

APPLICATION NOTE

Application of FISCHER products

AN046en

Measurement of thick NiP coatings on automotive parts

In the automotive industry, the plungers used inside the solenoid valves of automatic transmission gearboxes must fit smoothly into their through-holes to an accuracy of just a few μm , in order to prevent oscillations that would lead to jamming or canting. To meet these tight tolerance limits, the plungers must be coated very evenly, which requires strict quality control.

In the manufacture of parts in the automotive and machine-building industries, adhering to extremely tight tolerance limits is necessary to guarantee the components' proper functioning. That is why electroless metal platings like electroless nickel are being used more and more frequently, as they enable a very even coating: The layer builds up more homogeneously and with less variation in thickness than electroplated coatings, which tend toward excessive coating thicknesses on edges and corners.

In this example, steel plungers for solenoid valves are coated with approximately 60-70 μm of NiP containing at least 10% phosphorous. Afterwards, the parts are ground to an accurate fit; the end thickness of the coating is approximately 50 μm , which must be within a tolerance range of $\pm 4 \mu\text{m}$. This layer is itself non-magnetic and can, for purposes of incoming inspection and/or after grinding, be measured with the magnetic induction method using the DUALSCOPE[®] FMP100 and the FGAB 1.3 probe.

sample	Coating thickness	Standard deviation
Unground plunger	67 μm	$\varnothing 3 \mu\text{m} *$
Finished plunger	50 μm	$\varnothing 0.3 \mu\text{m} *$
Control of the measurement system variation by repeated measurements on a single measurement spot		0.03 μm

Tab. 1: Measurement results of a quality inspection
* 10 readings taken on different measurement spots per sample

The DUALSCOPE[®] FMP100 and FGAB1.3 probe are employed in conjunction with a V12 BASE stand, which makes it possible to replicate the measurement procedure with consistent probe positioning and angle. This minimises operator influence and produces extremely repeatable results, as shown in Table 1: The standard deviation for the measurements of the coating after grinding is, on average, just 0.3 μm , and the variation of the entire measurement system itself is only 0.03 μm , which is negligible. Therefore the measurement device capability even for the required tight tolerances is fulfilled.



Fig. 1: DUALSCOPE[®] FMP100, probe FBAG1.3 and stand V12 BASE

The DUALSCOPE[®] FMP100, together with the probe FGAB1.3 and the stand V12 BASE, forms a reliable control system that can precisely and accurately measure NiP coatings on automotive components with minimal variation. This allows both monitoring of quality specifications and adherence to very tight tolerance limits – and therefore, the avoidance of potentially costly warranty claims. For further information please contact your local FISCHER representative.