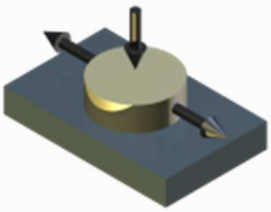
TE 104 HIGH SPEED RECIPROCATING MACHINE



Description

The test rig is based on a twin crank reciprocating assembly driven by a variable speed motor. Two test enclosures are mounted on top of the crank case with communicating gas ports. Each test enclosure provides locations for two test specimen pairs, providing a total of four test stations. Two fixed specimens are mounted on either side of each reciprocating rod in spherical seat self-aligning specimen holders.

The fixed specimens are loaded against each moving specimen surface, with the load on opposing fixed specimens equal, such that no net normal load is applied to the reciprocating rod.

An electrical heater is embedded in each reciprocating to allow independent heating of the two moving specimens. Electrical brushes are provided for transmission of power to the heaters.

Each fixed specimen is carried on flexure mounted articulated arms. One fixed specimen arm is restrained in the direction of the friction force by a piezo force transducer to allow friction to be measured on that particular test station.

Guidance and sealing of the reciprocating rods is by means of linear seals and a linear plain bearings. Non-reciprocating components are sealed with neoprene seals, allowing the rig to operate under conditions of slight over-pressure.

Movement of the fixed specimen relative to the moving specimen in monitored by means of capacitance displacement gauges to indicate wear.

Access to the test chambers for fitting and removal of test specimens is by means of removable access plates.

Load is applied by means of two pneumatic cylinders connected in parallel to the output of a pneumatic servo control valve. A pincer assembly results in equal and opposite force being applied to each specimen contact.

A force transducer is fitted to one of the pneumatic cylinders to provide load force feedback to the servo control system.

In addition to frictional heating, the moving specimens may be heated by means of cartridge heaters embedded in each reciprocating rod. Heaters are controlled by means of software PID controllers with PWM outputs via solid state relays. Feedback is provided by non-contact infra red sensors targeted on the moving specimen carriers.

The relative displacement of each fixed specimen arm, with reference its corresponding moving specimen rod, is measured by a capacitance proximity measuring system. Output from the device is in the form of a DC voltage proportional to displacement. The probe is mounted approximately 0.5 mm away from a reference surface. The capacitance of the gap is converted to a dc voltage by a charge amplifier. A reduction in gap implies an increase in wear, hence an increasingly negative output of the system implies increasing wear amount. The output from the transducer gives 1 V for 1.00 mm with a resolution of 0.2 microns. The variations in the gap due to wear, thermal expansion, mechanical deflection of the specimens, entrainment of debris, or a combination of these, are picked up by the system. It is thus advised that measurements should be made under conditions of steady state running.

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.

TE 104 FOUR STATION LONG STROKERECIPROCATING RIG

Technical Specifications

Contact Configurations:	Area Contact
Minimum Load:	20 N
Maximum Load:	200 N
Frequency/Stroke:	25 mm at 20 Hz 50 mm at 16 Hz 70 mm at 12 Hz 100 mm at 10 Hz
Maximum Temperature:	200 C
Maximum Frequency:	20 Hz
Motor:	2.2 kW @ 1500
Drive:	Variable frequency flux vector
Interface:	Phoenix Tribology USB micro-controller interface
Software:	COMPEND 2020

Controlled Parameters

Speed
Master Load
Specimen Temperature 1
Specimen Temperature 2
Test Duration

Measured Parameters

Speed
Master Load
Specimen Temperature 1
Specimen Temperature 2
Wear Displacement 1
Wear Displacement 2
Wear Displacement 3
Wear Displacement 4
RMS Friction Force 1

	Relative Humidity
	Test Duration

Services

Electricity:	220/240V, single phase, 50 Hz, 5 kW
	110/120V, single phase, 60 Hz, 5 kW