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2023-07-05

Technical Information
Liquistation CSF28

Automatic stationary sampler for liquid media



Applications

Liquistation CSF28 is suitable for time- and flow-controlled sampling in the following applications:

Municipal and industrial wastewater treatment plants:
- Self-monitoring
- Process monitoring
- Monitoring of dischargers
- Monitoring of wastewater systems

Authorities and water management offices:
- Water pollution control and water quality
- Monitoring of dischargers

Your benefits

- **Intended purpose:** Application-specific operation, e.g. filling capabilities
- **Easy commissioning:** Quick customization to monitoring task with wizard-guided setup
- **Reliable and robust sampling:** Keep your process running without interruptions or variations thanks to time-tested components and comprehensive diagnostic capabilities at the device for maintenance purposes
- **Reduced maintenance:** Liquistation CSF28 enables fast and easy cleaning and maintenance thanks to the simple and tool-free removal of parts in contact with the medium
- **Basic monitoring functions:** Definition of time- or flow-controlled sampling routines adapted to your requirements, simple monitoring without event sampling
- **Cutting-edge cooling technology:** Benefit from sustainable and environmentally friendly technologies to store your samples
- **Full compliance:** Automatic water sampling in full compliance with all the relevant national and international standards such as ISO 5667

Endress+Hauser
People for Process Automation

Table of contents

Function and system design 3
Device principle 3
Sampling unit 5
Reliability 9

Input 10
Types of input 10
Binary input, passive 10
Temperature input 10
Analog input, passive/active 10

Output 10
Communication 10
Relay output 11

Protocol-specific data 11
Web server 11

Power supply 11
Supply voltage 11
Power consumption 11
Electrical connection 11
Cable entries 11
Mains fuse 11

Performance characteristics 12
Sampling methods 12
Dosing volume 12
Dosing accuracy 12
Repeatability 12
Intake speed 12
Suction height 12
Hose length 12
Temperature control 12

Installation 13
Installation instructions 13
Installation conditions 13

Environment 14
Ambient temperature range 14
Storage temperature 14
Electrical safety 14
Relative humidity 14
Degree of protection 14
Electromagnetic compatibility (EMC) 14

Process 14
Medium temperature range 14
Process pressure range 14
Medium properties 14
Process connection 14

Mechanical construction 15
Dimensions 15
Weight 15
Materials 15

Operability 17
Operating concept 17
Display 17
On-site operation 17
Remote operation 18
Communication 18
Software 18

Certificates and approvals 19

Order information 20
Product page 20
Product Configurator 20
Scope of delivery 20

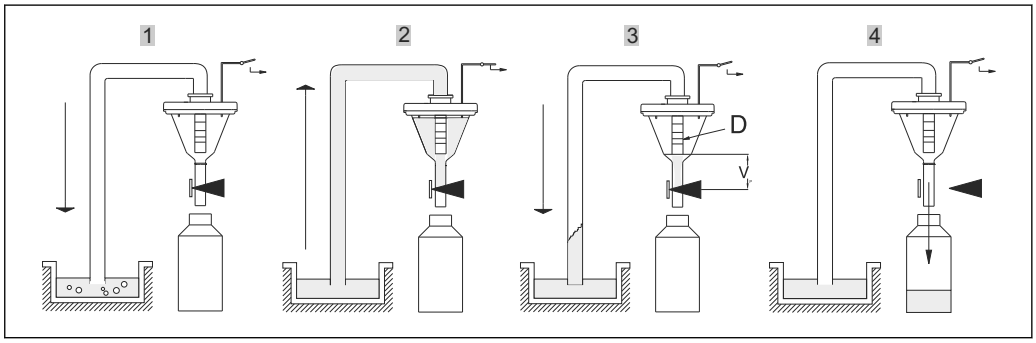
Accessories 21

Function and system design

Device principle

Mode of operation with a vacuum pump

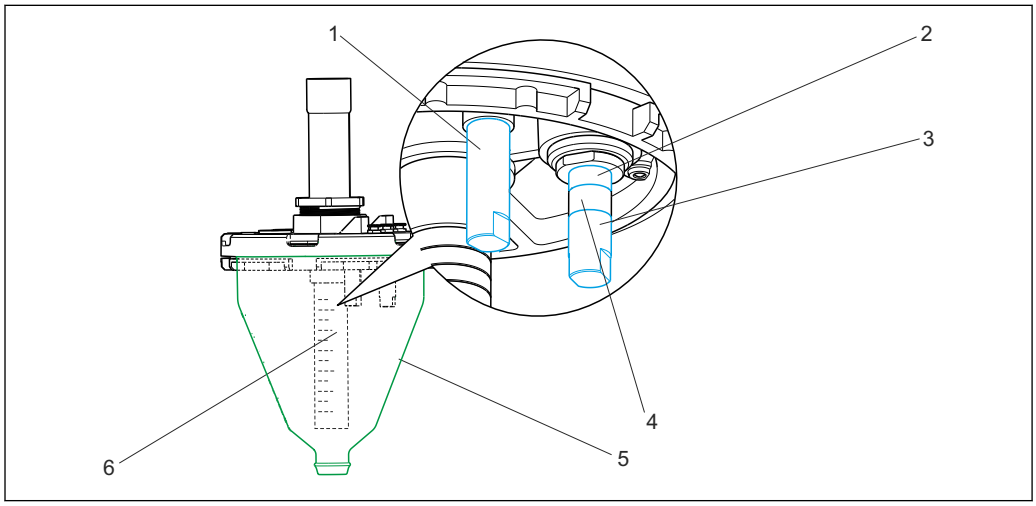
Sampling takes place in four steps:



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1. Blow clear
   ↳ The vacuum pump blows the suction line clear via the dosing system.
2. Intake
   ↳ The "Airmanager" (pneumatic control unit) switches the air path of the vacuum pump to "intake". The sample is drawn into the dosing beaker until it reaches the conductivity probes of the dosing system.
3. Dose
   ↳ The intake process ends. Depending on the position of the dosing tube (item D), the excess sample liquid flows back to the sampling point.
4. Drain
   ↳ The hose clamp is opened and the sample is drained into the sample bottle.

Dosing system with conductive sample sensor



1 Conductive dosing system

1 Conductivity sensor 1 (common electrode)
2 Conductivity sensor 2 (safety electrode)
3 Conductivity sensor 3 (standard electrode)
4 Insulation
5 Measuring jug (plastic version)
6 Graduated dosing tube, white and blue scale

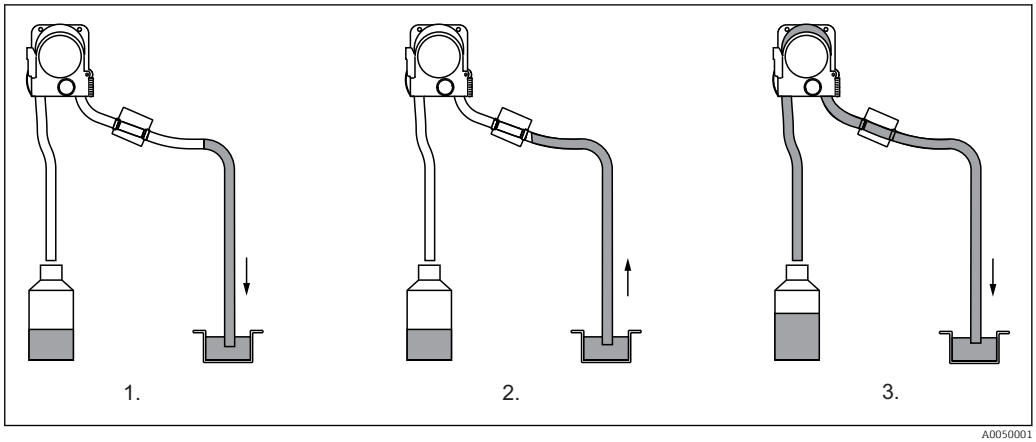
Level detection principle

When the sample is drawn in, the sample level reaches conductivity sensors 1 and 3. As a result, the system detects that the measuring jug is filled and the intake process is stopped. If sensor 3 fails or is very dirty, a safety shutdown is performed by conductivity sensor 2. This patented sample detection method prevents vacuum pump failure due to flooding and enables predictive maintenance information to be displayed.

Sample dosing without/with 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 involving a low suction height, small sampling volumes or high-viscosity samples. In these cases, the sample medium cannot flow back on its own. The excess sample is forced out of the measuring jug under pressure and back to the sampling point. The sample 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.

Mode of operation with a peristaltic pump

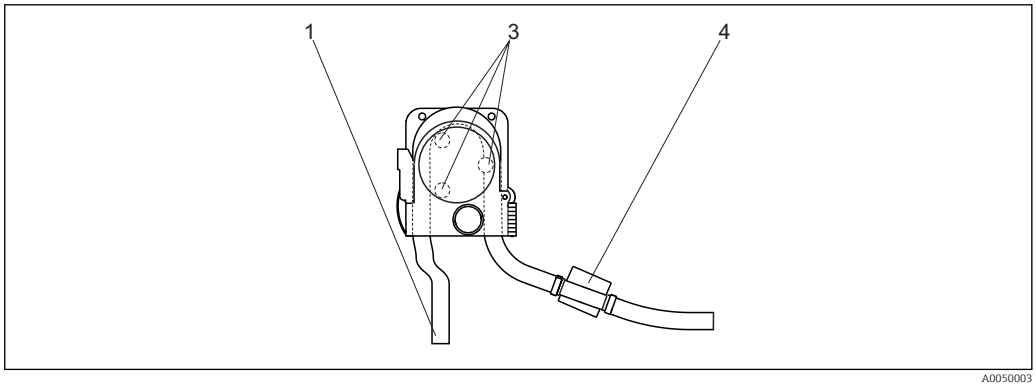


2 *Sampling steps with a peristaltic pump*

Sampling takes place in three steps:

1. Rinse
   ↳ The peristaltic pump runs in reverse and forces medium back to the sampling point.
2. Intake
   ↳ The peristaltic pump runs forward and draws in medium. If the medium detection system detects the sample, the pump is controlled by the flow and the specified sample volume is calculated automatically.
3. Drain
   ↳ The pump runs in reverse again and forces the medium back to the sampling point.

One advantage for obtaining a representative sample is the possibility of rinsing the suction line several times: Medium is initially drawn in until the medium detection function responds, then the pump switches and forces the medium back to the sampling point. This process can be repeated a maximum of three times. The sample is then taken as described.



3 *Peristaltic pump*

1 Pump tube
3 Pump rollers
4 Medium detection system (patented)

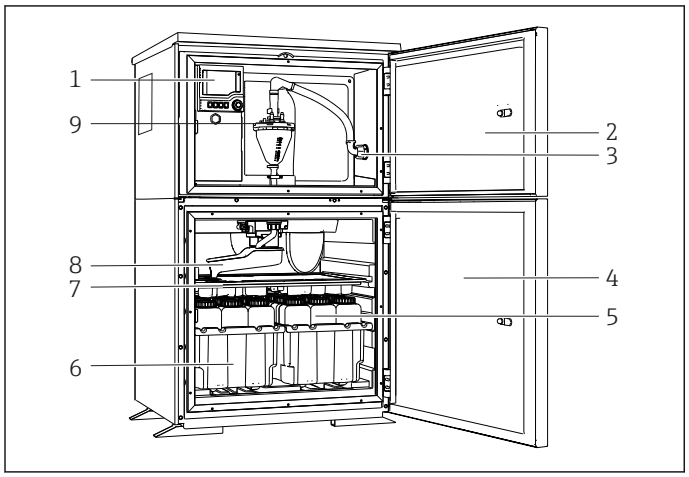
The pump rollers deform the hose, thereby causing a negative pressure and the suction effect. The medium detection system is based on a pressure sensor which detects the difference between a pipe that is filled and not filled. Thanks to a patented process for automatically detecting the suction height, the user does not need to enter the suction height or suction line length. The self-learning software guarantees a constant sample volume.

Sampling unit

Samplers Liquistation CSF28

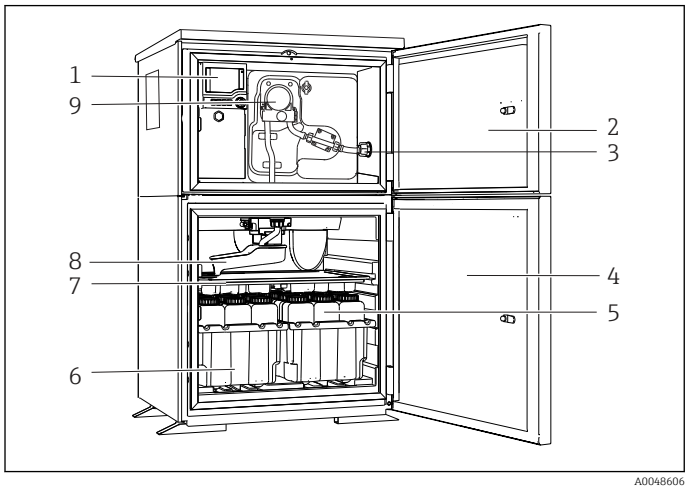
Depending on the version, a complete sampling unit for open channels comprises:

- Controller with display, soft keys and navigator
- Vacuum or peristaltic pump for sampling
- PE sample bottles for sample preservation
- Sampling chamber temperature regulator for safe sample storage
- Suction line with suction head



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

4 Example of a Liquistation, version with vacuum pump



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

5 Example of a Liquistation, version with peristaltic pump

Sample distribution

The sampler offers a wide range of bottle combinations and distribution versions. The versions can be changed or replaced easily without the need for special tools.

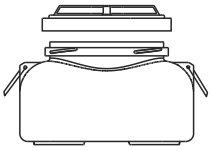
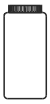
Sample preservation

The sample bottles are located in the sample compartment. This is fitted with a seamless plastic dish to ensure easy cleaning. All parts that transport medium (distribution arm, dosing system...) can be removed and cleaned easily without the need for tools.



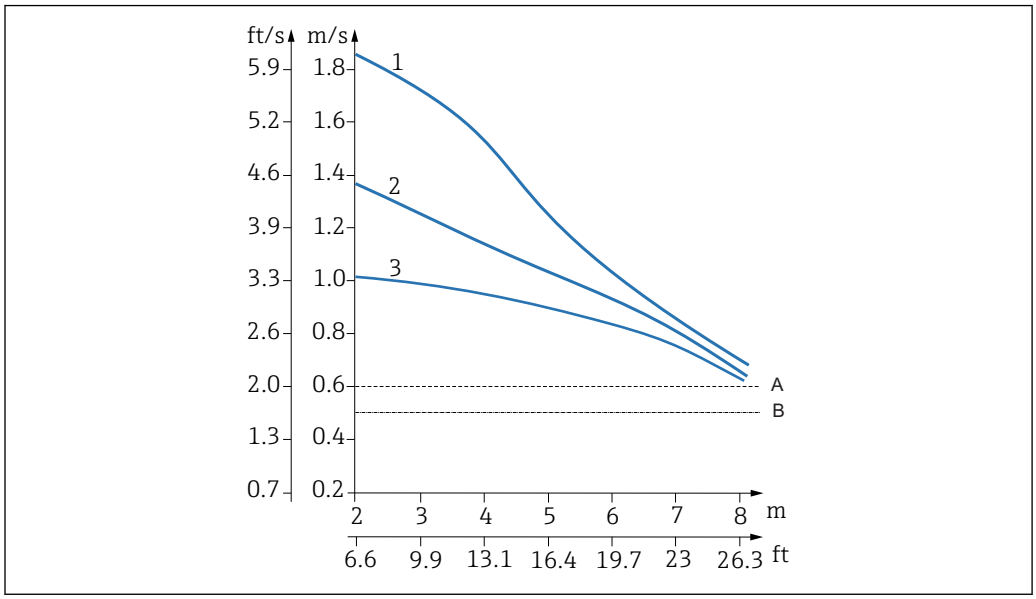
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Bottle groups and distribution versions with the number of bottles.

1x 30 liters PE direct distribution  A0024349	1x 60 liters PE direct distribution  A0025843	4x 17 liters LLDPE direct distribution  A0025967
4x 13 liters PE direct distribution  A0025968	12x 3 liters PE plate distribution  A0025971	24x 1 liter PE plate distribution  A0025974

Sampling control

Intake speed with different suction lines



6 Intake speed in m/s (ft/s) with suction height in m (ft)

A Intake speed as per Ö 5893; US EPA
B Intake speed as per EN 25667, ISO 5667
1 ID 10 mm (3/8 in) vacuum pump
2 ID 13 mm (1/2 in) vacuum pump
3 ID 10 mm (3/8 in) peristaltic pump

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 is recorded in the internal data logger once the user has successfully run through the Commissioning Wizard.

The vaporizer and defrost heater are integrated in a special housing such that they are protected against corrosion and damage. The compressor and the condenser are located in the upper section of the sampler. They can be easily accessed by removing the upper rear panel (for maintenance purposes).

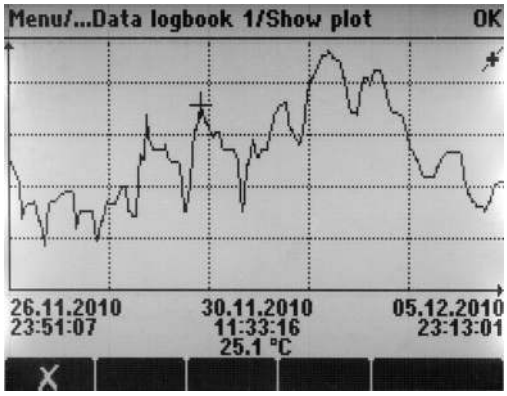
Sampler housing

The housing is made from high-grade plastic ASA+PC VO. This material is highly resistant to external influences and is very suitable for outdoor installations.

Reliability

Ease of maintenance

Memory
- Independent, integrated ring memories (FIFO)
  - an analog value (e.g. temperature, flow measurement)
  - events (e.g. power failure)
  - Sample statistics (e.g. sampling volume, filling times, bottle assignment)
- Program memory: max. 3 programs
- Data logbooks:
  - Adjustable scan time: 1 to 3600 s (1 h)
  - Max. 8 data logbooks
  - 150,000 entries per logbook
  - Graphic display (load curves) or numerical list
- Calibration logbook: max. 75 entries
- Hardware logbook:
  - Hardware configuration and modifications
  - Max. 125 entries
- Version logbook:
  - Including software updates
  - Max. 50 entries
- Operations logbook: max. 250 entries
- Diagnostic logbook: max. 250 entries



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7 *Data logbook: graphic display*

FieldCare
Configuration and asset management software based on FDT/DTM technology
- Complete device configuration when connected via FXA291 and service interface
- Logbooks can be downloaded in CSV format

SD card
The exchangeable storage medium enables:
- Quick and easy software updates and upgrades
- Data storage of internal device memory (e.g. logbooks)
- Transfer of complete configurations to a device with an identical setup (backup function)
- Transfer of configurations without the device designation to devices with an identical setup (copy function)

Safety

Real-time clock

The device has a real-time clock, which is backed up by a button cell in the event of a power failure. This ensures that the device continues to keep the correct time and date if it is restarted and that the time stamp for the logbooks is correct.

Data security

All settings, logbooks etc. are stored in a non-volatile memory to ensure that the data are retained even in the event of a disruption to the power supply.

Input

Types of input

1 analog input
1 binary input

Binary input, passive

Span

12 to 30 V, galvanically isolated

Signal characteristics

Minimum pulse width: 100 ms

Signal edge

Low-high

Temperature input

Measuring range

-30 to 70 °C (-20 to 160 °F)

Accuracy

± 0.5 K

Type of input

Pt1000

Analog input, passive/active

Span

0/4 to 20 mA, galvanically isolated

Accuracy

±0.5 % of measuring range

Output

Communication

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

Relay output

Electrical specification

Relay type
1x changeover contact, coupled with binary output

Maximum load
Alarm relay: 2.0 A

Relay switching capacity

Relay coupled with binary output

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, cosΦ = 0.8 to 1	5 A	100,000
24 V DC, L/R = 0 to 1 ms	5 A	100,000

Minimum load (typical)
- min. 100 mA at 5 V DC
- min. 1 mA at 24 V DC
- min. 5 mA at 24 V AC
- min. 1 mA at 230 V AC

Protocol-specific data

Web server

The web server enables full access to the device configuration, measured values, diagnostic messages, logbooks and service data via standard WiFi/WLAN/LAN/GSM or 3G routers with a user-defined IP address.

TCP port	80
Supported features	▪ Remote-controlled device configuration ▪ Save/restore device configuration (via SD card) ▪ Logbook export (file format: CSV) ▪ Access to web server via DTM or Internet Explorer

Power supply

Supply voltage

100 to 120/200 to 240 V AC ±10 %, 50/60 Hz

Power consumption

- Version with vacuum pump: 290 VA
- Version with peristaltic pump: 290 VA

Electrical connection

See the "Electrical connection" section ()

Cable entries

1 x M25, 1 x M20 cable gland

Permitted cable diameter:
- M20x1.5 mm: 7 to 13 mm (0.28 to 0.51")
- M25x1.5 mm: 9 to 17 mm (0.20 to 0.67")

Mains fuse

T3.15A (for 230V power supply)

Performance characteristics

Sampling methods

Vacuum pump:
- Time-paced
- Flow-paced

Peristaltic pump:
- Time-paced
- Flow-paced
- Flow proportional sampling/time override (CTVV)

Dosing volume

Vacuum pump:
20 to 350 ml (0.7 to 12 fl.oz.)

Peristaltic pump:
10 to 10000 ml (0.3 to 340 fl.oz.)

The dosing accuracy and the repeatability of a sample volume < 20 ml (0.7 fl.oz) can vary, depending on the specific application.

Dosing accuracy

- **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

5 %

Intake speed

> 0.5 m/s (> 1.6 ft/s) for ≤ 13 mm (1/2 in) ID, as per EN 25667, ISO 5667, CEN 16479-1

> 0.6 m/s (> 1.9 ft/s) for 10 mm (3/8 in) ID, as per Ö 5893; US EPA

Suction height

- **Vacuum pump:**
  Max. 6 m (20 ft)
- **Peristaltic pump:**
  Max. 8 m (26 ft)

Hose length

Max. 30 m (98 ft)

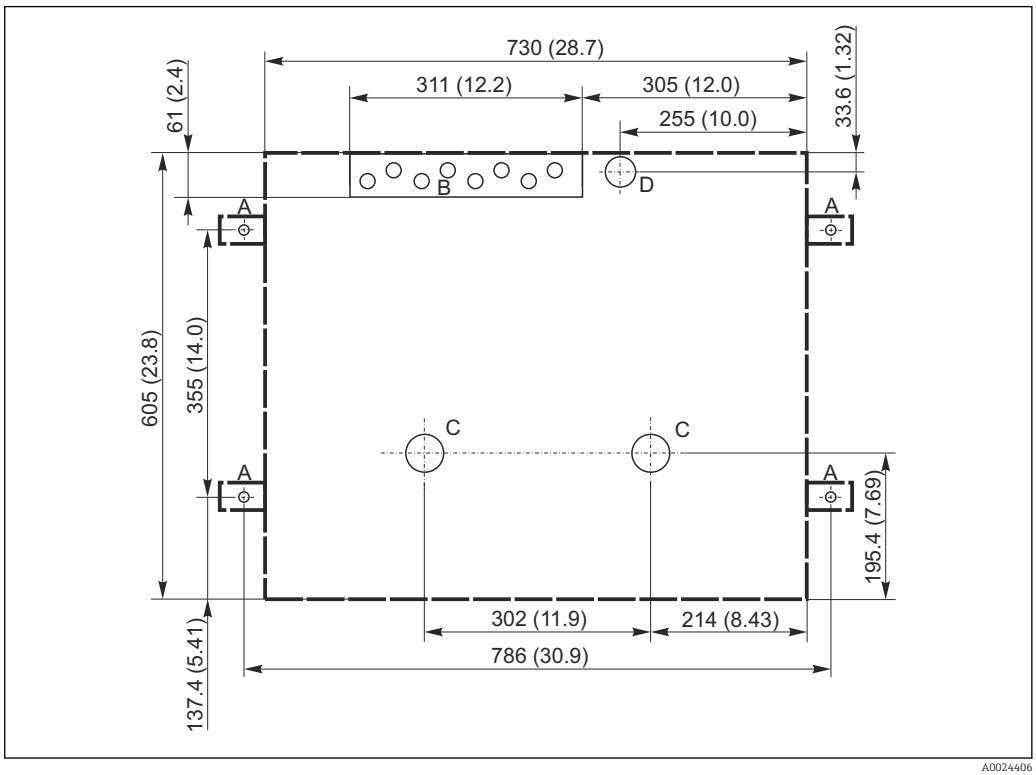
Temperature control

Temperature sensors:
Sampling compartment temperature

Cooling module:
- Sample temperature range: 2 to 20 °C (36 to 68 °F)
  Factory setting: 4 °C (39 °F)
- Automatic defrost system
- Cooling rate in accordance with Ö 5893 (Austrian standard):
  4 liters of water at 20 °C (68 °F) cool down to 4 °C (39 °F) in less than 210 minutes
- Temperature constancy of sample at 4 °C (39 °F) at an operating temperature range of -15 to 40 °C (5 to 105 °F)

Installation

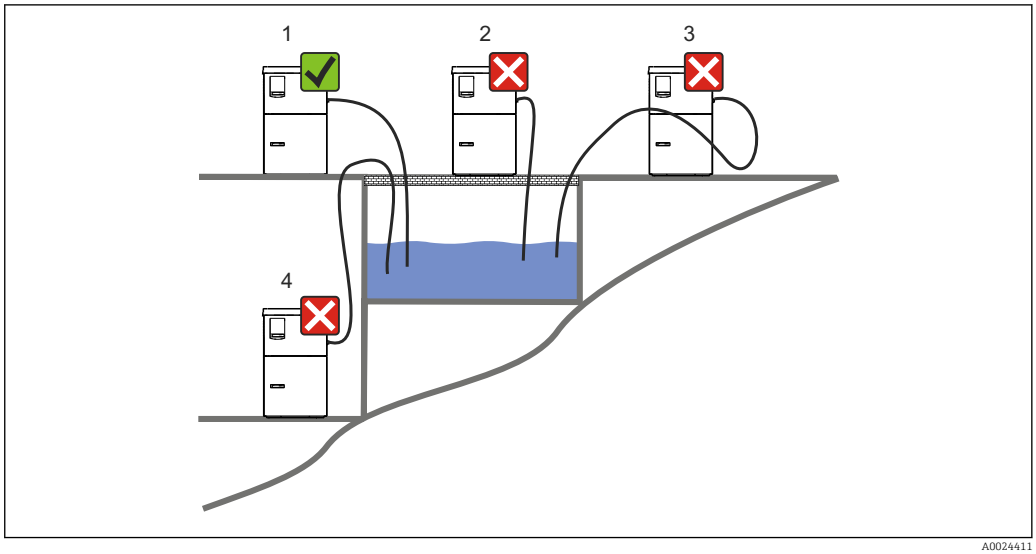
Installation instructions



8 *Foundation plan. Unit of measurement mm (in)*

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

Installation conditions



9 *Liquistation mounting conditions*

Mounting conditions
Route the suction line with a downward gradient to the sampling point.
Never mount the sampler in a place where it is exposed to aggressive gases.

Mounting conditions
Avoid siphoning effects in the suction line.
Do not route the suction line with an upward gradient to the sampling point.

Note the following when erecting the device:
- Erect the device on a level surface.
- Connect the device securely to the surface at the fastening points.
- Protect the device against additional heating (e.g. heaters or direct sunlight).
- Protect the device against mechanical vibrations.
- Protect the device against strong magnetic fields.
- Make sure air can circulate freely at the side panels of the cabinet. Do not mount the device directly against a wall. Allow at least 150 mm (5.9 in.) from the wall to the left and right.
- Do not erect the device directly above the inlet channel of a wastewater treatment plant.

Environment

Ambient temperature range

With cooling module: -20 to 40 °C (0 to 104 °F)

Storage temperature

–20 to 60 °C (–4 to 140 °F)

Electrical safety

In accordance with EN 61010-1, protection class I, environment ≤ 2000 m (6500 ft) above MSL. The device is designed for pollution degree 2.

Relative humidity

10 to 95%, not condensing

Degree of protection

- Front dosing compartment: IP 54
- Rear dosing compartment: IP 33
- Front panel with display (internal): IP 65
- Sample compartment: IP 54

The IP protection ratings listed above apply for individual sections of the overall device. The resulting degree of protection for the overall device is IP33.

Electromagnetic compatibility (EMC)

Interference emission and interference immunity as per EN 61326-1:2013, Class A for Industry

Process

Medium temperature range

2 to 50 °C (36 to 122 °F)

Process pressure range

Unpressurized, open channel (unpressurized sampling)

Medium properties

Vacuum pump
Sample media has to be free of abrasive substances.

Peristaltic pump
Sample media has to be free of abrasive substances.

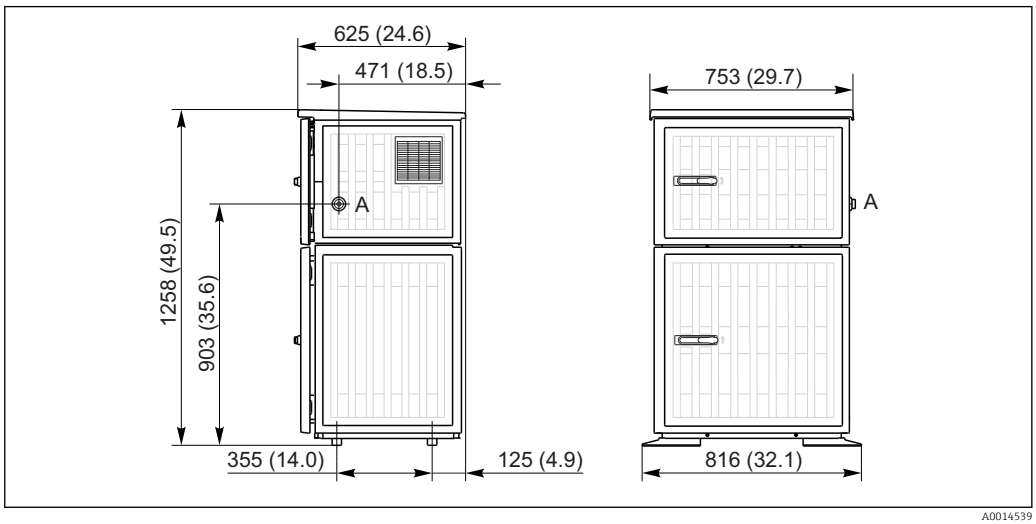
Pay attention to the material compatibility of the wetted parts.

Process connection

- **Vacuum pump:**
  Intake hose ID 10 mm (3/8 in) and 13 mm (1/2 in)
- **Peristaltic pump:**
  Intake hose ID 10 mm (3/8 in)

Mechanical construction

Dimensions



10 *Dimensions of Liquistation, plastic version. Unit of measurement mm (in)*

A Suction line connection

Weight

Sampler version	Weight
Plastic version with refrigeration	101 kg (223 lbs)

Materials

Non-wetted parts	
Cabinet housing	**Plastic ASA+PC V0** For industrial wastewater treatment plants with an aggressive atmosphere
Sample compartment inner lining	Plastic PP
Insulation	Plastic EPS "Neopor®"

Wetted parts	Vacuum pump	Peristaltic pump
Dosing tube	Plastic PP	-
Measuring jug cover	Plastic PP	-
Conductivity sensors	Stainless steel V4A (1.4404)	-
Measuring jug	PMMA	-
Dosing system outflow hose	Silicone	-
Pump tube	-	Silicone
Distribution arm	Plastic PP	
Distribution arm cover	Plastic PE	
Distribution plate	Plastic PS	
Composite container/bottles	Plastic PE	
Intake hose	Plastic PVC, EPDM (depending on version)	
Hose connection	Plastic PP	

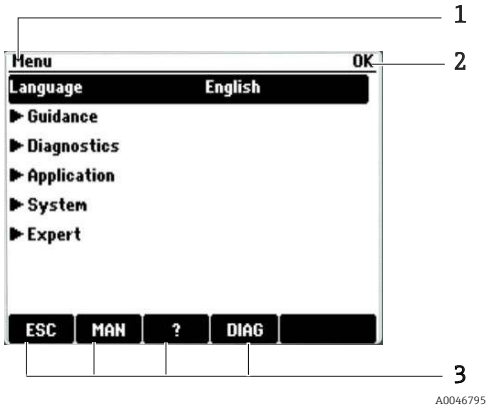
Choose process seal depending on the application. Viton is recommended for standard applications involving watery samples.

Vacuum pump only	
Pneumatic hoses	Silicone
Air Manager housing	PC
Air Manager sealing plate	Silicone
Pump head	Aluminum, anodized
Pump membrane	EPDM

Operability

Operating concept

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

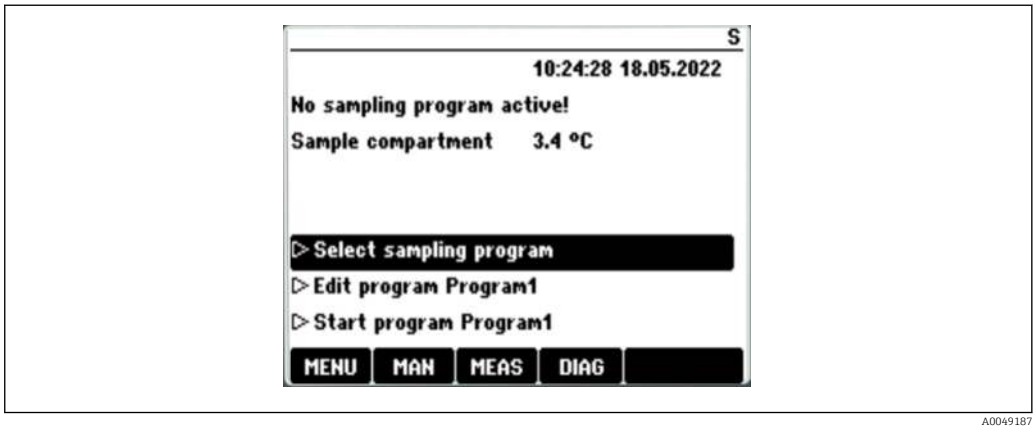


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1 Menu path and/or device designation
2 Status indicator
3 Assignment of soft keys, e.g.:
ESC: escape or abortion of a sampling process
MAN: manual sample
?: Help, if available
DIAG: link to Diagnostics menu
(If the program is active: MODE: stop program)

Display

Graphic display:
- Resolution: 240 x 160 pixel
- Back light with switch-off function
- Red display background for alarms alerts users to errors
- Transflective display technology for maximum contrast even in bright environments



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11 Example of start menu

On-site operation

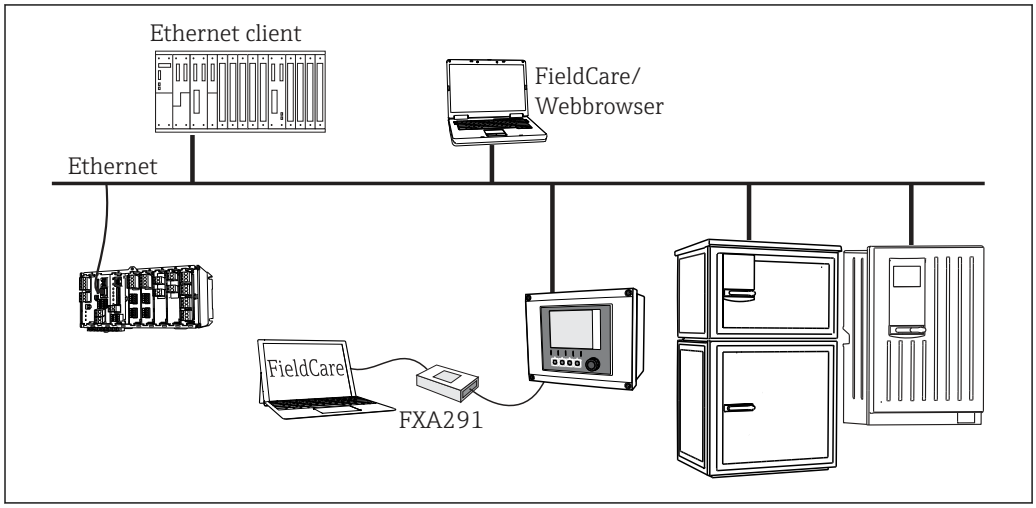


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- LCD, illuminated (with red background in the event of an error)
- 160 x 240 pixels
- 4 operating keys (soft key function) and navigator (jog/shuttle and press/hold function)
- Menu-guided operation

Remote operation

Web server



12 Example of system integration via web server

Communication

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

Software

FieldCare

- Storage of device settings in a database
- Parameter configuration

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

Order information

Product page

www.endress.com/CSF28

Product Configurator

1. **Configure**: Click this button on the product page.
2. Select **Extended selection**.
   ↳ The Configurator opens in a separate window.
3. Configure the device according to your requirements by selecting the desired option for each feature.
   ↳ In this way, you receive a valid and complete order code for the device.
4. **Apply**: Add the configured product to the shopping cart.

For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.

5. **Show details**: Open this tab for the product in the shopping cart.
   ↳ The link to the CAD drawing is displayed. If selected, the 3D display format is displayed along with the option to download various formats.

Scope of delivery

The scope of delivery comprises:
- 1 Liquistation CSF28 with:
  The ordered bottle configuration
- Accessories kit
  For peristaltic or vacuum pump:
  Hose adapter for suction line with various angles (straight, 90°), Allen screw (for version with vacuum pump only)
- 1 printed copy of the Brief Operating Instructions in the language ordered
- Optional accessories

Accessories

The following are the most important accessories available at the time this documentation was issued.

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible.
   Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

Order no.	Bottle tray + bottles + cover
71111152	Bottle tray + 6 x 3 liter (0.79 US gal.) PE+ cover
71111154	Bottle tray + 12 x 1 liter (0.26 US gal.) PE + cover

Order no.	Distributor plate; centering plate
71111158	Distributor plate for 2 x 6 bottles
71111159	Distributor plate for 2 x 12 bottles

Order no.	Bottles + covers
71111164	1 liter (0.26 US gal.) PE + cover, 24 pcs
71111167	3 liter (0.79 US gal.) PE + cover, 12 pcs
71111169	13 liter (3.43 US gal.) PE + cover, 1 pc
71111172	30 liter (7.92 US gal.) PE + cover, 1 pc
71111173	60 liter (15.8 US gal.) PE + cover, 1 pc
71146645	17 liter (4.49 US gal.) PE, 1 pc

Order no.	Complete suction line
71111233	Suction line ID 10 mm (3/8"), PVC, reinforced fabric, length 10 m (33 ft), suction head V4A
71111234	Suction line ID 10 mm (3/8"), EPDM, length 10 m (33 ft), suction head V4A
71111235	Suction line ID 13 mm (1/2"), PVC, reinforced spiral wire, length 10 m (33 ft), suction head V4A
71111236	Suction line ID 13 mm (1/2"), EPDM, length 10 m (33 ft), suction head V4A

Order no.	Terminated hose: vacuum pump
71111188	Dosing hose to distributor, 2 pcs, material: silicon
71111189	Dosing hose to distributor, 25 pcs, material: silicon

Order no.	Terminated hose: peristaltic pump
71111191	Pump tubing, 2 pcs; material: silicon
71111192	Pump tubing, 25 pcs; material: silicon

Order no.	Retrofit kits
71111195	Kit CSF48: Retrofit kit distribution assembly (distribution arm, distribution arm drive)
71111196	Kit CSF48: Retrofit kit casters
71111197	Kit CSF48: Retrofit kit stand, V2A; 304(x)
71111198	Kit CSF48: Retrofit kit stand, V4A; 316(x)
71111199	Kit CSF48: Retrofit kit for flow assembly, without stand; with stand cover V2A; 304(x)
71136999	Kit CSF48: Retrofit kit service interface (CDI flange connector, counter nut)
71136101	Kit CSF48: Retrofit kit door stop (2x)

Order no.	Suction head
71111184	Suction head V4A for ID 10 mm (3/8"), 1 pc
71111185	Suction head V4A for ID 13 mm (1/2"), 1 pc

Order no.	Communication; software
71110815	SD card, 1 GB, Industrial Flash Drive
51516983	Commubox FXA291 + FieldCare Device Setup
71127100	SD card with Liquiline Firmware, 1 GB, Industrial Flash Drive



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