

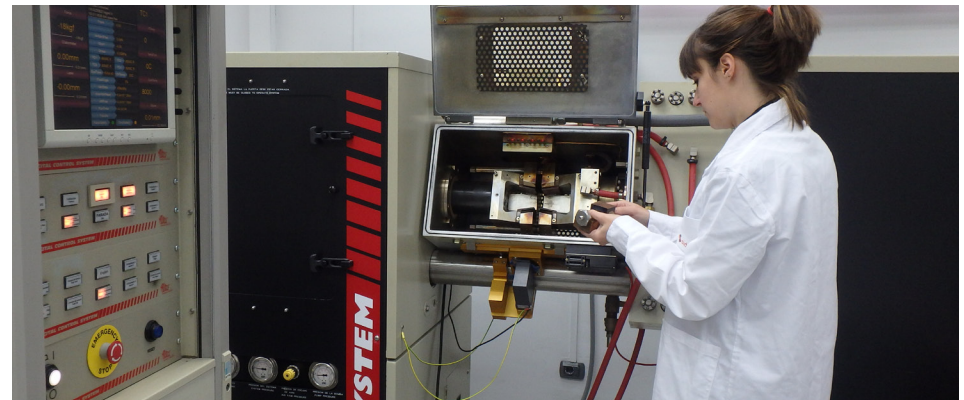
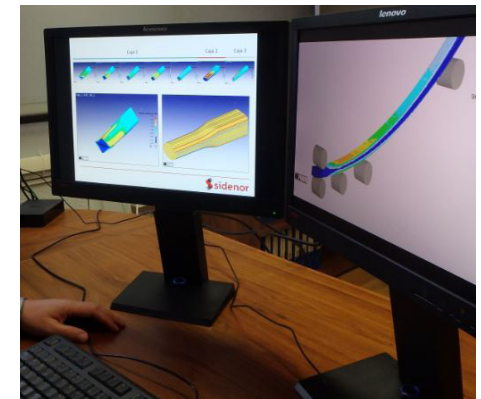
# Innovative Steels for Automotive Components

A new approach for the oncoming challenges



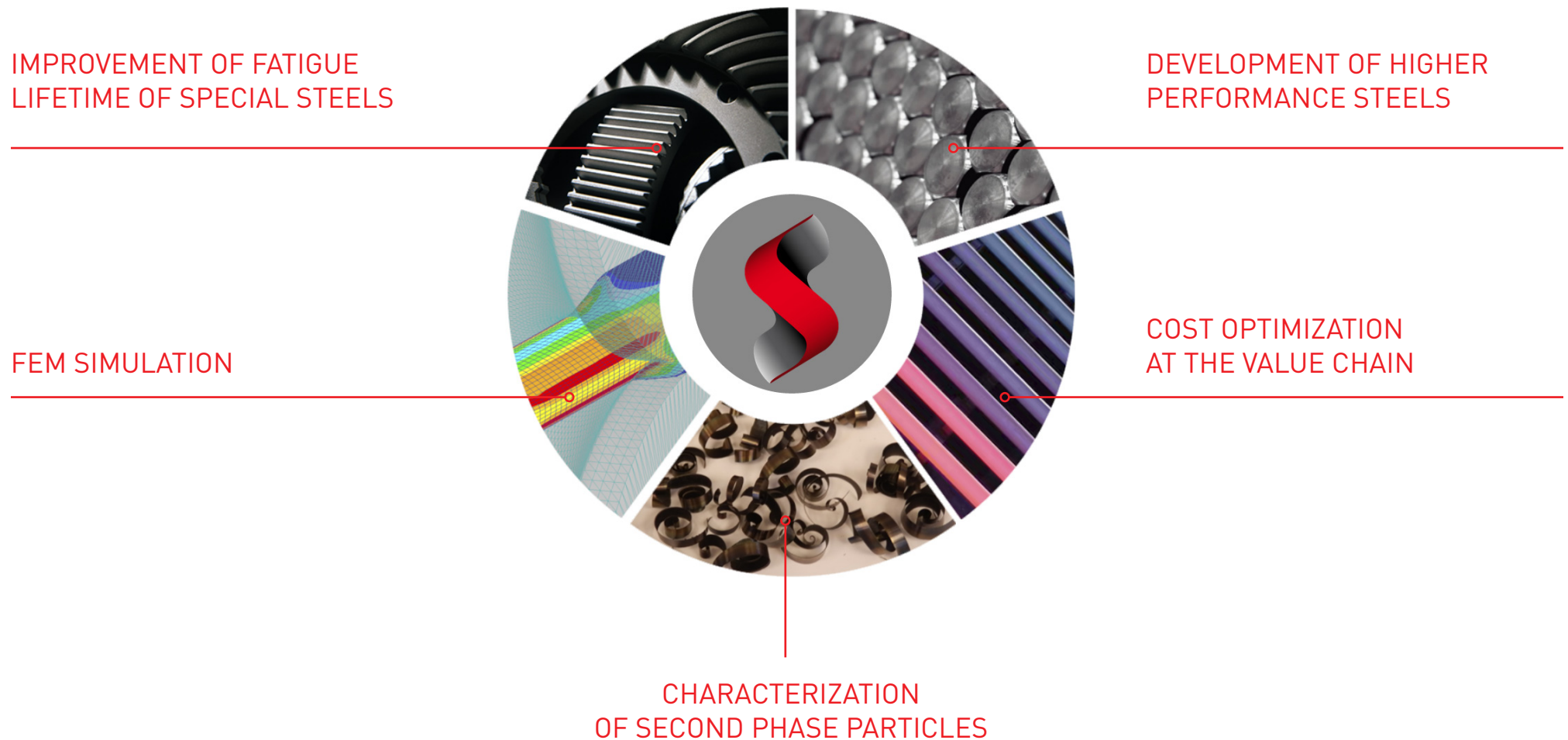
## R&D Strategy

- Synergy between Special Steel plants
- Optimize resources in the development of new products
- Match the product portfolio and the R&D strategy with Technical Service and Marketing, seeking greater assertiveness and focus on the market
- Share the knowledge acquired through innovation with the plants
- Strong relationship with universities
- Develop innovative and alternative products



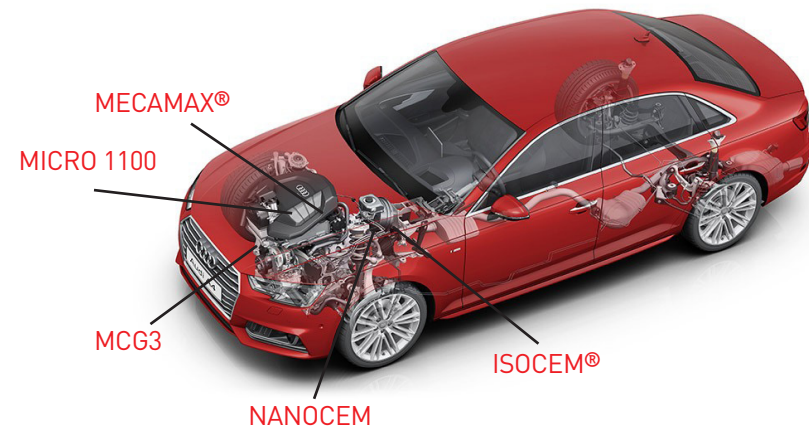
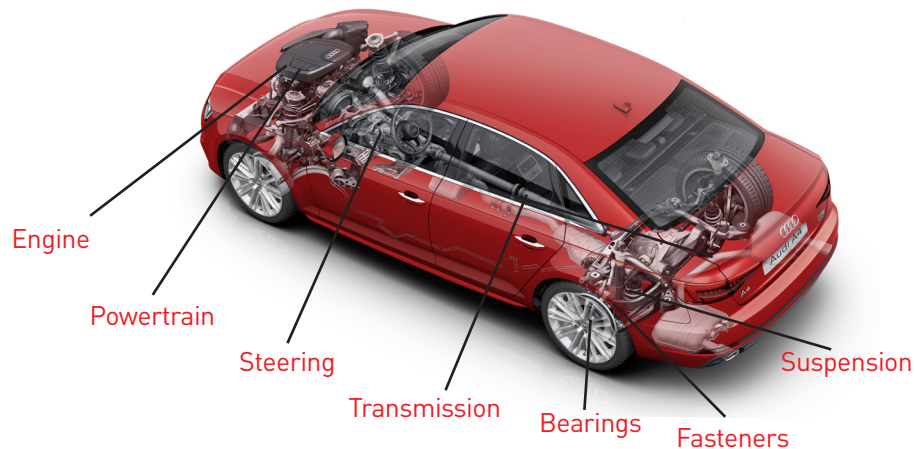


# Main Knowledge Areas



## How can SIDENOR create Value to our stakeholders?

- Customers' Partnership
- Promoting **alliances** to integrate steel-process-product know-how and to increase the value in the whole supply chain
- Developing ad-hoc **tailored** steels for specific applications
- **Adapting** steels and manufacturing routes to optimize properties and profits
- Forming “innovative teams” to provide solutions to automotive end-users (OEM's and TIER1)



## MECAMAX® MB

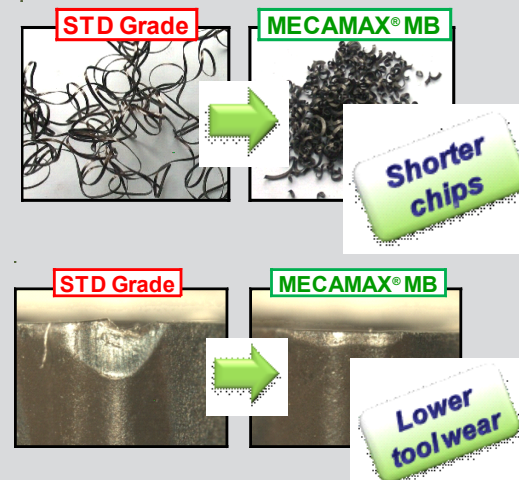
MECAMAX® MB was developed by SIDENOR to reduce machining costs (20-50%) by **Bismuth addition**, a **non toxic** element.

Recommended for high performance automotive applications: no influence in mechanical properties and process.



### Benefits of Bi alloyed steels:

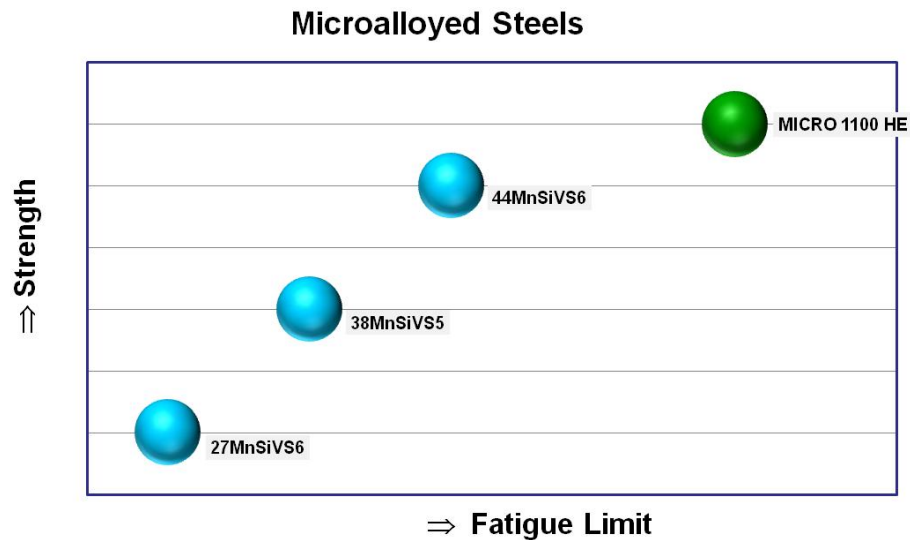
- Self-lubricating
- Promote chip fragmentation
- Reduce cutting forces and temperatures
- Reduce adhesive tool wear





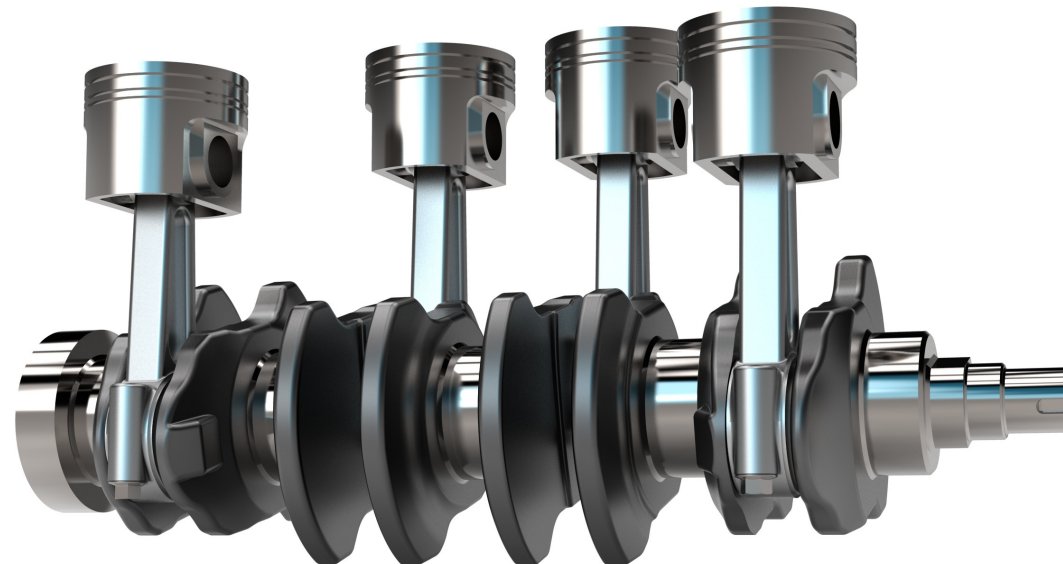
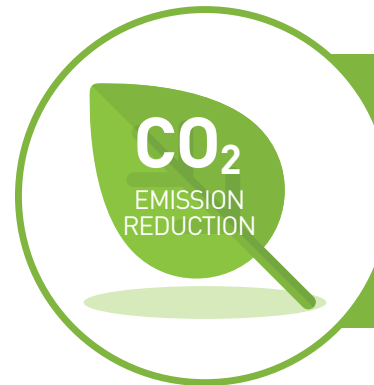
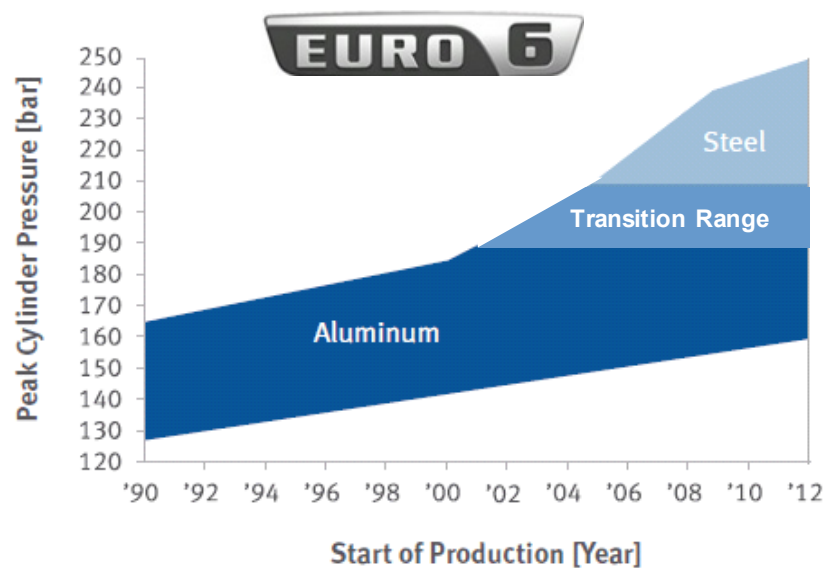
## M1100: Forged Common Rail Parts & Crankshafts

**M1100** offers High tensile strength ( $\rightarrow 1000\text{MPa}$ ) with excellent fatigue performance and homogeneous ferrite-pearlite microstructure and good machinability for Automotive applications



## MCG3: Forged Pistons

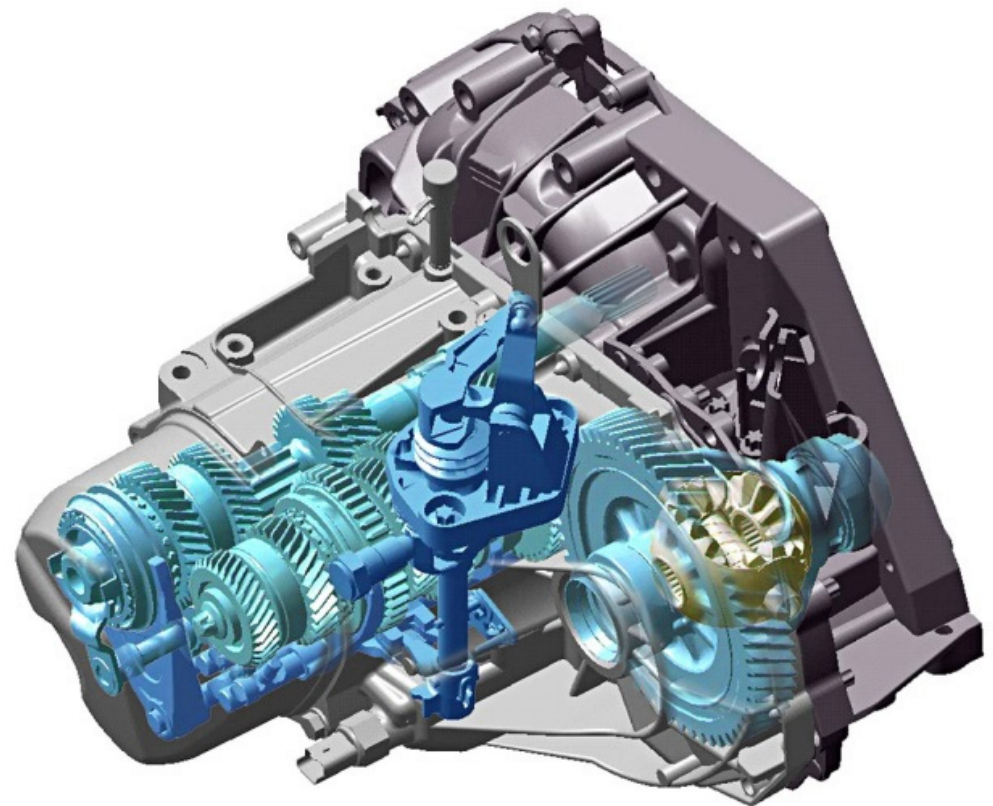
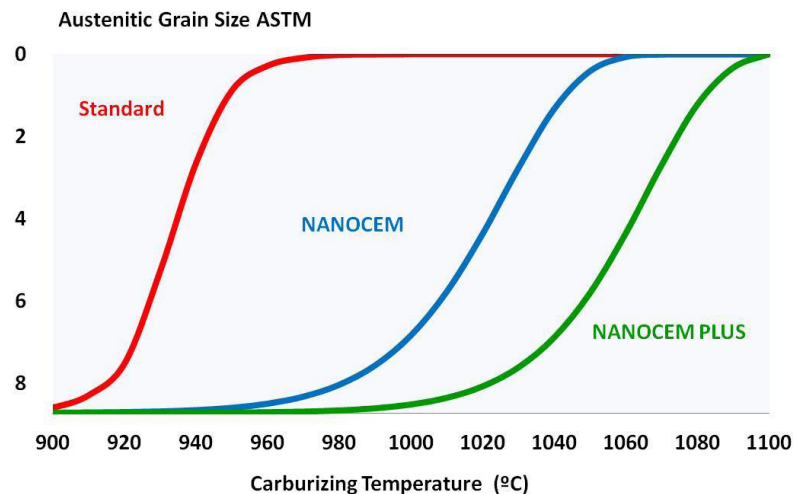
**MCG3** steel, with high oxidation resistance at high temperature, allows substituting Aluminum in forged diesel engine pistons and makes possible to increase temperature and pressure, improving efficiency and reducing fuel consumption and greenhouse-effect emissions





# NANOCEM: Energy Savings. High Temperature Carburizing

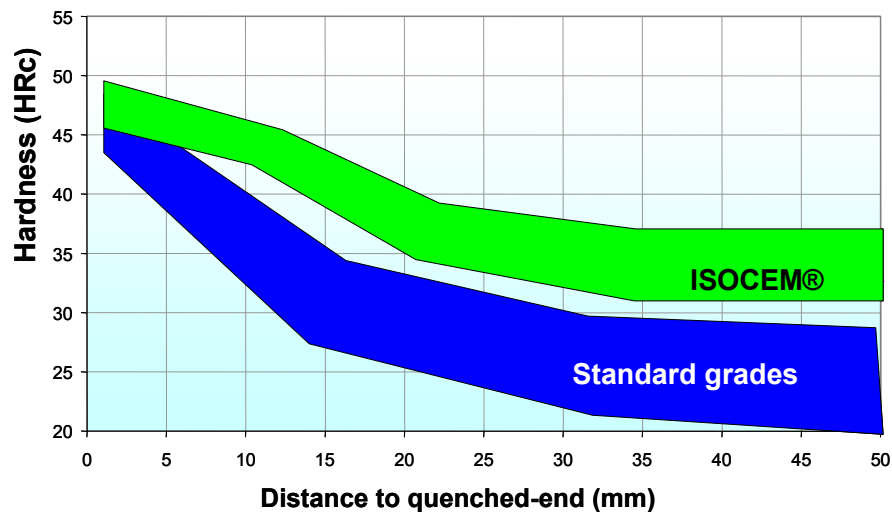
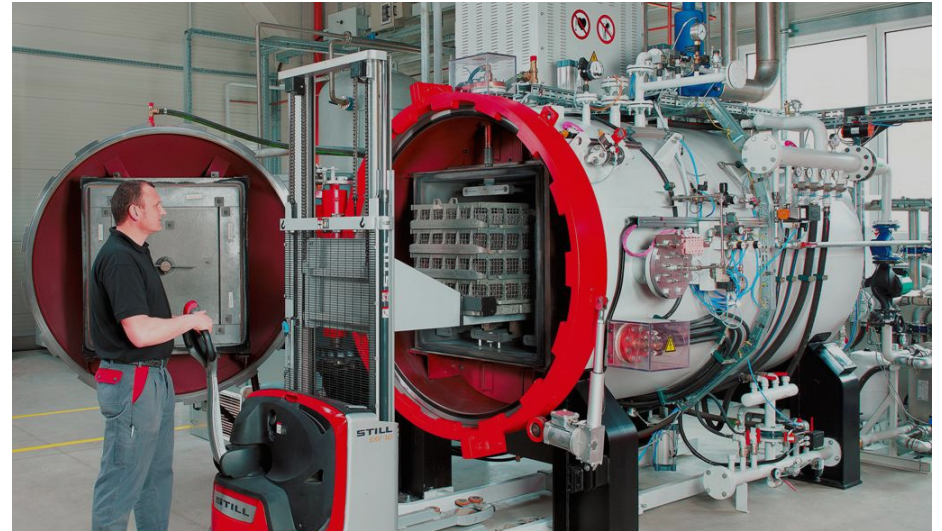
NANOCEM steels apply nanoprecipitation technology to control austenitic grain size at high temperature. Carburizing can be shortened 3-4 times increasing holding temperature up to 1050°C keeping grain size as fine as conventional treatments at 950°C



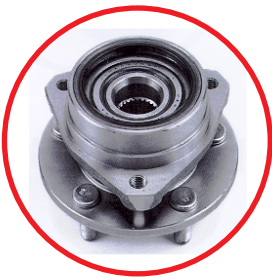


## ISOCEM®: Innovative Technologies. Vacuum Carburizing

ISOCEM® steels are suitable for low pressure carburizing and gas quenching processes. Hardenability is tailored to ensure the final mechanical properties at both the case and the core and an upper service performance



## Commitment with Innovation







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