



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Liquistation CSF33

Automatic stationary sampler for liquid media
Integrated multiparameter controller



Application

Liquistation CSF33 is a stationary sampler designed for the fully automated sampling, defined distribution, and temperature-controlled storage of liquid media. The standard product version has two 0/4 to 20 mA analog inputs, two binary inputs and two binary outputs.

The sampler is designed for use in the following applications:

- Municipal and industrial sewage treatment plants
- Laboratories and Water Conservancy Boards
- Monitoring of liquid media in industrial processes

Your benefits

- Rugged and reliable:
 - Different kinds of housing material
 - Two-door housing for reliable sample temperature regulation
 - Optimal air circulation
- Simple and easy to use:
 - Swift menu guidance, navigator and large display
 - Two bottle trays for easy sample transportation
 - Parts carrying medium are easy to disassemble, making cleaning and maintenance simple
- Flexible:
 - User friendly programs ranging from simple time programs to event programs
 - Functionality can be extended by installing modular electronic components
 - Sample can be supplied from the side or from below
- Communicative:
 - Integrated data logger for recording measured values
 - Service interface for data transmission
- Safe:
 - Touch-safe low-voltage supply for electronic components
 - Automatic diagnostic monitoring
 - Galvanically separated inputs

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Endress+Hauser 

People for Process Automation

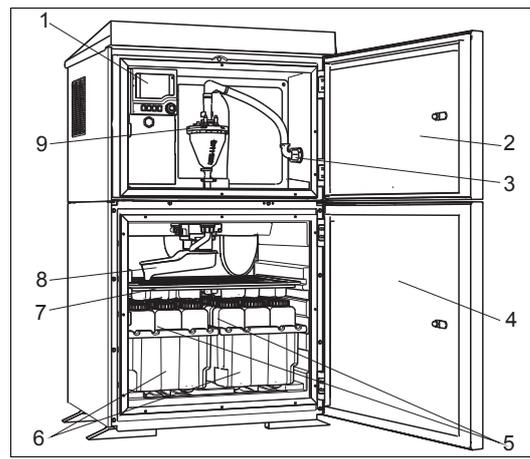
Function system design

Liquistation CSF33 sampler

A complete sampling unit comprises:

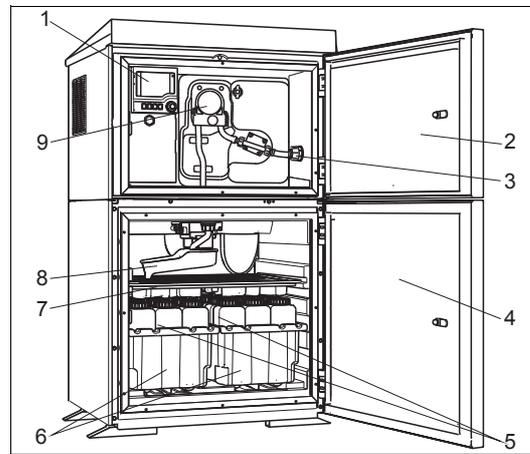
Liquistation CSF33, with the following depending on the version ordered:

- Controller with display, soft keys and navigator
- Vacuum or peristaltic pump for sampling
- Plastic (PE) sample bottles for sample preservation
- Sample compartment temperature control for safe sample storage
- Suction line with suction strainer



Example of a Liquistation CSF33, version with vacuum pump

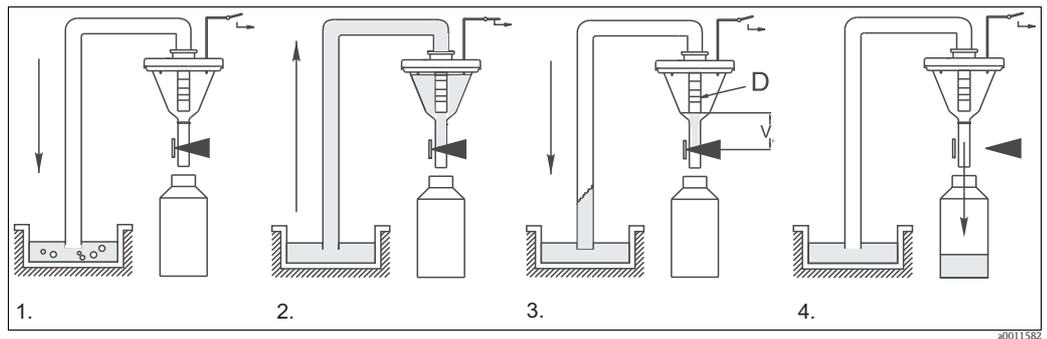
- 1 Controller
- 2 Dosing compartment door
- 3 Suction line connection
- 4 Sampling compartment door
- 5 Sample bottles, e.g. 2 x 12 PE 1 liter bottles
- 6 Bottle trays (depending on the sample bottles selected)
- 7 Distribution plate (depending on the sample bottles selected)
- 8 Distribution arm
- 9 Vacuum system, e.g. dosing system with conductive sample sensor



Example of a Liquistation CSF33, version with peristaltic pump

- 1 Controller
- 2 Dosing compartment door
- 3 Suction line connection
- 4 Sampling compartment door
- 5 Sample bottles, e.g. 2 x 12 PE 1 liter bottles
- 6 Bottle trays (depending on the sample bottles selected)
- 7 Distribution plate (depending on the sample bottles selected)
- 8 Distribution arm
- 9 Peristaltic pump

Mode of operation with a vacuum pump

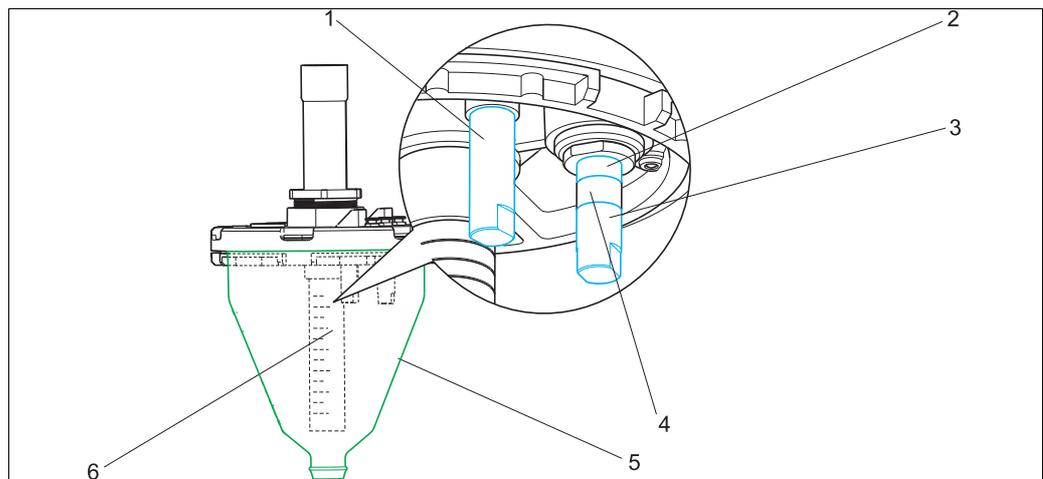


Sampling with a vacuum pump

Sampling takes place in four steps:

1. **Purge**
The vacuum pump blows the suction line clear via the dosing system.
2. **Intake**
The "air manager" - a pneumatic control unit - switches the air path of the vacuum pump to "intake". The sample is drawn into the dosing chamber under vacuum. The level of liquid reaches the detectors in the dosing system.
3. **Dose**
The intake process is completed and pressure compensation takes place. Depending on the position of the dosing tube (D), the excess sample liquid flows back to the sampling point.
4. **Drain**
The hose valve is opened and the sample is drained into the sample bottle.

Dosing system with conductive sample sensor



Conductive dosing system

- 1 Conductivity sensor 1 (common electrode)
 - 2 Conductivity sensor 2 (safety electrode)
 - 3 Conductivity sensor 3 (standard electrode)
 - 4 Insulation
 - 5 Dosing chamber (plastic version)
 - 6 Graduated dosing tube, white and blue scale
- Not shown since hidden: hose connection for vacuum pump

Level detection principle

When the sample is drawn in, the sample level reaches conductivity sensors 1 and 3. The system thus detects that the dosing chamber is filled and terminates the suction process.

If sensor 3 is heavily fouled or fails, conductivity sensor 2 switches to safety mode and turns off the system. This patented sample detection method along with predictive maintenance information prevent vacuum pump failure as a result of flooding.

Sample dosing with/without pressure

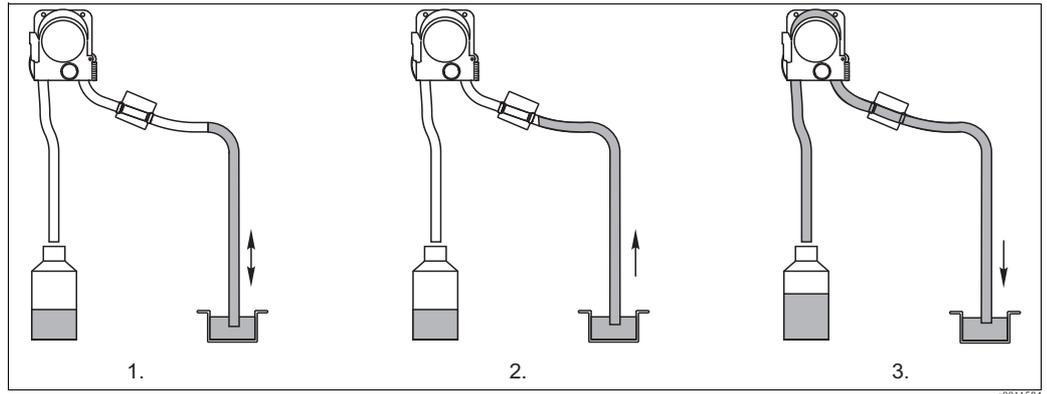
Sample dosing without pressure is the factory setting for all standard applications in which the sample medium is taken from an open channel or a gravity line. The excess sample can flow back under atmospheric pressure. Sample dosing with pressure is selected for applications in which the sample is taken from a pipe, or for applications involving a low suction height and a low sample volume. In such instances, the sample medium cannot flow back on its own. The maximum pressure in the pipe must be < 0.8 bar. Pressure is applied and the excess sample is forced out of the dosing chamber and back to the sampling point.

Adjusting sampling volume

The sampling volume is set by adjusting the dosing tube. The white "A" scale applies if dosing without pressure, and the blue "B" scale applies if dosing with pressure.

The unthoughtful relocate of the dosing tube is prevented by an Allen screw.

Mode of operation with a peristaltic pump



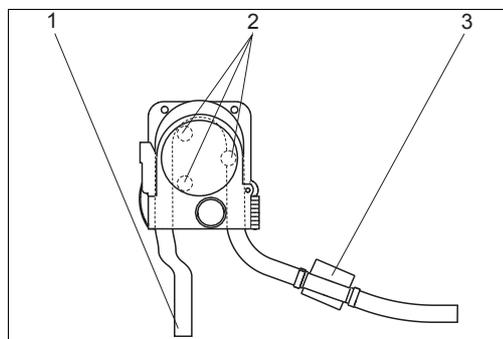
Sampling steps with a peristaltic pump

Sampling takes place in three steps:

1. **Purge/rinse**
The peristaltic pump runs in reverse and forces liquid back to the sampling point.
2. **Intake**
The peristaltic pump runs forward and draws in liquid. If the liquid detection system detects the sample, the pump is controlled by the flow and the specified sample volume is calculated automatically.
3. **Purge**
The pump runs in reverse again and forces the liquid back to the sampling point.

One advantage this system offers for obtaining a representative sample is the possibility of rinsing the suction line several times:

Liquid is initially drawn in until the liquid detection system reacts, then the pump switches and forces the liquid back to the sampling point. This process can be repeated a maximum of three times. The sample is then taken as described.



- 1 Pump tubing
- 2 Pump rollers
- 3 Liquid detection system (patented)

Peristaltic pump

The pump rollers deform the tubing, thereby causing a negative pressure and the suction effect. The liquid detection system is based on a pressure sensor which detects the difference between a pipe that is filled and not filled.

Thanks to a patented process for automatically detecting the suction height, the user does not have to enter the suction height or suction line length. The self-learning software guarantees that the sample volume remains constant.

Navigator and plain text display

The simple and structured operating concept sets new standards:

- Intuitive operation with the navigator and soft keys
- Fast configuration of application-specific measurement options
- Easy configuration and diagnosis thanks to plain-text display
- All languages that can be ordered are available in every device



Easy operation

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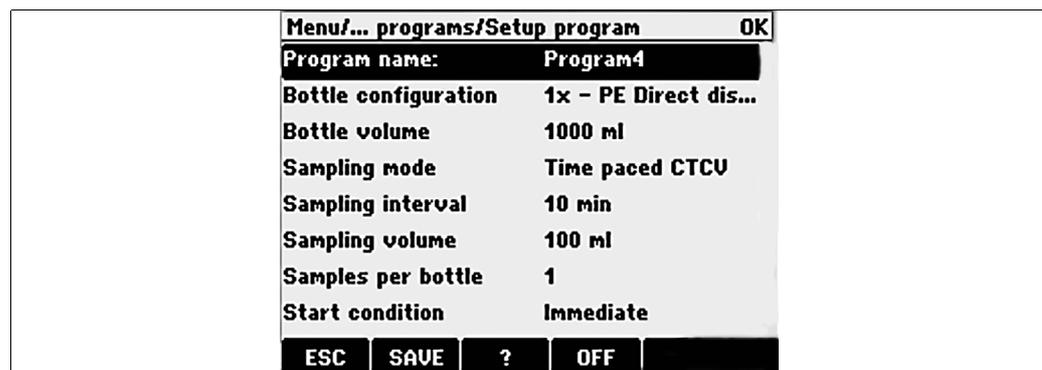
Plain-text menu

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Display

Graphic display:

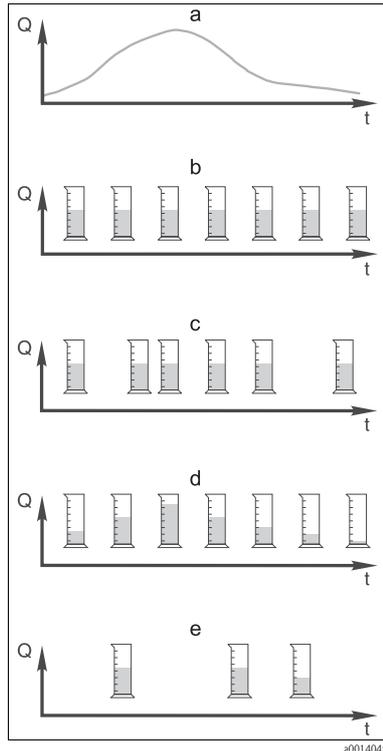
- Backlight with switch-off function
- Red background display for alarms alerts users to errors
- Transflective display technology for maximum contrast even in bright environments



Example of program setup

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Sampling control

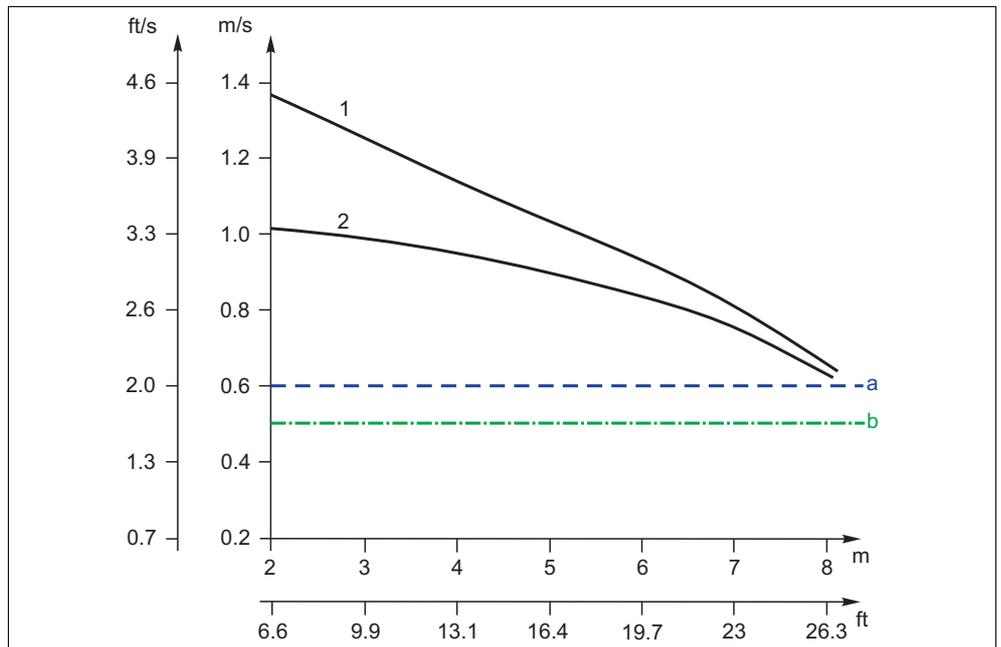


- a. Flow curve
- b. **Time proportional sampling: Constant time constant volume (CTCV)**
A constant sampling volume(e.g. 50 ml) is taken at steady intervals (e.g. every 5 minutes).
- c. **Flow proportional sampling: Variable time constant volume (VTCV)**
A constant sampling volume is taken at variable intervals (depending on the amount of flow volume).
- d. **Flow proportional sampling/time override: Constant time variable volume (CTVV)**
A variable sampling volume is taken at steady intervals.
- e. **Event-controlled sampling:**
Sampling is triggered by an event.

Single and multiple samples can also be grouped in a program in addition to the sampling methods listed. Furthermore, the software allows interval sampling, switchover and event functions. The latter permit up to 24 subprograms to be active simultaneously for a variety of applications.

A sampling table makes it possible for users to program the bottle assignment, time interval and sample volume. Signals for external control can be connected via 2 analog inputs and 2 binary inputs in the standard version of the product. Customized text is entered to ensure the correct assignment of the inputs in the memory.

Intake speed with different suction lines



Intake speed in m/s at suction heights in m (vertical lift)

- a Intake speed as per Ö 5893 (Austrian standard), US EPA
- b Intake speed as per EN 25667, ISO 5667
- 1 ID 13 mm (1/2") vacuum pump
- 2 ID 10 mm (3/8") peristaltic pump

Sample distribution

CSF33 offers a wide range of bottle combinations and distribution versions. The versions can be changed or replaced easily without the need for special tools. In addition, the software makes it possible to configure individual bottles and bottle groups as well as assign them to change based on a programmed event.

Bottle groups and distribution version depending on the order version:

		CSF33-*****
	30 liter, PE, direct distribution	1 piece
	13 liter, PE, direct distribution	4 pieces
	3 liter, PE, plate distribution	12 pieces
	1 liter, PE, plate distribution	24 pieces

Sample preservation

The sample bottles are located in the sample compartment. This is fitted with a seamless plastic inner shell to ensure easy and effective cleaning.

All parts that transport liquid (distribution arm, dosing system, distribution plate etc.) can be removed and cleaned easily without the need for additional tools.



Distribution plate, distribution arm and bottle trays

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Sample temperature regulation

The temperature of the sample compartment can be adjusted using the controller. The factory setting is 4 °C (39 °F). The current temperature is shown on the display and recorded in the internal data logger. The vaporizer and defrost heater are integrated in a special housing such that they are protected against corrosion and damage. The compressor and condenser are located in the upper section of the sampler, and can be easily accessed by removing the upper rear panel.



Cooling system

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Input

Input types	<ul style="list-style-type: none"> ■ 2 analog inputs ■ 2 binary inputs
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Binary input, passive

Span	12 to 30 V, galvanically isolated
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Signal characteristics	Minimum pulse width: 100 ms
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Analog input, passive/active

Span	0/4 to 20 mA, galvanically isolated
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Accuracy	±0.5 % of measuring range
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Output

Output types	2 binary outputs: Open collector, max. 30 V, 200 mA
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Power supply

Electrical connection	→ For a detailed wiring diagram, see the Operating Instructions for Liquistation CSF33
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Supply voltage	100 to 120/200 to 240 V AC ±10 %, 50/60 Hz
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Caution!

A fuse with a maximum rating of 10 A must be provided by the customer. Observe the local regulations for installation.

Cable entry	<p>Depending on the version:</p> <ul style="list-style-type: none"> ■ 1 x M25, 7 x M20 cable gland ■ 1 x M25, 1 x M20 cable gland <p>Permitted cable diameter:</p> <ul style="list-style-type: none"> ■ M20x1.5 mm: 7 to 13 mm (0.28 to 0.51") ■ M25x1.5 mm: 9 to 17 mm (0.20 to 0.67")
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Power consumption	<ul style="list-style-type: none"> ■ Device version with vacuum pump: 290 VA ■ Device version with peristaltic pump: 290 VA
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Power failure	<ul style="list-style-type: none"> ■ Real-time clock: lithium battery, type CR2032
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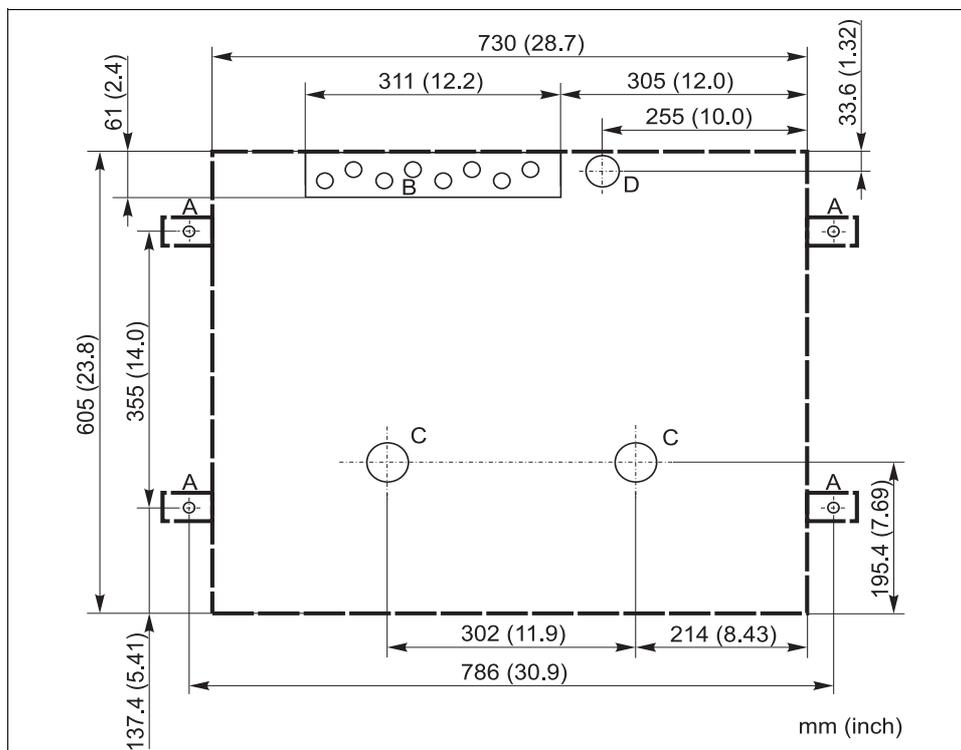
Performance characteristics

Sampling methods	<p>Vacuum pump / peristaltic pump:</p> <ul style="list-style-type: none"> ■ Event sampling ■ Single and multiple samples ■ Sampling table <p>Vacuum pump:</p> <ul style="list-style-type: none"> ■ Time proportional sampling (CTCV) ■ Flow proportional sampling (VTCV) <p>Peristaltic pump:</p> <ul style="list-style-type: none"> ■ Time proportional sampling (CTCV) ■ Flow proportional sampling (VTCV) ■ Flow proportional sampling/time override (CTVV)
Dosing volume	<ul style="list-style-type: none"> ■ Vacuum pump: 20 to 350 ml (0.7 to 12 fl.oz.) ■ Peristaltic pump: 10 to 10000 ml (0.34 to 340 fl.oz.)
Dosing accuracy	<ul style="list-style-type: none"> ■ Vacuum pump: ±5 ml (0.17 fl.oz.) or 5 % of the set volume ■ Peristaltic pump: ±5 ml (0.17 fl.oz.) or 5 % of the set volume
Repeatability	<ul style="list-style-type: none"> ■ Vacuum pump: 5 % ■ Peristaltic pump: 5 %
Intake speed	<p>> 0.5 m/s (> 1.6 ft/s) for ≤ 13 mm (1/2") ID, in accordance with EN 25667, ISO 5667</p> <p>> 0.6 m/s (> 1.9 ft/s) for 10 mm (3/8") ID, in accordance with Ö 5893 (Austrian standard), US EPA</p>
Suction height	<ul style="list-style-type: none"> ■ Vacuum pump: 6 m (20 ft) or 8 m (26 ft), depending on the version ■ Peristaltic pump: Max. 8 m (26 ft)
Hose length	Max. 30 m (98 ft)
Temperature control	<p>Temperature sensors:</p> <ul style="list-style-type: none"> ■ Sampling compartment temperature <p>Cooling module:</p> <ul style="list-style-type: none"> ■ Sample temperature range: 2 to 20 °C (36 to 68 °F) ■ Automatic defrost system

Installation

Installation instructions

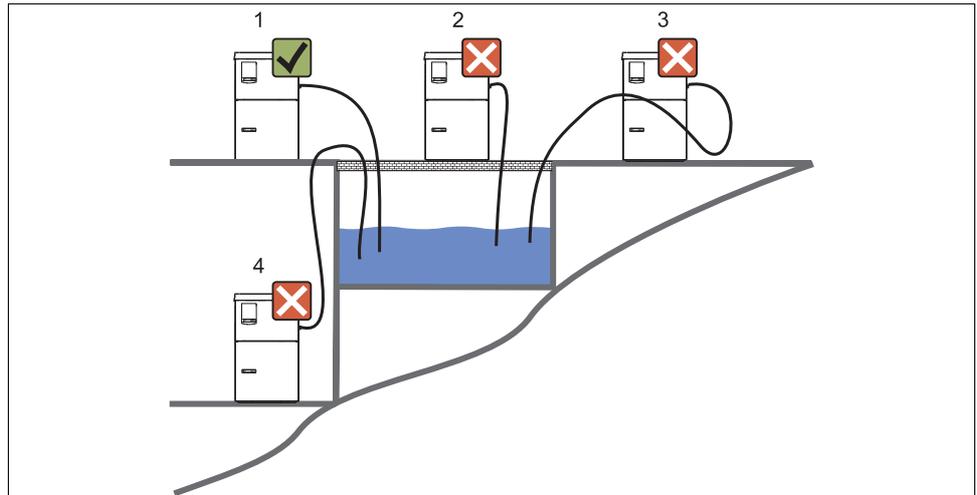
Foundation plan



Foundation plan

- A Fasteners (4 x M10)
- B Cable inlet
- C Outlet for condensate and overflow > DN 50
- D Sample supply from below > DN 80
- Dimensions of Liquistation

Mounting conditions



Mounting conditions

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1. **Correct**
The suction line must be routed with a downward slope to the sampling point.
2. **Incorrect**
The sampler should never be mounted in a place where it is exposed to aggressive gases.
3. **Incorrect**
Avoid siphoning effects in the suction line.
4. **Incorrect**
The suction line should never be routed with an upward slope to the sampling point.

Note the following when mounting the sampler:

- Mount the sampler on a level surface.
- Protect the sampler from additional heating (e.g. from heaters).
- Protect the sampler from mechanical vibrations.
- Protect the sampler from strong magnetic fields.
- Make sure air can circulate freely through the side panels of the housing. Do not mount the sampler directly against a wall. Allow at least 150 mm (5.91") between the wall and the sampler on the left and right-hand sides.
- Do not mount the sampler directly over the inlet channel of a municipal wastewater treatment plant.

Environment

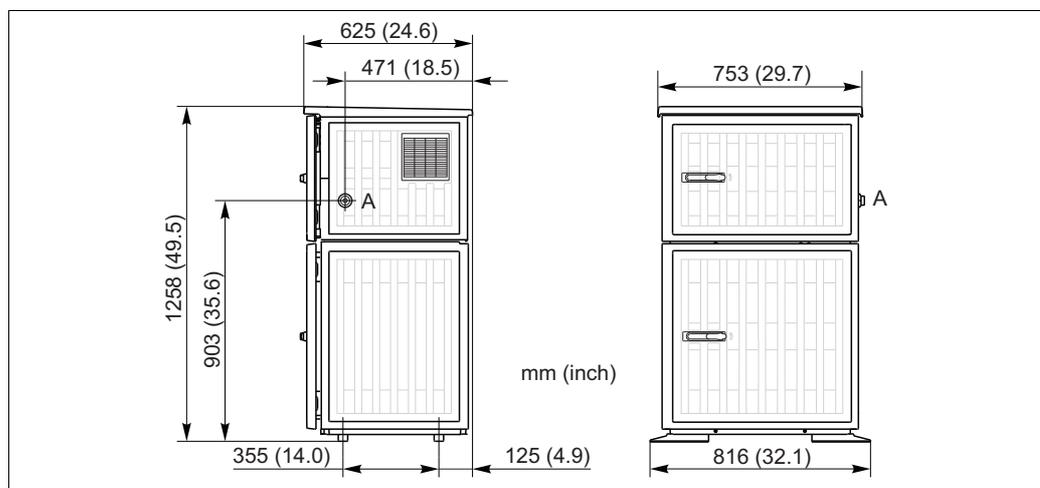
Ambient temperature range	-20 to 40 °C (0 to 100 °F)
Storage temperature	-20 to 60 °C (0 to 140 °F)
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1: 2006, class A for industry
Electrical safety	In accordance with EN 61010-1, protection class I, environment ≤ 2000 m (6500 ft) above MSL; pollution degree 2
Relative humidity	10 to 95%, not condensing

Process

Medium temperature range	2 to 50 °C (36 to 122 °F)
Process pressure	<ul style="list-style-type: none"> ■ Unpressurized, open channel (unpressurized sampling) ■ Max. 0.8 bar piping (pressurized sampling)
Medium properties	<p>Sample media has to be free of abrasive substances.</p> <p>Caution! Pay attention to the material compatibility of the wetted parts.</p>

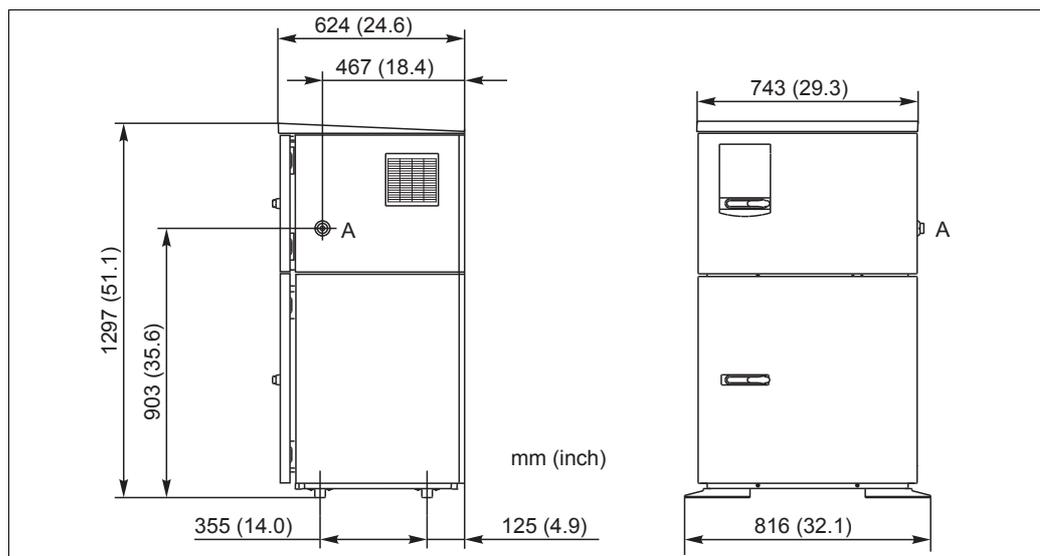
Mechanical construction

Dimensions



Dimensions of plastic version of Liquistation CSF33

A Suction line connection



Dimensions of stainless steel version of Liquistation CSF33

A Suction line connection

Weight

CSF33 sampler version	Weight
Plastic version with refrigeration	101 kg (223 lbs)
Stainless steel version with refrigeration	118 kg (260 lbs)

Material

Non-wetted parts	
Cabinet housing	Plastic polystyrene V0 For standard applications in wastewater treatment plants and environmental monitoring Stainless steel V2A (1.4301) For standard applications in wastewater treatment plants and environmental monitoring
Sample compartment inner shell	Plastic PP
Insulation	Plastic EPS "Neopor"

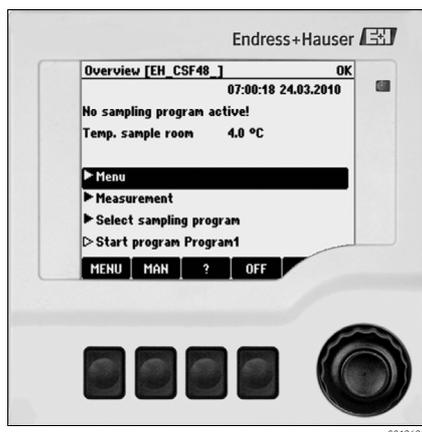
Wetted parts	Vacuum pump	Peristaltic pump
Dosing tube	Plastic PP	-
Dosing chamber cover	Plastic PP	-
Conductivity sensors	Stainless steel V4A (1.4404)	-
Dosing chamber	Plastic PMMA	-
Dosing system outflow tubing	Silicone	-
Pump tubing	-	Silicone
Distribution arm	Plastic PP	
Distribution arm cover	Plastic PE	
Distribution plate	Plastic PS	
Composite container/bottles	Plastic PE	
Suction line	Plastic PVC	
Suction line connection	Plastic PP	

Process connections

- Vacuum pump:
Suction line ID 13 mm (1/2")
- Peristaltic pump:
Suction line ID 10 mm (3/8")

Human interface

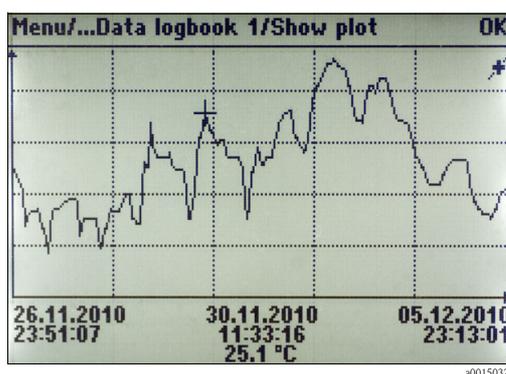
Display and operating elements



- Liquid crystal display, backlighting
- 160 x 240 pixels
- 4 operating keys (soft key function) and navigator
- Menu-guided operation

Memory

- Independent, integrated ring memories (FIFO) or stack memories for recording:
 - An analog value (e.g. flow rate, pH value, conductivity)
 - Events (e.g. power failure)
 - Sample statistics (e.g. sample volume, filling times, bottle assignment)
- Program memory: max. 100 programs
- Data logbooks:
 - Adjustable scan time: 1 to 3600 s (6 h)
 - Max. 8 data logbooks
 - 150,000 entries per logbook
 - Graphic display (load curves) or text display
- Calibration logbook: max. 75 entries
- Hardware version logbook:
 - Hardware configuration and modifications
 - max. 125 entries
- Version logbook:
 - e.g. software updates
 - max. 50 entries
- Operation logbook: max. 250 entries
- Diagnostics logbook: max. 250 entries



Data logbook: Graphic display

Communication

- 1 service interface
- Commubox FXA291 (accessory) required for communication with the PC

Ordering information

Product structure

		Approval	
	AA	Non-hazardous area	
		Sampling method, suction height, dosing chamber, sample detection	
	11	Vacuum pump, 6 m (20 ft), acrylic, conductive	
	15	Vacuum pump, 8 m (26 ft), acrylic, conductive	
	22	Peristaltic pump, 8 m (26 ft)	
		Housing	
	A	Plastic polystyrene PS V0	
	C	Stainless steel V2A (AISI 304x)	
		Sample distribution	
	B	1 x 30 liter (7.92 US gal.), LLDPE, direct	
	E	4 x 13 liter (3.43 US gal.), PE, direct	
	G	12 x 3 liter (0.79 US gal.), PE, plate	
	H	24 x 1 liter (0.26 US gal.), PE, plate	
CSF33-			Order code

Initial setting for operating language (only one option may be selected)	
AA	English
AB	German
AC	French
AE	Italian

Scope of delivery

The scope of delivery comprises:

- 1 stationary sampler with:
 - The ordered bottle configuration
 - Suction line with strainer
 - Optional hardware
- Accessories kit with:
 - Connection fitting for suction line with various angles
 - Allen key (vacuum pump)
- 1 "Commissioning" Operating Instructions
(In the preferred language if the "Default operating language" order option is selected. Otherwise, the Brief Operating Instructions are supplied in English)
- 1 CD-ROM with Operating Instructions in all the languages available
- Optional accessories

Certificates and approvals

CE approval

Declaration of conformity

The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.

The manufacturer confirms successful testing of the product by affixing the CE symbol.

Accessories

i In the following sections, you find the accessories available at the time of issue of this documentation. For information on accessories that are not listed here, please contact your local service or sales representation.

Accessories for Liquistation CSF33

Bottle tray + bottles + cap	
71111152	Bottle tray + 6 x 3 liter (0.79 US gal.) PE+ cap
71111154	Bottle tray + 12 x 1 liter (0.26 US gal.) PE + cap
Distribution plate; Locating insert	
71111158	Distribution plate for 2 x 6 bottles
71111159	Distribution plate for 2 x 12 bottles
Bottles + caps	
71111164	1 liter (0.26 US gal.) PE + cap, 24 pcs.
71111167	3 liter (0.79 US gal.) PE + cap, 12 pcs.
71111169	13 liter (3.43 US gal.) PE + cap, 1 pc.
71111172	30 liter (7.92 US gal.) PE + cap, 1 pc.
Complete suction line	
71111233	Suction line ID 10 mm (3/8"), reinforced braided, PVC, clear, length 10 m (33 ft), strainer V4A
71111235	Suction line ID 13 mm (1/2"), reinforced spiral wire, PVC, length 10 m (33 ft), strainer V4A
Suction line coil	
71111482	... m, ID 10 mm (3/8"), PVC suction line coil
71111485	... m, ID 13 mm (1/2"), PVC suction line coil
Strainer	
71111184	Strainer V4A for ID 10 mm (3/8"), 1 pc.
71111185	Strainer V4A for ID 13 mm (1/2"), 1 pc.
Tubing customized; Vacuum pump	
71111188	Dosing tubing to distributor, 2 pcs.
71111189	Dosing tubing to distributor, 25 pcs.
Tubing customized; Peristaltic pump	
71111191	Pump tubing, long and short tubing included, 2 pcs. of each
71111192	Pump tubing, long and short tubing included, 25 pcs. of each

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