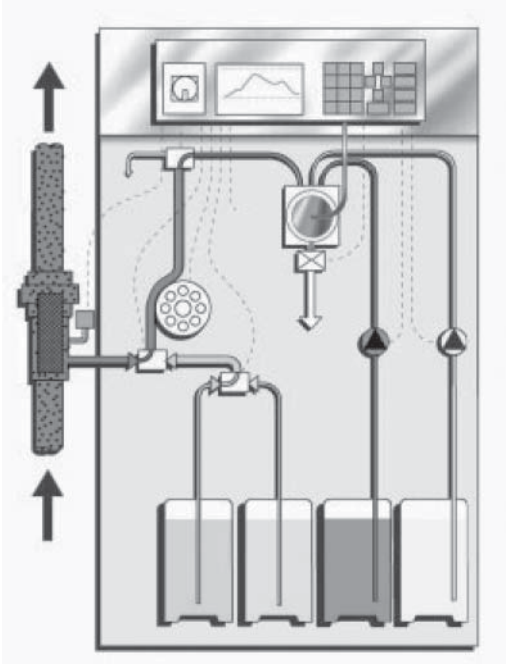
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

# SPECTRON Total Phosphorus

## 1 200 87 15EB



BA 825C/24/ae/01.07

Endress+Hauser

People for Process Automation

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# 1 Safety regulations

## 1.1 General instructions

*General instructions*

**Follow the instructions in the operating manual**

- Knowledge of the basic safety regulations is essential for the safe handling and disruption-free operation of the unit.
- These operating instructions contain the most important guidelines necessary in order to safely oversee the unit's operation.
- All persons working on the unit should take note of these operating instructions, and especially those relevant to safety.
- On top of this, all rules and regulations pertinent to accident prevention which are in force at the measuring site are to be heeded.

*Operator*

**Operator's responsibilities**

It is the operator's responsibility to allow only those persons to work on the unit who:

- are familiar with the regulations concerning safe handling and the prevention of accidents, and who have been informed how to operate the unit
- have undersigned a statement to the effect that they have read and understood the chapter on safety, and other warnings, contained in this operating manual.

The level of safety consciousness of the personnel whilst they work on the unit should be checked at regular intervals.

*Personel*

**Responsibilities of personel**

Before commencing work, personnel directed to service the unit are required to:

- adhere to regulations concerning work safety, and the prevention of accidents
- read the chapter on safety, and other warnings contained in this operating manual, and to confirm that they have understood them by signing a statement to this effect.

*Servicing the unit*

**Dangers involved in servicing the unit**

The unit has been constructed to the latest technological standards, and to recognised safety regulations. The unit is only:

- to be used for the purpose designed
- to be used when in perfectly safe working order.

Improper handling may result in physical danger to operating personnel, or to third parties, or to impairments to the unit or to other property.
Disruptions which may affect the safe operation of the unit are to be rectified immediately.

*Designed purpose*

**Designed purpose**

The exclusive designed purpose of the unit is measurement in the areas of the prevention of water pollution, and waste water treatment.
Utilisation for other purposes, or those exceeding these stipulations, are adjudged to be in non-accordance with its purpose. The company ISCO STIP Siepmann und Teutscher GmbH is not responsible for damages resulting from such use. Utilisation for the designed purpose also includes:

- observance of all instructions contained in the manual, and
- adherence to the correct inspection and maintenance intervals.

*Warranty and liability*

**Warranty and liability**

On principle, the "General terms of sale and delivery“ of the company ISCO STIP Siepmann und Teutscher GmbH apply. These are made available to the operator upon signing the contract at the latest. All warranty or liability claims made for damage to persons or property are invalid when they prove to have as a cause one or more of the following:

- operating the unit for reasons other than its designed purpose
- improper assembly, initialising, operating or maintenance of the unit
- operating the unit when any safety or protection devices are defect or non-functioning
- non-adherence of any instructions in the operating manual concerning; transport, storage, assembly, initialising, operating or maintenance of the unit
- unauthorised constructional alterations to the measuring unit
- unauthorised alteration of the compressed air supply
- exceeding or reducing the prescribed submergence depth
- incorrect maintenance of unit components which are subject to wear
- maintenance and repair work improperly carried out
- catastrophes caused by outside interference or acts of God.

## 1.2 Safety instructions

*Symbols and instructions*

**An explanation of symbols and instructions**

The following descriptions and symbols are included in the operating instructions to indicate possible dangers:


**DANGER**

This symbol indicates a direct threat of physical danger to the life and health of personnel.

Not heeding this warning may have serious consequences to health and safety, and may even involve life-threatening injuries.


**WARNING**

This symbol indicates a possible threat of physical danger to the life and health of personnel.

Not heeding this warning may have serious consequences to health and safety, and may even involve life-threatening injuries.


CAUTION

This symbol indicates that a situation contains a potential for danger.

Not heeding this warning can lead to light injuries, or damage to equipment.

INFORMATION

This symbol gives important information concerning the correct procedure for operating the unit.

Non-compliance with the directions can lead to defects in the unit or its surroundings.

NOTE

This symbol offers hints, operating tips and useful information.

These will help in ensuring that the unit functions correctly and optimally.

## 1.3 Organisational provisions

The operator must provide the necessary garments for personal protection.

All of the safety devices installed must be regularly checked before any work can begin.

## 1.4 Safety devices

Before any initialising of the unit, all of the safety devices must be properly mounted and functional.

Safety devices may only be removed:

- during maintenance and repair work, or when the unit has been disconnected from the electrical mains
- after the unit has been safeguarded against renewed operation.

When any spare parts have been delivered, the operator must ensure that the safety devices have been properly mounted.


### Danger

During operation, the screw-mounted protection covers **may not be** removed.

Passive safety devices:

- protection covers in the unit
- water-proof protection cover IP54

## 1.5 Additional safety procedures

The operating instructions must always be stored at the measuring site of the unit.

In addition to the operating instructions, any applicable general on-site regulations concerning accident prevention and environmental protection must be made available and heeded.

## 1.6 Training of personnel

Only trained and instructed personnel are allowed to work on the unit.

The jurisdiction of those personal responsible for tasks concerning initialising, operating, maintenance and repair work should be clearly set down.

Personnel being trained to work on the unit must only do so in the presence of trained staff.

## 1.7 Regulating the unit

Only fully trained staff are allowed to enter in, or change data in the unit.

On no account may program changes be made to the unit's software.

## 1.8 Safety procedures in normal operation

The unit may only be operated when all of the safety devices are in working order.

## 1.9 Electrical dangers

Work on the unit's power supply may only be carried out by a qualified electrician.

The electrical equipment in the unit must be routinely checked. Loose connections and scorched cables must be replaced immediately.

The mains switch must be switched off during work on electrical components.

## 1.10 Particular danger areas

The unit has been built by the company STIP ISCO GmbH with the greatest care and attention to detail, and is constructed according to the present level of scientific and technological knowledge. Residual risks, and danger areas incapable of being alleviated through constructional change, never the less remain.

Warnings concerning these residual risks and danger areas are contained below.

## 1.11 Cleaning and maintenance, repairing faults

Observe the regulations concerning accident prevention.

## 1.12 Constructional changes to the unit

No changes, additions or constructional alterations are to be carried out on the unit without authorisation from the manufacturer.

All alteration work requires prior written permission from the company STIP ISCO GmbH.

Unit components no longer in perfect working order must be replaced immediately.

Only original spare, wearable and replacement parts may be used. There is no guarantee that non-original parts are designed and manufactured to cope with the demands on performance and safety.

## 1.13 Cleaning the unit and disposing of waste

All materials must be correctly disposed of. This applies especially:

- when cleaning with solvents
- when emptying chemical tanks
- reagents: danger due to pH value (either strongly alkaline or acidic).

## 1.14 Noise level of the unit

The constant noise level emanating from the unit lies below 70 db (A).

Should the noise level of the unit under special conditions reach a level which could cause damage to hearing, personnel are to be suitably equipped with protective gear, and protective procedures carried out.

## 1.15 Copyright

These instructions are only intended for use by the operator and their staff.

They contain regulations and instructions which may be neither reproduced, distributed nor otherwise made available, either partially or in entirety.

Infringements may be liable to criminal prosecution, and civil claims for damages.

# 2 Design and function

## 2.1 Design

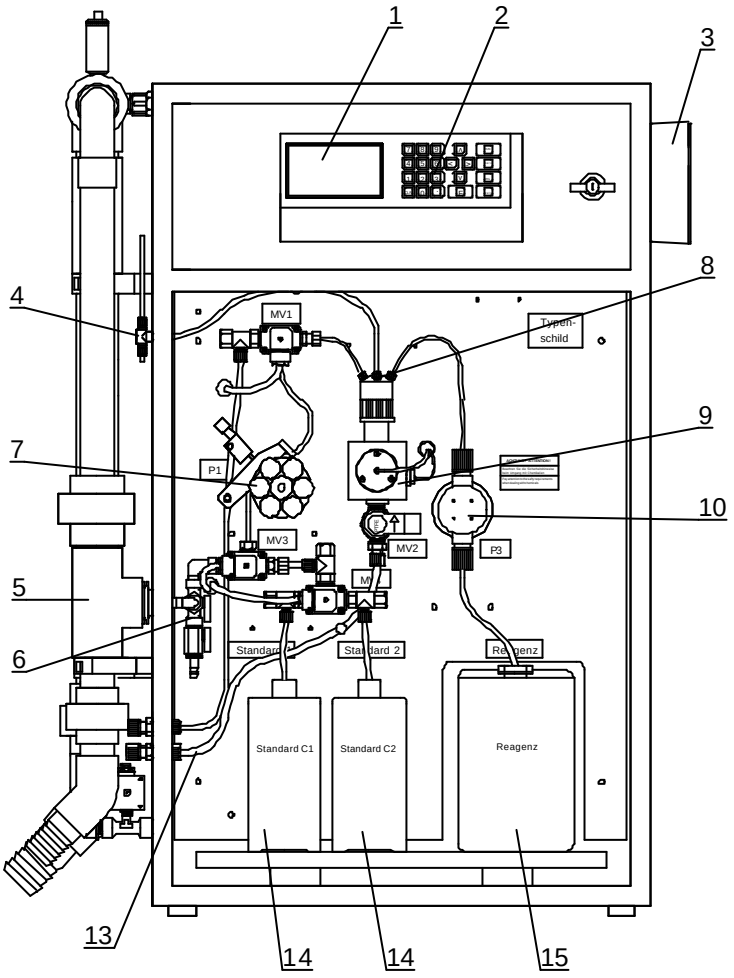
The STIP SPECTRON is manufactured in three different versions.

In variant 1 (illus. 1, illus. 4), the unit measures one parameter spectrophotometrically.

In variant 2 (illus. 2, illus. 5), the unit is capable of measuring one parameter spectrophotometrically which requires two separate reagents. Unlike the unit in variant 1, this unit contains an additional reagent pump which will be referred to from here on as P4.

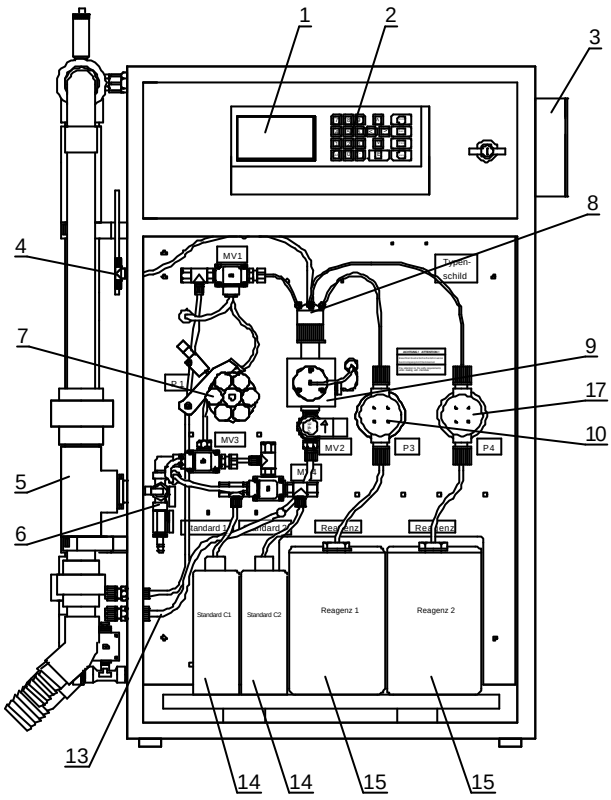
In variant 3 (illus. 3, illus. 6), the unit can measure one parameter spectrophotometrically, and a second with the aid of an ion-selective electrode. Unlike variant 1 (and 2), the third variant contains a chamber equipped with an ion-selective electrode which is fed with reagent by a dosage pump, hereafter referred to as P2.

illus. 4



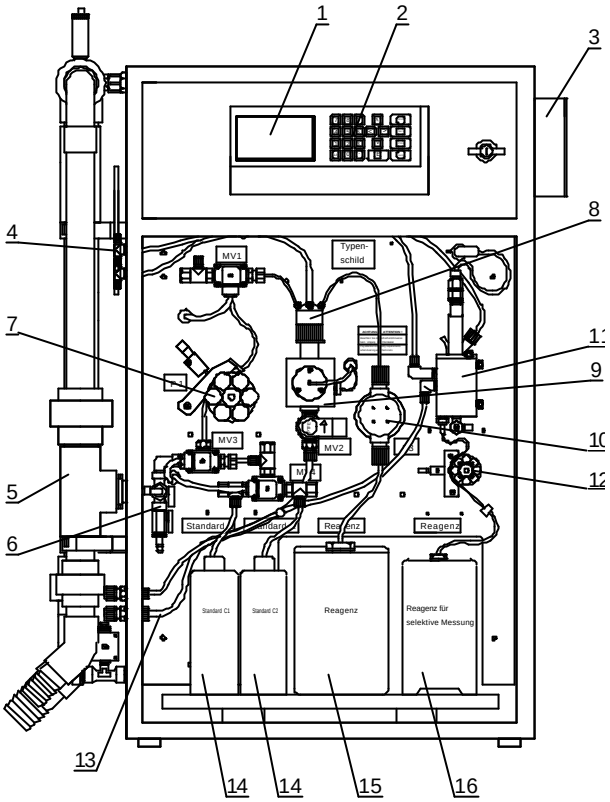

STIP SPECTRON Variant 1, Front view

illus. 2




STIP SPECTRON Variant 2, Front view

illus. 3




STIP SPECTRON Variant 3, Front view

**1** = Computer with graphic display

**2** = Keyboard

**3** = EMV - Box with connections for printer, modem, signal outputs, alarms

**4** = Ventilation vent(s) for meas. chamber

**5** = Sample Processor PA-2 (option) with screen cartridge

**6** = Reagent inlet, with valve 1 and valve 2, solenoid valves MV3 & MV4

**7** = P1 peristaltic pump with tube bed and throttle

**8** = Measuring chamber head, with dosing unit and solenoid valve MV1 to feed sample into the chamber

**9** = Optical cell (measuring chamber for the spectrophotometrical parameter), with solenoid valve MV2 situated at its outlet

**10** = Reciprocating piston pump P3 which supplies the reagent for the spectrophotometrical analysis

**11** = Special optional cell (chamber for the parameter to be measured ion-selectively), with its electrode

**12** = Peristaltic pump P2, which supplies reagent for the ion-selective measurement (optional)

**13** = Outlet for the measuring chambers

**14** = Standard solution canisters

**15** = Reagent canister for the spectrophotometrical measurement

**16** = Reagent canister for the ion-selective measurement (optional)

**17** = Reciprocating piston pump P4, used to feed the second reagent for a spectrophotometrical measurement (optional)

Sample water is supplied to the unit via the Sample Processor PA-2 (**5**). The P1 pump (**7**) then feeds the sample to the analytical part of the unit. The solenoid valve MV1 (**8**) then directs the sample flow into the optics cell (**9**). When enough sample has been delivered, MV1 re-directs the flow in variants 1 & 2 out of the unit via the sample outlet (**13**), and in variant 3 into the electrode chamber (**11**).

The MV2 solenoid valve shuts off the optics chamber for the duration of the measurement. Now the reciprocating piston pump P3 (and in variant 2, the P4 pump) can deliver reagents (**15**) into the optics cell. After the reagent(s) and the sample have had time to react together, the absorption is measured by the optical unit and a value calculated by the computer (**1**).

When measurement is completed, the solenoid valve MV2 opens and the mixture flows out via the sample outlet (**13**). In variant 3, the second parameter is measured simultaneously to the optical measurement by the ion-selective electrode in the electrode chamber (**11**). To this effect, the P2 pump (**12**) continuously feeds reagent (**16**) into the electrode chamber.

## 2.2 Rear view

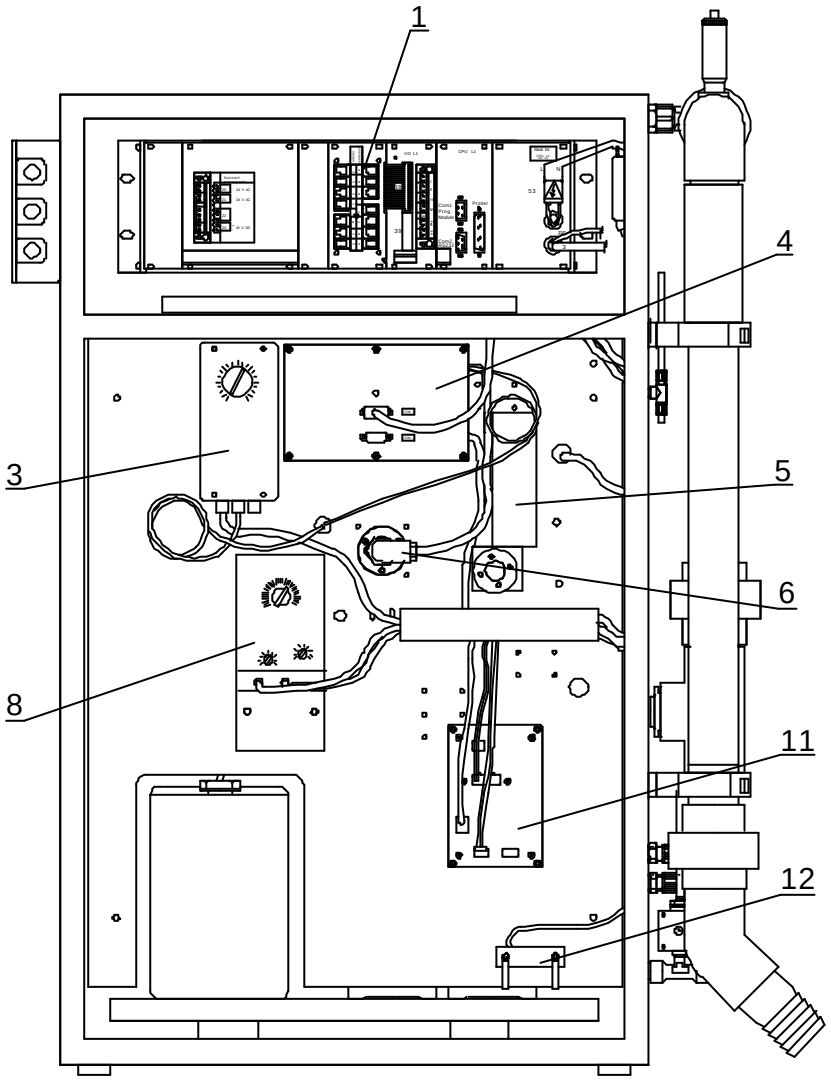
You can open up the rear door of the unit by using the special key supplied.


CAUTION

Before opening the rear door, always turn off the main switch !

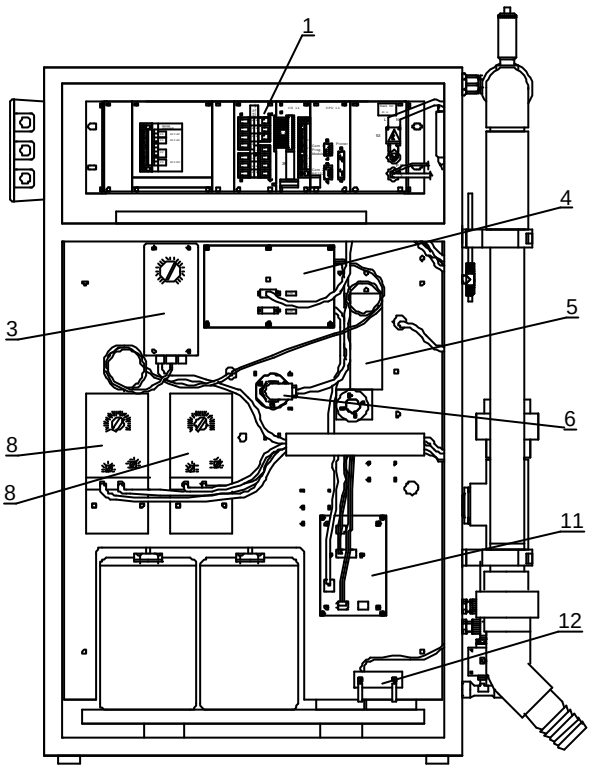
The three SPECTRON variants vary only slightly in design from one-another in their rear sections, which are illustrated in the diagrams 4 to 6.

illus. 4



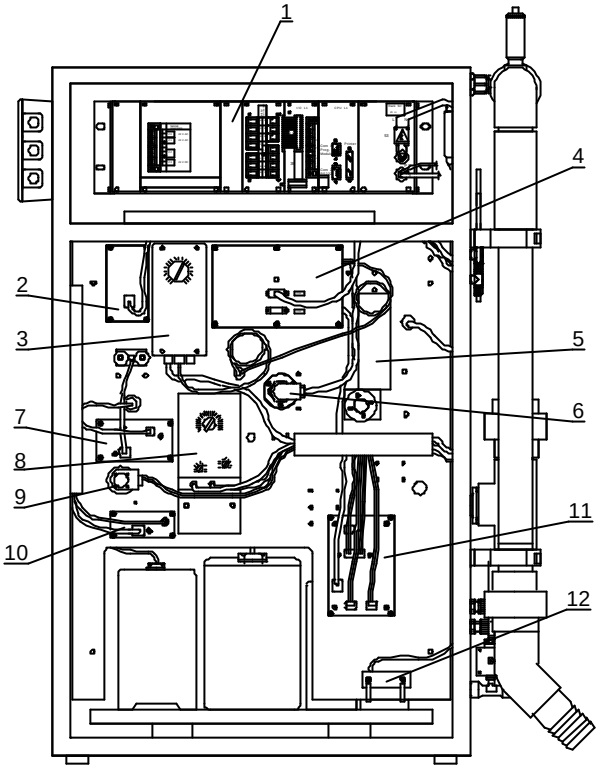

STIP SPECTRON Variant 1, rear view

illus. 5




STIP SPECTRON Variant 2, rear view

illus. 6




STIP SPECTRON Variant 3, rear view

**1** = Electronics section with connections

**2** = Amplifier for ion-selective electrode (optional)

**3** = Heater controller (optional)

**4** = Spectrometer electronics

**5** = Motor for pump P1

**6** = Optics unit lamp

**7** = Stirrer controller (optional)

**8** = Reciprocating piston pump(s)

**9** = Motor for pump P2 (optional**)**

**10** = Amplifier for temperature control (optional)

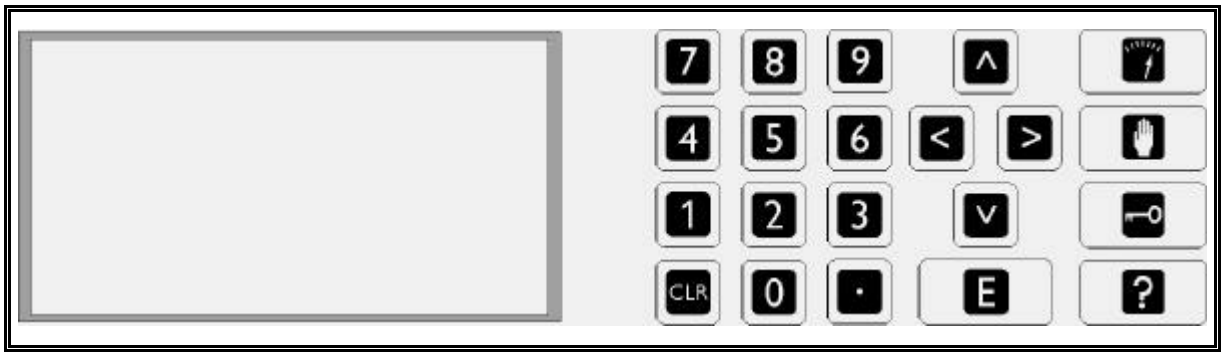
**11** = Pump controller for P1 and P2

**12** = Leakage detector

## 2.3 Computer

All operations are controlled and carried out by the computer. It supervises all of the unit's functions and documents the values measured. Furthermore, the measured values can be accessed and transferred to a PC for additional processing.

Computer display and keyboard




*Monitor*
Display, 16 lines à 40 characters

*Numerical key-pad with **CLR**–key*

*Arrow keys (to move the cursor) and **ENTER***

*Function keys*

The unit has three operational levels:

- Operation
- Service mode
- Programming mode.

***Operation***

You can return to operation mode at any time by pressing the "OPERATION" key.
In operation mode, the current measuring value is displayed and the values for the last 6 hours shown as a graphic curve with the time of day.

***Service***

In order to carry out any maintenance work on the unit, press the "SERVICE" key.
In the service mode, normal operation is interrupted in order to carry out one of the "SERVICE PROGRAMS“, for instance, to re-fill reagent or to change a pump tube.

***Programming***

Press the "Program" key in order to access the programming level. Upon pressing the key, you will be requested to enter in the password. You will find the 4 digit numerical code printed on your unit's code card.

In the programming mode, the conditions at your measuring site, the time and date and the name of the measuring site are entered into the computer. In this mode, you can also examine interferences in operation, e.g.for servicing work or for any other interruptions of normal operation.

In order to access a particular menu item, move the cursor ■ to it with the arrow keys.

In the settings level of the program, you can also enter in negative values for certain parameters with the right hand arrow key. A minus sign then appears when this key is pressed.

By using the "E key", you can access any menu items, or activate a program. Always confirm any entries made by pressing this key. Each stage of any maintenance program should also be confirmed with this key after being carried out.

When the "? key" is pressed, a brief help text will appear for that particular program item. This will explain the substance of the item.

Additional information is available here in any of the maintenance programs, in addition to the normal on-screen directions.

The help text will disappear when the "? key" or an arrow key is pressed again.

By pressing the "7" key in a unit equipped to measure 2 parameters, the screen will switch between displays of both measured parameters.

A display of the unit's current operational status is available by pressing the "period key". This includes information on the various current operational variants, e.g. temperature, pH value, pump volume, measuring signal etc.

When the "CLR key" is pressed during normal operation, the STIP ISCO logo screen is displayed which includes the unit type, the EPROM program version and the unit options included.

CLR start

In order to re-set the data and values stored to default, you can carry out a "Clear start". This entails erasing any parameters, stored data, graphic curves and settings entered, and re-loading the basic program from the unit's EPROM.

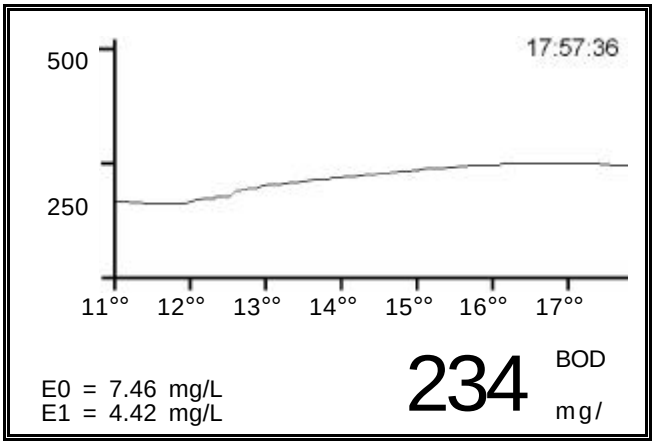
In order to do this, press and hold down the "CLR key" whilst simultaneously turning on the main switch, then keep the key pressed for at least a further 5 seconds before releasing it.

## 2.4 Using the computer during operation

Normal operation runs fully automatically, manual intervention is impossible.

During operation, the current value and the values from the last 6 hours are displayed on the screen (previous values as a graphic curve). The present time is shown in the top right hand corner. After initialising, "Measuring pause" appears for a short while in the display until normal operation is begun. Malfunction alarms are also displayed on the screen. They appear in the upper third of the screen.

*Display during measurement: (example: BIOX-1010)*




← Computer clock

← Graphic curve stored over the last 6 hours

← Time axis

← current measuring value

↑
Measuring value of electrodes

### 2.4.1 Setting the scale of the graphic curve

The curve in the display has to be scaled. The scale can be set under the menu item PROGRAMMING/SETTINGS/SCALE according to the levels expected for the present measuring site. The scale set here also applies to the printout from the printer (option). In units capable of measuring 2 parameters, it is possible to set each scale individually

### 2.4.2 Record mode

By pressing the ◄ -key during normal operation, you can access the "Record mode". Use the arrow keys to scroll through the stored values from the past 10 days. The graphic curve, time of day, and date are displayed.

▲ 1 day earlier;

▼ 1 day later;

◄ 2 hours earlier;

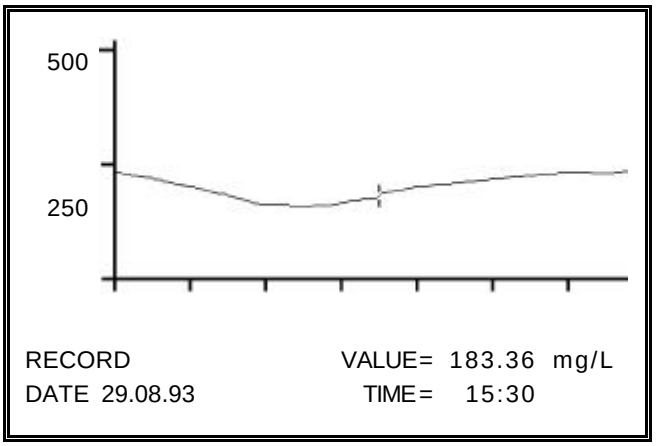
► 2 hours later.

If you've found a specific period or graphic curve that you'd like to inspect in more detail, then press:

### 2.4.3 Spot view function

E When the spot view function is activated, a small "viewer" (cursor) appears along the graphic curve of the chosen time period in order that this specific value can be examined more closely. The exact value, time and date are thereby displayed. The viewer enables you to scan through the entire 6 hour period.

*Display during operation when the viewer has been activated: (example BIOX 1010)*




- Move the cursor with the arrow keys. The time and specific value are displayed.

← *Cursor (marks a place in time on the graphic curve)*

← *measurement value for the chosen time*

▲ 1 hour earlier;

▼ 1 hour later;

◄ 2 minutes earlier

► 2 minutes later;

E switches off the viewer;

return to operation.

### 2.4.4 Switching between channels in units equipped to measure two parameters

In order to change the display from one parameter to another, press the "7" key. The scale of the new graphic curve is set to that of the corresponding parameter (*PROGRAMMING - RANGE DATA - SCALE)*. The classification of the measurement value is also changed to the appropriate type.
The currently measured value of the other parameter is always shown in the bottom left hand corner of the display.
All of the functions described above are of course also available for use with this second parameter. By re-pressing the "7" key you can return to the original parameter.

NOTE

Please note that should you have an optional printer attached to print out the graphic curves, this will not be affected by your switching between the two parameter channels with the "7" key.

In order to switch the print out from one channel to another, go to *PROGRAMMING - PRINTER* and select there the parameter you wish to have printed.

# 3 Installation and initialising

## 3.1 Transport and storage

| Contents | Packaging | Dim. | [mm] | weight (gross) |
|---|---|---|---|---|
| Measuring unit | carton | **height:** | 1450 | 90 kg |
| | | **width:** | 600 | |
| | | **depth:** | 800 | |
| Accessories: | carton | **height:** | 100 | 0.5 kg |
| | | **width:** | 220 | |
| | | **depth:** | 300 | |

*Storing the unit*

When storing the unit over a long period, the following should be noted:

- storage time should be kept as short as possible,
- shut down the unit acc. to the instructions in chapter "Shutting down",
- store any electrodes (if included) acc. to chapter "Electrodes",
- store only in dry rooms,
- use an appropriate packing material (e.g. plastic foil).

## 3.2 Extent of supply and transit damages

In order to correctly set up the unit at the customer's site, the supplied parts must first be checked for completeness in accordance with the delivery note. The unit should also be examined for evidence of any transit damages.

## 3.3 Installation conditions

The unit can either be set up on a ISCO STIP supporting frame which includes rollers ord.-no. 8.040.20.01 (optional), or simply placed on a solid table. The unit can also be supported by a ISCO STIP wall-mounted swivelling frame (ord.-no. 8.040.20.03).

In setting up the measuring unit, the following conditions must first be fulfilled:

- the site must be protected from rain and frost;
- the site must be dry;
- the ambient temperature of the site must be between +5° and +40°C;
- mains supply 230 V, 50 Hz (optional 60 Hz);
- the unit should not be exposed to direct sunlight;
- the unit must be accessible from the rear and front sides;
- a correct supply of sample water to the unit must be installed;
- a fresh water supply (when a Sample Processor PA-2, PA-3 or a preliminary dilution chamber is installed) with a pressure from 3.0 bar to 7.0 bar;
- a pressure-free drainage for Sample Processors PA2 and PA3 (optional);
- an open channel for the measuring chamber outlets.

Pay attention to the disposal instructions in the chapter "Measuring".

## 3.4 Preparatory tasks

- Remove the transport packaging and take out the accessories;
- examine for any transit damages and loose parts;
- close all of the valves in the unit.


**WARNING**

Heavy object!

It is possible to get injured by falling surveying instruments while mounting them onto the rotating rack.

***Installing connecting pipes***

- Connect up the sample inlet and outlet according to the chapter on "Dimensions, connections".
- When an optional sample processing componant is included (Bypass, sand filter, settling chamber or dilution chamber), then prepare the sample inlet and outlet, and fresh water connection according to the chapter on "Options".

***System leak-proof test***


**WARNING**

To avoid injuries (skin) and infections it is vital to wear protective gloves while being in contact with waste water (i.e.while working on and with the surveying instruments being).

- Switch on the waste water pump and test the connections for leaks.
- Switch off the pump.

***Connecting the ventilation and sample outlet***

- Connect up the tubes for ventilation and sample drainage (accessories) according to chapter "Dimensions, connections". Take care to ensure that they can flow **pressure-free** into an open chamber.

NOTE

When installing the measuring instrument in enclosed rooms make sure there is enough air ventilation!

***Reagents***

**WARNING**


Wear acid resistant gloves, glasses and overall!

Do obey the working specifications of your country regarding the handeling of corrosive chemicals. After contact with skin wash with plenty of water and a 1% sodiumhydrogencarbonate solution. Seek medical advice and show him this canister or label.

- Place the canisters in the unit according to their inscriptions;
- Exchange the canister in accordance with the chapter 7.5.4 ("Reagent"), and connect the tubes. Follow the safety regulations !

***Standards***

- Fill the canisters with standards.

INFORMATION

Please note the chapter 7.4.1 („Determining the standard solution concentrations“) and 7.4.2 („Mixing calibration standards“).

- Place the canisters in the measuring instrument.
- Exchange the cannister in accordance with the chapter "Reagent", and connect the tubes. Follow the safety regulations !

***Pumps***

- Close the tube beds of pumps P1 and P2. Take care that the tube is fed in a straight line from the left hand side.

  For further information, see the chapter on pumps in "Cleaning and Maintenance".

***Electrode (option special meas. chamber)***

- connect up the electrode (8) to the amplifier with the electrode cable (6) (see chapter mentioned above, illus. 6);
- prepare the electrode according to the chapter "Electrodes";
- insert the electrode (8) with the O-ring (12) into the measuring chamber until it sits snugly (see the chapter on measuring chamber s in " Cleaning and Maintenance", illus. 6+7);
- Insert the mains supply plug into the mains socket (230V, 50 (60) Hz) whilst the main switch is turned off.

***Electronic connections***

**WARNING**


Grounding of the surveying instrument over the power supply has to be insured (50 V ≤ R·$I_{max}$ applies, at which $I_{max}$ is the max. current, at which the earth-leakage circuit breaker is not liberated yet and R is the resistance between the safety grounding and grounding).

If this can not be insured, do perform a local grounding of the apparatus.

- Prepare the signal outputs, limit alarm and malfunction alarm contacts according to the connection plan in chapter 10.3 ("Electronic connections"). Hereby, connect the signal output 0/4 - 20 mA for parameter 1 (optical measurement) to plug no. 40.

- Connect up the signal output for parameter 2 to plug no. 41. First remove the plug and bridge, then connect up the signal line (max. 500Ω).
- Connect the signal line for the malfunction alarm to plug no. I.
- Connect the signal line for the limit alarm to plug no. II.

The cables are lead out through the EMV-screening box on the outer right hand wall of the unit.

NOTE

Make sure all cables have enough play to reach the surveying instrument from the rear later on.

- Plug power supply plug into the outlet when main switch is turned off (230V, 50 Hz, and/or. 230 V, 60 Hz optional) .


**WARNING**

Electricity is still going through the hum eliminator, the surge modulus and the main switch when the main switch is turned off.

When working in these areas the power supply has to be disconnected!

## 3.5 Program start (CLR-start)

This chapter will lead you safely through the installation of the surveying instrument. Strictly heed the sequence and the instructions of this chapter. Press the keys of the keyboard as you are told and follow the instructions.

The STIP-SPECTRON is build with the knowledge of the newest technology. To be able to use the surveying instrument in its full effectiveness it is vital to adjust the computer to the surveying site. For this please read chapter 6 („Optimizing the surveying instrument“), to find out which set-up you need to choose to get the best results at your surveying site. Then, program the surveying instrument according to this in the program mode. For this you need to follow the instructions:

- Press key CLR for about **5 seconds**, **at the same time, turn on the main switch**

The operating program is thereby loaded from permanent memory.

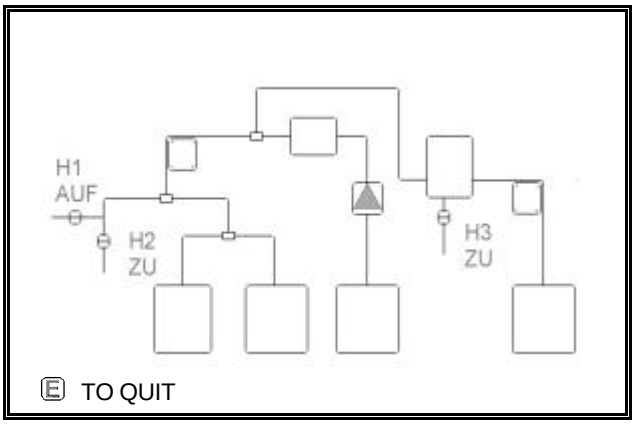
- Release the CLR key

INFORMATION

When a disk-drive is installed, there should be no disk in it when the CLR-key is pressed.

The program-start display with the STIP company logo and the program number of the loaded program is now shown in the monitor.


E A diagram with the correct valve settings of the unit is now displayed. Only confirm these settings as correct when the following tasks have been completed.




Go into the programming mode in order to adjust the data settings .

## 3.6 Adjusting the data settings

You are now required to enter in the password for this measuring site. You will find the 4-digit number code written on the code-card of your unit.

ENTER IN THE PASSWORD

- Enter in the code, and confirm by pressing E .

The following menu appears:

P R O G R A M M I N G

- **SETTINGS**
  - **RANGE DATA**
  - **SET CLOCK**
  - **LIMIT VALUES**
  - **BASIC DATA**
  - **MEASURING SITE**
  - **INIT. MODEM**
- LISTS
- TEST
- PRINTER

***Time and date***

Many units are time-activated. For the initialisation, activate the computer clock by entering in the date and precise time.

**SETTING CLOCK**

- Enter in the new time and date by using the numerical key-pad and period key, then confirm by pressing

```
DATE    :  dd.mm.yyyy
           12.07.1997

TIME    :  hh.mm.ss
           09.01.38
           ■
ENTER IN THE CORRECT FORMAT
```

- Enter in the correct time and confirm with

The seconds begin to count when - has been confirmed.

- Confirm again with

The cursor jumps back again to: *SETTINGS*
*RANGE DATA*

An error message is displayed when the values have been falsely entered. In this case, re-enter the values as described above.

***Changing the settings***

During the first initialisation, the default value settings of the operating system are loaded. Some of these values must now be altered according to the requirements of your measuring site.

```
RANGE DATA

CALIBRATION/DAY                    3.00
FLUSH SCREEN/DAY      : ■          30.00
DAY BREAK             :            10.00
RANGE                 :            10.00
PAR 1 SCALE           :             1.00
      STANDARD 1      :             1.00
      STANDARD 2      :             1.00
PAR 2 SCALE           :             0.00
      STANDARD 1      :             1.00
      STANDARD 2      :            20.00
OPERATING TYPE 0/1/2  :                0
```

- Move the cursor ■ with the arrow keys to the value to be changed.
- Enter in the new value, e.g.: for CALIBRATION/DAY :3.00
- 3 .

The new value is now confirmed, and the cursor jumps down to the next setting. If you don't wish to alter a certain value, just press E.

NOTE

Take heed of the suggested settings for each of the parameters in the chapter "Procedure, Data-settings".

In order to choose the concentrations of the standard solutions, see the notes in the chapter "Mixing standard Solutions".

| | | | |
|---|---|---|---|
| | **CALIBRATION/DAY:** | activates the daily automatic calibration. Enter in just how many calibrations should be carried out per day. | E |
| ▼ | **FLUSH SCREEN/DAY:** | Bypass option. (see - "Options, sample supply") | |
| ▼ | **DAY BREAK:** | this sets the time day for the calculation of the max, min, and average values. On top of this, automatic tasks such as calibrations are also carried out at this time. The daily protocol is also printed out at the day break time. | E |
| ▼ | **RANGE:** | adjusts the measuring range. (see the chapter, "Measurement")<br>Enter = 1, 2 or 3 | E |
| ▼ | **SCALE:** | This simultaneously sets the scale end values for the grafic display, the printout and the signal output 0/4-20 mA. Please note that for units equipped with 2 measurement parameters, that there is an independant field for each of these. Enter in the highest expected concentration for your measuring site. | E |
| ▼ | **STANDARD:** | The concentration of the standard solution is etered in here in mg/L. Please note that for units with 2 parameters, there are independant values for each of them. Take care to enter in the precise value of your standard solution. | E |
| ▼ | **OPERATION METHOD 0/1/2:** | this activates and de-activates either parameter 1 or 2 in systems equipped with 2 parameters.<br>0 = Parameter 1 + 2<br>1 = only Parameter 1<br>2 = only Parameter 2 | E |

**LIMIT VALUES** Enter in values here which correspond to the limits you wish to monitor. When a limit alarm is tripped, the contact in the limit alarm is opened. E

**DELAY (sec):** this sets down the interval by which the tripping of an alarm is delayed by. E

**UPPER LIMIT:** this sets the value for the upper alarm limit. E

**SLOPE / 2 min:** this sets the value for the slope alarm limit. The alarm is tripped when the measured value increases by more than this setting between two measuring points (inside 2 mins.). E

**LOWER LIMIT:** this sets the value for the lower alarm limit. E

**BASIC DATA** An alteration of the basic data is necessary in certain units after a CLR-start. Enter in the values outlined in the chapter, "Procedure". E

**PROCEDURE:** establishes the measuring mode (see chapter, "Measurement"). No adjustment is necessary during initialising. E

**Q P1 [ml/min]:** Delivery volume of the pump in ml/min. P1 during measurement. No adjustment is necessary during initialising. E

**MEASURING TIME:** Chemical reaction time + measuring at the end of this time. To initialise, enter in an appropriate value from those suggested in the chapter "Measurement". E

**CALIBRATION TIME:** The total time for calibration in units equipped with a thermic fusion process (TP,...) can be reduced here, when the standard solution is mixed from substances which don't require disintegration. To initialise, enter in an appropriate value from those suggested in the chapter "Measurement". E

**MEASURING PAUSE MIN:** Represents the shortest interval between 2 measuring cycles. You can vary this value according to your requirements. E

**MEASURING PAUSE MAX:** Represents the longest interval between 2 measuring cycles. You can vary this value according to your requirements. E

**THRESHOLD MP [%]:** Sets the value for the difference in % between 2 measuring cycles, when it is exceeded, the shoter measuring interval is activated. Otherwise, the longer period *MEAS. DELAY MAX* is activated in order to save reagent. You can vary this value according to your requirements. E

**L-FLUSH:** Sets the flushing value for the bypass option (see, "Options, Sample Processors"), standard setting is 20.

| | | |
|---|---|---|
| ▼ | **EXCHANGE TIME:** | Time setting in seconds for the sample to be flushed from the sample tubes. No exchange time is necessary for the initialisation. |
| ▼ | **OFFSET PAR 1** | A correction factor to compensate for any deviations in the photometric measuring value. Negative values can also be entered. The offset is then subtracted from the measured value. No offset is necessary for the initialisation. |
| ▼ | **DC OUT 0/4 - 20 mA:** | sets the signal output at either 4-20 or 0-20 mA.<br>Enter = 0 or 4 |
| ▼ | **SETTLING TIME [sec]:** | (only for the SAND FILTER option) Sets the settling time interval. Enter in a value in acordance with the settling properties of the sample water. A 20 mm zone of clear water should be visible after this time has run out. You can change the value according to the way your sample water varies. |
| ▼ | **P1 (AT) [ml/min]:** | (only for the SAND FILTER option) During the settling time, the pump P1 delivers at this volume setting. It is recommended to enter in the delivery volume of the pump P1 during operation (QP1). Should sediment be stirred up, it might be necessary to lower the volume to an appropriate level. No adjustment is necessary during initialisation. |

◄ ► ▼ ▼ ▼ ▼ **MEASURING SITE**

To facilitate easy recognition, the measuring site can be given a name of max. 24 letters, or 4 characters for disk storage. In order to enter in the name of the site, use the ▼ ▲ - keys to choose a letter, then the ◄ ► - keys to move to the next letter. Under FILE XXXX, you can name the files which are then stored on disk.

After completing the settings, you should write them down. Use the template supplied at the end of this chapter.

NOTE

Copy the template before you write on it. This will enable you to use fresh copies, should you need to document alterations in the future.

If your unit came supplied with an optional printer, you may also use this to store a record of your settings. In this case go to: PROGRAMMING - LISTS - DATA SETTINGS.

For further instructions refer to the printer documentation.

- Fill up the standard cannisters with the concentration chosen (see chapter "Mixing standard solutions").

- Place the reagents in the unit which have been prepared according to the instructions in "Changing reagent" . Go into the service menu, and then to, Changing reagent.

**CHANGING REAGENT**

- Press key(s) "3" and / or "4" in order to de-aerate the reciprocating pump(s) P3 and P4 (if supplied). Observe the safety regulations. See also the chapter on "Changing Reagent", in "Cleaning and maintenance".
- Activate a calibration. In order to do this, go into the Service menu and press:

**CALIBRATE MEAS. SYSTEM** 

The unit begins a calibration cycle.

The measuring chamber is hereby filled twice with standard 1. Afterwards, the spectrometer automatically adjusts itself to the optical conditions.

INFORMATION

The spectrometer cannot measure properly without this preparatory calibration !

After this preparatory calibration, the unit reverts fully automatically to normal operation.

NOTE

It is recommended to calibrate the unit again after approx. 1 hour's operation, as the unit is now run in, any optional electrodes included will have lost their initial drift, and the heater will by now have warmed the optics chamber to operating temperature.

**THE ANALYSER IS NOW READY FOR ON-LINE MEASUREMENT**

Fill out the RECORD OF ANALYSER SETUP

Date: _____

| Reaction conditions (special menu) | | Pump settings (special menu) | |
|---|---|---|---|
| V Reac. chamber | = _____ | Q P1 100% | = _____ |
| Sample portion | = _____ | Q P2 100% | = _____ |
| Reg 1 portion | = _____ | Q P3 / 15 strokes | = _____ |
| Reg 2 portion | = _____ | Q P4 / 15 strokes | = _____ |
| Bulb length | = _____ | | |
| **Range data** | | **Basic data** | |
| Calibration/day | = _____ | Procedure | = _____ |
| Screen flush/day | = _____ | Q P1[ml/min] | = _____ |
| Day break | = _____ | Meas. time | = _____ |
| Range | = _____ | Cal. time | = _____ |
| Scale Par1 | = _____ | Meas. pause min. | = _____ |
| Standard 1 | = _____ | Meas. pause max. | = _____ |
| Standard 2 | = _____ | Threshold MP[%] | = _____ |
| Scale Par 2 | = _____ | L-flush [sec] | = _____ |
| Standard 1 | = _____ | Exchange time | = _____ |
| Standard 2 | = _____ | Offset Par 1 | = _____ |
| | | DC Out 0/4-20mA | = _____ |

# 4 Procedure

## 4.1 Measuring procedure

When light enters the chamber it also passes through the sample water, whereby the sample can absorb some of the light (the beam of light is weakened). Should the light be absorbed in the visible part of the spectrum (380 – 780 nm), then the sample will become discoloured to an extent also visible to humans. Substances which alter the colour of the water can then be quantified by the degree of discolouring. The stronger the colouring is, the more intensive the light is absorbed.
The Diode-Array-Spectrometer in the unit measures the amount of absorption due to the sample in the wavelength range between 380 nm and 780 nm. According to the Lambert-Beer law, the concentration of a discolouring substance is proportional to the absorption the sample causes.

Absorption = concentration x proportionality constant

(Lambert-Beer)

Because most substances are absorbed to varying degrees at different wavelengths (different proportionality constants), it's possible to recognise a specific substance amongst other absorbing substances due to the special pattern of its absorption spectrum (all rates of absorption for all wavelengths next to one-another). Because it utilises a spectrometer, the unit is aware of the entire absorption spectrum, and can use this data to filter out disturbances when evaluating the measurement results. The unit uses three procedures in order to do this:

1. In the first procedure (called procedure 1 in the program), the difference between two rates of absorption at different wavelengths is evaluated. This the standard procedure, and yields good results, even when the sample water is clouded.
2. In the second procedure (called procedure 2 in the program), the first deviation of the absorption spectrum is used in evaluation. This procedure is recommended for waters which cause problems when using the first procedure due, for instance, to excessive clouding and a discolouring of the sample. Never the less, this procedure isn't recommended for all wavelengths (see special tips). A slightly larger measurement value deviation is to be expected than with procedure 1.
3. In the third procedure (referred to as procedure 3 in the program), the second deviation of the absorption spectrum is used in evaluating. In certain situations, this procedure can lead to better results with self-coloured samples then the other two procedures.
   It should never the less be noted that this procedure is not recommended for all wavelengths (see special tips), and that it can also have a slightly higher level of measuring signal noise than when using procedure 1.

NOTE

In the program of the menu TEST - TEST OF INPUTS - OPTICS the measured values of each procedure for the current measuring range are displayed parallel to one another. Operation carries on simultaneously in the background.

## 4.2 Spectrophotometrical total-phosphorus evaluation

In a strong solution of sulphuric acid, phosphoric compounds are broken down at boiling point in reaction with peroxodisulphate ions. The peroxodisulphate ions serve as an oxidiser, whilst the acid supports the hydrolysis of the polyphosphates. As the sample solubilizes, orthophosphate ions are formed. These react with molybdate ions to form a heteropolyacid, which then reacts with any vanadate ions present to create a yellow colour-complex with a light-absorption between 380 nm and 480 nm. This can then be clearly analysed spectrophotometrically.

***Chemicals used***

Only use our original chemicals for your measurements. No responsibility can be taken for any damages caused by using other chemicals.

The reagent used in total-phosphorus measurements contains two component solutions:
Component 1 (ord.-no. 8.024.77.02) contains sodiumperoxodisulphate. Component 2 consists of sulphuric acid, molybdate and vanadate. For measurement ranges until 25 mg/L TP the reagent with the ord-no. 8.024.77.02 should be used for the component 2. For a measurement range ≥ 25 mg/L TP use the reagent for high concentration (ord.-no. 8.024.27.41).

**WARNING**

Caution! Sulfuric acid causes severe burns. Wear protective clothing, gloves and eye/face protection!

After contact with skin, wash immediately with plenty of 1% sodiumhydrogencarbonate solution! Seek medical advice and show this container or label!

Mix chemicals only in well aerated places.

Follow the valid working instructions for dealing with corrosive chemicals.

Never add water to the sulfuric acid or to the mixed reagent! Contact with water liberates extremly heat!


CAUTION

Sodiumperoxodisulphate may support fire!

Do not breath powder of sodium peroxodisulfate and the rising vapours.

NOTE

Before use, the component 1 must be mixed with 1 liter of distilled water, and then topped up to a total of 2 liters. Close the lid of the 2 L canister, and mix it well by stirring. Let it settle for 30 minutes, then shake again briefly. It's now ready for use.

***Disposal***

Canisters which have been cleaned out can be returned to STIP ISCO GmbH. Please dispose of any chemicals remaining in the canisters in a way which is protects the environment.

### 4.2.1 Measurement specifications

| range | meas range[1] | meas. range[2] | procedure 1 | procedure 2 | procedure 3 |
|---|---|---|---|---|---|
| 1 | 0.2 - 16 mg/L TP | 0.1 - 8 mg/L TP | recom. | do not use | from 5 mg/L[1] recom. |
| 2 | 1.0 - 80 mg/L TP | 0.5 - 40 mg/L TP | recom. | recom. | recom. |
| 3 | 2.0 - 100 mg/L TP | 1.0 - 50 mg/L TP | recom. | recom. | do not use |

[1] For a bulb length of 10 mm
[2] For a bulb length of 20 mm

NOTE

For the ranges 2 and 3 the reagent for high concentration, ord.-no. 8.024.27.41, should be used for the component 2.

| | |
|---|---|
| Ratio of reagent to sample water: | 0.8 parts component 1 +<br>2.2 parts component 2 +<br>7 parts sample<br><br>For values under 8 mg/L*:<br>half of the reagents +<br>8.5 parts sample<br><br>For values higher than 65 mg/L*:<br>0.8 parts component 1 +<br>3.2 parts component 2 +<br>6 parts sample |
| Detection limit: | 0.1 mg/L $PO_4$-P (for a bulb length of 20 mm and range 1) |
| Error margin: | 5% (procedure 1) |
| Reagent consumption: | 97.5 ml per day (for 1 measurement / 10 mins and values under 8 mg/L)) |
| $T_{90}$-time: | dependant upon the duration of a cycle. 90% of the final value is reached after the 2nd measurement ** |
| Shortest measurement cycle | 6 minutes |

* requires a change in the unit's basic data (see the chapter on optimising the unit)
** plus an additional idling time, which is determined by the sample preparation of the respective unit

***Crossover-sensitivities***

Ferric ions have only a marginal influence on the measurement at iron concentrations below 5 mg/L, yet the value will still increase slightly. Silicate has no effect. Substances which have a strong buffering effect can increase the value measured by influencing the acid concentration of the reagent. This can only be noticed at very high buffer capacities or pH values in the sample water. When iodide and bromide are oxidised they create a yellow discolouring, which can lead to measurement value increases. High concentrations of either organic substances or chloride will burn up the oxidising agent, thus leading to drops in the resulting values. In such cases, the double or quadruple amount of the component 1 is to mix up into 2 liters.

***Further notes***

When stored separately the reagents have a shelf life of 2 years. When component 2 has been mixed with water it will only last for 6 weeks. For values under 8 mg/L $PO_4$-P, it is advisable to reduce the reagent to sample water ratio from 1.5 to 8.5. This saves 50 % more reagent, and leads to greater accuracy at the lower end of the scale. This is never the less not recommended for waste waters which have a high buffer capacity or a high COD load. The disintegration times for polyphosphates are otherwise lengthened (especially for samples with a high COD load), in which case silicates which are then also measured will lead to an increased measurement value.

### 4.2.2 Settings for spectrophotometrical measurements of total phosphorus

The values in this special menu (for further details see the chapter on "Optimizing the system") are set up correctly during testing, and don't normally need to be altered.

**REACTION MODIFIERS** (special menu)

| | | |
|---|---|---|
| V REAC.-CHAMBER | 4.50 | for bulb length 10 mm |
| | 6.50 | for bulb length 20 mm |
| SAMPLE PORTION | 70.00 | for values over 8 mg/L TP |
| | 85.00 | for values under 8 mg/L TP |
| REG 1 PORTION | 22.00 | for values over 8 mg/L TP |
| | 11.00 | for values under 8 mg/L TP |
| REG 2 PORTION | 8.00 | for values over 8 mg/L TP |
| | 4.00 | for values under 8 mg/L TP |
| BULB LENGTH | 10.00 | note, indicating which bulb length |
| | 20.00 | is installed. Change for other lengths. |
| REACTION TIME | 180 up | duration for the oxide disintegration |
| | to 5400 | The value is in sec |

**RANGE DATA**

| | | |
|---|---|---|
| CALIBRATION/DAY | 1.00 | |
| SCREEN FLUSH/DAY | 1.00 | |
| DAY BREAK | 0.00 | |
| RANGE | 2.00 | * |
| PAR 1 SCALE | 30.00 | * |
| STANDARD 1 | 1.00 | * |
| STANDARD 2 | 10.00 | * |

for units measuring two parameters, values are also entered for PAR 2 in SCALE, STANDARD 1 and STANDARD 2.

**BASIC DATA**

| | | |
|---|---|---|
| PROCEDURE | 1.00 | * |
| Q P1 [ml/min] | 5.00 | |
| MEAS TIME | 900.00 | can be reduced if necessary |
| CAL-TIME | 900.00 | can be reduced if necessary |
| MEAS PAUSE MIN | 120.00 | |
| MEAS PAUSE MAX | 1200.00 | |
| THRESHOLD MP [%] | 20.00 | |
| L-FLUSH [sec] | 20.00 | |
| EXCHANGE TIME | 10.00 | |
| OFFSET PAR 1 | 0.00 | |
| DC OUT 0/4-20 mA | 4.00 | |

* these parameters must be appropriately altered to suit conditions at the measuring site

# 5 Programming mode

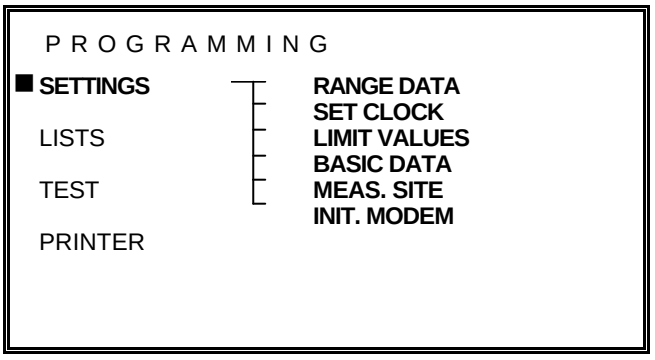
The unit's computer is programmable to accept new operating parameters. In order that the unit can work effectively – i.e. that the measured values are as accurate as possible, and the consumption of reagent(s) is kept as low as possible – it is necessary to adapt the unit's measuring parameters to suit your particular measuring site.

INFORMATION

The programming of the unit is to be carried out exclusively by trained personnel specifically authorised to do so (e.g. shift supervisors, works managers)!

In order to protect the programming level from unauthorised tampering, you will be required to enter the unit's code upon pressing the programming key. The four-digit number code is written down on the unit's code-card.

Enter in the "key", and confirm with E. After the code is entered, the following **Menu** will appear:




Should you wish to access a variety of menus in the PROGRAMMING MODE, you can return to the PROGRAMMING **Menu** after having dealt with one item by pressing the ◄-key. In this way, you can avoid having to re-insert the codeword for each separate item in the PROGRAMMING MODE.

Parameter 1 (PAR 1) is used for the spectrophotometrically measured parameter. Parameter 2 (PAR 2) is used by units equipped to measure a second, ion-selective parameter.

## 5.1 Menu item "settings"

In the settings menu item you can alter the parameter data entered into the unit.

### 5.1.1 Range data

The range data settings affect information pertinent to the range to be measured.

**RANGE DATA** [E]

| | | |
|---|---|---|
| **CALIBRATION/DAY:** | activates the daily automatic calibration. Enter in the number of daily calibrations you would like to be carried out. | [E] |
| [▼] **FLUSH SCREEN/DAY:** | Bypass option. (see Options - Sample Processors) | [E] |
| [▼] **DAY BREAK:** | this sets the time day for the calculation of the max., min, and average values. On top of this, automatic tasks such as calibrations are also carried out at this time. The daily protocol is also printed out at the day break time. | [E] |
| [▼] **RANGE:** | adjusts the measuring range. (see the chapter, "Measurement")<br>Enter = 1, 2 or 3 | [E] |
| [▼] **SCALE:** | The simultaneously sets the scale end values for the graphic display, the printout and the signal output 0/4-20 mA. Please note that for units equipped with 2 measurement parameters, that there is an independant field for each of these. | [E] |
| [▼] **STANDARD:** | The concentration of the standard solution is entered in here in mg/L. Please note that for units with 2 parameters, there are independant values for each of them. | [E] |
| [▼] **OPERATION PROCEDURE 0/1/2:** | this activates and de-activates either parameter 1 or 2 in systems equipped with 2 parameters.<br>0 = Parameter 1 + 2<br>1 = only Parameter 1<br>2 = only Parameter 2 | [E] |

### 5.1.2 Setting the clock

[►] [▼] **SET CLOCK** [E]

Enter in the new **DATE** and **TIME** and confirm each with [E].

### 5.1.3 Entering limit values

**LIMIT VALUES**

| | | |
|---|---|---|
| **DELAY (sec):** | this sets down the interval by which the tripping of an alarm is delayed by. | E |
| **UPPER LIMIT:** | this sets the value for the upper alarm limit. | E |
| **SLOPE / 2 min:** | this sets the value for the slope alarm limit. The alarm is tripped when the measured value increases by more than this setting between two measuring points (inside 2 mins.). | E |
| **LOWER LIMIT:** | this sets the value for the lower alarm limit. | E |

### 5.1.4 Basic data

The basic data menu contains parameters which have a defining influence on the measuring performance of the unit. Please take this into account when altering the settings.

**BASIC DATA**

| | | |
|---|---|---|
| **PROCEDURE:** | establishes the measuring mode (see chapter, "Measurement"). | E |
| **Q P1 [ml/min]:** | Delivery volume of the pump in ml/min. P1 during measurement. | E |
| **MEASURING TIME:** | Chemical reaction time + measuring at the end of this time.<br>When operating units with two reagent pumps a sepperate entered reaction time is running down. The accompanying programme point is<br>REACTION TIME | E |
| **CALIBRATION TIME:** | The total time for calibration in units equipped with a thermic fusion process (TP,...) can be reduced here, when the standard solution is mixed from substances which don't require disintegration. | E |
| **MEASURING PAUSE MIN:** | Represents the shortest interval between 2 measuring cycles. | E |
| **MEASURING PAUSE MAX:** | Represents the longest interval between 2 measuring cycles. | E |

**THRESHOLD MP [%]:** Sets the value for the difference in % between 2 measuring cycles, when it is exceeded, the shorter measuring interval is activated. Otherwise, the longer period *MEAS. DELAY MAX* is activated in order to save reagent.

**L-FLUSH:** Sets the flushing value for the bypass option (see "Options, Sample Processors"), standard setting is 20.

**EXCHANGE TIME:** Time setting in seconds for the sample to be flushed from the sample tubes.

**OFFSET PAR 1** A correction factor to compensate for any deviations in the photometric measuring value. Negative values can also be entered. The offset is then subtracted from the measured value.

**DC OUT 0/4 - 20 mA:** sets the signal output at either 4-20 or 0-20 mA.

**SETTLING TIME [sec]:** (only for the SAND FILTER option) Sets the settling time interval. Enter in a value in accordance with the settling properties of the sample water. A 20 mm zone of clear water should be visible after this time has run out.

**P1 (AT) [ml/min]:** (only for the SAND FILTER option) During the settling time, the pump P1 delivers at this volume setting. It is recommended to enter in the delivery volume of the pump P1 during operation (QP1). Should sediment be stirred up, it might be necessary to lower the volume to an appropriate level.

### 5.1.5 Labelling the measuring site

**MEAS. SITE**

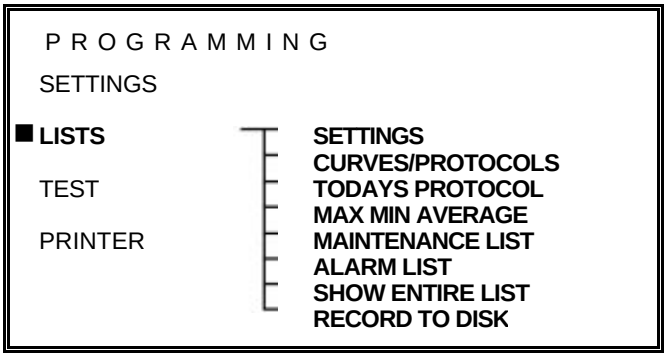
To facilitate easy recognition, the measuring site can be given a name of max. 24 letters, or 4 characters for disk storage. In order to enter in the name of the site, use the ▼ ▲ - keys to choose a letter, then the ◄ ► - keys to move to the next letter. Under FILE XXXX, you can name the files which are then stored on disk.

**INIT MODEM**

Go to this item if you've linked up your unit to the telephone net via a modem. Enter in the init-string of your modem. (option RS 232) (For further information, see chapter - Options - RS232)

## 5.2 Lists menu

In the lists section, you can print out the unit settings, measuring results and protocols, and also view some of them on the unit's display.




**LISTS** E

**SETTINGS:** Prints the current range data, basic data and limit value settings. E

**CURVES/PROTOCOLS:** Offers a 14 day list of graphic curves and daily protocols which can the be printed out. Please note that in units set up to measure two different parameters, that one of them has first to be selected under the menu item *PRINTER*. E

**TODAYS PROTOCOL:** Prints the current daily protocol (from day break to day break). E

```
MEASURING SITE
PROTOCOL          03.02.98   ← Date of the protocol
PRINTOUT:  03.11.97-13:50    ← Printout date

PROGRAM START     13:17      ← List of events sorted ac-
CHANGE DATA       13:17        cording to time of occur-
CHANGE DATA       13:18        rence
CAL. OPTICS       13:42
    - 0.1         3.8
CAL PROBE         13:42
    0.4           22.83 *
```

**MAX MIN AVERAGE:** Either prints out, or displays, the maximum, minimum and average values from the past 14 days on record. E

### 5.2.1 Maintenance list

**Maintenance list:** In the maintenance list you will find all work carried out sorted according to the type of task performed. You can scroll through a list of these in the display. If a printer is connected and activated, the list will automatically be printed out. The list contains both the time and date of the event being recorded.

***Items on the Maintenance list:***

**PROGRAM START** Records the time and date of any CLR starts

**CHANGE DATA** Records the time and date of any changes in the data settings

**P1 CHANGE TUBE** Records the time and date of any P1 pump tube changes

**P2 CHANGE TUBE** Records the time and date of any P2 pump tube changes

**CAL. OPTICS** Records the time and date of any calibrations of the spectrophotometrical measurement. In addition, the recorded values for the calibration slope, and the interception of the graduation axes X0 are documented on a separate line (see chapter "Cleaning an maintenance - Calibrating the measuring system").
Please note that any abortive calibrations are coded with an asterisk . In such cases, the previous calibration values remain determinant.

**CAL PROBE** Records the time and date of any electrode calibrations. In addition, the values for the potential determined for 1 mg/L, and the slope of the calibration gradient are documented in a separate line.
Please note that any abortive calibrations are coded with an asterisk . In such cases, the previous calibration values remain determinant.

**CAL PUMPS** Records the time and date of any pump calibrations. In addition, the delivery volume determined, and appropriate pump no. (1,3,4) are documented on a second line.

**OPTICS CHAMBER** Records the time and date after selecting the appropriate item in the service menu

**ELECTRODE CHAMBER** Records the time and date after selecting the appropriate item in the service menu

**FLUSH SCREEN** Records the time and date after selecting the appropriate item in the service menu. Please note that any automatic flushings aren't documented.

| | |
|---|---|
| **BYPASS SCREEN** | Records the time and date after selecting the appropriate item in the service menu |
| **CHANGE REAGENT** | Records the time and date after selecting the appropriate item in the service menu |
| **STANDBY** | Records the time and date of any stand-by event due to a loss of sample supply. This is part of an optional accessory, and is thus only available when this has been incorporated. |
| **OPTIC JUSTAGE** | records the time of a spectrometer analysis in millisec and the found intensity when doing the zero measurement of the calibration.<br>This information is only important to service technicians. |

### 5.2.2 Alarm list

**ALARM LIST**

The alarm list contains details about the time and date when any such event has occurred. You can view this list on the screen, or print it out when a suitable printer is connected up. Any of the following alarms may be included:

***Entries in the alarm list:***

| | |
|---|---|
| **POWER CUT** | Records a failure in the mains supply |
| **POWER ON** | Records when the power supply was restored |
| **SCALE EXCEEDED ON** | Records when the unit's measuring scale has been exceeded.<br>Please note that when the reagent has run out, or a calibration has been performed incorrectly, that these could have a similar effect. |
| **SCALE EXCEEDED OFF** | Records when the measuring value returns to lie inside the scale again. For the time between SCALE EXCEEDED ON and SCALE EXCEEDED OFF, "NO VALUE" is shown in the display. |
| **LEAKAGE:** | Records a when a leak occurs in the unit. The unit will switch automatically into a standby mode. |

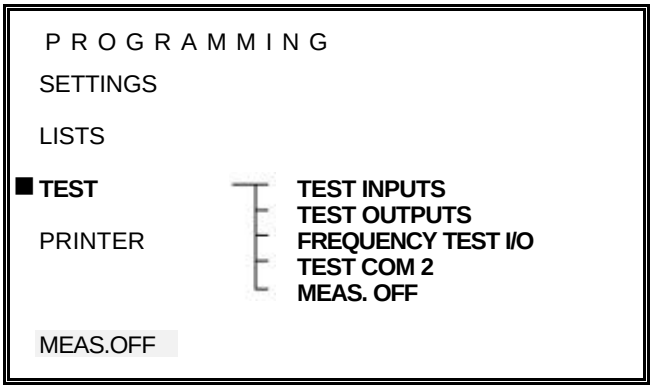
**SHOW ENTIRE LIST:** Chronological listing of all events recorded. All of the last 200 events are stored on this list. (E)

**RECORD TO DISK:** Records selected measurement curves and protocols onto a diskette. (E)

Measuring data from the past 10 days can be accessed in the unit's computer.

## 5.3 Test menu item

The sub items in the TEST section are test programs which are designed purely to be able to test the unit's correct functioning.




NOTE
Before you access any of the test programs, activate **MEAS. OFF** to avoid any alarms being set off in the unit.

**TEST INPUTS** E

**OPTICS:** Test program for the optical components. This shows the value amount of absorption that the spectrometer sends to the computer for processing. If you use this item without previously deactivating measurement with *MEAS. OFF,* then the unit will carry on operation in the background. You can then see the way that each of the three evaluation procedures measure in the current range (see settings in the range data). This allows you to choose the best procedure of measuring for your measuring site. E

**SWITCHING INPUTS:** Displays the current states for each of the switching channels. E

**TEST OUTPUTS** E

**SIGNAL OUTPUT:** this sets the analogue signal outputs at a specific value between 0 and 20 mA. E

**PUMPS:** Item to check the correct functioning of the various pumps (see also the description of the pumps). E

**SWITCHING OUTPUTS:** Function test for the switching outputs. It displays the current state of each channel. E

***Allocations of the switching channels***

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | = | MV1 | Sample in chamber | **OFF** | Sample flows past chamber | **ON** |
| **2** | = | MV2 | Close meas. chamber | **OFF** | Open meas. chamber | **ON** |
| **3** | = | MV3 | sample | **OFF** | Standard | **ON** |
| **4** | = | MV4 | Standard 1 | **OFF** | Standard 2 | **ON** |
| **5** | = | MV5 | Flush screen off | **OFF** | Flush screen on | **ON** |
| **6** | = | MV6 | Sample outlet sand filter (optional) closed | **OFF** | Sample outlet sand filter (optional) open | **ON** |

**7** = Heater off (optional) **OFF**

**8** = Pump P3, changing between O**N/OFF** activates one stroke of the pump

**9** = Malfunction alarm

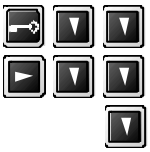
**10** = Limit value alarm

**11** = Pump P4 (Optional) changing between **ON/OFF** activates one stroke of the pump

**12** = not used

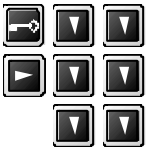
**FREQUENCY TEST I/O:**

Checks the correct functioning of the I/O card by testing inputs and outputs. In order to test the frequency in and outputs, first a specific frequency is entered, then the connections to a channel bridged, and the value read off.



**TEST COM2**

Displays the transmitting data for the computer port RS232 (optional).



**MEAS. OFF**

De-activates measuring operation. The status indicator MEAS. OFF is displayed enabling tests to be carried out without setting off any alarms in the unit.

**PRINTER**

Under this item, in units which measure two parameters, you choose which one you want printed out. This affects both the curves which are printed out, and the corresponding max., min and average values.

# 6 Optimizing the measuring system

## 6.1 General notes

In order to get the best possible measuring results, it is absolutely necessary to carry out a calibration of the unit. Because it is often the case that the type of measurement demanded of the unit changes after several weeks operation – whether this is due to the processes surrounding the unit being optimised, or that new knowledge about the measuring site has come to light – then the standard solutions should be checked anew. The accuracy of the unit can be increased by correctly choosing the concentration of the standard solutions.

When more accurate knowledge of the measuring site is available, it is advisable to check that the range set in the range data parameters actually coincides with any new range discovered. Please see the section "Measurement specifications" in the chapter "Procedure".

Example:
If you set up a Spectron Phosphate unit to measure behind a phosphate precipitation process, you might expect values of between 0.1 - 0.9 mg/L – yet the range set in the RANGE DATA is still the default value 2. By choosing a smaller range here, you can increase the unit's accuracy.
Furthermore, by using a bulb length of 20 mm (ord.-no. 9.071.25.02; 2 disks) instead of the standard length of 10 mm, the unit's sensitivity can be increased by a factor of two. You should also note that when using a bulb length of 20 mm, that the reagent consumption will rise by up to a third. You can check which bulb length is used in your unit in the "Special menu - Reaction Modifiers" under the appropriate item.

You can save on reagent when you set the unit to measure only as often as is absolutely necessary. SPECTRON units also offer you the possibility of reducing the measuring cycle frequency during times when the measuring values show little dynamic change, by suitably altering the parameters MEASURING PAUSE MIN, MEASURING PAUSE MAX and THRESHOLD MP.

| | | |
|---|---|---|
| Example: | MEASURING PAUSE MIN | 120 sec |
| | MEASURING PAUSE MAX | 600 sec |
| | THRESHOLD MP | 20 % |

The unit will pause for the minimum length of 120 seconds between measuring cycles, when the current value deviates by more than 20 % from the previous measurement. The maximum pause length of 600 seconds between cycles applies when these values diverge by less than 20 % (e.g. during the night).

Moreover, whilst taking the measuring range parameters into consideration, the ratio between reagent and sample water can also be altered. In order to do this, it is imperative that you follow the instructions found in the chapter "Measurement specifications".

It is necessary to regularly check the settling time of the sludge in units equipped with settling chambers, in order to be able to react in time to changes in the settling process and to optimise it. Remember that no optical measuring process can function optimally when the sample water is clouded too much by sludge.

In cases of extremely problematical waste water (strong turbidity, discolouring), it is useful to test whether the unit will produce better results in a different measuring mode. Do this by changing the data under the item PROCEDURE in the "Basic data", referring to the advice in the chapter "Procedure - Measurement Specifications".

NOTE

You can view the corresponding measurement values for each separate procedure in the measuring range chosen under - TEST OUTPUTS - OPTICS whilst the unit carries on operation in the background.

The unit doesn't require re-calibrating when either the range or the procedure are modified.

## 6.2 Special menu

In addition to the parameters which can be altered in both the Range and Basic data levels, the settings in the Special menu can also be changed, to document modifications to the system. Contrary to other data stored in the unit's memory, data entered into the Special menu remains intact after a CLR start.

You can access the Special menu by pressing:

- Go to the Programming level  .

The cursor can be found in the top right hand corner after the 4-digit code has been entered.

- Now press the "5“ key three times.

You can now re-set the Reaction Modifiers by pressing the "1“ key:

## REACTION MODIFIERS

**V.REAC.-CHAMBER** Enter in here the appropriate volume for the OPTICS CHAMBER: 4.5 ml for a 10 mm bulb, 6.5 ml for a 20 mm bulb. E

**SAMPLE PORTION:**
**REG 1 PORTION:**
**REG 2 PORTION:** These three parameters determine the ratio of the sample water and reagent mix. E

Please note that the sum of all three must come to 100, as they are expressed as percentages.
Set REG 2 PORTION to 0 for all units which have only one reagent pump.

**BULB LENGTH:** This term has a purely notational value, which doesn't affect the unit's performance. You can access it to see which bulb length is being used; either 10 or 20 can be entered. E

**REACTION TIME** Specifys the duration of the reaction of sample with reagent in sec before dosing reagent 2 is added.

Exit the menu by pressing the ◄ -key.

INFORMATION

The values entered will only be stored when the program is exited by pressing the ◄ -key.

Whilst in the main level of the Special menu, you can reach the menu controlling the pump settings by pressing the "2" key.

**Q P1 100%:** Pertains to the delivery volume ascertained during the last pump calibration. E

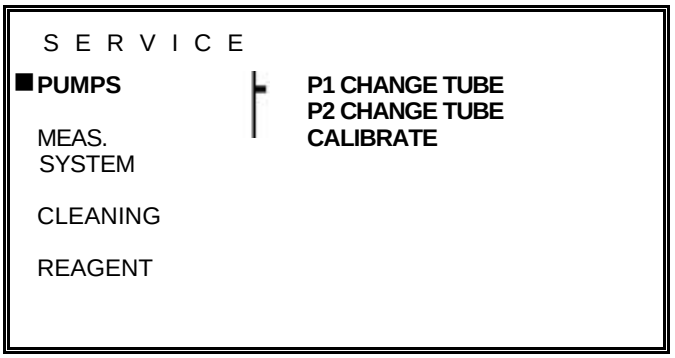
**Q P2 100%:** This contains the works' setting for the delivery volume of the pump at 100 % pump speed. This value can be changed after carrying out a manual calibration of P2. E

**Q P3 / 15 STROKES:**
**Q P4 / 15 STROKES:** The delivery volumes for P3 and P4 (if existent) determined during calibrations are entered in here.

By pressing the "9“ key in the main level of the Special menu, you can obtain a printout of the entries in the Special menu when a printer (optional) is attached.

# 7 Cleaning and maintenance

In order to carry out any maintenance work on the unit, press the "SERVICE-KEY“. The following menu will appear:




CAUTION

Protective gloves must be worn at all times whilst carrying out maintenance work on the unit, in order to avoid any damage to skin, and infection from contact with the waste water

Carry out the instructions in the display precisely. The program will guide you step by step through the maintenance task. When an item in the service menu is chosen, operation is immediately suspended. Carry out the maintenance task. Confirm that you've carried out each step by pressing the E-key. Pressing the E-key causes the next screen to be displayed. After the last step has been carried out and confirmed, the unit returns automatically to operative mode.

***PUMPS***

Use the program item *PUMPS,* in order to change the pump tubes of the P1 & P2 pumps, and to calibrate them.

***MEASURING SYSTEM***

Use the program item *MEAS. SYSTEM*, in order to calibrate the optical measuring system. If your unit is also equipped to measure ion-selective parameters, this will be calibrated at the same time.

***CLEANING***

Use the program item *CLEANING,* in order to clean the optics cell, the electrode cell (optional), and the bypass screen (in the optional Sample Processors PA-2 and PA-3), or to activate a screen flushing (option - pressure flushing of the bypass screen).

In order to clear any residual reagent out of the optics chamber before manual cleansing is carried out, accessing the menu items "Calibrate pumps" and "Clean measuring chamber" pre-flushes the chamber with standard solution or sample water.

When the unit is equipped with an optional sand filter, an automatic settling cycle is activated after any maintenance work has been completed.

***REAGENT***
Use this program item in order to change the reagent.

## 7.1 Spectron maintenance plan

Compilation maintenance schedule– Perfomance in logical sequence

| ***INTERVAL*** | ***SERVICE*** |
|---|---|
| every 3 - 4 days | • Visual check (see following subsection „Performing visual check“); |
| every 6 weeks | • Cleaning the pumps P1, P3, P4 (see subsection „Calibrate pumps“); |
| every 1-2 weeks | • Bypass screen (option) cleaning by hand (see options Bypass) |
| every 2-4 weeks | • Clean sand trap (option), exchange sand (see option sand trap); |
| every 6 weeks | • Cleaning other sample purifications by hand (see options); |
| every 3 month | • Exchange pump hoses P1, P2 (see according subsection pumps); |

| | |
|---|---|
| If necessary, at least every 4 weels | • Exchange standard (s. subsection „Calibration of the measuring instrument“); |
| If necessary, | • Exchange reagent (s. subsection „Optical chamber“); |
| If necessary | • Cleaning electrode (option) (s. subsection „probe chamber“); |
| If necessary | • Cleaning optical chamber (see subsection „optical chamber“). |

***Performing visual check***

To perform a visual check, check this:

- Time and date;
- Measurement within standards; measurement values plausible.


CAUTION

Wear protective gloves, overall and glasses while being in contact with samples.

Danger of getting an infection!

- Sample supply sufficient ??
  Place a collection vessel beneath valve 2. Open valve 2 shortly.
- Magnetic valve MV2 sealed ?
  check the magnetic valve MV2 for formation of drops inside the hose.
- Standard and Reagent sufficient ?
  Check for sufficient reagent and standard solution inside the canister.
- Pump hoses ok ?
  Check the pump hoses for embrittlement, leakage and formation of drops..

Printer (Option):

- Is the printer connected and online ?
- Take the progress curves/reports of the day out of the printer and put them into the operation-diary.

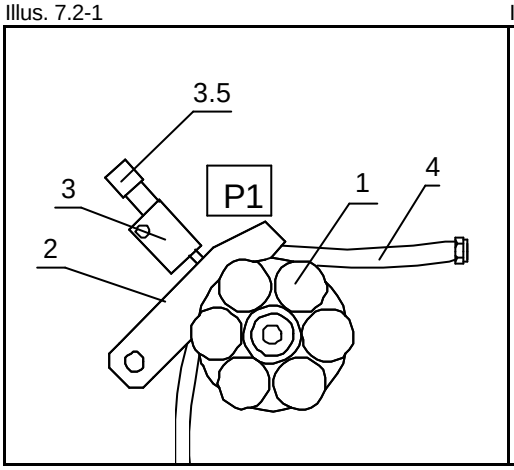
## 7.2 Peristaltic pump P1

### 7.2.1 Assembley

The P1 pump is peristaltic pump which consists of a motor and gearbox , pump head (**1**), tube bed (**2**) and a tube bed throttling screw (**3**)**.** The pump can be set up with a single tube bed (illus.7.2-1), or with a double tube bed (illus.7.2-2).
The P1 tube pump is used to deliver reagents into the measuring chamber.

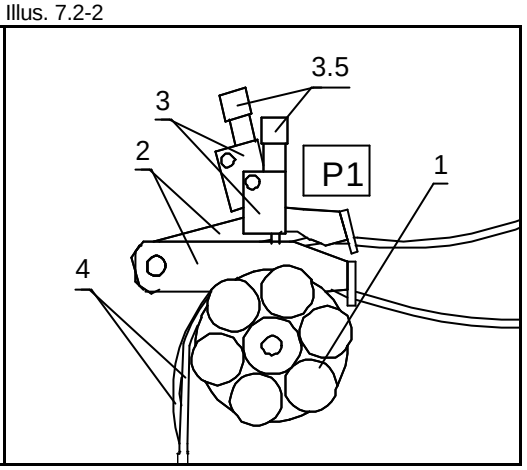
See the table on the following page for the pump delivery volume.

Illus. 7.2-1




Pump P1 with single tube bed

Illus. 7.2-2




Pump P1 with double tube bed

**1** Pump head Ø 12 cm
**2** Tube bed
**3** Tube bed throttle
**3.5** Tube bed throttle thumb-screw
**4** Pump tube

### 7.2.2 Function

The pump tube (**4**) is fed around the pump head (**1**). The tube bed (**2**) simultaneously guides the tube around the bed, and presses it against the rollers. The tube bed throttle presses the tube bed against the pump head. As the pump head revolves, the tube is wrung, and the sample pumped through.


WARNING

Don't touch the pump head whilst it is turning!

Risk of finger injuries (chrushing) !

- Tube bed throttle (**3**) → presses the tube bed (**2**)
- Tube bed (**2**) → presses pump tube (**4**) against the pump head rollers (**1**)
- Pump head rollers → wrings the pump tube as the head turns

***Double tube bed***

By using two tube beds, water can be pumped through two tubes simultaneously. This is neccessary when operating units with two measuring parameters or when using the optional equipment Preliminary dilution chamber or Settling chamber.

***Tube bed throttle***

The tube bed throttle (**3**) can be tilted back. The amount of pressure exercised by the tube bed (**2**) upon the pump head (**1**) is regulated by turning the thumb screw (**3.5**) on the throttle. It should be set so that the liquid is only just pumped. After this point has been ascertained, the screw should be tightened by one more turn.

### 7.2.3 Tips and instructions for usage

***Tube bed***

The tube bed (**2**) should be correctly positioned by sliding the bed along its mounting bolt so that the tube (**4**) is fed in a straight line from the left hand side around the head

***Tube bed throttle***

The thumb screw of the tube bed throttle should only be tightened enough to ensure that the pump tube is sufficiently pressed against the head. If the pressure is too high, the tube will be unnecessarily flattened, and soon lose its elasticity, and subsequently its accuracy. On top of this, needless pressure on the tube will undoubtedly lead to leaks in the outer wall of the tube.

### 7.2.4 Delivery volume of the P1 Pump

See in the table 7.2.4.-1 the pump P1 delivery volume in microliter / minute (µl/min) during use for each separate tube diameter at 25%, 50% and 100% pump speed.

Delivery volume depending on the tube diameter

| tube internal diameter [mm] | delivery volumne at 25% pump speed [µl/min] | delivery volumne at 50% pump speed [µl/min] | delivery volumne at 100% pump speed [µl/min] |
|---|---|---|---|
| 1.6 | 2.5 | 5 | 10 |
| 2.4 | 8.3 | 16.5 | 33 |
| 3 | 10 | 20 | 40 |
| 4 | 15.5 | 31 | 62 |
| 6 | 30 | 60 | 120 |

Tab. 7.2.4-1

### 7.2.5 Overload protection pump P1

In order to protect it from overloading, the pump P1 is equipped with a fuse. The fuse can be tripped for example by a tube bed which has been adjusted too tightly, or when the pump head is retarded. The pump is then shut down. In this case, check the adjustment of the tube bed, and if necessary loosen the thumb screw. Check the pump head as well, and release any blockage.


**WARNING**

Do not touch the roll head while the pump in running!

Risk of finger injuries (chrushing) !

When the fuse has been tripped, test the pump in this way:

PUMPS - P1 CHANGE TUBE

Press the > key in order to briefly activate the pump. Should this not work, then press:

TEST - TEST OF OUTPUTS - PUMPS - PUMP NO. 1

| TEST PUMPS |
|---|
| PUMP NO. 1 → **0** % |

- Enter in 0% for pump no. 1

The overload fuse will be re-activated.

Press the „Operation“ key in order to resume measurement.

### 7.2.6 Replace tube of Pump P1

NOTE

Always change both tubes at the same time in units equipped with a double tube bed.
Units equipped with a drainage valve in the measuring chamber shoud always first be drained.

**WARNING**

Wear protective gloves, overal and glasses while being in contact with specimen.

Danger of getting an infection!

Press:

PUMPS - P1 REPLACE TUBE

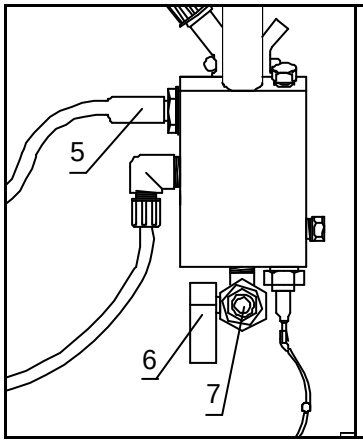
*Service menu display (example Genion 3)*

```
S E R V I C E
■PUMPS          P1 REPLACE TUBE
                P2 REPLACE TUBE
 PROBES
 CLEANING
```

***Emptying pump tube***

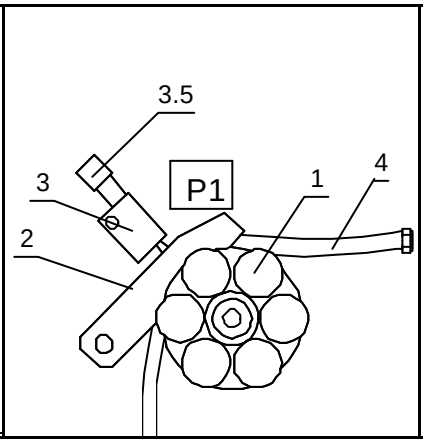
- Close valve 1.
- In order to drain the pump tube, open valve 2 after having placed a receptacle beneath it. Then open the tube bed by tilting back the throttle.

Illus. 7.2.6-1



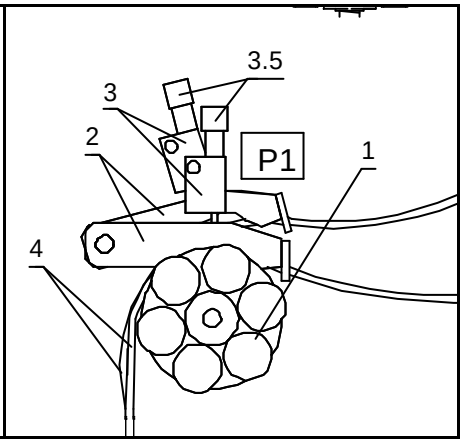

Measuring chamber with drain

Illus. 7.2.6-2




P1 pump with single tube bed

Illus. 7.2.6-3




P1 pump with two double tubebeds

NOTE
For easier removal of the hoses, perform a twist-pull-move. With this you can prevent skin injuries.

***Loosening the pump tube from the tube nipples and removing it***

- Twist the tube to the left and right in order to loosen it from tube nipples.
- Remove the tube.

***Pushing the new pump onto the tube nipples***

- Feed a new tube around the pump head.
- Screw the new tube clockwise onto the nipple. Ensure that the new tube has been pushed **untwisted** onto the nipple.

***Closing the tube bed***

- Slide the tube (**2**) along its mounting bolt until the tube is fed in a straight line around the head, then tilt back the throttle (**3**) into its compression position. E
- Check the pressure of the tube bed (**2**), and adjust the setting of the thumb screw (**3.5**), should this be necessary.

***Check start up of the pump***

Select:

TEST - TESTING THE OUTPUTS - PUMPS - PUMP NO. ?

| TESTING THE PUMPS |
|---|
| PUMP NO. ? → **0** % |

- Enter the according No. for the PUMP and 200% for the rotation speed. E
- The roller head has to spin steady but not jerk.
- If the pump does not start running, the binding screw of the pneumatic bed throttle is to tight. Loosen the setting of the binding screw.

***Closing the valves***

- Rearrange the valves settings according to the system layout in the display. E

The measuring instrument returns to ***OPERATION***, first at *PAUSE VALUE.*

### 7.2.7 Manual checking of the pump P1 delivery volume

Certain units contain an automatic program level which tests the delivery volume of the P1 pump. Check as to whether your unit provides this option, and then activate it.

INFORMATION

The precise delivery volume of the pump can also be ascertained via a manualtest. You will need a stopwatch and a measuring beaker 100 - 250 ml in order to carry out this test. Carry out the following instructions.

**WARNING**

Wear protective gloves, overal and glasses while being in contact with specimen.

Danger of getting an infection!

**WARNING**

Do not touch the roll head while the pump in running!

Risk of finger injuries (chrushing) !

TEST - TEST OF OUTPUTS - PUMPS

| TEST OF PUMPS |
|---|
| PUMP NO. 1 → **0** % |

- Enter in 0% to stop the pump 1

***Empty measurement chamber***

- Tilt back the tube bed throttle (**3**) and open the tube bed (**2**) (illus. 1+2)
- In order to drain the measuring chamber, place a receptacle underneath thedrainage valve (**7**), and open the drainage valve (**6**) (illus. 3)

***Releasing the pump tube from the Luer-connector***

- Twist the tube off from the Luer-connector. In order to do this, grip the tube at the connector end and twist it anticlockwise.

***Calibrating the pump***

- Place a measuring cylinder underneath the opened end of the tube
- Enter 100% for pump no.

| TEST PUMPS |
| --- |
| PUMP NO. 1 → **100** % |

Let the pump run for precisely 1 minute. Whilst the pump is turning, enter in 0 %, without pressing the E key.

| TEST PUMPS |
| --- |
| PUMP NO. 1 → **0** % |

- After exactly 1 minute, press E
- Read off the delivered volume in the beaker.

Differentiations of ±25% from the table 7.2.4-1 are essentially tolerable. Larger divergences should be entered into the computer.

***Entering the verified values into the computer***

SETTINGS - BASIC DATA - P1 100% (ml) E

In the STIP-SPECTRON, these values are located in a separate menu. In the STIP-toc and Phoenix-thermcat these values are to enter in the parameter Q-D 0.510.

- Enter in the determined value for P1 100% (ml) E

***Connecting the pump tube with the meas. chamber via the Luer-connector***

- Push the tube firmly onto the Luer-connector, and fasten it by twisting it clockwise.

Press „Operation“ in order to measure again.

## 7.3 Calibrate pumps

STIP-SPECTRON units contain a program item whereby the calibration of the pumps P1, P3 and P4 (when present) can be carried out.


**WARNING**

Wear protective gloves, overal and glasses while being in contact with specimen.

Danger of getting an infection!


**WARNING**

Wear acid resistant gloves, glasses and overall!

Do obey the working specifications of your country regarding the handeling of corrosive chemicals. After contact with skin wash out with plenty of water and a 1% sodiumhydrogencarbonatesolution. Seek medical advice and show this canister or label.

Press:

 **CALIBRATE PUMPS** 

The first step entails the optics chamber being filled twice with standard solution, in order that any residual reagent can be flushed out. You are then instructed to unscrew and remove the chamber lid.

```
CALIBRATE PUMPS

KEY (1) PUMP 1
KEY (3) PUMP 3
KEY (4) PUMP 4




E TO QUIT
```

You can now choose which pump you wish to calibrate. Choose the pump no. by pressing the appropriate key "1", "3" or "4", and follow the succeeding instructions.

Use the 25 ml measuring tube supplied with the unit.

Should any bubbles be visible in the supply tubes, flush them out by pressing the ▶ key. After one pump has been calibrated, the cursor will return to the primary program level, and you can calibrate any of the other pumps.

NOTE

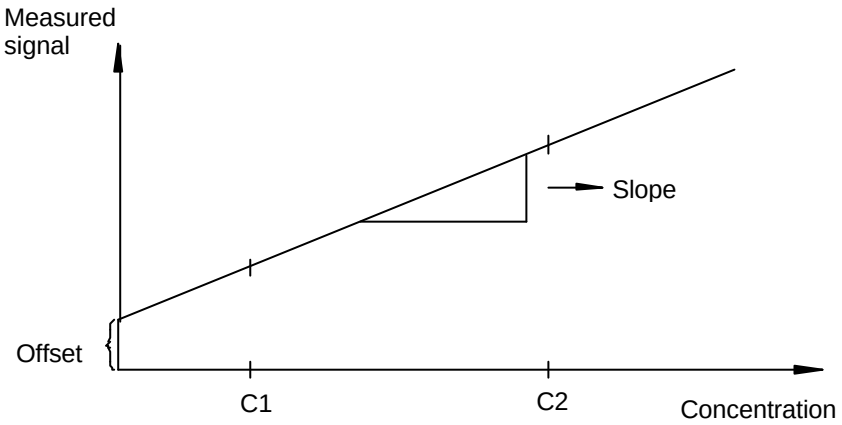
Always calibrate a pump after its tube has been changed. The P3 & P4 pumps don't normally need to be calibrated.

Each of the pumps has been calibrated during testing at STIP, so that it isn't necessary for you to calibrate them again in order to initialise the unit.

## 7.4 Calibrating the measuring system

The measuring system can be calibrated both automatically or manually. In both cases, the unit is calibrated against two standard solutions, each with different concentrations of the substance to be measured.

During the calibration, the two different solutions are fed into the system one after another.
Each time, the computer registers the parameters measured (potential, absorption,...) and relates them to the respective concentration. The slope and interception of the calibration graduation axes are then calculated by use of the rule of proportion, and by taking into account the mathematical correlation between concentration and measuring signal. The values for both the interception of the axes (in electrodes, this is the potential for 1 mg/L concentration), and the calibration graduation (measuring signal for each concentration), are stored in the maintenance list protocol under "CAL CONSTANTS".




### 7.4.1 Determining the standard solution concentrations

Choosing the correct solution concentration is essential for the measurement to be accurate .
Before determining the concentrations of the solutions, decide precisely what measuring range the unit will have to operate in. The standard solutions should encompass the normal levels.
Please note though, that the two concentrations of the standard solutions should be in a ratio of between 1:5 and 1:20 to one another.
In order to guarantee the greatest accuracy in cases when a limit value is to be monitored, mix one of the standard solution concentrations so that it corresponds to this value.

NOTE

Please note that no measuring procedure can operate to any fine degree of accuracy when the ratio is larger than 1:30.

Example:

| | |
|---|---|
| concentration to be measured: | 0 to 30 mg/L |
| most usual concentration: | 5 to 15 mg/L |
| limit value to monitor: | 20 mg/L |

Standard concentrations of 2 and 20 mg/L should be chosen here. The unit will thereby be able to measure precisely inside the range between 1 to 30 mg/L (taking into account the unit's measuring range). Higher levels of deviation from the measured values should then be expected for concentrations below 1 mg/L, and above 30 mg/L.

### 7.4.2 Mixing calibration standards

Mother solutions for a variety of measuring parameters are available from ISCO STIP. A mother solution consists of a precise, highly concentrated solution of the substance to be measured. The calibration standards are then produced by appropriately diluting this solution. In order to prepare a standard solution, put a precisely measured amount of the mother solution into a measuring cylinder of sufficient capacity, and fill this up to the required volume with distilled water.
The amount of mother solution required can be easily determined by using the rule of three.

*Example:*
*To mix up 1 liter of standard solution with a concentration of 2 mg/L, use 2 ml of a mother solution with a concentration of 1000 mg/L, and fill up to 1 liter with distilled water.*

NOTE

Please note that both substances to be measured have to be included in each standard solution in units which measure 2 parameters. Also, standard solutions should not be used for periods longer than 4 weeks (2 weeks in the case of nitrite).

Take great care when mixing up standard solutions.

INFORMATION

Any mistakes made during this mixing process will have drastic results on the measuring process. You must always be completely sure that the solutions contain the correct concentrations.

To this end, always work with clean receptacles. If at all in doubt, mix up a new standard solution.

INFORMATION

Please note that checking the concentration of the standard by reference test (e.g. cell-testing), can introduce mistakes far easier than when the mixing is performed conscientiously.

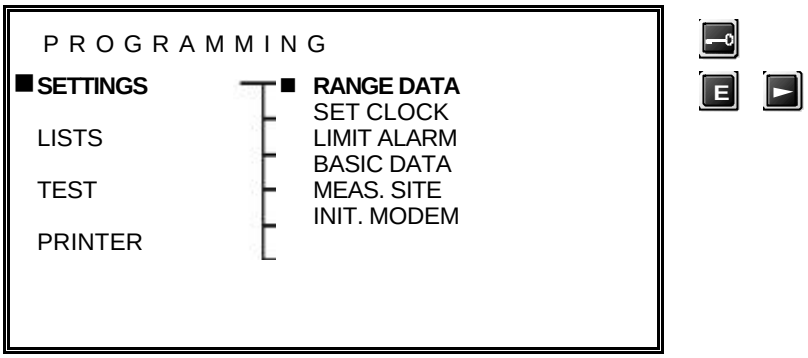
Therefore, always enter the concentration into the unit of the solution that you actually mixed, and not that of the result of any reference test performed. Values culled from any reference tests should only be seen as supplying roughly plausible values. If for example, the tested value should differ greatly from that projected, then mix up a new solution, and carry out another reference test.

### 7.4.3 Entering in the standard solution concentration

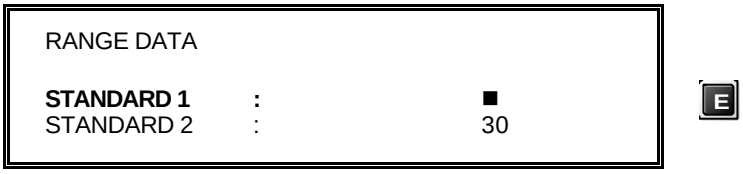
In order to enter in the concentration values, go to the programming section, and set them under STANDARD C1 und STANDARD C2 in the range data, then confirm by pressing the E-key. To do this press:

SETTINGS - RANGE DATA

*Display of the programming menu*




*Relevant program items on the follow-up display*




In units which are equipped to measure 2 parameters, the fields for the concentration values are directly below one another. Be careful in this case to enter in the values correctly.

### 7.4.4 Activating the calibration

There are two methods to calibrate the unit, one is activated manually, the other is fully automatic.

Use the manual method in order to make the unit fit for operation again after any cleaning or maintenance work has been carried out.

NOTE

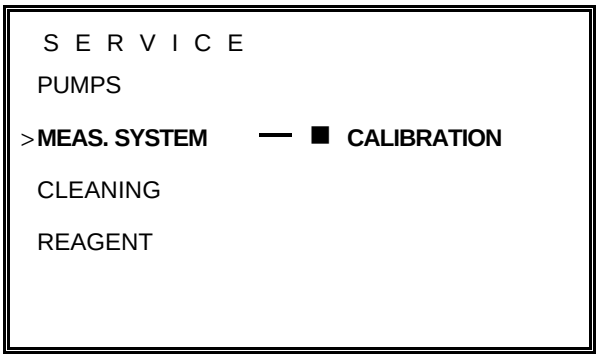
Please note that any disturbance of the measuring system (optics, electrodes,...) may cause deviations in the subsequent measurements. Therefore, after such work has been carried out, always activate a manual calibration.

***Manual calibration***

In order to activate a manual calibration, press:

 MEAS. SYSTEM - CALIBRATION 

*Display of the service menu*

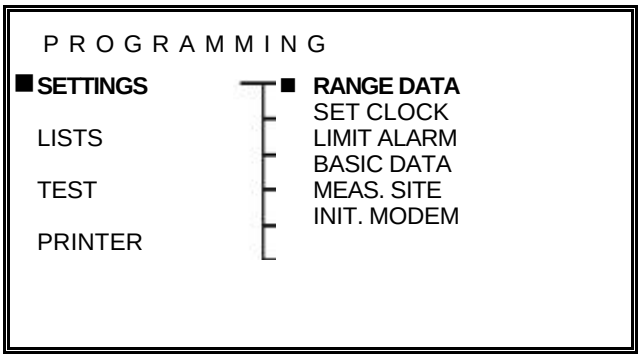



***Automatic calibration***

The unit can also be calibrated automatically. This guarantees that the measuring system will always produce highly accurate results. At the same time, an automatic calibration tests the efficiency of the whole system. To activate the automatic calibration, go into the programming section and press:

 SETTINGS - RANGE DATA 

*Display of the programming menu*




*Relevant program items on the follow-up display*

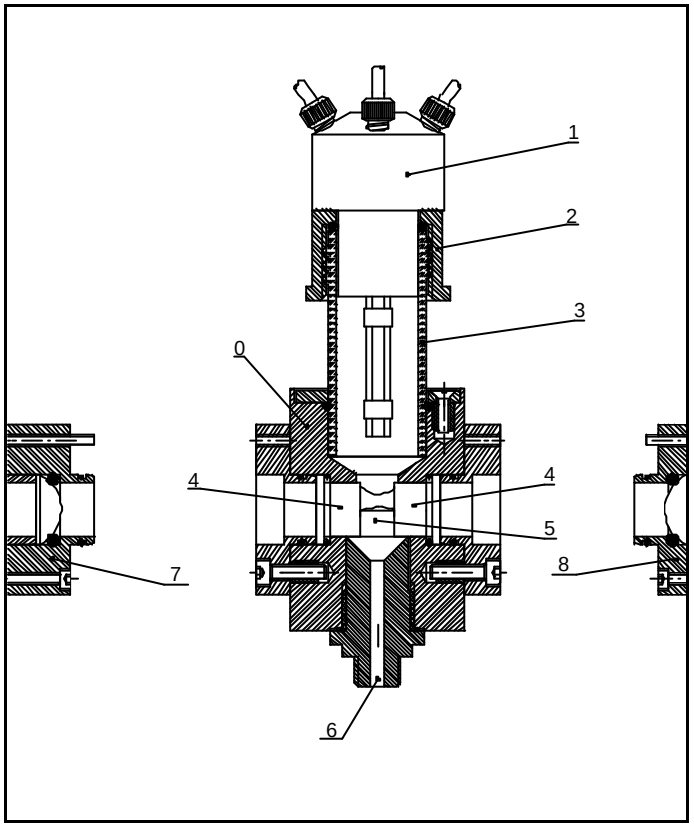

- Enter into CALIBRATION/DAY the number of automatic calibrations to be carried out per day. It is not generally necessary to actuate more than one calibration per day.

## 7.5 Optics chamber

### 7.5.1 Design

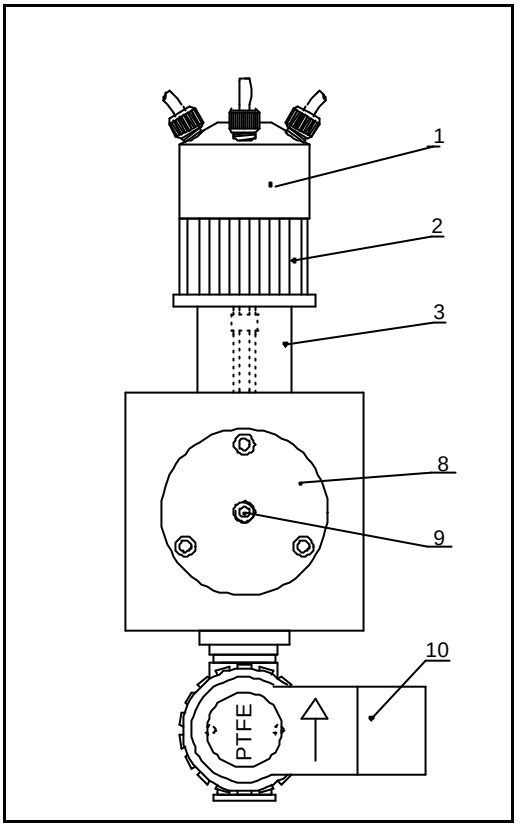
The measuring chamber consists of a rectangular chamber block (**0**) with the dosing unit (**1**), lamp (**7**), detector (**8**) and spectrometer electronics situated on top.

illus. 1




Left side view of the measuring chamber in cross-section

illus. 2




Frontal view of the measuring chamber

**0** Measuring block
**1** Dosing unit
**2** GL-cap
**3** Glass tube
**4** Graduation glasses
**5** Measuring chamber
**6** Measuring chamber outlet
**7** Lamp
**8** Detector
**9** Connection for the fibre-optics cable
**10** Solenoid valve

***Measuring block***

The measuring block (**0**) contains the measuring chamber (**5**) and sample outlet (**6**). Sample drainage is carried out automatically via the computer-controlled solenoid valve MV2 (**10**).

The detector (**8**) and lamp (**7**) are attached to the front and back of the block.

A heater for the measuring chamber is also available, which is then inserted into the left hand side of the block.

***(2) Dosing unit***
The dosing unit is used to deliver the sample water and reagent, and to de-aerate the chamber. The unit is set upon a glass tube on top of the chamber, and held in place by a GL-cap. Inside the unit, three PTFE tubes are merged together. These tubes should always point straight into the chamber.

***(3) Lamp***
The lamp is screwed on to the back of the measuring block, and is situated in the rear of the unit.

***(4) Detector***
The detector is screwed on to the front of the measuring block, and contains a connection for the fibre-optical cable.

***(5) Spectrometer electronics***
The electronics for the spectrometer are situated in the rear of the unit, and are connected to the detector in the measuring block via a fibre-optic cable. The spectrometer electronics contains two serial ports, COM3 and COM4. The electronics are connected via a connecting cable from COM3, to the computer's serial port COM1. A small red lamp above the port indicates when data is being transmitted between the two. The lower serial port COM4 is used to include optional program modules such as DATLOG (see the special chapter on program options).

INFORMATION

The fibre-optics cable can be easily damaged if bent too much, therefore, never force it beyond a bending-radius of 20 mm.

### 7.5.2 Function

The 3/2 way solenoid valve MV1 is situated between the P1 pump and the measuring chamber. The P1 pump feeds sample water continuously through the valve, either into the sample drainage, or into the chamber for selective measurement. In this way, fresh sample water is always available directly near to the measuring chamber.

***Dosing unit***
At the beginning of a measuring cycle, the MV1 solenoid valve switches for a pre-determined period of time. Sample water is fed into the chamber, and the valve closes off again.
After the sample has been fed in, pump P3 (and Pump P4 when included) feeds in a pre-determined amount of reagent in to the measuring chamber. Delivery of reagent and sample water is displayed on the screen (visible after the period key has been pressed).

***Measurement***

The reagent and sample water react together to form a colour complex characteristic for the substance being measured.

When the measuring period has ended, the spectrometer electronic determines the variation of light intensity caused by the discolouration, then calculates the absorption and transmits this to the computer.

***Drainage***

When measurement is completed, the chamber is automatically drained via the solenoid valve MV2.

- Sample water + reagent → feed into measuring chamber
- Sample mixture → react with one-another, and form a colour complex which absorbs light
- Spectrometer electronics → calculates the absorption from the variation in light intensity

### 7.5.3 Cleaning the measuring chamber

INFORMATION

The chamber can be cleaned manually, this is generally not necessary though.

In case you should wish to clean the chamber though, then press:

CLEANING - OPTIC CHAMBER 

The chamber is pre-flushed with standard solution.


**WARNING**

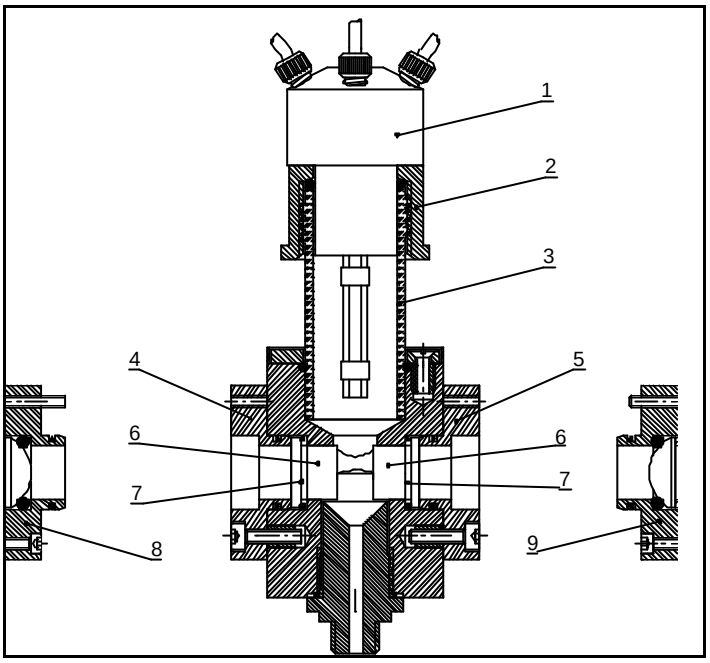
Wear protective gloves, overal and glasses while being in contact with specimen.

Danger of getting an infection!


**WARNING**

Wear acid resistant gloves, glasses and overall!

Do obey the working specifications of your country regarding the handeling of corrosive chemicals. After contact with skin wash with plenty of water and a 1% sodiumhydrogencarbonate solution. Seek medical advice and show this container or label!



Cross-section of a side view of the chamber, with lamp and detector

- Loosen the GL-cap (**2**) on the dosing unit
- Remove the dosing unit (**1**) and GL-cap (**2**) then screw on the glass sealing disc (accessories) with the GL-cap.
- Now clean out the chamber from above

NOTE

Please take care when you re-insert the dosing unit that the three Teflon tubes point straight down into the chamber, and are not aimed at the glass tube or at the wall of the cell! If necessary, re-align the tubes in the chamber.

Should you wish to clean the glasses in the chamber, then follow these steps:

- Unscrew the sleeve nut holding the fibre-optics cable to the detector (**9**) and remove both nut and cable.
- Unscrew the detector (**9**) from its anchorage (**5**).
- Unscrew and remove the detector anchorage (**5**).
- Remove the cable connection from the lamp in the rear of the unit.
- Unscrew the lamp (**8**) from its anchorage (**4**) and remove it.
- Loosen the lamp anchorage (**4**) and remove it.
- Remove the graduation glasses with the suction cap (accessories) and clean them.

NOTE

Be careful with the sealing O-rings (**7**) when removing the graduation glasses, if necessary change them.

Carry out the cleaning:

- Re-insert the O-rings (**7**).
- Re-insert the graduation glasses into the chamber with the suction cap.

- Screw on the detector anchorage (**5**).
- Screw on the detector (**9**).
- Screw on the lamp anchorage (**4**).
- Screw on the lamp (**8**).
- Re-insert the fibre-optics cable and tighten the sleeve nut
- Remove the sealing glass from with in the GL-cap (**2**), and re-insert the dosing unit back into its glass anchorage (**3**), tightening it.
- E to confirm the cleaning

INFORMATION

Please note that the measuring unit has to be calibrated again after any of the optical components (lamp, detector, fibre-optics cable,...) have been dismantled. In order to do this, activate a calibration by hand (for further details see chapter "Calibration").

### 7.5.4 Filling up reagent

***Safety regulations***

**WARNING**

WARNING

Wear protective clothing, gloves and eye/face protection!

Mix chemicals only in well aerated places.

Caution! Sulfuric acid causes severe burns. After contact with skin, wash immediately with plenty of 1% sodiumhydrogencarbonate solution! Seek medical advice and show this container or label! Follow the valid working instructions for dealing with corrosive chemicals.

Keep out of the reach of children!

Do not breath powder of sodium peroxodisulfate and the rising vapours.

Never add water to the sulfuric acid or to the mixed reagent! Contact with water liberates extremly heat!

Sodium peroxodisulfate may support fire. Don´t store with combustible substances.

***Chemicals used***

Only use our original chemicals for your measurements. No responsibility can be taken for any damages caused by using other chemicals.

The reagent used in total-phosphorus measurements contains two component solutions:
Component 1 (ord.-no. 8.024.77.02) contains sodiumperoxodisulphate. Component 2 consists of sulphuric acid, molybdate and vanadate. For measurement ranges until 25 mg/L TP the reagent with the ord-no. 8.024.77.02 should be used for the component 2. For a measurement range ≥ 25 mg/L TP use the reagent for high concentration (ord.-no. 8.024.27.41).

In contrast to component 2, the component 1 must be mixed with 1 liter of distilled water, and then topped up to a total of 2 liters before use. Close the lid of the 2 L canister, and mix it well by stirring it. Let it settle for 30 minutes, then shake again briefly. It's now ready for use.

Table 7.5.4-1 informs you about the reagent you need for the parameter you want to measure:

| parameter | pump P3 | | pump P4 | |
|---|---|---|---|---|
| | ord.-no. | component 1 | ord.-no. | component 2 |
| Total-P | 8.024.77.02 | Peroxodisulfate solution, 2 liters | 8.024.27.30 | Reagent total-phosphorus, 5 liters |
| For concentration values higher than 25 mg/L TP: | | | | |
| Total-P | 8.024.77.02 | Peroxodisulfate solution, 2 liters | 8.024.27.41 | Reagent total-phosphorus, 5 liters |

Tab. 7.5.4-1 Chemicals used

NOTE

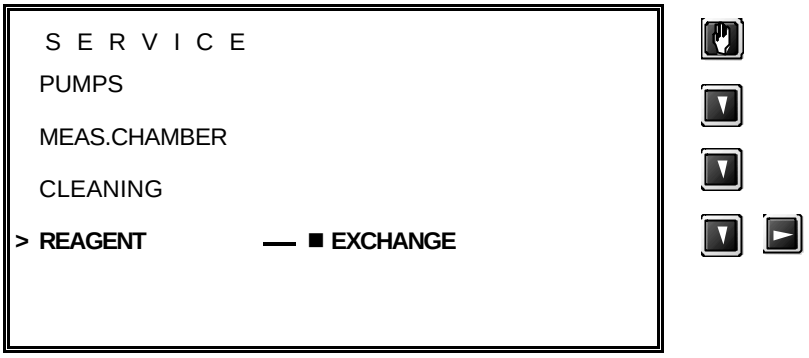
For concentration values higher than 65 mg/L TP the ratio of reagent to sample water has to be changed. Pay attention to the instructions in chapter 4.2.1 („Measurement specifications“).

***Reagent exchange***

In order to exchange reagent press:

 REAGENT - EXCHANGE

*Display des Service-Menüs*




*Following display*


- Remove cap of new reagent
- Open and remove cap with dosing tube of the canister standing in the instrument

NOTE

It is recommended to have a moist sponge at hand, to wipe of eventually droping reagent.

- Remove empty canister
- Insert new canister into the instrument and set up cap with dosing tube
- Screw on cap tightly
- with keys „3“ and „4“ charge reagent, until a bubble free supply is available 

***Disposal***

Canisters which have been cleaned out can be returned to STIP ISCO GmbH. Please dispose of any chemicals remaining in the canisters in a way which is protects the environment. Note the references of disposal in chaper “Produces”.

# 8 Shutting down operation

## 8.1 Preparing for a long interruption of operation

- Switch off the sample pump


**WARNING**

Wear protective clothing, gloves and eye/face protection while being in contact with specimen!

Danger of getting an infection!

***Bypass cleaning (when a PA-2 or PA-3 is installed)***

- Activate a screen flush

 CLEANING - SCREEN FLUSH 

- Let the bypass empty itself
- Close valve 1

***Empty tubes***

- Let the reagent flow back down into the canister by opening the lower tube connection on pump P3.


**WARNING**

Wear acid resistant gloves, glasses and overall!

Do obey the working specifications of your country regarding the handeling of corrosive chemicals. After contact with skin wash with plenty of water and a 1% sodiumhydrogencarbonatesolution. Seek medical advice and show this canister or label.


CAUTION

Please take heed of the safety precautions in the chapter "Chleaning and maintance – Optics chamber“ !

- Loosen the tube connector below the pump P2 according to the instructions in "Cleaning and maintenance - Pump P2", and let the reagent flow back into the canister.
- Re-attach the emptied tube to the connector according to the chapter mentioned above.

***Removing the reagent canister***

- Prepare a canister containing approx. 2l of distilled water.
- Exchange the canister with distilled water for the canister containing reagent.

***Removing the electrode (if installed)***

- Remove and store the electrode according to the instructions in the chapter "Electrode".

***Flush tubes***

- In order to clean the tubes of P3 and P4 (if installed), press:
  
  CHANGE REAGENT

- Flush the tubes of P3 or P4 with distilled water from the canister by repeatedly pressing the keys "3" or "4". Press:
  
  TEST - TEST OUTPUTS - PUMPS 

- Enter in Pump P2 = 100%, and let the pump run for a while. Place a receptacle under valve 3 and open the valve. The open up the hose bed throttle for pump P2.

***Cleaning the measuring chamber(s)***

- Activate an automatic flushing of the chamber(s).
  
  CLEANING - OPTICS CELL 
  In order to manually clean the optics chamber, see "Cleaning and maintenance - Optics chamber".

  When an electrode chamber is installed:
  
  CLEANING - ELECTRODE CHAMBER 
  Carry out a manual cleansing of the chamber according to the instructions in the chapter "Cleaning and maintenance - Electrode chamber".

***Removing the standard solution canister***

- Open the hose bed throttle of pump P1
- Place a receptacle under valve 2 and open the valve.

  Valve 2 is missing in units equipped with sand filters, in this case the liquid flows back into the sand filter chamber.
- Remove the canister.

***Optional Sample Processors***

- Carry out a manual cleansing according to the instructions in the appropriate chapter in "Options".

***Switching off the unit***

- Switch off the unit's main switch.

In order to store the unit, refer to the chapter 8.2 "Transport and storage".

## 8.2 Transport and storage

| Contents | Packaging | Dim. | [mm] | weight (gross) |
|---|---|---|---|---|
| Measuring unit | carton | **height:** | 1450 | 90 kg |
| | | **width:** | 600 | |
| | | **depth:** | 800 | |
| Accessories: | carton | **height:** | 100 | 0.5 kg |
| | | **width:** | 220 | |
| | | **depth:** | 300 | |

*Storing the unit*

When storing the unit over a long period, the following should be noted:

- storage time should be as short as possible,
- shut down the unit acc. to the instructions in chapter "Shutting down",
- store any electrodes (if included) acc. to chapter "Electrodes",
- store only in dry rooms,
- use an appropriate packing material (e.g. plastic foil).

# 9 Trouble shooting

## 9.1 Error messages

| Error message in the display | Reason | Countermeasures |
|---|---|---|
| "Spectrometer ???“ | No communication is possible with the spectrometer.<br>Transmission cable or the contacts aren't functioning. | Examine the transmission cable between COM1 and COM3 on the spectrometer. |
| | The power supply to the spectrometer has been disconnected. | Examine the power supply to the spectrometer. (When the unit's main switch is turned on / off briefly, the red LED on the spectrometer will blink.) |
| "Outside range“ | A fault has occurred in the measurement. The last value has been discounted and a new measuring cycle begun.<br>Measuring range has actually been exceeded | Change the current setting in the range data to a less sensitive value.<br>e.g.<br>if the present range = 1, change this to read range = 2. |
| | Fault in the optical system. | Is the optical waveguide mounted, does the LED light up?<br>If everything seems to be working, yet the fault still persists in the display, switch the unit on / off and calibrate it again. |

## 9.2 Implausible measuring values

| | Test: | | If **yes** | If **no** |
|---|---|---|---|---|
| 1. | Is an indicated value of 1000mg/L at the indication of Electrode-parameters(NO3 or NH4)? | | → 2 | → 3 |
| 2. | Connecting lead is damaged or bad connection fit. Look at connection fir or change over connecting lead.. | | → 20 | → 3 |
| 3. | Are the values from the last calibration okay? (inside the normal range, no asterisk?) | | → 4 | → Fault finding implausible calibration values |
| 4. | Is there enough standard solution in the canisters? | | → 6 | → 5 |
| 5. | Re-fill with standard solution. | Problem solved? | → 22 | → 6 |
| 6. | Are the solutions being delivered bubble-free? | | → 8 | → 7 |
| 7. | Examine all of the tubes and seals along the path of delivery. | Problem solved? | → 22 | → 8 |
| 8. | Is there still any reagent left in the canister? | | → 10 | → 9 |
| 9. | Re-fill the canister with reagent. | Problem solved? | → 22 | → 10 |
| 10. | Is the reagent being delivered bubble-free? | | → 12 | → 11 |
| 11. | Mend the leak in the delivery flow. | Problem solved? | → 22 | → 12 |
| 12. | Does sample water reach valve 2?<br>Place beaker under valve and open briefly. | | → 14 | → 13 |
| 13. | Examine the bypass screen, sample inlet path and waste water pump. | Problem solved? | → 22 | → 14 |
| 14. | When a heater is installed:<br>Is the detector or the measuring chamber warm? | | → 16 | → 14 |
| 15. | Examine the heater, heater-controller, relay no. 7 and the power supply. | Problem solved? | → 22 | → 16 |

| | Test: | | If **yes** | If **no** |
|---|---|---|---|---|
| 16. | Does solenoid valve MV1 switchover?<br>Check in the program item - PRG/Test/Outputs/Switching outputs, as to whether the valve MV1 switches electrically when channel 1 is activated. | | → 18 | → 17 |
| 17. | Examine whether the appropriate relay, fuse, electrical connections and the solenoid valve itself are all in working order. | Problem solved? | → 22 | → 18 |
| 18. | Does sample water drop down into the measuring chamber at all?<br>Lift the dosing unit about 2 cm out of the chamber to check during the next cycle. | | → 20 | → 19 |
| 19. | Examine the delivery route from valve 1 up to the dosing unit and clear the blockage . | Problem solved? | → 22 | → 20 |
| 20. | Does MV3 have a leak?<br>Pull the tube out of the canister filled with standard 1. During normal operation, no solution should be pumped up the tube. | | → 23 | → 21 |
| 21. | Replace the seal from solenoid valve MV3 | Problem solved? | → 22 | → 23 |
| 22. | Activate a new calibration. | Problem solved? | | return to the last item you addressed in this fault table.<br><br>Have you checked all of the points?<br><br>→ 23 |
| 23. | Please notify ISCO STIP Service.<br><br>Please fill out the STIP ISCOinfo sheet at the end of this chapter | Telephone ++49-6078-78620 | | |

## 9.3 Implausible calibration values

| | Test: | | If **yes** | If **no** |
|---|---|---|---|---|
| 1. | Is there enough solution in the standard canisters? | | → 3 | → 2 |
| 2. | Re-fill the canisters with standard solution. | Problem solved? | →28 | → 3 |
| 3. | Are the solutions being delivered bubble-free? | | → 5 | → 4 |
| 4. | Examine all of the seals and tubes along the delivery route. | Problem solved? | → 28 | → 5 |
| 5. | Is there enough reagent available? | | → 7 | → 6 |
| 6. | Re-fill the reagent canister. | Problem solved? | → 28 | → 7 |
| 7. | Is the reagent being pumped bubble-free? | | → 9 | → 8 |
| 8. | Repair the leak in the reagent stream. | Problem solved? | → 28 | → 9 |
| 9. | Do MV3, MV4 have any leaks?<br>Is sample water being mixed with standard solution, or standard 1 with standard 2?.<br>Pull both of the tubes out of the standard 1 & standard 2 canisters. Close valve 1. Push a 4 mm tube (or smaller) onto valve 2, and place the other end in a beaker containing water. Go to PRG/Test/Switching outputs/Pumps, and set P1 at 100%. Change to .../Outputs/Switching outputs, and check whether only the appropriate standard or sample water is pumped when either channel no. 3 or 4 are activated. | | → 11 | → 10 |
| 10. | Replace the seal of either solenoid valve 3 or 4. | Problem solved? | → 28 | → 11 |
| 11. | Does MV1 switchover?<br>Check in the program item PRG/Test/Outputs/Switching outputs whether MV1 switches electrically when channel 1 is activated. | | → 13 | → 12 |
| 12. | Examine whether the appropriate relay, fuse, electrical connections and the solenoid valve itself are all in working order. | Problem solved? | → 28 | → 13 |
| 13. | Does sample water drop down into the measuring chamber at all?<br>Lift the dosing unit about 2 cm out of the chamber to check during the next cycle. | | → 15 | → 14 |

| | Test: | | If **yes** | If **no** |
|---|---|---|---|---|
| 14. | Check the sample delivery route from MV3 up to the dosing unit, and release any blockages. | Problem solved? | → 28 | → 15 optical measurement<br>→ 18 selective measurement NH4-N<br>→ 22 selective measurement NO3-N |
| **15.** | **For the spectrometrical measurement:**<br>Are the glasses in the measuring chamber clean?<br>If X0 is unusually large (left hand entry in the maintenance list, Cal-optics), then disconnect both the optics cable and the detector (Cleaning and maintenance - Optical chamber), and empty the chamber by pressing the service key. | | → 17 | → 16 |
| 16. | Clean the glasses (Cleaning and maintenance - Cleaning optical chamber). | Problem solved? | → 28 | → 17 |
| 17. | Is the slope unusually large or small? | | → 26 | → 29 |
| **18.** | **For selective measurement (NH4-N):**<br>for further information, consult the chapter on electrodes.<br><br>Is the pH-value > 11,5 at the measuring chamber outlet? | | → 19 | → 20 |
| 19. | Not enough, or no reagent at all is reaching the chamber, check the pumping route! | Problem solved? | → 28 | → 20 |
| 20. | Is the membrane inside the module clean, and does the tip of the electrode form a clear, bubble-free image through the membrane? | | → 28 | → 21 |
| 21. | Change the electrode module (Manual - chapter electrodes). | Problem solved? | → 28 | → 29 |
| **22.** | **For selective measurement (NO3-N):**<br>for further information, consult the chapter on electrodes .<br><br>Is the pH-value < 5 at the measuring chamber outlet? | | → 24 | → 23 |

| | Test: | | If **yes** | If **no** |
|---|---|---|---|---|
| 23. | Not enough, or no reagent at all is reaching the chamber, check the pumping route. | Problem solved? | → 28 | → 24 |
| 24. | Is the membrane smeared or dirty? | | →25 | → 26 |
| 25. | Rinse the membrane with distilled water, then condition it for several hours in a concentrated standard solution (1000 mg/L). Afterwards, rinse the electrode with distilled water again and re-insert it. | Problem solved? | → 28 | → 26 |
| 26. | Are the standard solutions okay ? (Check them using a different method, or make up new solutions. Please heed the information in "Mixing calibration standards“). | | → 29 | → 27 |
| 27. | Mix up some new standards. | Problem solved? | → 28 | → 29 |
| 28. | Activate a calibration. | Problem solved? | | return to the last item you addressed in this fault table.<br><br>Have you<br>→ 29 |
| 29. | Please notify ISCO STIP Service.<br><br>Please fill out the ISCO STIP info sheet at the end of this chapter | Telephone ++49 6078 - 78620 | | |

# Service-Info-Sheet for STIP SPECTRON

Should any problems occur, please fill out a copy of this sheet and fax it together with a description of the fault to ISCO STIP:++49 6078 / 786 88

Name: _____ Unit number: _____ Tel.: _____

☐ Trouble-shooting carried out according to manual?

☐ Bypass and measuring chamber outlet pressure-free?

**SPECIAL MENU DATA**

Key (1)

| | | |
|---|---|---|
| V Reac.-chamber | = | _____ |
| Sample portion | = | _____ |
| Reag 1 portion | = | _____ |
| Reag 2 portion | = | _____ |
| Bulb length | = | _____ |

Key (2)

| | | |
|---|---|---|
| Q P1 100% | = | _____ |
| Q P2 100% | = | _____ |
| Q P3 / 15 strokes | = | _____ |
| Q P4 / 15 strokes | = | _____ |

If you have a unit printer, then you can print out the data by pressing keys no. 5 & and then no. 9 in PRG-mode 3!

**RANGE DATA**

| | | |
|---|---|---|
| Calibration/day | = | _____ |
| Screen flush/day | = | _____ |
| Day break | = | _____ |
| Range | = | _____ |
| Scale Par 1 | = | _____ |
| Standard 1 | = | _____ |
| Standard 2 | = | _____ |
| Scale Par 2 | = | _____ |
| Standard 1 | = | _____ |
| Standard 2 | = | _____ |

**BASIC DATA**

| | | |
|---|---|---|
| Procedure | = | _____ |
| Q P1[ml/min] | = | _____ |
| Meas. time | = | _____ |
| Cal-time | = | _____ |
| Meas. pause min. | = | _____ |
| Meas. pause max. | = | _____ |
| Threshold MP[%] | = | _____ |
| L-flush [sec] | = | _____ |
| Exchange time | = | _____ |
| Offset Par 1 | = | _____ |
| DC Out 0/4-20 mA | = | _____ |

If you have a unit printer, then you can print out the range and basic data lists in PRG-mode, Lists/Settings

**Description of measuring site**

☐ Industrial
☐ Municipal
☐ Inlet
☐ Aeration tank
☐ Final-settling tank
☐ Other (brief description)

_____

Ambient temperature:
☐ < 0°C ☐ 0 - 40 °C ☐ > 40°C

**Description of sample water**

☐ Turbidity:
☐ weak ☐ middle ☐ strong
☐ Discolouring Colour: _____
☐ high salt content mg/L:_____
☐ Contains fibres
Sludge volume: _____ ml/l
Dry solids: _____ g/L
Temp. sample: _____ °C

Either print out, or note down on another sheet the information stored in the PRG-mode/Lists:

- The alarm reports before and after the problem occurred. /Lists/Alarm list
- The last 3 calibration values /Lists/Maintenance list/Cal-Optic und Cal-Probe
- If a printer is connected, the printout curves for three days before and after the problem began.

Alarms

Calibration values

If available, write down any comparative measurements.

Isco Stip: Comparison:

Comparison done with:? _____

# 10 Technical Data

## 10.1 General information

### 10.1.1 Dimensions

| | SPECTRON | with PA-2 |
|---|---|---|
| **Dimensions [mm]** | 645 x 1010 x 400 (width x height x depth) | 757 x 1090 x 400 (width x height x depth) |
| **weight [kg]** | 65 | 70 |

### 10.1.2 Link-up data

| | |
|---|---|
| **Power supply** | 230 V / 50 Hz |
| **Average current requirements** | 0.18 A / 0.21 A* |
| **Maximum current consumption** | 0.27 A / 0.56 A* |
| **Protection type** | IP54 acc. to DIN 40050 |
| **Protection class** | 1 acc. to IEC 1010 |
| **Noise voltage resistance** | EN 50022 |
| **EMV-Noise signal** | EN 50081-1 12/96 |
| **Resistance to EMV jamming** | EN 50082-2 12/96 |
| **Mark of conformity** | CE-symbol |
| **Test procedure** | acc. to DIN/VDE 0701 |

* for units with heaters

## 10.2 Data transmission, input & output

| | |
|---|---|
| **Display** | LCD-graphic-monitor, 16 lines à 40 characters, back-lit |
| **Keyboard** | 21 keys, 13 x 13 mm with pressure-point |
| **Measured value output** | 6-hour graphic curve, plus 5-digit current value |
| **Memory capacity** | Values measured over last 10 days available for display, 1 dot every 2 mins. |
| **Functions monitored** | Records available of maintenance, malfunctions, limit alarms and calibrations for last 4 weeks. Reports on leaks, faulty spectrometer unit, compilation of faults: outside measuring range |
| **Signal output** | 0-20 mA or 4-20 mA (changeable), galvanically separated, max. load 500Ω |
| **Limit value alarm** | potential-free contact (max. 0.5A and 100V) for too igh, low & slope alarms, normal operation = closed |
| **Malfunction alarm** | potential-free contact (max. 0.5A and 100V), normal operation = closed |
| **Disk drive** | 3½“ internal, to record data (optional) |
| **Computer interface** | RS 232 C for data transmission and remote control (optional) |

## 10.3 Dimensions and connections

***Dimensions***
The measuring unit is contained in an aluminium cabinet which has doors at the front and rear and the following dimensions:

Width x height x depth = 645 x 1010 x 400 mm.

The measuring system is covered by a front door with an opening radius of 525 mm. The electronics section is accessed by a front door (290 x 130 mm) with a built in window.

NOTE

Please note that the outside measurements may be greater when optional extras such as Sample Processors are added.

***Connections***
All connections and tube inlets are located on the sides of the unit, all preparations for these are to be completed by the operator.

***Power supply***
230 V/L/N/PE/50 Hz/16 A, connections at the mains suppression filter at the rear of the electronics section.

Fixed connection through line-entrance PG 11 or by mains plug.

An optional version 230 V/60 Hz/16 A is also available.

***Computer serial port & printer (optional) (illus. 4)***
An optional computer serial port RS 232 is available. Nine-pin D-Sub connection at COM2.

An optional external graphic printer is available for measurement curves and protocol printouts. The printer is connected via a parallel port.

***Signal outputs (if required) (illus. 4)***
- Measurement value output on channel 1: either 0–20 or 4–20 mA (changeable), max. 500 Ohm; at plug 40 on the I/O-card *(see also the chapter "Link-up data")*.
- Malfunction alarm: Potential-free contact (closed during normal operation), max. 100 mA, max. 50 V; Connection I (*see also the chapter "Link-up data")*.
- Value limits alarm: Potential-free contact (closed during normal operation), max. 100 mA, max. 50 V; Connection II (*see also the chapter "Link-up data")*.

***Sample outlet optics chamber (illus. 3)***
Tube connector d. 4/6 mm (crimping nut) on the left hand outside wall. Pressure-free drainage into either an open drain or pipe.

***Sample outlet electrode chamber** (illus. 3)*
Tube connector d. 6/8 mm (crimping nut) on the left hand outside wall. Pressure-free drainage into either an open drain or pipe.

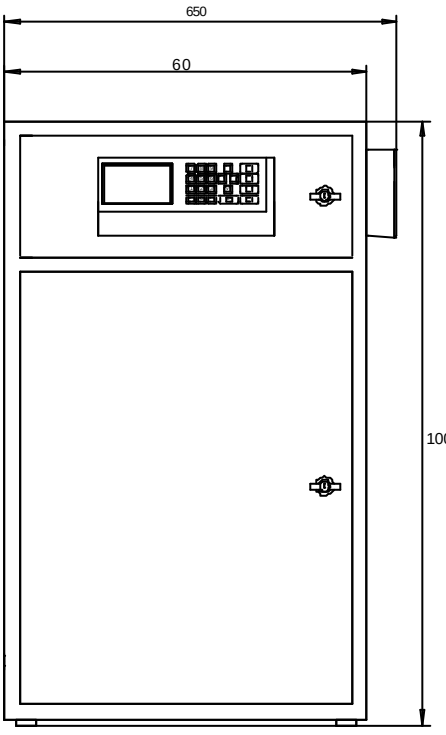
***Sample inlet** (illus. 3)*
A 3/8" connection is available on the outside left hand wall for the sample water inlet.

NOTE

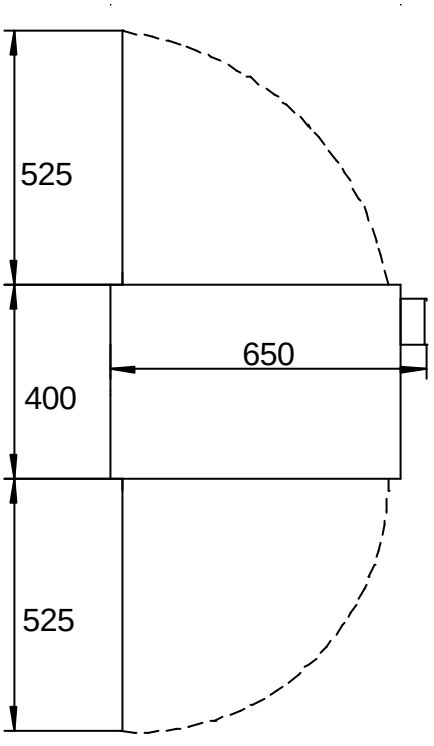
Please note that when Sample Processors PA-2, PA-3 or any other components have been installed, that additional connections will be necessary. Consult the documentation supplied with the component for more information.

***Unit dimensions***

illus. 1

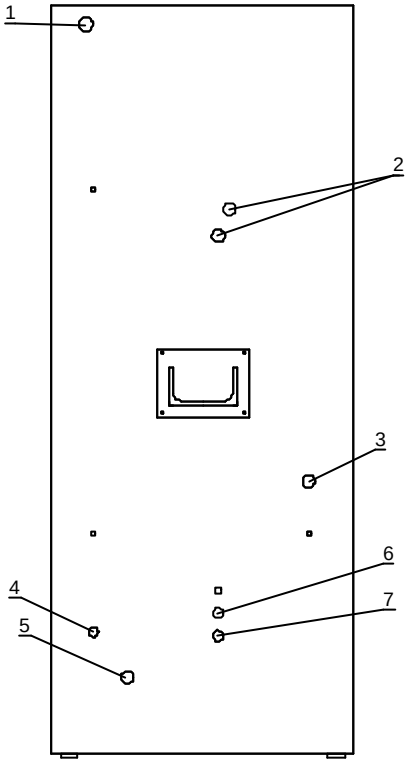



illus. 2

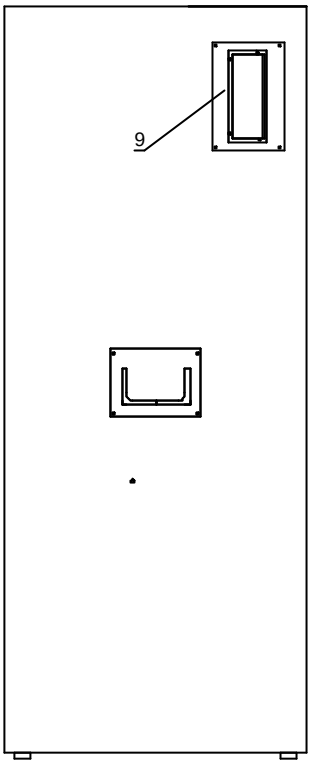


***Left and right outer walls***

*illus. 3*




*illus. 4*




1 = Power supply

2 = Ventilation

3 = Sample inlet

4 = Line feed-in, solenoid valve screen flush

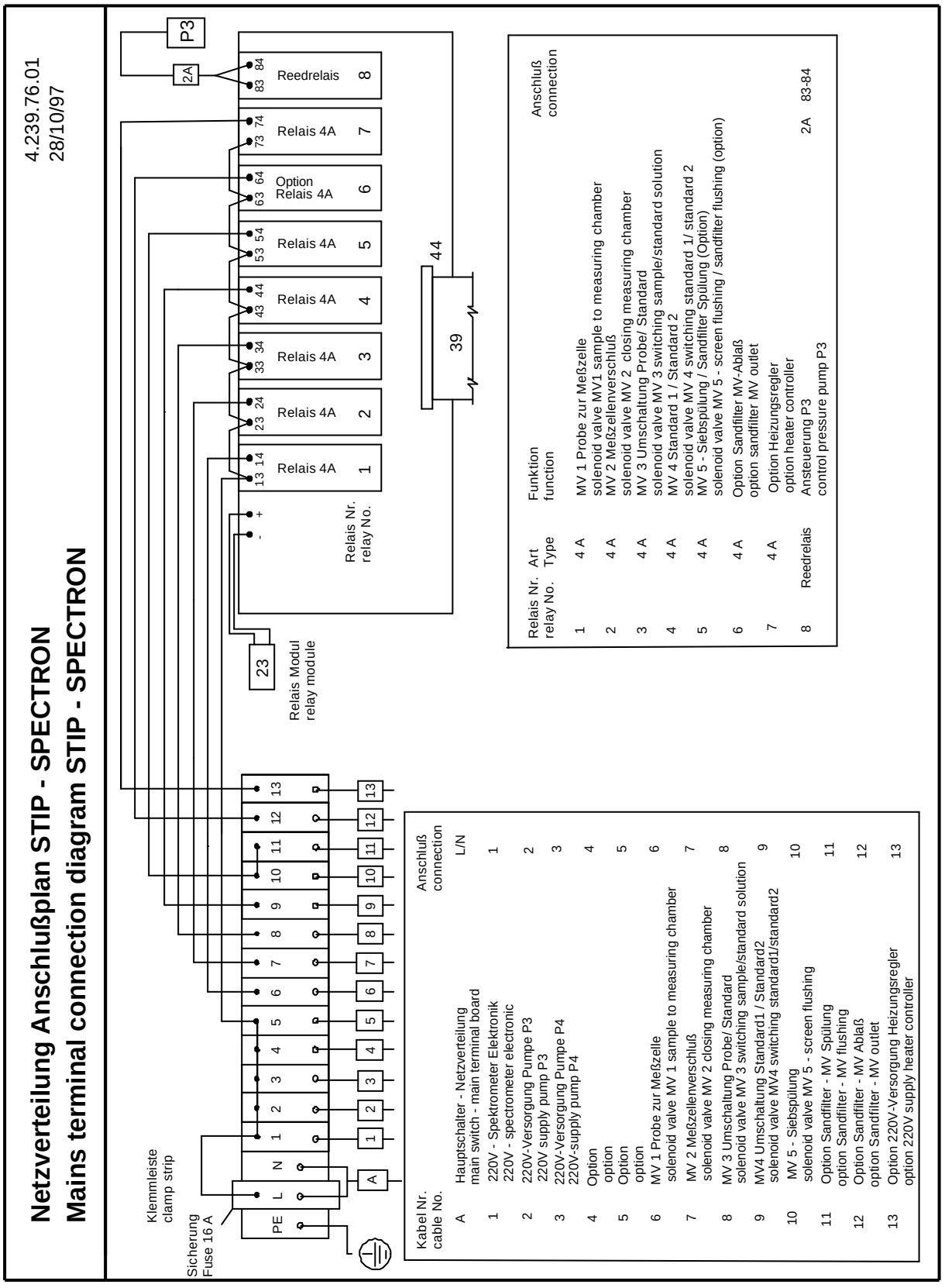
5 = Fresh water supply (only necessary with certain options)

6 = Sample outlet optics cham ber

7 = Sample outlet electrode chamber (optional)

9 = Line feed-in for printer and computer serial port RS 232, and for signal outputs.

## 10.4 Connection diagrams



# Elektronik-Rahmen Anschlußplan STIP - SPECTRON
# Electronic frame connection diagram STIP - SPECTRON

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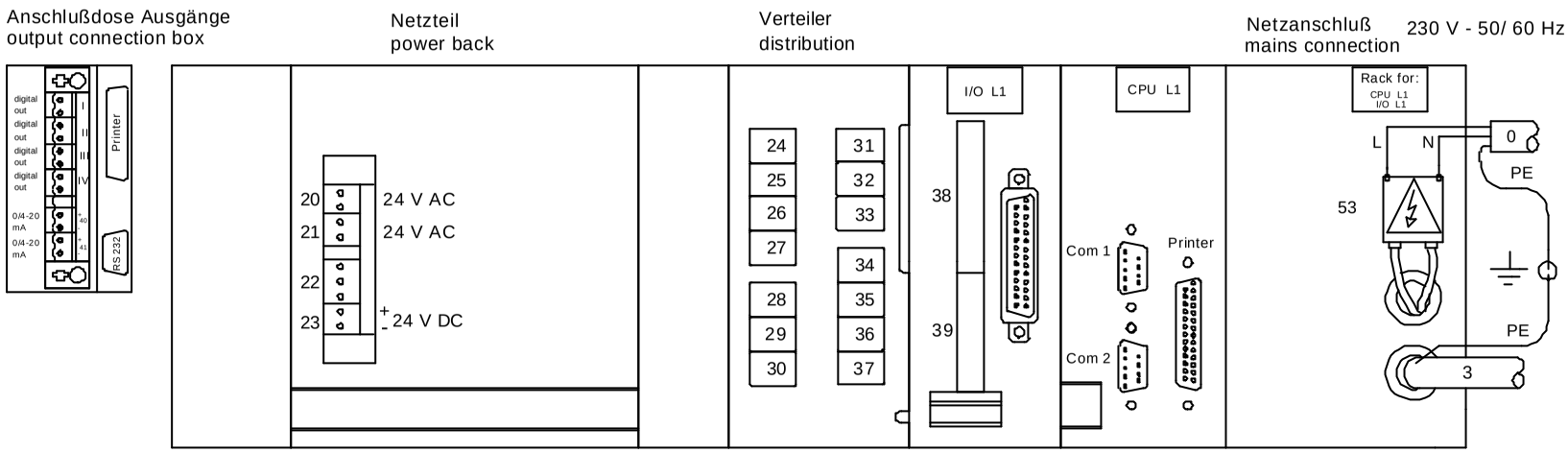
28/10/97



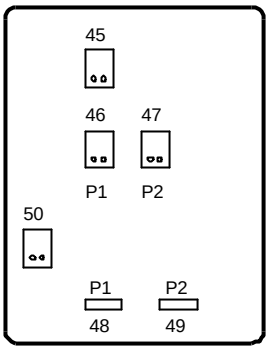

| Kabel Nr. cable No. | | | Anschluß connection |
|---|---|---|---|
| 0 | Netzanschluß mains connection | 230 V - 50/60 Hz | 53 |
| 20 | Pumpensteuerung pump control | 24 V AC | 20 |
| 21 | Magnetrührersteuerung magnetic stirrer control | 24 V AC | 21 |
| 23 | Relais-Modul relay module | 24 V DC | 23 |
| 25 | Option Temperatur-Frequenzwandler option temperatur amplifier | | 25 |
| 26 | Option mV-Meßverstärker option mV-amplifier | | 26 |
| 29 | Leckmelder leakage sensor | DI 7 | 29 |

| Kabel Nr. cable No. | | | Anschluß connection | |
|---|---|---|---|---|
| 31 | Pumpensteuerung pump control | FO 1+2 | 31 | |
| 37 | Option Standby (IN) option Standby (IN) | DI 5 | 37 | |
| 39 | Relais-Modul Daten relay module data | | 39 | |
| extern | Reedrelais Störmeldung malfunction alarm | potentialfreier Kontakt potential free contact | I | |
| extern | Reedrelais Grenzwertalarm limit alarm | potentialfreier Kontakt potential free contact | II | |
| 3A | Option Ansteuerung Pumpe P4 option control pressure pumpe P3 | potentialfreier Kontakt potential free contact | III | |
| extern | Option option | potentialfreier Kontakt potential free contact | IV | |

| Kabel Nr. cable No. | | | Anschluß connection |
|---|---|---|---|
| extern | Stromausgang Kanal 1 DC-signal channel 1 | 0/4-20 mA | 40 |
| extern | Stromausgang Kanal 2 DC-signal channel 2 | 0/4-20 mA | 41 |
| extern | Drucker printer | Option | Printer |
| 60 | Spektrometer Elektronik spectrometer electronik | Option | COM1 |
| extern | RS232 | Option | COM2 |

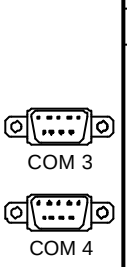
## Pumpensteuerung Anschlußplan STIP - SPECTRON
## Pump control connection diagram STIP - SPECTRON

| Kabel Nr. cable No. | | Anschluß connection |
|---|---|---|
| 20 | Netzteil 24 V AC power pack 24 V AC | 45 |
| 31 | Frequ. out 1+2 | 50 |
| 46 | P1 - Motor | 46 (blau / rot) (blue / red) |
| 47 | Option P2 - Motor | 47 (blau / rot) (blue / red) |
| 48 | Drehzahlgeber P1 speed sensor P1 | 48 |
| 49 | Option Drehzahlgeber P2 option speed sensor P2 | 49 |



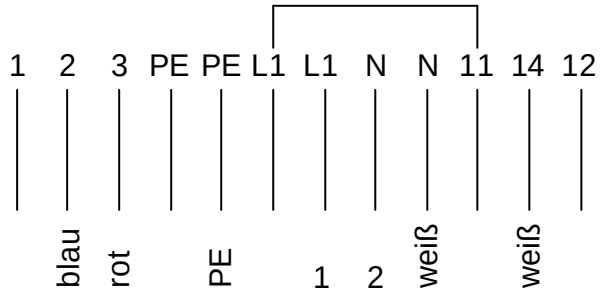

## Spektrometer Elektronik
## spectrometer elektronic

| Kabel Nr. cable No. | | Anschluß connection |
|---|---|---|
| 1 | Stromversorgung power supply | 54 |
| 60 | Anschluß CPU connect CPU | COM3 |
| | Programm-Modul programme module | COM 4 |




4.253.87B1-asl 28/10/97

## Heizungsregler
## heater controller



## 10.5 Measurement data

### 10.5.1 Spectrophotometrical phosphate evaluation

***Measurement specifications:***

| Range | Meas. range[1] | Meas. range[2] | Method 1 | Method 2 | Method 3 |
|---|---|---|---|---|---|
| 1 | 0.1 - 16 mg/L PO4-P | 0.05 - 8 mg/L PO4-P | recom. | do not use | from 5 mg/L[1] recom. |
| 2 | 1.0 - 80 mg/L $PO_4$-P | 0.5 - 40 mg/L $PO_4$-P | recom. | recom. | recom. |
| 3 | 2.0 - 100 mg/L $PO_4$-P | 1.0 - 50 mg/L $PO_4$-P | recom. | recom. | not recom. |

[1] For a bulb length of 10 mm
[2] For a bulb length of 20 mm

| | |
|---|---|
| Ratio of reagent to sample water: | 3 parts reagent + 7 parts sample<br>For values under 8 mg/L*:<br>1.5 parts reagent + 8.5 parts sample |
| Detection limit: | 0.05 mg/L $PO_4$-P (with bulb length 10 mm) |
| Verfahrensvariationskoeffizient: | 2% (Method 1) |
| Reagent consumption: | 98 ml per day (for 1 measurement / 10 min and values under 8 mg/L)) |
| $T_{90}$-time: | dependant upon the duration of a cycle. 90% of the final value is reached after the 2nd measurement ** |
| Shortest time for 1 meas. cycle | 3 min |

* requires a change in the unit's basic data (see the chapter on optimising the unit)
** plus an additional idling time, which is determined by the sample preparation of the respective unit

### 10.5.2 Spectrophotometrical phosphate evaluation (green)

***Measurement specifications:***

Measuring range with reagent-variant 1:

| range | meas range[1] | meas range[2] | procedure 1 | procedure 2 | procedure 3 |
|---|---|---|---|---|---|
| 1 | 25 - 1000 µg/L $PO_4$-P | 12 - 500 µg/L $PO_4$-P | recom. | do not use | do not use |
| 2 | 100 - 2000 µg/L $PO_4$-P | 50 - 1000 µg/L $PO_4$-P | alterternat. | do not use | do not use |

[1] for a bulb length of 10 mm
[2] for a bulb length of 20 mm

Measuring range with reagent-variant 2 (thinned reagent):

| range | meas range[1] | meas range[2] | procedure 1 | procedure 2 | procedure 3 |
|---|---|---|---|---|---|
| 1 | 100 - 2000 µg/L $PO_4$-P | 50 - 1000 µg/L $PO_4$-P | recom. | do not use | do not use |
| 2 | 150 - 3000 µg/L $PO_4$-P | 75 - 1500 µg/L $PO_4$-P | alterternat. | do not use | do not use |

[1] for a bulb length of 10 mm
[2] for a bulb length of 20 mm

| | |
|---|---|
| Ratio of reagent to sample water: | 1 part reagent + 1 part sample + 3 parts water |
| Detection limit: | 12 µg/L $PO_4$-P (for a bulb length of 20 mm) |
| Error margin: | 4% (procedure 1) |
| Reagent consumption: | 300 ml per day (for 1 measurement / 10 min) + 7 ml Aceton per calibration |
| $T_{90}$-time: | dependant upon the duration of a cycle. 90% of the final value is reached after the 2nd measurement ** |
| Shortest measurement cycle | 3 min |

* requires a change in the unit's basic data (see the chapter on optimising the unit)
** plus an additional idling time, which is determined by the sample preparation of the respective unit

### 10.5.3 Spectrophotometrical evaluation of total phosphorus

***Measurement specifications:***

| range | meas range[1] | meas. range[2] | procedure 1 | procedure 2 | procedure 3 |
|---|---|---|---|---|---|
| 1 | 0.2 - 16 mg/L TP | 0.1 - 8 mg/L TP | recom. | do not use | from 5 mg/L[1] recom. |
| 2 | 1.0 - 80 mg/L TP | 0.5 - 40 mg/L TP | recom. | recom. | recom. |
| 3 | 2.0 - 100 mg/L TP | 1.0 - 50 mg/L TP | recom. | recom. | do not use |

[1] For a bulb length of 10 mm
[2] For a bulb length of 20 mm

NOTE

For the ranges 2 and 3 the reagent for high concentration, ord.-no. 8.024.27.41, should be used for the component 2.

| | |
|---|---|
| Ratio of reagent to sample water: | 0.8 parts component 1 +<br>2.2 parts component 2 +<br>7 parts sample<br><br>For values under 8 mg/L*:<br>half of the reagents +<br>8.5 parts sample<br><br>For values higher than 65 mg/L*:<br>0.8 parts component 1 +<br>3.2 parts component 2 +<br>6 parts sample |
| Detection limit: | 0.1 mg/L $PO_4$-P (for a bulb length of 20 mm and range 1) |
| Error margin: | 5% (procedure 1) |
| Reagent consumption: | 97.5 ml per day (for 1 measurement / 10 mins and values under 8 mg/L)) |
| $T_{90}$-time: | dependant upon the duration of a cycle. 90% of the final value is reached after the 2nd measurement ** |
| Shortest measurement cycle | 6 minutes |

* requires a change in the unit's basic data (see the chapter on optimising the unit)
** plus an additional idling time, which is determined by the sample preparation of the respective unit

### 10.5.4 Spectrophotometrical nitrate evaluation

***Measurement specifications***

| Range | meas range[1] | meas range [2] | Method 1 | Method 2 | Method 3 |
|---|---|---|---|---|---|
| 1 | 0.5 - 30 mg/L $NO_3$-N | 0.25 - 10 mg/L $NO_3$-N | recom. | do not use | under certain cond. |
| 2 | 5.0 - 70 mg/L $NO_3$-N | 2.5 - 35 mg/L $NO_3$-N | recom | recom | do not use |
| 3 | 3.0 - 60 mg/L $NO_3$-N | 1.5 - 30 mg/L $NO_3$-N | recom | under certain cond. | under certain cond. |

[1] For a bulb length of 10 mm
[2] For a bulb length of 20 mm

| | |
|---|---|
| Ratio of reagent to sample water: | 8 parts reagent + 2 parts sample<br>for values under 20 mg/L:<br>7 parts reagent + 3 parts sample |
| Detection limit: | 0.1 mg/L $NO_3$-N (20 mm bulb length, range 1)) |
| Error margin: | 5% (range 1, method 1) |
| Reagent consumption: | 450 ml per day (for 1 measurement / 10 min and values under 20 mg/L) |
| $T_{90}$- time: | dependant upon the duration of a cycle. 90% of the final value is reached after the 2nd measurement |
| Shortest measurement cycle | 3 min |

requires a change in the unit's basic data (see the chapter on optimising the unit)

### 10.5.5 Spectrophotometrical nitrite evaluation

***Measurement specifications***

| range | meas range[1] | meas range[2] | procedure 1 | procedure 2 | procedure 3 |
|---|---|---|---|---|---|
| 1 | 10 - 500 µg/L $NO_2$-N | 5 - 250 µg/L $NO_2$-N | recom. | do not use | from 25 µg/L[1] recom. |
| 2 | 30 - 1500 µg/L $NO_2$-N | 15 - 750 µg/L $NO_2$-N | recom. | recom. | from 60 µg/L[1] recom. |
| 3 | 100 - 6000 µg/L $NO_2$-N | 50 - 3000 µg/L $NO_2$-N | recom. | recom. | from 200 µg/L[1] recom. |

[1] For a bulb length of 10 mm
[2] For a bulb length of 20 mm

| | |
|---|---|
| Ratio of reagent to sample water: | 8 parts sample + 2 parts reagent |
| | 9 parts sample + 1 part Reagent for values under 1000 µg/L*: |
| Detection limit: | 5 µg/L $NO_2$-N (for a bulb length of 20 mm and range 1) |
| Error margin: | 2% (procedure 1) |
| Reagent consumption: | 65 ml per day (for 1 measurement / 10 mins and 9:1 ratio of reagent to sample water) |
| $T_{90}$-time: | dependant upon the duration of a cycle. 90% of the final value is reached after the 2nd measurement ** |
| Shortest measurement cycle | 4 min (6 min at 9:1 ratio of reagent to sample water) |

* requires a change in the unit's basic data (see the chapter on optimising the unit)
** plus an additional idling time, which is determined by the sample preparation of the respective unit

### 10.5.6 Ion-selective nitrate evaluation

***Measurement specifications***

Meas. range: 0.1 - 50 mg/$NH_4$-N *

* The maximum spread ratio of measurable concentrations is 1 to 50. The exact level of this measuring range is defined by the choice of calibration standards.

| | |
|---|---|
| Ratio reagent - sample water | 1 : 100 |
| Detection limit | 0.1 mg/L $NO_3$-N |
| Error margin | 5% |
| Reagent consumption | 75 ml per day (at 5 ml/min sample flow) |
| $T_{90}$-time | 2 min ** |

** plus an additional idling time, which is determined by the sample preparation of the respective unit

### 10.5.7 Ammonium evaluation with a gas-selective electrode

***Measurement specifications:***

Meas. range: 0.1 - 1000 mg/L $NH_4$-N *

* The maximum spread ratio of measurable concentrations is 1 to 50. The exact level of this measuring range is defined by the choice of calibration standards.

| | |
|---|---|
| Ratio reagent - sample water | 1 : 64 |
| Detection limit | 0.1 mg/L $NH_4$-N |
| Error margin | 4 % |
| Reagent consumption | 110 ml/day (at 5 ml/min sample flow) |
| $T_{90}$-time | 3 min ** |

** plus an additional idling time, which is determined by the sample preparation of the respective unit

| USA | Canada | Mexico |
|---|---|---|
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