



# FALEX Four-Ball Wear Test Machine

The Falex Four Ball Wear Test Machine is used to determine the relative wear-preventing properties of lubricating fluids and greases in sliding and rolling applications.



Three ½ inch diameter steel balls are clamped together and covered with the test lubricant. A fourth ½ inch diameter steel ball is pressed into the cavity formed by the three clamped balls for three point contact, and rotated for a set duration. Lubricants are compared using the average size of the scar diameters worn on the three lower clamped balls.

The Standard Falex Four Ball Wear Test Machine is supplied with a 1/2 HP motor to drive the rotating ball at 1200 rpm. A mechanical lever arm applies loads up to 50 kilograms on the ball specimen. A digital temperature system controls the initial temperature set point (ambient to 200° C) and displays the lubricant temperature during the test. A digital timer system controls the test duration (1 second to 999 hours).

The Falex Four-Ball Variable Drive Wear Test Machine is supplied with a 1 HP variable speed motor with a standard operating range of 60 to 3600 rpm. Optional systems are available for rotational speeds up to 10,000 rpm. A pneumatic load system applies loads up to 180 kilograms on the ball specimen. A digital friction measurement system displays the test friction force (0 to 1000 grams). A digital temperature system controls the initial temperature set point (ambient to

200° C) and displays the lubricant temperature during the test. A digital timer system controls the test duration (1 second to 999 hours). An optional system is available for controlling the atmosphere in the test cup.

The Falex Four-Ball Wear Test Machine is designed to provide the precision loading required for performing accurate wear tests. It is the only test machine that has proven through cooperative inter-laboratory testing to meet the requirements of the precision as stated in the ASTM Standard Test Methods D2266 and D4172. Insist on the Falex Four-Ball Wear Test Machine to meet your ASTM testing requirements.

# FOUR-BALL WEAR SPECIFICATIONS

## **LOAD:**

Variable Drive Four Ball Wear Tester: Pneumatic loading, 180 kg max.

Standard Four Ball Wear Tester: Dead weight and mechanical lever, 50 kg max.

## **SPEED:**

Variable Drive Four Ball Wear Tester: 60 to 3600 rpm continuously variable. 1 to 10,000 rpm with speed conversion options.

Standard Four Ball Wear Tester: 1200 rpm

## **TEMPERATURE CONTROL:**

Digital control from ambient to 200°C

Auto start-up upon reaching test temperature

## **TEST DURATION:**

Digital Programmable Timer (1 second to 999 hours)

## **FRICITION MEASUREMENT:**

Variable Drive Four Ball Wear Tester: Load Cell Assembly and Digital Display of Test Friction Force

Standard Four Ball Wear Tester: Not Available

## **ENVIRONMENTS:**

Dry or lubricated (fluids, greases, dry film)

## **SPACE REQUIREMENTS:**

66 in (H) x 36 in (D) x 32 in (W) (168 cm x 91 cm x 81 cm)

## **UTILITY REQUIREMENTS:**

220V, 60Cycles (50 Cycle optional), Single Phase, 10 Amps

80 psig clean dry air (Model F-1519)

## **SHIPPING INFORMATION:**

750 lb. (341 kg); 43 in x 36 in x 75 in (109 cm x 91 cm x 191 cm)

## **TEST PROCEDURES**

<b>ASTM D 2266</b>	Standard Test Method for War Preventative Characteristics of Lubricating Grease (Four-Ball Method)
<b>ASTM D4172</b>	Standard Test Method for Wear Preventative Characteristics of Lubricity Fluids (Four-Ball Method)
<b>ASTM D5183</b>	Standard Test Method for Determination of the Coefficient of Friction of Lubricants using the Four-Ball Wear Test Machine
<b>IP 300:</b>	Rolling Contact Fatigue Test for Fluids in a Modified Four-Ball Machine

# FOUR-BALL EP COMPONENTS AND OPTIONS

## **F-1519 VARIABLE DRIVE FOUR-BALL WEAR TEST MACHINE**

### **Includes the following:**

1 HP Variable Speed Motor	Temperature Controller System
60 to 3600 rpm	Heater Assembly (200° C max)
Speed Indicator and Controller	Automatic Test Start
Digital Test Duration Timer	Ball Cup Assembly and Fixtures
Friction Measurement System	Ball Cup with Thermocouple
Load Cell Assembly	Ball Chuck
Air Bearing Assembly	Ball Cup Tightening Base
Pneumatic Loading System	Ball Cup Disk Adapter
180 Kg max load	0-25 lb-in Torque Wrench
Load Regulator and Display	Emergency Stop Switch

## **F-1520 STANDARD FOUR-BALL WEAR TEST MACHINE**

### **Includes the following:**

½ HP Single Speed Motor, 1200 rpm	Ball Cup Assembly and Fixtures
Mechanical Loading System	Ball Cup with Thermocouple
Lever Arm and Weight Hager	Ball Chuck
50 Kg max load	Ball Cup Tightening Base
Digital Test Duration Timer	Ball Cup Disk Adapter
Temperature Controller System	0-25 lb-in Torque Wrench
Heater Assembly (200° C max)	Emergency Stop Switch
Automatic Test Start	

# FOUR-BALL EP ACCESSORIES

## **F-1519-D1 VIBRATION DETECTION SENSOR**

For use with F-1519-D FALEX SoftWEAR™ Data Acquisition System. Sensor, Display and Cutoff System used for determining onset of fatigue when testing materials under rolling conditions.

## **F-1519-5 STANDARD BALL CUP ASSEMBLY**

Standard Test Cup, Disk, Clamp Ring, Lock Nut and Thermocouple

## **019-108-004 ROLLING FOUR-BALL CUP ASSEMBLY**

Rolling Ball Cup, Lock Nut and Thermocouple

## **006-500-101 ROLLING FOUR-BALL SPECIMEN RACE**

Rolling Test Specimen evaluating materials under rolling conditions. Requires F-1519-5A.

## **F-1519-6 DISK FIXTURE**

For punching ¼ inch diameter disk from 1/16 inch sheet stock (must be used with arbor press).

## **020-005-028 BALL CHUCK**

Holds Fourth ½ inch diameter rotating ball during testing.

## **F-1519-8 THERMOCOUPLE**

Ball Cup Thermocouple

## **F-1519-9 DISK ADAPTER**

Permits use of three ¼ inch diameter by 1/16 inch thick disk specimens (F-1519-56) in place of lower balls for alternate material combinations.

## **F-1519-9A B.O.T.D. CONVERSION KIT**

Includes anti-vibration ball clamp ring, anti-vibration cup disk, light load kit (F-1519-13A), calibration weight, 6:1 low speed drive.

## **F-1519-11 LOW SPEED CONVERSION**

Allows 1/2 to 25 rpm. For use with F-1519 model only.

## **F-1519-12 HIGH SPEED CONVERSION**

Allows 200 to 10,000 rpm. For use with F-1519 model only.

## **F-1519-15 FOUR-BALL WEAR LOAD CALIBRATOR**

Calibration Load Cell and Meter for the pneumatic load system on Variable Drive Four-Ball Wear Test Machine, model F-1519.



# FALEX SCAR MEASUREMENT SYSTEMS

**F-1519-31A**

## **HIGH PRECISION SCAR MEASUREMENT SYSTEM**

Includes binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm. System includes ball cup stand with single ball holder. Allows reading of ball scar without removal from ball cup.

**F-1519-31B**

## **DIGITAL SCAR MEASUREMENT SYSTEM with CCD CAMERA**

Includes a CCD camera and digital display of ball scar and capability of measurement on screen to 0.001 mm. System includes ball cup stand with single ball holder and CCD camera with USB port for recording scar diameters to Falex computerized data acquisition system or host computer. Allows for reading ball scar without removal from ball cup.



# FALEX TEST SPECIMENS

**006-500-161**

## **FALEX TEST SPECIMEN BALLS**

AISI E 52100 steel. 500/box

Balls conform to ASTM D2596 and, D2783.

**F-1519-9B**

## **ROLLING FOUR-BALL SPECIMEN RACE**

Replacement lower specimen race for evaluating materials under rolling conditions

**F-1519-56**

## **BOTD TEST SPECIMEN SET**

Test balls and disks are available in a wide range of materials, surface finishes and hardnesses. Please contact Falex Corporation or a Technical Sales Representative for pricing and availability.



# For All of Your Lubricant and Materials Testing

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## Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

## Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

## Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

## Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

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