



TORONTECH

ROLLING CONTACT FATIGUE (RCF) TESTER



Rolling Contact Fatigue (RCF) Tester - 30kN/40kN - ToronTribo™ RCF

Rolling contact fatigue tester simulates the cyclic contact stress that bearings, gears, wheels, and rolling components experience in service, serving manufacturers and research laboratories in heavy industry and transportation. The ToronTribo™ RCF applies a constant load of up to 30 kN or 40 kN through a two-roller configuration, driving the rollers in rolling or rolling-sliding contact so the specimen surface accumulates cyclic contact stress cycle after cycle. An adjustable slip ratio from 0 to 100 percent lets engineers reproduce anything from pure rolling to significant sliding at the contact interface.

The system integrates a normal force loading system, friction force measurement, a specimen clamping system, and a spindle drive capable of speeds up to 2000 rpm, all supported by water circulation cooling and electric control. High-temperature heating and temperature control extend testing beyond room temperature, so operators can evaluate dry friction or oil-lubricated rolling contact at elevated conditions relevant to bearing and gear service. Test duration is programmable from 1 second to 9,999 minutes to support both short screening runs and extended fatigue-life studies.

Bearing manufacturers, gear producers, and railway component suppliers use the ToronTribo™ RCF to determine how long a material or surface treatment lasts under repeated rolling contact before pitting, spalling, or fatigue cracking begins. The two-roller format gives engineers a controlled, repeatable way to rank candidate materials and lubricants ahead of full-scale component testing.

APPLICATIONS

Rolling Contact Fatigue (RCF) Tester - 30kN/40kN - ToronTribo™ RCF Applications

The ToronTribo™ RCF supports rolling contact fatigue evaluation for components and materials subjected to repeated rolling or rolling-sliding contact stress.

- Bearing Material and Surface Qualification: evaluates fatigue life and pitting resistance of bearing steels and surface treatments under simulated rolling contact load
- Gear Tooth Contact Fatigue Testing: assesses pitting and micro-pitting resistance of gear materials and lubricants under controlled slip ratio conditions
- Railway Wheel and Rail Steel Testing: reproduces wheel-rail rolling and sliding contact to study rolling contact fatigue and wear behavior of rail and wheel steels
- Lubricant and Additive Screening: compares how different oils and additive packages influence rolling contact fatigue life under controlled load and slip conditions
- Surface Coating and Treatment Evaluation: quantifies fatigue resistance improvements from coatings, carburizing, or other surface treatments applied to rolling components
- Power Transmission Component Research: supports fatigue life studies of rollers, cams, and other line-contact components used in machine tools and industrial drivetrains
- Materials Science and Failure Analysis Research: investigates fatigue crack initiation and propagation mechanisms under repeated rolling contact stress



FEATURES

Rolling Contact Fatigue (RCF) Tester - 30kN/40kN - ToronTribo™ RCF Key Features

The ToronTribo™ RCF combines high load capacity with adjustable slip ratio and temperature control for rolling contact fatigue testing.

- High-Capacity Loading: applies up to 30 kN or 40 kN of constant test force to simulate heavy-duty rolling contact conditions found in bearings and gears
- Adjustable Slip Ratio: sets sliding contact from 0 to 100 percent, reproducing everything from pure rolling to significant slip at the contact interface
- High-Speed Spindle Drive: reaches rotational speeds up to 2000 rpm for accelerated fatigue life testing
- Integrated Temperature Control: combines high-temperature heating with water circulation cooling to test across room temperature, elevated, and controlled thermal conditions
- Dry and Lubricated Testing: evaluates rolling contact fatigue under dry friction or oil-lubricated conditions to match actual service lubrication
- Extended Time Control: programs test duration from 1 second to 9,999 minutes, supporting both short screening tests and long-duration fatigue studies
- Integrated Force and Friction Measurement: continuously monitors normal force and friction force throughout the test for direct fatigue life correlation

THEORY & METHOD

Theory and Method

Rolling contact fatigue develops when a material surface experiences repeated cyclic contact stress from a rolling or rolling-sliding load, without the surface ever reaching a single overload failure. Each pass of the mating roller compresses the contact zone and induces subsurface shear stress that peaks below the surface rather than at it. Over enough cycles, this repeated subsurface stress initiates fatigue cracks that propagate toward the surface, eventually producing pitting or spalling, the characteristic failure modes of bearings, gears, and rail steels.

The ToronTribo™ RCF reproduces this mechanism with two independently loaded rollers pressed together under a constant normal force while a spindle drive rotates them at a controlled speed. Setting the two rollers to different rotational speeds introduces a slip ratio, the percentage difference in surface speed between the rollers, which adds sliding friction on top of the rolling contact. Because real rolling components rarely experience pure rolling, adjusting slip ratio from 0 to 100 percent lets engineers match the test condition to the sliding behavior seen in the actual application, from near-pure rolling in some bearing contacts to substantial slip in gear tooth or wheel-rail contact.

Temperature and lubrication further influence how quickly fatigue damage accumulates, since oil film thickness at the contact interface affects how much load transfers through direct asperity contact versus hydrodynamic separation. Running tests at controlled temperature with dry friction or oil lubrication lets engineers isolate the effect of lubrication regime from the effect of load and slip ratio, producing fatigue life data that better predicts real-world component performance.

TECHNICAL SPECIFICATIONS

Rolling Contact Fatigue (RCF) Tester - 30kN/40kN - ToronTribo™ RCF Technical Specifications

Parameter	Specification
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Maximum Test Force	30 kN / 40 kN
Maximum Test Torque	50 N·m
Maximum Speed	2,000 rpm
Test Time Control Range	1 second to 9,999 minutes
Slip Ratio	0 to 100%, freely adjustable
Friction Pair Configuration	Two-roller (rolling / rolling-sliding contact)
Specimen Size	Per standard test requirements



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