Description

The TE 79 Multi-Axis Tribometer is for friction and wear testing of materials under low loads in pin or ball on disc or reciprocating plate configurations. In pin on disc mode the machine can perform tests according to ASTM G 99 and DIN 50 324 and provides a Class 1 contact
configuration (pin or ball loaded vertically downwards onto a horizontally rotating disc). In both pin on disc and pin on plate modes, the indexing capability allows tests to be performed in accordance ASTM G132 Standard Test Method for Pin Abrasion Testing, which requires indexation of the pin so that it is always presented with a fresh abrasive surface. The Tribometer is modular, with two possible configurations, each used in conjunction with the TE 79 Base Unit.

TE 79 Base Unit

This comprises the loading and friction force measurement system mounted on a base plate, control hardware with PLINT SLIM 2000 serial interface unit and control software. The machine is bench-top mounted and includes a transparent enclosure and ambient humidity and temperature sensor. The enclosure is also used as a safety cover for the machine and incorporates a magnetic proximity switch. The machine will not run if the enclosure is removed.

The fixed pin or ball sample is carried on a trunnion and gimble mounted loading beam. This is counterbalanced both to give a neutral balance and to bring the centre of gravity onto the contact plane. Load is applied by dead weights in a range from 0.1 N to 50 N.

The loading beam is restrained by a strain gauge force transducer in a sliding link. This link ensures that only the tangential component of force in the contact (the friction force) is measured even with the large deflections associated with elastomeric test pieces. As the lower specimen surface moves the friction force on the ball or pin sample is measured.

The load beam lift/lower is servo controlled so that the load can be applied at a specific point in the test. The program can also introduce a dwell between load application and movement. This dwell period is an important parameter in determining the start-up friction in elastomeric contacts.
TE 79/P Indexing Pin on Disc Module

This Module comprises a rotating disc assembly mounted on a cross slide, thus allowing the pin sample to follow a spiral track on the disc, if required. Rotary and translatory motions are driven by stepper motors. The module locates on the base plate of the TE 79 Base Unit and is fixed in place with locating screws.

The disc specimen is mounted in a reservoir to retain lubricating fluid. The reservoir is mounted on a vertical drive shaft assembly. This is mounted on a traversing slide, which permits the radius to be changed during a test. The control software may be set to run with a constant rpm or constant velocity during a traverse.

TE 79/R Indexing Reciprocating Module
The Module locates on the base plate of the TE 79 Base Unit and is fixed in place with locating screws. It provides X/Y axis movement with linear positional feedback. Tangential (friction) force measurement is in the X direction. The axes are formed by cross-axis linear slides with 1 mm pitch lead screws and are driven by stepper motors.

The fixture for the lower (moving) specimen includes an electrical resistance heater and two thermocouples for temperature measurement and control above ambient conditions.

A programmable motion controller is used to coordinate movement of the two axes. Numerous motions are possible including:

Simple reciprocating along one track in the X direction.

Reciprocating in the X direction with indexing in the Y direction at stroke end, so that the wear track resembles a square wave.

Reciprocating in the X direction with indexing in opposite Y directions at stroke end, so that the wear track is rectangular.

Simultaneous indexing on both the X and Y axes so that the pin follows a circular or elliptical track with an orbiting (rotating friction vector) motion.

Test Environment

The TE 79 Base Unit is provided with a plastic safety cover, which also acts as a chamber for the user to run under controlled humidity conditions. An ambient temperature and humidity sensor is mounted on the machine base inside the chamber.

TE 75/R/C Cooler Pad and Laboratory Chiller

This test assembly replaces the standard fixed specimen heater block in the reciprocating module with a cooler pad. Used in conjunction with a Laboratory Chiller unit with water/glycol mixture as the coolant, temperatures from -25°C to ambient may be achieved. To avoid ice formation, this adapter is best used in conjunction with a simple desiccant dehumidifier system used in conjunction with a controlled air supply.

Control and Data Acquisition

The TE 79 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 79 MULTI-AXIS TRIBOMETER**

**Technical Specifications**

Contact Configurations:  
Ball on Flat  
Pin on Flat  
Customised Specimens

Normal Load:  
0.1 to 50 N

Friction Force Range:  
0 to 50 N

Humidity Sensor:  
10 to 90% RH

Interface:  
Serial Link Interface Module

Software:  
COMPEND 2000

**TE 79/P Indexing Pin on Disc Module**

Contact Configurations:  
Ball on Disc  
Pin on Disc

Disc Diameter:  
100 mm

Track Radius:  
0 to 40 mm

Y Traverse Speed:  
10 mm/min

Rotation Speed:  
0 to 250 rpm

Sliding Speed:  
up to 1 m/s

**TE 79/R Indexing Reciprocating Module**

Contact Configurations:  
Ball on Plate  
Plate on Plate  
Plate on Hemisphere

Maximum X Axis Speed:  
10 mm/s

Maximum X Stroke:  
50 mm

Maximum Y Axis Speed:  
10 mm/s

Maximum Y Stroke:  
30 mm

Temperature Range:  
ambient to 100°C

Dwell (time delay):  
User selected in seconds up to 8 hours
Temperature Sensor: J-type thermocouple
Heating Power: 150 W

**TE 79/R/C Peltier Cooler**
Minimum Temperature: -15°C (ambient water cooled)
Minimum Temperature: -30°C (chiller water/glycol cooled)

**RE 79/R/C Laboratory Chiller**
Working Fluid: 50:50 Water/Glycol
Fluid Temperature: -35°C

**Controlled Parameters**
- X Position (TE 79/R)
- RPM (TE 79/P)
- X Axis Speed (TE 79/R)
- Y Position (TE 79/P and TE 79/R)
- Y Axis Speed (TE 79/P and TE 79/R)
- Temperature (TE 79/R)
- Dwell Period
- Test Duration

**Measured Parameters**
- X Position (TE 79/R)
- Y Position (TE 79/P and TE 79/R)
- Humidity
- Ambient Temperature
- Temperature (TE 79/R)
- Friction
- Friction Coefficient

**Services**
Electricity:
- 220/240 V, single phase, 50 Hz, 720 W
- 110/120 V, single phase, 60 Hz, 720 W
Installation

Bench-mounting machine: 570 mm x 600 mm x 600 mm high, 40 kg
Bench-mounting controller: 530 mm x 530 mm x 240 mm high, 20 kg
Packing Specifications: 0.59 m³, GW 120 kg, NW 70 kg