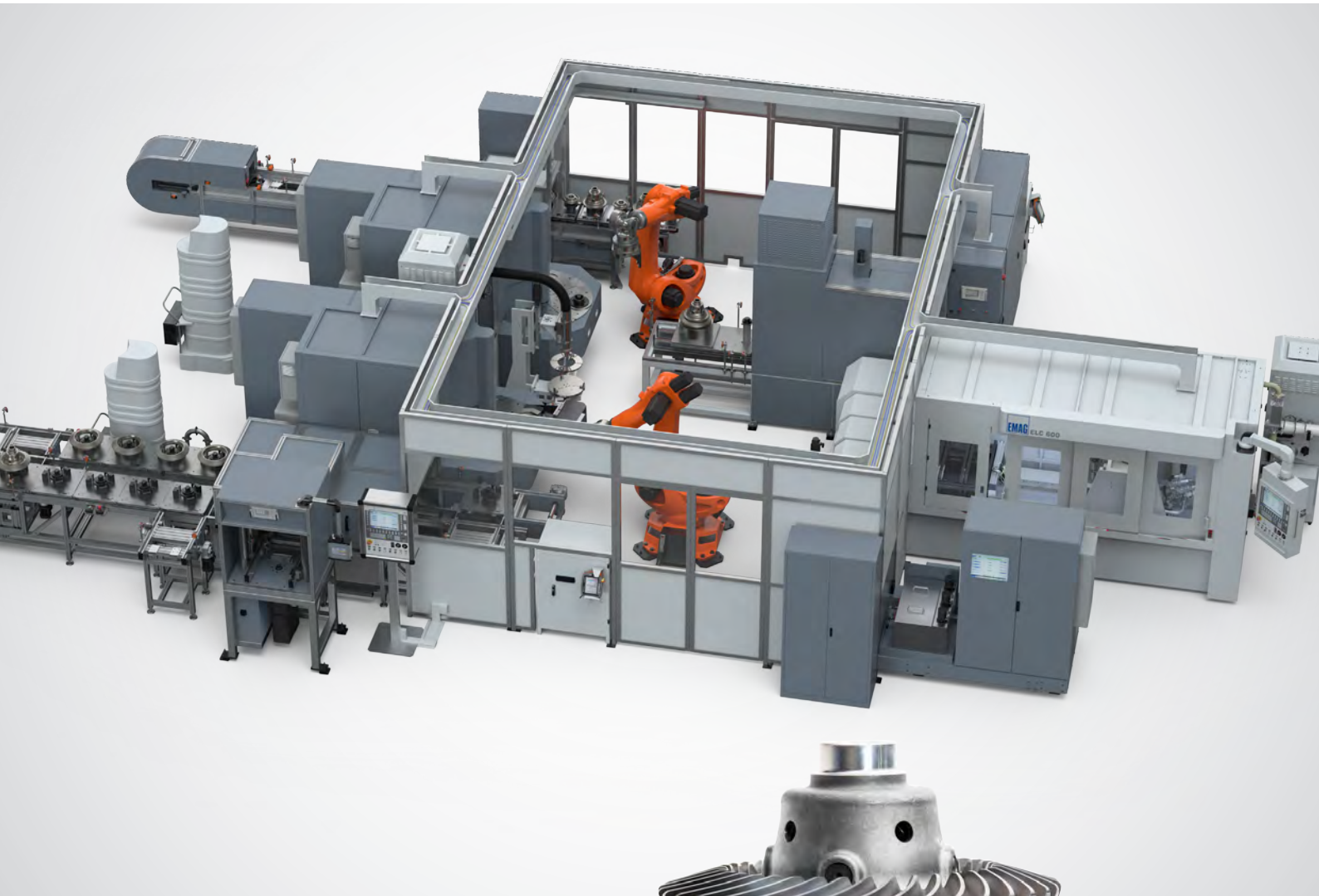


EMAG LASERTEC – ELC 600 LASER WELDING SYSTEM

Production Solution for Large Differentials



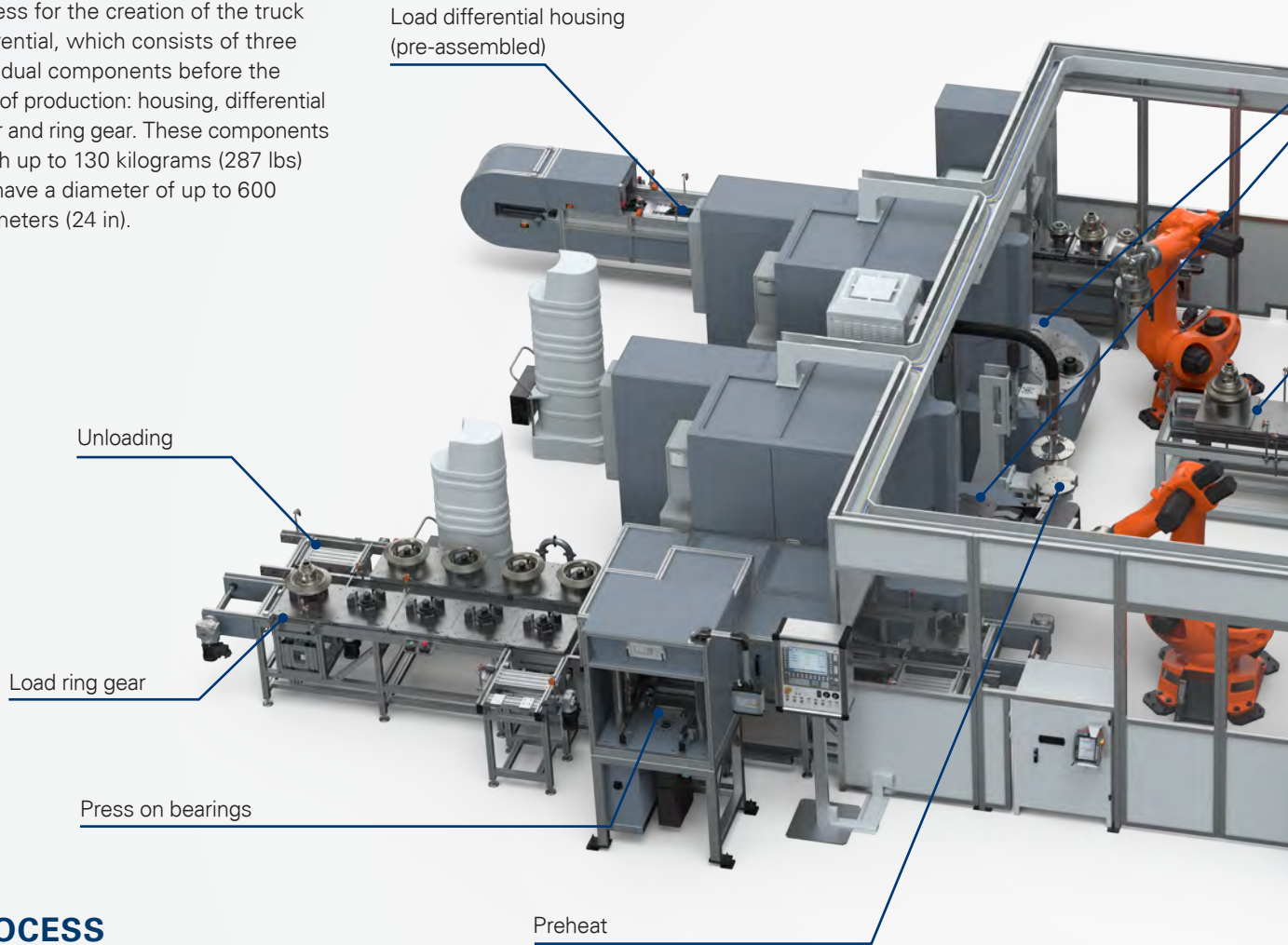
Truck differential



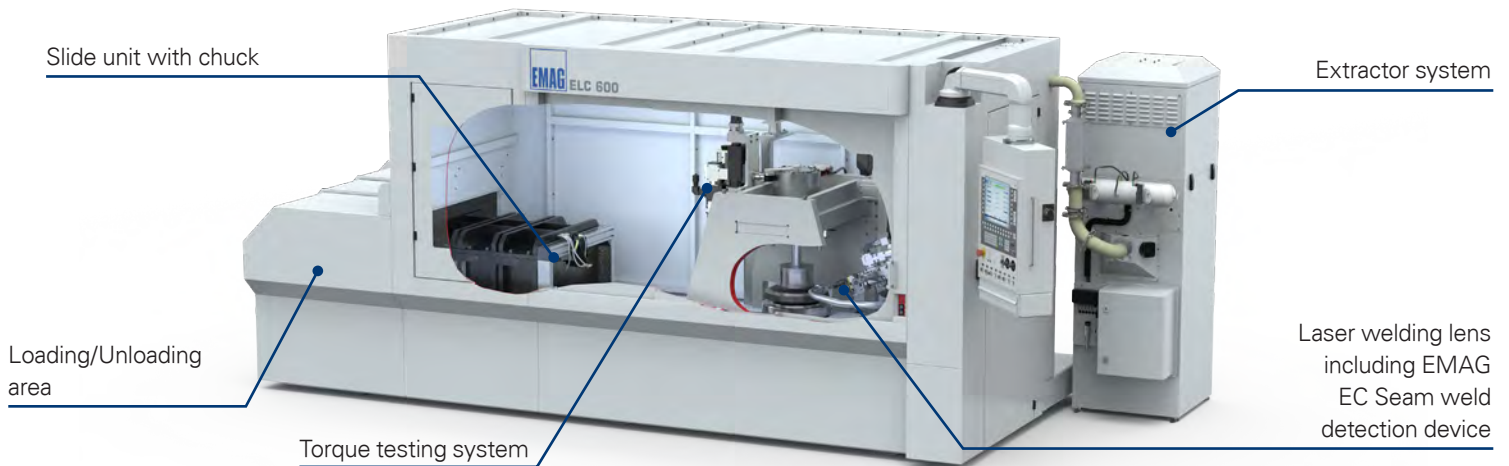
Car differential
(for comparison)

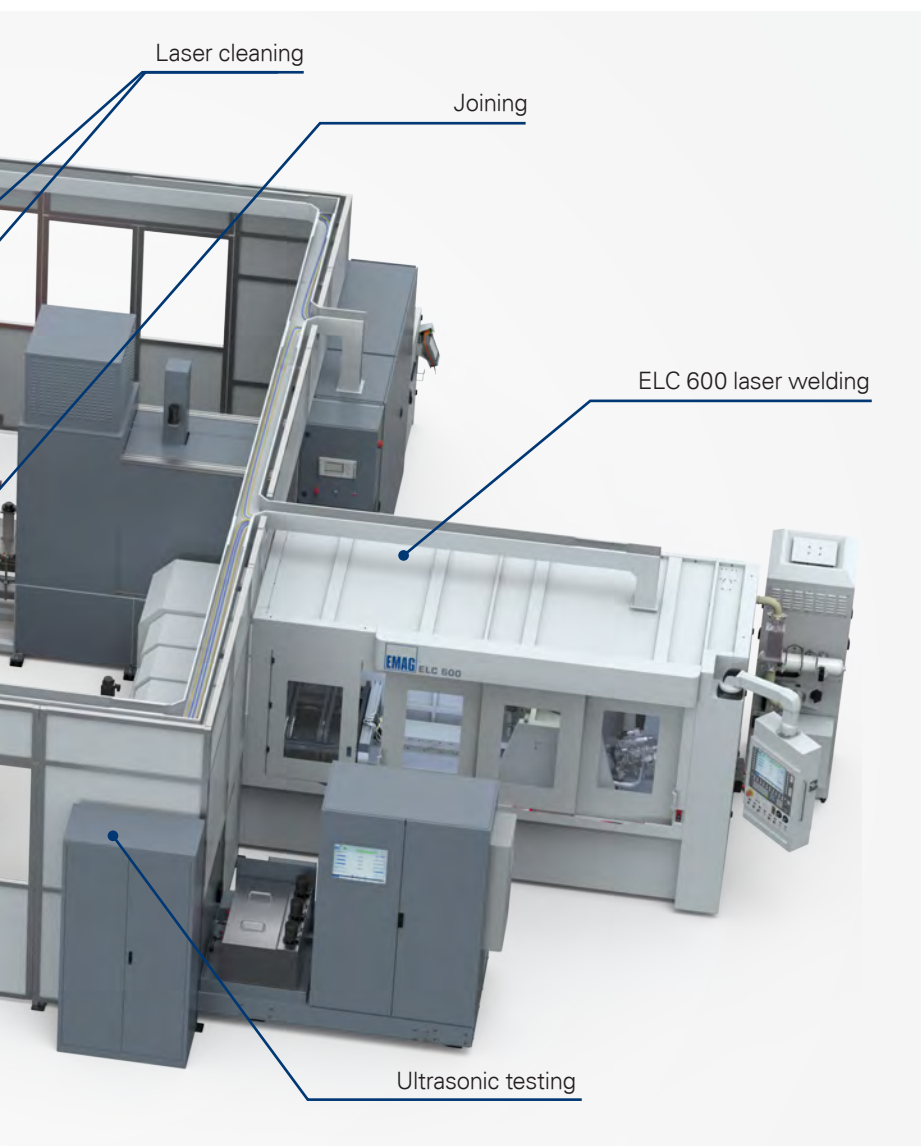
TRUCK DIFFERENTIAL PROJECT – ELC 600

Below is the perfect production process for the creation of the truck differential, which consists of three individual components before the start of production: housing, differential cover and ring gear. These components weigh up to 130 kilograms (287 lbs) and have a diameter of up to 600 millimeters (24 in).



PROCESS





HIGHLIGHTS

- + Maximum workpiece weight of 130 kg (287 lbs)
- + Maximum workpiece diameter of 600 mm (24 in)
- + Two welds on one workpiece
- + Welds from 90° radial to 45° axial
- + Joining and holding forces of to 100 kN during the welding process
- + Integrated torque testing of the differential
- + EMAG EC Seam included

PROJECT DATA

- + Approx. footprint: 16 m x 9 m (52 x 30 ft)
- + Cycle time: 108 seconds
- + Autonomous Production: around 10 minutes (6 workpieces)

5

Check joint with integral vision system to ensure completeness



6

ELC 600 laser welding machine with integral torque testing system



7

EMAG ultrasonic testing



8

Press on bearings



9

Remove the finished parts



Truck differential



Car differential (for comparison)

LIGHTWEIGHT CONSTRUCTION FOR COMMERCIAL VEHICLES COMPLETE PRODUCTION SOLUTION FOR TRUCK DIFFERENTIALS

When the word “lightweight” is used in mass production, it is typically referring to cars, and very rarely includes commercial vehicles.

These days, it is standard practice to replace the old, bolted connection between the differential housing and ring gear with a laser welded connection. While there are a number of benefits supporting this production change, the primary ones are overall part weight reduction and minimization of manufacturing costs.

EMAG LaserTec is the leading supplier of this process, and has a number of references located around the world, as well as the largest application expertise anywhere on the planet.



Linking the stations using industrial robots allows for a variety of system configurations, customizable to your production requirements including workpiece range, part processes and output.

UNIQUE SELLING POINT

Commercial vehicle manufacturers are beginning to discover and take advantage of the enormous potential provided by this technology. EMAG system solutions are world class manufacturing systems that incorporate experience from more than 50 differential welding systems.

The development and creation of holistic production systems focused on laser welding is a genuine USP for EMAG LaserTec in the market.



The parts have a maximum weight of approximately 130 kilograms (287 lbs) and a maximum diameter of 600 millimeters (24 in).

VEHICLES – DIFFERENTIALS



CLEANING, PRESSING, WELDING, AND TESTING ON ONE LINE

After being supplied parts from two separate loading stations, the two housing parts and the ring gear pass through two EMAG laser cleaning machines – a new system developed in house, modeled after our standard machines. The process is extremely fast, and removes all residue such as cutting fluid and preservatives using a focused laser beam, precisely on where the weld will be made later in the process.



The housing parts and the ring gear are cleaned on the newly developed EMAG laser cleaning machine before being welded.

QUALITY ASSURANCE INCLUDED

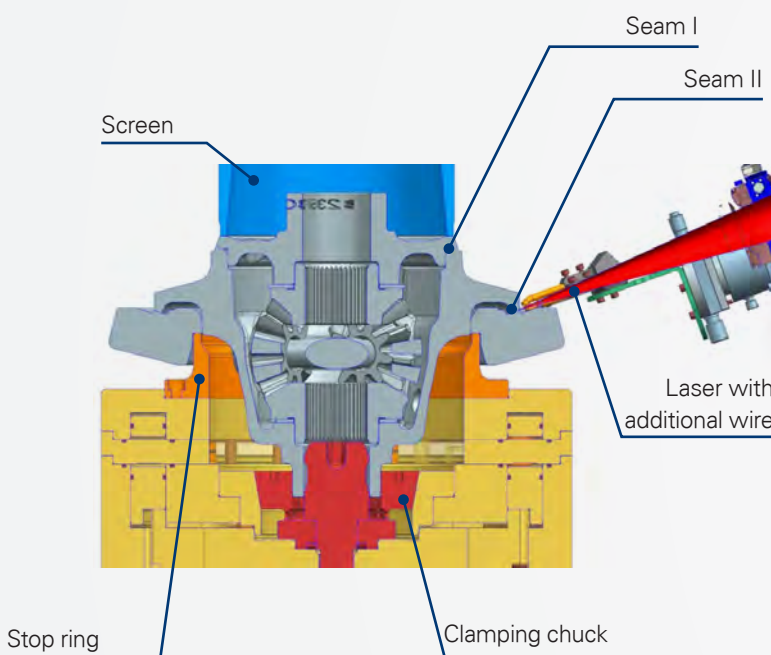
The integrated ultrasonic crack testing system evaluates every single part, and assesses the quality of the welds, then archives the workpiece-related data.

EMAG uses its own EC Sonic testing software to examine the data. This software was developed specially for series testing rotation-symmetric workpieces, and implements test regulations based on a standard range.



ELC 600

The ELC 600 is the perfect platform for the welding of the large, heavy parts found in commercial vehicle powertrains. Parts are moved into the position needed for laser welding by machine slides with an integrated chuck. Welding is then performed very quickly thanks to the precise axes and high precision beam control systems.



(Illustration of workpiece during the welding process. The workpiece is rotating around its own axis, the welding beam is fixed.)



TECHNICAL DATA

Working range

- » Workpiece diameter, max. 600 mm
24 in
- » NC axis 3 (XCW), optional + 2 XB
(lens) + 1 torque test W
- » Device max. 3
- » Max. workpiece height 600 mm
24 in

Process modules

- » Weld counter bearing 1x radial 1
- » Weld counter bearing 1x axial 3
- » Welding clamping force, max. 100 kN
23 lbs
- » CNC controller SIEMENS
SINUMERIK 840D sl

Other (optional)

- » Sensors adapted to the components, e.g., true-running measurement, workpiece orientation
- » Welding with additional wire -
- » Welding with protective gas -
- » Induction preheating -
- » EMAG EC Data production data memory -
- » Torque testing system 65 Nm
48 ft-lb

Laser technology (solid-state laser)

- » Solid-state laser, max. 8 kW
10 hp
- » Welding lens PRECITEC YW52
or others
- » Sensors PRECITEC LWM,
EMAG EC Seam weld
detection device,
or others

Machine dimensions

- » Width x depth x height approx. 2,300 x 4,700 x
2,500 mm
approx. 90 x 185 x 98 in
- » Footprint approx. 11 m²
approx. 118 ft²
- » Weight approx. 11 t
approx. 24,250 lb

EMAG LASER SYSTEMS APPLICATION LABORATORY

Our in-house laser systems application laboratory can provide you with:

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

Efficient laser welding systems, laser beam hardening machines, laser cleaning machines, a very well-equipped metallographic laboratory, ultrasonic and microhardness testing stations, a measuring room and, last but not least, highly qualified and experienced staff are always at our disposal at our application laboratory. By using ELC laser welding systems and standard clamping and processing equipment during the prototype phase, you can ensure that you receive accurate and reliable information about the quality of welds, possible tolerances and cycle times.

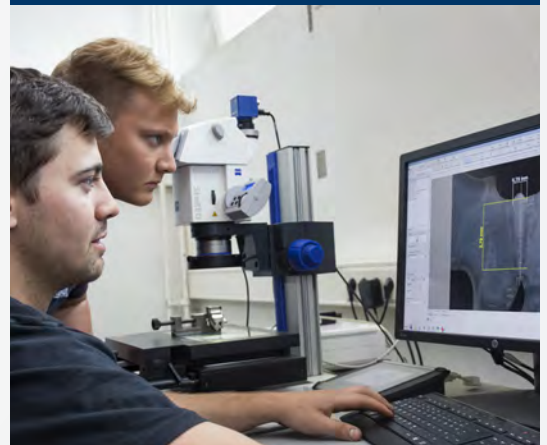


SERVICES INCLUDE:

1. Component and process development
2. Prototyping
3. Small batch series production

LABORATORY EQUIPMENT

- + Laser welding (CO₂, disc and fiber lasers)
- + Laser hardening
- + Laser cleaning
- + Ultrasound crack inspection
- + Cross-section inspection through polished sections
- + Video microscope
- + Microhardness tester
- + Surface test
- + Thermal camera
- + Measurement room



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