

Operating manual

SYCON 2802



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

Safety reliably produced.

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General information

These operating instructions describe the installation and operation of the SYCON 2802 online analyzer. Installation and commissioning must only be carried out by an authorized specialist.

The device may only be operated under the conditions described in this operating manual. The device may only be used for the specified purpose. When installing and operating the analyzer, all local regulations (e.g. EN, DIN, VDE, UVV) must be observed.

The analyzer is used for the automatic determination of the total water hardness or the carbonate water hardness in the 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 programming must only be carried out by a qualified specialist.

The water connection lines to the unit should be kept as short as possible and should not be laid together with mains cables or in their immediate vicinity. In the vicinity of strong electromagnetic radiators, interference with the analysis may occur. In this case, special interference suppression measures must be taken, in particular the EMC guidelines must be observed.

It is recommended that you always have access to the analyzer when familiarizing yourself with this operating manual so that you can immediately understand the relationships and functions explained. Since certain areas build on each other, it makes sense to work through the chapters in the given order.

If you have any questions when using the analysis device, you will receive support from our partners or from us. You can reach us by telephone during normal business hours or by email. The contact details of our technicians and partners can be found on our website.

Safety instructions and symbols used

In this operating manual you will find various safety instructions that point out possible risks when using the analyzer. In detail, this concerns risks for

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

General information

Various symbols in this operating manual draw attention to special hazards in order to avoid personal injury and damage to equipment. Please read the entire text completely before you begin.



This symbol indicates useful tips that will help you to better understand the device.



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



pressure

This symbol is a warning that you may encounter piping under pressure.



Voltage

This symbol indicates the danger of electric current as well as the danger to persons and electronic components and assemblies.

Transport



Immediately after receipt, check that the device is complete and not damaged in transit. The analyzer is delivered safe for transport. Nevertheless, damage may occur during transport. Immediately inform the deliverer of any transport damage.



Protect the analyzer from possible damage during transport. Remove any remaining liquids in advance. Remove the reagent bottle and close it to prevent the reagent from leaking.

Storage



Store the analytical instrument 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. Take the device to a collection point. The battery must be disposed of separately.

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

SYCON 2802 in detail

The online analyzer SYCON 2802 is characterized by the following features:

- Reliable, accurate and fully automatic analyzer
- Monitoring of two programmable limit values
- Measurement of total hardness or carbonate hardness possible with the same analyzer
- Simple commissioning via configuration wizard
- BOB operation (72 hours)
- Self-calibrating and self-monitoring
- Easy maintenance and cleaning
- Compact design
- Multi-colored, multi-lingual graphic display
- Relay output for limit value 1
- Relay output for limit value 2 or reagent alarm
- Relay output for fault indication
- Relay output for feed pump, reagent alarm or cooling water valve
- Analog output 0/4 - 20 mA for measured value or status message
- 2 programmable digital inputs
- Measurement data memory and measurement data protocol on SD card
- No formation of condensate in the optics
- Software updates via SD card



SYCON 2802 is not a system that prevents hardness breakthroughs.

Scope of supply

The SYCON 2802 is available in two versions:

1. *Analyzer on wall bracket*

The analyzer consists of a control unit and the measuring chamber. Both are mounted on a wall bracket. This version is fully functional and contains the connections for the water inlet and outlet as well as a holder for an reagent bottle (Figure 1).

2. *Analyzer in housing*

A plastic housing is available as an option for the analyzer on a wall bracket to allow the analyzer to be used in locations where heavy soiling is to be expected (Figure 2). The analytical instrument on the wall bracket can be quickly mounted into the housing with 4 screws. If the analytical instrument and housing are ordered together, the instrument is already mounted in the housing.

SYCON 2802 in detail

Article description	Item number
Analytical instrument SYCON 2802 on wall bracket 230 VAC version	30-110 164
Analytical instrument SYCON 2802 on wall bracket 24 V AC/DC version	30-111 164
Analytical instrument SYCON 2802 in housing 230 VAC version	30-310 164
Analytical instrument SYCON 2802 in housing 24 V AC/DC version	30-311 164
Housing for SYCON series including wall mounting brackets	33-099 005
Instruction manual (English)	33-099 725

The operation of the analyzer is menu-driven and intuitive via the graphic display and the 8 keys on the control housing.



Figure 1:
SYCON 2802 on wall bracket



Figure 2:
SYCON 2802 in housing



The analytical instrument SYCON 2802 on a wall bracket is fixed in the housing with 4 screws supplied.

SYCON 2802 in detail

Device description

The analyzer consists of the following components: The control unit with graphic display and control panel is located on the left side of the device. 4 cable bushings are provided on the lower control housing. On the right side there is the dosing pump and below it the measuring chamber.

The dosing pump is plugged onto the motor shaft of the motor and engages in the receptacle. It can be removed without tools. The measuring chamber is attached to 2 guide pins on the control housing. It can also be removed without tools and is released with 2 captive locking pins. In the same way, dosing plugs, actuator plugs, inlet and outlet plugs are attached to the measuring chamber and can be released quickly.

In the middle is the measuring chamber, which is basically pressure less and always filled in order to avoid germs. The actuator plug with a white high-performance LED is located in the middle of the measuring chamber. The sensors are located in the housing. Below the measuring chamber is a stirrer (magnetic stirrer) which is firmly connected to the housing.

Under the reagent bottle are the water connections for hoses with an outside diameter of 6 mm: inlet with sample water (left) and outlet (right). Both are firmly screwed to the wall bracket.

Behind the reagent bottle there is a solenoid valve in the feed line.



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



A more detailed description of the components can be found starting on page 43.

SYCON 2802 in detail

Operating principle

The SYCON 2802 based on the SYCON series is an online analyzer for the automatic determination of water parameters according to the colorimetric titration method. By adding an reagent to the water sample, a color reaction is generated. Depending on the reagent used, the device evaluates the intensity of the color. SYCON 2802 calculates the concentration of the water content substance by changing the color of the sample during the addition of the reagent. The device can only determine one parameter at a time. Parameters and measuring range are determined by the reagent used.

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)
resilience	Load capacity of relays with internal power supply 1 A from terminals 1 to 4	
	Load capacity of relays with external power supply 2.5 A	
protection class	open wall mounting	IP43
	mounting in housing	IP54
storage temperature	0 °C - 45 °C	
ambient temperature	10 °C - 45 °C	
sample water temperature	5 °C - 40 °C	
air humidity	20 - 90 % RF (without ice or condensation)	
Supply water pressure	min: 0.5 bar - max: 5 bar / recommendation 1 - 2 bar	
General inflow water	clear, colorless, solids-free, without gas bubbles	
Water quality requirements	pH:	4 - 10
for water hardness	Iron:	< 3 ppm
measurement	Copper:	< 0.2 ppm
	Aluminum:	< 0.1 ppm
	Manganese:	< 0.2 ppm
	Acid capacity:	KS 4.3 < 5 mmol/l

Note on oxidizing agents:

Oxidizing agents such as calcium hypochlorite, chlorine, chlorine dioxide, sodium hypochlorite or ozone above the limit values permitted in "TrinkwV 2012" attack the dye contained in the reagent and interfere with the measurement. An exact determination of the water hardness is therefore no longer guaranteed. An activated carbon filter upstream of the analyzer can remove these oxidizing agents from the sample water and thus enable the correct determination of the water hardness. The capacity of an activated carbon filter is consumed during operation. The activated carbon filter must therefore be replaced at regular intervals. The effectiveness of the activated carbon filter can be checked with the help of Caldur® test kits.

SYCON 2802 in detail

Technical data

Parameter	Value / Range	
installation	Wall mounting in closed rooms	
Dimensions (mm)	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. 2.0 kg
	with housing:	approx. 4.0 kg

Analytical properties

Parameter	Value / Range		
method of measurement	Titration with color change		
measuring range	total hardness		carbonate hardness
	°dH	0.012 ... 30	0.3 ... 22.5
	°f	0.021 ... 53.6	0.5 ... 40.2
	ppm CaCO ₃	0.21 ... 535.7	5.4 ... 401.8
	mmol/l	0.0021 ... 5.36	0.11 ... 8.04
	°e	0.015 ... 38.6	0.39 ... 28.9
	°Ж	0.0043 ... 10.7	0.21 ... 16.1
	The measuring range is defined by the reagent used. The entire measuring range of the total hardness is achieved by using different reagents. <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>		
precision	<p>Accuracy of measurement: ± 5 % of the maximum measured value of the respective reagent used</p> <p>Repeat accuracy: ± 2.5 % of the maximum measured value of the respective reagent used</p> <p>Please note: Depending on the substances contained in the water, there may be shifts in the measured value which influence the measuring accuracy. In such cases, we recommend carrying out a hardness measurement by hand titration and calibrating the analyzer to this measured value.</p>		
current interface	± 0.3 mA		
reagent consumption	approx. 0.05 - 0.5 ml / analysis, depending on the measured water hardness		
measuring time	approx. 3 min, depending on the water hardness and the set rinsing time		
number of analyses	max. approx. 10,000 analyses / 500 ml reagent at low water hardness. The consumption depends on the measured water hardness and the reagent used.		
Durability of reagents	min. 2 years with proper storage (< 25 °C, dark)		
water consumption	approx. 1 l / analysis at 2 bars. The water consumption varies depending on the inlet pressure and the set flushing time.		

Safety reliably produced.




SYCON 2802 in detail

Inputs/outputs

Parameter	Value / range
4 relay outputs	max. 250 VAC / VDC 1 A as potential-free outputs NC/NO The relays provide the following functions: <ul style="list-style-type: none">• Limit value alarm 1• Limit value alarm 2• device faults• Analysis active with switchable delay time• reagent message
2 signal inputs	galvanically isolated contact input <ul style="list-style-type: none">• Start analysis• Flow switch• Interval reset• Water meter
Analog output	0 - 20 mA / 4 - 20 mA Resolution: < 100 µA max. load: 750 Ω
RS-485	Protocol Modbus-RTU

Maintenance interval

Interval	Maintenance works
every 6 months	Cleaning the measuring chamber
	 In the case of high ambient and water temperatures or water with a high organic load, the cleaning intervals may have to be shortened.
all 30,000 analyses or after 2 years of operation	Cleaning the measuring chamber (as above), Installation Maintenance kit: Replace the Peristaltic pump cartridge and seals. Reset the maintenance counter.

SYCON 2802 in detail

Reagents for monitoring total hardness

Name Reagent	Measuring range			Item no. 500ml bottle	Item no. 4 x 500 ml bottles
	°dH	ppm CaCO ₃	°f		
H25-0,02	0,012 ... 0,12	0,21 ... 2,14	0,021 ... 0,214	32-084 115	32-484 115
H25-0,05	0,02 ... 0,2	0,36 ... 3,57	0,036 ... 0,357	32-084 125	32-484 125
H25-0,1	0,03 ... 0,3	0,54 ... 5,36	0,054 ... 0,536	32-084 135	32-484 135
H25-0,2	0,06 ... 0,6	1,1 ... 10,7	0,11 ... 1,07	32-084 145	32-484 145
H25-0,3	0,09 ... 0,9	1,6 ... 16,1	0,16 ... 1,61	32-084 155	32-484 155
H25-0,5	0,15 ... 1,5	2,7 ... 26,8	0,27 ... 2,68	32-084 165	32-484 165
H25-1	0,3 ... 3,0	5,4 ... 53,6	0,54 ... 5,36	32-084 175	32-484 175
H25-2	0,6 ... 6,0	10,7 ... 107,1	1,1 ... 10,7	32-084 185	32-484 185
H25-3	0,9 ... 9,0	16,1 ... 160,7	1,6 ... 16,1	32-084 195	32-484 195
H25-5	1,5 ... 15	26,8 ... 267,9	2,7 ... 26,8	32-084 205	32-484 205
H25-10	3 ... 30	53,6 ... 535,7	5,4 ... 53,6	32-084 215	32-484 215

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

Reagents for monitoring carbonate hardness

Name Reagent	Measuring range			Item no. 500 ml bottle	Item no. 4 x 500 ml bottles
	°dH	mmol/l	°f		
C25-1	0.3 ... 7.5	0.11 ... 2.68	0.5 ... 13.4	32-086 125	32-486 125
C25-1,5	0.5 ... 11.5	0.16 ... 4.11	0.8 ... 20.5	32-086 135	32-486 135
C25-2	0.6 ... 15.0	0.21 ... 5.36	1.1 ... 26.8	32-086 145	32-486 145
C25-3	0.9 ... 22.5	0.32 ... 8.04	1.6 ... 40.2	32-086 155	32-486 155

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



The measured value to be monitored should be as close as possible to the middle of the measuring range of the reagent.

A bottle of reagent is sufficient for at least 10,000 analyses if the measuring point is in the lower range of the reagent type used.

The exact number of possible analyses with an reagent bottle depends on the respective degree of hardness and the reagent used.

Installation

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

- Install the analyzer in a dry, easily accessible and visible location.
- Secure the analytical instrument or the housing firmly with screws according to the instructions.
- Connect the device electrically and make sure that the input voltage is correct. Check the type plate.
- Connect the inlet and outlet according to the installation instructions. Ensure that the inlet pressure is correct and that the drain is free and kept short.
- 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 preparatory work has been completed and the housing is closed.
- Now make the device settings on the device.



The sample water must be clear and free of solids. Otherwise, a filter must be installed 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 no longer opens or closes, the flow through the measuring chamber is not correct. This leads to incorrect measurements.



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

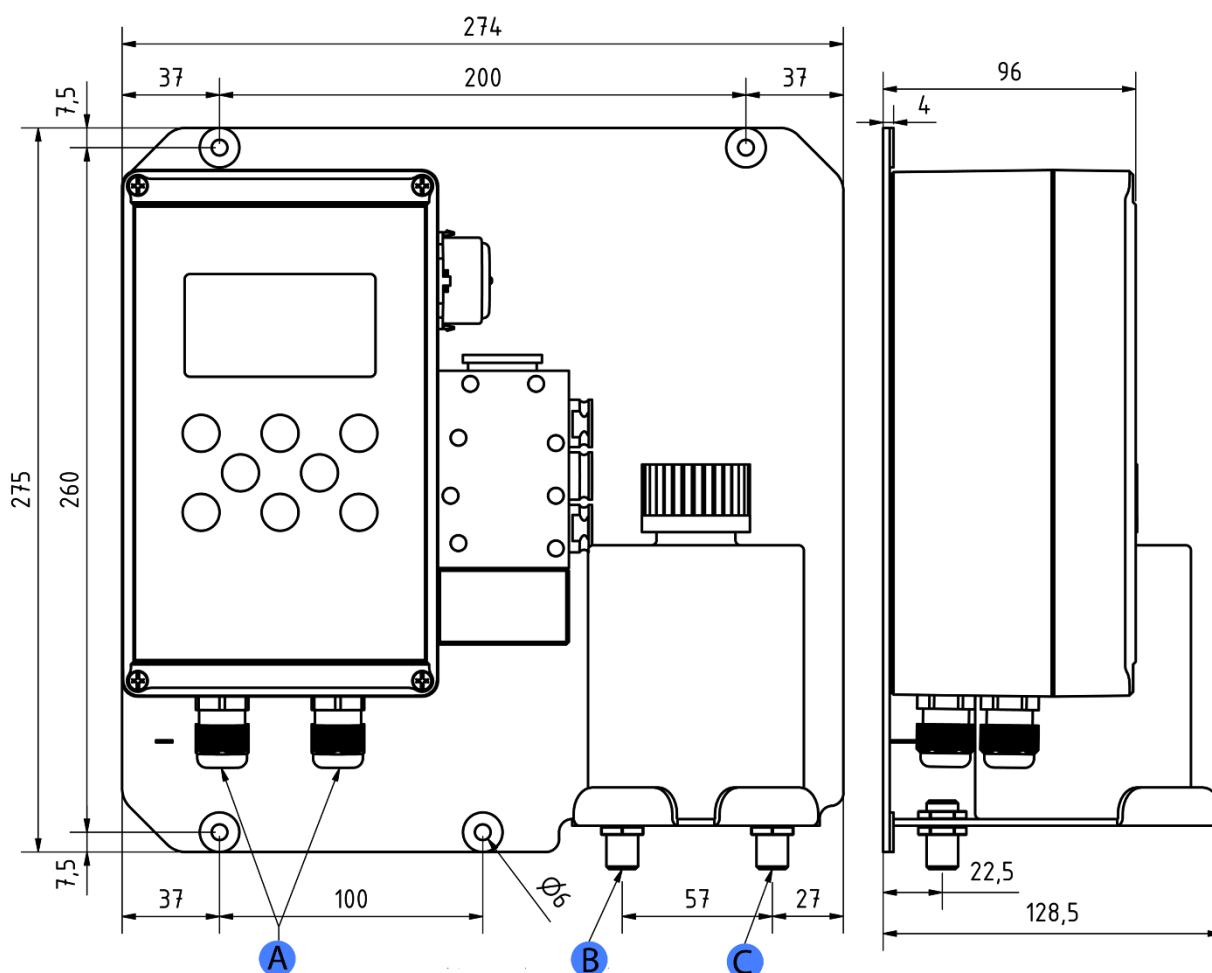


If the sample water has a higher temperature, a sample cooler should be used. This is available as an accessory.

Installation

Wall mounting without housing

The SYCON 2802 must be installed upright. There are four 6 mm holes in the wall bracket for mounting the analyzer.



Picture: Drilling plan for fixing the analytical instrument without housing

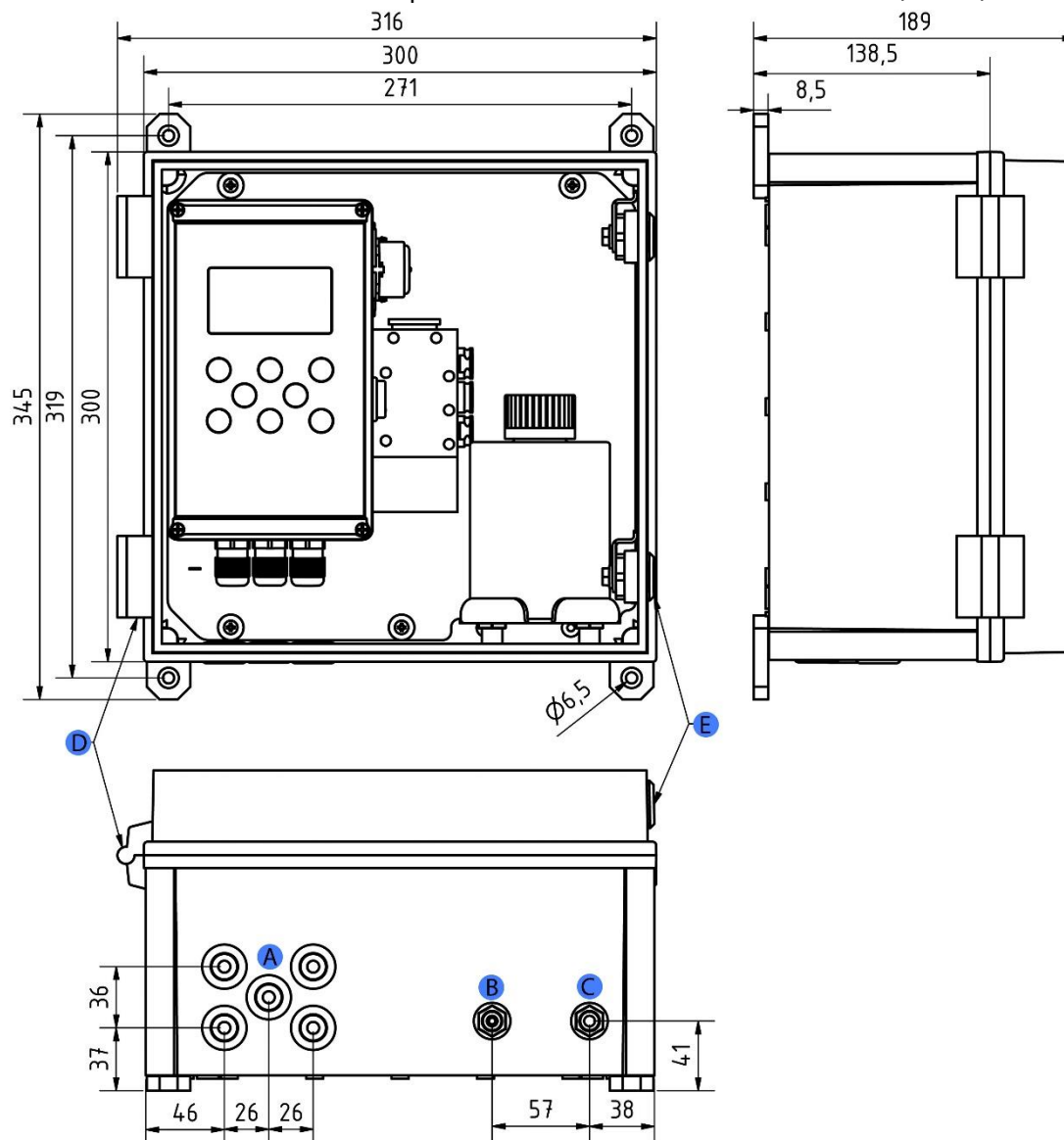
position	Description of the
A	Cable glands for electrical connection
B	Water inlet - connection for hose with 6 mm outer diameter
C	Water drain - connection for hose with 6 mm outer diameter

Installation

Wall mounting with housing

The analytical instrument is optionally supplied with a suitable housing. As an accessory pack, you will receive 4 fixing straps with 6.5 mm holes, which are fixed to the rear of the housing.

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



Picture: Drilling plan for fixing 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

As shown in the picture, the mounting brackets can be mounted vertically or rotated by 45° or 90°.

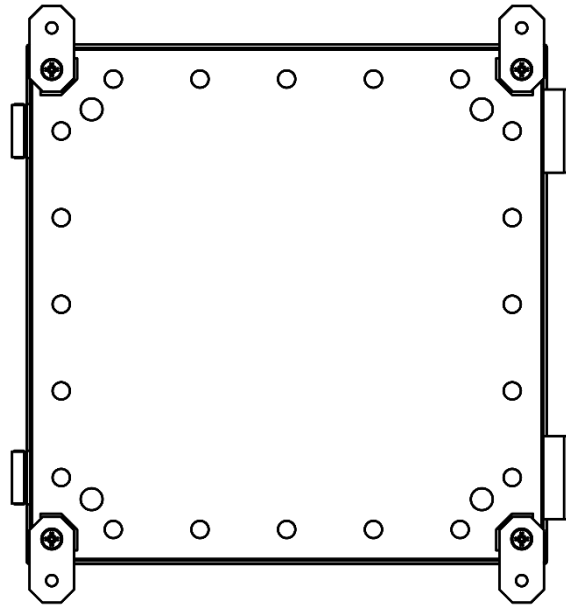


Figure: Rear view of the housing with vertically mounted fixing straps

Work on pressurised water lines



pressure

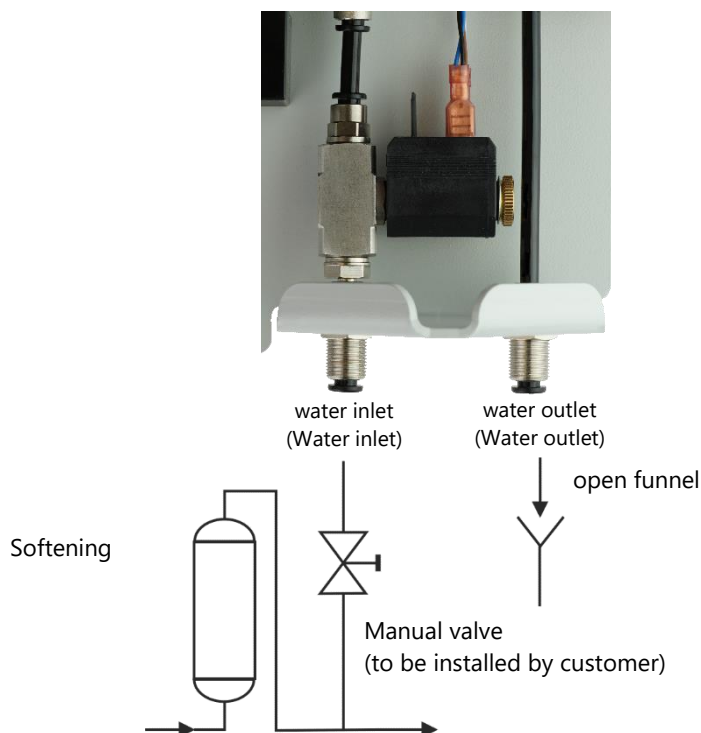
Maintenance and repair work may only be carried out by qualified personnel.

- Before starting work, make sure that all lines are depressurized.
- Hoses, connections and seals must be checked regularly and, if necessary, replaced preventively, even if they show no visible damage. Maintenance intervals must be observed.
- Before commissioning after maintenance, make sure that all connections, fittings and gaskets are properly installed. Check that all housing parts are closed and that filters or other parts connected to the unit are correctly installed.
- Remove all tools, spare parts or other material required for maintenance before commissioning.
- Clean the device, absorb any leaking liquids and leave the device in a clean condition.
- Check that all safety devices are present and ready for operation.

Installation



The analyzer has two connections with bulkhead fittings for plastic hoses with an outside diameter of 6 mm for the water inlet (left) and the water outlet (right). These are simply inserted into the screw connections.



Picture: Connection of the 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 drain must not be longer than 2 m and must lead vertically downwards. The system must be able to relax freely in relation to atmospheric pressure. There must be no back pressure greater than the inlet pressure. The water is discharged without pressure into an open funnel or drain.

Operation with unpressurized sample water

If the sample water is without pressure, a pressure-controlled diaphragm or submersible pump is required to convey the sample water into the measuring chamber of the analyzer.

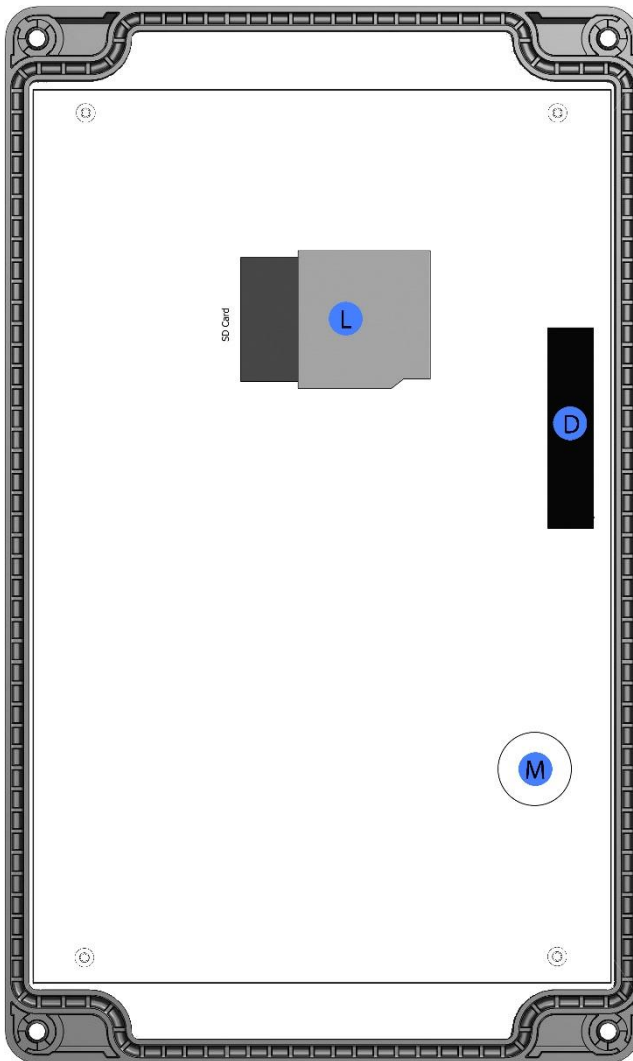
Electrical Installation



Voltage

Work on electrical connections may only be carried out by authorized specialist personnel in compliance with current regulations. All cables must be de-energized.

Open the cover of the control unit by loosening the four screws in the corners of the cover.

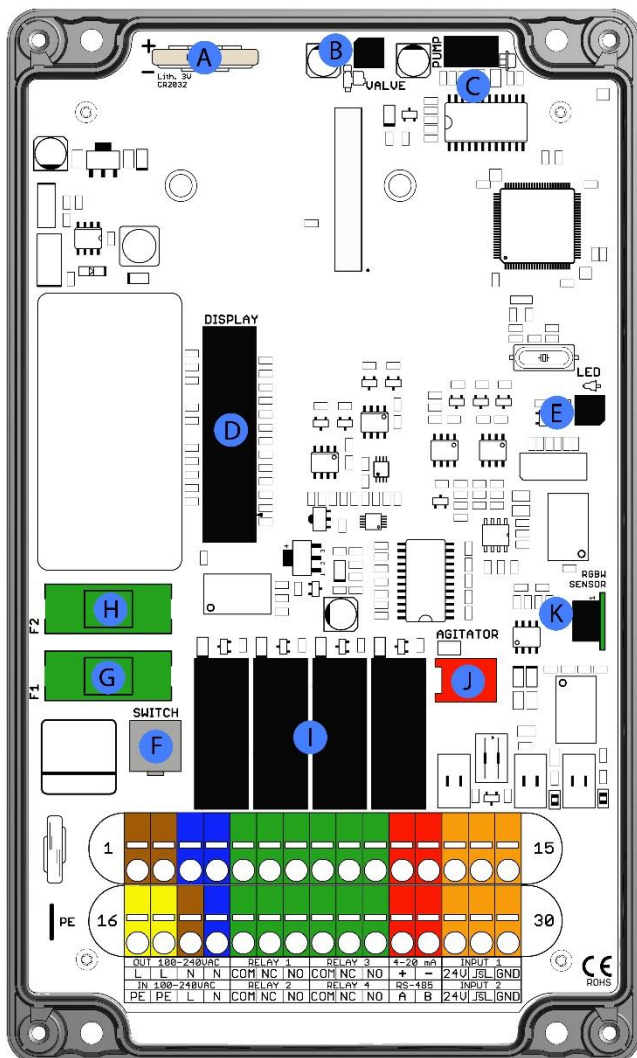


Position	Description
D	Display connector
L	SD card socket
M	Sound signal generator

Illustration: Back side of the lid

Electrical Installation 230 VAC

Mainboard 230 VAC



Position	Description
A	Battery holder
B	Solenoid valve connection
C	Reagent pump connection
D	Display connector
E	Actuator plug LED connection
F	Main switch connection
G	Fuse (5 x 20 mm) 2 A inertia
H	Fuse (5 x 20 mm) 400 mA inertia
I	4 x relay
J	Agitator connection
K	RGB sensor

Electrical Installation

Connection of supply voltage

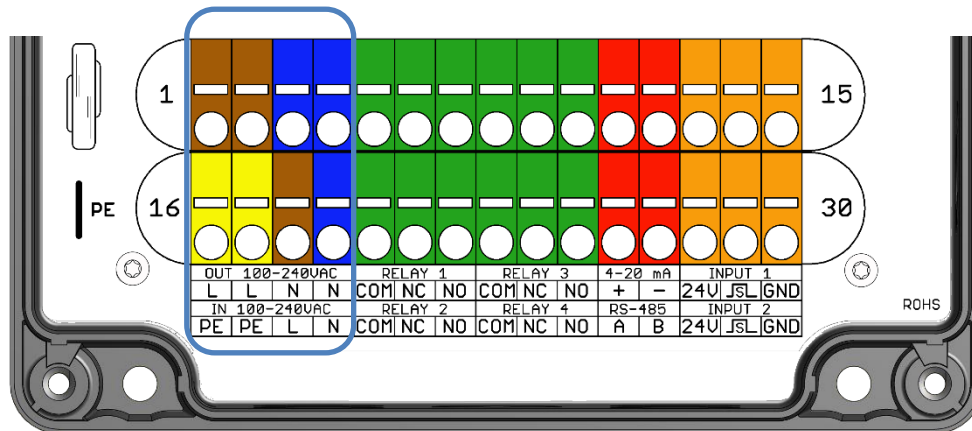


Figure: Terminals for connecting the supply voltage (blue border)

Connection of the supply voltage

Terminal designation	Description
16 PE	Earthing
17 PE	Earthing
18 L (power in)	Supply voltage between L and N
19 N (power in)	

Output terminals that are switched via the device switch

Terminal designation	Description
1 L power out	Switched supply voltage between L and N
2 L power out	
3 N power out	
4 N power out	



Voltage

The maximum connected load of all loads must not exceed 250 VA / 1 A.

Electrical Installation

Connection of the relay outputs

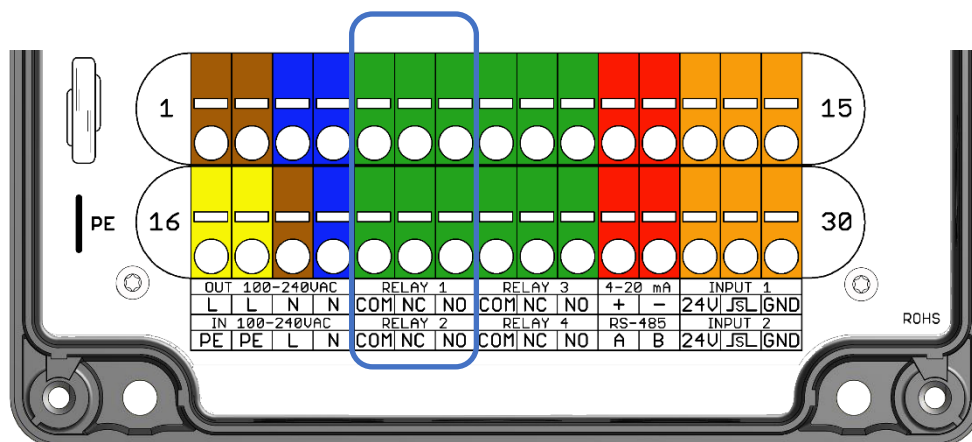


Figure: Terminals for connecting the relay outputs (blue border)

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

RELAY 1 (relay 1): Limit value alarm 1 / (upper limit value 1)

Terminal designation	Description	Connection
5 COM	Relay 1 COM common connection	see page 10 "Load capacity".
6 NC	Relay 1 NC normally closed	
7 NO	Relay 1 NO normally open	

Relay 1 Function limit value alarm 1 / (upper limit value 1)

If the measured value of the sample lies within the nominal range set in the SYCON, relay 1 drops out and establishes a connection from COM to NC. In addition, the symbol R1 is not marked in the display.

If the measured value of the sample exceeds the limit value 1 set in SYCON (upper limit value 1), relay 1 picks up and establishes a connection from COM to NO. In addition, the symbol R1 is marked black in the display.

Electrical Installation

RELAY 2 (relay 2): Limit value alarm 2 / (lower limit value 2) or reagent level warning

Terminal designation	Description	Connection
20 COM	Relay 2 COM	common connection
21 NC	Relay 2 NC	normally closed
22 NO	Relay 2 NO	normally open

see page 10
"Load capacity".

Relay 2 Function limit value alarm 2 / (lower limit value 2)

Limit value 2 (lower limit value 2) Alarm can be set either on exceeding or falling below the set limit value.



Observe the limit value mode Max/Min or Max/Max.
See "Limit value mode" on page 40

Relay 2 Function Reagent level:

If the reagent level has fallen below 10%, the reagent level warning is activated. When operating with soft water, a bottle content for 1000 analyses remains after an incoming warning. Alternatively, the function can also be used on relay 4.

If the filling level of the reagent bottle is above 10%, relay 2 has dropped out and establishes a connection from COM to NC. In addition, the symbol R2 is not marked in the display.

If the level falls below 10%, relay 2 picks up and establishes a connection from COM to NO. In addition, the symbol R2 is marked black in the display.

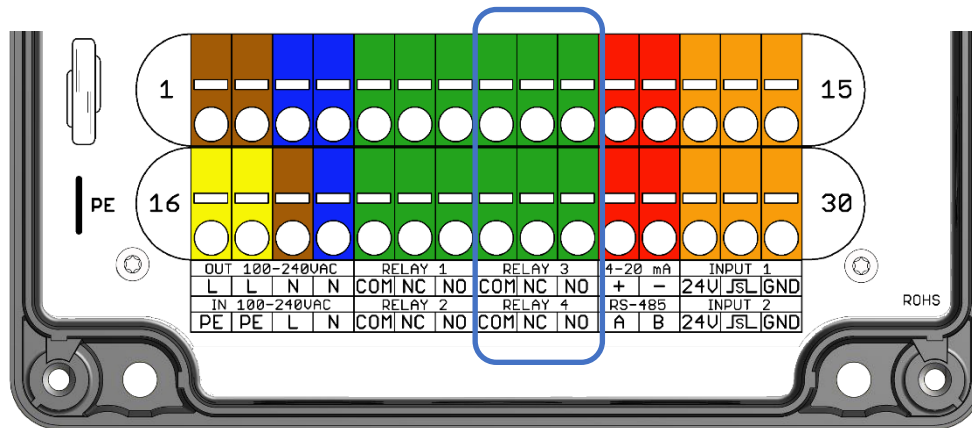


Figure: Terminals for connecting the relay outputs (blue border)

RELAY 3 (relay 3): Device error

Terminal designation	Description	Connection
8 COM	Relay 3 COM common connection	see page 10 "Load capacity".
9 NC	Relay 3 NC normally closed	
10 NO	Relay 3 NO normally open	

Relay 3 Function Message of device faults:

If a device error occurs or the device is switched off, relay 3 has dropped out (connection from COM to NC). In addition, the symbol R3 is not marked in the display.

Relay 3 is energized when the device is in error-free condition (connection from COM to NO), this serves to prevent wire breakage. In addition, the symbol R3 is marked black in the display.



The switching behavior of relay 3 is inverted. This allows a switched-off device and a wire break to be detected.

Electrical Installation

RELAY 4 (relay 4): Indication of reagent level or control Accessories (Analysis deceleration)

Terminal designation	Description	Connection
23 COM	Relay 4 COM	common connection
24 NC	Relay 4 NC	normally closed
25 NO	Relay 4 NO	normally open

Relay 4 Function Reagent level:

If the reagent level has fallen below 10 %, the reagent level warning is activated. When operating with soft water, a bottle content for 1000 analyses remains after an incoming warning. Alternatively, the function can also be used on relay 2.

If the level of the reagent bottle exceeds 10 %, relay 4 has dropped out and establishes a connection from COM to NC. In addition, the R4 symbol is not marked in the display.

If the level falls below 10 %, relay 4 picks up and establishes a connection from COM to NO. The R4 symbol is also highlighted in black on the display.

Accessory control (Analysis deceleration)

Alternatively, relay 4 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 R4.

Note on Analysis deceleration

The start of analysis is delayed. The relay already switches ahead
Start of analysis for the set delay time + analysis duration of
COM to NO for cooling water valves of sample coolers or pumps
to be able to head for it.



After the delay time has elapsed, the solenoid valve on the
Sycon and the analysis begins. The relay remains in operation for the
duration of the
Analysis switched.

For more information, see page 38.

Current interface and RS-485

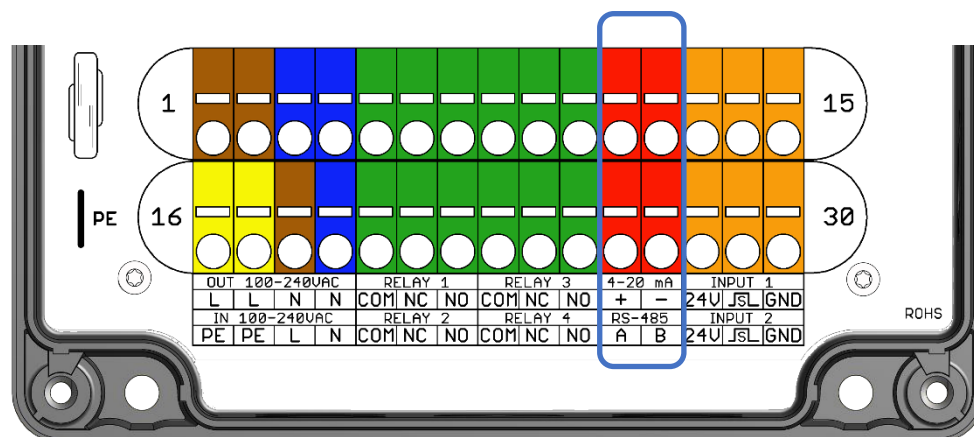


Figure: Terminals for connecting the current interface and RS-485 (blue border)

Output 0/4 - 20 mA: Current interface

Terminal designation	Description
11 (+)	+ Output 0 - 20 mA or 4 - 20 mA
12 (-)	- exit 0 - 20 mA or 4 - 20 mA

Current interface Function:

The current interface outputs the current water hardness or the device status as current. The current range can be selected between the settings 0 - 20 mA or 4 - 20 mA. The maximum load is 750 Ω.

Selection options Current interfaces Type:

- Off
- 0 - 20 mA Value
- 4 - 20 mA Value
- 0 - 20 mA Status
- 4 - 20 mA Status



For more information, see page 42.

RS-485 interface: Modbus

Terminal designation	Description
26 (A)	Output A RS-485
27 (B)	Output B RS-485

Electrical Installation

Input contacts 1 and 2

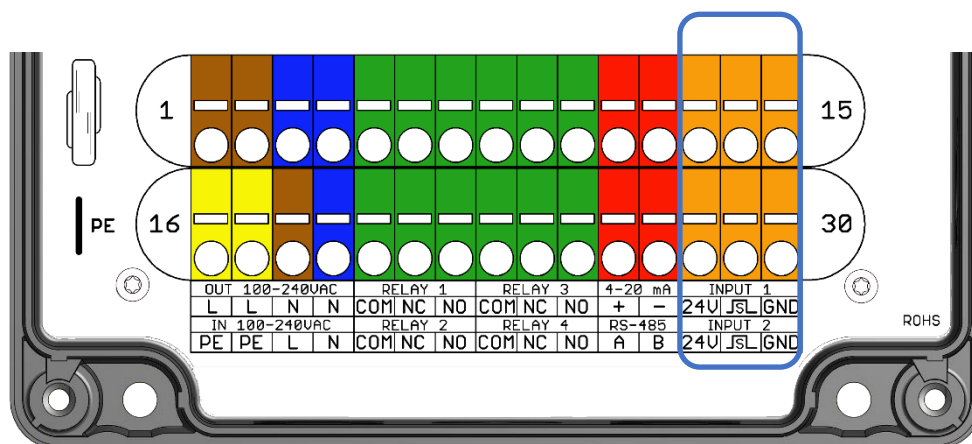


Figure: Terminals for connecting the input contacts (blue border)

INPUT 1: Start input contact for analysis / water meter / flow switch / interval reset

Terminal designation	Description
13 (24V)	+ 24 V auxiliary voltage to connect potential-free outputs
14 (S)	Signal input
15 (GND)	Ground connection for + 24 V connection

Input contact 1 Function:

Other potential-free switches can be connected to the input contact. If the input contact is closed, the IN symbol is highlighted in black on the display.



Further information can be found on pages 31 to 34.

INPUT 2: Input contact for remote reset

Terminal designation	Description
28 (24V)	+ 24 V auxiliary voltage to connect potential-free outputs
29 (S)	Signal input
30 (GND)	Ground connection for + 24 V connection

Input contact 2 Function:

A remote reset controller can be connected to the input contact.



See page 35 for more information.

Connection of external components

For the connection of additional components, the device is equipped with two inputs (Input), 4 relays and one analogue output (current interface 0/4 - 20 mA). A flow switch, a potential-free switch or an electronic switch (open collector) can be connected to the inputs. Electronic or contact water meters can be connected for measurement in a quantity interval. An auxiliary voltage of 24 VDC at terminal 13 and GND at terminal 15 is available for the electronics. For signal detection, 24 VDC must be bridged to terminal 14. 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 relay connections are all potential-free. The internal mains voltage or alternatively an external supply voltage can be used to switch external devices. The connection to external controls is usually made via the potential-free contacts of the relays.

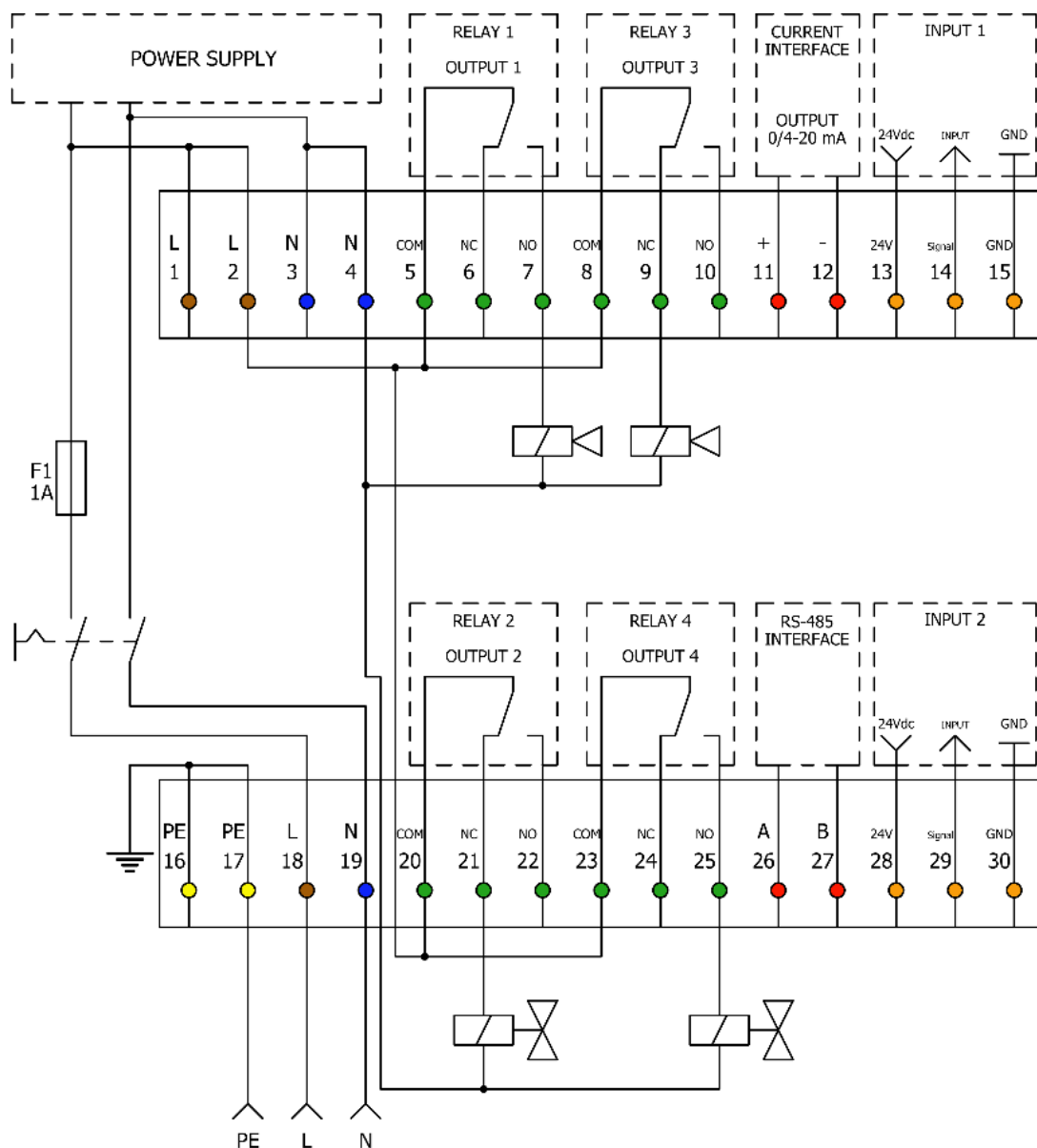


Figure: Schematic view of the connection terminals

Connection of external components



Relay 3 is always energized in normal operation: Connection COM to NO (wire break safety)



Voltage

The supply voltage switched via the device switch is applied to the output terminals 1 to 4 and can be used at the output relays to control pumps, solenoid valves or other loads. The maximum total connected load at output terminals 1 to 4 must not exceed 250 VA. The output terminals are switched with the mains switch of the analyzer and protected by the fine-wire fuse of the instrument.

Connection of external components

Switch for external analysis start

In addition to the options of starting an analysis time-dependently, it is also possible to trigger additional analyses via an external pushbutton. This can be a potential-free pushbutton or the relay output of a PLC control or softening control.

The use of an input switch is intended as an addition to the normal time interval. The analyzer operates at a set time interval, a signal can be supplied 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.)

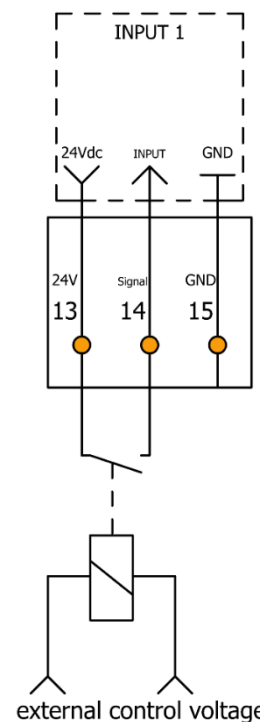
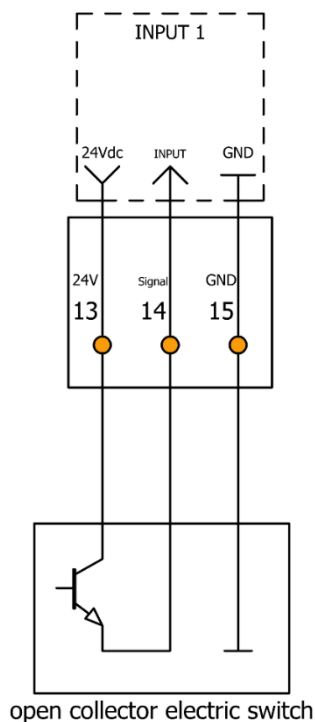
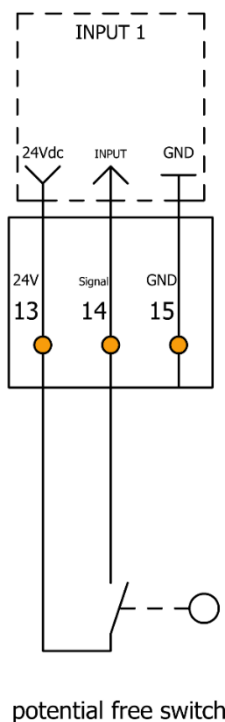


An additional analysis can also be triggered by pressing the [OK] key for 3 seconds.



If the input contact is permanently connected in analysis start mode, analyses are performed permanently.

Programming: Menu > Settings > Inputs > Input 1 > Start analysis



Connection of external components

Connection of a water meter for analyses in the 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 > Inputs > Input 1 > Water meter

1. Enter the characteristics of the water meter used in the **liter/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 the 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.

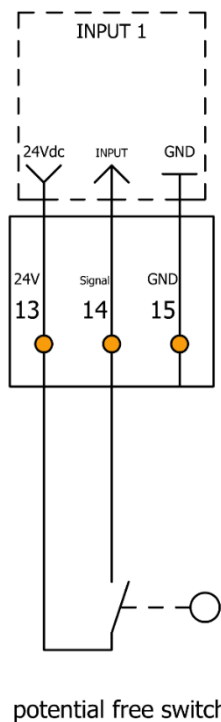


After switching on the instrument, the first analysis is started after 3 minutes. The counting of the water quantity is already active during this time.

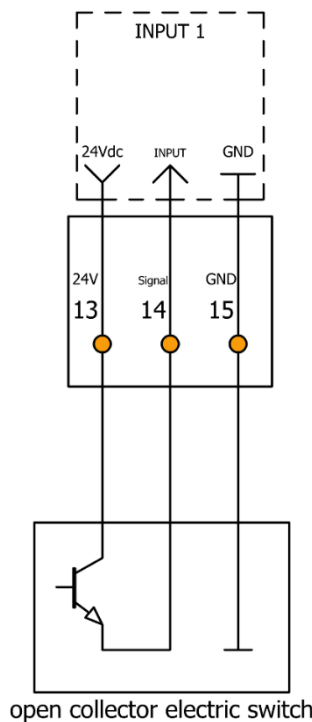
The operation of contact water meters (reed) in the input mode for electronic water meters (Hall) can lead to incorrect interval quantities due to the contact bounce.

Programming: Menu > Settings > Inputs > Input 1 > Water meter

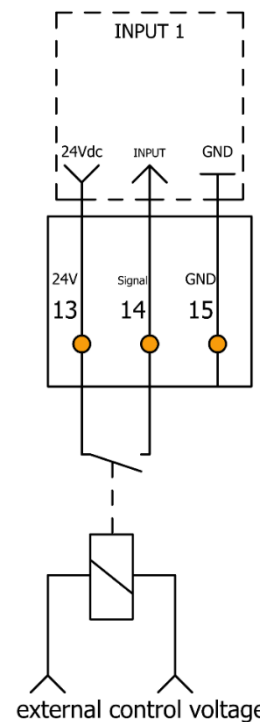
Programming: Menu > Settings > Analysis > Auto.Interval amount



potential free switch



open collector electric switch



external control voltage

Connection of external components

Flow switch

An ion exchanger is usually monitored every 10 minutes to ensure that no hard water reaches the consumer in the event of a sudden hardness breakthrough. When installed on a system where monitoring is only necessary during operating hours, the input contact can be used in combination with a flow switch or a timer. This allows the time interval to be paused during a plant shutdown, thus reducing the reagent and power consumption.

A paddle can be used as a flow switch. The potential-free contact of a timer is also possible. The examples below show various connection options at the input contact.

If a flow switch is used, the analyses are only carried out if a defined signal is present at the input (flow switch signals running water).

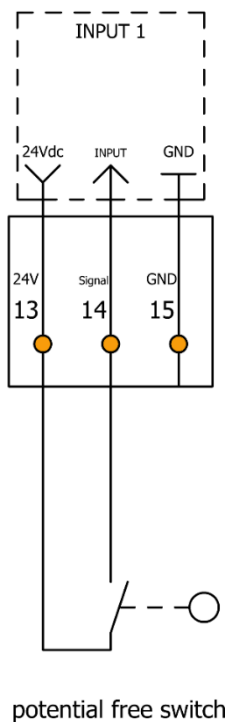
Depending on the installed contact, the input can be configured as NC or NO type.

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

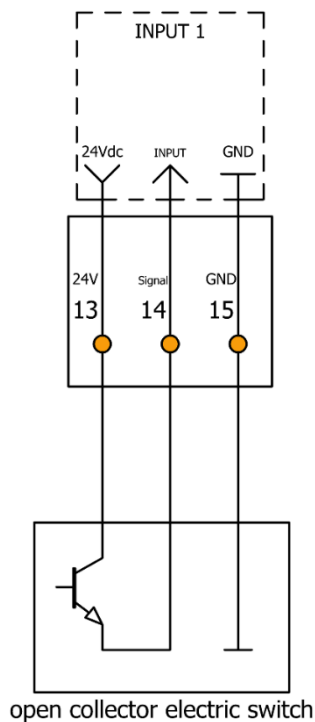
Programming: Menu > Settings > Inputs > Input 1 > Flow switch



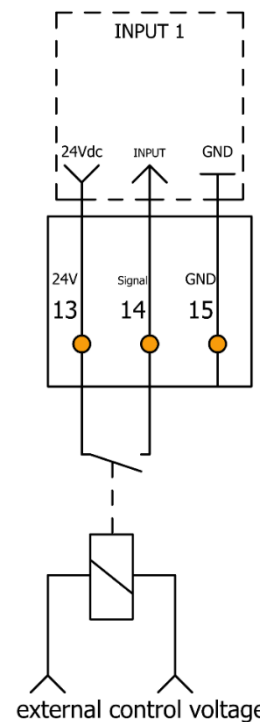
This function must not be confused with the function "Start analysis" by external control.



potential free switch



open collector electric switch



external control voltage

Connection of external components

Interval 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/open.

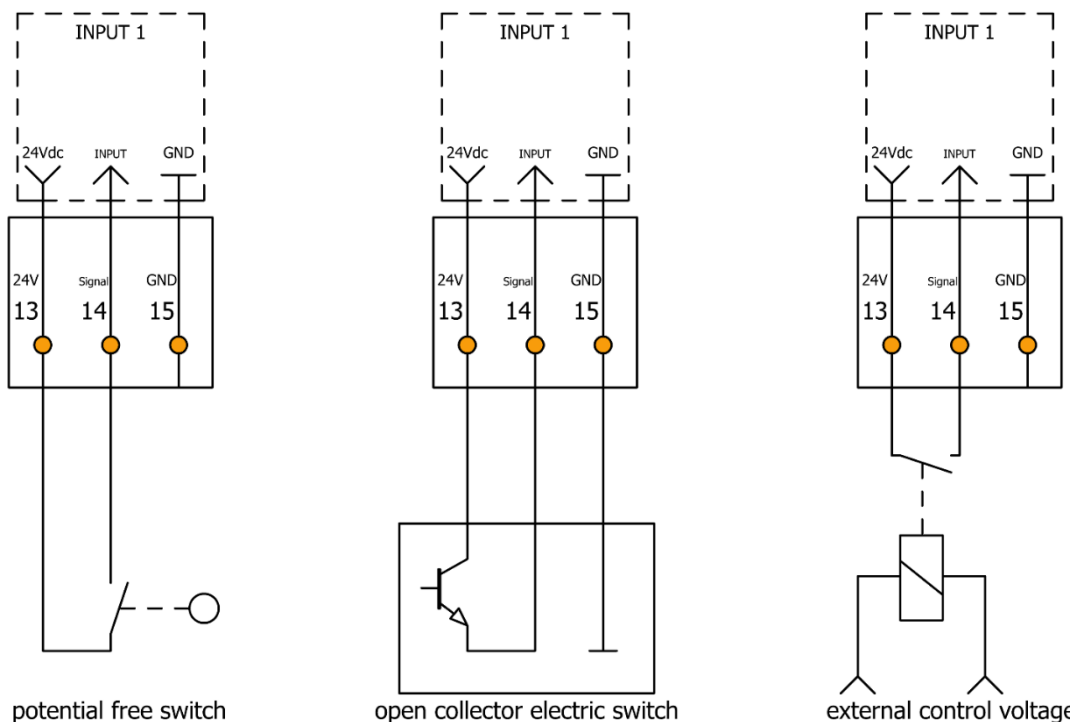
After completion of the regeneration or after switching over to the second softening plant the input contact is closed/opened again. The first analysis starts after one minute. The following analyses are carried out again at the programmed analysis interval.

[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 > Inputs > Input 1 > Interval reset



Connection of external components

Input 2: Connection of a switch Error RESET

It is possible to cancel running analyses or delete error messages from an external switch. This can be a potential-free switch or the relay output of a PLC controller or control room.

An auxiliary voltage of 24 VDC at terminal 28 and GND at terminal 30 is available for the electronics. For signal detection, 24 VDC must be bridged to terminal 29. No external voltage sources may be connected to the input. If necessary, a potential separation with a relay or optocoupler must be carried out.

Programming: no programming required for input 2

Connection of external components

Reagent light/horn

A signal lamp or horn can be connected to relay 1 / output 1 to signalize a limit exceedance.

The relay 3 / Output 3 is used to report detected faults (e.g. optical faults, faulty zero sample, missing supply voltage at the analyzer). If the analyzer is in normal operation and there is no error, then relay 3 / Output 3 is energized and the connection from COM to NO is switched. If an error is detected, relay 3 / Output 3 drops out and establishes the connection from COM to NC.

Relay 1 / Output 1 is energized when the limit value is exceeded (upper limit value 1) and switches the connection from COM to NO. This position can be programmed in the program as a permanent contact or as a pulse contact.

Permanent contact at relay 1 / output 1:

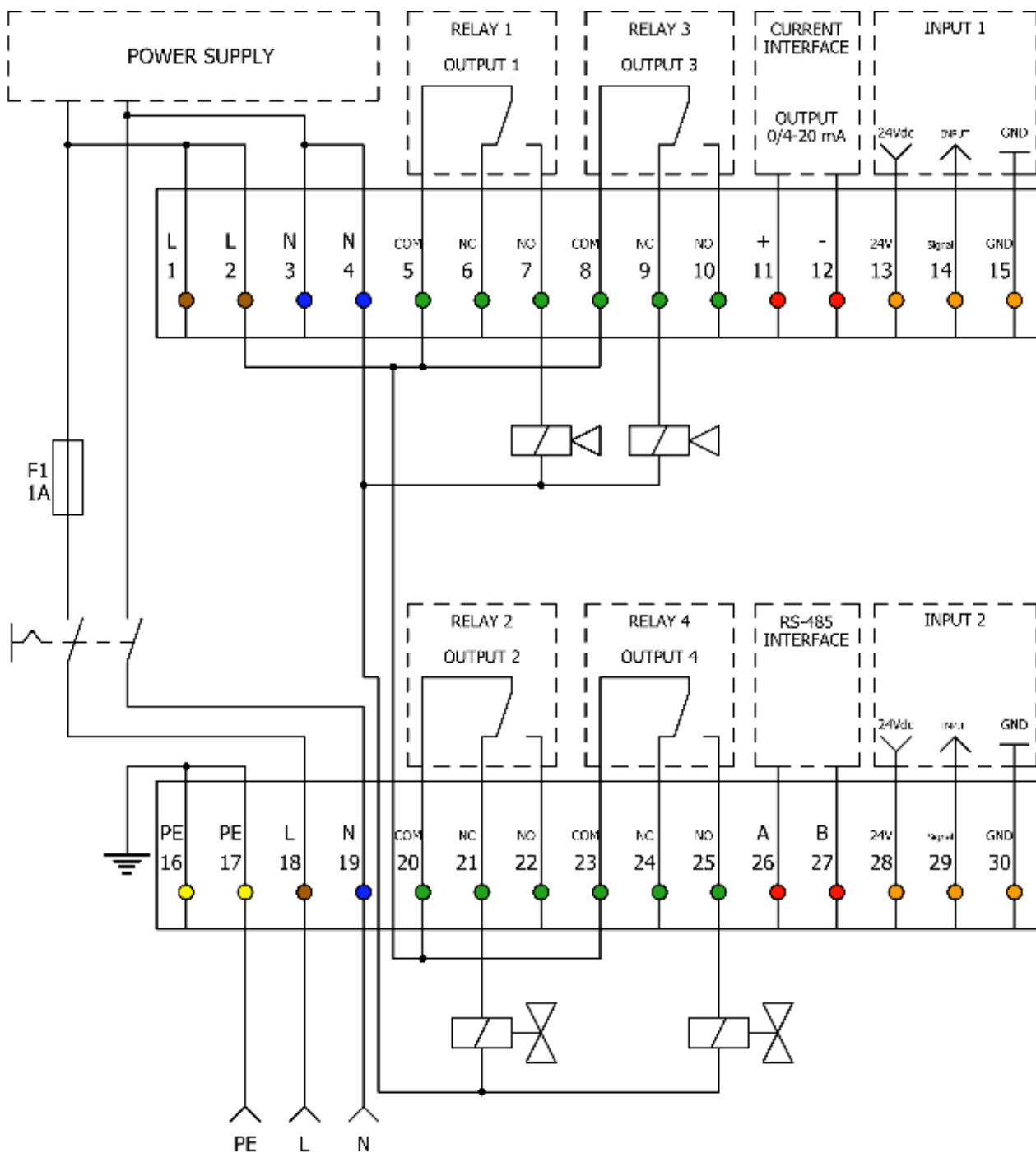
The relay 1 / output 1 remains switched in the position (connection from COM to NO) when the limit value is exceeded (upper limit value 1) until the measured water hardness is again below the limit value (upper limit value 1). Then the limit value is exceeded again and the relay 1 / Output 1 switches back (connection from COM to NC).

Pulse contact at relay 1 / output 1:

The relay 1 / output 1 remains in the position (connection switched from COM to NO) only for a programmed pulse duration if the limit value is exceeded (upper limit value 1). As soon as the programmed pulse duration has expired, the relay 1 / Output 1 switches back (connection from COM to NC). The next time the limit value is exceeded (upper limit value 1), 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

Connection of external components



Picture: Terminal assignment when connecting a signal lamp/horn

Connection of external components

Regeneration system for demand-controlled activation of regeneration

Processing plants are usually regenerated according to their capacity after a constant flow rate. In order to ensure that no hard water reaches the consumer, regeneration takes place before the actual exhaustion of the system. If the regeneration is triggered via an analyzer, regeneration agent and water are saved. With strongly fluctuating raw water hardnesses a qualitative regeneration triggering via an analysis device is unavoidable.

The impulse output for the regeneration triggering takes place via relay 1 / output 1. Due to longer idle times or too high a load, premature regeneration triggering may occur due to the counter ion effect. It is therefore recommended to repeat the measurement with a control measurement if the limit value is exceeded.

Programming: Menu > Settings > Analysis > Control measurement

Connection of a controller for reagent level warning

Relay 2 or relay 4 can be used to switch a low reagent level signal (reagent level <10%) to a controller or other signal transmitter. For this purpose, the relay 2 or relay 4 must be programmed to the operating mode reagent low.

Programming: Menu > Settings > Outputs > Relay 2 > Reagent

Programming: Menu > Settings > Outputs > Relay 4 > Reagent

Relay function analysis active

Relay 4 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 4 is active during analysis:

Programming: Menu > Settings > Outputs > Relay 4 > 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 4 is active before and during analysis:

Programming: Menu > Settings > Outputs > Relay 4 > Analysis > Analysis deceleration

If selected before and during analysis, the Analysis deceleration 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.

Connection of external components

Connection of a blending device

There are applications where a certain water hardness is required. Here the hard water is mixed with a softened water. An upper and a lower limit value are programmed to monitor and control such systems. After an analysis, the following signals can be picked up: limit value 2 undershot (relay 2 energized), measured value at setpoint (relays 1 and 2 de-energized), limit value 1 exceeded (relay 1 energized). These signals can be evaluated by an external controller. At the same time, the current interface is also available to control the blending valve accordingly.

Programming: Menu > Settings > Analysis > Limit Mode > Max/Min.

Programming: Menu > Settings > Outputs > Relay 1

Programming: Menu > Settings > Outputs > Relay 2

For more information, see "Limit Mode" on page 40.

Connection of external components

Limit Mode

Programming: Menu > Settings > Analysis > Limit Mode

Mode: Max/Min (blending device, for monitoring a desired water hardness)

The water hardness shall be less than limit value 1 (upper limit value 1) and greater than limit value 2 (lower limit value 2). If the measurement result is less than limit value 2 (lower limit value 2), the fault hardness too low is reported to relay 2.

If the measured value of the sample exceeds the limit value 2 (lower limit value 2), relay 2 drops out and establishes a connection from COM to NC. In addition, the symbol R2 is not marked in the display.

If the measured value of the sample falls below the limit value 2 (lower limit value 2), relay 2 picks up and establishes a connection from COM to NO. In addition, the symbol R2 is marked black in the display.

Mode: Max/Max (softener, for signaling when limit value 2 is exceeded (lower limit value 2))

In Max/Max mode, the required water hardness is below limit value 1 (upper limit value 1) and limit value 2 (lower limit value 2). Limit value 2 (lower limit value 2) must be programmed smaller than limit value 1 (upper limit value 1). Thus, limit value 1 is used as alarm message and limit value 2 as pre-alarm.

If the measured value of the sample falls below the limit value 2 (Lower limit value 2), relay 2 drops out and establishes a connection from COM to NC. In addition, the symbol R2 is not marked in the display.

If the measured value of the sample exceeds the limit value 2 (lower limit value 2), relay 2 picks up and establishes a connection from COM to NO. In addition, the symbol R2 is marked black in the display.

Connection of external components

Analog current interface

The current measured value is available as an analog value at terminals 11 and 12. Recorders or external devices can be connected for processing the measured value. You can choose between a current output 0 - 20 mA value or 4 - 20 mA value. In addition, you must determine which current value of 20 mA corresponds to which total hardness / carbonate hardness.

Programming: Menu > Settings > Outputs > Current loop Type

Programming: Menu > Settings > Outputs > Current loop calibration

(Enter the Total Hardness/Carbonate Hardness value to correspond to 20 mA.)

The supplied current of the current loop for the displayed measured value is also calculated:

$$I = I_0 + \frac{(20 \text{ mA} - I_0) \cdot \text{MeasuredHardness}}{\text{Max_Hardnessvalue}} [\text{mA}]$$

Depending on the operating mode, 0 or 4 mA is to be used for I_0 .

The number " *Max_Hardnessvalue* " corresponds to the entered water hardness value for 20 mA.

Usually the measuring range end of the used reagent is used.



We recommend setting the upper hardness level to the end of the reagent measuring range.

Connection of external components

Example calculation:

An reagent H25-0.3 is used for the analysis. Measuring range 0.09 °dH to 0.9 °dH.

The upper hardness level is set to 0.9 °dH, which corresponds to 20 mA.



For current interfaces type "0 - 20 mA", 0 mA corresponds to 0 °dH.

For current interfaces type "4 - 20 mA", 4 mA is corresponding to 0 °dH.

Calculation for current interfaces type "0 - 20 mA"

$$I = 0 \text{ mA} + \frac{(20 \text{ mA} - 0 \text{ mA}) \cdot 0,42 \text{ °dH}}{0,9 \text{ °dH}} [\text{mA}]$$
$$I = 9,3 \text{ mA}$$

9.3 mA correspond to 0.42 °dH.

Calculation for current interfaces type 4 - 20 mA

$$I = 4 \text{ mA} + \frac{(20 \text{ mA} - 4 \text{ mA}) \cdot 0,42 \text{ °dH}}{0,9 \text{ °dH}} [\text{mA}]$$
$$I = 11,46 \text{ mA}$$

11.46 mA correspond to 0.42 °dH.

Operating status via analog current interface

The operating status of the device can be transmitted via the current interface terminals 11 and 12.

Programming: Menu > Settings > Outputs > Current loop Type

Choices:

- 0 - 20 mA Status
- 4 - 20 mA Status

Operating status	Current interface	
	0 - 20 mA Status	4 - 20 mA Status
Operation	3.5 mA	6.8 mA
Limit value undershot	7.5 mA	10.0 mA
Limit value exceeded	12.5 mA	13.6 mA
Reagent filling level < 10 %	16.5 mA	16.8 mA
Disruption	0 mA	4 mA



The specifications listed here may deviate by ± 0.3 mA.

Operation



Picture: SYCON 2802 analytical instrument with inserted reagent bottle

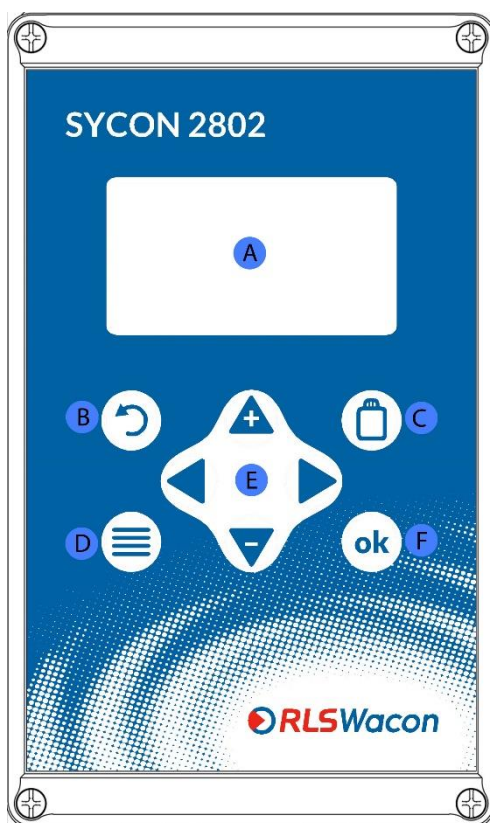
Position	Description
A	control
B	graphic display
C	control panel
D	cable bushing
E	On / Off switch
F	dosing pump
G	Metering plug (reagent plug)
H	Optical measuring section
I	Measuring chamber (The locking pins can only be pulled up and not out)
K	Agitator (magnetic stirrer)
L	drain plug
M	Actuator plug LED
N	inlet plug
O	Solenoid valve (concealed behind the reagent bottle)
P	wall bracket
Q	Reagent bottle 500 ml
R	Water inlet / sample water (plug-in connection for plastic hoses with 6 mm outer diameter)
S	Water drain (plug-in connection for plastic hoses with 6 mm outer diameter)

Operation

Display and Keyboard

The analyzer has a graphic display in which both the measured values and the menu for operation can be displayed. The background color of the display changes depending on the status of the device:

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



Picture: Structure of the front cover of the control unit

Settings can be made 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 options are available in the menu window:



Menu item	Description
Automatic	To activate and deactivate the automatic analysis operation.
Settings	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)
Wizard	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.

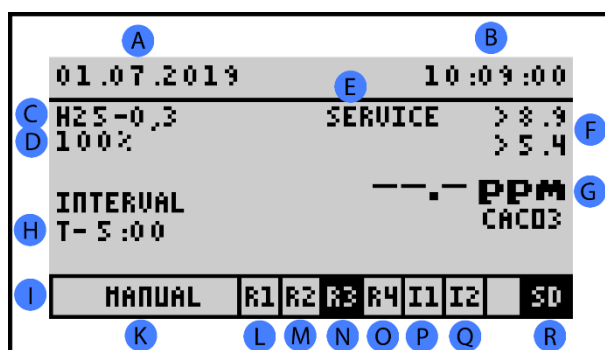
Menu languages

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 filling level in %
E	Device status (maintenance: maintenance counter expired, cleaning: optics dirty)
F	Set limit values
G	analytical result
H	Analysis step (T - 5:00 remaining time in minutes until next analysis)
I	status bar
K	Manual mode or automatic mode
L	Relay 1 de-energized
M	Relay 2 de-energized
N	Relay 3 energized (fields with black background are active)
O	Relay 4 de-energized
P	Digital input (IN 1) inactive
Q	Digital input (IN 2) inactive
R	SD card available



Simple start of analysis.
Press and hold the [OK] button for 3 seconds to start an analysis.



The analysis can be started in manual and automatic mode.

Operation

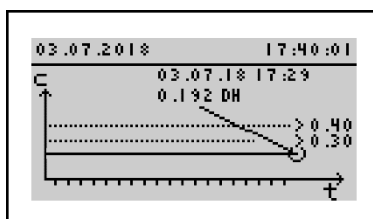
Display of measured value history (history)

In display mode, the arrow keys [◀] and [▶] can be used to read the last 100 measurements with date and time stamp. The set limit value is drawn as a dotted line in the course.



For the evaluation of the measured values on a PC, the file trend.csv is available on the SD card.

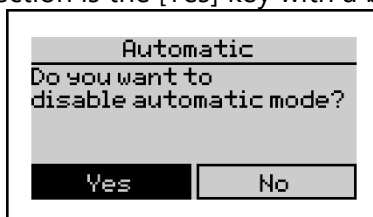
You can open the history using the Menu > History buttons. Press the [Back] key to return to the measured value display.



Display of selection menu

When selecting, use the [◀] and [▶] buttons to change the selection. 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 with a black background.

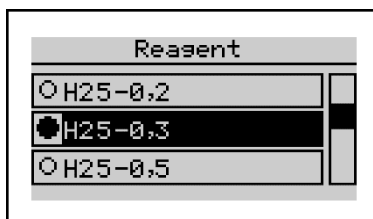


Display of selection list

In a selection list, you can use the [▲] and [▼] buttons to change the selection. 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 at the right edge of the display.

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

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



Operation

Display with value entry

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

You will see an input keyboard. 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 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.

You see the following information:

Current: currently set value
Minimum: smallest adjustable value
Maximum: largest adjustable value



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

In the example below, the flushing time can be set between 15 and 1800 seconds. The currently programmed flushing time is 120 seconds.

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

Flush time	
<input type="text" value="90"/>	s
CURRENTLY: 120	7 8 9
MINIMUM: 15	4 5 6
MAXIMUM: 1800	1 2 3
	0 OK

After you have entered a flushing time of 90 seconds, confirm with [OK] to overwrite 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
Analysis	reagent	H25-0,3
	Limit value 1	> 0.5 °dH
	Limit value 2	> 0.3 °dH
	flushing time	120 seconds
	Car. Interval Time	5 minutes
	Car. Interval Quantity	No
	Stop analysis	No
	control measurement	No repetition
	calibration factor	100 %
	Input Input 1	Start analysis
Inputs	Input Input 2	Off
	Current interfaces Type	4 ... 20 mA Value
Outputs	Current interface 20mA	0.9 °dH
	Relay 1	Limit value 1 as permanent contact
	Relay 2	Limit value 2 as permanent contact
	Relay 3	Reporting errors
	Relay 4	reagent alarm



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

Configuration

Configuration wizard

The configuration wizard is used for simplified initial commissioning. Menu-driven, the device guides you step by step through all the necessary settings. This also includes checking whether the device is functioning properly.



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

To start the wizard, select:

Programming: Menu > Wizard



The following steps are performed:

Automatic mode	If automatic mode is still active, it must be terminated now. Select [Yes] or [No] with the arrow keys [◀] and [▶] and confirm with [OK]. [Yes] Exits the automatic mode. [No] Return to measured value display
Language selection	Please choose your language. / Please select your language. Press the [OK] key. Selection of languages: German, English, Français, Italian, Espanyol, Russian Select the language with [▲] and [▼] and confirm with [OK].

Configuration

Wizard

Would you like to start the configuration wizard?



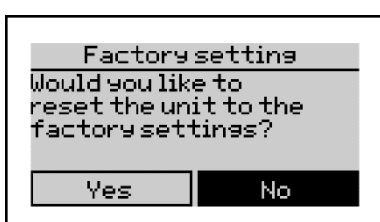
Select [Yes] or [No] with [◀] and [▶] and confirm with [OK].

[Yes] Starts the configuration wizard.

[No] Jumps back to the main menu.

Factory settings

Would you like to reset the device to the factory settings first?



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

[Yes] Resets the unit to the recommended factory settings.

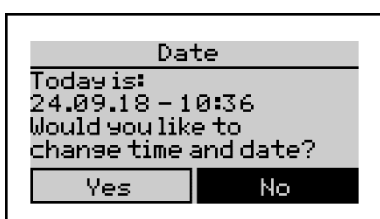
[No] The unit retains the settings programmed by the user.

See page 49 factory settings.

Date

It's today: XX.XX.XX - XX:XX

Would you like to set the date and time?

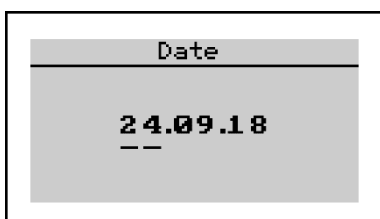


Select [Yes] or [No] with [◀] and [▶] and confirm with [OK].

[Yes] Set the date and time.

[No] The unit keeps the date and time unchanged.

Set date



Use the [▲] and [▼] arrow keys to increase or decrease the date.

Press the [OK] key to confirm and gradually change from day to month and year until the date is set.

Press the [OK] key.

Configuration

Setting the time

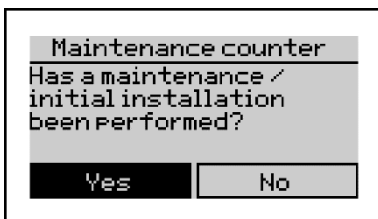


Use the [▲] and [▼] arrow keys to increase or decrease the hour.

Confirm the hour with the [OK] key and program the minutes in the second step. The seconds are set to 0 seconds at completion.

Press the [OK] key.

Maintenance counter



Is a maintenance/first installation carried out?

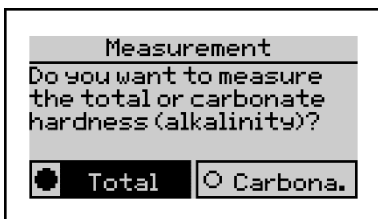
Select [Yes] or [No] with [◀] and [▶] and confirm with [OK].

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

(Read off in menu > Info)

[No] The device retains the previous data.

Parameter



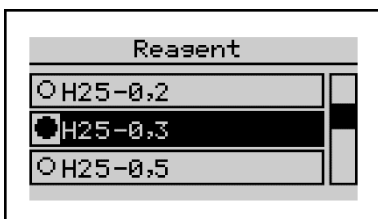
Would you like to measure the total hardness or carbonate hardness (alkalinity)?

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

[Total] The total or residual hardness is measured.

[Carbonate] The carbonate hardness is measured.

With selection Total hardness



Please select a total hardness reagent.

Use [▲] and [▼] to select the H25 reagent used for total hardness monitoring from the displayed list.

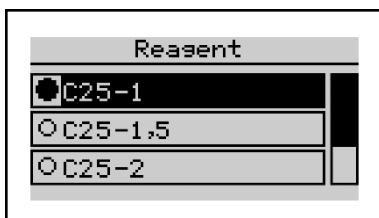
Please refer to the table on page 13 measuring ranges of the reagents.

After selection, press [OK] key.

Configuration

When selecting Carbonate hardness

Please select a carbonate hardness reagent.



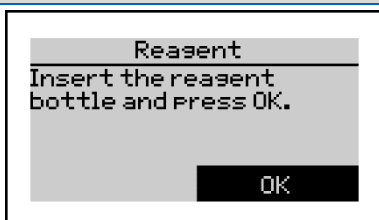
Use [▲] and [▼] to select the C25 reagent used for carbonate hardness monitoring from the list displayed.

Please refer to the table on page 13 measuring ranges of the reagents.

After selection, press [OK] key.

Reagent

Insert a new reagent bottle and press OK.



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

Reagent

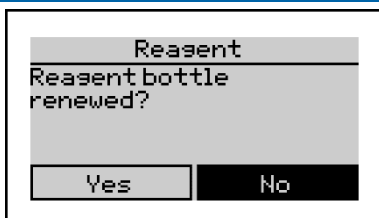
The reagent is pumped into the measuring chamber. The pumping process can be aborted with the [OK] key before the time has elapsed.



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

Reagent

Was a full reagent bottle used?



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

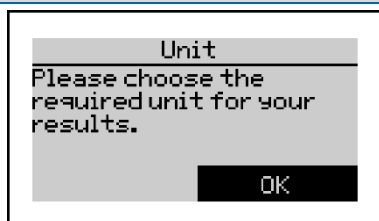
[Yes] The cylinder filling level is set to 100 %.

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

Configuration

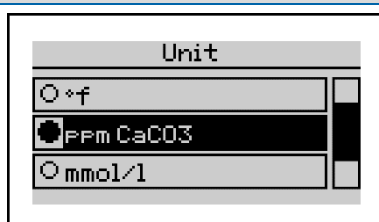
Unit

Select the displayed hardness unit.



Press the [OK] key.

Unit

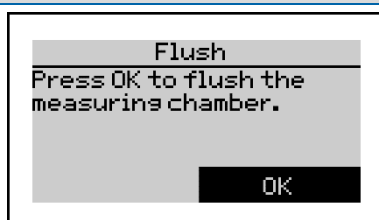


Use [▲] and [▼] to select the desired unit for the display and SD card measurement log from the list displayed.

After selection, press [OK] key.

Flushing

Press OK to flush the supply line and measuring chamber.



Press the [OK] key.

Flushing



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

The rinsing process is terminated with the [OK] key. The solenoid valve closes.



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

Configuration

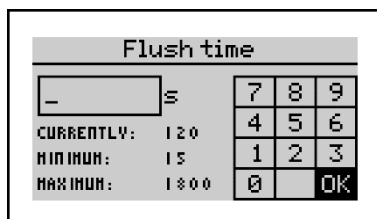
Flushing time

Set the rinsing time in the following mask.



Press the [OK] key.

Flushing time



You will see an input keyboard on the right.

Now 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 flushing time is within the frame.

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



You can see the following information on the left:

Current: currently programmed value

Minimum: smallest adjustable value

Maximum: largest adjustable value

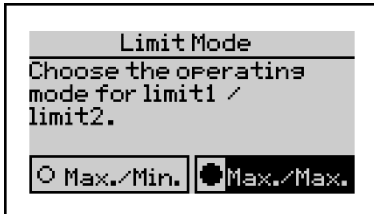


If the value at "Current" corresponds to your wish, then you do not need to enter the numbers again and can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Configuration

Limit mode

Select the mode for Limit 1 / Limit 2



In Max/Max mode, the measurement is evaluated as good if the measurement results in a value below the programmed limit values. This mode is used for softening plants. In Max/Min mode, the measurement is evaluated as good if the measurement result lies between limit value 1 and limit value 2. This mode is used for water intersection systems.

The value of limit value 2 must be lower than limit value 1.

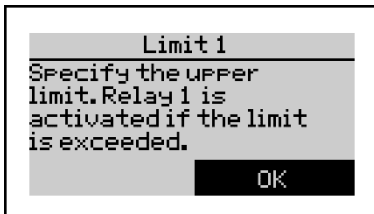
Press the [OK] key.

(Further information on page 40)

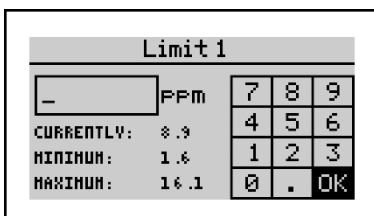
Limit value 1

Enter the upper limit value 1, when which relay 1 is to be switched if it is exceeded.

Press the [OK] key.



Limit value 1



You will see an input keyboard on the right.

Now 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 limit value is reached. Now move the cursor to the OK field in the keyboard and press the [OK] key.

You can see the following information on the left:

Current: currently programmed value

Minimum: smallest adjustable value

Maximum: largest adjustable value

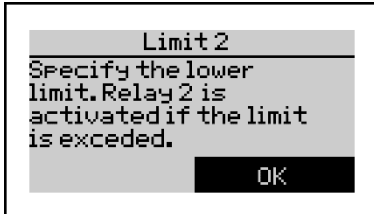
If the value at "Current" corresponds to your wish, then you don't need to enter the number again and can immediately move the cursor to the OK field in of the keyboard and confirm with the [OK] key.

Configuration

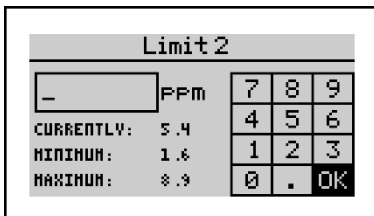
Limit value 2

Specify the lower limit value 2 which relay 2 is to be switched when the value exceeds or falls below.

Press the [OK] key.



Limit value 2



You will see an input keyboard on the right.

Now 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 limit value is reached. Now move the cursor to the OK field in the keyboard and press the [OK] key.



You can see the following information on the left:

Current: currently programmed value

Minimum: smallest adjustable value

Maximum: largest adjustable value

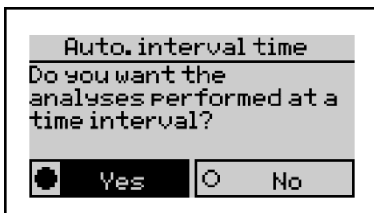


If the value at "Current" corresponds to your wish, then you do not need to enter the number again and can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Auto. Interval Time

Would you like the analyses to be carried out in a time interval?

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

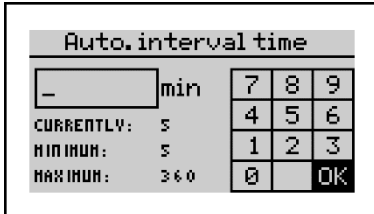


[Yes] Analyses are performed in an automatic time interval.

[No] Do not perform analyses in the automatic time interval.

Configuration

Auto. Interval Time



Set the Auto. Interval Time in which the analyses are to be performed.

You will see an input keyboard on the right.

Now 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 analysis interval time is displayed in the frame.

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



You can see the following information on the left:

Current: currently programmed value

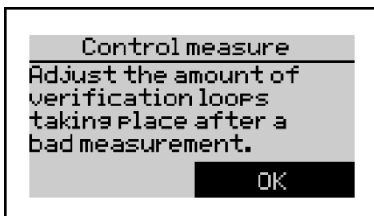
Minimum: smallest adjustable value

Maximum: largest adjustable value



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

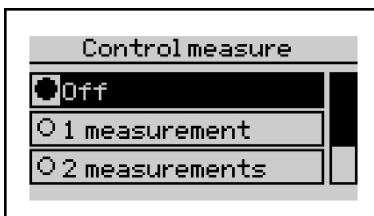
Control measurement



How often should a limit value exceedance be verified before reporting?

Press the [OK] key.

Control measurement



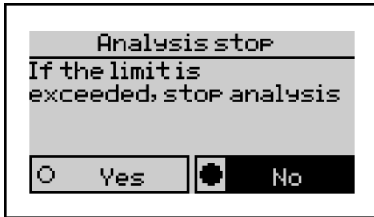
Use [▲] and [▼] to set the number of control measurements to be performed before reporting a limit exceedance. These are carried out every 3 minutes after a limit value has been exceeded in order to avoid false alarms due to the counterion effect of the softening plant.

Make your selection and confirm with [OK].

Configuration

Analysis stop

Auto. Stop interval after limit exceedance?



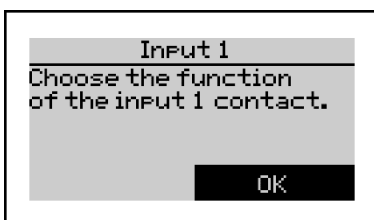
Select [Yes] or [No] with [◀] and [▶] and confirm with [OK].

[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 value has been exceeded.

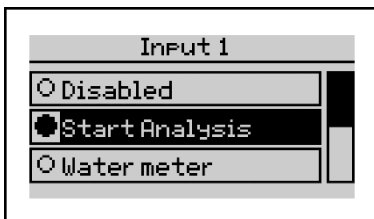
Input 1

Select the function of the input.



Press the [OK] key.

Input 1

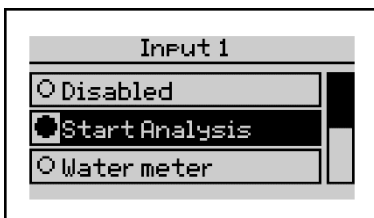


You have the following options at the entrance:

- Disabled
- Start analysis
- Water meter for quantity interval
- Flow switch for analyses during operating time
- Interval reset for softening switchover

Make your selection and confirm with [OK].

If Start analysis is selected



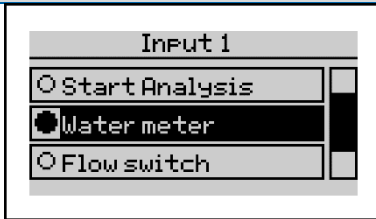
An analysis is started as soon as the "Start/Stop Input: Input contact" terminal 13 is bridged to terminal 14.

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

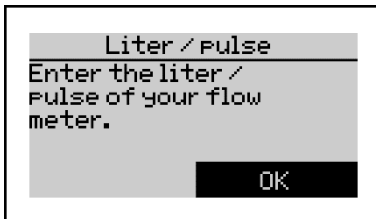
Configuration

If water meter is selected

Enter the liters/impulse of your water meter.



You will see an input keyboard on the right.
Now 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.



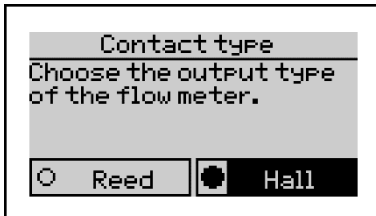
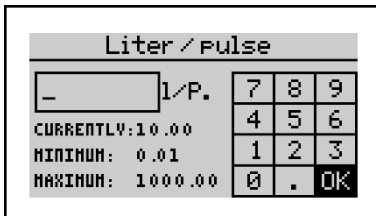
Now move the cursor to the OK field in the keyboard and press the [OK] key.

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



You can see the following information on the left:

Current: currently programmed value
Minimum: smallest adjustable value
Maximum: largest adjustable value

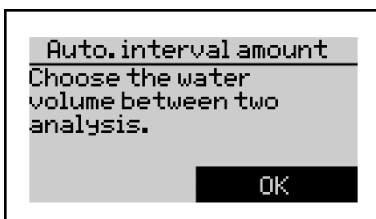


If the value at "Current" corresponds to your wish, then you do not need to enter the numbers again and can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Is the water meter a reed or hall contact type?

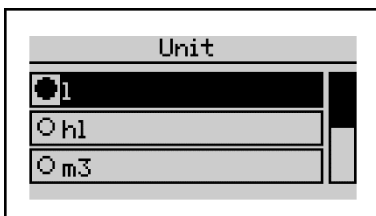
Reed for potential-free water meters
Hall for electronic water meters

Make your selection and confirm with [OK].



Set the amount of water after which an analysis is to take place.
Press the [OK] key.

Adjust the unit.



Configuration

Set the amount of water after which an analysis is to take place.



Auto.interval amount				
-	1	7	8	9
CURRENTLY: 100		4	5	6
MINIMUM: 1		1	2	3
MAXIMUM: 9999		0		OK

You can see the following information on the left:

Current: currently programmed value

Minimum: smallest adjustable value

Maximum: largest adjustable value



If the value at "Current" corresponds to your wish, then you do not need to enter the numbers again and can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

If flow switch is selected

Is the flow switch an NC or NO type?

Input 1	
<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: next analysis start waits for a closed input contact.

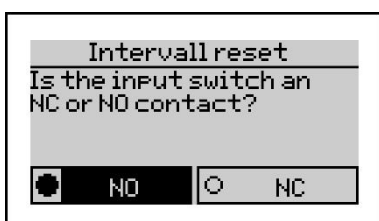
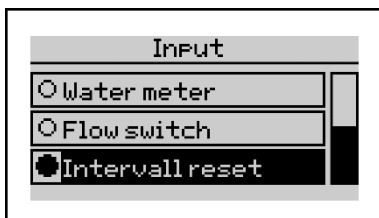
[NC] Analysis interval paused: next analysis start is waiting for an open input contact.

Make your selection and confirm with [OK].

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

Configuration

If Interval-Reset is selected



[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.

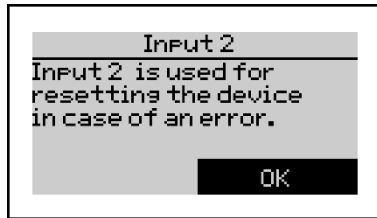
As soon as the input contact is opened/closed, the analysis interval starts. However, since no display value is shown on the display yet, the first analysis is performed after 1 min before the set analysis interval (e.g. 5 min) begins.

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

Configuration

Input 2

Input 2 (input 2) is used to reset the device in case of an error.

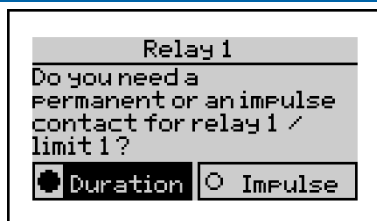


Input 2 can be used to reset the device in case of a device fault.

Confirm with [OK] key.

Relay 1

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



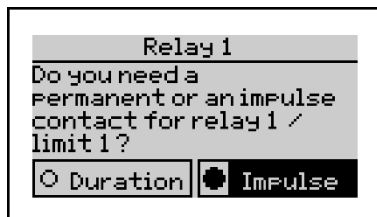
[Duration] or select [Impulse] and press the [OK] key.

[Duration] If the limit value is exceeded, the relay switches to continuous contact until an analysis is carried out that falls below the limit value 1.

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

If impulse contact is selected

Set the impulse duration for relay 1.



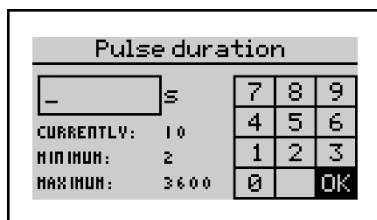
You will see an input keyboard on the right.

Now 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 impulse duration is within the frame.

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



You can see the following information on the left:

Current: currently programmed value

Minimum: smallest adjustable value

Maximum: largest adjustable value

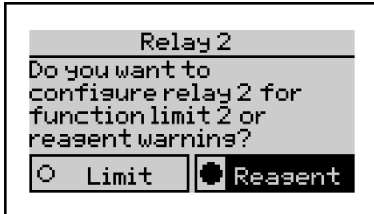


If the value at "Current" corresponds to your wish, then you do not need to enter the number again and can immediately move the cursor to the OK field in the keyboard and confirm with the [OK] key.

Configuration

Relay 2

Configure relay 2 for the function limit value 2 or reagent level <10%?

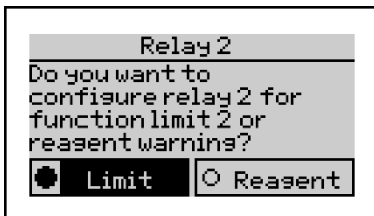


Select [Limit] or [Reagent] and press the [OK] key.

[Limit] The relay switches when the limit value is exceeded or not reached.
(For more information see page 40)

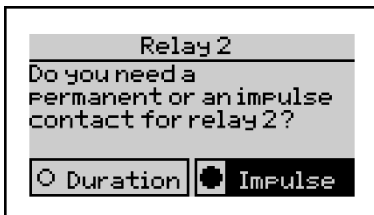
[Reagent] The relay switches when the reagent level falls below 10 % residual content.

If limit value 2 is selected



The relay switches when the limit value 2 is exceeded or not reached.

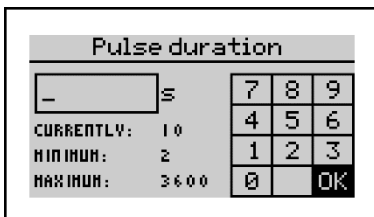
(For more information see page 40)



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

[Duration] The relay switches to continuous contact when the limit value is exceeded or not reached until an analysis is carried out that exceeds or not reaches the limit value.

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



You will see an input keyboard on the right.

Now 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 Impulse duration is within the frame.

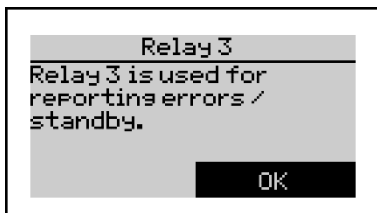
Now move the cursor to the OK field in the keyboard and press the [OK] key.

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

Configuration

Relay 3

Relay 3 is used to indicate a device error.



Relay 3 is used to indicate a device error and cannot perform any other functions.
Press the [OK] key.

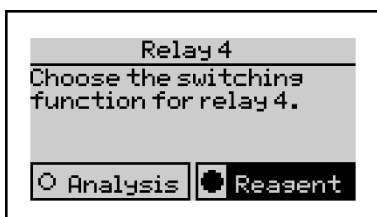


Relay 3 is always energized in normal operation, connection COM to NO (wire break safety).

If a device error occurs, relay 3 drops out and establishes the connection COM to NC.

Relay 4

Select the switching function for relay 4.



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

[Analysis]	The relay switches during analysis.
[Reagent]	The relay switches when the value falls below the Reagent filling level of 10% residual content.

Configuration

When selecting Analysis

Should I wait before opening the solenoid valve?

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

[Yes]

The start of the 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].

(See page 38 more information)

Current interfaces Type.

Select the operating mode of the current interface.

Press the [OK] key.

Current interfaces Type.

Use [▲] and [▼] to select the current interface type setting from the following options:

- Off
- 0 to 20 mA Value
- 4 to 20 mA Value
- 0 to 20 mA Status
- 4 to 20 mA Status

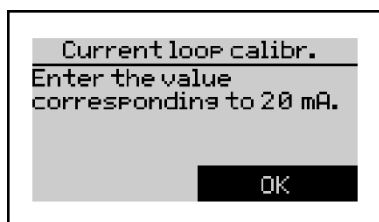
Make your selection and confirm with [OK].

(For status selection, see further information on page42.)

Configuration

Calibrate current interface if value is selected

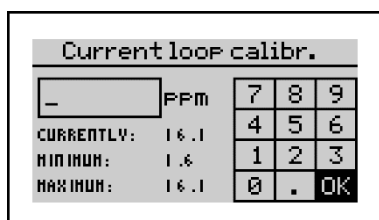
Enter the value corresponding to 20 mA.



Press the [OK] key.

Calibrating the current interface

Enter the value corresponding to 20 mA.



Here you can enter the measured value up to which the current interface is to be scaled.

We recommend to set the value for 20 mA to the end of the reagent measuring range, but it is also possible to select values below it. For more information, see page 41.

You will see an input keyboard on the right.

Now 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.



You can see the following information on the left:

Current: currently programmed value

Minimum: smallest adjustable value

Maximum: largest adjustable value



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

Configuration

Wizard

The configuration is complete. The wizard is closed.



Press the [OK] key.

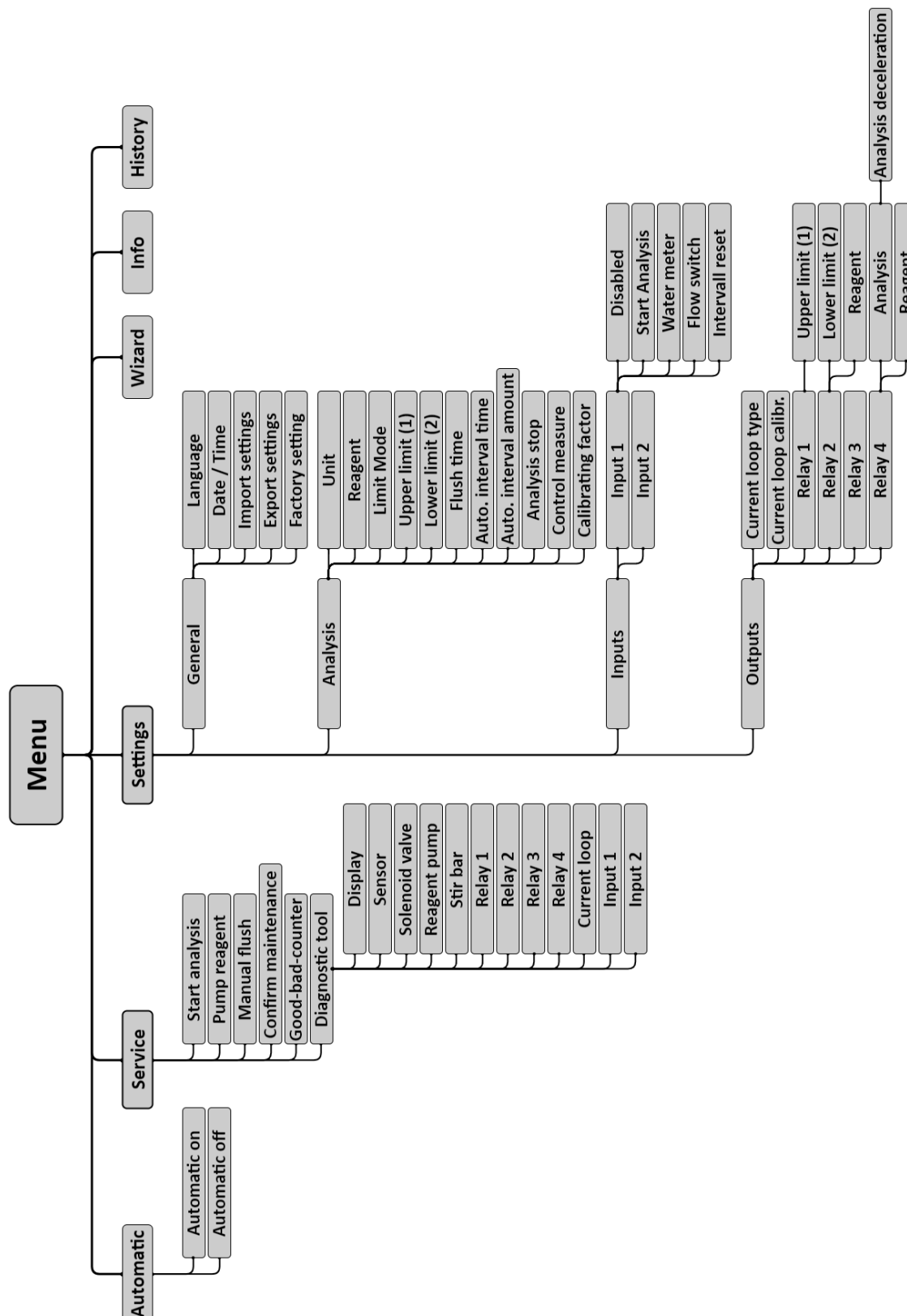
The device is now completely configured.

If required, individual settings can also be made without the Wizard.

Programming: Menu > Settings

Menu structure

In the following, the menu structure is listed as an overview to give you an overview of all the functions of the analyzer.



Mode

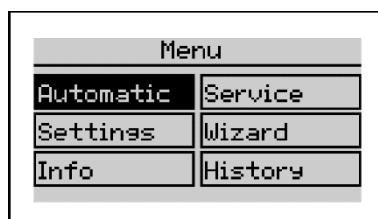
Manual and automatic mode

The analyzer can be started in automatic mode (Menu > Automatic) time-dependently or via an external button or flow switch. In manual mode (automatic off), functions such as starting the analysis, conveying the reagent or manually controlling flushing can be performed. Manual operation also includes a diagnostic function for testing individual device components.

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

Main menu

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



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 on the device and the measurement loop:

Sycon 2802	
HARDWARE VERSION	18.10.2018
SOFTWARE VERSION	13.11.2019
ANALYSIS COUNTER	0
MAINTENANCE COUNTER	30000
MAINTENANCE DATE	07.07.2021
GOOD MEASURES	0
BAD MEASURE COUNTER	0

Information	Description of the
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 cassette: is set to 30,000 analyses when the maintenance is confirmed in the service menu.
maintenance date	Expiration date of the Peristaltic pump cartridge used: is set to 2 years when the maintenance is confirmed in the service menu.
goods counter	Number of analyses without exceeding the limit value: can be reset in the service menu under the item good/bad counter.
bad counters	Number of analyses with limit value exceeded: can be reset in the service menu under the item Good/Bad counter.

Behavior in case 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 even after the unit has been switched on. If the instrument has been in automatic mode, the analysis instrument 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 be used to 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 further processed. The SD card also contains system files (.bin).

The analyzer is also fully functional without an SD card, but then only the last 100 measured values are stored 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 filling level from the SD card and therefore issues a message (bottle filling level below 10%).

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

Memory capacity:	max. 2,0 GB
File system:	FAT16
Size of the allocation files:	32 kB

Mode

The following files are stored on the card:

filename	type	content
trend.csv	data	Measured values in tabular form with date, time and measured value The data is stored in the following format: YYYY.MM.DD [Tab] hh.mm [Tab] x.xxx [Tab] Unit [LF] The measured values (x.xxx) are stored in the unit displayed on the instrument.
error.csv	data	Error messages in tabular form with time, date and error The data is stored in the following format: YYYY.MM.DD [Tab] hh.mm [Tab] Error code [LF].
history.dat	system	Analysis results with time stamp The device loads them into the internal memory at startup.
setting.dat	system	Complete instrument setting of the analyzer (optional file) Before replacing the analyzer, you can transfer the stored instrument configuration directly to the new instrument. The export can be found in the menu under Settings > General > Settings. Export. The device configuration is stored in the menu below: Settings > General > Settings Import.
logfile.dat	system	Date, time stamp and device start This file is required for internal purposes.
TA28xxx.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. For more information about installing a software update, see page 83. We recommend that you delete the file from the SD card after installing an update.

Maintenance and service

In order to ensure long and trouble-free operation of the analyzer, regular maintenance work must be carried out on the instrument. Make sure that the unit is switched off before maintenance. No analyses are performed during this time. Always wear protective goggles and gloves during maintenance to avoid contact with the reagent, cleaning fluid or other liquids.

The following maintenance intervals must be observed:

Interval	Maintenance and service
every 6 months	Cleaning the measuring chamber at high ambient and water temperatures or water with a high organic load, the cleaning intervals may have to be shortened.
all 30.000 analyses or after 24 months	Maintenance as after 6 months and Install maintenance set

Maintenance and service

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 Peristaltic pump cartridge from the bracket by unlocking it from the clips at the top and bottom.
- Loosen the connection to the reagent plug and to the 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 Agitator 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 87.



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

On the other hand, the black O-rings (3 x J and 1 x C) must be lubricated with technical Vaseline before being inserted into the measuring chamber.

- Pull up the locking pins Insert the reagent plug and lock it.
- Push the cleaned measuring chamber onto the retaining bolts and lock.
- Insert the Agitator 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).

Maintenance and service

- Connect the Peristaltic pump cartridge to the reagent plug and to the reagent bottle.
- Place the Peristaltic pump cartridge on the bracket so that it clicks into place.
- 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).

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 device is ready for operation again.

Maintenance and service

Inserting the "Maintenance set for Sycon 2802".

The Peristaltic pump cartridge, hoses and seals must be replaced at regular intervals. The required replacement parts are included in the "Maintenance set for SYCON 2802". See page 89.

Maintenance takes about 25 minutes.

Proceed as follows:

- Switch off the device.
- Pull the Peristaltic pump cartridge from the bracket by unlocking it from the clips at the top and bottom.
- Loosen the connection to the reagent plug and to the reagent bottle.
- Replace the bottle connector, the suction lance and the Peristaltic pump cartridge.
- 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 Agitator blade
- Use a flat-tip screwdriver to lever the reagent plug upwards. (When levering 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 picture Spare parts on page 87.
- 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 87.

Maintenance and service



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

On the other hand, the black O-rings (4 x J and 1 x C) must be lubricated with technical Vaseline before being inserted into the measuring chamber.

- 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.
- Push the cleaned measuring chamber onto the retaining bolts and lock.
- Insert the Agitator 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 Peristaltic pump cartridge to the reagent plug and to the reagent bottle.
- Place the Peristaltic pump cartridge on the bracket so that it clicks into place.
- 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).

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).
- Reset the maintenance counter to 24 months / 30,000 analyses
(Programming: Menu > Service > Confirm maintenance).

The device is ready for operation again.

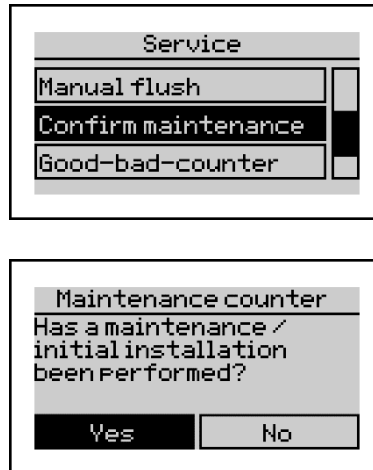
Maintenance and service

Reset maintenance counter

After a maintenance with inserted "Maintenance set for SYCON 2702" the maintenance counter in the 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].

[Yes] The maintenance counter is set to 30,000 analyses and the maintenance date to 24 months.
(Read off in 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. Only use reagents whose shelf life has not yet expired.



Always use reagent bottles containing 500 ml.

Proceed as follows:

- Switch off the device.
- To change the reagent bottle, loosen the screw cap on the bottle and insert the new reagent bottle. Absorb dripping 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 bubble-free. Then press the [OK] button to stop bleeding the reagent line.

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) to clean the measuring chamber.
- Test the analysis process by starting an analysis. To do this, press and hold the [OK] key for 3 seconds in the measured value display.

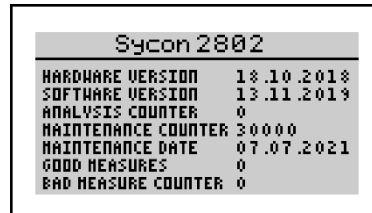
The device is ready for operation again.

Maintenance and service

Good and bad counter

The analysis results are counted with the good and bad counter. They are displayed on the Info screen.

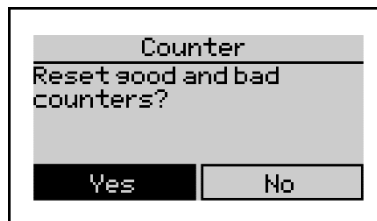
Programming: Menu > Info



Sycon 2802	
HARDWARE VERSION	18.10.2018
SOFTWARE VERSION	13.11.2019
ANALYSIS COUNTER	0
MAINTENANCE COUNTER	30000
MAINTENANCE DATE	07.07.2021
GOOD MEASURES	0
BAD MEASURE COUNTER	0

If the limit value is exceeded, the bad counter is increased and if the limit value is not reached, the good counter is increased. This counter can be used to evaluate the function of a softening plant. The number of bad measurements should be significantly smaller than the number of good measurements. The counters can be reset in the menu.

Programming: Menu > Service > Good-bad counter



Maintenance and service

Calibrating the device

The device is calibrated in the factory at a room temperature of 20 °C. The temperature of the device is set by the manufacturer. When operating in very hot or cold places, we recommend that you calibrate the unit during commissioning.

To calibrate the instrument, proceed as follows:

- Perform an analysis with the instrument. The water hardness of the sample must lie within the measuring range of the reagent used. A measured value such as < 0.012 °dH cannot be used.
- Analyze the water in the laboratory in parallel.
- Calculate the correction factor for the analyzer using the following formula:

$$\text{Correctionfactor} = \frac{\text{Measured}_{\text{Laboratory}}}{\text{Measured}_{\text{Analyser}}} \cdot 100 \%$$

- Set the correction factor in the device under the specified path.
(Programming: Menu > Settings > Analysis > Calibration factor)

Example calculation:

Measured value laboratory = 0.55°dH

Display value from the SYCON display = 0.61°dH

$$\text{Correctionfactor} = \frac{0,55 \text{ °dH}}{0,61 \text{ °dH}} \cdot 100 \%$$

$$\text{Correctionfactor} = 90,1 \%$$

90.1% rounded => *Correction factor* = 90%

The input is made only with whole numbers, therefore round off/round up and enter the correction factor into the input mask on the instrument.

Maintenance and service

Changing the battery

If the device does not display the time after it has been switched off and on again, the internal buffer battery must be replaced. The battery used ex works has a service life of several years. When the clock is switched on, it is powered by the power supply unit. Therefore, the battery life is longer if the unit is not turned off.

Proceed as follows:

- Switch off the device and disconnect the power supply.
- Open the control unit housing with the 4 screws. On the inside you can see the battery holder.
- Replace the battery with a new CR2032.
- Close the control unit again. Make sure that the connecting cable between the display board and the controller has not come loose.
- Dispose of the battery at a battery collection point.

Software update

The analyzer offers the possibility of a software update. As part of the product improvement, you will receive software updates via your dealer or via our website. Should this be necessary, your dealer will send you a file with the name TA28xxx.bin.

To perform a software update, proceed as follows:

- Switch off the device and disconnect the power supply.
- Open the control housing with the 4 screws and remove the SD card.
- Copy the file TA28xxx.bin to the SD card using a computer and insert it again.
- Close the control unit again. Make sure that the connecting cable between the display board and the controller has not come loose.
- Press and hold the [OK] button and turn on the power. As soon as the display shows Software Update, release the [OK] button. The device updates the software.
- Switch off the device, remove the SD card, and delete the file TA28xxx.bin from the SD card.
- Insert the SD card back into the unit.
- Check the device configuration of the device.

Diagnostic functions

Pay attention to any connected controllers and peripherals.
Observe the applicable safety regulations.

To do this, call the following program function:
Programming: Menu > Service > Diagnostic tool

Display

The display changes color between red, green and blue.
Press [OK] key to exit.

Sensor

The LED in the measuring chamber is switched on and off. In the case of a defective color sensor, an error message appears. If the LED in the measuring chamber does not light up, check the electrical connection of the LED on the actuator plug and in the device. If the plugs are properly seated, the actuator must be replaced. During the test, intensity bars for red, green and blue are displayed. Press [OK] key to exit.

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 using the [OK] key. If this is not the case, please check the electrical connection of the solenoid valve in the device. If the plugs are seated properly, measure the voltage between the connections on the valve when the valve is "open". This should be 24 VDC. If this is the case, a fault in the electronics must be ruled out and the solenoid valve 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, the proper operation of the sample cooler must be checked in advance in order to rule out any danger from hot steam or hot water.

Reagent pump

When the reagent pump is started, the Peristaltic pump cartridge is driven for 2 seconds. The rotation of the rollers in the Peristaltic pump cartridge is visible and the rotation of the motor can be heard. If this is not the case, check the four-pole connection of the motor on the circuit board. If only the noise is audible, the Peristaltic pump cartridge is defective. In the other case an error of the motor or the control 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.

Diagnostic functions

Agitator blade

The Agitator blade in the measuring chamber is controlled and slowly increases its speed up to the maximum. If the agitator blade does not rotate, check that the connector of the drive motor is correctly seated on the control board (red connector).

Remove the measuring chamber and check that the drive disk (which has two silver magnets) in the agitator does not rub against the motor housing.

If none of these causes can be determined, the drive motor must be replaced.

Press [OK] key to exit.

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

Relay 1 to 4

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

Use a continuity tester to check the contact between the COM and NC as well as COM and NO connections. If the switching operations cannot be measured, the control board must be replaced.

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

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

Current interface

A current meter is required to test the current interface. Measurements are taken between terminals 11 (+) and 12 (-).

The output current is shown in the display as $I = xx \text{ mA}$. The same value should also be measured at the two terminals. Tolerance $\pm 0.3 \text{ mA}$. Please note the accuracy of your current meter.

By pressing the [OK] key, the output current is increased by 2 mA each until the maximum value of 20 mA is reached.

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

Input 1 and 2

To test the inputs, you need a wire or multimeter set for continuity testing.

If no jumper is set between terminals 13 (28) and 14 (29), the display shows "open".

If a bridge is set between terminals 13 (28) and 14 (29), the display shows "closed".

(If you want to connect the bridge with a multimeter, the COM connection of the multimeter must be connected to terminal 13 (28) and the volt connection of the multimeter to terminal 14 (29).

Otherwise, the multimeter will not bridge the gap.

Press [OK] key to exit.

The positioning of the inputs can be found on page 28.

The diagnostic mode is terminated.

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.
- 0mA is output at the current output if the type "Value" is set at the current interface.

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.
- 0mA is output at the current output if the type "Value" is set at the current interface.

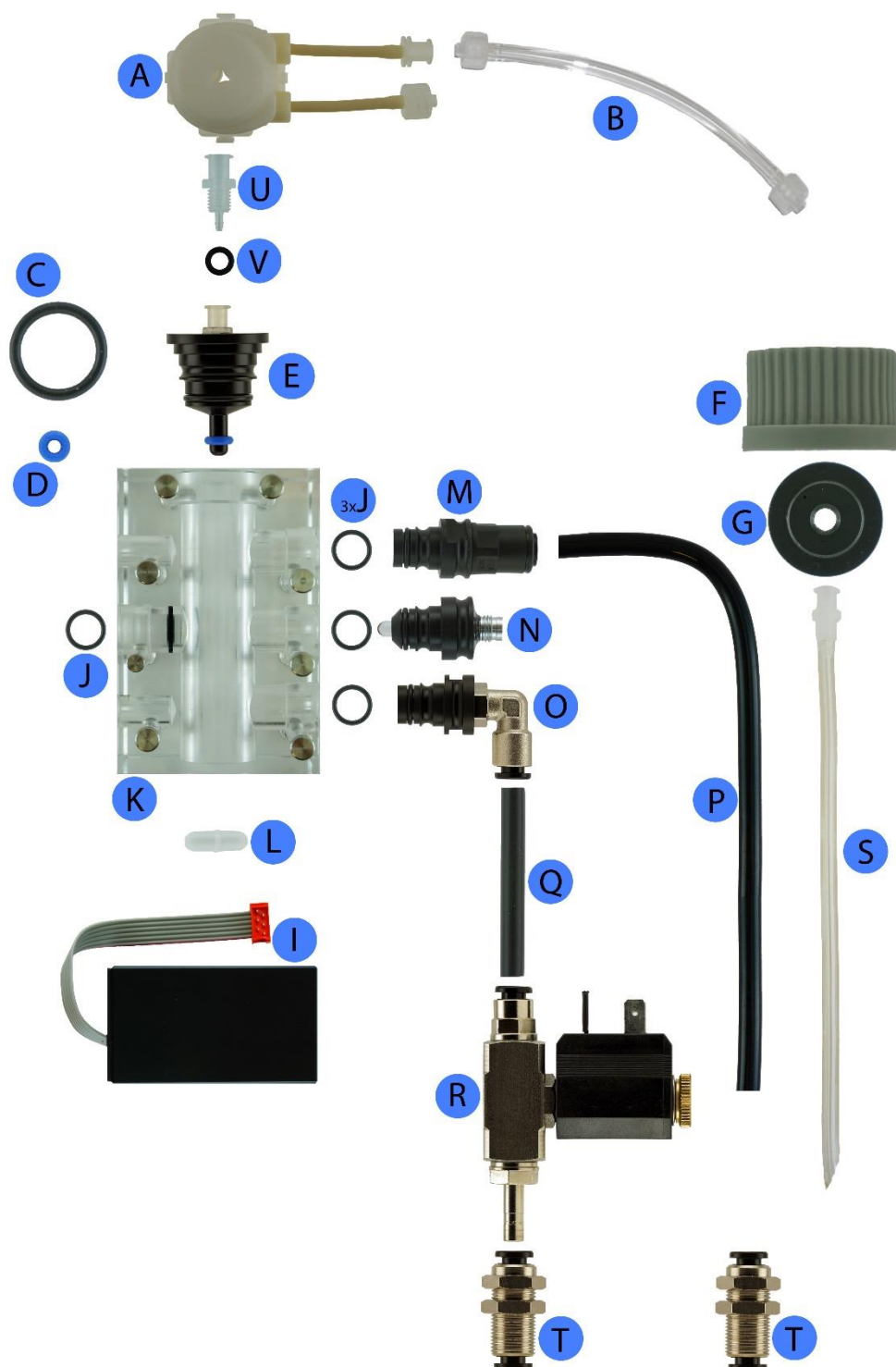
Error message E13 Optics

- 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.
- 0mA is output at the current output if the type "Value" is set at the current interface.

Error message E14 Titration

- 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 the inlet and outlet are connected the right way round.
- Check whether the programmed type of indicator corresponds to the type of indicator used.
- Check that the water outlet is free and that no foreign bodies have settled in the solenoid valve.
- Check the function of the dosing pump.
- Check the dosing plug and indicator tubes for foreign bodies.
- Check whether the blue O-ring on the dosing plug is present and correctly seated.
- 0mA is output at the current output if the type "Value" is set at the current interface.

Spare parts



Annex

Position	Article name	Article no.
A	Complete Peristaltic pump cartridge	33-030 614
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	Reagent plug incl. position U, V, C, D	33-090 716
F	bottle cap	33-093 060
G	Bottle adapter SYCON	33-090 009
I	agitator	33-090 056
J	O-ring 9 x 1.5	33-090 210
K	Measuring chamber pre-assembled	33-090 731
L	Agitator blade	33-090 002
M	Drain plug 6 mm incl. O-ring	33-090 712
N	Actuator plug (LED) incl. O-ring	33-090 713
O	Inlet plug with angle connection incl. O-ring	33-090 156
P	Drain hose 200 mm long ø 6 x 4 mm	33-090 124
Q	Supply hose 50 mm long ø 6 x 4 mm	33-090 112
R	Solenoid valve SYCON 24 V	33-090 157
S	suction lance	33-090 011
T	Schott connector straight	33-090 116
V	O-ring 5,28 x 1,78	33-090 215
U	Luer connection	33-090 414

Spare parts without illustration

Article name	Article no.
Measuring chamber incl. position E, M, N, O, L	33-190 700
Display board	33-033 607
Mainboard SYCON 2802 230 VAC	33-030 649
Mainboard SYCON 2802 24 V AC/DC	33-030 657
Peristaltic pump cartridge with motor complete, SYCON 2802	33-030 625
Connecting cable solenoid valve SYCON series	33-090 079
Connecting cable Actuator	33-090 074
Maintenance set SYCON 2802 incl. position A, B, C, D, S, 4 x J, L	33-090 034
Cleaning set SYCON CLEAN (Please refer to the chapter Spare Parts > Maintenance Sets for the contents of the set)	30-010 900
Cleaner FIT 3000 (1000 ml) for cleaning measuring chambers	32-089 100

Maintenance sets

The SYCON 2802 is largely maintenance-free. A maintenance set is available for the analyzer. It is recommended to change the peristaltic pump cassette, tubing and O-rings after 30,000 analyses or 24 months. At the end of the maintenance interval, the device displays a maintenance message on the display. The maintenance counter must be reset or acknowledged after maintenance has been carried out.

In addition, it is recommended to clean the measuring chamber regularly, but at least every 6 months. For this purpose the cleaning set SYCON Clean is offered. 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". from page 74.

Article name	Article no.
Maintenance set for SYCON 2802	33-090 034
Contains 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 33-030 614 Peristaltic pump cartridge • 1 x 33-090 002 Agitator blade 	
Cleaning set SYCON Clean	30-010 900
Cleaning set for measuring chambers, contains the following articles:	
<ul style="list-style-type: none"> • 10 pairs of XL gloves • 1 x funnel made of PP • 1 x Cleaner FIT 3000 (1000 ml) • 1 x pipette brush • 1 x test tube brush • 1 x container with lid 	
Measuring chamber cleaner FIT 3000 (1000 ml)	32-089 100



Annex

Accessories

Article name	Article no.
Pressure regulator with wall bracket	33-090 734
<p>Contains the following articles:</p> <ul style="list-style-type: none">• Pressure regulator with wall bracket• 2 x hose connection outer diameter 6 mm <p>Technical data:</p> <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
<p>Contains the following articles:</p> <ul style="list-style-type: none">• Reducing nipple Stainless steel 1.4408 V4A 1/2 inch to 1/4 inch (conical male thread)• Socket ball valve stainless steel 1.4408 V4A with 1/4 inch (cylindrical female thread)• Straight screw-in fitting, nickel-plated brass. 1/4 in. (cylindrical male thread with sealing ring), hose connection Outer diameter 6 mm• 5 meter plastic hose outer diameter 6 mm	
sample cooler	



+ 5 meter plastic hose outer diameter 6 mm

The maximum inlet temperature of the sample water is 40°C. If the sample water has a higher temperature, a preliminary cooler should be used. Depending on the temperature of the water and the cooling water, ballast coolers are offered for flow cooling.

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

Notes

Notes

Notes

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 2802
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 <i>Low Voltage Directive</i>
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
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Safety reliably produced.





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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