

Application Information

Piston Ring Tension Test

Determine the tension force of sealing piston ring.

A racing team's ultimate goal is to make every effort to improve and maximize the performance of their racecars in order to provide the driver the best chance to finish on top. One such top-tier team was looking at a crucial component affecting engine efficiency- testing the tension force of the piston sealing rings.

Piston rings serve several vital purposes in the combustion engine. They keep the contents of the combustion chamber and the crankcase separated, facilitate heat transfer between the piston and the cylinder walls and scrape the oil on the cylinder walls transferring the lubricant back to the crankcase. But most importantly for the racing team, the piston rings play a major role in the efficiency and horsepower of the engine. If the piston rings are not precisely fitted within the piston cylinder, performance is compromised. If too much space is between the rings and the cylinder the compression will decrease producing lower power, while the tighter the fit and the friction increases wasting energy and power. Even an increase in the piston's tension of a few pounds can culminate in a significant horsepower loss due to the high engine speed, positioning the car and driver at a considerable disadvantage. Additionally if the rings are not properly sized to perform, a blown ring may cause catastrophic damage to the engine, causing the car to exit the race early.

A common method of testing the tension force of the piston and ring combination is to use a basic fish scale and simply pull the piston through the cylinder bore to obtain the maximum drag or tension force. This is highly inaccurate due to the low performance specifications of the test instrument. To obtain the necessary level of precision, this racing crew utilized the SHIMPO FG-7000 Digital Force Gauge with $\pm 0.2\%$ full scale accuracy. One key reason for choosing this gauge was the ability to acquire accurate and repeatable measurements across all the various ring performance tests. Another key to utilizing the FG-7000 was its ability to store data and download it to their PC via the EDMS software. The included software allows uploading of data points, calculates statistics, plus plots a comprehensive graph of the entire test or specific portion of the test for further analysis.

After several tests runs the team has found the FG-7000 combined with PC software to be an invaluable tool for assessing ring seal tension and will continue to utilize this equipment as a regular part of the diagnostic operations.

Equipment Used

- *FG-7000 Series Digital Force Gauge*
- *EDMS Data Acquisition Software for FG-7000*

