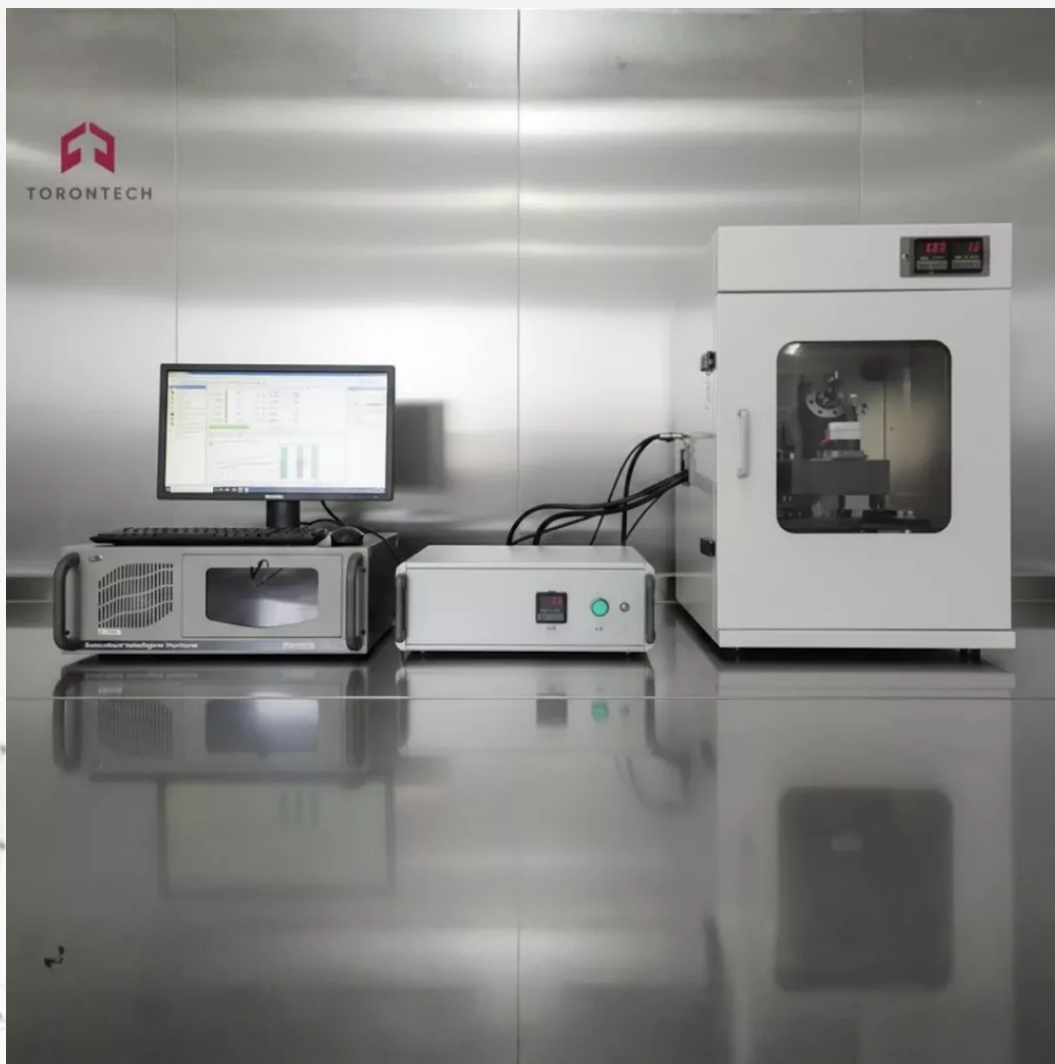




DIESEL LUBRICATING HIGH FREQUENCY RECIPROCATING TESTING MACHINE(HFRR)

Diesel Lubricating High Frequency Reciprocating Testing Machine(HFRR) TT-6079

According to ASTM D6079 Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig (HFRR), this method is used for evaluating the lubrication performance of diesel engine fuel, including diesel fuel containing lubrication performance modifiers. The operation of the automatic constant temperature and humidity system is simple and easy, with the corresponding control area activated by clicking on the main control interface. No additional steps are required. After the test is completed, the sampling data from the experimental process is automatically closed and stored, reducing the operator's steps and increasing efficiency.

APPLICATIONS

The primary application of the High-Frequency Reciprocating Rig (HFRR) TT-6079 is to evaluate the **lubricity of diesel fuels**, in compliance with the **ASTM D6079** standard. The test measures the fuel's ability to prevent wear between metal surfaces by creating a standardized wear scar on a steel ball under controlled conditions. This is a critical performance test, especially for modern low-sulfur diesel fuels, which have inherently lower lubricity. The test is also used to evaluate the effectiveness of lubricity-improving additives.

Key Industries

- **Petroleum Refining:** This is a mandatory quality control test for refineries producing ultra-low sulfur diesel (ULSD). The refining process that removes sulfur also removes the natural lubricating compounds, so refiners must use this test to ensure the final product has been treated with the correct amount of lubricity additive to prevent fuel pump wear.
- **Additive Manufacturing:** Chemical companies that develop and manufacture lubricity-improving additives for diesel fuel rely on this instrument for their research and development and for quality control of their products.
- **Automotive and Engine Manufacturing:** Engine and fuel system component manufacturers use this test to understand the impact of different fuels on the wear and durability of their products, particularly high-pressure fuel

pumps and injectors which are highly sensitive to fuel lubricity.

FEATURES

- **Electromagnetic actuator:** Energy conversion, stable and high control precision (no vibration and easy thrust control).
- **Push rod design:** Utilizes a composite and custom-made slide way, ensuring no transverse interference, high straightness of reciprocating motion displacement, stable displacement, and good repeatability.
- **Oil box design:** Features a 2ml marked line for convenient oil addition.
- **Steel ball chuck:** Easy to dismantle.
- **Heater:** Uses PTC ceramic chip for uniform heating, safety, long service life, and no need for replacement.
- **Sample steel ball:** Diameter: 6mm, material conforms to ANSI E-52100 28th grade steel of ANSI B3.12, HRC: 58-66, Ra < 0.05 μ m.
- **Test piece:** Round steel conforming to ANSI E-52100 Standard HV30: 190-210, Ra < 0.02 μ m.
- **System installation:** Mounted on a steel pedestal to reduce internal extra vibration.

Software Main Function

- **Process Monitoring:** Monitors each parameter and stores data sampling periods.
- **Test Parameter Settings:** Allows setting of stroke length, reciprocating frequency, friction, test temperature, and test time, with course settings for each parameter.
- **Mechanical Control:** Controls the running time of the mechanical parts, continuously monitoring stroke length, reciprocating frequency, and sample temperature. The test starts when the temperature reaches the set value and continues until the test time is reached.
- **Result Recording and Display:** Records and displays the average friction value, oil film value, and relevant curves.

- **Microscope Communication:** Facilitates wear scar measurement, calling up wear pictures and data directly to generate test results and print them.
- **Wear Scar Measuring System:** Magnification of 100 times, accuracy of 1μm. The computer captures the wear scar picture, measures the scar size, and saves the data. Includes a communication interface.

TECHNICAL SPECIFICATIONS

1. Reciprocating frequency: 10~60Hz, Accuracy: 1Hz.
2. Reciprocating stroke: 0.01~2.5mm, Accuracy: 0.001mm.
3. Test temperature: Room temperature~200°C, Accuracy: 2°C.
4. Load: 0.1~1kg.
5. Maximum friction: 30N.
6. Test ball: Diameter: 6mm, material conforms to ANSI E-52100 28th grade steel ANSI B3.12.
7. HRC: 58-66, Ra < 0.05μm.
8. Test piece: Round steel conforming to AISI E-52100 standard HV30: 190-210, Ra < 0.02μm.
9. Oil bath area: 600±100mm².
10. Wear scar measuring system: Microscope, Magnification: 100 times, Division: 1μm.
11. Constant Temperature and Humidity Chamber:
 - Temperature control range: 23~30°C, ±0.1°C.
 - Temperature control accuracy: ±2°C.
 - Humidity control range: 40~70%, Humidity display accuracy: ±1%.
 - Humidity control accuracy: ≤3%RH.
12. Ambient Temperature: 5~35°C.
13. Ambient humidity: 20~80%.

Test condition parameter

1. Reciprocating displacement: 1.0 ± 0.02 mm.
2. Reciprocating frequency: 50 ± 1 Hz.
3. Applied load: 200 ± 1 g.
4. Oil sample volume: 2 ± 0.2 ml.
5. Sample temperature: 60 ± 2 °C.
6. Test time: 75 ± 0.1 min.

Configuration Sheet

Category	Serial Number	Name	Quantity	Notes
Products	1	Mainframes	1	
	2	Control box	1	
	3	Constant temperature and humidity box	1	Content
	4	Industrial Control Computer	1	
	5	A4 Printer	1	
	6	Abrasion Mark Measuring System	1	Including microscope, digital camera, LED light source
	7	Ultrasonic cleaner	1	
	8	Data processing software backup CD	1	
Technical Documentation	1	Configuration Sheet	1	
	2	Certificate of compliance	1	
	3	Instruction Manual	1	
Appendices	1	High lubricity reference oil	100mL	
	2	Low lubricity reference oil	100mL	

Configuration Sheet

3	Test Ball test piece	100	Ball ϕ 6 Piece ϕ 10 $\times$ 3
4	Test Ball fixture	2	
5	Test Ball fixture fixing screw	4	
6	Test Ball screw	4	
7	Test Tank	2	
8	Test Oil box fixing screw	8	
9	Fix The sample screw	10	
10	Loading widget	1	
11	Loading weights	10	100g
12	Stainless Steel Lid Cup	2	
13	Stainless steel tray	2	
14	Tweezers	1	

Configuration Sheet

15	Screwdriver	2	One Cross, one word, magnetic
16	Hexagon socket wrench	2	M1.5, M2
17	Pipette	1	
18	Tool box	1	



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