



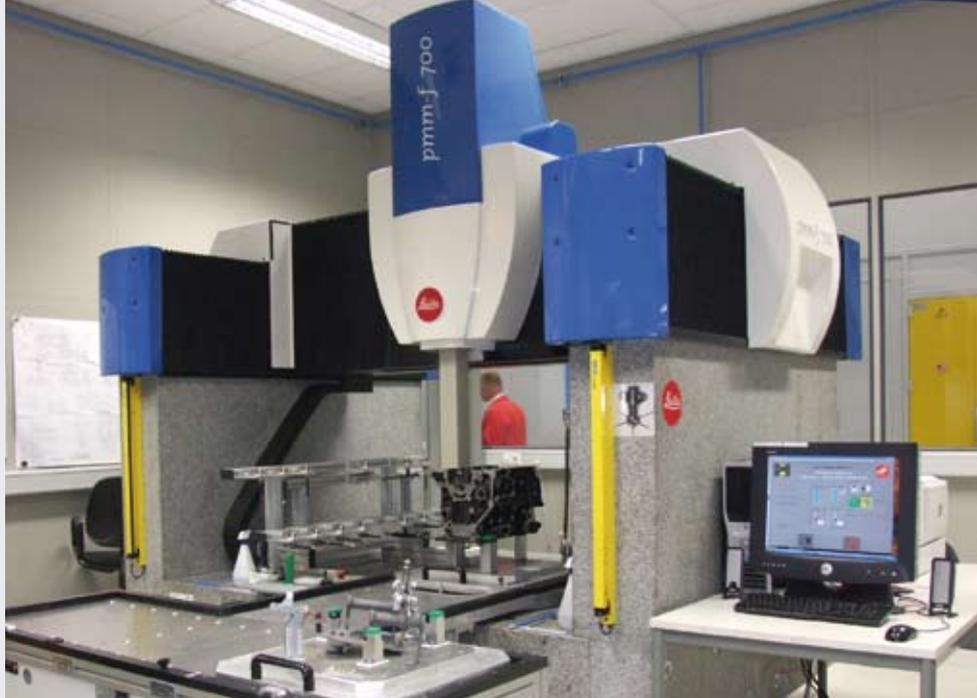
Case Study AUDI HUNGARIA MOTOR Kft.
Leitz CMMs with QUINDOS test the accuracy of engine components for one of the largest engine plants in the world



 **HEXAGON**
METROLOGY



A total of three Leitz Reference belong to the measuring inventory. On two of these coordinate measuring machines the cam units and basic shafts are tested.



In 2002, PMM-F 700 started to be use at Audi. The process control is controlled by the quality guide lines.

Autobahn signs can already be seen some 1,5 hours Southeast of the Vienna city lines announcing the famous four interlinked rings. Immediately a vision pops into your mind: a sporty Audi racing through the spectacular landscape, hugging the passing curves of the hilly, serpentine and perfectly smooth asphalt. A part of this image your having is created by the subsidiary company AUDI HUNGARIA MOTOR Kft., which can be found in Hungarian Győr, close to the Austrian border. Over 1,9 million engines were produced here for various models of the Audi and VW Corporation in 2008. The quality assurance of the complex engines is amongst other things, measured on a total of 19 high-precision Leitz coordinate measuring machines.



Twelve Leitz SIRIOs, three Leitz References, three Leitz PMMs, one Leitz PMM-F – the list of the coordinate measuring machines that can be found in the measuring rooms of the Hungarian subsidiary company reads like an encyclopaedia article written on the Leitz brand. The youngest member of the Leitz machinery: a Reference with an integrated rotary table.

Innovative Engine Technique Meets...

A little less than 400 engine varieties are produced at Győr. Amongst these are for instance, the R4 engines, or the so called Global Engine, a 2 litre turbo FSI engine. However the biggest power packs of the corporation are also manufactured here: the V6, V8 and V10 engines, and now also quite recently, the V12 diesel engine – which is the heart of the Q7 model. All of the main engines are produced in Hungary. The spectrum spans from engine blocks and cylinder heads to piston rods and up to crankshafts and camshafts.

In the future, more engines will be equipped with the new camshaft generation, the Audi Valvelift System (AVS). This is a new challenge for Audi: between 2008 and 2009 as well as from 2009 to 2011, Audi will double the quantity of this new camshaft generation, not only

because of the enormous amounts to be produced but also the fact that the new camshafts are very complicated parts to manufacture and require the full 100% commitment and performance of man and machine. Gearing, cams, mountings, axial control grooves are all found in one single unit. At the moment this feature of continuous testing in one sequence is only possible with coordinate measuring machines. Leitz measuring systems achieve these unusually high demands seven days a week, in three shift operations.

... Highly Modern Coordinate Metrology.

Two general purpose Leitz Reference CMMs are used for camshaft measuring, this means for basic shafts measurements and the measuring of cam units. Graduate Engineer. Kohán Zoltán, employed at Audi's production planning explains: "On the basic shafts we measure, amongst other things, gearings. Parameters such as pitches, flank direction and profile form play a special role here. Aside from the gearings in this unit, there are also control geometries that are necessary to measure. Whereas with cam units, the cam shape is important but also the cam angle as well. In addition, we can also control free form surfaces and bearing diameters with the Leitz Reference and QUINDOS."

The latest Reference has come up with a special feature: the integrated rotary table. This feature makes this CMM an economic solution for Audi. It enables a complex inspection of the AVS camshaft components and has the potential to test parts with large measuring volumes. At the same time this solution enables greater stability and accuracy. The measurement range of 1500 x 900 x 700 mm is aligned to the measurement of the aggregate engines. The basic shaft is for example, measured horizontally as well as vertically. Varying fixtures also require a large measurement range. Fixtures on the rotary table are necessary, amongst others, to be able to measure the internal gears of the camshaft lobes. Special fixtures are required for the pump cam so that no deformations are generated.

Zohán Koltán explains why the decision for Leitz Reference was made: "In order to be able to support product quality through stable control processes, we trust the dependability and accuracy of Leitz coordinate measuring machines. The Reference convinced us because of its accuracy, its dynamics, its robustness and the QUINDOS measuring software, which has proven itself to us over the years. Our existing Leitz machines have reliably seen us through the manufacturing process so well that we have decided again for Leitz."

Safer Engine Performance Thanks to the Leitz PMM-F and the Leitz SIRIO

Other large CMMs from Hexagon Metrology are also to be found at Audi Hungary – such as the Leitz PMM-F and a whole fleet of Leitz SIRIO 688. With the PMM-F, measuring technicians can test components of the Global Engine. To do this you need for example, the series production analysis from cylinder bores. Form measurements of all kinds are possible thanks to high speed scanning, ISO compliant filter algorithms in QUINDOS and a low probing variation with the PMM-F.

Kohán Zoltán comments: "The cylinder bore analysis is a very complex measurement. Previously we conducted this measurement with special form measuring machines. A measurement took an hour to carry out. With QUINDOS

and the excellent scanning features of the PMM-F, we can achieve production control appropriate results within a half hour – and within close distance to the factory floor. Previously the equipment we used required a climatic chamber for this and the chamber had to achieve three times as high climatic demands. The PMM-F is not as sensitised when compared to temperature influence and can also be set up in a measurement room close to production."

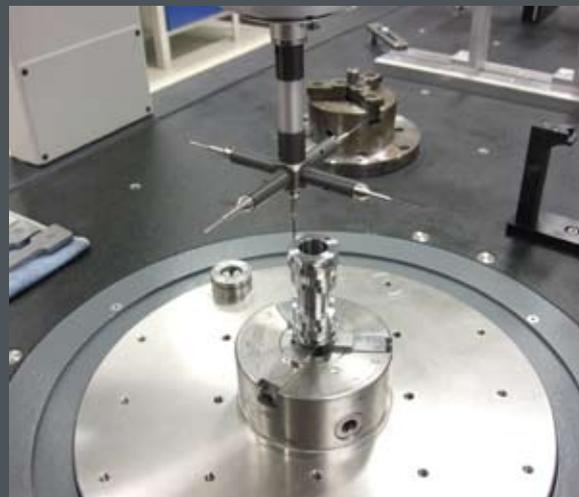
Numerous Measuring Machines – One Measurement Software

Another advantage of the measurement software from QUINDOS that Audi values: "Our company has different measuring machines from different manufacturers. Until now, each of the measuring machines used their own specific software. However that limited the versatility of the machines. The future solution is QUINDOS7 with its manufacturer independent support of

the I++ interface. In this way we can use QUINDOS as an overlapping software on all different kinds of measuring machines. This raises the versatility of the measuring machines and of the operating personnel. Furthermore, we can compare the measurement results better and simplify the programming efforts and management of the measurement programmes," says Kohán Zoltán.

Due to the complex engine component construction and the inter-connection of the components there's generally no route at Audi that passes by the stationary, high-precision coordinate metrology. Through the combination of Hexagon Metrology systems and well engineered quality processes, Audi achieves a high process stability that's based on speed and accuracy. And only in this way will the Audi cars glide smoothly through desert, winter and mountain landscapes.

By Birgit Albrecht and Gerhard Ehling



The main attraction of the Leitz Reference for the measurement of cam units and basic shafts is the rotary table, with which very small internal gearing and control geometries can also be measured.



Complex parts like this cylinder head of the Global Engine are measured from a Leitz SIRIO. The SIRIO MultiScan offers speed and flexibility.



Leitz

The Leitz brand as part of Hexagon Metrology stands for high accuracy coordinate measuring machines, gear inspection centers and probes. Leitz measurement systems master quality assurance tasks equally well both in metrology labs as well as on the shop floor. The development and production are located in Wetzlar, Germany. For more than 30 years Leitz has been offering its customers the best innovative measurement technology available. The primary goal remains offering modern solutions for demanding measurement tasks.

Hexagon Metrology

Hexagon Metrology is part of the Hexagon group and brings leading brands from the field of industrial metrology under one roof.

Hexagon Metrology GmbH
Leitz Division
Siegmond-Hiepe-Straße 2 – 12
35578 Wetzlar
Germany

E-mail contact.leitz@hexagonmetrology.com
Phone +49 (0)6441 207 0
Fax +49 (0)6441 207 122

www.leitz-metrology.com
www.hexagonmetrology.com

©2009 Hexagon Metrology GmbH
All rights reserved. Due to continuing product development, Hexagon Metrology GmbH reserves the right to change product specifications without prior notice.

Printed in Switzerland. April 2009.