26 EMAG EN NEWS

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KARSTENS
KOPP
NAXOS-UNION
KOEPFER
LASER TEC
ECM
ELDEC
RICHARDON

EMO Hannover
18-23·9·2017

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HALL 17, BOOTH C31

INDUSTRY 4.0 – MOVING TOWARDS THE INTELLIGENT FACTORY

What will the factory of the future look like? In short: Networked!

An intelligent entity which, on the one hand, accomplishes every production requirement efficiently and economically, and on the other, is able to learn and to improve itself.

EMAG is working consistently on digitizing and networking its production technologies. One of the starting points is the large quantity of sensor, operating and production data which every machine tool produces while in operation. This source offers many opportunities to better monitor and control production.

MultiMachineMonitor

Full control of all machines in production on a single terminal device

MultiMachineMonitor offers an overview of all machines in production. All selected persons are informed if it is necessary to intervene. This process allows for the minimization of machine downtimes.

MachineStatus

The whole manufacturing process at a glance

MachineStatus clearly presents all operating and production data on a central dashboard. Whether it is quality analysis, production status or comparisons of energy efficiency, with MachineStatus all information is just a mouse click away.

PartStatus

Detailed analysis of the process and machining parameters

Using MachineStatus facilitates the traceability of the production and quality data of a workpiece. In this way, machining processes can be specifically analyzed and optimized, in order to improve quality and to reduce costs.

EC Data

Workpiece tracking th
process and quality d

WORLD PREMIERE

Industry 4.0

LIVE AT EMO Hannover 18-23·9·2017

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"4.0 TOOLS"

The buzzword "Industry 4.0" contains many possibilities allowing a company to produce more quickly, precisely and flexibly. In order to take advantage of these changes, those interested are required to make many virtual adjustments. EMAG is continuing to develop the tools necessary to support this. Here are a few examples:

+ **LifetoolAnalytics:** The system continuously monitors the wear and tear on the tools.
+ **eQC RFID:** Every inductor tool on a MIND hardening machine from EMAG eldec contains an RFID chip. Before manufacturing starts, eQC RFID checks to verify that the correct tool has been selected, and what condition the tool is in.
+ **SolidProcess:** Finished components undergo measurement while still in the gear hobbing machine. If required, the feed of the tool can be automatically corrected – a self-learning system.

hrough operating, ata

EC Data is a software package that facilitates the traceability of the production and quality data of a workpiece.

SecurityAssessment

The central security control for EMAG Industry 4.0 products

With SecurityAssessment you have full control over your data. The detailed access control facilitates the control and release of data right down to the sensor level. This is how EMAG guarantees that your data is only made available to those who really need it.

Fingerprint

Assessment of machine condition – at any time

The movements of the axes are recorded with the aid of sensors. EMAG Service prepares a reliable diagnosis of the condition of the mechanical components by analyzing this data and comparing it with EMAG reference data. Condition-oriented maintenance is made possible and the availability of the machine is increased.

Remote Experts

The complete EMAG expertise at the push of a button

With Remote Diagnosis, you have the most efficient means of detecting and rectifying failures and errors if service is required, right at your disposal.

If there is a fault, the EMAG service team will be available to you at the push of a button using Remote Experts. This service will also supply you with detailed, quarterly machine evaluations.

VLC 50 TWIN – HIGHLY PRODUCTIVE SIMULTANEOUS MACHINING

Twin-spindle turning center for the highly productive manufacturing of workpieces up to 75 mm in diameter

The VLC 50 TWIN has two main spindles in one machining area which can simultaneously machine two identical workpieces. This method allows for a massive increase in output quantities and lowers cost per piece.

The diameter and length of both components can be corrected independently of one another using both spindles. In addition, the machine also has a direct position measuring system and a linear motor in the X-axis to ensure the highest machining quality and maximum productivity.

HIGH SPEED **LINEAR MOTOR**

1g

- Machine base made of MINERALIT® polymer concrete
- Linear motor (secondary component) in the X-axis
- Slide unit (X-axis)
- Spindle unit (Z-axis)
- Direct position measuring system (Z-axis)
- OP 10 / OP 10 automation belt
- Tool turret for 2 x 4 VDI30 or BMT45 tools
- Chip tray for wet and dry machining

TECHNICAL DATA

Workpiece diameter, max.	75 mm
Chuck diameter	140 mm
Swing diameter	160 mm
Workpiece length, max.	75 mm
Workpiece weight	1 kg
Travel distances X / Z	600 / 200 mm
Main spindle	
» Power rating, 40% / 100%	9.9 / 9.4 kW
» Torque, 40% / 100%	136 / 95 Nm
» Number of revolutions, max.	6,000 rpm
Rapid-traverse rate X / Z	80 / 30 m/min
Tool stations	2 x 4 – VDI30 / BMT45
CNC controls	Fanuc 31i with MANUAL GUIDE i

Planetary gear

Workpiece
diameter: 38 mm
Material: 20CrMoH

Sleeve

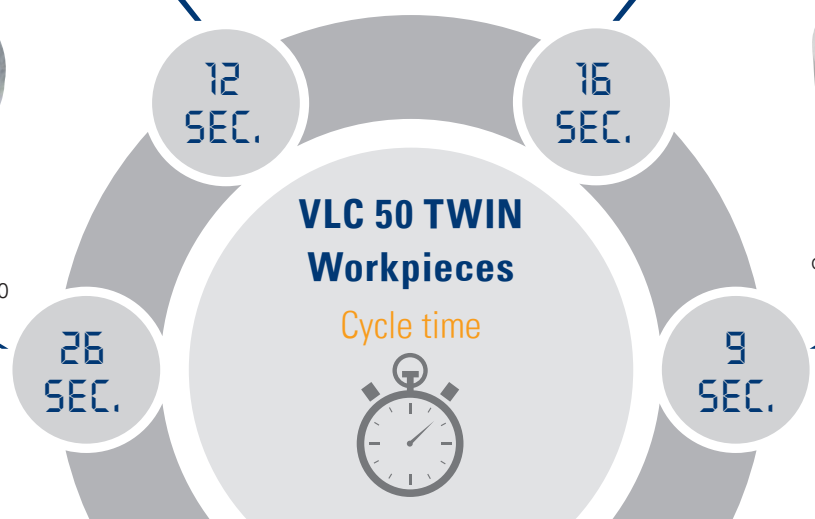
Workpiece
diameter: 51 mm
Material: 21NiCrMo2

Flange

Workpiece
diameter: 52 mm
Material: CrNi1810

Cam

Workpiece
diameter: 42 mm
Material: 100Cr6



SIMULTANEOUS MACHINING FOR HIGHLY PRODUCTIVE MANUFACTURING

WORLD PREMIERE

VLC 50 TWIN

LIVE AT EMO Hannover 18-23·9·2017

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MULTI-SPINDLE TURNING

HIGHLIGHTS

+ High precision
Machine base made of MINERALIT® with optimal vibration-damping properties, size 45 linear roller guides as well as a direct positioning measuring system in the X-axis for optimal positioning, repetition and long-term accuracy.

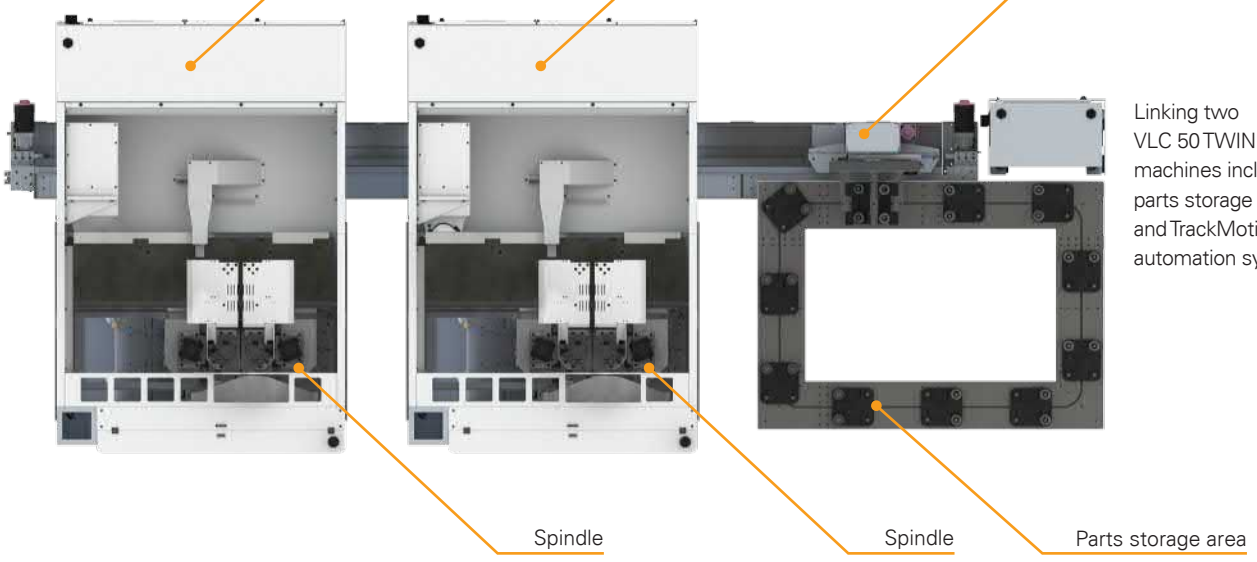
+ Integrated automation
Two pick-up working spindles for loading / unloading. "Automation ready": linking with other EMAG machines / technologies (e.g. gear hobbing) possible thanks to TrackMotion automation system.

+ Unique TWIN concept
Simultaneous machining of two identical workpieces is possible, doubling the output and reducing the cost per piece. Diameter and length (X / Z direction) of both components can be corrected independently of one another using the two spindles.

+ Maximum dynamism
Linear drive in the X-axis for maximum dynamism (1g acceleration), minimal wear and maximum positioning accuracy.

AUTOMATION INCLUDED

On the VLC 50 TWIN machines, the working spindles are not only used to machine workpieces, but also to load and unload them. This saves money, space and unnecessary peripheral devices.



Linking two VLC 50 TWIN machines including parts storage area and TrackMotion automation system

MEASURING – FULLY INTEGRATED

Optional measuring stations are available outside the machining area. The measuring stations are installed between the machining areas and the pick-up stations. Measurement is performed during transportation to the loading / unloading station, thus saving time.

HLC 150 H – COMPLETE GEAR CUTTING SOLUTION PROVIDES MORE FLEXIBILITY AND REDUCED COSTS

Horizontal gear hobbing machine with integrated chamfering unit for maximum productivity.

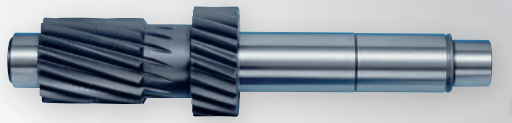
The new HLC 150 H impresses with a wide range of new developments that cover a unique range of the manufacturing spectrum.

Whether it is a steering pinon or shaft, straight, helical or worm gears, the HLC 150 H puts the full expertise of EMAG KOEPFER at the user's disposal. This unique machine is complemented by the chamfering and deburring of components parallel to the machining process which takes place during loading/unloading.

Machining of gearbox shafts with gear hobbing and chamfering free of secondary burrs

The first step is the gear hobbing of the running gears (roughing), then the gears are pressure-deburred and the second gear hobbing process represents the final dressing.

The result is a burr-free, chamfered running gear.



TECHNOLOGY IN THE HLC 150 H

- Gear hobbing
- Chamfering
- Worm gear peeling
- Worm gear milling
- Skiving

BENEFITS OF THE HLC 150 H

+ Uniquely broad range of workpieces for pinions, shafts and gears as well as worm gears
+ Integrated chamfering technology
+ Drive technology with extraordinary performance data for high-performance machining
+ Attractive price-performance ratio

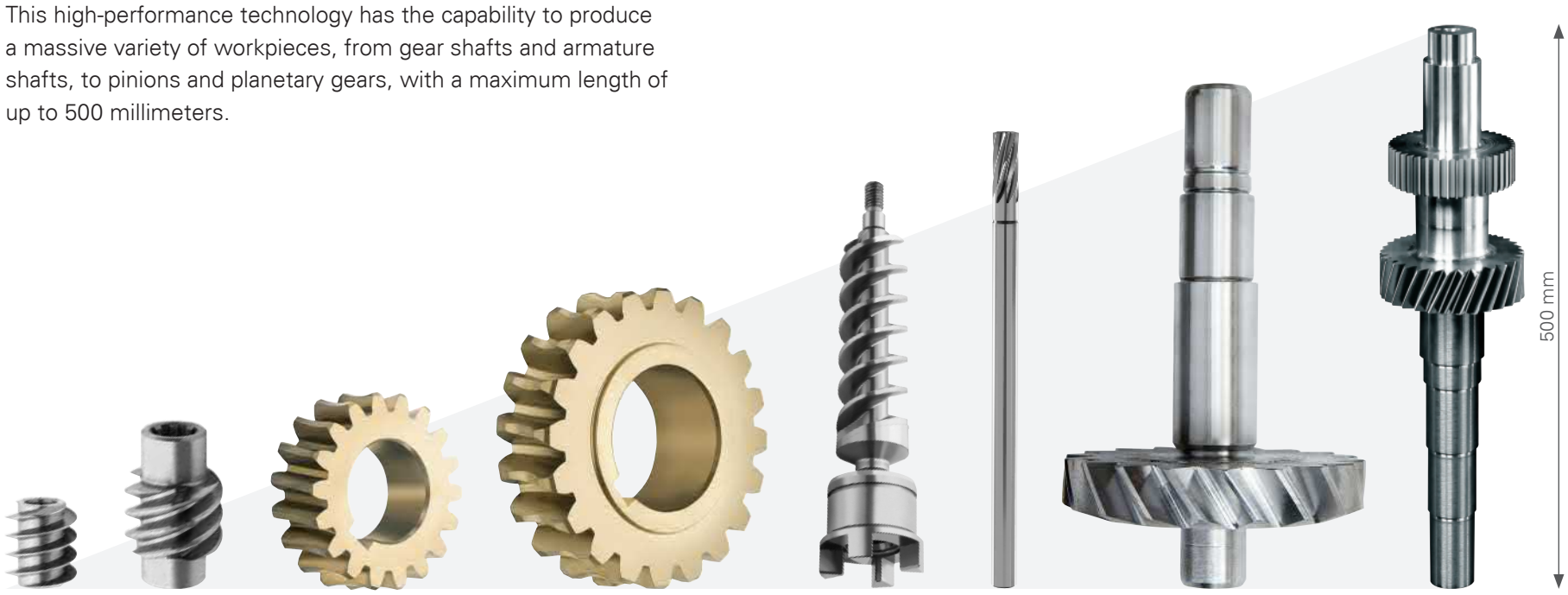
There is a high-speed loading portal with double rotary gripper or a linear gripper in a V layout available for automation.

TECHNICAL DATA

Module, max.	3
Workpiece diameter, max. (fully automatic)	150 mm
Workpiece length, max.	500 mm
Shift distance, max.	220 mm
Cutter diameter, max.	120 mm
Torque, max.	130 Nm
Milling head drive rating, max.	28 kW

RANGE OF WORKPIECES FOR THE HLC 150 H

This high-performance technology has the capability to produce a massive variety of workpieces, from gear shafts and armature shafts, to pinions and planetary gears, with a maximum length of up to 500 millimeters.



MANUFACTURING SOLUTIONS FOR EVERY MODULE SIZE

With gear cutting machines from EMAG KOEPFER and EMAG Richardon, the EMAG Group offers a wide range of toothing solutions for almost every module size – with a choice of gear hobbing or hob peeling processes.

K Series

K Series horizontal gear hobbing machines from EMAG KOEPFER

The K Series gear hobbing machines are characterized by a sturdy machine design, combined with the most up-to-date gear hobbing technology.

The machines are designed for both dry and wet machining of workpieces up to module 2.5. Completing the machines are individual automation solutions and a comprehensive technology package.

EXAMPLE: K 160

Module, max.	2.5
Workpiece diameter, max.	100 mm
Workpiece length, max.	1,000 mm
Cutter diameter, max.	63 mm
Cutting length, max.	200 / 480 mm
Shift distance, max.	160 mm

VL 4 H / VLC 200 H

Vertical gear hobbing machines from EMAG KOEPFER for gears up to module 4

These vertical gear hobbing machines combine the expertise of EMAG KOEPFER, the gear production and hobbing specialists, with the standard EMAG machine concept, the vertical pick-up machine. This results in gear hobbing machines that guarantee maximum quality and productivity. Particularly in the manufacturing of gears for gearbox components up to module 4 with a diameter of 200 mm. which can be efficiently produced using these machines.

EXAMPLE: VL 4 H

Module, max.	4
Workpiece diameter, max.	200 mm
Workpiece length, max.	200 mm
Cutter diameter, max.	100 mm
Cutting length, max.	180 mm
Shift distance, max.	200 mm

R-WSM
from EMAG Richardon

Hob peeling is a highly productive alternative for gear production – it is clearly more effective than gear shaping and more flexible than broaching, particularly for the machining of internal gears up to module 5.

The benefits of hob peeling versus gear shaping / broaching:

+ Internal gears, external gears, hard precision finishing – on a single machine
+ Manufacturing of crowned, conical and helical gears
+ A multitude of corrective possibilities
+ Separate modification of the right and left edges
+ High-speed process

R Series
Gear hobbing machines from EMAG Richardon: maximum flexibility for a wide range of parts

Long travel distances, large machining areas plus a drive with a broad range of speeds – these features allow the gear hobbing machines in the R Series from EMAG Richardon to provide exceptionally flexible gear cutting solutions. Those users who wish to cut a lot of different components on one machine benefit most.

EXAMPLE: R-400

Module, max.	12 (25)
Workpiece diameter, max.	700 mm
Workpiece length, max.	1,500 mm
Cutter diameter, max.	180 (300) mm
Cutting length, max.	1,000 mm
Shift distance, max.	350 mm

In addition, the specialists can flexibly integrate important processes into the machines, like deburring, chamfering, brushing or post-turning. This results in multi-functional gear hobbing machines – precisely designed for a broad range of parts.

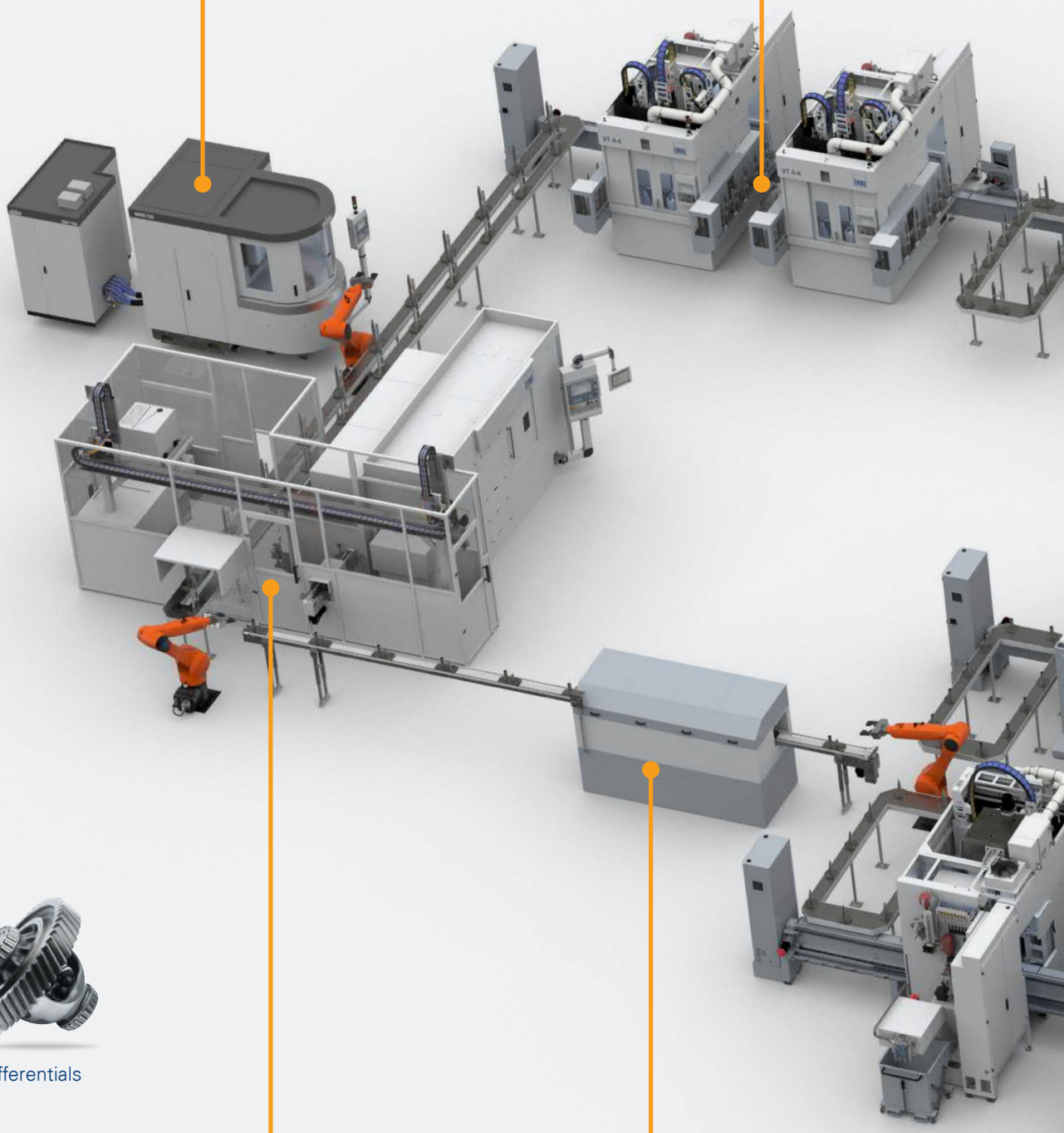
Parts such as spur gears, shaft gears, drilling parts (up to module 25, tooth length of 1,000 mm) as well as worm gears, worm gear shafts, rotors and straight bevel gears can be machined precisely, effectively and in alternation with the R Series.

E-MOBILITY – ELECTRICITY IS IN

Majority of experts have long predicted that the number of cars with an electric motor will soar in the coming decades.

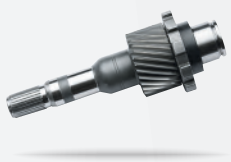
However, these vehicles, which often appear in studies under the heading "e-mobility", in most cases will have a hybrid drive system including a combustion engine.

Nevertheless, the electric revolution is in full swing and accompanying it are other innovations such as autonomous driving. Yet what is seldom referred to in current discussions is that the increasing number of electric motors will also require new production solutions in order to be able to produce the components more quickly and efficiently.
Compared to the usual quantities produced in automotive manufacturing, electric cars are currently being produced in extremely small batch sizes.




Gears


Gears


Gearbox shafts


Differentials


Rotor

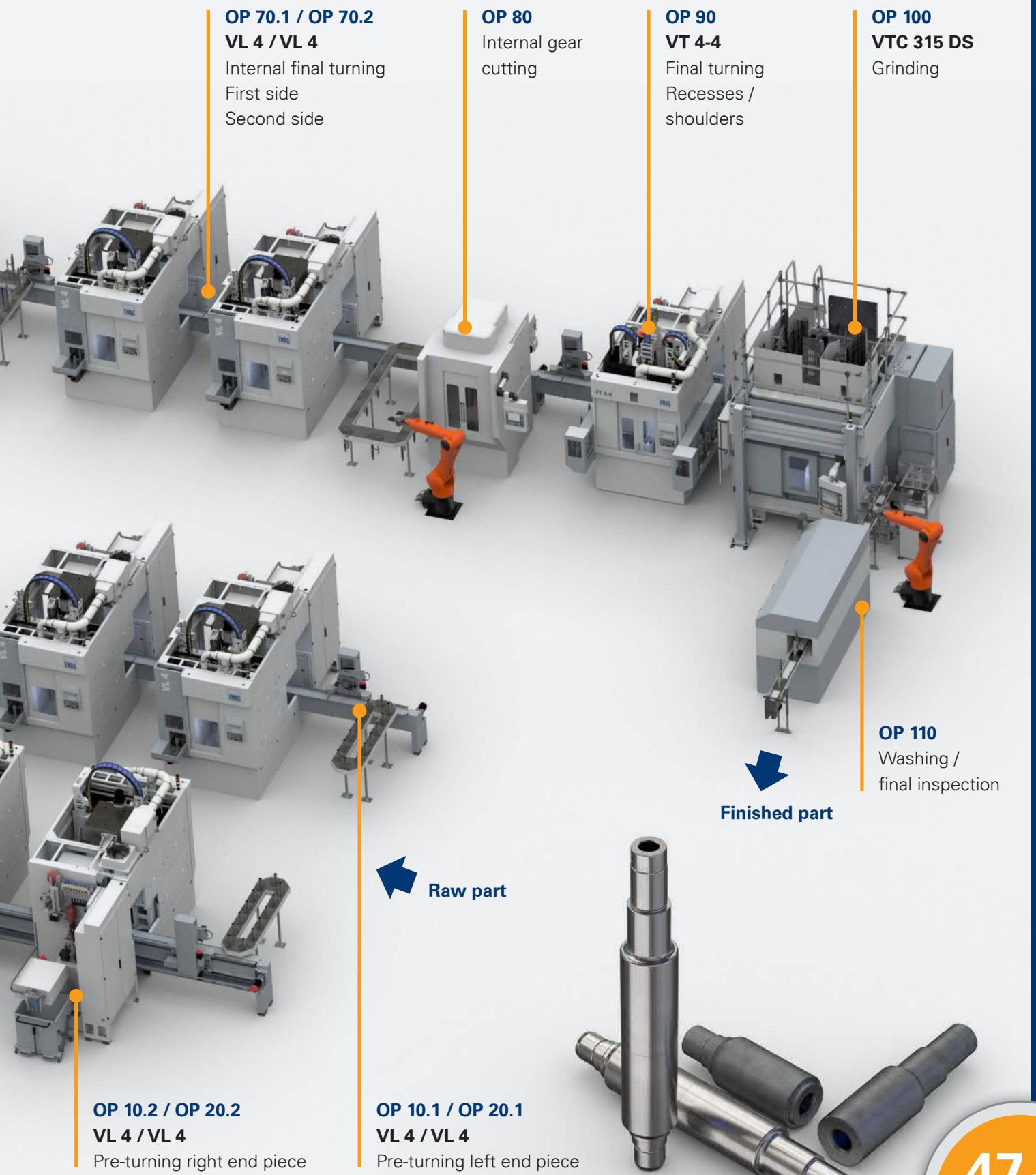

Rotor


Rotor cover


Rotor cover

SMALLER, LIGHTER, MORE PRECISE

For a long time, "lightweight construction" has shaped the automotive industry. This topic will be even more important for electric cars because with less weight, they will be able to travel longer distances before re-charging the batteries. EMAG has at its disposal a range of applications which simplify the lightweight construction of many components (e.g.: laser welding, pre-heating & joining technology, ECM etc.) – with the highest machining quality.



MACHINING OF ELECTRICAL MOTOR SHAFTS IN SEVERAL SECOND CYCLES

EMAG already offers the perfect complete solution for the production of central components for every electric car. This includes the turning machines in the VL and VT series, ELC laser welding machines, induction hardening machines from the MIND series as well as grinding machines of the VTC DS series.

Together, they provide enormous benefits in both soft and hard machining:

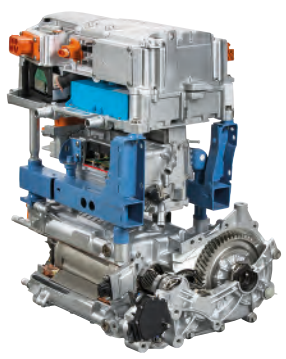
+ The technology, automation and process development all come from a single source. You'll have *a* complete solution – with short lead times and a fast production start guaranteed.
+ We coordinate the manufacturing systems, peripheral machines and automation systems perfectly.
+ The complete system developed by EMAG benefits from simple automation systems, optimized interfaces and short transport distances. This ensures that the full process can be started quickly and remains economical long term.
+ Many identical components are used in the machines, simplifying spare part ordering, and benefiting from short retooling and maintenance times.
+ A contact at EMAG takes on the central project work and makes your overall planning process easier with his experience and system expertise.

47 SEC. CYCLE TIME

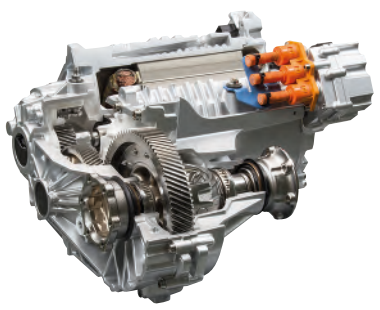
MANUFACTURING SOLUTIONS FOR ELECTRIC MOTOR COMPONENTS AT THE EMO

There are already many variants of e-mobility today, ranging from pure electric motors through mild hybrids, full hybrids and plug-in hybrids up to range extenders. The trend is clearly towards plug-in hybrids, which currently offer the best balance between pure electrical driving and range provided by the internal combustion engine.

At the EMO, we are demonstrating various drive concepts as well as the corresponding manufacturing solutions from EMAG.



RENAULT ZOE electric drive



VW e-Golf electric drive

BMW i8 electric drive

VW Touareg hybrid transmission

MODULAR, PRECISE, FAST – INDUCTION HARDENING FROM ELDEC

HARDENING MACHINE VLC 100 IH FOR MASS PRODUCTION

The VLC 100 IH hardening machine with "induction hardening" technology is based, as the name suggests, on the VLC 100 modular machine type. The EMAG vertical-lean-customized series has a very compact design and is built on a machine base made of Mineralit® polymer concrete. Other design features include the customizable side-mounted part storage area, and the self-loading pick-up automation system that minimizes non-productive time.

The automatic loading of the machine also ensures an optimum clamping operation of the workpiece, and contributes to the high quality of induction hardening.

Due to a center drive chuck, suitable components can be simultaneously top and bottom hardened (e.g., rotor shafts, axle jacks).

LIVE AT THE EMO!
Hall 17
Booth C31

BENEFITS OF THE VLC 100 IH

+ Integrated automation
+ Precise and stiff – High process reliability
+ Optimal integration in production lines
+ High availability – machine base has been proven over 1,000 times

Induction soldering of flat copper wires with brazing pistols

ELDEC GENERATORS

eldec offers a wide range of energy sources for the induction heating in power rating from 5 to 3,000 KW, as stand-alone devices or with the help of various interfaces (e.g. Profibus, Profinet) and the ability to be integrated into complete production systems.

PICO by eldec
Compact, red, strong:
Just heat. Low-cost energy sources with a single output and very simple intuitive control MF and HF 5 – 150 KW.

eldec ECO LINE
The mid-range:
Energy sources with single or multiple outputs to act as a stand-alone solution or for integration in complete systems. MF and HF 5 – 150 kW.

eldec CUSTOM LINE
Everything is possible:
Bespoke energy sources with single or multiple outputs and a wide range of power and frequency combinations. LF, MF, HF, DF, SDF® 20 – 3,000 kW.

INDUCTION HEATING WITH THE SUPPORT OF ELDEC

In addition to the hardening systems already shown, eldec also offers solutions for industrial soldering, joining, fusion, preheating for welding, cutting edge hardening and many other applications for electrical machine engineering in the automotive and aerospace industries.

eldec MICO-M:
Mobile induction heating

INDUCTION HARDENING

is a surface hardening method in which the chemical composition of the material is not changed. The advantages are short heating times (0.5- 5 sec), integration into a single workpiece flow, low distortion, high energy efficiency and traceability with process data assignment.

ELDEC MIND – PRODUCTIVITY DOWN TO THE VERY LAST DETAIL

The MIND modular induction hardening machine from eldec represents maximum precision, uncompromising process reliability and economical part production.

The modular system is used to configure the basic machine and energy source, coolant system, automation and inductors. EMAG eldec offers a unique selection of low frequency (LFG), medium frequency (MFG), high frequency (HFG), dual frequency (DFG and simultaneous frequency generators (SDF)). With its solidly manufactured welding assemblies, high precision drive technology and start-of-the-art energy sources (including dynamic control and regulation), quality is guaranteed for every component.

Keeping perfect time

With this flexibility, keeping perfect time is almost guaranteed. The MIND hardening machines are available as either manually operated stand-alone solutions, as heat-treatment systems with individual automation level or as hardening cells, with the ability to be completely integrated into the process chain.

In short: MIND-systems from eldec are economical solutions for demanding induction hardening tasks – always customized for specific requirements.

eldec MIND: Modular induction hardening systems

1 Basic machine:

Part diameter, max.:	600 / 1.200 mm
Part length, max.:	750 / 1.500 mm
Workpiece weight, max.:	500 kg

2 Energy source:

LFG (Low frequency) power:	50 kW – 500 kW
MFG (Medium-Frequency) power:	5 kW – 1.500 kW
HFG (High-Frequency) power:	5 kW – 1.500 kW
DFG (Dual-Frequency) power:	50 kW – 200 kW
SDF® (Simultaneous Dual Frequency) power:	15 kW – 3.000 kW

3 Tool / inductor:

Helped by FEM simulation and 3D CAD, produced on high-precision CNC machine tools and completed by experienced experts.

4 Coolant system:

Precisely dimensioned depending on system configuration and customer circumstances.

ELC 160 HP – HIGH PERFORMANCE FOR THE WELDING OF GEARS

Four processes simultaneously – high performance due to perfect timing: the automatic retooling of the ELC 160 HP can flexibly process all the ratchets of a gearbox without a break in production.

Within a production line, the ELC 160 HP covers the sub-operations of joining (pressing), pre-heating for welding and finally laser welding. These sub-processes run in parallel in order to achieve the shortest possible cycle times. The ELC 160 H is a rotary indexing machine and therefore predestined for highly productive manufacturing. By using a method patented by EMAG for automatic retooling of the workpiece clamping technology, the ELC 160 HP is able to flexibly manufacture different workpieces for batch sizes as small as one.

The ELC 160 HP is a manufacturing solution from EMAG that was especially developed for the joining and welding of wheel and clutch bodies.

LOADING

The machining process starts at the loading or unloading station. There are two pick-and-place units available fitted with pneumatic grippers for transporting parts from the conveyor belt to the index table and back.

JOINING STATION

The joining station can be fitted with up to three (different) joining punches. These can be selected by NC commands and retooled with no loss of time.

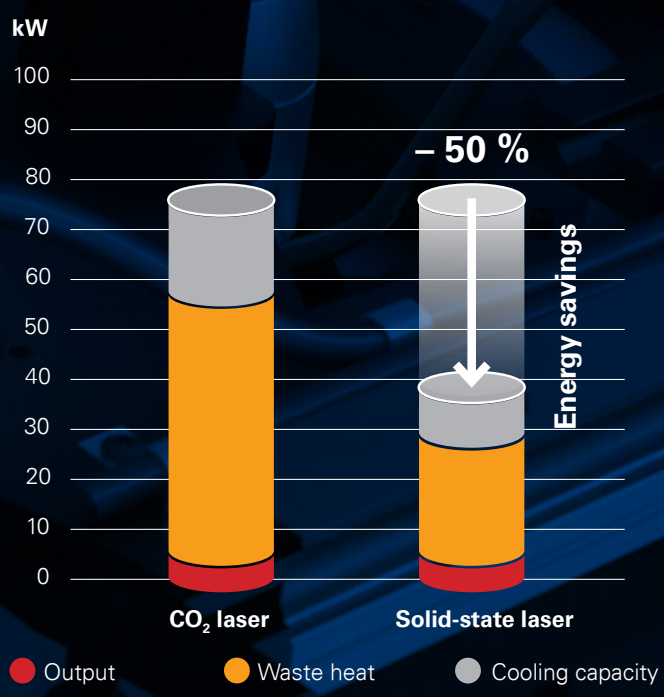
INDUCTION PRE-HEATING

Here, there is a slide unit with a maximum of two inductors available, which can be automatically retooled.

ELC 160 – universal solution for automatic gearbox and dual clutch parts

The ELC 160 was conceived according to the trusted "moving workpiece / fixed tool" principle. The fixed guide and welding lens for guiding the laser beam is therefore extremely safe in operation and servicing-friendly as it is very easily accessed for adjustments and maintenance work. Different "tools" for up- and downstream operations can be easily integrated, thus creating customer- and part-specific optimized solutions.

Compared to a CO_2 laser, the solid-state laser used delivers the same optical output but at considerably lower energy costs.



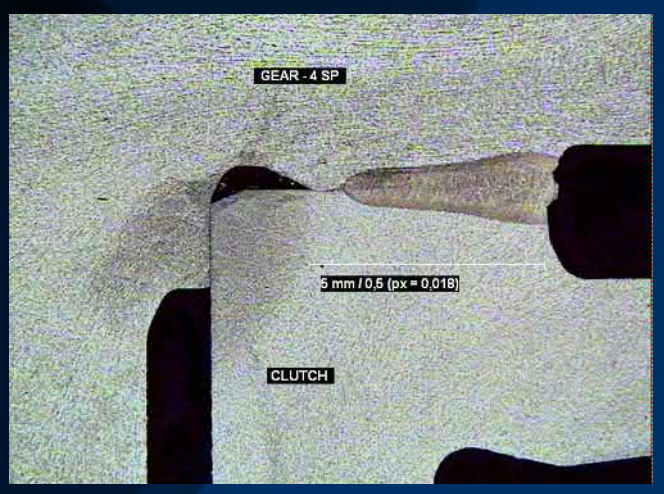
LASER WELDING

The clamping and fixing technology can be automatically retooled for different workpiece geometries in time with the machine cycle.

CYCLE TIME OF 10 SECONDS PER RATCHET

Manufacture of differential gears on the ELC 250 DUO laser welding machine

The twin-spindle machine follows the typical EMAG pick-up principle. This facilitates loading and unloading during the cycle time. Machining at two stations (one for laser cleaning, the other for laser welding) only requires one laser source. The laser beam is simply switched to and fro between the two welding stations. This improves the usage of the laser and increases the productivity of the laser welding system.



PERFECT CONNECTION

Precision mechanical engineering and the latest laser technology ensure maximum, uniform quality.

THE LATEST TESTING TECHNOLOGY

The workpieces are checked by ultrasound after each operation to guarantee uniform high quality.

MACHINING ROTOR BRACKETS

AT THE EMO!
Hall 17
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Rotor brackets, a component of electric motor housings for hybrid vehicles, are being manufactured in increasingly large numbers. Electro-checmical machining (ECM), provides major benefits in their production.

ECM technology is characterized by the residue-free and non-contact machining of metal parts, making it perfect for the production of thin-walled workpieces such as rotor brackets. Any deformation is precluded as there is no contact at any time between the rotor bracket and the tool. In addition, ECM machining leaves behind finished surface qualities, eliminating the need for reworking.

1 SIMPLE

+ Burr-free machining
+ No chips

TECHNICAL DATA

Machining area	1,150 x 950 mm
Vertical stroke	300 mm
DC	2–55 / 400–5,000 V / A
Pulsed power, max.	12,000 A
Electrolyte	$NaNO_3$ / NaCl
Operating pressure	10 bar

WHAT IS ECM?

Electro-chemical machining is an erosion production process for particularly hard materials, designed for simple deburring work, all the way up to the manufacturing of complicated three dimensional shapes.

THE BENEFITS

+ Non-contact machining without thermal and mechanical effects
+ Complex geometries are possible
+ No process-related cathode wear
+ Peak-to-valley heights of up to Rz 0.2 / Ra 0.05 (depending on material)
+ Machining of hardened components and high temperature-resistant materials
+ Scalable cycle times thanks to the equipment design

2 STURDY

+ Thermally neutral machining
+ No micro-cracks
+ No white layer

3 FAST

+ Machining of several workpieces at once
+ Several cathodes active at the same time

4 VARIABLE

+ Soft and hard machining

5 FORCE-FREE

+ No mechanical stresses / deformation of thin wall workpieces

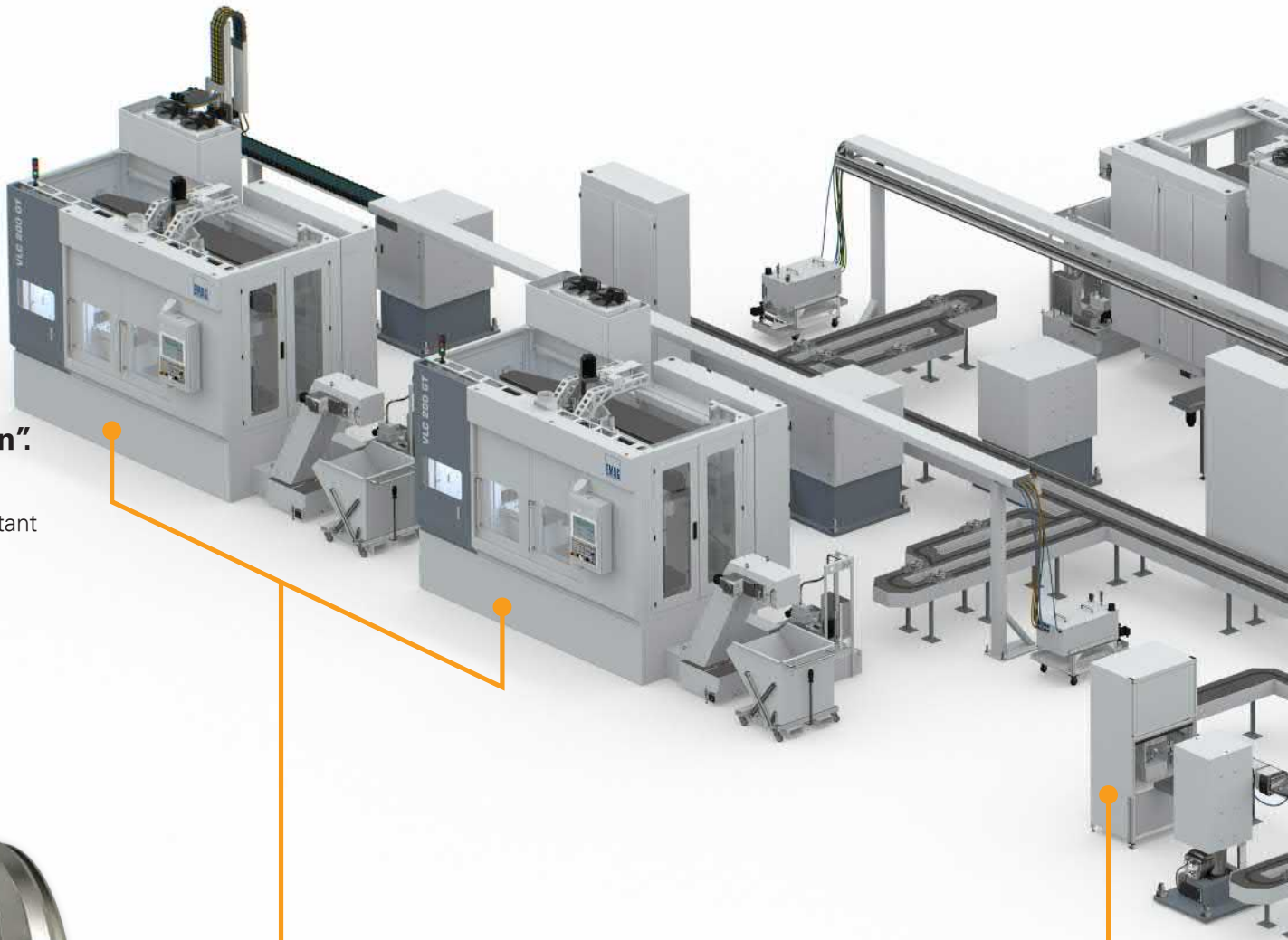
ROTOR BRACKETS

+ ECM gear “broaching”
+ Electro-chemical drilling

PULLEY PRODUCTION SYSTEM FOR CVT GEARS

The abbreviation “CVT” stands for “Continuously Variable Transmission”.

Frequently, this technology is being used in the production of hybrid drives, making it a very important component for the future of electric mobility.



OP 120
Turning / grinding

OP 130
Finishing

VLC 200 GT

Hard turning, external and internal grinding in a single machine

The VLC 200 GT combines the benefits of vertical hard turning with those of grinding – on a single machine and in a single clamping operation.

TECHNICAL DATA

Chuck diameter	210 mm
Swing diameter	270 mm
Workpiece diameter, max.	160 mm
Workpiece length, max.	100 mm
Travel distances X (total stroke from pick-up to turret) / Z	1,700 / 250 mm
Loading time (depending on clamping device)	6 – 10 sec.
Main spindle	
» Power rating, 40% / 100% duty cycle	22 / 18 kW
» Torque, 40% / 100% duty cycle	250 / 202 Nm
» Number of revolutions, max.	3,000 rpm
» Spindle bearing diameter, front	110 mm

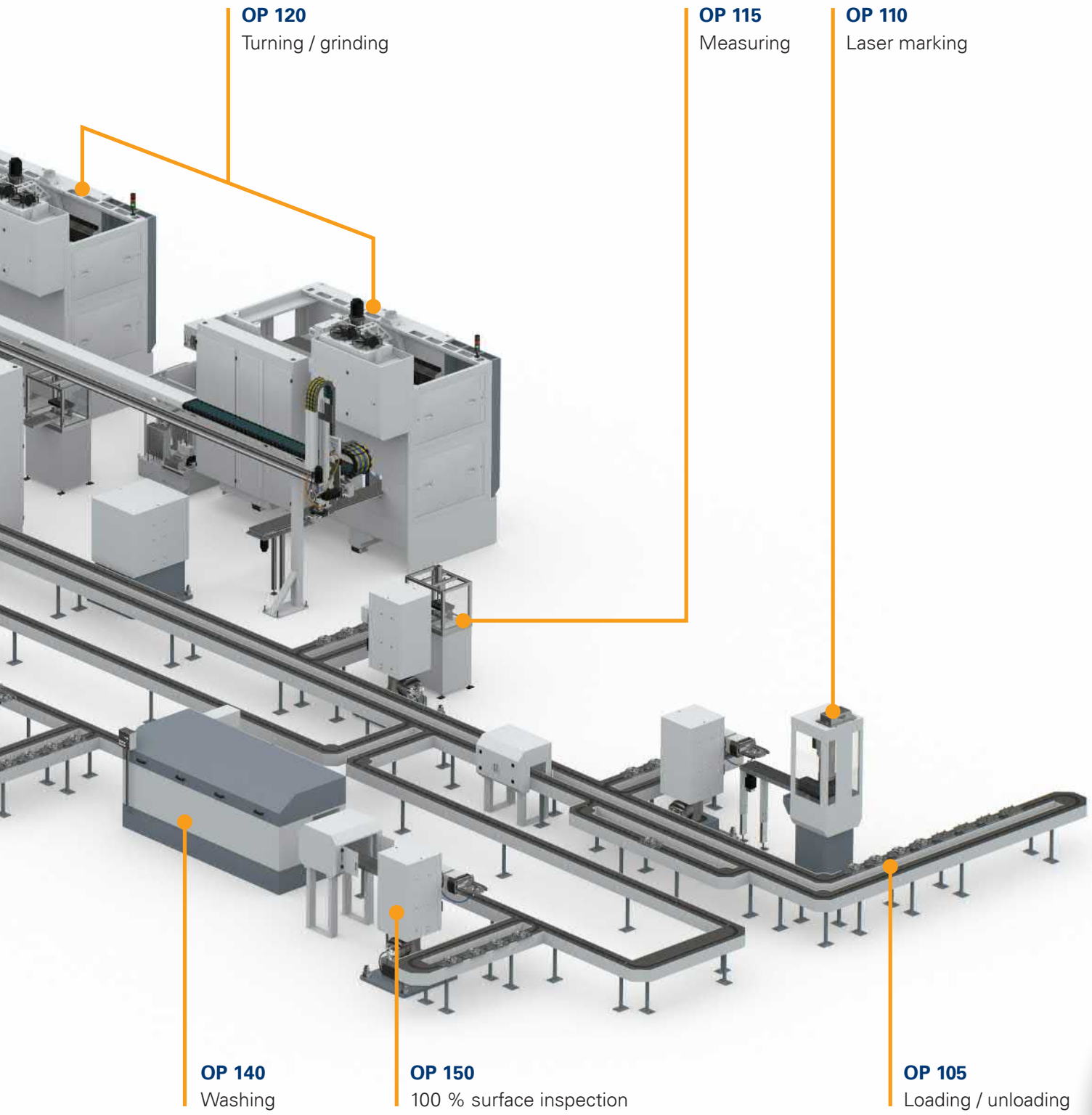
VL 3 DUO

Highly productive manufacturing

+ Fast automation: machining OP 10 + OP 20 incl. handling and turning
+ With machining times from 15 sec and no downtime of the machine
+ Up to 400 parts in the parts storage area

TECHNICAL DATA

Chuck diameter, max.	210 mm
Workpiece diameter, max.	150 mm
Workpiece length, max.	110 mm
Travel distances X / Y (optional) / Z	505 / ± 30 / 250 mm
Rapid-traverse rate X / Y / Z	60 / 30 / 30 m/min
Turret tool positions	12
Main spindle (x 2)	
» Power rating, 40% / 100% duty cycle	18 / 14 kW
» Torque, 40% / 100% duty cycle	77 / 59 Nm
» Number of revolutions, max.	5,200 rpm
» Spindle bearing diameter, front	100 mm



HARD MACHINING OF PULLEYS

The specialists for CVT gears at EMAG use the newly-developed VLC 200 GT for the hard machining of pulleys. The process is divided into three main operations:

1. First, the component is checked, marked with a matrix code and measured.
2. Then comes hard machining performed on a total of four VLC 200 GT machines. The internal and external diameters, as well as the curved surface of the component, are subjected to various turning and grinding processes.
3. Finally the process is wrapped up with additional grinding processes including super-finishing, as well as washing and a final surface inspection.

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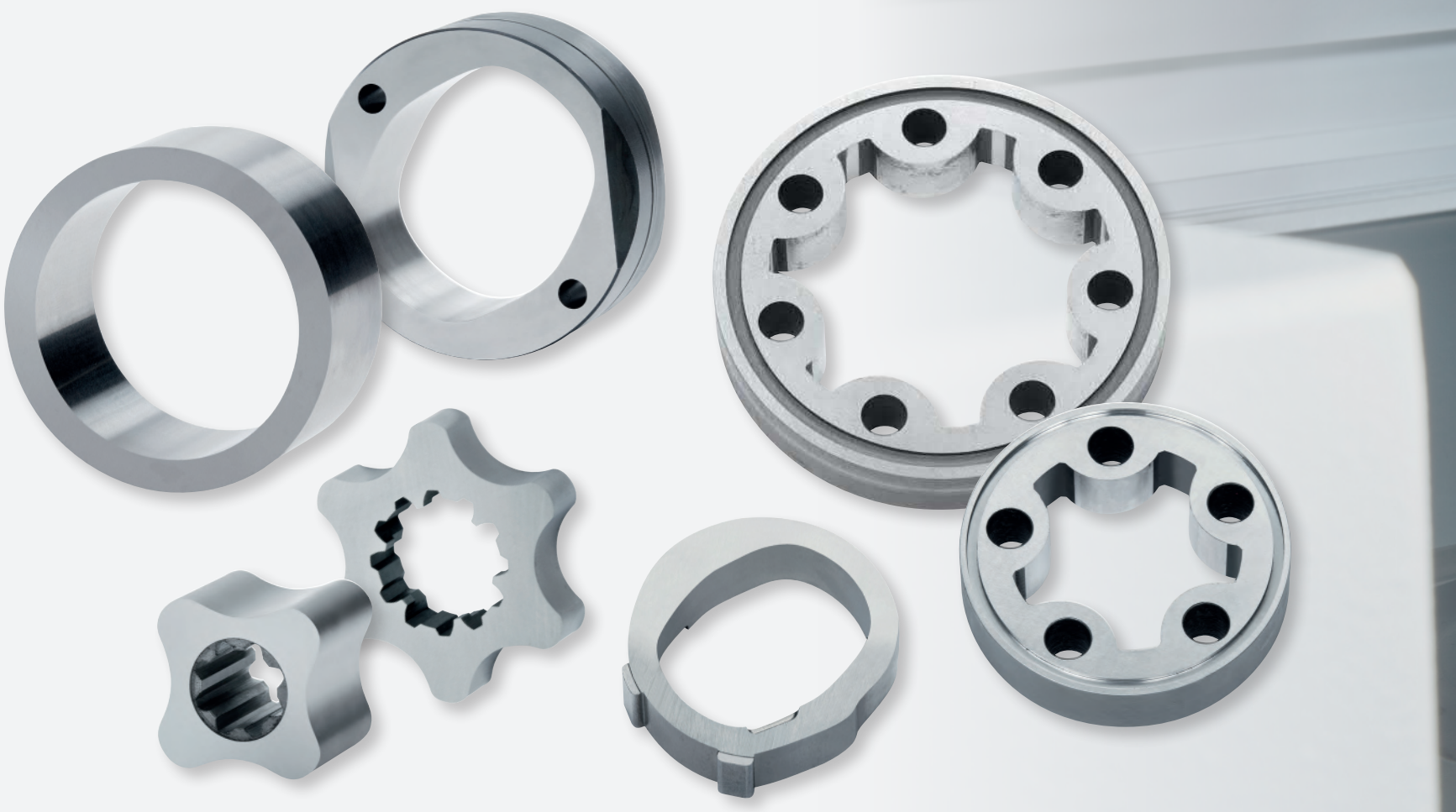
SOFT MACHINING WITH MINIMAL FOOTPRINT

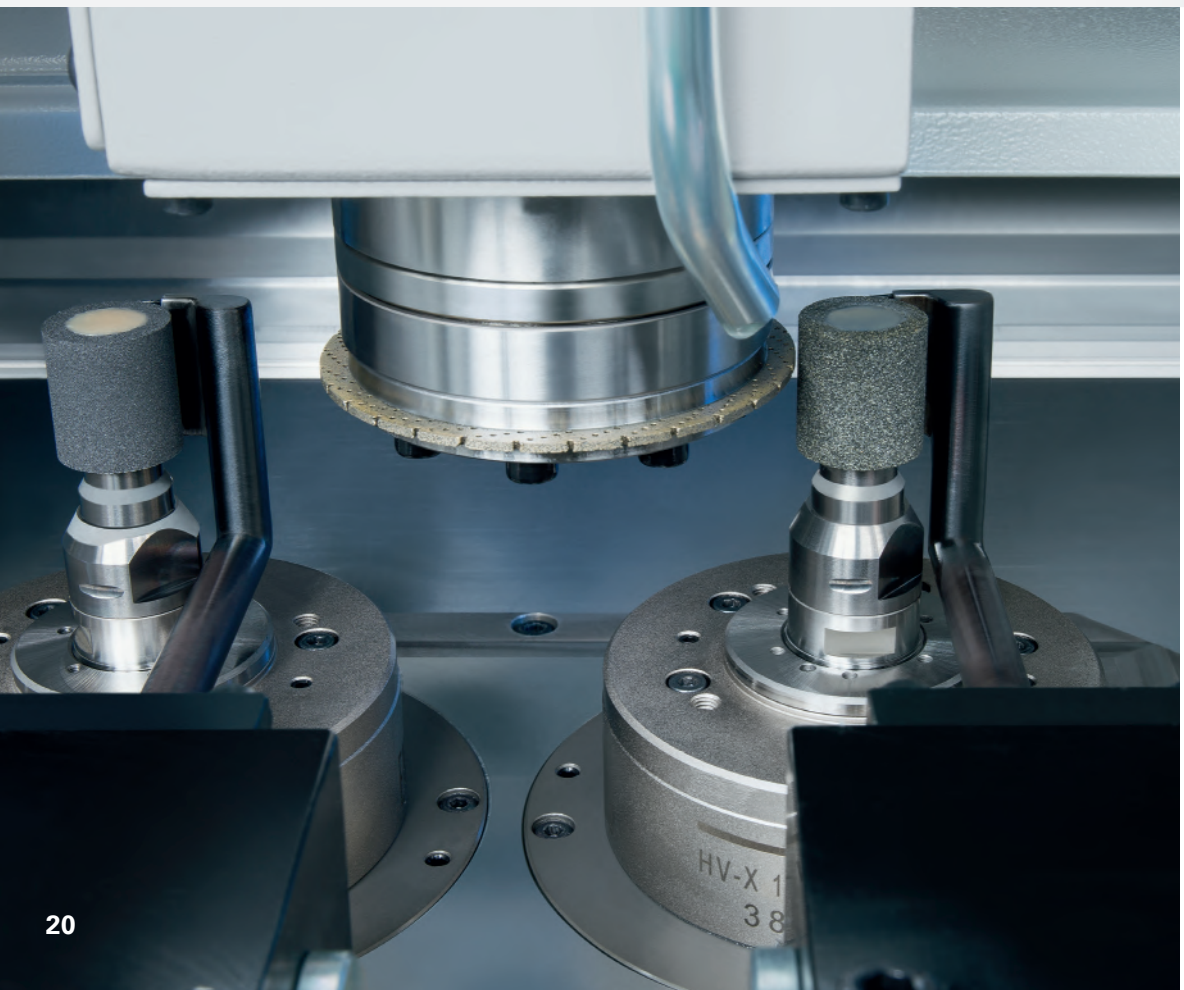
EMAG, a multi-technology company, has the ability to offer complete process chains for the production of CVT gears. For example, the twin-spindle VL 3 DUO vertical turning machine is ideal for the turning of the raw parts for pulleys. With EMAG technology, a manufacturing system for the soft machining of pulleys in just two operations can be created. This flexible manufacturing solution, which is linked using the EMAG TrackMotion automation system, can provide maximum productivity in a very small space. With the ability to offer all available loading options to the user, this system can be integrated into every manufacturing setting without any problem.

VG 110 – HIGHLY PRECISE GRINDING MACHINE FOR NON-CIRCULAR PARTS

The trend toward miniaturization of components, and increasing precision requirements continues.

For precisely this reason, EMAG has developed the VG range – for the vertical high-speed machining of small workpieces. Practical experiences, in particular in the automotive and hydraulic industries, show that the quality of the finished products and with that, success in the user's market place, markedly increase through good machining quality.





COMPACT DESIGN

The VG 110 is characterized by its extremely compact design with no additional units. The machining area can be accessed via the front of the machine. The energy container, the fluid and electrical components are mounted at the back.

The VG 110 offers all modern grinding technologies:

+ **GRINDING TOOLS**
  e.g. ceramic or galvanic CBN grinding wheels
+ **GRINDING SENSOR TECHNOLOGY**
  Adaptive grinding, initial cut detection, touch dressing
+ **DRESSING TECHNOLOGY**
  Dressing spindle for use of diamond form rolls

BENEFITS

+ High precision
+ Optimum accessibility, quick machine set-up
+ Small footprint
+ Low chip-to-chip time
+ Chips fall downwards
+ Complete machining in a single clamping operation
+ Optional turning tool
+ Ease of operation
+ Pre- and post-process measurement possible
+ Circular and non-circular grinding

TECHNICAL DATA

Chuck diameter	up to 190 mm
Machining diameter	up to 100 mm
X-axis travel distance	460 mm
Z-axis travel distance	225 mm
Spindle flange to DIN 55026	Size 5
Number of revolutions, max.	6,000 rpm
Grinding spindle speed	30,000 – 90,000 rpm
Tool unit	1 or 2
Rotating dressing roll speed	3,000 – 16,000 rpm

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Combined with an automatic loading and unloading system, the VG 110 achieves optimum economy for a maximum number of items while guaranteeing low-intervention operation. For example, the unground parts are taken from the same pallets to which they are returned once the grinding process has been carried out.

THE VM AND VMC SERIES – ECONOMICAL MANUFACTURING OF LARGE PARTS AND COMPLEX WORKPIECES

Universality is the main feature of the VMC MT series which can be configured to suit almost any customer demand. This means that the machines deliver the full range of technologies for turning, drilling and milling. Various spindle and tool socket versions round off the range.

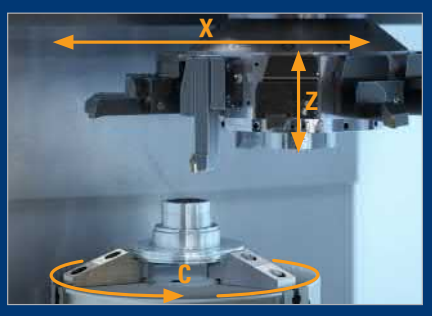
TECHNICAL DATA		VM 9 VMC 450	VM 12 VMC 600	VMC 450 MT VMC 450-5 MT	VMC 600 MT
Clamping chuck diameter, max.	mm	450	630	450	450
Travel distance X / Y / Z	mm	330 / 500	565 / 500	630 (780*) / 500 / (350*)	780 / 500
Main drive unit					
» Synchronous motor (40% duty cycle)	kW	48 / 72	72 / 106	72 / 106	72 / 106
» Torque (40 % duty cycle)	Nm	590 / 860	860 / 1,450	860 / 1,450	860 / 1,450
» Number of revolutions, max.	rpm	3,000 / 2,400	2,400 / 2,000	2,400 / 2,001	2,400 / 2,001
Workpiece height, max.	mm	300	500	300	300
Max. weight (incl. clamping chuck)	kg	300	300	300	300

THE VM 9

The VM 9 vertical turning center is designed for the manufacture of large, widely varying parts.

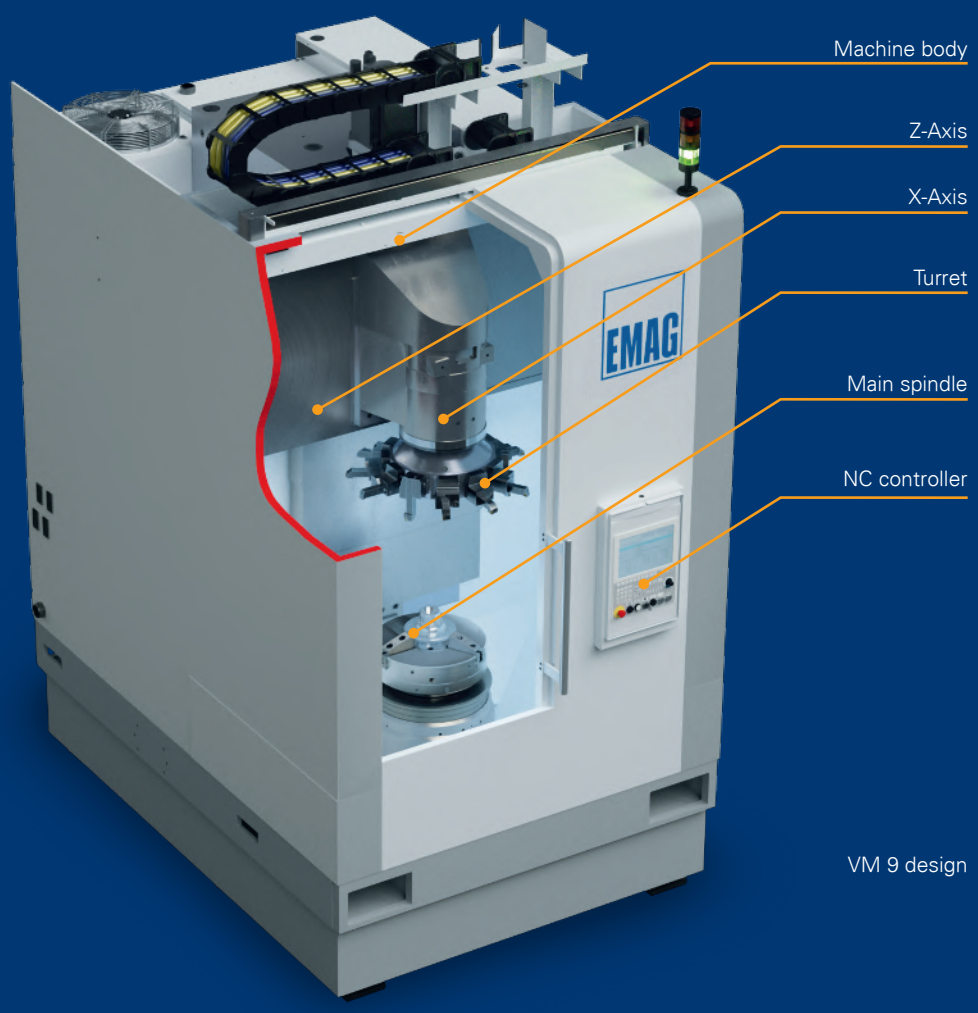
For machining, there is a tool turret with eight or twelve tool positions, depending on the tool interface desired (BMT or VDI). The turret can be equipped with driven tools to perform drilling operations, for example. The integrated probe ensures process reliability and guarantees a consistently high workpiece quality (first part = OK part).

The VM 9 is thus extremely well equipped for a wide variety of production tasks.



VM 9 axis design

Drilling and milling operations can also be completed by powered tools in the turret.



VM 9 design

THE MAIN KEYWORDS

+ **MAXIMUM PRODUCTIVITY:**
  Highly dynamic axes for short idle times and quick machining processes

+ **HIGH SURFACE ACCURACY:**
  Axis monitoring by rotary, indirect absolute encoders. All axes equipped with fully encapsulated linear glass scale (optional).

+ **SIMPLE HANDLING:**
  All the service units are easy to reach

+ **IDEAL FOR HEAVY-DUTY MACHINING:**
  Generously dimensioned main spindle, maintenance-free spindle motors and rigid guideways

+ **SHORT IDLE TIMES:**
  Thanks to short transport distances and compact design

+ **VERY LONG WORKPIECE SERVICE LIVES:**
  Machine body made of MINERALIT®, six to eight times better damping properties than gray cast iron

+ **MAXIMUM FLEXIBILITY:**
  With the additional Y + B axes, the VMC 450-5 MT is the first choice for complete machining of complex component geometries.

THE VMC 450-5 MT

The use of a tool magazine allows even the most complex geometries to be machined on a wide variety of parts. This makes the VMC 450-5 MT turning and milling machine a productivity miracle! Various tool magazines starting with 40 tool positions are available.

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Manufacturing Systems
for Precision Metal Components

EMO Hannover
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INVITATION TO THE EMO 2017

Manufacturing for a digital world

New products in manufacturing and automation for a digital world – find out how you can network, optimize, in short, revolutionize your production with solutions from EMAG.

We cordially invite you to find out more about the new developments from the EMAG Group at our exhibition booth in **Hall 17, Booth C31**.

You can order free tickets from our website at **emo.emag.com**.

We look forward to seeing you there!

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