



**ELC 6/ ELC 6i**

**LASER WELDING MACHINES**

**FOR MAXIMUM**

**PRODUCTIVITY**

For manufacturing rotor shafts and other  
powertrain components in fast cycles





## THE ELC 6 FROM EMAG

A highly efficient solution for joining rotor shaft halves and other powertrain components: The ELC 6 from EMAG LaserTec delivers outstanding results with its combination of high-speed processes.





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# INTRODUCTION

## THE FAST TRACK TO MANUFACTURING ROTOR SHAFTS

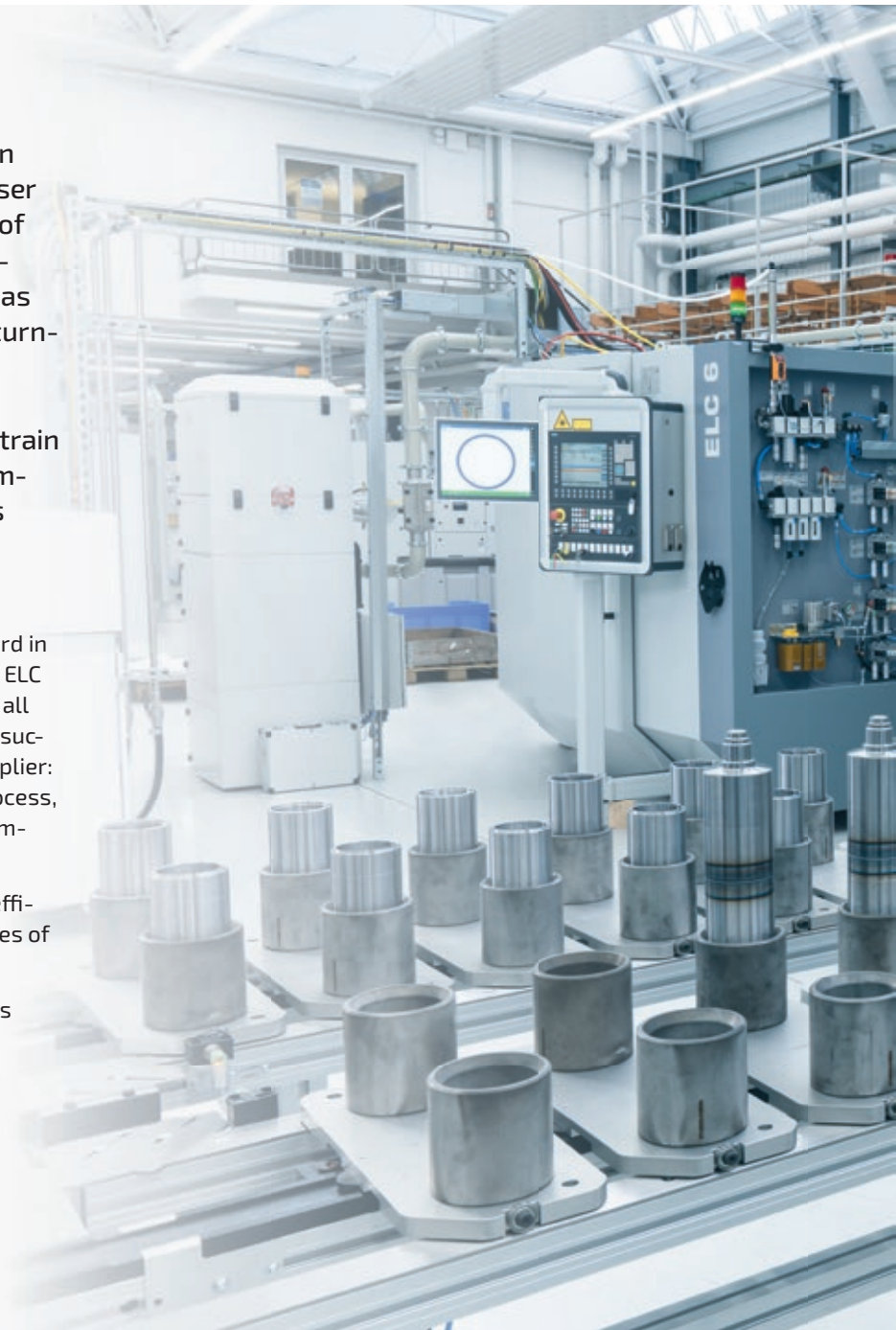
EMAG LaserTec has set a new standard on the market by launching its ELC 6. This laser welding machine combines a wide range of welding processes, including joining, pre-heating, and welding operations as well as handling in a compact machine with its turn-table system delivering excellent cycle times.

Assembled rotor shafts and other powertrain components with circular welds, for example, gain significant advantages from this approach.

EMAG LaserTec has built an impressive track record in the production of assembled rotor shafts with its ELC (EMAG Laser Cell) laser welding machines in use at all major automotive manufacturers. The key to this success lies in EMAG LaserTec's role as a system supplier: with deep knowledge of the entire production process, the company is able to design and develop the complete process chain.

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.

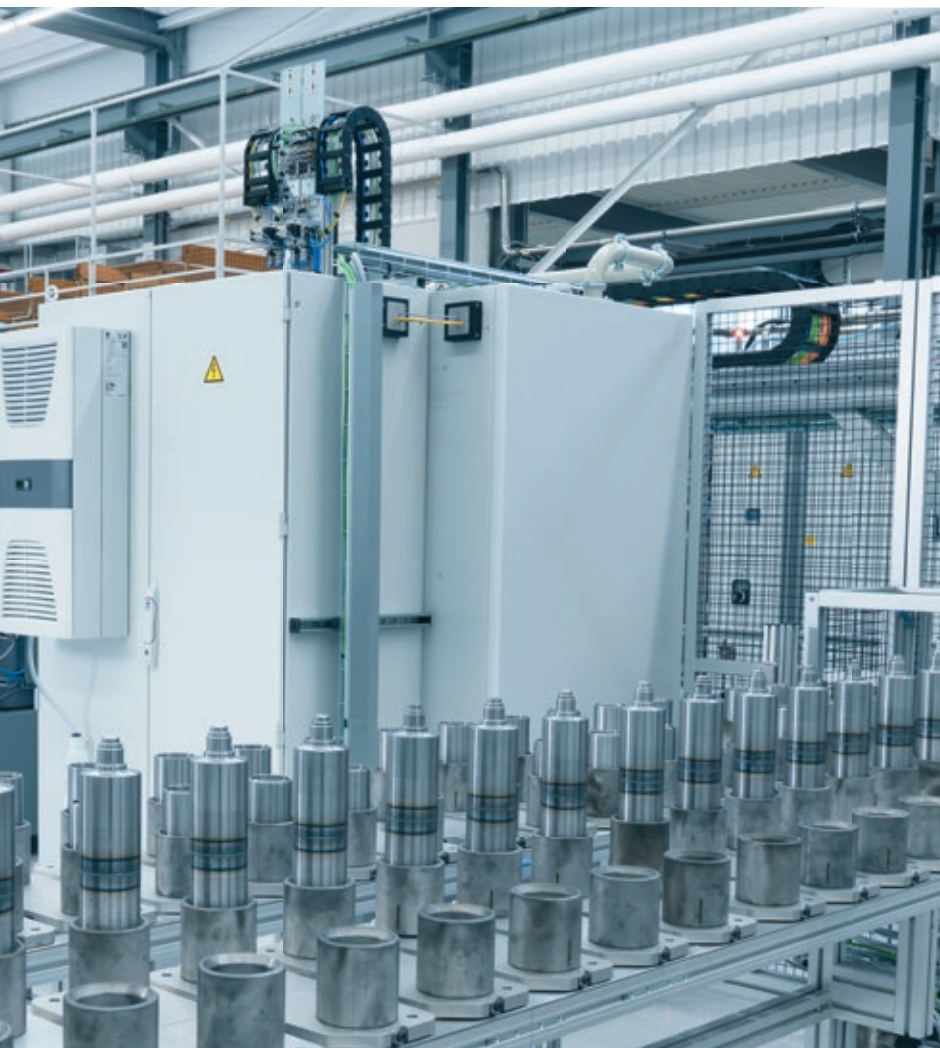
The following pages contain a presentation of this technology.



### 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



## 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 re-tooling
- + **Integration of additional processes**  
possible joining, preheating, weld detection, etc.

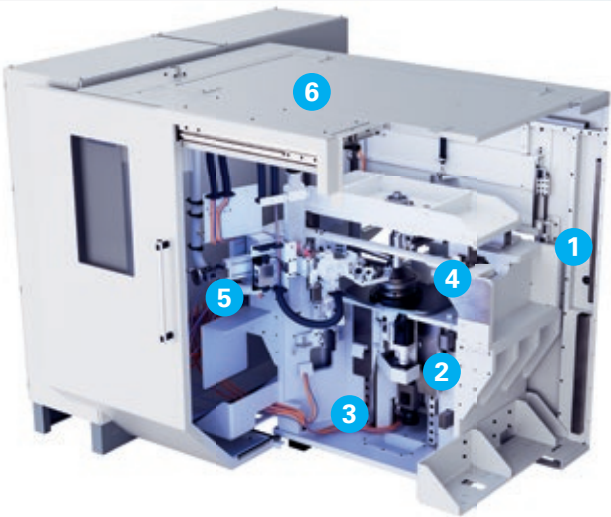
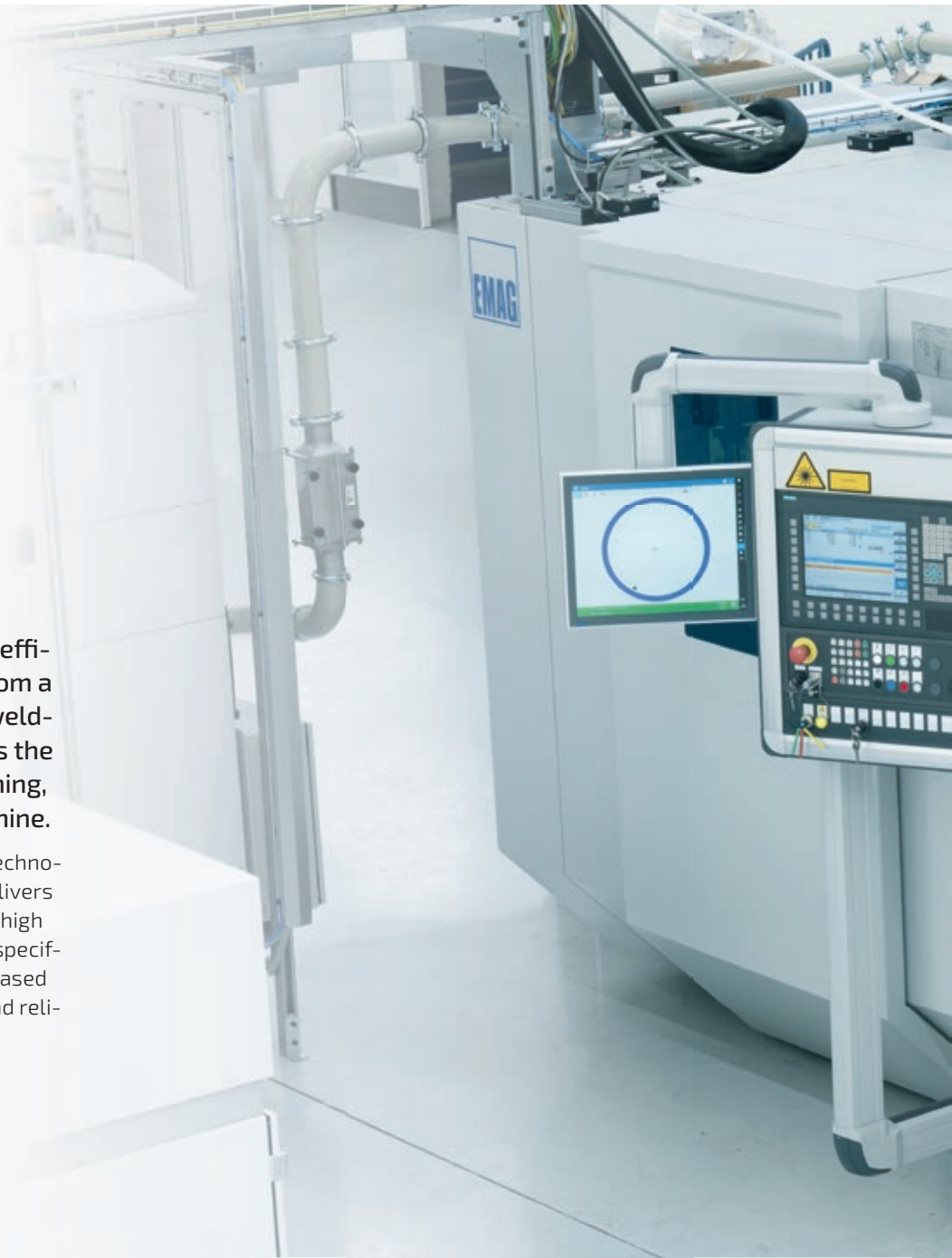




# SMALL FOOTPRINT – MAXIMUM PRODUCTIVITY

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

With extensive expertise and proven technological competence, EMAG LaserTec delivers complete process chains that combine high speed with maximum safety. For your specific components, customized solutions based on the ELC 6 ensure top productivity and reliable performance.



## 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





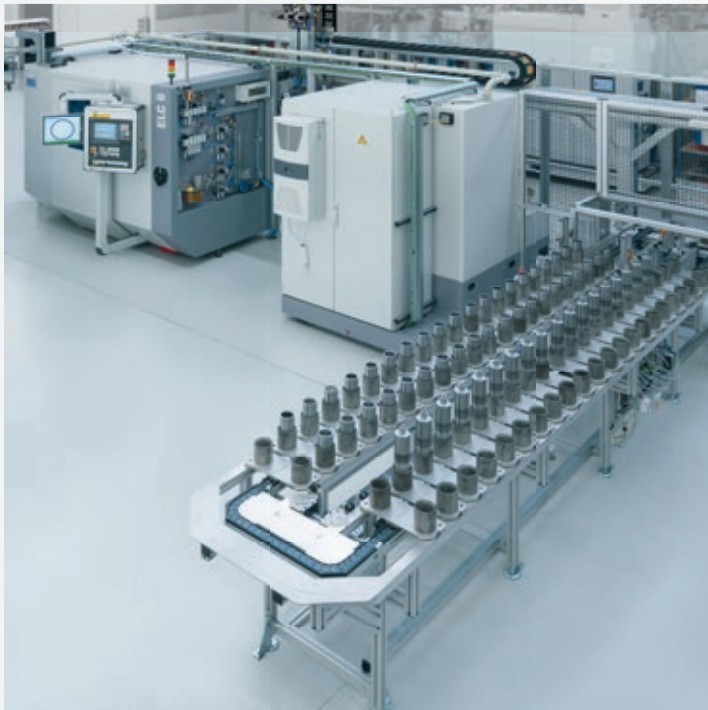
# EXAMPLE OF A ROTOR SHAFT – WHAT DOES THE PROCESS LOOK LIKE?

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:



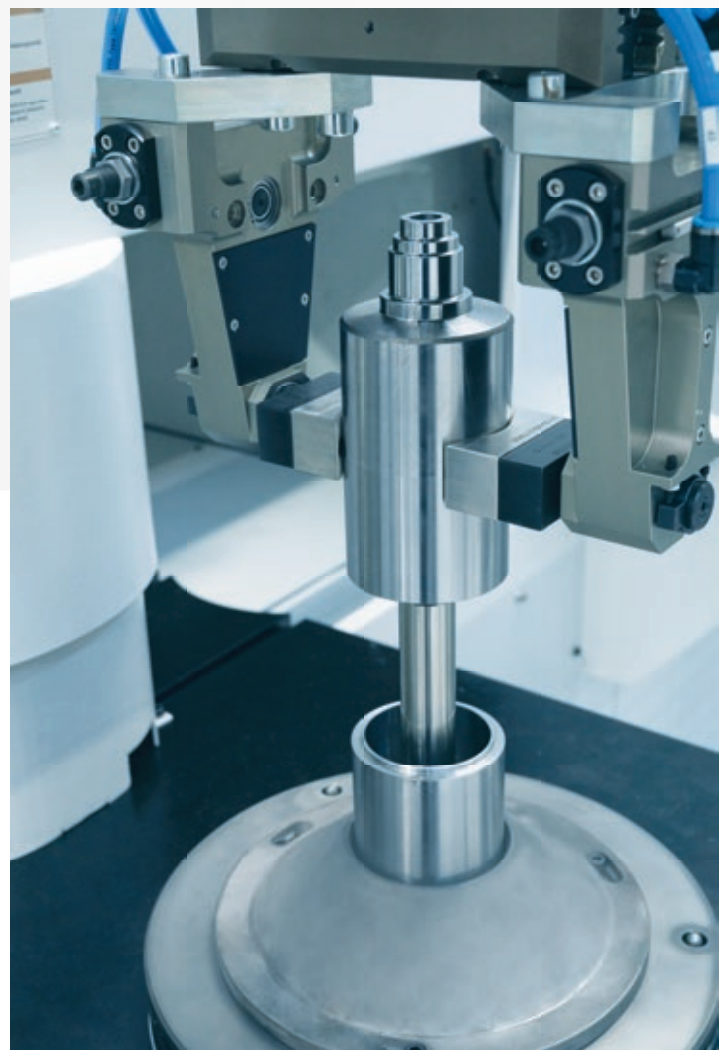
## 2. LASER CLEANING

The second step is laser cleaning, where residues and contaminants are removed from the two blanks. Pulsed laser radiation targets the surface, causing the material to evaporate almost instantly. EMAG LaserTec offers the LC 4 laser cleaning machine for this purpose, which can be seamlessly integrated with the ELC 6 to create a fully optimized manufacturing line.



## 1. SUPPLY

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







#### 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 circumferential 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. Induction equipment then brings the system to the optimal 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 temperature during the process.





## ... AND ANOTHER THING

EMAG excels in this field of application with an extensive portfolio of technology. Various solutions for the joining of the rotor shaft and rotor sheet metal package and high-precision turning 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 workpieces 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.

# ELC 6i – COMPACT STANDARD SOLUTION FOR INDUSTRIAL LASER WELDING

The EMAG ELC 6i is a fully automated laser welding system that integrates up to six process steps in a single machine. Its standardized concept minimizes engineering effort, reduces investment costs and shortens delivery times – all without compromising on precision and process quality.



## INTEGRATED PROCESS SEQUENCE - LASER WELDING IN A CONTINUOUS LINE

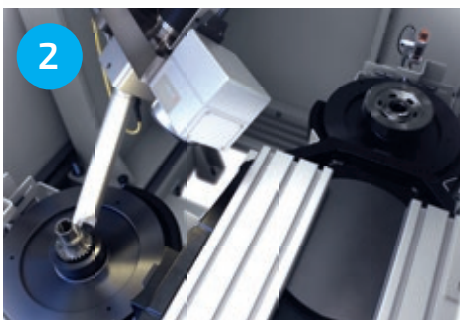
The ELC 6i delivers a fully integrated process chain, with each step automated and seamlessly connected within the system:

### 1. Loading and unloading

Two stations for raw-part placement and two stations for removing the finished assemblies.

### 2. Laser cleaning

Precise removal of impurities and coatings on the joining surfaces



### 3. Inductive preheating 1 (optional)

Reduces pressing forces.

### 4. Joining (pressing)

Force-displacement-monitored pressing process using a servomechanical unit.



### 5. Inductive preheating 2 (optional)

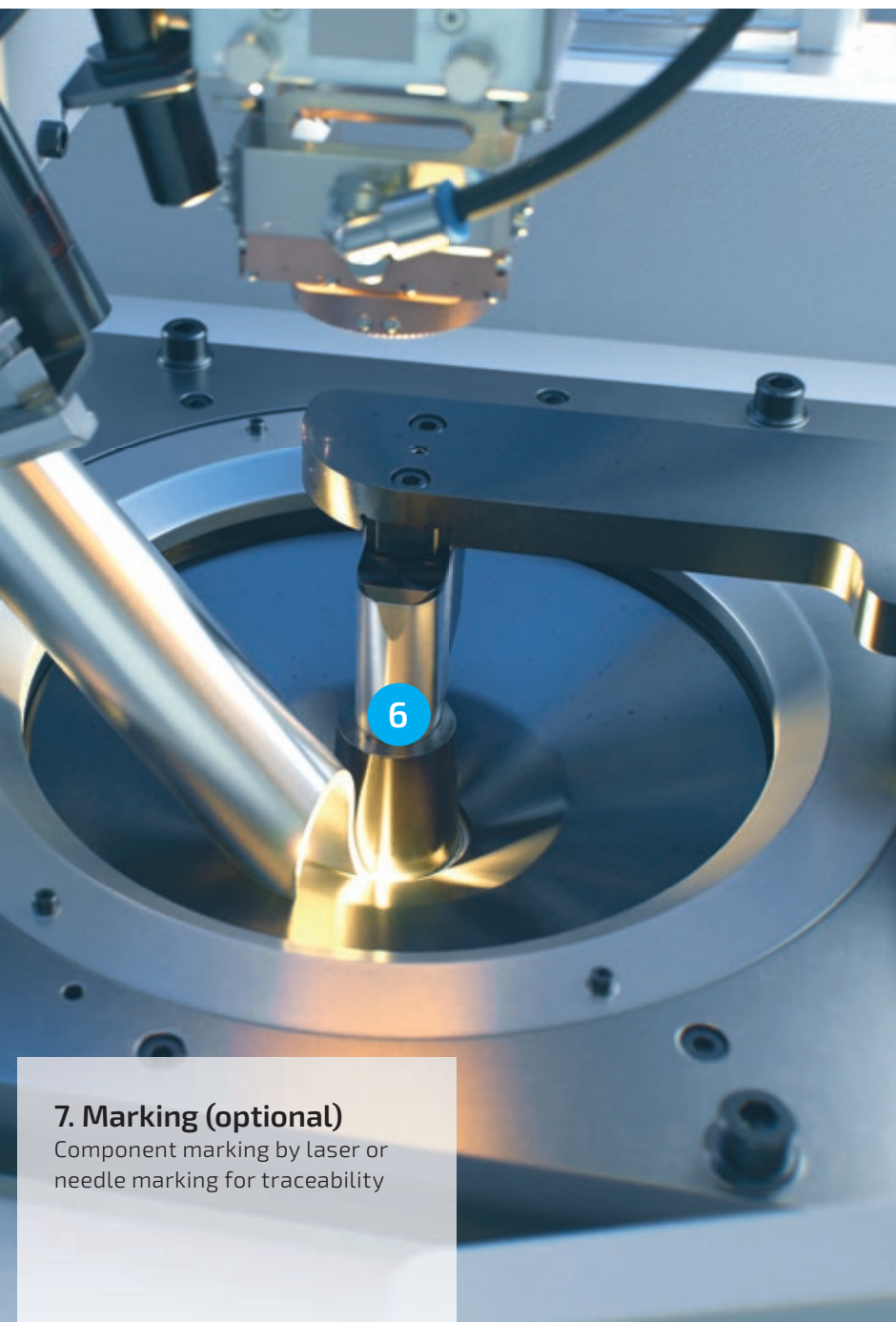
Improves weld seam quality with challenging materials and / or component geometries

### 6. Laser welding

High-precision circumferential welding with optional wire feed and seam position control.







## 7. Marking (optional)

Component marking by laser or needle marking for traceability

## ADVANTAGES ELC 6i

- + **Reduced footprint:** up to 36% smaller than comparable systems.
- + **Faster delivery:** up to 10 % shorter lead times with predefined modules.
- + **Lower investment costs:** up to 15 % cost savings through standardized assemblies.
- + **High availability:** simplified spare parts management
- + **Short changeover times** of less than 20 minutes for component-specific adaptations.
- + **Good accessibility** facilitates maintenance and servicing

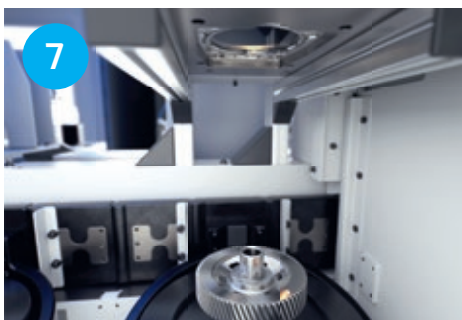
## TECHNICAL DATA

ELC 6i

Max. external diameter	mm in	300 12
Max. workpiece height	mm in	300 12
Axial welding diameter	mm in	75/200 3/8
Radial welding diameter	mm in	75/250 3/10
CNC controller	SIEMENS SINUMERIK ONE	

## KEY FEATURES AT A GLANCE:

- » **Process integration:** laser cleaning, preheating 1 (option), joining, preheating 2 (option), laser welding, marking (option)
- » **Compact design:** only approx. 21.5 m<sup>2</sup> footprint, up to 36% less space required than conventional systems
- » **High productivity:** cycle times under 20 seconds with a fixed transfer system and up to 18 workpiece carriers
- » **Process reliability:** proven multi-axis kinematics for high-precision welding processes
- » **Cost-efficiency:** up to 15% lower investment costs and up to 10% shorter delivery times.



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