



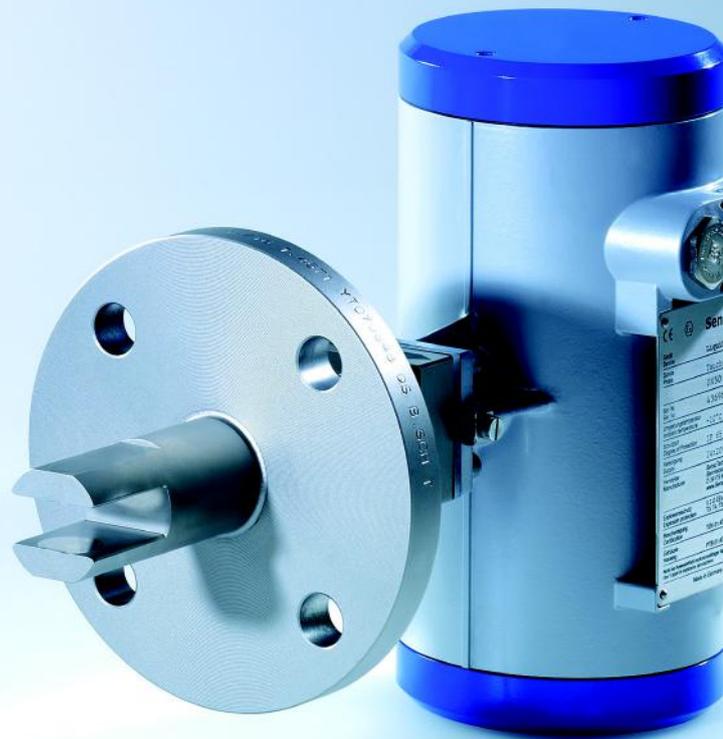
# Phase separation

- in pipelines
- in batch processes
- in continuous processes
- as valve solution

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**LiquiSonic®**

quality, **saving resources: LiquiSonic®.**  
-value, **innovative sensor technology.**  
accurate, **user-friendly.**

LiquiSonic® is an inline analytical system for determining the concentration in liquids directly in the running process and without delay. The device is based on high-precision measurement of the absolute sonic velocity and process temperature and thus allows the detection of phase transitions.

Benefits for the user include:

- immediate detection of phase transitions (response time less than 1 s)
- replacement of manual, visual or indirect detection methods (e.g. timing)
- improvement of the product yield
- saving of energy and material costs
- optimal plant control through online information about the state of the process
- increased plant reliability by continuous monitoring

Using the latest digital signal processing technology ensures a highly accurate and fail-safe measurement of the absolute sonic velocity and the concentration.

In addition, integrated temperature sensors, a sophisticated sensor design and the know-how resulting from numerous series of measurements and many applications guarantee a high reliability of the system with a long lifetime.

Advantages of the measuring method are:

- absolute sonic velocity as a well-defined and retraceable physical value
- independent of color, conductivity and transparency of the process liquid
- installation directly into pipelines as well as tanks or vessels
- robust and completely metallic sensor design without gaskets or moving parts
- maintenance-free
- corrosion resistance by using special material
- use at temperatures up to 200 °C
- high, drift-free measuring accuracy even with high concentration of gas bubbles
- connection of up to four sensors per controller
- forwarding of measuring results through field-bus (Profibus DP, Modbus), analogue outputs, serial interface or Ethernet



**Inline process analysis**

## Contents

1	Process	6
1.1	Phase separation in pipelines	7
1.2	Phase separation in batch processes	7
1.3	Phase separation in continuous processes	9
2	LiquiSonic® system	10
2.1	LiquiSonic® 30	11
2.2	Accessories	11
2.2.1	Controller and field housng	11
2.2.2	Fieldbus	11
3	Quality and support	12

# 1 Process



## 1.1 Phase separation in pipelines

The precise detection of different phases in a pipeline is necessary in various industries. Often different products flow through the same pipe, but every single product is supposed to end in a different location.

In applications in which product A is discharged by product B, the intermediate phase is to be separated. For example, in breweries, different kinds of beer are bottled in succession, whereas the first and last runnings are removed from circulation and return into the brewing process.

Safety aspects are relevant in applications with high-risk potential. In particular, the monitoring in multi-fuel pipelines for the petrochemical industry provides not only data about the product quality (incoming goods), but also avoids incorrect filling of storage tanks and thus serious accidents.

In the petrochemical industry, different fuels are conveyed over very long distances in just a pipeline. Here the rapid detection of the different products as well as the quality monitoring are focused.

## 1.2 Phase separation in batch processes

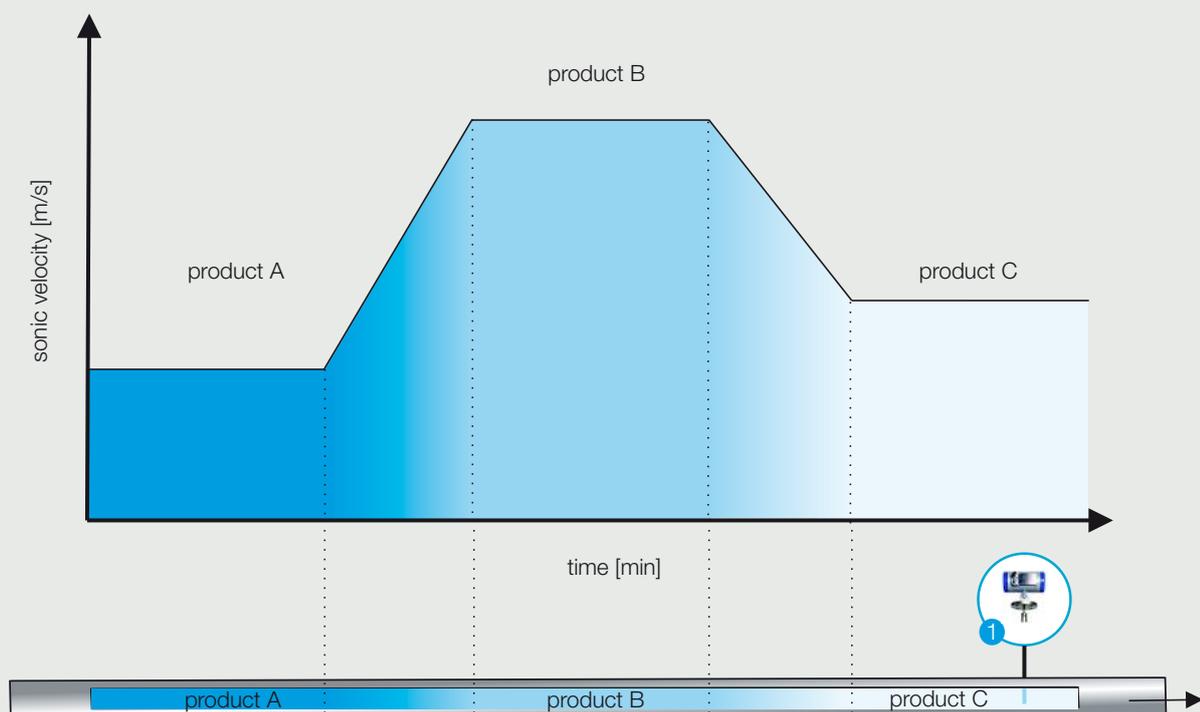
In batch processes the product phases are separated due to the physical and chemical properties of each product.

### Application example 1: organics

In the production of cosmetics, a salt-containing aqueous phase is separated from an primary product phase. The aqueous lower phase is disposed via sewage-works. The upper phase of the primary product is slightly hazardous to water and only moderately biodegradable. Therefore, this phase must not be discharged into sewage. The rapid and reliable detection of the primary product phase has the highest priority to prevent discharging into the effluent via an immediate shutdown.

Optical measuring methods may not be used here, because different colours may occur during the phase separation. In addition, a mixed layer may form, which can be critical for the optical measurement due to contamination effects.

## Phase separation with LiquiSonic® in pipelines



#### Application example 2: biodiesel / glycerol

In the manufacture of biodiesel, glycerol is produced as a by-product. The mixture of the two substances is conveyed in large settling tanks and then has several hours to separate. The LiquiSonic® sensors are usually installed into the outlet of the tank. By the detection of the phase transitions, the valve is activated and the biodiesel and the glycerol is supplied to the processing. The intermediate phase returns to the separation process.

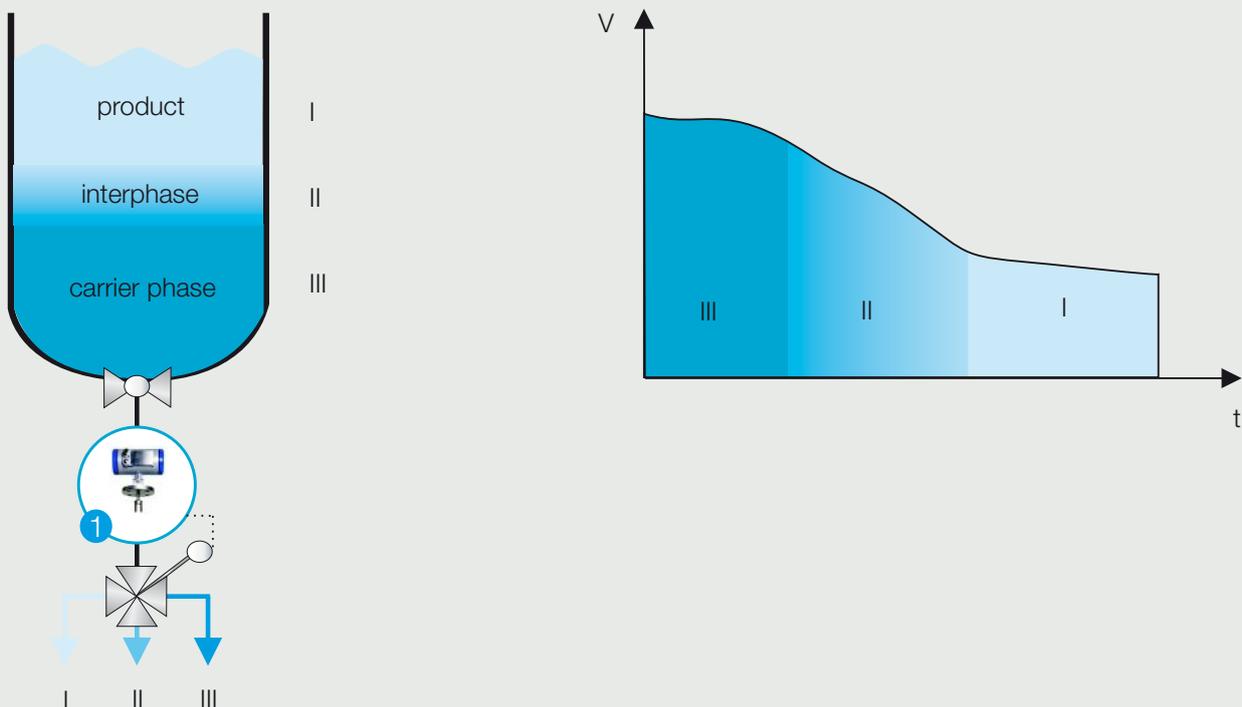
#### Application example 3: integrated valve solution

Various vessel configurations such as agitators, double casing features or coatings prohibit the integration of additional sensor technology. Therefore, SensoTech developed with a famous manufacturer of bottom outlet valves (BOV) a sensor solution that is integrated directly into the valve disc. So the only existing process connection at the outlet will be used optimally. The sensor detects the phases directly at the drain of the vessel.



Outlet valve (BOV) with integrated LiquiSonic® sensor

### Phase separation with LiquiSonic® in batch processes



### 1.3 Phase separation in continuous processes

In a continuous process, one or more sensors control the separation of a process stream. In this case, only the phase-specific value of sonic velocity is monitored and kept constant.

Often, the product concentration of the carrier phase varies in the inlet. This quickly shifts the height of the phase boundary. Thus, the carrier phase could be pulled off with the product, which greatly affects the purity.

In process the separation is made via one pump in each of the two outlet pipes. In this way, for example, the continuous separation of a reaction mixture can be controlled.

The advantages of the LiquiSonic® measuring and analyzing technology are both the extremely fast response time of less than 1 s and the connection of up to four sensors to only one LiquiSonic® controller. The controller processes all measuring values and passes the data to the process control system.

Depending on the type of vessel and process objectives different installation variants are possible, which are shown in the illustration below.

#### Installation variant 1

Most commonly, the sensors are installed on the side of the vessel. The requirement of the central sensor (measuring point 2) depends on the application and the forming of the intermediate phase.

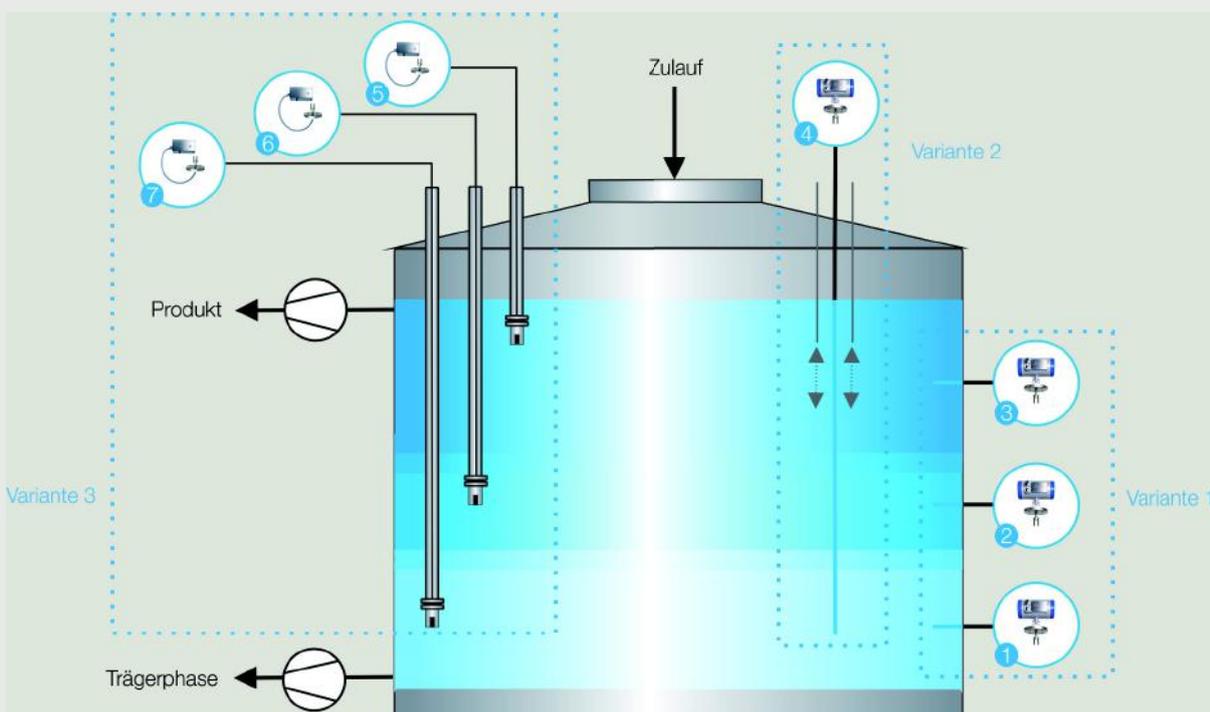
#### Installation variant 2

By the use of a single sensor of a length of up to 4 m, the phase profile of the entire vessel can be determined. By mounting the sensor on a movable carriage, for example, and in combination with a distance meter, the phase boundaries can be accurately determined in their current height.

#### Installation variant 3

In vessels in which connections are not provided at the side or cannot subsequently be realized, the sensors are positioned using a submerged tube in the right place, for example at heated double jacket vessels. Here, the sensor electronics are mounted apart at a distance of up to 15 m away from the vessel.

### Installation variants of LiquiSonic® for phase separation in continuous processes

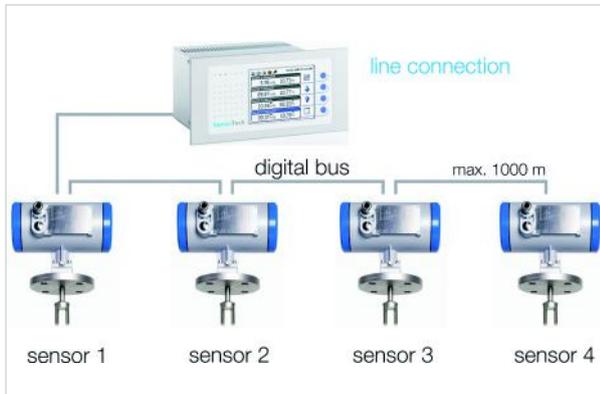


## 2 LiquiSonic<sup>®</sup> system



## 2.1 LiquiSonic® 30

The LiquiSonic® 30 system consists of one or more sensors and one controller.



Controller with connection of up to four sensors

Each sensor works autonomously and can be used in different applications. The liquid-wetted parts of the sensor are made of stainless steel DIN 1.4571 as standard. In chemical aggressive liquids the sensor is made of special non-corrosive material. The rugged and completely enclosed design does not need any gaskets or “windows” to the process and is thus completely maintenance-free.

Different additional functions integrated in the sensor like flow stop monitoring and full/empty liquid monitoring in pipes increase the benefits significantly. A special high power technology ensures stable measurement results, even at high portions of gas bubbles and strong signal attenuation by process liquid.

The sensor electronics is integrated in a closed die-cast housing with a protection degree of IP65 and enables the cleaning of process systems, for example, through a high pressure cleaner.

The controller 30 analyzes and visualizes the measuring data. The displayed value can be adjusted to internal reference values using a calibration function. All process data or related values will be refreshed every 250 milliseconds. If the measuring results are within or outside the threshold, it will be displayed immediately. System information and warning messages are also clearly shown in 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 datasets each with 32 measuring values. The software SonicWork facilitates to read-out the data log and create 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.

## 2.2 Accessories

### 2.2.1 Controller and field housing

The controllers are designed for rack-mounted systems. It is also available with a 19“ housing 3RU.

In order to be able to mount controllers 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.



Stainless steel housing with protection degree IP66

### 2.2.2 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 and Profibus DP.

## 3 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 centre 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 optimise 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 a 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 analyse 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 programmes.

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

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**SensoTech**

SensoTech



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Field Bus

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standards **for process analysis.**  
n, that **creates new solutions.**  
bsolute **spirit of development.**

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 the concentration and density of liquids. Our analytical systems set benchmarks that are used globally.

Manufactured in Germany, the main principle of our innovative systems is to measure ultrasonic velocity and density in continuous processes. We have perfected this method into an extremely precise and remarkably user-friendly sensor technology. As well as 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® measurement and analysis systems ensure optimal product quality and maximum plant safety. Thanks to their 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 reproducible measuring results even under difficult process conditions. Inline analysis eliminates safety-critical manual sampling and is immediately available for your automation system. All parameters can also be adjusted with high-performance configuration tools, so that you can 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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In liquids, we set the measure.