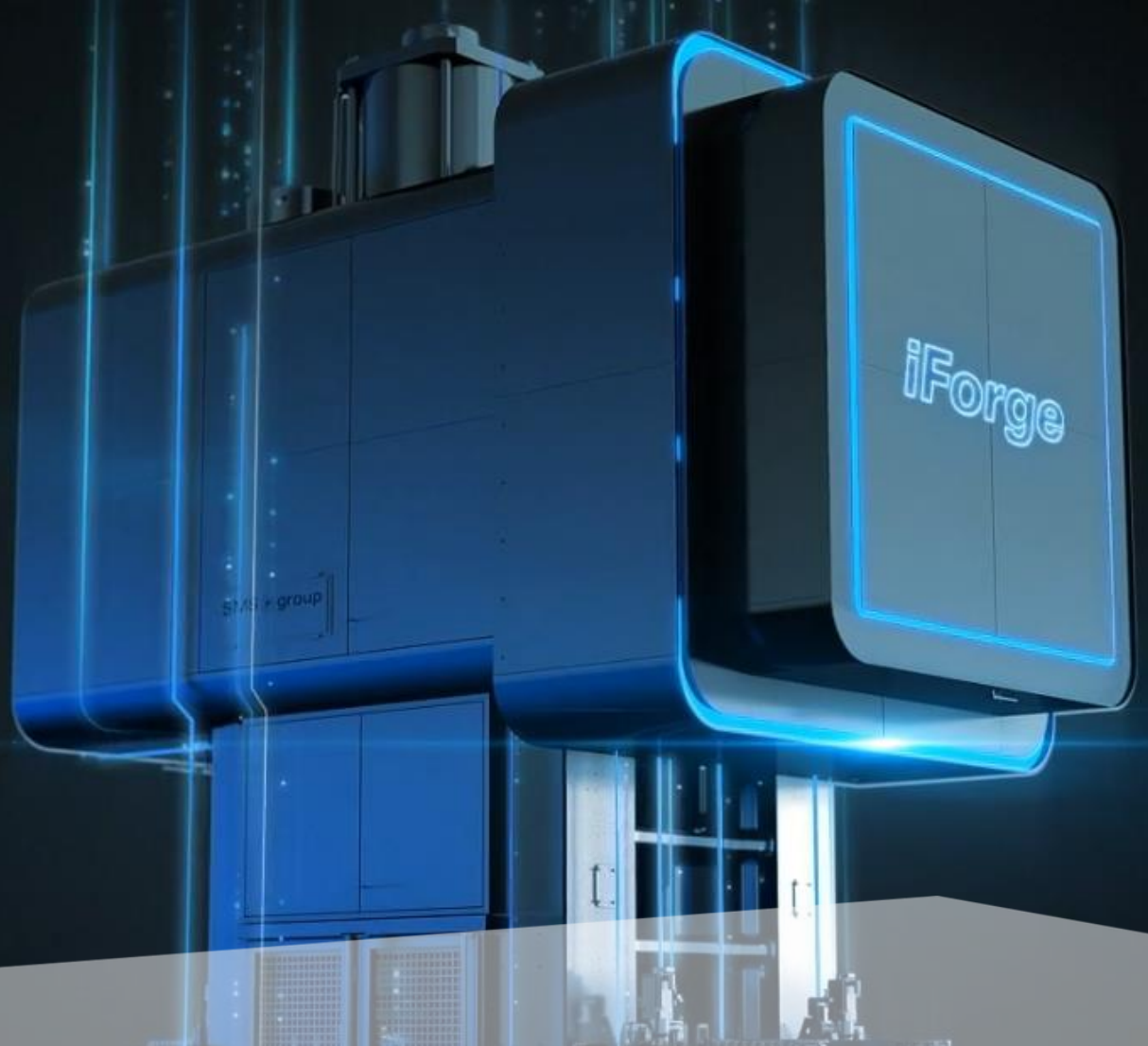
SHAPING THE NEXT INDUSTRIAL REVOLUTION WITH YOU



iForge Traceability – Production Part Tracing Along The Forging Process Chain

iForge

iForge is much more than just a software tool – it is the chain to interlink metrology, programming, engineering (CAD, FEM) as well as process and control technology to rule your forging processes.

Die Crack Detection	Product Traceability	Process Data	Predictive Maintenance
Die Condition Monitoring			Online Support
OEE	Process Monitoring	Tool Life Monitoring	Process Parameter Analysis

iForge Integration in an automated Screw Press Forging Cell with integrated tactical, thermal and vision control sensors for process optimization

Production Part Tracing in the World of Forging

All key components need to be traceable designed to meet OEM requirements

Traceability integral element for meeting OEM requirements

Certified production processes require production part traceability

Allocation of production data to a singular part means added value for suppliers and OEM‘s

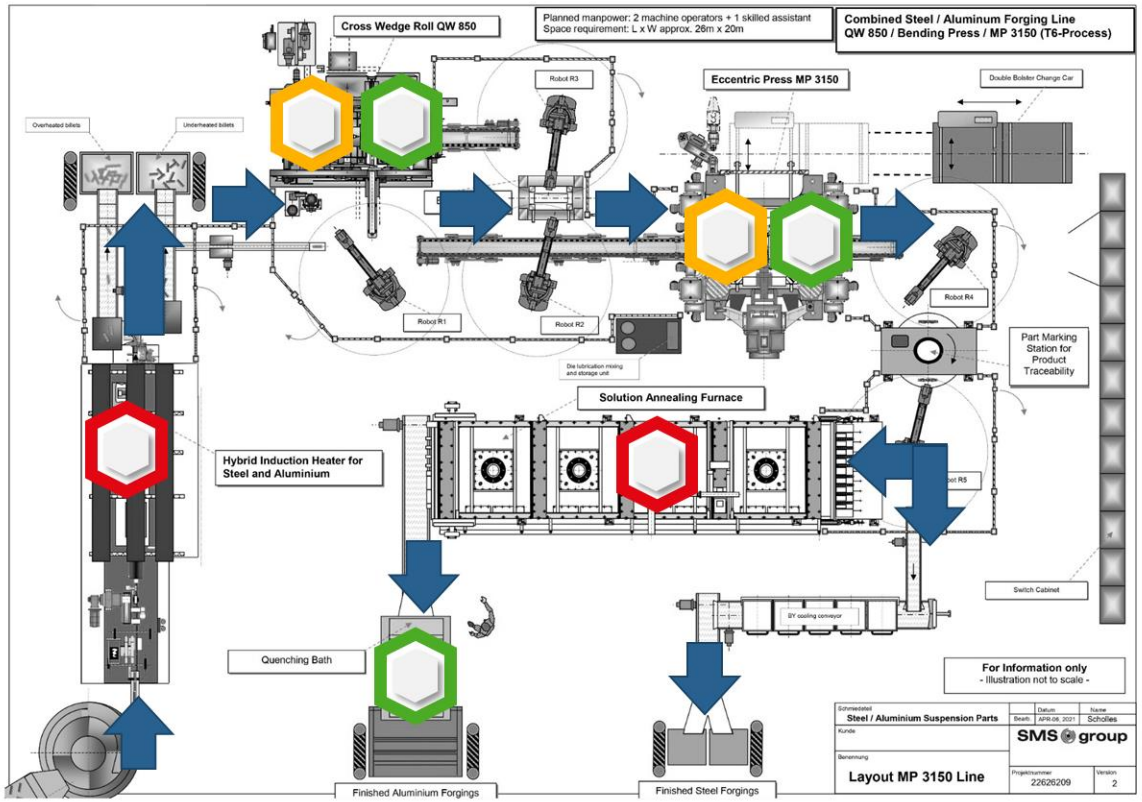
Product Traceability minimizes risk of quality claims and rejects

Exact determination of CO_2 footprint

Optimization Potentials in Different Areas

- Material Tracking
- Planning Optimization

- Condition monitoring for critical equipment
- Holistic Alarm Management System
- Plant-wide rule and AI based machine condition monitoring



- Energy Optimization
- Holistic Energy Mgmt / Carbon Footprint

- Process Improvement
- Quality Tracking

SMS DataFactory

Get more value from your data

Integration of multiple data sources. Data enrichment with meta information and length time correlation for complete product history

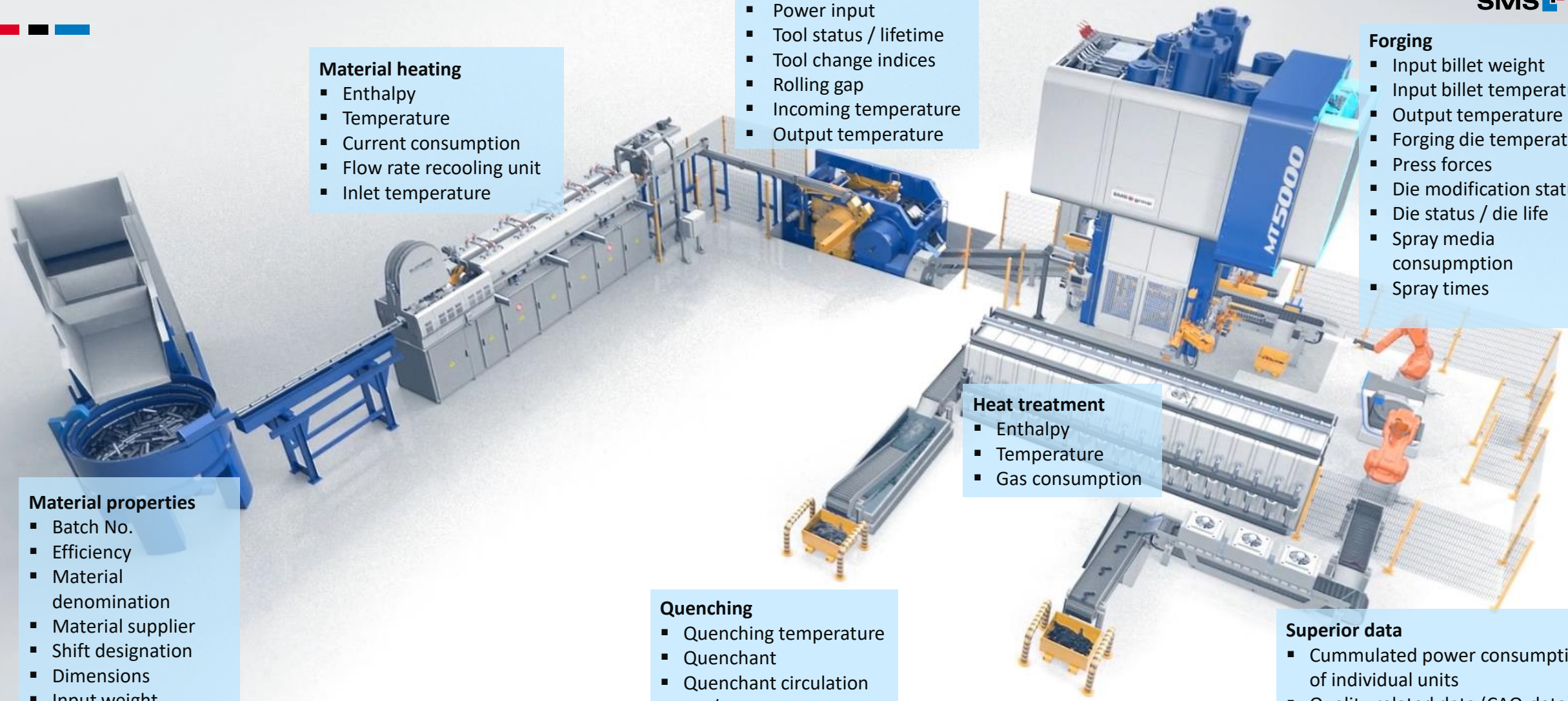
- Value chain transparency
- Focus on data analytics not data preparation
- Analyze the data along all production steps
- Document & manage the genealogy of your product

DataFactory: Examples of Collectable Data

Material heating
- Enthalpy
- Temperature
- Current consumption
- Flow rate recooling unit
- Inlet temperature

Preforming Equipment
- Rolling forces
- Rolling torque
- Power input
- Tool status / lifetime
- Tool change indices
- Rolling gap
- Incoming temperature
- Output temperature

Forging
- Input billet weight
- Input billet temperature
- Output temperature
- Forging die temperature
- Press forces
- Die modification status
- Die status / die life
- Spray media consupmption
- Spray times



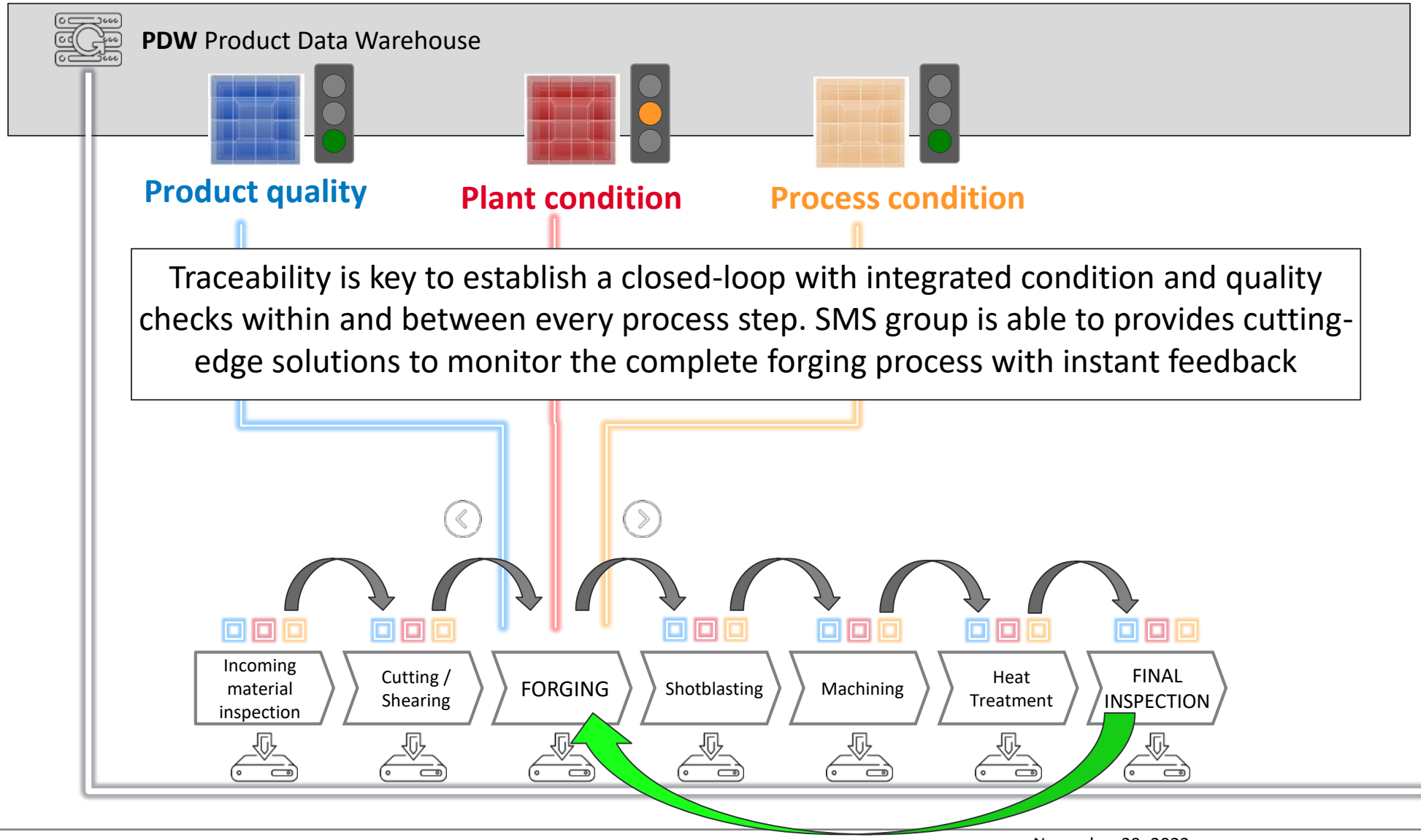
Material properties
- Batch No.
- Efficiency
- Material denomination
- Material supplier
- Shift designation
- Dimensions
- Input weight
- Site temperature

Heat treatment
- Enthalpy
- Temperature
- Gas consumption

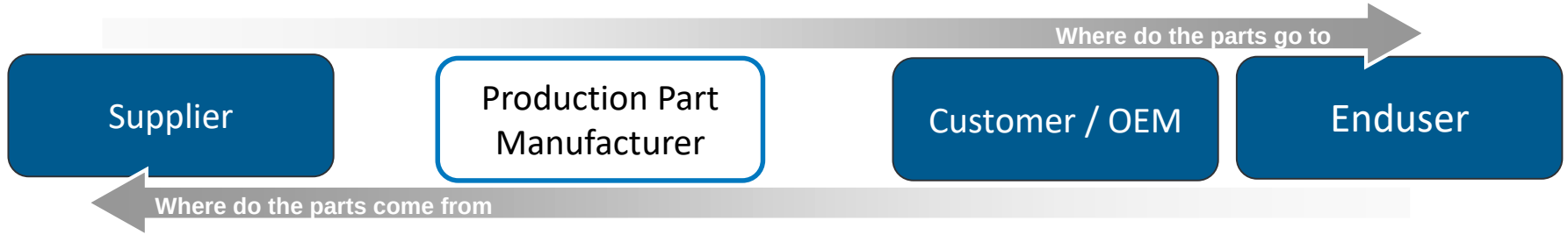
Quenching
- Quenching temperature
- Quenchant
- Quenchant circulation yes/no
- Additives

Superior data
- Cummulated power consumption of individual units
- Quality related data (CAQ-data)
- Condition Monitoring data

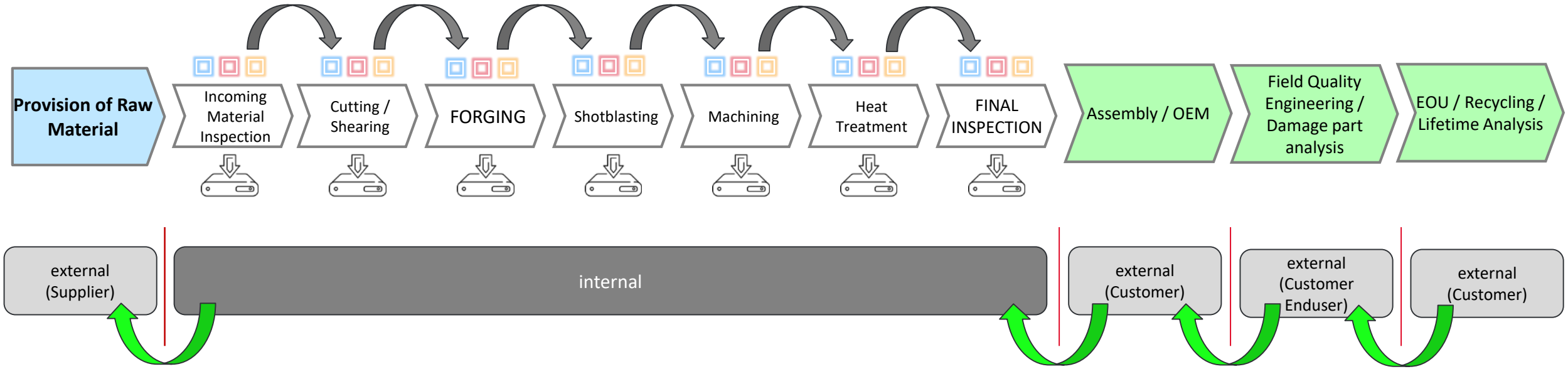
Traceability – Singular Production Part Tracking



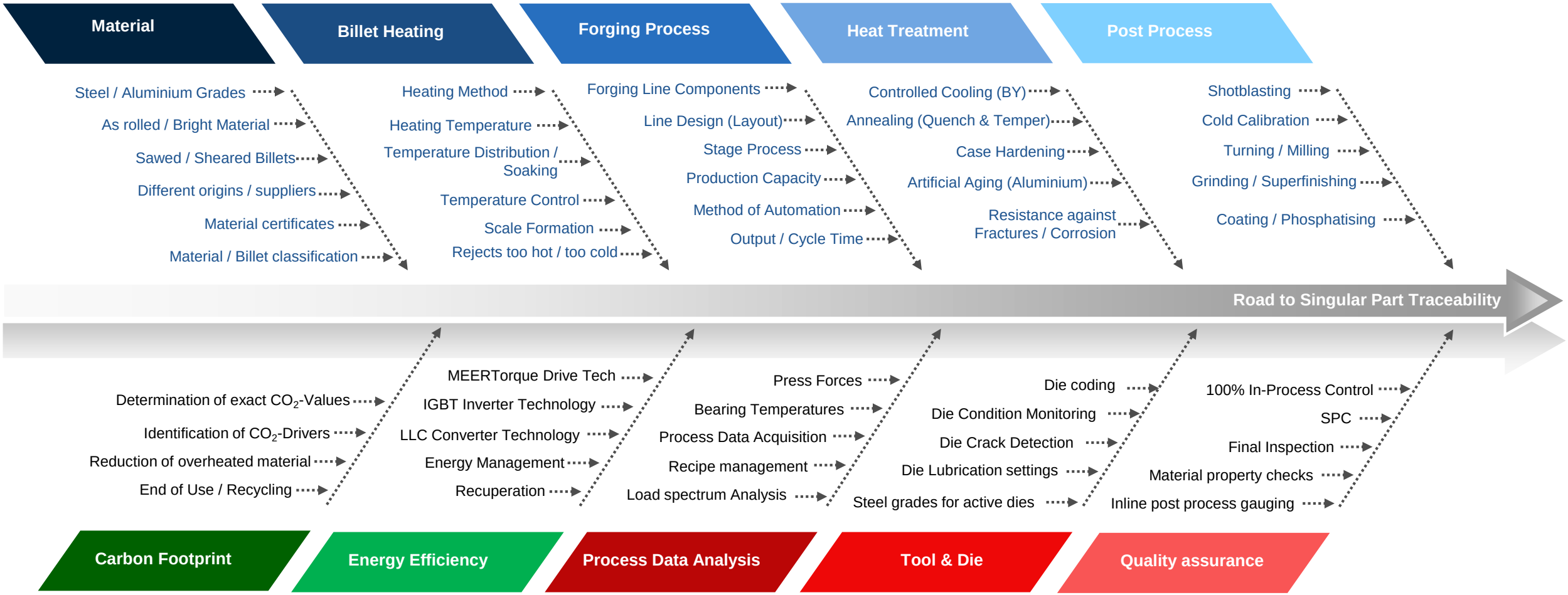
Traceability – Why Product Traceability?



Traceability within the manufacturing and supply chain means that the progression from procurement of raw materials and parts to their machining, assembly, distribution and sale can be traced, both downstream and upstream.

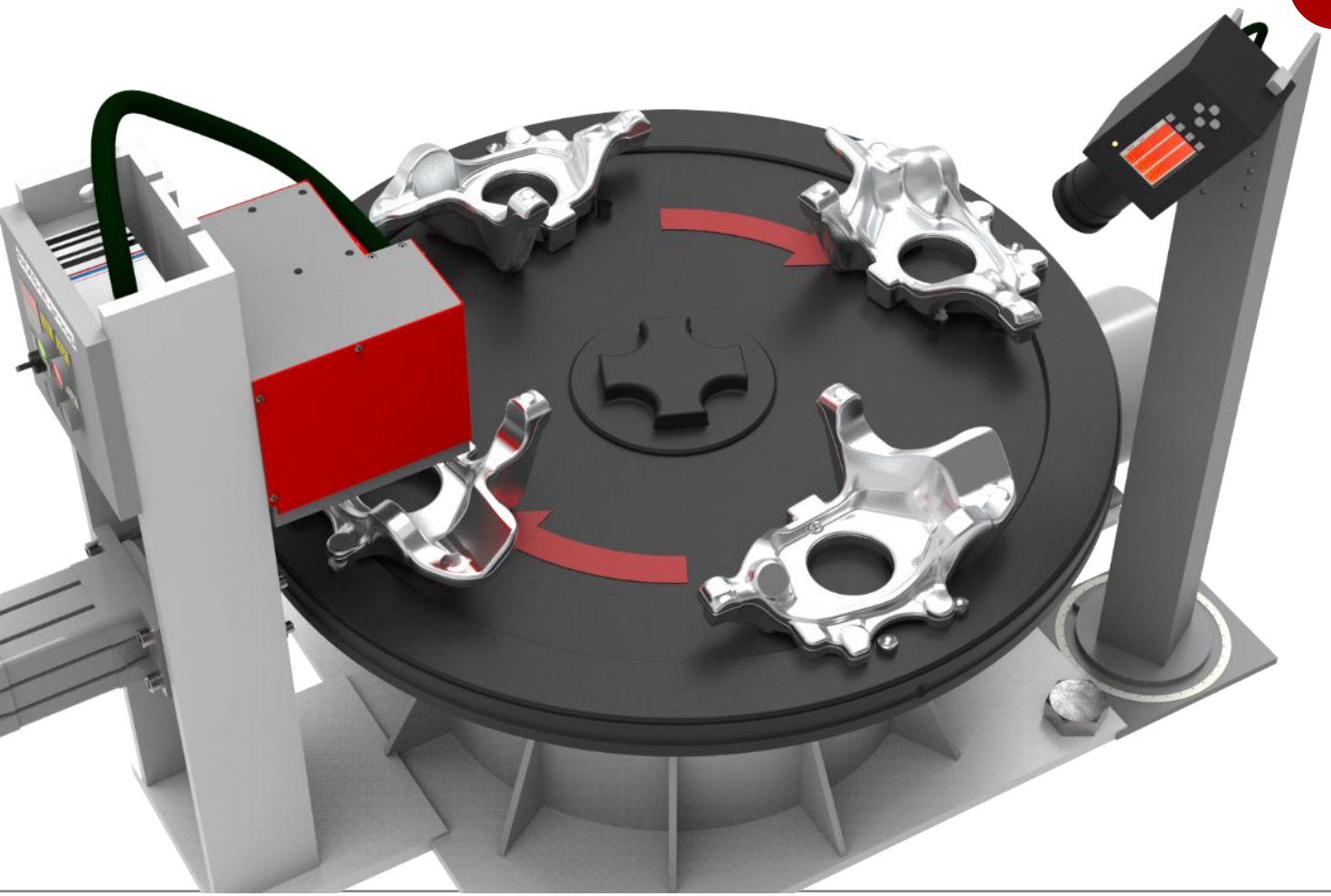


Traceability - Challenges



iForge Traceability

Dot peen marking of hot parts / Data Matrix Code

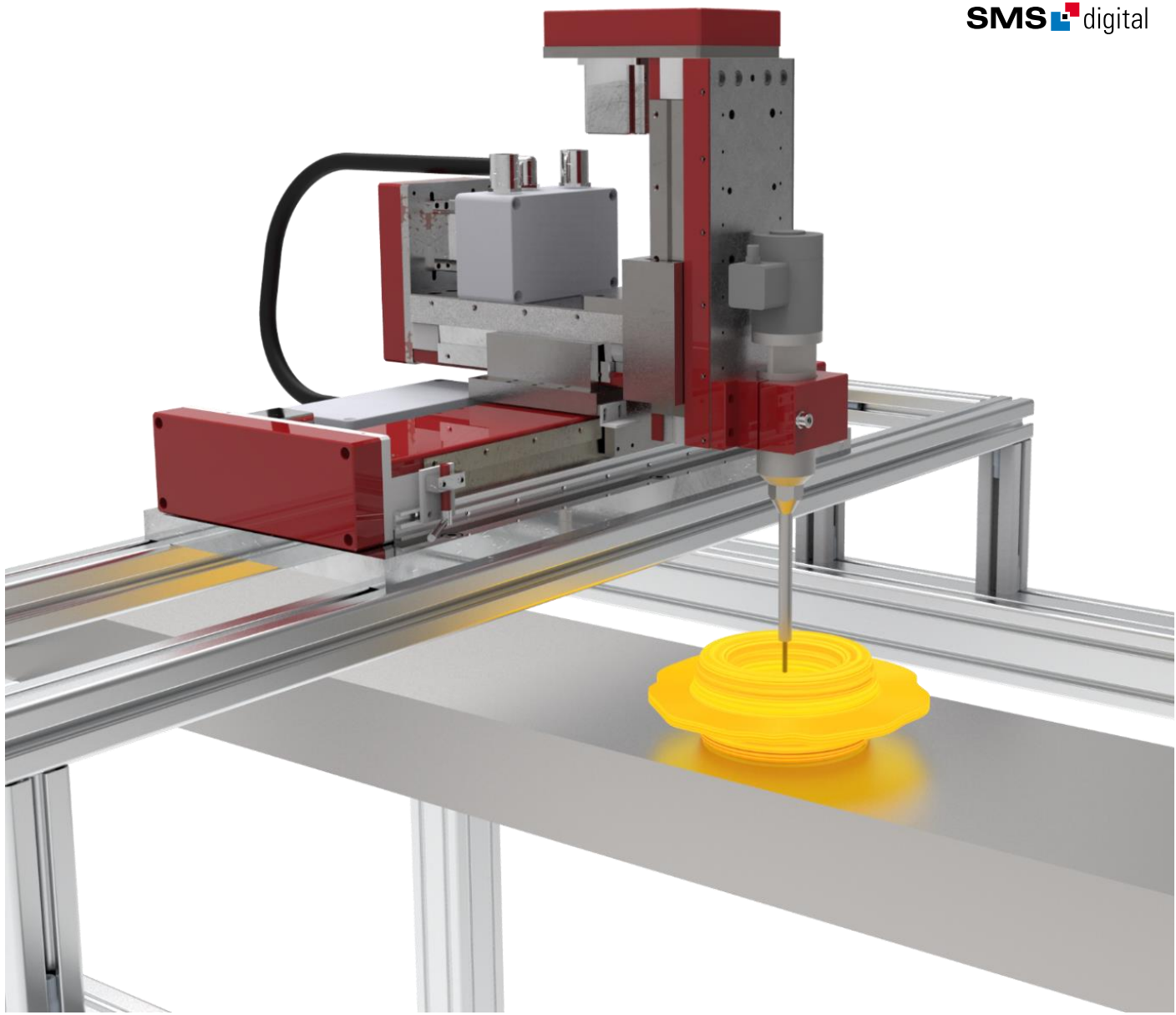


- First comprehensive solution for tracking hot forged parts on the market
- Detailed CO_2 detection broken down on each individual part
- Transparent proof of the values results in a high level of acceptance and excellent market opportunities

iForge Traceability

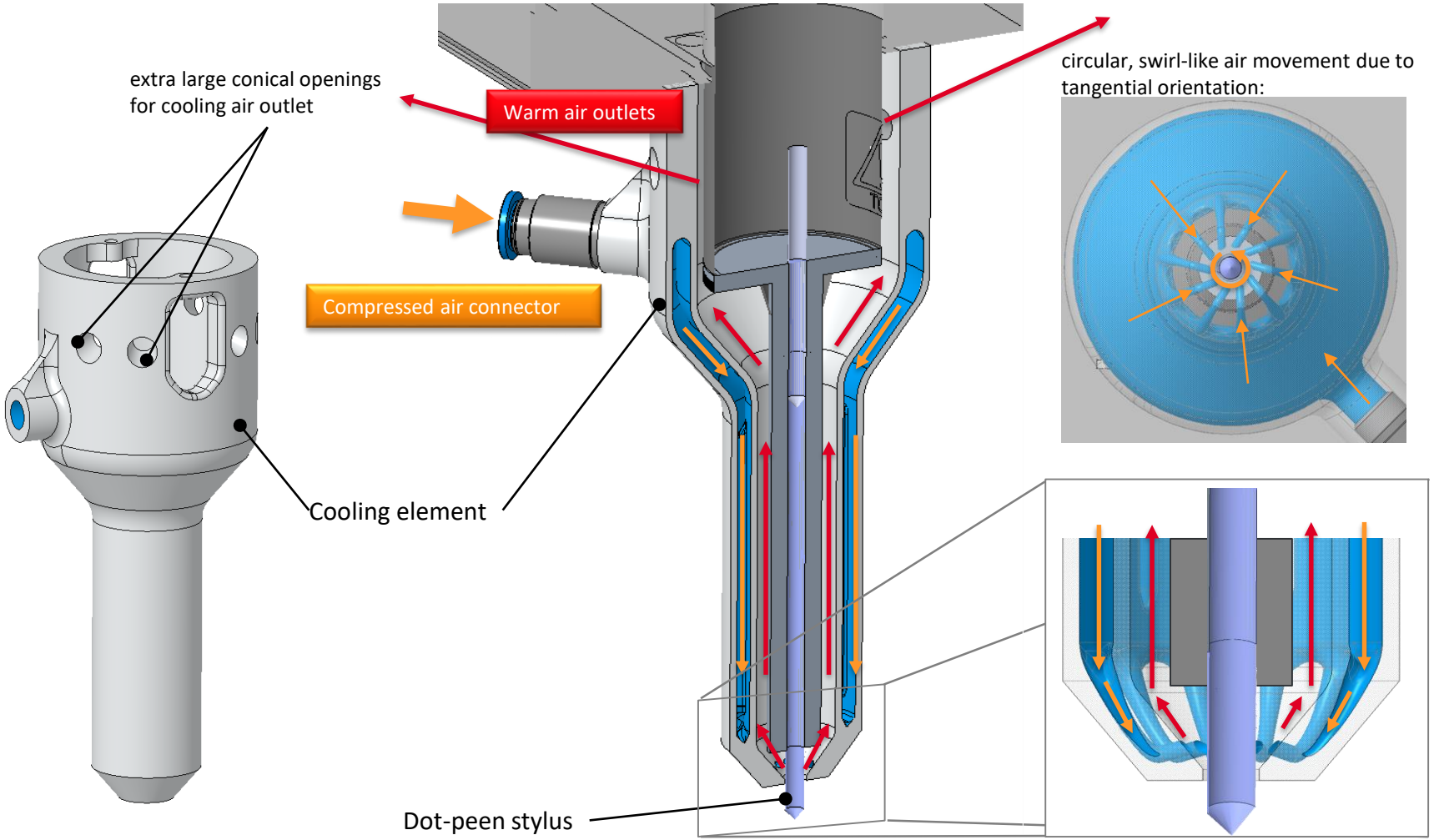
Dot peen marking of hot parts / Data Matrix Code

- Dot peen marking has proven to be best practice to deliver high-quality markings suitable to withstand mechanical and thermal influences
- Data-Matrix-Code is industry standard in product tracing due to its ability to tolerate reading errors
- Dot peen marking will be applied on a surface to be machined afterwards. Before the machining sequence starts the code will be read and processed during machining
- The sequence number of the workpieces being in the process between the forging press and the marking station is stored in the control system to ensure that every workpiece will receive the related process data correctly



Dot-peen marking / Stylus cooling

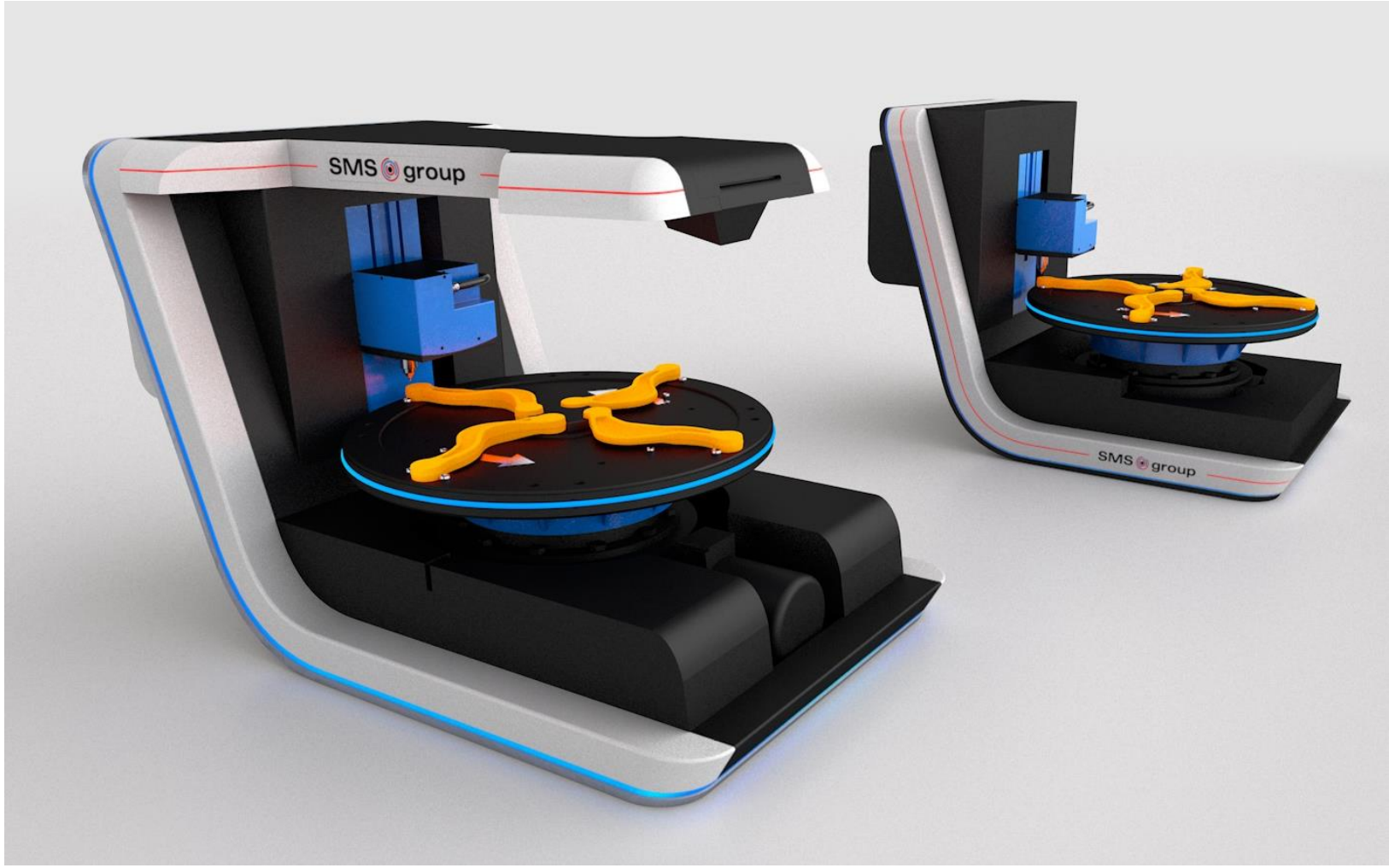
3D-printed cooling element for dot-peen stylus



iForge Traceability

Dot peen marking station

- Right after leaving the forging press, each workpiece is identified and uniquely marked by dot peen marking with an individual and unique data matrix code
- The marking station comes as stand-alone solution with interfaces to be easily integrated into fully automated forging lines via handling systems or industry robots
- Immediately after the marking process the readability of the code is verified by an integrated vision sensor



iForge Traceability

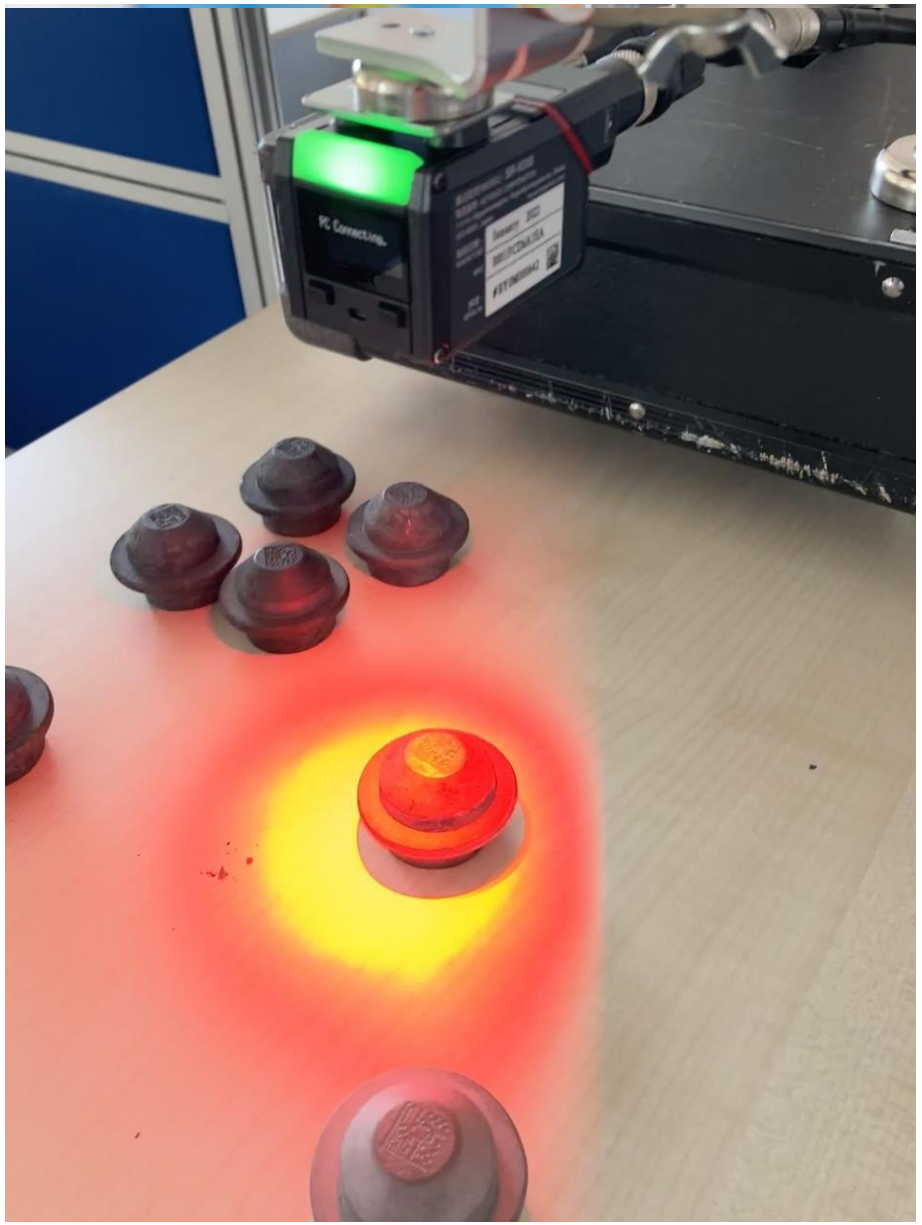
Dot peen marking

- Tests in automation process

iForge Traceability

reading Codes

- Camera for reading at various points in the process
- Handheld readers for spontaneous checking



iForge Traceability

Laser marking of finish machined parts

- To keep the Code size as small as possible, a 10x10 dot code will be used that only transmits a 6 digit number to clearly identify every part being produced
- This code will be replaced by a DataMatrixCode marked with a fibre laser thus generated and tested for perfect readability using an integrated camera system
- The laser-marked code may contain additional information, such as serial and batch numbers, production date and other information.
- The laser, camera system, software and handling system are integrated part of the production line creating the final part surface

iForge Traceability

CURRENT STATUS

Capture of batch data:

- Data acquisition for entire batch only
- Quality data always related to whole batch

CO_2 Footprint:

- Only averaged CO_2 data
- Poor data transparency and accuracy

IN FUTURE WITH iFORGE TRACEABILITY

Capture of singulary part data:

- Production data for each individual part
- Quality data for each individual part
- Each part traceable in production history

CO_2 footprint for each individual part:

- Exact CO_2 single part data
- High data transparency

Costs

- High losses in the event of product recalls
- High premiums for risk insurance in case of product recalls
- Roughly estimated CO2 data for products

- Loss of profit only for individual parts during recalls
- Better starting point for insurance conditions
- Increased competitiveness through verifiably accurate CO_2 data

iForge Traceability

Animation Video Sequence / Forging Line with iForge Traceability

- Integrated Forging Line MT 4000 with Cross Roll QW 850 for steel suspension parts

- Duration 5 min 16 sec

Summary and Discussion

Advantages of iForge Traceability

- All process data collected can be assigned to a singular component
- End-to-end solution from incoming material to the finished product
- No slip between the acquired data and the associated component
- Seamless integration into digital solutions provided by SMS digital
- Additional digital services and solutions (cloud-based or on premise) coming soon

SMS group

- High quality plants
- Digital Ready Automation
- Technology driven
- Process Expertise

SMS digital

- Infrastructure / Tools
- Data Storage / Cloud
- Web-Development
- Data Science / ML

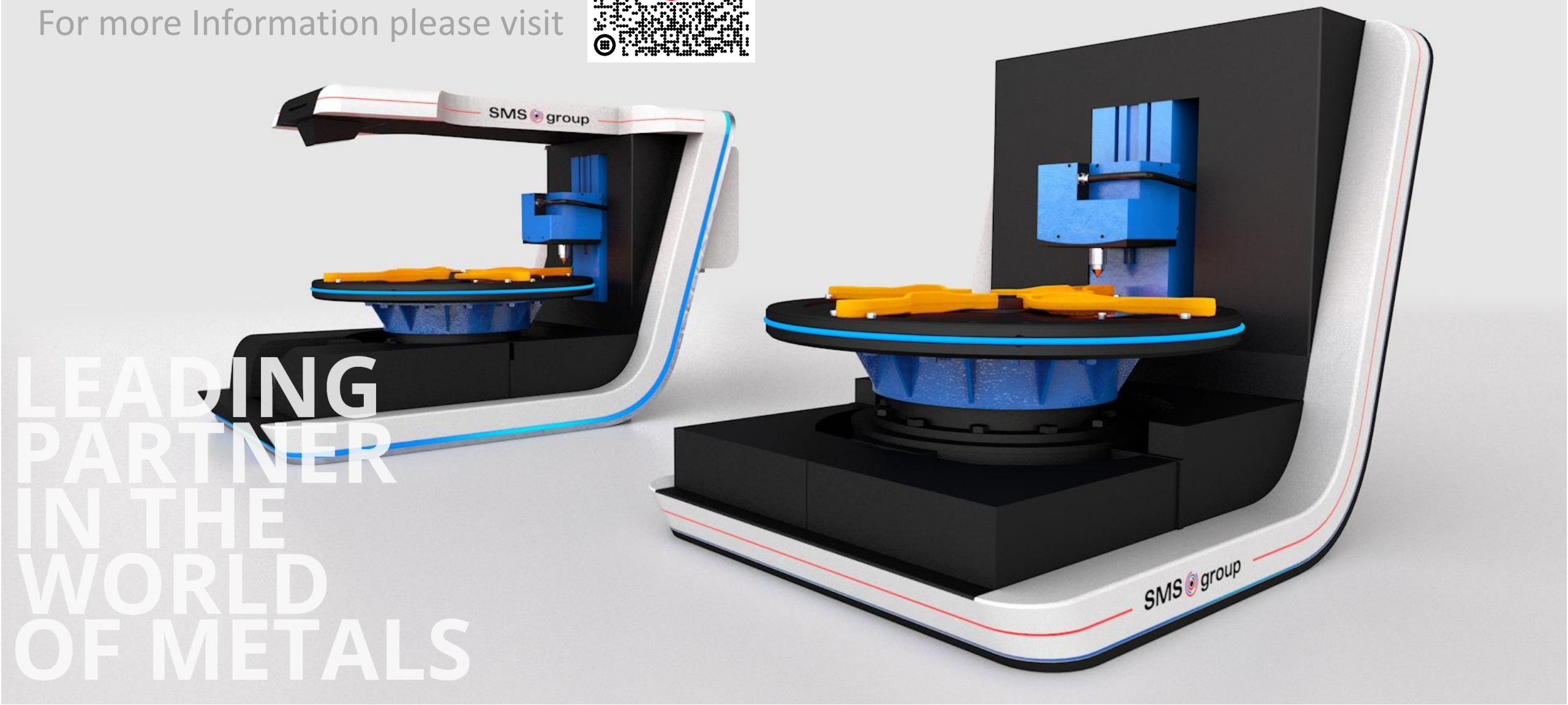
SMS group
SMS digital

- Customer Centered
- Use-Case orientated
- Business Cases Driven

End-to-end solution from SMS group

iForge Traceability

For more Information please visit



LEADING PARTNER IN THE WORLD OF METALS