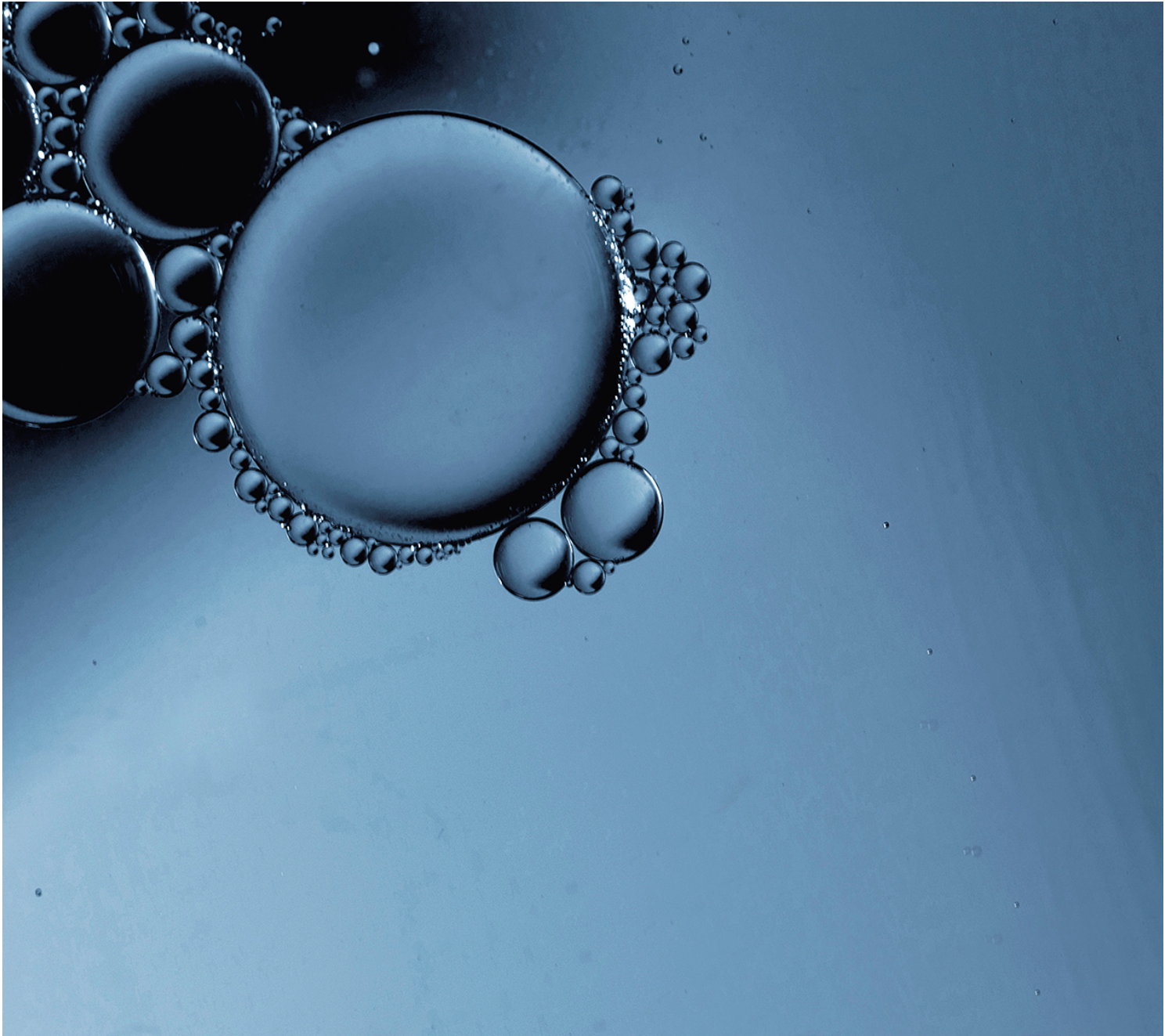


# More to Explore

Analyzing Oil Interactions at High Pressure with QSense

---



# It's all about Optimization

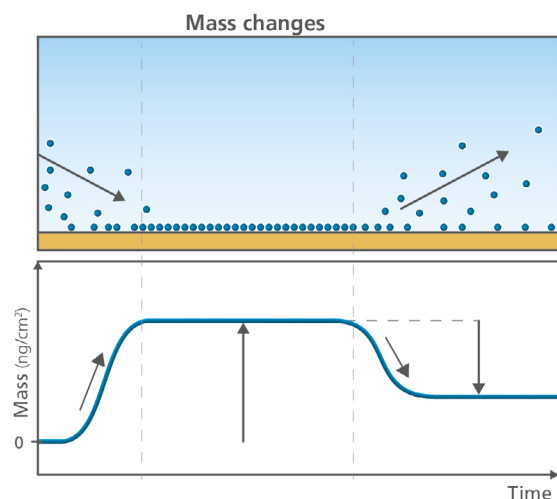
Even a small change you make can have a large impact on your business. Basing your decisions on analytical science strengthens the opportunity to succeed. QSense® provides a unique solution for you to understand the surface interactions of oil components, additives and other relevant chemicals in real-time. QSense® High Pressure gives you the additional possibility to explore more with experiments closer to real-life conditions. We hope to lit your imagination on what you can measure, what you can learn and how to optimize for better results.

## You are the Expert

You know your field of work better than we do. However, whether you are struggling to increase oil yield, to prevent fouling of pipes or finding an optimal lubricant for engines, it is valuable to understand your processes better. By improving your understanding of oil interaction at surfaces, you might be able to make even smarter decisions in the future.

## We have the Tool

QCM-D is short for Quartz Crystal Microbalance with Dissipation. Recording the changes of frequency and dissipation of a quartz crystal sensor, the technology offers you a new set of eyes in the studies of molecule-surface interactions at the nanoscale. With QSense instruments you can follow events at the surface as they happen, and quantify mass, thickness and structural properties.



Mass adsorption/desorption amounts and rates measured by QSense.

## Explore Real-life Conditions

We are providing sensors custom made to fit your needs. Study what happens in real-time to draw conclusions and optimize your process based on QCM-D results. Analyzing under relevant conditions can make the whole difference. That is why we created QSense High Pressure.

- Choose sensor materials and coatings based on your specific needs
- Experiment with solvents and samples to find your best choice
- Explore more with experiments in high pressure and high temperature



# QSense High Pressure

QSense® High Pressure is a QCM-D instrument providing the possibility for you to explore real-life conditions in your experimental set up. Pressure and temperature can be set to a maximum of 200 Bar and 150 degrees Celsius, but the instrument can also be configured after your specific needs.



The system consists of a high temperature chamber, a high pressure flow cell, a high pressure pump, a liquid handling unit and an electronics box.

## 3 Reasons to Invest



- Make smart decisions based on information about the surface interaction processes that are key to your outcome
- Explore your real-life conditions in terms of surface material, chemistry, pressure and temperature
- Equip your lab with a highly sensitive scientific tool

## Flow Assurance

Fouling and clogging of pipes can be a costly problem. Added chemicals are commonly used for flow assurance.

### Prevent Fouling

Examine fouling processes to find methods or additives to minimize the problem. Use carbon steel sensors to mimic the surface of pipelines and study adsorption and release of crude oil/asphaltenes under different conditions. Experiment with chemical composition, surface material, pressure and temperature.

## Oil Recovery

Extraction of oil from underground reservoirs or tar sands require carefully considered process conditions. Use scientific analysis to find your way to optimize.

### Enhanced Oil Recovery

The use of polymers and surfactants can change the viscosity of the injected water and the wettability of the rock to dissolve oil from the mineral. Measure the adsorption of polymers or surfactants and the release of oil from a mineral sensor to optimize your chemical solutions and increase your yield. Less surfactants used gives a more environmentally friendly solution and reduces costs.

### Bitumen Liberation

Extracting bitumen from oil sands can be difficult. A silica sensor coated with bitumen can simulate the oil sand and enable analysis of the bitumen liberation process. Study the bitumen detachment to find the optimal conditions of e.g. pH and temperature to maximize the recovery.

## Fuels and lubricants

Lubricants are used in numerous applications to control friction and increase the life-span of moving parts. These fluids consist of a variety of surface active chemistries competing for the surface.

### Optimize Engine Lubricants

Understanding the nature of adsorption of surface active chemicals is key to finding a well-balanced lubricant. Study the effect of fuel and lubricant additives in engines with a stainless steel sensor. Observe the adsorption in real-time to find the delicate balance of chemicals for optimal performance.

# Specifications

| Sensors and sample handling system                     |                                                                                                                                                                                                                                                            |            |            |             |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-------------|
| Working temperature <sup>a</sup>                       | 4 to 150 °C, controlled via the software, stability ± 0.02 °C                                                                                                                                                                                              |            |            |             |
| Working pressure                                       | 90 to 200 bar (with the alternative peristaltic pump measurements can also be performed at ambient pressure)                                                                                                                                               |            |            |             |
| Number of sensors                                      | 1                                                                                                                                                                                                                                                          |            |            |             |
| Sensor materials                                       | Over 50 standard materials including metals, oxides, carbides and polymers (e.g. Gold, SiO <sub>2</sub> , SS2343 and SS2348 stainless steel, Iron oxide, Kaolinite)<br>Additional materials, including steels and minerals, can be customized upon request |            |            |             |
| Measurement characteristics                            |                                                                                                                                                                                                                                                            |            |            |             |
| Maximum time resolution, 1 frequency                   | > 100 data points per second                                                                                                                                                                                                                               |            |            |             |
| Maximum mass sensitivity in liquid <sup>b</sup>        | < 1 ng/cm <sup>2</sup> (10 pg/mm <sup>2</sup> )                                                                                                                                                                                                            |            |            |             |
| Maximum dissipation sensitivity in liquid <sup>b</sup> | < 0.08 x 10 <sup>-6</sup>                                                                                                                                                                                                                                  |            |            |             |
| Electrical Data QE401                                  |                                                                                                                                                                                                                                                            |            |            |             |
| Power supply and frequency                             | 100 / 115-120 / 220 / 230-240 V AC, 50-60 Hz<br>The power supply should be properly grounded                                                                                                                                                               |            |            |             |
| Software and computer requirements                     |                                                                                                                                                                                                                                                            |            |            |             |
| Acquisition Software (QSoft)                           | USB 2.0, Windows XP or newer                                                                                                                                                                                                                               |            |            |             |
| Analysis Software (QSense Dfind)                       | PC with 64-bit Windows 7 SP1, 8, 8.1 or 10 > 1366x768 px screen resolution > 4 GB RAM                                                                                                                                                                      |            |            |             |
| Import/export                                          | Excel, BMP, JPG, WMF, GIF, PCX, PNG, TXT                                                                                                                                                                                                                   |            |            |             |
| Dimensions and weight                                  | Height (cm)                                                                                                                                                                                                                                                | Width (cm) | Depth (cm) | Weight (kg) |
| Electronics unit                                       | 18                                                                                                                                                                                                                                                         | 36         | 21         | 9           |
| Measurement chamber                                    | 8                                                                                                                                                                                                                                                          | 9          | 11         | 2           |
| Valve and cylinder panel                               | 68                                                                                                                                                                                                                                                         | 50         | 50         | ca 30       |
| HPLC pump                                              | 14                                                                                                                                                                                                                                                         | 26         | 42         | 10          |

<sup>a</sup>The temperature stability depends on variations in how the ambient affects the warming or cooling of the chamber. The specified temperature stability may not be reached if the room temperature changes more than  $\pm 1^\circ$  C, if there is a draft or a heat source nearby. <sup>b</sup>Data has been collected for standard QSense flow module (data from single frequency mode, one data point is collected every 5 seconds, the Sauerbrey relation is assumed to be valid). The stated sensitivity for the QSense High Pressure system states a worst case scenario for how much the liquid on the back side of the sensor can reduce the sensitivity. The specifications above are valid for this configuration. All specifications are subject to change without notice.

## About Us

We are Biolin Scientific. A worldwide company making state of the art instruments and smart solutions for scientists. Knowledge is our greatest resource and an essential part of everything we do. Collaborating with leading universities and industries, we solve challenges to simplify the everyday life in the lab. Our customers are the experts of surface science, and we have the tools for them to progress.

Visit us at [biolinscientific.com](http://biolinscientific.com)



**Biolin Scientific**  
[ Progress Together ]