

2019-10-10



# ENABLING CHANGE



## **OUR MISSION**

To make our customers more competitive in the global market

## **OUR BUSINESS**

AP&T provides sheet metal industries worldwide with complete production systems as well as with stand-alone presses, automation, tooling and related aftermarket services



## **OUR FOCUS**



Energy efficiency

Lightweight

Safety



## MORE THAN 50 YEARS OF SUCCESS

- » From three small companies operating in the Swedish countryside to world-leading knowledge partner.
- » Global presence. Local know-how.
- » More than 100 press hardening lines installed.



AUTOMATION · PRESSES · TOOLING

**Press Hardening** 

### The Press hardening process





## **AP&T Multi-Layer Furnace (MLF) - Generation 3**





### **Press hardening development**



AUTOMATION PRESSES TOOLING

# The TemperBox<sup>®</sup> Process

## **Process definition partial hardening**



## **Process definition partial hardening**









## **Process definition partial hardening**

with furnace feeder



Austenization Heat in AP&T MLF 870°C + min. 75 seconds



TemperBox<sup>®</sup> 30–70 seconds (depending on sheet thickness)

Transfer to press

> Hydraulic press Forming and quenching

APT





### **Process definition partial hardening – history**

#### Trials 2013-2014





Classic transition on surface e.g. B-pillar

Soft spot on hard surface



## **Process description and history**

- » Benchmark 2016/2017
- » Daimler A-pillar

Requirements	Rp <sub>0,2</sub> [MPa]	Rm [MPa]	A <sub>30</sub> [%]	Results
DBL 4093.11	secondary	850-1000	secondary	OEM Release
DBL 4093.14	370-500	550-700	>13	OEM Release
DBL 4093.15	340-470	500-650	>16	OEM Release



Part section with higher ductility







### **Hardness results**



#### Hardness requirements:

Hard: 400–520 HV (acc. VW-TL4225) Soft: 170–250 HV (acc. VW-TL4225)



## **Solutions**

## **TemperBox**<sup>®</sup> solutions



One (1) TemperBox<sup>®</sup> integrated into a 5xMLF unit



Dual TemperBox<sup>®</sup> Stand alone unit



### **TemperBox<sup>®</sup> Line solution for new MLF PH lines**



- One (1) TemperBox<sup>®</sup> integrated into a 5xMLF unit
- 4 units requested for approx.
   12-second cycle time

 Footprint for MLF furnace with TemperBox<sup>®</sup> approx. 16 x 16 meters



 Two (2) double furnace feeders enable a 10-second cycle time



## **TemperBox<sup>®</sup> Line solution for new RHF PH lines**



## Competitiveness

## **Cost comparison**

#### B-pillar with max 30 mm transition zone

Cost per part	TemperBox <sup>®</sup>	Tailored tempering with partially heated tool	Tailor welded blank
Soft bottom	100%	112%	126%
Advantages and disadvantages of process	<ul> <li>Cycle time neutral</li> <li>High precision of transition areas</li> <li>No thermal distortion</li> <li>High design flexibility</li> <li>High repeatability</li> </ul>	<ul> <li>High precision of transition areas</li> <li>High thermal distortion</li> <li>Limited design freedom</li> <li>High scrap rate (geometry)</li> <li>High tool wear (≈ 600°C tool temperature)</li> <li>High and extensive tryout procedure</li> </ul>	<ul> <li>Cycle time neutral</li> <li>High precision of transition areas</li> <li>No thermal distortion</li> <li>Limited design freedom</li> <li>Separate welding process needed.</li> <li>Expensive</li> </ul>





AUTOMATION PRESSES TOOLING

Trust automotive experience.



## TemperBox<sup>®</sup> – Summary

- » Variation freedom of mechanical properties
- » Multiple soft zones in one component
- » High design flexibility
- » Adjustable transition zones from 30–100 mm
- » Short product change time and low cost per product (aluminum mask)
- » High robustness and no thermal distortion
- » Cycle time neutral production process
- » Approved by several German OEM:s
- » Cost efficient compared to alternative methods





