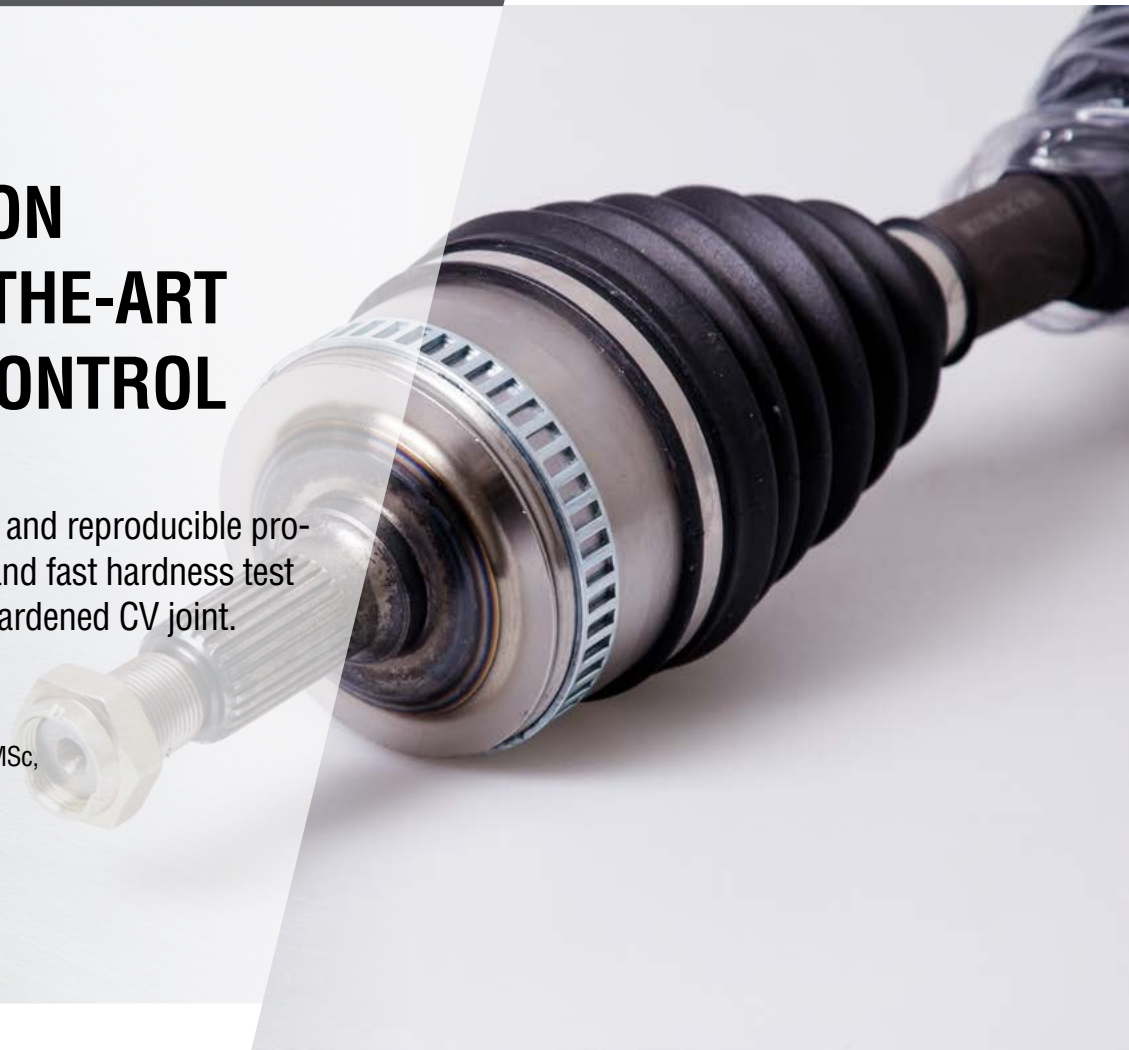


INSIGHTS ON STATE-OF-THE-ART QUALITY CONTROL

Learn how automated and reproducible processes bring reliable and fast hardness test results for a surface hardened CV joint.

By Lars Hagsted Rasmussen MSc,
Application Specialist, Struers



CV JOINT

PREFACE

Quality assurance is a critical process in automotive manufacturing. Quality control ensures customers receive products that meet their needs and are free from defects. If quality assurance processes are not supported by appropriate quality control procedures or these are done insufficiently or in the wrong way it potentially can put customers at risk.

Manufacturers are under constant pressure to meet market demands for safety, operational stability, environmental standards, and durability while at the same time improving productivity and remaining competitive in a global market.

At Struers, we aim to support manufacturers in meeting these demands in the global marketplace.

Our range of technology and expertise helps manufacturers prepare, analyse and ensure the highest quality of raw and processed solid materials in the manufacturing process.

In this materialographic report, we describe the procedure used for testing the hardness of a surface hardened CV joint. Using highly-automated equipment and reproducible processes, it is possible to reduce time consumption and maximise test reliability in quality control.



Lars Hagsted Rasmussen
MSc, Application Specialist, Struers

THE FIELD OF STUDY

Automated and reproducible processes can quickly and reliably deliver case depth for CV joint. This is done by using a smart clamping setup due to the geometry of the CV joint and semi-automated equipment to conduct the complete materialographic process of hardness testing on specific parts, especially the spline and ball tracks.



Exhibit 1: A surface prepared for hardness testing with an automated series of indentations.

Solution



Cutting
Axitom-5



Polishing
AbraPol-30



Verification
Duramin-40 AC1

HARDNESS TESTING OF SURFACE HARDENED CV JOINT USING SEMI-AUTOMATED AND REPRODUCIBLE PROCESSES

Cutting:



- Equipment: Axitom-5
- Cut-off wheel: 50A35
- Feed-rate: 0.7 mm/s
- Clamping tool: Vertical clamping tool 12 mm T-Slot

For the cutting process, we used a [Struers Axitom-5](#) with a 58A35 cut-off wheel and a special clamping setup (Cat. No. 05046904). The feed-rate was set at 0.7mm/s and we applied a cutting sequence, which prevented pinching of the cut-off wheel.

The first two cuts were performed parallel to the ball tracks. The third cut was made perpendicular to the spline, freeing the ball track specimen. The fourth and final cut was performed from the top of the spline until one half detached.

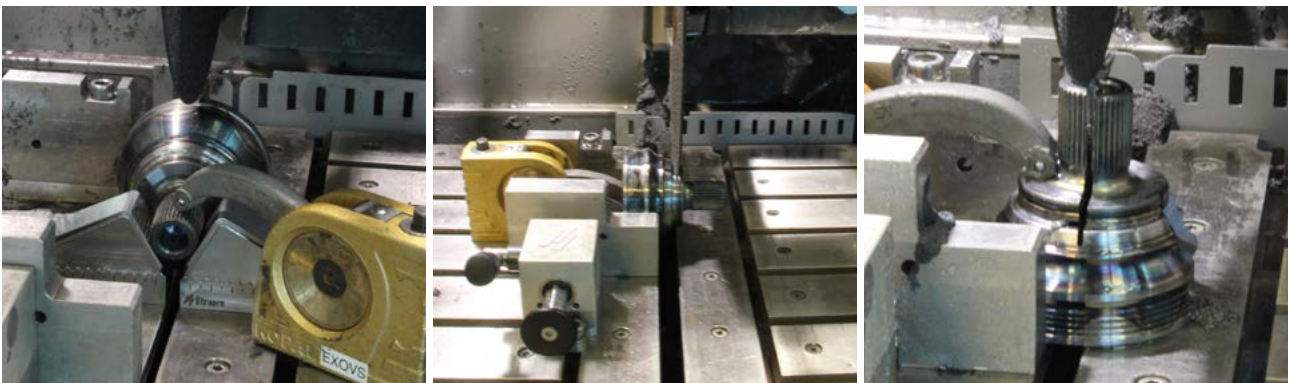


Exhibit 2: Illustrating the clamping and 4 cuts to prepare specimens from the ball tracks and spline for hardness testing.

Polishing:



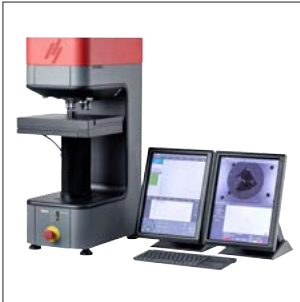
- Equipment: AbraPol-30
- Disc diameter: 300 mm / 12"
- Specimen holder: 02606916 - MAXCY

For grinding and polishing, we used the [Struers AbraPol-30](#) with a 300 mm/12" disc diameter. The specimen holder, 02606916-MAXCY, was used during the four step process of preparing the surface for hardness testing and microstructure evaluation.

Step	1	2	3	4
 Disc / Cloth	MD-Piano 220	MD-Allegro	MD-Dur	MD-Chem
Speed [rpm]	300	150	150	150
Dressing [µm]				
 Cooling				
 Suspension		DiaPro Allegro/Largo 9 µm	DiaPro Dur 3 µm	OP-U NonDry
Pre-dosing				
Dosing				
 Lubricant	Water			
Pre-dosing				
Dosing				
 Force [N] Single/Holder	40 /	40 /	30 /	20 /
Holder speed	150	150	150	150
 Rotation direction	>>	>>	>>	>>
 Time [min]	1:00	3:00	3:00	1:00
Stock removal [µm]				
Pause between steps	No	No	No	No

Exhibit 3: The configuration of the grinding and polishing of the specimens.

Verification:



- Equipment: Duramin-40 AC1
- Method type: Vickers

For the verification process, we used the [Struers Duramin-40 AC1](#) AC1 hardness tester to conduct an automated CHD measurement of 15 indentations. The results of the CHD measurements were delivered in an informative report.

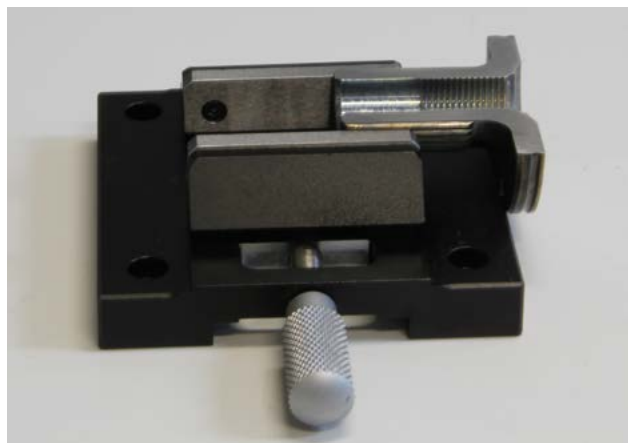
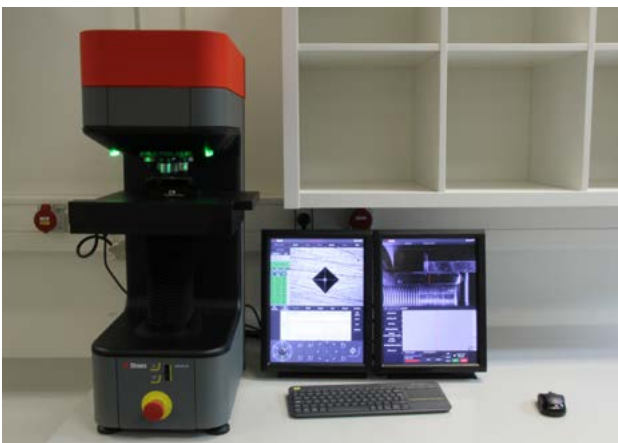


Exhibit 4: The sample is placed in vise before the hardness test is performed with a series of 15 automated indentations.

RESULT AND OVERVIEW

A reliable, fast and reproducible process suitable for a mass produced component is defined.

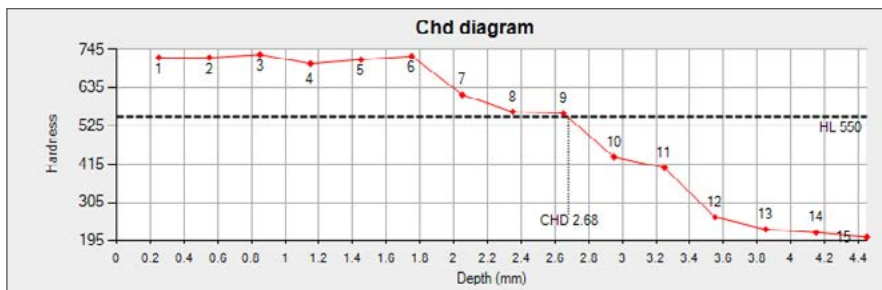
From a benefits standpoint, smart clamping during the cutting process helps to avoid pinching of the cut-off wheel during the cutting process and allows spline and ball track specimens to be separated for testing.



Exhibit 5: Hardened surface with indents.

The four step semi-automated grinding and polishing process allows for a plane specimen surface for conducting hardness testing of spline and ball tracks.

Immediate results are given via an automated CHD-measurement of 15 indentations.



Solution



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