

## TE 82 MICROPROCESSOR CONTROLLED FOUR BALL MACHINE



### Test Capabilities:

The TE 82 is a modified version of the TE 92 Microprocessor Controlled Rotary Tribometer, using manual dead-weight loading (instead of automatically controlled pneumatic loading) and direct vector motor controlled test start (instead of electromagnetic clutch). The machine may be used to run tests according to the following standards:

- ASTM D2266 Wear Preventive Characteristics of Lubricating Greases
- ASTM D4172 Wear Preventive Characteristics of Lubricating Fluid
- ASTM D2596 Extreme Pressure Properties of Lubricating Greases
- ASTM D2783 Extreme Pressure Properties of Lubricating Fluid
- IP 239 Extreme Pressure Properties: Friction and Wear Test for Lubricants
- DIN 51350/1-5 Testing Lubricants: Testing in the Shell Four-Ball Tester
- ISO/CD 11008 Petroleum Products and Lubricants - Determination of Extreme Pressure Properties of Lubricating Greases - Four Ball Method

### **TE 82 with TE 82/RCF Rolling Four Ball Test Assembly**

IP 300 Rolling Contact Fatigue Tests for Fluids

### **TE 82 with TE 82/KRL Shear Stability Test Adapter and TE 82/SM Temperature Control Service Module**

DIN 51350/6 Testing of Shear Stability of Lubricating Oils Containing Polymers

CEC L-45-T-93 Viscosity Shear Stability of Transmission Lubricants (Taper Roller Bearing Rig)

### **TE 82 with TE 82/TW Thrust Washer Test Assembly**

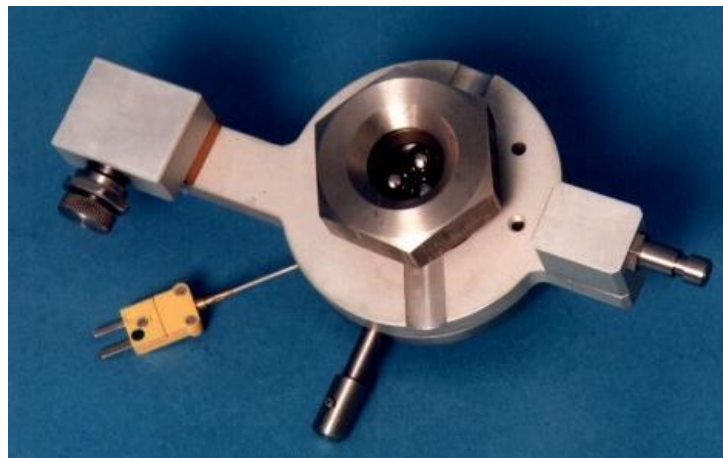
ASTM D3702 Standard Test Method for Wear Rate of Materials in Self-Lubricated Rubbing Contact Using a Thrust Washer Testing Machine

### **Description:**

The TE 82 has dead weight loading, vector controlled motor speed with encoder feedback, SUPERSLIM Serial Link Interface Module and [COMPEND 2000](#) Window compatible control and data acquisition software. The machine is floor-standing.

The test spindle projects downwards and runs in a housing with precision greased for life bearings. The drive motor is connected to a pulley on the test spindle by means of a timing belt.

Vector control of the motor with encoder feedback provides a variable speed turn-down ratio of 100:1. The motor is four-pole providing a constant torque of 14 Nm up to 1,500 rpm and constant power of 1.5 kW from 1,500 to 2,000 rpm. The motor is capable of providing 50% overload for 30 seconds and therefore a maximum torque of 21 Nm is available for this time. The welding limit in 4-ball EP tests is typically 12 Nm.



The TE 82 includes the test adapter for sliding four ball tests. This comprises a test reservoir, clamping nut, thrust face and clamping ring for the three test balls, integral torque arm and thermocouple sensor.

The clamping ring is designed to hold the test balls at the defined contact angle for 4-ball testing. The thread of the clamping nut is designed to provide the correct clamping torque for 4-ball EP testing. The upper ball is placed in a split taper collet, which is a push fit into the spindle taper. The test assembly is also designed to locate on the TE 82/SCOPE Microscope Assembly to allow post-test measurement of wear scars.

### **Optional Accessories:**

#### **TE 82/RCF Rolling Four Ball Test Assembly:**

The TE 82/RCF comprises a test reservoir and precision polished test race. The race is designed to permit the test balls to rotate freely maintaining a defined contact angle with the upper ball fixed in the spindle. In this case there is no torque measurement and the rotation of the adapter is prevented by dowels in the heated pad locating in three holes in the load cross-beam. The upper ball is placed in a split taper collet, which is a push fit into the spindle taper.

#### **TE 82/KRL Shear Stability Test Adapter:**

The DIN 51350-6 and CEC test methods are for the determination of the shear stability of lubricating oils with polymer additives. For this a taper roller bearing is used to shear the fluid. The purpose of the test is to determine the permanent drop in viscosity caused by mechanical stresses under practical conditions.



The test assembly comprises a test reservoir, clamping nut, integral labyrinth for temperature control, torque arm and thermocouple sensor. The temperature of the lubricant is maintained at 60°C by means of the TE 82/SM Temperature Control Service Module, which is a free-standing temperature controlled water circulating system.

#### **TE 82/TW Thrust Washer Test Assembly:**

The test assembly comprises an electrically heated test bath rated to 200°C and a self-aligning hub adapter for carrying standard thrust washer test samples.

Thrust Washer: 1.125" O/D according to ASTM D 3702  
2" O/D according to ASTM D 3702

## **Instrumentation and Control:**

The TE 82 has PC based sequence programmable control and data acquisition. This is provided by an integrated Serial Link Interface Module and [COMPEND 2000](#) software running on a host PC, operating under Windows. Data is stored to hard disc in standard spread sheet compatible file formats (.csv or .tsv).

Tests are defined by a sequence of steps, each step containing set-point, data recording rates and alarm level information. Set-points may be adjusted by step change or ramp. The test sequence is followed unless interrupted by the operator or an alarm. Set-points may also be adjusted manually using on screen toggles.

## **TE 82/SCOPE High Resolution Microscope Assembly:**



The TE 82/SCOPE High Resolution Microscope Assembly provides for rapid measurement of the wear scar on the test balls from a sliding four ball test (EP or Wear) without having to removing the balls from the sliding 4-ball test adapter.

The sliding four ball test adapter fits onto the base of the microscope assembly. The microscope is located on angled holder which is set to the standard contact angle of the balls in the machine. This means that the microscope is normal to the centre of the wear scar.

The microscope has a rack and pinion focusing system and the wear scar is illuminated by the internal light source. Each ball may be viewed in turn by rotating the test adapter by hand. Two interchangeable eye pieces are provided with internal gratitudes as follows:

Range 2 mm with 0.01 mm divisions

Range 4 mm with 0.02 mm divisions

The wear scar is measured in one direction and then the eyepiece is twisted 90° to read the second value.

TE 82/SCOPE-IC Digital Image Capture option allows wear scar images to be logged to PC with subsequent on-screen measurement of wear scar dimensions.

## Technical Specification:

Size of Test Balls:	12.7 mm (0.5") diameter
Load Range:	10 to 1,000 kg
Loading Method:	Dead Weights
Rotational Speed:	60 to 2,000 rpm
Temperature Range:	Ambient to 200°C
Heater Power:	550 W
Temperature Sensor:	k-type thermocouple
Motor:	1.5 kW ac

## Services:

Electricity:	220/240V, single phase, 50 Hz, 3 kW 110/120 V, single phase, 60 Hz, 3 kW
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## Installation:

Floor-standing machine:	900 mm x 670 mm deep x 2000 mm high, 300 kg
Bench-mounting cabinet:	530 mm x 420 mm x 300 mm high, 20 kg
Packing Specifications:	2.2 m <sup>3</sup> , GW 600 kg, NW 450 kg

## Order As:

TE 82	Microprocessor Controlled Four Ball Machine
TE 82/RCF	Rolling Four Ball Test Assembly
TE 82/KRL	KRL Shear Test Adapter (DIN 51350-6)
TE 82/SM	Temperature Control Service Module (for KRL test)
TE 82/TW	Thrust Washer Test Assembly
TE 82/SCOPE	High Resolution Microscope with Ball Cup Measuring Assembly
TE 82/SCOPE-IC	High Resolution Microscope with Ball Cup Measuring Assembly and Digital Image Capture

## Consumables:

TE 82/CV1	Box of 800 Test Balls
TE 82/CV2	Ball Collet
TE 82/CV3	Five Test Races for Rolling Four Ball Tests
TE 82/CV4	Ball Clamp and Thrust Race for Sliding Four Ball Tests