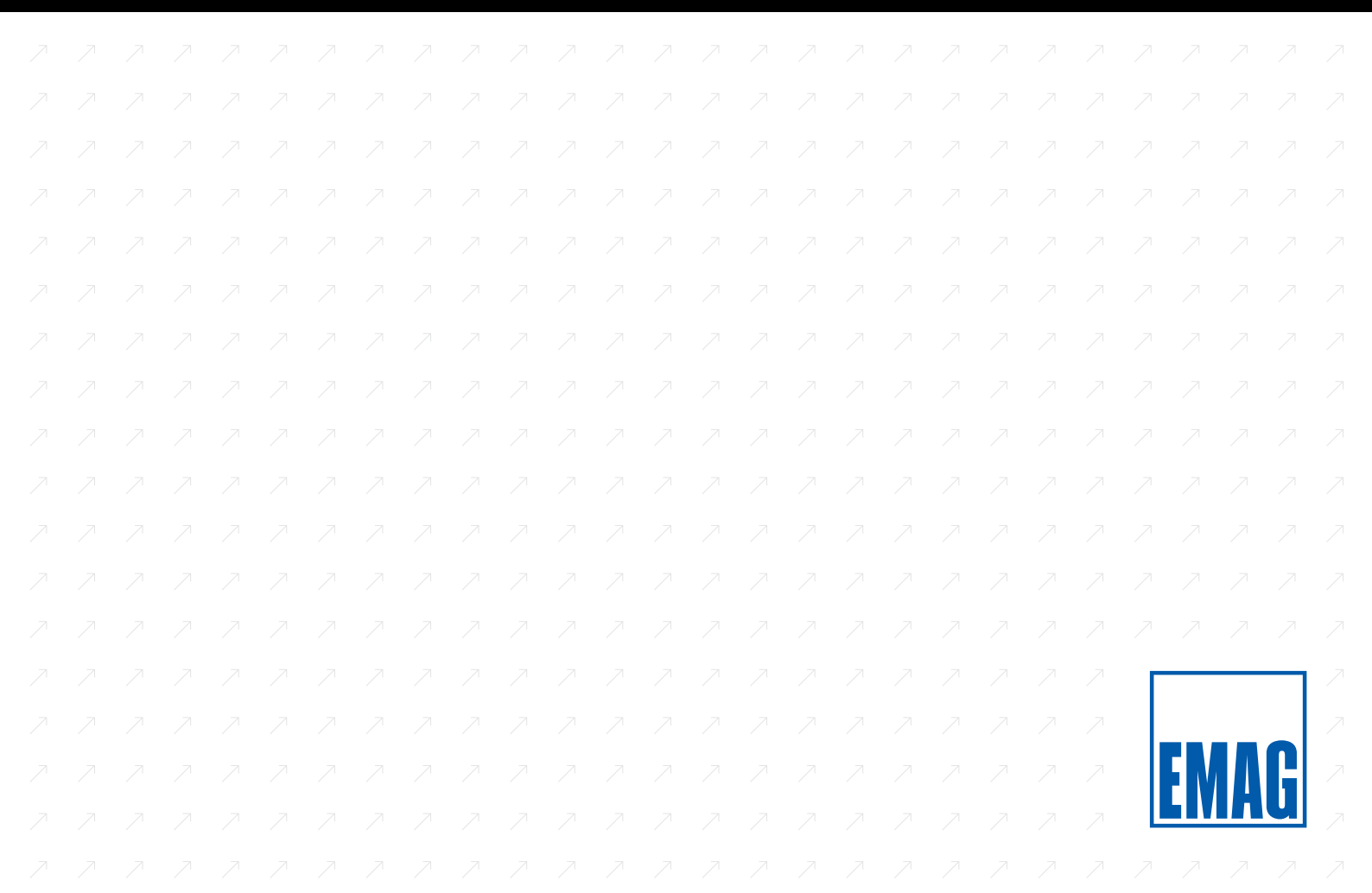


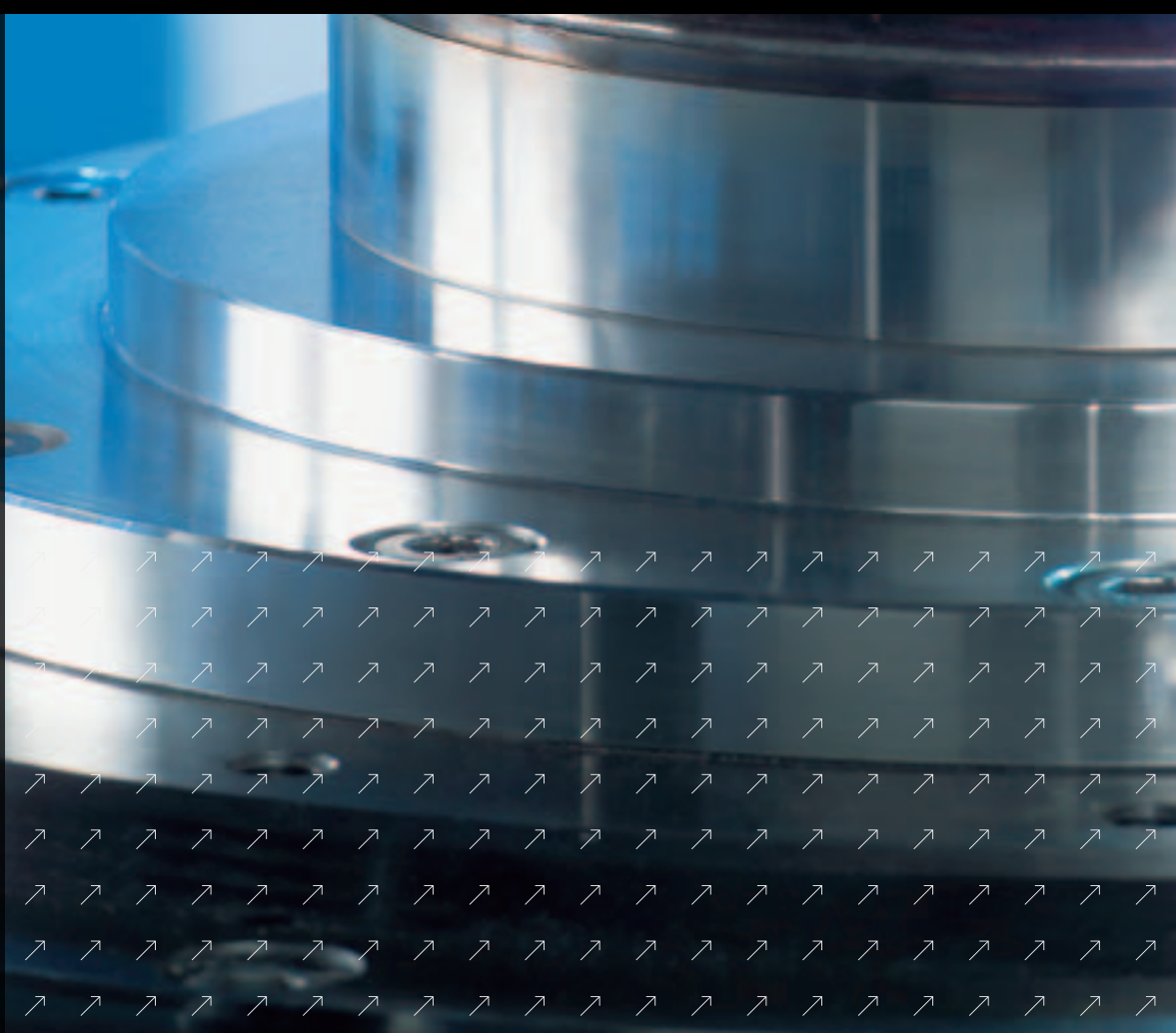
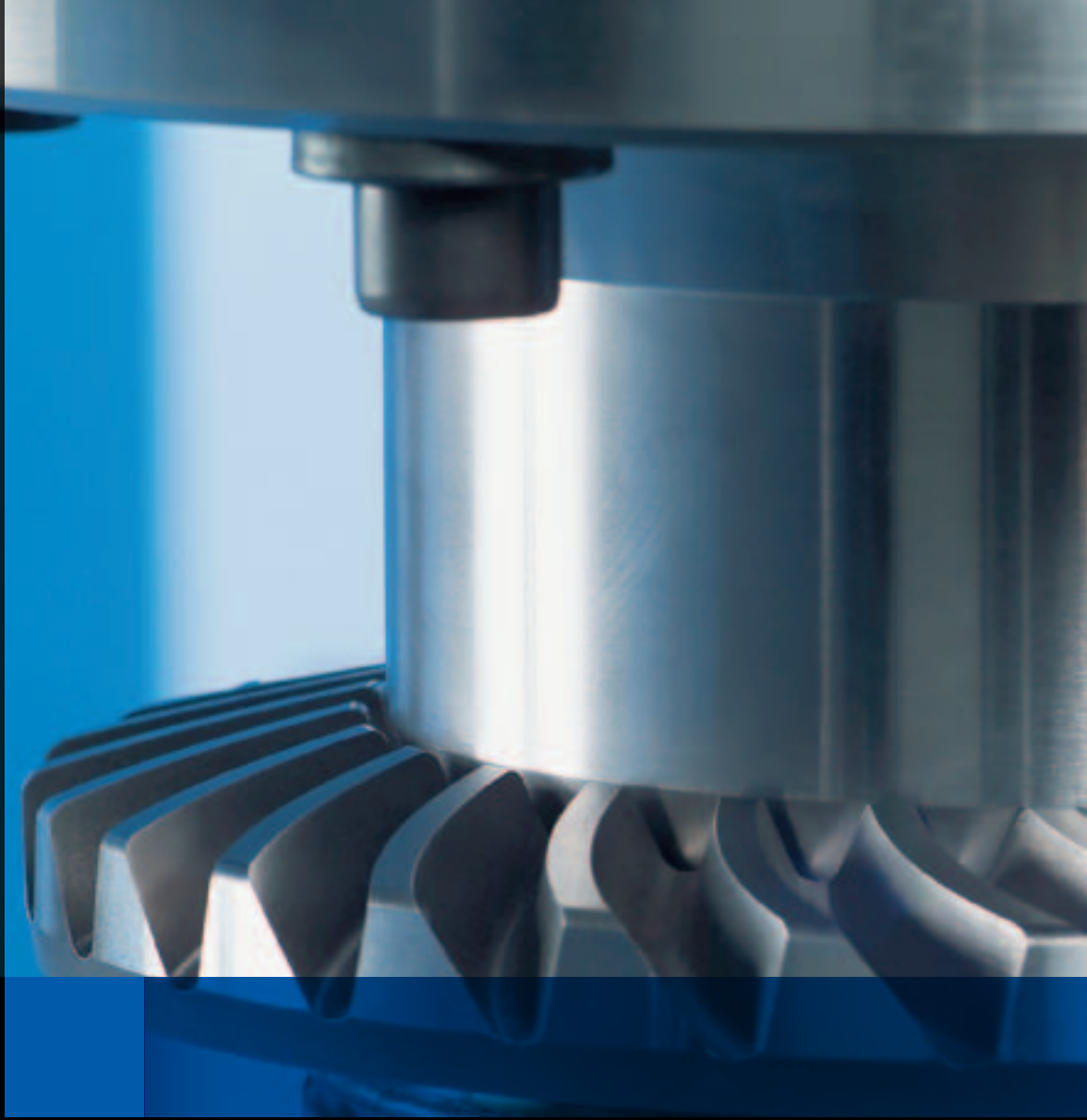
# EMAG ELC Laser Welding Systems



People in the industry can no longer imagine a car component production line without a laser welding system. This technology is a prerequisite in the use of compact, weight-optimized components, and subsequently energy-efficient vehicles. The precise and adjustable, concentrated energy of the laser beam allows for high welding speeds and results in minimal distortion at the welding seam. It also ensures that components can be finish machined cost-effectively and welded, without

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requiring further processing before going to the assembly line.





HIGH-PRODUCTIVITY LASER WELDING SYSTEMS



# High-productivity laser welding systems.

## EMAG Laser Cell ELC

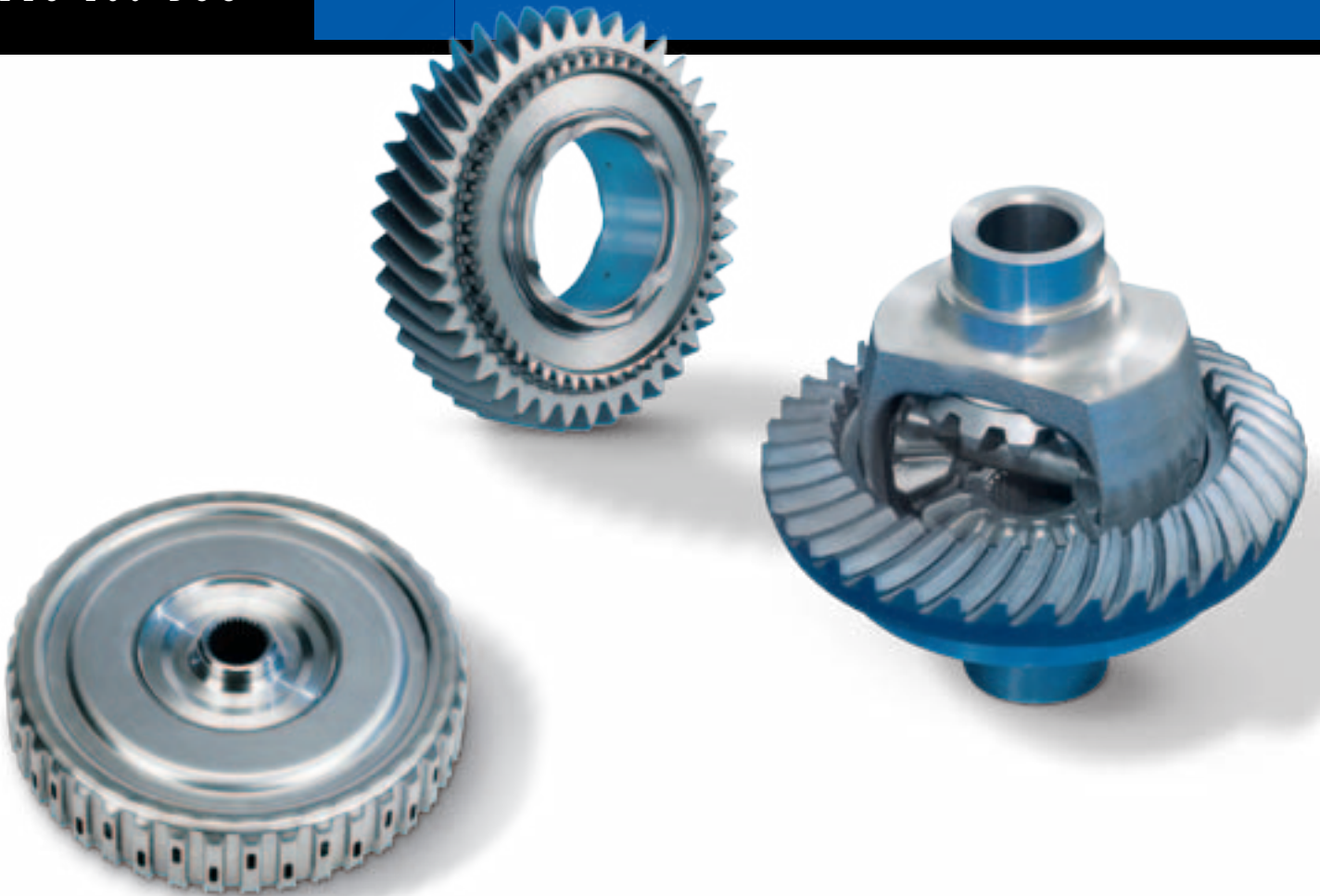
EMAG ELC Laser Welding Systems are compact, laser-equipped machine tools that can – on the basis of standardized platforms and machine assemblies – be configured to match component-, customer- and project-specific manufacturing systems.

EMAG ELC Laser Welding Systems have been developed and optimized – uncompromisingly – for the production laser welding of high-quality components.

## New workpiece geometries possible with laser welding

The flexibility of laser welding processes allows for the development of new component designs. For example, it makes the trouble-free joining of cast materials with case-hardened steels possible. Its high processing speeds and the accuracy with which it can reproduce the process, makes laser welding the ideal technology for the batch production of precision components in the powertrain and chassis assemblies of modern vehicles.

ELC 160  
ELC 200 H  
ELC 250 DUO





# Precision and productivity – the measure of all things.

## Precision

The precision of the basic machine and the components used, and the workholding equipment developed and manufactured in-house, provides for accurate, reproducible results.

Inherent to its functional principle the stationary optic ensures that the negative influences of beam divergence when using CO<sub>2</sub> lasers are totally eliminated. The beam guide is a sealed and purged tube that remains clean. This ensures that the welding process encounters static conditions, an important factor for maintaining constant quality.

Using fiber-guided lasers avoids the mechanical wear and tear to which sensitive light-conducting cables are subject.

## Productivity ...

... through short idle times, multi-station operation and in-house produced, optimised automation equipment.

## Flexibility

The laser, the process technology, the degree of automation and the component specification of every ELC are chosen to suit the individual task in hand.

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## Eco-friendliness and energy efficiency

Use of the latest in solid-state lasers with their unrivalled energy efficiency makes for low consumption levels. The stationary machining optic ensures that the welding fumes extractor can work with pinpoint accuracy. This increases effectiveness and guarantees operational safety.

## Shortest setup times

Inherent to their functional principle ELC Laser Welding Systems require a minimal amount of component-specific equipment and consequently offer very short reset times, which can be reduced to practically nothing with a number of upgrade modules up to and including the automated setting-up of a variety of workpieces.

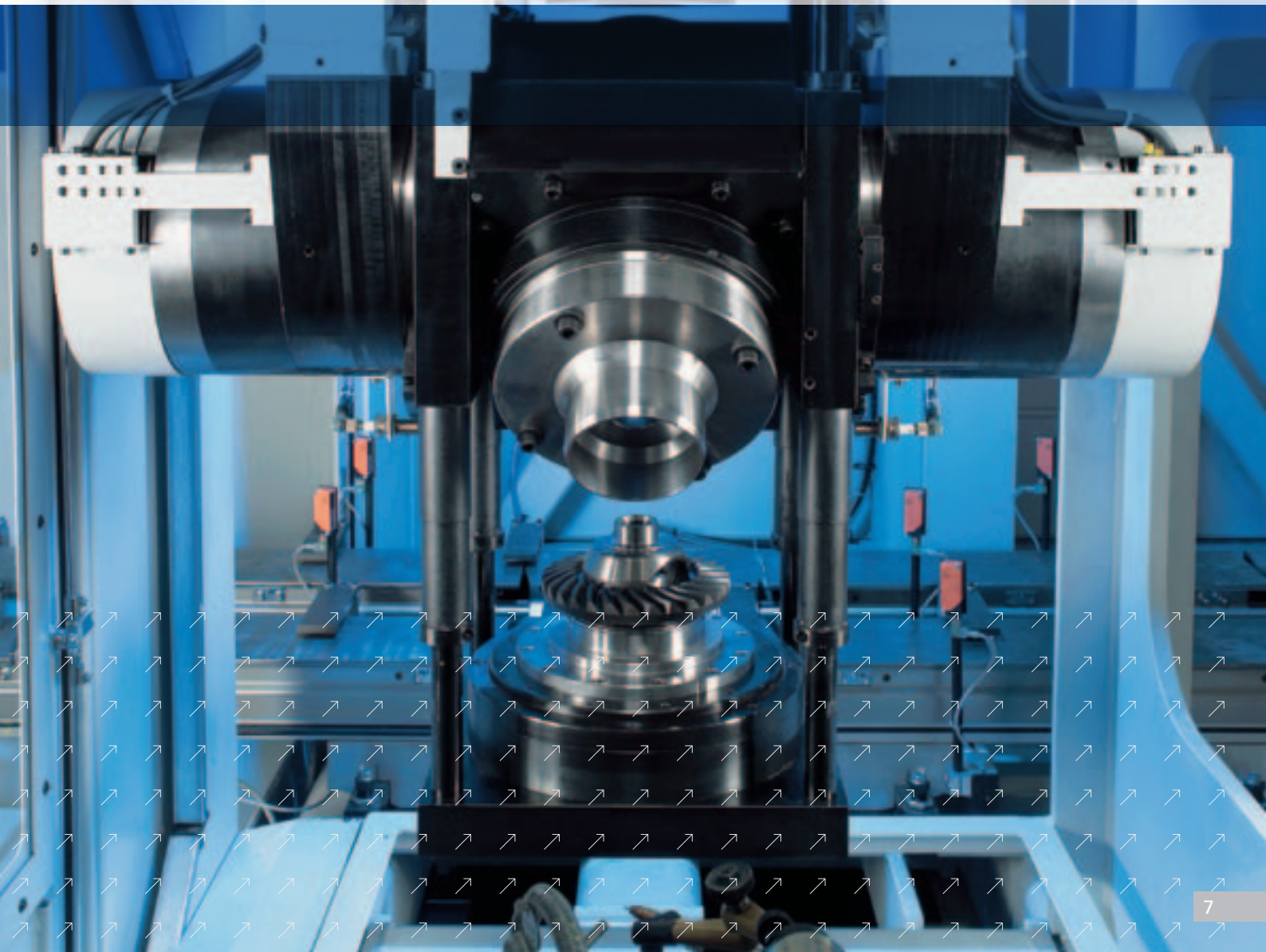
## Compact design

All EMAG ELC Laser Welding Systems are compact and fully integrated. Machine, laser beam source, laser guide, cooling system, electrical cabinet and supply systems are all mounted on a commonly shared, self-supporting machine base. A foundation is not required. The footprint is minimal and the system can be moved at any time to suit a change in production requirements and layout. Optimized installation of all integral components benefits the operational safety of the system.

## Operational safety

Design characteristics such as the stationary beam guide, the use of tested components from the machine tool supply industry, the use of fully developed machine platforms and modules, state-of-the-art laser technology, a well-proven process technology and, last but by no means least, EMAG's know-how in the development and manufacture of highly efficient, high-quality production systems, can be found in every ELC.

The design principle „Moving workpiece / stationary tool“ minimizes the number of reclamping processes, cuts idle times and guarantees high precision, operating safety and flexibility. The integration of auxiliary functions (laser cleaning, joining, preheating, measuring, brushing, marking, process sensors, ...) is just as easy.



## Maximum flexibility – from one-offs to batch production.

The ELC 160 is a modular laser welding system configurable for the most diverse requirements.

At the heart of the ELC 160 lies a three-axis NC machining module, with the machine base carrying the stationary processing units.

The workpieces are loaded into the spindle and transported from machining station to machining station. The machining modules are mounted on the machine base and remain stationary during processing of the components.

Depending on the desired output rates the ELC 160 is also available in a DUO and a TRIO version, on which the various stations can be operated independently, allowing for the cycle time-concurrent machining of different workpieces.

### Technological flexibility

The ELC 160 can be equipped with all the various laser technologies. Whether it is CO<sub>2</sub> lasers or solid-state systems (fiber, discs) – anything is possible.

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ELC 200 H  
ELC 250 DUO





### Manually or automatically loaded

The ELC 160 is equally suitable for manual and automatic loading, with the latter using either a gantry loader or industrial robots. This offers the flexibility to adjust the ELC 160 to your own manufacturing concept and your own brand of logistics.

### Automatic resetting included

The ELC can be equipped with several mating stations and welding fixtures (counter supports). The resetting process is numerically controlled. This allows for the flexible machining of complete component families without

the need for manual resetting. Time and effort are thus reduced and the destructive testing of components avoided.

### Expansion stages / Additional functions

- Joining / Pressing of single components
- Inductive preheating / postheating
- Brushing the weld seam
- Laser marking
- Workpiece measurement



## The production laser welding of shafts.

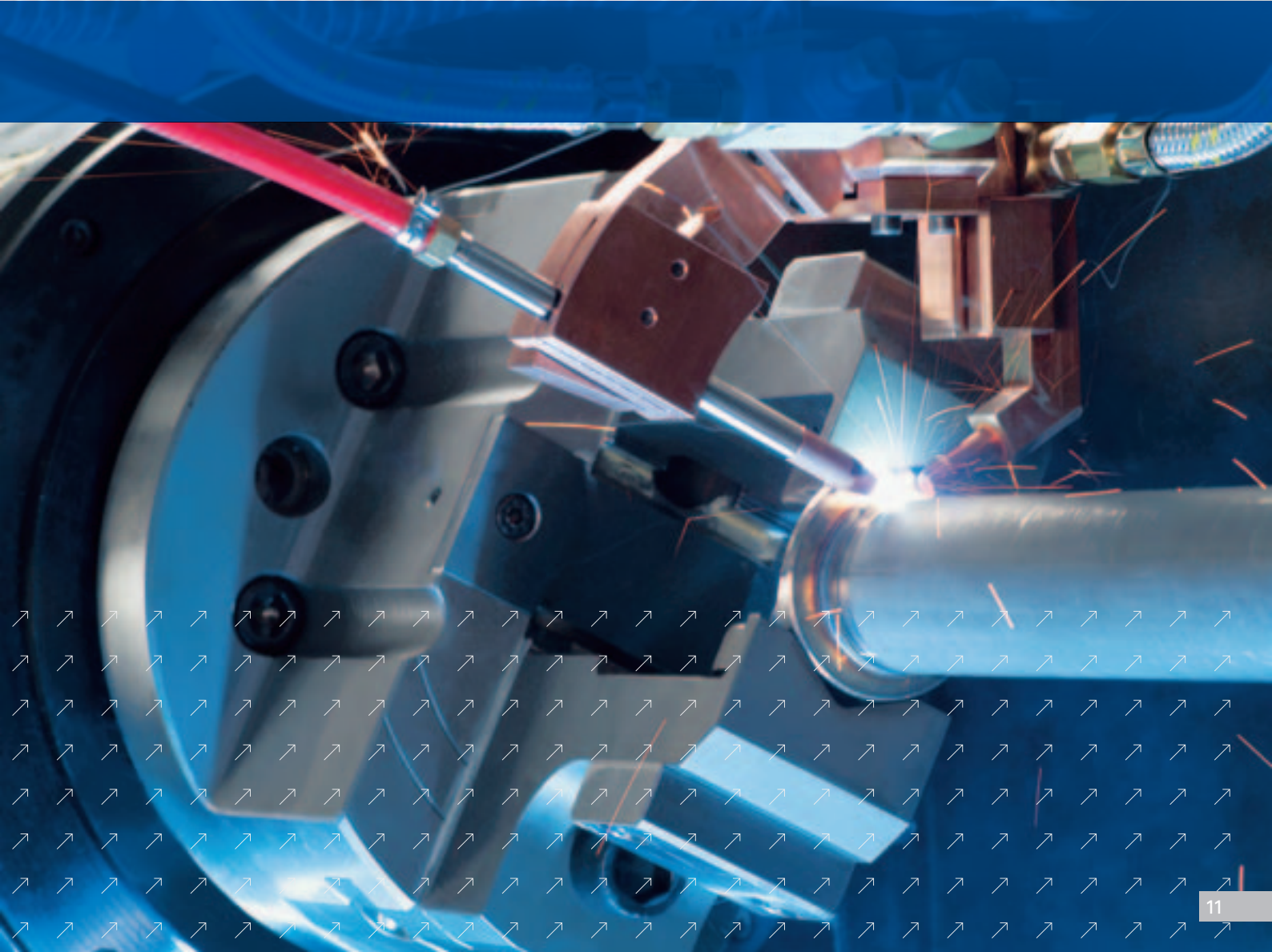
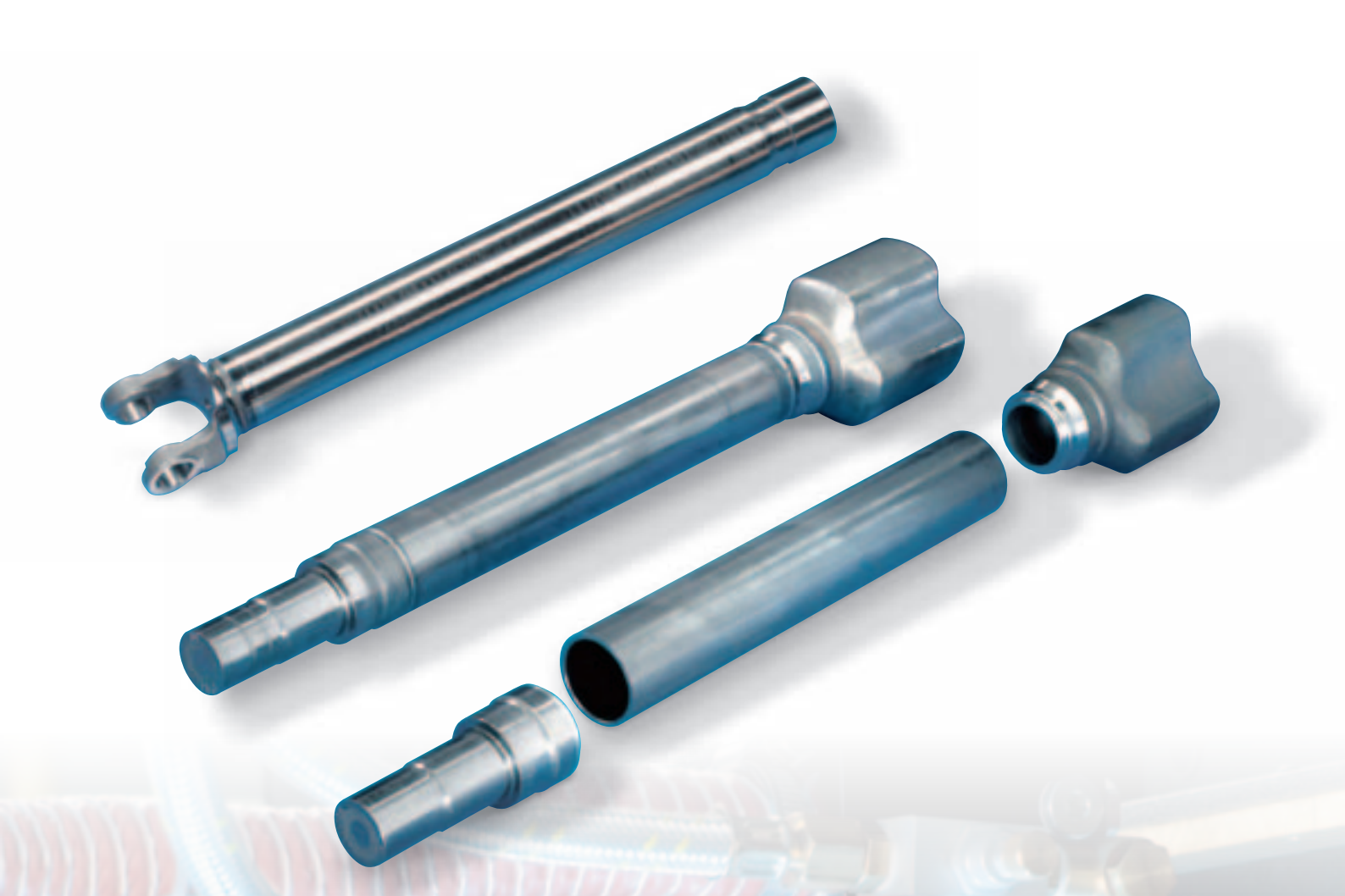
The ELC 200 H is designed for the machining of drive shafts, cardan shafts, steering shafts and other similar workpieces. This allows for the laser welding process to be used in areas which were previously the exclusive domain of friction or magnet-arc welding.

The advantages of the pick-up principle are clear: workpiece loading and unloading is becoming much simpler, as the machine loads itself.

The horizontal spindle and the NC tailstock ensure that families of components of different length can be machined with flexibility, and that the resetting on different workpiece geometries is achieved in the shortest possible time.

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ELC 200 H  
ELC 250 DUO





## ELC 250 DUO – the multifunctional laser welding machine.

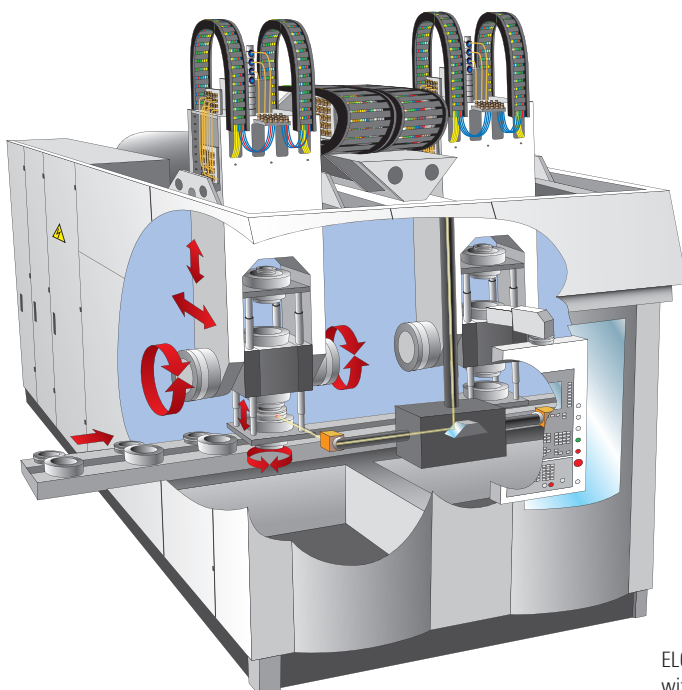
The ELC 250 DUO also works on the pick-up principle: the spindle loads itself and positions the workpiece where the welding optic requires or takes it to other processing modules.

The ELC 250 DUO features two independent machining stations that share a single laser beam source; i.e. the laser beam is switched between stations. This increases productivity (cycle time-concurrent component loading and unloading) and allows for the parallel machining of different workpieces or the inclusion of complex downstream machining operations

(e.g. laser cleaning / joining / welding / brushing / checking). The result is optimal technological flexibility

The principle of a stationary optic allows for the integration of all laser technologies: the ELC 250 DUO can be equipped with either CO<sub>2</sub> lasers or with solid-state lasers (fiber, disc). A number of different machining optics are available to suit a variety of requirements.

ELC 160  
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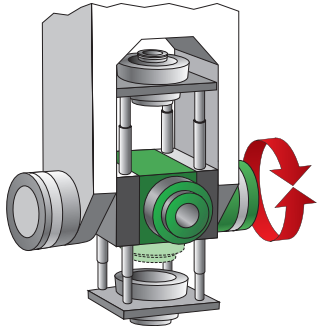


Use of the wire-to-wire welding process avoids the presence of great lengths of tube packs. The integration of process observation and monitoring sensors is also made easy.

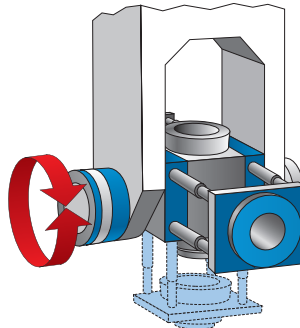
The compact design of the integrated energy-container and cooling system ensures the laser system takes up minimal floor space within the production line.

ELC 250 DUO, the laser welding system with two swivelling pick-up spindles

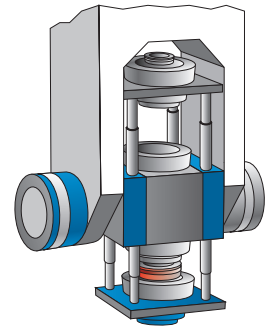
## Stationary beam guide.



The swivelling spindle permits axial as well as radial welding



Pick-up position



Welding position, radial

DUO stands for flexibility. In the spindles of the two machining stations, identical or totally different component pairs can be welded independently of each other.



## The complete process from a single source.

In the case of all its welding machines EMAG's emphasis is on the stationary beam guide, with the workpiece moving from station to station. This concept is clearly directed towards process chain consolidation by means of process integration and makes the addition of auxiliary operations very easy. The ELC 250 DUO features a four-column mating press, on which mating and clamping is done in a single operation. A preheating unit and a brushing station are available as options.

To meet the demands for greater productivity, EMAG welding systems also incorporate a beam diverter that can supply two stations, making it possible to load and unload the components cycle time-concurrently.

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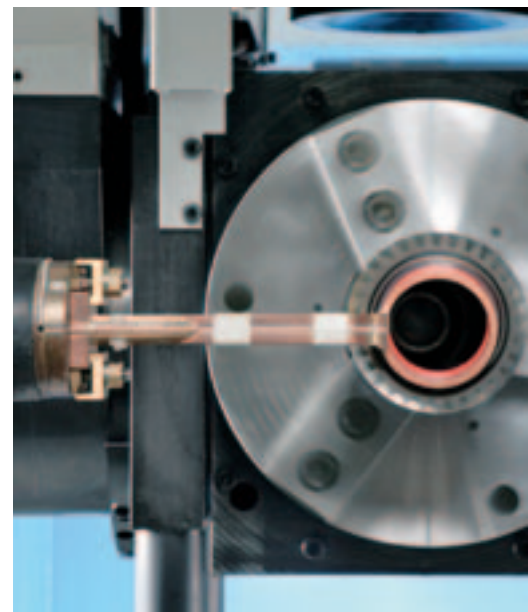
Loading (pick-up)



Joining



Inductive pre-heating

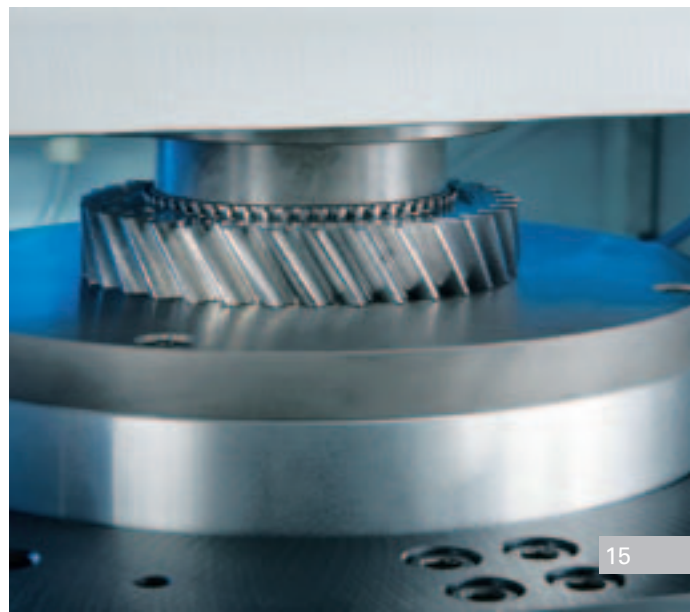


In accordance with the EMAG principle of a platform strategy with relevant automation solutions, their welding systems are able to work highly efficiently with either shuttle or robots. With floor-to-floor times of up to ten seconds and batch sizes of up to a million per year the productivity rates of automated laser welding can hardly be improved.



Laser welding

Brushing the weld seam



# Quality assurance.

EMAG offers a comprehensive portfolio of quality assurance systems for your production. Besides our own process monitoring products we also integrate into our machines systems from well-known alternative suppliers.

## EMAG WeldCheck

The EMAG WeldCheck is a compact, perfectly integrated solution to plasma monitoring of the laser welding process. It detects irregularities – like discharges, performance fluctuations, strong splatter, shielding gas failures and others – wherever they occur during the welding process.

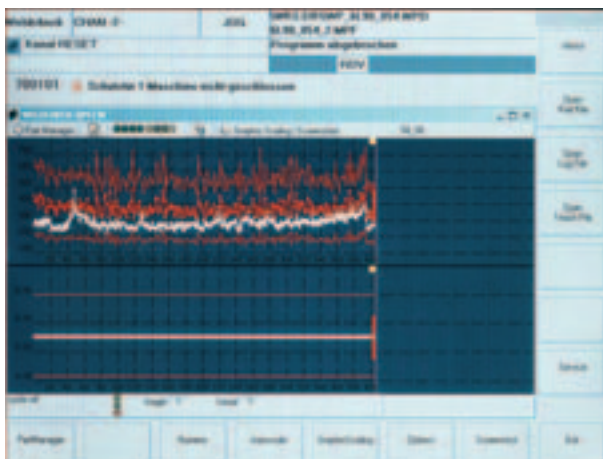
## EMAG Data Recorder

This software tool guarantees the 100% traceability of your workpiece details. Setup and process parameters are allocated to every component and archived with ease.

## Integration of third-party systems

EMAG has extensive practical experience with the integration of quality assurance systems from other well known manufacturers, of which we will advise you during the analysis of your requirements prior to selection.

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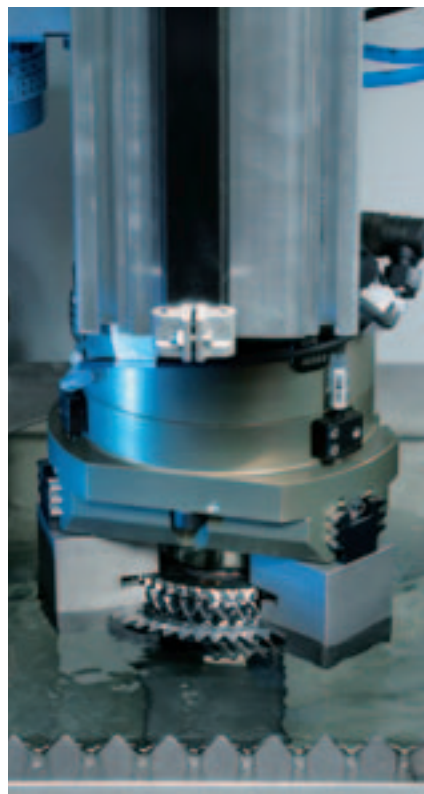


## Ultrasonic test technology.

EMAG offers you ultrasonic test equipment for the damage-free, 100% control of your welded workpieces – interlinked with your ELC or as a standalone system. We take charge of system integration and will supply semi- or fully-automatic testing equipment.

We can also integrate ultrasonic test technology from well-known alternative manufacturers.

Test station, fixtures, water supply, component drying, workhandling, automation and control system technology are all developed and manufactured in-house.



EMAG ultrasonic test technology, comprehensive quality assurance in the ELC 160.

## Workholding technology.

Accurate workpiece clamping is a prerequisite for accurate results; only then can the advantages of laser technology be applied successfully in a production environment.

Our workholding specialists have many years of experience in the development and manufacture of special-purpose clamping equipment.

All workholding equipment and fixtures for ELC laser welding systems are developed and manufactured in-house. This ensures that all specific, welding related requirements can be met.



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# Process development and prototyping.

Our application laboratory offers you:

- Feasibility studies
- Treatment tests
- Welding process developments and component optimization
- Prototype and mini-series production

Efficient laser welding systems, a well equipped metallographic laboratory, ultrasonic and micro-hardness testing stands, a measuring room and – last but not least – qualified and highly experienced staff are always at your disposal.

The use of ELC Laser Welding Systems and series-ready workholding and processing technologies as early as at the prototype phase guarantee that you are given reliable information on welding seam quality, achievable tolerances and processing times.



Cross section for the assessment of the welding seam quality.

# At home in the world.

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