FOAM ANALYZERS

A Complete Range of Instruments For Foam Study

FOAMSCAN Brochure

www.teclis-scientific.com

ABOUT FOAM STUDY

The issue of foamability and foam stability are vital for many industrial applications, from beer industry to health care products such as shampoos and foam flotation processes for mineral separation. Number of foam tests are used in the industry to characterize foam properties. However, accurate measurement of foam properties represents a challenge.

Our foam analyzers has been specifically designed to study foam properties while precisely controlling experiment parameters. Those are crucial in measurement reliability and reproducibility. Our foam analyzers guarantee the conditions in which foams properties can be compared quantitatively and qualitatively.

Foam Generation mode

Our Instruments can replicate foam generation.


By Gas Injection in a liquid through a Porous glass filter


By Mechanical stirring: mixer, shaker..


By Liquid recirculation

Foams generated externally can also be studied

Conditions of measurement

- at high temperature up to 200°C
- at high pressure up to 100 bar (1.450 psi).

FOAMSCAN™ software

- The image analysis software accurately measures the volume of foam over time and thus determines the foamability of the liquid and the stability of the foam.
- The liquid fraction or liquid volume is measured in real time by the conductivity electrodes determining the dryness of the foam and the drainage.
- The software precisely controls all parameters during the measurement. That guarantees the reliability of a measurement and ensure repeatability.

Cell Size Analysis software

- The Cell Size Analysis (CSA) software analyses a specific area of the foam and measures the size and distribution of the bubbles over time to study the density and stability of the foam.

Range of Measurements

All along the experiment

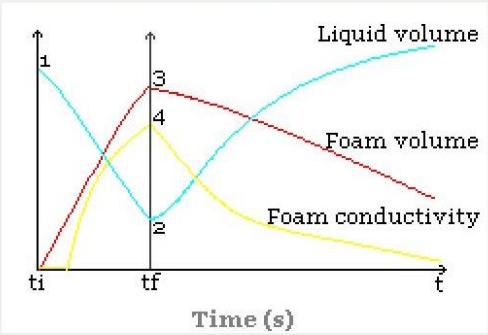
- Volume of foam / liquid
- Liquid fraction (Drainage)
- Foam Density / Stability
- Bubble Size and distribution analysis

During the foam formation

- Capacity of Foam
- Index Bikerman

Since end of foaming

- Capacity of Foam
- Index Bikerman
- Expansion coefficient
- Conductance
- Foam maximum density
- Foam stability index



ti : Initial time, Start of experiment
1 : Vi(liq) -> Initial liquid volume
tf : Time to stop foaming
2 : Vf(liq) -> Final liquid volume
3 : Vf(foam) -> Final foam volume
4 : Cf(foam) -> Final foam conductivity

For lots of Applications…

- **Fuel formulation**: Foamability of fuel, defoamer testing.
- **Crude oil**: Foamability by sparging and depressurization, defoamer testing.
- **Cosmetics**: Foam texture depending on liquid fraction and bubble size, foam stability.
- **Sodas, beer, Champagne:** control of foam by depressurization or when pouring a glass.
- **Environment**: Foam study for material extraction from soil, decontaminating foam study.
- **Chemistry**: Anti-Foam for manufacturing products, detergents, solid foam properties (cement).

A COMPLETE RANGE OF FOAM ANALYZERS

STANDARD INSTRUMENTS

designed to characterize Foam properties depending on Foam generation

FOAMSCAN™ / FOAMSPIN™

Modular Foam analyzer that can be equipped either with:

- FOAMSCAN™ base: The foam is generated by injecting a gas into the liquid
- FOAMSPIN™ base : The foam is generated by mechanical stirring with a 3-pales helix.

FOAMVIEW™

- Device added to FOAMSCAN™ / FOAMSPIN™ to study Foams and Bubbles generated externally.

JETSCAN™

- The foam is generated by the circulation of the liquid. Particularly designed to measure defoamers effectiveness.

INSTRUMENTS HIGH TEMPERATURE / HIGH PRESSURE

designed to characterize Foam properties in most demanding Applications

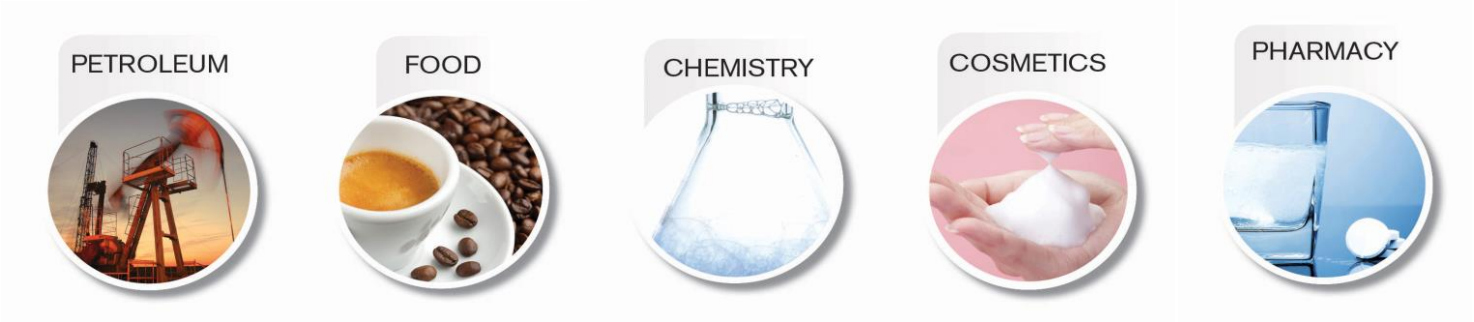
FOAMSCAN™ HTMP

- Designed to measure the foam properties up to 120°C & 8bar.

FOAMSCAN™ HTHP

- Designed to measure the foam properties up to 200°C & 100 bar. Including supercritical CO^2 conditions.

...For many Research Applications



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FOAMSCAN™ / FOAMSPIN™

designed to characterize Foam properties depending on Foam Generation

FOAMSCAN Brochure

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FOAMSCAN™

Foam Generation by Gas Injection

FOAMSCAN™ is designed to characterize the properties of foams generated by injecting some gas into the liquid through a Porous glass filter.

The optical system includes:

- The light source
- One CCD video camera (USB2, 744x480, 76fps) and 2.9/8.2mm focal length Lens for foam height measurement

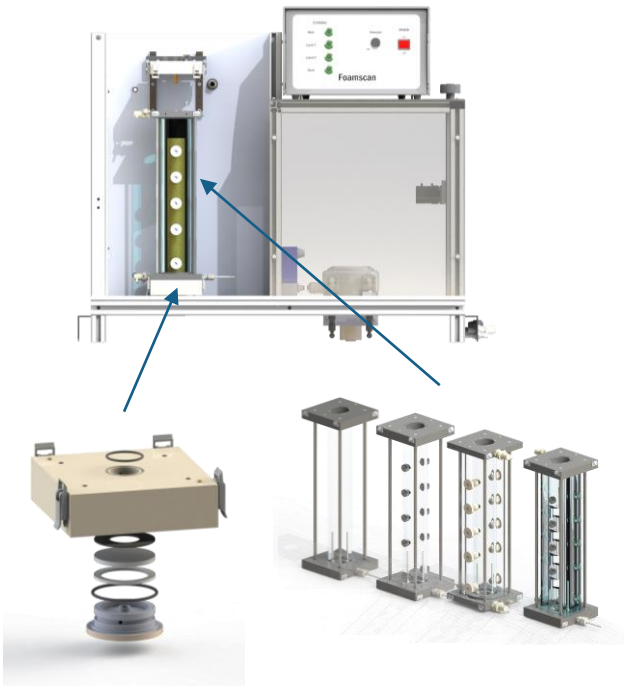
The measuring tube is chosen according to the applications that are studied. The tube can combine the following functionalities:

- Cylindrical single-walled glass tube without conductivity electrodes for foam volume measurement only.
- equipped with conductivity electrodes to measure the liquid fraction of aqueous foams in real time.
- with double glass wall to control the temperature during the foam study (from an optional circulating bath).
- equipped with 4 prisms to adapt to the Cell Size Analysis (CSA) option.

FOAMSCAN™ Software controls measurement parameters all along the experiment: Gas flow rate, Temperature. The volume of foam is measured in real time by image analysis whereas liquid fraction and liquid volume are determined from the conductivity electrodes. Cell Size Analysis (CSA) option measures bubbles size and distribution over the time.

Automatic cleaning can be programmed before or after the experiments avoiding to remove and clean the tube.

FOAMSCAN™ is provided in a protective box that protects from light disturbance and from dust.



Measurements and Data	
• Foam volume • Liquid volume • Liquid fraction • Gas flow rate • Temperature • Foam conductance	• Volume of gas supplied • Foaming capacity • Foam stability • Drainage • Foam density • Bikerman index

Applications

- Foamability : shampoo, cream, coffee, beer, additives, formulation...
- Stability of foams
- Foam quality , Scientific correlation with sensorial test
- Formula improvement and surfactants' screening

Technical specifications	
Gas Flow	100 ml/min ; 500 ml/min ; 1000 ml/min ; 5000 ml/min depending on flow meter
Liquid Volume	30-80 ml
Gas	Air, N_2, O_2, CO_2...
Options	Automatic Cleaning, Size of the bubbles (CSA), Stirring, Sampler

FOAMSPIN™

Foam Generation by Stirring

FOAMSPIN™ is a variant of FOAMSCAN™, designed to characterize the properties of foams generated by mechanical stirring.

The foam is produced by a set of rotating blades in a stirring chamber. Maximum rotation speed is 6 000rpm and depends on liquid viscosity.

The measuring tube is chosen according to the applications that are studied. The tube can combine the following functionalities:

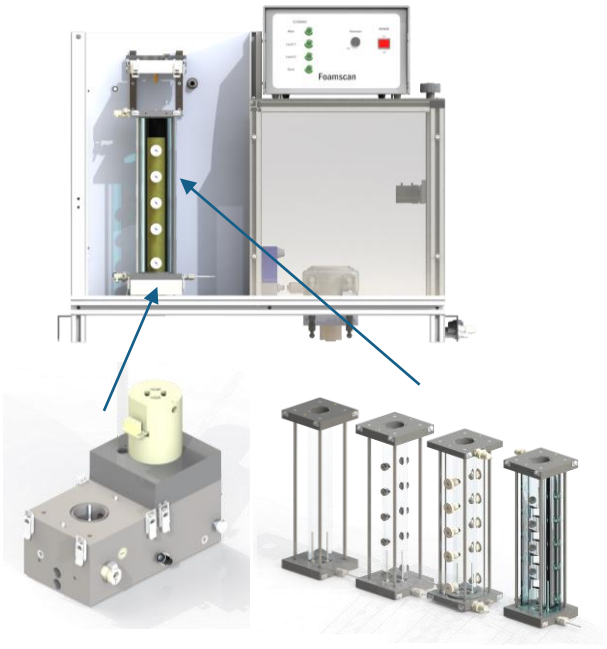
- Cylindrical single-walled glass tube without conductivity electrodes for foam volume measurement only.
- equipped with conductivity electrodes to measure the liquid fraction of aqueous foams in real time.
- with double glass wall to control the temperature during the foam study (from an optional circulating bath).
- equipped with 4 prisms to adapt to the Cell Size Analysis (CSA) option.

FOAMSCAN™ Software controls measurement parameters all along the experiment: Stirring speed, Temperature. The volume of foam is measured in real time by image analysis whereas liquid fraction and liquid volume are determined from the conductivity electrodes. Cell Size Analysis (CSA) option measures bubbles size and distribution over the time.

Automatic cleaning can be programmed before or after the experiments avoiding to remove and clean the tube.

FOAMSPIN™ is provided in a protective box that protects from light disturbance and from dust.

FOAMSCAN™ generation by Gas injection can be combined with FOAMSPIN™ generation by stirring, in the same instrument.



Measurements and Data	
• Foam volume • Liquid volume • Liquid fraction • Stirring rate • Temperature • Foam conductance	• Foaming capacity • Foam stability • Foam liquid stability • Foam density

Applications

- Foamability: shampoo, cream, wine, beer, additives, formulation etc...
- Scientific correlation with sensorial test
- Improve formula and screening surfactant
- Foam generates with shear

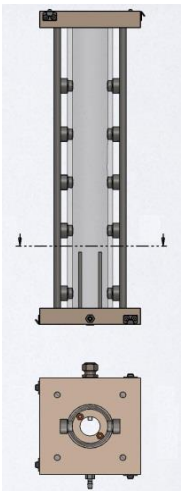
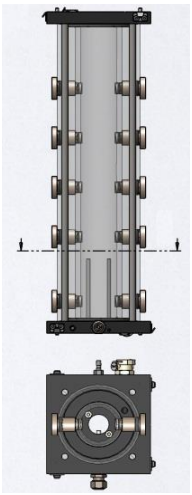
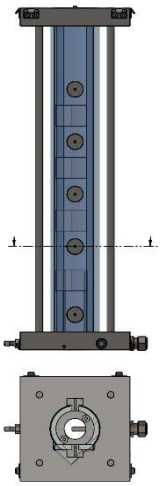
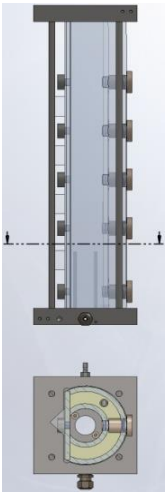
Technical specifications	
Stirring rate	500 to 6 000 RPM depends on product viscosity
Liquid volume	90 - 180 ml
Options	Automatic Cleaning, Size of the bubbles (CSA), Sparging, Sampler (Automation of the device)

Cylindrical Glass Measuring Tubes

Cylindrical measuring tubes are made of **optical glass to ensure the perfect reproducibility of the foam measurement**.

The tube is chosen according to the foams or the applications that are studied. The tube can combine the following functionalities:

- Cylindrical single-walled glass tube without conductivity electrodes for foam volume measurement only.
- equipped with conductivity electrodes to measure the liquid fraction of aqueous foams in real time.
- with double glass wall to control the temperature during the foam study (from an optional circulating bath).
- equipped with 4 prisms to adapt to the **Cell Size Analysis (CSA) option**.

	Cylindrical Single Jacket w/h electrodes	**Cylindrical Single Jacket**	**Cylindrical Double Jacket**	**Cylindrical-CSA Single Jacket**	**Cylindrical-CSA Double Jacket**
					
Shape	Cylindrical			Cylindrical - Prism	
Inside Diameter (mm)	35			35-36	
Jacket	Single/double	Single	Double	Single	Double
Electrodes	No	Yes	Yes	Yes	Yes
CSA option	No	No	No	Yes	Yes
Liquid Fraction / Volume	No	Yes	Yes	Yes	Yes

Software

Experiment protocol and parameters are fully controlled by the FOAMSCAN™ software: Gas flow rate, Agitation speed, Temperature, Pressure.

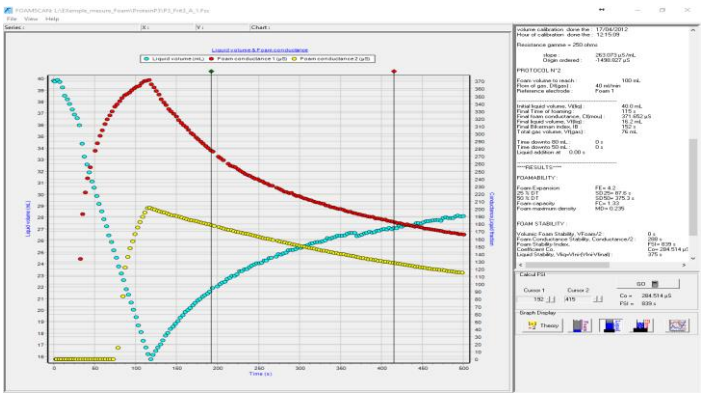
Foam generation

Several protocols can be chosen. The period of foam formation is defined according to the time, the volume of gas or the volume of foam to be reached.

Measured data

The following data are measured and displayed in Real-time (during foam formation and collapse phases) :

- Conductance of the foam (linked to the quantity of liquid present in the foam)
- Gas flow rate (cut off during the collapse phase)
- Volume of gas injected
- Residual volume of the liquid sample
- Volume of foam



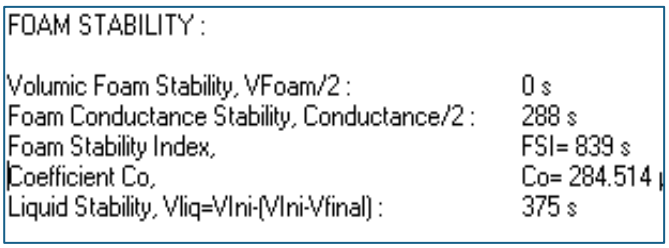
Calculated data

The software calculates and displays the following features in real time:

- Relating to the aptitude of the liquid to form foam
  → foaming capacity
- Related to the stability of the foam (after the gas injection or stirring has been cut off) :
  → volumetric stability of the foam, measured by the relative variation of its volume
  → Liquid stability of the foam, measured by the increase in volume of the liquid sample (drainage),
  → density of the foam.

Calculation of characteristics at specified times:

- Related to the aptitude of the liquid to form foam (when bubbling/stirring stops):
  → volume of gas injected
  → coefficient of expansion of the foam,
  → foaming capacity,
  → volume of the liquid sample,
  → conductance of the foam.
- Related to foam stability (at the end of experiment)
  → volumetric stability at half time,
  → liquid stability at half time,
  → stability index,



Experiment control and display

- Continuous graphic display of the foam volume, conductance and drainage (scales chosen by the operator).
- Ability to change the experiment conditions or parameters during the measurement without interrupting it.

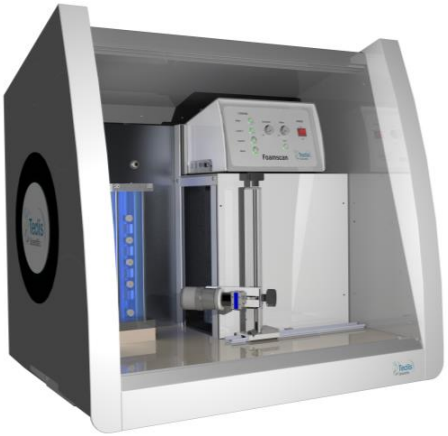
File management (settings and results files)

- Save configuration and result files (graphs and values files),
- Recall of saved files
- Comparison of results
- Editing of comments
- Data Export

Optical system and software

The **CSA optical system** includes:

- The light source
- One CCD video camera (USB2, 744x480, 76fps) and Partially Telecentric Lens (55mm Focal Length) for bubbles size analysis



The camera is focused on one of the four prisms along the tube which delimits the area of foam that will be studied (about 1cm²).

The camera can be moved up and down along the tube to adjust to the foam height and choosing the prism where bubbles will be studied.

The pictures are acquired and stored by the software automatically and displayed during the measurement (Fig1).

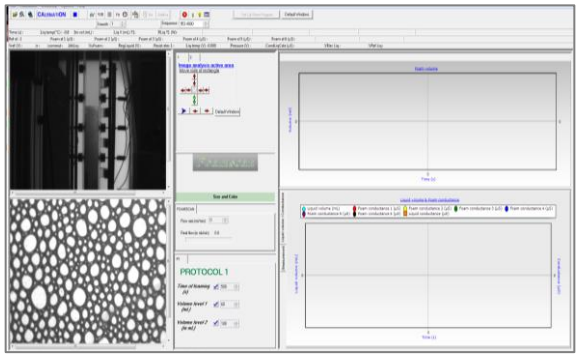


Fig1 Images acquisition during measurement

CSA Software

The **CSA software** is a powerful image processing tool tailored to identify distribution of object size. The CSA performs image segmentation, i.e., the decomposition of images into separate bubbles.

It covers most state-of-the-art techniques in digital image processing, from classical algorithms to advanced solutions ready-made for specific tasks.

The CSA software does not provide a closed solution and leaves the user free to process the image. It allows the analysis of images obtained not only by TECLIS foam analyzers but also by other video devices.

The CSA software detects the bubbles automatically and calculates all the selected parameters (Fig2)

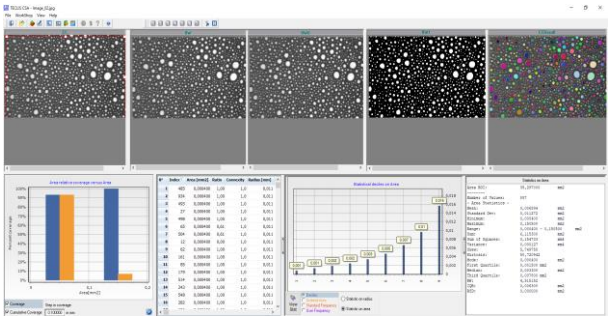


Fig2 Image processing and analysis

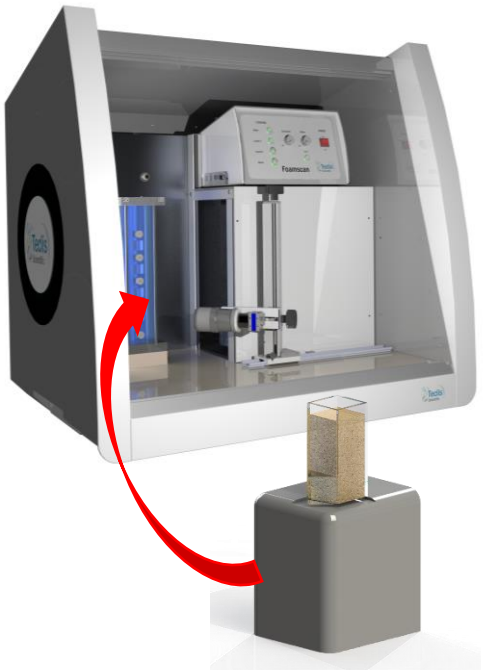
The results are presented in the form of various statistics (Fig3) which can be exported to Excel files..

Number of values	Total number of objects considered in the data set
Mean	Total value divided by count of objects
Standard dev	A measure of the amount of variation or dispersion of a set of values
Minimum	Minimum occurring value in the data set
Maximum	Maximum occurring value in the data set
Range	Range of all values
Sum	Sum of all values in the data set
Sum of Squares	Sum of values squared
Variance	the expectation of the squared deviation of a random variable from its mean.
Skew	A measure of the asymmetry of the probability distribution of a real-valued random variable about its mean.
Kurtosis	A measure of the "tailedness" of the probability distribution of a real-valued random variable
Mode	The value that appears most often.
First quartile / Third quartile	A quartile is a type of quantile. The first quartile (Q_1) is defined as the middle number between the smallest number and the median of the data set. The third quartile (Q_3) is the middle value between the median and the highest value of the data set.
Median	The value separating the higher half from the lower half of a data sample
RW	Random Walk, a mathematical object.
IQR	interquartile range, a measure of statistical dispersion, being equal to the difference between 75th and 25th percentiles, or between upper and lower quartiles.
RSD	Relative standard deviation, a standardized measure of dispersion of a probability distribution or frequency distribution.

Fig3 Summary statistics

Device to study Foams generated externally

The cylindrical glass measuring tube can be replaced by a glass cuvette equipped with prisms to study foam that are generated by an external device or by pouring . The size of the cuvette can be customized on demand.

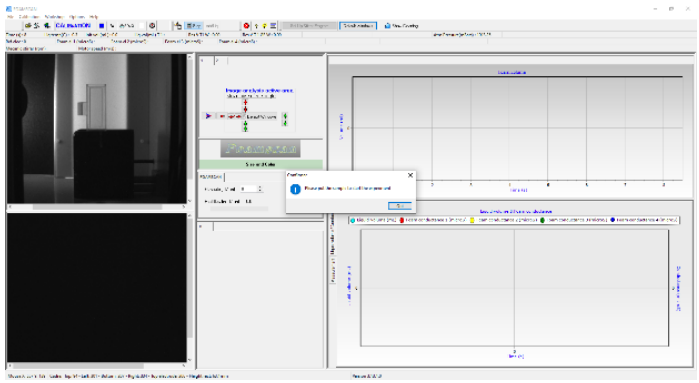


The CSA video camera is focused on the prism of the cuvette which delimits the area of foam that will be studied (about 1cm²) with the CSA software.

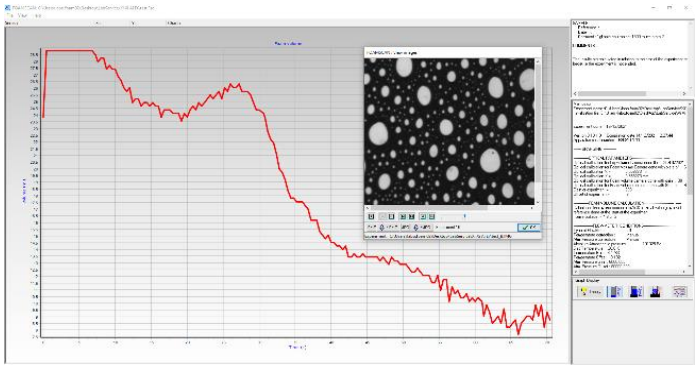
The protocol *External Foam* selected in the software allows to measure the foam volume by image analysis.

Measurement

Measurement is set up in the FOAMSCAN™ software. After setting all the parameters and adjusted the region of interest to the cuvette, the software is waiting for the sample to start the measurement.



Once the foam is poured or introduced in the cuvette the measurement can start. At the end of experiment, the volume of foam vs time is displayed. The images of the foam volume recorded by the CSA Video camera can be analyzed with the CSA software.



JETSCAN™

designed to characterize Defoamers effectiveness

FOAMSCAN Brochure

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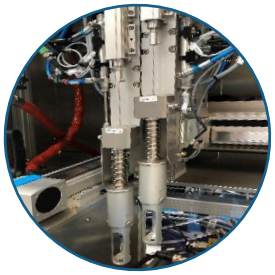
JETSCAN™ - Defoamer Tester

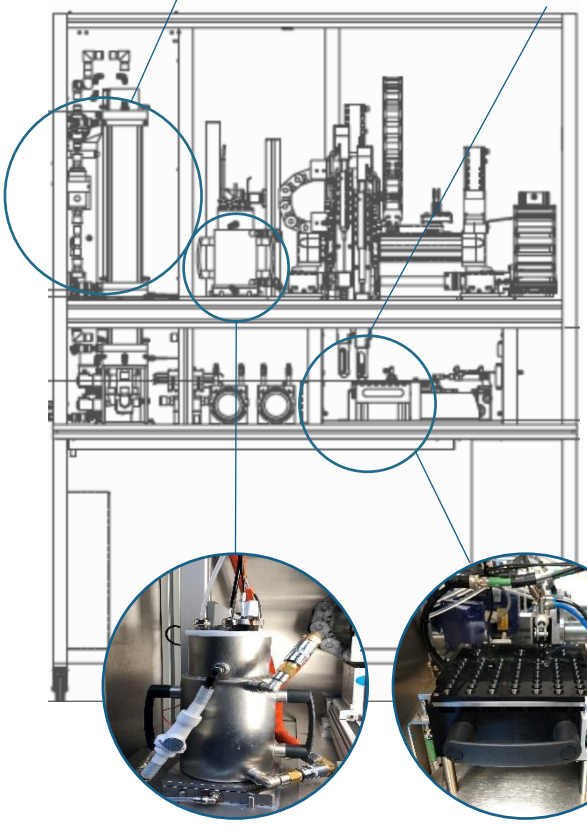
Foam Generation by liquid jet

JETSCAN™ has been designed to measure defoaming agents' efficiency and persistence on foams produced by liquid jet circulation, using image analysis technics combined with TECLIS software.
Fully automated, JETSCAN™ controls experiment parameters, measures foam volumes over the time and clean the whole system after testing.
JETSCAN™ can be equipped with an automated sampler that collects and injects up to 28 defoamer samples, which gives the JETSCAN™ a high added-value in high-through-put defoamer testing.

Measuring unit



Automated sampler
Defoamer injection



Pre-heating system

Automated Sampler

⇨ Automated Testing

- Test Protocol controlled by JETSCAN™ Software
- Automated circulation of foaming liquid
- Automated defoamer injection → up to 28 defoamers can be loaded
- Automatic cleaning

⇨ Testing reliability

- Control of foaming liquid volume injected controlled by image analysis and sensor, accuracy ±2 mL
- Defoamer volume accuracy ±1 µL
- Control flow rate, accuracy ±1% of reading
- temperature control, accuracy ±0,01°C

Antifoam and defoamer applications

- Food and beverage production, processing and packaging
- Laundry detergent manufacturing
- Paper industry and bio sourced material
- Industrial wastewater treatment
- Home & personal care
- Beers, sodas dispensers
- Antifoams & Defoamers effectiveness
- Foam prevention for paints and varnishes

JETSCAN™ - Defoamer Tester

Foam Generation by liquid jet

Although foams are thermodynamically unstable, under practical conditions they can remain stable for a considerable time. Therefore, foaming causes problems throughout a range of industrial processes. Defoamers are chemical additives (Fig1&2) added to the surface of the foam to eliminate existing stable foams (produce low foam stability) by a shock effect.

- The effectiveness of the defoamer is evaluated from the ratio of the foam volumes after defoamer introduction (knock down effect).
- The persistence is measured by the time needed on reaching the maximum foam height with the presence of defoamer.

Fig1 Defoamer

Fig2 Silicone antifoam

JETSCAN™ has been designed to measure defoaming agents' efficiency and persistence on foams produced by liquid jet circulation.

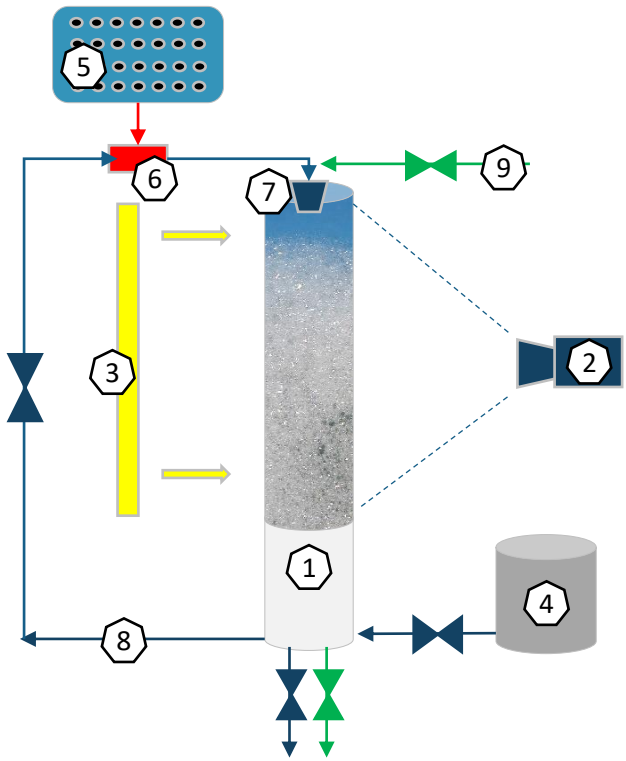
Experiments can be made at temperatures up to 90 °C. Experiment parameters such as T°, liquid volume, flow rate, defoaming agent quantity, and cleaning cycles are fully configurable and controlled by the software to ensure perfect reproducibility of the measurements.

A video camera views foam in the glass tube, providing data to image analysis software which determines foam volume before and after defoamer injection to measure their effectiveness and persistence.

JETSCAN™ is equipped with an automated sampler to test up to 28 defoaming agents.

JETSCAN™ is fully automated: controls experiment parameters, collects and injects defoamer samples, measures foam volumes, cleans the whole system between each defoamer testing which gives the JETSCAN™ a high added value in high-through-put defoamer testing.

JETSCAN™ schematic Diagram



1- Measuring double walled glass tube
2- CCD Camera
3- Light Source
4- Pre-heating beaker for the liquid
5- Automatic sampler
6- Defoamer injection chamber
7- Nozzle for the Liquid Jet
8- Main loop for the liquid
9- Cleaning system

Foam Generation by liquid jet

The measurement is based on an **Experiment Protocol** divided in 4 steps (Fig1) :

1. The foam is produced by liquid jet circulation for a chosen time → foam volume is measured
2. After stop liquid jet → foam stability is measured
3. Liquid jet is started again.
4. At chosen time or when the expected foam volume is reached, the Defoamer is injected → the change in foam volume determines the defoamer effectiveness and persistence

   → effectiveness is evaluated from the ratio of the foam volumes after defoamer introduction.

   → persistence is measured by the time needed on reaching the maximum foam height with the presence of defoamer

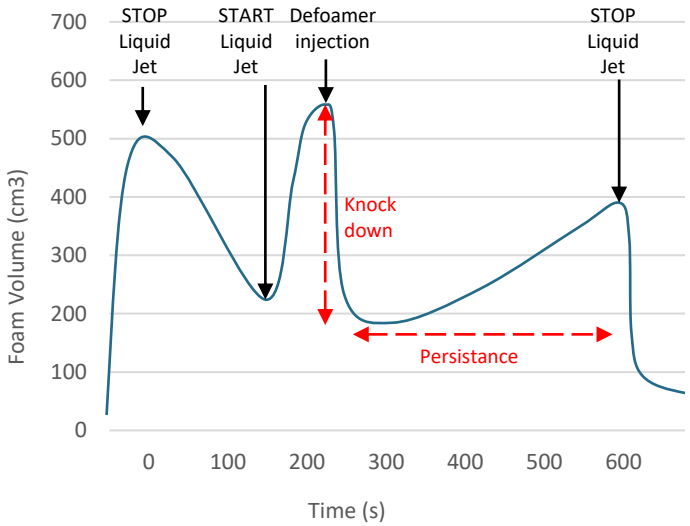


Fig1 Experiment profile Procedure

JETSCAN™ is equipped with a pre-heater beaker that heat the foaming liquid while the previous defoamer sample is tested. Pre-heating the foaming liquid saves 15 to 20 minutes time in between 2 measurements. Defoamer testing can be run up to 90°C.

Moreover, the pre-heater beaker encloses a probe that controls the foaming liquid volume injected in the main loop. Thus, the volume of foaming liquid injected for testing is controlled by both image analysis and by volume probe.

The foaming liquid flow rate is controlled by an oval-gear flowmeter (flow range 15-550 L/h Accuracy 1 % of reading), for maximum measurement reliability.

JETSCAN™ measuring optical system includes:

- The light source
- One CCD video camera (USB2, 744x480, 76fps) and 2.9/8.2 mm focal length Lens for foam height measurement

An **Automatic Cleaning** can be run after each defoamer testing which is out of the most importance to ensure perfect reliability of the measurements.

JETSCAN™ is equipped with an **Automated Sampler.** Up to 28 defoaming agents can be tested in a row. Each defoamer sample volume capacity is 4 mL.
A double syringes system allows to inject from 10 µL to 1000 µL of defoamer (accuracy +/- 1 µL):

- Automated switch from one to the other syringe is controlled by the software depending on the experiment parameters.
- Automated sampling capillary cleaning after defoamer picking (up to 3 cleaning positions)
- Automated syringe calibration (in option with interfaced 0.001 precision balance).

The speed of the sampler obviously depends on the experiment parameters, a usual rate is 3 to 6 defoamer samples tested per hour is realistic.

A digital control panel (Fig2) allows to easily control and monitor the experiment parameters, samples injection and cleaning cycles.

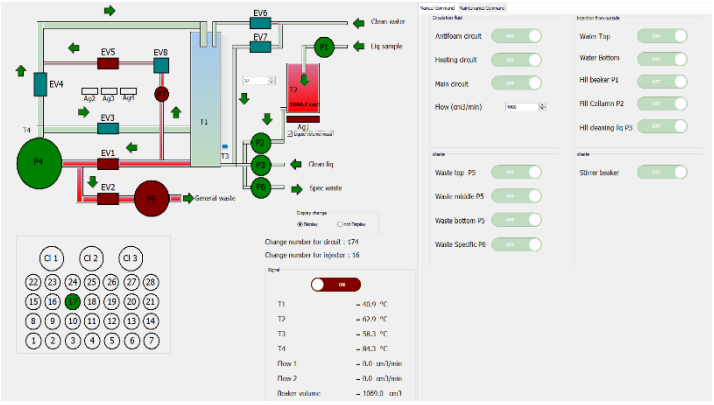


Fig2 Control Panel

The whole set, measurement unit and automated sampler, are integrated into a rolling stainless-steel chassis for easy access to the components.

JETSCAN™ - Defoamer Tester

Foam Generation by liquid jet

JETSCAN™ software controls experiments parameters, collects and injects defoamer samples, measures foam volumes, manages cleaning process.

Measurement

All experiment parameters such as T°, liquid volume, flow rate, defoaming agent quantity, and cleaning process are fully configurable and controlled by the software.

The CCD video camera views the foam in the measuring glass tube, providing data to image analysis software which determines foam volume in real time.

Each step of the experiment protocol is controlled by the software. Foam volume is continuously measured (Fig1) before and after defoamer injection to measure their effectiveness and persistence

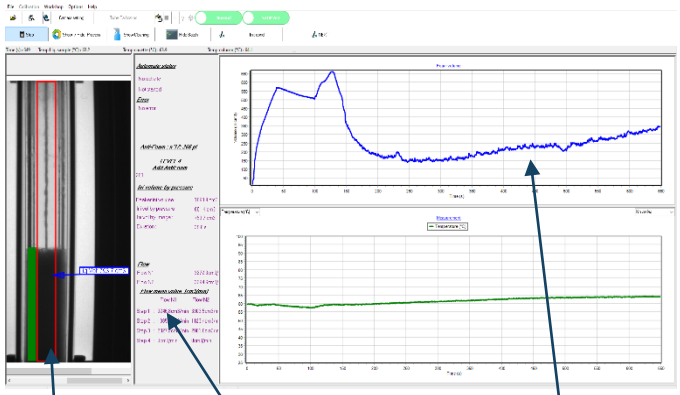


Fig1 Live Measurement

Live foam image analysis

Summary of experiment protocol and parameters

Foam volume measurement displayed in real time

Batch management

Batch function enables to write a scenario with an unlimited number of experiments (Fig2). All experiment parameters can be set or changed independently, even during measurement.

Any line in the set of experiments can be modified or deleted even though the series has started. Cleaning cycles can also be added or changed even though the series has started.

The set of experiments can be repeated in the same order or randomly.

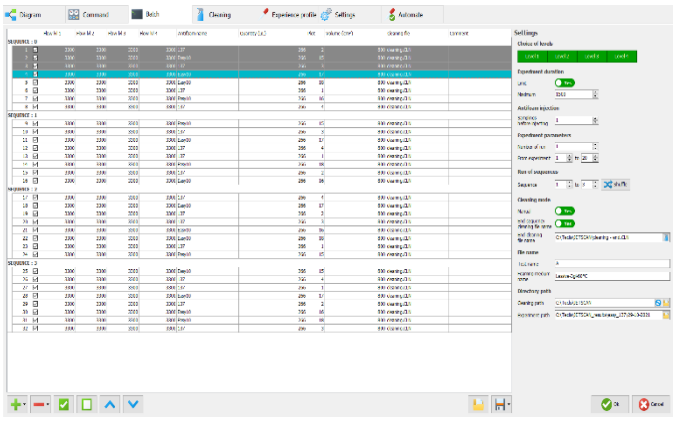
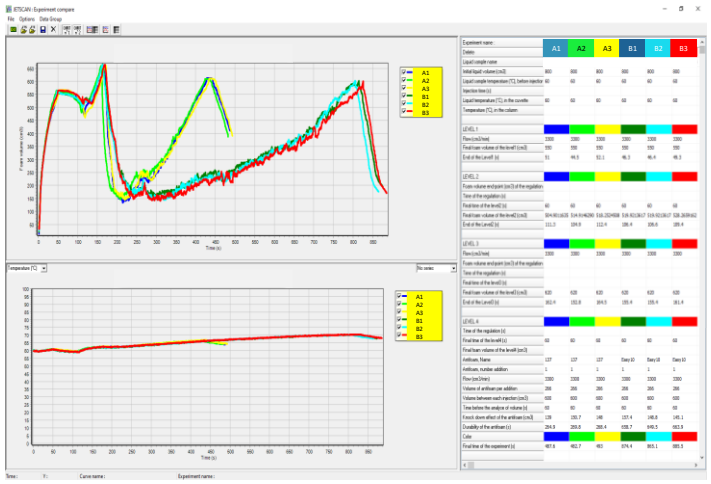


Fig2 Batch management

Data analysis

The results of each experiment are recorded, they can be exported or compared within the JETSCAN Software.

The results (Fig3) are displayed on graphs that enable a quick comparison of results. Each defoamer results' curve is displayed in one color that ease comparison and repeatability check.



The table displays the experiment parameters and results detailed for each defoamer at each step of the experiment protocol. When a series of experiments has been made for the same defoamer in the same conditions, the software calculates the mean and standard deviation of the effectiveness and persistence .

JETSCAN™ - Defoamer Tester

Foam Generation by liquid jet

Measurement system	
System	Aqueous foams
Foaming liquid Volume	750 mL – 900 mL → Optimum liquid volume for jet circulation is 800 mL
Foam volume	Max 800 mL – accuracy +/- 2 mL
pH range	2-13
Temperature	Up to 90°C
3 Fluids Input	Main water – foaming liquid - cleaning liquid
2 Fluids output	Main drainage – special drainage
Pre-heating system	Double walled stainless-steel beaker 1,1L
Oval Gear Flow meter	Measuring Range 15-550 L/h - Accuracy: 1 % of reading - Viscosity range: 0 -1000 mPa·s
Defoamer volume capacity	4 mL
Defoamer Viscosity	0-6000 mPa·s
Nozzle size	2.5 to 5 mm diameter
Automated sampler	
Defoamer volume injection	10 µL to 1000 µL - accuracy +/- 1 µL with 2 sizes of capillary 50 µL and 350 µL
Automatic sampler	28 positions + 3 capillary cleaning positions
Material	
Measuring Tube	Double-walled Cylindrical Borosilicate glass – H450 mm / Int. Diam 50 mm – Volume 880 mL
Pump/Flaw meter/valves	Stainless steel
Tubing	FEP (fluorinated ethylene propylene), Norprene®
Tubes connectors	acetal
O-rings	FKM
Chemical compatibility	Not to use with organic / aromatic solvents such as benzene, toluene, Chlorophorm, ether
Optical system	
Light Source	LED 60x30 cm 32W 3200 lm
Video Camera	CCD video camera (USB2, 744x480, 76 fps) and 2.9/8.2 mm focal length Lens
Dimensions	
Size	H198 – L150 – l78 (with automated sampler)
Weight	200 kg
Power supply	
Voltage	220V
Pneumatic system	compressed air 6bars
Hardware and software	
Software	TECLIS JETSCAN™ software running on W10
Computer	Window 10 / Processor Intel I5 / RAM 8 Giga / Hard Drive 1 T

FOAMSCAN™ HIGH PRESSURE & TEMPERATURE

designed to characterize Foam properties in demanding conditions

FOAMSCAN Brochure

www.teclis-scientific.com

FOAMSCAN™ HTMP

Generation by Gas Injection

FOAMSCAN™ HTMP is designed to measure the ability of a liquid to generate foam by sparging a gas into the liquid through a Porous glass filter, at a temperature up to 120°C and a pressure up to 8 bar.

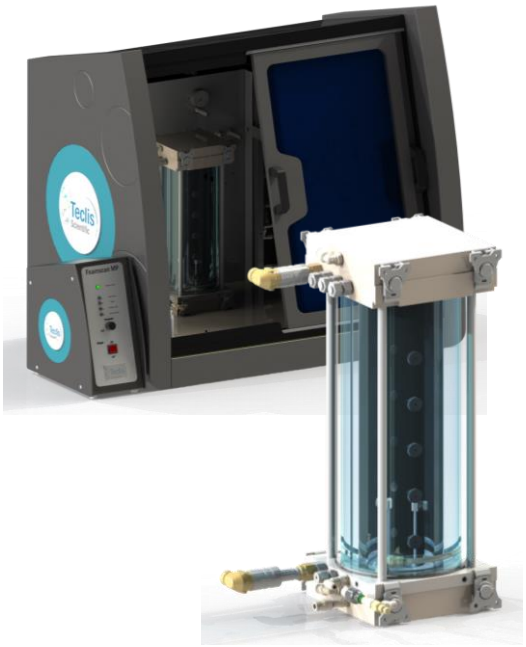
The software controls the injected gas flow rate, and the foam volume is analyzed in real time by the images analysis software.

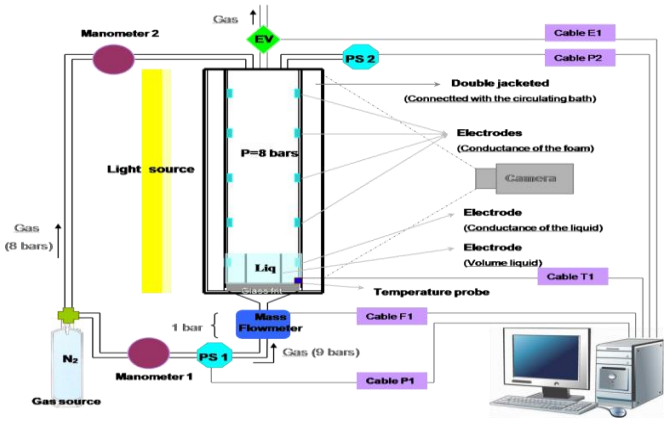
FOAMSCAN™ HTMP is equipped with a triple-walled glass tube to control both temperature (from an optional circulating bath) and pressure.

The triple-walled glass measuring tube is equipped with electrodes to measure liquid fraction of aqueous foams, determined in real time by electrical conductivity.

FOAMSCAN™ HTMP can be provided with a second tube equipped with prisms that allows to analyze bubbles size and distribution at atmospheric pressure and up to 90°C.

FOAMSCAN™ HTMP is provided in a protective box that protects from light disturbance when operating experiments and protects the instrument from dust.





Measurements and Data	
• Foam volume • Liquid volume • Liquid fraction • Gas flow rate • Temperature • Pressure • Foam conductance	• Volume of gas supplied • Foaming capacity • Foam stability • Foam liquid stability • Foam density

Applications

- Oil & Gas
- Effect of the foam under pressure and temperature
- Efficiency of the surfactant to create Foam in difficult conditions (EOR)

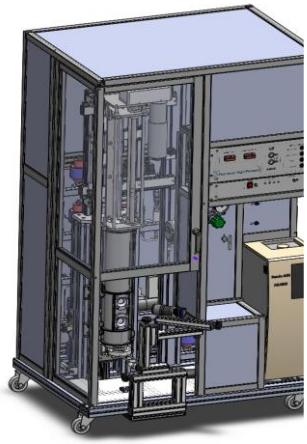
Technical specifications	
Flow rate	500 ml/min ; 1000 ml/min ; 5000 ml/min (real flow rate depends on the reference conditions of temperature and pressure)
Gas	Air, N_2, O_2, CO_2…
Temperature	Up to 120°C
Pressure	Up to 8bar

FOAMSCAN™ HTHP

Generation by Gas Injection

The **FOAMSCAN™ HTHP** is designed to characterize the properties of aqueous foam generated by sparging a gas through a liquid **at high temperature up to 200°C and high pressure up to 100bar**.

The instrument is available as standard or compatible CO_2 supercritical

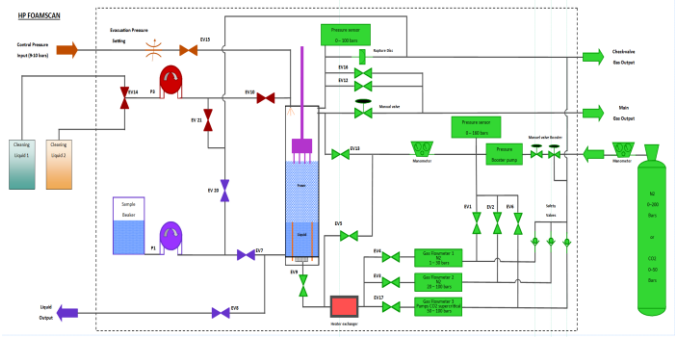


HTHP Standard

HTHP supercritical CO_2

The foam is generated in Inconel cell. The gas is injected through the glass frit by a flowmeter. A thermocouple measures the temperature inside the cell.

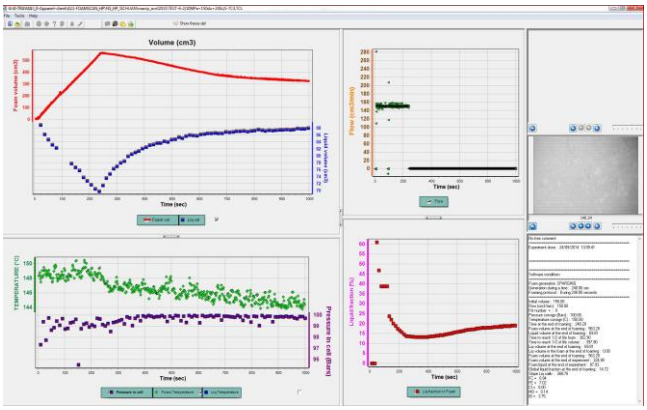
The temperature control is achieved by oil circulation heater built into the environmental chamber walls. Foam volume is measured by stainless steel foam probe or by image analysis. One pair of electrodes measures Liquid volume.



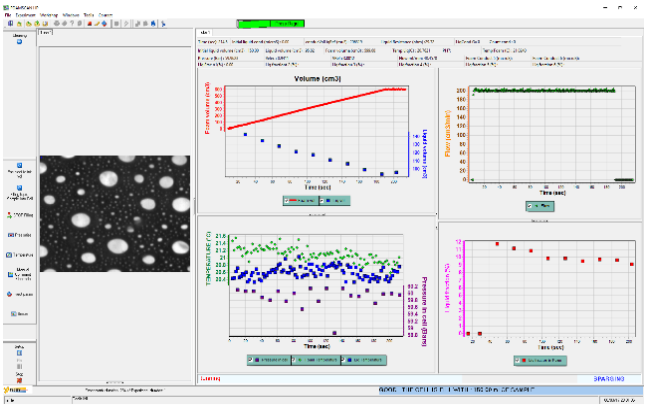
During the measurement, the pressure inside the cell is kept constant.

Automatic cleaning at the end of the measurement is done.

The software FOAMSCAN™ HTHP controls the parameters of temperature, pressure and foam generation . The measured data are displayed in real time.



The FOAMSCAN™ HTHP is equipped with the CSA function including camera and software for the statistical analysis of bubble size and distribution.



Measurements and Data	
• Foam volume • Liquid volume • Liquid fraction • Bubbles size/distribution • Gas flow rate • Temperature • Pressure	• Volume of gas supplied • Foaming capacity • Foam stability • Foam liquid stability • Foam density

FOAMSCAN™ HTHP

Generation by Gas Injection

Applications

- Oil & Gas
- Effect of the foaming under pressure and T°
- Efficiency of the surfactant to create Foam in difficult conditions (EOR)
- Supercritical CO_2
- Bubble size analysis at HTHP

Technical specifications	
Foam type	Aqueous Foam
Flow rate	0-500 ml/min (real flow rate depends on the reference conditions of temperature and pressure)
Liquid Volume	Max 150ml
Foam volume	Max 1000ml
Gas	Air, N_2, O_2, supercritical CO_2
Temperature	Up to 200°C
Pressure	Up to 100bar
Foam sensor	Stainless Steel
Voltage	110-240 VAC

FOAM ANALYZERS

Consumables & Accessories

FOAMSCAN Brochure

www.teclis-scientific.com

Porous Glass Filters

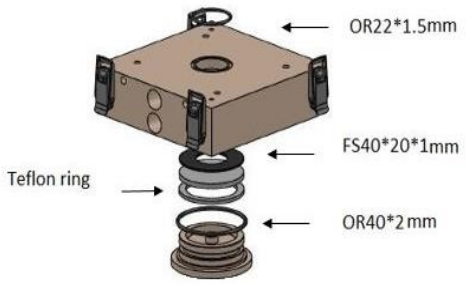
Porous glass filter fits into the base assembly, between an O-ring and the cell bottom. **They can be changed easily and are available in a range of different porosities**.

The standard porosity supplied corresponds to the reference **F028-3** and has a porosity of 16-40 µm. Porous glasses are sold per five

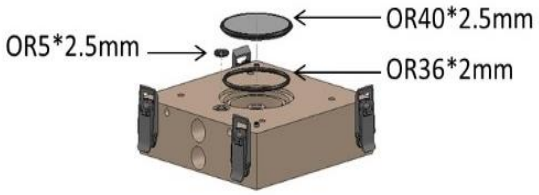
Ref.	Porosity	Pore size	Diameter
F028-0	0	180-250 µm	40mm
F028-1	1	100-160 µm	40mm
F028-2	2	40-100 µm	40mm
F028-3	3	16-40 µm	40mm
F028-4	4	10-16 µm	40mm

O-rings

Ref.	NEW VERSION	Ref.	FORMER VERSION
FMS-NBR-OR	Set of NBR O-rings for cylindrical glass measuring tube. (1) 38*2 mm / (1) 22*1.5 mm / (1) 40*20*1 mm / (1) 40*2 mm / (2) 8*2 mm	**FMS-NBR-ORO**	Set of NBR O-rings for cylindrical glass measuring tube. (1) 38*2 mm / (1) 40*2.5 mm / (1) 5 *2.5 mm / (1) 36*2 mm / (2) 8*2 mm
FMS-FKM-OR	Set of FKM O-rings for cylindrical glass measuring tube. (1) 38*2 mm / (1) 22*1.5 mm / (1) 40*20*1 mm / (1) 40*2 mm / (2) 8*2 mm	**FMS-FKM-ORO**	Set of FKM O-rings for cylindrical glass measuring tube. (1) 38*2 mm / (1) 40*2.5 mm / (1) 5 *2.5 mm / (1) 36*2 mm / (2) 8*2 mm



NEW VERSION OF TUBE BASE



FORMER VERSION OF TUBE BASE

O-RINGS CONDITIONS OF USE	NBR	FKM	FFKM
Temperature Max	80° C	220° C	250° C
Supercritical conditions	Yes	No	Yes
Chemical compatibility	Not to used with most of solvents (ketone, toluene, chloroform...) Good compatibility with acid and base		Full compatibility

Technical Features

	FOAMSCAN™	FOAMSPIN™	JETSCAN™	FOAMSCAN™ HTMP	FOAMSCAN™ HTHP
Reference	FMS	FMSP	JTS	FMS-HTMP	FMS-HTHP
Foam generation	Gas injection	Stirring	Liquid jet	Gas injection	Gas injection
Tube included	No	No	Yes	Yes	Yes
Liquid volume	30-80ml	120-180ml	750-900ml	30-80ml	150ml
Temperature	Up to 90°C	Up to 90°C	Up to 90°C	Up to 120 °C	Up to 200 °C
Pressure	AP	AP	AP	8bar	100bar
Gas	Air, N_2, O_2, CO_2	No	No	Air, N_2, O_2, CO_2	Air, N_2, O_2, CO_2
Flow / stirring rate	100-5000ml/mn	500-6000RPM	15-550 L/h	100-5000ml/mn	100-5000ml/mn
Defoamer-injection	Optional	Optional	Yes	No	No
Auto-cleaning	Yes	Yes	Yes	Yes	Yes
CSA	Optional	Optional	No	Optional at AP	Yes
Video Camera	CCD video camera USB2 744x480, 76fps	CCD video camera USB2 744x480, 76fps	CCD video camera USB2 744x480, 76fps	CCD video camera USB2 744x480, 76fps	CCD video camera USB2 744x480, 76fps
Lens	2.9/8.2mm focal length	2.9/8.2mm focal length	2.9/8.2mm focal length	2.9/8.2mm focal length	2.9/8.2mm focal length
CSA Lens	Partially Telecentric 55mm FL	Partially Telecentric 55mm FL	Partially Telecentric 55mm FL	Partially Telecentric 55mm FL	Partially Telecentric 55mm FL
IS Compatibility Computer not included	Windows XP, W7, W8, W10 32-64 bits	Windows XP, W7, W8, W10 32-64 bits	Windows XP, W7, W8, W10 32-64 bits	Windows XP, W7, W8, W10 32-64 bits	Windows XP, W7, W8, W10 32-64 bits
Instrument Size L / w / H (cm)	77*43*69	77*43*69	150*78*198 (with automated sampler)	77*46*69	107*84*182
Weight	≈ 45kg	≈ 45kg	≈ 270kg	≈ 60kg	≈ 270kg

About US

TECLIS Scientific is a French company specializes in measuring instruments and services for Interface Science for more than 25 years.

TECLIS Scientific designs and markets analytical equipment and provides scientific expertise to characterize dispersed systems such as foams and emulsions and to characterize solids surface energy. .

An advanced technology software based on image analysis is applied in all instruments. A complete range of measuring instruments has been developed to study and understand interfaces properties of liquid/liquid, solid/liquid and gas/liquid interfaces.

TECLIS Scientific uses innovative engineering to create efficient instruments and software solutions which are easy to use for researchers.

Measuring Instruments for Interface Science

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