

## Sycon 2501 Fe



### On-line Analysis of the Iron Content in Water

V24.02.2015

U S E R M A N U A L



## INTRODUCTION

We appreciate your purchase of a Limit Analyser type Sycon 2501 Fe for the on-line monitoring of the iron content of water.

The 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 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 based on the Sycon 2501 series is an on-line analysis system. It can automatically monitor iron leakage in water treatment plants and issue an iron leakage alarm.

It is not a system that remedies iron leakage itself.

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	→ ZERO-TRANSMISSION	
	→ COLOUR DETECTION	

## SUMMARY SYCON 2501 SERIES



With the Limit Analyser, RLS Wacon offers a very compact and easily operated water analyser for automatic on-line monitoring of water treatment plants. The system controls selectable limit values according to the colorimetric principle. A broad range of functions guarantee reliable field-operation. Units can be supplied in standard as well as tailor-made housings

**Application:** → Limit monitoring (below and above limit detection)  
→ suitable for operation without permanent supervision (BOB)

### Order numbers

#### Limit Analyser

SYCON 2501 Fe	30-010321
Standard enclosure	33-099005

#### Reagents

Fe-LRS	0.03 – 0.6 mg Fe/l	32-080320
Fe-HRS	0.3 – 6.0 mg Fe/l	32-080330

## CHAPTER 1

## SAFETY WARNINGS AND PRECAUTIONS

This Chapter explains the dangers, precautionary signs and notes that apply to the handling, installation, wiring and maintenance of the SYCON 2500 series Limit Analyser. These instructions are not a substitute for vocational training.



This manual describes the installation and operation of the on-line analyser of type Limit Analyser Fe based on SYCON 2501 series. Installation and commissioning must only be performed by qualified 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 condense 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 local regulations must be complied with.

The analyser is used to monitor the limits of the iron content in process water. Proper operation can only be guaranteed with the manufacturer's recommended reagents and spare parts.

Changes to the electrical connections and the programming should only be performed by a qualified person.

If it is necessary to connect cables for the sensors they should be kept as short as possible and not run together with power cables. The vicinity of a strong electromagnetic field 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 in order 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 and which conditions lead to the problem. We will then be in a better position to help you.

## Safety 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 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 cannot 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 is not necessarily to be expected.



**PRESSURE**

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



**ELECTRICITY**

This symbol indicates electric and electronic systems.



**NOTE**

This symbol indicates no safety information, but information to improve understanding of the plant or machine processes.



## Work on hydraulic and pneumatic equipment



**PRESSURE**



**WARNING**

- Maintenance and repair of hydraulic and pneumatic equipment should 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!
- During preventive maintenance, pipes 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 and that push-in fittings are secured.
  - Ensure that the container lid, screens or filters are re-installed in the correct order.
- After completion of the maintenance and repair services, and before the resumption of operation, 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 are removed!
  - ...all safety devices of the system work properly again!

## Transportation

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



**NOTE**

- Transport equipment carefully and do not throw it!
- 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, damage could occur during 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 no longer than a year to avoid loss of the warranty. Store the equipment under the following conditions.

- Cool and dry location.
- Ambient temperature between 0 and 45 °C.

**Shipment**

Shipment consists of:

- Equipment in accordance with the confirmation of order,
- 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**

- ▶ Install the system in accordance with the following sequence will save you time and avoid damage which could lead to malfunction.

- Mount the device:
  - Place the unit in a dry, easily accessible and conspicuous place.
  - Drill holes in the wall according to template (typically, these are four holes) and mount the device using suitable screws (usually four screws).
- Connect the initiators (e.g. level sensor)
- Connect the actuators (for example pumps, valves)
- Connect the power.
  - Make sure that the supply voltage is correct  
for example: 230 VAC or 115 VAC or 24 VAC  
For correct supply voltage, refer to the serial number label of the unit
- Program the device (setting of parameters and conditions).
  - Note the information in the manual

**WARNING**

## CHAPTER 2 SPECIFICATION AND OVERVIEW

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 safe operation.

### 2.1 General Specifications

Power-supply	85 ... 264 VAC 47... 63 Hz
Power consumption	25 VA (in 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 condensation)
Feed water pressure	approx. 0.5...5 bar (1...2 bar recommended)
Feed water condition	clear, colourless, free of suspended solids, no gas bubbles

#### → Technical data

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

#### → Analysis characteristics

Evaluation	colorimetric method
Limit value alarm is defined by the reagent used	Limit-Value-Reagents LR: 0.03 mg/l 0.05 mg/l, 0.1 mg/l, 0.2 mg/l, 0.3 mg/l, 0.4 mg/l, 0.5 mg/l, 0.6 mg/l
→ bottles volume 500 ml	Limit-Value-Reagents HR: 0.3 mg/l 0.5 mg/l, 1.0 mg/l, 2.0 mg/l, 3.0 mg/l, 4.0 mg/l, 5.0 mg/l, 6.0 mg/l
Reagent consumption	approx. 0.4 ml / analysis
Reagent shelf life	2 years
Relay outputs	3 x Relays
1. Limit alarm 2. Unit failure 3. Analysis	250 VAC / VDC 4 A potential free outputs NC/NO
Remote signal input	potential free contacts (load 24 V;10 mA)
Water usage	approx. 1000 ml/analysis → Drainage volume may vary depending on feed water pressure and flush time

#### → Water inlet and outlet

Water inlet connection	For connecting 6 mm outer diameter pipe
Water outlet connection	For connecting 6 mm outer diameter pipe
→ atmospheric pressure / open funnel	→ Inlet and outlet pipes are not attached to the device. Please use specified pipes. Using tubes other than those specified may cause leakage. → Please contact our distributors.

## Order numbers for unit and reagent

### Limit Analyser

SYCON 2501 Fe	30-010321
Standard enclosure	33-099005

### Reagents

Fe-LRS	0.03 – 0.6 mg Fe/l	32-080320
Fe-HRS	0.3 – 6.0 mg Fe/l	32-080330



#### NOTE

The system works with one-component reagents with different limit values. Shelf-life of the reagents is 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 cooled down before analysis takes place!



#### NOTE

If the programme switch S9 is set to 'ON', the analysis evaluation will be reversed. That means there will be an error warning when the test result is below the limit.

### → Accessories



#### **SYCON CLEAN order n°. 30-010 900**

Cleaning set for acryl glass measuring-chambers

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

#### **FIT 3000 order n°. 32-089 100**

Cleaning solution for acryl glass measuring-chambers

- 1000 ml cleaning solution FIT 3000

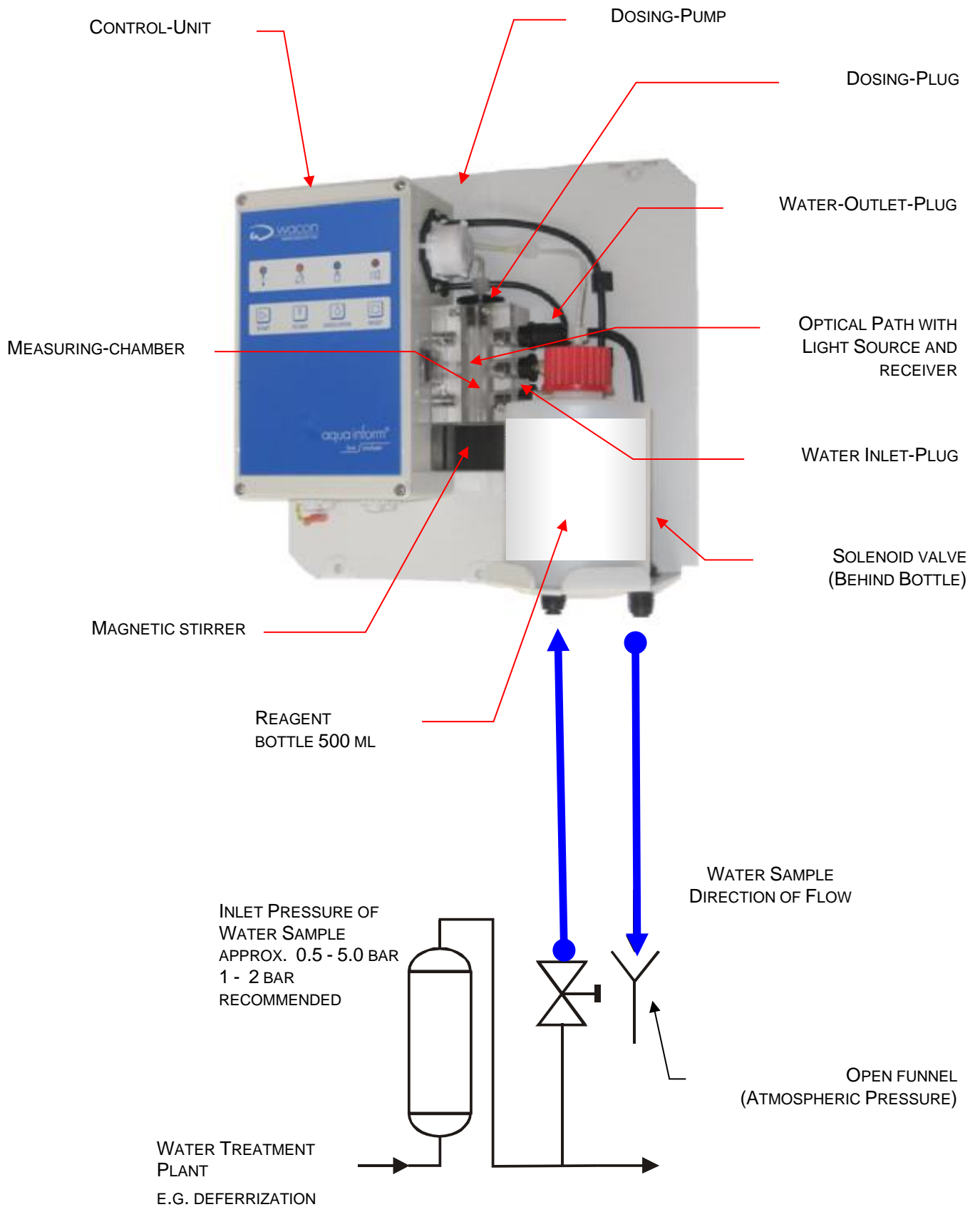
### → Sample cooler

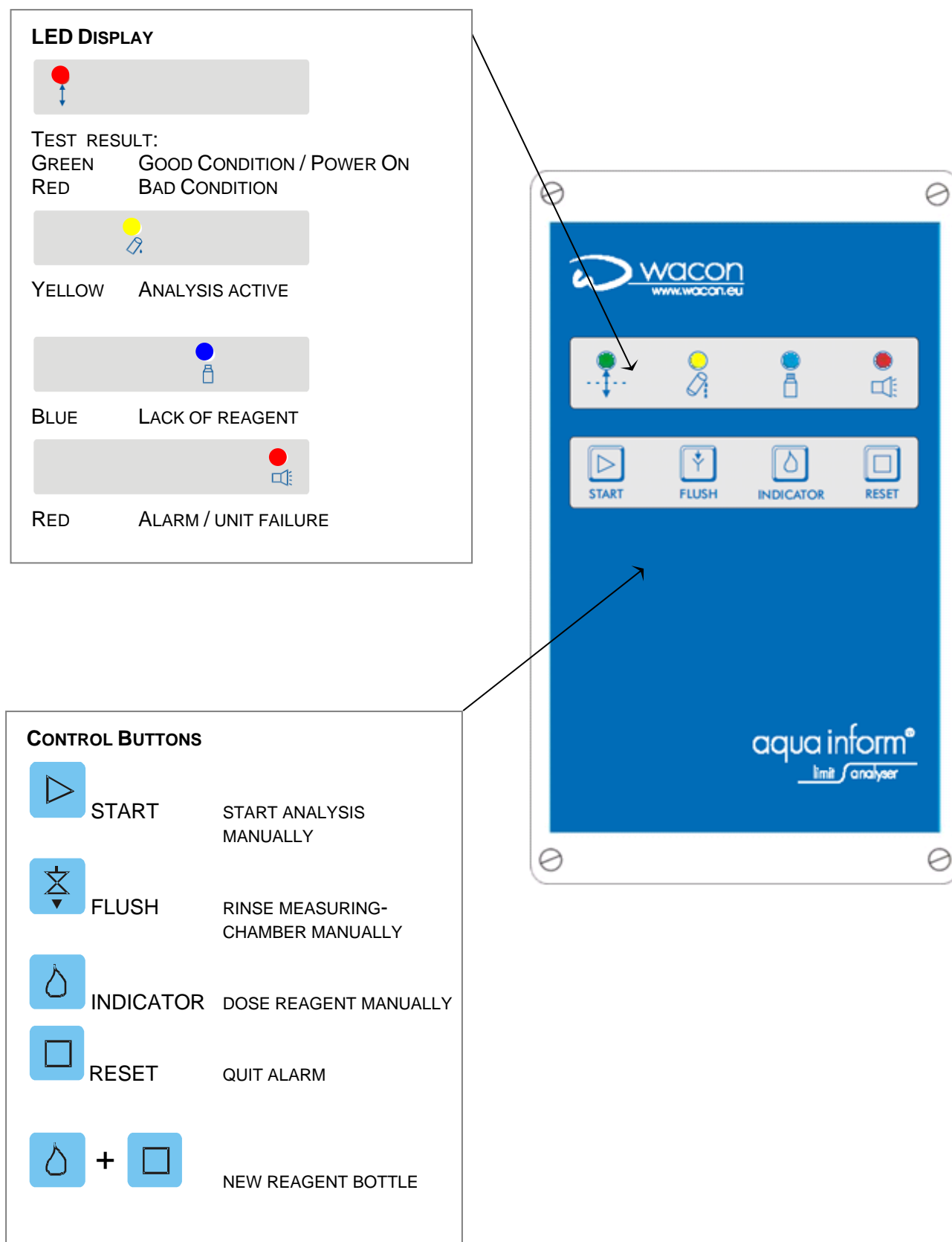


#### **PC 200 order n°. 30-015 100**

#### **PC 400 order n°. 32-015 200**

For details please refer to our home page  
**[www.rls-wacon.de](http://www.rls-wacon.de)**

**FIG. 2.1****2.2 Overview – limit analyser – configuration**

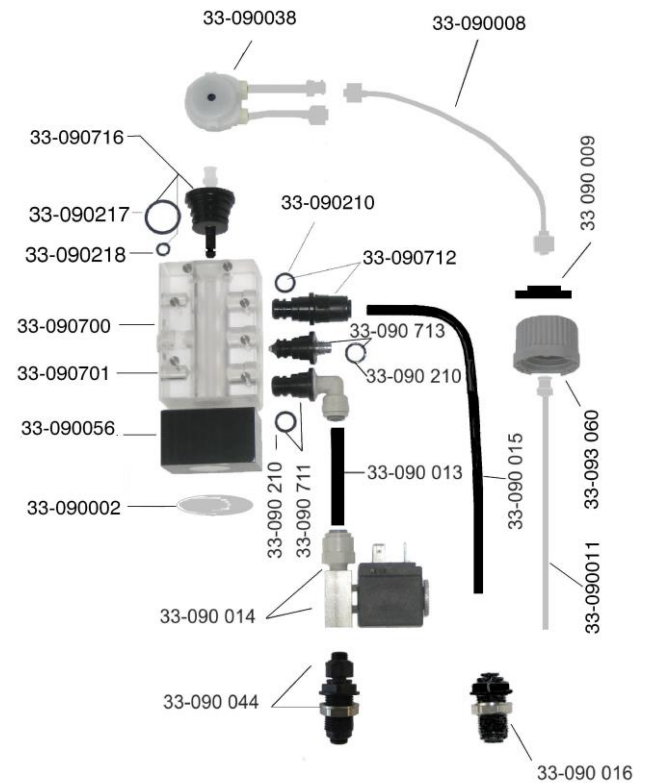
**FIG. 2.2**      **2.3**      **LIMIT ANALYSER – DISPLAY AND OPERATING PANEL**

## 2.4 SPARE PARTS LIST

Order №.	Description
33-090 002	Magnetic stirrer
33-090 008	Bottle Adapter
33-090 009	Bottle adapter
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
33-090 044	Bulkhead fitting 6mm with threaded connector
33-090 056	Activator for magnetic stirrer
33-090 210	O-Ring 9 x 1,5
33-090 217	O-Ring 17x2
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
33-090 711	Inlet plug ¼"
33-090 712	Outlet plug ¼"
33-090 713	Actuator (LED)
33-090 716	Dosing plug
33-093 060	Bottle cap

33-090 023	Power supply circuit board 85-264 V
33-090 024	Main board complete
33-090 025	Control unit complete 85-264 Volt
33-090 026	Peristaltic pump complete
33-099 007	Housing for control unit with lid
33-099 700	Operating manual German
33-099 701	Operating manual English

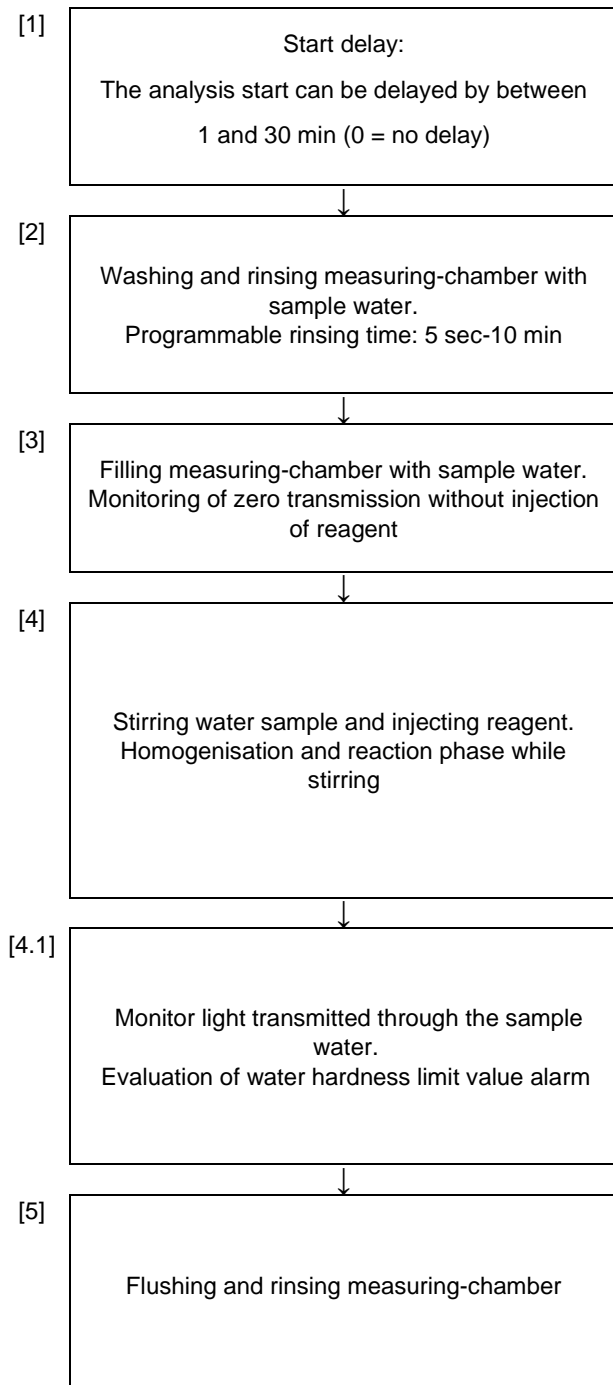
FIG 2.3



<b>33-090 028</b>	<b>MAINTENANCE – KIT</b>
1x 33-090 038	Cartridge of peristaltic pump
1x 33-090 008	Bottle connector
1x 33-090 011	Suction lance
1x 33-090 217	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

## 2.5 Operation principle of Sycon 2501

An analysis cycle consists of 5 steps



When monitoring hot water, it is necessary to cool the water before it can be analysed. A cool water valve can be opened via **REL 3**. The delay time should be set to ensure that the water is cool enough before the inlet valve is opened and the analysis begins.

When the inlet valve is opened, the measuring-chamber and pipes are rinsed until all traces of the previous analysis are removed and the new water sample is in the chamber.

Before an analysis begins, an internal calibration takes place based on a water sample without reagent content. If the LED is defect a fault will be reported.

The dosing pump injects a defined amount of indicator into the water sample. The stirrer coil, activated at the same time, mixes water and reagent. The reagent causes colouration of the water sample in accordance with the hardness components of the water. Reagents are calibrated to change colour at certain limit values. When unreasonable values are registered – e.g. no reagent - a fault will be reported.

Results are shown by the red/green LED. If the limit is exceeded, an alarm will be set off. The result of the analysis is evaluated on the following basis:  
Below the limit = Good (green)  
Over the limit = Bad (red)  
NB. The result is inverted if switch S9 is set to 'ON'.

NB: During Interval measuring-chamber is kept filled with water.

Analysis start:

- A automatically in 4 programmable intervals: (0)15 / 30 / 60 / 120 minutes
- B manually by pushing the Start-button
- C via an external switch if the programmable switch S10 is 'ON'

Attention! If the interval (0)15 is programmed, analysis runs can only be triggered through an external switch (interval 0 minutes).

By means of a flow monitor or a timer, the analyses can be suppressed during periods when the water conditioning system is switched off or in regeneration, or no samples are being taken. In this case the programmable switch S10 must be in 'OFF' position.



## 2.6 Functions

The SYCON 2501 Fe system has the following features:

- [1] Automatic detection of iron leakage in accordance with limit value reagent 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.
- [3] The interval between each analysis can be set to 15; 30; 60 or 120 minutes. The start of analysis can be triggered by an external switch
- [4] Reliable detection of iron leakages by means of limit value reagents.
- [5] Monitoring of limit values with higher accuracy  
When a BAD condition is detected, a reference analysis may be made after 4 minutes.
- [6] LED status display is independent of language.
- [7] Alarm functions:  
When a hardness leakage is detected, an alarm is issued by switching the potential free relay – **REL 1**. This alarm output may be used, for example, to send a signal to a control panel, to sound a buzzer, to close a valve or to control a programme for the regeneration of a water softening plant.
- [8] Diagnostic programme:  
If a fault occurs in the system an alarm is issued by switching the potential free relay – **REL 2**. Technicians may run step by step through the diagnostic program to check functions and find faulty parts in the device (→ page 48).
- [9] Requires minimal maintenance:  
Depending on measurement intervals and frequency of analyses respectively the measuring-chamber has to be cleaned and reagent pipes and o-rings changed once or twice a year (→ page 42).
- [10] Minimal reagent consumption:  
The reagent bottle is easily replaced. The 500 ml bottle does not need to be replaced for approximately three or 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).
- [12] Digital input 'IN':

The potential free switch of a flow monitor, a timer or any other condition switch can be connected to this input. (→ page 26). When the contacts are open, no analysis will be carried out during the programmed interval. As an alternative, this input can be used as a start input.

### Three potential free Relay Outputs - REL 1 / REL 2 / REL 3

The potential free relay outputs can be used to transmit a limit alarm (REL 1), a unit failure (REL 2) or an active analysis (REL 3) to a control panel for example (→ page 25). Alternatively, signalling units or valves may be activated.

#### [13] 'BOB'- operation

The abbreviation BOB comes from the German Betrieb ohne Beobachtung (operation without permanent supervision) and follows a regulation of German TÜV (technical inspection authority) especially for boiler houses, which requires reliability of instruments for at least 72 hours.

The REL 2 output may be used to transmit a warning to a remote location when the reagent needs to be replaced.

Analytical devices of type SYCON 2501 were specially designed for BOB-operation (operation without permanent supervision). Boiler houses, running in BOB-operation, require a qualitative monitoring of water hardness in the boiler feed water according to the technical guideline TRD 604 ('Technische Regeln für Dampfkessel' published by German TÜV).

Analytical devices of type SYCON 2501 record the consumption of reagent in order to ensure that in periods of operation without supervision, a sufficient amount of reagent for reliable analysis is available in the bottle. The sufficient amount of reagent should be calculated independently of set analysis intervals for the next 72-hour operation.

If the very next 72-hour BOB-operation cannot be reliably guaranteed, an alarm "lack of reagent" is issued via relay REL 2.



**WARNING**



**NOTE**



**WARNING**



+



**NEW REAGENT BOTTLE**

- 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 are pressed during an analysis without a new, full bottle of reagent being installed, the reagent quantity will not be properly calculated, and the alarm will not be issued on time or at the wrong time. This also applies if the RESET action is forgotten.

Attention! If no iron is present in the water, no colour change will appear. If no reagent is dosed, even for water with iron content no colour change will appear and the reading will wrongly indicate no iron content.

## CHAPTER 3

INSTALLATION AND COMMISSIONING  
OF LIMIT ANALYSER**WARNING****3.1 Installation Requirements**

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

Proper operation can only be guaranteed if reagents approved by the manufacturer are used (→ page 12 or 27).

Changes to the electrical connections and the programming should only be carried out by a qualified person.

The plant 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 electro-magnetic 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) should be fitted.

**3.2 Instruction for Installation**

When making connections to printed circuit boards, the following guidelines must be followed:

**NOTE**

- Do not apply excessive force to the terminals. Only apply the force necessary to open the terminal (or to release the cable when disconnecting).

Push terminals are capable to receive single-strand conductors up to 1.5 mm<sup>2</sup>. However, multi-stranded conductors without cable shoes should not exceed 1.0 mm<sup>2</sup> and with cable shoes only 0.75 mm<sup>2</sup>. According to the manufacturer, use of cable shoes is not required.

To loosen a clamp, a small slot screwdriver, with a maximum blade width of 3mm is to be used.

- Observe all applicable electrical regulations.
- 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 enclosure. The manufacturer offers a standard enclosure. The mounting and dimensions are described in this guide:



#### NOTE

Custom-built or tailor made enclosures for the devices of the series Limit Analyser /SYCON 2501 / SYCON 2800 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**

Use 4 screws (max. 6 mm) to mount the unit on a wall or suitable support structure. For spacing of holes see (**Fig. 3.3**→ page 24)

#### Or ► **step I b mounting with enclosure**

Use the 4 brackets included to mount the unit (**Fig. 3.4**→ 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 spacing of holes 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 pipe 6x4. Between water treatment plant and analyser a manual shut-off valve and particle filter (if necessary) should be installed. Drainage should be fed via short connection into an open funnel → run off to atmospheric pressure.



#### WARNING

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

#### ► **step III electrical connections**

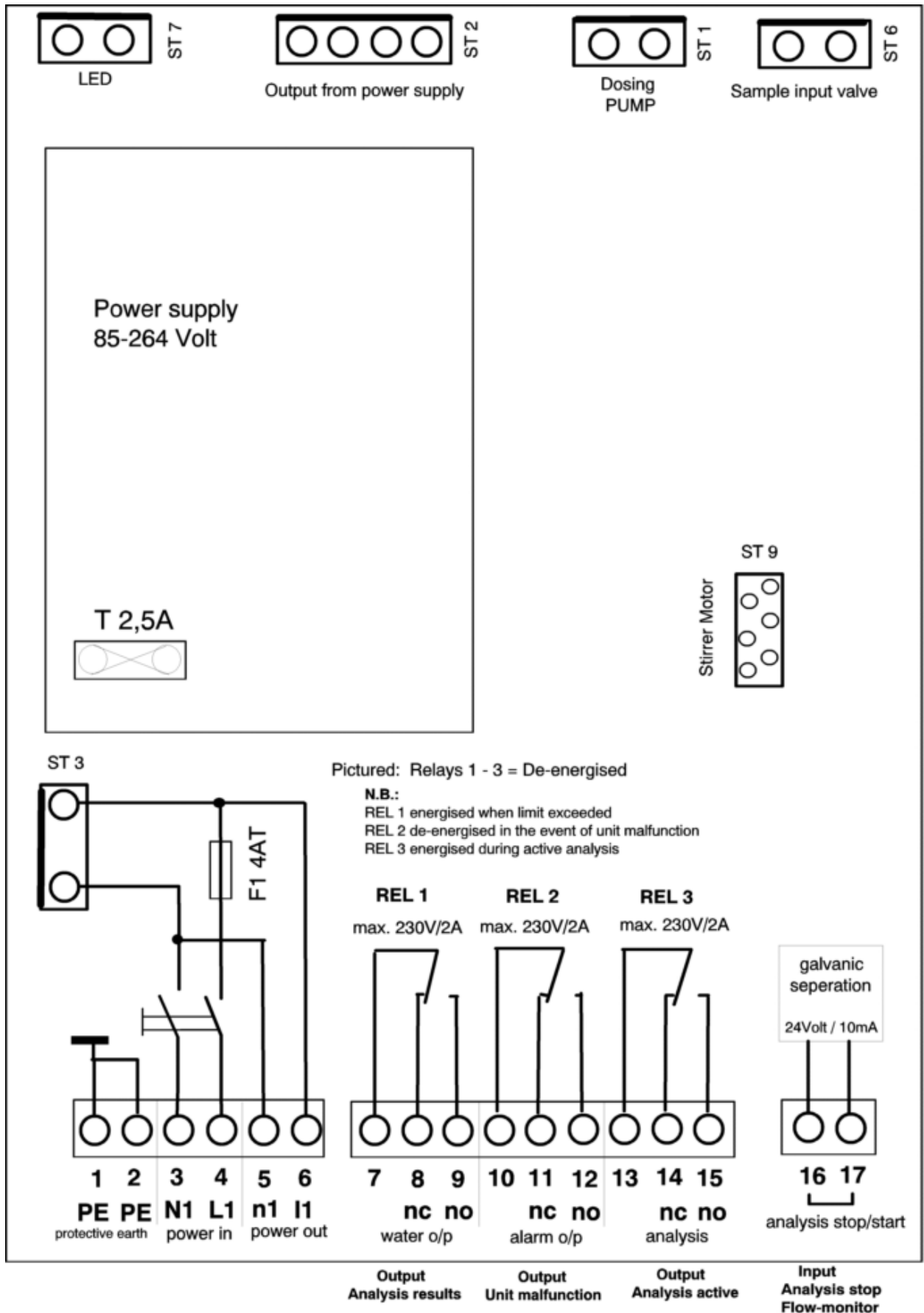
Refer to information in figure 3.1 (terminal connection (→ page 21) and figure 3.2 (connection instructions (→ page 22).

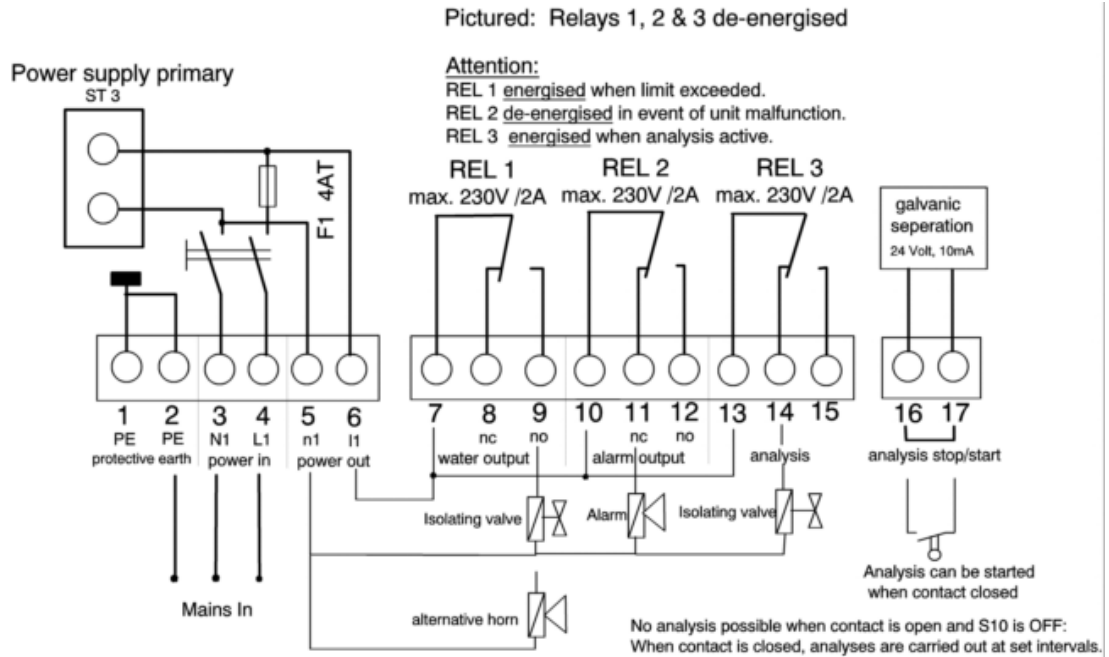


#### ELECTRICITY

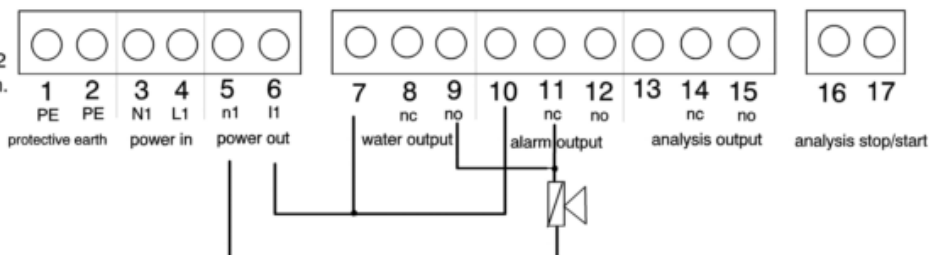
Work on electrical equipment of the plant / machinery must be performed by a qualified electrician! Observe all applicable electrical installation rules

→ applicable supply voltage 85 - 264 VAC, 47 - 63 Hz

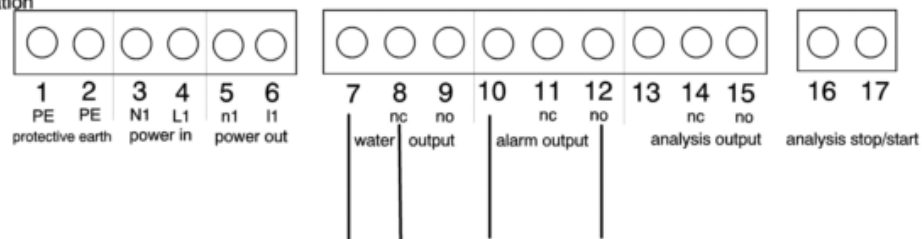
**Fig. 3.1** Terminal layout and internal connections

**Fig 3.2** Wiring diagram

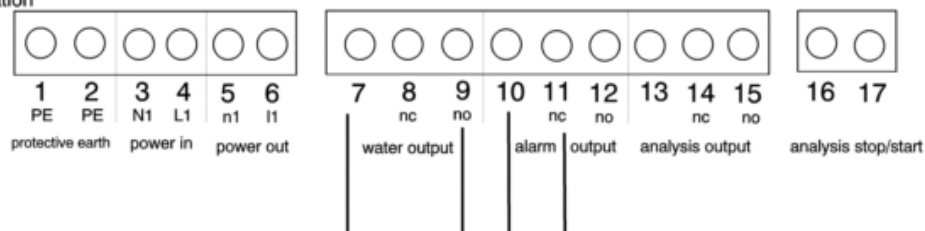
Option:  
Parallel operation  
of REL 1 und REL 2  
if connecting a horn.



Option:  
Connecting potential free  
contacts for communication  
with a control room or  
controller: Contacts are  
closed if limit exceeded  
or unit malfunctions.



Option:  
Connecting potential free  
contacts for communication  
with a control room or  
controller: Contacts are  
open if limit exceeded  
or unit malfunctions.



**► Step IV install a new, full reagent bottle**

Open the reagent bottle and insert the suction lance into the bottle. Secure the cap by hand. Avoid cross threading (refer also → page 45 "changing reagent bottle").

**NOTE**

The reagent bottle is not automatically included with the device.  
For available reagents and corresponding order numbers refer to chapter 3  
→ page 12

→ only use original reagents of type Fe-LRS or Fe-HRS in round 500 ml bottle

**WARNING****risk of pollution**

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

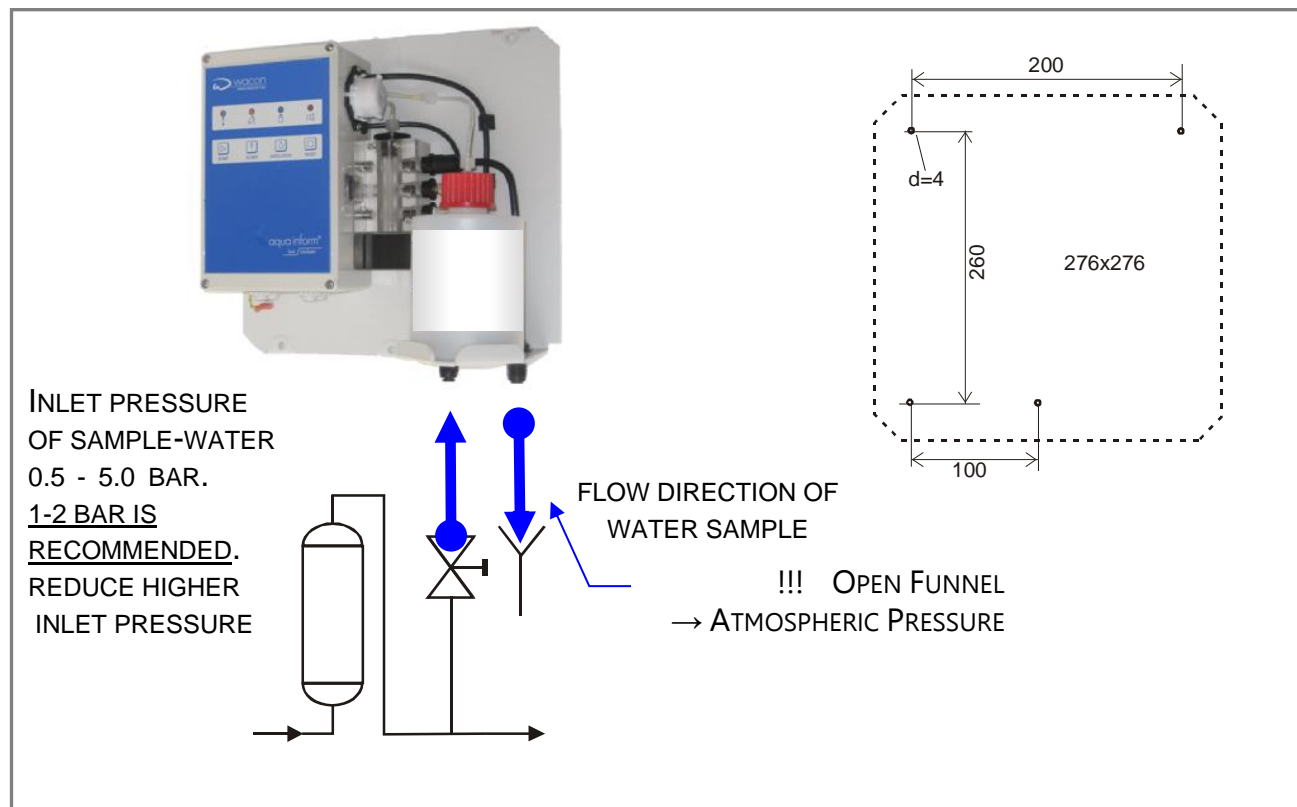
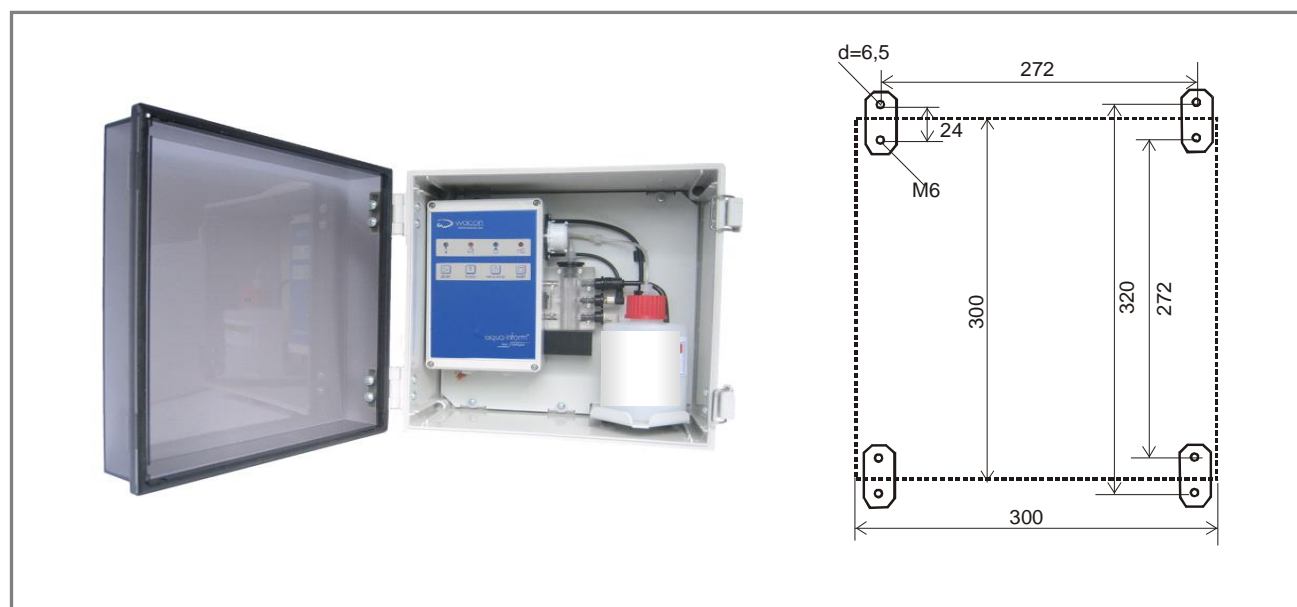
→ Follow the instructions in the safety data sheets

Safety data sheets on common types of reagents are available for download on our website [www.rls-wacon.de](http://www.rls-wacon.de)

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

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

- work wear
- 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

#### Exceeded limit → relay REL1 terminals 7 / 8 / 9

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

Using the program switches S4 and S5 (→ page 33) to set different functions for the relay REL1.

1. Impulse contact → 3 seconds
2. Impulse contact → 60 seconds
3. Permanent contact → without interruption of analysis
  - Alarm auto-quit.
  - the left red LED flashes until reset-button is pressed.
  - Further analyses will be carried out during the selected interval.
4. Permanent contact → with analysis stop
  - The alarm is active and must be quit manually
  - the left red LED flashes until reset-button is pressed
  - No further analyses will be carried out at the selected intervals until the alarm is reset.

#### Malfunction → relay REL2 terminal 10 / 11 / 12

Relay REL2 signals 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 reagent → content of reagent bottle is lower than app. 10%  
refer to page 18: **BOB-operation**
- Zero transmission error → insufficient brightness before the addition of reagent
  - 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 reagent
  - no reagent was dosed
  - no water in measuring chamber
  - no homogenisation (magnetic stirrer misses or agitator failure)

#### Analysis process → relay REL 3 terminals 13 / 14 / 15

Signal devices and valves can be connected. The relay switches during the analysis.

The taking of a sample can be delayed by means of the rotary switch 'Delay time'. It can thereby be ensured that, if a sample cooler is installed, the sample has time to cool before it is introduced to the measuring-chamber.

### 3.5 Connection of remote signals

#### Digital input

→ 'IN'

terminals 16 / 17

An analysis while the water softener is in regeneration may erroneously indicate hardness leakage. An attempt to test with the water feed closed would return either hardness leakage or stagnant water into the feed pipes or a system error due to a lack of flow would be signalled.

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

Connecting an external potential free contact (e.g. flow control switch or level control switch) will allow an analysis only while the water softener is turned on and water flows, or will suspend analysis while the water softener is in regeneration.

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

#### Method 2

Utilizing an external timer

Analysis start time and stop time may be set by an external timer. A potential free timer-output can be connected to this remote-signal input terminal block.

#### Alternative contact input

→ 'IN'

terminals 16 / 17



#### NOTE

If programme switch S10 is set to 'ON', this input serves as an analysis start input. In addition to the programmed start intervals, an analysis can be started at any time via this input.

NB. If switches S1 and S2 are both 'OFF' (5 Min. Interval), an analysis can only be started via this input or manually.



#### NOTE

It is recommended to connect a remote signal wherever possible to prevent false readings and avoid unnecessary false alarms.

Especially when there is a direct connection to a water treatment plant should false readings be avoided.



#### WARNING

Connect only potential free contacts to terminals 16 + 17

Function of terminals 13+14 can be checked in diagnostic menu step 13

If terminals 16 + 17 are not used, they must be bridged and S9 set to 'OFF'

## CHAPTER 4 OPERATION AND USE

### 4.1 Summary of limit analysers of Sycon 2501 series

Analysers of Sycon 2501 series, type Fe are designed to monitor the limits set for the iron content in water through the use of colorimetric analysis.

The one reagents specifically designed for this instrument react with the iron present in the water. Depending on the iron concentration a different colour of the water will appear. The instrument then analyses the translucence of the resultant colouration for light of a specific wavelength.

The time consuming and inaccurate measurement by hand is no longer necessary and measurement can take place 24 hrs a day.

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

For the monitoring of limits different reagents were developed. For the analytical instrument Sycon 2501 Fe the following limit reagents are offered:

#### Limit Analyser

SYCON 2501 Fe	30-010321
Standard enclosure	33-099005

#### Reagents

Fe-LRS	0.03 – 0.6 mg Fe/l	32-080320
Fe-HRS	0.3 – 6.0 mg Fe/l	32-080330

## 4.2 Before initial operation

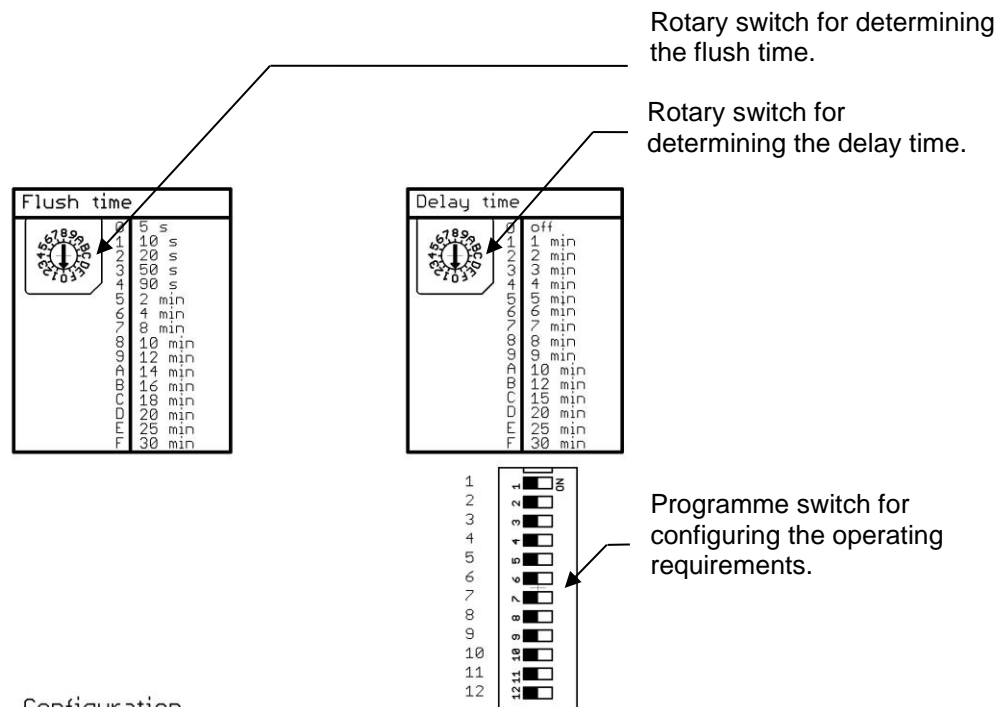


### NOTE

- Make sure that the steps from **chapter 3** (→ page 19) have been performed properly.
- Make sure that the unit is securely mounted to a wall or suitable surface.
  - If in doubt, consult a specialist or contact your supplier or distributor
- Make sure electrical connections are correct
- 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 (→ **chapter 2** see table on page 11)
    - Install, where necessary, a pressure reduction valve
  - Make sure that water quality meets the specified requirements (→ **chapter 2** see table on page 11)
    - Take any appropriate measures to improve the feed water quality (e.g. installation of a filter)
- Make sure that the bottle has sufficient reagent
  - Check the seal of the bottle for leaks and that the top is firmly screwed on the bottle.
  - Verify that the correct type of reagent is used for the application.
  - Verify that the reagent has not expired.
- Make sure that all plugs are firmly in the measuring chamber, in the correct place and that they are properly secured with securing pins (→ see **Fig 2.3** → page 15).
- Make sure that all water and reagent 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 correctly connected to 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 Programme Switches

The Limit Analyser has 3 programme switches:



Configuration

1	Interval	<input type="checkbox"/> 5( $\infty$ )	<input type="checkbox"/> 10	<input type="checkbox"/> 20	<input type="checkbox"/> 30
2		<input type="checkbox"/> min	<input type="checkbox"/> min	<input type="checkbox"/> min	<input type="checkbox"/> min
3	Retry cycle	<input type="checkbox"/> off	<input type="checkbox"/> on		
4	Relay	Impulse	Permanent/Analysis		
5		<input type="checkbox"/> 3 <input type="checkbox"/> 10	<input type="checkbox"/> No <input type="checkbox"/> Stop		
		<input type="checkbox"/> sec <input type="checkbox"/> sec	<input type="checkbox"/> stop <input type="checkbox"/> stop		
6	Indicator	<input type="checkbox"/> Total	<input type="checkbox"/> Carbonat		
7	See manual	<input type="checkbox"/> hardness	<input type="checkbox"/> hardness		
8	for more	<input type="checkbox"/>	<input type="checkbox"/>		
9	Limit	<input type="checkbox"/> off (Exceeded)	<input type="checkbox"/> on (Shortfall)		
10	Input	<input type="checkbox"/> off (Stop)	<input type="checkbox"/> on (Start)		
11	Reserved	<input type="checkbox"/> off	<input type="checkbox"/> on		
12	Mode	<input type="checkbox"/> off (Service)	<input type="checkbox"/> on (Test)		

## 4.4 Setting the programme switches

The operating requirements of the Limit Analyser are programmed using the small DIP switches S1 – S12.



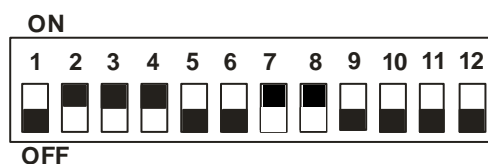
**WARNING**

Switch off the unit and open the lid of the controller

→ **WARNING** supply voltage 85 -264 VAC 47 – 63 Hz

→ The DIP-switches (dual in-line package) are located on the reverse side of the display board. The display board is screwed to the unit lid and should not be removed.

Also located on this board are the 2 16 position rotary switches for setting the flush time and the delay times.



**DIP SCHALTER**

Factory settings

Flush time	4 minutes	Position 6	4 min.	
Delay time	Off	Position 0	0 min.	
Analysis interval	30 minutes	S1 OFF	S2 ON	
First result suppression	Yes	S3 ON		
Function Relay 1	Contact closed = continuous analysis	S4 ON	S5 OFF	
Limit value iron content	0.2 mg/l	S6 OFF	S7 ON	S8 ON
Monitoring	Signal when limit exceeded	S9 OFF		
Indicator type	Fe-LRS 0.03-0.6 mg/l	S11 OFF		
operating mode	Analysis	S12 OFF		



**ELECTRICITY**

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

→ **WARNING** supply voltage 85 – 264 VAC 47 – 63 Hz



**NOTE**

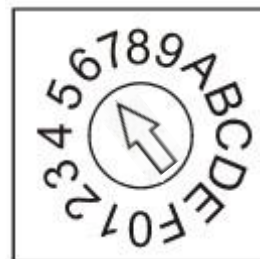
For the operation of the rotary switches and for setting the slide switch you need a small insulated screwdriver

→ Please use only good quality tools, this will help avoid damage to sensitive components

### ► flush time

The pre-analysis flush time is programmed using the left hand rotary switch “Flush time“. The range is from 5 seconds to 30 minutes.

Pos	time	Pos	time	Pos	time	Pos	time
0	5 s	4	90 s	8	10 m	C	18 m
1	10 s	5	2 m	9	12 m	D	20 m
2	20 s	6	4 m	A	14 m	E	25 m
3	50 s	7	8 m	B	16 m	F	30 m



#### NOTE

Calculate the flush time according to the length of the water supply pipe in order to ensure an analysis of a fresh sample.

→ For example:

a 5 meter long pipe (6 x 4) with an inner diameter of 4 mm has a volume of approximately 63 ml and, depending on the pressure, will be flushed in approximately 4 seconds.

rules of thumb:

- one meter of a pipe with inner Ø 4mm contains approx. 13 ml water
- doubling the diameter results in a fourfold volume (Ø 8 mm ca. 50 ml/m)
- The rate of flow is influenced by the internal diameter of the inlet valve and the water pressure.



#### NOTE

The operating conditions will vary according to the location of the plant. They are affected by the size of the supply pipes and the pressure reductions due to heavy demand from other users, etc.

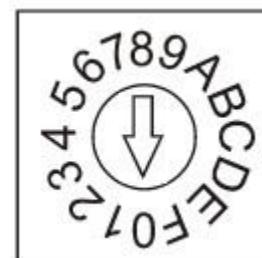
Measure the amount of flushed water at the current settings and then compare this with the theoretical amount that you have calculated. Set the flush time accordingly to ensure that a fresh sample is taken.

**We recommend a minimum flush time of 20 seconds.**

### ► delay time

The time delay prior to taking a sample is programmed using the right hand rotary switch “delay time“. The range is from 0 seconds to 30 minutes.

Pos	time	Pos	time	Pos	time	Pos	time
0	0 m	4	4 m	8	8 m	C	18 m
1	1 m	5	5 m	9	9 m	D	20 m
2	2 m	6	6 m	A	10 m	E	25 m
3	3 m	7	7 m	B	12 m	F	30 m



#### NOTE

Choose the delay time to ensure that no hot water is introduced into the measuring-chamber.

- When monitoring condensate, it is necessary to cool the sample to below 40°C. If there is a long time interval between analyses, it makes no sense to keep the condensate permanently cool. A cool water valve can be opened when a sample is required. Only when the sample temperature is under 40°C should the inlet valve to the analyser be opened.

- The delay time must be calculated on site since it will depend on the water temperatures, the water pressure and the flow conditions of the system. Always begin with a higher delay time and adjust accordingly.

### ► analysis interval

There are four fixed interval times selectable by varying the positions of switches 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.



#### NOTE

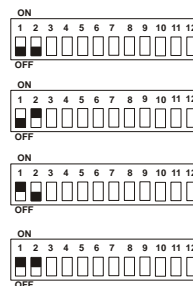
→ When input 'IN' is open circuit, analysis start is disabled. The unit is delivered with terminals 16 / 17 bridged. Ensure that this bridge is in place or, alternatively, connect an external switch (e.g. flow monitor).

→ Input 'IN' can be switched over from flow-monitor function to start function by means of S10 (S10 = ON). Only the intervals 30, 60 and 120 minutes apply to the start function. If S1 and S2 are OFF, auto-start is disabled.

NB! The external start is disabled when input 'IN' is bridged.

Analysis intervals:

S1	S2	time
OFF	OFF	5( $\infty$ )* min.
OFF	ON	30 min.
ON	OFF	60 min.
ON	ON	120 min.



( $\infty$ )\*When the programme switches S1 and S2 are OFF, and S10 is ON, the interval function is deactivated.

### ► analysis repetition

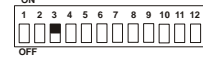
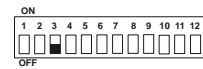
It can be determined whether a second analysis should be carried out to verify the result of a failed test by utilising the retry function. (first result suppression). Only when two consecutive analyses indicate bad water conditions, will the relay REL1 be activated.

This second analysis is carried out independently of the set interval approx. 4 minutes later. If a flow monitor is connected to terminals 16 / 17 (IN) the 2<sup>nd</sup> analysis will be carried out even when no flow has been detected.



First result suppression REL 1
--------------------------------

S3	Function
OFF	No first result suppression
ON	First result suppressed



### ► Relay function REL 1

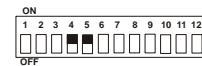
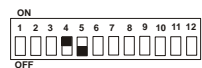
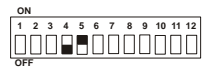
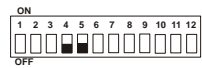
Relay REL 1 signals that the limit has been exceeded. You can choose between an impulse contact (3 und 60 seconds) and a permanent contact.

Possibilities for permanent contacts:

1. Further analyses will be carried out and if the sample is below the limit, REL 1 will be deactivated automatically.
2. If the limit is exceeded, no further analyses will be carried out and REL 1 must be deactivated manually (RESET). Only then can more analyses be carried out.

Function relay 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



► **measurement parameter****NOTE**

The analyser can be used to monitor the iron content for two different reagents:

- type LRS, range 0-0.6 mg/l
- type HRS, range 0-6.0 mg/l

For each reagent 8 limit values can be set through the switches S6 – S8 (see table below and the diagrams on the following page).

Limit Values in mg Fe/l					
S6	S7	S8	Indicator LRS	Indicator HRS	
OFF	OFF	OFF	0.03	0.3	
OFF	OFF	ON	0.05	0.5	
OFF	ON	OFF	0.1	1.0	
OFF	ON	ON	0.2	2.0	
ON	OFF	OFF	0.3	3.0	
ON	OFF	ON	0.4	4.0	
ON	ON	OFF	0.5	5.0	
ON	ON	ON	0.6	6.0	

► **limit monitoring**

Normally a signal is given if the designated limit is exceeded. In which case, for example, a deferrization process can be monitored for iron leakage.

- If S9 is in the OFF position, a signal is given if the iron content of the sample is above the designated limit.
- If S9 is in the ON position, a signal is given if the iron content of the sample is below the designated limit. This feature is useful in a water grading plant when a minimum iron content is required.
- When S9 is ON all the functions described in this manual apply except that the function of the limit is inverted

**NOTE**

Limit monitoring		
S9	Function	
OFF	Signal when above limit	
ON	Signal when below limit	

### ► input function

The input 'IN' can be assigned to two different functions:

**flow monitoring function:** This function is used if an analysis is to be started when a water sample is taken. It is particularly useful for plants that require sporadic tests (e.g. when filling storage containers at long time intervals).

This function is also used when an analysis is not required (e.g. during the regeneration of a filtration plant).



#### NOTE

→ NB. Contacts to terminals 16 / 17 must always be potential free.

→ Any other contact source can be used with these terminals.

→ The unit is delivered with terminals 16 / 17 bridged. The flow monitor function is therefore disabled.

### ► start function

With this setting, you configure the operating mode of the input contact.

#### **Application 1: Analyses are to be carried out continually at pre-set time intervals.**

In this case, the switch S10 is OFF (works setting). The IN terminals 16 & 17 should be bridged.

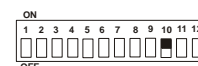
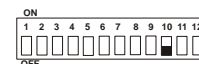
#### **Application 2: Analyses will be carried out at fixed time intervals if a flow-monitor registers flowing water.**

The switch S10 is in the OFF position. The flow-monitor is connected to terminals 16 & 17 in place of the bridge. The first analysis takes place 3 minutes after switching on the unit even when the flow-monitor has not detected any water flow. Thereafter, the analyses are carried out at the pre-set intervals only when the flow-monitor registers water flow.

#### **Application 3: The analysis is started by an external controller.**

In order to control the analysis intervals from a controller, the controller must be connected to terminals 16 & 17. The switch S10 must be set to ON in order to deactivate the unit's internal intervals. If the switches S1 & S2 are set to OFF, no interval controlled analyses will take place. Otherwise, the intervals 10, 20, and 30 minutes for the settings of both switches apply.

Input function 'IN'	
S10	Function
OFF	Flow monitor No analysis when contact open
ON	Start function Analysis start when contact closed



## ► Selection of Indicators

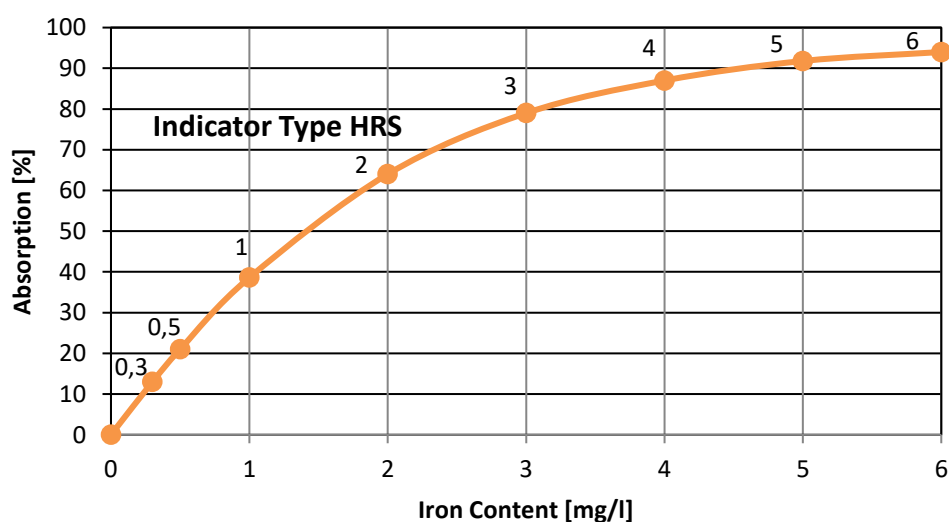
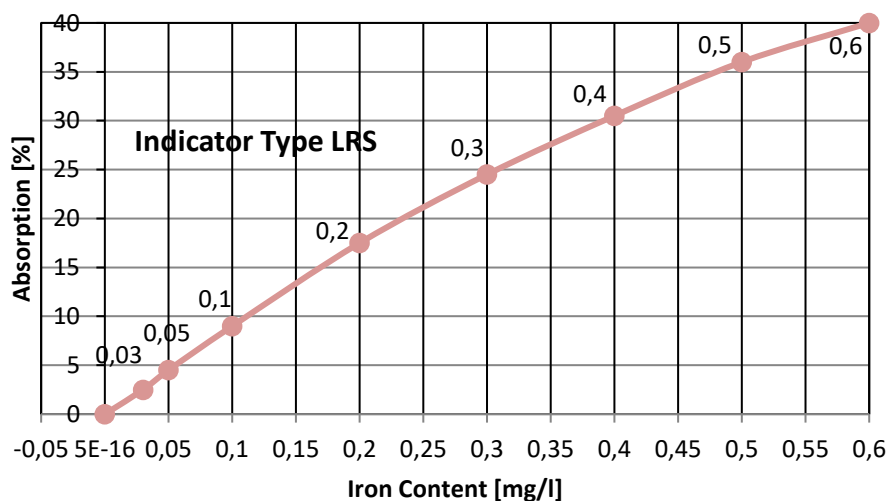
You can choose between two indicators:

Type LRS, range 0 – 0.6 mg Fe/l

Type HRS, range 0 - 6 mg Fe/l

→ see the following diagrams with the displayed programmable limit values (switches S6, S7 und S8).

Selection of Indicators	
S11	Function
off	Indicator LRS
on	Indicator HRS



## 4.5 Start up in 5 steps



### 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 as described under **chapter 4.3/4.4** (→ page 29/30).

#### step 1

##### switch on the unit

- Switch power "on"
- Green LED "analysis result" flashes.

green



#### step 2

##### reset reagent level



- Press the INDICATOR and RESET button at the same time

**WARNING !!!**

run reset function only when you have replaced the empty bottle with a full one

(→ page 45)



#### step 3

##### fill 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 reagent is delivered continuously into the measuring-chamber.

→ During this process, the stirrer rotates.



#### step 5

##### start analysis



- Press START button to run first analysis
- An analysis starts with the flushing of the measuring-chamber



## 4.6 Operation of the unit → automatic operation



### 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 **chapter 4.3/4.4** (→ page 29/30).

→ the unit must be switched on

**analysis result** This LED has different colours and signals the analysis result.

1. **green-flashing:**  
the unit is switched on (green-flashing does 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 is not yet activated  
→ repeat analysis (first result suppression)
4. **red-flashing:**  
the limit has been exceeded – and the relay REL 1 is activated

#### green



#### red



**analysis active** 1. **yellow:**  
the LED lights continuously, thus indicating that an analysis is in progress.

#### yellow



- 2a. **yellow-flashing:**  
the LED will flash, signalling that the analysis interval has expired - next analysis start is delayed because input contact IN is opened (flow –monitor function)

- 2b. **yellow-flashing + (red):**  
the LED will flash, signalling that no analysis can be started automatically. The device was programmed so that after a limit is exceeded, the analysis stops. The red "analysis result" LED flashes or lights simultaneously (see program switch S4 and S5 on page 34)

#### Red yellow

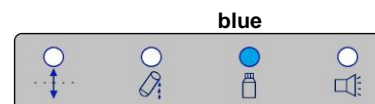


- 2c. **Rapidly flashing yellow:**  
the LED flashes rapidly, signalling that the analysis start is delayed (e.g. in conjunction with a sample cooler).

See setting the delay time on page 31.

**Reagent shortage**

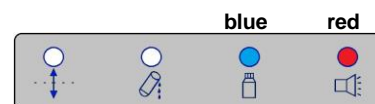
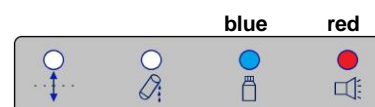
1. **blue:**  
the LED lights continuously, thus indicating that the reagent level is below 30%
2. **blue-flashing:**  
the LED flashes, signalling that the reagent level is below 10%. At the same time, the fault relay REL 2 is activated.  
**'BOB-function'** → page 18

**alarm message limit exceeded**

- 1a. **red-flashing + red-flashing**  
Red "Analysis result" LED flashing + red "alarm" LED flashing:  
The "alarm" LED flashes and signals that the limit has been exceeded in conjunction with the LED "analysis results".  
The relay REL 1 "limit exceeded" is energised.
- 1b. **red-flashing + red**  
Red "Analysis result" (LED flashes + red alarm" LED':  
The "alarm" LED is on and signals that the limit has been exceeded in conjunction with the LED "analysis results".  
→ The relay REL 1 "limit exceeded" was de-energised by a reset.

**alarm message: reagent shortage**

- 2a. **blue-flashing + red-flashing**  
Blue "indicator" LED flashing + red "alarm" LED flashing:  
The red LED flashes and signals "lack of reagent" in conjunction with the flashing blue LED <10%  
→ the fault relay is energised.
- 2b. **blue-flashing + red**  
Blue "indicator" LED flashing + red "alarm" LED  
The red LED lights permanently and signals reagent level is <10% in conjunction with the flashing blue LED.  
→ the fault relay is de-energised.



**alarm message:  
malfunction of  
unit**

**3a. red-flashing**

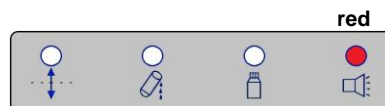
Red “alarm” LED flashing:  
the LED signals a malfunction of the unit

- incorrect zero transmission
- or
- incorrect measurement
- all other displays are off
- the fault relay is energised

**3b. red**

Red “alarm “ LED:  
the LED signals a malfunction of the unit

- incorrect zero transmission
- or
- incorrect measurement
- all other displays are off
- the fault relay is de-energised.





## 4.7 Operation of the unit → manual operation



### 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 **chapter 4.3/4.4** (→ page 29/30).

→ 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.
- If an analysis is started manually and REL1 and REL 2 are activated, the relays will be de-activated.



### FLUSH



#### rinsing and filling of measuring-chamber

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



### INDICATOR



#### de-aerate dosing-pump

- By pressing the button INDICATOR you can turn on the peristaltic pump at any time to add reagent or to de-aerate the dosing system.
- During this process, the stirrer rotates



### RESET



#### RESET function

- De-activates relay REL1 if limit exceeded
  - see analysis result page 37.
- De-activates relay REL2 when a malfunction has occurred or there is a lack of reagent.
  - see alarm messages page 39/40.
- Interrupts analysis process.
  - Alarms should be cancelled first.



#### Reagent level reset

- Pressing "indicator" and "reset" together resets the reagent level monitor to "full".



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



The reset has been carried out when the blue and red LEDs light up simultaneously.

## CHAPTER 5 MAINTENANCE AND SERVICE

To ensure long-term functioning of the analyser, it is necessary to clean the measuring-chamber and replace worn parts from time to time depending on the frequency of analyses 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 trained personnel. Always observe the following safety instructions.

Ideally, the maintenance work should be carried out 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 at the main switch.

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



### ELECTRICITY

**WARNING:** In the case the cover of the control box is opened, note that 230 Vac 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

NB. During your maintenance work no analysis can be carried out and a hardness leakage may not be detected.



### PRESSURE

Switch off the water supply before disconnecting the inlet water pipe.

→ Water can damage the electronics.



### WARNING

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

- Follow the instructions in the safety data sheets.
- Wear suitable protective clothing i.e. Work wear; laboratory gloves; eye protection.

## ► Maintenance in 3 steps

### For routine maintenance in intervals of 4 to 6 months

#### Requirements

time:	approximately 30 minutes	
material:	reagent→	page 12
	maintenence set no.1	depending on limit Art.nº 33-090 033
	cleaning set	Art.nº. 30-010 900
	paper towels	
tools:	screw driver	
	cup or small bucket	
	cleaning set	

#### Before commencing switch unit OFF!

#### MAINTENANCE STEP 1

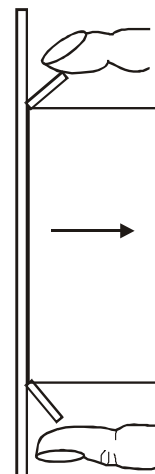
#### CHANGE CARTRIDGE OF PERISTALTIC PUMP

After about 6 month, the dosing-pump cartridge and pipe should be replaced because the terminal clutch wears out and the pipe becomes brittle.

1. Press locking clips together with thumb and forefinger and pull cartridge to the right off the motor shaft
2. Disconnect the pipes.
3. Remove the reagent inlet plug at the top of the measuring-chamber and replace the blue O-ring.
3. Re-insert the plug firmly and secure with the securing pins.
4. Wipe up fluid leaks with a paper towel.
5. Replace new peristaltic pump cartridge in reverse order of the above.
6. De-aerate pump  
→ press button INDICATOR



INDICATOR

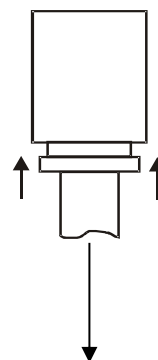


**MAINTENANCE  
STEP 2 A**

→ MAINTENANCE 2B  
(SEE ON PAGE 46)

**WARNING****FLUSH****WARNING****CLEANING OF MEASURING-CHAMBER:  
REMOVE, CLEAN AND REINSTALL**

1. First release pressure from water supply line
  - shut off water supply in the treatment plant
  - switch on the unit for a while
  - briefly press the flush button. By opening the inlet valve you release any residual pressure.
2. Hold or place the small bucket under the water inlet connection.
3. Open the connector. Unplug the 6 mm inlet pipe
  - Briefly press the flush button. By opening the inlet valve, the measuring-chamber drains almost completely.
  - collect leaking water in the bucket
  - **switch the unit off again.**
4. Pull the securing pins outwards (do not attempt to remove the pins entirely) and pull the plugs out of the measuring-chamber
  - plugs can be pried gently with a screw driver.
5. Remove measurement-chamber from the retaining bolts
  - Empty the measuring-chamber
  - Insert measuring-chamber in a sufficient quantity of cleaning liquid in the box of the cleaning set for about 10 minutes
  - Clean the measuring-chamber carefully with the brushes of cleaning set
  - Rinse the measuring-chamber with clean water.
6. Clean the plugs.
7. Reassemble the measuring-chamber in the reverse order of disassembly.



**MAINTENANCE  
STEP 3****NOTE**

FLUSH



INDICATOR



+

**REFILL REAGENT AND RESET THE STORAGE  
COUNTER**

1. remove empty reagent bottle
  - open bottle cap by turning
  - remove the suction pipe carefully
  - if reagent fluid leaks, wipe up with a paper towel
  - dispose of empty bottle
2. replace full reagent bottle
  - remove the cap
  - insert the suction pipe carefully
  - screw bottle cap firmly shut
  - pay attention to a correct positioning of the cap and the adapter.
3. de-aerate the reagent pipe
  - fill the measuring-chamber with water by pressing the FLUSH button
  - dose reagent until the pipes and the cartridge of the peristaltic pump are completely filled with reagent and no air bubbles are visible by pressing INDICATOR button
4. confirm bottle change and reset counter
  - press INDICATOR and RESET button simultaneously until the right red and the blue LEDs light up briefly

blau      rot



**Step 1 - step 2A - step 2B - step 3****Annual maintenance in intervals of 6-12 month**

requirements	time:	approximately 30 minutes	
	material:	reagent → page 27	depending on limit
		maintenance set no.2	Art.nº. 33-090 028
		cleaning set	Art.nº. 30-010 900
		paper towels	
	tools:	screw driver	
		cup or small bucket	
		cleaning set	

**Carry out steps 1 & 2 as described on page 42 & 43 then follow the instructions below:**

:

**MAINTENANCE  
STEP 2B****CHANGE PIPES AND O-RINGS**

The maintenance step 2B follows the maintenance step 2A → page 43

Orientate yourself on **Figure 2.3** in page 15

**NOTE**

- 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. Lubricate well.

Now continue with step 3 (page 45)

## ► Replacing components



### WARNING

Please read the notes at the beginning of Chapter 5 → page 42.  
→ Please read the notes in the data sheets of components

#### CHANGE OF SOLENOID INLET VALVE

Artikel Nr. 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. Remove ¼" inlet connector
4. Install the new valve in reverse order

#### REPLACEMENT OF AGITATOR

Artikel Nr. 33-090 710

1. Disconnect power and open the lid of the control box
2. Unplug the red connector
3. Unscrew the mounting screws
4. Install the new agitator in reverse order

#### REPLACEMENT OF PERISTALTIC PUMP MOTOR

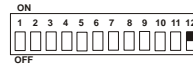
Artikelnr. 33-090 026

1. Dismantle cartridge of peristaltic pump → page 41
2. Disconnect power and open the lid of the control box
3. Unplug the pump
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

A test programme is installed to check the functions of the unit. It is necessary to open the cover of the control (**chapter 4.3** → page 29) and to change the position of DIP-switch combination S12:

test programme	
S12	Function
ON	Test programme



START



NOTE

**Note the position of the DIP switches and ensure that they are returned to these settings on completion of the test.**

This test programme should only be called up and checked by a competent person. Please observe the following safety instructions!



DANGER

The test program must be operated with the control unit lid open.

**Take great care!**

**WARNING:** 230 VAC 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
- Damage of the equipment.



ELECTRICITY



WARNING

NB. Activating the output relays can cause error signals. Therefore it may be necessary to remove peripheries during this function test.



PRESSURE

NB. When checking the inlet valve with the water feed connected, water will be fed into the measuring-chamber. Therefore ensure that all water connections are properly fitted or that the water feed is turned off.

→ **Remember! Water can damage the electronics.**



Diagnosis in 15 Steps



After turning the switch S12 to the ON position, the test steps described below are called up by pressing the START button

DIAGNOSIS 1

CHECK LEDs

Press the START button briefly.  
The LEDs light one after the other:

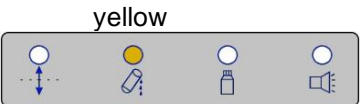
1. **GREEN** ANALYSIS GOOD



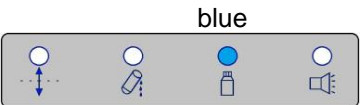
2. **RED** ANALYSIS BAD



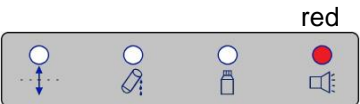
3. **YELLOW** ANALYSIS ACTIVE



4. **BLUE** REAGENT



5. **RED** ALARM



DIAGNOSIS 2

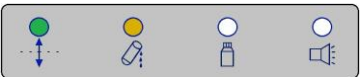


CHECK THE PUSH BUTTONS

Press the START button briefly.  
Pressing the following buttons will cause the LEDs to light jointly with the green LED.



FLUSH GREEN + YELLOW



INDICATOR GREEN + BLUE



RESET GREEN + RED



## DIAGNOSIS 3

## CHECK THE DIP-SWITCHES

Press the START button briefly.

Each slide switch S1 to S11 is assigned to a combination of LEDs.

2. 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



S10 = BLUE + RED



S11 = YELLOW+ BLUE + RED



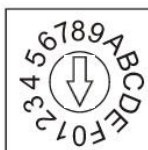
**DIAGNOSIS 4**3. X  START**CHECK THE "FLUSH TIME" ROTARY SWITCH**

Press the START button briefly.

→ Turn the switch through all 16 positions. At every position, a combination of LEDs will light according to the HEX -code.

Green=8 - Yellow=4 - Blue=2 - Red =1

16 position rotary switch



switch position	LED display			
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
A				
B				
C				
D				
E				
F				

**DIAGNOSIS 5****CHECK THE "DELAY TIME" ROTARY SWITCH**

4. X  START

Press the START button briefly.

→ Turn the switch through all 16 positions. At every position, a combination of LEDs will light according to the HEX -code.

Green=8 - Yellow=4 - Blue=2 - Red =1

LED – display as in  
Diagnosis 4 (above)

**DIAGNOSIS 6****CHECK RELAY OUTPUT REL 1**

5. X  START

Press the START button briefly.

The relay output REL 1 is checked.

→ terminals 7 / 8 / 9

→ The red LED will flash and the relay REL1 will switch on and off at 1 second intervals.

red

**DIAGNOSE 7****CHECK RELAY OUTPUT REL 2**

6. X  START

Press the START button briefly.

The relay output REL 2 is checked.

→ terminals 10/11/12

→ The green LED will flash and the relay REL 2 will switch on and off at 1 second intervals.

green

**DIAGNOSE 8****CHECK RELAY OUTPUT REL 3**

7. X  START

Press the START button briefly.

The relay output REL 2 is checked.

→ terminals 13/14/15

→ The green and yellow LEDs will flash and the relay REL 3 will switch on and off at 1 second intervals.

green yellow



**DIAGNOSE 9**8. X  START**CHECK SOLENOID VALVE**

Press the START button briefly.

The inlet valve is checked.

→ The yellow LED will flash and the inlet valve will open and close at 1 second intervals.

yellow

**DIAGNOSE 10**9. X  START**CHECK WHITE LED (ACTIVATOR)**

Press the START button briefly.

The function of the LED in the optical path of the measuring-chamber is checked.

→ The blue LED will flash and the white measurement-LED will switch on and off at 1 second intervals.

blue

**DIAGNOSIS 11**10. X  START**CHECK PERISTALTIC PUMP**

Press the START button briefly.

The function of the reagent dosing-pump is checked.

→ The red LED will flash and the peristaltic pump will pulse on and off at 1 second intervals

red

**DIAGNOSIS 12**11. X  START**CHECK AGITATOR**

Press the START button briefly.

The function of the agitator is checked.

→ The red + blue LEDs will flash and the agitator will be activated (the stirrer begins to spin).

blue red

**DIAGNOSIS 13**12. X  START**CHECK DIGITAL INPUT 'IN'**

Press the START button briefly.

The function of digital input contact is reviewed.

- terminal 16 + 17
- If the digital input contact is bridged, the left red + the yellow LED light up.
- If the digital input contact is open, the left green + the yellow LED light up.

green yellow



red yellow

**DANGER**

It is recommended to close the lid of the control box before running through diagnosis step 14 and 15

## DIAGNOSE 14

13. X



START

## CHECK ZERO TRANSMISSION

Press the START button briefly.

The function of the zero transmission measurement in the optical path of the measuring-chamber is checked.

→ the first three LEDs from the left (green + yellow + blue) light up

→ For this test, the measuring-chamber should be filled with clean water. Fill the measuring-chamber by pressing the FLUSH button

→ This test step is required in order to set the zero value of the sample in preparation for the next test → step 13

→ For a correct measurement, check that switches S6, S7 and S8 are in the right position according to required parameters (→ page 32).



FLUSH



## NOTE

yellow blue red



## DIAGNOSE 15

14. X



START

## CHECK COLOUR DETECTION

Press the START button briefly.

The function of colour detection in the optical path of the measuring-chamber is checked.

→ all four LEDs light up.

The LED „analysis result“

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

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

→ with the INDICATOR button you dose reagent into the filled measuring-chamber

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

→ water sample is evaluated as **GOOD**

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

→ water sample is evaluated as **BAD**

→ the change-over point is no indication of the water hardness since the amount of reagent dosed is undefined

→ the position of switches S6-S9 have a bearing on the evaluation.



FLUSH



INDICATOR



red yellow blue red



green yellow blue red



**NOTE**

After checking the functions of the unit, exit the test program and change back to analysis mode by switching S10 off.

Close the cover of the control box.

Return the switches to the settings noted at the outset.

Close the cover of the control box.

Switch **S11** has currently no function.

S12	Function
OFF	analysis mode





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01.07.2021

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