

aqua inform

limit analyser



on-line water hardness monitor

INTRODUCTION

We appreciate your purchase of the on-line water hardness Limit Analyser based on Sycon 2500 series.

The on-line water hardness Limit Analyser is part of a water treatment plant. Distribution of this manual is intended for the manufacturer and the owner of this plant.

This user's manual covers instructions for the use of your Limit Analyser. Please read through this manual and understand the contents before using the system.

We also recommend that the manual be kept nearby for reference when operating the Limit Analyser system.

Operate the system only in accordance with the instructions given in this manual.

Under no circumstances whatsoever will we be liable for damages arising from the user's failure to follow the instructions given in this manual.

- Some details of the instructions contained in this manual may be different from the actual system purchased. The instructions are also subject to change without prior notice.



WARNING

The Limit Analyser system on basis of Sycon 2500 series is a hardness leakage monitoring system that monitors the total and residual hardness of water and issues a hardness leakage alarm.

It is not a system that remedies hardness leakage itself.

LIMIT ANALYSER H
ON-LINE WATER HARDNESS ANALYSER

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CONVERSION TABLE OF
CONVENTIONAL WATER HARDNESS UNITS

LIMIT ANALYSER H ON-LINE WATER HARDNESS ANALYSER



With limit Analyser, WACON offers a very compact and easily operated water analyser for automatic on-line detection of hardness leakages and quality control of water softeners. The system controls selectable limit values according to the colorimetric principle. A broad range of functions (incl. BOB) guarantee reliable field-operation. Units will be supplied in standard as well as tailor-made housings.

Application:
→ Detection of Hardness Leakages
→ Limit monitoring

- Analysis START

a) manually
pushing START – button

b) automatically
in programmable intervals 5, 10, 20 or 30 minutes
→ via remote input signal (flow- or level-control switch)
automatic starts can be switched on/off
- Analysis Cycle

→ Programmable rinsing phase 30 sec – 10 min.
→ Zero compensation without indicator injection (Self calibration)
→ Dosed injection of indicator via peristaltic pump and stirring of water sample
→ Monitoring and evaluation according to the colorimetric method
→ LED status indication of evaluation result
→ Rinsing and cleaning of mixing chamber / solenoid valve stops flow of sample water
- Retry Cycle

→ Control monitoring 4 min. after first detection of hardness leakage
- digital Input

Potential free switch
e.g. for connecting timer or flow monitor
-> no analysis if break-contact is open
- digital Outputs

• 2 x potential free Relays

→ REL 1
Limit value alarm (Permanent or Impulse)
→ REL 2 Failure

• lack of Indicator (BOB-operation)
• fouling or electronic failure
• lack of water(pressure) or incomplete reagent injection
- Reset-Functions

→ RELAY 1

• Quit “Limit value alarm”

→ RELAY 2

• Quit „Failure“ „Alarm“
• Quit “Indicator refilled”
• Interruption/Stop of Analysis
- Dimension

W: 300mm
H: 300mm
D: 190mm
Weight ca. 2 kg
- Power Supply

85 – 264 V 47-63 Hz , Protection Category IP 54
- Indicator à 500 ml

• Consumption app. 0.10 ml/Analysis (5000 each bottle)

• shelf life 24 month
- Maintenance Interval

app. 2-3 times a year cleaning of mixing chamber
Once a year exchange of wearing parts

• Annual-Service-Set

| | | | | | | | | | | |
|--|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Order Numbers | SYCON 2500 30-010120 | | | | | | | | | |
| | Standard Housing 33-099005 | | | | | | | | | |
| Limit Value-Indicator Residual Hardness °dH H25 | 1 mg/l | 2 mg/l | 4 mg/l | 6 mg/l | 10 mg/l | 20 mg/l | 40 mg/l | 60 mg/l | 100 mg/l | 200 mg/l |
| | 0,05 | 0,1 | 0,2 | 0,3 | 0,5 | 1 | 2 | 3 | 5 | 10 |
| Order Number | 32-084125 | 32-084135 | 32-084145 | 32-084155 | 32-084165 | 32-084175 | 32-084185 | 32-084195 | 32-084205 | 32-084215 |
| Carbonate Hardness °dH C25 | 1 | 1,5 | 2 | 3 | | | | | | |
| | 32-086125 | 32-086135 | 32-086145 | 32-086155 | | | | | | |
| Order Number | | | | | | | | | | |

CHAPTER 1 SAFETY WARNINGS / PRECAUTIONS

This Chapter explains the danger and precautionary signs and notes that apply to the handling, installation, wiring and maintenance of the SYCON 2500 series Limit Analyser.



This manual describes the installation and operation of the on-line water-hardness analyser of type Limit Analyser H based on SYCON 2500 series. Installation and taking into operation must be performed only by authorized personnel.

Operate the system only in accordance with the instructions given in this manual: In particular, the system has to be protected against humidity and moisture. Avoid direct contact with splash or condenser water. The device may only be used for the specified purpose. When installing and operating the equipment, the relevant standards (e.g. EN, DIN, VDE, UVV) and applicable national regulations must be complied with.

The analyser is used only to determine a total or residual hardness or carbonate hardness in the process water. Proper operation can only be guaranteed with the manufacturer's recommended indicators and spare parts.

Changes to the electrical connections and the programming should only be performed by an authorized specialist.

If connecting cables for the sensors are necessary they should be kept as short as possible and not run together with power cables. The vicinity of strong electromagnetic emitters may lead to deviations of evaluation and measurement results. In such cases, appropriate measures must be taken to suppress interferences. EMC-directives are especially applicable.

When working with this manual, it is recommended to have access to the operational instrument to understand the functions described immediately. Read the chapters in the order given.

If you have questions regarding the operation of the instrument, or when problems occur, please contact us or one of our distributors. Try to locate problems as accurately as possible. Also describe what actions you have taken, which conditions lead to the problem. We can help you better and more focused.

Safty instructions and symbols used

In this manual you will find specific safety instructions to indicate the unavoidable residual risks when operating the unit. These residual risks imply dangers to

- People
- Product / Plant / Machinery
- Environment

The symbols used in the instructions should draw attention in particular to the safety instructions!

The main objective of the safety precautions is to prevent personal injury. The symbol used in each case can not replace the text of a safety warning. Therefore, the text must always be read completely



DANGER

This symbol indicates a potential danger to persons.

- mortal danger
- risk of injury

- A safety notice with warning triangle DANGER points out that risks to plant, machinery, materials, environment and people are not excluded



WARNING

This symbol indicates a potential danger to product, plant and machinery

- A safety notice with warning triangle WARNING points out that risks to plant, machinery, materials and/or environment are not excluded. Danger to persons are not necessarily to be expected



PRESSURE

This symbol points to hydraulic and pneumatic systems and indicates pressurised systems.



ELECTRICITY

This symbol points to electric and electronic systems and indicates electrical systems.



NOTE

This symbol indicates no safety information, but information to better understand the plant or machine processes

Work on hydraulic and pneumatic equipment



PRESSURE



WARNING

- Maintenance and repair of hydraulic and pneumatic equipment shall be carried out by specially trained personnel !
- Before all maintenance and repair work, the pneumatic and hydraulic equipment of the system / machine must be depressurised !
- Hose pipes in preventive maintenance should be changed regularly, even if there is no visible damage (Please note the information provided by the manufacturer)
- Before starting up after maintenance or repair work:
 - Check the screw connections for a tight fit.
 - Ensure that the container lid, screens or filters are reinstalled in the correct order.
- After completion of the maintenance and repair services, and before the resumption of production, make sure that...
 - ...all the materials, tools and other equipment required for the execution of maintenance or repair work are removed from the work area!
 - ...any leaked fluids were removed !
 - ...all safety devices of the system work properly again !

Transport

Use appropriate equipment to transport the system to prevent damage during transport.



NOTE

- Transport equipment carefully and do not throw !
- Choose a cool and dry storage location.
- Pay attention to the permitted ambient temperatures !
- Check the entire delivery immediately upon receipt for completeness and shipping damage
- Devices are packed in a transport-safe packaging. Nevertheless, it can lead to damage in transit. Please tell the transport company and the manufacturer in writing IMMEDIATELY - no later than eight days after receiving the goods - of the details of the damage. In this case, you must keep the instrument and the packaging for inspection for the further processing of the complaint.

**NOTE**

Storage

We recommend storing equipment not longer than a year, because you lose the warranty. Store equipment under following conditions.

- Cool and dry location / ambient temperature between -5 and 45 °C

Scope of Delivery

Scope includes the following modules:

- Equipment in accordance with the delivery of the ordered form
- Operating Manual

Check that all parts were delivered.

Obvious damage and / or missing components must be reported in writing within 8 days of receipt of goods. After that, no complaints will be accepted

**NOTE**

Installation

The installation of the device includes the following:

- Install the system in accordance with the following sequence. So you save time and avoid damaging the plant, which can lead to malfunction.

- Mounting of the device:
 - Place device in a dry, easily accessible and conspicuous place.
 - Drill holes in the wall according to template (typically, these are four holes) and tighten the device by means of screws (usually four screws).

- Connect the initiators (eg level sensor)
- Connecting the actuators (for example pumps, valves)
- Connect the power supply
Make sure the correct input voltage

for example : 230 VAC or 115 VAC or 24 VAC

For correct supply voltage, refer to the nameplate of the unit

- Program the device (setting of parameters and conditions).
 - Note the information in the manual

**WARNING**

CHAPTER 2 SPECIFICATION

The Limit Analyser is used for the automatic monitoring of hardness in water. We recommend that the user read this chapter before installation of the device for safety operation.

2.1 General specification

| | |
|-------------------------------|--|
| Power-supply | 85 ... 264 V AC 47... 63Hz |
| Power consumption | 25 VA (on operation) |
| Protection Class | IP 54 |
| Ambient operating temperature | 5°C ... 45°C |
| Raw water temperature | 5°C ... 40°C |
| Humidity | 20%RH ... 90%RH (without ice or dew condensation) |
| Feed water pressure | app. 0.5...5 bar (1...2 bar recommended) |
| Feed water condition | clear, colourless, free of suspended solids, no gas bubbles pH 4 ~ 10.5, Iron < 3 ppm, Copper < 0.2 ppm, Aluminium < 0.1 ppm, Manganese < 0.2 ppm Acid Capacity K _{S4.3} < 5mmol/l |

→ Physical data

| | |
|---------------------|--|
| Installation method | indoor wall mount |
| External dimensions | without enclosure: 280[W] × 250[L] × 140[D] mm with enclosure 300[W] × 300[L] × 190[D] mm |
| Mass | app. 2.0 kg |

→ Monitoring capabilities

| | |
|--|--|
| Evaluation method | via the colorimetric method |
| Limit value alarm is defined by the indicator used | Total Hardness Limit-Value-Indicators: 0.05 °dH , 0.10 °dH , 0.20 °dH , 0.30 °dH , 0.50 °dH , 1 °dH , 2 °dH , 3 °dH , 5 °dH , 10 °dH |
| → bottles volume 500 ml | Carbonate Hardness Limit-Value-Indicators: 1 °dH , 2 °dH , 3 °dH , 5 °dH |
| Indicator consumption | < 0.10 ml / monitoring |
| Remote alarm output | 2 x Relay |
| Indicator exchange output | 250 V AC / V DC 4A potential free outputs NC/NO |
| Remote signal input | No voltage contact input (Contact A or Contact B) |
| Drainage | Approx. 1000ml / monitor → Drainage volume may vary depending on feed water pressure and flush time |

→ Water feed & drain

| | |
|--------------------------------------|---|
| Feed-water connection diameter | For connecting 1/4" (6mm) external dia. pipe |
| Drain-water connection diameter | For connecting 1/4" (6mm) external dia. pipe |
| → atmospheric pressure / open funnel | → Inlet and outlet tubes are not attached to the device. Please use specified tubes. Using tubes other than specified tubes may cause leakage. → Please contact our distributors. |

Order numbers for device and indicator

device

| | |
|-----------------------|-----------|
| SYCON 2500 | 30-010120 |
| Option Housing | 33-099005 |

limit value indicator

total hardness
order number

HG

| 0,05 °dH | 0,1 °dH | 0,2 °dH | 0,3 °dH | 0,5 °dH | 1 °dH | 2 °dH | 3 °dH | 5 °dH | 10 °dH |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 32-084125 | 32-084135 | 32-084145 | 32-084155 | 32-084165 | 32-084175 | 32-084185 | 32-084195 | 32-084205 | 32-084215 |

carbonate hardness
order number

HC

| 1 °dH | 1,5 °dH | 2 °dH | 3 °dH |
|-----------|-----------|-----------|-----------|
| 32-082125 | 32-082135 | 32-082145 | 32-082155 |

→ for convert units for water hardness used please refer to table in page 50

**NOT**

The System works with one-set-indicators for different limit values. Shelf-life of indicators are 2 years if properly stored (→ not opened → cool →dark). After opening, bottles should be used within twelve months.

Sample waters with temperatures over 45°C must be chilled down before analysis !

**WARNING**

colour reaction in mixing chamber

| type of indicator | sample evaluated as GOOD condition limit not exceeded | sample evaluated as BAD condition limit exceeded |
|--------------------|--|--|
| | | |
| total hardness | Green | red |
| carbonate hardness | yellow | violet |
| plus M-value | orange | blue |

→ **accessories**



SYCON CLEAN order no. 30-010 900

Cleaning set for acryl glass mixing chambers

- 1000 ml cleaning solution FIT 3000
- 5 pairs of gloves
- 2 brushes, funnel, container
- manual

FIT 3000 order no. 32-089 100

Cleaning solution for acryl glass mixing chambers

- 1000 ml cleaning solution FIT 3000

→ **sample cooler**



PC 200 order no. 30-015 100

PC 400 order no. 32-015 200

For details please refer to our home page

www.wacon.eu

FIG. 2.1

2.2 Overview – limit analyser – configuration

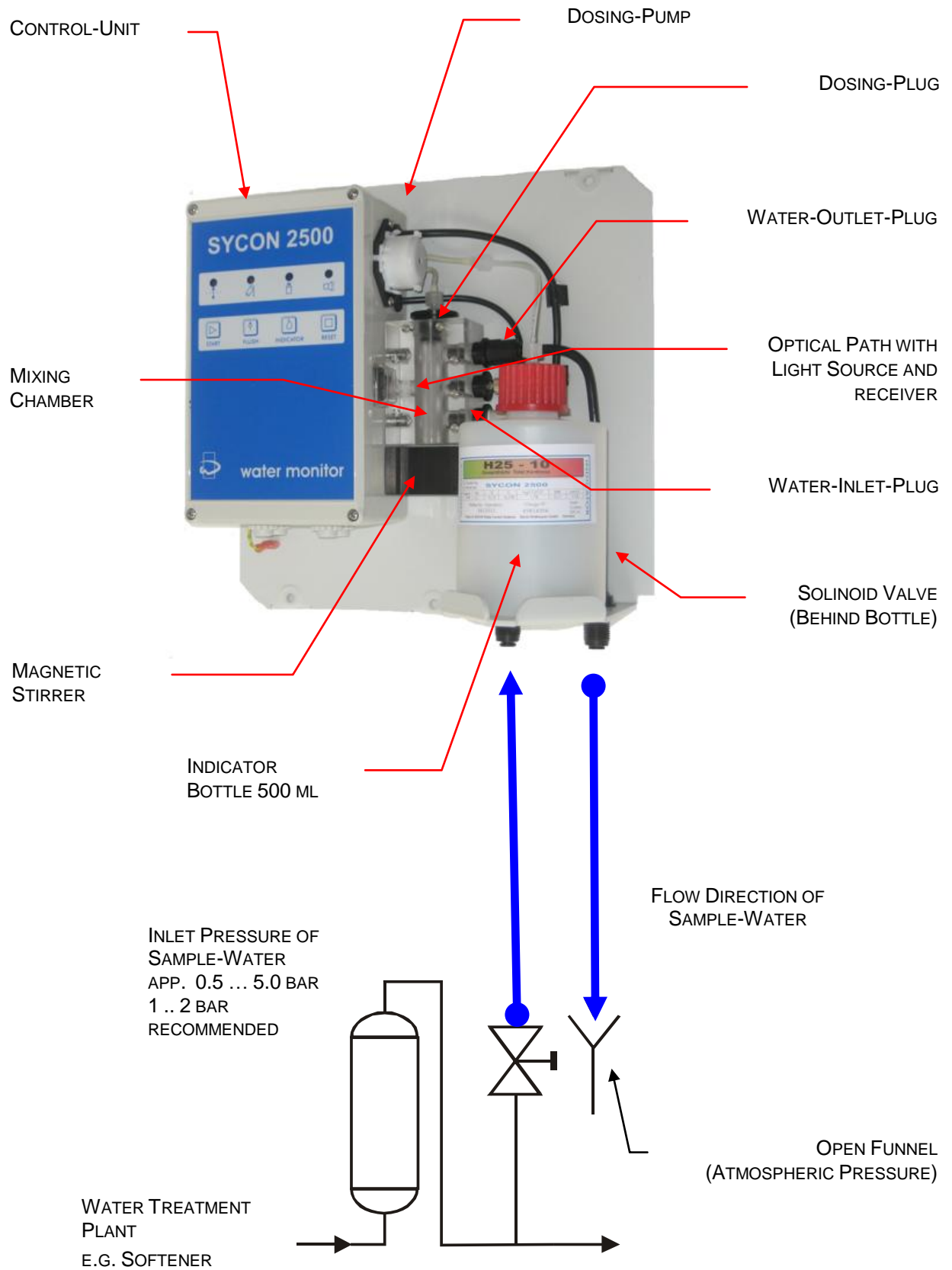
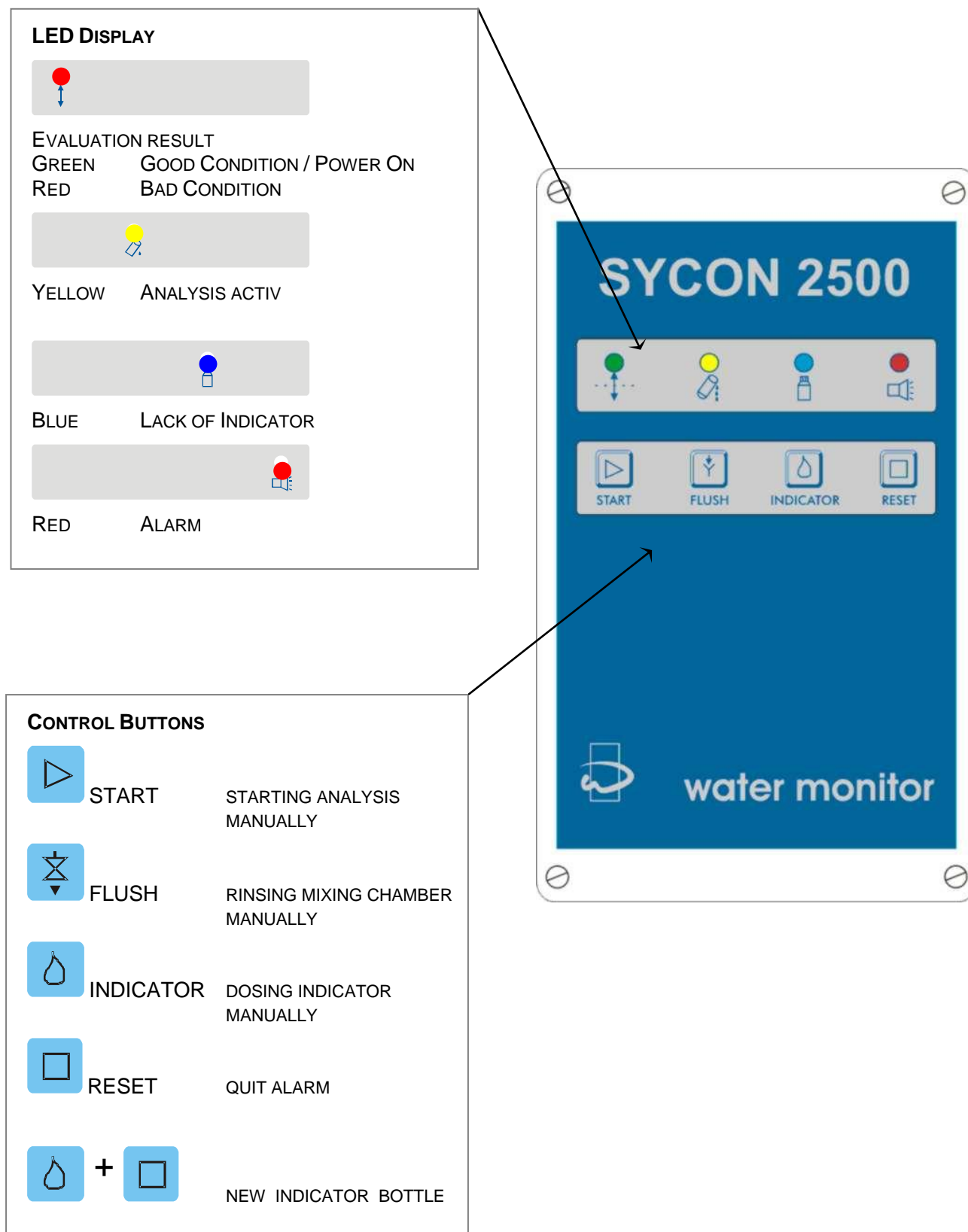


FIG. 2.2**2.3 LIMIT ANALYSER – DISPLAY-CONFIGURATION**

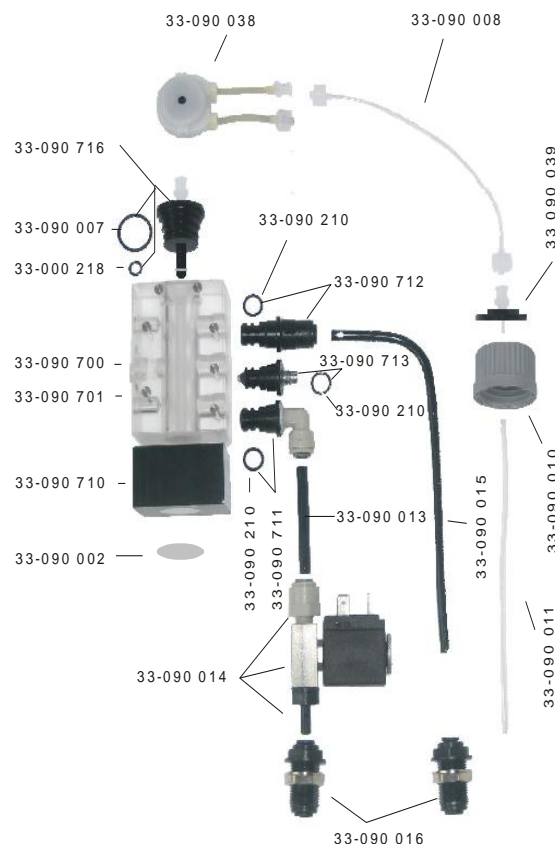
SPAR-PART-LIST

| order no. | description |
|------------|---|
| 33-090 002 | magnetic stirrer |
| 33-090 007 | O-Ring 17x2 |
| 33-090 008 | bottle connection |
| 33-090 010 | bottle cap |
| 33-090 011 | suction lance |
| 33-090 013 | inlet connection ¼" |
| 33-090 014 | solenoid valve 24V complete. |
| 33-090 015 | outlet connection 6mm |
| 33-090 016 | bulkhead fitting 6mm |
| 33-090 038 | cartridge of peristaltic pump |
| 33-090 039 | bottle adapter |
| 33-090 210 | O-Ring 9 x 1,5 |
| 33-090 218 | O-Ring 3,2 x 2,5 |
| 33-090 700 | measuring chamber complete 33-090002, 33-090701, 33-090711, 33-090712, 33-090713, 33-090716 |
| 33-090 701 | measuring chamber |
| 33-090 710 | actuator of magnetic stirrer |
| 33-090 711 | inlet plug ¼" |
| 33-090 712 | outlet plug ¼" |
| 33-090 713 | aktor (LED) |
| 33-090 716 | dosing plug |

SPARE-PARTS NOT PICTURED

| | |
|------------|--|
| 33-090 020 | connecting cable solenoid valve |
| 33-090 021 | connecting cable aktor (LED) |
| 33-090 022 | display circuit board cpl. |
| 33-090 023 | power supply circuit board 85-264 V cpl. |
| 33-090 024 | main circuit board complete |
| 33-090 025 | control unit complete 85-264 Volt |
| 33-090 026 | peristaltic pump complete |
| 33-090 027 | housing for control unit with lid |

ILLUSTRATION 2.3

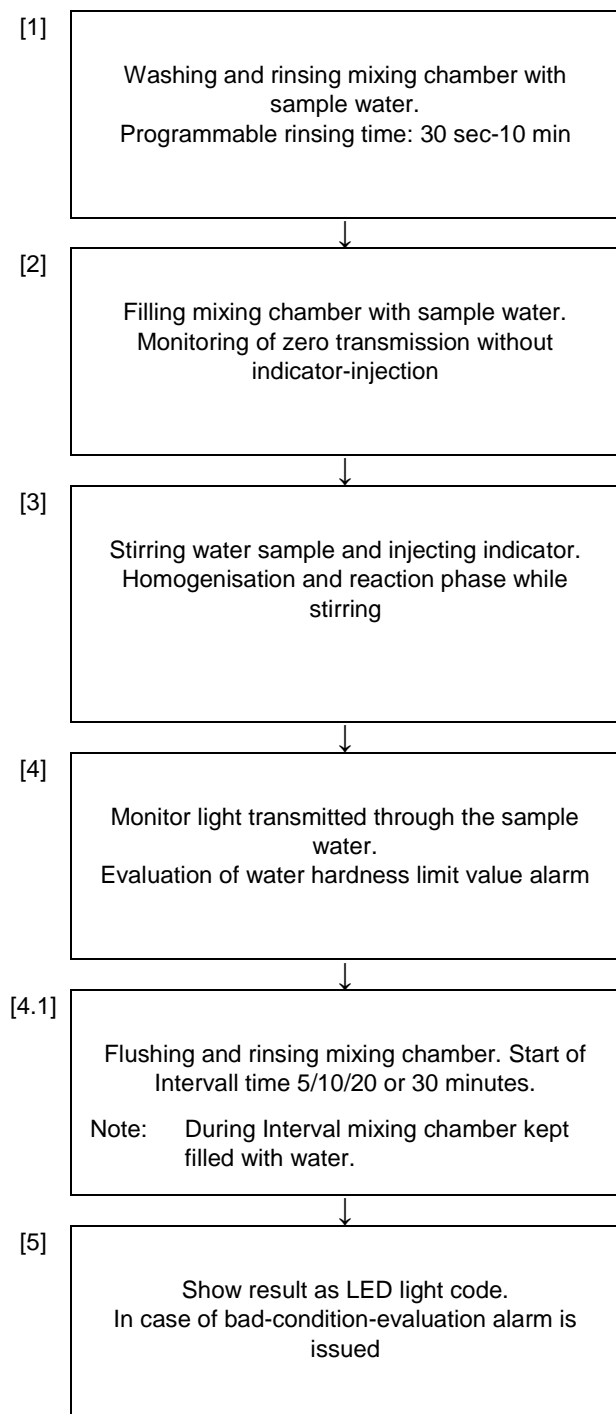


| 33-090 001 | MAINTENANCE – Kit 1 |
|---------------|-------------------------------|
| 1x 33-090 038 | cartridge of peristaltic pump |
| 1x 33-090 218 | dosing-O-ring 3,2 x 2,5 |

| 33-090 028 | MAINTENANCE – Kit 2 |
|---------------|-------------------------------|
| 1x 33-090 038 | cartridge of peristaltic pump |
| 1x 33-090 008 | bottle connector |
| 1x 33-090 011 | suction lance |
| 1x 33-090 007 | O-ring 17 x 2 |
| 3x 33-090 210 | O-ring 9x1,5 |
| 1x 33-090 218 | dosing-O-ring 3,2 x 2,5 |

| 33-090 029 | MAINTENANCE – Kit 3 FOR TWO-YEAR-OPERATION |
|---------------|---|
| 1x 33-090 710 | actuator for magnetic stirrer |
| 1x 33-090 014 | solenoid valve 24V cpl. |
| 1x 33-090 700 | measuring chamber cpl. |
| 1x 33-090 026 | peristaltic pump cpl. |

2-5 Operation principle of Sycon 2500



monitoring can start..

A automatically in 4 programmable intervals: 5 / 10 / 20 / 30 minutes

B manually by pushing the Start-button



START

A monitoring cycle of Sycon 2500 follows 5 steps

The solenoid valve opens, washing and rinsing the mixing chamber with sample water. Old sample water remaining in the container is pushed out, and the container is washed at the same time. Rinsing time is programmable between 30 seconds and 10 minutes and should be set in relation to length of sample pipeline. Recommended values 1-2 min. (→ page 30)

The mixing chamber is filled with water sample to be analysed. The solenoid valve closes. The light source is activated to project light into the sample water without indicator injection to define a zero transmission and absorption respectively. In case of turbidity detection in certain ranges of absorption the device gives alarm.

The injection pump injects a defined amount of indicator into the sample water. The stirrer coil, activated at the same time, homogenises the mélange of water and indicator. The indicator causes coloration of the sample water in accordance with the hardness components of the water. Indicators are calibrated to change colour at certain limit values. For a list of available indicators please refer to page 12 or 27.

Light receptors electronically monitor the light transmitted through the sample water. The absorption characteristic of transmitted light in water changes if the water sample changes its colour (for example from green to red) caused by a colour-reaction of indicator with ions in water (e.g. calcium and magnesium). After monitoring the mixing chamber is flushed.

The monitoring results in a BAD or GOOD-condition evaluation. The status is displayed as LED code (→ page 12).

- Connecting an external no-voltage-contact-switch or a timer may allow limit analyser monitoring only while water softener is turned on or is suspend monitoring while the water softener is in regeneration.

The purpose of remote signal is to prevent a monitoring while the water softener is regenerating or the feed water is stopped (→ page 26).

2.6 Functions

The SYCON 2500 system has the following features:

- [1] Monitors hardness leakage automatically in accordance to limit value indicator used.
The monitoring process is fully automated, saving a significant amount of work by eliminating the need for complicated manual procedures.
- [2] Requires no periodic calibration
The system needs no cumbersome periodic calibrations.
- [3] Interval for each monitoring may be set in 4 programmable intervals: 5 / 10 / 20 / 30 minutes
- [4] Reliable detection of hardness leakages by use of limit value Indicators

| | | | | | | | | |
|----------|----------|----------|----------|----------|--------|--------|---------|---------|
| 1mg/L | 2mg/L | 4mg/L | 6mg/L | 10mg/L | 20mg/L | 40mg/L | 100mg/L | 200mg/L |
| 0.05 °dH | 0.10 °dH | 0.20 °dH | 0.30 °dH | 0.50 °dH | 1 °dH | 2 °dH | 5 °dH | 10 °dH |

- [5] Evaluates hardness leakage at higher accuracy
When a BAD-condition is detected, monitoring may be repeated with a delaytime of 4 minutes
- [6] LED status display is independent on language areas
- [7] Offers an alarm function
When it is evaluated that there is a hardness leakage, an alarm is issued by switching a potential free relay. This remote alarm output may be used to send an alarm remotely or sounds a buzzer for example.
- [8] Offers a diagnostic-program. If a problem occurs in the system an alarm is issued by switching a potential free relay. Technicians may run step by step through the diagnostic program to check functions or find faulty parts in the device (→ page 44).
- [9] Requires minimal maintenance
Depending on measurement intervals and frequencies respectively the measuring chamber has to be cleaned up and indicator hose pipes have to be changed app. twice a year (→ page 38).
- [10] Minimal indicator consumption
The indicator bottle may be replaced easily. The 500 ml bottle needs no replacement for approximately three to four months in typical applications. (Note that more frequent replacement may be necessary, depending on the application.)
- [11] Compact in design, easy to install
The main unit is installed easily on a wall.
Installation is a simple process (→ page 19).
Wacon provides the most compact designed devices of this type.

- [12] Remote signal input function
 Connection the remote non-voltage signal for example from a flow- or level-control-device or from regenerating water softener prevents a false detection that can occur, for instance, while the water softener is regenerating or no water flows, thus providing more accurate evaluation (→ page 26).

Two Remote alarm outputs REL 1 / REL 2

Two potential free Relais alarm contact outputs may be used to transmit hardness-leakage-alarm (REL 1) and mechanical-error- or mal-functions to a remote location (→ page 25).

[12] **BOB-operation**

The abbreviation **BOB** comes from the German Betrieb ohne Beobachtung (unattended operation) and follows a regulation of German TÜV (technical inspection authority) especially for boiler houses, which requires reliability of instruments at least for next 72 hours.

The REL 2 output may be used to transmit to a remote location when an indicator storage needs to be replaced.

Analytical devices of type SYCON 2500 specially were designed for BOB-operation (unattended operation). Boiler houses, running in BOB-operation, require a qualitative monitoring of water hardness in boiler feed water according to the technical guideline TRD 604 ('Technische Regeln für Dampfkessel' published by German TÜV).

Analytical devices of type SYCON 2500 record the consumption of indicator in order to ensure that in periods of unattended operation a sufficient amount of indicator for reliable running of measurements is available in bottle.

The sufficient amount of indicator should be calculated independent of set analysis intervals for a next 72-hour operation.

If a very next 72-hour BOB-operation is no more reliably guaranteed an alarm "lack of indicator" is issued via relay REL 2.



WARNING

The indicator stocks can only be calculated correctly if the internal counter is reset after installing a new 500 ml reagent bottle by pressing the RESET key combination.



NEW INDIKATOR BOTTLE



NOTE

- The device does not recognize the contents of the bottle, but resets the counter of the metering pump, which then counts back starting from 500 ml. You can reset the counter to zero only. If the keys pressed on the fly, without a new, full bottle indicator is used, the indicator stocks may not be properly calculated, and the alarm is not issued on time or is wrong.

CHAPTER 3

INSTALLATION AND COMMISSIONING OF LIMIT ANALYSER



WARNIN

3.1 Installation Requirements

The analyser shall be used only to determine a parameter in the process water.

A proper operation can only be guaranteed by use of indicators which were tested and recommended by the manufacturer(→ page 12 or 27).

Changes to the electrical connections and the programming should be carried out only by an authorized specialist.

The controlled system must meet the following conditions:

- The maximum allowable load capacity of the switching outputs and the overall performance of the system must not be exceeded by the connected load (note phase angle for inductive loads).
- All inductive loads (valves, motors, contactors, transformers) of the plant must be equipped with suitable suppressors (e.g. RC element, varistor, diode, etc.)
- If the analyser could be influenced by external devices with high electromagnetic interference levels, these effects should be reduced by appropriate measures. On the supply voltage input of the offending equipment appropriate external interference suppression (line filter) have to be fitted.

3.2 Instruction for Installation

During the assembly of printed circuit boards, the following guidelines must be followed:



NOTE

- Upon actuation of the clamping lever, only apply the force required.

Screwless terminals are capable to receive one- and finely-stranded conductors (without core pods) to 0.5 mm² (in sensor and analog output terminals) or 2.5 mm² (all other terminals). Using wire sleeves according to the manufacturer is not require (only in case of screwless terminals)

- Observe all applicable electrical installation work rules.
- Work on electrical equipment of the plant / machinery must be performed by a qualified electrician!



ELECTRICITY

3.3 Installation in 4 steps

The analyser can be mounted with or without protective housing. The manufacturer offers a standard housing; the mounting and dimensions are described in this guide:



NOTE

Custom-built or tailor made enclosures for the devices of the series aqua inform LimitAnalyser / aqua inform TrendAnalyser / SYCON 2500 / SYCON 2800 and SYCON 3000 as well as devices with custom names and labels that are technically based on these ranges are not described in detail in this manual.

► **step I a mounting without enclosure**

Using 4 screws (max. 6 mm) to mount the unit on a wall or suitable support structure. Hole spacing see page 24

or ► **step I b mounting with enclosure**

Using the included 4 brackets to mount the unit (→ page 24). The tabs can be rotated by 45 degrees or 90 degrees outside. Alternatively, the unit can be mounted without the brackets from the rear on a plate (M6). For hole spacing see page 24



NOTE

In both variants, avoid direct sunlight and strong artificial light sources
→ disturbance of the optical path in the measuring chamber
→ electromagnetic interferences by artificial light source

Do not install under dripping pipes.

► **step II establish sample and drain pipe line**

Use flexible hose pipe 6x4. Between water treatment plant and analyser a manual shutoff valve and particle filter (if necessary) should be installed. Drainage should be lead via short connection into an open funnel → runoff to atmospheric pressure.



WARNING

Make sure that you connect the inlet and outlet properly
→ Figure 2.1 in page 13

► **step III electrical connections**

refer to information in figure 3.1 (terminal connection (→ page 21) and figure 3.2 (connection instructions (→ page 22).



ELECTRICITY

Work on electrical equipment of the plant / machinery must be performed by a qualified electrician! Observe all applicable electrical installation work rules

→ applicable supply voltage 85 ... 264 V AC 47 ... 63Hz

Fig. 3.1 terminal layout and internal connections

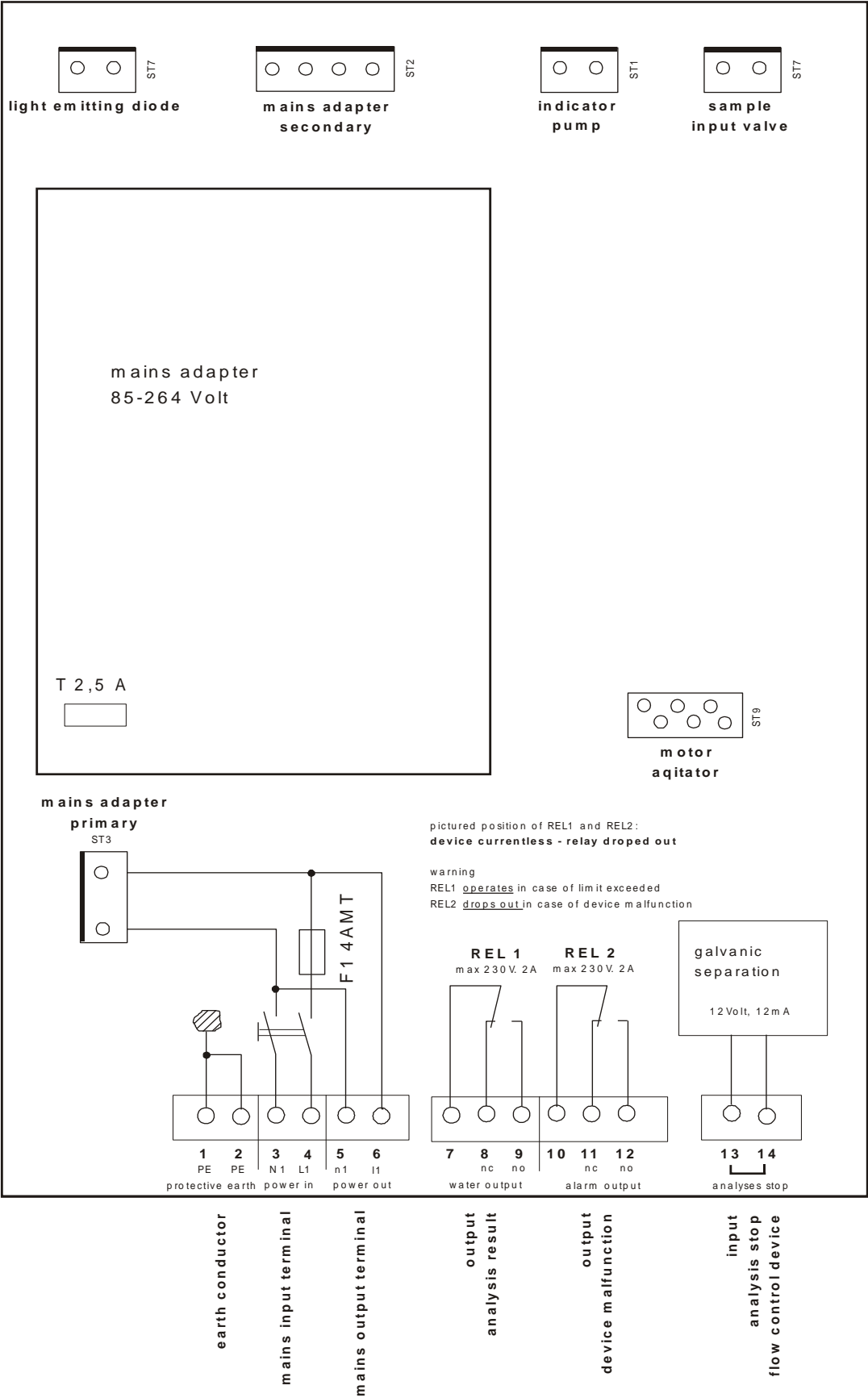
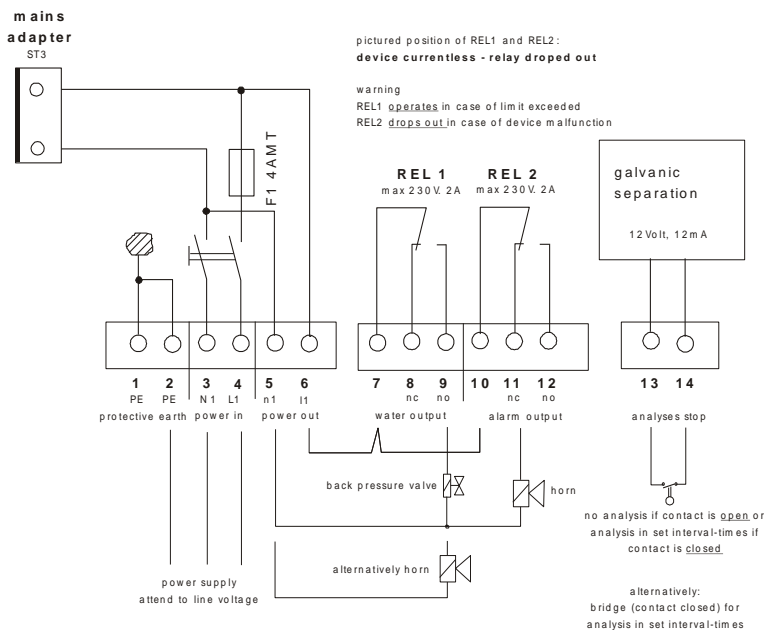
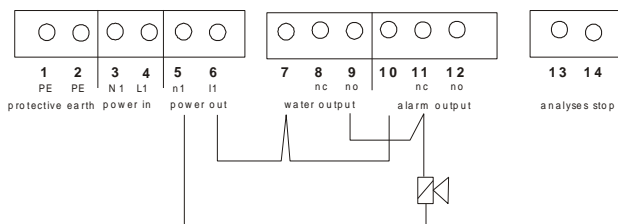
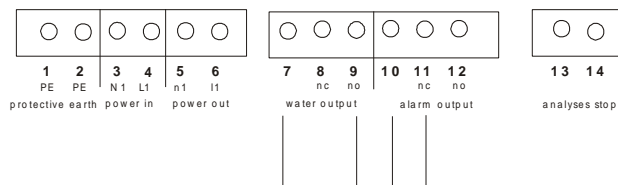


Fig 3.2 connection instructions

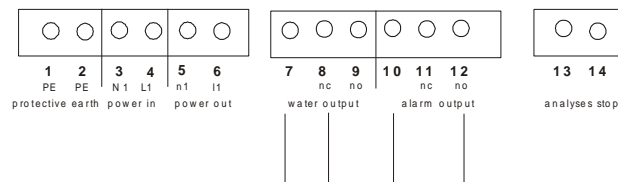
option:
parallel operating of relay
REL1 and relay REL2 if
connecting a horn



option:
connecting potential free
contacts for
communication with
control room or controller
contacts are closed if limit
exceeded or device
malfunctions



option:
connecting potential free
contacts for
communication with
control room or controller
contacts are open if limit
exceeded or device
malfunctions



► **step IV** **replace the empty with a new, full indicator bottle**

Open the reagent bottle by turning the locking cover. Included the added suction hose into the bottle and fix the screw fitting by hand with the thread of the bottle (refer also → page 41 "change indicator")



HINWEIS

The reagent bottle is not automatically included with the device.

For available indicators and corresponding order numbers refer to chapter 3 → page 12

→ only use original indicator of type H25 in round 500ml bottle



WARNING

risk of pollution

When handling the indicator, take care that your eyes, your skin and your clothes do not come into contact with the liquid.

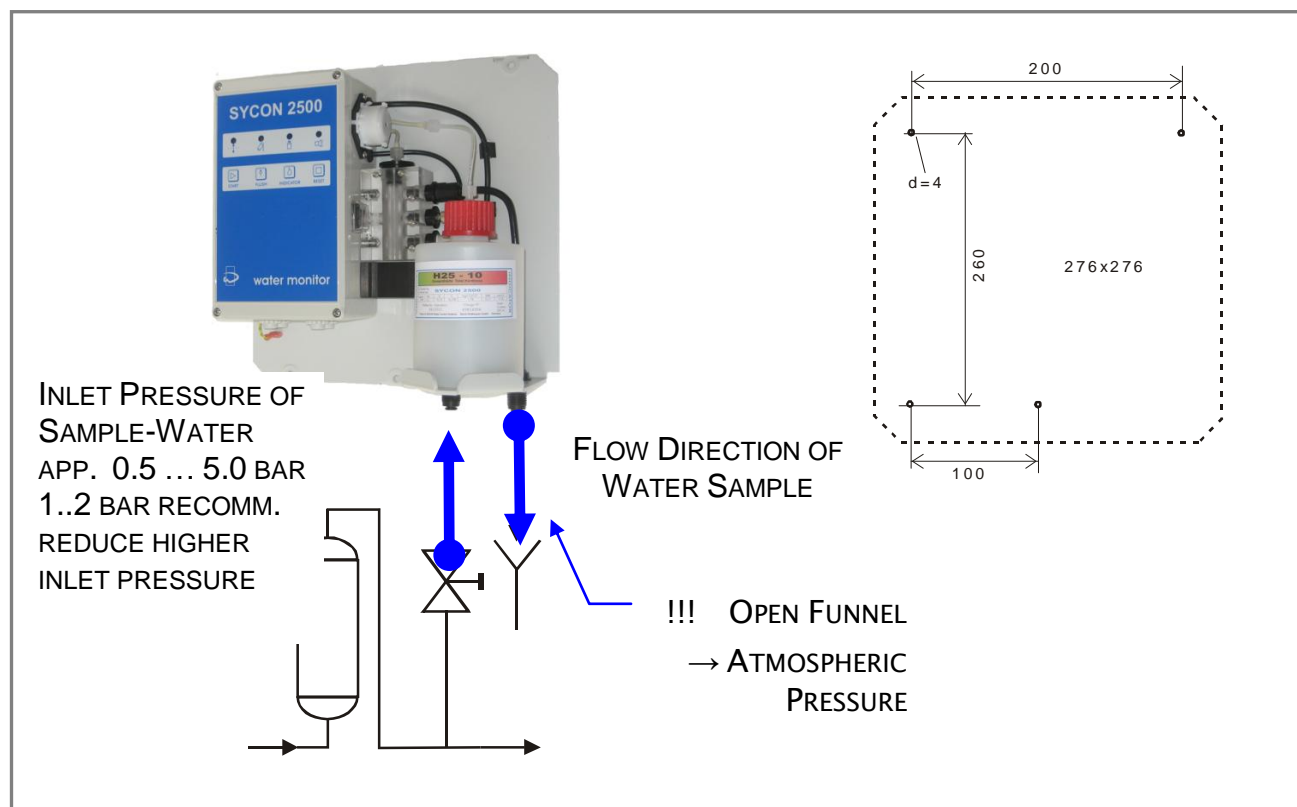
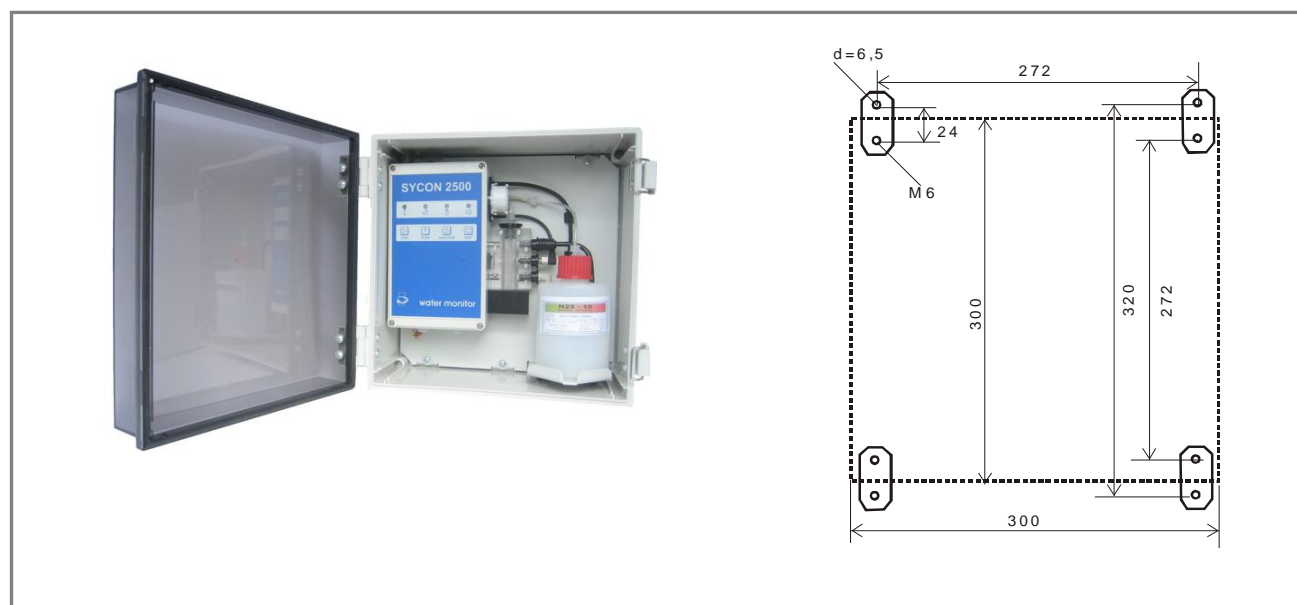
→ Follow the instructions in the safety data sheets

Safety data sheets on common types of indicators are available for download on our website www.wacon.eu

We accept no liability for permanent stains by the dyes in the indicator and personal damage caused by improper handling of the indicator.

We recommend wearing appropriate protective clothing when working with the indicator :

- workwear
- laboratory gloves
- eye protection / goggles

Fig. 3.3 wall mounting without enclosure**Fig. 3.4** wall mounting with standard enclosure

3.4 connection of relay outputs

limit exceed → **relay REL2** **terminal 7 / 8 / 9**

Signal devices and valves can be switched on when the limit is exceeded. The relay switches as → permanent contact or alternatively as → impuls contact to trigger a control system for the regeneration of a water treatment plant.

Using the program switches S4 and S5 (→ page 32) to set different functions for the relay REL1.

1. impuls contact → 3 seconds
2. impuls contact → 60 seconds
3. permanent contact → without stop of analysis
 - auto-quit of alarm.
the left red LED flashes until reset-button is pressed
 - It will be further analysis carried out in the selected interval
4. permanent contact → with analysis stop
 - alarm is active and must be quit manually
the left red LED flashes until reset-button is pressed
 - It will be no further analysis carried out in the selected interval until the alarm is reset.

mal function → **relay REL2** **terminal 10 / 11 / 12**

Relay REL2 signal malfunctions. It is normally closed in case of no malfunction.

The following faults are signalled:

- power failure → unit is switched off (relay drops)
- lack of indicator → content of indicator bottle is lower than app. 10%
→ refer to page 32: BOB-operation
- error zero transmission → insufficient brightness before the addition of indicator
 - pollution of measuring chamber
 - pollution of water sample or turbidity effects
 - malfunction of electronic
- measurement error → insufficient difference of measured value before and after addition of indicator
 - no indicator was dosed
 - no water in measuring chamber
 - no homogenisation (magnetic stirrer misses or agitator failure)

3.5 connection of remote signals

digital input

→ IN

terminal 13 / 14

Monitoring while the water softener is in regeneration may erroneously indicate hardness leakage. An attempt to monitor with the water feed stopped would return either hardness leakage in stagnant water in the plumbing or a system error due to a lack of flow.

The limit analyser provides the following two methods, which may be used alternatively, to avoid false alarms:

Method 1

Utilizing the remote input-signal feature

Connection the external contact with no-voltage!

e.g. → flow control switch

→ level control switch

may allow SYCON 2500 monitoring only while the water softener is turned on and water flows respectively, or to suspend monitoring while the water softener is in regeneration.

The purpose of remote signals is to prevent a monitoring while the water softener is regenerating or the feed water is stopped.

Method 2

Utilizing an external timer

Monitor start time and monitor stop time may be set by an external timer. A no-voltage timer-output can be connected to the remote-signal input of the Sycon 2500 terminal block.



NOTE

It is recommended to connect a remote signal wherever possible to prevent false detections and avoid recovery operations.

If only remote regeneration signal from water softer is connected, a false detection of hardness leakage may result from monitoring the stagnant water while the water is stopped, or a system error may occur due to the lack of flow.



WARNING

Connect only **no-voltage** inputs on terminal block 13 + 14

If no remote signal is connected, be sure to close contact terminals 13+14

If IN-contact is open no monitoring will occur with the exception of manual monitorings.

Function of terminal block 13+14 can be checked in diagnostic menu step 11

→ page 48

CHAPTER 4 OPERATION OF LIMIT ANALYSER

4.1 Summary of limit analyser of Sycon 2500 series

Analysers of Sycon 2500 series in model H are designed to monitor a certain limit-value-concentration of total or carbonate hardness in water through the use of colormetry analysis.

In a colormetry process the ionic and other concentration in water is monitored by allowing an indicator to react against the target ions and others, and monitoring the transmissivity of the resultant coloration for light of a specific wavelength. An example procedure is to check for hardness leakage via the coloration of a hardness indicator.

Basically, the system has been developed as part of a water treatment system (e.g softeners for boiler water).

Sycon 2500 limit analyser automatically and regularly implements the process of sampling the water, injecting the indicator, stirring and evaluating the result. The analyser automatically determines a hardness leakage and gives an alarm through a potential free relay output. This contact can be used to trigger, for example, a regeneration of the softener.

The time-critical, and inaccurate manual analysis or the analysis of indirect methods will be replaced by an accurate and above all, reliable method of measurement.

With external alarm output, fault-diagnostic function as well as the suspension (by remote signal input) of monitoring while the water softener is in regeneration or the water feed is stopped Sycon 2500 limit analyser provides a useful functionality.

Because of the simple LED display, the device can be used in all language areas.

The limit for water quality to be monitored is defined by the indicator used. For the analytical instrument Sycon 2500 the following limit indicators are offered:

device

| | |
|-------------------------|-----------|
| SYCON 2500 | 30-010120 |
| option enclosure | 33-099005 |

limit value indicators

total hardness

HG

| 0,05 °dH | 0,1 °dH | 0,2 °dH | 0,3 °dH | 0,5 °dH | 1 °dH | 2 °dH | 3 °dH | 5 °dH | 10 °dH |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 32-084125 | 32-084135 | 32-084145 | 32-084155 | 32-084165 | 32-084175 | 32-084185 | 32-084195 | 32-084205 | 32-084215 |

order number

carbonate hardness

HC

| 1 °dH | 1,5 °dH | 2 °dH | 3 °dH |
|-----------|-----------|-----------|-----------|
| 32-082125 | 32-082135 | 32-082145 | 32-082155 |

order number

4.2 Before first use



HINWEIS

- Make sure that the steps from chapter 3 (→ page 19 ff) have been performed properly.
- Make sure that the unit is securely mounted to a wall or suitable suspension.
 - If in doubt, consult a specialist or contact your supplier or distributor
- Make sure that the hydraulic connections are correctly installed
 - Check in particular whether water supply and drainage are installed in the correct arrangement → Fig. 2.1 page 13.
 - Make sure that the maximum allowable operating pressure is not exceeded on the water supply line (→ see table on page 11)
 - Install where necessary a throttle valve
 - Make sure that water quality meets the specified requirements (see table → page 11)
 - Take any appropriate measures to improve the feed water quality (eg installation of a strainer)
- Make sure that a sufficiently good indicator bottle is used
 - Check the seal of the bottle for leaks and whether this is really screwed with the thread of the bottle.
 - Verify that the correct type of indicator is used for the application.
 - Verify that the expiration date of the indicator has not expired.
- Make sure that all plugs are tight at the measuring chamber and sit in the correct sockets and that they are secured with locking pins (see Fig 2.3 → page 15).
- Make sure that all water and indicator hose pipe connections in the system are connected correctly and firmly (→ see Fig 2.3 in page 15).
- Make sure that the monitored water treatment plant is in operation and sample water is supplied.
- Make sure that the input and output contacts of the analyser are associated in the desired manner with the the water treatment plant to be monitored (→ see Fig 2.1 in page 13).
 - If in doubt, consult a specialist or contact your supplier or distributor

4.3 Setting the program switches

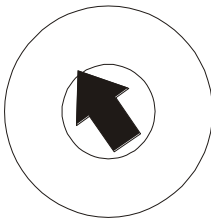
The Limit Analyser is programmed using small dual-in-line-switch S1-S10 and adjusted to specific operating requirements.



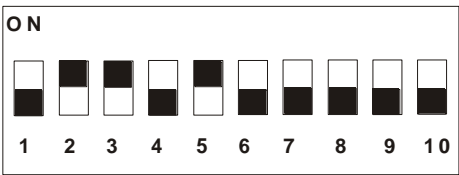
switch off the unit and open the lid of the controller

→ WARNING supply voltage 85 ... 264 V AC 47 ... 63Hz

→ The DIP-switches (dual in-line package) are located between the LED lights and the push buttons. Next to the switches you see the potentiometer for setting the flushing time.



FLUSHING TIME



DIP SWITCHES

factory settings

| | | | | |
|-------------------|---|-----------|---------|--------|
| flushing time | ca. 2 minutes | Poti app. | 10:00 | |
| analysis interval | 10 minutes | S1 OFF | S2 ON | |
| retry cycle | yes | S3 ON | | |
| relay function | permanent contact without analysis stop | S4 ON | S5 OFF | |
| parameter | total hardness | S6 OFF | S7 OFF | S8 OFF |
| operating mode | analysis mode | S9 OFF | S10 OFF | |



ELECTRICITY

Work on electrical equipment of the plant / machinery must be performed by a qualified electrician! Observe all applicable electrical installation work rules.

→ WARNING supply voltage 85 ... 264 V AC 47 ... 63Hz



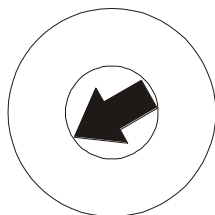
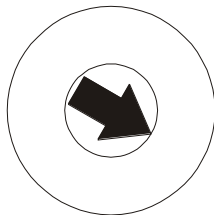
NOTE

For the operation of the rotary potentiometer and for setting the slide switch you need a small insulated screwdriver

→ Please use only good, proven tools, you will help avoid damage to sensitive components

► **setting of flushing time**

The flushing time before an analysis is set using the potentiometer (left of the DIP switches) in 30 seconds (left) and 10 minutes (right).

**FLUSHING TIME 30 SEC****FLUSHING TIME 600 SEC****NOTE**

Choose the flushing time as a function of the length of the water supply so that you have fresh sample water for the current measurement

- recommendation:
a 5 meter hose pipe with inner Ø 5 mm need to be flushed app. 20 sec to 1 min. depending on fittings installed
- hose pipe volume $= \pi_{(PI)} * R^2 * L$
 $= 3,14 * (0,25)^2 \text{ cm}^2 * 500 \text{ cm} = 98,13 \text{ cm}^3$
 ca. 100 ml = 0,1 Liter

rule of thumb:

- one meter of a hose pipe with inner Ø 5 mm contains app. 20 ml water
- doubling the diameter results in a fourfold volume (Ø 10 mm app. 80 ml/m)
- The flushing efficiency of the device is limited by the cross-section in the inlet solenoid valve and depending on water pressure. With a pressure of 1.5 bar the washing performance is about 1 l/min, which is sufficient to rinse a 10 meter hose pipe with Ø 5 mm in app. 10-15 sec or 10 meter hose pipe with Ø 10 mm in app. one minute flushing time.
- At higher and lower line pressures, the irrigation flow changes accordingly up or down.

**NOTE**

Depending on the design of water supply system, in addition to the hose pipe volume another volume needs to be flushed to ensure that the analyser always monitors a representative water sample.

We recommend a minimum flushing time of 30 seconds.

► **analysis interval**

There are four fixed interval times selectable by varying the position of switch S1 and S2.

The choice of analysis interval determines the frequency at which analyses are carried out. The interval time is the time interval between two measurements.

If the potential-free input "flow switch" is open, no analysis is carried out.

When delivered, the switch is bridged

→ Analyses are performed in a set interval

Make sure that the switch is either jumpered properly, or an external signal is issued.



NOTE

| analysis interval: | | |
|--------------------|--|--|
|--------------------|--|--|

| S1 | S2 | time |
|-----|-----|---------|
| OFF | OFF | 5 Min. |
| OFF | ON | 10 Min. |
| ON | OFF | 20 Min. |
| ON | ON | 30 Min. |



► **retry cycle**

It can be determined whether a second analysis should be carried out to verify the result of a failed test by utilising the retry function. Only when two consecutive analyses indicate bad water conditions, will the relay REL1 be activated.

This second analysis is carried out independently of the set interval app. 4 minutes later

| retry cycle | | |
|-------------|--|--|
|-------------|--|--|

| S3 | | function |
|-----|--|------------------------|
| OFF | | without retry cycle |
| ON | | with retry cycle |



► **function relay REL 1**

The relay REL 1 indicates violation of the limit. You can choose between an impulse contact of 3 and 60 seconds for the control of a controller or a permanent contact. For a permanent contact there are two alternatives:

- Analyses are performed at the set interval and at levels below the threshold, the relay REL 1 will be deleted automatically .
- After the limit is exceeded, no further analysis is carried out. The relay REL 1 must be deleted by pressing the RESET button. Only then next analysis is carried out in set interval.

| relay function REL 1 | | |
|----------------------|-----|---------------------------------------|
| S4 | S5 | function |
| OFF | OFF | impulse contact 3 seconds |
| OFF | ON | impulse contact 60 seconds |
| ON | OFF | permanent contact no analysis stop |
| ON | ON | permanent contact analysis stop |

► **measuring parameter****NOTE**

The analyser can be used to limit monitoring of different water parameters. The relevant limit is determined by the type of indicator used

→ available indicators see page 27

| measuring parameters | | | |
|----------------------|-----|-----|--------------------|
| S6 | S7 | S8 | function |
| OFF | OFF | OFF | total hardness |
| OFF | OFF | ON | carbonate hardness |
| OFF | ON | OFF | minus M-value |
| OFF | ON | ON | plus M-value |



4.4 Start up in 5 steps



HINWEIS

Make sure that the analyser was installed in accordance with chapter 3 (→ page 19) and the program switches were set properly according to the application like described under Section 4.3 (→ page 29).

step 1

switch on the unit

- switch power button „on“
- green LED
- “analysis result” flashes.

green



step 2



reset indicator storage volume

- Press the INDICATOR and RESET button at the same time
- WARNING !!!
- run reset function only when replace empty bottle by a full one
- (→ page 41)

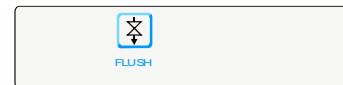


step 3



flood measuring chamber with water

- Press the FLUSH button until the measuring chamber is completely filled with water and free of bubbles.



step 4



de-aerate dosing pump

- Press the INDICATOR button until indicator is delivered continuously into the measuring chamber. During this process, the agitator rotates.



step 5



start analysis

- press START button to run first analysis
- an analysis starts with the flushing of the measuring chamber



4.5 operating of the device → display of functions



NOTE

Make sure that the analyser was installed in accordance with chapter 3 (→ page 19) and the program switches were set properly according to the application described under Section 4.3 (→ page 29).

→ the unit must be switched on

analysis result

This LED has different colours and signals the analysis result.

1. **green-flashing:**
the unit was switched on (green-flashing do not indicate an analysis result)
2. **green:**
the water quality is below the specified limit
3. **red:**
the limit has been exceeded - the relay REL 1 has not yet activated
→ retry cycle
4. **red-flashing:**
the limit has been exceeded – and the relay REL 1 has activated

green



red



analysis activ

1. **yellow:**
the LED-display lights continuously, thus indicating a started analysis
- 2a. **yellow-flashing:**
the display will flash, signaling that the analysis interval is expired - next analysis start is delayed because input contact IN is opened
→ flow control function
- 2b. **yellow-flashing:**
the display will flash, signaling that no analysis can be started automatically. The device was programmed so that after a threshold is exceeded, the analysis stops. Simultaneously flashes or lights the red LED "analysis result" (see program switch S4 and S5 on page 32)

yellow



red yellow



lack of indicator

1. **blue:**
LED-display lights continuously, thus indicating that the indicator stocks is less than about 30%
2. **blue-flashing:**
the display will flash, signaling that the stock of indicator is less than 10%. At the same time, the fault relay REL2 enabled.
BOB-function → page 18

blue



**alarm message
limit exceeded**

- 1a. **red-flashing + red-flashing**
Analysis result (red-flashing) + alarm (red-flashing):
The display flashes and signals exceeding the given limit in connection with the flashing red display "analysis results".
The relay REL 1 "limit exceeded" is active
- 1b. **red-flashing + red**
Analysis result (red-flashing) + alarm (red):
The display lights permanent and signals exceeding the given limit in connection with the flashing red display "analysis results"
→ The relay REL 1 "limit exceeded" was deleted automatically by pressing a button or a pulse control of the relay

red

red



**alarm message
lack of indicator**

- 2a. **blue-flashing + red-flashing**
lack of indicator (blue-flashing) + alarm message (red-flashing):
The red LED-display flashes and signals in conjunction with the flashing blue LED display "lack of indicator". <10%
→ the fault relay is active.

blue

red



2b. **blue-flashing + red**

lack of indicator (blue-flashing)
+ alarm message (red):

The red LED-display lights permanent and signals in conjunction with the flashing blue LED display "lack of indicator" <10%.

→ the fault relay was deleted

blue red



**alarm message
malfunction of
device**

3a. **red-flushing**

alarm message (red-flushing):
the LED-display signals a malfunction
of device

→ incorrect zero transmission

or

→ incorrect measurement

all other displays are off

→ the fault relay is active

red

3b. **red**

alarm message (red):
the LED-display signals a malfunction
of device

→ incorrect zero transmission

or

→ incorrect measurement

all other displays are off

→ the fault relay was deleted

4.6 operating the unit → control by hand



NOTE

Make sure that the analyser was installed in accordance with chapter 3 (→ page 19) and the program switches were set properly according to the application described under Section 4.3 (→ page 29).

→ the unit must be switched on

START



start analysis

→ By pressing the START button you can start an analysis at any stage

→ If an analysis procedure was started already, you may jump to the next program step by pressing the START button.



FLUSH



rinsing and filling of measuring chamber

→ By pressing the FLUSH button you can flush and rinse the measuring chamber and the feed line to the measuring chamber without an analysis process.



INDIKATOR



de-aerate dosing pump

→ By pressing the button INDIKATOR you can turn on the peristaltic pump at any time to add indicator or to de-aerate the hose pipe system. Simultaneously with the pump the agitator is stirring



RESET



by pressing the button RESET..

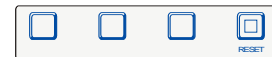
→ .. delete the relay REL1 if exceeding the limit

→ see analysis result page 34

→ .. delete the relay REL2 when a malfunction or lack of indicator message occurs

→ see alarm messages page 35/36

→ .. analysis process can be interrupted
→ ALARM-Resets are deleted first.



by pressing the buttons INDIKATOR + RESET

→ .. reset the Indicator quantity measurement

The provision is established when the LEDs "lack of indicator" (blue) and alarm (red) light up simultaneously.



Please use this function or key combination only if you installed a new 500 ml indicator bottle

CHAPTER 5 MAINTENANCE AND SERVICE

To ensure long-term function of the analyser it is necessary to clean the measuring chamber and replace worn parts from time to time depending on the frequency of analysis and general pollution levels. Depending on the load of the appliance maintenance work should be done at intervals of about 6 months.



NOTE

Maintenance is easy to perform. We recommend that the maintenance is performed by a trained professional. In each case, observe the following safety instructions.

Complete the maintenance work, ideally in connection with the maintenance of the water treatment plant or during operating pauses



WARNING

Prior to the service it is advisable to switch off the analyser by pressing the power switch off.

→ it is not necessary to open the control box in order to carry out maintenance



ELECTRICITY

WARNING: In the case of an open cover of the control box:
A 230 V AC is applied to terminal blocks 1-6 and depending on the wiring, to the relay output terminals 7-12.
Contact can lead to serious personal injury.

- Mortal danger
- Risk of injury
- By improper handling can damage the machine.



WARNING

Note that during your maintenance work no analysis be carried out. During maintenance a hardness breakthrough may not be detected.



PRESSURE

Note the line pressure on the water supply.
Switch off the water supply before disconnecting the inlet water-hose-pipe.

Splash damage to the electronics can cause electrical short circuits.



WARNING

When handling the indicator keep care that your eyes, your skin and your clothes do not come in contact with the liquid.

Follow the instructions in the safety data sheets
Wear suitable protective clothing as required for maintenance:
workwear / laboratory gloves / eye protection / protective goggles

► Maintenance in 3 steps

step 1 - step 2A without 2B - step 3

routine maintenance in intervals of app. 4-6 month

requirements

| | | |
|----------|----------------------|--------------------|
| time | app. 30 minutes | |
| material | indicator → page 12 | depending on limit |
| | maintenance set no.1 | Art.nr. 33-090 038 |
| | cleaning set | Art.nr. 30-100 900 |
| | paper towels | |
| tools | screw driver | |
| | cup or small bucket | |
| | cleaning set | |

prior to maintenance

SWITCH OFF THE UNIT
► **switch power off**

MAINTENANCE STEP 1

CHANGE CARTRIDGE OF PERISTALTIC PUMP

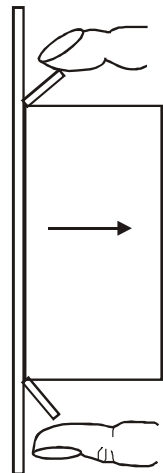
After app. 6 month, the pump cartridge with hose pipe should be replaced because the the terminal clutch wears out and tube material becomes brittle.

| order no. | description |
|------------------|--------------------------------------|
| 33-090038 | cartridge of peristaltic pump |

1. Press locking clips together with thumb and forefinger and pull cartridge to the right off the motor shaft
2. open the bayonet connectors of the LUER-fittings
3. If indicator fluid leaks, wipe up with a paper towel.
3. replace new peristaltic pump cartridge in reverse order
4. de-aerate pump
→ press button INDICATOR



INDICATOR



MAINTENANCE

STEP 2A

→ 2B see page 42



WARNING



FLUSH



FLUSH

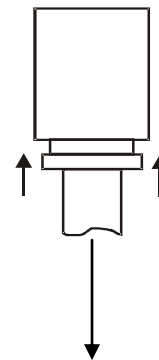


WARNING

CLEANING OF MEASURING CHAMBER

REMOVE, CLEANING AND REINSTALL

1. First release pressure from water supply line
 - shut off water supply in water treatment plant
 - switch on the unit for a while
 - Briefly press the flush button. By opening the solenoid valve you expend the water supply system.
2. Hold or place the small bucket under the water inlet connection.
3. Open the connector. Unplug the 6 mm inlet tubing
 - Briefly press the flush button. By opening the solenoid valve, the measuring chamber drains almost completely.
 - collect leaking water in the bucket
 - **switch off the unit again**
4. Pull the locking pins out of the holes and pull the plugs in sequence from the measuring chamber
 - pry fixed plug gently with a screw driver.
5. remove measurement chamber by pulling from the retaining bolts
 - Empty the measuring chamber
 - Insert Measuring chamber for about 10 minutes in sufficient quantity of cleaning liquid in the box of cleaning set
 - Clean the measuring chamber carefully with the brush of cleaning set
 - rinse measuring chamber with clean water.
6. Clean the plugs
7. Remove the measuring chamber in the reverse order of disassembly



MAINTAINANCE
STEP 3



NOT



FLUSH



INDICATOR



+



REFILL INDICATOR AND RESET THE STORAGE COUNTER

1. remove empty indicator bottle
 - open bottle cap by turning
 - remove the suction pipe carefully
 - If indicator fluid leaks, wipe up with a paper towel
 - dispose of empty bottle

2. replace full indicator bottle
 - remove the cap
 - insert the suction pipe carefully
 - screw bottle cap by turning

When you are installing pay attention to a correct position of the screw and the adapter.

3. de-aerate the indicator hose pipe
 - fill measuring chamber with water
 - press FLUSH button several times
 - dose indicator until the hoses and the cartridge of peristaltic pump are completely filled with indicator and no air bubbles are visible
 - press INDICATOR button several times

4. confirm bottle change and reset counter
 - press INDICATOR and RESET button simultaneously until the right red and the blue LED light up briefly



step 1 – step 2A – step 2B - step 3

annual maintenance in intervals of 6-12 month

requirements

| | |
|------------|---|
| time | app. 30 minutes |
| material : | indicator → page 27 depending on limit maintenance set no.2 Art.nr. 33-090 028 cleaning set Art.nr. 30-100 900 paper towels |
| tools | screw driver cup or small bucket cleaning set |

prior to maintenance

SWITCH OFF THE UNIT
► **press power switch off**

MAINTENANCE STEPS 1 TO 3

refer to page 39

MAINTENANCE STEP 2B

CHANGE HOSE-PIPES AND O-RINGS



NOT

The maintenance step 2B follows the maintenance step 2A → page 40
orientate yourself on Figure 2.3 in page 15

- Replace worn parts with the parts supplied with the maintenance kit.
- When fitting O-rings, roll the O-rings carefully down to the first groove of the plug.

► Replacing components

Please read the notes at the beginning of Chapter 5 →page 38.

→ Please read the notes in the data sheets of components



WARNING

CHANGE OF INLET SOLENOID VALVE

order no. 33-090 014

1. Release pressure from water supply and empty measuring chamber → page 40
2. Remove inlet plug from measuring chamber
2. Pull down retaining ring on the bulkhead fitting and remove valve
3. pull out inlet connector ¼"
4. Install the new valve in reverse order

REPLACEMENT OF AGITATOR

order no. 33-090 710

1. Disconnect power and open the lid of the control
2. Remove cable connections
3. Unscrew the mounting screws
4. Install the new agitator in reverse order

REPLACEMENT OF PERISTALTIC PUMP MOTOR

order no. 33-090 026

1. Dismantle cartridge of peristaltic pump → page 39
2. Disconnect power and open the lid of the control
3. Remove display circuit board
4. Unscrew the mounting screws of peristaltic pump motor
5. Remove worn pump motor and install the new pump motor in reverse order.

CHAPTER 6 **DIAGNOSTIC FUNCTION**

To control the device functions, a test program can be turned on. It is necessary to open the cover of the control (→ page 29) and to change the position of DIP-switch combination S9-S10:

| test program | | |
|--------------|-----|--------------------|
| S9 | S10 | function |
| OFF | OFF | analysis operation |
| OFF | ON | test program |



After turning the switch S10 in position ON the test steps described below are called by repeatedly pressing the START button



NOTE

This test program should only be called and checked by an experienced specialist. Do observe the following safety instructions !



DANGER

To proceed the test program the analyser must be operate with opened lid off the main control unit. Control buttons are used while device is opened. The relay function is tested while device is opened.



ELECTRICITY

- WARNING: In the case of an open cover of the control box:
A 230 V AC is applied to terminal blocks 1-6 and depending on the wiring, to the relay output terminals 7-12.
Contact can lead to serious personal injury.
- Mortal danger
 - Risk of injury
 - By improper handling can damage the machine.



WARNING

Note, activating the output relays can cause operational problems



PRESSURE

Note the line pressure on the water supply.
Avoid splashing water as this could damage the electronics of the analyser, and cause electrical short circuits

Diagnosis in 13 steps



After turning the switch S10 in position ON the test steps described below are called by repeatedly pressing the START button

DIAGNOSIS 1



CHECK LED DISPLAY

After 1st pressing the START button, the LED lights are reviewed.
One after another light up:

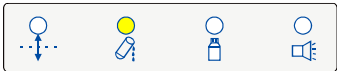
1. **GREEN** ANALYSIS GOOD



2. **RED** ANALYSIS BAD



3. **YELLOW** ANALYSIS ACTIVE



4. **BLUE** LACK OF INDICATOR



5. **RED** ALARM MESSAGE



DIAGNOSIS 2



CHECK THE PUSH BUTTONS

After 2nd pressing the START button, the push buttons are reviewed

By pressing the above LED lights illuminate jointly with the green LED display "GOOD analysis"



FLUSH

GREEN + YELLOW



INDICATOR

GREEN + BLUE



RESET

GREEN + RED



DIAGNOSIS 3

CHECK THE DIP-SWITCHES

After 3rd pressing the START button, the DIP-switches are reviewed

Each slide switch S1 to S9 is a combination of LED lights assigned

3. X  START

S1 = GREEN



S2 = YELLOW



S3 = BLUE



S4 = RED



S5 = GREEN + YELLOW



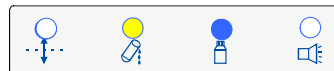
S6 = GREEN + BLUE



S7 = GREEN + RED



S8 = YELLOW + BLUE



S9 = YELLOW + RED

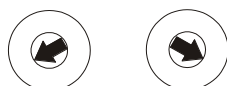


DIAGNOSIS 4

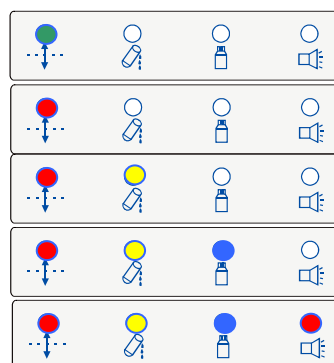
CHECK POTENTIOMETER FOR FLUSH TIME

After 4th pressing the START button, the potentiometer for triggering the flush time is reviewed

→ Turn the potentiometer from left to right. The further it becomes rotated to the right, the more LEDs light up - starting with green, red, red + yellow, etc



LEFT.....RIGHT



4. X  START

DIAGNOSIS 5

5. X  START

CHECK RELAY OUTPUT REL 1

After 5th pressing the START button, the relay output REL 1 is reviewed.

- terminals 7 / 8 / 9
- The red LED will flash and the relay REL1 every second will switched on and off



DIAGNOSIS 6

6. X  START

CHECK RELAY OUTPUT REL 2

After 6th pressing the START button, the relay output REL 2 is reviewed.

- terminals 10 / 11 / 12
- The green LED will flash and the relay REL2 every second will switched on and off



DIAGNOSIS 7

7. X  START

CHECK SOLENOID VALVE

After 7th pressing the START button, the inlet solenoid valve is reviewed.

- The yellow LED will flash and the solenoid valve every second will switched on and off



DIAGNOSIS 8

8. X  START

CHECK MEASUREMENT-LED (ACTOR)

After 8th pressing the START button, the function of the LED in the optical path of the measurement chamber is reviewed.

- The blue LED will flash and the white measurement-LED every second will switched on and off



DIAGNOSIS 9

9. X  START

CHECK PERISTALTIC PUMP

After 9th pressing the START button, the function of the peristaltic indicator pump is reviewed.

- The red LED will flash and the peristaltic pump every second will switched on and off



DIAGNOSIS 10



CHECK AGITATOR

After 10th pressing the START button, the function of the agitator is reviewed.

- The red + blue LED will flash and the agitator will switched on



DIAGNOSIS 11



CHECK DIGITAL INPUT IN

After 11th pressing the START button, the function of digital input contact is reviewed.

- terminal 13 + 14
- If the digital input contact is bridged, the left red + yellow LED light on.
- If the digital input contact is opened, the left green + yellow LED light on.



DANGER

It is recommended to close the lid of the control box before running through diagnosis step 12 and 13

DIAGNOSIS 12



CHECK ZERO TRANSMISSION

After 12th pressing the START button, the function of zero transmission measurement in the optical path of the mixing chamber is reviewed.

- the first three LEDs from the left green + yellow + blue light up
- For the examination of the test section, the measuring chamber should be filled with clean water. Fill the measuring chamber by repeatedly pressing the FLUSH button



NOTE

- This test step is required to perform the zero value of the sample for the following examination of the colour detection
→ step 13
- Note that for a correct measurement switches S6, S7 and S8 are in the right position according to measured parameters (→ page 32).

DIAGNOSIS 13

13. X  START

CHECK COLOUR DETECTION

After 13th pressing the START button, the function of colour detection in the optical path of the mixing chamber is reviewed

→ all four LEDs from green + yellow + blue + red light up



The LED „analysis result“

→ first left LED green or red signals if detection is under (green) or above (red) the limit

→ with the FLUSH button you fill the measurement chamber with soft or hard water of known condition

→ with the INDICATOR button you dose a drop of indicator into the filled measuring chamber

→ If the water hardness of your water sample is lower than the color change point of the limit indicator used, the left green LED flashes

→ water sample is evaluated as GOOD

→ If the water hardness of your water sample is higher than the color change point of the limit indicator used, the left red LED flashes

→ water sample is evaluated as BAD



green + yellow + blue + red



red + yellow + blue + red



FLUSH



INDICATOR



NOTE

After controlling the device functions you exit the test program and change back to analysis mode by pushing switch S10 in the OFF position again. Close the cover of the control box.

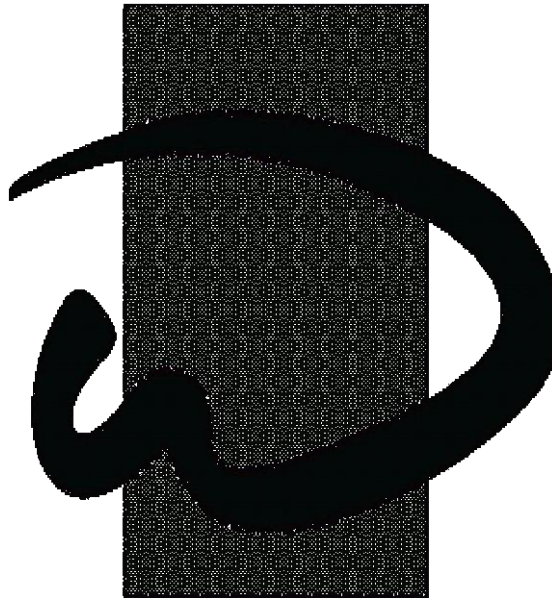
| test program | | |
|--------------|-----|---------------|
| S9 | S10 | function |
| OFF | OFF | analysis mode |
| OFF | ON | test program |



Notes

| conversion of the units of the residual/total water hardness | | | | | | | Tipp! |
|--|------------|-------|-------|------|------|--------|--------------|
| | | °dH | °e | °fH | ppm | mval/l | mmol/l |
| German degree | 1 °dH = | 1 | 1,253 | 1,78 | 17,8 | 0,357 | 0,1783 |
| English degree | 1 °e = | 0,798 | 1 | 1,43 | 14,3 | 0,285 | 0,142 |
| French degree | 1 °fH = | 0,56 | 0,702 | 1 | 10 | 0,2 | 0,1 |
| ppm CaCO ₃ (USA) | 1 ppm = | 0,056 | 0,07 | 0,1 | 1 | 0,02 | 0,01 |
| mval/l earth alkaline metals | 1 mval/l = | 2,8 | 3,51 | 5 | 50 | 1 | 0,5 |
| mmol/l earth alkaline metals | 1 mmol/l = | 5,6 | 7,02 | 10 | 100 | 2 | 1 |

In this context the unit 1 ppm is defined as 1 mg/L CaCO₃.



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