



MultiSpecimen Test Machine

The FALEX MultiSpecimen Test Machine is a versatile system for evaluating the friction, wear, and abrasion characteristics of materials, coatings, and lubricants. The FALEX MultiSpecimen Test Machine will perform numerous Standard Test Methods and Application Specific Custom testing programs

User selected contact geometries, motions, velocities, temperatures, and contact pressures, and test specimen materials allow one test apparatus to meet many commercial and military test specifications and simulate a broad range of field applications.

Applications for the FALEX MultiSpecimen include research and development, quality control, product qualification and the evaluation of physical and performance characteristics of materials, coatings, and lubricants. Test studies and a number of technical publications confirm exceptional correlation with field service.



Tribology and Petroleum Testing Equipment for More Than 75 Years
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FALEX MULTISPECIMEN TEST MACHINE

FEATURES AND SPECIFICATIONS

DRIVE SYSTEM

Computer controlled servo motor configured for 220 V, Single Phase, 50 or 60 cycle operation.

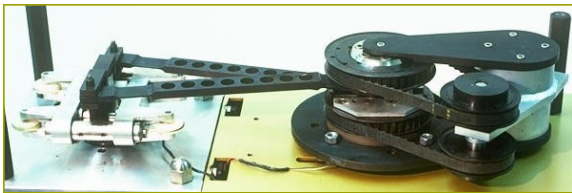
The motor drives the upper vertical shaft. The lower vertical shaft is held stationary by the Torque Measurement System. Standard speed range is 30 to 3600 rpm. Optional pulley configurations are available for speed ranges 15 to 1800 rpm and 60 to 7200 rpm.

An optional rotational speed reducer is available for the operation of Stick/Slip and Static Torque and COF determinations. Programmable speed control to as low as 0.01 rpm.

The optional Reversible Drive SoftWEAR™ provides Oscillatory Motion Control from 2° to 720° (angle of motion dependent on test speeds and loads).

<u>Degrees of Oscillation</u>	<u>Cycles per Minute, max</u>
720°	150
5°	1150
2°	1600

Mechanical Oscillating Drive Systems are also available in standard and high-speed versions enabling simulation of start/stop motion. Maximum oscillation is 90° (angle of motion dependent on test speeds and loads).



<u>Degrees of Oscillation</u>	<u>Cycles per Minute, max</u>
0° - 20°	1500
21° - 30°	1200
31° - 40°	1100
41° - 50°	900
51° - 70°	600
71° - 90°	500

TEST LOAD

Programmable MultiSpecimen: Automated Test Load Control System eliminates the use of test weights. User defined parameters for test load ramping rates, soaking times, and test cycle control. Dual Range Pneumatic System for applied test load ranges of 50 to 800 lbs. and 10 to 60 lbs. Optional ultra low load ranges are available upon request.

Semi-Automated MultiSpecimen: Manual Test Load System: Test Load is applied using a Dual Range Mechanical Lever (2:1 or 10:1 ratio) and Dead Weights. Maximum Bale Weight is 80 lbs. The 2:1 lever ratio applies loads from 1 lb. to 160 lbs. The 10:1 lever ratio applies loads from 20 lbs. to 800 lbs.

ENVIRONMENTS

Standard Systems provide fluid and test specimen initial temperature set point (ambient to 150°C) using liquid or dry environments.

Optional Systems for temperature regulation (-30°C to 200°C), humidity measurement and/or control, and test fluid recirculation.

FALEX MULTISPECIMEN TEST MACHINE

FEATRURES AND SPECIFICATIONS

TEMPERATURE CONTROL

Programmable MultiSpecimen: Automated Test Temperature System with computer control. User defined parameters for test temperature ramping rates, soaking times, and test cycle control. Standard Systems provide test table heaters (ambient to 150°C) for liquid and dry test environments. User programmable test alarms and abort levels.

Semi-Automated MultiSpecimen: User defined test temperature set point and ramp rate. Standard Systems provide test table heaters (ambient to 150°C) for liquid and dry test environments. User programmable test alarms and abort levels.

Optional Systems increase the temperature set point and regulation (-30°C to 200°C). Heater Cups and Heated and/or cooling recirculating systems increase the flexibility of temperature control and regulation for liquid and dry environments.

FRICION MEASUREMENT

The lower shaft transmits a signal through a load cell for determining torque. The Standard System includes a 0 to 100 lb Load Cell. The Falex SoftWEAR™ records and displays the test torque data and calculates a real-time Coefficient of Friction. User programmable test alarms and abort levels.

WEAR MEASUREMENT

Programmable MultiSpecimen: Dynamic Digital Wear Measurement System records and displays the real-time test system wear displacement. User programmable test alarms and abort levels.

Semi-Automated MultiSpecimen: Standard System includes a dial gage indicator for test system wear displacement. An Optional Dynamic Wear Measurement System is available for the Semi-Automated MultiSpecimen.

TEST DURATION

Standard Systems include user defined alarms and abort levels for test time (H:MM:SS) and test cycles (shaft revolutions).

UTILITY REQUIREMENTS

Power: 220 Volts, 60 cycle or optional 50 cycle, single phase.
Pneumatics: 80 psig clean, dry air required for pneumatic load systems.

SPACE REQUIREMENTS

Bench-top: 72 in. (L) x 28 in. (D) x 36 in. (H) 2 m (L) x 0.7 m (D) x 1 m (H)

FALEX MULTISPECIMEN TEST MACHINE

STANDARD TEST METHODS

- ASTM D3702 Standard Test for Wear Rate and Coefficient of Friction in Self-Lubricated Rubbing Contact Using a Thrust washer Testing Machine
- ASTM D2266 Standard Test Method for Wear Preventive Characteristics of Lubricating Grease (Four Ball Method)
- ASTM D4172 Standard Test Method for Wear Preventive Characteristics of Lubricating Fluids (Four Ball Method)
- ASTM D5183 Standard Test Method for Coefficient of Friction Using a Four Ball Wear Test Machine
- ASTM G99 Standard Test Method for Wear Testing with a Pin on Disk Apparatus
- Proposed Standard Test Method for Predicting Coefficient of Friction and Wear Properties of Hydraulic Fluids Using a Cyclic Stress Vane Apparatus

AVAILABLE TEST ADAPTER CONFIGURATIONS

Four Ball Wear	Oscillating Roll/Slide	Thrust Washer	Rolling Four Ball
Gear/Cam Contact	Three Pad on Disk	Ball on Flat	Pin on Disk
Ball Bearing	Powder Friction	Slurry Erosion	Three Balls on Flat
Three Pin on Disk	Sheet Abrasion	Three Ball Microfilm	Sliding Bottle
Walking Cam	Ball on Three Disk	Shear Stability	O-Ring Wear
Face Seal	Pump Rotor Vane	Roller Bearing	Hypoid Gear
Lip Seal	Thrust Bearing	Impact	Piston Ring Test
Cyclic Stress Pump Rotor Vane	Viscous Drag Friction	Timing Belt Friction and Wear	Stick-Slip / Static COF

FALEX MULTISPECIMEN TEST MACHINE

F-1506-330 FALEX MULTISPECIMEN TEST MACHINE WITH AUTOMATED SOFTWARE™ DATA ACQUISITION AND CONTROL

Fully Automated Test System with Pneumatic Loading System and Test Program Creation, Control, and Data Acquisition using FALEX SoftWEAR™.

Standard System includes the Automated Test Load Control System, Programmable Variable Speed Motor, Automated Temperature Control System, Friction Measurement System, Wear Measurement System, Torque Calibrator, Table Heater Assembly, Oil Reservoir Cup, Chamber Cooling Fan, and Standard Test Specimen Table.

<u>TEST PARAMETER CONTROL</u>	<u>TEST DATA ACQUISITION</u>
Test Program Creation and Control Software	Test Data Acquisition and Data Storage
Test RPM Control	Test RPM Indicator
Test Temperature Set Point Control (Chamber or Test Specimen)	Test Temperature Indicators (Chamber and Test Specimen)
Test Load Set Point and Control	Test Load Indicator
Test Duration Control (Time and/or Cycles)	Test Wear Indicator
Programmable Parameter Loop Configuration	Test Duration Indicators (Time and Cycles)
Test Program Pause System	User Defined Fast Data Acquisition Trigger
Test Program Manual Override	User Defined Real Time Data Graph

F-1506-30 FALEX MULTISPECIMEN TEST MACHINE WITH SOFTWARE™ DATA ACQUISITION

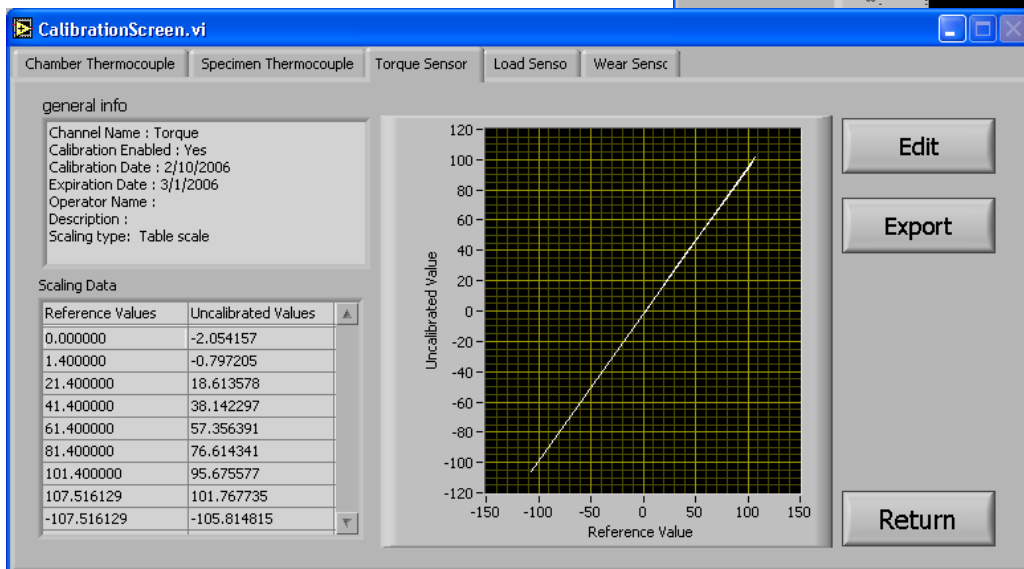
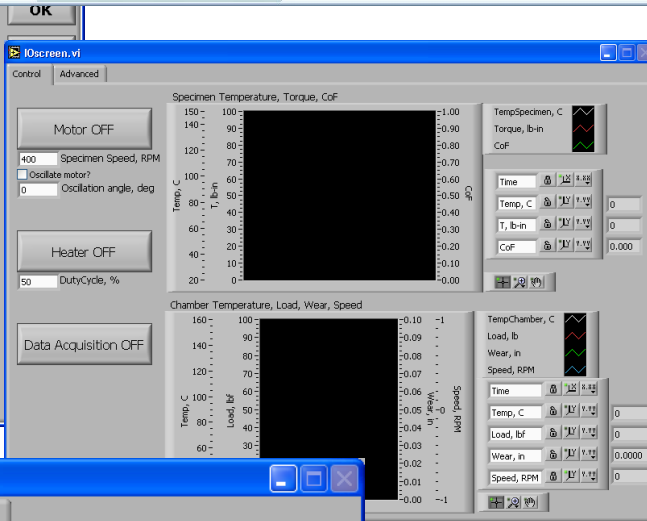
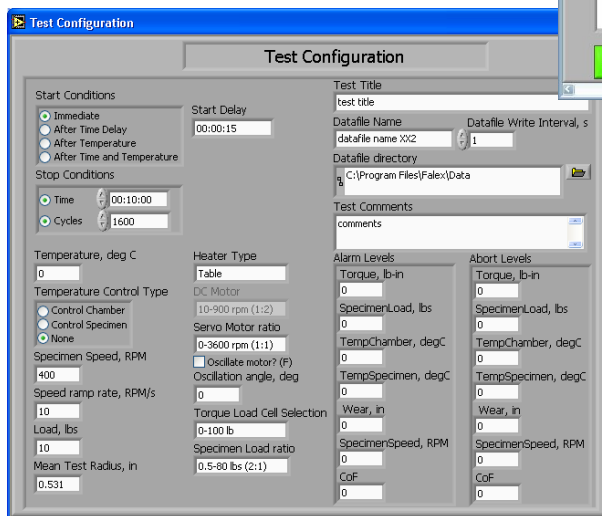
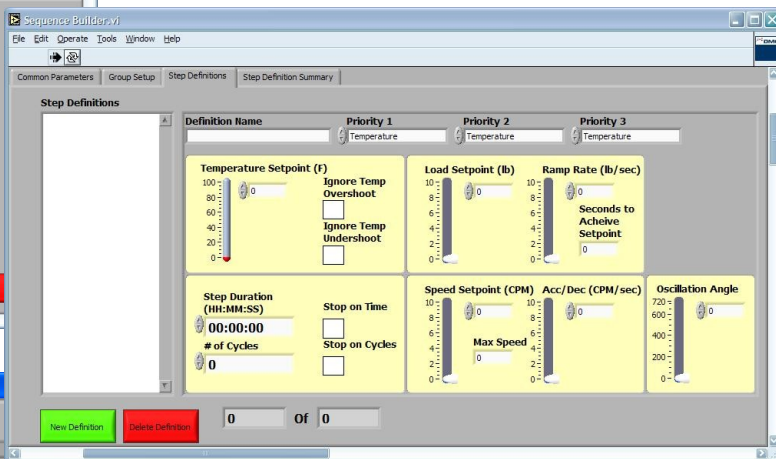
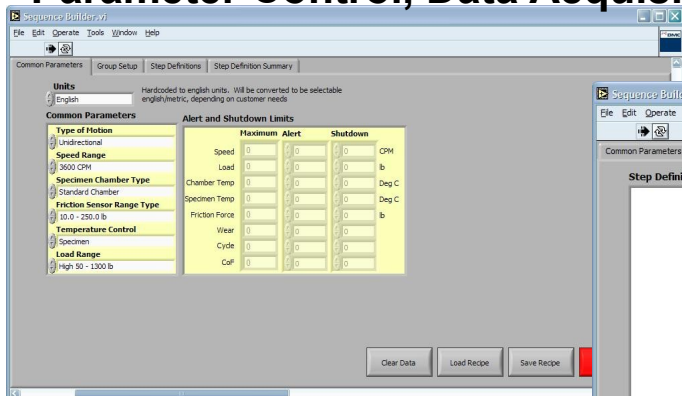
Semi-Automated Test System with Mechanical Loading System and Test Parameter Control, and Data Acquisition using FALEX SoftWEAR™.

Standard System includes the Mechanical Dead Weight Load System, Variable Speed Motor, Temperature Control System, Friction Measurement System, Dial Indicator Wear Gage, Torque Calibrator, Table Heater Assembly, Oil Reservoir Cup, Chamber Cooling Fan, and Standard Test Specimen Table. Optional Test Load Indicator and Digital Wear Indicator are available.

<u>TEST PARAMETER CONTROL</u>	<u>TEST DATA ACQUISITION</u>
Test Parameter Control Software	Test Data Acquisition and Data Storage
Test RPM Control	Test RPM Indicator
Test Temperature Set Point Control (Chamber or Test Specimen)	Test Temperature Indicators (Chamber and Test Specimen)
Test Load Set Point	Test Load Indicator (optional)
Test Duration Control (Time and/or Cycles)	Test Wear Indicator (optional)
	Test Duration Indicators (Time and Cycles)
	User Defined Real Time Data Graph

FALEX MULTISPECIMEN TEST MACHINE SOFTWARE™

FALEX Windows SoftWEAR™ for Test Program Creation, Parameter Control, Data Acquisition and Instrument Calibration



FALEX MULTISPECIMEN TEST MACHINE

OPTIONS AND ACCESSORIES

- F-1506-D1 DYNAMIC DIGITAL WEAR SENSOR FOR F-1506-310**
Optional Digital Wear Sensor and Display System for FALEX 310 SoftWEAR™
- F-1506-D2 DIGITAL LOAD SENSOR FOR F-1506-310**
Optional Digital Load Sensor and Display System for FALEX 310 SoftWEAR™
- F-1506-D3 TEST VIBRATION SENSOR SYSTEM FOR FALEX SOFTWARE™ SYSTEMS**
Optional Vibration Sensor and Display System for FALEX 310 and 330 SoftWEAR™
- F-1506-D4 TEST CHAMBER HUMIDITY SENSOR FOR FALEX SOFTWARE™ SYSTEMS**
Optional Humidity Sensor and Display System for FALEX 310 and 330 SoftWEAR™
- F-1506-2 LOW SPEED MECHANICAL OSCILLATING DRIVE SYSTEM**
Optional System for low speed oscillatory tests (90° max angle, 600 max rpm)
**for use with older versions of the Falex MultiSpecimen Test Machine*
- F-1506-3 MECHANICAL OSCILLATING DRIVE SYSTEM**
Optional System for oscillatory tests (90° max angle, max rpm dependent on angle of oscillation) **for use with older versions of the Falex MultiSpecimen Test Machine*
- F-1506-3A REVERSIBLE DRIVE SYSTEM**
Optional System for oscillatory tests (720° max angle, max rpm dependent on angle of oscillation)
- F-1506-5 HEATED RESERVOIR TEST CUP**
Optional Heated Test Cup for liquid and dry test (200°C max)
- F-1506-7 LOAD CALIBRATION SYSTEM FOR FALEX 330 SOFTWARE™ SYSTEM**
Digital Meter and Load Cell Assembly for Test Load Calibration of Pneumatic Load System
- F-1506-132C CONVECTIVE AIR COOLING TEST RESERVOIR WITH COVERS**
Test Reservoir Assembly with increase surface area to improve air cooling
- F-1506-132G STANDARD 100 ML TEST RESERVOIR WITH COVERS**
- F-1506-132H 25 ML TEST RESERVOIR WITH COVERS**

FALEX MULTISPECIMEN TEST MACHINE

OPTIONS AND ACCESSORIES

F-1506-132	LOW TEMPERATURE CHAMBER (DRY ICE)
F-1506-132A	LOW TEMPERATURE CHAMBER (FOR USE WITH COOLER)
F-1506-132B	LOW TEMPERATURE RECIRCULATING CHILLER (-30°C)
F-1506-12	LOW RANGE LOAD CELL FOR TORQUE MEASUREMENT SYSTEM (0 TO 10 LBS)
F-1506-5	TEST FLUID RECIRCULATION SYSTEM (150°C MAX)
F-1506-60	HUMIDITY CONTROL SYSTEM (30 TO 60% RH)

FALEX SCAR MEASUREMENT SYSTEMS

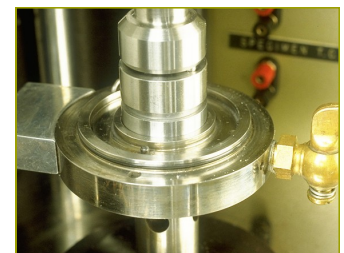
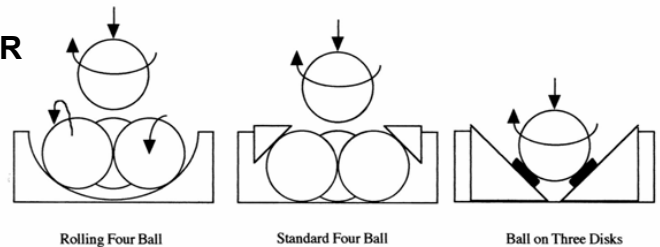
F-1519-31	SCAR MEASUREMENT SYSTEM Binocular microscope with scaled eyepiece and light. Ball cup stand and single ball holder. Allows reading of ball scar without removal from ball cup.
F-1519-31A	HIGH PRECISION SCAR MEASUREMENT SYSTEM Includes binocular microscope with X-Y base and digital display of 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-1518-31B	DIGITAL SCAR MEASUREMENT SYSTEM with CCD CAMERA Includes a CCD camera and digital display of ball scar and capability of measurement on screen to 0.01 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 MULTISPECIMEN TEST MACHINE

OPTIONS AND ACCESSORIES

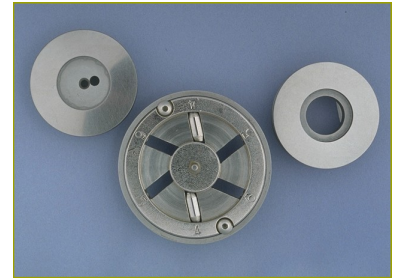
006-108-009	FOUR BALL WEAR TEST ADAPTER
006-200-013	METRIC WEIGHT SET
006-099-052	THREE DISK HOLDER (FOUR BALL CONFIGURATION)
006-108-012	BALL ON THREE DISK (BOTD) TEST ADAPTER
F-1506-116B	B.O.T.D. ACCESSORY KIT
F-1506-116C	B.O.T.D. TEST WEIGHT SET
F-15196	DISK FIXTURE
006-500-101	ROLLING FOUR BALL SPECIMEN RACE
006-105-066	COLLET ASSEMBLY
006-108-004	GEAR LUBRICANT TEST ASSEMBLY
006-099-020	ROLLER PLATE AND PIN ASSEMBLY (FOR 006-108-004)
006-108-021	WALKING CAM LUBRICANT TEST ASSEMBLY
006-099-002	ROLLER PLATE AND PIN ASSEMBLY (FOR 006-108-021)
006-009-001	ROLLER SPECIMEN DRIVER (FOR 006-108-004 AND 006-108-021)
006-108-003	PUMP ROTOR VANE
006-108-	CYCLIC CONTACT STRESS VANE TEST SYSTEM
006-108-015	STICK-SLIP TEST ASSEMBLY
006-108-007	THRUST WASHER, SMALL
006-108-006	THRUST WASHER, LARGE
F-1506-122A	SPECIAL SMALL THRUST WASHER CLAMPING SYSTEM
F-1506-122B	SPECIAL LARGE THRUST WASHER CLAMP
006-108-005	SINGLE PIN-ON-DISK TEST ADAPTER
006-108-008	THREE PIN-ON-DISK TEST ADAPTER
006-108-019	SINGLE BALL-ON-DISK
006-108-026	SINGLE BALL-ON-DISK, VAMAS STYLE ADAPTER
006-108-018	THREE BALL-ON-DISK TEST ADAPTER, SMALL
006-108-017	THREE BALL-ON-DISK TEST ADAPTER, LARGE
006-108-022	LIQUID EROSION TEST ASSEMBLY



FALEX MULTISPECIMEN TEST MACHINE

OPTIONS AND ACCESSORIES

006-108-013	FACE SEAL TEST ADAPTER
006-108-011	LIP SEAL TEST ADAPTER
F-1506-131	THREE BALL MICRO FILM TEST ADAPTER
F-1506-131A	UPPER AND LOWER DISK SET
006-108-025	O-RING WEAR TEST ADAPTER
006-108-029	OSCILLATING ROLL/SLIDE ADAPTER
006-108-033	SHEAR STABILITY OF FLUIDS ADAPTER
006-108-034	BALL BEARING TEST ASSEMBLY
006-108-	HYPOID GEAR TEST ASSEMBLY
006-500-044	UPPER RACE SPECIMEN
006-500-045	LOWER RACE SPECIMEN
006-500-037	ROLLER SPECIMEN
006-108-	THREE PAD ON DISK TEST ASSEMBLY
006-108-040	TIMING BELT TEST ADAPTER
006-108-034	BALL BEARING TEST ADAPTER
006-108-010	VISCOUS DRAG FRICTION TEST ADAPTER
006-108-	MPACT TEST ADAPTER
006-500-055	IMPACT TEST OCTAGONAL SPECIMEN, 1018 STEEL
006-500-054	IMPACT TEST ROLLER SPECIMEN, 440C STAINLESS STEEL
006-108-001	PLASTIC POWDER FRICTION AND WEAR TEST
F-1506-144A	SPECIMEN RING
006-108-049	SHEET ABRASION TEST ADAPTER
F-1506-146	SHEET METAL DRAWING AND FORMING ADAPTER
F-1506-147	SLIDING BOTTLE TEST ADAPTER
F-1506-148	POWDER FRICTION TEST ASSEMBLY
006-105-079	LINING PLATE SPECIMEN HOLDER ASSEMBLY



Hypoid Gear Test Assembly



Three Pad on Disk Test

FALEX MULTISPECIMEN TEST MACHINE

STANDARD TEST SPECIMENS

STANDARD SPECIMENS - THRUST WASHER CONFIGURATION

006-500-041	Small Rotating Upper Specimen	1018 Steel, Rc 15-25, 14-18 rms
F-1506-41	Large Rotating Upper Specimen	1018 Steel, Rc 15-25, 14-18 rms
006-500-001	Small Stationary Lower Specimen	1018 Steel, Rc 15-25, 14-18 rms
006-500-021	Large Stationary Lower Specimen	1018 Steel, Rc 15-25, 14-18 rms

STANDARD SPECIMENS - FOUR BALL CONFIGURATION

006-500-161	Falex Test Specimen Balls	
F-1519-55	Ball-On-Three-Disks (BOTD) Specimen Set	

STANDARD SPECIMENS - PIN-ON-DISK CONFIGURATION

006-500-131	Upper Rotating Pins	440C Stainless Steel, Rc 55-58
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STANDARD SPECIMENS - VANE PUMP CONFIGURATION

F-1506-70	Upper Rotating Vanes	(3 per Test) M-2 Steel, Rc 58-62, 6-12 rms, 0.590 in. radius
F-1506-70A	High Stress Upper Rotating Vanes	(3 per test) M-2 Steel, Rc 58-62, 6-12 rms, 0.250 in. radius
F-1506-71	Stationary Lower Specimen	52100 Steel, Rc 58-62, 9-15 rms
F-1506-71A	Cyclic Stress Lower Specimen	52100 Steel, Rc 60-63, 9-15 rms

STANDARD SPECIMENS - GEAR/CAM AND WALKING CAM TEST CONFIGURATION

006-500-173	Upper Specimen Rollers (2 per Test)	8620 Steel, Rc 55-58, 24-30 rms
F-1506-80A	Upper Specimen Rollers (2 per Test)	8620 Steel, Rc 50-54, 24-30 rms
F-1506-81	Lower Specimen Gear	8620 Steel, Rc 55-58, 24-30 rms
006-500-006	Lower Specimen Walking Cam	400 C Stainless Steel, Rc 55-58, 24-30 rms

STANDARD SPECIMENS - OSCILLATING ROLL/SLIDE

F-1506-85	Test Specimen Inserts	(4 Required per Test) 440C Stainless Steel, Rc 55-58, 14-18 rms.
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For All of Your Lubricant and Materials Testing

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