



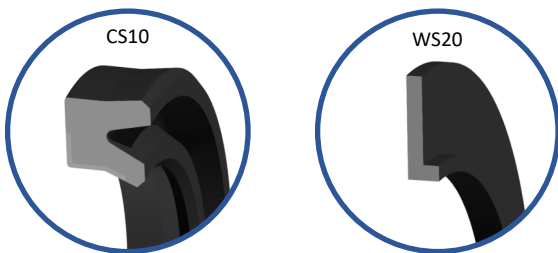
Dynamic Testing Report

CS10 and WS20 Plunger Pump Seals (1000 hours)

Test Objective

CS10 and WS20 seals are designed for use in plunger pump applications. This test replicates the sealing of a crosshead assembly within a plunger pump application. The oil seal (CS10) can be used on its own to retain the crankcase's oil reservoir, or in conjunction with the wiper (WS20) to prevent the ingress of environmental contaminants.

The objective of the test is to determine how effective the seal assembly is at isolating the crankcase oil reservoir from environmental contaminants.



Test Conditions

- Test temperatures ranging from ambient room temperature to 80°C.
- Reciprocating stroke of 75mm, up to 2.2 m/s.
- Surface roughness $<0.2\mu\text{m Ra}$.
- The test was carried out with fully synthetic gear oil (8.7cSt at 100°C, 50cSt at 40°C).

Test Procedure

Testing carried out by in-house custom rig as per customer validation parameters.

- Seal samples assembled onto plunger and test fixture.
- Plunger speed is determined and regulated by FTL's reciprocating test rig.
- Test temperature, torque, and duration is monitored by integrated instrumentation and continuously logged at 10 seconds interval.
- The volume of any leakage is collected and measured.

Test Results

- Completed 1000 hours (5067 km) of a dynamic test, continued more than 1500 hours (7600 km).
- 0ml oil leakage recorded during the endurance test.
- Plunger surface roughness measures $<0.2\mu\text{m Ra}$ after 1000 hours of testing.
- There is no evidence of environmental contaminant within the oil after 1000 hours of testing.

Conclusion

After 1000 hours of testing, the seal assembly proved effective at isolating the crankcase oil reservoir from the environmental contaminants.

- ⇒ No deterioration in performance after 1000 hours
- ⇒ No material loss from the seal
- ⇒ No compression set
- ⇒ No oil leakage



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