ELC 6 LASER WELDING MACHINE

FOR MAXIMUM PRODUCTIVITY

For manufacturing rotor shafts and other powertrain components in fast cycles

EMAG

THE ELC 6 FROM EMAG

A highly efficient solution for joining the component halves of rotor shafts and similar powertrain shafts: The ELC 6 from EMAG LaserTec scores heavily with a combination of high-speed processes.

CONTENTS

INTRODUCTION
THE FAST TRACK TO MANUFACTURING ROTOR SH

EMAG LaserTec has set a new standard on the market by launching its ELC 6. This laser welding machine combines a whole range of welding processes, including joining, preheating, and welding operations as well as handling in a compact machine with its turntable system delivering excellent cycle times. Assembled rotor shafts and other powertrain components with circular welds, for example, benefit massively from this approach.

EMAG LaserTec can look back at an impressive history of success in the production of assembled rotor shafts with its laser welding machines bearing the abbreviation "ELC" (EMAG Laser Cell) used by all major automotive manufacturers. The main feature behind this success is that as it is a system supplier, EMAG LaserTec is familiar with the entire production process for the components concerned and develops the complete process chain on this basis.

With this in mind, the ELC 6 is yet another highly efficient solution for joining the two component halves of rotor shafts and similar powertrain components.

The following pages contain a presentation of this technology.

PERFORMANCE FEATURES

	ELC 6
Workpiece dimensions (diameter x length)	300 x 300 mm
Footprint	2,600 x 1,600 mm
Range of parts	rotation-symmetric
Stations/Apertures	up to 3

AFTS & CO.

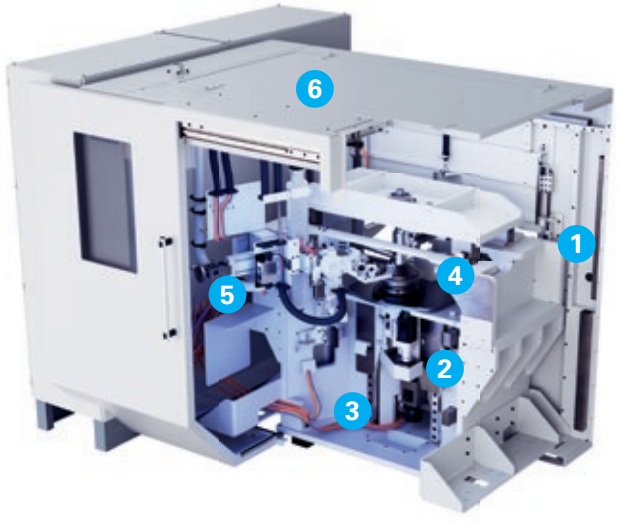
THE ELC 6 AT A GLANCE

+ **Small footprint**
+ **Short cycle times**
  using rotary indexing table (loading and unloading during the machining time)
+ **Great flexibility**
  due to the NC axes in the machining lens
+ **Up to three workstations/apertures**
  for workpiece changing without retooling
+ **Integration of additional processes possible**
  joining, preheating, weld detection, etc.

SMALL FOOTPRINT – MAXIMUM PRODUCTIVITY

EMAG is synonymous for highly efficient manufacturing systems from a single source – including laser welding and joining. EMAG LaserTec is the only contact you need for planning and building your machine – and indeed for service.

Its technological competence and massive experience guarantee perfect process chains featuring extreme speed and high safety levels. The specialists for your components: customized solutions can be built on the basis of the ELC 6 to ensure maximum productivity and process reliability.



MACHINE LAYOUT AND COMPONENTS

1	Loading area	5	Welding head axes
2	Swivel table	6	Machining chamber casing
3	CW axis	7	Control panel
4	Aperture with counter bearing	8	Energy container

TECHNICAL DATA ELC 6

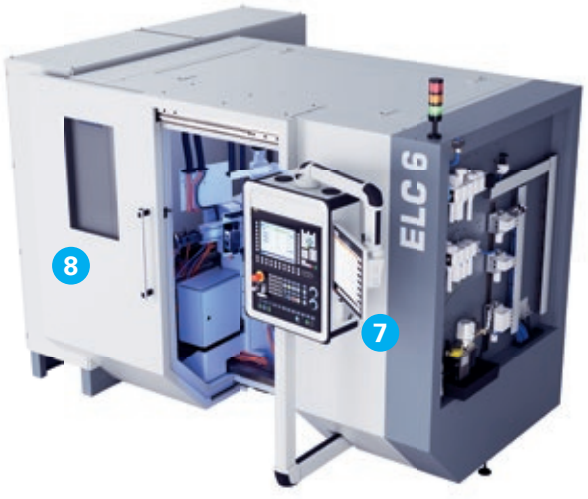
Beam source	Solid-state laser < 8 kW
Welding clamping force	max. 10 kN (30 kN optional)
Control system	Siemens 840 Dsl
Automation	Manual loading, robot loading, gantry loading
Cycle time	from 15 seconds
Turntable changeover time	2 sec.
Vertical axis feed	2 sec.
Loading/unloading height	1,000 mm

Machine dimensions
(excluding laser and loading gantry)

Height	max. 2,750 mm depending on axis configuration
Width	max. 3,500 mm depending on number of apertures
Depth	max. 2.500 mm excluding energy container

Workpiece dimensions

Outer diameter	max. 300 mm
Height	max. 300 mm
Axial welding diameter	75 – 200 mm
Radial welding diameter	75 – 250 mm



EXAMPLE OF A ROTOR SHAFT – WHAT DOES THE PROCESS LOOK LIKE?

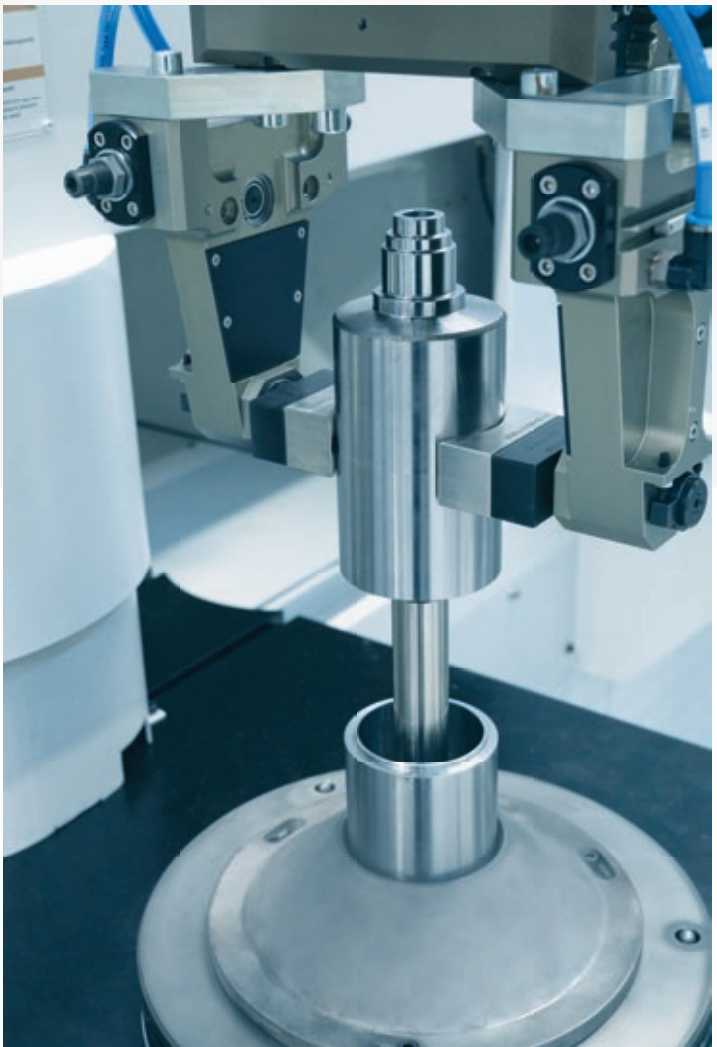
Customized solutions that can machine rotor shafts in large quantities – users can perfect their production process with the ELC 6 manufacturing system. What a line for this purpose may look like:

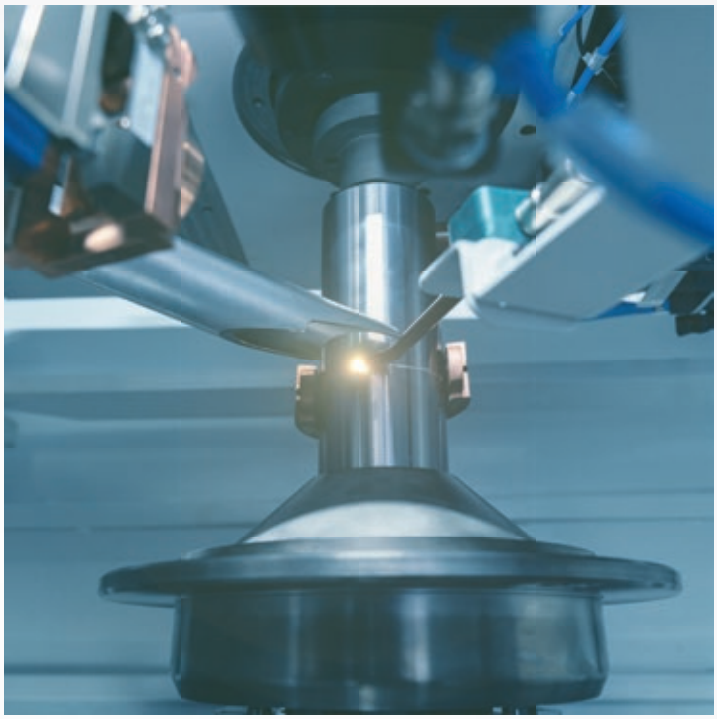
1. SUPPLY

A gantry takes the individual parts from the transfer system and places them on the swivel table.

2. LASER CLEANING

The second step is the laser cleaning of the components during which working materials and dirt are removed from the two blanks. Pulsed laser radiation is aimed at the surface and the material evaporates extremely quickly. For this purpose, EMAG LaserTec can supply the LC 4 laser cleaning machine, which can be linked seamlessly to the ELC 6 to form a perfect manufacturing line.





4. LASER WELDING

Before welding, the position of the weld seam is checked and the position of the component is readjusted. The contours are precisely scanned and the data are transmitted to the welding lens and NC axes.

During the welding process, the vertically aligned workpiece rotates while the laser lens only moves radially relative to the workpiece. The welding process with its focused energy is completed from the side of the cirumferential weld. A pyrometer monitors the process temperature.

5. UNLOADING

After welding, the part is transported out of the machine through a swiveling movement of the turntable and unloaded by a robot.

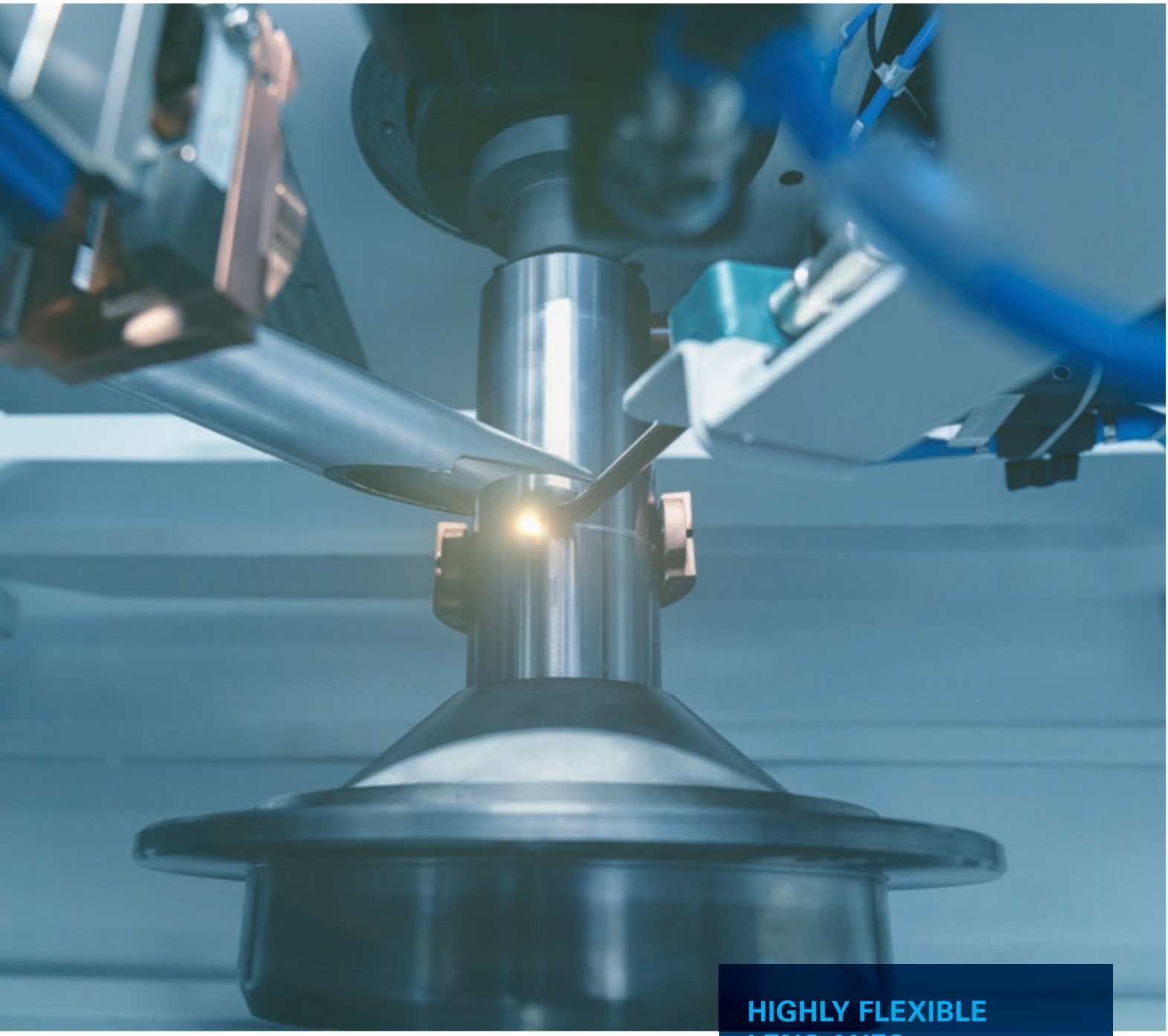
PERFECT CYCLES EVERY TIME

Overall, this solution delivers fantastic production speed, partly because the machine is loaded and unloaded during the welding process (and therefore during the machining cycle) using its turntable. In addition, the individual sub-processes are perfectly coordinated.

3. JOINING AND PREHEATING

For the next step, the components are fed into the ELC 6. The first process there is to join them. Thereafter, the induction equipment ensures that the system is at the perfect temperature for the welding process.

LENS AXES AND SWIVEL TABLE – A LOOK AT THE DETAILS



As with other machine models from EMAG LaserTec, only the workpiece (C-axis) rotates in the ELC 6, while the lens generally remains stationary.

HIGHLY FLEXIBLE LENS AXES

Nevertheless, the kinematics for the lens axes (X/Z/B) are designed to be very flexible with a view to ensuring supply and interpolation during the process. As a result, the system can incorporate many different processes and various workpieces.

SWIVEL TABLE FOR PARALLEL PROCESSES

The loading area of the machine with its swivel table is just as important for the productivity of the process: While one component is in the machining area, the second half of the table is carrying out a loading and unloading process. Depending on the workpiece, the swiveling time may take as little as two seconds.

The swivel table requires just two seconds for the changeover process.

YOUR BENEFITS AT A GLANCE

The ELC 6 is a production laser welding system for maximum output. The following properties are responsible for ensuring this:

FAST

Loading and unloading in the ELC 6 at the same time as machining ensures short cycle times.

PRECISE

The concentrated energy of the laser beam can be controlled precisely to enable high speed and minimum warping on the welded component.

SAFE

A check is carried out to find the position of the weld seam before welding and a pyrometer monitors the process temperature during the process.

… AND ANOTHER THING

EMAG scores heavily in this field of application with an extensive portfolio of technology as our specialists have already developed various solutions for the subsequent joining of the rotor shaft and rotor sheet metal package and the high-precision turning of this package, for example. The same is true of turning, gear cutting and grinding the two rotor shaft components before they are welded. This means we can supply customers with complete solutions.

FLEXIBLE

EMAG LaserTec has designed this solution to be very flexible for the customer in terms of technology, output, and automation, and work-pieces with a maximum height of up to 300 mm can be machined in the ELC 6.

ECONOMICAL

The high efficiency of the laser delivers low operating costs. The same applies to the wide-ranging use of electric drive units rather than pneumatic and hydraulic units.

COMPACT

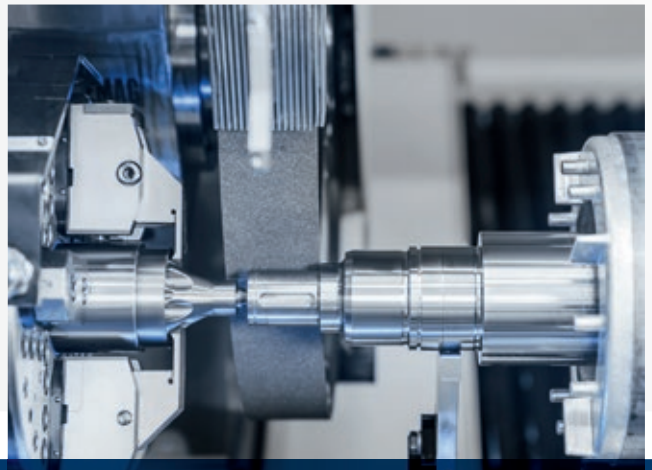
Its compact design means that the machine has a very small footprint. What is more, it delivers good accessibility which makes retooling easier.

TECHNOLOGY. CONNECTED.

Turning Chucked Components

Turning Shafts

Gear Grinding

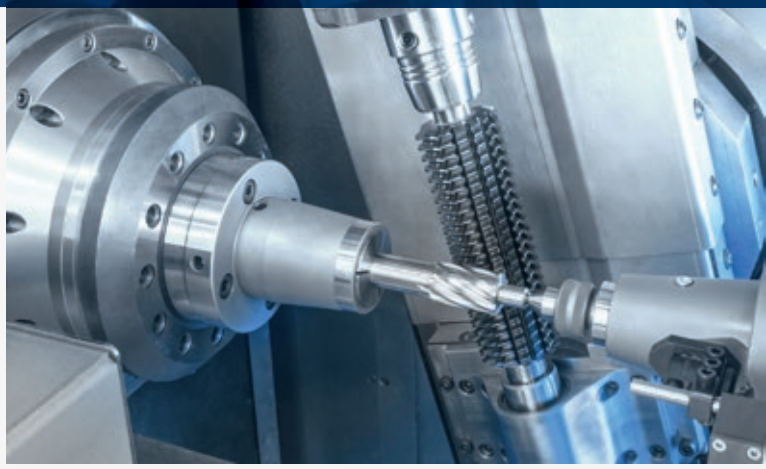


Cylindrical Grinding

Out-of-round Gr

Milling

Gear Hobbing



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