LEIPZIG FOAM TESTER

Test Set for Estimating the Foaming Potential

of Substrates for Biogas Plants

Instruction Manual

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1. Description of the LEIPZIG FOAM TESTER

The LEIPZIG FOAM TESTER is designed for the estimation of the potential of a substrate to produce foam in a biogas reactor. The principle is based on modelling reactor conditions in a laboratory-scale test set, permitting visual determination of foam production. A sample of fresh fermentation material from the biogas reactor is amended with the substrate to be tested and is incubated in the LEIPZIG FOAM TESTER at fermentation temperature. If foam is being produced during the next hours, this hints on an elevated tendency of the substrate to produce foam in the biogas reactor.

Please note:

If the LEIPZIG FOAM TESTER does not produce foam in a test, foam production in the biogas reactor from other reasons cannot be excluded.

The LEIPZIG FOAM TESTER was developed by the Helmholtz Center for Environmental Research and is manufactured and sold by:

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2. Safety Instructions

Please read this manual thoroughly and follow all warnings and instructions.
Save this manual as a future reference.

Do not place the instrument on unstable cart or stand. It might fall causing serious damages or personal injuries.

Prevent any kind of liquid from entering the instrument.

The instrument must be operated at room temperature in clean and dry environment which is not subjected to excessive vibration or temperature variations.

The instrument must be operated with the power adapter delivered and must be operated with the line voltage specified in the data sheet and on the serial number label. The use of other power adapters and of wrong line voltage can cause destruction of the instrument.

If you are experiencing difficulties or problems with your foam tester, always contact your sales representative or Eismann & Stöbe GbR.

3. Intended Use

The LEIPZIG FOAM TESTER has to be used exclusively for the estimation of foaming potential of substrates for biogas reactors. Any other use can lead to damages or personal injuries.

Only use original parts or original spare parts by Eismann & Stöbe GbR.

Do not manipulate or change technical set-up of the instrument. Any technical manipulation voids warranty.

4. Packing List

The LEIPZIG FOAM TESTER is delivered with the following parts:

Foam tester with silicone heater in aluminium housing (1 pc.)

Test bottle (glass, 1000 mL) with safety lid (1 pc.)

Foam trap (1 pc.)

Power adapter 24 VDC (1 pc.)
(230 V AC, 50 Hz or 115 V AC, 60 Hz)

5. Operating Conditions

Place the LEIPZIG FOAM TESTER on a stable and even ground. Avoid wet or very humid or very dusty locations. The place should be well-aerated, but should not be exposed to strong temperature variations.

The test must be performed at room temperature (about 20 to 30°C).

Do not place the foam tester near an air conditioning, refrigerator or heater.

The test bottle must be clean for the test. Remove residual contamination from the glass wall in order to be capable of evaluating foam production by visual observation.

Do not perform a test without foam trap. Foam could flow out of the test bottle and could contaminate the instrument and neighbouring surfaces. In case of re-use of a foam trap, be sure that it is clean, dry and not damaged. Make sure that the plastic bag can easily unfold out of the funnel.

If gas is collected in the plastic bag of the foam trap, this gas can contain methane and hazardous constituents and can be easily flammable. Avoid sources of ignition in the surrounding. Do not inhale the gases and take care for sufficient fresh air while opening the test bottle after the test.

6. Power Supply

The instrument must be operated with the power adapter delivered and must be operated with the line voltage specified in the data sheet and on the serial number label. The use of other power adapters and of wrong line voltage can cause destruction of the instrument.

The power connector is placed on the back side of the instrument.

7. Test Procedure for Estimating the Foaming Potential of Substrates for Biogas Plants

1. Weigh the substrate to be tested into the test bottle of the LEIPZIG FOAM TESTER. The amount of substrate depends on the dry weight of the substrate according to the equation:

$$m_{substrate} = \frac{1000}{\text{dry weight [\%]}} \text{ [g]}$$

If the dry weight of the substrate is unknown, the following table provides an estimation for the amount of substrate to be weighed in:

Examples of substrates:

	Dry weight content	FOAM TESTER weigh-in
Maize silage	35 %	29 g
Sugar beet silage	22 %	45 g
Cereal grist	88 %	11 g
Grass silage	25 %	40 g
Silage from whole plants	33 %	30 g
Dry chicken dung	45 %	22 g
Manure (cattle or pigs)	4 %	50 mL (~50 g)
Fat from grease traps	1 %	50 mL (~50 g)
Fruit marc	22 %	45 g
Bio-waste	40 %	25 g

2. Take a sample of about 1 Litre of active medium from your biogas reactor. Remove coarse particles and fibres (> 10 mm).

3. Add the biogas reactor medium to the substrate in the test bottle up to a final volume of about 500 mL. Mix substrate and biogas reactor medium in the test bottle using a long spoon or bar.

4. Close the test bottle with the safety lid.

5. Place a foam trap into the plastic screw of the safety lid and tighten the plastic screw by hand so that the foam trap will not be pushed out of the lid. Make sure that the foam trap is not damaged and that the plastic bag can unfold easily out of the funnel.

6. Place the test bottle into the heater of the foam tester.

7. Connect the power adapter with the foam tester. Switch the heater on by pressing the power switch on the front side. The green control LED is turned on. The internal heater heats the content of the test bottle according to the set temperature programmed at the temperature controller (see chapter 9). Depending on the foaming potential of the substrate, foam is produced in the test bottle or not during the following hours. The foam trap captures gas and foam in the flexible plastic bag.

8. After 24 hours, the test has been finished. Switch power off and evaluate the hight of foam in the test bottle. If the foam has already collapsed, you will see residual traces of the foam on the wall of the glass bottle. The test duration should not exceed 24 hours, because on-going formation of digestion gas in the test bottle can lead to odour emissions.

8. Cleaning and Maintenance

Before cleaning the foam tester, switch power off and separate the instrument from the power supply.

Before opening the test bottle, take the bottle out of the silicone heater of the foam tester. Gases formed during the test can contain methane and hazardous gases. The gases can be easily flammable. Keep sources of ignition away. Do not inhale the gases and take care for sufficient fresh air.

Dispose the content of the test bottle according to the governmental or regional legislations.

Rinse the test bottle with water.

The content of the test bottle can contain pathogenic microorganisms. Take care for the appropriate hygienic precautions.

Do not use aggressive liquids or organic solvents for cleaning the LEIPZIG FOAM TESTER. Use a soft towel humidified with water. In case of massive contamination of the inner parts of the foam tester, ask the manufacturer.

9. Change of Set Temperature

The LEIPZIG FOAM TESTER is factory-set to a temperature of 37°C or 55°C or according to a specific customers' order. The pre-set temperature of your foam tester is indicated in the data sheet (chapter 12) and on the product label.

In case that you want to change set temperature, perform the following steps:

1. Take the test bottle out of the foam tester.
2. Separate foam tester from power supply.
3. Turn the foam tester upside down.
4. Release the eight outer housing screws.
5. Turn the bottom part to the upright position and place it beside the top part. CAUTION: An internal cable connects the two parts. This cable must remain connected.
6. Connect the power adapter to the foam tester and switch power on. The temperature controller displays current temperature and set temperature; the mark "K1" (top left) indicates that the heater is on.
7. To change set temperature use the up/down keys and confirm with OK (bottom right).

   Because of the heat loss via the test bottle, the effective temperature in the test bottle is 1 to 5°C lower than the programmed temperature of the silicone heater.

   For mesophilic biogas plants: Add 1°C to the desired temperature and enter the result as new set point at the temperature controller (example: desired set temperature: 35°C, enter 36°C).

   For thermophilic biogas plants: Add 5°C to the desired temperature and enter the result as new set point at the temperature controller (example: desired set temperature: 55°C, enter 60°C).
8. Switch power off and separate the power adapter.
9. Place the top part on the bottom part and adjust the eight outer housing screws.
10. Set test bottle in.

10. Troubleshooting

If the instrument does not operate, the following table summarizes some possible reasons. If you have other problems, ask the manufacturer.

Problem	**Possible reason**	**Solution**
Instrument does not operate.	Is the power adapter connected?	Connect power adapter.
	Is power switched on?	Switch power on. The green control LED turnes on.
Silicone heater remains cold.	Is set temperature higher than ambient temperature?	Check set temperature at temperature controller and change if necessary (see chapter 9).
The test does not produce foam.	The substrate has no potential to produce foam.	
	The bioreactor medium is not fresh enough.	Re-start the test with fresh bioreactor medium

11. Limited Warranty

The manufacturer, Eismann & Stöbe GbR, Leipzig, Germany, warrants your LEIPZIG FOAM TESTER against defect in material and workmanship, under normal use, for a period of twenty-four months from the date of purchase. In case that the instrument is defective within the warranty period, Eismann & Stöbe GbR will, at its option, repair or replace the defective product.

This warranty voids, if: a) the instrument was operated or stored under conditions of abnormal use or maintenance, b) the instrument has been repaired, modified or altered without expressed authorization by Eismann & Stöbe GbR, c) the product label is defaced or missing.

Foam traps are generally excluded from warranty. Foam traps are consumables at can be ordered at any time from Eismann & Stöbe GbR.

Eismann & Stöbe GbR does not take responsibility for the correctness of the tests carried out with the LEIPZIG FOAM TESTER. Eismann & Stöbe GbR will not be liable for direct or consequential damages or expenses resulting from conclusions drawn from foaming tests with the LEIPZIG FOAM TESTER.

12. Data Sheet

Model		LEIPZIG FOAM TESTER
Power supply:		Power adapter 24 V DC (230 V AC, 50 Hz or 115 V AC, 60 Hz)
Power consumption:		~ 30 VA
Dimensions	Width:	250 mm
	Depth:	250 mm
	Hight:	Without test bottle: 100 mm With test bottle and foam trap: 350 mm
Weight:		3050 g
Set temperature:		37°C
Serial number:		110522
Date of check out:		17/05/2022
Signature:		