EIE Instruments Pvt Ltd

www.eieinstruments.in

Survey No. 1098, Nr. Mahakali Temple, Opp. Primary School,
Village Kubadthal, Tal- Daskroi,Dist-Ahmedabad, Gujarat -382430.
Email : service@eieinstruments.com , kunal@eieinstruments.com
Telephone: +91-9909903582, +91-79-66040600

Organization's ISO 9001:2008 Certificate

QUALITY MANAGEMENT SYSTEM

Certificate of Registration

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for the following scope :

MANUFACTURER & SUPPLIER OF LABORATORY TESTING INSTRUMENTS.

Certificate No	**22DQJT93**		
Initial Registration Date	: 27/06/2022	Issuance Date	: 27/06/2022
Date of Expiry*	: 26/06/2025		
1st Surve. Due	: 27/05/2023	2nd Surve. Due	: 27/05/2024

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B-7, 1st Floor, Sector-2 Noida, Gautam Budh Nagar, UP-201301
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CB-QMS-035

Forward

Dear valued customer,

We just want to take a moment out to thank you for your keen interest in our company products. We greatly appreciate your business and the opportunity you provided us to assist you. You have joined a selected group of customers who have switched to the technologically superior and quality enhanced laboratory testing product.

Time has changed, so do the technology. Your purchase lists you on the cutting edge of 21st century technology. The attached test report is an excellent way of expressing and maintaining your trust in EIE's - superior quality testing products. Our continued efforts and commitment is to provide you efficient sales after services, prompt attention and highest level of customer satisfaction. If for any reasons, you have questions or comments, we are delighted to hear from you. Call us on 0091-79-660406013 or send us email at info@eieinstruments.com/kunal@eieinstrumentsc.com. You can expect us to respond to your email within 24-48 working hours.

Once again, thank you for your trust and kind patronage. We look forward to serve you better in future.

Yours sincerely,

EIE Instruments

Table of contents

1. What is Foaming and its disadvantages

Foam is a collection of small bubbles of air that accumulate on or near the surface of the fluid. Foam in used lubricants has been studied for more than 50 years. It typically forms on a fluid that's been agitated. The bubbles range from about 10 µm to 1,000 µm in diameter and aren't uniformly dispersed. They rise to the surface and coalesce to form larger bubbles. As bubble size overcomes surface tension, they break.

In severe cases, the foam can leak out of the machine through breathers, sight glasses and dipsticks. Foam is an efficient thermal insulator, so the temperature of the oil can become difficult to control. The presence of air bubbles in the fluid can lead to excessive oxidation, cavitations, the reduction of lubricating properties of the oil and hydraulic system failure.

Foaming is a common problem with oil-lubricated components. It is a fundamental physical property of a lubricating fluid. Foam can degrade the fluid's life and performance as well as that of the equipment being lubricated. It can be difficult to troubleshoot, and for this reason, accurate testing to determine the root cause of the foaming is essential. We, at EIE, have developed Foaming test apparatus as per ASTM D892 standard to know the effect of foaming in laboratory oil testing.

2. Causes of Foam Generation and its effects

The causes of foaming are many. The most common include:

- Water contamination
- Solids contamination
- Depleted defoamant (possibly due to the use of excessively fine filtration and electrostatic separation technologies)
- Mechanical issues (causing excessive aeration of the fluid)
- Overfilling of the sump with splash and bath-lubricated compartments
- Cross contamination of the fluid with the wrong lubricant
- Contamination of the fluid with grease
- Too much defoamant additive, either by incorrect formulation or by incorrect reconstruction (sweetening) of the additive package

3. Introduction to EIE Foaming Characteristic Test Apparatus

EIE – Foaming test apparatus are used in research laboratories, Petroleum Jelly Industries, Industrial quality control laboratories, Lube oil plants, Testing Laboratories, Cosmetic Industries and other similar places, where the Foaming test is required to be carried out to ascertain finished product quality.

EIE - Foaming test apparatus is manufactured in four different kinds of model as per the customer requirement. Both the models take similar exterior look, but they differ in capacity to test the number of samples. Following table will throw more light on EIE – foaming test models.

Serial No	Model No	Description of Model	Cooling temperature @ 24 °C (ASTM D892)	Heating temperature @ 93.5 °C (ASTM D892)
1	EIE-PTLT-114-SC	Single water bath Jar with provision for insertion of Single test cylinder (Graduated - 1000 ml)	Combined cooling & heating system in glass jar bath. Cooling coil, which is to be connected to external chiller for cooling effect, is provided within the glass Jar.	Heating element is suspended in the glass jar bath for achieving and controlling test temperature of 93.5 °C
2	EIE-PTLT-114-TC	Single water bath Jar with provision for insertion of Two test cylinders (Graduated – 1000 ml)	Combined cooling & heating system in glass jar bath. Cooling coil, which is to be connected to external chiller for cooling effect, is provided within the glass Jar.	Heating element is suspended in the glass jar bath for achieving and controlling test temperature of 93.5 °C
3	EIE-PTLT-115-SCTB	Twin water bath Jars with provision for insertion of Single test cylinder in each Jar bath. (Graduated – 1000 ml)	One water bath jar is dedicated for conducting the test @ 24 °C. This glass jar is equipped with cooling coil, which is to be connected	Other water bath jar is dedicated for conducting the test @ 93.5 °C. This glass jar is fitted with heating element, which is suspended from

			to the external chiller for maintain the jar temp @ 24 °C through-out the test .	the top, to achieve and maintain test temperature @ 93.5 °C.
4	EIE-PTLT-115-TCTB	Twin water bath Jars with provision for insertion of twin test cylinders in each of the Jar Bath. (Graduated – 1000 ml)	One water bath jar is dedicated for conducting the test @ 24 °C. This glass jar is equipped with cooling coil, which is to be connected to the external chiller for maintain the jar temp @ 24 °C through-out the test . Test on two different samples can be carried out at one time.	Other water bath jar is dedicated for conducting the test @ 93.5 °C. This glass jar is fitted with heating element, which is suspended from the top, to achieve and maintain test temperature @ 93.5 °C. Test on two different samples can be carried out at time.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Foaming characteristic test apparatus. This manual should also be used in conjunction with applicable published laboratory procedures ASTM D892.

4. Getting Started

The instructions for preparing the equipment assume that the user is aware of the contents of this document, which lists the warranty conditions and important precautions.

4.1 Packing list

- Digital Constant-Temperature Glass Jar Waterbath
- Electric Motor with Stainless Steel Paddles (Pre-Installed at factory) for uniform stirring
- Diffuser ball (Diffuser stone) for generating the foam within Oil Test Sample
- Air compressor (Diaphragm pump) for supplying required air flow
- Flow meter to maintain constant flow rate **at 94 ± 5 ml/Min** as per ASTM D892
- 1000 ml graduated glass beaker
- Bottom holding clamp (chrome plated) for graduated glass beaker
- Rubber cork to pass the air diffuser pipe through the glass beaker
- Silicon rubber transparent pipe to extract the water from Foaming Glass Jar

4.2 Delivery and Uncrating the instrument

1) Inspect equipment and shipping crate immediately upon receipt. If any damage is apparent, immediately discuss it with the delivery person and contact the transportation company immediately. Make notes of any damages on the bill of landing.
2) Retain all shipping material for later inspection.
3) Check packing slip carefully and ensure all materials have been received as indicated in packing slip.
4) Instrument is supplied in enclosed wooden case. Unpack the wooden case, locate and count the number of accessories and main working unit. Remove packing strip from surroundings of the instrument and all its accessories. Please inspect and note whether any part of the instrument is damaged or any accessory is missing according to packing slip? If it is so, then immediately make note of it and report to the manufacturer.
5) Due to the vibration incurred during shipping and handling, it is possible that mechanical connection could become loose. Inspect all connection to ensure that they are secure.
6) After visual inspection, if everything is found to be okay, transit the instrument to suitable safe place where it is intended to install. **Caution: Heavy weight, protect yourself first. Handle with care.**

7) Recycle the packing material and wooden box. Do not throw it away for environment protection.

5. How to make instrument ready for the use?

a) Place the equipment on a plain, even and sturdy surface leaving 5-6" space away from the wall.

b) Do not install unit in a corrosive environment. A corrosive environment may lead to poor performance and deterioration of unit.

c) Do not place the equipment in a draft, sunlight or near a place of equipment, which emits heat as well as electromagnetic conduction emission.

d) Check the electrical specifications label located on the equipment. Make sure the power specifications must confirm to your local standard.

e) Provide 1Ø / 230V / 50Hz stabilized power source with proper earthling.

f) Keep the equipment in well ventilated place. The laboratory room temperature should be maintained @ 25 °C to achieve the efficient cooling effect while conducting the test @ 24 °C.

g) Clean the inner chamber of glass bath thoroughly before operating it.

h) Clean the graduated glass beaker with laboratory cleaning solution or aceton and oven dry it before taking it into experimental use.

i) Install the unit near the place, where distilled water or RO water or DM Water is easily available.

j) Plug the power cord into a properly grounded outlet.

6. Brief construction details of EIE Water Bath

1) The EIE Foaming characteristic test apparatus is a compact and self-contained unit.

2) It consists of Round Glass Jar bath with drain connection, in which the experiment is carried out.

3) The glass jar bath is pre-installed with immersion heater (wet heater – heating element), cooling coil, Stainless steel stirrer and top backelite cover to allow the 1000 ml Graduated Test Cylinder to pass through it.

4) The base of the Foaming test apparatus is manufactured from Mild steel material, which is powder coated in attractive shades.

5) All the controlling accessories and electrical wiring is housed in the base of the unit, which acts as a control panel for EIE – Foaming test apparatus.

6) Control panel is equipped with Auto-Tune PID Digital Temperature Indicator Cum Controller, Heater switch, Stirrer switch, Mains switch and Air compressor switch.

7) Flow meter to maintain the air flow rate at 94 ± 5 ml/min is installed at front right hand side corner of the Base of the unit.
8) The top cylindrical cover of glass jar is fabricated from the backelite material in order to protect an operator from the excessive heating surface. The backelite cover is installed with two different sub-circular covers – one for pouring the water in glass jar and other for inserting the glass cylinder inside the glass jar.
9) Unit is also supplied with silicon pipes to pour and extract the water inside the glass jar. Another pair of thin silicon pipe is also supplied to connect the air compressor pump through flow meter with air diffuser ball/stone.
10) Designed for easy cleaning and simple maintenance
11) Built -in boost for initial heating.

7. Control panel and its accessories

The panel shows switches and lamps for mains and stirrer. Digital temperature indicator cum controller with precise calibration read temperature in degree centigrade corresponding to mill volts, produced by PT-100 thermocouple is installed.

The following are the switches for various functions provided on the front side of the panel.

Mains Switch cum indicator

In this advanced model, mains switch serves the purpose of switching and indicating both. An operator can switch on / switch off the entire unit from mains switch mounted on front panel. Also, the switch incorporates a lamp inside which indicates that the mains supply is on and the unit is currently in the operating mode. It also supplies direct power to stirrer and digital controller.

Permanent Heater Switch

This switch controls turning ON/OFF the Permanent heaters installed within the chamber. These heaters are mostly responsible to take care of set point temperature.

Stirrer Switch

This switch controls turning ON/OFF the Stainless Steel paddle stirrer installed within the chamber. The stirrer maintains the uniform temperature distribution throughout the chamber.

Air compressor Swtich

This switch controls turning ON/OFF the Booster heater installed as an additional accessory within the chamber. This heater aids the permanent heaters in achieving higher temperature set-points at quicker rate. An operator shall turn on this switch, when he/she wants to achieve set-point temperature values within short span of time.

Digital temperature indicator cum controller

The auto-tune Digital PID temperature controller is installed to monitor and maintain the set-point temperature value within the jar bath. A proportional–integral–derivative controller (PID controller) is a generic control loop feedback mechanism (controller) which calculates an "error" value as the difference between a measured temperature value and a desired set-point value. The controller attempts to minimize this error by adjusting the process control inputs. A tiny manual book is supplied along withthe main instrument for In-detailed explanation of digital temperature controller. Please refer to the same for additional information.

8. Technical specifications of EIE – Foaming test apparatus

Parameters	Technical Specifications	
Temperature Range without cooling coil	+5 °C above ambient to 100 °C	
Temperature Range with cooling coil	+ 5° - 100 °C, (Provided connection shall be made between cooling coil and external chiller)	
Display Resolution	0.1 °C	
Display Accuracy	± 0.5 °C	
Temperature Controller	Microprocessor based PID Digital temperature Controller cum Indicator	
Temperature Display	LED Display	
Control Accuracy	± 0.5 °C	
Cabinet Material	**Exterior**	CRC with Powder Coated
	Interior	Glass chamber
	Jar cover	Made of Bakelite or plastic material
Power Source	230 Volts, 50 Hz, Single Phase , AC Supply	
Accessories	PT - 100 Sensor	
	Air compressor pump	
	Digital temperature controller	
Blower	1300 rpm motor with stirrer for uniform Temperature	
Heater	Water (Immersion) Heater	
Heater	2000 watt	

9. Preparation of test apparatus

Thorough cleansing of the test cylinder and air-inlet tube is essential after each use to remove any additive remaining from previous tests which can seriously interfere with results of subsequent tests.

Graduated Glass Cylinder – 1000 ml

Rinse the glass cylinder with heptane. Wash the cylinder with a suitable detergent. Rinse the cylinder, in turn, with distilled water, then acetone (Warning—extremely flammable, vapors can cause a flash fire) and dry in a current of the compressed air or in a drying oven. Interior walls that drain the water cleanly, that is without drops forming, are adequately cleaned.

Gas Diffuser Ball and Air Supply Tube

Clean the gas diffuser with toluene and heptane. Immerse the gas diffuser in about 300 mL of toluene. Flush a portion of the toluene back and forth through the gas diffuser at least five times with vacuum and air pressure. Repeat the process with heptane. After the final washing, dry both the stainless steel air tube and the gas diffuser thoroughly by forcing clean air through them. Wipe the outside of the air inlet tube, first with a cloth moistened with heptane, then a dry cloth. Do not wipe the gas diffuser.

10. Experimental Test procedure

The foaming characteristic of lubricating oil as per ASTM D892 is determined in three different test sequences. In first sequence, the temperature will be maintained at 24 °C. In the second sequence, the sample from the first test will be discarded and the new sample will be taken and the same will be maintained at 93.5 °C test temperature to carry out the experiment. In the third sequence, the same sample from the sequence - 2 will only be utilized and the test will again be carried out at test temperature of 24 °C. The description of all three test sequences is narrated below.

10.1 Sequence - I

1) Fill the glass jar bath with the appropriate heat transfer fluid (distilled water) for conducting the test process. The water should be poured inside the glass cylinder with the help of the bucket or silicon pipe which is supplied along with the equipment. Fill the bath thoroughly and make sure that the wet heater (immersion heater) is completely immersed within the water.
2) Make sure that the heating element shall always remain immersed in the water; otherwise it will be burnt off. Do not conduct the experiment if the heating element is partially immersed.

3) Now, pour the oil desired oil sample into the 1000-mL cylinder until the liquid level is at the 190-mL mark.

4) Immerse the test cylinder such a way that it remains immersed at least to the 900-mL mark. Water level should be at exact or above this level in the waterbath jar.

5) Connect the cooling coil of the unit with external chiller to achieve first test temperature of 24 °C. Remember, foaming test apparatus is supplied without built-in refrigeration system and hence, it has to be connected to external cooling system to circulate cold water within the chamber as per the following picture.

6) Turn on the mains power switch on the socket board.

Note: Before running a test, make sure the unit is level. Otherwise, the results will be affected.

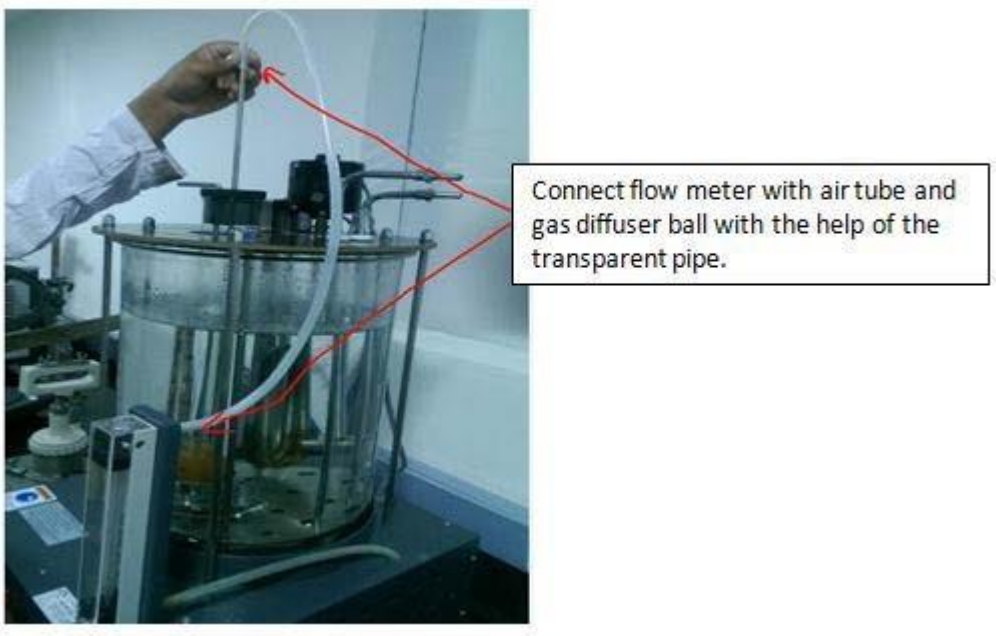
7) Now switch on the mains switch on the control panel. This will turn on the digital temperature controller on the control panel. The digits in red on the upper side will indicate the Jar temperature (process temperature), while the digits in green in the bottom line will indicate the set point temperature.

8) Set the desired operation temperature using the ▲(Up) and ▼(Down) keys on the controller. Here set the test temperature at 24 °C. (Refer to the attached tiny book let for more information about digital temperature controller). Controller will now automatically start tuning the set point temperature.

9) Keep an eye on the controller display to know when it reaches to 24 °C temperature. Now, cross check and double verify, with the help of the ASTM Thermometer supplied with the unit, whether the oil sample inside the glass cylinder also indicates 24 °C ? If yes, then move to the next step. If not, then please wait till the time oil sample reaches to 24 °C mark.

10) When the oil has reached the bath temperature, insert the gas diffuser and the air-inlet tube through top backelite cover inside the glass cylinder and permit the gas diffuser to soak for about 5 min.

11) At the end of 5 min soak for gas diffuse ball, turn on diaphragm pump switch on the control panel. This will cause the compressor pump to supply air to the air inlet tube and diffuser stone. Adjust the air flow rate on flow meter to 94 ± 5 mL/min. Connect the flow meter with air inlet tube as per following image. Flow meter is already connected to air diaphragm pump, which is housed in the basement, to supply required air flow rate 94 ± 5 ml/min to air inlet tube and diffuser stone.



12) This connection will force clean dry air through the gas diffuser for 5 min ± 3 s, timed from the first appearance of air bubbles rising from the gas diffuser.

13) At the end of this period, shut off the air flow by disconnecting the hose from the flow meter and immediately record the volume of foam; that is, the volume between the oil level and the top of the foam. Allow the cylinder to stand for 10 min ± 10 s and again record the volume of foam

10.2 Sequence - II

14) Now, follow the same steps from 1-13 of ***Sequence – I.*** Only, difference is, this time maintain the bath temperature at 93 ± 0.5 °C. Pour a second portion of sample into a cleaned 1000-mL cylinder until the liquid level is at the 180-mL mark. Immerse the cylinder at least to the 900-mL mark in the bath maintained at 93.5 ± 0.5°C. When the oil has reached a temperature of 93 ± 1°C, insert a clean gas diffuser and air-inlet tube and proceed as described in ***Sequence - I***, recording the volume of foam at the end of the blowing and settling periods.

10.3 Sequence – III

15) Collapse any foam remaining after the test at 93.5°C (in sequence – II) by stirring. Cool the sample to a temperature below 43.5°C by allowing the test cylinder to stand in air at room temperature, then place the cylinder again in the bath maintained at 24 ± 0.5 °C. After the oil has reached bath temperature, insert a cleaned air-inlet tube and gas diffuser and proceed as described in sequence - I, recording the foam value at the end of the blowing and settling periods.
16) In case, if the process temperature takes more time to reach to set point temperature, turn on the booster heater switch which will aid the permanent heater in heating application and will increase the heating rate so that the set-point temperature can quickly be reached.
17) Repeat the above complete process for three more times and record the readings.

11. Report

Report the data in the following manner:

Tests as conducted	Foaming Tendency ASTM D 892Foam Volume, mL, at end of 5- min blowing period	Foam Stability ASTM D 892 Foam Volume, mL, at end of 10-min settling period
Sequence I		
Sequence II		
Sequence III		

For the purpose of reporting results, when the bubble layer fails to completely cover the oil surface and a patch or eye of clear fluid is visible, the value shall be reported as nil foam.

12. Precautions to be observed

1) Always disconnect from power supply prior to maintenance & servicing.
2) Keep correct level of bath media to avoid damage to heaters (At least above the heater level).
3) Never leave the bath connected to main supply after day's use.
4) Preferable use de-mineralized distilled water as a bath media, for long life of heaters.
5) While cleaning the inner chamber, take care that the Immersion heater and Stirrer assembly do not get damaged.
6) Clean the working chamber and keep the water level well above the perforated platform provided with the bath.
7) Always connect the chamber to 220 volts, 50 hz, Single phase, AC supply via voltage stabilizer of specified ratings.
8) To avoid electrical shock, this equipment must always use a properly grounded electrical outlet or correct voltage and current handling.
9) Maintain a safe distance of at least 5" to 6" from the wall while installing the unit.
10) The unit is supplied with the brush-less AC motor, hence there is no need to replace the carbon brush.
11) Keep the instrument tidy, clean and dry with mint cream. Before initiating the fresh day, use preferably clean soft cloth. Brush up the unit body as to maintain its finishing.
12) Disassembly of this equipment is strictly limited to the qualified persons and licensed engineers.
13) In case of any difficulty, please do not try repairs without consulting us, especially when the instrument is under warrantee period.

13. Warranty Certificate

Your EIE product is guaranteed to be free from defects in materials and workmanship for one (1) year under normal use from the date of purchase. This WARRNATY does not apply to any product damaged by accident, misuse, mishandling, abuse, negligence, transit, improper line voltage, drop, fire, flood or if the products were altered or repaired by anyone other than the qualified service personnel.

The liability of EIE Instruments is limited to repair or replacement and under no circumstances shall EIE be liable for any collateral consequential damages or loss. This guarantee specifically excludes the expendables and consumables. All warranty claims must be directed to your corresponding purchase organization that is responsible for the sale of this equipment. The users are responsible for shipping expense. The warranty cards which are not signed and stamped by the actual user will be treated as void. The warranty card should accompany the defective products sent for repair, without which no claims would be entertained. Please detach the below warranty card from following cut-line.

.....

Name of the company : _____

Address : _____

_____

Telephone no : _____

Mobile no : _____

Email address : _____

Date of purchase : _____

Product model : _____

Serial no : _____

Bill or cash memo no : _____

This card should be detached, filled in properly and posted within 15 days from the date of purchase otherwise the warranty becomes invalid.

EIE Instruments (Factory Address)

Survey No. 1098, Nr. Mahakali Temple, Opp. Primary School,
Village Kubadthal, Tal- Daskroi,Dist-Ahmedabad,
Gujarat -382430.

Email : service@eieinstruments.com

Phone : +91-9909903582

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www.eieinstruments.com