Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Special documentation

Application handbook – Sampler

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Valid from:
Software version 01.03.00

Endress+Hauser
People for Process Automation

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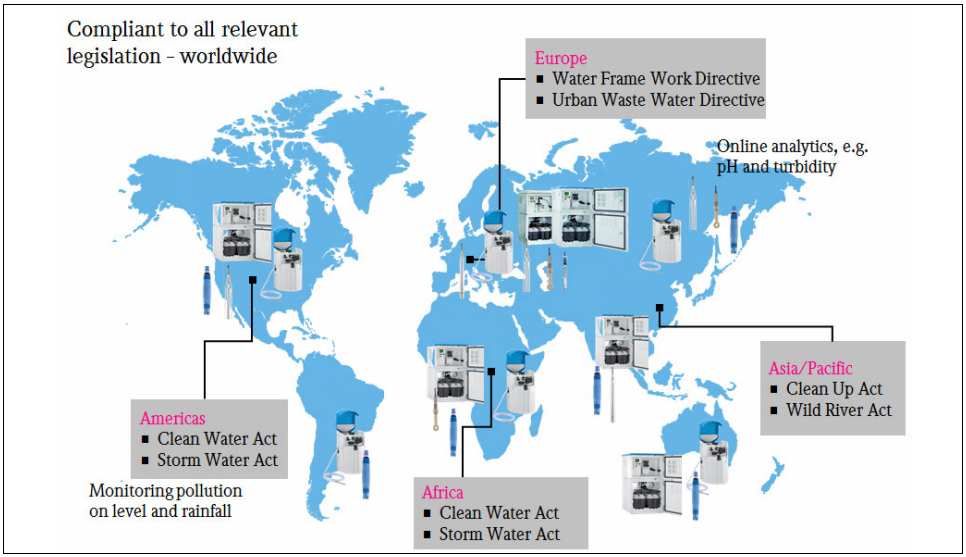
1 Marketing and sales

The current world population is growing at a rate of about 1.14% per year. At this rate it will double in the next 60 years to reach a total world population of 13 billion people. As currently only 1% of the world's water is drinkable, water will continue to be a precious natural resource. Automatic water samplers will help monitor our most precious natural resource and can sample and transmit real-time data anywhere the customer chooses. The Liquistation and Liquiport can monitor the runoff of pollution that could contaminate our drinking water. By monitoring our rivers and runoff water, local municipalities can be more proactive in managing the inlets of our drinking water plants, as well as track data to toughen international regulations surrounding water conservation.



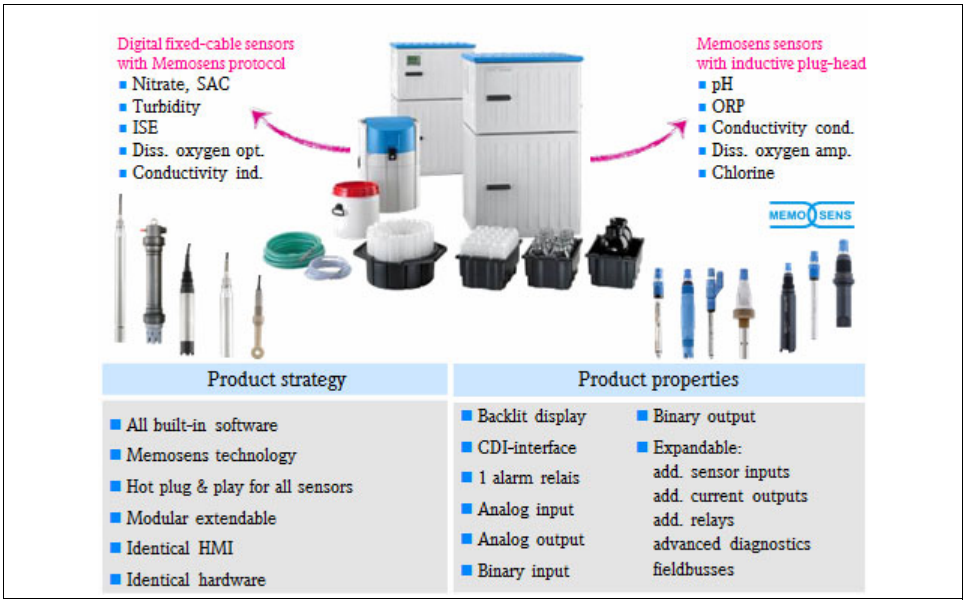
With expenses skyrocketing, the international market constantly has its eyes on the latest technological advances, as technology can usually help drive down cost. The Endress+Hauser liquid samplers are the breakthrough product of 2010 that not only save companies money but also give them a new online control point to make their processes more efficient, and thereby generate more revenue. The sampler also allows consumers to purchase the product as a base "simple" unit and add or upgrade any feature they want over the lifetime of the unit. The Liquistation CSF48 is important for every industry, ranging from municipal drinking water to the dairy industry and everything in between. By allowing operators or lab analysis personnel to monitor samples as they are taken or take samples based on pre-defined parameters, the Liquistation CSF48 will ultimately become an integral feature of the plant infrastructure of the future.

The integration of a multiparameter controller with the Memosens protocol constitutes one of the technological benefits that the samplers offer. This allows any of our Memosens sensors, which cover nine different parameters, to be seamlessly plugged into the sampler and measure simultaneously during a sampling program. Numerous communication protocols have also been implemented in the sampler, giving consumers endless possibilities to transfer the data back to their control system. The modular platform is an improvement on the existing sampler architecture as it allows all maintenance to be performed in the field and the easy removal of parts subject to normal wear and tear.

Thanks to the financial advantages afforded by the samplers, customers can purchase a sampler and save money that would otherwise be spent on an additional multiparameter transmitter; with the samplers, all these parameters are integrated. By addressing two needs at once, the sampling station helps municipalities worldwide make the most of their finances: a welcome development amid ever-tightening state and federal budgets.

1.1 General

The goal of water sampling is to collect samples that accurately represent the liquid being sampled. If the samples do not reflect an actual representative sample, a laboratory cannot compensate to obtain accurate data.
The new Liquistation CSF48 and Liqiuiport 2010 CSP44 are automatic liquid sampling systems. They have revolutionized the sampler market with the integration of on-line measurements and numerous communication protocols.
The sampler is built to collect a representative sample based on a time or flow condition and store the sample until the lab can collect and further analyze the sample. The new generation integrates a modular multiparameter controller into the sampler to allow the customer to take samples based on events that are triggered either by pH, conductivity, dissolved oxygen, nitrate, turbidity, or even a flow event. The sampler has transformed from a simple sample collection instrument to a complete refrigerated and integrated solution that can collect and analyze water quality while storing the information in one of eight log books or transmitting the data remotely via one of several communication protocols.



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Automatic wastewater samplers are an important tool in monitoring discharges to receiving waters. At WWTPs automatic samplers are installed in major numbers at the inlet, the primary settling tank, the aeration basin and the final outlet, depending on the plant size. Other industries use this important tool for product and process control.
Understanding the sampling application, site, mode and subsequent analysis is key to obtaining a representative sample.

1.2 Product use

Principle applications

Automatic samplers can be found in all industries for municipal and industrial environmental water quality control. Given that sampling is the first step in the analysis, inadequate processing or handling can affect the results. To ensure valid water quality values, many steps must be followed. The correct sampling site must be identified, properly trained staff must perform the process with the correct techniques, quality equipment including bottles must be used, and sample stability must be monitored in addition to many other factors.

Automatic samplers can be also be used for river monitoring. The sampler can be placed upstream from a drinking water plant to continuously monitor the water that is coming down river. By analyzing the water quality over a period of time, the drinking water plant can forecast when the least polluted water will enter the plant based on daily spikes of the toxic loads.

Regardless of whether a company manufactures a food product or lumber, automatic samplers are needed in just about any manufacturing facility. There is always some point in the process where water is used that should be analyzed before it leaves the facility.

The following are the main applications for automatic water samplers:

- Water agencies at rivers, reservoirs, canals, lakes, . . .
  - Sample to monitor water quality upstream of drinking water intake
  - Need for on-line analysis with sampler, multi-parameter sensors and flow system
  - Monitoring of storm water runoff, determine impact on receiving waters during rainfall
  - Monitoring of industrial plants and other facilities
  - Monitoring of non-point sources, parking lot runoff, industrial runoff
  - Watershed monitoring
  - "Holistic" management of water resources
- Industries for direct and indirect discharge
  - Evaluation of water quality for discharge permits
  - Monitoring of direct discharges to receiving waters
  - Monitoring to waste water treatment facility
  - Process monitoring at outflow points to determine product loss
- Pre-treatment control of a sewage system
  - Monitoring of combined sewage overflow, detect overflow conditions
  - Monitoring of industrial discharges
  - Determine impact on receiving waters
- Waste water treatment plants

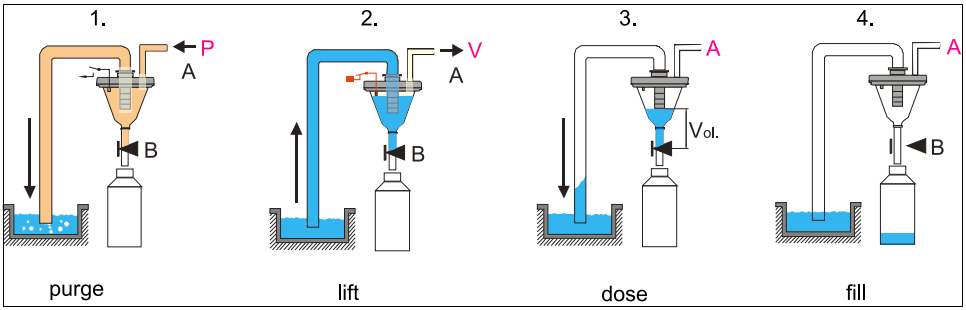
The main application for automatic refrigerated samplers is within wastewater treatment plants. There are more than 250,000 WWTPs worldwide. All of them need samplers in some form or another. An example of a well-equipped WWTP with all sampling points identified is provided below.

1.3 The sample intake system

One of the most important aspects of a liquid sampler is the type of sample intake system selected. Samplers are available with either **vacuum or peristaltic pumps**, depending on the application and sample analysis required. Both systems purge the intake hose with pressurized air and retrieve a sample with suction. The main difference is found in the physics (sample velocity): the faster the air can be removed in the intake hose, the faster the sample is transported through the system and into the bottle or container.
While vacuum pump systems deliver accurate, repeatable sample volumes and better performance in more demanding applications, peristaltic pump samplers are convenient for short intake hose lengths and suction heights, variable sample volumes and toxic applications.

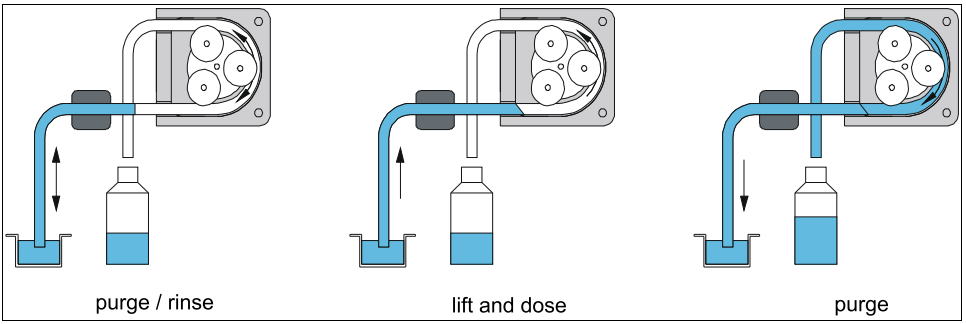
1.3.1 The vacuum intake system

1. The vacuum pump pushes air into the chamber, causing the liquid to be purged out of the intake hose.
2. The fluid is drawn into a chamber by the vacuum pump until the sample touches the capacitance or conductive electrodes, depending on the type of sample being collected.
3. The dosing system is vented to atmospheric pressure so the excess sample siphons back into the sample source.
4. The measured sample volume is then distributed into the bottle/bottles.



1.3.2 The peristaltic intake system

1. The peristaltic pump runs counter clockwise to purge the sample line.
2. The pump then changes to a clockwise rotation to create a vacuum that draws in the sample fluid.
3. Once the fluid passes the liquid detection sensor, the sampler begins to calculate the sample volume.
4. The calculated sample volume is dosed into the sample bottle, then the pump switches back to a counter clockwise rotation to purge the suction line.



1.3.3 The sample velocity

Select your sample intake method and suction line size to suit your application and regulations. The chart below helps you to understand sample velocity by suction height.
With Liquistation CSF48 you are flexible.

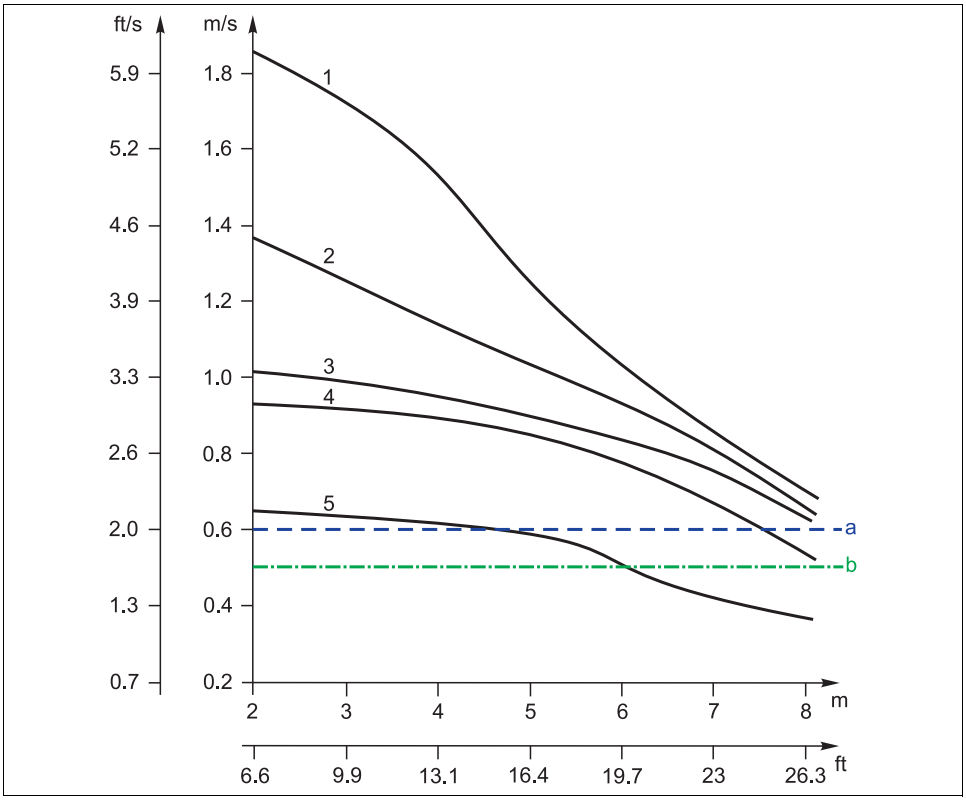


Fig. 1: Suction line options

a Intake speed as per Ö 5893 (Austrian standard); US EPA recommended
b Intake speed as per EN 25667, ISO 5667
1 ID 10 mm (3/8") vacuum pump
2 ID 13 mm (1/2") vacuum pump
3 ID 10 mm (3/8") peristaltic pump
4 ID 16 mm (5/8") vacuum pump
5 ID 19 mm (3/4") vacuum pump

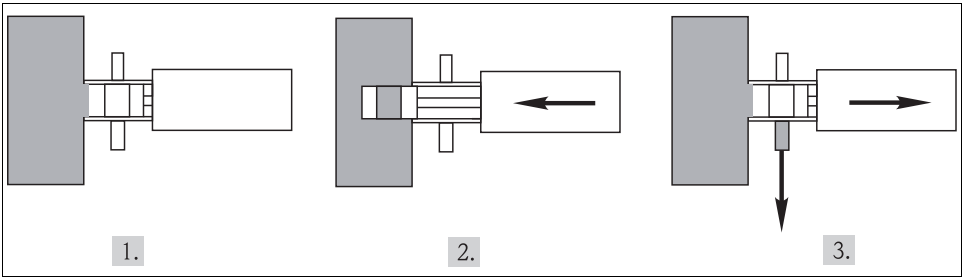
1.3.4 The (inline) sampling assembly system

The sampling assembly system is used to extract liquid sample from pressurized systems, such as pressurized piping or pressurized tanks.
The sampling assembly system provides accurate samples of liquids and slurries such as water, wastewater, sludge, acids, alkalis, foodstuff etc.
The sampling assembly system operates when compressed air forces the plunger into the process line to capture a fixed volume of material. Compressed air then acts on the opposite side of the piston to retract the plunger to a position which allows the sample to drop into a container.

Benefits at a glance

- Ideal for combining with Liquistation CSF48 stationary sampler
- Operating sample pressure up to 6 bar (87 psi)
- Operating sample temperature up to 50°C (122°F)
- Operating sampling interval > 10 seconds
- Modular design with 10 ml, 30 ml and 50 ml sample volume
- Process-oriented with various material and equipment options
- Simple installation directly at piping via Triclamp 2" or flange DN50
- Optional automatic cleaning function

Principle of operation



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Sampling is performed in three steps:

1. **Standby**
   The plunger is in standby position in the assembly. The sample chamber is ventilated from the outside.
2. **Sample**
   The plunger is driven by compressed air into the sample pipe. An adjustable hold time allows a representative blending of the sample in the sample chamber.
3. **Drain**
   The plunger is in standby position in the assembly. The sample chamber is ventilated from the outside. The sample is drained into the sample bottle.

Principle of operation with optional cleaning valve (air pressure)

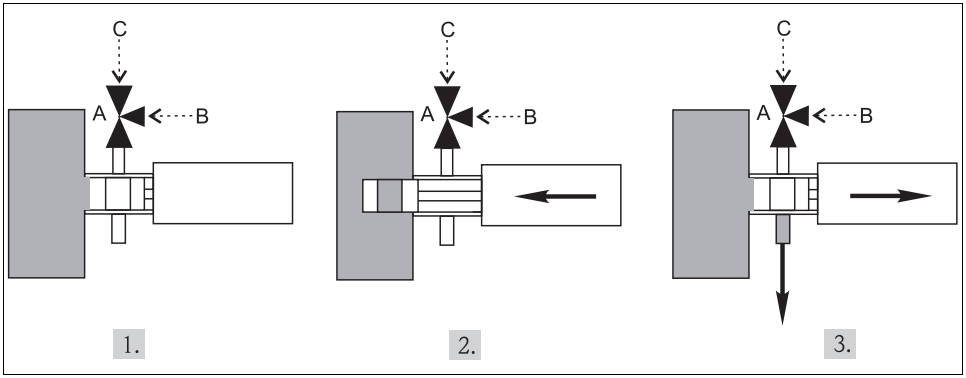


Fig. 2: Sampling steps with sampling assembly

A Rinsing valve
B Compressed air
C Atmosphere

1. **Standby**
   The plunger is above the outlet. The valve is open to atmosphere (C).
2. **Sample**
   The plunger is driven by compressed air into the sample pipe. The valve is open to atmosphere. Sample stream is mixed.
3. **Drain**
   The plunger is driven by compressed air back into assembly. The valve is open to air pressure (B) and the sample volume is forced by pressure into the bottle.

Principle of operation with optional cleaning valve (water pressure)

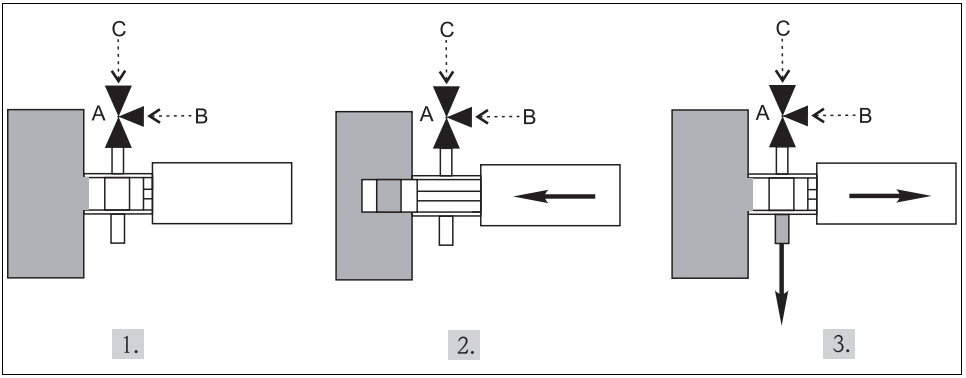


Fig. 3: Sampling steps with sampling assembly

A Rinsing valve
B Compressed air
C Atmosphere

1. **Standby**
   The plunger is above the outlet. The valve is open to atmosphere (C).
2. **Sample**
   The plunger is driven by compressed air into the sample pipe. The valve is open to atmosphere. Sample stream is mixed.
3. **Drain**
   The plunger is driven by compressed air back into assembly. Gravity causes the sample volume to drain into the bottle. The valve is open to atmosphere. After a delay time the valve is switched to compressed air and the line is rinsed into a separate bottle.

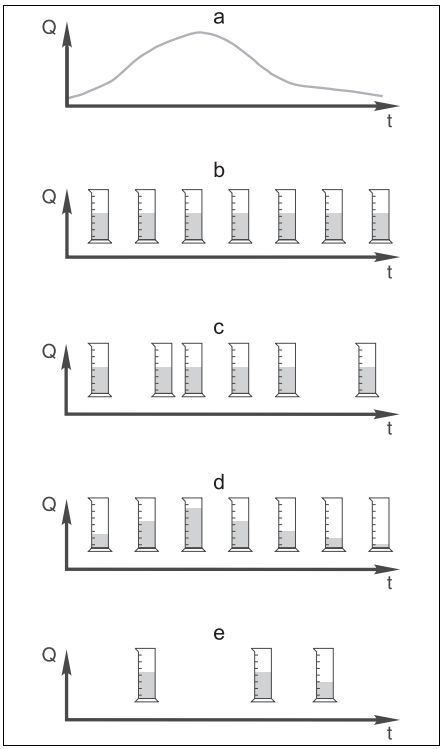
Select "Dose with pressure (B)" in "Menu/Setup/General settings/Sampling/Dosing mode". Valve connected to binary output 2.

1.4 The operating software - human interface

The sampler software includes **all software functionalities** for existing requirements as well as for future sampling programs. In addition to the standard ISO5667 modes, switching and event sampling programs are included. Since the sampler will be used as both a stand-alone sampler and an "integrated solution", the software covers all the features of the Liquiline CM44x multiparameter transmitter and data logger. To keep software programming simple for a wide variety of WTTP applications, the software is structured around 3 different levels. By selecting "Basic", "Standard", or "Advanced" when setting up a sampling program, different software features are displayed to match the complexity of the application.

Below is a graph showing the five most common sampling programs and accompanying acronyms.

1.4.1 Sampling modes according to ISO, EN and DIN standards



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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 min).

c. **Flow proportional sampling:**
Variable time constant volume (VTCV)
A constant sampling volume is taken at variable intervals (depending on the inflow volume).

d. **Flow proportional sampling/time override:**
Constant time variable volume (CTVV)
A variable sampling volume (the sampling volume depends on the inflow) is taken at steady time intervals (e.g. every 10 min).
Only for versions with peristaltic pump

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

A program can consist of single and multiple samples from the different sampling methods listed above. In addition, the software allows interval sampling, single bottle sampling as well as event sampling. We offer the flexibility of permitting 1 main program to run with up to 24 subprograms simultaneously for complex or variable applications. A sampling table makes it possible for users to program the bottle assignment, time interval and sample volume very easily. Signals for external control can be connected via an analog or binary input which both come as standard options in our basic sampler version. Customized text can be entered to ensure the correct assignment of the inputs in the memory.
With nine (9) lines of information, the sampler has the biggest display on the sampler market. Most competitors have a 2- or 4-line display with no graphical feature. In the "Basic" setup, the display shows the complete program overview (see screenshot below). Entering numbers, values, names and other terms is as simple as using the keyboard of a calculator or GPS unit.
"One-hand operation" by simply turning and pressing the navigator is extremely user friendly.

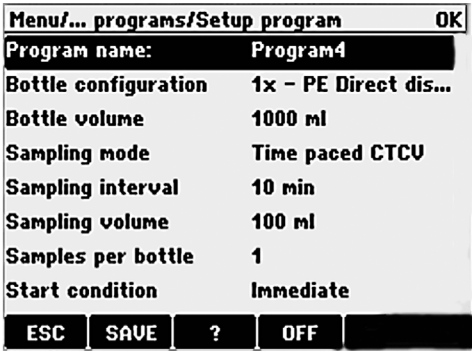

Fig. 4: Example of program setup

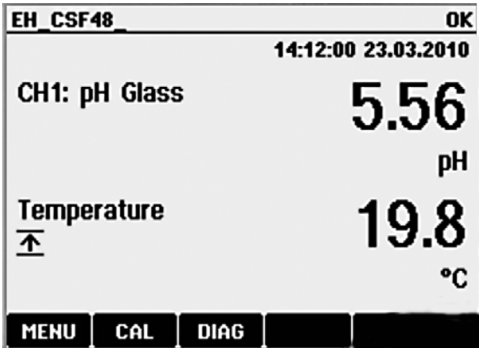

Fig. 5: Example of measuring menus

1.4.2 Easy operation: unique features

- User interface with navigator enables very easy operation even when wearing gloves
- Transflective display technology offers best readability and contrast even in bright ambient light conditions
- All events, diagnostics, programs and measured data can be stored for later analysis
- A new sampling program can be created while another is running
- Errors are indicated by an LED and a red flashing display – clearly visible

1.4.3 Process safety: unique features

- All inputs and outputs are galvanically isolated
- All languages are available for safe user operation
- Automatic identification of sensors (**true** plug-and-play technology)
- Automatic assignment of sensors to channels
- Automatic identification of type and position of modules
- Option to make automatic changeover between summertime and wintertime
- Support of diagnostics categories (F/M/C/S) according to NAMUR NE107
- Display of help menu and remedy information in case of a diagnostic message
- Minimum interruption time thanks to failure description and clear instructions
- Limit monitoring function also assignable to diagnostic messages
- Free assignment of current inputs and outputs to various signal sources e.g. measurement/calculated values, controller, etc.
- Increased reliability thanks to verification of the current output value by selftest-diagnostics -> deviations from the set value are detected.
- Device configuration and logbooks can be saved or restored via SD card and/or FieldCare software and/or Ethernet web server.
- Online data communication:
  - Analog signal 0/4 to 20mA
  - HART
  - Profibus DP (Liquistation CSF48 only)
  - Modbus TCP (Liquistation CSF48 only)
  - Modbus RS485 (Liquistation CSF48 only)
- Data logger functions:
  - Calibration logbook: max. 75 entries
  - Hardware version logbook: max. 125 entries
  - Version logbook: max. 50 entries
  - Operation logbook: max. 250 entries
  - Diagnostics logbook: max. 250 entries
  - Data logbooks:
    - Adjustable scan time: 1 to 3600 s (6 h)
    - Max. 8 data logbooks
    - 150,000 entries per logbook
    - Graphic display or text display

2 Liquistation CSF48

2.1 Housing options

We offer **four different housing** options depending on the customer's application, permit requirement or installation point.

- Polystyrene for standard applications in waste water treatment plants and water treatment plants (yellowing can occur in direct sunlight – sun protection required).
- ASA+PC (Luran) for outdoor standard applications and industrial applications with chemically-loaded environment.
- Stainless steel (304) for standard applications in WWTP and WTP.
- Stainless steel (316) for industrial applications in WWTP

Below is a graph outlining the strengths of each housing material.

	CSF48			
	Plastic ASA+PC	Plastic Polystyrene	Stainless Steel 1.4301/AISI 304x	Stainless Steel 1.4571/AISI 316x
Mechanical stress	✔✔	✔✔	✔	✔
Scratch resistance	✔✔	✔✔	✔✔	✔✔
Heat resistance	✔✔	✔✔	✔✔	✔✔
Weathering + UV resistance	✔✔	✔✔	✔✔	✔✔
Chemical resistance	✔✔	×	O	✔
Fire performance	✔✔	✔✔	✔✔	✔✔
Antistatic performance	✔✔	✔✔	✔✔	✔✔
Electrical properties	✔✔	✔✔	×	×
Varnishing possibility	✔✔	✔✔	✔	✔
Shrinkage	✔✔	✔✔	✔✔	✔✔
Recycling	✔✔	✔✔	O	O

2.2 The sample cooling system

ISO 5667-3 (International Standard) gives details on how to preserve, transport and store samples for water analysis. The most common way of preserving liquid samples is to cool them to a temperature between +2°C and +5°C. When cooled to this temperature and stored in the dark, most samples are normally stable for several hours or even days. The samples can be preserved for a specific analysis method by adding chemicals to stabilize the sample. When adding additional stabilizers to the sample bottle, it is necessary to use more than one sample container to allow both preserved and unpreserved samples to be taken.
When **cooling the sample**, it is important that the sampler cooling system allow the sample to cool down as quickly as possible and have enough cooling capacity to keep the temperature stable.

Rear view of the upper housing
- Compact cooling with 24VDC cooling system
- Unique advantage for installations anywhere in the world: no problem with different line voltages and frequencies
- Easy service and maintenance

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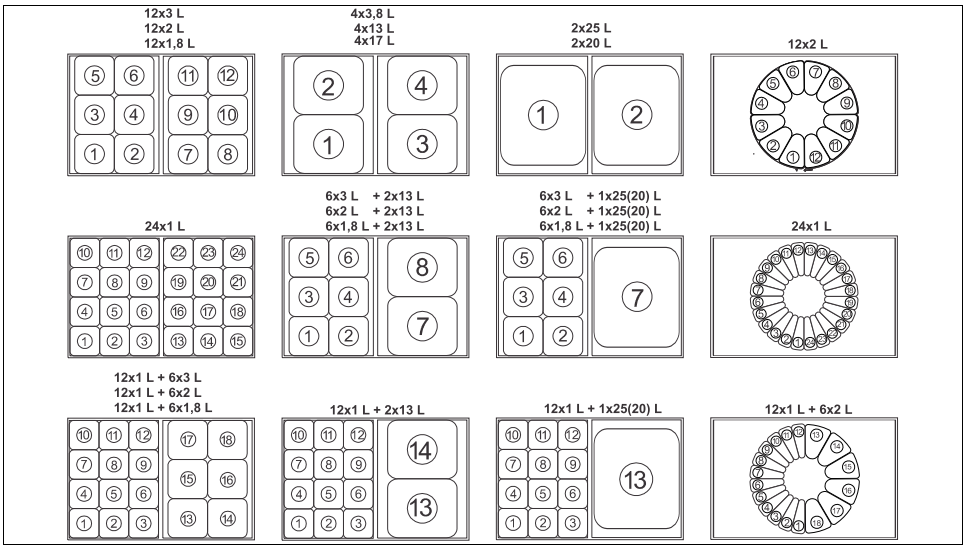
2.3 The widest range of bottle configurations

At many WWTPs, permit requirements demand composite samples for inlet (loading), process control and outlet points. Typical composite samples are needed for parameters such as BOD, suspended solids, ammonium, nitrogen and total phosphorus. Composite samples ensure that data obtained from a slug or spike flow cannot bias the sample. The more individual samples collected, the better the flow stream is represented. For example: US EPA requires samples to be taken every 15 minutes over a 24-hour period. This method equals 96 samples over a 24-hour period and is very representative of the entire flow.
The software in the Liquistation CSF48 includes all the functions for the current needs as well as for future sampling programs with up to **21 different bottle configurations**.

Sequential sampling in multiple bottles is used to obtain more detailed information on the sample quality at certain intervals. Multiplexing of samples per bottle allows sample preservation with chemicals depending on the subsequent analysis.
In addition to the standard modes of sampling described in ISO5667, switching and event sampling programs are included in the software of the Liquistation CSF48. Samplers connected to online measurements can cut lab costs by sampling by a parameter-triggered event. The sampling program trigger can be enabled by an event parameter limit, range, or rate of change.
The mixed bottle configuration is mainly used for program combinations with standard and event sampling. In such applications the composite daily sample is found in a big container, e.g. 20 liter and the event samples, activated by pH, conductivity or other parameters, are found in 1 liter bottles.



2.4 Summary of CSF48

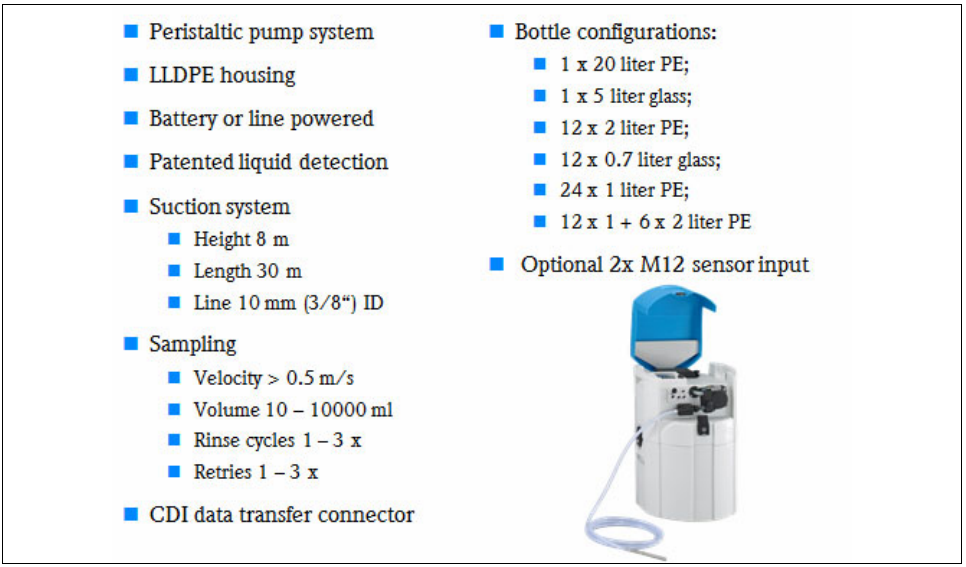
Feature	Advantage	Benefit
4 different housing materials: plastic PS or ASA-PC, SS304 or SS316	Select the best for your municipal and industrial application	Design suits application, flexible to use in harsh environment
21 different bottle configurations	Easy to choose, same or mixed bottle configuration for standard and event sampling	All built-in software, easy to replace and select the bottles and start the program
Sample bottles in separate bottle trays with integrated carrying handles	Sample bottles can be easily removed and transported in the bottle trays	Transportation of sample bottles does not pose a health risk as sample weight halved
Bottle compartment with seamless plastic internal shell	Can be easily cleaned using a water hose	Simple and fast cleaning
Wetted parts can be easily removed and replaced without the need for tools	Simple cleaning and maintenance	Reliable operation, time saving
Compact, active 24VDC low-voltage cooling system	Quick cooling performance for safe sample storage	Reliable operation with any line voltage
Data logging	Up to 8 data memories with 150000 data records each	Free built-in recorder
Power supply	Worldwide use with: 24VDC and 90 to 265VAC, battery backup for sample safety	No problems with different voltage and frequencies save time and cost
Sample intake technique	Choose the best for your application, vacuum or peristaltic pump. Inline sampling for pressurized pipes.	Sample volume and velocity can be matched to the application.
Multichannel	2 analog inputs, 2 binary inputs and up to 4 digital sensor inputs with MS protocol	Flexibility, cost-saving, easy to create a small measuring station
Memosens technology	All sensors can be connected to one transmitter, use of precalibrated sensors	Identical configuration for all sensors. Hot plug and play for sensors
Display 95x75 mm	Large, high-contrast display for best usability, 9 lines of information	Large measured values easy to read; excellent overview within the menus; graphical information for intuitive handling
Navigator and soft keys	Intuitive navigator, quick access with 4 soft keys	Easy and fast navigation through the software menu
Fast setup	Self-explanatory, menu-guided configuration	Save time and reduce risk during configuration
Clear text messages	Easy to understand	Configuration possible without manual
Communication	Use Profibus DP, Modbus RTU or Modbus TCP to integrate into your network	Remote access to PLC

3 Liquiport 2010 CSP44

3.1 Product characteristics at a glance

The Liquiport 2010 CSP44 is a portable water sampler designed for the fully automated sampling and defined distribution of liquid media.

The sampler is designed for use in the following applications:
- Municipal and industrial sewage treatment plants:
  - Self-monitoring
  - Process monitoring
  - Monitoring of indirect dischargers
  - Manhole monitoring
- Authorities and water conservancy boards:
  - Water protection and water quality
  - Monitoring of indirect/direct dischargers
  - Labs and hydrological institutes



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Sample distribution:
The sampling liquid is distributed into the individual bottles using a rotating distribution arm. In addition to a 20 liter PE composite container, various bottle configurations are available. The distribution version can be changed easily without the need for tools. The Liquiport 2010 CSP44 allows flexible configuration of the sample distribution. Individual bottles and bottle groups can be defined for the main, switching and event programs.

3.2 Summary of CSP44

Feature	Advantage	Benefit
Housing material: Plastic LDPE	Municipal and industrial application	For use in harsh environment
6 different bottle configurations	Easy to choose, same or mixed bottle configuration for standard and event sampling	All built-in software, easy to replace and select the bottles and start the program
Bottle compartment with seamless plastic internal shell	Can be easily cleaned using a water hose	Simple and fast cleaning
Wetted parts can be easily removed and replaced without the need for tools	Simple cleaning and maintenance	Reliable operation, time saving
Sample cooling with ice packs or crushed ice	Quick cooling performance for safe sample storage	Cheap operation
Data logging	Up to 8 data memories with 150000 data records each	Free built-in recorder
Power supply	Worldwide use with: 24VDC and 90 to 265VAC	No problems with different voltage and frequencies save time and cost
Sample intake technique	Peristaltic pump	Sample volume can be easily matched to the application.
Multichannel	Different combinations with analog and binary inputs and up to 2 digital sensor inputs with MS protocol	Flexibility, cost-saving, easy to create a small measuring station
Memosens technology	All sensors can be connected to one transmitter, use of precalibrated sensors	Identical configuration for all sensors. Hot plug and play for sensors
Display 95x75 mm	Large, high-contrast display for best usability, 9 lines of information	Large measured values easy to read; excellent overview within the menus; graphical information for intuitive handling
Navigator and soft keys	Intuitive navigator, quick access with 4 soft keys	Easy and fast navigation through the software menu
Fast setup	Self-explanatory, menu-guided configuration	Save time and reduce risk during configuration
Clear text messages	Easy to understand	Configuration possible without manual
Communication	Use Fieldcare to configure and download the logbooks	Remote access to PC

4 Software and setup examples

The Liquistation CSF48 and the Liquiport 2010 CSP44 have an identical control concept.
The control concept consists of a complete software package which offers 3 levels of program features for standard and complex applications.

4.1 Basic Level

The following functions are available in the “Basic” program level:
- Time proportional sampling with constant volume (CTCV)
- Flow proportional sampling with variable time (VTCV)
- Time proportional sampling with variable volume (CTVV) –> only peristaltic
- Bottle change mode controlled by time or number of samples
- Synchronization of sample bottle –> only with selected bottle change on time
- Program start and stop conditions setup

4.2 Standard Level

The Standard Level offers the same functions for the main programs as the Basic Level program version. With the addition of timed changeover programs, this program level is mainly used with weekday, weekend, monthly or interval sampling. The programs are set up as subprograms and are able to run either in parallel or consecutively. With the bottle assignment function, it is possible to select "No", "Dynamical" or "Statical" if more than one subprogram is created. If "Dynamical" is selected, the next subprogram starts with a new sample bottle; if "Statical" is selected, each subprogram can hold a specific bottle or bottle set in the bottle assignment table. In addition, the start condition can be selected with "Volume". This start volume is calculated from the flow meter input at the analog input or binary input.

4.3 Advanced Level

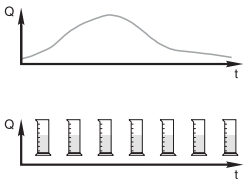
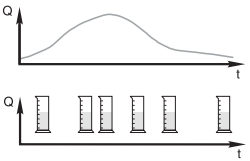
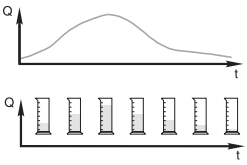
The Advanced Level offers the same functions as before with the addition of event programming features:
- Event sample in predefined bottle or bottle set, activated by an internal or external parameter measurement or external signal.
- Parallel sampling using two subprograms – one as daily composite, the other for alarms in defined bottle or bottle set.
- Consecutive sampling using two subprograms - such as the storm water program where the main program is activated on rainfall, the first subprogram runs time-paced and next subprogram is flow-paced.

4.4 Differences between program levels

To set up a program quickly, please refer to the tables below and find the correct program level.

The following steps explain some of the rules:
- Basic = 1 routine program for daily work in WWTP paced on time or flow, first bottle change or bottle number can be synchronized with switching time.
- Standard = 1 or more subprograms + time-synchronized programs paced on time or flow, interval and date / time sampling.
- Advanced = 1 or more subprograms + event-triggered sampling, external control with binary inputs

The table shows all the possible functions for easy selection of the correct program level:

Sampling Technique	**Sampling Modes**		
	BASIC	**STANDARD**	**ADVANCED**
Vacuum + peristaltic + sampling assembly 	Time proportional CTCV = constant time + constant volume	Time proportional CTCV = constant time + constant volume	Time proportional CTCV = constant time + constant volume
Vacuum + peristaltic + sampling assembly 	Flow proportional VTCV = variable time + constant volume	Flow proportional VTCV = variable time + constant volume	Flow proportional VTCV = variable time + constant volume
Peristaltic 	Time/flow proportional CTVV = constant time + variable volume	Time/flow proportional CTVV = constant time + variable volume	Time/flow proportional CTVV = constant time + variable volume
Vacuum + peristaltic + sampling assembly			Single sample = 1 sample per bottle
Vacuum + peristaltic			Sampling table = variable time + variable volume + variable bottles

Sampling Technique	Sampling Modes		
	BASIC	STANDARD	ADVANCED
Vacuum + peristaltic + sampling assembly			External signal = external control connected to binary inputs

4.5 Start and stop conditions

The following table shows all the possible functions for start and stop conditions of the various program levels:

Sampling Actions		
BASIC	**STANDARD**	**ADVANCED**
Program Start Options		
Immediate	Immediate	Immediate
Date/time Start date xx.xx.xxxx Start time xx:xx:xx	Date/time Start date xx.xx.xxxx Start time xx:xx:xx	Date/time Start date xx.xx.xxxx Start time xx:xx:xx
	Volume Start flow sum xx.x	Volume Start flow sum xx.x
		External start = binary input pulse
		External duration = binary input signal
Program Stop Options		
Program end = all bottles filled	Program end = all bottles filled	Program end = all bottles filled
Continuous = no stop, remember to replace bottles	Continuous = no stop, remember to replace bottles	Continuous = no stop, remember to replace bottles
	Date/time Stop date xx.xx.xxxx Stop time xx:xx:xx	Date/time Stop date xx.xx.xxxx Stop time xx:xx:xx
		External signal = binary input

4.6 Standard and Advanced Level

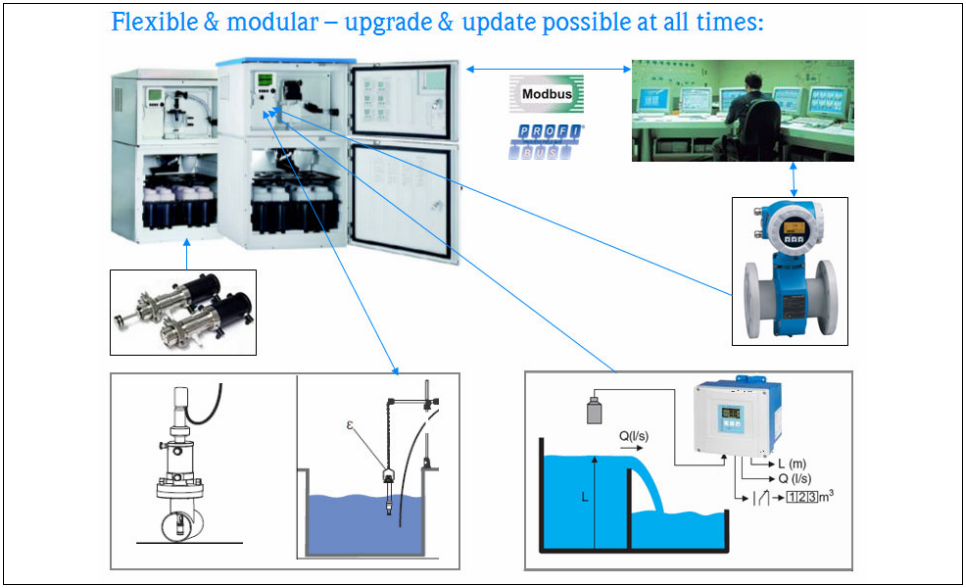
The following table shows the difference between all the possible functions for “Standard and Advanced” program levels:

Sampling Actions	
STANDARD	**ADVANCED**
Create up to 24 subprograms	
Select activation of the subprogram	
Immediate	
Individual dates Up to 24: Start date xx.xx.xxxx Start time xx:xx:xx Stop date xx.xx.xxxx Stop time xx:xx:xx	
Multiple date Start time xx:xx:xx (synchronization of first sampling) No delay Date/time Start date xx.xx.xxxx Start time xx:xx:xx Time Start time xx:xx:xx Activity time 00-00:01 - 00-23:59 Repeating date Daily interval Repetition 1 - 999 Weekly interval Repetition 1 - 999 Days of week Monday - Sunday	
Interval Start time xx:xx:xx (synchronization of first sampling) No delay Date/time Start date xx.xx.xxxx Start time xx:xx:xx Time Start time xx:xx:xx Activity time 00-00:01 - 31-00:00 Inactivity time 00-00:01 - 31-00:00	
Deactivate program part 1 - only if more than 1 subprogram is created	

Sampling Actions	
STANDARD	**ADVANCED**
	Event Start time xx:xx:xx (synchronization of first sampling) No delay Date/time Start date xx.xx.xxxx Start time xx:xx:xx Time Start time xx:xx:xx Number of events 1 to 3 (and/or combination of up to 3 events possible) Source of data (selection of possible data entries shown) Select measured value (one parameter can show more than one value) Select the operation mode: Upper limit Lower limit Within range Out of range Rate of change
	External start Activation with binary input signal

5 FAQ

Only a few examples are provided in this section. As the Liquistation CSF48 sampler covers a wide range of options, possibilities, features and benefits it is not possible to list all the questions customers have posed in the past.



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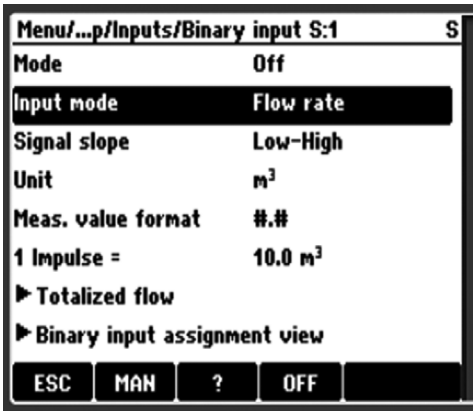
5.1 Does the sampler have binary inputs for external control?

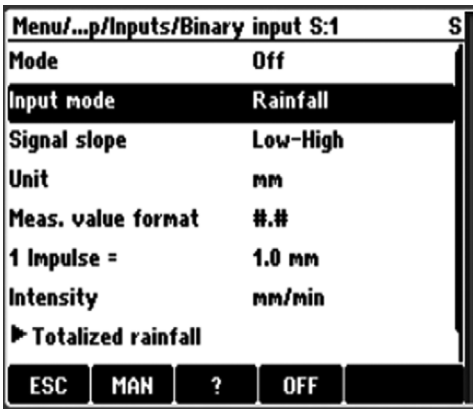
Yes, the standard sampler has 2 binary inputs which are galvanically isolated from one other.

To set up the inputs, enter "MENU/Setup/Inputs/Binary input" to select the control functions to suit your needs:

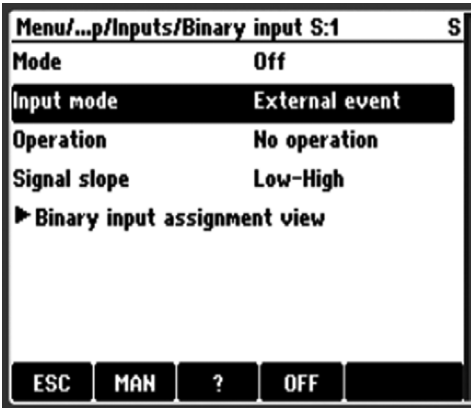
Select "Input mode" : "Flow rate" to pace the sampler on flow pulses from a flow meter.
Select the "Unit" of measure from your flow meter.
Enter the "Meas. value format".
Enter the value for "1 Impulse =" coming from the flow meter.



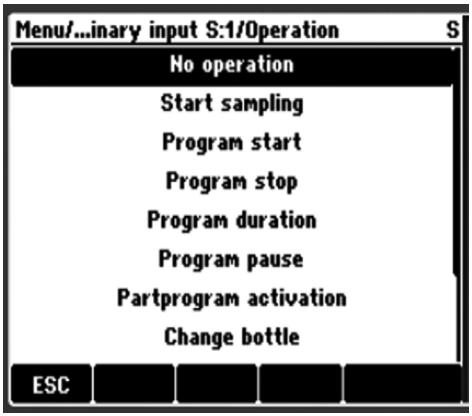
Select "Input mode" : "Rainfall" to pace the sampler on pulses from a rain gauge.
Select the "Unit" of measure from your rain gauge (mm or inch).
Enter the "Meas. value format".
Enter the value for "1 Impulse =" received from the rain gauge.



Select "Input mode" : "External event" to pace the sampler on external pulses or signal changes.
Select the "Operation" to enter the function for your application.



Select one of following events:



No operation	No action is executed.
Start sampling	A pulse triggers sampling.
Program start	A pulse starts a program.
Program stop	A pulse stops all programs running.
Program duration	A program is active as long as the input signal is present. The signal is a level signal, i.e. the action takes effect as long as the level is present. The level that triggers the action is configured in the "Signal slope" menu item that follows.

Program pause	The input signal stops all programs running. The programs continue running when the signal disappears. The signal is a level signal, i.e. the action takes effect as long as the level is present. The level that triggers the action is configured in the "Signal slope" menu item that follows.
Partprogram activation	A pulse triggers a subprogram.
Change bottle	A pulse triggers a changeover to the next bottle.
Bottle synchronization	A pulse triggers a changeover to the set bottle position. —> Select the bottle position in the menu item that follows.
External hold	The input signal triggers an external hold. The signal is a level signal, i.e. the action takes effect as long as the level is present. The level that triggers the action is configured in the "Signal slope" menu item that follows.

5.2 How can I connect a Promag 50W flowmeter to the Liquistation?

Two possible outputs of the flowmeter and two possible inputs of the sampler can be used: the binary input or the current input.

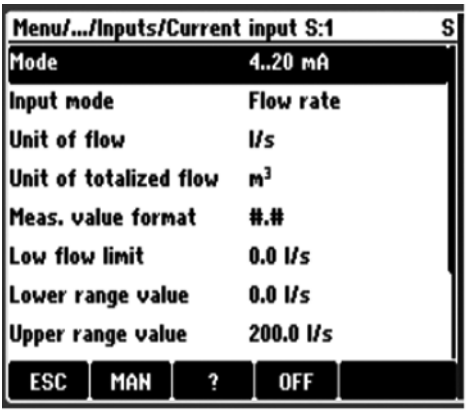
The Promag 50W has the following specifications:

- Current output
  Active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100s), full scale value selectable
  – Active: 0/4 to 20 mA
  – Passive: 4 to 20 mA, operating voltage VS: 18 to 30 V DC
- Pulse/frequency output
  Passive, open collector, 30 V DC, 250 mA, galvanically isolated
  – Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.5 to 2000 ms)
  – Frequency output: full scale frequency 2 to 1000 Hz (fmax = 1250 Hz), on/off ratio 1:1, pulse width max. 10s

Current output/input software connection

To configure the inputs to suit your needs, enter "MENU/Setup/Inputs/Current input S:1 or S:2":

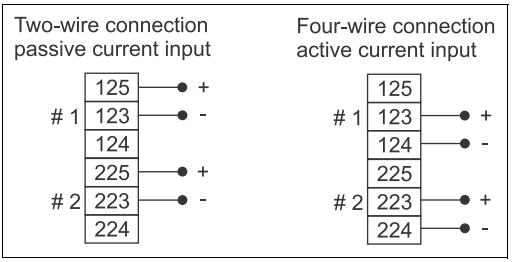
1. Select "Input mode" : "Flow rate" or "Current".
2. If "Flow rate" is selected, please enter the correct units of measure and the range. You can enter a value for the "Low flow limit" which is between the "Lower range value" and the "Upper range value. This disables the sampling cycle if the actual flow rate is below this limit value.
3. In the "Totalized flow" counter submenu, the display shows the "Current totalized flow". The totalizer can be reset in three different ways: "Manual", "Automatic (Daily, Weekly, Monthly) or at "Program start".



Current output/ input hardware connection

Refer to the "Wiring" section of the commissioning manual.
Use the active output on the Promag and connect the 2 wires to the active input on the sampler terminals 123 + and 124 –.

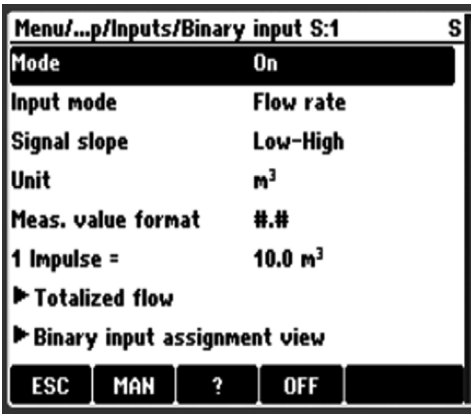
Liquistation CSF48 current inputs:



Pulse output/binary input connection

To set up the configuration of the inputs to suit your needs, enter "MENU/Setup/Inputs/Binary input %0V"[1]:

1. Select "Mode" : "On".
2. Select "Input mode" : "Flow rate".
3. Enter the correct "Unit" and the value per "1 Impulse =". This correct setting calculates the correct totalized flow and sets the sampling cycle to flow-paced. The example shows 1 pulse per 10m³. This value can be multiplied and displayed in the sampler software. With that function the sampling interval is calculated in 1 – n x 10m³.
4. In the "Totalized flow" counter submenu, the display shows the "Current totalized flow". The totalizer can be reset in three different ways: "Manual", "Automatic (Daily, Weekly, Monthly) or at "Program start".



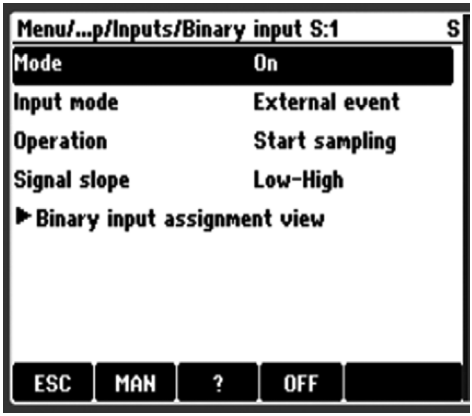
1) "%0V" here stands for text that depends on the context. This text is generated automatically by the software and inserted in place of %0V. In the simplest situations, the generated text could be the name of the measuring channel, for example.

If no flow information on the sampler is required and flow pulses do not need to be multiplied, you can enable a sampling cycle with 1 pulse input from the flow meter. In this case enter the correct sampling pulse in the flow meter software, for example 100m.

Pulse output/binary input connection

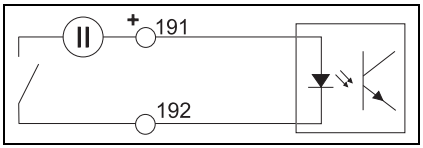
To set up the configuration of the inputs to suit your needs, enter "MENU/Setup/Inputs/Binary input %0V":

1. Select "Mode" : "On".
2. Select "Input mode" : "External event".
3. Enter the "Operation" : "Start sampling" to enable the sampling cycle with each flow meter pulse.



Pulse output/input hardware connection

Refer to the "Wiring" section of the commissioning manual.
Use the pulse output on the Promag and connect the two wires as shown in the figure below. Use +24VDC at the terminal to drive the output to a signal level at terminal 191+ and 192–.



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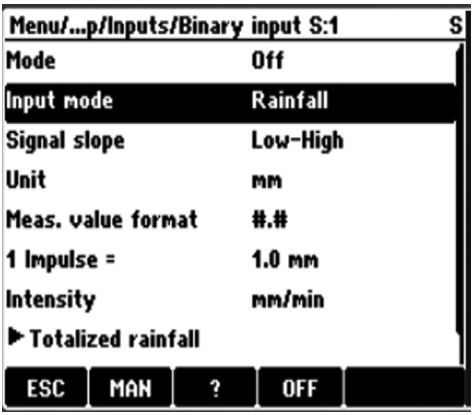
5.3 Is it possible to connect a rain gauge and pace and trigger the sampler on rainfall?

Yes, the standard sampler has two binary inputs which are galvanically isolated from each other. Most rain gauges with a tipping basket have a reed switch output which is simple to connect to the terminals.

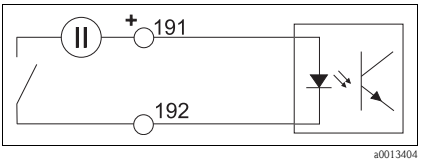
To set up the configuration of the inputs to suit your needs, enter "MENU/Setup/Inputs/Binary input":

1. Select "Input mode" : "Rainfall" to pace the sampler on pulses from a rain gauge.
2. Select the "Unit" of measure from your rain gauge (mm or inch).
3. Enter the "Meas. value format".
4. Enter the value for "1 Impulse =" from the rain gauge.
5. In the "Totalized rainfall" counter submenu, the display shows the "Totalized rainfall". The totalizer can be reset in three different ways: "Manual", "Automatic (Daily, Weekly, Monthly) or at "Program start".



Pulse output/input hardware connection

Refer to the "Wiring" section of the commissioning manual.
Use the two-wire output from the rain gauge switch and connect one wire to the – 24VDC terminal and the other wire to terminal 192-. Use a short cable connection from + 24VDC to terminal 191+.



5.4 Is it possible to upgrade my “basic” sampler to digital sensor inputs?

Yes, you can select 1, 2 or 4 digital sensor inputs with or without 2, 4, or 6 current outputs.

5.5 Does the sampler hold any certificates?

Yes, the Liquistation and Liquiport are certified to:

5.6 Why is the warning still on after the pump tubing has been replaced (peristaltic pump)?

Reset counter in "Menu/Diagnostics/Term information/Pump tube life".

5.7 Why is the volume still incorrect after the pump tubing has been replaced (peristaltic pump)?

Reset counter in "Menu/Diagnostics/Term information/Pump tube life".

6 Program examples

6.1 Basic - Time-paced (CTCV) composite sampling for daily lab work

The composite container (30 liter) is replaced every day, sample volume 21600 ml after 24 h (6 x 24 x 150 = 21600 ml).

Customer needs:

Sampling interval:	10 minutes ≙ 6 samples per hour
Sampling volume:	150 ml
Sampling container:	30 liter
Sampling start:	Immediate
Sampling stop:	No -> Continuous work

1. Set up the sampler configuration:
   To set up the configuration, enter "Menu/Setup/Basic setup" to select the bottle configuration and the sampling volume or use "Menu/Setup/General settings/Sampling" for detailed configuration.
2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Basic" to select the Basic level.

Program steps	**Enter values**	**Check or change**
Program name	B CTCV	Enter a program name
Bottle configuration	1x - PE Direct distribution	No change - default
Bottle volume	30000 ml	No change - default
Sampling mode	Time	No change - default
Sampling interval	00:10:00	Enter interval time
Dosing volume	150 ml	No change - default
Multiplier	1	Not used
Bottle change mode	Number of samples	No change - default
Samples per bottle	1	No change - default
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous

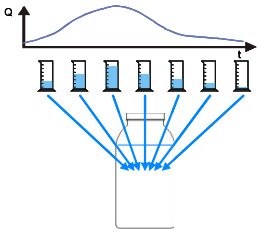
3. To start the program press SAVE -> Name of program -> Start.

6.2 Basic - Time-paced/volume on flowrate (CTVV) composite sampling – peristaltic only

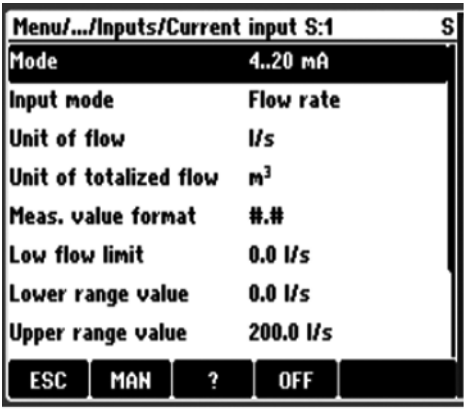
The composite container (30 liter) is replaced every day, sample volume in total depends on flow rate: at 20mA = max flow rate = 200ml sample volume. The total sample volume in the container could be less than 28800ml.

Customer needs:

Sampling interval	10 minutes
Sampling volume 20mA	200 ml
Sampling container	30 liter
Start condition	Immediate
Stop condition	No -> Continuous work

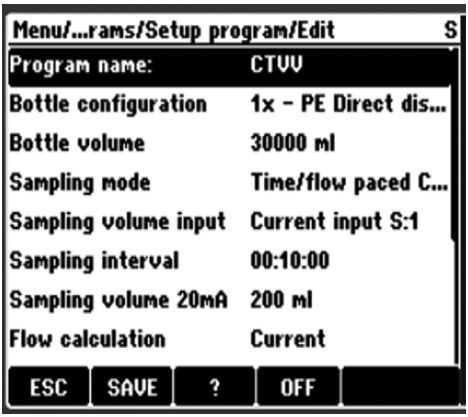


1. Set up the flow meter input:
   To set up the configuration of the inputs to suit your needs, enter:
   "Menu/Setup/Inputs/Current input S:1":



Program steps	Enter values	Check or change
Mode	4 ... 20 mA	Enter Mode
Input mode	Flow rate	Enter Input mode
Unit of flow	l/s	Enter the unit of flow
Unit of totalized flow	m^3	Enter the unit of totalized flow
Low flow limit	0.0 l/s	You can enter a value for the "Low flow limit" which is between the "Lower range value" and "Upper range value". This disables the sampling cycle if the actual flow rate is below this limit value.
▶ Totalized flow		In Totalized flow, the display shows the Current totalized flow and the Flow rate. The totalizer can be reset in three different ways: Manual, Automatic (Daily, Weekly, Monthly) or At program start.

2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Basic" to select the Basic level.



Program steps	Enter values	Check or change
Program name	B CTVV	Enter a program name
Bottle configuration	1x - PE Direct distribution	No change - default from setup
Bottle volume	30000 ml	No change - default from setup
Sampling mode	Time/flow paced CTVV	Select
Sampling volume input	Current input S:1	Select
Sampling interval	00:10:00	Enter interval time
Sampling volume 20mA	200 ml	Enter the volume at max flow
Flow calculation	Current	Select Current or Average flow
Bottle change mode	Number of samples	No change - default
Samples per bottle	1	No change - default
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous

There are two ways to select the "Flow calculation". If "Current" is selected, the actual flow rate every 10 minutes is used to calculated the sample volume. If "Average flow" is selected, the average flow rate between the 10-minute interval is used to calculate the sample volume – if this option is selected, the first sample is taken after a 10-minute delay.

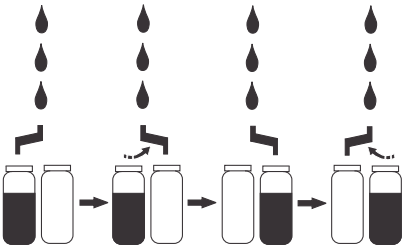
3. To start the program press SAVE -> Name of program -> Start.

6.3 Basic - Flow-paced (VTCV) 2 container composite sampling

Two composite containers (25 liter) are installed in the sampler. One container is replaced every day. The sample volume in total depends on the flow rate. The total sample volume in the container could be less than 20000 ml.

Customer needs:

Sampling interval	100 m^3
Sampling volume	80 ml
Sampling container:	2x25 liter
Bottle synchronization	00:00
Sampling start	Immediate
Sampling stop:	No -> Continuous work



1. Flow meter connected to binary input S:1
   Flow pulse calculation:
   - 1 flow meter pulse = 10 m^3
   - Maximum flow rate 1000 m^3/h
   - Sampling interval 100 m^3 = maximum 10 samples per hour
   - Maximum samples per day = 240
   - Bottle volume: number of samples = sample volume = 80 ml
2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Basic" to select the Basic level.

Program steps	Enter values	Check or change
Program name	B VTCV	Enter a program name
Bottle configuration	2x - PE Direct distribution	No change - default from setup
Bottle volume	25000 ml	No change - default from setup
Sampling mode	Flow paced VTCV	Select
Flowmeter input	Binary input S:1	Select
Sampling interval	100 m^3	Enter flow interval time
Sampling volume	80 ml	Enter sampling volume
Bottle change mode	Time	Select
Time interval	01-00:00	Enter 1 day
Multiple bottles	0	
Bottle synchronization	1. bottle change time	Select
Synchronization time	00:00	Select
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous

"Bottle synchronization" - only visible with "Bottle change mode" "Time"
There are three options to choose from:
- "None" = the bottle change is based on the starting time of the program
- "1. bottle change time" = enter the time of the first bottle (1 -> 2) change from 00:00 to 23:59
- "1. Time of change + bottle number" = is mainly used with 12 or 24 bottles to synchronize the bottle number with the switching time (e.g. 2h)

3. To start the program press SAVE -> Name of program -> Start.

6.4 Basic - Time-paced (CTCV) 4 container composite sampling

Four composite containers (13 liters each) are installed in the sampler. One container is replaced every day at 08:00 am. The total sample volume in the container must be more than 5000ml.

Customer needs:

Sampling interval:	15 minutes
Sampling volume:	100 ml
Sampling container:	4 x 13 liter
	1 per day = 96 samples
Bottle synchronization	08:00
Start condition	Immediate
Stop condition	No -> Continuous work

1. Set up the sampler configuration:
   To set up the configuration, enter "Menu/Setup/Basic setup" to select the bottle configuration and the sampling volume or use "Menu/Setup/General settings/Sampling" for detailed configuration.
2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Basic" to select the Basic level.

Program steps	**Enter values**	**Check or change**
Program name	B CTCV	Enter a program name
Bottle configuration	4x - PE Direct distribution	No change - default from setup
Bottle volume	13000 ml	No change - default from setup
Sampling mode	Time paced CTCV	No change - default
Sampling interval	00:15:00	Enter interval time
Sampling volume	100 ml	No change - default from setup
Bottle change mode	Time	Select
Time interval	01-00:00	Enter 1 day
Multiple bottles	0	No change - default
Bottle synchronization	1. bottle change time	Select
Synchronization time	08:00	Select
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous

"Bottle synchronization" - only visible with "Bottle change mode" "Time"
There are three options to choose from:
- "None" = the bottle change is based on the starting time of the program
- "1. bottle change time" = enter the time of the first bottle (1 -> 2) change from 00:00 to 23:59
- "1. Time of change + bottle number" = is mainly used with 12 or 24 bottles to synchronize the bottle number with the switching time (e.g. 2h)

3. To start the program press SAVE -> Name of program -> Start.
4. The program starts immediately with filling bottle 1, the automatic first bottle change takes place the next morning at 8:00 a.m. and then every day at 8:00 a.m. The sampler holds samples from the last 4 days.

6.5 Basic - Time-paced (CTCV) 12 bottles 2h composite sampling

12 composite containers (3 liters each) are installed in the sampler. Bottle trays are replaced every day at 8:00 a.m. The total sample volume in the bottle must be more than 2000ml.

Customer needs:

Sampling interval:	10 minutes
Sampling volume:	200 ml
Sampling container:	12 x 3000 liter
	1 per 2 h = 12 samples
Bottle synchronization	08:00 (bottle number 1)
Start condition	Immediate
Stop condition	No -> Continuous work

1. Set up the sampler configuration:
   To set up the configuration, enter "Menu/Setup/Basic setup" to select the bottle configuration and the sampling volume or use "Menu/Setup/General settings/Sampling" for detailed configuration.
2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Basic" to select the Basic level.

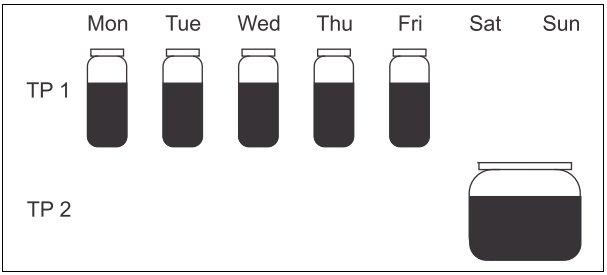
Program steps	**Enter values**	**Check or change**
Program name	B CTCV	Enter a program name
Bottle configuration	12x - PE/Glass Plate distribution	No change - default from setup
Bottle volume	3000 ml	No change - default from setup
Sampling mode	Time paced CTCV	No change - default
Sampling interval	00:10:00	Enter interval time
Sampling volume	200 ml	
Bottle change mode	Time	Select
Time interval	0-02:00	Enter 2 hours
Multiple bottles	0	No change - default
Bottle synchronization	1. Time of change + bottle number	Select
Synchronization time	08:00	Select
Day of week	Daily	No change - default
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous

3. To start the program press SAVE –> Name of program –> Start.
4. The program starts immediately. The distributor arm moves to the actual timed position (calculated back to 08:00). Bottle 1 is filled the next morning from 08:00 – 10:00, then there is a bottle change every 2 hours.

"Bottle synchronization" - only visible with "Bottle change mode" "Time"
There are three options to choose from:
- "None" = the bottle change is based on the starting time of the program
- "1. bottle change time" = enter the time of the first bottle (1 –> 2) change from 00:00 to 23:59
- "1. Time of change + bottle number" = is mainly used with 12 or 24 bottles to synchronize the bottle number with the switching time (e.g. 2h)

6.6 Standard - Two-part program, weekdays flow-paced (VTCV) and weekend time-paced (CTCV) with mixed bottle configuration 12 x 1 liter and 1 x 25 liter

One bottle tray with 24x 1 liter bottles and 1 composite container (25 liters) are installed in the sampler, the bottle tray for VTCV is replaced every business day (Monday – Friday), the composite container is used for weekend CTCV sampling and is replaced every Monday.



Customer needs:

Peristaltic pump sampler	
Sampling container:	12x+1x - PE/Glass Plate distribution
12 x 1 liter	VTCV 100m³, bottle change 2 h, 40 ml
1 x 25 liter	CTCV 15 min, 100 ml
Bottle synchronization	00:00
Sampling start	Immediate
Sampling stop:	No -> Continuous work

1. Set up flow meter input:
   Set up the configuration for the flow meter input, "Menu/Setup/Inputs/Current input S:1" or "Menu/Setup/Inputs/Binary input S:1".
2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Standard" to select the Standard level.

Program steps	Enter values	Check or change
Program name	S VTCV - CTCV	Enter a program name
Bottle configuration	12x+1x - PE/Glass Plate distribution	Select
Bottle volume left	1000 ml	No change - default from setup
Bottle volume right	25000 ml	No change - default from setup
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous
Bottle assignment	Statical bottle assignment	Select
▶ Bottle assignment table		Later used
▶ Setup subprogram		Enter End of "Main program".

Program steps	Enter values	Check or change
Programpart1		Select
▶ Edit		
Subprogram	VTCV	Change name
Sampling mode	Flow paced VTCV	Select
Sampling volume input	Binary input S:1	Select
Sampling interval	100	Enter flow interval time
Sampling volume	40 ml	Enter
Bottle change mode	Time	Select
Time interval	00-02:00	Enter 2 hours
Enable subprogram	Multiple date	Select
Start condition	No delay	Default
Activity time	00-23:59	Enter
▶ Repeating date		Enter
Repetition mode	Days of week	Select
Monday - Friday	Yes	Select and press ESC
Sample at enable	Yes	Default
Sample at disable	No	Default
New bottle at disable	Yes	Default

Program steps	Enter values	Check or change
Bottle synchronization	1. Time of change + bottle number	Select
Synchronization time	00:00	Enter
Days of week	Daily	Default
Days of week	Daily	Default
SAVE	->	New

Program steps	Enter values	Check or change
Programpart2		Select
▶ Edit		
Subprogram	CTCV	Change name
Sampling mode	Time paced CTCV	Default
Sampling interval	15	Enter
Sampling volume	100 ml	Enter
Bottle change mode	Number of samples	Default
Samples per bottle	192	Enter
Enable subprogram	Multiple date	Select
Start condition	No delay	Default
Activity time	00-23:59	Enter
▶ Repeating date		Enter
Repetition mode	Days of week	Select
Saturday - Sunday	Yes	Select and press ESC
Sample at enable	Yes	Default
Sample at disable	No	Default
New bottle at disable	No	Select
Bottle synchronization	None	Default
SAVE	ESC	ESC

Program steps	Enter values	Check or change
▶ Bottle assignment table		Enter
Bottle 1 – Bottle 12	VTCV	Select
Bottle 13	CTCV	Select
ESC	SAVE	Start

6.7 Standard - Two-part program, flow-paced (VTCV) in two bottles, seven day interval in 1 bottle (CTCV) and manual sample in one bottle

4 x 13 liter bottles are installed in the sampler, bottle 1 + 2 contains daily composite samples, bottle 3 takes a 2 hour composite sample every 7 days + 2 hours. Bottle 4 is reserved for a manual sample take by the environmental agency.

Customer needs:

Vacuum pump sampler	
Sampling container:	4 x 13 liter
	VTCV 10m³, bottle change 24 h, 100ml
	CTCV 10 min, 200 ml
Bottle synchronization	00:00
Sampling start	Immediate
Sampling stop:	No -> Continuous work

1. Set up the flow meter input:
   Set up the configuration for the flow meter input, "Menu/Setup/Inputs/Current input S:1" or "Menu/Setup/Inputs/Binary input S:1".
2. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Standard" to select the Standard level.

Program steps	**Enter values**	**Check or change**
Program name	S 2d VTCV - 7d CTCV	Enter a program name
Bottle configuration	4x - PE Direct distribution	Select
Bottle volume	13000 ml	No change - default from setup
Start condition	Immediate	No change - default
Stop condition	Continuous	Select Continuous
Bottle assignment	Statical bottle assignment	Select
▶ Bottle assignment table		Later used
▶ Setup subprogram		Enter End of "Main program".

Program steps	Enter values	Check or change
Programpart1		Select
▶ Edit		
Subprogram	2d_VTCV	Change name
Sampling mode	Flow paced VTCV	Select
Flowmeter input	Binary input S:1	Select
Sampling interval	10	Enter flow interval time
Sampling volume	100 ml	Enter
Multiplier	1	No change - default
Bottle change mode	Time	Select
Time interval	01-00:00	Enter 1 day
Multiple bottles	0	No change - default
Enable subprogram	Immediate	Select
Sample at enable	Yes	No change - default
New bottle at disable	Yes	No change - default
Bottle synchronization	1. bottle change time	Select
Synchronization time	00:00	No change - default
SAVE	->	New

Program steps	Enter values	Check or change
Programpart2		Select
▶ Edit		
Subprogram	7d_CTCV	Change name
Sampling mode	Time paced CTCV	No change - default
Sampling interval	10	Enter
Dosing volume	100 ml	Enter
Multiplier	2	Enter
Bottle change mode	Time	Select
Time interval	00-02:00	Enter 2 hours
Multiple bottles	0	No change - default
Enable subprogram	Interval	Select
Start condition	Time	Select
Start time	00:00:00	Enter
Activity time	00-02:00	Enter 2 hours
Inactivity time	07-02:00	Enter 7 days and 2 hours
Sample at enable	Yes	No change - default
Sample at disable	No	No change - default
New bottle at disable	Yes	No change - default
Bottle synchronization	None	No change - default
SAVE	->	ESC

Program steps	Enter values	Check or change
▶ Bottle assignment table		Enter
Bottle 1 + Bottle 2	2d_VTCV	Select
Bottle 3	7d_CTCV	Select
ESC	SAVE	Start

A manual sample can be taken in bottle 4 on request at any time.

6.8 Advanced - Stormwater two-part program, 4 bottles direct distribution

This example of a two-part program requires a series of timed samples to be taken during the initial run-off of the storm event, followed by flow-paced samples during the remainder of the event. A flow meter and rain gauge must be connected to the sampler.
4 bottles (13 liters each) are installed in the sampler; the bottles are replaced after the end of the program.

Customer needs (peristaltic pump sampler):

Sampling container:	4 x 13 liter
Start condition	Immediate
Stop condition	Program end

Program part 1:

Sampling container:	1x first flush bottles
Sampling interval	Time-paced, 5 minutes
Sampling volume	1000 ml
Sampling start	Event of rain 2 mm in 30 minutes, first sample when function enabled

Program part 2:

Sampling container:	3 bottles
Sampling interval	Flow-paced, 10 m^3
Sampling volume	100 ml
Sampling start	Deactivation part 1, sample when function enabled

1. Set up the flow meter input:
   Set up the configuration for the flow meter input, "Menu/Setup/Inputs/Current input S:1" or "Menu/Setup/Inputs/Binary input S:1".
2. Set up the sampler configuration:
   To set up the configuration, enter "Menu/Setup/Basic setup" to select the bottle configuration and the sampling volume or use "Menu/Setup/General settings/Sampling" for detailed configuration.
3. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Advanced" to select the Advanced level.

Program steps	Enter values	Check or change
Program name	A1 Storm	Enter a program name
Bottle configuration	4x – PE Direct distribution	No change – default from setup
Bottle volume	13000 ml	No change – default from setup
Start condition	Immediate	No change – default from setup
Stop condition	Program end	No change – default from setup
Bottle assignment	Statical bottle assignment	Select
▶ Bottle assignment table		Later used
▶ Setup subprogram		Enter End of "Main program".

Program steps	Enter values	Check or change
Programpart1		Select
▶ Edit		
Subprogram	Program part 1	No change – default
Sampling mode	Time paced CTCV	No change – default
Sampling interval	00:05:00	Enter interval time
Sampling volume	1000 ml	Enter volume
Bottle change mode	Number of samples	Default
Samples per bottle	6	Enter 6 samples per bottle
Multiple bottles	0	No change – default
Enable subprogram	Event	Select
Start condition	No delay	No change – default
▶ Activation event		Enter
Number of events	1	Select
▶ Event Editor 1		Edit
Source of data	Binary input S:1	Select
Measured value	Rainfall per time	Select
Operating mode	Rate of change	Select
Hysteresis	0.1 mm/min	Enter

Program steps	Enter values	Check or change
Delta value	2.0 mm/min	Enter
Delta time	00:30 hours	Enter
Auto Confirm	00:01 hours	No change - default
ESC	->	ESC
Sample at enable	Yes	No change - default
Sample at disable	No	No change - default
Deactivation	Bottles full	Select
New bottle at disable	Yes	No change - default
Synchronize samplings	To subprogram start	No change - default
Bottle synchronization	None	No change - default
SAVE	ESC	New

Program steps	Enter values	Check or change
Programpart2		Select
▶ Edit		
Subprogram	Program part 2	No change - default
Sampling mode	Flow paced VTCV	Select
Flowmeter input	Current input S:1	Select
Sampling interval	10 m^3	Enter interval
Sampling volume	100 ml	Enter volume
Bottle change mode	Number of samples	No change - default
Samples per bottle	100	Enter 100 samples per bottle
Multiple bottles	0	No change - default
Enable subprogram	Deactivation program part 1	Select
Sample at enable	Yes	No change - default
Sample at disable	No	No change - default
New bottle at disable	Yes	No change - default
Synchronize samplings	To subprogram start	No change - default
Bottle synchronization	None	No change - default
SAVE	ESC	

Program steps	Enter values	Check or change
▶ Bottle assignment table		Enter
Bottle 1	Program part 1	Select
Bottle 2 – Bottle 4	Program part 2	Select
ESC	SAVE	

Program steps	Enter values	Check or change
Select program	A1 Storm	Enter
▶ Start		

6.9 Advanced - Stormwater two-part program, 24 bottles direct distribution

This example of a two-part program requires a series of timed samples to be taken during the initial run-off of the storm event, followed by flow-paced samples during the remainder of the event. A flow meter and rain gauge must be connected to the sampler.
24 bottles (1 liter each) are installed in the sampler. The bottle tray is replaced after the end of the program.

Customer needs:

Sampling container:	12x+1x - PE/Glass Plate distribution
Start condition	Immediate
Stop condition	Program end

Program part 1:

Sampling container:	6x first flush bottles
Sampling interval	Time-paced, 5 minutes
Sampling volume	800 ml
Sampling start	Event of rain and level, sample when function enabled

Program part 2:

Sampling container:	Rest of bottles
Sampling interval	Flow-paced, 200 m^3
Sampling volume	800 ml
Sampling start	Deactivation part 1, no sample when function enabled

1. Set up the flow meter input:
   Set up the configuration for the flow meter input, "Menu/Setup/Inputs/Current input S:1" or "Menu/Setup/Inputs/Binary input S:1".
2. Set up the sampler configuration:
   To set up the configuration, enter "Menu/Setup/Basic setup" to select the bottle configuration and the sampling volume or use "Menu/Setup/General settings/Sampling" for detailed configuration.
3. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Advanced" to select the Advanced level.

Program steps	Enter values	Check or change
Program name	Storm	Enter a program name
Bottle configuration	24x - PE Direct distribution	No change - default from setup
Bottle volume	1000 ml	No change - default from setup
Start condition	Immediate	No change - default from setup
Stop condition	Program end	No change - default from setup
Bottle assignment	Statical bottle assignment	Select
▶ Bottle assignment table		Later used
▶ Setup subprogram		Enter End of "Main program".

Program steps	Enter values	Check or change
Programpart1		Select
▶ Edit		
Subprogram	Program part 1	No change - default
Sampling mode	Time paced CTCV	Select
Sampling interval	5 minutes	Enter interval time
Sampling volume	800 ml	Enter volume
Bottle change mode	Number of samples	Default
Samples per bottle	1	Enter 1 sample per bottle
Multiple bottles	0	No change - default
Enable subprogram	Event	Select
Start condition	No delay	No change - default
▶ Activation event		Enter
Number of events	2	Select
▶ Event Editor 1		Edit
Source of data	Binary input S:1	Select
Measured value	Rainfall per time	Select
Operating mode	Rate of change	Select
Hysteresis	0.1 mm/min	Enter
Delta value	2.0 mm/min	Enter

Program steps	Enter values	Check or change
Delta time	00:30 hours	Enter
Auto Confirm	00:01 hours	No change – default
-> ESC		
▶ Event Editor 2		Edit
Source of data	Current input S:1	Select
Measured value	Flow rate	Select
Operating mode	Upper limit	Select
Limit value	100 l/s	Enter
Hysteresis	5.0 l/s	Enter
Start delay	0 s	No change – default
Switch off delay	0 s	No change – default
-> ESC		
Interconnection	E1 and E2	No change – default
-> ESC		
Sample at enable	Yes	No change – default
Sample at disable	No	No change – default
Deactivation	Bottles full	Select
New bottle at disable	Yes	No change – default
Synchronize samplings	To subprogram start	No change – default
Bottle synchronization	None	No change – default
SAVE	ESC	New

Program steps	Enter values	Check or change
Programpart2		Select
▶ Edit		
Subprogram	Program part 2	No change - default
Sampling mode	Flow paced VTCV	Select
Flowmeter input	Current input S:1	Select
Sampling interval	200 m^3	Enter interval
Sampling volume	800 ml	Enter volume
Bottle change mode	Number of samples	No change - default
Samples per bottle	1	Enter 1 sample per bottle
Multiple bottles	0	No change - default
Enable subprogram	Deactivation %0V	Select
Sample at enable	No	Select
Sample at disable	No	No change - default
New bottle at disable	Yes	No change - default
Synchronize samplings	To subprogram start	No change - default
Bottle synchronization	None	No change - default
SAVE	ESC	

Program steps	Enter values	Check or change
▶ Bottle assignment table		Enter
Bottle 1 - Bottle 6	Program part 1	Select
Bottle 7 - Bottle 24	Program part 2	Select
ESC	SAVE	Start

Program steps	Enter values	Check or change
Select program	Storm	Enter
▶ Start		

6.10 Advanced - Routine and event-paced sampling on pH value with mixed bottle configuration

This example of a two-part program requires a digital pH sensor connected to the sampler or the use of the analog input of an external measurement system.
2 x 13 liters are used for daily composite samples and 12 x 1 liter bottles are used for event sampling.

Customer needs:

Sampling container:	2 x 13 + 12 x 1 liter
Start condition	Immediate
Stop condition	Continuous

Program part 1:	Daily composite
Sampling container:	2 x 13 liter
Sampling interval	Time-paced, 10 minutes
Sampling volume	70 ml
Sampling start	Date/time, Sample at enable
Bottle change	24 h

Program part 2:	Event
Sampling container:	12 x 1 liter
Sampling interval	Time-paced, 5 minutes
Sampling volume	70 ml
Sampling start	> pH 8, Sample at enable
Bottle change	10 samples or new event

1. Set up the optional analog input:
   Set up the configuration for the input, "Menu/Setup/Inputs/Current input S:1". Choose "Input mode:Parameter".
2. Set up the sampler configuration:
   To set up the configuration, enter "Menu/Setup/Basic setup" to select the bottle configuration and the sampling volume or use "Menu/Setup/General settings/Sampling" for detailed configuration.
3. Set up the sampler program:
   Enter "Menu/Setup/Sampling programs/Setup program" or from the start screen "Select sampling program", enter "New" to create a new program, enter "Advanced" to select the Advanced level.

Program steps	Enter values	Check or change
Program name	A3 Event pH > 8	Enter a program name
Bottle configuration	12x+2x - PE+PE Plate distribution	No change - default from setup
Bottle volume left	1000 ml	No change - default from setup
Bottle volume right	13000 ml	No change - default from setup
Start condition	Date/time	Select
Start date	xx.xx.xxxx	Enter
Start time	xx:xx:xx	Enter
Stop condition	Continuous	Select
Bottle assignment	Statical bottle assignment	Select
▶ Bottle assignment table		Later used
▶ Setup subprogram		Enter End of "Main program".

Program steps	Enter values	Check or change
Programpart1		Select
▶ Edit		
Subprogram	Program part 1	No change - default
Sampling mode	Time paced CTCV	No change - default
Sampling interval	10 minutes	No change - default
Sampling volume	70 ml	Enter volume
Bottle change mode	Time	Select
Time interval	01-00:00	Enter
Enable subprogram	Immediate	Select
Sample at enable	Yes	No change - default
New bottle at disable	Yes	No change - default
Synchronize samplings	To subprogram start	No change - default
Bottle synchronization	None	No change - default
SAVE	ESC	New

Program steps	Enter values	Check or change
Programpart2		Select
▶ Edit		
Subprogram	Program part 2	No change - default
Sampling interval	5 minutes	Enter interval
Sampling volume	70 ml	Enter volume
Bottle change mode	Number of samples	No change - default
Samples per bottle	10	Enter 10 samples per bottle
Enable subprogram	Event	Select
Start condition	No delay	No change - default
▶ Activation event		
Number of events	1	No change - default
▶ Event Editor 1		
Source of data		Select input of pH measurement
Measured value	pH	Select
Operating mode	Upper limit	No change - default
Limit value	8	Enter
Hysteresis	0.1	Enter
Start delay	0 s	No change - default
Switch off delay	0 s	No change - default
ESC	->	ESC
Sample at enable	Yes	No change - default
Sample at disable	No	No change - default
Deactivation	Enable invalid	No change - default
New bottle at disable	Yes	No change - default
Synchronize samplings	To subprogram start	No change - default
Bottle synchronization	None	No change - default
SAVE	->	ESC

Program steps	Enter values	Check or change
▶ Bottle assignment table		Enter
Bottle 1 - Bottle 12	Program part 2	Select
Bottle 13 - Bottle 14	Program part 1	Select
ESC	SAVE	Start

Program steps	Enter values	Check or change
Select program	A3 Event pH > 8	Enter
▶ Start		

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