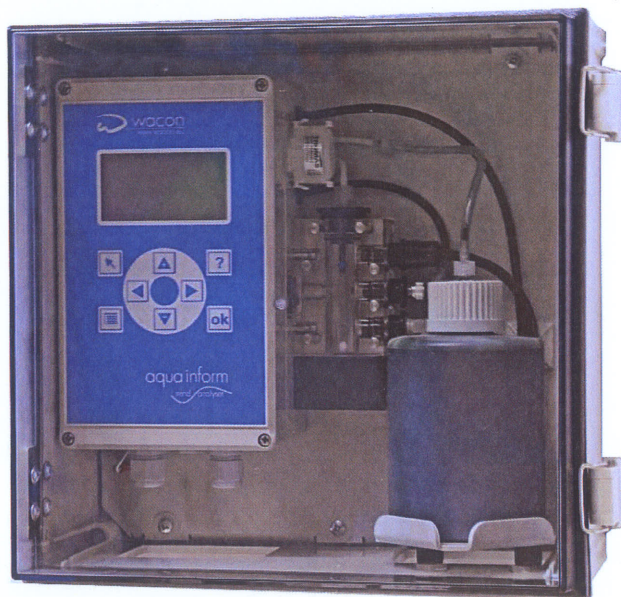


## Sycon 2800



**Analyzer for automated measuring  
of water hardness**



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## 1 Introduction

Thank you for buying the **Trend Analyser** from the product range **Sycon 2800** on-line water quality monitors.

The **Trend Analyser** belongs to the most modern systems on the market and sets new standards:

- Simple to operate
- Quick commissioning via menu
- Easy maintenance and cleaning
- Intelligent measuring-chamber design
- High measuring accuracy
- Self calibrating

The **Trend Analyser** for the monitoring of water quality is part of a water preparation system. This handbook is tailored for both the manufacturers and the operators of such equipment.

This handbook contains instructions for the use and operation of the **Trend Analyser**. Please read these instructions carefully before operating the unit.

We recommend that this handbook be kept near to the unit for quick reference although we have made every effort to make the unit, as far as possible, self explanatory in its operation.

The unit should only be operated in harmony with the instructions in this handbook.

We will not accept any liability for damage caused by operator error or failure to follow the instructions found in this handbook.

**Some details and instructions in this handbook may vary slightly from the delivered unit. We reserve the right to make technical changes to improve our products without prior notice.**

The **Trend Analyser** from the product range **Sycon 2800** is an on-line analyser that automatically recognises and warns of the increase in water hardness in a water preparation system. When used with a water-grading system the Sycon 2800 monitors the mixed water and reports if it is out of tolerance.

**This is not a system to prevent increase in water hardness.**

---

## 2 Trend Analyser at a glance

The on-line Analyser **Trend Analyser SYCON 2800** has the following features:

- ✓ Reliable, exact and fully automatic analysing unit with matching reagents for measuring the total hardness in the range 0.02 - 30 °dH (3.6 - 5349 µmol/l) as well as carbonate hardness in the range 0.3 – 9 °dH (53.5 – 1605 µmol/l)
- ✓ Measurement of all parameters with one sensor.
- ✓ Simple commissioning with configuration assistant.
- ✓ BOB-Operation(72h)
- ✓ Self calibrating and self monitoring
- ✓ High measuring accuracy
- ✓ Easy maintenance and cleaning.
- ✓ Compact design 300x300x140mm.
- ✓ Multi-coloured and multi-lingual graphic display.
- ✓ 4 programmable relay outputs.
- ✓ 1 analogue output 0.4-20mA.
- ✓ 2 programmable digital inputs.
- ✓ Optional reagent level monitor.
- ✓ Measurement data storage.

Diverse programmable alarm functions

- ✓ Connection possibilities for: water-meters; turbines; pre-coolers; rinsing valves
- ✓ External operation by means of external controller
- ✓ Many programmable functions for the inputs and outputs
- ✓ Monitoring of 2 limit values
- ✓ No condensation
- ✓ CAN- interface
- ✓ Software updates by means of SD-card possible
- ✓ Open wall mounting or wall mounting in protective casing (optional)
- ✓ Supply voltage 85-264 Vac, 47 – 63 Hz

---

## 3 Unit description

The on-line hardness monitor **Trend Analyser** is a compact analysis unit which is able to monitor the presents of various chemicals in water. In these instructions, only the on-line monitoring of total hardness and carbonate hardness are described.

### 3.1 Principle of Function

The **Trend Analyser** is an on-line analyser for the automatic ascertainment of water parameters by the colorimetric test method. Following the introduction of a reagent into the water sample, a colour reaction occurs. Depending on the chosen method, the unit either evaluates the *intensity* of the colour or ascertains the *value* at which the colour changes. From this information the **Trend Analyser** calculates the concentration of the chemical content. The unit can only ascertain one parameter. The method and the measurement range are determined by the reagent.

### 3.2 Unit overview

The **Trend Analyser** has two variations:

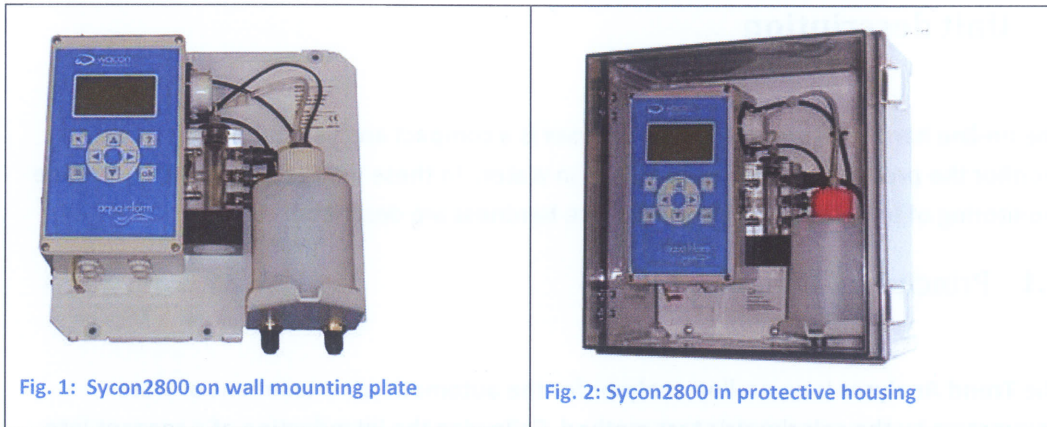
1. **Analysis unit on wall mounting**

The Analysis unit consists of a control unit and a measuring chamber. Both are mounted on a wall mounting plate. This variation is completely functional and includes the connections for the water inlets and outlets as well as the holder for the reagent bottle. (Fig. 1)

2. **Analysis unit in protective case**

In addition an optional plastic case is available to protect the unit in environments where extreme levels of dirt and grease are expected. (Fig. 2) The Analysis unit on the wall mounting plate is easily fixed in the protective case by 4 screws. If the analysis unit and the protective case are ordered together, they will be delivered assembled.

The analysis unit is operated by means of a menu, a graphic display and 6 keys on the control panel.



Description	Article number
Trend Analyser (SYCON 2800 H) on wall mounting plate 230V Version	30-010130
Trend Analyser (SYCON 2800 H) on wall mounting plate 24V Version	30-010131
Housing for Sycon 2500/2800	33-099005

### 3.3 Scope of delivery

The analyser is delivered completely pre-configured and ready for connection. Before installation, please check that all components are present and correct.

If you receive the analyser on a mounting plate, you will receive the following components:

Description	Article number
Basic unit on mounting plate	30-010130
Accessory kit with bottle connector	33-090039
Operating Instructions (English)	33-099721

If a housing is ordered:

Description	Article number
Case for Sycon2800 / Sycon2500	33-099005



### 3.4 Specifications and Areas of application

#### General Specification

Supply Voltage (230V Version)	85 - 265 Vac (47 - 63Hz)	
Supply Voltage (24V Version)	24V AC/DC +- 10%	
Power consumption	25 VA (in operation)	3.5 VA (stand by)
Protection class	Open wall mounting	IP43
	Mounting in case	IP 54
Environmental temperature	10°C – 40°C	
Measuring water temperature	5°C – 40°C	
Humidity	20 -90 % RF (without ice or condensation)	
Water inlet pressure	ca. 0.5 - 5 bar (max.) (Recommended 1 - 2 bar)	
Water inlet in general	clear, colourless, free of solid particles, without gas bubbles	
Requirements of the water quality during measurement of the water hardness	pH:	4 – 10
	Iron:	< 3 ppm
	Copper:	< 0.2 ppm,
	Aluminium:	< 0.1 ppm
	Manganese:	< 0.2 ppm
	Acid capacity:	KS 4.3 < 5mmol/l

#### Technical Data

Installation	Wall mounting in closed rooms	
Dimensions	Without case:	280x300x140 mm (WxHxD)
	With case:	360x300x200 mm (WxHxD)
Weight	Without case:	ca. 2.1 kg
	With case:	ca. 4.0 kg

### Analysis Qualities

<b>Measurement method</b>	<b>titration method with colour change</b>			
<b>Measurement range</b>	Total hardness			
	°dH:	0.02	- 18	(max. 30)
	°TH / °fH	0.04	- 32	(max. 53.5)
	°TH / °fH	0.04	- 32	(max. 53.5)
	°e	0.03	- 22	(max. 37.5)
	ppm	0.4	- 320	(max. 535)
	mmol/l	0.004	- 3.2	
	<p>The measurement range of the unit is defined by the reagent used. The full measurement range of the total hardness from 0.004 to 3.2 mmol/l is acquired by the application of different reagents (see page 56). Reagents dictating the carbonate hardness in the range from 0.9 dH to 9.0 dH are available. Restrictions apply to the maximum indicated measurement range upper limits respecting the environmental temperature and accuracy.</p>			
<b>Accuracy</b>	<p>Measurement accuracy:</p> <p>+/- 5% of the upper value of the respective reagent (see page 56.)</p> <p>Repetition accuracy:</p> <p>+/- 2.5% of the upper value of the respective.</p> <p>Please note: The accuracy of the measurements may be adversely affected by the impurity of the water. In such cases, we recommend that you take a hardness measurement by hand titration and then calibrate the analysis unit to this value.</p>			
<b>Reagent consumption</b>	ca. 0.20 ml / analysis depending on the hardness of the water			
<b>Measurement duration</b>	ca. 3 minutes depending on the hardness of the water			
<b>Number of analyses</b>	ca. 10,000 analyses / 500 ml reagent by low hardness. The consumption is dependant on the measured water hardness and the reagent used.			
<b>Shelf life of the reagent</b>	At least 2 years			
<b>Water consumption</b>	<p>ca. 1l/analysis at 2 bar</p> <p>The water consumption varies according to pressure and flush-time.</p>			

### Inputs / Outputs

<b>4 Relay outputs</b>	<p>max. 250 Vac / Vdc; 4A</p> <p>as potential free output NC/NO</p> <p>the relays offer the following functions:</p> <ul style="list-style-type: none"><li>• Threshold alarm 1</li><li>• Threshold alarm 2</li><li>• Unit error</li><li>• Analysis / Cooler / Pump</li><li>• Reagent shortage</li></ul>
<b>2 Signal input</b>	<p>Galvanic separated contact input</p> <p>Input 1: Cancel error</p> <p>Input 2:</p> <ul style="list-style-type: none"><li>• Analysis start</li><li>• Water meter</li><li>• Flow monitor</li><li>• Turbine</li></ul>
<b>Analogue Output</b>	<p>0 – 20 mA / 4 – 20 mA</p> <p>Resolution: &lt; 100 <math>\mu</math>A</p> <p>max. working resistance: 750 <math>\Omega</math></p>
<b>CAN Interface</b>	<p>Adjustable baud rate: 10.20 Kbit/s</p> <p>CAN 2.0A compatible</p> <p>Applicable in Multi-master Systems</p> <p>3 adjustable frames:</p> <ul style="list-style-type: none"><li>• Test result transmission</li><li>• Status transmission</li><li>• Control and Status request</li></ul>

### Maintenance Intervals

All 6 months	Cleaning of the measurement chamber  (In the event of higher environmental / water temperatures or water with higher biotical content, cleaning intervals need to be reduced accordingly.)
All 50,000 Analyses	Installation maintenance set.

### 3.5 BOB-Operation

The abbreviation BOB stands for „Betrieb ohne Beobachtung“ (which means „Operation without Observation“). This is a special term found in the German ‘TÜV’ rules for boiler-houses. These rules require that an analysis unit has enough reagent to last for 72 hours for unmanned operation.

A relay output can be used, for example to activate an alarm if the reagent level is below that necessary for the minimum time interval.

The analysis unit is specially designed for ‚BOB‘-operation. Boiler systems require an accurate monitoring of water quality, especially the hardness of the boiler supply water according to the technical guide-lines for boiler systems TRD 604 (Technische Regeln für Dampfkessel, published by the ‘TÜV’).

The analysis unit calculates the consumption of reagent to make sure that enough reagent is available for reliable measurements during the period of unobserved operation.

If the next 72 hour ‘BOB’-operation cannot be reliably guaranteed, the alarm “Reagent shortage” will be activated. Please check to see that the reagent is within its best before date. Only use fresh reagent.

### 3.6 Installation requirements

#### Reagents / Maintenance sets / Accessories

There are various reagents available for the **Trend Analyser** that cover a wide range of measurement. When choosing the correct reagent, it is important that the hardness range to be monitored lies in the middle of the measurement range of the reagent.

In all, the **Trend Analyser** covers the measurement range of 3.6 - 5349 µmol/l. There are 11 reagents available:

The order numbers of the reagents (500ml) are shown in the following table. Some reagents are available as advantage packs each with 4 bottles 4x 500ml).

### Total hardness

Article Reagent	Range			Order-No. 500ml bottle	Order-No. 4x 500ml bottle
	°dH	mmol/l	°f		
H25-0,02	0,02 ↔ 0,12	0,004↔0,021	0,036↔0,214	32-085 115	-
H25-0,05	0,02 ↔ 0,2	0,004↔0,036	0,036↔0,356	32-085 125	-
H25-0,1	0,03 ↔ 0,3	0,005↔0,053	0,053↔0,53	32-085 135	32-485 135
H25-0,2	0,06 ↔ 0,6	0,01 ↔ 0,10	0,11↔1,07	32-085 145	-
H25-0,3	0,09 ↔ 0,9	0,02 ↔ 0,16	0,16↔1,6	32-085 155	32-485 155
H25-0,5	0,15 ↔ 1,5	0,03 ↔ 0,27	0,27↔2,7	32-085 165	32-485 165
H25-1	0,3 ↔ 3,0	0,05 ↔ 0,53	0,53↔5,34	32-085 175	32-485 175
H25-2	0,6 ↔ 6,0	0,11 ↔ 1,07	1,1↔10,7	32-085 185	32-485 185
H25-3	0,9 ↔ 9,0	0,16 ↔ 1,6	1,6↔16,0	32-085 195	32-485 195
H25-5	1,5 ↔ 15	0,27 ↔ 2,6	2,7↔26,7	32-085 205	-
H25-10	3 ↔ 30	0,53 ↔ 5,3	5,4↔53,4	32-085 215	-

N.B. Indicators H25-3 and above are very temperature sensitive and it may be necessary to correct the test results with reference to the environmental temperature.

### Carbonate Hardness

Article Reagent	Range			Order-No. 500ml bottle	Order-No. 4x 500ml bottle
	°dH	mmol/l	°f		
C25-1	0,3 ↔ 3,0	0,11 ↔ 1,07	0,5 ↔ 5,3	32-086125	-
C25-1,5	0,45 ↔ 4,5	0,16 ↔ 1,6	0,8 ↔ 8,0	32-086135	-
C25-2	0,6 ↔ 6,0	0,21 ↔ 2,1	1,1 ↔ 10,7	32-086145	-
C25-3	0,9 ↔ 9,0	0,32 ↔ 3,2	1,6 ↔ 16,0	32-086155	-

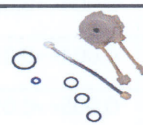


The reagents are available in 500ml bottles. This amount is sufficient for about 10,000 analyses at low hardness. The number of analyses is dependant upon the hardness level and the reagent used.

**Reagents that are not in use should be stored in a cool dark place. Avoid direct sunlight. The shelf life of the reagents is at least 24 months if stored below 25°C and in a dark place. High temperatures and direct sunlight can significantly reduce the shelf life!**

### 3.7 Maintenance sets



The analysis unit needs very little maintenance. There is a **maintenance set** available for the analysis unit. It is recommended to change the dosing-pump cassette, the reagent pipes and the 'o'-rings after 50,000 analyses or every 6 months.

It is also recommended that the measuring chamber is regularly cleaned – at least every 6 months. The cleaning set **SYCON Clean** is offered for this purpose. This set contains everything necessary in the way of equipment including the cleaning fluid **FIT 3000**.

Article		Order number
Cleaning set for the Trend Analyser		33-090034
SYCON Clean Cleaning set for the chamber		30-010900
Measurement chamber cleaner FIT 3000 (1000ml)		32-089100

#### Pre-cooler

The maximum input temperature of the sample water is 40°C. If the sample water exceeds 40°C, a pre-cooler must be installed. Which of the 2 pre-coolers is used depends on the temperature of the sample water and the cooling water.

Article		Order number
Pre-cooler PC 200  Body: Stainless steel 1.4571, 103x225mm (D x H)  Cooling coil: Stainless steel 1.4571; 2,6m x 8mm		30-015100
Pre-cooler PC 400  Body: Stainless steel 1.4571, 103x448mm (D x H),  Cooling coil: Stainless steel 1.4571; 5m x 8mm		30-015200

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## 4 General Safety

Please observe the following safety instructions before operating the unit.

We wish to inform you of the appropriate use, installation and maintenance of the **Trend Analyser** in order to ensure a safe, problem free operation. Please take careful note of the possible dangers that may result from incorrect use. The safety symbols are explained and fundamental instructions given. The reading of this chapter does not replace technical training. **The installation and the commissioning of this unit should only be carried out by an authorised and qualified person.**

This handbook describes the installation and the operation of the on-line **Trend Analyser** for the automatic ascertainment of water hardness.

This unit may only be used in accordance with the conditions described in this handbook. In particular, the unit must be protected from wet and damp. The protection class of the unit on an open mounting plate is IP43. When mounted in a protective case, the protection class is IP54. Splashing or condensation should be avoided. The unit may only be used for the specified purpose. During installation and operation of the analysis unit, the relevant regulations (e.g. EN, DIN, VDE, UVV) should be observed.

The analysis unit should only be used to ascertain the total water hardness or the carbonate hardness in the sample water. **Correct operation can only be warranted if the manufacturers recommended reagents and spare parts are used.**

Changes to the electrical wiring and the programmes should only be carried out by a designated and qualified person.

The connecting cables should be kept as short as possible and not laid next to, or in close proximity to, power cables. Analysis may be adversely affected by strong electromagnetic fields. In this case special protective measures should be applied. Correct earthing is essential.

It is recommended to have these operating instructions at hand during the initial operating of the equipment in order to get an immediate understanding of the functions. Since the various ideas build upon the previous information it makes sense to work through the chapters in their printed order.

If any problems occur or questions arise during the operation of the analysis unit, you can get assistance from your supplier. Try to locate the problem as accurately as possible or to record the action and conditions that lead to the problem. This makes speedy assistance possible.

### Safety Instructions and Symbols

In this handbook you will find various safety details that warn of possible dangers associated with the use of the analysis unit. This applies to specific dangers to:

- persons,
- this product or connected equipment and installations,
- working environment.

Various symbols in this handbook point out special dangers for the purpose of protecting persons and equipment from injury or damage. Please read the whole text completely before you start working.



Danger

This symbol warns of possible danger of injury.



Warning

This symbol warns of a general risk to the unit, the installation, the materials, the working area and the persons therein.



Pressure

This symbol warns that the parts may be under pressure.



Voltage

This symbol warns of the danger of electrocution as well as damage to electrical parts.



This symbol warns of a general risk and the need to take note of certain conditions.



This symbol is to make the user aware of useful tips to improve the understanding of this unit.

### Working with pipes that are under pressure

Maintenance and repair work are only to be carried out by qualified persons.

- Before you begin, make sure there is no pressure in the pipes.
- Pipes, joints and seals are to be checked regularly and where necessary, or as a precautionary measure, replaced. Maintenance intervals should, in any case, be observed.



- 
- Before operating after maintenance, ensure that all joints, fittings and seals are correctly fitted. Check that all casing parts are closed and filters or other parts connected to the unit are correctly fitted.
  - Remove all maintenance tools, parts and other materials before operating the system.
  - Clean the unit and wipe up any fluids that have run out thereby leaving the unit in a clean condition.
  - Check that all safety systems are in position and working.

### **Transport**

Protect the analysis unit during transport. Remove any remaining fluids. Remove the reagent bottle and firmly close it to avoid any spillage.

Transport unit carefully and do not throw it.

Avoid direct sunlight moisture and high temperatures.

Immediately on delivery, check that the unit is complete and has no damage. Even though the unit is well packed, damage can occur during transport. In the event of damage, inform the deliverer immediately.

### **Storage**

Do not store for more than a year on account of the guarantee. Only store the analysis unit in a cool, dry place with temperature between 5 and 45°C and avoid direct sunlight.

### **Scope of Delivery**

Check that all the ordered components are present.

Damage or missing parts are to be reported within 7 days of delivery. Later claims will not be accepted.

### **Installation**

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

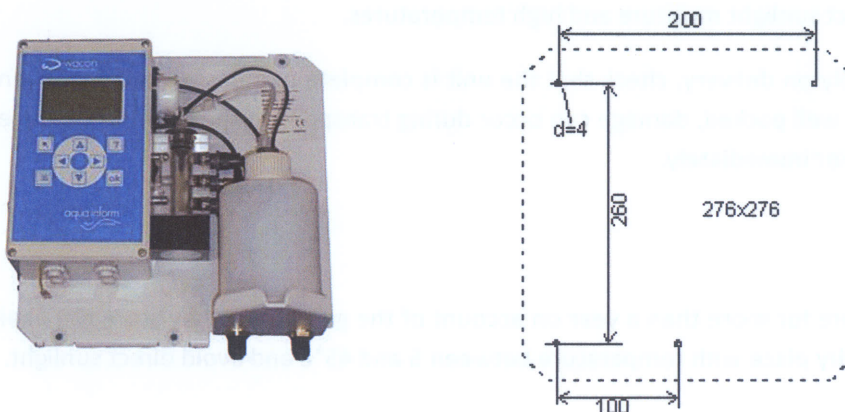
- Install the analyser in a dry and easily accessible place.
- Fix securely according to the mounting instructions.
- Power up the unit with the correct supply voltage as noted on the type label.

- Connect the inlet and outlet pipes according to the installation instructions.
- Insert the reagent bottle and connect to the dosing pump. Make sure the pipe is not twisted.
- Set the unit up according to the instructions in the following sections.
- Only switch on the unit when all preparation is done, the case is closed and the unit is set up.

## 5 Installation

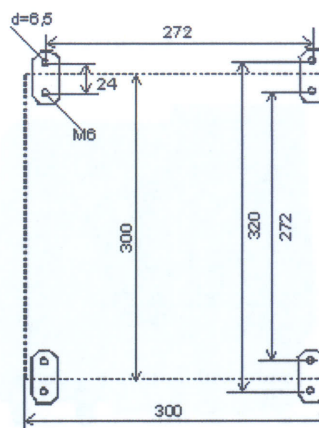
### 5.1 Wall mounting without case

The analysis unit must be installed vertically. In the mounting plate there are 4 holes for fixing the unit as shown in the following drilling plan:



### 5.2 Wall mounting with case

The analyser can be delivered with a compact protection case as an optional extra. The case is delivered with the unit already mounted inside and 4 mounting brackets for fixing the case as shown in the drilling plan below:



To allow for opening the case, the designated mounting space must be at least 450x350mm (D x H).

Alternatively, the 4 brackets can be fixed at 45 or 90°. The drawing pictures vertical fixing.

### 5.3 Water Connections

Although the ideal input pressure for the analysis unit is between 1 and 2 bar, it should never be less than 0.2 bar. In the water inlet pipe is an input valve which, when closed, allows the measuring chamber to operate without pressure. The unit can also be operated with an input pressure of up to 5 bar, however when the pressure is released, gassing may occur.

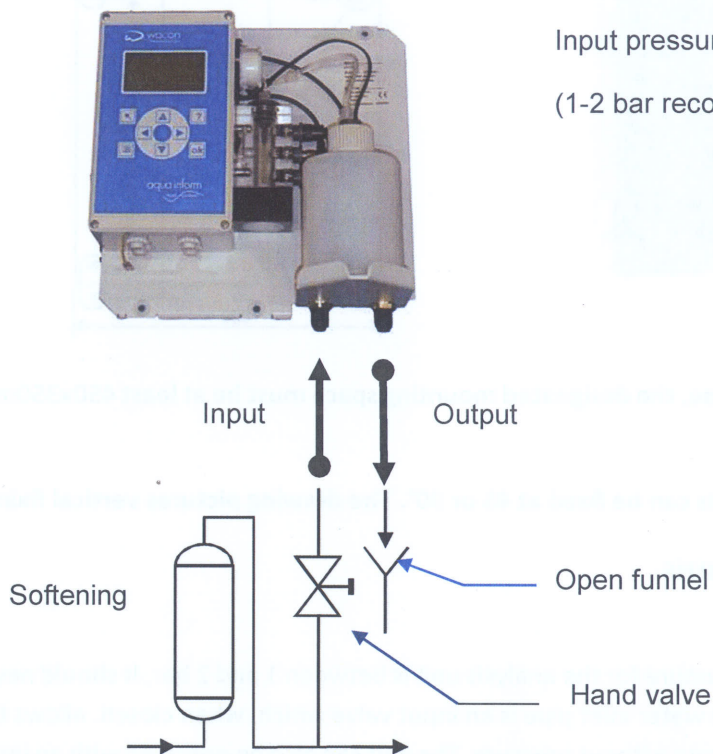
It is recommended to reduce the pressure with a simple valve. A pressure reducer is not necessary.

**The sample water must be clear and free of solid particles or a filter installed. Solid particles in the water can damage the magnet valve or prevent it from closing. If the magnet valve is blocked or doesn't open and close properly, the measuring chamber will not be properly flushed and this could lead to erroneous measurements.**

The sample water temperature should not be less than 5 °C or greater than 40 °C.

If the sample water has a higher temperature, a pre-cooler should be installed. These coolers are available as accessories.

The analysis unit has 2 connections with fittings for plastic pipes with an external diameter of 6mm for the water inlet (left) and the water outlet (right). These only need to be pushed into the fittings.



Input pressure: ca. 0.2 - 5.0 bar  
(1-2 bar recommended)

The water outlet should be as short as possible and the water should be able to run away vertically and freely. The system output must be at atmospheric pressure. The output pressure must not exceed the input pressure. The pipes should not be laid horizontally. Pipes should not exceed 2m in length. The output water must run into an open funnel or wastewater pipe/drain.

#### 5.4 Operating with pressure-less sample water

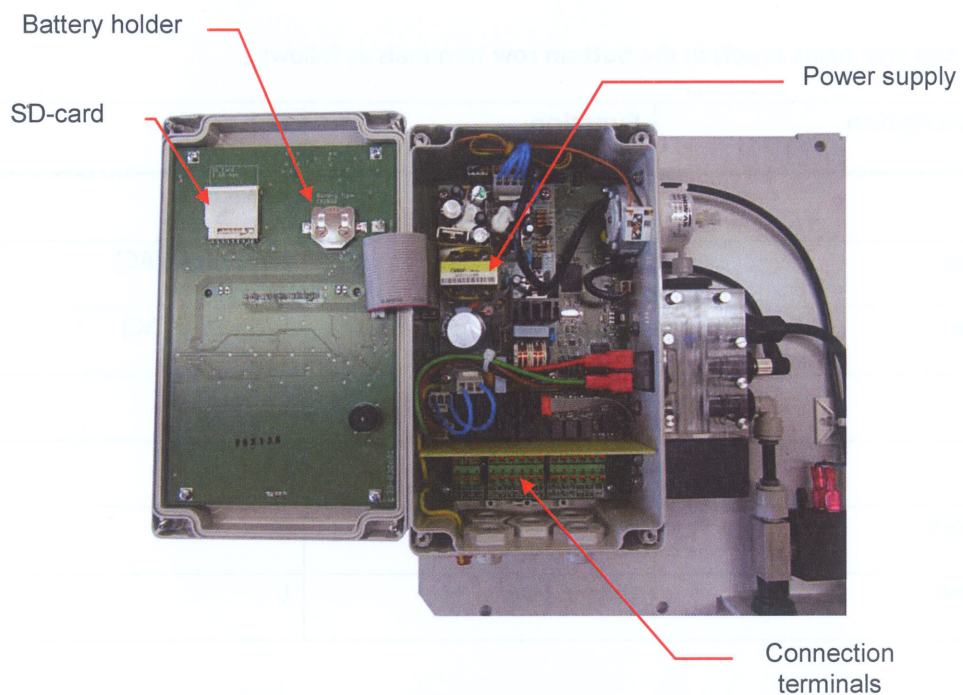
If the sample water is not under pressure, a simple membrane or immersion pump is necessary to deliver the sample to the analysis unit. Relay 4 can be used for this purpose.

## 6 Electrical Installation

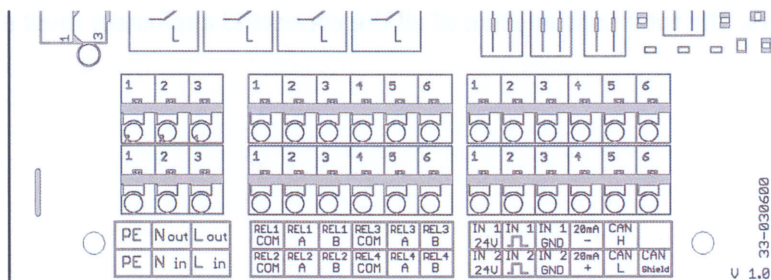
Please note that all electrical installation work should only be carried out by authorised and qualified personnel and according to current regulations. Make sure that cables are not connected to power.

**The required supply voltage is: 85 to 264 Vac / 47 to 63 Hz!**

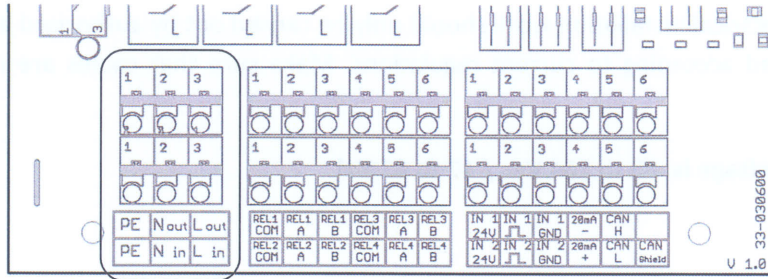
Open the lid of the control box



The analysis unit has 2 rows of terminals. The terminal descriptions are underneath the bottom row.



## 6.1 Connecting the supply voltage



Connect the mains supply in the **bottom** row terminals as follows:

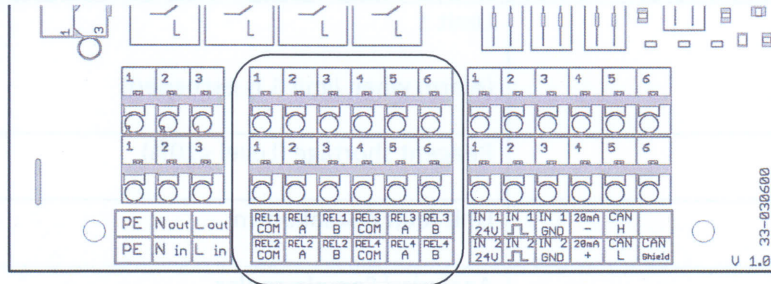
Description	Function	Connection
PE	Protective earth	PE
N in	Neutral	N (85-264 VAC)
L in	Live	L (85-264 VAC)
PE	Protective earth	PE
N out	Output Neutral	N
L out	Output Live	L

Take care to make a good earth contact to avoid possible malfunctions of the unit.

The mains output appearing on the top row can be used via the output relays to drive pumps, valves or others. The total consumption of all the connected appliances must not exceed 500 VA.

## 6.2 Connecting the relay outputs

In the second terminal block you will find the connections for the 4 output relays. All relays are 2 way changeover types with a common contact and outputs A and B.



Description	Function	Connection
Relay 1 COM	Common	Relay 1 (max. 250Vac / 4A)
Relay 1 A	NC	Relay 1 (max. 250Vac / 4A)
Relay 1 B	NO	Relay 1 (max. 250Vac/ 4A)
Relay 2 COM	Common	Relay 2 (max. 250Vac / 4A)
Relay 2 A	NC	Relay 2 (max. 250Vac / 4A)
Relay 2 B	NO	Relay 2 (max. 250Vac / 4A)
Relay 3 COM	Common	Relay 3 (max. 250Vac / 4A)
Relay 3 A	NC	Relay 3 (max. 250Vac / 4A)
Relay 3 B	NO	Relay 3 (max. 250Vac/ 4A)
Relay 4 COM	Common	Relay 4 (max. 250Vac / 4A)
Relay 4 A	NC	Relay 4 (max. 250Vac / 4A)
Relay 4 B	NO	Relay 4 (max. 250Vac / 4A)

All relays can be allocated as you wish. We recommend however, the following:-

Recommended allocation for water softening:

Relay	Recommended Function
Relay 1	Limit 1 (Alarm when limit 1 is exceeded)
Relay 2	Reagent shortage (Level <10%)
Relay 3	Unit fault / Breakdown
Relay 4	Analysis / Sample cooler (Activation of magnet valve for pre-cooler or external controller)

Recommended relay allocation for blending:

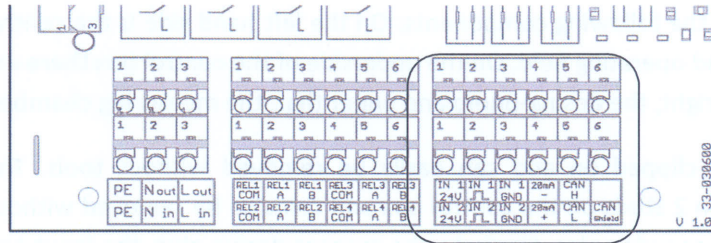
Relay	Recommended Function
Relay 1	Limit 1 (Alarm when limit 1 is exceeded)
Relay 2	Limit 2 (Alarm when limit 1 is not reached or exceeded)
Relay 3	Unit fault / Breakdown
Relay 4	Reagent shortage (Level <10%)

Please note the difference in behaviour when configured as error contact.



### 6.3 Connecting the digital inputs

In the third terminal block you will find the connections for the digital inputs, the power outputs and the CAN interfaces.



Description	Function	Connection
IN 1	Input	Input signal
IN 1 24V	Output	Aux. voltage to connect potential free outputs
IN 1 Gnd	Output	
IN 2	Input	Input signal
IN 2 24V	Output	Aux. voltage to connect potential free outputs
IN 2 Gnd	Output	
20 mA +	Output	Output + current interface 0.4-20mA
20 mA -	Input	Input – current interface 0.4-20mA
CAN high	Bi-directional	Data line CAN high
CAN low	Bi-directional	Data line CAN low
CAN shield	Bi-directional	Data line CAN (optional)

All inputs can be allocated as you wish. We recommend however, the following:

Recommended input configuration:

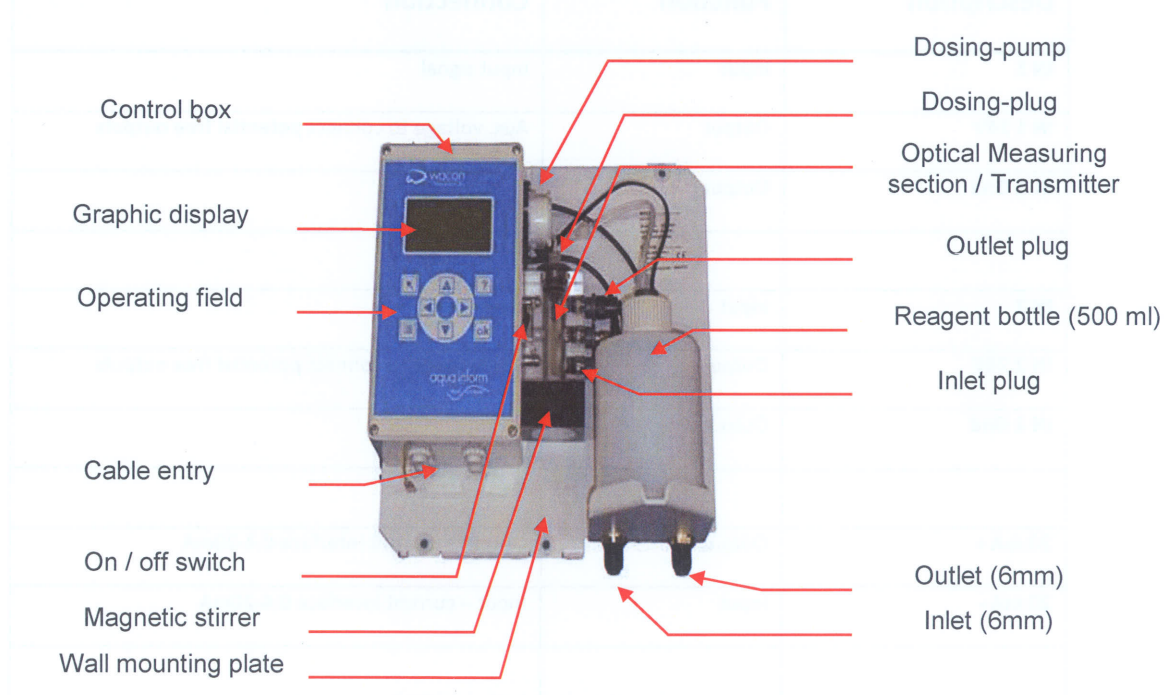
Input	Function	
Input 1	Deactivated; water meter Flow monitor ; Analysis request	
Input 2	Deactivated; Cancel error	

## 7 Components

### 7.1 Location of Components

The analysis unit consists of the following components: On the left hand side is the control box with a graphic display and operating field. On the underside of the control box there are 4 cable entry fittings, to the right, the dosing-pump and under that, the measuring chamber.

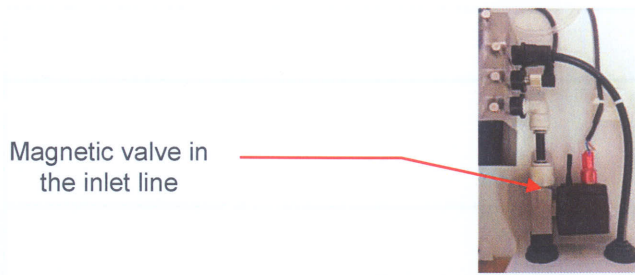
The dosing-pump is simply clipped on and can easily be removed without tools. The measuring chamber hangs on 2 studs on the control box and can also be removed without tools simply by pulling the 2 securing pins. Similarly, the reagent dosing plug, the input and output plugs are mounted on the measuring chamber and can easily be removed.



**The securing pins can only be pulled and not removed.**

The measuring chamber is always at atmospheric pressure and full of water in order to avoid the development of algae. In the middle of the chamber is the white high powered led transmitter. The sensor is located inside the control box. A magnetic stirrer is located underneath the measuring chamber. The magnetic stirring unit is securely fixed to the chamber.

At the bottom right of the mounting plate you will find the water inlet (left) and outlet (right) connectors both of which are secured to the mounting plate. The magnetic input valve is located behind the reagent bottle.

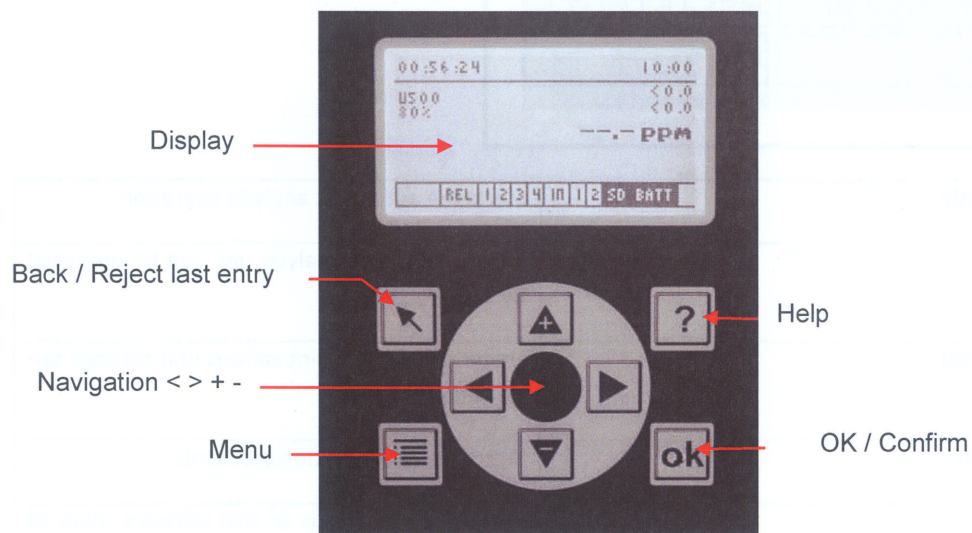


## 7.2 Display and keyboard





The analysis unit has a graphic display that displays both the test results and the operating menu. The unit is set up by means of the 8 keys in the operating field. The background colour of the display changes according to the current function of the display:

Back-ground colour	Function
White	Unit is working normally
Yellow	The warning limit has been exceeded in the operating mode 'softening'.
Red	Limit exceeded or unit fault

Located centrally in the middle are 4 keys for navigation and entry of values (< > + -):



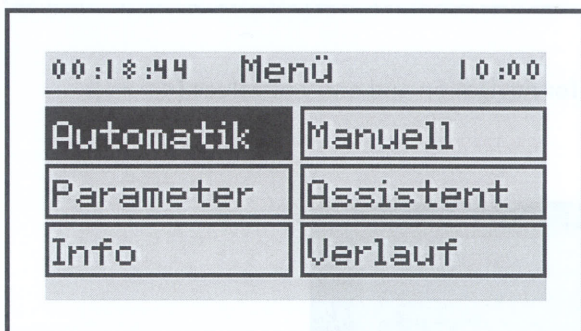
Additionally there are 4 function keys:

Key	Function
	Back / Reject last entry Cancel current analysis
	Enter menu Switch between menu and display of test results
	Reserved for Help function
	OK Confirm

The display can be switched between “menu” and “measurement” by means of the menu key.

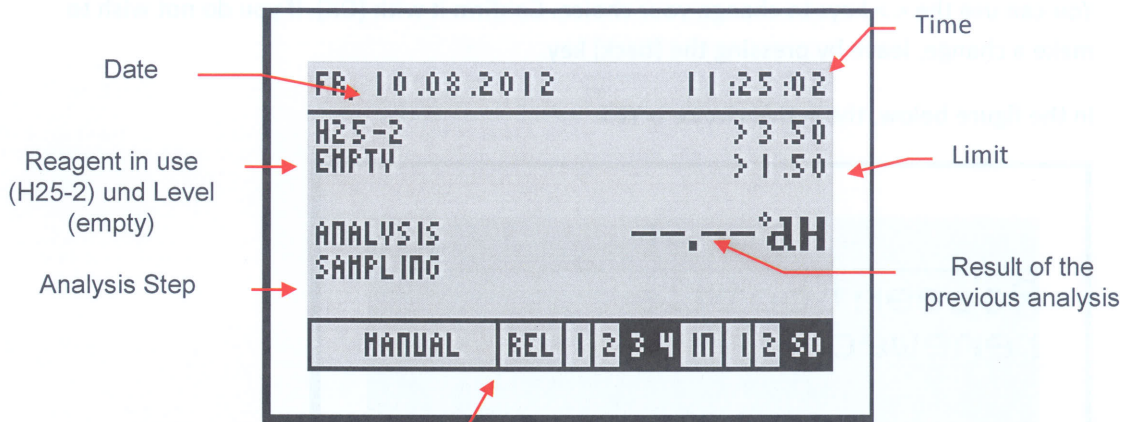
#### Display (Menu)

The menu window offers the following choices:



<b>Automatic</b>	Starts the automatic analysis operation
<b>Manual</b>	In this mode the analysis unit can be operated by hand
<b>Parameter</b>	Under this menu point various unit settings can be undertaken
<b>Assistant</b>	Starts the configuration assistants
<b>Info</b>	Informs about status of the software, date of manufacture and serial number of the unit
<b>History</b>	Shows the last 100 measurements as a graph

Display (measurement)



Display (Reading progress)

Status bar:

Automatic active

Relays 1-4 (3&4 energised)

Digital inputs 1-2

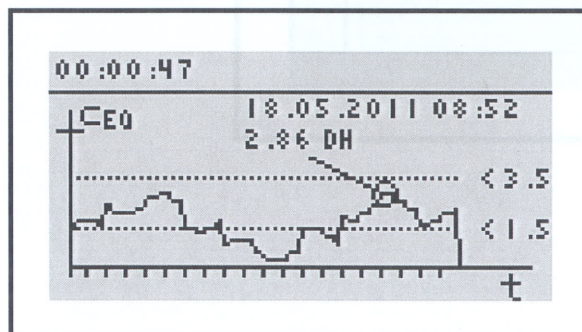
SD card present

- i** Simple start of analysis  
by pressing and holding of the OK button for more than 3 seconds, an analysis can be started. This function is available in manual and automatic mode.

Display (history)

With the help of the 'left' < and 'right' > keys you can call up the results history with date and time (max. 100 analyses). All results are stored on the SD-card and can be called up and read. The limit settings are shown as points on the graph.

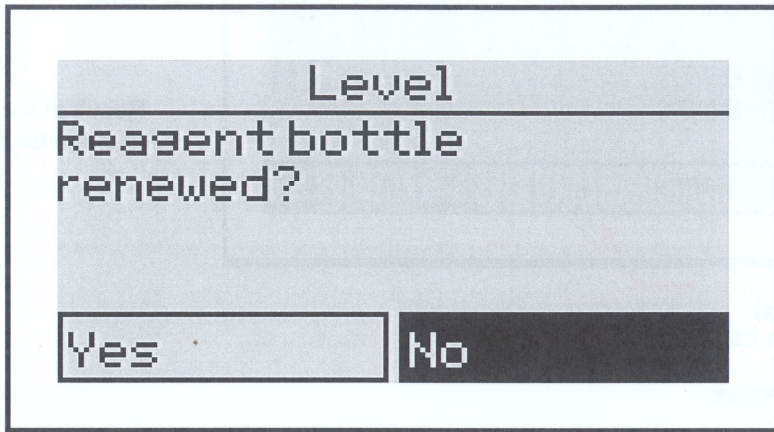
You can call up the record by selecting Menu > History. By pressing the key [OK] or [Back] you can return to the measurement value.



### Display (Select)

You can use the < > keys to change your choice. Confirm it with [OK]. If you do not wish to make a change, leave by pressing the [back] key.

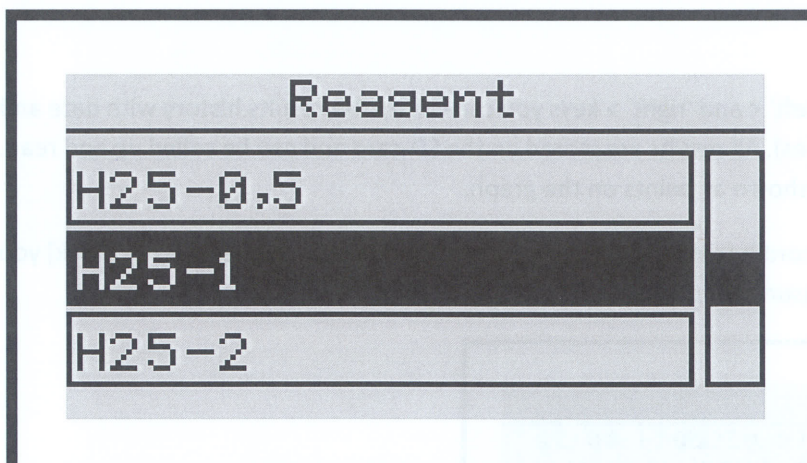
In the figure below, the active choice is YES.



### Display (Selection lists)

You can navigate the selection list by means of the 'up' + and 'down' - keys. Confirm with the [OK] key. Leave the list with the [back] key. If there are more than 3 choices in the list, you can use the scroll facility on the right of the display.

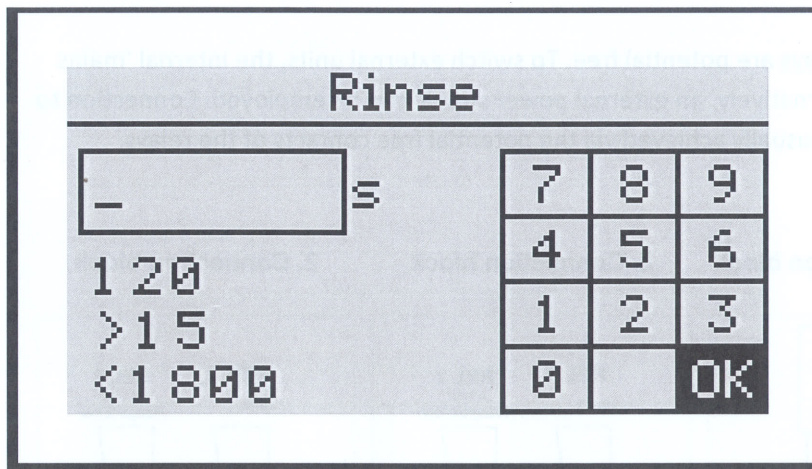
In the figure below, the active choice is indicator H25-1.



**Display (Entering a value)**

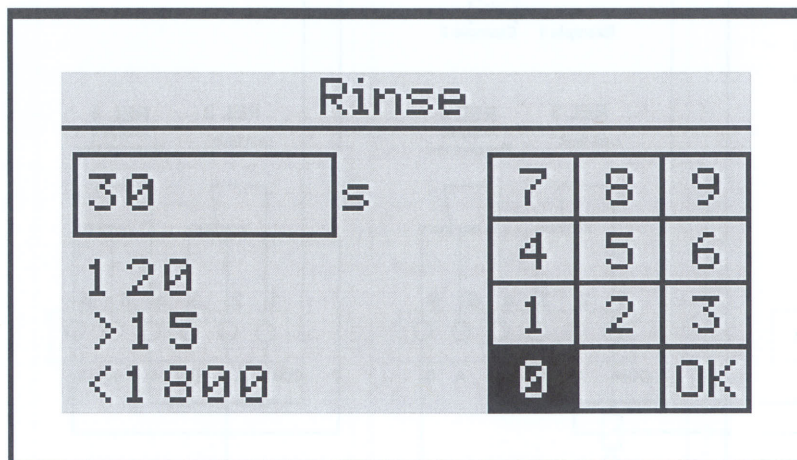
Numbers can be given in via the virtual keyboard on the display. The cursor is moved by the < > + - keys. The entry mask shows the numbers given in.

When the cursor is not moved and the [OK] key pressed the highlighted number will be entered.



As an example: the flush -time = 30 seconds.

The possible times are from 15 to 1800 seconds.



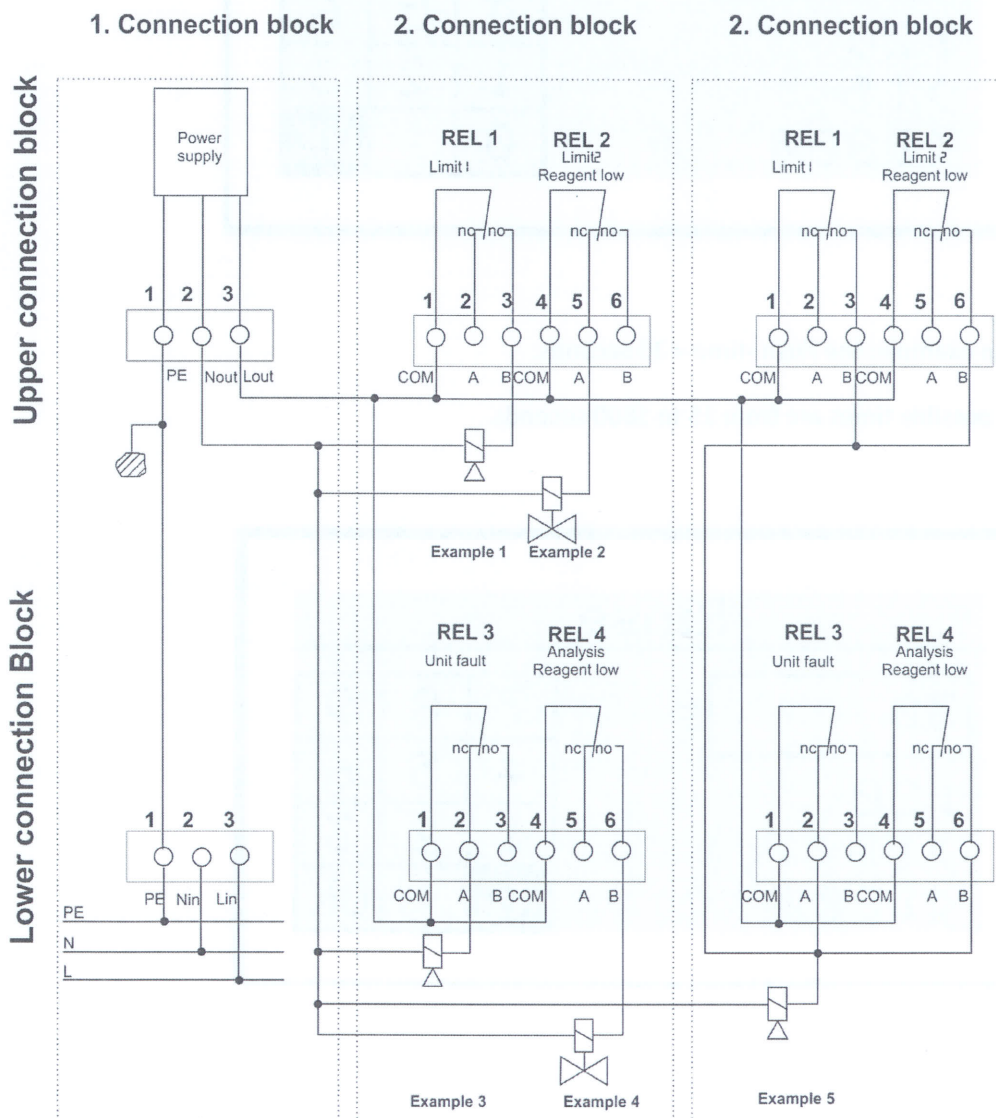
## 8 Connecting Additional Components

To facilitate the connection of additional components, the unit is equipped with 2 inputs, 4 relays, an analogue output and a bus output. The inputs can be connected either via a potential free switch or via an electronic switch (open collector). A 24Vdc supply is available for the latter.

Do not connect any components with a voltage output to the inputs. Where necessary a potential separation must be achieved as, for example, in example 3 below.

If input **IN 1** is not used, it should be programmed to “Deactivated” in order to avoid malfunctions.

The outputs of the relays are potential free. To switch external units, the internal ‘mains out’ can be used. Alternatively, an external power supply can be employed. Connection to external controllers is usually achieved via the potential free contacts of the relays.





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Over view of the Connecting Block Connections

### 8.1 Connecting a flow monitor

An ion-exchanger is normally monitored at 10 minute intervals to ensure that a sudden hard water break through doesn't reach the user. Often, though, there are longer pauses in operation or a storage tank may need to be filled at irregular intervals. The flow monitor was conceived for such eventualities.

A so-called paddle can be used as a flow monitor. Also the potential free contact of a timer may be used – see example 1(below). Example 2 shows the connection of an electronic flow monitor. Example 3 shows the converting of a 230V signal to a potential free signal. This example is useful in an osmosis plant where a water-softening unit only needs to be monitored when the pump of the plant is switched on.

Programme: Menu>Parameter>Inputs> Input 1>Flow monitor.

NB. This function should not be confused with the analysis start by external controller function.

### 8.2 Connecting a Water Meter

Apart from the time dependant activation of an analysis, water-volume activation is possible. This is achieved either by a contact water meter with a potential free reed switch (example 1) or an electronic turbine with a Hall-switch (example 2).

Programme: Menu>Parameter>Inputs> Input 1>Water meter

Programme: Menu>Parameter>Inputs> Through -flow meter type>Reed or Hall

Programme: Menu>Parameter>Inputs> Through -flow meter unit>l, hl, m3 or gallon

Programme: Menu>Parameter>Inputs> Through- flow 0 - 5000

Programme: Menu>Parameter>Analysis> Auto interval amount> Amount 5 – 9999

### 8.3 Connecting a switch "Analysis START"

Additionally, it is possible to start an analysis with an external switch. This could be a potential free switch (example 1) or the relay output of an SPS controller (example 9).

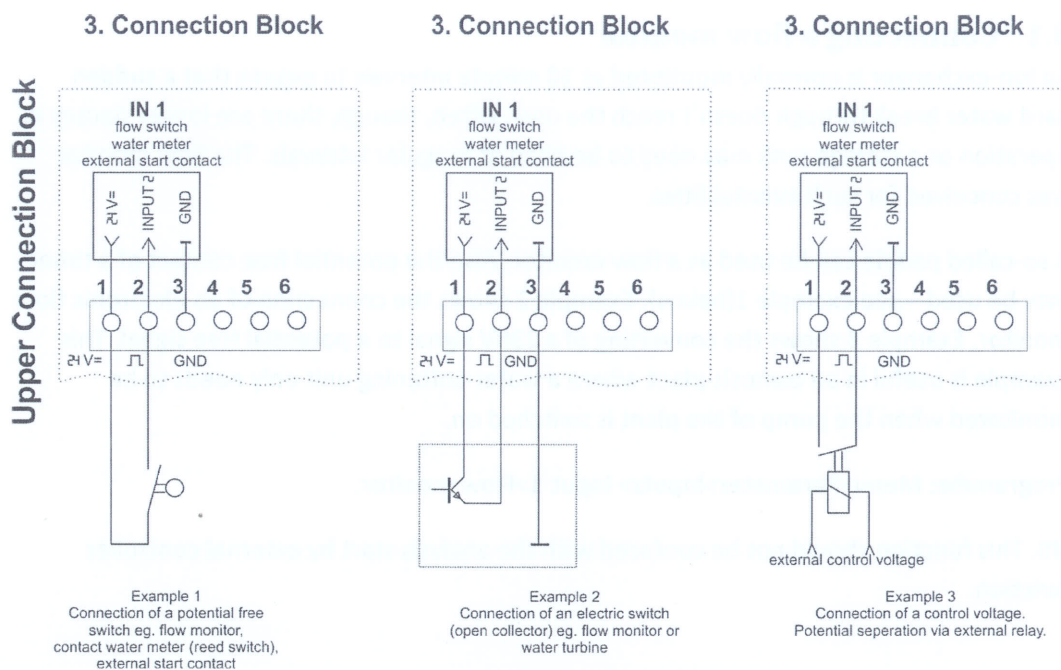
Programme: Menu>Parameter>Inputs> Input 1>Analysis start

### 8.4 Connecting a switch "Fault RESET"

It is possible to cancel a fault indication via an external switch.

This could be a potential free switch (example 14) or the relay output of an SPS controller (example 9).

Programme: No programming of IN 2 necessary.



Connection Examples for Input 1 (IN 1)

## 8.5 Connecting a Buzzer

A buzzer can be connected to signal the exceeding of limits 1 or 2, low reagent level or fault condition. Power for the buzzer can be acquired from the internal power supply (example 1, 3 or 5) or from an external source (example 6).

Programme: Menu>Parameter>Outputs> REL 1- REL 4. According to the required function.

## 8.6 Connecting a Control Unit for a Regeneration Unit

Water treatment plants are generally regenerated according to the amount of water that flows through them. To ensure that no hard water gets through to the users, regeneration is carried out before the softening medium is exhausted. If the regeneration is activated via an analysis unit, softening medium and water will be saved. If the hardness of the water supply varies widely, a qualitative regeneration activation via an analysis unit is unavoidable.

The impulse delivery for activating the regeneration is achieved via **REL 1** (limit value 1) or **REL 2** (limit value 2). On account of longer standing time or higher demands, it can come to a premature regeneration. In event of a limit being exceeded, therefore, it is recommended that the analysis be repeated.

For the connection of **REL 2**, (limit 2) see example 7.

Programme: Menu> Parameter > Output >Relay 2 > Limit 2 >Impulse >5 – 3600 Seconds.

Programme: Menu> Parameter >Analysis>Result check> Repeat 1

## 8.7 Connection “Analysis Active”

Relay 4 can be used to signal that an analysis has been started.

You can connect signaling units, pumps or valves.

For the connection of **REL 4**, (analysis) see example 4, 11 and 13.

Programme: Menu> Parameter > Output >Relay 4 > Analysis

## 8.8 Connecting a Valve for a Pre-cooler

If the sample water temperature is above 40°C, it must be cooled down. Relay 4 can then be employed to operate a cool water valve. To ensure that no hot water can enter the measuring-chamber, the cool water valve will be opened before the input valve when an analysis is started. In this case, an analysis delay must be programmed.

For the connection of **REL 4**, (analysis) see example 4.

Programme: Menu> Parameter > Output >Relay 4 > Analysis

Active before beginning the analysis until the end:

Programme Analysis>Analysis delay>0 – 1800 seconds

## 8.9 Connecting a Feed Pump

If there is not enough water pressure in the system, or if it is necessary to analyse a sample from a storage tank, relay 4 can also be employed to control a feeder pump.

For the connection of **REL 4**, (analysis) see example 13.

Programme: Menu> Parameter > Output >Relay 4 > Analysis

## 8.10 Connecting a Blending Facility

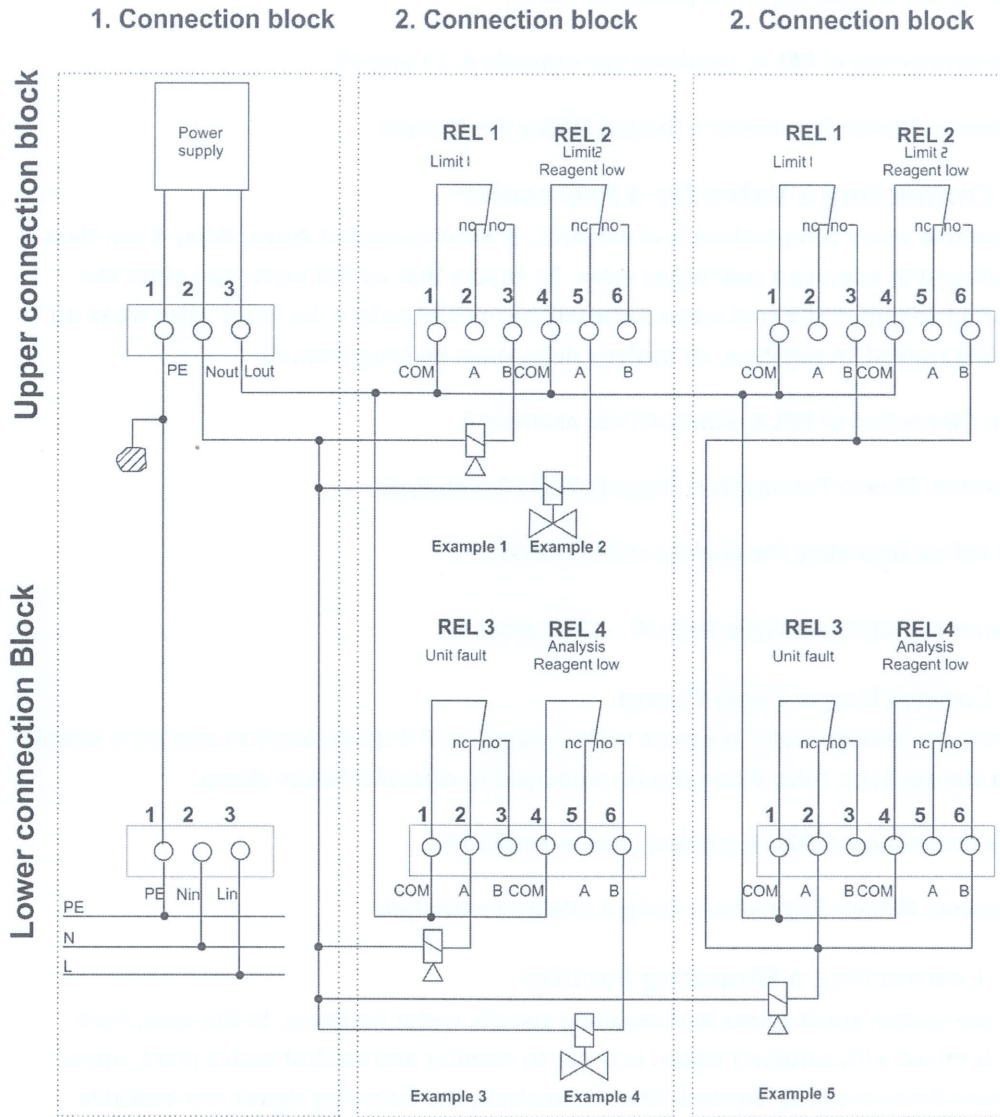
There are certain applications that require a specific water hardness. In this case, hard water is mixed with softened water. In order to monitor and control such a plant, upper and lower limits are programmed. After an analysis, the following signals are available: Result below lower limit (**REL2** = on); Result within limits (**REL1** and **REL2** both off); Result over the upper limit (**REL1** = on). These signals are evaluated by an external controller that operates the blending valves accordingly.

For the connection **REL 1** and **REL 2**, see example 8.

Programme: Menu> Parameter >Analysis>Limit mode> Max. /Min

Programme: Menu> Parameter >Output relay 1>Duration

Programme: Menu> Parameter >Output relay 2>Duration



Connection Example REL 1 – REL 4

### 8.11 Connecting an Analogue measuring device

The actual measurement result is available as an analogue value (see example 4). A recorder or other external device can be connected to evaluate and implement the results. You can choose between a current output of 0 – 20mA and 4 – 20mA. Additionally, you must define which degree of hardness relates to 20mA.

Programme: Menu> Parameter > Output > Current interface type: 0-20mA or 4-20mA

Programme: Menu> Parameter > Output > Calibrate current interface (select measurement range and unit of measurement)

### 8.12 Connecting the CAN-Bus

Devices with a bi-directional CAN-Bus can be connected.

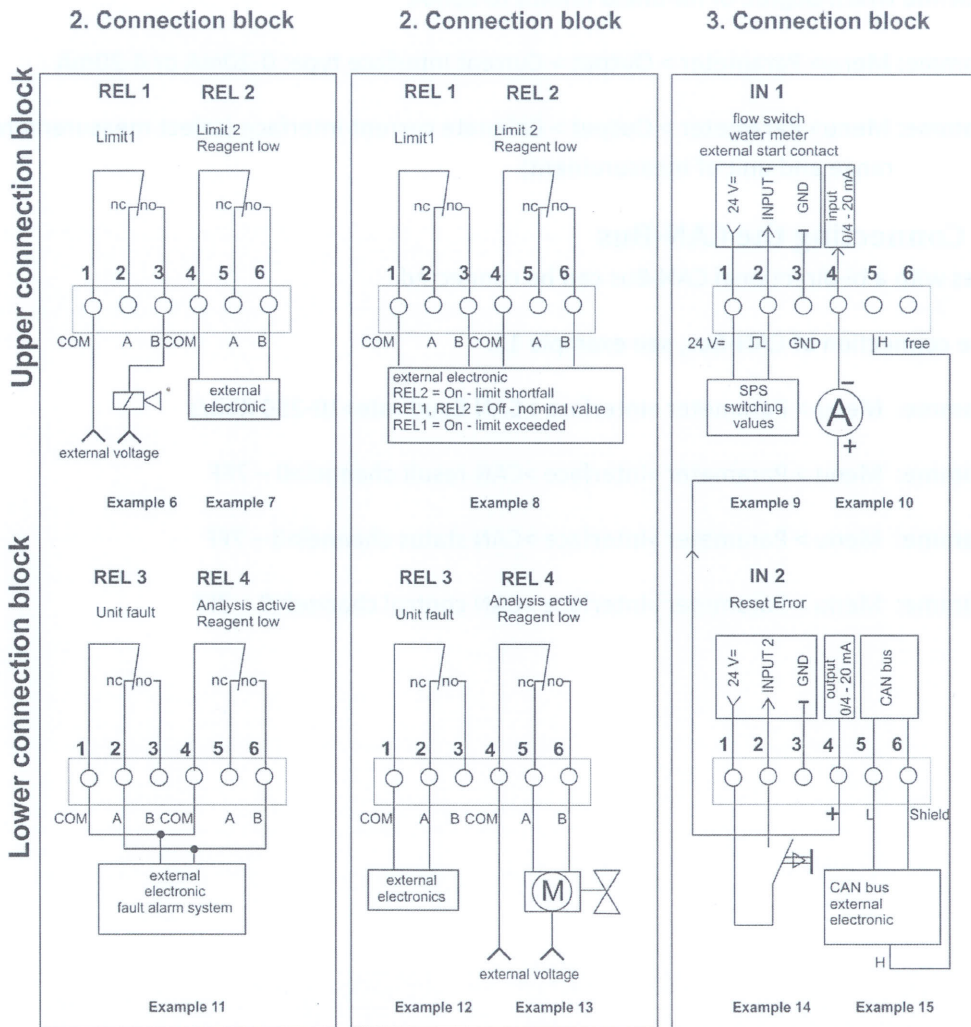
For the connection of CAN-Bus, see example 15.

Programme: Menu > Parameter >Interface >CAN Baud rate>10-250 Kbit/s

Programme: Menu > Parameter >Interface >CAN result channel>0 – 7FF

Programme: Menu > Parameter >Interface >CAN status channel>0 – 7FF

Programme: Menu > Parameter >Interface >CAN control channel>0 – 7FF



Connection Example REL 1- REL 4, IN 1, IN 2, Analogue output and CAN-Bus

## 9 Configuration

### 9.1 Works Settings

The unit has the following works settings:

		Parameter	Working setting
<b>Parameters</b>	<b>General</b>	• Language	Deutsch
		• Measurement	Total hardness
		• Unit	dH°
		• Codeword	0000
	<b>Analysis</b>	• Reagent	H25-2
		• Limit mode	Max/Max
		• Upper limit 1	3,5°dH
		• Lower limit 2	1,5°dH
		• Flush time	120 s
		• Analysis deceleration	0 s / off
		• Auto. interval time	10 min
		• Auto. interval amount	off
		• Analysis stop	off
		• Retry cycle	1 retry
	• Calibration factor	100%	
	<b>Inputs</b>	• Input 1	deactivated
		• Input 2	Error reset
		• Flowmeter typ	-
		• Flowmeter unit	-
		• Flowmeter K-factor	-
		• Flow controller	off
		• Level control sensor	off
	<b>Outputs</b>	• Currentloop type	4..20 mA
		• Currentloop. cal.	1°dH
		• Relay 1	Limit 1
		• Relay 2	Limit 2
		• Relay 3	Error
		• Relay 4	Reagent low
<b>Interface</b>	• CAN baudrate	20kBit/s	
	• CAN results channel	0x74h	
	• CAN status channel	0x76h	
	• CAN control channel	0x75h	

Reset to works settings: Menu>Parameter>General>Load works settings

## 9.2 Configuration Assistant

The configuration assistant serves to simplify the initial commissioning. Via the menu, the unit guides you step by step through all necessary settings. At the same time the full functionality of the unit is checked.

All settings of the menu parameters can later be changed again.

To start the assistant, select the selection assistant in the menu and confirm with [OK].

The following steps will be carried out:

Language Selection	Please choose your language. / Bitte wählen Sie Ihre Sprache. [OK]  Choice of language:
Your setting:	German, English, French, Italian, Polish, Dutch, Turkish, Spanish, Portuguese  Select and confirm with [OK]  <i>*at this time, only German, English, French and Italian are available</i>

Start  Configuration assistant	Do you want to start the configuration assistant?  [YES / NO] [OK]  YES: Starts the Configuration assistant  NO: Return to main menu
--------------------------------------	--

Works setting	Do you wish to reset the unit to the works settings?  [YES / NO] [OK]  YES: Resets the unit to recommended settings.  NO: The unit keeps your settings.
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Select test parameters	Please select the test parameters  [OK]  You have the choice* between:  Total hardness or carbonate hardness
------------------------	--



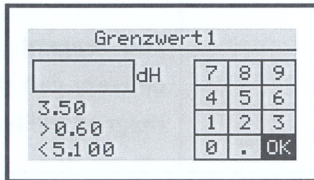
Your setting:	<p>Select and confirm with [OK]</p> <p><i>* Further parameter are being prepared</i></p>
---------------	--

Select reagent	<p>Please select your reagent [OK]</p> <p>According to test parameters, a choice of possible reagents is now shown:</p> <p>Total hardness: H25-0.02 to H25-10</p>
Your setting:	<p>Carbonate hardness: C25-1 to C25-3</p> <p>Select and confirm with [OK]</p>

Deliver reagent	<p>Place a new bottle of reagent in position [OK]</p> <p>The reagent pump starts the delivery of reagent. The delivery can be stopped with [OK]. After ca. 30 seconds reagent will have reached the measuring chamber.</p>
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Select unit of measurement	<p>Select the unit in which the test results should be displayed. [OK] You will get a choice of possible measurement units according to the measurement parameters:</p> <p>°dH, °f, ppm(CACO3), mmol/l, mg/l, mval/l, e</p> <p>Select and confirm with [OK]</p>
Your setting:	

Set flushing time	<p>Give in the required flushing time. [OK]</p> <p>Flushing time: 0001 – 9999 seconds</p> <p>The flushing time must be set according to the length of the inlet pipe and the water pressure. It must be sufficiently long to allow a complete change of sample water in the chamber.</p>
Your setting:	

	Select with navigation keys and confirm. [OK]
Flushing	You will now be invited to flush the system [OK]. Flush as long as necessary to rid (as far as possible) the chamber of bubbles. You can end the flush with [OK].
Set limit mode	Choose the mode of limit 1 and limit 2. Select with navigation keys and confirm. [OK] With this choice, you set the unit's logic to limit monitoring. In a softening system, the test result should lie below limit 1 (warning) and below limit 2 (error). In a blending system, on the other hand, the test result should lie <i>between</i> limit 1 (lower limit) and limit 2.(upper limit)
Your setting:	
Set limit 1 (Upper limit)	At what value should the monitoring of limit 1 take place? [OK] You can see this mask:
Your setting:	 <p>Via the navigation keys, you can select the value and confirm [OK].</p> <p>The recommended value is displayed under the entry box. Pressing [OK] accepts this suggestion. The minimum und maximum values for the selected indicator are shown behind the &lt; and &gt; symbols.</p>
Set limit 2 (Lower limit)	At what value should the monitoring of limit 2 take place? [OK]
Your setting:	<b><i>This limit must be <u>less</u> than limit 1.</i></b> Via the navigation keys, you can select the value and confirm [OK].

Set analysis start	Select whether the analysis should be started after a time interval, after a discharge or both. [OK]
Your setting:	<p>You have the possibility to start an analysis via one of the following:</p> <p>External contact, time, amount, time and amount</p>
Your setting:	<p>Select and confirm [OK].</p> <p><b>Select [external contact]</b></p> <p>After selecting external contact, no further settings are necessary.</p> <p><b>Selection [time]</b></p>
Your setting:	<p>After selecting time, you will be invited to select a time interval between measurements:</p> <p>Select the required time interval [OK].</p> <p>001 – 999 min</p> <p>Via the navigations-keys, select the value and confirm [OK]</p> <p><b>Selection [amount]</b></p>
Your setting:	<p>Select the unit of measurement for the amount of water discharged [OK]</p> <p>You are given the following choices:</p> <p>l, hl, m3, gallons(US), gallons(Imp)</p> <p>Select the value using the navigation keys and confirm [OK]</p> <p>Select the amount after which the analysis should start [OK]</p>
Your setting:	<p>e.g. 1000 l</p> <p>Select the value using the navigation keys and confirm [OK]</p> <p><b>Selection [time and amount]</b></p> <p>As above.</p>
Test repetition, First result suppression	<p>Set the number of tests that you require to be made following a failed test. [OK]</p> <p>You have the following possibilities:</p> <p>No repeat</p> <p>Repeat once</p> <p>Repeat twice</p>

	<p>Repeat 3 times</p> <p>Via the navigation keys, you can select the value and confirm [OK].</p>
Your setting:	<p>An analysis can produce a bad result after the system has stood a while. It is, therefore advisable to carry out a control test to confirm a result before an alarm is set off.</p>

Define input 2	<p>Choose the function of input 2 [OK]</p> <p>You have the following possibilities:</p> <p>Deactivated, analyse start, water-meter, flow-monitor</p>
Your setting:	<p>Via the navigation keys, make a selection and confirm [OK].</p> <p>Different functions can be assigned to input 2.</p> <p><b>Deactivated</b></p> <p>If the input is not used</p>
	<p><b>Analysis start</b></p> <p>The analysis can be started by a controller. This is only possible if the unit is ready and not already in the process of an analysis.</p> <p><b>Water meter</b></p> <p>This setting should be selected if the unit is to be controlled by an external water-meter.</p> <p><b>Flow-monitor</b></p> <p>This setting should be selected if an external flow-monitor is connected to the input and the analysis unit should only carry out tests at preset time intervals if water is removed from the system.</p>

Relay 1 (Limit 1)	<p>Do you need a period or impulse contact on relay 1?[OK]</p>
Period or impulse contact	<p>You have the following possibilities:</p> <p>Period / Impulse [OK]</p>
Your setting:	<p>By selecting impulse, you can set the impulse length to control a switch room:</p>

	001 to 999 seconds.
--	---------------------

Define Relay 2	Choose the function of input 2 [OK] You have the following possibilities:
Your setting:	Limit 2 or reagent level <10% Via the navigations-keys, make a selection and confirm [OK]. Alternatively, the reagent level can be configured to relay 4.

Relay 2 (Limit 2)	Do you need a period or impulse contact on relay 2?[OK]
Period or impulse contact	You have the following possibilities: Period / Impulse [OK] By selecting impulse, you can set the impulse length to control a switch room: 001 to 999 seconds.
Your setting:	

Define Relay 4	Choose the function of input 4. [OK] You have the following possibilities:
Your setting:	Analysis or reagent level <10% Via the navigations-keys, make a selection and confirm [OK]. With analysis, you can control an external pump, the cool water valve of a sample cooler or an external controller. Alternatively, the reagent level can be configured to relay 2.

Interface configuration	Select the operating mode for the current interface[OK] You have the following choices:
Your setting:	Off, 0 to 20mA, 4 to 20mA Select the value via the navigation keys and confirm [OK].

<p>Your setting:</p>	<p>Current loop:</p> <p>Assigning a hardness-grade limit to the maximum output current (20mA). <b>Although other values are also possible, we recommend that you select the upper limit of the reagent used as the hardness-grade.</b></p> <p>Formula for calculating the output current corresponding to the value displayed:</p> $I = I_0 + \frac{(20mA - I_0) \cdot \text{result}}{\text{hardness grade limit}} [mA]$ <p>For I<sub>0</sub>, 0 or 4 (mA) should be inserted according to operating mode.</p> <p>The value of "hardness grade limit" is the value you selected above.</p>
----------------------	--

<p>CAN-interface configuration</p>	<p>Do you wish to use the CAN interface? [OK]</p> <p>You have the following choices:</p> <p>YES / NO [OK]</p> <p>If you have selected YES, you will be invited to make the following choice:</p> <p>Choose the baud rate of your CAN net [OK]</p>
<p>Your setting:</p>	<p>10 kbits/s, 20 kbits/s</p> <p>Select the value via the navigation keys and confirm [OK].</p> <p>Choose the channel-ID, on which the unit is to be controlled [OK].</p> <p>Test result channel</p> <p>0000-CFFF</p> <p>Choose the channel-ID, on which the unit is to transmit the test results [OK].</p>
<p>Your setting:</p>	<p>0000- CFFF</p> <p>Choose the channel-ID, on which the unit is to transmit the status message [OK].</p> <p>0000- CFFF</p> <p>Select the value via the navigation keys and confirm [OK].</p>

The unit is now completely configured.

## 10 Operation

### Manual and Automatic operation

In the automatic mode, (menu > automatic), the analysis unit can be started by time, amount or via external switch. In the manual mode, (menu > manual), functions like analysis start, inject reagent or flush can be controlled manually. Also included in the manual mode is a diagnosis function through which individual components can be tested.

### Main menu

Via the main menu it is possible to set up the unit set (Menu > Parameter), start the configuration assistant (Menu > Assistant), call up system information (Menu > Info) and to carry out the necessary functions for maintenance and installation (Menu > Manual).

The operating of the analysis unit is virtually self-explanatory and all functions are well arranged in a tree like structure.

### 10.1 Menu structure

The menu structure is laid out in the following table in order to give you an overview of the various functions that the analysis unit has to offer.

Main menu		1. Under menu		2. Under menu	Unit function
Automatic					Automatic operation on / off.
Manual	->	Analysis			Start analysis
Manual	->	Reagent			Inject reagent
Manual	->	Diagnosis			Start diagnosis
Manual	->	Flush			Flush chamber

Main menu		1. Under menu		2. Under menu	Unit function
Parameter	->	General	->	Display contrast	Set display contrast
Parameter	->	General	->	Language	DE, EN, FR, and others
Parameter	->	General	->	Date / time	Set date / time
Parameter	->	General	->	Measurement size	Total / carbonate hardness,
Parameter	->	General	->	Unit	°dH, °f, mg/l, ppm, Set parameter
Parameter	->	General	->	Code word	Assign code word (0000)
Parameter	->	General	->	Import settings	Load configuration from SD-card
Parameter	->	General	->	Export settings	Save configuration to SD-card
Parameter	->	General	->	Works settings	Reset to works settings

Main menu		1. Under menu		2. Under menu	Unit function
Parameter	->	Analysis	->	Reagent	Select reagent type
Parameter	->	Analysis	->	Limit mode	Select Binding or Softening system
Parameter	->	Analysis	->	Limit 1	Set Limit 1
Parameter	->	Analysis	->	Limit 2	Set Limit 2
Parameter	->	Analysis	->	Flushing time	Set pre-analysis flush time
Parameter	->	Analysis	->	Analysis delay	Time setting to delay analysis start
Parameter	->	Analysis	->	Auto-start option	Define start initiator i.e. Time /amount/ or time and amount
Parameter	->	Analysis	->	Auto-interval time	Define time interval between 2 analyses
Parameter	->	Analysis	->	Auto-interval amount	Define water volume between 2 analyses
Parameter	->	Analysis	->	Check measurements	Set amount of check measurements (0-3)
Parameter	->	Analysis	->	Check interval	Set interval between check measurements
Parameter	->	Analysis	->	Calibration factor	Value correction in %



Main menu		1. Under menu		2. Under menu	Unit function
Parameter	->	Inputs	->	Input 1	Select input function
Parameter	->	Inputs	->	Input 2	Select input function
Parameter	->	Inputs	->	Through-flow measurement	Select contact or semi-conductor sensor
Parameter	->	Inputs	->	Through-flow unit of measurement	Select unit of measurement
Parameter	->	Inputs	->	Through-flow K-factor	Select the K-factors
Parameter	->	Inputs	->	Flow meter	Select NPN / PNP output sensor
Parameter	->	Inputs	->	Level indicator	Select whether or not an external level reagent is to be used
Parameter	->	Inputs	->	Input 2	Select input function

Main menu		1. Under menu		2. Under menu	Unit function
Parameter	->	Outputs	->	Current loop Type1	Setting the operating mode: 0..20mA 4..20mA
Parameter	->	Outputs		current loop cal	Setting the hardness value relating to the 20mA
Parameter	->	Outputs	->	Relay 1	Settings for relay 1
Parameter	->	Outputs		Relay 2	Settings for relay 2
Parameter	->	Outputs		Relay 3	Settings for relay 3
Parameter	->	Outputs		Relay 4	Settings for relay 4

Main menu		1. Under menu		2. Under menu	Unit function
Parameter	->	Interface	->	CAN-Baud rate	Transmission rate of the CAN net
Parameter	->	Interface	->	CAN-Results channel	Identifier ID of the result
Parameter	->	Interface	->	CAN-Status channel	Identifier ID of the Status message
Parameter	->	Interface	->	CAN-Control channel	Identifier ID of the control commands

## 10.2 Maintenance functions

Various functions of the analysis unit can be checked and tested via the menu point Menu > Manual > Diagnosis.

## 10.3 Action in event of power loss

Various settings can be saved on to the SD-card or to the internal memory. In the event of a power loss, the settings will be available at the next power-up. If the unit had been running in automatic mode, it will automatically re-commence analysing after a short interval. The previous settings of amount and time intervals will still apply.

If the analysis unit fails and has to be replaced, you only have to remove the SD-card from the old unit and install it in the new. Using menu function Parameter > General > Settings, import the unit settings and test result history.

## 10.4 SD-Card

The analysis unit contains an SD-card. The following information is stored on this card: Test results, error reports, unit firmware.

The information is stored as .csv files. These files can be opened and further processed on an editor or table calculation programme (e.g. MS Excel, OO Calc). The system data remains on the SD-card (.bin).

The analysis unit is also fully functional without an SD-card. However, it will only store the last 100 test results in the internal memory.

If you use an SD-card other than the one supplied, it must be formatted as follows:

Memory capacity:	max. 2.0 GB
Data system:	FAT16
Size of the allocation data:	32 k Byte

Bigger SD-cards can be formatted under e.g. Windows 7 > START > execute command und then by entry of format x: /FS:FAT /A32K. X stands for the letter of the disc-drive assigned to the SD-card.

The following files are saved on the card:

File name	Content
trend.csv	Contains the results in table form with Date; time; result. The data are stored in the following formats: YYYY.MM.DD [Tab] hh.mm [Tab] x.xxx [LF] The results (x.xxx) will be stored in the unit mmol/l. The relevant conversion tables can be found on page 57.
error.csv	Contains the results in table form with Date; time; error. The data are stored in the following formats: YYYY.MM.DD [Tab] hh.mm [Tab] Error code [LF]
history.bin	System data. These files contain the last 100 results which are loaded into the internal memory when unit is switched on.
config.bin	System data. These files contain various settings of the analysis unit. If the analysis unit fails and has to be replaced, use menu function Parameter > General > Settings to import the unit settings and test result history.
firmware.bin	<p>These files are not to be found on the SD-card. If software updates for your analysis unit become available, they can be acquired from our distributors or as a download from the home page.</p> <p>You can then copy these files on to the SD-card. Press and hold the [OK] key while switching the unit on. Following a security question, the new software can be successfully installed.</p> <p>We recommend that the files are removed from the SD-card after they have been installed in the unit.</p>

## 11 Maintenance and Service

In order to ensure a long and disturbance free functioning of the analysis unit, maintenance of the unit should be carried out at regular intervals. In most cases tools are not needed. Before commencing maintenance work, ensure that the unit is switched off. During this period, no analyses will be carried out. Always wear protective glasses and gloves while carrying out maintenance to avoid contact with reagent, cleaning fluid or water

Please observe the following maintenance intervals

All 6 Months	Clean the measuring chamber (by higher environmental or water temperatures or high levels of biocides, it may be necessary to reduce the interval)
all 50.000 analyses or 6 Months	Installation maintenance set

### 11.1 Cleaning the measuring chamber

Cleaning the measuring chamber requires about 20 minutes. This is done as follows:

- Remove the dosing-pump-cassette from its mounting by squeezing the clips above and below then pulling outwards.
- Remove the connections to the dosing-plug and reagent-bottle.
- Pull the securing pins outwards until all the plugs are free. Do not try to remove the pins completely.
- Remove the chamber from the holding pins on the control box.
- Clean the chamber using the cleaning kit SYCON Clean (Art.-Nº: 30-010900) according to the instructions.

When re-assembling, please follow the following sequence:

- Push the clean chamber on to the two holding pins and push in the securing pins to secure.
- Re-insert all plugs and secure with securing pins. Ensure that the plugs are firmly pushed in to their holes before attempting to push in the securing pins. **Do not force them!** This may lead to damage of the plugs or pins. All pipes must be free and not twisted.
- Switch the unit on again, flush the measuring chamber then pump reagent into the chamber. The unit is now ready for use (Menu > Manual > Flush / Reagent).

---

## 11.2 Changing the dosing-pump-cassette

It is necessary to change the dosing-pump-cassette at regular intervals. This is included in the "maintenance set for Trend Analyser (Sycon 2800H)" (Art.-No: 33-090034). The exchange takes about 10 minutes.

The exchange is achieved as follows:

- Switch off.
- Remove the connections to the dosing-plug and reagent-bottle.
- Remove the pump-cassette from its mounting by squeezing the clips above and below then pulling outwards.
- Remove the dosing plug at the top of the chamber by pulling the 2 securing pins and gently pulling the plug upwards.
- Discard cassette and tubes.

When re-assembling, please follow the following sequence:

- Connect the cassette to the reagent bottle. Turn the bottle until all bends are removed and the pipe hangs freely.
- Connect the cassette to the dosing-plug. First ensure that the pipe is not twisted then re-insert the plug. Ensure that the plug is firmly pushed in to its hole before attempting to push in the securing pins. **Do not force them!** If you have difficulty inserting the plug without force, apply a little Vaseline to the o-ring.
- Clip the cassette securely on to the pump.
- Switch the unit back on, flush and pump reagent into the chamber. The unit is now ready for use (Menu > Manual > Flush /Reagent).

---

### 11.3 Changing the reagent bottle

Ensure that the new reagent is within its best before date. Only use fresh reagent.

The exchange is achieved as follows:

- Switch off.
- Unscrew the cap and remove the bottle adapter and lance. Insert these in the new bottle and secure cap. Clean up any spilt fluid.
- Switch the unit back on, flush and pump reagent into the chamber. By confirming the reagent bottle change after the injection of reagent, the reagent level for the 'BOB' operation will be reset to 100%. Only use 500 ml bottles.

### 11.4 Calibrating the unit

The unit is calibrated at the factory at a room temperature of 20°C. If the unit is to be used in especially hot or cold environments, please re-calibrated when commissioning.

You can calibrate the unit as follows:

- Carry out an analysis using the unit. The hardness of the sample have to be within the measurement range of the used reagent. A calibration with a value like '<0,1 °e' is not possible.
- At the same time carry out an analysis in the laboratory (lab.)
- Calculate the correction factor for the unit with the following formula:

$$\text{Correction factor} = \frac{\text{Value}(lab.)}{\text{Test result}} \times 100\%$$

- Feed the correction factor into the unit via (Menu > Parameter > Analysis > Correction factor). To do this, it is necessary to give in the code word of the unit or assign a new code word via (Menu > General > Code word).

---

## 11.5 Changing the Battery

If the unit does not show the time when it is switched of, it is necessary to change the back up battery as follows:

- Switch off and disconnect the power from the unit.
- Open the control box by removing the 4 screws. The battery holder is found on the circuit board under the lid.
- Replace the battery with the type CR2032.
- Ensure that the ribbon cable between the 2 circuit boards has not come loose. Close the control box again.
- Dispose of the battery in a responsible way.

## 11.6 Software Update

The analysis unit offers the possibility to update the software. In the framework of product improvement, you can receive updates from our agents or from our home-page. If it is necessary, the agent will send you the data with the file-name firmware.bin

To install an update:

- Switch off unit.
- Open the control box by removing the 4 screws. The battery holder is found on the circuit board under the lid. Remove the SD-card which is found under the lid.
- Copy the firmware.bin files on to the SD-card using a computer and then return the SD-card to the unit.
- Ensure that the ribbon cable between the 2 circuit boards has not come loose. Close the control box again. Reconnect power.
- Press [OK] while switching on the unit. The unit will actuate the software and recommence normal operation.
- Switch the unit off again. Remove the SD-card and delete the firmware.bin files from it.
- Re-insert the SD-card in its slot under the lid.
- Switch on and check the unit configuration.

## 12 Error Analysis

### 12.1 Fault finding

#### The analysis will not begin

Check that the flow meter is correctly configured and connected.

Check that the interval time is set.

Check whether a water meter is connected and correctly configured.

Check, if relevant, connections from an external controller.

#### Error during the blank test

Check that there is water in the chamber and that the supply and waste pipes are not swapped.

Check the chamber for dirt, gas bubbles or foreign bodies.

Check the water pressure (recommended 1-2 bar).

Check that the waste pipe is free and that there are no foreign bodies in the magnet valve.

If a pump is used to supply the sample water, ensure that it is correctly connected.

With the help of the diagnosis menu, check the function sensor and magnet valve.

#### Error during Titration

Check that there is enough reagent available.

Check the pipes between the reagent bottle and the dosing-pump for air bubbles. If necessary, pump reagent until the pipes are full of reagent.

Check that the blue o-ring is still on the nozzle of the dosing-plug.

Check that there is water in the chamber.

Check that there is a magnetic stirrer (stir-fish) in the chamber.

Check the reagent delivery, the sensor and the stir-fish with the diagnosis menu.

#### False test result

Check that the reagent corresponds to that programmed.

Check for air bubbles in the reagent delivery pipe.



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During the blank test, check that the sample water is not coloured by foreign substances, sediment or air bubbles.

Check that there is water in the chamber and that the supply and waste pipes are not swopped.

Check that there is a magnetic stirrer (stir-fish) in the chamber.

Check that the blue o-ring is still on the nozzle of the dosing-plug and that it is positioned correctly.

Check that the magnet valve closes properly.

Exchange the reagent pump-cassette

Re-calibrate the unit with a new correction factor.

## **12.2 Diagnosis function**

If the analysis unit doesn't function properly, you have the possibility to check all the functions. Please take in to consideration any controllers and peripherals that are connected. Observe all safety regulations.

Select Menu > Manual > Diagnosis. You can check every part step for step:

### **Display**

The display changes its colour between red, green and blue.

### **Sensor**

The LED in the chamber pulses on and off. If this doesn't happen, check the electrical connections to the LED-plug and in the unit. If everything is ok, the LED-plug must be replaced.

### **Magnet valve**

The magnet valve in the water inlet can be heard opening and closing. If this is not the case, check the electrical connections to the valve and inside the unit. If all connections are okay, measure the voltage at the valve while the test is in progress. It should switch between 0V and 20V. When this is okay then an electrical error can be ruled out. Change the magnet valve.

### **Reagent dosing**

When the diagnosis starts, the dosing pump can be seen to turn. It can also be heard. If this is not the case, check the 4 pole connector on the circuit board. If you can hear the motor but there is no movement, then the pump-cassette is defect. If the connection are okay and the pump can neither be seen or heard, then the pump is defect or there is a defect in the electronics.

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### Magnetic stirrer

The stirrer in the measurement chamber should spin - at first slowly – then increasing to its maximum speed. If the stirrer doesn't spin, check the connection to the circuit board (red plug).

Remove the chamber and check that nothing is obstructing the movement of the drive disk.

If the above are okay, change the motor assembly.

### Relay 1 to 4

When this function is selected, you should hear the relays clicking as they operate.

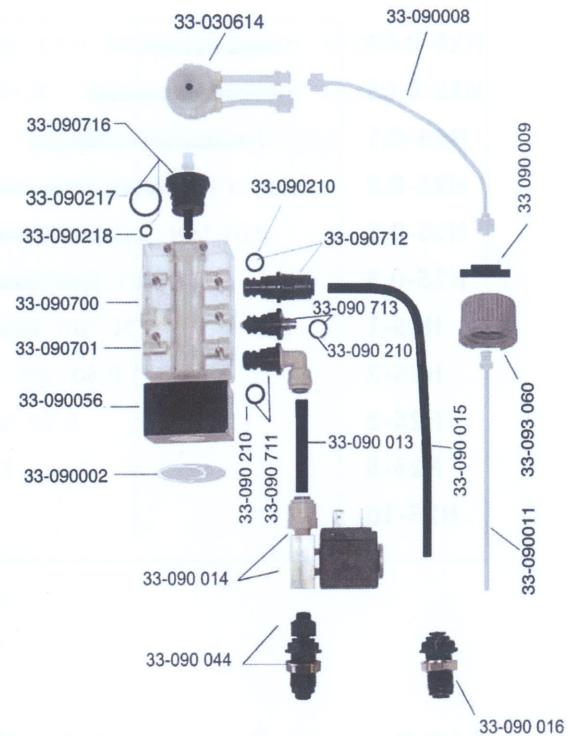
Using a continuity meter or buzzer, measure between COM and A then COM and B. If there is no continuity when the relay contacts close or there is no sound of clicking, the control circuit board must be changed.

### Current loop

To test the current loop, a test meter set to mA is necessary. Connect the meter probes to the connector marked [20mA+ und 20mA-].

## 13 Spare parts

Article nº	Description
33-090 002	Magnetic stirrer
33-090 008	Bottle connector
33-090 009	Bottle adapter
33-090 011	Suction lance
33-090 013	Inlet pipe ¼"
33-090 014	Magnet valve 24V complete
33-090 015	Outlet pipe 6mm
33-090 016	Connector 6mm
33-090 044	33-090 016 + screw fitting.
33-090 056	Actuator for magnetic stirrer 12V
33-090 210	O-Ring 9 x 1,5
33-090 217	O-Ring 16x2
33-090 218	O-Ring 3,2 x 2,5
33-093 060	Bottle cap
33-030614	Dosing-pump cassette
33-090 700	Measuring-chamber complete 33-090002,33-090701,33-090711, 33-090712,33-090713,33-090716 + o-rings
33-090 701	Measuring-chamber
33-090 711	Inlet plug 6mm + O-ring
33-090 712	Outlet plug 6mm + O-ring
33-090 713	Actuator plug (LED) + O-ring
33-090 716	Dosing plug + O-ring



Spare parts (not shown in picture)	
33-090 020	Cable for magnet valve
33-090 057	Cable for Actuator(LED)
33-090 023	Power supply board 85-264 V
33-090 090	Power supply board 24V (for 24V Version)
33-030 602	Control box case (with lid)
33-030 625	Dosing-pump Sycon 2800 complete
33-033 600	Control board complete
33-033 601	Display board complete
33-099 720	Operating manual (German)
33-099 721	Operating manual (English)

33-090 034	Maintenance set Sycon 2800
1x 33-030 614	Cartridge of peristaltic pump Sycon 2800 complete
1x 33-090 008	Bottle connection
1x 33-090 011	Suction lance
3x 33-090 210	O-ring 9x1,5
1x 33-090 217	O-ring 16 x 2
1x 33-090 218	Dosing O-ring 3,2 x 2,5 (blue)

33-030 624	Spare parts package
1x33-090 056	Actuator for magnetic stirrer
1x33-090 014	Magnet valve complete
1x33-090 700	Measuring-chamber complete
1x33-030 625	Dosing-pump Sycon 2800 complete

## 14 Measurement range of our reagents

### 14.1 Reagents for ascertaining the total hardness



### 14.2 Reagents for ascertaining the carbonate hardness.

Article description	Measurement range °dH	Contents	Article number
C25-1	0.3 to 3.0	500ml	32-086125
C25-1.5	0.45 to 4.5	500ml	32-086135
C25-2	0.6 to 6.0	500ml	32-086145
C25-3	0.9 to 9.0	500ml	32-086155

## 15 Calculation table for common units of water hardness

		°dH	°e	°fH	ppm	mval/l	mmol/l
<b>Deutsche Hardness</b>	1 °dH =	1	1.253	1.78	17.8	0.357	0.1783
<b>English Hardness</b>	1 °e =	0.798	1	1.43	14.3	0.285	0.142
<b>French Hardness</b>	1 °fH =	0.56	0.702	1	10	0.2	0.1
<b>ppm CaCO<sub>3</sub> (USA)</b>	1 ppm =	0.056	0.07	0.1	1	0.02	0.01
<b>mval/l Earth alkali</b>	1 mval/l =	2.8	3.51	5	50	1	0.5
<b>mmol/l Earth alkali</b>	1 mmol/l =	5.6	7.02	10	100	2	1

## 16 Instructions for disposal

- Do not dispose of the unit in household rubbish.
- The unit should be taken to a certified collection point for electrical devices.
- The battery must be disposed of separately.

The unit can also be returned to the dealer or manufacturer for proper disposal.

## 17 CAN Bus Protocol

One or more Sycon 2800 can be controlled by CAN Bus with little effort. Usually the bus ends is terminated with 120 Ohm resistors. These resistors have to be connected at both ends of the bus wire.

First of all the baud rate is set to the value of the used CAN controller. If several Sycons are connected to the bus, eachone has to be set to this value.

For communication 3 channel IDs are used for the different types of information.

- Control channel  
The control channel is used to send commands to the Sycon like analysis start.
- Status channel  
On the status channel the device's information will be transferred to the controller, e.g. relay status.
- Measured value channel  
On the measured value channel, the measured value is transmitted at the end of the titration process.

### Control commands

Channel	Command	Data Byte [0]	Note
Control channel	Analysis start	0x01	Acknowledged on the status channel
Control channel	Reagent level	0x02	Acknowledged on the status channel
Control channel	BOB control state	0x03	Acknowledged on the status channel
Control channel	Rinse active	0x04	Acknowledged on the status channel
Control channel	Relay 1 state	0x05	Acknowledged on the status channel
Control channel	Relay 2 state	0x06	Acknowledged on the status channel
Control channel	Relay 3 state	0x07	Acknowledged on the status channel
Control channel	Relay 4 state	0x08	Acknowledged on the status channel

### Status messages

Channel	Command	Data Byte [0],[1]	Note
---------	---------	-------------------	------

Status channel	Analysis start	0x01, 0x00 0x01, 0x01	Analysis not started Analysis active
Status channel	Reagent level	0x02, 0x00 0x02, 0x64	Reagent level 0% Reagent level 100% The level indication is sent in the second byte in percent
Status channel	BOB control state	0x03, 0x00 0x03, 0x01	BOB impossible BOB possible
Status channel	Rinse active	0x04, 0x00 0x04, 0x01	Valve closed Valve open
Status channel	Relay 1 state	0x05, 0x00 0x05, 0x00	Contact open Contact closed
Status channel	Relay 2 state	0x06, 0x00 0x06, 0x00	Contact open Contact closed
Status channel	Relay 3 state	0x07, 0x00 0x07, 0x00	Contact open Contact closed
Status channel	Relay 4 state	0x08, 0x00 0x08, 0x00	Contact open Contact closed
Status channel	Error	0x64, 0x00 0x64, 0x01	Reagent level low Malfunction

### Measurement result

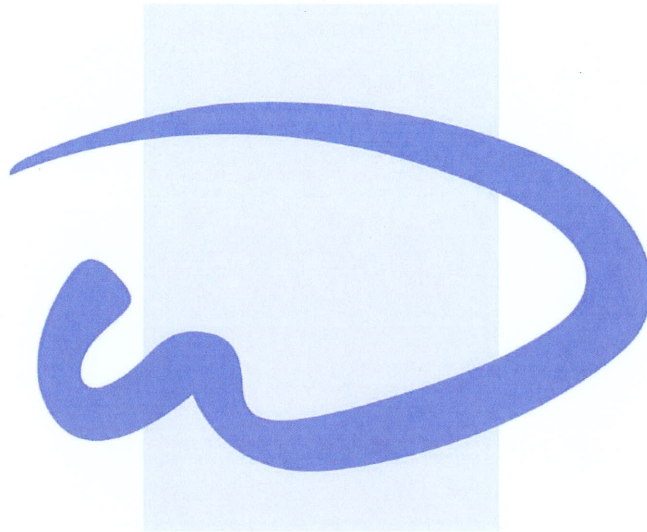
The transmission of the measured value is a float data type. Byte 0 to Byte 3.

3	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
1	0	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0
Byte[0]				Byte[1]				Byte[2]				Byte[3]																			
Exponent				Mantissa																											
Sign																															

For water hardness the measured value is transmitted as mmol/l value. Byte 4 shows the measured value in relation the measuring range of the used reagent.

Channel	Data Byte [0],[1],[2],[3],[4]	Value Byte [0],[1],[2],[3]	Measuring range Byte [4]
Measuring channel	0xXX,0xXX,0xXX,0xXX,0x00	Value of titration	Measured value within measuring range
Measuring channel	0xXX,0xXX,0xXX,0xXX,0x01	Lower value of measuring range	Value lower than lowest possible value
Measuring channel	0xXX,0xXX,0xXX,0xXX,0x02	Higher value of measuring range	Value greater than highest possible value





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**WE ENDEAVOR TO KEEP OUR UNITS UP TO DATE AND THEREFORE WE  
RESERVE THE RIGHT TO MAKE TECHNICAL CHANGES WITHOUT PRIOR  
NOTICE.**