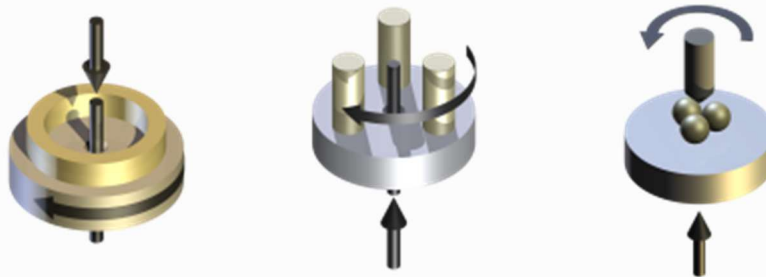


TE 95 PRECISION ROTARY TRIBOMETER – LOW TEMPERATURE ENABLED



Description

A unique feature of TE 95 Precision Rotary Tribometer – Low Temperature Enabled is the use of a dual axis, in-line, torque and axial force transducer, allowing measurement of both axial load and friction torque on the rotating, upper specimen, as opposed to the more conventional methods associated with more standard rotary tribometers. Measuring the load and friction at the rotating specimen, instead of at the fixed lower specimen, means that the latter can be attached to bulky refrigerant pipes, without inducing unwanted tare forces.

Tests may be run using geometries specified in the following standards:

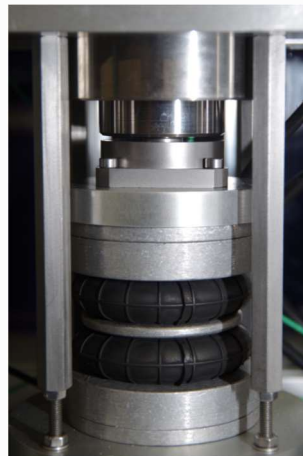
- ASTM G99 Wear Testing with a Pin-on-Disc Apparatus
- ASTM D3702 Standard Test Method for Wear Rate of Materials in Self-Lubricated Rubbing Contact Using a Thrust Washer Testing Machine
- ASTM D2266 Wear Preventive Characteristics of Lubricating Greases
- ASTM D4172 Wear Preventive Characteristics of Lubricating Fluid
- ASTM D5183 Determination of the Coefficient of Friction of Lubricants

Customised test assemblies and tooling can be accommodated, provided these work with axisymmetric loading and produce a pure couple friction torque.

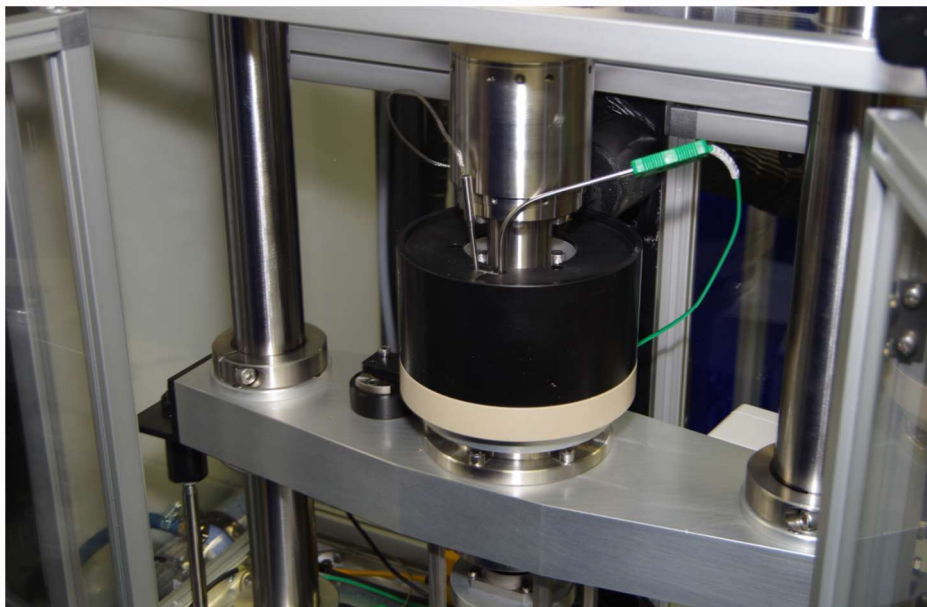
Load Application

Lower test assemblies are mounted on an adjustable height cross-beam. Pneumatic cylinders are provided for raising and lowering the cross-beam.

A servo pneumatic load bellows, mounted beneath the cross-beam and acting through an air bearing, applies the axial load. A force transducer mounted on top of the bellows is used to monitor the force applied by the bellows, with the actual force applied to the specimens sensed by the in-line transducer. Load control is implemented by cascade control using both force measurements for feedback.



Refrigerated Assembly



The refrigerated test assembly mounts on the bellows actuator shaft, which projects through the air bearing, with the bulky refrigerant pipes projecting through the rear of the test enclosure. The rotating specimen, mounted on the lower end of the in-line transducer, projects downwards into the refrigerated assembly.



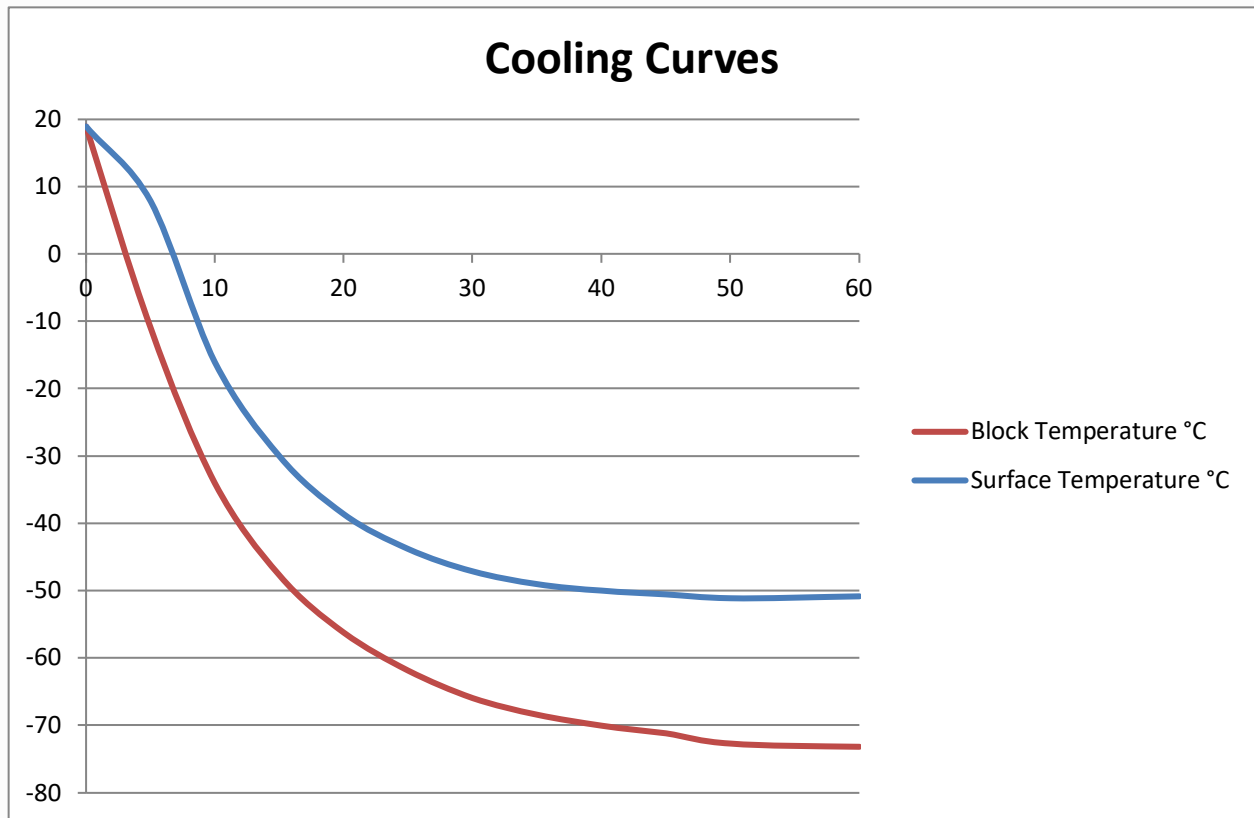
A unique feature of the cooling system is that, unlike more conventional systems, it does not involve the use of a pumped heat transfer medium. Instead, the refrigerant from a standard laboratory chiller is delivered, under pressure, to the test assembly, where it is expanded in a cooling coil, which is wrapped around an aluminium cooling block. This provides a very efficient means of cooling, having eliminated the heat transfer and pumping losses associated with using a heat transfer fluid.

The aluminium cooling block is mounted on a PEEK sub-base with a nylon tube wall, with the resulting gap filled with loose vermiculite, for insulation.



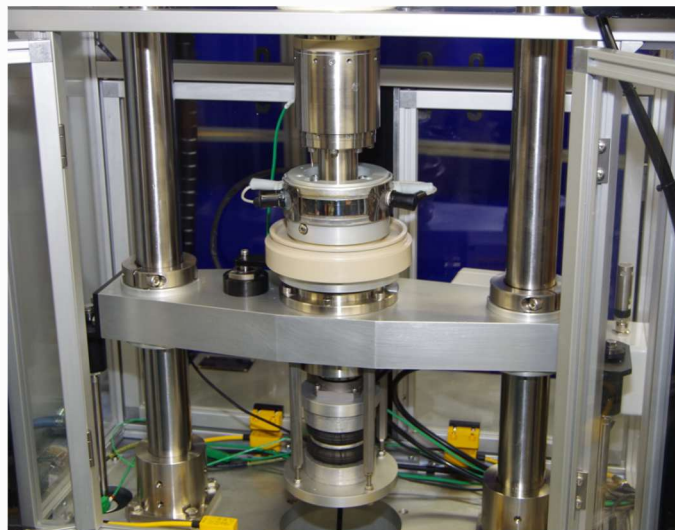
An NC-DVRT sensor is mounted in the centre of the cooling block, to measure the gap between the lower specimen assembly and a target on the upper specimen shaft, a reduction in the gap providing a measure of specimen wear.

In order to avoid icing in the test assembly, an enclosure is provided, fed with compressed air via a desiccant dehumidifier tube.



The cooled test assembly allows tests to be performed with specimen surface temperatures down to -50 °C.

Heated Test Assembly



For tests at temperatures above ambient, a separate heated test assembly is provided. This incorporates an aluminium heater block with an electrical band-heater and includes an NC-DVRT sensor for wear displacement measurement. The assembly allows tests to be run at temperatures up to 150 °C.

Control and Data Acquisition

Control and data acquisition are implemented via host PC running COMPEND 2020 Windows compatible software, in conjunction with a Phoenix Tribology USB micro-controller interface.

Automatic control is implemented via user programmable test sequences. Manual control is implemented using on screen toggles. Data is stored to hard disc in either .csv or .tsv file formats.

Adapters and Tooling

TE 95/1 Cooled Test Assembly

Including refrigerant cooling system for temperatures from ambient to -50°C and linear inductive displacement sensor

TE 95/2 Heated Test Assembly

Including band-heater system for temperatures from ambient to 150°C and linear inductive displacement sensor

TE 95/3 Thrust Washer/Three Pin on Disc Tooling

For use with TE 95/1 and TE 95/2

TE 95/4 Four Ball Wear Test Tooling

For use with TE 95/1 and TE 95/2

Technical Specifications

Rotational Speed:	30 to 3,000 rpm
Load Range:	10 to 1,000 N
Maximum Friction Torque:	10 Nm
Motor:	a.c. servo
Motor Output:	16 Nm @ 4,000 rpm continuous rated
Drive Belt:	Poly-vee
Interface:	Serial Link Interface Module
Software:	COMPEND 2000

Controlled Parameters

Rotational Speed
Load
Temperature
Test Duration

Measured Parameters

Rotational Speed
Wear
Friction Force
Temperature
Number of Revolutions
Test Duration
Sliding Speed
Friction Coefficient
Sliding Distance

Adapters and Tooling

TE 95/1 Cooled Test Assembly

Minimum Temperature:	-50°C
Wear Sensor:	Linear Inductive Displacement Sensor
Wear Resolution:	0.2 microns
Cooling System:	Laboratory Chiller

TE 95/2 Heated Test Assembly

Maximum Temperature:	150°C
Wear Sensor:	Linear Inductive Displacement Sensor
Wear Resolution:	0.2 microns
Heating System:	Band-heater

TE 95/3 Thrust Washer/Three Pin on Disc Tooling

Thrust Washer:	According to ASTM D 3702
Pin Track Radius:	10 to 35 mm
Pin Size:	8 mm diameter x 15 mm long
Disc Diameter:	75 mm maximum

TE 95/4 Four Ball Wear Test Tooling

Services

Electricity:	380/415V, three phase, 50/60 Hz, 7.5 kW
Clean, dry air:	4 cfm at 8 bar (120 psi)

Installation

Floor-standing machine:	900 mm x 600 mm deep x 2000 mm high, 250 kg
Floor-standing cabinet:	600 mm x 600 mm x 1800 mm high, 150 kg
Packing Specifications:	2.2 m ³ , GW 550 kg, NW 400 kg