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2022-09-16

Technical Information
Liquistation CSF34

Automatic stationary sampler for liquid media; integrated controller with up to four measuring channels and digital Memosens technology



Applications

Liquistation CSF34 is a stationary sampler designed for the fully automated removal, 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. Thanks to the modular platform concept, the CSF34 can be quickly and easily modified to create a measuring station.

- Communal and industrial wastewater treatment plants
- Laboratories and water management offices
- Monitoring of liquid media in industrial processes

Your benefits

- All-purpose plastic ASA-PC housing material
- Two-door housing for reliable sample temperature regulation
- Cooling system with forced-air cooling and protective finish
- Swift menu guidance, navigator and large display
- Dual bottle trays for easy sample transportation
- Practice-oriented programs ranging from simple time programs to event programs
- Functionality can be extended by installing modular electronic components
- Integrated data logger for recording measured values
- Service interface for data transmission

Endress+Hauser
People for Process Automation

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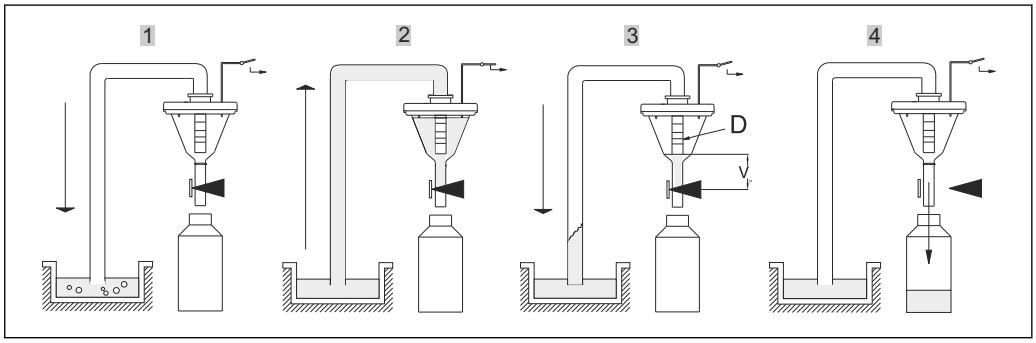
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Function and system design

Device principle

Mode of operation with a vacuum pump

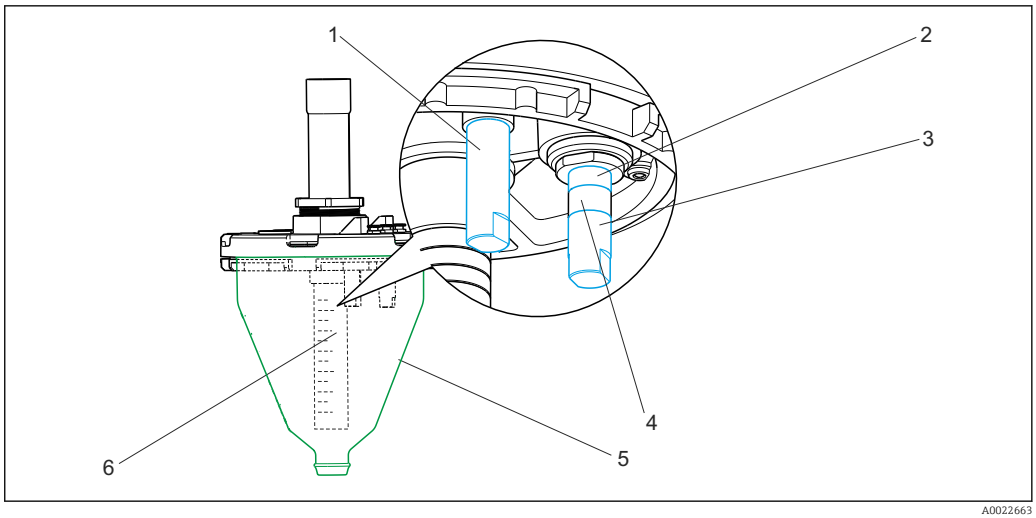
Sampling takes place in four steps:



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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



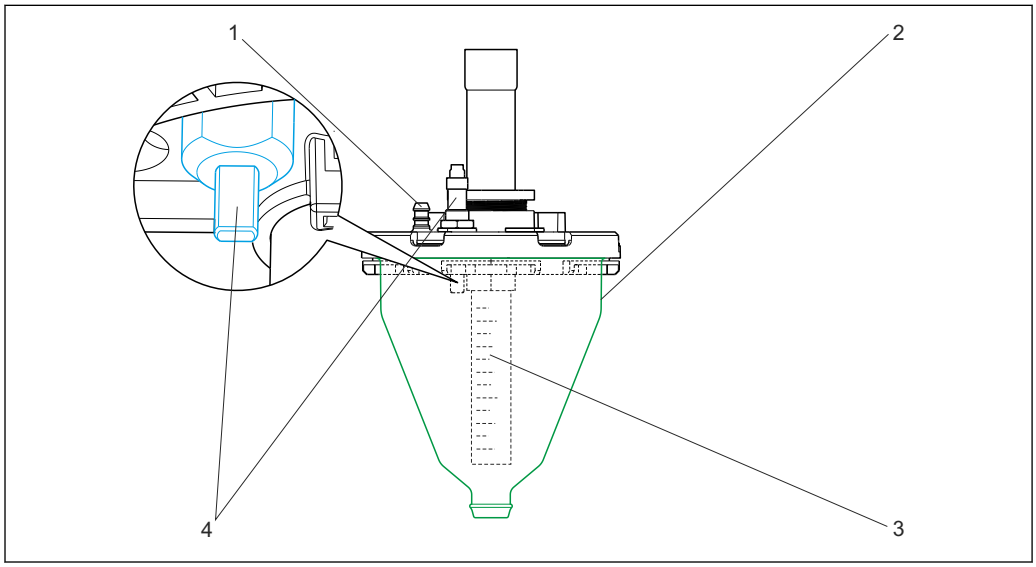
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1 *Conductive dosing system*

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 with graduated scale or glass)
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.

Dosing system with capacitance sample sensor



2 *Capacitance dosing system*

1 *Hose connection for vacuum pump*
2 *Measuring jug with graduated scale*
3 *Graduated dosing tube, white and blue scale*
4 *Capacitance level sensor*

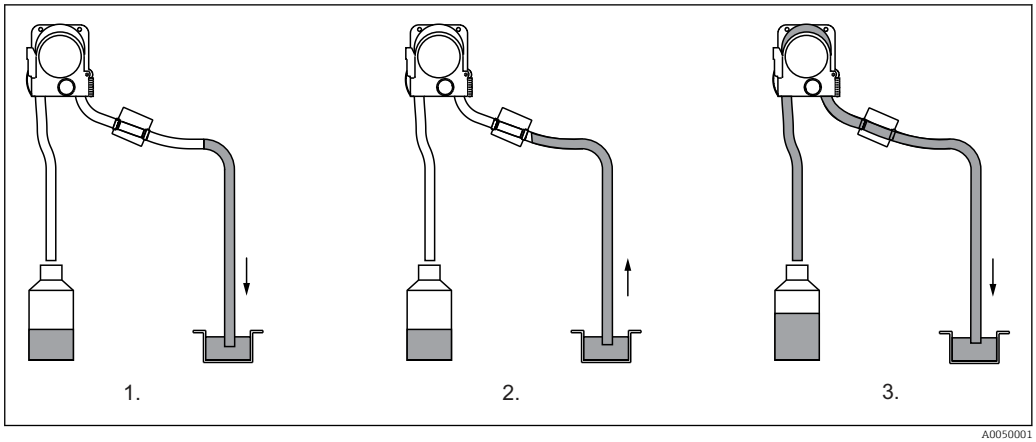
Level detection principle

When the level of medium in the measuring jug changes, the capacitance of a capacitor partially formed by the liquid also changes.
The capacitance sensor ensures rapid sample detection in foaming media, media with a high fat content and media with a conductivity <30 µS/cm. Only capacitance level detection is possible in the latter type of media.

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

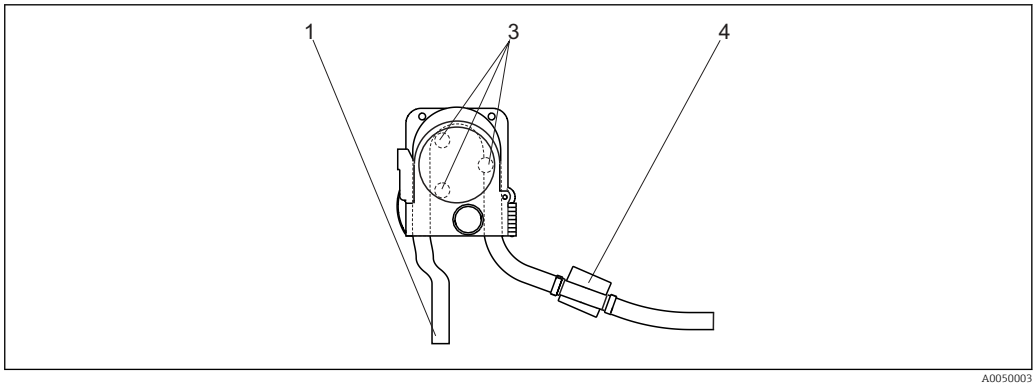


3 Sampling steps with a peristaltic pump

Sampling takes place in three steps:

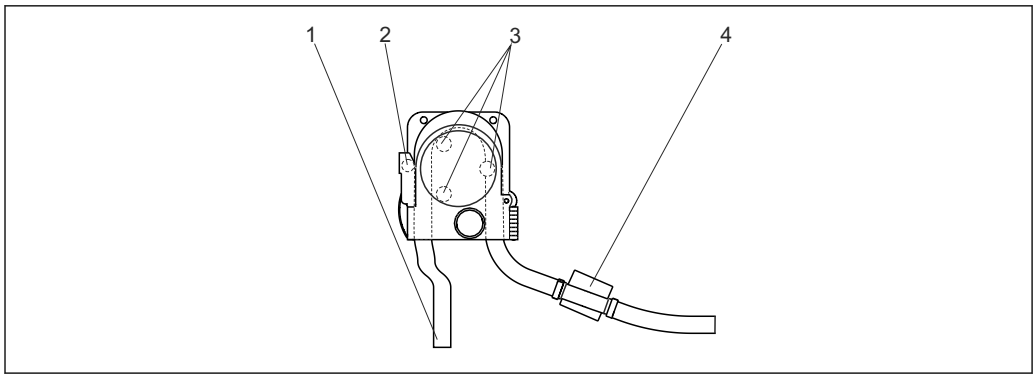
1. Rinse
   - ↳ The peristaltic pump runs in reverse and forces medium back to the sampling point.
2. Intake
   - ↳ The peristaltic pump runs forward and draws in medium. If the medium detection system detects the sample, the pump is controlled by the flow and the specified sample volume is calculated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



4 Peristaltic pump

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



5 Peristaltic pump

1 Pump tube
2 Safety switch (optional)
3 Pump rollers
4 Medium detection system (patented)

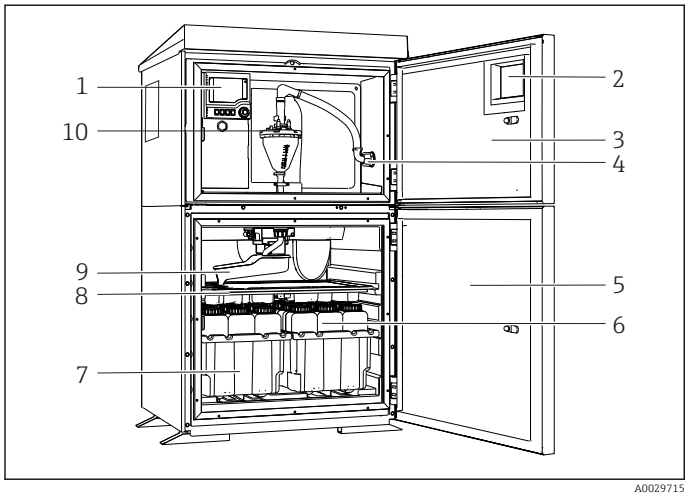
The pump rollers deform the hose, thereby causing a negative pressure and the suction effect. The medium detection system is based on a pressure sensor which detects the difference between a pipe that is filled and not filled. Thanks to a patented process for automatically detecting the suction height, the user does not need to enter the suction height or suction line length. The self-learning software guarantees a constant sample volume. An optional safety switch integrated in the pump housing immediately switches off the pump when the pump is opened (recommended if third-party staff are performing maintenance work).

Sampling unit

Sampler Liquistation CSF34

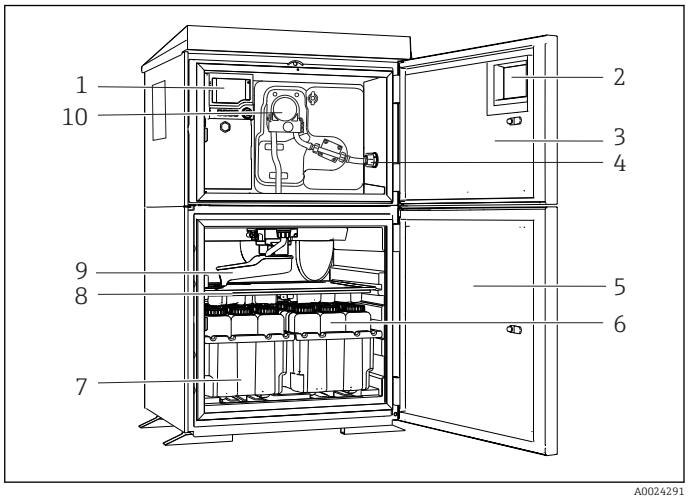
A complete sampling unit comprises:

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



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

6 Example of a Liquistation, version with vacuum pump



7 Example of a Liquistation, version with peristaltic pump

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

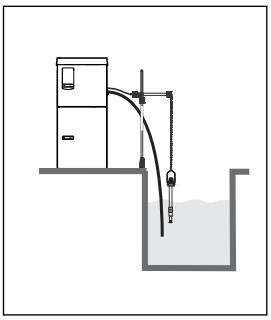
Sampler with online measurement

The following overview shows examples of the design and layout of a measuring system. Other sensors and assemblies can be ordered for conditions specific to your application. See Accessories section and also --> www.endress.com/products

Measuring point

A complete measuring system with online measurement consists of:

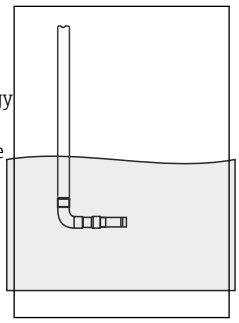
- Liquistation CSF48 sampler
- Sensors with Memosens technology
- Immersion or flow assemblies to suit the sensors used



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Nitrate

- Liquistation CSF48 sampler
- Sensors with Memosens technology
- Immersion or flow assemblies to suit the sensors used



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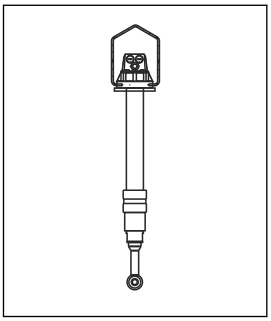
Conductivity

Inductive conductivity measurement

- Flexdip CYA112 immersion assembly
- Indumax CLS50D sensor with fixed cable

Conductive conductivity measurement

- Flexdip CYA112 immersion assembly
- Condumax CLS15D sensor

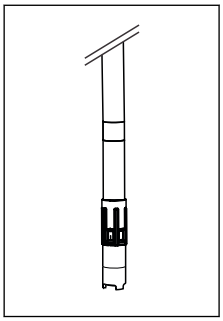


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Oxygen

- Flexdip CYA112 immersion assembly
- Flexdip CYH112 holder
- Sensor
  - Oxymax COS61D (optical) with fixed cable,
  - Oxymax COS51D (amperometric) cable CYK10

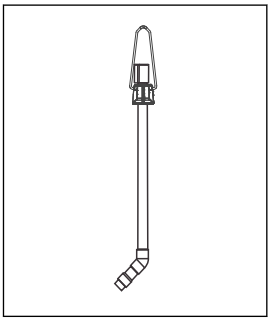
Figure: CYA112 with COS61D



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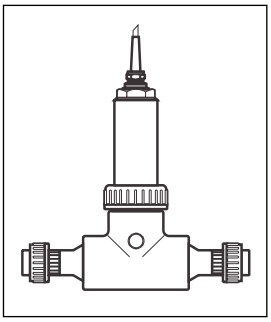
Turbidity

- Flexdip CYA112 immersion assembly
- Spray head CUR4 (optional)
- Turbimax CUS51D sensor with fixed cable



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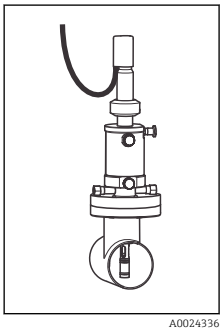
- Flowfit CUA250 flow assembly
- Turbimax CUS51D sensor with fixed cable



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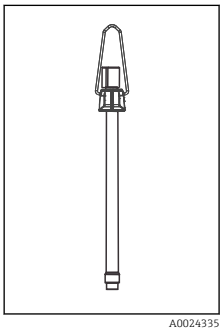
pH value or ORP

- Retractable assembly Cleanfit CPA471
- Orbisint CPS11D, CPS12D sensor
- Measuring cable CYK10



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- Flexdip CYA112 immersion assembly
- Orbisint CPS12D, CPS11D sensor
- Measuring cable CYK10



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Sampling with a flow assembly

A flow assembly is integrated in the stand for sampling purposes.

The flow assembly is used for sampling in pressurized systems e.g.:
- Tanks positioned at a height
- Pressure piping
- Conveyance using external pumps

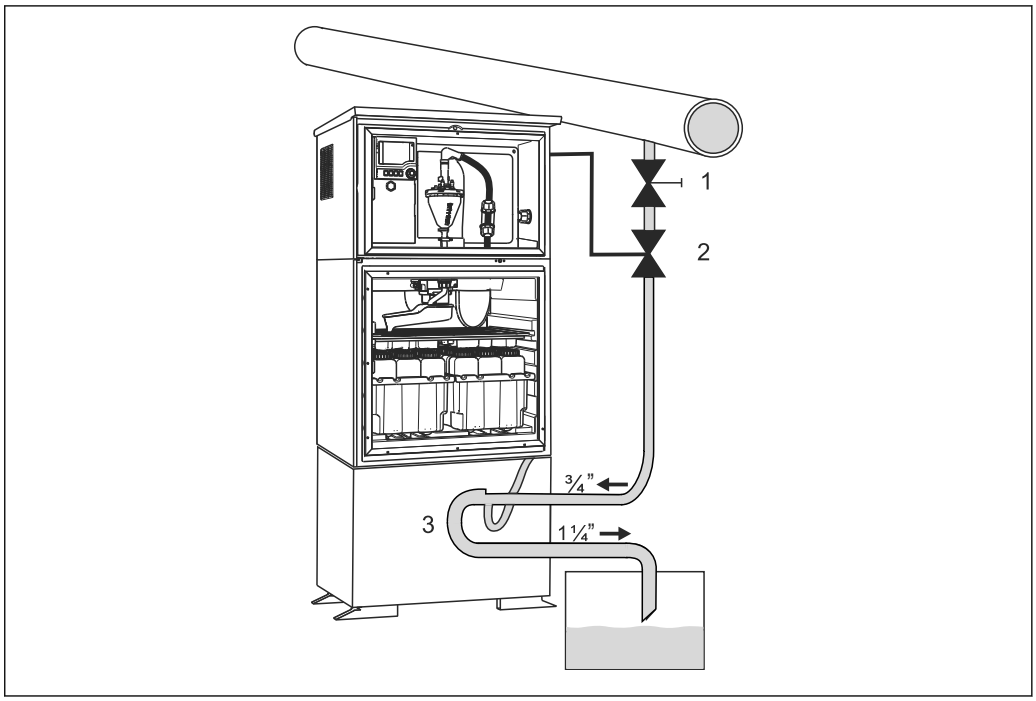
The flow rate should be 1000 to 1500 l/h.

NOTICE

Pressure in the assembly

Damage to the assembly

► The outlet of the flow assembly must be unpressurized (e.g. drain, open channel).

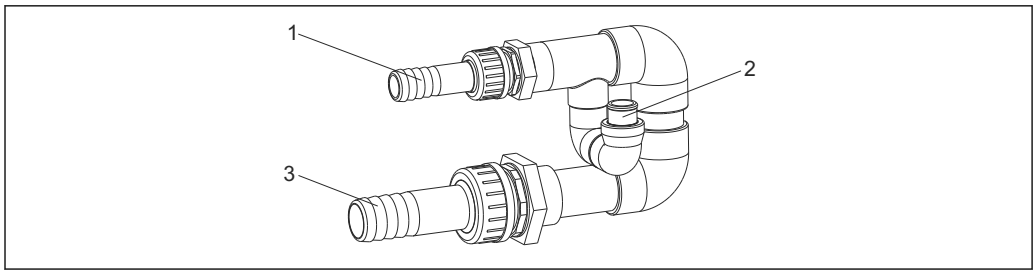


8 Example: Sampling from pressure piping

1 Ball valve 1
2 Valve 2
3 Flow assembly integrated into the stand

Use the ball valve 1 to set the flow rate to 1000 l/h to 1500 l/h. When the sampling cycle begins, one of the relay outputs can be used to control and open valve 2. The medium flows through the pipe and the flow assembly and into the outflow. Once an adjustable delay time has elapsed, the sample is taken directly from the flow assembly. Valve 2 is closed again once the sample has been taken.

Valve 1 and valve 2 are not included in the scope of delivery (order code TSP 71180379).



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9 Flow assembly (can also be ordered separately as kit no.: 71119408)

Flow assembly inflow: ¾"
Sampling connection
Flow assembly outflow: 1¼"

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.

In addition, the software program makes it possible to configure individual bottles and bottle groups and assign them to switchover or event programs.

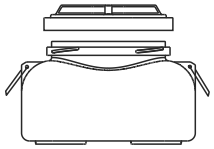
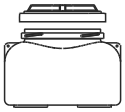
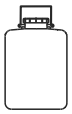
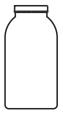
Sample preservation

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.

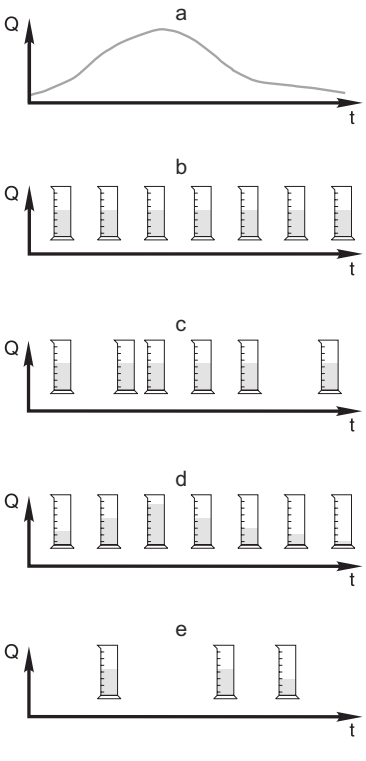


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Bottle groups and distribution versions with the number of bottles depending on the order version.

	B	C	D	E	I	F	G	H
30 liter, PE, direct distribution  A0024349	1							
60 liter, PE, direct distribution  A0025843		1						
25 liter, PE, direct distribution  A0024349			2					
13 liter, PE, direct distribution  A0025968				4				
3.8 liter, glass, direct distribution  A0025970					4			
2 liter, PE, direct distribution  A0025976						12		6
1 liter, PE, direct distribution  A0025978							24	12

Sampling control



a. **Flow curve**

b. **Time-proportional sampling (CTCV)**
A constant sample volume (e.g. 50 ml) is taken at regular intervals (e.g. every 5 min).

c. **Volume-proportional sampling (VTCV)**
A constant sample volume is taken at variable intervals (depending on the inflow volume).

Time override can be enabled in an advanced program. This allows long, flow-controlled sample intervals to be interrupted if the flow rate is low. A time-controlled sample is collected.

d. **Flow-proportional sampling (CTVV)**
A variable sample volume (the sample volume depends on the flow rate) is taken at regular intervals (e.g. every 10 min).

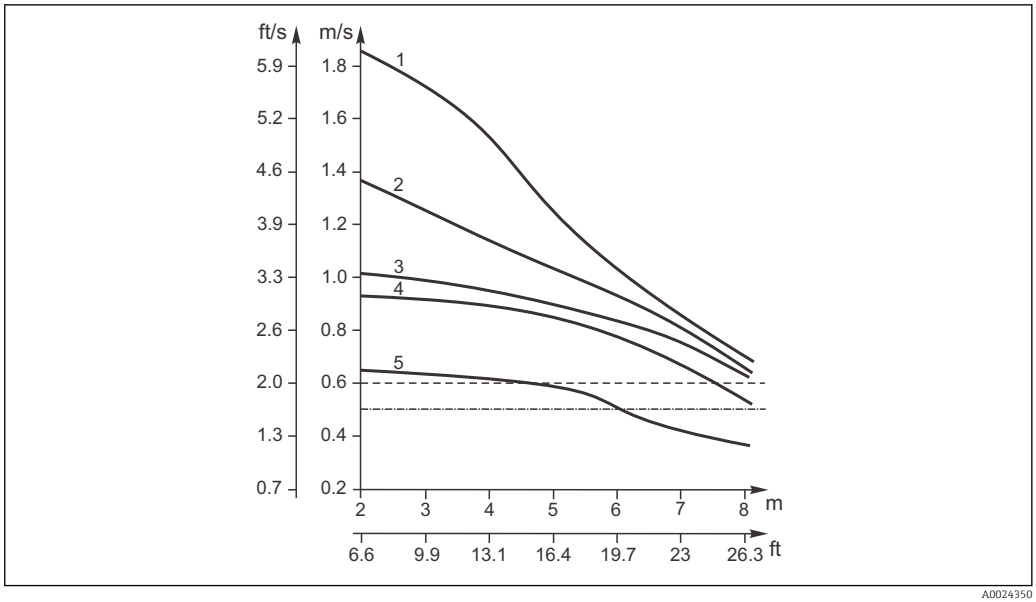
Only in version with peristaltic pump.

e. **Event-controlled sampling**
Sampling is triggered by an event (e.g. pH limit value). Sampling can be time-paced, volume-paced or flow-paced, or single samples can be taken.

10 Sampling control

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



11 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
4 ID 16 mm (5/8 in) vacuum pump
5 ID 19 mm (3/4 in) vacuum pump

Sample temperature regulation (optional)

The standard cooling system is located in the upper rear section. Any exposed copper materials are coated to protected against corrosion.

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 can be recorded in the internal data logger.

A temperature sensor for measuring individual sample temperatures can be ordered as an option.

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).



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12 Cooling system

Sampler housing

Pay attention to the installation conditions in the "Installation" section and the information on the materials of the different housing types in the "Mechanical construction" section.

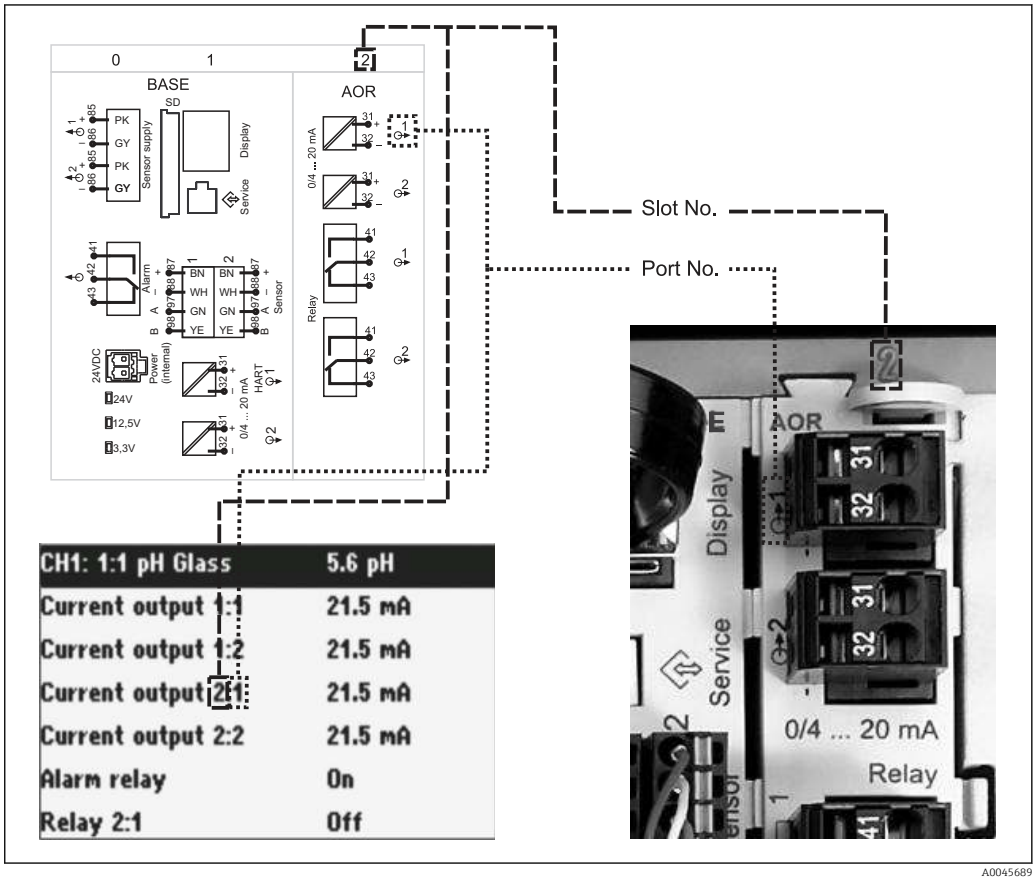
NOTICE

Plastic polystyrene V0 can discolor when exposed to direct sunlight.
In the case of stainless steel housings, the frame around the window can discolor if exposed directly to sunlight.

- For outdoor use without a weather protection cover, the use of Plastic ASA+PC V0 is recommended. The functionality is not affected by the discoloration.

Equipment architecture

Slot and port assignment



13 Slot and port assignment of hardware and presentation on the display

The electronics configuration follows a modular concept:

- There are several slots for electronics modules. These are referred to as "slots".
- These slots are numbered consecutively in the housing. Slots 0 and 1 are always reserved for the base module.
- In addition there are also inputs and outputs for the control module. These slots are labeled "S".
- Each electronics module has one or more inputs and outputs or relays. Here they are all collectively known as "ports".
- Ports are consecutively numbered per electronics module and are recognized automatically by the software.
- Outputs and relays are named according to their function, e.g. "current output", and are displayed in ascending order with the slot and port numbers.
  Example:
  "Current output 2:1" shown on the display means: slot 2 (e.g. AOR module) : port 1 (current output 1 of the AOR module)
- Inputs are assigned to measuring channels in the ascending order of "slot:port number"
  Example:
  "CH1: 1:1" shown on the display means:
  Slot 1 (base module) : port 1 (input 1) is channel 1 (CH1).

Communication and data processing

Communication protocols:

- Fieldbus systems
  - HART
  - PROFIBUS DP (Profile 3.02)
  - Modbus TCP or RS485
  - PROFINET
  - EtherNet/IP
- Configuration via Ethernet

Only one type of fieldbus communication can ever be active. The last activation code entered decides which bus is used.

The device drivers available make it possible to perform a basic setup and display measured values and diagnostics information via the fieldbus. A full device configuration via the fieldbus is not possible.

Bus termination on the device

- Via slide switch at bus module 485DP/485MB
- Displayed via LED "T" on bus module 485DP/485MB

Dependability

Reliability

Memosens technology

Memosens makes your measuring point safer and more reliable:
- Non-contact, digital signal transmission enables optimum galvanic isolation
- No contact corrosion
- Completely watertight
- Laboratory sensor calibration possible, thus increasing measured value availability
- Predictive maintenance thanks to recording of sensor data, e.g.:
  - Total hours of operation
  - Hours of operation with very high or very low measured values
  - Hours of operation at high temperatures
  - Number of steam sterilizations
  - Sensor condition



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Sensor check system (SCS)

The sensor check system (SCS) monitors the high impedance of the pH glass. An alarm is triggered if a minimum impedance value is undershot or a maximum impedance is exceeded.
- Glass breakage is the main reason for a drop in high impedance values.
- The causes of increasing impedance values are:
  - Dry sensor
  - Worn pH glass membrane

Process check system (PCS)

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

The main causes of stagnating measured values are:

- Sensor fouled or outside the medium
- Sensor defective
- Process error (e.g. through control system)

Sensor condition check (SCC)

This function monitors the electrode condition and the degree of electrode aging. The status is indicated by the messages "SCC electrode condition bad" or "SCC electrode condition OK". The electrode condition is updated after every calibration.

Maintainability

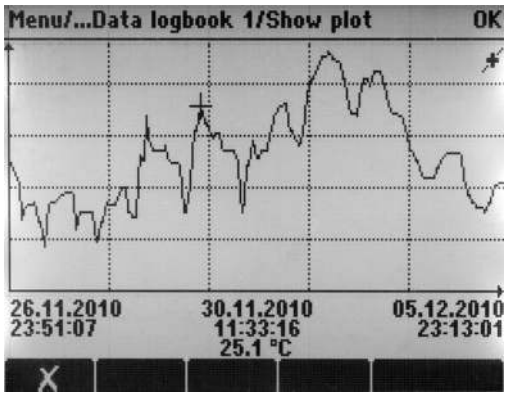
Modular design

The modular sampler can be easily adapted to suit your needs:
- Retrofit extension modules for new or extended range of functions, e.g. current outputs and relays
- Upgrade from one channel to multichannel measurement with digital sensors
- Upgrade to fieldbus communication (PROFIBUS DP, Modbus TCP, Modbus RS485, Ethernet, PROFINET for configuration and EtherNet/IP)

Memory

- Independent, integrated ring memories (FIFO) or stack memories for recording
  - an analog value (e.g. flow, pH value, conductivity)
  - events (e.g. power failure)
  - Sample statistics (e.g. sampling volume, filling times, bottle assignment)
- Program memory: max. 100 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



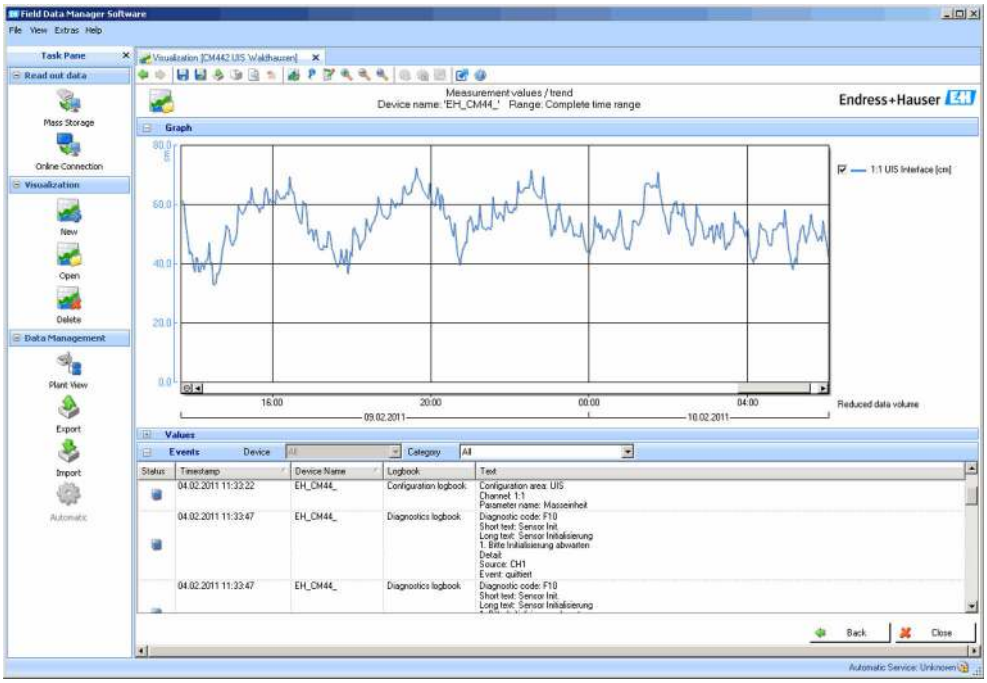
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14 Data logbook: graphic display

FieldCare and Field Data Manager

FieldCare
Configuration and asset management software based on FDT/DTM technology
- Complete device configuration when connected via FXA291 and service interface
- Access to a number of configuration parameters and identification, measuring and diagnostic data when connected via HART modem
- Logbooks can be downloaded in CSV format or binary format for the "Field Data Manager" software

Field Data Manager
Visualization software and database for measuring, calibration and configuration data
- SQL database which is protected against manipulation
- Functions to import, save and print out logbooks
- Load curves to display measured values
- All the logbooks can be read out and saved online



A0016009

15 Field Data Manager: load curves

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 and bus address to devices with an identical setup (copy function)

Endress+Hauser offers industry-approved SD cards as accessories. These memory cards provide maximum data security and integrity.

Other SD cards can also be used. However, Endress+Hauser does not accept any responsibility for the data security of such cards.

Security

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

Measured variables	→ Documentation of the connected sensor
Measuring ranges	→ Documentation of the connected sensor
Types of input	▪ 2 analog inputs ▪ 2 binary inputs + 2 binary inputs (optional) ▪ 1 to 4 digital inputs for sensors with Memosens protocol (optional)

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

Output signal

- 2 binary outputs (standard) + 2 binary outputs (optional):
  Open collector, max. 30 V, 200 mA
- Up to 2 x 0/4 to 20 mA, active, galvanically isolated from the sensor circuits and from each other
  2 to 6 x 0/4 to 20 mA, active, galvanically isolated from the sensor circuits and from each other
- Of those, 1 x with optional HART communication (only via current output 1:1). Limited to 2 current outputs with optional fieldbus communication.

Communication

- 1 service interface
- Accessible via front panel connection (optional)
- Commubox FXA291 (accessory) required for communication with the PC

Output signal

Depending on version:
- 2 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- 4 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- 6 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- 8 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- Optional HART communication (only via current output 1:1)

HART	
Signal encoding	FSK ± 0.5 mA above current signal
Data transmission rate	1200 baud
Galvanic isolation	Yes
Load (communication resistor)	250 Ω

PROFIBUS DP/RS485	
Signal encoding	EIA/TIA-485, PROFIBUS DP-compliant acc. to IEC 61158
Data transmission rate	9.6 kBd, 19.2 kBd, 45.45kBd, 93.75 kBd, 187.5 kBd, 500 kBd, 1.5 MBd, 6 MBd, 12 MBd
Galvanic isolation	Yes
Connectors	Spring terminal (max. 1.5 mm), bridged internally (T-function), optional M12
Bus termination	Internal slide switch with LED display

Modbus RS485	
Signal encoding	EIA/TIA-485
Data transmission rate	2,400, 4,800, 9,600, 19,200, 38,400, 57,600 and 115,200 baud
Galvanic isolation	Yes
Connectors	Spring terminal (max. 1.5 mm), bridged internally (T-function), optional M12
Bus termination	Internal slide switch with LED display

Ethernet and Modbus TCP	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	10/100 MBd
Galvanic isolation	Yes
Connection	RJ45
IP address	DHCP (default) or configuration via menu

Ethernet/IP	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	10/100 MBd
Galvanic isolation	Yes
Connection	RJ45
IP address	DHCP (default) or configuration via menu

PROFINET	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	100 MBd
Galvanic isolation	Yes
Connection	RJ45
Name of station	Via DCP protocol by means of configuration tool (e.g. Siemens PRONETA)
IP address	Via DCP protocol by means of configuration tool (e.g. Siemens PRONETA)

Current outputs, active

Span

0 to 23 mA

2.4 to 23 mA for HART communication

Signal characteristic

Linear

Signal on alarm

Adjustable, as per NAMUR Recommendation NE 43
- In measuring range 0 to 20 mA (HART is not available with this measuring range): Failure current from 0 to 23 mA
- In measuring range 4 to 20 mA: Failure current from 2.4 to 23 mA
- Factory setting for failure current for both measuring ranges: 21.5 mA

Load

Max. 500 Ω

Electrical specification

Output voltage

Max. 24 V

Cable specification

Cable type

Recommended: shielded cable

Cross-section

Recommended: shielded cable

Relay outputs

Electrical specification

Relay types
- 2 x changeover contact, coupled with binary output (optional)
- 1 single-pin changeover contact (alarm relay)
- 1 relay card with 2 or 4 relays (optional)

Maximum load
- Alarm relay: 0.5 A
- All other relays: 2.0 A

Relay switching capacity

Power unit (Alarm relay)

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, cosΦ = 0.8 to 1	0.1 A	700,000
	0.5 A	450,000
24 V DC, L/R = 0 to 1 ms	0.1 A	500,000
	0.5 A	350,000

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

Extension module

Switching voltage	Load (max.)	Switching cycles (min.)	
230 V AC, cosΦ = 0.8 to 1	0.1 A	700,000	
	2 A	120,000	
	115 V AC, cosΦ = 0.8 to 1	0.1 A	1,000,000
2 A		170,000	
24 V DC, L/R = 0 to 1 ms		0.1 A	500,000
	2 A	150,000	

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

HART

Manufacturer ID	11_h
Device type	$119D_h$
Device revision	001_h
Device description files (DD/DTM)	www.endress.com/hart Device Integration Manager DIM
Device variables	
Supported features	PDM DD, AMS DD, DTM,

PROFIBUS DP

Manufacturer ID	11_h
Device type	$155C_h$
Profile version	3.02
Device database files (GSD files)	www.endress.com/profibus Device Integration Manager DIM
Output variables	
Supported features	▪ 1 MSCY0 connection (cyclical communication, master class 1 to slave) ▪ 1 MSAC1 connection (acyclical communication, master class 1 to slave) ▪ 2 MSAC2 connections (acyclical communication, master class 2 to slave) ▪ Addressing using DIL switches or software ▪ GSD, PDM DD, DTM

Modbus RS485

Protocol	RTU/ASCII
Function codes	03, 04, 06, 08, 16, 23
Broadcast support for function codes	06, 16, 23
Output data	16 measured values (value, unit, status), 8 digital values (value, status)
Input data	4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information
Supported features	Address can be configured using switch or software

Modbus TCP

TCP port	502
TCP connections	3
Protocol	TCP
Function codes	03, 04, 06, 08, 16, 23
Broadcast support for function codes	06, 16, 23
Output data	16 measured values (value, unit, status), 8 digital values (value, status)
Input data	4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information
Supported features	Address can be configured using DHCP or software

EtherNet/IP

Log	EtherNet/IP	
ODVA certification	Yes	
Device profile	Generic device (product type: 0x2B)	
Manufacturer ID	$0x049E_h$	
Device type ID	0x109	
Polarity	Auto-MIDI-X	
Connections	CIP	12
	I/O	6
	Explicit message	6
	Multicast	3 consumers
Minimum RPI	100 ms (default)	
Maximum RPI	10000 ms	
System integration	EtherNet/IP	EDS

	Rockwell	Add-on-Profile Level 3, Faceplate for Factory Talk SE
IO data	Input (T → O)	Device status and diagnostic message with highest priority Measured values: ▪ 16 AI (analog input) + Status + Unit ▪ 8 DI (discrete input) + Status
	Output (O → T)	Actuating values: ▪ 4 AO (analog output) + status + unit ▪ 8 DO (discrete output) + Status

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 formats: CSV, FDM) ▪ 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

The device does not have a power switch.

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

Power consumption

- Version with vacuum pump: 290 VA
- Version with peristaltic pump: 290 VA
- Version with sampling assembly: 290 VA
- Version with 24V power supply: 240 W

Electrical connection

See the "Electrical connection" section ()

Cable entries

Depending on version:
- 1 x M25, 7 x M20 cable gland
- 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)
- T10A (for 24V power supply)
- T10A (fuse for battery backup)

Power supply failure

Power supply (optional): 2 x 12 V, 7.2 Ah, with additional charge controller

Replace the rechargeable batteries with type Panasonic LC-R127R2PG1.

Real-time clock: lithium battery, type CR2032

Performance characteristics

Sampling methods

Vacuum pump/peristaltic pump/sampling assembly:
- Event sampling
- Single and multiple samples
- Sampling table

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) or max. 8 m (26 ft), depending on the version
- **Peristaltic pump:**
  Max. 8 m (26 ft)

Hose length

Max. 30 m (98 ft)

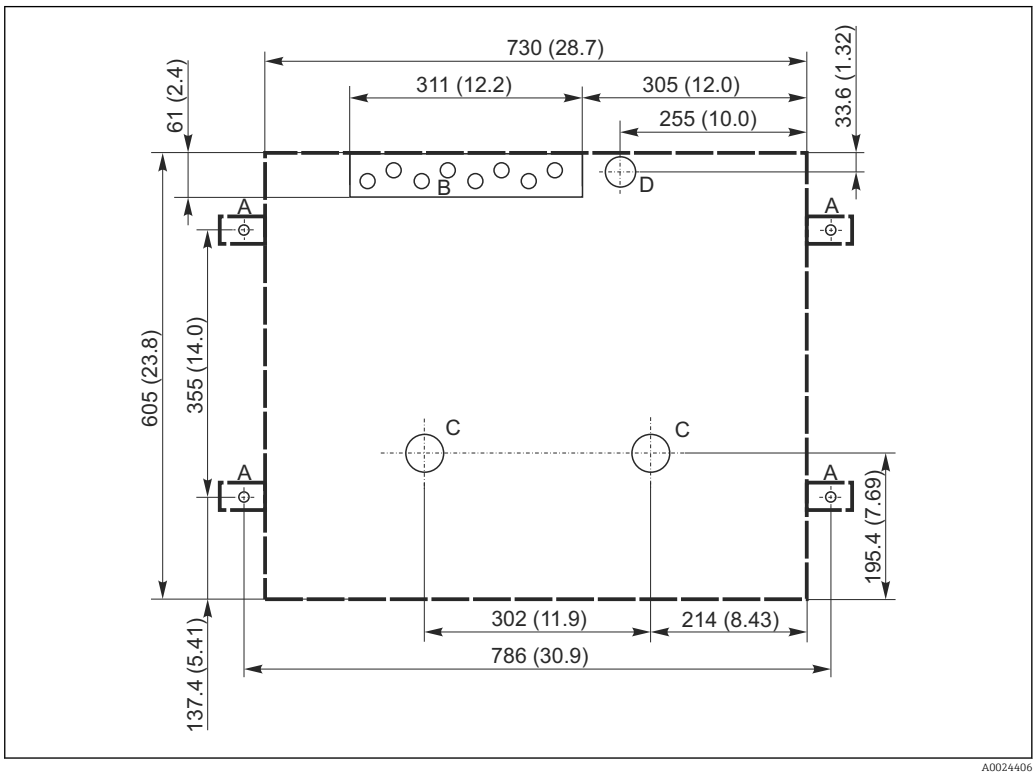
Temperature control

Temperature sensors:
- Sampling compartment temperature
- Sample temperature (optional)
- Outside temperature (optional)

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)

Mounting

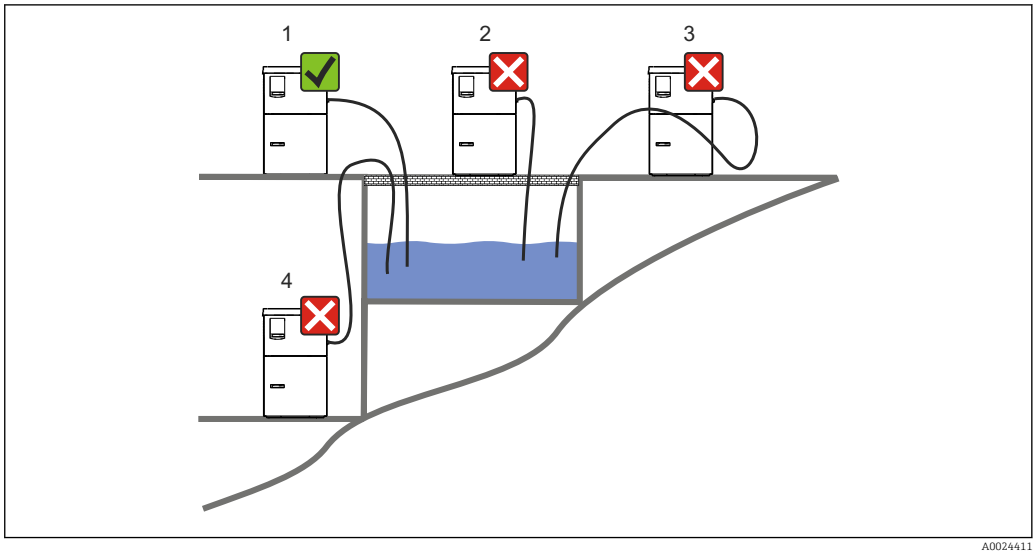
Mounting instructions



16 *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

Mounting conditions



17 *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
-30 to 50 °C (-20 to 120 °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)
- Max. 0.8 bar piping (only with shutoff/inlet valve)

Sampling assembly:
Max. 6 bar

Medium properties
Vacuum pump
Capacitance level measurement used for:
- Sample media has to be free of abrasive substances.
- Media that tend to create a lot of foam or contain fats and grease
- Media with a conductivity < 30 µS/cm

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

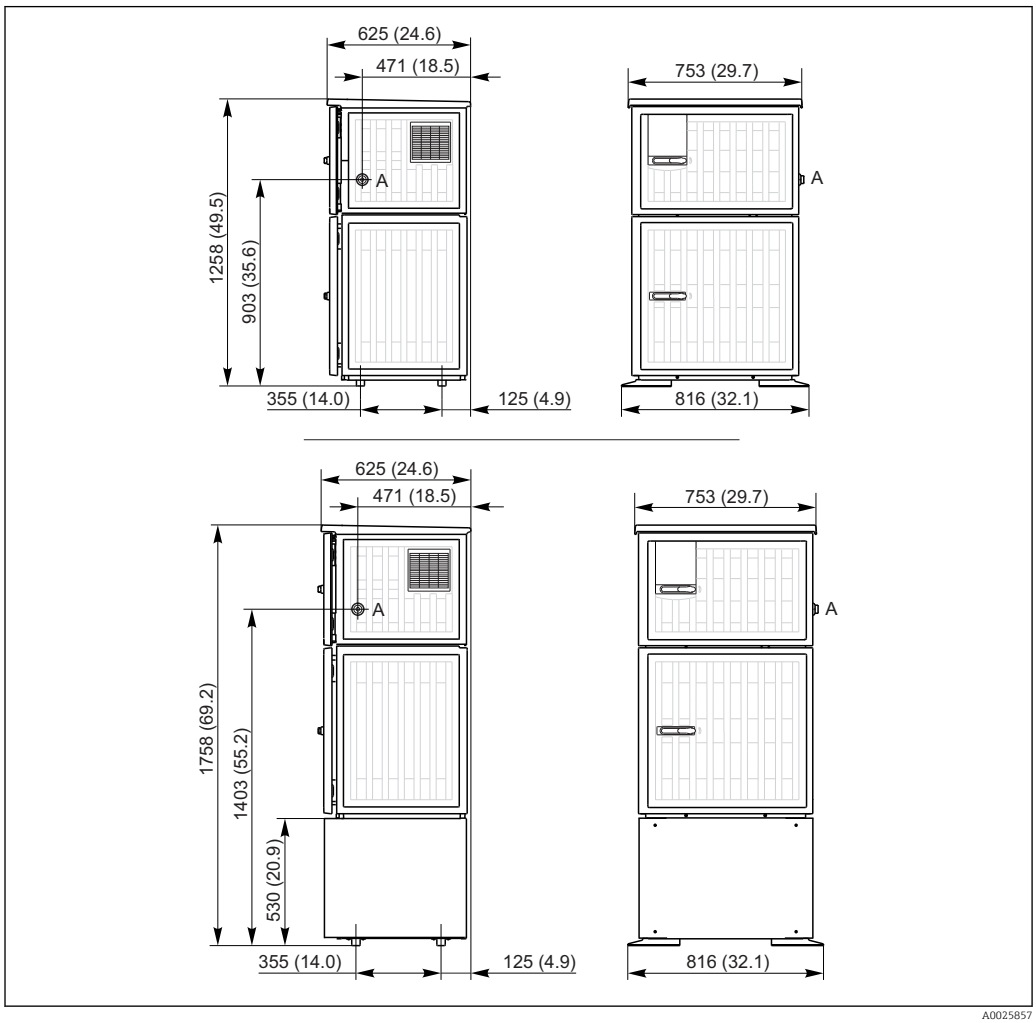
Pay attention to the material compatibility of the wetted parts.

Process connection

- **Vacuum pump:**
  Intake hose ID 10 mm (3/8 in), 13 mm (1/2 in), 16 mm (5/8 in) or 19 mm (3/4 in)
- **Peristaltic pump:**
  Intake hose ID 10 mm (3/8 in)
- **Sampling assembly:**
  - Flange DN50, PP
  - Triclamp DN50, DIN 32676

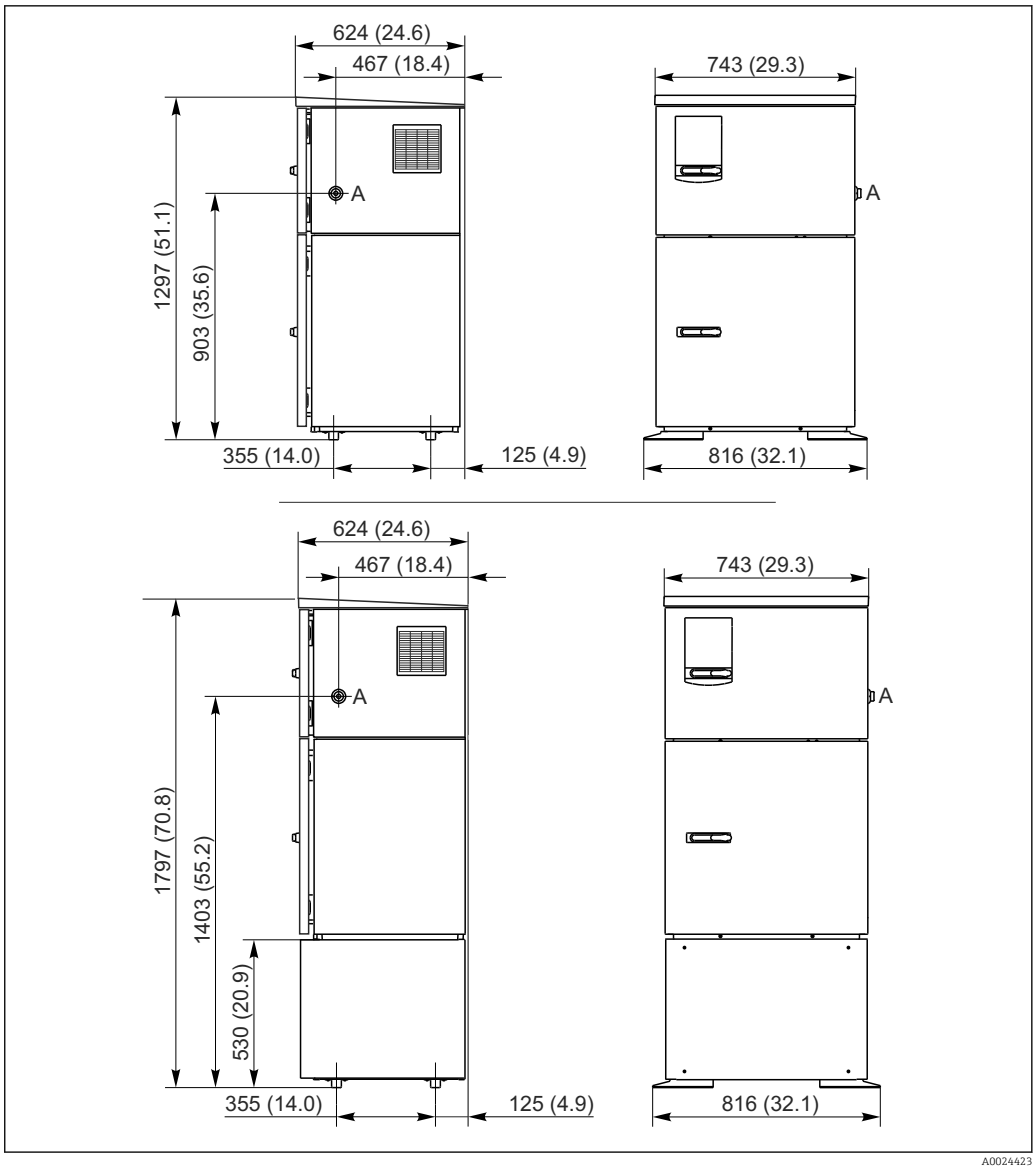
Mechanical construction

Dimensions



18 Dimensions of Liquistation, plastic version, without/with stand. Unit of measurement mm (in)

A Suction line connection



19 *Dimensions of Liquistation, stainless steel version, without/with stand. Unit of measurement mm (in)*

A Suction line connection

Weight

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

Materials

Plastic polystyrene VO can change color when exposed to direct sunlight. For outdoor use without a weather protection cover, the use of Plastic ASA+PC V0 is recommended. The functionality is not affected by the discoloration.

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

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

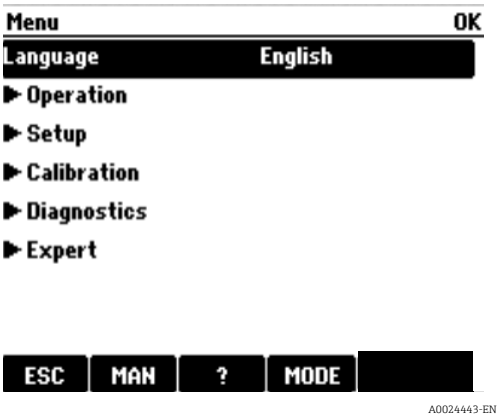
Operating concept

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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20 Easy operation

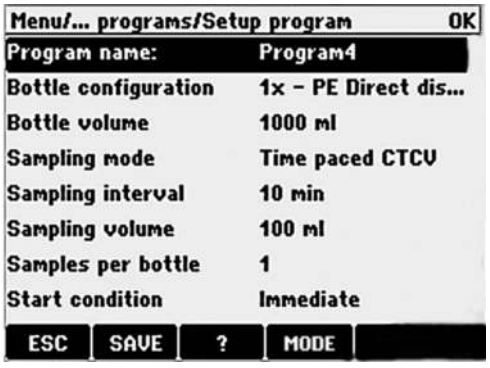


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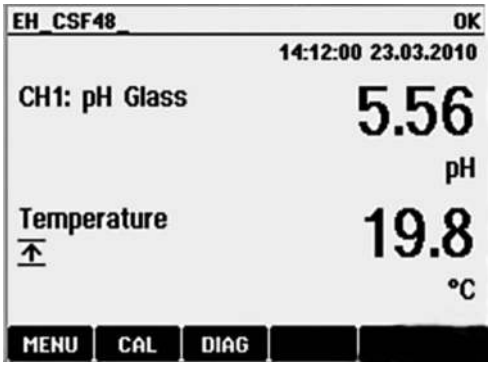
21 Plain-text menu

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
- User-definable measuring menus mean you can always keep track of the values that are important for your application.



22 Example of program setup



23 Example of measuring menu

Local operation

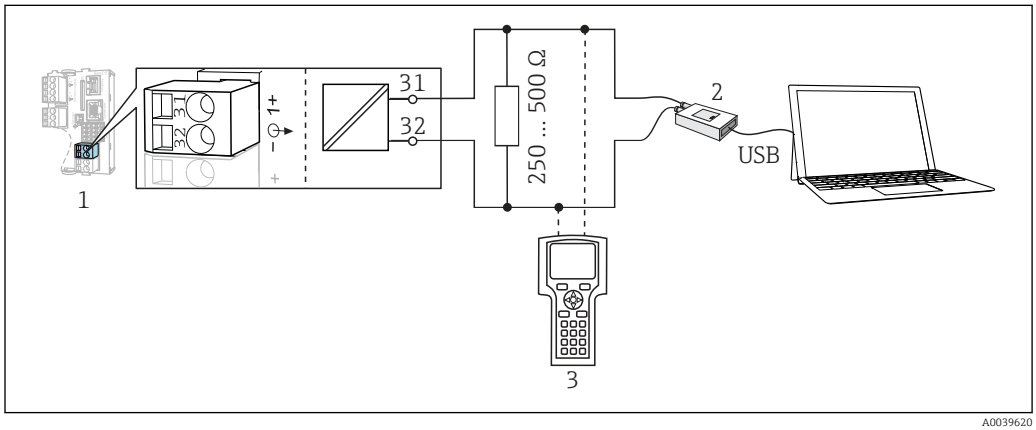


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- LCD, illuminated (with red background in the event of an error)
- 160 x 240 pixels
- 4 operating keys (soft key function) and navigator (jog/shuttle and press/hold function)
- Menu-guided operation

Remote operation

Via HART (e.g. via HART modem and FieldCare)



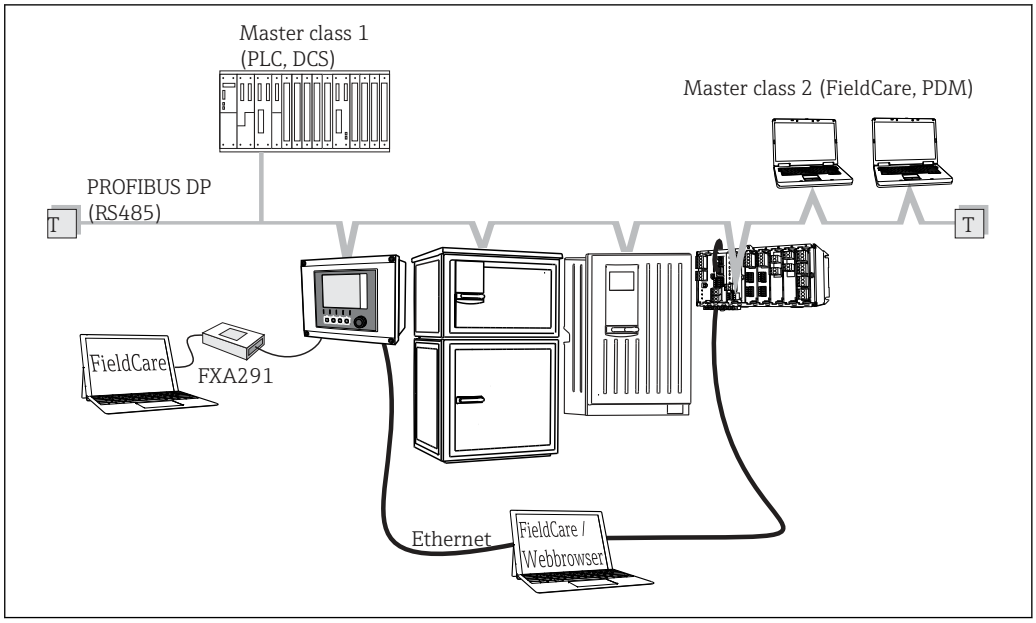
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24 HART using modem

1 Device module Base2-E: current output 1 with HART
2 HART modem for connection to PC, e.g. Commubox FXA191 (RS232) or FXA195 [1] (USB)
3 HART handheld terminal

[1] Switch position "on" (substitutes the resistor)

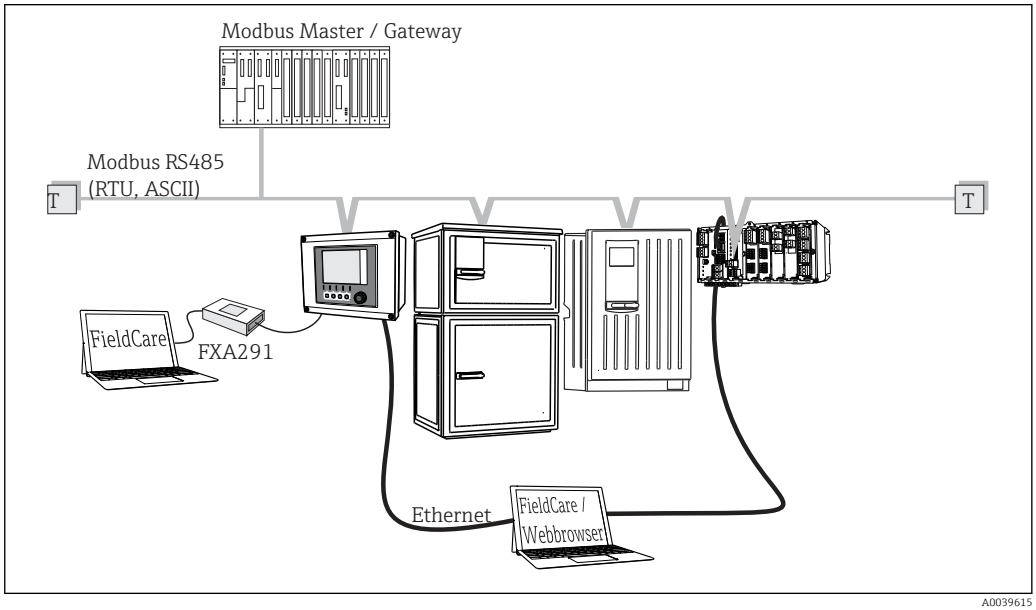
Via PROFIBUS DP



25 PROFIBUS DP

T Terminating resistor

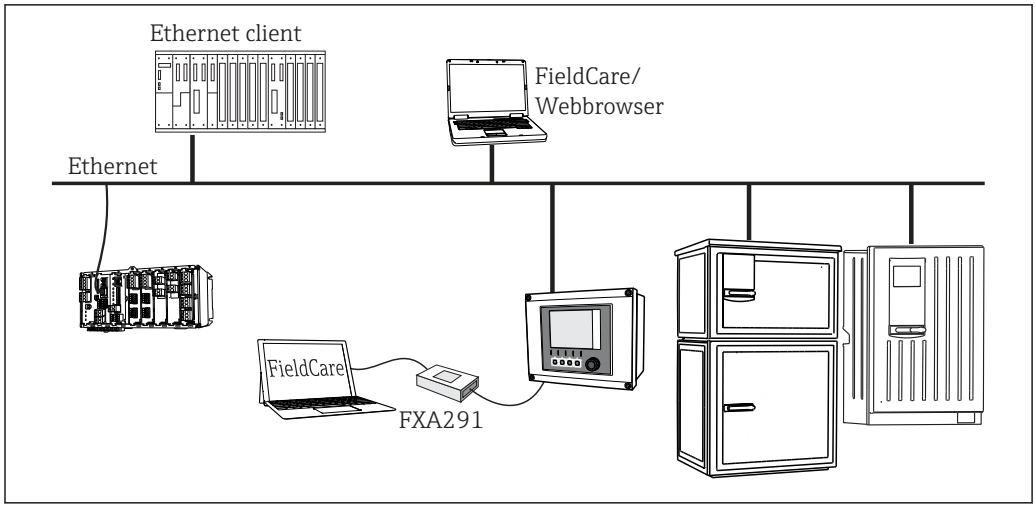
Via Modbus RS485



26 Modbus RS485

T Terminating resistor

Via Ethernet: web server/Modbus TCP/PROFINET/Ethernet/IP



27 Modbus TCP or Ethernet/IP or PROFINET

Communication

- 1 service interface
- Optionally on front panel
- Commubox FXA291 (accessory) required for communication with the PC

Software

Field Data Manager
- Standardized user interface under Windows®
- Reading data out of internal data memory with measured flow rate, sampling volume taken etc.

FieldCare
- Storage of device settings in a database
- Parameter configuration

Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:

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

Ordering information

Product page

www.endress.com/CSF34

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 CSF34 with:
  - The ordered bottle configuration
  - Optional hardware
- 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
71162811	Bottle tray + 2 x 3.8 liter (1.00 US gal.) glass + cover
71111155	Bottle tray + 12 x 2 liter (0.53 US gal.) PE wedge-shaped bottle + cover
71111156	Bottle tray + 24 x 1 liter (0.26 US gal.) PE wedge-shaped bottle + cover
71111157	Bottle tray + 12 x 1 liter (0.26 US gal.) + 6 x 2 liter (0.53 US gal.) PE wedge-shaped bottle + cover

Order no.	Distributor plate; centering plate
71111163	Centering plate for bottle tray with wedge-shaped bottles
71186013	Centering plate for 4 x 5 liters Schott DURAN GLS 80 bottles

Order no.	Bottles + covers
71162812	3.8 liter (1.00 US gal.) glass + cover, 1 pc
71111169	13 liter (3.43 US gal.) PE + cover, 1 pc
71111170	25 liter (5.28 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
71111176	1 liter (0.26 US gal.) PE wedge-shaped bottle + cover, 24 pcs
71111178	2 liter (0.53 US gal.) PE wedge-shaped bottle + cover, 12 pcs

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
71111237	Suction line ID 16 mm (5/8"), PVC, reinforced spiral wire, length 10 m (33 ft), suction head V4A
71111238	Suction line ID 16 mm (5/8"), EPDM, length 10 m (33 ft), suction head V4A
71111239	Suction line ID 19 mm (3/4"), PVC, reinforced spiral wire, length 10 m (33 ft), suction head V4A
71111240	Suction line ID 19 mm (3/4"), 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)
71111200	Kit CSF48: Retrofit kit for flow assembly, without stand; with stand cover V4A; 316(x)
71111205	Kit CSF48: Retrofit kit for temperature sensor PT1000
71111210	Kit CSF48: Retrofit kit 1x to 2x digital sensor, Memosens protocol + 2x output 0/4-20mA (software)
71146969	Kit CSF48: Retrofit kit 2x digital sensor + 2x output 0/4-20mA and extension backplane
71136999	Kit CSF48: Retrofit kit service interface (CDI flange connector, counter nut)
71136885	Kit CSF48: Retrofit kit relay (2x + cable set)
71136101	Kit CSF48: Retrofit kit door stop (2x)
71184459	Kit CSF48: Retrofit kit BASE-E module + backplane extension
71207321	Kit CSF48: Sample distribution 24 x 2 liters
71111053	Kit CM442/CM444/CM448/CSF48/CA80: extension module AOR; 2 x relay, 2 x 0/4 to 20 mA analog output
71125375	Kit CM442/CM444/CM448/CSF48/CA80: extension module 2R; 2 x relay
71125376	Kit CM442/CM444/CM448/CSF48/CA80: extension module 4R; 4 x relay
71135632	Kit CM442/CM444/CM448/CSF48/CA80: extension module 2AO; 2 x 0/4 to 20 mA analog output
71135633	Kit CM442/CM444/CM448/CSF48/CA80: extension module 4AO; 4 x 0/4 to 20 mA analog output
71135631	Kit CM444/CM448/CSF48: extension module 2DS; 2 x digital sensor, Memosens
71135634	Kit CM442/CM444/CM448/CSF48/CA80: extension module 485; Ethernet configuration; can be extended to PROFIBUS DP or Modbus RS485 or Modbus TCP. This requires an additional activation code which can be ordered separately (see Communication; software).
71135638	Kit CM444R/CM448R/CSF48/CA80: extension module DIO; 2 x digital input; 2 x digital output; auxiliary power supply for digital output
71135639	Kit CM442/CM444/CM448/CSF48/CA80: extension module 2AI; 2 x 0/4 to 20 mA analog input
71575177	Upgrade kit, extension module 485DP; extension module 485DP; PROFIBUS DP
71575178	Upgrade kit, extension module 485MB; extension module 485MB; Modbus RS485
71140890	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module 485; Modbus TCP (+ Ethernet configuration)
71219868	Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48; extension module 485; EtherNet/IP (+ Ethernet configuration)

Order no.	Retrofit kits
71140891	Kit CM444/CM448: Upgrade code for 2 x 0/4 to 20 mA for BASE-E
71107456	Kit CM442/CM444/CM448/CSF48: M12 socket for digital sensors; pre-terminated
71140892	Kit CM442/CM444/CM448/CSF48: M12 socket for PROFIBUS DP/Modbus RS485; B-coded, pre-terminated
71140893	Kit CM442/CM444/CM448/CSF48: M12 socket for Ethernet; D-coded, pre-terminated

Order no.	Communication; software
71239104	Activation code: Chemoclean Plus
71110815	SD card, 1 GB, Industrial Flash Drive
51516983	Commubox FXA291 + FieldCare Device Setup
71129799	Field Data Manager software; 1 license, analysis report
71127100	SD card with Liquiline Firmware, 1 GB, Industrial Flash Drive
71128428	Activation code for digital HART communication
71367524	Activation code for Heartbeat Verification and Monitoring
71135635	Activation code for PROFIBUS DP
71135635	Activation code for PROFIBUS DP
71135637	Activation code for Modbus TCP
71219871	Activation code for EtherNet/IP
71211288	Activation code for feedforward control
71211289	Activation code for measuring range switch

Measuring cable

Memosens data cable CYK10

- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk10

Technical Information TI00118C

Measuring cable CYK81

- Unterminated cable for extending sensor cables (e.g. Memosens, CUS31/CUS41)
- 2 x 2 cores, twisted with shielding and PVC sheath (2 x 2 x 0.5 mm^2 + shielding)
- Sold by meter, Order No.: 51502543

Sensors

Glass electrodes

Orbisint CPS11D

- pH sensor for process technology
- With dirt-repellent PTFE diaphragm
- Product Configurator on the product page: www.endress.com/cps11d

Technical Information TI00028C

Memosens CPS31D

- pH electrode with gel-filled reference system with ceramic diaphragm
- Product Configurator on the product page: www.endress.com/cps31d

Technical Information TI00030C

Ceraliquid CPS41D

- pH electrode with ceramic junction and KCl liquid electrolyte
- Product Configurator on the product page: www.endress.com/cps41d

Technical Information TI00079C

Ceragel CPS71D
- pH electrode with reference system including ion trap
- Product Configurator on the product page: www.endress.com/cps71d

Technical Information TI00245C

Orbipore CPS91D
- pH electrode with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps91d

Technical Information TI00375C

Orbipac CPF81D
- Compact pH sensor for installation or immersion operation
- In industrial water and wastewater
- Product Configurator on the product page: www.endress.com/cpf81d

Technical Information TI00191C

Pfaudler electrodes

Ceramax CPS341D
- pH electrode with pH-sensitive enamel
- Meets highest demands of measuring accuracy, pressure, temperature, sterility and durability
- Product Configurator on the product page: www.endress.com/cps341d

Technical Information TI00468C

ORP sensors

Orbisint CPS12D
- ORP sensor for process technology
- Product Configurator on the product page: www.endress.com/cps12d

Technical Information TI00367C

Ceraliquid CPS42D
- ORP electrode with ceramic junction and KCl liquid electrolyte
- Product Configurator on the product page: www.endress.com/cps42d

Technical Information TI00373C

Ceragel CPS72D
- ORP electrode with reference system including ion trap
- Product Configurator on the product page: www.endress.com/cps72d

Technical Information TI00374C

Orbipac CPF82D
- Compact ORP sensor for installation or immersion operation in process water and wastewater
- Product Configurator on the product page: www.endress.com/cpf82d

Technical Information TI00191C

Orbipore CPS92D
- ORP electrode with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps92d

Technical Information TI00435C

pH-ISFET sensors

Tophit CPS441D
- Sterilizable ISFET sensor for low-conductivity media
- Liquid KCl electrolyte
- Product Configurator on the product page: www.endress.com/cps441d

Technical Information TI00352C

Tophit CPS471D
- Sterilizable and autoclavable ISFET sensor for food and pharmaceutics, process engineering
- Water treatment and biotechnology
- Product Configurator on the product page: www.endress.com/cps471d

Technical Information TI00283C

Tophit CPS491D
- ISFET sensor with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps491d

Technical Information TI00377C

Conductivity sensors with inductive measurement of conductivity

Indumax CLS50D
- High-durability inductive conductivity sensor
- For standard and hazardous area applications
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cls50d

Technical Information TI00182C

Conductivity sensors with conductive measurement of conductivity

Condumax CLS15D
- Conductive conductivity sensor
- For pure water, ultrapure water and hazardous area applications
- Product Configurator on the product page: www.endress.com/CLS15d

Technical Information TI00109C

Condumax CLS16D
- Hygienic, conductive conductivity sensor
- For pure water, ultrapure water and Ex applications
- With EHEDG and 3A approval
- Product Configurator on the product page: www.endress.com/CLS16d

Technical Information TI00227C

Condumax CLS21D
- Two-electrode sensor in plug-in head version version
- Product Configurator on the product page: www.endress.com/CLS21d

Technical Information TI00085C

Memosens CLS82D
- Four-electrode sensor
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cls82d

Technical Information TI01188C

Oxygen sensors

Oxymax COS22D
- Sterilizable sensor for dissolved oxygen
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos22d

Technical Information TI00446C

Oxymax COS51D
- Amperometric sensor for dissolved oxygen
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos51d

Technical Information TI00413C

Oxymax COS61D
- Optical oxygen sensor for drinking water and industrial water measurement
- Measuring principle: quenching
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos61d

Technical Information TI00387C

Memosens COS81D
- Sterilizable, optical sensor for dissolved oxygen
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos81d

Technical Information TI01201C

Chlorine sensors

CCS142D
- Membrane-covered amperometric sensor for free chlorine
- Measuring range 0.01 to 20 mg/l
- With Memosens technology
- Product Configurator on the product page: www.endress.com/ccs142d

Technical Information TI00419C

Ion-selective sensors

ISEmax CAS40D
- Ion selective sensors
- Product Configurator on the product page: www.endress.com/cas40d

Technical Information TI00491C

Turbidity sensors

Turbimax CUS51D
- For nephelometric measurements of turbidity and solids in wastewater
- 4-beam scattered light method
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cus51d

Technical Information TI00461C

Turbimax CUS52D
- Hygienic Memosens sensor for turbidity measurement in drinking water, process water and in utilities
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cus52d

Technical Information TI01136C

SAC and nitrate sensors

Viomax CAS51D
- SAC and nitrate measurement in drinking water and wastewater
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cas51d

Technical Information TI00459C

Interface measurement

Turbimax CUS71D
- Immersion sensor for interface measurement
- Ultrasonic interface sensor
- Product Configurator on the product page: www.endress.com/cus71d

Technical Information TI00490C



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