Application & Instrument Training
TRIBOMETER

@ ITESM - CEM
Laboratorio de Tribología

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Nora, thanks for your support

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Introduction

Discovery Hybrid Rheometer (DHR) from TA Instruments.

- Optical Encoder Dual Reader.
  - Resolution better than 2 nanoradians.
- Advanced drag cup motor.
  - Keeps inertia, temperature and friction an absolute minimum.
- 2nd generation magnetic bearing.
  - Less than 70% of the friction of air-bearing.
  - It can measure down to 0.5 nNm of torque.
- Force rebalance transducer (FRT).
  - High accuracy normal fo4rce measurements up to 50N.
- True Position Sensor (TPS).
  - True gap accuracy via a high resolution linear position sensor.

Figure 1. Discovery hybrid Rheometer. TA Instruments.

Purposes

- To learn how to turn on the instrument in the correct order and the conditions needed for using it.
- To understand the software and how to design Rheology experiments.
- To learn how to calibrate the instrument before each experiment.
- To perform rheology experiments for practicing.

Materials

Certified Viscosity Standard. S600.

Discovery hybrid Rheometer.
TA Instruments.

Peltier plate for rheology.

Geometry: Parallel plate 60 mm.

Ethanol.

Procedure

- Initial setup

remove protective covers

open air valves AKA. ball valve / T

check air pressure, which shall be around 30 (±2) psi

plug the instruments to the orange (isolated ground) outlet

turn on the TA-supplied Air Cooled Circulator (below the working table)

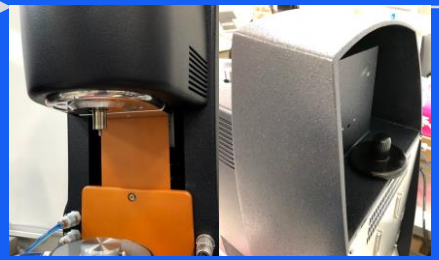
SW UP is ON

DOWN is OFF

Procedure

- Initial setup (continued)

remove the bearing clamp



turn on the Electronics Control Module

"I" is ON

"O" is OFF

- Replace the Lower Stage (if required)

Press the Release button

disconnect the power cable

disconnect the fluid hoses

Procedure

- Replace the Lower Stage (continued)

Press the Release button again

remove the attachment

Press the Release button again

align and fit the attachment

connect the power cable & fluid hoses

Procedure

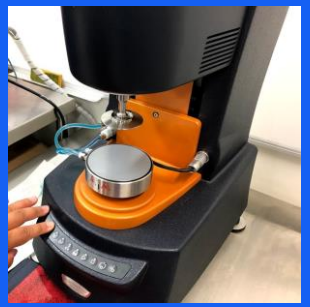
- Install a Geometry

clean the geometry (with alcohol)

The geometry is gently placed (clockwise direction until the first stop)

Procedure

- Prepare the sample



the sample is placed on the Peltier plate

the geometry is lowered using the arrows (until it is touching the sample)

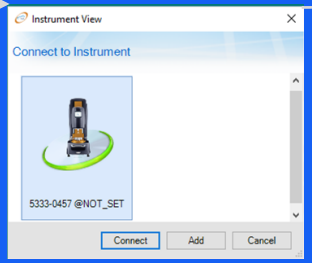
the sample that comes out of the geometry, it is cleaned

It is checked that all the area of the geometry is covered by the sample

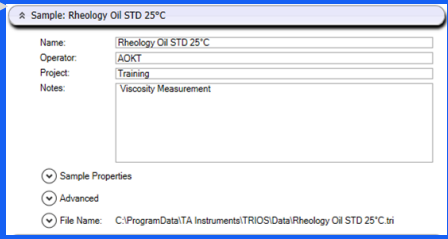
Procedure

- Run the experiment

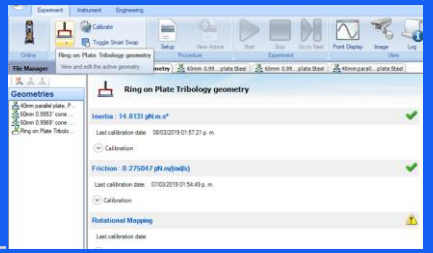
Open the TA software & connect to the instrument



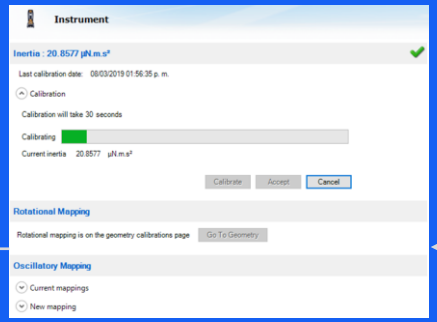
input the experiment data



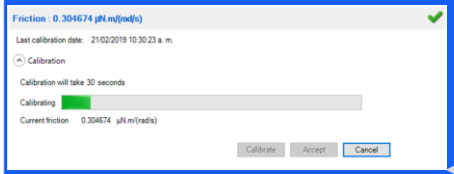
select the geometry



calibrate the instrument's inertia

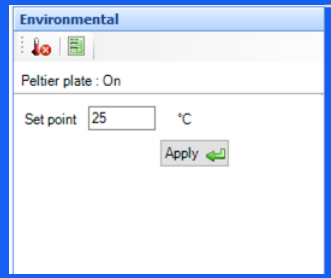


calibrate the instrument's friction

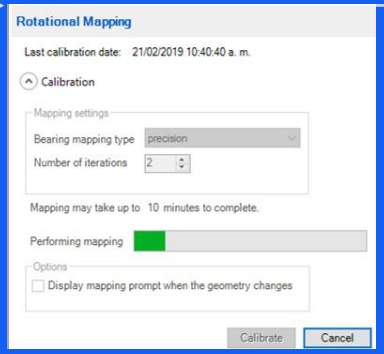


Procedure

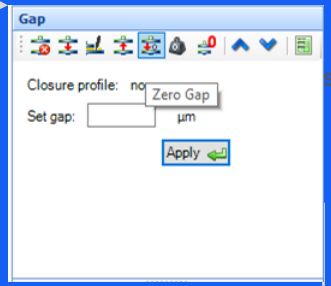
- Run the experiment (continued)



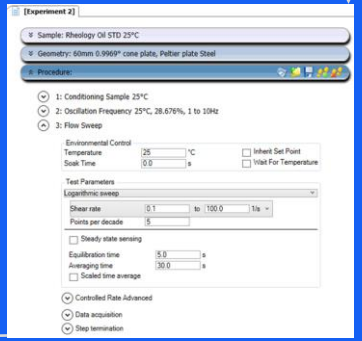
Set the plate's temperature



perform the rotational mapping

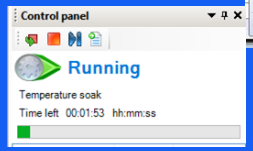


Get the Zero Gap

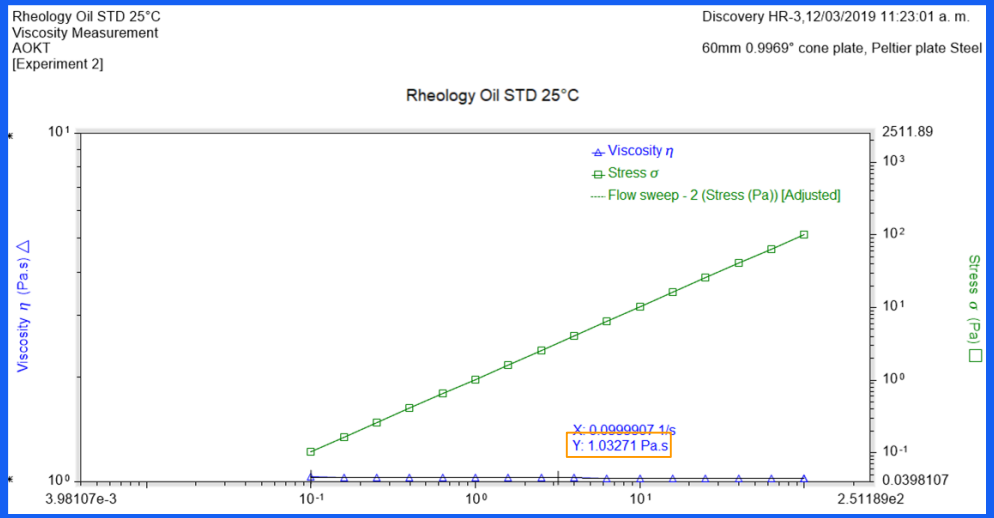


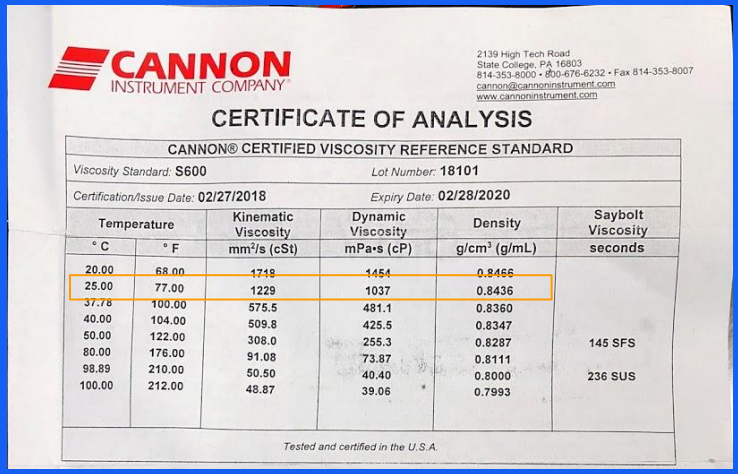
define the experimental procedure

run the experiment



Results





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cannon@cannoninstrument.com
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CERTIFICATE OF ANALYSIS

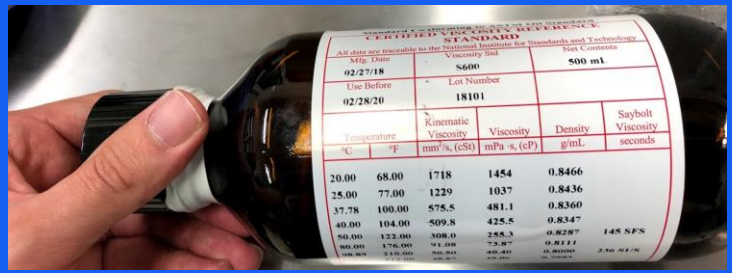
CANNON® CERTIFIED VISCOSITY REFERENCE STANDARD

Viscosity Standard: S600 Lot Number: 18101

Certification/Issue Date: 02/27/2018 Expiry Date: 02/28/2020

Temperature		Kinematic Viscosity	Dynamic Viscosity	Density	Saybolt Viscosity
°C	°F	mm²/s (cSt)	mPa•s (cP)	g/cm³ (g/mL)	seconds
20.00	68.00	1718	1454	0.8466	
25.00	77.00	1229	1037	0.8436	
37.78	100.00	575.5	481.1	0.8360	
40.00	104.00	509.8	425.5	0.8347	
50.00	122.00	308.0	255.3	0.8287	145 SFS
80.00	176.00	91.08	73.87	0.8111	
98.89	210.00	50.50	40.40	0.8000	236 SUS
100.00	212.00	48.87	39.06	0.7993	

Tested and certified in the U.S.A.



$$\text{In[1]:= } \text{error} = \frac{\text{Abs}[1032.71 - 1037]}{1037} * 100$$

Out[1]= 0.413693