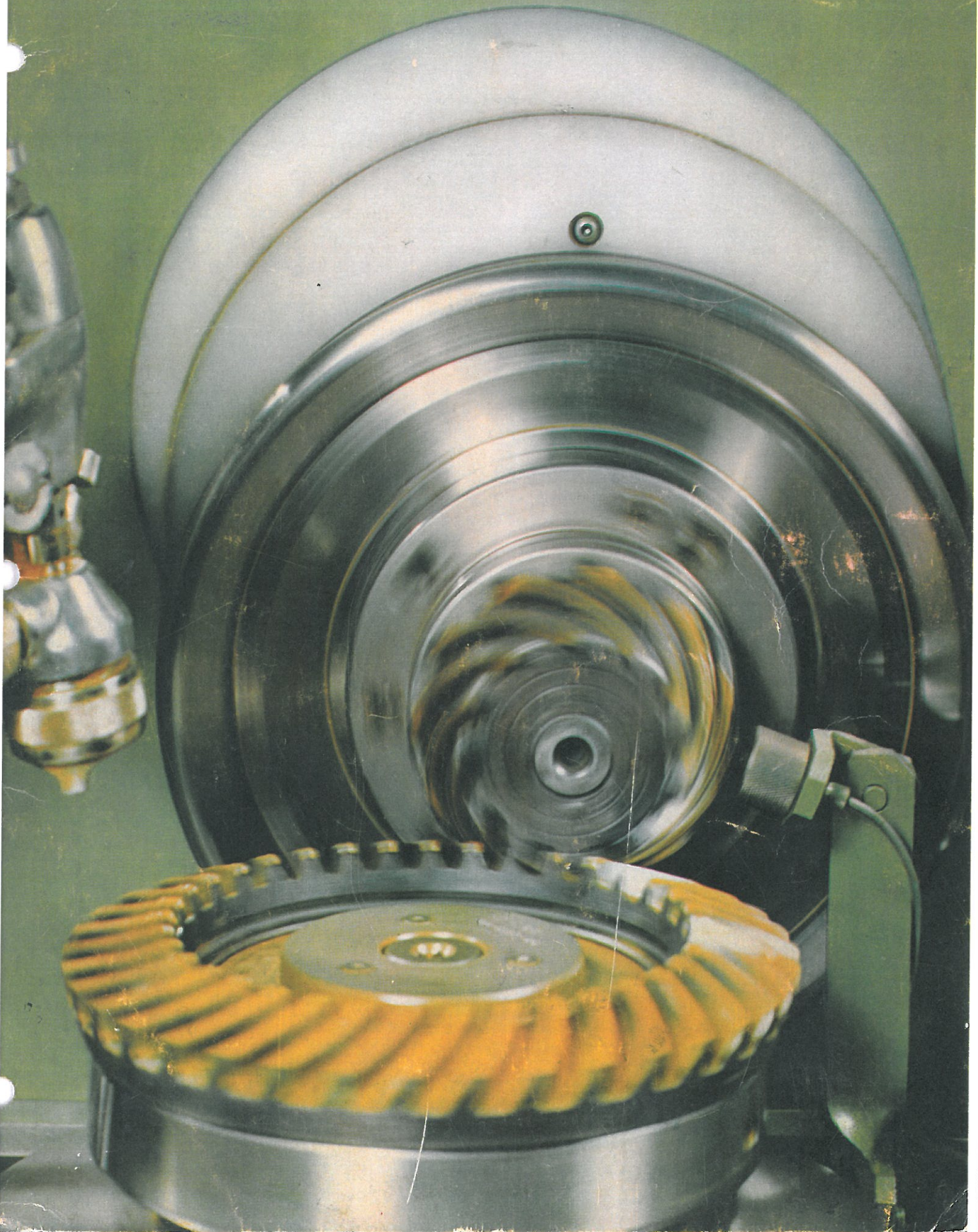


The Gleason No.513 Hypoid Tester





The No. 513 Hypoid Tester represents a technological breakthrough in testing spiral bevel and hypoid gears. It features a unique quality measurement system that automatically identifies gear sets as acceptable or reject, on the basis of running quality. This system eliminates the dependence on human judgment previously required.

The Gleason 513 Tester with Quality Measurement System provides these advantages:

Features built into the No. 513 Tester, such as controlled brake load and machine rigidity, assure consistent, reliable gear inspection. In addition, direct measurement of the V & H readings by dial indicators eliminates the possibility of errors from backlash or wear in lead screws and adjustment mechanisms.

Since the machine, instead of the man, tests gear quality, each and every gear set is tested the same way . . . brake load, duration of test cycle, amount of marking compound or oil applied, and spindle speed can be held constant. Once the machine is set up for a particular job, rating quality is consistent and reliable for all successive gear sets.

RELATES GEAR TESTING TO ACTUAL VEHICLE TESTS.

Correlation is established between actual vehicle road tests and machine quality rating. Quality limits are based on the sound level that is acceptable in the vehicle. This technique, relating production testing to assembled gear performance, assures complete confidence in machine test results.

INCREASES PRODUCTIVITY.

When the Gleason 513 Hypoid Tester is arranged for automatic operation, it will test approximately 60 gear sets per hour—twice as many as the previous average. After setup, the machine operator simply loads and unloads gear sets. Therefore, one man can easily operate several machines.

DISPLAYS QUANTITATIVE RATING OF THE GEAR SET RUNNING QUALITY.

With the quality measurement system, the rating is no longer simply an opinion. A numerical quality rating can be assigned to each gear set. At the end of the test cycle, "indicating lights" show if the gear set is acceptable or reject, and a digital read-out shows the optimum pinion mounting distance. This information can also be automatically stamped on the pinion face.

IDENTIFIES QUALITY BEFORE ASSEMBLY.

Since gear set quality is determined on the test machine, and since the rating correlates with actual vehicle operation, only acceptable gear sets are assembled into axles. This results in fewer rebuilds because of improper rating, and assures that performance in the vehicle is satisfactory.

Gleason 513 Quality Measurement System operates on an entirely new principle.

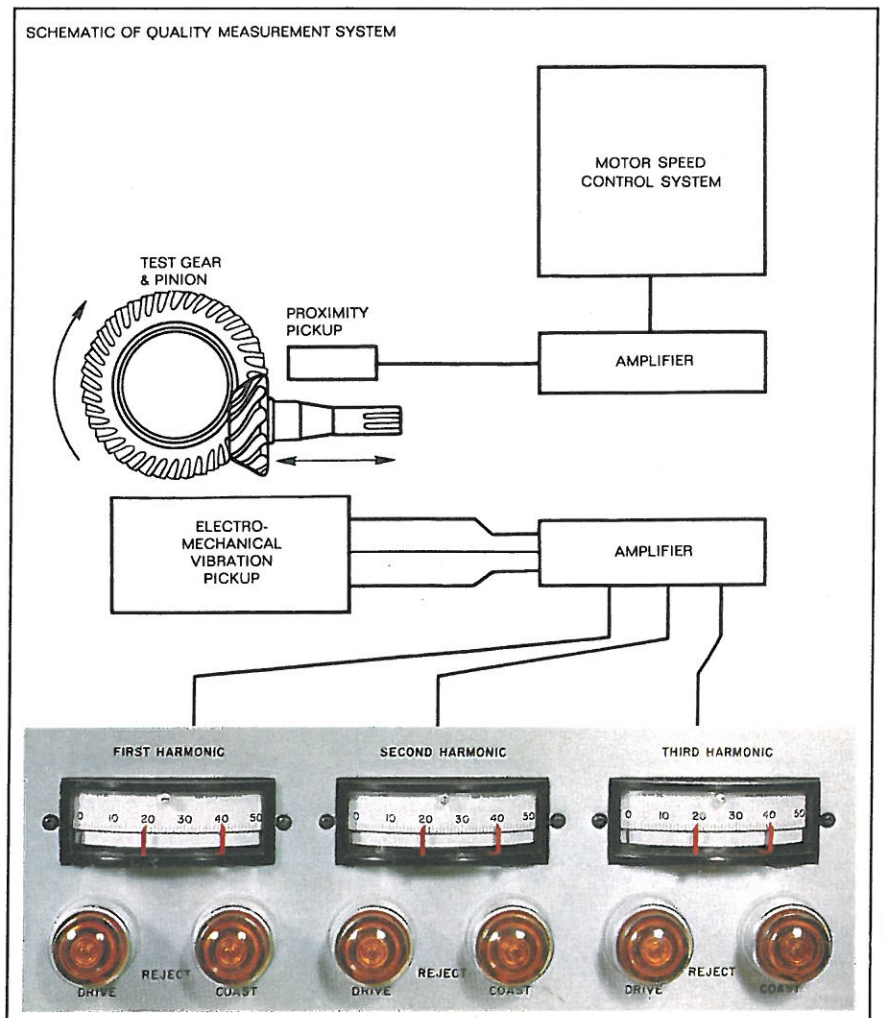
Several years of research have been devoted to the successful development of an electronic method for rating gear noise. From observations and measurements made during this investigation, several consistent factors were noted. These form the basis of the Gleason 513 quality measurement system:

1. Audible drive gear noise in a passenger car falls within a frequency range of approximately 200-1200 cycles per second.
2. Within this range, the gear noise can be traced to the fundamental, second or third harmonic of the tooth-mesh frequency.
3. Gear noise is caused by variations in angular motion transmission rate between pinion and gear—referred to as displacement error.
4. During drive conditions at which noise is most apparent, such as cruise or light drive, the load on the gears is relatively light.
5. At these light loads, the displacement error of the drive gears (variation in angular motion transmission rate) is very small.
6. The vibration generated by these displacement errors is small and must be amplified by resonant members in the structure to produce audible levels.

The adjacent diagram shows how these principles are used in the quality measurement system.

Gear sets are run in the tester at a predetermined tooth-mesh frequency which is controlled by the proximity pickup. This counts the number of teeth per second passing a given point and generates a signal which is amplified to control motor speed.

Gear tooth displacement errors resonate the electro-mechanical vibration pickup in the test machine. This signal is amplified and relayed to the meters which display the vibration amplitudes for the fundamental, second and third harmonics of the tooth-mesh frequency. The acceptable vibration amplitudes for each harmonic can be preset independently for drive and coast sides. Vibration amplitudes shown on the meters provide a quantitative rating of the gear set running quality.



How to establish quality limits for the No. 513 Tester.

These five illustrations show the suggested techniques used to establish correlation between the tester and actual vehicle road tests, and to set quality limits.

FIGURE 1. Production gear sets are run on the No. 513 Tester. A quantity of approximately 30 is suggested to obtain results that are statistically significant. Vibration amplitudes are recorded at the best pinion cone position using the quality measurement system.

FIGURE 2. The gear sets are then assembled in an axle and set at the same cone position obtained on the tester. These axles are then road tested and rated.

FIGURE 3. Machine and vehicle test data are analyzed. Then quality limits are established.

FIGURE 4. Quality measurement meters on the Gleason 513 are then set to these established limits.

FIGURE 5. The No. 513 Tester is now ready to rate the quality level of production gear sets.

