SensoTech

Hydrofluoric acid

Inline analytical technology for:

- concentration & density
- limit monitoring
- blending
- alkylation

Increase quality, save resources: LiquiSonic®. With high-quality, innovative sensor technology. Robust, precise, user-friendly.

LiquiSonic®

LiquiSonic® is an inline analytical system for determining the concentration in liquids directly in the production process. The analyzer is also used for phase separation and reaction monitoring. Sensor installation within the product stream means an extremely fast measurement that responds immediately to process changes.

User benefits include:

- optimal plant control through online and real-time information about process states
- maximized process efficiency
- increased product quality
- reduced lab costs
- immediate detection of process changes
- energy and material savings
- instant warning of irruptions in the process water or process liquid
- repeatable measuring results

LiquiSonic's® ‚state-of-the-art' digital signal processing technology guarantees highly accurate, fail-safe measuring of absolute sonic velocities and liquid concentrations.

Integrated temperature detection, sophisticated sensor design, and know-how from SensoTech's extensive measurement history in numerous applications promises users a highly reliable, long life system.

Advantages of the measuring method are:

- absolute sonic velocity as a well-defined and retraceable physical quantity
- independent from conductivity, color or optical transparency of the process liquid
- installation directly into pipes, tanks or vessels
- robust, all-metal, gasket-free sensor design with no moving parts
- corrosion-resistant by using special material
- maintenance-free
- use in temperatures up to 200 °C (390 °F)
- accurate, drift-free measurements
- stable measurements even amid gas bubbles
- controller connection capacity reaching up to four sensors
- data transmission via fieldbus (Profibus DP, Modbus), analog outputs, serial interface or Ethernet

Inline process analysis

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Applications

Concentration measurement in binary liquids

The sonic velocity in a liquid depends on the on the concentration of the individual components and the temperature. To determine the sonic velocity, a sound pulse is sent through the liquid and the time it takes for the pulse to reach the receiver is measured. As the distance between the ultrasonic transmitter and receiver is constant due to the design, the sonic velocity can be calculated.

The sonic velocity as a physical quantity can therefore be used to determine the concentration or density in liquids with high precision.

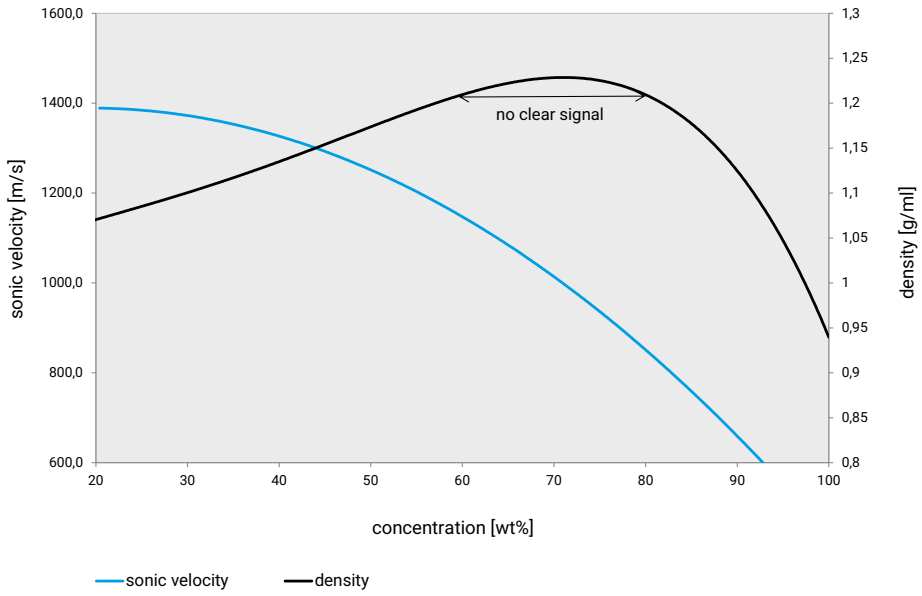
The LiquiSonic® measuring system based on the sonic velocity is particularly robust, as the design requires neither moving parts nor other wearable components. LiquiSonic® measuring systems work reliably, maintenance-free and with long-term stability for many years.

The measuring process is independent of optical influences such as colour or transparency of the liquid. LiquiSonic® systems always deliver stable measured values with an accuracy of ± 0.1 m%.

As shown in the graph below, it is at any point possible to measure exact concentrations with the sonic velocity, as there is no inflection point between 60 wt% and 80 wt% compared to density measurement.

The LiquiSonic® sensors are installed directly in pipes without a bypass, so that sensors made of corrosion-resistant material such as ETFE have been specially developed for use in hydrofluoric acid.

Dependence of sonic velocity and density on hydrofluoric acid concentration



3-component analysis

The LiquiSonic® 40 analyzer can gauge concentrations within three-component flow mixtures. Concentration changes of individual components within a liquid mix often exert differing sensitivity effects on certain physical properties.

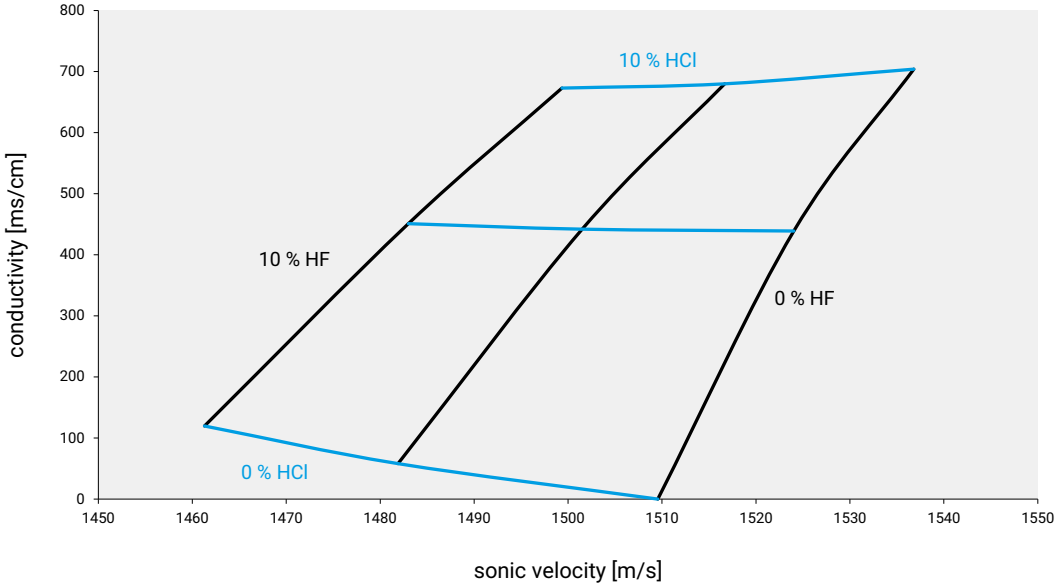
With a clear and strong relationship between a varying concentration and an affected physical property, each component concentration can be determined from a measured physical change according to an analytical mathematical function.

The graph below reveals an example of sonic velocity and conductivity at different concentrations for each of two components (HCl and HF in water) at temperature of 30 °C.

Useful computation models are stored in the LiquiSonic® 40 control unit. With the relevant physical parameter in hand, the controller calculates and displays concentrations for each single component. By a parallel analysis of two physical measures, two concentrations can be pinpointed simultaneously at varying temperatures. In addition to conductivity, physical properties like density or refractive index may also factor into a 3-component analysis.

Since process temperature plays a highly sensitive role, it's tracked very accurately as a significant element in the calculation model. The concentration measures of the components must always be temperature-compensated.

Dependency of Sonic Velocity and Conductivity on Hydrofluoric Acid and Hydrochloric Acid Concentration in Water



LiquiSonic® system

The LiquiSonic® system consists of one controller and one or more sensors. The controller 30 can include up to four sensors.

The ultrasonic sensor houses both the actual ultrasonic measuring path and the highly precise temperature detector (Pt1000).

Each sensor works autonomously and can be deployed in different applications. The liquid-contacting areas of the device are secured in corrosive HF-acid flows by a standard ETFE coating (layer thickness of 1.5 mm to 2 mm).

The rugged, completely enclosed design requires no gasket or “window”, making it totally maintenance-free.

LiquiSonic® flange sensor with ETFE coating

LiquiSonic® replaces manual sampling

Special high-power technology stabilizes measurement results, even when facing gas-bubble accumulations or large-scale signal attenuation through the process flow.

The sensor electronics integrate into an enclosed die-cast housing that offers a protection degree of IP65.

LiquiSonic® 40 system, for use in 3-component mixtures, is equipped with a controller 40 and an ETFE-coated flange sensor featuring a PFA / PEEK-coated conductivity detector.

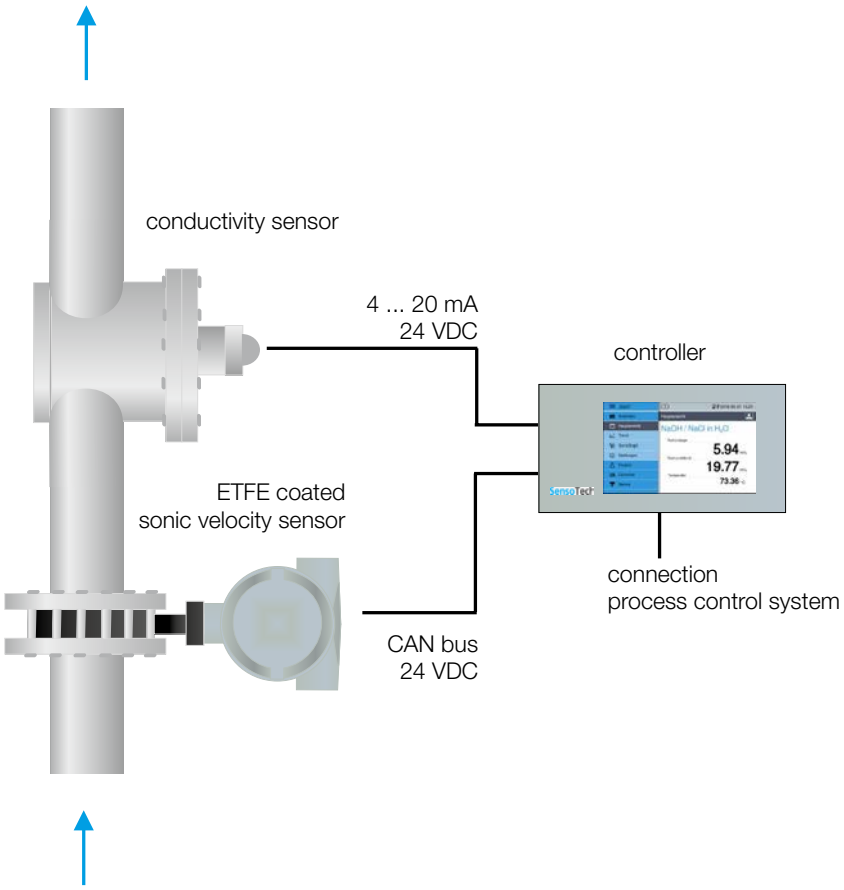
The controller processes the measuring data and is the interface to the operator by displaying the concentration values. The displayed value can be adjusted to internal reference values through a calibration function. All process data or related values will be refreshed every second. If the measuring values are either within or outside the threshold, it will be shown immediately in the display. System information and error messages are also clearly shown on the display.

The measuring data can be transmitted via several adjustable analog or relay outputs as well as via different fieldbus interfaces to process control systems or computers.

The controller has a data log that stores up to 15,000 data-sets each with 32 measuring values. The software SonicWork facilitates to read-out the data log and to create its own process reports in an easy manner.

An additional function integrated in the controller is the event log. This feature documents events like manual product switch, changes on date, time or system states.

LiquiSonic® controller in a plastic wall mount housing



LiquiSonic® 40 measuring system

Accessories

There are several possibilities to install the LiquiSonic® analyzer appropriately and to facilitate the integration into the process control system. The following products have proved to be useful.

Controller rack mounting 19" 4 HE

Controller rack mounting

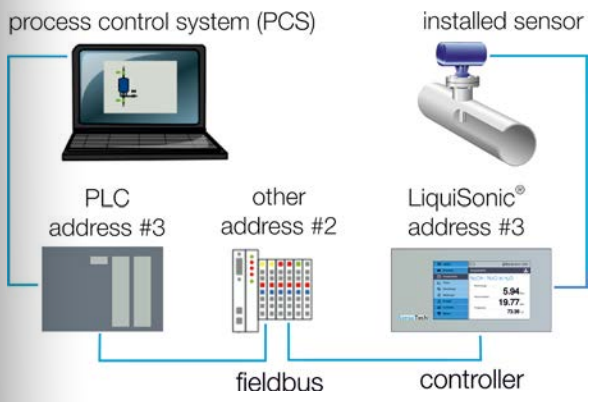
The controller is designed for rack-mounted systems. It is alternatively available with a 19" housing 4 HU.
In order to be able to mount the controller into the field, two variants of field housings made of plastic or stainless steel can be delivered, which meet on-site conditions in an optimal way.

- material: anodized aluminum
- dimensions: 482.9 (19") x 177 (4 HU) mm
- application: rack-mounted system

Fieldbus

The fieldbus option provides the possibility to integrate the controller in a PCS or to automate the process flow via PLC. Beside the transfer of measuring values like concentration and temperature it is also possible to exchange parameters and control data (for example product switch).

The controller supports different fieldbus systems and follows the standards recommended by the respective standards organizations. Common variants are Modbus, Profinet, CAN Bus and Profibus DP.



Connection interfaces

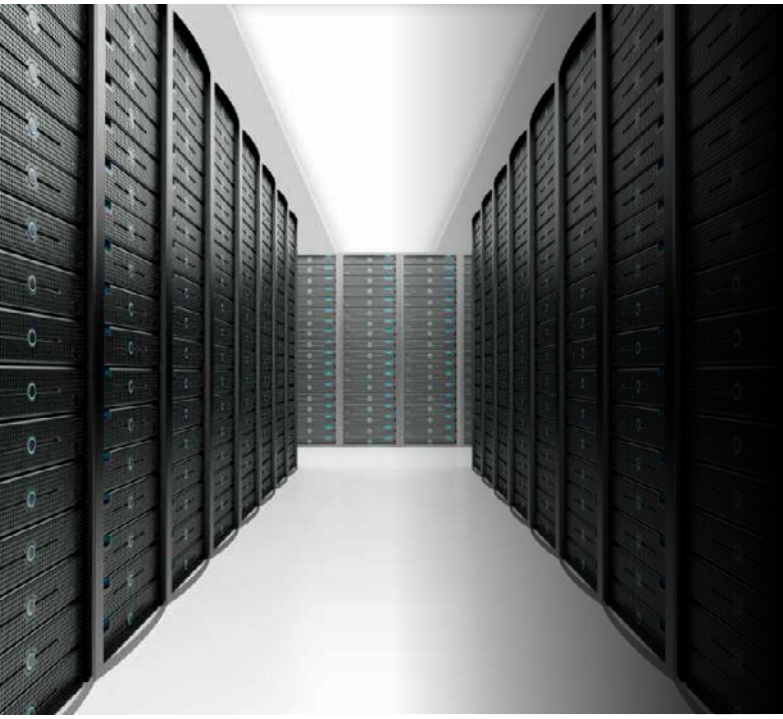
Controller stainless steel housing

Controller stainless steel housing

The controller is designed for the installation in control panels. In order to install the controller in the field, a stainless steel housing is available.

- material: stainless steel DIN 1.4301 (AISI 304)
- protection degree: IP66 (NEMA 4X)
- dimensions: 430 x 300 x 230 mm
- window: VSG with 6 mm thickness
- application: in areas with highly hygienic requirements like pharmaceutical and food industry, e.g. breweries

LiquiSonic® flange sensor with ETFE coating and external PTFE-temperature sensor



Network Integration

The LiquiSonic® controller has an Ethernet interface, that makes the integration into the corporate network possible. After entering the user name and password, the access to the stored logs is possible.

Integrating the controller into the network enables remote control, view of status information, transfer of product data sets or calibration of products.

The Network integration includes
- web server (HTTP),
- command line (TELNET),
- file transfer (FTP),
- time synchronisation (NTP),
- e-mail notification (SMTP).

Quality and Support

Enthusiasm for technical progress is the driving force behind our company as we seek to shape the market of tomorrow. As our customer you are at the center of all our efforts and we are committed to serving you with maximum efficiency.

We work closely with you to develop innovative solutions for your measurement challenges and individual system requirements. The growing complexity of application-specific requirements means it is essential to have an understanding of the relationships and interactions involved.

Creative research is another pillar of our company. The specialists in our research and development team provide valuable new ways to optimize product attributes, such as testing new types of sensor designs and materials or the sophisticated functionality of electronics, hardware and software components.

Our SensoTech quality management also only accepts the best production performance. We have been certified according to ISO 9001 since 1995. All device components pass various tests in different stages of production. The systems have all gone through an internal burn-in procedure. Our maxim: maximum functionality, resilience and safety.

This is only possible due to our employee`s efforts and quality awareness. Their expert knowledge and motivation form the basis of our success. Together we strive to reach a level of excellence that is second to none, with passion and conviction in our work.

Customer care is very important to us and is based on partnerships and trust built up over time.

As our systems are maintenance free, we can concentrate on providing a good service to you and support you with professional advice, in-house installation and customer training.

Within the concept stage we analyze the conditions of your situation on site and carry out test measurements where required. Our measuring systems are able to achieve high levels of precision and reliability even under the most difficult conditions. We remain at your service even after installation and can quickly respond to any queries thanks to remote access options adapted to your needs.

In the course of our international collaboration we have built up a globally networked team for our customers in order to provide advice and support in different countries.

We value effective knowledge and qualification management. Our numerous international representatives in the important geographical markets of the world are able to refer to the expert knowledge within the company and constantly update their own knowledge by taking part in application and practice-oriented advanced training programs.

Customer proximity around the globe: an important element of our success worldwide, along with our broad industry experience.

In liquids, we set the measure.
With innovative sensor technology.
Tough, accurate, user-friendly.

SensoTech

SensoTech is a provider of systems for the analysis and optimization of process liquids. Since our establishment in 1990, we have developed into a leading supplier of process analyzers for the inline measurement of liquid concentration and density. Our analytical systems set benchmarks that are used globally.

Manufactured in Germany, the main principle of our innovative systems is to measure ultrasonic velocity in continuous processes. We have perfected this method into an extremely precise and remarkably user-friendly sensor technology. Beyond the measurement of concentration and density, typical applications include phase interface detection or the monitoring of complex reactions such as polymerization and crystallization.

Our LiquiSonic® measuring and analysis systems ensure optimal product quality and maximum plant safety. Thanks to their enhancing of efficient use of resources they also help to reduce costs and are deployed in a wide variety of industries such as chemical and pharmaceutical, steel, food technology, machinery and plant engineering, car manufacturing and more.

It is our goal to ensure that you maximize the potential of your manufacturing facilities at all times. SensoTech systems provide highly accurate and repeatable measuring results even under difficult process conditions. Inline analysis eliminates safety-critical manual sampling, offering real-time input to your automated system. Multi-parameter adjustment with high-performance configuration tools helps you react quickly and easily to process fluctuations.

We provide excellent and proven technology to help improve your production processes, and we take a sophisticated and often novel approach to finding solutions. In your industry, for your applications – no matter how specific the requirements are. When it comes to process analysis, we set the standards.

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