

Operating manual SYCON 2602



Analyzer for automated monitoring
of total hardness, residual hardness or carbonate hardness in process water

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Safety reliably produced.



General notes

This operating manual describes the installation and operation of the online analyzer SYCON 2602. The installation and commissioning are to be carried out by an authorised specialist.

The device may only be operated under the conditions described in this operating manual. The device may be used only for the specified purpose of use. For the installation and operation of the analyzer, all the provisions applicable on site (such as EN, DIN, VDE, UVV) are to be followed.

The analyzer is used for automatic determination of total water hardness or carbonate water hardness in process water. Proper operation can only be guaranteed if the reagents and spare parts recommended by us are used.

Modifications to the electrical wiring and the programming may only be made by a trained specialist.

The water connection pipes to the device should be kept as short as possible and should not be laid together with AC power lines or in their immediate vicinity. In the vicinity of strong electromagnetic emitters, the analysis can become disturbed. In this case, separate interference suppression measures are to be taken; in particular the EMC-regulations are to be followed.

It is recommended to always have access to the analyzer when familiarising oneself with these operating instructions in order to understand the described relationships and functions immediately. Since certain areas are built upon one another, it is advisable to work through the chapter in the specified order.

If there are any questions when using the analyzer, you will receive support from our partners or us. You can reach us by phone during normal business hours or by email. You will find complete contact details of our technicians and our partners on our website.

Safety instructions and used symbols

This operating manual contain various safety instructions that indicate possible risks when using the analyzer. This specifically concerns hazards for

- people,
- this product or related devices and installations,
- the working environment.

General notes

Various symbols in this manual indicate special hazards in order to avoid personal injury and equipment damage. Please read the entire text in full before starting work.



This symbol indicates useful tips for a better understanding of the device.



This symbol is a general warning that indicates circumstances that need to be considered.



Pressure

This symbol is a warning that you must expect lines under pressure.



Voltage

This symbol indicates the risk of electric current and the endangerment of people and electronic components and assemblies.

Transport



Check immediately after receipt that the device is complete and free from transport damage. The analyzer is shipped in a manner safe for transport. Nevertheless, damage may occur during transport. Instruct the deliverer immediately about damage during transport.



Protect the analyzer from possible damage during transport. If necessary, remove any liquids still in it in advance. Remove the reagent bottle and close it to prevent the reagent from leaking.

Storage



Store the analyzer in a dry place at temperatures between 0 - 45 °C and without direct sunlight.

Instruction on disposal

The device must not be disposed of as residual waste. Bring the device to a collection point. The battery should be disposed of separately.

Alternatively, you can return the analyzer to your dealer or us for disposal.

SYCON 2602 in detail

The SYCON 2602 online analyzer has the following features:

- reliable, accurate and fully automatic analyzer
- Monitoring a limit value
- Monitoring of the total or carbonate hardness can be measured with the same analyzer
- simple commissioning via configuration wizard
- programmable analysis interval
- BOB operation (72 hours)
- self-calibrating and self-monitoring
- easy maintenance and cleaning
- compact design
- multicoloured, multilingual graphic display
- relay output for limit value
- relay output for error message
- relay output for sample cooler valve, reagent signal or feed pump
- digital input for start analysis, water meter, flow switch or interval reset
- Measurement data memory and measurement data protocol on SD card
- no condensation in the optics
- Software updates via SD card



The SYCON 2602 is not a system that prevents hardness irruption.

Scope of supply

The SYCON 2602 is available in two versions:

1. *Wall-mounted analyzer*

The analyzer consists of a controller and the measuring chamber. Both are mounted on a wall holder. This version is fully functional and includes connections for the water inlet and -outlet and a holder for holding a reagent bottle (Figure 1).

2. *Analyzer in housing*

Optionally for wall-mounted analyzer, a plastic housing is available in order to use the analyzer in locations where more severe contamination is expected (Figure 2). The analyzer on the wall holder can be quickly mounted in the housing with 4 screws. If the analyzer and the housing are ordered together, the device is already mounted in the housing.

SYCON 2602 in detail

Article name	Article no.
Analyzer SYCON 2602 with wall mounting 230 VAC Version	30-110 160
Analyzer SYCON 2602 with wall mounting 24 V AC/DC Version	30-111 160
Analyzer SYCON 2602 in housing 230 VAC Version	30-310 160
Analyzer SYCON 2602 in housing 24 V AC/DC Version	30-311 160
Housing for SYCON series including wall mounting brackets	33-099 005
Operating manual (English)	33-099 727

The analyzer can be operated intuitively via menu using the graphic display and 8 keys on the controller housing.



Figure 1:
Wall mounted SYCON 2602



Figure 2:
Wall mounted SYCON 2602 in housing



The wall mounted SYCON 2602 analyzer is mounted in the housing with 4 supplied screws.

SYCON 2602 in detail

Device description

The analyzer consists of the following components: The controller with graphic display and control panel is on the left side of the device. 5 cable bushings are provided on the lower controller housing. The dosing pump is on the right side and the measuring chamber is below the dosing pump.

The dosing pump is plugged onto the motor shaft of the motor and snaps into the receptacle. It can be removed without tools. The measuring chamber is attached to 2 guide pins on the controller housing. This can also be removed without tools and is undone with 2 captive locking pins. Dosing plugs, actuator plugs, inlet- and outlet plugs are attached to the measuring chamber in the same way and can be quickly undone.

The measuring chamber, which is always depressurised and always filled to prevent germs, is in the middle. The actuator plug with a white high-power LED is in the middle of the measuring chamber. The sensor system is located in the housing. The stirring unit (magnetic agitator), which is firmly connected to the housing, is below the measuring chamber.

The water connections for hoses with an outer diameter of 6 mm are below the reagent bottle. Inlet with sample water (left) and outlet (right). Both are firmly bolted to the wall holder.

There is a solenoid valve in the supply line behind the reagent bottle.



Figure: View of the solenoid valve (no reagent bottle installed)

SYCON 2602 in detail

Principle of function

The SYCON 2602 based on the SYCON series is an online analyzer for the automatic determination of water parameters according to the colorimetric limit value method. By adding an reagent to the water sample, a colour reaction is produced. Depending on the reagent used, the device evaluates the colour intensity. The SYCON 2602 monitors the limit value of the water content substance by changing the colour of the sample after the addition of the reagent. The device can only determine one parameter at a time. Parameters and limit value are determined by the reagent used and the programmed unit of measurement.

General specification

Parameter	Value/range
Power supply	(230 VAC version) 85 – 305 VAC (47...440 Hz) (24 V AC/DC version) 21.6 – 26.4 V AC/DC (50Hz)
Power consumption	25 VA (in operation) 3.5 VA (standby)
Load capacity	Load capacity of the relays with internal current supply: 1 A from terminals 5 to 8 Load capacity of the relays with external current supply: 2.5 A
Protection class	open wall mounting IP43 Installation in the housing IP54
Storage temperature	0 °C – 45 °C
Ambient temperature	10 °C – 45 °C
Measuring water temperature	5 °C – 40 °C
Air humidity	20 – 90 % RH (without ice or condensate)
Pressure of inlet water	min: 0.5 bar - max: 5 bar / recommended 1 - 2 bar
General inlet water	clear, colourless, free of solids, without gas bubbles
Requirements for the water quality when measuring the water hardness	pH: 4 - 10 Iron: < 3 ppm Copper: < 0.2 ppm Aluminium: < 0.1 ppm Manganese: < 0.2 ppm Acid capacity: KS 4.3 < 5 mmol/l

Note on oxidizing agents:

Oxidizing agents, e.g. calcium hypochlorite, chlorine, chlorine dioxide, sodium hypochlorite or ozone beyond the limits permitted in "TrinkwV 2012" attack the dye contained in the reagent and interfere with the measurement. An exact determination of the water hardness is no longer guaranteed. An activated carbon filter upstream of the analyzer can remove these oxidants from the sample water and thus allow the correct determination of the water hardness. The capacity of an activated carbon filter consumes during operation. Therefore, the activated carbon filter must be replaced at regular intervals. The effectiveness of the charcoal filter can be checked using Caldur® test kits.

SYCON 2602 in detail

Technical data

Parameter	Value/range
Installation	Wall mounting in closed rooms
Dimensions	without housing: 274 x 275 x 129 mm (W x H x D)
	with housing: 332 x 345 x 190 mm (W x H x D)
Weight	without housing: approx. 1.9 kg
	with housing: approx. 3.8 kg

Analysis properties

Parameter	Value/range	
Measurement method	Titration with colour change	
Measuring range	Total hardness	
	Carbonate hardness	
	°dH	0.02 .. 10
	°f	0.04 .. 20
	ppm CaCO ₃	0.4 .. 200
	mmol/l	0.004 .. 1.78
	°e	0.028 .. 14
°Ж	0.008 .. 4	
	The measuring range is defined by the reagent used. Due to an adapted measuring sequence, the limit values differ depending on the programmed hardness unit. <i>(The following units are available for the analysis value: °dH, °f, ppm CaCO₃, mmol/l, °e, °Ж these are shown in the display).</i>	
Accuracy	Measuring accuracy: ± 10% of the limit value of the reagent used	
Reagent consumption	approx. 0.1 ml / analysis, depending on the measured water hardness	
Measuring duration	approx. 5 min, depending on the flush duration set	
Number of analyses	approx. 5,000 analyses / 500 ml reagent, independent of water hardness	
Shelf life of the reagents	at least 2 years with proper storage (<25° C, dark)	
Water consumption	approx. 1 l/analysis with 2 bar The water consumption varies depending on the inlet pressure and the set flush duration.	

SYCON 2602 in detail

Inputs/outputs

Parameter	Value/range
3 relay outputs	max. 250 VAC / VDC 1 A (For more information, see page 10) as potential-free outputs NC/NO The relays provide the following functions: <ul style="list-style-type: none">• Limit value alarm• Device error• Analysis active with switchable delay time• Reagent message
Signal input	electrically separated contact input <ul style="list-style-type: none">• Start analysis• Water meter• Flow switch• PLC interval reset

Maintenance interval

Interval	Maintenance works
every 6 months	Cleaning of measuring chamber
	 At high ambient- and water temperatures or water with high organic load, the cleaning intervals may need to be shortened.
every 30,000 analyses or after 2 years of operation	Cleaning of measuring chamber (as above), Installation of maintenance set: Changing the peristaltic pump cartridge and the gaskets

SYCON 2602 in detail

Reagents for monitoring total hardness

Name Reagent	Measuring range			Art. no. 500 ml bottle	Art. no. 4 x 500 ml bottles
	°dH	ppm CaCO ₃	°f		
H25-0.02	0.02	0.2	0.04	32-084 115	32-484 115
H25-0.05	0.05	1	0.1	32-084 125	32-484 125
H25-0.1	0.1	2	0.2	32-084 135	32-484 135
H25-0.2	0.2	4	0.4	32-084 145	32-484 145
H25-0.3	0.3	6	0.6	32-084 155	32-484 155
H25-0.5	0.5	10	1.0	32-084 165	32-484 165
H25-1	1.0	20	2.0	32-084 175	32-484 175
H25-2	2.0	40	4.0	32-084 185	32-484 185
H25-3	3.0	60	6	32-084 195	32-484 195
H25-5	5	100	10	32-084 205	32-484 205
H25-10	10	200	20	32-084 215	32-484 215

(The following units are available for the analysis value: °dH, °f, ppm CaCO₃, mmol/l, °e, °Ж these are shown in the display).

Reagents for monitoring carbonate hardness

Name Reagent	Measuring range			Art. no. 500 ml bottle	Art. no. 4 x 500 ml bottles
	°dH	mmol/l	°f		
C25-1	1	0.4	2	32-086 125	32-486 125
C25-1.5	1.5	0.6	3	32-086 135	32-486 135
C25-2	2	0.8	4	32-086 145	32-486 145
C25-3	3	1.2	6	32-086 155	32-486 155

(The following units are available for the analysis value: °dH, °f, ppm CaCO₃, mmol/l, °e, °Ж these are shown in the display).

The dosing quantities of the reagent are adjusted to the unit set on the device. They differ according to the selected unit of water hardness.

One bottle of reagent is sufficient for at least 5,000 limit value analyses.

Installation

The installation should be done in the following steps to avoid errors:

- Install the analyzer in a dry, easily accessible and easily visible location.
- Fix the analyzer or housing stably with screws according to the manual.
- Connect the device electrically and pay attention to the correct input voltage. Ensure this using the nameplate.
- Connect inlets and outlets according to the installation manual. Pay attention to a correct inlet pressure and free, short outlet.
- Insert the reagent and connect it to the dosing pump. Make sure that the connecting hoses are not twisted.
- Do not switch on the device until all preliminary works have been completed and the housing is closed.
- Now set the device settings on the device.



The sample water must be clear and free of solids. Otherwise, a filter should be provided in front of the analyzer. Solids in the water can damage the solenoid valve or prevent it from closing. If the solenoid valve blocks or does not open or close any longer, the measuring chamber will not be flown-through properly. This leads to incorrect measurements.



Temperature of the sample water must be between 5 and 40° C.



If the sample water has a higher temperature, a sample cooler should be used. This is available as an accessory.

Installation

Wall mounting without housing

The SYCON 2602 must be installed upright. The wall holder has four 6 mm holes for attaching the analyzer.

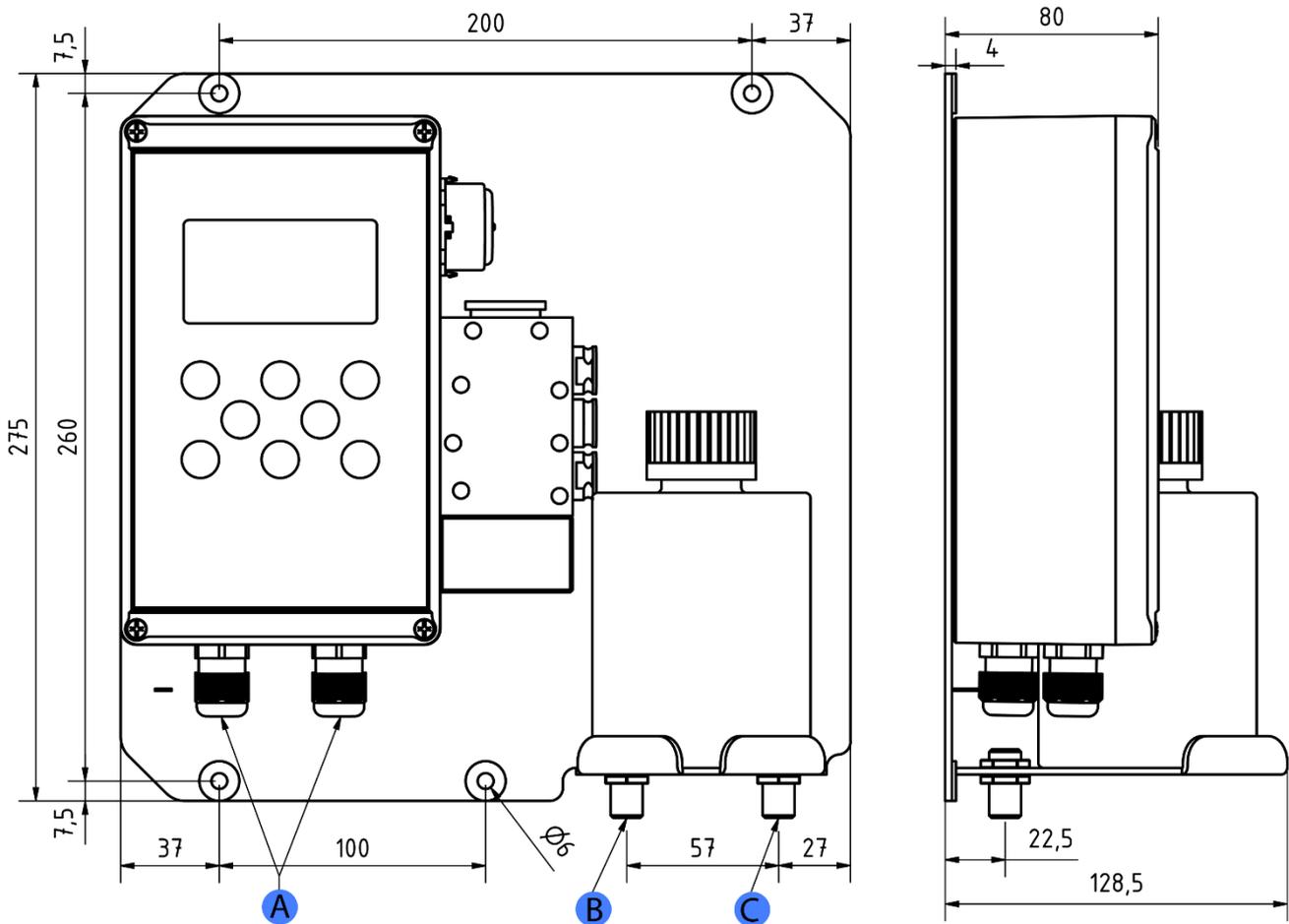


Figure: Drill guide for attaching the analyzer without housing

Position	Description
A	Cable glands for electrical connection
B	Water inlet connection for hose with 6 mm outer diameter
C	Water outlet connection for hose with 6 mm outer diameter

Installation

Wall mounting with housing

The analyzer is optionally supplied with a matching housing. As accessories kit you will receive 4 mounting lugs with 6.5 mm holes, which are attached to the rear side of the housing.

To open the device, the available free space should be at least 450 x 350 mm (W x H).

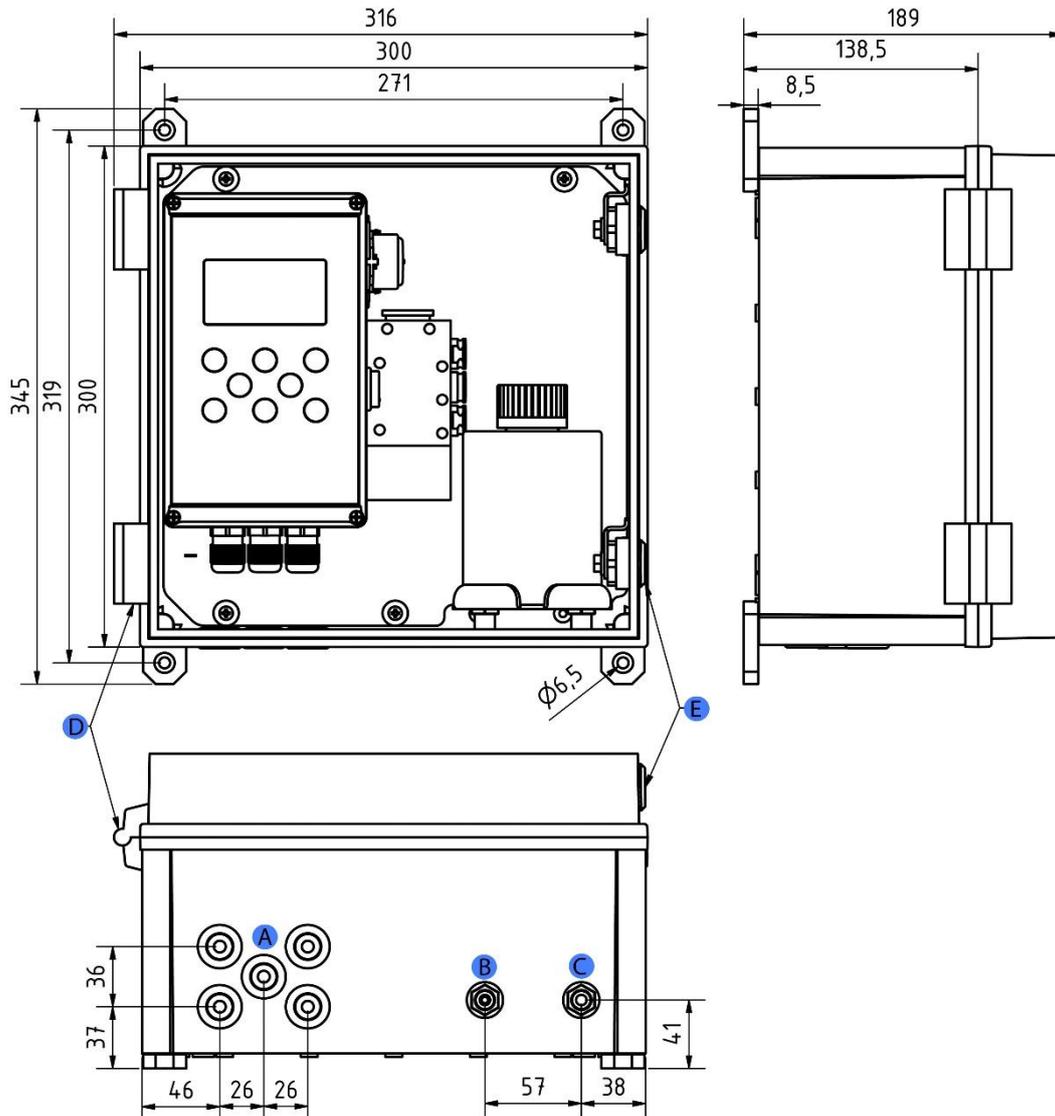


Figure: Drill guide for attaching the analyzer in the housing

Position	Description
A	Cable bushings for the electrical connection
B	Water inlet connection for hose with 6 mm outer diameter
C	Water outlet connection for hose with 6 mm outer diameter
D	Door stop
E	Door locks

Installation

The mounting lugs can be attached perpendicularly, as shown in the picture, or as rotated by 45° or 90°.

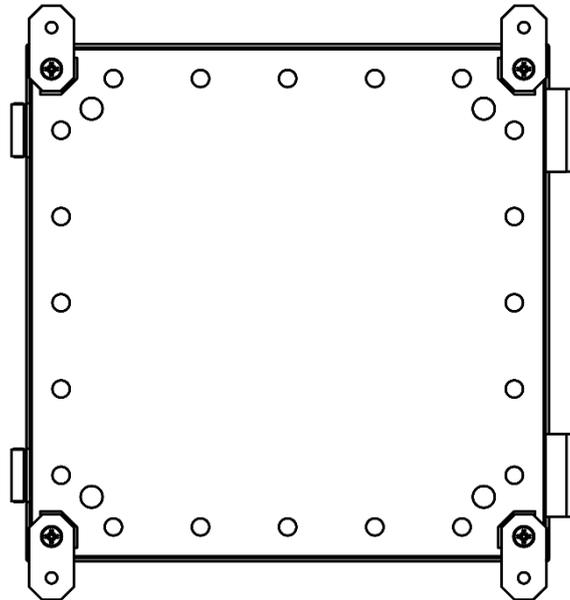


Figure: Rear view of the housing with vertically mounted mounting lugs

Work on pressurised water lines



Pressure

Maintenance and repair works should only be carried out by qualified personnel.

- Before starting work, make sure that all lines are depressurised.
- Hoses, connections and gaskets must be regularly checked and, if necessary, preventively replaced, even if they show no visible damage. Maintenance intervals must be complied with.
- Before commissioning after maintenance, make sure all connections, threaded fittings, and gaskets are properly installed. Check that all housing parts are closed and filters or other parts connected to the device are installed correctly.
- Remove all tools, spare parts or other materials required for maintenance prior to commissioning.
- Clean the device, take any leaked fluids and leave the device in a clean condition.
- Check that all safety devices are present and ready for operation.

Installation



The analyzer has 2 connections with bulkhead fittings for plastic hoses with an external diameter of 6 mm for the water inlet (left) and water outlet (right). These are only inserted into the screwed connections.

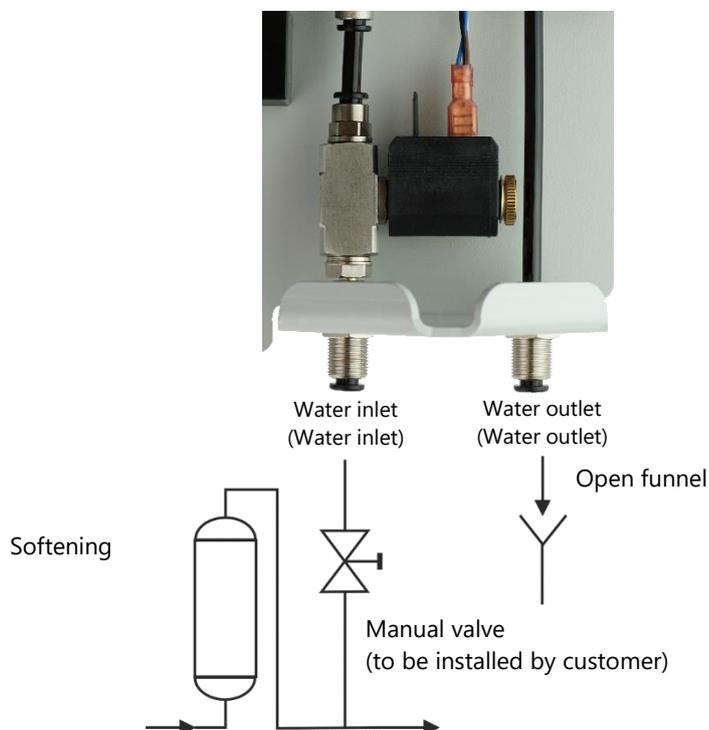


Figure: Connection of water inlet and -outlet



Pressure

The inlet pressure of the water sample must be between 0.5 and 5.0 bar.



The recommended inlet pressure of the water sample should be between 1 and 2 bar.



The hose length of the water outlet must not be longer than 2 m and must lead away vertically downwards. The system must be able to relax freely against the atmospheric pressure. There must be no back pressure greater than the inlet pressure. The water is drained without pressure in an open funnel or drain.

Operation with unpressurised sample water

If the sample water is depressurised, a pressure-controlled membrane or submersible pump is required to transport the sample water into the measuring chamber of the analyzer. This pump can be controlled with relay 3 of the analyzer.

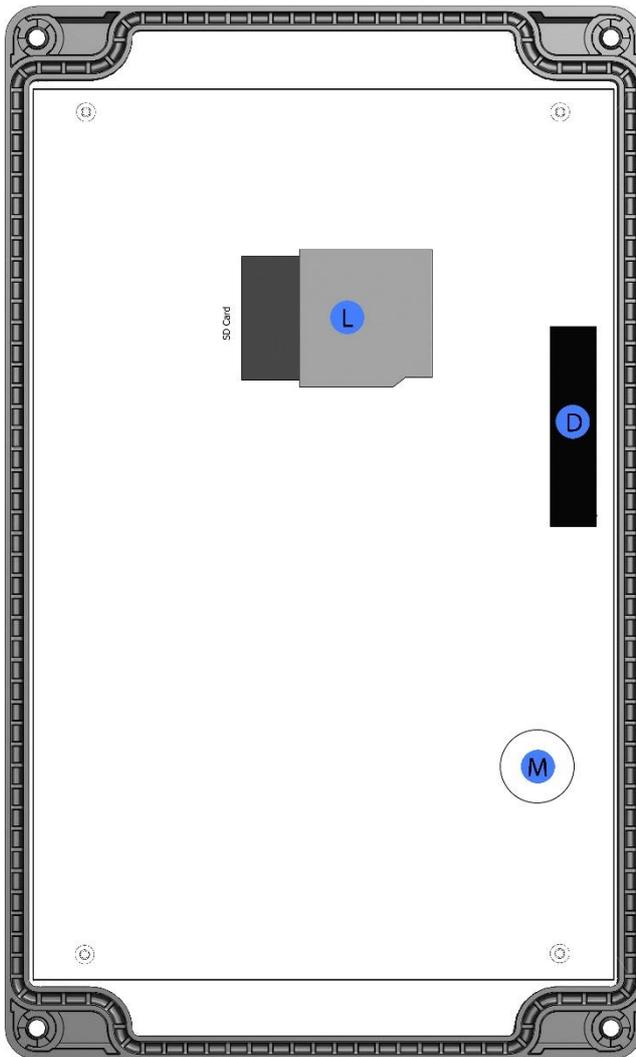
Electrical installation



Voltage

Work on electrical connections may only be carried out by authorised specialist personnel in compliance with the current regulations. All lines must be de-energised.

Open the lid of the controller by loosening the four screws in the corners of the lid.

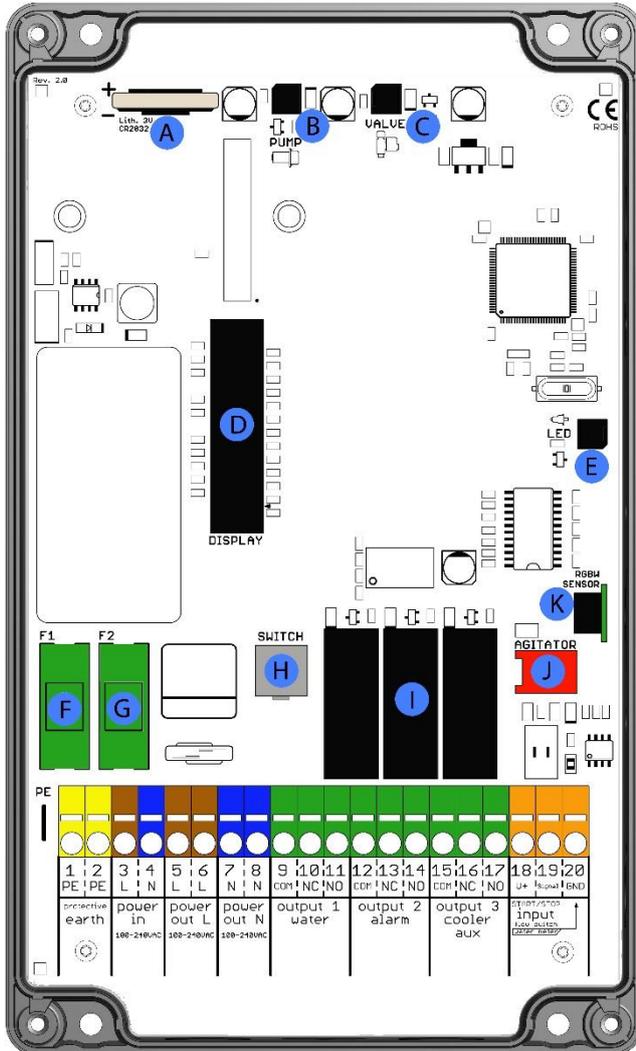


Position	Description
D	Display connector
L	SD card socket
M	Sound signal generator

Illustration: Back side of the lid

Electrical Installation 230 VAC

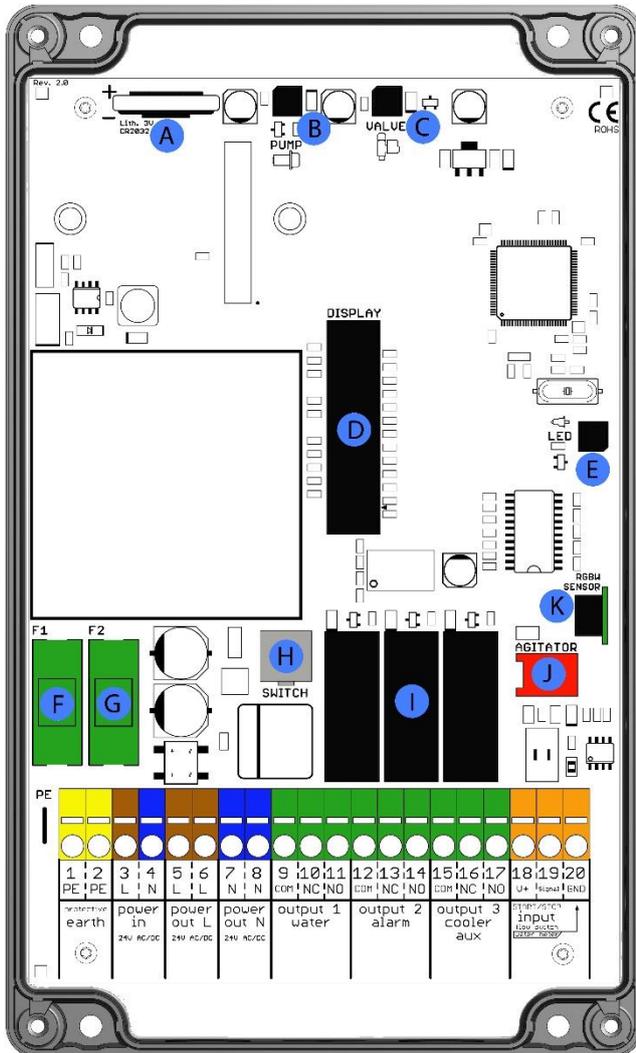
Mainboard 230 VAC



Position	Description
A	Battery holder
B	Reagent pump connection
C	Solenoid valve connection
D	Display connector
E	Actuator plug LED connection
F	Fuse (5 x 20 mm) 2 A inertia
G	Fuse (5 x 20 mm) 400 mA inertia
H	Main switch connection
I	3 x relay
J	Agitator connection
K	RGB sensor

Electrical Installation 24 V AC/DC

Mainboard 24 V AC/DC



Position	Description
A	Battery holder
B	Reagent pump connection
C	Solenoid valve connection
D	Display connector
E	Actuator plug LED connection
F	Fuse (5 x 20 mm) 2 A inertia
G	Fuse (5 x 20 mm) 1 A inertia
H	Main switch connection
I	3 x relay
J	Agitator connection
K	RGB sensor

Electrical installation

Connection of supply voltage

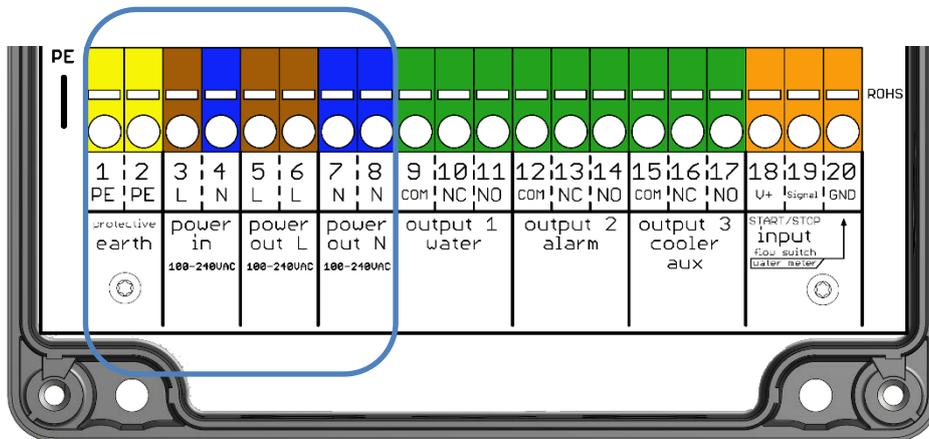


Figure: Terminals for the connection of the supply voltage (blue border)

Connection of supply voltage

Terminal designation	Description
1 PE	Earthing
2 PE	Earthing
3 L (power in)	Supply voltage between L and N
4 N (power in)	

Output terminals which are connected via the device switch

Terminal designation	Description
5 L power out	Switched supply voltage between L and N
6 L power out	
7 N power out	
8 N power out	



Voltage

The maximum connected capacity of all loads must not exceed 250 VAC / 1 A.

Electrical installation

Connection of the relay outputs

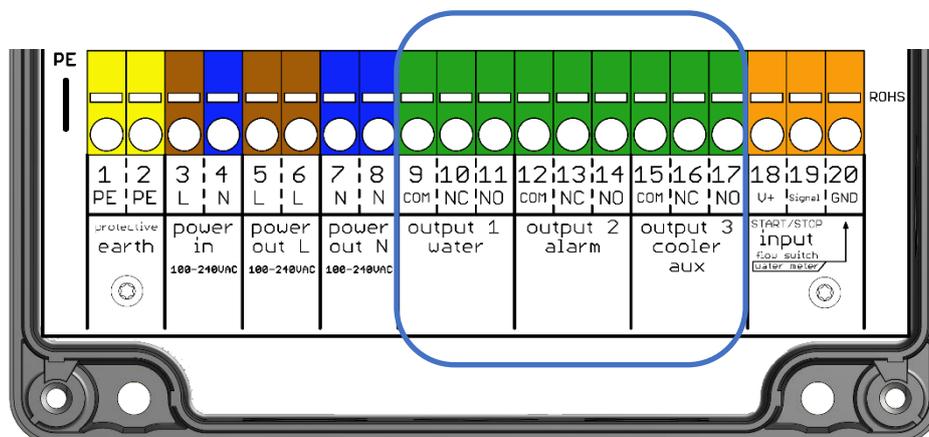


Figure: Terminals for connecting the relay outputs (blue border)

The relays are designed as change-over contacts, with a common connection and the switching outputs NC and NO.

Output 1 water (relay 1): Water hardness notification

Terminal designation	Description	Connection
9 COM	Relay 1 COM common connection	see page 10 "Load capacity"
10 NC	Relay 1 NC normally closed	
11 NO	Relay 1 NO normally open	

Output 1 / relay 1 function (notification of water hardness):

If the measured value of the sample falls below the limit value set in the SYCON, relay 1 is de-energised and a connection from COM to NC is established. In addition, the symbol R1 is not marked in the display.

If the measured value of the sample exceeds the limit value set in the SYCON, relay 1 is energised and a connection from COM to NO is established. In addition, the symbol R1 is highlighted in black on the display.

Output 2 alarm (relay 2): Device error notification

Terminal designation	Description	Connection
12 COM	Relay 2 COM common connection	see page 10 "Load capacity"
13 NC	Relay 2 NC normally closed	
14 NO	Relay 2 NO normally open	

Output 2 / relay 2 function (device error notification):

If a device error occurs or the device is switched off, the relay 2 is de-energised (connection from COM to NC). In addition, the symbol R2 is not marked in the display.

The relay 2 is energised in the error-free state of the device (connection from COM to NO), this serves the wire break safety. In addition, the symbol R2 is highlighted in black on the display.

Electrical installation

Output 3 cooler / aux (Relay 3):

Indication of reagent fill level or control accessories (Analysis deceleration)

Terminal designation	Description	Connection
15 COM	Relay 3 COM	common connection
16 NC	Relay 3 NC	normally closed
17 NO	Relay 3 NO	normally open

Output 3 / Relay 3 function

(Indication of reagent fill level or control accessories (Analysis deceleration)):

Indication of reagent fill level

Relay 3 switches from COM to NO when the reagent level falls below 10% residual content.

Accessory control (Analysis deceleration)

Alternatively, relay 3 can be programmed for the analysis function with optional delay for controlling the cooling water valve, sample cooler, bypass valve or feed pump. The switching status of the relay is shown in the display as R3.

Note on analysis delay

The start of analysis is delayed. The relay switches before the start of the analysis for

the set delay time + analysis duration from COM to

NO to control the cooling water valves of the sample coolers or pumps.

After the delay time has elapsed, the solenoid valve on the

Sycon and the analysis begins. The relay remains on for the duration of the Analysis switched.



See page 26 for more information.

Electrical installation

Inlet contact

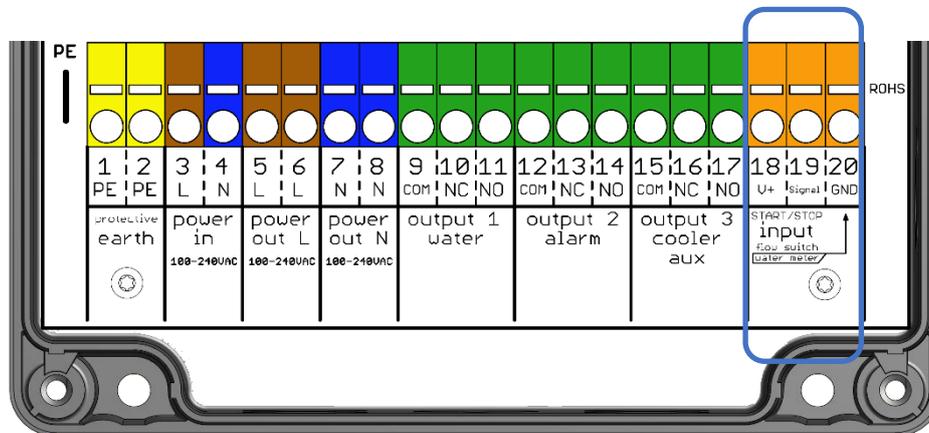


Figure: Terminals for connecting the inlet contact (blue border)

Start/Stop Input: Start input contact for analysis / water meter / flow switch / interval - reset

Terminal designation	Description
18 V+	+ 24 V auxiliary voltage to connect potential-free outputs
19 Signal	Signal input
20 GND	Ground connection for the + 24 V connection

Inlet contact function:

A flow switch or other potential-free switches or a water meter can be connected to the inlet contact. If the inlet contact is closed, the symbol (IN) is highlighted in black on the display.



For more information, see pages 27 through 30.

External component connection

For the connection of additional components, the device is equipped with an input and 3 relays. A water meter, flow switch, a potential-free switch or an electronic switch (open collector) can be connected to the input. An auxiliary voltage of 24 VDC is available for the electronics at terminal 18 (V+) and terminal 20 (GND). For signal detection, 24 VDC of terminal 18 (V+) must be bridged to signal terminal 19 (signal). No external voltage sources may be connected to the input. If necessary, a potential separation with a relay or optocoupler must be carried out.

The connections of the relays are all brought out potential-free. For switching external devices, the internal network voltage or alternatively an external supply voltage can be used. The connection to external controllers is usually established via the potential-free contacts of the relays.

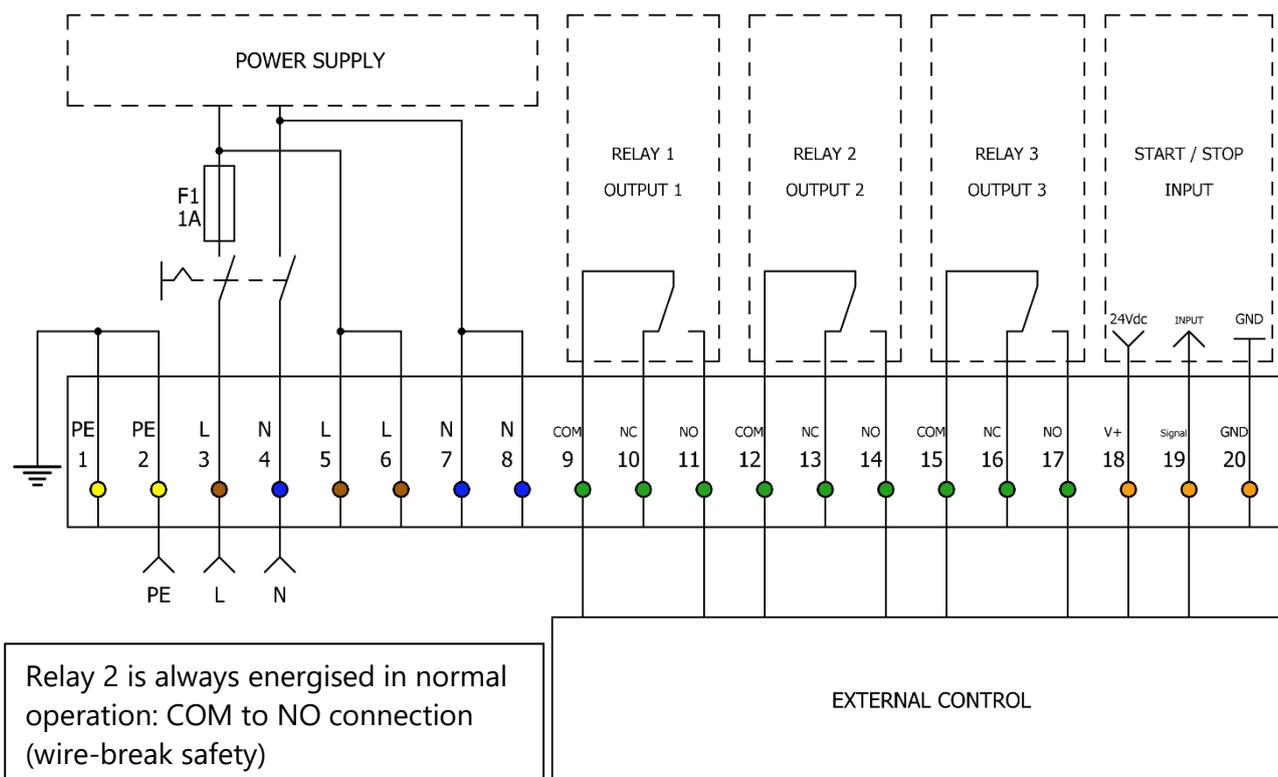


Figure: Schematic plan view of connection terminals



The supply voltage connected through the device switch is applied to output terminals 5 to 8 and can be used on the output relay in order to actuate drive pumps, solenoid valves or other loads. The maximum total connected load to output terminals 5 to 8 must not exceed 250 VA. The output terminals are switched with the network switch of the analyzer and protected by the fine-wire fuse of the device.

Connecting external components

Switch for starting the analysis externally

In addition to the option of running an analysis on a time-dependent basis, there is also an option to trigger additional analyses using an external button. This can be a potential-free push-button or the relay output of a PLC controller or water softening controller.

The use of a switch at the input is intended as an addition to the normal time interval. The analyzer operates at a set time interval. A signal can be delivered to the input via the switch and thus an additional analysis can be started.

(When using this function, the Sycon must be in automatic mode.)



An additional analysis can also be triggered by pressing down the [OK] key for 3 seconds.



With a permanently connected inlet contact in the analysis start mode, analyses are carried out permanently.

Programming: Menu > Settings > Input > Start analysis

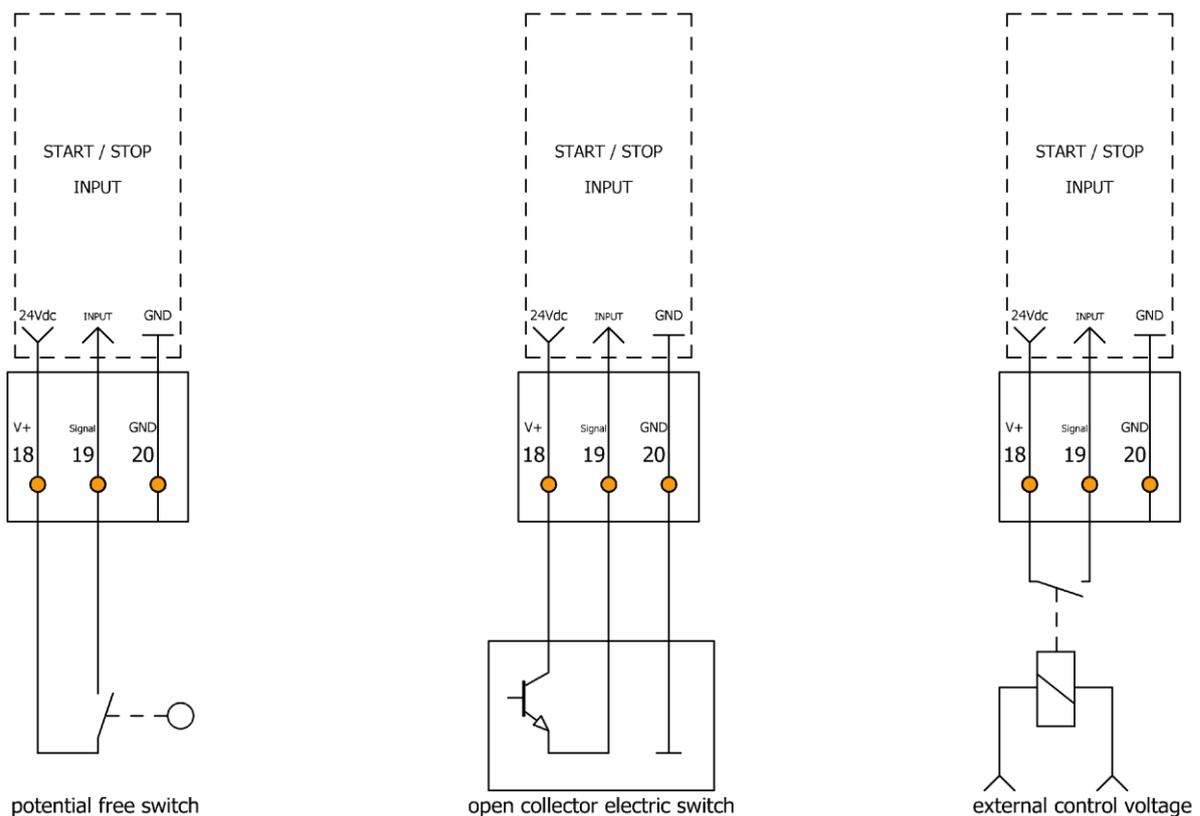


Figure: Three possible connection variants to start the analyzer with an external controller

Connection of external components

Connection of a water meter for a quantity interval

In addition to time-dependent triggering of an analysis, there is also the option of quantity-dependent triggering. Either a contact water meter with a potential-free reed switch or an electronic turbine with a Hall switch is used.

(When using this function, the Sycon must be in automatic mode.)

Programming: Menu > Settings > Input > Water meter

1. Enter the characteristic data of the water meter used in the **litre/impulse** unit.
2. Enter the type of water meter Hall or Reed. In Reed mode, the input is debounced to prevent miscounts.

Programming: Menu > Settings > Analysis > Auto.interval amount

3. Activate Analyses in Quantity Interval
4. Select the unit of measure to be shown in the display.
5. Enter the quantity according to which an analysis is to take place.



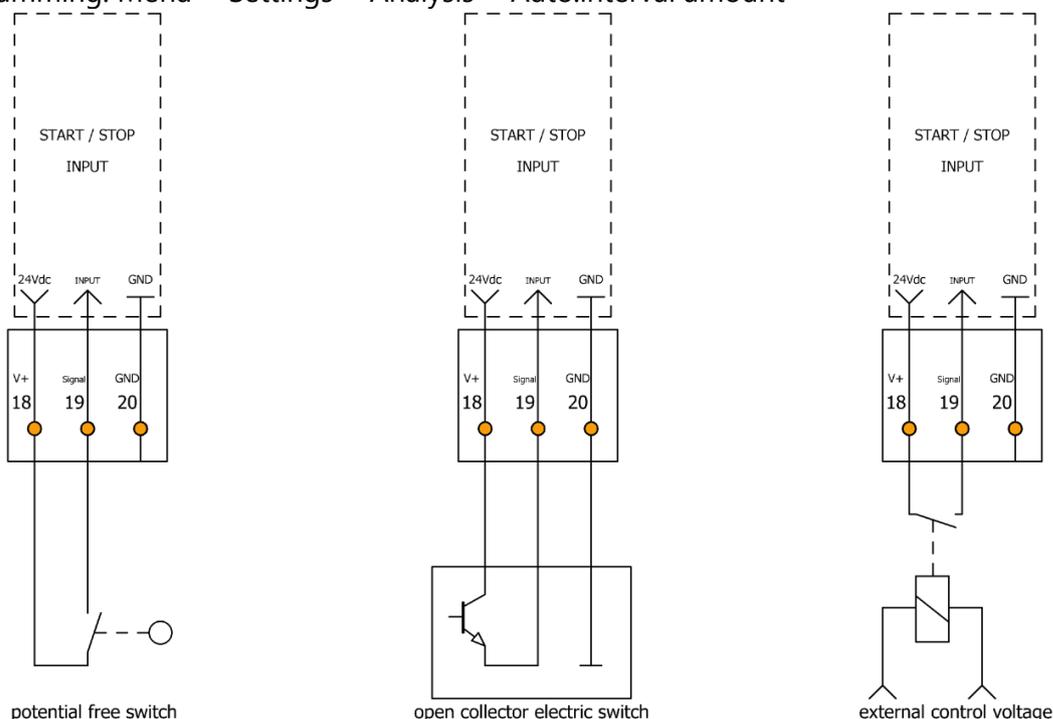
After switching on the device, the first analysis is started after 3 minutes. The counting of the water quantity is already active during this time.



The operation of contact water meters (reed) in the input mode for electronic water meters (Hall) can lead to incorrect interval quantities due to the contact bounce.

Programming: Menu > Settings > Inputs > Water meter

Programming: Menu > Settings > Analysis > Auto.interval amount



Connection of external components

Flow switch

Typically, an ion exchanger is monitored every 10 minutes to ensure that hard water does not reach the load in the event of a sudden hardness breakthrough. When installed on a system where monitoring is required only during operating hours, the inlet contact can be used in combination with a flow switch or a timer. Thus, the time interval can be paused during a system downtime, which can reduce reagent and power consumption.

As a flow switch, a paddle can be used. Potential-free contact of a timer is also possible. The examples below show various connection options at the inlet contact.

When using a flow switch, the analyses are only carried out if a defined signal is present at the input (flow switch reports flowing water).

Depending on the installed contact, the input can be configured as NC or NO type.

(When using this function, the Sycon must be in automatic mode.)

Programming: Menu > Settings > Input > Flow switch



This function must not be confused with the function "Start analysis" by external controller.

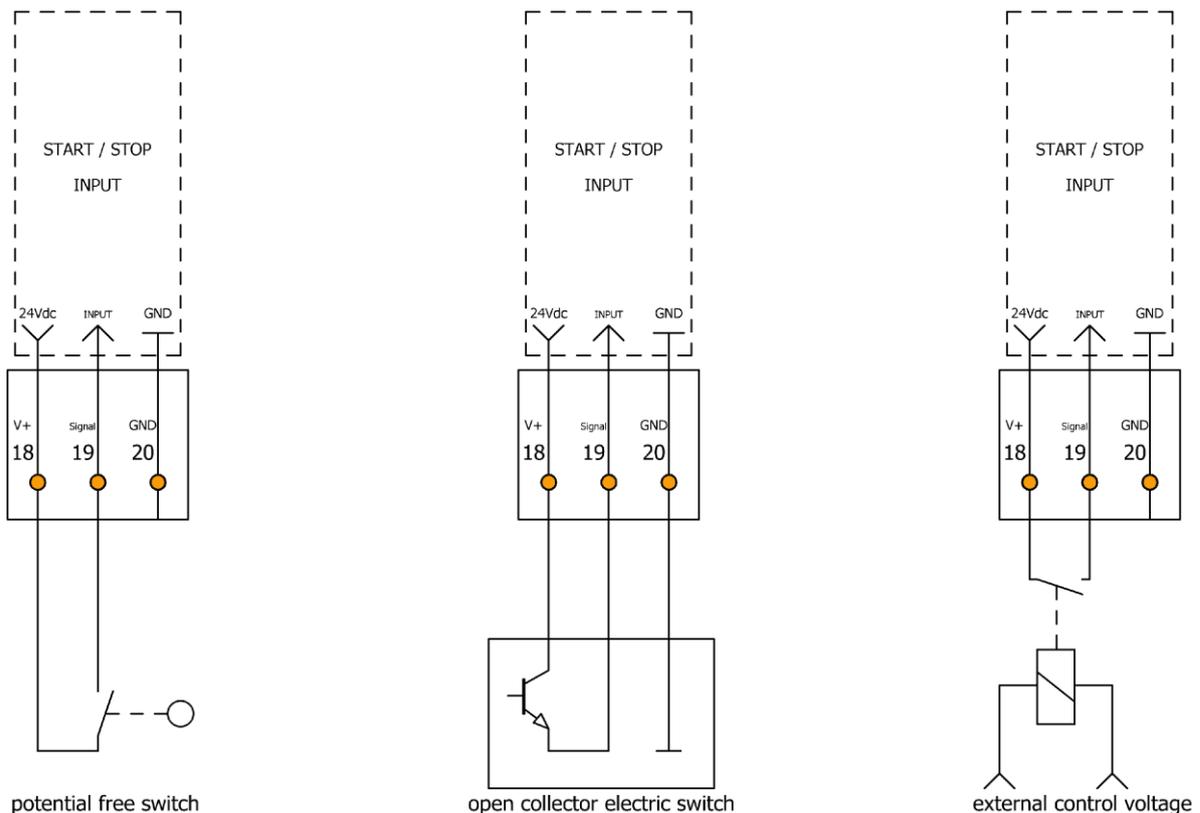


Figure: Three possible variants for connecting a flow switch

Connection of external components

Intervall reset

Input IN as interval reset in automatic mode

The Interval Reset mode is used for monitoring simple or pendulum softeners. During operation of the softener, the analyses are performed at the programmed analysis interval. When regeneration starts, the input contact is closed/opened, the analysis is started and the analysis interval is stopped immediately. The last display value is deleted from the display and the analysis interval is paused as long as the input contact is closed/opened.

After completion of the regeneration or after switching over to the second softening plant the input contact is closed/opened again. The first analysis starts after one minute. The following analyses are carried out again at the programmed analysis interval.

[NO] Analysis interval active: Analysis interval is stopped by a closed input contact.

[NC] Analysis interval active: Analysis interval is stopped by an open input contact.

(When using this function, the Sycon must be in automatic mode)

Programming: Menu > Settings > Input > Interval reset

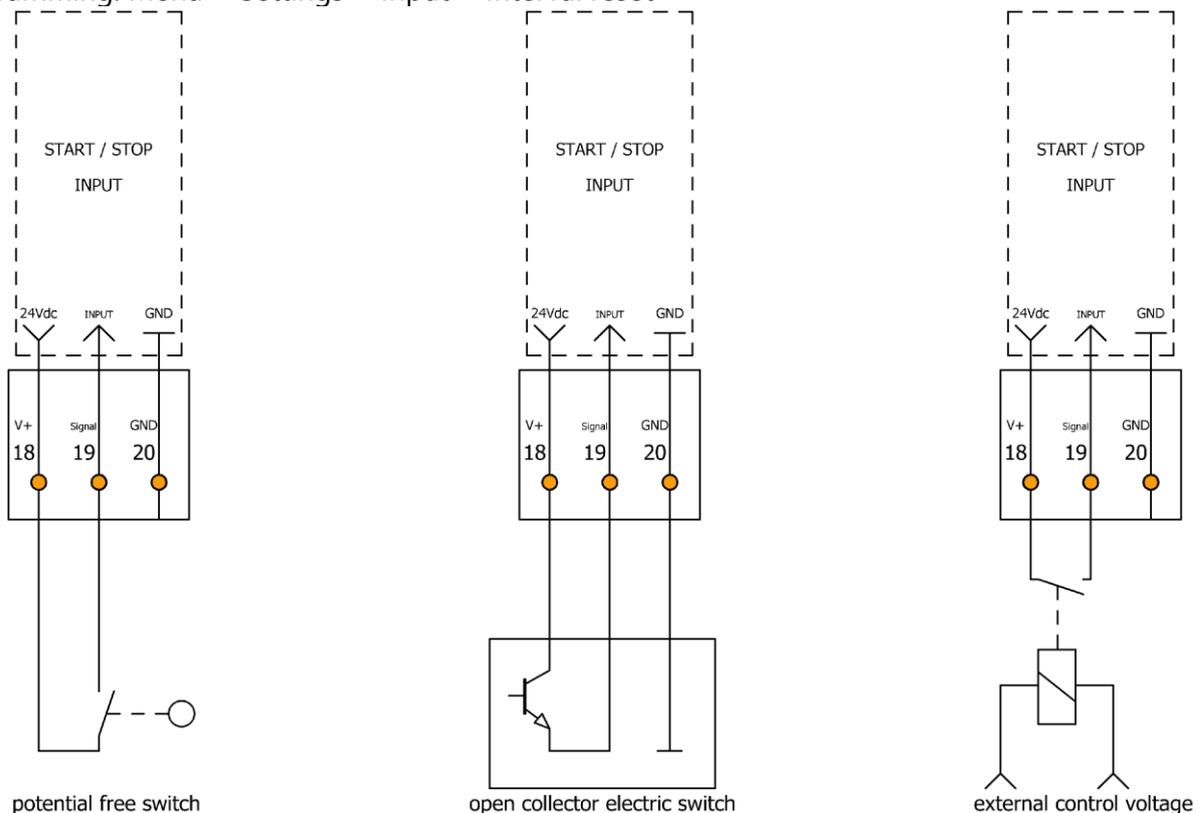


Figure: Three possible variants for connecting a reset switch

Connection of external components

Reagent light / horn

A reagent light or horn to signalise an exceedance of the limit value can be connected to relay 1 / output 1.

Relay 1 / output 1 is energised when the limit value is exceeded and the connection from COM to NO is made. This position can be programmed in the program as a permanent contact or as a pulse contact.

Continuous contact on relay 1 / output 1:

Relay 1 / output 1 remains switched in the position (connection from COM to NO) when the limit value is exceeded until the measured water hardness is below the limit again. Next, the limit value exceedance is lifted and relay 1 / output 1 is switched back (connection from COM to NC).

Pulse contact on relay 1 / output 1:

Relay 1 / output 1 remains switched in the position (connection from COM to NO) only for a programmed pulse duration when the limit value is exceeded. Once the programmed pulse duration expires, relay 1 / output 1 switches back (connection from COM to NC). The next time the limit is exceeded, relay 1 / output 1 is switched again as a pulse. This function is often used in combination with pilot distributors.

Programming: Menu > Settings > Outputs > Relay 1

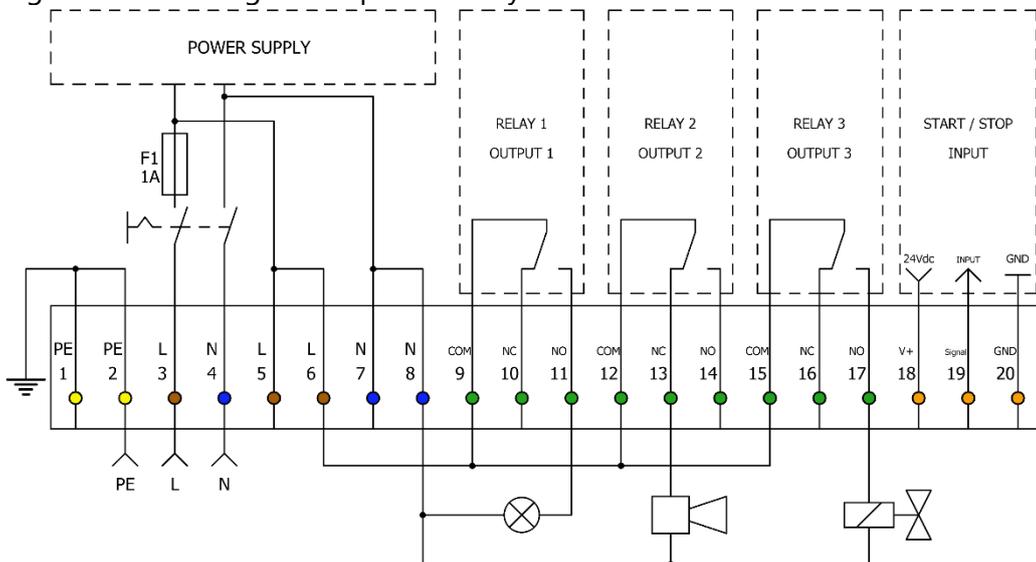


Figure: Terminal assignment when connecting reagent light / horn

The relay 2 / output 2 is used to report detected errors (e.g. optical error, faulty zero sample, missing supply voltage at the analyzer). If the analyzer is in normal operation and there is no fault, relay 2 / output 2 is energised and the connection from COM to NO is made. If an error is detected, the relay 2 / output 2 is de-energised and the connection from COM to NC is established.

Connection of external components

Regeneration system for demand-controlled activation of regeneration

Processing plants are usually regenerated according to their capacity according to a constant flow rate. To ensure that no hard water reaches the load, the regeneration takes place before the actual exhaustion of the plant. If regeneration is triggered by an analyzer, regenerants and water are saved. In the case of strongly fluctuating raw water hardness, a qualitative regeneration triggering via an analyzer is unavoidable.

The pulse output for the regeneration triggering takes place via relay 1 / output 1. Due to longer service life or excessive load, premature regeneration can be triggered by the counter ion effect. It is therefore recommended to repeat the measurement if the limit value is exceeded with a control measurement.

Programming: Menu > Settings > Analysis > Control measurement

Connection of a controller for reagent level warning

Relay 3 can be used to switch a low fill level of reagent (fill level of reagent <10%) to a controller or other signal transmitter. For this purpose, relay 3 must be programmed to the lack of reagent operating mode.

Programming: Menu > Settings > Outputs > Relay 3 > Reagent

Relay function analysis active

Relay 3 can be used to signal that an analysis has been started.

Signal devices, pumps or valves can be connected. The connection to a control room is also possible. There is a choice between:

Relay 3 is active during analysis:

Programming: Menu > Settings > Outputs > Relay 3 > Analysis



In this mode, for example, a feed pump can be connected to the relay in order to feed pressure-free sample water into the measuring chamber.

Relay 3 is active before and during analysis:

Programming: Menu > Settings > Outputs > Relay 3 > Analysis > Analysis deceleration

If selected before and during analysis, the analysis delay is entered in the next step. This time is waited until the solenoid valve of the device opens. This enables functions such as the switching of cold water at sample coolers.



When using the Analysis function to switch cold water on a sample cooler, a manual bypass of the cold water valve must be provided in order to prevent hazards to man and material during maintenance or test operation. Design, integration into the safety chain and installation must be carried out in accordance with the applicable standards and laws. Talk to the manufacturer of your steam boiler.

Operation



Figure: SYCON 2602 analyzer with installed reagent bottle

Position	Description
A	Controller
B	Graphic display
C	Control panel
D	Cable grommet
E	On/Off switch
F	Dosing pump
G	Dosing plugs (dosing plugs)
H	Optical measurement path
I	Measuring chamber (The locking pins can only be pulled up and cannot be pulled out)
K	Stirring unit (magnetic agitator)
L	Drain plug
M	Actuator plug LED
N	Inlet plug
O	Solenoid valve (concealed behind the reagent bottle)
P	Wall holder
Q	Reagent bottle 500 ml
R	Water inlet / sample water (Plug connection for plastic hoses with 6 mm outer diameter)
S	Water outlet (plug connection for plastic hoses with 6 mm outer diameter)

Operation

Display and keypad

The analyzer has a graphic display in which both the measured values and the menu can be displayed for operation. Depending on the state of the device, the background colour of the display changes:

Background colour	State
White	Device operates correctly
Red	Limit value exceedance or device error

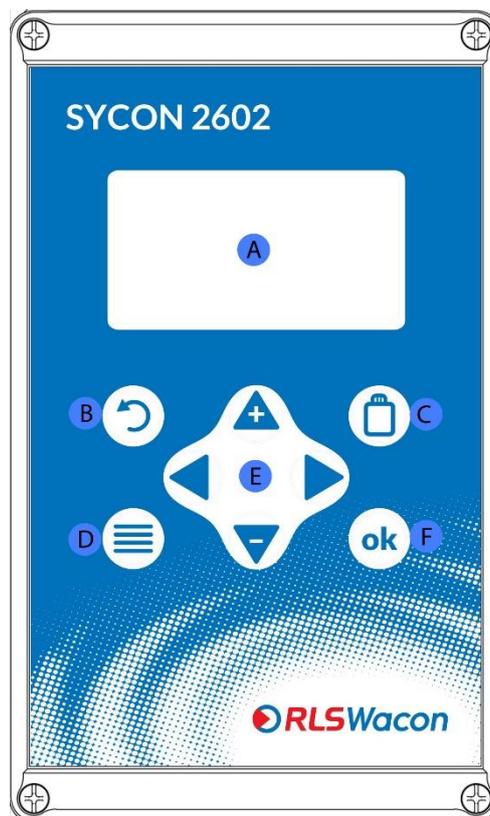


Figure: Structure of the front cover of the controller

Settings can be set via 8 keys.

Position	Description
A	Display
B	Back / discard input / aborting a running analysis
C	Inserting a new reagent bottle
D	Main menu / switching between main menu and analysis display
E	Arrow keys for navigation / entry of value
F	OK / confirm

Operation

Display menu

The following selection options are available in the menu window:



Menu item	Description
Automatic	To activate and deactivate the automatic analysis operation.
Parameter	Under this menu item, all device settings can be made.
Info	Informs about: Hardware- and software versions, analysis counter, maintenance counter, maintenance date, good- and bad measurements.
Service	Start analysis (manual), Pump reagent (new bottle inserted), Manual flushing, Confirm maintenance, Reset good- and bad counter, Diagnostic program (testing of the actuators and sensors installed in the SYCON including the hardware).
Assistant	The wizard guides you through all settings in the device and facilitates the commissioning.
History	Displays the history of the last 100 measurements as a graph.

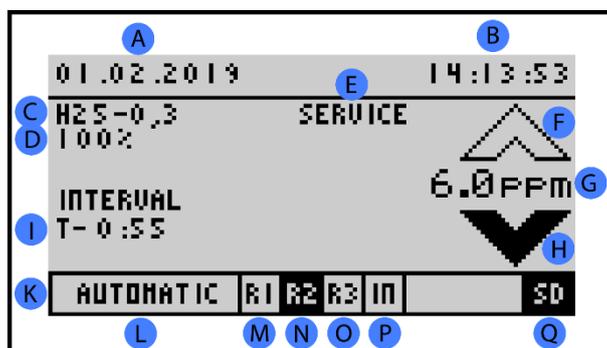
Menu languages

Sycon offers the following languages for operating the analyzer.

- German (Deutsch)
- English
- French (Français)
- Italian (Italiano)
- Spanish (Español)
- Russian (Русский)

Operation

Display during a measurement



Position	Description
A	Date
B	Time
C	Selected reagent
D	Bottle fill level in %
E	Device status (maintenance: maintenance counter expired, cleaning: optics dirty)
F	Analysis result limit value overshoot
G	Limit value
H	Analysis result limit value undershot (fields with black background are active)
I	Analysis step (T – 0:49 remaining time in minutes: seconds until next analysis)
K	Status bar
L	Manual mode or automatic mode
M	Relay 1 de-energised
N	Relay 2 energised (fields highlighted in black are active)
O	Relay 3 de-energised
P	Digital input (IN) inactive
Q	SD card present



Simple starting of analysis.
press down the [OK] key for 3 seconds to start an analysis.



The analysis can be started in manual and automatic mode.

Display of measured value history (history)

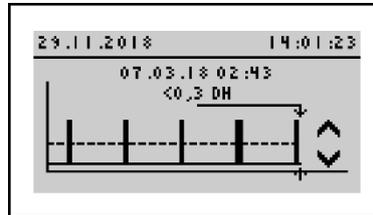
With the aid of the arrow keys [◀] and [▶] the last 100 measurements with date and time stamp can be read in the display mode. The measurement result can be read off as limit value undershot or overshoot.



To analyse the measured values on a PC, the trend.csv file is available on the SD card.

Operation

You can open the history using the Menu > History keys. Press the [Back] key to return to the measured value display.



Display of selection menu

When selecting, you can change the selection with the [◀] and [▶] keys. The setting is confirmed with the [OK] key. If you do not want to change the setting, you can leave the selection with the [Back] key.

In the picture below, the active selection is the [Yes] key highlighted in black.

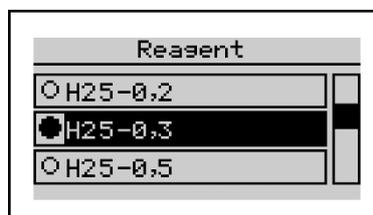


Display of selection list

You can change the selection in a selection list using the [▲] and [▼] keys. The setting is confirmed with the [OK] key. If you do not want to change the setting, you can leave the selection with the [Back] key. If the selection list offers more than three options, a scroll bar is displayed on the right edge of the display.

The currently selected reagent type is highlighted in black (H25-0.3).

The circle to the left of the reagent type filled in black indicates which reagent is currently programmed for analysis.



Operation

Display with value entry

The numbers are entered via a display keypad. You can move the cursor with the arrow keys [◀], [▶], [▲] and [▼] of the device. The input mask additionally displays the currently set numerical value and the valid input range.

You will see an input keypad. Now use the arrow keys to move the black cursor to the desired digit and press the [OK] key.

The selected digit appears on the left side in a frame. Repeat the entry until the desired number is in the frame. Now move the cursor to the OK field in the keyboard and press the [OK] key.

You will see the following information:

Currently: currently set value

Minimum: smallest settable value

Maximum: largest settable value



Should the value at "Current" corresponds to your request, then you do not need to re-enter the number and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

In the lower example of flush duration, a flush duration between 15 and 1800 seconds can be set. The currently programmed flush duration is 120 seconds.

Flush time	
<input type="text"/>	s
CURRENTLY: 120	7 8 9
MINIMUM: 15	4 5 6
MAXIMUM: 1800	1 2 3
	0 OK

Flush time	
90	s
CURRENTLY: 120	7 8 9
MINIMUM: 15	4 5 6
MAXIMUM: 1800	1 2 3
	0 OK

After entering a flush duration of 90 seconds, confirming with the [OK] key overwrites the current flushing time with 90 seconds.

Configuration

Factory settings

The following factory settings are stored in the device:

Menu items		Factory settings
General	Language	German
	Unit	°dH
	Reagent	H25-0.3
	Flush time	120 seconds
Analysis	Auto.interval time	5 minutes
	Auto.interval amount	No
	Analysis stop	No
	Control measure	Off
	Calibrating factor	100 %
Input	Input	Start analysis
	Flow switch	Off
Outputs	Relay 1	Limit value as permanent
	Relay 2	Reporting of errors
	Relay 3	Lack of reagent



Reset the factory settings with
Programming: Menu > Settings > General > Factory settings

Configuration

Configuration assistant

The configuration wizard is designed for simplified commissioning. The menu-driven device accompanies you step by step through all necessary settings. It also checks whether the device is working properly.



Later, all settings can be changed separately in Menu > Settings again.

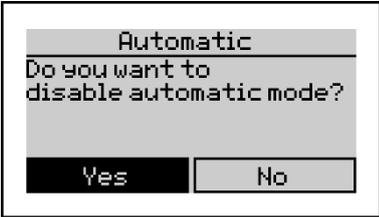
To start the wizard, select:

Programming: Menu > Wizard

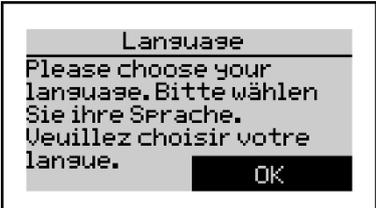


The following steps are executed:

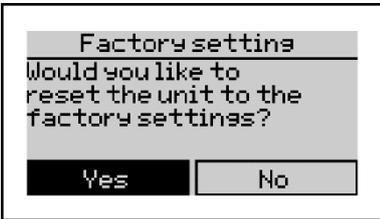
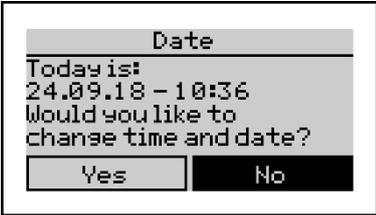
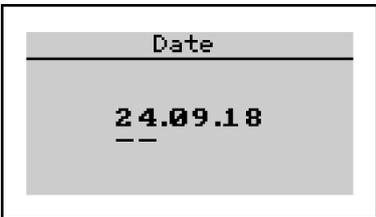
Automatic mode	If the automatic mode is still active, it must now be quit. Select [Yes] or [No] with the arrow keys [◀] and [▶] and confirm with [OK] key. [Yes] Terminate the automatic mode. [No] Return to measured value view.
-----------------------	--



Language selection	Please choose your language. Press [OK] key. Selectable languages: German, English, French, Italian, Spanish, Russian Select language with [▲] and [▼] and confirm with [OK] key.
---------------------------	---



Configuration

<p>Assistant</p> 	<p>Would you like to start the configuration wizard?</p> <p>Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.</p> <p>[Yes] Start the configuration wizard.</p> <p>[No] Go back to the main menu.</p>
<p>Factory settings</p> 	<p>Do you want to reset the device to factory settings first?</p> <p>Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.</p> <p>[Yes] Reset the device to the recommended factory settings.</p> <p>[No] The device retains the settings programmed by the user.</p> <p>The factory settings can be found on page 39.</p>
<p>Date</p> 	<p>Today is: XX/XX/XX – XX:XX Do you want to set date and time?</p> <p>Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.</p> <p>[Yes] Set date and time.</p> <p>[No] The device keeps the date and time unchanged.</p>
<p>Adjust date</p> 	<p>Use the arrow keys [▲] and [▼] to move the date. Confirm with the [OK] key and change step by step from day to month and further to the year until the date is set. Press [OK] key.</p>

Configuration

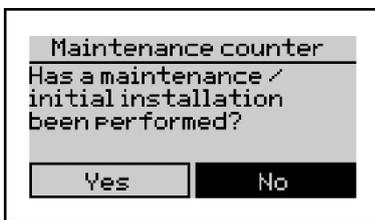
Setting the time



You can move the hour with the arrow keys [▲] and [▼]. Confirm the hour with the [OK] key and program the minutes in the second step. The seconds are set to 0 seconds upon completion. Press [OK] key.

Maintenance counter

Is a maintenance / initial installation carried out?



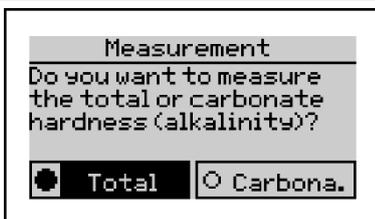
Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.

[Yes] Maintenance counter is set to 30,000 analyses and the maintenance date is set to 24 months. (Can be read in the Menu > Info)

[No] The device retains the previous data.

Parameter

Would you like to measure the total hardness or carbonate hardness (alkalinity)?



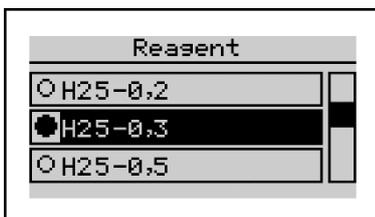
Select [Total] or [Carbonate] with [◀] and [▶] and confirm with [OK] key.

[Total] The total or residual hardness will be measured.

[Carbonate] The carbonate hardness will be measured.

When selecting total hardness

Please select a total hardness reagent.



Select the reagent H25 used for total hardness monitoring with [▲] and [▼] from the displayed list.

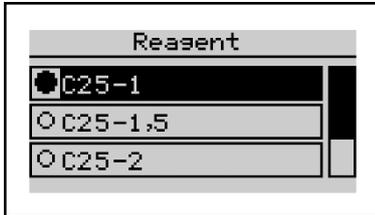
Measuring ranges of the reagents can be found in the table on page 13.

After selecting, press the [OK] key.

Configuration

When selecting carbonate hardness

Please select a carbonate hardness reagent.



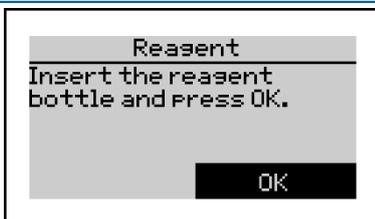
Select the reagent C25 for carbonate hardness monitoring with [▲] and [▼] from the displayed list.

Measuring ranges of the reagents can be found in the table on page 13.

After selecting, press the [OK] key.

Reagent

Insert a new reagent bottle and press OK.



Insert new reagent bottle and press the [OK] key.

Reagent

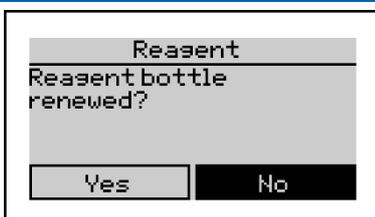
Reagent is pumped into the measuring chamber. The pumping process can be stopped by pressing the [OK] key before the time has elapsed.



Make sure that the reagent has been pumped bubble-free into the measuring chamber.

Reagent

Has a full reagent bottle been used?



Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.

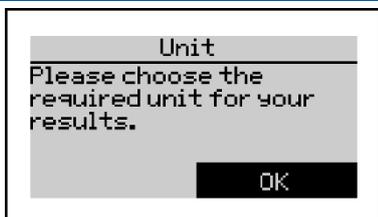
[Yes] The bottle fill level is set to 100%.

[No] The previous bottle fill level in % is maintained.

Configuration

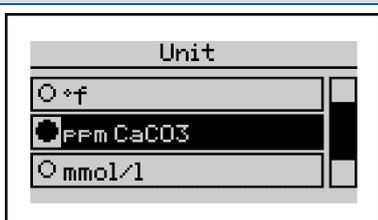
Unit

Select the displayed hardness unit.



Press [OK] key.

Unit



Use [▲] and [▼] to select the desired unit for display and SD card measurement protocol from the displayed list.

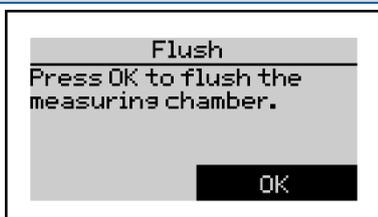
After selecting, press the [OK] key.



When using a sample cooler, check the proper operation of the sample cooler before the next step in order to rule out any danger from hot steam or hot water.

Flushing

Press OK to flush the supply line and the measuring chamber.



Press [OK] key.

Flushing



The solenoid valve opens and flushes the measuring chamber. Here, the previous flush duration is shown in the display. This can be used as reference time to set the flush duration before analysis.

The flushing process is ended with the [OK] key. The solenoid valve closes.



Make sure the sample water is clear and free of bubbles.

Configuration

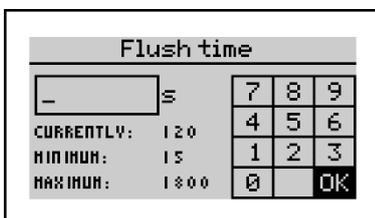
Flush duration

Set the flush duration in the following mask.



Press [OK] key.

Flush duration



You will see an input keyboard on the right side. Use the arrow keys ([◀],[▶],[▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key. The selected digit appears on the left side in a frame. Repeat the entry until the desired flush duration is within the range. Now move the cursor to the OK field in the keyboard and press the [OK] key.



You will see the following information on the left:

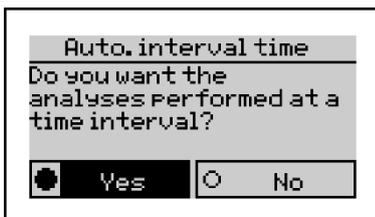
Currently: currently programmed value
Minimum: smallest settable value
Maximum: largest settable value



Should the value at "Current" corresponds to your request, then you do not need to re-enter the digits and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Auto. Time interval

Do you want the analyses to run in a time interval?



Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.

[Yes] Analyses are performed in an automatic time interval.
[No] Do not perform any analyses in the automatic time interval.

Configuration

Auto. Time interval

Set the automatic interval time, in which the analyses are to be carried out.

Auto. interval time	
<input type="text"/>	min
CURRENTLY: 5	7 8 9
MINIMUM: 5	4 5 6
MAXIMUM: 360	1 2 3
	0 OK

You will see an input keyboard on the right side.

Use the arrow keys ([◀],[▶],[▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key.

The selected digit appears on the left side in a frame.

Repeat the entry until the desired analysis interval time is within the range.

Now move the cursor to the OK field in the keyboard and press the [OK] key.



You will see the following information on the left:

Currently: currently programmed value

Minimum: smallest settable value

Maximum: largest settable value



Should the value at "Current" corresponds to your request, then you do not need to re-enter the digits and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Control measurement

How often should a limit exceedance be verified before notification?

Control measure
Adjust the amount of
verification loops
taking place after a
bad measurement.
OK

Press [OK] key.

Control measurement

Control measure
 Off
 1 measurement
 2 measurements

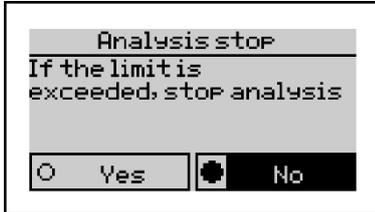
Use [▲] and [▼] to set the number of control measurements that should be performed before any exceedance of limit value should be reported. These are carried out after a limit value exceedance in a 3-minute interval to avoid false alarms due to the counter ion effect of the water softening plant.

Make a selection and confirm with the [OK] key.

Configuration

Stopping the analysis

Auto. Stop interval after limit exceedance?



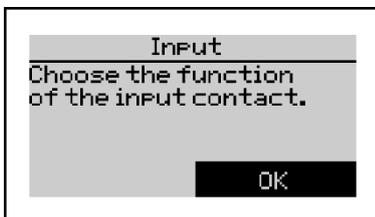
Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.

[Yes] Auto. Interval is paused after a limit exceedance. (In order to carry out further analyses, the automatic mode must be reactivated on the device).

[No] Further analyses are also carried out after a limit has been exceeded.

Input

Select the function of the input.

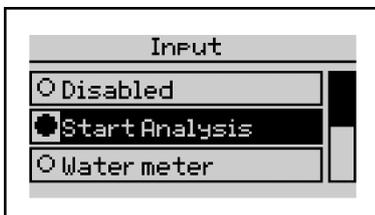


Press [OK] key.

Input

You have the following options at the input:

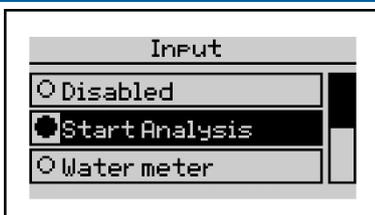
- Deactivated
- Start analysis
- Water meter
- Flow switch
- Interval reset



Make a selection and confirm with the [OK] key.

If Start analysis is selected

An analysis is started as soon as the "Start/Stop Input: Inlet Contact" terminal 18 is bridged to terminal 19.



(When using this function, the Sycon must be in automatic mode.)

Configuration

If Water meter is selected

Enter the litres/pulse of your water meter.

Input

- Start Analysis
- Water meter
- Flow switch

You will see an input keyboard on the right side. Use the arrow keys ([◀],[▶],[▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key.

The selected digit appears on the left in a frame. Repeat the entry until the desired number appears in the frame.

Now move the cursor to the OK field in the keyboard and press the [OK] key.

Liter / Pulse

Enter the liter / pulse of your flow meter.

OK

(When using this function, the Sycon must be in automatic mode.)

Liter / Pulse

1/P. []

7	8	9
4	5	6
1	2	3
0	.	OK

CURRENTLY: 10.00
MINIMUM: 0.01
MAXIMUM: 1000.00



You will see the following information on the left:

Currently: currently programmed value

Minimum: smallest settable value

Maximum: largest settable value

Contact type

Choose the output type of the flow meter.

- Reed
- Hall



Should the value at "Current" corresponds to your request, then you do not need to re-enter the digits and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Auto. interval amount

Choose the water volume between two analysis.

OK

Is the water meter a reed or hall contact type?

Reed for potential-free water meters

Hall for electronic water meters

Make a selection and confirm with the [OK] key.

Unit

- l
- hl
- m3

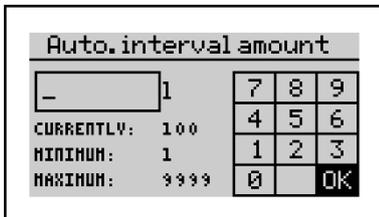
Set the water quantity according to which an analysis is to take place.

Press [OK] key.

Set the unit.

Configuration

Set the water quantity according to which an analysis is to take place.



Auto. interval amount			
<input type="text" value="1"/>	7	8	9
CURRENTLY: 100	4	5	6
MINIMUM: 1	1	2	3
MAXIMUM: 9999	0		OK



You will see the following information on the left:

Currently: currently programmed value

Minimum: smallest settable value

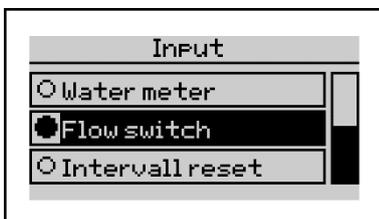
Maximum: largest settable value



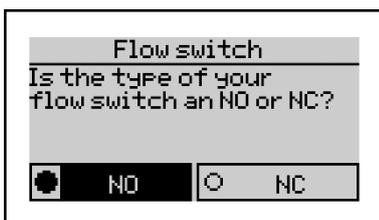
Should the value at "Current" corresponds to your request, then you do not need to re-enter the digits and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

When selecting flow switch

Is the flow switch an NC or NO type?



Input	
<input type="radio"/> Water meter	
<input checked="" type="radio"/> Flow switch	
<input type="radio"/> Intervall reset	



Flow switch	
Is the type of your flow switch an NO or NC?	
<input checked="" type="radio"/> NO	<input type="radio"/> NC

[NO] Analysis interval paused: start of next analysis waits for a closed inlet contact.

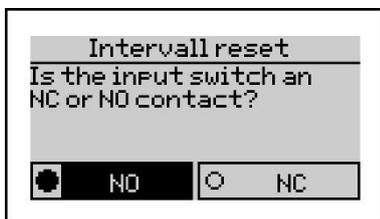
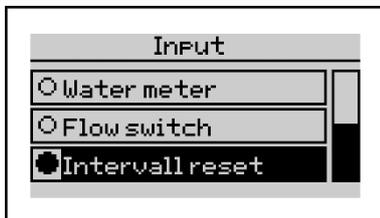
[NC] Analysis interval paused: start of next analysis waits for an open inlet contact.

Make a selection and confirm with the [OK] key.

(When using this function, the Sycon must be in automatic mode.)

Configuration

When selecting interval reset



- [NO] Analysis interval active: Analysis interval is stopped by a closed input contact.
- [NC] Analysis interval active: Analysis interval is stopped by an open input contact.

Make your selection and confirm with the [OK] key.

If the analysis interval is stopped, the analyses are stopped immediately and paused as long as the input contact remains closed/open.

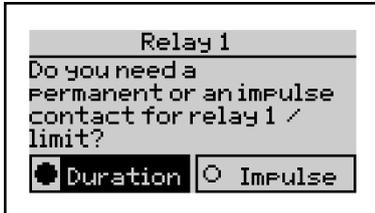
As soon as the input contact is opened/closed, the analysis interval starts. However, since no display value is shown on the display yet, the first analysis is performed after 1 min before the set analysis interval (e.g. 5 min) begins.

(When using this function the Sycon must be in automatic mode)

Configuration

Relay 1

Do you need a permanent or impulse contact at relay 1 / limit value?



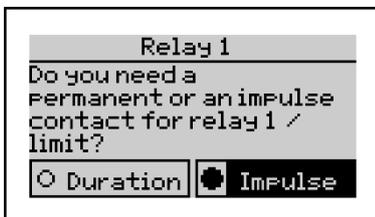
[Duration] or select [Impulse] and press the [OK] key.

[Duration] The relay switches to a permanent contact if the limit value is exceeded until an analysis that falls below the limit value takes place.

[Impulse] The relay switches for a set impulse time.

If Relay 1 impulse contact is selected

Set the impulse duration for Relay 1.



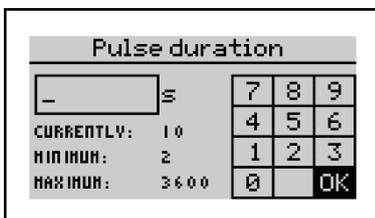
You will see an input keyboard on the right side.

Use the arrow keys ([◀],[▶],[▲] and [▼]) to move the black cursor to the desired digit and press the [OK] key.

The selected digit appears on the left side in a frame.

Repeat the entry until the desired pulse duration is within the range.

Now move the cursor to the OK field in the keyboard and press the [OK] key.



You will see the following information on the left:

Currently: currently programmed value

Minimum: smallest settable value

Maximum: largest settable value



Should the value at "Current" corresponds to your request, then you do not need to re-enter the digits and you can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Configuration

Relay 2

Relay 2 is used to indicate a device error.
Press [OK] key



Relay 2 is used to indicate a device error and can not perform any other functions.



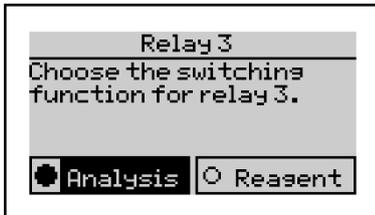
Relay 2 is always energised in normal operation, connection from COM to NO (wire break safety).



In the event of a device error, relay 2 is de-energised and establishes the connection from COM to NC.

Relay 3

Select the switching function for Relay 3.
Press [OK] key



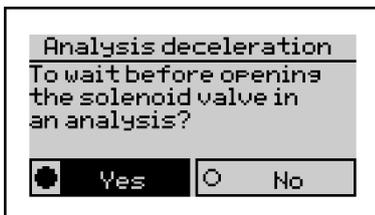
Select [Analysis] or [Reagent] and press the [OK] key.

[Analysis.] The relay switches during analysis.

[Reagent] The relay switches when the fill level of reagent falls below 10% residual content.

If Analysis is selected

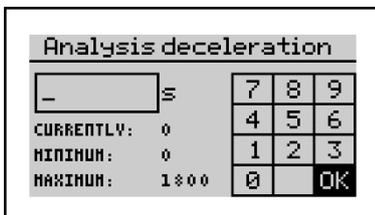
Should I wait before opening the solenoid valve?



Select [Yes] or [No] and press the [OK] key.

[Yes] The start of analysis is delayed. The relay switches from COM to NO before the start of the analysis for the set delay time + analysis duration in order to control the cooling water valves of the sample coolers or pumps. After the delay time has elapsed, the solenoid valve on the Sycon opens and the analysis begins. The relay remains switched for the duration of the analysis.

[No] The relay switches from COM to NO (no delay time) only for the duration of the analysis.



Enter the delay time in seconds to be waited before an analysis begins before the analysis begins and the solenoid valve is opened.

Confirm the entered value with [OK].

Configuration

Assistant

The configuration is complete. The wizard is terminated.



Press [OK] key.

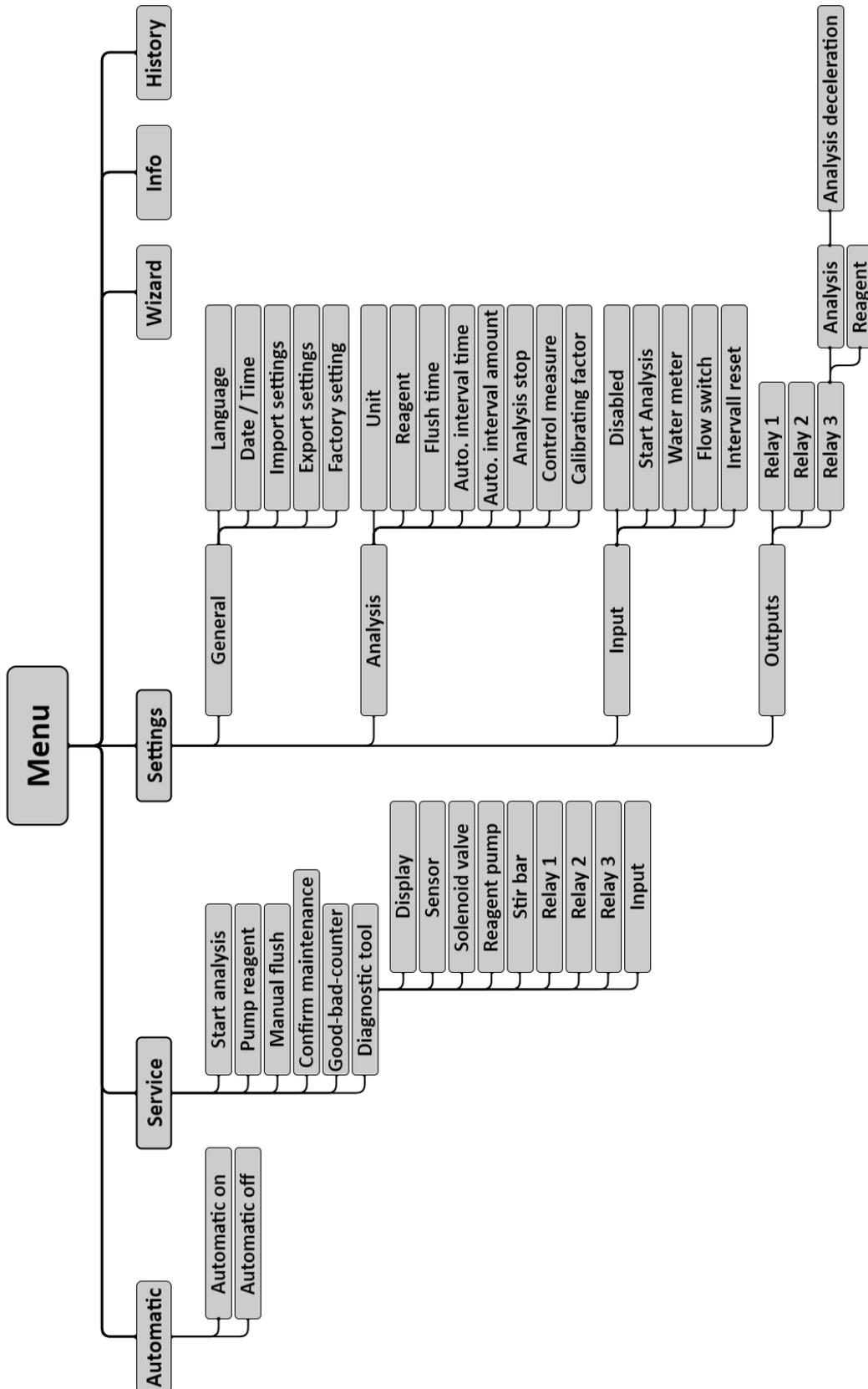
This completes the configuration of the device.

If necessary, individual settings can also be set without the wizard.

Programming: Menu > Settings

Menu structure

The following is an overview of the menu structure to give you an overview of all the functions of the analyzer.



Mode

Manual and automatic mode

The analyzer can be started in automatic mode (Menu > Automatic), depending on the time or via an external button or flow switch. In manual mode (automatic off), functions such as starting analysis, conveying reagent or flushing can be manually controlled. In addition, a diagnostic function is included in manual mode to test individual device components.

In automatic mode, analyses are carried out at the programmed interval or by external starting. After switching on, the automatic mode is active. The first analysis is started after switching on at the programmed internal interval after 3 minutes. All subsequent analyses are performed in the programmed interval.

Main menu

The main menu can be opened by pressing the [Menu] key from the measured value view.

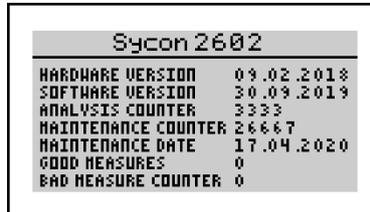


Menu item	Description
Automatic	Changing between automatic and manual mode
Settings	Setting the device and analysis parameters
Info	Overview of hardware- and software version and display of counter readings
Service	Functions for maintenance, diagnostics, and changing reagent
Wizard	Setup wizard for a guided parameterisation of the device
History	Display of the last 100 measurement results with date and time

Mode

Info display

The Info menu item in the main menu displays additional information about the device and the measuring point:



Sycon 2602	
HARDWARE VERSION	09.02.2018
SOFTWARE VERSION	30.09.2019
ANALYSIS COUNTER	3333
MAINTENANCE COUNTER	26667
MAINTENANCE DATE	17.04.2020
GOOD MEASURES	0
BAD MEASURE COUNTER	0

Information	Description
Hardware version	Version of the hardware used
Software version	Installed software version
Analysis counter	Number of analyses performed since commissioning
Maintenance counter	Number of remaining analyses – service life of the peristaltic pump cartridge: will be set to 30,000 analyses when the maintenance is acknowledged in the service menu.
Maintenance date	Expiry date of the peristaltic pump cartridge used: is set to 2 years when the maintenance is acknowledged in the service menu.
Good measures	Number of analyses without exceedance of the limit value: can be reset in the service menu under the item good/bad counters.
Bad measure counter	Number of analyses with limit exceedance: can be reset in the service menu under the item good/bad counters.

Operation

Reagent warning / Operation without supervision

The Sycon 2602 monitors the reagent consumption and reports whether there is sufficient reagent for operation without supervision for 72 hours. The calculated fill level of the reagent bottle is shown on the display below the reagent type.

The reagent requirement for operation without supervision is calculated depending on the set analysis interval. For the reagents H25 and C25 with a filling quantity for 5,000 analyses, the following filling quantities apply:

Analysis interval in minutes	Minimum fill level for operation without supervision
5	18%
10	9%
20	5%



When operating in quantity interval or external analysis start mode, it is not possible to calculate consumption for the next 72 hours. In these configurations, the reagent warning occurs when the level falls below 10%.



For a correct calculation of the filling level, the consumption meter may only be reset to 100% when the reagent bottle is replaced.

For a correct calculation of the filling level, the consumption meter may only be reset to 100% when the reagent bottle is replaced.

Behaviour in the event of power failure

All settings of the device are stored on the SD card or in the internal memory. In the event of a power failure, all settings are available again after switching on the device. If the device has been in automatic mode, the analyzer automatically restarts after a short dwell time with an analysis according to the set interval times.

Relay 2 (ready for operation/error) picks up after switching on the device (connection COM to NO). Thus, an external controller can determine whether the device is ready for operation or whether there is a fault such as a device fault, power failure or a defective line.

If a device failure occurs and the device needs to be replaced, you can export the settings from the old device to the SD card inserted in the device (Menu > Settings > General > Export settings). After inserting the SD card into the new device, the settings can be imported (Menu > Settings > General > Import settings). The measurement protocol on the SD card is continued by the new device.

SD-card

The analyzer contains an SD card. The following information is stored on this memory card: measured values, error messages, device configuration, device firmware.

The data is stored on the SD card as .csv files. These files can be opened with an editor or spreadsheet program (e.g. MS Excel, OO Calc) and the data can be processed further. Furthermore, system files are present on the SD card (.bin).

The analyzer is fully functional even without an SD card, but only the last 100 readings are saved internally.

The bottle level is stored on the SD card. If the device is switched off and on again without an SD card, the device cannot read in a bottle level from the SD card and therefore issues a BOB message (bottle level below 10%).

If you want to use a different SD card than the one supplied, make sure that it is formatted as follows:

Storage capacity:	max. 2.0 GB
File system:	FAT16
Size of the allocation files:	32 kB

Operation

The following files are stored on the card:

File name	Type	Content
trend.csv	Data	Measured values in tabular form with date, time and measured value The data becomes filed in the following format: YYYY.MM.DD [Tab] hh.mm [Tab] x.xxx [Tab] Unit [LF]. The measured values (x.xxx) are stored on the device in the unit displayed.
error.csv	Data	Error messages in tabular form with time, date and error The data becomes filed in the following format: YYYY.MM.DD [Tab] hh.mm [Tab] Error code [LF].
history.dat	System	Time-stamped analysis results The device loads these into the internal memory at start-up.
setting.dat	System	Complete device setting of the analyzer (optional file) Before replacing the analyzer, you can transfer the saved device configuration directly to the new device. The export is located in the menu under Settings> General> Export settings. The device configuration can be imported in the menu under: Settings> General> Import settings.
logfile.dat	System	Date, time stamp and device start This file is needed for internal purposes.
LA26xxx.bin	Operating system	This file is not on the SD card by default. If there are any software updates for your analytical instrument, they will be made available to you by our sales partners or can be downloaded from our homepage. You can copy this file to the SD card and perform a software update. More information about installing a software update can be found on page 69. We recommend that you delete the file from the SD card after installing an update.

Maintenance and service

In order to enable a long and trouble-free operation of the analyzer, maintenance on the device must be carried out at regular intervals. Make sure the device is turned off before performing any maintenance. During this time no analyses are carried out. As a general rule, wear protective goggles and gloves during maintenance to avoid contact with reagent, cleaning fluid or other liquids.

The following maintenance intervals must be complied with:

Interval	Maintenance and service
every 6 months	Cleaning of measuring chamber At high ambient- and water temperatures or water with high organic load, the cleaning intervals may need to be shortened.
every 30,000 analyses or after 24 months	maintenance as after 6 months and installing maintenance set

For cleaning, we recommend the "SYCON Clean Cleaning Set" See page 75.

Cleaning the measuring chamber

The cleaning of the measuring chamber takes about 20 minutes. Proceed as follows to clean the measuring chamber:

- Switch off the device.
- Pull the hose pump cassette from the bracket by unlocking the clips at the top and bottom.
- Release the connection to the reagent plug and reagent bottle.
- Pull the locking pins slightly forward. (The locking pins can only be pulled up and not out).
- Pull the drain plug, actuator plug and inlet plug out of the measuring chamber.
- Pull the measuring chamber to the right from the retaining bolts on the control housing.
- Remove the stirring blade.
- Use a flat-tip screwdriver to lever the reagent plug upwards. (Make sure that the locking pins are raised before levering.)
- Clean the measuring chamber and the plugs using the SYCON Clean cleaning set as described on the package insert.



For a trouble-free operation it is important that not only the measuring chamber, but also the actuator plug is cleaned with the white (LED). Take a cloth and moisten it with the FIT3000 (included in the SYCON Clean Set) and wipe the actuator plug thoroughly.

Please observe the following sequence when assembling:

- Lubricate O-rings (3 x J and 1 x C) with technical Vaseline. See picture Spare parts on page 73.



The blue dosing O-ring (D) on the reagent plug must not be lubricated with technical Vaseline.

In contrast, the black O-rings (3 x J and 1 x C) must be lubricated with technical Vaseline before insertion into the measuring chamber.

- Pull up the locking pins Insert the reagent plug and lock it.
- Place the cleaned measuring chamber on the retaining bolts and lock.
- Insert the stirring blade into the measuring chamber.
- Pull up the locking pins Insert the inlet plug, actuator plug and drain plug into the measuring chamber and lock.

(Make sure that all plugs are inserted into the measuring chamber up to the stop and only then locked, otherwise the plugs can be damaged).

Maintenance and service

- Connect the hose pump cassette to the reagent plug and to the reagent bottle.
- Place the peristaltic pump cassette on the bracket so that it snaps into place.
- Switch the unit on again.
- Flush the measuring chamber (Programming: Menu > Service > Manual flush).
- Feed the reagent into the measuring chamber (Programming: Menu > Service > Pump reagent).

Was a full reagent bottle used?

Select [Yes] or [No] and press the [OK] key.

[Yes] The cylinder filling level is set to 100 %.

[No] The previous cylinder filling level in % is retained.

- Flush the measuring chamber again (Programming: Menu > Service > Manual flush).

The instrument is ready for operation again.

Maintenance and service

Inserting the "Maintenance set for SYCON 2602"

The hose pump cassette, hoses and seals must be replaced at regular intervals.

The required replacement parts are included in the "Maintenance set for SYCON 2602". See page 75.

Maintenance takes about 25 minutes.

Proceed as follows:

- Switch off the device.
- Pull the hose pump cassette from the bracket by unlocking the clips at the top and bottom.
- Release the connection to the reagent plug and reagent bottle.
- Replace the bottle connector, the suction lance and the hose pump cassette.
- Pull the locking pins slightly forward. (The locking pins can only be pulled up and not out).
- Pull the drain plug, actuator plug and inlet plug out of the measuring chamber.
- Pull the measuring chamber to the right from the retaining bolts on the control housing.
- Remove the stirring blade.
- Use a flat-tip screwdriver to lever the reagent plug upwards. (When levering it out, make sure that the locking pins are raised).
- Pull up the locking pin for light rod plugs.
- Take a non-metallic object such as a plastic or wooden rod, insert it into the actuator plug hole and push out the light rod plug (The light rod stopper belongs to the optical measuring section and must not be scratched).
- Remove the O-rings (4 x J, 1 x C and 1 x D) from the plugs. See Spare parts illustration on page 73.
- Clean the measuring chamber and the plugs using the SYCON Clean cleaning set as described on the package insert.



For a trouble-free operation it is important that not only the measuring chamber, but also the actuator plug is cleaned with the white (LED). Take a cloth and moisten it with the FIT3000 (included in the SYCON Clean Set) and wipe the actuator plug thoroughly.

Please observe the following sequence when assembling:

- Slide the O-rings onto the plugs (4 x J, 1 x C and 1 x D) See spare parts illustration on page 73.



The blue dosing O-ring (D) on the reagent plug must not be lubricated with technical Vaseline.

In contrast, the black O-rings (4 x J and 1 x C) must be lubricated with technical Vaseline before insertion into the measuring chamber.

Maintenance and service

- Pull up the locking pin Insert the light rod plug and lock it.
- Pull up the locking pins Insert the reagent plug and lock it.
- Place the cleaned measuring chamber on the retaining bolts and lock.
- Insert the stirring blade into the measuring chamber.
- Pull up locking pins Insert inlet plug, actuator plug and outlet plug into the measuring chamber and lock.
(Make sure that all plugs are inserted into the measuring chamber up to the stop and only then locked, otherwise the plugs can be damaged).
- Connect the hose pump cassette to the reagent plug and to the reagent bottle.
- Place the peristaltic pump cassette on the bracket so that it snaps into place.
- Switch the unit on again.
- Flush the measuring chamber (Programming: Menu > Service > Manual flush).
- Feed the reagent into the measuring chamber (Programming: Menu > Service > Pump reagent).

Has a full reagent bottle been inserted?

Select [Yes] or [No] and press the [OK] key.

[Yes] The cylinder filling level is set to 100 %.

[No] The previous cylinder filling level in % is retained.

- Flush the measuring chamber again (Programming: Menu > Service > Manual flush).
- Reset the maintenance counter to 24 months / 30,000 analyses.
(Programming: Menu > Service > Confirm maintenance).

The device is ready for operation again.

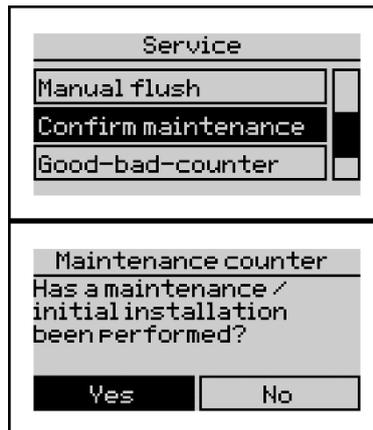
Maintenance and service

Reset the maintenance counter

After maintenance has been carried out with the "Maintenance set for SYCON 2602" inserted, the maintenance counter in SYCON must be reset.

The message "Maintenance" disappears from the display and only appears after the 24 months have elapsed or after 30,000 analyses, then maintenance must be carried out again.

(Programming: Menu > Service > Confirm maintenance).



Select [Yes] or [No] with [◀] and [▶] and confirm with [OK] key.

[Yes] Maintenance counter is set to 30,000 analyses and the maintenance date is set to 24 months.

(Can be read in the Menu > Info)

[No] The device retains the previous data.

Maintenance and service

Changing the reagent bottle

First check the expiry date of the new reagent bottle. Use only the reagent whose shelf life has not been exceeded.



Always use reagent bottles with 500 ml content.

Proceed as follows:

- Switch off the device.
- To replace the reagent bottle, undo the screw cap on the bottle and insert the new reagent bottle. Absorb drip quantities if necessary.
- Switch the device on again.
- Flush the measuring chamber (Programming: Menu > Service > Manual flush).
- Feed the reagent into the measuring chamber (Programming: Menu > Service > Pump reagent) until the reagent reaches the measuring chamber free of bubbles. Then press the [OK] key to stop purging the reagent line.

Has a full reagent bottle been used?

Select [Yes] or [No] and press the [OK] key

[Yes] The bottle fill level is set to 100%.

[No] The previous bottle fill level in % is maintained.

- Flush the measuring chamber again (Programming: Menu > Service > Manual flush) to clean the measuring chamber.
- Test the analysis process by starting an analysis. To do this, hold down the [OK] key for 3 seconds in the measured value view.

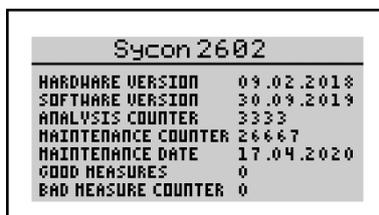
The device is again ready for operation.

Maintenance and service

Good- and bad counter

The good and bad counters are used to count the analysis results. They are displayed in the info screen.

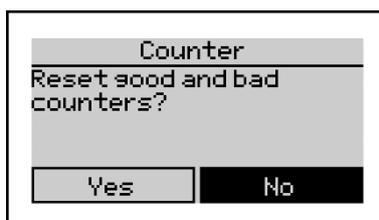
Programming: Menu > Info



Sycon 2602	
HARDWARE VERSION	09.02.2018
SOFTWARE VERSION	30.09.2019
ANALYSIS COUNTER	3333
MAINTENANCE COUNTER	26667
MAINTENANCE DATE	17.04.2020
GOOD MEASURES	0
BAD MEASURE COUNTER	0

If the limit is exceeded, the bad counter is increased, and if the limit is undershot, the good counter is increased. This counter can be used to assess the function of a water softening plant. Here, the number of bad measurements should be much smaller than that of the good measurements. The counters can be reset in the menu.

Programming: Menu > Service > Good-bad-counter



Calibrating the device

The Calibrate input field can be used to change the added reagent quantity. This results in a shift of the controlled limit value.

In the factory setting, the calibration factor of 100% is used to monitor the specified limit value of the reagent used and programmed. Adjusting the dosing quantity can cause an incorrect level calculation and a deviation from the limit value.

Therefore, this function should only be used in exceptional cases for special water samples.

Programming: Menu > Settings > Analysis > Calibrating factor

Maintenance and service

Changing the battery

If the device does not display any time after switching off and switching on again, the internal back-up battery must be replaced.

Proceed as follows:

- Switch off the device and disconnect the power supply.
- Open the controller housing with 4 screws. On the inside you will see the battery holder.
- Replace the battery with a new one of CR2032 type.
- Close the controller again. Make sure that the connection cable between the display board and the controller has not come loose.
- Dispose of the battery in a collection point for batteries.

Software update

The analyzer offers the option of a software update. As part of the product improvement, you will receive software updates via your dealer or our website. Should this be required, your dealer will send you a file called LA26xxx.bin.

To perform a software update, proceed as follows:

- Switch off the device and disconnect the power supply.
- Open the controller housing with 4 screws and remove the SD card.
- Copy the LA26xxx.bin file to the SD card using a computer and reinsert it.
- Close the controller again. Make sure that the connection cable between the display board and the controller has not come loose.
- Hold down the [OK] key and turn the device on. When software update appears on the display, release the [OK] key. The device updates the software.
- Turn off the device, remove the SD card, and delete the LA26xxx.bin file from the SD card.
- Insert the SD card back into the device.
- Check the device configuration of the device.

Diagnosis functions

Here, pay attention to possibly connected controllers and peripherals.
Follow the valid safety regulations.

Call up the following program function:
Programming: Menu> Service> Diagnostic program

Display

The display changes colour between red, green and blue.
To exit, press the [OK] key.

Sensor

The LED in the measuring chamber is switched on and off. If this is not the case, check the electrical connection of the LED on the actuator plug and in the device. If the connectors are properly seated, the actuator must be replaced. To exit, press the [OK] key.
The positioning of the connectors can be found on page 19.

Solenoid valve

The solenoid valve in the water inlet can be opened and closed via the [OK] key. If this is not the case, check the electrical connection of the solenoid valve in the device. If the connectors are properly seated, measure the voltage with "valve open" between the connections on the solenoid valve. This should be at 24 VDC. If this is the case, a fault in the electronics is to be excluded and the solenoid valve is defective.
To exit, move the cursor to Exit and press the [OK] key.
The positioning of the connectors can be found on page 19.



When using a sample cooler, first check the proper operation of the sample cooler in order to rule out any danger from hot steam or hot water.

Reagent

When starting the reagent pump, the peristaltic pump cartridge is driven for 2 seconds. Here, rotation of the rollers in the peristaltic pump cartridge is visible and the turning of the motor can be heard. If this is not the case, check the connection of the motor on the circuit board. If only the noise is noticeable, the peristaltic pump cartridge is defective. Otherwise, a fault of the motor or the control circuit board is possible. To exit, move the cursor to Exit and press the [OK] key.
The positioning of the connectors can be found on page 19.

Diagnosis functions

Magnetic stirrer

The magnetic stirrer in the measuring chamber is actuated and slowly increases its speed to the maximum. If the magnetic stirrer does not turn, check the correct seating of the drive motor connector on the main board (red plug connector).

Remove the measuring chamber and check whether the drive disc (which has two silver-coloured magnets) in the stirring unit does not drag or rest on the motor housing.

If none of these causes can be determined, the drive motor must be replaced. To exit, press the [OK] key.

The positioning of the connectors can be found on page 19.

Relay 1, 2 and 3

When the diagnostic function relay is started, the selected relay is switched between the two contacts NC and NO via the [OK] key.

Use a continuity tester to check the contact between the COM and NC connection and COM and NO connection. If the switching operations are not measurable, replace the main board.

To exit, move the cursor to Exit and press the [OK] key.

The positioning of the connectors can be found on page 23.

Input

To test the input, you will need a ladder or multimeter that is set for continuity testing.

If there is no jumper between terminals 18 and 19, the display shows "opened".

If a jumper is set between terminals 18 and 19, the display shows "closed".

(Should you wish to make the jumper with a multimeter, the COM port of the multimeter must be connected to terminal 18 and the Volt port of the multimeter must be connected to terminal 19.

Otherwise, no bridge will be made by the multimeter). Press the [OK] key to exit.

The positioning of the connectors can be found on page 25.

The diagnostic mode has ended.

Error messages

Analysis does not start

- Check whether a flow monitor is configured and connected.
- Check whether an interval time has been entered.
- Check whether a water meter is fully configured and connected.
- If necessary, check the connection from an external controller to the device.

Error message E11 Indicator

- Check whether there is still sufficient indicator in the indicator bottle.
- Check the connection hose between the indicator bottle and peristaltic pump for air bubbles. If necessary, pump indicator until the hose is completely filled with indicator.
- Check whether there is water in the measuring chamber.
- Check the dosing pump and stirrer assemblies.
- Check whether the water drain is free and that no foreign bodies have settled in the solenoid valve.
- When using a pump for sample delivery, check whether the pump is connected correctly.
- Check whether the inlet and outlet are connected in the correct direction.
- Check whether the stirring blade is in the measuring chamber.

Error message E12 Water flow

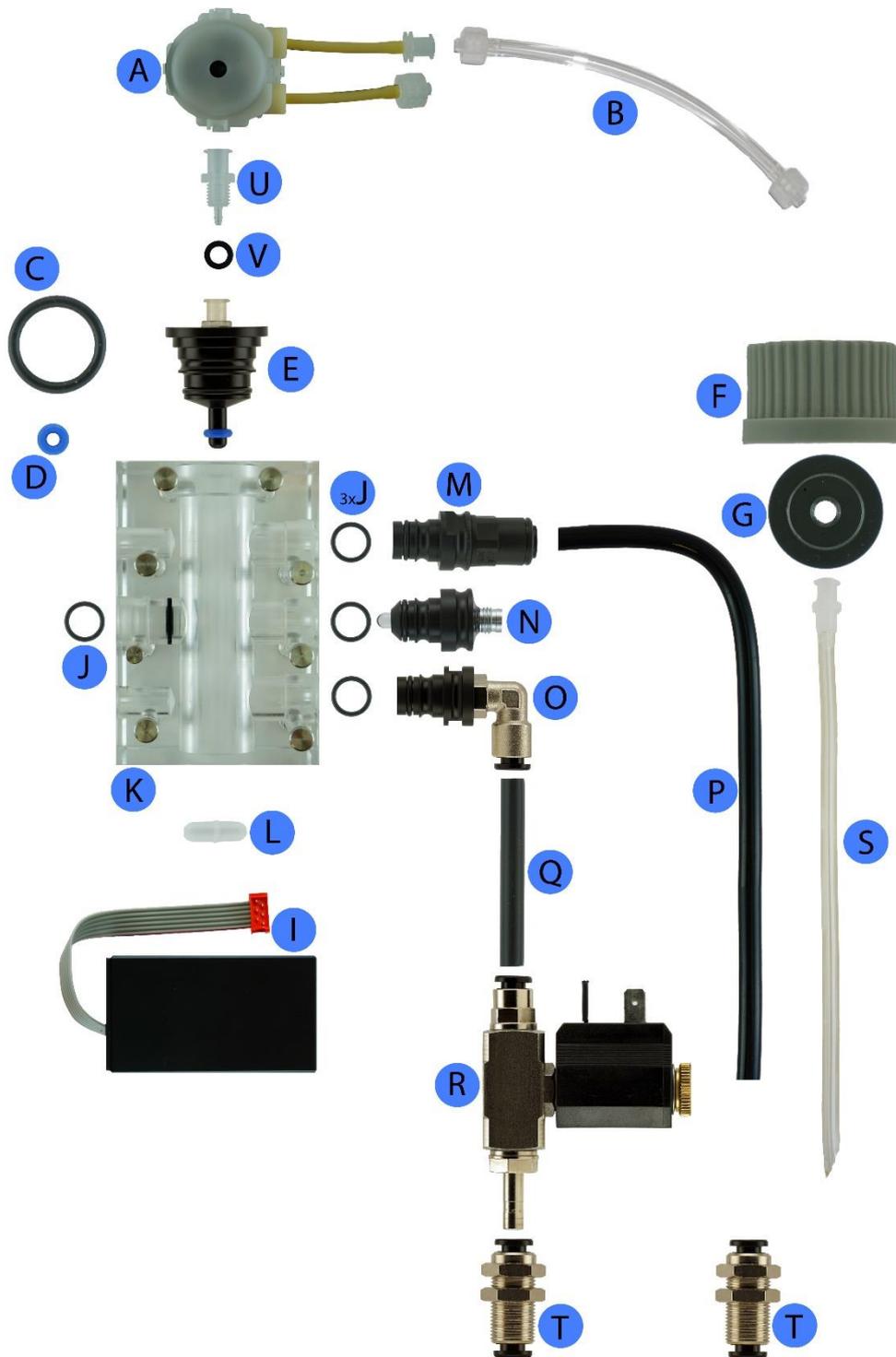
- Check whether there is line pressure at the device connection.
- Check the function of the magnetic valve.
- Check if the drain is blocked.
- If necessary, check the function of the sample pump, stopcocks and valves.

Error message E13 Optics

- Check the measuring chamber for contamination.
- Check the electrical connection of the actuator plug.
- Check the correct position of the actuator plug.
- Check the color sensor in the diagnostic menu.

Annex

Spare parts



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Annex

Position	Article name	Article no.
A	Peristaltic pump cartridge complete	33-090 038
B	Bottle connector	33-090 008
C	O-ring 16 x 2	33-090 217
D	Dosing O-ring 3.2 x 2.5 blue	33-090 218
E	Dosing plug including position U, V, C, D	33-090 716
F	Screw cap	33-093 060
G	Bottle adapter SYCON	33-090 009
I	Stirring unit	33-090 056
J	O-ring 9 x 1.5	33-090 210
K	Measuring chamber pre-assembled	33-090 731
L	Magnetic stirrer	33-090 002
M	Outlet plug 6 mm including O-ring	33-090 712
N	Actuator plug (LED) including O-ring	33-090 713
O	Inlet plug with angle connection including O-ring	33-090 156
P	Outlet hose 200 mm long \varnothing 6 x 4 mm	33-090 124
Q	Inlet pipe 50 mm long \varnothing 6 x 4 mm	33-090 112
R	Solenoid valve SYCON 24 V	33-090 157
S	Suction lance	33-090 011
T	Bulkhead plug connector straight	33-090 116
V	O-ring 5.28 x 1.78	33-090 215
U	Luer lock connection	33-090 414

Spare parts without illustration

Article name	Article no.
Measuring chamber including position E, M, N, O, L	33-190 700
Display circuit board	33-033 607
Main board SYCON 2602 230 VAC	33-030 647V
Main board SYCON 2602 24 V AC/DC	33-030 655
Peristaltic pump cartridge with motor complete, SYCON 2602	33-090 227
Connecting cable of solenoid valve SYCON series	33-090 079
Connecting cable of actuator	33-090 074
Maintenance set SYCON 2602 including position A, B, C, D, S, 4 x J, L	33-090 028
SYCON CLEAN cleaning kit (please read the contents of the set in chapter Spare parts > Maintenance sets)	30-010 900
FIT 3000 (1000 ml) cleaner for cleaning the measuring chamber	32-089 100

Maintenance sets

The SYCON 2602 is largely maintenance-free. A maintenance set is available for the analyzer. It is recommended to change the hose pump cassette, hoses and O-rings after 30,000 analyses or 24 months. At the end of the maintenance interval, the instrument displays a maintenance note on the display. The maintenance counter must be reset or confirm after maintenance has been carried out.

In addition, it is recommended to clean the measuring chamber regularly, but at least every 6 months. The SYCON Clean cleaning set is offered for this purpose. It contains all the aids required for cleaning as well as the cleaning fluid FIT 3000.

Information on performing maintenance can be found in the chapter "Maintenance and Service" starting on page 60.

Article name	Article no.
Maintenance set for SYCON 2602	33-090 028
Includes the following articles:	
<ul style="list-style-type: none"> • 1 x 33-090 008 bottle connector • 1 x 33-090 011 suction lance • 1 x 33-090 217 O-ring 16x2 • 4 x 33-090 210 O-ring 9x1.5 • 1 x 33-090 218 O-ring blue • 1 x 33-090 038 peristaltic pump cartridge • 1 x 33-090 002 magnetic stirrer 	
SYCON Clean cleaning set	30-010 900
Cleaning set for measuring chambers, contains the following items:	
<ul style="list-style-type: none"> • 10 pairs of gloves XL • 1 x funnel made of PP • 1 x cleaner FIT 3000 (1000 ml) • 1 x pipette brush • 1 x reagent glass brush • 1 x container with lid 	
Measuring chamber cleaner FIT 3000 (1000 ml)	32-089 100

Accessories

Article name	Article no.
Pressure regulator with wall holder	33-090 734
Includes the following articles:	
<ul style="list-style-type: none">• Pressure regulator with wall bracket• 2 x hose connection outer diameter 6 mm	
Technical data:	
<ul style="list-style-type: none">• Max. Inlet pressure 8 bar• Control range 0.8 to 3.9 bar• Optionally a manometer can be mounted	



Connection set SYCON	33-000 701
Includes the following articles:	
<ul style="list-style-type: none">• Reducing nipple stainless steel 1.4408 V4A 1/2 inch to 1/4 inch (conical male thread)• Ball valve with socket ends made of 1.4408 V4A stainless steel with 1/4 inch (cylindrical internal thread)• Straight screwed connection, nickel-plated brass. 1/4 inch (cylindrical external thread with sealing ring), hose connection with outer diameter of 6 mm• 5 meters of plastic hose with outer diameter of 6 mm	



+ 5 meters of plastic hose with outer diameter of 6 mm

Sample cooler

The maximum inlet temperature of the sample water is 40° C. If the sample water has a higher temperature, use a pre-cooler. Pre-coolers are offered for flow cooling depending on the temperature of the water and the cooling water.

Further information and data sheets can be found on our website.

Declaration of conformity



EG-KONFORMITÄTSERKLÄRUNG

EC-Declaration of Conformity

Hersteller <i>Manufacturer</i>	RLS Wacon analytics GmbH
Anschrift <i>Address</i>	Gropiusstr. 12 D-31137 Hildesheim
Produktbezeichnung <i>Product specification</i>	SYCON 2602
Wir erklären in alleiniger Verantwortung, dass das oben bezeichnete Produkt mit folgenden Europäischen Richtlinien übereinstimmt: <i>We declare that the above product is in conformity with the following directives:</i>	2014/35/EU Niederspannungsrichtlinie Low Voltage Directive
Angewandte harmonisierte Normen und technische Spezifikationen <i>Applied harmonised standards and technical specifications:</i>	DIN EN 61000-3-2 DIN EN 61000-3-3 DIN EN 61000-3-4 DIN EN 61326-1
Qualitätssicherung der Produktion: <i>Production Quality Assessment:</i>	DIN EN ISO 9001:2015

Hildesheim, 16.04.2021
*Ort, Datum der
Ausstellung
Place, date of issue*

Dr. Sascha Matern
*Name des Befugten /
Dokumentenbevollmächtigter
Name of authorized person /
Document manager*

Gültige Version unter www.rls-wacon.de

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Imprint:

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Photo at the back: Vitali Vidnevski (employee of RLS Wacon analytics GmbH), 2015
Changes and errors excepted

26.04.2021

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The logo for RLS Wacon analytics GmbH features a stylized blue and red circular icon to the left of the text 'RLS Wacon' in a bold, sans-serif font, with 'analytics GmbH' in a smaller font below it.



The RLS Wacon analytics GmbH is a family-owned enterprise based in Hildesheim, Germany. For more than 40 years, we are developing and manufacturing robust and safe measurement and sensor technology for demanding applications. We hereby consistently focus on quality and well-known products. Our particular interest is the dialogue with customers, partners and suppliers. That's how *safety is reliably produced.*

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