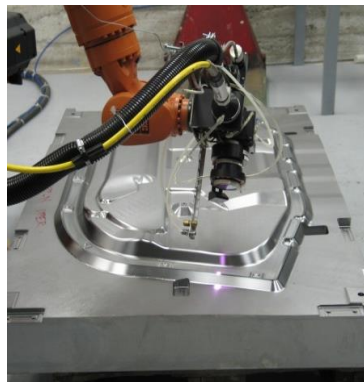


## Application

# Laser Heat Treatment



### Strength Increase

- Low distortion
- Reduced process time
- Less process steps

### Wear Protection

- Strength and lifetime increase
- Closed loop pyrometer controlled process
- Tailored spot

### Local Ductility

- High strength part but ductile areas for joining
- Less tool wear

### Variety of Applications

- Mobile hardening
- Side cutters hardening
- Gear wheel hardening
- Spring hardening

## Heat Treatment

# Mobile Hardening

- Cooperation Alotec, Alpha Laser, Laserline
- Job Shop hardening on-site
- Deep drawing tools and others
- Mobile: moveable robot and integrated LDM 3000-100
- Flexible: zoom homogenizer, 5x5 - > 16x30
- Temperature feedback control with E-MAqS camera (Fraunhofer IWS)



## Applications and Examples

# Forming: Increased ductility of high strength metal sheets

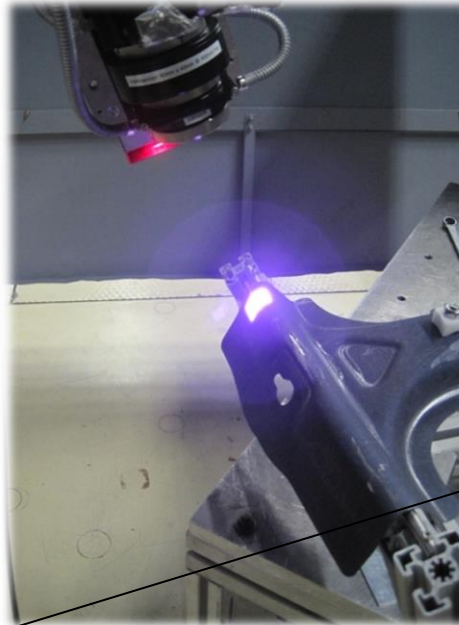
Hot-stamping produces fully martensitic part

LHT (Laser heat treatment) to locally increase ductility

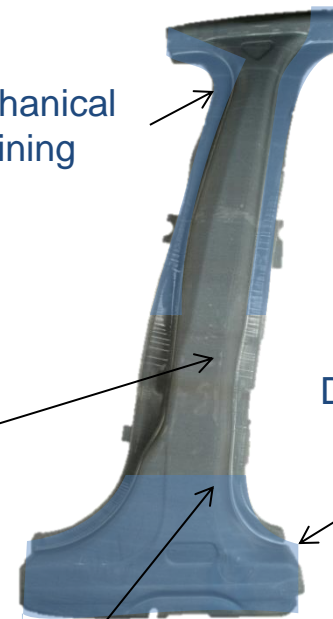
high strength part, but ductile in a desired zone



Tensile strength ~ 1500MPa  
Max. elongation ~5%



Mechanical joining

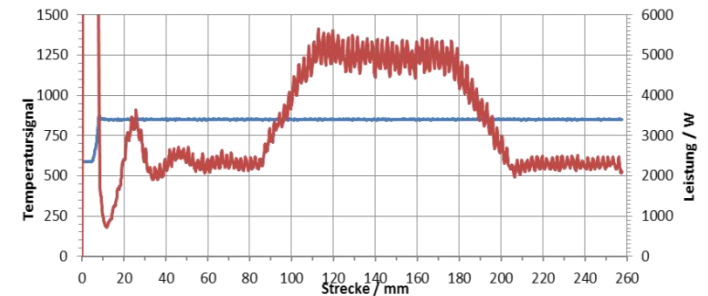
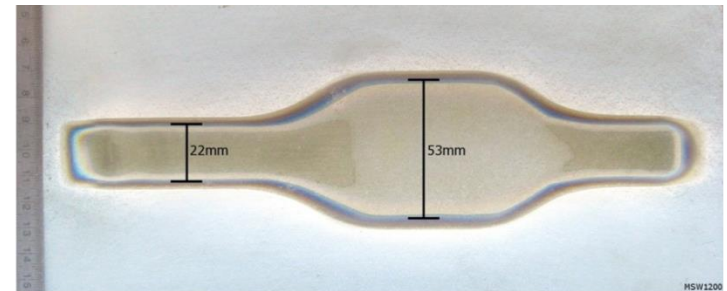
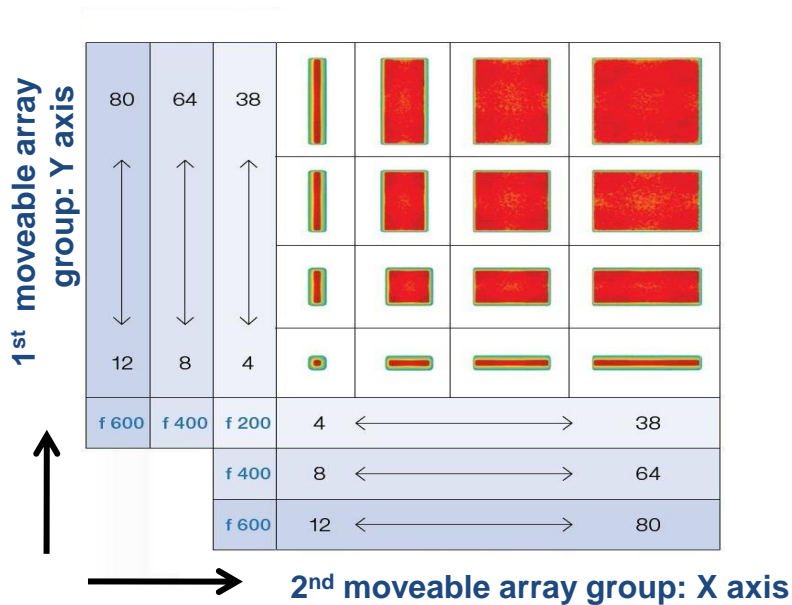


Deformation zone

Tensile strength down to 600 MPa  
Max. elongation up to 25%

## Laserline Optics Components

# Zoom Homogenizer: Variable Rectangles



## Applications and Examples

# Harden Automotive Car Body Tools

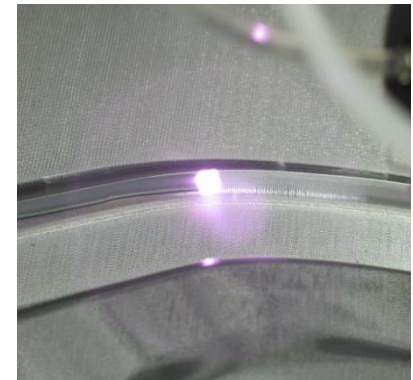
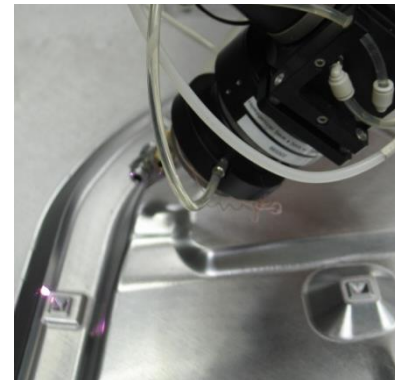
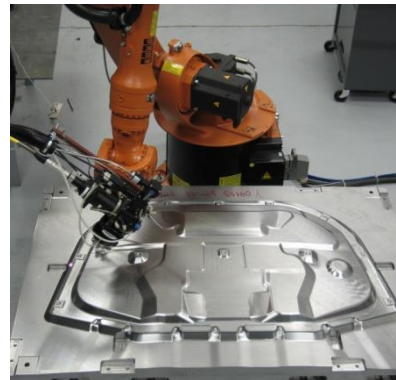
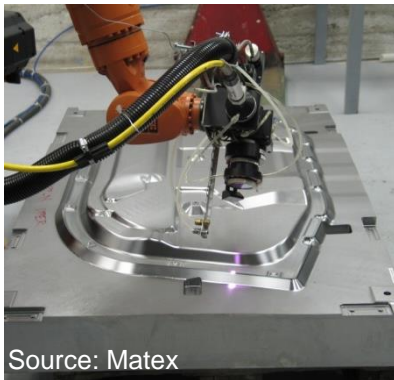
- Low space requirement
- Operation in standard industrial environment
  - *No special clean area required*
- Complete repair of system possible on-site
- Example applications
  - *Harden automotive car body tools*
    - ▶ *As shown*
    - *Harden construction equipment*
    - *Harden cylinder liners (Diesel engine)*
    - *Harden transmission components*
    - *Annealed wire production*
    - *Axle keyway*
- Multi kilowatt fibre coupled diode lasers



Source: Erlas

## Applications and Examples

# Pinch-edge



- Hardening of a cutting tool for the automotive industry.
  - *Pinch-edge: used to produce sandwich panels for the interior in the car, roof, door, floor, etc.*
  - *The edge is hardened in the final state with no further rework needed*
  - *Control of temperature is very important to avoid melting of the edges. The system must be 100% reliable.*

- Data
  - *Steel 1.2311*
  - *Laser 3,5kW*
  - *Fiber 600µm*
  - *T controlled with Pyrometer*