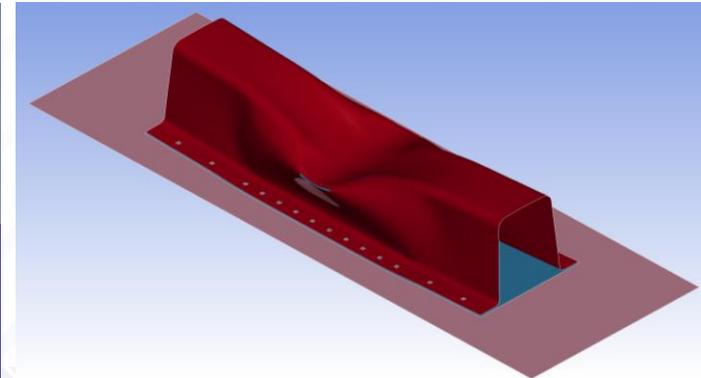
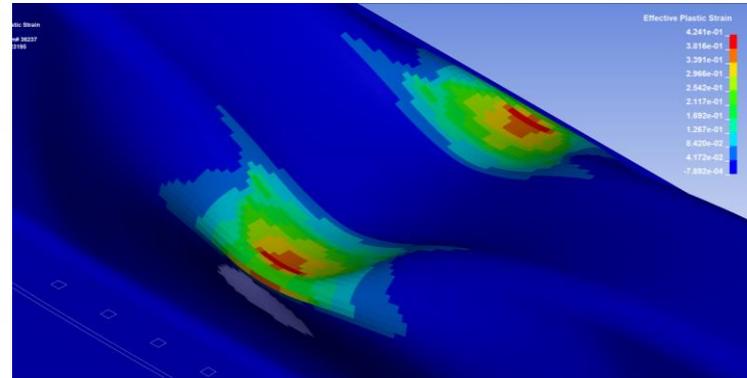
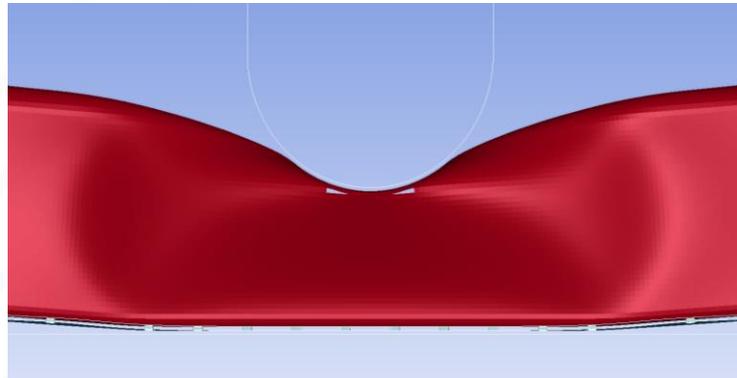
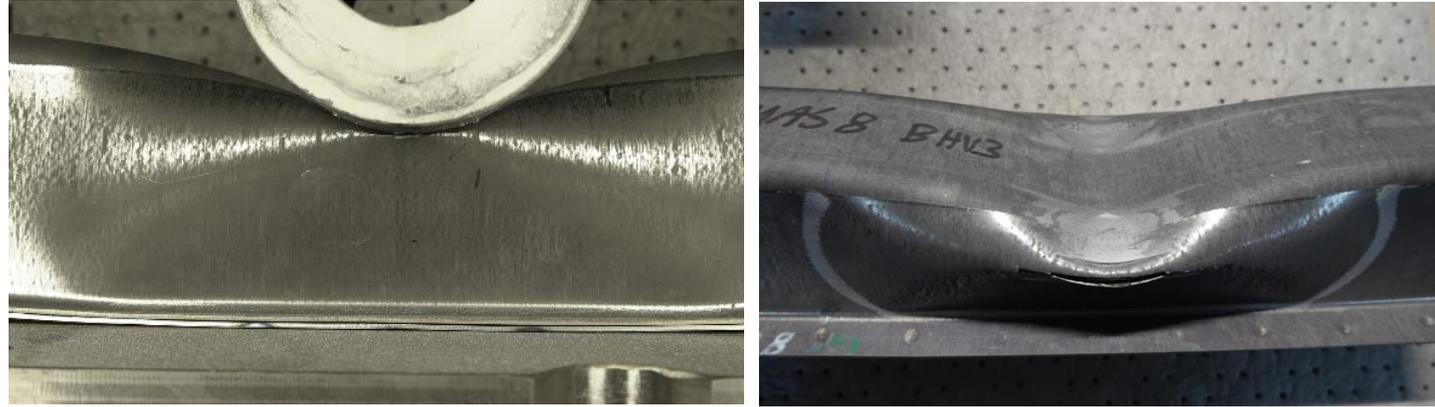
CCT DIAGRAM



EV TREND – IMPACT ON COST/STRUCTURE

GES-MULTISTEP® The all-new 2nd Generation!

Three Point bending test and CAE correlation

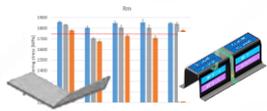


EV TREND – IMPACT ON COST/STRUCTURE

GES-MULTISTEP® The all-new 2nd Generation!

PHASE 1

INITIAL MATERIAL INVESTIGATIONS



Basic material properties

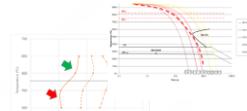


Resistance Spot Welding feasibility

Complete 2022

PHASE 2

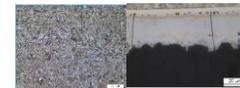
ADVANCED INVESTIGATIONS



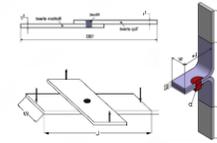
CCT diagrams



Extended coating analysis



Extended microstructure analysis



Advanced welding validation

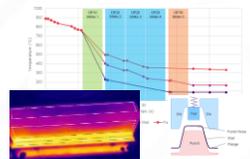
Complete 2023

PHASE 3

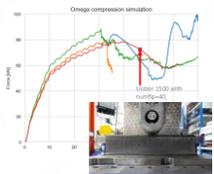
INDUSTRIAL VALIDATION

Ongoing

INITIAL VALIDATION



Basic process research



Basic material data cards

FUNCTIONAL VALIDATION



Forming data cards



HE & SCC assessment

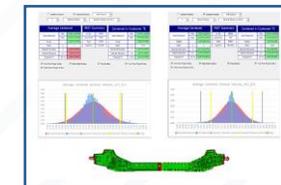


Corrosion performance



Prototypes & process window validation

INDUSTRIAL VALIDATION

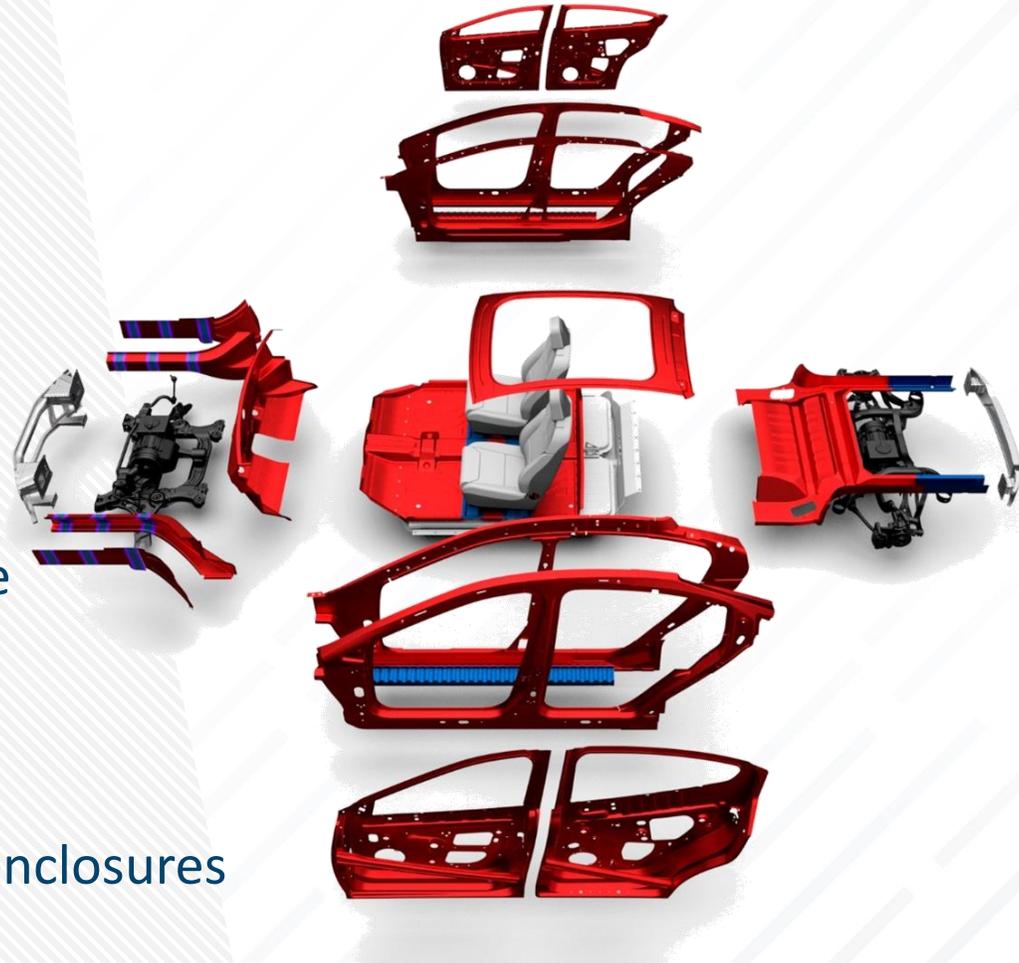


Serial line validation

EV TREND – IMPACT ON COST/STRUCTURE

Advanced Hot stampings

- Extreme-size strategy to reduce part count
- Cost reduction through part integration, blank optimization & innovative processes
- Experience and existing Gestamp Assets
- Global Footprint: USMCA, Asia and Europe
- CO₂ optimized products
- Solutions leading to simpler steel battery enclosures



For more information

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Gestamp

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