LiquiSonic®

In-line Process Analysis for Liquids

Product Description

- ◆ Controller
- ◆ Sensor
- ◆ Software
- ◆ Accessories

1.1. SensoTech

For almost 20 years, **SensoTech** GmbH has been engaged in the development, manufacturing and marketing of analytical systems for liquid processes. With more than 5,000 measuring points installed worldwide to monitor concentrations, compositions, changes in characteristics or chemical changes directly in liquid processes, SensoTech has significantly contributed to the enhancement of the state of the art.

SensoTech in-line analyzers set the pattern for the fields like self-monitoring, user friendliness and reproducibility of process devices. Advanced methods of calculation and highly sophisticated sensor technologies enable precise and reproducible measuring results even under most difficult process conditions. **SensoTech** systems provide stable and reliable measuring results even at temperatures from up to 200°C or process pressures of up to 500 bar. Using the latest digital signal processing technologies ensures an extremely high measuring accuracy. Additionally, integrated temperature sensors ensure the sophisticated sensor design and the knowledge gained from several series of measurements and applications ensures extremely precise results.

The measuring method working without contact is characterized by high utilization rates and by an extremely low maintenance effort.

The knowledge and the experience of the highly motivated and committed **SensoTech** staff are the result of numerous applications provided at premium customers from the
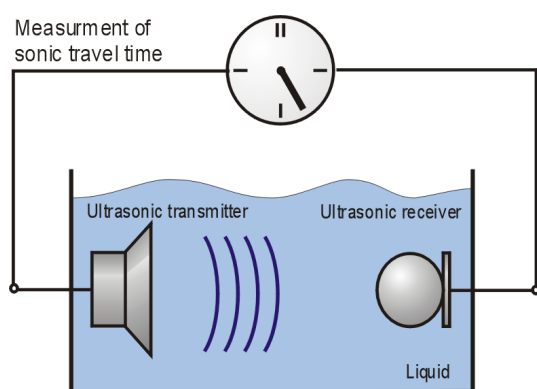
- chemical industry
- steel manufacturing industry
- food processing industry
- semiconductor industry
- pharmaceutical industry
- petrochemistry
- and other related industries

and open up unexpected solutions also for new challenges!

With **SensoTech** you will have a reliable and competent partner for optimizing your processes. **SensoTech** products help to optimize the desired product quality, save raw materials and energy, and improve the plant safety.

1.2. Measuring Principle

The sonic velocity of a liquid depends on the concentration of individual components. In order to determine the sonic velocity, a sonic pulse is sent through the liquid and the time is detected until this pulse reaches the receiver. The sonic velocity can be calculated, because the distance between the ultrasonic transmitter and receiver is constant.

described for a number of liquids. The resulting product datasets are stored in the LiquiSonic® controller and are used for the calculation of the correct concentration. The customer can adjust the measuring results to its own reference values via an adjusting function in controller menu at any time.

With additional measuring variables, it is possible to control multi-component measurements, e.g. in neutralization processes or gas scrubbers.

The relation between sonic velocity, temperature and concentration is different in each liquid and is fully
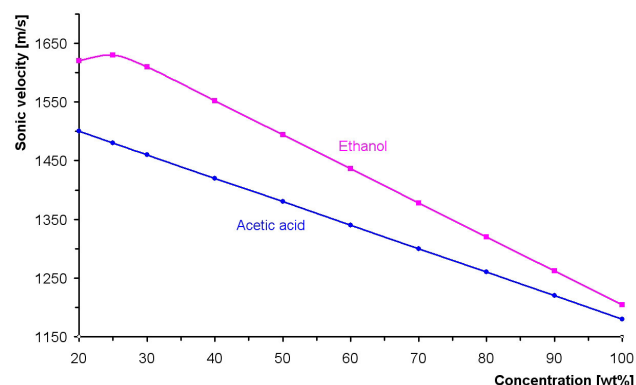
1.3. System

LiquiSonic consists of one or more sensors and a controller. Ultrasonic sensor has the actual ultrasonic measuring path and the highly precise temperature detection.

The controller calculates and presents the concentration as well as communicates with the user. A TFT color display and a membrane keyboard enable an easy handling.

After system installation, the controller display shows directly the desired concentration. With the adjusting function, the display value can be adjusted to in-house reference values.

Immersion Type Sensor Ex

The sensors are connected with the controller digitally to enable a fail-safe data exchange.
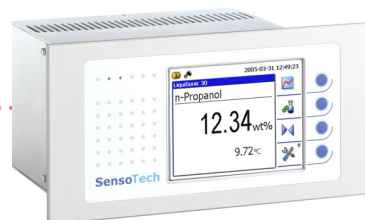
LiquiSonic Controller

1.4. Applications

For many years, SensoTech has been leading in the development and application of measuring devices for in-line process control. Wide research and development activities, industry-specific solutions as well as sophisticated products and technologies ensure the user high quality and reliable solutions, which are beyond the scope of concentration measurement.

Using the sonic velocity measurement for monitoring of sophisticated technical processes like crystallization and polymerization the combination of wide application knowledge and the latest technology develop unexpected application potentials.

- Concentration & density measurement
- Phase interface detection, phase separation
- Polymerization monitoring

- Process monitoring
- Cleaning and etching processes
- Neutralization control
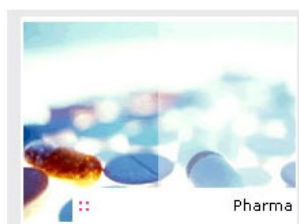
- Crystallization control
- Reaction monitoring
- Supersaturation measurement
- Crystal content

- Determination of DM content
- Brix and Plato measurement
- Evaporation control

- Emulsion monitoring
- Pickling bath monitoring
- Control of gas scrubbers

1.5. Advantages

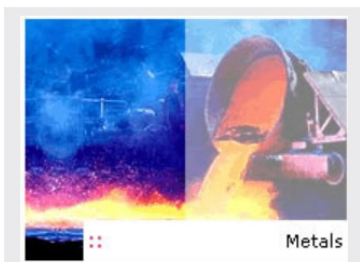- Maintenance free in-line measurement method without contact

- No moving parts and gaskets

- Measurement of sonic velocity with a high absolute accuracy

- Application in open and pressurized tanks and vessels as well as in all nominal diameters

- Use of all common process adapters

- Independent of conductivity, color or transparency

- Determination of concentrations with accuracies up to 0.05%wt

- Connection of several sensors to one controller possible

- Recording of measuring values in internal data memory

- Selection of up to 256 different product calibration data

- Display of measuring variable clearly at TFT – color display

- User management and automatic self-monitoring

- Event logbook with documentation of calibrations and configurations

- Output of measuring variable as current signal 4..20 mA and via serial or field bus interfaces

- Varied remote control opportunities like modem or Web interface
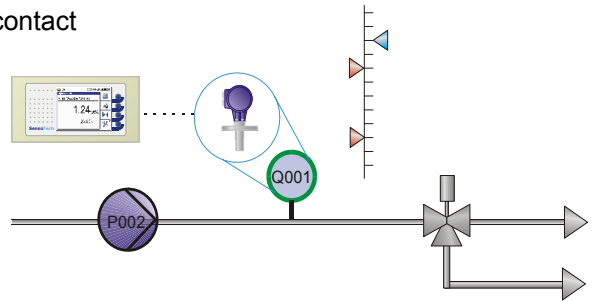
1.6. General Parameters

Measuring method	Determination of sonic velocity and temperature in liquids as dimension for concentration of components compensated by temperature
Measuring range	100 to 3,000 m/s, -90 to 200°C
Specialty	Direct conversion into concentration [wt%, vol%, g/l, kg/m³, °Plato, °Brix etc.]
Accuracy of sonic measurement	+-0.05 m/s
Accuracy of temperature measurement	+-0.05 K
Communication	Data exchange with superior systems via current signal 4..20 mA and RS-232 as well as field bus
Sensors	It is possible to connect up to 4 ultrasonic sensors to one controller

2. Controller Variants

LiquiSonic 30 is the standard device with all functions. Up to 4 sensors can be connected with one controller. Several functions, like trend presentation or the logbook make this controller to an efficient analyzer.

LiquiSonic 20 is the low budget version with only basic functions.

LiquiSonic 40 is an efficient version to calculate 2 different concentrations within a 3-component mixture. The controller uses the sonic velocity and an external measurement value like the density or the conductivity.

LiquiSonic 50 has features for optimal application in crystallization and polymerization processes.

LiquiSonic Lab is especially used in laboratories and can be used in different applications.

| LiquiSonic	20	30	40	50	Lab
art. no.	21001201	21001301	21001401	21001501	21001351
number of sensors for one controller	1	4	1	1	1
3-component-calculation			●		
application program crystallization				●	
application program polymerization				●	
display	color	color	color	color	color
housing	metal	metal	metal	metal	aluminum
trend chart		●	●	●	●
product datasets	16	256	256	256	256
product choice external	●	●	●	●	
automatic product choice		●			●
editing of product identifiers		●	●	●	●
several operation languages	●	●	●	●	●
data memory with 15,000 data lines		●	●	●	●
event logbook (error logbook)		●	●	●	●
user management	optional	optional	optional	optional	optional
switching outputs	4	6	6	6	
analog inputs	1	4	4	4	
analog outputs	2	4	4	4	
interface RS232	●	●	●	●	●
SonicGraph	optional	optional	optional	optional	optional
attenuation measurement	optional	optional	optional	optional	optional
field bus interface (e.g. Profibus DP)	optional	optional	optional	optional	optional
network integration (Ethernet)	optional	optional	optional	optional	optional
web server	optional	optional	optional	optional	optional
cleaning and degassing control	optional	optional	optional	optional	

2.1. LiquiSonic 20 Controller (article no. 21001201)

The controller 20 is a highly efficient device which stores process values of one sensor. It is the low budget version of LiquiSonic 30 and it can be used reasonable for individual measuring units.

The controller processes the sensor data and is the interface to the operator by displaying the concentration values. **LiquiSonic** controller is equipped with a high sophisticated microprocessor, even handles complex concentration calculations.

The large display with high resolution color TFT ensures an optimal view under any light conditions. The clear, user-friendly and multi-lingual menu structure allows operating the system without extensive reading of the complex user's manual.

All process data or related values will be refreshed every second. They can be transmitted via several adjustable analog or relay outputs as well as via different field bus interfaces.
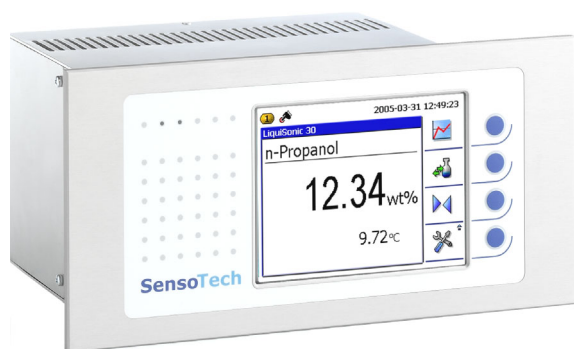
- Output of concentration, temperature and further important measured values
- Simple parameterization
- Interfaces like analog and digital outputs, field bus, Ethernet
- Degree of protection for device front IP65
- Automatic self-monitoring
- Easy installation

- Comfortable handling due to tree structure in system menu
- Recording of events e.g. exceeding the limit value
- Storage of up to 16 products
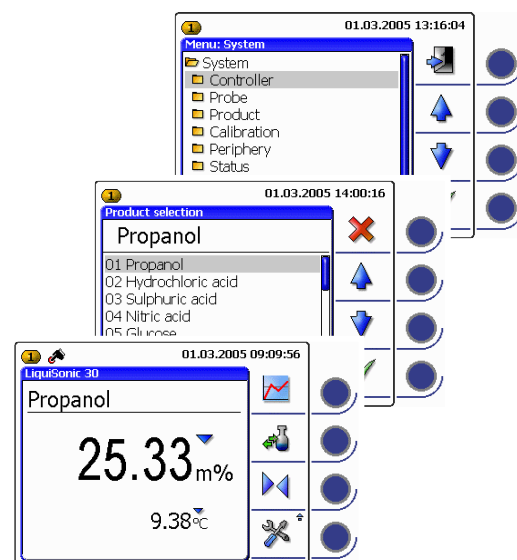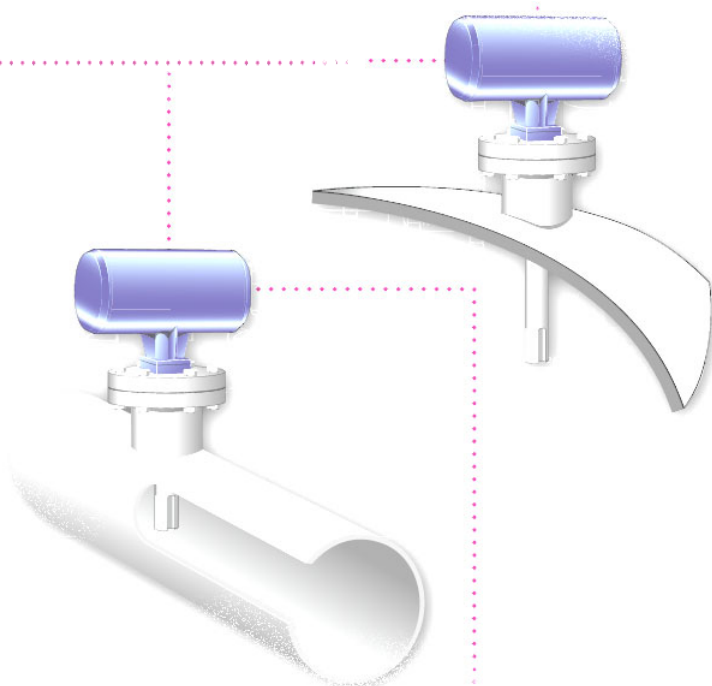
Technical Information LiquiSonic 20 Controller

Housing

Dimensions	Front panel: 280 x 138 mm (width x height)
	Installation depth: 245 mm
Panel cut-out	243 x 123 mm (width x height)
Material	Stainless steel 1.4571
	Front panel: anodized aluminum
	Display protection: glass
Weight	Approx. 3.5 kg
Degree of protection	IP30, Front IP65
Ambient temperature range	0 to 40 °C

Electrical Data

Power supply	115/230 V AC, 50/60 Hz (88 to 264 V AC, 47 to 63 Hz) Optional: 24 V DC (19 to 32 V DC)
Power consumption	230 V AC: Typ. 15 W
	24 V DC: Typ. 14 W
Fuse	External delay fuse with 4 A rated current
Connections	Clip contact, nominal cross section: 2.5 mm^2 (0.08 to 2.5 mm^2)
EMC	According to directive 89/336/EEC
Electrical security	According to directive 2006/95/EC

Outputs

Outputs analog	2x 4...20 mA (0...20 mA for status information), active
	Burden: max. 600 Ω
	Isolated to the device
	Individual configuration
Outputs digital	2x electronic relays
	Max. switching voltage: 30 V AC/DC
	Max. continuous current: 2 A AC/DC (L/C free load)
	Protective circuit: Transient voltage suppression diode (800 W, > 33 V)
	Isolated among each other and to the device
	Individual configuration

Inputs

Inputs analog	1x 4...20 mA (0...20 mA for status information), passive
	Isolated to the device
Inputs digital	4x binary inputs
	Switching level: 1 signal („H") $\geq$ 19 V DC, 0 signal („L") $\leq$ 17 V DC
	Isolated to the device

Data Interfaces

Standard interface	RS-232
	Ethernet (optional)
	CompactFlash Slot
Field bus (optional)	MODBUS
	MODBUS/TCP
	Profibus DP
	DeviceNet
Connection to sensors	CAN-Bus, max. 1000 m pipeline length

User Interface

Display	TFT color display
	Diagonal 5.7" (14.5 cm)
	320 x 240 pixel resolution
Handling	Membrane keyboard, 4 keys

## 2.2. LiquiSonic 30 Controller (article no. 21001301)

The controller is a highly efficient device which includes up to 4 sensors. Each sensor works autonomous and it can be used in different applications.

The controller processes the sensor data and is the interface to the operator by displaying the concentration values. **LiquiSonic** controller is equipped with a high sophisticated microprocessor, even handles complex concentration calculations.

The large display with high resolution color TFT ensures an optimal view under any light conditions. Operator can define his own identifiers, process tags or physical units. The clear, user-friendly and multilingual menu structure allows operating the system without extensive reading of the complex user's manual.

The internal data memory has a capacity of up to 15,000 data sets. By reading out via an integrated TCP/IP or RS232 interface it is possible to create own process reports in an easy way. The process data or related values will be refreshed every second. They can be transmitted via several adjustable analog or relay outputs as well as via different field bus interfaces.
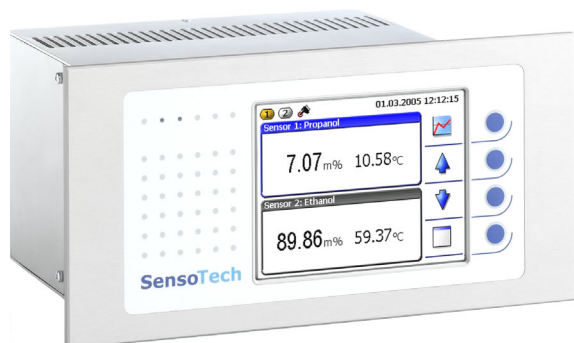
- Storage of up to 4 sensors
- Output of concentration, temperature and further important measured values
- Simple parameterization e.g. of periphery
- Interfaces like analog and digital outputs, field bus, Ethernet
- Degree of protection for device front IP65
- Automatic self-monitoring
- Simple installation

- Storage of measured data for many days or years
- User management with authorization steps
- Comfortable handling due to tree structure in system menu
- Recording of events e.g. exceeding the limit value
- Storage of up to 256 products

SensoTech
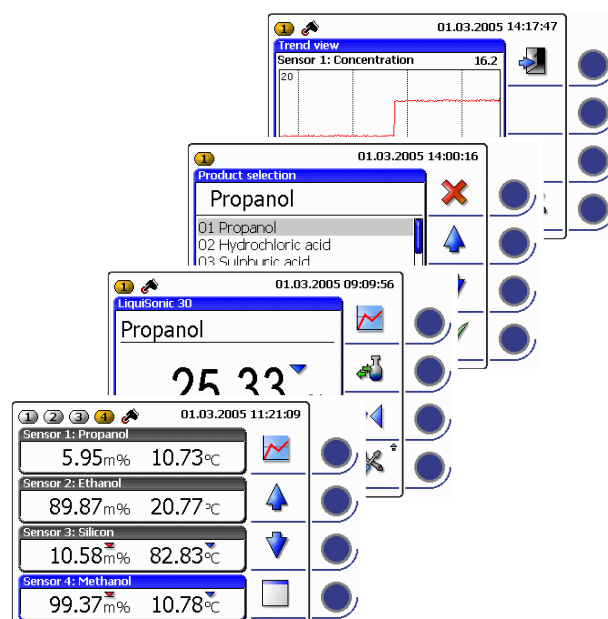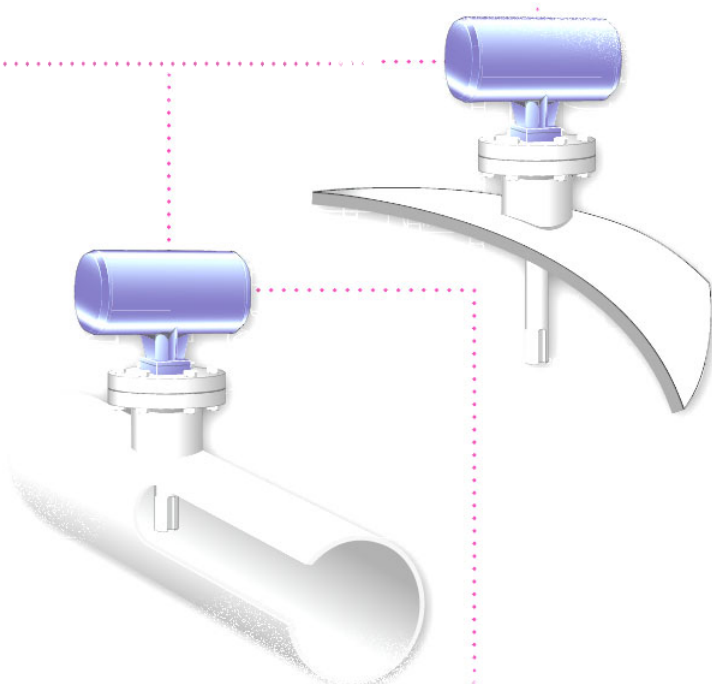
Technical Information LiquiSonic 30 Controller

Housing

Dimensions	Front panel: 280 x 138 mm (width x height)
	Installation depth: 245 mm
Panel cut-out	243 x 123 mm (width x height)
Material	Stainless steel 1.4571
	Front panel: anodized aluminum
	Display protection: glass
Weight	Approx. 3.5 kg
Degree of protection	IP30, Front IP65
Ambient temperature range	0 to 40 °C

Electrical Data

Power supply	115/230 V AC, 50/60 Hz (88 to 264 V AC, 47 to 63 Hz) Optional: 24 V DC (19 to 32 V DC)
Power consumption	230 V AC: Typ. 15 W (with 1 sensor) Typ. 37 W (with 4 sensors)
	24 V DC: Typ. 14 W (with 1 sensor) Typ. 34 W (with 4 Sensors)
Fuse	External delay fuse with 4 A rated current
Connections	Clip contact, nominal cross section: 2.5 mm^2 (0.08 to 2.5 mm^2)
EMC	According to directive 89/336/EEC
Electrical security	According to directive 2006/95/EC

Outputs

Outputs analog	4x 4...20 mA (0...20 mA for status information), active
	Burden: max. 600 Ω
	Isolated to the device
	Individual configuration
Outputs digital	6x electronic relays
	Max. Switching voltage: 30 V AC/DC
	Max. Continuous current: 2 A AC/DC (L/C free load)
	Protective circuit: Transient voltage suppression diode (800 W, > 33 V)
	Isolated among each other and to the device
	Individual configuration

Inputs

Inputs analog	4x 4...20 mA (0...20 mA for status information), passive
	Isolated to the device
Inputs digital	6x binary inputs
	Switching level: 1 signal („H") $\geq$ 19 V DC, 0 signal („L") $\leq$ 17 V DC
	Isolated to the device

Data Interfaces

Standard interfaces	RS-232
	Ethernet (optional)
	CompactFlash Slot
Field bus(optional)	MODBUS
	MODBUS/TCP
	Profibus DP
	DeviceNet
Connection to sensors	CAN-Bus, max. 1000 m pipeline length

User Interface

Display	TFT color display
	Diagonal 5.7" (14.5 cm)
	320 x 240 pixel resolution
Handling	Membrane keyboard, 4 Keys

3.2. Fieldbus

The fieldbus option provides the possibility to integrate the LiquiSonic controller into a Process Control System (PCS) or to automate the process run via programmable logic controller (PLC). Beside the transfer of measuring values like the concentration or temperature, it is also possible to exchange parameters and control data (e.g. product switch).

process control system (PCS)
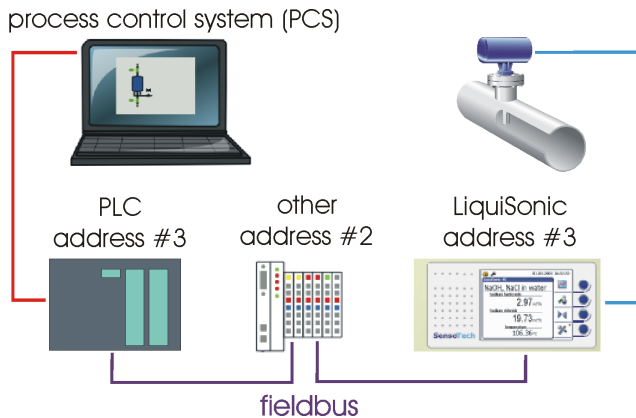
The controller supports different fieldbus systems and follows the standards recommended by the respective standards organizations.

Modbus (article no. 21004430)

The company Modicon, today Schneider Electric, has developed the Modbus protocol. This protocol will be maintained and further developed by the Modbus organization.

The integration into the PCS or into a PLC is very easy. The connecting parameters (baud rate, device no.) will be integrated into the controller. Then the system is ready for operation. The data are stored hierarchically in the controller, they are addressed as register and can be read or written.

Profibus DP (article no. 21004435)

PROFIBUS was developed by Siemens and is well known worldwide. It is maintained and further developed by PROFIBUS Nutzerorganisation e.V (PNO).

The integration into the PCS or into a PLC is very easy. Device data files (GSD file) are included to the delivery. This file contains all parameters being able to read and write and is available in different languages. The GSD file will be loaded into the project planning program. The parameters to be monitored can be selected from an offered list and can be integrated into the control software.

The controller is used in a PROFIBUS-PA network via a bus coupler, also known as converter or gateway.

3.3. Windows Network Integration (article no. 21004444)

The LiquiSonic controller has an Ethernet interface, with which via a SMB protocol the integration into a Microsoft Windows network is possible.

All LiquiSonic controller integrated into the network appear in the "network environment" within the group "LiquiSonic". After entering the user name and password the access to the stored logbooks is possible.

Furthermore, the Telnet protocol can be activated. Thus, all functions of SonicWork program (e.g. remote control, query of status information, transfer of product datasets and calibration of products) are available in the network.
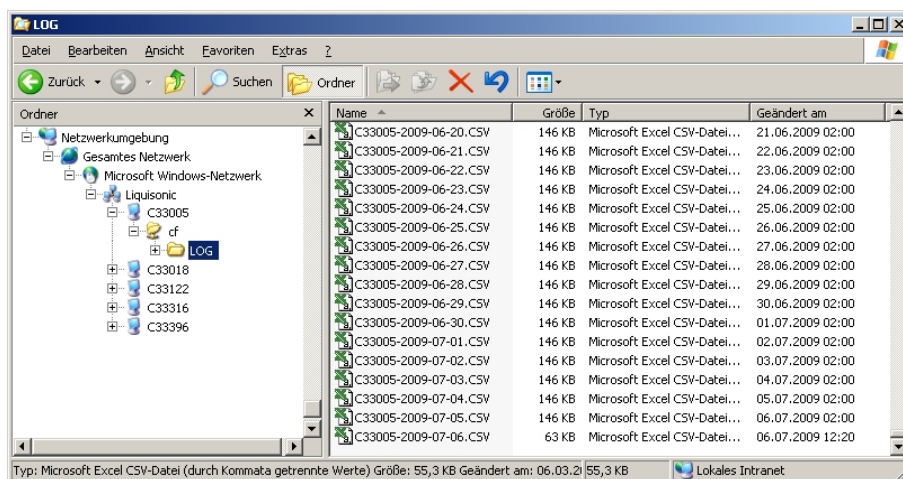
3.4. Web Server (article no. 21004445)

With the Web server, a remote access to the LiquiSonic controller within a network is possible without installing special application software.

The Web server enables the direct access to the controller with

usual Web browsers (e.g. Firefox or Internet Explorer).

The option "Web Server" requires the availability of option "Windows Network Integration".

3.5. User Management (article no. 21004443)
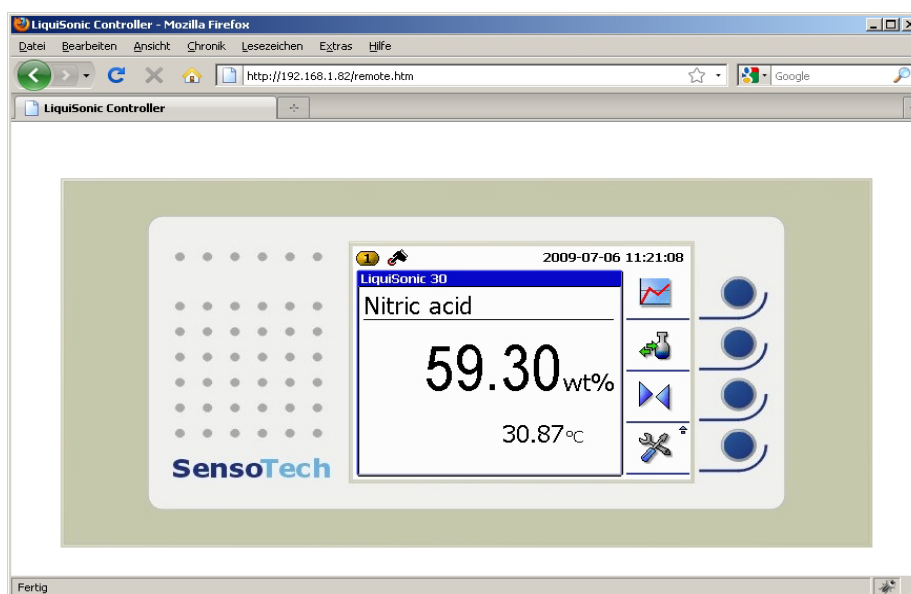
With the user management it is possible to achieve an **increased security** against unauthorized access and a **better traceability** of modifications in the system.

The user management provides an alternative way of system login. The user can log in the system by using a valid login name and the corresponding password.

The user management has the following functions:

- five configurable user accounts

- assignment of user rights (e.g. calibration, periphery configuration)

- free selectable user names

- individual passwords

- existing accounts can be locked by an administrator (temporarily)

In order to access to the system (system menu, product calibration, product switch if required), the user has to log in

by entering a valid user name and the corresponding password.
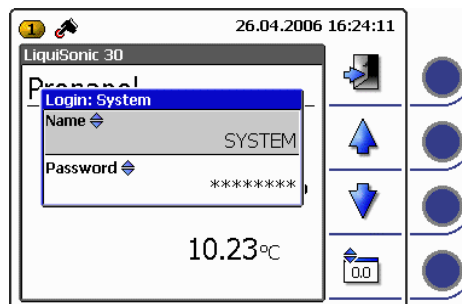
Actions being executed are then stored in the event logbook related to the user and they are safe for detection at any time.
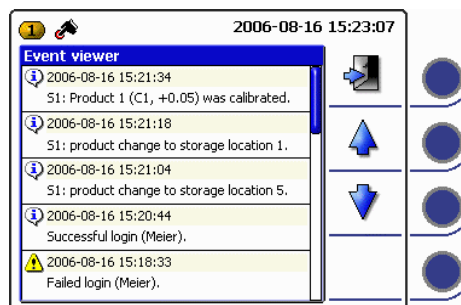
3.6. Modem

With SonicWork, it is possible to communicate with the LiquiSonic controller via a phone connection. In doing so, the controller and the computer are respectively connected with a modem.

This remote connection provides the following advantages:

- Downloading new product datasets on controller
- Reading out the controller logbooks, e.g. to record product data for unknown liquids
- Monitoring of all system functions via remote access
- Configuration of controller and sensor via remote access
- Worldwide and fast customer support by SensoTech Service

GSM Modem (article no. 21004439)

With GSM (Global System for Mobile Communications) Modem, it is possible to perform a remote maintenance at the controller in the field. A fixed line network access is not necessary.

modem connection (GSM)
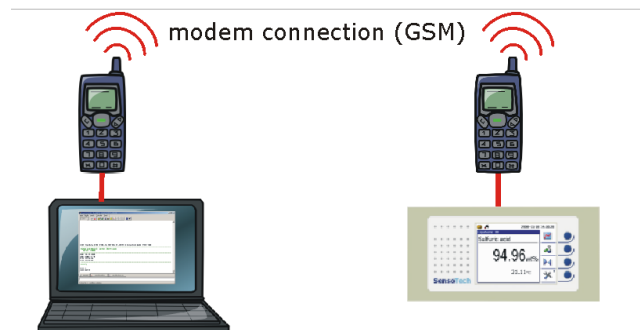
The GSM modem will be connected to the RS232 interface (SUB-D, 9-pin). The voltage supply of modem is executed via external current output of controller.

Analog Modem (article no. 21004436)

The remote connection is performed with the analog modem via the analog telephone network (not ISDN).

modem connection (analog)
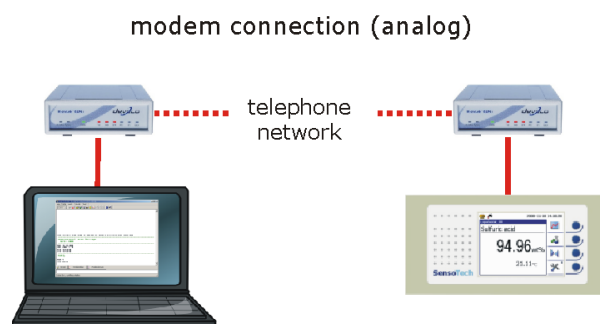
The controller modem is specifically programmed for connection to controller and is connected via RS232 interface of the controller.

The analog modem is a variant of remote control for a very reasonable price.

4. Sensor Variants

Immersion Type Sensor 40-14
- Different lengths
- Stable up to 120°C, optionally up to 180°C
- Pressure rating up to 16 bar, optionally up to 40 bar
- Simple installation

Lab Sensor 40-14
- Convenient sensor for use in laboratory and for mobile devices
- Sensor will be combined with LiquiSonic Lab article no. 21001351

Immersion Type Sensor 40-40 Ex
- Different lengths
- Max. operation temperature 120°C, optionally up to 180°C
- Pressure rating up to 16 bar, optionally up to 300bar
- ATEX approval

Flange Type Sensor Halar
- Very good resistant to corrosion
- Very good anti-adhesive
- Max. operation temperature 100°C
- Nominal diameter DN 80
- Fitting of intermediate flange
- Very good barrier properties

Varivent Sensor (Type N)
- Aseptic design
- Max. operation temperature 120°C
- Pressure resistance 10 bar
- DN 50 to 200
- Degree of protection IP68

Flange Type Sensor PFA
- Greatly resistant to corrosion
- Greatly anti-adhesive
- Max. operation temperature 130°C
- Nominal diameter DN 80
- Fitting of intermediate flange

Immersion Type Sensor Pharma
- Aseptic design
- Polished surface
- Resistant up to 120°C, optionally up to 180°C
- Pressure resistance up to 16 bar
- Clamp flange (e.g. according to DIN 32676)

Flange Type Sensor
- Max. operation temperature 200°C
- DN 25 to DN 80
- optionally with PFA coating or Tantal coating
- Pressure resistance up to 16 bar, optionally up to 65

Immersion Type Sensor Clamp
- For cramped installation situations
- Separated electronics
- Max. operation temperature 120°C, optionally up to 180°C
- Pressure resistance up to 16 bar
- Clamp flange (e.g. according to DIN 32676)

Special Types
Depending on application the sensors are variable concerning:
- Flange
- Length (up to 3m)
- Operation temperature (up to 180°C)
- Pressure rating (up to 500 bar)
- Special material (e.g. Hastelloy)

Immersion Type Sensor GF
- For plastic pipe line system Georg Fischer
- Max. operation temperature 120°C, optionally up to 180°C
- Pressure resistance up to 16 bar

Separated Electronics
- For sensors being subject to extreme vibrations of pipe lines
- Deliverable for different sensor variants

4.1. Immersion Type Sensor 40-14, DN 50, L092 (article no. 21003210)

The sensor contains the measurement of sonic velocity and the temperature. The wetted parts consist of stainless steel 1.4571 as standard. The rugged and completely enclosed design does not need any gaskets or "windows" for process and is thus completely maintenance free.

There are no straight unimpeded pipe sections necessary to install the sensors.

Different additional functions integrated in sensor like flow stop monitoring and full/empty liquid monitoring in pipes increase the customer's benefit 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 immersion type sensor 40-14 is available in different special materials as well as pressure and temperature ratings. The sensor is primarily used for the following applications:

- Caustic soda blending (chemical industry)

- Rolling oil (steel industry)

- Preliminary stages of polyamide production (polymer chemistry)

- Detergents (semi-conductor)

- Deicing (airports)

Available Options:

- High power electronics article no. 21004110

- High power sensor electronic article no. 21004115

- Sonic Graph (oscilloscope) article no. 21004400

- Attenuation measurement article no. 21004402

- Separated electronics

- Flow detector, (Flow/Stop) article no. 21004590

- Variations in length, material, pressure and temperature rating as well as process connection
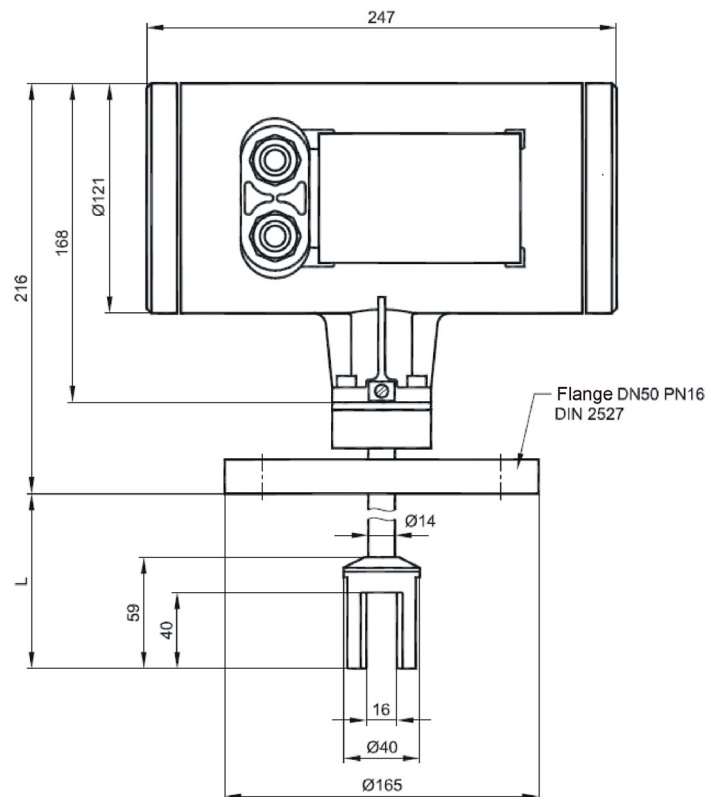
Immersion Type Sensor 40-14

Technical Information Immersion Type Sensor 40-14

Housing

Dimensions electronic housing	Standard: die-cast housing: 247 x 121 x 168 mm (width x diameter x height) Optional: stainless steel housing: 200 x 140 x 100 (width x depth x height)
Material	Standard: die-cast housing: aluminum Optional: stainless steel housing: Stainless steel 1.4404
Degree of protection	Standard: die-cast housing: IP65 Optional: stainless steel housing: IP68
Ambient temperature range	Standard: 0 to 40 °C Optional: -20 to 50 °C

Electrical Data

Power supply	24 V DC $\pm$15 %
Power consumption	Max. 6 W
Fuse	Internal delay fuse with 1 A rated current
Connections	Clamp terminals Nominal cross section: 2.5 mm^2
EMC	According to directive 89/336/EEC
Electrical security	According to directive 2006/95/EC

Data Interfaces

Connection to sensor	CAN-Bus, max. 1000 m pipeline length
Configuration interface	RS-232 (internal)

Measured Quantities

Sonic velocity	Measuring range	Standard optional	1000 to 3000 m/s 700 to 3000 m/s
	Resolution		0.01 m/s
	Reproducibility		+-0.02 m/s
	Accuracy		+-0.05 m/s
	Refresh rate	Standard optional	1000 ms 250 ms
Temperature	Measuring range	Standard optional	-20 to 120 °C -90 to 180 °C
	Resolution		1 mK
	Reproducibility		+-0.02 K
	Accuracy		+-0.05 K
	Refresh rate	Standard optional	1000 ms 250 ms
Attenuation (optional)	Measuring range		80 dB
	Resolution		0.1 dB
	Reproducibility		+-0.2 dB
	Accuracy		+-0.3 dB
	Refresh rate		1 to 5 s (dependent on configuration)

4.2. Immersion Type Sensor Ex 40-40, DN 50, L092 (article no. 21003240)

The immersion type sensor Ex 40-40 is approved for use in explosive areas according to ATEX approval zone 0 to 2.

The rugged sensor design has also proven itself in practice in highly viscous process liquids with extreme shear forces.

The sensor contains the measurement of sonic velocity and temperature. The wetted parts are usually made of stainless steel 1.4571. The rugged and completely enclosed design does not need any gaskets or "windows" for process and is thus completely maintenance free.

Different additional functions integrated in sensor like flow stop monitoring and full/empty liquid monitoring in pipes increase the customer's benefit 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 immersion type sensor Ex 40-40 is available in different special materials as well as pressure and temperature ratings. The sensor is primarily used for the following applications:

- Solvent receipt of goods (chemical industry)

- Phase separation oil/water (petrochemistry)

- Polymerization processes (polymer chemistry)

- Tar (coking plant)

- Epoxy and phenol resin (polymer chemistry)

- Isopropanol (printing plant)

Available options:

▪ High power electronics article no. 21004110

▪ High power sensor electronic article no. 21004115

▪ Sonic Graph (oscilloscope) article no. 21004400

▪ Attenuation measurement article no. 21004402

▪ Flow detector, (flow/stop) article no. 21004590

▪ Variations in length, material, pressure and temperature rating as well as process connection
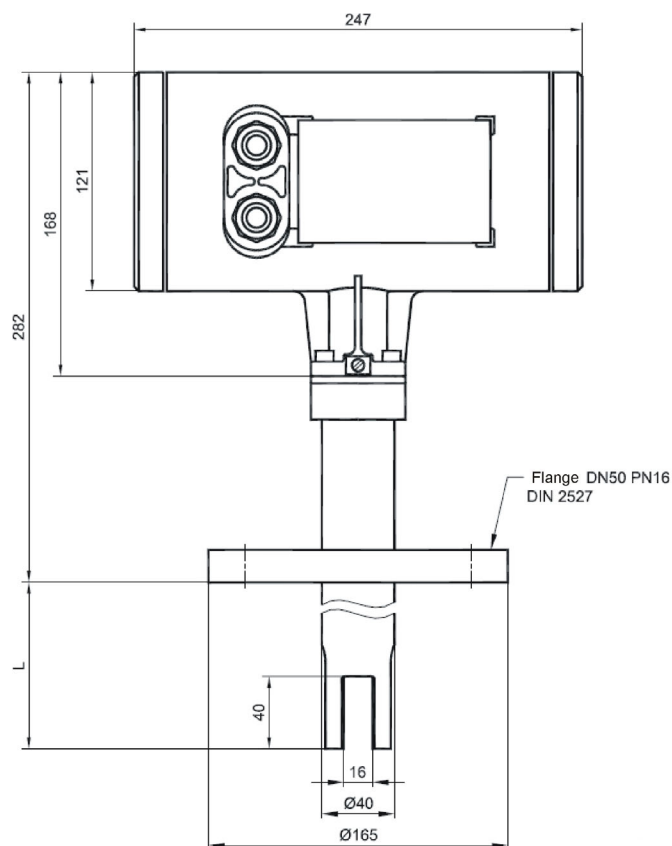
Immersion Type Sensor Ex 40-40

Technical Information Immersion Type Sensor 40-40 Ex

Housing

Dimensions electronic housing	247 x 121 x 168 mm (width x diameter x height)
Material	Aluminium
Degree of protection	IP65
Ambient temperature range	Standard: 0 to 40 °C Optional: -20 to 50 °C

Electrical Data

Power supply	24 V DC ±15 %
Power consumption	Max. 6 W
Fuse	Internal delay fuse with 1 A rated current
Connections	Clamp terminals Nominal cross section: 2.5 mm^2
EMC	According to directive 89/336/EEC
Electrical security	According to directive 2006/95/EC

Data Interfaces

Connection to sensor	CAN-Bus, max. 1000 m pipeline length
Configuration interface	RS-232 (internal)

Measured Quantities

Sonic velocity	Measuring range	Standard optional	1000 to 3000 m/s 700 to 3000 m/s
	Resolution		0.01 m/s
	Reproducibility		+-0.02 m/s
	Accuracy		+-0.05 m/s
	Refresh rate	Standard optional	1000 ms 250 ms
Temperature	Measuring range	Standard optional	-20 to 120 °C -90 to 180 °C
	Resolution		1 mK
	Reproducibility		+-0.02 K
	Accuracy		+-0.05 K
	Refresh rate	Standard optional	1000 ms 250 ms
Attenuation (optional)	Measuring range		80 dB
	Resolution		0.1 dB
	Reproducibility		+-0.2 dB
	Accuracy		+-0.3 dB
	Refresh rate		1 to 5 s (dependent on configuration)

EG-Type-Examination-Certificate

Type of protection	⟨Ex⟩ II 2 G EEx de IIC T3, T4, T5 or T6
Test certificate number	TÜV 01 ATEX 1792
Device designation in test certificate	Immersion Type Sensor, Type Ex-1

4.3. Immersion Type Sensor 40-14 Varivent, (article no. 21003221)

The immersion type sensor Varivent (Type N) is primarily used in food industry, it also complies with the highest hygienic requirements due to its aseptic design including the stainless steel sensor housing.

The sensor contains the measurement of sonic velocity and temperature. The wetted parts are usually made of stainless steel 1.4571. The rugged and completely enclosed design does not need any gaskets or "windows" for process and is thus completely maintenance free.

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

Sensor electronics is mounted in a closed stainless steel housing with IP68 degree of protection and enables the cleaning of process systems, for example, by high-pressure emitter or steam.

The sensor is primarily used for the following applications:

- Measurement of original gravity (beer)
- Brix measurement (mixed drinks, juice, sugar)
- Dry matter in whey (milk)

Available Options:

- High power electronics article no. 21004110
- High power sensor electronic article no. 21004115
- Sonic Graph (oscilloscope) article no. 21004400
- Attenuation measurement article no. 21004402
- Separated electronics
- Flow detector, (flow/stop) article no. 21004590

Immersion Type Sensor 40-14 Varivent

SensoTech
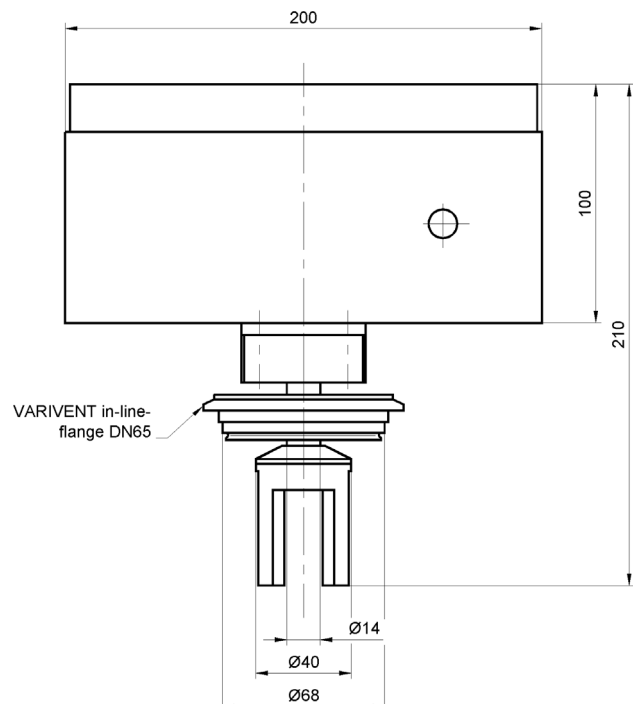
Technical Information Immersion Type Sensor 40-14 Varivent

Housing

Dimensions electronic housing	Stainless steel housing: 200 x 140 x 100 (width x depth x height)
Material	Stainless steel housing: Stainless steel 1.4404
Degree of protection	Stainless steel housing: IP68
Ambient temperature range	Standard: 0 to 50 °C Optional: -20 to 50 °C

Electrical Data

Power supply	24 V DC $\pm$15 %
Power consumption	Max. 6 W
Fuse	Internal delay fuse 1 A rated current
Connections	Clamp terminals Nominal cross section: 2.5 mm^2
EMC	According to directive 89/336/EEC
Electrical security	According to directive 2006/95/EC

Data Interfaces

Connection to sensor	CAN-Bus, max. 1000 m pipeline length
Configuration Interface	RS-232 (internal)

Measured Quantities

Sonic velocity	Measuring range Resolution Reproducibility Accuracy Refresh rate	 Standard optional	1000 to 3000 m/s 0.01 m/s +-0.02 m/s +-0.05 m/s 1000 ms 250 ms
Temperature	Measuring range Resolution Reproducibility Accuracy Refresh rate	Standard optional Standard optional	-20 to 120 °C -90 to 180 °C 1 mK +- K 0.02 K +- ms 0.05 ms 1000 250
Attenuation (optional)	Measuring range Resolution Reproducibility Accuracy Refresh rate		80 dB 0.1 dB +-0.2 dB +-0.3 dB 1 to 5 s (dependent on configuration)

4.4. Immersion Type Sensor 40-14 Tri-Clamp, (article no. 21003263)

Primarily, the sensor is used in the pharmaceutical industry. The sensor can be applied at minimum flows and nominal pipe sizes in miniplants or lab plants by using a flow adapter.

The sensor contains the sonic velocity measuring path as well as the temperature measurement. The wetted parts are usually made of stainless steel 1.4571. The rugged and completely enclosed design does not need any gaskets or "windows" for process and is thus completely maintenance free.

Different additional functions integrated in sensor like flow stop monitoring and full/empty liquid monitoring in pipes increase the customer's benefit 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 with separated electronic housing enables the space-saving integration in cramped installation situations as well as the protection of electronics at strong vibrations within the pipeline-

The clamp flange is connected according to DIN 32676 or similar standards.

The sensor is primarily used for the following applications:

- NaOH (Blending)
- Formic acid
- Methanol
- Ammonium molybdate

Available options:

- High power electronics article no. 21004110
- High power sensor electronic article no. 21004115
- Sonic Graph (oscilloscope) article no. 21004400
- Attenuation measurement article no. 21004402
- Separated electronics
- Flow detector, (flow/stop) article no. 21004590
- Variations available in length, material, temperature levels etc.

Immersion Type Sensor 40-14 Clamp, with separated electronics

Technical Information Immersion Type Sensor 40-14 Tri-Clamp

Housing

Dimensions electronic housing	Standard: die-cast housing: 247 x 121 x 168 mm (width x diameter x height) Optional: stainless steel housing: 200 x 140 x 100 (width x depth x height)
Material	Standard: die-cast housing: aluminum Optional: stainless steel housing: stainless steel 1.4404
Degree of protection	Standard: die-cast housing: IP65 Optional: stainless steel housing: IP68
Ambient temperature range	Standard: -10 to 40 °C Optional: -20 to 50 °C

Electrical Data

Power supply	24 V DC ±15 %
Power consumption	Max. 6 W
Fuse	Internal delay fuse 1 A rated current
Connections	Clamp terminals Nominal cross section: 2.5 mm^2
EMC	According to directive 89/336/EEC
Electrical security	According to directive 2006/95/EC

Data Interfaces

Connection to sensor	CAN-Bus, max. 1000 m pipeline length
Configuration Interface	RS-232 (internal)

Measured Quantities

Sonic velocity	Measuring range Resolution Reproducibility Accuracy Refresh rate	 Standard optional	1000 to 3000 m/s 0.01 m/s +-0.02 m/s +-0.05 m/s 1000 ms 250 ms
Temperature	Measuring range Resolution Reproducibility Accuracy Refresh rate	Standard optional Standard optional	-20 to 120 °C -90 to 180 °C 1 mK +-0.02 K +-0.05 K 1000 ms 250 ms
Attenuation (optional)	Measuring range Resolution Reproducibility Accuracy Refresh rate		80 dB 0.1 dB +-0.2 dB +-0.3 dB 1 to 5 s (dependent on configuration)

5. Sensor Options

5.1. SonicGraph (article no. 21004400)

SonicGraph is a digital oscilloscope and is a comfortable function for visualizing the ultrasonic received signal. SonicGraph enables the **optimal adjustment** of device parameters to the measuring conditions, e.g. for achieving an optimal signal-to-noise ratio. This is relevant, especially in difficult measuring conditions and strongly attenuating process liquids.

Above of the view, additional parameters are shown as follows:

- Temperature and concentration of the liquid
- Runtime of ultrasonic signal
- Standard deviation of runtime
- Sonic velocity of liquid
- Attenuation

The received signal is readjusted via the variation of sonic performance and the digital signal amplification. These modifications are visualized immediately, because the ultrasonic signal will be read once a second.

SonicGraph is a sensor option, especially used for applications in the research, polymerization as well as crystallization and it is required for an optimal device setting.

Additionally, the attenuation signal is visualized at active attenuation measurement (article no. 21004402).
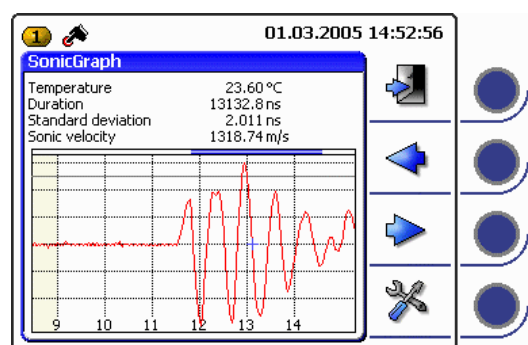
attenuating sonic signal
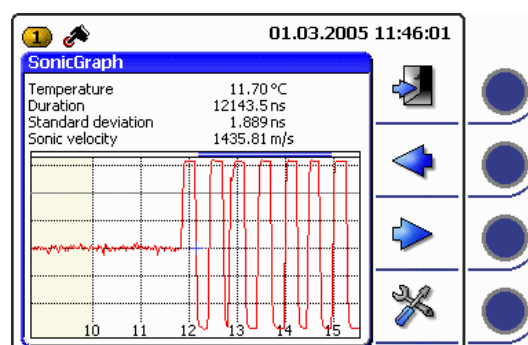
optimized sonic signal

5.3. High Efficient Ultrasonic Ceramic (article no. 21004115)

In this option, the standard ultrasonic transducer is replaced by a high frequent design.

When using this special transducer, the influence of gas bubbles will be minimized to the sonic velocity measurement. Therefore, it is possible to achieve high accuracies even in process liquids with a huge gas rate during concentration measurement.
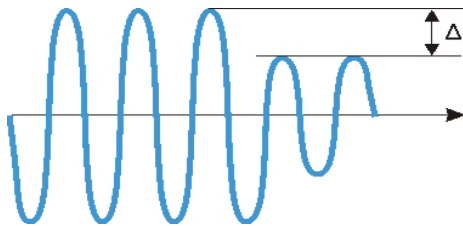
The high efficient ceramic has proved as successful in the following applications.

- Gas scrubbers
- Original gravity measurement (brewery)
- Rolling oil (after filtration)
- Mixed processes (blending)

5.4. High Power Sensor Electronic (article no. 21004110)

The high power sensor electronic is used in process liquids with strong attenuating characteristics.

Therefore, a high solid content leads to a reduction of signal amplitude (Δ) at the receiver within the process liquid.

This reduction can be compensated by increasing the transmitter power. The power is increased at approx.

10 times for this sensor option. Then it is possible to receive an optimal sonic signal even in rough measuring conditions.

In the following applications, the high power sensor electronic has proved to be successful a few times.

- Polymerizations
- Crystallization (Suspensions)
- Particle solutions
- Extrusion products (e.g. adhesive)

5.5. Flanges

A number of flanges and fitting variants are available for an optimal installation of sensors into pipelines or tanks and vessels.

Furthermore, special designs can also be realized.

The following types are available:

Type	Art. no.
DIN Flange DN50	21005310
DIN Flange DN65	21005318
DIN Flange DN80	21005319
DIN Flange DN 100	21005320
ANSI Flange 2"	21005311
ANSI Flange 3"	optional
ANSI Flange 4"	optional

Hygienic fitting DIN 11851	21005322
Pipe thread G 1"	21005316
Pipe thread G 1/2 "	21005314
Pipe thread G 3/4"	21005315
Pipe thread G 2"	21005317
Tri-Clamp Flange DN 25 DIN32676	21005324
Tri-Clamp Flange DN 50 DIN32676	21005312
Varivent Flange	21005321
APV Flange	optional
GF Flange	optional

5.6. Pressure Rating

If the process pressure is over 16 bar / 150 lbs, it is necessary to use process connections with a higher pressure resistance. There are different variants available, especially for DIN and ANSI flanges:

Type	Pressure Nominal	Art. no.
DIN / ANSI Flange	PN 16 / 150 lbs	Standard
	PN 40 / 500 lbs	21005104
	PN 63 / 1000 lbs	21005106
	PN 100 / 1500 lbs	21005110
	PN 200 / 3000 lbs	21005120
	PN 300 / 4000 lbs	21005130
	PN 500 / 7000 lbs	optional
Hygienic fitting DIN 11851		Standard
Pipe thread G	PN 16	Standard
Tri-Clamp Flange DIN32676	PN 16	Standard
Varivent Flange	PN 10	Standard
APV Flange		Standard

5.7. Temperature stability

The standard temperature stability is 120°C. Depending on the sensor type, the following higher stabilities are available for higher process temperatures:

Sensor Type	Temperature Stability	Art. no.
Immersion / Flange Type Sensor	< 120 °C	Standard
Immersion / Flange Type Sensor	< 150 °C	21005215
Immersion / Flange Type Sensor	< 180 °C	21005218
Flange Type Sensor	< 200 °C	21005220

5.8. Certificates

Certificate Pressure Proof (art. no. 21007830)

The LiquiSonic sensors are manufactured for different pressure ratings depending on type and requirements.

In line with the quality assurance, all sensors are checked on impermeability and resistance with 1.5-times of pressure nominal.

The certificate pressure proof can be ordered separately, if required.

LiquiSonic Calibration Certificate (art. no. 21007841)

In order to ensure the specified accuracies, all ultrasonic sensors are calibrated and adjusted in ultrapure water.

Calibration and adjustment are documented in a calibration certificate and they can be ordered separately, if required.

5.9. T-Adapter

In order to facilitate the installation of sensors into the process, a wide range of T-adapters is available for different pipe dimensions.

T-adapter DN 50-50-50

Varivent-In-line-Housings are primarily available for application in the food industry.

Varivent-In-line-Housing

DN 50 art. no. 21004470

DN 65 art. no. 21004471

DN 80 art. no. 21004472

Flow meter adapters having a minimum dead volume are used for low liquid flows.

Tri-Clamp-Adapter

DN 25 art. no. 21004368

Upon prior agreement, **special types of construction** are available in addition for special installation requirements, for example PFA fitting adapters for pipelines with liquids producing deposits.

The adapters can also be delivered as **weld-in socket**.

The following T-adapter are available as standard:
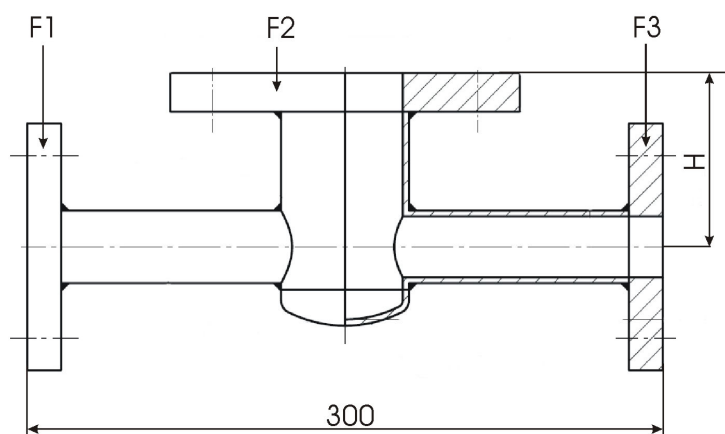
F1 (DN)	F2 (DN)	F3 (DN)	H [mm]	Art. No.
10	50	10	81	21004341
15	50	15	81	21004342
25	50	25	81	21004343
40	50	40	81	2100xxxx
50	50	50	81	21004350
80	50	80	140	21004352
100	50	100	140	21004353
1"	50	1"	81	2100xxxx
1"	2"	1"	81	2100xxxx
2"	2"	2"	81	21004348
3"	2"	3"	140	2100xxxx
2"	3"	2"	124,3	21004345*
2"	3"	2"	100	21004374*

*

*for conductivity sensors

5.10. Cable

The connecting cable is used for digital data exchange between sensors and the controller and supplies the connected sensors with an operating voltage of 24 V DC. This power supply is already integrated into the controller.

The required cross-section of power supply is dependent on cable length (max. 1000m) and on the number of sensors:

Total Length	1 Sensor	2 Sensors	4 Sensors
100 m	2×0.25 mm^2	2×0.5 mm^2	2×0.75 mm^2
200 m	2×0.5 mm^2	2×0.75 mm^2	2×1.5 mm^2
400 m	2×0.75 mm^2	2×1 mm^2	2×2.5 mm^2

Bus cable for indoor

Cables of such a type are intended for running in dry and wet areas.

Quantity	Art. no.
per running meter	21004200
roller 10 m	21004201
roller 100 m	21004202
roller 500 m	21004203

Bus cable for outdoor

This type is suitable for indoor and outdoor due to reinforced PVC outer jacket. It is also suitable for direct running in the ground.

Quantity	Art. no.
per running meter	21004210
roller 10 m	21004211
roller 100 m	21004212
roller 500 m	21004213

Cable for 4-20 mA connection

Additional sensors like conductivity sensors can be connected to the controller via a 4 - 20 mA signal. The following cables are available for connection:

Designation	Art. no.
Indoor installation	21004204
Outdoor installation	21004214

6. Configuration Software

The RS232 interface of the LiquiSonic controller can be addressed by each terminal program or process control system with RS232 support.

SensoTech offers a software with SonicWork, which enables an optimal configuration and data exchange of LiquiSonic analyzers.

6.1. SonicWork (article no. 21007812)

LiquiSonic devices can be operated and configured by means of SonicWork via the RS232 interface and null modem cable.

The most important menu functions are:

Loading of product dataset

If the process changes, it can be necessary to pass a new product dataset for a certain product subsequently to measurement system being already in use.

Loading of device configurations

If the measurement task of a LiquiSonic device being already in use changes, it is possible to adjust the device in an optimal way by loading a corresponding file to this task.

Reading-out of memory

Each LiquiSonic controller contains an internal measured data memory, which stores up to 15,000 datasets (lines) with respectively 32 measured values.

After deactivation of the device, these data remain available. When the data are read-out, they are available in a CSV format and can be further processed, if necessary.

The memory is read-out in the department of research and development, because it is an optimal tool to evaluate reactions, trials and productions.

Recording of process trends

With SonicWork, it is possible to display process trends. In doing so, different measured data can be visualized in real time during a laboratory measurement and these data can also be stored to the internal memory in addition.

Creating of data sheets

Data sheets can be created for purposes of either documentation or diagnostics. These are:

- **General data sheet** with an overview of controller and sensor concerning status, periphery and product datasets.

- **Calibration data** with calibration data of all product datasets for all connected sensors.

- **Periphery** with detailed configuration of inputs and outputs.

Remote Control of controller

SonicWork enables the remote control of LiquiSonic controller. With the integration of devices into a network (TCP/IP) or with the connection of a modem, the devices can be operated from any sites. The same range of functions can be used, as they are available for direct operation of the device.

Calculation of product datasets (optional)

With the option „calculation of product datasets" of SonicWork, the customer receives an effective tool, with which he can react quickly and flexibly on product changes or changes of product measuring ranges concerning their concentration and temperature.

Therefore, it is possible to self-calculate the product datasets. Nevertheless, the employees of SensoTech are available at any time to assist you for validation of your product datasets to achieve a maximum accuracy.

Calculation of product datasets	Art. no.
2-components	21007813
3-components	21007814