

# TRACE GAS CALIBRATION SYSTEMS

## LIQUID CALIBRATION UNIT



## GAS CALIBRATION

## USING LIQUID STANDARDS

- > Production of custom calibration gas for analyzer calibration
  - > Evaporation of user-defined liquid mixtures - from ppt to ‰
  - > Optionally available: zero-air generator for feed gas of LCU

### LIQUID CALIBRATION UNIT (LCU)

The IONICON Liquid Calibration Unit (LCU) evaporates aqueous standards into a gas stream, resulting in a gas flow containing compounds at defined trace concentrations.

This gas can be used for calibration of trace gas analyzers over an extensive range of compounds and concentrations.

The preparation of an aqueous standard mixture is simple, can be done immediately, and for a large variety of compounds.

The LCU uses an optimized evaporation technique that can be used for volatile as well as semi-volatile compounds.

An optional high-pressure zero-air generator (HPZAG) is available for providing the necessary voc free feed gas.

The LCU is a cost efficient, highly versatile, all-in-one calibration device for trace gas analyzers, used in many fields of research, such as food and flavor, biotechnology, breath-gas analysis, environmental research, and petrochemical analysis.

### LCU STANDARD

- Dilution range\*: ppt ... ‰
  - 1 gas port - output flow: 500 ... 1000 sccm
  - zero-gas intake feed: clean air/N<sub>2</sub> @ 5.5 bar(g)
  - 1 liquid port - consumption: 0, 1, ... 50 µl
  - Precision, accuracy\*: < 5%
  - Response time: < 1 min. (calibration step)
  - Humidity range: 10% to 100% @ 40 °C
  - Compact dimensions: 35 x 35 x 15 cm, 10 kg
  - Cold-spot free connection
- \*depends on aqueous standard

### LCU ADVANCED

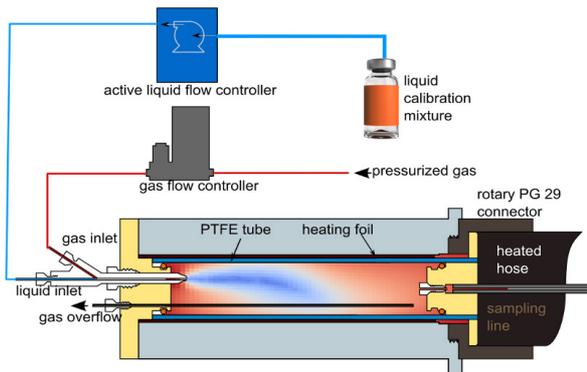
- 1 additional liquid port: 2<sup>nd</sup> standard or constant humidity
- 1 additional gas port: Sulfinert™ coated for admixing of gas standards

Find out more: [www.ionicon.com](http://www.ionicon.com)

ULTRA-SENSITIVE SOLUTIONS FOR REAL-TIME TRACE GAS ANALYSIS

## FEATURES

To produce trace gas concentrations of (in-)organic compounds, the IONICON LCU evaporates a defined flow of a liquid standard into a gas stream. The gas and liquid mix together at the tip of the nebulizer where turbulences form a fine mist, which greatly aids evaporation.



The active Liquid Flow Controllers (aLFC) are an integral part. They provide precisely controlled liquid flows and are designed to have low dead-space volumes (< 100  $\mu$ l) for rapid flushing. With their built-in micro-pump the liquid inlet port is self-priming. The other key component is the purpose-built nebulizer. Operating on an enhanced parallel path design it provides less clogging and smaller droplets than comparable nebulizers.

## EVAPORATION

The micro-droplets are ejected into a heated (up to 120°C) evaporation chamber (see figure above), which aids the evaporation process. Evaporation using micro-droplets has several advantages:

- 1) The evaporation of compounds with a slow rate is enhanced by the enlarged surface area of the droplets.
- 2) Compounds which are dissociated in water, such as acids (or bases), experience a decreasing pH value when the water evaporates from a droplet. This in turn reduces the dissociation and leads to a total evaporation of the compound.

## AQUEOUS SOLUTION

A very low solubility of a compound in water is already sufficient to produce an aqueous standard. As an example, this has been successfully achieved for propofol, which has a solubility of only 0.12 g/l (25 °C) in water.

The efficient evaporation mechanism enables calibration of compounds even with very low vapor pressures (i.e. semi-volatiles). This has been successfully demonstrated for caffeine and indole (vapor pressure of only 1.6 Pa at 25 °C), which set the current benchmark.

## HPZAG: ZERO-AIR GENERATOR

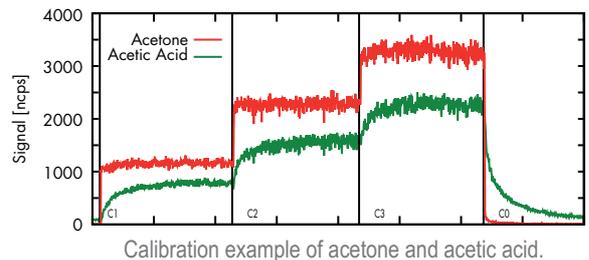
An optional high-pressure zero-air generator (HPZAG) is available for providing the necessary VOC free air feed, cutting down on gas cylinder costs.

Ambient air is pressurized by a compressor and cleaned of VOCs by a catalytic VOC scrubber. The output pressure (max. 6 bar, ~ 1 l/min) can be regulated by a valve.

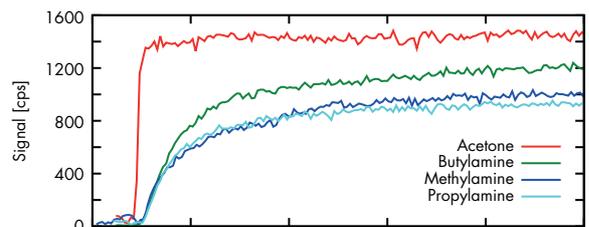


## APPLICATION EXAMPLES

The key specifications and the wide-ranging applicability of the LCU have been demonstrated in trials using real-time gas analysis with IONICON PTR-MS.



Calibration example of acetone and acetic acid.



Calibration example of acetone and different amines.

The LCU is used with a growing variety of compounds, including ketones, aldehydes, alcohols, amines, terpenes, organic acids, esters and more.

Contact us and let our experts check on your calibration needs or get a quote for your LCU all-in-one trace calibration device!