MAG AUTOMOTIVE GROUP
At your disposal on site – worldwide

MAG is a leading manufacturing technology group with manufacturing, sales and service locations in Germany, the USA, China, India, Hungary, the UK, and Switzerland. With a strong foundation based upon renowned machine tool brands such as Boehringer, Cross Hüller, Ex-Cell-O, and Lamb, MAG has become a global player since its founding in 2005. MAG serves the automotive and truck industries and their suppliers with unmatched technology and expertise.

MAG offers machine tools, manufacturing systems, and services including turning, milling, honing, systems integration, automation & software, services, retrofit, core components, and e-learning. As full-scale supplier, MAG manufacturing solutions include a comprehensive range of equipment and technologies, process capability and full turnkey systems. With an in-depth knowledge of applications and manufacturing requirements, MAG partners with its customers to continuously reduce their production costs.

MAG IAS GmbH
Salacher Strasse 93
73054 Eislingen/Fils, Germany
tel +49 7161 805-0
fax +49 7161 805-223

MAG Automotive, LP
6015 Center Drive
Sterling Heights, MI 48312, USA
tel +1 586 446 7000
fax +1 586 446 7001

Efficient and economical machining of powertrain components

www.mag-ias.com

Turning | Milling | Honing | Systems Integration | Automation & Software Services | Retrofit | Tooling & Fluids | Core Components | e-Learning
Crankshaft machining >>
Traditional ways on highly efficient machines

<table>
<thead>
<tr>
<th>Machine type</th>
<th>max. length</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOEHRINGER 220 Cx</td>
<td>600 mm</td>
</tr>
<tr>
<td>BOEHRINGER 221 / 226 Cx</td>
<td>530 / 730 mm</td>
</tr>
<tr>
<td>BOEHRINGER 320 / 325 Cx</td>
<td>600 / 1300 mm</td>
</tr>
</tbody>
</table>

Highlights
- Crankshaft machining up to 1300 mm in length
- Powerful main and counter spindles
- Model range for 2, 3, 4, 6 and 8 cylinder crankshafts
- Milling drive with active spindle cooling
- Hard fine machining as dry machining reduces lasting manufacturing costs
- Modern, ergonomic design
- Particularly suited for linking in systems
BOERHRINGER 180 / 250 / 300 T

Horizontal Turning with a large Choice of Features

Horizontal turning >>
the right feature for every requirement

Highlights

- Shortest cycle time through machining with up to three tool carriers
- 3-way bed (250 T and 300 T) – no collision between steadies, tailstock and turret
- Long tool life and reduced tooling costs through a damping-optimized mineral cast bed
- Modular machine design for the whole machine series
- High cutting capacity also in hard turning through powerful drives
- Large variety of optional features (e.g. IR probes, tool measurement within the working area, dry grinding, finishing of running surfaces of bearings with belt grinding etc.)

Turning – horizontal

<table>
<thead>
<tr>
<th>Machine type</th>
<th>max. length</th>
<th>max. ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOERHRINGER 180 T</td>
<td>900 mm</td>
<td>290 mm</td>
</tr>
<tr>
<td>BOERHRINGER 250/300 T</td>
<td>850/1850 mm</td>
<td>290/350 mm</td>
</tr>
</tbody>
</table>

Tailstock

Lead-free turning—high-quality surface finish without grinding

Automatic tool measurement within the working area

Highlights
- Hard turning with extremely robust machine design

Dry grinding

Workpiece measuring with IR probes in process

Finishing, e.g. of running surfaces of different bearings

(SMART PRODUCTION SYSTEMS)
BOEHRINGER 250 VT >> Vertical Turning for the Automotive Industry

Vertical Turning >>
The optimum solution for system integration

Turning – vertical

<table>
<thead>
<tr>
<th>Machine type</th>
<th>max. length</th>
<th>max. ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOEHRINGER 250 VT</td>
<td>680 mm</td>
<td>250 mm</td>
</tr>
</tbody>
</table>

(turning lengths of 1000 mm available on request)

Highlights

- Compact design – minimal space requirements
- Vertical machine design with two tool turrets, tailstock or counter spindle and trouble-free chip fall
- Machining of long shafts with highest precision through retractable steadies
- Machining in 4 axes also for chuck parts
- Manual loading or integrated, flexible loading system (can be placed on 3 sides)
- Excellent integration into systems through flexible arrangement of power supply and chip removal
**The SPECHT® Series >>**
High-performance CNC machine tools

**Unique characteristics of the SPECHT® series**

**SPECHT® DUO – The most precise dual spindle model in its class**
- Unique “Dynamic Axis Compensation” (K/Y/Z) – single-spindle precision on a DUO center
- Synchronizing DUO spindles to the workpieces
- Highest quality through process traceability
- Temperature compensation down to the workpieces
- Taper cleaning for lasting tool precision

**Various standards and options**
- Honing on CNC centers (single or dual spindle)
- Wet or dry machining (dual-channel MQL) with best machine design for optimal chip flow
- Workpiece clamping with zero-point clamping system or adapter plates for fast changeover
- Automatic tool breakage monitoring

**Common Part Strategy >>**
Flexibility thanks to modular system

**SPECHT® series**
- Single spindle: SPECHT® 500 / 600 / 700 / 800
- Dual spindle: SPECHT® 450 / 500 / 600 DUO
- Axis drive with ball screw or linear drive
- Motor and gear spindles (HSK-A63 / HSK-A100) with high power and torque
- DUO spindle distance: 540 / 720 / 810 mm

**Shortest downtimes – The basis for a perfect production**
- Fastest tool changer on the market (patented)
- Chip-to-chip time less than 2.5 seconds
- Intelligent tool management “Smart Tooling” – correct tool preselection at any time – no idle time
- Cycle-time concurrent loading on floor level
- Simulation of processes and machines – highest transparency

**À la carte SPECHT® centers according to your operating philosophy**
A step forward for your component manufacturing

All advantages of the successful SPECHT® DUO series including:

- Shortest downtimes – the basis of a perfect production
- SPECHT® DUO – the most precise dual-spindle model in its class
- Large working area and large spindle distance allowing for comfortable machining of multiple setups
- Modular system with various standards and options providing highest flexibility
- Modular system for best configurability according to work piece and the respective machining requirements (e.g. linear drives)
- Manual or automatic workpiece loading with preparation for different automation concepts

User-friendly from all sides

- Setup station, tool magazine and maintenance units are easily accessible
- Cycle-time concurrent setup at the NC-rotatable and ergonomic workpiece setup station

Compact design in every way

- Low space requirement thanks to their compact setup
- Lean in system integration from the highly flexible position of chip disposal
- Compact and user-friendly arrangement of maintenance units for clean and clear service
Increase your production on multiple spindles

Transfer Center XT 525

No time for downtime

Highlights
-> Multi-spindle transfer center XT 525 replaces several CNC machines with sequential machining
-> Working spindles can be adapted to the manufacturing process in speed, rigidity and precision
-> Highest productivity in medium- and large-scale series
-> Optimum conditions for both dry and wet machining (aluminum, cast iron, steel and magnesium)
-> No tool changeover times, no disturbances owing to tool changes
-> Easy automation by shuttle and pick-up

Axis design
-> Horizontal positioning of workpiece
-> All movements within workpiece
-> X/Y-cross slide (vertical)
-> Z-sleeve with C-axis
-> U-shaped spindle arrangement

Special features
-> Solid angle machining with tilted spindles and interpolation of feed axes
-> NC cutting edge adjustment for highest precision
-> Tactile tool breakage monitoring with test plate at the working area roof
-> Cycle-time concurrent laser-controlled tool breakage monitoring

Traditional sequential machining

Transfer Center

- MC 1
- MC 2
- MC 3
- MC ..
Cold-forming

- Machine models XK 2xx bis XK 12xx capable of rolling diameters of up to 120 mm
- Workpiece lengths up to 5000 mm are possible
- Rollable module from 0.3 to 3.5 mm, depending on shaft diameter and profile width (max. 120 mm)
- MAG Cold-forming Centers are very flexible thanks to their usable parameters

Highlights

- High contact ratio in rolling through linear racks
- Low temperature impact due to high degree of efficiency
- Simultaneous rolling of several profiles possible
- Axial conicity at the tooth ends allows easy joining of splines
- Special racks for rolling of spherical radii at teeth runout
- Free from grooves – no retrospective machining necessary
- Jointing/beveling at tooth engagement for optimum prior centering of splines with straight teeth
- Tapered tooth engagement as assembly support for splines
Agile Systems and Transfer Lines >>
Highest Efficiency in high-volume Production of Workpieces

Highest flexibility, also in high-volume manufacturing

Transfer line
for cylinder head manufacturing
(450,000 pieces per year)

Linear system
for crankshaft manufacturing with port loading

Agile production system, flexible in volumes,
for cylinder blocks with adapter plates and
32 single-spindle machines (450,000 pieces per year)

Highlights
- Parallel or sequential system configurations with front or top loading
- Manual or automatic loading of workpieces in different materials (cast iron, aluminum, magnesium etc.)
- Workpiece loading through ports, robots or handling devices
- Workpiece clamping with clamping devices plus flexible clamping systems with adapter plates or zero-point clamping systems
- Wet or dry machining with Minimum Quantity Lubrication (MQL)
- Compact system layout (patented) with excellent accessibility
- Cutting machines arranged centrally and ergonomically
- Ancillary equipment (washing, assembly and chip removal) removed from air-conditioned central area
Modernize or replace machines or machining processes through Retrofit or Retooling

**Customer’s Benefit**
- Safe and fast implementation with manufacturer’s knowhow and secure spare parts supply
- Increased productivity, quality and availability
- Cost savings by keeping the base machine including its bed
- Tried and tested mechanics in robust format but with extended service life
- Increased utilization of machine capacity thanks to new processes and cutting patterns
- No unexpected follow-on costs thanks to comprehensive calculation of all concerned segments
- Integration of additional processes saves complete machines, space and money

**Retrofit/Retooling Benefits**
- Many years of experience in the BOEHINGER tradition, particularly in retrofitting crankshaft machining centers
- Overhauling of mechanics and electrics
- Retrofit of controls
- Update of safety technology
- Execution of the work on site or at our retrofit centers
- Engineering and documentation
- Adapting a machine to new machining processes and components
- Program and process implementation directly at the production facility
- Full control of costs during decision making thanks to high transparency and relevant documentation
- Accompanying support from planning and development to preseries

**Core Components >> In-house manufacturing at MAG Corcom**

- **Complex welded parts**
  - Machine beds, Y-stand

- **Tool magazines**
  - Disk, chain, drum and cartridge magazines with or without automatic tool changer

- **Rotary tables**
  - Direct and pallet loading, worm gear units, torque motor and index rotary tables

- **Clamping devices**
  - Workplace families from small to large scale series

- **Pallet changer**
  - Automatic pallet changer, Motor-driven rotating loading positions

- **Spindles**
  - Motor, gear and belt-driven spindles, solutions for milling and turning

- **Precision manufacturing**
  - Rotatory and cubic parts

- **5-axes solutions**
  - Tilt spindles, B-on-A-axis

- **Engineering**
  - Modular system development, standardization, commissioned design

- **Core Components >>**
  - In-house manufacturing at MAG Corcom
Clean and clear service for MAG machines

Reasons for MAG Service Solutions

- Clearly arranged, service- and function-oriented design of MAG machines
- Compact design through walk-in service and maintenance area
- Clear layout and centrally arranged fluid boxes and electric control cabinets
- Online Shop with high availability of spare parts and 24/7 delivery service
- Repair, overhaul and exchange service for spindles with loop program
- Engineered Services in technology, training, hard- and software

Excellent customer service with original spare parts – spindle service included

Customer Service

- Service hotline with 24/7 support
- Repair service
- Maintenance
- Retrofit and rebuild
- Used machines
- Machine relocation
- Servicing contracts

Original Spare Parts

- 24/7 spare parts service
- MAG Online Shop
- Customized spare part concept
- Central warehouse ensuring high availability of parts

Spindle Service

- Repairs
- Overhaul
- Loop programs
- Exchange spindles

Engineered Services

- Integration of technologies
- Complete Care
- Optimization of production
- Training
- Software Solutions
- Energy management
- Fingerprint

Your Spindle Service Advantages:

- Spindle service – a keystone of MAG Group
- Easy and quick exchange of motor spindles of SPECHT® machines
- Lifting device included in delivery
- In no time at all, you can pull out the motor spindle from the rear and just as easily put it back again using the existing lifting device and a cran
Product-related Software Services for increased Productivity

**Productivity**
- Overall Equipment Effectiveness (OEE) – availability, performance and quality
  - > Transparency
  - > Detection of bottlenecks
- Order Tracking
  - > Optimized workflow
  - > Transparent productivity
- Intelligent Tooling
  - > Shorter cycle times
  - > Lower energy consumption

**Quality**
- Vibration Analysis
  - > Monitoring of machine status
- Online Status Monitoring
  - > Higher availability
  - > Lower maintenance costs
- Energy Consumption Display
  - > Transparency
  - > Idle mode
- e-Learning
  - > Online training platform
  - > Reference for service

**Flexibility**
- Process and Machine Simulation
  - > Visualization of machining processes entailing highest transparency already at planning and bid phases
  - > Process and cycle time optimization
  - > Collision detection

**Smart Tooling**

**Virtual Machine**

**Energy Monitor**

**MAG University**

**eLog**

**eMonitor**

**Environment and Ergonomics**
Productivity

- **Dry Machining (MQL)**
  - Efficiency increase and cost reduction

- **Cryogenic Machining**
  - Productivity increase
  - Extended service life

Flexibility

- **Adapter plate systems**
  - Flexibility of workpieces

- **Honing and thermal coating**
  - High flexibility of the system

Quality

- **Machining in one setup**
  - High quality
  - Low investment volume

- **Temperature compensation**
  - Reliable quality

Environment and Ergonomics

- **Compensation during the machining process**
  - Less scrap

- **Hard fine machining**
  - Hard fine machining of main and pin bearings, and flange and pins
  - Dry machining reduces finish machining production costs on a sustained basis
System Expertise

**Turnkey**
- Expertise in integral designing of process and system environments
- Expertise in layout, engineering, project management and system integration as well as well as start of production (SOP)

**Volume Flexibility**
- System layout for demand-oriented output expansion
- Tailored system layout
  - Parallel processes
  - Sequential processes
  - Hybrid systems

**Productivity +**
- Customer valued USP
- MAG machines only

**Workpiece Flexibility**
- System structure for future workpiece types and requirements (Reconfigurability)
- System life > 20 years
  - Workpiece life < 7 years
- System workpiece flexibility
  - Flexibility to cope with future workpiece types

**System Life**
- System life > 20 years
  - Workpiece life < 7 years
  - System workpiece flexibility
  - Flexibility to cope with future workpiece types

**Continuous Optimization**
- Continuous optimization through Simultaneous Engineering
  - Activating untapped potential
  - Increasing system efficiency

**Learning with system – productivity increase through employee motivation**
- MAG e-Learning
- Blended learning

**MAG Machines only**