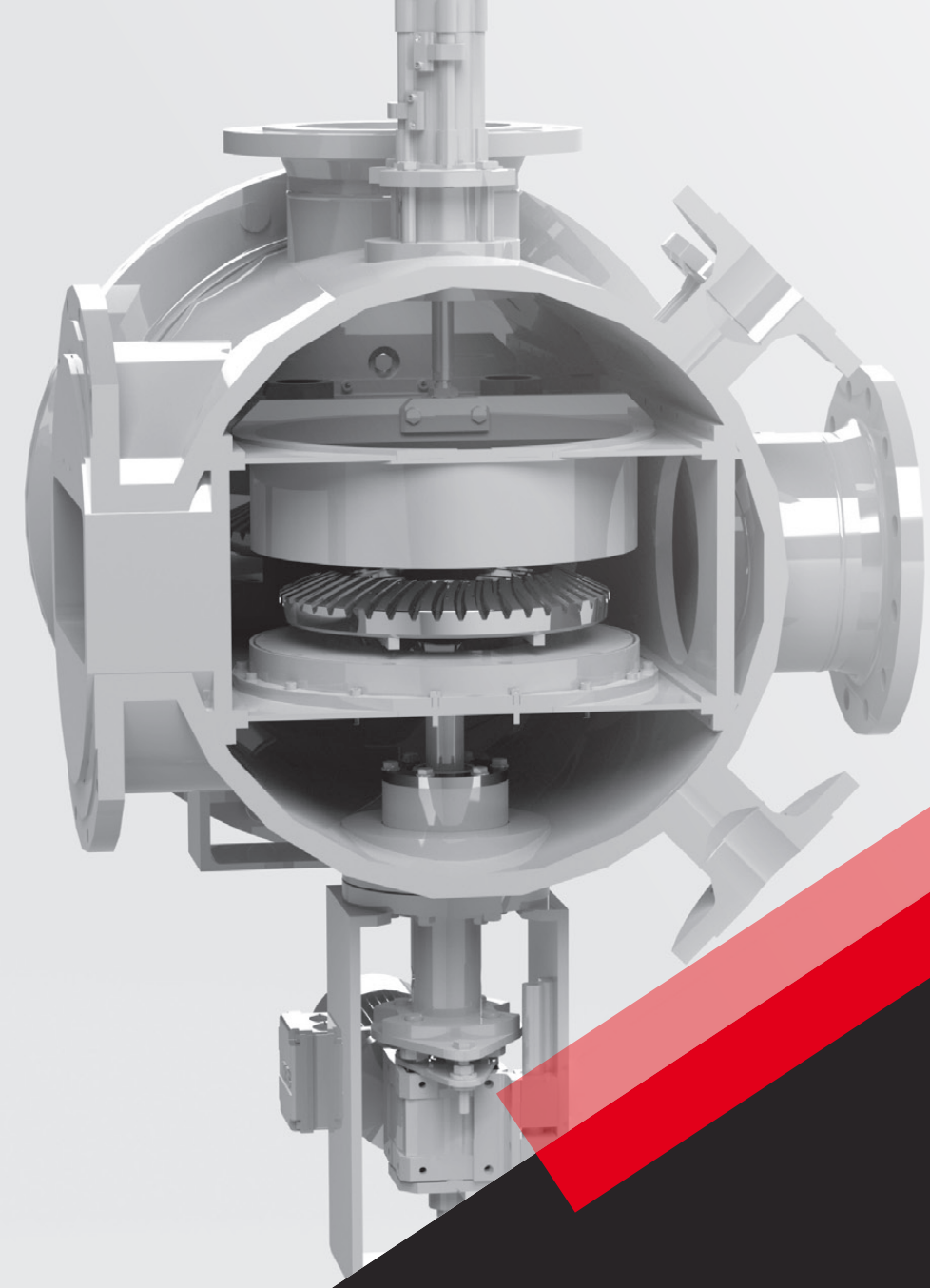
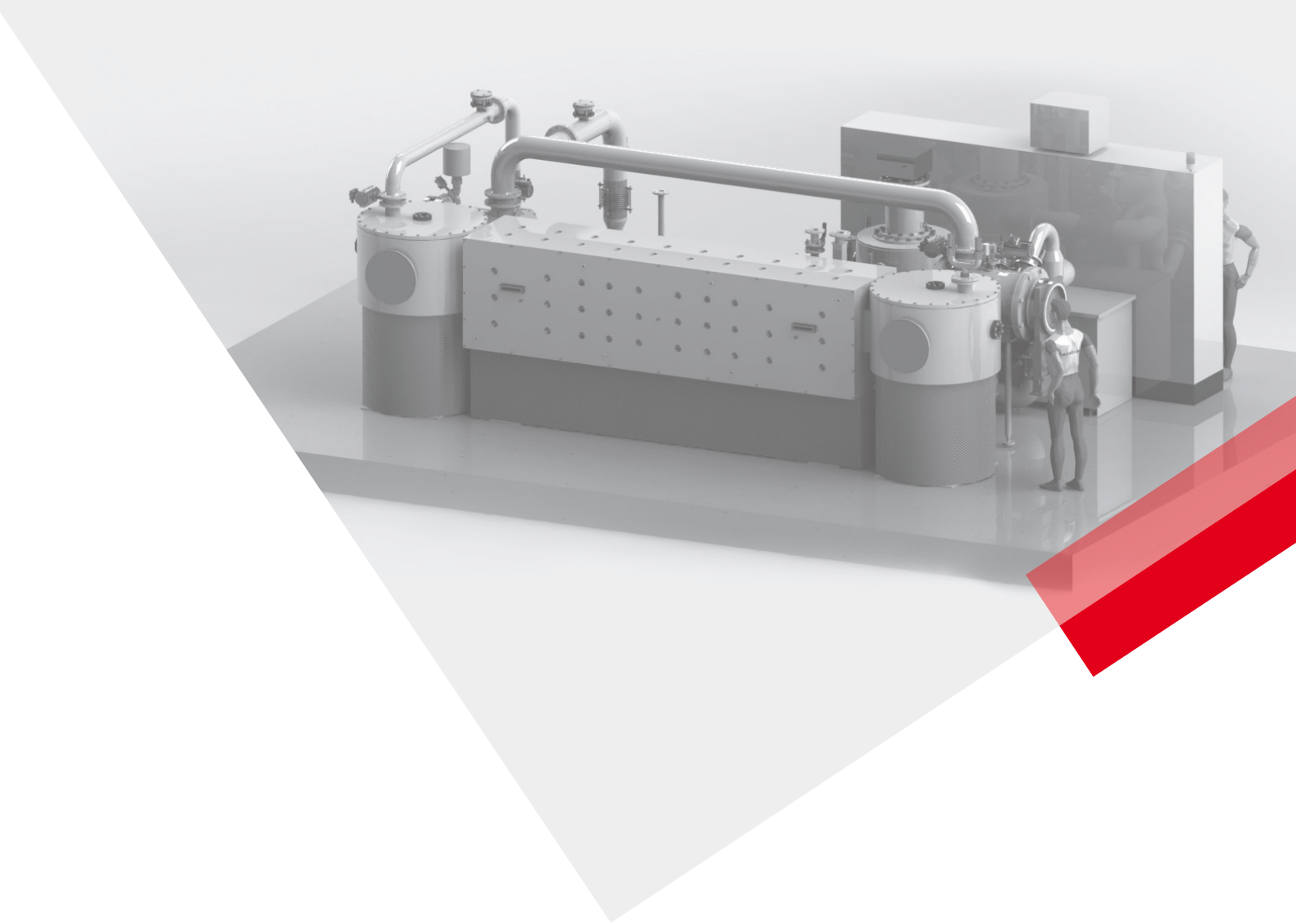
SECO/WARWICK

INVENTION MEETS RELIABILITY



4D Quench / UniCase Master

Vacuum system for individual hardening with distortion control



4D QUENCH / UNICASE MASTER

A vacuum system for single-piece nitrogen quenching with distortion control as an attractive alternative to a press quenching.

APPLICATION

/ All press quenching steels.

INDUSTRIES

/ Aerospace
/ Automotive
/ Transmission
/ Bearing
/ Machinery

MATERIALS

/ Traditionally oil quenched steels for post carburizing or through hardening applications.

TECHNOLOGIES

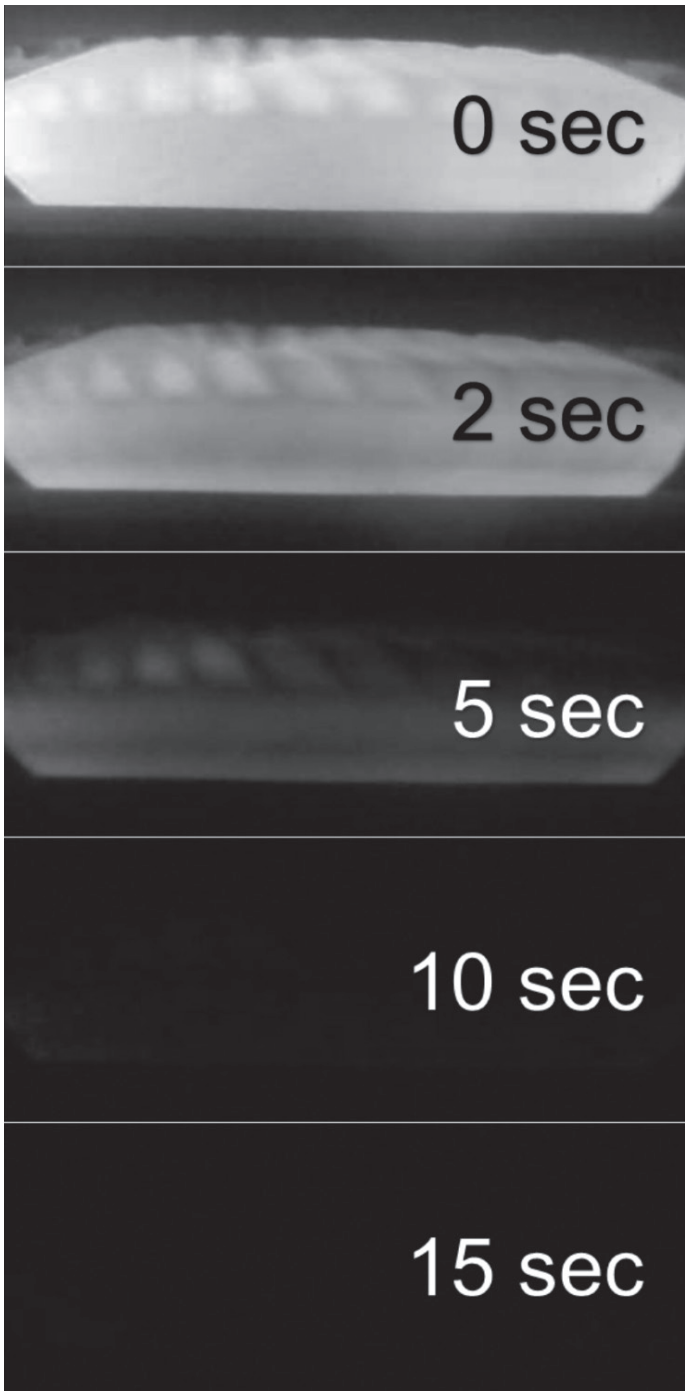
/ Bright hardening (High Pressure Gas Quench) with distortion reduction and control.
/ Alternative to press quenching.

UCM 4D Quench® - is a vacuum heat treatment solution for individual quenching of component parts such as gears, shafts, bearing races, rings, selves, etc. made of standard or custom case and through hardening steels. It provides excellent distortion control and notably increases precision and repeatability of heat treatment while reducing unit and overall production costs. The system is fully automated and

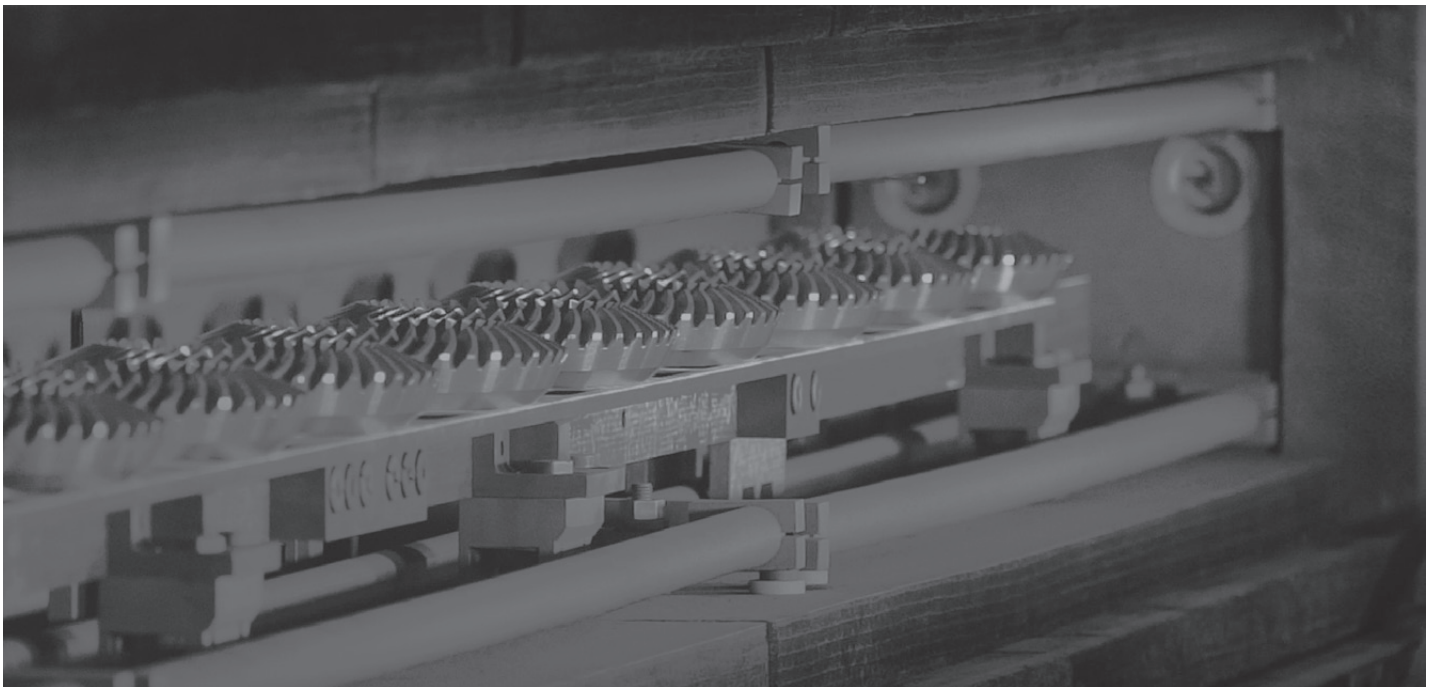
easily integrated with in-line production. It's a modern and attractive alternative to hardening in a press, eliminating all its disadvantages.

UCM 4D Quench® is dedicated to these who want to significantly increase production quality and economy of mechanical transmission components compared to batches or continuous heat treatment systems as well as to eliminate quench presses and their disadvantages. It consists of a vacuum heating chamber and a high pressure nitrogen quench chamber equipped with transportation mechanisms.

Parts are heated up to hardening temperature in the heating chamber under vacuum, which protects the part's surface against contamination and unexpected composition changes. The quenching process provides unique and significant improvements related to the reduction of distortion. This is done primarily using a high-pressure gas quenching system installed in the quenching/unloading chamber. The system utilizes a proprietary arrangement of cooling nozzles that surround the part to ensure a uniform flow of cooling gas from all sizes, as well as the top and bottom. This is referred to as „3D" quenching. In addition, a table spins the part, further enhancing quench uniformity. The forth dimension in the process is referred to when the part is rotated during quench, allowing us to „4D" quench parts for the best possible uniformity. The cooling nozzles pattern can be adequately adjusted to fit the particular parts size and shape. The entire nitrogen cooling system provides the equivalent of an oil quench with more uniform cooling, which results in absolute repeatability, reduces distortion and allows for highly repeatable results. Oil or specialized gases such as helium are not required. The single piece-flow method,



while parts are passing through heat treatment one by one, enables full integration into in-line manufacturing, alongside CNC machines. It eliminates heat treatment fixtures, material logistic cost and time as well as shortens production cycle. Moreover, repeatability of quenching results and distortion control and reduction provides great potential for reduction of hard machining costs. In addition, every single part is monitored and reported during heat treatment, which provides 100% traceability and quality control. The system and applied technology is safe, clean and environmentally friendly.

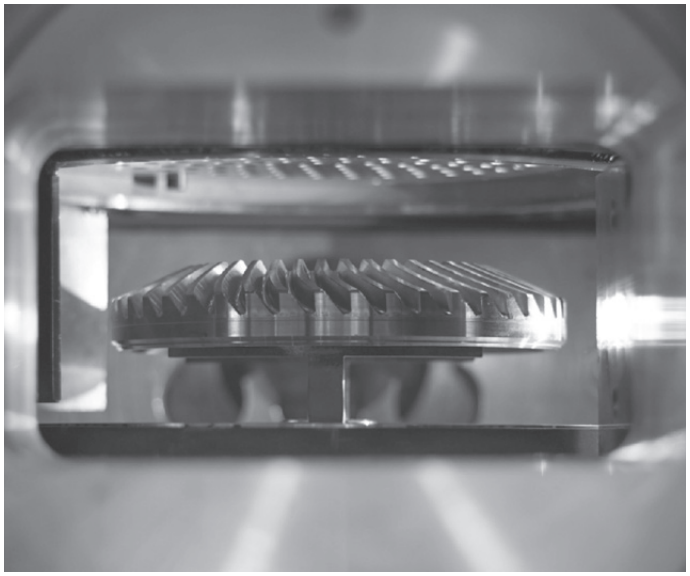


BENEFITS

- Distortion control, reduction and prediction.
- Absolute precision and repeatability of results.
- Improved safety and no fire risk.
- Total process integration and automation.
- Full single part traceability and reporting.
- Compact footprint.
- Flexible, on-demand operation.
- No human involvement and impact.
- Elimination of press tooling.
- Eliminates the need for furnace fixtures.
- No decarburization and oxidation.
- Clean part surface (vacuum).
- Nitrogen quench (neither oil nor helium is needed).
- Elimination of copper masking or stop off paints.
- Elimination of high-temperature radiation and fire risk.
- Elimination of oil and oil vapor contamination.
- Elimination of washers and cleaning chemicals.
- Safe and environmentally friendly process.

UNIQUE FEATURES

- Single-piece flow Vacuum heat treatment.
- 4 dimensional-forced nitrogen quenching.



Parameter/Model	UCM-1-200/50-4DQ	UCM-1-300/100-4DQ	UCM-1-500/150-4DQ
Working zone OD/H	200/50 mm, 8/2”	300/100 mm, 12/4”	500/150 mm, 20/6”
Part mass	5 kg, 11 lb	10 kg, 22 lb	20 kg, 44 lb
Temperature	1260 °C, 2300 °F		
Heating positions	15	10	6
Cycle time	40 s	60 s	90 s
Vacuum	10^{-2} mbar/torr		
Heating power	75 kW	120 kW	180 kW
Quenching type	10 bar N_2		
Quenching rate	2000 W/m²K (oil range)		
Footprint	7 x 4m, 23 x 13 ft		

SECO/WARWICK
Invention Meets Reliability

SECO/WARWICK is the 1st choice supplier
of solutions for heat treatment and metallurgy.

We create innovative products that provide our customers with reliable, safe and environmentally friendly solutions for heat treatment and metallurgy and ensure the economic efficiency of their businesses. Expertise includes end-to-end solutions in 5 categories: vacuum heat treatment, atmosphere, and aluminum thermal processing, controlled atmosphere brazing of aluminum heat exchangers and vacuum metallurgy.

SECO/WARWICK Group, with 8 companies located on 3 continents, has customers in nearly 70 countries with more than 4000 deployed solutions. The company provides standard or customized state-of-the-art heat processing and metallurgy equipment and technologies to leading companies in the following industries: automotive, aerospace, electronics, tooling, medical, recycling, energy including nuclear, wind, oil, gas, solar and production of steel, titanium, and aluminum.

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