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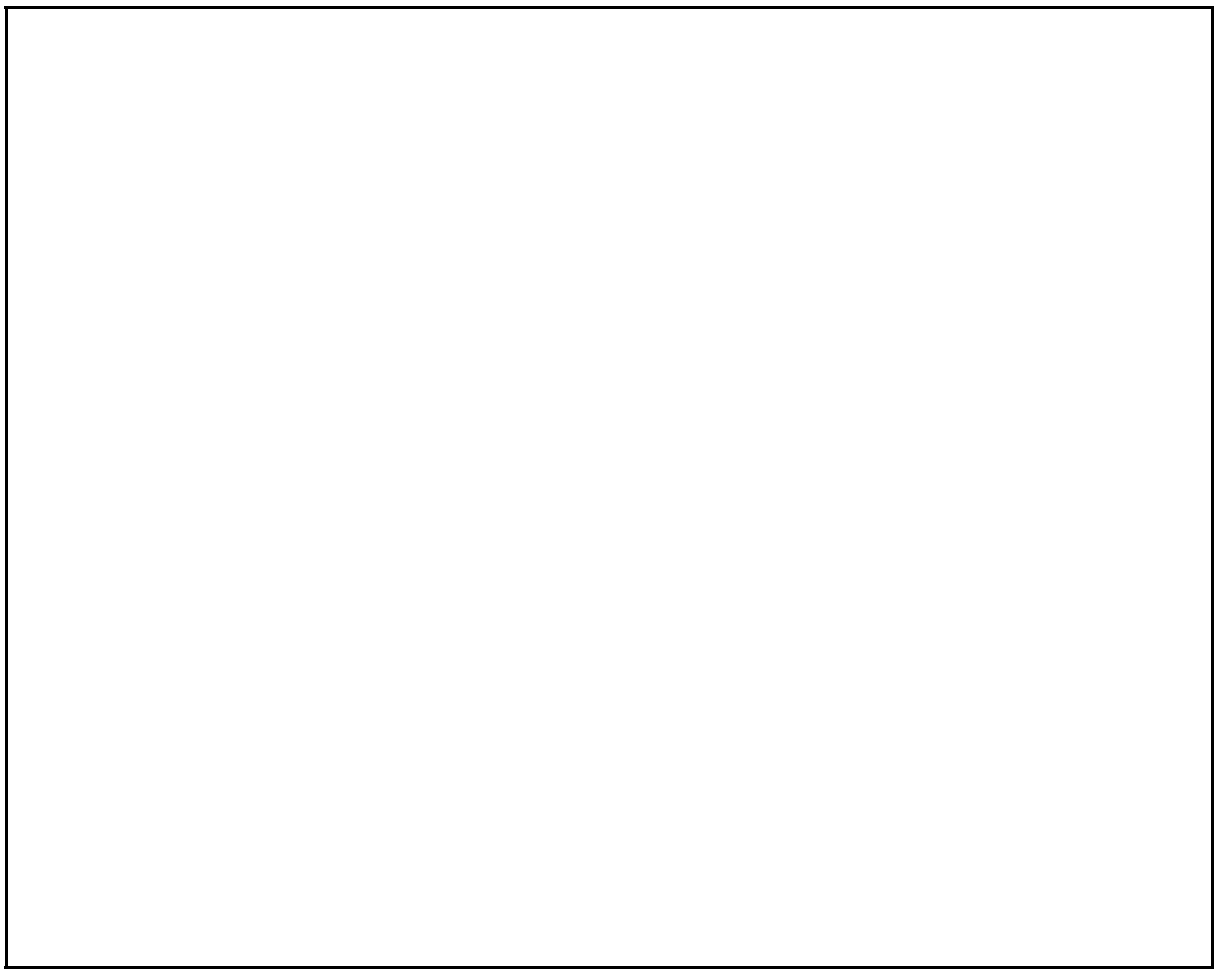
Probox Analysis THCl

Combined Process-Photometer for total chlorine 0 - 2.5ppm and Process-Titrator for water hardness 0.25 - 2.50°dH



Operating Instructions

Contents

Introduction

These operating instructions describe the installation, operation and programming of the combined process photometer and titrator Probox Analysis THCl.
We recommend that, whilst familiarising yourself with the operation of the unit aided by this manual, you have immediate access to the unit in order to perform the functions and combinations as described. As certain functions are interrelated, it is advisable to follow the instructions in the given order.
Should problems or questions arise which are not described in this manual and/or cannot be solved, our customer service is always at your disposal.
Try to identify the problem as accurately as possible and record the conditions under which it has occurred. This will enable us to offer you swift effective assistance.

Symbols and abbreviations used in these instructions:

L Note for the user "STANDBY" = STANDBY lamp is “ON”

⚠ Important to observe / warning note "M" = Press menu key M **T** Tip: Helpful hint

º SERVICE º MANUAL OPERATION º FLUSH = Sequence in a menu selection

Short description

The Probox Analysis THCl is an online monitor for monitoring the concentration of total chlorine in the measuring range 0 - 2.5 mg/l (ppm) using the colorimetric analysis principle and determines the water hardness through titration.
The analysis of total chlorine is implemented by adding three reagents, after a reaction time of approx. 1 minute (measuring time without flush time) the analysis result is shown.
Areas of use are, e.g. the protection of reverse osmosis membranes from blocking due to hardness and from destruction due to a high content of chlorine. Two independent programmable limit value contacts are available for monitoring. The analysis result can be recorded using the optional printer board (interface SK910, item no. 270305) and a dotted or continuous line printer (0/4-20mA).

		Parameter / Measuring range		
		water hardness TH 2025		**total chlorine**
Unit	**°dH** (Resolution)	0.25 - 2.50 (0.05)		-
	°f (Resolution)	0.45 - 4.48 (0.1)		-
	ppm $CaCO_3$ (Resolution)	4.47 - 44.7 (0.9)		-
	mmol/l (Resolution)	0.04 - 0.45 (0.01)		-
	mg/l (ppm)	-		0.0 - 2.5 (0.1)

L **A consistently reliable result can be guaranteed by the Probox Analysis units only with the use of original BWT Probox Analysis indicators and reagents! Failure or problems which are caused by the use of different indicators are not covered by the warranty or refund services.**

⚠ Larger quantities of heavy-metal ions in the softened water can affect the colour reaction, especially iron above 0.5 mg/l, copper above 0.1 mg/l and aluminium above 0.1 mg/l (brownish-red colour indication).The measuring is possible in a range of pH 4 - 10.5.
At a concentration of more than 100 mg/l of CO_2 (carbon dioxide) in the water the analysis can be affected.

⚠ Fault influences:

Concentration values of these ingredients can be determined safely and simply with our TESTOVAL® colorimetric test comparators.

Notes for the user

- **Repeated switching 'on' and 'off':**
  Wait at least for 5 seconds before you switch the unit repeatedly 'on' or 'off' at the main switch.
- **Observation of the environmental conditions:**
  In order to guarantee a reliable operation, the unit must only be used under the environmental conditions described in the technical data. Protect the controller against excessive humidity, condensation and water-splash.
- **Safety seal:**
  The original seals attached during manufacture (e.g. EPROM labels) must not be broken, otherwise all warranty rights are lost.
- **Malfunction / repair of defective units:**
  The repair of a defective unit is only possible when the unit is dismantled and returned to us with a description of the fault. In addition, please inform your supplier of the reagent type used.
  Before you return the unit for repair, remove the reagent bottle and ensure that the measuring chamber is flushed out and empty.
- **Electrical load capacity**
  The maximum electrical load capacity of the relay outputs and the total power rating must not be exceeded.
- **Operate the Probox Analysis THCl strictly in accordance with the manufacturer's instructions.**
- **Environmental protection regulations**
  Please observe the environmental protection regulations, collect large amounts of any unused reagent which you can no longer use and send this to us for correct disposal.

Operational checks

Careful handling of the unit increases both the operational reliability and the service life!
Therefore, the following visual inspection should be carried out at regular intervals.

- Are the hose connections with the dosing pump free of leaks?
- Is there any air inside the dosing hoses?
- Are all the water connections free of leaks?
- Are the doors of the unit properly closed? (Check door seals!)
- Is the unit unduly contaminated with dirt?

Maintenance and servicing notes
(See page 21)

Safety notes

- The unit must be installed and operated in compliance with the relevant standards (e.g. DIN, VDE, UVV), or in accordance with the regulations laid down by the individual country.
- Some functions (e.g. the manual analysis) allow the direct manipulation of the installation without locking or monitoring. These functions may only be used by trained staff and for this reason are only accessible after a password has been entered.
- If you observe the unit malfunctioning, switch it off immediately. Then shut off the water supply and contact your supplier.
- Do not attempt to repair the unit yourself (loss of warranty rights); instead always get in touch with authorised service staff. This is the only way a reliable and safe operation of the unit can be ensured.
- After a protective circuit (fuse) has tripped, first of all, attempt to correct the cause of the malfunctioning (e.g. replace the solenoid valve) before reactivating the protective circuit. Frequent tripping is always due to a fault which, in certain circumstances, may also cause damage to the unit.
- Observe the safety notes about working with reagents, chemicals and cleaning agents.

⚠ Ignoring these notes can result in damage to the unit as well as to the installation and may result in a loss of warranty rights.

Installation and commissioning

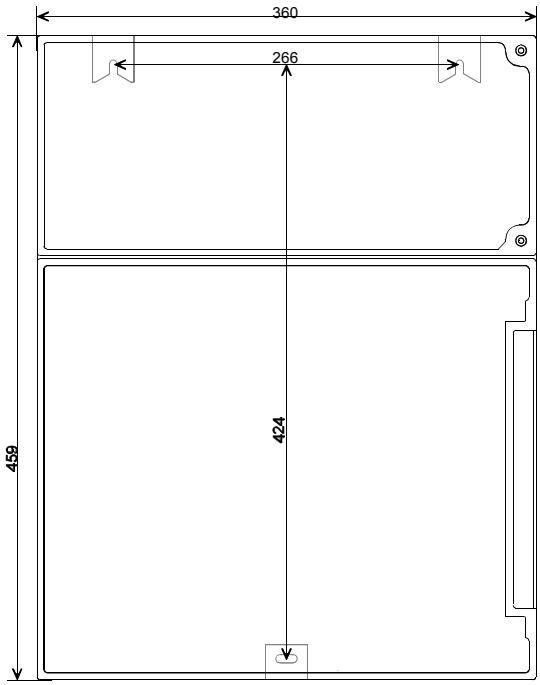
Installation and commissioning must be undertaken only by authorised technicians!

Installation

The unit should be fixed vertically!

Avoid tension of the housing.

The unit doors swing to the left when they are opened. Please ensure that there is sufficient space for opening them. In this way, you facilitate the electrical installation and later maintenance and service work.



Dimensioned sketch

Electrical connection

⚠ Check supply voltage on the rating plate!

Basic requirement
The external cables (e.g. water meter, interface) should be kept as short as possible and clear of power cables.

Connection
Loosen both fastening screws and open the upper door. Pierce the required rubber cable glands with a screwdriver and insert the cable (1). Then pull back the cable until the bush (2) has been turned over. Ensure that the leads are held securely in the terminals, then close the upper door after the installation is completed using the two fastening screws.

Mains water supply

⚠ The temperature of the sample water must be between 10 °C and 40 °C. Higher water temperatures can lead to damage to all parts coming into contact with water (e.g. filter housing, measuring chamber)!
Lower water temperatures can cause misting on the sight-glass windows.

L In the event of higher temperatures, the KCN type cooler must be installed in the branch line of the Probox Analysis THCl.

⚠ Hot water can cause scalding!

The sampling tube to the Probox Analysis THCl must be equipped with a hand-operated shut-off valve and be kept as short as possible (not longer than a maximum of 5 metres). It is important that the branch line connection is taken vertically from the top of the main soft water line in order to prevent dirt particles from entering into the measuring chamber. Remove the valve body out of the regulator/ filter housing when operating the Probox Analysis THCl with a pressure range of 0.1 to 1 bar.

Plug connector
The unit is equipped as a standard with a plug connector for opaque plastic hoses 6/4 x 1 (external diameter 6 mm/ internal diameter 4 mm).

Quick-acting coupling (accessory: optional adapter for water inlet, item no. 40123)
When fabric reinforced pressure hoses (e.g. for existing installations) are used, please replace the plug connector at the controller and filter housing with a plug for the quick-acting coupling (not included with the delivery).

Water to drain
The feed water flows through the measuring chamber then, via the outlet pipe, to the drain (hose connection internal diameter 14 mm). Make sure, by using a funnel for example, that the water can run freely to drain and cannot back-up into the measuring chamber. A hose impervious to light should also be used for the drain pipe (to discourage algae formation).

Commissioning

1. Full reagent bottles must be connected before commissioning and switching on. Attach the vacuum connection onto the reagent bottle using the union nut. Please observe the correct allocation of the reagents A, B and C to the dosing pumps: **TH2025 = DOSIClip 1 (left), Cl2025A = DOSIClip 2, Cl2025B = DOSIClip 3, Cl2025C = DOSIClip 4 (right).**

2. Switch the unit 'on' and press the "STANDBY" key. In this mode, an analysis is prevented from being carried out before a correct program has been entered which could possibly result in an error or alarm message.

3. Then bleed the dosing pump and the capillary by repeatedly pressing the "Manual" key on the dosing pump. Ensure all air is removed from the tubing! (If necessary tighten up the connections.)

4. Program the unit as applicable to your requirements, e.g.: - Mode of operation - Displayed units - Limit values - Flush time / interval

   For a description of programming see from page **17** onward.

5. Enter the correct fill status of the reagent bottles:
   "M" º SERVICE I º INPUT REAGENTS º REAGENT TH FILLING (100%)
   "M" º SERVICE I º INPUT REAGENTS º REAGENT A FILLING (100%)
   "M" º SERVICE I º INPUT REAGENTS º REAGENT B FILLING (100%)
   "M" º SERVICE I º INPUT REAGENTS º REAGENT C FILLING (100%)

6. Then remove all air from the water supply side of the unit by manual flushing.

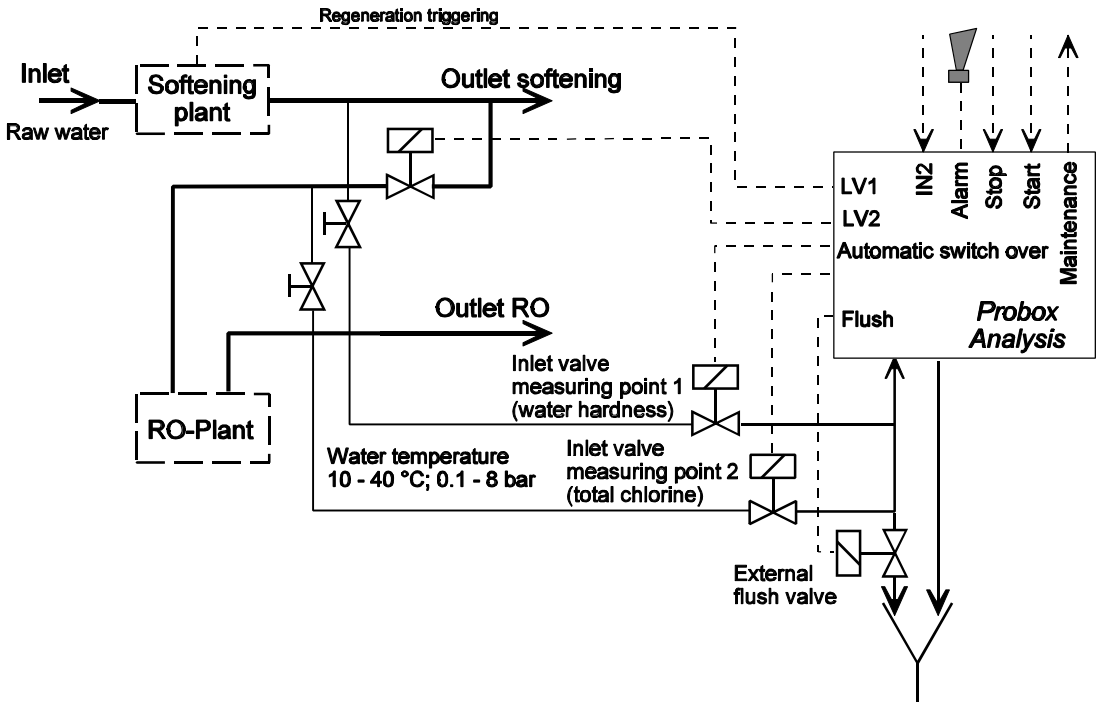
   "M" º SERVICE º MANUAL OPERATION º FLUSH (*"ENTER"* press repeatedly).

   Continue flushing until no bubbles can be seen in either the measuring chamber or the filter housing.

7. Check all connections for tightness.

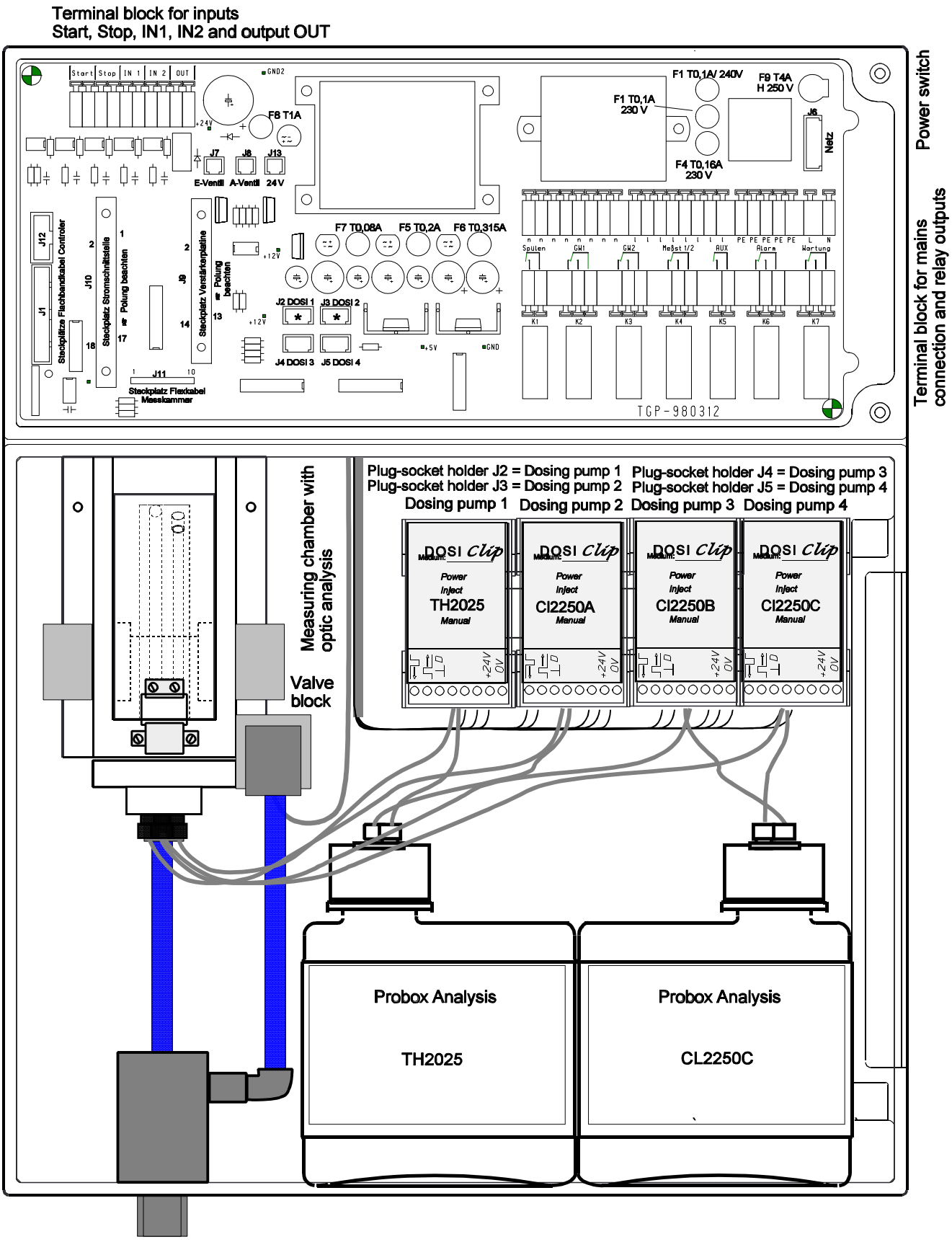
8. Carry out the first analysis by pressing the *"Manual"* key.

Installation (example):



General description

Internal construction



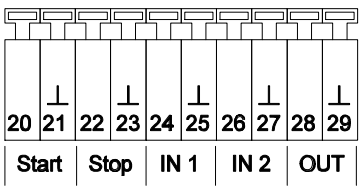
Description of the electrical connections

Terminal block identification

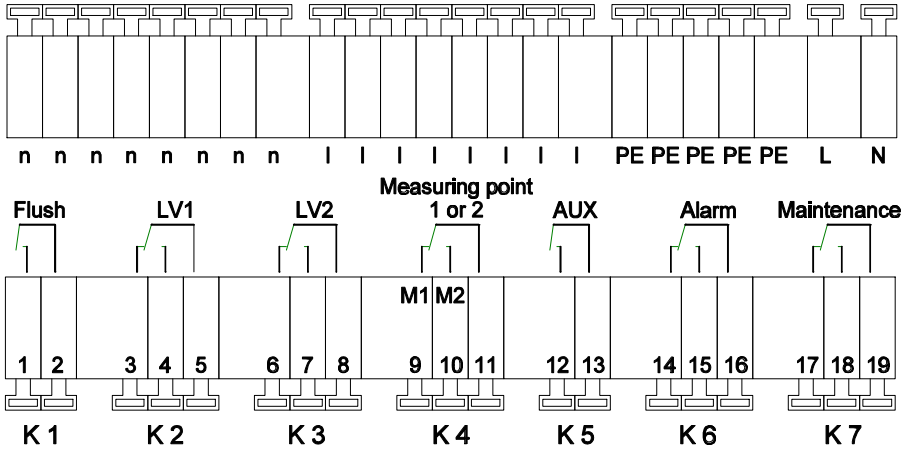
IN = input, OUT = output

No.	Terminal	Type	Function	Note
-	PE	IN	Mains-Protective earth (5 x)	
- -	N L	IN	Mains, N = Neutral Mains, L = Live	Mains-input 230 - 240 V AC (or 24V AC)
- -	n l	OUT	Neutral switched (8 x) Mains switched (8 x)	Mains voltage, max. 4 A
1 2	Flush	OUT	External flush valve	Volt-free relay output max. load 240 V AC, 4 A
3 4 5	LV1	OUT	Limit value output 1 - Normally closed Limit value output 1 - Normally open Limit value output 1 - Common	Residual hardness Volt-free relay output max. load 240 V AC, 4 A
6 7 8	LV2	OUT	Limit value output 1 - Normally closed Limit value output 1 - Normally open Limit value output 1 - Common	Chlorine Volt-free relay output max. load 240 V AC, 4 A
9 10 11	Measuring point 1/2	OUT	Measuring point 1 - Normally closed Measuring point 2 - Normally open Measuring point switch-over -Common	Volt-free relay output max. load 240 V AC, 4 A
12 13	AUX	OUT	Universal output	Volt-free relay output max. load 240 V AC, 4 A
14 15 16	Alarm	OUT	Fault message - Normally closed Fault message - Normally open Fault message - Common	Volt-free relay output max. load 240 V AC, 4 A
17 18 19	Maintenance	OUT	Maintenance message - Normally closed Maintenance message - Normally open Maintenance message - Common	Volt-free relay output max. load 240 V AC, 4 A
20 21	Start 2	IN	External analysis start Common earth for inputs	Only for volt-free normally open contact!
22 23	Stop 2	IN	External analysis stop Common earth for inputs	Only for volt-free normally open/ normally closed contact!
24 25	IN1 2	IN	External measuring point switch Common earth for inputs	Only for volt-free normally open/ normally closed contact!
26 27	IN2 2	IN	Universal input 2 (Water meter) Common earth for inputs	Only for volt-free normally open contact!
28 29	OUT	OUT	0/4 - 20 mA or serial interface	Potential output ! 28 = 0/4 - 20 mA, 29 = 2

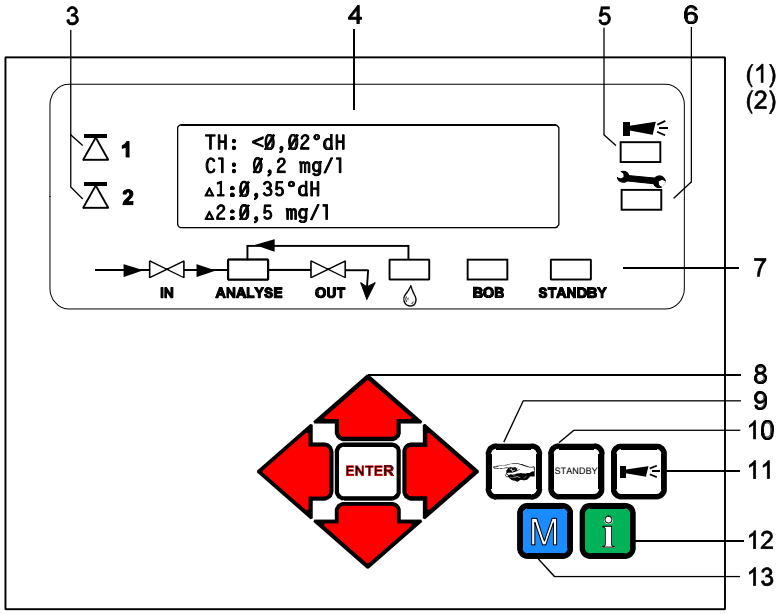
Terminal block for inputs
Start, Stop, IN1, IN2 and output OUT



Terminal block for mains connection and relay outputs



Description of displays and operating features



(1) Power switch
The 'ON'/'OFF' switch is located on the right-hand side panel. Use it to switch the unit on and off.

(2) Unit fuse (inside the unit)
Protects outputs against overload and short circuit.

3 Status of limit value displays
Displays the status of the limit values of residual hardness LV1 (1) and chlorine LV2 (2).

4 Text display
Displays the current analysis, all important status results and programming data in a 4-line LC-Display.

5 Alarm
Displays a function fault.

6 Maintenance message
Displays a maintenance request.

7 Status display
6 LEDs signal the current status (analysis and unit status) of the Probox Analysis THCl.

8 Programming keys (Cursor block with ENTER)
These keys are used to enter all values and programming data.

Function keys:
9 Manual" = manual start of analysis
10 STANDBY = manual analysis stop/standby
11 "Horn" = cancels alarm message

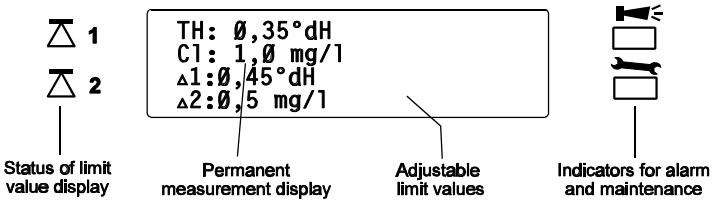
12 i-key
Call-up all unit information (see **i-Menu**).

13 M-Taste
Call-up the programming menu for user and specific unit settings (see **M-Menu**).

Display functions

Status of limit value displays 1 and 2

The display signals the status of the limit values.



1: The red display lamp lights up if the limit value 1 (residual hardness) is reached or exceeded. Lights up green if the measured value falls below the set limit value.
2: The red display lamp lights up if the limit value 2 (chlorine) is reached or exceeded. Lights up green if the measured value falls below the set limit value.

Measured value display
The current measured value for the residual hardness (TH:) and for the total content of chlorine (Cl:) are shown in line 2 and 3, e.g. `TH: 0.37 °dH` or `Cl: 0.73ppm`
When the measured value exceeds the measuring range ">" is displayed, e.g. `TH:>2.50 °dH` or `Cl: > 2.5 mg/l`

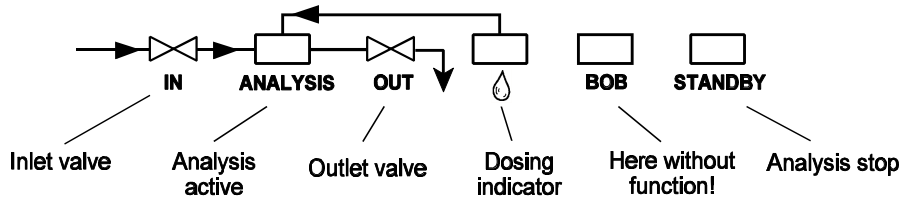
Limit value displays
The set limit values are shown in the bottom display lines 3 and 4.
1: residual hardness, 2: total chlorine

Alarm and maintenance message
Display of present error messages (red) and of present maintenance request (yellow).

L Error messages are displayed alternately with the normal display text and can only be deleted by cancellation and correction of the fault.

Status display

The display indicates active unit components.



Description of relays outputs

Flush external flush valve
We recommend the fitting of a programmed flush valve upstream of the unit if, when installing the unit, the use of a long sampling tube is unavoidable
Also, in cases where the unit is used for monitoring two measuring points, an external flush valve should be installed in order to prevent faulty measurements caused by mixing of the samples.
Immediately before each analysis the external flush valve is opened for a programmed period, thereby allowing the tube up to the Probox Analysis THCl to fill with the water to be measured. Please ensure that the programmed flush time is sufficiently long.
The flush time is set with menu item
"M" º BASIC PROGRAM º PROGRAM VALUES º FLUSH TIMES/INTERVAL º EXTERNAL FLUSH TIME

LV1 and LV2 Limit value outputs
Two volt-free relay contacts are available for reporting that a limit value has been exceeded. For both contacts the limit values, the hysteresis and the function can be independently programmed:

Function	Type of contact	Action
LV1 – active at limit value in excess of limit value 1 (residual hardness) (Measuring point 1)	volt-free change-over contact	programmable: – Continuous contact – Impulse (1 - 99 seconds/minutes) – Interval (1 - 99 seconds/minutes) – Hysteresis (1, 2 or 3 limit value in excess)
LV2 – active at limit value in excess of limit value 2 (total chlorine) (Measuring point 2)	volt-free change-over contact	programmable: – Continuous contact – Impulse (1 - 99 seconds/minutes) – Interval (1 - 99 seconds/minutes) – Hysteresis (1, 2 or 3 limit value in excess)

Menu values:
"M" º BASIC PROGRAM º PROGRAM VALUES º LIMIT VALUES
"M" º BASIC PROGRAM º PROGRAM VALUES º FUNCTION LV1
"M" º BASIC PROGRAM º PROGRAM VALUES º FUNCTION LV2
"M" º BASIC PROGRAM º PROGRAM VALUES º HYSTERISIS LV1
"M" º BASIC PROGRAM º PROGRAM VALUES º HYSTERISIS LV2

(Measuring points 1 or 2) Measuring points switch-over
If the unit is used for monitoring two measuring points, the solenoid valves (individual valves or one 3/2-way distributing valve) must be connected to the corresponding sampling tubes. The switch-over can occur automatically: **The analyses are carried out alternately from measuring point 1 or 2**.
Or via an external request: **Inlet IN1 active = next analysis from measuring point 1 (hardness)**

It is important that the terminals are strictly allocated to the appropriate measuring points and to the parameter to be measured:
Terminal 9 = Measuring point 1= Residual hardness
Terminal 10 = Measuring point 2 = total chlorine
IN1 active = measurements only from measuring point 1

"M" º BASIC PROGRAM º PROGRAM VALUES º MEASURING POINTS 1/2

AUX Programmable function output
The function of this volt-free relay output is programmable:
1. Message of a current analysis
"M" º BASIC PROGRAM º PROGRAM VALUES º FUNCTION AUX º CONTACT DURING ANALYSIS
and/or
2. Contact before an analysis, e. g. control of a cooler
"M" º BASIC PROGRAM º PROGRAM VALUES º FUNCTION AUX º CONTACT BEFORE ANALYSIS
or
3. Contact after an analysis
"M" º BASIC PROGRAM º PROGRAM VALUES º FUNCTION AUX º CONTACT AFTER ANALYSIS

Alarm Fault message
The "Alarm" output is a volt-free change-over relay contact. During trouble-free operation the contact between the terminals 14 - 16 is closed and the one between terminals 15 - 16 is open. When the voltage fails, the contact between terminals 15 - 16 is closed and the one between 14 - 16 is open.
The unit is equipped with a range of monitoring functions. You can define certain situations as a fault and program a corresponding message either as continuous contact (A) or as a message impulse (M).

- With a continuous contact, the "Alarm" output remains activated (with terminals 15 and 16 closed) as long as the fault persists.
- For a message impulse, the output is alternately switched 'on' for 2 seconds and then switched 'off' for 5 seconds.
- If several faults with different programmed messages are reported simultaneously, the output is switched to continuous contact.
- The red LED "Alarm (5)" and the text on the display indicate a fault.
- The error signal at the "Alarm" output is deleted by cancelling the fault with the "Horn" key.
- An error message can only be deleted after the fault has been corrected.
- **Exception**: The maintenance date has been exceeded. This message is confirmed in the M-menu, see below (maintenance).
- Each new fault is entered into the fault history (also see i-menu, page 16).

The following faults activate the "Alarm" output and are displayed:

The following conditions **always** trigger an error message:
Power failure
Low-water pressure
Function fault optics
Function fault dosing pump
Function fault outlet to drain
Function fault failure 24V

Conditions which can be **programmed** as faults:
Indicator low level
Reagent low level (A, B, C)
Measuring fault dirtiness
Measuring fault turbid
Transfer error
Measuring range exceeded
Maintenance interval exceeded

Error messages are described on page 20.

Maintenance, maintenance message
The "Maintenance" output is a volt-free change-over relay contact. During trouble-free operation and without a programmed maintenance interval the contact between terminals 17 and 19 is closed and the one between 18 and 19 is open.
The unit is equipped with a range of monitoring functions and a programmable maintenance interval. The maintenance message is always a continuous contact.

A maintenance request is displayed by the yellow "Maintenance" LED. The maintenance display can only be deleted after the condition has been corrected, or after the maintenance request has been confirmed.
"M" º SERVICE º CONFIRM MAINTENANCE

The following conditions activate the "Maintenance" output:
Reagent low level
Measuring chamber dirty (Measuring fault dirtiness)
Maintenance date reached

For a more detailed description of the programming refer to page 17 onward. For general maintenance refer to page 21.

Description of the signal inputs and output

L Connect the signal inputs "Start", "Stop", "IN1" and "IN2" only with **volt-free** contacts!

Start external analysis start
Stop external analysis stop

Function	Type of contact	Test time	Action
Start – External analysis start (e.g. from the process controller)	normally open volt-free!	none	– Mode of operation EXTERNAL starts an analysis by triggering a contact at the input
Stop – External analysis stop (e.g. via flow controller or from the process controller)	programmable normally closed/ normally open volt-free!	none	– As long as the contact at the input is 'open' or 'closed', no analyses are carried out.

M" º BASIC PROGRAM º PROGRAM VALUES º INPUT STOP

IN1 and IN2 Universal inputs

Function	Type of contact	Test time	Action
IN1 – External measuring point switch-over (suppression of measuring point 2)	programmable normally closed/ normally open volt-free!	none	– As long as the contact at the input is 'open' or 'closed', the analyses are carried out by measuring point 1
IN2 – Water meter input	normally open volt-free!	none	– Quantity recording to start an analysis and for plant monitoring

"M" º BASIC PROGRAM º PROGRAM VALUES º INPUT IN1

OUT Interface output (optional)

Function	Terminal	Test time	Action
Programmable interface – 0 - 20 mA – 4 - 20 mA	max. load 500 Ohm	-	– Measuring value residual hardness (measuring range 0-10 / 4-12 mA) – Measuring value total chlorine (measuring range 10-20 / 12-20 mA)
Serial interface RS 232	serial bus (2-cable-line)	-	– See description of the plug-in circuit card RS910

Change the function of the output by changing the plug-in circuit board.

"M" º BASIC PROGRAM º PROGRAM VALUES º INTERFACES

Function characteristics

Mode of operation (analysis controller)

MODE OF OPERATION ▲▼ M E	
TIME-CONTROLLED	*
Volume interval	
External (START)	

1. **Time control:** Internal triggering by a timer. The shortest interval = 0 minutes between analyses, longest interval = 99 minutes.
   (see page 12, interval periods)

L The analysis interval is determined by the duration of the supplementary program AUX, the set flush times (internal and external), the programmed pause (interval) and the duration of the analysis. The analysis duration is a **direct** function of the value to be measured.

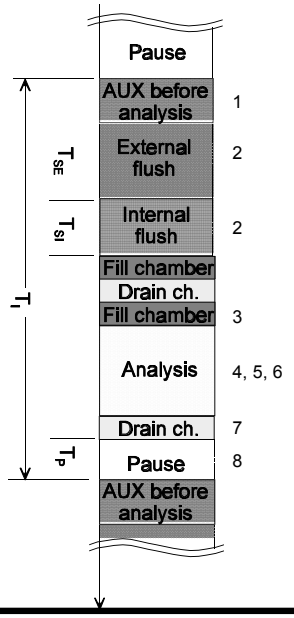
2. **Quantity control:** Triggered by the water meter.
   Minimum interval = 1 litre, maximum interval = 9999 litres.
   After the programmed water quantity is measured, the analysis is carried out. Prior to the analysis, the capillary and the measuring chamber are flushed (observe the programmed flush times).

3. **External analysis start** via contact "**Start**" input

L The current analysis interval can be interrupted by making contact at the "**Stop**" input.

Analysis cycle (example with schematic cycle diagram)

1 Supplementary program AUX before analysis
2 Flush branch line and measuring chamber (note flush time of the sampling line), T_{SE} and T_{SI}
3 Fill measuring chamber
4, 5 Check the sample for dirtiness (stirring mechanism is "ON"),
Chlorine: Measure out reagents: 12 x reagent A, 5 x reagent B and 2 x reagent C, then a reaction time of 2 minutes
Residual hardness: Measure out indicator (titration)
6 Evaluate and display reaction (approx. 1 minute)
7 Drain measuring chamber
8 Pause period up to the next analysis (time or quantity analysis interval), Tp.
T_I = total analysis interval, ch = measuring chamber



Displayed unit

It is possible to program the units of the displayed value. You have the choice of °dH, °f, ppm $CaCO_3$ and mmol/l for the residual hardness and mg/l und ppm for the chlorine. All the following inputs and displays will then be displayed in the programmed unit.

DISPLAY OF UNIT Cl ▲▼ M E	
DISPLAY IN mg/l	*
Display in ppm	

Measuring points switch-over

The Probox Analysis THCl enables the monitoring of 2 measuring points. The measuring points switch-over occurs automatically, but can be suppressed by a contact at input IN1.
The active status of IN1 should be programmed correspondingly.

The parameters are assigned to the measuring points:
Measuring point 1 = Residual hardness
Measuring point 2 = Total chlorine
IN1 active = Measurements only from measuring point 1

Setting the timer

FLUSH TIMES/INTERVAL	▲▼ M E
INTERNAL FLUSH TIME	00s
External flush time	00s
Interval pause	1m

Internal flush
In order to ensure the analysed sample represents the current value, the sampling tube must be sufficiently well flushed taking its length into consideration. After the installation has been out of operation for a longer period, or in the case of long analysis intervals, it is sensible to select a flushing time in excess of 60 seconds. Flush is initiated by simultaneously opening the inlet and the outlet valve of the Probox Analysis THCl.

L The analysis interval directly depends on the programmed flush time. If a flush time of, for example, 60 seconds is set, the analysis interval itself cannot be shorter than 60 seconds.

External flush
An external flush valve should be installed upstream of the Probox Analysis THCl if very short analysis intervals are required, the sampling tube is very long (several metres), or when using a tube with a large diameter. This is connected to the "Flush" outlet. The external flush time for the valve depends, like the flush time for flush by the unit, on length and diameter of the connection to the Probox Analysis THCl.

Example: For connections longer than 3 m and an internal tube diameter of 6 mm, a minimal internal flushing time of 10 seconds is required to ensure a current sample is taken from the sampling tube. The quantity of flush water for an internal flush of 1minute is 0.5 litres.

Interval pause
In the case of timed triggering of the analysis, the interval between two analyses (plus flush time) is determined by the interval pause. The shortest interval can be 0 minutes. In this case, the analyses are carried out continuously. The longest interval is 99 minutes.

Monitoring of limit value

LIMIT VALUES	▲▼ M E
LIMIT VAL. TH: 0.30°dH	
Limit val. Cl: 0.50 mg/l	

The limit values can be programmed on a continuous scale. The range for the limit value depends on the measuring range of the respective parameter.

Two outputs for the limit value are available for monitoring.

Limit value	Parameter	Measuring point	Function	Hysteresis
LV1	Residual hardness	1	duration, impulse, interval	1st, 2nd or 3rd exceeds
LV2	Total chlorine	2	duration, impulse, interval	1st, 2nd or 3rd exceeds

The functions of these outputs can be programmed independently from each other:

If the limit value **LV1** is exceeded, the limit value control display lights up **LV1** ***RED*** and the relay output **LV1** reacts as programmed in the switch function. If this limit value is not exceeded, the display lights up ***GREEN***.
The unit operates in the same way for the limit value **LV2**.

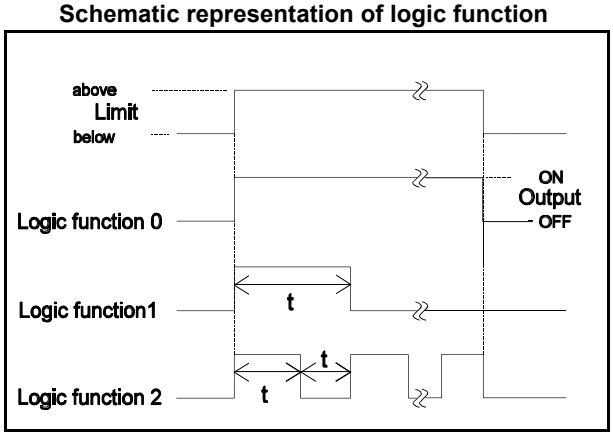
Hysteresis

HYSTERESIS LV1	▲▼ M E
Analysis (1,2,3)	1

Each limit value output reacts only after the 1st, 2nd or 3rd limit value excess (suppression of the first or the second measured value).
This increases the reliability during the evaluation of the analysis, e.g. after the measuring point has been switched over or if the sampling line has possibly not been flushed sufficiently. The hystereses of the two outputs LV1 and LV2 can be set independently from each other.
Operation: With a hysteresis of 2 a further analysis is carried out immediately after the limit value has been exceeded. Only if the limit value of this analysis is exceeded again, is the corresponding output energised. If you have set a hysteresis of 3, the corresponding output reacts only after the limit value has been exceeded for the 3rd time in succession. (Basic setting is 1 for LV1 and LV2)

Logic functions of the limit value outputs LV1 and LV2

Schematic representation of logic function



Logic function 0, *Duration*
Output relay LV1 or LV2 pulls up when the measured value rises above limit value LV1 or LV2. If the measured value falls below the limit value LV1 or LV2 without lock out, the relevant relay drops out again.

Logic function 1, *Impulse*
If the measured value rises above limit value LV1 or LV2, the relevant output pulls up for a set time t.
Independent of the time taken for the limit value to rise above the set limit, the relevant output **always** remains in the "ON" position for the **set** time.

Logic function 2, *Interval*
If the measured value rises above one limit value, the relevant output pulls up at intervals with the time set (Impulse/Pause).

Function IN1

When measurements are carried out by two measurement points, the measuring points switch-over can be suppressed by activating IN1. If IN1 is active, measurements are only carried out by measuring point 1. A corresponding controller has to be connected to the IN1 (e.g. timer) (a volt free contact is required!). The energised status of IN1 must be programmed correspondingly.

Water meter

For quantity dependent analysis triggering it is necessary to connect a water meter to the **IN2 input**. Program the corresponding water meter rating under menu item "WATER METER".

TYPE OF WATER METER ▲▼ M E	
1 LITRE/IMPULSE	
2.5 Litres/Impulse	
5 Litres/Impulse	
10 Litres/Impulse	
100 Litres/Impulse	*
500 Litres/Impulse	
1000 Litres/Impulse	

Alarm / Message

The unit is equipped with an alarm relay output for reporting errors. The events which could mean a fault at the unit, or are intended to trigger a message, can either trigger an alarm (continuous contact) or a message (2 second impulse).
For certain unit faults it is already pre-determined whether they trigger an alarm or a message

The faults are entered into the fault history and stored if the event is programmed as an alarm or message. For example, if reagent low is not programmed as ALARM or MESSAGE, then it will not be registered in the fault history. Up to 20 error messages can be stored. This list can be called up via the information menu. The information stored is the time (day, month, year and hour) and the type of the fault.

ALARM/MESSAGE ▲▼ M E		
REAGENT Cl LOW LEVEL	A	A/M/-
Indicator TH low level	A	A/M/-
Low water pressure	A	A/M
Ff. optics	A	A/M
Ff. dosing pump	A	A/M
Ff. outlet to drain	A	A/M
Mf. dirtiness	M	A/M/-
power failure 24 V	A	A/M
Mf. turbid	M	A/M/-
Transfer error	M	A/M/-
Meas. range exceeded	M	A/M/-
Maint. int. exceeded	M	A/M/-

A = Alarm / M = Message / - = no action
Ff. = Function fault
Mf. = Measuring fault

L After a power failure, the error messages are lost.

Function AUX

The AUX relay output can be programmed for the following control functions:

– It can be programmed as a functional output for providing a contact of a programmable duration before and/or during, or after an analysis.

FUNCTION AUX ▲▼ M E	
CONTACT BEFORE ANALYSIS	*
Contact during analysis	
Contact after analysis	
Time:	00m 10s

For example, the cooling water flow in an upstream cooler can be controlled by means of a solenoid valve. Cooling water will then only flow when necessary, i.e. while an analysis is being carried out.

Service II

SERVICE II	▲▼ M E
Reset operating time	
Maintenance interval	

The service II menu contains a number of functions for monitoring the operation of the unit.

L The functions in the service II menu have a direct influence on the operation, and monitoring functions of the unit!

Reset operating time

After replacing the metering pump or the holder for the measuring chamber, the current operating time can be reset to 0 hours:
"M" º BASIC PROGRAM º SERVICE II º RESET OPERATING TIME

The current operating time can be called up in the information menu:
"i" º INFORMATION º OPERATING VALUES

Maintenance interval

MAINTENANCE INTERV.	▲▼ M E
	001d

The observance of the maintenance interval is monitored and displayed by the Probox Analysis THCl. Program the desired maintenance interval in days.
(0 days = no maintenance interval.)

Interfaces (optional)

INTERFACES	▲▼ M E
Type 0-20 mA	
Type 4-20 mA	*
Type RS232	

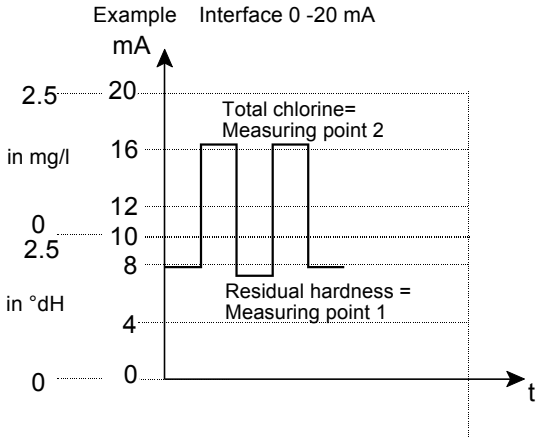
Interface 0/4 - 20 mA

Another possibility for monitoring the analysis is the connection of a recorder. For this purpose the unit is equipped with a programmable current output.

Standard values of 0 - 20 mA or 4 - 20 mA can be selected.

L A maximum working resistance of 500 Ù must not be exceeded!

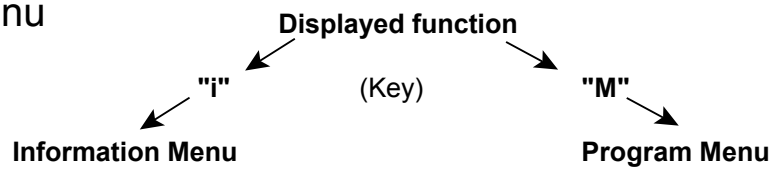
In situations where interferences might occur, and where very long cables are used (approx. 20 m), a screened cable should be used if possible.



Serial interface RS232

The connection of the Probox Analysis to a protocol printer via the serial interface RS232 enables the print out of measuring results and error messages. This means the analyses can be continuously recorded. This option is only possible in conjunction with the plug in circuit card RS910 (Item No. 270310).

Structure of the menu



Selection and input

Start menu
Select one of the two menus by pressing either the "M" or the "i" key.

Selection
The active line position is displayed in CAPITALS. Use the "ENTER" key to activate the line, i.e. to enter a submenu. By using the arrow key "w", the next parameter appears below the lowest display line:
The menu can be scrolled.

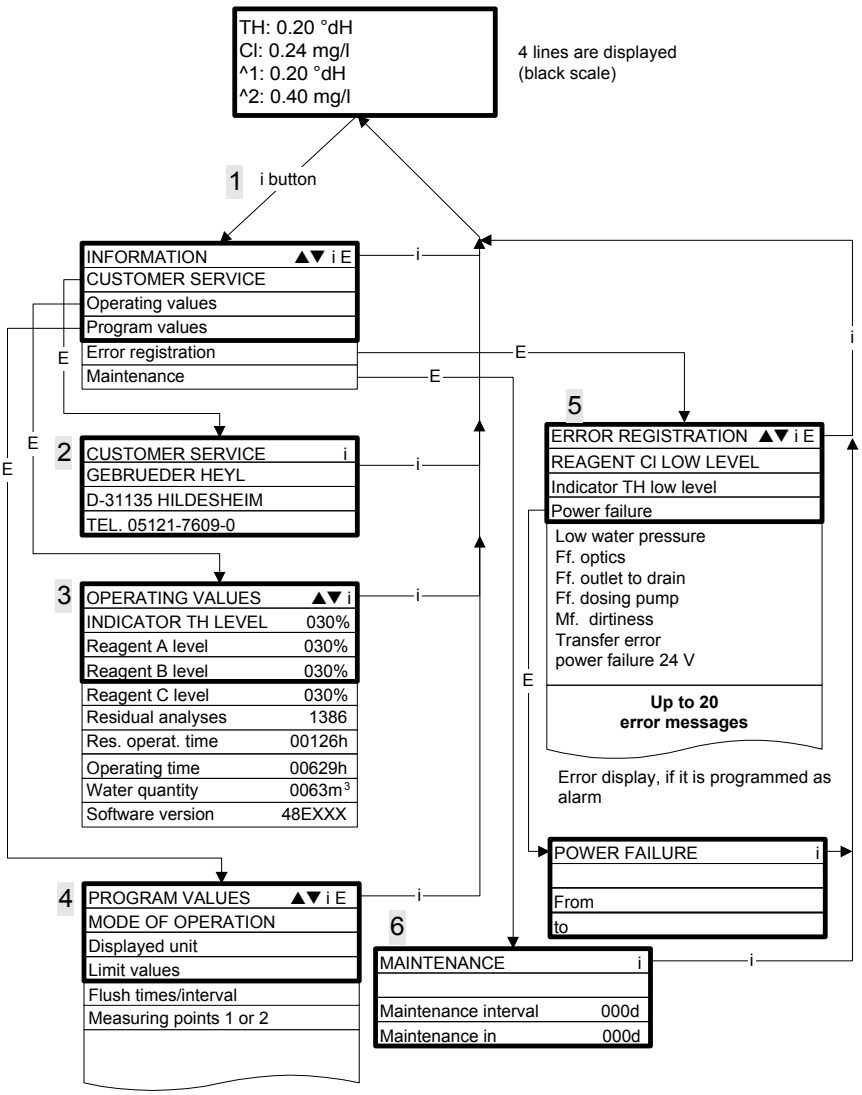
Input (only possible in the "M" menu)
- Select a programming step by means of the arrow keys "w" and "v" and activate the entry function by pressing the "ENTER" key.
- In the case of digits to be entered, the first digit to be modified flashes.
- The value can be changed using the arrow keys "w" and "v".
- By pressing the arrow keys ">" and "<", it is possible to confirm the entry and simultaneously change to the next or the preceding digit (which then starts flashing).
- Terminate the entry function by pressing "ENTER".
- The following line is activated.
- Change to the menu one level up by pressing the "M" key.

End menu
Return to the menu one level up by pressing either the "M" or the "i" key. After returning from the highest menu level the unit returns to the display mode.

Information Menu "i"

Structure of the "i" - menu

The information menu can be used to call up the active settings and status of the unit, the error registration, the date for the next maintenance and the customer service address.



Call (1)

Call up the information menu "i" by pressing the "i" key.

Customer Service (2)

Display of the customer service address or, e.g. of a service telephone number.
These three lines can be independently programmed in the basic program (**protected by a password**):

"M" ° BASIC PROGRAM ° CUSTOMER SERVICE

Operating values (3)

Display of the current values.

Program values (4)

Call up the menu item "program values" by pressing the arrow keys. By pressing "ENTER" the list with the set values can be opened. The active setting of a parameter can be queried by pressing "ENTER".

The selected function is marked by a star. (In this context there are no active lines.)

Error registration (5)

Open the error registration by pressing the "i" key and then "ENTER". The error registration is a list of the errors or status, that have been programmed as faults. This list is lost during a power failure and the recording is started afresh

Provided no faults have accumulated since the start-up, the display will show the last time the unit was switched on, e.g.:

```
POWER FAILURE
from  16.06.99 06:56
to    16.06.99 07:09
```

Maintenance (6)

Display of the date of the next maintenance and of the programmed maintenance interval.
The maintenance interval can be set in the basic program (**protected by a password**):
"M" ° BASIC PROGRAM ° SERVICE II

For further maintenance information refer to page 21 onward.

Program Menu "M"

Call (1)

The program menu "M" is selected by pressing the "M" key

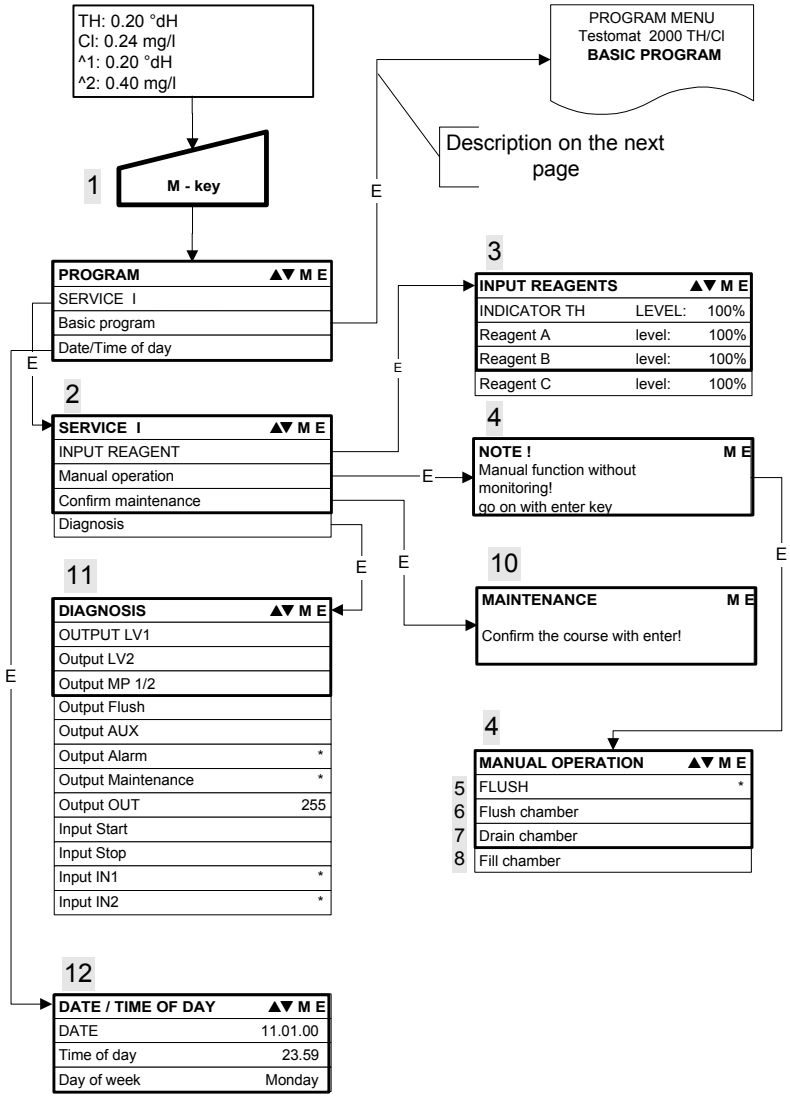
Except for the basic programming, all functions can be called up without password protection.

Service I (2)

Input reagent (3)
The new filling level has to be entered after **every** refill or replacement of the reagent bottle. As soon as the menu item for the filling level "Reagent X filling (0 - 100%)" has been selected by pressing "ENTER", the value is preset to 100%. Confirm the connection of a full bottle pressing "ENTER".

If only a partially filled bottle is connected, enter the corresponding % value.

Manual operation (4)
After the information message (4) has been confirmed by pressing ENTER, the desired function can be selected using the arrow keys and then activated by pressing "ENTER".
These functions are used for monitoring the operation and for commissioning.



L All manual functions can only be selected during an interval between two analyses. No analyses are carried out during manual operation. All signal inputs and outputs are locked.

Flush (5)
Start the flushing of the sampling tube through the internal valve by pressing "ENTER". This function is terminated by pressing the "ENTER" key again.

Flush chamber (6)
By pressing "ENTER", the measuring chamber is flushed once.

Drain chamber (7)
The outlet valve to drain the water from the measuring chamber is opened by pressing "ENTER".
This function is terminated by pressing the "ENTER" key again.

Fill chamber (8)
The measuring chamber is filled by pressing "ENTER".

Confirm maintenance (10)

After maintenance has been carried out confirm this by pressing "ENTER", and leave this item by pressing "M". The maintenance interval is started afresh.

L A maintenance request at the end of the maintenance interval must be confirmed in the M-menu. The message on the display is deleted and the maintenance output is reset.

For information on which maintenance has to be carried out and in which time intervals refer to the section **maintenance** on page 22.

Diagnosis (11)
The current status of the signal inputs and outputs can be called up from a list.
An active status is marked with a * (see menu structure).

Date/time of day (12)

Set the time of day and date by selecting the desired function using the arrow keys and activating them by pressing "ENTER". Then press the "M" key again to store the setting and to return to the display mode.

Basic program

This menu item is only reached after entering the password!

Example for a password entry:

After entering the password and confirming it by pressing "ENTER", it is possible to carry out the basic programming of the unit and to select a number of service functions (e.g. calibration).

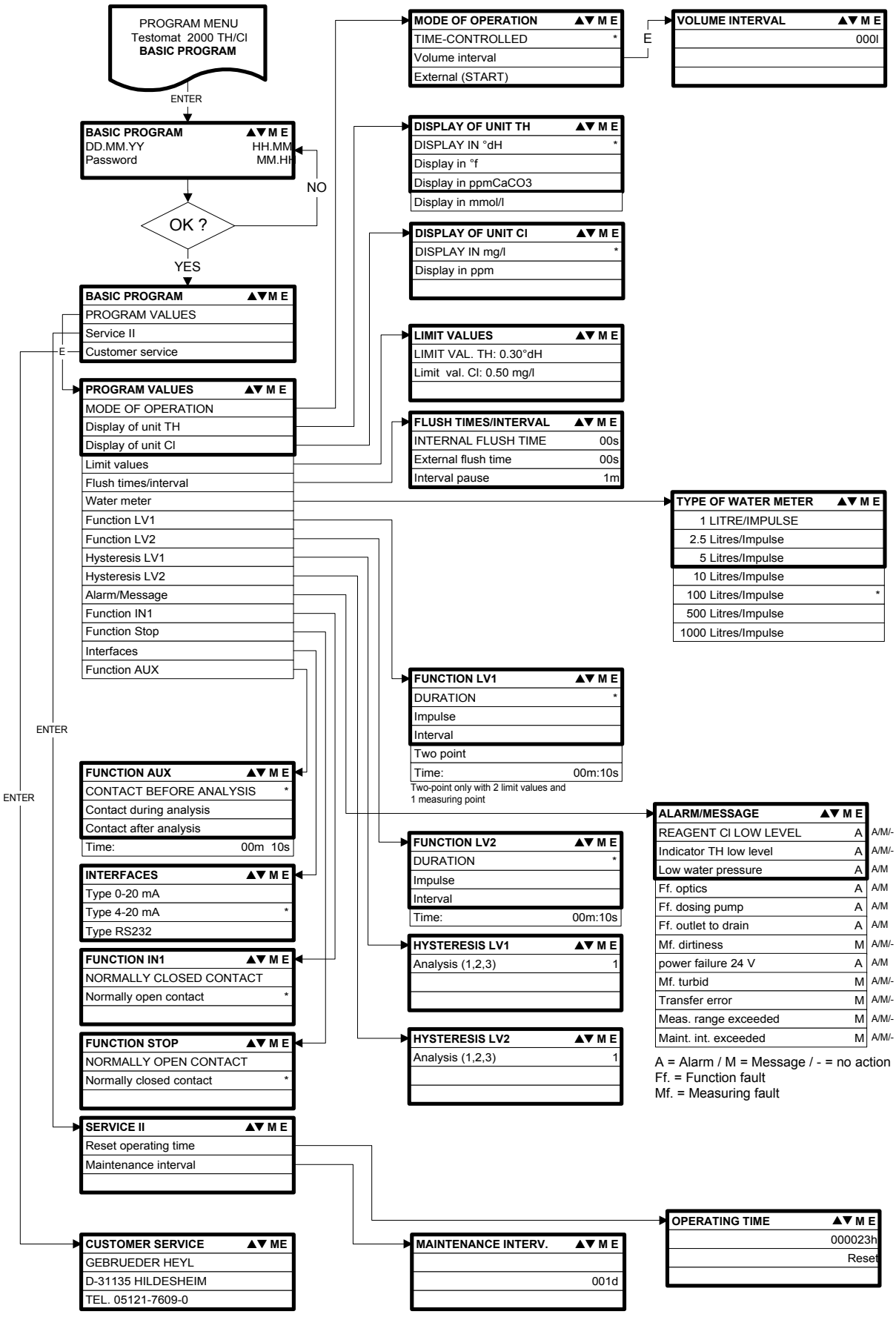
Program values

To call up the factory-set basic default setting, briefly hold down the "M" and "i" keys while switching the unit "ON". Values and settings are described in the structure of the basic program on page 19.

The following program values can be entered and stored in the basic program:

Abbreviations:
s = seconds
m = minutes
h = hours
d = days
l = litres

Structure of the basic program



To call up the factory-set basic program, briefly hold down the "M" and "i" keys while switching the unit "ON". CAUTION, the last set of programming will be erased!

Error Messages / Trouble Shooting

Displayed Message (flashes at selected display)	Unit result functions	Possible causes	Remedies
POWER FAILURE 24V CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses – Standby	• Internal power failure of the 24 V supply	Replace fuse F4 or F8 (The control-lamp "Power" of the dosing pump must light up)
Ff. DOSING PUMP CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses – Standby	• Dosing pump defective • No dosing message from the dosing pump	Replace dosing pump Check cable to the dosing pump for correct connection
Mf. TURBID CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses or no message – Continue measurements	• The water is turbid / dirty	
MEASURING RANGE EXCEEDED CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses or no message – Continue measurements	• The measuring range is exceeded	
LOW WATER-PRESSURE CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses – Standby	• No water input although LED *"IN"* lights up • Inlet pressure too low • Overflow reagent is not active	Check water inlet Connector of the inlet valve oxidised Clean filter strainer Replace valve block Extract pressure regulator valve Replace fuse F6
Ff. OUTLET TO DRAIN CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses – Standby	• Water remains in the measuring chamber although LED "OUT" lights up	Check water outlet Connector of the outlet valve oxidised Replace valve block
REAGENT LOW CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses or no message – LED and output *"maintenance"* on – Continue measurements	• Reagent quantity is below minimum setting 50 ml (10 %),	Check reagent level, fill up if necessary (enter level: "M" ° SERVICE)
Mf. DIRTINESS CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses or no message – LED and output *"maintenance"* on – Continue measurements	• Sight-glass windows dirty	Clean sight-glass windows
Ff. OPTICS CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses – Standby	• Plug-in circuit board defective • Error at the optic component (Transmitter or Receiver defective)	Replace plug-in circuit board Replace measuring chamber sealing rings
MAINTENANCE INTERVAL EXCEEDED XXX DAYS CANCEL WITH HORN-KEY	– After programming: Continuous alarm or message impulses or no message – LED and output *"maintenance"* on – Continue measurements	• Programmed maintenance date reached or exceeded	Carry out maintenance and finally cancel or confirm

Ff. = Function fault
Mf. = Measuring fault

Further information

Fault	Possible causes	Remedies
Interface works incorrectly	• Incorrect measuring value at the output or no power supply	– Replace fuse F7 – Replace the plug-in circuit board
Although unit is switched "ON" No display	• Fuse F9, F5 or F2 (240 V: F1) defective • Power switch defective • Multi-pin strap cable at display circuit board or base circuit board loose contact • Fault on display circuit board or base circuit board	– Replace fuses – Replace power switch – Check and reconnect multi-pin strap cable – Replace display or base circuit board

Maintenance

Regular maintenance is necessary in order to ensure trouble-free operation of the unit!

Please carry out the maintenance work described in the following section if
– the programmed maintenance date has been reached (display "maintenance date exceeded")
– the unit displays the following error messages: "Mf. dirtiness" or "Reagent low level"
– the last maintenance was carried out more than 6 months ago

⚠ Never use organic solvents to clean the measuring chamber and other plastic parts!
Please observe the safety rules when handling cleaning agents!

Description of maintenance work

Cleaning the measuring chamber and the sight-glass windows
1. Switch the unit 'off' or press the "STANDBY" key (drain measuring chamber completely!).
2. Close the hand-operated valve on the branch line to the Probox Analysis THCl.
3. Unhook toggle type fastener, tip the measuring chamber upwards and extract.
4. Slacken both sight-glass window holders, extract and clean the sight-glass windows.
5. Remove coating from the sight-glass windows.
6. Clean the measuring chamber with 10% hydrochloric acid and then rinse well.
7. After cleaning, replace the sight-glass windows and secure these with the sight-glass windows holder (do not forget the O-ring seals and check for correct seating in the recess).
8. Insert the measuring chamber by tilting it backwards until the slot engages with the rear guide bar and press down. Finally secure the chamber with the toggle type fastener.

Cleaning the filter housing
1. Close the hand-operated valve on the branch line to the Probox Analysis THCl.
2. Undo the hose connections to the filter housing.
3. Unscrew inlet connection, remove sealing ring, spring and filter strainer and clean.
4. Extract the retaining pin and withdraw the flow regulator and finally remove the valve body.
5. Clean filter housing with water or alcohol and reassemble. Insert filter strainer point downwards!
6. Install the hose connections to the filter housing.

⚠ Water leakage from the seals can result in damage to parts of the unit.

TTip: Please check the unit for leaks before carrying out the first analysis

1. Switch the unit to STANDBY
2. Manually fill the measuring chamber
3. Manual reagent dosing (key "Manual")
4. Check the connections and seals for leaks

Notes on unit care

The surface of the unit has not been treated. Therefore, a contamination with reagent, oil or grease should be avoided. Should the housing, however, be contaminated, please clean the surface with isopropanol (never use other solvents).

SPARE PARTS LIST Probox Analysis THCl

Item No.	Pressure regulator
040120	Regulator / filter housing
040129	Regulator plug T2000, complete
011225	Flow regulator valve (1 - 8 bar)
011230	Retaining pin for regulator plug
011217	Inlet filter
011218	Spring for inlet filter
040121	Inlet connector
040153	Plug in connector - G 1/4" -6
011209	Holding screw M3 x 42
	Measuring chamber
040173	Sight-glass window 30 x 3 with seal
040170	Sight-glass window 30 x 3
040176	Sight-glass retaining disc
033253	Screw spindle M3 x 40
040032	Latch fastener TL 800-7-1
011203	Plastic plug
040022	Measuring chamber complete T2000
	Holding block for measuring chamber
0400xx	Holding block DUO complete (without measuring
040050	Magnetic stirrer
040186	Plug connector
040018	Solenoid valve, 2/2-Way
040181	Rear guide bar for measuring chamber 5 x 60
	Dosing pump DOSIClip®
040001	Jet pump complete
040011	Suction capillary complete
040016	Pressure capillary complete
037232	Base circuit board TI, complete
034668	Magnet 24 VDC
032046	Plastic cover CNH 45 N
	Bottle connection / Suction tube
040131	Screwed cap with bottle insert T2000
040130	Screwed cap GL32 - only
040132	Bottle insert for screwed cap

Item No.	Electrical components	
031582	Fuse M4A	
037236	Base circuit board T2000 complete 230V	
040092	Control circuit board T2000 complete	
040091	Plug-in circuit board Transmitter / Receiver T2000	
040190	Cable sleeve 5 - 7	
040191	Cable sleeve 7 - 10	
040197	Mains on / off switch T2000	
040198	Cover for Mains on / off switch	
031713	Multi-pin strap cable 10 pol. with EMI filter clamp	
040096	Multi-pin strap cable 26 pol. with EMI filter clamp	
040060	Cable loom 2V complete (for valves)	
040064	Cable loom 4P complete (for four dosing pumps)	
040200	Cable loom for mains on/off switch complete	
031596	Fuse T0.08A	
031585	Fuse T0.315A	
031595	Fuse T0.1A	
031622	Fuse T0.16A	
031592	Fuse T1.0A	
Spare parts requirement for 2 - 3 years of operation		
040173	Sight-glass window 30 x 3 with seal	2
011217	Inlet filter	1
040124	Gasket set T2000 (after maintenance)	X
031585	FuseT0.315A	1
031592	Fuse T1.0A	1

x* X*Accurate operation of the Probox Analysis THCl can only be assured with regular maintenance and replacements of seals / gaskets (see chapter on maintenance).

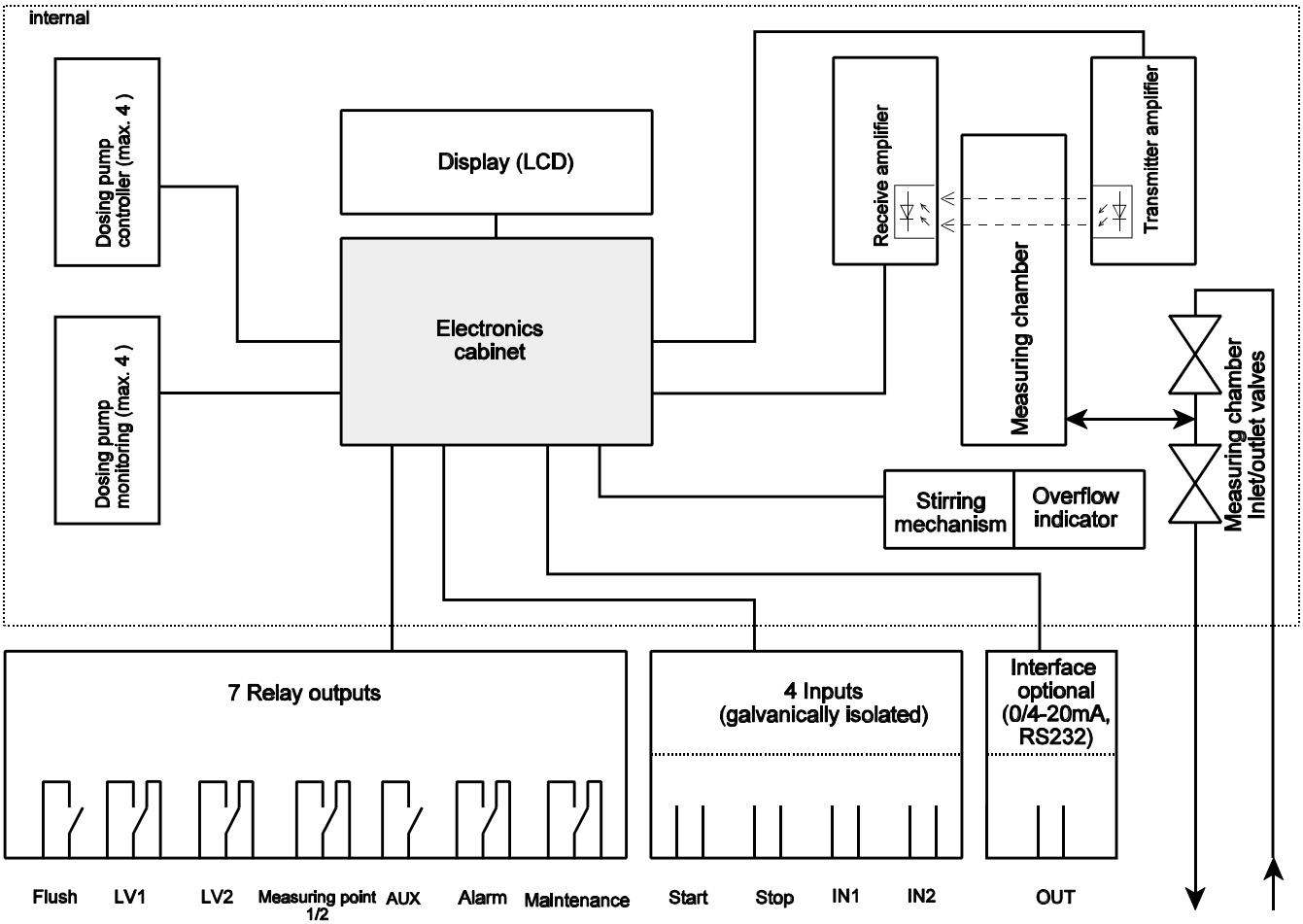
Accessories:

Item no..	
040123	Optional adapter for water inlet T2000 (Quick-acting plug and -coupling)
270305	Interface (plug-in card) SK 910
270310	Plug-in card RS910 (Interface RS232)
270335	Maintenance case T2000

Reagents:

Item no.			
156230	CL2250A	Chlorine	0 - 2.5 mg/l (ppm), Reagent A, 500ml
156231	CL2250B	Chlorine	0 - 2.5 mg/l (ppm), Reagent B, 500ml
156232	CL2250C	Chlorine	0 - 2.5 mg/l (ppm), Reagent C, 500ml
152025	TH2025	Water hardness	0.25 - 2.5 °dH, 500ml

Block diagram Probox Analysis THCl



Technical data

Power supply:	230 V or 24 V ± 10 %, 50 - 60 Hz, fuse M4A
Unit protection:	230 V: T0.1A 24 V: T1.0A **The unit is power failure protected**
Power consumption:	max. 30VA
Degree of protection:	IP 65
Protection class:	I
Conformity:	EN50081-1, EN50082-2, EN 61010-1 CE
Ambient temperature:	10 - 45 °C
Contact rating of the relay outputs:	4 A resistive load, fuse M4A
Measuring range:	see page 1
Interface:	0/4 - 20 mA, max. load 500 Ù (optional)
Water supply:	0.1 - 8 bar = 10^4 - 8 x 10^5 Pa
Water temperature:	max. 40 °C
Dimensions (W x H x D):	380 x 480 x 280 mm
Weight:	approx. 10.5 kg

We reserve the right to make technical changes without notice in the interest of constantly improving our products!